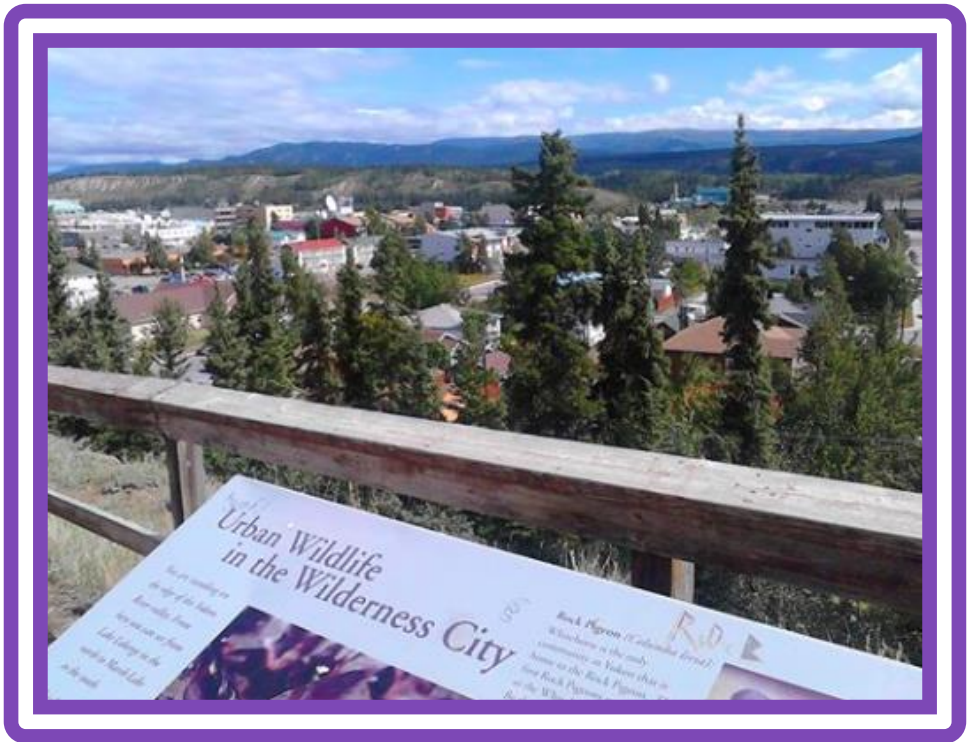
Whitehorse Bear Hazard Assessment

Whitehorse, Yukon Territory



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EXECUTIVE SUMMARY

To conduct the Whitehorse Bear Hazard Assessment, we compiled data from the Yukon Territorial Government (YG), information from public input sessions, habitat mapping data, information collected during interview sessions and data collected in the field to summarize and describe human-bear conflict causes in Whitehorse, Yukon.

Non-natural attractants were surveyed in all urban residential subdivisions, rural residential subdivisions, trailer parks and campgrounds, as well as in a sampling of seven schools, 13 playgrounds, and four trails. Information was also gathered from interviews with Environment Yukon employees, City of Whitehorse employees, local non-government organizations and public information sessions, where data was collected on public opinion of conflict history within the city and opinions on bear management.

Black bears accounted for most wildlife occurrence reports (81%), with grizzly bears accounting for 15% of reports (YG data). The remaining 4% were bears of unknown species. Occurrence reports typically begin in early April, peak in late June and early July, and decline sharply from August to October. The cause of conflict was most often related to bears accessing human food and garbage.

During non-natural attractant audits, we noted high proportions (over 50% of properties surveyed) of unsecured attractants considered high value to bears (e.g. garbage, recycling, compost/organics), particularly in rural residential areas. Mapping was conducted at a scale of 1:20,000 based on the Ecological Map created by Applied Ecosystems Ltd in 2000. All areas surveyed were ranked by comparative hazard for bears and people. Hazard maps account for proximity to green space, previous reported human-bear conflict, non-natural attractants and natural bear habitat, and rank each subdivision within area type (e.g. rural residential, urban residential) from highest to lowest hazard. Downtown, Robert Service campground, Hidden Valley school and the playground at Northlands trailer park ranked in the highest hazard categories for residential areas, campgrounds, sample of schools, and sample of playgrounds respectively. Northlands trailer park, Hi Country RV Park,

Golden Horn school and the playground at Mary Lake ranked the lowest hazard categories for residential areas, campgrounds, sample of schools, and sample of playgrounds respectively.

We discuss management options for decreasing the accessibility of garbage for bears, how to manage natural attractants (in particular, soapberry), and make recommendations to reduce human-caused bear mortality and increase human safety in Whitehorse.

RECOMMENDATIONS

HIGHEST PRIORITIES

1. Conduct a thorough assessment of available bear-resistant garbage management systems (described in the Discussion section) to determine which system would work best for Whitehorse. With the unique needs of each subdivision type, there is not likely one prescription that would fit every area. We suggest either the Haul-All system for the entire city; or an equivalent system with tested and certified self-latching bear-resistant garbage totes for urban residential areas and a system similar to Haul-All for rural residential areas.

2. Implement a city-wide bear-resistant waste management system (for residential and commercial properties).

3. For Kwanlin Dün areas (MacIntyre, Crow & Swan), replace wooden garbage boxes at residences and community buildings with bear-resistant metal boxes that can hold garbage and recycling/compost. Hold a community spring clean-up to remove any left over bones from the fall hunt that were given to dogs. Make the event social to encourage resident participation.

4. Draft and pass a wildlife attractants bylaw (see Appendix V for a sample bylaw from the District of Squamish). Consider including all non-natural attractants, including bird feeders, livestock (electric fence) and fruit trees.

5. Install bear-resistant food lockers and garbage bins at campground tenting sites, prioritizing Robert Service campground tenting area.

6. Pedestrian garbage bins in parks, campgrounds and scattered around the city are often not bear-resistant, as many have had the latches removed. These

bins should be completely audited (and monitored on a 1-5 year cycle) and replaced or repaired as required. Prioritize bins bordering on green space and campgrounds.

7. Open sightlines and remove soapberry plants prioritizing the areas abutting green spaces in the highest hazard areas: the downtown escarpment, Hamilton Boulevard, Copper Ridge, Hidden Valley school, the tenting loop at Robert Service campground. Work with Fire smart initiatives to pool planning and resources.

8. Require new developments to install bear-resistant garbage bins (or provide bear resistant garbage totes) as part of the development plan.

9. Implement an education program for city workers (bylaw, permit granting staff) about the merits of electric fencing (constructed for predator exclusion) for livestock. The cost-sharing program implemented by the agriculture branch appears to be under-utilized and should be advertised to local agriculturalists.

MODERATE PRIORITIES

1. Landfill maintenance should be increased to ensure the electric fence maintains a high charge. Keep vegetation and loose garbage that could short out wires near the fence low for at least four feet outside the fence (use a weed-whacker/bobcat as often as is necessary).

2. Start a program to manage community fruit trees (including education). Assist residents who want to harvest their fruit (with community gleaning programs etc.) so bears don't access the fruit first. Implement a program to replace unwanted fruit trees with trees that blossom in the spring but do not produce fruit (e.g. spring snow crabapple trees).

3. Start a bear-resistant bin loaner program for recycling and livestock feed. These programs have been quite popular in some communities (e.g. Bragg Creek, AB; Meadow Creek, BC).

4. Remove fruiting berry bushes from city landscaping and enact a policy of planting natural food less attractive to bears.

5. If certain trails are experiencing high numbers of bear sightings, consider a trail audit, to assess sightlines and bear food on trails popular with recreationalists.

6. Audit the remaining schools to determine if sightlines need to be increased or bear food (e.g. soapberry) needs to be removed.

7. Erect educational bear signage at the recreation areas, prioritizing Day Use areas, as users are more likely to have food with them. Replace non bear-resistant bins with bear-resistant ones.

8. Continue partnerships (including the Bear Working Group) with the City of Whitehorse, Wild Wise Yukon and Environment Yukon to ensure human-bear conflict issues are mitigated with input and resources from all stakeholders. Developing capacity through staff and volunteers at Wild Wise Yukon will help keep much of the work required for these recommendations local.

9. Update this hazard assessment in approximately five years to track progress and measure success.

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INTRODUCTION

Conflicts between humans and bears are increasing worldwide, contributing to declines in local populations of species (Can *et al.* 2013). Across North America wildlife was historically managed using bounties, over-hunting and over-trapping. Predators were particularly targeted in many areas as they were viewed as either dangerous to life and property, or as competition for resources (e.g. moose/wild game). The Yukon Territory was no different; however, without the high human population density to completely wipe out large predators that were extirpated in much the south, Yukon maintains its historic complement of predators. While predator control is no longer as widespread and unrestricted as it once was, killing (or removing by relocation) predators is still a common wildlife management tool.

Whether undertaken by wildlife managers or property owners, the effects of predator control on local bear populations can be devastating if not carefully monitored and managed. Bears have a slow reproductive rate: black bears give birth to (on average) two to three cubs every two years starting around age four (Czetwertynski, 2007) and grizzly bears give birth to (on average) two cubs every three years, starting around age eight (McCann, 1998). This means that it is more difficult, and can take more time, for bears to repopulate an area when their population is depressed, when compared with other, faster-reproducing species. Unlike coastal areas of neighboring British Columbia, where black bear populations can approximate 1 bear/km^2 (Appleton 2006), Yukon's short growing season and dry habitat does not allow for a dense bear population. Black bears numbers are estimated at a little under 25 bears/1000 km^2 and grizzly bears are estimated at approximately 5-22 bears/1000 km^2 (Smith and Osmond-Jones 1990).

Wildlife managers have been shifting policies in attempts to reduce human-wildlife conflict from reactive measures to proactive measures. Proactive measures, such as increasing emphasis on education, enforcement, and prevention of conflict have allowed threatened and endangered bear populations in various locations North America to begin to recover (e.g. Alberta ESRD 2013, U.S. Fish and Wildlife Service 2015, New Jersey Division of Wildlife 2015). Bear population recovery can lead to increased conflict with humans; however, wildlife managers are creating programs to help prevent human-bear conflict. One such program is the assessment of hazards to bears and public safety within a community, which is used to take steps to address hazards and move forward with pro-active bear management.

The Whitehorse Bear Working Group (a group comprising Wild Wise Yukon, The City of Whitehorse, and the Yukon Government), contracted Wind River Bear Institute, Canada (Wind River Consulting) to conduct a bear hazard assessment of the City of Whitehorse in the summer of 2015. The goals of the Wind River Bear

Institute are to reduce human-caused bear mortality, which we accomplish through social programs (including bear hazard assessments) and biological programs (including Bear Shepherding programs).

OBJECTIVES OF BEAR HAZARD ASSESSMENTS

For the purpose of this hazard assessment, a hazard is defined as any risk of injury or property damage to humans, and/or any risk of injury or death to a bear. Bear hazard assessments are used to provide a community or organization professional advice and direction to identify, rank, prioritize and mitigate causes of bear hazards (human-bear conflict) in their area. Human-bear conflict can increase risks to human safety, and can be a significant source of mortality for bears, which is problematic in declining or threatened populations. A bear hazard assessment is the first step of the multi-step process formally identified in British Columbia for a community seeking Bear Smart status, which involves the following:

1. Conduct a bear hazard assessment
2. Write a human-bear conflict management plan
3. Implement an education program
4. Implement a bear-proof waste management system
5. Implement and enforce Bear Smart bylaws
6. Revise Official Community Plan documents to be consistent with the Management Plan

The goals of a bear hazard assessment are to

- Identify sites, areas, trails, and practices that have historic, existing, and potential human-bear conflict;
- Identify knowledge gaps of bear use and human-bear conflict in the area
- Provide recommendations for further investigation, and additional hazard assessment phases; and
- Produce management recommendations to reduce existing and potential conflict within the community (Davis *et al.* 2002).

Bear hazard assessments should be repeated or updated as knowledge gaps are filled, as the community implements recommended changes, and as standards of practice change. The community stakeholders should also implement a monitoring system to gauge progress in measures of success.

Measures of success include:

- A trend toward a decrease in the presence of non-natural foods available to bears,

- Decreases in the number of;
    - Human-bear conflicts reported to the C.O.S.,
    - Bears destroyed by the C.O.S., RCMP, and individuals,
    - Bears translocated.
- Decreases in property damage, and
- Decreases in resources expended in dealing with human-bear conflicts.

Success will most likely be achieved if local community members champion a recommendation and obtain community support to see the recommendation through when possible.

STUDY AREA

The original inhabitants of the Whitehorse area were the Tagish Kwan, who are linguistically affiliated with the Southern Tutchone, and include Southern Tutchone people, Tagish people, and Tlingit people. Kwanlin, which means "running water through canyon" in Southern Tutchone, is what the indigenous inhabitants of the area called Miles Canyon, the Yukon River's famous rapids. It was an area people used for hunting and fishing for hundreds, if not thousands, of years. Today, the Kwanlin Dün, and the Ta'an Kwäch'än First Nations, both Southern Tutchone people, inhabit the Whitehorse area.

In 1896, prospectors in the Klondike region east of Dawson City, Yukon, discovered gold, and approximately 10,000 people migrated to the area seeking gold, passing through Whitehorse on the way. Paddle-wheelers transporting people on the Yukon River could only travel as far as the rapids south of the city, in Miles Canyon. A permanent settlement was established, as the area became a natural stopping point at the dangerous rapids. The gold rush ended in 1899 when gold was discovered in Alaska. Whitehorse subsequently experienced a brief copper boom, and played a significant role linking the north and south travel routes during World War II. The city is, in modern times, a popular tourism destination, and is still a stopover point for people traveling to and from Alaska.
(http://www.explorenorth.com/yukon/whitehorse-history.html)

Whitehorse has a population of just fewer than 28,000 people (Yukon Bureau of Statistics Population Report 2013) and is located at km 1426 on the Alaska Highway in the Southern Lakes region of the Yukon Territory. Whitehorse is in the Cordilleran climate region, the Complex Soils of Mountain Areas soil region, the Cordilleran vegetation region, and the Boreal Cordillera ecozone, Yukon Southern Lakes Ecoregion. At 60°, 22' N, the city has a subarctic climate with an average annual temperature of -0.1° C. Summer days have 20 hours of daylight near the solstice, and average daily temperatures around 20° C. Lying in the rain shadow of

the Coast Mountains, the area is relatively dry, receiving on average 145 cm of precipitation in the form of snow and 163 mm of precipitation in the form of rain (Environment Canada 2010).

White Spruce (*Picea glauca*) and Subalpine Fir (*Abies lasiocarpa*) dominate the forest cover; with Trembling Aspen (*Populous tremuloides*) and Lodgepole Pine (*Pinus contorta*) appear in varying amounts throughout the lower elevations. Higher elevations contain Subalpine Fir in a "krumholz" (stunted) form. Alpine vegetation is sparse, with mosses, lichens and herbs; most of the alpine consists of rock and ice (Ecological Framework of Canada).

The Whitehorse Bear Hazard Assessment was generally confined to Whitehorse city limits (Map 1). This is a large area that includes urban residential, rural residential, commercial, industrial and green space recreational uses. Many areas outside of human developments are natural and undisturbed, or contain networks of trails.

Map 1. City of Whitehorse aerial photo. Study area is bounded by the city limits (black line).

METHODS

DATA COLLECTION

Human-bear conflict in a community can be influenced by many factors, including the quality of bear habitat in and adjacent to developments, availability of non-natural food (e.g. garbage, recycling, bird feeders, pet food, etc.) and history of conflict in the study area. We compiled data from the Yukon Territorial Government (YG) (Occurrence &TIPP Line reports), information from public input sessions, habitat mapping data, information collected during extensive interview sessions and data collected in the field from July to August 2015 (Field data).

Occurrence & TIPP line reports

YG uses two methods to collect data internally: YG data and the "Turn in Poachers and Polluters" (TIPP) hotline. When members of the public call the TIPP line to report a human-bear conflict, the report is recorded as an encounter/sighting, an incident (actual conflict, e.g. bear accessing garbage), a mortality (bear is removed either by relocation or death), or other. YG hunting harvest data is also collected, including the harvest location. Conservation Officers respond to reports and record encounters, incidents, mortalities, harvests and the probably cause of the conflict if it can be ascertained. Consistency of these reports, however, varies by officer. Reports are compiled in a YG database.

Habitat Mapping

Applied Ecosystem (2000) supplied the habitat mapping data. This project mapped wildlife habitat in the Whitehorse area in 1999 at a scale of 1:20,000, and described the different ecosystem types based on soil and vegetation cover in field samples.

The Southern Lakes Grizzly Bear Project has radio-collared a number of bears using the Whitehorse area. Some of this data, when bears were in close proximity to the City, were used to illustrate how grizzly bears use the area.

Field Data

To assess the risk of conflict and prescribe mitigation measures, we identified areas within the city where high quality bear habitat overlaps with areas where high levels of non-natural food occur. To accomplish this assessment effectively, we employed different methods of data collection for different development types within Whitehorse. We categorized development types according to common characteristics in the following ways:

- Urban residential
- Rural residential
- Urban commercial
- Industrial areas
- Trailer parks
- Campgrounds and RV parks
- Schools
- Playgrounds
- Trails
- City parks and recreation areas
- Additional audits

For each development type, similar methods were used, with adjustments to account for inherent differences between development types. Field efforts were concentrated on collecting data to detail availability of non-natural attractants and quality of surrounding bear habitat.

The goal was to compare each subdivision or development type assessed, with others of the same type, and to rank them from highest to lowest risk of hazard. The goal was to reveal common concerns for each subdivision or development type (listed above) and to highlight which areas within groups are currently experiencing, or are more likely to experience higher conflict with bears in the future.

Urban residential

All urban residential neighborhoods in Whitehorse were surveyed, including: Hillcrest**,** Logan, Arkell, Ingram, Copper Ridge, Granger, MacIntyre, Downtown, Takhini, Riverdale, Porter Creek, Crestview, Crow and Swan, and Whistle Bend. In each subdivision, we conducted a garbage audit, a general attractant audit, and assessed playgrounds and schools. We discuss playgrounds and schools separately in this document.

Garbage audits began between 21:00 and midnight, and consisted of a count of the number of garbage totes placed curbside before the garbage pickup day. A minimum of 300 residences were surveyed in larger subdivisions, a minimum of 200 residences in medium-sized subdivisions (e.g. Granger), and a minimum of 100 residences in small subdivisions (e.g. Logan, Ingram). If a subdivision contained fewer than 100 residences, every residence was surveyed. The City provides each residence with a black garbage tote and a green compost tote, each of which are picked up bi-monthly from the curb.

A general attractant audit was conducted in each subdivision to assess the number of non-natural attractants constantly available to wildlife. Only non-natural

attractants visible from the street without entering private property were counted and auditors did not record resident addresses. The same number of total residences was surveyed as for the garbage audits. Non-natural attractants included unsecured garbage, recycling, compost, bird feeders, pet food, fruit trees, mountain ash trees and barbeques. Coolers, pet food, and petroleum products were categorized under "other." If a garbage tote was visible, it was counted that garbage as available, despite not being able to confirm whether the bin contained garbage at that moment. This was done because residents were often observed putting bags of garbage into garbage totes outside homes between pickup days. Even if garbage totes are empty, they are likely both an olfactory attractant and a visual attractant to food-conditioned bears. Compost was recorded in the same way as garbage; if the tote was visible from the street it was counted as an available attractant. All barbeques were counted as available attractants despite not knowing if residents had emptied the grease traps or burnt off their grills. Bears are not currently targeting mountain ash berries in Whitehorse (Ramona Maraj, Yukon carnivore biologist, personal communication, July 22, 2015), but mountain ash berries are a preferred food source for black bears where the plant occurs in the wild naturally and can be a source of human-bear conflict in urban areas (Homstol *et al.* 2006). Therefore, mountain ash berries were included in our assessment as a potential future source of human-bear conflict in Whitehorse.

Rural Residential

All rural residential neighborhoods were surveyed for non-natural attractants and public opinion of conflict history. Because community members in rural residential areas of Whitehorse are responsible for their own garbage disposal (to the landfill), garbage tote audits were not conducted. Only general attractant audits were conducted in these areas. As rural residences are less visible from the road, residents were contacted by door-to-door canvasses, speaking with them directly about attractants on their property and history of human-bear conflict both on their property and in the neighborhood. In each rural residential area, ten houses were surveyed for non-natural attractants, using the same methodology as for urban residential areas, with the exception of Wolf Creek, where 20 homes were surveyed due to the subdivision's larger size.

Urban Commercial

An attractant audit was conducted on ten businesses in the urban commercial core (Downtown) by assessing how various commercial operators stored garbage, recycling, compost and restaurant grease.

Industrial Areas

Fifteen residences were surveyed in four Whitehorse industrial areas (Kulan, MacRae, Marwell, and Mt. Sima). In each area, general attractant audits were conducted as per the methodology for residential areas; however, petroleum

products were also counted, because industrial areas are more likely than residential areas to have large amounts of unsecured petroleum products, which bears often find attractive.

Trailer Parks

All five trailer parks within the city of Whitehorse were surveyed. In each area an attractant audit was conducted on 50 residences (same methodology as the residential area attractant audits). Three of the trailer parks (Lobird, Northlands Park, and Mountain View) provide a central bin or bins for garbage and/or recycling, and the other two (Range Road trailer park and Kopper King) require residents to manage their own waste. General attractant audits were conducted at all the trailer parks, where unsecured garbage, recycling, compost, bird feeders, pet food, fruit trees, mountain ash trees and barbeques were recorded.

Campgrounds and RV Parks

Campground and RV Parks were assessed through attractant audits on a site-by-site basis, and by recording general non-natural attractants available at the campground. A ground survey of natural attractants and sight lines around the perimeter of the campground was also conducted. Natural attractants can attract bears into closer proximity to humans, which increases the risk of an encounter and subsequent conflict. Sight lines (how far a person can see into the forest) influence both a bear and a person's ability to detect the other; areas with higher sight lines allow for greater visibility and can help avoid surprise encounters.

Non-Natural Attractants

Since most people in RV Parks and campgrounds are visitors unfamiliar with the area and potentially unfamiliar with camping in bear country, campgrounds and RV Parks were assessed by how they conducted visitor education (signage, speaking to them at check-in), how they managed general attractants onsite (central garbage, recycling and other non-natural attractants), and the nature of any human-bear conflict issues experienced in the recent past. A general attractant audit, (similar to audits conducted in residential areas), was conducted, surveying between 13 and 66 campsites, depending on the size of the campground and the number of campers onsite.

Natural attractants

To assess natural attractants (bear food) and sight lines surrounding campgrounds, the perimeter was walked; rangefinder measurements of sight lines recorded, and the relative abundance of common bear foods assessed (for both black bears and grizzly bears), whenever the vegetation appeared to change. Three sightlines in each zone were recorded, which were averaged to get a sightline for that particular zone. For the assessment of natural attractants (bear food) in each zone, a representative

10m^2 plot was used to estimate the percentage of ground cover in the plot each bear food plant occupied.

Schools
We assessed schools by noting availability of non-natural attractants, natural attractants, sightlines and proximity to green space. We recorded central garbage storage, recycling storage and pedestrian garbage bins in schoolyards. The same methodology was used to assess bear food and sight lines as in Campgrounds and RV Parks.

Playgrounds
Playgrounds were assessed using the same methodology as used for schools, recording availability of non-natural attractants in pedestrian garbage bins and employing the same methodology for assessment of natural attractants and sight lines.

Trails
Whitehorse has an extensive trail system through urban and residential green spaces, popular with both residents and visitors. Four trails were sampled based on proximity to previous reported human-bear conflict. Trails were assessed by walking the entire length and recording sightline visibility, (using a range finder) up and down the trail and perpendicular to the trail on both sides. Sightline measurements were recorded and relative bear food abundance estimated in each zone (obvious change in vegetation along the trail as we walked), using the same methodology as in Campgrounds and RV Parks.

City Parks and Recreation areas
Parks and recreation areas are likely to receive high visitor use, making educational effort (e.g. signage) important, as recreational areas are not manned the way campgrounds and RV Parks are. We recorded whether major recreational areas had any educational signage, or bear-resistant garbage and/or recycling bins at trailheads.

Additional audits
Pedestrian garbage bins located around the city were checked to determine if they were bear-resistant. Twenty-one condominium complexes were also audited to check their garbage and recycling systems.

Public Input

We held two open house drop-in presentations, at the Whitehorse public library over approximately four hours, on July 30 and July 31. Each session consisted of

quick surveys to gauge level of public support for potential recommendations that have been implemented in other Management areas in North America. Recommendations ranged from bear-resistant garbage disposal systems to bylaws, and partnerships for electric fence cost-sharing or other programs designed to reduce the availability of non-natural attractants to bears. Attendees drew on maps to record previous sightings and conflicts they experienced within the city limits. Wild Wise Yukon advertised the events on social media, using flyers, and in a radio interview on CBC. Identical posters were displayed at the Canada Games Center, the Kwanlin Dün office, and at the Ta'an First Nation office, which were open for feedback for several weeks.

In addition to the public information sessions, an online public opinion poll was circulated for three weeks (Survey Monkey). Twenty-eight participants answered 10 questions to determine management options the public might support in order to reduce human-bear conflict.

Extensive interviews were conducted with numerous City of Whitehorse employees, Yukon Government employees, First Nation representatives, and local non-governmental organizations. A list of those interviewed is provided in Appendix I.

DATA ANALYSIS

Occurrence & TIPP line reports

YG provided historical grizzly and black bear occurrence reports for the City of Whitehorse from two key sources: the Yukon Government Microsoft Access Database of wildlife occurrences, and the TIPP line. The YG database included historical grizzly and black bear occurrences up to, and including the year 2012. All grizzly and black bear reports from within the YG occurrence database after the electric fencing of the landfill in 1997 (with locational data) were identified and mapped using *ArcMap* and occurrences (n=86) which took place within or near the City of Whitehorse were selected for analysis. There were not enough occurrence reports with locational information from prior to the fencing of the Whitehorse Landfill site to allow assessment of pre- and post- mitigation changes.

AllSmith Overland provided GIS support and encounter and sighting data from the TIPP line, which included 243 sightings and encounters from the Whitehorse area from 2012-2014. In 2012 there was some overlap between the TIPP and YG database, encounters reported in both systems were cross-referenced to ensure that they were not duplicates. It was expected, however, that these reports likely involve many of the same individual bears. Reports from the YG and TIPP line were merged into one Statistical Package for the Social Sciences (SPSS Version 21) database for analysis.

We summarized data to get information on where and when conflicts occur (by year, and by season), and the probable source of the conflict. In some cases we lumped the data from both sources together, cross-referenced them to ensure there was no duplication, but in other cases we separated the data out by source. To avoid confusion, we specify which data source we used in the Results section.

