Bird Feeders and Yukon Bears:

Best Practices for Coexistence

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http://www.adfg.alaska.gov/index.cfm?adfg=livingwithbears.abchome

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Abstract

This study was directed at gaining an understanding of the abundance and characteristics of bird feeders in the Yukon and their risk as possible bear attractants, with the overarching goal of creating a best practices list for Yukon bird feeder operators. Throughout this study, I examined relevant literature, along with results from a survey sent to the Yukon Bird Club and Yukon Environmental Network. I also examined data from WildWise Yukon's door to door surveys, the Whitehorse Bear Hazard Assessment and a portion of the Conservation Officer Services Branch 2012-2017 dataset. Results indicated that there had been 9 human-bear conflicts associated with bird feeders between 2012-2017. Survey data based on 64 individual results indicated that a large portion of Yukon bird feeders are set up in a manner that could make them accessible to bears. Based on information from my literature review and results, the most effective means of reducing human-bear conflict caused by bird feeders is to ensure that bird feeders are not stocked during active bear season (April- October). However, there are other viable options too, such as hanging the feeder out of a bear's reach, and securing it on an anchored metal pole. Reducing the presence of any other attractants on the property, as well as cleaning up spilled seed will also reduce the chances of attracting a bear to one's property.

Introduction

My topic of study - how bird feeder operations can be improved in the Yukon to reduce the potential for human-bear conflict, fits under a wider umbrella of human-bear conflicts related to anthropogenic food sources for bears. According to Hopkins et al. (2010) human-bear conflicts occur when a bear exhibits stress-related or curious behaviour, causing a person to take evasive action, or when a bear makes physical contact with a person, exhibits clear predatory behaviour, or was intentionally harmed or killed (not including legal harvests) by a person. Human-bear conflict is worsening worldwide (Can et al. 2014) and the Yukon is no exception. While black bears (*Ursus americanus)* are not considered to be at risk, according to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 1999), Yukon populations of grizzly bears (*Ursus arctos)* are designated as a 'special concern' as there are reports of 'unsustainable mortality rates in Western Canada and the Yukon' (COSEWIC 2012). One of the key drivers in human-bear conflict, particularly for black bears, is their attraction towards anthropogenic food sources, such as garbage, compost, pet food and bird seed (Gore et al. 2006; Baruch-Mordo et al. 2011). Thus, mitigation strategies can be developed and implemented by better understanding the extent and nature of how particular attractants may influence bear behaviour and how these attractants can be responsibly managed by residents living in bear country.

This study investigates the extent of bird feeders as bear attractants throughout the Yukon. The goal of this study is to identify practices that minimize the risk for bear-human conflicts that may be instigated by people operating bird feeders.

The study fits with a more general goal of reducing potential bear attractants throughout the Yukon, as a means of decreasing the rate of human-bear conflicts, which generally result in the destruction of the bear.

Bird feeders, like many other anthropogenic food sources, may represent a 'high reward' meal for a bear. A full bird feeder could contain a large portion of the necessary calories that a bear preparing for winter would seek to gain through a day's foraging. As the bear becomes increasingly conditioned to the positive feedbacks associated with foraging in human areas, it unknowingly seals its fate by becoming a 'nuisance bear' to the human inhabitants of the area.

The general focus of my study can be divided into three specific objectives that were undertaken by means of research, in the form of a literature review and a survey that was distributed to bird feeder operators in the Yukon. My first objective was to gain a better understanding of how Yukon residents operate their bird feeders and develop an idea of how instrumental bird feeders have been as bear attractants in the Territory.

Another key aspect of this study was to better identify the extent to which bird feeders contribute to bear encounters out of the variety of anthropogenic attractants within the Yukon. A literature review that included a bear hazard assessment of the Whitehorse area was particularly helpful in gaining insight into the proportion of bird feeders in relation to other attractants in the area. Survey responses were also helpful in identifying how and why bears may target certain bird feeders. Peer-reviewed articles that discussed bear diet and foraging helped to better illustrate what an 'at-risk' bird feeder may look like. My findings from

these objectives were synthesized with pre-existing data to create a list of best practices for operating a bear feeder in the Yukon.

Literature Survey

I began my literature survey with a high level scan looking at the causes of human-bear conflict in general and then focused on reports related to anthropogenic food attractants and bird feeders. I found few sources and articles pertaining specifically to human-bear conflicts associated with bird feeders. While some research did touch upon the subject, it was often lumped in with a larger focus on the fundamental role of attractants instigating human-bear conflict. While many sources discussed municipal strategies for reducing attractants and their availability to bears, I also read a number of articles related to bear foraging behaviour and diet. In addition to scholarly articles, I examined studies from communities in bear country, to try and assess the frequency of human-bear conflicts related to bird feeders and bear conflict prevention strategies that these communities employed.

However, before beginning my literature survey, I have included a lexicon of terms related to human-bear management that occur frequently throughout my report (Table 1).

Table 1. Glossary of selected technical terms used in human-bear conflicts associated with attractants (Hopkins et al. 2010, p.157).

anthropogenic food	*Foods or attractants having a human origin*
conditioning	*Learning involved in receiving a reward or punishment for a given response (behavioral act) to a given stimulus.*
food-conditioned bear	*A bear that has learned to associate people (or the smell of people), human activities, human-use areas, or food storage receptacles with anthropogenic food.*
human–bear conflict	*When a bear exhibited stress-related or curious behavior, causing a person to take extreme evasive action, made physical contact with a person or exhibited clear predatory behavior, or was intentionally harmed or killed (not including legal harvests) by a person.*
habituated bear	*A bear that shows little to no overt reaction to people as a result of being repeatedly exposed to anthropogenic stimuli without substantial consequence*

My research uncovered fairly mixed statistics regarding the attractiveness of bird feeders surrounding urban areas. Morehouse and Boyce's (2017 p.4) extensive survey of human-bear conflict records in Southern Alberta indicated that bird feeders were the third most common attractant responsible for human-bear conflicts (after garbage and vegetation, such as fruit trees). Morehouse and Boyce's study found that bird feeders played a significant role as an attractant in 11% of the human-bear conflicts reported in the area. Similarly, Beausoleil and Lackey (2015) cite human-bear conflicts associated with bird feeders as being one of the most frequently reported incidents. Beausoleil and Lackey (2015) state that the top three anthropogenic attractants for bears were garbage, bird feeders and fruit trees. Lewis et al.'s (2015) study in Aspen Colorado found garbage to overwhelmingly be the greatest anthropogenic attractant to bears. Bird feeders and pet food were only accounted as 1.2% of the anthropogenic food sources for black bears foraging within their study region, however, as the authors note, bird feeders were also not a very common attractant, making up only 2.3% of the attractants found throughout the study area.

