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"Bear Smart" Community Program: Background Report
Prepared for: BC Ministry of Water, Land and Air Protection - March 2002

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Executive Summary

Conflicts between humans and bears within British Columbia communities have occurred frequently in the past. Management of human-bear conflicts was largely reactive: problems were managed after they had developed. This usually involved the destruction of the bears involved. However, this reactive management approach is very expensive and ineffective at decreasing both the frequency and intensity of future conflicts. This deficiency, in combination with shifts in the public's attitudes towards the destruction of wildlife, has resulted in changes to the ways in which human-bear conflicts are managed. This document details the steps and procedures by which communities can reduce the frequency and intensity of human-bear conflicts. The process involves a shift from the reactive management of "problem" bears to the proactive management of the attractants that draw bears into the communities. The Province of British Columbia has chosen to facilitate this change by accrediting communities with "Bear Smart" status, which will be granted to those communities that reach a benchmark level of proactive management of human- bear conflicts.
…

1 Program Introduction

With the expansion of human development, an extensive history of conflict between humans and bears (Ursus spp.) has developed. A primary contributing factor to this conflict is that many of the habitats that bears prefer are also desirable to humans. For example, communities are occasionally situated near abundant food sources for bears, such as salmon spawning streams, or in valley bottoms that also serve as major travel corridors for bears.

Conflict ensues when this overlap of habitats is combined with people providing bears with easy access to non-natural food and garbage. Once bears learn they can obtain food from humans, they become persistent in their attempts to access this resource. This tenacity often escalates in frequency and intensity and can pose a threat to human life and property. As a result, these bears are frequently destroyed.

The effects of human settlement on bears are then twofold: bears are displaced from their natural habitats by community expansion and development, and they are also drawn into communities by attractants. Since it is not feasible to relocate towns and communities, we can reduce the source of this conflict by managing attractants within the communities of British Columbia.

In the past, human-bear conflict was widely perceived to be the result of "problem" bears. However, these conflicts typically arose because bears were simply looking for food. Many people were not aware that their own behaviour contributed greatly to the creation of these conflicts. The natural ecology of the bear plays only a small role in the development of these problems.
…

Ultimately, people need to understand that poor management of attractants within communities often results in the destruction of bears. Unfortunately, this reactive approach to human-bear conflicts is

ineffective, as it focuses on managing the bears, not managing the problem. In many cases the bear that is removed from a non-natural food source is soon replaced by a new bear that, if allowed access to the attractant, will also become a ”problem” bear and will be removed from the system. Treating the symptom and not the cause perpetuates the cycle.
…

2.4 Learning and Development
…
Throughout their life, bears remain curious and continue to learn through trial and error. Curiosity is an adaptive characteristic that helps bears discover the most productive and nutritious foods, which are fundamental to their survival (Graf et al. 1992, Herrero 1985, Heuer 1993). Bears also possess the ability to learn through observing other bears; they may even be able to follow information communicated by the marking behaviours of other bears (Tony Hamilton, MWLAP, personal communication). Because bears are very effective learners, any high-energy food that they feed on may be included in their search image.
Bears have an excellent sense of smell (Graf et al. 1992) and are able to associate smells with food types. In the spring, bears may travel long distances to locate carrion. Garbage, fruit tree windfall, and carcasses of animals are all extremely pungent attractants that have the ability to draw bears in from long distances.
…

3 Creating “Problem” Bears
…
THE CREATION OF “PROBLEM” BEHAVIOUR DISCUSSED IN THIS DOCUMENT IS THE RESULT OF THE AVAILABILITY OF NON-NATURAL ATTRACTANTS; THE AVAILABILITY OF NON-NATURAL ATTRACTANTS IS THE DIRECT RESULT OF HUMAN ACTIONS AND MISMANAGEMENT.
…

3.3 Effects of Non-Natural Attractants
The availability of non-natural attractants within a community can have several profound effects on bears that pass nearby the community. Each of these effects directly influences the likelihood of human-bear conflicts.
By providing artificial foods we may accelerate the natural reproductive cycle of the bear. Bears may respond with a decreased interval between breeding, larger litter size and earlier reproduction (Rogers 1983). However, non-natural mortality rates of bears that feed on unnatural food sources are greater than those of wild bears (Cole 1974, Rogers 1983, Ciarniello 1996). Bears that feed on garbage at landfills often suffer from burns, cuts from broken glass and can starve from having containers stuck on their tongues/mouths (Smith and Lindsey 1989) or heads (Huber 1998).

3.3.1 Human Food Conditioning or Garbage Conditioning
Operant conditioning is the form of learning most often related to the process of bears feeding on garbage (Herrero 1989). Bears that are attracted to human food and are subsequently rewarded develop behaviour patterns that enable them to exploit their conditioning. For example, if a bear is attracted to the smell of garbage in a can, it may push the can over, exposing the contents for consumption. The animal's action of pushing over the can was instrumental in obtaining a reward (i.e., food). Bears have the ability to learn from a single experience, and this process may be all that is necessary for the animal to become conditioned to pushing over garbage cans to obtain food. As a result of learning, whenever the animal encounters garbage cans in the future, with or without any food odours, it will likely

investigate them (i.e., associative learning). In addition to this conditioning, the association between the smell and a reward has also been made. In this situation, the bear would likely be attracted to smells similar to the can (e.g., garbage on a porch).
Generally, bears attracted to non-natural foods other than garbage (e.g., fruit trees, grains) will behave differently towards humans than "garbage" bears. Regardless of the type of attractant, once bears have been successful in obtaining human foods, they begin to develop behaviour patterns and continue to seek food at sites used by humans (i.e., they become human-food conditioned). The bear then repeatedly returns to the source of the conditioning (Ciarniello 1996).
Bears are very effective learners. Cubs remain with their mother for one to three years and in that time learn the requirements necessary for survival. If the mother is a "garbage" bear, then the cubs will learn to forage on garbage. Similarly, if the mother does not display an avoidance of humans and/or if the cubs acquire food from humans, then they may learn a lack of fear of humans and an association between humans and food.

3.3.2 Habituation in Combination with Human Food Conditioning

The majority of "problem" bears display a combination of human food conditioning and human habituation. Herrero (1989:12) comments on the relationship between food conditioning and human habituation in grizzly bears
in the following manner:
...when human-related foods are first sensed by a grizzly bear, an approach-avoidance conflict exists. A bear is attracted by the odour of food or garbage, and repelled by human presence or even the odour of people. Such food-seeking behaviour has thus far only been mildly rewarded by food odour (a secondary, not a primary reinforcer). At first the perceived risk may be too great for a bear to approach the food source. However, upon repeated exposure to similar situations, and if no harassment or harm occurs, then habituation develops. The bear comes to accept the smell of, or even the presence of, people nearby, and finally it feeds on the food or garbage. It is then food-conditioned ...It has learned to accept the risks associated with eating human-related foods. It has also become habituated to some extent... to the presence of people. It is less likely to flee from people, more likely to approach them.

"Bear Smart" Community Program: Background Report

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Executive Summary

Conflicts between humans and bears within British Columbia communities have occurred frequently in the past. Management of human-bear conflicts was largely reactive: problems were managed after they had developed. This usually involved the destruction of the bears involved. However, this reactive management approach is very expensive and ineffective at decreasing both the frequency and intensity of future conflicts. This deficiency, in combination with shifts in the public's attitudes towards the destruction of wildlife, has resulted in changes to the ways in which human-bear conflicts are managed.

This document details the steps and procedures by which communities can reduce the frequency and intensity of human-bear conflicts. The process involves a shift from the reactive management of "problem" bears to the proactive management of the attractants that draw bears into the communities. The Province of British Columbia has chosen to facilitate this change by accrediting communities with "Bear Smart" status, which will be granted to those communities that reach a benchmark level of proactive management of human-bear conflicts.

It is recommended that achieving "Bear Smart" status should be a two-stage process. In Phase I, the sources of potential human-bear conflicts within the community are identified. This typically involves identifying non-natural and natural attractants. In Phase II, a human-bear management plan is developed and implemented. This management plan includes components on monitoring human-bear conflicts, education, managing waste, implementing and enforcing bylaws, managing green space, and community planning. The "Bear Smart" process is designed to be adaptive, so that new management options or improvements can be incorporated into each phase. Criteria for each step in the process are provided so that communities have clearly defined and achievable targets.

Acknowledgements

Without hesitation, we would like to give much of the credit for the material and ideas in this report to many highly dedicated and motivated individuals in Canada and the U.S.A. who have been working to minimize human-bear conflicts and increase awareness and understanding of bears. These people all freely shared their expertise and time to assist us. Most of these people we acknowledge have been involved in the initiation and evolution of the "Bear Smart" Community Program (in various aspects, stages and under various program names) for numerous years. We are merely the people contracted to pull together the ideas and experience of others in a report with the "Bear Smart" Community Program name. We would like to give special thanks to the following British Columbians:

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In closing, we hope that all of your efforts to reduce human-bear conflicts are generously rewarded with success. Our communications with others while researching this report has been a major reaffirmation that many people have chosen to work for bears because they care....a lot!

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Mission Statement

"To accept personal and community responsibility for reducing human-bear conflict in and around our communities"

1 Program Introduction

With the expansion of human development, an extensive history of conflict between humans and bears (*Ursus* spp.) has developed. A primary contributing factor to this conflict is that many of the habitats that bears prefer are also desirable to humans. For example, communities are occasionally situated near abundant food sources for bears, such as salmon spawning streams, or in valley bottoms that also serve as major travel corridors for bears.

Conflict ensues when this overlap of habitats is combined with people providing bears with easy access to non-natural food and garbage. Once bears learn they can obtain food from humans, they become persistent in their attempts to access this resource. This tenacity often escalates in frequency and intensity and can pose a threat to human life and property. As a result, these bears are frequently destroyed.

The effects of human settlement on bears are then twofold: bears are displaced from their natural habitats by community expansion and development, and they are also drawn into communities by attractants. Since it is not feasible to relocate towns and communities, we can reduce the source of this conflict by managing attractants within the communities of British Columbia.

In the past, human-bear conflict was widely perceived to be the result of "problem" bears. However, these conflicts typically arose because bears were simply looking for food. Many people were not aware that their own behaviour contributed greatly to the creation of these conflicts. The natural ecology of the bear plays only a small role in the development of these problems.

Because of this perception, management of human-bear conflicts in British Columbia has been primarily reactive: that is, "problem" bears were translocated (moved to another area) or destroyed. In British Columbia, the Conservation Officer Service receives an average of 9000 complaints per year and destroys over 1000 bears per year. The cost of having the Conservation Officer Service respond to human-bear conflicts in this manner is estimated at more than one million dollars annually.

Ultimately, people need to understand that poor management of attractants within communities often results in the destruction of bears. Unfortunately, this

reactive approach to human-bear conflicts is ineffective, as it focuses on managing the bears, not managing the problem. In many cases the bear that is removed from a non-natural food source is soon replaced by a new bear that, if allowed access to the attractant, will also become a "problem" bear and will be removed from the system. Treating the symptom and not the cause perpetuates the cycle.

In recent years, several communities have taken proactive steps towards reducing human-bear conflicts in their communities. By using proactive measures, including education and eliminating sources of non-natural foods, many of these communities have been able to decrease the number of bears destroyed each year in their communities. The BC Ministry of Water, Land and Air Protection (MWLAP) is now taking further action to reduce the number of bears that are destroyed in British Columbia each year. By spearheading the delivery of the "Bear Smart" Community Program, the province is encouraging individuals and communities to take responsibility for reducing human-bear conflicts within their community.

The primary goal of the program is to diminish the rate and intensity of human-bear conflicts, which will thereby increase public safety and reduce the number of bears that are killed. Using proactive management, communities can reduce conflicts between humans and bears by identifying and eliminating the root causes of the conflicts. The "Bear Smart" Community Program provides communities with options for addressing their own unique situation and helps them reach the objectives of the program.

It is recommended that "Bear Smart" status be achieved through a two-stage process. In Phase I, the sources of potential human-bear conflicts within the community are identified. This typically involves identifying non-natural and natural attractants. In Phase II, a human-bear management plan is developed and implemented. This management plan includes components on monitoring human-bear conflicts, education, managing waste, implementing and enforcing bylaws, managing green space, and community planning. The "Bear Smart" process is designed to be adaptive, so that new management options or improvements can be incorporated into each phase.

This document is designed to guide communities through the process of becoming "Bear Smart." It focuses on proactive changes that can be made within the community and is limited to those changes that are within the community's jurisdiction. Criteria for each step in the process are provided so that communities have clearly defined and achievable targets. This document does

not address activities such as hunting or backcountry recreation or reactive techniques such as aversive conditioning[1].

This report follows a report released in 1997: "Reducing human-bear conflicts: solutions through better management of non-natural foods" (Ciarniello 1997).

[1]Various aversive conditioning techniques and translocations are available but should be used *only* after non-natural attractants are eliminated and *only* if bears have little or no history of food conditioning and/or human habituation.

2 Understanding Natural Bear Behaviour

To fully understand the development of "problem" bears, it is necessary to examine the biological requirements of bears and the process by which they learn specific behaviours. The following sections outline how bears behave in natural settings without non-natural foods and attractants. Using this as a framework in which we can predict how bears function, we are better able to manage conflicts with bears based on their biology. Although grizzly bears (*U. arctos*) and black bears (*U. americanus*) share many similarities, they are different species that have learned to exploit different niches. These differences need to be understood and applied properly for management decisions to be effective.

2.1 General Biology

Although classified as carnivores, grizzly and black bears are opportunistic omnivores that mainly feed on graminoids (i.e., grasses and sedges), emergent forbs (e.g., the leaves or stems of herbaceous plants), roots, and berries) but prefer richer, fatty foods when available (e.g., fish, ungulates). Bears will switch foods according to their digestibility, distribution, and abundance. Unlike ungulates, bears lack digestive organs such as a caecum and a rumen that are specialised for digesting vegetative materials; therefore they pass food quickly through their digestive system. Because of this, fewer nutrients are extracted and only the most digestible components of the food are utilized. As a result, bears must obtain vegetation when it is in a tender and easily digestible stage and will select habitats that contain plant foods high in soluble nutrients and relatively low in fibre (Bunnell and Hamilton 1983, Hamer and Herrero 1987, Pritchard and Robbins 1990).

Bears need to accumulate a large reserve of fat to survive up to six months of winter hibernation. Their physiological imperative is to consume enormous amounts of food, so dramatic that biologists label the process "hyperphagia," literally "excessive eating," They are attracted to nutrient rich foods that are easily digested and absorbed. For example, bears gorge themselves when eating fat-rich salmon during their hyperphagic period; they have been recorded to consume over 10 to 15 salmon per hour or approximately 100,000 calories per day (Olson 1993, B.K. Gilbert, Utah State University, personal communication).

2.1.1 Reproduction

A special reproductive characteristic of grizzly bears and black bears is delayed implantation. Mating occurs from mid-May to early July, but implantation of the embryo will not occur until November or December while the bear is hibernating (Barber and Lindzey 1986). Successful implantation of the embryo is dependent upon the female's fat reserves; the embryo will implant if she has

enough reserves to successfully sustain herself and her offspring (Samson and Huot 1995).

2.1.2 Home Range, Movements and Dispersal

The home range of a grizzly bear is generally larger than the home range of a black bear. Home range sizes are affected by sex, age, population density, and habitat quality. In both black and grizzly bears, adult males have the largest home ranges, which usually overlap other male ranges and often contain part or all of a number of adult female home ranges. Adult females have more restricted and well-defined home ranges than males. Females accompanied by cubs of the year (COY) generally have the smallest home ranges. The home range of a family group increases as the cubs mature. Females may allow partial use of their home range by their female offspring (Rogers 1987). However, subadult males are usually forced to disperse and establish a new home range.

The forced dispersal of subadult males by their mothers, the need to find and establish their own home range in areas dominated by larger, more aggressive males, and their curious nature are keys to understanding why this cohort dominates wildlife complaint records. Subadults are more likely to accept risk and feed in closer proximity to humans when natural food is limited, or when bears perceive the benefits to be greater than the costs. Less dominant bears, including subadults, females with cubs, and black bears, may use humans to avoid more dominant bears (Mattson 1990). In general, females with cubs of the year will avoid both adult males and humans.

Home range size depends on the distribution, abundance, and quality of food available within an area. Study areas with high densities of bears normally report smaller home ranges and a richer food base than those with low population densities of bears (Gilbert and Lanner 1995). The major determinants of habitat quality are the relative and average abundance of bear foods (i.e., quantity, productivity, and distribution). In areas with poor habitat quality, bears must search more widely for food, thus increasing the size of their home ranges. For example, bears habituated to humans and conditioned to human foods will alter their natural movements between habitat types to utilize areas with lax garbage management (Ciarniello 1996). This affects bear density in the area and places bears and humans in closer proximity than would otherwise be the case. Furthermore, concentrations of non-natural foods provide a high-quality food source, which has the potential to increase the bear population artificially beyond that which is possible in the natural environment (e.g., British Columbia's South Okanagan, Tony Hamilton, MWLAP, personal communication).

2.2 Grizzly Bears

The grizzly bear is wide-ranging and generally secretive in nature. The grizzly bear is listed as a vulnerable species by the Committee on the Status of Endangered Wildlife in Canada (McLellan and Banci 1999), as a blue-listed species (species at risk) in British Columbia (BC Conservation Data Centre), and as a threatened species in the United States (listed in 1975 by the U.S. Fish and Wildlife Service).

Grizzly bears are extinct from approximately 24% of their original range in Canada, and some local populations in British Columbia are known or are believed to be declining. The BC Ministry of Water, Land and Air Protection estimates the population of grizzly bears in the province to be 13,800 individuals (M. Austin, MWLAP, personal communication). The "Bear Smart" program is less applicable to grizzly bears in specific locations in south and central British Columbia because grizzly bears have largely been extirpated in these areas (e.g., Kamloops, William's Lake, Kelowna; Tony Hamilton, MWLAP, personal communication).

2.2.1 Reproduction

Female grizzly bears average between five and seven years of age before they reach reproductive maturity in the wild (Russell et al. 1979, Nagy et al. 1989). Cubs are born every two to five years, with one to two cubs per litter being most common. As mentioned, implantation of the embryo is correlated with nutrient availability; larger females tend to be more successful in producing more offspring and reducing the intervals between breeding events (Eiler et al. 1989). Because reproduction begins at a late age, is dependent upon nutrient availability, and occurs at lengthy intervals, the majority of females reproduce only a few times during their life. For example, in an optimum scenario, if a female grizzly bear begins successful reproduction at the age of five, reproduces at every minimum interval (two years), averages two cubs per litter, and reproduces until age 20, she will produce 12 cubs during her life time. Because cub mortality ranges from 15% to 44% (McLellan 1994), seven to ten of these cubs will survive, of which half will have the chance of being female and thus able to contribute to the future population. This scenario does not factor in mortality from "problem" bear management; hunting; poaching; vehicles; habitat loss, alienation, alteration, and fragmentation; and those years in which the female is unable to obtain a weight sufficient for reproduction. The low reproductive rate of grizzly bears makes them sensitive to overharvest (Dueck 1990).

2.2.2 Habitat Use

In interior mountainous areas, from early May to late June, grizzly bears tend to follow the receding snow-line, using higher-elevation habitats as they become available (Hamer and Herrero 1987, Ciarniello and Paczkowski 2001). Grizzly

bear movements tend to be characterized by shifts from avalanche slopes and low-elevation riparian habitats (e.g., stream valleys, wet meadows) in the spring to high-elevation forests and alpine zones in the summer, and back to low elevations in autumn (Mundy and Flook 1973). In coastal British Columbia, grizzly bears tend to use forested and non-forested habitats on lower slopes and valley bottoms through all seasons (MacHutchon et al. 1993). In both coastal and interior areas, grizzly bears prefer habitats with high ecosystem productivity, such as avalanche slopes and riparian and seepage areas, especially in spring when vegetation is protein-rich and easily digestible. Adult males often occupy the habitats with the greatest productivity.

2.3 Black Bears

Black bears are more adaptable to humans and human settlement than grizzly bears and continue to occupy 85% of their historic range. As a result, the black bear is not listed by COSEWIC and is not a species at risk (yellow-listed) in British Columbia (BC Conservation Data Centre). Black bears have been extirpated in areas of heavy human settlement but remain in all of British Columbia's major forested areas, including those adjacent to towns and cities. Throughout British Columbia, black bears have been known to enter towns or development sites in search of human food and garbage. The population of black bears in British Columbia is estimated to range between 120,000 and 160,000 individuals (M. Badry, MWLAP, personal communication).

2.3.1 Reproduction

In British Columbia, black bears normally become sexually mature between four and five years of age. Adult female black bears are able to breed every other year and produce an average of two cubs per litter. However, this level of breeding will occur only if the food supply is adequate. In environments with limited food, black bears may average three to four years between successful litters (Samson and Huot 1995). Although black bears are able to breed at shorter intervals than grizzly bears, they are still considered to have low reproductive rates; a severe reduction in their local population may seriously affect population viability.

2.3.2 Habitat Use

The most important factor affecting the use of habitats by black bears is the distribution, availability, and abundance of preferred foods (Hatler 1967, MacHutchon 1989), combined with security cover (Kansas et al. 1989, Ciarniello 1996). Avoidance of grizzly bears also affects the black bear's selection of habitat. Females, and especially those with cubs, may avoid areas occupied by adult male black bears and grizzly bears (Chi and Gilbert 1999). Because of these factors, black bears display distinct seasonal variations in their habitat use.

