PERSPECTIVES ON GRIZZLY BEAR MANAGEMENT IN BANFF NATIONAL PARK AND THE BOW RIVER WATERSHED, ALBERTA: A Q METHODOLOGY STUDY

by

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B.A., McGill University, 2003

RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF RESOURCE MANAGEMENT (PLANNING)

In the

School of Resource and Environmental Management

Report No. 394

SIMON FRASER UNIVERSITY

Spring 2006

APPROVAL

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Degree: **Master of Resource Management (Planning)**

Title of Research Project: **Perspectives on grizzly bear management in Banff National Park and the Bow River Watershed, Alberta: A Q Methodology study**

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ABSTRACT

Conserving populations of large carnivores such as grizzly bears (*Ursus arctos*) requires not only biophysical research, but also an understanding of the values and beliefs of the people involved with and affected by carnivore management. I used Q methodology to examine views of stakeholders concerning grizzly bear management in the Banff-Bow Valley region of Alberta, Canada. In recent years, decision-making about bears in this region has been characterized by acrimonious disputes over scientific research and appropriate management responses. The study identifies four distinct factors, or views, about the problems with grizzly bear management and three views about possible solutions. I explore the differences between these problems and solutions factors, and also discuss areas of common ground which could guide future management efforts in the region.

Keywords: grizzly bears, Banff National Park, policy, attitudes, decision-making, problem definition, wildlife management, Q methodology

ACKNOWLEDGEMENTS

This research would not have been possible without the financial support of Parks Canada, Simon Fraser University and the School of Resource and Environmental Management. Thank you.

Murray Rutherford – thank you for your continued support and dedication to this work, for your patience, for your constructive feedback and insight, and for being a mentor throughout this process.

Mike Gibeau – thank you for all your work in organizing this study and the workshops, for your thoughtful feedback on the project, and for your continued work in improving decision-making about grizzly bear management in the Bow Valley.

To Steve Brown and Tim Clark – thank you for your feedback and insight into this research.

To the participants of this project – thank you for the time and energy devoted to the research and your willingness to participate. This work would not have been possible without your participation.

To the REM Staff – Rhonda Keleher, Bev Hunter, Sarah Luis, Laurence Lee – thank you for all your help during my time in the program.

To my family – Mom, Dad, and Stephen – thank you for always believing in me.

And last but not least, to my friends in REM – thank you for your support and for distracting me with laughter, wine, and playing outside.

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BBV	-	Banff-Bow Valley
BNP	-	Banff National Park
BRW	-	Bow River Watershed
COSEWIC	-	Committee on the Status of Endangered Wildlife in Canada
CRE	-	Central Rockies Ecosystem
ENGO	-	Environmental non-government organization
ESGBP	-	Eastern Slopes Grizzly Bear Project
HDNR	-	Human Dimensions of Natural Resources
IPS	-	Interdisciplinary Problem Solving

CHAPTER 1: INTRODUCTION

1.1 Rationale for research

Large carnivore conservation policies in Canada generally aim to maintain well-distributed and viable populations of species. This goal is especially challenging in areas with human development, where wildlife are likely to encounter humans and human enterprises. Grizzly bears (*Ursus arctos*) are particularly at risk in these settings as they have a low ability to persist when their environment is disturbed compared to other large carnivores (Weaver, Paquet & Ruggiero, 1996)

The Banff-Bow Valley region (BBV), which includes Banff National Park (BNP) and the Bow River Watershed (BRW) in Alberta, Canada, supports a small population of grizzly bears. This region is one of the most developed areas in the world where grizzly bears survive (Gibeau, 2000). Humans have been by far the most significant cause of grizzly bear mortality in the BBV in recent years (Gibeau, 2005a). There is considerable biological knowledge about grizzly bear demography in the BBV. The Eastern Slopes Grizzly Bear Project (ESGBP) began in 1994 to study grizzly bear biology, ecology and demography in the Central Rockies Ecosystem of Alberta and British Columbia (Herrero, 2005a). This project included a 9 year study of grizzly bear demography in the BRW (Garshelis, Gibeau & Herrero, 2005a). Garshelis et al. (2005a) found that despite human development in the BBV, the bear population exhibited marginally positive population growth over the study period. However, the long term viability of the population is highly

susceptible to stochastic events and losses of reproductive females (Garshelis, Gibeau & Herrero, 2005b).

Despite the biological knowledge of grizzly bears in the BBV, bear management policies remain controversial. Policy-makers in the region have struggled to find an appropriate balance between bear conservation and demands for commercial development and recreational use. Some interest groups believe that the ESGBP has produced enough information to demonstrate that the population of grizzly bears in the BBV will not persist unless conditions are changed to reduce mortality (Bow Valley Grizzly Bear Alliance, 2002). Other groups have argued that the scientific research methods used in the ESGBP are flawed (Leighton, 2001), that the bear population is healthy, and that results from the research are being used to limit human use and enjoyment of national parks (Cooper, Hayes & LeRoy, 2002). There has been little empirical research in the region on the perspectives of the various parties arguing about bear conservation and management.

Successful carnivore conservation requires not only sound biological knowledge, but also a good understanding of the social, cultural, economic and institutional factors that shape decision-making processes and outcomes (Rutherford & Clark, 2005). This is especially important when humans are the primary cause of mortality. Values and attitudes about large carnivores vary, ranging from the desire to master or dominate (dominionistic), to the desire to study scientifically (ecologistic), or treat ethically (moralistic) (Kellert, Black, Rush & Bath, 1996). Moreover, myths and symbolism play important roles in people's beliefs about grizzly bears, and bears may be symbolically tied to deeper socio-political struggles (Primm & Murray, 2005). As Primm and Clark

(1996) observe, the "role of [biological] knowledge in the policy process is limited by the belief systems" of competing constituent groups (p. 1042).

This research will investigate the belief systems of participants in the BBV on grizzly bear management. In addition to contributing to knowledge about the role of perspectives in policy making, investigating these belief systems can help decision-makers and other participants with the tasks of 1) developing a better understanding of the problem and the constituents who are framing it, 2) developing a shared problem definition, and 3) developing and successfully implementing an effective problem-solving strategy (Clark, Curlee & Reading, 1996). This may lead to more effective bear management strategies that are in the common interest.

1.2 Research objective

The objective of this research is to use Q methodology to explore the perspectives of stakeholders in the Banff-Bow Valley about the problems of grizzly bear management and possible solutions to these problems.

1.3 Organization of report

This report is organized as follows. Chapter 2 provides background information on the Banff-Bow Valley study area, the grizzly bear population in the BBV, and the policies in place for bears. Chapter 3 discusses the theoretical frameworks of the study, including a discussion of the policy sciences, and a conceptual framework of values and attitudes in the policy process. Chapter 4 outlines the research methodology (Q methodology) used to explore perspectives on grizzly bear management. Chapter 5

discusses the perspectives that were uncovered through Q method and explores the differences between discourses and the common ground among views. In chapter 6, I explore the different narratives about the definition of the problem with grizzly bear management. I also discuss a localized participatory strategy as a policy option, and suggest areas of further research.

CHAPTER 2: BACKGROUND

2.1 Study area

The Banff-Bow Valley (BBV) is located in the eastern slopes of the Central Rockies Ecosystem (CRE), an area of 42,000 km^2 which straddles the continental divide of the Canadian Rocky Mountains. The CRE ranges from the western Columbia Trench to the eastern Alberta foothills, and from the northern end of Banff National Park to south of Alberta's Kananaskis Country (Gibeau & Stevens, 2005). The CRE includes three National Parks (Banff, Kootenay and Yoho), Alberta and British Columbia provincial land, privately owned land, and federal Indian reserve (treaty) lands. Consequently, the region is managed by various federal and provincial agencies, each with a range of multiple-use mandates (Gibeau, 2000). Thirty-five percent of land in the CRE is protected either as provincial or national parks (Parks Canada, 2003). Banff, Kootenay, and Yoho National Parks in Alberta, along with Mt. Assiniboine National Park in B.C., are collectively recognized as part of the UNESCO (United Nations Educational, Scientific and Cultural Organization) Canadian Rocky Mountains World Heritage Site (Parks Canada, 2003).

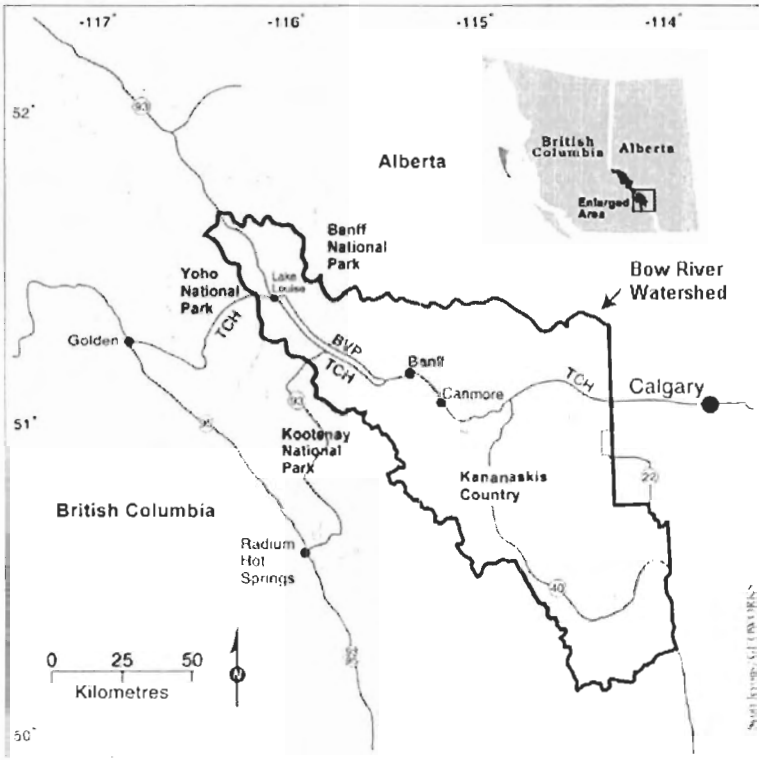
The grizzly bear population in the CRE is not assumed to be a closed population as the boundaries in the north and south are permeable to bear movements. Habitat availability for grizzly bears varies greatly throughout the ecosystem. A significant portion of the CRE is unsuitable bear habitat because it is composed of rock and ice; for

example, 48% of the land surface of combined national parks in the CRE is unsuitable bear habitat (Gibeau, Herrero, McLellan & Woods, 2001). The western side of the continental divide has more productive bear habitat than the eastern slopes which have a drier climate (Gibeau & Stevens, 2005)

The BBV region is located in the southeastern portion of the CRE, and includes Banff National Park and the Bow River Watershed (Figure 2.1). Banff National Park encompasses an area of 6,641 km^2. The Bow River Watershed is 11,400 km^2 and includes 50% of Banff National Park, as well as adjacent Kananaskis Country, and other Alberta provincial land. Kananaskis Country is multiple-use provincial land, with 50% designated as provincial parks and the rest managed as forest lands or recreational areas (Garshelis et al., 2005a).

The BBV has been substantially modified by human activity. The region has an extensive network of high speed, high volume highways and is bisected by the Trans-Canada Highway. No other occupied grizzly bear habitat in North America is known to have a transportation network developed to this extent (Gibeau & Stevens, 2005). Two towns, Banff (population 7700) and Canmore (population 10,800), and one hamlet, Lake Louise (population 2000) are internationally known tourist destinations that attract approximately 4 million visitors annually (Gibeau & Stevens, 2005). Major developments in the area include hotels, campgrounds and picnic areas, five golf courses, five downhill ski hills, and a network of hiking, biking and equestrian trails (Gibeau & Stevens, 2005).

Figure 2.1 Map of Banff National Park and the Bow River Watershed
Adapted from Gibeau (2000) with permission



2.2 Grizzly bear population dynamics

2.2.1 Status and distribution of grizzly bears

2.2.1.1 North America

Two subspecies of grizzly bears (*Ursus arctos*) have been identified in North America: *Ursus arctos middendorffi* of the Kodiak Islands of Alaska, and *Ursus arctos horribilis* throughout the rest of the continent. Historically, grizzly bears numbered approximately 100,000 in North America and ranged from the Arctic to central Mexico, and from the Pacific coast to as far east as the Hudson Bay and central Texas (British Columbia Ministry of Environment, Lands, and Parks, 1995).

In the conterminous United States, the range of grizzly bears has been reduced by 98% (Ross, 2002), and the population has been reduced to less than 1000 bears (British Columbia Ministry of Environment, Lands, and Parks, 1995). Grizzly bears in the U.S. range in six ecosystems, four of which are contiguous with Canada. In 1975, *Ursus arctos horribilis* was listed as a threatened species in the lower 48 States under the *Endangered Species Act, 1973* (16 U.S.C. 1531 et seq.) and grizzly bears continue to be designated as threatened (United States Fish and Wildlife Service, 2006)

In Canada, grizzly bears have maintained more of their range and population than in the United States. Grizzly bears have disappeared from 24% of their original distribution in Canada, including being extirpated from the Prairies, and the Boreal Lowlands of Alberta, Saskatchewan, Manitoba, and the Northwest Territories (British Columbia Ministry of Environment, Lands, and Parks, 1995). Grizzly bears presently range throughout parts of British Columbia, Alberta, Yukon, Northwest Territories and Nunavut.

2.2.1.2 Alberta

Grizzly bears once ranged across all of Alberta, but presently their primary range is western Alberta (Ross, 2002). The pre-European grizzly bear population is estimated to be approximately 6000 bears (Eastern Slopes Grizzly Bear Project, 1998). In 2000, the total grizzly bear population on provincial lands was estimated to be 841 (Kansas, 2002), and an additional 175-185 bears were estimated to occur in Jasper, Banff and Waterton Lakes National Parks (Ross, 2002). The bear population in national parks remained relatively stable between 1988 and 2002 (Ross, 2002).

2.2.1.3 Banff-Bow Valley

The number of grizzly bears that occur in the Banff-Bow Valley is estimated at 60-80 individuals (Herrero, Roulet & Gibeau, 2001; Gibeau, Herrero, Kansas & Benn, 1996). The ESGBP included a study of grizzly bear demography in the Bow River Watershed from 1994 to 2002 (Garshelis et al., 2005a). The study found that although reproductive rates of these bears are among the lowest for any grizzly bear population yet studied in North America, relatively high survival rates during the study period enabled marginally positive population growth ($\lambda = 1.04$). However, the confidence intervals around this estimate include the possibility that the population is actually declining (95% CI = 0.99-1.09), and the long term viability of the population is highly susceptible to stochastic events and losses of reproductive females (Garshelis et al., 2005b; Herrero et al., 2005).

2.2.2 Factors contributing to status and distribution of bears

2.2.2.1 Grizzly bear life-history traits

Grizzly bears have certain life-history traits that frequently bring them into contact with humans, which has implications for bear conservation. In mountainous regions, such as the BBV, the most productive grizzly bear habitat is found in the montane ecoregions (lower slopes and valley bottoms). The montane ecoregion in Banff National Park makes up only 4% of the park area, yet this area is heavily impacted by human development as it includes the town of Banff, the Trans-Canada Highway, and the Canadian Pacific railway (Parks Canada, 2004).

The dietary needs of grizzly bears also bring them into contact with humans. Grizzly bears are omnivorous and move through their home range in response to seasonal change and the location of foods. This movement results in large home ranges for grizzly bears of the eastern slopes. An analysis of home ranges from 1994-2002 showed that average home range size in the CRE was 521 km^2 for female grizzly bears and 1405 km^2 for males; some males had home ranges greater than 2000 km^2 (Stevens & Gibeau, 2005). The home ranges of grizzly bears often cross jurisdictions, making inter-agency cooperation essential.

Weaver et al. (1996) found that grizzly bears have low biological resilience to environmental disturbance compared to other large carnivores at three hierarchical levels of organization. Resilience is "a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables" (Holling, 1973, p. 14). This low biological resilience makes conservation challenging given the tendency of bears to come into contact with human activity.

At the individual level, bears have fast-acting, non-specialized digestive systems, and require foods that are easily digestible (young vegetation, berries, meat). When these foods aren't readily available, energetic stress follows (Herrero, 2005b) and bears move widely in search of food which may bring them into contact with people and increase their chances of mortality (Weaver et al., 1996).

At the population level, grizzly bears have a relatively low reproductive potential compared to other large carnivores (Weaver et al., 1996), and reproduction rates of

grizzly bears in the Bow Valley are among the lowest reported for the species (Garshelis et al., 2005a). These reproduction rates are set by a late age of first reproduction, small litter sizes, and long inter-birth intervals. These characteristics mean that grizzly bears have a low capacity to increase reproduction and/or survival rates to compensate for increased mortality rates (Weaver et al., 1996) and populations recover slowly from human-caused mortality (Herrero, 2005b).

At the metapopulation level, grizzly bears have limited dispersal from their natal range. In particular, subadult female bears tend to establish their home range within or adjacent to their natal range (McLellan & Hovey, 2001). This trait reduces the speed of recolonizing areas where populations have been depleted, and means that bears have low resilience to habitat fragmentation at the landscape scale (Weaver et al., 1996)

2.2.2.2 Human-caused mortality

Human-caused mortality is the dominant factor that limits grizzly bear distribution and population densities along the southern and eastern edges of their distribution in Canada (McLellan, 1998). The probability of human-caused bear mortality is determined by the rate of encounter between humans and bears and the chance that this encounter will be lethal (Mattson, Herrero, Wright & Pease, 1996). Therefore, human-caused bear mortality is likely to be higher in areas such as the BBV than in areas without human activity.

Humans have been by far the most significant cause of grizzly bear mortality in the BBV in recent years, accounting for 34 of 39 known grizzly bear deaths in the Bow River Watershed from 1993-2002 (Gibeau, 2005a). Fourty-one percent of these human-

caused mortalities were female bears (Gibeau, 2005a). Similarly, Benn and Herrero (2002) found that 119 of 131 known deaths between 1971-1998 in Banff and Yoho National Parks were human-caused.

Most human-caused mortality in the BBV occurs near roads and trails. Benn and Herrero (2002) found that all 95 human-caused bear mortalities in Banff and Yoho National Parks with known accurate locations occurred within 500 metres of roads or 200 metres of trails. Most bear deaths in Alberta and B.C. provincial lands in the CRE occurred near roads and trails as well (Benn, Jevons & Herrero, 2005).

2.2.2.3 Habitat loss and fragmentation

Human development has changed the southern edge of grizzly bear range in Canada into a series of islands that are isolated from each other (McLellan, 1998). Island populations have extensive fringe area and have increased probably of human contact and mortality (McLellan, 1998). Furthermore, island populations are more susceptible to extinction than connected ranges (McLellan, 1998).

In addition to direct loss of habitat, there has also been a decrease of security areas in the BBV (Gibeau, 2005b; Stevens, 2002; Gibeau et al., 2001), most likely due to increased human use (Gibeau, 2005b). Security areas are productive grizzly bear habitats where adult female grizzly bears have a low probability of encounter with humans. Maintaining security areas can help reduce the number of habituated bears and the probability of human-caused mortality (Gibeau et al., 2001).

Further, grizzly bear habitat in the BBV is fragmented by transportation networks and human settlement. Proctor (2005) studied the effects of the Trans-Canada Highway on grizzly bear movement in the Bow Valley during 1996-2001. The author found limited evidence for female movement across the highway, but that genetic connectivity across the highway was mediated by male movement. Fragmentation can disrupt the willingness of bears to move across feeding areas, and on the regional scale may also block movements along valley bottoms and cut off interbreeding populations from reaching each other (McLellan, 1992).

2.3 Grizzly bear management

2.3.1 Banff National Park

In 1991, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listed the northwestern grizzly bear population of Alberta, British Columbia, and the territories as a species of special concern[1] (COSEWIC, 2002). Recovery of populations of threatened and endangered species is mandated under the *Species at Risk Act*, S.C. 2002, c. 29, but recovery plans are not required for species of special concern. In Banff National Park, grizzly bears are managed through the *Canada National Parks Act*, S.C. 2000, c. 32, and through the Parks Canada Agency.

Portions of Banff National Park have been protected since 1885, with the establishment of the Banff Hot Springs Reserve. Most wildlife was protected in the park at its establishment, though a 1909 regulation gave the Warden Service the right to

[1] Species in this risk category are listed "because of characteristics that make it particularly sensitive to human activities or natural events" (COSEWIC 2002, p. vii).

destroy noxious, dangerous, and destructive animals (including bears) when necessary (Herrero, 2005b).

The *Canada National Parks Act, 2000* s. 4.(1) mandates that national parks are dedicated to the people of Canada for their benefit, education and enjoyment, and that parks will be maintained for the use of future generations. The *Act* also requires in s. 8.(2) that "ecological integrity" be the first priority in management decisions in parks. Ecological integrity is defined in s.2.(1) as "a condition that is determined to be characteristic of its natural region and likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rates of change and supporting processes."

The *Act* specifies in s.11.(1) that park managers are required to prepare a park management plan to provide direction for managing toward ecological integrity. The Banff National Park Management Plan was approved in parliament in 1997, and reviewed and amended in 2004 (Parks Canada, 2004). The Management Plan's "Framework for the Conservation of Grizzly Bears" (s. 5.6.2) outlines Parks Canada's strategic goal for managing bears:

> To maintain a non-declining and viable population of grizzly bears within the regional landscape through collaborative management of human-caused grizzly bear mortality, human land use and landscape conditions. Parks Canada's actions will contribute to the long-term persistence of a healthy population of grizzly bears.

