Human-Wildlife Coexistence

Recommendations for Improving Human-Wildlife Coexistence in the Bow Valley

Town of CANMORE

TOWN OF Banff

Alberta

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1.0 Executive Summary

The Bow Valley is an increasingly desirable destination for people to visit, live and recreate. This is in part due to its proximity to Calgary, as well as its reputation as a world class tourist destination. Both people and wildlife concentrate their movements along the valley bottoms, which can lead to human-wildlife occurrences, displacement of wildlife from important habitat, and human-caused mortality. Managers in the Bow Valley have taken innovative approaches to improve human-wildlife coexistence through a variety of actions, including improved garbage management, reductions of human use in corridors, highway mitigations, and pro-active education.

However, the movements and management of a young female grizzly bear (GB148) in 2017 highlighted challenges faced by agencies within the Bow Valley. These included enforcement capacity, differing management tools and approaches, continued human activity in wildlife corridors, risks of injury, natural and unnatural foods in developed areas, public communication and a lack of public compliance. In 2017, the Bow Valley Human-Wildlife Coexistence Roundtable tasked a Human-Wildlife Coexistence Technical Working Group to address four objectives:

- Identify current state of human-wildlife coexistence within the Bow Valley by summarizing historical data, current trends, and management tools and practices being used throughout the Bow Valley;
- Identify potential research opportunities to fill knowledge gaps pertaining to human-wildlife coexistence;
- Develop proactive measures to reduce the probability of negative human-wildlife interactions in the Bow Valley; and
- Examine how agencies manage specific incidents of human-wildlife occurrences and achieve cooperation; implement coordination to create consistency where possible; and ensure transparent communication and management.

The Human-Wildlife Coexistence Technical Working Group worked over six months to address these objectives. The working group consisted of technical experts from Parks Canada, Government of Alberta, Town of Canmore, Town of Banff, and several non-governmental organizations. Coexistence was defined as a state stemming from a suite of strategies aimed at balancing the needs of wildlife and humans in the Bow Valley. This includes reducing human use in designated wildlife habitat, excluding wildlife from developed areas, and mitigating negative human-wildlife interactions. The group identified six key areas for improving human-wildlife coexistence in the Bow Valley. These included:

- Trans-boundary Management;
- Wildlife in Developed Areas;
- Habitat Security;

- Food Conditioning and Habituation;
- People Compliance; and
- Wildlife Management.

Within these 6 key issues, the group developed 28 recommendations to improve human-wildlife coexistence. Recommendations were informed by current issues and trends, available data, best practices, expert opinion, and published literature. While the team only included recommendations where consensus was reached, it also identified knowledge gaps and made recommendations for future research and monitoring.

Key strategies for improving coexistence were the following: exclude wildlife from developed areas; improve habitat security in wildlife corridors; reduce human-caused mortality; remove natural and unnatural attractants in developed areas; enhance habitat away from developed areas; increase capacity for enforcement; improve interagency collaboration; and improve communications. Implementation of the recommendations will require additional resources and public consultation.

2.0 Introduction

This report and the recommendations included were developed at the request of the Human-Wildlife Coexistence Roundtable (the Roundtable) and through the technical expertise of the Human-Wildlife Coexistence Technical Working Group (the Technical Working Group).

How to use this report:

This report provides expert advice to improve human-wildlife coexistence in the Bow Valley. Decisions on how and when to apply any of these recommendations will vary among different jurisdictions depending on their priorities, challenges, opportunities and constraints. Some actions may require extensive consultation, while others may be readily implemented by various jurisdictions.

2.1 Vision and Priorities

Vision:

Wildlife in the Bow Valley is able to effectively utilize natural habitats with minimal human disturbance and seldom ventures into developed areas such as town sites and campgrounds.

Visitors and residents maintain year-round opportunities to undertake a wide range of outdoor activities in support of a healthy lifestyle within the Bow Valley, and understand their roles and responsibilities in learning how to avoid occurrences with wildlife, consistently adhere to best practices, and comply with human-use zoning strategies and legislation, aimed at providing wildlife with habitat security where and when it is needed.

Key wildlife species, such as elk and large carnivores, seldom intrude into developed areas, which are areas prioritized for human use such as residential areas, campgrounds, day use areas (picnic sites), industrial landscapes, and urban green-spaces. When wildlife intrusions do occur, they are immediately reported by an informed public, and quickly resolved with minimal impacts to people and wildlife.

Human-wildlife coexistence is coordinated and integrated among the responsible agencies and the public understands and supports these efforts.

Priorities:

- Reducing negative interactions between people and wildlife, particularly in developed areas;
- Restoring or maintaining habitat effectiveness for wildlife in the Bow Valley;
- Supporting safe, responsible recreation, active lifestyles, and enjoyment of the natural environment by residents and visitors in the Bow Valley; and
- Public transparency in decision making and policy approaches.

2.2 Principles and Governance for the Technical Working Group

The Technical Working Group upheld the following principles during development of this report:

- Consensus-based decision making: The Technical Working Group is comprised of municipal, provincial, federal and non-governmental organizations, environmental, planning, and communication specialists, and was not assembled to reflect proportional representation. Consensus decisions were based on sharing of scientific data, operational experiences, best practices and expert opinion;
- Open, honest, direct, respectful communication: Collectively the Technical Working Group comprised individuals with well over one hundred years of experience in management wildlife and related human use. An environment of mutual trust and respect allowed participants to engage in difficult discussions and share knowledge and experiences to better inform the outcomes of this process; and
- Evidence-based decision making: For each recommendation, the group challenged one another to provide solid data, expert knowledge and/or local Bow Valley experiences, to support both the importance of addressing a particular problem and the expected level of success of the proposed solution.

2.3 Objectives

- Identify current state of human-wildlife coexistence within the Bow Valley by summarizing historical data, current trends, and management tools and practices being used throughout the Bow Valley;
- Identify potential research opportunities to fill knowledge gaps pertaining to human-wildlife coexistence;
- Develop proactive measures to reduce the probability of negative human-wildlife interactions in the Bow Valley; and
- Examine how agencies manage specific incidents of human-wildlife occurrences and achieve cooperation; implement coordination to create consistency where possible; and ensure transparent communication and management.

2.4 Technical Working Group Scope

The Technical Working Group was tasked with assessing the current state of human-wildlife coexistence in the Bow Valley and providing the Roundtable with recommendations to effectively decrease the probability and severity of negative wildlife encounters, and reduce risk for people and wildlife based on credible literature, available data and expert opinion. The Technical Working Group was not asked to provide specifics of implementation associated with land use

planning, as this is future work that will require considerable public input. The scope of the work was to provide expert information to allow land managers to consult and plan effectively, by understanding key challenges in reducing risk related to human-wildlife incidents, and recommend solutions to mitigate these challenges.

Spatially, the scope was constrained to the portion of the Bow Valley extending from Castle Junction in Banff National Park, downstream to the confluence with the Kananaskis River near Seebe (Figure 1).

Temporally, assessment was focused on data and trends using the best data available (e.g., 20+ years of winter wildlife corridor tracking and agency occurrences data) to better understand changes over time and how these influence the current condition. Recommendations extend for over 10 years (Table 1).

Table 1. Suggested Timeline for Initiating Recommendations

Suggested Timeline for Initiating Recommendations		
Short term	Medium term	Long term
1 – 5 years	6 – 9 years	10+

Given the short window of time to develop this technical summary, the Technical Working Group was not tasked with incorporating Traditional Ecological Knowledge. In the future, this important information is envisioned to be incorporated through the involvement of indigenous subject experts by the Roundtable. The roundtable members reached out to several indigenous representatives and they agreed that this approach was better suited to gathering and sharing Traditional Ecological Knowledge.

The Technical Working Group did not attempt to incorporate input from various human use organizations or user groups (e.g., bikers, hikers, skiers) to better understand the potential impacts of applying various recommendations in a given setting. Public consultation and land-use planning was beyond the scope of the Technical Working Group, whose task was to provide an evaluation of “what’s working, what isn’t”, and the most effective solutions that can be expected to work, based on expert opinion and best available data of interactions between people and wildlife.

The Technical Working Group is a diverse team of wildlife management and communications experts. Its recommendations are intended to be applied in each jurisdiction in a manner consistent with that setting, and although there will be future discussion as to exactly where or how much change is needed, these recommendations should withstand technical scrutiny regarding their relevance and effectiveness.

2.5 Bow Valley

The Bow Valley is situated in the Front Ranges of the Rocky Mountains, 100 kilometers west of Calgary, Alberta. The study area includes lands within the Bow Valley from Castle Junction in Banff National Park east to the Kananaskis River. The valley is bordered by federal and provincial parks, and protected areas. These include Banff National Park, Bow Valley Wildland Provincial Park, Canmore Nordic Centre Provincial Park, Spray Lakes Provincial Park, and Bow Valley Provincial Park (Figure 1). Other public lands include Alberta Forest Reserve. Towns within the Bow Valley include Banff and Canmore. Hamlets within the Municipal District of Bighorn include Exshaw, Harvie Heights, Lac Des Arcs and Deadman's Flats. The Settlement of Little Kananaskis also lies just east of Exshaw within the Municipal District of Bighorn.

The natural vegetation of the valley is dominated by dense fire-origin coniferous forest cover. The Bow Valley, particularly lands along the valley bottom, are generally considered high quality habitat for wildlife. Topography ranges from flat land along the Bow Valley bottom to steep mountainside terrain on either side of the valley (Walkinshaw, 2002).

Animal movement is fundamental for ecosystem function and species survival. Throughout the Bow Valley, the ability to support wildlife has been reduced by the loss, fragmentation, and alteration of key habitats due to human development. To ensure the safe passage of wildlife through the Bow Valley, federal, provincial, and municipal agencies have identified wildlife corridors to guide planning.

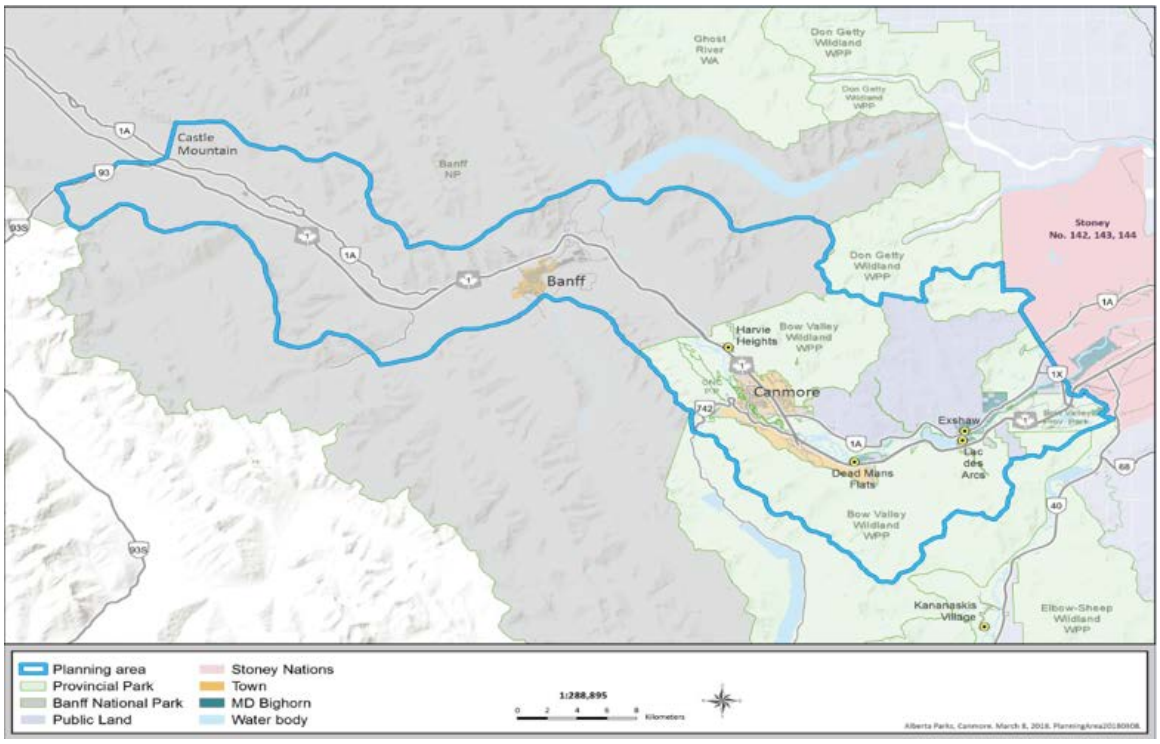

Figure 1. Bow Valley Human-Wildlife Coexistence Technical Working Group Study Area

2.6 Roles and Responsibilities in Human-Wildlife Coexistence

The Bow Valley is jurisdictionally comprised of the following federal, provincial, and municipal government agencies, working closely to ensure human and wildlife management is delivered as effectively as possible: Parks Canada, Government of Alberta, Town of Banff, Town of Canmore and the Municipal District of Bighorn. Beyond these agencies, there are many partners involved in human wildlife management in education, advocacy and human use.

Parks Canada

Banff National Park is part of a national network of federally protected heritage areas managed by the Parks Canada Agency. These lands are managed in accordance with the Canada National Park Act and Regulations, and guided by the Banff National Park Management Plan (renewed every 10 years). Banff National Park (BNP) is operationally split into two separate Field Units known as the "Banff Field Unit" and the "Lake Louise, Yoho and Kootenay Field Unit". For the purpose of this report, the entire study area falls within the portion of BNP managed by the Banff Field Unit. Wildlife management within Banff Park is led by the Resource Conservation function, while visitor management, infrastructure and services within the park (e.g., campgrounds, day-use areas, entry gates, interpretation programming) is led by the Visitor Experience function, in cooperation with the External Relations function, which focuses on media relations and outreach. Enforcement is conducted by Park Wardens who report to the national Law Enforcement Branch.

Government of Alberta

The Government of Alberta is responsible for wildlife management in Alberta. Alberta Environment and Parks - Wildlife Policy and Operations staff work to deliver sound policy to manage wildlife and improve wildlife coexistence, including the delivery of proactive human-wildlife occurrence mitigation. Human-wildlife occurrence response and enforcement on non-protected lands is the responsibility of the Justice and Solicitor General Ministry - Fish and Wildlife Enforcement Branch, while Alberta Environment and Parks - Parks Division, is responsible for human-wildlife occurrence response and enforcement on protected area lands. These various government agencies work closely to ensure human-wildlife occurrence management is delivered as effectively as possible.

Town of Banff

The Town of Banff is the local government authority for the Banff townsite located within Banff National Park. The Town delivers a range of municipal services including land use planning, bylaw enforcement, and waste management. The management of wildlife within the Town remains the responsibility of Parks Canada.

Town of Canmore

The Town of Canmore is responsible for controlling wildlife attractants and managing human use within the municipal boundary through the use of municipal bylaws, land use planning and local enforcement.

Municipal District of Bighorn

The Municipal District of Bighorn is responsible for managing the private land component using municipal bylaws, land use planning and local enforcement within the municipal district.

3.0 Technical Working Group Methodology

3.1 Key Methodology

Facilitated Process

The facilitation process supported the work of the Technical Working Group by:

- Building investment in the process and deliverables;
- Fostering positive working relationships among members;
- Determining interconnections among jurisdictions;
- Creating clarity on previously held assumptions;
- Generating ideas to build content;
- Striving for consensus as voting would have assumed representation by individual interests; and
- Developing processes for constructively clarifying and resolving differences.

Bi-weekly meetings were held between November 2017 and May 2018.

Identifying Issues and Developing Content

After several initial meetings to share information and gain perspectives from all jurisdictions, the Technical Working Group identified six main topics for exploration: Trans-boundary Management, Wildlife in Developed Areas, Habitat Security, Food Conditioning and Habituation, People Compliance and Wildlife Management. These topics were assigned to a series of smaller working groups to further develop issues and recommendations. Eventually, a chairperson for each sub-group drafted much of the content contained in this report and worked with their sub-group and the entire Technical Working Group to revise and edit the content.

Terminology

Many of the terms used to describe interactions between people and wildlife vary substantially among, and even within, the partnering agencies. Inconsistent use of terminology for describing human-wildlife occurrences makes it difficult to compare issues across jurisdictional boundaries and can cause further confusion when communicating these issues to the public. These problems are amplified when inconsistent terminology is perpetuated in the media. Effective and consistent communication amongst agency personnel and the public, when speaking about the successes and failures of human–wildlife management programs, will increase the effectiveness of human-wildlife coexistence programs (Hopkins et al. 2010).

To communicate more effectively, terminology will need to be standardized; terms and concepts used in human-wildlife management are clearly defined and used in a consistent manner within this report. The Technical Working Group adopted a standard lexicon published for bear management (Hopkins et al 2010) with a few modifications to better suit the context of the Bow Valley, newly emerging concepts and terminology, and focal species of this report. While the past and present application of these terms may vary by agency, agency mandate, species, location and available resources, a more consistent approach and a communications plan is evolving (see Recommendation 20 in Section 4.6: People Compliance). A glossary of terms used in the report is included as Appendix A.

3.2 Species Analysis

Species analyses were based on current literature, local data, and wildlife managers' experiences managing these species in the Bow Valley. Based on historic experience and expert opinion, these priority species were chosen based on the level of human risk. Species considered in the Bow Valley human-wildlife coexistence analysis included the following:

- Grizzly bear (Ursus arctos);
- Black bear (Ursus americanus);
- Cougar (Puma concolor);
- Elk (Cervus canadensis);
- Wolf (Canis lupus); and
- Coyote (Canis latrans).

For each of these species, an exercise to summarize key data related to the life history, behaviours, management strategies and constraints related to each species was completed. For the purpose of this report the term "wildlife" refers to these six species, rather than the full complement of wildlife species that occur in the Bow Valley.

See Appendix B: Species Analysis for these summaries.

3.3 Data Resources

Data resources were compiled from the following agencies:

- Parks Canada;
- Government of Alberta;
- Town of Banff;
- Town of Canmore; and
- WildSmart.

4.0 Human-Wildlife Coexistence Current State and Recommendations

4.1 Overview

The Bow Valley is characterized by rugged mountainous terrain and flat valley bottoms. Historically, the entire Bow Valley was likely a broad travel corridor partitioned into a network of wildlife trails at different elevations and habitats. The primary travel routes for many wildlife are along the banks of the Bow River and the vast majority of natural biodiversity is located within the floodplain (Hauer et al, 2016). Human use and development have also concentrated on these valley bottoms. As a result, much of the best quality flat and gently sloping wildlife habitat is occupied by urban development and bisected by highways, secondary roads, railways, and power line corridors. Some of the lands not designated for development have been set aside as wildlife corridors and habitat patches to facilitate wildlife movement through the Bow Valley and to provide habitat security, respectively.

The Bow Valley's proximity to Calgary along with its reputation as a world class tourist destination have made the area desirable for people to reside, visit, and recreate. This results in increasing human pressure on wildlife and the environment within the Bow Valley. As human use in the valley increases, so does the probability of encountering wildlife and the likelihood of human-wildlife incidents. At higher densities, human use can reduce wildlife habitat effectiveness by displacing wary carnivores and restricting their ability to move between habitats.

An increase in human presence and use on the landscape requires increased levels of enforcement and compliance if human-wildlife coexistence is to be achieved. Currently, enforcing compliance of human-wildlife based legislation such as wildlife attractants, dogs' off-leash and entering officially closed areas (a management action put in place to ensure the safety of humans and wildlife) is challenging. Efforts to enforce non-compliant behaviours and actions are limited due to insufficient resourcing and differences in legislation amongst jurisdictions (Figures 2 and 3).

