

# **Bear Hazard Assessment for Prince George, British Columbia**

## *Application for Bear Smart Community Status Phase I*

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*"When we put our houses and cabins next to good bear habitat, the onus falls on us to learn how to live with bears."*

Chuck Schwartz, chief researcher with the federal Yellowstone Interagency Grizzly Bear Study team.

Cover Photo: Male black bear using cover adjacent to a roadway. Copyright© Lana M. Ciarniello.

### Disclaimer

This document was prepared in accordance with the Bear Smart guidelines for conducting a Provincial bear hazard assessment (Davis et al. 2002) and uses expert knowledge and recent data to address the potential risk of human-bear conflict within the city of Prince George. Input was also provided by the Conservation Officer Service, Northern Bear Awareness Society members, University of Northern British Columbia staff, City staff, the public, and others. This report is based on the most accurate information available; however, ***bears are wild animals that can occur anywhere in Prince George at any time and the author assumes no liability with respect to use and application of the information contained herein.***

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## EXECUTIVE SUMMARY

The following *Bear Hazard Assessment for Prince George, British Columbia: Application for Bear Smart Community Status Phase I* is the first phase of a series of 6 steps required for Prince George to achieve Provincial Bear Smart Status as established by the BC Ministry of Environment (Davis et al. 2002):

Steps	Description of Activity	Completed for Prince George
1	Prepare a Bear Hazard Assessment using the criteria outlined.	√
2	Prepare a bear-human conflict management plan designed to address the bear hazards and land-use conflicts identified in the hazard assessment.	In progress at time of report
3	*Revise planning and decision-making documents to be consistent with the bear-human conflict management plan.	
4	Implement a continuing education program directed at all sectors of the community.	√
5	*Develop and maintain a bear-proof municipal solid waste management system.	
6	*Implement "Bear Smart" bylaws prohibiting the provision of food to bears as a result of intent, neglect, or irresponsible management of attractants.	

\*Fulfillment of these steps requires partnership between the Northern Bear Awareness Society, the Conservation Officer Service, and the City of Prince George, which is currently being worked towards.

This document presents a problem analysis for the City of Prince George in which the results of the analyses will be used to form the basis for a management plan aimed at reducing the number of bears destroyed and preventing bear-human conflicts (Phase II of the Bear Smart requirements). The hazard assessment rates the probability of selected areas for creating problem bears and/or negative bear-human encounters and concludes by detailing bear hazards by select neighbourhoods, schools and Parks.

The reader is reminded that hazard ratings represent the likelihood of a bear becoming food conditioned and/or habituated to humans, which increases the probability of a negative bear-human encounter and/or destroying the bear(s). Hazard ratings *do not* represent the probability of simply encountering a bear but rather the hazards that exist for the development of ‘problem’ bears and the potential for a negative bear-human encounter. For example, one would have a greater likelihood of encountering a bear at Otway during spring and summer than on Ridgecrest Road in the Hart Highlands but the hazard associated with encountering a bear is rated higher for the residential area and lower for Otway. For more on methods for hazard ratings refer to Section 3.4.

**Readers of this hazard assessment are asked to keep in mind these Notes of Caution:**

- Bears are wild animals and can occur anywhere on the landbase at any time. Prince George is situated within prime interior bear habitat and all areas of the City have the potential to have a bear present. Therefore a ‘problem’ bear(s) could be present within an area assigned a rating of “low”.



- Not all areas were surveyed due to budget limitations and the size of the City of Prince George. It is possible that some hazards were not identified.
- Field assessments were completed in 2008, which was also a year with abundant berry productivity and lower bear complaints (to date) than previous years. Bear sign within the City may not have been as prevalent had the field work been completed in a year with more bear complaints.

*For further limitations to Please refer to Section 7.0 Potential Data Limitations.*

**Some selected report highlights include:**

- ❖ Prince George is within bear habitat and lies at the confluence of 2 major rivers: the Nechako and the Fraser Rivers. The natural topography of the landscape funnels wildlife movement towards the “bowl.” This means that bears will be a part of Prince George and surrounding areas.
- ❖ The focus of this report is to examine the hazards present for bears within the City and Regional District of Fraser Fort George in order to determine ways bears can fulfill their life requirements while also reducing the number of negative encounters for bears and humans.
- ❖ Prince George has one of the highest records of bear complaints and numbers of bears destroyed in the province.
- ❖ The premise behind achieving “Bear Smart” status is to move from reactive management of “problem” bear behaviour to applying a proactive approach.
- ❖ Achieving provincial Bear Smart status requires a commitment by the City of Prince George where the City must lead by example, for example by instituting a bylaw addressing the storage of garbage.
- ❖ Achieving provincial Bear Smart status requires an alliance between the City, the Regional District of Fraser Fort George, the Conservation Officer Service, and the Northern Bear Awareness Society.
- ❖ 2,124 bear occurrences ( $\bar{x} = 531/\text{yr}$ ) were reported within City limits for 2004-2007 (4-years).
- ❖ The majority of bear reports were from densely populated neighbourhoods that backed onto large tracks to undeveloped land.
- ❖ Highest number of occurrence reports that persisted throughout the 4 years: (1) College Heights; (2) Charella Gardens; (3) Hart Highlands upper and lower, (particularly the Hoferkamp road and Inverness Trailer Park areas to the south Hart); and, (4) Foothills immediately west and east of the Nechako River Bridge / Moore’s meadow.
- ❖ Bears sighted by the public were the most common occurrence reported followed by problems with garbage.

- ❖ After removing sightings and not recorded occurrences from the database, 68% of the remaining reports were due to garbage, 17% were bears attracted to fruit on trees, 13% were bears attracted to domestic items, and 2% were bears that had been injured or orphaned.
- ❖ Of the non-natural attractant categories by season: Spring bears feeding on garbage; summer garbage decreased and problems with fruit trees increased; and, fall problems with garbage increased to highest level of the 3 seasons, problems with fruit decreased slightly from summer but remained.
- ❖ Bear reports were highest in the fall, followed by the summer, and spring.
- ❖ 17 of approximately 50 elementary, middle and high schools (34%) in Prince George and surrounding area reported bears on or immediately adjacent to their property (2004-2007).
- ❖ All schools assessed had non-bear resistant garbage receptacles on their properties.
- ❖ A number of schools had vegetation overgrowing the fence line and poor lines of sight between the school and play area(s).
- ❖ The majority of schools with bears reported were within neighbourhoods identified as being primary areas with a history of bear reports, particularly College Heights and the Hart Highlands.
- ❖ 624 bears have been recorded destroyed within the city of Prince George and surrounding areas (1994-2007), with 135 (22%) destroyed in the last 4 years (2004-2007).
- ❖ The majority of bears destroyed were black bears (91% versus 9%).
- ❖ The discrepancy between the criteria used to destroy a bear and results from the database suggest a problem with the way Bear Occurrence Reports are recorded by the Conservation Officer Service.
- ❖ Highest number of bear deaths within the City by neighbourhood: College Heights and Charella Gardens to the south and Hoferkamp Road-Inverness Trailer Park in the lower Hart Highlands (3 areas).
- ❖ Clusters of bear destructions within the City appear to be related to green-spaces, and identified travel routes and movement corridors.
- ❖ Some residents of the Hart Highlands area believe the introduction of the automated system increased problems with bears and garbage in their neighbourhood, while the City claims it has reduced problems with bears.
- ❖ To date, the introduction of the automated residential garbage system does not appear to have reduced or increased bear complaints or destructions.
- ❖ Residential and commercial garbage was readily available to bears and was not being managed to reduce bear conflicts.
- ❖ The majority of Prince George residents appeared to keep their automated garbage cans in non-bear resistant locations.

- ❖ Some residents report switching to storing their garbage receptacle outside since the introduction of the automated system because they stated that they bin was “designed to be kept outdoors”.
- ❖ Primary hazards associated with transfer stations were: (1) improper user compliance resulting in garbage being left outside the bins and/or bin lids left open; (2) insufficient frequency of emptying bins resulting in garbage overflowing (volume of garbage received was too large for the number of bins); (3) chain link perimeter of transfer stations (particularly those in remote areas) were not complete and/or gates were left open at night; and, (4) lack of proper bear aware user information signs.
- ❖ Improper management of fruit on trees, even in densely populated residential areas with numerous bear complaints such as the Hart Highlands, was noted and contributes to the conditioning of bears caught within or attracted to these areas.
- ❖ Natural bear foods were in abundant supply within the City due to clearing forested areas which increases the amount of light thereby allowing for the release of the shrub and herb layers.
- ❖ Numerous early seral habitats were present adjacent to residential areas due to clearing associated with the mountain pine beetle epidemic and these areas are expected to become more productive for berries for a period of years.
- ❖ The distribution of high-quality natural food resources, such as berry producing species, will shift in response to changes to the landbase.
- ❖ As Prince George continues to develop and expand the spatial distribution of bear problems/occurrence reports will also shift in response to shifts in distribution of natural bear foods and habitat loss.
- ❖ Access for bears to artificial food sources is greatly enhanced by the numerous green spaces within the urban areas such as the Varsity Creek corridor retained off of the Fraser River providing a network of trails through College Heights.
- ❖ The retention, connectivity and spatial layout of the green spaces within the City provide numerous travel corridors for bears and other wildlife. These green spaces provide access routes from the surrounding undeveloped landscape and ultimately act to filter wildlife into the urban areas. This is especially evident in College Heights and Charella Gardens.
- ❖ A number of the large and small parklands, such as Otway and Forests for the World, back onto large tracks of undeveloped habitat. This spatial structure of the landscape allows for bears to live near the City while the numerous non-natural attractants available in these periphery areas draws bears into the City and ultimately makes “problem” bears (i.e., food conditioned and human habituated).
- ❖ The most apparent issue for the high occurrence of bears reported and destroyed in the College Heights area was connectivity of the retained human-use trail network.
- ❖ The Hart Highlands and Foothills/Moore’s Meadow areas contained abundant easily accessible garbage available from residential, commercial and City run sources.

- ❖ College Heights, Charella Gardens, Hart Highlands (north and south), and Hoferkamp Road/Aberdeen are a threat to both bears and humans and require immediate management and mitigation techniques to avoid negative encounters, food conditioning, and habituation of bears to humans.
- ❖ The University of Northern British Columbia backs onto undeveloped land and bear problems were reported. Garbage overflowed from student housing outside residence buildings and stories were reported of students throwing pizzas out windows to attract bears and watch them feed.
- ❖ Some bears may get caught in town where green-spaces end at residential areas or green-space configuration acts to filter bears into residential areas.
- ❖ Other bears likely live on the periphery of the City and slowly acquire conditioned behaviour in the outlying areas soon becoming attracted into urban Prince George where abundant residential and commercial garbage and fruit on trees were available.
- ❖ If not managed, the cycle of creating and destroying problem bears can result in population sinks where animals are attracted to areas that result in high mortality. Over time population level consequences for the surrounding areas may result.
- ❖ The association between humans and food can result in serious injury or even death of a person(s) as bears become bolder in their attempts to attain food rewards. To reduce this risk, available non-natural attractants within the City and Regional District areas must be appropriately managed.

## **1.0 INTRODUCTION**

Prince George, BC, has one of the highest records of bear complaints and numbers of bears destroyed in the province. Black and grizzly bears inhabit areas surrounding Prince George, although black bears are more frequently encountered. In 1998, the Omineca Bear Human Conflict Committee (OBHCC) was formed by a group of concerned residents to address bear-human conflicts and bear destroyed within the city limits. In 2000, the OBHCC developed the Northern Bear Awareness Society (NBA) with the goal of promoting public awareness on issues such as bear behaviour and learning. The goal of the NBA, as overseen by the OBHCC, was to focus on reducing “problem” bear behaviour, human-bear conflicts, and the number of bears destroyed within the city of Prince George. Despite considerable efforts, such as working with the City to install bear resistant garbage containers in a number of parks, running a fruit exchange program, and continuous extensive public outreach programs, between 2004 and 2007, the number of bear complaints more than doubled and 135 bears were destroyed within the city of Prince George and surrounding areas. In 2006, the NBA refocused its efforts towards achieving Provincial Bear Smart Status for the City in an effort to further identify and examine ways to reduce the number of bears destroyed and the potential for negative bear-human conflicts.

Prince George is a rapidly expanding city located within bear habitat. The natural topography of the surrounding landscape tends to filter wildlife movement into a bowl area that is nestled within the confluence of 2 major river systems, the Fraser and Nechako Rivers. The resulting natural travel and movement corridors means bears will continue to inhabit areas surrounding the city and may occasionally wander through residential and commercial areas. Bears may be attracted to areas of human use as they forage, especially when non-natural attractants are available. Food rewards are often associated with nuisance behaviours as bears learn that available garbage and residential fruit trees provide abundant easily obtainable calories.

Current management of problem bears within the city of Prince George has focused on employing a reactive approach as evidenced by the large numbers of bears destroyed within and adjacent to the city limits each year. The primary concern with employing a reactive approach is that it does not address the underlying cause of the problems but rather focuses on removing bears and alleviating immediate dangers and the potential for liability issues. However, by not addressing the development of problem bear behaviour the root cause of the problem remains; the constant and predictable availability of non-natural attractants throughout the City will continue to draw new bears into the area being quick to replace gaps where others have been destroyed. This leads to a predictable cycle of destroying bears and in extreme cases can cause what biologists term a population sink. The lure of easily obtainable calories through improper garbage and other non-natural attractant management effectively draws bears into the City from the surrounding areas with unknown consequences to the surrounding/source bear numbers.

*The premise behind achieving “Bear Smart” status is to move from reactive management of “problem” bear behaviour to applying a proactive approach. Achieving a proactive approach requires the city of Prince George to dissuade bear-human interactions before they occur. Proactive management, then, is achieved largely through*

managing human-provided attractants, particularly through restricting bear access to garbage (landfills, residential garbage bins, commercial bins, etc.), discouraging the planting of fruit trees, and encouraging proper management of gardens, bird feeders, pet food, composts, livestock calving areas, and livestock carcass removal before they encourage bears to develop “problem” behaviours. Achieving provincial Bear Smart status, then, requires a commitment on the part of the City of Prince George where the City must lead by example, for example by instituting bylaws pertaining to garbage collection and the planting fruit bearing trees.

*1.1 Criteria for Phase 1 Hazard Assessment and Bear Smart Status:*

The goal of this hazard assessment follows the Province of BC’s Bear Smart guidelines for conducting a bear hazard assessment and is to “qualitatively and/or quantitatively identify existing and potential hazards in and around communities” (Davis et al. 2002:21). Specifically, there are 5 main criteria required to a Prepare a Phase 1 Bear Hazard Assessment of the community and surrounding area:

1. Identify high-use bear habitat by species (grizzly or black) in the community and surrounding area (travel corridors, natural food sources such as berry patches and salmon streams, breeding areas, denning areas, etc.)
2. Map non-natural attractants within the community and surrounding area that attract and/or are accessible to bears such as landfills, transfer stations, park and highway pull-out litter barrels, orchards, residential garage collection routes, downtown dumpsters, etc.
3. Review and map patterns of historic bear-human conflicts based on complaint records to assist with the identification of bear hazards.
4. Map human-use areas that may conflict with bear habitat such as school yards and residential areas located adjacent to heavy bush, walking trails that pass through berry patches, etc.
5. Using the above information, identify and map existing and potential bear hazards. The hazards should be mapped with a ranking scheme of high/moderate/low.

Once the Bear Hazard assessment has been completed for the community and surrounding area, there are 5 main criteria that communities must follow to be designated as Bear Smart:

*Remaining criteria for communities to be designated as Bear Smart:*

1. Prepare a bear/human conflict management plan that is designed to address the bear hazards and land-use conflicts identified in the hazard assessment.
2. Revise planning and decision-making documents to be consistent with the bear/human conflict management plan.
3. Implement a continuing education program, directed at all sectors of the community.
4. Develop and maintain a bear-proof municipal solid waste management system.

5. Implement "Bear Smart" bylaws prohibiting the provision of food to bears as a result of intent, neglect, or irresponsible management of attractants.

(The above criteria are from: <http://www.env.gov.bc.ca/wld/bearsmart/bearsminintro.html> [accessed May 28, 2007] and Davis et al. 2002).

### 1.2 Report Objectives:

The overall objective of a Phase 1 Bear Hazard Assessment as stated by the Provincial Bear Smart program is to identify “the current and potential agents of human-bear conflict that occur within the community” (Davis et al. 2002:21). This requires establishing a community-specific profile as it relates to bears, humans, and bear-human conflicts (Davis et al. 2002).

The objectives of this bear hazard assessment are to present a problem analysis specific to Prince George determined by:

1. Reviewing and mapping patterns of past bear-human conflicts based on Problem Wildlife Occurrence Reports for bears and/or Conservation Officer experience;
2. Interviewing personnel from the Conservation Officer Service, local wildlife biologists and other biologists that have worked in the area to assess:
  - 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. Examining non-natural attractants that are available within the City, such as:
  - landfills and transfer stations
  - park and highway pull-out litter barrels
  - residential and commercial garbage containment
  - orchards, honeybee colonies, and ranching and agricultural attractants
4. Identifying bear routes and travel corridors, including:
  - major non-natural features that may influence the travel patterns of bears (major roads, edges of the community, and security cover/green space within the community)
  - natural movement patterns of bears in the area (including travel corridors)
5. Identifying general bear habitat suitability within and adjacent to the City.
6. Identifying human-use areas that have high risk for conflict with bears (schools, playgrounds, community campgrounds, and residential areas located adjacent to bear habitat).
7. Identifying regional, inter-provincial and/or international issues in areas outside the community that may affect the effectiveness of the “Bear Smart” program.
8. Providing ranks of hazards as identified above (high/moderate/low); and,
9. Presenting potential data limitations.

*These objectives have been modified from the Provincial Bear Smart document (Davis et al. 2002).*

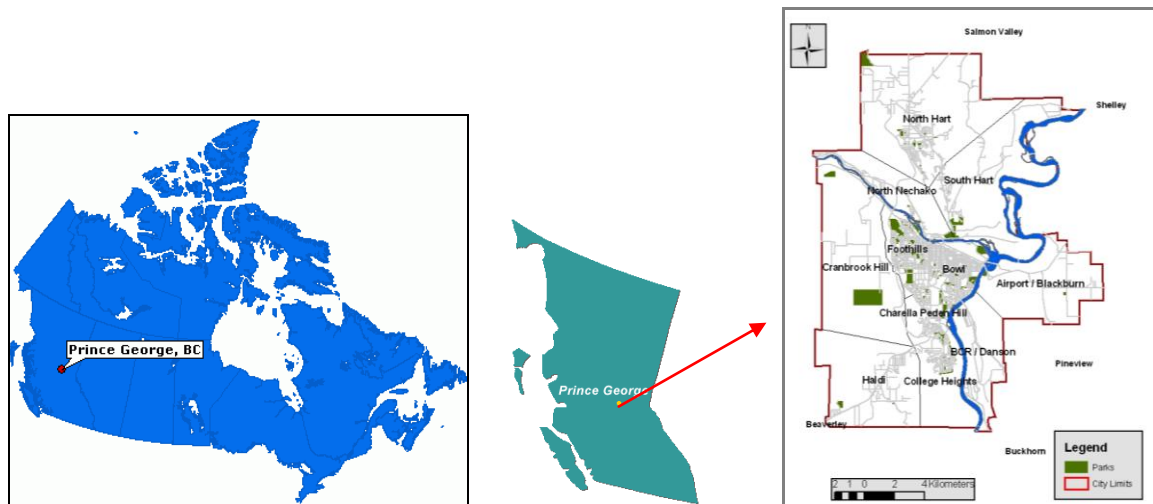
## 2.0 STUDY AREA

The city of Prince George lies at the confluence of the Fraser and Nechako Rivers in central British Columbia, Canada (53°53'N, 122° 47'W) (Figure 1). Prince George has often been referred to as the capital of the north partly because it is home to the primary pulp and paper processing mills for the northern timber industry, a rail line used to access Prince Rupert or Vancouver, the University of Northern British Columbia, and numerous large department stores and restaurants. Approximately 77,000 people live within the city and surrounding area. The average elevation is 575 metres (1,886 ft) above sea level. Yearly precipitation averages 36.5 cm (14.4") rainfall and 166 cm (5.5') snowfall. The average temperature is 16°C (60F) for July and -5° C (22.5 F) in January.

Prince George is located in the sub-boreal spruce (SBS) biogeoclimatic zone within 3 major subzones: dw3 (dry warm), mk1 (moist mild), and mh (moist hot) (DeLong et al. 1993). Most forests are a mix of white spruce (*Picea glauca*), pine (*Pinus contorta*), and subalpine fir (*P. engelmannii*). The dominant climax tree species is a mix of hybrid white spruce and subalpine fir (*P. engelmannii x glauca*) or pine stands. Black spruce (*Picea mariana*) bogs occur in lower elevation wet areas and commonly include willows (*Salix* spp.), scrub birch (*Betula glandulosa*), and sedges (*Carex* spp.). Interior Douglas-fir (*Pseudotsuga menziesii*) occurs on dry, warm sites (Meidinger and Pojar 1991). Aspen (*Populus tremuloides*), cottonwood (*Populus balsamifera*), and paper birch (*Betula papyrifera*) are present within these forests, especially along riparian areas and in areas disturbed by logging or wildfires.

