



Understanding and Managing Resident

Canada Geese

in Vancouver

August 2016

Report for the Vancouver Park Board and City of Vancouver by Jennifer Rae Pierce

Understanding and Managing Resident Canada Geese in Vancouver has been created as a result of the Greenest City (GC) Scholars program.



The GC Scholars program is a partnership between the University of British Columbia (UBC) and the City of Vancouver (CoV). It offers select UBC graduate students a part-time summer internship with a CoV mentor.

Each GC Scholar researches a topic identified by their mentor that contributes towards a specific goal of Vancouver's Greenest City 2020 Action Plan.

This report is part of the final deliverable for GC Scholar Jennifer Rae Pierce, a PhD student at the School of Community and Regional Planning at UBC, along with the companion report, *Understanding and Managing Beavers in Vancouver*.

The goal of these reports is to improve management of beavers and Canada Geese in the city through more informed decision-making.



Particular thanks go to Nick Page, biologist at the Vancouver Park Board, who dedicated his time to mentoring Jennifer through this project and Ziggy Jones, who took Jennifer to see her work with the geese in the field.

cover page and section introductions photo credit: Jennifer Rae Pierce

TABLE OF CONTENTS

Summary	4
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CANADA GEESE IN THE CITY

Population Status	7
Spatial Use Patterns	8
Planning and Regulations	11
Habitat	13
Diet	14
Mortality	15
Social Life	16
Environmental Impact	17
Public Opinion	17
Human Health Risk	18

MANAGEMENT OF CANADA GEESE

Management in Vancouver	22
Other Management Techniques	24
Recommendations	31
References Cited	33
Acknowledgements	35

APPENDICES

Appendix 1:	38
Appendix 2:	39

SUMMARY

The chart below compares Canada Goose populations and management strategies in Vancouver. Population counts are shaded areas, using the scale on the left. The counts show the average Canada Goose counts for December. The Christmas Bird Count is a city-wide annual effort. The Parks Counts are a combination of Stanley Park, McCleery Golf Course, and Langara Golf Course. Data for the golf courses is not available prior to 2003. See Appendix 2 for an explanation of the counts. There is also an exponential trend line that shows a general trend of growth for the Christmas Bird Counts.

The Park Board's Canada Goose management methods are shown as bar charts or line charts for each year, and use the scale on the right. See the "Management in Vancouver" section of this report, page 22, for more.

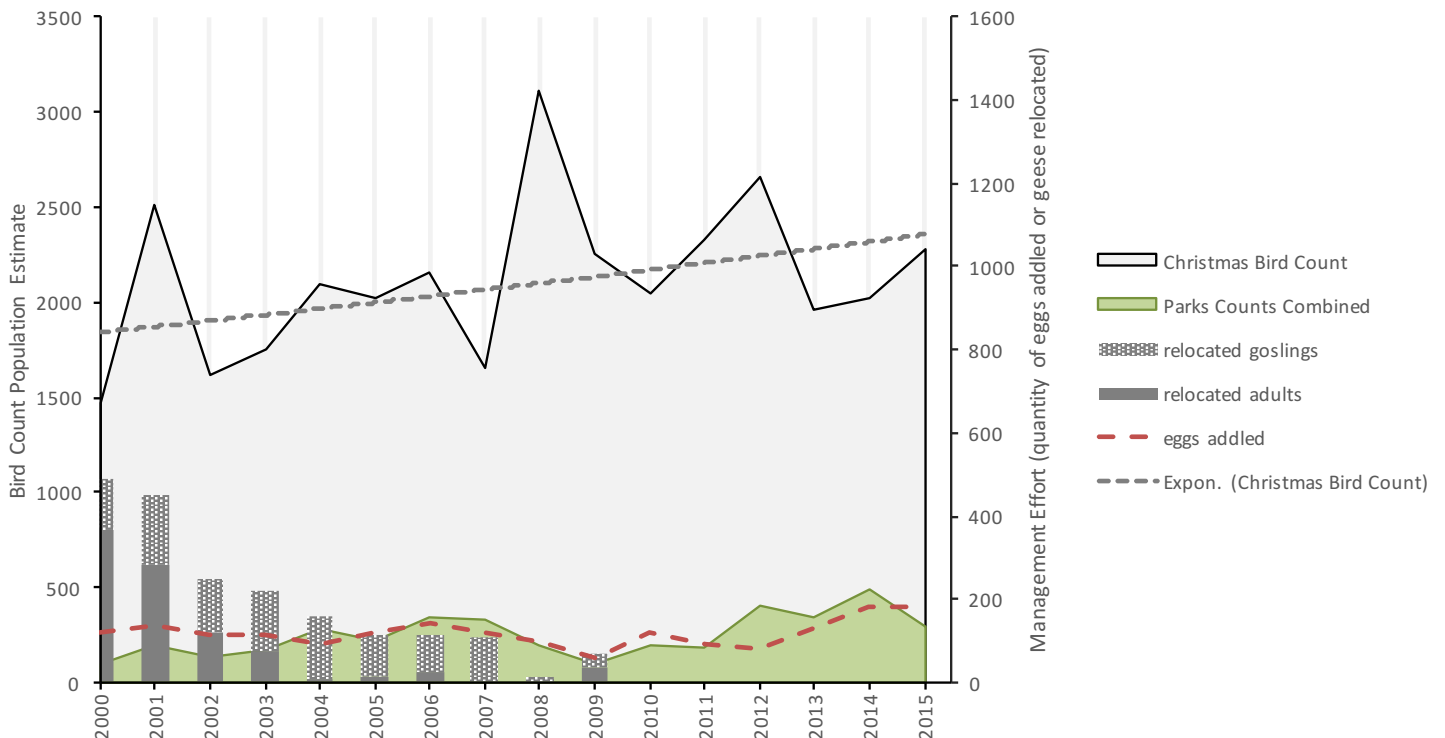
The purpose of this report is to summarize the status of resident goose populations in the City of Vancouver and present management options to mitigate impacts from over-abundant geese in parks and other areas. Resident urban Canada Geese were introduced into Metro Vancouver in the 1970s and have thrived in the urban environment. Vancouver and many other municipalities in North America are seeking ways to manage their Canada Geese populations, navigating complex political decisions trying to understand goose behaviors and human behaviors related to geese.

Status

According to the Canadian Wildlife Service, southern British Columbia hosts 37,828 Canada Geese. Regulatory goals for southern British Columbia have adopted a population objective of 10-15,000 geese, requiring a massive reduction in population. The primary approach to achieving this goal is through increased harvesting (hunting) opportunities (CWS 2015).

The most comprehensive count of Canada Goose populations in the Metro Vancouver area is the BC Coastal Waterbird Survey (BCCWS), which counts birds over waterways in the BC portion of the Salish Sea every month. This count shows an average population increase of 3.8% per year from 1999-

Canada Goose Population and Management Efforts in Vancouver





Resident urban geese have behavior patterns distinct from their rural and migratory cousins. Without population management, these introduced populations can balloon quickly, increasing conflict with humans and altering native ecosystems. photo credit: Jennifer Rae Pierce

2011, and 8.6% since they were introduced (Crewe 2012). Vancouver's Christmas Bird Counts (CBC), an annual volunteer effort to count birds within in city limits, also show growth but do not match the trend demonstrated by BCCWS. In winter 2015, the CBC recorded a citywide Canada Goose population of 2,273 geese.

Preferred Habitat

Population counts conducted by the author over the summer of 2016 show that the geese primarily gather along shoreline parks with open grass areas. They will tend to raise young and molt in large green areas with sloping access to water. They prefer mowed lawns, which offer easy access to new grass shoots and a wide-open vista to spot predators approaching.

Their preferences are also impacted by human behavior. They will gather in places where hand feeding is common and where off-leash dogs are uncommon.

Seasonal Patterns

In the summer, geese care for flightless goslings and moult, losing their capacity to fly for several weeks. During this time, geese seek particularly safe areas with open water and gather together in large flocks for safety. They do not move around as much since they cannot fly. The flocks will remain in one area for a few weeks to moult and raise young, increasing fecal matter density.

Impacts

The larger flock size and decreased mobility in the summertime concentrates the impacts of Canada Geese over particular areas. Goose feces are an aesthetic and hygienic concern for the public. Non-migratory geese have higher impacts on local ecosystems as well, and can alter dominant

Resident Canada Geese in Vancouver have adapted to urban conditions and have learned to nest on rooftops and balconies for increased safety. Management plans that consider only park areas will miss much of the population.
photo credit: Jennifer Rae Pierce



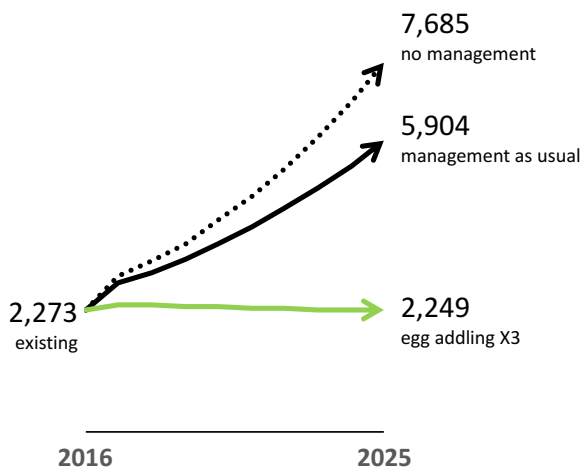
meadow and lawn grass species and contaminate small, stagnant water bodies such as ponds with their feces.

Management

The Vancouver Park Board has relied upon egg addling (sterilization of eggs) for population management of Canada Geese for the last few years. No target goose population is currently set. There is no broad strategy for goose management.

Geese Population Projection

3 management scenarios for Vancouver



Goals for goose population management are needed as soon as possible, along with a stabilization of support for existing programs. The chart at right illustrates the consequences of stopping current management programs, continuing them without changes, and the required effort to stabilize goose populations in the city.

Regional cooperation between Vancouver, other municipalities, and the public is recommended.

Opportunities

Potential synergies for goose management can be found by integrating the goose management strategy with other plans such as the dog strategy, special events coordination, tourism, and the biodiversity strategy. Many tourists and other park visitors enjoy watching and interacting with the geese. Some regular visitors to the park come with the purpose of feeding or just sitting with the geese.



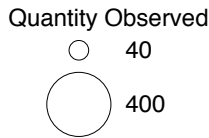
Starting with the Christmas Bird Count from Christmas of 2015, we can forecast the goose population under various management scenarios. The dotted line is the population if all management ceases. The solid black line is the continuation of the current management, egg addling for part of the city. The green line is the scenario for a stable population. It would require a threefold increase in addling outcomes. Other management scenarios using a mixed approach may be more feasible.



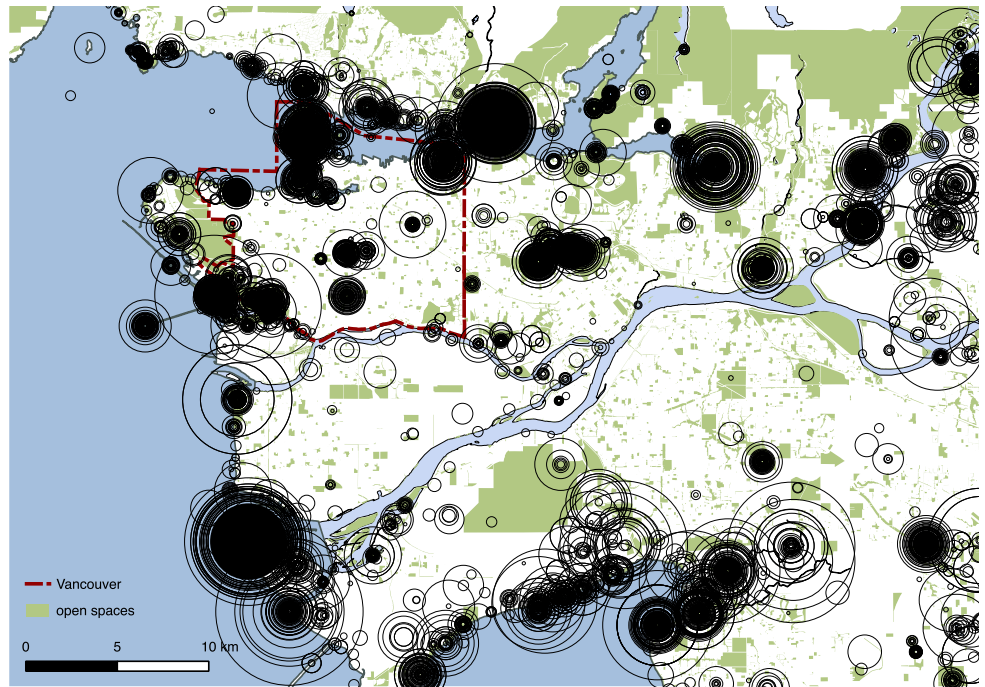
Canada Geese

IN THE CITY

The map at right illustrates eBird observations from 1995-2015. Circle sizes indicate the quantity of Canada Geese observed, per this scale:



Black circles are due to overlapping observations of different bird quantities in the same place. Observations indicate that geese are found throughout Metro Vancouver and tend to cluster along shorelines.