Permanent Population - Census of Canada

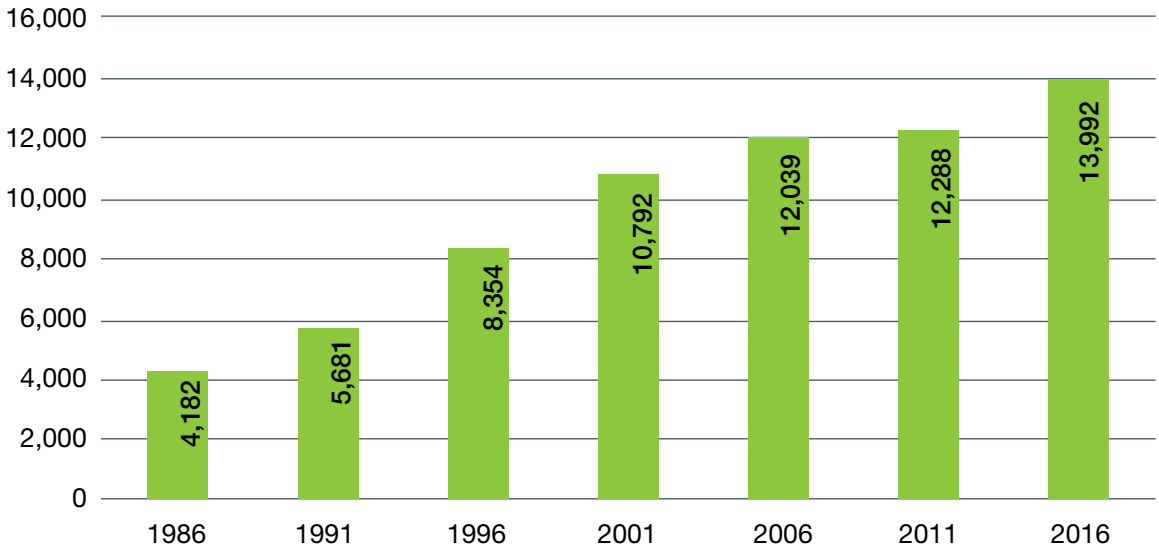

Figure 2. Population growth of Canmore from 1986 to 2016

Town of Banff Vehicle Volumes - 2014 to 2017

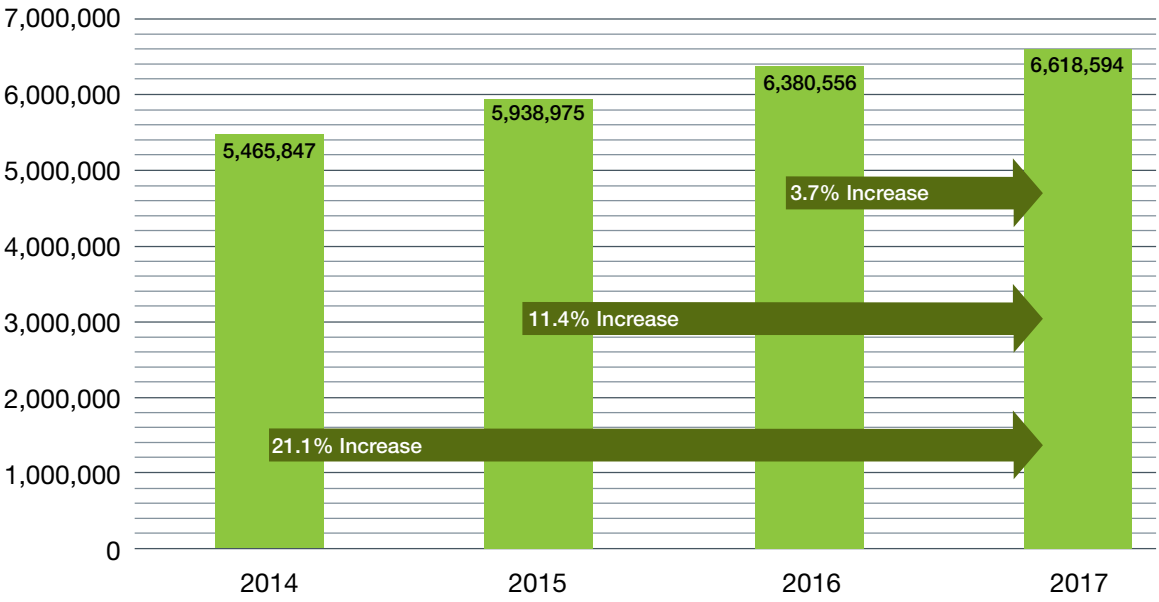

Figure 3. Visitation growth in Banff townsite from 2014 to 2017

Local communities and various levels of government have taken a very proactive approach to implementing programs to provide opportunities for people to live, work and recreate in the Bow Valley, while ensuring wildlife are able to feed and rear their young and safely move through the valley. In many cases, the programs created here are considered to be on the leading edge of wildlife conservation management worldwide. The film Living with Wildlife chronicles some of these efforts over the last twenty years. The Bow Valley has been described as one of the busiest landscapes in North America where grizzly bears continue to exist (Gibeau 2001).

Even with these advances in human-wildlife occurrence mitigation, the challenges continue. This report further exemplifies the commitment by the people of the Bow Valley to continue to strive towards finding a balance between human use and a healthy ecosystem for wildlife.

The Technical Working Group identified six key issues requiring additional effort, to improve human-wildlife coexistence in the Bow Valley.

- Trans-boundary Management;
- Wildlife in Developed Areas;
- Habitat Security;
- Food Conditioning and Habituation;
- People Compliance; and
- Wildlife Management.

Falling out of these six key issues are 28 recommendations that will inform municipal, provincial and federal land managers and public of changes that can be made in the Bow Valley to reduce the probability and severity of human-wildlife interactions. These recommendations were developed by reviewing current issues, trends and best practices, and by considering expert opinion within the working group and in the published literature. Only recommendations where consensus was reached were included, indicating full support from this team of subject experts. Comment is not provided on mitigations deemed unreasonable or ineffective (e.g., mandatory wearing of bear bells when hiking), but key knowledge gaps are identified and recommendations made for future research and monitoring.

The role of the Technical Working Group was to provide a list of recommendations that can be effective, if well implemented. Implementation of these recommendations will require public engagement to influence “where” and “when” and “how much”, and will require a strategic and prioritized approach. The adoption of an “adaptive management” cycle is proposed, with initial efforts focusing on implementing strategies that are readily achievable; these priority solutions should become evident through the next phase which includes consultation, design and setting targets. This report provides much of the material needed in the “assessment” stage of adaptive management (Figure 4).

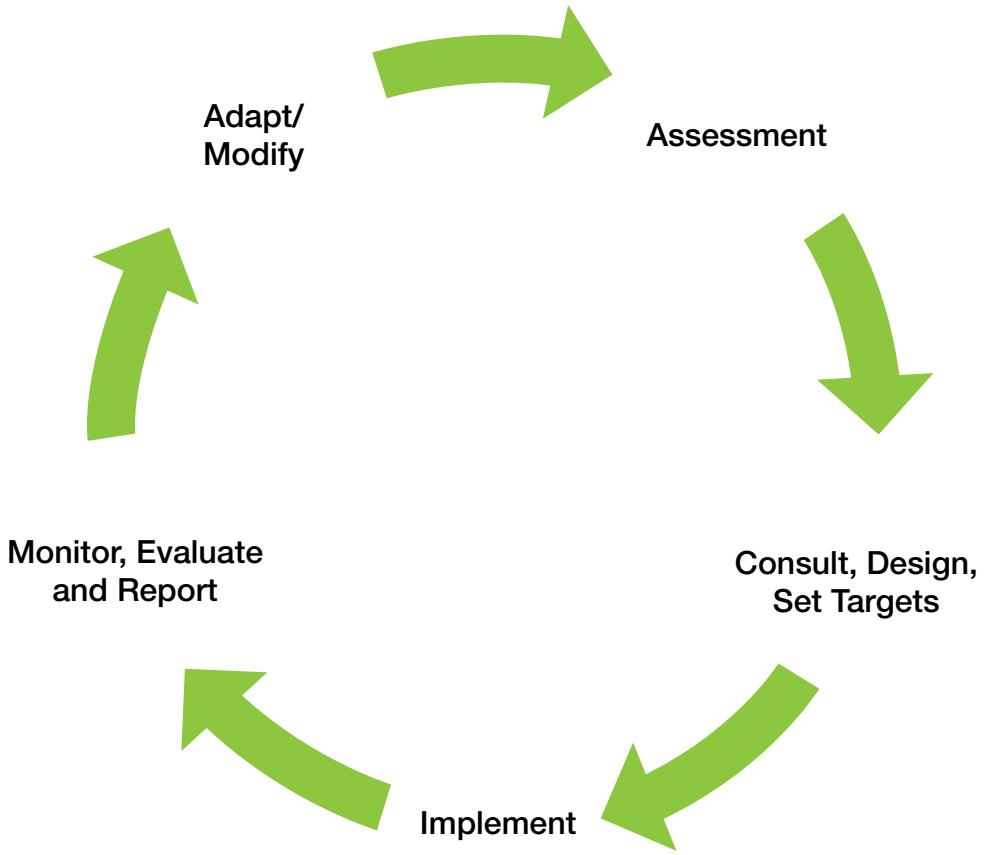

Figure 4. Adaptive Management Cycle for the report, currently in Assessment stage.

There will be questions of “how much is enough?” For example, do all garbage cans need to be bear proof, or would 80 per cent be enough to keep bears from seeking garbage? These become risk management decisions, and “more is better” often applies. One must weigh the risks associated with an incomplete effort. Conversely, achieving 100 per cent effectiveness may provide increased certainty, but at what cost (financial, social, and ecological)?

Another key consideration is ensuring a balanced approach, where potentially unintended consequences (e.g., displacement of human use) are assessed and mitigated. For that reason, timelines are suggested for initiating the recommendations: short term (1-5 years), medium term (6 – 9 years) or long term (10+ years) (Table 1). It is acknowledged that this timing may be affected by operational constraints and logistics.

The Technical Working Group has also provided guidance regarding “measures of success” that will help managers understand if initial mitigations are resulting in meaningful outcomes for people and wildlife, or if more effort is required. Many of these will require a more thorough evaluation as frequency of incidents are often impacted by population level changes in wildlife abundance, food availability or human use levels (Johnson, et al., 2015).

In almost all cases, additional resources (e.g., capital funding, staffing, contracted work, and partnerships) will be required if recommendations are to be implemented effectively, so rather than repeating this consideration for each recommendation, it is assumed that strategies for providing additional capacities will be consulted on, and addressed (funded) as part of each implementation plan.

4.2 Trans-Boundary Management

Current State

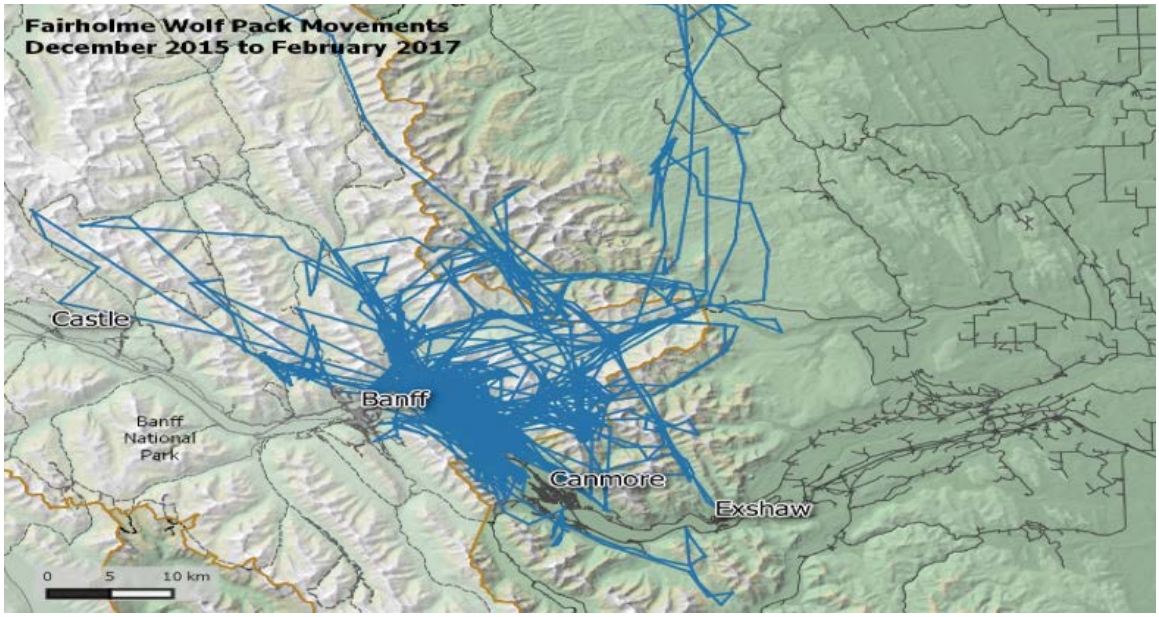

Figure 5. Radio telemetry data showing the wide ranging movements of the Bow Valley's Fairholme wolf pack.

Jurisdictionally, the Bow Valley is a mosaic of federal, provincial, municipal lands including privately-owned lands (Figure 1). As a result, wide-ranging animals like wolves may cross multiple jurisdictional boundaries on a seasonal or even a daily basis (Figure 5). In the case of grizzly bears, the best chance of persistence must include provincial lands and National Parks (McLellan, 1999) and requires a cooperative and coordinated approach across agencies (Gibeau, 2001).

Inconsistent approaches to wildlife management amongst jurisdictions can create challenges for wildlife that move across these boundaries on a daily or seasonal basis. For example, highly habituated wildlife may face increased risks of traffic or hunting mortality when they leave protected areas (where major highways are mitigated and hunting is illegal). Ensuring consistent approaches to wildlife management, where possible, allows for an increased predictability for wildlife and may improve the chances of success for any particular management strategy.

Similarly, residents and visitors in the Bow Valley are often equally challenged to understand and comply with regulations or best practices, and this is exacerbated by real or apparent inconsistencies among jurisdictions. If land managers are to reduce the probability of negative human-wildlife interactions, consistent and seamless "messaging" will need to be provided for both wildlife and visitors. Where possible, management approaches need to be coordinated, and where differences are warranted, the rationale for such differences must be articulated. This coordination will require increased capacities, as well as improved mechanisms for building and maintaining relationships between policy makers and practitioners of people and wildlife management in the Bow Valley.

Current Mitigations

There are many examples of positive communications and processes related to wildlife management that cross jurisdictions within the Bow Valley. These include the adoption of bear proof garbage bin standards, urban fruit tree removal programs, highway fencing and wildlife crossing structures, and the development and adoption of consistent Area Closure (red) and Area Warning (yellow) signs to improve consistency in communications (Figure 6).

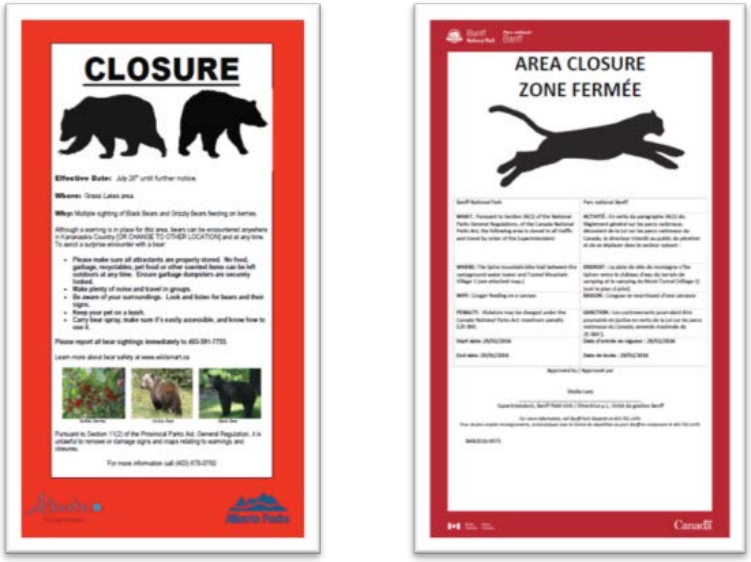

Figure 6. Examples of area closure notices using similar templates to increase recognition and understanding. Government of Alberta (left) and Parks Canada (right).

However, there are also areas where consistency amongst agencies may be improved. In some cases, human-wildlife issues are managed differently due to current policies, available tools (e.g., legislation) or because of limited capacity and resources. Examples of differences include policies and approaches for managing roadside viewing of wildlife, use of wildlife translocations as a management tool, application and enforcement of area closures to provide habitat security for wildlife, and expectations that wildlife will remain wary when their home range is centered on the Bow Valley.

Recommendations

1. **Continued Cooperation and Coordination – The Technical Working Group recommends improving mechanisms to allow wildlife and human use management staff in the Bow Valley to more readily participate in supporting or delivering cross-jurisdictional human-wildlife coexistence responses where and when appropriate (Short Term).** This may require development or amendment of Memorandums of Understanding, mutual aid agreements, and/or legislation, and will require increased coordination and cross-training between jurisdictions.

2. **Multi-Agency Training – The Technical Working Group recommends implementing annual opportunities for joint training initiatives between human and wildlife management professionals (Short Term).** This training will help maintain relationships and allow field staff to develop personal knowledge of neighboring jurisdictions (geography, operations, procedures, etc.) while better preparing teams to work together during both proactive efforts and reactive incidents.

3. **Ongoing Collaboration – The Technical Working Group recommends establishment of a permanent group to coordinate efforts, provide continuity and critical support in the consultation, and refine and implement these recommendations (Short Term).** This Technical Working Group will:

    - Support the communication, consultation, engagement, and implementation of these recommendations;

    - Meet regularly to maintain relationships, prepare for, and debrief following peak operating seasons, discuss emerging issues, and coordinate proactive responses;

    - Cooperatively review and debrief effectiveness of current tools, policies and programs, across jurisdictions, to identify best practices, opportunities for increased consistency in management, and coordinated education and communication programs, and to identify knowledge gaps;

    - Collaborate on cross-jurisdictional academic research needed to address key knowledge gaps; and

    - Prepare an annual summary to ensure consistent public reporting of key human-wildlife coexistence data, and related incidents.

4. **Leadership – The Technical Working Group recommends the Human-Wildlife Coexistence Roundtable continues to meet, at least annually, to provide direction to the proposed Technical Working Group and to review annual reporting and recommendations provided by the Technical Working Group (Short Term).**

Measures of Success

- Increased cooperation, coordination and communication among jurisdictions;
- Increased consistency in messaging to the public related to human-wildlife coexistence;
- Increased compliance with management tools such as travel restrictions, public wildlife reporting, or area closures; and
- Continued support for the implementation of recommendations by the Technical Working Group.

4.3 Wildlife in Developed Areas

Current State

A variety of wildlife travel into and throughout the Bow Valley. Wildlife can often be seen using developed areas, including townsites, campgrounds and picnic areas at various times of the year. They can be drawn into these developments for a variety of reasons including searching for both unnatural (garbage, domestic fruit trees, domestic prey) and natural (berry bushes, wild prey) attractants and for the security these developments can provide from predators. They may also move through developments when the location is deemed to be preferable to the alternatives, an example being a townsite or campground adjacent to a river in the valley bottom.

The presence of wildlife within developed areas causes public safety concerns. Spring elk calving within townsites, for example, continues to attract grizzly bears which key in on young elk calves as an important early season food source. Human incidents with elk form the greatest number of occurrences in Banff National Park, although Parks Canada's active management of this risk, through elk removals and increased education in the late 1990's, has significantly reduced the frequency and severity of incidents (Figure 7). Elk are becoming an increasing concern in Canmore as they continue to utilize golf courses, playing fields, school yards, and other green spaces in the town.