Parks Canada's objectives for managing bears include: minimizing human/bear interactions, preventing human-caused displacement of bears from food sources, minimizing the risk of human-caused mortality and human injury inflicted by bears, and

working collaboratively with other land-mangers in the CRE. Parks Canada strives to have annual human-caused grizzly bear mortality be < 1% of the bear population (Parks Canada, 2004) although the agency has not been able to meet this target in recent years (Parks Canada, 2003).

Measures in the park that have been taken to reduce bear mortality include: highway mitigation (highway fencing, over- and under-passes, lowered speed limits), aversive conditioning (e.g. rubber bullets), educational programs, and garbage management (Garshelis et al., 2005a).

2.3.2 Alberta

In Alberta, the Ministry of Sustainable Resource Development's Fish and Wildlife Division is responsible for managing grizzlies through the *Wildlife Act*, R.S.A 2000, c. W-10. Grizzly bears are managed as a big game species, and in 1990 the Fish and Wildlife Division prepared a *Management Plan for Grizzly Bears in Alberta* (Alberta Forestry, Lands, and Wildlife, 1990). In this plan, the goals of grizzly bear management are: 1) maintain a viable bear population; 2) maximize benefits to Albertans by optimizing aesthetic, commercial, and recreational uses; 3) minimize property damage and other problems caused by grizzlies; and 4) promote and encourage scientific and educational activities. Management objectives include increasing the provincial population to 1000 bears and reducing human-caused mortality to 6% of the population (Alberta Forestry, Lands, and Wildlife, 1990).

The province of Alberta currently lists the species as "may be at risk"[2] (Alberta Sustainable Resource Development, 2001), largely because of human-caused mortality of bears (Kansas, 2002). After a detailed assessment of the grizzly bear status in Alberta was completed (Kansas, 2002), Alberta's Endangered Species Conservation Committee recommended that grizzly bears be reclassified as "threatened"[3] because of the small population size, limited dispersal from adjacent jurisdictions, and continued threats of human activity (Alberta Sustainable Resource Development, 2005). A draft recovery plan has been prepared by the Alberta Grizzly Bear Recovery Team (2005) which outlines recovery objectives and strategies and an action plan for population recovery. Recommendations from this report include reducing human-caused mortality (in particular, controlling human use and development in bear habitat and suspending hunting), reducing the rate of human/grizzly bear conflicts, improving knowledge of the grizzly bear population, and improving public education and outreach (Alberta Grizzly Bear Recovery Team, 2005).

Hunting of grizzly bears is generally prohibited in the BBV (Garshelis et al., 2005a). However, under treaty agreements, First Nations people can hunt bears outside of national parks. As well, grizzly bears may be exposed to hunting when they travel outside the BBV, or through ungulate and carnivore hunting which occur outside of BNP (Garshelis et al., 2005a).

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[2] In Alberta, the "may be at risk" category (previously known as "blue-listed") is defined as "any species that 'may be at risk' of extinction or extirpation, and is therefore a candidate for detailed risk assessment" (Alberta Sustainable Resource Development 2001, p. 3).

[3] The Endangered Species Conservation Committee defines "threatened" as "a species likely to become endangered if limiting factors are not reversed" (Alberta Sustainable Resource Development 2003).

Other provincial statutes and regulations may also affect grizzly bear management. The Ministry of Community Development manages protected areas and Kananaskis Country. Provincial parks are administered through the *Provincial Parks Act,* R.S.A. 2000, c. P-35 and the *Wilderness Areas, Ecological Reserves, Natural Areas, and Heritage Rangelands Act*, R.S.A. 2000, c, W-9. Management plans are further prepared for various protected areas within Kananaskis Country; for example, the *Kananaskis Country Recreation Policy* (Alberta Environmental Protection, 1999) guides recreation management throughout this area. Various provincial agencies manage tourism, forestry, oil and gas extraction, mining and stock grazing throughout Kananaskis Country and adjacent provincial lands in the BBV. Municipalities, commercial developers, residential owners, and First Nations councils further diversity management (Gibeau & Stevens, 2005).

CHAPTER 3: THEORETICAL FRAMEWORK

3.1 Policy

Policy can be defined as a "social process of authoritative decision-making by which the members of a community secure their common interests[4]" (Clark, 2002, p. 6). The process of policy-making is "the manner in which problems get conceptualized and brought to government for solution; governmental institutions formulate alternatives and select policy solutions; and those solutions get implemented, evaluated, and revised" (Sabatier, 1999a, p. 3). Policy-making is a complex process, which can involve hundreds of different actors with various values, multiple levels of government, scientific and legal issues, and can take place over long time spans (Sabatier, 1999a). Given this complexity, the policy analyst must simpify the policy process in order to understand it, and must "look at the world through a lens consisting of a set of simplying presuppositions" (Sabatier, 1999a, p. 5).

Conceptual frameworks have been developed to analyze and understand the policy process. Frameworks identify a set of elements and the relationships among them that one needs to consider for analysis (Ostrom, 1999). Several conceptual frameworks of policy are reviewed in Sabatier (1999b). The following section focuses on one particular conceptual framework of policy and policy-making: the policy sciences.

[4] The "common interest" is defined by Clark (2002) as an interest that is "widely shared within a community and demanded on behalf of the whole community" (p. 13).

3.2 Policy sciences framework

The term "policy sciences" was coined by Lerner and Lasswell (1951) to refer to an emerging policy orientation among specialists. The conceptual framework of the policy sciences was developed by Lasswell (1970, 1971) and his colleagues at Yale University, and has been further discussed by Brewer (1974), Brewer and deLeon (1983), Ascher (1986), Torgenson (1986), Brunner (1982, 1984, 1991), deLeon (1981, 1988, 1994, 1999), Lasswell and McDougal (1992), Clark (1992, 2002) and others.

The policy sciences are concerned with improving "knowledge *of* and *in* the decision processes of the public and civic order" (Lasswell, 1971, p. 1). That is, the policy sciences study knowledge that is useful in the policy process, but also knowledge of the process itself (Clark, 1992). *Policy* is a process focused on problem-solving, involving some substantive content and participants with different perspectives and interests; *sciences* refer to systematic, empirical inquiry (Clark, 2002). The policy sciences are thus "a set of integrated concepts or conceptual tools for framing thought and action and for guiding analysis in the resolution of any problem" (Clark, 2002, p. 4).

The policy sciences framework consists of mapping categories that help analysts define a problem and understand its context (Clark, 2002). The framework considers three elements in the examination of any problem: contextuality, problem orientation, and multiple methods (Lasswell, 1971). Contextuality requires understanding the context of a problem, and entails mapping the process of decision-making from the initiation to the evaluation of decisions. As decisions are part of the larger social context, being contextual also requires understanding the social process. Problem orientation requires

understanding and analyzing the problem under examination. Multiple methods must be used to gather and interpret information in order to carry out decisions (Clark, 2002). The decision and social processes of the policy sciences framework are discussed briefly below, followed by a more thorough discussion on problem orientation.

3.2.1 Contextuality

The decision process (policy process) "is a means of reconciling or at least managing conflicts among policies through politics...[in order to] secure a [communities'] common interest" (Clark & Brunner, 1996, para. 11). Lasswell (1971) identifies seven functions (activities) of the decision process: intelligence, promotion, prescription, invocation, application, appraisal and termination. Intelligence is the process of obtaining, processing and distributing information relevant to the policy process. Promotion is the process of mobilizing support for particular policy alternatives, and prescription is the stage where policies or guidelines for action are enacted (Clark, 2002). Invocation is the action to invoke, or appeal to, a prescription whereas application is the final characterization of people's behaviour in terms of a prescription in specific situations (Clark, 2002).

Appraisal is the stage of evaluating the success of prescriptions in meeting their goals. Termination is the repeal or adjustment of prescriptions; this function ends policies or components of policies that have accomplished their goals or are not meeting their goals, and allows for the development of new policies (Clark, 2002).

The social process is the interaction of individuals and organized interests in society. In the social process, "participants are seeking values that they perceive will

leave them better off, they do so through society's institutions, and this process has identifiable outcomes and long-term effects on other people and the environment" (Clark, 2002, p. 32). The social process includes: participants, perspectives, situations, base values, strategies, outcomes, and effects (Lasswell, 1971). Participants are individuals or groups in the policy process and have different perspectives on the policy problem. Perspectives are made up of expectations (what people think is likely to happen in a social process), demands (what people prefer about practices) and identity (how people see themselves as part of some aggregate or group) (Clark, 2002). Situations are the "zones" in which people interact. Social processes have outcomes and effects. While outcomes are the short-term events that indulge or deprive participants of values in a given situation, effects are the long-term outcomes in terms of values, institutions or effects (Clark, 2002).

Values are desired states of affairs, and are the medium of exchange in all human interactions (Clark, 2002). Lasswell (1971) recognizes eight categories of values: power, wealth, enlightenment, skill, well-being, affection, respect, and rectitude.

3.2.2 Problem orientation

Problems are typically seen as undesirable circumstances that require solutions (Dery, 1984). This technocratic-rational approach to problem-solving often presumes problems to be objective entities with rational solutions (Clark et al., 1996). Ascher and Healy (1990) argue that many public programs accomplish little because they devise solutions without understanding and analyzing the problem.

Another approach is to understand problems as subjective and defined by people who view problems based on their own values, experiences and beliefs (Dery, 1984). This approach understands problems to be discrepancies between "what is" and "what ought to be." Problems are also an opportunity for improvement, and the process of understanding problems requires finding and examining alternatives (Dery, 1984). Problem definition is therefore "a package of ideas that includes, at least implicitly, an account of the causes and consequences of undesirable circumstances and a theory about how to improve them" (Weiss, 1989, p. 97).

A "problem orientation" in the policy sciences requires defining problems before devising solutions. Lasswell (1971) describes a strategy that requires understanding five "intellectual tasks" in solving any problem. These tasks are (Lasswell, 1971, p. 39):

- *Goal clarification*: What future states are to be realized as far as possible in the social process?
- *Trend description*: To what extent have past and recent events approximated the preferred terminal states? What discrepancies are there? How great are they?
- *Analysis of conditions*: What factors have conditioned the direction and magnitude of the trends described?
- *Projection of developments*: If current policies are continued, what is the probable future of goal realizations or discrepancies?
- *Invention, evaluation, and selection of alternatives*: What intermediate objectives and strategies will optimize the realization of preferred goals?

The five intellectual tasks of problem orientation assist in defining and resolving problems. A problem exists when there is discrepancy between goals (what ought to be) and trends (what is). An understanding of the problem should include an account of conditions (causes) and projections (consequences) of the trends, as well as the selection of alternatives to deal with the problem.

As problems are subjective, multiple problem definitions can exist for a single problem. The task of problem-solvers is not simply to find one single rational solution, but to 1) develop a better understanding of the problem and the constituents who are framing it, 2) develop a shared problem definition, and 3) develop and successfully implement an effective problem-solving strategy (Clark et al., 1996).

Problem definition determines which solutions seem appropriate to solve these problems (Cronon, 1992; Weiss, 1989; Dery, 1984). Weiss (1989) argues that problem definition serves three functions in policy-making. First, as the overture (start-up) to policy-making, it provides an analytical framework to develop useful solutions. Second, in the process of policy-making, problem definition is a weapon of advocacy and consensus during the interaction between defining problems and acting on them. Third, as an outcome, problem definition creates language for talking about problems, locates responsibility for problems, and mobilizes participation around issues. Problem definition also determines which participants are included in the policy process and which groups are excluded (Weiss, 1989).

3.2.3 Criticisms of the policy sciences framework

The most widely accepted component of the policy sciences has arguably been the decision process, or policy process, in which a policy is proposed, examined, carried out, and evaluated (deLeon, 1999). Lasswell's framework was the "textbook policy process" during the 1970s and 1980s (Nakamura, 1987). Lasswell's idea of a delineated, sequential policy process was further developed by Jones (1970), Anderson (1975), and Brewer and deLeon (1983) and versions are still commonly used in policy analysis.

In 1987, Nakamura began to question this "textbook policy process," arguing that it could not be a paradigm because the stages (e.g. policy formulation, implementation, evaluation), have different meanings for the various sets of actors that use them (Nakamura, 1987). Jenkins-Smith and Sabatier (1993) write that the policy process (which the authors call the "stages heuristic") "has serious limitations as a basis for research and teaching" (p. 3). One major criticism raised about the framework is the lack of causal theory, since the framework does not identify causal drivers between variables nor indicate how one variable leads to another. Jenkins-Smith and Sabatier (1993) argue that because the framework lacks a causal theory, it does not provide a basis for empirical hypothesis testing.

This critique of the policy sciences was recognized early on (Lasswell & Kaplan, 1950), and has been discussed by Brunner (1991) and deLeon (1999). Brunner (1991) argues that this critique overlooks the presence of a central body of theory in the policy sciences that helps integrate policy events. As the decision process model is only one component of the policy sciences it should not be judged in isolation. Moreover, Brunner maintains that the purpose of policy sciences is not prediction, but to use the central theory to better understand the policy context in any given setting, in order to foster freedom through insight.

3.3 Perspectives in the policy process

3.3.1 Conceptual framework

Numerous concepts exist in the human dimensions of natural resources (HDNR) literature to describe environmental perspectives including values, attitudes, perceptions, expectations, evaluations, beliefs and opinions, and multiple definitions exist in the literature to describe these concepts (Manfredo, Teel & Bright, 2004). Attitudes and values are of particular interest to HDNR researchers and are frequently examined topics (Manfredo et al., 2004).

Rockeach (1973, p. 5) defines value as "an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence." Brown (1984) distinguishes between held values (desirable outcomes) and assigned values (process of evaluating). Held values are end states, modes of conduct or qualities that are desirable to an individual (Brown, 1984); this concept is consistent with the term used in the policy sciences literature, where values are desired objects or situations (Clark, 2002). The policy sciences further distinguishes between scope values (values that are sought as ends or outcomes) and base values (values already possessed by people or groups, and that may be used to attain scope values) (Clark, 2002).

According to Brown (1984), held values influence assigned value, which is the relative importance or worth of objects to an individual or group. In this sense, values are used to evaluate the desirability of modes of conduct or outcomes (Fulton, Manfredo &

Lipscomb, 1996). This evaluative component of values is a foundation for attitudes and behaviours (Manfredo et al., 2004).

Attitudes can be defined as "an orientation toward certain objects or situations that is emotionally toned and relatively persistent. An attitude is learned and may be regarded as a more specific expression of a value or belief in that an attitude results from the application of a general value to concrete objects or situations" (Theodorson and Theodorson, 1969, p. 19). Manfredo et al. (2004) define attitude as an individual's evaluation of an entity.

Some conceptual frameworks suggest that an individual's view of their environment can be organized in a cognitive hierarchy of values, attitudes, and behaviours (Homer & Kahle, 1988). This value-attitude-behaviour model suggests that values influence attitudes which in turn predict human behaviour (Vaske & Donnelly, 1999; Fulton et al., 1996; Homer & Kahle, 1988). Values are few in number, relatively stable, and central to the cognitive structure (Fulton et al., 1996). Fulton et al. build upon the value-attitude-behaviour model, and suggest that value orientations (or basic beliefs) strengthen and give individual meaning to more general values, which influence an individual's attitude toward their environment.

3.3.2 Perspectives toward grizzly bears

Values and attitudes are a critical component of wildlife policy. Kellert and Clark (1991, p. 18-19) define wildlife policy as the "interactive relationship of various constituencies in an exchange of information, values, and efforts to control wildlife...throughout the 'life' of a wildlife policy from its initiation to termination."

Kellert (1980) developed a typology to classify various domains of thought about wildlife. Kellert refers to these categories as both values (Kellert, 1980) and attitudes (Kellert, 1991, 1985a, 1985b). They include (Kellert, 1980):

- naturalistic – emphasis on the experience of wildlife in an outdoor recreational setting;
- ecologistic – interest in the interrelationships of species in the context of ecosystems;
- humanistic – feelings of strong affection for individual animals;
- moralistic – concern for the right and wrong treatment of animals;
- scientistic – interest in the physical attributes and biological functioning of animals;
- aesthetic – interest in the attractiveness and symbolic significance of animals;
- utilitarian – concern for the practical and material value of wildlife;
- domionionistic – interest in the mastery and control of animals;
- negativistic – active avoidance of wildlife due to dislike or fear;
- neutralistic – passive avoidance of animals due to indifference.

Attitudes are one of the more frequently examined topics in the HDNR literature (Manfredo et al., 2004). There have been few studies of public attitudes toward grizzly bears. Strumpf-Allen, McFarlane & Watson (2004) examined attitudes in the Foothills Model Forest of western-central Alberta of residents from the Foothills Model Forest, Jasper National Park and Edmonton, and showed that attitudes toward grizzly bears were positive among all sample groups. Respondents strongly agreed that grizzly bears were important to the balance of nature and were symbolic of the greatness of nature, and agreed that it was important that Alberta have a sustainable bear population. Although attitudes were generally positive, the authors found that compared to residents of Jasper National Park or Edmonton, the respondents of the Foothills Model Forest were more optimistic about the sustainability of grizzly bears, perceived less risk to bears from industrial activities, and were not as supportive of restrictions on human use in bear habitat (Strumpf-Allen et al., 2004).

Kaczensky, Blazic & Gossow (2004) documented highly positive attitudes toward grizzly bears among the general public and hunters in Slovenia. These positive attitudes existed despite an increase in sheep predation in one of the study areas. The authors found that people's perception of the harmfulness of bears was a stronger predictor of attitudes than actual damage levels caused by bears. Andersone & Ozolins (2004) demonstrated positive views toward grizzly bears among the general public in Latvia; the majority of respondents believed there were too few bears and supported protection measures. A study of attitudes among recreationalists in Montana found that respondents held strong ecologistic beliefs about bears (McCool & Braithwaite, 1989).

Although these studies documented generally positive attitudes toward grizzly bears, negative attitudes toward bears have also been described, particularly among more resource-dependent groups (farmers, livestock producers, rural residents) (Kaczensky et al., 2004; Kellert et al., 1996; Kellert, 1994).

Research on attitudes toward other large carnivores (wolves, mountain lions, and black bears) suggests positive to neutral attitudes toward these species in many studies (Kellert et al., 1996; Brooks, Warren, Nelms & Tarrant, 1999; Pate, Manfredo, Bright & Tischbein, 1996). However, negative perceptions toward large carnivores have been documented among some rural residents (Ericsson & Heberlein, 2003; Kellert et al., 1996; Kellert, 1991, 1985a, 1985b), and among some resource-dependent groups (farmers, livestock producers, hunters) (Ericsson & Heberlein, 2003; Naughton-Treves, Grossberg & Treves, 2003; Kaltenborn, Bjerke & Vitterso, 1999; Lohr, Ballard & Bath, 1996; Kellert et al., 1996; Kellert, 1991, 1985a, 1985b).

CHAPTER 4: METHODOLOGY

4.1 Methodologies for studying perspectives

Attitude surveys are commonly used by natural resource professionals to gauge public perspectives (Bright & Manfredo, 1996). Standard attitude scaling methods (e.g. Guttman, Thurstone, or Likert) attempt to arrive at a single score that represents the respondent's evaluation of an attitude object (Fishbein & Ajzen, 1975). In these attitude scaling methods, respondents are given a number of statements of belief or intention about an issue, and asked to rate each statement on a scale with response items (e.g. strongly agree to strongly disagree). These statements of belief or intention are used to infer the person's location on a bipolar dimension vis-à-vis the object in question (Fishbein & Ajzen, 1975).

Attitude scaling methods have commonly been employed to measure attitudes toward large carnivores. Kellert (1985a) developed scales to measure the attitude types identified in Kellert (1980) (naturalistic, ecologistic, humanistic, moralistic, scientistic, aesthetic, utilitarian, dominionistic, negativistic). The scales included questions related to each attitude type, and included Likert-style response options (strongly agree to strongly disagree) for each question.

Other studies that use attitude scales to study attitudes towards large carnivores include: Strumpf-Allen et al., 2004; Kaczensky et al., 2004; Ericsson & Heberlein, 2003;

Brooks et al., 1999; Kaltenborn et al., 1999; Bjerke, Retan & Kellert, 1998; Lohr et al., 1996; Pate et al., 1996; Kellert, 1991; McCool & Braithwaite, 1989; Bath & Buchanan, 1989; and Kellert, 1985b.

Brunner (1982) offers a critique of these conventional quantitative research methods in social science, arguing that "quantitative data...do not speak for themselves. Rather their meanings depend upon the contexts in which they are produced and interpreted" (p. 116-117). Methods that attempt to validate a scale emphasize the investigator's perspective about the context, while not allowing other perspectives to emerge (Brunner, 1982).

Q methodology offers an alternative to these traditional research methods by combining the strengths of qualitative and quantitative research methods (Addams, 2000). Quantitative methods (such as attitude scales), are statistically rigorous but, as noted by Brunner, may be based on poorly conceived categories and therefore may not accurately reflect attitudes. Qualitative methods (such as focus groups) can perhaps more accurately reflect perspectives, as attitudes are measured in the normal context of discussion. However qualitative methods are often criticized for lacking statistical rigour. Q method explores social discourses, while using a statistical technique (factor analysis) to explore the range of discourses held by a group (Addams, 2000).

4.2 Q methodology

4.2.1 Development

Q methodology was developed by British physicist-psychologist William Stephenson to study human subjectivity (Stephenson, 1953). This method is based on the principles of correlation and factor analysis. Factor analysis, invented by Charles Spearman in the early 1900s, has conventionally been used to factor analyze the intercorrelations across traits of people (Stephenson, 1953). This procedure has been termed "R" methodology in reference to Pearson's product-moment correlation *r* (Stephenson, 1953). The possibility of correlating and factor analyzing persons was raised in 1935 independently by two factorists - Sir Godfry Thomson and William Stephenson. Thomson never pursued the technique, whereas Stephenson's innovations on correlating people allowed a separate methodology to be possible (Brown, 1980). The fundamentals of Q method are laid out in Stephenson's work (1953) and Q method has been described in detail by Brown (1980) and McKeown & Thomas (1988).