POPULATION STATUS

The Canada Goose (*Branta canadensis*) is found throughout BC and is considered to be healthy and growing in Canada. Their numbers have increased such that managers are now more concerned about overpopulation of Canada Geese than conservation.

What are resident Canada geese?

Canada Geese were once only a migrant seasonal visitor to the Lower Mainland, but now there are two distinct populations in Canada. One population migrates seasonally in Spring and Fall; the other stays in the same region year-round and is referred to as resident, or temperate-breeding.

The resident populations are non-native, unlike their migratory cousins. In the 1970s, resident Canada Geese were intentionally introduced to the Metro Vancouver and other areas in southern Canada to enhance wildlife viewing and hunting.

Resident or temperate-breeding Canada Geese populations live in Vancouver year-round. They did not learn to migrate when they were introduced, and so formed a distinct non-migratory behavioral pattern. Migratory populations migrate through the city every Spring and Fall. This behavior difference results in divergent population growth patterns. Migratory populations have been stable since the early 2000s whereas the temperate-breeding populations have quickly grown. This results in increasing conflict with humans, particularly in urban areas, farms, and airports (CWS Waterfowl Committee 2015). For this reason, this report focuses on resident geese.

The BC Interior supported over 40,000 breeding Canada Geese as of May 2016, a 9% increase from last year (CWS Waterfowl Committee 2015). Comprehensive data of this nature for the lower mainland is not available. A survey of the B.C. coast found Canada Goose populations increasing steadily at a rate of 3.8% annually from 1999-2011 (Crewe et al. 2012). Christmas Bird Count data found a dramatic 8.6% annual increase in the resident Canada Goose population from 1959-1988. The southern Ontario Waterfowl Plot Survey estimated 37,828 resident Canada Geese in southern BC in 2015 (a 9% increase over the previous year), and gave a population objective of less than half that number (CWS Waterfowl Committee 2015).

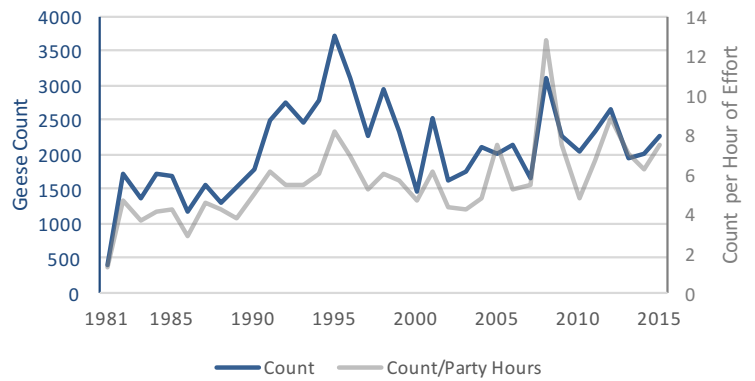
Modern land-use changes provide these geese with a plethora of grassy lawns that keep them surrounded by food and safer from their predators who are shy of humans.

The Vancouver Canada Goose Population

The high mobility of Canada Geese makes population assessment very difficult. While wildlife managers in Metro Vancouver agree that Canada Goose

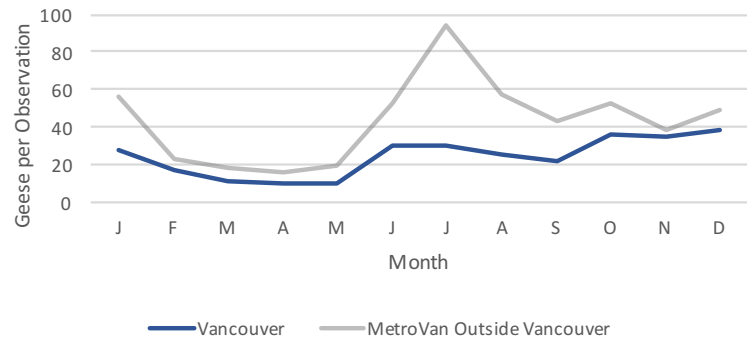
The chart at right shows the counts of Canada Geese from the Christmas Bird Counts that take place each December across the city. A general upward trend is clearly visible for the last few decades, with the exception of the late 90s.

Canada Goose Population in Vancouver



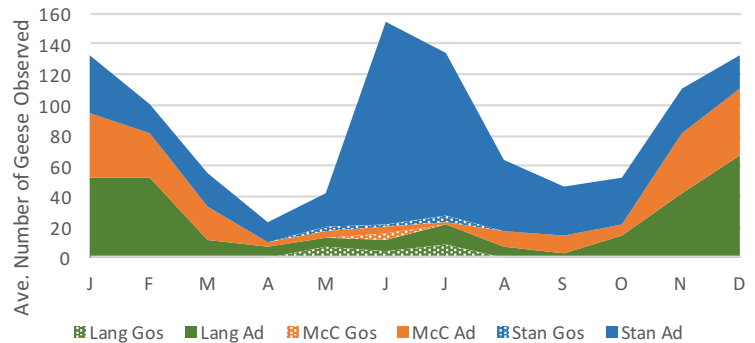
Organizing eBird data by month shows how seasonal behavior of geese impacts the apparent number of birds. Late Spring/Early April is nesting season, so geese are harder to spot. In mid-summer, moulting geese and goslings gather in large groups and are much easier to count.

Seasonal Trends in Canada Goose Observations on eBird



Compiling monthly counts from Langley Golf Course (Lang), McCleery Golf Club (McC) and Stanley Park (Stan) for both goslings (gos) and adults (Ad) shows a similar trend as the eBird data..

Monthly Average Canada Goose Counts by Location 2003-2016

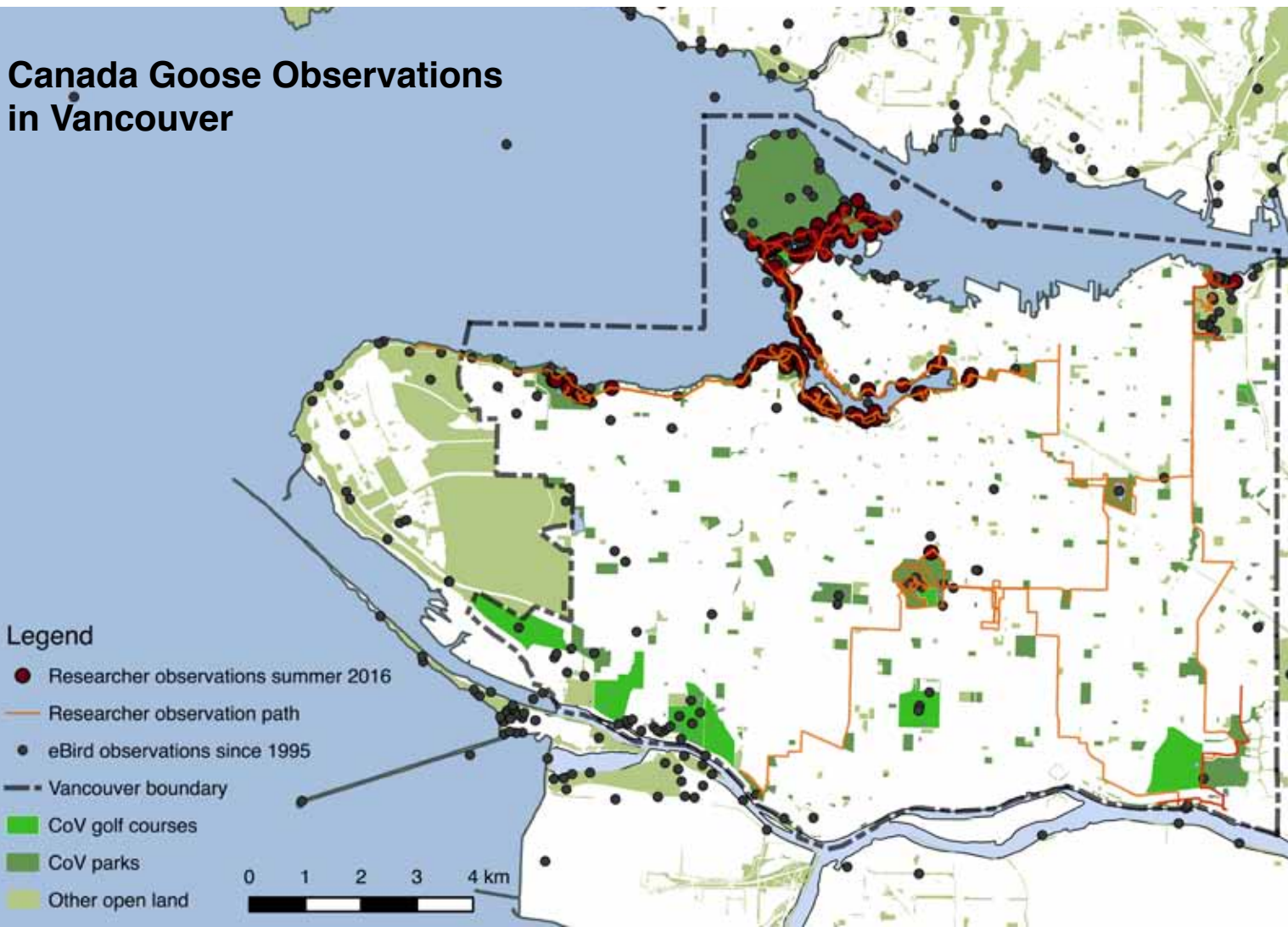


populations are increasing, these opinions stem primarily from anecdotal evidence rather than any official count. Bird count efforts focus on species with conservation concern, rather than potentially over-populating species.

Annual data for the city primarily comes from the Christmas Bird Counts, which counted 2,273 geese in 2015. Monthly data is only available for particular golf courses, major waterways, and Stanley Park, but even these sets are not consistent (see Appendix 2). They are also not easily compared since they follow different data-gathering methods. Monthly data for May, June, and July 2016 was gathered specifically for this report. This data indicates over 330 geese and over 60 goslings across the city in the observation areas.

Hourly data for the same time period just for the southern part of Stanley

Canada Goose Observations in Vancouver



The Map above shows the observations of Canada Geese gathered by the author for this report over May, June, and July compared to similar eBird observations since 1995. The author followed the look-see method, basically counting all geese visible while moving along a path. The paths are indicated on the map above.

Park, one of the higher density areas of Canada Goose habitation. The Stanley Park counts yield an estimate of about 300 geese and 60 goslings in the southern half, so up to 600 geese may be inhabiting the entire park. Additional data gathering is needed before conclusions can be drawn from the data. There is no data currently available that would definitively indicate population size, growth rate, nor indicate the ideal population size for resident Canada Geese in Vancouver.

