

Minutes – Standing Policy Committee on Protection and Community Services – February 10, 2014

REPORTS

Minute No. 45 Management of the Canada Goose Population at Retention Ponds

STANDING COMMITTEE DECISION:

The Standing Policy Committee on Protection and Community Services concurred in the recommendation of the Winnipeg Public Service and received as information the Winnipeg Public Service report.

Minutes – Standing Policy Committee on Protection and Community Services – February 10, 2014

DECISION MAKING HISTORY:

Moved by Councillor Fielding,

That the Winnipeg Public Service recommendation be concurred in.

Carried

STANDING COMMITTEE RECOMMENDATION:

On December 2, 2013, the Standing Policy Committee on Protection and Community Services requested that the Winnipeg Public Service submit a written report in 60 days.

Further on December 2, 2013, Mr. D. Domke, Manager of Parks and Open Space, Public Works Department, provided a verbal update on the Management of the Canada Goose Population at Retention Ponds.

On November 7, 2013, the Standing Policy Committee on Protection and Community Services requested that the Winnipeg Public Service report back, at the December 2, 2013 meeting of the Standing Policy Committee on Protection and Community Services, with an update on the management of the Canada Goose population at retention ponds since the Fall of 2011 and an action plan for the St. Vital Park.

ADMINISTRATIVE REPORT

Title: MANAGEMENT OF THE CANADA GOOSE POPULATION AT RETENTION PONDS

Critical Path: STANDING POLICY COMMITTEE ON PROTECTION AND COMMUNITY SERVICES

AUTHORIZATION

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RECOMMENDATIONS

That this report be received as information.

REASON FOR THE REPORT

That at its December 2, 2013 meeting, the Standing Policy Committee on Protection and Community Services requested that the Winnipeg Public Service submit a written report in 60 days on the Management of the Canada Goose Population at Retention Ponds.

IMPLICATIONS OF THE RECOMMENDATIONS

Canada goose populations in the City of Winnipeg can affect quality of life for citizens due to their waste deposits, noise, aggressive behaviour, health concerns and traffic safety issues. At the same time, geese can be considered to have recreational value and citizens will seek out goose populations in order to interact with them. Thus, there are variable tolerance levels that exist for geese in the City of Winnipeg. In the attached Canada goose project report there are a number of recommendations for the future study and long term management of Canada geese in the City of Winnipeg.

Recommendations included in the report involve six main areas: population monitoring, population management, the efficacy and feasibility of using deterrents and hazing techniques, vegetation management at retention basins, community education and involvement, and an examination of the feeding of Canada geese.

At this time, all recommendations contained within this report can be pursued within the current budget allocation.

Updated population numbers for resident and migratory geese completed in 2012 and 2013 are an important part of any goose management program. Continuation and expansion of population monitoring will be an important part of any long-term strategy to determine the efficacy of management techniques. Egg removals along Kenaston Boulevard by the Urban Goose Working Group, of which the City of Winnipeg is a member, reduced traffic safety issues related to the goose population in that area. Expanded egg removals may be an effective and humane method to reduce conflicts related to the goose population at retention ponds and other locations. In anticipation of expansion, goose nest mapping was added to the monitoring strategy in 2013.

In 2012 and 2013, deterrent trial studies were conducted with variable results. Some deterrents were subject to vandalism, their use was affected by weather conditions, and feeding of geese in the trial area affected the outcome. In cases where the deterrent appeared to work, geese did not leave the area but appeared to avoid the areas where the deterrent was placed. Thus, the use of deterrents/hazing is unlikely to reduce the overall population of Canada geese within the City of Winnipeg, but may be used on a site-specific basis to improve the efficacy of other management techniques. More importantly, moving geese from one retention pond may result in the goose population causing conflict in another area.

Vegetation affects how geese use retention ponds and where they spend their time. Conventional mowed retention ponds are ideal habitat for resident geese providing easy access to water, abundant food and open sight lines for predators. Naturalized retention basins are less likely to host resident geese in large numbers after goslings have hatched. Migratory geese will continue to use these naturalized basins as roosting sites, but observations showed that migratory populations tended to be lower at naturalized sites. It was noted that the establishment of a no-mow zone may be an effective way to reduce resident goose use near sensitive areas such as school yards and sports fields. Alternative turf trials began in 2013 and will be assessed in 2014, evaluating the potential of using goose deterring turf at sensitive sites.

Public feedback proved valuable in 2012 and 2013. Public involvement will serve to increase the probability of achieving management goals. Along with anecdotal evidence from the public, observations at retention pond sites were important in understanding the varying levels of tolerance that exist for Canada geese. Feeding of Canada geese at retention ponds was common. Any efforts to manage Canada geese at certain sites will be hampered by supplemental feeding. Public education and signage will attempt to reduce this behaviour.

HISTORY

Canada goose populations have been increasing in the City of Winnipeg as the amount of suitable habitat has increased. The system of parks and retention ponds within urban areas is ideal habitat for Canada geese, and has contributed to the proliferation of loyal resident populations. Winnipeg is also part of natural migratory flyways with geese using the City as staging grounds prior to migration in the fall. Over the years, a number of management techniques have been implemented in the City of Winnipeg to help manage the various conflicts associated with Canada goose populations.

In the 1990s, at Deacon's Reservoir, City of Winnipeg officials expressed concerns about water quality and contamination from increasing numbers of waterfowl. The City of Winnipeg developed the Deacon's Reservoir Management Plan. Active hazing of geese and other waterfowl took place between 1996 and 1999 with reported success using patrols with screamer shells and pyrotechnics at dawn and dusk. Beginning in 1998, birds of prey were added to the program and were reported to be a useful addition to the hazing program. In 2001, the Water and Waste Department trialed a laser goose dissuader to supplement the bird of prey hazing program. The laser goose dissuader was deemed useful during low light hours at deterring geese from the reservoirs.

The City of Winnipeg has been involved with the Urban Goose Working Group (UGWG) since its inception in 2000. The group was formed to address the conflicts related to Canada geese in the City of Winnipeg, and was formed by representatives of Environment Canada, Manitoba Conservation, and the Winnipeg Airport Authority. The goal of the UGWG is to reduce risks to human health and safety caused by Canada geese in Winnipeg's urban environment.

On September 26, 2007, City Council passed the recommendation to initiate a pilot project using professionally-handled herding dogs in order to disperse geese at Burland Park. In 2012, anecdotal evidence from a staff member of the Louis Riel School Division indicated that the program was not as successful as initially hoped. At the same site, a no-mow zone was established in 2007 along the northern edge of the retention basin as an effort to reduce the number of Canada geese using the school yard. Formal data for this site was collected in 2012, and it showed that geese do not spend much time feeding and resting in the no-mow area at this retention pond.

In January 2011, the Standing Policy Committee on Protection and Community Services recommended that City of Winnipeg Public Service report back on relevant legislation related to the management of Canada geese, provide an overview of the best practices used by the public and private sectors to manage Canada geese at retention ponds, and recommend a pilot project based on the best management practices.

In 2011, the Urban Goose Working Group began to address concerns related to traffic safety along Kenaston Boulevard. Egg removals in 2011 and 2012 reduced the number of geese using and nesting along Kenaston Boulevard. Continued egg removals along Kenaston Boulevard, and the expansion of the program to other areas where traffic safety is a concern is being considered by the Urban Goose Working Group for 2014.

A recommendation from the September 26, 2011, Standing Policy Committee on Protection and Community Services was supported by City Council through the 2012 budget process. Council agreed to fund a seasonal position and associated resources to monitor goose populations, hold consultations with residences, develop education and awareness materials, and work with residents to form goose dissuading programs in community areas.

In 2012, the Public Service began working towards an integrated Canada goose management plan for the City of Winnipeg with a focus on Canada goose populations at retention ponds. Population monitoring was conducted, an examination of goose use at different types of retention ponds (naturalized and conventional), deterrent trials and public education tools were developed in 2012. In 2013, population monitoring continued and was supplemented by nest searches, a novel deterrent trial and alternative turf trial studies were also added to the project.

FINANCIAL IMPACT

Financial Impact Statement Date: January 24, 2014

Project Name:

MANAGEMENT OF THE CANADA GOOSE POPULATION
AT RETENTION PONDS

COMMENTS:

As this report is for information purposes only, there is no financial impact associated with the recommendation. Recommendations related to future management goals outlined in the Canada Goose Project Management Report (Appendix A) are expected to be pursued within the current budget allocation.