Habitat Mapping

Ecosystem types were ranked and mapped into feeding seasons of pre-berry (April 1 – July 15), berry (July 16 – August 31), and post-berry (September 1 – November 30). The ecosystem descriptions used were from the Ecosystem Map created by Applied Ecosystem Management Ltd. (2000) to define feeding seasons. It is important to note that the scale of this map is 1:20,000; small patches of habitat (along with road and trail-side vegetation) may be overlooked due to the coarseness of the map scale. Zones were ranked by their importance to both black bears and grizzly bears based on the vegetation description of ecosystem type. We cross-referenced some of the more important ecosystem types with high quality habitat areas surveyed in the field to ensure accurate interpretations of habitat quality.

Field Data

Data collected throughout the city was analyzed by Subdivision type or development type in similar ways.

Saturation of attractants

Saturation of attractants was calculated for all areas where attractant audits were conducted (urban residential, rural residential, industrial areas, trailer parks, and campgrounds and RV parks). Saturation of attractants in an area (or number of attractants per residence) was calculated by adding total number of attractants counted during the attractant audit in each subdivision or development type and dividing that number by the total number of residences surveyed.

Value of non-natural attractants at residences

All areas where attractant audits were conducted, (urban residential, rural residential, industrial areas, trailer parks, and campgrounds and RV parks), also had potential value of non-natural attractants ranked. Each non-natural attractant was ranked by assigning it a score based on its level of attractiveness to bears and subsequent potential threat to human safety. If a bear would likely defend an attractant from humans present in its vicinity (threat to human safety), or if a bear would likely attempt to repeatedly access the attractant (and therefore more likely to be re-located or destroyed), we rated the attractant in the high category. If the item was either something a bear might defend, or a threat to bear's life for repeatedly accessing it, but not both, we rated it as moderate. Highly attractive items included pet food, garbage, recycling and compost (in urban residential areas); moderately attractive items included fruit trees and compost (rural residential areas). Compost was rated higher in attractiveness in urban residential areas because it is not actually composting, but is the organic food waste of garbage and therefore the most attractive part of garbage. Less attractive items included barbeques and mountain ash.

Natural Habitat Assessments

When surveying smaller sites such as the campgrounds and RV parks, schools, playgrounds and trails, the scale of Ecological mapping data available (Applied Ecosystems Ltd. 2000, 1:20,000) was too coarse to accurately describe the site. In these cases natural habitat assessments were conducted including sight line measurements and natural attractant (bear food) plots.

Sightlines

To assess how visible bears and people are to each other in a forested area, sightlines surrounding a site were measured, by zone, as described in the data collection of natural attractants section. Sightlines were ranked high (>50 m),

moderate (25 – 50 m) or low (<25 m). The zones surrounding each campground, school, playground and trail were then mapped to illustrate the highest risks zones.

Natural attractants

To assess natural attractants at a scale smaller than the habitat mapping could provide, common bear foods were categorized and ranked by importance to bears, season in which bears target them (pre-berry, berry and post-berry) and by relative attractiveness to bears (low, moderate or high) in all of the areas where natural habitat assessments were conducted, (campgrounds and RV parks, schools, playgrounds and trails). Assessment was based on professional opinion of the authors and Sandra MacDougall, in consultation with the Territorial carnivore biologist, Dr. Ramona Maraj. Bear foods included in each category were categorized as follows:

<u>Pre-berry Season (April 1 – July 15)</u>

High	*Hedysarum alpinum* (bear root)
	Oxytropis campestrus (locoweed)
	Equesetum arvense (horsetail)
	Taraxacum officionale (dandelion)
Moderate	*Trifolium pratense* (clover)
	Arctostaphylus uva-ursi (Kinnickinnick/bear berry)

<u>Berry Season (July 16 – August 31)</u>

High	*Shepherdia canadensis* (soapberry),
	Empetrum nigrum (crowberry)
Moderate	*Rosa acicularis* (wild rose)
Low	*Viburnum edule* (cranberry)

<u>Post-berry Season (September 1 – November 30)</u>

High	*Hedysarum alpinum* (bear root)
Moderate	*Empetrum nigrum* (crowberry)
	Viburnum edule (cranberry)
Low	*Taraxacum officionale* (dandelion)

Percentage cover of high value bear foods in each season was used to create a map of hazard zones surrounding the area we were assessing. We used this methodology for campgrounds and RV parks, schools, playgrounds and trails.

Public Input

Public input data, including the Survey Monkey poll, were summarized by transcribing reports of sightings and travel corridors from public events and poster demonstrations at the Kwanlin Dün First Nation office and the Canada Games Center onto an aerial photo. Each potential recommendation was listed in a table and indicates the level of public support.

Hazard Rankings

Hazard rankings help to obtain within-group comparisons in order to prioritize mitigation strategies. All data collected in the field was compiled into a hazard ranking score, in order to compare areas by type.

Subdivisions

Each subdivision was ranked out of a top score of 10. Scores were calculated based on four categories: whether the area bordered a green space, availability of non-natural attractants, quality of bear habitat surrounding the subdivision, and previous occurrences in the area. Subdivisions that border green spaces automatically scored 1, due to increased likelihood of a bear traveling adjacent to the area, the other three categories were scored out of 3.

TIPP line reports were recorded by subdivision between 2012 and 2014. The percentage of occurrences from the TIPP line was converted to a score out of 3, where the highest score equaled 3, remaining subdivisions scored reflectively. Non-natural attractants were ranked by calculating the percentage of high value attractants counted in the total number of residences surveyed. That percentage was multiplied by the saturation score (number of attractants per house), to give a total score out of 300 (which was converted to a score out of 3).

Quality of bear habitat was ranked by assigning the Ecosystem Map (Applied Ecosystem Management Ltd. 2000) in each food season (pre-berry, berry and post-berry) a score out of one. Any high quality habitat types in each season scored 1, and moderate habitat types scored 0.5. Ranking habitat quality of the Ecosystem Map (Applied Ecosystem Management Ltd. 2000) polygons was based on professional opinion, and cross-references of our notes on high quality bear habitat in locations surveyed while in the field. The three seasonal scores out of 1 were added together to get a habitat quality score out of 3.

These scores were added together for an overall hazard ranking out of 10. Each score was categorized as highest hazard if it fell in the top quarter of scores in the group, as lowest if it fell in the bottom quarter of scores in the group, and as either high or low moderate if it fell in the middle. Categorizing in this way enabled comparison between subdivisions.

Non-natural attractants + bear habitat + green space + conflict history = 10
(3) (3) (3) (1)

While schools, playgrounds and campgrounds were all ranked on a ten point scale in a similar fashion, the scale is not meant to allow comparisons from one group (e.g. subdivisions) to another (e.g. campgrounds) because of inherent differences between groups.

Campgrounds and RV Parks

Campgrounds and RV Parks were ranked by assigning a score out of 10. This score was broken down into: non-natural attractants (3 points), presence of high quality natural bear food, (3 points), sightlines (3 points) and whether the campground had a human-bear conflict history (1 point). For the non-natural attractant category, the campground scored 1 if it contained a non bear-resistant dumpster, 1 if it contained non bear-resistant pedestrian bear-resistant garbage bins, 0.5 if it contained non bear-resistant recycling, and 0.5 based on attractant saturation and proportion of high value attractants that were left unsecured at campsites.

Each site received a score out of one for each feeding season of pre-berry, berry and post-berry for habitat quality based on bear food plots (see Campgrounds, Natural attractants section – page 12 for details). If a site contained any zone with 75% high value bear foods in any season, it received a score of 1. If a site contained any zone with 25-75% high quality bear food in any feeding season, it received a score of 0.5. The seasonal scores out of 1 were added together to get a habitat quality score out of 3.

Measurements of sightlines in all zones surrounding the site were averaged. If the average sightline for a school was low (under 25 m), that school received a score of 1; moderate sightlines (25 – 50 m) scored 0.5.

If a campground had any previous recorded conflict, it scored 1. Each score was categorized (highest, high moderate, low moderate and lowest) in the same way as for subdivisions, and schools and playgrounds.

Non-natural attractants	+	bear food by season	+	sightlines	+	conflict history	=	10
(3)		(3)		(3)		(1)		

Schools

Schools received a total score out of 10, based on four categories: availability of non-natural attractants (3 points), presence of high quality natural bear food (3 points), sightlines (3 points), and whether the school bordered a green space. Availability of non-natural attractants was scored by assigning a score out of 1 for the status of their central garbage bin (bear-resistant = 0, non bear-resistant = 1), pedestrian garbage bins (bear-resistant/total bins), and bear resistant recycling (scored as per the central garbage bin).

Each school was scored on high quality bear foods and sightlines in the same way as playgrounds and schools were scored above.

Each score (highest, high moderate, low moderate and lowest) was categorized in the same way as for subdivisions.

Non-natural attractants	+	bear food by season	+	sightlines	+	green space	=	10
(3)		(3)		(3)		(1)		

Playgrounds

Playgrounds were scored out of 10 similarly to the methodology used to rank schools. Presence of a non bear-resistant garbage bin scored 1 point.

Non-natural attractants	+	bear food by season	+	sightlines	+	green space	=	10
(3)		(3)		(3)		(1)		

Trails

Trails were not scored as a ranking system as only four trails out of hundreds of local named and un-named trails were sampled. Of the four trails assessed, the sections between vegetation changes were ranked as high, moderate or low by natural bear food and sightlines.

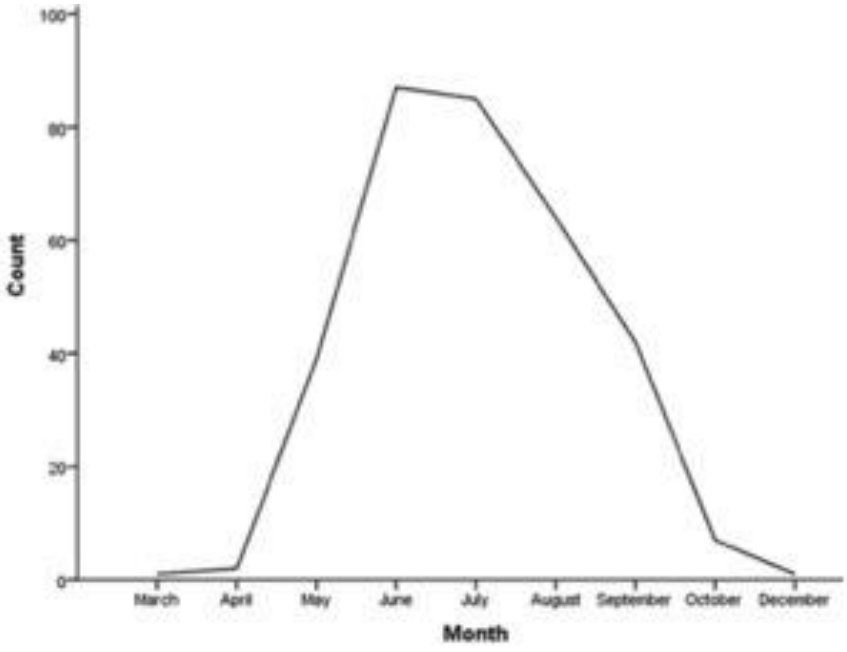
RESULTS

OCCURRENCE & TIPPLINE REPORTS

Black bears comprised 81% (*n*=265) of the species reported within the YG occurrences database and 15 % (*n*=48) of the TIPP line database. Grizzly bears comprised 5 % (*n*=16; Table 1).

Table 1. Summary of bear species reported within the City of Whitehorse, Yukon from 1997 – 2014.

Species	YG	TIPP line	Total
Bear – unknown species	12(14%)	36 (15%)	48(15%)
Black bear	69 (80%)	196 (81%)	265 (81%)
Grizzly bear	5 (6%)	11 (5%)	16 (5%)
Total	86	243	329



Occurrences (including sightings, encounters, conflicts and mortalities) tend to rise sharply in early April, peak in late May and early June, and stay relatively high until late July, after which occurrences drop sharply until early October (Figure 1).

Figure 1. Monthly grizzly bear and black bear occurrences (sightings, encounters, conflicts, and bear mortalities) in Whitehorse, Yukon, 2006 – 2014 (YG occurrences from 2006-2012, TIPP line reports from 2012 – 2014, n = 328).

Occurrences rose sharply in 2011 and 2012, especially related to incidents (conflicts with humans; Figure 2). Black bear incidents averaged 7.5/year, with only one grizzly bear incident. In 2011 and 2012 black bear incidents jumped from an average of 2.75 incidents per year from 2006 to 2010 to an average of 17, a 6-fold increase. There was no conflict data recorded in 2008.

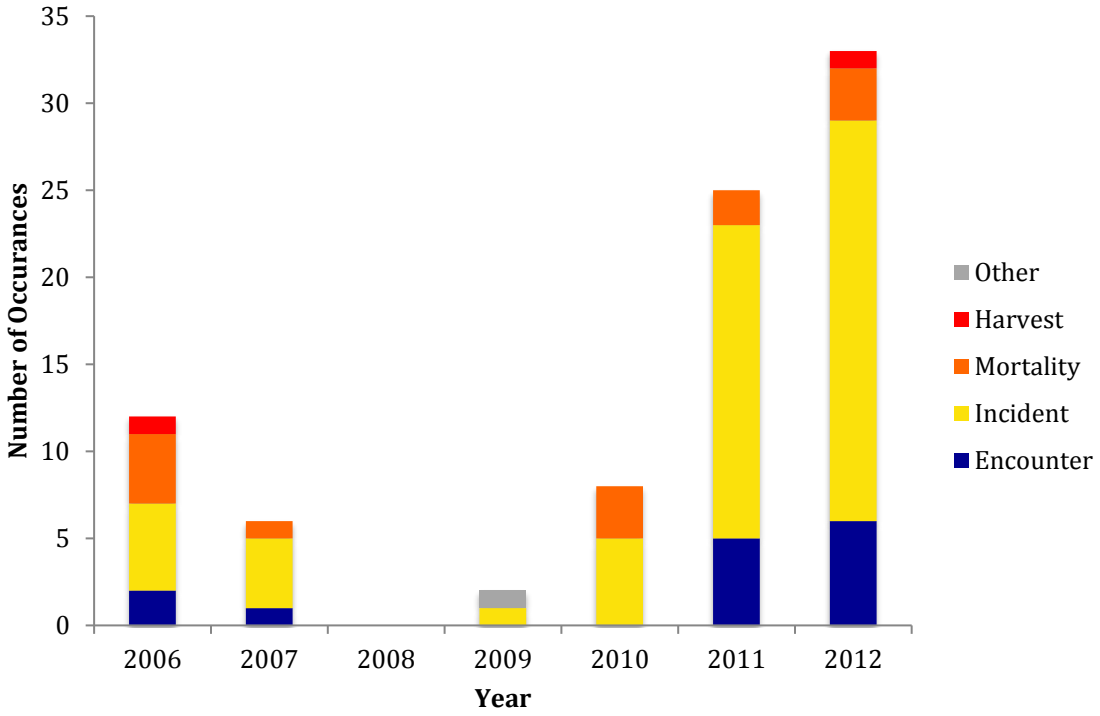


Figure 2. Occurrence type by year in Whitehorse, Yukon for grizzly bear and black bears.

When an individual's sex was known, mortalities more frequently involved a female with offspring than unaccompanied bears (Table 2).

Table 2. Black bear mortalities by cohort in Whitehorse, Yukon, 2006 – 2012 (Source: YG database).

Cohort	Frequency	Percent
Female with offspring	4	8.9
Single bear, sex unknown	34	75.6
Single female	2	4.4
Single male	2	4.4

2 bears, sex unknown	1	2.2
Unknown	1	2.2

Probable cause of human-bear conflict in Whitehorse was mostly human food and garbage (Figure 3). Although in this data, 'food-conditioning' and 'bears accessing human food and garbage' are recorded separately, they are essentially the same. Together, these conflicts caused nearly twice the number of occurrences as curious bears, bears travelling through an area, and legal harvest combined, (Figure 3, below).

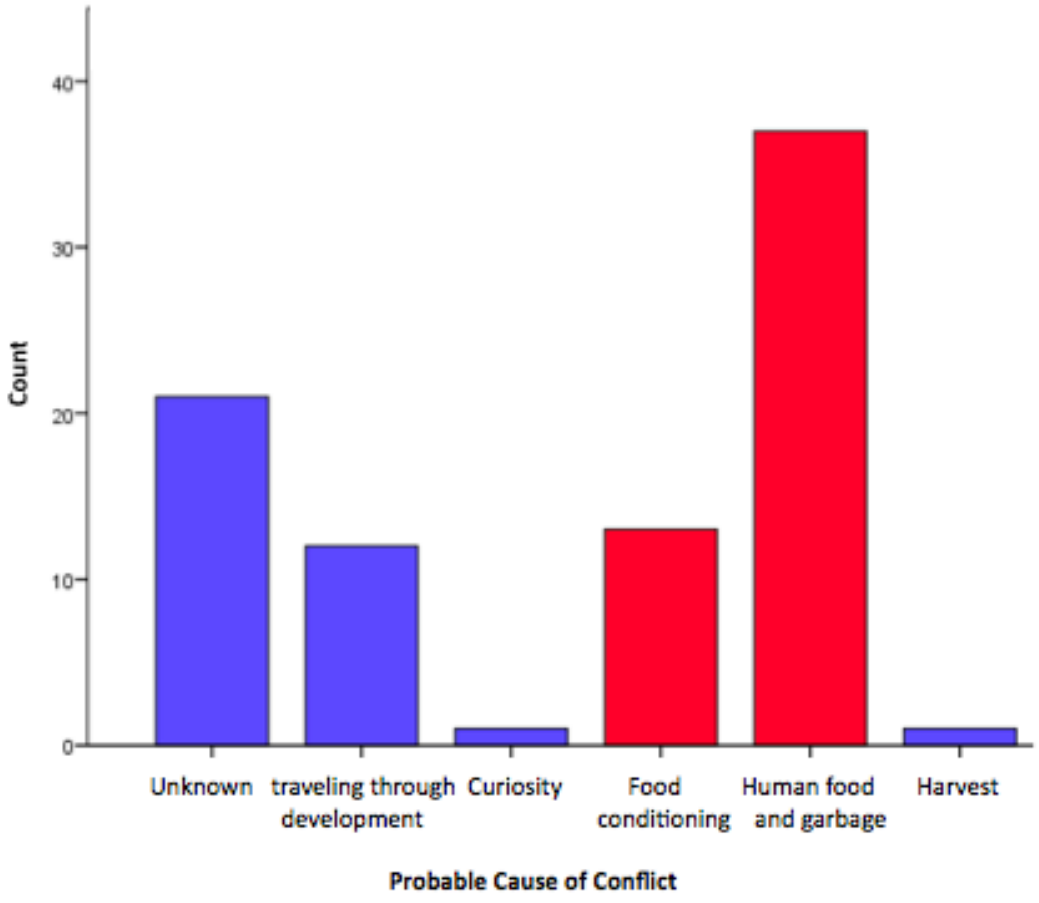


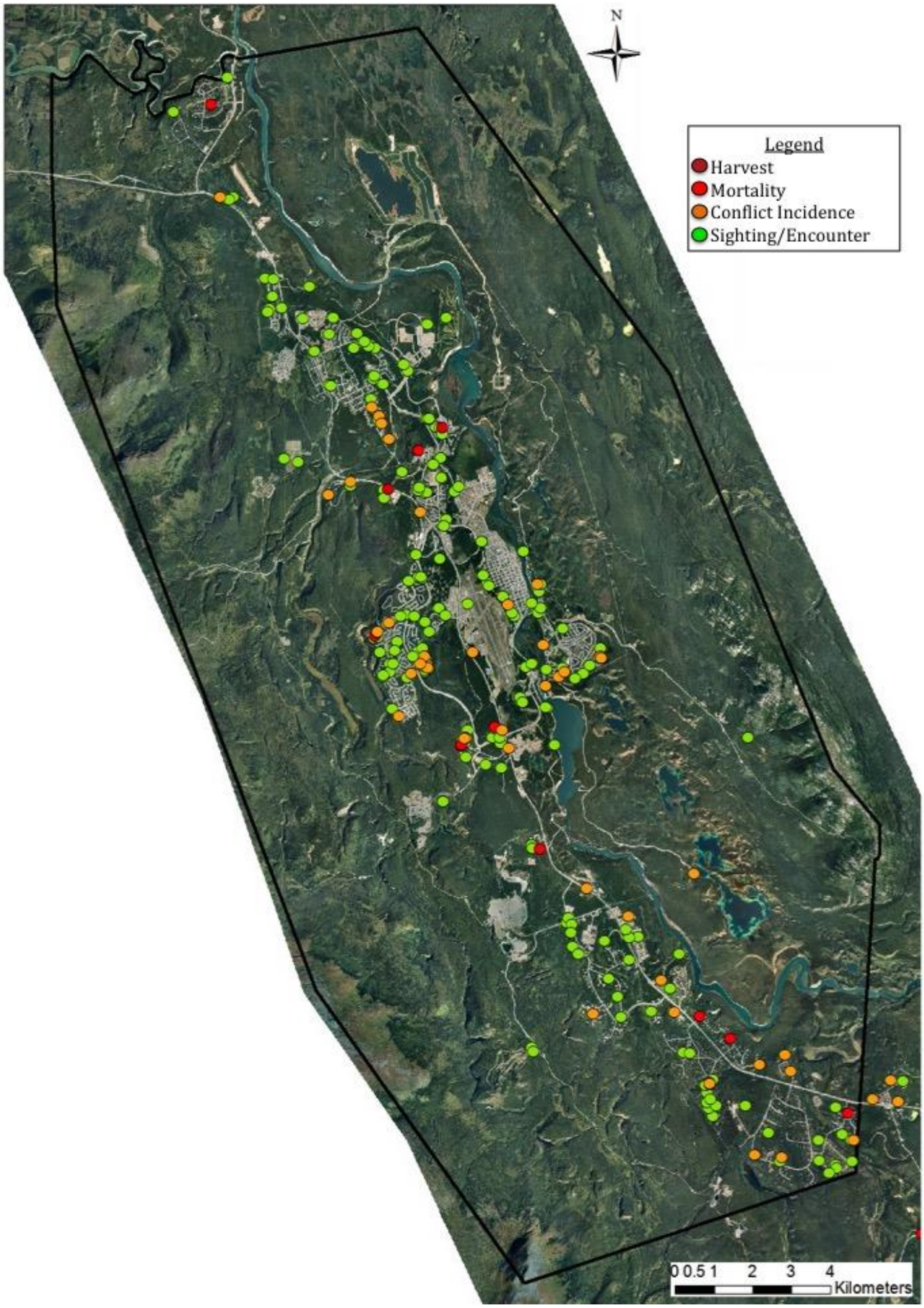
Figure 3. Probable cause of human-bear conflict in Whitehorse, Yukon (2006 – 2012).

Not all Whitehorse subdivisions are recognized by the TIPPline system. Of those recorded, the Downtown area reported highest frequency of occurrences, followed

closely by Copper Ridge. McCrae and Valleyview reported the lowest frequency of occurrences (Table 3).

Table 3. Frequency of grizzly bear and black bear occurrences by neighborhood in Whitehorse, Yukon, 2012 – 2014 (TIPPLine data only).

Neighborhood	Frequency	Percent
Downtown	33	13.6
Copper Ridge	31	12.8
Porter Creek	17	7.0
Riverdale	15	6.2
Granger	14	5.8
Mt. Sima	13	5.3
Lobird	12	4.9
Takhini	12	4.9
Mt. View Dr.	10	4.1
Wolf Creek	9	3.7
Canyon	8	3.3
Cowley Creek	8	3.3
Hillcrest	8	3.3
Crestview	7	2.9
McIntyre	7	2.9
Northland	6	2.5
Yukon College	6	2.5
Kopper King	4	1.6
Hidden Valley	3	1.2
Mary Lake	3	1.2
Pine Ridge	3	1.2
Cousin's Airstrip	2	0.8
Logan	2	0.8
MacRae	2	0.8
Marsh Lake (outside Whitehorse)	2	0.8
Unknown	1	0.4
Alaska Hwy N	1	0.4
Klondike Hwy N	1	0.4
McCrae	1	0.4
Tagish (outside Whitehorse)	1	0.4
Valleyview	1	0.4
Total	243	100.0

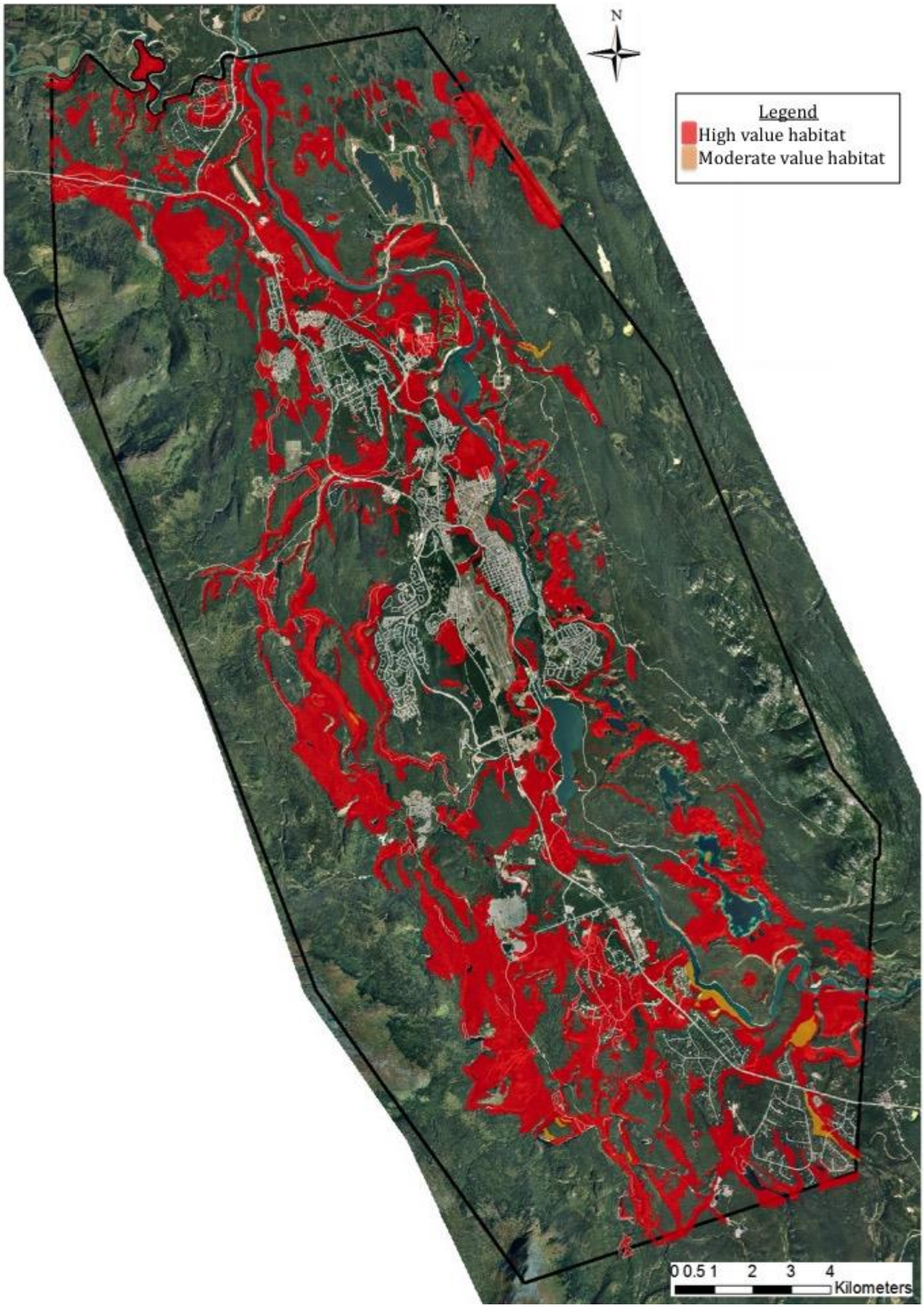


Map 2. Occurrence Reports compiled from YG dataset and TIPPline reports from 2006 – 2014, colored by occurrence type.