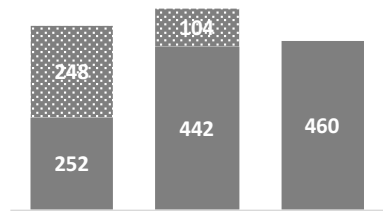
SPATIAL USE PATTERNS

In Vancouver, Canada Geese are drawn to different habitats by several factors; food availability, visibility,

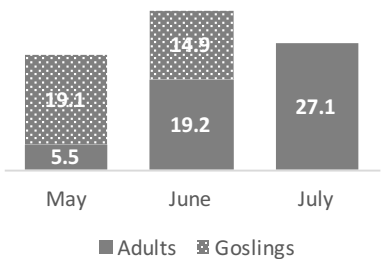
Geese gather around areas where feeding is regular, such as Sutcliffe Park, English Bay Beach, Thornton Park, Hinge Park, and the South Shore of Lost Lagoon and Ceperley Playground in Stanley Park (circled areas on the map at right). Below right, a woman feeds handfuls of seeds to geese at Lost Lagoon. photo credit: Jennifer Rae Pierce



Total Geese Observed



Average Geese per Observation



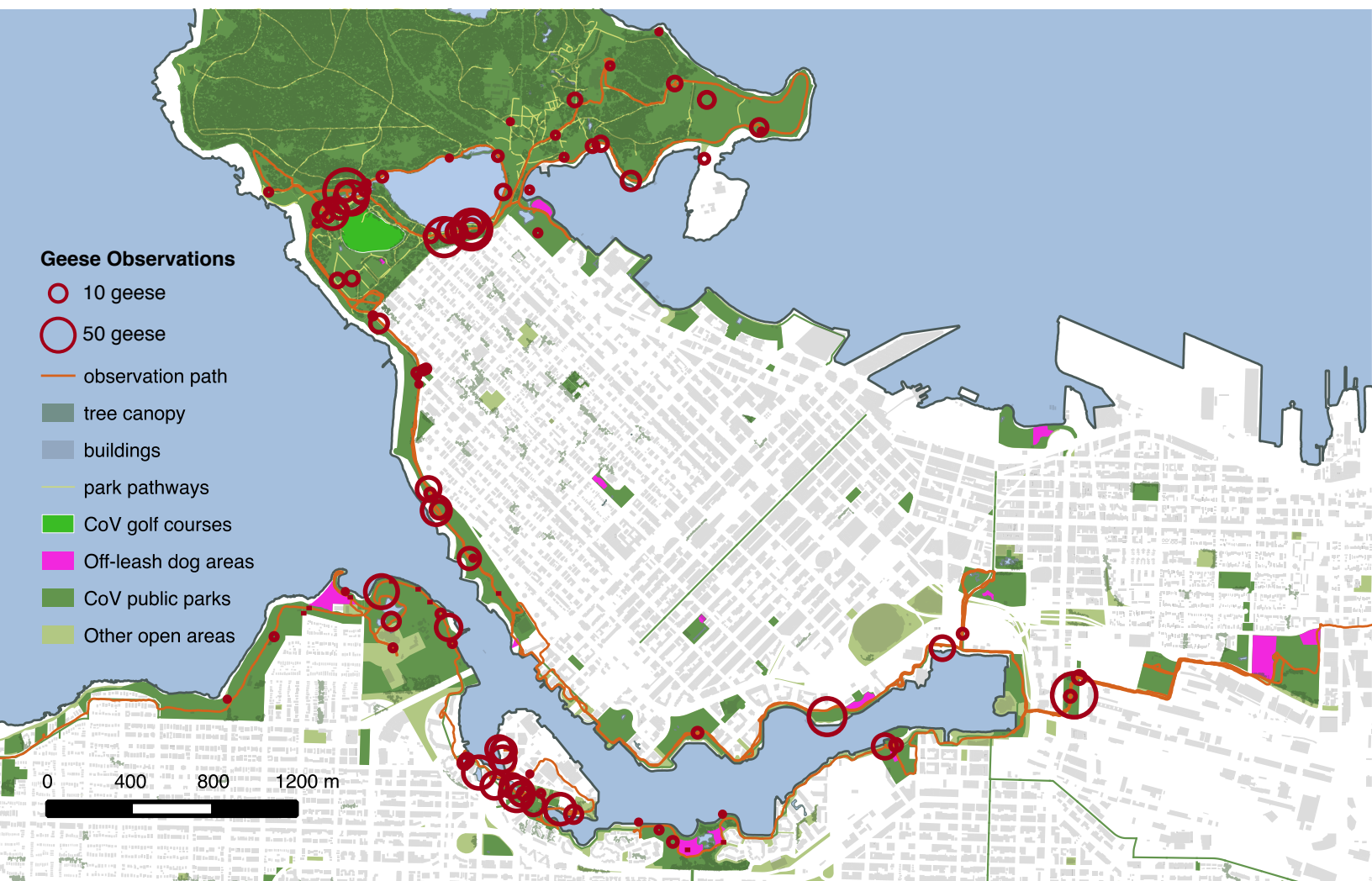
■ Adults ■ Goslings

The charts above indicate total geese observed and the geese per observation for each month. By July, goslings are indistinguishable from the adults.

Right, goslings particularly congregate near the safety of open freshwater. These observations are by the author from summer of 2016.



Below, monthly observations of Canada Geese by the author over the summer of 2016 confirm that geese congregate along shorelines, near freshwater, and in places where hand feeding is common. They avoid off-leash dog areas, shown in pink on this map.





*Urban Canada Geese can be found in unexpected places. This flock has settled on an industrial site rather than the adjacent green fields of New Brighton Park where dogs are sometimes abundant.
photo credit: Jennifer Rae Pierce*

drinking water, and easy-access water. They avoid areas with off-leash dogs, steep gradients, lots of tall shrubbery, choked up ponds, and places remote from humans. Contrary to expectation, they are also found in areas with tall trees, and areas with unmowed grass and other low vegetation. This is especially true if these areas have other attractive features. Geese do not seem deterred by on-leash dogs, bicyclists, or other traffic.

Goslings and moulting geese are particularly drawn to areas with a low sloping access to water.

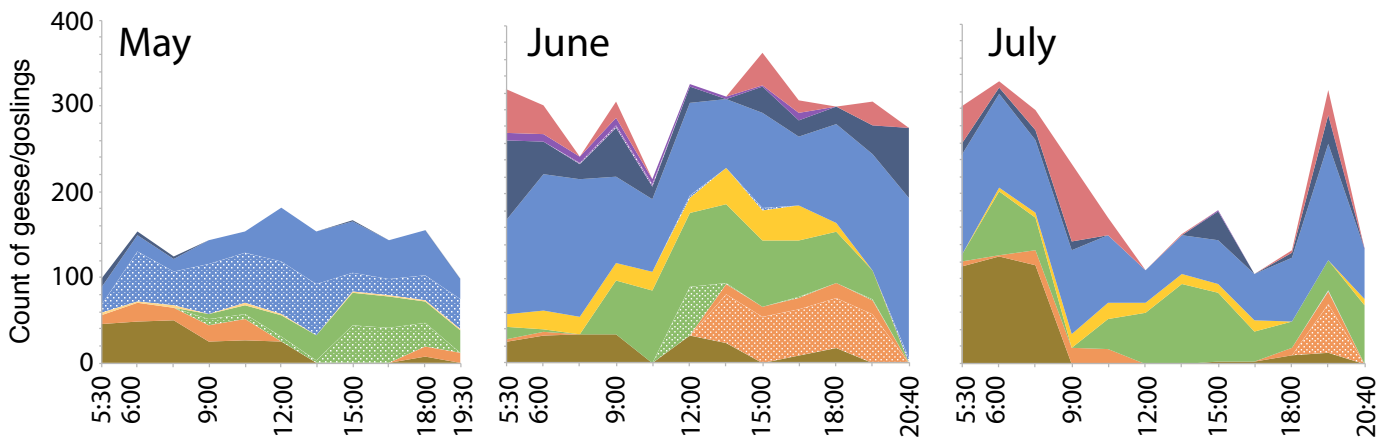
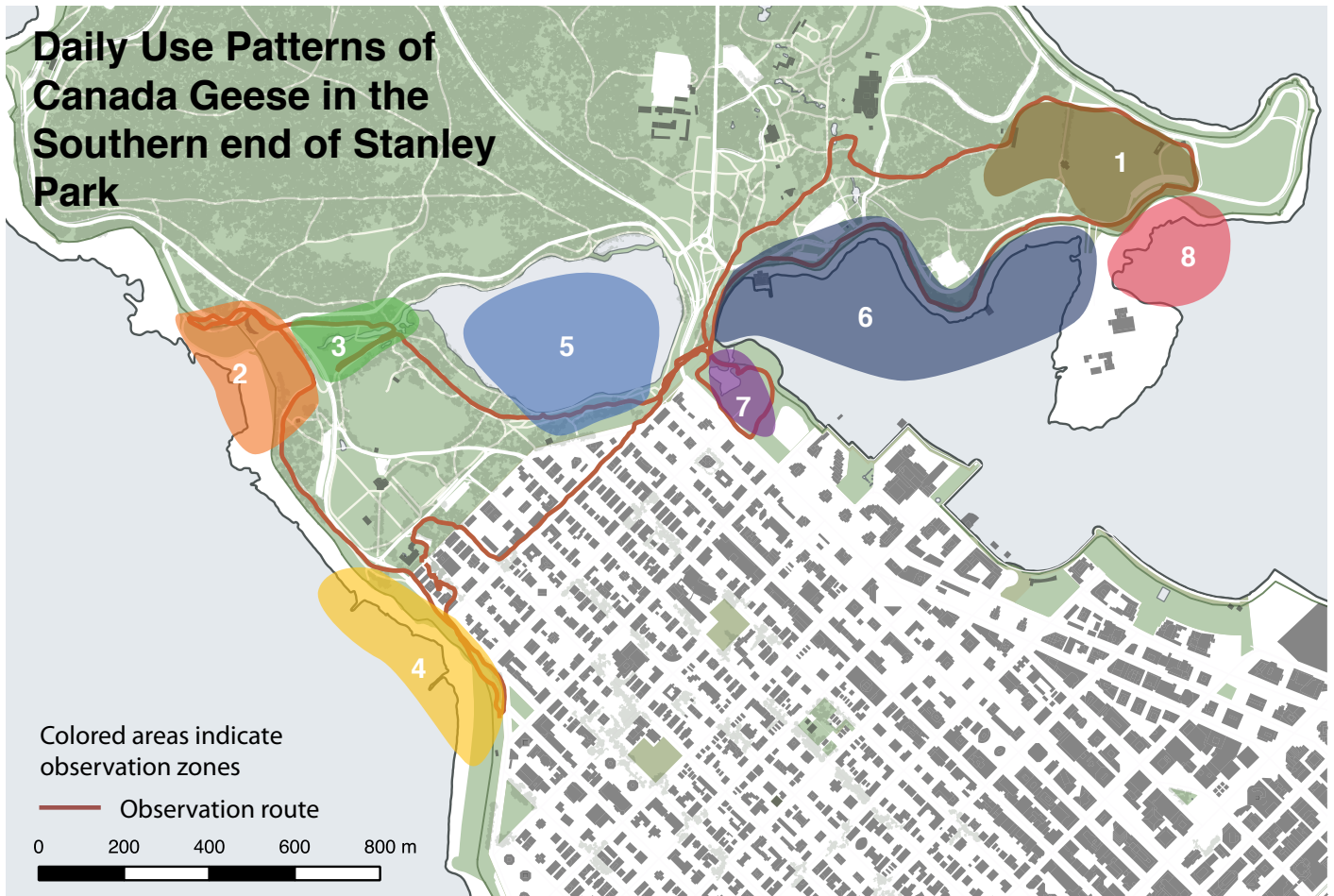
Geese will disperse across the city during the nesting season (Spring), and then come together in large flocks during the moulting season (Summer). This moulting time period overlaps with the time that Vancouverites also increase their use of the parks and beaches, contributing to potential conflict.

Geese will move about throughout the day, and do not seem to stay in one location for a full day. They will travel 2 km or more in the city to find a particular place. Their activities vary throughout the day, from sleeping to grazing, swimming, and simply standing around.