There is potential for future enhancement of goose management activities identified in the report for which additional funding may be required.

"Original Signed by D. Stewart, CA"

D. Stewart, CA

Manager of Finance & Administration

CONSULTATION

In preparing this report there was consultation with:

Water and Waste Department

SUBMITTED BY

Department: Public Works Department

Division: Parks and Open Space Division

Prepared by: K. Tuchscherer, Education Coordinator and R. Penner, City Naturalist

Date: January 29, 2014

Attachment: Appendix A – Canada Goose Management Project Report

Appendix B – Summary of tasks completed and goals towards a long term Canada goose management plan.

Appendix A – Canada Goose Management Project Report

Executive Summary

Canada goose populations have been on the increase in North America since re-introduction programs began in the 20th Century. Geese were re-introduced to their traditional breeding grounds and also introduced to areas where they were traditionally not found. In many cases this included introduction to urban centres to provide wildlife viewing opportunities for city-dwellers. A variety of factors have contributed to the abundance of geese in urban areas. One of the most important contributing factors in the City of Winnipeg has been the development of retention basins for land drainage. These basins and the surrounding land are ideal habitat for resident geese. Since these open spaces, manicured lawns and access to water are attractive to both people and geese, conflict can result. Winnipeg is within a traditional migratory bird flyway. The availability of retention ponds for roosting at night, the absence of hunting within City limits, and the close proximity of agricultural fields for food has made the city attractive to migratory populations in the fall.

In 2012, the City of Winnipeg began examining the population of Canada geese within City limits. Resident Canada goose counts indicated there were 2142 geese located in the City of Winnipeg at 89 retention ponds (811 adults and 1331 goslings). In the fall of 2012, 119 sites were counted and the peak number was 70,027 geese. In 2013, population counts continued, 133 areas were assessed and a total of 2958 geese were counted (1482 adults and 1476 goslings). In the fall of 2013, the peak migratory count from 152 sites was 120,974. A large range of geese occurred between sites for both resident and migratory counts. Additionally in 2013, nest searches occurred at 31 sites at and near ponds. Nests were mapped and this information will play an important role in determining if egg removals are a reasonable part of goose management activities in the future.

Studies of goose habitat at naturalized retention basins showed these types of ponds support smaller numbers of resident geese. Vegetation management around retention ponds also appears to effect where geese spend their time feeding, loafing and depositing waste. When tall, un-mown vegetation was present (a no-mow zone), geese appeared to spend less time at these areas. Emergent vegetation appeared to deter Canada geese from spending time nearby while any break in an emergent vegetation buffer appeared to be exploited by geese at naturalized retention basins. While it appears to reduce goose numbers, naturalization does not prevent migratory geese from using the basins as roosting ponds and they will also nest at these locations. Both the updated population numbers and the in-depth study of retention ponds will provide the framework for future management. Vegetation management by using endophyte-infected turf may also play an important role in deterring geese from sensitive sites and a study was initiated in 2013 to determine the feasibility of using these alternatives.

Behavioural differences between resident and migratory geese affect the efficacy of deterrent use. Resident geese do not scare as easily as migratory populations. Deterrents trialed this year showed that even when effective, geese rarely left the area but typically moved further away from the perceived threat. Tolerance for use of predator models and mylar tape appears to vary among members of the public. Theft and vandalism affected the use of some deterrents, in particular when the deterrent was easily accessible. Public tolerance for noise-making, light-based devices and active hazing using dogs is unknown at this point in time, and could be studied further if deemed necessary.

Feedback from the public, City of Winnipeg staff and school groundskeepers indicated that the source of human-goose conflicts in Winnipeg is related to their droppings, aggressive birds, road safety and noise. Further public feedback suggests that resident geese are the source of greater conflict than migratory geese. To gain additional information from the public and other stakeholders, an informational website has been created and provides a way to contact the project, learn about geese and keep updated with the project activities.

Observations at retention basins showed that feeding of Canada geese was a normal occurrence. This is important to note because feeding of Canada geese will have direct impacts on any management

practices used on Canada geese. Feeding of geese also illustrates the recreational value that geese provide for some citizens which can be in direct conflict with other's perception of geese.

1.0 Canada Geese in the City of Winnipeg

1.1 Canada Goose Population Monitoring

Population monitoring is the cornerstone of Canada goose management in the City of Winnipeg. Accurate numbers that describe both the distribution and abundance of Canada geese will direct management efforts as well as aid in determining their effectiveness. Additionally, some management techniques require permits under the federal Migratory Birds Act. These permits require population numbers prior to their approval and continued population monitoring as a requirement of their renewal.

From 1998 to 2007 population monitoring of Canada geese in the City of Winnipeg was conducted, initially by Manitoba Conservation and beginning in 2002 with the members of the Urban Goose Working Group. In 2012, the City of Winnipeg initiated population counts by the members of the Urban Goose Working Group. Population counts were conducted in the summer and in the fall following the same procedures used between 1998 and 2007 to assist with data comparison. Goose counts are conducted during two periods in order to cover the two distinct populations of Canada geese – the urban or resident population and the migratory population.

1.1.1 Resident Canada Goose Populations

Summer goose counts take advantage of the flightless period of adult geese and goslings and their need to stay around bodies of water. Working with the member groups of the Urban Goose Working Group, the counts for the resident population took place in 2012 between June 13 and 22 and in 2013 between June 19 and July 4.

In 2012, 89 ponds and surrounding areas were assessed for Canada goose numbers. In total, 2142 resident Canada geese were counted which included 811 adult geese and 1331 goslings (Table 1). In 2013, 133 areas were assessed and a total of 2958 geese were counted of which, 1482 were adults and 1476 were goslings. These numbers are likely lower than the actual population. Private land owners, private and public golf courses, geese in and along rivers, and swaths of inaccessible land, host Canada geese as well. The summer population counts however, do include the areas where human-goose interactions are most likely to occur, at retention ponds. This is due to their locations in parks, near schools and sports fields as well as their proximity to households.

The natural response to the recent goose population counts is to question if there has been an increase or decrease in Canada geese in the City of Winnipeg. Based on the observations in 2012 and 2013, it may be possible to state that the population has been fairly consistent since the last observations in 2005 (Table 1). Manitoba Conservation estimated the pre-1999 summer population to be less than 2000 geese. The trend throughout North America, and Winnipeg is not the exception, has been an increase in Canada goose populations in urban areas since re-introduction programs took place in the 1960s. Since available data about urban Canada goose populations is from the recent past (1999 to 2005), anecdotal observations from area residents, particularly long-term residents, may play a role in answering that question over a longer period of time.

Within year variability in summer populations can be explained by natural movements of geese. Although geese tend to stay within the vicinity of ponds, resident flocks often move together between 2 or 3 nearby ponds. Many geese, either sub-adults or adults that had a failed nesting attempt typically move north from their breeding grounds to undergo the moult - known as moult migration. For example, Winnipeg geese without young will often moult migrate as far north as Hudson Bay. At the same time, Winnipeg receives moult migrants from the northern United States.

Counts may have more value looking at a site to site basis rather than on a City-wide basis. Geese numbers may result in conflicts in certain areas and examining population changes at those sites may

be particularly important. Reductions or increases in goose numbers on a city-wide scale may not have an impact on an individual site where geese are considered an issue.

Table 1: Canada Goose Summer Population Counts (1999-2013)

Year	Adults	Goslings	Total	# of Ponds/Areas Sampled
Pre-1999			<2000	Population Estimate
1999	664	1364	2028	110
2001	1430	1362	2792	93
2002	785	1199	1984	92
2003	1050	1019	2069	88
2004	1215	1580	2795	102
2005	953	1756	2709	53
2012	811	1331	2142	89
2013	1482	1476	2958	133

1.1.2 Migratory Canada Goose Populations

Canada goose populations in Winnipeg increase dramatically in the fall of each year with the arrival of geese from further north, using the City as a staging area prior to migration. For this reason, a second count is required in the fall. Recommendations from both the Canadian Wildlife Service and Manitoba Conservation indicated that peak migration occurs between September 25 and October 5 annually. Using this information two dates were selected each year for counting the migratory population.