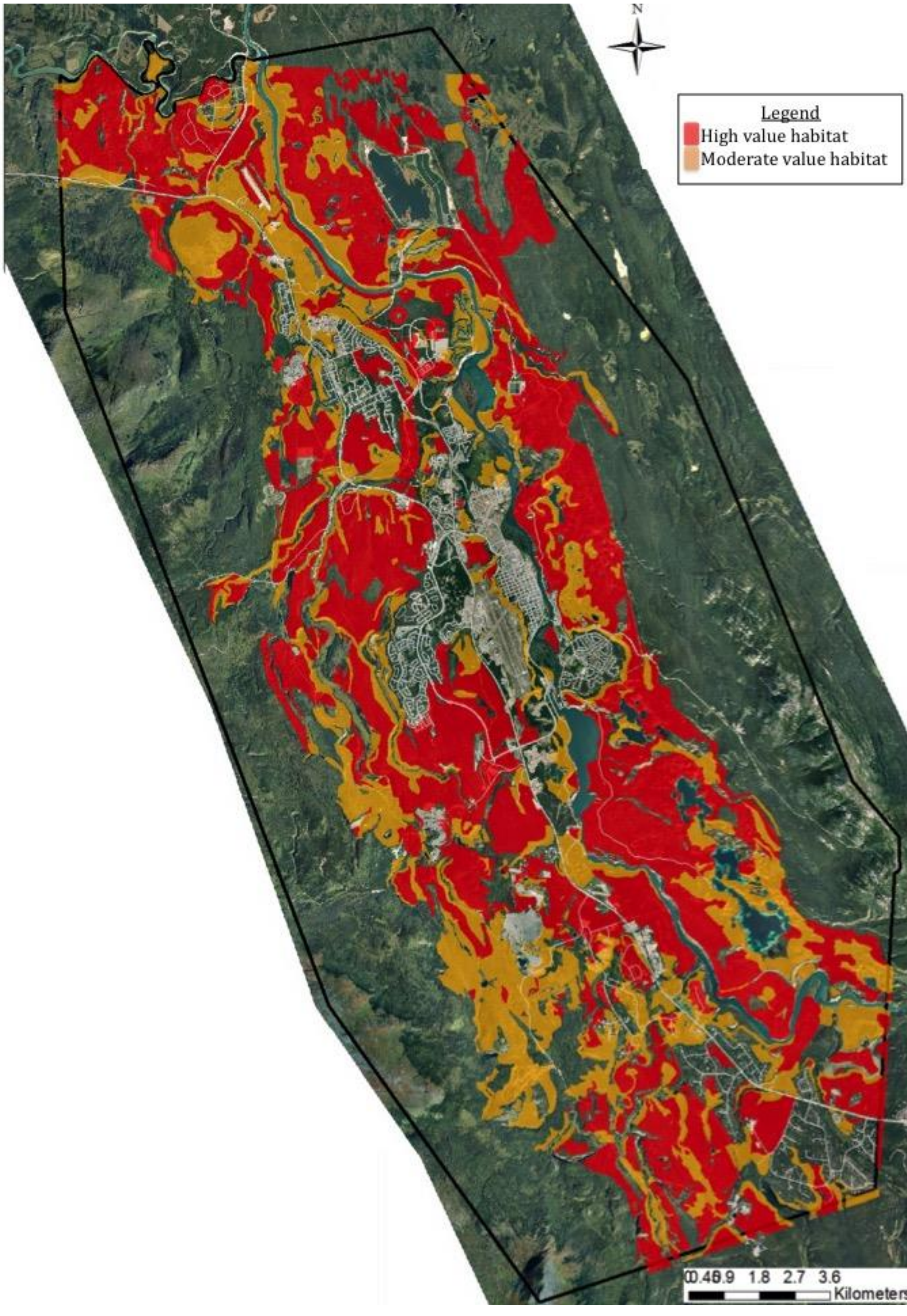
HABITAT MAPPING

Pre-berry and berry feeding seasons provided relatively high quality bear habitat in Whitehorse (Map 3 and Map 4), while post-berry feeding season habitat was less widespread (Map 5). Many of the areas rated high in berry season were dense with highly productive soapberry plants (Photo 1). Grizzly bear use of the Whitehorse area is outlined in Map 6.

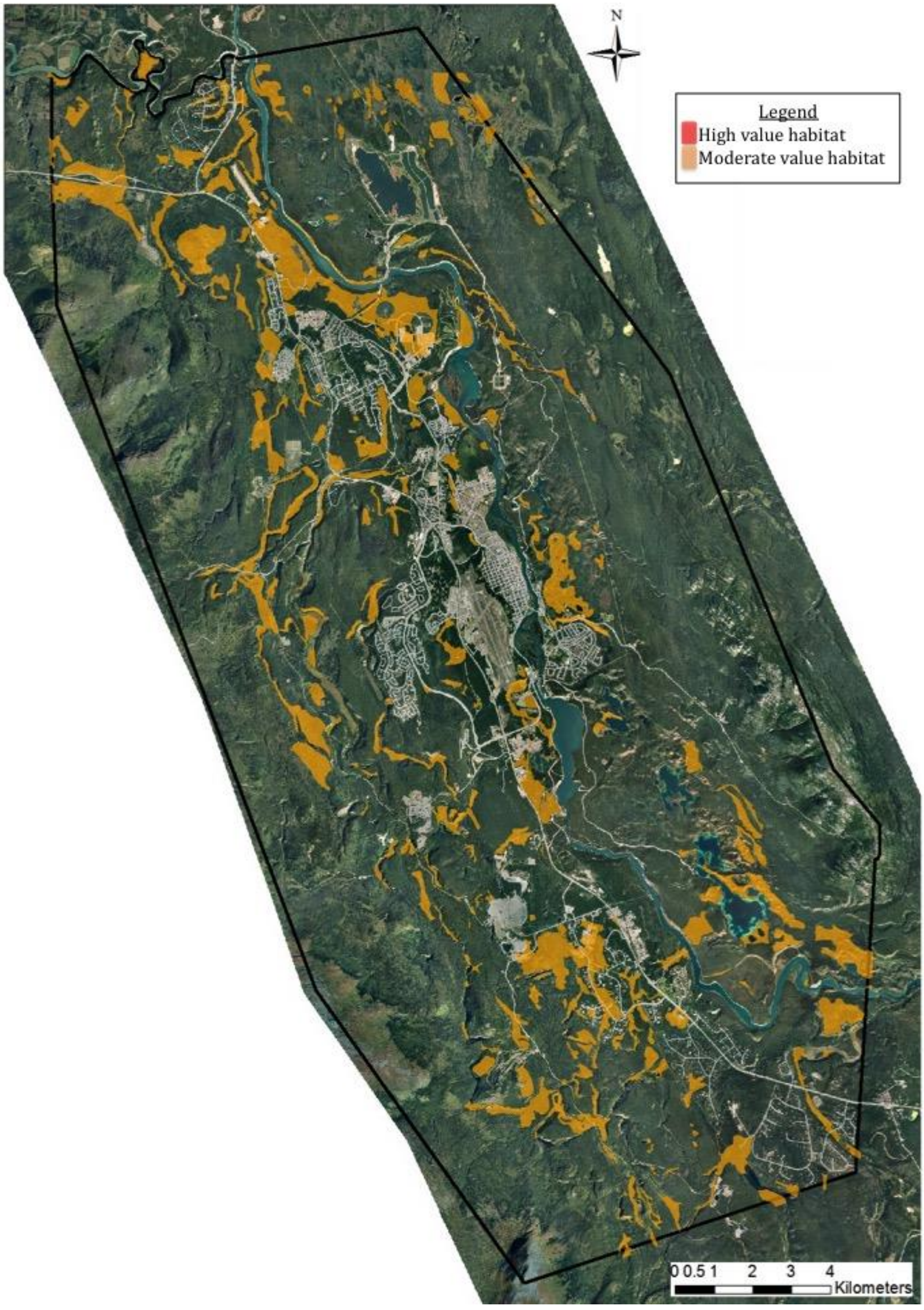
Photo 1. *Shepherdia canadensis* berries along a trail in downtown Whitehorse, near the escarpment. July 27, 2015.



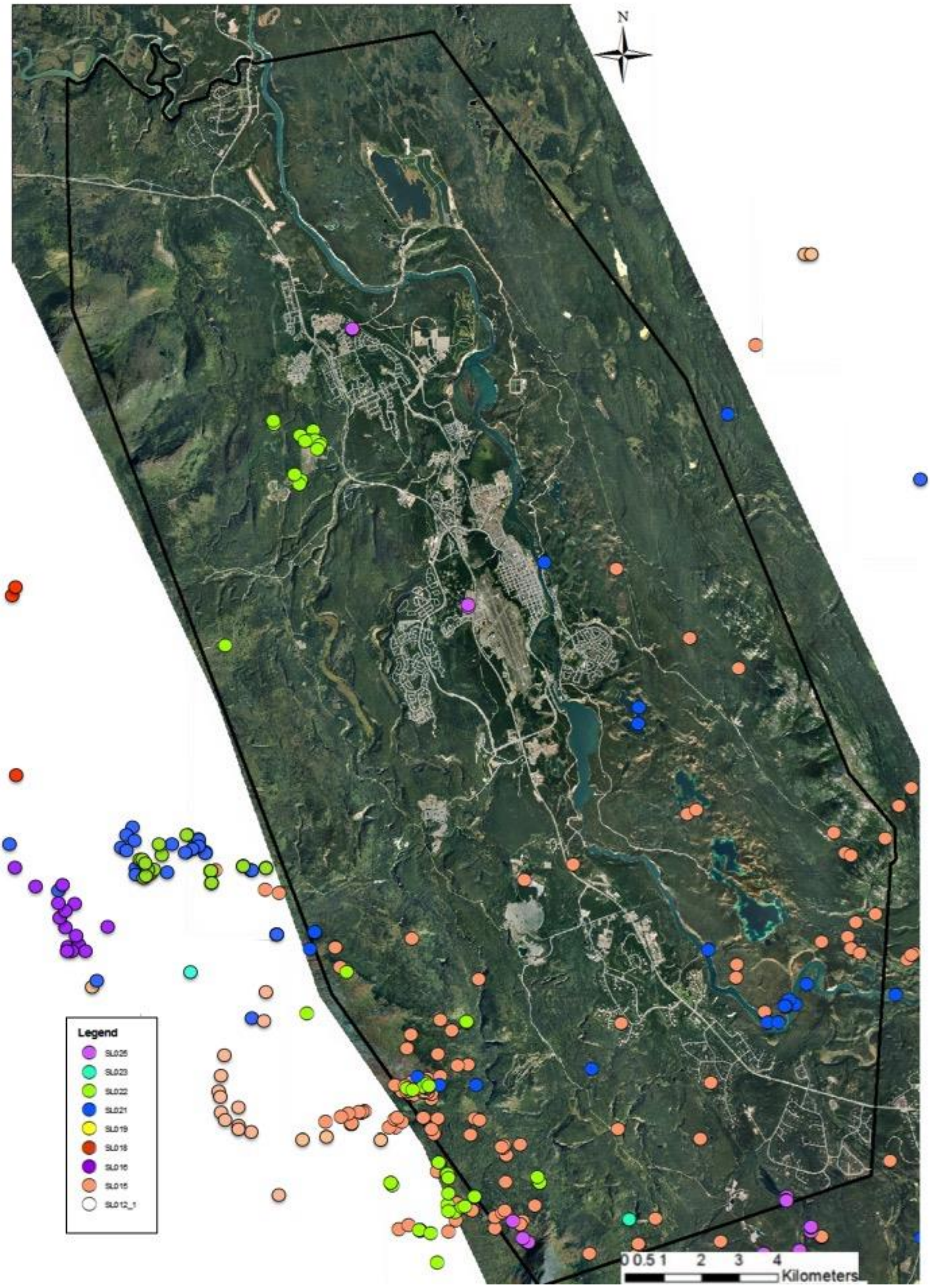
Map 3. Pre-berry feeding season habitat quality based on Ecosystem Map (Applied Ecosystem Management Ltd. 2000) ratings in Whitehorse, Yukon.



Map 4. Berry feeding season habitat quality based on Ecosystem Map (Applied Ecosystem Management Ltd. 2000) ratings in Whitehorse, Yukon.



Map 5. Post-berry feeding season habitat quality based on Ecosystem Map (Applied Ecosystem Management Ltd. 2000) ratings in Whitehorse, Yukon.



Map 6. Radio-collared grizzly bear locations in and near Whitehorse, Yukon from the Southern Lakes Grizzly Bear Project (2009 – 2015).

FIELD DATA

Residences in rural residential areas of Whitehorse had the highest saturation of attractants (number of available bear attractants per residence), followed by urban residential and industrial areas. Campgrounds and trailer parks had the lowest saturation of attractants (Figure 4)

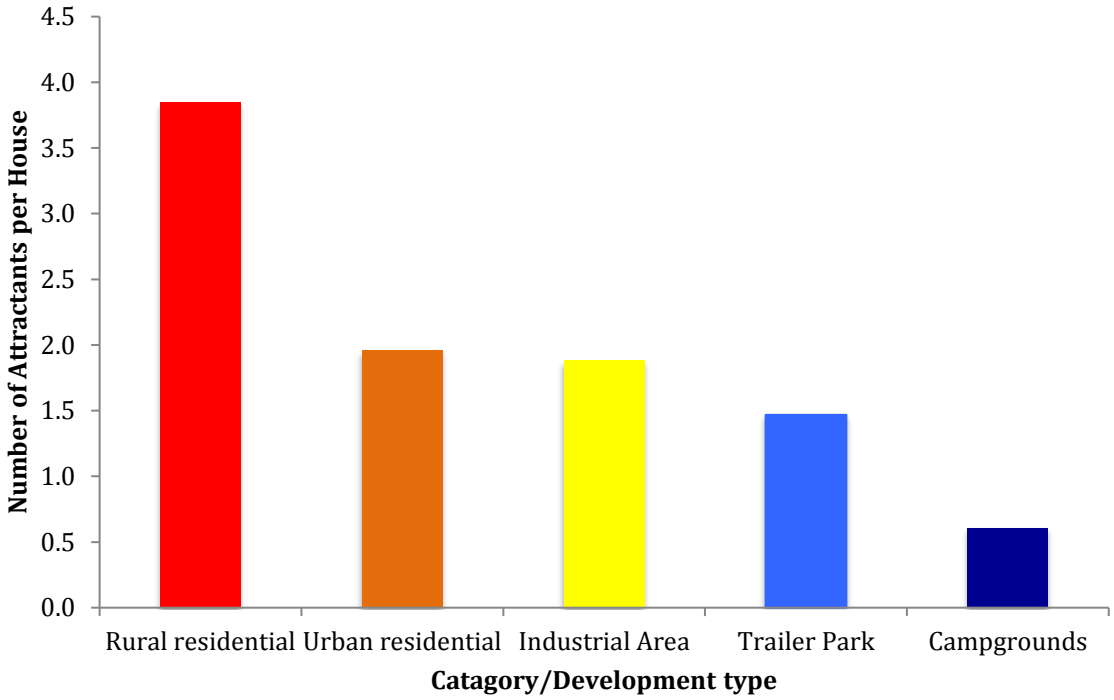


Figure 4. Number of bear attractants per residence in all area types of Whitehorse, Yukon, 2015.

The bulk (72%) of citywide attractants are high value attractants to bears (e.g. garbage and recycling; Figure 5). Low value attractants comprised 16% of the total attractants unsecured from bears.

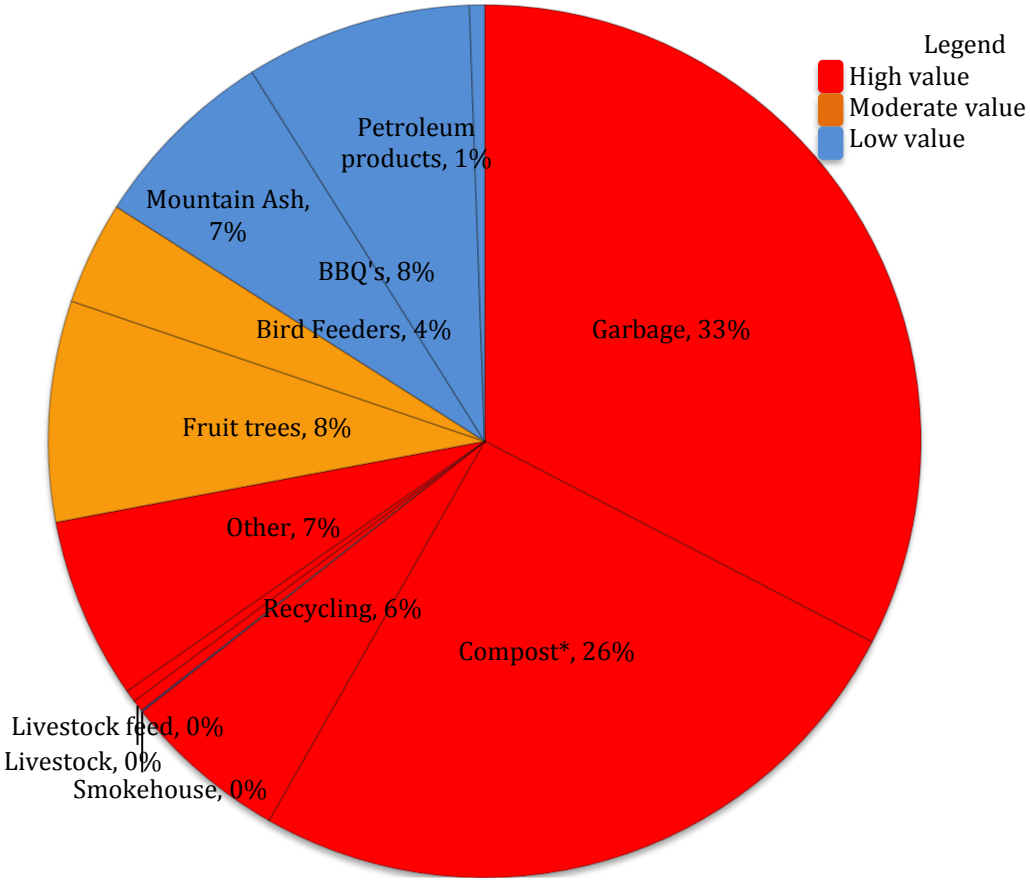


Figure 5. Relative quality of non-natural bear attractants visible from the street at surveyed residences in all area types of Whitehorse, Yukon, 2015.

Urban residential

Saturation of attractants in urban residential areas (average number of attractants per residence) was 2.0 attractants per residence, ranging from a low of 1.2 in Riverdale to a high of 2.7 in Arkell (Figure 6). Attractant audits also revealed large amounts of high value attractants (Figure 7). We noted evidence of inappropriate use of garbage totes (Photo 2.), in particular where bins were overflowing with garbage and had been accessed by wildlife (in this photo example, birds).

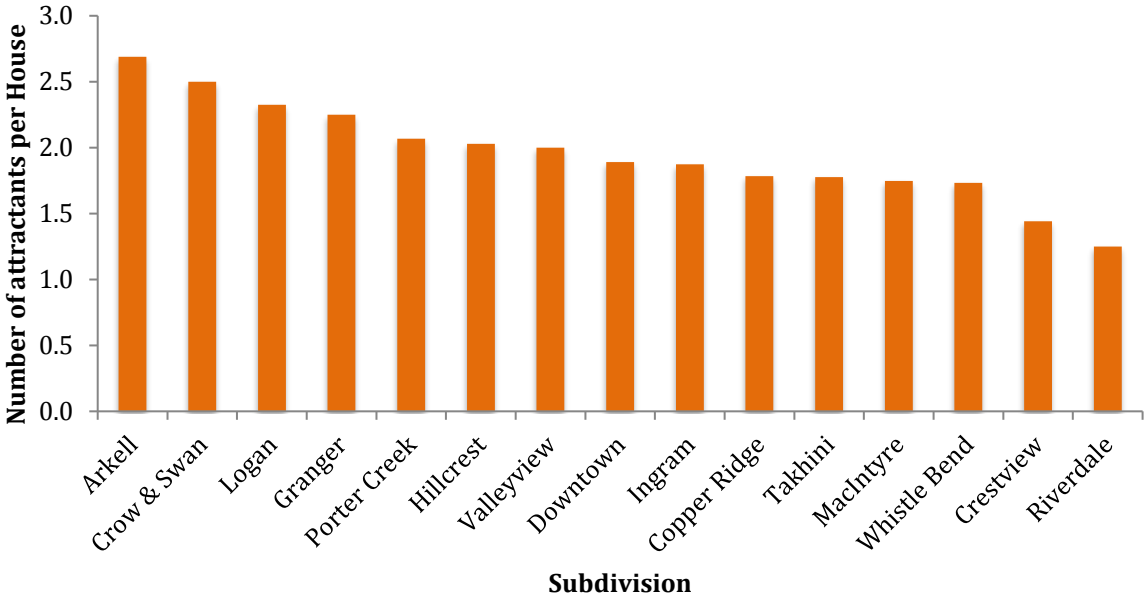


Figure 6. Number of bear attractants per residence in urban residential areas of Whitehorse, Yukon, 2015.

Photo 2. Overfilled garbage bin accessed by wildlife (birds) and inappropriate use of curbside garbage totes in Whitehorse, Yukon, 2015.

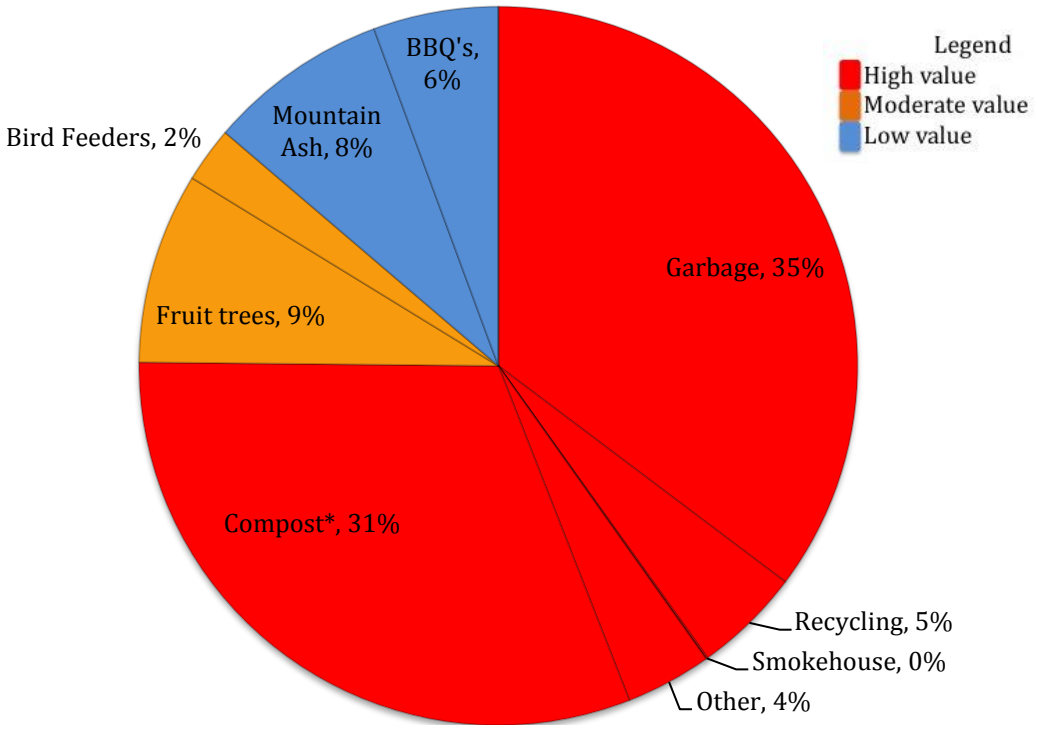


Figure 7. Relative quality of non-natural bear attractants that were visible from the street in urban residential areas of Whitehorse, Yukon, 2015.

Curbside garbage tote audit

The curbside garbage tote audit revealed that, on average, 35% of households place their garbage or composting totes on the curb the night before their morning pickup. Copper Ridge subdivision had the highest rate of overnight curbside bins at 59%, more than 4 times the number of households leaving garbage totes curbside overnight on the low range of the scale in Granger subdivision (Figure 8).

