

Article

Grizzly Bear Management in the Kananaskis Valley: Forty Years of Figuring It Out

Don Carruthers Den Hoed ^{1,*}, Michelle N. Murphy ², Elizabeth A. Halpenny ² and Debbie Mucha ³

¹ Institute for Environmental Sustainability, Mount Royal University, Calgary, AB T3E6K6, Canada

² Faculty of Kinesiology, Sport and Recreation, University of Alberta, Edmonton, AB T6G2H9, Canada; mnmurphy@ualberta.ca (M.N.M.); elizabeth.halpenny@ualberta.ca (E.A.H.)

³ Alberta Environment and Parks, Canmore, AB T1W1P1, Canada; debbie.mucha@gov.ab.ca

* Correspondence: ddenhoed@mtroyal.ca

Received: 30 October 2020; Accepted: 4 December 2020; Published: 8 December 2020



Abstract: Case studies offer rich insight into the way knowledge is gathered, understood, and applied (or not) in parks and conservation contexts. This study aims to understand how knowledge and information have been used to inform decision-making about human-wildlife co-existence—specifically what knowledge has informed decisions related to grizzly bear management in the Kananaskis Valley. Focus groups of decision-makers involved in the valley’s bear program painted a rich account of decision-making since the late 1970s that was coded thematically. Our findings suggest there are typical impacts on knowledge mobilization, such as management support (or lack thereof), other agencies, capacity, and social and political pressures. In addition, the special context of the Kananaskis Valley and the forty-year timespan explored in focus group conversations provide unique lenses through which to understand knowledge mobilization. This case study reflects the barriers identified in the literature. However, the findings also include unique aspects of decision-making, such as the evolution of decision-making over a period of time in a multi-use landscape, the successful creation of networks to mediate knowledge and practice, and the creation of knowledge by practitioners.

Keywords: knowledge mobilization; protected areas; evidence; wildlife; management effectiveness; grizzly bears

1. Introduction

Evidence-based decision making allows for more effective conservation management by integrating ideas from academic literature, Indigenous knowledge, and local knowledge. Yet, the potential benefits of evidence-based approaches have not been fully optimized in Canadian conservation planning. Instead, managers rely on internal information and institutional knowledge to develop plans and make decisions about protected areas [1].

1.1. Conservation Planning and Evidence-Based Decision-Making

As global conservation efforts shift from creating new parks to maintaining current ones, evidence-based approaches become more important to effective management [1]. A lack of evidence-based decision-making can undermine conservation and reduce its support in the face of economic challenges [2]. The research focused on the use of evidence in decision-making has found managers rely more on knowledge created internally than on empirical research, Indigenous knowledge, and local knowledge [1–3]. Personal experience often guides decisions [4]. Empirical evidence is valued

by managers [3], but knowledge exchange between researchers and decision-makers is lacking [5]. Furthermore, there is often no framework to integrate research into management plans [2].

Decisions in conservation are often required immediately, before data can be gathered for analysis [2]; but there are barriers to accessing different types of evidence. Issues like limited financial resources and staff, the urgency of the decision, and a lack of communication between researchers and managers create a gap between evidence and decisions [1]. Additionally, cultural differences between researchers and managers, accessibility of knowledge, barriers within institutions, and a lack of experience in interpreting research and information can impede the use of evidence [4,6]. Gaps in knowledge can be addressed by embedding knowledge producers in conservation planning [5] and providing more accessible summaries of important literature [7]. Improving the accessibility of various forms of knowledge is critical to effective conservation planning.

1.2. Local Knowledge

There is an absence of local, traditional ecological, and Indigenous knowledge use in policy, research, and management in conservation [8]. These forms of knowledge are complementary to Western science and can be mobilized through collaboration [9]. Epistemological differences between Western science and Indigenous knowledge create challenges and, as a result, scientists may find it difficult to include other ways of knowing in ecological research because of their own philosophical underpinnings and methodology [9]. However, different forms of knowledge can complement and evaluate each other, leading to a co-production of conservation knowledge [9,10].

Knowledge co-production is important to conservation because community members, researchers, and governments have different values that can be integrated into management and policy. Inclusion of local knowledge is important for relationship- and trust-building and can also address gaps in the literature and help to prioritize conservation goals [11]. Co-learning and finding creative ways to weave in knowledge is key to producing new ideas, evaluating current scientific approaches, and finding solutions to environmental and conservation challenges [12].

Despite these benefits, issues with integration remain. In a review of current literature, Benyei, Arreola, and Reyes-García found Indigenous knowledge holders often do not participate in research beyond the provision of their knowledge, with researchers designing and leading the projects [8]. The role of knowledge holders has been criticized by other authors as a surface-level integration of local and Indigenous knowledge [12] or as a method to “educate” the knowledge holders instead of mobilizing and engaging them with the research [8]. These issues further the tension between different ways of knowing and limit the benefits of co-producing knowledge for conservation planning and management.

1.3. Grizzly Bears in the Kananaskis Valley

The geographic extent of the present case study includes the Kananaskis Valley, oriented north to south along the eastern slopes of the Canadian Rocky Mountains from the Bow Valley to the Highwood Pass (Figure 1). It is part of Kananaskis Country, a provincially managed multiple-use area located west of Calgary, Alberta, that includes 51 parks with various levels of protection [13]. Parks within this study area include Bow Valley Provincial Park, Evan-Thomas Provincial Recreation Area, Elbow Sheep Wildland Provincial Park, Peter Lougheed Provincial Park, Spray Valley Provincial Park, and various other provincial recreation areas. Management of these sites falls under the West Kananaskis Area Manager and the Kananaskis Regional Director of Alberta Parks.