In general, black bears prefer moderate to heavily forested areas with a dense shrub understory and high availability of foods (graminoids, forbs, and berries), often in small openings. These vegetation characteristics are typical of unlogged valley bottoms. Since transportation corridors and communities are also commonly developed in valley bottoms, human settlement often conflicts with the preferred habitat of black bears. Black bears will utilize clearcuts and the subalpine when it does not compromise their safety (i.e., no grizzly bears or other threats present). Females with cubs usually avoid such openings. Black bears normally use trees for cover or climbing when they feel threatened (Davis and Harestad 1996).

A reduction of forest cover, or insufficient food supply, may cause black bears to retreat into less preferred habitats. In Banff National Park, Kansas et al. (1989:5.70) found that "in some instances cover was the overriding factor determining black bear ecosite importance."

2.4 Learning and Development

Understanding how bears learn is critical to the implementation of effective strategies to reduce human-bear conflicts. Thorpe (1963:56) comments on the processes of learning in the following manner:

> Many workers have considered that the more or less frequent repetition of a stimulus or of a changed situation is necessary for learning; but, while it is true that most learning comes about as a result of repeated application of a stimulus or combination of stimuli, such repetition can be no necessary part of the concept because we all know that learning can, on occasion, result from one experience only.

An initial learning environment imprints heavily on the future behaviours displayed by cubs. Grizzly and black bear cubs learn skills fundamental for their survival from their mother in the one to three years they remain with her, and once weaned, they must fend for themselves. For example, if a mother spends her time foraging at a landfill, the cubs will learn this behaviour. As a result, these bears will likely become highly reliant on the landfill as a food source and in some cases may not be able to survive in the natural environment.

Throughout their life, bears remain curious and continue to learn through trial and error. Curiosity is an adaptive characteristic that helps bears discover the most productive and nutritious foods, which are fundamental to their survival (Graf et al. 1992, Herrero 1985, Heuer 1993). Bears also possess the ability to learn through observing other bears; they may even be able to follow information communicated by the marking behaviours of other bears (Tony Hamilton, MWLAP, personal communication). Because bears are very effective learners, any high-energy food that they feed on may be included in their search image.

Bears have an excellent sense of smell (Graf et al. 1992) and are able to associate smells with food types. In the spring, bears may travel long distances to locate carrion. Garbage, fruit tree windfall, and carcasses of animals are all extremely pungent attractants that have the ability to draw bears in from long distances.

3 Creating "Problem" Bears

This section focuses on those aspects of the learning process of bears that contribute to the creation of "problem" bear behaviour. The intent is to gain a better understanding of the connection between human-bear conflicts and the biological requirements of bears so that people recognize the pressures that bears face in relation to humans and their activities. The reader should keep in mind that THE CREATION OF "PROBLEM" BEHAVIOUR DISCUSSED IN THIS DOCUMENT IS THE RESULT OF THE AVAILABILITY OF NON-NATURAL ATTRACTANTS; THE AVAILABILITY OF NON-NATURAL ATTRACTANTS IS THE DIRECT RESULT OF HUMAN ACTIONS AND MISMANAGEMENT.

3.1 Causes of Bears' Attraction to Human Food

Many factors affect bears' attraction to human food. Each of these factors operates on bears in a fairly predictable manner. Understanding how these factors affect the frequency and intensity of human-bear conflicts is crucial to the implementation of a proactive management strategy.

3.1.1 Community Development and Habitat Loss

Many cities and towns in British Columbia are situated in areas of good to excellent bear habitat (Fuhr and Demarchi 1990). When humans move into areas inhabited by bears, they often introduce new feeding opportunities that the bears are quick to discover and exploit. In addition, an expanding human population requires developments that decrease the suitability of the natural landscape to sustain bear populations.

British Columbia's rapidly expanding human population continues to encroach upon the natural habitat of grizzly and black bears. As a result, habitat loss, alteration, alienation, and fragmentation can disrupt bears' use of natural habitat and ultimately result in negative impacts to individual bears and bear populations through displacement or mortality.

Grizzly bears and black bears that are wary of humans will be displaced to other, generally less productive, habitat. Displaced bears may then have to compete with bears already established in the area. Displaced bears may experience stress associated with adapting to the new habitat, and there is an increased chance of mortality inflicted by more dominant bears in their quest for, or defence of, habitat. Black bears appear to have a wider variety of habitat selection patterns, making them more resilient to human change, whereas grizzly bears may have a narrower pattern, which accounts for their lack of resiliency when landfills are closed. Given that existing towns in British Columbia cannot be moved or closed means we must make them as bear resistant and bear friendly (e.g., accommodation of movement corridors) as possible. In addition, most communities are

expanding, and this expansion should also be done in a bear-friendly way. Currently, the majority of bears that adapt to living adjacent to communities are drawn into the community by the availability of non-natural attractants.

3.1.2 Natural Food Shortages

Bears in North America commonly experience food shortages. The failure of critical natural food crops, such as salmon and berries, and the resultant increase in competition among bears, forces them to search for alternate foods (Tompa 1987, Mattson et al. 1992, Ciarniello and Paczkowski 2001). As opportunistic feeders, bears are naturally attracted to scents that suggest food. During years of natural food scarcity, the hunger of some bears may lead them to overcome their fear of humans in order to acquire accessible foods. The effects of natural food shortages and an increase in negative human-bear interactions have been well documented (Hatler 1967, Knight et al. 1988).

Natural food shortages can be local or sub-regional in extent, both affect "problem" bear generation: in years of low food availability, bears move more and encounter human situations more (local shortages). When food shortages are on the sub-regional scale, it can be catastrophic to bear populations. In British Columbia we get both kinds of failures. Failure of food crops tend to have more consequence in areas with limited food choices or availability (e.g.., interior habitats tend to have lower diversity in berry species than coastal habitats), making any failure that much more disastrous.

3.1.3 Concentration of Food Resources

The poor digestive ability of bears and their constant struggle to attain the thickest layer of fat possible (to survive winter denning and increase reproductive success), are keys to understanding their attraction to non-natural foods. Probably the greatest reason that bears are attracted to communities is the concentration of food resources that are found there. Landfills and other non-natural foods that humans create are attractive to bears because they contain highly concentrated sources of calorie-rich foods that require little energy expenditure to acquire (Graf et al. 1992, Herrero 1989). The amount of nutrition attained influences reproductive success and social status, and is vital to survival. Clearly, bears are simply maximizing their energetic balance sheet when they select these concentrated food sources.

Another element affecting bears' attraction to non-natural foods is their use of habitats. Natural bear foods vary widely in their abundance, quality, and distribution. Thus, bears must move widely in response to this variable supply of foods. Doing so increases their chances of finding non-natural foods in their travels. Unlike seasonal fluctuations of natural food sources, landfills are not seasonal, and when bears find them, they do not have to use energy to search for new food sources.

3.2 Habituation of Bears to Humans

Another issue that contributes to the development of human-bear conflict is habituation of bears to humans. Thorpe (1963:60-61) provided the following definition of habituation:

> Used in its widest sense, habituation is a simple learning not to respond to stimuli which tend to be without significance in the life of the animal .... Habituation can, therefore, be defined as the relatively permanent waning of a response as a result of repeated stimulation which is not followed by any kind of reinforcement. It is specific to the stimulus.

Human-habituated bears are those that tolerate human presence, reducing their fleeing response in the presence of humans (McCullough 1982, Herrero 1985, Gilbert 1989, Aumiller and Matt 1994). An example of habituation by bears to humans (without food conditioning) is best illustrated at McNeil River Falls in Alaska. At this site, grizzly bears have become habituated to the presence of people, whose activities are strictly monitored to ensure no food or garbage is accessible (Aumiller and Matt 1994).

Food-conditioning and human habituation are considered separate behaviours because a food reward is not a necessary condition for human habituation (Herrero 1985, Gilbert 1989, Aumiller and Matt 1994,). Thus, used in a behavioural sense, the term "garbage-habituated" is incorrect because bears are not known to "respond" to garbage. and garbage provides reinforcement of bear behaviour through reward.

3.3 Effects of Non-Natural Attractants

The availability of non-natural attractants within a community can have several profound effects on bears that pass nearby the community. Each of these effects directly influences the likelihood of human-bear conflicts.

By providing artificial foods we may accelerate the natural reproductive cycle of the bear. Bears may respond with a decreased interval between breeding, larger litter size and earlier reproduction (Rogers 1983). However, non-natural mortality rates of bears that feed on unnatural food sources are greater than those of wild bears (Cole 1974, Rogers 1983, Ciarniello 1996). Bears that feed on garbage at landfills often suffer from burns, cuts from broken glass and can starve from having containers stuck on their tongues/mouths (Smith and Lindsey 1989) or heads (Huber 1998).

3.3.1 Human Food Conditioning or Garbage Conditioning

Operant conditioning is the form of learning most often related to the process of bears feeding on garbage (Herrero 1989). Bears that are attracted to human food

and are subsequently rewarded develop behaviour patterns that enable them to exploit their conditioning. For example, if a bear is attracted to the smell of garbage in a can, it may push the can over, exposing the contents for consumption. The animal's action of pushing over the can was instrumental in obtaining a reward (i.e., food). Bears have the ability to learn from a single experience, and this process may be all that is necessary for the animal to become conditioned to pushing over garbage cans to obtain food. As a result of learning, whenever the animal encounters garbage cans in the future, with or without any food odours, it will likely investigate them (i.e., associative learning). In addition to this conditioning, the association between the smell and a reward has also been made. In this situation, the bear would likely be attracted to smells similar to the can (e.g., garbage on a porch).

Generally, bears attracted to non-natural foods other than garbage (e.g., fruit trees, grains) will behave differently towards humans than "garbage" bears. Regardless of the type of attractant, once bears have been successful in obtaining human foods, they begin to develop behaviour patterns and continue to seek food at sites used by humans (i.e., they become human-food conditioned). The bear then repeatedly returns to the source of the conditioning (Ciarniello 1996).

Bears are very effective learners. Cubs remain with their mother for one to three years and in that time learn the requirements necessary for survival. If the mother is a "garbage" bear, then the cubs will learn to forage on garbage. Similarly, if the mother does not display an avoidance of humans and/or if the cubs acquire food from humans, then they may learn a lack of fear of humans and an association between humans and food.

3.3.2 Habituation in Combination with Human Food Conditioning

The majority of "problem" bears display a combination of human food conditioning and human habituation. Herrero (1989:12) comments on the relationship between food conditioning and human habituation in grizzly bears in the following manner:

> ...when human-related foods are first sensed by a grizzly bear, an approach-avoidance conflict exists. A bear is attracted by the odour of food or garbage, and repelled by human presence or even the odour of people. Such food-seeking behaviour has thus far only been mildly rewarded by food odour (a secondary, not a primary reinforcer). At first the perceived risk may be too great for a bear to approach the food source. However, upon repeated exposure to similar situations, and if no harassment or harm occurs, then habituation develops. The bear comes to accept the smell of, or even the presence of, people nearby, and finally it feeds on the food or garbage. It is then food-conditioned ...It has learned to accept the risks associated with eating human-related foods. It has also become habituated to some extent... to

the presence of people. It is less likely to flee from people, more likely to approach them.

Ciarniello (1996:26) identified two behavioural traits displayed by bears that were human habituated and garbage conditioned:

1. The bear loiters around humans and appears tame; or
2. The bear searches out human food and garbage with little or no fear of humans.

With both of these behavioural traits, bears have made the association between humans and food. In the first case, the bear appears tame to humans, who in turn try to approach the bear. These bears may beg and will accept handouts from humans (Mundy and Flook 1973, Herrero 1985, Ciarniello 1996). This type of behaviour increases the risk of injury to humans from bears.

Bears displaying the second trait pose the greatest threat to human safety by boldly approaching people (Herrero 1985, Ciarniello 1996). Kunelius and Browne (1990: 1) cite the availability of unnatural food sources as a "major cause of bear management problems and related public safety hazards" in Banff National Park. Holroyd and Van Tighem (1983:338) state that "the first documented human death due to a bear attack was caused by a black bear which had become habituated [sic; conditioned] to handouts in Jasper." The combination of human habituation and garbage conditioning poses a threat to human safety and is the most difficult trait to discourage (Herrero 1985).

The level of habituation to humans varies with individual bears and their past experiences with people (Herrero 1985). Generally, food-conditioned and human-habituated bears have a higher probability of being involved in a negative human-bear encounter than wild bears because their attraction to human foods brings them into more frequent contact with people (Ciarniello 1996).

4 Moving Towards Becoming "Bear Smart"

4.1 Overview of "Bear Smart"

The goal of the "Bear Smart" Communities Background Report is to assist communities in understanding and achieving "Bear Smart" status. The information in this report is based on a thorough literature review of human-bear conflict management. In many ways, the "Bear Smart" Community Program applies the same strategies that have been implemented in many national and provincial parks in Canada and the U.S. The report is also based on interviews with government personnel and biologists in British Columbia, Alberta, Yukon, Northwest Territories, Alaska, Washington, and Montana that have been involved in various aspects of the management strategies that make up the "Bear Smart" Community Program.

This report presents the criteria that must be met to achieve "Bear Smart" status and strategies for fulfilling them. Firstly, the criteria by which communities will be assessed are outlined, and the logic behind each criterion is provided. Secondly, several methodologies are provided by which communities can fulfil the criteria. Because each community is unique, the methods that should be used will likely be community-dependent, so options have been developed, as necessary, for the fulfilment of criteria. Thirdly, quantitative measures are provided by which external reviewers can assess the success of a community's attempt to become a "Bear Smart" Community. Finally, the report concludes with a number of case histories as examples of the process of becoming "Bear Smart." An overview of the process of preparing for, implementing, and monitoring the program is provided in Figure 1. The background report is divided into several sections, with a rationale provided for each step in the process.

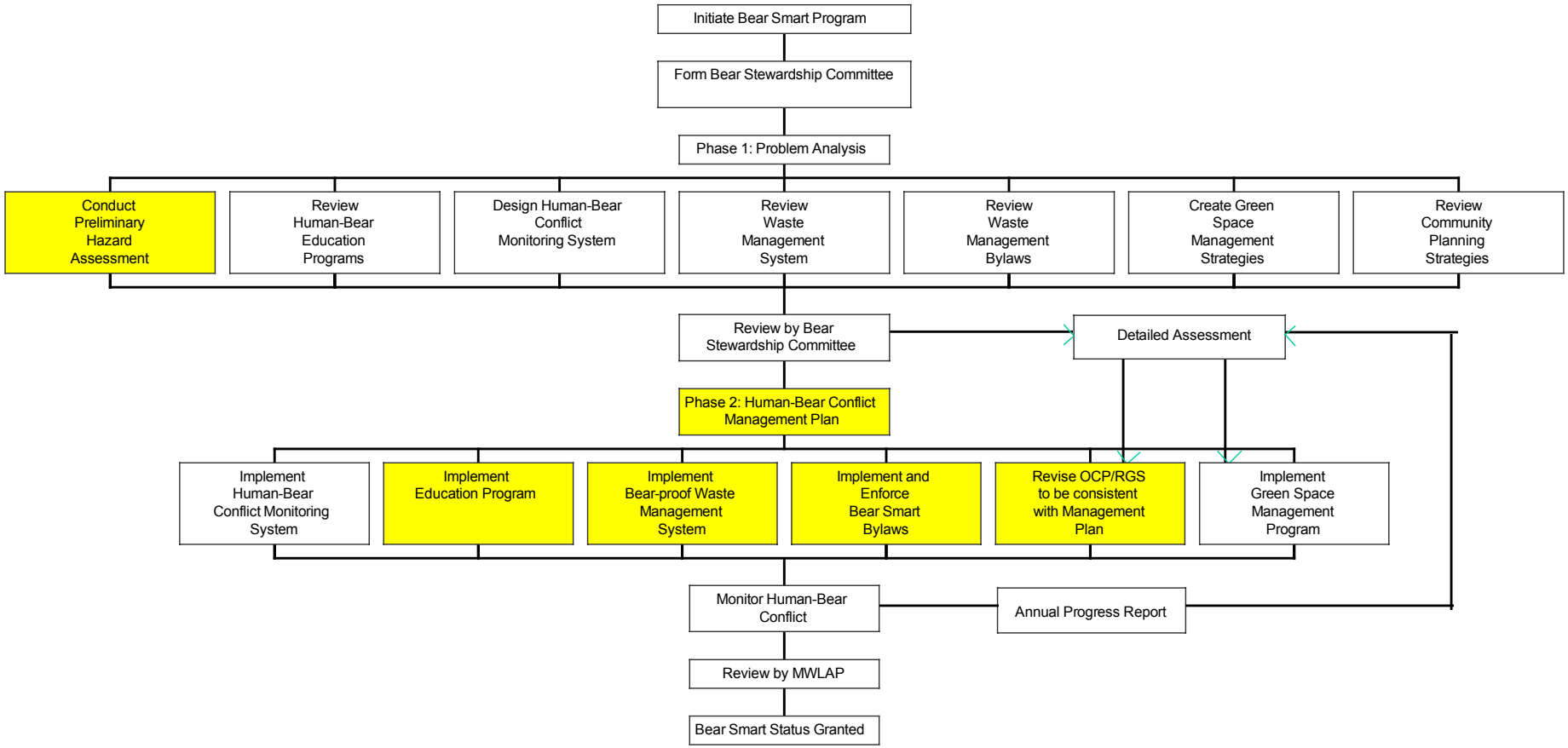

Figure 1. Flow chart of recommended steps in the process of becoming a "Bear Smart" Community. Highlighted boxes are required criteria.

4.1.1 Changing Attitudes

In the early 1900s, the attitudes of the public and management agencies towards bear management throughout North America was generally reactive, in that "problem" bears were simply removed from the system. These attitudes have been well documented in Canadian National Parks (Ralf 1995) and U.S. National Parks (Gniadek and Kendall 1998). During this period of reactive management, injuries inflicted on humans by bears and the subsequent destruction of bears became common and eventually were considered a serious management issue. In more recent years, many parks have managed to reduce human-bear conflicts through proactive management. However, in community settings the process of change towards proactive management has only just begun.

In 1960, the U.S. National Park Service implemented a bear management program that aimed to reduce property damage and injuries to humans and also enable bears that used National Parks to return to their natural behaviours. The following management strategies were identified to achieve these objectives:

- educate the public about bears, bear behaviour, and methods for reducing human-bear conflict,
- control garbage to reduce the dependence of bears on garbage,
- enforce regulations restricting the feeding of bears,
- develop bear-proof garbage cans,
- remove potentially dangerous food-conditioned bears.

In 1968, Glacier National Park in Montana wrote its first bear management plan. Gniadek and Kendall (1998) concluded that this park management plan reduced the amount of property damage done by bears, the number of injuries to humans by black bears, and the number of bears removed from the park system (either through culling or translocation).

Similarly, Denali National Park in Alaska implemented a human-bear conflict management plan in 1982 in response to a dramatic increase in the number of visitors and problems with grizzly and black bears during the 1970s. Denali's human-bear conflict plan focussed on visitor education, food-storage regulations, backcountry closures, and experimental aversive conditioning (Schirokauer and Boyd 1998). Evidence indicates that Denali's program also effectively reduced human-bear conflicts, even as visitation levels rose (Schirokauer and Boyd 1998).

In Yellowstone National Park in Wyoming, injuries to humans from bears also decreased because of increases in public education and removal of food-conditioned bears following the implementation of a bear management plan in 1970. As a result of this plan, bears' access to human foods was almost entirely eliminated by 1979; bears conditioned to human food inflicted the most injuries prior to 1980. Data from elsewhere strongly suggests that food-conditioned bears that had access to human food and garbage were the primary cause of injuries

inflicted by bears on humans in developed areas. In Canada, bear removals in Jasper National Park also declined as a result of garbage becoming inaccessible to bears because of bear-proofing during the 1970s and 1980s (Ralf 1995).

4.1.2 Adaptive Management

Adaptive management is a formal process for continually improving management polices and practices by learning from their outcomes (BC Ministry of Forests). The "Bear Smart" Community Program should be flexible enough to allow for new research and professional expertise to further develop the program. This will enhance the efficacy of proactive management in reducing human-bear conflicts within the community. The development of new, cost-effective methods under the guidance of a biologist experienced in the ecology and behaviour of bears, as well as human-bear conflicts, is strongly encouraged.

5 Initiating the "Bear Smart" Community Program

5.1 Formation of a Bear Stewardship Committee

The most effective way to implement the "Bear Smart" Program is to create a Bear Stewardship Committee. Decisions on the process, delivery, and implementation of the "Bear Smart" Community Program must come from a community that takes ownership of the program. Several communities currently have a committee for addressing human-bear conflict issues (Black Bear Task Team 1998, Maltby 2000, Stroh 1999, Nahornoff 2000). Community ownership implies that the community values the lives of bears. It also suggests that these communities have a desire to reduce preventable destruction of bears and foster an attitude that will ensure the health of bear populations over the long term.

Communities need to decide if and how they will co-exist with bears. Without public and community support for proactive management, human-bear conflicts will continue to increase, and bears will continue to pay the price. Change in public attitudes and commitment can change decades of reactive management into a co-operative effort of which a community can be proud. Several communities provide evidence of this change. With time and measured success from communities at the forefront, other communities are sure to follow.

5.1.1 Objectives of Bear Stewardship Committee

The primary objectives of the Bear Stewardship Committee are to:

- Initiate and support the development of the "Bear Smart" Community Program.
- Review management strategies and options for attaining "Bear Smart" Community status.
- Initiate and review the Problem Analysis.
- Establish a Human-Bear Conflict Management Plan that will implement the recommendations from the Problem Analysis.
- Monitor the progress of the program.
- Provide annual reports that identify the progress of the program, evaluate the success or failure of management strategies, and provide direction for the program for the following year.