In 2012, Canada goose population counts were conducted at 119 sites which included retention ponds, water treatment plants and parks in the City of Winnipeg. Additionally, open areas were counted both inside and just outside the Perimeter Highway. These are the locations where geese spend time feeding, particularly if they are agricultural fields. The first count on September 26th, 70,027 geese were counted while on October 4th, only 17,693 were counted (Table 2). There was a snow storm that day and it appeared that the geese hunkered down in fields outside of the count areas waiting out the storm. In 2013, migratory counts occurred at 152 sites which included retention ponds, open areas just inside and outside the perimeter, water treatment plants and parks. On September 24, 120,974 geese were counted with that number falling to 49 963 on October 4.

Migratory Canada goose counts exist for the City of Winnipeg from 1998 to 2007. The numbers are variable over those time periods due to natural variability in animal numbers and count methodology. It is believed that there were less than 100,000 geese staging in Winnipeg prior to 1998 and migratory counts reached up to 170,000 geese in 2004. Year to year fluctuations in animal populations are normal and examining the overall population trends over an extended period of time may have greater value. Data constraints such as counting a different number of locations each year and gaps in data from previous surveys can make city-wide comparisons difficult, but in many cases site-to-site comparisons are possible. It appears that areas with high migratory numbers are consistent year to year.

In both 2012 and 2013, there was large variability in migratory population numbers between ponds within the City. Looking at retention pond sites only, numbers ranged from 0 to 6500 geese in 2013 and between 0 and 5300 geese in 2012. Variability can be explained by location of the ponds and their

proximity to feeding areas, especially nearby agricultural fields. In the northwest portion of the city, migratory populations were the greatest. Proximity to the Winnipeg International Airport where geese and other wildlife are actively hazed and hunting pressure in the adjacent RM of Rosser makes the City of Winnipeg ponds in the northwest particularly attractive to goose populations. High migratory numbers also occurred at industrial sites, water treatment plants and at Fort Whyte Alive.

Table 2: Peak Fall Migratory Canada goose Estimates

Year	Maximum Fall Count	Areas Counted
1998	99,683	-
1999	120,714	-
2000	124,650	-
2001	120,977	-
2002	142,213	-
2003	146,362	-
2004	174,808	-
2005	167,132	-
2006	132,414	-
2007	50,050	-
2012	70,027	119
2013	120,974	152

1.2 Population Monitoring Goals

- Continued resident and migratory goose counts and nest searches/mapping
- Increase the number of sites where goose counts occur including:
 - New retention ponds in new developments
 - Private land owners, golf courses and other privately-owned properties
- Use population data to determine areas where management would be advisable

2.0 Population Management of Canada Geese in the City of Winnipeg

Population management is one way to reduce human-geese conflicts in the City of Winnipeg. Reducing goose numbers would likely result in less human-geese conflict, however, population management itself can generate conflicting views. Public opinion may dictate whether population management is a desirable management technique. Population management can involve translocating geese, lethal control, or egg removals. Permits from Environment Canada are required for population management under the federal Migratory Birds Act and are often considered the 'last line of defense'.

2.1 Current Population Management

2.1.1 Egg Removals

The Urban Goose Working Group (UGWG) is reducing traffic safety issues related to resident Canada geese along Kenaston Boulevard by using egg removals that target resident geese. Beginning in 2011, goose nests were mapped and eggs were collected in order to reduce the risk of accidents due to goose crossings. The UGWG applies for a permit from Environment Canada in order to conduct this activity and permission must be received from land owners prior to removals taking place. In 2011,

1,071 eggs were removed from 212 Canada goose nests from properties in the project area. 2012 saw a drop in the number of eggs as well as nests with 682 eggs being removed from 133 nests. This was attributed to geese finding a new location to nest in the year following an unsuccessful mating attempt. In 2013, both the number of nests and eggs removed were higher, 900 eggs were removed from 175 nests. A colder, later than normal spring may have resulted in the increase in the number of nests along roadways due to heat island effects causing snow and ice to melt in those locations first. Geese nest on vegetation rather than on snow, and examining weather data shows 2012 and 2013 to be much different. In 2012, the last recorded day with snow for Winnipeg was March 11 in comparison the last day with measurable snow cover in 2013 was April 23.

Egg removals have two main benefits, one immediate and one that may occur over the long-term. Adult geese without young will usually moult migrate after their unsuccessful nesting attempt, moving further north to undergo the moult. This can result in a reduction in the normal summer population (Table 3). Over the longer term, there may be a stabilization of goose populations in these areas, each year fewer goslings are produced.

Table 3: Egg removal and population data along Kenaston Boulevard (Sterling Lyon Parkway to Waverley) for 2011, 2012, 2013

Year	Goose Eggs Removed	# of nests	Estimated population of breeding adults (before egg removals)	Kenaston Area Resident Population		
				(after egg removals)		
				Adults	Goslings	Total
2011	1071	212	424	77	154	231
2012	682	133	266	46	65	111
2013	900	175	350	89	166	255

The City of Winnipeg will continue to work with the Urban Goose Working Group in situations requiring egg removal. Consideration towards expanding the egg removal program in the City of Winnipeg would involve a few steps prior to implementation. Completing this process requires population and nest mapping, as well as a description of the damage or losses caused by geese in order to apply for a permit under the Migratory Birds Act. Provided egg removals are part of an integrated management plan, it is considered an effective way to reduce human-goose conflicts in some areas. Organizations such as the Humane Society of the United States approve and promote egg removals as part of an integrated approach to conflict reduction.

For migratory populations, it is important to be aware that Winnipeg is part of a migratory bird flyway. Pressure from hunting outside of the city limits, in particular in the adjacent RM's of Macdonald and Rosser, also affects the movement of migratory geese. The City serves as a sanctuary from hunting during migration while nearby agricultural fields make the City even more attractive. In certain situations, implementing techniques that make retention ponds unattractive to roosting geese may be an option worth exploring. However, given the amount of desirable habitat within the city limits and the lack of suitable roosting ponds outside of the City, any techniques will likely not result in a reduction in the overall number of migratory geese using the city. In some instances, geese from ponds where effective control measures are put in place would likely move to another retention basin within the City limits. Still, since migratory populations will likely continue to be high in Winnipeg, some retention basins may be more suitable for higher numbers of migratory geese based on their location.

2.1.2 Nest Mapping

Nest mapping is essential for implementing reproductive control beyond the current egg removal area. Nest searches were conducted in areas where the public service had received notice that goose

conflicts may be occurring and/or where the 2012 population counts were the highest. The expansion of egg removals may prove to be an important component to an integrated management plan for geese. Nest searches were conducted at 31 ponds and surrounding areas. A total of 48 nests were located with 18 of those nests occurring in St. Vital Park. St. Vital Park has 2 islands in the duck pond. Islands and peninsulas are thought to be the most preferred nesting locations for geese due to their perceived protection against predators.

Geese prefer to nest in areas where there is some vegetation cover to reduce losses from predation. In wetland settings (i.e. naturalized retention ponds in urban areas), muskrat houses and vegetation islands are preferred by geese, but for geese that nest on the ground some vegetation cover is sought (i.e. there is likely a preference for taller vegetation over mown). Naturalized ponds appeared to host more nests than conventional ponds. It was much rarer to find geese nesting in mown lawn areas near retention ponds or along rock revetment, but it did occur in a few instances. However, looking at summer brood counts, naturalized ponds did not attract more families of geese, typically the number of goose families were either equal to or less than the number of nests. In other words, new families of geese were not moving to naturalized retention ponds to spend the summer months. At conventional ponds, in most cases, the number of nests present was 2 or less, but the summer goose population increased dramatically. For example, one pond had 0 nests in the spring but expanded to 77 geese in the summer, 50 of which were goslings.

In 2013, it was quickly learned that nest searches had to be expanded to areas adjacent to ponds in land that was un-mown. Binoculars helped to find nests but nest searches proved more challenging than initially thought. It may be found that 2013 was an abnormal year for nesting due to the late start of spring and 2014 may provide more favourable results at retention ponds. A goose nest was found behind a fast food restaurant on McPhillips Avenue by a citizen reporter which is 400 metres away from the nearest retention pond. In contrast, available literature indicates that geese typically prefer to nest within 50 to 100 metres of water. These observations indicate that nest searches in 2014 would have to be expanded beyond retention ponds, and likely will be selected based on land use (i.e. vacant agricultural, vacant residential or vacant industrial). Private land has potential to host many goose nests. Rail lines illustrate this point. Geese have been observed to be nesting along rail lines, however, access to this land is limited. In fact, the Urban Goose Working Group has not been able to receive railway permission for egg removals along rail lines near Kenaston Boulevard.

