PERSPECTIVES ON GRIZZLY BEAR MANAGEMENT IN BANFF NATIONAL PARK AND THE BOW RIVER

APPROVAL

Name: **Emily Carter Chamberlain**

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**

Examining Committee:

_____

Senior Supervisor: **Dr. Murray Rutherford**
Assistant Professor
School of Resource and Environmental Management
Simon Fraser University

_____

Committee Member: **Dr. Mike Gibeau**
Adjunct Professor
Department of Geography
University of Calgary

Date Defended/Approved: _____

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

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

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

CHAPTER 2: BACKGROUND

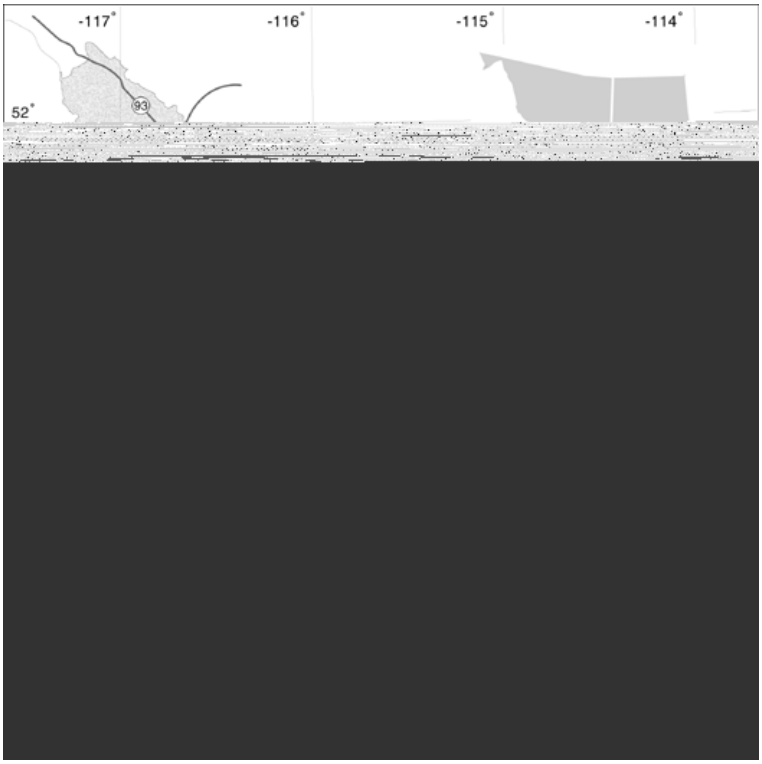
2.1 Study area

The Banff-Bow Valley (BBV) is located

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 Wate

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 ra

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 Superintendent the [illegible] to

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).

[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

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 opport

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, 198

In 1987, Nakamura began to question this “textbook policy process,” arguing that

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 e

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 cont

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

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

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 respond

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

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

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.

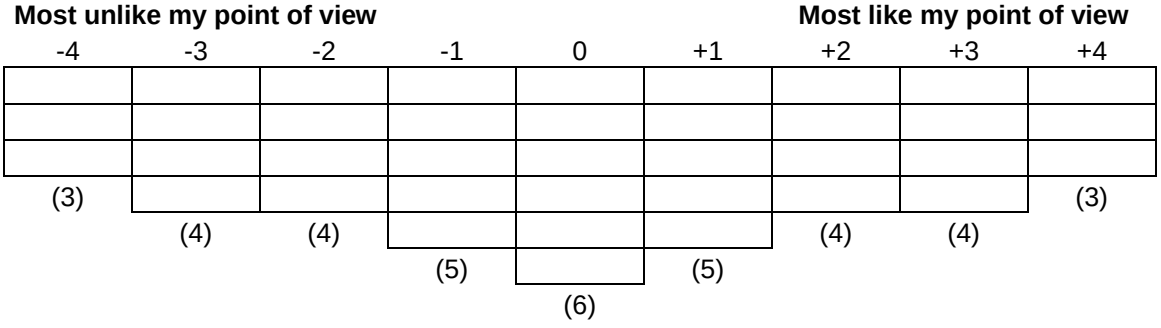


Figure 4.2 Statement template for solutions Q sort

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). 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

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 repr

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

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

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**

(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

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 "*."