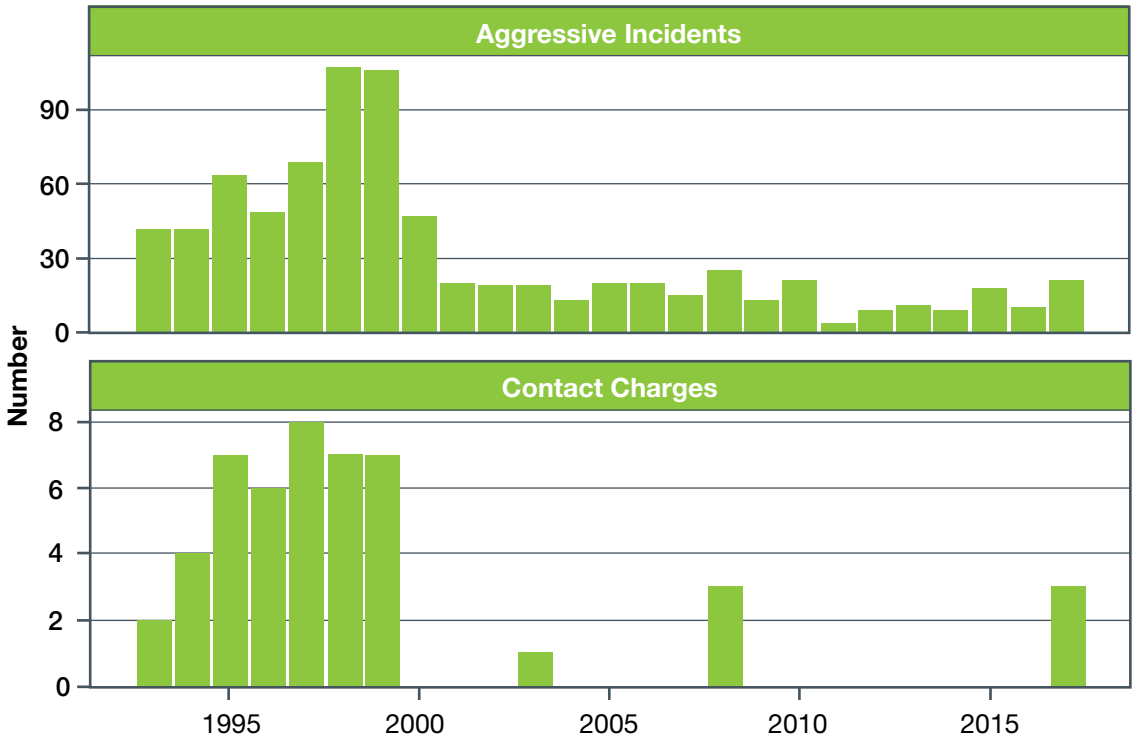

Figure 7. Human-wildlife occurrences with elk in Banff National Park.

Use of developed areas can often result in wildlife becoming habituated and/or food conditioned, resulting in human-wildlife occurrences (Figure 8). This can result in the animal being translocated or in some cases destroyed. Determining the probability of human caused adult grizzly bear mortality is related to the rate of contact with people and the potential lethality of each encounter (Mattson et al, 1990).

This suggests that wildlife and people do not mix well. Developed areas need to be managed for people and they should not be considered a place for wildlife. Discouraging the use of existing developed areas by wildlife, keeping new development out of identified wildlife corridors and habitat patches and seeking opportunities to remove misplaced development from areas intended for wildlife will reduce human-wildlife occurrences, increase efficacy of wildlife corridors, and improve overall viability of wildlife in the valley.

Many Bow Valley residents enjoy seeing ungulates, feral rabbits, and even large carnivores in their backyards and neighbourhoods, as it forms part of their identity as Bow Valley residents. The greatest challenge in this set of recommendations will be to help residents and visitors understand why wildlife are hiding or foraging in town and that this undesirable behaviour inevitably places the wildlife and others at risk.

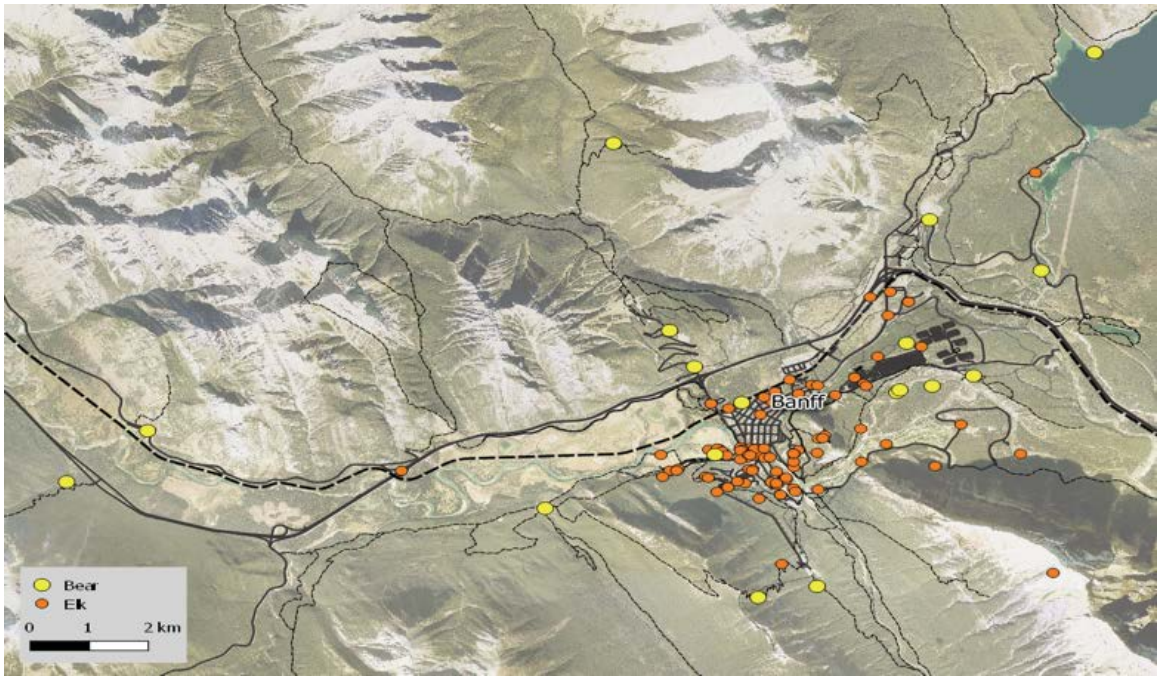

Figure 8. An example of the spatial distribution of aggressive bear and elk incidents near the Town of Banff between 2008 and 2017.

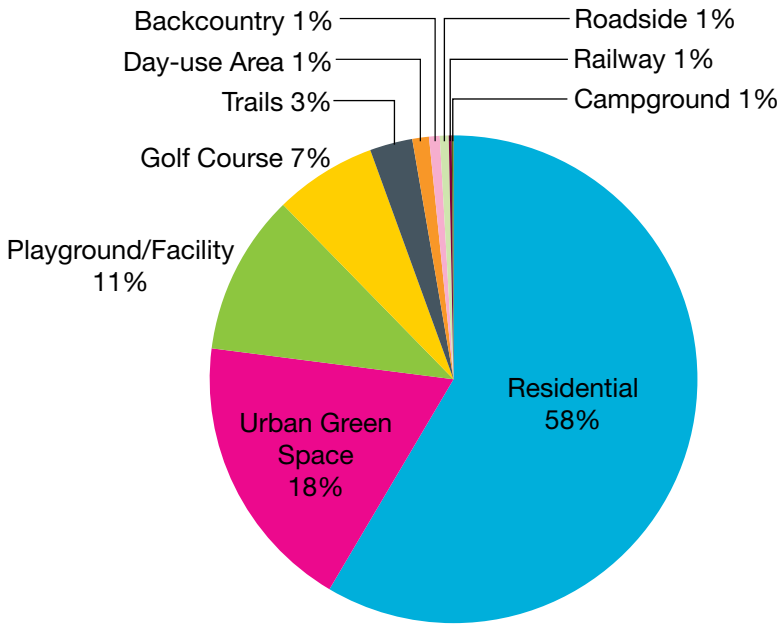

Figure 9. Human-bear occurrences in Provincial Bow Valley data by land use, 1998 to 2016 (N= 2,542).

There is consensus among wildlife managers that wildlife need to be discouraged from using developed areas. In the provincially managed area of the Bow Valley the vast majority of occurrences exist within developed areas (Figure 9). There have been a number of programs that have attempted to remove the incentive for wildlife to come into developed areas. Much of this focus is around the removal or securing of unnatural and natural attractants within developed areas.

There are programs in place across jurisdictions that have been successful in securing or removing unnatural foods such as buffalo berry (Shepherdia canadensis), red-osier dogwood (Cornus stolonifera), and chokecherry (Prunus virginiana) from within developments. They include the creation of wildlife attractant bylaws and fruit tree removal programs. The towns of Banff and Jasper have fenced school yards, which has helped to reduced elk occurrences in those areas (Fyten, 2018). In the community of Waterton (and in the past, the town of Banff), contracted dog handlers are used to efficiently haze ungulates out of urban areas to avoid direct conflicts and attracting predators into town.

In Banff National Park in 1981, Park officials developed a bear proof garbage bin (Figure 10) that revolutionized how waste was managed in bear country across North America (Herrero, 2018).

Figure 10. An example of a bear proof waste management container as part of the regional waste management system.

The Town of Canmore, Municipal District of Bighorn and Kananaskis Country followed suit in the late 1990's, making the Bow Valley a leader in bear proof waste management systems. Over thirty-five years later, there has been very little change to the original design. Occurrences related to garbage have been significantly reduced during this time (Figure 11).

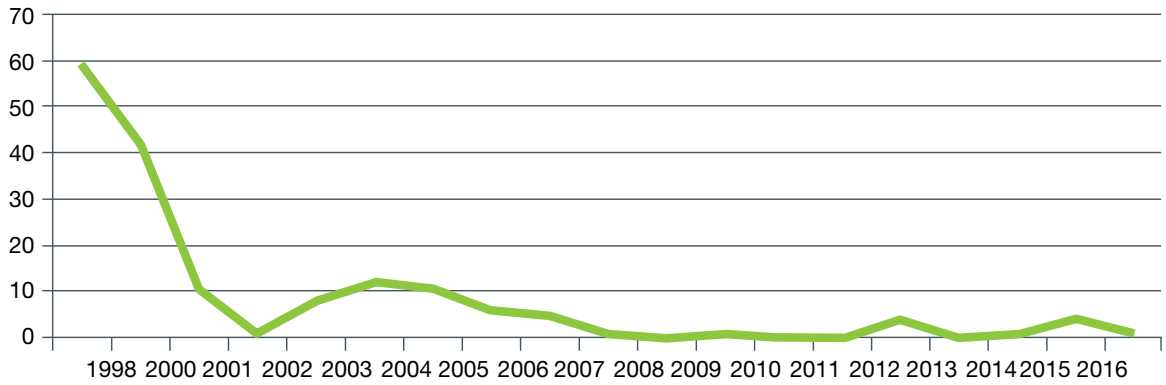

Figure 11. Decrease in garbage related bear occurrences in Canmore following the introduction of bear-proof garbage bins in 1998.

Recommendations

5. **Education - The Technical Working Group recommends educating the public as to the rationale for the need to keep wildlife out of developed areas, thereby reducing human-wildlife occurrences (Short Term).**

6. **Enforcement – The Technical Working Group recommends increasing enforcement capacity in developed areas to improve compliance regarding unsecured attractants (Short Term).** For example, enforce policies related to attractant bylaws, bear proof bins, dogs off leash and entering closed areas.

7. **Ongoing Assessment - The Technical Working Group recommends reviewing the effectiveness of current initiatives, and best practices elsewhere, to fill knowledge gaps and better inform future management decisions regarding developed area wildlife mitigation (Short Term).** Examples include use of aversive conditioning, attractant removal and relevant municipal bylaws.

8. **Remove Attractants or Exclude Wildlife from Accessing Attractants – The Technical Working Group recommends removing or securing natural and unnatural attractants and removing hiding cover to discourage wildlife activity within developed areas (Short Term).** This includes removal of natural attractants like buffalo berry and elk calving, and unnatural attractants such as fruit trees or feral rabbits. It also includes using fencing to exclude ungulates from grass playing fields and preventing carnivores and prey from accessing cover under decks and sheds.

9. **Reactive Response – The Technical Working Group recommends wildlife management agencies implement or continue programs that encourage public reporting of wildlife in developed areas and conduct routine strategic patrols, to detect and haze key wildlife species (elk and large carnivores) out of urban areas (Short Term).**

Measures of Success

- Reduced annual occurrences of wildlife in developed areas;
- Reduced annual incidents of wildlife accessing species specific natural and unnatural attractants (garbage, birdfeed, buffalo berry, crabapples etc) within developed areas; and
- Reduced management removals from developed areas.

4.4 Habitat Security

Current State

The Bow Valley includes prime, valley bottom montane lands which are extremely rare and highly desirable for wildlife, and which provide critical corridors for wildlife movement. However, much of the valley bottom is taken up by urban and commercial development as well as significant linear human transportation corridors such as the Trans-Canada Highway, secondary highways (Highway 1A Bow Valley Parkway), and the Canadian Pacific Railway. This fragmentation has reduced the ability of the Bow Valley to support wildlife as key habitat is altered by human use, urbanization and facility development. Maintaining and restoring wildlife corridor effectiveness continues to be a challenge throughout the Bow Valley, especially in the face of increasing human use and expanding development.

Many wildlife species require secure habitat away from disturbance to feed, rest, reproduce, and move, all to meet various life history strategies. The lack of secure habitat may result in increased wildlife occurrences in urban areas, increased interactions in human-wildlife interface areas, and increased human intrusions into areas that are closed to protect wildlife. All of these contribute to increased risk of human-wildlife occurrences.

To encourage the separation of wildlife and human development, not only do wildlife attractants and refuge options need to be removed from within the urban footprint, but alternative secure habitat that is comparatively more attractive to wildlife needs to be supplied nearby. This means providing enough secure, quality habitat with low levels of human disturbance, as well as secure movement corridors to allow wildlife to move around, rather than through, urban areas.

> "There is a strong case for preserving these 'secure' areas where grizzly bears will be relatively free from encounters with people; that is, where bears can meet their energetic needs while at the same time choosing to avoid people" (Mattson, 1993). "Providing these wildlife corridors and habitat patches will help reduce the incidences of habituated bears, bears killed in self-defense, and bears removed by management agencies because of unacceptable behaviour" (Gibeau, 2001). "It would also foster the wary behaviour in grizzly bears that most managers consider desirable" (Mattson, 1992).

Issues surrounding how best to manage these areas along with the competing recreational use of wildlife corridors is currently under review in Canmore. It is no longer feasible to manage effective wildlife corridors while accommodating intensive and growing recreational use on those same lands. While development in Banff Park is much more constrained, despite a fixed amount of overnight accommodations, levels of visitation have grown by about 5 – 6 % annually, over the past five years, through increasing levels of day-use.

Predictability is key for successful coexistence – for both people and wildlife. The greater the certainty provided for both people and wildlife, the more success there will be in modifying human and wildlife behaviour to increase separation in space and/or time, thereby reducing human-wildlife occurrences.

The designation of wildlife corridors near the communities of Canmore and Banff (Figures 12 and 13) has helped facilitate wildlife movements around towns and other developments; however, corridor effectiveness depends on a number of factors, including the level of human use within the corridor, the habitat quality within and adjacent to the corridor, and the nature of the corridor itself. The key variables that can be controlled in either identifying or maintaining wildlife corridors are the proximity of human development and levels of human use, respectively. Corridor use can vary considerably in both the timing and frequency of use by carnivores.

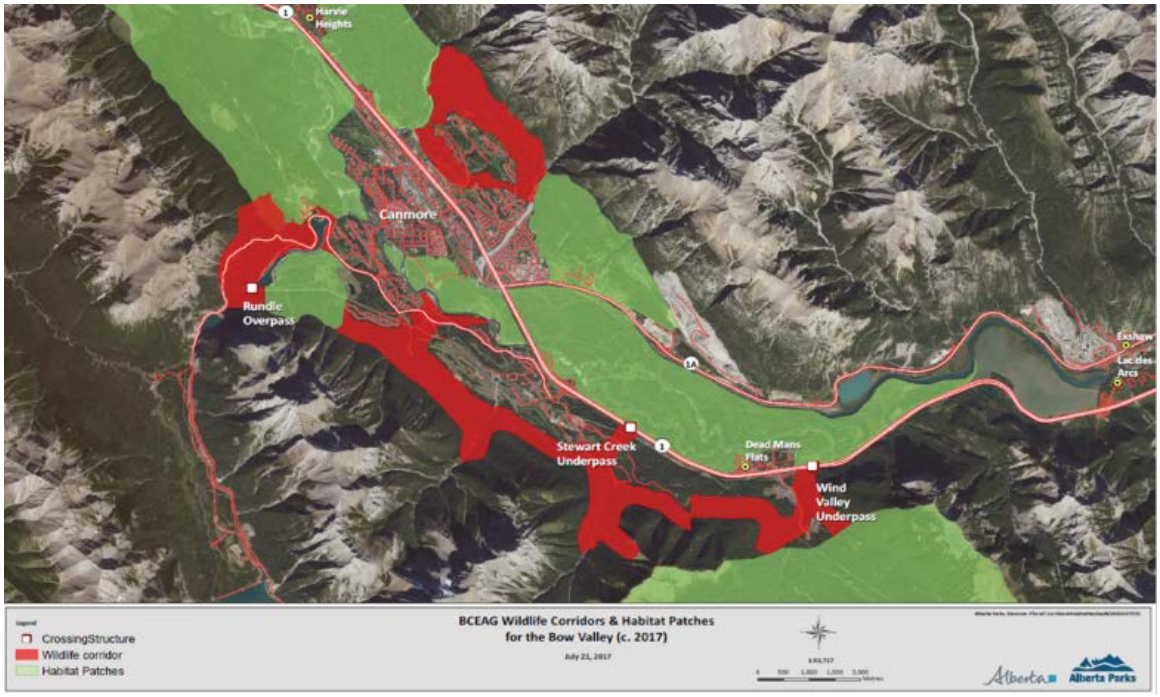

Figure 12. Wildlife Corridors (red) and Habitat Patches (green) in the Bow Valley around Canmore Alberta as determined by the Bow Corridor Ecosystem Advisory Group (BCEAG 2012).

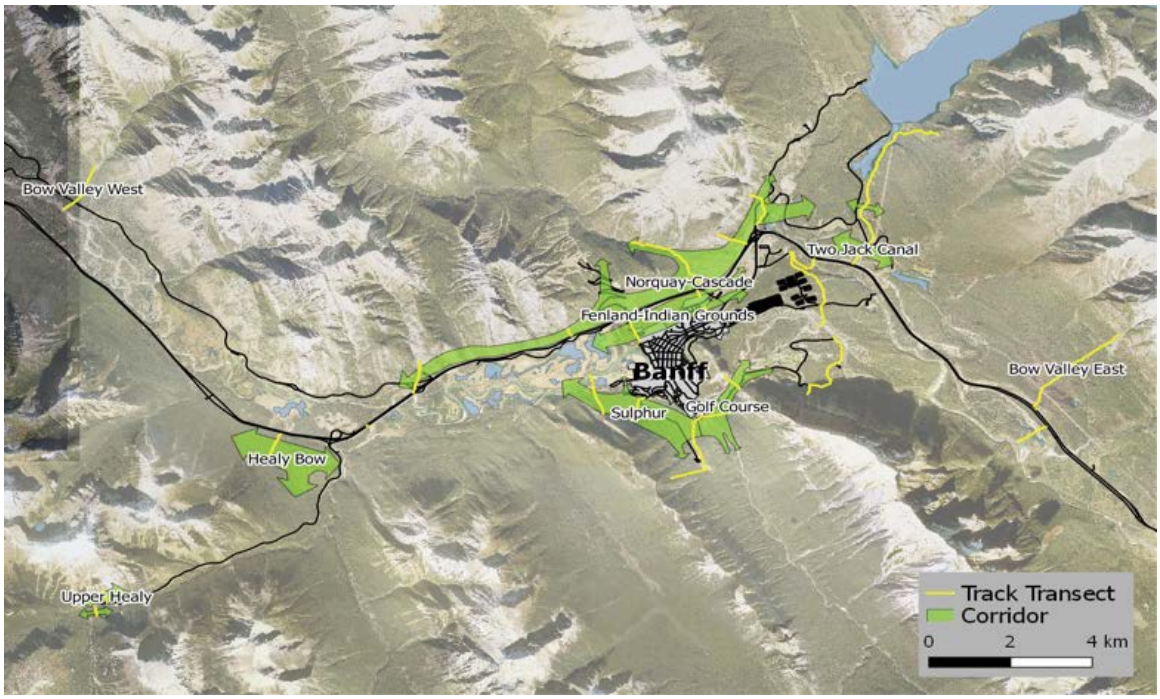

Figure 13. Wildlife corridors (green) and snow transect routes (yellow) used for more than 20 years, to monitor corridor effectiveness around the Town of Banff, Alberta.