While it is common knowledge that bears are strongly attracted to a wide range of anthropogenic products, further understanding of bear behaviour can help to evaluate the best course of action for compiling a 'best practices' list for reducing the possibility of human-bear conflicts. I examined a few sources related to bear diet and food preferences. While bears were generally considered to be largely opportunistic eaters, scavenging whatever food was available, studies displayed evidence that, given a choice between two food sources, with different nutrient abundances, bears would generally prefer the food source with a higher abundance of carbohydrates (Kimball et al. 1998). While Kimball's study was specifically focused on bear preference for food sources with varying amounts of terpenes, it also discussed the possibility of a positive feedback mechanism for carbohydrate rich foods. The positive nutritional and taste related rewards of carbohydrates is a driving force in bear foraging behaviour.

Further examining bears' reward-driven behaviour, Merkle et al. (2013), studied factors affecting the probability of bears foraging near urban and residential areas. While some evidence indicated that bears would forage more frequently in urban areas when wild foods were in lower abundance, the correlation was relatively low. Instead, data indicated that bears would forage in urban environments even when their natural foods were available, as human foods often provided nutrients that were hard to attain, or completely unavailable in the wild. The centre point of Merkle et al.'s (2013) study was that bears' lives are almost entirely governed by food and foraging decisions are based upon a perception of risk, reward and availability. Interestingly, the authors found that

garbage, often the most prolific bear attractant, did not have as great an impact upon foraging behaviour as other foods, such as fruit from orchards. Merkle et al. (2013) suggested that a possible explanation for this was due to the bear's perceived risk of foraging for garbage. Furthermore, the rewards of attaining garbage can vary from household to household and containers may require a great deal of effort for a bear to open.

Lewis's et al.'s (2015) study of bear foraging behaviour complements Merkle's. Similar to Merkle, Lewis's study (2015) stated that urban areas provided food sources for bears that were predictable and containing nutrients that were often rare or simply unavailable in the wild. Bears were found to be approximately five times more active in urban areas during years in which there were less natural foods available. In addition, some bears were seen to follow the same urban foraging habits, regardless of the availability of natural foods. Lewis's study also recorded seasonal trends in bear foraging activity. Before winter, bears enter a state of hyperphagia, a period of excessive eating and drinking in order to gain as many calories as they can, in preparation for torpor. In the wild, bears will seek out high calorie foods such as nuts and acorns. During this time period, bear foraging activity generally increases.

Masterson (2006) highlights the significance of nutritional rewards within human foods. Masterson notes that 454g of black oil sunflower seeds, commonly used for bird feed, were shown to contain 2,585 calories. This abundance of calories could not be rivalled by a bear's natural foods. The closest 'runner up' in terms of caloric content would be 454g of acorns, which contains approximately

2,000 calories- however, it is unlikely for a bear to find this abundance of acorns as neatly ‘packaged’ as they would find birdseed. The average black bear at the end of summer, in the process of fattening up for the winter requires approximately 20,000 calories a day (Masterson 2006). Such caloric value would denote birdseed as a ‘high reward’ food, according to Merkle’s analysis of bear behaviour.

I also reviewed the human-bear conflict literature to find existing strategies to minimize the caloric rewards of bird feeders, or increase the perceived costs and risks for foraging bears. The Alberta Bear Smart (Bear Smart 2011) website recommends the most effective means of reducing human-bear conflicts caused by bird feeders is to stop feeding birds during active bear season, which, in Alberta, is typically from late March until October.

In lieu of a bird feeder, bird enthusiasts could place a small bird bath in their yard. Adding running or trickling water to the bath would greatly increase the bath’s appeal to birds (Bear Smart 2011). This could be a particularly effective way of attracting birds to one’s yard in the Yukon, where summers are typically quite dry. Removing a bird feeder for the spring also makes some nutritional sense. During the spring and summer, birds generally switch from their carbohydrate rich winter diet to a more protein rich diet, by eating insects (Bear Smart 2011). However, this may not be an appealing option to some bird enthusiasts. Masterson (2006) herself claims that she maintains a bird feeder throughout bear season, as she lives in an alpine region where the most exciting birding events happen throughout the summer.

For those who do wish to maintain a bird feeder throughout bear season, Bear Smart (2011) recommends a number of ways of reducing the attractiveness of a bird feeder. Spilled bird feed is often initially more attractive to a bear than the feeder itself. Buying 'quality' feed, with lower ratios of millet (especially during the summer), which birds will often sift through and push to the ground, along with regularly cleaning up spilled feed are options for mitigating the attractiveness of a bird feeder. Additionally, bird feeder owners should avoid using suet, peanut butter and grease throughout the summer, as these calorie rich 'treats' can become aromatic and more alluring to bears when left in the heat. 'Bear proofing' a feeder can significantly reduce the chances of attracting bears and other unwanted mammals to the feeder. Depending on the feeder type, there are a number of options for preventing a bear from accessing the feeder. Suspending a hanging feeder from a raised cable, or raising the feeder out of reach on a smooth, sturdy metal pole will decrease the bear's chances of accessing the feeder. Both of these options would still require the owner to clean any spilled food regularly. Another option for people operating bird feeders throughout bear season is to take them inside at night, when black bears are most likely to be foraging (this is particularly true in urban areas, according to Merkle et al. (2013). Bear Smart (2011) also provided some insight for people with hummingbird feeders: rather than having a nectar filled feeder, bird enthusiasts could attract hummingbirds to their gardens by planting vibrant red and pink flowers. Although the Yukon only has one regular species of hummingbird, the Rufous Hummingbird (*Selasphorus rufus*), this could be a useful strategy.

