AN ANALYSIS OF BLACK BEAR MANAGEMENT IN NOVA SCOTIA

by

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ABSTRACT

Effective black bear management incorporates both biological and social factors. This thesis assessed black bear management in Nova Scotia using interviews, surveys, and a policy analysis. Nova Scotia Department of Natural Resources (NSDNR) staff members are generally satisfied with the department's management but expressed a desire for increased bear research and population monitoring, and a reduction in bear-human conflicts. Hunting over bait is a contentious issue. Stakeholders' (hunter/trappers, agriculturalists, non-consumptive) opinions of NSDNR varied both between and within the groups, and there was no overwhelming support from any group. Wildlife managers from other jurisdictions report that having a formal black bear management plan in place is useful for managing black bear populations. Nova Scotia would be well-served by having a management plan in place. NSDNR should put greater effort into public outreach and education to reduce bear-human conflicts and help residents better understand how to share their environment with bears.

LIST OF ABBREVIATIONS USED

CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
IRM	Integrated Resource Management
NSDNR	Nova Scotia Department of Natural Resources
PETA	People for the Ethical Treatment of Animals
WIR	Wildlife Investigation Report

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CHAPTER 1: INTRODUCTION

Black Bear Management in North America

The American black bear (*Ursus americanus*) is globally the most abundant of all bear species (Servheen et al., 1999) and it inhabits most of North America (Servheen, 1990). The ecology, demographics, and behaviour of black bears have been well-studied across the continent. Black bears are very adaptable and can survive both in areas of high human density (Lyons, 2005, Adams et al., 2006) and in vast, remote areas far from much human disturbance (Servheen, 1990, Williamson, 2002). They are omnivores that eat a wide variety of foods including hard and soft mast, vegetation, insects, mammal remains, garbage and crops (Rogers, 1987, Garshelis et al., 1999, Noyce and Garshelis, 1997, Fortin et al., 1999a). Despite humans' common fear of bears, the black bear is a shy creature that is rarely involved in human attacks (Herrero, 1985, Herrero and Higgins, 1999). However, humans and black bears often interact and human contact is the most common cause of death among black bears, generally due to hunting, road accidents, or nuisance kills (Rogers, 1987, Elowe and Dodge, 1989, Schwartz and Franzmann, 1991, Fortin et al., 1999b, Lee and Vaughan, 2005).

Humans have had a fickle relationship with black bears over the last two centuries. Bears have long been an important symbol in children's tales and as mascots, and they are a species that evoke great human interest (Adams et al., 2006). However, black bears were extirpated from many parts of their range in the 1800s as habitat was converted and fragmented to make room for human settlement. Until the mid-1900s black bears also

had a widespread negative reputation as a nuisance to agricultural interests and bounties were in place motivating their killing (Servheen, 1990). Populations then rebounded as bounties were removed, hunting regulations were put in place, and farmland reverted to forested areas suitable for bear habitat (Hristienko and McDonald, 2007). Nowadays there is generally support for the maintenance of black bear populations where they currently exist (Jonker et al., 1998, Lafon et al., 2003).

Black bears are currently managed as a game species in most states and provinces in North America (Williamson, 2002), and bear management generally focuses on sustainable harvest, minimization of bear-human conflicts, and appropriate population densities to allow humans and bears to co-exist with minimal problems (Huber et al., 2008). Managing harvests is becoming more of a challenge because of increasing opposition towards hunting as a sport (Shaw, 1977, Mankin et al., 1999, Teel et al., 2002), a decreasing number of hunters (Hristienko and McDonald, 2007) and controversies surrounding certain bear-hunting techniques such as baiting, spring hunts, and hunting with hounds (Beck 1998, Boulay et al., 1999, Hristienko and McDonald, 2007). Nonetheless, harvest is a primary tool used to manage bear populations and in jurisdictions with regulated harvest seasons black bear populations have continued to grow and thrive (Garshelis, 2002, Hristienko and McDonald, 2007). It is likely that most black bear populations are limited not by the environmental carrying capacity but by the cultural carrying capacity (Garshelis, 1994), which is "the maximum number of animals that can coexist compatibly with local human interests" (Ellingwood, 1999, p.135). Black bears are still frequently considered a nuisance because they can cause damage to crops, residential properties, and businesses while in search of food (Garshelis et al., 1999, Peine,

2001) and the number of nuisance bear incidences is increasing in North America (Spencer et al., 2007).

The traditional mandate of wildlife agencies to simply provide game for harvest is no longer appropriate as the role of a wildlife manager has expanded (Todd, 1980). Managing black bear populations has become a balancing act of trying to accommodate both wildlife needs and human population growth (Layden et al., 2003), appease consumptive and non-consumptive wildlife users (Kellert and Clark, 1991), and integrate "public concerns and scientific management of resources" (McMullin, 1993, in Lafon et al., 2003, p.62). Trying to develop management strategies that are appropriate and socially acceptable is a challenge because of differing views towards hunting, bear damage, and the value of bears (Reiter et al., 1999, Lafon, 2002). Many groups of people hold an interest in black bear management including hunters, trappers, animal-rights organizations, environmental groups, agriculturalists, homeowners, business operators, and First Nations, and their input is important for consideration in decision-making (Garshelis et al., 1999).

Most of the black bear research in eastern North America has focused on assessing the size and distribution of populations, and examining the effects of harvests on black bear populations (Mclaughlin and Vaughan, 1999). While biological studies on black bears generally dominate the literature, in recent years there has been increased research into the human dimensions of black bear (and wildlife) management in North America (Loker and Decker, 1995, Loker et al., 1998). This is due, in large part, to increased controversies around game management and an increased recognition that wildlife

management is a practice that must consider public sentiments. Much of that research has focused on the importance of including public input in management decisions (Decker and Chase, 1997, Beck, 1998, Green et al., 1997). There are also several studies on attitudes and opinions of stakeholders and the public towards wildlife management practices (Mankin et al., 1999, Reiter et al., 1999, Lafon et al., 2003), especially controversial management practices around hunting and hunting practices (Loker and Decker, 1995, Teel et al., 2002). While this research has enhanced managers' understanding of different stakeholder perspectives, how to develop management strategies that encompass differing views and unite stakeholders remains a challenge (McMullin, 1996).

Black Bear Management in Nova Scotia

The black bear is the only species of bear that inhabits Nova Scotia and black bear management falls under the jurisdiction of the provincial Department of Natural Resources (NSDNR). Over the last twenty years NSDNR has greatly adjusted its bear management policies and bear harvesting regulations (Department of Natural Resources, 1997). In that period the black bear's status has changed from nuisance to valued game species. Currently, the black bear is classified by NSDNR as a "green-listed" species meaning it is "not believed to be sensitive, or at risk" (Department of Natural Resources, 2002, no page number). The Nova Scotia bear population has not been formally estimated; however, based on indirect indicators derived from the harvest, nuisance incidents, and sightings, the population is believed to be abundant and has increased over the past 20 years (Nette, NSDNR, pers. comm.). Similar to other jurisdictions, NSDNR

manages the population to ensure a healthy population (regulated through hunting) and a reduction in bear-human conflicts (Department of Natural Resources, 1997).

The Nova Scotia black bear population has not been well-studied. Other than two master's theses - one assessed the composition of the black bear harvest (Anderson, 1984), and the other examined habitat suitability in Richmond and Cape Breton counties (Macmichael, 2007) - there has been no research conducted on the province's bear population. There is no literature in any scholarly journals related specifically to Nova Scotia's black bear population or its management.

Purpose of Thesis

The purpose of this research is to assess black bear management in Nova Scotia and offer recommendations for appropriate changes, if necessary. It examines bear-management practices and formal black bear management plans from other jurisdictions to determine if Nova Scotia should apply any practices used in other jurisdictions. The research will contribute to the current paucity of literature on black bears in Nova Scotia. There has not been any previous research on opinions related to black bear management practices in Nova Scotia and there is an identified need for greater research into the human dimensions of bear management in north-eastern North America (Mclaughlin and Vaughan, 1999). There is also little research examining the effectiveness of formal management plans (Fallding, 2000). Although Lafon (2002) examined staff and participant opinions of the development of the Virginia Black Bear Management Plan, there are no studies on the value, effectiveness or use of black bear management plans despite their increasing use in several jurisdictions.

This research will examine how stakeholders and departmental staff perceive NSDNR's black bear management practices, and determine whether the practices are adequate for managing bear populations and maintaining public acceptability. It will also incorporate the opinions of a few Aboriginal participants, to assess First Nations' role in black bear management. Options for reducing the number of bear-human conflicts in Nova Scotia will be explored. Finally, the use of formal black bear management plans in other jurisdictions will be assessed, and black bear management practices in Nova Scotia will be compared to those of other jurisdictions, to determine whether Nova Scotia's current management practices are appropriate.

Objectives

The goal of this research is to provide a better understanding of effective and socially acceptable bear management practices for potential application in Nova Scotia. This research will achieve its goal by meeting the following objectives:

- determine the social acceptability of current NSDNR practices by analyzing how various stakeholders perceive the management of bears in Nova Scotia;
- determine what strategies can feasibly be employed to reduce the number of bear-human conflicts in the province;
- assess Nova Scotia bear management policies, practices and regulations against best practices used elsewhere and as described in the literature and determine which, if any, of these may be appropriate to apply within the Nova Scotia context; and,

- assess the need for a formal black bear management plan in Nova Scotia.

Achievement of these goals will help NSDNR develop management practices that are socially acceptable and address sustainable bear harvest and reduce bear-human conflicts. The findings may also be relevant for application in other areas where similar bear management circumstances exist.

Structure of the Thesis

The remainder of the thesis is divided into five chapters. Chapter 2 details the methods used in the data collection and analysis. Chapters 3 to 5 cover substantive issues arising from the research and are written as journal articles to be submitted for publication. Each has its own introduction, methods, results, and discussion sections, thus some overlap occurs. Chapter 3 compares and analyzes how both NSDNR staff members and stakeholders in Nova Scotia perceive the management of black bears in the province. Chapter 4 examines options for reducing bear-human conflicts in the province. In Chapter 5, Nova Scotia's bear management practices are compared to other jurisdictions in North America to determine whether there is a need for a formal black bear management plan in the province. Chapter 6 serves to tie together the major issues covered in Chapters 3 to 5, and provides concluding thoughts and recommendations for the overall project.

CHAPTER 2: METHODS

The data collection for this research had several components and used a mixed-methods approach. Interviews, surveys, and a policy analysis were used to assess Nova Scotia's bear management practices. All aspects of the data collection relied on the extensive literature available on black bear ecology and behaviour, perceptions of bear and wildlife management, nuisance bear activity and management, and tools and techniques for black bear management.

Prior to the interviews and surveys being conducted, approval was granted by the Dalhousie Human Research Ethics Board. All interviewees were advised that their participation was voluntary and their responses were confidential unless they gave permission to be cited. Some of the interviews were audio-recorded, with permission. Survey participants were advised, both by electronic mail (e-mail), and on the introductory page of the survey, that their participation in the survey was voluntary, their responses were confidential, and that they could withdraw at any time.

INTERVIEWS

Interviews of varying lengths and styles were conducted with three groups: NSDNR staff members, wildlife managers or biologists from other jurisdictions in eastern North America, and Aboriginal participants. Each type of interview is described in further detail in the following sections.

NSDNR Interviews

In-depth interviews were conducted with 10 NSDNR staff members who were chosen based on suggestions from the manager, wildlife resources for NSDNR (Tony Nette). The suggested staff members were contacted via e-mail and all who were contacted agreed to participate in an interview. Interviewed were two experienced wildlife technicians, the manager, wildlife resources, and the province's seven regional biologists. The interviews were conducted either in person or on the telephone, depending on scheduling, location, and other logistics, and ranged from 30-70 minutes. The interviews were semi-structured; the interviewees were asked a set of open-ended questions, with additional probing questions when appropriate (Bryman and Teevan, 2005). Additionally, the wildlife technicians were asked to detail how they deal with bear-human conflict situations. The interview questions were developed through a literature review of pertinent bear management issues and in discussion with thesis committee members (Appendix A). The interviews were audio-recorded and transcribed. The transcripts were then read and re-read to identify the key themes that emerged (e.g. importance of education in reducing bear-human conflicts). Passages that related to the key themes were grouped and assessed to determine where there is agreement and/or disagreement among staff members regarding bear management issues in Nova Scotia.

Interviews with Other Wildlife Managers

Interviews were conducted with a wildlife manager or biologist from 10 other jurisdictions in eastern Canada (New Brunswick and Ontario) and north-eastern United States (Maine, New Hampshire, Vermont, New York, New Jersey, Pennsylvania, Maryland, and Virginia). To determine what jurisdictions would be included, an internet

and literature search was conducted to determine what kinds of management policies existed in the north-east. Jurisdictions with any type of available black bear management policy were contacted. New Hampshire, New Jersey, Pennsylvania, Maryland, and Virginia were included because they all had black bear management plans. New York was contacted to obtain more information on the state's publicly-available nuisance response policy. Maine, Vermont, and New Brunswick were selected because they are very close geographically to Nova Scotia and share the same eco-region; Ontario was chosen because of the desire to have another Canadian province included in the assessment. The number of interviews was capped at 10 due to the need to also focus on the other methods of data collection. The participants were either contacted directly by e-mail if the appropriate person could be identified, or the responsible department/agency was contacted and an appropriate person was suggested and contacted. All participants who were contacted agreed to participate.

The interviews were brief (approximately 20 minutes) telephone conversations that were not audio-recorded or transcribed, however notes were taken during the interview. The purpose of these interviews was to gain insight into how other jurisdictions manage their black bear populations. Similar topics were covered in each interview; however the questions were modified for each jurisdiction based on information collected about each province or state before the interview (Appendix B). Questions pertained to population monitoring, harvest regulations, various management policies, and methods of dealing with bear-human conflicts. In jurisdictions that had black bear management plans or frameworks, the interviewees were asked about the process of developing the plan and the value of having a plan in place. In jurisdictions without a management plan, interviewees

were asked about the department's management practices in the absence of a plan. The interviewee from New York was questioned about that state's detailed black bear response manual. All the responses were divided and organized into similar categories (e.g. management plans, population monitoring, harvest regulations) to determine how different jurisdictions manage their black bear populations, and to assess how the interviewees perceive their department's management.

Aboriginal Interviews

Interviews were conducted with two Aboriginal participants in Nova Scotia. The interviews were conducted in person and written notes were taken. The individuals were chosen based on advice from Tony Nette (NSDNR's manager, wildlife resources). Both had experience dealing with NSDNR on a variety of issues, including wildlife management. Tony Nette contacted three potential Aboriginal participants and informed them of the project, and inquired if they would be interested in participating. Two of those contacts replied and both indicated they were interested and interviews were then set-up. The purpose was not to obtain information that was representative of the entire Aboriginal community in Nova Scotia, but to gain insight into how two Aboriginals perceive NSDNR's black bear management and what they think the role of Aboriginals should be in management. There were a few standard questions asked (Appendix C), however each interview ended up being more than an hour in length, as the interviews were of a conversational style. The participants were asked about their relationship with NSDNR and Aboriginal perspectives on black bear management. Following the interviews, the notes were summarized and the issues that emerged in both interviews were determined and related back to the other data and the key themes of the thesis.

SURVEYS

Survey Design

Two web-based, self-administered surveys were developed using the survey software Opinio (Version 5.2.9, 2006, ObjectPlanet Inc.). One survey was developed for distribution to NSDNR staff members and the other for distribution to members of selected stakeholder groups (agriculturalists, hunters and trappers, and non-consumptive). The purpose of the surveys was to gather knowledge and opinions from both staff and stakeholders about black bears in Nova Scotia, NSDNR's current management practices, dealing with nuisance bears, and controversial black bear issues. An on-line survey was chosen because it is cost-effective, allows for simple and instant communication with participants, and has the potential for rapid return rates on questionnaires (Czaja and Blair, 2005, Dillman, 2007).

Survey questions were developed by reviewing the literature for pertinent issues and with input from the thesis committee. As well, Lafon (2002) conducted two surveys of agency staff members and stakeholders who participated in the development of the Virginia Black Bear Management plan. Those surveys provide an excellent resource of questions and some of the same, or modified, questions were used with permission. Established survey design methods were also used to help ensure appropriate order and wording of questions, style of the questionnaire, and appropriate methods for contacting participants (Fowler, 1993, Czaja and Blair, 2005, Dillman, 2007). The surveys were pre-tested several times both formally on committee members and knowledgeable professionals, and informally among family and friends. The pre-testing allowed for clarification of

question wording, identification and correction of errors, and assurance that the software worked well.

The two surveys had different questions but covered similar issues (Appendices D and E). Respondents were asked about their experience with bears, how they think NSDNR is managing the black bear population, and whose input should be considered in black bear management. Respondents were also asked about controversial issues: hunting over bait, hunting with hounds, the sale/export of bear gall-bladders, and spring hunting. The questions were all closed-ended, with the option for respondents to comment freely in a few places. Several questions used response categories designed to measure the strength of respondents' attitudes or opinions on certain issues (e.g. strongly agree/agree/neutral/disagree/strongly disagree).

NSDNR Survey Sample

The NSDNR survey was intended to obtain opinions from a broader sample of NSDNR staff to complement the results obtained in the interviews and to compare with the responses from stakeholder groups. The survey was sent to staff members (n=111) who have a role in black bear management including wildlife technicians, biologists, forest technicians, area supervisors and conservation officers. A list containing the e-mail addresses of staff members in those positions was provided by NSDNR. Ten days prior to the survey invitation and link being sent by e-mail, participants were informed by e-mail of the study and its purpose. To increase response rate (Czaja and Blair, 2005), two reminder e-mails were sent, one week apart, to anyone who had not yet completed the survey.

Stakeholder Survey Sample

Stakeholder groups invited to take part in the survey were agriculturalists (blueberry growers and beekeepers), hunters and trappers, and individuals with non-consumptive interests in bears. Groups were selected through discussions with committee members and through a literature review where the same groups were often identified as important stakeholders. Appendix F provides a list of the groups contacted. The Nova Scotia Beekeepers Association, the Wildlife Blueberry Producers Association of Nova Scotia, and the Nova Scotia Federation of Anglers and Hunters all provided a description of the project to their members either through a posting on their websites or e-mail messages to members. This generated several participants from each of those groups. Naturalist societies and environmental organizations were also contacted to solicit participation of non-consumptive stakeholders and in most cases only one person from each group participated. Participants represented a purposive (or convenience) sample meaning that they were not randomly selected, and were not representative of the entire group they represented, or of the general public (Czaja and Blair, 2005). Forty-seven stakeholders agreed to participate and were sent a link to the survey by e-mail. Similar to the NSDNR survey, stakeholders were sent two reminders, one week apart, if they had not yet completed the survey.

Survey Analysis

Once the surveys were completed, reports were tabulated and generated in Opinio (Version 5.2.9, 2006, ObjectPlanet Inc). The reports were generated based on criteria entered (e.g. hunter responses only) and they showed the number and percentage of

respondents who selected each response. The survey results were analyzed comparatively but not statistically because the use of non-random participant selection means that the results can not be used to generalize for a larger population (Czaja and Blair, 2005). The survey responses were examined to determine when respondents agreed or disagreed, and how the responses compared among and between NSDNR staff and stakeholder groups when the same questions were asked of both groups. NSDNR reports were generated to analyze the responses in two ways: (1) as a whole, and (2) the responses of staff members having less than 10 years work experience with the Department were compared to those with 10 or more years' experience. Responses from the stakeholder survey were examined to compare (1) stakeholder groups, and (2) rural versus urban residents.

POLICY AND DATA ANALYSIS

Analysis of Black Bear Management Plans and Practices

Black bear management plans of six jurisdictions were obtained and analyzed. The plans were from Maryland, New Hampshire, New Jersey, Pennsylvania, Vermont, and Virginia. The plans were selected based on the general geographical proximity of the jurisdiction to Nova Scotia. The jurisdictions were limited to north-eastern North America because many of those jurisdictions are similar to Nova Scotia in that they have relatively high human-density levels, have had similar black bear management histories, and do not manage for grizzly bear populations. The plans were also selected based on their availability. Two other jurisdictions stated that they had management plans or frameworks, but a copy was not available because it was not in electronic format or because a new plan was in the development process. The organization and format of the plans were compared to determine what components are common to all or most of the

plans, or whether there is a common format used in all of the plans. Contents of the plans were also assessed to determine common issues represented in the plans, and what aspects of black bear management appear to be absent from some or all of the plans.

A comparison of management practices among jurisdictions in eastern North America was conducted. The jurisdictions were the same as those represented by the managers/biologists who were interviewed. Harvest regulations were compared among provinces and states. Research activities and efforts towards population monitoring were also compared across jurisdictions. The goal was to determine whether any specific practices are common in most jurisdictions, and to determine how Nova Scotia's practices compare to those of other jurisdictions. Information was derived from the telephone interviews with the wildlife managers and biologists in these jurisdictions, the departments' websites, scholarly literature, and black bear management plans and policies (where applicable).

Assessment of Other NSDNR Data

Every time NSDNR receives a wildlife-related call a Wildlife Investigation Report (WIR) is completed. These reports can be related to a number of incidents including vehicle accidents involving wildlife, unusual wildlife sightings, and wildlife nuisance complaints. All WIRs for black bear incidents from 2003 to 2007 were provided by NSDNR technicians. Subsequently the number, type and location of all nuisance complaints were determined. These reports were used to get an accurate description of the number, type, and location of calls NSDNR handles related to black bears. This allowed for assessment of what types of nuisance complaints are most common, how the complaints are

distributed across the province, and how most complaints are resolved. The WIR data were also compared to the responses provided by NSDNR staff to determine whether they are dealing with conflicts as they stated in the interviews and surveys, and to the responses of stakeholders to see if the concerns expressed by stakeholders matched the types of conflicts taking place at a provincial level.

INTEGRATION OF RESULTS

Once the data collection was complete the key issues from each data set were compared to determine the most important overarching issues. The information obtained from the various groups was combined to create a complete picture of black bear management in Nova Scotia. The main issues covered in all aspects of the data collection (e.g. controversial issues, bear-human conflicts) were compared to see how the different groups perceive the issue in Nova Scotia. The major issues that emerged from the NSDNR interviews (bear-human conflicts, population monitoring, controversial issues, need for proactive management) were generally complemented by the results of the NSDNR and stakeholder surveys that also addressed these issues. The thesis objectives were then re-visited to determine how they could be addressed through a series of papers that address both the research objectives and the key themes that emerged through the data collection.

CHAPTER 3: SOCIAL CONSIDERATIONS IN BLACK BEAR MANAGEMENT

This chapter is a stand-alone paper to be submitted to a scholarly journal yet to be determined. Kathleen Witherly collected the data and wrote the paper with input from. Karen Beazley and Tony Nette as thesis supervisors.

ABSTRACT

This study used interviews and surveys to determine how provincial Department of Natural Resources (NSDNR) staff, Aboriginal participants, and members of stakeholder groups (hunters/trappers, agriculturalists, non-consumptive) perceive the management of black bears in the province of Nova Scotia. NSDNR staff members were generally satisfied with the department's management of black bears but expressed a desire for increased education, research, and population monitoring. Within and between the stakeholder groups, opinions varied about NSDNR's practices and controversial bear-management issues. Opinions on certain controversial practices (hunting over bait, hunting with hounds, spring hunting, and sale/export of bear gall-bladders) were gathered and most groups only supported hunting over bait and the sale/export of bear gall-bladders. For dealing with bear-human conflicts, staff members' approach to handling situations generally coincided with the approach desired by stakeholders. The results show a need for increased public outreach by NSDNR to determine why stakeholders' opinions are divided. The results are useful to wildlife managers elsewhere because they highlight areas of agreement and disagreement among stakeholder groups, and provide insight into how departmental staff perceive management practices.

INTRODUCTION

The American black bear (*Ursus americanus*) exhibits abundant populations throughout most of its current range and populations are growing in many areas (McCracken et al., 1995, Pelton et al., 1999, Williamson, 2002, Garshelis and Hristienko, 2006). Managing black bear populations in a socially acceptable manner is a challenge for wildlife managers (McMullin, 1996) given conflicting opinions and public values around the black bear (Kellert, 1995). Bears evoke various human emotions. Many people believe that bears have aesthetic and ecological values (Shaw 1977, Jonker et al., 1998, Garshelis et al., 1999), they are popular symbols for mascots and children's toys (Adams et al., 2006), and they have utilitarian value and are an important game species throughout the continent (Servheen, 1990, Williamson, 2002). However, black bears can be an irritant to homeowners, agriculturalists and business operators as they are voracious eaters who often damage property in search of food (Peine, 2001). Many people fear bears because they are concerned for their safety or for damage to their property (Hygnstrom and Hauge, 1989). Achieving management strategies that satisfy these conflicting values can be challenging.

This study uses interviews and surveys to examine conflicting and/or complementary knowledge and opinions among stakeholders, Aboriginals, and government departmental staff towards bears and bear management, using the province of Nova Scotia as an example. The study identifies and focuses on opinions about four controversial bear-management issues: hunting over bait, the use of hounds, spring hunting, and the sale/export of bear gallbladders. Determining what stakeholders and staff members think about a government department's practices is useful for wildlife management agencies as

they try to develop effective and socially acceptable black bear management practices. The paper provides a brief contextual overview of black bear management issues, then presents the Nova Scotia case study and methods. Results focus on opinions of black bear management in general and the four controversial issues, and reveal differences in opinion among stakeholders, staff members, and Aboriginals. Management implications are discussed with specific reference to social acceptability of various practices and the inclusion of different groups in decision-making. Recommendations are then made for incorporation into bear management practices and policies in Nova Scotia, with potential utility for application in other regions where similar challenges exist.

Black Bear Management Issues

Persistent and widespread challenges in bear management exist with respect to bear-human conflicts and harvest practices. Concerns about bear-human conflicts are a dominant focus of wildlife managers (Peine, 2001, Adams et al. 2006, Spencer et al., 2007). There is no single-best way to deal with nuisance situations, but some common methods include providing information to the complainant to help avoid or minimize future conflicts, relocation of the bear, or lethal control (often referred to as "euthanasia"). Generally lethal control of nuisance bears is a last resort because there is often little support for it among members of the public (Reiter et al., 1999, Lafon, 2002).

Harvest is a long-standing traditional method of controlling bear and other game populations that is losing popularity among the general public in North American due to increasing opposition to the killing of wildlife for sport (Shaw, 1977, Mankin et al., 1999, Messmer, 2000, Teel et al., 2002). Select bear-hunting techniques are especially

controversial. According to Beck (1998, p.22), "[w]e have permitted hunting methods for bears that we prohibit for nearly every other species (baiting, spring hunting, use of hounds, waste of meat)". The first three issues he cites (baiting, spring hunting, use of hounds) have come to a head in many jurisdictions. States such as Colorado, Alaska, Oregon, Washington and Maine have all held referendums (through initiative processes in their states' constitutions) allowing voters to decide whether hunting over bait and/or hunting with hounds should continue to be legal (Boulay et al., 1999, Gray et al., 2004, Koehler and Pierce, 2005, Hristienko and McDonald, 2007). Consequently, only Alaska and Maine continue to allow those practices. In Canada there is no process for citizens to initiate referendums however these same issues are contentious. Activists in Ontario were successful in stopping the annual spring bear hunting season in 1999 (Canadian Broadcasting Corporation, 2000) and in Manitoba there has been a push by animal-rights groups to end the spring hunting season in that province (Hristienko et al., 2004). Recently, the People for the Ethical Treatment of Animals (PETA) called on the Canadian Prime Minister to end bear hunting over bait in the country (Canadian Press, 2008). The sale/export of bear gall-bladders is another issue of concern because of trade in Asiatic black bear gall-bladders for use in traditional Asian medicines and food (Twiss and Thomas, 1999, Williamson, 2002). Concern that "bear parts from *protected* Asian bears were entering trade falsely labelled as *unprotected* American black bears" led to the American black bear being listed in 1992 under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) under the "look-alike" provision (Williamson, 2002, p.2). Stricter laws at the state or provincial level governing the trade of bear gall-bladders were also enacted. Five states and two provinces banned the export of bear gall-bladders between 1992 and 1999 (Williamson, 2002).

Managing black bear populations in the midst of these controversies has become especially challenging as input from, and consultations with, various interest groups have become a necessary component in decision-making (Lafon et al., 2003, Lindsey, 2003). While traditionally the only stakeholders with much input were hunters (Lindsey, 2003), this has changed and the support of a variety of groups including farmers, environmental organizations, homeowners, and the general public has become essential for wildlife managers to do their job effectively (Teel et al., 2002). In Canada, because of agreements to "share governance of natural resources" (Doyle-Bedwell and Cohen, 2001, p.170), communication and partnerships with Aboriginal peoples is also an important aspect of black bear management. Increased input and consultation into black bear management can present challenges for management agencies because different groups demonstrate varying opinions and knowledge of black bear management, leading to a wide-range of opinions on what kinds of management decisions are acceptable (Decker and Chase, 1997, Lafon, 2002).