Failure to maintain effective wildlife corridors results in long term ecological impacts, by preventing wildlife from moving between habitats; it can also increase the likelihood of wildlife incursions into the communities as they attempt to move within the valley (Figure 14).

Some of the wildlife corridors and habitat patches are also heavily utilized by the public for recreational purposes (Figure 15). A recent Human Use study by the Town of Canmore and Alberta Environment and Parks shed light on the fact that extensive human use in these areas may be negatively impacting the ability of wildlife to use those areas (Hojnowski, 2017). These impacts can also be clearly seen in corridor effectiveness monitoring data, where some corridors in Banff are less frequently used by wary carnivores.

Thresholds for human use in areas designated for wildlife have been established for some species (eg. Banff National Park Grizzly Bear Habitat Security Model) and models for bears, wolverine (Gulo gulo), and other species are being refined as new research is completed (Whittington et al, in prep). Even if human use thresholds are determined, it is not clear if there is an appetite for recreationists to limit their use of an area for the benefit of wildlife. These are difficult questions that need to be resolved.

Managing human disturbance to maintain amounts of natural habitat and connectivity of patches is a well-accepted approach to meet objectives related to ecosystem function and resiliency (Forman, 1995). There is a need for providing security areas where bears can be relatively free

of human disturbance in order to meet their individual requirements (Gibeau, et al., 2001). Thresholds for human use in areas designated for wildlife have been established for some species and models for bears and other species are being refined as new research is completed. One example is the Banff National Park Grizzly Bear Habitat Security Model. “Perhaps the most challenging steps ahead will be implementing new management prescriptions to achieve security for grizzly bears (and other wildlife)” (Gibeau, 2001).

Figure 14. Cougar winter tracking data in the Town of Banff following an intrusion event. Initial track (yellow) when sighting was reported and follow-up track (green) through the “Fenlands/ Indian Grounds Wildlife Corridor”. The cougar showed no signs of seeking or acquiring anthropogenic food sources during this tracking session.

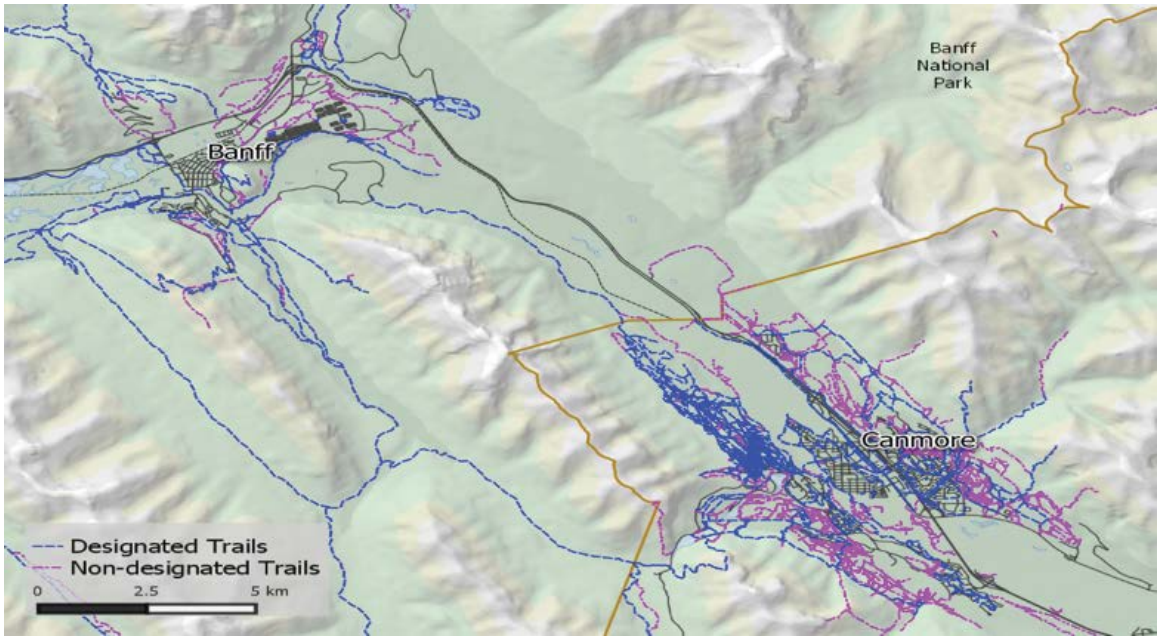

Figure 15. Designated and undesignated trails within the Bow Valley.

Current Mitigations

The first formal wildlife corridor guidelines in North America were developed in the Bow Valley (BCEAG, 1998). In the 1990's, a group consisting of federal, provincial, and municipal agencies identified key characteristics of wildlife corridors and mapped movement corridors and patches to guide planning around Banff and Canmore; these guidelines were recently updated (BCEAG, 2012).

Corridor Restoration

In the late 1990's Banff National Park demonstrated that wildlife corridors can be restored. Along the valley bottom, below Cascade Mountain, wildlife movement around the north end of the Town of Banff was constrained by human use and development including horse corrals, a bison paddock, an airstrip and a Cadet Camp (Figure 16). In response to the Bow Valley Study, most of this infrastructure was removed or relocated by Parks Canada (Page et al., 1996). Long-term monitoring through winter snow-track transects, remote cameras and collared wildlife demonstrate that this corridor restoration has been extremely effective in improving wildlife movement through this area.

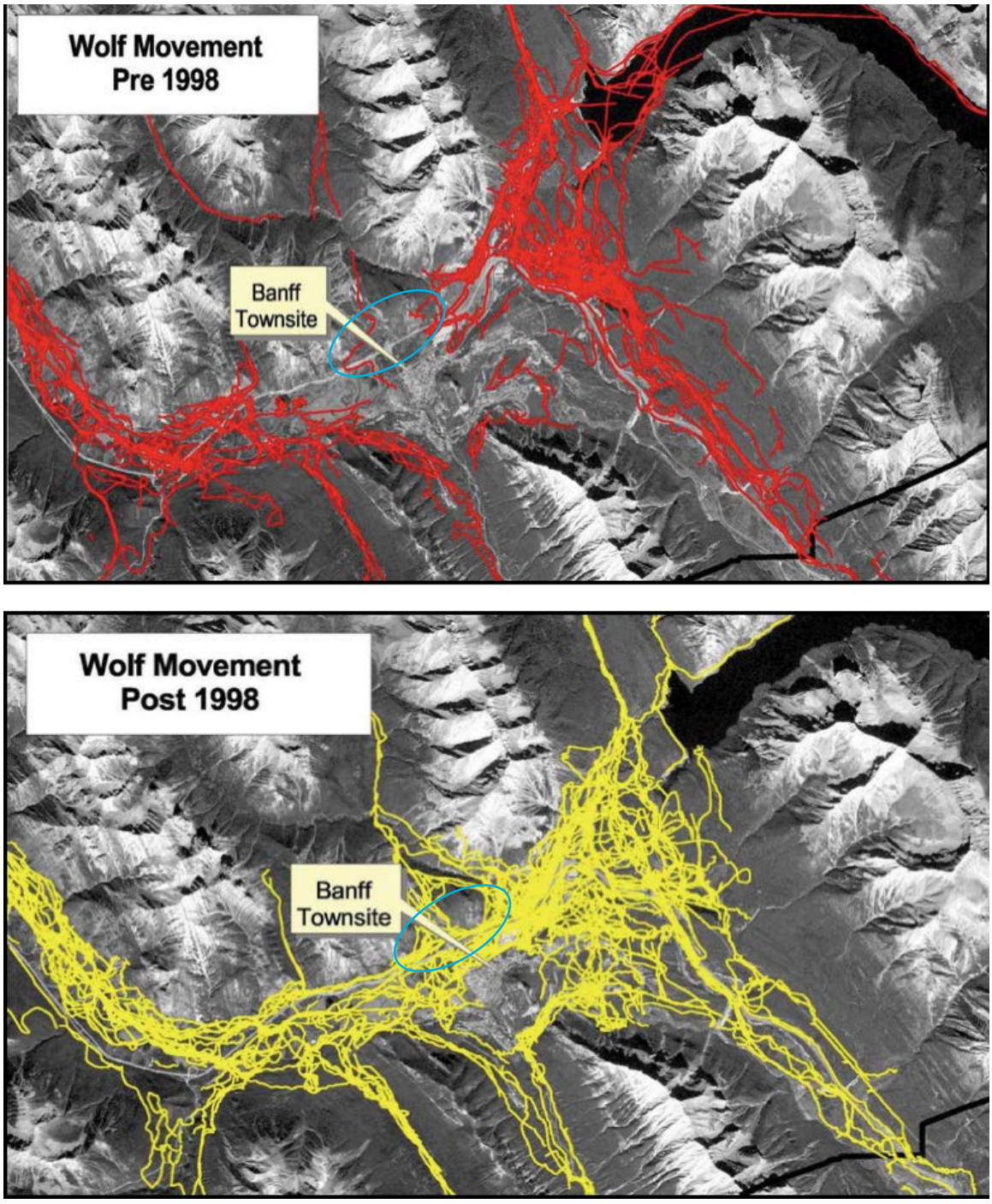

Figure 16. Wolf movement around the Town of Banff, in the Bow Valley of Banff National Park, assessed through winter snow tracking both before (Pre-1998 red) and after (Post 1998) restoration of the Cascade Wildlife Corridor (blue circle).

Human Use Management

In addition to using closures and warnings reactively, in response to hazardous wildlife persisting in an area due to a temporary food resource (e.g., elk calving, kill site, or berry crop) there are many examples of successfully managing human use, in a pro-active manner, to improve habitat quality for wary wildlife, or to provide security at key times of day, or during certain seasons when carnivores are provisioning young. Examples of human use management tools include:

- Annual seasonal closures (e.g., Middle Springs wildlife closure at the south end of the Town of Banff, the Silvertip Corridor Closure, and the winter closure of the Banff Golf Course Road);
- Restricted Trail Access – where hikers are only allowed on trails if travelling in a group of 4 or more persons, carrying bear spray, and without dogs or bikes, to reduce negative encounters with wildlife; and
- Temporal Travel Restrictions such as the Bow Valley Parkway travel restriction where all access is prohibited at key times of year (spring) during the nighttime period (8pm to 8am) each day to allow carnivores to forage and provision their young.

Recent monitoring has demonstrated the effectiveness of many of these efforts. When we are able to provide wary wildlife with predictable patterns of human use, they often respond by taking advantage of windows of time, or specific locations, where human use is reduced.

Habitat Security Mapping and Maintenance

Habitat Security Mapping has been incorporated into the Park Management Plan in Banff National Park for almost two decades. The management target is to improve or maintain levels of habitat security, in numerous smaller sub-units of land, over time. This is a coarse tool, but it does provide a measure to look at the broader picture and understand the importance of offsetting high use areas by securing other areas through human use restrictions (Figure 17). It also provides an appropriate spatial scale to conduct this assessment, as the objective is to maintain relatively high quality habitats across the entire landscape, as much as possible, rather than just in some areas.

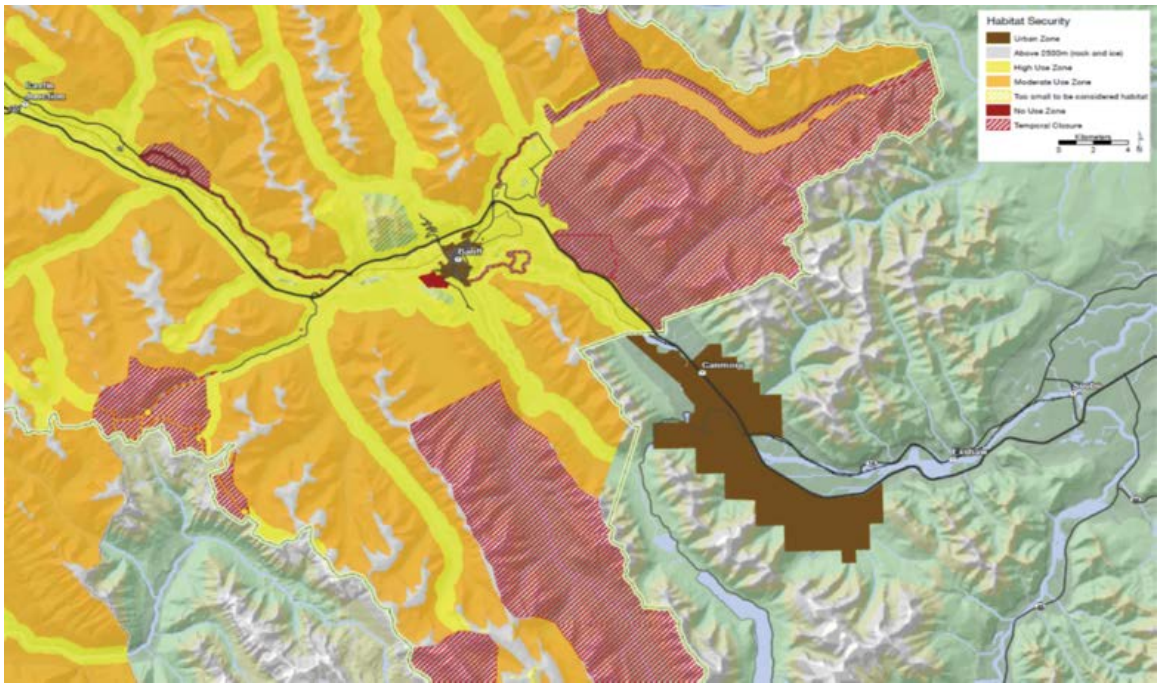

Figure 17. Grizzly Bear habitat security map in the lower Bow Valley of Banff National Park. Brown areas are urban areas (no-go for wildlife), yellow areas are non-secure due to high human use, orange areas are secure, red areas are closed to human use (secure).

Table 2. Example of Habitat Security Mapping Zones and Likelihood of Wildlife Interactions.

Zone	Human Use	Wildlife	Human-wildlife Interactions	Map Colour
Urban Zone	Current developed human footprint.	Wildlife not tolerated.	Very rare	Brown (solid)
Future Urban Zone	Areas identified for future urban development	Plan for future wildlife exclusion, as these areas will become unavailable for wildlife.	Should become very rare – avoid establishing wildlife-use patterns.	Brown (cross-hatched)
High Use Zone	Human-wildlife Interface with high levels of use (>100 disturbance events/month).	Not secure for wildlife.	Frequent	Yellow (solid)

Zone	Human Use	Wildlife	Human-wildlife Interactions	Map Colour
Moderate Use Zone	Human-wildlife Interface with low levels of human use (<100 disturbance events/month).	Secure for wildlife.	Few	Orange (solid)
No Use Zone	Wildlife Area Closure - no human use permitted.	Secure for wildlife	None	Red (solid)
Temporal Closure/ Restriction	Proactive human-use closures or restrictions	Secure for wildlife during closure.	Variable	Red (cross-hatched)
Rock and Ice	Varies – generally low.	Not viable for target wildlife species.	All lands above 2500m elevation	Grey (solid)

Recommendations

10. **Mapping Habitat Security – The Technical Working Group recommends that all jurisdictions collaborate to produce a single habitat security map (Figure 18) to support better implementation of current zoning and to inform future consultation and planning (Short Term).** The habitat security zoning map will identify where secure habitat is currently located, as well as areas where mitigations may be necessary to improve habitat security in the Bow Valley (Table 2).

    Habitat security mapping will also help communicate current distribution of habitat security areas (in both time and space) within the Bow Valley, so that recreational users know where to go, and can either avoid key areas or times, or concentrate human use into areas where wildlife are not encouraged to persist.

    Habitat mapping models continue to be refined and updated as information and methodologies improve.

11. **Reduce Human Footprint in Corridors – The Technical Working Group recommends that land mangers pursue opportunities to remove, relocate and/or consolidate existing developments (trails, roads, buildings) within identified and agreed upon wildlife corridors, if they are impediments to wildlife habitat and connectivity. Where removals are not feasible, or as interim measures, try regulating human use, or restricting use to daylight hours to reduce nocturnal displacement of wildlife (Medium Term).**

12. **Proactive Seasonal Closures – The Technical Working Group recommends that human use restrictions (e.g., closures) be implemented annually, where predictable patterns occur, as pro-active management allows users to plan their recreational pursuits while allowing wildlife to learn predictable patterns of human use (Short Term).** Reoccurring seasonal area closures provide habitat security to wildlife while reducing the need for reactionary closures in response to high rates of human-wildlife occurrences. Reactive area closures will remain necessary where unanticipated.

13. **Predictable Patterns of Human Use – The Technical Working Group recommends that additional recreational zoning be identified to further increase predictability of human use patterns for wildlife (Medium Term). This may include trail planning for the temporal and spatial use of trails and mitigating the impacts of human use on trails for wildlife.** Consideration will be given to activities that may antagonize and attract wildlife (e.g., dog walkers) or those with high rates of speed that have increased risks of surprise encounters (e.g., running or mountain biking). Designated trails or facilities may require design modifications (e.g., increased sight-lines, buffalo berry removal, and purpose built facilities) to further reduce risk and attract desired users. Adjacent jurisdictions could work together to establish common design standards and labelling. Other zoning considerations may include constraining nocturnal trail use to limited areas to provide secure habitats during dusk, night and dawn when wary wildlife may be more active on the landscape.

14. **Remove natural attractants – The Technical Working Group recommends that in non-developed areas, where wildlife are not wanted (e.g., along human-use corridors such as roads, rails or trails), natural attractants be removed to reduce risk to people or wildlife (Short Term).** This may include removal of buffalo berry bushes or other preferred vegetation, and should be first offset with successful habitat enhancement. The removal of natural foods within areas designated for wildlife should be discouraged or minimized through facility/infrastructure consolidation.

15. **Enhance Wildlife Habitat - The Technical Working Group recommends that in addition to reducing human disturbance, land managers work to improve habitat quality and diversity in areas where we want wildlife to persist (Medium Term).** This may include the use of prescribed fire, mechanical thinning, or planting of preferred natural vegetation. Such efforts should be integrated with other vegetation management strategies such as FireSmart to ensure mutual benefit and cost effectiveness. Thinning or trail clearing can also be used to improve wildlife travel routes around key pinch points.

16. **Strategic alternatives for recreating - The Technical Working Group recommends that land managers promote or facilitate options for recreational use away from wildlife at key times or in wildlife corridors (Medium Term).** Examples would include promoting watersports (paddleboard) rather than trail running in August when bears are focused on buffalo berry found in valley bottoms, or directing trail runners to areas where berries are much less abundant or to specific trails where risks have been better mitigated through trail design or attractant removal.