The city and surrounding area is home to black bears and some transient grizzly bears. Radiocollared grizzly bears have been documented to use the Salmon Valley, Nukko Lake, Chief Lake, Nechako Bench, Lower Mud River areas, and Foothills landfill (Ciarniello unpublished data). Grizzly bear den sites have been located in the Salmon Valley and Pilot mountain areas (Ciarniello 2005). Because Prince George lies at the confluence of 2 major rivers, the Nechako and the Fraser, it is likely that the lay of the land contributes to a natural movement corridor for bears.

Figure 1. Location of Prince George, British Columbia, Canada.



\*Canada and BC image were obtained and modified from various web sites.



## **3.0 METHODS**

### **3.1 Conservation Officer Service Bear Occurrence Reports**

Areas with high potential for human-bear conflict were identified through mapping Conservation Officer Bear Occurrence reports, 2004-2007, obtained from the BC Ministry of Environment, Conservation Officer Service (Prince George, BC). These reports indicate complaints received by the public and bears destroyed by the RCMP, COS, or the public. COS reports were limited to the years 2004-2007 because of significant changes to the City of Prince George's landbase, primarily resulting from the introduction of large department stores to the College Heights area, expanding residential dwellings, and extensive land-clearing as a result of infestations of the mountain pine beetle. Therefore, complaints received prior to 2004 were not felt to be representative of the current state of the landbase. For those interested, the Northern Bear Awareness organization provides maps detailing bear occurrence reports from 1999 to present ([http://www.northernbearawareness.com/index\\_files/Page400.htm](http://www.northernbearawareness.com/index_files/Page400.htm)).

The reader is cautioned that bear occurrence reports represent those areas where bears are reported sighted and are therefore are not necessarily representative of bear use of the city of Prince George and surrounding area. For example, bear numbers are likely higher in adjacent pristine or lightly developed areas but bears are also less likely to be sighted or reported in these areas. Furthermore, rural residents appear to be less likely to report bears unless there is a direct threat to persons or property than urban residents. An additional reminder when viewing these data is that bears may be sighted multiple times by different people resulting in more than one report of the same animal to the COS. Bear occurrence reports should not be used to estimate the number of bears using an area but may provide insight into potential problem neighbourhoods.

Databases were visually searched and a preliminary list of 21 attractant types was developed. Fifteen of the 21 attractant types represented only 140 of 1,247 complaints received (11 %), and therefore were pooled for analysis purposes into 5 primary attractant categories: (1) domestic attractants which included apiary, BBQ, bird feeders, carcass, cookhouse, crops, freezers, hunter kills, and livestock; (2) fruit trees including gardens; (3) garbage; (4) sightings including bears feeding on vegetation, bears along the road, bear-dog interactions; and, (5) unrecorded. Comparison of attractant types between years was calculated using a Mann-Whitney U-test with a significance level of  $\alpha = 0.05$ .

### **3.2 Geographic Information Systems**

Bear occurrence reports and locations where bears were destroyed were plotted using ArcMap™ 9.2 (ESRI™, ArcGIS version 9.2, Environmental Systems Research Institute, Inc., Redlands, California). Plotting the UTM locations identified clusters of bear occurrences. In an attempt to identify the root cause(s) of complaints the description of each occurrence report was reviewed and the attractant type noted, such as commercial establishments, accessible garbage, topographical features and the like. Although reports and destructions in the outlying areas were examined most data presented were restricted to within the city boundaries omitting outlying areas. Plotting of the bear report locations on LandSat™ images were also used to examine how bears may be moving through and around Prince George.

### 3.3 Literature Review and Interviews

Previous research, information, and reports on black and/or grizzly bears for Prince George and Regional District of Fraser-Fort George include:

Northern Bear Awareness Society / Omineca Bear-Human Conflict Committee (1998 to present)

- Primary contact: Sandra Nahornoff
- Board of volunteer members
- Students hired yearly through the BC Conservation Corps.
- Extensive public education initiatives (schools, camps, radio, TV, newspaper)
- Year end reports available
- Public Surveys on Prince George resident attitude towards bears
- Web site: <http://www.northernbearawareness.com/>

Parsnip Grizzly Bear Project (1998 – 2004)

- Primary contact: Dr. L. Ciarniello
- 59 radiocollared grizzly bears
- Only major research project on radiocollared grizzly bears that had been conducted within and adjacent to Prince George
- Combination of GPS and VHF telemetry
- Provides bear food species list
- Provides bear use of habitat types and biogeoclimatic zones
- Yearly progress reports and study end report
- PhD thesis
- 5 peer-reviewed journal publications available
- Web Site: <http://web.unbc.ca/parsnip-grizzly/index.html>

Peace-Williston Compensation Program (2000 - 2003)

- Primary contact: M. Wood
- 12 radiocollared grizzly bears
- Combination of VHF and GPS telemetry
- Grizzly bear response to the scheduled closure of the McLeod Lake in 2001
- One progress report available (2000)
- Web Site: <http://www.bchydro.com/pwcp/index.html>

University of Northern British Columbia

1. John Prince Research Station black bear den site study (2005): Evaluating specific ecological conditions around three types of American black bear dens in central British Columbia.
  - Primary Contact: D. Hodder & R. Rea
  - Black bears incidentally encountered den sites
  - Web Site: <http://researchforest.unbc.ca/jprf/jprf.htm>
2. Directed study 4<sup>th</sup> year: student M. Anderson, title, Prince George problem bears: corridors, greenness and attractants (2007).

Numerous correspondences with Conservation Officer, G. Van Spengen were used to assess problem bear reports, problem areas, and potential access routes. Further individuals contacted included: D. Heard and D. Wilson of the Prince George Ministry of Environment; T. Hamilton of the Victoria Ministry of Environment; Marten Geertsema. BC Ministry of Forests; D. Hodder of the University of Northern British Columbia John Prince Research Forest; Sean LeBrun City Parks and Solid Waste Services; members of the Northern Bear Awareness Board of Directors; attendants present when transfer sites were visited, such as Shelly, Chief Lake, Pine View and Foothills landfill; and, any opportunistic discussions with residents regarding garbage disposal in their neighbourhoods, problems with fruit on trees, and bears in their neighbourhoods.

### 3.4 Hazard Ratings

Hazard ratings were determined based on the potential for a negative bear-human encounter. Areas with higher bear occurrence reports were rated higher than those with lower or no reports. Further, areas with bear problems within the city limits were rated higher than those outside or adjacent to city limit boundaries because of the increased amount of undeveloped landbase available to bears with farm land or large country acreages. Criteria evaluated included: (1) number of bear occurrence reports; (2) number of multi-year bear occurrence reports; (3) proximity to non-natural attractants, primarily garbage and fruit; (4) proximity to high-density city dwellings; (5) proximity to green spaces and travel corridors (natural topographical features and created green spaces); and, (6) proximity to schools.

Problem neighbourhoods identified through GIS applications were evaluated for their seasonal habitat potential, travel route capability, cover/visibility and sensory attributes, accessibility of non-natural attractants, and proximity to schools and known child-care facilities. The resulting subset of neighbourhoods with a high 'cluster' of bear occurrence reports were field visited to allow for a more quantitative assessments of site specific hazards and development of management recommendations. Ground visits were not feasible for all neighbourhoods due to funding and time constraints. Ground sampling was conducted by hiking, driving, bicycling or all terrain vehicle around previously identified neighbourhoods.

High risk areas that received on-site assessments included:

- Schools with known bear sightings or occurrences reported;
- Greenbelt trails within the city (identify representative habitat types, cover and security values, and available food items). Focus was placed on greenbelts in the lower College Heights and Hart Highland areas.
- Transfer stations and the Foothills landfill; and,
- Potential movement corridors along the Nechako and Fraser Rivers, focusing on those pass through parks, such as Cottonwood Park.

Field assessment ratings were used to examine the suitability of the habitat to support bears and were based on the amount of natural food sources, adjacent habitat, evidence of past and present bear activity, and availability of non-natural attractants. Areas were evaluated for the connectivity to continuous habitat, amount of security cover present, and amount and season(s) of bear foods present. Typically, areas rated as high

contained: (1) connectivity with larger undeveloped areas; (2) a high abundance of bear foods; (3) a variety of bear foods across multiple seasons; and, (4) available non-natural attractants. Data recorded included evidence of bear activity, cover or line-of-sight, UTM coordinates, and lists of potential bear foods and non-natural attractants. Photographs were used to document sites.

## **4.0 RESULTS**

### **4.1 WHY ARE BEARS ATTRACTED TO PRINCE GEORGE?**

Bears are not attracted to Prince George rather Prince George is within bear habitat. Prince George lies at the confluence of 2 major rivers: the Nechako and the Fraser Rivers. The natural topography of the landscape funnels wildlife movement downwards towards the valley/bowl. The Fraser River allows for North-South (and vice versa) movement of bears, whereas the Nechako allows for East-West (vice-versa) movements. Due to the placement of Prince George both movement corridors ultimately pass through the City. The slope of the land and the confluence of these 2 major rivers contribute to the increased likelihood that bears naturally travel through the Prince George area. Once within the city, there are a number of moderate to high quality bear habitats available to bears, such as riparian areas along rivers' edges, parks, green spaces, and undeveloped tracts of land. The Sub-Boreal-Spruce Biogeoclimatic Zone contains a variety of bear foods for spring and summer seasons (Table 1). The availability of bear foods combined with large tracts of undeveloped land surrounding the City allow for a permanent population of bears within and immediately adjacent to the City limits.

In the spring bears primarily forage on emergent shoots of vegetation such as grasses (graminoids), dandelions (leaves, flower heads, and roots), fireweed (green portion tops of small plants), horsetails, cow parsnip, pea vines, and clovers (Table 1). The first areas to become available to bears in the spring (i.e., green-up) are normally wet (hygric) areas, such as bogs, fens and riparian habitats. These habitats tend to be low-lying occurring in valley bottoms. During the spring season bears increase their movements likely in search of winter carrion and available green vegetation, while large May-June movements tend to be influenced by breeding opportunities. Typically, the lower elevation of the bowl area becomes snow-free earlier in spring thereby providing better foraging opportunities than higher elevations. Bears will switch to feeding on berries as soon as they are available, which is primarily during the summer. Berries are an easier source of calories for bears than green vegetation and bears capitalize on calorie-rich forage at any opportunity. In the fall, bears continue to feed on berries but once again supplement their diet with increased amounts of green vegetation, especially as the availability of berries decreases. Bears will feed on meat or carcasses whenever available because they are the highest source of nutrition.

**Table 1.** Bear foods that commonly occur throughout the city of Prince George and in the SBS biogeoclimatic zone. This table is modified from Ciarniello et al. (2003).

Latin Name	Common Name	Seasonal Use Intensity		
		Spring	Summer	Fall
<b>Trees</b>				
<i>Populus tremuloides</i>	Trembling aspen	High		
<b>Shrubs, herbs and dwarf shrubs</b>				
<sup>1</sup> <i>Amelanchier alnifolia</i>	Saskatoon	Low	High	Medium
<sup>1</sup> <i>Arctostaphylos uva-ursi</i>	Kinnikinnik	Low-medium		
<sup>1</sup> <i>Cornus stolonifera</i>	Red-osier dogwood		High	Medium
<i>Empetrum nigrum</i>	Crowberry	Low	Medium	Low
<sup>1</sup> <i>Lonicera involucrata</i>	Bracted honeysuckle		High	Low
<sup>1</sup> <i>Oploplanax horridus</i>	Devil's club		High	Low-med.
<sup>1</sup> <i>Ribes lacustre</i>	Bristly black currant		Medium	Medium
<i>Ribes oxycanthoides</i>	Wild gooseberry		Low	Low
<sup>1</sup> <i>Rosa acicularis</i>	Prickly rose	Low		Low-med.
<i>Rubus idaeus</i>	Wild red raspberry		Low	Low
<sup>1</sup> <i>Rubus parviflorus</i>	Thimbleberry		Medium	Low
<i>Salix spp.</i>	Willow	Low	Low	
<i>Sambucus racomosa</i>	Red elderberry		Low	Low
<sup>1</sup> <i>Shepherdia canadensis</i>	Canada buffalo-berry or soap berry		High	Medium
<i>Sorbus scopulina</i>	Western mountain ash		Medium	Low
<i>Sorbus sitchens</i>	Sitka mountain ash		Medium	Low
<sup>1</sup> <i>Vaccinium caespitosum</i>	Dwarf blueberry		High	Medium
<sup>1</sup> <i>Vaccinium membranaceum</i>	Black huckleberry		High	Medium
<sup>1</sup> <i>Vaccinium myrtilloides</i>	Velvet-leaved blueberry		High	Medium
<i>Vaccinium ovafolium</i>	Oval-leaved blueberry		High	Medium
<i>Vaccinium oxycoccus</i>	Bog cranberry	Low	Medium	Low
<i>Vaccinium scoparium</i>	Grouse-berry			Low
<i>Vaccinium uliginosum</i>	Bog blueberry		Low	
<i>Vaccinium vitis-idaea</i>	Lingonberry		Low	Low
<sup>1</sup> <i>Viburnum edule</i>	Highbush cranberry		High	Medium
<b>Forbes</b>				
<i>Angelica arguta</i>	White angelica	Low	Low	
<i>Aster spp.</i>	Aster species	Medium	Low	Low
<i>Astragalus spp.</i>	Milk vetch	Medium		Medium
<i>Caltha leptosepala</i>	Alpine white marsh marigold		Low	
<i>Epilobium angustifolium</i>	Fireweed	High	Low	
<i>Epilobium ciliatum</i>	Purple-leaved willowherb	Low		
<sup>1</sup> <i>Equisetum arvense</i>	Common horsetail	High	Medium	
<sup>1</sup> <i>Equisetum pratense</i>	Meadow horsetail	Medium	Medium	
<i>Erythronium grandiflorum</i>	Glacier lily	High	High	Low
<i>Fragaria virginiana</i>	Wild strawberry		Low	
<sup>1</sup> <i>Heracleum lanatum</i>	Cow parsnip	High	Medium	Low
<i>Hieracium albiflorum</i>	White-flowered hawkweed	Low		
<i>Lathyrus ochroleucus</i>	Creamy pea vine	Low		Low
<i>Lysichiton americanum</i>	Skunk cabbage		Low	

Latin Name	Common Name	Seasonal Use Intensity		
		Spring	Summer	Fall
<i>Menyanthes trifoliata</i>	Buckbean	Medium		
<sup>2</sup> <i>Osmorhiza species</i>	Sweet cicely	Low		High
<i>Pedicularis bracteosa</i>	Bracted lousewort	High	Low	
<i>Petasites sagittatus</i>	Arrow-leaved coltsfoot	Low		
<i>Potentilla palustris</i>	Mash Cinquefoil	Medium	Low	
<i>Rubus pubescens</i>	Dewberry		Low	
<i>Senecio triangularis</i>	Arrow-leaved groundsel		Low	
<i>Streptopus amplexifolius</i>	Twisted-stalk	Low	Medium	Low
<sup>1</sup> <i>Taraxacum officinale</i>	Common dandelion	High	Low	Medium
<sup>1</sup> <i>Trifolium repens</i>	White clover	High	High	Low
<sup>1</sup> <i>Trifolium pratense</i>	Red clover	High	Medium	Low
<i>Urtica dioica</i>	Stinging nettle	Medium	Low	
<b>Ferns</b>		<b>Medium</b>	<b>None</b>	<b>None</b>
<sup>1</sup> <i>Athyrium filix-femina</i>	Lady Fern	Medium		
<i>Dryopteris expansa/assimilis</i>	Spiny wood fern	Low		
<i>Matteucia struthiopteris</i>	Ostrich fern	Medium		
<b>Gramminoids</b>		<b>High</b>	<b>Medium</b>	<b>Low</b>
<i>Bromus species</i>	Bromes	High	Low	
<i>Carex species</i>	Sedges	Medium		
<i>Deschampsia caespitosa</i>	Tufted hair grass	Low	Low	
<i>Poa species</i>	Bluegrass species	High	Medium	
<i>Trisetum spicatum</i>	Spike trisetum	Low		
<b>Other Sources</b>				
<i>Formicidae</i>	Ants	Low	High	Low
<i>Vespidae</i>	Wasps		Low	
<i>Ungulate/bear</i>	Carcasses	High	Low	High
<i>Alces alces</i>	Moose (adult & calf)	High	Low	Medium
<i>Ursus arctos</i>	Grizzly bear	Opportunistic	Low	
<i>Ursus americanus</i>	Black bear	Opportunistic		Low
<i>Castomomus commersoni</i>	Common white sucker	Low		
<i>Castor canadensis</i>	Beaver	Medium		
<b>Human Influenced Foods</b>				
Alfalfa		Medium	Low	
Carcasses	<i>Ungulate</i>	Opportunistic		
Domestic cow	<i>Carcass</i>	Opportunistic		Low
Fruit trees (planted)		Low	High	High
Garbage		High	Medium	High
Gut piles	<i>Ungulate</i>	Opportunistic		Medium
Oats			Medium	High

<sup>1</sup>Common plants of the SBS zone

<sup>2</sup>Primarily digging by grizzly bears.

There are likely 2 types of black bears in Prince George: residents and transients. The large areas of undeveloped land surrounding, for example, Forests for the World and adjacent areas are large enough to contain the home ranges of a few resident black bears, particularly females. Transient bears are those that are using the river systems and movement corridors to travel north-south or east-west through the City in search of breeding opportunities, seasonal food resources, and/or their own home range (i.e., recently dispersed subadult males). Research suggests that grizzly bears are transient to the City area largely due to their large home range sizes (Ciarniello et al. 2003). Resident and transient bears may become attracted to certain areas of the City because of the readily available and abundant non-natural attractants, such as garbage and ripe fruit on trees. The potential for creating problem bears, and therefore for negative bear-human encounters within the City, is greatest due to the availability of these attractants.

#### 4.1.1 Habitat Characteristics of Black and Grizzly Bear Den Sites in Prince George

One black bear den site has been reported within the City limits across from the penitentiary (M. Geertsema pers. comm.) and it is highly probable that more bears den within the City. The City contains habitat characteristics suitable for den sites (Table 2). Both grizzly bear and black bear den sites have been investigated adjacent to the City limits. Grizzly bear den sites have been located in the Salmon Valley, Nukko Lake, and Pilot Mountain areas (Ciarniello et al. 2003). Two of these dens were excavated into the side of small slopes while 1 was under the cut stump of a Douglas fir tree (Photo 1, Ciarniello et al. unpublished). Black bear den sites have been located in the Saxton Lake area (M. Geertsema pers. comm.) and UNBC's John Prince Research Forest (D. Hodder pers. comm.). Hodder et al. (2005) provide characteristics of black bear den sites located in the SBS dw3 and mk1 that could be used to predict areas suitable for black bear den site areas within the City limits (Table 2).

Photograph 1. Den site used by a radiocollared grizzly bear under the root of a cut Douglas fir tree in the Pilot mountain area of Prince George, BC.



Note: Out of 86 den sites located on the Parsnip Grizzly Bear Project was the only den located under a cut stump and is considered atypical.  
Photo ©: Lana M. Ciarniello

**Table 2.** Characteristics of black bear den sites in the John Prince Research Forest in Central British Columbia as identified by Hodder et al. (2005).

Den site Characteristics	Den Types		
	Excavated	<sup>1</sup> Tree hole	Rock cavities
Aspect	various	various	various
Slope	mid to upper	valley bottoms	mid to upper
Soils	sandy, loamy minor clay well drained	sandy soils (alluvial floodplains) wet	exposed bedrock & boulder piles very dry
Moisture regime	mesic	hygric	xeric

<sup>1</sup>Requires large DBH trees, mainly cottonwoods.

#### 4.2 HISTORY OF BEAR SIGHTINGS AND OCCURRENCE REPORTS

##### 4.2.1 Bear occurrence reports by neighborhood

From 2004-2007, 2,124 bear occurrences were reported within the City limits to the Prince George COS ( $n$  [2004] = 204,  $n$  [2005] = 490,  $n$  [2006] = 553,  $n$  [2007] = 877). Areas with the highest number of bear occurrence reports were Hart Highlands, Charella Gardens, College Heights, and west Foothills areas (Figure 2). The majority of bear reports were from areas along the boundaries of urban development, particularly the western boundary (Fig. 2). These areas contained urban dwellings that tend to back onto largely undeveloped bear habitat. Few reports occurred in “sparsely-populated areas like Blackburn and Cranbrook Hill, despite abundant bear habitat” (Anderson 2007). Areas such as Hoferkamp road and west Nechako bench have a higher probability of grizzly bear occupancy because they back onto undeveloped tracks of land and are adjacent to river corridors. With the exception of 2007, few complaints were reported within the bowl area where intensive urban development occurs.