	Factor Scores

Statement	Factor Scores			
	I	II	III	IV
Statements rejected by factor I				
P21. We’re taking our local situat				

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				

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

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		

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**

Politicized decision-making

Factor IV strongly believes that decision-making is politicized, which in turn has hindered science-based management. This narr

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

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 ≥ +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

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

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

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	+3		

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

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

Figure 6.1 General relationship between problems factors and solutions factors

6.1.2 Mapping problem definition

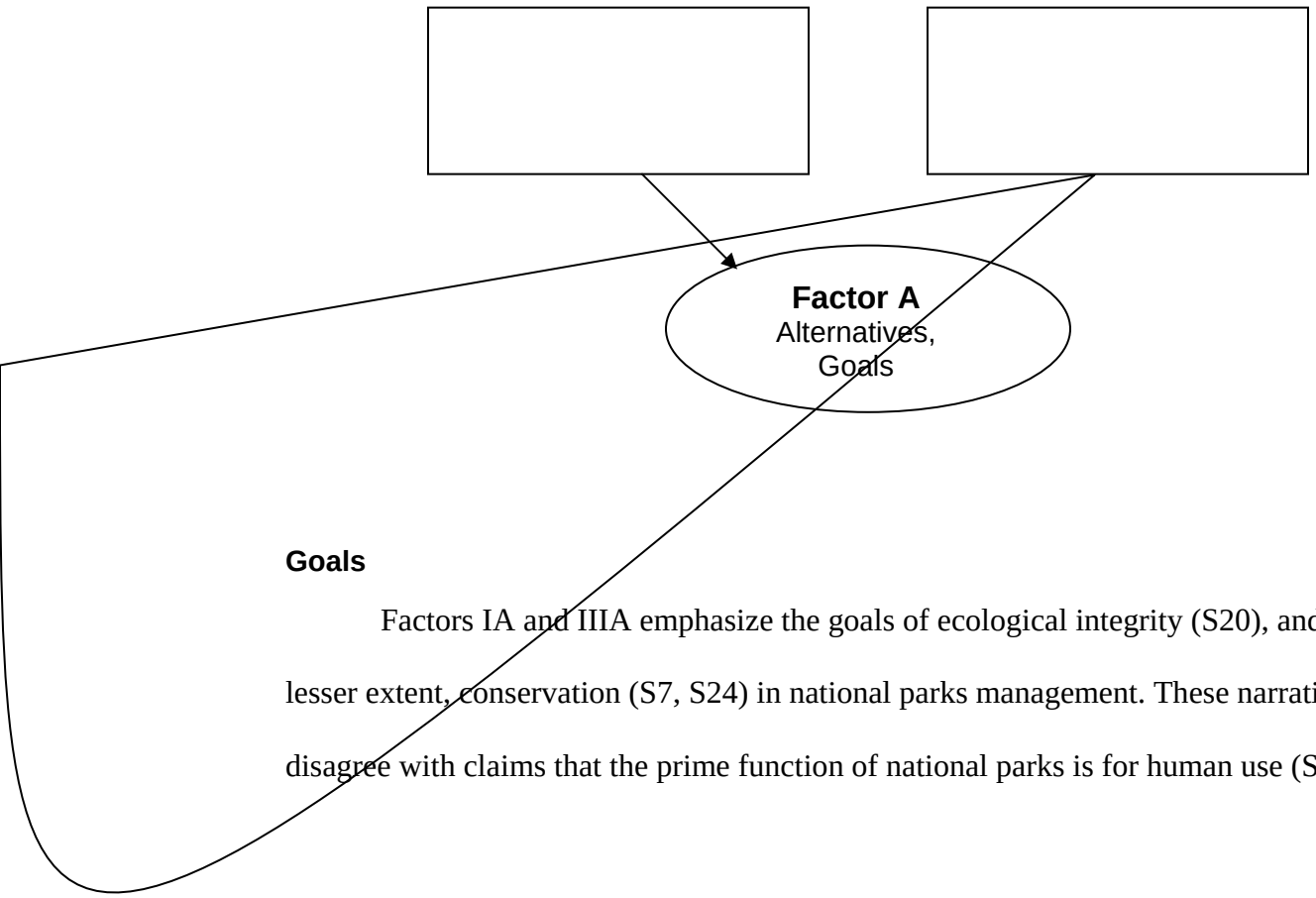
In order to get a more complete understanding of these relationships between perceived problems and preferred solutions for grizzly bear management in the Banff-Bow Valley, I examined the full narrative about problem definition represented by each linked problem/solution factor pair shown in Figure 6.1. 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 a000ions f