Measures of Success

- Reduced frequency of key wildlife incursions into the urban areas;
- Reduced frequency of human incursions into “no use” and “moderate use” areas;
- Reduced frequency of contact incidents between wildlife and humans (may need to account for changes in abundance of people or wildlife over time);
- Increased time spent by wildlife in secure habitat patches (measured via remote cameras and/or collared individuals);
- Connectivity for wildlife to move between secure areas, throughout the year (measured via winter tracking, remote cameras and collared individuals); and
- Reduced need for reactionary closures (ad hoc) due to well established, clearly communicated, proactive, seasonal closures in key spaces and/or at certain times.

4.5 Food Conditioning and Habituation

Current State

Extensive development and human use in the Bow Valley increases levels of interaction between people and wildlife. As a result, both people and wildlife may develop an increasing tolerance towards one another and become habituated. This can lead to problems for both people and wildlife. There are costs and benefits to habituation. In Alberta, where grizzly bears are currently listed as a Threatened species, habituation may increase mortality risk. Habituation should be discouraged unless the mortality risk can be managed (Herrero, et al., 2005).

Table 3. The potential benefits, risks and costs of bear to human habituation (Herrero et al., 2005).

Benefits primarily to humans	Costs (risks) primarily to humans
1. Provides highly sought-after opportunities for acceptably safe bear viewing, photography, film-making. 2. Bear-viewing is a growing industry in North America offering economic benefits too many. 3. Evidence that habituated brown bears are less likely to threaten or attack hikers or bear viewers. 4. Habituation and use of roadside habitat could, in theory, increase carrying capacity of protected areas for brown bears.	1. Not appropriate in all contexts; may conflict with sport- fishing and hunting. 2. Close proximity of habituated bears may encourage ignorant, even illegal acts. 3. More interactions with habituated bears may increase cumulative odds of injury. 4. Habituated brown bears, especially sub adults, have a greater tendency to approach people and people may respond inappropriately and dangerously. 5. Habituated bears in roaded areas may encourage traffic jams and serious collisions. 6. It costs money to manage habituated bears, especially if they become food conditioned.

Benefits primarily to bears	Costs (risks) primarily to bears
1. Habituated bears are better able to access natural foods and other resources that exist near centers of human activity. 2. Some bears may use presence of humans to avoid encounters 3. Habituated bears promote bear-viewing which, in turn, may promote bear conservation.	1. Habituated bears near roadsides or railways are more likely to be injured or killed. 2. Habituated bears are more likely to be killed if outside of protected areas. 3. Habituated bears near roads are more likely to be fed by people or get people's food and become food-conditioned. 4. Despite regulations, habituated bears are more likely to be approached by people for better photographs or viewing, resulting in greater risk of human injury and bear harassment or removal.

A certain level of habituation in wildlife may be unavoidable in the Bow Valley due to high levels of human use. Furthermore, wildlife living in the Bow Valley requires some level of habituation if they are to successfully navigate this busy and complex landscape with its many fragmented wildlife corridors, complex highway crossing structures, and compromised habitat patches. Also, it can be argued that surprise encounters with people, habituated animals are less likely to show the same severity of response (fight or flight) as wary animals, which may result in lower risk to the public.

However, when habituated wildlife - those that show little reaction to humans - travel out of protected areas into areas where attractants may be more abundant or less secure, major highways are not fully fenced, and/or hunting is permitted, conflict can arise due to a lack of fear of humans.

In extreme cases, habituated wildlife may become so comfortable around people that they begin to use human-use areas as refuges from carnivores. This behaviour can be seen with elk that calve in town to avoid predators, and with female bears that occupy areas near people to avoid wary male bears that threaten young cubs. Predator avoidance behaviour can attract carnivores into urban areas, generating public safety concerns that frequently result in carnivores being translocated or destroyed.

Conversely, human users of the Bow Valley who gain experience around habituated wildlife such as urban elk or roadside bears may unwittingly expose themselves to much greater risk than they realize; when they apply the same indifference around a truly wary bear, a carnivore protecting a kill site, or a cow elk that is now protecting a newborn calf.

One of the strongest arguments against habituation of wildlife is that it may lead to food conditioning. Food conditioning, however, is a very different behaviour; in this case, rather than being indifferent to people, wildlife begin to associate people with a food reward. In the

Bow Valley, despite high-caliber education and outreach programs, people continue to be documented feeding wildlife which invariably leads to food conditioning.

While some experts debate the risks and benefits of wildlife habituation in areas of high human use, they agree that food-conditioned wildlife is a danger to people. When managing food-conditioned wildlife, managers have few options other than destroying individual animals; aversive conditioning is often unsuccessful. For this reason, wildlife managers strongly discourage the feeding of wildlife and other interactions that can lead to food conditioning, such as allowing access to unnatural attractants.

Current Mitigations

Habituated wildlife remains an ongoing challenge for wildlife managers as it is difficult to avoid habituation if wildlife are to survive in the Bow Valley. Wildlife need to be less wary if they are to make use of crossing structures and successfully navigate and survive in the complexity of the Bow Valley landscape. However, once wildlife leaves the security of protected areas, habituation may result in conflict with people or wildlife mortality. There are multiple examples of habituated grizzly bears in the Bow Valley that were translocated or killed because of their high tolerance for people and developments.

Aversive conditioning programs, ad hoc hazing, and securing available foods have helped to discourage wildlife from using developed areas. However, hazing habituated roadside bears away from preferred forage such as roadside dandelions or buffalo berry can be futile. Instead, it is often more effective to manage the behaviour of people who are viewing wildlife roadside. For this reason, Parks Canada has developed the Wildlife Guardian Program, where specially trained staff attends roadside bear jams throughout the summer, to educate visitors and manage human behaviour to ensure the safety of people and wildlife.

In both Canmore and Banff, wildlife professionals work to haze habituated wildlife species out of urban areas when they are reported by the public or detected by staff. Even with these programs, wildlife continue to use developments for security and because of available foods (e.g., playing field and golf course grasses, buffalo berry, feral rabbits) that developed areas provide. Proactive measures have focused on better managing potential attractants in urban areas to reduce habitation and wildlife intrusions into urban areas.

Preventing food conditioning by securing all animal attractants and preventing the direct or indirect feeding of wildlife is one of the most effective mitigations for reducing human-wildlife occurrences.

A key challenge in the Bow Valley occurs when visitors and residents purposely feed wildlife either because they don't know better, they don't believe their actions have significant impacts, or they have overriding motivations to do so. The solutions currently in place are to consistently and effectively inform, warn, then legally prosecute offenders. Enforcement outcomes are communicated widely in hopes of deterring others. Once wildlife becomes food conditioned, the effectiveness of various wildlife management tools, such as aversive conditioning, is limited and rarely successful. Prevention is the key.

Another key challenge in preventing food conditioning is consistency in securing wildlife attractants. Despite the overwhelming success of bear-proof garbage bins, there remain many garbage receptacles in the Bow Valley that do not meet these standards. Common problems include restaurant waste bins, hasty bins at gas stations and other convenience providers, grease receptacles and many forms of recycling bins. Other ongoing issues include food waste that is accidentally deposited in open bins intended only for construction waste, roadside litter that is readily found by animals like wolves and bears, messy campsites and day use areas, and grain which is accidentally spilled on railways or purposefully dumped by highway transport trucks.

Recommendations

17. **Reduce Feeding of Wildlife – The Technical Working Group recommends that all land managers increase and coordinate efforts to prevent people from directly feeding wildlife through effective education, prevention and compliance, rigorous enforcement, and legislation (Short Term).**

18. **Secure Attractants - The Technical Working Group recommends implementation of initiatives to secure attractants including litter, garbage, grease, grain spillage and grain dumping (Short Term). Options could include:**

    - **Mandatory bear-proof waste bins** - All partners in this project conduct an annual review to inspect and approve all waste receptacles in the Bow Valley, including garbage, recycling, grease, and restaurant wastes. Problems may exist with restaurant food-waste bins, hasty-waste bins at gas stations/hotels, and unsecured receptacles for kitchen waste and grease;

    - **Label Construction Waste** – All licensed providers of trade waste bins (construction waste) in the Bow Valley add standardized symbols to indicate “No Food Waste”. This will prevent accidental dumping of food waste into commercial trade-waste bins;

    - **Clean Campgrounds and Day Use Areas** - Additional education, compliance, enforcement and clean-up at campgrounds and day use areas to eliminate unsecured coolers/ groceries, pet food, barbeques, and recycling/ garbage;

    - **Reduce Roadside Litter** - More frequent and thorough removal of roadside litter to remove wildlife attractants, as roadside litter can lead to food conditioning in wildlife. Prevention through education (signage), active enforcement, and regular volunteer litter picks are key recommendations to mitigate this impact; and

    - **Eliminate Grain Dumping and Spillage** - Increased and targeted enforcement to reduce grain dumping by transport trucks. Improved detection of spills and actual removal on railways.

19. **Reduce Habituation of Wildlife - The Technical Working Group recommends further investigation into initiatives that will enhance wariness of wildlife towards people wherever possible (Medium Term).** Initiatives may include improving habitat security (reducing human use) and habitat quality (burning or vegetation enhancement) in areas away from roads where we do want bears. While excluding wildlife from urban areas and reducing attractive roadside vegetation so bears spend less time in close proximity to people. Additionally, wildlife (carnivores and elk) may be actively hazed out of urban areas to reduce close interactions with people.

Measures of Success

- Reduced prevalence of roadside wildlife because attractive vegetation is removed from roadside areas. Wildlife viewing opportunities become more common at a distance, and viewers most often remain in their vehicles and always at a safe viewing distance;
- Unsecured wildlife attractants is eliminated in urban areas, campgrounds and day use areas;
- Annual urban inspections of garbage facilities show complete compliance with mandatory bear proof bins;
- Roadside litter picks conducted frequently and roadside litter is seldom observed;
- Decrease in the occurrence of food conditioned wildlife;
- Grain dumping on roadside pullouts is eliminated and any remaining grain spills on railways are quickly detected and removed; and
- Elk are increasingly wary of people and elk calving occurs outside urban areas.

4.6 People Compliance

Current State

Compliance promotion is any activity that increases awareness, educates, motivates, or changes behaviour, and encourages voluntary compliance with a regulatory requirement. Compliance promotion is a key strategy in achieving voluntary compliance. To voluntarily comply with a regulatory requirement, parties must be:

- Aware of the requirement;
- Able to understand the requirement and the consequences of non-compliance;
- Able to comply with the requirement (e.g., it is technically or financially possible);
- Aware of the impact of their actions on wildlife; people may choose not to comply because they feel safe around wildlife and do not feel their actions impact wildlife significantly; and

- Willing to comply with the requirement, which is dependent on three elements:
- There is a risk of being held accountable for the non-compliance
- The financial consequence of non-compliance exceeds the cost to comply
- There is a real impact or risk to themselves or others, including wildlife.

Numerous factors interact to influence the location, timing, and scale of non-compliant behaviours. Designing conservation interventions that encourage compliance requires accurate data that tracks what non-compliant activities occur, where they occur, when they occur, who is involved, and why they undertake these activities (Gavin et al., 2010).

Understanding why non-compliance behaviour occurs is critical for conservation interventions (Arias, 2015), as is understanding why compliance occurs. Understanding the drivers of non-compliance and compliance contributes insight into the design of more effective management interventions. Motivations for non-compliance may be different than those for compliance (Arias, 2015; Kahler and Gore, 2012). The range of motivations of an individual's conservation behaviour is wide and complex, can vary from one individual to another, and, even within the same individual, may change across different contexts and for different behaviours (Kahler and Gore, 2012; Kollmuss and Agyeman, 2002).

The Bow Valley is one of the most popular tourism destinations in Canada and is a highly sought-after location for people to live, work and play. Providing opportunities for human enjoyment and experiences along with recreation and leisure activities is an ongoing challenge. Specifically, the Bow Valley is faced with ensuring the ecological integrity and health of wildlife populations and the demands for providing opportunities for human enjoyment and quality visitor experiences.

One of the top reasons people come to Banff National Park is to view wildlife, and arguably, people are excited to see wildlife anywhere in the Bow Valley. It is critical for the various jurisdictions to provide the public with information and an understanding of how to behave responsibly in areas where wildlife are, or may be present. Being educated and complying with the rules will contribute towards ensuring visitor safety and towards the long-term survival of wildlife in the Bow Valley.

Banff National Park alone receives over four million visitors annually and accommodates almost twice as many visitors through traffic. With the projected increase in the population and expansion of the Town of Canmore, along with the transient nature of resident populations and increased visitation, pro-active communications, planning and consistent messaging are critical to improve public awareness, understanding, and behaving responsibly in areas where wildlife may be, and are, present.

When working towards achieving human-wildlife coexistence it is important that the public (residents and visitors) understands what this means with regards to behaving responsibly around wildlife, which includes adopting best practices (safe wildlife viewing distances) and obeying legislative requirements (e.g., dogs must be on-leash). People compliance will

contribute towards achieving human-wildlife coexistence. If people knowingly choose to be non-compliant, they need to understand the potential consequences their actions may have – for both their safety and the well-being of the wildlife.

In the Bow Valley, behaving responsibly near wildlife means:

- Giving wildlife lots of space; in Banff National Park this means 100 m for carnivores and 30 m for ungulates;
- Never feeding wildlife and removing / securing attractants (do not litter, do not leave food/ scented items unattended, use wildlife-proof garbage bins);
- Recreating and travelling in groups;
- Carrying bear spray; ensure it is accessible and know how to use it;
- Ensuring dogs are on-leash and under control at all times; and
- Complying with area closures and travel/trail restrictions.

At any given time, the human population within the Bow Valley is made up primarily of residents, recreationists and visitors from all over the world. Some individuals are more educated than others with regards to acting responsibly while living, recreating and travelling through areas where wildlife are or could be.

An increase in human presence and use on the landscape requires increased levels of enforcement and compliance if human-wildlife coexistence is to be achieved. Currently, compliance with regards to obeying human-wildlife based legislation such as wildlife attractants, dogs' off-leash and entering officially closed areas (a management action put in place to ensure the safety of humans and wildlife) is challenging. Efforts to enforce non-compliant behaviours and actions are limited due to insufficient resourcing and differences in legislation amongst jurisdictions.

Table 4. Written warnings, tickets and charges issued by Enforcement Officers within the Bow Valley study area in 2017.

Non-Compliant Behaviour	Town of Canmore	Province of Alberta	Town of Banff	Parks Canada
Dogs Off-Leash	Warnings: 64 Tickets: 19	Warnings: 6 Tickets: 48 Evictions: 1	Warnings: 0 Charges: 9	Warnings: 7 Charges: 8
Entering Closed Areas	NA	Warnings: 0 Tickets: 4	N/A	Warnings: 8 Charges: 16
Wildlife Attractants	Warnings: 6 Tickets: 2	Warnings: 0 Tickets: 0	*see "Garbage Violation"	Warnings: 4 Charges: 3
Wildlife Harassment	NA	Warnings: 0 Tickets: 0	N/A	Warnings: 3 Charges: 1
Feeding Wildlife	0	NA	N/A	Warnings: 5 Charges: 4
Garbage Violation	Warnings: 11	Warnings: 1 Tickets: 2	Warnings: 9 Tickets: 4	Warnings: 6 Charges: 18
Campsite Condition Violation		Warnings: 23 Tickets: 49 Evictions: 13	N/A	Warnings: 11 Charges: 24
TOTALS	**Warnings: 81 Charges: 21**	**Warnings: 30 Charges: 107 Evictions: 14**	**Warnings: 9 Charges: 13**	**Warnings: 44 Charges: 74**

Current challenges related to achieving compliance in the Bow Valley may be related to:

- Those who are genuinely unaware about how to behave responsibly around wildlife (e.g., have not had the opportunity or taken the initiative to be educated);
- Those who are aware and educated and make a conscious decision to not comply with best practices (e.g., choosing not to carry bear spray);
- Those who are aware but strongly believe the rules do not apply to them (e.g. walking their dogs off-leash, knowingly entering area closures);
- An individual's level of risk tolerance;
- Not fully understanding the impact their behaviour may have on wildlife, themselves and others;
- How their individual actions contribute to, and culminate in, negative impacts; and
- The inability of enforcement officers to respond to non-compliant behaviours (infractions) due to limited resourcing.

Figure 18. A cyclist and a walker with stroller knowingly entering an officially closed area within Canmore, Alberta © Alberta Environment and Parks, 2017.

Current Mitigations

Some of the most progressive and innovative educational programs with regards to wildlife and how to behave responsibly are offered by Parks Canada, Kananaskis Country and WildSmart. Tools to ensure compliance also exist in the form of the National Parks Act, Alberta Parks Act and Regulations and Alberta Wildlife Act. In addition, municipalities have by-laws related to wildlife, attractants and the requirement to have dogs on leash.

WildSmart

The WildSmart program is a proactive conservation strategy that encourages efforts by communities to reduce negative human-wildlife interactions in the Bow Valley. First established in 2005, WildSmart's outreach programs now include wildlife safety workshops, bear spray training, volunteer programs, attending and hosting community events, a speaker series, removal of buffalo berry in high occurrence areas, lending of fruit-gleaning equipment, a weekly bear activity report, and co-facilitating an annual "Bear Day" celebration. WildSmart is a program of the Biosphere Institute of the Bow Valley, a non-profit charitable organization.

Living with Wildlife Film

This 2017 film by local film maker Leanne Allison, Living with Wildlife, chronicles the various programs that have been implemented over the last 20 years in the Bow Valley, in an effort to coexist with wildlife. It has been shown at film festivals around the world and has been translated

into several different languages including Italian and Chinese. It has been an excellent example of how an educational story regarding 'best practices' in human wildlife management can reach people worldwide. It also demonstrates that even with the challenges being faced in the Bow Valley today, there is much to be proud of when it comes to coexisting with wildlife. https://vimeo.com/214597705

Banff National Park's Wildlife Guardian and Picnic Patrol Teams

During the summer months, the majority of visitation to Banff National Park is day-users who visit from Calgary. While the number of overnight guests has reached a maximum based on built accommodations, the number of day users grows steadily with an average increase of 4% annually over each of the past 4 years. Members of Banff National Park's Wildlife Guardian and Picnic Patrol interpretation teams are out in the park where the visitors are, personally delivering messages of safe wildlife viewing etiquette and keeping campsites and picnic areas clean to help ensure the long-term survival of Banff wildlife.

From late May to early September, the Wildlife Guardians assist Resource Conservation staff with grizzly bear monitoring and wildlife jam management, in addition to sharing information about Banff's wildlife with visitors along secondary roads, at popular day-use areas, and in campgrounds. They participate in special events and community engagement activities throughout the season, sharing messaging about how to be prepared and act responsibly in areas where wildlife is present. Picnic Patrollers have a daily presence at popular day-use areas sharing best practices for keeping a clean picnic site, disposing of food and garbage appropriately, not leaving any food or scented items unattended, and the importance of not feeding any wildlife.

Banff National Park's Wildlife Messaging Campaign

During 2016, there were numerous incidents where wolves accessed human food and garbage in Banff National Park. The situation resulted in the destruction of two food-conditioned wolves and the dispersal of one of four wolf packs. As a result of these challenges, in 2017 Banff National Park created a wildlife messaging campaign to provide clear and captivating messaging to park visitors, residents, and businesses (Figures 19 and 20). A small, multi-disciplinary team was assembled which included Visitor Experience, External Relations, and Resource Conservation Wildlife Specialists, to collaborate on the following objectives:

- Increase awareness regarding the negative impacts of human food on wildlife (e.g. feeding, garbage, littering, unattended food); and
- Increase awareness of the need to give wildlife space, to help ensure safety of both people and wildlife (e.g., when viewing roadside, within the town site area and on trails, along with the importance of respecting speed limits).

The goal is to provide consistent and coordinated communications throughout the Bow Valley using personal and non-personal communications tactics. A messaging toolkit is available to all park staff to ensure consistent understanding and delivery of messages.

Figure 19. Example of a double-sided rack card distributed by front line staff to visitors in popular day-use areas in Banff National Park.