5.1.2 Recommended Composition of "Bear Smart" Stewardship Committee

The Bear Stewardship Committee will need a strong leader that is committed and prepared to spend the time necessary to develop and direct the implementation of "Bear Smart" criteria. Ideally this position would be a paid part-time or full-time position for as long as is required to implement the program successfully. In many communities, the person that takes the lead in the "Bear Smart"

Community Program may also coordinate the education program. The rest of the committee should have members that represent:

- the community, including:
    - local governments (regional district and/or city, municipality),
    - First Nations governments,
    - waste management contractor,
    - local RCMP,
    - community stakeholders (e.g., ranchers, orchardists, bee-keepers),
    - university or college representative if wildlife management or other relevant subjects are part of the curriculum,
    - other community interest groups (e.g., naturalist club, rod and gun club), and
    - local tourism representatives (local tourist booths).
- Regional MWLAP, including staff from:
    - Conservation Officer Service
    - Wildlife Sciences and Allocation
    - Environmental Management

The committee also needs a committed public relations person and fund-raiser.

5.1.3 Importance of the Bear Stewardship Committee

The objectives of the "Bear Smart" Community Program will be achieved through the guidance of a Bear Stewardship Committee. This committee should meet on a regular basis to follow the process from program initiation through to completion. The committee should begin the process by establishing a meeting schedule and process that suits the particular needs of the community. When "Bear Smart" status has been achieved, the committee could then downsize to a core group that will be focused primarily on maintaining and monitoring "Bear Smart" status for the community.

6 Phase I: Problem Analysis

The Problem Analysis has the broad goal of identifying the current and potential agents of human-bear conflict that occur within the community. There are several components to the Problem Analysis, each of which will need to be implemented in a step-wise fashion.

6.1 Preliminary Hazard Assessment

The first step of the Problem Analysis is to conduct a Preliminary Hazard Assessment. The basic objective of the Preliminary Hazard Assessment is to establish a general but community-specific overview of human-bear conflict in and adjacent to the community. It will include the identification of community-specific natural or non-natural features or practices that increase the potential for conflict. The hazard assessment will provide the initial direction for the community to become "Bear Smart." The Preliminary Hazard Assessment may also identify areas that will need more Detailed Hazard Assessments (section 7.0).

Hazard assessments of varying levels of detail have been conducted to qualitatively and/or quantitatively identify existing and potential hazards in and around communities (Simpson and Jaward 1997, Diggon 1999, Maltby 2000, Wellwood 2001a). The purpose of these assessments is to identify existing and potential hazards and provide recommendations for reducing human-bear conflicts that may arise from these hazards.

The results and recommendations from the Preliminary Hazard Assessment will be used by the Bear Stewardship Committee to establish community-specific priorities and direction for implementing the "Bear Smart" Community Program. Results are to be presented in the Human-Bear Conflict Management Plan.

6.1.1 Objectives

The specific objectives of the Preliminary Hazard Assessment are to: 1) identify sites, areas, trails, and practices that have historic, existing, and potential human-bear conflict, 2) identify gaps in the existing knowledge of bear use and human-bear conflict in the area and provide recommendations for further investigation and additional hazard assessment phases, and 3) produce management recommendations to reduce existing and potential conflict within the community.

The Preliminary Hazard Assessment is the first step in an in-depth process that will be required to reduce human-bear conflicts. The Preliminary Hazard Assessment should distinguish the major and most readily identifiable issues that influence existing or potential human-bear conflict. Generally, these will be issues that are related to the availability of non-natural foods within the community. However, natural features that influence the existing or potential conflicts should

also be identified where appropriate. The assessment should identify areas in the community where bear proofing is needed (based on existing or potential human-bear conflict) and should be implemented. The Preliminary Hazard Assessment report should be used as a reference tool to set priorities for the implementation of bear-proofing measures within the community.

6.1.2 Recommended Components and Steps

Preliminary hazard assessments will be comprised of several key components and should be approved by a Registered Professional Biologist with expertise in bear ecology and behaviour and human-bear conflicts. The assessment should include the following:

1. A review of patterns of historic human-bear conflicts based on Problem Wildlife Occurrence Reports for bears and/or Conservation Officer experience.
2. Interviews with personnel from the Conservation Officer Service, local wildlife biologists and other biologists that have worked in the area, the Bear Stewardship Steering Committee, and other agencies responsible for the community to identify:
   - sites, areas, and trails that are considered high risk for human-bear conflict, and
   - practices that are considered high risk for human-bear conflict.
3. Identification of non-natural foods and attractants that are available within the community and surrounding area. This process should assess the following issues:
   - residential and commercial garbage containment,
   - garbage transfer and disposal at landfills and transfer stations,
   - park and highway pull-out litter barrels, and
   - orchards, honeybee colonies, and ranching and agricultural attractants.
4. Identification of major non-natural features that may influence the travel patterns of bears, including major roads, edges of the community, and security cover/green space within the community.
5. Identification of general bear habitat suitability within and adjacent to the community, potential natural movement patterns of bears in the area (including travel corridors), and visibility and other sensory issues (see below).
6. Identification of human-use areas that have high risk for conflict with bears, such as schools, playgrounds, community campgrounds, and residential areas located adjacent to bear habitat, and walking/hiking/bike trails that pass through higher-quality bear habitats, including berry patches, etc.
7. Identification of regional, inter-provincial and/or international issues in areas outside the community that may affect the effectiveness of the "Bear Smart" Community Program. For example, non-natural foods that are outside the community but within the home range of a bear that uses the

community can increase the potential for food-conditioned bears within the community. Bears do not adhere to or respect political boundaries (see Canmore Case History section 12.2).

8. Identification of potential data limitations.

An example of a Preliminary Hazard Assessment outline is provided in Appendix D.

6.1.3 Assessment Approaches

Three major factors affect the methodology that should be used for the Preliminary Hazard Assessment. Each of these factors play an important role in determining the strategies that will be implemented and identifying available techniques that may be used to achieve "Bear Smart" status.

Natural and non-natural features influence the potential for human-bear conflict, and these features differ among communities. Therefore, communities will vary in the time and effort required to complete comparable hazard assessments. For example, a community that is adjacent to high-quality bear habitats and is confined by terrain features that concentrate the movements of bears into the community may need to commit considerable effort to identifying and mitigating problems. Communities that have a higher overall rating for potential human-bear conflict may be required to conduct a Detailed Hazard Assessment, whereas other communities that are rated lower may need to do very little in addition to the Preliminary Hazard Assessment.

Hazard assessments are largely based on informed, but subjective, professional opinions of biologists. It is important to identify the limitations of the data that can be collected in a community. The process of completing hazard assessments should remain adaptive until a standardized methodology has been established and the methodology has been tested. This will allow new and more effective methodologies to be implemented as they become available.

Finally, the amount of work required should not discourage communities from beginning to pursue "Bear Smart" Community status. Therefore, the process of conducting a Preliminary Hazard Assessment and additional Detailed Hazard Assessments should proceed by stages so that communities can receive some acknowledgement for their progress even though they are aware that additional work is required.

6.1.4 Potential Data Sources

The process of completing the Preliminary Hazard Assessment should use several sources of data to examine risks to the community. Communities need to identify the habitat's potential for attracting bears with natural food sources as well as

habitat features that affect the likelihood of conflicts, evidence of past bear activity, and sources of non-natural food or attractants within the community. Potential sources of data regarding human-bear conflict include Conservation Officers, RCMP, and provincial or national parks records. Other sources of information include terrain maps, ecosystem maps, vegetation maps, bear-suitability maps, and drainage system maps.

6.1.5 Qualitative Assessments

Qualitative assessments can be conducted through brief investigations of specific hazards and representative habitat types while walking through and/or driving around the community. Time constraints may not allow entire sites, areas, or trails to be assessed. Therefore, effort should be focused on investigating features identified as high risk during interviews or on obtaining information from the number of reports in areas over the years and investigating other potentially high-risk features as they are encountered. Photographs should be taken of sites, areas, trails, and other hazards. Record all sites, areas, and trails on air photos, on 1:50,000 National Topographic System (NTS) map sheets, and/or on a detailed map of the community.

To assess the potential for bear–human conflicts at sites, areas, and trails, investigators need to evaluate habitat potential, travel issues, and visibility and other sensory issues. Record bear sign as it is encountered. Document the availability of security cover and non-natural foods. Describe and/or rate the following conditions during assessments and/or interviews.

Habitat Potential

Understanding the natural habitat potential of an area is important to understanding the likelihood of a bear using an area once non-natural attractants have been eliminated from the community. A community that has abundant high-quality habitats in close proximity to the town is more likely to have bears nearby. High-quality bear habitat adjacent to the community will continue to influence the potential for conflict even after access to non-natural foods has been eliminated. If a detailed inventory of vegetation habitats and a study of bear food habits have been conducted for areas adjacent to the community, this information should be used to evaluate habitat potential at sites, areas, or trails.

Many communities will not have detailed habitat inventories or information on the specific food habits of bears in their area. In these cases, it would be beneficial to begin by referring to the food habits of bears that have been documented by researchers in ecologically similar areas. Understanding the habitat potential of an area will enable a community to relocate or restrict human activity or development from high-quality habitats. Assumptions about habitat potential can be supported by opportunistically recording vegetation descriptions, as well as by

having investigators record their observations of bears when they are consuming natural foods and their observations of the contents of scats.

Travel Issues

Travel issues are geographic features such as creek and river corridors and steep mountains that influence the likelihood of bears travelling through specific sites or along trails. In some communities, travel issues may have a major influence on the potential for a human-bear conflict but less so in another community. For example, travel routes may contribute to the likelihood of human-bear conflicts on the edge of a community that is located in a narrow, steep-sided valley bottom, but not for a community that is located in a wide, gently sloped valley. The location and proximity of wildlife trails and/or potential travel routes should also be documented and included in this category.

Visibility and Other Sensory Issues

Sensory issues are environmental features that reduce the ability of bears and humans to detect each other. Visibility issues occur because of features such as vegetation and topography that limit visibility and thus increase the potential for surprise encounters. Other sensory issues result from the noise made by creeks or from persistent, strong valley winds that affect the ability of bears and humans to hear each other.

Bear Sign

Bear sign such as trails, mark trees, beds, and scats should be opportunistically recorded when encountered.

Security Cover Issues

Security cover issues arise when vegetation provides cover for bears, thus lowering the likelihood of detection by humans. Investigators will need to identify high hazard areas for security cover.

Non-natural Food Issues

Document sources of non-natural food and practices that enabled bears to access non-natural food. These include, but are not limited to, landfills, residential and commercial garbage, fruit trees, composts, and apiaries. The assessment should provide an overview of the types and spatial distribution of major non-natural food issues that is detailed enough for the Bear Stewardship Committee to establish preliminary direction in tackling non-natural food issues as well as direction for ongoing data collection to identify additional non-natural food issues.

Identify Hazards for Human-Bear Conflict

Following ground investigations, an overall rating of the potential for bear–human conflict should be estimated based on habitat potential, travel issues, visibility and other sensory issues, security cover issues, and non-natural food issues. Generally at this stage, ratings will be based on overall potential for conflict. However, any preliminary information that can be gathered and discussed on the seasonal habitat potential and the seasonal potential for conflict will be valuable to the program. Sites, areas, and trails that are assessed as higher risk should be identified and management recommendations provided. Locations that do not appear to be higher risk should not be given a rating until more detailed investigations can be conducted because preliminary investigations may have missed potential hazards.

Provide Recommendations for Reducing the Potential for Conflict

Recommendations for reducing the potential for human-bear conflict within the community should be identified for the Bear Stewardship Committee. This section should include general management recommendations that are specific to the community, but that also go beyond site-specific hazards:

- Observations and recommendations with respect to ensuring that bears do not have access to non-natural foods, including background on observed handling of residential, commercial and industrial garbage, garbage transfer, and landfill disposal. The assessment should identify any observed weak links in the waste management system and provide recommendations for addressing these problems.
- Recommendations for brushing specific sites, areas, or trails where potential for conflict was observed.
- Recommendations for establishing a Human-Bear Conflict Monitoring System.
- Recommendations for interagency exchange of bear incident reports
- Recommendations for improving the management of "problem" bears and "problem" people.
- Identify gaps in knowledge and provide general recommendations for subsequent phases of a Detailed Hazard Assessment.
- Identify other issues that were observed but not addressed in the results and discussion.

6.2 Education Program

The Phase I: Problem Analysis should identify what, if any, education programs exist within the community and whether multiple agencies are delivering such programs (e.g., MWLAP, BCCF, BC Parks, commercial businesses). The Problem Analysis should then be followed up with a coordinated and thorough education program implemented under the Human-Bear Management Plan.

Several communities are already taking action to reduce the number of bears that are destroyed by delivering a Bear Aware Education Program. In 1995, Whistler began a bear-awareness education program. The BC Conservation Foundation (BCCF), a non-profit society and registered charity, has delivered similar Bear Aware programs in many communities in British Columbia, including Castlegar, Kamloops, Nelson, Rossland, Revelstoke, Trail, and the Alberni Clayoquot Regional District (Bennett 1996, Stroh 1999, Haas 2000, Paquet 2000, Maltby 2000, Robinson 1997, 1998, 2000; Quarterman 2000). Interest groups in other communities such as Prince George (Narhornoff 2000), Kitimat and Terrace (Wellwood 2001b), and Kimberly have also delivered the education program with partial or joint support from BCCF.

6.3 Bear-Proof Waste Management System

To achieve "Bear Smart" status, a community must develop and maintain an entirely bear-proof municipal solid waste management system, from generation to disposal. Bear-proofing the waste disposal within a community and implementing an education program are the first steps in bear-proofing a community. It is absolutely critical that these steps be taken *before* landfill closure. While the initial capital costs of implementing a waste management system that is bear-proof may seem large, in the longer term it is often more cost-effective to have a bear-proof collection system (Philipp 2000) and landfill (R. Trouttmann, Central Kootenay Regional District, personal communication).

There are also additional benefits to bear-proofing waste management within a community. Bear-proof waste management systems often reduce human-bear conflicts, but garbage is also no longer available to other animals. For example, Norman Wells, NWT, has been bear-proof since 1991, and because of the bear-proof dumpsters, birds or dogs no longer scatter garbage. As a result, the community is cleaner as a whole (A. Veitch, Wildlife Management Supervisor, Government of the NWT, personal communication).

The handling of residential waste needs to be bear-proof from "cradle to grave" to ensure the success of the system as a whole. The responsibility for each of these steps falls on several different parties. The first step is for residents to ensure that garbage is stored in a bear-proof manner at each residence. Garbage cans must be kept in a bear-proof location at all times except during the day of pick-up or transfer to a disposal container/site. This can be achieved by keeping garbage inside, in the basement or in a bear-proof out-building. The second step in this process is bear-proofing the transfer of garbage to the municipally operated system. If curb-side garbage collection is retained, garbage should not be placed on the streets before a specified hour on the morning of pick-up. After transfer to the municipal system, the responsibility for bear-proofing shifts to the

municipality. The transfer of garbage, temporary storage, transfer stations, and end disposal must all be bear-proof.

There must be high rates of compliance with the following waste management recommendations in order to produce any appreciable reduction in human-bear conflicts within a community. In most instances, bylaws must be in place and enforced to ensure compliance.

6.3.1 Recommended Actions

- Ensure that all municipally owned and operated components of putrescent waste management system collection, transfer, disposal, recycling, and composting are bear-proof in areas that are accessible to or are frequented by bears.
- Implement bylaws to ensure that the same is true of all private sector components of putrescent MSW collection, transfer, disposal, recycling, and composting.
- Implement a compliance strategy for the municipal solid waste management bylaws.

6.3.2 Recommended Techniques

The Bear Stewardship Committee will have to examine the extent of the problems with the community's current waste disposal system (in Phase I: Problem Analysis) and judge which are the best options for bear-proofing the disposal system. Differences in community layout and environment can greatly affect the feasibility of each of the different options for dealing with residential and commercial garbage.

Here are some examples of "how to" approaches for bear-proofing MSW systems.

Handling Residential Garbage

There are several basic options for acceptable residential waste management systems in a "Bear Smart" community:

1. RESIDENTIAL DUMPSTERS (see Canmore Case History, section 12.2). In this option, bear-proof dumpsters are located throughout residential areas (one per 20-35 homes). Residents take their household garbage to their nearest bear-proof container. To reduce odours, containers are emptied regularly and taken to a bear-proof landfill. There are significant savings in using this system over curb-side pick-up, even after factoring in the capital costs of purchasing and implementing new containers (Philipp 2000). Replacing curb-side collection with dumpsters that are emptied with a self-loading truck (a one-operator system) is the main cost saving in switching to a bear-proof container system (Philipp 2000; A. Veitch, Wildlife Management

Supervisor, Government of the NWT, personal communication). This system takes away the potential problem of residents storing garbage on their property.

2. LARGE COMMUNITY DUMPSTERS (see Whistler Case History section 12.1). With this system, the entire community uses several large bear-proof compactors. The compactors are emptied regularly, and the contents are taken to a bear-proof landfill. Similar, but not as effective, is the use of transfer stations. There are often problems with lids being left open at transfer stations. In this instance, there has to be a plan in place to ensure that bins are not allowed to overflow and that the lids are kept closed. Education on the proper use of transfer stations is essential: "This container is only bear-proof if the lid is closed" stickers seem to work well. It may be necessary to put an electric fence around transfer stations.
3. CURBSIDE COLLECTION. If curb-side collection is to continue in a "Bear Smart" community, garbage cans must be kept in a bear-proof location at all times except on the day of pick-up. Garbage cans may not be placed on the streets before a specified hour on the morning of pick-up. Both of these requirements will likely need to be reinforced with bylaws and their enforcement. This option may work in areas with relatively few human-bear conflicts, but it is not likely to work in areas with chronic problems.
4. DISPOSAL DIRECTLY AT THE LANDFILL. Disposal directly at an electrified landfill is an option for smaller communities. Problems that can occur with this method include leaving the electrified gates open, which can be remedied by having a staffed landfill. Additionally, people occasionally dump garbage at the gates of the landfill when it is closed. This problem may be reduced by having a bear-proof dumpster at the gates to the landfill, although this solution has many problems of its own. "Bear Smart" status will not be granted to communities with a landfill that is continuously open to the public unless it is staffed continuously as well.

Selecting a Residential Garbage Handling Option - Considerations

Although single-family dwellings may not have difficulty storing garbage away from bears, smaller dwellings such as mobile homes and condominiums often have space constraints that restrict the ability to store garbage effectively. The odour from stored garbage may also be offensive to many homeowners. Solutions to this problem include freezing odourous refuse until garbage pick-up day or the use of communal bear-proof garbage dumpsters in locations with these problems (e.g., mobile home parks, condominium complexes, apartment buildings).

Communities that experience heavy snowfalls may have greater difficulty with some waste management systems. The placement of bear-proof containers needs to consider access during the winter months, as well as their effect on snow removal activities. Additionally, any waste that is left on the streets may be plowed into snow banks in winter months and end up being revealed in the

spring. Adequate spring clean-up should be addressed in communities that have experienced these problems.

It is also important that maintenance of waste receptacles occurs on a regular basis and that all waste that may have fallen out is collected. This will reduce odours and the risk of bears investigating and possibly damaging garbage containers and dumpsters.

Handling Commercial Garbage

Several aspects of commercial garbage storage and collection need to be considered and addressed in a "Bear Smart" community.

- Bear-proof garbage containers need to be implemented at:
    - downtown streets that bears may be attracted to,
    - all municipal park facilities (campsites, ball parks, soccer fields, etc.), and
    - school grounds.

  These may be phased in, starting with high-risk areas identified in the Preliminary Hazard Assessment and followed by lower risk areas.
- Commercial/industrial collection routes should use bear-proof dumpsters. Dumpsters should be emptied often enough to prevent waste from overflowing or waste being placed next to dumpsters. If dumpsters are not bear-proof, then dumpsters must be housed within a bear-proof building (i.e., on a concrete slab and with four solid walls and a roof). A phase-in process for existing businesses is appropriate, but all new business should be required to be bear-proof upon opening.
- Any attractants, especially grease barrels, must be housed in a bear-proof building.
- Construction sites must have either 1) a bear-proof garbage receptacle for items that may be attractive to wildlife, 2) a receptacle that is kept within a bear-proof building outside of working hours, or 3) removal of food wastes to a bear-proof location at the end of every working day.

Disposal of End Waste (Landfills)

Once garbage has been collected from commercial and residential locations, the disposal of this end waste may be completed in the following bear-proof ways.

1. Residential and commercial garbage may be taken to a bear-proof transfer station that ships the refuse to a bear-proof disposal facility.
2. Complete-combustion incineration may be a possibility for smaller communities or remote camps. The incinerator must be appropriately sized for the amount of waste produced by the community.
3. Disposal in a landfill located inside a properly designed, constructed, and operated electric fence (see Appendix B). Aggressive maintenance must be undertaken to ensure that the fence is operating at full capacity and is not

breachable. Note that the community needs to be bear-proof before the landfill is fenced. Bear-proofing of landfills should *not* be done in years with shortages of natural bear foods. This will substantially exacerbate human-bear conflicts. Bear-proofing dates may have to be modified to help reduce potential human-bear conflicts.

In addition, a bear-proof landfill must be covered with fill or heavy duty tarps after every day that it receives refuse to reduce odours, insect and rodent problems, and the amount of refuse scattered by wind and birds. Tarps may be used once a landfill is bear-proof, otherwise bears will rip them, but once in use, tarps can significantly reduce the costs of buying, trucking, and covering landfills with fill. Use of tarps also significantly extends the life of a landfill by decreasing the amount of non-refuse fill (R. Troutmann, Central Kootenay Regional District, personal communication). There are also sprayable biodegradable foams that serve the same purpose.