4.2.2 Core concepts

Q methodology has several fundamental concepts that differentiate it from traditional survey research, or R technique. Brown (1980, p. 2) writes that R method "conceptualizes attitudes, feelings, and other relevant human events as internal states or traits that can only be measured indirectly through devices such as attitude scales." R method emphasizes the external standpoint of the researcher; the researcher constructs scales to measure attitudes, and in doing so, assigns meanings to the items in the scale. A

respondent's attitude is dependent on the prior meaning of the pre-determined categories used (Brown, 1980).

Q methodology, on the other hand, emphasizes operant subjectivity. Q is operant, because unlike scales or tests, it is not dependent on measures determined by the researcher. In Q method, the respondent "maps" their point of view by rank-ordering statements of opinion in the Q sort; this method attempts to examine the world from the internal standpoint of the respondent (Brown, 1980). Q is subjective as it allows the respondent to communicate their own point of view (McKeown & Thomas, 1988) and speak for themselves (Dryzek & Berejikian, 1993). By not using pre-determined categories, Q method has the capacity to reveal unrecognized or unanticipated discourses (Addams, 2000).

In R method, the individual being studied is considered to be a package of traits. The R method approach is analytic in that the respondent is studied as component parts - traits are measured in isolation from one another, and statements in a scale are measured in isolation (Brown, 1980). Traits are assumed to be objective and measurable for an entire population, and a scale constructed to measure traits is assumed to be universal (Brown, 1980). R method rarely examines the importance of the question to the subject (Brown, 1980).

As opposed to R, the approach in Q is synthetic in that it studies the whole response (viewpoint or attitude) and maintains the relationships among the parts (Brown, 1980). The response is assumed to be non-fractional and subjective in that it cannot be reduced and originates from the respondent. When completing the Q sort, the respondent

must make comparisons between statements, instead of looking at statements in isolation as is done in R technique. Q method therefore allows the investigator to explore "dynamic connections" between statements (Addams, 2000) and explore the respondent's attitude as a whole.

4.2.3 Applications of Q methodology

The applications of Q method have been reviewed by Brown (1980). A number of studies have used Q method to explore perspectives on environmental issues (Mattson, Byrd, Rutherford, Brown & Clark, in press; Brown & Byrd, 2004; Webler, Tuler, Shockey, Stern & Beattie, 2003; Byrd, 2002; Focht, 2002; van Eeten, 2001; Webler, Tuler & Krueger, 2001, Addams & Proops, 2000a; Robbins, 2000; Woolley & McGinnis, 2000; Steelman & Maguire, 1999). When Q method has been applied to environmental issues that are particularly controversial and polarized, it is capable of revealing a great diversity and complexity of environmental beliefs beyond the typical "for" and "against," and of uncovering unanticipated discourses (Addams & Proops, 2000b).

Large carnivore management is often a controversial issue for the stakeholders involved. Mattson et al. (in press) and Byrd (2002) have used Q to explore perspectives on large carnivore conservation. Mattson et al. explored views of scientists, managers, and environmental advocates about the problems and solutions for large carnivore (wolves, grizzly bears, cougars) conservation in the U.S. Rocky Mountains. The authors found four problems factors and four solutions factors, and found considerable overlap between the problems and solutions narratives. Two discourses had perspectives that were polar opposites: "carnivore advocates" (problems and solutions) promoted changing

policy goals to conserve large carnivores, and "devolution advocates" (problems and solutions) recommended engaging locals in management. Other factors were: "process reformers" (problems and solutions) who recommended strategies to promote respectful interactions among participants, "agency empathizers" (problems) who rejected critiques of policy and agency implementation, and "economic pragmatists" (solutions) who advocated using economic incentives.

Byrd (2002) used Q to explore beliefs about the wolf in Minnesota and found three distinct views toward wolves. These views were: 1) the idealist perspective, which believed that humans have a moral obligation to correct their relationship with nature; 2) the institutional perspective, which endorsed scientific management and rationality; 3) the localist perspective, which promoted respect and power for its local supporters.

4.2.4 Application of Q methodology to explore perspectives on grizzly bear management

4.2.4.1 Participants

I selected the group of participants included in the Q study (the P set) by targeted, non-random sampling. I chose participants of theoretical interest, that is, those who represented the diversity of interests and views involved with grizzly bear management in the BBV. Twenty-nine individuals participated in the study; I selected participants who were staff of federal and provincial agencies, wildlife biologists, local business operators, tourism representatives, environmental activists, employees of NGOs, local residents, industry representatives, and others.

The participants in Q are not statistical sample elements of the broader population; instead participants are variables who sort a sample of statements on an issue (Brown, 1980). Therefore, in Q, participants are chosen who are likely to define each of the main factors (attitudes) about the issue under investigation, and it is only necessary to have enough participants with a particular attitude to establish the existence of a factor. Unlike R method where large numbers of people are sampled, Q method typically uses a small number of participants or single-case studies. The assumption in Q is that a limited number of attitudes/perspectives exist about any particular issue and the law of diminishing returns suggests that additional participants provide no further validation to the factors (Brown, 1980). The factors that emerge in Q studies are generalizations, representing the general way that people associated with these factors tend to think. These factors represent different modes of thought that retain their characteristics regardless of the number of participants included in a study (Brown, Durning & Selden, 1999).

4.2.4.2 Q sample

The Q sample (the set of statements Q sorted by the participants) was developed as follows. I developed a population of statements (a large number of opinions) about the problems of grizzly bear management in the BBV, and solutions to those problems, by conducting semi-structured interviews with the each of the participants. McKeown & Thomas (1988) identify two advantages of selecting statements for the Q sample from participants' own communications instead of other sources. First, the Q sample mirrors the opinions of the persons performing the Q sorts. Second, it expedites the Q sorting

process and the subjects' attribution of meanings to the statements since the statements are based on the respondents' own communications.

To understand perspectives about problems and solutions for grizzly bear management, I used the problem orientation framework of the policy sciences to structure the interviews, asking participants questions designed to explore their views about goals, trends, conditions, projections of the future, and possible alternatives for bear management (Table 4.1). I also asked participants their opinions about the scientific research that had been conducted on bears in the region. This topic has been particularly controversial in recent years. Furthermore, I specifically asked participants their opinions on decision processes in bear management. I conducted interviews either in person or by phone depending on the availability of the participant.

Table 4.1 Interview questions to develop population of statements.

Interview Question	Problem orientation
Can you briefly describe the main problems associated with grizzly bear management in the Banff-Bow Valley?	Problem definition
What do you think is the present status of bears in the Banff-Bow Valley? Is this status acceptable to you?	Trends
What factors have caused or contributed to the present status of bears in the Banff-Bow Valley?	Conditions
What do you think is likely to happen in the future if the current policies and management practices concerning grizzly bears in the Banff-Bow Valley area remain in effect?	Projections
Would this future scenario satisfy your goals for grizzly bear management?	Projections, goals
What changes would you recommend to improve grizzly bear management in the Banff-Bow Valley area?	Alternatives
What do you think about the scientific research that has been conducted on grizzly bears in the Banff-Bow Valley area? (Why?)	Goals, trends, conditions, alternatives
What do you think about the ways that decisions are made about grizzly bear management in the Banff-Bow Valley area?	Trends, conditions
How could decision-making processes concerning grizzly bear management in the Banff-Bow Valley area be improved?	Alternatives

Interview Question	Problem orientation
What should be the goal or goals for grizzly bear management in the Banff-Bow Valley area? Are these goals presently being achieved?	Goals, trends
Do you have any other comments or suggestions concerning grizzly bears in the Banff-Bow Valley area or their management?	All categories

Interviews were tape-recorded, with the consent of participants, and I later transcribed statements that I encountered. I recorded statements that captured the ideas expressed for each answer to an interview question. In total, I recorded 491 statements from the interviews.

Next, I selected two samples of statements from the population of 491. I used two separate Q samples in the study – one with problems statements, one with solutions statements – in order to have participants sort problems and solutions statements separately. To develop the Q samples, I first grouped statements into two categories: 1) statements that identified problems with bear management, and 2) statements that identified solutions to these problems.

I used a structured Q sample design to select statements for the problems and solutions Q samples. The purpose of developing Q samples is to represent the population of statements in miniature (Brown, 1980). In structured samples, representativeness of the population of statements is typically achieved by applying the principle of variance design (Fisher, 1960) in which the population of statements is modelled or conceptualized theoretically (Brown, 1980). The benefits of using variance design are that it provides the investigator a means to provide comprehensiveness and it can be used to ensure that all possible perspectives on a controversial issue are represented in the Q sample (Brown, 1970). In this design, statements are selected purposefully for the Q

sample according to categories that the researcher designates and defines (McKeown & Thomas, 1988). Brown (1980, p. 189) writes that: "the idea behind structuring a population of statements is therefore an innocent one: the observer merely organizes it from the standpoint of what appears to him to be the most useful way of thinking, each theoretical standpoint bringing to light different aspects of the same item."

I used an inductive design to structure the Q sample. In an inductive design, categories and levels for the Q sample are unknown at the outset and emerge from the patterns that are observed during statement collection (McKeown & Thomas, 1988). I used variance design to group problems and solutions statements according to their "focus," or the issue that they focused on. For each group of statements that focused on an issue, I further grouped statements according to each sub-issue, or dimension of the focus. The focus and dimension categories for problems and solutions are presented in Table 4.2 and Table 4.3.

Table 4.2 Categories of problems statements.
"Dimensions" are the sub-categories of each focus.

Focus	Dimension
A. Decision-making process – special interests/common interest	1. Special interests (non-specific) versus common interest 2. Human use versus common interest 3. Environmentalists versus common interest 4. Special interests versus science
B. Decision-making process – geographic scope	1. Banff Park alone 2. Banff and surrounding ecosystem 3. Banff and much broader geographical context
C. Decision-making process – other	1. Vision/goals 2. Funding 3. Fragmented authority and control 4. Precautionary principle 5. Celebrate successes

Focus	Dimension
D. Decision outcomes – bear population	1. Healthy 2. Acceptable given the circumstances 3. Not acceptable (for bears) 4. Not acceptable (for human use)
E. Decision outcomes – human use levels	1. Acceptable 2. Not acceptable (for bears) 3. Not acceptable (for human use)

Table 4.3 Categories of solutions statements

"Dimensions" are the sub-categories of each focus.

Focus	Dimension
A. Participation in decision making	1. Broaden participation
B. Goals for management	1. Bear conservation goals 2. Other goals
C. Human use	1. Restrict 2. No further restrictions
D. Interjurisdictional coordination	1. Improve coordination
E. Science	1. Science and policy 2. Bear research methods
F. Habitat	1. Actively manage
G. Human values	1. Change values

I selected statements for the Q samples by choosing an equal number of statements from each dimension category. I chose responses that were the most unique within each of these dimensions. Stephenson (1953) supports this "principle of heterogeneity," that is, given the relative homogeneity of statements within a category, the investigator should choose statements which are most unalike. The selection of heterogeneous statements within each dimension "tends to produce a sample of stimuli more nearly approximating the complexity of the phenomenon under investigation" (Brown, 1980, p. 189). In the problems Q sample, I selected 2 statements from each dimension for a total of 38 statements. In the solutions Q sample, I selected 3 statements from each dimension for a total of 30 statements.

4.2.4.3 Q sort

In the Q sort, the participant rank-orders the statements in the Q sample to map their viewpoint. The statement templates used for the problems and solutions Q sorts are shown in Figure 4.1 and Figure 4.2. In both sorts, the scoring continuum ranges from -4 to +4; this range is typical for a Q sample with less than 40 statements (Brown, 1980). I asked the participants to sort the statements to form an inverted quasi-normal distribution, with fewer statements in the extremes (-4, -3, +4, +3) and more statements towards the middle of the distribution (-2 to +2). Statements placed at the extremes of the distribution are more significant for an individual, whereas statements placed towards the centre of the distribution are relatively neutral. Brown (1980) argues that this dynamic matches the way people tend to think – those items which are unlike a person's point of view are just as important, in a negative sense, as items that are like a person's point of view.

Figure 4.1 Statement template for problems Q sort.

Template shows ranking scale for statements (+4 to -4). The number of statements to be placed in each column is shown in brackets.

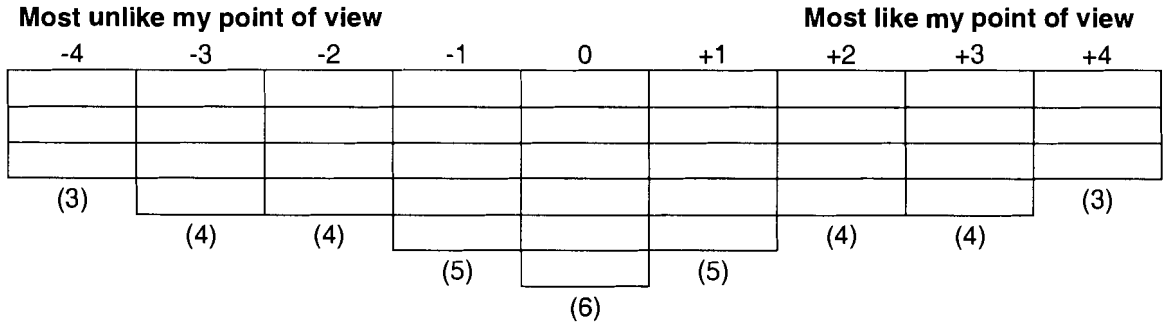


Figure 4.2 Statement template for solutions Q sort

Template shows ranking scale for statements (+4 to -4). The number of statements to be placed in each column is shown in brackets.

Most unlike my point of view								Most like my point of view
-4	-3	-2	-1	0	+1	+2	+3	+4
(3)	(3)	(3)				(3)	(3)	(3)
			(4)	(4)	(4)			

There has been some debate over this forced-distribution feature, where subjects are instructed to place a prescribed number of statements in each column instead of being at liberty to distribute statements freely. A forced-distribution may limit the individuality of the response. However, Brown (1980) asserts that the forced-distribution still allows ample room for individuality, and is beneficial as it encourages respondents to make distinctions between statements, and be selective about statements that are most like or unlike their view, which they might not do voluntarily. McKeown & Thomas (1988) support that participants have freedom to place statements within the distribution, and maintain that the recommended distribution is merely a device for encouraging participants to consider statements more systematically than they might under other conditions.

I met with participants individually for the Q sorts. Each statement in the Q samples was printed on a separate card to be used in the Q sort. The cards for each Q sort were placed in a stack and shuffled before being given to the respondent.

I first administered the problems Q sort. I showed the participant the problems statement template and explained that they would be arranging the statements on a scale from those "most like their point of view" (+4) to those "most unlike their point of view"

(-4). I suggested that the participant arrange the statements according to the statement template (Figure 4.1); however, the participant could deviate slightly from the distribution if they felt that it would not accurately represent their point of view.

I instructed the participant to first read through the statements to get an impression of the overall content of the statements. I asked them to sort the cards into three groups: 1) those that were like their point of view; 2) those that were unlike their point of view; 3) the remainder – statements that were unclear, contradictory, neutral or those which he/she was uncertain about.

I then asked the participant to take the group of statements most like their view, to read through them again, and to select three that they thought were the *most like* their view out of all the statements available and place them under the +4 label. Following this, I asked the participant to take the pile of statements unlike their view, select the three that were *most unlike* their view, and place them under the -4 label. Next, they were asked to return to the positive side of the distribution and select the four statements that were next-most like their point of view and place them under the +3 label, followed by the four statements that were next-most unlike their point of view under the -3 label. The participant was instructed to continue working back and forth between the positive and negative sides of the distribution and move towards the middle.

After sorting the problem statements, the participant was invited to re-examine the array to ensure that it represented his/her point of view. The subject could continue to make any adjustments to the Q sort until they felt it represented their view. Once they

confirmed the array represented their view, statement scores were recorded on a sheet with the participant's identity.

Following completion of the problems Q sort, I conducted a follow up interview. Brown (1980) highlights the importance of an interview following the Q sort, in which "the subject is given an opportunity to expound on his reasoning for ranking the statements in his unique way" (p. 200). In this interview, I asked participants:

> Given the way you've sorted the statements, and especially in light of the statements you've placed in the +/-3 and +/-4 ranks, what is your view on the problem with grizzly bear management in the Banff-Bow Valley?

The follow up interview also provided an opportunity to clarify aspects of the respondent's Q sort that were unclear to me.

I next administered the solutions Q sort. The conditions of instruction for the solutions Q sort were identical to the problems, except for explaining to the subject that the statement template was different due to the smaller number of statements in the solutions Q sample.

4.2.5 Analytic methods

Statistical analysis in Q method consists of 1) correlation and factor analysis of Q sorts, 2) factor rotation and 3) computation of factor scores. Factor analysis is the means by which similar Q sorts are grouped together; factors are the groupings of participants who think similarly about the issue. This process "lend[s] statistical clarity to the behavioural order implicit in the matrix [of correlated Q sorts] by virtue of similarly (or dissimilarly) performed Q sorts" (McKeown & Thomas, 1988, p. 50). Once the Q sorts

are factor analyzed, the investigator selects factors for rotation. The purpose of factor rotation is to maximize the number of Q sorts that are pure factor representations on one or the other of the factors (McKeown & Thomas, 1988). Factor loadings represent the extent to which a Q sort correlates with a factor; pure factor representations are Q sorts significantly[5] loaded on only one factor (McKeown & Thomas, 1988).

Statistical analysis was done separately for the problems and solutions Q sorts. The problems and solutions Q sorts were correlated and factor analyzed using the Principal Components Method in the PQ Method (2.11) computer software program (Schmolk & Atkinson, 2002). PQ Method extracts up to eight factors for each Q study and the investigator must determine the number of factors to rotate. The choice of criterion to use for selecting which factors to rotate is contentious (Brown, 1980). Four recognized methods for selection are:

- Eigenvalue criterion (Brown, 1980). Extract factors that have eigenvalues (the sum of squared loadings for a factor) greater than 1.00. This is the most common method used to determine the number of factors in R factor analysis.

- Cattell's Scree Test (Kim & Mueller, 1978). Select factors for which the eigenvalue is above or at the break in the slope of a graph of eigenvalues against factors.

- Two significant loadings (0.01 level) (Brown, 1980). Accept factors that have at least two significant loadings at the 0.01 level.

- Two significant loadings (0.05 level) (Brown, 1980). Accept factors that have at least two significant loadings at the 0.05 level.

[5] Q sorts significantly associated with a factor at the 0.01 level are those sorts with factor loadings in excess of $2.58(1/\sqrt{N})$, where N is the number of statements in the Q sample (McKeown and Thomas, 1988).

Generally, two to four factors are extracted based on statistical criteria (Brown, 1980).

To select factors for rotation, I used the eigenvalue criterion and Cattell's Scree Test, and also considered whether factors had two or more significant loadings. I also used PQ method program to rotate different factor solutions (1 factor, 2 factors, 3 factors...8 factors), and considered whether pure factor representations were associated with the rotated factors.

I selected three factors to rotate for the problems factors. Three factors were significant according to the Scree test, and these factors also had eigenvalues greater than 1 (see Appendix A). As well, these three factors all had two or more significant loadings at the 0.05 level.

The solution for three rotated factors is shown in Appendix A. All three factors had Q sorts that significantly loaded on that factor alone, and 17 of 29 participants significantly loaded on one of the three factors without significantly loading on any other factor. Ten of the other participants loaded significantly on more than one factor and only two participants did not load significantly on any factor. In this solution, four Q sorts were pure factor representations of factor I, and another four were significantly negatively associated with only factor I. This pattern indicated that factor I was bipolar, and showed that two directly oppositional views were represented. I separated Q sorts with high negative loadings on this factor from those sorts with high positive loadings to distinguish two separate factors - factors I and II. Consequently, the factor loadings of participants associated with factors I and II have equal magnitude but inverse sign.

I rotated the factors using varimax rotation in PQ Method, the most commonly used objective procedure for rotation (McKeown and Thomas, 1988). I manually flagged Q sorts that were pure representations of each problems factor. The PQ Method program takes a weighted average of the flagged Q sorts and merges these sorts to form a single array of factor scores for each factor. That is, PQ Method makes a model Q sort for each factor, made up of the Q sorts of the flagged participants which were significantly associated with the factor and not with any other factor. The problems factor arrays are shown in Appendix B.

The solutions Q sorts were also correlated and factor analyzed using the Principal Components Method and rotated using varimax rotation. I extracted three solutions factors for rotation. Three factors were significant according to the Scree test; these factors also had eigenvalues greater than one (Appendix A), and all had two significant loadings at the 0.01 level.

Brown (1980, p. 42) emphasizes that "the importance of a factor can not be determined by statistical criteria alone, but must take into account the social and political setting to which the factor is organically connected." To take into account the social setting, I compared the outcome of a two factor solution with a three factor solution. In the two factor solution, 26 of 29 participants were significantly associated with either factor A or factor B. This solution emphasized two polarized views with a correlation of -0.28. In the three factor solution, 26 participants were again pure factor representations, but three of these participants now loaded only on the third factor (factor C). As is shown in Chapter 5, factor C offers a unique perspective from factor A or B on the alternatives to bear management; this group shares some perspectives with factor B, but is distinct in

its support of habitat management and its rejection of science or interagency collaboration as alternatives. For these statistical and substantive reasons, I selected the three factor solution. I manually flagged Q sorts that were pure factor representations and used the PQ Method program to create factor arrays (Appendix B).