*These Canada Geese have established their nests close to humans and above the ground for safety.
photo credit: John Gray*

PLANNING AND REGULATIONS



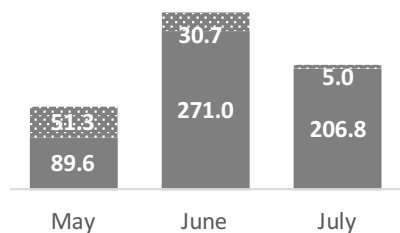


The map and charts above illustrate hourly observations each month of Canada Geese in the southern part of Stanley Park by the author over the summer of 2016. Counts of geese for each area 1-8 indicated on the map were conducted every hour and a half from sunrise to sunset.

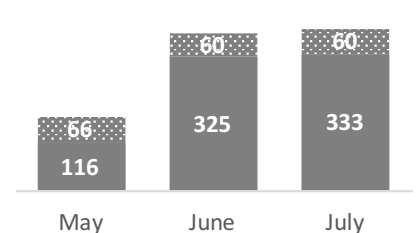
The results show the high variability in results from counting a geese count of any one area. In July, geese numbers dropped midday, implying that at that time the geese went somewhere else, likely to the shoreline.

Note: in May, data was not gathered from areas 6, 7, and 8.

Average Observations per 1.5 Hour Circuit



Maximum Observation per 1.5 Hour Circuit



■ Geese ■ Goslings



Canada Geese are protected at the federal and provincial level. Several municipal plans lay out guidelines for the approach to wildlife, but not for overabundant species. There is no comprehensive regional or local plan for Canada Geese management.

Geese and goslings are regulars near Ceperley Meadow in Stanley Park, even though this area is not mowed and has some shrubbery. photo credit: Jennifer Rae Pierce

Regulations

The Canadian *Migratory Birds Convention Act* (MBCA), 1994, prohibits the killing or trapping of Canada Geese and the disturbance of their nests without authorization under the Migratory Birds Regulations. Permits are required for culling, some hazing techniques, adding, hunting, or relocation.¹ Relocation permits have been increasingly difficult to acquire because of the lack of places willing to take them.

The BC *Wildlife Act*, 1996, protects active nests and prohibits disturbance of nests when occupied by birds or their eggs without permit.²

Municipal Plans

The Vancouver Bird Strategy calls for enhancing native birds in the city, and enhancing public access to such birds. Resident Canada Geese are introduced rather than native, so it is unclear how the city approaches this population specifically.

In 1984, the Park Board passed a resolution to adopt a “policy of controlling Canada Geese populations” as part of the Stanley Park Master Plan (VBPR 1984). This policy supported the subsequent roundups and relocation of geese from Stanley Park in the 1980s. The relocation program has since stopped (Worcester 2010).



Despite prohibitions, hand feeding of geese is common. These geese eat cereal on English Beach Bay. photo credit: Jennifer Rae Pierce

1 See the MBCA here <http://laws-lois.justice.gc.ca/eng/acts/M-7.01/index.html>

2 See the *Wildlife Act* here http://www.th.gov.bc.ca/key_enviro_topics/wildlife_possess_brief.html



As these ponds at Hastings Racecourse and McCleery Golf Club have choked up with plants, geese have gone elsewhere. photo credit: Jennifer Rae Pierce

HABITAT

Each resident goose will move around throughout the day and the year covering a single square kilometer area (Guerena et al. 2014). Lawns with easy access to open water are the preferred habitat for geese, especially when they are caring for goslings and moulting in summer. The water provides a place where the geese feel secure from predators. A low-cut lawn similarly provides good visibility and a source of food. Geese require a long takeoff “runway”, so large expanses of open water or lawn are also a draw. As water bodies become choked up with vegetation, they lose their draw for geese.

Traditionally, geese nest adjacent to water and prefer nesting on small islands (Canada 2010). In Vancouver, they have adapted to also nest on large tree stumps, in planters, on balconies, and on rooftops.

Geese will also seek fresh drinking water in shallow pools. In urban conditions, they will drink from dog water bowls.

Geese will avoid predators, and urban populations have adapted to living in close quarters with people since their natural predators avoid humans. Urban geese have also adapted to living relatively close to dogs. They recognize and remember particular dogs (and humans) and will avoid particularly aggressive dogs. In Vancouver, most geese will give non-aggressive dogs about 10 m of space, though in particular areas such as Sutcliffe Park, they will get even closer. Areas with high numbers of off-leash dogs running around, such as Charleson Park, Spanish Banks, and New Brighton Park, deter geese, but dogs walking calmly alongside their owners along the path are not a deterrent for urban geese.

DIET

Canada Geese consume grass and other tender plants, aquatic plants, berries, grains, algae, and seeds. In summer, goslings and moulting adults require more protein and prefer young shoots of grass which are most easily found on mown lawns (Canada 2010). Geese do not like coarse plants. Geese will eat handouts from people; grains or seeds are more healthful for

them compared to bread which can cause a disfiguration called “angel wing” if over-consumed.

Geese are also attracted to shallow freshwater puddles for drinking. They will gather around these amenities, and will even drink from water bowls meant for dogs.

MORTALITY

Geese are long-lived, with a lifespan of up to twenty years. Urban geese have lower mortality rates than their urban cousins, likely due to the increased safety they are able to secure from their predators by being so close to humans. As a result, city populations often supplement those in the suburbs (Ronke 2014), with outmigration rates to surrounding areas of about 15% (Beston et al. 2014).

Geese predators in the region are many, including bald eagles, otters, coyotes, mink, dogs, opossum, and raccoons. Their eggs are the most vulnerable, and goslings too, but some desperate predators will even go after adult geese.

Historically, insufficient nutrients limited egg-laying capacity, and predators ate adults, goslings, and eggs. These pressures are substantially reduced in urban settings. Goose population growth is primarily limited by adult survival rate, so hunting by people or other predators are a major factor in goose population stability. Municipal restrictions of firearm discharge have

English Beach Bay has drinking water and cut grass on hand for these geese. photo credit: Jennifer Rae Pierce





eliminated this pressure from resident urban geese. There is the occasional hand-caught goose that becomes dinner, though this activity is prohibited and appears to be rare in Vancouver.

Many of these predators are abundant in Vancouver, especially eagles, raccoons and coyotes. The Stanley Park Ecology Society's Coexisting with Coyotes program has documented coyotes across the city, and estimates over 200 that call Vancouver home. In the city, many goose predators also scavenge off of people, and so the predatory pressures may be lowered. Garbage cans may be easier to raid than nests.

Geese may be injured or killed by automobiles. 3-1-1 calls about injured or dead geese have been on the rise in the last few years.

SOCIAL LIFE

Geese are highly social, adaptable, resourceful, and intelligent. They communicate with one another using honks and body language and can be quite interesting to observe. They will remember particular people and act differently with individuals according to their past experience with them, whether it was harassment or handouts.

Geese find a mate and begin nesting at age two or three. They will seek a nesting site that offers privacy from other geese and safety from predators near where they learned to fly. In cities, geese can be quite creative, nesting on rooftops, balconies and planters. The female generally sits on the nest, while the male stands guard. Both geese will aggressively defend the nest.

Egg-laying takes a week and the first clutches begin at the end of March. One clutch is typically 5 or 6 eggs, but can be as many as 10. Pairs can lay multiple clutches, and continue to lay into late May. Any nest disturbance or loss of eggs can prompt the couple to lay a second clutch. Eggs hatch after 25 days of incubation, with the average hatch date in mid-May.

Goslings will group together into larger flocks watched by a smaller number of adult baby-sitters. They will stay close to the water, and seek out young grass shoots to eat. They will shed their baby down, growing flight feathers and learn to fly in two months (Canada 2010).

At the same time of year, adult geese will moult, or lose their current feathers and grow new wing feathers. This renders all geese incapable of flight for

The unique looking geese above are all hybrids with other goose types, such as the domestic goose. The goose below is leucistic, meaning it was born without coloring in some of its feathers. photo credit: Nick Page (above left and right), Jennifer Rae Pierce (below and center above)



Once goslings are mobile, parents share babysitting responsibilities, resulting in huge gosling flocks. photo credit: Jennifer Rae Pierce



a 4-6 week period from mid-May to early June. During this time, the geese are particularly vulnerable to predators and so they will gather together into larger flocks and stay near water for safety (Canada 2010). Not all geese will moult at the exact same time, so flocks may have some geese capable of flight and others who are flightless at any given time during these months.

Migrating flocks come through in Spring and Fall, though Fall flocks are generally smaller since this is the hunting season.

ENVIRONMENTAL IMPACT

As a newly introduced population in the last few decades, non-migratory Canada Geese bring new pressures to meadows and aquatic habitats. They graze an area year-round, and can therefore more easily damage ecosystems than their migratory cousins. Year-round grazing and trampling of lawn areas can damage grass and alter dominant lawn species.³ Goose droppings make lawn areas unsuitable for people and can foul stagnant water bodies (Canada 2010). Geese have come under fire for fecal coliform levels in False Creek and other beaches, but removal of geese did not impact contaminant levels, so the primary sources are more likely human-derived.

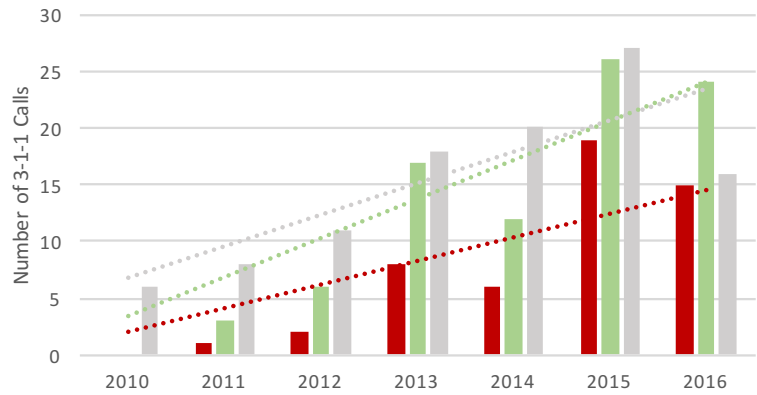
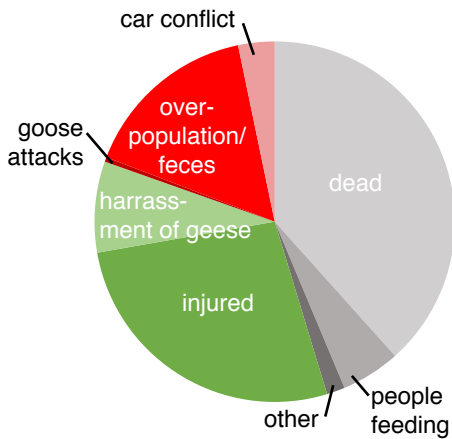
Overgrazing by Canada Geese has negatively impacted shoreline vegetation on the East side of Vancouver Island, and possibly also at the head of Port Moody Inlet and the Indian River estuary. Damage to estuarine vegetation negatively impacts the ecosystem, and can even be detrimental to salmon populations (Butler et al. 2015).

³ A connection has been found between non-migratory Canada Geese and the spread of exotic plant life in meadow ecosystems of Vancouver Island (Isaac-Renton et al. 2010)



Geese have grazed the grass down very short on the South shore of Lost Lagoon and may be helping to shift the dominant ground-cover. photo credit: Jennifer Rae Pierce

Topics of 3-1-1 Calls to Vancouver Regarding Geese



PUBLIC OPINION

Since 2010, the public has made 245 calls to the city’s 3-1-1 system regarding Canada Geese. The calls reveal a divided public, but with slightly more frequent calls showing a positive view of geese than a negative one. It also reveals an increase in call frequency of all types of calls over time, indicating increasing interaction with Canada Geese by the public. See the charts on this page for more detailed information.

Public opinion ranges widely, from people who see the goose as a potential meal, a wild animal to be left alone, or a cute bird who is fun to feed. But nothing changes opinions more quickly than changing context. Fans of geese in parks may not appreciate geese who have left feces in their yard, or made a nest on their balcony. Sometimes one goose is too many. Some dog owners enjoy letting their dogs have exercise chasing geese, though if the flocks are large enough, the relationship can go in reverse!