6.4 Bylaws

Bylaws to ensure compliance with the goals of the "Bear Smart" program may need to be implemented. "Bear Smart" bylaws should be implemented to prohibit the supply of food to bears as a result of intent, neglect, or irresponsible management of attractants. A compliance strategy needs to be created to ensure compliance with these bylaws.

Recent changes to the *Wildlife Act* can help supplement bylaws and thereby reduce the likelihood of human-bear conflicts and provide public safety. Under the new amendments to the *Wildlife Act*, it is an offence for people in British Columbia to feed dangerous wildlife (i.e., bears, cougars, coyotes, and wolves) or to disobey orders to remove and clean up food, food waste, or other substances that can attract dangerous wildlife to their premises. Conservation Officers may issue a written dangerous wildlife protection order, which requires "the removal or containment of compost, food, food waste or domestic garbage." If people fail to comply with the order, they could face a heavy court-ordered penalty of up to $50,000 and/or six months in jail. However, this new legislation is only applicable to residences, not farms or apiaries, commercial establishments, or landfills, all of which are strong attractants for bears.

The Phase I: Problem Analysis should identify whether any bylaws currently exist for the community and determine whether any will be necessary given the bear-proof waste management system that is selected and the problems that were identified in the Preliminary Hazard Assessment.

6.5 Green Space Management

Green space within and adjacent to a community can provide security cover for bears to access non-natural foods within and adjacent to the community. Green space can also provide natural feeding habitats and travel corridors for bears and other wildlife to by-pass the community. Green space includes vacant properties that are over-grown with vegetation, parks and alleyways, trail networks, and undeveloped areas adjacent to the community. Other species using green spaces should be documented and the potential impacts on these species assessed if brushing occurs. Mitigation measures to reduce the impacts to other species should be taken. In some cases there will be a trade off between the benefits of clearing or modifying green space in terms of increasing human safety versus the cost of eliminating natural bear or other wildlife habitats. The risk of human-bear conflict relative to the cost to other species and the priorities of the community should be evaluated when establishing plans to remove vegetation.

6.5.1 Green Space Objectives

In some communities, bears may use vegetation cover within and adjacent to the community for security cover while feeding on garbage and other non-natural attractants. As long as bears have access to non-natural foods, removing brush that provides security cover for bears may reduce the likelihood that some bears will travel through the community. However, eliminating access to non-natural foods in the community will likely have a greater influence on decreasing the probability that bears will use the inner areas of the community. If non-natural foods are no longer available to bears, brushing can then be focused on achieving the following objectives:

- reduce the habitat potential in natural feeding areas that are commonly used by humans by removing natural bear foods, and
- increase visibility where people are most likely to surprise bears, such as along trails, and in areas with user groups that may be at higher risk such as schools, playgrounds, and campgrounds, particularly those in areas that are on the outer edges of the community.

6.5.2 Recommended Actions

1. Formally identify and map problem areas that will require continual removal of brush, such as parks, schools, playgrounds, and campgrounds as well as alleys that bears are using for cover.
2. Direct the removal or modification of green space by brushing vegetation to reduce security cover and habitat potential in areas of high human use (e.g., removing brush around portions of parks, schools, playgrounds, golf courses, and campsites and in areas adjacent to residences in high-risk attraction areas).
3. Develop a community landscaping plan that avoids the use of fruit trees and other plants the may act as attractants to bears. Adjustments to the

landscape plan may include removing existing fruit trees that have been identified as sources of human-bear conflict.

6.5.3 Recommended Techniques

1. Consult recommendations provided in the Preliminary Hazard Assessment for removing or modifying brush to increase visibility or reduce habitat potential and security cover at specific sites, areas, or trails.
2. Regularly review the human-bear conflict monitoring system to assess whether brushing or modifying green space may alleviate some of the human-bear conflict in specific problem areas.
3. Consult with Conservation Officers annually to determine whether additional sites, areas, or trails should be added to the list of locations identified for brushing.
4. Consult with the appropriate agencies to ensure that clearing is permitted. For example, the Department of Fisheries and Oceans restricts the clearing of vegetation within varying distances of fish-bearing streams.
5. Consult with the public and other agencies to evaluate the cost of brush removal to other species and the aesthetic qualities of the community versus the potential for reducing human-bear conflict. Consult with a biologist with experience in bear ecology and behaviour and human-bear conflicts to determine an effective strategy for removing vegetation (i.e., how, where, and what to remove) to reduce potential human-bear conflict while protecting habitat for other species where appropriate/possible. This may also require consulting an additional biologist with broader wildlife expertise, particularly regarding Red-listed (endangered or threatened) and Blue-listed (vulnerable) species. Conservation Officers should also be consulted to determine areas that are high priority for brushing.
6. Formally inventory all of the brush removal as it is conducted. Ideally the documentation would be in a digital format as a layer in the Human-Bear Conflicts Monitoring System Database (see section 9.0). However, in the short term, it may be feasible for small communities to document the information on a plasticized paper map. Complete a new map for brushing conducted each year. This information will be useful for documenting annual progress and will assist new employees or council members with directing the continuation of brushing.
7. Ensure that green space is inspected annually in order to schedule removal efforts. Note that some vegetation that grows quickly will likely have to be removed each year to be effective. Removing bear foods before the major season of use is strongly recommended. In addition, removing vegetation, particularly tall shrubs and trees, opens up the canopy and will increase berry production for many berry-producing plant species. If brushing is

started, there must be a commitment to removing all the brush and to continuing to remove it in subsequent years as necessary.

8. Consult with Conservation Officers annually to determine whether additional areas require brushing and to assess the general effectiveness of brushing.

6.6 Community Planning Documents

It may be appropriate in some communities to have a higher-level plan, such as an Official Community Plan (OCP) and/or Regional Growth Strategy (RGS) that is consistent with the Human-Bear Conflict Management Plan. As a minimum, the Regional Solid Waste Management Plan should be modified to be compatible. The Province of British Columbia addresses land use planning, mostly of Crown Lands, through Land and Resource Management Plans (LRMP) while municipalities and regional districts prepare Official Community Plans and Regional Growth Strategies, which focus mainly on private land.

> A Regional Growth Strategy is a strategic plan that enables regional districts and municipalities to plan for economically and environmentally healthy human settlements, and for efficient use of public facilities, services, land and other resources. The RGS is initiated and adopted by a regional district and referred to all affected local governments for acceptance. An Official Community Plan establishes policies and objectives for the form and character of land use and servicing and is implemented by zoning, subdivision, and servicing by-laws. The effectiveness of land use planning and management improves if local and provincial plans are compatible ("Links" brochure, BC Ministry of Municipal Affairs).

Whether it is necessary to change these plans to reflect the Management Plan depends on the community. Changes to the OCP and RGS would be useful in terms of long-term planning and ensuring that the goals of the Management Plan are carried out indefinitely, regardless of changes in local government.

As part of Phase I: Problem Analysis, the Bear Stewardship Committee should identify the schedule for updating the OCP or RGS to determine how quickly their input may be needed on such changes. The primary objective of this process is to ensure that the community planning process recognizes that some community developments may increase the potential for human-bear conflict and/or the displacement of bears from important habitats (e.g., feeding habitats and travel corridors). Thus, the community planning process needs to address the effect of the presence and locations of new facilities on the rate of human-bear conflict. For example, new landfills, campgrounds, or schools should be situated in areas of low-quality bear habitat and away from travel corridors. It is up to the

Bear Stewardship Committee to decide if changing these plans is appropriate, and possible, for their community.

7 Detailed Human-Bear Conflict Hazard Assessments

Detailed Hazard Assessments may be conducted to focus more specifically on identifying, assessing, and mitigating the potential for conflict as a result of natural issues (e.g., high-quality bear habitats with high human presence). Detailed Hazard Assessments may also be conducted to reduce the potential for displacement of bears from important habitats (e.g., well-used travel corridors, feeding areas). Detailed Hazard Assessments may be conducted at sites that received a Preliminary Hazard Assessment to provide more detailed information and further investigate the potential for additional mitigation measures. They may also be conducted at locations that are recommended for Detailed Hazard Assessments by the Bear Stewardship Committee or the Regional MWLAP office but were not specifically identified for further assessment during the Preliminary Hazard Assessment.

Detailed Hazard Assessments have been conducted in numerous provincial and national parks (Herrero et al. 1986, McCrory and Mallam 1990, MacDougall et al. 1999, Wellwood and MacHutchon 1999). These assessments include detailed quantitative and/or qualitative assessments of natural features that influence the potential for human-bear conflicts, as well as assessments of other issues such as bears' access to non-natural foods.

To date, no communities in British Columbia have conducted a hazard assessment of specific hazards within and immediately adjacent to the community such as those completed in some provincial and national parks. In general, the primary objectives of many national and provincial parks are to reduce impacts to bears and increase the safety of humans by reducing the potential for human-bear conflicts (McCrory and Mallam 1990, Katmai National Park and Preserve 1990, Environment Canada 1992, BC Parks 1995). Communities will also have to decide what their primary objectives are with respect to stewardship of bear populations and their habitat and human-bear conflict and how to achieve a balance between these objectives.

In some areas where use by humans is concentrated, it may be beneficial or necessary to initiate research to determine the cumulative effects of human activity, including road access, urban development, logging, and mining, on the ecology and viability of bears in and adjacent to the community.

The Detailed Hazard Assessment should expand upon the information gathered in the Preliminary Hazard Assessment. Detailed Hazard Assessments should be conducted in the growing season so that bear food plant quantity and quality can be rated. The assessment should include hazard ratings (i.e., low, moderate, and high) and maps of known and potential bear hazards.

The methods that are used for additional hazard assessments will depend on the information available from bear studies in the area or other ecologically similar areas and the priorities of the community with respect to reducing human-bear conflict. If detailed information on the food habits, habitat use, and movements of bears using the area is not available, investigators may need to conduct studies in addition to the Detailed Hazard Assessments. These studies should focus on the following objectives.

1. Identify preferred wildlife movement corridors around the community and recommend restoration of natural corridors that may have been interrupted by human activity/development (this may require moving existing facilities to other, less intrusive areas).
2. Conduct a study to determine the seasonal food habits of bears near the community. Use detailed information about food habits and plant phenology to identify seasonal use and better understand the bears' spatial and temporal movements.
3. Identify the vegetation cover of the area in and adjacent to the community, using research conducted in the area or other areas that are as ecologically similar as possible. Ideally the area covered would incorporate the home ranges of most bears using the area.
4. Identify and rate seasonally important bear habitats. As a minimum, green spaces within and immediately adjacent to the community should be classified, rated, and mapped for bear habitat quality, including identification of well-used travel corridors and other areas of concentrated use.
5. Conduct more detailed investigations to identify, verify, and assess the potential movements of bears, including major travel corridors.
6. Where applicable, document and monitor the timing and abundance of salmon runs. For example, a bear activity monitoring system that is conducted by fisheries personnel may assist in anticipating activity by bears related to salmon spawning.
7. Identify denning areas.

7.1 Detailed Hazard Assessment Techniques

Additional sites, areas, and practices that result in human-bear conflicts should be identified so that issues at these locations can be addressed. If necessary, these issues may need to be further assessed in subsequent phases of the hazard assessment. The Preliminary Hazard Assessment, data collected by the Bear–Human Conflict Monitoring System, and annual interviews with Conservation Officers will be beneficial for identifying other hazard locations that may require a Detailed Hazard Assessment.

Methodology should be approved by a Registered Professional Biologist with expertise in the assessment of bear habitat. Specific methodology will depend on the information and time available, specific characteristics of the community, and the priority the community, region and/or province has assigned to obtaining more detailed information regarding human-bear conflicts.

8 Phase II: Human-Bear Conflict Management Plan

Proponents will need to prepare a Human-Bear Conflict Management Plan that is designed to address the human-bear conflict issues identified in the Phase I: Problem Analysis.

The goals of the Human-Bear Conflict Management Plan are to:

- provide a general summary of the human-bear conflict issues in the community based on the Phase I: Problem Analysis,
- identify the community's level of commitment to the program,
- identify the level of tolerance of the community towards maintaining or restoring natural bear habitats (e.g., travel corridors and feeding areas) adjacent to the community,
- clearly establish goalposts for the success of the program,
- identify the agencies, groups, or individuals responsible for addressing problems,
- determine what is necessary to address each problem successfully,
- set priorities for specific actions to be taken,
- develop a timetable for addressing each problem, and
- conduct a cost estimate of proposed management actions and provide a budget break-down for each of the criteria in the program.

Preparation for the management plan should include a brainstorming stage for generating ideas and concepts for developing the plan. The contents of the management plan should be developed using a consensus-based approach for identifying and assessing preferred solutions.

8.1 Education Program

8.1.1 Objectives

A mission statement that succinctly summarizes the message of the program can be a powerful tool for delivering the program.

Example Mission Statement

"To help people reduce human-bear conflict through education, innovation and cooperation (BCCF draft)*."*

The primary objectives of the education program are to:

1. develop a greater understanding of bear ecology and behaviour,

2. facilitate support from local residents for bear-proofing the community. This can include identifying methods and options for eliminating bears' access to non-natural foods and attractants.
3. develop guidelines for human activities in bear habitat to reduce the likelihood of human-bear conflict,
4. recommend actions to take during a bear encounter, and
5. encourage tolerance towards the presence and natural behaviours of bears in reasonable numbers in or near the community.

8.1.2 Recommended Actions

Program Structure

The education program should be implemented in three stages: 1) a program development stage, 2) a program delivery stage, and 3) annual progress reports.

Program Development

Ideally, the development of the Bear Aware Education Program will be completed between January and April of the year it is to be delivered. The goals of the development stage are to:

- secure financial, logistical, and volunteer support for the delivery of the education program,
- establish a Bear Stewardship Committee, and
- establish working relationships with local media to help raise the profile of the program.

Program Delivery

Delivery of the program should be initiated at least two weeks prior to the anticipated arrival of bears in and around the community. The program should continue to be delivered until bears have left the area for the season. The goals of the delivery phase are to:

- help individuals/communities reduce the frequency of human-bear conflict within and around their communities,
- eliminate the bears' access to sources of non-natural foods by providing support, solutions, and encouragement for individual/community bear-proofing, and
- increase individual/community awareness and understanding of bears and human-bear conflict.

Annual Progress Report

A program progress report should be completed at the end of each year. The goals of the progress report are to:

- document the success or failure of various components of the program,

- provide a program history for new coordinators and other parties that enter the program at later stages of the process, and
- facilitate the sharing of information among communities on the success or failure of the various methodologies used to deliver the program so that other communities can learn from and utilize the experience of others.

See Appendix D for an example of an outline for progress reports.

8.1.3 Recommended Techniques

Program Development

Proponents will need to hire a Bear Education Program coordinator for each community. In the past, considerable controversy has been created over bears and human-bear conflict. Therefore, the coordinator must be capable of promoting and conveying program information that is based on defendable scientific research and expert opinion. It is imperative that the coordinator does not have a personal bias or agenda that undermines the goals of the program. The coordinator must have strong interpersonal skills: this is considered critical to the success of the program. To minimize misinformation, the program should be developed with the support of experts (e.g., bear biologists, Conservation Officers). Expertise may be provided to community coordinators by a regional coordinator with expertise in bear ecology and behaviour and human-bear conflicts. Ideally, community coordinators should live in the community and be respected members of the community.

Suggested Skills for Program Coordinators

The community coordinator and regional coordinator should have strong interpersonal skills, including:

- oral communications skills for conducting presentations to groups of various sizes, age groups, backgrounds, and interests,
- conflict resolution skills, including the ability to motivate individuals to modify their behaviours to reduce human-bear conflict. The Stewardship Continuum, as identified by the Nature Conservancy and adapted by BCCF, identifies three stages that the public and individuals go through as the "Bear Aware" program is delivered: an initial stage of denial/ignorance that the problem exists, a gradual transition to admission, and finally motivation to change (BCCF draft).
- ability to communicate well with individuals of various ages and interest groups,
- ability and willingness to learn from and openly share with other community coordinators, and
- considerable patience, needed to accept progress through the stages identified in the Stewardship Continuum.

At least one person involved in the program should have the following professional skills:

- experience related to bear ecology and behaviour,
- an understanding of the process of habituation and food-conditioning,
- an understanding of human-bear conflict,
- air photo and map interpretation (beneficial to ongoing data collection using the Human-Bear Conflict Monitoring System),
- vegetation and habitat classification (beneficial to ongoing data collection using the Human-Bear Conflict Monitoring System),
- data collection, summary, and analysis skills, and
- report-writing ability.

The coordinator will be responsible for:

1. becoming familiar with education programs being conducted in other communities.
2. writing a work plan and time schedule for completion of the delivery phase of the program.
3. developing an education program prospectus for delivery to potential volunteers, funding groups, and local media. The goal of the prospectus is to introduce the program and delivery team in a professional manner that will maximize the potential for attracting contributors. BCCF has developed a brochure and slide show prospectus for introducing their education program (Wellwood 2001b). The prospectus could include the following:
    - a mission statement for the program,
    - an introduction to the program,
    - program development goals,
    - program delivery goals,
    - education program deliverables and expected benefits of the program,
    - description of the individual/community/agency support that the education program is asking for, and
    - brief introduction to the project coordinator(s) and the skills that they will bring to the program.
4. encouraging, supporting, and participating in the Bear Stewardship Committee.
5. reviewing and selecting existing bear information and education resource materials for relevance and usefulness to the community.
6. developing and producing bear information and education resource materials specific to the community. Schirokauer and Boyd (1998) suggest "it is important to provide multiple sources and formats of information" to reach the audience.
7. working with the media to profile the education program.

8. developing a delivery plan for disseminating the education program throughout the community, including schools, residents, businesses, industrial and resource companies, tourists, and agencies.
9. developing a delivery plan for providing neighbourhoods and businesses with support and strategies for "bear-proofing" their communities.
10. preparing contact and event lists, including the following:
    - individuals, agencies, and stakeholders that might be willing to supply financial, logistical, or volunteer support for program delivery,
    - committee members who might be willing to become involved in a Bear Stewardship Steering Committee, and
    - public events and community groups that might be willing to host the Education Program.
11. initiating the following:
    - a campaign to establish financial, logistical, and volunteer support for program delivery,
    - formation of a Bear Stewardship Steering Committee for the community.
    - meetings with local media to establish a plan for conveying the education program messages,
    - development of a plan (including a budget and timetable) for the delivery of the program.

Many of the following components of the education program have been successfully delivered to British Columbia communities and are available for adaptation for other community education programs (Bennett 1996, Black Bear Task Team 1998, Stroh 1999, Haas 2000, Paquet 2000, Maltby 2000, Robinson 1997, 1998, 2000; Narhornoff 2000, Quarterman 2000). The delivery plan should include the following:

- a door-to-door education campaign such as the "We are bear aware" window sticker campaign conducted by BCCF,
- education efforts targeted to reducing human-bear conflicts that result from site-, area-, or practice-specific activities. For example, moving a summer concert away from areas where bears are known to be attracted to a natural food source (e.g., berries or salmon). Local conservation officers and others knowledgeable in bear use of the area should be consulted when developing timetables of seasonally affected human activities so that potential problems can be anticipated and efforts can be focused on specific sites, areas, or practices,
- events and groups that will receive the education program through slide presentations or public displays,
- fruit tree management campaign,
- school education program presentations,
- surveys to determine the success of the education program, and
- delivery of the final annual report.

Depending on the priorities of the community, the timetable will document the timing of some or all of the following:

- program start and anticipated end date,
- staff and volunteer training dates,
- bear stewardship steering committee meetings,
- visits to private campground operators and local businesses,
- presentations to industrial and resource companies,
- presentations to tourist information and food-related businesses,
- presentations to community groups,
- contests such as BCCF's colouring contest for children,
- compost workshops, and
- schedule for media updates.

Program Delivery

Delivery of the program should be initiated at least two weeks before the end of the hibernation period, regardless of when bear problems are evident in the community. Begin with newspaper ads stating that "Spring is in the air and it will soon be time for bears to wake up. This means you need to put your garbage away." The message should provide a general overview of major human-bear conflict issues. In association with general messages, special messages should target specific human-bear conflict-related activities that are season specific. For example, concentrate on information about dealing with fruit in fruit-bearing season or salmon in the spawning season. The program will be ongoing throughout all active seasons for bears and should continue to be delivered until bears have denned for the winter. The start and end dates for the program can be identified by consulting the Conservation Officer Problem Wildlife Occurrence Reports for bears. These dates should be modified, if necessary, in subsequent years based on data from Conservation Officers and education program experience.

The delivery stage should focus on the following:

- working with the Bear Stewardship Committee to identify options for eliminating sources of non-natural foods to bears.
- educating the public about options for eliminating sources of non-natural foods for bears (section 8.3). This can include educating residents about the management of garbage, fruit trees, compost, and other attractants (e.g., bird seed, pet food, and barbecues). Options should be reasonable with respect to cost and ease of implementation. If reasonable options are not available, the steering committee is strongly encouraged to work with the BC Union of Municipalities and local, regional, and provincial governments to find solutions for problematic bear-proofing issues.
- assisting Conservation Officers in educating residents as problem sites, areas, or practices arise.

- increasing awareness of the program's activities in local and regional governments so that they can help support the delivery of the program.
- working with the media on a regular basis to convey the messages of the program.
- increasing public understanding and tolerance of bears in general. This can best be achieved by illustrating to people the actions that they can take to reduce human-bear conflicts. This does not mean tolerating specific bears that are considered a threat to human safety.
- continuing to collect data for the Problem Analysis. This can include mapping attractants such as fruit trees, agricultural attractants (i.e., beehives, livestock, and crops), and non-bear-proof commercial and residential dumpsters.
- considering establishing a method for communicating current bear activity to residents and visitors. For example, Whistler has proposed a "Bear Activity" rating sign (like a fire index sign), with high/medium/low bear activity (S. Dolson, JJWBF, personal communication).