4.2.5.1 Post Q-study workshop

In order to make sure that the factors accurately represented the views of participants of the study, and to better understand these views, I held a workshop for participants following the Q-study to present the preliminary results and get feedback on the study. The workshop was held one month after the Q-sorts were completed. All participants of the Q-study were invited to participate, and 15 of 29 participants attended this session. The workshop included participants associated with all of the problems and solutions factors. The workshop was professionally facilitated, and included a presentation introducing the policy sciences framework and problem orientation. I presented the problems and solutions factors revealed in the Q-study, highlighting the differences between factors and the common ground.

Following the presentations of the problems and solutions factors, there was an opportunity for participants to ask questions about the methodology or results and clarify points that were unclear. We then asked participants to discuss:

- Do the viewpoints identified by the Q analysis correspond with your own experiences and observations?
- Are there any important viewpoints missing?
- What are the implications of the consensus statements? Do they provide some common ground for moving forward?

CHAPTER 5: RESULTS

5.1 Factors

5.1.1 Factor loadings

Factor arrays for the problems and solutions factors are shown in Appendix B. These idealized Q sorts, created from a weighted average of Q sorts solely and significantly associated with one factor, show factor scores (+4 to -4) for each statement in the Q samples.

Factor loadings show the extent to which each participant's actual Q sort is similar or dissimilar to the factor array, and are shown in Table 5.1. Participants significantly associated with a factor tend to sort statements similarly as a function of their understanding of grizzly bear management in the BBV. Some participants have Q sorts that are significantly associated with more than one factor, meaning that they share perspectives with members of more than one factor. Other participants have Q sorts that are not associated with any factor, meaning that they have a view that is unique from the other participants in the study.

Table 5.1 Factor loadings for problems factors and solutions factors.

Loadings of participants significantly associated with a factor ($p < 0.01$) are identified with "*". Pure factor representations (participants significantly associated with only one factor) are identified in boldface.

		Problems				Solutions		
Participant affiliation	**ID**	**I**	**II**	**III**	**IV**	**A**	**B**	**C**
Participants associated with solutions factor A								
Alberta Community Development Parks and Protected Areas	12	**76***	-76	23	25	**64***	-54	5
Year of the Great Bear	15	**75***	-75	40	-1	**72***	18	-29
Parks Canada	27	**78***	-78	28	29	38	3	-20
Environmental organization	3	72*	-72	51*	07	**85***	-17	-03
Environmental organization	6	79*	-79	44*	-13	**82***	-11	-36
B.C. agency	9	55*	-55	55*	03	**77***	-09	-01
Canadian Parks and Wilderness Society	16	64*	-64	55*	03	**80***	-04	00
Yellowstone to Yukon Conservation Initiative	20	76*	-76	48*	01	**72***	-38	-24
Parks Canada	21	72*	-72	49*	06	**70***	13	-18
Arc Wildlife Services Ltd.	2	28	-28	**75***	07	**80***	-04	25
Anonymous	7	10	-10	**70***	42	**58***	44	11
University of Calgary	26	17	-17	**83***	-07	**82***	-04	-16
B.C. Ministry of Water Land and Air Protection	28	25	-25	**70***	-08	**82***	-02	-20
Parks Canada	29	11	-11	**73***	14	**76***	31	03
Alberta agency	18	38	-38	26	**45***	**82***	-11	-23
Tourism Canmore	4	12	-12	20	39	**56***	13	16
Commercial business	19	41	-41	40	**55***	47*	47*	-09
Participants associated with solutions factor B								
Shell Canada	13	**63***	-63	24	18	36	**63***	-7
Alberta Beef Producers	1	-46	**46***	-18	40	-08	**78***	05
National Park Ski Areas Association	22	-76	**76***	15	18	-35	**63***	29
Commercial business	25	-47	47*	53*	31	-01	**72***	28
Anonymous	5	-62	62*	-16	46*	-49	**64***	-06
Commercial business	24	-64	64*	-02	42*	-34	46	13
Parks Canada	14	33	-33	**79***	20	39	**48***	-24
Parks Canada	10	-15	15	50*	56*	01	**71***	07
Community resident	17	-05	05	05	39	17	**57***	10
Participants associated with solutions factor C								
Anonymous	8	-63	**63***	-40	39	-50	45	**54***
Commercial business	11	-78	**78***	22	11	-13	04	**90***
Anonymous	23	-30	30	-44	**78***	01	22	**74***

5.1.2 Factor correlation

Table 5.2 shows the correlation between the four problems factors. As factors I and II were originally a single bipolar factor in the factor analysis, these factors are highly negatively correlated (-0.70). Factors I and III are strongly positively correlated

(0.58), and factors II and IV are also positively correlated (0.27) which demonstrates that factors I and III have similar understandings of the problem, as do factors II and IV.

Table 5.2 Correlation of problems factors

	Factor 1	Factor 2	Factor 3	Factor 4
Factor 1	1.00	-0.704	0.576	0.094
Factor 2	-0.704	1.00	-0.179	0.265
Factor 3	0.576	-0.179	1.00	-0.028
Factor 4	0.094	0.265	-0.028	1.00

Table 5.3 shows the correlations between solutions factors. Factors B and C are positively correlated (0.24). Factors A and C are negatively correlated (-0.28) while factors A and B have little relationship (-0.10).

Table 5.3 Correlation of solutions factors

	Factor A	Factor B	Factor C
Factor A	1.00	-0.104	-0.275
Factor B	-0.104	1.00	0.240
Factor C	-0.275	0.240	1.00

5.1.3 Factor interpretation

Factors are interpreted by examining the factor arrays (Appendix B). Generally statements with factor scores (rankings) of $\geq +2$ are those supported by individuals associated with a factor, statements with scores of ≤ -2 are those with which they disagree, and statements with scores of -1, 0 and +1 are considered less important to them or neutral. Interpretation focuses on statements which members of a factor most strongly agree (+4 and +3) and disagree (-4 and -3). Factors are also interpreted by focusing on statements that significantly differentiate one factor from other factors ($p < 0.01$), or statements that members of one factor perceive as more important than other factors.

Statements scored toward the middle of the Q sort distribution (+1, 0, -1) are typically of little importance in interpretation. However, if members of one factor rank a statement as neutral, while all other factors strongly support or reject this statement, the statement may contain sentiments that participants who ranked the statement as neutral would like to deny or accept but for some reason feel they cannot. This pattern may indicate that the statement is more or less problematic than a factor is willing to acknowledge (Brown, 1980).

I assigned each of the factors names to describe the viewpoint that the factor expresses. The names for the problems factors emphasize the group's perceived problem with bear management that distinguishes it from the other groups: deficient directives (factor I), exaggerated problems (factor II), problematic institutions (factor III), and politicized management (factor IV). Similarly, the names for the solutions factors highlight the group's preferred solution: bear conservation advocates (factor A), process reformers (factor B), and habitat modifiers (factor C).

5.2 Problems factors

5.2.1 Problems factor I (deficient directives)

Four participants are pure representations of this narrative; one is affiliated with Alberta Community Development Parks and Protected Areas, one with Parks Canada, one with the oil and gas sector, and another with the Year of the Great Bear (a partnership between public and private interests that signed on to a public-awareness campaign around bears in 2001). Participants significantly associated with factor I (but also

associated with other factors) include: environmental organization employees, a B.C. provincial agency employee, and a Parks Canada employee.

5.2.1.1 Narrative of factor I

Factor I believes that the problems with bear management are that goals are deficient, the bear population is unsustainable, and human use management is inadequate (Table 5.4).

Table 5.4 Statements characterizing factor I .

Statements that significantly ($p < 0.01$) differentiate a factor narrative from all others are identified by an "*."

Statement	Factor Scores			
	I	II	III	IV
Statements supported by factor I				
P8. An unrelenting tide of humanity has descended on a place that has a finite capacity to accommodate human pressure.	**+4**	-4	0	+4
P14. There will be more challenges for residents with bear activity intruding in communities in the future.	**+4**	+1	+1	+3
P16. The Bow Valley is an important linkage for the regional grizzly bear population. If we lose the connections and opportunities in this area, then there is a high risk of the population being placed in jeopardy.	**+4**	0	+4	-2
P2. There is a lack of an overall conservation strategy for grizzly bears, lack of clear goals, targets and a bigger vision.	**+3***	-3	-1	0
P15. The population status of grizzly bears is not sustainable in the long term. If we sit back today and call it acceptable, we won't make the improvements that need to be made to maintain the position we're in now.	**+3**	-1	+3	-1
P19. There is no well organized or visionary plan in place that outlines when success is achieved in management and when we've achieved a healthy population.	**+3**	-2	-2	+3
P29. Management is largely reactive, it's based on the political bureaucratic mood of the day and is not entirely science based.	**+3**	-2	0	+2
P18. Management is fragmented by jurisdiction. There are no system wide specific objectives that Parks Canada and the provincial agencies are trying to manage for.	**+2**	-4	+2	-1

Statement	Factor Scores			
	I	II	III	IV
Statements rejected by factor I				
P21. We're taking our local situation with bears and extrapolating. In the regional context, grizzly bear populations are healthy.	**-4**	+1	-3	+1
P24. We have unnecessarily sacrificed human activities in Banff National Park for grizzly bear protection.	**-4**	0	-3	-2
P38. The grizzly bear population is doing very well, describing the population as just "stable" is the crisis version of what is happening.	**-4**	+1	-2	0
P6. People management in Banff Park has been successful and has led to us cultivating bears not wiping them out.	**-3***	+3	0	-1
P26. The population status of grizzly bears is acceptable as it is. We'll never achieve zero mortality of bears given the circumstances we're in and that's fine.	**-3***	+2	0	+2
P32. Grizzly bears have been over managed. The trend of closing each area with a female grizzly in it is leading us to close Banff.	**-3**	+1	-4	-1
P37. Grizzlies are managed from the perspective that they're an endangered species when they're not. The Banff-Bow Valley is not the last stand of the grizzly bear.	**-3***	+3	-1	0
Statements ranked neutral				
P31. Human use issues receive greater priority in Parks management to the point where grizzly bears have been jeopardized.	**+1***	-4	0	-3

Goals and conservation strategy

Factor I believes that directives for grizzly bear management in the BBV are deficient. The concern about lack of an overall conservation strategy, goals, targets, vision (statement P2) and criteria for success in management (P19) fits with the perception that management is largely reactive and not grounded in science (P29). To a lesser extent, this narrative is also concerned about the lack of system wide objectives across jurisdictions (P18). Perhaps because of these perceived failings, factor I believes there will be increasing challenges for residents of the BBV arising from bear intrusions in communities (P14).

Population status

Factor I also expresses concern about the current status of the grizzly bear population in the BBV. This group does not believe that the population of bears is doing well (P38), nor that the status is acceptable or sustainable (P26, P15). Moreover, factor I

does not agree that regional grizzly bear populations are healthy (P21) and does not see a problem with managing bears as an endangered species (P37). Members of this group believe that the habitat in the BBV is important for the regional grizzly bear population, and loss of this habitat will be problematic for bears (P16).

Human use management

Factor I also identifies increased human use in the BBV and the management of this use as problems. This narrative is concerned about increased human pressure in the BBV (P8). The group strongly rejects the idea that human use management in the park has been successful for bears (P6). Similarly, they disagree that human activities in Banff have been unnecessarily sacrificed (P24) or that area closures to protect bears are closing BNP (P32). Factor I is also relatively neutral about the claim that human use issues receive greater priority in the park to the point where bears have been jeopardized (P31) which is significantly different than the beliefs of other factors.

Factor I is neutral about the claim that challenges with bear management are exaggerated, a claim which is strongly supported by the other three factors (P36). Given the concerns that factor I expresses about grizzly bear management (current status of bears, human use, and lack of goals), the ranking of statement 36 suggests that this group is not prepared to agree that stressing the challenges with management is unwarranted.

5.2.2 Problems factor II (exaggerated problems)

Four participants are pure representations of factor II: two are affiliated with commercial businesses, one is affiliated with the ranching industry, and one chose to remain anonymous. Other participants who are significantly associated with this factor

include two participants affiliated with commercial businesses and another anonymous participant.

5.2.2.1 Narrative of factor II

Factor II's understanding of the problems is virtually opposite to that of factor I, as these groups were originally represented by a single bipolar factor. Factor II believes that management is largely successful, but that problems are overstated. Statements associated with factor II are identified in Table 5.5.

Table 5.5 Statements characterizing factor II

Statements that significantly ($p < 0.01$) differentiate a factor narrative from all others are identified by an "*."

Statement	Factor Scores			
	I	II	III	IV
Statements supported by factor II				
P10. We tend to get caught up in the chicken little syndrome – thinking that the sky is falling and we need to fix everything – without recognizing Parks Canada's successes in grizzly bear management.	-1	**+4***	+1	+1
P28. It is not the role of a National Park to be a bear factory and produce bears, but instead to have the right amount of bears for the Park itself.	-2	**+4**	0	+3
P36. Instead of celebrating our achievements in grizzly bear management, we continue to talk about our challenges.	0	**+4**	+3	+2
P5. The grizzly bear population of the Banff-Bow Valley is the healthiest it has been in 25 years.	0	**+3**	+1	+1
P6. People management in Banff Park has been successful and has led to us cultivating bears not wiping them out.	-3	**+3***	0	-1
P12. Although human use in Banff Park has increased, that use is more concentrated and people are better educated, so people are having less of an impact on grizzly bears.	-1	**+3***	-1	-2
P37. Grizzlies are managed from the perspective that they're an endangered species when they're not. The Banff-Bow Valley is not the last stand of the grizzly bear.	-3	**+3***	-1	0
P1. There is a false crisis mentality spurred by interest groups who have more in line than the health and welfare of grizzly bears.	-2	**+2**	-2	+3
P9. The grizzly bear population is at an equilibrium, it's neither dropping nor increasing. Management is doing a good job with what they're working with.	-2	**+2***	+1	-1

Statement	Factor Scores			
	I	II	III	IV
P25. We are on a trend to having way too many bears in the area which means we'll be bound to have more problems between bears and people, and a huge proportion of habituated bears.	-1	**+2**	-4	0
Statements rejected by factor II				
P8. An unrelenting tide of humanity has descended on a place that has a finite capacity to accommodate human pressure.	+4	**-4***	0	+4
P18. Management is fragmented by jurisdiction. There are no system wide specific objectives that Parks Canada and the provincial agencies are trying to manage for.	+2	**-4***	+2	-1
P31. Human use issues receive greater priority in Parks management to the point where grizzly bears have been jeopardized.	+1	**-4**	0	-3
P2. There is a lack of an overall conservation strategy for grizzly bears, lack of clear goals, targets and a bigger vision.	+3	**-3***	-1	0
P7. The current management of grizzly bears is somewhat disjointed between several different responsible agencies. Techniques to manage bears are not consistent and communication is not as good as it could be between these agencies.	+2	**-3***	+3	0
P13. Increasing human use of grizzly bear habitat, through recreational use, residential use, and tourism development, both inside and outside of the Park has resulted in increased mortality rates of grizzly bears.	+2	**-3**	+4	-2
P27. Politics and special interest pleading have interfered with the essential scientific understanding of the fundamental established mandates of conservation organizations. We're no longer talking about science, we're talking about who can speak the loudest and who can get the most media coverage.	+1	**-3**	-1	+2
P29. Management is largely reactive, it's based on the political bureaucratic mood of the day and is not entirely science based.	+3	**-2***	0	+2
Statements ranked neutral				
P32. Grizzly bears have been over managed. The trend of closing each area with a female grizzly in it is leading us to close Banff.	-3	**+1**	-4	-1
P24. We have unnecessarily sacrificed human activities in Banff National Park for grizzly bear protection.	-4	**0***	-3	-2
P30. A disproportionate amount of resources are going into saving bears when they're shot just outside Park borders.	-2	**0**	-3	-4

Recognizing successes

Factor II's narrative centres around a belief that grizzly bear management has largely been successful and a concern that successes and achievements have not been adequately recognized or celebrated (P10, P36). This group rejects many of the criticisms with bear management that factor I and III emphasize, disputing that management is fragmented between agencies and jurisdictions (P7, P18), and that there is a lack of a conservation strategy (P2) or system wide objectives (P18). Factor II disagrees with

criticisms that management is not grounded in science (P29) and in particular rejects the claim that politics and special interest pleading have impeded science-based management (P27).

Population status

Factor II's perception is that the population of grizzly bears in the BBV is doing well, and that problems with the population status have been overemphasized, in part by interest groups with other objectives. Factor II's position is that the grizzly bear population of the BBV is healthy, not in crisis and well managed (P1, P5, P9). To a lesser extent, Factor II believes that there is a trend of having too many bears in the area, which may lead to more conflicts between bears and people (P25). This group does not believe that grizzly bears should be managed as an endangered species in the BBV because the region is not the last stand of the bear (P37). Factor II agrees that the park should not be managed as a "bear factory" to supply bears for the regional population (P28).

Human use management

Unlike factor I, factor II believes that human use in the BBV has not increased excessively and is being well managed. Factor II disagrees that human pressure has been excessive or unrelenting (P8). People management has been successful and human use is not problematic for bears (P6, P12). This group does not agree that increasing human use of bear habitat has led to greater mortality rates of bears (P13) or that parks management has jeopardized bear conservation by prioritizing human use (P31).

Because of this group's beliefs about human use and the status of bears, it is perhaps unwilling to join the other factors in rejecting the claim that human activities

have been unnecessarily sacrificed for grizzly bear protection (P24), that over-management of grizzly bears is closing Banff (P32), or that too many resources have been put into saving bears (P30).

5.2.3 Problems factor III (problematic institutions)

The participants who are pure representations of factor III are generally affiliated with research institutions or government agencies. Participants are affiliated with: Arc Wildlife Services, University of Calgary, B.C. Ministry of Water, Land and Air Protection, and Parks Canada, together with one anonymous participant. Other participants significantly associated with this factor are affiliated with environmental organizations, a B.C. provincial agency, Parks Canada, or a commercial business.

5.2.3.1 Narrative of factor III

Factor III is characterized by beliefs about poor institutional arrangements to manage bears, a problematic bear population status and problematic human use management (Table 5.6)

Table 5.6 Statements characterizing factor III

Statements that significantly ($p < 0.01$) differentiate a factor narrative from all others are identified by an "*."

Statement	Factor Scores			
	I	II	III	IV
Statements supported by factor III				
P4. The grizzly bear population is vulnerable.	+1	0	**+4***	+2
P13. Increasing human use of grizzly bear habitat, through recreational use, residential use, and tourism development, both inside and outside of the Park has resulted in increased mortality rates of grizzly bears.	+2	-3	**+4**	-2
P16. The Bow Valley is an important linkage for the regional grizzly bear population. If we lose the connections and opportunities in this area, then there is a high risk of the population being placed in jeopardy.	+4	0	**+4**	-2
P3. There is not enough funding to implement what we know needs to be done for grizzly bear management.	0	-1	**+3***	-4
P7. The current management of grizzly bears is somewhat disjointed between several different responsible agencies. Techniques to manage bears are not consistent and communication is not as good as it could be between these agencies.	+2	-3	**+3**	0
P15. The population status of grizzly bears is not sustainable in the long term. If we sit back today and call it acceptable, we won't make the improvements that need to be made to maintain the position we're in now.	+3	-1	**+3**	+1
P36. Instead of celebrating our achievements in grizzly bear management, we continue to talk about our challenges.	0	+4	**+3**	+2
P18. Management is fragmented by jurisdiction. There are no system wide specific objectives that Parks Canada and the provincial agencies are trying to manage for.	+2	-4	**+2**	-1
P11. The squeaky wheel wins in grizzly bear management. Organizations that speak loudly and are connected to the media have their views incorporated into policy.	0	0	**-2***	+1
Statements rejected by factor III				
P20. Banff Park doesn't have room for more bears because the ecosystem in the Park is at carrying capacity.	-1	-1	**-4***	-1
P25. We are on a trend to having way too many bears in the area which means we'll be bound to have more problems between bears and people, and a huge proportion of habituated bears.	-1	+2	**-4***	0
P32. Grizzly bears have been over managed. The trend of closing each area with a female grizzly in it is leading us to close Banff.	-3	+1	**-4**	-1
P21. We're taking our local situation with bears and extrapolating. In the regional context, grizzly bear populations are healthy.	-4	+1	**-3**	+1
P24. We have unnecessarily sacrificed human activities in Banff National Park for grizzly bear protection.	-4	0	**-3**	-2
P30. A disproportionate amount of resources are going into saving bears when they're shot just outside Park borders.	-2	0	**-3**	-4
P34. Most of the discourse associated with policy making has been high-jacked by people whose views are short term and do not take into account the larger interests, sensibilities or history of this country.	0	-2	**-3**	0

Institutional arrangements for bear management

Factor III is distinct from the other narratives in that it emphasizes problems with institutional arrangements for bear management. This group sees management as disjointed, fragmented, inconsistent, and hampered by poor communication (P7, P18). Moreover, bear management is inadequately funded (P3). In spite of these problems, factor III does not feel that too many resources are devoted to management (P30). Further, factor III does not believe that decision-making has only considered short-term interests or is biased towards promoting the interests of certain groups. (P34, P11). Factor III also believes, though, that challenges with bear management tend to be overemphasized while achievements are not adequately celebrated (P36).

Population status

Similar to factor I, factor III is characterized by strong concern about the population status of grizzly bears. Factor III believes that the BBV bear population is vulnerable and is not sustainable in the long term (P4, P15), and disagrees that interest groups have overemphasized these problems (P1). Furthermore, the BBV is an important linkage for the regional grizzly bear population, and regional populations are not healthy (P16, P21).