Dubois' (2012) study of methods to 'silence the dinner bell' for wildlife feeding in British Columbia offers some suggestions that could be applied to limiting human-bear conflicts instigated by bird feeders. Dubois suggests that traditional conservation strategies for minimizing unwanted human/wildlife interaction focuses primarily upon the wildlife, applying such methods as culling, translocation and aversive conditioning, generally display limited effectiveness. Furthermore, reactive management strategies are often resource-intensive and costly (Dubois 2012). Instead, management strategies should invest more time on preventative, proactive strategies, such as public education and enforcement, to alter human behaviours related to wildlife feeding. Communication with the public can take a variety of forms, for example, by appealing to moralistic values or social norms or by appealing to fears, such as fines, or the danger of wildlife interactions. However, research is inconclusive as to the lasting effectiveness and impact of these communication strategies and requires more thorough measurements of human behavioural changes. Bird feeders are often eclipsed by other anthropogenic food sources as bear attractants and receive less attention and policy directed towards them. For instance, Dubois (2012) notes that only one municipality in BC prohibits operating bird feeders during bear season, while four municipalities have regulations pertaining to requiring 'bear proof' bird feeders. Whitehorse currently has no regulations pertaining to bird feeders, although the Whitehorse Bear Hazard Assessment (WBHA) does recommend removing bird feeders from April- October every year (Homstol and Edwards 2015).

Masterson's (2006) case study of Snowmass Village in Colorado documents the effectiveness of applying proactive education and enforcement as a means of reducing human-bear conflicts. After a particularly bad season of human-bear conflicts during the summer of 1998, the community increased public education efforts and drafted and passed a series of bylaws, including a particular bylaw that laid fines on residents who did not suspend their bird feeders from a wire at a specified height during bear season, while maintaining that the ground beneath the feeder was free of discarded feed. The officers noted that fines were an effective measure for giving their program the 'necessary muscle to hit repeat offenders' (Masterson 2006 p.75).

Methods

I collected data primarily by means of an online survey, directed specifically towards bird feeder operators in the Yukon. The online survey, using software provided by SurveyMonkey, consisted of three main sections - the participant informed consent form (Appendix), a series of questions about the respondent's bird feeder operation and finally, a set of questions to gather some general information regarding the respondent's property location (these questions were kept to a general level- to avoid the loss of anonymity) and overall education/knowledge surrounding bears and attractants. A draft survey was sent out to several Yukon College faculty members and the President of the Yukon Bird Club. After receiving feedback and revising the survey, I contacted various Yukon NGO's to obtain their support in forwarding the survey invitation by email (Table 2). Following approval, several copies of the survey were distributed

digitally. One copy was sent by email to the Yukon Bird Club and sent out to their mailing list of members. Another survey was posted online to the Yukon Bird Club Facebook group (including a message that group members who had already filled out the survey sent on the mailing list should not fill out the survey again) and finally, a survey was also sent to the Yukon Environmental Network, where it was distributed to members on the network's mailing list. Finally, the Yukon Conservation Society sent the survey link with a note to their email membership list.

I report Yukon data I obtained from several primary sources that describe the prevalence of bird feeders on residential properties or the number of bear occurrences associated with various anthropogenic attractants including bird feeders. These sources include 3 local sources of information on the use of bird feeders: (i) a series of WildWise Yukon surveys from 2014, 2016 and 2017 that carried out a door to door survey (WildWise Yukon 2014, 2016, 2017), (ii) the Whitehorse Bear Hazard Assessment (Homstol and Edwards 2015) and (iii) a summary of bear occurrence reports provided by the Conservation Officer Services Branch (COSB) for the Whitehorse region covering the years 2012-2017.

In this report I refer to bears by species (grizzly bear or black bear) where this detail is available and use the generic term "bears" where the respondents or published reports did not identify the species. The anonymous survey in my study was conducted as part of the course work for Yukon College's NSCI 202 under REB Course Certification YC2018

Results

Survey Results

In total there were 64 participants in the survey who had experience operating bird feeders and they lived in a variety of locations in the Yukon (Tables 2 and 3).

Table 2. Target groups to which the online survey was distributed. The survey was made accessible to participants by a survey link sent out either by email, or posted on the Yukon Bird Club Facebook group.

Target Group	Date of Email Invitation	Sample Size
Yukon Bird Club (email list)	Jan 29th, 2018	42
Yukon Bird Club (Facebook group)	Feb 4th, 2018	14
Yukon Environmental Network	Feb 22nd, 2018	8
Yukon Conservation Society E-Newsletter	March 10th, 2018	
Total		64

Table 3. Geographic composition of survey respondents. Participants were only asked to select a general description of the area that they lived, so as to ensure anonymity.

Geographical area identified by respondents:	
Whitehorse Urban Area	38%
Country Residential	19%
Yukon Community	26%
Rural Residential	17%

For the first section of the survey, results indicated that most bird feeder owners usually only had one or sometimes two bird feeders on their property. The most popular bird feeders were hanging feeders, suet hangers and open platforms. Hummingbird feeders were the least popular, but their numbers are significant as they are set up exclusively during bear season.

Many participants included comments regarding other feeding techniques, such as sprinkling a small amount of seed or food scraps on their deck, or lawn. In terms of location, the most popular places to install a bird feeder were trees, or the side of the house. Many participants left comments about the details of the installation, highlighting how the bird feeder was bear-proofed by hanging at a certain height, or being attached to a pole. Feed generally consisted of store-bought mix, sunflower seeds, Nijer seeds and suet, with most respondents filling their feeders with small quantities (between 0 and 2 litres).

Although most participants claimed they had no problems with their bird feeder, 28% of respondents claimed they had issues with feed spilling or leaking from their feeder and 13% claimed that rainwater had spoiled the seeds. Several comments discussed the annoyance of squirrels and certain birds, such as redpolls, sifting through the feeder and knocking feed to the ground. Four participants commented on the importance of cleaning and maintaining the feeder and one participant commented that rainwater often caused the seeds to spoil and rot.

