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Summary of New York City Canada Goose Removals 2009 through 2013



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INTRODUCTION

The Metropolitan New York City region had an estimated population of 20,000 – 25,000 resident Canada Geese in 2009. This population density was approximately five times the amount that most residents would find socially acceptable (B. Swift, New York State Department of Environmental Conservation, Bureau of Wildlife, pers. comm.). The increasing abundance of these 8-10 pound flocking birds in urban and suburban landscapes has resulted in a significant aviation safety hazard for the flying public and military aircraft. On January 15, 2009, USAir Flight 1549 struck a flock of Canada Geese on departure from LaGuardia Airport. The plane landed on the Hudson River with miraculously no loss of human life. The plane was a \$60 million loss. The crash of Flight 1549 was a wakeup call to the aviation hazard caused by Canada Geese.

The Mayor of New York City (NYC) and the Port Authority of New York and New Jersey created a steering committee to address the wildlife risk to aviation. The committee was a comprehensive committee made up of local, state and federal agencies with responsibilities toward aviation and wildlife¹. Based on the current population size of resident Canada Geese, efforts to reduce the number of resident geese in metropolitan NYC were implemented to protect aviation safety, water supplies from fecal contamination, public and private property from damage to turf and ornamental plantings, loss of land use due to excessive fecal droppings, and against unintended consequences of hazing programs (e.g., displacing geese to areas that historically haven't had goose abundance issues). The NYC Wildlife Hazard Steering Committee decided to reduce aviation strike hazards by decreasing the local population of resident Canada Geese, to the extent possible, living within 7-miles of John F. Kennedy International Airport (JFK), LaGuardia Airport (LGA), and Newark Liberty International Airport to protect aviation and other resources.

The Federal Aviation Administration (FAA) and United States Air Force have established a zero-tolerance policy for Canada Geese on or near airports due to the high probability of aircraft damage and reduced public safety. The FAA Advisory Circular 150/5200-33B provides guidance to airports for managing hazardous wildlife attractants near airports (FAA 2007). An analysis of data from the FAA Wildlife Strike Database estimates that 81% of 1,238 reported Canada Goose strikes nationwide from 1990-2009 were from resident non-migrating Canada Geese (R. Dolbeer, USDA WS, National Wildlife Research Center, unpublished data).

The steering committee evaluated risks of wildlife strikes caused by migratory birds. The scientific literature identified Canada Geese as the wildlife species of third greatest risk to aviation for causing a damaging wildlife strike after deer and vultures (Dolbeer et al. 2000). There are two populations of Canada Geese in the metropolitan NYC area: resident Canada

¹ New York City (NYC) Wildlife Hazard Steering Committee is comprised of the following agencies: Mayor's office, NYC Departments of Environmental Protection, Parks and Recreation, and Sanitation; New York State Department of Environmental Conservation Bureau of Wildlife; Port Authority of New York and New Jersey; U.S. Fish and Wildlife Service; Federal Aviation Administration; National Park Service; U.S. Department of Agriculture Wildlife Services.

Geese and migratory Canada Geese. Both populations are behaviorally and ecologically different which would require different management strategies. Moreover, resident Canada Geese are more likely to be involved in a bird aircraft strike, thus management plans and actions started here. Resident Canada Geese live within 7-miles of the pond they complete the annual summer molt. The most effective and efficient means to reduce the local population of resident Canada Geese would be to capture them on the ponds while molting. Molting is the annual process of replacing old feathers with new feathers.

The U.S. Fish and Wildlife Service is the management and regulatory authority for migratory birds in the United States. The “Service” works in collaboration with the state wildlife agencies (e.g., New York State Department of Environmental Conservation) to develop management objectives, goals and plans for migratory birds. This collaboration resulted in the national Management plan for resident Canada Geese (USDI 2005), Atlantic Flyway Management Plan for resident Canada Geese (Atlantic Flyway Council 2011, 1999), and designation of resident Canada Geese as overabundant.

The steering committee established an objective and management plan over several months in spring 2009. The management plan reflects the knowledge of the steering committee members, national resident Canada Goose management plan, Atlantic Flyway resident Canada Goose management plan and resident Canada Goose population goals for the state of New York. Within this knowledge and management plan parameters, the steering committee set an overriding objective. The objective was to increase aviation safety by reducing the risk of Canada Goose strikes related to the abundance of resident Canada Geese populations at public parks, ball fields and other man-made and natural habitats located 7-miles or less from JFK, LGA, and Newark Liberty International Airport.

BENEFITS EXPECTED

The steering committee recognized far-reaching benefits from managing the resident Canada Goose population. They also recognized some members of society would oppose wildlife management, usually for moral reasons. On balance, the steering committee had a legal obligation to protect aviation safety and a public trust obligation to manage natural resources (i.e., Canada Geese) responsibly. The recognized benefits included decreasing the resident Canada Goose population would reduce the year-round risk these birds pose to aviation safety. While migrating Canada Geese temporarily increase the risk to aviation safety, the reduction of resident Canada Geese is a step in reducing the abundance of larger-bodied birds that cause the most damaging strikes to aircraft. Moreover, Canada Geese are the second most hazardous bird species for aircraft to strike (FAA 2007, Dolbeer et al. 2000). Additional benefits of removing over-abundant Canada Geese include reduced fecal droppings and required costs of clean up, decreased water contamination from fecal pollution (Klett et al. 1998), decreased excessive grazing on turf grass and plantings, and decreased conflict with recreational users of park properties. Reducing Canada Goose populations near ecological restoration sites can minimize the risk and extent of damage to newly planted vegetation (e.g., salt marsh restoration).