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 probl

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.

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

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 betw

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 st

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

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 a

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 engageme

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 greate tho iesu9s de2-0.sdraa

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

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

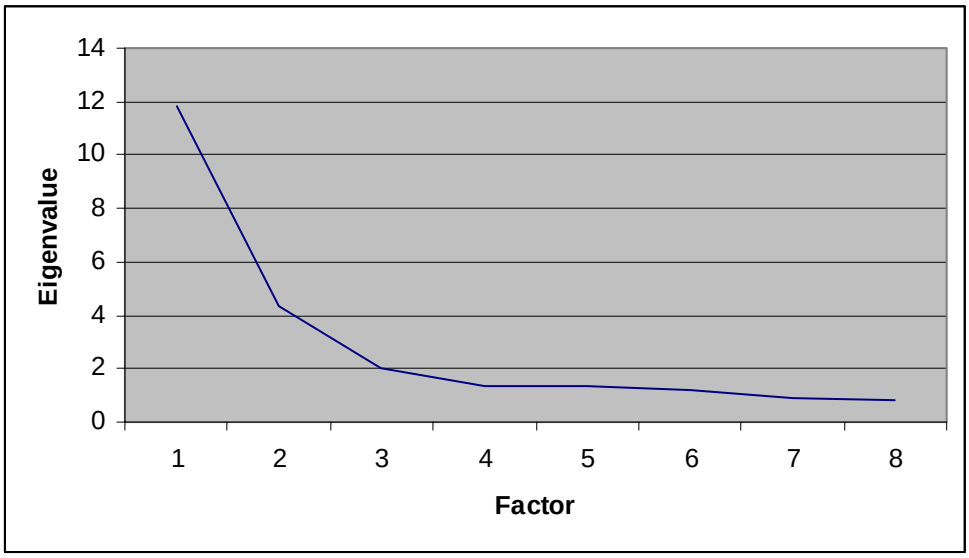
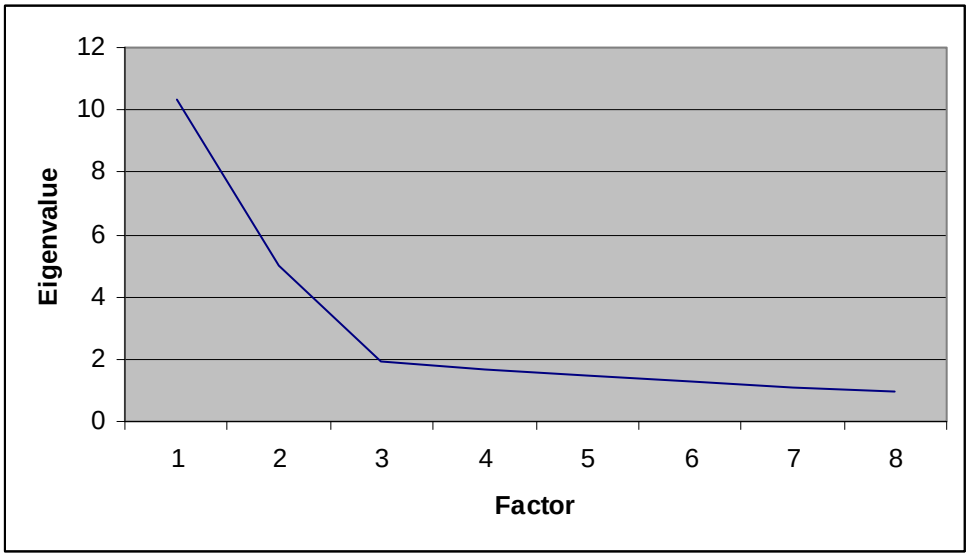