2.2 Future Population Monitoring Activity

Continuing to monitor populations is an important step in Canada goose management in the City of Winnipeg. Data from population surveys is effective in determining where resident and migratory populations of Canada geese are the highest and where management may be necessary. Continued population monitoring is also necessary in determining the success of implemented management techniques.

Areas that need to be assessed more thoroughly are the newest retention basins being developed in new housing developments. This is an opportunity to examine goose populations from the pond's inception and observe changes over time. Population comparisons between naturalized and non-naturalized retention basins are important and as more naturalized retention basins become fully functional, more comparisons will be possible.

Locations of goose nests are particularly important information for a few reasons. Due to goose loyalty for nesting sites, mapping nest locations will be required to decide where deterring geese from nesting will be effective. For resident populations, deterring geese before they establish nests is more effective because adult pairs will rarely abandon a nest once it has been initiated. Additionally, egg removals require information that ensures this activity is done in a humane and effective way including monitoring of when incubation of the eggs begins. Nest reporting by citizens should be implemented to alleviate the problems associated with covering a large geographic area and an abundance of nests on private property with limited available resources. Activities associated with humane egg removals include: nest

searches on public property and reports from private property owners, landowner permissions and permitting, nest monitoring (to determine initiation of incubation), egg removals, follow-up monitoring after egg removals to determine success. Egg removals require a permit from Environment Canada, and require an assessment of damage and identification of the root cause of the nuisance population (food sources readily available, water bodies nearby and their characteristics, and presence of suitable nesting areas or nesting structures). Permitted activities, such as egg removals, require short-term preventative measures to be implemented first. If the short-term measures are unsuccessful and a permit is required, it is intended for a temporary relief of nuisance geese. Thus, there is a need to propose alternative management activities to reduce reliance on egg removals.

Other considerations for the expansion of egg removals for nuisance geese would include when egg removals are used and how many citizen complaints trigger removal activities. In addition, given the mobility of geese, areas where eggs are removed may not have an impact/reduce populations at 'problem' areas (i.e. difficult to pinpoint which families of geese end up at which pond) due to the proximity of retention basins.

2.3 Population Management Goals

- Continued egg removal in areas of safety concern (Kenaston Boulevard) in partnership with UGWG members
- Consider expanding egg removals to other areas where traffic safety is of concern (Lagimodiere)
- Consideration of the expansion of egg removals for nuisance geese
 - Document impacts of Canada geese at retention ponds in order to facilitate egg removal permit application for potential control of nuisance geese

3.0 Deterrents and Hazing Techniques

Deterrents and hazing techniques were investigated and some trials occurred in Winnipeg in 2012 and in 2013. Each type of deterrent was investigated prior to selection for experimental trials. Much consideration was given to the sensitive nature of wildlife management in an urban environment and deterrents were also chosen with regards to animal welfare. The trials completed functioned as a method to determine their efficacy as well as the public's tolerance for some of the available deterrents. An indirect benefit from the trials was that they functioned as an informal method to get more citizens in contact with the project due to their visibility in public areas.

Table 4: Summary of Potential Deterrent and Hazing Techniques

Deterrent	Options	Trialed in 2012/2013	Notes
Chemical	Methyl anthranilate (ReJex-It, Avigon)	No	Not approved for use on recreational areas of parks, unable to use under the Pest Control Products Act.
Visual	Predator Models	Yes	Efficacy affected by vandalism
	Mylar Tape	Yes	Pilot project indicates some effectiveness, but effectiveness may be weather dependent
	Lasers and Lights	Yes	Flashing Beacon trialed and proved relatively ineffective.
Auditory	Goose alarm call play-back systems or cracker shells	No	Limited ability to use in a residential setting due to noise disturbance
Hazing	Dogs, and/or remote control boats	No	Require further study to determine feasibility in a residential setting. Level of commitment required for successful outcome limited by available resources.

3.1 Chemical Deterrent Options

3.1.1 Methyl Anthranilate

Chemical deterrents are marketed as a way to reduce the amount of damage caused by geese feeding on grass. In Canada, there are two products approved by Health Canada's Pest Management Regulatory Agency (PMRA), Avigon 14.5 and Rejex-It Migrate. These products have an active ingredient of 14.5% methyl anthranilate which is the same chemical used in grape flavouring in food. The chemical, when ingested by geese, causes them to get sick and they learn to avoid areas where it was applied. The Pest Control Products Act requires that any pesticide be applied following the product label instructions. In Canada, the product label for both Avigon 14.5 and Rejex-It Migrate indicates that these products can be applied to golf courses and municipal parks but not recreational areas of parks or on residential lawns. For this main reason, chemical deterrents were not trialed in City parks.

Consideration was given to setting up a pilot project based on using a buffer system on the non-recreational areas of parks. However, the delineation between recreational and non-recreational areas, in many instances, is not clear. Further, chemical deterrents applied to non-recreational areas would likely cause geese to avoid the sprayed areas and use the unsprayed recreational areas. Goose use of recreational areas is an existing source of conflict.

Other factors that make the use of these specific chemical deterrents challenging are related to the required application of the products. Any precipitation or mowing would require an additional application. Examining Environment Canada's climate data indicate that rain events in May and June would make re-application of these products very likely. This method is expensive with one application over a 1 hectare area costing approximately \$425 for the product alone. This amount does not include costs related to labour, equipment and other incidentals.

3.2.1 Predator Models

Predator models exploit a goose's natural aversion to staying where they perceive danger. Some types of predator models available are coyotes, foxes, owls and eagles. It is thought that seeing these models will make geese uncomfortable and they will move to another area. In 2012, predator models were chosen for a trial study to explore their effectiveness as well as the tolerance level of the public. Model coyotes, prowler owls with flapping wings and an eagle kite were chosen. Some of the deterrent sites had a single deterrent set up while other trial sites had a combination of deterrents used.

Coyotes could be considered the least effective as they were stolen within 24 hours of their placement. The location of one of the coyotes was reported through 311, however, even after searching the area, the coyote was never found. The prowler owl decoys stayed in place and were not stolen, likely because they were mounted onto soccer goal posts and less accessible. Strong autumn winds did damage the prowler owls, but they were modified to take the wind into account. In the spring of 2013, the owls were placed, but again damaged by wind making them unusable. The flying eagle kite because of its perceived value was only used by a kite handler and never left at a site unattended.

3.2.2 Mylar Tape

Mylar tape is considered a noise deterrent and a visual deterrent dependent on the brand. Irri-tape was used in two trial locations in the City of Winnipeg in 2012. The holographic tape flashes and shines in the sunlight and also makes a noise when the wind blows. Through the trial period the benefits and limitations of this method were discovered. This method was dependent on weather conditions. Wind is required for the tape to move and flash. However, unlike other visual deterrents, mylar tape can be effective after the sun goes down as the tape will continue to make noise given sufficient wind. In the study conducted in 2012, mylar tape was mounted to wooden stakes and a perimeter formed around a school's soccer field. At one site, there was some damage to the tape probably due to school children inadvertently damaging the tape. Another trial field that is near a high school yard had almost no damage. Mylar tape can also interfere with recreational activities if placed on stakes near sports fields, for example, mylar tape was used at school fields in 2012, but was requested not to be used in 2013 due to safety concerns from the school's teachers.

3.2.3 Lights- Lasers

A reportedly effective way to prevent geese from roosting on retention ponds is through laser lights or flashing lights. A laser system was reportedly effective at Deacon's Corner (water reservoir) at dusk when migratory geese were coming in to roost overnight. In residential settings the feasibility of using a laser light is still unknown. In fact, one anecdote from a resident in the south end of the city indicated that laser lights are a disturbance for area residents. In this case, homeowners were using a laser pointer to prevent migratory geese from roosting on the pond adjacent to their house. They deemed this technique very effective and geese avoided landing on the pond. The most interesting outcome was that Winnipeg Police Department came to their house because of complaints about the light from the laser. The residents suspect that they were inadvertently shining the light into someone's window. Any use of a laser-type deterrent would require approval and support from area residents prior to their use.