METHODS

Site Evaluations - The decision to remove Canada Geese from a site was made following criteria developed by the NYC Wildlife Hazard Steering Committee. Wildlife Services used these criteria to make a recommendation to NYC Department of Environmental Protection about removal of Canada Geese from city owned properties. Properties within five miles of the three airports were considered eligible for resident Canada Goose damage abatement if there were 10 or more geese on the property, while properties located five to seven miles from any of the three airports were considered eligible if there were 20 or more geese on the property. The list of sites eligible for goose removal were reviewed and confirmed with NYC government and other property owners.

From June 2009- 2013, Wildlife Services (WS) conducted site evaluations at 161 properties in NYC to determine which sites met the determined criteria for goose removal (Appendix 1). The initial screening criteria used to identify potential properties that may have resident Canada Geese were 1) the property was within 7-miles of a Port Authority airport (within 5-miles of an airport in 2009), 2) the site had fresh or brackish water on it and 3) there was enough grass to sustain a local population of Canada Geese. Of the 161 surveyed sites, 30 were recommended for goose removal. WS biologists and specialists documented the number of Canada Geese and damage (fecal droppings, turf damage) present at each site. Risk to local aircraft movements was also documented. Additionally, efforts to reduce damage caused by Canada Geese (e.g., presence of *no feeding wildlife* signage) were documented.

Removal - Canada Geese were captured during the summer molting period (when the birds are unable to fly) using corral traps. The summer molt period is approximately June 15 to July 15 each year. If geese were in the water, then biologists and specialists used kayaks or motor boats to guide the geese onto shore and into the corral traps. The captured geese were placed alive into commercial turkey crates and transported to a state inspected commercial poultry processing facility. Prior to transport any identification markers (i.e., neck collars and tarsal bands) were removed from the geese for reporting and historical location data analysis.

RESULTS

Of the 161 properties surveyed for geese and damage caused by geese over the past five years (Appendix 1), WS identified 30 locations that met the criteria to conduct removals of Canada Geese. WS historically conducted removals between the end of June and the beginning of July. Of the 4,722 Canada Geese observed at the 30 NYC-owned properties 3,658 were removed from 2009 to 2013.

DISCUSSION

The location and habitat components of removal sites in 2009-2013 provided a great amount of information as to the preferred molting sites of resident Canada Geese in NYC. Based on the information gathered during the 2009-2012 goose removals, WS was able to identify and survey

59 sites in NYC in 2013. The number of sites surveyed each year varied depending on historical presence/absence of geese and activities at the site (e.g., construction or habitat changes). Many of the locations surveyed each year based on their potential to attract geese; however, each year new sites are identified or brought to our attention when geese are present.

Prior to molting, Canada Geese will often move to temporary locations where food and water are accessible. The knowledge gained from identifying preferred molting sites in NYC will allow for more efficient future Canada Goose management. The surveyed locations where geese were not present during site evaluations were more than likely sites where geese feed and loaf at other times of the year, but were absent of geese at the time of site evaluations due to lack of suitable molting habitat.

Canada Geese are a public resource held in trust by the state and federal governments. The public had raised several issues over the five-year period the resident Canada Goose removal program was conducted within 7-miles of JFK, LGA, and Newark Liberty International Airports. The issues raised were about 1) efficacy of protecting aviation safety by removing resident Canada Geese from the environment, 2) using harassment to permanently disperse resident Canada Geese, 3) the removal of resident Canada Geese would result in new geese re-occupying the park, 4) harm caused to the environment by resident Canada Geese, 5) importance of wildlife to residents of metropolitan NYC and 6) donation of Canada Geese as food.

Efficacy of Protecting Aviation Safety

The objective of the resident Canada Goose management program was to reduce the number of goose – aircraft strikes. Four evaluation criteria were established in 2009 to evaluate the effectiveness of the Canada Goose management program. The four evaluation criteria were:

1. Changes in abundance of resident Canada Geese at locations within 7 miles of JFK and LGA. A change in abundance represents a change in risk of a goose strike.
2. Changes in abundance of resident Canada Geese observed on the aircraft operating area (AOA) at JFK and LGA. A change in abundance represents a change in risk of a goose strike.
3. Change in number of Canada Geese shot on the airport from April to September when only resident Canada Geese are present. A change in abundance of geese shot would represent effort expended to reduce risk to aviation.
4. Change in number of Canada Goose strikes at JFK and LGA. This criteria would bear the most weight on evaluating the efficacy of the resident Canada Goose management program.

The first criteria to evaluate was changes in abundance of resident Canada Geese at locations within 7-miles of JFK and LGA airports. There clearly has been a substantial reduction in risk to aviation since the number of geese needing to be removed has declined 84% from 2009 to 2013 for the original 17 locations (Table 1) and has declined 96% from 2010 to 2013 for the next seven locations (Table 2).