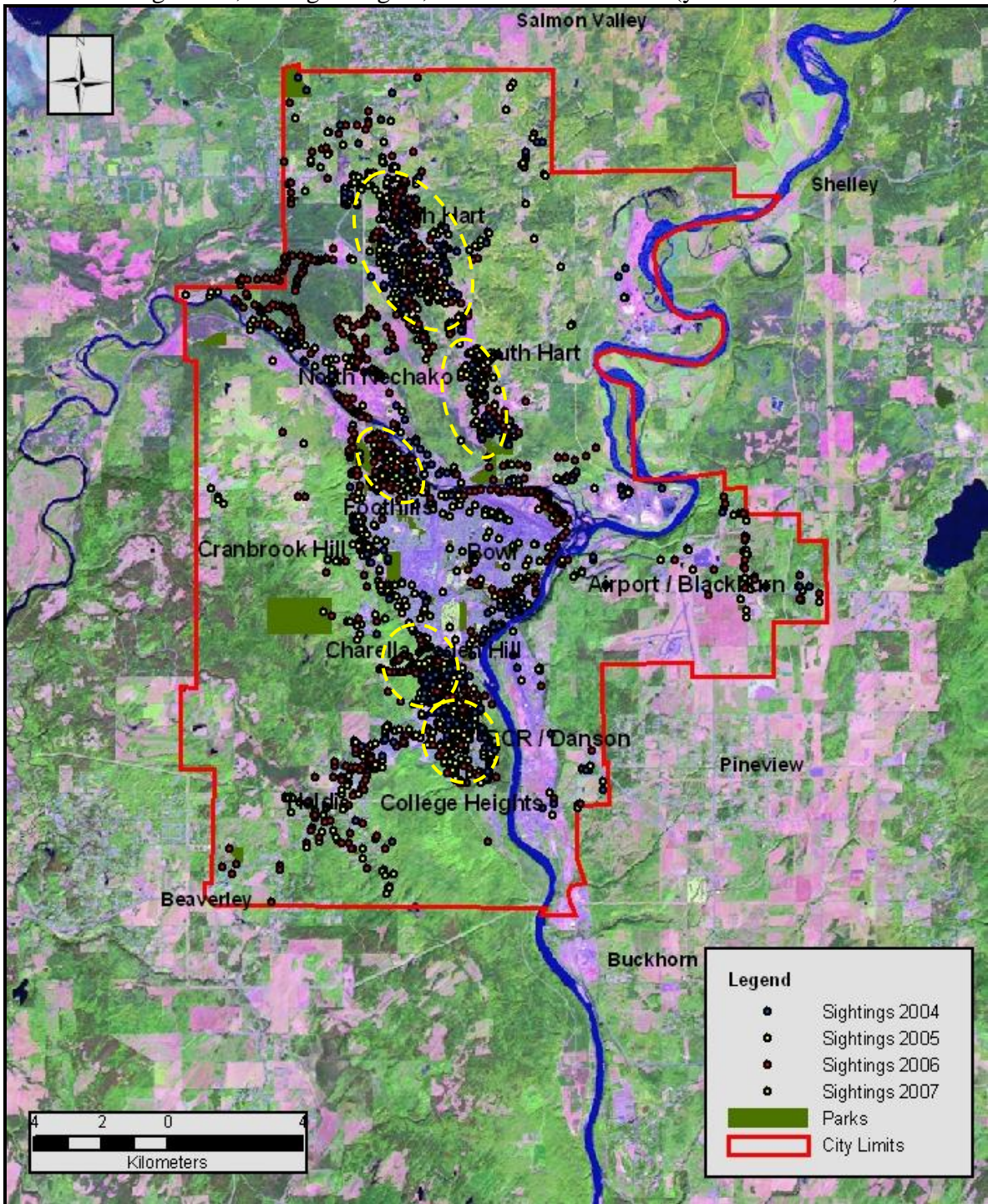
Anderson (2007) used a kernel analysis to identify “hotspots” of bear occurrences throughout the city. Her analysis revealed the following primary occurrence locations for 2004: North Hart Highlands, Hoferkamp road, College Heights, and the Fort George Park; in 2005: Hart Highway at Northwood Pulp Mill Road, Noranda Road Charella Gardens, College Heights trailer park, and west Foothills at the Nechako River; in 2006: Hart Highlands, Hoferkamp road, College Heights, Charella Gardens, Lafreniere, and Foothills at the Nechako River (Anderson 2007). 2007 had higher occurrence reports than previous years but a similar distribution; however, more occurrences were reported downtown and on the periphery of City, which can be expected as development rapidly expands into forested areas.

The primary cluster areas with a history of bear reports that persisted throughout the 4 years were:

- College Heights
- Charella Gardens
- Hart Highlands upper and lower, particularly Hoferkamp road and Inverness Trailer Park areas in the south Hart
- Foothills west and east of the Nechako River Bridge / Moore’s meadow, and
- Outskirts/periphery of the City



Figure 2. Bear sightings for the city of Prince George, BC, 2004-2007. Notice how each year sightings clustered along the outskirts of town and in specific neighbourhoods, such as the Hart Highlands, College Heights, and Charella Gardens (yellow dashed lines).



*Plotting occurrence reports to identify clusters areas aids in targeting management actions, such as where to focus the installation of latches for the automated garbage collection system.*

#### 4.2.2 Bear Occurrence Reports by Attractant Category

Bear occurrence reports provided by the public listed 21 activities of the bear at the time of the report. These 21 activities have been combined into 5 primary categories (Table 3).

**Table 3.** List of attractant categories recorded by the COS for the city of Prince George, 2004-2007. The category column represents the combined category the attractant was placed within for analysis purposes. An \* indicates attractants reported for grizzly bears as well as black bears.

Original Activity Reported	No. Reports	Combined Activity Category
Apiary	1	(domestic attractant)
BBQ	4	(domestic attractant)
*Bird feeders	63	(domestic attractant)
Carcass	1	(domestic attractant)
Compost	10	(domestic attractant)
Cookhouse	1	(domestic attractant)
Crops	2	(domestic attractant)
*Dog	12	(sighting)
Freezer	4	(domestic attractant)
*Fruit trees	129	
Fruit trees & secondary reason	5	(fruit trees)
*Garden	11	(fruit trees)
*Garbage	538	
Garbage & secondary reason	42	(garbage)
*Hunter kills	3	(domestic attractant)
*Injured/orphaned	21	(2007 only)
*Livestock & livestock feed	15	(domestic attractant)
*Pet food or pets	5	(domestic attractant)
Pool	1	(domestic attractant)
Road	49	(sighting)
*Sighting	682	
Vegetation	36	(sighting)
*Not recorded	489	
<b>Total</b>	<b>2124</b>	

\*Also recorded for grizzly bears.

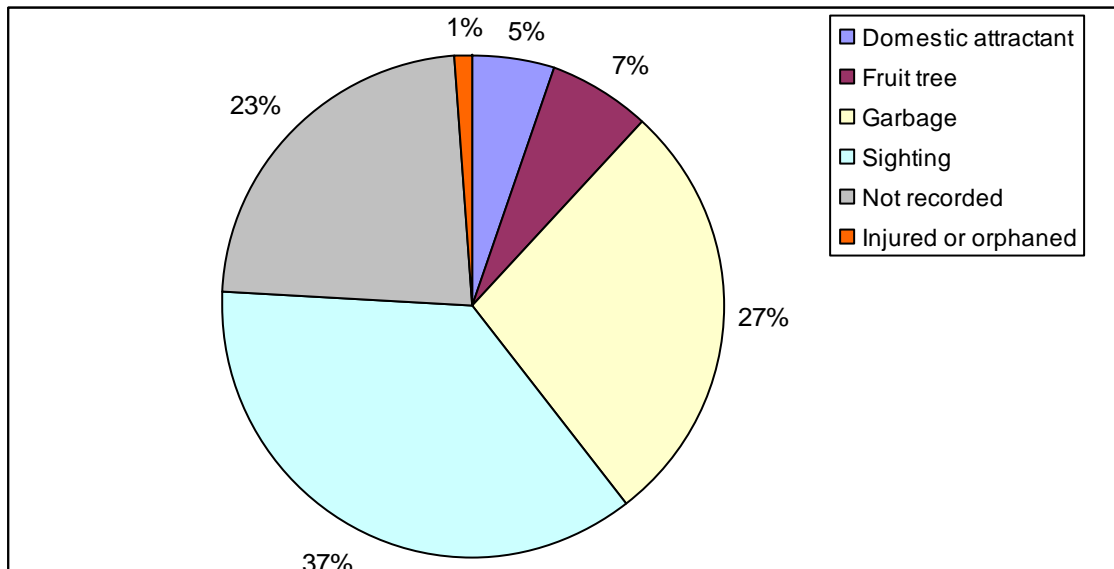
In 2007, 52% of calls to the COS centre lacked information on an attractant type or sighting (Table 4). For 2004-2006, reports of attractant types between years were consistent and variation between years was not significant ( $P = 0.95$ ). The highest bear occurrences for those years were bears reported “sighted” by the public, which included bears feeding on vegetation or sighted along roadsides. The next highest recorded activity was bears feeding on garbage, followed by bears attracted to fruit trees, and lastly, domestic attractants (Table 4).

Excluding 2007 due to the large number of not recorded attractants, for all years combined bears sighted by the public was the most common occurrence reported followed by problems with garbage (Table 4, Figure 3). Conservation Officer G. Van Spengen believes that a number of the activities recorded as sightings actually involved bears that obtained garbage and therefore have been wrongly recorded in the database. Consequently, numbers provided for garbage may be higher than those reported here. The remaining attractant types (i.e., fruit trees, domestic, and not recorded) accounted for 36% of occurrences reported for 2004-2007 but only 13% when 2007 is omitted due to the large number of unreported occurrences in that year.

**Table 4.** Number of bear complaints recorded by the COS by year, 2004-2007, for each of the main attractant categories. Also provided is a subset of the number of reported grizzly bears.

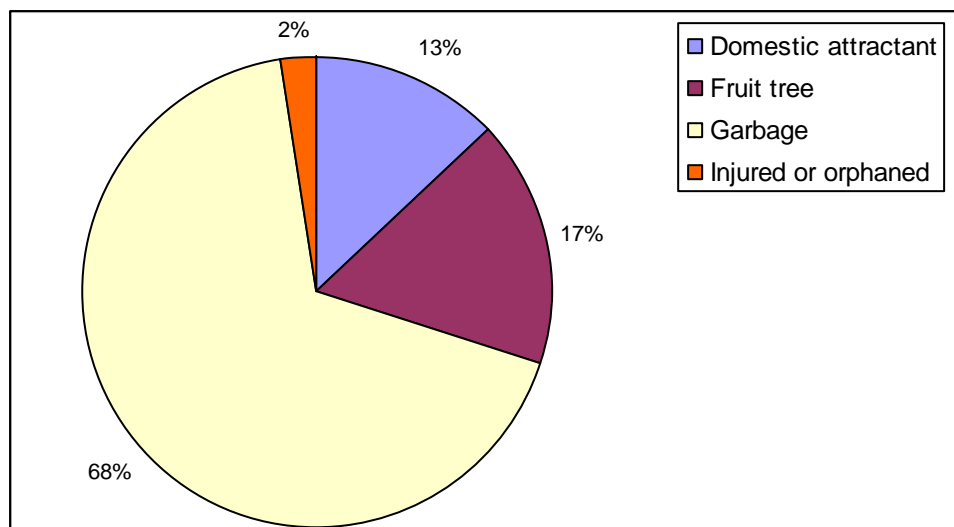
Attractant	Year	No. Reported		Total	Percent (%) by Year	Percent (%) 2004-2007
		Black bear	Grizzly bear			
Domestic	2004	10	1	11	5	
Fruit tree	2004	13		13	6	
Garbage	2004	39		39	19	
Sighting	2004	141		141	69	
Not recorded	2004	0		0	0	
<i>2004 Total</i>		<i>203</i>	<i>1</i>	<i>204</i>	<i>100</i>	
Domestic	2005	19		19	4	
Fruit tree	2005	23		23	5	
Garbage	2005	134		134	27	
Sighting	2005	312	2	314	64	
Not recorded	2005	0		0	0	
<i>2005 Total</i>		<i>488</i>	<i>2</i>	<i>490</i>	<i>100</i>	
Domestic	2006	22	1	23	4	
Fruit tree	2006	33		33	6	
Garbage	2006	152	3	155	28	
Sighting	2006	295	14	309	56	
Not recorded	2006	33		33	6	
<i>2006 Total</i>		<i>535</i>	<i>18</i>	<i>553</i>	<i>100</i>	
Domestic	2007	56	2	58	7	5
Fruit tree	2007	73	3	76	9	7
Garbage	2007	247	4	251	29	27
Sighting	2007	14		14	2	37
Not recorded	2007	443	14	457	52	23
Injured/orphaned	2007	20	1	21	2	1
<i>2007 Total</i>		<i>853</i>	<i>24</i>	<i>877</i>	<i>100</i>	<i>100</i>
<b>All 5 Years</b>		<b>2079</b>	<b>45</b>	<b>2124</b>		

Figure 3. Percent of occurrence reports recorded by the COS for each of the main attractant categories, 2004-2007.



Given that an undetermined number of sightings and not recorded occurrences may have actually been related to bears being attracted to available garbage (G. Van Spengen pers. comm.) those categories were removed from the database (Figure 4). Of the remaining reports 68% were due to garbage, 17% were bears attracted to fruit on trees, 13% were bears attracted to domestic items, and 2% were bears that had been injured or orphaned (Figure 4).

Figure 4. Percent of occurrence reports for the non-natural attractants categories (i.e., excluding bear sightings) recorded by the COS, 2004-2007.



Bears forage on a number of different food items dependent upon the season, digestibility of forage, and availability of foods. Within the City, reports of bears are highest in the fall, followed by the summer, and spring (Table 5). During the spring green-up season (den emergence through mid-July as defined by Ciarniello et al. 2003) natural fruits and berries are generally not available to bears and therefore bears will forage primarily on green vegetation (see Section 4.1 above). Garbage is a higher source of calories for bears than green vegetation and accounted for 26% of the spring occurrence reports, followed by attraction to domestic items (10%), and reports of bears attracted to fruit trees (0.5%). Bear occurrence reports within the City increased during the summer (15 July to 20 September) coinciding with the ripening of fruit on trees and a number of berry species. Reports of bears feeding on garbage decreased during the summer to 18% of occurrence reports, while fruit increased to 10%, and domestic attractants were 4%. In the fall (21 September to den entry) reports of bears feeding on garbage again increased to 34%, while attraction to fruit on trees accounted for 7%, and domestic attractants were 4%.

**Table 5.** Bear occurrence reports by year, season, and attractant type for Prince George, BC and surrounding area, 2004-2007.

<sup>1</sup> Season	Year	Domestic Attractant	Fruit Tree	Garbage	Sighting	Not recorded	Injured / orphaned	Total
Greenup	2004	2	0	5	34	0	0	41
	2005	3	0	5	30	0	0	38
	2006	12	1	46	76	0	0	135
	2007	22	1	48	0	105	7	183
<b>Subtotal green-up</b>		<b>39</b> <i>(10%)</i>	<b>2</b> <i>(0.5%)</i>	<b>104</b> <i>(26%)</i>	<b>140</b> <i>(35%)</i>	<b>105</b> <i>(26%)</i>	<b>7</b> <i>(2%)</i>	<b>397</b> <i>(19%)</i>
Summer	2004	3	5	5	36	0	0	49
	2005	9	10	35	138	0	0	192
	2006	5	15	41	109	1	0	171
	2007	10	43	47	11	185	6	302
<b>Subtotal Summer</b>		<b>27</b> <i>(4%)</i>	<b>73</b> <i>(10%)</i>	<b>128</b> <i>(18%)</i>	<b>294</b> <i>(41%)</i>	<b>186</b> <i>(26%)</i>	<b>6</b> <i>(1%)</i>	<b>714</b> <i>(34%)</i>
Fall	2004	6	8	29	71	0	0	114
	2005	7	13	94	146	0	0	260
	2006	6	17	68	124	32	0	247
	2007	26	32	156	3	167	8	392
<b>Subtotal fall</b>		<b>45</b> <i>(4%)</i>	<b>70</b> <i>(7%)</i>	<b>347</b> <i>(34%)</i>	<b>344</b> <i>(34%)</i>	<b>199</b> <i>(20%)</i>	<b>8</b> <i>(1%)</i>	<b>1013</b> <i>(48%)</i>
<b>Total</b>		<b>111</b>	<b>145</b>	<b>579</b>	<b>778</b>	<b>490</b>	<b>21</b>	<b>2124</b>

<sup>1</sup>Definition of seasons follows Ciarniello et al. (2003) where spring = den emergence to 14 July, summer = 15 July to 20 September, and fall = 21 September to den entry.

#### 4.2.3 Bear Occurrence Reports for Schools

School District No. 57 has 35 elementary schools, 1 middle school, and 10 secondary schools. A few private and/or religiously oriented schools also occur within the City. Seventeen schools have reported bears within their school grounds or immediately adjacent areas from 2004-2007 (Table 6). The majority of these schools are within neighbourhoods previously identified as being primary areas with a history of bear reports, particularly the College Heights and Hart Highlands neighbourhoods. Two schools (Westside Christian and Immaculate Conception) are on the south side of Highway 16 west leading into urban Prince George. One school was located in Central Fort George (Carnie Hill Elementary). For bear attractants at the University of Northern British Columbia please refer to section 5.1.6-B. UNBC Compost Facility and University Grounds.

**Table 6.** Schools with reported bear sightings and destructions for Prince George and surrounding area, 2004-2007.

School Name	Area	Year
Austin road elementary school	Hart Highlands (Austin west)	2005, 2006
<sup>1</sup> Beverley Elementary School	Beaverley	2004
<sup>1</sup> Buckhorn Elementary School	Buckhorn (South-East)	2006
Carney Hill Elementary School	Central Fort George (Bowl)	2005
College Heights Elementary School	College Heights	2005
College Heights Secondary School	College Heights	2007
<sup>2</sup> Glenview Elementary	Hart Highlands (Glenview)	2006, 2007
Heather Park Middle School	Hart Highlands (Austin west)	2006, 2007 (x4)
Hart Highland Elementary School	Hart Highlands	2007
Immaculate Conception School	College Heights (Westgate)	2006, 2007
Kelly Road Secondary School	Hart Highlands	2007
<sup>3</sup> Malaspina Elementary School	College Heights	2006
Quinson	Foothills (Bowl)	2007
Sacred Heart School	Bowl	2005
Vanway Elementary School	College Heights (east Lafrenier)	2007
West Wood Elementary School	Bowl (lower Peden/Charella)	2007
Westside Christian School	Highway 16 West (College Heights)	2004

<sup>1</sup>Outside city limits.

<sup>2</sup>Grizzly bear reported

<sup>3</sup>Trail between Rochester Crescent & Malaspina Elementary School

#### 4.3 BEARS DESTROYED IN PRINCE GEORGE AND SURROUNDING AREA

##### 4.3.1 Number of bears destroyed

From 1994-2007 (14 years), 624 bears have been recorded destroyed within the city of Prince George and surrounding areas (Table 7). One hundred and thirty-five (22%) of those bears were destroyed in the last 4 years (2004-2007). The reader is

cautioned that only those data for 2004-2007 have been verified and checked and therefore errors in the 1994-2003 data may have been included.

From 2004-2007, the majority of bears destroyed were black bears (91% versus 9%). More black bears were destroyed within the city limits than the surrounding areas. No grizzly bears were destroyed within the city limits; however, in 2007 a grizzly bear was relocated from Hoferkamp road and was shot by a rancher at the release site. In addition, some grizzly bears were destroyed in areas immediately adjacent to the City limits (e.g., Salmon Valley).

Bear destructions were highest in 2005, followed by 2007, 2006, and 2004 (Table 7). Due to suspected irregular entries into the bear occurrence database, it has been stated that the number of bears destroyed in 2004 under-represents the actual number of bears destroyed but more detailed records were not available (G. Van Spengen pers. comm.). There is no difference in the number of bears destroyed since the introduction of the automated garbage system in 2005 (2005 date listed on the City's web site; Figure 5).