Primary conflict zones in the city are Sutcliffe Park at Granville Island and people with geese nesting or gathering on their property. One uniquely sensitive site is the Women’s Memorial at Thornton Park, in front of the Central Train Station. This site is discussed in more detail on the next page.

HUMAN HEALTH RISK

Analysis of 3-1-1 calls since 2010 regarding geese in the city supports the idea that the public generally call in with a positive view (36%, shown in shades of green) of geese in the city, rather than a negative one (21%, shown in shades of red). Neutral or unknown views are shown in grey. The chart on the right shows how these views have changed over time. The quantity of all three types has increased over time, indicating more frequent interaction between geese and the public each year. Note that numbers for 2016 are only up through the end of July.

Tourists and locals enjoy watching and interacting with the Geese. photo credit: Jennifer Rae Pierce



Spotlight: Thornton Park

Thornton Park offers an ideal habitat for geese. It is close to False Creek, has clear sightlines and dense human occupation to be sure of safety from predators, plenty of lowcut grass to eat, frequent handouts of food, and pools of rainwater to drink that collect on the memorial. As many as 90 geese have been recorded at Thornton Park, although it more typically supports around 20.

This frequent geese usage results in a lot of fecal contamination, which particularly causes an aesthetic problem at the memorial. The Park Board has been investigating options to protect the memorial.

There is political pressure to relocate the birds, but this would likely not have any long-term impact. Thornton Park has no pond and is therefore not a place for moulting birds or goslings, which are the

only type of goose that can be rounded up for relocation. Even if they could be relocated, the geese would return within a month since the draws for the geese would still be present. Additionally, relocation permits are difficult to obtain because there is nowhere that will take the geese.

Fencing around the memorial has been considered. Removing the turf in the center of the memorial or applying chemical deterrent there is also a possibility. Additional no feeding signs may be installed.

The Park Board briefly tried providing a metal bowl of drinking water separate from the memorial. A hose is also being installed to ease cleaning of the memorial, and a design to fill in the depressions with clear resin is being investigated in order to reduce the drinking water availability.



Thornton Park, left, has clear sightlines and plenty of grass. Geese drink water from the depressions in the women's memorial (bottom left) leaving behind feces that foul the memorial (bottom right). photo credit: Jennifer Rae Pierce





This hissing goose is showing displeasure, but not all members of the public recognize this warning. photo credit: Jennifer Rae Pierce

Canada Geese pose very little risk to human health. Three potential risks are geese aggression, vehicular accidents, and disease transmission.

Geese are typically not aggressive towards humans, and many urban geese are accustomed to being fed by hand. However, during the nesting season, geese will defend their nest from anyone who comes too close, and geese will hiss at people and dogs who come too close to the goslings under their care. A desperate goose defending its young will first warn the offending person with hissing and an aggressive stance. If the aggressor does not move away, a goose can potentially buffet the person with their powerful wings, a hit that can cause a concussion or other injury. There is no record of such an incident happening to the public, but it is wise to educate people not to get too close during late spring and early summer.

Geese will cross vehicular roads and cycling paths, causing traffic jams and potentially increasing the risk of accidents. They are a risk to aircraft as well, and in extreme cases can cause jet engine failure.

The main concern regarding disease transmission is the exposure rate of people and dogs to goose feces. Diseases that are potentially infectious to humans are found in goose feces,⁴ but there is no data regarding rates of infection, nor any indication of disease spikes around areas with geese (HSUS 2012). Warmer months pose the greatest risk because they provide ideal bacterial growth conditions (Ray 2011; Kullas et al. 2002). Typical washing protocols should be sufficient for hygienic purposes.

There has been concern that geese populations are to blame for fecal coliform levels at beaches and other shorelines. However, the contribution of Canada Geese feces to water bodies is only significant for small, stagnant water bodies such as ponds. It is not advisable for humans or their pets to swim in ponds contaminated with goose feces.



⁴ The following bacteria have been found in urban goose feces: *Escherichia coli*, *Enterobacter cloacae*, *Salmonella* sp., *Aeromonas hydrophila* and *Providencia alcalifaciens*, and the parasite *cryptosporidium*. Many of these are commonly found in feces of pets and other animals.



MANAGEMENT OF Canada Geese

What is egg addling?

Egg addling is a process of sterilizing eggs soon after they are laid. Eggs can be shaken, frozen, covered in oil, or any combination therein. Once the eggs are sterilized, they are replaced in the nest to reduce the chances of the goose laying a second clutch. If eggs are removed, the goose can lay up to four replacement clutches throughout the season. Addling is a common management practice, approved by stringent animal welfare organizations such as People for the Ethical Treatment of Animals (PETA no date) for overpopulating birds. Some geese in Vancouver have adapted to addling and will lay a second clutch even after addling.



Eggs gathered for addling. photo credit: Jennifer Rae Pierce

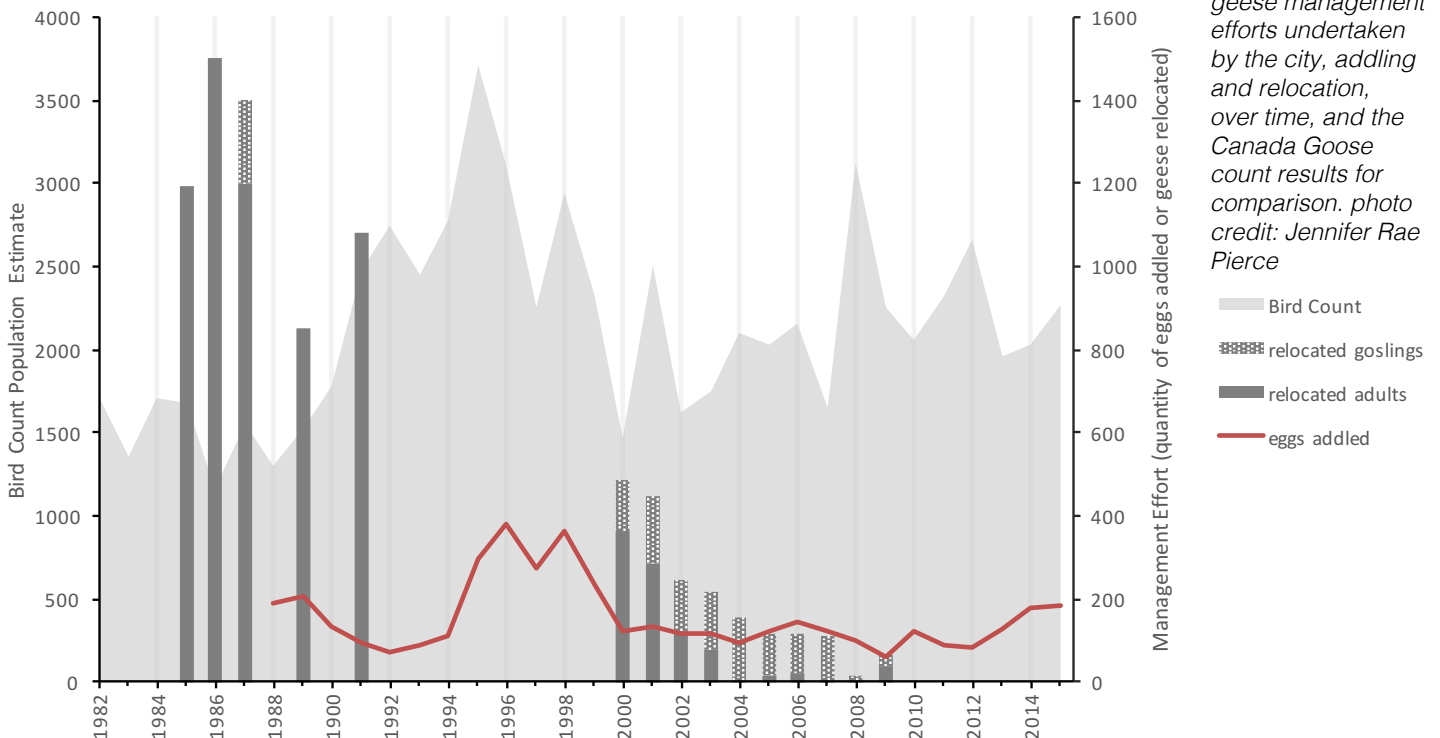
MANAGEMENT IN VANCOUVER

Vancouver's management approach to Canada Geese has shifted over time, though the city has not adopted a comprehensive plan for resident Canada Goose population.

Currently, the Park Board has a part-time staff member who conducts egg addling in only the most goose-populated areas of the city. Permits for addling are obtained from CWS. Egg addling is a difficult and dangerous task, especially as the geese find more remote rooftops and other hidden locations to lay their eggs. Many nests are not accessible because they are on private land to which the city has not been granted access. Nests must be revisited after two weeks to ensure that another clutch has not been laid. Geese who nest too close to people can be dangerous because they will defend the nest. In extreme cases, the nest is removed entirely to increase safety.

In the past, the Park Board combined addling with relocations of goslings and adults during the moulting season. Relocations peaked in the 1980s and stopped by 2010. Roundups involve using canoes and kayaks to herd

Canada Goose Population and Management Efforts in Vancouver



The chart at left illustrates the two major geese management efforts undertaken by the city, addling and relocation, over time, and the Canada Goose count results for comparison. photo credit: Jennifer Rae Pierce

Spotlight: Vancouver Goose Management History

1960s

The city worked cooperatively with Federal Government to assess introduced goose pairs in the city, including in Stanley Park

1970s

early Relocations of goslings still ongoing into Metro Vancouver from outside.

Stanley Park Canada Goose population reaches the thousands. Annual roundups and relocation program of moulting geese by the Canadian Wildlife Service (CWS) begins. Geese adapt to nesting on top of stumps for increased safety from people and dogs.

1978 Observers note over 3,000 Canada Geese in Stanley Park, causing a blackened sky when flying overhead.

late Feces become a problem on lawns and in Lost Lagoon. CWS begins egg addling program around this time. The addling program brought in volunteers to cover parks, golf courses, the racetrack, and any private areas where they could obtain permissions. 300-400 eggs addled annually. Public concern over the ethical implications of addling also arises. Egg addling continues sporadically into the early 90s.

1980s

Annual roundups in Stanley Park continue, relocating up to 2,000 geese during the summer moult (Jones, et al., 2001). Banding is added to aid in population assessment and monitoring.

Addling seems to have resulted in a reduced population; addling numbers decline.

Three to six staff members are involved in assessments and addling; additional staff are called in for roundups which require about 30 people at a time.

Goose management approach expands to include other areas of the city rather than just Stanley Park. Public awareness program begins, advertising to the public via posters and door-to-door outreach. People against addling sometimes come around once the goslings are born and they request city assistance to round

up the young, such as at the Law Courts building downtown.

1991 Relocation destination shifts from Agassiz to Pitt Lake due to concerns from the mayor of Agassiz. Relocation numbers reduced to around 600 annually due to lower populations in Stanley Park.

1992 The Vancouver-Richmond Health Board partially funds the goose management program (\$10,000 annually). People began to suspect human health dangers from high geese populations due to high fecal coliform counts along beaches such as Sunset Beach (Jones et al. 2001). The Canada Goose population in Stanley Park slowly declines.

1990s

Stanley Park and False Creek Goose population reaches less than 400. Relocations stop and addling is reduced. Complaints continue about overpopulation of geese in the English Bay area where geese congregated.

2000s

2000 Last large relocation from Stanley Park.

mid The Vancouver-Richmond Health Board funding assistance of goose management ceases. The connection between fecal coliform counts and geese populations increasingly tenuous as counts remain high after geese have been removed. Hours spent on goose management begin to decline.

2008 Gosling relocations received negative attention in the press.

2009 Reduction in program funding from the city reduces management capacity. Smaller scale roundups conducted occasionally from False Creek, English Bay and Stanley Park.

2010s

Geese populations on the rise, but addling is now more difficult due to the adaptive behavior of geese to nest off of public land. Public resistance to relocations grows, at times becoming violent.