This emphasis on the status of bears is accompanied by a belief that BNP could support more bears. Factor III strongly disagrees that the park has reached a carrying capacity in its ability to support bears or is on a trend to having too many bears (P20, P25).

Human use management

Factor III also shares factor I's concern about increasing human use in the BBV and the management of human use. These groups both disagree that human use has been unnecessarily restricted in the park and that grizzly bears have been over-managed (P24, P32). Factor III is more concerned than factor I with the relationship between increasing human use in the BBV and mortality rates of bears (P13).

5.2.4 Problems factor IV (politicized management)

Three participants are pure representations of factor IV: one affiliate of an Alberta provincial agency, one affiliate of a commercial business, and one who chose to be anonymous. Other participants significantly associated with this narrative include: one affiliate of Parks Canada, one affiliate of a commercial business, and another who chose to be anonymous.

5.2.4.1 Narrative of factor IV

Factor IV is unique in that it shares some beliefs with factor I and other beliefs with factor II. Factor IV differs from both, however, in strongly rejecting statements that identify funding as a problem, and in emphasizing politicized decision-making and a lack of science-based management as key problems (Table 5.7).

Table 5.7 Statements characterizing factor IV

Statements that significantly ($p < 0.01$) differentiate a factor narrative from all others are identified by an "*."

Statement	Factor Scores			
	I	II	III	IV
Statements supported by factor IV				
P8. An unrelenting tide of humanity has descended on a place that has a finite capacity to accommodate human pressure.	+4	-4	0	**+4**
P33. Political pressure lets people get what they want. Decision making is politicized.	+1	+1	+2	**+4**
P1. There is a false crisis mentality spurred by interest groups who have more in line than the health and welfare of grizzly bears.	-2	+2	-2	**+3**
P14. There will be more challenges for residents with bear activity intruding in communities in the future.	+4	+1	+1	**+3**
P19. There is no well organized or visionary plan in place that outlines when success is achieved in management and when we've achieved a healthy population.	+3	-2	-2	**+3**
P28. It is not the role of a National Park to be a bear factory and produce bears, but instead to have the right amount of bears for the Park itself.	-2	+4	0	**+3**
P26. The population status of grizzly bears is acceptable as it is. We'll never achieve zero mortality of bears given the circumstances we're in and that's fine.	-3	+2	0	**+2**
P27. Politics and special interest pleading have interfered with the essential scientific understanding of the fundamental established mandates of conservation organizations. We're no longer talking about science, we're talking about who can speak the loudest and who can get the most media coverage.	+1	-3	-1	**+2**
P29. Management is largely reactive, it's based on the political bureaucratic mood of the day and is not entirely science based.	+3	-2	0	**+2**
Statements rejected by factor IV				
P3. There is not enough funding to implement what we know needs to be done for grizzly bear management.	0	-1	+3	**-4***
P22. Elsewhere in Alberta, grizzly bear populations are shrinking. The Bow Valley needs to be a source of bears to increase the regional population of bears.	0	-2	+1	**-4***
P30. A disproportionate amount of resources are going into saving bears when they're shot just outside Park borders.	-2	0	-3	**-4***
P17. The precautionary principle doesn't hold water in grizzly bear management. The onus of proof is still on those defending wildlife instead of on developers.	+2	-1	+2	**-3***
P23. Decisions are made with urban perceptions and by wildlife groups, with less consideration given to agriculture. Livestock producers have generally borne the costs of grizzly bear protection and do not get adequate compensation for losses incurred by bears.	-1	0	-1	**-3**
P31. Human use issues receive greater priority in Parks management to the point where grizzly bears have been jeopardized.	+1	-4	0	**-3**
P35. If something will impact recreational opportunities, the burden of proof is always on the bear, their habitat, and the people who defend their habitat, to show that harm is being done. This is wrong.	+1	-1	+2	**-3**

Politicized decision-making

Factor IV strongly believes that decision-making is politicized, which in turn has hindered science-based management. This narrative emphasizes that decisions are largely influenced by political pressure of interest groups, which allows them to pursue their own agendas (P33). Furthermore, it agrees that politics and special interest pleading have interfered with science-based management (P27). Similar to factor I, factor IV believes that management decisions are largely based on the political mood of the bureaucracy, and are not science-based (P29).

Although factor IV feels that decision-making is politicized, this group strongly disagrees with the claim that decisions are made without consideration of agriculture interests (P23).

Funding for management

Factor IV is unique in strongly disagreeing with statements that identify funding as a problem. Although this group disagrees that management is underfunded (P3), it also disputes that the resources devoted to bears have been excessive (P30). Together, these statements suggest that this group feels that funding for management has been adequate and not problematic.

Perspectives shared with factor II

Factor IV shares some of factor II's perspectives on the status of the grizzly bear population. This group believes the population status is acceptable (P26), but that problems with the status of the population have been overemphasized by groups with other objectives (P1). Factor IV also supports factor II's beliefs that the BBV should not

be managed as a "bear factory" or a source of bears to increase the regional population (P22, P28).

Perspectives shared with factor I

While Factor IV shares beliefs with factor II on the population status of bears, factor IV shares some of factor I's concerns about increasing challenges for residents due to bear activity in communities (P14), and the lack of criteria for measuring success (P19).

Factor IV agrees with factor I's narrative about increased human use in the BBV (8), however, this group does not go so far as to support the claim that human use receives greater priority in management to the detriment of grizzly bears (P31) or that the precautionary principle is not applied in bear management (P17). Further, Factor IV strongly disagrees with the statement that the burden of proof improperly falls on bears and bear advocates to show that harm is being done when recreational use is constrained (P35).

5.2.5 Virtual consensus

Analysis of shared beliefs on the problems factors identified 10 statements of "virtual consensus" (Table 5.8). Using the criterion in Mattson et al. (in press), I defined statements of virtual consensus as:

- Statements of virtual agreement: standardized scores of ≥ 0 for all factors and at least one standardized score $> +2$ or,

- Statements of virtual disagreement: standardized scores of ≤ 0 for all factors and at least one standardized score < -2

The criterion of having at least one standardized score of > +2 (for statements of virtual agreement) or < -2 (for statements of virtual disagreement) was applied to select statements that are supported or rejected by participants associated with at least one factor, rather than statements that are unimportant or unclear to all. Statements of virtual consensus represent areas of common ground or at least limited agreement across the views.

Table 5.8 Problems factors statements of virtual consensus

Statement	Factor Scores			
	I	II	III	IV
P4. The grizzly bear population is vulnerable.	+1	0	+4	+2
P5. The grizzly bear population of the Banff-Bow Valley is the healthiest it has been in 25 years.	0	+3	+1	+1
P14. There will be more challenges for residents with bear activity intruding in communities in the future.	+4	+1	+1	+3
P20. Banff Park doesn't have room for more bears because the ecosystem in the Park is at carrying capacity.	-1	-1	-4	-1
P23. Decisions are made with urban perceptions and by wildlife groups, with less consideration given to agriculture. Livestock producers have generally borne the costs of grizzly bear protection and do not get adequate compensation for losses incurred by bears.	-1	0	-1	-3
P24. We have unnecessarily sacrificed human activities in Banff National Park for grizzly bear protection.	-4	0	-3	-2
P30. A disproportionate amount of resources are going into saving bears when they're shot just outside Park borders.	-2	0	-3	-4
P33. Political pressure lets people get what they want. Decision making is politicized.	+1	+1	+2	+4
P34. Most of the discourse associated with policy making has been high-jacked by people whose views are short term and do not take into account the larger interests, sensibilities or history of this country.	0	-2	-3	0
P36. Instead of celebrating our achievements in grizzly bear management, we continue to talk about our challenges.	0	+4	+3	+2

All factors agree that while the grizzly bear population is vulnerable (P4), that it is also the healthiest it has been in 25 years (P5). The agreement on these statements suggests that there is general agreement that there have been improvements in the status of the grizzly bear population over the past 25 years, but that the status may still be problematic. There is virtual agreement that the ecosystem in the park could support more

bears and is not at carrying capacity (P20), but also concern for increasing challenges with bear activity in communities in the future (P14). Thus, these participants generally accept that there could be more bears in the BBV, but are concerned that there will be increased bear activity in communities.

There is virtual agreement that decision making is politicized (P33), and all factors have scores of > 0 for this statement. However, none of the factors believe that the policy-making has been hijacked by those whose views are short term (P34), or that decisions are made without consideration or compensation for livestock producers (P23). In addition there is general rejection of the claim that excessive funding and resources have gone into bear management (P30). Participants reject the claim that human activities have been unnecessarily sacrificed for bear protection (P24), suggesting support that human use sacrifices have been necessary for bears. Finally, there is general agreement that challenges in management tend to be overemphasized and achievements are not adequately celebrated, and three factors have scores of $\geq +2$ for this statement (P36).

5.3 Solutions factors

5.3.1 Solutions factor A (bear conservation advocates)

Participants that are pure representations of factor A are mostly identified environmentalists, wildlife biologists, and agency managers. This group includes: four ENGO employees, four affiliates of provincial (Alberta or B.C.) agencies, two affiliates of Parks Canada, one affiliate with the Year of the Great Bear, one with Arc Wildlife Services, one with the University of Calgary, one affiliate of the tourism sector, and one

who chose to be anonymous. An individual affiliated with a commercial business was also significantly associated with this factor.

5.3.1.1 Narrative of factor A

Factor A recommends prioritizing ecological integrity and giving bears stronger protection in Alberta, limiting human use and development, and improving collaboration between agencies and other interests (Table 5.9).

Table 5.9 Statements characterizing factor A

Statements that significantly ($p < 0.01$) differentiate a factor narrative from all others are identified by an "*."

Statement	Factor Score		
	A	B	C
Statements supported by factor A			
S15. Develop a more formal process between Parks Canada and the provincial agencies for managing bears by developing a multiagency group to deal with grizzly bear management that has some power to influence decisions.	**+4**	+4	-4
S21. We need a more concerted management effort between the province, Parks Canada, industry, and people who do things on the land.	**+4**	+4	-2
S25. Design human use around ecological constraints.	**+4**	+1	+3
S20. Parks Canada must take a stronger stance towards prioritizing ecological integrity in Banff National Park.	**+3***	-3	0
S14. Restrict human use in the Park, create areas where bears can live on the landscape and meet their year round needs.	**+3***	-4	-2
S4. Make bears a higher priority in provincial management. In Alberta, create bold, legally accountable legislation that makes government manage for the needs of grizzly bears.	**+3***	-2	-1
S3. Limit growth on provincial lands adjacent to the Park.	**+2***	-3	0
Statements rejected by factor A			
S1. Restricting human use doesn't have to be the answer. Human use has already been restricted in the areas most important for grizzly bears and we don't need more restrictions.	**-4***	+3	-3
S5. Use less invasive research on grizzly bears and strictly monitor the population. Research is not a mandate for National Parks, and parks are not a lab.	**-4***	0	+1
S9. When management closes one area of the Park for grizzly bear management, they have to open another area for recreational opportunity.	**-4***	-1	+4
S7. National Parks are not game preserves, they should be managed for people to come here to see and learn things.	**-3***	0	-2

Statement	Factor Score		
	A	B	C
S13. Keep collaring and drugging bears to a minimum because these techniques completely change a bear's behaviour and then you're no longer studying wild bears. This is the bear's National Park too.	**-3***	-1	+2
S16. We need to keep in mind the historical context for ecological integrity. People think that Banff National Park is Eden, but in fact Banff history was for tourism.	**-3***	-1	+1
S23. Find ways so that humans and grizzly bears can co-habitate in the same ecosystem by minimizing bear habituation. Our biggest mistake in management has been to designate separate spaces for bears and humans.	**-2***	0	0
Statements ranked neutral			
S22. We need to change our value system and value other things besides profit if we want bears on the landscape. We are compromising our long term well-being for short term material gains of wealth and power.	**+1***	-4	-3
S24. Managers should say outright that the function of a National Park is a conservation function. Someone needs to say no to the next round of development expansion.	**+1***	-4	-4
S18. Focus on monitoring trends of the grizzly bear population in scientific research, and finding less intrusive ways to do so.	**-1**	+2	+2

Ecological integrity

Factor A believes that grizzly bears, ecological integrity and conservation should be given higher priority in management. Thus, factor A strongly recommends that ecological integrity be given greater priority in BNP (S20) and that grizzly bears be given higher priority in Alberta provincial management (S4). Although factor A did not assign a high ranking to the statement that conservation be given a higher priority in parks management (S24), its positive ranking of this statement is significantly different than the other factors ($p < 0.01$). Conversely, factor A opposes the idea that BNP management should prioritize human uses (S7, S16).

Human use and development

Given factor A's opinions about the priority of ecological integrity and conservation, it is not surprising that this group supports constraints on human use and development throughout the BBV. Factor A supports restricting human use, designing

use around ecological constraints, creating areas for bears (which may need to be separate from humans), and reducing recreational opportunities if necessary for bear management (S1, S25, S14, S23, S9). To a lesser extent, this factor supports limits on growth and development inside and outside of BNP (S3, S24).

Collaboration in management

Factor A sees an opportunity for increased coordination in management. This narrative recommends a joint management effort involving Parks Canada, the provinces, industries, and land users (S21), and the creation of a multi-agency management group, comprised of Parks Canada and provincial agencies (S15).

Grizzly bear research

Factor A does not agree that bear research techniques need to be changed. This group strongly disagrees with the claim that research is not a mandate for national parks and that less invasive research is needed (S5), and does not appear to object to research on bears involving radio-collaring and drugging (S13). Factor A is relatively neutral about the recommendation of finding less intrusive ways to monitor the population, whereas factors B and C support this idea (S18).

Values

Factor A accepts the suggestion that we must change our value system to keep bears on the landscape (S22). Although factor A's support for this suggestion is weak, its ranking of the statement is significantly different from factors B and C.

5.3.2 Solutions factor B (process reformers)

Participants that are pure representations of factor B include two individuals affiliated with industry (oil and gas, and ranching), two with commercial businesses, two with Parks Canada, one community resident, and one who chose to be anonymous. Another affiliate of a commercial business was also significantly associated with this factor.

5.3.2.1 Narrative of factor B

Factor B supports changing decision-making processes and using science to guide bear management. This group differs fundamentally from factor A in its beliefs on conservation and human use, but agrees with factor A on improving collaboration. Statements associated with factor B are shown in Table 5.10.

Table 5.10 Statements characterizing factor B

Statements that significantly ($p < 0.01$) differentiate a factor narrative from all others are identified by an "*."

Statement	Factor Score		
	A	B	C
Statements supported by factor B			
S10. Create bear habitat in wilderness areas in the backcountry, outside of communities and development areas, to keep bears and people separate.	-1	**+4**	+3
S15. Develop a more formal process between Parks Canada and the provincial agencies for managing bears by developing a multiagency group to deal with grizzly bear management that has some power to influence decisions.	+4	**+4**	-4
S21. We need a more concerted management effort between the province, Parks Canada, industry, and people who do things on the land.	+4	**+4**	-2
S1. Restricting human use doesn't have to be the answer. Human use has already been restricted in the areas most important for grizzly bears and we don't need more restrictions.	-4	**+3***	-3
S30. Find a more effective way of including interests, not just those who are loud, but where prudence and understanding drive the logic and argument, not just passion.	0	**+3**	+2
S6. Use science more to guide policy decisions.	+2	**+3**	-1
S2. Tighten the integration of scientific management and research. Management actions should be directly coupled to the outcomes of research.	0	**+2***	-4
Statements rejected by factor B			
S14. Restrict human use in the Park, create areas where bears can live on the landscape and meet their year round needs.	+3*	**-4**	-2
S22. We need to change our value system and value other things besides profit if we want bears on the landscape. We are compromising our long term well-being for short term material gains of wealth and power.	+1	**-4**	-3
S24. Managers should say outright that the function of a National Park is a conservation function. Someone needs to say no to the next round of development expansion.	+1	**-4***	-4
S3. Limit growth on provincial lands adjacent to the Park.	+2	**-3***	0
S20. Parks Canada must take a stronger stance towards prioritizing ecological integrity in Banff National Park.	+3	**-3***	0
S29. Adjust values and attitudes so that people value a live bear so highly that they wouldn't cause the circumstances of that bear's death.	-1	**-3***	-1
S11. Develop specific objectives for each habitat area. Figure out how many bear deaths can be tolerated in each area (demographic target), and how much habitat change is acceptable.	+1	**-2***	+3

Decision-making processes

Factor B emphasizes the need for improved decision-making processes. This group also advocates a process that more effectively includes interests and encourages reasoned argument (S30). Factor B places higher emphasis than the other factors on the use of science to guide or direct policy and management (S6, S2). This narrative shares

beliefs with factor A about the need for greater coordination and collaboration in grizzly bear management (S15, S21)

Conservation and human use

Factor B differs fundamentally from factor A in its beliefs about the priority of conservation and ecological integrity in management, and about solutions that involve restrictions on human use and development. Factor B disagrees that human use should be restricted further in BNP, in part because it believes that human use has already been restricted in the areas most important for bears (S14, S1). Similarly, those on factor B perceive that ecological integrity and conservation need not be given higher priority in BNP (S20, S24). The opposition to restrictions on human use extends to provincial lands (S3).

Values

Factor B disagrees with proposals to change values and attitudes. This group does not believe that society's value system overemphasizes short term wealth and power at the expense of bears or human well-being (S22). To a lesser extent, factor B does not support the strategy of trying to adjust attitudes towards valuing live bears (S29), although this perception is not significantly different from the views of factors A and C.

Habitat management

Although factor B would like to see bears separated from human development, and strongly supports creating bear habitat in the backcountry as a strategy to accomplish this (S10), it disagrees with the idea of establishing specific limits on bear deaths and habitat change for each habitat area (S11).

5.3.3 Solutions factor C (habitat modifiers)

Three participants are pure representations of factor C: one affiliated with commercial business, and two anonymous participants.

5.3.3.1 Narrative of factor C

Factor C recommends solutions that call for managing bear habitat to keep humans and bears separate on the landscape. Factor C shares some of the reservations of factor B about prioritizing conservation or limiting human use and development, however factor C believes that certain restrictions to human use are necessary to protect bears. This narrative strongly disagrees that multi-party collaboration is the solution or that science should be used more to direct management. Solutions associated with factor C are listed in Table 5.11.

Table 5.11 Statements characterizing factor C

Statements that significantly ($p < 0.01$) differentiate a factor narrative from all others are identified by an "*."

Statement	Factor Score		
	A	B	C
Statements supported by factor C			
S9. When management closes one area of the Park for grizzly bear management, they have to open another area for recreational opportunity.	-4	-1	**+4***
S10. Create bear habitat in wilderness areas in the backcountry, outside of communities and development areas, to keep bears and people separate.	-1	+4	**+3**
S11. Develop specific objectives for each habitat area. Figure out how many bear deaths can be tolerated in each area (demographic target), and how much habitat change is acceptable.	+1	-2	**+3**
S12. Build an appreciation for grizzly bears among recreational users. The issue of management comes down to managing people.	+2	+1	**+3**
S25. Design human use around ecological constraints.	+4	+1	**+3**
S28. Change the configuration of habitat to reduce the potential for conflict between humans and bears, such as getting rid of high quality bear habitat near human development.	-2	-2	**+3***
S13. Keep collaring and drugging bears to a minimum because these techniques completely change a bear's behaviour and then you're no longer studying wild bears. This is the bear's National Park too.	-3	-1	**+2***
Statements rejected by factor C			
S2. Tighten the integration of scientific management and research. Management actions should be directly coupled to the outcomes of research.	0	+2	**-4***
S15. Develop a more formal process between Parks Canada and the provincial agencies for managing bears by developing a multiagency group to deal with grizzly bear management that has some power to influence decisions.	+4	+4	**-4***
S24. Managers should say outright that the function of a National Park is a conservation function. Someone needs to say no to the next round of development expansion.	+1	-4	**-4***
S1. Restricting human use doesn't have to be the answer. Human use has already been restricted in the areas most important for grizzly bears and we don't need more restrictions.	-4	+3	**-3***
S22. We need to change our value system and value other things besides profit if we want bears on the landscape. We are compromising our long term well-being for short term material gains of wealth and power.	+1	-4	**-3***
S26. Increase habitat in the Park for bears so that less bears move onto the plains and come into conflict with agricultural operations.	-2	-1	**-3**
S14. Restrict human use in the Park, create areas where bears can live on the landscape and meet their year round needs.	+3	-4	**-2**
S21. We need a more concerted management effort between the province, Parks Canada, industry, and people who do things on the land.	+4	+4	**-2***
Statements ranked neutral			
S3. Limit growth on provincial lands adjacent to the Park.	+2	-3	**0***
S20. Parks Canada must take a stronger stance towards prioritizing ecological integrity in Banff National Park.	+3	-3	**0***
S6. Use science more to guide policy decisions.	+2	+3	**-1***

Habitat management

Factor C emphasizes actively managing bear habitat to keep bears and human uses apart. This group strongly supports reducing bear habitat near human development and increasing bear habitat in the backcountry (S28, S10). Both of these strategies are aimed at keeping bears and people separate on the landscape, and potentially reducing conflicts between bears and people. However, factor C strongly disagrees with increasing bear habitat in BNP for the purpose of reducing bear activity on agriculture lands outside the park (S26). Factor C also agrees with developing specific targets for each habitat area with respect to acceptable limits of bear deaths and habitat change (S11). Finally, this group recommends that recreation areas be more proactively managed, such that when one area of BNP needs to be closed for bear protection, another area is opened for recreational use (S9).