Figure 20. Double-sided wildlife messaging flat sheet for use by all Parks Canada front line staff, visitor center staff, and businesses operating in Banff National Park.

Complete listings of mitigation tools used by agencies involved in the Technical Working Group are described in Appendix D.

Recommendations

20. **Communications – The Technical Working Group recommends participating agencies develop and implement an inter-agency communications strategy based on consistent and clear wildlife messaging to increase public awareness regarding responsible behaviour in areas where wildlife are, or may be, present (Short Term).** To be achieved through non-personal media (e.g., signage, social media) and personal communications and programming (e.g., uniformed staff presence out where the public is recreating).

21. **Enforcement capacity - The Technical Working Group recommends increasing legislation and enforcement capacity to respond to non-compliant behaviour (Short Term).** Increase capacity and allocation of resources for enforcement which may include non-traditional inter-agency enforcement opportunities within and across jurisdictions. In addition, the Government of Alberta currently lacks legislation which prohibits the feeding of dangerous wildlife.

22. **Research – The Technical Working Group recommends the creation and implementation of standardized data collection and analysis tools for human dimensions research to better understand user types and patterns, and perceptions and risk tolerance related to human-wildlife coexistence (Medium Term).** Due to a lack of current data, assumptions are made regarding human use and behaviour in the Bow Valley. There is a need for consistent data collection, monitoring, and reporting to track and better understand human behaviour and level of awareness and risk tolerance. This data will identify trends and commonalities and will facilitate sound, evidence-based decision-making. For example: Are users genuinely unaware? If so, what is their willingness to change their behaviour in support of coexisting with wildlife today and into the future?

23. **Adaptive management – The Technical Working Group recommends participating agencies implement adaptive management strategies based on human dimensions data in support of improving human-wildlife coexistence (Medium Term).** To be successful, there must be public support and political will to implement empirically proven recommendations. Demonstrating the success of early actions will result in social acceptance and support for additional efforts if required. A good example of this is recent monitoring data that demonstrates the effectiveness of the Bow Valley Parkway travel restriction.

Measures of Success

- An inter-agency communications strategy is implemented and has effectively increased public awareness regarding responsible human behaviour which reduces negative human-wildlife occurrences;
- There is an increased and consistent enforcement presence within jurisdictions resulting in an increase in people compliance and a reduction in human-wildlife occurrences;
- The Government of Alberta has formalized legislation which prohibits the feeding of dangerous wildlife;
- Human dimensions data has been collected, evaluated and implemented amongst all agencies to inform sound decision making. Research results are reported to Bow Valley residents; and
- There is public and agency support for the implementation of decisions, and management actions to improve human-wildlife coexistence in the Bow Valley (e.g., area closures).

4.7 Wildlife Management

4.7.1 Transportation Mortality

Current State

Major transportation networks can impact wildlife populations through direct morality and habitat fragmentation. A major transportation corridor, consisting of the four-lane, Trans-Canada highway, the Canadian Pacific Railway line, and multiple secondary roads, bisects the Bow Valley. Vehicle collisions and rail strikes are a major source of mortality for numerous species of wildlife and pose a significant public safety and financial risk for drivers (Figure 21 and 24).

Highway mitigation through the construction of exclusion fencing and crossing structures (wildlife overpasses and underpasses) can substantially reduce collisions, increase connectivity, and increase public safety. Parks Canada has mitigated the TransCanada Highway throughout Banff National Park by installing wildlife fencing, 38 wildlife underpasses and 6 wildlife overpasses. Wildlife road mortality has decreased by at least 80% as a result of these actions and reduced risks to motorists (Clevenger et al 2001) (Figure 21). The long-term public safety and financial gains of such mitigations are substantial (Huijser, et al., 2009). Despite this success a large portion of the Trans-Canada highway, within the Bow Valley, remains unfenced and wildlife related vehicle collisions and mortality continue to occur (Figure 22).

From a population perspective, grizzly bear related mortality associated with transportation is probably the largest source of both mortality (Figure 24) and human-wildlife occurrences in the Bow Valley. With the low reproductive rate of the regional wildlife populations, minimizing occurrences, mortality and removals from the ecosystem are essential to the long-term sustainability of wildlife populations in the Bow Valley.

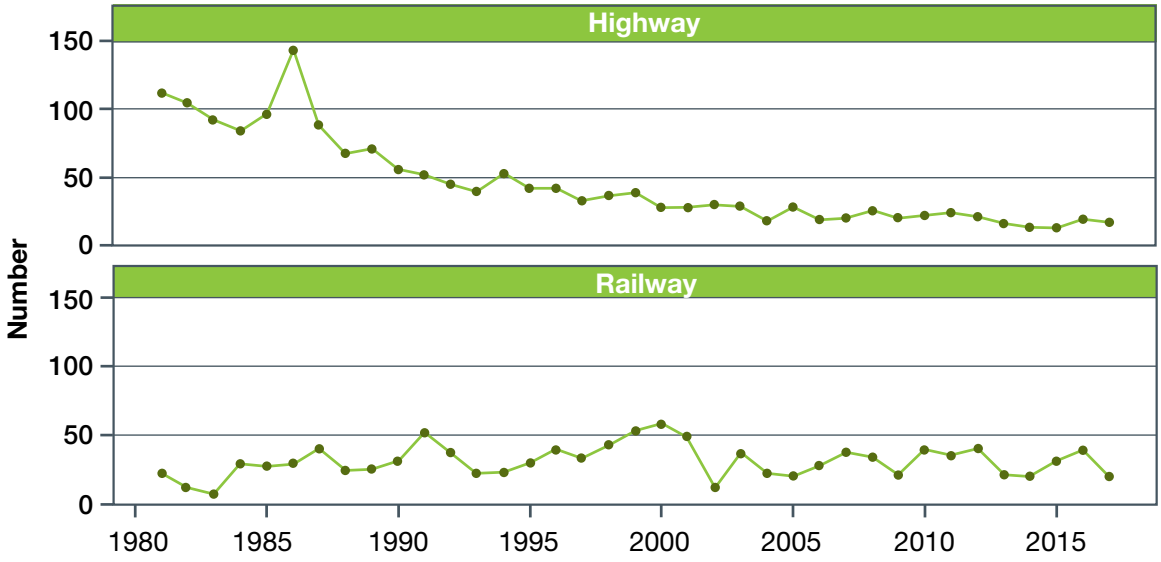

Figure 21. Banff Field Unit Highway and Railway Mortalities from 1982-2017 including the following species: Black Bear, Cougar, Coyote, Elk, Grizzly Bear, Moose, Mule Deer, Sheep, White-tail Deer, and Wolf.

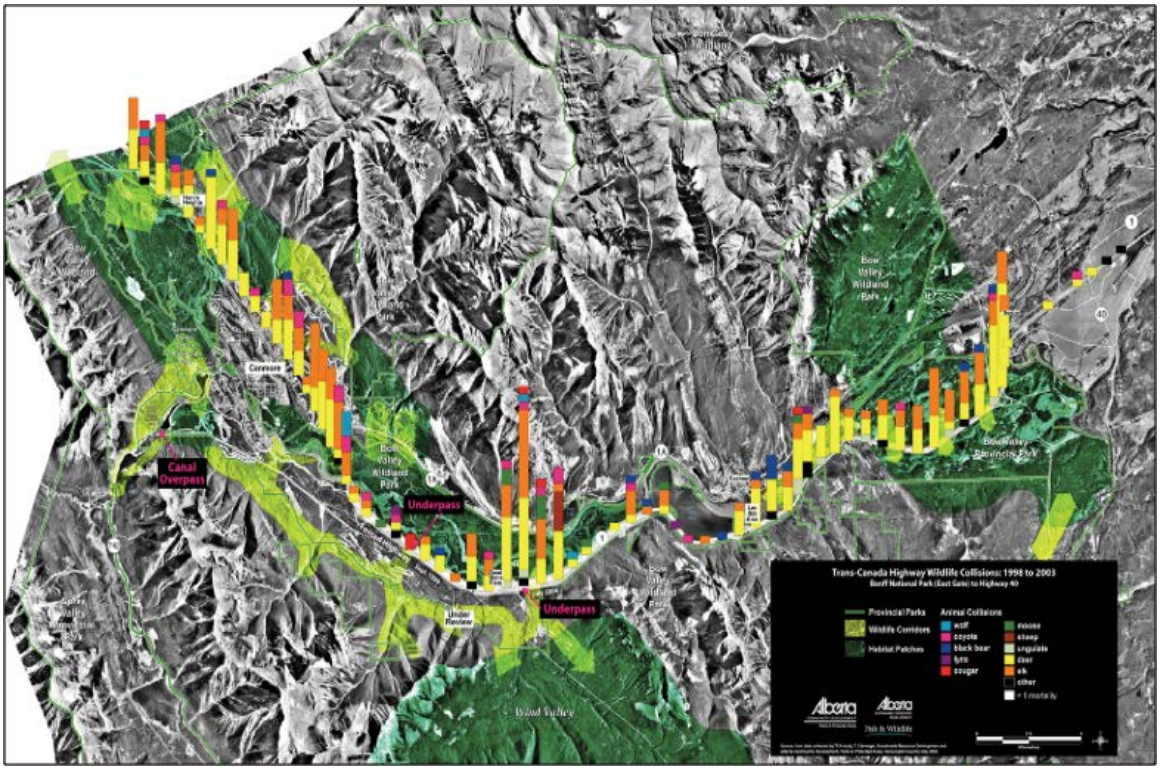

Figure 22. Trans-Canada Highway Collisions within the study area: 1990 to 2003.

Current Mitigations

As mentioned earlier, Parks Canada has fully mitigated the Trans-Canada Highway throughout all of Banff National Park to increase public safety and reduce wildlife collisions. The approach of combining fencing and wildlife crossing structures, first pioneered in Banff National Park, is now being replicated around the world; this is largely because of the excellent monitoring work that followed, to quantify the effectiveness of these mitigations. Building on this success, between 1998 and 2004, the Government of Alberta installed two wildlife underpasses and approximately three km of fencing near Dead Man's Flats, thereby decreasing wildlife-vehicle collisions along that stretch of highway by 79% (Lee, et al., 2012) (Figure 23).

While highway mortality has been significantly reduced where highway mitigation exists, rail strikes continue to be a major source of mortality for wildlife (Figures 21 and 24). Solutions to these challenges have proven difficult, and work continues to better understand the risk and potential mitigations of rail mortality in Banff and Yoho National parks. Banff National Park is proceeding with habitat enhancement (prescribed fire and forest fuel modification) and wildlife trail enhancement projects, to reduce rail mortality within the park.

Figure 23. Trans-Canada Highway wildlife underpass near Dead Man's Flats, Alberta.

Recommendations

24. **Trans-Canada Highway Mitigation - The Technical Working Group recommends installing fencing and wildlife crossing structures on the TransCanada Highway (Short to Medium Term).** Install 20 km of wildlife exclusion fencing and wildlife crossing structures (e.g., one overpass and six underpasses) along the TransCanada Highway from the Banff National Park East boundary to the Kananaskis River Bridge.

25. **Secondary Highway Mitigations - The Technical Working Group recommends the implementation of wildlife mortality mitigation on Highways 1A and 742 (Medium Term).** Wildlife mortality and collisions with vehicles could be reduced on secondary roads and the railway with the combination of attractant removal, speed reductions, and improvement to habitat quality away from transportation routes.

26. **Railway mortality mitigation - The Technical Working Group recommends the continuation of research to minimize railway wildlife mortality (Short to Medium Term).**

Measures of Success

- Construction of highway fencing and crossing structures along the TransCanada
- Highway over the next 10 years;
- Reduction in highway and railway mortality (corrected for changes in population size and traffic volumes); and
- Upon implementation of mitigation, a reduction of wildlife vehicle collisions is observed and reported upon.

4.7.2 Management Removals

Current State

Wildlife mortalities can also result from management decisions when dealing with human-wildlife occurrences. Some human-wildlife occurrences in the Bow Valley results in removal of individual animals, either by lethal means or indirectly through translocation. The rates and impacts of these mortalities on wildlife populations is species-dependent and can differ amongst jurisdictions (Figure 24). Management actions to mitigate human-wildlife occurrences on provincial lands are guided by Response Guidelines for black bears, grizzly bears, cougars, wolves, coyotes and elk. In cases of serious public safety risk, which cannot be reasonably mitigated, lethal removal of an animal may be necessary. The provincial Response Guidelines direct decision makers as to when lethally removing an animal is an option. The lethal removal of wildlife is determined on a case by case basis by evaluating many different factors including the nature, frequency and severity of key behaviours.

There are occasions, resulting from human-wildlife occurrences, where animals are translocated outside of their typical home ranges (Figure 24). On provincial lands, decisions to translocate an animal are guided by the provincial Response Guidelines. A recent study in Alberta showed that a third of grizzly bear translocations were successful (Milligan et al., 2018). These authors also identified considerations that could result in higher translocation success rates, such as time of year and habitat quality at release sites. The provincial government continues to study the translocation of grizzly bears in an effort to better support species recovery (Stenhouse et al., 2018). In Banff National Park, translocations are no longer used as a management tool due to low success rates, animal care concerns, and limited geography in which to move an animal where it would have a reasonable chance of not encountering similar problems.

It should be noted that even in the case of serious injury to people; wildlife may not always be translocated or lethally removed. For example, closing an area may be deemed an appropriate response. This often occurs when an animal is believed to be acting defensively such as in a surprise encounter (e.g. for Alberta lands: Grizzly Bear Response Guide, 2016). As indicated previously, each situation is evaluated on a case-by-case basis.

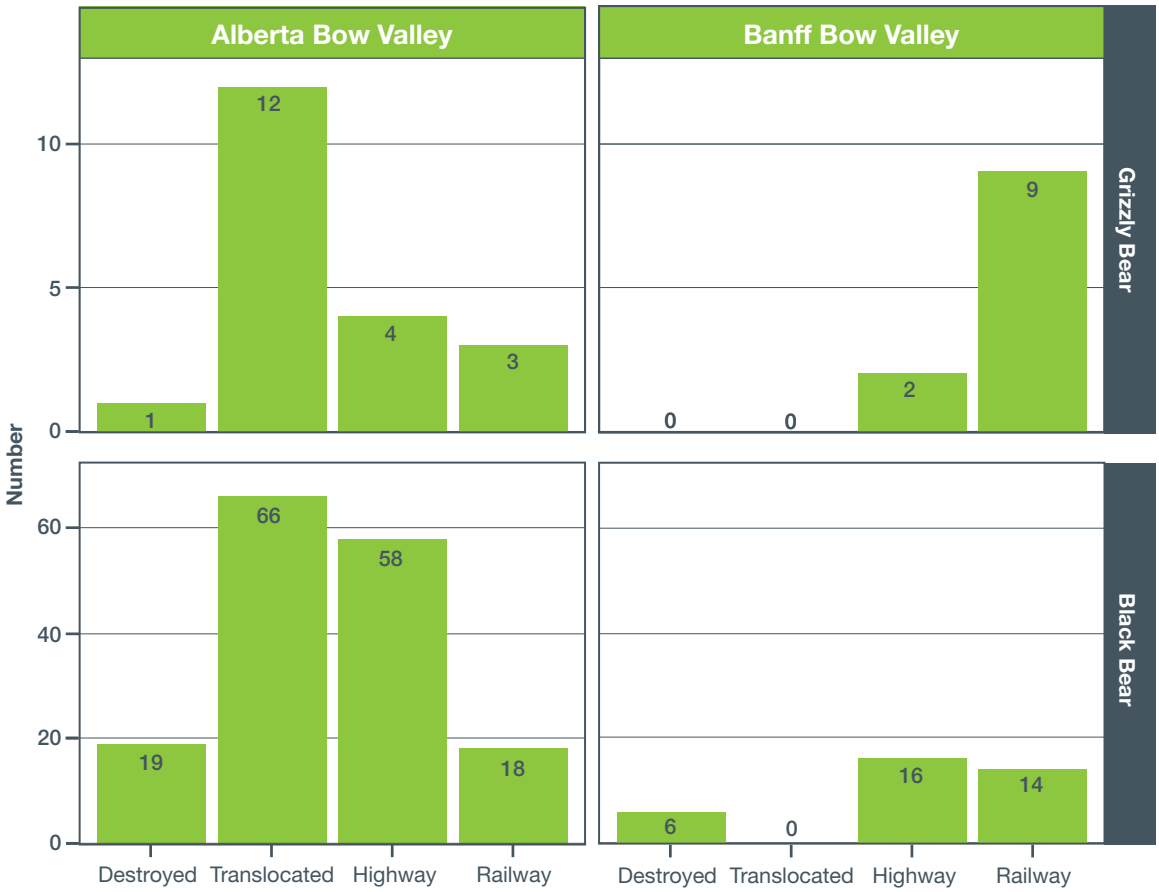

Figure 24. Banff National Park and Government of Alberta bear mortality and translocation summary (within the Bow Valley study area only).

Current Mitigations

Implementing the recommendations within this report, focused on reducing the probability and severity of negative human-wildlife encounters in the Bow Valley, will improve our ability to manage human-wildlife occurrences, thus reducing the need to remove individuals.

Recommendations

27. **Translocations – The Technical Working Group recommends that land managers implement the proactive measures identified in this report, with a goal of reducing the need for management removal of bears (Short Term).**

28. **Research – The Technical Working Group recommends continuing to research the effectiveness of translocations to ensure the best chance of success for translocated wildlife (Short Term).**

5.0 Conclusion

The Bow Valley, with its proximity to Calgary and its mountain setting, offers an abundance of recreational opportunities that make it a desirable place to live, visit, and play. As human use in the valley increases, so too does the likelihood of interactions with wildlife. The Bow Valley is made up of federal lands (Banff National Park), public land (Provincial Parks and Protected areas), municipal lands, deeded and privately owned lands. Wildlife in the Bow Valley cross multiple jurisdictional boundaries and can be subject to various management actions if a human-wildlife interaction occurs. The jurisdictions in the Bow Valley have proven to be leaders in the management of human wildlife interactions. There are many examples of innovative mitigations designed to reduce human-wildlife occurrences and build awareness of wildlife within the Bow Valley. Despite the successes of managing human-wildlife interactions, there continue to be challenges.

The Technical Working Group was established to report on current data trends, existing mitigation approaches and provide recommendations to manage human wildlife interactions in the Bow Valley. Twenty eight (28) recommendations were developed to address six key issues:

- Transboundary Management;
- Wildlife in Developed Areas;
- Habitat Security;
- Food Conditioning and Habituation;
- People Compliance; and
- Wildlife Management.

The recommendations focus on reducing the probability and severity of negative wildlife encounters in the Bow Valley. Many of these recommendations have already been implemented to varying degrees, and have proven effective here in the Bow Valley. Key recommendations were developed to increase cooperation across agencies, enable areas and time for wildlife to be undisturbed, remove attractants from areas where we do not want wildlife and create a degree of separation of wildlife from public areas using strategies such as highway fencing. An adaptive management approach will allow us to be efficient with our cooperative efforts by doing, monitoring, and adapting. A coordinated and consistent approach is possible in the area of human-wildlife coexistence. This would enable jurisdictions to apply a landscape management toolkit that supports human-wildlife coexistence in the Bow Valley. This report is an example of the commitment by the jurisdictions of the Bow Valley to continue to strive towards finding a balance between human use and ensuring a healthy ecosystem for wildlife.

Everyone who lives in, or is a visitor to the Bow Valley has an important role to play in achieving human-wildlife coexistence. Through collaboration, cooperation and compliance, this collective effort will contribute to the survival of wildlife in the Bow Valley while remaining a top destination for people to live, work and play.

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Appendices

Appendix A - Glossary

Wildlife Management terms used by the Bow Valley Human Wildlife Co-existence Technical Working Group for the creation of the Technical Report.