Figure A2 Cattell's Scree Test for unrotated solutions factors



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

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

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

Appendix C: Q samples and factor scores

Table C1 Problems Q sample statements and factor scores

Statement	Factor Score

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				

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

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 land 610.5land .48nB2 wa1(io)5.5(0 Tc-0.0024 Tw[S19. Enk)-166T[S19. Engage)6(lah76 553.8 Tn

REFERENCES

Addams, H. (2000). Q methodology. In H. Addams, & J. Proops (Eds.), *Social discourse and environmental policy* (pp. 14-40). Cheltenham, U.K.; Northampton, Massachusetts: Edward Elgar.

Addams, H., & Proops, J. (Eds.), (2000a). *Social discourse and environmental policy*. Cheltenham, U.K.; Northampton, Massachusetts: Edward Elgar.

Addams, H., & Proops, J. (2000b). Introduction. In H. Addams, & J. Proops (Eds.), *Social discourse and environmental policy* (pp. 1-13). Cheltenham, U.K.; Northampton, Massachusetts: Edward Elgar.

Alberta Environmental Protection. (1999). *Kananaskis Country Recreational Policy.* Retrieved February 9, 2006 from http://www.cd.gov.ab.ca/all_about_us/ legislation/parks/kcpolicy/kcpolicy.pdf

Alberta Forestry, Lands and Wildlife. (1990). *Management plan for grizzly bears in Alberta*. Edmonton, Alberta: Alberta Forestry, Lands and Wildlife.

Alberta Grizzly Bear Recovery Team. (2005). *Draft Alberta grizzly bear recovery plan.* Edmonton, Alberta: Alberta Sustainable Resource Development, Fish and Wildlife Division.

Alberta Sustainable Resource Development. (2005). *Alberta grizzly bear recovery team update*. Retrieved January 21, 2006, from http://www3.gov.ab.ca/srd/fw/ speciesatrisk/pdf/Grizzly_web_update_Mar_05.pdf

Alberta Sustainable Resource Development. (2003). *Endangered Species Conservation Committee, Alberta and*

Andersone, Z., & Ozolins, J. (2004). Public perception of large carnivores in Latvia. *Ursus, 15*(2), 181-187.

Ascher, W. (1986). The evolution of the policy sciences: Understanding the rise and avoiding the fall. *Journal of Policy Analysis and Management, 5*(2), 365-373.

Ascher, W., & Healy, R. (1990). *Resource policymaking in developing countries*. Durham, North Carolina: Duke University Press.

Bath, A. J., & Buchanan, T. (1989). Attitudes of interest groups in Wyoming toward wolf restoration in Yellowstone national park. *Wildlife Society Bulletin, 17*, 519-525.

Benn, B., & Herrero, S. (2002). Grizzly bear mortality and human access in Banff and Yoho National Parks, 1971-98. *Ursus, 13*, 213-221.

Benn, B., Jevons, S., & Herrero, S. (2005). Grizzly bear mortality and human access in

Brooks, J. J., Warren, R. J., Nelms, M. G., & Tarrant, M. A. (1999). Visitor attitudes toward and knowledge of restored bobcats on Cumberland Island National Seashore, Georgia. *Wildlife Society Bulletin, 27*(4), 1089-1097.

Brown, S. R. (1999). Turning Q into a survey. Message posted to www.qmethod.org, March 1999. Retrieved February 3, 2006, from www.qmethod.org.

Brown, S. R. (1980). *Political subjectivity: Applications of Q methodology in political science.* New Haven, Connecticut: Yale University Press.

Brown, S.R. (1970). On the use of variance designs in Q methodology. *Psychological Record, 20,* 179-189.