Commercially available flashing beacons have claimed to be effective at deterring geese from lawns and from roosting on ponds. Most deterrent products typically have strong claims for their efficacy, however, the public service's experience with other deterrents have provided poor to fair results in a public setting. One issue, beyond habituation by geese, has been the amount of vandalism that takes place when deterrents are placed in public areas. Given the advertised efficacy of a flashing beacon as a goose deterrent, a solar-powered, floating flashing beacon system was designed and constructed for use by the City of Winnipeg. In the fall of 2013, a beacon was installed at one pond in the City to determine its efficacy in deterring roosting geese. At the time of the report writing, data from the trial is still being analyzed.

3.3 Auditory Deterrents

Auditory deterrents were not trialed in 2012 and 2013 due to their potential for disturbance in residential neighbourhoods. The Neighbourhood Liveability by-law (No. 1/2008) addresses noise disturbance in the City of Winnipeg, however, there are exceptions under this by-law for activities performed by the City (By-law No. 1/2008 Part 5 Section 66g). Even in light of this exception noted in the By-law, the use of some of the auditory tactics may not be suitable for a residential retention pond. While cracker shells are used with apparent success in rural areas to prevent birds from feeding on agricultural fields, their use in populated areas has rarely been studied. The potential disturbance that they may cause to residents cannot be ignored, and would require further study and consultation prior to attempting to conduct a trial on their effectiveness in the City.

3.4 Hazing

Hazing can be more effective than the static use of deterrents, but requires a greater amount of resources. Effective hazing programs for resident geese reported in the literature usually promote a terrestrial and an aquatic component to hazing. Hazing on land causes geese to move to water for safety, once the hazing activity is finished, the geese return to land. Hazing programs in other jurisdictions have proven effective with the use of trained dogs to chase geese on land and at the same time using remote control boats in the water of a retention basin. Other variations of this program exist, but in order to have greater chance of success, the aquatic and terrestrial components of hazing are key features.

Remote control boats have also been noted as being effective in available literature on preventing geese from using ponds for roosting sites. The operation of a motorized boat in a retention pond requires greater analysis. There would be a need for a retrieval system and sufficient training to reduce the chances of losing boats in the water. Over the course of 2012 and 2013 field seasons, it has been noted that an effective deterrent to migratory geese may be the use of a canoe or kayak. Using a boat in a retention pond at the right time of day may be an important tool in hazing geese from ponds where migratory geese are an issue.

Conversations about the use of trained dogs with the supervisor of maintenance for the Louis Riel School Division proved to be informative. In 2007, dogs were used at Samuel Burland School, and were effective for keeping geese off of the field during the time they were there. However, as soon as the dogs left, the geese would return. He mentioned that the dogs would come at the same time every day and the geese seemed to remember and begin entering the water just before that time. Prior to implementation, an amendment to the Pound By-law was required to allow for the pilot study to be conducted at this location. In addition, some types of hazing will require permits under the Migratory Birds Act administered by Environment Canada. Hazing with dogs as a deterrent for Canada geese would need further examination prior to implementation in a residential setting.

3.5 Deterrent Studies

3.5.1 Fall 2012 Deterrent Study

The effectiveness of the deterrent techniques was evaluated at study sites in mid-September during the peak levels of fall migration of Canada geese. The study sites were previously reported as having nuisance populations of geese where goose droppings were an issue. Effectively removing geese from a retention pond and its surrounding area is challenging. Available literature indicated that when an area is large and is desirable as habitat, geese will often move less than a kilometre away. Working with that in mind, it was decided that the target for deterrents would be the areas of a park where goose use of the area would be the greatest nuisance – school fields and sports fields.

Sites 1 to 4 shown in Table 5 have populations of geese that conflict with high-use areas situated in school fields near residential neighborhoods. All sites were surveyed the week before the study commenced to ensure that the first migratory geese had begun visiting the area. Approximately 15-100

geese were observed at each site, and almost 1000 geese were observed at the Island Lakes retention pond.

To monitor goose activity in the absence of deterrents, each treatment site was paired with a control site that was within close proximity and was similar in area/habitat type to the treatment site. Deterrent(s) were established at each of the four treatment sites that included one or more of the following: mylar ribbon, a 3D coyote or a prowler owl (Table 5). An eagle kite was established at site 5 but, unlike the other deterrents, was not permanently installed on site throughout the study. Instead, the eagle was only flown for half an hour at a time.

Table 5: Goose deterrent(s) installed at each study site

Site	Treatment-Control Location	Deterrent(s) Used
1) John Forsyth Park	Soccer field – adjacent southwest field	Mylar ribbon
2) Burland/ River Park South	Samuel Burland School field – Highbury School field	prowler owl
3) Van Welleghem/ Pembina Trails	Soccer field – soccer field by Linden Meadows School	Mylar ribbon, prowler owl, coyote
4) Island Lakes	Waterfront Park – Parc de la Seigneurie	coyote
5) Wilkes – Waverley	Around retention pond – n/a	Eagle Kite

The deterrents were placed as follows. A strip of mylar ribbon stapled to one end of a wooden stake was placed every 10 m around the perimeter of the treatment area. Owls were mounted onto wooden dowels and duct taped onto the highest point of soccer goal posts on school fields. The original plan was to move the coyotes to a different position every 2 days to reduce habituation of geese to the coyotes and to create a more lifelike predatory display.

A survey of goose numbers was conducted at each treatment and control site for 10 days following the installation of deterrents. In addition, qualitative factors such as goose alarm calls and gaggle body language were also noted at the time of each count. Statistical analyses were performed to determine the effectiveness of the deterrents.

Results of the deterrent trials indicate that the mylar tape combined with a prowler owl decoy was effective at one of the sites with no observations of geese in the deterrent zone compared to the control site. Although the coyote was stolen, initial placement did result in geese moving away from the site or flying off. Since the effectiveness of a coyote model could not be determined due to theft, it is difficult to recommend this deterrent for future use in public areas. However, it may have value on private property provided the coyote was moved around frequently. Results indicate that geese at the trial sites did not seem to be affected by the prowler owl decoy probably due to its lack of visibility at dusk when geese are returning to their roosting ponds. Mylar tape alone appeared to be effective on migratory geese, but resident geese quickly habituated to it.

Use of the eagle kite caused geese to enter the water and swim away from the area where the eagle was being flown. The kite was used at a site where the geese will typically approach humans for food. This technique did not cause geese to fly away or prevent new geese from landing in the pond, but it did help to move geese away from an area.

From this trial study it was found that area schools and the public seemed generally supportive of the use of goose deterrents providing helpful comments and feedback. Information was gathered from each site that would be known to park users and area residents. For example, at John Forsyth Park residents

feed the geese daily right at the study site. It was found that public's tolerance for static deterrents seemed to be sufficient to consider their use in the future; however, any deterrent that was not placed out of reach would likely suffer from vandalism.

3.5.2 Fall 2013 Deterrent Study

In October 2013, a trial using a light deterrent was initiated. Based on prior experience, any deterrents would likely have to be out of the reach of the general public. Flashing lights have been purported to work on roosting Canada geese, reportedly because it disrupts sleep. Thus, the use of a visual deterrent that is placed out of the reach to reduce the chance of vandalism was deemed useful for further exploration in the fall of 2013. One deterrent that would fulfill these criteria is a floating, flashing beacon to reduce goose roosting on retention basins. There were two main desired outcomes of the trial: determining if a flashing beacon is an effective goose deterrent on migratory geese, and determining if the flashing light would be a disturbance to the general public.

The study site was selected carefully. There was an attempt to select ponds where a flashing light would not knowingly be a direct disturbance to nearby homes. Ponds that did not have homes backing up directly onto the water and where the pond sat at a lower grade to the adjacent park land were chosen by examining aerial photos and conducting site visits. Initially, two residential retention basins were selected as the site for beacon installation and as a control site, however, migratory counts (September 24 and October 4) showed a dramatic decrease in numbers at the desired ponds before installation took place. Given the intention to reduce migratory numbers at the retention basin it was decided to move the study site to an industrial area off of Mazenod Road. The site chosen had high migratory numbers, but eliminated the ability to measure the effect of disturbance on nearby homes. In hindsight, the change to an industrial site may have prevented potential issues at a residential site where the beacon did not work to deter geese but served to bother people.

Initially, direct observations were made at the site after beacon installation. These observations indicated that the presence of the beacon did not prevent geese from landing on the pond. Further measurement of the effect of the deterrent was facilitated by the use of a trail camera. The camera was set up along the edge of the pond and set to scan at dusk and dawn for 2 hours. Photos were taken at 5 minute intervals and will be used to determine if Canada geese were avoiding the area where the beacon was placed. The results from the trail cam will be assessed this winter to determine whether a flashing light could be an effective deterrent to goose roosting at night.