Attractant: – a food, smell or habitat component that will attract wildlife. Can be anthropogenic foods (garbage, crab apples, chickens) or natural foods (buffalo berry, dandelions, grass).

Aversive conditioning: a learning process in which deterrents are continually and consistently administered to reduce the frequency of an undesirable behavior.

Conditioning: learning involved in receiving a reward or punishment for a given response (behavioral act) to a given stimulus (verbatim from McCullough 1982).

Developed areas: lands designated for human use including picnic areas, industrial areas, urban areas, urban greenspaces and campgrounds.

Displacement: The decline in habitat use by wildlife, often due to increased levels of human use, resulting in reduced habitat security. Can also refer to a particular incident where the person and/or the wildlife, flee the area to avoid escalation or contact; similar to “evasive action”.

Conflict (human–wildlife): when wildlife: exhibit stress-related or curious behavior, causing a reasonable person to take extreme evasive action (adapted from Schirokauer and Boyd 1998), make physical contact with a person or exhibit clear predatory behavior, or were intentionally harmed or killed (not including legal harvests) by a person. Unintentional wildlife mortality incidents (e.g. road or rail mortality) are typically considered conflicts also. The term human-wildlife conflict is often used differently between and within agencies and may or may not include sightings, interactions, incidents, or occurrences.

Coexistence (human-wildlife): The term coexistence refers to a state stemming from a suite of strategies have successfully balanced the needs of wildlife and humans which includes managing human use in designated wildlife habitat; excluding wildlife from developed areas; and mitigating negative human-wildlife interactions.

Food-conditioning: Food conditioning develops when wildlife begin to associate people with a food reward and then seek out these opportunities.

Food-conditioned behavior: wildlife that has learned to associate people (or the smell of people), human activities, human-use areas, or food storage receptacles with anthropogenic food (after Herrero et al. 2005).

Habitat patch: Habitat patches are areas of land linked together by wildlife corridors. Habitat patches are generally large in area and meet a wider spectrum of habitat requirements (e.g., feeding, breeding, thermal regulation, security, resting) for wildlife in the Bow Valley. (BCEAG 2012)

Habituation: the waning of a response (or muted response) when a reward or punishment is discontinued (verbatim from McCullough 1982).

Habituated behaviour: wildlife that shows little to no overt reaction to people (after Herrero et al. 2005) as a result of being repeatedly exposed to anthropogenic stimuli without substantial negative consequence.

Hazing: a technique where deterrents are administered to a bear to immediately modify the bear's undesirable behavior (Schirokauer and Boyd 1998).

Human food: anthropogenic foods that only include human foodstuff and food waste.

Incident: an occurrence that involved a human–wildlife conflict or situation where wildlife caused property damage, obtained anthropogenic food, killed or attempted to kill livestock or pets, or were involved in vehicle collisions (Gunther 1994, Schirokauer and Boyd 1998, Gunther et al. 2004, Wilder et al. 2007). In Parks Canada, term can be used to track occurrences.

Interaction (human-wildlife): a sighting or encounter when a person and wildlife are mutually aware of each other (from Smith et al. 2005). The person or the wildlife may perceive the interaction as: negative, positive, or neutral.

Management removal: lethal or non-lethal removal of wildlife from the population by or at the direction of management personnel management status.

Occurrence: any human/wildlife interaction that warrants a management response. This will vary by agency, location, time of day, season, species and many other factors. Parks Canada refers to these as an incident.

Restricted access: In the National Parks this refers to a standardized form of travel restriction, seasonally applied to hiking trails, to reduce the probability of negative encounters between people and bears by requiring hikers to travel on foot (no bikes), in a group of four or more people, and requiring all persons to carry bear spray, and where dogs are not permitted.

Translocation (long range): the capture and subsequent transport of wildlife from the site of capture to a location outside its presumed home range often in an attempt to permanently mitigate incidents or augment a population.

Travel restriction: a human use management tool commonly applied in the National Parks, where, a Superintendent uses a regulatory tool called a "restricted activity order" to permit only certain uses or activities at specified times or places (e.g. the Bow Valley Parkway Travel Restriction).

Urban area: within developed areas that are clearly defined geographic area surrounding a community or town where people reside which can differ from a municipal boundary.

Wary wildlife: wildlife that exhibits caution around people (Gibeau 2017 pers comm.) and can be readily displaced and usually avoids humans and human developments (non-habituated) (Mattson 1993, Hererro 1985). This may be a learned response, or some wildlife may be innately wary.

Wildlife jam: an instance when people slow or stop their vehicles to view or photograph wildlife, causing traffic congestion (Gunther and Biel 1999)

Wildlife corridor: An area of land designed and managed to maintain connectivity for wildlife (BCEAG 2012).

Appendix B - Species Analysis

The species analysis is based on current literature, local data, and wildlife manager's experiences managing these species here in the Bow Valley. Based on historic experience and expert opinion, these priority species were chosen because of the human risk level. Species considered in the Bow Valley Human-wildlife Coexistence analysis include the following:

- Grizzly Bear (*Ursus arctos*)
- Black Bear (*Ursus americanus*)
- Cougar (*Puma concolor*)
- Elk (*Cervus canadensis*)
- Wolf (*Canis lupus*)
- Coyote (*Canis latrans*)

Grizzly Bear and Black Bear

Primary Interactions with People:

Aggressive encounters can occur with Grizzly and Black bears if the bear is surprised by the encounter, they are defending young or a food source.

Property damage is common if attractants are accessible: food, garbage, beehives, livestock, etc. Regular frequent interaction at close range can reduce wariness and lead to habituation where bears become increasingly tolerant to humans.

As omnivores, bears can readily become food conditioned, which inevitably leads to conflict with people.

Seasonal Factors

Spring: Bears emerge with limited food sources and residual snowpack. Foraging in valley bottoms brings them into close proximity to humans and anthropogenic foods (grain spill, garbage, etc). Frequent use of golf courses and other early green up areas.

Elk calving: key spring food and attracts bears into calving areas; including urban areas where elk will often attempt to calve to avoid predators.

Berry Season: July/August. Bears focus on Buffalo Berry (Shepherdia canadensis) and there use of habitat is more predictable in space and time. Surprise encounters are likely as bears are focused on foraging.

Fall: Bears seeking nutrients prior to winter denning and are often back in valley bottoms where conflicts with anthropogenic food sources such as fruit trees (crab apples) Natural foods within developed areas including dogwood, chokecherry wolfwillow in areas east of Canmore (Lac Des Arcs, Exshaw) may also occur,.

Denning: Bears remain active for much of the year in the Bow Valley, with large males often staying active late into early winter (December) and emerging in early spring (late February and early March). Females with cubs, born in the den, typically emerge in May. .

Motivations and Behaviours

Bears are primarily motivated by gaining calories – they are constantly searching for food in order to build the necessary reserves for winter denning and reproduction. Failure to acquire enough resources each season will lead to reduced reproductive success (delayed implantation) or death of the adult.

Bears can readily become food conditioned, if unnatural food sources are accessible, and show tremendous ingenuity and persistence to access any new smell or food source. Habituation can lead to food conditioning.

Bears are creatures of habit and will return, annually, to times and places where they've successfully found food - these include grain spills, fish spawning areas, elk calving areas, avalanche paths, key berry crops, or garbage; even if the resource is no longer present. For that reason, it may take a full generation to "teach" bears not to search for anthropogenic food sources, once they've been eliminated.

Females are very aggressive in defense of their cubs. They will protect them from large male bears that seek to kill cubs so they can breed with the female.

Sub-dominant bears, such as females with cubs or sub-adults, may use human use areas to avoid encounters with warier males.

Males occupy large home ranges in an effort to access resources and overlap with multiple female home ranges.

Bears use trails, railroads and roads to increase efficiency of travel. Camera data reveals that bears will often move off a trail to allow people to pass, if they are able to detect them approaching.

Bears are highly individual and adopt very different life strategies depending on their individual situation. These can change as a bear ages.

Attractants

Anthropogenic food sources:

- Unsecured Food/Garbage/Compost
- Fruit Trees, birdfeeders, pet food, etc.
- Grain spilled on railway tracks (especially attractive in spring and fall when other food sources as scarce), as well as grain purposely dumped on roadways so commercial truckers can meet weight restrictions.
- Vegetation along habitat edges of roads, railways and trails. Examples: grasses, dandelions, etc.

Natural food sources:

- Buffaloberry in August, dogwood, chokecherry, wolf willow in September and October. Carcasses at the bottom of avalanche slide paths, along roadways etc.
- Fish spawning areas such as the sucker pond at Vermilion Lakes Elk calves in spring
- New successional forest communities following fire or forest thinning (which can encourage buffaloberry growth).

Active Management Tools

Temporary Area Closures: to eliminate human interactions in areas where bears are likely to persist due to the presence of a food source (e.g. a carcass, shepherdia, or less mobile female with young cubs). Closure may be pro-active (scheduled) where conditions are seasonally predictable (berry crop), or reactive when not (e.g. carcass site).

Hazing: inconsistent delivery of pain / non pain stimuli in an attempt to change behaviour / reduce conflict, or temporarily move subject animal.

Aversive Conditioning: consistent delivery of pain/ non pain stimuli to change behaviour / reduce conflict. Requires individual radio collared bears and considerable resources to be consistent. Generally low levels of success, if delivered inconsistently, in large, complex developments such as townsites or where unsecured food is available for bears. . It is also considered less effective on mature animals with established behaviour

Habitat Enhancement outside of developed areas: Create habitat outside of developed areas and away from human access by forest thinning, cutting or burning. Could also integrate the construction of wildlife travel routes (trails) on the periphery of developed areas to facilitate movement around urban areas. May have benefits for other species. As natural attractants are removed we should create compensatory habitat enhancements elsewhere.

Translocation: is the practice of moving a management animal from its home range to an area outside its home range. This practice is not used in Banff National Park, but is used in Alberta as a last measure and alternative to lethal removal (as per provincial Bear Response Guidelines). . It is generally challenging to move a highly habituated or food conditioned animal into a new site, where it won't again encounter people and come into conflict. Additionally, survival is considered low, due to the challenges of translocated animals establishing themselves in a new area (competition, forage, denning, etc).

Passive (Pro-active) Management Tools

Seasonal area closures and/or travel restrictions: increase habitat security for bears and provide predictability for both bears and people. Reduce interactions without high enforcement cost. Seasonal (pro-active) restrictions can be cost effective to implement and require fewer resources.

Electric fencing: to exclude bears from localized attractants.

Attractant management: securing attractants (food/garbage/compost, fruit trees, and berry bushes) in urban areas removes the desire for wildlife to be in developed areas and reduces the chances of food conditioning.

Public education/awareness: effectiveness varies. Visitors highly motivated to interact/ photograph this species.

Highway fencing/crossing structures: highway mitigations such as fencing and crossing structures allow bears to safely cross busy transportation corridors. Female grizzlies with cubs show strong preference for overpasses (rather than underpasses). However black bears readily climb the highway fences, and bears and wolves are known to access highway exclusion areas by walking across the texas gates (which are most effective at deterring hooved mammals).

Reasonable Expectations

Surprise encounters – Many bears, particularly grizzly bears, will react defensively when surprised. Such attacks are often comparatively brief, but can result in serious injuries or be fatal to the person involved. Generally, wary bears may react more severely to a surprise encounter (fight or flight), than habituated bears (aware, tolerant). Habituated bears reaction may be in the form of indifference or flight. For this reason, habituated bears survivability may not be as high outside protected areas where bears can die from a variety of causes including vehicle/ rail collisions, poaching, self-defense kills or mistaken identification during the black bear hunting season. Generally - surprise encounters (in areas where bears are supposed to be) are a human use management problem rather than a "problem bear" problem.

Public bear safety tools: Bear spray works, if it is readily accessible and can be deployed in time (depends on the speed/surprise of the encounter). Bear bell noise does not travel far enough to be effective and should not be encouraged as a bear deterrent tool. Travelling in a tight group of 4 or more hikers, and yelling "Hey-Bear" in areas of poor visibility (dense forest), noisy streams, or known bear habitat (scat, berries) is an effective means of safely alerting bears to your presence.

Predatory encounters: Predatory events involving people (where a bear seeks out humans as a food source) are rare. This can be exacerbated by food conditioning - where bears come to associate people with food rewards. Some human activities (e.g. hunting) may increase the chances of a predatory encounter (moving quietly in the dark, handling game, etc).

Habituation vs food conditioning: Bears occupying habitats in the mainstream Bow Valley will encounter humans at comparatively higher rate than bears in remote habitats. This will invariably lead to increased habituation. If food/attractants are properly secured, this need not result in food conditioning. Habituation may reduce severity of outcomes during a surprise encounter with people, and allow a bear to successfully navigate the complex travel routes in the Bow Valley (crossing structures, etc) but can also lead to unacceptable use of urban areas by a bear, due to tolerance of people, or attempts to locate 'secure' areas from more dominant male bears. This can lead to frequent encounters with people at close range creating public safety concerns. If not corrected, this "urban" behaviour often leads to translocation and eventual mortality.

Developed areas: is it reasonable to expect habituated bears to learn to avoid built up areas. Habituated grizzly bears are more common in the Bow Valley than elsewhere in the province. This is due to a relatively high level of tolerance for bears by locals and visitors alike. Developed areas can provide natural and unnatural foods and security for sub dominant bears from other more dominant bears. High levels of habituation become problematic near communities or when bears move across jurisdictional boundaries into areas of rural/agricultural, industrial/ commercial, or high/diverse recreational use. Habituation needs to be discouraged with bears and other wildlife.

Dogs: bears often react negatively to domestic dogs as they would a wolf or coyote. Dogs will often respond incorrectly to bears resulting in bears becoming aggressive and chasing / injuring the dog or the bear chasing the dog back to the owner. Dogs must remain in control of the owner if we expect to avoid displacement of, or negative interactions with, bears.

Cougar

Primary Interactions with People

Negative encounters are often related to fast human motion (bike, ski, run), but not exclusively. Only one human caused cougar fatality known in Alberta (Lake Minnewanka – XC skier).

Almost impossible to surprise a cougar – in most cases the person will not be aware of the cougars presence and nothing happens.

Cougars are solitary ambush hunters and very specific in selecting prey.

Negative encounters with cougars foraging on pets in urban areas often involve young animals that have just left their mother, or old cougars that can no longer forage on wild prey species. However healthy cougars may prey on pets or livestock.

Despite healthy cougar populations we see relatively low rates of conflict, in the Bow Valley.

Cougars are increasing expansion in Alberta and into developed areas/ communities following ungulate populations.

Increasing incidents of cougars being seen during day, following people, suggests habituated cougar behaviour may be on the rise.

There is a cougar hunting season in the Bow Valley. Cougar harvests through hunting have been minimal in Bow Valley for last decade.

Seasonal Factors

Cougars are active throughout the year and can breed year round but do not usually aggressively defend offspring. Cycle of prey fitness may influence conflicts. Ungulates are higher fitness in fall, and cougars may be stressed thus enabling increased potential conflict as cougars look for other food sources.

Motivations and Behaviours

Cougars like to follow things that move fast or injured. Very selective for small stature prey so risk is greater for children.

Food stressed cats more likely to engage in conflict. Search for prey that seek refuge in and around developed areas (e.g. search for pets as prey).

Adaptable: can do well in high human use areas that have reliable prey (natural or domestic). Habituation may be increasingly more common.

Attractants

Prey animals (sheep, deer, elk, moose) or domestic animals (dogs/cats/ rabbits).

Places that provide refugia for cats (e.g. under decks, or shrubs) can act as spatial attractants within communities

Active Management Tools

Hazing: short term. Cougars can be easily displaced, even from kill/carcass sight. Generally, the hazing of cougars is not carried out on provincial lands. .

Remove or relocate: If cougars kill prey in areas that are too close to developed areas or trail systems, the kill can be relocated to a safer location or removed entirely to discourage the cat from continuing to hunt in that area and to eliminate the risk of human encounters at the kill site. The area can also be closed to human use where appropriate.

Aversive conditioning: seldom used - challenging and few success stories. Aversive condition of cougars is not carried out on provincial lands.

Temporary area closures: to eliminate human interactions at a kill site. Lethal removal: often used to deal with problem cats on provincial lands as per provincial Cougar Response Guidelines.

Translocation: this option is not used in Banff NP or on provincial lands

Managing prey populations: discouraging wildlife (deer, elk) from using developed areas will help to keep cougars from entering developments

Managing prey abundance (e.g. elk): can help regulate distribution and abundance of cougars.

Passive Management Tools

Public education/awareness: Public perceptions of cougars often appear to be more fearful than for other species, even though they cause less conflict. This may be because of their stealthiest and because they are more nocturnal and are active predators year round.

Exclusion: Discourage cougars from utilizing residential structures (e.g. decks in yards) by closing them off. Covered pet kennels may reduce risk of conflict.

Highway fencing / crossing structures: cougars frequently make use of highway crossing structures (including underpasses) but can also readily jump over highway fencing. Cougar mortalities are minimal on mitigated highways but continue to occur on sections of highway where mitigation does not exist.

Reasonable Expectations

Developed areas: if prey species (sheep, elk, deer, etc.) are kept out of developed areas, cougars should not enter them. This is more of a problem in areas where urbanization along with hobby farms with livestock is expanding into cougar habitats. Cougar range is also expanding eastward into developed areas where sufficient wild and domestic prey exists.

Surprise encounters: People encountering a cougar on a trail will most often be able to displace the cougar. It is quite rare to surprise a cougar and does not regularly occur.

Predatory encounters: if you get some fore-warning, a cougar attack can often be deterred by being aggressive, grouping with others, and through use of bear spray.

Dogs: Cougars dislike dogs– this is likely because they perceive them as wolves that present a risk to them or displace them from their kills. Cougars will occasionally attack or prey on dogs and these risks likely increase if dogs are off leash. Cougars that are incapable of hunting (naïve young/injured/decrepit) may seek out domestic animals as easy prey.

Dispersing juveniles: Young cougars that have just left the care of their mother and are looking for a place to live have been known to seek out developed areas for prey in recent years provincially.

Curious: There have been cases recently of cougars following people and pets at relatively close distance in the Bow Valley.

Elk

Primary Interactions with People

Aggressive encounters: Occur with people most often when cows are protecting newborn calves in the spring, or when bulls are defending cows during fall rut.

Dogs: Elk can be very aggressive to domestic dogs – especially when calves are young.

Habituation: elk often seek refuge in urban areas to avoid predators and access unnatural foods (grass, shrubs) and therefore become very tolerant of people. This contributes to people approaching elk for photos, etc and often results in negative interactions or contact encounters.

Property damage: golf courses and vehicles, bushes/ shrubs, birdfeeders

Seasonal Factors

Spring: Calving season (April – June). Cows that drop calves will then move away and guard site. They can be aggressive when people get too close to calves. Calves are immobile for first 48 hours which helps them to avoid predators. Preferred habitats include mid-stream islands and open forest cover with good sight lines.

Calving activity attracts predators such as bears/ coyotes and potentially cougars into an area. These areas can include urban green spaces that provide cover and security from predators.

Fall (Rut): Bull elk compete for mates and pursue females. They can be very aggressive and may charge people or cause damage to property and are difficult to haze.

Fall hunting: Elk may move into town to avoid hunters. Successfully harvested animals and/or remaining gut piles in or near developed areas may attract large carnivores.

Winter: highway mortality occurs year-round but increases in winter on unmitigated sections of the Trans-Canada Highway.

Motivations and Behaviours

Elk are highly motivated to avoid predators (cougars/wolves) and hunters. They will use urban areas as predator refugia.

Cows motivated to protect calves, especially in spring. Bulls motivated to protect/guard cows in fall rut.