Brown, S.R. & Byrd, K.L. (2004). *Workshop on large-scale conservation: Summary report to participants* (unpublished report).

Brown, S.R., Durning, D.W. & Selden, S. (1999). Q methodology. In G.J. Miller & M.L. Whicker (Eds.), *Handbook of research methods in public administration* (pp. 599-638). New York: Marcel Dekker, Inc.

Brown, T.C. (1984). The concept of value in resource allocation. *Land Economics, 60(3),* 231-246.

Brunner, R. D. (1991). The policy movement as a policy problem. *Policy Sciences, 24,* 65-98.

Brunner, R. D. (1984). Integrating knowledge and action. *Policy Sciences, 17,* 3-11.

Brunner, R. D. (1982). The policy sciences as science. *Policy Sciences, 15,* 115-135.

Brunner, R. D., Colburn, C. H., Cromley, C. M., Klein, R. A., & Olson, E. A. (2002). In ience. Brunner R. D. (Ed.), *Finding common ground: Governance and natural resources in the American west*. New Haven, Connecticut: Yale University Press.

Byrd, K. L. (2002). Mirrors and me6.0003 TIn

Clark, T. W., & Brunner, R. D. (1996). Making partnerships work in endangered species conservation: An introduction to the decision process. *Endangered Species Update, 13*(9), 1-5. Retrieved 12/03, 2006 from http://www.umich.edu/~esupdate/library/96.09/clark.html

Clark, T. W., Curlee, A. P., & Reading, R. P. (1996). Crafting effective solutions to the large carnivore conservation problem. *Conservation Biology, 10*(4), 940-948.

Cooper, B., Hayes, J., & LeRoy, S. (2002). *Science fiction or science fact? The grizzly biology behind Parks Canada management models.* Critical Issues Bulletin. Vancouver, B.C.: The Fraser Institute.

COSEWIC. (2002). *COSEWIC assessment and update status report on the grizzly bear* Ursus arctos *in Canada.* Ottawa: Committee on the Status of Endangered Wildlife in Canada.

Cronon, W. (1992). A place for stories: Nature, history and narrative. *The Journal of American History, 78*(4), 1347-1376.

Day, J. C. & Gunton, T. (2003). The theory and practice of collaborative planning in resource and environmental management. *Environments, 31*(2), 5-19.

deLeon, P. (1999). The stages approach to the policy process: What has it done? Where is it going? In P. A. Sabatier (Ed.), *Theories of the policy process* (pp. 19-32). Boulder, Colorado: Westview Press.

deLeon, P. (1994). Reinventing the policy sciences: Three steps back to the future. *Policy Sciences, 27*, 77-95.

deLeon, P. (1988). *Advice and consent: The development of the policy sciences*. New York: Russell Sage Foundation.

deLeon, P. (1981). Policy sciences: The discipline and profession. *Policy Sciences, 13*, 1-7.

Dery, D. (1984). *Problem definition in policy analysis*. Lawrence, Kansas: University Press of Kansas.

Dryzek, J. S., & Berejikian, J. (1993). Reconstructive democratic theory. *The American Political Science Review, 87*(1), 48-60.

Eastern Slopes Grizzly Bear Project. (1998). *Grizzly bear population and habitat status in Kananaskis Country, Alberta: A report to the Department of Environmental*

Protection, Natural Resources Service, Alberta. Calgary, Alberta: University of Calgary. Retrieved, March 29, 2006 from http://www.canadianrockies.net/ Grizzly/ kc_summary.html

Ericsson, G., & Heberlein, T. A. (2003). Attitudes of hunters, locals, and the general public in Sweden now that the wolves are back. *Biological Conservation, 11,* 149-159.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research.* Reading, Massachusetts: Addison-Wesley Publishing Company, Inc.

Fisher, R. A. (1960). *The design of experiments*. New York: Hafner.

Focht, W. (2002). Assessment and management of policy conflict in the Illinois River Watershed in Oklahoma: An application of Q methodology. *International Journal of Public Administration, 25*(11), 1311-1349.