Results were almost split almost entirely down the middle when it came to the operating season for bird feeders. Slightly less than half (45%) of respondents stated that they operated their bird feeder year-round, while 55% stated that they ran it seasonally (Figure 1). However, ‘seasonally’ had different implications depending on the type of feeder. Hummingbird feeders were generally operated from June until September, while most other feeders were set up from late August to December (with October being the most popular month for set up) and

taken down between late March and June (with most respondents taking theirs down around May).

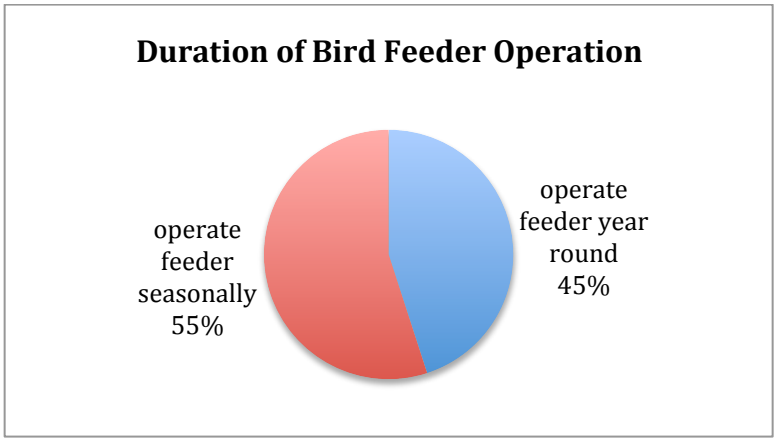

Figure 1. Bird feeder operations in the Yukon are split almost in half, in terms of residents operating their bird feeders all year, or seasonally. Most seasonal operators run their feeders over the winter, although some hummingbird feeders are seasonally run in the summer.

The survey asked the participants some general questions regarding their personal level of bear knowledge and the approximate location of their property. Ninety percent of respondents claimed that they had a good knowledge surrounding bears and how to live in bear country.

Nine respondents (23.5%) stated that there was a history of bear encounters on the property where the bird feeder was located. These encounters, as described by the participants' comments, were most often due to a bear 'wandering through' (3/9 respondents) as the property was located on or close to a wildlife corridor, or the bear was interested in some nearby attractant, such as a neighbour's chicken coop. In total, 46% of encounters were attributed to some type of bear attractant other than a bird feeder that the respondent had on their property, such as compost, a barbeque, raspberry bushes or garbage. In total, 21% (3/14) of respondents stated that their bird feeder was the primary reason

for the encounter on their property. Two of these instances involved the bear eating spilled seed from the ground, while the third case described the bear attempting to reach a suet feeder that was hanging in a tree. In all 3 of these encounters, the participants had claimed to be using their bird feeder year round. Two of the participants were using multiple types of feeders, including hanging feeders, suet hangers, hummingbird feeders and open platforms. Two of the respondents had disclosed problems with their feeder, including rainwater spoiling the seeds and excessive amounts of seed being spilt. In one case, the bear was seen eating spilled seeds on the ground by the feeder. The other two cases involved the bear attempting to reach the feeder. One respondent specified that a black bear was attempting to reach his suet feeder, while the other respondent didn't give any details. In response to the bear encounters, each respondent adjusted their bird feeder operation. Two respondents hung their feeders higher, while another bought a tray to catch any spilled seed.

I received extensive feedback from respondents to an open-ended question about whether they had any strategies for preventing bears from interacting with their feeders (Table 4). Out of the 37 responses, 31% stated that they did not employ any preventative measures, or didn't believe that their bird feeder was a problem, while 25% of the participants said they opted for operating their bird feeder so that it didn't overlap with active bear season. Other practices included fencing the area (7%), hanging the feeder higher (9%) and feeding in smaller quantities/ensuring the yard is tidy.

Table 4. Survey respondent comments regarding best practices for using bird feeders in bear country (n = 37).

Practices for preventing bears accessing feeders?	
Nothing/Hasn't been an issue	30.90%
Don't operate in bear season	25.50%
Hung feeder higher	9.10%
Stopped feeding	9.10%
Place feeder inside fence	7.30%
Bear dogs	5.50%
Keep yard tidy	5.50%
Feed in small quantities	3.60%
Place feeder on metal pole	1.80%
Use a tray to catch spillage	1.80%

Finally, respondents provided some general comments regarding bird feeder operations (Table 5). Numerous comments discussed the importance of seasonal feeding, so as to avoid overlap with the active bear season and also because birds often eat a more insect-rich diet in the summer. One comment suggested that people are educated enough, but just don't care about consequences and we should introduce a fine. Another participant discussed the problems of people building houses in natural wildlife corridors.

Table 5. General comments from survey participants. Comments were not altered, although any disclosures that could lead to reducing anonymity were excluded.

I think it's important to have as little attractants as possible if you want to feed birds.
Have had feeders for 19 years in the backyard. Also have had compost bins as well. No problems with the bins as we monitor what goes into them and do not put in meat,fish..... have friends that contribute to our compost as well. Compost is used in our backyard garden. Live on country residential property of about 4 Acres. Have had neighbors have problems with chickens and bears. Need to electrify all chicken coops!
The Bears occasionally come through our property but we are quite isolated and they have not become habituated.
Perhaps need to ask about domestic animals present.
This also applies to garbage that attracts bears
I remove the fat during the summer as it can drip and stink in hot weather.
When the bear tried to get into the dog door he was only after the dog food or the dog, he never messed up the platform which he could easily reach. The bakery across the street smells much more attractive.I see one there more often.
My bird feeder has attracted deer to my property
The single BMP [best management practice] *for this issue is never to use bird feeders in spring and summer. The only exception would be a late spring snowfall (Late April through June), in order to help recently arrived migratory birds survive through unusually harsh conditions for a few days.*
Vital work. We MUST whack those idiots who dump seed or have very smelly composts or who get all in a knot when grizzlies invade their greenhouses (as one fBriend whined about), or, for those with dogs in the distance (who let their dogs go free for gawd's sake in rural-residential--at night!!! for the wolf reason). Heavy fines, never mind this "educating" thing. Makes me furious when I hear people say wolf-hating or bear-despising things when they throw bones in their compost or let the mutt out at 1am. The plastic bins should help--they can be wheeled into sheds--but people are stupid and bears are hungry.
Not aware of bears visiting any feeders in the City if Whitehorse
tell us how to keep squirrels away!
Public service announcements telling people to stop feeding birds during bear season??