Elk are attracted to green grass in fall/winter and early spring on golf courses, playgrounds and schools

Attractants

Large urban green spaces: Elk are attracted to urban areas with large green spaces such as playgrounds, school yards, golf courses, and open forested patches (e.g. FireSmart) within town because they offer high quality forage, are free of predators, provide greater detection or reaction distance and increased flight options, and allow elk to remain in large herds. Maintaining herd size increases overall vigilance allowing each animal to devote comparatively more time to foraging (less time alert with head up; more time head-down foraging); especially if wildlife corridors lack these habitat features (resources).

Open forested stands are often preferred for elk calving (some cover but with good sight lines); typical of those created through Firesmart thinning projects.

Novel forage species such as grass/ornamental shrubs / trees and hanging pots with flowers and bird feeders are all attractants for elk at various times of the year. There are regulations in both Banff and Canmore that prohibit the feeding of wildlife.

Active Management Tools

Temporary area closures: in response to active calving in areas where this is feasible. This may be discouraged in developed areas so that elk do not get comfortable calving in developed areas regularly.

Scoop & run with calves: Used to move calf short distances where area closure not feasible. This is not done on provincial lands due to limited resources

Hazing: short term. More effective with adults. Less effective during calving or rut.

Intensive hazing: to keep elk out of urban areas using herding dogs, was expensive and saw limited success in Banff over several season. Study at Ya Ha Tinda used horses/riders to apply daily pressure to elk in attempt to displace them, found to be unsuccessful.

Habituated elk removal: this has been ongoing in Banff for over a decade to manage herd size and selectively remove the most habituated individuals.

Increasing hunting opportunities: Investigate the possibility of increased hunting opportunities where appropriate to help manage elk using developed areas.

Hunter management: moving hunting away from residential areas to avoid carcass/gut piles attracting carnivores. Removal or relocation of elk carcasses/gut piles within or near developed areas

Destruction: random culling, or increased hunter harvest, intended to manage herd size.

Passive Management Tools

Fencing: Page wire, chain link and 5 rail wooden fences have been used to keep elk out of developed areas such as schools and playgrounds. Fenced areas must include a method to chase elk back out of fenced areas; both actively (gates) and passively (jump-outs). Fencing requires ongoing management (incursions, fence damage) and regular planned/funded maintenance.

Highway fencing and crossing structures: These have been very successful at reducing elk mortality on roadways.

Seasonal area closures: pro-active closures can eliminate human interactions in known calving/rutting areas. They should not be used in areas where you don't want elk such as urban parks and green spaces.

Attractant management: Fencing key areas such as playing fields will reduce attractive vegetation and help to reduce the amount of time elk spend in developed areas. E. Exclude elk from refuge areas in town with fencing or repurposing those areas to fenced off-leash dog parks or general hardening of landscape (remove hiding cover to 6 feet high in forested areas). Removing undergrowth (hiding cover) will discourage elk from calving in developed areas.

Habitat enhancements: Providing better forage, hiding cover and fewer disturbances in areas where elk are encouraged to be will increase elk activity in those areas. This can be accomplished through controlled burns/mechanical clearing. Consider that opening the forest canopy may result in buffaloberry growth (bear attractant).

Reasonable Expectations

Urban refugia: Elk will inhabit urban areas to avoid predation risk (which is a 24/7 pressure) regardless of intermittent hazing efforts. Hazing at a level to counteract predation pressure is likely not sustainable.

Aggression towards people: Cow elk will aggressively protect their calves – these behaviour traits should be retained in the population where possible if elk are to be successful outside urban areas. Bull elk will be aggressive towards people during the fall rut.

Dogs: Elk will be aggressive to dogs – we expect this is because they perceive them as wolves or coyotes that present a risk to them or their offspring. Off leash dog parks should be fenced to avoid conflicts with elk.

Wolves

Primary Interactions with People

Wolves are generally quite wary of people. Almost all negative interactions with people are linked to food conditioning.

Wolves will “escort” people out of a denning area. This following behaviour can be very disconcerting for the person, but has not been known to result in contact encounters.

Wolves are adaptable and can readily become food conditioned through interaction with anthropogenic food sources including roadside litter, unsecured attractants (food/garbage, camping coolers, and pet food) or hand-feeding.

Wolves are often on the move in search of food, so human observations are often much more fleeting than, for example, bear sightings. This may encourage people to throw food rewards to cause the wolf to pause long enough for a photo. Contrast to bear jam where bear spends hours feeding on roadside vegetation.

Seasonal Factors

Active on the landscape year-round, as both hunters and scavengers. Will push a cougar off a kill site and consume the carcass.

Protect/guard den sites in spring and early summer; packs work together to bring food back to den sites to sustain lactating female and young pups which are immobile at that time.

Motivations and Behaviours

Motivated to feed/hunt ungulates and produce/care for pups.

Pack composition is very dynamic. Only lead male and female breed. Young often disperse great distances.

They will access carcasses on highways, hunting areas (near / in developments).

Habituation and wariness amongst wolves is highly variable. They are considered much more wary in the province where hunting and trapping occur.

Attractants

Wolves hunt all species of ungulates including sheep and goats. They will also prey on domestic livestock including cattle, sheep and goats.

They will investigate all garbage/litter as potential food sources and will bring litter back to den for doggy toys.

Wolves will readily accept human foods if presented and can become food conditioned leading to bold/aggressive/ curious behaviours.

Active Management Tools

Hazing: This is considered inconsistent, short term and has had limited success.

Aversive conditioning: This is challenging to implement, even with collared wolves. Efforts are of limited success. Wolves do seem to respond, generally, to consistent pressure such as those found in hunted populations (increased wariness) but even this may not be effective in deterring a food conditioned individual.

Destruction: This is a common response by agencies for food conditioned wolf. Lethal options are outlined in the provincial wolf response Guidelines.

Passive Management Tools

Temporary area closures: to eliminate human interactions – especially effective at known den sites to improve habitat security and decrease potential for negative interactions (Predictable in time and space).

Attractant management: Secure food/garbage at all times and prevents feeding of wildlife – this is the most important preventative measure to avoid food conditioned individuals.

Public education/awareness: Small percentages of public seem highly motivated to feed wolves for experience/photos. Efforts can be targeted when wolves show less wary behaviour in a given home range.

Prey management: Exclude/discourage prey species from utilizing developed areas. Managing prey abundance and distribution can affect wolf behaviour and density; however wolves have such a broad range of prey species and are so opportunistic that this may be less effective than intended.

Highway fencing / crossing structures: effective for wolves; especially with buried apron to prevent wolves from digging under. However wolves have been observed walking across Texas Gates to enter exclusion areas of Trans-Canada Highway.

Reasonable Expectations

Urban refugia: If attractants are secure and wolves are not food conditioned, it is reasonable to expect to exclude them from developed areas. However, presence of prey species, within developed areas, can attract wolves into these spaces. Ineffective wildlife corridors, around communities can also lead to incidental incursions into developed areas, as wolves attempt to navigate the Bow Valley.

Surprise encounters: People encountering a wolf on the trail generally have nothing to fear unless the animal has been food conditioned, is protecting young, or attracted/threatened by a domestic dog. Wolves generally won't present a danger, even at a kill/carcass site.

Public perception of wolves: Wolves have historically been vilified and some public may perceive a wolf encounter as being more dangerous than it was. This should be evaluated when receiving reports. Conversely others may perceive wolves as being very similar to domestic animals (dogs) and be inclined to feed them, or approach too close.

Reproductive capacity: Wolves are incredibly resilient and respond to culling by increasing reproduction. Unlike bears or cougars, they have the capacity to rebound much more rapidly. This makes culling less effective (requires ongoing maintenance) but also allows them to recover from natural mortality incidents more rapidly.

Pack dynamics: are very fluid. Alpha pair (breeding) is often changing and home ranges are dynamic as a result. This may result in very different behaviours (predation, travel routes, wariness etc) over time.

Linear travel routes: Wolves occupy large home ranges and will consistently take advantage of linear features such as roads, rails, trails etc for ease of travel. This is hard to deter.

Aggressive encounters: Most often linked to food conditioned wolves and often while trying to access human foods. Human death is extremely rare but trends in contact encounters have been increasing over the past 20 years. The 80 years previous, contact encounters were essentially non-existent.

Dogs: wolves will most often be aggressive to dogs – they either want to breed, kill, or prey on them.

Coyotes

Primary Interactions with People

Coyotes readily adapt to urban settings and habituate to people.

Coyotes may follow and stalk dogs on, and off, leash. They may opportunistically kill small dogs or cats.

Some coyotes use developed areas to avoid larger predators like wolves. They can become nocturnal in urban areas.

There are records of coyotes biting people, especially children. These instances can often be linked to food conditioning. Interactions are more likely to occur at urban/forested interfaces.

It is common to see coyotes in the middle of day in certain areas of Canmore (usually in winter). Coyotes are attracted into Canmore by the presence of feral rabbits.

There have been multiple incidents of coyotes following or making contact with people over the years in the Bow Valley.

Seasonal Factors

Nothing significant.

Motivations and Behaviours

Food: Coyotes will seek out rabbits, garbage, fruit trees, microtines, scavenging gut piles.

They avoid large carnivores and will use developed areas to avoid predation risk from wolves (i.e. safe zone).

They can become food conditioned if people feed them. This leads to increased aggressive behaviour and risks to people. In some local schools, students are not allowed to take food outside at recess / lunch due to historic feeding of coyotes (intentional or not).

Attractants

Food: rabbits, garbage, recycling outside, compost, human foods, fruit trees, microtines, scavenging gut piles, small dogs & cats

Active Management Tools

Hazing: Aggressive actions by public can be effective early on. Hazing with sound deterrents, paint balls, bear spray and rubber bullets does not occur frequently enough to be effective

The destruction of coyotes through lethal management action occurs when reports of aggressive individuals are received.

Removing prey such as feral rabbits would reduce the amount of coyote activity within developed areas. This could be accomplished through trapping (currently being done in Canmore) and eliminating hiding cover for rabbits (screening around decks etc).

Short term closures may be an option with aggressive coyotes (denning?) outside of developed areas.

Passive Management Tools

Securing all attractants. Bear proof garbage bins.

Exclusion fencing from places like school grounds.

Pet control - in yards, fenced dog parks, or on leash.

Design trails to avoid denning areas.

Attractant management policies (no food outside at schools)

Highway fencing / Crossing structures – are effective for coyotes which use both overpasses and underpasses.

Reasonable Expectations

Urban refugia: Will likely always have coyotes in and near develop areas, especially where food is available (feral rabbits, domestic pets). It becomes important to secure attractants where possible to reduce the chances of food conditioning.

Surprise Encounters: People encountering coyote on a trail will most often be able to displace the coyote. Use bear spray whenever possible.

Aggressive encounters: Rarely occurs, but fatal attack did occur in Cape Breton a few years ago involving food conditioned coyotes. Coyote(s) in Canmore have made contact with people, including children, multiple times at various times of the year.

Dogs: Dogs can chase coyotes, but coyotes can also chase and attack dogs, especially smaller dogs.

Cats: Coyotes will prey on domestic cats.

Appendix C - Agency Mitigation Tools

Category	Tool	Agency/Department
Attractant Management	Sheperdia Removal in Human Use Nodes or transects	Alberta Environment and Parks / Town of Canmore/ MD Bighorn
Attractant Management	Bear Proof Garbage Bins	Alberta Environment and Parks
Attractant Management	Fruit tree replacement	Town of Canmore/ Alberta Environment and Parks
Attractant Management	Natural attractant removal	Alberta Environment and Parks / Town of Canmore / MD Bighorn
Attractant Management	Sheperdia Removal in Human Use Nodes	Parks Canada
Attractant Management	Fruit Tree Replacement Program	Parks Canada
Attractant Management	Fencing attractants (e.g. playing fields and elk) and removing entanglement hazards (swings taken down each fall).	Parks Canada
Attractant Management	Securing garbage/attractants/ composting rules, no bird feeders, pumpkins limited to 1 day, annual garbage inspections recorded/ enforced)	Parks Canada
Attractant Management	Manage attractants at b/c camps, lodges, huts, etc. (bear proof fencing).	Parks Canada
Attractant Management	Shepherdia Removal in Human Use Nodes	Town of Canmore
Attractant Management	fruit tree removal program	Town of Canmore
Attractant Management	wildlife attractant bylaw	Town of Canmore
Attractant Management	Feral rabbit control program	Town of Canmore
Category	Tool	Agency/Department
Attractant Management	Bear Proof Garbage Bins	Town of Canmore
Attractant Management	Bear Proof Recycle Bins	Town of Canmore

Category	Tool	Agency/Department
Attractant Management	Residential Solid Waste Management - Bear Proof System	Town of Banff
Attractant Management	Commercial Waste Management - Enclosed waste room system	Town of Banff
Attractant Management	Vegetation Removal	Town of Banff
Attractant Management	Ground Squirrel Relocation / Rodent Vacation Program	Town of Banff
Attractant Management	Fruit Tree Removal	Town of Banff
Human Use Management	Close/shut-down/reclamation of non- designated trails	Town of Canmore/ Alberta Environment and Parks
Human Use Management	Special Events Permits.	Town of Canmore/ Ab Parks
Human Use Management	Proactive planning: Utilization of planning processes and techniques in the location, design, and development of infrastructure including trails, campgrounds, etc.	Alberta Environment and Parks
Human Use Management	Wildlife Corridors/ habitat patches	Alberta Environment and Parks / Town of Canmore / MD Bighorn
Human Use Management	Prescribed fire -habitat enhancements	Alberta Environment and Parks - Alberta BearSmart
Human Use Management	Area Closure - reactive	Parks Canada
Human Use Management	Area Closure - seasonal	Parks Canada
Human Use Management	Dogs MUST be on Leash at ALL times; dog walking discouraged in wilderness areas.	Parks Canada
Human Use Management	Limit Road Access - Temporal Travel Restriction	Parks Canada
Human Use Management	Trail Restriction - Restricted Access (group of 4)	Parks Canada
Human Use Management	Trail Restriction - Official Trails ONLY - **no off trail use** permitted, use of informal trails prohibited	Parks Canada
Human Use Management	Area WARNING	Parks Canada

Category	Tool	Agency/Department
Human Use Management	**Wildlife Corridor FULL Closure** - no human use at all.	Parks Canada
Human Use Management	Wildlife Corridor Restoration - removal of use and infrastructure	Parks Canada
Human Use Management	Fairholme Environmentally Sensitive Site - Voluntary Closure	Parks Canada
Human Use Management	Wildlife Guardians - 2 teams managing bear jams and educating wildlife viewers.	Parks Canada
Human Use Management	CROSSING STRUCTURE CLOSURES: Area closures and habitat security on and adjacent to crossing structures to reduce conflict	Parks Canada
Human Use Management	promote use of and improve existing dog parks; install new dog parks	Town of Canmore
Human Use Management	concentrate use in areas where use is acceptable (e.g. trail improvements/ decomissioning in South Canmore Habitat Patch; Quarry Lake off leash expansion pilot)	Town of Canmore
Human Use Management	Golf Course Corridor - Operational vehicle limits	Town of Banff
Human Use Management	Development Planning consultation (CEAA; Management Plan and National Parks Act adherence)	Town of Banff
Human Use Management	Capital Planning consultation (e.g. sewage line reconstruction; Rec Grounds redevelopment; Lighting policy)	Town of Banff
Human Use Management	Integration of conservation authority within planning approval function (MPC)	Town of Banff

Category	Tool	Agency/Department
Human Use Management	Land use planning decisions to reduce our footprint within wildlife corridors (e.g. Pinewoods lands, Middle Springs lands)	Town of Banff
Infrastructure Design	Crossing Structures	Alberta Environment and Parks
Infrastructure Design	Highway fencing	Alberta Environment and Parks
Infrastructure Design	Mitigated highways (fending and crossing structures) to reduce direct mortality of people and wildlife.	Parks Canada
Infrastructure Design	Trail standards (brushing/sight lines, seperation of sleeping/ eating areas at campsites, bear poles, etc.).	Parks Canada
Infrastructure Design	Wildlide Exclusion Fencing	Town of Banff
Legislation	Activity restrictions	Alberta Parks
Legislation	Area/Trail Closures through Ministerial Order (MO) - can be reactive or seasonal or ongoing.	Alberta Environment and Parks
Legislation	Wildlife warnings (e.g., bear warning).	Alberta Parks/ JSG
Legislation	Designated Trail Ministerial Order (MO). Provincial Parks Act - Section 13(1)	Alberta Environment and Parks/ Town of Canmore/ MD BigHorn
Legislation	Legislation (WildlIfe Act/ Parks Act)	Town of Canmore/ Alberta Environment and Parks-Operations Ops/ Ab Parks
Legislation	Birfeeder bylaw	Town of Canmore
Legislation	Off-leash Animal Enforcement	Town of Banff
Monitoring	Monitoring - wildlife corridor backtracking/transects	Parks Canada
Monitoring	Aerial Suvey or Ground Census	Parks Canada
Monitoring	Hair Snagging / DNA	Parks Canada
Monitoring	Remote Camera Monitoring	Parks Canada

Category	Tool	Agency/Department
Monitoring	Collaring/Marking - Sat/VHF, ear tags	Parks Canada
Monitoring	Wildlife Reporting App for Public	Parks Canada
Prevention/ Education	Education through Media (television, newspaper, online news, etc.)	Alberta Environment and Parks
Prevention/ Education	Education through Website.	Alberta Environment and Parks
Prevention/ Education	Education through public presentations.	Alberta Environment and Parks
Prevention/ Education	Education Outreach	Alberta Environment and Parks - Alberta BearSmart
Prevention/ Education	Education through Media	Parks Canada
Prevention/ Education	Education through Website	Parks Canada
Prevention/ Education	On-site media (personal and non- personal).	Parks Canada
Prevention/ Education	Aggressive - “do not feed” educational campaign	Parks Canada
Prevention/ Education	education through Website and other media (e.g. Living with Wildlife movie)	Town of Canmore
Prevention/ Education	Social Services - newcomers education around wildlife conflict and local norms	Town of Banff
Prevention/ Education	Visitor education re: wildlife	Town of Banff
Prevention/ Education	Education through interactive website	WildSmart
Prevention/ Education	Eductation through interactive Facebook page	WildSmart
Prevention/ Education	Education through interactive twitter account	WildSmart
Prevention/ Education	Education through weekly “Bear Report” newsletter (during bear season) and mailing list	Alberta Environment and Parks / WildSmart
Prevention/ Education	Speaker Series (events)	Alberta Environment and Parks / WildSmart
Prevention/ Education	Educational children’s workshops (children under 18)	WildSmart

Category	Tool	Agency/Department
Prevention/ Education	Educational workshops (adults and rec groups)	WildSmart
Prevention/ Education	Wildlife safety info in other languages	WildSmart
Prevention/ Education	Education through Media	Alberta Environment and Parks / WildSmart
Prevention/ Education	Volunteer Wildlife Ambassadors	Alberta Environment and Parks/ WildSmart
Staffing	Human Wildlife Conflict Biologist	Alberta Environment and Parks - Operations
Staffing	Human Wildlife Conflict Prevention Committee -	Alberta Parks
Staffing	Human Wildlife Conflict Technician	JSG
Staffing	Regional Problem Wildife Specialists	JSG
Wildlife Management	Aversive Conditioning	Alberta Environment and Parks
Wildlife Management	Hazing	Alberta Environment and Parks
Wildlife Management	Grizzly bear , black bear, wolf, cougar Response Guides	Alberta Environment and Parks - Policy
Wildlife Management	hazing - wildlife in urban areas	Parks Canada
Wildlife Management	hazing - roadside wildlife (discontinued)	Parks Canada
Wildlife Management	Aversive Conditioning - consistent deterring of collared animal to generate learned response	Parks Canada
Wildlife Management	Removal/culling	Parks Canada
Wildlife Management	within home range relocation	Parks Canada
Wildlife Management	translocation (not used) [move animal outside home range]	Parks Canada
Wildlife Management	Rehabilitation (orphaned or injured wildlife)	Parks Canada
Wildlife Management	Scoop & Run for elk calves	Parks Canada