Recommended Educational Messages

The program messages are an important component of the education strategy. The education program should deliver to residents the strategies that have been developed to eliminate specific non-natural food and attractant problems. Within acceptable limits, the program should also foster awareness, understanding, appreciation, respect, and tolerance for bears. Specific messages that should be delivered in the program include a history of human-bear conflict and solutions to eliminate sources of conflict.

History of Human-Bear Conflict

When displayed visually, the history of human-bear conflict within and around the community will be effective for illustrating to residents where troublesome areas have been in the past. Educators may wish to use a map of documented Problem Wildlife Occurrence Reports for bears for several years to provide a powerful message for the public. The map can be produced as part of the Human-Bear Monitoring Program (section 9.0).

Delivery of Program Messages

To maximize the effectiveness of the education program, messages should be delivered using multiple methods (Schirokauer and Boyd 1998). In-person delivery of the program by a person knowledgeable in human-bear conflict, is considered an highly effective method of communication (M. Madel, Montana Department of Fish, Wildlife and Parks, personal communication; H. Davis personal observation; D. Wellwood, personal observation).

While in-person (e.g., door-to-door, event displays, public presentations) delivery of the education component of the program is critical to the success of the program, educational materials are also an important method for delivering the program. "If urban homeowners are educated by use of a bear brochure on why urban bear problems occur, and how to prevent them, a substantial number will change their behavior" (A. L. LeCount, bear biologist Hocking College, personal communication). They can serve as a reminder and as reference material for review at a later date. The following is a list of materials that have been produced and typical distribution locations.

Signs

A variety of permanent signs can be developed to provide general, community-specific, residential, and tourist information and to identify seasonally high-use areas. Temporary signs can also be used to identify hot spots for bear activity. Signs can be posted at rest stops, bus stops, and/or tourist information booths.

Brochures

Different brochures can be developed to provide general, community-specific, residential, and tourist information. These can be distributed at mailboxes, hotels, and offices of the BC Ministry of Water, Land and Air Protection, as well as through Conservation Officers and BC Parks offices, tourist information booths, campgrounds, and public events.

Window Stickers

These can be similar to the "We are Bear Aware" stickers currently used in several communities to identify "Bear Aware" households and businesses.

Other Stickers

Other stickers can be used to promote the program or as a reminder of a specific program message. Display locations include store windows, car bumpers, garbage cans, and dumpsters.

Annual Progress Report for the Education Program

An annual progress report for the education program should be completed at the end of each year and included in the education program section of the "Bear Smart" Community Program Progress Report. Annual reports from education programs have been an invaluable reference tool for other communities to develop their own program. Details such as delivery budget, level of success of various methods, and recommendations for future delivery of the program are not only valuable to the community but to many others as well. Sharing of information is critical to maximizing the efforts of all involved. See Appendix D for an example of an annual progress report outline.

8.2 Bear-proof Waste Management System

Once the Bear Stewardship Committee has reviewed the options for bear-proofing its waste management system, it should begin to implement the chosen techniques. A program to phase in new systems and containers may be inappropriate due to the high implementation costs and the program's dependence on the fiscal calendar. For instance, if new garbage trucks are necessary to empty a new container system, but a new truck has been purchased recently, it may be more appropriate to develop a temporary system of restrictions until new capital purchases can be afforded.

If the community has a landfill, it must ensure that the electric fence around the landfill is appropriately constructed and maintained. The town or municipality must regularly monitor maintenance if an independent contractor operates the landfill. The Pollution Prevention Branch should inspect landfills for compliance at least yearly, preferably in the spring before bears become a problem and in late August or early September before the fall season of increased bear activity at landfills. If landfills do not comply with regulations, there should be immediate action, with escalating enforcement until problems are resolved. The town or municipality should ensure that its landfill, or landfill maintenance contractor, complies with provincial regulations.

If the local landfill is to be closed because of the community's conversion to a waste transfer system, then the proper closure of the landfill is important. Landfills need to be capped by a minimum of 60 cm of fill, preferably 1 m, although this may not guarantee that persistent bears will not attempt to access buried wastes. Because of this, it should be a requirement of the closure contract that the contractor must do whatever maintenance is necessary to repair any failures of the capping (e.g., damage by digging). If there is an existing electric fence, it should remain functional until the capped landfill no longer appears to be attracting bears.

8.3 Control of Attractants within the Community

The Preliminary Hazard Assessment will identify many non-natural attractants within the community. Many of these attractants are the responsibility of individual residents and companies. Thus, the onus for controlling these attractants to reduce human-bear conflict lies with these parties. The most effective method of facilitating proper storage and management of these attractants will likely be through education programs.

Bird Feeders

The public must be made aware that bird feeders need to be inaccessible to bears during the non-denning period. To make them inaccessible, feeders must be suspended from a cable or other device. Bringing feeders indoors at night may be

another option in summer months. The area below the feeder should be kept free of accumulations of seed. Feeders should not be overfilled. Bylaws may be necessary for restricting the use of bird feeders to structures that are inaccessible to bears in summer months, or restricting feeding to winter months only (see section 12.2 Canmore Case History).

Honeybee Colonies

Honeybee colonies are a non-natural attractant that are commonly targeted by bears. Two options are available for making apiaries bear-proof:

1. the preferred option is to surround colonies with a properly constructed bear-proof electric fence (see Appendix B: usually only four strands are necessary).
2. placing colonies on raised platforms (at least 2 m) supported with posts that bears can't climb.

Electric fencing has been used effectively to keep bears out of honeybee colonies. For example, in Revelstoke, one bee-keeper had 100+ hives but no bear problems because all colonies were electric fenced (Bennett 1996). Under the British Columbia *Bee Act*, the location of permanent bee colonies must be approved and registered by the BC Ministry of Agriculture, Fisheries and Food. Names of local bee-keepers can be requested from the Ministry in order to target education efforts.

Fruit trees

In some locations, fruit trees can be a significant attractant to bears. Landowners should pick fruit daily before it is ripe and also pick up any windfalls. Mapping fruit trees was completed in Revelstoke (Bennett 1996), and it proved effective at targeting trees for removal by volunteers and harvesting by neighbours. There are two ways community volunteers can help manage this particular attractant:

1. by picking fruit and donating it to local food banks if the landowner doesn't want it. Establishing a Fruit Tree Registry (as per Revelstoke, Robinson 2000) can help pair up owners of unwanted fruit trees with people who want the fruit and are willing to pick it. Neglected fruit trees do not always produce attractive fruit, but the fruit is still acceptable for use in processing (canning, jams etc.), or it can be given to agricultural operations to feed livestock. The best model for fruit sharing is the "Earth Matters" program in Nelson, BC. Earth Matters is a community-based organization that establishes links between social and environmental issues, including community food security. Nelson residents with fruit trees can call the program and volunteers will come and pick fruit and clean the area beneath the trees in exchange for a portion of the fruit harvested. One-third of the fruit goes to the pickers, one-third to the

property owner, and one-third to various non-profit community organizations such as Meals on Wheels (Haas 2000). For information on the Earth Matters program, call (250) 352-2140 or e-mail at: info@earthmatters.ca.

2. by cutting down unwanted trees for landowners (and if possible, replacing them with non-fruit-bearing native varieties).

It should be noted that removing non-cared-for fruit trees or removing blossoms will remove attractants from bears, but it may also meet the requirements of the Sterile Insect Release (SIR) program in the interior of British Columbia. In the Similkameen, South Okanagan, and Creston valleys (Zone 1 of the SIR program), Central Okanagan Valley (Zone 2), and North Okanagan and Shuswap valleys (Zone 3), homeowners must maintain their trees free of codling moth to comply with SIR policies (Okanagan-Kootenay Sterile Insect Release Program brochure, 2000). Host trees for codling moth include apples, pears, crabapples and quince. There are other methods of controlling codling moth, but stripping the fruit or removing trees removes attractants for bears. SIR offers incentives to anyone in the three zones who strips or removes host trees (contact SIR program for more information, 1-800-363-6684).

Commercial orchards

Commercial orchards should consider putting electric fencing around the perimeter of the orchard, which would also lessen damage by ungulates. In addition, the use of specially trained dogs could be considered as an additional deterrent.

Composting

If composting is conducted properly (i.e., covering with soil or lime, frequent aerating), it should not be an attractant to bears. However, if bears are attracted by other sources of food in the area, compost can become a problem. Meats, fish, oils, and milk products should never be composted. Sweet smelling attractants, such as rotting fruit, should also be avoided.

The following rules regarding composting may need to be implemented.

- Backyard composting may need to be restricted in residential areas adjacent to high-use bear habitat or otherwise required by bylaw to be conducted in a bear-proof manner (e.g., use of electric fencing in backyards). Community composting of putrescent matter shall be conducted inside an electric fence.
- Composting of lawn clippings and leaves may continue in backyards. However, the composting of organic kitchen material may have to be restricted to indoor worm composters (see section 12.2 Canmore Case History).

Barbeques

The odours on barbeque grills are very attractive to bears. Grills should be burned at a high temperature following use to burn off residues and should be cleaned regularly. Barbeques should be stored in a bear-proof location such as a garage. If they must be left outside, barbecues should be covered to reduce odours.

Hanging carcasses and smokehouses

Structures for these types of activities should be located away from forest and shrub cover or natural movement corridors. Commercial coolers may be utilized in some communities for hanging carcasses during the hunting season (e.g., coolers used by forestry companies for keeping seedlings cool). These areas should be kept as clean as possible to reduce odours. Community planning may need to consider the central placement of structures for smoking fish, away from the periphery of town. Motion sensitive lights may help scare away bears investigating these attractant for their first time. Electric fencing around buildings used for these activities could be attempted. If problems occur, it is best not to conduct these activities when bears are active.

Pet Food

Pet foods must be kept indoors or in other bear-proof locations. If fed outside, animals should be fed only enough so that they can finish the entire meal, and bowls should be stored inside.

Livestock operations

Bears are attracted to livestock feed, carcasses, and birthing areas. Removing cover and locating attractants (such as grain) away from natural cover and movement corridors can be helpful. Electric fencing can be used to deter bears from birthing areas (e.g., calving, lambing) or chicken coops. Use of lights hooked up to motion sensors, or scare guns, can be attempted.

Grain and other feed should be housed in a bear-proof structure or container. Seed mixes containing low-quality bear foods should be used for areas being seeded for ground cover.

Dead livestock should be disposed of in one of three ways: 1) carcasses should be sent to a rendering (by-products) plant (see Appendix C for local companies); 2) carcass piles should be electric fenced; or 3) if only black bears are present in the area, carcasses should be buried deeply (this approach should not be used in areas with grizzly bears).

Campgrounds

All campgrounds must be bear-proof. Therefore, the education program must also focus on reaching tourists. Bear-proof lockers for food storage should be

provided. Campgrounds should use bear-proof receptacles and bear-proof dumpsters for garbage disposal.

8.4 "Bear Smart" Bylaw Implementation and Enforcement

Bylaws in a "Bear Smart" community may include the following prohibitions:

- No person shall leave garbage of any kind accessible, either intentionally or unintentionally, to wildlife or domestic animals. This includes, but is not limited to, household garbage, compost, fruit, livestock feed, apiaries, barbeques, and the hanging of carcasses.

This bylaw wording covers all aspects of non-natural attractants. However, it may be easier to target specific activities through other bylaws:

- Make it an offence for commercial establishments to discard edible waste in a non-bear-proof manner.
- If curb-side collection is retained: garbage may be placed curb-side only on the morning of pick-up (not before 6 am), and the garbage container must be returned a bear-proof location by 7 pm. The bylaw should also require that attractants be stored in a bear-proof container and/or location (i.e., house or garage, not garden shed, carport or wooden box). A number of communities in British Columbia have enacted bylaws to restrict curb-side placement of garbage between certain hours. Kamloops has experimented with the use of restriction in one small area (R. Olsen, District Conservation Officer, personal communication). Kimberly prohibits placement of garbage before 5 a.m., and requires removal of the container within eight hours of pick-up. This strategy must be accompanied by a strict commitment by the public works employees or contractor employees to be expeditious in picking up and removing the refuse put out for collection. Lengthy or lackadaisical pick up contributes to the non-natural attractants being available. See Canmore and Revelstoke Case Histories (sections 12.2 and 12.3) for bylaws with respect to garbage collection.
- Include community composting requirements in high-risk areas of the community or prohibit composting of organic kitchen refuse. See Canmore Case History (section 12.2),
- Bird feeders may be allowed with certain restrictions during the non-denning period: feeders must be suspended from a cable or other device so that they are inaccessible to bears. The area below the feeder should be kept free of accumulations of seed. There are no restrictions during winter months (when bears are denned). See Canmore Case History (section 12.2), and
- Garbage at special community events (festivals, ball tournaments, concerts, etc.) must be removed at the end of each day's activities. See Whistler Case History (section 12.1).

Enforcing by-laws must be the responsibility of an agreed-upon service, such as a by-law enforcement officer, the C.O.S., or police. Money generated from bylaw enforcement should go towards a special fund set aside to address human-bear conflicts, such as the purchase of additional bear-proof waste containers. Alternately, people who violate bylaws could do community service work on a human-bear conflict issue in the municipality, such as garbage clean-up in areas with problems.

8.5 Community Planning Documents

The Bear Stewardship Committee should work closely with local government and other agencies to ensure that planning and decision-making processes are both consistent with and compatible with the objectives of the Human-Bear Conflict Management Plan. This will reduce the potential for new community developments or practices to increase the risk of human-bear conflict and/or potential displacement of bears. Possible changes to community planning documents include the following:

1. Revise components of the Regional Solid Waste Management Plan (which Regional Districts are mandated to prepare) pertaining to the community (in cooperation with the regional district) to make them consistent with the Human-Bear Conflict Management Plan.
2. If the "Bear Smart" program is implemented at the regional district level, the Regional Growth Strategy may need to reflect the program, which will then be reflected within each Official Community Plan (OCPs have to be revised to make them consistent with RGSs).
3. Include consideration of important bear habitat and travel corridors in all documents related to land-use decisions. Avoid development in areas with prime bear habitat in order to minimize the potential for human-bear conflicts.
4. Revise land zoning consistent with any revisions of the Official Community Plan.
5. Landowners may implement restrictive covenants that are consistent with the revised Official Community Plan.

Most communities in British Columbia that have moved towards becoming "Bear Smart" (such as Whistler and Revelstoke) have not changed their OCP or RGS to be consistent with their bear management plans. In the future, changing these plans may prove to be helpful for providing the impetus to keep the programs running. However, in the case of land-use planning , "higher-level plans" can be very important for reducing the long-term impact of developments on surrounding bear habitats and movement corridors.

9 Monitoring Human-Bear Conflict

Several data sources are available for monitoring the level of human-bear conflict within a community. The Conservation Officer Service currently collects data on human-bear conflict complaints and actions that were taken by its members. The Northern Region Bear Aware Program, with support from the University of Northern British Columbia, created a GIS database to map human-bear conflicts between 1994 and 1999 (Nahornoff 2000). This map provides a powerful visual method for monitoring human-bear conflict complaints so that problem areas can be investigated and management strategies can be focused where they are needed most. A human-bear conflict map will also be a valuable visual aid for showing the public the spatial aspects of the problem and the changes over time. Data collection and subsequent mapping of other information would also be useful for monitoring and analysing issues that influence human-bear conflict (e.g., non-bear-proof dumpster locations, fruit trees, and green space used by bears).

Input from the community will be crucial to the successful collection of data on human-bear conflicts. Thus, it will be necessary to sustain enthusiasm for the project as time proceeds. The general public can help by continuing to identify, document, and address all sources of non-natural foods and green spaces that provide security cover in areas of high human use until the problems associated non-natural foods and green space are effectively eliminated.

Data regarding non-natural food and other issues should be collected, reviewed, and summarized annually. Continuing to add to the information obtained during the Preliminary Hazard Assessment will be important for increasing knowledge of human-bear conflicts and the way bears and humans use a community. The Human-Bear Conflict Monitoring System will be the primary tool the community will use to continue to collect information that can help reduce the potential for human-bear conflict. The Bear Stewardship Committee, or annual reports, should recommend one or more Detailed Hazard Assessments as problem areas are identified (see Section 7.0), using the data collected by the Human-Bear Conflict Monitoring System.

9.1 Objectives

The objective of the Human-Bear Conflict Monitoring System is to establish and maintain a data collection system, including all Problem Wildlife Occurrence Reports for bears on an annual basis, that can be used to identify and map sites that continue to have human-bear conflict. This will focus future effort on eliminating sources of non-natural foods. Additionally, more detailed assessments can be conducted to determine the source of the human-bear conflicts.

9.2 Recommended Actions

The ongoing identification of hazards for the Human-Bear Conflicts Monitoring System could be carried out by the bear education program coordinator with the guidance of local Conservation Officers and a Registered Professional Biologist with experience in bear ecology and behaviour and human-bear conflicts. A map display of the ongoing data collection on Human-Bear Conflicts should be a major component of the system. A year-end report summarizing progress and work required should be completed annually.

9.3 Recommended Techniques

A spatial database is an integral component of the successful implementation of the "Bear Smart" community program. GIS databases will provide the most valuable tool for documenting human-bear conflicts and progress made by the community. Some communities are already digitally mapped. In some cases, small communities that do not have a digital map base and compatible software may need to start by recording information on a large hard-copy map of the community. At least one community has used GIS students at a local college or university to develop the GIS database (Narhornoff 2000). If production of a GIS database is feasible through the joint efforts of the school and the community, the database provides a valuable learning process for the students and a valuable product for the community.

The following spatial information should be included in the ongoing data collection for the Human-Bear Conflict Monitoring System and entered as layers in the GIS database or hard-copy maps.

1. Document and map sources of non-natural foods so that management efforts to eliminate non-natural foods can be focused on problem areas.
2. Document and map green space that provides security cover and/or foods in areas of high human use so that management efforts can be focused on clearing, brushing, or modifying green spaces to reduce the potential for conflict.
3. Document and map human-bear conflict reports so that the temporal and spatial patterns of human-bear conflict can be investigated and problem areas and practices can be identified and investigated.
4. Document natural factors that appear to increase the potential for conflict, including habitat potential, terrain features, visibility and security cover issues, and other sensory issues, and conduct a Detailed Hazard Assessment of specific sites or areas where human-bear conflicts are occurring.

The spatial database will also be a valuable tool for new participants in the program (e.g., new bear education coordinators).

10 Annual Progress Reports

Annual progress reports are necessary for monitoring the success and failures of the "Bear Smart" Community Program. They are also important for establishing direction for the upcoming year. These reports are a vital tool to help other communities just starting the program decide which strategies or options may be most successful in their own community. As a result, details such as delivery budget, level of success of various methods, and recommendations for future delivery of the program are not only valuable to the community in question but to many others as well. Sharing of information is critical to maximizing the efforts of all involved. See Appendix D for a recommended outline.

11 Measures of Success

The ultimate measure of success of the "Bear Smart" program is to its ability to reduce or eliminate the instances of "problem" bears being killed in communities and injuries to humans or their property from encounters with garbage-conditioned or habituated bears. Despite major efforts on the part of the community to reduce human-bear conflicts, incidents are still likely to occur, although they should occur at a much lower frequency. Evidence from Denali National Park indicates that some level of reactive management will continue to be required in response to bear incidents (Schirokauer and Boyd 1998).

Success will be gauged by:

- a trend toward a decrease in the presence of non-natural foods available to bears,
- a decrease in the number of human-bear conflicts reported to the C.O.S.,
- a decrease in the number of bears destroyed by the C.O.S., RCMP, and individuals,
- a decrease in the number of bears translocated,
- a decrease in property damage, and
- a decrease in resources expended in dealing with human-bear conflicts.

12 Case Histories

While massive positive changes have been occurring in public attitudes and actions towards responsible community-based stewardship of bears, at the time of this report, no community in British Columbia has yet qualified for "Bear Smart" status. However, two communities, Whistler and Revelstoke, stand out as exemplary, and these two communities are in the unique position of leading the world by example in applying responsible-based stewardship of bears.

We have identified four case histories that serve as examples of bear-proofing communities. Each of the communities has used a slightly different approach, with varying degrees of success. None of these communities implemented the "Bear Smart" Communities Program *per se*, but each community attempted to develop bear-proofing systems to reduce the number and extent of human-bear conflicts within their jurisdictions.

The following case histories examine three communities in British Columbia and one in Alberta that have implemented programs to reduce the occurrence of "problem" bear behaviour. The three British Columbia communities were originally profiled in Ciarniello (1997). Each of the towns profiled in the case histories had slightly different human-bear conflict issues to deal with because different bear species used their landfills and towns. Whistler had problems with black bears, Mackenzie had mainly grizzly bear problems, Revelstoke experienced both black bear and grizzly bear problems. These case studies were chosen based on their applicability to management problems experienced in other areas of the province. Canmore was included as an example of how human-bear conflicts have been addressed in other jurisdictions. The first step that each community took was to install an electric fence around their respective landfills. The successes and failures of these communities in their efforts to reduce human-bear conflicts can serve as examples for other communities that are working towards becoming "Bear Smart."

The data regarding the number of reported human-bear conflicts does not necessarily reflect upon the effectiveness of a particular strategy that a community has implemented. The number of bear problems varies a great deal from year to year because of climate changes from year to year, which in turn affect the food supply for bears. In years when the berry crop fails, the number of "problem" bears increases substantially because they must search farther for potential food sources. If many bears are destroyed in these years, the number of complaints will decrease in the following year, usually regardless of the food supply, because the bears killed the year before have not all been replaced yet. Therefore, the numbers tend to be high in certain years, management actions are

taken, and the next year the numbers go down, not necessarily due to an improvement in management of attractants, but because the population has been negatively impacted.