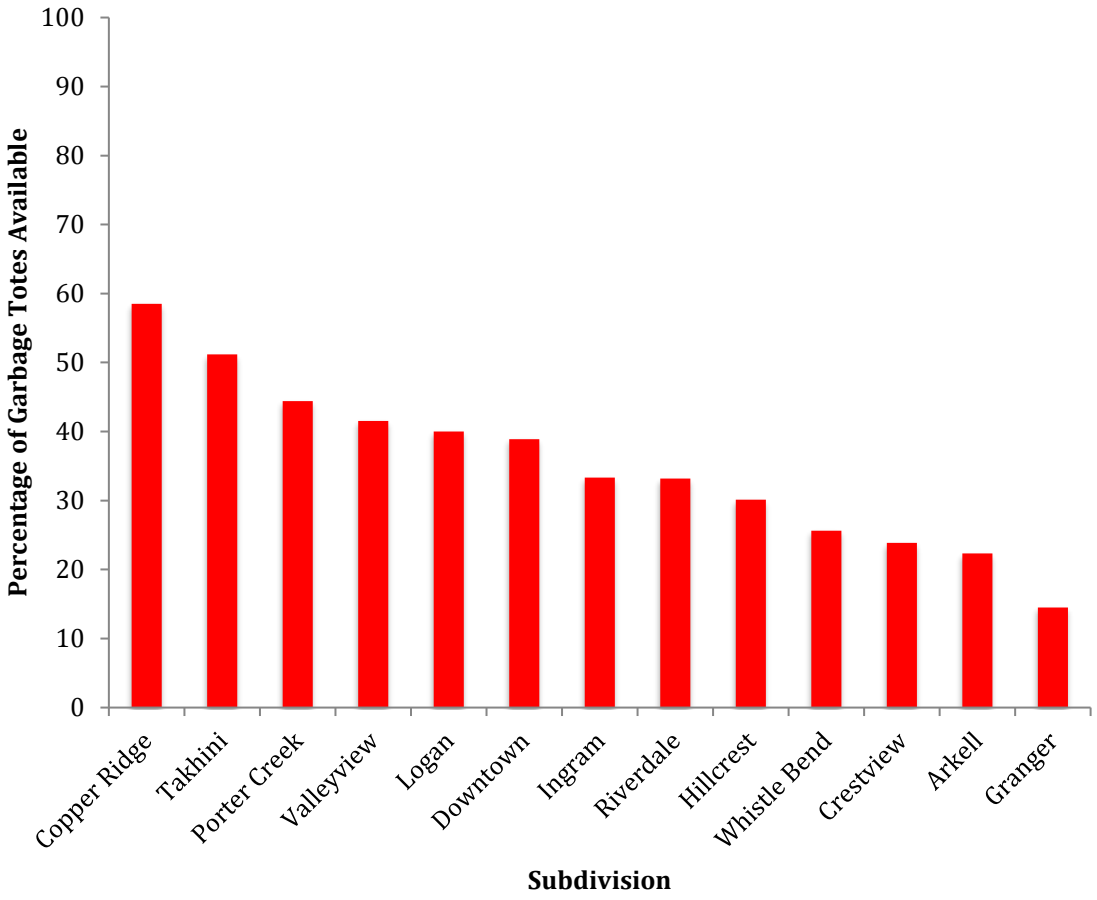


Figure 8. Curbside garbage tote audit count for the number of garbage bins set out on the street the night before pickup in urban residential subdivisions of Whitehorse, Yukon, 2015.

Bear-resistant latches on garbage totes were noted in three subdivisions, Granger, Logan and Porter Creek; however, an average of 56% of the bins were not latched, leaving their contents unsecured from bears (Table 4).

Table 4. Rate of user error for bear-resistant totes during attractant audits in Whitehorse, Yukon, 2015.

Subdivision	Latched (bear-resistant)	Unlatched (not bear-resistant)	Total
Granger	4 (40%)	6 (60%)	10
Logan	21 (48%)	23 52%)	44
Porter Creek	0 (0%)	1 (100%)	1

Rural Residential

Saturation of attractants (average number of attractants per residence) in rural residential areas was higher than urban residential areas with an average of 3.85 attractants per residence. Fox Haven and Cowley Creek had lowest saturation with 2.7 attractants per residence. Canyon Crescent had the highest saturation with 5.2 attractants per residence (Figure 9). While rural residential areas contained fewer high value attractants than urban residential areas (74% vs. 56%), they still contained relatively large amounts of high value attractants overall (Figure 10).

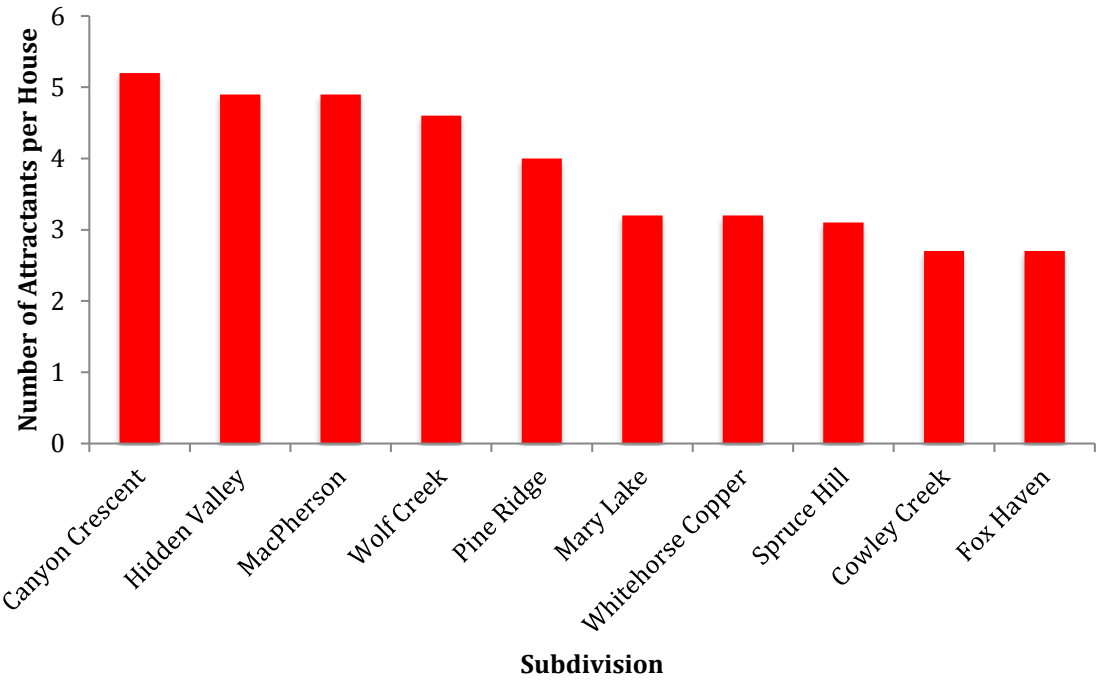


Figure 9. Number of bear attractants per residence in rural residential areas of Whitehorse, Yukon, 2015.

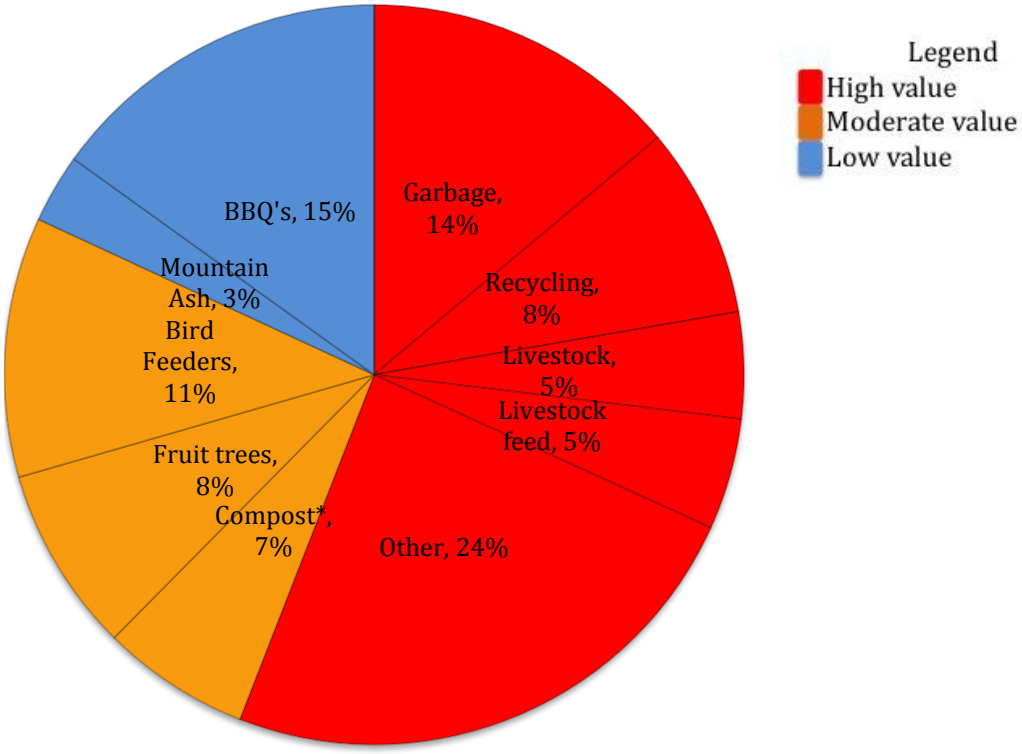


Figure 10. Relative quality of non-natural bear attractants in rural residential areas of Whitehorse, Yukon, 2015.

Residents in rural residential subdivisions, were asked about garbage management practices and history of conflict in their areas. Residents reported sightings from Canyon Crescent (2), Cowley Creek (4), Fox Haven (2), Mary Lake (3), Pine Ridge (1), Spruce Hill (4) and Wolf Creek (5). Residents reported incidents (conflicts) at Canyon Crescent (2), Cowley Creek (1), Mary Lake (2), Spruce Hill (2) and Wolf Creek (4).

Urban Commercial

Ten locations were surveyed downtown for attractants. Of the ten locations we visited, none had bear-resistant garbage bins.

Industrial Areas

Saturation of attractants in industrial areas (average number of attractants per residence; Figure 11) averaged 1.9 attractants per residence. Mt. Sima had the lowest saturation with 1.4 attractants per residence, and Kulan had the highest saturation with 2.4 attractants per residence (Figure 11). Overall, 62% of attractants noted in industrial areas were of high value to bears (Figure 12).

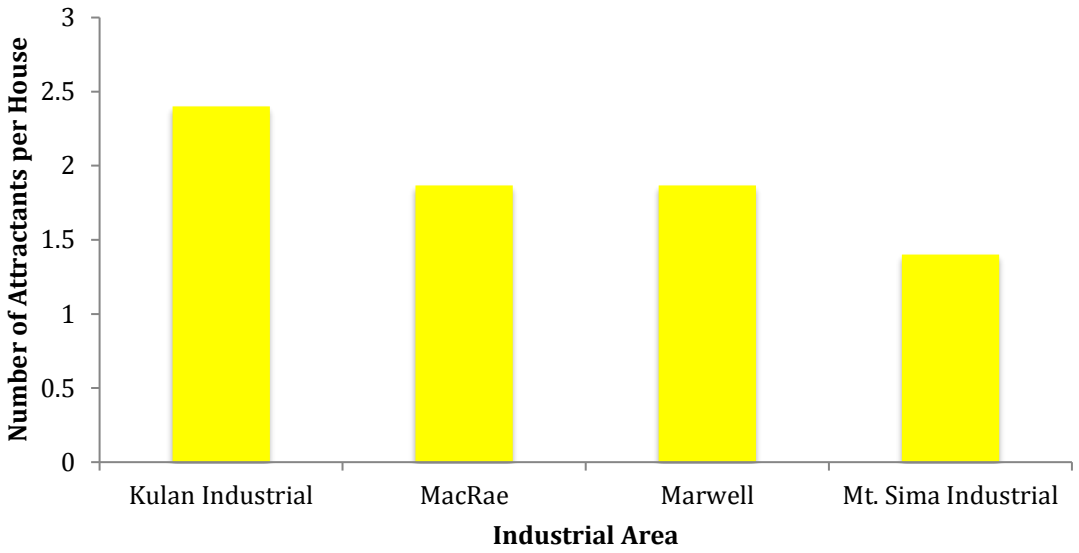


Figure 11. Number of bear attractants per residence visible from the street in Industrial areas of Whitehorse, Yukon, 2015.

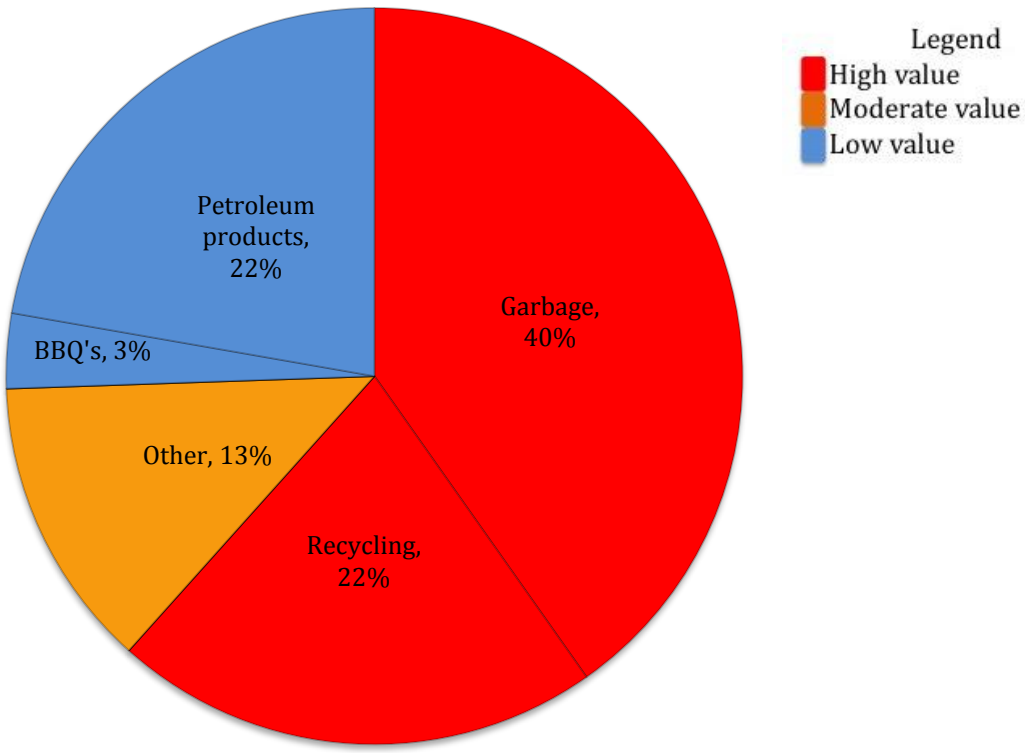


Figure 12. Relative quality of non-natural bear attractants visible from the street in Industrial areas in Whitehorse, Yukon, 2015.

Trailer Parks

Saturation of attractants (number of bear attractants per residence; Figure 13) in trailer courts in Whitehorse averaged 1.5 attractants per residence, with a low of 0.8 attractants per residence in Mountain View Drive, and a high of 2.5 attractants per residence in the Range Road trailer parks. Of all the types of subdivisions surveyed, trailer parks had the lowest relative amount of high value non-natural attractants in Whitehorse, at 51% (Figure 14).

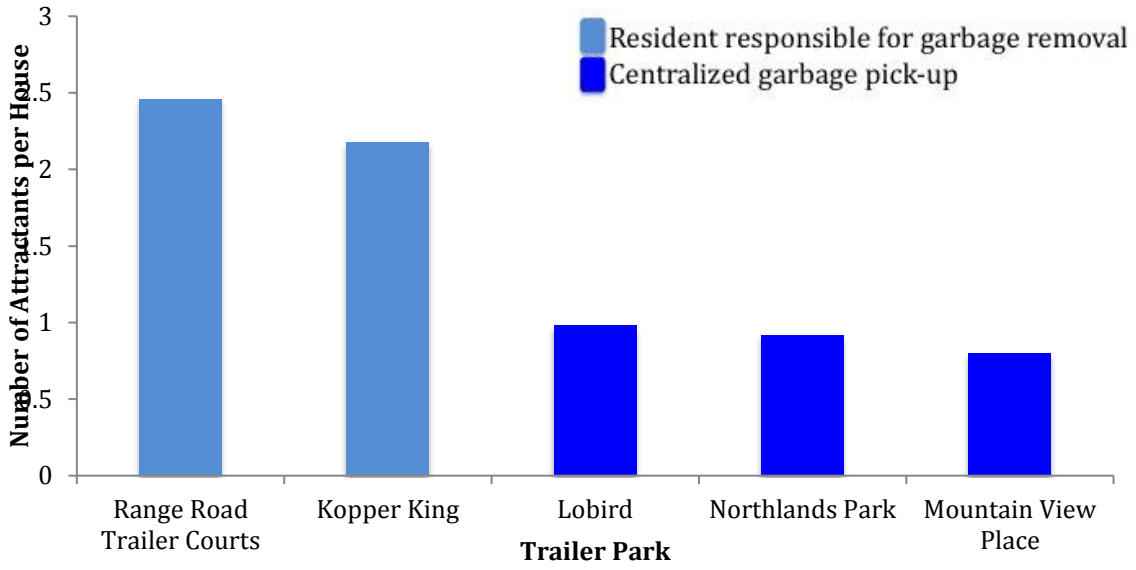


Figure 13. Number of bear attractants per residence visible from the street in trailer parks of Whitehorse, Yukon, 2015.

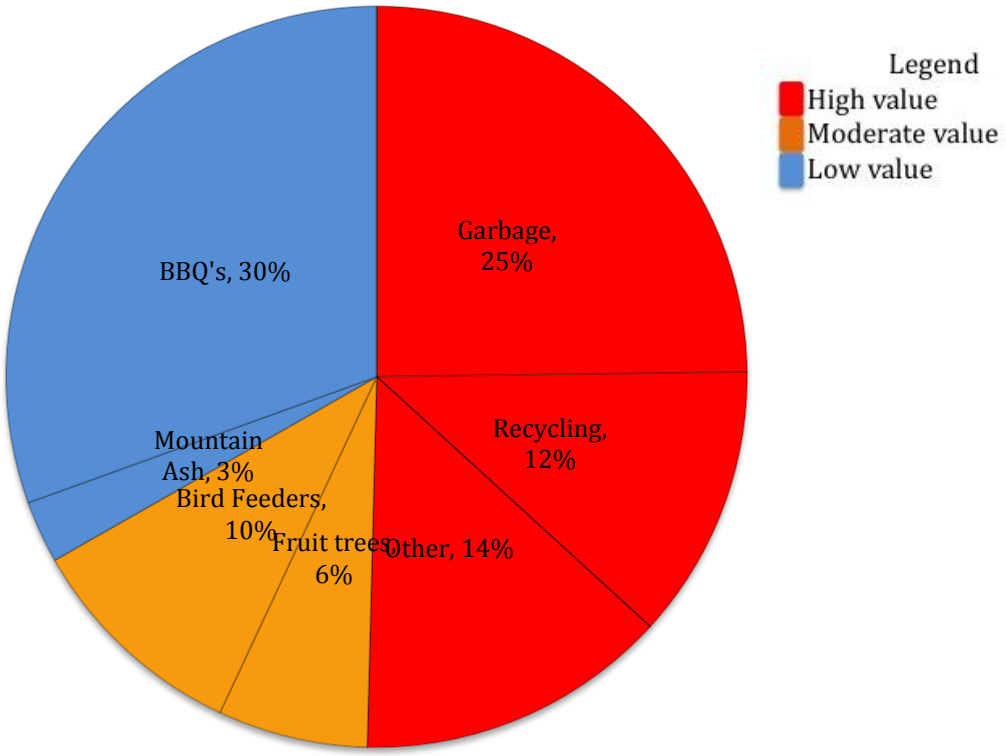


Figure 14. Relative quality of non-natural bear attractants visible from the street in trailer parks in Whitehorse, Yukon, 2015.

Campgrounds and RV Parks

All four campgrounds and RV Parks in Whitehorse were surveyed: Pioneer RV Park, Wolf Creek campground, Robert Service Campground, and Hi Country RV Park, auditing both natural and non-natural attractants.

Non-natural attractants

In each campground, general campground attractants and attractants on a site-by-site basis (Table 5), were assessed. Robert Service and Pioneer RV Park scored just under one unsecured attractant per site, while Hi Country RV Park and Wolf Creek campground had lower levels of unsecured attractants per site with an average 0.3 (Figure 15). High value attractants comprised most (72%) of the attractants left unsecured at campgrounds, and 24% of the attractants were low value (Figure 16).

Table 5. Summary of Whitehorse, Yukon campground audits, 2015. Attractants were counted if they were left at the site unattended.

Campground	Attractants Left onsite	Bear-resistant Garbage	Bear-resistant Recycling
Hi Country	21/66	0/2	0/1
Pioneer	34/39	0/2	0/2
Robert Service	24/26	0/11	0/1
Wolf Creek	4/13	15/25	1/1

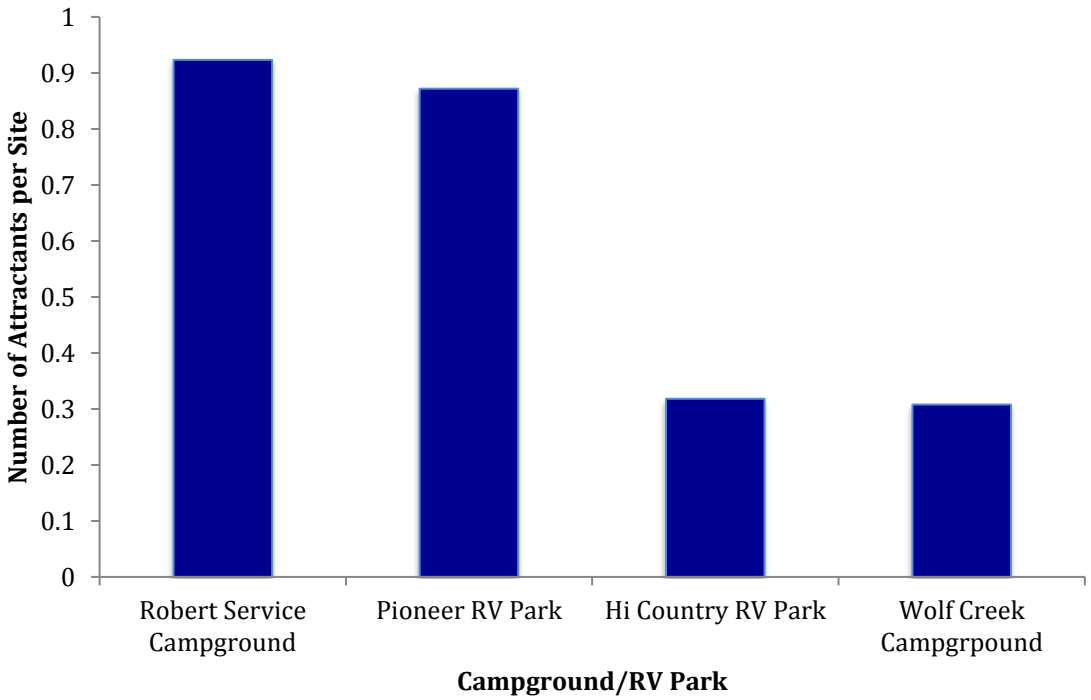


Figure 15. Number of attractants per site at campgrounds in Whitehorse, Yukon, 2015.

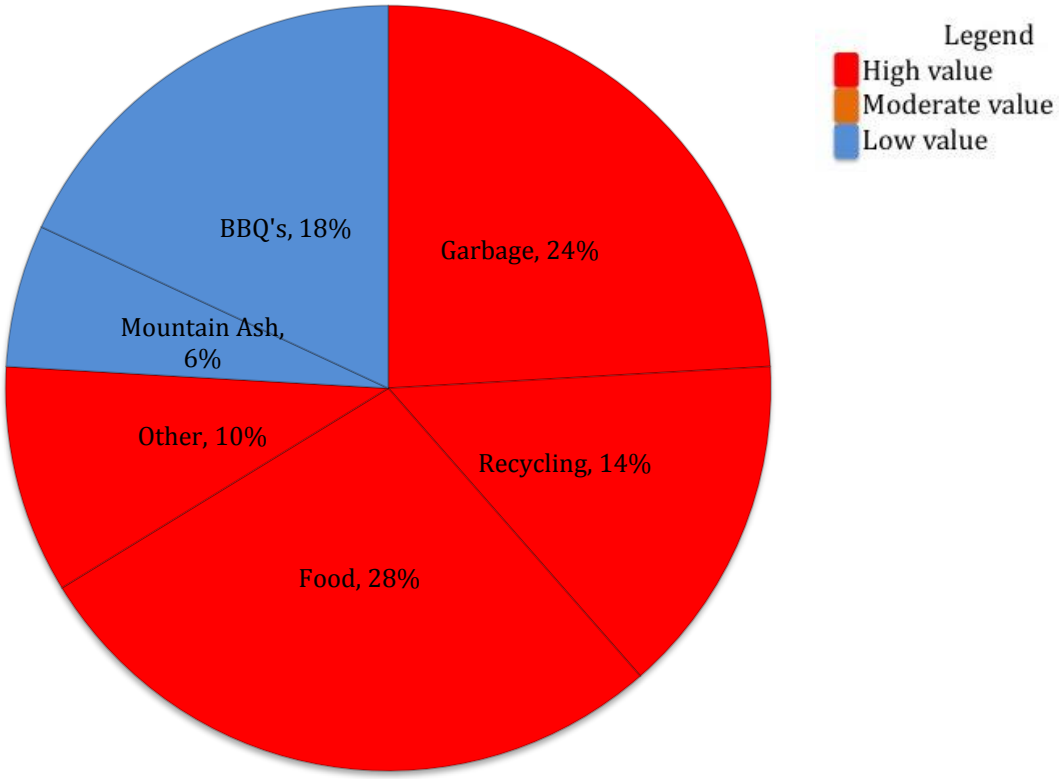


Figure 16. Relative quality of non-natural bear attractants visible from the street in campgrounds in Whitehorse, Yukon, 2015

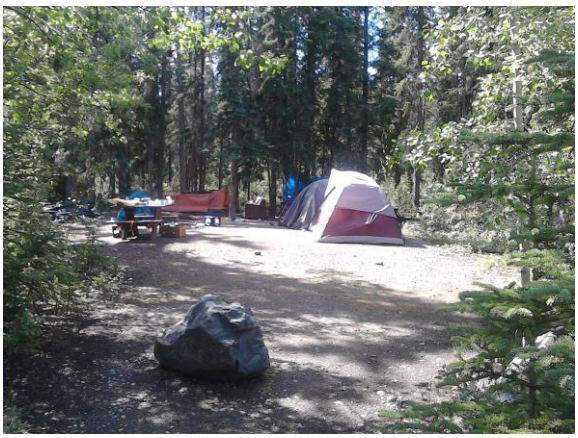


Photo 3. A campsite in Robert Service Campground with unsecured attractants left unattended.

Photo 4. Non bear-resistant garbage bins at Robert Service campground.

Natural attractants

Hi Country RV Park (Figure 17) had two zones with low sightlines. Pioneer RV Park in berry season (Figure 18), and Wolf Creek campground in pre-berry and berry season (Figure 20) have high levels of high quality bear food around the edge of the campground. Robert Service campground (Figure 19) had the lowest sightlines.