Conservation and human use

Although factor C does not believe that the primary function of a national park is conservation (S24) nor agree with further restricting human use to create areas for bears (S14), this group differs from factor B in acknowledging that human use does need to be restricted in some ways (S1). Moreover, factor C recommends that human activities be designed around ecological constraints (S25). One of factor C's solutions to human use management is to open new recreational areas to compensate for the loss of areas closed for bear protection, such that there is a no net loss of recreational opportunity. Factor C is significantly different from factor B in that while factor B strongly disagrees with prioritizing ecological integrity in the park (S20) and limiting development on provincial lands (S3), factor C is more neutral about these ideas.

Grizzly bear research

Factor C is not in favour of using science to further guide or direct policy and management (S2, S6), and supports less intrusive research (such as minimal collaring and drugging of bears in research) (S13). Although Factor C does not strongly oppose statement S6, the statement is significantly different from Factors A and B which both accept the idea.

Collaboration in management

Factor C does not agree with Factors A or B that greater coordination and collaboration between agencies and other interests is a priority for grizzly bear management, and rejects the idea of developing a multi-agency management team (S15, S21).

Values

Factor C strongly supports increasing appreciation for bears among recreational users, because managing bears is about managing people (S12). However, this group does not go so far as to suggest that value systems need to change (S22).

5.3.4 Virtual consensus

Analysis of overlapping beliefs among the three solutions factors revealed 6 statements of virtual consensus about solutions. Statements of virtual consensus were defined by the same criterion as used for the problems statements, and are shown in Table 5.12.

Table 5.12 Solutions factors statements of virtual consensus

Statement	Factor Score		
	A	B	C
S7. National Parks are not game preserves, they should be managed for people to come here to see and learn things.	-3	0	-2
S12. Build an appreciation for grizzly bears among recreational users. The issue of management comes down to managing people.	+2	+1	+3
S25. Design human use around ecological constraints.	+4	+1	+3
S26. Increase habitat in the Park for bears so that less bears move onto the plains and come into conflict with agricultural operations.	-2	-1	-3
S29. Adjust values and attitudes so that people value a live bear so highly that they wouldn't cause the circumstances of that bear's death.	-1	-3	-1
S30. Find a more effective way of including interests, not just those who are loud, but where prudence and understanding drive the logic and argument, not just passion.	0	+3	+2

There is shared support for finding a more effective way of including interests and encouraging reasoned argument in decision-making (S30). Factors B and C both support this alternative, whereas factor A is neutral.

There is also consensus that human use should be designed around ecological constraints (S25) and factors A and C strongly support this strategy. BNP should be managed for more than visitor enjoyment, and, to some extent, should be administered as a game preserve (S7). These statements suggest that respondents generally accept that ecological constraints are important and that BNP should be managed for both human use and ecological processes.

There is no support for increasing bear habitat in the park for the purpose of keeping bears separate from agricultural operations adjacent to the park (S26), and this statement is strongly rejected by two factors. There is also no support for trying to change people's values so that they value live bears so highly that they won't cause bear deaths. (S29). However, there is consensus about building an appreciation for bears among recreational users, and agreement that managing bears requires managing people (S12).

CHAPTER 6: DISCUSSION

6.1 Problem orientation

6.1.1 Relationship between problems and solutions factors

As would be expected from previous empirical research and theory (Clark et al., 1996; Dery, 1984), there is a direct link between the ways in which participants in the Banff-Bow Valley define the problems with grizzly bear management and the solutions that they prefer. Problem orientation requires examining goals, trends, conditions, projections, and alternatives in problem solving. In the Q-study, I conducted separate "problems" and "solutions" Q sorts. The problems Q sort contained statements about trends, conditions, and projections, while the solutions Q statements identified alternatives. Goal statements were found in both sorts. Although I mapped problems and solutions factors separately, I found a clear relationship between people's views on the problems and the solutions they recommend.

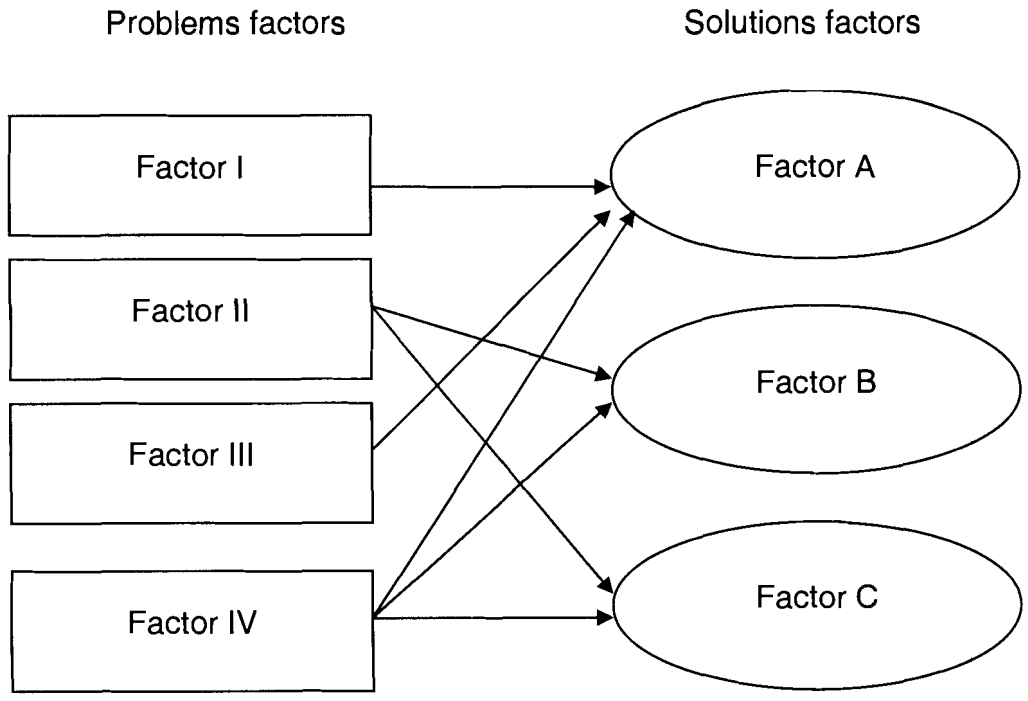
Generally, participants associated with problems factors I and III tend to favour solutions factor A (13 of the 18 individuals significantly associated with either factor I or factor III are also significantly associated with factor A). Factors I and III are strongly positively correlated (0.57). Given the strong relationship between these problems factors, it is not surprising that most of the participants associated with these factors have a shared perception on solutions.

Participants associated with problems factor II tend to align with solutions factors B or C (4 of the 7 individuals significantly associated with problems factor II are significantly associated with solutions factor B, 2 are significantly associated with solutions factor C, and 1 is not significantly associated with any solutions factor). Solutions factors B and C are positively correlated (0.24) which may explain why many participants associated with them are associated with a common problems factor.

Participants associated with problems factor IV diverge in the solutions they favour (6 participants significantly associated with problems factor IV; 1 of these participants favours solutions factor A, 2 prefer factor B, 1 is associated with both A and B, 1 aligns with factor C, and 1 is not associated with a solutions factor). This may be explained by the fact that factor IV shares some beliefs about problems with factor I and some with factor II, although factors I and II have virtually opposite perspectives on the problems. Given their hybrid perception of the problems, participants on factor IV diverge in their beliefs about strategies.

These general connections between problems and solutions factors are displayed in Figure 6.1.

Figure 6.1 General relationship between problems factors and solutions factors



6.1.2 Mapping problem definition

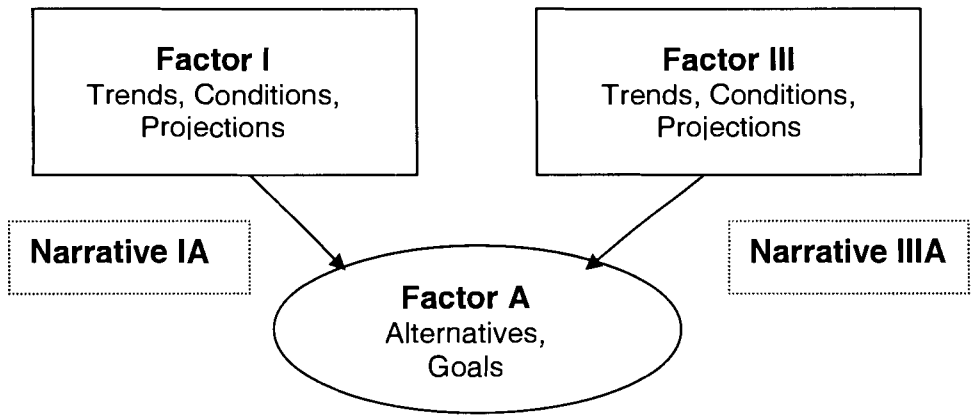
In order to get a more complete understanding of these relationships between perceived problems and preferred solutions for grizzly bear management in the Banff-Bow Valley, I examined the full narrative about problem definition represented by each linked problem/solution factor pair shown in Figure 6.1. There are 5 main narratives on problem definition evident: 1) problems factor I and solutions factor A (narrative IA); 2) problems factor III and solutions factor A (narrative IIIA); 3) problems factor II and solutions factor B (narrative IIB); 4) problems factor II and solutions factor C (narrative IIC); and 5) problems factor IV (narrative IV). Problems factors contain statements about trends, conditions and projections, while solutions factors contain statements about alternatives. There were few explicit goal statements in the Q samples, but some goals are found in both the problems and solutions views.

Given the overlap between narratives IA and IIIA, I describe these problem definitions together and highlight the similarities and differences between them. I describe the problem definitions for IIB and IIC in the section that follows, and conclude with a description of narrative IV.

6.1.2.1 Problem definition of narratives IA and IIIA

Narratives IA and IIIA share beliefs about goals and alternatives for bear management, but have differing perceptions of trends, conditions and projections. The connections between IA and IIIA are demonstrated in Figure 6.2.

Figure 6.2 Map of problem definition narrative IA and IIIA



Goals

Factors IA and IIIA emphasize the goals of ecological integrity (S20), and to a lesser extent, conservation (S7, S24) in national parks management. These narratives disagree with claims that the prime function of national parks is for human use (S7, S16).

Trends

Narratives IA and IIIA have shared perceptions of the trends with grizzly bear management in the BBV. Both see the population status in the BBV as problematic – IA disagrees the status is acceptable (P26) while IIIA perceives it as vulnerable (P4). These groups are also concerned with the status of regional populations of bears (P21). View IA further sees a trend of increasing and unrelenting human pressure in the BBV, while IIIA does not identify this as an important trend (P8).

Conditions

Narratives IA and IIIA identify some common conditions that contribute to the trend of the population status of bears in the BBV. First, these groups believe that human use management has been problematic. IA believes that human use management has been unsuccessful in protecting bears (P6, P12) while IIIA believes that increased human use has led to greater bear mortality rates (P13). Second, these groups believe that the habitat in the BBV has important linkages and connections for regional bear populations, which may explain why the groups are concerned with the population status of bears in the regional context (P16).

Narratives IA and IIIA differ in their beliefs about other conditions. IA believes that goals, conservation strategies, and criteria for success in management are deficient and that management is reactive and not science-based (P2, P19, P29). In their view, this lack of directive may contribute to the problematic population status of bears. IA also believes that the BBV has a finite biophysical capacity to support human pressure, which makes the trend of increased human activity in the region more problematic (P8).

Narrative IIIA emphasizes problems with institutional arrangements for bear management – disjointed management between agencies (P7), and inadequate funding (P3) – as conditions which may contribute to the population status of bears.

Interestingly, IA and IIIA both support the claim that management is fragmented by jurisdiction and that there are no system-wide objectives for managing bears throughout the BBV (P18). This statement contributes to the narratives of deficient goals for bear management (IA) and inadequate institutional arrangements (IIIA)

Projections

Narratives IA and IIIA share projections that the population status will deteriorate as the population is not sustainable in the long term (P15). IA and IIIA also believe that if habitat is lost in the BBV, the regional population beyond the BBV will also be in jeopardy (P16). These claims demonstrate a perception that current trends are moving away from the goals of ecological integrity and conservation.

Narratives IA and IIIA have different projections about bear activity in the park in the future. IIIA strongly disagrees that the park is on a trend to having too many bears, which suggests that this group believes the park could support more bears in the future (P20, P25). IA highlights that bear activity in the region in the future may be problematic, as this narrative projects that there will be increased bear intrusions in communities (P14).

Alternatives

Narratives IA and IIIA both recommend limiting human use and development and prioritizing ecological integrity and conservation throughout the BBV (S20, S3, S4, S1,

S14). Given IA and IIIA's shared concerns about what they perceive as a problematic trend of the bear population, and about the condition of deficient human use management, it follows that these groups both recommend stronger conservation practices in the area.

IA and IIIA would like to see increased collaboration between Parks Canada, provincial agencies and other interests (S15, S21). This strategy may be to address the condition that IA perceives of deficient goals, and the condition that IIIA perceives of an uncoordinated management effort between agencies. These narratives are summarized in Figure 6.3.

Figure 6.3 Summary of problem definition narratives IA and IIIA

Problem definition	Narrative I
Trends	• Bear population status not acceptable • Increased human use
Conditions	• Deficient goals/plans • Inadequate human use management
Projections	• Population not sustainable • Increased bear-human conflict

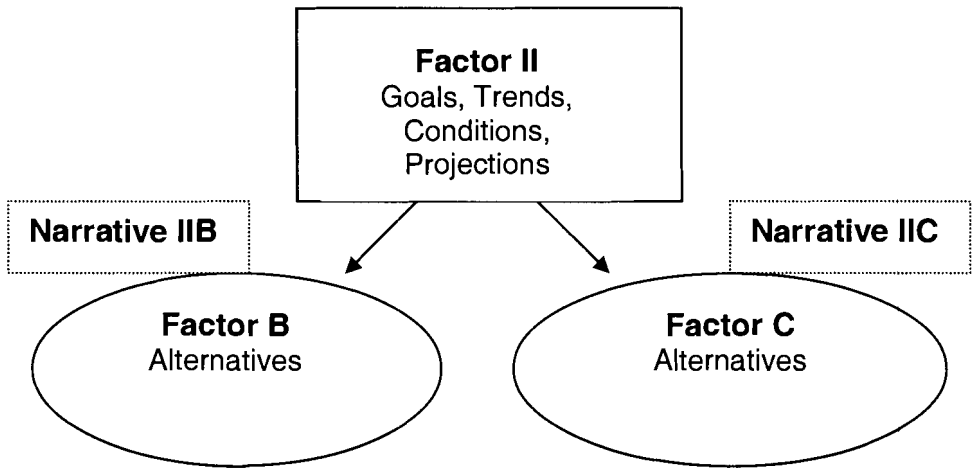
Problem definition	Narrative III
Trends	• Bear population vulnerable
Conditions	• Deficient institutions • Inadequate human use management
Projections	• Population not sustainable • Park could support more bears

Problem definition	Narrative A
Alternatives	• Prioritize ecological integrity • Limit human use and development • Improve collaboration between agencies and interest groups

6.1.2.2 Problem definition of narratives IIB and IIC

Narratives IIB and IIC share beliefs about goals, trends, conditions, and projections for bear management, but differ in some of their preferred alternatives to alleviate these problems. The relationship between narratives IIB and IIC is shown in Figure 6.4.

Figure 6.4 Map of problem definition narratives IIB and IIC



Goals

IIB and IIC believe that the goal of national parks should be to have the right amount of bears for the park and Parks Canada should not manage bears as a source to increase the regional populations (P28). IIB and IIC strongly disagree that the solution to bear management problems is to prioritize conservation as the goal of national parks (S24).

Trends

Narratives IIB and IIC strongly believe that the grizzly bear population status of the BBV is healthy (P5). These groups highlight that successes and achievements aren't

recognized in management (P10, P36) while problems tend to be overemphasized by interest groups with other objectives (P1). Bears are managed as endangered species in the BBV when they are in fact healthy (P37).

Conditions

IIB and IIC believe that human use management has been successful, which may be a factor leading to what they perceive as a healthy grizzly bear population (P6, P12). These groups strongly disagree with many of the conditions emphasized by IA and IIIA (deficient goals, disjointed management, problematic human use management).

Projections

Narratives IIB and IIC agree that there is a trend toward having too many bears in the area, which may lead to more conflicts between bears and people (P25). This projection seems to be moving away from their goal of having the right amount of bears in the park.

Alternatives

Narratives IIB and IIC are similar in that they both reject solutions that propose limiting human use and development in the BBV, or giving conservation or ecological integrity further priority in management (S20, S24). Given their perception that the bear population is doing well, and that human use management has been successful, it follows that IIB and IIC do not believe that there is a need to restrict human use (S14, S3). Narratives IIB and IIC are different in that while IIB believes that human use has already been restricted in the areas most important for bears and that further restrictions to human use are unnecessary (S1), IIC is more willing to acknowledge that restrictions in some

areas may be necessary and recommends opening new areas for human use if an area needs to be closed for grizzly bear conservation (S1, S9).

Narratives IIB and IIC's largest concern with bear management seems to be that problems with management have been overstated, in part by interest groups with other objectives. Given this concern, it follows that IIB and IIC support the strategy of developing decision-making processes that more effectively include interests, where prudence and understanding drive decision-making (S30).

Narratives IIB and IIC have certain fundamental differences on alternatives. IIB emphasizes changes to the decision-making process, and in particular would like to see a greater coordinated management effort between agencies and other interests (S15, S21). This solution could be to address IIB's perception that certain interest groups are overemphasizing problems with bear management, and their desire to see a management approach that coordinates the interests of various stakeholders.

While narrative IIB focuses on the decision-making level, IIC emphasizes on-the-ground strategies of actively managing bear habitat to keep bears and people separate (S9, S28, S11, S10). This strategy could be to address IIC's perception that the bear population status is healthy and is on a trend to having too many bears in the area, which may lead to conflicts between bears and people.

Science

Narrative IIB strongly supports using science to guide policy and management while IIC fundamentally opposes this concept (S2, S6). The strong belief of IIB in science is noteworthy. Mattson et al. (in press) found that of all the factors in their study,

the "carnivore advocates," the group most concerned about the status of large carnivore populations, most strongly endorsed science. The authors speculate that the carnivore advocates supported science because they fuse scientific results with value and policy preferences. I speculate that IIB also supports science because it reinforces their policy preferences. Given the Eastern Slopes Grizzly Bear Project findings that the bear population is exhibiting marginal growth (Garshelis et al., 2005a), IIB may feel that the science justifies its belief that management has been successful. Further, the science may reinforce IIB's belief that conservation and ecological integrity need not be given greater priority in parks management, given that the population is growing (albeit marginally).

Interestingly, statements that recommend using science to guide management (S2, S6) are seen as neutral by narratives IA and IIIA. Narratives IA and IIIA don't reject using science, but compared with alternatives such as prioritizing ecological integrity and coordinating management efforts, statements about using science are less important. These narratives may believe that prioritizing conservation and coordinating management efforts would in fact be implementing the science-based recommendations from the ESGBP.

IIC's rejection of science is notable as well. This narrative feels that there have been enough scientific studies on bears, and disagrees that science should guide management. Their perception that the population is healthy would support the belief that more science, especially intrusive scientific practices, is unwarranted. It appears that science is being used by these different groups to reinforce their values (see Kellert et al., 1996).

The problem definitions of IIB and IIC are summarized in Figure 6.5.

Figure 6.5 Summary of problem definitions narratives IIB and IIC

Problem definition	Narrative II
Goals	• Maintain right amount of bears for park • Conservation is not the only goal of national parks
Trends	• Grizzly bear population healthy • Problems overemphasized
Conditions	• Successful human use management • Successful bear management
Projections	• Too many bears in area

Problem definition	Narrative B
Alternatives	• Rejects prioritizing conservation and limiting human use • Effectively include interests • Improve collaboration • Use science to guide policy

Problem definition	Narrative C
Alternatives	• Rejects prioritizing conservation and limiting human use • Effectively include interests • Actively manage habitat • Change science practices

6.1.2.3 Problem definition of narrative IV

As participants associated with problems factor IV diverge in the solutions they recommend, only the goals, trends, conditions, and projections identified in factor IV are described in the summary of this narrative's problem definition; alternatives are not reviewed (see chapter 5 for a detailed review of the range of solutions preferred by those who loaded on factor IV).

Goals

Narrative IV agrees with IIB and IIC in strongly believing that the park should be managed to have the right number of bears for the park itself, and should not be managed as a source to increase the regional bear population (P22, P28).

Trends

Narrative IV also agrees with narratives IIB and IIC that the population status of bears is acceptable (P26) and that there is a false crises mentality pushed by interest groups with other objectives (P1). Similar to narrative IA, however, IV perceives a trend of increased human pressure in the BBV (P8).

Conditions

Narrative IV identifies several factors that contribute to the population being acceptable, but problems being overemphasized. These include: politicized management (P33) and management that is not science-based (P27, P29). Similar to IA, IV also believes there is a lack of a plan that outlines when success is achieved in management (P19). This condition of not having clear criteria for determining success in management may contribute to problems being overemphasized. Given this group's support for the goal of having the right amount of bears in the park, it follows that this group would emphasize having criteria for measuring when a healthy population is reached. Another condition which may have contributed to IV's view of a successful bear population status is adequate funding levels (P3, P30).

Although narrative IV identifies a trend of increased human pressure (P8), this group does not believe that inadequate human use management has contributed to this trend or is a problem (P17, P31, P35).

Projections

Narrative IV believes that there will be increased problems with bear activity in communities in the future, similar to narrative IA (P14). This projection may be due, in part, to this group's perception of increased human pressure in the BBV. The projection about increased bear activity appears to be a move away from IV's goal of having the right amount of bears for the park itself. The problem definition of narrative IV is summarized in Figure 6.6.