Case Study of Nova Scotia

Nova Scotia is a small province on Canada's Atlantic Coast. The management of bears in the province falls under the jurisdiction of the Nova Scotia Department of Natural Resources (NSDNR). Nova Scotia has one bear-hunting season in the fall; there has never been a spring bear-hunting season in the province. Legal methods of harvest include trapping by foot snare and hunting over bait. Hunters are required to hunt over bait at a registered bait site prior to the opening of the deer hunting season, at which time the requirement is removed and hunters no longer need to use bait. Nova Scotia has

never allowed hunting with the use of hounds, but hounds have been used on occasion to scare off nuisance bears. The sale and export of bear gall-bladders from legally-harvested bears is legal in Nova Scotia, providing the gall-bladder is registered and sealed with a permanently attached locking seal by NSDNR. All bear hunters, regardless of success, are required to submit a report form at the end of the hunting season, and successful hunters are required to submit the bear's skull to extract a tooth for age and sex determination. However, submission of forms and skulls from hunters has been low in recent years (Nette, NSDNR, pers. comm.). A challenging bear-management issue in Nova Scotia is that of bear-human conflicts as NSDNR staff are busy throughout the spring and summer responding to bear complaints throughout the province.

METHODS

Interviews and web-based surveys with NSDNR staff and members of various interest groups were used to addressed various aspects of bear management including general approaches and specific practices. Responses were analysed to determine key issues in bear management in Nova Scotia, and once those key issues were identified the responses were assessed to determine how respondents agreed and disagreed on those issues. Methodological details are provided in the following sections.

Interviews

Interviews were conducted, either in-person or over the telephone, with 10 NSDNR staff members. The staff members to be interviewed were suggested by the manager, wildlife resources for NSDNR who is responsible for overseeing management programs for bear, deer, and moose in Nova Scotia. The manager was interviewed along with wildlife

technicians (n=2), who often deal first hand with bear-human conflicts, and wildlife biologists (n=7), who carry out management regimes in each region. Staff members were asked similar sets of questions pertaining to bear management in Nova Scotia including those about how NSDNR could reduce the number of bear-human conflicts, what the role of the public should be in bear management, and their opinions on controversial bear-management practices (spring hunting, hunting with hounds, hunting over bait, and sale/export of bear gall-bladders). The interviews generally lasted from 30-70 minutes and responses were audio-recorded and transcribed. The information was then assessed to allow for identification of key issues in bear management in Nova Scotia and determination of opinions on controversial issues.

Two interviews were also conducted with Aboriginal (Mi'kmaq) individuals in Nova Scotia. The participants were identified on advice from NSDNR's manager, wildlife resources, and they both have experience dealing with NSDNR on many issues, including harvest and wildlife matters. The interviews were conducted to gain perspectives on how Aboriginal groups perceive black bear management in Nova Scotia, and what they think Aboriginal involvement should be in black bear management. The opinions gathered were not meant to represent those of all Aboriginals in Nova Scotia, but to gather some insight from these individuals who are familiar with NSDNR and wildlife management issues.

Surveys

Two surveys were developed to investigate knowledge and opinions of the management of black bears, similar to surveys developed by Lafon (2002). Lafon's surveys focused

on knowledge and opinions of staff and stakeholders of bear management practices in Virginia, while this study focused on Nova Scotia. The surveys were web-based and were developed using the software Opinio (Version 5.2.9, 2006, ObjectPlanet Inc.). One survey was developed for distribution to NSDNR staff members and the other for distribution to members of stakeholder groups. The survey for NSDNR staff was sent to all staff who have a role in black bear management either through dealing directly with complaints, or by supervising on-the-ground staff (n=111). The participants were advised of the survey by electronic mail (e-mail) 10 days prior to the survey invitation and link being sent by e-mail. A reminder e-mail containing a link to the survey was sent one week later if the survey had not been completed; one week after that a second and final reminder e-mail was sent.

Three classes of stakeholder groups were solicited for participation in the stakeholder survey: (1) hunters/trappers, (2) agriculturalists (beekeepers and blueberry growers), and (3) members of environmental or non-consumptive wildlife organizations. These groups were chosen because they are consistently part of black bear management planning in other jurisdictions (Lafon, 2002, Maryland Department of Natural Resources, 2004, Bureau of Wildlife Management, 2006). The respondents chosen were not meant to represent the general public or the stakeholder groups as a whole but to gather insights from a few members. Members of these groups were contacted directly through telephone calls or e-mails to organizations and associations (Appendix F) and/or a posting on their websites. Fifty-one individual stakeholders agreed to participate and were sent a link to the survey. As with the NSDNR survey method, two reminder e-mails were sent to anyone who had not yet completed the survey.

Following completion of the surveys the data were summarized and tabulated, and Opinio provided reports of the number and percent of respondents who selected each response. The survey results were analyzed comparatively but not statistically because the use of non-random participant selection means that the results can not be used to generalize for a larger population (Czaja and Blair, 2005). The results were assessed to determine where respondents agreed or disagreed, and on what issues respondents were divided. The NSDNR survey responses were analyzed in two ways: (1) as a whole, and (2) by comparing the responses of staff members with 10 or fewer years of experience with NSDNR to those with more than 10 years. The stakeholder surveys were also analyzed (1) as a whole, (2) by comparing stakeholder groups, and (3) rural versus urban residents. Finally, NSDNR and stakeholder survey responses were compared to assess similarities and differences between the groups.

RESULTS

Respondents

The NSDNR has an experienced, long-term staff. The 10 interviewees have worked for NSDNR an average of 22 years. Sixty-one NSDNR staff members responded to the web-based survey (55% response rate). Most of the NSDNR survey respondents (70%) have been employed by the Department for 11 or more years. The most common black bear-related responsibilities of these respondents were "deal[ing] primarily with public complaints" (66%), "site visits, euthanizing [lethal control] or relocating animals" (62%), and "supervising field staff dealing with bears" (57%). Most of the NSDNR respondents

(67%) have hunted/snared game in Nova Scotia within the last five years and 28% have hunted/snared black bear in the province in those five years.

Forty-seven completed responses were received from the stakeholders (92% response rate). The dominant stakeholder group represented was hunters/trappers, with 26 respondents (55%). Sixteen respondents (34%) identified as beekeepers or blueberry growers (agriculturalists), and 11 respondents (23%) as members of either environmental or non-consumptive wildlife organizations (non-consumptive). Some respondents identified as both hunter/trapper and agriculturalist (n=7), or hunter/trapper and member of a non-consumptive/environmental organization (n=2); however no respondent identified as both agriculturalist and member of a non-consumptive/environmental organization. Most of the stakeholders (68%) identified as living in an area that was rural/forested or rural/agricultural while 32% identified as living in an area considered urban or urban/rural fringe. There were urban and rural residents representing every stakeholder group.

The stakeholder respondents do not represent the general public and they are more likely to be knowledgeable about black bears in Nova Scotia than the average resident. All but one of the respondents had seen a black bear in the wild in Nova Scotia and over half (66%) had received most of their information about black bears through personal experience or observation. Most of the respondents (70%) had hunted or snared game in Nova Scotia within the past five years, and 57% of all the respondents had hunted or snared black bear in the province (including some participants who identified as belonging to a non-consumptive wildlife organization).

The agriculturalists were the only stakeholder group that had experienced routine problems with bears and had suffered economic losses due to bears. Three-quarters (75%) of the agriculturalists had experienced damage due to black bears in the past five years and 38% experience damage on average more than six times per year. Respondents were asked to describe the extent of the damage they experienced and the economic losses suffered. Eleven of the 13 responses related to agricultural damage: eight cited beehives destroyed, two suffered damage to blueberry fields, and one respondent had both beehives and blueberry fields destroyed. The other two responses mentioned backyard damage (e.g. birdhouse torn down). The cost of the agricultural damage cited ranged from $600 – $10,000 CAD. None of the non-consumptive and only 31% of the hunters/trappers have experienced damage in the last five years. When respondents were compared by residency, none of the urban residents had experienced bear damage in the last five years while half (50%) of the rural residents had experienced damage.

Stakeholders were asked whether they had contacted NSDNR about damage they had suffered and 13 respondents (11 agriculturalists) left comments. Two respondents stated that they call NSDNR often, while another two did not call NSDNR because they solved the problem themselves (isolated incidents). Four respondents (all agriculturalists) said that they call NSDNR but do not generally find the Department to be helpful and two others (agriculturalists) stated that they had given up calling NSDNR because they did not receive adequate assistance in the past. Three additional agricultural respondents said that they contacted NSDNR to obtain a permit to shoot the nuisance bear.

NSDNR Perspectives of Black Bear Management in Nova Scotia

Most NSDNR survey respondents think the Department is doing well in many operational aspects of black bear management in Nova Scotia (Table 3.1) and 56% think there are an appropriate number of bears in the province. The highest percentage (75%) of staff responses is in those indicating that the Department is performing well in collecting harvest data. This may be considered surprising given the low response rates of the hunter report forms. In the interviews with NSDNR staff members, participants were asked how the Department could improve the response rate of hunter reports. Most suggested greater enforcement and follow-up with hunters, with some possible methods including a reduced price for those who returned their forms, or not allowing hunters to purchase a licence the following year if they did not return their form. Some staff members commented that enforcement efforts have become increasingly difficult since hunting licences are sold not only at NSDNR offices but also by over 900 vendors throughout the province.

Table 3.1: Opinions of NSDNR staff members (n=61) of the Department's performance on operational aspects of black bear management.

	Good/ very good	Neutral	Poor/ very poor	No opinion
Implementing biologically sound hunting regulations	62%	26%	10%	2%
Implementing socially acceptable hunting regulations	70%	23%	5%	2%
Training staff adequately for on-site visits	62%	30%	8%	0%
Staff appropriately responding to bear complaints	74%	20%	6%	0%
Balancing interests of hunters and non-consumptive users	46%	36%	13%	5%
Collecting yearly harvest data	76%	11%	11%	2%
Compiling data from Wildlife Investigation Reports	72%	14%	7%	7%
Maintaining data of registered bait sites	56%	16%	23%	5%

In the interviews with NSDNR staff members, the most pressing issue that emerged was that of bear-human conflicts; every staff member mentioned the conflicts as a problem at some point during their interview. Although staff members indicated that they think the Department is doing a good job at handling the complaints (Table 3.1), they are concerned about the number of complaints they deal with, especially in residential areas. NSDNR staff members believe that greater efforts need to be put into educating Nova Scotia residents about reducing problems with bears. The issue of bear-human conflicts is addressed in greater detail in Chapter 4.

NSDNR staff members also expressed concern about the lack of black bear research and population monitoring in the province. When asked "in what areas is management weak", six of the 10 interview respondents stated that the Department does not do any population monitoring or research on the province's bear population. Seven interviewees at some point mentioned that better population monitoring was needed. Trends in the provincial bear population are assessed by looking at indirect indicators of relative abundance and distribution using information obtained through hunter effort and success, as well as Wildlife Investigation Reports (WIR), which are completed by NSDNR staff after a bear-related incident. The Department does not come up with estimates of the population but instead monitors long-term trends in harvest and nuisance situations. Most NSDNR interviewees mentioned a desire for a better understanding of population levels, however most also acknowledged the many difficulties associated with estimating bear populations including the intense resources required and the movement and shy nature of bears. The single manager that was interviewed indicated that, from a management perspective,

increased population monitoring is expensive and unnecessary. He is confident that the Department is appropriately monitoring the population levels through indicators of abundance as previously described.

The Department does not conduct research on the life-history of black bears in the province. When nine of the interviewees were asked specifically whether more research needed to be done on the province's black bear population, eight of them replied affirmatively, although one was prefaced with "in a perfect world". Interviewees generally expressed a desire to have a better understanding of the habitat, ecology, and life-history of Nova Scotia's black bears. Similar to the majority of interviewees, 67% of NSDNR staff survey respondents agreed or strongly agreed that greater management efforts by the NSDNR should focus on studying the biology of the province's bear population (23% were neutral and 8% disagreed or strongly disagreed). The manager interviewed did not think biological research was necessary, believing instead that any research-related resources should be directed at exploring ways to reduce nuisance issues. None of the staff members thought that a lack of research or population monitoring was having an impact on the bear population, however several staff members expressed that the lack of information about the black bear population prevents the Department from making the soundest decisions possible.

Another area of concern among NSDNR staff is staffing levels. Half of the interviewees commented that their workload is increasing and expanding while the number of employees is shrinking. This issue tied into their other concerns as a few staff members commented that increased efforts towards things like research and public education are

not possible given their current workload. The following passage sums up some of the perspectives expressed:

> I think I would be safe in speaking for most of our people here…We are running pretty thin….we need more manpower to educate, get the information out, actually go inspect a lot of these complaints, and [with] a little more footwork on the ground we could educate and eliminate a lot of these problems….but it's like everything else, we're just downsizing (NSDNR staff member).

Stakeholder Perspectives of NSDNR's Management

The results of the stakeholder survey highlight differences in opinions between the various stakeholder groups. Hunters/trappers and non-consumptive respondents show a greater appreciation for residing in a region populated by black bears than do agriculturalists (Table 3.2, statements 1-2). Most agriculturalists think there are too many bears in Nova Scotia, most non-consumptive stakeholders think there are too few, and most hunters/trappers think there are an appropriate number. Hunters/trappers demonstrated the highest level of agreement with statements pertaining to NSDNR's performance in black bear management (Table 3.2, statements 3-6), while the agriculturalists had the highest level of disagreement.

Not only are there differing opinions and varying levels of support for NSDNR between stakeholder groups, there are also divisions within stakeholder groups (Table 3.2). For example, hunters/trappers are equally divided (46% each) on whether NSDNR considers the concerns of interested parties when making management decisions about black bears. Non-consumptive respondents indicate divergent opinions about whether NSDNR manages black bears appropriately (18% agree/strongly agree versus 36%disagree/strongly disagree), and whether NSDNR considers all available

biological/behavioural information when making management decisions about black bears (18% versus 27%). The statements about more detailed management actions by NSDNR (statements 4-6) have a relatively high level of "neutral" or "no opinion" responses, indicating that many respondents are less knowledgeable or are less interested or concerned about specific management actions by NSDNR. The results in Table 3.2 indicate that NSDNR does not appear to have overwhelming support from any of the stakeholder groups.

Table 3.2: Opinions of the stakeholders who participated in the survey on black bears and black bear management in Nova Scotia (Hunters/trappers: n=26, Agriculturalists: n=16, Non-consumptive: n=11).Due to rounding, numbers do not always add up to 100%.

Statement	Stakeholder group	Agree/ strongly agree	Neutral	Disagree/ strongly disagree	No opinion
1. I am glad I live in a province where we share our environment with a black bear population	Hunters/ trappers	100%	0%	0%	0%
	Agriculturalists	56%	31%	13%	0%
	Non-consumptive	100%	0%	0%	0%
2. To prevent endangerment I would approve of protecting black bears even if it hurt economic development	Hunters/ trappers	77%	0%	19%	4%
	Agriculturalists	37%	19%	44%	0%
	Non-consumptive	100%	0%	0%	0%
3. The NSDNR manages Nova Scotia's black bears appropriately	Hunters/ trappers	54%	4%	38%	4%
	Agriculturalists	25%	0%	75%	0%
	Non-consumptive	18%	27%	36%	18%
4. When making management decisions about black bears the NSDNR adequately considers all available biological/ behavioural information	Hunters/ trappers	42%	15%	31%	12%
	Agriculturalists	19%	25%	44%	12%
	Non-consumptive	18%	27%	27%	27%

Statement	Stakeholder group	Agree/ strongly agree	Neutral	Disagree/ strongly disagree	No opinion
5. When making management decisions about black bears the NSDNR considers the concerns of interested parties	Hunters/ trappers	46%	8%	46%	0%
	Agriculturalists	25%	19%	56%	0%
	Non-consumptive	36%	36%	9%	18%
6. The NSDNR effectively educates Nova Scotia residents about how to avoid problems with bears on their property	Hunters/ trappers	58%	15%	27%	0%
	Agriculturalists	19%	12%	69%	0%
	Non-consumptive	55%	18%	27%	0%

Conflict Situations

In both the interviews and on the survey (Table 3.1) NSDNR staff members expressed confidence that the Department is appropriately responding to bear-related complaints from the public. NSDNR staff members were asked to rate both what they thought was the most effective, and the most socially acceptable way of dealing with certain bear-related situations, in urban and rural situations (Appendix G). A higher percentage of staff members chose "euthanasia" (lethal control) and "no action taken" as a socially acceptable solution for rural situations than in urban situations. The results were compared for staff with 10 or fewer years' experience with NSDNR to staff who have been employed more than 10 years. For the most part the solution chosen by the highest number of respondents matched among both levels of staff experience (Appendix G). However, for most situations a higher percentage of staff with fewer years experience chose "euthanasia" as a socially acceptable solution. The most pronounced difference in what staff members thought was effective versus socially acceptable was in the practice of euthanasia of repeat offender bears, and not taking any action for bears passing through

property (Table 3.3). Table 3.6 demonstrates what method the highest number of NSDNR staff members thought was the most socially acceptable in dealing with the situations presented.

Table 3.3: Differences in perceived effectiveness and social acceptability in dealing with two specific bear human conflict situations among NSDNR staff survey participants (n=61).

Location of situation	Euthanasia for repeat offender bears		No action taken for bears passing through property	
	Effective	*Socially acceptable*	Effective	*Socially acceptable*
Rural	87%	*61%*	100%	*75%*
Urban	87%	*46%*	84%	*57%*

Stakeholders were asked to select their preferred method for NSDNR to use in handling bear-related situations on their property. The results were separated and compared for rural versus urban respondents (Table 3.4). There are members of every stakeholder group represented in both the rural and urban categories. Urban stakeholders are less supportive than rural stakeholders of euthanasia as an option for every situation, except for "bear passing through property", in which case neither group is supportive. Capture & release and aversive conditioning are similar methods of dealing with a situation in that they both involve actively dealing with a bear in a non-lethal manner.

Table: 3.4**:** Preferred method for NSDNR to use in dealing with nuisance situations as indicated by rural and urban stakeholder participants in the survey on black bear management (Rural: n=32, Urban: n=15).

	Residency of respondent	Euthanasia	Capture & release	Aversive conditioning	No action taken/ information provided	No opinion
Bear passing through property	*Rural*	*0%*	*3%*	*6%*	*91%*	*0%*
	Urban	0%	7%	7%	87%	0%
Bear foraging in garbage/ compost	*Rural*	*6%*	*19%*	*31%*	*41%*	*3%*
	Urban	0%	13%	13%	73%	0%

	Residency of respondent	Euthanasia	Capture & release	Aversive conditioning	No action taken/ information provided	No opinion
Crop damage	*Rural*	*31%*	*38%*	*25%*	*6%*	*0%*
	Urban	0%	33%	53%	13%	0%
Aggression towards human	*Rural*	*81%*	*13%*	*6%*	*0%*	*0%*
	Urban	47%	27%	20%	7%	0%
Repeat offender bears	*Rural*	*66%*	*34%*	*0%*	*0%*	*0%*
	Urban	27%	60%	13%	0%	0%

To determine whether NSDNR staff are accurately assessing social acceptability, the responses selected by the greatest number of stakeholders and NSDNR staff members were compared (Table 3.5). The NSDNR responses represent what they think is the most socially acceptable way of dealing with the situation presented and the stakeholder respondents are divided into urban and rural residents. Table 3.5 shows NSDNR staff tend to underestimate when it is not necessary to take action, and overestimate when euthanasia is socially acceptable, especially for urban situations. However, the urban respondents in this survey have not experienced any bear damage in the past five years, so the results need to be treated cautiously because results from urban respondents who have recently experienced damage could be different. In general, the method selected by the highest number of NSDNR staff matches that of the highest number of stakeholders and, most importantly, NSDNR is appropriately assessing when euthanasia is a socially acceptable method of dealing with a situation.

Table 3.5: Method of dealing with bear situations chosen by the highest number of NSDNR respondents (n=61) for both urban and rural situations, and the highest number of urban (n=15) and rural (n=32) stakeholder respondents on the survey.

Situation	**Method selected by highest number of respondents**			
	Urban situations		*Rural situations*	
	NSDNR (socially acceptable)	Urban stakeholders	NSDNR (socially acceptable)	Rural stakeholders
Bear passing through property	No action taken/ information provided (57%)	No action taken/ information provided (87%)	No action taken/ information provided (75%)	No action taken/ information provided (91%)
Bear foraging in garbage or compost	Capture & release (54%)	No action taken/ information provided (73%)	Capture & release (43%)	No action taken/ information provided (41%)
Crop damage	Capture & release (59%)	Aversive conditioning (53%)	Capture & release (48%)	Capture & Release (38%)
Aggression towards humans	Euthanasia (77%)	Euthanasia (47%)	Euthanasia (84%)	Euthanasia (81%)
Repeat offender bears	Capture & release (46%)	Capture & release (60%)	Euthanasia (61%)	Euthanasia (66%)

Table 3.6: Method for NSDNR to use in dealing with bear situations chosen by highest number of respondents from each stakeholder group (Hunters/trappers: n=26, Agriculturalists: n=16, Non-consumptive: n=11).

	Method selected by highest number of respondents		
Situation	**Hunters/trappers**	**Non-consumptive**	**Agriculturalists**
Bear passing through property	No action taken/ information provided (100%)	No action taken/ information provided (91%)	No action taken/ information provided (75%)
Bear foraging in garbage or compost	No action taken/ information provided (62%)	No action taken/ information provided (72%)	Aversive conditioning (38%)
Crop damage	Capture & release (50%)	Aversive conditioning (55%)	Euthanasia (50%)
Aggression towards humans	Euthanasia (77%)	Capture & release (36%)	Euthanasia (88%)
Repeat offender bears	Euthanasia (54%)	Capture & release (72%)	Euthanasia (81%)

The results were also compared between stakeholder groups (Table 3.6). Agriculturalists were supportive of euthanasia in more cases than any other stakeholder group (crop damage, aggression towards humans, and repeat offender bears). Euthanasia was not the preferred solution for any situation among the non-consumptive respondents. The results were also compared between rural and urban respondents for each stakeholder group

(Appendix H). The results do not differ much between rural and urban respondents for each stakeholder group, indicating that stakeholder group is a greater indicator of a person's opinion than residency. However, within each stakeholder group, a higher percentage of rural respondents were in favour of euthanasia than were urban respondents.

Controversial Bear Management Issues

Interview and survey participants were asked about four controversial bear-management issues: hunting over bait, hunting with hounds, a spring hunting season, and the sale and export of bear gall-bladders. Tables 3.7 and 3.8 demonstrate the results for the stakeholder and NSDNR surveys, respectively. Hunters/trappers and agriculturalists favoured all of the practices more so than did non-consumptive stakeholders (Table 3.7), though the majority of hunters/trappers (67%) do not support hunting with the use of hounds. NSDNR staff were asked if they thought these practices were biologically sustainable or socially acceptable, either currently (for legal practices: hunting over bait and sale/export of bear gall-bladders) or if the practices were to be legalized in Nova Scotia (hunting with hounds and spring bear-hunting season). The answers were analyzed to compare the responses of staff members with >10 years experience with the Department with those with ≤10 years (Table 3.8). Staff with ≤10 years' experience with NSDNR indicated that three of the practices are socially acceptable, with hunting with hounds as socially unacceptable; whereas staff with >10 years experience indicated that two of the four practices are socially acceptable (hunting over bait and sale/export of bear gall-bladder) (Table 3.8). For every issue a higher percentage of staff with ≤10 years' experience think the practice is socially acceptable. In both surveys, respondents had the opportunity to comment freely on why they do or do not support certain practices.

Table 3.7: Opinions of the stakeholder survey respondents about controversial bear management practices in Nova Scotia (Hunters/trappers: n=26, Agriculturalists: n=16, Non-consumptive: n=11). Due to rounding, numbers do not always add to 100%.

		Yes	No	Don't know	No opinion
Would you support a spring bear hunting season in Nova Scotia?	Hunters/ trappers	77%	23%	0%	0%
	Agriculturalists	75%	25%	0%	0%
	Non-consumptive	9%	91%	0%	0%
Would you support the legalization of hunting black bears using hounds in Nova Scotia?	Hunters/ trappers	27%	62%	8%	4%
	Agriculturalists	38%	38%	19%	6%
	Non-consumptive	0%	100%	0%	0%
Do you support hunting over bait as a legal hunting practice in Nova Scotia?	Hunters/ trappers	88%	8%	0%	4%
	Agriculturalists	69%	25%	6%	0%
	Non-consumptive	18%	82%	0%	0%
Do you support the sale and export of gall-bladders from legally taken bears as a legal practice in Nova Scotia?	Hunters/ trappers	65%	31%	0%	4%
	Agriculturalists	63%	12%	19%	6%
	Non-consumptive	18%	82%	0%	0%

Hunting with hounds was the only controversial issue that led to general consensus. Most of the survey comments and responses by all three groups of stakeholders opposed the practice. While NSDNR staff indicated that hunting with hounds would be biologically sustainable (Table 3.8), the responses from the interviews and the NSDNR survey comments indicate that NSDNR staff are not in favour of the practice, regardless of whether the bear population could sustain such a hunt. Respondents oppose the practice because they consider it unsportsmanlike, it could cause conflicts with landowners, and it would not be socially acceptable. The sale/export of bear gall-bladders was the issue that

generated the fewest comments on the survey and is a practice that was supported by most NSDNR staff members and every stakeholder group except the non-consumptive stakeholders. Many participants support the practice because it allows hunters to make better use of the harvested bear. Respondents opposed to the practice stated that they do not believe wildlife should be treated as a commodity and they are concerned that the practice could encourage the poaching of bears in the province.

Table 3.8: NSDNR staff respondents' responses to questions about controversial bear-management practices in Nova Scotia. Table shows responses of all the staff respondents (n=61), those who have worked for NSDNR for 10 or fewer years (n=18), and respondents with more than 10 years experience (n=43).

		Biologically sustainable		Socially Acceptable	
		Yes	*No*	*Yes*	*No*
Spring bear hunting season	All respondents	90%	10%	25%	75%
	≤10 years	89%	11%	61%	39%
	>10 years	91%	9%	9%	91%
Hunting with hounds	All respondents	61%	39%	13%	87%
	≤10 years	39%	61%	17%	83%
	>10 years	70%	30%	12%	88%
Hunting over bait	All respondents	92%	8%	70%	30%
	≤10 years	89%	11%	83%	17%
	>10 years	93%	7%	65%	35%
Sale/export of bear gall-bladder	All respondents	97%	3%	80%	20%
	≤10 years	100%	0%	83%	17%
	>10 years	95%	5%	79%	21%

Most of the concern expressed about a spring bear-hunting season was related to concern about the social acceptability of such a hunt. The large difference in opinion among NSDNR staff about the perceived social acceptability of a spring bear-hunting season (Table 3.8) may be explained by a previous consideration of a spring hunt. In the 1990s NSDNR explored the possibility of implementing a spring hunt; however it was met with intense public outcry denouncing the possibility. Staff members who were employed during that period may be more likely to be cautious of public acceptability around that issue. In the interviews most (8 of 10) staff members (all had worked for NSDNR for

over 10 years) expressed opposition to a spring hunting season based on concern that it would not be socially acceptable. Other comments opposed to a spring hunt included concerns about orphaned cubs, and comments that one bear-hunting season per year was sufficient.

Baiting was the issue that solicited the most survey comments from both stakeholders and NSDNR staff members, and the most concern in the interviews. NSDNR staff are divided among those who support baiting as a safe and effective way to hunt, and those who are concerned about the use of non-natural foods as bait, and the potential habitualizing of bears to human food sources. Seven of the 10 staff members interviewed expressed concerns about baiting in terms of where bait sites are set-up (i.e. too close to homes) and/or the use of unnatural foods (e.g. doughnuts, grease) as bait. However, several of the interviewees also noted that despite the concerns, baiting allows for a selective harvest and is an effective way to hunt bear because without bait, harvesting a bear can be very difficult. Among the stakeholders, most comments supported baiting as an ethical and safe way to hunt because it localizes hunters near the bait site and gives them time to be cautious of their shot and selective in the bears they harvest. Most stakeholders who opposed baiting described it as lazy because they think it requires less effort by hunters to harvest a bear and unfair because the bear is lured to the bait site. Thus although there are concerns around baiting among some NSDNR staff and stakeholder groups, their reasons for opposing the practice differ.

Input Into Black Bear Management

Staff and stakeholders were asked to rate the importance of input of interested parties into black bear management (Table 3.9). The respondents considered the input of all of the different groups to be important with some considered more important than others by various groups. NSDNR staff consistently scored in the mid-range of the values reported for stakeholder groups. There were slight differences in how staff members with more than 10 years experience with NSDNR rated the importance of groups compared to staff members with 10 or fewer years experience. A higher percentage of staff with fewer years experience rated the input of non-consumptive interests as important while a higher percentage of staff with over 10 years rated the input of hunters and trappers as important. "Individuals who primarily are interested in watching or photographing bears" and "People who fear bears are a threat to human safety" were generally considered important by lowest percentage of responses from across NSDNR and most stakeholder groups.

Table 3.9: Percentage of survey respondents that thought the input of the party listed was important or very important. Respondents divided into all NSDNR respondents (n=61), all stakeholders (n=47), Hunters/trappers (n=26), Agriculturalists (n =16), and Non-consumptive (n=11).