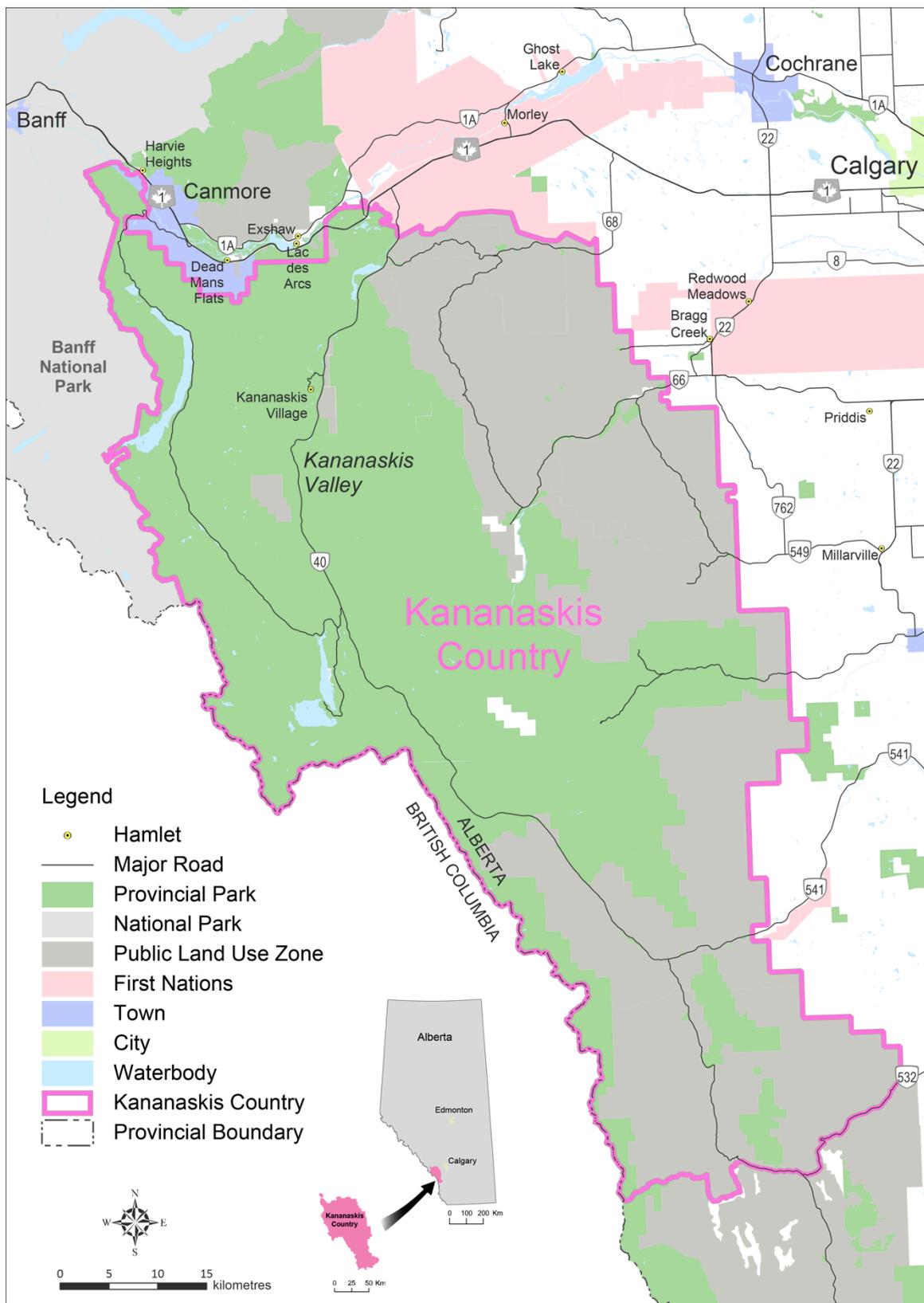


Figure 1. Map of Kananaskis Valley.

Elevations in the Kananaskis Valley range from 1600 m along the valley bottom to tall mountain peaks over 3000 m along the western boundaries of Kananaskis Country near the continental divide [14].

The valley is a movement corridor for wildlife like ungulates, carnivores, and small mammals; as well as for humans traveling along highway 40 to campgrounds, day-use areas, and hiking trails. The landscape contains important habitat for grizzly bears (*Ursus arctos*), a species that is an indicator of ecosystem health and is classified as threatened in Alberta because of small population size, habitat destruction, and human-caused mortality [15,16]. While not protected in Canada under the Species at Risk Act, grizzly bears were listed as a Species of Special Concern in 1991 [17] and as Threatened by Alberta Government in 2010. Managing human-caused mortality rates has been identified as key to the survival of grizzly bears who live along the front ranges of the Canadian Rocky Mountains [18]. Though their geographic range once extended from central Mexico to the Arctic Ocean and from the Pacific Ocean to the Mississippi River, grizzly bears are now mostly found in the mountain and foothills of Canada and Alaska. Habitat has shrunk into peninsular shapes that isolate local populations and create more space for contact with humans, increasing their risk of local extirpation [18]. Accurate population estimates of bears are difficult to obtain. In 2010, it was estimated that Alberta had between 700 and 800 grizzly bears [16]. In Kananaskis Country, approximations from 2006 place the population between 50 and 75 individuals [14].

Grizzly bears hibernate throughout the winter. Emerging from their dens in the spring, they can be found along valley bottoms, near rivers, and into upper alpine and sub-alpine zones in search of roots and sometimes moose, deer, and elk. By mid-summer, they concentrate their feeding to lower elevations, searching for high-energy buffaloberries (*Sherpherdia canadensis*) while occasionally consuming various ungulates [14,19]. Decades of fire suppression have increased the density of forests and reduced open-canopy habitat [20,21], limiting important berry crops to open slopes, meadows, and disturbed areas like those located near human facilities (campgrounds, picnic sites, trails, etc.) [18]. To reduce the occurrence of human-bear interactions, buffaloberries are managed by removing bushes near facilities and encouraging their growth elsewhere [22]. While most bears prefer to avoid human activity, less-dominant bears (such as sub-adults and adult female bears) will forage in areas closer to human facilities to avoid predation by adult males [23].

Grizzly bears have been studied intensively in Kananaskis Country. The Eastern Slopes Grizzly Bear Project (ESGBP) was an 11-year project that focused on species conservation in the Bow River Watershed, which includes all of Kananaskis Country. This research identified management actions that would reduce bear mortality rates and minimize human-grizzly bear conflicts [18]. Recreation and tourism are growing in Kananaskis Country with direct impacts on grizzly bear habitat security, which creates the potential to habituate bears to human activity, increasing the likelihood of human-bear conflict [24]. Research over the last several decades has stressed the importance of proactive management to reduce conflicts with humans. Management actions like trail closures, seasonal closures, and aversive conditioning are supported in the literature; whereas there is a consensus that actions like relocation and destruction of problem bears should be reduced [25,26].

2. Materials and Methods

We hope to understand what knowledge and information have been used to inform decision-making about human-wildlife co-existence—specifically what knowledge has informed decisions related to grizzly bear management in the Kananaskis Valley. This study included three phases, (1) collaboration with a local liaison to refine the scope of the research, (2) a review of academic literature, reports, news articles, and meeting minutes related to the topic of grizzly bear management, and (3) a series of focus groups with decision-makers who reflect the decision-makers involved in grizzly bear management in the Kananaskis Valley.

2.1. Case Study

We adopt a case study research method to explore grizzly bear management and knowledge mobilization in the Kananaskis Valley. By applying this research design, an in-depth and complex understanding of a phenomenon can be developed about a specific case [27] and new knowledge about

a real-world circumstance is created [28]. Temporal and contextual conditions of a phenomenon might be of particular interest, and these can be examined through exploration, description and explanation, or evaluation [28]. In the present study, we describe a unique approach to grizzly bear management and explore how different forms of knowledge are utilized in decision-making. Limitations of case studies include generalizability and limited transferability of findings from single cases to other situations [29]. This case study is part of a larger study that examines knowledge mobilization cases in different parks across Canada.

2.2. Identify Key Management Issue with Local Liaison

The local liaison for the case study was the West Kananaskis Area Manager, responsible for park operations in the Kananaskis Valley including the parks human-wildlife conflict prevention program. While well-versed in the current grizzly bear management issues, the individual was relatively new in the position and interested in understanding the history of grizzly bear decisions prior to her tenure, which began in 2015. In addition, the case study lead previously worked with Alberta Parks in the Kananaskis region and was able to provide input on the context of the case.

The study examines grizzly bear management decisions in the Kananaskis Valley, a critical wildlife corridor and habitat for grizzly bears that is highly visited for tourism and recreation. It is a site where the only land management agencies are provincial and have a history of collaboration through the Kananaskis Country Interdepartmental Coordinating Committee (KCICC). Notably, many of the original Kananaskis Country facilities—such as campgrounds and trails—were developed in the late 1970s in areas that were not known at the time to be important grizzly bear travel corridors and habitat.

The Kananaskis Valley is also part of a unique grizzly bear and human-wildlife conflict management program, the epicenter of which is viewed as a success as it is a valley with increasing human use, multiple recreational facilities, and a growing grizzly bear population with very few reported negative human-wildlife incidents. The liaison identified several key turning points in the history of the Kananaskis Valley that may have influenced decisions around grizzly bear management: most notably were the creation of Kananaskis Country and Kananaskis Provincial Park (now Peter Lougheed Provincial Park) in 1977; the ESGBP in the mid- to late-1990s; the G8 Summit hosted in the Kananaskis Valley in 1998; and the subsequent creation of the dedicated Human-Wildlife Conflict Prevention Program, ongoing government and community education programs (interpretive programs and the wildlife ambassadors with WildSmart); and two incidents involving bears—referred to as the Nakiska bear, a grizzly that was removed and sent to the Calgary Zoo after a non-fatal encounter; and the Picklejar Lakes incident, in which a bear was left on the landscape after a fatal encounter. The Kananaskis Valley was also the study site for a novel cultural monitoring study and report led by the Stoney Nakoda and shared with park agencies in 2016.