Table 1. Number of resident Canada Geese removed from 17 New York City parks and lands to protect aviation safety in 2009 and subsequent number of geese removed over four years.

<u>Park</u>	Number of resident Canada Geese removed				
	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>
Alley Pond Park	9	208	79	0	0
Baisley Pond Park	29	0	0	0	0
Bronx Zoo	77	0	0	0	0
Brookville Park	43	8	0	0	0
Captain Tilly Park	12	0	0	0	0
Clearview Park	12	0	0	6	7
Crotona Park	7	0	0	0	0
Flushing Meadows	188	19	7	0	0
Fort Totten	240	14	30	0	0
Kissena Park	39	0	0	0	0
NYC DOT Belt Parkway Right-of-Way and Pennsylvania Ave Landfill	90	100	92	40	0
Old Flushing Airport	45	0	0	37	76
Pelham Bay Park	216	55	65	32	48
Randall's Island Park	96	88	0	17	0
Riker's Island	112	32	55	47	51
Riverside Park	12	0	0	36	13
<u>Roy Wilkins Recreation Center</u>	<u>8</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	1235	524	328	215	195

Table 2. Number of resident Canada Geese removed from 7 New York City parks and lands to protect aviation safety in 2010 and subsequent number of geese removed over three years.

<u>Park</u>	Number of resident Canada Geese removed			
	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>
Douglaston Park Golf Course	109	0	0	0
Forest Park Golf Course	23	0	0	0
Hendrickson Park	91	0	0	0
Inwood Hills Park	30	42	0	13
Marine Park and Golf Course	146	73	0	0
Prospect Park	368	0	0	0
<u>Van Cortlandt Golf Course</u>	<u>157</u>	<u>26</u>	<u>0</u>	<u>24</u>
Total	924	141	0	37

The second criteria to evaluate were changes in abundance of resident Canada Geese observed within the aircraft operating area at JFK and LGA (Table 3). Overall, the number of geese observed around both airports is small. The difference between the number of geese observed between LGA and JFK likely reflects the differences in damage abatement programs and visibility. Habitat around both airports is very different. Habitat around LGA is open water, short grasslands, and tidal mudflats which leaves few locations to obscure geese. Whereas at JFK, the surrounding Jamaica Bay marsh provides expansive spartina wetland to obscure the view of geese and other birds. Also at JFK, there were few geese observed on the airport likely due to an active on airport hazing and shooting program. However, to put the number of geese observed at both airports in perspective, there are relatively few geese seen on the airport compared to what would and has been seen at parks, golf courses and wetlands in metropolitan New York City from 2009 to 2013.

Table 3. Average number of resident Canada Geese observed per survey at John F. Kennedy International and LaGuardia Airports for each month from April 2009 – September 2013. Data is for months when only resident Canada geese are present.

		<u>Apr</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Resident CAGO Average</u>
LGA	2009	1.0	2.0	0	0	14.5	4.5	3.7
	2010	1.3	0.3	2.1	6.9	6.1	5.0	3.6
	2011	1.3	1.5	1.3	13	2.5	9.0	4.8
	2012	5.0	0	0	18.5	24.0	0	7.9
	2013	1.0	2.0	0	0	14.5	4.5	3.7
JFK	2009	1.0	2.0	0	0	0	3.0	1.0
	2010	0.0	0.0	0.9	0	1.7	0.9	0.6
	2011	1.3	2.5	-	-	-	-	1.9
	2012	1.0	0.0	3.5	0.0	0.0	3.5	1.3
	2013	1.0	2.0	5.0	5.0	1.0	6.0	3.3

The third criteria were changes in the number of resident Canada Geese shot on the airport from April through September from 2009 through 2013. There are minor differences in the number of geese shot between the two airports which have different wildlife abatement programs. The interesting observation is the same pattern of total geese shot each year was consistent between the two airports which is indicative of a likely environmental affect. However, the point to remember is few geese were shot which is indicative of few geese entering the airspace to threaten aviation safety.

The number of geese shot at LGA and JFK fluctuated indicating no overall trend or apparent relationship to Canada Goose management activities among all New York City owned lands within 7-miles of LGA (Table 4). For JFK, the risk of geese striking aircraft remains low due to few birds being observed on or adjacent to the airport and those geese that enter JFK airspace are hazed or shot removing the hazard to aviation. Similar statements could be made for LGA which had slightly higher abundance.

Table 4. Average number of resident Canada Geese depredated from John F. Kennedy International and LaGuardia Airports for each year from April 2008 – September 2013. Months when only resident Canada geese are present are presented.

<u>Airport</u>	<u>Year</u>	<u>Total Number of Geese Depredated</u>
LGA	2009	72
	2010	11
	2011	68
	2012	29
	2013	54
JFK	2009	70
	2010	13
	2011	79
	2012	49
	2013	43

The fourth criteria were changes in Canada Goose aircraft strikes as a measure of the effectiveness of the Canada Goose program in NYC. The effectiveness of the program at reducing goose-aircraft strikes was proven for LGA and JFK. We evaluated the number of goose strikes involving geese or Canada Geese at both airports for strikes < 500 feet above ground level, since strikes above this limit are beyond traditional wildlife damage management control techniques (Dolbeer 2011). The reduction in resident Canada Geese utilizing Riker’s Island is largely credited with reducing this hazard to aviation at LaGuardia. The overall reduction of local resident Canada Geese near JFK helped reduce the strike rate.