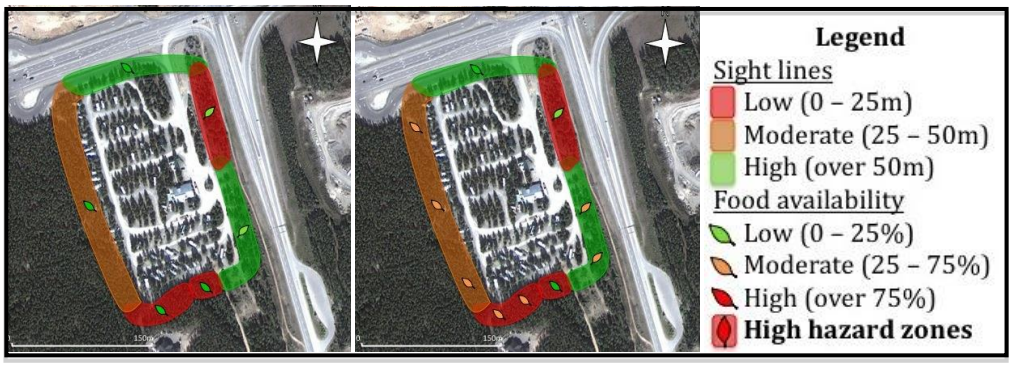


Figure 17. Hi Country RV Park bear hazard assessment. From left to right are assessments for pre-berry (April 1 – July 15), berry (July 16 – August 31) bear feeding seasons in Whitehorse, Yukon. Post-berry season (September 1 – November 30) had the same result as pre-berry season.

Figure 18. Pioneer RV Park bear hazard assessment. From left to right are assessments for pre-berry (April 1 – July 15), berry (July 16 – August 31) bear feeding seasons in Whitehorse, Yukon. Post-berry season (September 1 – November 30) had the same result as pre-berry season.

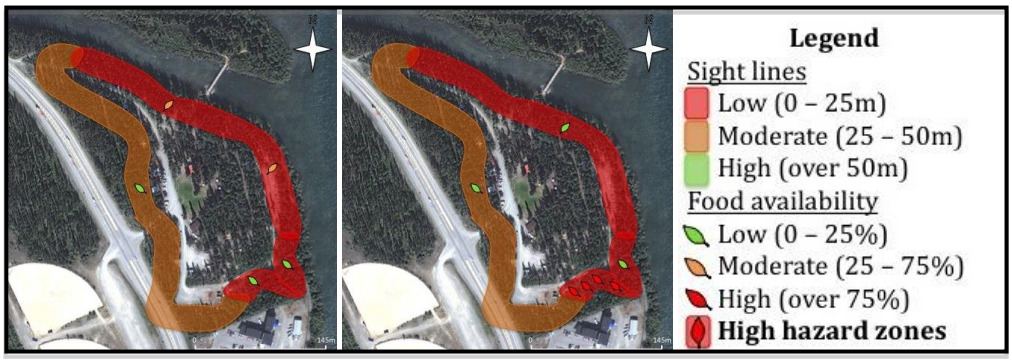


Figure 19. Robert Service campground bear hazard assessment. From left to right are assessments for pre-berry (April 1 – July 15), berry (July 16 – August 31) bear feeding seasons in Whitehorse, Yukon. Post-berry season (September 1 – November 30) had the same result as pre-berry season.

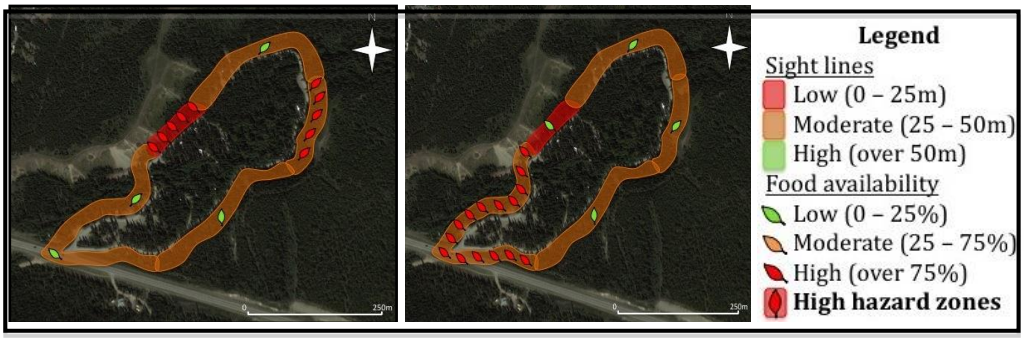


Figure 20. Wolf Creek campground bear hazard assessment. From left to right are assessments for pre-berry (April 1 – July 15), berry (July 16 – August 31) bear feeding seasons in Whitehorse, Yukon. Post-berry season (September 1 – November 30) had the same result as pre-berry season.

Schools

Seven schools were surveyed (École Émelie Tremblay, Elijah Smith, Golden Horn, Grey Mountain, Porter Creek, Hidden Valley and Takhini Elementary), auditing both non-natural and natural attractants

Non-natural attractants

Of the seven schools surveyed, only Golden Horn, Porter Creek, and Hidden Valley had any bear-resistant pedestrian bins available on the schoolyard. Most of those bins were not functioning due to removed latches in the handle (Table 6).

Table 6. Non-natural attractants survey results at 7 schools in Whitehorse, Yukon, 2015.

School	Central bear-resistant garbage?	Pedestrian bear-resistant garbage?	Bear-resistant Recycling?
École Émelie Tremblay	No	No	No
Elijah Smith	No	No	No
Golden Horn	No	1/1	No
Grey Mountain	No	No	No
Porter Creek	No	4/9	No
Hidden Valley	No	No	No
Takhini Elementary	No	1/9	No

Natural attractants

École Émelie Tremblay in berry season (Figure 21) and Hidden Valley School in berry season (Figure 26) had high hazard zones related to bear habitat quality and sightlines immediately adjacent to the school grounds. Golden Horn school in pre-berry and berry season (Figure 23) and Grey Mountain School in berry season (Figure 24) had the lowest hazards related to bear habitat quality and sightlines immediately adjacent to the school grounds. Elijah Smith Elementary School (Figure 22) had low sightlines around the entire perimeter of the school, but low value natural food. Porter Creek Elementary (Figure 25) also had low sightlines around significant portions of the schoolyard, and a zone with high levels of soapberry. Takhini Elementary School (Figure 27) had one zone of low sightlines, but no zones containing high natural attractants.

Figure 21. École Émelie Tremblay School bear hazard assessment. From left to right are assessments for pre-berry (April 1 – July 15), berry (July 16 – August 31) bear feeding seasons in Whitehorse, Yukon. Post-berry season (September 1 – November 30) had the same result as pre-berry season.

Figure 22. Elijah Smith School bear hazard assessment. From left to right are assessments for pre-berry (April 1 – July 15), berry (July 16 – August 31) bear feeding seasons in Whitehorse, Yukon. Post-berry season (September 1 – November 30) had the same result as pre-berry season.

Figure 23. Golden Horn School bear hazard assessment. From left to right are assessments for pre-berry (April 1 – July 15), berry (July 16 – August 31) bear feeding seasons in Whitehorse, Yukon. Post-berry season (September 1 – November 30) had the same result as pre-berry season.

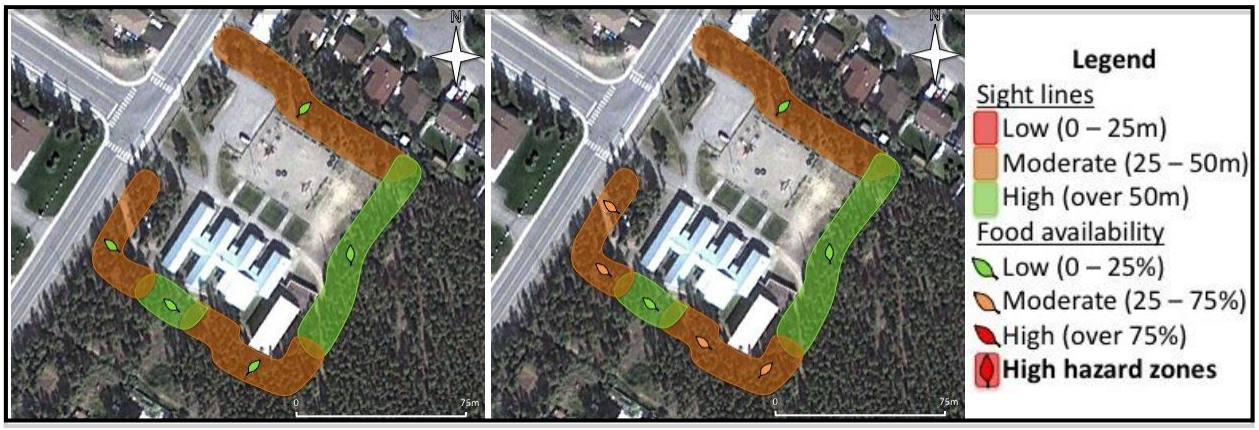


Figure 24. Grey Mountain School bear hazard assessment. From left to right are assessments for pre-berry (April 1 – July 15), berry (July 16 – August 31) bear feeding seasons in Whitehorse, Yukon. Post-berry season (September 1 – November 30) had the same result as pre-berry season.

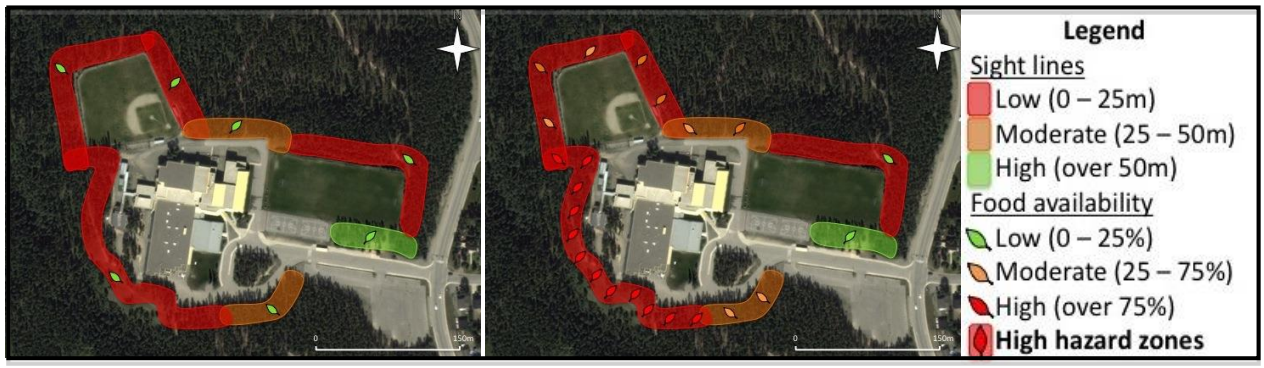


Figure 25. Porter Creek School bear hazard assessment. From left to right are assessments for pre-berry (April 1 – July 15), berry (July 16 – August 31) bear feeding seasons in Whitehorse, Yukon. Post-berry season (September 1 – November 30) had the same result as pre-berry season.

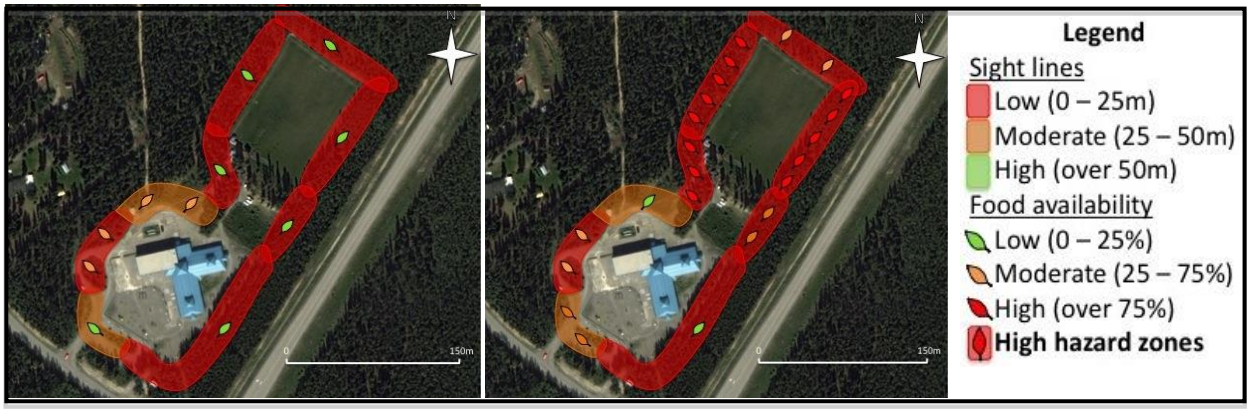


Figure 26. Hidden Valley School bear hazard assessment. From left to right are assessments for pre-berry (April 1 – July 15), berry (July 16 – August 31) bear feeding seasons in Whitehorse, Yukon. Post-berry season (September 1 – November 30) had the same result as pre-berry season.

Figure 27. Takhini Elementary School bear hazard assessment. From left to right are assessments for pre-berry (April 1 – July 15), berry (July 16 – August 31) bear feeding seasons in Whitehorse, Yukon. Post-berry season (September 1 – November 30) had the same result as pre-berry season.

Playgrounds

A sample of 13 playgrounds throughout the city of Whitehorse were sampled for non-natural attractants, sightlines, and the quality of surrounding bear habitat. Nine out of thirteen provided bear-resistant garbage bins, which had the latched disabled, making them non-bear-resistant, (Table 7).

Table 7. Bear-resistant garbage bin audit at 13 playgrounds in Whitehorse, Yukon, 2015.

Playground	Bear-resistant pedestrian garbage bins
Downtown (Black Street)	Yes
Cowley Creek	Yes
Mary Lake	Yes
Porter Creek (Wann x Hickory)	Yes
Logan (Finch Crescent)	No
Copper Ridge (Grizzly Circle)	No
Hidden Valley	No
Northlands	No
Granger (Thompson Road)	No
Valleyview	No
Whitehorse Copper	No
Wolf Creek	No
Kopper King	No

Trails

The Escarpment trail (Figure 29), has low sightlines along the sections just south of Two Mile Hill, and along the section at the north end at Robert Service Way. The Copper Ridge trail (Figure 28), has low sightlines (mostly due to fences in the residential area) at the north end abutting the Logan and Arkell subdivisions. The Yukon College trail (Figure 30), has low sightlines along most of the trail, but low bear food for its entire length. The Millennium trail (Figure 31), had low sightlines along most of its length, and in pre-berry and post-berry seasons, it also had high bear food.

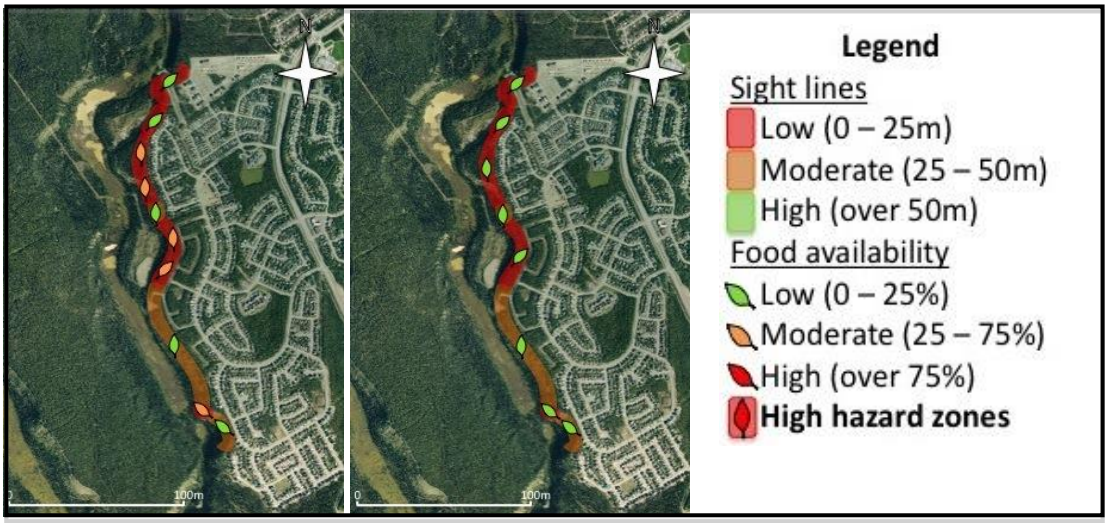


Figure 28. Copper Ridge trail bear hazard assessment. From left to right are assessments for pre-berry (April 1 – July 15), berry (July 16 – August 31) bear feeding seasons in Whitehorse, Yukon. Post-berry season (September 1 – November 30) had the same result as pre-berry season.

Figure 29. Escarpment trail bear hazard assessment. From left to right are assessments for pre-berry (April 1 – July 15), berry (July 16 – August 31) bear feeding seasons and post-berry season (September 1 – November 30) in Whitehorse, Yukon, 2015.

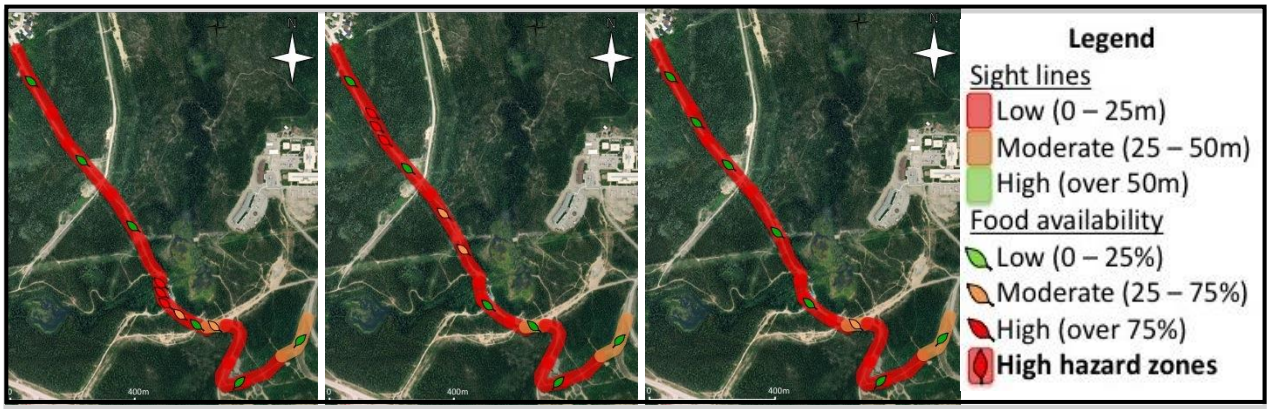


Figure 30. Yukon College trail bear hazard assessment. From left to right are assessments for pre-berry (April 1 – July 15), berry (July 16 – August 31) bear feeding seasons and post-berry season (September 1 – November 30) in Whitehorse, Yukon, 2015.

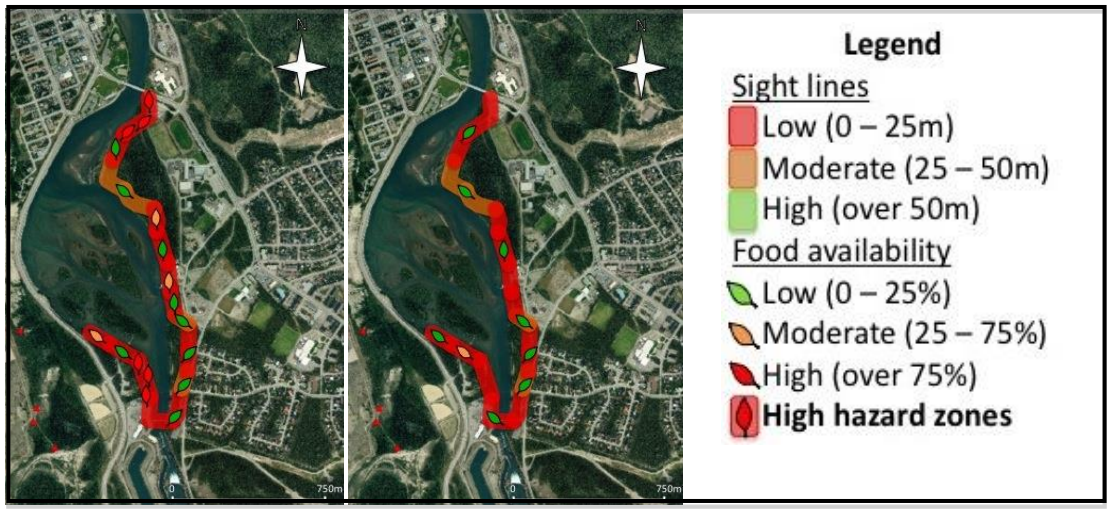


Figure 31. Millennium trail bear hazard assessment. From left to right are assessments for pre-berry (April 1 – July 15), berry (July 16 – August 31) bear feeding seasons in Whitehorse, Yukon. Post-berry season (September 1 – November 30) had the same result as pre-berry season.

City Parks and Recreation areas

Seven trailheads and recreation areas along Chadburn Lake road and Grey Mountain road were surveyed. Of these areas, only two provided bear-resistant bins and signage educating users about bears or other wildlife was in place (Table 8).

Table 8. Education and garbage facilities at trailheads in recreation areas in Whitehorse, YT, 2015.

Area	Bear signage	Bear-resistant garbage
Grey Mountain Road	No	0/1
Magnusson and Lower Grey Mountain	No	1/1
Upper Grey Mountain	No	0/1
Schwatka Lake Day Use	No	2/3
Chadburn Lake ski trails	No	0/1
Chadburn Lake boat launch	No	0/1
Chadburn Lake Day Use	No	0/1
Chadden Lake trail	No	0/1

Additional audits

Twenty-one condominium complexes were visited and garbage and recycling systems in place surveyed (Table 9). Garbage was considered bear-resistant if contained in a bear-resistant structure or was behind a sturdy fence. None of the condominium complexes had bear-resistant garbage in place.

Table 9. Condominium complex garbage bin audit in Whitehorse, Yukon, 2015

No. surveyed	No. garbage bins	No. bear-resistant?
21	29	0

Pedestrian bins at bus stops, in city parks and placed on sidewalks (Table 10) were opportunistically audited. Most bins were not bear-resistant.

Table 10. Public pedestrian bin garbage bin audit in Whitehorse, Yukon, 2015.

No. surveyed	No. not bear-resistant	No. bear-resistant?
27	21 (78%)	6 (22%)

Public Input

Public Information Sessions

Two drop-in style public information sessions were held at the Whitehorse public library. Attendees were asked if they supported several potential recommendations common in other communities seeking to reduce human-bear conflict. Feedback posters were left up for two weeks at the Canada Games Center, at the Kwanlin Dün First Nation office, and at the Ta'an First Nation office. An online survey (available from19th October to 17th November 2015) was advertised on social media for residents to provide opinion and input on local human-bear conflict issues.

Table 11. Summary of general public support for potential recommendations to reduce human-bear conflict in Whitehorse, Yukon.

Potential recommendation	Yes (%)	No (%)	Total (N)
Curbside pickup with bear-resistant bins	98.5	2.3	66
Loaner programs for bear-resistant livestock feed bins	75.0	25.0	56
Electric fence cost sharing program	42.5	57.5	80
Management of edible landscaping initiatives	53.3	46.7	45
Implement community bear-resistant garbage (e.g..Carcross)	95.7	4.3	23
Bird feeder restrictions (April 1 – November 30)	81.0	19.0	21
Bear resistant bird feeders required	88.2	11.8	17
Bylaw prohibiting curbside placement of bins until AM	88.2	11.8	17
Fruit picking drives, accumulation bylaws	0.0	100.0	4

*1 additional support vote conditional on the City paying for bear-resistant bins

General written comments:

- 13 comments that humans are the problem.
- 4 comments indicating that there is no bear problem in Whitehorse.
- 2 comments about education to reduce fear and over-reaction to bears.

- 2 comments about only putting garbage out the day of pickup (curbside).
- 1 suggestion that garbage pickup switch to weekly instead of biweekly.
- 1 suggestion to hire more people to patrol for bears.
- 1 suggestion of varying the appearance of curbside garbage bins.
- 1 comment about people leaving garbage bins on the curb for several days.
- 1 comment to wash and freeze attractants until garbage pickup day.
- 1 comment about using evidence-based decisions.
- 1 comment to increase the hunt.

Table 12. Summary of Kwanlin Dün First Nation support for potential recommendations to reduce human-bear conflict in Whitehorse, Yukon.

Potential recommendation	Support Yes	No
Bird feeder restrictions (April 1 – November 30)	8	0
Bear resistant bird feeders required	8	0
Fruit picking drives, accumulation bylaws	-	-
Edible landscaping initiatives in the city	9*	5
Community bear-resistant garbage (e.g. Carcross)	-	-
Curbside pickup with bear-resistant bins	-	-
Bylaw prohibiting curbside placement of bins until AM	-	-
Loaner programs for bear-resistant livestock feed bins	13	5
Electric fence cost sharing program	12	6

*1 vote conditional on edible landscaping being placed downtown only

General written comments:

- 1 suggestion to enforce laws prohibiting the feeding of wildlife.

Online Survey

The online survey was available from 19th October to the 17th November. After completed surveys had not been submitted for three days, the survey was taken offline and we summarized the results. Multiple choice questions were converted into pie charts (Figures 32 – 39), and results from Question 2, which asked which where in the City respondents thought human-bear conflict was highest, and Question 4, which asked where respondents have encountered bears, were added to the public input map (Map 6).

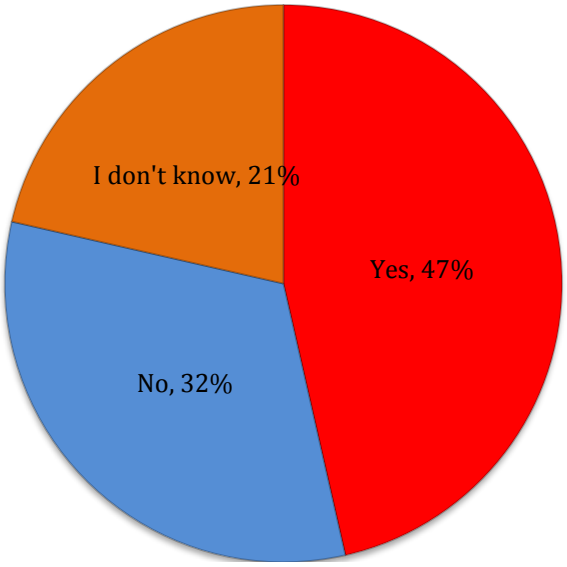


Figure 32. Is human-bear conflict in Whitehorse a significant issue (Question 1)?