2.3. Document Scan

Focusing on grizzly bears in Kananaskis Country and nearby protected areas, we reviewed academic literature from the natural and social sciences, newspaper articles, and media, as well as relevant policy, management plans, government documents, external agency reports, and meeting minutes from Alberta Parks and related non-governmental organizations. We identified (a) policies and events/occurrences related to grizzly bear issues in the Kananaskis Valley, (b) the influence of local and broader human-wildlife conflict prevention strategies, and (c) changes in how grizzly bear management was framed over time (e.g., terminology shifts from “problem wildlife” to “human-wildlife coexistence” or changes in management from site-based and activity-based to landscape level). Documents were not explicitly coded or interpreted but were noted as significant if they were referred to in subsequent materials or minutes, addressed specific grizzly bear management decisions or incidents, or represented direct policy (or policy changes) related to grizzly bear management in the Kananaskis Valley.

Three reports and two incidents were identified as important guiding documents. The ESGBP Report presented major science-based research findings from an 11-year study of a 40,000 km squared

area known as the Central Rockies Ecosystem (CRE), which includes Kananaskis Country [18]. The 2008–2013 Alberta Grizzly Bear Recovery Plan [30] and Response Guide [31] define long-term policy and acute responses to grizzly bear management across the province. The two important incidents include the relocation of a grizzly bear from the Kananaskis Valley to the Calgary Zoo after a non-fatal human-wildlife encounter in 2000, and the 2014 decision to *not* remove a grizzly bear after a fatal encounter in the Picklejar Lakes area. The latter incident was discussed in detail by focus groups in the present study.

The 2016 Stoney Grizzly Report, an Indigenous-led report on enhancing grizzly bear management with cultural monitoring and traditional knowledge was included in the literature review study, but to date, the organizations responsible for grizzly bear management have neither officially responded to the report nor incorporated any of the recommendations. Only a few participants were even aware of the existence of the report, and even fewer had reviewed it.

2.4. Focus Groups with Decision-Makers

In addition to gaining insight into decisions made regarding grizzly bears in the Kananaskis Valley, this review helped to guide focus group composition and development of interview questions. The individuals listed in the meeting minutes for decisions related to grizzly bears as attendees or guests were grouped into categories (Table 1) of educators (government and community), government managers, and field staff from Parks and Fish and Wildlife (including conservation enforcement, ecology, and planning staff). The distinction between field ecology staff from Fish and Wildlife and Alberta Parks reflects the two distinct government departments that play a role in managing grizzly bears in the Kananaskis Valley. Of note, there were no Indigenous people identified as being involved in decisions about grizzly bear management in any of the literature or documentation explored in the study. One mention was made of three First Nations bands responding to the consultation process for the Alberta Grizzly Bear Recovery Plan [30], but there was no indication which First Nation provided the feedback, what the feedback was, or whether this feedback was incorporated into decision-making.

Table 1. Categories of decision-makers identified in documents.

Educators (involved in delivering bear management messaging)	Community Educator (e.g., WildSmart, Friends of Kananaskis Country) Government Educator
Government Manager	
Field Staff	Parks Conservation Enforcement Parks Ecology Field Staff Parks Planning Staff Fish and Wildlife Ecology Staff

Originally, a focus group for each category of decision-maker was created, however, scheduling conflicts only accommodated focus groups with a mix of participants from each category. In addition, most categories were represented by both current and retired individuals.

The team held six focus groups with sixteen individuals in total. Each focus group was two-hours in length and followed a semi-structured interview format with question topics drawn from a script developed for similar case studies (see Table 2). This conversational structure was followed in each focus group. Each participant was given a chance to answer the question while also encouraged to build on the responses of others. Interviews were transcribed and each participant was given a chance to review and make changes.

Table 2. Focus Group Guiding Questions.

Background information	“Please share your professional and educational background related to decision-making about grizzly bears”
Types of information used in decision-making	“How has knowledge typically been integrated in planning and management here?”
Decisions made about grizzly bears	“Describe important management decisions you were involved in related to grizzly bear management”
Experience applying knowledge to decisions	“Describe a decision where natural science, social science, or Indigenous knowledge was used to help with the decision-making process”

2.5. Thematic Analysis

Focus group data were analyzed using NVivo software and Braun and Clarke’s thematic analysis approach [32]. This method examines, analyzes, and reports themes (or patterns) in the data and allows for a rich description of the data set. Themes represent important responses found in the data and there are different ways to uncover them (semantic/explicit or latent). The present study uses a semantic or explicit approach to identify patterns at a surface level without looking beyond what is directly said by the participants. This method complements the case study to create a rich description of a phenomenon and interpret the data for future practical uses. The thematic analysis allows for a description of how different types of knowledge were found, used, and applied in the Kananaskis Valley grizzly bear decision-making context by presenting overarching themes from across the focus groups.

We sought to define themes that connected the overarching conversation across focus groups, as opposed to creating detailed accounts, and hoped to lay a foundation for future inquiry. With NVivo, the three research team members individually familiarized themselves with the data and generated initial codes (Braun and Clarke’s Phases 1 and 2). We collaborated to review themes for internal homogeneity and external heterogeneity, define and name the themes, and to produce the report (Phases 3 to 5). After reviewing transcripts individually and defining initial codes, the team met to consolidate/compare codes and discuss internal homogeneity and external heterogeneity, as per Braun and Clark [32].

2.6. Ethics

Ethics for this case study were obtained from the University of Alberta Research Ethics Board (I.D. RES0039462) and the Mount Royal University Human Research Ethics Board (Ref # 6725).

3. Thematic Analysis Results

While there is room to interpret themes further and to look at broader aspects of decisions related to grizzly bears in the Kananaskis Valley, adjacent protected areas, and beyond, we see value in sharing observations based on this case study and feel that themes presented in the results offer significant insight into knowledge mobilization in general, grizzly bear management in particular.

Three overarching themes resolved immediately and remained relatively stable. First, that *decisions were impacted by things other than knowledge*, such as management/manager choices, other agencies, politics, and pressures on capacity. Second, that social science, natural science, and Indigenous knowledge are acknowledged as important, but these *different knowledge frameworks are generally not available nor integrated* into decision-making. Third, that *knowledge about bears was created by field staff and the special context of the Kananaskis Valley*. These themes each included sub-themes that clarified particular aspects of knowledge mobilization for grizzly bear management in the Kananaskis Valley and were determined through several rounds of iterative individual and collaborative coding until the research team agreed on the fidelity of these themes. The third theme was split into two top-level

themes of the special context of Kananaskis Country informed decisions and knowledge created internally by figuring it out (See Table 3).

Table 3. Themes and Sub-Themes. Representative quotes are provided to illustrate the kinds of statements shared by participants in each theme.