An experimental Canada Goose removal project was conducted at Riker’s Island, NY in an effort to reduce bird strike hazards at LGA in New York, NY (R. Dolbeer, WS, unpub. data). From July 2002 to June 2004, there were 9 Canada Goose strikes at LGA and an average goose strike rate of 0.38 strikes per month. Site evaluations revealed that Canada Goose hazards were linked to a group of geese using Riker’s Island. In June 2004, 2005 and 2006, 518, 288 and 200 Canada Geese were captured per year, respectively, and removed from Riker’s Island. From July 2004 to September 2006, there were only 3 goose strikes, 1 occurred in August 2004, another in September 2004, and the last in April 2006. Strike rate per month dropped to 0.11 strikes per month. After the NYC Wildlife Hazard Steering Committee implemented the resident Canada Goose hazard management program in 2009, there were only 2 Canada Goose or goose aircraft strikes from July 2009 to December 2013 for a strike rate per month of 0.04, a 64% reduction from the 2006 strike rate and an 89% reduction from the 2004 strike rate. The other goose aircraft strikes occurred in October 2010 and June 2013.

The Canada Goose strike rate for JFK International Airport was compared using the 3 year period (2006-2008) prior to the implementation of the resident Canada Goose program in NYC; the next 3 years (2009-2011) when the Canada Goose program in NYC was implemented; and the last two years (2012-2013) of the Canada Goose program in NYC and when an additional nearly 950 resident Canada Geese were removed from Rulers Bar Hassock which is about 1 mile from the airport. JFK International Airport has a safety program to shoot and haze Canada

Geese flying into the aircraft operating area. The benefits of the NYC Canada Goose program likely complimented the shooting and hazing program at JFK. The monthly Canada Goose strike rate at JFK International Airport declined from 0.14 (5 strikes in 36 months) during the 2006-2008 period to 0.08 Canada Goose strikes per month (3 strikes in 36 months) during the 2009-2011 period. The Canada Goose strike rate at JFK International Airport was 0.08 per month in 2012 – 2013 period when two Canada Goose strikes were reported to the FAA.

Using Harassment to permanently disperse resident Canada Geese

Some members of the public opposed to killing resident Canada Geese proposed alternative management strategies to reduce goose abundance near the airports. They proposed harassing the geese and nest and egg treatment. The NYC Wildlife Hazard Steering Committee evaluated harassment and nest and egg treatment as a strategy to reduce risk of a goose strike to aviation. The committee also reviewed the published scientific literature to evaluate hazing as a strategy (Holevinski et al. 2007, Pruesser 2008). Some members of the public proposed harassing the geese will make them go someplace else and nest and egg treatment will result in nest failure and cause the geese to go someplace else. Nest and egg treatment is treating the eggs with corn oil during the 28-30 day incubation period. A federal permit or registration number is required to treat Canada Goose eggs.

Scientific studies in NYC and Great Britain conclusively reported resident Canada Geese live within 7 – 8 miles of the molting pond (Seamans et al. 2009, Baxter and Robinson 2007). However, a few geese will travel to other locations to molt. Seamans et al. (2009) marked 300 resident Canada Geese captured near JFK International Airport and monitored the geese for 2 years. They found the geese were observed at the original banding location 75% of the time and 95% of the geese were observed within 5 miles of the original banding location.

WS analyzed banding data from the resident Canada Geese captured in metropolitan NYC to determine origin of resident Canada Geese removed to protect aviation safety. Seventy-five of the 3,658 captured geese were marked with a tarsal band, a neck collar, or both. Of the 75 marked geese, 40 (53.3%) were removed from the original banding site, 17 (22.3%) were removed from a site less than 1-mile from their original marking site and 18 (24%) were removed from a site further away than the 7-mile buffer (Table 5). In summary, 76% of the banded geese were local geese which are consistent with the findings in the published scientific literature. This data reinforces that Canada Geese are living locally and not continuing on their natural migration.

Table 5. Distance between original banding site and final removal site of Canada geese removed from New York City in June and July, 2009-2013.

<u>Distance Between Removal Site and Banding Site (miles)</u>	<u>Number of Marked Canada Geese Removed</u>
0 (Same Location)	40
1-7	17
<u>>7.1</u>	<u>18</u>
Total	75

The removal of resident Canada Geese from a park would result in new geese re-occupying the park

Some citizens were concerned the removal of resident Canada Geese would result in the park being re-occupied in short time by new geese. They were concerned the re-occupation will make protecting aviation safety impractical and will result in the continuous removal of the same number of geese from the same park every year.

WS analyzed the 5-year and 4-year take history of NYC owned parks and lands where resident Canada Geese were removed (Table 1 and 2). No sites were re-occupied with the original abundance some people claimed. In 2009, WS identified 17 locations that met the criteria for removals removing a total of 1,235 Canada Geese (Table 1). WS followed the take history of these 17 sites from 2009 to 2013. The number of geese removed from these parks declined in future years and some parks had few to no geese, thus risk to aviation was low and no additional removals were required (Table 1, Figure 1). Seven of the sites have never been recolonized by geese since the 2009 removals. Seven sites have shown steady decrease each year a removal has been conducted at that location. Three sites have stabilized with a lower population.