WildWise Yukon Door to Door Surveys (2014, 2016, 2017)

The 2014 Southern Lakes survey by WildWise Yukon (2014) was conducted during the summer and found that 22% of 105 surveyed residents had bird feeders, of which 30% were stocked with feed during bear season. WildWise Yukon developed the protocol for their door to door survey in collaboration with the Conservation Officer Services Branch and scored any birdfeeder less than 3m off the ground as within reach of bears.The 2014 survey found that 43% of

birdfeeders were within a bear's reach and 13% of all feeders had spilled seeds on the ground (Table 6).

Table 6. Data obtained from WildWise 2014 Southern Lakes survey (WildWise Yukon 2014). Bird feeders were assessed first by whether they were present on the property or not. If they were, data was recorded on whether they were stocked (full) during the summer, less than 3 metres from the ground, making them in reach of bears and whether they were stocked with millet, which is often picked over by birds and spread on the ground (spread) were it is more accessible to bears.

Neighbourhood	**bird feeder characteristics**							
	present	full	in reach	millet	spread	birdseed outdoors	Hummingbird Feeder	Lots Surveyed
Robinson	2	1	2	0	0	0	0	23
Annie Lake Road	1	0	0	0	0	0	0	8
North McClintock	3	1	0	1	1	0	1	7
South McClintock	7	1	4	0	1	3	0	26
Army Beach	11	4	4	2	1	3	0	41
Totals	23	7	10	3	3	6	1	105

In summer 2016, another survey of the Southern Lakes region was carried out (Table 7). The survey had a smaller overall percentage of bird feeders present in the sample size (26% of 170 surveys), however, of those present, 24 out of 26 feeders were stocked during active bear season and 23 of them were in reach.

Table 7. Data collected from WildWise 2016 Southern Lakes survey (WildWise Yukon 2016). Bird feeders were assessed first by whether they were present on the property or not. If they were, data was recorded on whether they were stocked (full) during the summer, less than 3 metres from the ground, making them in reach of bears and whether they were stocked with millet, which is often picked over by birds and spread on the ground (spread) were it is more accessible to bears. Hummingbird feeders and the storage location of the bird seed was also recorded.

Neighbourhood	**bird feeder characteristics**							
	present	full	in reach	millet	spread	birdseed outdoors	hummingbird feeder	Lots Surveyed
Robinson	7	7	7	0	0	0	1	26
Annie Lake Road	5	5	5	0	1	0	1	50
North McClintock	4	3	4	0	3	2	0	11

South McClintock	7	7	6	0	1	1	0	32
Army Beach	3	2	1	0	1	0	0	51
Totals	26	24	23	0	6	3	2	170

WildWise conducted a similar door to door survey of neighbourhoods around Whitehorse in the summer of 2017 (Table 8). The survey reported that a bird feeder was present on a lot in 26% of the residences (25/97 visited) and 64% of the bird feeders were stocked. The survey determined that the majority of feeders (72%) were within a bear's reach, and 60% of feeders had seed spread or scattered on the ground where it could be easily eaten by a bear. Summaries of these surveys have been grouped into a single table (Table 9), displaying bird feeder percentages for each neighbourhood surveyed. Overall, Table 9 indicates that there is a wide variation (2-45%) in the distribution of 'at risk' bird feeders in neighbourhoods surrounding Whitehorse.

Table 8. Data collected from WildWise 2017 (WildWise Yukon 2017) survey of Whitehorse neighbourhoods. Bird feeders were assessed first by whether they were present on the property or not. If they were, data was recorded on whether they were stocked (full) during the summer, less than 3 metres from the ground, making them in reach of bears and whether they were stocked with millet, which is often picked over by birds and spread on the ground (spread) were it is more accessible to bears.

Neighbourhood	**bird feeder characteristics**					
	present	full	in reach	millet	spread	Lots Surveyed
Spruce Hill	3	2	2	2	2	17
Mt. Sima	5	3	3	3	3	11
Wolf Creek	6	5	5	5	5	16
Copper Ridge	11	6	8	4	5	53
Totals	25	16	18	14	15	97

Table 9. Summary of bird feeder presence from all door to door survey data (WildWise Yukon 2014, 2016, 2017) and WBHA survey data (Homstol and Edwards 2015). *Sample sizes for WBHA data are based on the largest sample sizes for each residential categories' neighbourhoods, as data was not available for the total number of rural residential homes sampled, etc.

Date	Neighbourhood	% Birdfeeders Present	Sample Size
2014	Robinson	9%	23
	Annie Lake Road	13%	8
	North McClintock	43%	7
	South McClintock	27%	26
	Army Beach	27%	41
2015	Whitehorse- Rural Residential	11%	10*
2015	Whitehorse- Urban Residential	2%	300*
2015	Whitehorse- Trailer Parks	10%	50*
2016	Robinson	27%	26
	Annie Lake Road	10%	50
	North McClintock	36%	11
	South McClintock	22%	32
	Army Beach	6%	51
2017	Spruce Hill	18%	17
	Mt. Sima	45%	11
	Wolf Creek	38%	16
	Copper Ridge	21%	53

I also examined data from the Whitehorse Bear Hazard Assessment (WBHA) (Homstol and Edwards 2015). Overall, the hazard assessment indicated that bird feeders were slightly more common in Whitehorse than in the study area of Lewis et al. (2014) or Merkle et al. (2013). There were 94 bird feeders counted

throughout the hazard assessment, constituting 4% of the overall non-natural attractants visible from the street in the Whitehorse area (Homstol and Edwards 2015). Garbage was deemed to be the most significant attractant for bears in the Whitehorse area.