Figure 6.6 Summary of problem definition narrative IV

Problem definition	Narrative IV
Goals	• Maintain right amount of bears for park
Trends	• Grizzly bear population healthy • Problems overemphasized • Increased human pressure in BBV
Conditions	• Management is politicized • Management is not based on science • Deficient criteria for measuring success • Adequate funding
Projections	• Increased bear activity in communities

6.2 Limitations of study

Although the study provides considerable new insight into narratives about grizzly bear management in the BBV, there are several limitations to this type of research.

First, the findings of Q method studies cannot necessarily be generalized to a broader population; the factors uncovered in Q are specific to the group of participants that sorted the statements. As this study selected a group of participants that represented the diversity of interests in the grizzly bear policy process in the BBV, however, the factors may very well represent the dominant views held within the BBV on grizzly bear management. Even so, the study does not show how these views are distributed in the larger population of the BBV. Also, the factors of this study may not represent the views held about grizzly bears in Alberta or in Canada; the factors are specific to participants in the BBV.

The second consideration is that the 29 participants (the P set) of the study were assumed to represent the most significant participants in the BBV grizzly bear policy process. Although there are other participants involved with the policy process, their interests were assumed to be represented by participants in the study. For example, there are other ENGO, tourism, and industry interests (e.g. forestry), federal and provincial agency staff, and scientists involved in the policy process who were not included in the study.

Interests that were missing from the study included local government (municipalities of Banff and Canmore), First Nations, and hunters. I assumed that local

government interests would be represented by agency participants. However, the Q sorting revealed heterogeneous interests among participants from federal and provincial agencies, and the local government voice may be unrepresented. I was unable to include First Nations due to the current government to government negotiations between Parks Canada and First Nations groups in the region. However, as hunting under First Nations treaty agreements is a large source of bear mortality outside of BNP in the BBV (Gibeau, 2005a), this interest is important in the bear policy process. Further, many Aboriginal cultures have had longstanding spiritual relationships with the grizzly bear, and have a different worldview than Europeans about their relationship with the natural world. Another arguably "missing" interest is non-First Nations hunting. Although hunting is not permitted in the BBV and is not a strong interest in the BBV grizzly bear policy process, hunting is a strong interest in the province of Alberta. I suspect this interest would express utilitarian (exploitation of grizzly bear) or dominionistic (support for mastery and control of the bear) views. Kellert (1985b) found that hunters expressed strong utilitarian and dominionistic views towards wolves, but also expressed strong interest in outdoor recreational contact with wolves.

The third limitation of this study is that a possible bias may be introduced in developing the population of statements by taking participants' own communications gathered from interviews. Interviews were not transcribed in entirety; instead, I tape-recorded interviews and later transcribed statements. In this process, I attempted to closely represent the language and wording of the original statement. The drawback to this technique is that Q sample statements may have actually misrepresented the intended meaning of the statement. If the transcribed statements were to be attributed to individual

participants in this research, then these statements could have been reviewed by the participants before their use in the study to confirm that the statement matched the meaning that the participant intended. However, as statements drawn from the interviews were to be later Q sorted by the same group of participants, this technique was not possible as it would have biased the Q sorting. Although the transcribed statements may misrepresent the intended meaning of the statement, it is the meaning attributed to the statements by the sorters that matters, not the meaning intended by the maker of the statement.

The post Q-study workshop was designed to explore whether the factors revealed in the Q study represented participants' viewpoints. The discussion among participants at this workshop revealed that participants felt that the factors represented their perspectives. Although limits to the study exist in drawing Q sample statements from interviews, the fact that participants generally felt that the factors represented their views supports the study results and interpretation.

6.3 Implications of research

This research identifies perspectives of participants in the BBV on the problems and solutions with bear management, and the various problem definition narratives of these participants. Although there is considerable known biological information regarding the bear population in the BBV, the study demonstrates that participants perceive the problems with grizzly bears, and appropriate management responses to these problems, differently. The study has several implications for grizzly bear management in the BBV.

First, the belief systems identified in this study can provide policy-makers and other participants in the BBV with a better understanding of how participants in the BBV define the problem with grizzly bear management. This information can be used in the intelligence stage of the decision process to develop problem-solving strategies (policies) that are in the common interest. A number of solutions statements of virtual consensus were identified that were supported, to some degree, by all of the factors. These options are ones that management may consider pursuing, as they are likely to be supported by participants in the BBV.

Second, the study could be used in the appraisal stage of the decision process for policy-makers and participants to evaluate current aspects of management. For example, participants agree that management has been largely successful but that achievements in management aren't adequately recognized (P36). Also, there is a common belief that decision-making is politicized (P33) and support for decision processes that effectively include interests (S30). These statements of common ground offer an evaluation of the current decision process and could assist policy-makers in modifying the ways in which bear management decisions are made.

Third, this research has the potential to reduce future conflict over bear management in the region. The statements of virtual consensus demonstrate areas where participants have a generally common understanding of the problems and solutions. These statements show participants areas where there is a common understanding among viewpoints, and may provide a starting point for participants to engage in dialogue about this common ground.

The research also identifies statements that are contentious in that they were strongly supported by one factor and strongly rejected by another. The purpose of identifying these areas of disagreement is not to suggest that these groups draw back from promoting their preferred strategy for management, but instead for participants to recognize the potential for conflict over these strategies. This research provides an opportunity for participants and policy-makers to recognize ideas that are particularly controversial and to perhaps work with other groups to manage conflict over strategies that are not widely supported.

Another implication for future conflict is that the results provide participants with insight into their own viewpoint and the viewpoints of other participants in the policy process. This knowledge may give participants an understanding of the problem definition that is driving the preferred solutions of other constituents. This information may assist interest groups that have conflicting perspectives in discussing their goals and perception of the problem instead of arguing about best solutions. This may lead to groups reaching a mutual understanding of the problems and developing creative solutions to address these problems.

Clark et al. (1996) argue that developing policies in the common interest requires understanding participants' definitions of the problem and reaching a shared problem definition among participants. This research demonstrates that multiple definitions of the problems with grizzly bear management exist. The results show some competing narratives about problem definition, and highlight some common ground between narratives, but do not develop a shared understanding of the problem among participants. Several authors have recommended developing a shared problem definition for large

carnivore policies at the local level through localized participatory strategies (McLaughlin, Primm & Rutherford, 2005; Primm & Murray, 2005). A localized participatory strategy may be an option in the BBV for reducing conflict among participants and for improving grizzly bear decision processes. The following section reviews the literature on participatory strategies for large carnivore management, and explores the potential of this option for the BBV.

6.4 Participatory strategies for grizzly bear management

Developing localized participatory decision processes has been recommended as a policy option for large carnivore management (McLaughlin et al., 2005; Primm & Murray, 2005; Primm & Wilson, 2004; Nie, 2002). Participatory strategies involve "local participants working together on real, manageable, on-the-ground problems in which power and control are not such major issues and symbolic debate is minimized" (McLaughlin et al., 2005, p. 189).

Participatory strategies are an alternative to large-scale planning initiatives at broader (e.g. national or provincial) scales where carnivore conservation is highly politicized. Brunner, Colburn, Cromley, Klein, & Olson (2002, p. 29) write that at broader scales, "participants of all kinds are trapped to a considerable extent in a complex structure of governance that institutionalizes conflict more than it facilitates the integration or balance of different interests into consensus on policies that advance the common interest." In larger arenas, individuals are unlikely to have the time, motivation, or knowledge to address localized grizzly bear problems. Furthermore, regulatory top-

down approaches are more expensive to maintain than localized participatory strategies (Primm & Murray, 2005).

A number of benefits of participatory strategies have been identified. Successful projects can serve as models for subsequent projects in other areas. Feedback from concurrent projects can allow replication of successes and course corrections (Primm & Murray, 2005). Localized projects provide low-stake arenas to test innovative ideas, and provide learning opportunities for participants, including process and communication skills (McLaughlin et al., 2005).

Another argument is that participatory programs are more likely to have public support than programs without local input. Many solutions for coexistence with grizzly bears will require the initiatives of participants who live and work in bear habitat, and implementing these practices will depend on voluntary compliance. Agreement with management practices is more likely if participants are involved with developing programs (Primm & Murray, 2005). Strong local support is also important for programs to be resilient in the face of political or financial change (Primm & Murray, 2005).

The practice of dialogue has been recommended for guiding participatory strategies and for moving from conflict to cooperation. Yankelovich (1999) describes dialogue as a specialized form of discussion that includes equality, listening with empathy, and clarifying assumptions. Yankelovich lists several benefits to skilful dialogue including: dissolving stereotypes, overcoming mistrust, achieving mutual understanding, discovering new common ground and new perspectives and insights, and

strengthening the bonds of the community. Dialogue is a process of successful relationship building.

McLaughlin et al. (2005) suggest an overall strategy for participatory processes. The authors see processes moving from "engagement," which focuses on building trust and relationships among participants, to "collaboration," which emphasizes consensus-building, to "formalization," in which the program is institutionalized. As participatory processes become more formalized, the organization eventually can become a formalized decision-making body.

A number of authors have recommended collaborative decision-making to resolve environmental conflicts. Collaborative planning uses a higher level of collaboration than participatory strategies, and directly delegates control of the planning process to stakeholders who work together in face-to-face negotiations to reach a consensus agreement. Advocates of collaborative decision-making cite a number of advantages to this approach over litigation or traditional planning approaches (Susskind, van der Wansem & Ciccareli, 2003; Day & Gunton, 2003; Gunton & Flynn, 1992). First, collaborative decision-making processes are more likely to reach a decision that is in the public interest because more alternatives are generated for consideration through the interaction of participants. Second, participants are more likely to generate creative solutions as they search for mutually acceptable compromises. Third, these processes tend to resolve environmental disputes more expeditiously than litigation or traditional planning because decisions are likely to be supported by stakeholders if they are involved in the process. Fourth, an outcome of collaborative planning processes is the creation of

social capital – the development of improved knowledge, skills, trust and relationships among participants.

Many authors recognize, however, that collaborative planning is not a panacea for resolving environmental disputes. Critics of collaborative planning point out some drawbacks to this approach which are summarized by Day and Gunton (2003) and Gunton and Flynn (1992). First, collaborative planning is focused on stakeholders being motivated to reach consensus; stronger stakeholders in the process could undermine reaching consensus if their best alternative to negotiated agreement (BATNA) is preferable to negotiation. Second, collaborative planning may not include all relevant interests in the process. Third, collaborative planning may encourage seeking the "lowest common denominator," or compromised alternatives, in order to reach consensus on what may not be the best solution. Fourth, collaborative planning may not be appropriate in situations where there are fundamental value differences, and where negotiation involves compromising these values. Moreover, Peterson, Peterson & Peterson (2005) argue that consensus-based approaches may not be appropriate for environmental decision-making because the attempt to find a solution that is in the interest of all groups tends to reinforce the status quo.

6.4.1 Participatory strategies in the Banff-Bow Valley

A localized participatory strategy may be an option for grizzly bear management in the BBV. In the post Q study workshop, we presented the preliminary factor analysis, received feedback on the study, and provided an opportunity for dialogue concerning peoples' perspectives and common ground. Many participants felt that the discussion and

focus on common ground was positive, and this provided a forum for participants to engage in dialogue.

This initial workshop set the stage for a series of three subsequent Interdisciplinary Problem Solving (IPS) workshops. These workshops involved participants from the Q method study, as well as other stakeholders in the region. In total, 18 individuals have participated in the IPS workshops, including 13 participants of the Q study.[6]

The IPS workshops are organized around the policy sciences framework, and have introduced the policy sciences as a means for problem-solving. Each workshop is organized around a different component of the policy sciences. The first workshop focused on standpoint clarification; on participants understanding their own value systems and beliefs, and the values and beliefs of other participants. The second and third workshops focused on problem orientation, social process mapping, and decision process mapping. Discussion has centred around developing a common understanding of goals, trends, conditions, projections and alternatives for social process, decision process, and bears and habitat issues in the BBV. The objective is to develop a common understanding of the problem definition, in terms of the social process, decision process and grizzly bear population and habitat issues in the BBV.

The IPS workshops emphasize engagement –building and continuing dialogue among participants, and building trust and relationships among participants. The IPS

[6] Four participants of the Q study stopped being involved with the policy process for bear management in the BBV in the time between the Q study and the IPS workshops. In two of these cases, another individual has taken over the former position of the Q study participant, and this individual is involved with the IPS workshops.

workshops include various organization, skills, and interventions (see McLaughlin et al., 2005). The organization of the workshops is largely informal and focused on problem-solving. Skills include technical support from a professional facilitator and two policy scientists. The policy scientists have provided an introduction to the policy sciences as a tool for problem-solving, and assist the participants in considering all aspects of the social and decision processes, problem orientation, and standpoint clarification in problem-solving. Prototyping, or interventions, have included a presentation and written report of the Q method study, which showcased local perspectives on the problems with and solutions for grizzly bear management.

The Q study revealed a common belief among participants that decision-making is politicized (P33), and shared support for developing decision-making processes that more effectively include interests (S30). The IPS workshops may develop a decision-making process that is more participatory and reduces the symbolic and politicized nature of grizzly bear management. The hope is that these workshops will lead to processes in the BBV that manage conflict and develop bear conservation policies that are in the common interest.

6.5 Areas of further research

6.5.1 Multiple methods

While Q methodology was used to uncover the viewpoints that existed about grizzly bear management in the BBV, this method did not demonstrate how these views are distributed in the broader population. A survey technique could be used to estimate

this (Brunner, 1982). Brunner (1982) argues that using a single method to solve a problem creates blind spots and therefore, "the use of multiple methods...can ameliorate the degree of blindness" (p. 130). The survey could be administered to a large sample of respondents in the BBV, and could reveal how broadly each of the factors is distributed in the population. The survey could also uncover how the factors are distributed among different social or demographic groups.

A small number of studies have used questionnaire approaches to measure how Q-sorted factors are distributed in the population; these studies have been reviewed by Brown (1999). In the development of the survey, statements that most strongly characterize each factor could be extracted, and respondents could rank the statements on a Likert-type scale. Another approach, taken by van Exel and de Graaf (2005), is to write up short summaries of each Q factor, and ask survey respondents to identify which factor most strongly characterizes them.

6.5.2 Changing views

A number of the Q study participants, as well as several other stakeholders in the community, are involved in the IPS workshops. As discussed, these workshops are aimed at engaging participants in dialogue and building greater consensus around grizzly bear management in the BBV. Yankelovich (1999) claims that dialogue can overcome mistrust, dissolve stereotypes, and achieve mutual understanding of a problem. A study could be done to document whether the Q study factors have changed as a result of the IPS workshops. The Q sorts developed in the present study could be administered to the workshop participants at the end of the IPS workshops, and Q sorts could be factor

analyzed to study the views on problems and solutions following the workshops. Factors from before and after the workshops could be compared to explore whether the workshop and the process of dialogue changed the viewpoints on bear management in the BBV (see Pelletier, Kraak, McCullum, Uusitalo & Rich, 1999 for an example of using Q method to assess participant viewpoints before and after participatory planning events).

The Q study participants from before and after the workshops would not be identical as a number of participants from the Q study did not participate in the IPS workshops, and several participants in the IPS workshops did not participate in the Q study. However, both groups of participants should represent the then-current range of views in the BBV, and comparisons could be drawn from the studies.

6.6 Concluding remarks

Q methodology was used to explore perspectives on grizzly bear management in the Banff-Bow Valley. The study revealed four factors on the problems with grizzly bear management and three factors on solutions to alleviate these problems. Factor analysis revealed two polarized factors on the problems, demonstrating the controversial aspect of this issue, but also revealed a number of other discourses on problems and solutions. Considerable overlap was found between participants' perceptions of the problems and the solutions they recommended. From analysis of the problems and solutions factors, I uncovered five unique problem definitions regarding grizzly bear management in the BBV.

Q method may be an initial step to reduce controversy for issues that are polarized and symbolic, such as large carnivore management in western North America. This method can be used as a tool to help participants to better understand their own views, and the other discourses that exist about an issue. Q method allows discussion around certain statements on an issue that are contentious, and can also uncover common ground in large carnivore policy, which may be a point of optimism for participants involved in the policy process. The Interdisciplinary Problem Solving workshops that evolved from the Q study have shown that this method has the potential to be used as a preliminary stage in processes that build dialogue and relationships among participants and that reduce conflict in bear management.

APPENDICES

Appendix A: Analytic methods

A1. Unrotated factor matrices

Table A1 Unrotated factor matrix for problems Q sorts.

Factors that are significant according to the eigenvalue criterion (Brown 1980) are identified with an *.

Q sort #	Unrotated Factors							
	I	II	III	IV	V	VI	VII	VIII
1	-0.4638	0.3679	0.2152	-0.1071	-0.3392	-0.3314	0.2304	0.2779
2	0.6823	0.3588	-0.2329	0.0048	0.0676	0.1035	-0.1102	0.4146
3	0.8867	0.0042	0.0691	-0.1361	-0.0025	0.2521	-0.0417	0.144
4	0.2191	0.3183	0.2389	0.5936	0.5014	-0.0315	0.1496	-0.1082
5	-0.5797	0.5012	0.1888	-0.0645	-0.1284	-0.0735	0.1243	0.1472
6	0.8894	-0.201	-0.0196	0.1527	-0.0706	-0.0933	0.0714	0.171
7	0.5134	0.6387	-0.0138	-0.0071	0.0614	0.0518	0.0663	-0.2514
8	-0.7306	0.3188	0.2558	-0.0084	0.3141	0.1257	-0.2092	-0.0063
9	0.7743	0.0854	-0.052	0.3783	-0.0099	0.0236	0.0029	0.2194
10	0.2048	0.7313	0.1035	-0.3299	-0.0661	-0.3753	-0.2234	-0.0429
11	-0.4779	0.5699	-0.332	0.1866	-0.2288	0.0714	-0.208	-0.003
12	0.7451	-0.0667	0.3671	0.2618	-0.1895	0.0081	-0.1458	0.1155
13	0.6471	-0.0358	0.2581	-0.3977	0.3133	-0.2417	0.2466	0.0333
14	0.7497	0.4393	-0.1357	0.0923	0.1798	-0.0539	-0.2241	0.0378
15	0.8329	-0.1291	0.0748	-0.0224	0.3502	0.0167	-0.126	0.017
16	0.8436	0.0367	-0.008	-0.1509	-0.1003	-0.0932	-0.0823	-0.0546
17	-0.0031	0.3104	0.2528	-0.3852	-0.1338	0.7375	0.1325	0.0525
18	0.4636	0.2671	0.3568	0.324	-0.4776	-0.008	-0.2417	-0.2172
19	0.5821	0.4019	0.3657	0.0409	0.1036	-0.108	0.337	0.0347
20	0.8954	-0.0757	0.0524	-0.182	0.0658	0.0934	-0.1428	0.0994
21	0.8683	-0.0176	0.0739	-0.181	0.0956	-0.0512	-0.0281	-0.0044
22	-0.5015	0.5687	-0.2384	0.0702	0.2805	-0.01	0.1623	-0.0479
23	-0.4938	0.3947	0.6966	0.0754	-0.057	0.0455	0.0724	-0.0676
24	-0.5072	0.5697	0.0736	-0.1098	0.2933	0.2342	-0.2966	0.0014
25	-0.0328	0.7373	-0.2283	0.1045	-0.088	0.0028	0.084	0.3366
26	0.6421	0.3667	-0.4185	-0.0027	-0.1486	0.1495	0.2227	-0.173
27	0.7905	-0.0219	0.3804	0.0079	-0.1733	0.1325	-0.017	-0.1497
28	0.6285	0.2385	-0.3314	0.1006	-0.1238	0.2156	0.3297	-0.2188

Q sort #	Unrotated Factors							
	I	II	III	IV	V	VI	VII	VIII
29	0.5412	0.4704	-0.233	-0.255	-0.0532	-0.2907	-0.1024	-0.2777
Eigenvalue	**11.8387***	**4.3458***	**2.0298***	**1.385***	**1.367***	**1.2295***	**0.9126**	**0.8234**
Variance (%)	**41**	**15**	**7**	**5**	**5**	**4**	**3**	**3**

Table A2 Unrotated factor matrix for solutions Q sorts.

Factors that are significant according to the eigenvalue criterion (Brown 1980) are identified with an *.