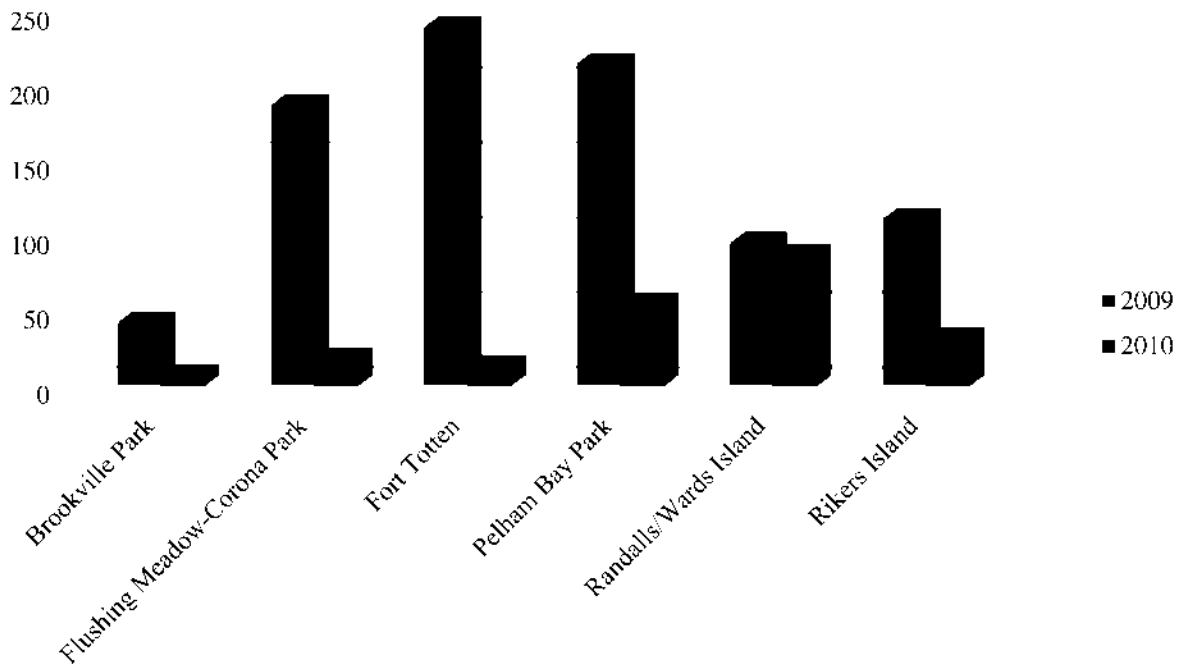


Figure 1. Difference in number of resident Canada Geese removed during summer molt from 6 of 17 New York City owned parks to protection aviation safety, 2009 compared to 2010.

In 2010, WS identified 7 new locations that met the criteria for capture during the molt and removed a total of 924 Canada Geese (Table 2). WS followed the take history of these 7 sites from 2010 to 2013. The same pattern of decline occurred at these 7 locations as the 17 locations from 2009. The number of geese removed from these parks declined in future years and some

parks had few to no geese, thus risk of aviation was lower and no additional removals were required (Table 1). Four of the sites have never been recolonized by geese since the 2010 removals. Three sites have shown steady decrease each year a removal has been conducted at that location. However, 2 of the 3 locations did have geese reoccupy during the fourth year, albeit at lower abundance than the first year.

Harm caused to the environment by resident Canada Geese

The Fish and Wildlife Service documented damage to wetlands from resident Canada Geese in their environmental impact statement review (USDI 2005). Locally, NYC is working to restore salt marsh habitat. Resident Canada Geese cause damage to salt marsh habitat restoration and require installation of exclusionary fencing at restoration sites to make restoration possible. Exclusionary fencing erected to protect restored wetlands from grazing by Canada Geese represents about one-third of the cost of a wetland restoration project in NYC (M. Feller, NYC Parks and Recreation, pers. commun.). In 2012 and 2013, WS removed a total of 221 geese from locations where ecological restoration projects have been conducted over the past several years to restore tidal wetlands and coastal grasslands at a cost of more than \$58 million (Table 6). Additional geese were removed from these sites in prior years.

Table 6. Active ecological restoration sites in New York City at the same location or near Canada Goose removal sites in 2012 and 2013.

<u>Restoration Site</u>	<u>Habitat Restored</u>	<u>Acres</u>	<u>Estimated Cost (millions)</u>
Pelham Lagoon	Tidal Wetlands and Coastal Grasslands	7	\$2.5
Turtle Cove	Tidal Wetlands and Coastal Grasslands	4	\$0.9
Randall's Island	Tidal Wetlands and Coastal Grasslands	5	\$4.0
Yellow Bar			
Hassock	Tidal Wetlands	42	\$19.6
Hendrix Creek	Tidal Wetlands, Coastal Grasslands and Shrublands	10	\$1.3
White Island	Tidal Wetlands and Coastal Grasslands	56	\$18.0
Gerritson Creek	Tidal Wetlands, Coastal Grasslands and Shrublands	42	\$12.0
Total		166	\$58.3

Importance of wildlife to residents of metropolitan NYC

Wildlife watching is one of the most popular activities in the United States with about one-third of the U.S. population (71 million people) watching wildlife (USDI 2006). An estimated 3.8 million people participated in wildlife watching in New York state during 2006 (USDI 2006). The public, including NYC residents, enjoy viewing wildlife. Wildlife Services captured 368 resident Canada Geese at Prospect Park in 2011 and Wildlife Services received many calls and letters about the removal of these Canada Geese. Several important themes emerged about *why these geese were important* to NYC residents. The themes were:

- 1) Most wildlife in NYC are invasive species (e.g., pigeons, starlings, house sparrows, rats) or minor in viewing value (squirrels). The public expressed a want to see native wildlife.