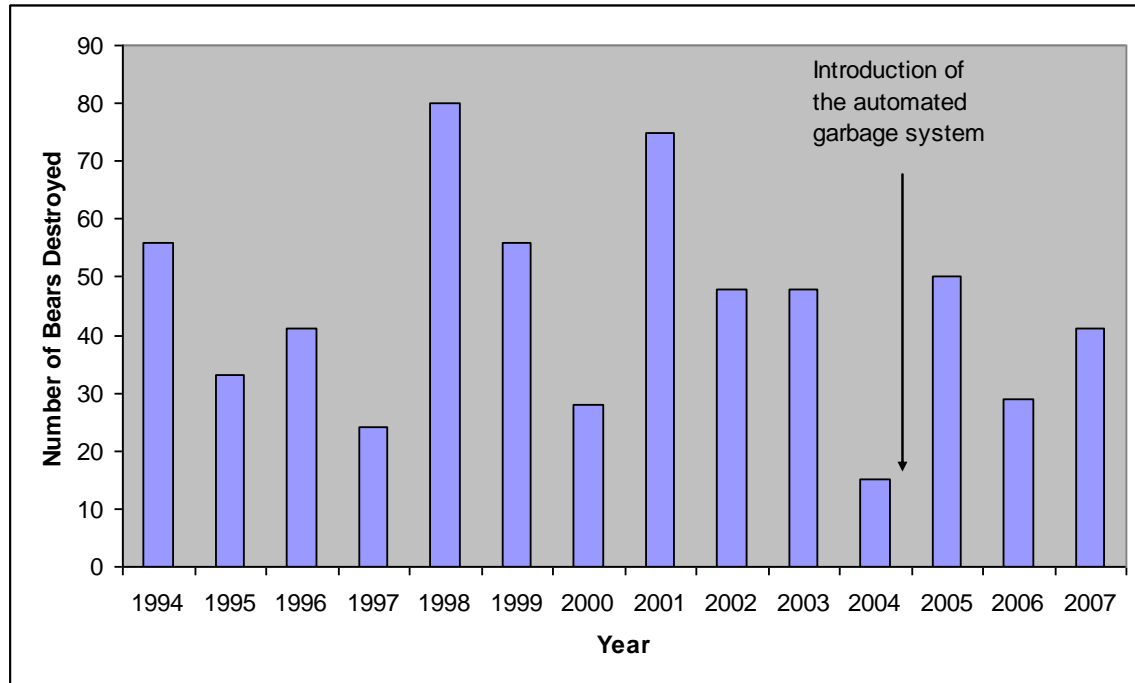
Although forage productivity was not measured for these years it is likely that the number of bears destroyed varied according to the amount of natural forage available to bears; in years of high natural forage availability bear destructions tend to be lower than those years when natural foods are scarce. Bears are more likely to take risks and enter human-use areas in search of foods when their natural foods are scarce. Young male bears that have dispersed from their mother and are attempting to establish their own home range tend to be the primary offenders.

**Table 7.** Number of bears destroyed within the city of Prince George and surrounding areas, BC, 1994-2007. Numbers in brackets indicate numbers of bears destroyed within City limits only.

Year	Black Bear	Grizzly Bear	No. Bears Destroyed	Yrs. Used to calculate Mean	Mean No. Bears Destroyed	Standard Error
1994			56			
1995			33			
1996			41			
1997			24	1994-97	38.5	6.8
1998			80			
1999			56			
2000			28			
2001			75	1998-01	59.75	11.8
2002			48			
2003			48			
*2004	14 (11)	1	15	2002-04	37	11
*2005	44 (26)	6	50			
*2006	27 (20)	2	29			
*2007	38 (27)	3	41	2005-2007	40	6.1
<b>Total</b>			<b>624</b>			
<b>2004-2007</b>	<b>123 (84)</b>	<b>12</b>	<b>135</b>			

\*Data were only recorded by species beginning in 2004.

Figure 5. Number of Bears Destroyed (Black & Grizzly) for Prince George and Surrounding Areas, 1994-2007.



As stated by the Conservation Officer Service the criteria for destruction of a bear in Prince George are:

- the bear must be in an area where previous complaints have been reported; and,
- the bear must be considered food conditioned (G. Van Spengen pers. comm.).

Food conditioning is defined by the COS as bears feeding on garbage, feed left in bird feeders, or fruit on trees, and is determined based on the types of complaints in the area and at the discretion of the Conservation Officer (G. Van Spengen pers. comm.). However, when querying the COS Bear Occurrence Reports the primary activity contained within the database was bears reported as sighted (46%) followed by not recorded, garbage, fruit trees, and domestic attractants. The discrepancy between the criteria used to destroy a bear and results from the database suggest a problem with the way Bear Occurrence Reports are recorded. For example, in 2007 the COS stated that all bears destroyed were feeding on accessible garbage or fruit on trees with the exception of injured or orphaned bears (G. Van Spengen pers. comm.). However, when examining the data obtained from the Provincial Occurrence Reports in Victoria the majority of bear destructions ( $n = 19$ ) had no associated reason for the destruction. *The reasons associated with why bears were destroyed helps determine which management actions*



should receive priority, such as available fruit and garbage; therefore, it is paramount that these data are systematically and correctly recorded.

Four percent of the overall bear occurrence reports resulted in destruction of the bear(s) (Table 8). However, when viewing this result the reader should keep in mind that although attempts were made to remove repeat calls from the database a number of the occurrence reports received are likely the same bear. Excluding the categories “Sightings” and “Not Recorded” bears feeding on garbage was the primary reason associated with bear destructions followed by feeding on fruit on trees.

**Table 8.** Attractant category resulting in the death of the bear for the city of Prince George, BC, 2004-2007. Bear deaths outside the City limits have been removed from analysis. Percents are in relationship to the grand total of bear attractant categories for the combined 4 years.

Attractant Category	Year				Total	% of overall reports by yr. resulting in bear death	% death by attractant type
	2004	2005	2006	2007			
Domestic attractant	1	1	1	0	<b>3</b>	3	4
*Fruit tree	0	0	0	6	<b>6</b>	4	7
Garbage	0	8	2	0	<b>10</b>	2	12
*Injured/orphaned	0	0	0	2	<b>2</b>	14	2
Sighting	10	17	12	0	<b>39</b>	3	46
Not recorded	0	0	5	19	<b>24</b>	44	29
<b>Total</b>	<b>11</b>	<b>26</b>	<b>20</b>	<b>27</b>	<b>84</b>	<b>4%</b>	<b>100%</b>

#### 4.3.2 Location of bears destroyed

Three areas previously identified as primary areas with a history of bear reports had the highest number of bear deaths within the City: College Heights and Charella Gardens to the south and Hoferkamp Road-Inverness Trailer Park in the lower Hart (Figure 6). Unlike previous years in 2007 a number of bears were destroyed in the North Hart Highlands as well as in the downtown Bowl. *The clusters of bear destructions helps to determine the high priority areas for management of green-spaces, movement and travel corridors in an attempt to dissuade bears from entering these areas.*

Travel routes and corridors were developed without examining the location of bear destructions (refer to Section 4.4 for methods used in potential travel routes and corridors placement); however, plotting potential movement routes and corridors against the location of bear destructions appeared to reveal a pattern - clusters of bear destructions within the City appear to be related to green-spaces, and identified travel routes and movement corridors (Figure 7). It may be possible to reduce the attractiveness and connectivity of these cluster areas to bears through various management techniques thereby potentially reducing the number of bears destroyed.

Figure 6. Location of bears destroyed within the city of Prince George, BC, 2004-2007. Notice how the destructions cluster in Charella Gardens, Upper College Heights, and Hoferkamp Road-Inverness Trailer Park as identified by the yellow dashed lines.

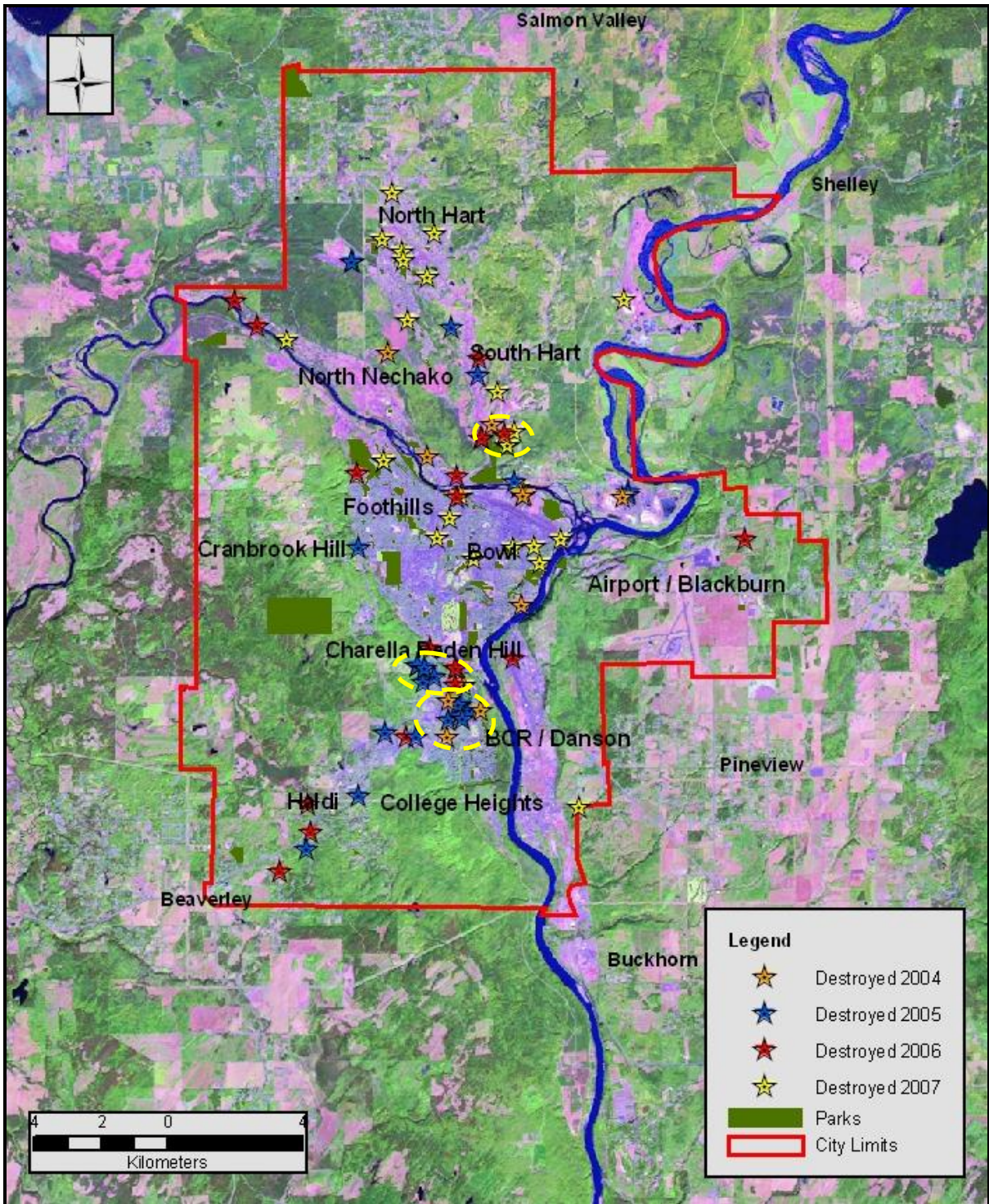
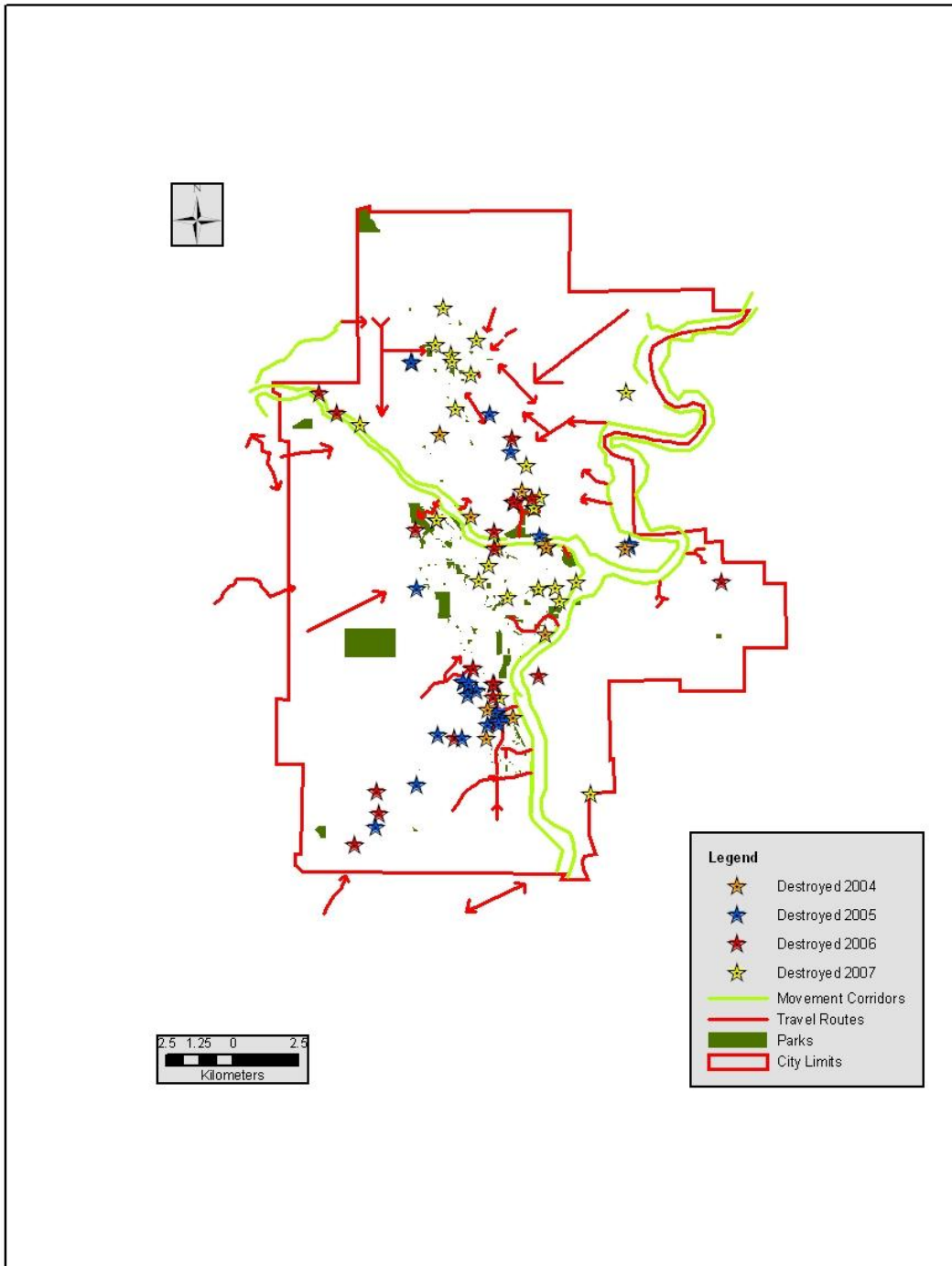


Figure 7. Location of bears destroyed within the city of Prince George, BC, 2004-2007, as they relate to green-spaces, identified travel routes and corridors. Destructions appear to follow a pattern of being associated with identified green-spaces, travel routes and movement corridors.



#### 4.4 POTENTIAL CORRIDORS AND TRAVEL ROUTES

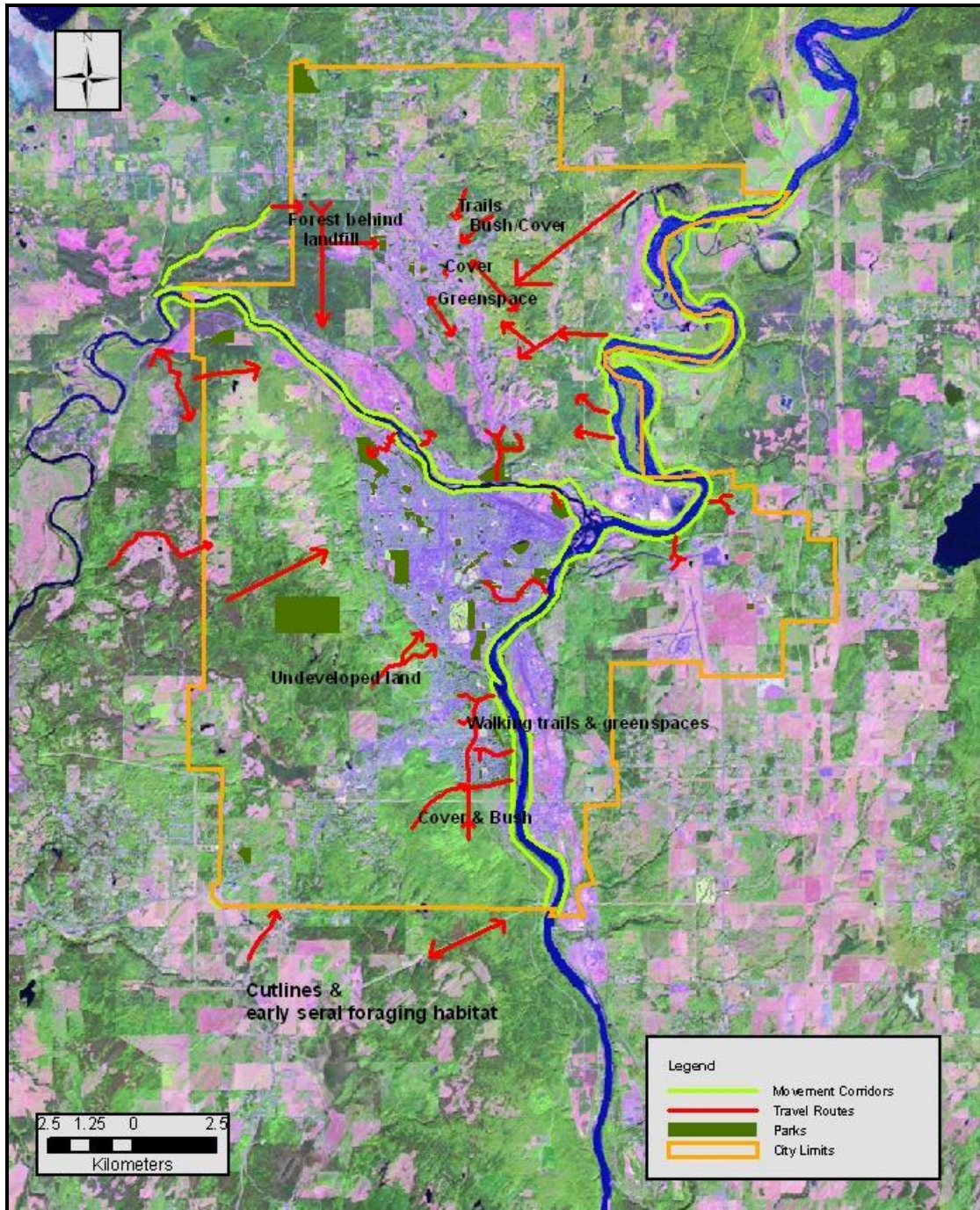
A number of potential travel routes and corridors have been mapped for bears (Figure 8). Corridors tended to follow the edge of the Nechako and Fraser Rivers, with the exception of areas where the bank becomes too steep. Travel routes tended to follow drainages and creeks. Bears are known to travel along areas where the River's edge remains somewhat flat and lush riparian habitats are present. Areas with steep sided topography where the slopes fall sharply towards the river are less likely to be used as travel corridors. In those areas bears will move to the upper bank to travel. For example, the west side of the Fraser River after Cottonwood Island park, passing through Fort George Park to the Hudson Bay Slough is likely an irregularly used travel route by bears due to steep sided terrain and limited river's edge available for travel. Therefore, the lay of the land tends to force bears into Fort George Park to travel along the upper edge of the Park's terrain. It is expected that there would be increased use by bears of retained green-spaces in these areas as bears attempt to stay within forested security cover. Bears that have found themselves in areas where human development severs natural movement corridors tend to be forced into closer distances with humans and development. For example, using the upper edge of the Park or retained green-space human-use trails acts as a filter for these bears to be attracted into town. Bears accessing interior residential areas of urban Prince George and Carrie Jane Gray Park likely do so when attempting to travel through this area presumably by the Hudson Bay Slough immediately to the south of Fort George Park. Bears accessing downtown may use the backchannel of the Fraser River between Cottonwood Park and the highway bridge.

From the Northwest, radiocollared grizzly bears have been located in Gavin's canyon, the undeveloped forest behind Foothills landfill (Pidherny), south to the Nechako bench, and across the Nechako River to the Lower Mud River (Ciarniello unpublished data). The lack of fencing on the west side of the Foothills landfill, which backs onto undeveloped forest lands, allows bears access to the landfill area. Both black and grizzly bear tracks have been noted at the Foothills landfill area (Ciarniello unpublished data) and 2 black bears have been destroyed by the COS at the landfill site. The amount of undeveloped habitat from the northeast Hart Highlands affords bears close proximity to residential areas. The extensive network of walking trails and bush brings bears and humans into close proximity. Easily accessible residential garbage and access to the Foothills landfill leads to food conditioning of bears using these areas. The Hoferkamp Road area is likely accessed by bears using the large tracks of surrounding forested habitat to the north and east. The south bank to the Nechako River travel corridor is believed to be too steep to filter bears into the Hoferkamp and Inverness areas.

Large tracks of undeveloped land surround the south-west portion of urban Prince George. College Heights contained a travel corridor along the River's edge with numerous walking trails that access interior urban College Heights. The extensive cover and bush allows bears to travel into the interior of this residential area. Easy access to unsecured garbage attracts bears into homes that back onto these retained corridors. Although it is possible that a few bears may cross over from the College Heights area into Charella Gardens it is more likely bears accessing Charella do so using travel routes that follow drainages off of the south side of Forests for the World, crossing Tyner Boulevard, following the ephemeral drainage behind Ginter's Hill (Figure 8). If new urban residential areas expand from the Tyner Boulevard development north towards UNBC

and east to Ospika road complaints are expected to shift from Charella Gardens to Tyner Boulevard.

Figure 8. Potential bear corridors and travel routes through the city of Prince George, BC. Corridors tend to follow the major river systems while travel routes tend to follow drainages leading from the corridors and those areas where undeveloped landscapes and trails remain.