	NSDNR	All stakeholders	Hunters/ trappers	Agriculturalists	Non-consumptive
Personnel from government agencies besides NSDNR	82%	77%	73%	81%	91%
Black bear researchers or university/college professors	87%	85%	88%	75%	100%
Individuals who primarily are interested in watching or photographing bears	51%	60%	69%	38%	82%
Individuals who primarily are concerned with preserving bears and bear habitat	62%	68%	77%	50%	91%
Agricultural producers who experience damage from bears	92%	83%	85%	94%	64%

	NSDNR	All stakeholders	Hunters/ trappers	Agriculturalists	Non-consumptive
Residential homeowners who experience damage from bears	72%	68%	58%	94%	55%
People who fear bears are a threat to human safety	54%	40%	31%	63%	36%
Bear hunters	89%	81%	100%	75%	55%
Bear trappers	87%	74%	97%	75%	45%
Aboriginal community	69%	62%	62%	63%	72%
General public	80%	54%	46%	56%	90%

Aboriginal Input

Through their traditional treaty rights, Aboriginals in Nova Scotia have the right to hunt bears without a government-issued licence. This makes them a party of special interest in black bear management. Two Aboriginal participants were interviewed and both thought that it was important that NSDNR and Aboriginal communities work together to share information collected and observed about black bears. One of the interviewees indicated that in his community they monitor bear sightings and harvest in a casual, off-the-record manner. The Native Council of Nova Scotia, which represents off-reserve Mi'kmaq, has its own licensing and harvest reporting system. Both interviewees indicated that there have been tense relations between Aboriginals and NSDNR in the past, but they expressed a desire for improved partnerships in the future. They also indicated that NSDNR's management needs to be more "eco-centric" in its approach and not focused only on managing for the harvest. One interviewee mentioned that NSDNR's "concept of management is so far removed from ours" (Aboriginal interviewee). They indicated that

improved working relations between Aboriginals and NSDNR could help NSDNR develop an approach to black bear management that complements Aboriginal perspectives which value wildlife in many ways, not solely as a game species.

Results indicate that there is support for including Aboriginal input into black bear management (Table 3.9). When asked specifically "do you think it is important that the Aboriginal Community has input into black bear management in Nova Scotia?" approximately half of the stakeholders (51%) responded "yes" (26% responded "no", 15% "don't know", and 8% "no opinion"). In the NSDNR interviews, most staff members agreed that Aboriginal groups should be consulted separately if a formal black bear management plan were to be developed.

DISCUSSION AND MANAGEMENT IMPLICATIONS

Concerns of NSDNR Staff Members

Overall, NSDNR staff members appear to think that the Department is doing a good job managing the province's black bears. Several staff members expressed discomfort, however, with the low level of research and population monitoring done in the province, and also indicated a need for greater education of the public and stakeholder groups around avoiding or minimizing human bear conflicts. Staff members think that greater efforts need to be made to inform residents about removing attractants to reduce the likelihood of attracting bears to their property. Many staff members think this is a key component to reducing the number of bear-human conflicts in the province.

NSDNR does not conduct research on the bear population, but recently had a master's student study habitat suitability in the province (Macmichael, 2007). Further research on the black bear population was recommended by Macmichael (2007), as was the case in an earlier study also conducted by a master's student (Anderson, 1984). Anderson (1984) suggested that "more accurate data concerning all aspects of the bear population are desirable" (p.40). The concerns over research and population monitoring show a divide between on-the-ground staff and the manager. This divide is likely a result of managers considering the costs and practical aspects of any undertaking more closely than other staff members. As is the case in Nova Scotia, research is generally not at the top of spending priorities for departments, most of which are always seeking out increased funding (Hygnstrom and Hauge, 1989, Mclaughlin and Vaughan, 1999).

Trying to get a handle on the size of bear populations is a challenge faced by many jurisdictions, and there is no ideal method for monitoring populations (Garshelis, 1990, Garshelis, 2002, Matthews et al., 2008). A lot of population data and information in North America, including Nova Scotia, comes from the harvest (Garshelis, 1990). A good estimate of bear populations generally involves combining harvest data with additional information obtained through capturing, tagging, and recapturing bears, a process that can be costly and logistically difficult (Kane and Litvaitis, 1992, Diefenbach et al., 2004, Garshelis and Hristienko 2006). As well, estimates of bear populations can be biased and error-laden, and should be considered cautiously (Noyce et al., 2001, Garshelis and Hristienko, 2006). In Nova Scotia, NSDNR does not estimate the black bear population. Instead, long-term trends in the population are monitored by gathering evidence from indirect indicators such as the frequency of road kills and WIRs. Over the

last 20 years the number of road kills and WIRs have increased, indicating to NSDNR a growing bear population (Nette, NSDNR, pers. comm.). Even staff who lamented the lack of population monitoring thought that the population was abundant in the province. Focusing on trends is a common way of monitoring animal populations; however, it is "more effective as a supplement to other methods of population estimation, such as mark-recapture, rather than as a substitute" (Brongo et al., 2005, p.1357).

Considering that most staff members appear to think there is an abundant black bear population in Nova Scotia, more intense efforts toward estimating the black bear population are not likely to be a priority of the department. However, it is important that NSDNR rely on a solid information base and one way NSDNR could improve its black bear data in a relatively simple manner would be to direct greater enforcement toward hunter returns. Harvest information is important data for NSDNR to use in monitoring population trends and a better return rate of harvest data "greatly increase[s] the reliability of bear population indices" (Hygnstrom and Hauge, 1989, p.165). Improved reporting of harvested bears was previously recommended in Washington to improve that State's black bear monitoring (Koehler and Pierce, 2005).

Social Acceptability of Black Bear Management in Nova Scotia

The stakeholder groups had varying opinions regarding NSDNR's management. These opinions expressed by the stakeholders may relate to their individual experiences. The hunters/trappers responded the most favourably towards the department's bear management practices. An explanation for the favourable response may be that NSDNR meets with the Nova Scotia Federation of Anglers and Hunters on a semi-regular basis to

discuss harvest results and regulations, and bear-human conflicts in the province (Nette, NSDNR, pers. comm.). This communication between the Department and the Federation allows for sharing of information about the department's management. Support for departmental efforts is related to knowledge of the department's practices and opportunities for input into management decision-making (Lafon, 2002).

The stakeholders who represented non-consumptive groups showed variation in their opinions as they agreed NSDNR is doing well in some aspects of bear management, but not others. The non-consumptive stakeholders had the highest level of "neutral" or "no opinion" responses which may indicate that they are less opinionated, knowledgeable about or interested in the issues presented than are the other stakeholder groups. None of the non-consumptive stakeholders had suffered damage caused by black bears, and only 36% had obtained most of their information about black bears from personal experience or observation. It should also be noted that the non-consumptive stakeholders represented the smallest stakeholder group (n=9), so a difference of only one response would correspond to a relatively large difference in related percentages.

The agriculturalists demonstrated the least amount of support for the department's bear management which likely stems from the circumstance that they regularly suffer black bear damage and they do not think NSDNR has sufficiently helped them. Agriculturalist complaints do not represent a high percentage of all bear complaints received by NSDNR at the provincial level (Chapter 4), however, in the survey agriculturalists do report economic consequences from bear damage to apiaries and blueberry fields. NSDNR should work more cooperatively with agriculturalists to address their concerns. Indeed,

the survey results indicate that NSDNR staff agree that the concerns of agricultural producers who experience damage are important to consider in bear management. Dealing with agricultural depredation can be complicated, however, as perceptions of the damage often vary between agriculturalists and departmental staff (Conover and Decker, 1991) and agriculturalists tend to have inflated opinions of the damage they have suffered (Garshelis et al., 1999). Although this survey asked specifically about bear damage, generally bears are only one of several crop-damaging species. Studies from other jurisdictions have found that deer destroy crops most often while bears are only responsible for a relatively small amount of damage (Conover and Decker, 1991, Conover, 1994, Garshelis et al., 1999). Some methods of helping agriculturalists include providing information about deterrents (Jonker et al., 1998), targeting hunting towards crop-raiding bears (Conover and Decker, 1991, Garshelis et al., 1999), or compensation for damages suffered (Jonker et al., 1998, Garshelis et al., 1999). The latter method is not recommended, however, because compensation is not useful for reducing the occurrence of damage, nor is it generally a preferred option of either agriculturalists or the public (Hygnstrom and Hauge, 1989, Garshelis, et al., 1999).

Although the results from the stakeholder survey cannot be considered to represent the general public, they can help guide NSDNR to improve its relations with some key parties interested in black bear management. Within the stakeholders groups there were divergent opinions of NSDNR's management. Even when more than half of the respondents agreed that the Department is doing a good job in one respect, there were instances in which a relatively large percentage disagreed. There was little consensus among the stakeholders on any issue and no overwhelming support for the NSDNR's bear

management by any group. This division within the stakeholder groups hinders the NSDNR's ability to please any group. Increased communication with the stakeholder groups may help them gain understanding of the department's practices, and in turn increase support for NSDNR as was demonstrated in the stakeholder survey results that indicated the hunters/trappers (who meet with NSDNR regularly) had the highest level of support for NSDNR. This is consistent with the findings of Lafon et al. (2003) who found that stakeholder participation in the development of the Virginia Black Bear Management Plan led to increased support of the department's practices by the participants.

Managing Human-Black Bear Conflicts

The results indicate that NSDNR staff think they are responding appropriately to complaints, and they are aware that their actions can be subject to public scrutiny. The methods that NSDNR staff select as being the most socially acceptable for each situation generally coincide with the responses of stakeholders. In terms of lethal control of bears, which is a publicly sensitive issue, the results show that NSDNR's perceptions of social acceptability in particular situations in urban and rural settings are accurate and that NSDNR staff appropriately consider social acceptability when dealing with black bears.

One area with which NSDNR faces difficulty is in dealing with repeat offender bears. Over 80% of NSDNR staff respondents think that euthanizing a bear that continuously causes problems is the most effective way of dealing with it, but their perception of the social acceptability of it is much lower. NSDNR's perceptions seem to be accurate as the responses of stakeholders also indicated that the social acceptability of euthanasia in that

situation is low. This demonstrates a challenge for NSDNR staff when dealing with bears that regularly cause problems, as they are caught between their professional opinions of the most effective response and the lack of social acceptability of that response. Trying to prevent conflict situations is the best solution because as the results showed, the respondents, especially urban residents, are generally not in favour of euthanasia. This finding is consistent with that of Spencer et al. (2007), who report that public pressure is generally the main reason a bear is relocated because the public prefers it over euthanasia. Thus, it is important that residents be properly informed of the problems associated with food-conditioned bears, and the little chance these bears have for rehabilitation (McCarthy and Seavoy, 1994, Peine, 2001). Habituated bears that are not euthanized are often captured and released at a different location, a solution which is often ineffective and costly (Garshelis, 1989, Landriault, 1998, Spencer et al., 2007).

There was a difference in perceptions of social acceptability between staff members with more than 10 years experience with NSDNR compared to staff members with 10 or fewer years with NSDNR. A higher percentage of staff members with fewer years experience generally found euthanasia and the controversial bear management issues to be socially acceptable. This may be attributed to the fact that staff who have worked for a longer period of time likely have more experience with public opposition and disapproval, such as with the previous controversy over a potential spring hunt, and therefore may be more cautious around issues of public acceptability. Although staff members were not asked about their age, staff with more years of experience are likely to be older, potentially affecting their opinions of euthanasia and controversial bear management issues. These differences in staff perceptions could affect the Department in the future as older staff

retire, leaving staff members who appear to be less cautious of public perceptions. This future shift in NSDNR staffing would likely be coupled with increasing urbanization in some areas of the province, with urban residents generally less supportive of either hunting or lethal control of nuisance bears. NSDNR should try and maintain a general sense of public and staff opinions to ensure they maintain management practices that are socially acceptable and a staff that are aware of public sentiments.

Controversial Bear Management Issues

Stakeholder opinions varied on the controversial bear management issues of a spring hunt, hunting with hounds, baiting, and sale/export of gall-bladders. It is likely that the opinions of the general public would fall somewhere in the middle of the opinions of the non-consumptive stakeholders (who opposed all four practices) and the hunters/trappers and agriculturalists (who were in favour of all the practices except for hunting with hounds). There was a difference between the controversial bear-management practices that NSDNR staff members thought were biologically sustainable and those they thought were socially acceptable. This indicates that NSDNR are confident that the black bear population in Nova Scotia can sustain varied hunting seasons and methods however they are concerned about negative public reaction to any such changes. Given that these practices have recently been outlawed in some North American jurisdictions, these concerns are warranted and NSDNR would not be well-advised to implement a spring hunting season or legalize hunting with hounds. There is a growing state of public unease towards hunting in general in North America (Shaw, 1977, Mankin et al., 1999, Teel et al., 2002) therefore any attempt to expand hunting opportunities in Nova Scotia may meet with considerable opposition.

Baiting appears to be the most contentious issue among NSDNR staff members. This is surprising because baiting is a legal hunting method in the province, and a common practice in Canada (Williamson, 2002, Hristienko and McDonald, 2007). In Nova Scotia, hunting without bait can be difficult because of a lack of forest clearing, a thick understory, and the reclusive nature of bears (Nette, NSDNR, pers. comm.). Some NSDNR staff are concerned that baiting conditions or habituates bears to human foods, thus increasing the number of nuisance problems close to bait sites. Several staff members interviewed were especially concerned about the use of non-natural foods as bait. Determining appropriate policies around baiting is a challenge because baiting is used for many purposes besides hunting. Setting up bait stations to monitor visitation rate is a tool for monitoring trends in black bear populations. Baits are used to trap bears for research purposes. As well, in Nova Scotia, setting-up bait sites is also permitted for the purpose of viewing and photography.

There is conflicting research on the effect of baiting (or feeding) bears adding an additional challenge to determining management strategies. Most of the concern around baiting in the research focuses on increased interactions between bears and humans. Peine (2001) attributed baiting near city limits as a factor in high nuisance levels in Gatlinburg, Tennessee. Brongo et al. (2005) concluded that bears had become habituated to the bait stations they set up. Gray et al. (2004, p.194) commented both that "feeding bears may increase their chances of becoming food-conditioned and habituated to people" and that "feeding sites close to roads may increase chances of unwanted bear encounters with humans, such as collisions with vehicles or campsite visitations" (p.188). In their

review of bear management Hristienko and McDonald (2007) state that there is evidence that bears depend on baiting as a source of food. However, they also argue (and provide several examples) that there is no strong evidence that baiting leads to increased nuisances and that baiting can actually reduce the number of nuisance complaints by removing nuisance animals in the harvest. Other research also indicates that the removal of bait increases nuisance situations because bears then have to search for new food sources, increasing the likelihood of interacting with humans (Gray et al., 2004).

NSDNR is currently considering eliminating the requirement to register bait sites during the first part of the hunting season. This may not be wise, however, considering the discomfort many staff members have expressed toward the practice of bear baiting. Maintaining data on the location of bait sites will help the Department track whether there are possible correlations between nuisance activity and baiting, and give the Department additional backing for the practice if no correlation exists. Baiting is becoming increasingly unpopular in the United States, with three states banning the practice in the 1990s (Hristienko and McDonald, 2007). Residents in Utah showed greater disapproval toward hunting over bait than hunting with hounds (Teel et al., 2002). There is potential for controversy to arise in Nova Scotia as well. NSDNR should ensure it is gathering as much information as possible on baiting in the province so as to provide appropriate evidence to make responsible management decisions regarding the practice in Nova Scotia.

Input into Bear Management

There is increasing recognition among wildlife managers that members of the public have a valuable role in wildlife management (Reiter et al., 1999). This has led to increased focus on the importance of including the input of a variety of stakeholders, and the general public, in decision-making (Lafon et al., 2003). Wildlife is a public resource which should be managed for the optimum benefit of all members of the public, not just specific interest groups. Trying to determine how to consider the input of different parties is a challenge among wildlife agencies, especially considering the varying knowledge and differing opinions among stakeholder groups (McMullin, 1996, Decker and Chase, 1997). Residency and stakeholder groups are not the only indicators of opinions and support for management practices: age, sex, education, length of time residing in an area, and personal morals and beliefs about wildlife and the environment are among many other contributing factors (Mankin et al., 1999, Teel et al., 2002, Layden et al., 2003, Bowman et al., 2004). Furthermore, although members of the public have strong opinions, those opinions are often rooted in "superficial knowledge" and "misconceptions" making it difficult to determine how much weight their opinions should be given (Mankin et al., 1999, p.471).

Despite these challenges there are benefits to public involvement in decision-making, mainly in terms of increased support for decisions and management strategies (Messmer et al., 1997, Lafon et al., 2003). Participation in the development of the Virginia Black Bear Management Plan increased participants' "understanding of the complexities bear managers face: multi-dimensional issues, diversity of opinions, technological limitations, resources capacities, administrative constraints" (Lafon 2002, p.129). Such benefits

indicate that the challenges associated with incorporating input from different interests are rewarded with satisfaction among stakeholders and staff along with well-supported management practices.

The results indicate that the input of a variety of groups is considered important by both staff members and stakeholders. These results are positive for NSDNR because the importance of including a variety of stakeholders in management planning has been noted in other studies (Decker and Chase, 1997, Messmer et al., 1997, Lafon, 2002). However the results also indicate that NSDNR staff members do not embrace the input of non-consumptive stakeholders as fully as other stakeholders. The input of people who are primarily interested in watching or photographing bears was considered important by the smallest number of staff members. It is important that NSDNR staff consider all stakeholder groups and not ignore non-consumptive interests, especially considering that most staff members identified as being hunters/trappers while the majority of Nova Scotians likely are not. In their review of black bear management practices in Canada, Pelton et al. (1999) suggest that the increase of non-consumptive uses is one of the most-needed management actions. Engaging groups that represent non-consumptive interests, however, can be a difficult task because hunters tend to show the most enthusiasm and interest in bear management (Litvaitis and Kane, 1994, Higgins Inman and Vaughan, 2002), a finding that was supported by this study where an enthusiastic response by hunters/trappers led to them being the dominant stakeholder group. Incorporating the diverse opinions of stakeholder groups into management is challenging, since they vary both between and within groups, often in oppositional or mutually exclusive ways. Nonetheless, it is important that managers provide opportunities for these diverse

opinions to be expressed and heard, recognize areas of agreement and disagreement, and consider these in their management decisions and processes.

In Nova Scotia, due to provincial government policies and Aboriginal and Treaty Rights, communication with Aboriginal (Mi'kmaq) groups should be an important aspect of black bear management (Office of Aboriginal Affairs, 2007). To a varying extent, Mi'kmaq communities in Nova Scotia monitor bear sightings and harvest, and the number of nuisance bear incidents appears to be increasing in at least one Mi'kmaq community, causing concern to residents (Kinnear, 2007). This indicates that Aboriginal groups in Nova Scotia have potentially valuable information to share with NSDNR. Mi'kmaq communities believe in a spiritual interconnection with animals, and the black bear is traditionally viewed as a protector of their people (Kinnear, 2007). Aboriginal perspectives consider oral traditions valid, view elders as experts, and believe strongly in the interdependency of land, animals, and humans (Doyle-Bedwell and Cohen, 2001). The Aboriginal interviewees thought they could broaden NSDNR's management strategies by including Aboriginal perspectives, if they work together, and both interviewees expressed interest in an improved working relationship between Aboriginals and the department. Incorporating Aboriginal beliefs and perspectives into different aspects of government management has been a challenging process across Canada, often due to a lack of respect for Aboriginal perspectives and beliefs among governments (Doyle-Bedwell and Cohen 2001, Borrows, 2002).

The question of how to establish good working relations between governments and Aboriginal groups is a challenge yet to be resolved. A deeper assessment of the complex

issues surrounding government-aboriginal relations and their relevance to bear management is beyond the scope of this research. However, the need for communication and consultation with Aboriginal groups has been recognized as important through numerous court victories (Doyle-Bedwell and Cohen, 2001) as well as the results of this study's surveys, and is something the Department should ensure it considers its black bear management.

CONCLUSIONS AND RECOMMENDATIONS

In general NSDNR appears to have a good sense of the social acceptability of various practices in managing its bear population, and its staff members appear to be generally satisfied with the department's practices. However, the results need to be treated cautiously as they are heavily dependant of information provided by NSDNR, and participants suggested by the department. Using input from more independent sources may have painted a less-positive perspective of the department's management. However, it has been previously observed by Lafon (2002) that departmental staff are able to assess social acceptability. After surveying stakeholder and staff members in Virginia, Lafon (2002, p.108) noted that "agency personnel are good synthesizers of public values". Nonetheless, the following paragraphs list some areas that could be addressed to improve understanding and communication for more effective bear management in Nova Scotia, and in other jurisdictions where similar situations exist. These management responses will help NSDNR gather additional information and improve communication with stakeholders and the public and will also serve to prepare NSDNR to defend its practices as humane, sustainable, and socially acceptable.

There is a need for increased communication between NSDNR managers and on-the-ground staff about black bear research, population monitoring, and baiting. These are issues with which many staff members are uncomfortable. This will allow NSDNR to get a better sense of why staff members are uncomfortable with those particular issues and what, if anything, can be done to address them. Addressing those concerns, or explaining why they are not able to be addressed, may result in staff members being more supportive of the department's practices.

Staff are especially concerned with the department's monitoring of the bear population. Therefore the Department should put increased effort into collecting harvest returns. This is a source of information used for monitoring long-term health and relative abundance of the black bear population that can be collected with few additional resources. NSDNR should impose penalties to those who do not return their form, or provide incentives for hunters to return the form. The Department also needs to work more closely with the external vendors who sell licences to ensure that the Department has current information on licences sold and rate of return.

There is also a need for greater outreach by NSDNR toward stakeholders and other interested parties. This may help increase knowledge and understanding among various groups and help determine why there is so much division within and between the stakeholders groups. Increasing use of the media to project the department's message and strategy could be a good way to help stakeholders and the public understand the department's actions and underlying reasoning as recommended by Loker and Decker, (1995) around black bear hunting in Colorado, potentially increasing support for the

department's practices. There is especially a need for greater communication with agriculturalists who expressed the most dissatisfaction with NSDNR. Meeting regularly with agriculturalists, as NSDNR currently does with hunters and trappers, may be a good way for agriculturalists and NSDNR staff to work together to try and resolve the issues agriculturalists have with bear damage.

Finally, the Department should maintain their current practices on the controversial issues of a spring hunt, hunting with hounds, and selling of gall-bladders. The NSDNR should not make any changes without first assessing public sentiments in the province to ensure the changes would be publicly acceptable. NSDNR should closely monitor its baiting regulations, and gather more information to determine if changes to the current regulations are warranted. There was a lot of discomfort expressed by staff members about baiting practices in the province so NSDNR should potentially re-evaluate its baiting regulations. There is a need for further research in the province to determine if there are any correlations between bait sites and nuisance complaints, a concern expressed by several staff members.

These results can be of use to wildlife managers everywhere as they highlight some of the social aspects of black bear management that must be considered. There are wide-ranging opinions among stakeholders towards black bear management practices in Nova Scotia, and likely in other jurisdictions, making it difficult to enact regulations that will satisfy a majority of residents. Stakeholder groups may not be unified in their opinions so managers should beware of trying to generalize what management actions they think a particular stakeholder group might deem appropriate.

This study highlights that staff members may not be fully supportive of the department's practices or regulations and that opinions of social acceptability in bear management vary depending on the length of time worked for the department. Communication between different levels of staff members should be encouraged to ensure staff concerns are addressed. Trying to promote management practices to the public without the support of staff members would add an additional level of difficulty to an already challenging task. Including social considerations has become an ever-important aspect of black bear management, and this study indicates that assessment of knowledge, opinions, and concerns of various parties is an important aspect of ensuring socially acceptable management practices.

REFERENCES

To avoid redundancy, the references for this chapter are included in the reference section at the end of the thesis.

CHAPTER 4: REDUCING BEAR-HUMAN CONFLICTS: AN EXAMPLE FROM NOVA SCOTIA

This chapter is a stand-alone paper to be submitted to a scholarly journal yet to be determined. Kathleen Witherly collected the data and wrote the paper with input from. Karen Beazley and Tony Nette as thesis supervisors.

ABSTRACT

Bear-human conflicts are common and pose a challenge for managers in Nova Scotia and throughout North America. Interviews and surveys were conducted with Nova Scotia Department of Natural Resources (NSDNR) staff and stakeholders in the province to assess how conflicts can be reduced. Based on results from interviews and surveys of departmental staff, it is apparent that the need to bear-human conflicts is an issue of prime importance to employees. NSDNR staff members think that education is the key component to reducing bear-human conflicts in the province. In other jurisdictions that have implemented conflict-reduction strategies, education is an important component of the strategy but as one of several actions. NSDNR needs to make educational initiatives a higher priority for the department, and investigate the possibility of implementing additional measures (e.g. regulations surrounding organic storage) to reduce bear-human conflicts. These results can be of use in other jurisdictions trying to determine how to deal with high levels of bear-human conflicts.

INTRODUCTION

Conflicts between humans and black bears are common in North America (Spencer et al., 2007) and can "include any negative interaction between a person and bear that is aggressive, defensive, or nuisance in nature" (Gore et al., 2006, p.75). Nuisance conflicts are of most concern to wildlife managers because black bears are rarely involved in aggressive or defensive conflicts (Herrero, 1985, Herrero and Higgins, 1999, Spencer et al., 2007). Black bears are able to exploit numerous food sources and can adapt and survive in close proximity to humans (Peine, 2001). Nuisance bear problems can take place in numerous settings - agricultural, rural, urban, suburban and remote – and situations involving garbage or food attractants are the most common type of bear-human conflict (Will, 1980, Spencer et al., 2007). Damage to agricultural crops is also of concern because of the potential economic impacts (Conover and Decker, 1991, Jonker et al., 1998, Garshelis et al., 1999). Nuisance bear problems are linked to natural food availability; in years of abundant natural food, there tend to be fewer nuisance complaints (Rogers, 1987, Peine, 2001, Hristienko and McDonald, 2007, Ryan et al., 2007). Most wildlife agencies in North America have identified black bear-human issues as a common problem (Spencer et al., 2007). While black bears are only one of several nuisance animals (Calvert et al., 1992), their ability to injure and kill humans and livestock makes bear-human interactions threatening to the public and makes reducing conflicts especially important for wildlife managers.

Determining how to both effectively handle and reduce bear-human conflicts is a challenge for wildlife managers. The goal of this paper is to determine what strategies can feasibly be employed to reduce the frequency of bear-human conflicts in Nova Scotia,

with potential utility for applications elsewhere. This paper will examine methods used by other jurisdictions to reduce bear-human conflicts, and consider what options might be most appropriate for the Nova Scotia Department of Natural Resources (NSDNR) to employ. Effective strategies to reduce bear-human conflicts are essential as the number of bear situations increases throughout North America and the public's tolerance for damage caused by bears erodes (Hristienko and McDonald, 2007).

Background: Nova Scotia

The province of Nova Scotia, Canada, is believed to be home to an abundant population of black bears (Nette, NSDNR, pers. comm.). There is no record of anyone being mauled by a black bear in Nova Scotia, however bear-human conflicts are common and some bear incidents have generated considerable media attention. Similar to other jurisdictions throughout North America, commercial blueberry fields and beehives in Nova Scotia suffer damage throughout the summer months. There are also cases of bears in the province frequenting suburban backyards and taking advantage of any food sources they find including garbage, barbeques, birdfeeders, and pet food. Most of the province has curb-side collection of organic materials for compost, which are stored outside in green carts (also referred to as green bins) and collected on a regular basis (Friesen, 2005), possibly serving as an additional attractant for bears (Nette, NSDNR, pers. comm.).

METHODS

The methods for this study consisted of interviews, web-based surveys of NSDNR staff and stakeholder groups, and a literature review of bear-human conflict reduction strategies. Interview and survey questions addressed issues pertaining to bear-human

conflicts including experiences dealing with bear problems and damage suffered due to bears. Methodological details are provided in the following sections.

Interviews

Interviews were conducted with 10 NSDNR staff members either in person or by telephone. The interviewees were wildlife technicians (n=2), who deal first hand with public complaints and bear-human conflicts, all of the province's regional biologists (n=7), who carry out management regimes in each region, and the manager, wildlife resources (n=1), who is responsible for overseeing the management program for bear, deer and moose in Nova Scotia. Staff members were asked similar sets of questions pertaining to bear management practices in Nova Scotia including questions about the most important bear-related issues, what strategies NSDNR should employ to reduce the number of bear-human conflicts, and how NSDNR handles nuisance complaints. The interviews lasted from 30-70 minutes and were audio-recorded, transcribed, and analyzed to assess the key issues surrounding bear-human conflicts in Nova Scotia.

Surveys

Two self-administered, web-based surveys were developed using the software Opinio (Version 5.2.9, 2006, ObjectPlanet Inc.). One survey was developed for distribution to NSDNR staff members and the other for distribution to stakeholder groups. The surveys contained questions about experiences with black bears and black bear damage. The survey for NSDNR staff was sent to all staff members who have a role in black bear management, either through dealing directly with complaints, or by supervising on-the-ground staff (n=111). NSDNR participants were advised of the survey by electronic mail

(e-mail) 10 days prior to the survey link being sent by e-mail. A reminder e-mail containing the survey link was sent one week later if the survey had not been completed; a second and final reminder was sent one week after that.