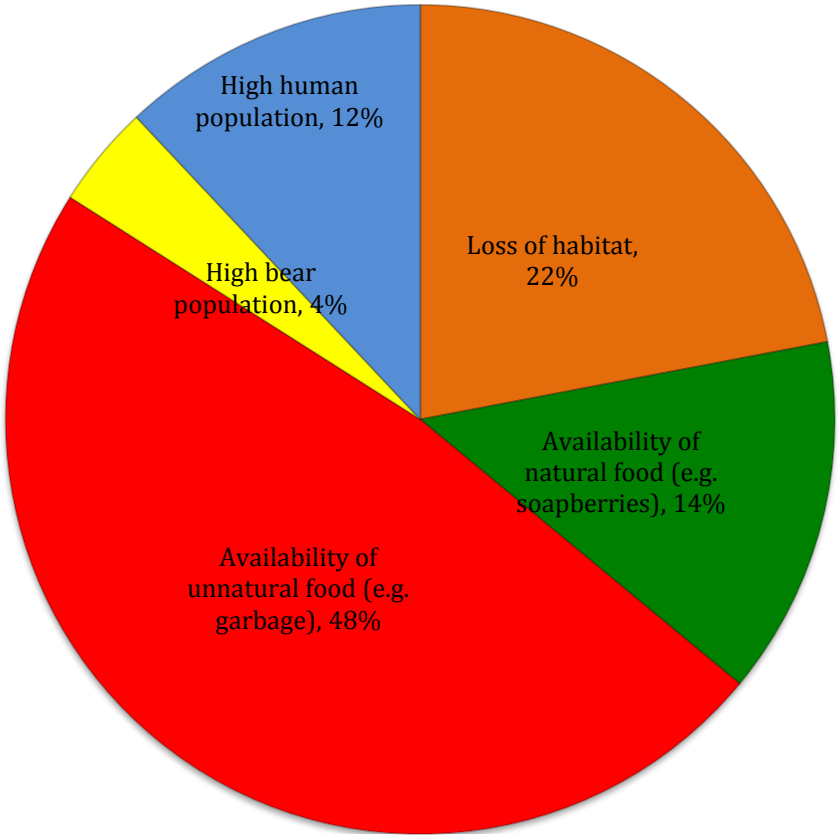


Figure 33. What is the biggest driver of human-bear conflict in Whitehorse (Question 3)?

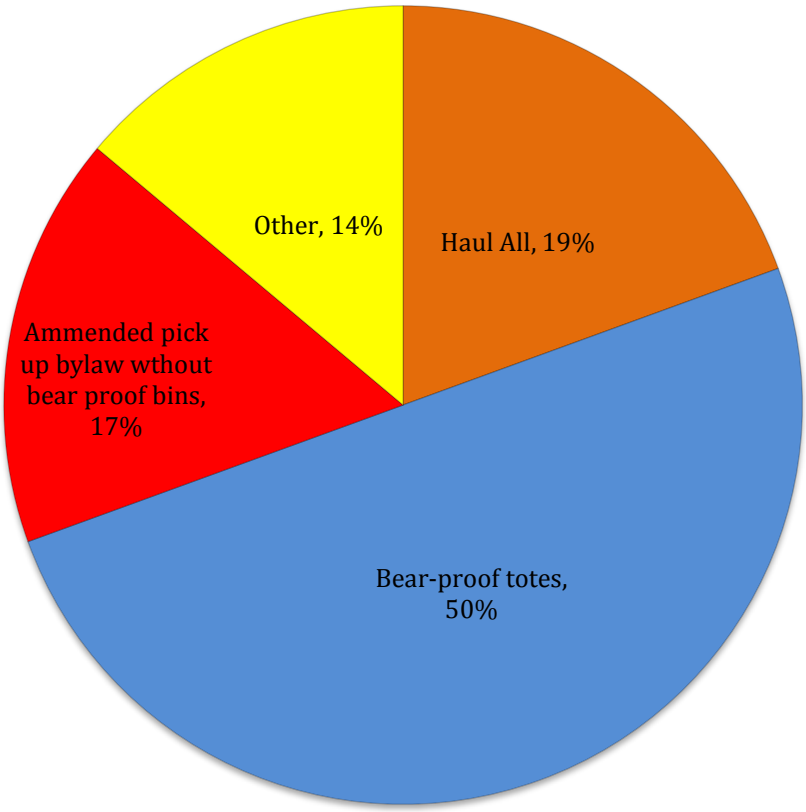


Figure 34. Which of the following bear-proof waste management systems would work for you (Question 5)?

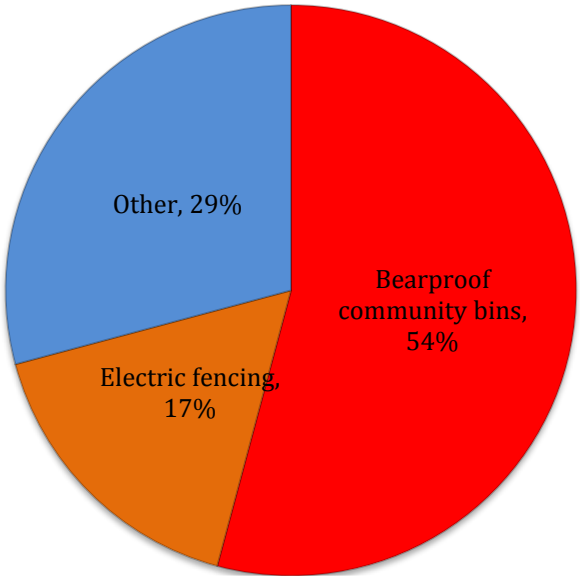


Figure 35. Which potential recycling and compost management systems would you like to see in place (Question 6)?

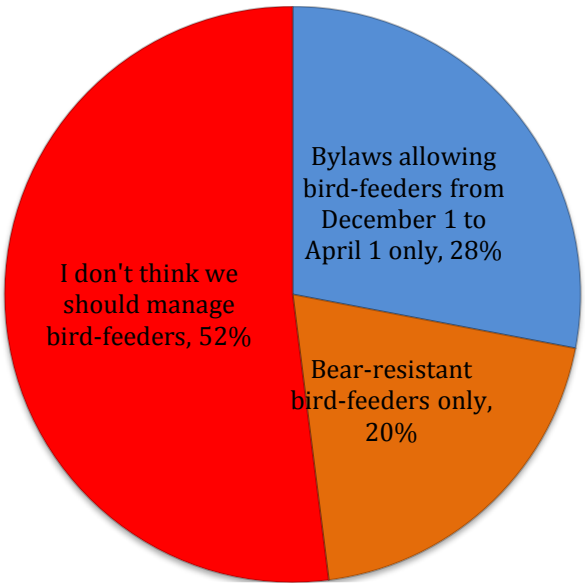


Figure 36. How would you like to see bird feeders managed in your neighborhood (Question 7)?

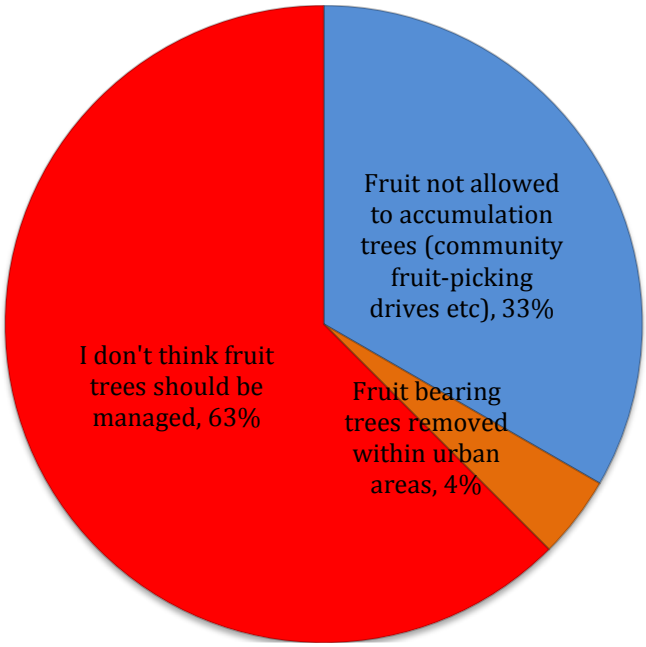


Figure 37. How would you like to see fruit trees managed in your neighborhood (Question 8)?

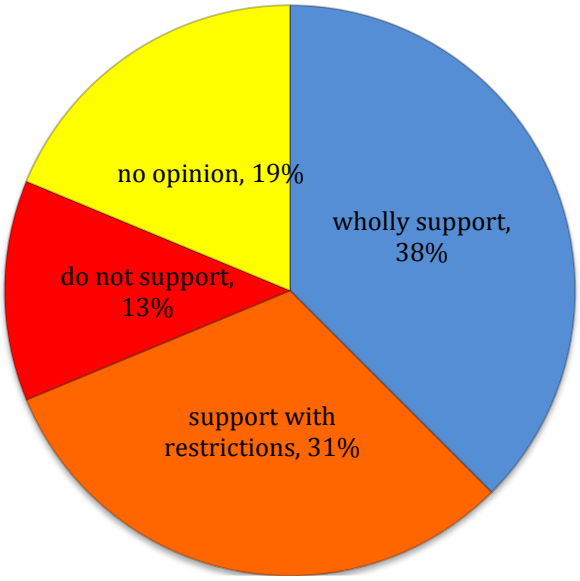


Figure 38. Do you support edible landscaping in the City of Whitehorse (Question 9)?

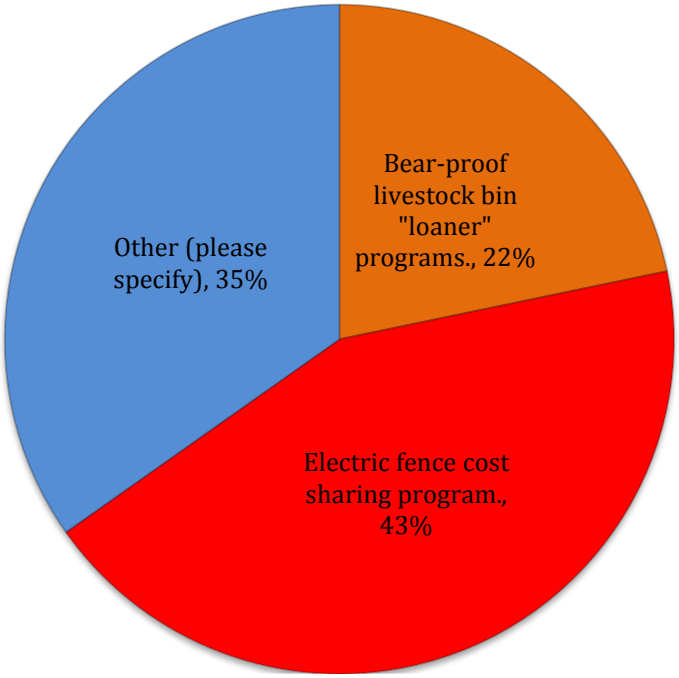


Figure 39. Which initiatives to manage agricultural attractants would you support (Question 10)?

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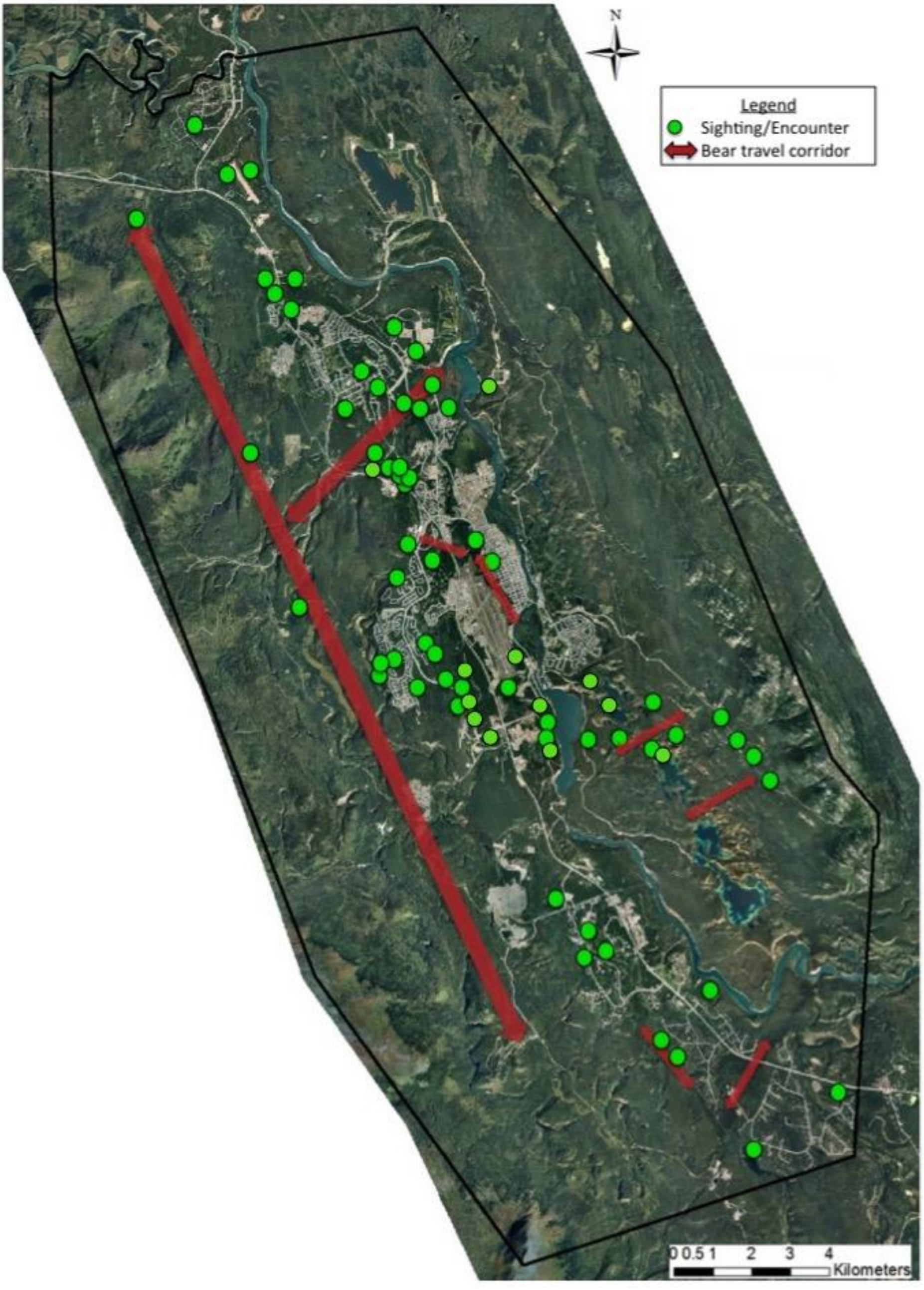


Map 7. Bear sightings and bear travel corridors from public input sessions in Whitehorse, Yukon, July – August 2015.

HAZARD RANKINGS

The average hazard ranking for Whitehorse subdivisions was 5.26/10 with a range of 8.0/10 Downtown and 1.66/10 for Northlands trailer park (Figure 32).

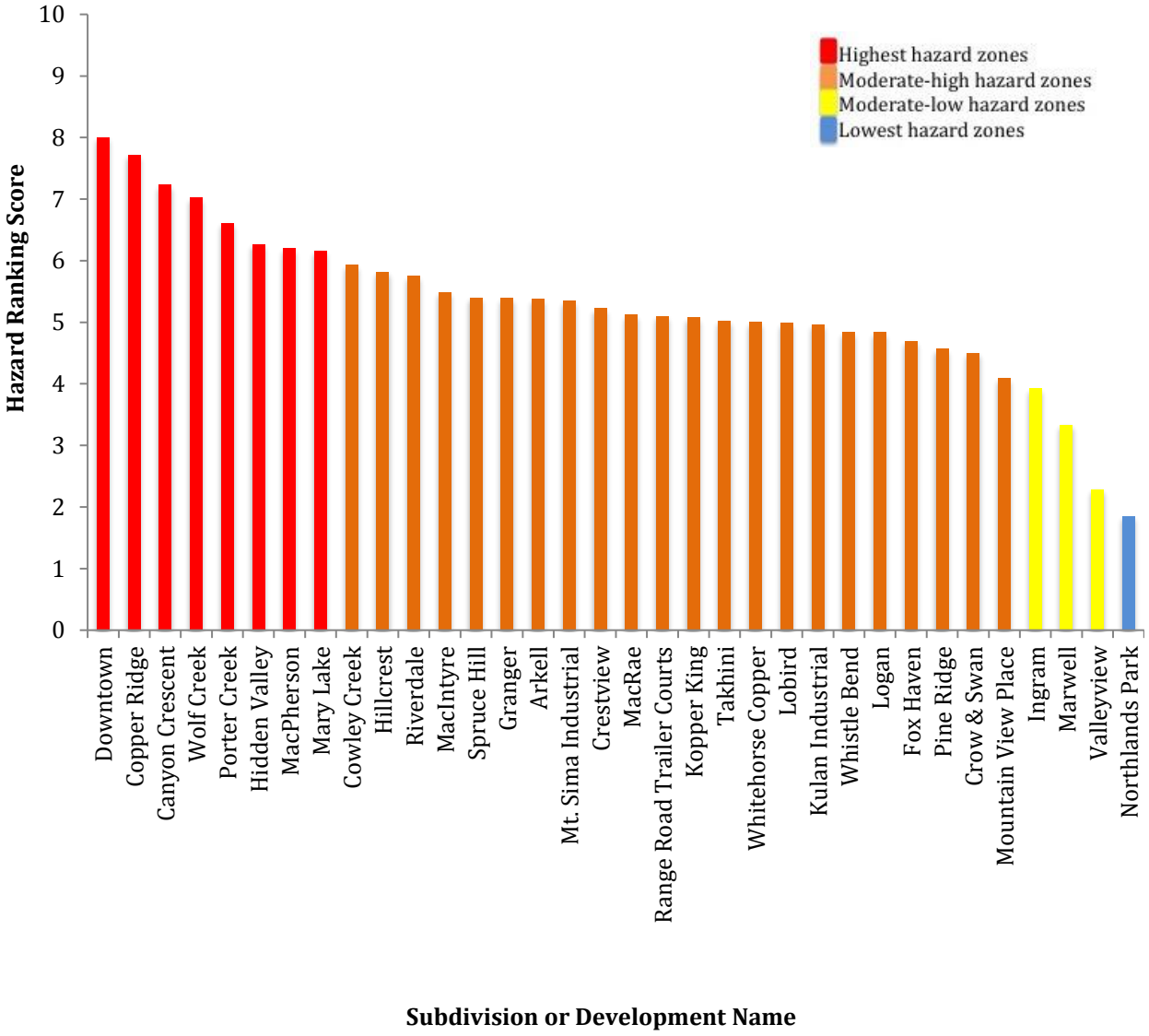
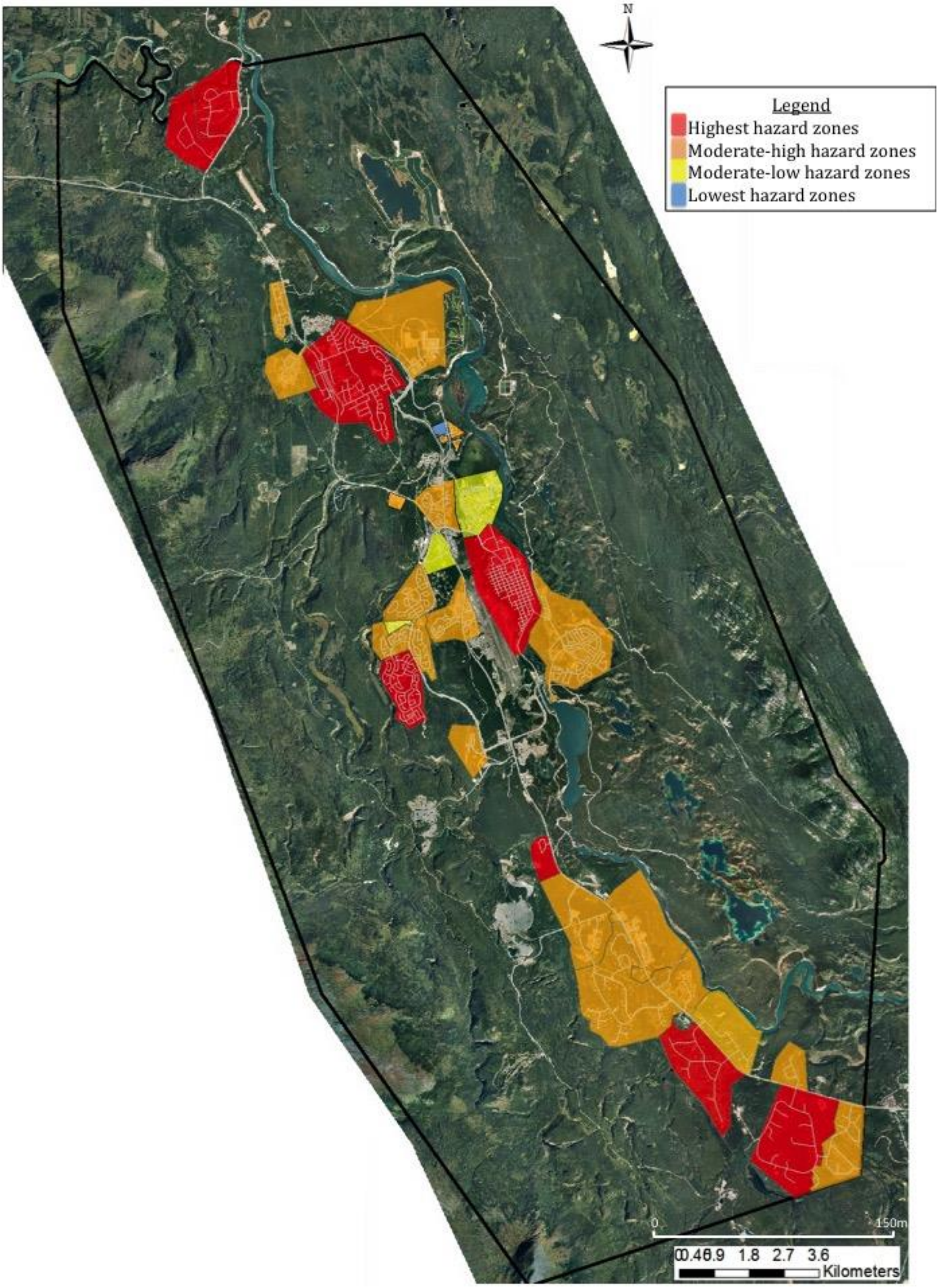


Figure 40. Overall hazard rankings for Whitehorse, Yukon subdivisions, 2015. Highest hazard subdivisions scored between 6 and 8, high moderate subdivisions scored between 4 and 6, low moderate subdivisions scored between 2 and 4, and lowest hazard subdivisions scored under 2 on a 10-point hazard ranking scale.



Map 8. Subdivisions in Whitehorse, Yukon, ranked according to overall bear hazard score, 2015

Average hazard ranking in campgrounds and RV parks was 4.5/10, with Robert Service campground scoring the highest at 6.6/10, and Wolf Creek campground scoring the lowest at 4.95/10 (Figure 33).

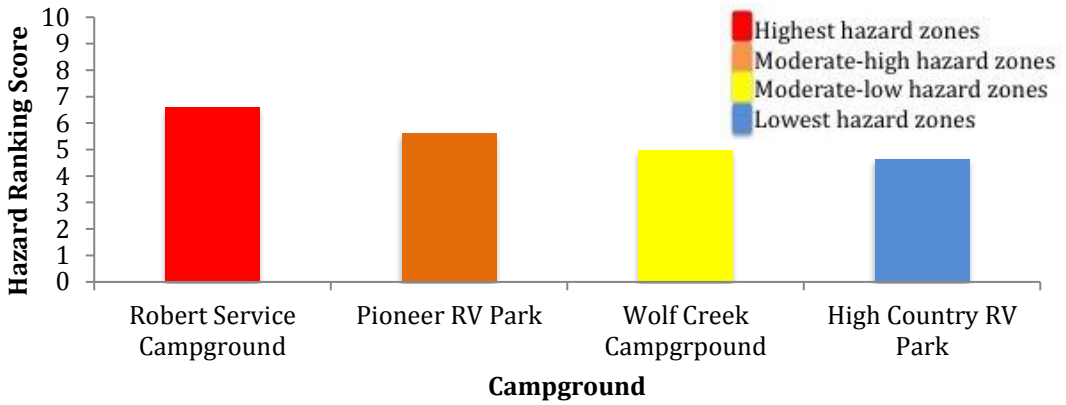


Figure 41. Overall hazard rankings for Whitehorse, Yukon campgrounds 2015. Highest hazard campgrounds scored between 6.25 and 7, high moderate campgrounds scored between 5.5 and 6.25, low moderate campgrounds scored between 4.75 and 5.5, and lowest hazard campgrounds scored between 4 and 4.75 on a 10-point hazard ranking scale.

Average hazard ranking for schools was 7.7/10, with Hidden Valley School scoring the highest hazard ranking at 9/10, and Golden Horn Elementary scoring the lowest at 6.5/10 (Figure 29).

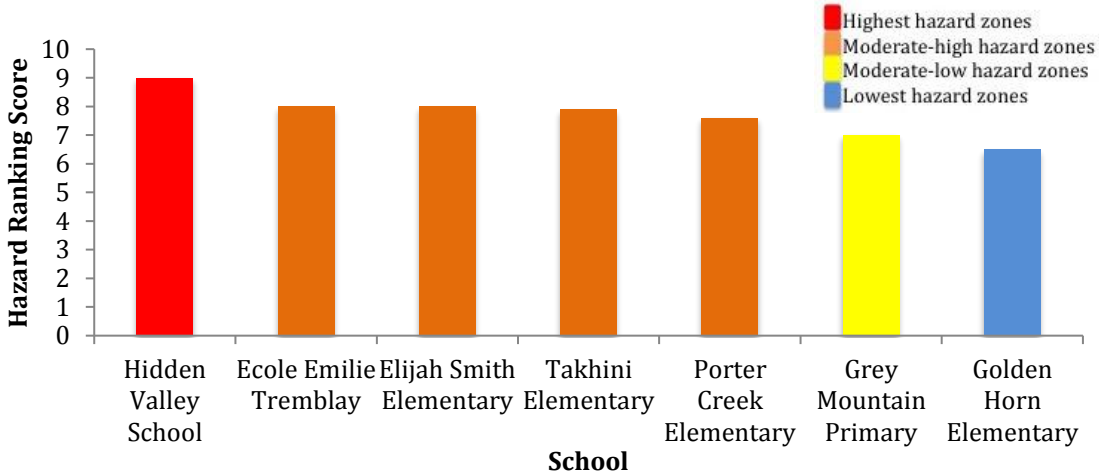


Figure 42. Overall hazard rankings for a sample of Whitehorse, Yukon schools, 2015. Highest hazard schools scored between 8.25 and 9, high moderate schools scored between 7.5 and 8.25, low moderate schools scored between 6.75 and 7.5, and

lowest hazard schools scored between 6 and 6.75 on a 10-point hazard ranking scale.

Average hazard scores for playgrounds was 4.5/10, with Northlands trailer park playground scoring highest hazard at 7/10, and Mary Lake's playground scoring lowest at 2/10 (Figure 35).