3.5.3 General Comments on the Use of Deterrents

Deterrents, not surprisingly, appear to impact migratory geese and resident geese differently. Observations of the migratory populations of Canada geese confirm the behavioural differences often noted in the literature. Migratory Canada geese will move away as soon as a person approaches either flying away to another location nearby or entering the water and moving to the furthest point possible away from the "threat". On the other hand, resident geese will not move away and at most residential locations the geese would approach humans looking for handouts. Adult geese with goslings in tow will have very high tolerance for deterrents and once goslings are present deterrents likely will have no to little effect. In the fall, behavioural observations showed the resident population sitting in the middle of the deterrent trial area, unfazed by the deterrents being used.

Deterrents alone will likely not change the population of Canada geese in the City of Winnipeg, but deterrents may help with attempts to move the population of Canada geese away from sensitive sites. The system of retention ponds in the City of Winnipeg and their close proximity to one another makes the successful use of deterrents challenging if city-wide population control is the goal. Attempts to repel geese from one pond may result in the geese moving to a nearby retention pond within the City limits. During the deterrent trials, in the instances where deterrents appeared effective, geese generally did not leave the area when deterrents were used but just moved away from the deterrent.

Goose populations can be considered problematic at some ponds based on the adjacent land use. The concept of tolerance zones that dictate where geese can and cannot be should be considered as a part of a Canada goose management plan. Using this concept, a system of varying tolerance zones could be implemented. As an example, goose use of a school sports field could be discouraged through the use of deterrents, while an adjacent area not used for recreation could be an area where geese are acceptable.

3.6 Deterrent and Hazing Goals

- Begin active hazing trial of migratory geese at 4 to 5 pond conflict areas in close vicinity to determine effectiveness
- Examine nest location data to determine if deterrents could be used to reduce nesting by resident geese.

4.0 Community Involvement and Education

The community involvement and education component of this project will improve the success of management techniques. Wildlife management is a sensitive topic, and there are a wide variety of opinions related to this issue. These opinions, no matter how different, are all valid. Any techniques implemented should be well thought-out with all stakeholders' opinions taken into account. Given the variability in individual tolerance for Canada geese as well as the differences in opinion about acceptable management practices, public input will be important. Control or management techniques need to be accepted by the community that will be affected.

4.1 Feedback from Citizens

Given the lack of recent population data, there was an opportunity to gain the background information necessary to know where to target the public consultation component of the project. There is not a significant number of calls that came from 311. There was not much available information about where geese were considered problematic, and much had to be inferred from potentially outdated population counts. Through multiple site visits, population counts and discussions with local residents it was possible to understand the goose-human conflicts in some areas. Communication from the public and feedback from Public Works Department staff, and school groundskeepers proved valuable. To date, the feedback from the community has been limited but has been in favour of reducing the issues associated with Canada geese.

The issues related to geese that were communicated by the public and others were: goose waste, aggressive birds, traffic safety, noise, and people feeding geese. Mapping the areas of concern did not reveal a strong geographic component with typically one complaint or comment in each area of concern.

4.2 Public Education Materials

In 2012, a website was launched and outlines the following:

- General information related to goose biology
- Education about feeding Canada geese
- Contact form to leave comments and to get involved
- Potential management options
- Progress reporting on activities
- Links to external websites for further detailed information
- Tips for homeowners
- Frequently Asked Questions

It is hoped the website will be an effective outlet that allows citizen's to give their feedback, raise awareness of their community's goose population, and provide ideas about goose management. Signage related to feeding of geese was developed in 2013, and will be piloted in 2014 in the Garden Grove Community.

4.3 Volunteer Opportunities

Given the number of residential retention ponds, assistance from community volunteers will be important in obtaining the goals set out in any City-wide management plan. To date, there has not been a significant interest generated from the website. Canada goose management activities will also provide unique and interesting opportunities for citizens. Some of the activities proposed to have a volunteer component are nest searches and location reporting, as well as assisting with deterrent use. There is a possibility, given proper permitting and training, citizens could be involved in any future egg removal activities. Citizens will also be able to help with monitoring goose populations and to improve effectiveness of control measures.

4.4 Community Involvement and Education Goals

- Increase feedback from the public through promotion of the website
- Increase number of publications created and plan for greater distribution
- Engage citizens to report nests in the City of Winnipeg
- Using recent population data and feedback from the public, try to determine goose population tolerance level

5.0 Vegetation Management

Canada geese are attracted to urban areas due to easy access to water bodies and the expanses of mown grass for food. Vegetation management near retention basins affects geese ability to access the retention pond and encounter food. Management decisions that can be made and can affect goose use are mowing, vegetation height and species composition. Literature reviews and anecdotal evidence indicate that Canada Geese use retention ponds differently depending on the surrounding vegetation. In 2012, an in-depth study was conducted to determine how Canada Geese were using retention ponds based on vegetation management practices in Winnipeg. In 2013, a trial study was initiated to determine if turf species can be selected to reduce feeding by geese in areas where mown turf is desired. These data and observations will aid decision-making with regards to vegetation management around retention ponds and the role it plays in a goose management plan.

5.1 Goose Habitat Use at Retention Ponds

Retention ponds were selected in Winnipeg to assess how geese use retention ponds; essentially where they spend their time eating and loafing (resting). An experiment was designed to determine if naturalized vegetation or no-mow zones could affect how geese use retention ponds. Geese were counted at eighty-nine retention ponds, and at eleven of these ponds, a goose dropping analysis was also completed. Geese will defecate where they feed. Using a quadrat system, fecal deposits were counted along with vegetation height to try to determine if the height of vegetation determined whether geese were using the area for feeding. Geese can spend up to 12 hours a day feeding, making goose waste counts a proxy for where geese are spending their time during the day.

Similar to other studies, it was found that geese spent less time in areas where vegetation was taller compared to areas where the vegetation around retention ponds was mowed. There are a few reasons for this phenomenon. At ponds where the vegetation was naturalized and there was an emergent buffer surrounding the pond, the ease of access into the pond is much reduced, especially for small-bodied goslings. Inability to easily move into the water would cause geese to choose areas where emergent vegetation was not present. In addition, preferred food in the form of the tender new shoots of the most

common lawn/grass species becomes less available when the grass is not mown. Finally, taller vegetation also provides locations where, from a goose's perspective, predators can lurk. Open views are preferred by geese.

Naturalized ponds in Royalwood and Harbourview South had goose populations; however, the fecal counts were concentrated in areas where there were breaks in the emergent vegetation. It was also noted that at the naturalized Royalwood retention basins, there was evidence of geese browsing on big bluestem. Big bluestem is a warm season grass, and it begins its growth later than cool season grasses. Most likely, this browsing ended once the big bluestem matured and became unpalatable. Browsing of native vegetation at Harbourview South was not noted likely due to the abundance of mown lawn surrounding this retention pond which would be a preferred food choice. The two naturalized Royalwood ponds lack these open areas of mown grass; the grass areas are limited to boulevard strips and front lawns of houses.

In practice, establishing a no-mow zone along the pond adjacent to the field of Samuel Burland School may have played a role in reducing problems with the goose population using the school field. Waste counts in 2012 indicated that the geese in the area were preferentially using the mown portion on the east side of this pond for feeding and loafing. The addition of houses along the south side of the pond probably contributed to the reduction in the problems for the school as well.

In general, traditional retention pond design produces ideal goose habitat. An effective way to prevent future ponds from having similar goose issues is to change how basins are designed. Landscaping can be an effective way to reduce geese raising young at retention ponds. Considering that a gosling requires about 85 days to develop the ability to fly, the goslings and their parents need to stay around retention basins during this time. Design of a future retention pond could incorporate features that are unattractive to geese to reduce conflicts in the future. Additionally, observations and measurements of geese showed them using breaks in emergent vegetation for entering and exiting water, and as a place to loaf. Encouraging the growth of and not removing vegetation along the edges of traditional ponds adjacent to sensitive areas may be an effective way to change goose feeding locations and subsequent defecation.