Loss of suitable sites for release of captured geese in Fraser Valley as resident Canada Goose population increases across the region. Relocations to areas outside of the city cease.

geese onshore, then using temporary fencing to guide them into the tennis courts, used as holding pens. Geese are then loaded onto poultry trucks for transport and taken to Agassiz or Pitt Lake. Permission is needed from the landowner at the destination point in order to obtain a permit for relocation. Adult geese will often return in a few weeks after they finish their moulting. Goslings, however, will typically stay and nest where they learned to fly if adult geese do not bring them back, as they often do.



The Stanley Park Ecology Society's Quack Snacks booth (left) is a public outreach program to reduce public feeding of geese and other waterfowl. On the right is a historic photo of Geese and goslings being relocated from Vancouver via van. photo credit: Jennifer Rae Pierce

OTHER MANAGEMENT TECHNIQUES

There are many management options available for Canada Geese. Once the Park Board decides on their strategic framework, they can select from a mixture of these techniques to achieve the desired effect. In this section, the various management techniques are grouped into the following categories and then compared in tables; food availability reduction, changing spatial distribution, reduction of habitat appeal, fertility reduction, increasing mortality rates, and public conflict reduction.

Not all of the techniques described here are applicable to Vancouver. This list is a catalogue of potential techniques to aid in decision-making and comparing between strategies.

Food availability reduction

Techniques that reduce food availability can change the spatial distribution of the geese away from problem areas and also influence population size,

primarily by reducing egg-laying capacity and reducing the draw of areas with food.

Specific grass and wetland plant mixes could be used as a starting point, combined with studies of local plants that are particularly coarse or high in tannins.⁵

Chemical sprays of methyl anthranilate and dimethyl anthranilate are used to reduce vegetation browsing, but are too expensive to use in large quantities. These chemicals are found in grape-flavoring and grape juice, so municipalities in New York and Ohio have sprayed unsweetened grape kool-aid every week instead to save costs.⁶

Technique	Effectiveness	Pros	Cons	Applicability in Vancouver
Reduce mowed lawn areas, change grass type	Long-term	Potential synergies with other techniques	Only applicable in certain areas. Expensive.	Lost Lagoon south shore, Thornton Park
“Do Not Feed” signage and programs	None found	Opportunity for public education	Likely a waste of effort. Alienates potential public allies.	Already in place, but signs could be upgraded
Enforce bird feeding penalties	Unknown	Likely more effective than signage	Angers and criminalizes people	Unknown
Apply chemical repellents (Methyl anthranilate) to lawn	Short-term	Easy to apply	Washes off in rain, chemical exposure to people, pets and other wildlife, expensive product	High conflict small areas such as the Thornton Park memorial

Changing spatial distribution

Techniques that change the spatial distribution of geese are only helpful in the context of a regional or temporal plan for geese populations. See the table below for more details.

Technique	Effectiveness	Pros	Cons	Applicability in Vancouver
Designate feeding areas	None on population size	Potential synergies with goose counts, events, and contraceptive distribution. Sets positive relationship with feeders.	Doesn't decrease goose population	Could be incorporated into the Park Board's strategic plan

5 See Volz 2001 and also “Nuisance Canada Goose Management: Solutions.”. Nuisance Canada Goose Management: Solutions. Indiana Department of Natural Resources. <http://www.in.gov/dnr/fishwild/3002.htm>

6 See <http://www.all-creatures.org/adow/pr-20130310.html>



*These geese (above) could be better tolerated if they were not on the cycle path.
photo credit: Jennifer Rae Pierce*

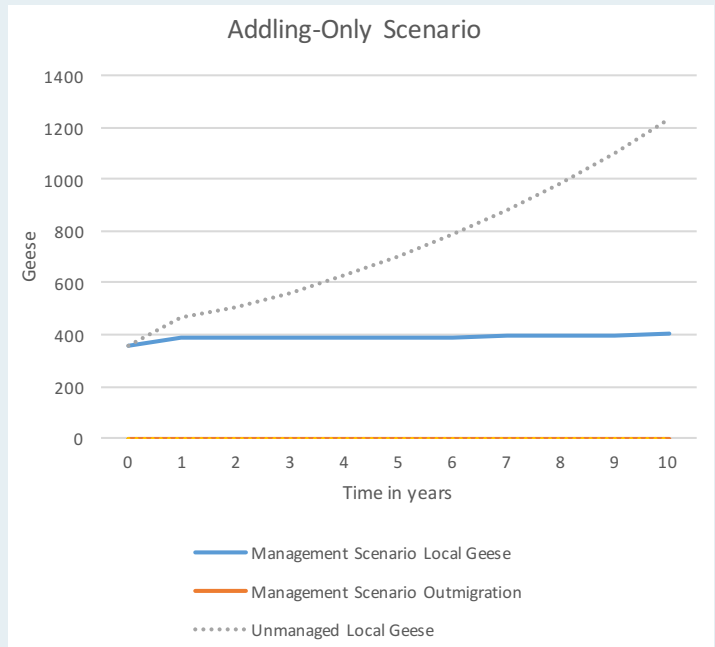
Designate new or temporary off-leash dog areas	Very effective as long as the park is used	Synergy with dog strategy. Partnership with dog owners.	Off-leash dog areas have their own issues	Useful for problem areas and before special events
Hazing with trained dogs or birds of prey	Effective as long as the program is in place	It works, and can be done without changing park use. Can be done during moulting season to reduce summer populations (HSUS 2012).	Expensive. Some public resistance. Geese modify use patterns to avoid hazing timing.	Sports fields or other lawn areas, especially in summer
Hazing with sound or light devices	3-4 days	Easy to implement. Some types can be done without permit.	Geese get used to it, sound disturbs the public	Before special events
Relocations of adults	While moulting only (a few weeks)	The public seems to like it	Expensive, temporary, nowhere to take the geese, permit required. Public concern about animal welfare.	Low
Relocations of goslings	Can be permanent	The public seems to like it	Expensive, nowhere to take the geese, permit required. Public concern about animal welfare.	Can be part of a regional strategy

Spotlight: Geese Management Scenarios Modeling for Stanley Park

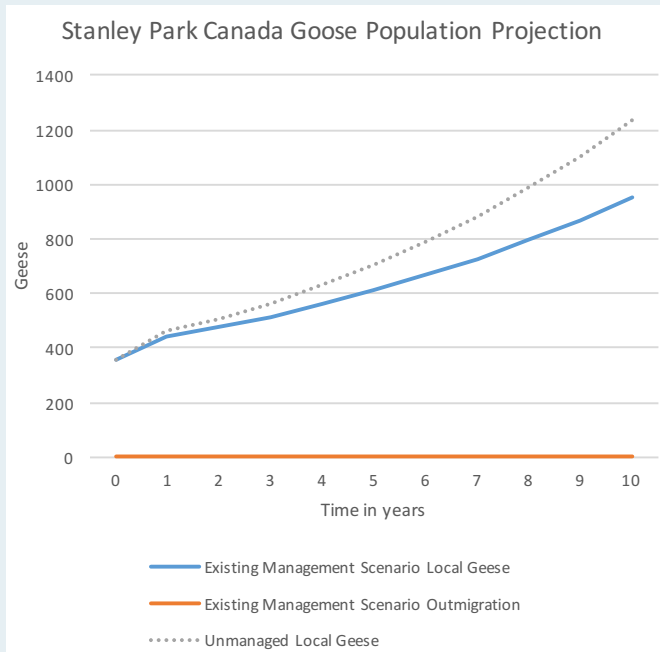
Using demographic data on the current goose population and research data on fertility rates and other important demographics, we can project future Canada Goose populations. We can then add research findings on management techniques to model the impacts of the techniques on the projected goose population.

The line graph below starts with an estimate of the current average population of geese (300) and goslings (60) in Stanley park. The dotted line projects out 10 years assuming no management techniques. The solid line projects out the same time assuming a continuance of the current management techniques (addling approximately 23 eggs from the Stanley Park population each year). The projections show that the Stanley Park geese population without any-mangement techniques would reach 1,236, and with the current addling program would be 949 in 10 years (see chart below).

In order to stabilize the population at its current size, we must increase management efforts to addle 58



eggs of the Stanley Park population per year (see chart above). This is an increase of more than 130% over current levels, and would require the addition of staff as well as other resources to allow for easier access by staff to harder-to-reach nests. It may not be feasible to reach this many nests.



Similar graphs can be made using other techniques. To achieve a stable population by adding contraceptives to current addling efforts, we would have to distribute contraceptives to about 188 geese every year. The same stable population can be achieved by increasing adult deaths by 25 per year, and continuing the addling program. No amount of relocation efforts will achieve a stable population since most geese simply fly straight back after moulting.

Another idea would be to mix various techniques to stabilize the Stanley Park population. Distributing contraceptives to 100 geese and addling 40 eggs every year also yields a stable population projection. This is an increase in addling of 80% over current levels, and the creation of a new contraceptives program.

With population estimates for the entire city, and a population goal, scenario modeling can provide a target annual management effort for each technique.

Goslings are adorable, but they grow up quickly. photo credit: Jennifer Rae Pierce



Reduction of habitat appeal

Techniques that reduce the appeal of habitat areas generally involve the alteration of green spaces, which has repercussions for human use, but can be more permanent than other techniques. Plantings and temporary fencing has been used with success in Coquitlam in Como Lake Park, an area that attracts geese during moulting season.

Technique	Effectiveness	Pros	Cons	Applicability in Vancouver
Replace lawn with shrubbery	Long-term	Some improved landscape aesthetics	Can conflict with public use such as for sports or picnicking	Thornton Park, some areas of Stanley Park
Temporary, low fencing of waterways	Moulting season only	Targets highest conflict season, nonviolent, signage opportunity	Aesthetically displeasing; requires public education	Pond areas and shorelines
Permanent grids or fences	Permanent	Keeps out geese reliably	Reduces human access, aesthetic issue	Best in areas not used by the public, under bridges, retention ponds

Fertility Reduction

Techniques that reduce fertility can keep population numbers in check, but their effects take more time. The contraceptive method shows promise as geese can be trained to take their daily dosage, but the contraceptive itself (Nicarbazin) is currently approved for chickens only (and soon pigeons), so a special permit would be needed to allow for administration to geese (Macdonald and Wolf 2013).

While some members of the public are averse to egg addling, it is approved by some of the most stringent animal welfare organizations such as People for the Ethical Treatment of Animals (PETA no date).

Technique	Effectiveness	Pros	Cons	Applicability in Vancouver
Egg addling	Long-term, but slow to show impacts	Approved by animal welfare groups, shown to be effective, cost effective	Can be controversial with the public, nests increasingly difficult to access	Currently in use; could be spread to cover more of the city
Contraceptives: Nicarbazin	50% effective when taken regularly	Nonviolent population control	Contraceptive not yet approved for geese in Canada	Sutcliffe Park, Lost Lagoon, and other high population areas
Nest destruction	Long-term	Potential for outmigration during molting season as well	Traumatic to geese	Currently used in areas where geese aggression is a problem. Could also be considered to reduce moulting populations

Increasing Mortality Rates

These techniques are the most controversial in urban settings whereas in rural areas they can be seen as common sense. They include encouraging natural predators, and also trapping and killing by humans.

Unbeknownst to much of the urban public, the Canada Goose is edible, and was once the standard Thanksgiving and dinner centerpiece before being ousted by the turkey.⁷ Despite the controversy, some animal welfare organizations admit to the utility of these techniques when compared to other options that can be deceptively harmful.

Controversies have arisen specifically over culling methods, such as a recent cull in Saanich which was criticized for their method of killing geese by breaking their necks.⁸

Urban areas are increasingly considering these techniques. The city of Oliver has issued six limited “harvesting” or hunting permits for use in particular areas of the city by particular individuals during the standard provincial hunting season, allowing for weapon discharge exemptions.⁹

While Vancouver is not in a position to implement a similar policy, increasing transparency and collaborating with the public and with animal rights groups is needed in order to make the best decisions about the health and rights

⁷ See <http://www.livescience.com/49251-the-history-of-eating-canada-geese.html>

⁸ See <http://globalnews.ca/news/2062778/250-canadian-geese-to-be-killed-on-the-saanich-peninsula/>

⁹ See <http://www.oliver.ca/sites/oliver.civicwebcms.com/files/media/Notice%20to%20Oliver%20Residents.pdf>

of non-native Canada Geese and the other species that they impact in the case of overpopulation.