Three classes of stakeholder groups were solicited for participation in the stakeholder survey: hunters/trappers, agriculturalists (beekeepers and blueberry growers), and members of environmental or non-consumptive wildlife organizations. The survey was not designed to represent these stakeholder groups as a whole, but to solicit opinions from a sample of group members. This survey was also not designed to represent the general population of Nova Scotia, but to gather the perspectives from a few groups that are expected to be more knowledgeable about, and interested in, bears in Nova Scotia. Members of these groups were contacted through telephone calls, e-mails, and postings on the organizations' websites. A complete list of groups contacted can be found in Appendix F. All of the stakeholder participants were contacted and agreed to participate in the survey before they were sent a survey link (n=51). As with the NSDNR survey, two reminder e-mails were sent.

Following the surveys the data were summarized and tabulated, and reports demonstrating the distribution of responses were generated in Opinio. The survey results were analyzed comparatively but not statistically because the use of non-random participant selection means that the results can not be used to generalize for a larger population (Czaja and Blair, 2005). The responses of the different stakeholder groups were compared, as were the responses of rural and urban residents. Drawing from the issues presented in the NSDNR interviews (e.g. the importance of education in reducing

bear-human complaints), the NSDNR survey results were assessed to determine if the survey respondents had similar or different opinions from the interviewees.

Review of NSDNR Data and Other Bear Conflict Reduction Techniques

In Nova Scotia, NSDNR uses Wildlife Investigation Reports (WIR) to document the number, type, location, and resolution of nuisance conflicts. The WIRs for the last five years were examined to determine the nature and location of the complaints, and the resolution strategies employed most often in dealing with nuisance complaints. A review of journal articles and websites was undertaken to find examples of bear-conflict reduction strategies from other jurisdictions. The strategies were assessed to determine what methods are used most often, and what techniques have been successful in reducing bear-human conflicts elsewhere.

RESULTS

Respondents

Sixty-one completed survey responses were received from NSDNR staff members (55% response rate). More than half (67%) stated that their current responsibilities with respect to black bear management included dealing with public complaints; 62% had responsibilities that included site visits, euthanizing or relocating animals. More than half (56%) of the survey respondents had worked for NSDNR for over 15 years. The average number of years the 10 interviewees had worked for NSDNR was 22.

Forty-seven completed stakeholder survey responses were received (92% response rate). Twenty-six respondents (55%) identified as a hunter or trapper (hunter), 16 (34%)

identified as either a beekeeper or blueberry grower (agriculturalists), and 11 (23%) identified as members of either an environmental or a non-consumptive wildlife organization (non-consumptive). There was some overlap between those who identified as a hunter and agriculturalist (n=7), and hunter and member of a non-consumptive organization (n=2); however no respondent identified as both an agriculturalist and a member of a non-consumptive organization. The respondents were mostly rural residents (68%), and 85% of all respondents live in or adjacent to a forested area.

Bear-Human Conflicts in Nova Scotia

Bear-human conflicts are of concern to NSDNR staff members who were interviewed and participated in the survey. When asked "what would you say is the most important bear-related issue in the province?" the responses of nine of the 10 interviewed staff members referred to bear-human issues (nuisance complaints, educating the public, or human safety). Staff members believe there have been relatively high levels of nuisance bear problems in recent years. When asked where the Department should focus its resources, eight of the interview respondents thought the resources should be put towards efforts to reduce bear-human conflicts, and six of those respondents thought education was the best approach.

NSDNR staff members expressed concern about the effect of bear-human conflicts on the black bear population. The interviewed staff members were presented with six factors that are potentially detrimental to the bear population in Nova Scotia: hunting pressure, poaching/sale of bear parts, attitudes and tolerance of landowners, habitat destruction, lack of habitat connectivity and corridors, and euthanized nuisance bears. The only factor

that most staff thought was likely to negatively affect the population in the near future was attitudes and tolerance of landowners. They indicated that the more bear complaints, the more bears that are eventually euthanized either by NSDNR or residents. Some staff members expressed concern that residents, especially in rural areas, are shooting bears on their property without informing the department. They also expressed fears that, if a bear were to maul a person in the province, it would likely lead to immediate negative public attitudes towards bears and a much higher level of lethal control (often referred to as euthanasia).

NSDNR staff members are, however, confident that they are appropriately dealing with bear complaints. Most of the NSDNR survey respondents (62%) think the department's training of staff for on-site visits is good or very good, and most staff members think they are appropriately responding to bear complaints (73% think the department's performance is good or very good). The situations are dealt with on a case-by-case basis but most calls are handled over the telephone, with staff members providing advice on how to remove attractants. If the bear persists in an area, or there is an immediate threat, then NSDNR will respond in person.

Over the last five years, NSDNR staff members completed 3248 Wildlife Investigation Reports (WIRs) related to black bears (e.g. dead or sick bears, nuisance issues, vehicular incidents). More than 2700 of these calls were related to nuisance bears (average of over 540 nuisance complaints/year). More than half of the nuisance WIRs (60%) are recorded as being because of fear of harm to either humans or pets. Agricultural complaints (damage to crops or fear for livestock) make up only 7% of the WIRs completed. Most

(60%) of the complaints are handled over the telephone with reassurance or advice to the complainants. Over the last five years 978 site visits have been conducted; 474 (48%) of these were resolved by giving advice or reassurance, and in 239 (24%) cases the bear was relocated or euthanized. Over a quarter of the complaints (26%) in the last five years have been from Halifax County, which is the most populated and highly urbanized region of the province. Figure 4.1 demonstrates the distribution of nuisance black bear complaints among Nova Scotia's 18 counties.

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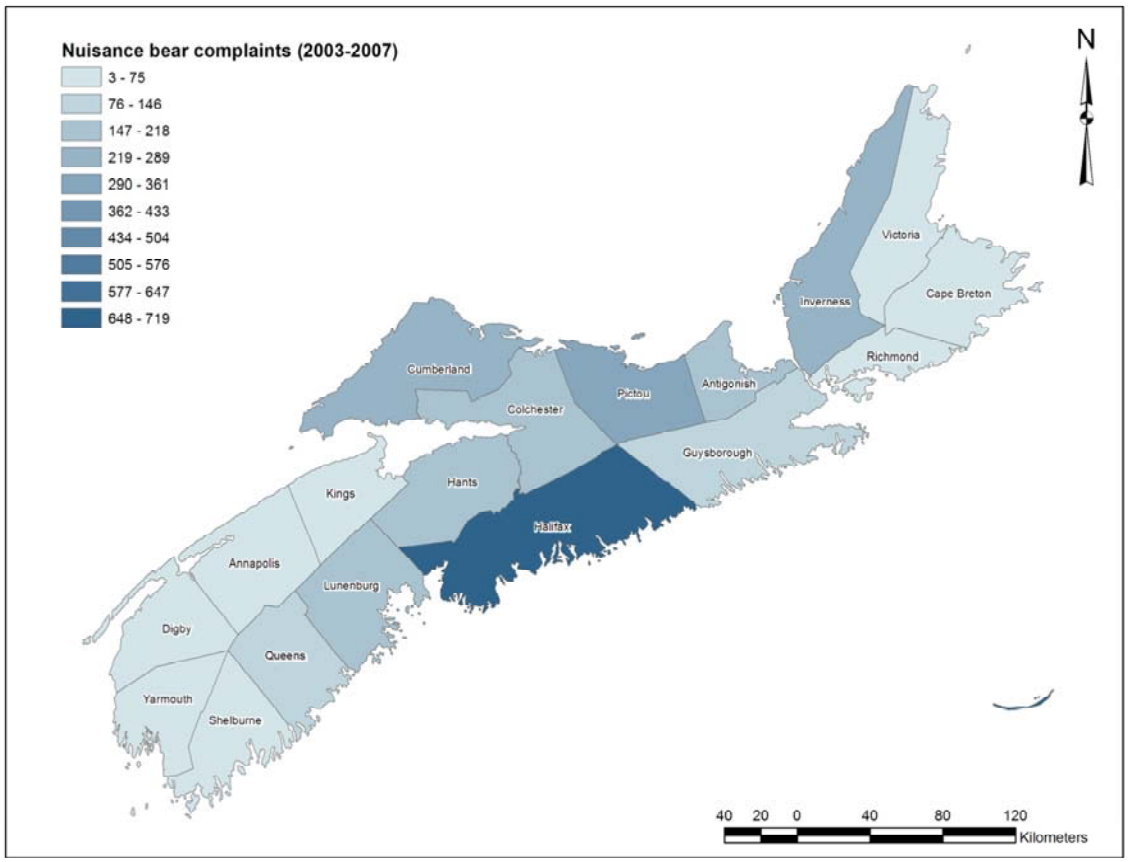

Figure 4.1: Distribution of nuisance bear complaints in Nova Scotia from 2003-2007 based on Wildlife Investigation Reports completed by NSDNR after a nuisance complaint is made to the department.

In the stakeholder survey, agriculturalists were the only respondents that expressed concern about bear damage. Over 80% of the agriculturalists agreed or strongly agreed

that they were concerned that black bears may damage their property or crops. This compares to none of the non-consumptive respondents and 15% of the hunters. Agriculturalists were also the only respondents who reported having experienced extensive damage (Table 4.1) and economic losses due to bear damage. In comments written on the surveys, nine agriculturalists mentioned suffering economic losses, and the losses they mentioned ranged from $600 - $10,000. NSDNR staff members rarely mentioned agriculturally-related bear problems, instead, residential bear problems and the need to reduce the number of bear complaints from urban residents were frequently mentioned.

Table 4.1: Average occurrence of bear damage during the past five years reported on the survey by the stakeholder groups (Hunters/trappers: n=26, Agriculturalists: n=16, Non-consumptive: n=11)

	Hunters/trappers	Agriculturalists	Non-consumptive
Never	70%	25%	100%
Less than once per year	15%	12%	0%
1-5 times per year	15%	25%	0%
6-10 times per year	0%	19%	0%
More than 10 times per year	0%	19%	0%

Cause of Conflicts

Overwhelmingly NSDNR staff members believe that the cause of most bear-related problems is uninformed residents who are unaware of how to properly store their garbage and who do not realize that there are other, less obvious items (e.g. birdfeeders and barbeques, green bins) that serve as strong bear attractants. In the interviews, NSDNR staff members especially pointed to urban dwellers who move into new subdivisions or rural properties as part of the problem because they are not used to dealing with nuisance wildlife. Similarly, very few NSDNR survey respondents think that Nova Scotians are

knowledgeable about black bears (Table 4.2). In the interviews, several NSDNR staff also mentioned that they thought the province's black bear population is more abundant than in previous years (based on increased sightings and nuisance complaints), indicating that the number of bears is possibly another contributing factor to the relatively high number of complaints.

Table 4.2: NSDNR staff members' survey responses (n=61) to statements about Nova Scotians understanding of bears.

	Agree/ strongly agree	**Neutral**	**Disagree/ strongly disagree**	**No opinion**
Nova Scotians adequately understand black bear behaviour/biology	2%	3%	93%	2%
Nova Scotians adequately understand how to co-exist in a shared environment with black bears	0%	5%	93%	2%

On numerous occasions throughout the interviews staff members pointed out that in many "nuisance" situations, the bears are simply doing what they normally do in searching for food sources, and that people (unintentionally or intentionally) are continuously providing them with easy meals. The following passage from one of the interviews is a good example of the perspectives expressed by several staff members:

> The wildlife is perceived as the problem but I think we both know that the initial problem is people moving into this sort of hinterlands. So from a nuisance animal perspective, that's kind of a balancing act, that we have to find how we can move into these areas yet still find a way to maintain amicable relations with wildlife…And again most people that move into these areas probably never think about bears or other wildlife until they get into their garbage, or are eating their flowers, etcetera" (NSDNR staff member).

Table 4.3: Opinions of urban (n=15) and rural (n=32) stakeholder respondents on statements about Nova Scotia residents' responsibilities in sharing an environment with black bears

Statement	Residency	Agree/ strongly agree	Neutral	Disagree/ strongly disagree	No opinion
Increased bear problems are due to poorly informed Nova Scotia residents	*Rural*	*38%*	*12%*	*47%*	*3%*
	Urban	53%	27%	13%	7%
Increased bear problems are due to an increasing number of bears	*Rural*	*53%*	*16%*	*28%*	*3%*
	Urban	40%	13%	47%	0%
I am aware of what measures I can take to reduce the likelihood of attracting bears to my property	*Rural*	*84%*	*0%*	*13%*	*3%*
	Urban	93%	0%	7%	0%
Nova Scotians are responsible for taking measures to reduce the likelihood of attracting bears to their property.	*Rural*	*81%*	*6%*	*13%*	*0%*
	Urban	93%	7%	0%	0%

Stakeholders were asked their opinions about the causes of increased bear problems in the province (Table 4.3). The urban respondents were more inclined to think that an uneducated public is the reason for the high number of bear complaints while rural respondents were more likely to think that the problem is due to a high number of bears. Stakeholders were also asked about the responsibility of residents in reducing the risk of attracting bears. The respondents reported that they are aware of their responsibilities (Table 4.3) with most (64% of the total respondents, 75% of the rural respondents, 40% of the urban respondents) reporting that they actively take measures to reduce the risk of bear damage to their property. Most measures described by the hunters and non-consumptive respondents related to garbage maintenance (keeping garbage inside until pick-up or in solid containers); among the agriculturalists electric fencing for apiaries was

the most common measure (15 agriculturalists commented: eight use electric fencing, one uses “bear fencing”, and the other comments pertained to garbage and compost/organic storage).

All participants in the surveys and interviews were asked about whether they thought the implementation of the green bin (compost) program had increased the number of bear problems in the province. In the NSDNR interviews, six of the 10 staff members responded that green bins had definitely increased the complaints and three thought that there was a possibility the green bins could have caused an increase. One staff member responded negatively because in his county they have a green bag program whereby the compost is only put out on the day of pick-up, reducing the potential for bear contact. Most of the NSDNR survey respondents (70%) think that the implementation of the green bin program has increased the number of bear-related complaints they have dealt with (10% responded “no”, 20% “don’t know”). Of the stakeholders that had experienced black bear damage (n=16), just over half (56%) responded that they had noticed an increase in problems since the implementation of the green bins (31% responded “no”, 13% “don’t know”).

Educational Efforts in Nova Scotia

Education was consistently cited by staff members as a way to reduce bear-human conflicts in Nova Scotia. At some point during their interview every NSDNR staff member commented on the role and/or importance of education in reducing bear-human conflicts. In response to the question of how NSDNR should try and reduce the number of bear-related complaints, seven of the 10 interviewees indicated increased educational

efforts. There was also consensus among the interviewees that, for the most part, responsibility for educating Nova Scotians about reducing the risk of attracting bears falls to the department.

On the NSDNR survey, almost all of the staff members (92%) agreed or strongly agreed with the statement "greater management efforts by NSDNR should be directed toward public education initiatives". None of the respondents disagreed or strongly disagreed with that statement (6% were neutral, 2% had no opinion). On the same survey staff were provided with a list of bear management issues for which they thought NSDNR should establish specific management goals (Chapter 5, Table 5.4). Public education was by-far the most-selected issue as it was chosen by 60 of the 61 respondents. At the end of the NSDNR survey there was opportunity for open comments and the need for increased education was the issue mentioned most often, arising in one-quarter of all comments.

Although NSDNR does not currently have specific management objectives related to education, they do put effort into educating the public about removing bear attractants. Every spring NSDNR sends out provincial news releases to inform residents that bears are coming out of their dens and that it is important that residents ensure they have removed attractants from their properties. The Department also posts information in its offices and on its website informing residents about the dangers of bear attractants. Other than general information sent out through the mass media, information is generally not delivered directly to residents unless a bear incident has occurred in their neighbourhood. At that point staff members may put pamphlets in residents' mailboxes or go door-to-door informing people that a bear has been spotted nearby. Residents are also provided with

information when they call in with a bear sighting or complaint. Some staff members put on workshops, or talk to the media, but those efforts are generally based on the staff members' willingness to initiate educational efforts.

Although in both the interviews and the survey NSDNR staff consistently stressed the need to increase educational efforts, they do not necessarily think that the department's current educational efforts are lacking. Close to half (41%) of the NSDNR survey respondents think the department's performance in educating Nova Scotia residents about how to reduce problems with bears has been good or very good, while 26% think the department's performance has been poor or very poor (33% were neutral). All of the respondents (6) who were specifically asked in the interviews if NSDNR needed to put more emphasis on education agreed that the Department did need to do more, but three of those same respondents also thought that the Department was doing its best at trying to get information to residents. Several staff members pointed out that part of the problem is that some people do not pay any attention to the information the Department delivers until they are faced with a bear situation. In the interviews, when asked "in what areas is management weak", none of the respondents indicated the department's educational efforts.

A general belief among staff members is that black bears do not need to be a higher priority for the department. In the NSDNR interviews, only three of the 10 respondents thought that black bear management should be a higher priority for NSDNR, but two of those respondents expressed concern in making them a higher priority (because of a lack of resources and the need to deal with other species). On several occasions throughout

the interviews staff made mention of a reduction in personnel in the department and increased workload. Several people commented that while increased education is needed, no one in the Department has any extra time. Many staff indicated that they did as much education as possible, but were severely restricted by time or resource constraints. As one staff member put it "I'll be honest, I know...every one of these callers that come (sic) in should have pamphlets and stuff sent out but there's just no way it's getting done, it can be done" (NSDNR staff member).

Bear Conflict Reduction Strategies in Other Jurisdictions

In response to an increase in bear-related complaints throughout North America many responsible agencies and departments have put increased focus into reducing bear-human conflicts. Many black bear management plans have goals dedicated to addressing conflicts (Chapter 5). In Ontario, the provincial Ministry of Natural Resources has developed a separate program, "Bearwise" for dealing with conflicts (Ontario Ministry of Natural Resources, 2008). It is run by the government and delivers information to the public, develops material for teachers to use, and provides opportunities for communities to engage in the program and work as a community to prevent conflicts. Several authors have examined bear conflict reduction strategies and initiatives in jurisdictions including Whistler BC, Juneau Alaska, New Jersey, and Gatlinburg Tennessee (McCarthy and Seavoy, 1994, Peine, 2001, Gore 2004, Gore et al., 2006). Although some of these jurisdictions are close to brown bear habitat, their conflict-reduction efforts are aimed at black bears because brown bears do not frequent populated areas (McCarthy and Seavoy, 1994, Black Bear Task Team, 1998). A common objective of these programs is to reduce

bear-human conflicts, primarily through messages aimed at modifying human behaviour towards responsible food storage (Will, 1980, Peine, 2001, Gore, 2004).

Jurisdictions generally educate residents about eliminating bear attractants through various means of information dissemination (Table 4.4). In Whistler, British Columbia, a major campaign was carried out with messages designed both for local residents and 40,000 summer guests involving the distribution of flyers, advertising on radio and TV, and handing-out of brochures (Gore, 2004). In New Jersey, 2.5 million pieces of educational material were produced and distributed between 1998 and 2006 (New Jersey Division of Fish and Wildlife, 2006). In Lake Tahoe, California a partnership was developed with a grocery store to distribute paper grocery bags printed with a message aimed at educating people about living in bear country (Gore, 2004). In the San Gabriel Mountains, California, community meetings were held to educate residents about securing garbage cans, not leaving pet food outside, and removing ripened and dropped fruit from trees (Lyons, 2005). Gaining voluntary compliance from residents was a challenge faced in many of these jurisdictions. In some cases improved garbage storage was not possible for residents who did not have bear-resistant structures in which to leave their garbage, while in other areas some residents purposely left out attractants because they enjoyed seeing bears (McCarthy and Seavoy, 1994, Peine, 2001, Lyons, 2005). Because of the difficulty in gaining voluntary compliance measures requiring bear-proof containers were enacted in some locations.

Table 4.4: Comparison of motivating factors, and the strategies implemented to reduce bear-human conflicts in four jurisdictions. Compiled from information collected from McCarthy and Seavoy (1994), Black Bear Task Team (1998), Peine (2001), Gore (2004), and Gore et al. (2006).

	Juneau	***Whistler***	***New Jersey***	***Gatlinburg***
Triggering Event				
High level of nuisance activity	●	●	●	●
Killing of nuisance bears	●	●		●
Human fatality				
Media attention	●		●	●
Educational components				
Media announcements	●	●	●	●
Presentations at schools, organizations etc.		●	●	
Brochures	●	●	●	
Pins, bumper stickers, gadgets etc.	●		●	
Door-to-door campaign	●			
Other initiatives				
Aversive conditioning	●			
Garbage containment ordinance	●	●	●	●
Bear-proof containers	●	●		●
Prohibition on feeding bears			●	●

Table 4.4 demonstrates that the city of Gatlinburg did not initiate as many educational efforts as the other jurisdictions and instead went straight to garbage containment ordinances and the city sent out notices to residents advising them they would be fined if they did not comply. By the time the garbage ordinances were in place, bears problems and controversies were regular news stories and a much talked-about issue in the city (Peine, 2001). This indicates that in the case of Gatlinburg, regular media attention was adequate for informing residents of the seriousness of the bear problems in the city, and the need to remove attractants. This demonstrates the power of controversial measures to generate media attention, which is a well-known communications strategy with potential utility in educational campaigns.

Garbage regulations, aversive conditioning, restrictions on the number of campers, lethal control, hunting and translocation are other options used by jurisdictions to reduce bear-human conflicts (McCarthy and Seavoy, 1994, Peine, 2001, Clark et al., 2002, Gore, 2004, Gore et al., 2006). Both Gore (2004) and Peine (2001) found that mandatory use of bear-proof garbage containers was the most effective method of reducing bear-human conflict. In several of the jurisdictions examined the communities originally used educational initiatives to reduce problems but those measures were then deemed inadequate so bear-proof garbage containers were implemented (Peine, 2001). For example in Juneau, the educational campaign which included public service announcements, bumper stickers, pins, fliers, and radio jingles, was not deemed fully successful and use of bear-proof garbage containers became mandatory (McCarthy and Seavoy, 1994, Peine, 2001). Although Gore (2004) and Peine (2001) found that bear-proof containers were the most effective means of reducing bear-human conflict, they and other authors still emphasized that education is an essential component of any conflict reduction strategy because it is the primary approach used for eliminating attractants, it is needed to inform residents of the seriousness of bear problems, and is helpful for obtaining public support to enact regulatory measures (Garshelis, 1989, Beckmann et al., 2004).

Despite evidence of the effectiveness of bear-proof garbage containers, only 24 jurisdictions in North America use bear-resistant containers (Spencer et al., 2007). Cost, at $500-$2,000 per container, is likely the biggest factor preventing bear-proof garbage containers from being used more widely (Spencer et al., 2007). Many jurisdictions are reluctant to mandate the use of bear-proof containers, but they still have the option of

implementing other strategies to make storage of garbage/organic materials less bear-attractive. Cheaper alternatives to bear-proof containers include regulations that prohibit leaving garbage outside prior to day of pick-up, requiring relatively clean garbage lids and containers, and mandating the use of garbage bins (not necessarily bear-proof) instead of bags.

Although wildlife managers have acknowledged the importance of proactive measures to reduce bear-human conflicts (Spencer et al., 2007), jurisdictions are slow to react in implementing regulations or programs designed to prevent nuisance situations. All of the campaigns launched to reduce bear-human conflicts were implemented after the conflicts had reached a "crisis" level (Gore, 2004, p.17) and, in many cases, it took years after identifying the seriousness of the bear problems before a plan was implemented. For example, in Gatlinburg a task force was established in 1997 to examine the issue of nuisance bears in the city, 10 years after an initial task force had been given the same mandate (Peine, 2001). Prior to sensational media coverage of the killing of nuisance bears in 1997 and 1998, there had been little public support for a nuisance bear policy in Gatlinburg (Peine, 2001). As evidenced in Table 4.4, the media often has a role in prompting action toward reducing bear problems.

DISCUSSION

This study complements results from other North American jurisdictions that indicate bear-human conflicts are of concern to wildlife managers, and education is considered an important aspect of reducing those conflicts. In Nova Scotia, dealing with bear-human conflicts threatens to overwhelm staff who are already feeling overworked. The results of

the interviews indicate that staff members want a reduction in the number of bear complaints and they think education is the key, even though they do not think the department's current educational efforts are poor, or that black bears need to be a higher priority for the department. While the stakeholder results from this study need to be treated cautiously because the agriculturalists were the only stakeholder groups who had experienced many problems with bears, they provide an interesting example of differing opinions among different groups of residents. The stakeholder participants are divided over whether the root of the problem is an uneducated public or a high number of bears, and staff acknowledged that both factors are likely at play. However, even if a large bear population is a key factor, NSDNR will be better-served by trying to adjust human behaviour because measures to reduce the bear population would likely not be popular among members of the public (Mankin et al., 1999, Lafon, 2002).

Although NSDNR staff members think education is the most-needed solution to reducing nuisance complaints, education is not a stand-alone tool for reducing bear-human conflicts (Gore, 2004). The case studies examined conclude that a combination of educational initiatives and garbage regulations is the most effective strategy for reducing bear-human conflicts. Education is the base of conflict-reduction strategies as it is used to inform residents about the seriousness of food-conditioned bears and how to reduce the likelihood of attracting bears, therefore deterring nuisance situations (Garshelis, 1989). Education is also generally supported by stakeholders and residents as a good solution for reducing problems (Messmer et al., 1997). As noted by several staff members in the interviews however, a challenge of education is ensuring engagement of residents and retention of the message. Therefore it is important that educational campaigns have

regular delivery of targeted information that delivers a clear, easy-to-understand message to different audiences. Using a variety of tools to educate residents increases the likelihood of message-retention. However, even with an education plan in place, management agencies need to remain prepared to deal with inevitable nuisance calls (Calvert et al., 1992).

In most jurisdictions there is a need to reduce bear-human conflicts in two areas: residential and agricultural. An educational program aimed at residential areas would focus on storage of food-waste and removing other backyard attractants, concentrating on the deterrence of nuisance bears through adjusting human behaviour (mainly food storage). It is important to inform residents of the effect on bears of habituation to human food; habituated bears are more likely to be involved in a human attack, and more likely to be euthanized if caught damaging property in search of food (Herrero, 1985). An effective educational program requires a great deal of effort to get the message out to a variety of residents and it is important to maintain regular distribution of materials to ensure retention of the message (McCarthy and Seavoy, 1994, Dunn et al., 2008). For example, in Ontario, the province's Bearwise program works with community leaders to establish local programs for educating residents (Ontario Ministry of Natural Resources, 2008). Also, Bearwise has teacher's guides that can be used in schools to educate children about bears and bear-human conflicts. This allows a variety of residents, including children, to become engaged and informed on how they can reduce the likelihood of attracting a bear to their property. Information dissemination methods that should be considered in educational campaigns include regular media releases to as many

media outlets as possible, mail-outs to regions with black bear populations, presentations to school children and door-to-door delivery in areas of high bear-human conflicts.

A focus on reducing bear-human conflicts in rural areas is also important, especially in Nova Scotia. The stakeholder survey results showed that agriculturalists report high levels of concern that black bears may damage their property or crops and there is evidence that agriculturalists are unhappy with the assistance NSDNR provides them (Chapter 3). Although agricultural complaints do not represent a large percentage of bear complaints in the province, given the dissatisfaction expressed by agriculturalists NSDNR should work towards helping agriculturalists prevent bear damage. Working with agriculturalists may also help NSDNR get a better picture of the actual number of agricultural problems because currently agriculturalists may shoot or deal with the bear without registering a complaint, a concern expressed by NSDNR staff members that occurs in other jurisdictions (Garshelis et al., 1999). As well, agriculturalists may be blaming damage on bears that is actually caused by other animals. In other jurisdictions it has been noted that deer actually cause the most crop damage (Conover and Decker, 1991, Conover, 1994, Garshelis et al., 1999). In many jurisdictions, electric fences have been deemed effective for protecting apiaries from bear damage (Maehr and Brady, 1982, Calvert et al., 1992, Jonker et al., 1998, Clark et al., 2005) and in Newfoundland they have been useful for keeping bears away from dumps (Fortin et al., 1999c). However, many of the survey respondents indicated that they use electric fences and they still suffer damages. It may be the case that agriculturalists are exaggerating the damages, or are unduly concerned, a situation that has been noted in other jurisdictions (Garshelis et al., 1999). This indicates that in Nova Scotia, and other jurisdictions with the same concerns,

efforts in agricultural areas may not need to be focused as much on education and information-delivery, but on communication with agriculturalists to get a better understanding of why they continue to suffer damage even when using electric fences. To help agriculturalists agencies can also put effort into focusing hunting toward crop-raiding individuals, a solution that was effective in Wisconsin (Hygnstrom and Hauge, 1989) and popular among agriculturalists in Minnesota (Garshelis et al., 1999). Compensation is another option to ease financial losses suffered by agriculturalists, but it is not always a popular solution because it does not prevent bear damage (Hygnstrom and Hauge, 1989).