The WBHA recommended the City of Whitehorse draft and pass a wildlife attractants bylaw, including all non-natural wildlife attractants such as bird feeders. The WBHA (Homstol and Edwards 2015, p. 81) recommended the bylaw be modelled after a bylaw that was passed in Squamish, British Columbia, specifying that "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". Currently, there are no bylaws in place surrounding the use of bird feeders, although it is illegal to feed mammals in the Yukon under Section 93 of the Yukon Wildlife Act (Yukon Government 2002).

Conservation Officer Services Branch Data

A small portion of the Conservation Officer Services Branch (COSB) dataset on bear occurrences in the Whitehorse and surrounding region was extracted to examine bear encounters related to bird feeders from 2012 to 2017. To provide the full context I have included the list of all anthropogenic attractants that were recorded by Conservation Officers when they assessed the scene at each bear occurrence. There were a total of 233 bear occurrences reported during this period and 9 (4%) of them were attributed to bird feeders. Garbage was the most frequently reported attractant for black bears (Table 10), while chicken coops

were the most reported attractant for grizzly bears (Table 11). Throughout the 5-year period, there were 7 incidents in which a bird feeder was responsible for a black bear encounter. Out of these incidents, 5 of the bears moved on, while 2 were destroyed by an officer (Table 10). There were less recorded grizzly bear encounters related to bird feeders; 2 grizzly bears were reported to have been interacting with bird feeders over the 5 year period. In both cases, the bears moved on (Table 11). WildWise Yukon also examined the COSB dataset to determine the range of dates that bears are typically active in the Yukon. The dates of bear conflict reported to COSB range from April to October. Table 12 presents a summary of both black bear and grizzly bear human-bear conflict associated with bird feeders over the period.

Table 10. Data from the Whitehorse region showing the attractant involved in black bear occurrences reported to Conservation Officers (COSB 2017).

Year	Chicken Coop	Compost	Garbage	Recycling	Garden	Pets	Human Food	Bird Feeder	Year total
2012	2	7	35	0	2	4	12	1	63
2013	0	3	13	2	0	0	3	0	21
2014	3	2	24	1	0	0	0	0	30
2015	2	0	9	1	0	1	4	1	18
2016	0	0	1	0	0	0	1	0	2
2017	3	7	16	3	2	0	1	5	37
Totals	10	19	98	7	4	5	21	7	171
%	6%	11%	57%	4%	2%	3%	12%	4%	

Table 11. Data from the Whitehorse region showing the attractant involved in grizzly bear occurrences reported to Conservation Officers (COSB 2017).

Year	Chicken Coop	Compost	Garbage	Recycling	Garden	Pets	Human Food	Bird Feeder	Year total
2012	2	0	2	0	0	3	2	0	9
2013	3	0	1	0	0	0	0	0	4
2014	9	5	5	0	3	1	0	0	23
2015	0	1	5	4	0	3	0	0	13
2016	3	0	0	1	0	2	0	2	8
2017	1	0	2	0	0	1	1	0	5
Totals	18	6	15	5	3	10	3	2	62
%	29%	10%	24%	8%	5%	16%	5%	3%	

Table 12 Summary of interactions between bears and bird feeders in the Whitehorse region between 2012-2017.

Year	Black Bear	Grizzly	Total	Fate of bear
2012	1	0	1	1 destroyed by officer
2013	0	0	0	
2014	0	0	0	
2015	1	0	1	1 moved on
2016	0	2	2	2 moved on
2017	5	0	5	4 moved on, 1 destroyed by officer

Discussion

Between 2012 and 2017 there have been 9 incidents in which a human-bear conflict was reported in the Whitehorse region as the result of a bird feeder and in two of these incidents, the bear was destroyed. While bird feeders are not as abundant as garbage, compost or some other attractants this data set shows their impact is certainly not negligible. In addition, it is possible that the threat bird feeders pose as a bear attractant can be reduced more easily than other attractants such as garbage; based on the assumption that the population of bird

enthusiasts who operate feeders are generally more considerate of wildlife than the population at large and thus, may be more willing to implement changes to their bird feeder operation.

My study spent some time trying to estimate the frequency with which bird feeders occur in the study area. I obtained some indication from my survey sample that showed 95% of 66 respondents operated a bird feeder. It is likely the groups I sampled over represent the frequency of bird feeders compared with the general population because the membership lists favoured bird watchers and naturalists. The WBHA and WildWise door to door surveys better estimate the abundance of bird feeders among the general population in the Whitehorse area. The combined percentage of bird feeders from the 2014, 2016 and 2017 WildWise surveys was 21% (75/372) while the WBHA survey observed bird feeders at 4% (94/2,350) of the residences they surveyed. However, it is worth mentioning that the WBHA survey was only counting attractants visible from the street, thus, it is possible that this percentage underestimates the number of bird feeders in the Whitehorse area and does not accurately represent the number of feeders stocked with feed either.

Findings from my survey indicated that of my sample group of Yukon bird feeder operators, 23.5% (15/64) had a history of bears on their property. Of this percentage, 25% had experienced a bear interacting with their feeder. In two of these cases, the bear was initially attracted by spilled seed by the feeder. In the other incident, the bear was attracted by the scent of a hanging suet feeder. None of these events occurred in the urban Whitehorse area- 2 of the incidents

occurred in other Yukon communities, while the third took place on a country residential property outside of Whitehorse.

Of my sample group, 45% of the respondents claimed that they ran their feeder year round. Suet and hanging feeders, along with open platforms were the most popular types of feeders employed by the participants of the survey. Approximately 69% of the survey respondents stocked their feeders with sunflower seeds, generally in quantities less than 2 litres, which, when full would amount to roughly 1000-2000 calories, classifying these feeders as 'high reward foods' (Merkle et. al 2013).