## **5.0 NON-NATURAL ATTRACTANTS AND HAZARD RATINGS FOR PRINCE GEORGE AND SURROUNDING AREAS**

### **5.1 NON-NATURAL ATTRACTANTS**

#### **5.1.1 Residential Garbage Containment**

In 2004/2005 the City changed the residential garbage program to an automated collection system for every household within the City limits. The City purchased garbage containers that were designed to be “placed curbside on their collection day” and emptied using an articulating arm

([http://www.city.pg.bc.ca/city\\_services/solidwaste/automatedgarbage/](http://www.city.pg.bc.ca/city_services/solidwaste/automatedgarbage/); accessed Sept 4, 2008).

The articulating arm on the collection vehicles allows the driver to remain within the vehicle and not handle the bins. During the development of the automated system the Northern Bear Awareness Society worked closely with the City to change to bear resistant bins. At the time, the City did not want the additional cost of bear resistant bins and there also were concerns with the possibility of residents forgetting to release the bear resistant bin latches resulting in the bin not being emptied and anticipated associated complaints from homeowners.

Despite NBA supplying designs to the City that had been implemented in other areas of the Province the City did not purchase any bear resistant containers for the automated system. Rather, homeowners were provided with their choice from three sizes of non-bear resistant receptacles: a large 360 litres (95 gallons is equivalent to four average-size garbage cans), medium 250 litres (65 gallon), and a small 135 litres (35 gallons). Residents are required to wheel carts to the curbside before 8:00am the day of collection and remove the containers from the roadway no later than 7:00pm (City web site; accessed Sept 4, 2008).

NBA also urged the City to adopt a ‘bear-friendly’ garbage storage bylaw, which was stated to hold particular importance if the new bins were not to be bear resistant. At that time, the City stated that a bylaw placing enforceable time restrictions on garbage curbside placement and removal may negatively affect shift workers and could be met with resistance from residents. As of September 8, 2008, information on the City’s web site under the section frequently asked questions: where do I store my carts states: “*Most residents choose to store carts in a convenient location such as their carport, garage or at the side of their house. The footprint (dimensions at the base of the cart) is not appreciably larger than average-size garbage containers.*”

To date, the introduction of the automated garbage collection system does not appear to have reduced or increased (i.e., no effect) the number of bears destroyed within the City limits (see Section 4.3.1, Figure 5) contrary to suggestions that it has contributed to reducing human/bear conflicts:

“The implementation of automated garbage collection has also contributed to reducing bear/human conflict. The fixed lid automated carts reduce bear attractants by reducing odours and significantly impairing the ability of crows and dogs to rip apart garbage bags at curbside, events that attract bears. In addition, when the City distributed collection carts to residents, NBA took the opportunity to attach to the carts brochures on reducing bear/human conflict.”

*Staff Report to Council. Dated June 19, 2006. To George Paul, City Manager from Bill Gaal, Manager of Parks and Solid Waste Services.*

During field assessments of neighbourhoods it was apparent that for all neighbourhoods assessed the majority of residents stored their bins in open carports and/or adjacent to their house. Bears can easily access these containers and a number of residents, particularly in the North Hart Highlands, voiced concerns with bears accessing garbage from these bins. Residents also noted an apparent increase of storing bins in non-bear resistant locations since switching to the automated system. A few residents stated that these garbage cans were meant to be kept outside due to their design and structure. Even in neighbourhoods with high bear use and destructions there appeared to be a general lack or ignorance of ways to deter bears from entering ones' property through proper garbage storage (Photographs 2-4).



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Photographs 2 and 3 - This resident made "Beware of Bear" sign was located immediately across the street from the house in photograph #3 that pictures a half-full automated garbage bin outside the front window despite having a 2-car garage available for garbage storage (Charella/Peden area). Numerous digs for ants and feeding on berries were recorded starting just 50 meters up the trail from the sign (July 23, 2008).

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Photograph 4. This residence was located just outside of the Inverness trailer park and appears to be the typical way of storing automated garbage cans, even in this high bear destruction area (July 10, 2008).

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### 5.1.1- B Trailer Park Garbage Containment

In trailer parks homes and property are smaller and tend not to contain areas where garbage may be secured from bears. A number of bears have been destroyed at the Inverness trailer park each year. The Inverness trailer park backs onto a track of undeveloped habitat that remains connected to large tracks of forested land. The trailer park itself was kept clean but the majority of residents stored their garbage immediately outside their homes (Photo 5). Single dwelling home owners in the Inverness area also stored garbage bins in non-secure locations (Photo 4 above). A central bear-resistant location was not available at the Inverness Trailer Park; however, it was noted that some trailer parks within the City have switched to bear resistant bins. The Sintich trailer park noted a significant reduction in bear problems since changing their garbage handling policies and installing a bear-resistant container (G. Van Spengen).



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Photograph 5. Residents of trailer parks often do not have a place to store their garbage bins and the majority of homes had bins located in carports or outside their back doors. This home had 3 bins located to the right of the stairs (July 10, 2008).

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The Caledonia Trailer Park offers a large, open bin where residents can deposit their garbage. However, the bin did not contain a lid, emitted a foul odour, and garbage overflowed from the bin (Photo 6). Garbage in this bin can be easily obtained by a bear. The Caledonia Park backs onto large tracks of land associated with the Pidherny Triangle and the Foothills landfill.



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Photograph 6. This large bin served the residents of the Caledonia Trailer Park off North Nechako and backs onto large expanses of undeveloped land surrounding the Pidherny Triangle to the North and the Nechako River to the South. Abundant bear sign was located in this area (July 17, 2008).

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### 5.1.2 Commercial Garbage Containment

Commercial establishments in Prince George tended to use the same type of garbage containers (Photos 7 & 8). The bin in Photograph 7 may be made bear resistant by keeping the metal lid shut and latched. The bin in photograph 8 requires changing the plastic lid to metal and in its current state is not considered bear resistant.



Photograph 7. Behind Save On Foods and other shops in College Heights mall (July 9, 2008).



Photograph 8. Typical commercial bin with plastic lid. These are also popular at schools and other City establishments.

A number of commercial establishments reported problems with bears. For example, the College Heights Pub noted bears in their garbage and grease bins. Garbage receptacles at the Pub were contained within a wooden perimeter fence; however, the odour associated with the garbage was evident and the storage area was not bear resistant. Further, staff noted that on occasion they leave garbage beside the bin or the bin lid open. The Pub is immediately adjacent to lush stream habitat with berries and some spring forage items. At the time of the assessment there was a bear that slept on the sand in front of the pub. Bear problems are so persistent at the Pub that employees are walked to their cars nightly. The night before the assessment a bear was reported in the pick up box of one of the employee's trucks. The handling of garbage and grease and the placement of the Pub along a strip of connected forested habitat means bears will be attracted to the Pub area. An employee claimed that the perimeter of the Pub was planned to be fenced with chain link this fall or next spring specifically to reduce bear problems.

Other establishments, such as the Pumhouse Pub stored their grease in barrels directly outside the establishment (photo 9).



Photograph 9. Grease barrels outside Pumhouse Pub at Noranda Road. In addition to these there were 3 open 45-gallon drums at the adjacent playing field and a large garbage bin that required a new lid (July 10, 2008).

### 5.1.3 City Placed Open Garbage Bins

A list of 100 non-bear resistant garbage bins was developed. Some bins were associated with high ‘problem’ bear neighbourhoods in green spaces (photo 10) or bus stops (photo 11). Bins will require removal, new lids, or changing to bear-resistant varieties.



Photograph 10. This garbage bin was located at the end of Bernard Street off Domano in lower College Heights in a residential area rated as “high” for problem bears (July 9, 2008).



Photograph 11. This can was chained to bus stop, close to a green area and Moore’s meadow. It smelled of garbage (Foothills Blvd just south of Freimuller Street). Additional ‘bus stop’ cans were noted along Foothills Boulevard (July 17, 2008).

### 5.1.3-B. Park Bins Non-Bear Resistant

In 2005, at the urging of NBA, council approved a \$20,000.<sup>00</sup> Capital Expenditure Program and replaced 15 park bins with bear resistant garbage cans. In 2006-07, an additional 10 containers were replaced. Unfortunately, in 2008 the capital project for bear proof litter containers did not make the short list for funding (T. Kadla pers. comm.). Some additional containers remain within Parks, such as Cottonwood (Photo 12) and Fort George Park that require changing to bear-resistant options. In addition, regular park maintenance is required to minimize bear-human conflicts in areas where bear resistant bins have been installed (Photo 13). Park employees should regularly clean up litter, empty and inspect containers.



Photograph 12. This garbage can was located between west Cottonwood Park & Heritage Trail and requires immediate changing (July 24, 2008).



Photograph 13. Garbage left at the base of the Sybertech can at Moore’s meadow. The lid of the can is also open (July 10, 2008).

### 5.1.4 Fruit Trees

The most common tree bearing fruit encountered on residential properties was mountain ash (*Sorbus spp.*; Photo 14), followed by apple trees (Photos 16 & 17), and planting of berries (such as raspberries; Photo 15). In July 2007, two sibling black bears were reported feeding on mountain ash berries in the Charella Gardens area, where they also broke apart the resident's compost bin.



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Photograph 14. Residential mountain ash trees with abundant fruit. This property is off Foothills Boulevard close to Moore's meadow.



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Photograph 15. Residential property in the College Heights area containing an automated garbage can, garden and planted raspberry bushes. This residence was located on Gladstone just up from the bear warning sign (July 9, 2008).

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Photograph 16. Apple tree with abundant fruit that hangs over onto the trail behind the houses in the Hart Highlands. Bear sign was noted along the trail (July 10, 2008).



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Photograph 17. Abundant crab apple trees were located along the trail that follows the Nechako River across from Moore's meadow (513580 5976363; July 14, 2008).

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### 5.1.5 Agricultural Attractants (orchards, honeybee colonies, and ranching)

Prince George is surrounded by agricultural activities. Ranching of cattle and sheep and planting of hay and oats appear to be the primary agricultural activities. There does not appear to be one area of the City/outskirts that is worse for agriculturally related bear problems than the others. Rather, problems with agricultural attractants and bears tend to shift depending on the year, crops planted, animals farmed, availability of natural attractants and the like.

The COS states that sheep are the primary animal agricultural attractant to bears in the area as they appear to be “easy targets” (G. Van Spengen pers. comm.). In 2005, a grizzly bear was destroyed for killing sheep in the Pineview area. The bear was reported sighted following streams leading from the Tabor Mountain area to Pineview (G. Van Spengen pers. comm.). In the first week of September 2008, an approximately 800 lb male grizzly bear was destroyed by the COS for killing sheep and a black bear at a farm in the Salmon Valley area of Prince George. The bear was old as evidenced by a number of missing and extremely worn teeth (G. Van Spengen pers. comm.). In the spring of 2008, a black bear was killing goats in the Willow River area and was removed by COS; however, problems between bears and goats tend to be minimal. The COS rarely receives problem reports with cattle and bears. Rather problems with cattle in the area are primarily due to predation by wolves and coyotes (G. Van Spengen pers. comm.).

Bears are known to be attracted to oat fields where their foraging behaviour causes extensive damage to the crop (Ciarniello et al. 2001, 2002; Photo 18). In 2000, the Parsnip Grizzly Bear Project reported that the most commonly fed upon non-natural attractant was oats in the fall (Ciarniello et al. 2001). The Project trapped 3 additional female grizzly bears in a privately owned forested stand adjacent to an oat field during attempts to recapture a female grizzly bear that had dropped her collar after feeding on oats in his field. The farmers reported not planting oats in 2001 to deter grizzly bears from loitering around their residence (Ciarniello 2002). The COS reports few bear destructions in association with oat fields although it is possible that ranchers and farmers may be removing bears themselves and not reporting it to the COS (G. Van Spengen pers. comm.).

There are a few honeybee colonies around Prince George and surrounding areas but the COS reports that the majority of hives are contained within an electric fenced perimeter. The COS does not receive complaints from owners of honeybee colonies (G. Van Spengen pers. comm.).

A noted agricultural attractant to bears within the City/outskirts is the disposal of domestic animal carcasses (Ciarniello et al. 2001, 2002, 2003). The Parsnip Grizzly Bear Project trapped one female grizzly bear with 3 cubs of the year using a cow carcass the bears had dug up in the Nukko Lake area. In addition, the Project tracked a different radiocollared grizzly bear in the Salmon Valley area to a dead cow/fetal calf carcass that the farmer had intentionally placed in a retention patch on his farm (Ciarniello et al. 2002). Intentionally disposed of carcasses were recorded throughout the Project study years and radiotracking bears lead to many carcasses disposal areas including an area that contained several domestic carcass bones and horse mane and tail. This site was associated with heavy bear sign leading investigators to conclude that it was a regular carcass disposal location for livestock (Ciarniello et al. 2001). The disposal of carcasses associated with butcher operations were also noted (Photo 19).



Photograph 18. Grizzly bear damage to an oat field in the Salmon Valley, 2000. Photo ©: Lana M. Ciarniello

Photograph 19 Disposal of animal carcasses for farms and butchers is an attractant and has been documented at a number of ranches in and surrounding Prince George. This picture was taken on the Parsnip Grizzly Bear Project where a female grizzly bear and her 2 cubs were attracted to a butcher's disposal site. Photo ©: Lana M. Ciarniello

The Prince George Regional Landfill takes horse, sheep, and other animal carcasses at \$100 per ton but *does not take* cow carcasses because of the possibility of mad cow disease (attendant at Foothills Regional Landfill per. comm. 250-962-8972). Landfill attendants recommended either burning or burying cow carcasses on the farms' property. The City (S. LeBrun and T. Kadla pers. comm..) and the COS were not aware that the Landfill did not take cow carcasses. The COS advises people to examine and follow the *Agricultural Practices Code* with respect to proper ways to bury carcasses. The COS also advises ranchers to bury carcasses in an area that is least likely to contain domestic animals at that time or in the near future.

### 5.1.6 Composts

#### 5.1.6-A. Residential Compost Bins

Bears have been reported to knock over and break residential compost bins within Prince George (Photo 19). In July 2007 in the Charella Gardens area a compost bin was tipped over and broken by a subadult sibling pair that also fed on mountain ash berries within the resident's yard. On site assessments composts were knocked over in the Hart Highlands and College Heights areas. Composts make up a small portion of the domestic attractant occurrence reports (see Table 3) and are not considered to be a significant attraction for bears by the COS. Regardless, bear investigations of compost bins are believed to contribute to food conditioned behaviour of bears within the City.



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Photograph 20. This knocked over compost lies at the base of a dig for ants and was presumably knocked over by a bear. It was located along the trail behind houses in the Upper Hart leading south towards Nechako Road (July 10, 2008). Composts were also found to be knocked over in Charella Gardens and College Heights.

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#### *5.1.6-B. UNBC Compost Facility and University Grounds*

Attendants at the UNBC compost facility reported a bear problem at the facility in the spring 2008. An assessment of the site revealed that it was located at the west side of the University backing onto large tracks of forested land that connect with Otway and Forests for the World (Photo 21). In addition, the perimeter of the site was not bear resistant and a number of naturally occurring bear foods such as berries as well as spring forbs and planted gardens were present (Photo 22). The facility itself was well maintained to minimize odours associated with compost. The attendant noted that a black bear(s) had frequented the facility for a number of consecutive years. The site assessment revealed abundant garbage associated with the nearby residence buildings (Photo 23). A bear warning sign was also posted on some walls and outside residence building doors (Photo 24). In addition, the attendant stated that students in the dorms threw pizzas out of their windows to attract bears and watch them feed. The large garbage receptacles in the residence parking lot were not bear resistant (Photo 25). The compost facility, residences and large garbage bins in the parking lots were also within hundreds of meters of the daycare. In addition, most entrance ways at the University were associated with open, 45-gallon style garbage receptacles, as were parking lots (Photo 26).



Photograph 21. UNBC compost facility with residence in back. Notice the surrounding forested habitat. All photos July 3, 2008



Photograph 22. Raspberry bushes planted in the UNBC compost facility.



Photograph 23. Overflowing garbage bin outside Keyoh Residence with daycare in background.



Photograph 24. Bear warning sign outside Keyoh Residence.



Photograph 25. This type of large bins pictured in the resident parking lot requires new lids to be bear-resistant.



Photograph 26. Parking Lot B contained 2 cans non-bear-resistant cans, which occurred near 2 bear-resistant cans.

### 5.1.7 Other Non-Natural Bear Attractants

Hoferkamp Road is a high area for bear destruction and has also had a number of grizzly bears reported. During site assessments it was noted that some people are throwing garbage off the cliff accessed from Hoferkamp Road (Photo 27a-b). A ‘no dumping’ sign was posted but ignored. The majority of garbage appeared to be large appliance items however it is possible that some residential garbage was present. Bears are likely accessing the Hoferkamp road area by moving north to south through the agricultural areas of the Salmon valley down McMillan Creek and/or by the large tracks of surrounding forested habitat to the east. Although it is less likely for bears to be accessing this area by coming up the cliff, the lower elevation habitat of the North Nechako was conducive to bears (Photo 28) and the presence of this non-natural attractant may serve to food condition and/or habituate bears to humans and their structures. Residential households along Hoferkamp Road were also noted to contain mountain ash trees.



Photographs 27a & b. Garbage thrown down cliff off Hoferkamp road (July 10, 2008).

Photograph 28. Expanse of the view surrounding the garbage thrown off Hoferkamp Road.

## 5.2 SITE ASSESSMENTS AND HAZARD RATINGS

### 5.2.1 Neighbourhood Assessment and Hazard Ratings

Four areas have been identified as high to extreme for their potential for negative bear-human interactions to occur: College Heights, Charella Gardens, Hart Highlands (north and south), and Hoferkamp Road/Aberdeen (Table 9). Three areas have been ranked as a high and 2 areas moderate to high, respectively (Table 9). Areas ranked high and extreme have human influenced attractants readily available to bears and were surrounded by tracks of forested land. These areas are a threat to both bears and humans and require immediate management and mitigation techniques to avoid food conditioning and habituation of bears to humans.

Table 9. Hazard Ratings for neighbourhoods within the city of Prince George and surrounding areas, BC.

<b>Area</b>	<b>Rating</b>	<b>Field Visit</b>	<b>Comment</b>
Aberdeen (see Hart Highlands assessment)	High	Yes	Surrounding land area available, esp. along river to east and linked up with powerline. Noranda Rd area contains lush spring forage wetlands. Available residential and commercial garbage a problem, especially in the <i>Hoferkamp road area</i> .
<sup>1</sup> Airport/Blackburn	Low to Moderate	No	Surrounding land area available. Curbside pick-up not available to portion outside city limits.
BCR/Danson	Low	No	Low residential area. This area will require assessment if residential developments are to occur.
<sup>1</sup> Beaverley	Low to Moderate	Yes	Land area available. Curbside pick-up not available. Vanway transfer station well maintained for exclusion of bears.



<b>Area</b>	<b>Rating</b>	<b>Field Visit</b>	<b>Comment</b>
Bowl (see Hudson Bay Slough assessment in Parks section)	Low	Partial/ Slough	Habitat largely developed. The Slough connects off the River and leads into the bowl area; however, the habitat becomes increasingly poorer towards Victoria Street.
<sup>1</sup> Buckhorn	Low to Moderate	No	Land area available. Curbside pick-up not available. Transfer station.
Charella/Peden Hill	<b><i>High to extreme</i></b>	Yes	Surrounding habitat on west side of Tyner Blv. Bears likely access from drainages south of UNBC/west of Tyner. Residential garbage, composts, and fruit trees available. Trails with high bear foods connect into area.
<sup>1,2</sup> Chief Lake	Moderate to Low	No	West Chief Lake areas out of city limits. Curbside pick-up not available. Transfer station. Access to fruit and domestic livestock may be a problem.
College Heights	<b><i>High to extreme</i></b>	Yes	Adjacent to travel corridor and large tracks of undeveloped land. Available residential and commercial garbage, open garbage bins, fruit available. Forested trails connect from the River into College Heights area, especially Varsity Creek. Trails have very poor line of sight.
Cranbrook Hill (see Otway assessment under Parks)	Moderate	Partial (Otway)	Hiding cover available. Surrounded by large tracks of forested stands. Large acreages. Access to available garbage and fruit was reported and may be a problem. High abundance of berries and spring wetland areas.
Haldi	Moderate to high	No	Some land area. Edge of town leads to more problems with bears. A number of bears destroyed. <i>Curbside garbage pick-up available in remote area and likely food conditions more bears.</i>
Hart Highlands – north	<b><i>High to extreme</i></b>	Yes	Includes Austin west & Glenview. Adjacent to Foothills landfill. Available garbage, open garbage bins, fruit available. Greenspace trail leading from north to south had fresh bear sign. Residents reported bears crossing Foothills Boulevard from landfill area.
Hart Highlands – south	<b><i>High to extreme</i></b>	Yes	Easily accessible garbage from Foothills landfill, residential automated bins, and the Caledonia trailer park. The change in elevation allows for spatially separated foods and a variety of foods by season.
<sup>2</sup> Hoferkamp Road (part of Hart South)	<b><i>High to extreme</i></b>	Yes	Part of Hart south but an extreme rated area as it backs onto undeveloped land, contains an illegal refuse dumping area, and residential fruit trees. McMillan Creek leads from agricultural areas of the Salmon Valley into Hoferkamp Road. Abundant non-natural attractants available. Haul-all garbage containers installed at Park but often left open.