- 2) Prospect Park was important to see native wildlife because most city parks abundant with wildlife (e.g., Pelham Bay) are inaccessible by the subway system.

Wildlife Services is working with the Prospect Park Alliance to manage the park for mutual wildlife benefits. While resident Canada Geese were admired by the public they had damaged the wetlands to the point native ducks rarely used the park anymore. Native ducks would include Mallards, Gadwall, Wood Ducks and Common Mergansers. The geese had eliminated much wetland vegetation through excessive herbivory. The Prospect Park Alliance, NYC agencies and Wildlife Services met to develop a plan where aviation safety was protected and the wetlands were allowed to recover for native wildlife. The park implemented an aggressive harassment and nest and egg treatment program to prevent the high abundance re-colonization of the park by resident Canada Geese that would necessitate another Canada Goose removal during summer molt. The park has been successful keeping the resident Canada Goose population low (< 5 geese) for the last few years because the reduction in overabundant geese gave a hazing program a chance to be successful.

Donation of Canada Geese as food

In the past three years (2011-2013) all geese removed from NYC were transported to a state inspected commercial poultry processor. An estimated 1,500 pounds of goose meat from the NYC program to protect aviation safety were delivered to food banks for distribution to people in need.

The public by a 2 to 1 margin wanted the captured Canada Geese put to a useful purpose such as donation for people to eat. Public opinion was determined by polling comments from the New York Times blogs and electronic copy. Initially, New York State disallowed the donation of Canada Goose meat to food banks for human consumption until an evaluation was completed. The New York State Department of Health, Department of Environmental Conservation and Department of Agriculture and Markets completed their evaluation in 2011. The breast tissue of resident Canada Geese was determined to be safe to eat. The greatest risk identified from eating goose breast was from non-toxic shot (usually steel shot) being imbedded in the breast tissue and someone biting down on the shot which may damage a tooth. All Canada Geese captured and removed from 2011-2013 were transported to commercial poultry processing facilities. The meat was distributed to food banks and charities, bringing food to people in need.

SUMMARY

A total of 3,658 resident Canada Geese were removed from NYC-owned properties between 2009- 2013. The number of resident Canada Geese surveyed and captured each year has decreased steadily since 2010. There was an increase in the number of geese surveyed and captured from 2009 to 2010; however, this increase is explained by the expansion of a five-mile radius in 2009 to a seven-mile radius in 2010. From 2009 to 2013 the number of Canada Geese removed from NYC-owned properties has decreased from 1,235 in 2009 to 281 in 2013 a decrease of 77% (Figure 2). WS surveyed 161 site locations over 5 years and identified 30 sites

that met the criteria for removals. In 2009 WS conducted removals at 17 sites and the number of sites with geese has reduced to 10 in 2013. The overall reduction in Canada Geese strikes at JFK and LGA in NYC supports the effectiveness of the multiple year Canada Goose removal program. The reduction in local abundance of resident Canada Geese has reduced risk to aviation operations at local airports.