One aspect to consider is that naturalized vegetation does not prevent migratory geese from using those ponds as roosting sites. Additionally, resident geese will use naturalized retention ponds for breeding and nesting. Nest searches in 2013 uncovered that although naturalized retention basins hosted goose nests (between 0 and 4 nests each), naturalized ponds did not have any further additions to their summer population. Reports from residents who live around a naturalized retention basin indicate that after breeding and the goslings hatch, there was a reduction in the number of geese, likely because families moved to more suitable brood-rearing grounds with short vegetation. At one new retention pond that is still being naturalized, it was observed that the goose population was taking advantage of any patches of short vegetation. However, these areas were small, and will not sustain many geese.

5.2 Alternative Turf as a Goose Deterrent

Vegetation management is a well-known solution to reducing issues related to Canada geese in urban settings. Naturalization, as previously noted, is one common method that appears to be effective in the City of Winnipeg and in other jurisdictions. In some areas, the use of naturalized vegetation is not always functional or desired by area residents. Thus, other options must be explored. Endophyte-infected tall fescue (*Festuca arundinacea*) has been seeded on airfields in the past and has been shown to reduce the numbers of geese feeding at those locations. Various studies have shown that ingestion of alkaloids produced within the endophyte-infected grasses can induce weight loss and reduce reproductive capacity in test animals, including birds. Additionally, it has been shown in captive bird studies that Canada geese, when given a choice, will selectively graze on uninfected grasses. The use of endophyte-infected grasses could prove to be a promising method for deterring geese from sensitive sites in areas where traditional turf is desired.

Endophyte-infected grasses are readily available commercially, and have good overall vigour, stress tolerance and resistance to insect pests. Careful selection of a turf grass mix that ensures suitability for both goose deterrence and public use is particularly important. It was necessary to look for characteristics that would ensure both high endophyte levels and the production of a quality turf that follows the City of Winnipeg standards. The three endophyte-infected grasses that were selected are tall fescue, creeping red fescue (*Festuca rubra*), and perennial ryegrass (*Lolium perenne*). Tall fescue was selected due to its high endophyte levels, providing it with potential goose deterrence capabilities. Tall fescue is a bunch grass that will not create a solid turf thus requiring the addition of red fescue. In order to out-compete weeds, perennial ryegrass was added due to its fast germination and growth rate. Each species of grass have multiple varieties available on the market. The varieties chosen are known to have high endophyte levels in the seed.

Study sites were selected using a number of criteria. Examination of aerial photos, site visits, brood count numbers and an assessment of land use near retention basins were used to determine trial sites. Sites were selected based upon the number of resident geese present during the 2012 and 2013 brood counts to ensure that measurable grazing would occur. At each site, observations were made to determine where the resident geese were grazing (presence of waste deposits, vegetation height and direct observations). After all observations were made, two sites were chosen based on those criteria and on the potential impact to recreational opportunities, public perception and adjacent land-use.

At each test site, half of the test plots were seeded in October 2013 with the endophyte seed mix described above. The other half of the test plots act as a control and were freshly seeded with a typical turf grass mixture following City of Winnipeg seeding specifications. The use of a typical turf grass mixture will attempt to eliminate the effects of goose preference for healthy, freshly-seeded turf. The turf grass chosen for the control sites is a mixture of Kentucky blue grass, perennial rye grass and creeping red fescue known to have low levels of endophytes.

Table 6: Test site location and characteristics

Test Site	Location	Resident Goose Count 2012	Resident Goose Count 2013	Plot Size
Santa Fe Park	Adsum Drive and Dr. Jose Rizal Way	58	45	25m x 12.5m
Woodsworth Park	Park Lane Ave	97	44	12.5m x 10m

The Santa Fe Park site had a total of 45 resident geese during summer brood counts while vegetation sampling indicated little to no desirable turf vegetation (Table 6). In fact, the amount of grazing by geese at this site was extraordinary. This site has no emergent vegetation that would limit areas of egress for geese but the site is small compared to the number of geese ensuring that there will be active grazing of the site. Two test plots (control and endophyte mix) were set up at this site and were sized to ensure the entire resident goose family groups would be able to graze in one plot. The Woodsworth Park site had 97 and 44 resident geese in 2012 and 2013, respectively, and two main areas where the turf was heavily grazed. Two smaller test plots (12.5m x 10m) were installed at this site at a break in the emergent vegetation where geese were frequently observed over the past two years grazing the existing grass. The emergent vegetation at this site limits the areas where geese are entering and exiting this pond and a naturalization area also limits the area in which they graze.

Assessment of the sites will begin in the spring of 2014 for germination and any follow-up weed control will be completed on an as needed basis. Trial plots will be gridded off in spring 2014 to prevent geese from grazing the newly germinated seedlings. Once the grass has grown to a sufficient height and vigour, geese will be allowed to graze freely and assessment of grazing patterns will commence.

There are multiple variables that can be assessed to determine the grazing differences, if any, between the control and endophyte plots. Possible analysis can include: assessment of waste deposits (count/m²), vegetation sampling of plot areas to plant composition before during and after goose grazing, height of vegetation to determine amount of grazing, presence/absence of geese in plots, observation of bill touches in the plot areas. Statistical analysis will be performed to determine any significant differences between the trial plots based on one or more of the variables listed above.

5.3 Future vegetation management

Trials and studies have covered the effects of naturalization at retention basins and turf species selection studies will be evaluated next year. Changing mowing cycles also can be examined as there is evidence that reductions in mowing may reduce conflicts with Canada Geese. A no-mow zone near Samuel Burland School appeared to reduce visits to the area with geese preferentially choosing a mown area. Strategic mowing may reduce problems with geese near sensitive sites. A trial study should be implemented to determine if mowing cycle changes can affect goose habitat use at residential retention ponds. Additionally, with public consultation, no mow zone additions could be supplemented with trees and shrubs. Shrub additions can be designed to reduce sight lines for geese, reducing their feeling of security.

5.4 Vegetation Management Goals

- Exploration of suitable sites for vegetation management based on lessons learned in 2012 and 2013. Vegetation management could include:
 - i. No-mow zone (reduction in mowing)
 - ii. No-mow zone supplemented with plantings (shrubs, wildflowers, etc.)
 - iii. Complete changeover (from conventional to naturalized retention basins)
 - iv. New retention basins are naturalized
- Assessment of endophyte-infected turf trial
 - Dependent on outcome from 2013 trial, a consideration toward expansion in other areas

6.0 Feeding of Canada Geese

Most wildlife experts agree that feeding of wildlife by the public is undesirable. However, from the public's point of view, it is often thought that supplemental food is beneficial to wildlife. Well-intentioned members of the public may actually be negatively affecting the health of a goose population as the food rarely meets the nutritional requirements of geese, and geese congregating at feeding sites can increase the chance of transmission of avian diseases.

From a management perspective, feeding can interfere with intended outcomes of management practices. Reproductive control, such as eggging, often causes the geese that are unsuccessful breeders to moult migrate. Feeding geese may prevent geese from moult migrating, causing them to stay around during the summer months, when the desired effect was to get them to leave in order to reduce the summer resident goose population. Achieving success using deterrent tactics is already difficult due to habituation (i.e. the geese get used to the scare after a while), and feeding may reduce the success of deterrent techniques even further. In the 2012 deterrent trials, some of the results in one area were influenced by people feeding geese.

Additionally, when geese congregate in areas where food is being provided, it concentrates the bird droppings and often geese are fed near pathways and benches where the general public is more likely to come into contact with droppings. Geese that are fed will also begin to approach humans without fear and some may begin to approach humans in a more aggressive manner. Studies indicate that in areas where geese are regularly fed, the damage to turf from goose feeding is actually greater.

6.1 Status of Feeding of Canada Geese in the City of Winnipeg

A number of residents in Winnipeg feed geese on a regular basis. This is an activity that many people enjoy, and it is one way people interact with nature. In parks where feeding by humans is practiced, there is a notable difference in goose behaviour. It is very easy to determine which geese are being fed. At retention ponds near residential areas observations of geese indicate that feeding of geese is the norm not the exception.

Available literature and Environment Canada suggest that as part of a long term management plan, feeding should be strongly discouraged, and, if possible, banned. Educating the public about the reasons not to feed geese may be an effective way to reduce the occurrences of feeding especially near sensitive areas such as school fields and sports fields. Opportunities to provide alternative ways to appreciate geese should be promoted with the goal that feeding is not necessary to enjoy the presence of geese and other wildlife.