Q sort #	Unrotated Factors							
	A	B	C	D	E	F	G	H
1	-0.1993	0.7445	-0.1728	0.1762	0.1051	0.163	-0.1889	-0.2673
2	0.729	0.1712	0.3852	-0.1816	-0.0945	-0.0921	-0.0707	0.1228
3	0.8487	-0.0068	0.1659	0.2577	0.1347	0.1669	0.0927	-0.0924
4	0.486	0.2659	0.2211	-0.2955	0.511	-0.2411	-0.0569	0.1998
5	-0.5455	0.508	-0.3051	-0.2421	-0.0409	-0.0373	0.0273	0.3767
6	0.8848	-0.0346	-0.1704	0.0943	0.1503	0.0895	0.078	0.088
7	0.4774	0.5548	0.0949	-0.2259	-0.272	0.2754	-0.1433	0.1691
8	-0.6673	0.4546	0.3121	-0.2603	0.0095	0.0093	0.0434	0.0536
9	0.7558	0.0526	0.1549	0.0072	0.0742	-0.0229	-0.3832	-0.1237
10	-0.1017	0.6971	-0.1162	-0.0493	-0.0257	0.2948	0.3136	-0.29
11	-0.3252	0.218	0.8167	0.0612	-0.1036	-0.1183	0.0015	0.0444
12	0.6838	-0.3813	0.2995	0.2865	-0.249	-0.0416	-0.0941	-0.0234
13	0.2776	0.6551	-0.1697	0.0762	0.4588	0.0563	-0.0389	-0.1599
14	0.3635	0.4827	-0.2805	0.311	-0.3246	-0.4633	0.0181	0.048
15	0.7349	0.2361	-0.196	-0.3496	0.2115	-0.132	0.222	-0.1041
16	0.7762	0.1088	0.1539	-0.034	0.0707	0.2644	-0.1707	0.3275
17	0.0641	0.5995	-0.0205	0.1777	-0.5361	0.0547	-0.2569	-0.0038
18	0.8577	-0.0001	-0.0489	0.1807	-0.2047	0.0255	-0.0053	-0.0725
19	0.4102	0.5206	-0.1216	0.0043	-0.2757	-0.4239	0.3937	0.1493
20	0.7947	-0.2793	-0.0021	-0.1086	0.0893	0.2223	0.074	0.201
21	0.7032	0.2118	-0.0821	0.2032	0.1172	-0.1831	-0.1545	-0.2339
22	-0.4885	0.6009	0.0562	0.349	0.1745	-0.0791	-0.0067	0.2586
23	-0.1762	0.3786	0.6441	0.3099	0.1489	-0.0182	0.4169	-0.1642
24	-0.4184	0.406	-0.0558	0.3622	0.3404	-0.2035	-0.3279	0.1991
25	-0.1682	0.7483	0.0762	-0.2803	-0.1533	0.3609	-0.0041	-0.0139
26	0.8342	0.0784	0.0016	-0.0769	0.0828	-0.1774	0.1814	0.0663
27	0.4027	0.0551	-0.1313	0.5854	0.0666	0.4282	0.2432	0.3149
28	0.8357	0.0917	-0.0379	-0.1848	-0.1585	-0.0063	0.1133	-0.0181
29	0.6899	0.4447	0.0804	-0.2011	0.001	-0.0765	-0.1975	-0.1709
Eigenvalues	**10.3279***	**5.0371***	**1.9234***	**1.6864***	**1.4976***	**1.2799***	**1.0917***	**0.9535**
Variance (%)	**36**	**17**	**7**	**6**	**5**	**4**	**4**	**3**

A2. Cattell's Scree Test

Figure A1 Cattell's Scree Test for unrotated problems factors

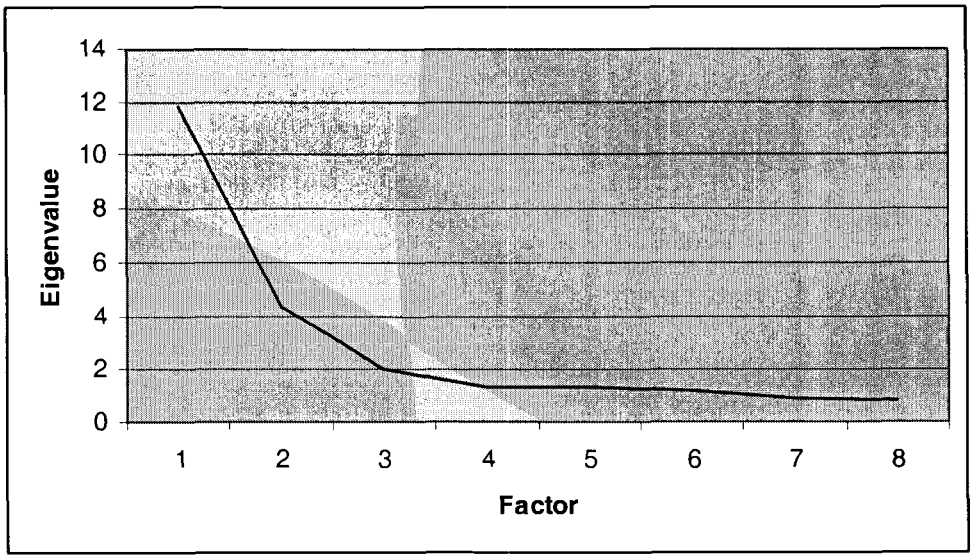
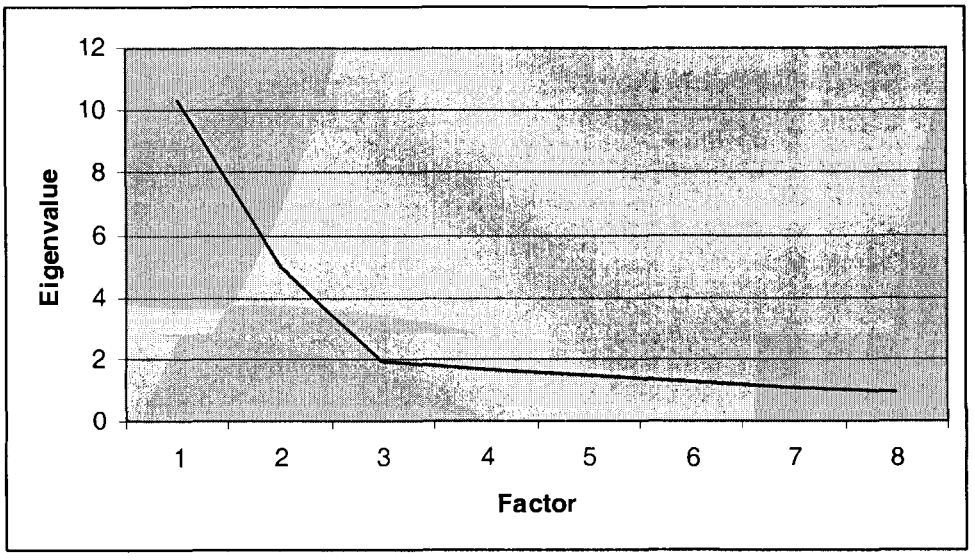


Figure A2 Cattell's Scree Test for unrotated solutions factors



A3. Rotated factor matrices

Table A3 Rotated factor matrix for problems Q sorts, 3 factor solution

Q sorts that are pure factor representations are indicated in boldface.

Q sort #	Rotated Factors			
	I	II	III	IV
1	-0.4553	**0.4553**	-0.1814	0.3956
2	0.2756	-0.2756	**0.7535**	0.0697
3	0.7235	-0.7235	0.5125	0.0697
4	0.1154	-0.1154	0.1976	0.3924
5	-0.6202	0.6202	-0.1604	0.4609
6	0.7883	-0.7883	0.4396	-0.1315
7	0.0958	-0.0958	**0.6998**	0.4157
8	-0.6262	**0.6262**	-0.3959	0.3898
9	0.5489	-0.5489	0.5544	0.0294
10	-0.1451	0.1451	0.5029	0.5598
11	-0.7774	**0.7774**	0.2151	0.1135
12	**0.7628**	-0.7628	0.2277	0.2465
13	**0.6281**	-0.6281	0.2426	0.1826
14	0.3287	-0.3287	**0.7916**	0.1969
15	**0.7467**	-0.7467	0.3978	-0.014
16	0.6438	-0.6438	0.5454	0.0319
17	-0.0505	0.0505	0.0489	0.3941
18	0.3785	-0.3785	0.2565	**0.4522**
19	0.4114	-0.4114	0.4042	**0.549**
20	0.7618	-0.7618	0.4795	0.005
21	0.7213	-0.7213	0.4858	0.0589
22	-0.7586	**0.7586**	0.1509	0.1831
23	-0.3025	0.3025	-0.4357	**0.7768**
24	-0.6409	0.6409	-0.0151	0.4197
25	-0.4655	0.4655	0.5337	0.3088
26	0.1673	-0.1673	**0.8303**	-0.0662
27	**0.7824**	-0.7824	0.2751	0.2866
28	0.2517	-0.2517	**0.7009**	-0.0843
29	0.1114	-0.1114	**0.7324**	0.1403
Variance (%)	30	30	23	10

Table A4 Rotated factor matrix for solutions Q sorts, 3 factor solution

Q sorts that are pure factor representations are indicated in boldface.

Q sort #	Rotated Factors		
	A	B	C
1	-0.0842	**0.784**	0.0466
2	**0.8045**	-0.0359	0.246
3	**0.8483**	-0.166	-0.0283
4	**0.5584**	0.1304	0.1643
5	-0.4864	**0.6395**	-0.0571
6	**0.8185**	-0.1107	-0.3619
7	**0.5817**	0.4404	0.1112
8	-0.5049	0.446	**0.5436**
9	**0.7676**	-0.0936	-0.0052
10	0.0113	**0.7106**	0.0685
11	-0.1292	0.0425	**0.8954**
12	**0.6426**	-0.5358	0.0502
13	0.3605	**0.6321**	-0.0741
14	0.3918	**0.484**	-0.2368
15	**0.7196**	0.1753	-0.2927
16	**0.7976**	-0.0424	0.0021
17	0.1701	**0.5698**	0.1015
18	**0.8202**	-0.1054	-0.2328
19	0.472	0.4729	-0.0875
20	**0.7155**	-0.3758	-0.2374
21	**0.7046**	0.1271	-0.1831
22	-0.3501	**0.6273**	0.2947
23	0.0142	0.2201	**0.7352**
24	-0.3385	0.4602	0.1292
25	-0.0095	**0.7191**	0.2773
26	**0.8211**	-0.0402	-0.1621
27	0.3763	0.0312	-0.1998
28	**0.818**	-0.0174	-0.1969
29	**0.7639**	0.3097	0.0266
Variance (%)	34	17	9

Appendix B: Factor arrays

B1 Problems factor arrays (model Q sorts)[7]

Factor I

-4	-3	-2	-1	0	+1	+2	+3	+4
P21	P6	P1	P10	P3	P4	P7	P2	P8
P24	P26	P9	P12	P5	P27	P13	P15	P14
P38	P32	P28	P20	P11	P31	P17	P19	P16
	37	30	P23	P22	P33	P18	P29	
			P25	P34	P35			
				P36				

Factor II

-4	-3	-2	-1	0	+1	+2	+3	+4
P8	P2	P19	P3	P4	P14	P1	P5	P10
P18	P7	P22	P15	P11	P21	P9	P6	P28
P31	P13	P29	P17	P16	P32	P25	P12	P36
	P27	P34	P20	P23	P33	P26	P37	
			P35	P24	P38			
				P30				

Factor III

-4	-3	-2	-1	0	+1	+2	+3	+4
P20	P21	P1	P2	P6	P5	P17	P3	P4
P25	P24	P11	P12	P8	P9	P18	P7	P13
P32	P30	P19	P23	P26	P10	P33	P15	P16
	P34	P38	P27	P28	P14	P35	P36	
			P37	P29	P22			
				P31				

Factor IV

-4	-3	-2	-1	0	+1	+2	+3	+4
P3	P17	P12	P6	P2	P5	P4	P1	P8
P22	P23	P13	P9	P7	P10	P26	P14	P33
P30	P31	P16	P18	P25	P11	P27	P19	
	P35	P24	P20	P34	P15	P29	P28	
			P32	P37	P21	P36		
				P38				

[7] Numbers in table refer to statement numbers

B2 Solutions factor arrays (model Q sorts)

Factor A

-4	-3	-2	-1	0	1	2	3	4
S1	S7	S23	S8	S2	S11	S3	S4	S15
S5	S13	S26	S10	S17	S22	S6	S14	S21
S9	S16	S28	S18	S19	S27	S12	S20	S25
			S29	S30	S24			

Factor B

-4	-3	-2	-1	0	1	2	3	4
S14	S3	S4	S9	S5	S8	S2	S1	S10
S22	S20	S11	S13	S7	S12	S17	S6	S15
S24	S29	S28	S16	S19	S25	S18	S30	S21
			S26	S23	S27			

Factor C

-4	-3	-2	-1	0	1	2	3	4
S2	S1	S7	S4	S3	S5	S13	S10	S9
S15	S22	S14	S6	S20	S8	S18	S11	
S24	S26	S21	S17	S23	S16	S30	S12	
			S29	S27	S19		S25	
							S28	

Appendix C: Q samples and factor scores

Table C1 Problems Q sample statements and factor scores

Statement	Factor Score			
	I	II	III	IV
P1. There is a false crisis mentality spurred by interest groups who have more in line than the health and welfare of grizzly bears.	-2	+2	-2	+3
P2. There is a lack of an overall conservation strategy for grizzly bears, lack of clear goals, targets and a bigger vision.	+3	-3	-1	0
P3. There is not enough funding to implement what we know needs to be done for grizzly bear management.	0	-1	+3	-4
P4. The grizzly bear population is vulnerable.	+1	0	+4	+2
P5. The grizzly bear population of the Banff-Bow Valley is the Healthiest it has been in 25 years.	0	+3	+1	+1
P6. People management in Banff Park has been successful and has led to us cultivating bears not wiping them out.	-3	+3	0	-1
P7. The current management of grizzly bears is somewhat disjointed between several different responsible agencies. Techniques to manage bears are not consistent and communication is not as good as it could be between these agencies.	+2	-3	+3	0
P8. An unrelenting tide of humanity has descended on a place that has a finite capacity to accommodate human pressure.	+4	-4	0	+4
P9. The grizzly bear population is at an equilibrium, it's neither dropping nor increasing. Management is doing a good job with what they're working with.	-2	+2	+1	-1
P10. We tend to get caught up in the chicken little syndrome – thinking that the sky is falling and we need to fix everything – without recognizing Parks Canada's successes in grizzly bear management.	-1	+4	+1	+1
P11. The squeaky wheel wins in grizzly bear management. Organizations that speak loudly and are connected to the media have their views incorporated into policy.	0	0	-2	+1
P12. Although human use in Banff Park has increased, that use is more concentrated and people are better educated, so people are having less of an impact on grizzly bears.	-1	+3	-1	-2
P13. Increasing human use of grizzly bear habitat, through recreational use, residential use, and tourism development, both inside and outside of the Park has resulted in increased mortality rates of grizzly bears.	+2	-3	+4	-2
P14. There will be more challenges for residents with bear activity intruding in communities in the future.	+4	+1	+1	+3
P15. The population status of grizzly bears is not sustainable in the long term. If we sit back today and call it acceptable, we won't make the improvements that need to be made to maintain the position we're in now.	+3	-1	+3	+1
P16. The Bow Valley is an important linkage for the regional grizzly bear population. If we lose the connections and opportunities in this area, then there is a high risk of the population being placed in jeopardy.	+4	0	+4	-2

Statement	Factor Score			
	I	II	III	IV
P17. The precautionary principle doesn't hold water in grizzly bear management. The onus of proof is still on those defending wildlife instead of on developers.	+2	-1	+2	-3
P18. Management is fragmented by jurisdiction. There are no system wide specific objectives that Parks Canada and the provincial agencies are trying to manage for.	+2	-4	+2	-1
P19. There is no well organized or visionary plan in place that outlines when success is achieved in management and when we've achieved a healthy population.	+3	-2	-2	+3
P20. Banff Park doesn't have room for more bears because the ecosystem in the Park is at carrying capacity.	-1	-1	-4	-1
P21. We're taking our local situation with bears and extrapolating. In the regional context, grizzly bear populations are healthy.	-4	+1	-3	+1
P22. Elsewhere in Alberta, grizzly bear populations are shrinking. The Bow Valley needs to be a source of bears to increase the regional population of bears.	0	-2	+1	-4
P23. Decisions are made with urban perceptions and by wildlife groups, with less consideration given to agriculture. Livestock producers have generally borne the costs of grizzly bear protection and do not get adequate compensation for losses incurred by bears.	-1	0	-1	-3
P24. We have unnecessarily sacrificed human activities in Banff National Park for grizzly bear protection.	-4	0	-3	-2
P25. We are on a trend to having way too many bears in the area which means we'll be bound to have more problems between bears and people, and a huge proportion of habituated bears.	-1	+2	-4	0
P26. The population status of grizzly bears is acceptable as it is. We'll never achieve zero mortality of bears given the circumstances we're in and that's fine.	-3	+2	0	+2
P27. Politics and special interest pleading have interfered with the essential scientific understanding of the fundamental established mandates of conservation organizations. We're no longer talking about science, we're talking about who can speak the loudest and who can get the most media coverage.	+1	-3	-1	+2
P28. It is not the role of a National Park to be a bear factory and produce bears, but instead to have the right amount of bears for the Park itself.	-2	+4	0	+3
P29. Management is largely reactive, it's based on the political bureaucratic mood of the day and is not entirely science based.	+3	-2	0	+2
P30. A disproportionate amount of resources are going into saving bears when they're shot just outside Park borders.	-2	0	-3	-4
P31. Human use issues receive greater priority in Parks Management to the point where grizzly bears have been jeopardized.	+1	-4	0	-3
P32. Grizzly bears have been over managed. The trend of closing each area with a female grizzly in it is leading us to close Banff.	-3	+1	-4	-1
P33. Political pressure lets people get what they want. Decision making is politicized.	+1	+1	+2	+4
P34. Most of the discourse associated with policy making has been high-jacked by people whose views are short term and do not take into account the larger interests, sensibilities or history of this country.	0	-2	-3	0

Statement	Factor Score			
	I	II	III	IV
P35. If something will impact recreational opportunities, the burden of proof is always on the bear, their habitat, and the people who defend their habitat, to show that harm is being done. This is wrong.	+1	-1	+2	-3
P36. Instead of celebrating our achievements in grizzly bear Management, we continue to talk about our challenges.	0	+4	+3	+2
P37. Grizzlies are managed from the perspective that they're an endangered species when they're not. The Banff-Bow Valley is not the last stand of the grizzly bear.	-3	+3	-1	0
P38. The grizzly bear population is doing very well, describing the population as just "stable" is the crisis version of what is happening.	-4	+1	-2	0

Table C2 Solutions Q sample statements and factor scores

Statement	Factor score		
	A	B	C
S1. Restricting human use doesn't have to be the answer. Human use has already been restricted in the areas most important for grizzly bears and we don't need more restrictions.	-4	+3	-3
S2. Tighten the integration of scientific management and research. Management actions should be directly coupled to the outcomes of research.	0	+2	-4
S3. Limit growth on provincial lands adjacent to the Park.	+2	-3	0
S4. Make bears a higher priority in provincial management. In Alberta, create bold, legally accountable legislation that makes government manage for the needs of grizzly bears.	+3	-2	-1
S5. Use less invasive research on grizzly bears and strictly monitor the population. Research is not a mandate for National Parks, and parks are not a lab.	-4	0	+1
S6. Use science more to guide policy decisions.	+2	+3	-1
S7. National Parks are not game preserves, they should be managed for people to come here to see and learn things.	-3	0	-2
S8. Increase participation and communication with park residents.	-1	+1	+1
S9. When management closes one area of the Park for grizzly bear management, they have to open another area for recreational opportunity.	-4	-1	+4
S10. Create bear habitat in wilderness areas in the backcountry, outside of communities and development areas, to keep bears and people separate.	-1	+4	+3
S11. Develop specific objectives for each habitat area. Figure out how many bear deaths can be tolerated in each area (demographic target), and how much habitat change is acceptable.	+1	-2	+3
S12. Build an appreciation for grizzly bears among recreational users. The issue of management comes down to managing people.	+2	+1	+3
S13. Keep collaring and drugging bears to a minimum because these techniques completely change a bear's behaviour and then you're no longer studying wild bears. This is the bear's National Park too.	-3	-1	+2
S14. Restrict human use in the Park, create areas where bears can live on the landscape and meet their year round needs.	+3	-4	-2

Statement	Factor score		
	A	B	C
S15. Develop a more formal process between Parks Canada and the provincial agencies for managing bears by developing a multiagency group to deal with grizzly bear management that has some power to influence decisions.	+4	+4	-4
S16. We need to keep in mind the historical context for ecological integrity. People think that Banff National Park is Eden, but in fact Banff history was for tourism.	-3	-1	+1
S17. Scientists and decision makers should be clearer about what the science indicates is in the interest of bears.	0	+2	-1
S18. Focus on monitoring trends of the grizzly bear population in scientific research, and finding less intrusive ways to do so.	-1	+2	2
S19. Engage landowners in decisions. Get more input from people out on the land who are actually seeing the wildlife on a more regular basis.	0	0	+1
S20. Parks Canada must take a stronger stance towards prioritizing ecological integrity in Banff National Park.	+3	-3	0
S21. We need a more concerted management effort between the province, Parks Canada, industry, and people who do things on the land.	+4	+4	-2
S22. We need to change our value system and value other things besides profit if we want bears on the landscape. We are compromising our long term well-being for short term material gains of wealth and power.	+1	-4	-3
S23. Find ways so that humans and grizzly bears can co-habitate in the same ecosystem by minimizing bear habituation. Our biggest mistake in management has been to designate separate spaces for bears and humans.	-2	0	0
S24. Managers should say outright that the function of a National Park is a conservation function. Someone needs to say no to the next round of development expansion.	+1	-4	-4
S25. Design human use around ecological constraints.	+4	+1	+3
S26. Increase habitat in the Park for bears so that less bears move onto the plains and come into conflict with agricultural operations.	-2	-1	-3
S27. Improve the communication structure between various parties that have a role to play in grizzly bear protection. Develop a standardized protocol for information sharing between organizations.	+1	+1	0
S28. Change the configuration of habitat to reduce the potential for conflict between humans and bears, such as getting rid of high quality bear habitat near human development.	-2	-2	+3
S29. Adjust values and attitudes so that people value a live bear so highly that they wouldn't cause the circumstances of that bear's death.	-1	-3	-1
S30. Find a more effective way of including interests, not just those who are loud, but where prudence and understanding drive the logic and argument, not just passion.	0	+3	+2

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