These findings were fairly congruous with three door to door surveys performed by WildWise Yukon in 2014, 2016 and 2017 in the Southern Lakes region and neighbourhoods surrounding Whitehorse. The 2014 survey indicated that about 30% (7/23) of bird feeder operators kept their feeder stocked year round, with 43% of feeders within a bear's reach and 13% of feeders having spilled seed on the ground (WildWise Yukon 2014). However, the 2016 survey of the same region had a markedly increased proportion of stocked bird feeders, (24/26) with 23 of the feeders identified as being within a bear's reach (Wildwise Yukon 2016). The 2017 survey of (97) homes in neighbourhoods around Whitehorse found somewhat larger occurrences. Of the homes with bird feeders surveyed, 64% (16/25) had their feeders stocked in the summer, with 60% within a bear's reach and 72% having spilled seed (Wildwise Yukon 2017). Based on the responses from my survey regarding participants who had experienced a human-bear conflict due to their bird feeder, it seems reasonable to say that a significant

portion of homes in the Southern Lakes and Whitehorse area are operating bird feeders that could attract bears, as many of the feeders described in the door to door surveys had similar characteristics to those described by the survey respondents who had experienced a human-bear conflict as a result of their bird feeder.

However, it is difficult to comment on the degree of risk that the bird feeders at these homes pose- for human and bear alike, as a bear's behaviour, though largely influenced by available food and its perceived risk and reward (Merkle et al. 2013) is nonetheless difficult to predict. In addition, it is difficult to determine how the circumstances of each property may influence a bear's decision to forage in that area. Additionally, it is worth mentioning that the sample size of bird feeder operators that had experienced a human-bear conflict as a result of their bird feeder is small (3 respondents) so it is difficult to generalize these individual situations.

Dubois (2012) discusses the notion of how we can shift from resource intensive bear management and conservation strategies towards proactive and preventative strategies that place the onus on the human populations learning to coexist with bears. The WBHA's small survey of 21 Whitehorse residents showed that they generally agreed that human-bear conflicts around Whitehorse were due to human fault, rather than the bear's (Homstol and Edwards 2015). In order to get citizens to implement preventative measures, strategies should appeal to people's values, such as fear (fines, risk of harm), or ethics (ie, 'if you love nature, don't feed wild animals') (Dubois 2012).

The WBHA suggests specific strategies that the City of Whitehorse could employ to mitigate human-bear conflicts caused by bird feeders. One suggested strategy is to introduce a bylaw, similar to one implemented in Squamish, BC that could direct fines at residents who were operating a bird feeder during active bear season (between April and October in the Whitehorse area). Masterson (2006) speaks to the strength of a similar bylaw passed in Snowmass, Colorado that enabled officers to 'flex' the necessary muscle to encourage residents to implement various bear smart changes on their properties. A possible variation of this bylaw could allow bird feeders during active bear season, provided they met certain 'bear proof' standards.

However, another approach that may be more successful initially is to increase awareness regarding the attractiveness of bird feeders to bears and provide education on how to create a bear-proof bird feeder operation. I have compiled a list of 'best practices for bird feeders in bear country' that could be used for a public education campaign to try and gain voluntary compliance (and reduce conflicts with bears). As mentioned earlier, bird feeder operators represent a group of citizens who clearly have an interest and concern for wildlife: discussing possible strategies for reducing the attractiveness of bird feeders to bears with local birding groups would be a good first step for implementing the insights from my report.

Best Practices for Bird Feeder Operators in the Yukon

Avoiding Conflicts Entirely

1. **Do not operate a bird feeder during active bear season (April-October in the Whitehorse area).** Bears are resourceful and the only guarantee they do not interact with your feeder is to ensure that it is not set up while they are out foraging. Aside from the potential threat of attracting bears, many birds will switch to a more insect-rich diet during the summer months and will rely less on birdseed. A good alternative to a bird feeder is a small bird bath. Broadly speaking, the Yukon is a relatively dry area and birds will be attracted to water (particularly running water).
2. **Hang your feeder out of reach.** Do not underestimate a bear's climbing ability. Suspending a feeder from a cable, at a height greater than 3 metres, or attaching the feeder to the second storey of a house could make it inaccessible to a bear. Care must still be taken to ensure that no seed is spilled. Hummingbird feeders are generally much easier to place out of reach (such as by a second storey window) than other feeders.
3. **Secure your feeder on a metal pole.** Using a smooth metal pole to raise the feeder above a bear's reach should prevent the bear from interacting with the feeder. The pole must be well anchored, so that it is not swayed by the bear's weight and should have a tray to ensure no seed is spilled.
4. **Plant vibrant red and pink flowers instead of hanging a hummingbird feeder.** Hummingbirds are naturally drawn to these colours and enjoy

large, showy flowers. An added benefit of planting flowers is an increase in other pollinators.

5. **Consider using an electric fence.** Electric fences are the primary means of reducing human-bear conflicts as a result of chicken coops. If you have several other attractants (such as compost, a garden or fruit trees) an electric fence may be a good option for you.

Reducing the Risk of Conflict

1. **Ensure all other attractants are kept to a minimum.** The likelihood of a bear interacting with your feeder is increased when you (or your neighbours) have other attractants in proximity of the feeder. A bear could be drawn over to your property by the smell of compost, or a chicken coop and end up being 'rewarded' by the bird feeder.
2. **Conduct a bear audit of your property.** Environment Yukon has a bear audit list available from their website[1] that can be useful for assessing and managing potential bear attractants on your property. In addition, it is good practice to conduct a personalized assessment. Do you live in a rural residential area? Is your property close to wilderness corridors? The location of your home will likely impact your bird feeding operation.
3. **Completely remove fatty or grease-based feeds such as suet.** These will easily spoil and rot in the heat, producing strong odours more likely to attract bears.

[1] http://www.env.gov.yk.ca/environment-you/documents/keep_bears_wild_alive_attractant_audit.pdf

4. **Reduce spilled birdseed.** Generally, bears will be attracted to spilled seed on the ground before they are attracted to the feeder. Using a tray to catch spilled feed can minimize the amount of feed that reaches the ground. Some birds will also ‘pick through’ feed that contains a large amount of millet, to reach more desirable seeds. Using a type of feed with less millet can also reduce the amount of feed that is spilled.
5. **Clean your feeder regularly.** Rainwater can spoil feed. Rotting feed is more pungent and bears have a keen sense of smell.
6. **Consider taking your feeder inside at night, when bears are most active.** Yukon bears can be active at all hours during summer so this may be weak advice and relies on the operator to be diligent (twice a day). This advice, from southern jurisdictions, has yet to be evaluated in the Yukon and more research remains to be done to better understand bear foraging schedules.