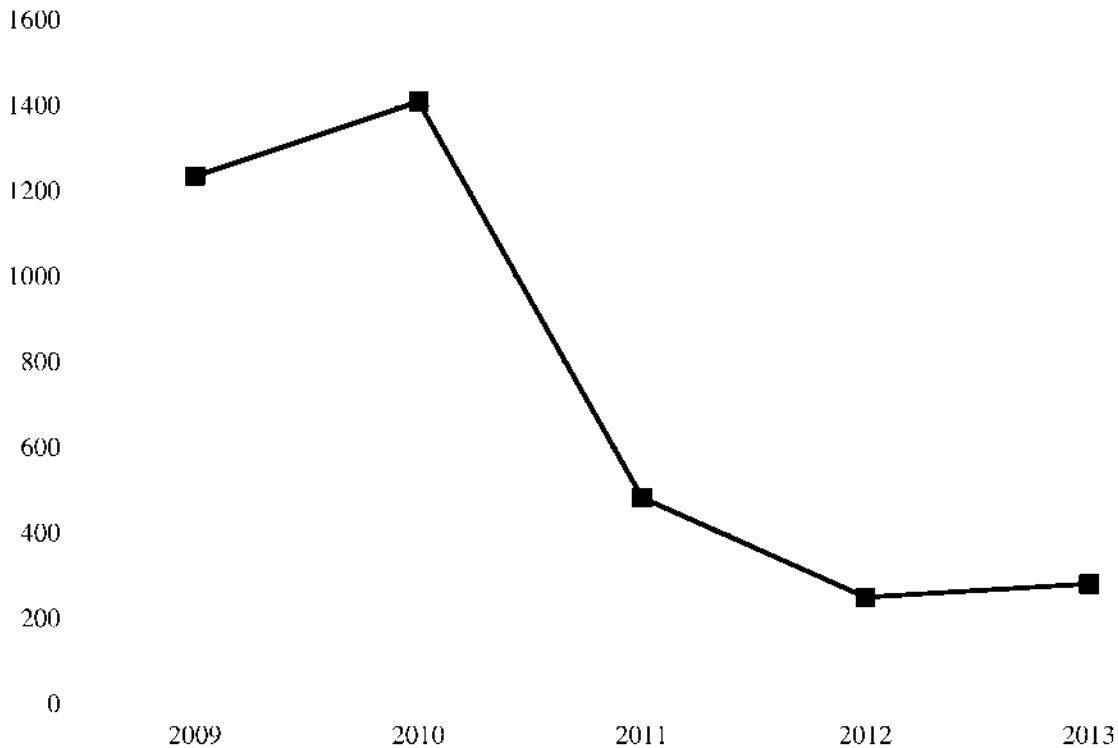


Figure 2. Number of Canada Geese removed during the molt period from New York City owned parks and lands within 7-miles of John F. Kennedy International and LaGuardia Airports, 2009 to 2013.

Data collected over the past five years have shown specific locations where geese were found annually due to the specific habitat and resources available. The specific sites where geese were found most years are Inwood Hills Park, Old Flushing Airport, Pelham Bay Park, Rikers Island, Riverside Park, Pennsylvania Avenue Landfill and Van Cortlandt Golf Course. While these seven locations had resident Canada Geese most of the past 5 years, their abundance declined 66% from 2009 to 2013. These locations are likely to be where resident Canada Geese will be found in most years due to habitat and resources attracting immigrating or local geese.

Band and collar recovery data were analyzed to determine the distance geese traveled from their banding locations to the removal site. Of the 75 marked geese captured, 57 were originally marked at a site less than one-mile from where they were removed, 18 were marked greater than seven miles away from where they were removed. This data supports the need for continued Canada Goose population management by identifying sites where Canada Geese historically molt as well as identifying land cover types that are attractive to geese. This information is useful in management of lands to prevent Canada Goose attractants in the future.

Overabundant Canada Goose populations can significantly impact native habitats. Newly created or restored habitats are especially sensitive to grazing from waterfowl because the vegetation has not established a strong root foundation. The successful establishment of these habitats is critical to absorbing storm water runoff, reducing non-point source pollution, and providing food and cover for other wildlife species such as Atlantic Brant. When Atlantic Brant have adequate food resources they stay off JFK International Airport which results in fewer brant killed to protect aviation safety.

RECOMMENDATIONS

1. Continue Canada Goose removals at sites in NYC within seven-miles of local airports. This will further reduce the risk of a strike to aircraft by protecting against movement of Canada Geese throughout NYC.
2. Conduct a survey of Canada Geese in as many NYC parks as possible year round to determine the number of Canada Geese in NYC.
3. Work with neighboring landowners to expand removal efforts, especially large property owners such as state and federal entities. Additional coordination between LaGuardia Airport and Riker's Island on resident Canada Goose management would increase program efficiency.
4. Consider using additional capture techniques to increase the number of sites where overabundant geese that pose an aviation hazard can be captured at times of the year outside the molting period or in locations where removals are not conducive.
5. Continue to educate residents about the importance of not feeding wildlife and the benefits of having a manageable population of wildlife that will not damage property and resources but retain its aesthetic value to wildlife watchers and citizens.
6. Increase enforcement of existing no-feeding policies to deter attracting geese to the airports' proximity.
7. Continue working with NYC Parks and Recreation to develop park specific management plans for wildlife.

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APPENDIX 1

Properties in New York City surveyed for Canada Geese presence during June 2009- 2013.

Property	Borough
Alice Austin Park	Staten Island
Alley Pond Park	Queens
Allison Pond Park	Staten Island
American Ballfields Park in Broad Channel	Queens
Arden Wood Park	Staten Island
Astoria Park	Queens
Baisley Pond Park	Queens
Barretto Point Park	Bronx
Battery Park	Manhattan
Bayswater Park	Queens
Bicentennial Veterans Mem Park	Bronx
Bloomington Park	Staten Island
Blue Heron Park Nature Center	Staten Island
Bowery Bay WWTP	Queens
Bowne Park	Queens
Brady's Pond Park	Staten Island
Brant Point Wildlife Sanctuary	Queens
Broad Channel Park	Queens
Broad Channel Wetlands	Queens
Bronx zoo Park	Bronx
Brooklyn Bridge Park	Brooklyn
Brookville Park	Queens
Bunker Pond Park	Staten Island
Calvert Vaux Park	Brooklyn
Canarsie Beach Park	Brooklyn
Canarsie Cemetary	Brooklyn
Canarsie Pier	Brooklyn
Capt Tilly Memorial Park	Queens
Carl Schurz Park	Manhattan
Cedar Grove Park	Staten Island
Central Park	Manhattan
Clay Pit Ponds State Park	Staten Island
Clearview Golf Course	Queens
Clove Lake Park	Staten Island
Property	Borough
College Point Park/Old Flushing	Queens