Fulton, D. C., Manfredo, M. J., & Lipscomb, J. (1996). Wildlife value orientations: A conceptual and measurement approach. *Human Dimensions of Wildlife, 1*(2), 24-47.

Garshelis, D. L., Gibeau, M. L., & Herrero, S. (2005a). Grizzly bear demographics in and around Banff National Park and Kananaskis Country, Alberta. *Journal of Wildlife Management, 69*(1), 277-297.

Garshelis, D. L., Gibeau, M. L., & Herrero, S. (2005b). Grizzly bear demographics in and around Banff National Park and Kananaskis Country - postscript for 2003-2004. In S. Herrero (Ed.), *Biology, demography, ecology, and management of grizzly bears in and around Banff National Park and Kananaskis Country: The final report of the Eastern Slopes Grizzly Bear Project*. (pp. 50-51). Calgary, Alberta: Faculty of Environmental Design, University of Calgary.

Gibeau, M. L. (2005a). Mortality of grizzly bears in the Bow River Watershed. In S. Herrero (Ed.), *Biology, demography, ecology and management of grizzly bears in and around Banff National Park and Kananaskis Country: The final report of the Eastern Slopes Grizzly Bear Project*. (pp. 61-62). Calgary, Alberta: Faculty of Environmental Design, University of Calgary.

Gibeau, M.L. (2005b). Habitat effectiveness and security area analysis. In S. Herrero (Ed.), *Biology, demography, ecology and management of grizzly bears in and around Banff National Park and Kananaskis Country: The final report of the Eastern Slopes Grizzly Bear Project*. (pp. 194-199). Calgary, Alberta: Faculty of Environmental Design, University of Calgary.

Gibeau, M. L. (2000). *A conservation biology approach to management of grizzly bears in Banff National Park, Alberta*. Doctoral dissertation. Calgary, Alberta: Resources and the Environment Program, University of Calgary.

Gibeau, M. L., Herrero, S., Kansas, J., & Benn, B. (1996). Grizzly bear population and habitat status in banff national park. In J. Green, C. Pacas, L. Cornwell & S. Bayler (Eds.), *Ecological outlooks project. A cumulative effects assessment and futures outlook of the Banff-Bow Valley study.* Prepared for the Banff-Bow Valley study. Ottawa, Ontario: Department of Canadian Heritage.

Gibeau, M. L., Herrero, S., McLellan, B. N., & Woods, J. G. (2001). Managing for grizzly bear security areas in Banff National Park and the Central Canadian Rocky Mountains. *Ursus, 12*, 121-130.

Gibeau, M. L., & Stevens, S. (2005). Study areas. In S. Herrero (Ed.), *Biology, demography, ecology and management of grizzly bears in and around Banff National Park and Kananaskis Country: The final report of the Eastern Slopes Grizzly Bear Project.* (pp. 12-16). Calgary, Alberta: Faculty of Environmental Design, University of Calgary.

Gunton, T., & Flynn, S. (1992). Resolving environmental conflict: The role of alternative dispute resolution. *Environments, 21*(3), 12-16.

Herrero, S. (Ed.), (2005a). *Biology, demography, ecology and management of grizzly bears in and around Banff National Park and Kananaskis Country: The final report of the Eastern Slopes Grizzly Bear Project.* Calgary, Alberta: Faculty of Environmental Design, University of Calgary.

Herrero, S. (2005b). The Eastern Slopes Grizzly Bear Project and science-based grizzly bear conservation. In S. Herrero (ed.), *Biology, demography, ecology and management of grizzly bears in and around Banff National Park and Kananaskis Country: The final report of the Eastern Slopes Grizzly Bear Project*. (pp 2-10). Calgary, Alberta: Faculty of Environmental Design, University of Calgary.

Herrero, S., Gibeau, M. L., Garshelis, D. L., Benn, B., Theberge, J., & Stevens, S. et al. (2005). Summary: Eastern slopes grizzly bear project final report. In S. Herrero (Ed.), *Biology, demography, ecology and management of grizzly bears in and around Banff National Park and Kananaskis country: The final report of the Eastern Slopes Grizzly Bear Project* (pp. vii-xviii). Calgary, Alberta: Faculty of Environmental Design, University of Calgary.