Area	Rating	Field Visit	Comment
Lafreniere / Parkridge / Bearspaw (see College Heights assessment)	High	Partial (drive through only)	Numerous bear sightings throughout years. Outskirts of town as it expands into undeveloped habitat. Includes West Gate park which requires a bear-resistant bin. Commercial establishments require changing bin lids or switching to bear resistant bins.
<sup>1</sup> Miworth	Low-Moderate	No	Park area available with abundant summer forage and good spring forage. Curbside residential garbage pick-up not available. Transfer station often overflowing.
Nechako River – north	High	Yes	South of landfill. Trails with abundant summer forage follow the upper bank of the Nechako River. This trail backs onto residential dwellings. Curbside garbage pick-up.
Nechako River South / Foothills	Moderate to high	Yes	Adjacent to travel corridor and parks. Non-natural attractants available. Abundant bear sign noted in Moore's meadow which backs onto residential dwellings. Requires proper storage of automated garbage containers. Travel corridor along river and Wilson Park with crab apple trees. Curbside garbage pick-up.

<sup>1</sup>Outside city limits.

<sup>2</sup>Grizzly bears known to use this area.

### 5.2.1-A. Charella Gardens & Peden Hill Assessment

Three routes were assessed in the Charella Gardens and Peden Hill neighbourhoods. The first route was approximately 1.6 km and began on the east side of Tyner Boulevard at the cutblock passing through a young stand regeneration of alder and willow with a high abundance of clover, fireweed, and dandelions for spring forage and raspberries, twinberry, wild strawberries, thimbleberry, and highbush cranberry for summer. The trail descended into lower elevation areas that were moister and followed creeks and ephemeral drainages. Feeding on red elderberry was noted in these areas. Devil's club and cow parsnip was also present in wet areas but berries were not yet ripe. Bear sign was apparent throughout the route with feeding on ants, twinberries, elderberry, tracks (Photo 29), and older spring fireweed feeding. There was also an aspen tree about 10 meters off an old game trail/forest path that had in the past been climbed by a bear to approximately 40 meters (Photo 30). Other wildlife sign noted included deer tracks, moose tracks, and coyote scat. Towards the end of the route 3 large, fairly fresh digs for ants were within 16 m of each other (Photo 31) and backed onto a residential area (Photo 32). The resident made "beware of bear" sign (see Photo 2) was posted at the end of this route at Hopkins Road. Part of this area was scheduled for new development(s) lots. Residential garbage cans were noted in non-bear resistant locations and contained garbage (see Photo 3).

The second route focused on Peden Hill and particularly the green-space between Hwy 16 and Ospika. We were unable to access the entire greenbelt/forested area along

Peden Hill because the bank was very steep and trails were not present. Garbage was noted in the forest belt and there were a lot of foul odours. Due to the steep bank the assessment focused on the houses that backed onto this green-space in the lower Peden, west up Hwy 16, north across the upper houses that backed onto the green-space, and across Ospika to Bona Dea. The band of this greenbelt appears to be approximately 100 m wide and quite steep with houses back onto the top from both upper and lower sides. Some bear forage items were present, such as soap berry (*Shepherdia canadensis*) but were more abundant in clearings than the forested stand. It is unlikely that bears are accessing the Charella Gardens area from College Heights (off the Fraser River) because it would require them to cross Hwy 16 and move along this steep bank.

The third route was approximately 1.5 km long and began at the end of Bona Dea road in Charella Gardens eventually meeting with Route 1. The vegetation was similar to the upper elevations of Route 1 passing through young regeneration cutblocks abundant with spring (clover, fireweed, dandelions, and the like) and summer (twin berry, raspberries, blueberries) forage items. Overall the average elevation was higher than route 1, contained more clearcut areas, and a higher abundance of young spruce, aspen, and birch stand regeneration. At one point the route passed through an upper elevation wetland area with moose sign and tracks (Photo 33). We noted a possible cougar track that had been preserved in the clay.



Photograph 29. Fresh black bear track.

Photograph 30. A bear climbed this aspen tree to approximately 40 feet. Note the claw marks.



Photograph 31. A bear dig for ants and larvae. Three large, fairly fresh digs were within 16 m of each other towards the end of the trail.

Photograph 32. Turning around from the ant dig, the trail backs onto and looks out over lower Charella/Peden areas.

Photograph 33. Route 3 was largely regenerating blocks but also passed through a few upper elevation wetland areas with fresh moose sign.

### 5.2.1-B College Heights Assessment

Five routes were assessed in the College Heights area: (1) Varsity Creek to the Fraser River; (2) Fraser River to Cowart Road; (3) Domano-Varsity Creek connector; (4) Upper College Heights to College Heights Pub; and, (5) the clearcut area at the end of Domano. The most apparent issue for the high occurrence of bears reported and destroyed in the College Heights area was connectivity of the retained human-use trail network which is believed to act as a filter for bear movement and attract bears into this residential neighbourhood. The human-use trail network tended to follow a number of small Creeks, such as Varsity Creek, and linked directly to a number of high bear forage and travel areas (Figure 9). The trails themselves contained lush bear habitat associated with moist areas (Photo 34) as well as abundant berry producing plants (Photos 35 & 36). The line-of-sight (ability to spot a bear or have a bear spot a person) was extremely poor along most sections of these trails increasing the potential for a negative bear-human encounter and also increasing the likelihood of a bear being filtered into the College Heights area (Photo 36). The trails back onto houses that contained gardens (Photo 37), fruit trees, composts, and garbage (Photos 10 & 15). Bear sign was evident along portions of these trails, particularly where the start of the trail met with the Fraser River (Photo 38). The Fraser River trail provided a nice movement corridor along the upper edge of the River. The abundance of lush vegetation, hiding cover, and dirt/gravel road provide for foraging opportunities as well as ease of travel. The cutblocks at the end of Domano were rated as providing the best bear forage of the areas assessed. The blocks contained an abundant variety of bear foods for all 3 seasons (Photos 39 & 40). The challenge for the College Heights area is to maintain the human-use trail network but to make it less attractive to bears. The current structure of the trail network acts to filter bears into the residential neighbourhoods of College Heights and directly contributes to the bear problems in this neighbourhood.

Of the neighbourhoods assessed, College Heights contained the highest mix of residential and commercial establishments. The abundance of non-natural attractants bears may encounter once within the College Heights area leads to food conditioning and

habituation of bears to humans. Easily accessible garbage was noted at the majority of commercial establishments in the College Heights area, such as the College Heights Pub (refer to Section 5.1.2 Commercial Garbage Containment) and Westgate Plaza (refer to Photos 7) as well as non-bear resistant City placed bins (Photo 10). Even in areas where “Bear Aware” signs were posted the majority of receptacles for the residential automated garbage collection system were noted to be kept in non-bear resistant locations, and mountain ash trees were abundant in residential yards.



<p>Photograph 34. Looking east down Varsity Creek (Route 1). July 9, 2008</p>	<p>Photograph 35. Abundant Saskatoon (pictured) and other berries were noted along the trail.</p>	<p>Photograph 36. Pointing at <i>Shepherdia canadensis</i> berries. Note the extremely poor line of sight (Varsity Creek trail)</p>
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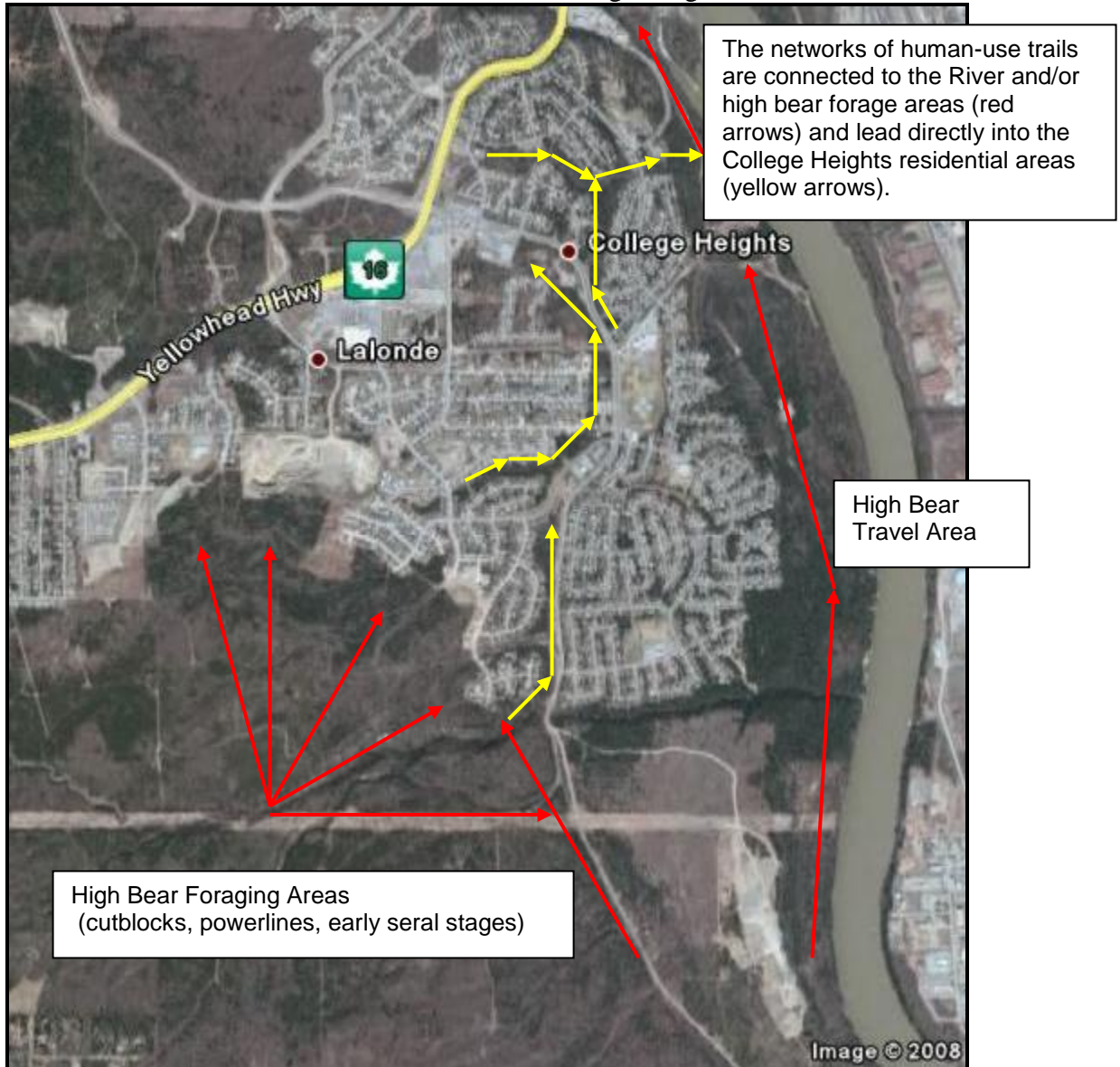


<p>Photograph 37. Houses back onto these trails. This house had planted rhubarb along the fence.</p>	<p>Photograph 38. Fresh bear digs for ants and larvae were noted where Varsity met the Fraser River.</p>	<p>Photograph 39. An abundance of bear foods for different seasons were recorded in the cutblock at the end of Domano including twinberry and cowparsnip (pictured).</p>
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<p>Photograph 40. A bear tore apart this log to feed on ants/larvae. Located in the cutblock at the end of Domano.</p> <p>Abundant non-natural attractants that contribute to food conditioning, habituation to humans, and potentially aggressive bear behaviour were also noted in the College Heights area, for examples refer to Photographs 7, 10, and 15.</p>
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Figure 9. Greenspaces and human use trails leading off high bear travel and foraging areas into the residential and commercial areas of College Heights.



5.2.1-C. Hart Highlands – North and South Assessment

Ten routes were assessed in the north and south Hart Highlands: (1) McMillan Creek Trails A and B; (2) Hoferkamp Rd (see Section 5.1.7 Other Non-Natural Bear Attractants); (3) Aberdeen Rd/Antree/Inverness Trailer Park; (4) Pulpmill and Noranda Roads; (5) Upper Hart greenspace-1; (6) Upper Hart greenspace-2; and, (7-10) Pidherny Triangle (contained 4 routes).

The Hart Highlands are surrounded by large tracks of undeveloped land to the North, East and West. The topography allows for 2 primary features that make the area attractive for bear movement and foraging: (1) the gradation from high to low elevation

tends to filter movement downwards towards the Nechako River, particularly in spring as these areas are snow-free earlier, and (2) the difference in elevation is enough to offer a variety of bear foods by season that tend to be spatially separated. The bank leading up from the Nechako River at McMillan Creek is thought to be too steep to draw bears off the River and likely acts as a barrier for bears entering the lower Hart areas. Rather, bears are more likely to access the Hart using the large tracks of surrounding habitat to the north, north-east, and north-west. McMillan Creek runs from the agricultural areas into the Hart/Hoferkamp Road area and may act to filter the movement of wildlife. Development of ‘problem’ bear behaviour in the agricultural areas of Chief and Nukko Lakes and the Salmon Valley must be managed to reduce the likelihood of “problem” bears in the Hart area.

The Hart Highlands contained abundant easily accessible garbage available from residential, commercial and City run sources. Accessible garbage was the most commonly noted non-natural attractant in the Hart Highlands area, followed by fruit (mountain ash and apple) trees. The Aberdeen Road, Antree Road, and Inverness Trailer Park areas contained a number of non-natural attractants, particularly residential automated garbage bins and open and accessible commercial receptacles. This area backs onto a greenbelt and the Inverness Trailer Park backs onto bush on its east side (See Section 5.1.1-B). The power line provides bears with travel opportunities as well as early spring forage. These areas tend to be snow-free earlier due to the removal of the canopy allowing increased light to penetrate the ground. Pulpmill and Noranda Roads contained an abundance of highly rated spring habitat and wetlands that are attractive to bears; however, abundant non-natural attractants were also noted such as the open grease bins at the Pumphouse pub (Photo 9) and residential non-natural attractants.

Similar to College Heights but not as defined were green-space human-use trails that backed onto residential households and connected to the surrounding ‘undeveloped’ or large acreage/agricultural areas. These trails contained abundant bear sign including foraging for ants and feeding on berries although they were not rated as high as the Noranda Road area for natural bear forage. The compost bin knocked over at the base of a fresh dig for ants (refer to Photo 20) was taken along the upper Hart trail as well as the backyard apple tree hanging over onto the trail (Photo 16). Overall, the trail contained a better line of sight than those in the College Heights area. Opportunistic encounters with residents of the Hart noted that bears also may be accessing the Hart Highland areas by crossing Foothills Boulevard by the Foothills landfill. A location was provided of a trail that bears were stated to use once they crossed Foothills Boulevard. Management of the Foothills Landfill should also be considered when attempting to reduce ‘problem’ bear behaviour (see Section 5.2.2 Landfills and Transfer stations).

The Pidherny Triangle is a series of mountain bike trails to the west of the landfill that begin at high elevation and descend to Pidherny Road/North Nechako. The 281 hectare future golf course development is also located in this area. The drier upper elevations were rated higher in early summer but lower in spring and later summer than the lower elevation, rich areas containing devil’s club and cow parsnip. Bear feeding on ants/larvae and berries were evident as were deer and moose tracks. Route 1 of the Pidherny Triangle began high on a ridge in a mature/old subalpine-Douglas fir mix forest and was rated as containing poor natural bear forage. The lower elevation areas were rated higher for bear forage. Raspberries were abundant in clearings, as was fireweed,

low bush blueberries, and a high abundance of thimble berry. The second route assessed was at lower elevations and contained better natural forage than route 1. Alder thickets were mixed with cow parsnip, a high abundance of thimble berry, equisetum, grass and clover. Route 3 contained the best habitat assessed as it passed through wet areas with Devil's club and equisetum while the upper elevations contained berries, particularly in regenerating clearings. Deer tracks and moose droppings were noted. The final route passed through a number of regenerating cutblocks with plentiful raspberries and thimbleberries. Garbage left by mountain bikers along the trail was noted. A number of wildlife trails spurred off the trails. The Pidherny triangle backs onto the residential areas of west North Nechako road to the south and the Foothills Landfill to the northeast. The large track of undeveloped land, adjacent North Nechako and Hart Highland residential areas, access to the landfill, and abundant seasonal bear foods and movement corridors affords this area an extreme hazard rating. Some portions of the assessed trails fell within the proposed golf course route. Golf course development is predicted to change the nature and distribution of bear conflicts in this area.



Photograph 41. Start of Route 3. Overall the trails of the Pidherny triangle were wide and made for easy movement (July 16, 2008)

Photograph 42. *Shepherdia canadensis* (buffalo / soap berry) feeding with feeding on ants in back of photo. Taken along Route 3.



Photograph 43. Start of Route 1. Garbage left by mountain bikers.

Photograph 44. Older sign from spring feeding on dandelion flower heads along route 4.



The majority of bear problems in the Hart Highlands are believed to be related to bear access to non-natural attractants available at the foothills landfill combined with storage of the residential automated garbage cans, garbage available at the trailer park and unpicked fruit on trees.

#### 5.2.1-D. Lower North Hart / North Nechako River Trail Assessment

Four routes were accessed using an all-terrain-vehicle in the lower north Hart / North Nechako River area. The first route was along a major access road that was gated but easily bypassed. The stand was a young regeneration and appeared to be only a few years old in some areas. The surrounding habitat was a mature pine forest with a low bush blueberry and kinnikinnik understory. Soapberry was in moderate to high abundance in open canopy areas, combined with rose, Indian helabore, clover, purely everlasting, junipers, and trembling aspen. In the forested areas there was an abundance of low bush blueberries. The habitat was rated low for spring, low-moderate for early summer, and high for late summer. The powerlines that run through this area allow for easy movement and act to link up the Upper Hart and the Nechako River, effectively acting as corridors (Photo 46). Deer tracks were noted along the road while a very large, deep, bear dig for ants/larvae was recorded (Photo 47). The second route was along a new road that passed through an old growth fir/spruce forest to the powerline and then south towards the Nechako River. The lower elevations were a mixed fir and spruce stand with alder. This route ended behind the old school and the Caledonia trailer park. Fresh foraging on ants (Photo 48) and berries by bear(s) were noted. Overall, the habitat was rated lower than the other routes; however, the houses of the North Nechako area that backed onto this route were surrounded by alder making it more likely for bear(s) to enter yards. Route three was drier and less productive than the previous routes and it passed predominately through a pine forest with soapberry abundant in clearings. Twinberry and low bush blueberries were common in the pine understory. This route was rated as low in spring, moderate in summer (due to the abundant soapberry), and low-moderate in late summer. A bear trail coming up from a wetland/gully to the powerline was noted. This area was rated high to extreme hazard due to surrounding large track of undeveloped land, adjacent residential areas, access to the landfill and Caledonia trailer park garbage, numerous movement corridors and the presence of a variety of seasonal bear foods.

North Nechako River Trail Assessment: The lower portion of the Nechako River (north-west side) could only be accessed for a few hundred meters before becoming overgrown. A cabin was noted along the River's edge while garbage was present on the north-east side of the River. The trail along the upper Nechako River bench contained a high abundance of soapberry and a well used bench travel corridor/trail for wildlife and people. Bear foraging on ants, soapberry, and twinberries were noted. This route was rated as high hazard due to the abundance of bear foods and adjacency of the lower North Nechako residential areas. Bear foods included a high abundance of soapberry, rose, thimble berry, dandelions, and moderate abundance of Saskatoon, highbush cranberry and forbs. This route ended at the backyard of residential houses (Photo 50) and had a very poor line of sight.



Photograph 45. Panorama facing North up Powerline to the East and the South. These features make for easy movement/travel and act to link up the North Nechako with the Hart.



Photograph 46. Large deep fresh dig for ants and larvae. Route 1. July 17, 2008.



Photograph 47. Fresh foraging for ants. Route 2. July 17, 2008.



Photograph 48. Bear trail leading to feeding on twinberry. Route 3. July 17, 2008.



Photograph 49. This lush trail of the Nechako River ends at the back of house(s) as pictured and was likely at the end of Rosia Road.

5.2.2 Landfills and Transfer Stations Assessments and Hazard Ratings

There are 8 transfer stations and 1 landfill (Foothills) within the City or immediately surrounding areas (Table 10, Figure 9) and all were assessed. Two of the transfer stations, Vanway and Quinn Street, are managed by the municipality while the remainder is managed by the Regional District of Fraser-Fort George. Interagency cooperation is therefore required to manage these sites for Bear Smart status.

Residential users of transfer stations often noted 2 major concerns: (1) overflow of garbage prior to collection, and (2) container lids left open allowing bears to access garbage. In 2005, a black bear was destroyed behind the Vanway Transfer Site due to reports of a bear in dumpster. On Sept 29, 2005, 2 black bears were trapped and destroyed at the Foothills Regional Landfill. The attendant at the Shelly landfill reported frequent use by a mother bear and 2 cubs in 2007. He also noted that when the site is gated people leave their garbage bags at the gate or throw them over the hill.