Themes	Sub-Themes	Illustrative Quotes from Focus Group
Section 3.1. The Special Context of Kananaskis Informed Decisions	Section 3.1.1. Creating Kananaskis Shaped Decisions	<i>"where's the best views? What's gonna attract the most people? What's, what's the least-cost construction? You know, what's already there that we could utilize because there were some existing facilities, those kinds of things, but little to no sort of ecological data that was integrated into that planning at that phase."</i>
	Section 3.1.2. The Focus of Decision-Making Shifted over Time	<i>"there was a sort of transition or shift in the culture of parks that occurred in the mid-nineties, from that sort of real strict recreational focus to, at least somewhat of a more ecological conservation focus for the park system in Alberta."</i>
	Section 3.1.3. Decision-Making Changed as Local Bear Populations Changed	<i>"it wasn't until, you know, we saw the opening up of the Valley with trail development, road development, buildings, that type of thing that we created that better habitat and better protection of grizzly bears to start seeing them on the landscape." "the clientele, the CO's, the legislation, the level of development seems to allow for grizzly bears to be able to . . . we're growin' grizzly bears here and it's been fairly successful."</i>
Section 3.2. Decisions Were Impacted by Things Other than Knowledge	Section 3.2.1. Management Impacts Decisions	<i>"most management, up until around almost probably 2005, I would say, came up through either the conservation or Fish and Wildlife officer ranks and that composed of the largest number of folks that were in management decision-making roles." "talking to my cohorts in national parks and, and elsewhere, there's a real dysfunction happening between upper levels to lower levels. And it's not, I think what we've, we've lost sight of is, they're talking two different languages more and more. Um, and how do you get the people in between to interpret those languages?"</i>
	Section 3.2.2. Other Agencies Impact Decisions	<i>"the bear world is a small world, like you know, you can call Kerry Gunther in Yellowstone or John Waller in Glacier or somebody in the Smokey Mountains and just ask "hey, what do you think?" and you're getting input from a variety of sources that ah, have got decades and decades of experience with this stuff."</i>
	Section 3.2.3. Capacity Impacts Decisions	<i>"the lack of funding when you are trying to deal with these kinds of issues, it's the difference between hope and promising outcomes and absolute disasters and desolation." "management decisions often are required, you know, next week or the next month or something's changing [. . .] if you want to go out and get the science and do some science to inform that decision, it's going to take a much longer timeframe"</i>
	Section 3.2.4. Social and Political Pressures Impact Decisions	<i>"[Kananaskis Country] was more about, you know, 'what did the public want? What did recreating Calgarians want?' And less of a concern about conservation, which I think was, you could probably extend that across the board for most parks." "maybe ultimately it's not natural science or social science or traditional knowledge that informs decision-making, its politics."</i>
Section 3.3. Different Knowledge Frameworks Are Generally Not Available Nor Integrated	Section 3.3.1. Natural Sciences Is Used	<i>"it's way easier to make a decision based on natural science because that's our comfort zone."</i>
	Section 3.3.2. Social Science Is Needed	<i>"What's the biggest bang for our buck for money spent on research? I would say certainly in this valley, social science research is going to give you the kind of data and the kind of understanding that's going to be necessary to deal with the problems and the challenges associated with limiting people use in this valley."</i>
	Section 3.3.3. Indigenous Knowledge Is Not Being Integrated	<i>"the barriers are, like, it doesn't agree with my science, I'm a scientist and if your telling me something and it's not supported by science, I have a hard time of getting out of my decision framework of saying 'well that's not, that's not the case.'" "there needs to be a method by which we can arrive at a conversation that's based on something other than numbers and data."</i>
Section 3.4. Knowledge Created Internally by Figuring It out	Section 3.4.1. Self-Education	<i>"we were cast into the position of participating in making recommendations and doing all of that kind of work without being very well prepared"</i>
	Section 3.4.2. Gain Experience in the Field	<i>"you can only watch bears eating sherpherdia in the middle of a campground so long to realize they're not there for the picnic baskets."</i>
	Section 3.4.3. Bears Inform Knowledge	<i>"All the sudden we know what this bear's been doing for a year, for two years, for three years. And a bear shows up and it's like it's not red alert, it's like "oh, that's this bear. We know that she pops in here" and I think that kind of knowledge going to management and to managers, all the sudden your tolerable risk levels go down"</i>

3.1. *The Special Context of Kananaskis Informed Decisions*

The research team identified several factors that seemed unique to the creation of Kananaskis Country and change in the Kananaskis Valley over time. Some of these confirmed findings in the document review, such as the impact of the ESGBP, the grizzly bear recovery plan, and the shift in language from “problem wildlife” to “human-wildlife conflict.” Participants also added the impact of the changed grizzly bear status, restrictions on hunting, and the G8 Summit. These turning points in grizzly bear management occurred alongside a cultural shift from a recreation focus to a conservation focus in the valley and the broader park agency. Participants involved at the beginning of Kananaskis Country emphasized that the rapid designation, development, and opening of 4000 square kilometers of multi-use recreation area over just a few years occurred prior to meaningful research or knowledge. While the strong vision of Premier Peter Lougheed was antithetical to integrating different pieces of knowledge, it accelerated decision-making, and created the still-active KCICC.

3.1.1. Creating Kananaskis Shaped Future Decisions

The designation of Kananaskis Country in the late 1970s began with the rapid development of facilities between 1977 and the early 1980s. Participants recalled build-out as occurring prior to any research on bear habitat suitability and absent of any research on grizzly bear ecology. Instead, participants suggested facilities and trails were built based on aesthetics and views, existing game or recreation trails, previously built facilities, and cost and efficiency. A participant explained this by stating: “you need to go back to the very start of Kananaskis, and how little knowledge was utilized in the original planning of Kananaskis Country from an ecological perspective, and particularly from a grizzly bear perspective.”

This lack of consideration of ecological information was attributed to a lack of available ecological information. Participants who had worked in the valley in the early 1980s recalled studies on grizzly bear habitat suitability by Stephen Herrero and Wayne McCrory completed after facility development with most of the construction already completed. The habitat data illustrated fundamental issues with the development of Kananaskis Country, notably that many facilities were built in the same places grizzly bears needed. For example, on the one hand, Elkwood Campground was identified by participants as being located “in the middle of one of the best grizzly bear habitat patches.” On the other hand, participants also recalled an attempt to mirror approaches taken in the adjacent Banff National Park—an even busier area also containing critical grizzly bear habitat. Knowledge and expertise were imported from the nearby national park and other local agencies, resulting in a forward-looking approach that mandated standards such as bear-proof garbage bins.

A final observation on the special context of Kananaskis Country was that it initially functioned as an integrated program informed by an overarching vision. The overarching vision of former Premier Peter Lougheed was executed through top-down direction from a centralized Calgary office, and an integrated, inter-departmental governance system (KCICC) generated collaboration and streamlining of decision-making across often-rivalrous government ministries.

While the context of Kananaskis Country has changed, both people and bears live with the consequences of decisions made in the past and can build on the foundation for successful management of grizzly bears in the Kananaskis Valley that persists today.

3.1.2. The Focus of Decision-Making Shifted over Time

As discussed in the previous section, there was an evolution of available information that, in hindsight, may have resulted in different decisions, such as avoiding placement of facilities within the prime grizzly bear habitat. The focus group participants confirmed several other turning points over the history of the Kananaskis Valley that either changed the direction of decisions related to grizzly bears or changed the access to knowledge. These included a cultural shift towards science-based

decisions, increased availability of grizzly bear research and information on specific incidents, and a reframing of the focus of grizzly bear management as human-wildlife conflict.

Participants noted that in the mid- to late-1980s there was a perceived shift toward more use of and access to natural science knowledge, primarily fueled by the work of Herrero and other prominent biologists. Participants felt the science affirmed many of their intuitive decisions and reinforced the expertise of those making decisions.

In the 1990s, a second shift occurred as the Alberta Parks system moved from recreation-focused to conservation-focused management. This shift correlated with the final report of the 10-year ESGBP. This report was identified as significant in our initial literature review and participants suggested that the creation of knowledge was influencing and supporting decisions and practice.

In the early 2000s, and partly supported by legacy funding from the G8 Summit, there was a shift in decision-making from being based on grizzly bear science, such as the ESGBP, to science focused on human-wildlife conflict. The latter was described as a program that included “collaring bears for management purposes, shepherding them, [and] making sure that they were staying out of areas that were dominated by people.” The program comprised a unique combination of infrastructure that is made to be bear-proof, legislation that allowed for key enforcement actions (e.g., ticketing for leaving coolers unattended), and interpretive and education programs that informed public behavior.