There are other factors, besides education, for agencies to consider if working toward a strategy to reduce nuisance situations. Garbage-related regulation is a common approach to reduce bear-human conflicts (McCarthy and Seavoy, 1994, Peine, 2001, Gore, 2004). Regulations governing the storage of garbage and other organic materials can be beneficial because they do not have to be specific to bears and thus can provide the additional benefit of helping reduce problems with other nuisance animal species. In a survey of wildlife managers in North America, Spencer et al. (2007, p.223) found that "garbage management" and "fines" were the two most popular responses to the question "what techniques would you like to see your agency use more when responding to human-bear interactions?". In the interviews with NSDNR staff members, legislation was mentioned only once when a staff member indicated that they potentially needed some regulations to force people to remove attractants. It is unclear why regulations were so rarely mentioned but it may be that staff members did not think of it and are not aware of the use legislation or ordinances in other jurisdictions, or that they do not think that the

public would be supportive of regulatory measures. Unlike western North America, where bear-proof garbage containers are fixtures at campgrounds, rest-stops, and in some communities, in the east they are not common. For example, it is only in the last few years that national parks in Nova Scotia implemented bear-proof garbage cans in their campgrounds (Brunt, Parks Canada, pers. comm.), thirty years after their implementation in national parks in the Rockies (Parks Canada, 2006).

In Nova Scotia specifically, green bins are another factor to consider in assessing bear-human conflicts in the province. Most staff members indicated that the number of nuisance complaints have increased in the last few years. The green bin program was implemented in the late 1990s (Friesen, 2000) indicating that the increase in complaints has coincided with the program. Although currently there is not enough empirical evidence to associate direct causality between green bins and a high number of nuisance complaints, many staff members and stakeholders think they are having an effect. There are several other factors that could explain the seemingly higher number of complaints including natural food factors, a high bear population, and increased human development. Also, there was some opposition among residents to the implementation of this program (Friesen, 2000) which may make people more likely to complain if they have any problems. There is a need for further investigation to determine if/how the compost program contributes to bear-human conflicts in Nova Scotia.

In many cases where jurisdictions implemented extensive conflict-reduction programs, it was in response to a serious incident that attracted media attention. Even in these cases, developing suitable strategies was a time-consuming process, in some locations spanning

10-25 years before an approved policy was in place (Peine, 2001). In Nova Scotia there is no record of anyone being mauled or hurt by a black bear, and although the Department has generated some media attention over cases of euthanized bears, it has yet to reach a crisis point. NSDNR has the opportunity to address bear-human conflicts before a crisis situation occurs and the Department will likely be well-served by taking a proactive stance to reduce bear-human conflicts.

Management Recommendations

NSDNR should consider a more aggressive, proactive approach to educating Nova Scotia's residents about avoiding problems with bears in both rural and residential areas. Some simple steps that could be taken by NSDNR include increasing the number of media outlets information is sent to, sending bulletins/press releases out several times over the spring and summer, and increased presentations to schools and organizations in areas of high bear-human conflicts. It is also important that any program aimed at reducing conflict, in both rural and urban settings, include a system for measuring effectiveness (Gore et al., 2006, Dunn et al., 2008). This is something that lacks in other strategies, making it difficult to fully understand the role education plays in black bear management (Gore et al., 2006). Because most staff indicated prohibitive time constraints to any further educational efforts, management should ensure they communicate to on-the-ground staff that educational efforts are a priority and develop a system for ensuring educational efforts are completed. A more proactive approach to reducing nuisance complaints could potentially reduce the department's workload during the peak bear activity seasons. If successful, these measures should help to reduce the number of nuisance bear complaints made to the department. However, no effort will

completely eliminate bear-human conflicts therefore it is important NSDNR maintain updated, thorough protocols for dealing with bear situations.

Since voluntary compliance is a challenge, NSDNR should take advantage of opportunities such as legislative measures to make compliance mandatory. In areas of high rates of bear-human conflicts the Department should work with municipalities to examine the possibility of enacting bylaws requiring people to properly store their garbage, green bins, and other possible attractants. This would give staff members who deal with on-site situations leverage in their attempts to enforce compliance. Since regulations are standard and apply to everyone, any concerns that NSDNR staff members treat some residents differently would be reduced.

Because Nova Scotia is one of few jurisdictions with a widespread organics program there is an opportunity for the province to be a leader in research and innovation around organic pick-up programs. The implementation of widespread compost programs is likely to increase throughout North America in an effort to reduce landfill waste. In Nova Scotia, NSDNR should consider working with municipalities and the manufacturers of the green bins to investigate methods to make the carts bear-proof such as locking devices for the lid and/or a different design. Nova Scotia can also be a test jurisdiction to determine if the compost program is linked to increased bear-human conflicts.

CONCLUSION

Although at this time bears are not of conservation concern in Nova Scotia or most other jurisdictions, their ability to harm people, pets, or livestock or cause major property

damage, along with their charismatic appeal, automatically makes them a management priority. Education is an essential component to reducing complaints, however the Department cannot ignore the importance of laws to reduce problems. NSDNR should improve its educational efforts to reduce bear-human conflicts, but if the complaints remain high the Department needs to be prepared to recommend legislation requiring people to eliminate attractants. Legislative initiatives are themselves likely to generate media attention, thereby increasing educational opportunities at the same time.

It is well-documented that bear-human conflicts are of concern to wildlife managers throughout North America. In trying to reduce these conflicts humans are the essential variable; the behaviour of black bears cannot be adjusted. The results of this study complement those of Spencer et al. (2007) who also indicate that garbage regulations and education are two key components of bear-conflict strategies along with a system for marking and monitoring captured nuisance bears. There is no magic bullet for reducing bear-human conflicts, and to a certain extent the conflicts will never cease as long as humans and bears occupy the same space (Hristienko and McDonald, 2007). However, a concerted effort by staff and residents to remove attractants and deliver information about the problems associated with nuisance bears can promote increased knowledge and understanding of black bears and, in turn, better relations between the two species.

REFERENCES

To avoid redundancy, the references for this chapter are included in the reference section at the end of the thesis.

CHAPTER 5: ASSESSING THE EFFECTIVENESS OF BLACK BEAR MANAGEMENT PLANS AND POTENTIAL FOR IMPLEMENTATION IN NOVA SCOTIA

This chapter is a stand-alone paper to be submitted to a scholarly journal yet to be determined. Kathleen Witherly collected the data and wrote the paper with input from. Karen Beazley and Tony Nette as thesis supervisors.

ABSTRACT

Formal black bear management plans are implemented with the aim of helping wildlife agencies and departments in North America effectively manage their black bear populations. The objectives of this paper are to analyze and compare the effectiveness of existing black bear management plans in eastern North America, and Nova Scotia's performance in the absence of such a plan, and to determine whether a management plan should be implemented in the province. Existing management plans vary in their style, content, development process, and success in achieving goals set-out. Jurisdictions with management plans in place report the plans to be of considerable value, especially for gathering public support. While the lack of a management plan appears to have not been detrimental to the bear population in Nova Scotia, results suggest that the province would likely be well-served by a formal, publicly-available management plan that sets out management goals, rationale, objectives, and program delivery strategies which allow the Department to better communicate to staff, stakeholders, and the public.

INTRODUCTION

Appropriately managing a natural resource is a difficult and complex task and each jurisdiction must determine what management strategies are best for the unique circumstances of their province/state/city/etc. In some cases management plans are developed to help guide the responsible department or organization (Ewert et al., 2004). Fallding (2000, p.185) describes a management plan as "an agreement on purposes, values, objectives and implementation processes". Management plans vary in their content, style, presentation, and quality as they are developed for a variety of purposes, by many different parties (Fallding, 2000). This paper focuses on black bear management plans that are developed to manage black bear populations for varied values and uses. There are black bear management plans implemented in jurisdictions representing every corner of North America including Whistler, Idaho, East Texas, and several north-eastern jurisdictions. A black bear management plan refers to a formal, publicly-available document that sets out management strategies for a jurisdiction's black bear population.

There is little literature examining the "preparation, content, implementation, or review of management plans in practice", especially management plans focused on natural resources (Fallding, 2000, p.186). However, Lafon (2002) conducted a post-development evaluation of the Virginia Black Bear Management Plan and its development process from the perspective of both agency staff members and stakeholders involved in planning. He found that staff and stakeholder participants were generally pleased with both the management plan and the planning process. There is a noted lack of information on the usefulness of management plans in practice (Fallding, 2000) or evaluative frameworks for determining the success of a plan (Hockings, 1998, Williams et al., 1999). This lack of

research is notable considering that management plans are becoming increasingly common in North America. For example, all national parks in Canada are mandated to have a management plan under the National Parks Act (Parks Canada, 2007). In Nova Scotia specifically, management plans have been implemented for a few natural resources (e.g. wilderness areas, trout), all within the last few years (Department of Environment and Labour, 2006, Department of Agriculture and Fisheries, 2005). Generally, plans are successful in some aspects, but rarely is every goal achieved (Williams et al., 1999). Some common inadequacies of management plans include a lack of public support, unattainable expectations or actions, a lack of mechanisms to achieve outlined objectives, and poor means of communication (Fallding, 2000).

The development of management plans has become a public and political process and an effective management plan is no longer based solely on technology or a good information base (Groves, 2003). The public demands a greater role in natural resource decision-making, and the importance of stakeholder input into management decisions is being recognized by governments (Messmer et al., 1997, Lafon et al., 2003). Governments are increasingly mandating some level of public involvement as a part of their decision-making (Halvorsen, 2001) and the implementation of a management plan by any government department generally involves some type of citizen participation or opportunity for input.

While there seems to be some general agreement that management plans are beneficial or desirable, there is little evaluation of their effectiveness to substantiate or justify this belief. Since citizen participation, data requirements, and other aspects of management

planning processes can make such plans resource-intensive to develop and implement, the question of whether to implement a management plan in any particular jurisdiction should not be left unexamined or taken for granted. Consequently, this paper considers black bear management planning in jurisdictions where a plan has been implemented and black bear management in Nova Scotia, a jurisdictions without a formal management plan. The aim is to determine whether black bear management plans are considered effective or desirable in general or in particular contexts, and to thus consider whether one should be implemented in Nova Scotia specifically.

METHODS

The methods for this study consist of a document and policy analysis, interviews with both wildlife managers and biologists from other jurisdictions and surveys and interviews with Nova Scotia Department of Natural Resources (NSDNR) staff. The document and policy analysis identified common black bear management practices in other jurisdictions, and compared formal black bear management plans. Interview and survey questions addressed issues pertaining to black bear management practices and formal black bear management plans. The details of each data-collection method are described in the following sections.

Document and Policy Analysis

Available black bear management plans from north-eastern jurisdictions were compiled, compared and assessed. Because of a lack of evaluative frameworks for determining the effectiveness of plans (Hockings, 1998, Williams et al., 1999), the management plans were not assessed against any standard framework. Instead they were compared in terms

of the similarities and differences in their development processes, organizational structures, and contents. Common subject matter addressed in the management plans was identified and compared across jurisdictions.

Certain aspects of black bear management in north-eastern states and provinces were examined, compiled and compared. The management practices of interest were harvest regulations, research efforts, population monitoring, and formal policies. The practices were examined to determine, for example, whether the harvest regulations are similar in most jurisdictions, or what methods are used to monitor the population. The formal policies examined include nuisance protocols and management frameworks. The information was collected from departmental websites, through interviews, scholarly literature, and from management plans (where applicable). The goal was to determine what management regulations or strategies are common in most jurisdictions in eastern North America and whether these differ for places with or without black bear management plans.

Interviews

Brief telephone interviews were conducted with a selection of wildlife managers or biologists in two provinces (Ontario and New Brunswick) and eight states (Maine, Maryland, New Hampshire, New Jersey, New York, Pennsylvania, Vermont, and Virginia). The interviews were conducted to gain a better understanding of how other north-eastern jurisdictions manage their black bear populations. Managers in jurisdictions that have management plans were asked about the development and content of the plans and their perceptions of the effectiveness and value of the plans. The

interviewee from New York was asked about the State's Black Bear Response Manual, which is the State's protocol for dealing with bear incidents.

In Nova Scotia, the responsibility for managing the province's black bears falls to the provincial Department of Natural Resources (NSDNR). Interviews were conducted with 10 NSDNR staff members. The staff members were identified based on advice of the NSDNR's manager, wildlife resources. The interviewees were wildlife technicians (n=2) who often deal first hand with bear-human conflicts, wildlife biologists (n=7) who carry out management regimes in each region, and the manager, wildlife resources (n=1) who is responsible for overseeing the management program for bear, deer and moose in the province. Staff members were presented with a series of questions about black bear management in Nova Scotia. More specifically they were asked about how NSDNR's black bear management practices could be improved, if at all, and whether NSDNR should develop more specific goals related to black bear management. Staff members were also asked specifically whether they thought there would be value in having a formal black bear management plan in place. Their responses served as a basis for comparison with results of the interviews with managers elsewhere and the review of practices and management plans.

Survey

A web-based survey of NSDNR staff members was conducted, powered by the software Opinio (Version 5.2.9, 2006, ObjectPlanet Inc). The survey was sent to all staff who have a role in black bear management either through dealing directly with complaints or by supervising on-the-ground staff (n=111). Staff members were asked a number of

questions pertaining to black bear management in Nova Scotia. The participants were all advised of the survey 10 days prior to the survey link being sent out by electronic mail (e-mail). Two reminder e-mails were sent to anyone who had not yet completed the survey.

RESULTS

Analysis of Management Plans

Management plans from six north-eastern states (Maryland, New Hampshire, Virginia, Pennsylvania, New Jersey, and Vermont) were analyzed and compared (Vermont Agency of Natural Resources, 1997, Virginia Department of Game and Inland Fisheries, 2002, Maryland Department of Natural Resources, 2004, Black Bear Policy Committee, 2005, State of New Hampshire Fish and Game, 2005). New Hampshire's plan is for big game (bear, deer, moose, turkey) while all the other plans are focused solely on black bears. Virginia, Pennsylvania and Maryland have deer management plans as well, and Vermont has management plans for its other big game species (moose, deer, and turkey). The black bear management plans from New Jersey and Vermont are both expired and new ones are in the process of development; the other management plans are currently valid. The plans do not represent all the bear management plans available in North America, however they serve as examples of how other jurisdictions in the northeast manage black bears, and they demonstrate what a plan in Nova Scotia could entail. Three aspects of the plans were assessed: the development process, use of public input, and content. These were considered and assessed along with reference to the opinions of the wildlife managers who use the plans.

1. Development of management plans

In the interviews with the wildlife managers and biologists from other states and provinces, respondents provided a variety of reasons why their jurisdiction established a management plan, including:

- to give managers consistency of purpose and strategy;
- to foster public support for department's activities; and,
- to help manage bear-human conflicts and a growing black bear population.

In many north-eastern American states, the black bear population has been steadily increasing over the last few years (Williamson, 2002) leading to bigger bear populations than management agencies are used to dealing with. As one interviewee mentioned, the bears were "back on the landscape". Another person said that with the bear population expanding into new areas, it seemed "timely" to develop a plan to give the department guidance. A larger bear population increases the potential for controversy around harvest, hunting practices, and lethal control (often referred to as euthanasia) of bears. In Virginia, controversy around hunting issues (seasons and use of hounds) pushed the responsible department to develop its plan, and extensive public participation was included in the development process to ensure public support for management practices. In New Jersey a black bear management plan was developed because the state is trying to implement a bear-hunting season. Because hunting is a controversial subject, a management plan is a tool for demonstrating to the public why a hunting season is desirable, and it provides information about other bear management techniques being used. Maryland, Virginia, and New Jersey have all had their bear hunting regulations challenged in court, so having

public support for the management plans was considered important for justifying the department's position.

The length of time taken to develop the management plans varied. The development of New Hampshire's big game plan took one year, while Pennsylvania's black bear management plan had a three-year development process. The first management plan was described as the most difficult to develop; once that plan is in place the same process and template can be used to develop the next plan. Vermont and New Jersey are both in the process of developing new management plans to replace expired ones (this will be the third management plan for both states). The interviewees from those states all said that a similar process would be used to develop the new management plan, and that the new plan would in large part be made up of revisions of the old one**.**

The management plans were not considered particularly costly to develop. For the most part, staff time was the only major input into plan development, with some interviewees citing additional minor costs for printing, travel, and food and supplies for meetings. The only major expense was incurred in states that contracted firms to conduct state-wide public surveys at a cost of approximately $20,000 USD for most jurisdictions. The states that had conducted surveys reported them to be valuable for helping to determine public opinion. An additional expense was incurred in Virginia where the department paid for work by a graduate student in the plan development.

2. Public input:

All of the plans included some level of public involvement in their development (Table 5.1). Providing a draft plan for public comment was the least intensive method of involving the public. Several states had a stakeholder task force (or public working group), that helped the department formulate either the values, or the goals and objectives of the management plan. In Pennsylvania, although there was no stakeholder task force that worked specifically on the plan, stakeholder groups were invited for a day-long session to discuss what values should drive the management plan, held before the plan was drafted by a departmental employee. Similarly, Vermont's plan was drafted by departmental staff and the public were invited to open houses and public hearings to comment on the plan. The stakeholder groups that were often invited to take part in the development of the management plans included hunting organizations, animal rights organizations, agricultural interests, and environmental organizations. In some cases private citizens, landowners, independent biologists, forestry interests, and representatives of other government departments also participated in the stakeholder committees.

3. Content of plans:

A summary of the components of the management plans analyzed can be seen in Table 5.1. More detailed information on the content, layout, and development processes of the plans can be seen in Appendix I. Although New Hampshire's plan is a big game plan that also sets out goals for deer, turkey and moose, the information in the "Goals/objectives" section of Table 5.1 pertains only to the bear section of the plan. The other plans are strictly devoted to black bears.

Table 5.1: Comparison of the development process, use of public input, and goals of the management plans examined. Information gathered from management plans and interviews with wildlife managers from the six jurisdictions.

	Maryland	Pennsylvania	Virginia	New Hampshire	New Jersey	Vermont
Date valid	2004-2013	2006-2015	2001-2010	2006-2015	2005	1997-2006
Number of pages	45	73	103	21	63	16
Content of plan						
Executive summary	●	●	●			●
Black bear life history		●	●			
Review of state's management	●				●	●
Black bear management options	●	●	●			
Involvement of public						
Public Survey	●			●		●
Stakeholder Task Force	●		●	●		
Public comment period	●	●	●	●	●	●
Goals/objectives						
Population viability	●	●	●	●	●	●
Population objectives		●	●	●		●
Habitat	●	●	●	●	●	●
Human-bear conflict	●	●	●	●	●	
Hunting-related	●	●	●		●	●
Non-consumptive recreation	●	●	●			
Research-related					●	
Dates for achieving goals		●	●			

There was no single, specific set-up that all of the plans followed, but several of them had a similar layout and content. The plans all contained introductory information and appendices. The introductory information covered a variety of topics including life-history of the black bear, a review of management practices in the state, and a summary of the human interest in bears. Except for New Hampshire and Vermont's plans (the shortest management plans), the majority of the content included in the black bear management plans examined was extensive introductory and background information. New Jersey's management plan was approximately half background information and appendices, and half discussion and recommendations around particular issues. Most of the plans contained goals and objectives. The management plans from New Jersey and Vermont had recommendations. New Jersey's management plan was divided into seven management issues, each of which constituted a section comprised of policy, discussion, and recommendations. The goals (or recommendations in Vermont's plan) of all of the other plans were concentrated in one section of the plan. There were generally a few objectives tied to each goal, and several strategies for each objective. The plans varied in the level of detail around mechanisms for achieving their goals. New Hampshire's objectives were the least detailed, and there was only one objective for each goal. All of the plans except New Hampshire had strategies that described how each objective would be met. With the exception of Maryland's management plan, which included a goal dedicated to potential sources of funding, the plans did not detail how achievement of the goals would be funded.

The management plans addressed several bear-related issues in a single document. Table 5.1 demonstrates that there are four common subjects that are addressed most-regularly in the plans' goals (or recommendations for New Jersey and Vermont): population, habitat, bear-human conflicts, and bear-related recreation. How these subjects are addressed varies in the plans. Table 5.2 presents some examples of the goals, objectives or recommendations set out for each of the four main issues. As previously mentioned, background information and appendices made up the majority of most of the plans while the goals and objectives did not make-up a large portion of the documents.

Table 5.2: Examples of some of the goals or recommendations set out in the six plans assessed related to each of the four key issues identified as being commonly-addressed in management plans: population, habitat, bear-human conflicts, and bear-related recreation. Information obtained from management plans assessed.

Population	▪ Maintain healthy and sustaining bear populations ▪ Regionally manage bear populations ▪ Develop population objectives ▪ Use regulated hunting to maintain population levels
Habitat	▪ Minimize loss and improve quality of habitat ▪ Develop black bear habitat conservation plan ▪ Monitor recreational and development demands that negatively affect black bear habitat
Bear-human conflicts	▪ Provide training to first responders who deal with human-bear conflicts ▪ Work with communities and organizations to reduce bear-human conflicts ▪ Use hunting as a tool to reduce bear-human conflicts ▪ Evaluate the effectiveness of different nuisance bear management options
Bear-related recreation	▪ Change hunting hours or seasons ▪ Ensure hunting methods are fair and sportsmanlike ▪ Provide non-consumptive recreational activities

4. Opinions of wildlife managers about the effectiveness of the management plans:

All of the managers interviewed had praise for their management plans. The plans were described as "an invaluable tool", "a life preserver for the agency", and a way for the department/agency to get a "big picture idea" of how to manage bears. None of the

interviewees provided negative comments about having a management plan**.** The management plans were considered useful because they give staff members direction in how to manage bears by laying out goals and objectives for the species. As one interviewee mentioned "establishment of goals and objectives have been extremely beneficial to managers", indicating that the plan is useful for departmental staff. The interviews with the wildlife managers/biologists from other jurisdictions were brief, however, so there was little elaboration beyond those points as to why specifically management plans are good or useful and none of the managers gave any specific, operational examples of how a plan is used.

For the most part, the praise of the plans related to their use as a tool for achieving or maintaining public support. Because several of the plans relied extensively on public input in the development process, the managers believe that the plans give the department credibility with the public and backing in its decision-making. One manager stated that the involvement of the public led to a plan that was better than what the department could have written on its own because it reflects the ideas of the public and not just the management agency. Using public opinion surveys was also described as a useful method of incorporating public input because it allows the department to use the results of the survey to demonstrate that the plan addresses concerns of the public. The managers were in agreement that a high level of public involvement in the plans is desirable.

Five of the wildlife managers were asked specifically whether the goals outlined in their plans had been achieved. The plans varied in their success, however none had achieved every goal set out in the plan. A few of the managers stated that the easy part of having a

management plan was the development process and that the challenges lie in actually implementing the plan. Most of the plans were only a few years into their implementation, so it can not yet be determined if they have been fully successful at achieving their goals. One interviewee responded as such and stated that they were only one year into a 10-year plan so little had been accomplished. Another interviewee stated that the department had given "good faith" (i.e. tried their best) in accomplishing the plan's goals, but had been hindered by financial issues. The other three managers highlighted that they had been successful in some aspects of the plan, but had not achieved every goal. For example one of those managers listed four of the plan's goals, and only one of those goals had been acted on. Another interviewee said they had done well on their goals related to bear-human conflicts and hunting seasons, but had fallen short on habitat conservation because of private land-owner issues. Despite this varying success on an operational level, none of the interviewees indicated that they thought the plan had been unsuccessful.

Black Bear Management Practices in Eastern North America

Management practices and regulations from Nova Scotia and several other north-eastern jurisdictions typically include harvest regulations, formal policies, research being conducted and methods of population monitoring. Each practice and regulation is described in more detail in the following sections, and a summary for each jurisdiction can be found in Table 5.3. Figure 5.1 identifies the jurisdictions examined. The descriptions are not exhaustive as they are based on information found on departmental websites, in the literature, management plans (where applicable), or provided in

interviews. There does not appear to be any major differences in regulations between jurisdictions with or without black bear management plans.

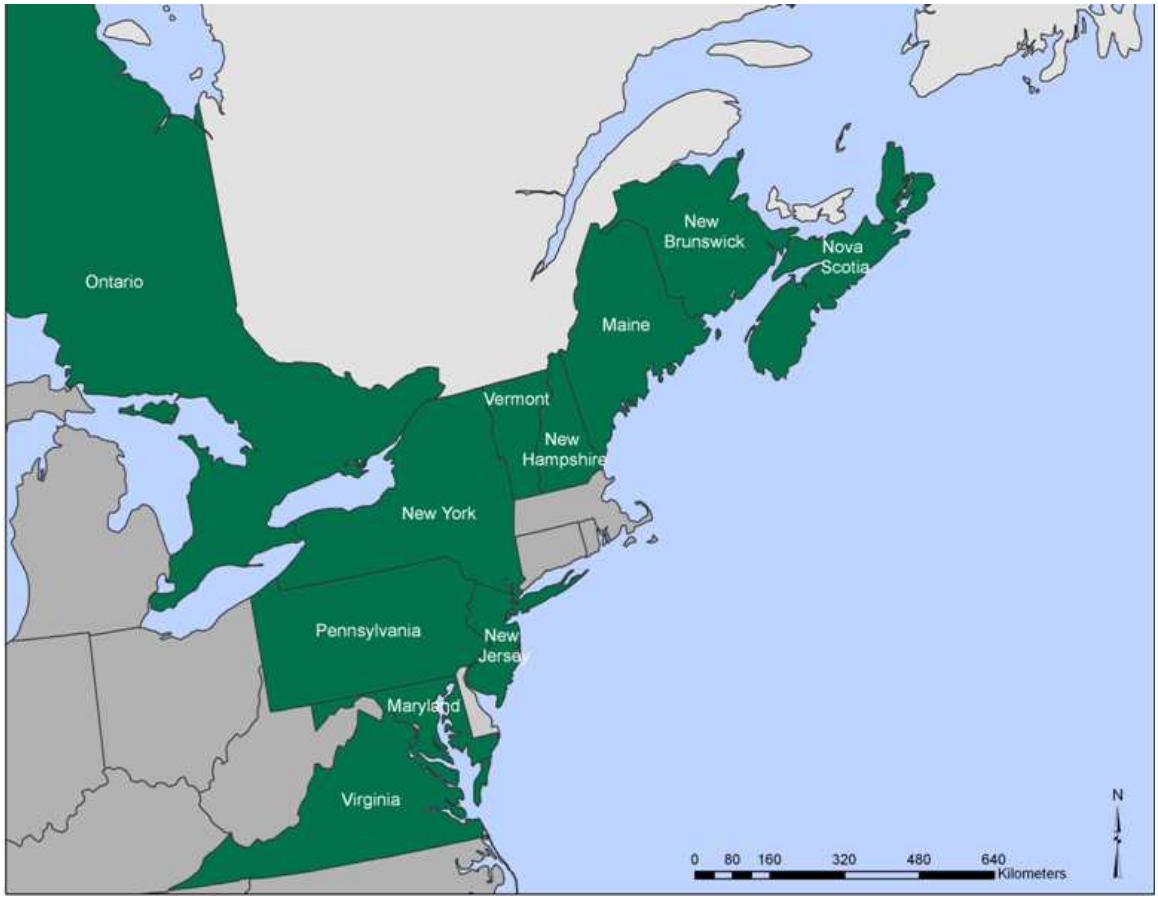

Figure 5.1: Map highlighting the jurisdictions that were subject to comparison of management practices.

1. Harvest:

Harvest regulations vary in the jurisdictions examined as "hunting programs are usually structured to suit the demographics, geography, and local traditions of jurisdictions" (Hristienko and McDonald, 2007, p.79). New Jersey is the only jurisdiction without a bear hunt. The state has only had two bear-hunting seasons since 1969 (in 2003 and 2005). The New Jersey Division of Fish and Wildlife has proposed a season every year

but political opposition has prevented the seasons from taking place. Hunting over bait, hunting with hounds, and the sale/export of bear gall-bladders are legal in half of the jurisdictions (Table 5.3). Spring hunting is legal only in New Brunswick. The fall-hunting seasons vary by jurisdiction and range from late August to mid-December. The seasons also vary within each state or province based on hunting method (bow, muzzleloaders, firearms, bait, or hounds) and region.

2. Research:

Many of the jurisdictions have conducted research projects that have contributed to scholarly knowledge about black bears. Table 5.3 indicates that every jurisdiction has had some level of research and several jurisdictions have had extensive, long-term research focusing on the ecology and demographics of their black bear population. For example, Ontario conducted a ten-year demographic study of a black bear population in the boreal forest (Obbard and Howe, 2006). Pennsylvania ear-tags approximately 600 bears per year, and in Maine they visit 70-100 dens per year to study adult/yearling survival. Research relating to human dimensions of black bear management is not as common, although Lafon (2002) examined stakeholder and staff attitudes and opinions during the development of the Virginia Black Bear Management Plan, and the risk perception of bear-human conflicts has been studied in New York (Gore et al., 2007). Most of the jurisdictions with management plans had previously conducted fairly extensive research on their black bear populations, as summarized in the background sections of their management plans. Nova Scotia has conducted little research on its black bear population and there is no literature in peer-reviewed journals pertaining to black bears or black bear management in the province. Some of the managers

interviewed in jurisdictions with plans were asked if it would have been possible to develop a management plan without prior research on the population. They responded that it would have been more difficult because many of the decisions made in the management plans relied heavily on the previously-collected data. However they thought it was still possible to develop a plan without much research although in such a case "more research" would likely be one of the goals set out in the plan.