Herrero, S., Roulet, J., & Gibeau, M.L (2001). Banff National Park: Science and policy in grizzly bear management. *Ursus, 12*, 161-172.

Holling, C. S. (1973). Resilience and stability of ecological systems. *Annual Review Ecology and Systematics, 4*, 1-23.

Homer, P.M. & Kahle, L.R. (1988). A structural equation test of the value-attitude-behavior hierarchy. *Journal of Personality and Social Psychology, 54*, 638-646.

Jenkins-Smith, H. C., & Sabatier, P. A. (1993). The study of public policy processes. In P. A. Sabatier, & H. C. Jenkins-Smith (Eds.), *Policy change and learning: An advocacy coalition approach* (pp. 1-9). Boulder, Colorado: Westview Press.

Jones, C. O. (1970). *An introduction to the study of public policy* (1st ed.). Belmont, California: Wadsworth Publishing Company, Inc.

Kaczensky, P., Blazic, M., & Gossow, H. (2004). Public attitudes toward brown bears (*Ursus arctos*) in Slovenia. *Biological Conservation, 118*, 661-674.

Kaltenborn, B. P., Bjerke, T., & Vitterso, J. (1999). Attitudes toward large carnivores among sheep farmers, wildlife managers, and research biologists in Norway. *Human Dimensions of Wildlife, 4*(3), 57-73.

Kansas, J. (2002). *Status of the grizzly bear (Ursus arctos) in Alberta.* Wildlife Status Report No. 37. Edmonton, Alberta: Alberta Sustainable Resource Development, Fish and Wildlife Division.

Kellert, S. R. (1994). Public attitudes toward bears and their conservation. *International Conference of Bear Research and Management, 9*, 43-50.

Kellert, S. R. (1991). Public views of wolf restoration in Michigan. *Transactions of the North American Wildlife and Natural Resources Conference, 56*, 152-161.

Kellert, S. R. (1985a). Public perceptions of predators, particularly the wolf and coyote. *Biological Conservation, 31*, 167-189.

Kellert, S. R. (1985b). The public and the timber wolf in Minnesota. *Transactions of the North American Wildlife and Natural Resources Conference, 51*, 193-200.

Kellert, S. R. (1980). Contemporary values of wildlife in American society. In W. W. Shaw, & E. H. Zube (Eds.), *Wildlife values*. (pp. 31-60). Institutional Serv. Report No. 1. Fort Collins, Colorado: U.S. Forest Service Rocky Mountain Forest and Range Experiment Station.

Kellert, S. R., Black, M., Rush, C. R., & Bath, A. J. (1996). Human culture and large carnivore conservation in North America. *Conservation Biology, 10*(4), 977-990.

Kellert, S. R., & Clark, T. W. (1991). The theory and application of a wildlife policy framework. In W. R. Mangun (Ed.), *Public policy issues in wildlife management* (pp. 17-36). Westport, Connecticut: Greenwood Press.

Kim, J-O. & Mueller, C.W. (1978). *Factor analysis: Statistical methods and practical issues.* Berverly Hills, California: SAGE Publications, Inc.

Lasswell, H. D. (1971). *A pre-view of the policy sciences*. New York: American Elsevier Publishing Company, Inc.

Lasswell, H. D. (1970). The emerging conception of the policy sciences. *Policy Sciences, 1*(1), 3-14.

Lasswell, H. D., & Kaplan, A. (1950). *Power and society*. New Haven, Connecticut: Yale University Press.

Lasswell, H. D., & McDougal, M. S. (1992). *Jurisprudence for a free society: Studies in law, science and policy*. New Haven, Connecticut: New Haven Press.

Leighton, D. (2001). *Background for assessing the status of the Banff / Central Rockies grizzly bear population*. Citizen's Report no. 1. Banff, Alberta.

Lerner, D., & Lasswell, H. D. (Eds.). (1951). *The policy sciences*. Stanford, California: Stanford University Press.