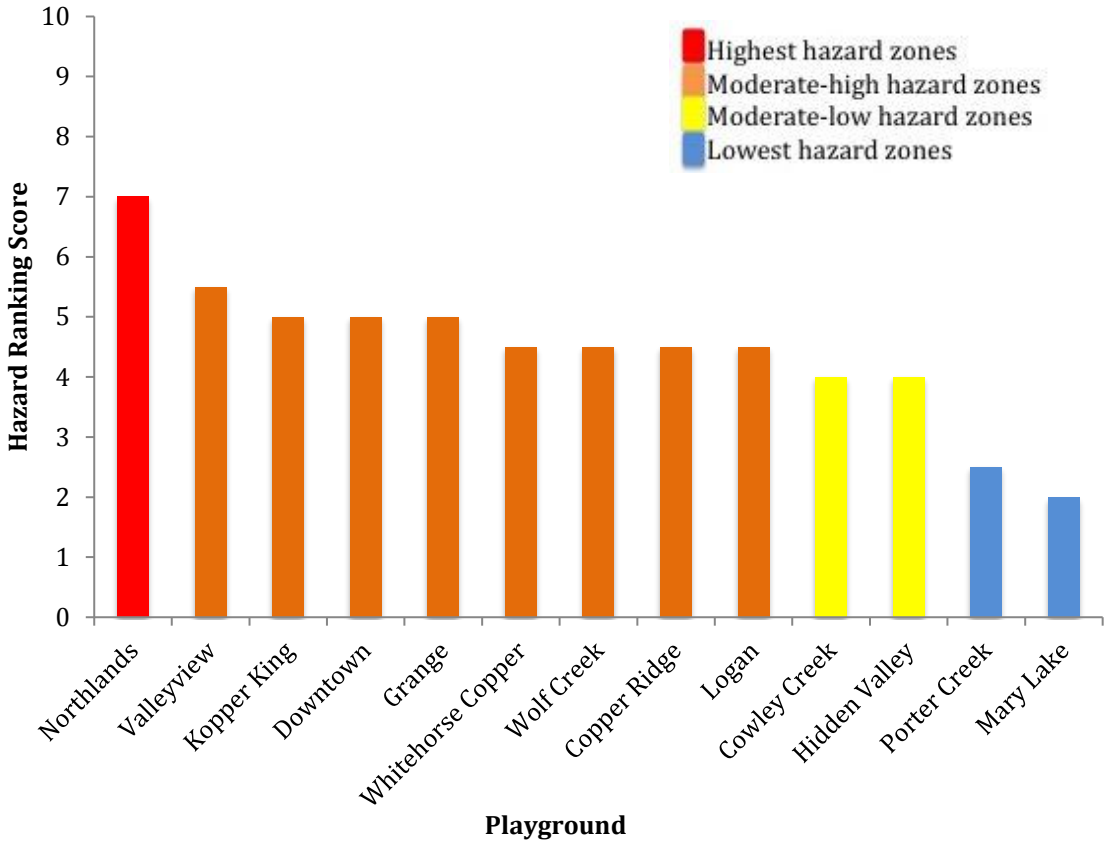


Figure 43. Overall hazard rankings for a sample of Whitehorse, Yukon playgrounds, 2015. Highest hazard playgrounds scored between 5.75 and 7, high moderate playgrounds scored between 4.5 and 5.75, low moderate playgrounds scored between 3.25 and 4.5, and lowest hazard playgrounds scored between 2 and 3.25 on a 10-point hazard ranking scale.

CURRENT PROGRAMS TO REDUCE HUMAN-BEAR CONFLICT

Whitehorse has a number of programs currently in place to help to reduce human-bear conflict, including bylaws, government programs, and non-governmental organizational programs.

The Whitehorse City landfill was electric fenced in 1997, the landfill has not been accessed by bears in many years (though wolves are a concern in winter). The fence is inspected weekly and vegetation is brush-cut annually (Dan Jordan, personal communication, August 20, 2015).

Bylaws in urban areas require chicken owners to apply for a permit, which provides opportunities for education of residents on securing chickens and their feed from predators (City of Whitehorse, 2012, revised bylaw 36(2) concerning residential hens/chickens). Rural residential areas do not require permits to house chickens.

Government programs include an agricultural incentive to cost share supplies (e.g. electric fences, wildlife deterrents) with large or small commercial farmers. While the program's mandate is to promote agriculture, being a subsistence farmer does not disqualify people from qualifying for a cost-share program.

A local non-profit, Wild Wise Yukon, was formed in 2012 and has a stated purpose of conducting "research, educational outreach and activities with a view to reducing negative human-wildlife conflicts in a comprehensive and collaborative manner by bringing together government, citizens and communities" (http://wildwise.ca/who-we-are). Wild Wise Yukon has partnered with the City of Whitehorse and Environment Yukon to implement educational programs and has made the bear-resistant latches for the curbside garbage totes available at no cost (Heather Ashthorn, Wild Wise Yukon coordinator, personal communication, July 21, 2015), though as a pilot program, any remaining latches were sold at cost. Representatives from the City, Environment Yukon, Wild Wise Yukon and other local stakeholders regularly meet as part of a bear working group to identify and mitigate local human-bear conflict issues.

DISCUSSION

Whitehorse appears to have many of the same human-bear conflict issues common in communities with urban bear populations, most notably, unsecured non-natural attractants, as well as the availability of natural food in urban areas (e.g. soapberries, fruit trees). Communities that restrict the availability of non-natural attractants have drastically reduced both the number of occurrences of human-bear conflict and the nature of conflict (less conflict related to food-conditioning; e.g. Honeyman 2007).

Human-wildlife conflict often fluctuates with the availability of natural food (Baruch-Mordo 2014), and this appears to be the case in Whitehorse. Bears often prefer high-value natural forage to anthropogenic food when high value natural food is available; however, in years of natural food shortage, the availability of anthropogenic food sources is the primary driver of conflict (Figures 2 and 3 demonstrate this effect well). In 2008 and 2009, berry crops were abundant and there was very little recorded human-bear conflict (demonstrated through a lack of, or low rate of occurrences), in 2011 and 2012 there were few berries, and rate of occurrences increased markedly. The primary cause of conflict in Whitehorse from 2006 - 2012, when it was known; (Figure 3) was bears accessing human food and garbage. The cause of human-bear conflict is usually highly driven by food availability. Managers and community members have some influence over the availability of naturally occurring food sources, but have near-complete control over the availability of anthropogenic food sources, especially garbage.

Bears accessing garbage is the biggest concern for reducing human-bear conflict in Whitehorse. Bears with access to garbage and other anthropogenic attractants are likely to spend more time in the community, increasing the likelihood of encounters with displays of aggression, and increasing the likelihood that bears will be removed from the population (Herrero 1985). From Map 6, it seems like collared grizzly bears are not spending more time in urban areas, but most bears periodically use more developed areas to at least cross the valley. In those movements, they are vulnerable to conflict with humans.

With a lower reproductive rate than most mammals, this is a conservation concern as well as a human safety concern. Killing a large number of bears even every few years can depress populations (Baruch-Mordo *et al.* 2014). Females with cubs are at increased risk, as they are more likely to occupy marginal habitat (i.e. urban/suburban areas) to avoid larger, more aggressive adult animals (McLoughlin *et al.* 2002). Dispersal animals are often adolescent males; individuals that are more

likely to display bold behavior. Black bear populations with stable adult populations have fewer cubs, and a lower total population than populations with a high mortality rate (Czetwertynski *et al.* 2007), which may also lead to reduced conflict with humans.

ATTRACTANT MANAGEMENT

Most wildlife managers mitigate human-wildlife by managing the symptom (bears) because the cause (garbage) is out of their jurisdiction. Communities that have successfully reduced human-bear conflict show significant partnerships between provincial or territorial governments (responsible for management of wildlife) with municipal governments (responsible for management of waste). Once a community implements bear-resistant waste management protocols, conflicts with bears are drastically reduced. For example, in Canmore, Alberta, bears accessing garbage became a rare event once the community implemented a bear-resistant garbage management system, and while human-bear conflict rose in surrounding areas, conflict actually decreased in the areas with bear-resistant garbage (Honeyman 2007). The single most important action a community can take to reduce conflict with bears is to implement a tested and certified bear-resistant waste management system. Since most of the non-natural attractants in the urban residential areas of Whitehorse are garbage and compost, the city could reduce the availability of non-natural attractants to bears by up to 35% and reduce the rate of occurrences by one half, through implementation of a bear-resistant waste management system.

Garbage Management

It is beyond the scope of this document to assess the different bear-resistant waste management systems available in a cost-benefit analysis, but we will provide an overview of systems in use in other communities.

To be successful, bear-resistant waste management systems must be:

1. Tested (and have passed testing) on bears at an approved testing facility (one is located in Kamloops, another in West Yellowstone).
2. Easily accessible to all user groups (residents, visitors, people with disabilities, people without vehicles).
3. Self-latching (user error should not be a significant factor in the efficacy of the system).

There are three bear-resistant waste management systems in wide use that show varying levels of success. Community bear-resistant bins (e.g. Haul All bins - Canmore, AB and Carcross, YT) have the most success; bears accessing garbage and

human attractants have become a rare event in communities that have implemented this system (Honeyman 2007). Even in Whitehorse, there is current evidence that such a system can reduce attractant availability. Northlands trailer park and Lobird subdivision both have a central garbage disposal system (though not currently bear-resistant), these areas show lower attractant saturation (Figure 13), and ranked lower overall on the hazard scores than all three trailer parks in which residents are responsible for their own waste disposal, (Figure 32).

The biggest barrier to the Haul All system is likely the upfront cost and required purchase of specialized garbage trucks, along with the loss of investment in the current system. It is worth considering however, that Canmore's experience was that the system paid for itself in a few years by substantially reducing the number of pickup sites (Town of Canmore 2000), and while initially cheaper, curbside garbage pickup options require higher annual costs in manpower and related initiatives to minimize human error.

Curbside pickup with bear-resistant latches on the garbage totes (e.g. Squamish, BC) have some success but require passing bylaws prohibiting garbage totes from being placed curbside before the morning of pickup. In Squamish, BC, Meg Toom (Squamish Bear Aware coordinator, personal communication, October 3, 2015) indicated that the establishment of this system dropped human-bear conflict in the city by approximately 80%. However, because this system is extremely prone to human error (people forgetting to latch their bins, overfilling bins, or putting the bins out the night before garbage pickup, as already evidenced in the City of Whitehorse), it is a labor-intensive system, requiring extensive and continuous public education and monitoring. This system will not be bear-resistant unless a bylaw prohibiting garbage totes from being placed curbside before the morning of pickup is passed and enforced. A monitor must be hired to patrol subdivisions the evening before garbage/compost pickup to tag bins with a sticker to educate users about the bylaw. The monitor then reports violations to bylaw officers who must dedicate an officer to follow up on the education message and levy fines, if appropriate. If the monitoring of this system is reduced, people quickly become complacent, leaving garbage out overnight, which bears can then access, (Meg Toom, Squamish Bear Aware Coordinator, personal communication, October 3, 2015). Parts of Durango, Colorado, are experimentally evaluating this system, and have significant issues with user compliance (Johnson 2015).

At present in Whitehorse, residents can voluntarily have their bins retro-fitted with a bear-resistant latch, which must be unlatched the morning of pickup so the garbage trucks can dump them automatically, without having to get out of the truck. Of the 1924 garbage totes we audited while in the field, 55 were retrofitted with bear-resistant latches, and of those 55 bins, only 25 were latched to make them

bear-resistant. Current challenges with these latches include issues with proper latch installation, lids being dumped by city garbage collectors, user compliance, and product integrity. The latches require ongoing, periodic inspection and maintenance (Heather Ashthorn, Wild Wise Yukon coordinator, personal communication, November 15, 2015). If the city decides to implement a system without self-latching clips to keep the totes bear-resistant, there is strong evidence that the system will need to be intensively and continuously monitored to be functional.

Cities with bylaws or city ordinances stating that non bear-resistant bins cannot be placed curbside before 6 AM on the day of pickup and must be stored in a bear-resistant structure, (e.g. Durango, CO) have issues with user compliance. In Durango, the level of user compliance in putting bins curbside the morning of pickup only, ranges between 34% and 52%, with significant effort towards education and enforcement (Johnson 2015). With approximately 5,800 totes in Whitehorse (Dan Jordan, personal communication, August 20, 2015), a similar level of non-compliance would result in between 2,784 and 3,828 unsecured garbage totes. In addition, since the totes are not bear-resistant, residents must have a bear-resistant structure to store totes, which many residents did not appear to have access to when we conducted our audits.

While 3,000 – 4,000 unsecured bins would be an improvement over the current situation of over 5,000 unsecured bins, it will not likely be biologically significant in reducing human-bear conflict. Bears appear to use urban areas to supplement their diet in years of food shortage (Johnson *et al.* 2015). In years where natural food is scarce (e.g. 2011 and 2012), bears are highly motivated to locate non-natural food sources used previously in food shortage years. The level of education and enforcement of this system would cost the city more money, and would likely still fail to reduce human-bear conflict, especially in years of natural food shortages.

Urban residential and rural residential subdivisions have different challenges in improving waste disposal, and will likely require different solutions. Even if a community bear-resistant garbage system is not desired where curbside garbage pickup currently exists, providing rural residential residents with a closer and bear-resistant alternative to storing garbage on their property until they are ready to drop it off at the landfill is prudent; people tend to do what is easiest and the more inconvenient it is for people to dump waste, the more likely that they will procrastinate, letting it accumulate on their property.

For curbside garbage pickup options, a garbage tote with self-latching lids that is compatible with standard garbage trucks passed the testing process in mid-October of 2015. (Patti Sowka, Living With Wildlife Foundation, personal communication,

October 17, 2015). The authors have asked for a sample to be shipped to Wild Wise Yukon to evaluate its potential for use in Whitehorse.

Table 13. Pros and cons of bear resistant waste management solutions available.

System	Pros	Cons	Recommend?
Haul-All	Guaranteed to work Long-lasting bins	Requires special truck (expense) Not as easy to recycle	Yes
Self-latching curbside totes	Compatible with current system	Tested and certified but not yet implemented (no track record yet)	Yes
Bear-resistant latches retro-fitted to totes	Relatively little up front cost	Unlikely to work unless carefully monitored, which will eventually cost more than the systems mentioned above	No

Whitehorse should most strongly consider implementing community bear-resistant garbage bins like those in Canmore and Carcross (Haul-All brand or comparable). These bins have been used successfully in many communities in Canada and the United States for decades. Another option may be the tested and certified self-latching curbside garbage totes that recently passed certification, to be implemented in areas that currently receive curbside garbage pickup, and larger commercial versions (that have also been tested and certified) to be shared by multiple houses in rural residential areas. Both of these systems minimize human error, and are therefore more cost-efficient and more likely to be successful.

The Survey Monkey results indicate that most would people support making garbage infrastructure more bear-resistant, but are less supportive of managing fruit trees and bird feeders. Using bear resistant totes (similar in style to the current system, but bear-resistant) had the most support at 50%. If the City wants a truer indication of public support for an effort to make garbage unavailable to bears, a professional polling company should be used to get a more accurate indication of the prevailing public opinion. Our results are likely biased, as only people interested in human-bear conflict issues are likely to take the time to answer the survey questions. Surveys should also avoid only asking people at the landfill as well, since we also spoke to rural residential residents who had paid for a neighborhood bin, and would be missed in a landfill survey.

Campgrounds are another area where garbage (and unsecured human food) is of particular concern. In Whitehorse, Robert Service campground was particularly of note. This campground hosts low-income campers who make their campsite a temporary residence on a monthly basis. Many residents do not own a vehicle where they could store their food, but even if they did, the tenting sites are walk-in, which makes retrieving food from the campground parking lot inconvenient. The campground is also situated between a major road entering Whitehorse, and the Yukon River, which functionally funnels bears through the campground in order to pass through the area.

Like garbage, recycling needs to be secured from bears in bear-resistant containers. While not as available as garbage is in Whitehorse, recycling can be highly attractive to bears, especially if it isn't thoroughly cleaned. At present, residents take their recyclables to one of a couple of commercial operators in Whitehorse, storing recycling at their residence until that time. Bins designed for storing garbage securely from bears will also work for recycling (and livestock feed), and could be stocked in the local feed store or loaned to interested residents.

Other non-natural attractants

Human-bear conflict does not end with bear-resistant garbage. Bears are opportunistic omnivores targeting fruit trees, bird feeders, pet food, and barbeque grease traps. During fruit season, many communities have found it necessary to pass bylaws requiring residents to harvest their fruit, or have implemented programs to encourage residents to replace fruit bearing trees with a tree that blossoms but does not fruit. Sample bylaws are included in the appendices. The two main issues with fruit trees include residential fruit trees (e.g. crabapple trees), and ornamental May trees. May trees in Whitehorse have attracted bears to urban areas, including Yukon College. The numerous, small berries are difficult to manage and the trees themselves may have high intrinsic value to a small number of residents. This same situation exists in Whistler, BC (with mountain ash), where the community has passed a bylaw requiring all fruit trees to be picked or the tree removed. Local non-profit groups have offered replacement non-fruit bearing ornamental or native plants as an incentive to residents and businesses. Community fruit-picking drives are also popular, where you can not only pick the fruit but people without fruit trees can buy or receive harvested fruit for their own use.

Bird feeders can be particularly problematic, as many residents and visitors enjoy feeding and seeing birds, and associated conflict with bears often goes unreported. Some communities (e.g. Canmore, AB) have restricted bird feeders to the winter months only, while other communities (e.g. Whistler, BC) have tolerated bird feeders, and the associated human-bear conflict. Feeding small amounts and not

leaving bird feeders out overnight, when birds are asleep anyway) can help reduce the likelihood of bears accessing birdseed.

One of the most concerning emerging issues is livestock and livestock feed, particularly with the rising popularity of backyard chickens. Bears can easily kill chickens, and most chicken coops are inadequately protected. Electric fencing is the best way to prevent bears from accessing livestock. The fence must be erected to predator exclusion specifications (6-8 wires, 10,000 volts, etc) to prevent bears from entering. The fence does require maintenance, ensuring the voltage stays high, but the investment is minimal compared to buying new livestock and rebuilding damaged structures. Electric fencing is not dangerous for people, pets or children (more on electric fencing here: http://www.bearsmart.com/docs/MFWP-ElectricFenceGuideBears.pdf).

Perhaps one of the most interesting and difficult to explain attractants are petroleum products. In some jurisdictions, bears have torn into buildings, seemingly initially attracted by used motor oil on the other (inside) side of the wall, causing enormous property damage (personal experience). In Whistler, there is a continuing problem with bears damaging hot tub covers in high-end resorts and condominiums, presumably due to the covers being made from petroleum products (Homstol *et al.* 2007). Petroleum product containers should be treated in the same way as recycling, as a bear attractant.

First Nation Communities

First Nation communities in Whitehorse have some unique issues related to non-natural attractants. The Kwanlin Dün collect their own garbage twice per week (John Miekle, personal communication, August 21, 2015). Each residence has a wooden garbage box near the street; wood is much better at accumulating odors, and is more difficult to clean, compared to metal or plastic, which makes these boxes highly attractive to bears. Replacing these boxes with sturdier, bear-resistant metal boxes that can also hold recycling and/or compost would be an ideal solution.

Meat processed in the fall can be highly attractive to bears while it is being processed (in smokehouses) and the following spring when bones thrown out to dogs thaw from the snow. We could find no occurrence reports indicating bears were targeting smokehouses, but if the data is simply not captured currently, or if smokehouses become more of an issue in the future, centrally locating some behind an electric fence, would deter bears from accessing the meat inside. Any bones in yards can be easily removed on an organized spring clean-up day, coordinated with social events to encourage participation.

Natural attractants

While non-natural attractants are the primary concern for Whitehorse, it is worth considering ways to reduce some of the natural attractants that initially attract animals into the human developments. Bears may defend a particularly laden berry bush from people, and many people are not expecting to encounter a bear within the city limits, making a surprise encounter more likely.

The practice of fire smarting communities (thinning forests near communities to reduce fuel for wildfires) helps to open up sightlines so bears and people are less likely to experience surprise encounters. However, it also opens the forest canopy and creates better conditions for soapberry (*Shepherdia canadensis*), which results in increased berry production (Hamer 1996). From mid-July to late August, black and grizzly bears target soapberries, which, due to their preference for partial shade and partial sun, often grow best on roadsides, trails, and in fire smarted areas. Because male plants don't produce berries (Cooper 1932), workers can pull or cut female shrubs to significantly reduce an area's attractiveness to bears. Removing the female *Shepherdia* shrubs within 100 m of human developments has become a standard recommendation and is commonly practiced in other communities situated in ecosystems where soapberry is a preferred bear food (Honeyman 2007, Homstol and Rear 2009). Concerns about impacts to forest aesthetics can be minimized through education; soapberry-reduced forests are still aesthetically pleasing (Picture 5) and safer for both bears and humans.

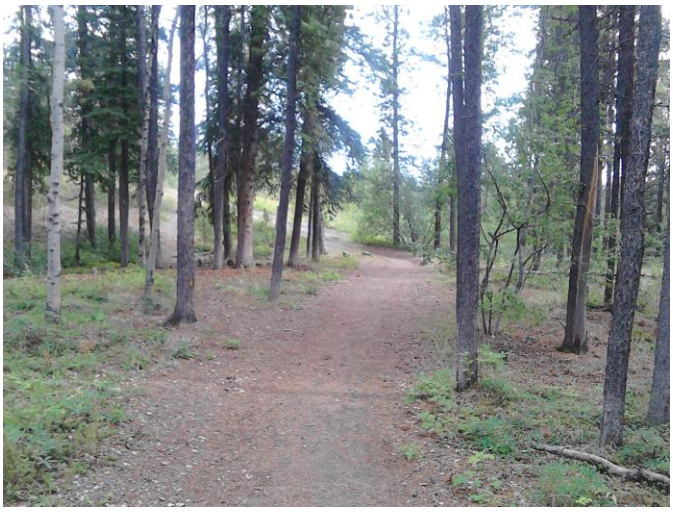


Photo 5. A trail in Porter Creek subdivision with high sightlines.

Soapberry is not the only significant bear food requiring semi-open habitat to flourish; dandelions (*Taraxicum officionale*), bear root (*Hedysarum alpinum*) and locoweed (*Oxytropus*) are all important bear foods in spring and/or fall and are

more likely to be growing on roadsides and trailsides, attracting bears into areas where they are more likely to encounter humans and their non-natural attractants.

Areas where this may be of particular concern include campgrounds, playgrounds and schools. Many of these areas abut green spaces, where people are more likely to encounter a bear. Our campground and park assessments of sightlines and habitat may capture some "edge effect" (where partial canopy cover allows for increased sunlight to hit the ground and encourage plant productivity). In addition, these habitat assessments are at a much finer scale than the GIS habitat maps; high bear food availability is calculated differently than for the larger scale habitat maps (see Methods section). It is meant to allow comparisons between different campgrounds, school yards and parks, and to highlight the priorities to address at this scale. Habitat manipulation is very difficult to accomplish at a large scale, but on a fine scale such as the perimeters of campgrounds, RV parks and school yards, it can be quite important. Completing the schoolyard and playground assessments can provide some direction with respect to sightlines improvements, and reduction of high quality bear foods in urban areas.

Potential future sources of conflict in Whitehorse

Mountain ash trees appear to be purely ornamental in Whitehorse at present, but since they are a preferred fall bear food in more southern areas where they grow in the wild (Homstol *et al.* 2007), bears in Whitehorse may eventually start to target them.

Hunting is a popular fall activity, and processing meat in the open, for residents without a garage or suitably bear-resistant shed, bears accessing meat may become a concern. If this becomes an issue, providing residents with some infrastructure to store and process wild game should eliminate this potential problem.

In Summary

Managing attractants for bears, both natural and non-natural, is a many faceted challenge and as such requires an integrated approach. Visible change can come slowly when dealing with a large area city of Whitehorse, with a complex system of fluctuating natural food availability. Reducing human-bear conflict will require buy in from community stakeholders, members of the public, and the City of Whitehorse. Finding community champions to take charge of a particular recommendation that resonates with them will help turn recommendations into reality.

CONCLUSION AND RECCOMENDATIONS

The most effective way to reduce human-bear conflict within the City of Whitehorse is to better secure non-natural attractants. The storage of garbage, compost and other high value attractants is a city-wide issue.

HIGHEST PRIORITIES

1. Conduct a thorough assessment of available bear-resistant garbage management systems (described in the Discussion section) to determine which system would work best for Whitehorse. With the unique needs of each subdivision type, there is not likely one prescription that would fit every area. We suggest either the Haul-All system for the entire city; or an equivalent system with tested and certified self-latching bear-resistant garbage totes for urban residential areas and a system similar to Haul-All for rural residential areas.

2. Implement a city-wide bear-resistant waste management system (for residential and commercial properties).

3. For Kwanlin Dün areas (MacIntyre, Crow & Swan), replace wooden garbage boxes at residences and community buildings with bear-resistant metal boxes that can hold garbage and recycling/compost. Hold a community spring clean-up to remove any left over bones from the fall hunt that were given to dogs. Make the event social to encourage resident participation.

4. Draft and pass a wildlife attractants bylaw (see Appendix V for a sample bylaw from the District of Squamish). Consider including all non-natural attractants, including bird feeders, livestock (electric fence) and fruit trees.

5. Install bear-resistant food lockers and garbage bins at campground tenting sites, prioritizing Robert Service campground tenting area.

6. Pedestrian garbage bins in parks, campgrounds and scattered around the city are often not bear-resistant, as many have had the latches removed. These bins should be completely audited (and monitored on a 1-5 year cycle) and replaced or repaired as required. Prioritize bins bordering on green space and campgrounds.

7. Open sightlines and remove soapberry plants prioritizing the areas abutting green spaces in the highest hazard areas: the downtown escarpment, Hamilton Boulevard, Copper Ridge, Hidden Valley school, the tenting loop at Robert Service campground. Work with Fire smart initiatives to pool planning and resources.

8. Require new developments to install bear-resistant garbage bins (or provide bear resistant garbage totes) as part of the development plan.

9. Implement an education program for city workers (bylaw, permit granting staff) about the merits of electric fencing (constructed for predator exclusion) for livestock. The cost-sharing program implemented by the agriculture branch appears to be under-utilized and should be advertised to local agriculturalists.

MODERATE PRIORITIES

10. Landfill maintenance should be increased to ensure the electric fence maintains a high charge. Keep vegetation and loose garbage that could short out wires near the fence low for at least four feet outside the fence (use a weed-whacker/bobcat as often as is necessary).