3. Population monitoring:

Harvest is used as the basis for population monitoring in most jurisdictions, including Nova Scotia, and harvest data contributes to every jurisdiction's black bear dataset. Some jurisdictions monitor the population more closely, using additional measures such as mark-recapture to help get a good estimate of the bear population. A combination of techniques is the best way to get a good estimate of the bear population (Garshelis, 1990). All the jurisdictions except Virginia and Nova Scotia have population estimates for their state/province varying from approximately 550 bears in Maryland to 100,000 in Ontario. All of the jurisdictions report a stable or growing bear population (Williamson, 2002).

4. Black bear management policies:

Seven of the 11 jurisdictions report having formal black bear management plans and the other three jurisdictions (Ontario, New Brunswick, and New York) have a framework that guides their black bear management (Table 5.3). Nova Scotia's management policies are discussed in the next section. From the information collected, frameworks appear to differ from formal management plans in that they do not lay out specific goals to be achieved, and in many cases are not readily accessible to the public. However, New York

had the only framework where a copy was available for assessment, so it cannot be deciphered in greater detail how frameworks and management plans differ or are similar. New York's black bear management framework discusses how decisions about black bears should be made, but does not specify any goals related to the black bear population. Public input was incorporated into development of that framework (New York State Department of Environmental Conservation, 2003). Ontario currently has a draft for a new "Enhanced black bear management framework", which the interviewee described as a standard management plan that is enhanced on a "rolling basis" to adapt to changes such as the cancellation of the province's spring bear-hunt. Public consultations are a part of that process as well. None of the interviewees from a jurisdiction without a formal black bear management plan thought that their jurisdiction's management strategy was lacking. The interviewee from New Brunswick stated that a formal management plan is not necessary, as long as some aspects of a plan are in place (e.g. limit on non-resident licences, nuisance wildlife policy, wildlife management zones), as they are in New Brunswick.

Many of the jurisdictions also have policies outlining how nuisance situations should be dealt with. Although in the management plans examined there was usually one or more goals related to bear-human conflicts, the nuisance policy, which outlines response measures for conflicts situations, was generally separate from management plans. Most of the jurisdictions have either a response manual for staff, or a nuisance bear/wildlife policy that directs staff in dealing with bear-human conflicts. Ontario has a separate program (Bearwise), run through the Ministry of Natural Resources, and the focus of the program is reducing bear-human conflicts, generally through community outreach. New

York has the most detailed nuisance policy of all the north-eastern jurisdictions examined. The state's "Black bear response manual" outlines 52 possible scenarios involving a bear and lists recommended actions and equipment for staff members. The manual is used state-wide so there is conformity in how departmental staff members as well as law enforcement agencies deal with bear situations. While several jurisdictions noted human injuries caused by bears, Ontario and New York are the only jurisdictions examined with any recent record of black bear-caused human fatalities.

Nova Scotia's Black Bear Management in the Absence of a Management Plan

In the absence of a management plan, NSDNR has addressed, to an extent, each of the four issues generally addressed in the black bear management plans examined (population, habitat, bear-human conflicts, bear-related recreation). However, the Department has not set out specific goals pertaining to any of these issues. NSDNR has acknowledged that bear-human conflicts are an important issue and the Department is working to inform residents about reducing bear complaints although there are greater efforts that should be made such as increased media release, door-to-door delivery, and school/community presentations (Chapter 4). The Department also has a detailed operations manual outlining how staff members should deal with various bear-human situations. In terms of habitat conservation, NSDNR has not done anything specific to maintain bear habitat, but the Department has been working on an Integrated Resource Management (IRM) strategy that includes habitat planning on crown lands (Department of Natural Resources, 2007). This IRM process has been ongoing since 2000, however it is not yet complete, and does not appear to be currently active (Department of Natural Resources, 2007). NSDNR monitors its black bear population by monitoring trends derived from indirect indicators

(age/sex data derived from harvest) and an abundant population has been maintained in the province (Nette, NSDNR, pers. comm.). As for bear-related recreation, NSDNR provides opportunities for hunting and allows people to register a bait site for the purpose bear of viewing and photography.

NSDNR has managed for many important bear-management issues, however its Black Bear Management Program states only one general objective, albeit with several aspects: "[t]o maintain a healthy population of bear throughout their natural habitat, permitting a safe and humane harvest through hunting and snaring (sustainable level) and assist the public in minimizing property damage and nuisance problems" (Department of Natural Resources, 1997, no page number). The Department does not have any specific long-term goals or objectives beyond that. So far, no major incidences involving black bears have occurred in Nova Scotia (e.g. human attack) and black bears are not currently an issue of widespread concern in the province. However, as the previous chapters and following paragraphs indicate, there is opportunity for NSDNR to put more effort into some aspects of black bear management.

Table 5.3: Summary of black bear management practices in a selection of north-eastern jurisdictions. Information collected from interviews with wildlife managers, departmental websites, and management plans (where applicable).

Location	Harvest season	Spring hunt	Hounds	Bait	Management plan	Nuisance bear policy	Examples of bear research	Population monitoring
Maine	Aug-Nov	N	Y	Y	Y (expired)	Y	Collared bears Visit 70-100 dens/year	Telemetry
Maryland	1 week in Oct	N	N	N	Y	Nuisance response plan	Habitat use Reproduction monitoring GPS collaring	Mark-recapture Scent surveys to monitor trends
New Brunswick	Apr – Jun Sept-Nov	Y	N	Y	N	General nuisance wildlife policy	A lot of research in 1980s	Harvest reconstruction
New Hampshire	Vary by region	N	Y	Y	Y (big game plan)	Protocol and education program	Aversive conditioning Mark-recapture study	Harvest reconstruction coupled with observation data
New Jersey	n/a	n/a	n/a	n/a	Y (under review)	Part of management plan	Aversive conditioning Extensive research since 1980 Den visits	Mark-recapture Radio telemetry
New York	Vary by region	N	N	N	N (framework)	Specific black bear response manual	Tetracycline to estimate population Extensive research over last 35-40 years	Harvest reconstruction
Nova Scotia	Sept -Dec	N	N	Y	N	Standard operating procedures	Habitat suitability study Current study	Harvest data, nuisance complaints and sightings used to monitor long-term trends
Ontario	Vary by region	N	Y	Y	N (framework)	Bearwise program	Long-term demographic study	Mark-recapture
Pennsylvania	3 days (Nov)	N	N	N	Y	N	Demographics (600 bears ear-tagged) Opinion surveys	Mark-recapture
Vermont	Sept-Nov	N	Y	N	Y (expired)	N (currently developing one)	1990s – telemetry studies	Harvest data
Virginia	Vary by region and hunting method	N	Y	N	Y	Standard operating procedures	Long-term study on nutrition Studies dating back to 1950s	Harvest data and nuisance complaints used to monitor population status and trends

Potential for a Black Bear Management Plan in Nova Scotia

1. Support among NSDNR staff:

In-depth interviews were conducted with 10 staff members of the Nova Scotia NSDNR, and 61 staff members completed the on-line survey (55% response rate). In general, NSDNR staff members are satisfied with the department's black bear management and think the Department is doing a good job at dealing with bear-human conflicts and implementing harvest regulations that are biologically sustainable and socially acceptable (Chapter 3). Staff are concerned, however, about the high number of bear-human conflicts being reported, and they expressed a desire for educational efforts to reduce the number of incidents and more intensive population monitoring and research on the province's black bears.

To help address some of these concerns, support was expressed by NSDNR staff in both the interviews and the survey responses for a black bear management plan. In the interviews, two staff members mentioned the need for a management plan without being asked; both thought a plan would be a good way to identify research needs and priorities. One interviewee also thought a plan would useful for promoting the department's management to the public and would be important if the department's management were subject to review: "I mean how can you defend something when you don't even have a management plan for it?" (NSDNR staff member). The other interviewees did not mention any need for a management plan except when specifically asked. When staff members were specifically asked if they thought the Department should implement a formal black bear management plan, six of the 10 interviewees responded with a straight

"yes". One person responded that they already have all the components of a management plan, and putting it all together in one document could be a good idea. Another staff member thought that they do need more of a plan than they currently have, but was also concerned that the plan would be "fluff". One staff member did not think a management plan was really necessary. In the survey, 79% of the respondents agreed or strongly agreed with the statement "the development of a formal Nova Scotia black bear management plan would be useful for helping NSDNR staff manage the black bear population more effectively". Only one respondent (2%) disagreed with that statement (16% were neutral and 3% had no opinion).

NSDNR staff members would be supportive of the development of more specific goals related to black bear management. In the survey, staff members were given a list of bear management issues and asked for which ones they thought the NSDNR should establish specific management goals. For five of the issues presented more than half of the staff members think a management goal should be developed (Table 5.4). In the interviews, however, when staff members had more opportunity to expand upon their responses, several commented that setting specific goals in many cases was unrealistic and not necessary. Some staff members pointed out that setting more specific goals (e.g. number of bears to be harvested) is difficult because the Department does not have a good estimate of the number of bears in the province. In both the survey and the interviews, public education was the issue for which most agreed that specific goals should be established.

Table 5.4: Percentage of NSDNR respondents (n=61) who thought that a specific management goal should be set for the bear management issues listed.

Bear management issue	**Percentage of respondents that selected issue**
Population	79%
Distribution of bears	42%
Number of bears harvested	79%
Amount of available bear habitat	49%
Non-consumptive recreation	18%
Minimization of human-bear conflict	66%
Public education	98%
Research	52%

Although NSDNR staff members are supportive of the development of a management plan and more specific goals for key issues, they are not convinced that black bears should be a higher priority for the Department than at present. Only three of the interview respondents thought that black bear management should be a higher priority for NSDNR, and two of those respondents expressed concern in making them a higher priority (one cited a lack of resources, the other stated that there were other species that should also be a higher priority). The other respondents did not think that black bears needed to be a higher priority.

2. Public and stakeholder input:

NSDNR staff members were asked about the importance of input by the public and interest groups in bear management. On the survey, staff members were asked to rate the importance of input from different parties (e.g. university professors, people who suffer damage due to bears, hunters, Aboriginal groups, general public) interested in Nova Scotia's black bears. The input of every group was considered important or very important by more than half of the NSDNR respondents (Chapter 3, Table 3.9). In the interviews, staff members were asked whether public consultations would be desirable if

a formal management plan were implemented; all 10 staff members acknowledged that public input would be necessary. There was also consensus, however, that although input is important, these parties do not necessarily need to be directly involved in decision-making.

Although the survey results do not show much support for considering non-consumptive recreation (Table 5.4) or the input of stakeholders with non-consumptive interests in developing management strategies (Chapter 3, Table 3.9), in the interviews most NSDNR staff were more supportive of giving consideration to non-consumptive interests. When asked whether the Department should focus more attention on the non-consumptive values of the black bear, five interviewees responded that increased promotion of non-consumptive activities could be a good opportunity for the department, one did not think increased focus on non-consumptive activities was necessary, and three of the staff members did not think there was much to promote (because there is nothing for the Department to regulate, as opposed to hunting). Half of the black bear management plans from other jurisdictions that were assessed included a goal for promoting non-consumptive recreation.

DISCUSSION AND MANAGEMENT IMPLICATIONS

Black Bear Management in North America

Management actions and priorities vary among jurisdictions so it is difficult to assess whether one jurisdiction's management is better than another's. Each jurisdiction must develop management strategies that suit their particular economic, social, and political situations. There is little conformity about legal and acceptable hunting practices in

North America and bear hunting regulations vary from province to province and state to state. Allowable hunting methods in jurisdictions depend on both biological and social factors, with social factors having a greater effect on harvest regulations (Hristienko and McDonald, 2007).

The difference in levels of research and population monitoring among the jurisdictions examined likely is due to financial or human resource issues. In Nova Scotia, the money derived from the sale of hunting licences is not allocated back towards wildlife management programs as it is in most of the American jurisdictions providing those states with additional revenue to use towards research projects. Population monitoring and obtaining a reliable estimate of a black bear population is difficult and dependant on resources. There are few places that have a good handle on the status of their bear populations (Garshelis, 2002). Although population estimates are useful for management purposes, most are not accurate and tend to be biased or error-laden (Noyce et al., 2001, Garshelis and Hristienko, 2006). The black bear population is believed to be abundant throughout most of its range in North America, and all of the jurisdictions examined report a stable or increasing bear population (Williamson, 2002). This indicates that the varying management practices used by different jurisdictions are all sufficient for maintaining sustainable bear populations (Garshelis, 2002).

Value of Management Plans

Although the interviewed wildlife managers from other jurisdictions all had praise for their management plans, it is unclear how useful or necessary the plans are in practice. Because only brief, telephone interviews were conducted with the managers, it is difficult

to determine in more detail how the management plans are useful to staff members on an operational level. As well, the lack of any evaluation of how the public perceives the plans makes it impossible to determine how the public values the plans or if they deem the plans useful or necessary. Management plans allow for several issues to be addressed in a single, publicly available document, and have the potential for fostering broad public support. Management plans also provide wildlife management agencies the opportunity to take a more proactive approach to management issues when generally wildlife agencies are reactive by nature (Beck, 1998, Spencer et al., 2007). A common problem with plans is that they are often heavy on process, but light on actual desired outcomes (Fallding, 2000). The management plans analyzed generally had more background information than details on how to determine whether the objectives were met, the effectiveness of the practices, or future needs. The only obvious value of the background information was that it summarized current information on the black bear population, however there is no indication that the provision of this information made achievement of the goals any more likely.

There are no standard evaluative frameworks developed for determining the success of management plans (Williams et al., 1999, Hockings, 1998). This made it difficult to evaluate the management plans in any way other than comparing them to each other. It also means that there is no standard measure against which a management agency can assess its management plan. This is an area where more research is needed to determine what effective black bear management plans should entail. Ideally a management plan sets out goals that can feasibly be accomplished. This is a challenging aspect of management plan development as often the monitoring and assessment efforts necessary

for setting and evaluating progress toward achieving goals get lost in the focus placed on the planning and implementation of a plan (Williams et al., 1999). There is also no specific, best format for a management plan (Fallding, 2000) therefore jurisdictions can have freedom in developing and considering the content of their management plan, although the design and content of other management plans as summarized here can provide a guideline.

For a plan to be effective, it is essential that it provide clarity in its direction and specific means to achieve goals (Fallding, 2000). Managers need to decide how to determine whether their management plan has been successful by implementing indicators to measure success. For example, if one of the goals of the management plan is to educate residents about removing bear-attractants from their properties, there are several different ways the Department could achieve this goal. Possible efforts include putting out a certain number of media releases, school presentations, and door-to-door delivery of educational materials. However, achievement of delivering education material (the goal) is different from successfully convincing residents to remove an attractant. Success would be indicated differently through something like a reduction in number of complaints, or fewer birdfeeders in residents' backyards. Because there is a difference between accomplishing a goal and measuring success, and several ways of assessing both, it is important departments lay out in detail how goals should be accomplished (outputs), and what indicates successful accomplishment of those goals (outcomes). This will help departments determine whether their management plan has been successful.

A survey of departmental staff after the development of the Virginia Black Bear Management Plan found that negative aspects of the management plan included "its length, its idealistic target dates for meeting objectives, and its lack of clarity about the mechanisms to be used for updating objectives" (Lafon, 2002, p.132). Although difficulty in achieving the goals set out in management plans is a concern noted by Lafon (2002) and the wildlife managers interviewed in this study, the plans are still lauded by the wildlife managers who use them. In Virginia, Lafon (2002, p.132) found that most surveyed staff were satisfied with the management plan and aspects they especially liked about the plan included "its management direction, its comprehensiveness, its collection of information on bear biology and management" and "its balanced approach with respect to all stakeholders". Management plans provide support, consistency, and guidance for managers and staff members when making decisions and dealing with the public. This suggests that a management plan is a useful tool for managers and staff, regardless of the achievement of all goals.

Possibility of a Black Bear Management Plan in Nova Scotia

Although there is relatively strong support among NSDNR staff members for development of a black bear management plan, staff also indicate that black bears need not be a higher priority for the department. Given the high number of nuisance complaints in Nova Scotia (Chapter 4), and the increasing controversy surrounding bear hunting in North America (Chapter 3) however, black bears are likely to be a priority for the department, and will continue to demand many of the department's resources. While Nova Scotia does not currently have a black bear management plan, black bear management practices in the province appear to be in-line with other jurisdictions (Table

5.3) and there is no evidence that the department's management practices are detrimental to the bear population.

If NSDNR were to implement a management plan, considering it would be the department's first species-based management plan, it would be wise to have a similar development process, format, and content as in the existing plans from other jurisdictions, particularly those that are common to all. Exceptions to this would be to (1) question the necessity for extensive background, and (2) include more detail on how to determine whether the objectives are met, the effectiveness of the practices, or future needs. Such management planning would provide an opportunity for the Department to establish more specific management goals and prioritize its objectives related to black bears, something that staff members have indicated they would support. Despite there being no evaluative frameworks, the existing management plans in other jurisdictions arguably serve as a good preliminary guide as they have already successfully been implemented and subject to public scrutiny.

Development of a management plan could be a useful tool to help NSDNR communicate with stakeholder groups and the public, and staff members have acknowledged the importance of public input. Because the development of a management plan should involve public participation (Groves, 2003), it will provide an opportunity for members of the public to express their opinions which so far may have been muted. Involving the public can help secure community buy-in and increase support for decisions (Messmer et al., 1997, Lafon et al., 2003) and provide legitimacy to the decision-making process (Lawrence and Deagen, 2001). Involving the public is also of benefit to the participants.

A study from the development of the Virginia Black Bear Management plan, found that stakeholders who participated in meetings and discussions about the management plan became more informed about bears, the department, and the views of different stakeholders (Lafon, 2002). To restrict public access to the plan development process and to the document itself would forfeit a potentially effective educational opportunity. Once developed, a management plan should be a publicly-available document, allowing interested members of the public to read the document and become informed of the department's objectives and practices.

A challenge in the development of a black bear management plan in Nova Scotia, and elsewhere, would be determining the appropriate method of including the public and stakeholders. Public involvement can range from making a draft document available for public comment to having stakeholder groups develop the goals and objectives that form the basis of the plan. The managers interviewed who used stakeholder groups to help formulate the management plans' goals believe that including members of the public extensively in the development of the management plan is beneficial because it gives the department additional public support. A public survey is an option for including public input that is less intensive in terms of involving the public in decision-making, but is more expensive. A survey is a way for a department to get an idea of how the general population perceives bear management, it allows for identification of management techniques that are preferred by the public, and it can enhance "wildlife managers' credibility with a non-traditional constituency group" (Green et al., 1997, p. 370). The form of public involvement will likely be determined by the amount of time and effort the department is willing or able to put into the development of a plan. Involving

stakeholders at every stage of plan development is much more resource-intensive than simply putting a draft out for public review, however Lafon (2002, p.133) argues that multiple involvement techniques "complement or enhance one another" and allow for more people to be involved.

The importance of being open to including the requests and opinions of non-consumptive users into management strategies has been acknowledged in the literature (Lafon et al., 2003, Lindsey, 2003). Although many NSDNR staff members do not appear to be convinced, the findings from elsewhere suggest that non-consumptive interests are important to consider. In many jurisdictions, including Nova Scotia, most wildlife managers are hunters (Beck, 1998). This makes it especially important for wildlife agencies to ensure they reach out to non-consumptive users. Three of the management plans assessed, had specific goals that addressed the need to provide non-consumptive bear-related activities.

With the exception of the relatively high cost of a public survey, staff time was the only major resource required for a plan development. In order to develop a plan, jurisdictions need qualified and willing staff members to focus on and lead the development process. This may be a challenge in Nova Scotia as many staff members claimed that the Department is short-staffed, leaving many feeling overworked (Chapter 3). This situation is not likely to improve given the resources required to respond to bear-human conflicts and to address other management issues. Development and implementation of a plan will require significant staff resources during the short and immediate term. However, while

there will never be an ideal time to develop a plan, in the long-term it may allow for more strategic use of resources and provide guidance for the best use of staff time.

Although this study focuses mainly on the Nova Scotia context, the results are useful for managers in other jurisdictions who are considering the implementation of a management plan. While black bear management plans are being developed in many jurisdictions, there has been little assessment of how management plans are most useful to managers and there is no literature on their effectiveness. This research provides insight into how managers value black bear management plans and what reasons were behind the decisions to develop a plan. Management plans are becoming increasingly popular tools in natural resource management, so it is important that the value and usefulness of these plans are assessed.

CONCLUSION AND RECOMMENDATIONS

In the absence of a management plan Nova Scotia has managed to maintain an abundant bear population and avoid any major public-relations problems. Given the increasing development of management plans in governmental sectors, it is likely that there will be increased pressure on the Department to develop management plans for its species. With bear hunting practices such as baiting and gall-bladder sales becoming increasingly controversial, rising incidences of bear-human interactions and demands on staff time to respond to these issues, proactive approaches black bear management that include engaging the public may be advisable. Processes of working towards a formal management plan may serve the Department well in addressing these and other issues and

in defining management priorities, goals and mechanisms, while raising public awareness around bear management.

The black bear could be a good model species for development of a species management plan in Nova Scotia. Many of the other jurisdictions that had black bear management plans also had management plans for their other big game species. The black bear is a well-studied, well-known species that attracts considerable public attention. There is also experience in plan development and implementation from other jurisdictions available for the Department to use to guide its development process. NSDNR could develop a black bear management plan, and use that process and plan as the framework for developing a management plan for other game species. Having a management plan in place could be of considerable value in the future as issues arise and the public demands that a clear and defensible management strategy be in place.

REFERENCES

To avoid redundancy, the references for this chapter are included in the reference section at the end of the thesis.

CHAPTER 6: CONCLUSION

Review of Thesis Objectives

This study examined relevant bear management issues in Nova Scotia and presented the results in three separate papers (Chapters 3-5), with each paper focusing on different objectives of the research project. The goal was to provide a better understanding of effective and socially acceptable bear management practices for potential application in Nova Scotia. Interviews, surveys, and an assessment of bear management practices elsewhere were used to collect the necessary information to achieve the research objectives.

The first research objective was to determine the social acceptability of current Nova Scotia Department of Natural Resources (NSDNR) practices by analyzing how various stakeholders perceive the management of bears in Nova Scotia. This objective is the focus of the paper "Social considerations in black bear management" (Chapter 3) where the opinions of NSDNR staff, Aboriginal participants, and stakeholder groups (hunters, agriculturalists, non-consumptive interests) were assessed. In general, NSDNR staff members appear to be supportive of the department's management practices; however areas of concern among staff members include population monitoring, bear-human conflicts, bear baiting, and staffing levels within the department. A challenge for the Department is in trying to please diverse stakeholders, a problem also faced in other jurisdictions. The survey results showed little consensus among stakeholders and no overwhelming support for the department's black bear management from any stakeholder

group. The Aboriginal interviewees expressed that NSDNR needs to broaden its management techniques to acknowledge different values of the black bear. Ensuring social acceptability is an essential aspect of black bear management (Decker and Chase, 1997, Garshelis et al., 1999, Reiter et al., 1999, Teel et al., 2002) and greater effort toward communicating with interest groups is proposed by some as a way to increase acceptance of management practices and help resolve differing opinions around controversial bear management issues (Lafon, 2002, Lafon et al., 2003, Lindsey, 2003). Although the results from the stakeholder survey and Aboriginal interviews need to be treated with caution because they do not represent the general public, the Aboriginal population in the province, or the stakeholder groups as a whole, they demonstrate that there are differing opinions both within and between various interest groups in Nova Scotia.

The second thesis objective was to determine what strategies could feasibly be employed to reduce the number of bear-human conflicts in the province. This objective is the subject of Chapter 4. The results of the interviews indicate that bear-human conflicts are an issue of serious concern among staff members in Nova Scotia, and the literature indicates that bear-human conflicts are of concern to staff members across North America (Spencer et al., 2007). Increased educational efforts coupled with regulations governing the storage of bear attractants have been an effective method of reducing conflicts in several jurisdictions (Peine, 2001, Gore, 2004) and should be considered in Nova Scotia. Bear-human conflicts will never be completely eliminated as long as the two species co-exist, however working to make relations more harmonious is an area where NSDNR should focus more attention.

The final two thesis objectives are addressed in Chapter 5, "Assessing the effectiveness of black bear management plans and potential for implementation in Nova Scotia". Those objectives were: 1) to assess Nova Scotia bear management policies, practices and regulations against best practices used elsewhere and as described in the literature and determine which, if any may be appropriate to apply within the Nova Scotia context, and, 2) to assess the need for a formal black bear management plan in Nova Scotia. There is a wide range of management tools and techniques used by jurisdictions in the North American northeast, and it is difficult to assess what practices may be more effective than others, given different social, economic, and political environments in each jurisdiction. In general, however, Nova Scotia has similar hunting regulations and nuisance bear policies to other jurisdictions, but the province appears to lag other states and provinces in terms of the amount of research being conducted. Formal black bear management plans have been implemented in many of the jurisdictions studied and could be a valuable tool in Nova Scotia. Management plans appear to be useful for wildlife managers because they clarify and document goals and objectives for the species, and are helpful for gaining public support for management practices.

General Findings and Conclusions

Black bear management is constrained by controversies around hunting and particular hunting practices, differing opinions of how to deal with nuisance bears, and challenges in monitoring bear populations. The results of this study demonstrate that NSDNR faces challenges in managing its black bear population similar to those faced in other jurisdictions where managers must appease differing opinions between different

stakeholder groups and the public. This research also illustrates that issues and controversies of concern within the public arena are also subject to mixed opinions among staff members.

A common theme throughout this study is that staff members are trying to appropriately manage a black bear population with few resources, presenting an additional challenge to an already complicated process. The results indicate that in Nova Scotia a lack of resources, both staff and financial, are hindering the department's performance in education, research, population monitoring, and public outreach. Resources will likely be a key factor in determining whether the Department develops a formal black bear management plan. Few staff members thought that black bears should be a higher priority for NSDNR, in large part because of the need to put resources towards species at risk instead of the black bear population that most staff members think is abundant. Although the lack of resources presents a challenge for staff at NSDNR, the Department should not use a lack of resources as an excuse to let significant bear management issues be ignored. Indeed, providing resources for stakeholder and public educational initiatives around reducing bear-human conflicts, particularly around the importance of, and methods for, minimizing bear attractants, could significantly reduce resources required to respond to bear nuisance complaints.

The results of this study indicate that there is a need for NSDNR to communicate more with both its staff members, and different stakeholders. Both of those groups expressed concerns about some aspects of NSDNR's management. Staff would like to see greater efforts toward monitoring and researching the province's black bear population, while

stakeholders are divided over their opinions of the Department's management. Another area where NSDNR needs to put increased effort is in educating residents about how to avoid bear-human conflicts. A challenge in educating residents is trying to engage them into willingly heeding the advice provided by the Department. NSDNR should also consider implementing regulations to force residents to comply when asked to remove a bear attractant from their property. This study also recommended that NSDNR consider the implementation of a formal black bear management plan to provide the Department with direction and specific management goals for the next few years.

Black bears' regular interactions with humans, coupled with the potential for a violent or fatal incident, makes it important that every management agency be able to defend their management strategies. The potential for harm to both humans and bears is a reason black bears should remain a priority for NSDNR and other wildlife management departments, even though they are not a species of conservation concern. Although NSDNR is not currently under intense public scrutiny one incident can quickly change perspectives of black bears and their management. Agencies need to strive for more communication with stakeholders and the public, and greater transparency in their management. While this can be a difficult and painful process, it has proven rewarding in other jurisdictions by helping the departments maintain public support. A reoccurring theme throughout this thesis and the literature is that there are many interests to consider in black bear management.

This research made several recommendations for NSDNR to help the Department ensure it is using a solid information base and public input into its decision-making. However,

the results from this study can also be applicable for wildlife managers in other jurisdictions because they highlight management challenges common to many regions of North America. Most wildlife agencies in North America are managing abundant black bear populations (Williamson, 2002, Hristienko and McDonald, 2007), so management challenges are not related to trying to increase a species population, but are instead focused on tying to manage black bears in a manner that maintains sustainable populations and is conducive to human development and needs. Common black bear management challenges described in this study and the literature pertain to high levels of conflict, harvest practices and controversies, and having a solid information base to support decision-making.

This study has provided new information of interest and use to scholars, wildlife managers in other jurisdictions, and NSDNR. There are few studies that examine knowledge and opinions of management agency staff. These results highlight issues that staff members in other jurisdictions are likely to grapple with, including controversial hunting practices, population monitoring, and bear-human conflicts. Staff members in Nova Scotia expressed a desire to have a better idea of how many bear inhabit the province and what the characteristics of the province's bear populations are. They also expressed concern about certain controversial bear management issues. Staff in Nova Scotia are concerned about the social acceptability of trying to implement new hunting methods in the province (e.g. hunting with hounds, spring hunting) and have mixed feelings about the use of bait as a hunting tool in the province. The biggest concern among staff members in Nova Scotia is that of trying to reduce bear-human conflicts.

This is an issue of concern across North America (Spencer et al., 2007) and educational measures and regulatory initiatives are two key components of reducing conflicts.