Lohr, C., Ballard, W. B., & Bath, A. (1996). Attitudes toward gray wolf reintroduction to New Brunswick. *Wildlife Society Bulletin, 24*(3), 414-420.

Manfredo, M.J., Teel, T.L. & Bright, A.D. (2004). Application of the concepts of values and attitudes in human dimensions of natural resources research. In M.J. Manfredo, J.J. Vaske, B.L. Bruyere, D.R. Field, & P.J. Brown (Eds.), *Society and natural resources: A summary of knowledge.* Prepared for the 10th International Symposium on Society and Resource Management (pp. 271-282). Jefferson, Missouri: Modern Litho.

Mattson, D.J., Byrd, K.L., Rutherford, M.B., Brown, S.R. & Clark, T.W. (In press). Finding common ground in large carnivore conservation: Mapping contending perspectives. *Environmental Science and Policy*.

Mattson, D. J., Herrero, S., Wright, R. G., & Pease, C. M. (1996). Science and management of Rocky Mountain grizzly bears. *Conservation Biology, 10*(4), 1013.

McCool, S. F., & Braithwaite, A. M. (1989)

Pate, J., Manfredo, M. J., Bright, A. D., & Tischbein, G. (1996). Coloradans' attitudes toward reintroducing the gray wolf into Colorado. *Wildlife Society Bulletin, 24*(3), 421-428.

Sabatier, P. A. (1999a). The need for better theories. In P. A. Sabatier (Ed.), *Theories of the policy process* (pp. 3-17). Boulder, Colorado: Westview Press.

Sabatier, P. A. (Ed.). (1999b). *Theories of the policy process*. Boulder, Colorado: Westview Press.

Schmolck, P., & Atkinson, J. (2002). *PQ method 2.11*. Retrieved June 13, 2005, from http://www.qmethod.org

Steelman, T. A., & Maguire, L. A. (1999). Understanding participant perspectives: Q-methodology in national forest management. *Journal of Policy Analysis and Management, 18*(3), 361-388.

Stephenson, W. (1953). *The study of behavior*. Chicago: University of Chicago Press.

Stevens, S. (2002). *Landsat TM-based greenness as a surrogate for grizzly bear habitat quality in the Central Rockies Ecosystem, Canada*. MSc Thesis. Calgary, Alberta: Resources and the Environment Program, University of Calgary.

Stevens, S., & Gibeau, M. L. (2005). Home range analysis. In S. Herrero (Ed.), *Biology, demography, ecology and management of grizzly bears in and around Banff National Park and Kananaskis country: The final report of the Eastern Slopes Grizzly Bear Project* (pp. 144-152). Calgary, Alberta: Faculty of Environmental Design, University of Calgary.

Strumpf-Allen, R. C. G., McFarlane, B. L., & Watson, D. O. (2004). *Managing for grizzly bears in the Foothills Model Forest: A survey of local and Edmonton residents*. Edmonton, Alberta: Canadian Forestry Service.

Susskind, L., van der Wansem, M., & Ciccareli, A. (2003). Mediating land use disputes in the United States: Pros and cons. *Environments, 31*(2), 39-58.

Theodorson, G., & Theodorson, A. (1969). *A modern dictionary of sociology*. New York: Thomas Y. Crowell.

Torgenson, D. (1986). Between knowledge and poli65 1eTD0.001 Tc0 Tw[(residen),f13.385kNf.0001 T

van Eeten, M. J. G. (2001). Recasting intractable policy issues: The wider implications of the Netherlands civil aviation controversy. *Journal of Policy Analysis and Management, 20*(3), 391-414.

van Exel, N. J. A., & de Graaf, G. (2005). Who cares? Youths' views of own health behavior in relation to gender, health status, personality, and happiness. *Proceedings of International Society for the Scientific Study of Subjectivity (ISSSS) conference*, Vancouver, B.C., October 6-8 2005.

Vaske, J. J., & Donnelly, M. P. (1999). A value-attitude-behavior model predicting wildland preservation voting intentions. *Society & Natural Resources, 12*