There was also a change of language among practitioners, a deliberate choice that was meant to set a new goal for grizzly bear management away from the term “problem wildlife” and toward “human-wildlife coexistence” language to focus on the relationship between people and wildlife. This shift was reflected in subsequent literature [25] and practice, including updates to the 2016 Bear Response Guide [31] and the development of management plans specific to human-wildlife conflict prevention and grizzly bears.

3.1.3. Decision-Making Changed as Bear Populations Changed

The context of the Kananaskis Valley, and by extension the focus of decision-making, appears to have changed alongside changes in the local ecology of bears. Participants recalled that, prior to 1977, bears (both black and grizzly) were infrequent in the Valley. One first-hand account was that “for me to see a black bear even back then was just was . . . it was rare.” However, a combination of factors supported a growing grizzly bear population, including the cessation of the grizzly bear hunt and internal management and development actions such as effectively creating bear habitat through clearing for trails and facilities and supporting a growing grizzly bear population through the success of the human-wildlife conflict prevention program. The management decisions, conservation actions, and even educational messages needed to change because the bears themselves had changed.

3.2. Decisions Were Impacted by Things Other than Knowledge

While the document review identified a variety of management plans, policies, and frameworks that were clearly intended to guide decisions related to grizzly bear management in the Kananaskis Valley, the focus group discussion revealed a number of other impacts to decision-making, including management, other agencies, capacity, and both social and political pressures.

3.2.1. Management Impacts Decisions

Managers in the study area are responsible for enacting the management plans for a particular park or species and for guiding the operations of field staff. The participants in the focus groups—who were not all managers—described some managers as facilitators of knowledge-based decision-making, while others were seen as impeding the gathering and use of evidence.

Between the 1980s and 2000s, managers in the area—generally perceived as having come up through the system—were supportive of using natural science knowledge to inform decisions about grizzly bears. This management support was credited to their previous first-hand experience as field staff prior to becoming managers, as well as their trust in the local knowledge of current field staff.

In recent years, newly hired managers were seen as having less-relevant backgrounds—and examples of these included those with MBAs or experience from other ministries but no experience in parks of conservation. In some cases, it was felt they had little to no field experience. Participants suggested these managers exhibited less trust for field-based decision-making, were less effective at communicating issues and information, and even overrode information with their own personal perspective. A statement from the focus groups that illustrates these concerns is:

We currently don't have a management team that maybe understands or trusts natural science, or how it can be incorporated into the decision making. If they don't trust science, or don't value science, there's a barrier. They don't really understand how to use it.

While participants expressed both the positive and negative impacts managers can have on decision-making, the most discussion was about the disconnect between management and field staff or ecologists, and the need to ensure managers are open to evidence that supports decisions.

3.2.2. Other Agencies Impact Decisions

Other agencies were viewed as sources of knowledge. Experts or resources from Banff National Park were engaged during the development of Kananaskis Country, and an entire community of grizzly bear experts from various agencies would frequently collaborate in the ensuing decades. At times, however, other agencies were seen as sources of frustration or conflict. For example, participants described other agencies producing inconsistent public information on whether bear spray should be carried by park users as a defensive tool in case of bear encounters, which complicated education messaging and compliance programs.

There was also ongoing conflict centered on different approaches to grizzly bear response between the provincial Fish and Wildlife program and the Parks program. Fish and Wildlife were described as having the mandate to deal with problem wildlife across the province, *including* within parks and protected areas managed by Parks. In cases where a decision needed to be made related to a grizzly bear incident, these two agencies—Fish and Wildlife vs. Parks—often took different stances. Fish and Wildlife took a more hard-line approach that Parks staff disagreed with. Over time, positive collaborations developed between Fish and Wildlife and Parks within the setting of the Kananaskis Valley. Participants attributed the change in tone to factors such as the local setting—and the likelihood that staff from either agency might live in the park as neighbors, the integrated decision-making generated by the KCICC, and the empowerment of Park field staff in conflict management through the grizzly bear management plan. In time, people from both sides were able to appreciate that each agency held their perspective for a reason. A description of this shift in relationship from adversarial to appreciative was provided by a Park staff member and presented here to illustrate this theme:

[Fish and Wildlife] are folks who have seen the absolute worst of what bears can do to people. And, you know, after hearing about their experiences and seeing some of the photos of fatalities . . . I had a much better understanding of the position that they're coming from and why they make some of the decisions that they do. And I think we can all say that we might do it differently, but until you've been in their shoes [. . .] it gave me a different perspective for decision making regarding to bears, but also relating to those people. Because we were so far apart before, but once you understand people's perspectives and the knowledge that they go on to make their decisions, you can kind of create bridges a little easier.

In some focus groups, this topic of conversation led to discussions about the importance of fostering cross-pollination across agencies—not just Fish and Wildlife, but also Parks Canada, the Crown of the Continent agencies, across other Alberta Parks' regions, and so on—to share ideas, training, and work toward consistency in approaches to management and messaging.

In several focus groups, there was also an illustration of effective interagency cooperation during the significant bear incident at Picklejar Lakes. Though we cannot share specifics of the incident,

it is generally seen as a pivotal moment when it was decided to leave a bear on the landscape after a fatal mauling. The agencies involved had lengthy discussions about how that decision was made collaboratively with a deliberate, iterative process to establish and agree on facts of the situation, to gather as much input as possible from each involved agency, and to come to a decision that everyone supported.

3.2.3. Capacity Impacts Decisions

Focus group participants suggested that the capacity to gather or apply knowledge impacted the availability and use of knowledge to inform grizzly bear management. Capacity pressures were categorized as funding, time, pace, or human capacity. The clearest capacity pressure was *funding*. Participants explained there was rarely enough funding to engage in research or knowledge-gathering, and even less available for social science and Indigenous knowledge-gathering relative to natural science.

The second capacity pressure was *time*, notably the lack of time for decision-makers to consider different sources of knowledge among competing work pressures. Managers in particular spoke of time-consuming internal processes. For example, urgent Action Requests (ARs) to higher levels in the organization would often take priority over knowledge gathering or applying evidence to decisions, which was seen as a self-perpetuating cycle where decisions were not based on evidence and could lead to bad decisions or even more ARs.

The third capacity pressure also related to time but focused on the *pace* at which decisions were made vs. the pace at which research moves. Participants explained that management decision timelines were often immediate and required action within weeks or months, while research required much more time and process. This incongruence creates decisions that are too reactionary to allow time to adequately gather information. Knowledge creation was not proactive enough to keep up with what is happening on the ground.

The fourth and final capacity issue was *human* capacity, or specifically the loss of human capital as people leave the organization over time. The timespan of this case study and the involvement of retired individuals sparked discussion on how key people leaving the organizations impacted the knowledge available for decision making. The following statement captured this loss of people connected to the Kananaskis Valley: “we’re losing that sort of institutional knowledge, or people would be moved around, or they’re not being dedicated to it as much.” There were also comments about the younger staff being more aware of new knowledge sources or having more recent training, especially in terms of their openness to considering social science or Indigenous knowledge. However, the overarching sense was that integrating evidence and knowledge became harder as the people who knew the context and issues of the Kananaskis Valley left the organization.

3.2.4. Social and Political Pressures Impact Decisions

The final area of impact on decision-making around grizzly bear management is the combination of social (or public) and political pressures. Social pressures included external, citizen-driven demands, and support for decisions in parks while political pressures were the internal machinations of government that may impact a decision. Many of the participants in the focus groups either stated or agreed that recreation and social/public interest were prioritized over conservation, noting that much like most parks in the Alberta Parks system in the late 1970s, the creation of Kananaskis Country was seen as rooted in meeting recreation needs with little obvious concern for conservation.

There was also discussion about how social pressures could support conservation, such as the general public support to restrict the grizzly bear hunt in Alberta (which had an impact on grizzly populations in Kananaskis). Though some groups, such as ranchers, supported grizzly bear hunting, general public opinion influenced specific grizzly bear management policy. The importance of public influence on decisions confirmed the value of including educators in this case study. All participants, whether educators or not, recognized the importance of interpretation and education programs to

increase compliance and support public safety, as well as the importance of education to foster public buy-in for grizzly bear management decisions.