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Appendix

Participant Informed Consent Form

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Purpose of the Research:

The goal of this research is to develop a comprehensive list of 'best practices' surrounding bird feeder usage in the Yukon as a way to reduce conflicts with bears. In order to develop this list, information must be gathered related to bear and bird feeder interactions, along with background information regarding bird feeder set up in general (such as seasons in which the feeder is deployed, type of feed used, type of feeder, quantity of feed used, migration events, or other events for which the feeder is specifically deployed, proximity to home and description of the environment in the area where the feeder is deployed). Additionally, some questions related to the respondent's knowledge of attractants and bear behavior, along with suggestions for research, will be included. Respondents will be able to voice their personal suggestions at the end of the survey.

Procedures:

Your participation should take approximately 5-7 minutes. Using a popular online survey tool, Survey Monkey, you will be asked questions about your experiences and responses to events that involved human-wildlife conflict involving bear and bird feeder interactions. Your participation is both anonymous and confidential and you are welcome to withdraw from the process at any point. This program does not record any identifying information about your digital connection to the Internet (i.e. IP address)

Potential Risks:

There are no known or anticipated risks to you by participating in this research.

Potential Benefits:

Your participation in this study will help us better understand human-wildlife conflicts and may contribute practical insights to reduce conflicts with bears in future.

Compensation:

There is no compensation available for this student research but we thank you for your time.

Confidentiality/Anonymity:

This is an anonymous survey. We will not ask you for any identifying information and the software will not record any identifying information about your digital connection to the Internet (i.e. IP address). The Yukon Research Ethics Board asks that we include the following information:

The survey tool being used is with a company in the U.S and therefore is subject to the U.S laws and in particular the Patriot Act, which allows the U.S government to access the records of internet service providers. Although no personal identifiers will be collected in this survey it is possible that the view and opinions you expressed may be linked to you without your knowledge or consent. In an effort to maintain anonymity, during the design of the survey, the option to collect your IP address has been disabled. The security and privacy policy for SurveyMonkey can be found at the following link:

https://www.surveymonkey.com/mp/policy/privacy-policy/

Right to withdraw:

Your participation is voluntary and you may skip questions you don't want to answer.

You may withdraw from the survey for any reason, at any time without explanation or penalty of any sort. Please click on the "withdraw" button at any time if you choose not to continue.

Whether you chose to participate or not will have no effect on your position because your participation is anonymous.

The anonymous information collected in this study will be kept for two years and shared with future classes of students for practice in analyzing results; at the end of two years the digital data will be deleted.

Bird Feeder Survey

Part 1. We'd like to start with questions about your bird feeder operation.

* 3. Have you had any experience operating a bird feeder in the Yukon?

- ◯ Yes
- ◯ No

4. How many bird feeders do you have?

	1	2	3	4+
Open platform	◯	◯	◯	◯
Hanging Feeder	◯	◯	◯	◯
Weather protected box	◯	◯	◯	◯
Suet hanger	◯	◯	◯	◯
Hummingbird feeder	◯	◯	◯	◯
Other (please specify below)	◯	◯	◯	◯

Other (please specify)

5. How long have your bird feeders been installed?

- ◯ 1 year
- ◯ 2-3 years
- ◯ 4+ years

6. Please briefly describe the location(s) of your bird feeders.

- [ ] Attached to house
- [ ] On deck
- [ ] On a pole
- [ ] On a tree

Other (please specify)

7. How well does your bird feeder operate?

- [ ] I have problems with feed excessively leaking/spilling out of the feeder
- [ ] I find that occasionally rainwater can get in and spoil seeds so they can start to rot in the feeder
- [ ] I have no issues with how my bird feeder operates.

Other (please specify)

8. Do you run your bird feeder all year long?

- ( ) Yes
- ( ) No

9. Can you tell us when you open and close your feeder?

I start the feeder about (month..)

I close the feeder about (month..)

10. What type of bird feed do you use to stock your feeders? (Select all that apply)

- [ ] Store-bought mix
- [ ] Peanuts
- [ ] Sunflower seeds
- [ ] Suet
- [ ] Millet
- [ ] Nectar
- [ ] I'm not sure

Other (please specify)

11. Can you tell us where you buy your feed? If you can provide the name of the feed you buy, that would be helpful too.

- [ ] The Feed Store
- [ ] Canadian Tire
- [ ] Walmart
- [ ] Home Hardware
- [ ] Other store

Name of feed

12. When stocking your feeder, approximately how much feed do you fill your feeder with?

- ○ 0 - 2L (0 - 0.5 gallons)
- ○ 2 -4 L (0.5 - 1 gallons)
- ○ 4+ L (1+ gallons)

13. Have you had any bear occurrences at your current property , or do you know if there was a history of bear encounters on the property before you arrived?

- ○ Yes
- ○ No
- ○ I'm not sure

14. Can you briefly describe the nature of the encounter? Were there any possible attractants?

15. Was there any interaction between the bear and the bird feeder?

- ◯ Yes
- ◯ No

Part 2

We'd like to ask a few questions to help us categorize your feedback.

16. Where is your home where you have your bird feeder located?

- ◯ Whitehorse- Urban
- ◯ Whitehorse- Country Residential
- ◯ Other Yukon Community
- ◯ Other rural residential

17. How would you rate your knowledge of bear behaviour and bear attractants?

- ◯ Good
- ◯ Fair
- ◯ I could use more information

18. Have you received any training related to understanding bear behaviour?

- ◯ Yes
- ◯ No

Can you tell us the name of the training program (e.g. *Staying Safe in Bear Country* video)?

19. Are there any practices that you have employed to prevent bears from interfering with your bird feeders?

20. If you would like to add any additional details, suggestions or comments please include them here.

Survey Complete

We thank you for taking the time to complete our survey.