12.1 Whistler

The Resort Municipality of Whistler, BC is located within the Coastal Mountain Ranges and is adjacent to Garibaldi Provincial Park. Being situated in a valley bottom in the Coast Mountain Ranges, Whistler is surrounded by quality bear habitat. Black bears are the only bear species of concern in the municipality because grizzly bears do not tend to frequent the community (Black Bear Task Team 1998).

Whistler has faced many challenges in its quest to reduce human-bear conflicts. There is a high density of black bears in the Whistler area. Prime bear habitat surrounds the resort community, due in part to the development of ski runs that help promote an abundance of natural foods. In addition, the availability of non-natural food within the resort community has attracted bears to developed areas in Whistler for several years. Finally, the large number of seasonal workers and tourists makes education and awareness a difficult challenge.

Whistler has been one of the most progressive and active communities in British Columbia in becoming bear-proof. A Black Bear Task Team involving key community stakeholders was established in 1997. The Task Team reviewed the entire waste management system, from collection of garbage to disposal at the landfill. The Task Team recommended a number of changes to the solid waste-handling program, including mandatory bear-proofing of waste containers throughout the municipality. Completely bear-proofing the system took a number of years and was completed in 1999/2000. In addition, an aversive conditioning program was implemented in 1999, and a comprehensive education program was launched to target residents, employees, and visitors.

Because of the short time that the community has been bear-proof, Whistler's efforts are just starting to yield positive results. However, despite this short time period, the number of bears killed by the Conservation Office Service decreased substantially in 2000 and 2001 when compared to previous years (Fig. 2).

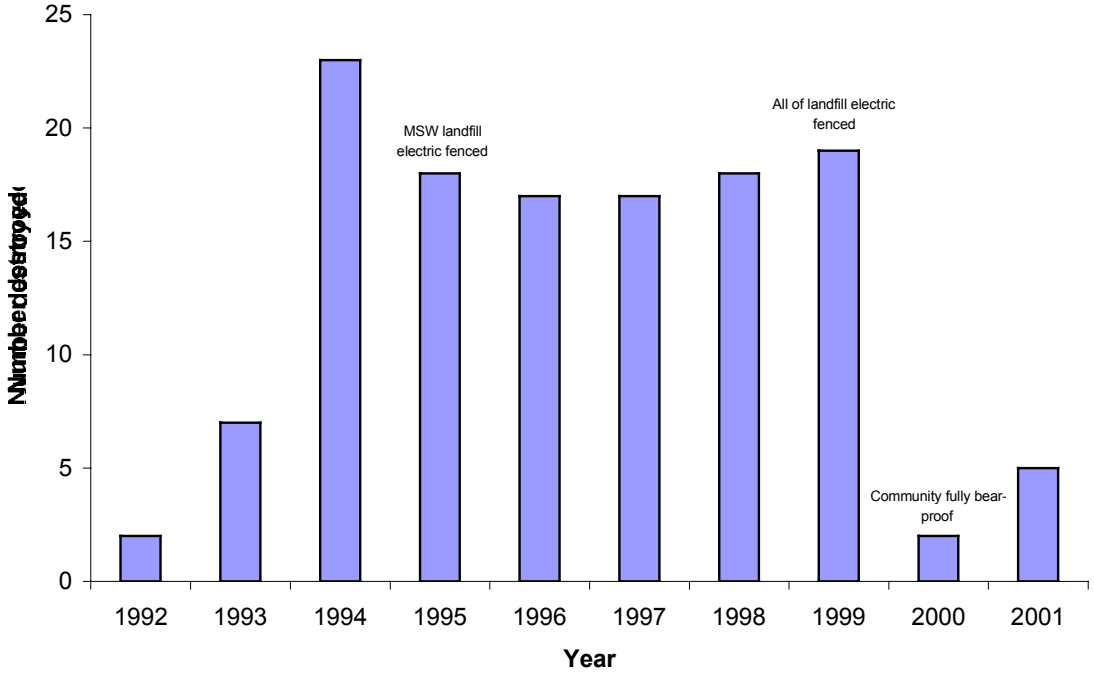

Figure 2. Number of black bears destroyed in Whistler, BC 1992-2001. Note: graph shows bears destroyed for the entire Whistler area, not just the town site of Whistler.

Moving Towards Becoming "Bear Smart"

Bear Stewardship Committee

In 1997, the Black Bear Task Team was created to establish and implement a Black Bear Management Plan (Black Bear Task Team 1998). The team consists of key stakeholders from the community, including members from the Jennifer Jones Whistler Bear Foundation (JJWBF), the Resort Municipality of Whistler staff, the local waste management company (Carney's Waste System), the Conservation Officer Service, Blackcomb-Whistler mountain staff, and the Association of Whistler Area Residents for the Environment (AWARE).

Phase I: Problem Analysis

Whistler has the most extensive Black Bear Management Plan of any community in British Columbia. The plan was "developed to minimize human-bear conflicts through effective waste management practices, extensive public education, a rigorous bylaw enforcement program, and non-lethal bear management practices" (S. Dolson, JJWBF, personal communication). Copies of the Black Bear Management Plan can be obtained from Brian Barnett, General Manager of Engineering and Public Works (phone: [604] 935-8191).

Although Whistler has not completed a full Problem Analysis, the Black Bear Task Team has essentially addressed all the important issues in the Black Bear Management Plan. As part of the plan, important bear habitats and travel corridors were identified within the Whistler area. The plan includes a good summary of local bear ecology, including how habitat use by bears changes by season and how this may affect potential human-bear conflicts.

Education

Whistler is the most urban of the case studies and has a large transient human population that poses challenges to the implementation of an effective education campaign. The seasonal nature of the work force and the large number of visiting tourists makes Whistler's situation unique when compared to many other communities. Many visitors are in Whistler for only very brief periods, so getting the Bear Aware message across effectively is extremely difficult. Many workers are employed on a seasonal basis and often come from foreign countries, and for these reasons, they have no previous experience with bears.

A number of agencies in Whistler have undertaken education programs aimed at informing the public about bears within and around the community.

Whistler has a community-based non-profit registered organization called the Jennifer Jones Whistler Bear Foundation (JJWBF). The organization was founded in 1995 and focuses on community awareness of bear issues and negative conditioning of bears. The ultimate goal of the JJWBF is to reduce the need for translocation and destruction of bears. The mandate of the foundation is "to protect the well-being and lives of bears by establishing a healthier coexistence between people and bears; to reduce the number of nuisance bears destroyed by increasing public understanding and appreciation of bears; educating people on dealing with bears in their communities; and promoting non-lethal bear management practices among wildlife managers" (Dolson 2000).

Many educational programs have been conducted in Whistler by the JJWBF. Programs include the Neighbourhood Bear Watch program and the Bear-Friendly Business sticker program. The JJWBF has also distributed pamphlets and information sheets, manned booths at local events, conducted seminars and workshops for residents, and erected signs throughout the town.

In addition, Whistler-Blackcomb (parent company: Intrawest) has a comprehensive bear ecology and bear-awareness education program (exclusive of the community). This program includes interpretive displays, educational signs, and a wildlife centre for children. Whistler-Blackcomb has tried to enhance forage production for bears on the ski hills by planting fruit-bearing shrubs. Whistler-Blackcomb has also thinned forests by helicopter logging rather than through conventional logging techniques. This approach allows more light to penetrate

the undisturbed understory and enhances berry production (A. De Jong, Whistler-Blackcomb, personal communication).

Also, Owen Carney, of Carney's Waste System (the local garbage contractor) has done extensive work on bear awareness.

The Municipality has taken a lead role in the education program within the community. It has developed brochures, erected signs at municipal parks and trailheads, placed annual radio and newspaper advertisements in the local media, and hand-delivered letters to businesses in the autumn to remind managers to dispose of garbage properly.

The efforts in Whistler have been widely reported in newspaper and magazine articles and on various TV news programs. The JJWBF and municipal staff have given presentations and advice to other communities interested in becoming bear-proof (S. Dolson, JJWBF, personal communication). Educational kits are available from the JJWBF (604-905-4209). A wealth of information can be obtained on the JJWBF website: www.bearsmart.com.

Bear-proofing and Attractant Management

Whistler does not have a household garbage collection system because of concerns about bears and other considerations specific to the resort community.

Instead, Whistler's household garbage collection system is comprised of two bear-proof compactor sites. These compactors are located at the north and south ends of town, just off the main highway, which makes them convenient places to stop as people leave town. The compactor sites are cleaned on a daily basis as part of Whistler's bear-proofing measures as well as for aesthetic reasons.

Carney's Waste Systems is the local waste hauler and is responsible for operating the compactor sites, commercial bins, and the landfill. Owen Carney has been instrumental in Whistler's bear-proofing measures, including designing a new commercial bin to satisfy the Black Bear Task Team's desire for a better bear-proof container.

The municipality passed a bylaw requiring all exterior garbage containers to be bear-proof. The conversion to the new bins was a major undertaking and was completed in 2000. Commercial bins are now bear-proof, or are housed within a bear-proof building. Thanks to the efforts of the Resort Municipality of Whistler, JJWBF, private businesses, and donations, all waste containers along pedestrian walkways are now bear-proof (S. Dolson, JJWBF, personal communication).

Landfill

The Whistler landfill was established in 1979. It is located 10 km from Whistler Village, 6 km from a main urban area, and 1 km from the nearest residence. The landfill was only used by black bears. In 1994, the use of the landfill by black bears increased substantially. Concurrent with this increase, the number of complaints about bears rose substantially within the community.

The landfill area was originally divided into two waste disposal sites, a municipal sanitary waste (MSW) site and a construction waste site. An electric fence was installed around the MSW site in 1995. An increase in bears within the town after the installation of the electric fence was not reported. Over the few years following the installation of the electric fence, the bears showed a remarkable determination to enter the landfill. They would dig holes under the fence, jump inside the enclosure from an adjacent tree or rock pile, climb up wooden fence posts, or enter through the gate when it was left open or not charged. Occasionally, despite the electric shock, bears would charge right through the fence. In response, the municipality installed concrete barriers around the electric fence to prevent bears from digging under it, spikes were nailed into the wooden posts, and the gate was replaced with one that had plastic hand holds so that the power to the gate could be maintained at all times (C. Jennings, Municipality of Whistler, personal communication). In addition, trees inside the electric fence were removed to make the landfill as unappealing as possible to the bears (bears were known to take refuge in the treed areas).

After the MSW landfill site was electrified, the bears focused their scavenging efforts on the construction waste site. In 1999, the electric fence was expanded to include all waste disposal areas at the landfill. An apron of chain link fencing was buried at the base of the new electric fence to prevent bears from digging underneath it. Both the chain link apron and the cement barriers appear to have worked well in stopping bears from digging under the electric fence (B. Barnett, Resort Municipality of Whistler, personal communication). Automatic gates were installed. The success rate of bears entering the landfill is now close to zero. The bear-proofing measures seem to have been successful: bears have now all but abandoned their efforts to feed at the landfill and have returned to the abundant source of natural foods in the surrounding area.

Bylaws

Whistler's garbage disposal bylaw has stringent requirements for bear-proof waste management – perhaps the most extensive requirements in British Columbia. As of August 2000, the Whistler Garbage Disposal Bylaw No. 1445 states:

- no domestic garbage and no food waste or other edible waste that could attract dangerous wildlife shall be stored outdoors, including on any patio, balcony or deck. "Dangerous wildlife" means a bear, cougar, coyote or wolf,
- every outdoor container or receptacle used for depositing or storing food waste or other edible waste that could attract dangerous wildlife shall be a wildlife resistant container,
- every commercial, industrial, institutional, and tourist accommodation building, and every multiple family residential development having three or more dwelling units, shall be provided with a garbage storage site located inside a building or within a wildlife resistant enclosure,
- garbage containers for special events are exempt from requirements as long as they are emptied by 10 pm,
- feeding dangerous wildlife and depositing or storing any domestic garbage, food waste, or other edible waste that could attract dangerous wildlife is prohibited, and
- bird feeders are required to be inaccessible by dangerous wildlife.

The municipal bylaw is strictly enforced and is part of the municipality's comprehensive bear management plan. Enforcement of bylaws increased compliance within the community (S. Jacobi, Conservation Officer, personal communication).

Discussion

Whistler has met many of the criteria set out in the "Bear Smart" program. With the inclusion of bear-proof garbage receptacles for pedestrians, fencing of the entire landfill, and changing gate systems, Whistler has met the objectives of bear-proofing their waste management system. Whistler also has ongoing education programs. With continued enforcement of existing bylaws (especially with respect to housing of commercial dumpsters) and maintenance of the electric fence at the landfill, the municipality appears to have met most of the criteria for "Bear Smart" status. The Regional MWLAP office will have to review the situation and determine whether to grant the municipality "Bear Smart" status. The community should continue to monitor human-bear conflicts in the future to determine if the number of nuisance wildlife complaints and bears destroyed decreases over the next few years.

The area of Whistler provides some interesting insights into bear and human conflicts due to its valley location and high density of people. The transient tourist population creates problems with waste management on the ski hill and surrounding cabins. The small number of waste disposal units available for the use of local residents creates problems because people dispose of their garbage in ways that attract bears. Despite all of these potential problems, the Municipality

of Whistler has met many of its goals for reducing human-bear conflicts. Unfortunately, keeping a community bear-proof is an ongoing struggle of vigilant maintenance and education.

Recommendations

While Whistler has made enormous strides in its management of bear attractants, several issues still need to be resolved before it can be considered "Bear Smart." The following is a list of necessary actions.

1. Conduct a brief hazard assessment using the Preliminary Hazard Assessment guidelines. Because so much groundwork has been accomplished, this should require relatively little effort and may be more of a reassessment in which details not addressed to date can be identified and addressed.
2. Conduct a committee review of the management strategies: in particular, green space management and community planning strategies.
3. Add an addendum to the Black Bear Management Plan to identify strategies and actions that may be taken to address the recommended criteria.
4. Conduct detailed hazard assessments if deemed necessary by the Conservation Officer Service, Black Bear Task Team, or Regional MWLAP office.
5. Produce annual reports as recommended in this report. Annual reports will be helpful to other communities by documenting the process Whistler has been through and the failures and successes of specific management actions.
6. Continue monitoring human–bear conflicts and investigate and address conflict issues.

12.2 Canmore, Alberta

Details from Andreas Comeau, Town of Canmore.

The Town of Canmore, Alberta has changed the manner in which it handles its waste and is a superlative example of a community's determination to become bear-proof. While this accomplishment is remarkable, the Town's approach of gradual implementation and consultation with residents make it an even more excellent example for other communities.

History

The Town of Canmore is situated in the Bow Valley at the gateway to the Canadian Rockies. Canmore, straddling the Trans-Canada highway, is 100 km from Calgary and 2 km from the gates of Banff National Park in Alberta.

Throughout the 1990s, as Canmore was experiencing steady growth, the Town was pressured to implement programs that would minimize the impact on the environment and wildlife populations in the area. In the Solid Waste Services department, this translated to the establishment of recycling programs, toxic round-ups, and implementation of an animal-proof waste handling system.

In the fall of 1996, responding to increasing concerns from the public and environmental groups about bears being attracted to waste, Council requested the Waste Management Committee to investigate options for animal-proofing the Town's waste handling system. Up until 1997, the Town of Canmore provided its residents with a traditional curb-side waste collection program. The committee recommended that the Town eliminate curb-side collection and implement a communal "bear bin" collection system. Despite this recommendation, Council voted in favour of a dual system that included both curb-side collection and neighbourhood animal-proof waste containers. There was the perception at the Council level that residents were opposed to the complete elimination of curb-side collection. This hybrid system gave residents the option of continuing to place waste out for curb-side pick up on their collection day or to use the bear-proof containers at any time.

Communal Waste Container Locations

The first hurdle in implementing the dual system was the selection of sites for 60 bear-proof containers in neighbourhoods and multi-residential areas. Placement of the 60 waste containers proved to be a difficult exercise because of the following perceptions:

- aesthetics: some residents viewed the containers as an eyesore, and some were also concerned about their effect on the real estate value of homes,
- space constraints – multi-family complexes have limited common space for containers,
- the containers may actually attract animals,
- contents of the containers may smell,
- soil contamination – effluent from containers entering storm sewer or groundwater,
- there may be loud noise from people banging lids,
- difficult to use – doors are difficult to operate for disabled and elder members of the community, and
- increased automobile traffic – neighbours will drive to the containers.

A review was completed of the entire community to find 60 suitable locations. The process started with the administration sending a letter and map to all the visually affected homeowners in all the proposed locations. The public was given two weeks to reply with comments and/or concerns. The majority of the public

was receptive to the introduction of the waste containers because they were aware of the wildlife concern and community obligations. Surprisingly, despite the concerns listed above, some residents wanted the containers *closer* to their house!

After several months, the community began to appreciate the benefits of the containers and their convenience and they became very popular. People appeared to appreciate the convenience of disposing of waste at any time, day or night. The containers were quickly becoming the preferred means of disposal for many of Canmore's residents.

The downside to this dual approach of curb-side collection and communal containers was that the program was becoming very costly to operate. This was because the town continued to pay for a complete curb-side program for all residents, many of whom were now opting for the bear-proof system.

During the summer months of 1997, members of the Waste Management Committee completed a curb-side monitoring program. The committee members rode on the waste collection trucks during the curb-side collection days and recorded the number of homes that did not have waste at the curb-side. It was assumed that if no waste was placed out for collection, then the household was using the animal-proof waste containers for waste disposal.

The monitoring results indicated an average of 55% of households used the bear-proof waste containers. In some neighbourhoods, it was also noted that up to 77% of households used the animal-proof waste containers. This information was presented to Council, who indicated they would consider eliminating curb-side collection if the total number of households using the bear-proof waste containers reached 66%.

In the summer of 1998, due in part to a poor berry crop, the number of bear sightings grew in town, and the number of incidents related to bears being attracted to waste increased substantially. Local Fish and Wild officers pleaded with the Town via the local newspaper to discontinue curb-side collection and provide a complete animal-proof waste handling system. In addition, members of the public were becoming involved, sending letters to the newspaper editor requesting the Town to eliminate curb-side collection. The summer season continued, and the number of problems increased to such a level that the Mayor sent a letter to all residents urging them to use only the animal-proof waste containers until the bears went into hibernation. When the summer season ended, over 300 bear sightings had been recorded within the town, nine bears had been relocated, and four bears had been destroyed.

Once again, the Waste Management Committee conducted a curb-side monitoring program from March to August of 1998. The total utilization of the

animal-proof waste containers was 62% of residents - only 38% continued to use the curb-side program. In September of 1998, the Waste Management Committee undertook another audit and found that only 23% of households were using the curb-side collection program. Despite this fact, the Town was paying the waste collection contractor a fee based on 100% of households receiving curb-side collection. The costs associated with running the dual collection system continued to rise. Subsequently, Council unanimously accepted the recommendation to eliminate curb-side collection.

The Site Selection Process for Additional Waste Containers

The Town administration and the Waste Management Committee were now faced with the task of selecting sites for an additional 60 animal-proof waste containers to service the entire community. Providing adequate volume for weekends and holidays when Canmore triples in population was imperative. The following criteria were developed:

- 3.0 m^3 waste container for every 20 homes,
- 4.5 m^3 waste container for every 30 homes,
- waste containers would be located a maximum of one block from every home,
- waste containers would be located on municipal reserve (i.e., public land),
- waste containers would be doubled-up only when necessary, and
- waste containers would not be combined with other services whenever possible (i.e., beside a Canada Post mail kiosk).

The process of selecting potential locations for the containers was similar to the first site-selection process. In the end, the administration and the Waste Management Committee successfully located all but one of the 120 proposed animal-proof waste containers.

The commercial sector was required to implement animal-proof waste handling systems as well. Existing businesses were allowed one year from the Waste Control Bylaw's enactment to replace their waste container with an acceptable animal-proof container. New businesses were required to conform to the new Waste Control Bylaw immediately.

Moving Towards Becoming "Bear Smart"

Bear Stewardship Committee

To assist with program implementation, the Town took advantage of a grass roots movement and established a Waste Management Committee (WMC) made up of interested and concerned residents. The WMC was used extensively during the implementation of the animal-proof waste handling system and proved to be a tremendous asset.

Phase I: Problem Analysis

No formal bear Problem Analysis of the community was completed.

Education

The town of Canmore has not implemented a comprehensive education program like the Bear Aware program in various British Columbia communities (e.g., Revelstoke, BC).

The Town of Canmore provided a "Bears & Your Garbage" brochure to all residents and businesses at the start of its dual collection system in 1997. Since the change to a complete animal-proof waste handling system in 1999, a one-page flyer was mailed out. In 2001, the "Bears & Your Garbage" brochure was updated to reflect the most recent changes in the collection system. Residents also have the opportunity to call the Town if they have any questions.

Bear-proofing and Attractant Management

Birdfeeders were identified as potential attractants within the town after bear-proofing took place. Several cases of damaged birdfeeders or sightings of bears up birdfeeder poles had been documented. Because of these problems, birdfeeders and other animal attractants (such as pet food and suet balls) were included in a new Waste Control Bylaw in 2001. This banned the use of birdfeed from April 1until October 31 while bears are active.

In 2000, composting was also identified as another animal attractant. Some residents actively compost both leaf and yard waste, but some also include kitchen organic material, which is an obvious animal attractant if not composted properly. Therefore, the changes in the 2001 bylaw banned outdoor composting of kitchen organic waste. Residents are encouraged to compost leaf and yard waste outside and compost kitchen organic material indoors with a vermi-composter.