Political pressures, sometimes referred to as “political interference”, were linked to the social pressures that influenced grizzly bear management decisions. The perceived political desire to maintain public support of decisions could undermine the use of available information. Some participants suggested the top-down directives from Ministers made knowledge-gathering irrelevant, and that decisions did not always reflect available science or the advice of experts. The disconnect between decision-makers and subject matter experts was attributed to the four-year election cycles of government and too cautious management by government officials unwilling to risk unpopular or incorrect action.

Managers in the case study acknowledged that part of the decision-making process had taken a “manage up” approach by ensuring both field staff perspectives and research reached the political levels of government. However, the general feeling among all the focus groups was that political pressure could influence, change, or even overturn good decisions. A salient comment that sums up these felt pressures is: “On a good day I would say that natural sciences have been part of making conservation decisions on the landscape. On a good day. Most days are not good days. Most days, most days the decisions are made based on politics, based on economics, based on, on social agenda.”

3.3. Different Knowledge Frameworks Are Generally Not Available Nor Integrated

One of the main areas of focus for this case study was how natural sciences, social sciences, and Indigenous knowledge had been used in decisions about grizzly bears in the Kananaskis Valley. Participants felt that all types of knowledge were underused or unavailable, though they recognized the value of each and were eager for ways to incorporate different knowledge frameworks. Decision-makers primarily relied on natural sciences knowledge, felt there was a lack of opportunity to incorporate social science, and had no successes integrating Indigenous knowledge.

3.3.1. Natural Sciences Is Used

Natural sciences were used in grizzly bear management over the course of this study timeframe. Though, as mentioned in the first theme, research data was not available until after Kananaskis was created, and, as mentioned in the second theme, there were multiple capacity pressures to gathering knowledge. The monitoring of grizzly bears through wildlife radio telemetry collars, remote cameras, and collecting observation reports was noted as an ongoing aspect of park operations in the Kananaskis Valley. Participants explained that the human-wildlife conflict prevention program (now referred to as the bear management program) relied on ongoing data collection for field operations.

3.3.2. Social Science Is Needed

Few participants could identify any examples of social science being used in decision making, though they expressed a crucial need for such research. Individuals involved in the early days of Kananaskis Country could not recall any related social science research being completed, though they did recall expressing an urgent need for it. Today, the need seems to be equally pressing, even more so than natural science because current management decisions related to grizzly bears may in part require interventions on human behaviors, such as restricting or redirecting human activity.

The lack of social science research was also blamed for challenges or missed opportunities in effectively managing people and bears—the “human” side of human-wildlife conflict. One participant characterized their approaches to providing information, changing behaviors, or shifting human use as “social science guesses.” Another appealed to the research team to include in this paper that “Kananaskis is a gold mine for social science [. . .] we’re desperate.”

3.3.3. Indigenous Knowledge Is Not Being Integrated

Participants in the focus groups were eager to talk about Indigenous knowledge and the barriers they saw both institutionally and personally that made Indigenous knowledge so difficult to gather,

understand, and integrate. Participants remarked on the biases and racism in our culture, as well as the lack of understanding, lack of willingness to engage with Indigenous knowledge, and even shame about not knowing how to acknowledge their lack of understanding and lack of action. Moreover, no participant could think of a time when Indigenous knowledge had been used to make a decision about grizzly bears in the Kananaskis Valley.

Even when the knowledge was available it was more common for decision-makers to find reasons *not* to use it than to try to integrate it. As an example, one participant referred to the 2016 Stoney Grizzly Bear Study, pointing out there had still been no formal response, aside from the interpretation and education program that included Stoney Nakoda speakers and elders to participate in public education events such as Bear Days. Even though the Stoney Nakoda First Nations made their knowledge available, acceptance by Managers and decision-makers was (and remains) subject to fitting the information into a Western science framework.

The desire to increase acceptance of Indigenous knowledge was explored at length in conversations, particularly among the ecologists who generally expressed their skepticism towards Indigenous knowledge because it did not fit their own worldview or known data. They also felt uneasy digging deeper into what Indigenous knowledge holders share. For example, participants were interested in how shared Indigenous knowledge relates to scientific knowledge like telemetry data that tracks bear movements, but they worried about asking respectfully or productively. The focus group conversations did reveal an awareness of the importance of building relationships and trust to support knowledge exchange with Indigenous people to find a place of intersection.

As a final note, none of the participants represented Indigenous perspectives on grizzly bears in the Kananaskis Valley, nor were any Indigenous people involved in decision-making about grizzly bears in the Kananaskis Valley. As such, this sub-theme only represents one side of the conversation around incorporating traditional knowledge into decision-making about grizzly bears.

3.4. Knowledge Created Internally by Figuring It Out

The research team agreed there was a need to distinguish the sort of local knowledge generated by staff and managers through various sources, field experience, and from the bears themselves. There was a clear sense that everyone involved in grizzly bear decisions was creating new knowledge every time they solved a problem. There were multiple characterizations of decision-making as a process of “flying by the seat of your pants” or “[going] with our gut.” This reactive approach led to people utilizing several informal methods of gathering knowledge internally or within the context of their role as decision-makers.

3.4.1. Self-Education

Participants felt unprepared for the grizzly bear management aspect of their work and felt there was a culture of proactively seeking new or additional information in order to effectively manage the changing grizzly bear populations in the Kananaskis Valley, post-park creation. The focus on recreation in the early days meant and that many of the people involved in decisions were educated in recreation and did not know how to access required ecological information for conservation. In order to remedy this knowledge gap, some people sought new information by reading published papers, getting involved in research projects (specifically the ESGBP), learning about the status of grizzly bears, and talking to colleagues in ecology. In some cases, they even pursued related formal education such as graduate degrees.

3.4.2. Gain Experience in the Field

Focus group conversations indicated that working in the Kananaskis Valley offered opportunities to observe bears (and people) over time. Managers in particular explained a reliance on the observations of field staff to understand bears and inform decisions. An example of this approach is a quote from a participant:

We rely very heavily even up to today on our long long-term conservation officers and people in the field. You're talking about people with 25, 30 years' experience, and we still rely very heavily on what they're seeing, what they think, that type of knowledge.

Years of staff, stakeholders, and user groups observing and reporting on bears, habitat, and people integrated with decision making as managers gleaned information from observational fieldwork to ensure human-wildlife coexistence in recreational areas.

3.4.3. Bears Inform Knowledge

Finally, through years of monitoring work, specific bears in the Kananaskis Valley (and beyond) were given number tags and fitted with radio telemetry collars. Field staff became familiar with individual bears and their offspring, and over time, there was a shift in the understanding of bears. Their personalities and previous behaviors and encounters were assessed when managing for risk. A participant noted, "they are all individuals and they all have good days and bad days." Specific bears, their personalities, and their unique behaviors were frequently mentioned in the focus groups and it became evident grizzly bears had become an important source of knowledge for decisions.

At the same time, while the connections between field staff and bears were seen as a positive contributor to decision making, one participant expressed concern that this relationship may be losing objectivity, with the potential to become complacent. Despite this concern, the relationship with individual bears was viewed as part of a cultural shift in bear management in the Kananaskis Valley that was appreciative of bears and drifted away from the idea of problem bears. Even if some sources of knowledge suggested higher levels of risk by keeping grizzly bears on the landscape, the philosophical approach had changed to one of accepting that risk for the sake of the bears in the valley.