The results emphasize the need for management agencies to be in communication with their employees to ensure concerns about management practices are addressed and the management approach is well understood and applied consistently. For wildlife managers considering implementation of a formal black bear management plan, this research provides a summary of the main components of several existing black bear management plans, discusses the practicality of developing and implementing a plan, and explores potential usefulness of having a plan in place. Management plans lay-out goals for pertinent black bear management issues (e.g. bear-human conflicts, bear-related recreation, bear populations) in a single publicly-available document. Achieving the goals set-out in the management plans appears to be a challenge in many jurisdictions, however wildlife managers are supportive of management plans because they provide direction for the management agency. Managers also like having a management plan in place because they think it is useful for ensuring public support for management practices since the public is given the opportunity to participate in the plan's development process.

This research introduces scholars and wildlife managers elsewhere to black bear management in Nova Scotia, and contributes to the small body of literature on black bears in the province. It is the first study to examine opinions about NSDNR's management both from perspectives of NSDNR managers and staff, and from key stakeholder groups. The results provide NSDNR with information about how their management is perceived, how the Department can work to reduce nuisance complaints, and what is involved in

developing a formal black bear management plan. NSDNR can use these results to ensure its black bear management practices are proactive, socially acceptable, and focused on helping bears and humans share their environment. Managers in other jurisdictions with similar contexts can make use of the findings as they provide insight into common black bear management issues. This information could also help guide management of other game and nuisance species because it provides evidence of opinions about hunting practices and dealing with nuisance problems in general, as well as specific to black bears.

Limitations

While this research provides potentially valuable information for NSDNR and other wildlife departments, there are several limitations to be considered in interpreting the results. The results of the stakeholder survey are not representative of the general public or the entire membership of the stakeholder groups, and they cannot be generalized to represent a larger sample. Both surveys (NSDNR and stakeholder) were also skewed towards hunters as over half of both groups identified as being hunters or trappers, a finding not representative of the general public in Nova Scotia. Potential biases exist in the stakeholder survey as the participants self-selected by agreeing to participate in the survey, by completing the survey, and by identifying the stakeholder groups with which they were identified. There were no criteria for including or excluding members from any stakeholder group, though participants recruited by appeals to a stakeholder group generally self-identified as a member of that group. Further, the survey was conducted on-line, likely excluding potential participants from the stakeholder groups, such as those without easy access to internet (Czaja and Blair, 2005). As well, the only information

obtained from the stakeholder was from the survey, which only allowed for limited information to be shared.

This study relied heavily on data and information provided by NSDNR, such as the in-depth interviews, survey responses from NSDNR staff, and the WIR data. There were no interviews conducted with stakeholders, so the information provided by them was not as detailed as the information collected in the interviews with NSDNR staff. As well, a lot of the information used in the study was provided by NSDNR staff in the in-depth interviews and it is possible that staff members were reluctant to say anything negative about the department, affecting the results of the study. Most of the interviewees were suggested by NSDNR's manager, wildlife resources indicating potential biases in the interview participants. The information that was used to provide a picture of nuisance complaints on a provincial level – their location, nature, and resolution – was provided by NSDNR through assessment of their Wildlife Investigation Reports (WIR) which are filled out every time NSDNR responds to a wildlife-related complaint from the public.

Research Directions

There are some avenues for further examination of the topics introduced in this study. The stakeholder survey was useful for highlighting some of the perspectives of a few Nova Scotia residents; however results are limited in their applicability to the broader provincial population, or even to the participating stakeholder groups. Community meetings or large-scale surveys would be methods better suited to gathering opinions that are more representative of the general population. Alternatively, a study that uses focus

groups would be a way to obtain more detailed results about the opinions of the different stakeholder groups. Because most of the complaints in the province come from Halifax County, the most populated area of the province, it may be useful to focus a study in that county. Surveying or interviewing residents in Halifax County may help NSDNR understand why there are so many complaints from that area.

Perspectives obtained from Aboriginal participants through this research were also limited. Only two individuals were interviewed, which is insufficient to adequately represent the perceptions of the Aboriginal community around black bear management in Nova Scotia. There are many issues surrounding Aboriginal land claims and treaty rights that affect Aboriginals' roles in black bear management that are beyond the scope of this research. A deeper exploration of the relationship between Aboriginals and NSDNR in bear management could be the subject of another study.

The results of the surveys and interviews indicate that, in-part, staff and stakeholders attribute a high number of nuisance bear problems to the widespread use of green bins for organic storage and curbside pick-up across the province. While some staff and stakeholders believe there is a relationship between the implementation of the green-bin program and the number of nuisance bear problems in the province, there is not currently sufficient evidence to associate causality to the green bins. This is an issue that could use increased examination. Nova Scotia is one of few jurisdictions with province-wide organics collection, indicating that the province has the opportunity to lead research that examines any relationship between organic carts and bear-human conflicts. A controlled experiment to assess whether and how the use of green bins increases nuisance bear

problems could help provide NSDNR and municipalities with information to help direct policies on green bin use, and provide useful information for other jurisdictions considering implementing an organics program. As well, this could be a good opportunity for NSDNR and the makers of the green bins to examine ways to bear-proof them and potentially improve their design.

Finally, there is a need for increased research into the effects of baiting black bears. This study illustrated that there are conflicting views on baiting by staff members, and it is likely a controversial issue among agency staff in other jurisdictions as well. Bear baiting is a common practice used for hunting, photography, research and population monitoring. There are reasons both to support baiting because it is used for research and it allows for selective hunting, and to discourage the practice because it involves feeding wild animals human-foods. There are conflicting views in the literature that provide evidence bears become habituated to human food (Peine, 2001, Gray et al., 2004, Brongo et al., 2005) but other evidence that this habituation does not necessarily lead to increased nuisance problems (Gray et al., 2004, Hristienko and McDonald, 2007). There is a need for more substantial evidence of how the use of baits affects bear movement, behaviour, and interactions with humans.

Recommendations

Several recommendations were made in Chapters 3-5 to give NSDNR the opportunity to make the best use of the information obtained in this study. The recommendations will allow NSDNR to address some of the concerns expressed by staff and stakeholders, and ensure NSDNR has management practices that can withstand public scrutiny.

The recommendations are summarized as follows.

1. There is a need for increased communication between different levels of staff within NSDNR. There are several issues with which staff members expressed discomfort including black bear research, population monitoring, and baiting. NSDNR management and on-the-ground staff should work through these issues to define for the Department a unified approach to its management practices.

2. There is also a need for increased outreach by NSDNR towards stakeholders, including those other than hunters and trappers. To address concerns expressed by the stakeholders, NSDNR could meet more regularly with diverse stakeholder groups to allow them to communicate directly with the department, allowing both NSDNR and the stakeholder groups to explain and understand each other's positions.

3. NSDNR needs to put more effort into collecting hunter and fur harvester information at the end of bear harvest season through increased follow-up and enforcement towards those who do not comply. These efforts are important for ensuring that NSDNR has a good information base on its black bear population through information such as hunting effort versus success, black bear observations, and age and sex of harvested animals.

4. In terms of the controversial bear-management issues covered in this research (hunting over bait, use of hounds, spring bear-hunting, and sale/export of bear gall-

bladders) no changes in NSDNR's current regulations are recommended. These are controversial issues throughout North America so any changes in regulations would require careful consideration of public sentiments to ensure the changes would be acceptable to residents. However, NSDNR should closely monitor baiting stations and bears to determine whether baiting leads to bear habituation to human food sources and subsequently to bear-human conflicts. Based on the results of such research, consideration of changes to bear baiting practices may be warranted.

5. NSDNR should implement a more aggressive and proactive approach to educating Nova Scotians about avoiding problems with bears. Efforts should be focused both on informing residential neighbourhoods about bear-proofing their backyards (e.g. appropriately storing garbage and organic materials, removing birdfeeders, storing pet food indoors, keeping barbeques clean), and agricultural stakeholders about using deterrents such as electric fences to reduce or minimize nuisance bear situations. If nuisance bear problems continue to occur regularly, NSDNR may also want to consider implementing regulations that force residents to improve storage of food waste and remove other attractants from their properties.

6. NSDNR may want to consider developing a formal black bear management plan. Although black bears are not currently of conservation concern in the province, they are a species that attracts a considerable amount of attention and demands many of the department's resources in the spring and summer, the peak time for nuisance complaints. A management plan could be a good way for the Department to be more proactive in its approach to managing black bears by setting out goals for

maintaining a sustainable population, reducing bear-human conflicts, and providing recreational opportunities involving black bears. A management plan would also be useful to clearly communicate management strategies and rationale to the public, allowing them to be informed.

The black bear is a high-profile, high-interest species and black bear management is a process that involves consideration of many factors. Different social, cultural, and political forces all need to be incorporated into management decisions (Messmer, 2000) and there is no one right management strategy for managing black bears (Lafon, 2002). Because there is no single, best strategy for managing a black bear population NSDNR and other wildlife management agencies need to ensure decision-making is based on the best information available. Good management practices are important in helping humans and bears co-exist in a shared landscape. This study provides NSDNR with important information by providing a sense of how the department's management practices are perceived by staff and stakeholders, how other jurisdictions are dealing with bear management issues, and by suggesting recommendations towards future management actions. NSDNR can make use of this information and take proactive measures to ensure it has socially acceptable bear management practices in place that allow black bears to maintain a sustainable population in a shared landscape with humans.

REFERENCES

Adams, C.E., Lindsey, K.J., & Ash, S.J. 2006. Urban Wildlife Management. Taylor & Francis, Boca Raton, Florida.

Anderson, S.B. 1984. Productivity and management of the black bear *Ursus americanus americanus* Pallas in Nova Scotia. Master's dissertation, Acadia University, Wolfville, Nova Scotia.

Beck, T.D.I. 1998. Citizen ballot initiatives: a failure of the wildlife management profession. Human Dimensions of Wildlife 3(2):21-28.

Beckmann, J.P., Lackey, C.W., Berger, J. 2004. Evaluation of deterrent techniques and dogs to alter behaviour of "nuisance" black bears. Wildlife Society Bulletin 32(4):1141-1146.

Black Bear Policy Committee. 2005. Comprehensive black bear (*Ursus americanus*) management policy. New Jersey Fish and Game Council.

Black Bear Task Team. 1998. Black bear management plan: Whistler, British Columbia. Resort Municipality of Whistler.

Borrows, J. 2002. Recovering Canada: the Resurgence of Indigenous Law. University of Toronto Press, Toronto, Ontario.

Boulay M.C., Jackson, D.H., & Immell, D.A. 1999. Preliminary assessment of a ballot initiative banning two methods of bear hunting in Oregon: effects on bear harvest. Ursus 11:179-184.

Bowman, J.L., Leopold, B.D., Vilella, F.J., & Gill, D.A. 2004. A spatially explicit model, derived from demographic variables, to predict attitudes toward black bear restoration. Journal of Wildlife Management 68:223-232.

Brongo, L.L., Mitchell, M.S., & Grand, J.B. 2005. Effects of trapping with bait on bait-station indices to black bear abundance. Wildlife Society Bulletin 33:1357-1361.

Bryman, A., & Teevan, J.J. 2005. Social research methods: Canadian edition. Oxford, Toronto, Ontario.

Bureau of Wildlife Management. 2006. Management and biology of black bears in Pennsylvania. Pennsylvania Game Commission. Harrisburg, PA.

Calvert, R., Slate, D., & Debow, P. 1992. An integrated approach to bear damage management in New Hampshire. Proceedings of the 11th Eastern Black Bear Workshop. Waterville Valley, New Hampshire.

Canadian Broadcasting Corporation. 2000. Ontario cancels spring bear hunt. November 10, 2000. http://www.cbc.ca/canada/story/1999/01/15/bearhunt990115.html. Accessed April 13, 2008.

Canadian Press. 2008. Peta urges Ottawa to ban bear baiting. March 11, 2008. http://www.ctv.ca/servlet/ArticleNews/story/CTVNews/20080311/bear_bating_080311/20080311?hub=Canada. Accessed April 13, 2008.

Clark, J.E., van Manen, F.T., & Pelton, M.R. 2002. Correlates of success for on-site releases of nuisance black bears in Great Smoky Mountains National Park. Wildlife Society Bulletin 30(1):104-111.

Clark, J.D., Dobey, S., Masters, D.V., Scheick, B.K., Pelton, M.R., & Sunquist, M.E. 2005. American black bears and bee yard depredation at Okefenokee Swamp, Georgia. Ursus 16(2):234-244.

Conover, M.R. & Decker, D.J. 1991. Wildlife damage to crops: perceptions of agricultural and wildlife professionals in 1957 and 1987. Wildlife Society Bulletin 19(1):46-52.

Conover, M.R. 1994. Perceptions of grass-roots leaders of the agricultural community about wildlife damage on their farms and ranches. Wildlife Society Bulletin 22(1):94-100.

Czaja, R., and J. Blair. 2005. Designing surveys: a guide to decisions and procedures. Sage Publications, Inc. Thousand Oaks, California.

Decker, D.J. & Chase, L.C. 1997. Human dimensions of living with wildlife – a management challenge for the 21st century. Wildlife Society Bulletin 25(4):788-795.

Department of Agriculture and Fisheries. 2005. Nova Scotia trout management plan. Inland Fisheries Division.

Department of Environment and Labour. 2006. Tobeatic wilderness area management plan.

Department of Natural Resources. 1997. The regulations of responsible bear management in Nova Scotia. http://www.gov.ns.ca/NATR/wildlife/lgmams/bear.htm. Accessed March 14, 2007.

Department of Natural Resources. 2002. General status ranks of wild species in Nova Scotia. http://www.gov.ns.ca/natr/wildlife/genstatus/ranks.asp. Accessed April 1, 2007.

Department of Natural Resources. 2007. Integrated Resource Management. http://www.gov.ns.ca/natr/irm/. Accessed May 17, 2008.

Diefenbach, D.R., Laake, J.L., & Alt, G.L. 2004. Spatio-temporal and demographic variation in the harvest of black bears: implications for population estimates. Journal of Wildlife Management 68(4):947-959.

Dillman, D. 2007. Mail and internet surveys: the tailored design method. Second Edition. John Wiley, Hoboken, New Jersey.

Doyle-Bedwell, P. & F.G. Cohen. 2001. Aboriginal peoples in Canada: their role in shaping environmental trends in the twenty-first century. In E.A. Parson (Ed.) Governing the Environment: Persistent Challenges, Uncertain Innovations (pp169-206). University of Toronto Press, Toronto.

Dunn, W.C., Elwell, J.H., & Tunberg, G. 2008. Safety education in bear country: are people getting the message? Ursus 19(1):43-52.

Ellingwood, M. 1999. Bear cultural carrying capacity: a northeast perspective. Proceedings of 15th Eastern Black Bear Workshop. Managing abundant black bears: needs, strategies, difficulties. Lenox, Massachusetts.

Elowe, K.D. & Dodge, W.E. 1989. Factors affecting black bear reproductive success and survival. Journal of Wildlife Management 53(4):962-968.

Ewert, A.W., Baker, D.C., Bissix, G.C. 2004. Integrated resource and environmental management: the human dimension. CABI Publishing, Cambridge, Massachusetts.

Fallding, M. 2000. What makes a good natural resource management plan? Ecological Management & Restoration 1(3):185-194.

Fortin, C., Anions, M., McCarthy, C., Mahoney, S., & Anions, D. 1999a. Seasonal variation and diversity of food items of black bear in a mixed forest of Gros Morne National Park. In G. Forbes & E. Daigle (Eds) Black Bear Ecology and Management Issues for Atlantic Canadian National Parks. Proceedings from the Parks Canada Atlantic Region Black Bear Workshop (pp11-24). Parks Canada-Ecosystem Science Review Reports.

Fortin, C., McCarthy, C., Day, S., Mahoney, S., & Anions, D. 1999b. The management implications of seasonal movements by black bears in Gros Morne National Park. In G. Forbes & E. Daigle (Eds) Black Bear Ecology and Management Issues for Atlantic Canadian National Parks. Proceedings from the Parks Canada Atlantic Region Black Bear Workshop (pp25-35). Parks Canada-Ecosystem Science Review Reports.

Fortin, C., M., McCarthy, C., Mahoney, S., & Wagener, D. 1999c. Use of electrified fence to deter black bears from Lomond Landfill, Gros Morne National Park. In G. Forbes & E. Daigle (Eds) Black Bear Ecology and Management Issues for Atlantic Canadian National Parks. Proceedings from the Parks Canada Atlantic Region Black Bear Workshop (pp36-45). Parks Canada-Ecosystem Science Review Reports.

Fowler, F.J. 1993. Survey Research Methods, Second Edition. Sage Publications Inc. Newbury Park, California.

Friesen, B. 2000. Landfill ban stimulates composting programs in Nova Scotia. BioCycle 41(3):53-55.

Friesen, B. 2005. Environment and economy win in Nova Scotia. BioCycle 46(5):48-49.

Garshelis, D.L. 1989. Nuisance bear activity and management in Minnesota. In M. Bromely (Ed.) Bear-People Conflicts - Proceedings of a Symposium on Management Strategies (pp169-180). Yellowknife, NWT: Northwest Territories Department of Renewable Resources.

Garshelis, D.L. 1990. Monitoring effects of harvest on black bear populations in North America: a review and evaluations of techniques. In Clark J.D., & K.G. Smith (Eds) Proceedings Tenth Eastern Workshop on Black Bear Research & Management. University of Arkansas Press, Fayettville.

Garshelis, D.L. 1994. Density-dependant population regulation of black bears. International Conference on Bear research and Management Monographs 3:3-37.

Garshelis, D.L., Sikes, R., Andersen, David E., & Birney, E. 1999. Landowners' perceptions of crop damage and management practices related to black bears in east-central Minnesota. Ursus 11:219-224.

Garshelis, D.L. 2002. Misconceptions, ironies, and uncertainties regarding trends in bear populations. Ursus 13:321-334.

Garshelis, D.L & Hristienko, H. 2006. State and provincial estimates of American black bear numbers versus assessments of population trend. Ursus 17:1-7.

Gore, M.L. 2004. Comparison of Intervention Programs Designed to Reduce Human-Bear Conflict: A Review of Literature. HDRU Series No. 04-4. Department of Natural Resources, Cornell University.

Gore, M.L., Knuth, B.A., Curtis, P.D., & Shanahan, J.E. 2006. Education programs for reducing American black bear-human conflict: indicators of success? Ursus 17(1):75-80.

Gore, M.L., Knuth, B.A., Curtis, P.D., Shanahan, J.E. 2007. Campground manager and user perceptions of risk associated with negative human-black bear interactions. Human Dimensions of wildlife 12:31-43.

Gray, R.M., Vaughan, M.R., & McMullin, S.L. 2004. Feeding wild American black bears in Virginia: a survey of Virginia bear hunters, 1998-99. Ursus 15:188-196.

Green, D,. Askins, G.R., & West, P.D. 1997. Public opinion: obstacle or aid to sound deer management? Wildlife Society Bulletin 25(2):367-370.

Groves, C.R. 2003. Drafting a conservation blueprint. Island Press. Washington, DC.

Halvorsen, K.E. 2001. Assessing public participation techniques for comfort, convenience, satisfaction, and deliberation. Environmental Management 28:179-186.

Herrero, S. 1985. Bear attacks: their causes and avoidances. Nick Lyons Books, New York, USA.

Herrero, S. & Higgins, A. 1999. Human injuries inflicted by bears in British Columbia: 1960-97. Ursus 11:209-218.

Higgins Inman, K. & Vaughan, M.R. 2002. Hunter effort and success rates of hunting bears with hounds in Virginia. Ursus 13:223-230.

Hockings, M. 1998. Evaluating management of protected areas: integrating planning and evaluation. Environmental Management 22(3):337-345.

Hristienko, H., Pastuck, D., Rebizant, K.J., Knudsen, B., & Connor, M.L. 2004. Using reproductive data to model American black bear cub orphaning in Manitoba due to spring harvest of females. Ursus 15(1):23-34.

Hristienko, H., & McDonald, J.E. 2007. Going into the 21st century: a perspective on trends and controversies in the management of the American black bear. Ursus 18(1):72-88.

Huber, D., Kusak, J., Majic-Skrbinsek, A., Majnaric, D., & Sindicic, M. 2008. A multidimensional approach to managing the European brown bear in Croatia. Ursus 19(1):22-32.

Hygnstrom, S.E. & Hauge, T.M. 1989. A review of problem black bear management in Wisconsin. In M. Bromely (Ed.) Bear-People Conflicts - Proceedings of a Symposium on Management Strategies (pp163-168). Yellowknife, NWT: Northwest Territories Department of Renewable Resources.

Jonker, S.A., Parkhurst, J.A., Field, R., & Fuller, T.K. 1998. Black bear depredation on agricultural commodities in Massachusetts. Wildlife Society Bulletin 26(2):318-324.

Kane, D.M. & Litvaitis, J.A. 1992. Age and sex composition of live-captured and hunter-killed samples of black bears. Journal of Mammalogy 73(1):215-217.

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

Kellert, S.R. 1995. Managing for biological and sociological diversity, or 'déjà vu, all over again'. Wildlife Society Bulletin 23(2):274-278.

Kinnear, L. 2007. Contemporary Mi'kmaq relations between humans and animals: a case study of the Bear River First Nation Reserve in Nova Scotia. Master's dissertation, Dalhousie University, Halifax, Nova Scotia.

Koehler, G.M. & Pierce, D.J. 2005. Survival, cause-specific mortality, sex, and ages of American black bears in Washington state, USA. Ursus 16:157-166.

Lafon, N.W. 2002. Evolution of stakeholder knowledge, attitudes, and opinions throughout a participative process to develop a management plan for black bears in Virginia. Master's dissertation, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

Lafon, N.W., McMullin, S.L., & D.E. Steffen. 2003. Knowledge and opinions of stakeholders of black bear management in Virginia. Ursus 14(1):55-64.

Landriault, L.J. 1998. Nuisance black bear (*Ursus americanus*) behaviour in central Ontario. Master's dissertation, Laurentian University, Sudbury, Ontario.

Lawrence, R.L. & Deagen, D.A. 2001. Choosing Public Participation Methods for Natural Resources: A Context-Specific Guide. Society and Natural Resources 14:857-872.

Layden, P.C., Manfredo, M.J., & Tucker, P. 2003. Integrating public values toward wildlife into land use planning: a case study in La Plata County, Colorado. Wildlife Society Bulletin 31(1):174-184.

Lee, D.J. & Vaughan, M.R. 2005. Yearling and subadult black bear survival in a hunted Virginia population. Journal of Wildlife Management 69:1641-1651.

Lindsey, K.J. 2003. A national assessment of wildlife information transfer to the public. Master's dissertation, Texas A&M University, College Station TX.

Litvaitis, J.A. & Kane, D.M. 1994. Relationship of hunting technique and hunter selectivity to composition of black bear harvest. Wildlife Society Bulletin 22(4):604-606.

Loker, C.A. & Decker, D.J. 1995. Colorado black bear hunting referendum: what was behind the vote? Wildlife Society Bulletin 23(3):370-376.

Loker, C.A., Decker, D.J., & Chase, L.C. 1998. Ballot initiatives – antithesis of human dimensions approaches or catalyst for change? Human Dimensions of Wildlife 3(2):8-20.

Lyons, A.J. 2005. Activity patterns of urban American black bears in the San Gabriel Mountains of southern California. Ursus 16:255-262.

Macmichael, C.D. 2007. Use of provincial black bear (*Ursus americanus*) habitat associations to assess the lack of an established population in southeastern Cape Breton, Nova Scotia, Canada. Master's dissertation, Dalhousie University, Halifax, Nova Scotia.

Maehr, D.S. & Brady, J.R. 1982. Florida black bear-beekeeper conflict: 1981 beekeeper survey. American Bee Journal 122(5):372-375.

Mankin, P.C., Warner R.E., & Anderson, W.L. 1999. Wildlife and the Illinois public: a benchmark study of attitudes and perceptions. Wildlife Society Bulletin 27(2):465-472.

Maryland Department of Natural Resources. 2004. Black bear management plan. Wildlife and Heritage Service.

Matthews, S.M., Golightly, R.T., and Higley, J.M. 2008. Mark-resight density estimation for American black bears in Hoopa, California. Ursus 19(1):13-21.

McCarthy, M.T., & Seavoy, R.J. 1994. Reducing nonsport losses attributable to food conditioning: human and bear modification in an urban environment. Ninth International Conference on Bear Research and Management 9(1): 75-84.

McCraken, C., Rose, D.A., & Johnson, K.A. 1995. Status, Management, and Commercialization of the American Black Bear (Ursus americanus). Washington DC: World Wildlife Fund, TRAFFIC USA

Mclaughlin, C.R. & Vaughan, M.R. 1999. Research needs and priorities. In: 15th Eastern black bear workshop. Lennox, Massachusetts.

McMullin, S.L. 1993. Approaches to management effectiveness in state fish and wildlife agencies. Dissertation, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

McMullin, S.L. 1996. Natural resource management and leadership in public arena decision making: a prescriptive framework. American Fisheries Society Symposium 16:54-63.

Messmer, T.A., Cornicelli, L., Decker, D.J., & Hewitt, D.G. 1997. Stakeholder acceptance of urban deer management techniques. Wildlife Society Bulletin 25(2):360-366.

Messmer, T.A. 2000. The emergence of human-wildlife conflict management: turning challenges into opportunities. International Biodeterioration & Biodegradation 45:97-192.

Noyce, K.V. & Garshelis, D.L. 1997. Influence of natural food abundance on black bear harvests in Minnesota. Journal of Wildlife Management 61(4):1067-1074.

Noyce, K.V., Garshelis, D.L., & Coy, P.L. 2001. Differential vulnerability of black bears to trap and camera sampling and resulting biases in mark-recapture estimates. Ursus 12:211-226.

New Jersey Division of Fish and Wildlife. 2006. Questions and answers about NJ's black bears. http://www.nj.gov/dep/fgw/bearq&a.htm. Accessed May 14, 2008.

New York State Department of Environmental Conservation 2003. A framework for black bear management in New York, second edition. Division of Fish, Wildlife and Marine Resources, Albany, NY.

Obbard, M.E., & Howe, E.J. 2006. Demography of black bears in hunted and unhunted areas of the boreal forest of Ontario. Journal of Wildlife Management 72(4): 869-880.

Office of Aboriginal Affairs. 2007. Consultation. Province of Nova Scotia. http://www.gov.ns.ca/abor/officeofaboriginalaffairs/whatwedo/consultation. Accessed May 25, 2008.

Ontario Ministry of Natural Resources. 2008. http://www.mnr.gov.on.ca/en/Business/Bearwise/index.html. Accessed May 21, 2008.

Parks Canada. 2006. Evolution of bear management in the Mountain National Parks. http://parcscanada.pch.gc.ca/docs/v-g/oursgest-bearmanag/sec2/og-bm2bii_E.asp. Accessed April 9, 2008

Parks Canada. 2007. Banff National Park Management Plan. http://www.pc.gc.ca/pn-np/ab/banff/docs/plan1/chap1/plan1_E.asp. Accessed April 21, 2008.

Peine, J.D. 2001. Nuisance bears in communities: strategies to reduce conflict. Human Dimensions of Wildlife 6:223-237.

Pelton, M.R., Coley, A.B., Eason, T.H., Doan-Martinez, D.L., Pederson, J.A., van Manen, F.T., & Weaver, K.M. 1999. American black bear conservation action plan. In C. Servheen, S. Herrero, & B. Peyton (Eds.) Bears: status survey and conservation action plan (p. 144-154). IUCN/SSC Bear Specialist Group.

Reiter, D.K., Brunson, M.W., & Schmidt, R.H. 1999. Public attitudes toward wildlife damage management and policy. Wildlife Society Bulletin 27(3):746-758.

Rogers, L.L. 1987. Effects of food supply and kinship on social behaviour, movements, and population growth of black bears in Northeastern Minnesota. Wildlife Monographs 51:1-72.

Ryan, C.W., Pack, J.C., Igo, W.K., & Billings, A. 2007. Influence of mast production on black bear non-hunting mortalities in West Virginia. Ursus 18(1):46-53.

Schwartz, C.C. & Franzmann, A.W. 1991. Interrelationship of black bears to moose and forest succession in the northern coniferous forest. Wildlife Monographs 113:1-58.

Servheen, C. 1990. The status and conservation of the bears of the world. Eighth International Conference on Bear Research and Management Monograph Series No. 2.

Servheen, C., Herrero, S., & Bernard Peyton. 1999. Bears: status, survey and conservation action plan. IUCN/SSC Bear Specialist Group.

Shaw, W.W. 1977. A survey of hunting opponents. Wildlife Society Bulletin 5(1):19-24.

Spencer, R.D., Beausoleil, R.A., & Martorello, D.A. 2007. How agencies respond to human-black bear conflicts: a survey of wildlife agencies in North America. Ursus 18:217-229.

State of New Hampshire Fish and Game. 2005. New Hampshire big game plan.

Teel, T.L., Krannich, R.S., & Schmidt, R.H. 2002. Utah stakeholders' attitudes toward selected cougar and black bear management practices. Wildlife Society Bulletin 30(1):2-15

Todd, A.W. 1980. Public relations, public education and wildlife management. Wildlife Society Bulletin 8(1):55-60.

Twiss, M.P. & Thomas, V.G. 1999. Illegal harvests of black bears, sale of black bear parts, and the Canadian legislative response. Wildlife Society Bulletin 27:692-697.