6.2 Jurisdictional Scan of Wildlife Feed By-laws in Canadian Cities

Examination of other city's websites for by-laws showed a large proportion of cities that had "no feeding" by-laws in place. At this time, it is not known if there is actual enforcement of these by-laws, but, regardless, they can serve to educate the public about the risks of feeding wildlife in the City (Table 7).

Table 7: Canadian cities with wildlife feeding by-laws in place

City	Feeding By-law
Calgary	No
Edmonton	No
Regina	No
Chilliwack	Yes
Victoria	Yes*
Dryden	Yes
Mississauga	Yes
Hamilton	Yes
Toronto	Yes
Milton	Yes
Whitby	Yes
Oakville	Yes
Halifax	Yes

* Does not include waterfowl

6.3 Reducing Supplemental Feeding Future Goals

- Examine effective ways to educate about the consequences of feeding geese. This could include:
Signage at known feeding areas
Providing alternative ways or ideas to enjoy nature without feeding
- Examine the possibility of a no feeding by-law in Winnipeg
- Consideration of other alternatives such as designated feeding areas and no feeding zones (e.g. away from sports fields, school yards, pathways, and benches)

Appendix B – Summary of tasks completed and goals towards a long-term Canada goose management plan

Technique/Activity	Tasks Completed	Outcome	Recommended Future Management Goals	Resources requirements and limitations to achieve recommended management goals
1. Population Monitoring	Resident Goose Population Counts– (2012 and 2013) Migratory Goose Population Counts (2012 and 2013) Nest Searches and Mapping (2013)	Counts updated historical population data (last completed by UGWG in 2005) General population trends can be inferred using historical data 31 ponds and their surroundings searched for nests Nesting appears to be limited on city-owned property	Continued resident and migratory goose counts and nest searches/mapping Increase the number of sites where goose counts occur including: New retention ponds in new developments Private land owners, golf courses and other privately-owned properties Use data to determine areas where management would be advisable	The current level of monitoring is likely able to continue with support from the UGWG members. In order to add additional goose counts, support will be required from the public and private land owners and may require additional resources to complete. Based on nest searching in 2013, nest mapping will require support from private landowners, as nests were not as abundant on city-owned property as imagined. If nest reporting does not occur by sufficient numbers of private land owners its potential use for the expansion of egg removals may be limited.

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2. Population Management	Egg Removal on Kenaston Boulevard (2011,2012,2013) Nest mapping (2013)	Local reduction in goose population along Kenaston and a likely reduction in traffic safety issues Experience with nest mapping indicates that nest searches should be expanded beyond retention basins if egg removals are to be considered for nuisance geese.	Continued egg removal in areas of safety concern (Kenaston Boulevard) in partnership with UGWG members Expanding egg removals to other areas where traffic safety is of concern (Lagimodiere) Consideration of the expansion of egg removals for nuisance geese Document impacts of Canada geese at retention ponds in order to facilitate egg removal permit application for potential control of nuisance geese	Current level of egg removals is likely sustainable provided the UGWG continues involvement in the project. An expansion for safety reasons (Lagimodiere) would likely be possible provided UGWG continues their involvement. A further expansion of egg removals for nuisance geese would require a greater amount of time and effort dependent on the number of areas to be targeted. The challenges involved in expansion of the egg removal program would involve the following: Likely requires substantial involvement/support from community members and private land owners in reporting nests. Alternately, permission could be given by private landowners to allow for nest searches on private property. General acceptance of egg removals as a management option by members of the public Level of commitment to achieve success may not be possible given current resources in the City of Winnipeg and there could be consideration to contracting out nest mapping activities:

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3. Deterrent and Hazing Techniques	Trials completed using mylar tape, 3-D coyote models, prowler owls, flashing beacons to deter migratory geese	Some effectiveness but greatly affected by weather conditions, habituation by geese, and vandalism	Begin active hazing trial of migratory geese at conflict areas 4 to 5 ponds in close vicinity to determine effectiveness Examine nest location data to determine if deterrents could be used to reduce nesting by resident geese.	Dispersal of migratory geese will likely require daily dedicated efforts throughout the migratory period, from around mid-September to mid-October which may be limited by currently available resources. The number of ponds to be hazed would likely include target ponds and other ponds in the vicinity. This is due to the proximity of retention ponds, the geese may move away but they may move nearby and could feasibly increase the goose population at nearby ponds. Knowing where geese relocate to may prove difficult to measure, however. Additionally, determining the cause of any potential decline in goose numbers may be attributed to either migration, the effect of hazing, or both. Importantly, it should be determined if success is achieved at the cost of higher goose counts at other ponds, prior to considering the expansion of hazing.

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4. Public Education and Community Involvement	Contact form available on City of Winnipeg website Development of a public education brochure Design of signage to reduce feeding	Some valuable information gained on goose populations and their impacts Information from the public helped to guide trial study locations and methods	Increase feedback from the public through promotion of the website Increase number of publications created and plan for greater distribution Engage citizens to report nests in the City of Winnipeg Using recent population data and feedback from the public, try to determine goose population tolerance level	Active participation by citizens may be difficult to achieve but is important to pursue since it can form the basis for other management goals (egg removals, nest mapping). Limited amount of feedback may not permit the determination of tolerance levels for Canada geese at ponds. This, in turn, could affect management decisions about Canada geese. For example, a threshold for the number of concerns about Canada geese may be effective in determining when management should occur (i.e. would one instance of citizen concern result in the implementation of a management program). In the development of management thresholds types of public concern should also be taken into account; safety concerns related to goose presence could be weighted heavier than a nuisance goose problem.

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5. Vegetation Management around retention basins	A study of goose habitat use at retention ponds based on vegetation – naturalized ponds, ponds with no-mow buffer zones, and conventional, mown ponds. Trial of alternative turf species as a goose deterrent	Naturalized retention basins appear to support fewer resident geese than mown retention basins Vegetation height affects goose use of an area Seeding of endophyte-infected turf species completed with results to be assessed in 2014.	Exploration of suitable sites for vegetation management based on lessons learned in 2012 and 2013. Vegetation management could include: v. No-mow zone (reduction in mowing) vi. No-mow zone supplemented with plantings (shrubs, wildflowers, etc.) vii. Complete changeover (from conventional to naturalized retention basins) viii. New retention basins are naturalized Assessment of endophyte-infected turf trial Dependent on outcome from 2013 trial, a consideration toward expansion in other areas	Given the results of the vegetation study at retention basins, vegetation management in order to reduce goose use of sensitive areas may be a promising method and cost effective in its simplest form (establishment of no-mow zones through mowing reduction). Public opinion may affect the implementation of no-mow zones since a reduction in mowing may result in the presence of weedy plants and may not be the desired aesthetic preferred by the community at large. Establishing showy, native plants (such as wildflowers) may improve the acceptance of a no-mow zone. A trial area will be attempted in 2014 to determine if the reduction in mowing reduces goose issues at retention basins. The complete changeover of retention basins would be cost prohibitive for the scope of this project. However, allowing emergent vegetation to remain around the edges of ponds may produce a desirable effect based on the results of the studies completed during the course of the project. For mown areas such as sports fields, costs for expanding the endophyte-infected turf to these areas may prove cost-prohibitive, but if this technique proves promising there could be consideration for implementing new turf specifications for mown areas near newly developed retention basins.

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6. Feeding of Canada Geese	Research and observation conducted related to the feeding of geese Examination of no-feeding by-laws in other jurisdictions Considered locations for installation of no feeding signage	Determined that feeding of Canada geese is widespread and can significantly influence the number of geese in an area as well as the effectiveness of deterrent measures.	Examine effective ways to educate about the consequences of feeding geese. This will include: - Trial signage at one feeding area - Providing alternative ways or ideas to enjoy nature without feeding Examine possibility of a no feeding by-law in Winnipeg Consideration of other alternatives such as designated feeding areas and no feeding zones (e.g. away from sports fields, school yards, pathways, and benches)	Signage is one alternative to educate the public about feeding geese and other wildlife that can be used given available resources. In the event a by-law is introduced, enforcement may not be possible based on current resources and thus, the by-law is ignored. A by-law without enforcement could lead to frustration by members of the public looking for a reduction in feeding. Reducing the locations where feeding occurs may be an important component, as an end to feeding of wildlife is likely not possible (feeding and no-feeding locations at one site). However, the practice is so prevalent that a small reduction may not prove to have a noticeable effect on goose behaviour.