Property	Borough
High Bridge Park	Manhattan
High Rock Park	Staten Island
Highland Park	Queens
Hook Creek Park	Queens
Hudson River Park	Manhattan
Huguenot Pond Park	Staten Island
Hunts Point WWTP	Bronx
Hybrid Oaks Woods Park	Staten Island
Idlewild Park	Queens
Inwood Hill Park	Manhattan
Jacob Riis Park (NPS)	Queens
Jamaica Bay Park	Queens
Jamaica WWTP	Queens
Jerome Park	Bronx
Joseph T. McGuire Park	Brooklyn
Kingdom Pond Park	Staten Island
Kingfisher Pond Park	Staten Island
Kissena Park Golf Course	Queens
La Tourette Park & Golf Course	Staten Island
Last Chance Pond Park	Staten Island
Lemon Creek Park	Staten Island
Leon S Kaiser Park	Brooklyn
Lister Park	Nassau Co.
Little Bay Park	Queens
Manhattan Beach Park	Brooklyn
Marcus Garvey Park	Manhattan
Marine Park Golf Course	Brooklyn
Mariners Marsh Park	Staten Island
Meredith Woods	Staten Island
Michaelis Park	Queens
Morningside Park	Manhattan
Newtown Creek WWTP	Brooklyn
North Brother Island	Queens
North River WWTP	Manhattan
Property	Borough
North Shore Esplanade	Staten

Airport	
Conch Basin	Queens
Conference House Park	Staten Island
Co-op City Park	Bronx
Crescent Beach Park	Staten Island
Crocheron Park	Queens
Cromwell Recreation Center	Staten Island
Crotona Park	Bronx
DEP 26th Ward	Brooklyn
Dobus Point Wildlife Sanctuary	Queens
Douglaston Park Golf Course	Queens
DSNY North Shore Marine Transfer Station	Queens
Dubos Point Wildlife Sanctuary	Queens
Dyckman Marina	Manhattan
Dyker Beach Golf Course	Brooklyn
East River Park	Manhattan
East River State Park	Brooklyn
Edgemere Park	Queens
Eibs Pond Park	Staten Island
Empire-Fulton Ferry State Park	Brooklyn
Fabar Pool & Park	Staten Island
FDR Boardwalk & Beach	Staten Island
Ferry Point Park	Bronx
Floyd Bennett Field	Brooklyn
Flushing Meadows Corona Park	Queens
Forest Grove Park	Staten Island
Forest Park Golf Course	Queens
Fort Totten Park	Queens
Fort Tryon Park	Manhattan
Fort Washington Park	Manhattan
Four Sparrow Marsh	Brooklyn
Francis Lewis Park	Queens
Frank M. Charles Mem Park (NPS)	Queens
Fresh Creek Park	Brooklyn
Fresh Kill Landfill	Staten Island
Freshkills Park	Staten Island
Fulton Ferry State Park	Brooklyn
Gantry Plaza State Park	Queens
Gateway National Recreation Area	Queens
Goethals Pond Complex	Staten Island
Property	Borough

	Island
Norton Basin	Queens
O' Donohue Park	Queens
Ocean Beeze Park	Staten Island
Paerdegat Basin Park	Brooklyn
Pelham Bay Park	Bronx
Pennsylvania Ave/ Fountain Ave. Landfills Complex	Brooklyn
Powell's Cove Park	Queens
Prospect Park	Brooklyn
Pugsley Creek Park	Bronx
Queensbridge Park	Queens
Rainey Park Playground	Queens
Randall's/Wards Island	Manhattan
Rikers Island	Queens
Rikers Island	Queens
River Bank State Park	Manhattan
Riverdale Park	Bronx
Riverside Park	Manhattan
Robert Clemente State Park	Bronx
Robert F Wagner Jr Park	Manhattan
Roberto Clemente State Park	Bronx
Rockaway Beach State Park	Queens
Rockaway Community Park	Queens
Rockaway WWTP	Queens
Roosevelt Island	Manhattan
Roy Wilkins-Southern Queens Park	Queens
Rulers Bar Hassack (NPS)	Queens
Schmul Park	Staten Island
Sherman Creek Park	Manhattan
Silver Lake Park & Golf Course	Staten Island
Snug Harbor Cultural Center	Staten Island
Soundview Park	Bronx
South Brother Island	Queens
South Shore Golf Course	Staten Island
Spring Creek Park	Brooklyn
Springfield Park	Queens
St. Mary's Park	Bronx
Staten Island Industrial Park	Staten Island
Tallman WWTP	Queens
Tottenville Shore Park	Staten Island
Property	Borough

Grant Pond	Nassau Co.
Great Kill Park (NPS)	Staten Island
Greenbelt Native Plant Center	Staten Island
Hallets Cove	Queens
Harlem River Park	Manhattan
Hermon A. MacNeil Park	Queens

Udall's Cove Park	Queens
Valentino Pier	Brooklyn
Van Cortlandt Park and Golf Course	Bronx
Von Briesen Park	Staten Island
William T. Davis Wildlife Refuge	Staten Island
Willowbrook Park	Staten Island
Wolfes Pond Park	Staten Island