Vermont Agency of Natural Resources. 1997. Black bear management plan for the State of Vermont: 1997-2006. Vermont Department of Fish and Wildlife. Waterbury, Vermont.

Virginia Department of Game and Inland Fisheries. 2002. Virginia black bear management plan (2001-2010).

Will, G.B. 1980. Black bear-human conflicts and management: considerations to minimize and correct these problems. In: Proceedings of the Fifth Eastern Black Bear Workshop (pp75-87), Wrightsville Beach, North Carolina.

Williams, B.K., Koneff, M.D., & Smith, D.A. 1999. Evaluation of waterfowl conservation under the North American waterfowl management plan. Journal of Wildlife Management 63(2):417-440.

Williamson, D.F. 2002. In the Black: Status, Management, and Trade of the American Black Bear (Ursus americanus) in North America. TRAFFIC North America. Washington D.C.: World Wildlife Fund.

APPENDIX A: NSDNR INTERVIEW SCRIPT

1. What is your current position with DNR?
2. How long have you been in that position?
3. What are your current responsibilities with respect to black bear management?
4. What kind of area do you serve? Rural/agricultural/urban?
5. What is your role when it comes to dealing with nuisance bear complaints?
6. Do you think the implementation of the green bin program has increased problems with nuisance bears?
7. How do you think DNR could improve its handling of nuisance bear complaints?
8. What measures should DNR employ to try and reduce the number of nuisance bear problems?
9. Is the DNR providing sufficient information to the public about how to reduce problems with bears?
10. Should there be any changes to current bear hunting regulations?
11. Do you support baiting as a legal hunting method?
12. Do you support the sale and export of bear gall-bladders as a legal practice in NS?
13. Do you think a spring bear-hunting season should be implemented in NS?
14. Do you think hunting with hounds should be legalized in Nova Scotia?
15. How can DNR work to improve rates of hunter responses?
16. Do you think the DNR should focus more attention on the non-consumptive values of the black bear?
17. What do you think are the most important bear-related issues facing the DNR?
18. When it comes to bears, how should the DNR focus its attention?
19. In what areas is the DNR's management of bears weak?

APPENDIX A: (CONTINUED)

20. Listed here are six factors which are potentially detrimental to bear populations. Do you think any of the following factors are affecting the long-term viability of Nova Scotia's black bear population?
    a. Hunting pressure
    b. Poaching/sale of bear parts
    c. Attitudes and tolerance of landowners
    d. Habitat destruction (urban sprawl, timber management, open roads)
    e. Lack of habitat connectivity and corridors
    f. Euthanized nuisance bears

21. Do any of those factors need to be addressed immediately?

22. Are there any areas in Nova Scotia where you believe the black bear population is threatened?

23. Should DNR develop a black bear management plan?

24. Should the DNR set specific management goals for (or monitor more closely):
    a. Abundance/number of bears
    b. Distribution
    c. Number of bears harvested
    d. Habitat selection/quality
    e. Amount of available bear habitat
    f. Natural food abundance
    g. Public education

25. Does DNR need to do more research on the province's black bears?

26. Are there any management decisions that are being impeded because of the lack of information about Nova Scotia's black bears?

27. Do you think a more accurate black bear population estimate would be feasible in Nova Scotia?

28. Should black bear management be a higher priority for the DNR?

29. Does the public have adequate input into bear management?

30. Do you think all interested parties should be given equitable consideration in bear management? Here is a list of some stakeholders:
    a. Personnel from other government agencies
    b. Black bear researchers or university/college professors
    c. Non-consumptive users (e.g.: wildlife photographers)

d. People concerned with preserving bears and/or bear habitat
e. Agricultural producers who experience damage from bears
f. Residential homeowners who experience damage from bears
g. People who fear bears are a threat to human safety
h. Hunters/trappers
i. Aboriginal community
j. General public

31. Would public consultation be a desirable process if a bear management plan were to be implemented?

32. If a formal management plan were implemented, should Aboriginal groups be consulted separately?

33. Do you think Nova Scotians are knowledgeable about black bears?

APPENDIX B: SAMPLE QUESTIONS FOR MANAGERS FROM OTHER JURISDICTIONS

1.(a) Why did the department decide to develop a black bear management plan?

1.(b) Has the department ever considered implementing a formal black bear management plan?

2. When was the first black bear management plan developed in [jurisdiction]?

3. Process of developing black bear management plan:
   - When was the plan developed/completed?
   - What was the development process?
   - How many people involved?
   - What kinds of resources were required to develop the plan? (people, money etc.)
   - Were any public consultations conducted?
   - What is the total estimated cost? (including human time/resources)

4. What were the major challenges associated with developing the bear management plan?

5. What are the key/most important aspects of the plan

6. Do you think the black bear management plan has been beneficial for the state?

7. Has the department met the recommendations set out in the plan?

8. Have there been any changes to the plan since its development?

9. In general was the plan well-received by the public?

10. What is the department's main focus when it comes to black bear management?

11. Does the Department have specific operating procedures for dealing with bear-related issues? (e.g.: nuisance bears)

12. Have black bears been extensively studied in [jurisdiction]?

13. Is poaching a concern?

14. Has there ever been a bear attack resulting in injury/death in [jurisdiction]?

APPENDIX C: SAMPLE QUESTIONS FOR ABORIGINAL PARTICIPANTS

1. Does your [name of first nation/council] have a historical and spiritual connection to the black bear?

2. If yes, please describe.

3. Do you deal with bears frequently in your communities/reserves? What kinds of problems do you have?

4. How does your community deal with bears when they are causing problems? Do you contact DNR?

5. Do you think the DNR adequately provides service to you community?

6. Do you consider DNR a partner when it comes to bear management?

7. Is bear hunting a common practice among members of [first nation/council]?

8. Do you think Aboriginal concerns are addressed in the DNR's hunting regulations and bear policies and practices?

9. Do you think the Aboriginal perspective differs from the government's perspective when it relates to bear management?

10. Do you have any specific concerns relating to the current bear management practices in Nova Scotia?

11. Do you have any thoughts about how the government's approach to bear management could be improved?

APPENDIX D: NSDNR SURVEY

1. How long have you been employed by DNR?

Less than 1 year	○
1-5 years	○
6-10 years	○
11-15 years	○
More than 15 years	○

2. What is your current position with DNR?

1. Wildlife Technician	○
2. Biologist	○
3. Technician Forest Resources	○
4. Area Supervisor	○
5. Conservation Officer	○
6. Other*	○

3. In your position with DNR, what are your current responsibilities with respect to black bear management? Please select all that apply.

1. Supervise field staff dealing with bears	○
2. Deal primarily with public complaints	○
3. Site visits, euthanizing or relocating animals	○
4. Policy development and implementation	○
5. Other	○

4. The DNR office where you are currently employed serves an area that is primarily:

1. Rural/agricultural	○
2. Rural/forested	○
3. Urban/rural fringe	○
4. Urban	○

APPENDIX D: (CONTINUED)

5. In your opinion, what is the most effective method of dealing with specific problem bear situations when you are on-site? There are two location categories for this question: residential/suburban/urban and rural/agricultural/forested. Please choose one option for each location category.

	Residential/urban/suburban				**Rural/agricultural/forested**			
	Euthanasia	Capture & release	Aversive conditioning	No action taken/ information provided	Euthanasia	Capture & release	Aversive conditioning	No action taken/ information provided
Bear passing through property	○	○	○	○	○	○	○	○
Bear foraging in garbage/compost	○	○	○	○	○	○	○	○
Crop damage	○	○	○	○	○	○	○	○
Aggression towards humans	○	○	○	○	○	○	○	○
Repeat offender bears	○	○	○	○	○	○	○	○

6. What do you perceive is the most socially acceptable method of dealing with specific problem bear situations, according to the complainants, when you are on-site? There are two location categories for this question: residential/suburban/urban and rural/agricultural/forested. Please choose one option for each location category.

	Residential/urban/suburban				**Rural/agricultural/forested**			
	Euthanasia	Capture & release	Aversive conditioning	No action taken/ information provided	Euthanasia	Capture & release	Aversive conditioning	No action taken/ information provided
Bear passing through property	○	○	○	○	○	○	○	○
Bear foraging in garbage/compost	○	○	○	○	○	○	○	○
Crop damage	○	○	○	○	○	○	○	○
Aggression towards humans	○	○	○	○	○	○	○	○
Repeat offender bears	○	○	○	○	○	○	○	○

APPENDIX D: (CONTINUED)

7. Has the implementation of the green bin (compost) program in Nova Scotia increased the number of bear-related complaints you have dealt with?

1. Yes	○
2. No	○
3. Don't know	○

Questions 8-14 pertained to the controversial issues of spring bear hunting, hunting with hounds, hunting over bait, and the sale/export of bear gall-bladders.
Respondents had the opportunity to comment freely on all issues.

	Biologically sustainable		Socially Acceptable	
	Yes	No	Yes	No
Spring bear hunting season	○	○	○	○
Hunting with hounds	○	○	○	○
Hunting over bait	○	○	○	○
Sale/export of bear gall-bladder	○	○	○	○

16. Please indicate whether you personally think there are currently too many, too few, or an appropriate number of black bears in Nova Scotia.

1. Too many	○
2. Too few	○
3. An appropriate number	○
4. Don't know	○

APPENDIX D: (CONTINUED)

17. The following items pertain to bear management issues in Nova Scotia. Please indicate the extent to which you agree or disagree with each statement.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	No opinion
Greater management efforts by DNR should be directed toward public education initiatives	○	○	○	○	○	○
Greater management efforts by DNR should be directed toward studying the biology of the Nova Scotia black bear population	○	○	○	○	○	○
Nova Scotians adequately understand black bear behaviour/biology	○	○	○	○	○	○
Nova Scotians adequately understand how to co-exist in a shared environment with black bears	○	○	○	○	○	○
The development of a formal black bear management plan would be useful for helping DNR staff manage the black bear population more effectively	○	○	○	○	○	○

18. Please indicate the bear management issues for which you think DNR should establish specific management goals.

Population	○
Distribution of bears	○
Number of bears harvested	○
Amount of available bear habitat	○
Non-consumptive recreation	○
Minimization of human-bear conflict	○
Public education	○
Research	○

APPENDIX D: (CONTINUED)

19. The following is a list of different parties that may be interested in black bears in Nova Scotia. Please indicate how important you think it is to consider the concerns of each of the following groups in the management of black bears in Nova Scotia.

	Very important	Important	Neutral	Unimportant	Very unimportant	No opinion
Personnel from government agencies besides DNR	○	○	○	○	○	○
Black bear researchers or university/college professors	○	○	○	○	○	○
Individuals who primarily are interested in watching or photographing bears	○	○	○	○	○	○
Individuals who primarily are concerned with preserving bears and bear habitat	○	○	○	○	○	○
Agricultural producers who experience damage from bears	○	○	○	○	○	○
Residential homeowners who experience damage from bears	○	○	○	○	○	○
People who fear bears are a threat to human safety	○	○	○	○	○	○
Bear hunters	○	○	○	○	○	○
Bear trappers	○	○	○	○	○	○
Aboriginal community	○	○	○	○	○	○
General public	○	○	○	○	○	○

20. Do you think the Aboriginal Community has had adequate input into how black bears are managed in Nova Scotia?

1. Yes	○
2. No	○
3. Don't know	○
4. No opinion	○

APPENDIX D: (CONTINUED)

21. Do you think it is important that the Aboriginal Community has input into black bear management in Nova Scotia?

1. Yes	○
2. No	○
3. Don't know	○
4. No opinion	○

22. The following items pertain to operational aspects of black bear management in Nova Scotia. Please indicate how good or poor you think the DNR's performance has been with respect to each bear management duty listed below.

	Good	Neutral	Poor	No opinion
Implementing biologically sounds hunting regulations	○	○	○	○
Implementing socially acceptable hunting regulations	○	○	○	○
Training staff adequately for on-site visits	○	○	○	○
Staff appropriately responding to bear complaints	○	○	○	○
Balancing the interests of hunters and non-consumptive users	○	○	○	○
Collecting yearly harvest data	○	○	○	○
Compiling data from Wildlife Investigation Reports	○	○	○	○
Maintaining data of registered bait sites	○	○	○	○

23. Have you hunted/snared any species of game in Nova Scotia within the last 5 years?

1. Yes	○
2. No	○

Have you ever hunted/snared black bear in Nova Scotia?

1. Yes	○
2. No	○

APPENDIX E: STAKEHOLDER SURVEY

1. In which county and town/village in Nova Scotia do you currently live?

2. Do you consider the immediate area where you live to be primarily:

Rural/agricultural	○
Rural/forested	○
Urban/rural fringe	○
Urban	○

3. Do you live on land that is used for agricultural purposes?

Yes	○
No	○

4. Do you live in or adjacent to a forested area?

Yes	○
No	○

5. The statements below represent different attitudes people may have about black bears. Please indicate the extent that you personally agree or disagree with each statement.

Statement	Agree	Neutral	Disagree	No opinion
I see little wrong with hunting black bears as long as their populations are not endangered	○	○	○	○
To prevent endangerment I would approve of protecting black bears even if it hurt economic development	○	○	○	○
It is important that we rehabilitate orphaned black bear cubs for release back into the wild	○	○	○	○
I am concerned that black bears may harm my children or pets	○	○	○	○
I am concerned that black bears may damage my property or crops	○	○	○	○
I am aware of what measures I can take to reduce the likelihood of attracting bears to my property	○	○	○	○
I am glad I live in a province where we share our environment with a black bear population	○	○	○	○

APPENDIX E: (CONTINUED)

6. Please indicate whether you think there are currently too many, too few, or an appropriate number of black bears in Nova Scotia:

Too many	○
Too few	○
An appropriate number	○
Don't know	○

7. From what source have you received most of your information about black bears (please select only 1)

Personal experience or observation	○
Media	○
Technical publications	○
Friends or family	○
Bear researchers or scientists	○
NS Department of Natural Resources	○
Other	○

8. Have you ever seen a black bear in the wild in Nova Scotia?

Yes	○
No	○

9. Have you ever seen a bear, or signs of a bear being present, on or adjacent to your property?

Yes	○
No	○

10. How often, on average have you experienced damage due to black bears during the past 5 years?

Never	○
Less than once per year	○
1-5 times per year	○
6-10 times per year	○
More than 10 times per year	○

APPENDIX E: (CONTINUED)

11. Have you suffered economic losses due to black bear damage to your property within the last 5 years?

Yes	○
No	○

14. Have you noticed an increase in black bear problems on your property since the implementation of the green bin (compost) program in Nova Scotia?

Yes	○
No	○
Don't know	○

15. Do you actively take measures to reduce the risk of bear damage to your property?

Yes	○
No	○

17. Have you hunted/snared ay species of game in Nova Scotia within the last 5 years?

Yes	○
No	○

18. Have you ever hunted/snared black bear in Nova Scotia?

Yes	○
No	○

19. Have you been bear hunting/snaring in Nova Scotia within the last 5 years?

Yes	○
No	○

20. What methods do you use to hunt bears? Please select all that apply.

Still hunting	○
Baiting	○
Snaring	○
Bow hunting	○

APPENDIX E: (CONTINUED)

21. In Nova Scotia, the management of black bears falls under the jurisdiction of the Nova Scotia Department of Natural Resources (DNR).
The following statements pertain to black bear management and decision-making by the DNR. Please indicate the extent that you personally agree or disagree with each statement.

Statement	Agree	Neutral	Disagree	No opinion
The DNR manages Nova Scotia's black bears appropriately	○	○	○	○
When making management decisions about black bears the DNR adequately considers all available biological/ behavioural information	○	○	○	○
The DNR understand societal interest in, and concern about, black bears.	○	○	○	○
When making management decisions about black bears the DNR considers the concerns of interested parties	○	○	○	○
The DNR effectively educates Nova Scotia residents about how to avoid problems with bears on their property	○	○	○	○
I have had positive interactions with DNR staff on issues concerning black bears in Nova Scotia	○	○	○	○

22. For each of the following situations, please indicate your preferred method for DNR in dealing with nuisance/problem bears on your property.

	Euthanasia	Capture & release	Aversive conditioning	No action taken/ information provided
Bear passing through property	○	○	○	○
Bear foraging in garbage/compost	○	○	○	○
Crop damage	○	○	○	○
Aggression towards humans	○	○	○	○
Repeat offender bears	○	○	○	○

APPENDIX E: (CONTINUED)

23. The following statements pertain to the role of Nova Scotians residing in an area populated by black bears. Please indicate the extent to which you personally agree or disagree with each statement.

Statement	Agree	Neutral	Disagree	No opinion
Nova Scotians are responsible for taking measures to reduce the likelihood of attracting bears to their property	○	○	○	○
Increased bear problems are due to poorly informed Nova Scotia residents.	○	○	○	○
Increased bear problems are due to an increasing number of bears.	○	○	○	○
Nova Scotians should have the right to kill bears in defense of their property.	○	○	○	○
Nova Scotians should have the right to kill bears in defense of themselves or other people.	○	○	○	○
DNR should take public opinion into consideration when making bear-management decisions.	○	○	○	○

24. In what ways have you had contact with DNR personnel during the past 5 years? Please select all that apply.

At a DNR office	○
At a meeting	○
Through a phone conversation	○
Through a visit by DNR personnel to my home or property	○
Through working with DNR personnel in a professional capacity	○
No contact	○
Other	○

APPENDIX E: (CONTINUED)

25. Although it may not be your preferred method for DNR to use, under which of the following circumstances would you support the use of euthanasia to control bears in Nova Scotia? Please select all that apply.

Bear passing through property	○
Bear foraging in garbage/ compost	○
Crop damage	○
Aggression towards humans	○
Repeat offender bears	○
Never	○

26. Would you support a spring bear-hunting season in Nova Scotia?

Yes	○
No	○

27. Would you support the legalization of hunting black bears using hounds in Nova Scotia?

Yes	○
No	○
Don't know	○

28. Do you support hunting over bait as a legal hunting practice in Nova Scotia?

Yes	○
No	○
Don't know	○

29. Do you support the sale and export of bear gall-bladders from legally taken bears as a legal practice in Nova Scotia?

Yes	○
No	○
Don't know	○

APPENDIX E: (CONTINUED)

31. Different parties interested in black bears in Nova Scotia are listed below. Please indicate how important you think it is to consider the concerns of each of the following groups in the management of black bears in Nova Scotia.

	Very important	Important	Neutral	Unimportant	Very unimportant	No opinion
Personnel from government agencies besides DNR	○	○	○	○	○	○
Black bear researchers or university/college professors	○	○	○	○	○	○
Individuals who primarily are interested in watching or photographing bears	○	○	○	○	○	○
Individuals who primarily are concerned with preserving bears and bear habitat	○	○	○	○	○	○
Agricultural producers who experience damage from bears	○	○	○	○	○	○
Residential homeowners who experience damage from bears	○	○	○	○	○	○
People who fear bears are a threat to human safety	○	○	○	○	○	○
Bear hunters	○	○	○	○	○	○
Bear trappers	○	○	○	○	○	○
Aboriginal community	○	○	○	○	○	○
General public	○	○	○	○	○	○

32. Do you think the Aboriginal community has had adequate input into bear management in Nova Scotia?

Yes	○
No	○
Don't know	○
No opinion	○

APPENDIX E: (CONTINUED)

33. Do you think it is important that the Aboriginal Community has input into black bear management in Nova Scotia?

Yes	○
No	○
Don't know	○
No opinion	○

34. Are you a member of an Aboriginal Community?

Yes	○
No	○

35. Specific groups were asked to take part in this study. Please indicate which of the following groups you either belong to, or identify with. Please select all that apply.

Hunting organization	○
Trapping organization	○
Beekeeper	○
Blueberry producer	○
Non-consumptive wildlife organization	○
Other	○

APPENDIX F: STAKEHOLDER GROUPS CONTACTED

Wild Blueberry Producers Association of Nova Scotia*
Nova Scotia Beekeepers Association*
Bragg Lumber*
Van Dyk's Health Juice Products Ltd.*
Nova Scotia Federation of Anglers and Hunters*
Bowhunters Association of Nova Scotia*
Halifax Field Naturalists*
World Wildlife Federation Canada
Canadian Parks and Wilderness Society*
Nature Conservancy of Canada
Annapolis Field Naturalists Society
Federation of Nova Scotia Naturalists*
Blomidon Naturalist Society*
Cape Breton Naturalists Society*
Eastern Mainland Field Naturalists*
Tusket River Environmental Protection Association*
Ecology Action Centre*

*indicates one or more representative(s) participated

APPENDIX G: SELECTED RESULTS AND COMPARISONS FROM NSDNR SURVEY

1.Method of dealing with bear situations in urban areas chosen by the greatest number of respondents (compared by number of years employed by DNR)

Urban Situation	All DNR staff (n=61)	DNR staff ≤10 years (n=18)	DNR staff > 10 years (n=43)
Bear passing through property	No action taken/ information provided (57%)	No action taken/ information provided (67%)	No action taken/ information provided (53%)
Bear foraging in garbage or compost	Capture & release (54%)	Capture & release (39%)	Capture & release (61%)
Crop damage	Capture & release (59%)	Capture & release (50%)	Capture & release (62%)
Aggression towards humans	Euthanasia (77%)	Euthanasia (89%)	Euthanasia (72%)
Repeat offender bears	Capture & release (46%)	Euthanasia (61%)	Capture & release (58%)

2. Method of dealing with bear situations in rural areas chosen by the greatest number of respondents (compared by number of years employed by DNR)

Rural Situation	All DNR staff (n=61)	DNR staff ≤10 years (n=18)	DNR staff > 10 years (n=43)
Bear passing through property	No action taken/ information provided (75%)	No action taken/ information provided (89%)	No action taken/ information provided (70%)
Bear foraging in garbage or compost	Capture & release (43%)	No action taken/information provided (33%) Capture & release (33%)	Capture & release (47%)
Crop damage	Capture & release (48%)	Aversive conditioning (33%)	Capture & release (58%)
Aggression towards humans	Euthanasia (84%)	Euthanasia (94%)	Euthanasia (79%)
Repeat offender bears	Euthanasia (61%)	Euthanasia (78%)	Euthanasia (53%)

APPENDIX G: (CONTINUED)

3. Comparison of how staff members rated the efficacy and social acceptability of certain methods of dealing with specific bear situations in urban areas.

Urban situations	**Euthanasia**		**Capture & release**		**Aversive conditioning**		**No action taken/ information provided**	
	Effective	*Socially Acceptable*	*Effective*	*Socially Acceptable*	*Effective*	*Socially Acceptable*	*Effective*	*Socially Acceptable*
Bear passing through property	0%	0%	5%	31%	11%	11%	84%	57%
Bear foraging in garbage or compost	8%	7%	33%	54%	30%	21%	30%	18%
Crop damage	8%	10%	51%	59%	31%	23%	10%	8%
Aggression towards humans	85%	77%	15%	23%	0%	0%	0%	0%
Repeat offender bears	87%	46%	13%	52%	0%	2%	0%	0%

4. Comparison of how staff members rated the efficacy and social acceptability of certain methods of dealing with specific bear situations in rural areas.

Rural situations	**Euthanasia**		**Capture & release**		**Aversive conditioning**		**No action taken/ information provided**	
	Effective	*Socially Acceptable*	*Effective*	*Socially Acceptable*	*Effective*	*Socially Acceptable*	*Effective*	*Socially Acceptable*
Bear passing through property	0%	0%	0%	16%	0%	8%	100%	75%
Bear foraging in garbage or compost	8%	5%	11%	43%	46%	28%	34%	25%
Crop damage	11%	20%	34%	48%	46%	26%	8%	7%
Aggression towards humans	83%	83%	16%	16%	0%	0%	0%	0%
Repeat offender bears	87%	61%	13%	37%	0%	2%	0%	0%

APPENDIX H: SELECTED RESULTS FROM STAKEHOLDER SURVEY

1. Hunters: method of dealing with bear situations chosen by the greatest number of respondents (rural vs. urban)

Situation	All hunter/ trapper (n=26)	Rural hunter/ trapper (n=18)	Urban hunter/ trapper (n=8)
Bear passing through property	No action taken/ information provided (100%)	No action taken/ information provided (100%)	No action taken/ information provided (75%)
Bear foraging in garbage or compost	No action taken/ information provided (62%)	No action taken/ information provided (50%)	No action taken/ information provided (88%)
Crop damage	Capture & release (50%)	Capture & release (56%)	Aversive conditioning (63%)
Aggression towards humans	Euthanasia (77%)	Euthanasia (78%)	Euthanasia (75%)
Repeat offender bears	Euthanasia (54%)	Euthanasia (56%)	Euthanasia (50%)

2. Agriculturalists: method of dealing with bear situations chosen by the greatest number of respondents (rural vs. urban)

Situation	All agriculturalists (n=16)	Rural agriculturalists (n=14)	Urban agriculturalists (n=2)
Bear passing through property	No action taken/ information provided (75%)	No action taken/ information provided (79%)	No action taken/ information provided (50%) Capture & release (50%)
Bear foraging in garbage or compost	Aversive conditioning (38%)	Aversive conditioning (36%)	Aversive conditioning (50%) Capture & release (50%)
Crop damage	Euthanasia (50%)	Euthanasia (56%)	Capture & release (100%)
Aggression towards humans	Euthanasia (88%)	Euthanasia (100%)	Capture & release (100%)
Repeat offender bears	Euthanasia (81%)	Euthanasia (93%)	Capture & release (100%)

APPENDIX H: (CONTINUED)

3. Non-consumptive: method of dealing with bear situations chosen by the greatest number of respondents (rural vs. urban)

Situation	All non-consumptive (n=11)	Rural non-consumptive (n=5)	Urban non-consumptive (n=6)
Bear passing through property	No action taken/ information provided (91%)	No action taken/ information provided (100%)	No action taken/ information provided (83%)
Bear foraging in garbage or compost	No action taken/ information provided (72%)	No action taken/ information provided (80%)	No action taken/ information provided (67%)
Crop damage	Aversive conditioning (55%)	Aversive conditioning (60%)	Aversive conditioning (50%)
Aggression towards humans	Capture & release (36%)	Euthanasia (40%) Capture & release (40%)	Capture & release (33%) Aversive conditioning (33%)
Repeat offender bears	Capture & release (72%)	Capture & release (60%)	Capture & release (83%)

APPENDIX I: DETAILS OF BLACK BEAR MANAGEMENT PLANS COMPARED

Title	Table of contents	Goals/recommendations	Development process
Maryland Black Bear Management Plan	1. Executive summary 2. Introduction 3. Status of Maryland's black bear population 4. Bears and humans 5. Black bear management options 6. Goals, objectives, and strategies 7. Appendices	Population viability Habitat conservation & management Human - bear conflicts Public values & recreation Animal welfare Funding black bear management in Maryland	• Black bear task force (made up of citizens) reviewed 1992 plan and submitted recommendations to department. • Department developed plan from recommendations. • Draft available for public comment. • State-wide public opinion surveys conducted
Management and biology of black bears in Pennsylvania	1. Executive summary 2. Mission, goals, objectives, and strategies 3. Life history 4. Historical and current status of bears in Pennsylvania 5. Recreation, economic significance, and public interest 6. Review of black bear management options 7. Appendices	Healthy and self-sustaining bear populations Minimize loss and improve quality of habitat Maintain human-bear conflicts at acceptable levels Provide recreational opportunities that involve black bears	• Stakeholders invited to attend meeting to develop missions statement and discuss black bear values • Plan written by departmental staff • Draft made available for public comment.
Virginia black bear management plan	1. Executive summary 2. Introduction 3. History 4. Black bear program supply and demand 5. Black bear management options 6. Bear plan goals, objectives and strategies 7. Appendices	Population viability Desirable population levels Habitat conservation and management Hunting seasons and demands Ethics of hunting methods Landowner and citizen conflicts with bear hunting Non-hunting recreation Human-bear problems	• Stakeholder advisory committee identified values and goals. • Technical committee designed objectives and strategies based on values. • Focus groups, regional meetings, and stakeholder surveys also conducted. • Draft plan made available for public comment.

APPENDIX I: (CONTINUED)

Title	Table of contents	Goals/recommendations	Development process
New Hampshire Big Game Plan for deer, moose, bear, turkey	1. Introduction and background 2. White-tailed deer 3. Moose 4. Black bear 5. Wild turkey	Regionally manage bear populations Implement public education Minimize conflicts Conserve bear habitat	• Public survey conducted • Big game public working groups (PWG) made up of stakeholders used survey and assessment reports to develop species goals and objectives • PWG submitted draft to agency staff for considerations • Draft plan made available for public comment
Black bear management plan for the state of Vermont	1. Introduction 2. Department mission statement and strategic plan 3. Historical perspective 4. Black bear issues 5. Appendices	Black bear population and distribution Bear habitat conservation strategies Bear licence Regional management zones Season length and structure Hunting hours Hunting bears with hounds Sale of bear parts	• Public survey conducted • Plan written by departmental staff • Public hearings and open houses held to solicit public input
Comprehensive Black bear Management policy	1. Introduction 2. History 3. Integrated black bear management strategy 4. Conclusion 5. Appendices	Education Control of human-derived food Research Bear control Depredation permits Habitat protection Bear population management	• Plan written by departmental staff • Draft plan made available for public comment