Old “bear aware” stickers were on bin lids at Miworth and West Lake transfer stations only. None of the transfer stations had separate ‘bear information’ signs stressing to visitors to assure bin lids are closed and that garbage is placed properly inside the bins. At most transfer stations one or more of the lids were left open/ajar. The primary hazards associated with transfer stations were: (1) improper user compliance resulting in garbage being left outside the bins and/or bin lids left open; (2) insufficient frequency of emptying bins resulting in garbage overflowing (volume of garbage received was too large for the number of bins); (3) chain link perimeter of transfer stations (particularly those in remote areas) were not complete and/or gates were left open at night; and, (4) lack of proper bear aware user information signs.

Table 10. Hazard Ratings for the Foothills landfill and transfer stations within the city of Prince George and surrounding areas, BC.

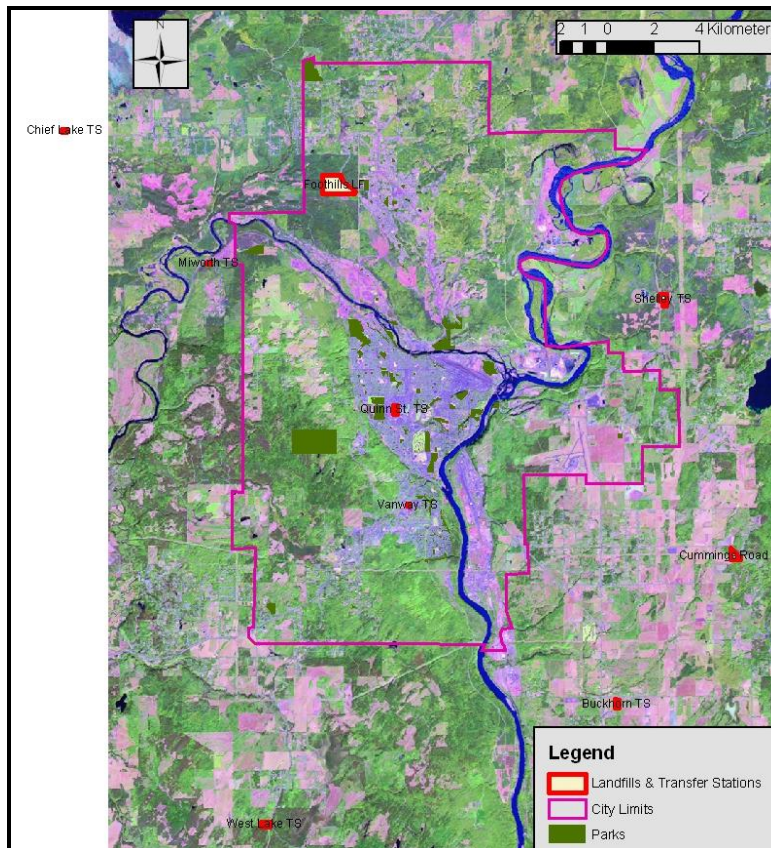
Area	<sup>1</sup> Rating	Comment
<i>Transfer Stations</i>		
<sup>1</sup> Buckhorn	Moderate	Partial fence, approximately 5 feet on 3-sides. No attendant. No gate. Surrounded by scrub-land (pine had been removed) with few trees, and residences. No bear sign. Some lids left unlatched.
<sup>1</sup> Chief Lake	Moderate	Partial fence. Site had an attendant on duty for most of the day, including Saturday. Attendant stated that she has not seen bears at the site. Residents reported bin lids were often left open.
<sup>1</sup> Cumming Road (Pine View)	Moderate to high	Partial fence on 2-sides. Gated only to road. Attendant on duty. Bears have been observed as reported by attendant. Surrounded by trees and bush.
<sup>1</sup> Miworth	Moderate	Garbage frequently overflows. Lids often left unsecured. Station is fenced with chain link but front gates remain open at all times. Bins require more frequent emptying and/or more bins available. No attendant on duty.
Quinn St.	Low	Surrounded by development. Person in attendance. Fenced.

<sup>1</sup> Shelly	<b>High to extreme</b>	Partial fence. Extreme garbage violations with garbage left at gate or down at lower appliance dump site. Surrounded by bear habitat. Mother with cubs reported late May 2007. Attendant reports that people often leave their garbage at the gate when the site is closed. He reports seeing many bears.
Vanway	Low	Fenced area but open containers. Person in attendance during the day but not monitored at night. Stated that bin lids are closed at night and emptied regularly. No open pit areas. Close to undeveloped land.
<sup>1</sup> West Lake	<b>High to extreme</b>	Area only partially fenced. Containers often overflowing with garbage & lids left open. Residents report that garbage bags are frequently left on ground beside containers. Visible bear aware signs on containers. Bear sign present at transfer station and residents reported bears/sign as a common occurrence.

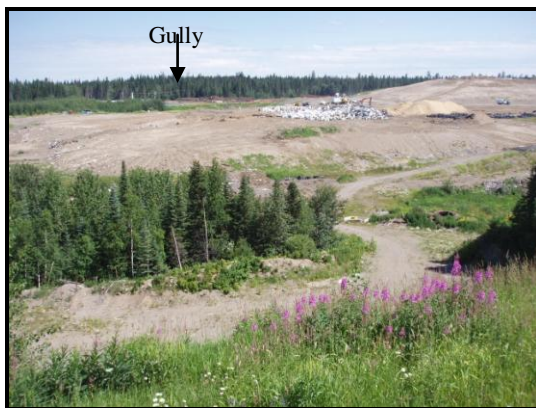
<b>Landfills</b>		
Foothills landfill	<b>High</b>	Not fenced on side that backs onto land connecting travel corridors. Very well managed site for smell and covering garbage. Bear sign noted in past. Bears trapped and destroyed at site in past.

<sup>1</sup>Outside city limits.

Figure 10. Location of the Foothills Regional Landfill and Transfer Stations for Prince George and Surrounding areas.



Foothills Landfill: The Foothills landfill is the main deposit area for the garbage of Prince George and surrounding areas. During the assessment the site was very well managed and had very little smell. No bear sign was noted at the landfill; however, garbage was currently being managed in a central, upper elevation area that was a distance from the surrounding forest perimeter. In 2001, the Parsnip Grizzly Bear Project monitored a radiocollared male grizzly bear that appeared to make regular use of the Landfill (Ciarniello et al. 2002). This bear regularly travelled between the Foothills Landfill and the Lower Mud River Landfill presumably crossing the Nechako River. He dropped his collar in the Chief Lake area in the berry bushes surrounding a house’s lagoon. The resident was unaware there was a grizzly bear on her property. He denned in the Salmon Valley. At that time site visits to the landfill revealed grizzly and black bear tracks; however, the primary dumping area was much closer to the forested perimeter than during this assessment. During this assessment garbage was noted strewn in the bushes surrounding the landfill suggesting that bears still access the landfill. The primary concern with the Landfill is that it is largely surrounded by undeveloped, connected bear habitat (Photo 50) and the chain link fencing perimeter is not complete (Photo 51) on the sides that back onto the forested habitat (Pidherny triangle area and north-west) including a gully that was rated as high bear habitat.



Photograph 50. The Foothills Landfill site was well managed and smells were minimized. However, the landfill site was surrounded by large tracks of forested land (July 16, 2008)



Photograph 51. The chain link fence surrounding the Foothills landfill is not complete on the west side that backs onto the Pidherny Triangle (July 16, 2008).

### 5.2.3 Parks, Green- spaces, and Golf Course Assessments and Hazard Ratings

Anderson (2007) examined the relationship between parks and problem bear occurrence reports. She concluded that larger and more “wild” parks with an “ecological focus”, such as McMillan Creek, Moore’s Meadow, and Forests for the World, had fewer bear complaints than the smaller city parks. Similarly, green spaces, such as the Hudson’s Bay Slough had very few complaints. Generally, bear occurrence reports were

higher in residential areas that were immediately surrounding the parks than those that were further from parks (Anderson 2007). The reader is reminded that the hazard ratings presented are not necessarily in relationship to a person’s probability of encountering a bear; rather they refer to the hazard(s) present that may result in a bear becoming food conditioned and/or habituated to humans, and/or the probability of a negative encounter with a bear (refer to Section 3.4 for determining hazard ratings for greenspaces).

Table 11. Hazard Ratings for selected parks, green spaces, and golf courses within the city of Prince George and surrounding areas, BC.

Area	Rating	Assessment	Comment
<i><sup>1</sup>Parks, Green spaces, and Golf Courses</i>			
Aberdeen Glen Golf Course	High	No	Backs onto undeveloped land and adjacent to cleared powerline (early green-up). Inverness area has high bear problems and a lot of residential garbage available.
Carrie Jane Gray Park	Low	No	Generally surrounded by development. Haul-all at entrance.
Cotton-wood Island Park	Moderate to Low	Yes	High bear use Park as it is along river corridor and contains abundant variety of bear foods by season, particularly spring and summer. Lower portion of Park contains high rated bear habitat as due surrounding islands. Low human occupancy. <i>All garbage cans bear-resistant, except one.</i>
College Heights Park	High to Extreme	Yes	Residential garbage available. The 2 garbage bins were not <i>bear resistant</i> . Residential garbage and fruit on trees available to bears. Connected to green-trails.
Connaught Hill	Low	No	Surrounded by development.
Fort George Park	Low	Yes	Steep bank generally separates river corridor from park. Park is largely manicured thereby reducing security cover. High human use. <i>Bear-resistant garbage cans recommended for main Park areas (currently exist only for upper River edge).</i>
Forests for the World	Low to Moderate	Yes	High bear use area but appears to be controlled for non-natural attractants. Large portion of area to separate wildlife from humans. Unleashed dogs may provoke encounters. Proximity to UNBC and other non-natural attractants could be a problem.
McMillan Regional Park	Low	Yes	Backs onto undeveloped land and river corridor. Bear resistant bin installed and warning sign at entrance. Park itself is managed well but surrounding residences and area had a number of non-natural attractants present.

Area	Rating	Assessment	Comment
Moore's Meadow	<i>High to Extreme</i>	Yes	Garbage available in surrounding residential neighbourhoods. A lot of bear sign noted. Sybertech garbage cans in park require more frequent emptying. Moderate lines of sight.
Otway Ski Centre	Low-Moderate	Yes	Connects to large tracks of undeveloped lands, Forests for the World, and large acreages. High bear foods for spring, summer, and fall. Bear in area during assessment.
PG and Pine Valley Golf courses	Low	No	River bend comes closer to golf course areas. Adjacency to College Heights area. Bears would be required to cross busy streets to access.
Rainbow Park	Low	No	Surrounded by development.
Rotary Park	Low	No	Potential exists due to proximity to Cranbrook Hill and non-natural attractants but generally in developed area.
Wilson Park	High	Yes	Adjacent to river travel. Very poor lines of sight in places. Garbage strewn in Parking lot. Crab apple trees abundant in one area.
Wilkins Park	Low-Moderate	Yes	Bear resistant garbage cans. Bears known to frequent the trails. Abundant bear foods, particularly berries and ants. Garbage in surrounding area generally unavailable to bears.
Yellowhead Grove Golf Course	Moderate	No	More rural. Garbage management requires site visit to check.

<sup>1</sup>Parks or golf courses in problem neighbourhoods, large parks and/or green spaces only. *Not all Parks were assessed.*

### 5.2.3-A. Cottonwood Park Assessment

Three routes were assessed in Cottonwood Park: (1) Cottonwood - Heritage Park Trail; (2) Upper Cottonwood Park; and, (3) Lower Cottonwood Park. Heritage Park Trail was a paved path that ran along the Fraser River with a good line of sight (574 meters to the closed sign). It was primarily a people walk/bike route and not a bear route. The probability of encountering a bear increased towards Cottonwood Park. Potential spring forage included forbs, clover, grass and dandelions. Saskatoon berries increased in abundance towards Cottonwood Park. The clear line of sight and few cottonwood trees along the River (i.e., open to River) decrease the likelihood of bears in this area; however, there is a need to change the open 45-gallon garbage can at end of Route 1 (see Photo 12). No bear sign was noted and overall this trail contained minimal bear forage.

The second route began in the upper Cottonwood park area to the west but focused on the lower park area. At the time of the assessment the lower park area was closed but we foraged the backchannel to conduct the assessment. The lower park area contained the highest abundance of bear forage and security cover. There were an abundance of berry species, including dogwoods (high), Saskatoon (moderate), *Lonicera*

(moderate), rose (moderate), as well as lush riparian areas with cow parsnip and purple pea vine. In addition, there was an abundance of hiding cover that occurred a good distance from areas with high human use. A small island was within swimming distance of the Park and contained excellent bear habitat for spring. The line of sight in the lower park area was extremely poor but could also have been a factor of the winter 2007 ice jam. Wildlife was encountered on the island but the forest/bush was thick and species could not be determined. The lower park area was rated as high for spring and summer bear forage; a high potential exists of encountering a bear. It was believed that bears would access this area from the North side of the River (swim) or from the Shelly area. Bear resistant garbage containers were installed. No bear warning signs were noted.

The upper Park area was more open and paved with a much better line of sight than the lower park area. Saskatoon berries were in high abundance in the upper Park. Bear resistant garbage cans were noted, closed, and overall the litter appeared well managed. The upper Cottonwood Park area had the potential to attract bears due to its proximity to the lower Park area and abundance of berries. The only black bear warning sign encountered occurred at the main entrance to Cottonwood Park. Overall the upper Park was rated as moderate-low hazard for creating problem bears or a negative bear-human encounter but the lower park area holds a high potential for encountering a bear.

#### 5.2.3-B. Cottonwood/Fort George connector Assessment

The Cottonwood-Fort George Park connector began at the “bridge out” sign in Cottonwood Park, passed under the Yellowhead Highway Bridge, and concluded at Fort George Park. After the bridge the route traversed up the bank and through a residential area (Taylor Drive) to Fort George Park. In high tide it would be difficult for bear(s) to travel along the banks of the River, particularly in places where the bank is steep and the River’s edge is minimized.

Overall the trail was open with a good line of sight. Forested stands were retained along the river and backchannels. Bears could access this area from the north and north-east as there were a number of forested/shrub islands that connect across the Fraser River. There were a high abundance of Saskatoon berries and willow species. This was a noisy route that was overall rated as low-moderate hazard due to its location by the River and proximity to lower Cottonwood Park area.

#### 5.2.3-C. Fort George Park and the Hudson Bay Slough

The steep bank leading up to Fort George Park from the Fraser River likely deters bears from entering this Park. Bear movement through this area would be restricted along the River’s edge. Fort George Park contained bear-resistant garbage containers along the upper bank (Taylor Drive); however, human-use areas a short distance away within the middle Park such as the Children’s play area, water works areas, and picnic areas were supplied with non-bear resistant barrels. The Park contained minimal bear forage items but was located between the green-space coming off the River that connected to the Hudson Bay Slough and Cottonwood Park.

The second route began at the green-space southwest of Fort George Park (that connects to the Hudson Bay Slough), to the residential neighbourhood on Banks Street, doubled back to the green-space, crossed Queensway Street, and followed the Hudson Bay Slough to Massey Drive. Although there was limited visibility to assess the River’s



edge at this location, it was believed that bears could travel on the bank of the River to Banks road, particularly in low tide. Higher human use and density once at Bank's Road makes travel less likely and may trap bears using this corridor forcing them into the green-space, Fort George Park or Slough area. Crossing Queensway during the cover of darkness is possible for bears due to low traffic volume. The Slough area contained a high abundance of Saskatoon, rose, and alder, and a moderate abundance of thimble berry, aspen, spruce. There were low to moderate rated riparian habitats available as the Slough crossed Queensway Street. This route contained kilometers of connected green-spaces that allowed travel to Massey Drive but residential areas become increasingly denser and green-spaces become narrower as one advanced towards Victoria Street. The lower Slough area was rated as containing the best habitat for bears (low to moderate) with ratings becoming poorer and the habitat becoming more degraded as the green-space advances towards Victoria Street. Bear sign was not noted. King Fishers were spotted using the green-space between Fort George Park and the Slough.

#### 5.2.3-D. McMillan Creek Park

Two routes were assessed passing through and adjacent to McMillan Creek Park. The primary purpose of the McMillan Creek assessment was to determine if bears were accessing the Hoferkamp and Inverness areas by being drawn off the Nechako River. The bank leading down to the River to Pulp Mill Road at the south end of McMillan Park was believed to be too steep to draw bears off the River into the Park or Hoferkamp Road areas. McMillan Creek itself connects onto large tracks of land to the north-east and bears are likely access the Park from those areas. Although less likely, bears could also cross the John Hart Highway at night. The Park contained a variety of berry species but a low abundance of wetland vegetation. Bear resistant bins and a bear warning sign were installed at the Park entrance. There was a good line of sight along the trails. The Park was rated as low bear forage for spring forage, moderate-high in summer, and low in fall. However, the surrounding residential area on Hoferkamp road contained fruit trees which increase the probability of bears in this area during fall.

#### 5.2.3-E. Moore's Meadow Park

Moore's Meadow Park contained an abundance of fresh bear sign within the first 50 meters of the entrance trail. In addition, the sybertech garbage can located in the parking lot had the lid open and garbage at the base (see Picture 13 above). The Park contained spring forage, such as fireweed, clovers and dandelions and older bear foraging sign for spring was noted (Photo 52). Numerous digs for ants/larvae were recorded (Photos 53 and 54) and the Park contained a number of large ant nests. Saskatoon, thimble berry, wild strawberry, and mountain ash were present. Wildlife trails were evident through the meadow, which contained abundant patches of cow parsnip, with some horsetail, dandelions and peavines. The line of sight along the trails was rated as moderate. Houses and a school back onto the Park area. The majority of garbage cans in the Clare-Heritage Crescent areas were not secured properly. The juxtaposition of meadow habitats, abundant ants and berry species, adjacent residential areas with garbage available, and high human use of this Park contributed to a high to extreme rating this park for potential negative bear encounters, particularly during late spring and summer. Further, the neighbourhoods surrounding the Park rate high for bear hazards.



Photograph 52. Spring bear foraging on the tips of fireweed (photo taken July 14, 2008).

Photograph 53. This large ants nest had been recently dug out.

Photograph 54. This foraging on ants/larvae was also fresh and was within an area with several digs for ants.

5.2.3-F. Wilson Park and Associated River Trail

Wilson Park and associated Nechako River trail was assessed from the gravel pit east of the Foothills Bridge to just before the Caribou Highway Bridge where travel was no longer possible without breaking trail. Riparian habitat was present at the gravel pit near the Foothills Bridge. A bear trail with bear sign was noted in this area and appeared to originate off of the River/backchannel, across the railroad tracks, and towards Moore’s Meadow Park/residential area in the vicinity of a gravel pit.

A bear warning sign and bear resistant garbage can was present in the main Wilson Park parking lot entrance; however, garbage was strewn throughout the lot (Photo 55). Generally, the human use trails along the River were overgrown with a poor line of sight (Photo 56). Berry producing plants were abundant along the route. To the east of the parking lot there was a concentration of crab apple trees that may have been associated with an old orchard (Photo 57). Abundant, lush forage was available to bears in Wilson Park. The combination of an acceptable travel route, combined with abundant non-natural attractants and a high human density contribute to this park’s high hazard rating.



Photo 55. Bear resistant can and warning sign but garbage strewn in parking lot (photo taken July 14, 2008).

Photo 56. Poor line of sight was noted along a number of trails including this one that passed by an old crab apple plantation?

Photo 57. Crab apple trees were abundant in this area.

### 5.2.3-G. Otway, Wilkins Park, and Forest for the World Assessments

Otway, Wilkins Park (Miworth), and Forests for the World were considered wilder parks with an increased ecological focus. These Parks were located either outside the City limits (Wilkins) and/or contained very large tracks of connected forests (Otway, Forest for the World). The large, wilderness Parks were limited in their assessments in relationship to their area. Regardless, some of the highest rated bear habitat occurred in Otway, Wilkins Park, and Forests for the World. These areas contained a juxtaposition of lush spring habitats, including wet lands and riparian areas with abundant cow parsnip, clovers, sedges, grasses, and fireweed and a variety of berry producing species. Moose and deer sign was apparent in Forests for the World and Otway, while bear sign was recorded in Otway and Wilkins Parks.

The garbage cans in Wilkins Park were bear resistant and the line of sight along the loop trail was rated as moderate. Bear sign included scat, digs for ants and spring foraging. The Park was closed and remained wet due to floods from the 2007 ice jam. In addition to a variety of spring forage including cow parsnip, sedges and clovers, dogwood (a late summer berry) and twinberry were abundant within the Park.

Forests for the world contained numerous upper elevation wetlands that were highly rated spring bear habitat once snow-free. In addition, many berry species were present including Saskatoons, thimble berry, and moderate soap berry. Although the entire park trails were not assessed due to time limitations it appears garbage cans were bear resistant. Despite being a leashed dog area many dogs were noted to be off-leash and this could be a potential problem if encountering a bear or moose. Overall, line of sight was moderate along trails being the highest from the Parking lot to the Lake but decreasing from the lake onwards.