Technique	Effectiveness	Pros	Cons	Applicability in Vancouver
Increase goose predator populations	Long-term	With the Biodiversity Strategy	Difficult to achieve; requires special knowledge and holistic approach	Potentially widely applicable; more information needed
Allow selective harvesting by private individuals	As long as program is in place	Direct influence over population size. Sustainable, local food source. This activity already takes place, and could be regulated to increase safety and encourage humane methods. Latent demand exists.	Huge political and regulatory barriers. Hunting season only. Trapping could endanger pets, and firearm discharge carries risk. Special permitting, training, and regulations would be needed.	Unlikely to be politically feasible even though capture by individuals already secretly takes place in the city among certain populations (low income, recent immigrants).
Trapping and culling by public authority	As long as program is in place	Most direct and targeted influence over population size	Expensive, requires permits, political barriers, humane culling method must be researched	Unlikely to be politically feasible

Public Conflict Reduction

There are also strategies that focus on reducing potential conflicts with the public rather than reducing the population size or damage of Canada Geese. These include feces cleanup, goose crossing signage, public education pamphlets on goose communications, and the like. Coquitlam tested a feces sweeper at Como Lake, but found that it wasn't 100% effective, so they decided not to use it. These should be supplementary techniques to the overall goose management strategy if the city wishes to stabilize or reduce the goose population since they do not influence goose population size.

Additional Resources for Goose Management Techniques

Additional sources on various management techniques include the Ministry of Environment Handbook "Canada and Cackling Geese: Management and

Signs like this have not shown any effectiveness at reducing feeding behaviors. photo credit: Jennifer Rae Pierce



Population Control in southern Canada.”¹⁰ and the PETA handbook “Humane Goose-Control Solutions”¹¹

The Ministry of Environment handbook espouses a seasonal approach to geese management that corresponds to geese behavior.

Goose Management techniques According to Seasonal Behavior

Season	Goose Behavior	Management Technique
Late winter	soon seeking nest location	reduce habitat quality
Early spring	seeking nest location	hazing and habitat modification to discourage nesting (or, the reverse to encourage nesting in accessible sites)
Spring	egg laying	egg addling
Late spring	soon to moult	hazing to scare away large moult flocks
Early Summer	moulting adults and goslings can't fly	erect barriers
Late Summer	all geese are flying	Increase the attractiveness of habitat in alternative areas where geese are not a problem or in hunting zones

10 Available online at https://www.ec.gc.ca/mbc-com/6D2B893B-C671-41AF-8439-713305DB384C/Handbook_Canada_Cackling_Geese_e%5B1%5D.pdf

11 Available online at http://www.marylandgoosepatrol.com/PETA_HumaneGooseControl.pdf



The South shore of Lost Lagoon in Stanley Park is a good candidate for redesign of the landscape that could enhance aesthetics, increase shoreline biodiversity, and reduce attractiveness to geese. Medium to low height shrubbery would reduce sightlines for the birds. photo credit: Jennifer Rae Pierce

RECOMMENDATIONS

Short-term

1. Strategic decisions regarding the Park Board's goal for Canada Geese management are an immediate need if the city is going to reduce costs and potential backlash in the future. Development of a plan for geese would therefore be a high priority. The Goose Population Management Analysis spreadsheet provided with this report can be a useful tool to aid in the generation of a goose population stabilization strategy. But first, the city must decide whether population stabilization/reduction is a goal or if public conflict reduction strategies are sufficient.

Areas of highest concern are Sutcliffe Park, the southern shoreline of Lost Lagoon, Ceperley Meadow, and Thornton Park.

2. Standard methods of counting geese and recording the data should be set in order to reduce data loss and make counts more useful and efficient. Population monitoring should be integrated with other counts, such as the Christmas Bird Count, and should continue on at least a monthly basis. Monthly population estimates should be based on more continuous monitoring. To increase the accuracy of counts, public volunteers could be recruited to cover populous areas continuously over a time frame of a few hours.

3. Expand the addling program to cover the entire city with 2 FTE staff to guard against a goose population boom while strategic decisions for geese management are made.

Medium-Term

1. Funding and support for the current and future geese population management program needs to be secured in order to prevent a lapse year that would increase the population for years to come.

2. Integration of the geese strategy with other Park Board planning activities such as the dog strategy, biodiversity strategy, bird strategy, tourism planning, and special events present a synergistic opportunity.

Pierce, J. R.

Location-based Recommendations

Sutcliffe Park at Granville Island

Issues: Close proximity of goose-populated areas and human occupation create issues for this park. Sutcliffe is a prime area for geese to raise goslings, often nesting on surrounding buildings. Concerns over feces, particularly during special events such as the Children's Festival are an issue. The close proximity of CMHC-controlled land also makes comprehensive management more difficult.

Recommendations: This site will require collaboration efforts with CMHC to coordinate goose feeding regulations, and to establish pre-event feces cleaning agreements. In the meantime, the implementation of contraceptive feeding could work well here. Public outreach regarding addling and nest access could be piloted in this neighborhood.

Lost Lagoon in Stanley Park

Issues: The South shore of Lost Lagoon is one of the most consistently occupied sites with large numbers of geese and goslings. The shoreline is non-vegetated and an easy slope for webbed feet. This is a common area for tourists and other visitors to encounter geese and goslings, so may be a good candidate to maintain some population but at a controlled density.

Recommendations: A redesign of the shoreline to reduce easy goose access points and to add shrubbery could improve aesthetics and reduce goose use while still maintaining high quality habitat for waterbirds. Lawn to the South of the cycling and walking pathways could be drastically reduced and replaced with shrubbery or gardens. This would reduce the draw for geese to cross the path and encourage them to stay along the shoreline.

(Continued on the next page)

For example, a dog event or promotion in the days leading up to the children's festival at Sutcliffe Park could clear the area of geese and their feces in advance of the festival.

Ceperley Meadow in Stanley Park

Issues: The bicycle and pedestrian pathways south of the meadow and the vehicular street to the West see a high frequency of goose and gosling crossings. The bike path is also a common place for geese to stand around, spreading feces on the trail.

Recommendations: The Park Board could investigate the installation of low fencing of an unobtrusive or aesthetically-pleasing style to reduce geese access to streets and pathways. Remaining open areas (such as at human crosswalks on the street) could have a "goose crossing" sign to increase safety.

Thornton Park

Issues: Frequent feeding of geese and clear sight lines combined with the Women's Memorial which gathers pools of drinking water make this site a hotspot for adult geese. Feces foul the memorial, causing distress for many visitors. See "Spotlight" section on page 20 for more information.

Recommendations: A grape-flavored powder added frequently to the memorial rainwater pools and sprayed on surrounding grass could reduce feces contamination. Geese feeding restrictions could be enforced here more strictly, possibly encouraging would-be feeders to relocate to areas nearby, such as the shoreline of Hinge Park or another area without the emotional weight of the Women's Memorial.

If a reduction in goose feeding behavior is not possible, a more costly option would be to consider landscape changes in the park. Shrubbery interspersed throughout the park and removal of mown lawn surfaces would decrease the comfort of geese who would have reduced sight lines and take-off/landing space. Shrubbery and fencing around the edges of the park and around the memorial could allow for certain areas of the park to be designated as off-leash for dogs.

3. A standardized public information packet with options for people facing goose problems should be available for city employees and the public in order to inform people of their options in handling cases such as geese nesting on buildings.

4. If contraceptive usage is to be approved for geese, the permitting process should be investigated.

Long-Term

1. Additional public outreach and education on the status and the management options for Canada Geese in the city are needed so that the public will be on board with the strategies that the city employs in managing Canada Geese. Increasing public support for egg addling, and awareness of the importance of reporting nest locations on private property would increase the effectiveness of geese management.

2. In order to strategize properly, coordinated actions across Metro Vancouver are needed, and also within the city such as with CMHC. Goose management in particular requires a high degree of coordination between land use agencies at all scales and public cooperation (Canada 2010).



photo credit: Thomas Walker



REFERENCES CITED

Beston, Julie A., Theodore C. Nichols, Paul M. Castelli, and Christopher K. Williams. 2014. "Survival of Atlantic flyway resident population Canada Geese in New Jersey." *Journal of Wildlife Management* 78 (4): 612-619

Butler, R.W., A. R. Couturier and E. Dickson. 2015. Status and Distribution of Marine Birds and Mammals in Burrard Inlet and Indian Arm, British Columbia. Pacific Wildlife Foundation & Bird Studies Canada. Unpublished Report. Port Moody, BC and Port Rowan, Ontario.

Canada. Environment Canada. 2010. Handbook: Canada and Cackling Geese: Management and Population Control in Southern Canada. Minister of Environment. pdf. accessed online at https://www.ec.gc.ca/mbc-com/6D2B893B-C671-41AF-8439-713305DB384C/Handbook_Canada_Cackling_Geese_e%5B1%5D.pdf

Canadian Wildlife Service (CWS) Waterfowl Committee. 2015. Population Status of Migratory Game Birds in Canada: November. CWS Migratory Birds Regulatory Report Number 45.

Crewe, Tara, Barry, Karen, Davidson, Pete, and Lepage, Denis. 2012. "Coastal waterbird population trends in the Strait of Georgia 1999–2011: Results from the first 12 years of the British Columbia Coastal Waterbird Survey." *British Columbia Birds* 22: 8-35.

Dawe, N. K. and A.C. Stewart. 2010. "The Canada Goose (*Branta canadensis*) on Vancouver Island." *British Columbia Birds* 20: 24-40.

Guerena, Katherine B., Paul M. Castelli, Theodore C. Nichols, and Christopher K. Williams. 2014. "Spatially-explicit land use effects on nesting of atlantic flyway resident canada geese in new jersey." *Wildlife Biology* 20 (2): 115-121

Humane Society of the United States, The (HSUS). 2012. Living with Wild Neighbors in Urban and Suburban Communities: A Guide for Local Leaders. available online at http://www.humanesociety.org/animals/wild_neighbors/register_community_leaders_wildlife_guide.html?credit=web_id97124018

Isaac-Renton, Miriam, Joseph R. Bennett, Rebecca J. Best, and Peter Arcese. 2010. "Effects of introduced canada geese (*branta canadensis*) on native plant communities of the southern gulf islands, british columbia." *Eco-science* 17 (4): 394-399.

Jones, Ziggy. 2001. The Management of Canada Geese Populations in the City of Vancouver. City of Vancouver Board of Parks & Recreation. pdf.

MacDonald, Alexander, and Wolf, Erick. 2013. "The Political and Social Barriers for Contraception in Pest Birds: A Case Study of Ovocontrol (Nicarbazin)." *Journal of Zoo and Wildlife Medicine* 44(4S): S132–S134.

Parksville, City of. 2016. Goose Management Strategy - City of Parksville. 2 Feb. pdf. <https://www.parksville.ca/cms/wpattachments/wpID507atID7092.pdf>

Kullas, Heather, Matt Coles, Jack Rhyhan, and Larry Clark. 2002. "Prevalence of escherichia coli serogroups and human virulence factors in faeces of urban canada geese (*branta canadensis*)." *International Journal of Environ Health Res* 12 (2): 153-62.

People for the Ethical Treatment of Animals (PETA). no date. Humane Goose Control Solutions: A guide to integrated management programs. pdf. Accessed online at http://www.marylandgoosepatrol.com/PETA_Humane-GooseControl.pdf

Ray, Elizabeth. 2011. Population Dynamics and Habitat Selection of Resident Urban Canada Geese (*Branta Canadensis*). Scottsdale, AZ. <http://hdl.handle.net/2286/9vrhemkaloc>

Ronke, Margaret E. 2014. Survival, abundance, and geographic distribution of temperate-nesting canada geese (*branta canadensis*) in arkansas . MSc Biology, ProQuest LLC.

Vancouver Board of Parks and Recreation (VBPR). 1984. Stanley Park master plan. City of Vancouver, Vancouver City Council.