4. Conclusions

The findings of this grizzly bear case study reflect previous observations in the literature related to knowledge mobilization in parks and conservation. These connections include the impact of managers on knowledge exchange, knowledge access barriers (e.g., capacity limitations), funding shortages, time pressures, and the imperative to take action even if evidence is not available [1,3,6]. In the grizzly bear case study, there were accounts of managers ignoring or impeding knowledge application and dictating decisions supported by their own views or political and social pressures. Additionally, there was a notion that managers may use personal anecdotal experiences or look within their organization rather than to research, as Lemieux et al. [1] describe in their work. Of note, however, participants, in this case, indicated that they feel *less* supported in knowledge mobilization in recent times despite calls in the literature and policy for *more* evidence, and despite accounts that meaningful support for informing decisions with social science and Indigenous knowledge had not even started.

Conversations also included descriptions of past times when managers acted as enablers of research and created a culture of accepting evidence and trusting the field staff, which were contrasted with recent times where managers were seen as impediments to knowledge mobilization. The suggestion of a deterioration in manager capacity calls for the study of current *and* historic management approaches to evidence-based decision making. It also could lead to an examination of whether pathways into park management roles have changed significantly and what supports are currently provided to managers to generate evidence-based decision-making. Future work (and this case study) could also inform training for managers on moderating political and social pressures, prioritizing workload demands, and on how to effectively promote natural science, social science, and Indigenous knowledge-use in decision-making.

Initial consideration of the changing context of grizzly bear decision-making over time could draw upon Nguyen, Young, and Cooke, who developed the Knowledge-Action framework to explore more generalizable relationships between Knowledge Production/Co-production, Mediation, and Action/Inaction spheres [33]. Using the Knowledge-Action framework to consider the overall findings of this study demonstrates a general alignment to the model (at least in terms of natural

science knowledge): grizzly bears have been managed in Kananaskis Country by *producing* knowledge (i.e., the Eastern Slopes Grizzly Bear Project), *mediating* the use of the knowledge (i.e., staff learning about the study and sharing knowledge with colleagues and the public), and *acting* on the knowledge (i.e., the human-wildlife conflict prevention program). However, the change in support for decisions in the Kananaskis Valley over time could potentially be explored by applying the Knowledge-Action Framework to different periods within the case study context. For example, in the inception of Kananaskis Country, *action* was taken with little consideration of, or opportunity for, *production* or *mediation*. In the 1980s through to the late 1990s, once knowledge was *produced* there was ample and meaningful *mediation* and *action*. Finally, in later years it appears the *action* sphere has become less positive, with a perceived trend toward less management support for *production* or *mediation* and decision-making *action* driven more by political and social pressure. This potential application of the Knowledge-Action Framework could illuminate the factors that may lead to declines in support for evidence-based decision-making over time.

In addition, literature exploring ways forward in knowledge mobilization for conservation is abundant with recommendations for knowledge co-production and networking [1,33,34]. The unique multi-decade cross-ministry collaborative structure in the study area (e.g., KCICC), the ongoing engagement with the community of grizzly bear “experts” across jurisdictions, and the sharing of information between researchers, community partners, and field staff offer a compelling case to study collaborative networks in practice. The findings also point to the role of field staff in monitoring bears, gathering occurrence reports, and communicating ecological knowledge within and beyond their organization. This role echoes Fleishman and Briske’s suggestion of Professional Ecological Knowledge, or PEK [35], that can frame and activate knowledge produced within conservation organizations. However, this approach risks glossing over the lack of Indigenous participation in networks and the resistance to recognizing TEK, or traditional ecological knowledge.

With healthy populations of bears living relatively close to increasingly growing numbers of outdoor recreationists (with limited conflicts or incidents to date), grizzly bear management in the Kananaskis Valley is a unique model within the bear management community and, arguably, a success story. Despite a hurried development of facilities and trails in the 1970s, subsequent ecological monitoring and research and evidence-based approaches to human-wildlife conflict prevention programs have helped the Kananaskis Valley implement an innovative and collaborative approach to decision-making in parks and protected areas. Though recent trends may indicate degradation of decision-making effectiveness due to management, capacity, external, social and political pressures, there is a culture of collaboration and a clear understanding of the value of various forms of evidence, even if those other forms of evidence are not available nor integrated.

This case study shows the value of exploring specific challenges facing decision-making in parks and protected areas as a means to improve understanding and acknowledge the need for evidence-based decisions. This case contributes to growing evidence of common challenges and pressures and offers generalizable insight. Developing an understanding of decision-making related to grizzly bears in the Kananaskis Valley reveals a complex, long-term co-evolution of grizzly bears, parks, and the people who make decisions about both. Further investigation of this protected area and the wildlife issues at hand should generate useful and relevant insight.

Author Contributions: Conceptualization, E.A.H.; methodology, E.A.H., D.P. and D.C.D.H.; original draft preparation, D.C.D.H. and M.N.M.; writing, reviewing, and editing, D.C.D.H., M.N.M. and D.M.; supervision, D.C.D.H.; funding acquisition, E.A.H. All authors have read and agreed to the published version of the manuscript.

Funding: This project was funded in part by a Partnership Development Grant from SSHRC (2018–2021), awarded to the Canadian Parks Research Network, administered by Elizabeth Halpenny, at the University of Alberta.

Acknowledgments: We thank the editor and the reviewers whose comments helped to improve the manuscript. The authors wish to thank all the members of the larger knowledge mobilization study, notably Glen Hvenegaard, Clara Jane Blye, Donelda Patriquin, and Elizabeth Halpenny, who developed the methodology and focus group questions. We also wish to thank the Kananaskis Region Public Engagement section for hosting focus groups

in the Peter Lougheed Discovery Centre and the current and past Alberta Parks and Fish & Wildlife staff of Kananaskis Country for their time participating in this study as well as their dedication to protecting grizzly bears. Finally, we would like to acknowledge that this research was supported by the Social Sciences and Humanities Research Council of Canada.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