Otway was rated as containing the highest natural bear foods of all the areas assessed. The ski/bike trails descended in elevation passing through regenerating cutblocks and lush wetlands. Otway contained more low elevation wetlands with abundant cow parsnip, fireweed, clovers and peavines. A black bear was encountered in the cutblock directly above the ski chalet which contained abundant raspberries, twinberry, thimble berry, and Saskatoon. In the west side clearing there was abundant blueberries. Bears have been observed on the trails on numerous occasions. Overall, the line of sight for Otway was moderate to high; however, some sections contained poor lines of sight due to overgrown vegetation. No garbage cans were noted except for those contained within the chalet itself.

### 5.2.4 Hazard Ratings for Schools with Bears Reported

Only those schools with bear(s) reported within the last 4 years were assessed (see Section 4.2.3). Primary criterion used to determine ratings for schools were: (1) the availability of non-natural attractants to bears; (2) the line of sight (visibility) between the children's play area(s) and the school; (3) fencing of the perimeter of the play area(s); and, (4) the surrounding landscape and neighbourhoods. For school assessments the hazard ratings reflect the likelihood of a bear(s) entering school grounds. Generally, schools located adjacent to connected green-spaces were rated higher than those that occurred in areas surrounded by development because the probability of encountering a bear increases in areas where green-space connectivity is maintained (Table 12).

Table 12. Hazard Ratings for schools with bear(s) reported between 2004 – 2007 within Prince George and surrounding areas.

<b>School Name</b>	<b>Rating</b>	<b>Comments</b>
Austin Road Elementary	Low	7, open 45-gallon receptacles on grounds, 2 large plastic lids locked. Adjacent fire hall has 1 large bin with open lid right beside play area. Residential areas tend to surround school. Fruit trees with abundant apples noted in neighbourhood.
Beverley Elementary	<b><i>High to moderate</i></b>	6, open 45-gallon drums on grounds, 1 large garbage receptacle with plastic lid in parking lot. Very poor line of sight from treed play area to school. Brushing back of vegetation required along fence line as well as clearing surrounding school. Treed play area is high hazard as it backs onto green-space and has very poor lines of sight.
Buckhorn Elementary	Moderate	5, open 45-gallon receptacles on grounds, large bins in parking lot. Generally surrounded by residential areas but could brush out forbs in area where the chain link is double fenced.
Carney Hill Elementary	Moderate to low	9, open 45-gallon receptacles on grounds, 2 large bins with plastic lids locked in parking lot. A lot of non-natural attractants were noted at both the school and surrounding area including strewn garbage and foul smells. Large, low chain link fence partly surrounds play areas. School is close to Slough and bears could get trapped in this area. High visibility and good lines of sight.
College Heights Elementary	Moderate	5 open 45-gallon drums on grounds, 1 large garbage receptacle with plastic lid in parking lot. Very poor line of sight from treed play area to school. Brushing back of vegetation required along fence line as well as clearing surrounding school. Tended to be cutoff from continuous bear habitat which reduced the rating from high to moderate.
College Heights Secondary	Low	3, open 45-gallon receptacles on grounds along with 4 large bins with open lids. Adjacent park bins are all bear resistant haul-all bins. Good visibility and minimal bear foods. School is currently under construction. Minimal green space surrounds. Automated garbage cans stored in carports surround.
Glenview Elementary	<b><i>Moderate to high</i></b>	2, open 45-gallon receptacles on grounds, 2 sybertechs, 1 large plastic lid not locked in parking lot. New housing development being built to the northeast. Currently school backs onto green space to east with notable bear foods and this contributed to rating. Some of the fence line is clear and has good example of proper lines of sight. Other areas require brushing along fence line. Warning sign should be placed along fence line.
Heather Park Middle School	<b><i>High to extreme</i></b>	8, open 45-gallon receptacles on grounds, 2 large bins with plastic lids. 3 on surrounding street including 1 City bin chained to light post. Line of sight is good on school grounds but very poor for surrounding green space. The landscape filters bears towards school grounds and surrounding green spaces. Gate is needed at the back fence northwest corner to green space. Brush out along back and side to increase sight in green space. Place warning signs at entrance to green space. Residential area needs campaign to clean up garbage.

<b>School Name</b>	<b>Rating</b>	<b>Comments</b>
Hart Highland Elementary	Moderate	4, open 45-gallon receptacles on grounds, 1 large plastic lid in parking lot. 3 of the 45 receptacles are metal boxes. Mountain ash trees with abundant fruits available on grounds! Lines of sight are moderate for back play areas because very poor in the back corners and treed play area. Only partial view of east side play area from school. School has limited side windows for viewing outside. No views of west side play area with garbage can. Treed area to southwest back corner can not be viewed from school. Possible relocation of play area to increase lines of sight. Brush removal required for back areas. Remove ash tree.
Immaculate Conception	<b>High</b>	4, open 45-gallon receptacles on grounds, 1 large plastic lid in parking lot. Very nice, high chain link fence surrounds play areas. Good lines of sight but the windows tend to be small, rectangular which can obscure lines of sight from within the school. Green space cover availability in surrounding areas makes this school a high hazard. As the residential area builds up to the SW of the school the ratings will decrease but bear problems are expected as development continues. Houses in back neighbourhoods have automated cans visible. Signs for the neighbourhood and school are required as is bear country education.
Kelly Road Secondary	<b>High to extreme</b>	9, open 45-gallon receptacles on grounds, 2 large bins with plastic lids (1 front, 1 back). Abundant green spaces to north and west. Berries and forbs in green space. Gully ends right at school with fireweed and forbs and an open garbage can. Garbage is strewn all over school grounds and into bushes. Surrounding neighbourhood has fruiting trees, garbage and city garbage cans with bus stop. Residential bear aware campaign required, clean up school grounds and garbage dragged into green space, complete the chain link fence and make it higher, brush removal along fence line to increase lines of sight, warning signs.
Malaspina Elementary	Moderate	4, open 45-gallon receptacles on grounds, 2 large bins in parking lot with plastic lid are locked. Sybertech bin in adjacent park. Low chain link fence surrounds large area and fields. This school is close to the River and end of Domano cutblocks. On the NW side is a small green space. Fruit and mountain ash trees in residential yards surrounding school. Automated garbage cans abundant in neighbourhood. Green space has minimal foods but does contain berries.
Quinson	Low	9, open 45-gallon receptacles on grounds, 1 large bin with metal lid that was locked. Very good lines of sight. Low chain link fence surrounds play area and fields. Surrounded by residential houses, some have automated cans visible. No close green spaces. Mountain ash trees with abundant fruits and residential garbage would have to pull bears off Nechako River area. No treed play areas.

School Name	Rating	Comments
Sacred Heart	Low to moderate	2, open 45-gallon receptacles on grounds, 1 large plastic lid in parking lot. Low chain link fence surrounds. Compost and garden at residence that backs onto play area. School is located just west of where the bank of the Fraser River becomes quite steep. Mtn ash trees in yards right next door as well as automated garbage cans. Potential for a problem exists if bear(s) trapped in this area. Rating due to proximity to Park and River.
Vanway Elementary	<i>Moderate to high</i>	6, open 45-gallon receptacles on grounds, 2 large in parking lot. Concern is with the east side green-space that backs onto Henry Road and Bear Road (across the street from play area). Also, open garbage receptacle in this area. Typical, low chain link fence surrounds large area. Brush removal and warning sign needed on east side. Hazard rating reflects adjacent green space and available garbage with moderate lines of sight to east.
Westwood Elementary	Low	6, open 45-gallon receptacles on grounds, 1 large bin parking lot with plastic lid. Good line of sight. Low chain link fence surrounds play areas and fields. Surrounding houses have automated cans visible. No treed play areas with good lines of sight.
Westside Family Fellowship Christian	Low to moderate	3, open 45-gallon receptacles on grounds, 1 large in parking lot. Houses built up in this area and surround the school. Some have automated garbage containers visible. Small green space immediately adjacent to east. A warning sign entering the green space required. Partial brush removal would open up line of sight to east. The play area in back is small and backs onto houses.

There were a number of similar hazards associated with the majority of the schools assessed:

*(1) Numerous non-bear resistant garbage receptacles occurred on school grounds:*

- All schools assessed had non-natural attractants present on their property (45-gallon type garbage receptacles).
- Up to 9 open 45-gallon receptacles were associated with schools (Photo 58). These included cemented down but open at top bins, bins in metal boxes that had openings at top, and plastic bins. None of these bins were considered bear resistant.
- The majority of schools had cemented in 45-gallon receptacles associated with each entrance way. Although they were cemented to the ground they were open at the top and were not considered bear resistant.
- All schools except Quinson had large, *plastic lid*, non-bear resistant garbage receptacles located in the parking lot (for an example, see Photo #8).

*(2) Some schools had multiple play areas and not all areas were visible from inside the school.*

- A bear could enter school property and not be viewed by attendants prior to allowing the children outside.

- Limited visibility could result in a decreased reaction time of attendants in emergency situations.

(3) *Treed play areas were commonly associated with elementary schools; however, these areas were often located the furthest distance from the school and tended to back onto overgrown green-spaces (Photo 59).*

- Overgrown vegetation along fence lines provides a bear with hiding cover and increases the probability of a close encounter between a child/person and bear.
- Green-spaces immediately adjacent to treed areas increase the probability that a bear will be in the area surrounding the school.
- The distance between the school and the trees and vegetation retained in these areas increases the probability of an encounter and decreases the response time of attendants should a problem occur.
- Line of sight tended to be poor in a number of these areas.
- Bear forage items were found in these areas, particularly berry producing species.

(4) Surrounding vegetation had overgrown the fence in a number of areas providing hiding cover for an animal(s) to approach at closer distances (Photo 59).

(5) Schools that backed onto tracks of undeveloped, unmanaged habitat that were conducive to a bear’s natural foraging behaviour were rated higher than schools where green spaces were further away.

(6) Schools with reported bear encounters in developed areas tended to be located in neighbourhoods with high bear occurrence reports and destructions, neighbourhood wide garbage management problems, and closely associated with the retention of connected green-spaces.

(7) Recent development surrounding some schools with older bear complaints reduced the probability of future bear problems due to habitat lost as long as green-space connectivity to the school area was not maintained and garbage in the surrounding neighbourhood was managed.



<p>Photograph 58. Open 45-gallon garbage cans appeared to be commonplace on school grounds.</p>	<p>Photograph 59. Many schools contained play areas that were in trees. These often had abundant hiding cover for bears as pictured at Ecole College Heights Elementary (July 9, 2008)</p>	<p>Photograph 60. Hiding cover/overgrown vegetation along fence line at Beaverley elementary (July 8, 08).</p>
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## **6.0 INTER-PROVINCIAL AND/OR INTERNATIONAL ISSUES**

A Provincial objective for hazard assessments is to “identify regional, inter-provincial and/or international issues in areas outside the community that may affect the effectiveness of the “Bear Smart” program.” The following issues have been identified and require partnerships between the City/municipality, Regional District of Fraser-Fort George (RDFFG), outlying agricultural farms, Conservation Officer Service, and the Northern Bear Awareness Society:

1) This Bear Hazard Report and the accompanying Bear Management Plan were initiatives of the Northern Bear Awareness Society (NBA). The NBA does not have the authority to develop, legalize, or enforce garbage storage bylaws required to achieve Provincial Bear Smart status. Nor does NBA have the authority to change the current automated garbage collection system to a bear-resistant system, change commercial garbage storage requirements, complete the fencing of Foothill Landfill, and the like.

***\*\*Partnerships and a commitment to move forward with pursuing Bear Smart status between the City of Prince George, the RDFFG, the Conservation Officer Service, and NBA are required to carry the program forward.\*\****

2) Transfer stations outside the City limits are managed by the Regional District of Fraser Fort George. *Interagency cooperation between the Regional District and the municipality are required to manage these sites for Bear Smart status.*

3) Bears are using the large tracts of retained green-spaces surrounding and within the City such as regional parks, connected green belts, and river corridors to access residential areas. The City must be willing to alter current green-space configurations and Parks management plans to dissuade use by bears. In addition, all non-natural attractants including garbage, planting of fruit bearing trees, bird feeders and composts management require the cooperation of and implementation by the City. Partnerships between biologists specialized in bear behaviour and the City are required to alter the spatial distribution of those green-spaces.

4) RDFFG and the City must work with the outlying communities to minimize the development of ‘problem’ bear behaviour in agricultural areas. Bear complaints overlap between the City and the RDFFG. Outlying agricultural areas of the Salmon Valley for example likely require interagency cooperation to proactively manage for bear problems in the Hart Highlands, particularly the Hoferkamp and Inverness Road areas. Similarly, a radiocollared bear in the Salmon Valley used the Foothills landfill and Lower Mud River areas (Ciarniello et al. 2002). Examples include examining ways to restrict access by bears through altering green-space configurations and examining domestic carcass disposal and/or crop placement and management. It is possible that food conditioning and habitation to humans of *some* ‘problem’ animals that use the City is a process that begins in the agricultural/rural areas and increases until the bear(s) become bolder and move closer to the City.



## **7.0 POTENTIAL DATA LIMITATIONS**

The data presented contains the following potential limitations:

- (1) Bear occurrence reports did not contain a number of vital information:
  - UTM Locations were generalized from street names and occurrence information. Reports that did not contain this information were omitted from the database.
  - Attractant categories were lacking for most 2007 occurrence reports. In previous years attractant categories were obtained by manually searching through paper copies of reports for details.
  - The COS stated that all bears destroyed were food conditioned (as per their definition) but this did not match reasons provided in the database.
  
- (2) There is no way to determine repeat bear occurrences with confidence:
  - Data should not be used to infer population size or trends as one bear may be reported by a number of different individuals over a long period of time.
  
- (3) The City of Prince George is large in area and it is not feasible to assess the entire City:
  - Ground visits were not feasible for all neighbourhoods, parks, schools and green-spaces due to funding and time constraints. It was essential to prioritize areas for assessments due to the size of the City and the time, person power and money required.
  - Areas were selected based on professional opinion, occurrence reports, and number of bears destroyed. A potential area may have been mistakenly omitted.
  - Large tracks of green-spaces were not assessed and their value was inferred based on professional opinion.
  
- (4) The City limits are narrow in relationship to actual distribution of dwellings of the people that comprise Prince George:
  - Miworth, Shelly, Buckhorn, and most of Beaverley neighbourhoods fall outside the City limits but bears using these areas likely use areas within the City.
  - Occurrence reports used for this document had been clipped to the City boundary and therefore under-represent actual number of reports and deaths as the outlying areas are not considered.
  
- (5) The City is continually expanding:
  - As the City expands into forested areas the distribution of complaints can be expected to change from what is presented in this report. It is anticipated that occurrence reports will follow the edge of developed Prince George and decrease towards the City core.
  - As development expands further into bear country there is anticipated to be an increase in conflict between bears, City residents, and agricultural areas.

(6) Hazard assessments are largely based on informed, but subjective, professional opinions of biologists:

- Bears are wild animals and can be anywhere around Prince George at any time. Although the most up-to-date data available was used for this report an area rated as low, such as the inner Bowl, could have a bear present. This is particularly true for Prince George because green-spaces and trails tend to spur off high bear use areas acting as a filter into areas that may be ranked as a low hazard.

## **8.0 DISCUSSIONS**

Between 2004 and 2007, the number of bear complaints more than doubled despite considerable efforts by the Omineca Bear Human Conflict Committee such as working with the City to install bear resistant garbage containers in a number of parks, running a fruit exchange program, removing some City maintained fruit trees, and delivering consistent extensive public outreach programs. The management of problem bears also remained very reactive as evidenced by the large numbers of bears destroyed each year. Prince George is located within bear habitat and along natural bear travel corridors and bears should be expected to be a part of the larger Prince George area. The focus of this report is to examine the hazards present for bears within the City and Regional District of Fraser Fort George in order to determine ways bears can fulfill their life requirements while also reducing the number of bears destroyed and negative encounters between bears and humans.

Reducing negative bear-human encounters requires an understanding of the biology of bears. Bears are quick learners as evidenced by their ability to learn behaviours required for a solitary life in the short time they spend with their mothers (approximately 1.5 years for black bears and 2-3 for grizzly bears). During hibernation bears do not eat, urinate, or defecate and therefore must rely on fat reserves built up over their active season. Bears in the Prince George area may spend as long as 5-6 months in their dens relying on these reserves (Ciarniello et al. 2005). Female bears also have delayed implantation where the number of cubs produced is dependent upon the amount of fat she has stored; if she has only enough fat to sustain herself then no cubs will be produced. Therefore, obtaining as many calories as possible during their 6-7 month active season is paramount to their survival, reproduction, and achieving a 'good life' as a bear.

Although carnivores, bears' diet primarily consists of vegetation and berries. In spring bears forage on newly emerging grasses, dandelions, and pea vines, switching to berries once available. Curiosity and constant learning by bears means they may be attracted to areas of human use as they forage, especially if non-natural attractants are available. If non-natural attractants are not available the majority of bears can be expected to pass through non-productive foraging areas on their way to seasonal breeding, good foraging, or denning habitats. Although we may view discarded foods as waste most contains high-calorie forage items for bears that may be obtained with little energy expenditure in a short amount of time. For example, a bear would be required to consume hundreds of berries or ants to be equivalent to the calories present in a discarded hamburger, fries, or rotting fruit.

Associations between humans, human developments and food rewards may be made by the bear when non-natural attractants are obtained. These associations, termed food conditioning and/or habituation to humans, can quickly develop due to the remarkable ability of bears to learn, possibly from a single instance, and often result in 'problem'/nuisance behaviours. Problem bears tend to be destroyed; however, if the non-natural attractant(s) remain another bear often quickly fills the void perpetuating the cycle of making and destroying 'problem' bears. If not managed, this cycle of creating and destroying problem bears can result in a population sink or ecological trap (see Delibes et al. 2001, Battin 2004). In these situations, animals are attracted to areas that result in high mortality. Prince George is within bear habitat and contains abundant, easily available non-natural attractants; bears may be drawn into the City by the availability of non-natural attractants or find themselves trapped as they attempt to travel by the City. Over time ecological traps can result in population level consequences for the surrounding areas (Kristan 2003).

Rural residents appear to have more tolerance for the presence of bears than urban residents. Despite backing onto abundant bear habitat there were few reports from sparsely-populated areas outlying the city limits such as Blackburn, Beaverley, Buckhorn, and Cranbrook Hill. Bear complaints followed the periphery of urban Prince George and lessened towards the urban core. The distribution of future bear complaint reports is expected to follow the pattern of expanding development. That is, as the City expands into formerly undeveloped habitats bears that live in those areas become displaced and are either forced to live in close proximity to humans or must attempt to find new unoccupied range. An increase in bear occurrence reports and bear-human interactions can be expected as new concentrated residential developments (e.g., Tyner Boulevard) expand further into areas formally unoccupied by people. Bears in these areas need time to learn to avoid humans and to find new land for their home ranges; as humans expand farther into bear habitat area residents need to become more vigilant against developing 'problem' bears. New development projects must be required by the City to employ proper planning in relationship to concerns for wildlife. Complaints about bears are expected to continue until such time as the habitat is no longer available to bears (habitat loss as in the City core) or attractants are managed to such a level that bears have no reason to enter or remain in residential areas.

Some bears may get caught in town where green-spaces end at residential areas or green-space configuration acts to filter bears into residential areas (examples include College Heights and Hudson Bay Slough areas). Other bears likely live on the periphery of the City and slowly acquire conditioned behaviour in the outlying areas soon becoming attracted into urban Prince George where abundant residential and commercial garbage and fruit on trees were available (examples include Hoferkamp/Inverness areas and upper College Heights/Lafreniere). For example, curbside automated garbage collection in outlying areas such as Haldi is believed to contribute to food conditioning of bears and likely influences bear use of the urban upper College Heights/Lafreniere area. In the upper Hart Highlands the availability of residential garbage and access to the Foothills landfill was believed to strongly influence the distribution of bear occurrence reports as well as the number of bears destroyed. Part of the difference in bear reports for areas such as the north Hart Highlands versus Cranbrook Hill likely lies in the type of garbage

collection. Cranbrook Hill residents bring their garbage to the Quinn Street transfer station, whereas the Hart Highlands has curbside pick-up.

This Bear Hazard Assessment provides detailed information on the potential agents of human-bear conflicts specific to the City of Prince George. In order to reduce the number of bear complaints, bears destroyed, and the potential for a serious negative bear-human encounter, the City of Prince George must take the initiative by implementing and enforcing a number of management techniques that address the hazards identified in this document. For example, regulations and bylaws will be required for residential and commercial garbage storage. Further, bears move freely between jurisdictional boundaries and therefore the City must form alliances with the Regional District of Fraser Fort George to manage non-natural attractants and reduce the likelihood of bears becoming conditioned in outlying areas and travelling into the City. Moving towards a proactive approach to bear management by dissuading negative encounters before they occur requires the Conservation Officer Service and Northern Bear Awareness Society to work with the City and District to continue to identify, remove, and manage the cause(s) of the development of 'problem' bear behaviour.

***\*Hazards identified in this Bear Hazard Assessment are being used to form the basis for detailed management plan recommendations for the City of Prince George. Please refer to the Bear-Human Conflict Prevention Management Plan for the City of Prince George, British Columbia. Expected completion date December 2008.\****

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