Volz, Trent J and Thomas P Clausen. 2001. "Tannins in *puccinellia arctica*: Possible Deterrents to Herbivory by Canada Geese." *J Chem Ecol Journal of Chemical Ecology* 27 (4): 725-732.

Worcester, Robin. 2010. State of The Park Report for the Ecological Integrity of Stanley Park. Stanley Park Ecology Society.

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General Manager, University Golf Club

Jeff Mclean

Superintendent at Langara Golf Course, Board of Parks & Recreation

Tricia Meneghello

Horticulturist at Sutcliffe Park, Board of Parks & Recreation

Britney Niedzielski

Migratory Bird Biologist, Canadian Wildlife Service

Jarrold Oliver

Assistant Links Superintendent, Marine Drive Golf Club

Colin Priddle

Park Manager, Board of Parks & Recreation

Henry Pahl

Superintendent, Musqueam Golf and Learning Academy

Nick Page

Biologist, Board of Parks & Recreation

Brian Quinn

Manager of Park Operations, Board of Parks & Recreation

Beverly Ramey

Director at Large, BC Nature (Federation of BC Naturalists)

Winson Tang

Team Lead, CoV HR, Digital Strategy & IT

Karen Taylor

Program Manager, UBC Sustainability Initiative

Frank Vargas

Superintendent, Point Grey Golf & Country Club

Jennifer Wahl

Policy Analyst, CoV Office of the City Manager

James Warkentin

Superintendent, Board of Parks & Recreation

Gloria White

Permits Officer, Environment and Climate Change Canada, Canadian Wildlife Service

Erick Wolf

CEO, Innolytics LLC

Robyn Worcester

Natural Resource Management Specialist, Metro Vancouver

Melinda Yong

Environmental Coordinator, Parks at the City of Burnaby

Appendices



APPENDIX 1:

eBird Data Explanation and Analysis Methods

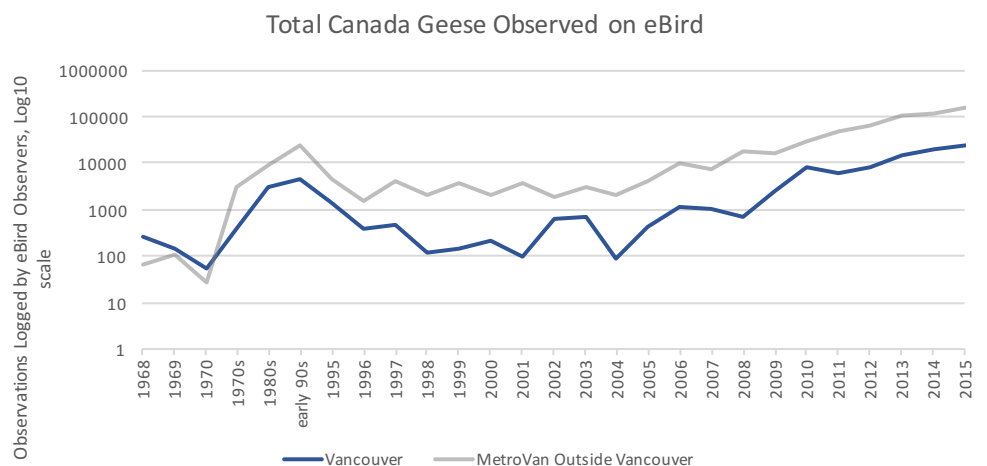
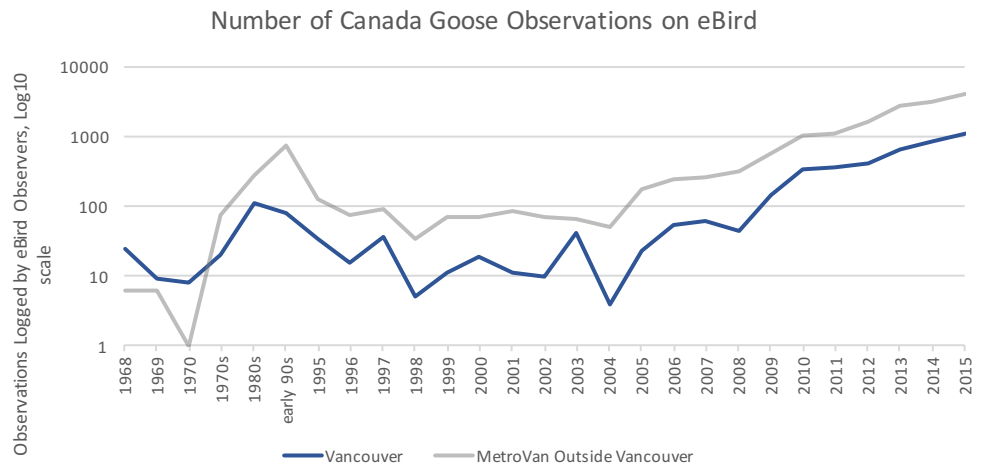
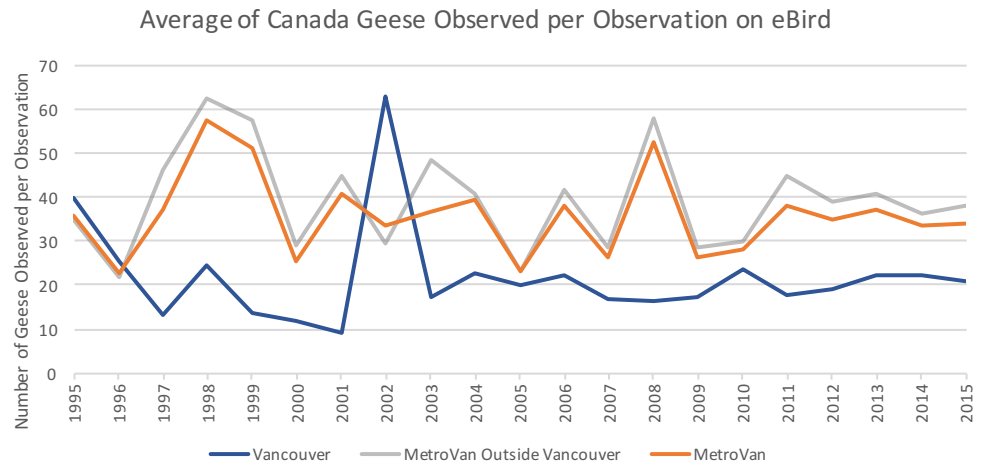
eBird data is submitted to the eBird website (www.ebird.ca/) by any user, combining citizen science with professional researchers.

The first chart at left shows the number of geese observed per observation in the Metro area, and then breaks down this data to the Vancouver area and outside of the Vancouver area. This is the most reliable method to indicate population growth because it accounts for the variable amount of time spent observing geese.

The second chart at left is an indicator for the reliability of the data. Years with less observations logged, have lower reliability. Data before 1995 is less reliable, based on the number of observers and consistency of the data.

The third chart is a simple count of all geese observed. Note how closely it follows the number of observations submitted. Therefore, it is not as accurate a method for counting the geese population as the first chart.

In order to increase the accuracy of the data, only data submitted under these eBird protocols are included: exhaustive, stationary, and travelling counts. Historical counts are included only in the annual analysis, not in the monthly (seasonal) analysis nor in maps. Casual observer and random location protocols are not included. The map only includes submittals by observers who have submitted at least 20 observations. Observations that indicate the presence of geese but not the quantity were replaced with the average observed size for all the data: 10.



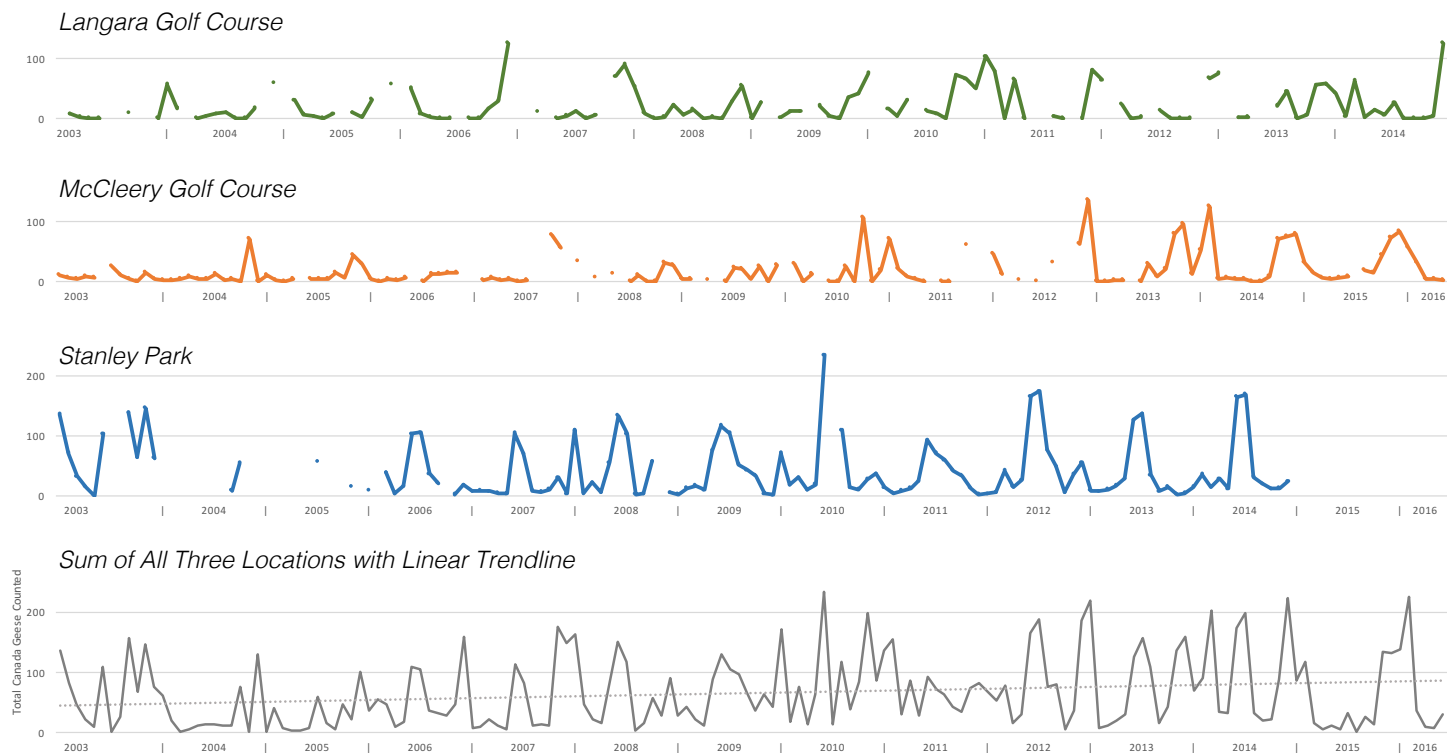
After eliminating these protocols, over 20,000 observations were available in the Metro area, more than 4,400 of which were in Vancouver.

APPENDIX 2:

Parks Board Monthly Data Collection Analysis

The Parks Board conducts Canada Goose counts approximately every month in their golf courses. Langara and McCleery courses consistently report having geese on the course, whereas other golf course counts are primarily fly over numbers. The Stanley Park Ecology Society counts Canada Geese at Stanley Park. These counts offer the most reliable data for Vancouver on a monthly basis, but they are not consistent.

Monthly Geese Counts by the City



The last chart sums all the data together. It shows high variability in the data, and a slight upward trend.

When all the data is added together, it seems consistent, but broken down by location, the data gaps become clear. There is not a consistent data collection method nor time of collection across sites. Also, a single data point for a species as mobile as geese is not very helpful since huge flocks can come and go in one location throughout the day. The counts are also time consuming. One golf course superintendent reported that the counts took 3 hours and covered the pond areas, but not the entire course. Observations from the University Golf Course are primarily fly over and are not included here.

Some months there are multiple data points for one location which have been averaged together to create this chart. Other months have no data at all, evidenced by the gaps in the lines.



*Understanding and Managing
Resident Canada Geese in Vancouver*

August 2016

Vancouver Park Board
and City of Vancouver

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