Landfill

The town of Canmore does not have a Class II or wet waste landfill site. Waste is collected, sorted at a transfer station, and shipped to a landfill in the Calgary area.

Bylaws

Coinciding with the start of the dual system in April 1997, strict new standards for storage and placement of waste were incorporated into the Town's Waste Control Bylaw. These bylaws no longer apply due to the conversion to bear-proof containers. However, they serve as a model for communities with continued curb-side collection.

The bylaws included the following provisions:

- waste must be stored in an animal-proof location between pick-up days (i.e., house or garage, not a garden shed or wooden box),
- waste placed for collection must be in a can with secure lid (i.e., no boxes or waste bags),
- waste cannot be placed out for collection earlier than 6 a.m. on collection day (i.e., not the night before).

Penalties for breaking bylaws are a minimum of $100, $200, and $500 for the first, second, and third offences respectively. Canmore's current bylaws (and fines) apply to all aspects of the animal-proof waste collection system. They require that:

> "Occupants of Residential Dwelling Units shall ensure Waste is stored in an Approved Storage Location at all times other than when the Waste is being transferred to an Animal Proof Waste Container."

Cost

Many communities may feel that Canmore's route to "Bear Smart" is not an affordable option. However, Haul-all, the company that supplied the system, conducted a cost-benefit analysis on introducing the new bear-proof waste management system. By using a waste container system that is emptied by one person using a side-loading vehicle, the town has saved money in operating costs that will eventually cover the capital costs of installing the new system. Canmore's 1996 fiscal budget shows that the cost of curb-side collection and transfer was $187,000. Operating the same system in 2001 was estimated to cost $361,000 (due to inflation and population growth). The most recent estimate of the cost of operating the bear-proof system was $201,000, an approximate saving of $160,000 or 44% (Philipp 2000). While the initial costs are high, the operating costs are lower - the new system saves the town money (A. Comeau, Town of Canmore, personal communication). If the new system meant bear-proofing a landfill that was able to then use tarps instead of fill, the long-term savings would be even greater.

Discussion

When the program began, several bear-waste related altercations occurred in the town each year. The change to the new system saw a slight decrease in conflicts; however, the number of bear-waste altercations did not drop as substantially as anticipated. Despite the stiff fines under the Waste Control Bylaw for improperly storing waste, some residents continued to keep waste in sheds or storage boxes that were not animal-proof. Therefore, the bears continued to have access to garbage as an easy food source.

In May of 1999 the curb-side collection system was eliminated and the residents of Canmore could only use the communal waste containers. Throughout the summer, the success of the complete animal-proof waste handling system became

evident. Although there were several sightings of bears in and around the Canmore town site, there were no reported incidents involving bears and waste. Success continues; there were no "problem" bears killed in 2000, and only one black bear was killed in 2001.

The community to the east of Canmore (Exshaw) was not as lucky. During 1999, the community still provided a curb-side collection program and were inundated with bears intent on consuming human food. This community introduced an animal-proof waste handling system in March 2000 with much success and minimal public opposition, due in part to the extensive media attention Canmore received.

Recommendations

The town of Canmore has done an excellent job in terms of creating and implementing bylaws and bear-proofing its waste management system. It should stand as an example of effective change. Although Canmore is not eligible for the "Bear Smart" program because it is in Alberta, the following actions would be needed to attain "Bear Smart" status.

1. Conduct a brief hazard assessment using the Preliminary Hazard Assessment guidelines.
2. Develop a more comprehensive education program to help educate residents on the continuing need to keep non-natural foods away from bears.
3. Complete a Human-Bear Conflict Management Plan to identify strategies and actions that may be taken to address the recommended criteria.
4. Conduct detailed hazard assessments if deemed necessary by the Conservation Officer Service, bear committee, or Regional MWLAP office.
5. Produce annual reports as recommended in this report. Annual reports would be helpful to other communities by documenting the bear-proofing process and the failures or successes of specific management actions.
6. Continue monitoring human–bear conflict and investigate and address conflict issues.

12.3 Revelstoke

The town of Revelstoke has been working toward becoming bear-proof since 1994 when its landfill was electric fenced. Revelstoke has been very successful in becoming more "Bear Smart" by implementing an intensive education program and by managing attractants within the community. Through these efforts, Revelstoke has experienced a significant decline in the need for management

actions (Fig. 3), reducing the number of bears destroyed or removed from 62 (33 destroyed, 29 relocated) in 1994 to just two in 2000 and 2001 (Couturier 2002).

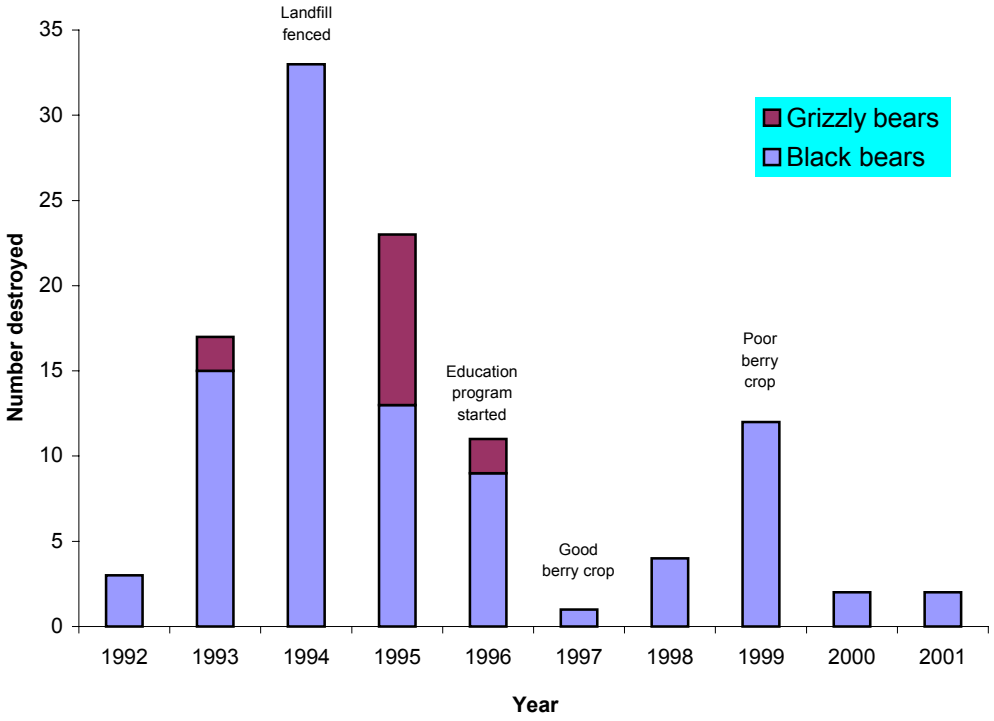

Figure 3. Number of bears destroyed in the community of Revelstoke, 1992-2001.

History

Revelstoke is located in the Selkirk Mountain Range in the Columbia River Valley. High-quality bear habitat surrounds the town. Between 1986 and 1995, over 100 grizzly bears were translocated and 17 were destroyed in the Revelstoke area (Proctor and Neumeier 1996). Garbage-related encounters were the main reason cited for grizzly bear translocations (77 of 107 translocations, 72%), followed by property damage (18%), and predation on livestock (6%). The main reason cited for destroying grizzly bears (information available on 13 grizzly bears between 1986-1995) was livestock depredation (including chickens and honeybee colonies) (5 of 13), followed by property damage (4 of 13) and "nuisance" (2 of 13). During this same period, over 50 black bears were translocated and 250 destroyed. Between 1989 and 1995 alone, 129 black bears were destroyed because of "nuisance" complaints (29%), because they were consuming fruit (26%), and because of garbage-related encounters (24%).

Prior to 1992, bears were not regularly tagged when translocated in Revelstoke. After 1992 bears were tagged and some were radio-collared. Proctor and

Neumeier (1996) reported that a minimum of 12 (26%) grizzly bears that were translocated between 1986 and 1995 returned to non-natural attractants either in Revelstoke (n=2) or other communities (n=10).

Moving Towards Becoming "Bear Smart"

Bear Stewardship Committee

A Bear Management Committee formed in 1996 continues to exist. The committee pulled together agencies that were directly involved in dealing with the problem of increasing bear problems that occurred after the landfill was electric fenced. Over time, the committee has consisted of representatives from the Columbia Shuswap Regional District, City of Revelstoke, Ministry of Environment, Ministry of Forests, Parks Canada, BC Hydro, Friends of Mount Revelstoke and Glacier National Parks, RCMP, Revelstoke Rod and Gun Club, and Save the Bears Committee (Robinson 2000).

Problem Analysis

The Revelstoke Bear Awareness program has worked on the development of an "urban bear habitat map" (Maltby 2000). This mapping has been used to set priorities for management actions and educational efforts and as a "tool for explaining risk factors associated with urban developments and recreational activities" (Maltby 2000).

Education

An intensive education campaign has been underway in Revelstoke since 1996 (Bennett 1996; Robinson 1997, 1998, 2000; Maltby 2000, Couturier 2002). The program educates residents about management of non-natural attractants in the community. Now called the "Revelstoke Bear Awareness Program," it operates under the guidance of a Bear Awareness Coordinator through the BC Conservation Foundation.

In 1996, a contractor was hired for six months to deliver a site-specific education program targeted at various groups within the community (Bennett 1996). Owners of vacant lots with fruit trees were contacted and permission was requested to allow volunteers to remove the trees. Furthermore, the contractor contacted bee-keepers in the area, questioned them about the extent of bear problems in their operations, and discussed possible solutions. Restaurants and food stores were also visited. The contractor also visited managers of restaurants and food stores to discuss options for making garbage receptacles bear-resistant. However, on subsequent checks, only two establishments had attempted to rectify their garbage management situation (Bennett 1996).

From 1996 through 2000, a variety of media campaigns were undertaken. The Ministry of Forests "Bear Aware" video was shown on the public cable network,

columns were printed in local magazines and newspapers, and announcements were broadcast on the local cable channel and radio. Bear Aware displays at farmer's markets and other local events were effective venues for getting out information on the Bear Aware program (Robinson 1998). In addition, the use of the Welcome Wagon to distribute Bear Aware brochures helped bring newcomers up to date with bear issues in the community (Robinson 1998), an approach that has also been useful in Nelson (Haas 2000). Many presentations were given to school classes over the years, focusing on proper management of non-natural attractants such as appropriate garbage storage. The Bear Aware program has a very high profile in the community: surveys indicate that 90% of the residents are aware of the program (Robinson 2000).

The Bear Management Committee and the Bear Awareness Coordinator have a good working relationship with the Conservation Officer Service, and the coordinator works closely with the C.O.S. as well as the bear biologists from Parks Canada to ensure correct information gets to the public and situations are dealt with quickly and properly.

Bear-Proofing and Attractant Management

Under the Bear Aware program, talks on bears and garbage were given to a number of community organizations, such as the Rotary Club and the Revelstoke Chamber of Commerce. A number of groups were contacted regarding donations towards the purchase of bear-resistant garbage receptacles for the community. School districts were also approached regarding their garbage bins, and one school began a fundraising campaign to purchase receptacles. Two bear-proof receptacles were purchased by Arrow Heights School due to the efforts of the Parent Advisory Council at the school (Robinson 1997). Two more bear-proof receptacles were purchased by City Council for two local parks in 1999.

An ongoing problem in Revelstoke is the improper use of commercial dumpsters by businesses. Dumpsters with locking lids are rarely secured, and bears can easily access the contents. Grease barrels are also kept outside and may attract bears (Maltby 2000, Couturier 2002).

Door-to-door campaigns have been used extensively in Revelstoke to educate residents about potential attractants near their homes (Robinson 1997, 1998, 2000; Maltby 2000, Couturier 2002). Residents who live within identified problem areas were visited and proper non-natural attractant procedures were discussed. Furthermore, residents living in areas in which the C.O.S. received bear complaints were contacted. "We are Bear Aware" window stickers were used to encourage participation by residents and businesses and a "Bear Aware Checklist" was distributed. The coordinators also attempted to help educate Revelstoke's visitors about bear attractants by ensuring that campgrounds had an

adequate supply of pamphlets and encouraging campgrounds to earn "We are Bear Aware" window stickers.

Volunteers helped remove fruit trees in which the fruit was not being picked. A fruit tree registry was established, but support in its first year (Robinson 1999, 2000) was low.

Landfill

The landfill was electric-fenced in September 1994 in an effort to eliminate non-natural food sources. The landfill primarily attracted grizzly bears and was operational for over 20 years. Prior to closure, some black bears were destroyed and 19 grizzly bears were translocated immediately after the installation of the fence (Proctor and Neumeier 1996).

The electric fencing appeared to be effective at eliminating bears from the landfill. After the installation of the electric fence, grizzly bears wore a path around the fence perimeter but none penetrated the fence. Fence performance was regularly monitored by a contractor (J. Marley, Margo Supplies, personal communication). Excluding bears from the landfill and a year with a poor crop of berries in mid-to-low elevations resulted in a number of bears moving into the community to seek out alternative food sources (Macpherson 1996).

Bylaws

Revelstoke put a bylaw amendment in place in 1996 to limit placement of garbage at the curb for pick-up to between 6 am and 7 pm on the day of collection. The bylaw only affects putting garbage on the street and not storing garbage on the property. Although many people are complying with the bylaw regarding placement of garbage at the curb, they are not storing garbage in a bear-proof manner on their own properties outside of these hours. This has been identified as a continuing problem in Revelstoke (Robinson 1998, Maltby 2000, Couturier 2002).

Discussion

Revelstoke's successes stem from a very committed Management Committee and overall support from the community. Revelstoke has had considerable success in implementing one of the most intensive education programs of any community and has documented its program with annual reports. Revelstoke is to be commended and used as a model for other communities. Revelstoke's detailed reports on its bear awareness education program are a good example of the value of these annual reports because they are being used by many other communities to establish their education programs.

Recommendations

While Revelstoke has made huge strides in its management of bear attractants, it still has a few issues that have to be dealt with. The following is a list of necessary actions.

1. Conduct a brief hazard assessment using the Preliminary Hazard Assessment guidelines. The "urban bear habitat mapping" will be a valuable tool for the assessment.
2. Conduct a committee review of the management strategies contained in this report, in particular, green space management, community planning strategies, waste management system, and monitoring system. Specific issues to address include those previously identified in annual bear awareness reports:
    - removal or continued harvesting of remaining fruit trees on private and public land (Robinson 2000; Maltby 2000, Couturier 2002),
    - bear-proofing of dumpsters at commercial establishments and apartments and mobile home parks (Robinson 2000, Couturier 2002),
    - an addition to the garbage bylaw that requires the use of bear-proof commercial dumpsters (Maltby 2000, Couturier 2002),
    - an addition to the garbage bylaw that requires storage of garbage and attractants in a bear-proof manner on residential properties (Maltby 2000, Couturier 2002),
    - More bear-proof containers are needed at schools, public parks and commercial campgrounds (Couturier 2002),
    - Bear-proofing of grease barrels has been an ongoing problem in Revelstoke that still needs to be addressed (Couturier 2002).
3. Complete a Human-Bear Conflict Management Plan to identify strategies and efforts that may be taken to address the recommended criteria.
4. Conduct detailed hazard assessments if deemed necessary by the Conservation Officer Service, bear committee, or Regional MWLAP office.
5. Produce annual reports as recommended in this report. Annual reports will also be helpful to other communities by documenting the bear-proofing process and the failures and successes of various management actions.
6. Continue monitoring human–bear conflicts and investigate and address conflict issues. Further development of the urban bear habitat map project should be encouraged because it shows considerable promise as a monitoring tool.

12.4 Mackenzie

The town of Mackenzie is located within the Sub-Boreal Spruce biogeoclimatic zone and has a population of approximately 6,000 people. The town site is situated along the Rocky Mountain Trench in an area of high habitat productivity for interior grizzly bear populations (BC MWLAP 1995a). Each year the C.O.S. has had

to deal with numerous complaints related to grizzly and black bears entering the town site.

Mackenzie is an example of the necessity of having a well-rounded and thorough strategy for dealing with "problem" bears prior to electric fencing of landfills. The town electric fenced its landfill (in 1995) but has not satisfied any other "Bear Smart" criteria in conjunction with this activity. Because of this, the number of bears destroyed has not declined as much as desired (Fig. 4). In 1997, one grizzly was destroyed in the town site and two were relocated. In 1999, one grizzly was destroyed in the town site and seven were relocated from the town site. Encouragingly, in 1996, 1998, and 2000 no grizzly bears had to be destroyed or relocated from the town site.

Moving Towards Becoming "Bear Smart"

Bear Stewardship Committee

No committee has been formed.

Problem Analysis

No Problem Analysis has been completed.

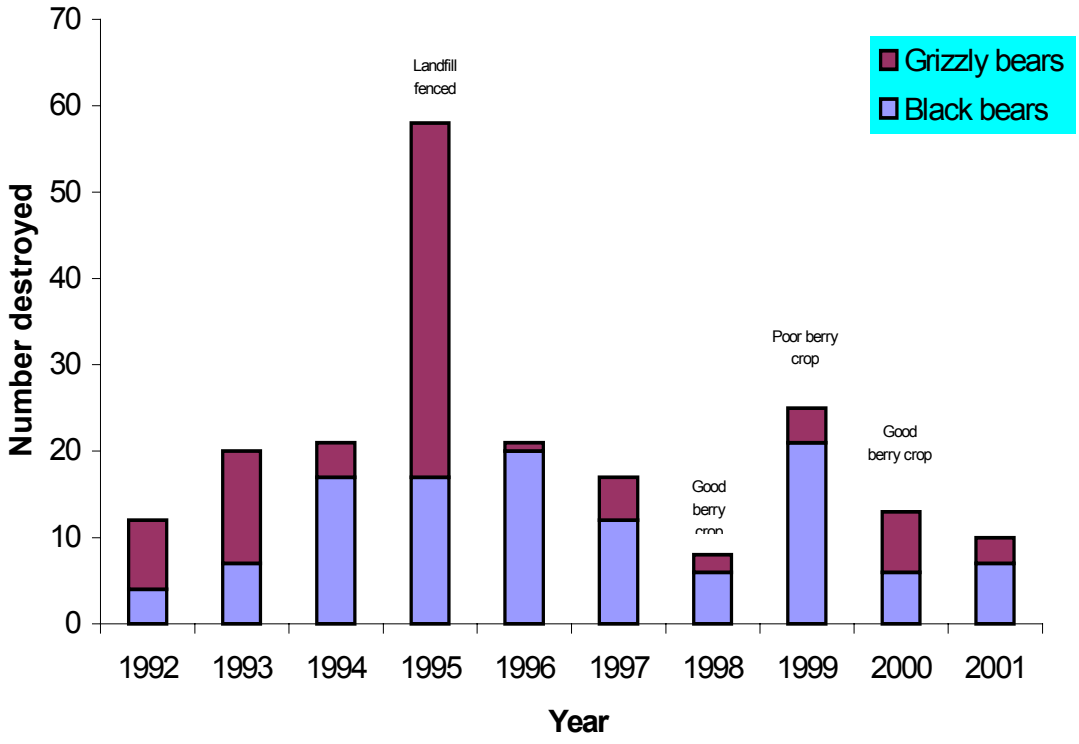

Figure 4. Numbers of bears destroyed in the Mackenzie District, 1992-2001. Note: graph shows bears destroyed for the entire district of Mackenzie, not just the town site of Mackenzie.

Education

In May 1992, the C.O.S. initiated an education campaign that targeted elementary schools and appeared in the local newspaper. The District Conservation Officer comments on the success of the education campaign:

> By 1994, the volume of garbage being placed at the curb the night before pickup had dropped considerably. These improvements were emphasized in the ongoing education program. However, poor maintenance of commercial dumpsters was an ongoing concern (MacKay 1996:3).

The education campaign was intensified in 1995 to prepare the community for the implementation of the electric fence. Pamphlets were distributed to households, a mall display was erected, and the regional district hosted an open house. Despite education efforts, some residents did not remove their non-natural attractants, and no bylaws were in place that could enforce compliance.

Since the landfill closure, the C.O.S. has tried to continue its education program; however, the service does not have the manpower or finances to do a thorough or effective job in the long term.

Bear-Proofing and Attractant Management

In March 1995, before activating the electric fence at the landfill, the BC Ministry of Environment, Lands and Parks identified 15 locations in the community that were potential problems, suggested management actions, and requested bylaws and chains with locking hooks for commercial dumpsters. In September 1995, after several requests to the District of Mackenzie, some commercial dumpsters received locking hooks. However, problems with improperly stored garbage and grease continued at a number of these commercial dumpsters. Conservation Officers took it upon themselves to lock a number of dumpsters after business hours.

Non-natural attractants continued to be available within the community before and after fence activation at the landfill. Despite education efforts since 1992, some residents (about 30%) were found to have a number of non-natural bear attractants associated with their homes. The main attractants within the town were: improperly stored residential and commercial refuse, crab apple trees, mountain ash trees, moose carcasses hanging in sheds, and vegetation on the golf course (MacKay 1996).

In 2001, the town planned to purchase bear-proof commercial and residential waste containers to replace existing containers at various locations throughout the community. Curb side waste collection at homes will continue. However, as of May 2002, the town had not replaced existing containers. Once bear-proof

containers are in place, reducing other non-natural attractants will have to be addressed, such as crab-apple trees, mountain ash trees, the hanging of carcasses, and storing refuse on residential properties.