References

- Lemieux, C.J.; Groulx, M.W.; Bocking, S.; Beechey, T.J. Evidence-based decision-making in Canada's protected areas organizations: Implications for management effectiveness. *FACETS* **2018**, *3*, 392–414. [[CrossRef](#)]
- Pullin, A.; Knight, T. Effectiveness in conservation practice: Pointers from medicine and public health. *Conserv. Biol.* **2001**, *15*, 50–54. [[CrossRef](#)]
- Cook, C.N.; Carter, R.W.; Fuller, R.A.; Hockings, M. Managers consider multiple lines of evidence important for biodiversity management decisions. *J. Environ. Manag.* **2012**, *113*, 341–346. [[CrossRef](#)] [[PubMed](#)]
- Giehl, E.L.H.; Moretti, M.; Walsh, J.C.; Batalha, M.A.; Cook, C.N. Scientific evidence and potential barriers in the management of Brazilian protected areas. *PLoS ONE* **2017**, *12*, e0169917. [[CrossRef](#)] [[PubMed](#)]
- Cvitanovic, C.; Hobday, A.J.; van Kerkhoff, L.; Wilson, S.K.; Dobbs, K.; Marshall, N.A. Improving knowledge exchange among scientists and decision-makers to facilitate the adaptive governance of marine resources: A review of knowledge and research needs. *Ocean Coast. Manag.* **2015**, *112*, 25–35. [[CrossRef](#)]
- Cvitanovic, C.; McDonald, J.; Hobday, A.J. From science to action: Principles for undertaking environmental research that enables knowledge exchange and evidence-based decision making. *J. Environ. Manag.* **2016**, *183*, 864–874. [[CrossRef](#)] [[PubMed](#)]
- Walsh, J.; Dicks, L.V.; Sutherland, W.J. The effect of scientific evidence on conservation practitioners' management decisions. *Conserv. Biol.* **2015**, *29*, 88–98. [[CrossRef](#)]
- Benyei, P.; Arreola, G.; Reyes-Garcia, V. Storing and sharing: A review of indigenous and local knowledge conservation initiatives. *Ambio* **2020**, *49*, 218–230. [[CrossRef](#)]
- Bohensky, E.L.; Maru, Y. Indigenous knowledge, science, and resilience: What have we learned from a decade of international literature on "integration"? *Ecol. Soc.* **2011**, *16*, 1–19. [[CrossRef](#)]
- Ulicsni, V.; Babai, D.; Vadász, C.; Vadász-Besnyői, V.; Báldi, A.; Molnár, Z. Bridging conservation science and traditional knowledge of wild animals: The need for expert guidance and inclusion of local knowledge holders. *Ambio* **2019**, *48*, 769–778. [[CrossRef](#)]
- Ainsworth, G.; Redpath, S.; Wilson, M.; Wernham, C.; Young, J. Integrating scientific and local knowledge to address conservation conflicts: Towards a practical framework based on lessons learned from a Scottish case study. *Environ. Sci. Policy* **2020**, *107*, 46–55. [[CrossRef](#)]
- Bartlett, C.; Marshall, M.; Marshall, A. Two-eyed seeing and other lessons learned within a co-learning journey of bringing together indigenous and mainstream knowledges and ways of knowing. *J. Environ. Stud. Sci.* **2012**, *2*, 331–340. [[CrossRef](#)]
- Kananaskis Country: Information & Facilities. Available online: <https://www.albertaparks.ca/parks/kananaskis/kananaskis-country/information-facilities/> (accessed on 1 October 2020).
- Alberta Community Development, Parks and Protected Areas. *Peter Lougheed & Spray Valley Provincial Parks*; Alberta Government: Canmore, AB, Canada, 2006. Available online: https://www.albertaparks.ca/media/447232/plppsprayplan_webversion.pdf (accessed on 1 October 2020).
- Herrero, S.; Roulet, J.; Gibeau, M. Banff National Park: Science and Policy in Grizzly Bear Management. *Ursus* **2001**, *12*, 161–168.
- Alberta Environment and Parks. *Grizzly Bear Recovery Planning*; Alberta Environment and Parks: Edmonton, AB, Canada, 2016; ISBN 978-1-4601-2927-2. Available online: <https://open.alberta.ca/dataset/70a45aa0-91fa-43d1-826e-f96f5e0300cd/resource/4ccf2a04-b5a6-43c6-bd18-c743a4e8ebf4/download/2016-alberta-grizzly-bear-recovery-planning-may-2016.pdf> (accessed on 1 October 2020).
- Species at Risk Act. Available online: <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/publications/act.html> (accessed on 1 October 2020).

18. Herrero, S. *Biology, Demography, Ecology and Management of Grizzly Bears in and around Banff National Park and Kananaskis Country: The Final Report of the Eastern Slopes Grizzly Bear Project*; University of Calgary: Calgary, AB, Canada, 2005.
19. Munro, R.H.M.; Nielsen, S.E.; Price, M.H.; Stenhouse, G.B.; Boyce, M.S. Seasonal and diel patterns of grizzly bear diet and activity in west-central Alberta. *J. Mammal.* **2006**, *87*, 1112–1121. [[CrossRef](#)]
20. Souliere, C.M.; Coogan, S.C.P.; Stenhouse, G.B.; Nielsen, S.E. Harvested forests as a surrogate to wildfires in relation to grizzly bear food-supply in west-central Alberta. *Forest Ecol. Manag.* **2020**, *456*. [[CrossRef](#)]
21. Hamer, D.; Herrero, S. Wildfire's Influence on Grizzly Bear Feeding Ecology in Banff National Park, Alberta. *Bears Boil. Manag.* **1987**, *7*, 179–186. [[CrossRef](#)]
22. Alberta Community Development, Parks and Protected Areas. *Evan-Thomas Provincial Recreation Area Management Plan*; Alberta Government: Canmore, AB, Canada, 2004. Available online: <https://www.albertaparks.ca/media/447224/etmgmtplan.pdf> (accessed on 1 October 2020).
23. Hojnowski, C.E. Spatial and Temporal Dynamics of Wildlife Use of a Human-Dominated Landscape. Ph.D. Thesis, University of California, Berkeley, CA, USA, 2017.
24. Gibeau, M.J.; Herrero, S.; McLellan, B.N.; Woods, J.G. Managing for grizzly bear security areas in Banff National Park and the Central Canadian Rocky Mountains. *Ursus* **2001**, *12*, 121–129.
25. Hopkins, J.B.; Herrero, S.; Shideler, R.T.; Gunther, K.A.; Schwartz, C.C.; Kalinowski, S.T. A proposed lexicon of terms and concepts for human-bear management in North America. *Ursus* **2010**, *21*, 154–168. [[CrossRef](#)]
26. Morehouse, A.T. Grizzly Bear Population Ecology and Large Carnivore Conflicts in Southwestern Alberta. Ph.D. Thesis, University of Alberta, Edmonton, AB, Canada, 2016.
27. Yin, R.K. Validity and generalization in future case study evaluations. *Evaluation* **2013**, *19*, 321–332. [[CrossRef](#)]
28. Yin, R.K. Case study methods. In *APA Handbook of Research Methods in Psychology, Vol. 2. Research Designs: Quantitative, Qualitative, Neuropsychological, and Biological*; Cooper, H., Camic, P.M., Long, D.L., Panter, A.T., Rindskopf, D., Sher, K.J., Eds.; American Psychological Association: Washington, DC, USA, 2012; pp. 141–155.
29. Cvitanovic, C.; Cunningham, R.; Dowd, A.M.; Howden, S.M.; van Putten, E.I. Using social network analysis to monitor and assess the effectiveness of knowledge brokers at connecting scientists and decision-makers: An Australian case study. *Environ. Policy Gov.* **2017**, *27*, 256–269. [[CrossRef](#)]
30. Alberta Grizzly Bear Recovery Team. *Alberta Grizzly Bear Recovery Plan 2008–2013*; Alberta Sustainable Resource Development: Edmonton, AB, Canada, 2008. Available online: <https://open.alberta.ca/dataset/fc7094f2-2038-46d9-880e-9af7313bd664/resource/00da70f0-a3f9-4ba1-a6c0-89cb28d68fcd/download/sar-grizzlybearrecoveryplan2008-2013-dec2008.pdf> (accessed on 1 October 2020).
31. Alberta Environment and Parks, Fish and Wildlife Policy Branch. *Grizzly Bear Response Guide*; Alberta Sustainable Resource Development: Edmonton, AB, Canada, 2016; ISBN 978-0-7785-7067-7. Available online: <https://open.alberta.ca/dataset/34f0b200-0df7-4b3c-8752-cdca6fcb560/resource/28450e52-4d54-4804-8493-5050c71c5ac9/download/grizzlybearresponseguide-2016.pdf> (accessed on 1 October 2020).
32. Braun, V.; Clarke, V. Using thematic analysis in psychology. *Qual. Res. Psychol.* **2006**, *3*, 77–101. [[CrossRef](#)]
33. Nguyen, V.M.; Young, N.; Cooke, S.J. Applying a knowledge-action framework for navigating barriers to incorporating telemetry science into fisheries management and conservation: A qualitative study. *Can. J. Fish. Aquat. Sci.* **2017**, *75*, 1733–1743. [[CrossRef](#)]
34. Nel, J.L.; Roux, D.J.; Driver, A.; Hill, L.; Maherry, A.C.; Snaddon, K.; Petersen, C.R.; Smith-Adao, L.B.; Van Deventer, H.; Reyers, B. Knowledge co-production and boundary work to promote implementation of conservation plans. *Conserv. Biol.* **2016**, *30*, 176–188. [[CrossRef](#)]
35. Fleischman, F.; Briske, D.D. Professional ecological knowledge: An unrecognized knowledge domain within natural resource management. *Ecol. Soc.* **2016**, *21*, 1–9. [[CrossRef](#)]

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



© 2020 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).