11. Start a program to manage community fruit trees (including education). Assist residents who want to harvest their fruit (with community gleaning programs etc.) so bears don't access the fruit first. Implement a program to replace unwanted fruit trees with trees that blossom in the spring but do not produce fruit (e.g. spring snow crabapple trees).

12. Start a bear-resistant bin loaner program for recycling and livestock feed. These programs have been quite popular in some communities (e.g. Bragg Creek, AB; Meadow Creek, BC).

13. Remove fruiting berry bushes from city landscaping and enact a policy of planting natural food less attractive to bears.

14. If certain trails are experiencing high numbers of bear sightings, consider a trail audit, to assess sightlines and bear food on trails popular with recreationalists.

15. Audit the remaining schools to determine if sightlines need to be increased or bear food (e.g. soapberry) needs to be removed.

16. Erect educational bear signage at the recreation areas, prioritizing Day Use areas, as users are more likely to have food with them. Replace non bear-resistant bins with bear-resistant ones.

17. Continue partnerships (including the Bear Working Group) with the City of Whitehorse, Wild Wise Yukon and Environment Yukon to ensure human-bear conflict issues are mitigated with input and resources from all stakeholders. Developing capacity through staff and volunteers at Wild Wise Yukon will help keep much of the work required for these recommendations local.

18. Update this hazard assessment in approximately five years to track progress and measure success.

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APPENDIX I

List of Interviewees during the Field Visit to Whitehorse, July and August 2015

Miles Hume	City of Whitehorse
Shannon Clohosey	City of Whitehorse
Tom Wyers	City of Whitehorse
Jackie Taylor	City of Whitehorse
Kinden Kosick	City of Whitehorse
Dan Jordan	City of Whitehorse
Kevin Lyslo	City of Whitehorse
Andrew Smith	Yukon College
Scott Gilbert	Yukon College
Ramona Maraj	Yukon Territorial Government
Ken Knutson	Yukon Territorial Government
Dave Bacika	Yukon Territorial Government
Matt Ball	Yukon Territorial Government
Christina MacDonald	Yukon Conservation Society
Lewis Rifkind	Yukon Conservation Society
Dave Sembsemoen	Kwanlin Dün First Nation
John Meikle	Kwanlin Dün First Nation
Dawna Hope	Ta'an First Nation
Heather Ashthorn	Wild Wise Yukon
Graham Van Tieghem	Yukon Fish and Wildlife Management Board
Clayton Hadley	General Waste Management

APPENDIX II

Residential, Commercial and Industrial Survey details

Table II.1. Number of curbside garbage totes left overnight the day before garbage pickup in urban residential areas, Whitehorse, Yukon, 2015.

Subdivision	surveyed	bins out	bins in
Arkell	103	23	80
Copper Ridge	200	117	83
Crestview	134	32	102
Crow & Swan	n/a	n/a	n/a
Downtown	203	79	124
Granger	145	21	124
Hillcrest	136	41	95
Ingram	108	36	72
Logan	105	42	63
MacIntyre	n/a	n/a	n/a
Porter Creek	304	135	169
Riverdale	214	71	143
Takhini	125	64	61
Valleyview	65	27	38
Whistle Bend	82	21	61

Table II. 2. Number and type of unsecured non-natural attractants in Whitehorse, Yukon, 2015.

Type	surveyed	garbage	recycle	smoke house	live stock	compost	fruit trees	bird fdrs	mtn ash	bbq	othr
urban res	2002	1329	182	3	0	1172	324	94	306	212	146
rural res	110	60	36	0	21	28	35	49	13	65	104
trailer park	250	91	44	0	0	0	24	36	10	112	50

Indust *	60	47	25	0	0	0	0	0	0	4	15

* also, 26 Petroleum products unsecured.

APPENDIX III

Ecosystem Map (Applied Ecosystem Management 2000) habitat descriptions and ranking according to habitat quality for Grizzly and Black bears

AB Trembling Aspen – Bearberry
Generally occur on south-facing slopes and ridges, but can be found in a variety of positions. Lichen and moss cover are low with a near carpet of bearberry (*Arctostaphylus uva-ursi*) forming ground cover. Sporadic soapberry (*Shepherdia canadensis*) is common. Steep slopes are often associated with GS (grass-sage). Aspen (Populus tremuloides) groves may also be locally- prominent on a range of conditions and are often considered "early successional" forest types.

PB Pine/Bearberry
Lodgepole pine-dominated stands on morainal or transitional upland sites with limited shrub understory development. Bearberry (*Arctostaphylus uva-ursi*) forms the dominant groundcover. Soapberry (*Shepherdia canadensis*) and willow cover sporadic, aspen and spruce may be intermixed in canopy and moss cover is generally low. Terrestrial lichens may be locally abundant. Labrador tea (*Ledum groelandicum*)/dwarf birch shrubs (Betula glandulosa) and mossberry (*Empetrum nigrum)* may be important on moist sites and in the lower subalpine. This community generally occurs on dry, poor sites, however.

PC Lodgepole Pine –Canoe (Paper) Birch
Open canopy lodgepole pine stands occurring on gently sloping, shallow soil ecosystems with rock outcrops. Rock outcrops may contain a high cover of terrestrial lichens. Moist depressions contain thick blankets of feathermoss with Paper Birch (*Betula paperifera*), alder (*Alnus crispa*) and Labrador Tea (*Ledum groenlandicum*). This community has only been described on one site within the City of Whitehorse, near Mount Sima. To the knowledge of the mapping team, this ecosystem unit has not been described elsewhere within the Southern Lakes Region.

PG Lodgepole Pine - Grass
Open, mesic stands with low shrub cover, abundant grass cover and a variable moss layer. Soapberry and Mooseberry (*Viburnum edule*) is often present in moderate amounts with large, sporadic willows growing in canopy openings. This unit has received limited description and field sampling.

PL Pine/Lichen Dry, open canopy lodgepole pine (*Pinus contorta*) forests with abundant terrestrial lichen cover (*Cladina and Cladonia spp.)* growing on coarse textured soils. Flat benches and complex terrain are the dominant terrain features.

Rapidly drained, poor sites. Usually associated with glaciofluvial parent materials (glaciofluvial sites generally have the highest abundance of terrestrial lichens). Complex fire history is common. PL is commonly associated with PB ecosystems.

RB Recent Burn Recent burn (<10 years old) with limited vegetation recovery. A recent burn in a previously forested area would receive the designation of Forested, Recent Burn. This would be differentiated from Non-forested areas by the presence of standing and downed snags, indicating forested conditions.

SF White Spruce - Feathermoss
A closed canopy, white spruce (*Picea glauca*) dominated forest community occurring on both level conditions and cool aspects. The shrub understory is usually sparse and ground cover is dominated by a thick layer of feathermoss. Pine may be interspersed throughout the canopy. Old stands may contain juniper; moist sites may contain mossberry and Labrador tea. Spruce-feathermoss forests that occur in riparian zones and on alluvial terraces can have variable but usually limited development of shrub understory. Moist sites may have extensive horsetail (*Equisetum spp.)* cover on rich, organic soils. They are generally not influenced by active flooding and deposition. These sites contain some of the most productive forests in southern Yukon.

SL White Spruce - Lichen - Grass
Open canopy white spruce stands growing on level medium textured soils with rapid drainage. Mixed spruce and pine canopy with predominantly lichen, grass and dwarf shrub groundcover. Lichen is not as dominant as the PL ecosystem unit. Willow or shrub birch may be interspersed throughout.

ST White/Black Spruce –Labrador Tea
Acidic, cool (possibly permafrost), moist to wet soils for portions of the year. Tree cover can be white or black (*Picea mariana*) spruce. Forest canopy is usually sparse and a thick layer of moss and Labrador tea in the understory. Limited shrub cover. Poor sites often in association with depressions and seepage areas. ST usually forms on mineral soils with peaty surface horizons.

SW White Spruce - Willow
Open canopy white spruce forests growing on a variety of sites but tending towards mesic, with moderate-high moss cover and a prominent shrub layer. Both willow and shrub birch may be present. Moss cover is variable. Depressions may contain Labrador Tea and mossberry.

SB Spruce Bog Acidic, partially saturated soils for portions of year. Partially forested with variable cover of willow and shrub birch. Bogs are rare in southern Yukon due to the dry climate.

SP White Spruce - Balsam Poplar Riparian
Generally limited to lowland riparian areas with rich organic soils. Are periodically influenced by flooding and similar low intensity disturbances. They tend to be structurally complex and are affected by fire to a lesser degree than upland stands.
ST White/Black Spruce – Labrador Tea
Acidic, cool (possibly permafrost), moist to wet soils for portions of the year. Tree cover can be white or black (*Picea mariana*) spruce. Forest canopy is usually sparse and a thick layer of moss and Labrador tea in the understory. Limited shrub cover. Poor sites often in association with depressions and seepage areas. ST usually forms on mineral soils with peaty surface horizons.

SW White Spruce -Willow
Wettest of the spruce-willow communities. Well developed herbaceous and gramminoid cover is common.

Table III.1 Habitat ratings for ecosystem types in Pre-berry (April 1 – July 15), berry (July 16 – August 31), and post-berry (September 1 – November 30) feeding seasons for black and grizzly bears in Whitehorse, Yukon.

Pre-berry	Berry	Post-berry	Unit	Name
Boreal Upland Forested Ecosystems				
H	H	M	AB	Trembling aspen – bear-berry
H	H	M	PB	Pine – bear-berry
L	L	L	PC	Lodgepole Pine – Grass
L	L	L	PL	Pine/Lichen
L	L	L	RB	Recent Burn
L	L	L	SF	White Spruce – Feather Moss
M	L	L	SL	White Spruce – Lichen – Grass
L	L	L	ST	White/Black Spruce – Labrador Tea
L	L	L	SW	White Spruce – Willow
Boreal Lowland Forested Ecosystems				
L	L	L	RB	Recent Burn
L	L	L	SB	Spruce Bog
H	L	L	SF	White Spruce – Feathermoss
M	L	L	SP	White Spruce – Balsam Poplar Riparian
L	L	L	ST	White/Black Spruce – Labrador Tea
M	L	L	SW	White Spruce – Willow

Boreal Vegetated, Non-forested Ecosystems

L	L	L	BG	Sphagnum Bog
M	L	L	FE	Sedge Fern
M	L	L	ME	Meadow
M	L	L	MR	Marsh
L	L	L	WA	Willow – Alder
M	L	L	WB	Willow – Shrub Birch


N
Legend
Trembling Aspen - Bearberry
Anthropogenic Disturbance
Cultivated Field
Cliff, rockL
Erodable slope, steep
Sedge Fen
Gravel/Sand Bar
Grass - Sedge
Lake, large
Lake, small
Meadow
Marsh
Open Water
Pine - Bearberry
Lodgepole Pine - Canoe (Paper) Birch
Lodgepole Pine - Grass
Pine - Lichen
Recent Burn
River
Rock Outcrop
White Spruce - Feathermoss
White Spruce - Lichen - Grass
White Spruce - Balsam Poplar Riparian
White/Black Spruce - Labrador Tea
White Spruce - Willow
Urban
Willow - Alder
0 0.45 0.9 1.8 2.7 3.6
Kilometers

APPENDIX IV

Hazard rankings

Table IV.1 Overall hazard rank scoring for subdivisions in Whitehorse, Yukon, 2015.

Type	Name	Non-natural attractants	Bear habitat	Previous occurrences	Borders green space	Rank
Indust	Kulan	1.47	2.5	0.0	1	4.97
Indust	MacRae	1.33	2.5	0.3	1	5.12
Indust	Marwell	1.33	1.0	0.0	1	3.33
Indust	Mt. Sima	0.67	2.5	1.2	1	5.34
Rural	Canyon Cres	3.00	2.5	0.7	1	7.23
Rural	Cowley Cr	1.70	2.5	0.7	1	5.93
Rural	Fox Haven	1.20	2.5	0.0	1	4.7
Rural	Hidden Valley	2.50	2.5	0.3	1	6.27
Rural	MacPherson	2.70	2.5	0.0	1	6.20
Rural	Mary Lake	2.40	2.5	0.3	1	6.17
Rural	Pine Ridge	1.80	1.5	0.3	1	4.57
Rural	Spruce Hill	1.90	2.5	0.0	1	5.40
Rural	WH Copper	1.50	2.5	0.0	1	5.00
Rural	Wolf Creek	2.70	2.5	0.8	1	7.02
Trailer	Kopper King	1.22	2.5	0.4	1	5.08
Trailer	Lobird	0.4	2.5	1.1	1	4.99
Trailer	Mtn View Pl	0.18	2.0	0.9	1	4.09
Trailer	Northlands	0.30	0.0	0.6	1	1.86
Trailer	Range Rd	1.60	2.5	0.0	1	5.10
Urban	Arkell	1.87	2.5	0.0	1	5.37
Urban	Copper Ridge	1.37	2.5	2.8	1	7.72
Urban	Crow & Swan	2.00	1.5	0.0	1	5.23
Urban	Downtown	1.48	2.5	3.0	1	8.00
Urban	Granger	1.60	1.5	1.3	1	5.39
Urban	Hillcrest	1.58	2.5	0.7	1	5.82
Urban	Ingram	1.43	1.5	0.0	1	3.93
Urban	Logan	1.66	2.0	0.2	1	4.83
Urban	MacIntyre	1.34	2.5	0.6	1	5.49
Urban	Porter Cr	1.56	2.5	1.6	1	6.61
Urban	Riverdale	0.87	2.5	1.4	1	5.75
Urban	Takhini	1.44	1.5	1.1	1	5.03
Urban	Valleyview	1.2	0.0	0.1	1	2.29
Urban	Whistle Bend	1.34	2.5	0.0	1	4.84

Table IV.2 Overall hazard rank scoring for schools in Whitehorse, Yukon, 2015.

Name	Non-natural attractants	Bear food	Sight lines	borders green space	Rank
Ecole Emilie Tremblay	3.0	1.0	3	1	8.0
Elijah Smith Elementary	3.0	1.0	3	1	8.0
Golden Horn Elementary	2.0	1.5	2	1	6.5
Grey Mountain Primary	3.0	1.0	2	1	7.0
Hidden Valley School	3.0	2.0	3	1	9.0
Porter Creek Elementary	2.6	1.0	3	1	7.6
Takhini Elementary	2.9	1.0	3	1	7.9

Table IV.3 Overall hazard rank scoring for playgrounds in Whitehorse, Yukon, 2015.

Playground	Non-natural attractants	Bear food	Sight lines	borders green space	Rank
Grizzly Circle	1.0	0.5	2	1	4.5
Black Street	0.0	1.0	3	1	5.0
Thompson Road	1.0	1.0	2	1	5.0
Finch Crescent	1.0	0.5	3	0	4.5
Wann x Hickory	0.0	0.5	1	1	2.5
Valleyview	1.0	0.5	1	1	5.5
Cowley Creek	0.0	1.0	2	1	4.0
Hidden Valley	1.0	0.0	2	1	4.0
Mary Lake	0.0	0.0	1	1.0	2.0
Whitehorse Copper	1.0	0.5	2	1.0	4.5
Wolf Creek	1.0	0.5	2	1.0	4.5
Northlands	2.0	1.0	3	1.0	7.0

Table IV.4 Overall hazard rank scoring for campgrounds in Whitehorse, Yukon, 2015.

Campground	Non-natural attractants	Bear food	Sight lines	previous conflict	Rank
Hi Country RV Park	0.64	0.5	3	0.5	4.64
Pioneer RV Park	2.62	1.0	2	0.0	5.62
Robert Service campground	2.10	1.5	2	1.0	6.60
Wolf Creek campground	0.95	2.0	2	0.0	4.95

APPENDIX V

Sample Wildlife Attractants Bylaw

DISTRICT OF SQUAMISH
WILDLIFE ATTRACTANT BYLAW NO. 2053, 2009 As Amended by Bylaws No. 2162 and 2336
THIS IS A CONSOLIDATED BYLAW PREPARED BY THE DISTRICT OF SQUAMISH FOR CONVENIENCE ONLY. THE CORPORATION DOES NOT WARRANT THAT THE INFORMATION CONTAINED IN THIS CONSOLIDATION IS CURRENT. IT IS THE RESPONSIBILITY OF THE PERSON USING THIS CONSOLIDATION TO ENSURE THAT IT ACCURATELY REFLECTS CURRENT BYLAW PROVISIONS.
WHEREAS Council for the District of Squamish deems it advisable to enact a bylaw to store and secure refuse and food sources securely so as to discourage and prevent bears, cougars, coyotes and wolves from accessing and becoming conditioned to or dependent on food sources generated or controlled by human activity,
NOW THEREFORE Council for the District of Squamish enacts as follows:
CITATION
1. This bylaw may be cited as the "District of Squamish Wildlife Attractant Bylaw No. 2053, 2009".

INTERPRETATION
2. In this bylaw: "**animal**" means domestic animals, birds, mammals and, without limitation, wildlife;
"**animal attractant**" means any substance or material, with or without an odour, which attracts or is likely to attract animals; and without limitation includes food or other edible products, whether intended for humans**,** animals, or birds, grease, oil, antifreeze, paint, petroleum products, and compost other than grass clippings, leaves or branches;
"**Bees**" mean any insect of the species apis mellifera;
"**Beehive**" means a structure which houses a colony of worker bees with a queen and drones
"**commercial refuse container**" means a metal receptacle that is designed or intended to dispose of waste by automated means;
"**Coop**" means a covered enclosed structure to shelter hens;
"**District**" means the District of Squamish;
"**Hen**" means a domesticated female chicken that is at least 4 months old
"**Manager of Operations**" means the person appointed to hold that position for the District, or a person designated to act in his or her absence;
"**refuse**" means any discarded or abandoned food, substance, material, or object, whether from domestic, commercial, industrial, institutional or other use;
"**Pen**" means a fully enclosed outdoor space for hens;

"**special event**" means a temporary, outdoor gathering; a sporting event; a wedding; or a convention, parade, public display, festival or other gathering for which any required permit has been obtained;
"**wildlife**" means a bear, cougar, coyote or wolf;
"**wildlife resistant container**" means a refuse container that is sufficient to accommodate normal uses of the property, is designed to discourage and prevent access by wildlife, and:
(a) has a sturdy cover capable of being completely closed and secured with a latching device; and
(b) if intended for use other than residential, is made of metal and is self latching.
"**wildlife resistant enclosure**" means a fully enclosed structure having 4 enclosed sides, a roof, doors and a latching device, designed to discourage and prevent access by wildlife.
"**Zoning Bylaw**" means the District of Squamish Zoning Bylaw as amended from time to time;

TREATMENT OF REFUSE
3. Except as permitted in this bylaw, a person must not store any refuse that is an animal attractant in such a manner that it is accessible to wildlife.

4. Without limiting section 3, a person must not leave, place or store outdoors any refuse that is a animal attractant except:
    1. (a) in a wildlife resistant container;
    2. (b) in a container enclosed within a wildlife resistant enclosure that meets the criteria established in Schedule A; or
    3. (c) in a commercial refuse container that meets the criteria established in Schedule B.
5. The requirements of Sections 3 and 4 do not apply with respect to a parcel of real property:
    1. (a) between the hours of 5:00 a.m. and 7:00 p.m. on a day that is designated by the District for refuse collection from that parcel; or
    2. (b) during a special event on the real property if refuse that is generated by that event:

(i) is kept in containers as required by any permit issued for that event; or
(ii) if no permit is required, is kept in containers that are sufficient in size and number for that event; and
the containers used for refuse are emptied into a container in accordance with Section 4 by midnight on each day of the special event.

6. Every owner and occupier of real property must ensure that a wildlife resistant container, a wildlife resistant enclosure, or a commercial refuse container located on the property is of a size that is suitable for the amount of refuse generated and is kept and maintained:
    1. (a) in a clean and sanitary condition;
    2. (b) in a closed and secure manner when refuse is not being deposited or emptied; and
    3. (c) in a good, workable condition and in accordance with the criteria set out in Schedule A or B as applicable.
7. If a wildlife resistant container, a wildlife resistant enclosure or a commercial refuse container is damaged, the owner or occupier of the real property on which it is

located must ensure that it is repaired within 5 business days of the damage occurring. In circumstances of adverse weather or delivery conditions, strikes, material or labour shortages, or similar hardship beyond the control of the owner or occupier, the 5-day period may be extended by the Manager of Operations in writing and in accordance with any specified time limits, conditions or requirements that the Manager of Operations may determine as being appropriate and necessary in the circumstances.

GENERAL REQUIREMENTS

8. A person must not feed wildlife, and must not feed animals in a manner that is likely to attract wildlife.

9. Every owner or occupier of real property must ensure that:

1. (a) any fruit that has fallen from a tree is removed from the ground within 3 days and if stored outdoors, only in a wildlife resistant container or wildlife resistant enclosure;
2. (b) any bird feeder containing bird feed, suet or nectar is suspended on a cable or other device in such a manner that it is inaccessible to wildlife; and the area below any bird feeding devices or activity is kept free of accumulations of seeds and similar animal attractants;
3. (c) any composting activity is carried out and any composting device or equipment is maintained in such a manner so as not to attract wildlife;
4. (d) barbecue equipment and tools that remain out of doors must be clean and free of residual food or grease;
5. (e) any refrigerator, freezer, storage container or similar appliance, device or apparatus that contains animal attractants of any type, if placed or located outdoors, is located and equipped in such a manner that it is inaccessible to wildlife; and
6. (f) any grease, antifreeze, paint or petroleum product is stored in such a manner that it is inaccessible to wildlife;
7. (g) keep bees and beehives in such a manner so as not to attract wildlife;
8. (h) keep bees and beehives in such a manner so that they are reasonably inaccessible to wildlife. Beehives must be enclosed by electric fencing and situated according to the Zoning Bylaw;
9. (i) keep hens in such a manner so as not to attract wildlife;
10. (j) keep hens, coops, and pens in such a manner so that they are reasonably inaccessible to wildlife. Coops and Pens must be enclosed by electric fencing and situated according to the Zoning Bylaw.

10. Without limiting any other provision of this bylaw, any person responsible for a site that is used for filming, a catered event or a construction site must ensure that any animal attractants are disposed of in a designated wildlife resistant container that is located on that site.

ENTRY & INSPECTION

11.A bylaw enforcement officer for the District may enter onto any property in accordance with section 16 of the *Community Charter*, S.B.C. c. 26 to inspect and determine whether this bylaw is being met.

Where a bylaw enforcement officer believes that, as a result of a breach of this bylaw, wildlife is located on or near the property and has endangered or harmed a person, or presents an imminent threat to the safety of any person, the officer may take steps to prevent, avert, reduce or mitigate the harm or threat or provide assistance. In so doing, the officer may seek the assistance of a conservation officer appointed under the *Wildlife Act*, R.S.B.C. 1996, c. 488, or a police officer, as may be reasonable or necessary in the circumstances.

12. A person must not obstruct or interfere with a bylaw enforcement officer who has entered onto property pursuant to section 11, or other person assisting the officer.

OFFENCE, PENALTY & ENFORCEMENT

13. Any person who contravenes or violates any portion of this bylaw, who fails or omits to do anything required under this bylaw, or who permits, suffers or allows any act or thing to be done or omitted to be done in contravention or violation of this bylaw, commits an offence; and where the offence is a continuing one, each day that the offence is continued shall constitute a separate offence.
14. Upon being convicted of an offence under this bylaw, a person shall be liable to pay a fine of not more than $10,000.

15. This bylaw may be enforced by means of a ticket issued under the "*District of Squamish Municipal Ticket Information Bylaw No. 1832, 2004"*, as amended or replaced from time to time.

SCHEDULES

16. Schedules A and B are attached hereto and form part of this bylaw.

SEVERABILITY

17. If any portion of this bylaw is held to be invalid by a court of competent jurisdiction, the invalid portion may be severed and such invalidity shall not affect the validity of the remaining portions of this bylaw.

REPEAL

18. This bylaw repeals and replaces the "*District of Squamish Wildlife Attractants Bylaw no. 1876, 2005".*

READ A FIRST TIME this 21st day of July 2009. READ A SECOND TIME this 21st day of July 2009. READ A THIRD TIME this 21st day of July 2009. ADOPTED this 8th day of September 2009.

Greg Gardner MAYOR
Robin Arthurs,
DIRECTOR OF ADMINISTRATIVE SERVICES

SCHEDULE A Wildlife Resistant Enclosures

The following criteria apply to a wildlife resistant enclosure**:**

1. The structure must be of sufficient size to allow for placement of containers for refuse and recycling, and for removal and emptying of those containers.

2. The foundation must be a concrete up stand of at least 600mm with a 100mm reinforced concrete slab on compacted gravel fill.
3. The structure must include a floor drain to sanitary in accordance with the British Columbia Building Code.
4. The exterior of the structure must be made of split face block or hardy plank nailed to 3/4 inch plywood backing with 3 1/4 inch nails, in accordance with the British Columbia Building Code for wood-frame construction, and with a minimum gap between sheets and a minimum gap between door and foundation.
5. The structure must include two separate entrances, one for personnel to enter and exit, and one service door.
6. Both doors must be installed with a minimum gap on tracks and latches on both sides and must close tightly to prevent access by wildlife.
7. The service door must be constructed of heavy duty commercial grade steel and be a garage door style with no latches or opening mechanisms located on the exterior. The bottom of the service door must have slide bolts on each side.
8. Personnel doors must be constructed of 18-gauge steel, open outwards, have a reinforced window, a self-closing device, and a lever opening on the interior. The exterior doorknob must be of such design that is accessible to persons with disabilities, in accordance with the British Columbia Building Code, and resistant to interference by wildlife.
9. Enclosures must have both interior lighting and motion activated exterior lighting, and wildlife resistant venting located either on the roof or in the top of the wall near the roof.

A structure that is of substantially similar design, and being of equivalent or superior strength and resistance to interference or access by wildlife, as approved by the Building Inspector for the District, may be employed as an alternative to the criteria set out above. A wildlife resistant enclosure that meets the criteria of Guideline A is deemed to comply with this bylaw.
Bumpers may be placed on door openings to prevent damage to building when the doors are opened.
The following 1. 2. 3. 4. 5. 6.

SCHEDULE B Commercial Refuse Container

criteria applies to a commercial refuse container:
The lid or lids, and any man doors, must close tightly to prevent access by wildlife.
The lid or lids, and any man doors, must be:
a) self-closing; or
b) self-latching; or
c) capable of being completely closed and secured with a latching
device.
The latches for the lid or lids and bag removal must be such that an adult bear using its claws will be unlikely to reach the latch trigger mechanism.
Hinges and latches for lids must be sufficiently strong, and sufficiently affixed to the container, that they cannot be pried open by an adult bear using its claws. As a guideline, a lid that can be dismantled using a crowbar is not sufficient.

The container must be sufficiently stable or capable of being so anchored as to prevent tipping by an adult bear.
Container material must be of sufficient strength to prevent wildlife from chewing, battering or crushing the container.