Landfill

The landfill was established 2 km from the town site of Mackenzie in the 1960s. Bears using the landfill were predominately grizzly bears (Murray 1991). In 1991, the BC Ministry of Environment, Lands and Parks commissioned a study to assess bear use of the landfill site, identify ways to reduce the number of negative human-bear encounters, and meet the goal of the new solid waste management plan for the province (Murray 1991). The study employed the use of a consultant to view the landfill from a tower and record bear use and behaviour. Twenty-nine grizzly bears (22 adults and seven cubs) were identified as permanent users of the landfill while another large, yet undetermined, transient population used the landfill in the fall. Use of the landfill by black bears was not identified (Murray 1991).

During the 1991 monitoring program, the contractor determined that a number of negative human-bear encounters were occurring at the landfill site. Each night, residents and tourists were observed viewing bears at the landfill. A number of visitors were found to view bears at dangerously close distances. Some people harassed bears, and even chased mothers and their cubs. Murray (1991) concluded that many Mackenzie residents did not respect bears.

Prior to the installation of the electric fence, resident landfill bears were dealt with through destruction (Figure 4) or translocation. The C.O.S. attempted "to remove as many full time resident bears as possible before the electric fence was erected" (MacKay 1996:4). The landfill electric fence was activated in April 1995.

The majority of translocations were found to be ineffective because most of the bears either returned to the town site or could not adapt to the new environment (MacKay 1996). For the transient population (i.e., those present in the fall), the level of garbage conditioning and human habituation was determined to be less than that of the resident population. It was believed that most transient bears would hit the fence, receive negative reinforcement, and continue on to their destination. Therefore, the transient population was not removed prior to installation of the electric fence.

In mid- to late August 1995, the population of transient grizzly bears came to the landfill site, patrolled the fence perimeter, and attempted to gain access to garbage by digging under the fence (MacKay 1996) or jumping over the gate (J. Marley, Margo Supplies, personal communication). By the end of August, a number of the transient bears entered the town, using the green belts and frequent areas of bush surrounding the town as cover. Complaints rose

substantia1ly during September and October of 1995 to the highest ever recorded for the District. No serious encounters between humans and bears occurred.

Grizzly bears began using locations within the town that had not experienced problems prior to fencing of the landfill, and this resulted in many complaints (e.g., the golf course). Residents circulated a petition during the height of bear problems within the community claiming that the fence drove the bears into town. Some residents did not appear to make the association between their non-natural attractants and bears within the town (MacKay 1996).

During the period of increased complaints, Mackenzie C.O.S. required additional staff to deal with the problem. Intercept trapping between the landfill and town was performed to reduce the number of incidents within town. In one 24-hour shift, six grizzly bears were removed from the town site. Peak grizzly bear activity within the town was found to occur from 2:00 a.m. to 5:00 a.m. (MacKay 1996).

The landfill is now bear-proof and is not being breached.

Bylaws

There are no bylaws in the community of Mackenzie that address management of non-natural food sources.

Discussion

The four year total (1992 to 1995) of bear management at Mackenzie cost the BC Ministry of Environment, Lands and Parks $85,000 above normal C.O.S. fees incurred, of which reactive management (primarily destruction) in 1995 accounted for $27,655,37.

After 1995, grizzly bear complaints did decrease (possibly due to the decrease in population from control measures) and only 11 grizzly bears have had to be killed or translocated since 1995. However, other problems within the community did not change much. The landfill was fenced, but non-natural attractants within the community still existed, and thus, so did problems with bears. Electric fencing a landfill site should be only one part of an overall community plan, especially in areas with a high population of conditioned bears. While the objective at Mackenzie was to "increase public safety by reducing potential contact between bears and humans," it is apparent from the number of bears destroyed that the welfare of the bears themselves was not part of the management decisions. Recently, the town council has been making strides towards bear-proofing the town. Hopefully these positive steps are supported and continue.

Recommendations

The town of Mackenzie needs to implement the following to become "Bear Smart."

1. Create a Bear Management Committee composed of members of the city council, C.O.S., Environmental Stewardship, Environment Protection, interested residents, and other stakeholders.
2. Conduct a committee review of the management strategies contained in this report, in particular, green space management, education program, waste management system, bylaws, community planning strategies, and monitoring system. The following are some specific recommendations.
    - The abundance of green space throughout town offers bears security cover. The preliminary hazard assessment should address the management of areas to decide if brushing is appropriate.
    - The town should create an additional agency responsible for delivering an ongoing bear education program.
    - Because Mackenzie is retaining curb-side collection, the town needs bylaws that deal with timing of curb-side garbage placement and storage of containers in a bear-proof manner at residences. In addition, bylaws should address other non-natural attractants such as fruit trees.
3. Complete a Human-Bear Conflict Management Plan to identify strategies and actions that may be taken to address the recommended criteria.
4. Conduct detailed hazard assessments if deemed necessary by the Conservation Officer Service, bear committee, or Regional MWLAP office.
5. Produce annual reports as recommended in this report. Annual reports will also be helpful to other communities by documenting the bear-proofing process and the failures or successes of various management actions.
6. Continue monitoring human–bear conflicts and investigate and address conflict issues.

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Appendix A: Animal Proof Criteria for Waste Containers

From Waste Control Bylaw No. 12-97, Town of Canmore:

- Tight lids to reduce odours.
- Lids must be self-closing.
- Latches for lids and bag removal must be bear-proof (i.e., claws unable to reach the latch trigger mechanism).
- Hinges and latches for lids must be sufficiently strong such that they can not be pried open by claws (able to withstand several thousand pounds of force). If it can be dismantled using a crowbar, it is not bear-proof.
- The container must be sufficiently stable or capable of being anchored to prevent tipping by large bears.
- Container material must be sufficiently strong to prevent bears chewing, battering or crushing the containers (i.e., able to withstand several thousand pounds of force).

While the use of bear-proof containers is essential, containers must be chosen that are user friendly or the public will not use them. Instructions need to be easy to understand for all people, including foreign visitors. Container doors must be light enough and low enough to allow use by children and the elderly (Black Bear Task Team 1998).

Appendix B: Electric Fencing of Landfills

Details from Jeff Marley, Margo Supplies Ltd. and Frazer McKenzie, Environmental Protection Compliance Officer, BC Ministry of Water, Land and Air Protection.

Properly designed, operated, and maintained electric fencing has been proven to be effective in preventing bears from gaining access to many sorts of non-natural attractants, including garbage, apiaries, and landfills. Electric fences are designed to deliver a strong enough shock to deter the animal from entering the enclosure. The first recommendation to fence landfills electrically in order to restrict bears' access to non-natural attractants occurred in 1913 in Yellowstone National Park (Harding 1987). In the 1930s, electric fencing was first implemented as a management tool to keep bears out of apiaries in California (Storer et al. 1938). Between the 1940s and 1960s, electric fencing went on to become a popular tool for domestic livestock control. Since then, electric fencing has been used consistently as a management tool to keep black bears and grizzly bears out of specific areas. The first electric fenced landfill site in Canada was in Jasper National Park in 1981. In 1991, Norman Wells was the first community to electric fence a landfill.

Voltage

The maximum amount of voltage output is determined by the unit's design and must be tested and approved by the Canadian Standards Association (CSA) and Underwriter Laboratories (UL). The output voltage can be as high as 12,000 volts, depending upon the total amount of resistance and how well the system is grounded. The minimum voltage needed to deter bears and all long-haired animals (e.g., raccoons and dogs) is generally accepted to be 6,000 volts. Black, grizzly, and polar bears all respond to the same voltage. Hairless animals, such as pigs, require substantially less voltage. Zoos and agricultural activities employ the same systems and use similar voltage levels to those recommended for bears.

Human Safety

An electric fence must hurt but not harm. Modern fence energizers can deliver the desired effect to bears while ensuring human safety during accidental human contact. The type of current used in electric fences must not be confused with the continuous alternating current (AC) electrical system that powers lights and tools. In standard household electrical systems of 120 volts AC at 60 cycles, the power is on continuously, causing the muscles to contract and only partially release, and making it very difficult to let go of the shock source. In electric fencing, high voltage is combined with low amperage in a pulsating charge at 60-65 pulses/minute. When a shock is experienced, there is an involuntary muscle contraction. The pulsating charge allows the person receiving the shock to let go of the wire during the 3/4-second time off. It is important to use smooth wire and

not barbed wire because it is possible for a person's clothing to get caught in the barbs.

Permanent vs. Portable Electric Fences

Permanent electric fencing can remain in place for a period of years and provide a more formidable structure than portable fences. Landfill sites are good candidates for permanent fences because bears are consistently attracted to these areas, which have a high lure value, and in most cases, the bears are already conditioned to the site.

Permanent structures require less maintenance than portable designs and will withstand environmental conditions (e.g., snow load) better than portable designs. In permanent designs, the hi-tensile wire may be tightened to 200 psi, which easily separates the animal's hair when the animal pushes against it and delivers a shock directly to the bear's hide.

Permanent fence designs are hi-tensile, multi-strand systems whose construction requires a specialized expertise and equipment. They are more expensive than portable designs, such as those used in apiary operations. However, it costs less to move a portable system than a new permanent structure.

Permanent Electric Fence Designs

Permanent electric fences are recommended for landfill sites and camps that will be occupied for longer than one year. Permanent bear-proof electric fences should meet the following specifications:

- eight strands of graduating height 12.5 gauge high-tensile galvanized wire (tightened to a minimum of 125 lbs. tension at 20^{o}C),
- attached to fibreglass posts or wooden posts with insulators. Posts pounded into the ground rather than placed in pre-dug holes tend to be more stable (J. Marley, Margo Supplies, personal communication). Posts should be spaced a maximum of 7.5 m apart,
- the bottom wire should be 5 cm from the ground (no more than 10 cm); then, strands shall be alternating positive/negative at the following heights above soil surface: 20 cm, 35 cm, 50 cm, 70 cm, 90 cm, 110 cm, and 135 cm to the final positive wire, and
- the system is properly grounded with three 5/8" (16 mm) ground rods, buried 2-3 m deep and spaced at least 3 m apart, connected to the negative output terminal of the fence charger by ground clamps. Depending on local conditions, alternate methods are sometimes needed to ensure adequate delivery of electric current, such as the use of ground plates, or deeply driven larger diameter rods.

Alternating positive/negative wires insures that the animal will receive the electric current, even during dry periods. Also, the shock from touching both wires is intensified with this set up and localized to a specific part of the animal, resulting in a strong, negative experience.

The fence should be powered by either 1) a solar charged unit containing a built-in battery (battery operated), or 2) a connection to a regular electrical outlet (powerline input models). Powerline models tend to cost less and take more load (amperage) and are the preferred choice (J. Marley, Margo Supplies, personal communication). On-site monitoring of the fence's performance is indicated by either a built-in performance meter or flashing lights.

Aprons under Permanent Electric Fences

Digging has been a problem at some landfills after the installation of electric fencing. In some cases a chain link fence buried horizontally underground (known as an apron) in front of the electric fence has prevented animals from breaching the fence. Installing an apron at the same time as a permanent electric fence is installed is not recommended because digging up the ground to install the apron may make the soil unstable for the fence itself (J. Marley, Margo Supplies, personal communication). If there is proper maintenance of the fence (i.e., filling in holes, fence operating at full capacity) as soon as the fence is installed and turned on, digging should not become an issue. An apron should be considered only if digging persists. The installation of an apron significantly increases the cost of bear-proofing a landfill.

Portable Electric Fence Designs

There are two main types of portable electric fence designs used to deter bears: (1) positive systems and (2) alternating positive/negative systems. The portable positive system (light gauge/shock cord) normally consists of four strands of shock cord; 14 or 16-gauge wire stretched to 20 lbs of tension. The spacing of the positive wires from the ground up is 15 cm, 40 cm, 65 cm, and 90 cm. The bottom wire also aids in protecting the enclosure from animals such as skunks and racoons. This type of fence is most often used at apiaries, small camps, and in residential situations (e.g., to protect gardens, etc.).

In areas devoid of a good grounding plane (i.e., dry gravel) and where the control needed does not warrant a high-tensile fence, a portable (light-gauge wire) alternating positive/negative system is used. This system employs six wires spaced from the ground up at 5 cm negative, 20 cm positive, 40 cm negative, 60 cm positive, 85 cm negative, and 110 cm positive. Installation of this system does not require special equipment or tools.

For both fence designs, a wire apron mesh is recommended on extremely dry lands such as a gravel ridge devoid of green vegetation. This ensures good

grounding for the bear to receive the shock. Spreading calcium chloride on the ground around the fence can also increase grounding during dry periods.

Gates

The most effective models of electrified gates being installed are:

- two12-foot wide swing gates (24-foot opening) that are similar in design to the fence, with alternating positive and negative wires
- minimum voltage 6000 volts
- maximum gaps of 10 cm either side of gate panels, between panels, and between the gate and the ground

The frame of the gate is insulated, and the positive and negative gate wires are hard-wired to the fence. There is no hooking and unhooking with this design and no need for calcium chloride treatments. The drop latch mechanism is user friendly, and the risk of shock to humans appears to be minimal. Automatic cantilever gates, such as those used in Whistler, work well but are more costly. Depending on local bear behaviour, gates may need to be closed while vehicles are dumping garbage because bears may have learned to run in after vehicles drive in (J. Marley, Margo Supplies, personal communication). In other locations, gates may be left open during the day and only need to be closed at night.

Canadian Standards Association (CSA) Approval

All manufacturers of electric fence controllers must be registered with the CSA. Any device that is powered by 120 volts must have its circuitry tested and approved (Standard 22.2, document 103-M1983). The design features that CSA requires are:

- fence energizer must not have a time off (i.e., the time between pulses) less than 3/4 of a second or no more than 65 pulses per minute; and
- current (amps) output must be sufficient to push voltage but not cause fires or present a danger to animals or people.

The recommended fence chargers are 100% solid state units, with low impedance, programmable circuitry which is tested and approved by the CSA and UL. Open circuit voltage is 6000 to 10,000 volts. This high voltage presents no danger or hazards to humans. Similar systems are employed at zoos and in livestock areas where there is a requirement for animal control in close proximity to people.

CSA and UL standards are regulated by the industry itself and "policed" by the provincial power authority, BC Hydro. CSA approval is not required for units operating with voltage input (primary power) less than 48 volts nominal. Therefore, all six- and twelve-volt models do not require CSA. However, these units do require UL approval. There is no difference in voltage between permanent and temporary electric fences.

Fence Maintenance

An electric fence is only effective if it is well maintained. The perimeter of the fence should be walked routinely, preferably every day. Metal objects, vegetation, and build-up of blowing debris against the fence will cause the fence to short. Signs of bear activity must also be monitored. If bears are attempting to dig under the fence wire, all holes must be immediately filled and packed with a loader or bulldozer.

The voltage of the fence should be measured in several places and the results entered into a log book. Any drops in output voltage should be investigated and corrected immediately. The fence should be checked with a hand held digital meter at each side of all gates. Battery and off-season maintenance is also required.

The electric fence needs to be functional only during the non-denning season. This can be highly variable in different parts of British Columbia, especially in the area of a landfill, so local information will have to be collected to decide what these dates may be. The fence must be on whenever bears are active in the area of the landfill.

Appendix C: Potential Suppliers

The following companies state that they sell the items listed; however, the authors of this report have not tested their claims. They are listed in no order of preference.

Electric fencing of landfills

Jeff Marley
Margo Supplies Ltd.
P.O. Box 5400
High River, AB T1V 1M5
phone (403) 652-1932
fax (403) 652-3511
www.margosupplies.com

Bear-proof containers, dumpsters, waste management systems

Haul-All Equipment Systems
4115-18th Ave. North
Lethbridge, AB
phone 1-800-661-1162
fax (403) 328-9956
www.haulall.com
contact: Dennis Neufeldt, President

BC distributor:
Rollins Machinery Ltd.
21869-56th Ave. RR13
Langley, BC V2Y 2W9
phone 1-800-665-9060
fax (604) 533-3820

Inground Waste Management Systems (containers, dumpsters)

Inground, or deep-collection, systems look like regular waste containers above ground but actually continue deep underground. This keeps the contents cool, reducing decay and odours, and greatly increases the length of time between waste collections (even up to only once a year). The system has a bag inside, and the contents are lifted with a truck-mounted lift system.

Sybertech Waste Reduction Ltd. (BC distributor for Alfa Products Inc.)
2284 Marshall Avenue
Port Coquitlam, BC V3C 1M2
phone 1-888-888-7975
fax (250) 523-9699
www.equinox-industries.mb.ca
contact: Rob Mitchell, President

Molok North America (call for nearest distributor)
618 Main St. N.
Mount Forest, ON N0G 2L0
phone 1-877-558-5576
fax (519) 323-9910
www.molok.com
contact: Marja Loshkov, President

Commercial Bear-Proof dumpsters

Universal Handling Equipment Co. Ltd.
4024-39139 Hwy 2A
Red Deer County, AB T4S 2A8
phone (403) 346-1233
fax (403) 340-8720

Worm Composters

All Things Organic
471 Pemberton Terrace
Kamloops, BC
phone/fax (250) 372-1835
www.allthingsorganic.com

Collection of Large Animal Carcasses (horses and cows)

Lower Mainland
Carson Stock Farm. Aldergrove. (604) 856-2414.
Dargatz Mink Ranch Ltd. Chilliwack. (604) 795-7890.
K-9 Products. Chilliwack. (604) 864-9322 or (604) 795-3640.

Outside Lower Mainland
McLeod's By-products Ltd. covers all of BC except the lower mainland and northeastern BC (250) 546-3046 for the local contact in your area. In most locations animals would have to be delivered to a truck by the owner.

Appendix D: Outline of Reports

Example Outline for Preliminary Hazard Assessment

Executive Summary

Introduction

- including rationale for the study and objectives.

Goals and Objectives

Study Area Description

- including general details about the community location, study area boundaries, biogeoclimatic zones, population of the community etc. that will put the results and discussion into context.

Methods

- methods used to for each component of the assessment.

Results and Discussion

- including, but not limited to, the results and discussion of known or potential bear movements and travel issues in the community, known or potential food habits of bears, known or potential habitat quality, visibility and other sensory issues, garbage and attractants issues, green space issues, high risk sites, areas, and trails, high risk natural food sites, history of human-bear conflicts, regional issues, interagency issues (i.e., areas outside the community that may potentially affect the behaviour of bears within the community), and data limitations.

Recommendations

- general recommendations, specific to the community, that will assist the community in becoming "Bear Smart" and are not in this background report should be included here. This section should include recommendations for: the bear awareness education program, securing garbage and attractants from bears, green space, bear incident reporting, data collection, interagency exchange of bear incident reports, management of "problem" people and "problem" bears (i.e., how can management of human-bear conflicts in the community be improved, other issues, interagency commitment to reduce human-bear conflict,

- identify gaps in knowledge, and
- recommendations for subsequent phases of hazard assessments.

Example Outline for Human-Bear Conflict Management Plan

The bear management plan should be developed based on the Preliminary Hazard Assessment, information collected by the Bear Stewardship Committee and the information in this report. The plan should include, but not be limited to, the following sections.

Introduction

Goals and Objectives

Responsibilities

- who is responsible for what parts of the plan?

Interagency Cooperation to Reduce Conflict

- how will agencies co-operate?

Human-Bear Conflict Education Program

- how the education program be delivered?

Bear-Proof Waste Management System

- how will waste management issues be addressed?
- what bear-proof structures will be used and what criteria will be used to select placement sites?
- how will carcasses be removed or disposed of?

Waste Management Bylaws

- what bylaws will be developed?
- how will bylaws be developed?

Green Space Management Strategies

- how will green space be managed?

Community Planning Strategies

- how will community development plans address human-bear conflict issues?
- how will ecosystems around the community manage for bears?

Human-Bear Conflict Monitoring System

- who will develop and maintain the monitoring system?
- how will bear observations and human-bear conflict be reported?

Annual Reports

- who is responsible for writing annual progress reports?
- what is the review processes?
- how will recommendations be review and selected for implementation?

Research Priorities

- what information is needed to manage human-bear conflict and what are their priorities?

Implementation Plan

- who will do what, when and how?

Program Budget

- what are the costs of various bear management strategies?
- make recommendations on a budget cycle to finance implementation of the plan.

Example Outline for Annual Progress Report for Education Programs

The following is an example of information to include, but should not be limited to, in a progress report. Other information that will assist in the future delivery of the program should also be included.

Introduction

Goals and Objectives

Methods

- including all methods used to disseminate information and methods used to monitor success.

Results and Discussion

- including a summary of staff and volunteer activities, number of households, businesses, and agencies visited, events attended, schools and students reached, media relations, identification of hazardous area, sites

and practices that were focused on, media relations, bear-proofing and elimination of attractants progress, and surveys, and
- the level of success achieved through various methods.

Recommendations

- recommendations for subsequent delivery of and improvement to the program delivery, and
- identify gaps in existing knowledge that are important to the continuing delivery of the program.

Appendices

- including media coverage, educational materials distributed, school program outline, and data collection and survey forms,
- program budget.

Example Outline for Annual Progress Reports for the "Bear Smart" Community Program

The annual progress report should include the following:

Introduction

Objectives

Methods

Summary of "Bear Smart" Committee Meeting

Progress Report and Results

- Preliminary Hazard Assessment
- Bear Education Program
- Waste Management System
- "Bear Smart" Bylaws
- Green Space Management System
- Community Planning Strategies
- Human-Bear Conflict Monitoring System, including map display of data collected

Discussion

- summary of annual progress, including the level of success achieved for various methods and strategies used.

Recommendations

- recommendations for continuation of or adaptation to strategies to resolve human-bear conflicts,
- research priorities, including recommendations for Detailed Hazard Assessments, and
- recommendations for continuing development and implementation of the "Bear Smart" Program.

Program Budget

- year completed program budget, and
- forecast budget for the upcoming year.