The Effect of Experimental Removal of Single Breeding Pairs of Resident Canada Geese

Ryan P. Lynch and **Gino J. D'Angelo**
USDA APHIS Wildlife Services, Quakertown, Pennsylvania

Abstract: Resident Canada geese cause substantial economic losses to agriculture and personal property and compromise air traffic safety throughout the U.S. Destroying eggs of Canada geese nesting in the contiguous U.S. is a primary component of the integrated management regime to reduce damage caused by the species. This requires regular searches to destroy eggs throughout nesting season, which may be laborious and costly. Much of the breeding by resident Canada geese occurs on small ponds (≤5 acres). Anecdotal observations suggested that social pressure among breeding pairs of Canada geese typically dictates that only one aggressive breeding pair establishes a territory on small ponds. Using this logic, managers allow a single nesting pair on small ponds and destroy their eggs, while deriving the perceived benefits of the sentinel geese excluding other nesting geese. However, a single pair of geese may also cause damage, decimating plants and depositing accumulations of feces in the localized area. We hypothesized that removal of single nesting pairs of Canada geese on small ponds after the onset of breeding activity would result in a void of geese for the remainder of the reproductive season, thus providing an alternate lower-cost management strategy. We further hypothesized that if the male goose was not removed, he would continue to defend the territory, excluding other nesting geese. Our study was conducted on 22 independent sites with small ponds in Bucks County, southeastern Pennsylvania. Each site held historically one nesting pair of Canada geese. To test our hypotheses, breeding pairs of Canada geese were assigned to one of three experimental groups: 1) control – neither female nor male goose was removed, the eggs were treated under normal protocols to prevent hatching, and the nest and eggs were removed after the 28-day incubation period; 2) after nest initiation, only the female goose was removed, and the nest and eggs were removed; and 3) both the female and male goose were removed and the nest and eggs were removed. We determined that targeted removal of a nesting pair or only the female of a nesting pair of Canada geese could be effective in eliminating breeding on a small pond for the entire nesting season. Likewise, the traditional approach of allowing a single aggressive nesting pair on small ponds reliably excluded additional nesting pairs.

Key Words: *Branta canadensis*, Canada geese, clutch, cultural carrying capacity, Pennsylvania, reproductive control, waterfowl

Proc. 25th Vertebr. Pest Conf. (R. M. Timm, Ed.)
Published at Univ. of Calif., Davis. 2012. Pp. 220-224.

INTRODUCTION

Resident Canada geese (*Branta canadensis*) exploit highly disturbed, urban environments (Smith et al. 1999), and are a main point source for complaints related to domestic property damage and damage to agriculture. Through a combination of uninhibited foraging and fecal deposition in a concentrated area, Canada geese cause damage to a variety of habitats. Airports, parks, golf courses, agricultural fields, drinking water reservoirs, and manicured lawns are examples of sites harboring resident Canada geese where human-wildlife conflicts occur (Conover and Chasko 1985, USDA 1999, Seamans et al. 2009). Resident geese do not instinctively migrate, but rather remain in temperate zones year-round (USFWS 2011). These permanent residents exhaust vegetation that acts as a natural buffer to waterways through overgrazing. They also contribute to soil compaction, increased fecal coliform presence in water, and potential disease transmission to humans (Hussong et al. 1979, Wobeser and Brand 1982, Conover and Chasko 1985, Conover and Kania 1991).

As adults, resident Canada geese within the Atlantic Flyway have few natural predators; therefore, annual mortality is generally low after recruitment of goslings into the population (Sheaffer et al. 2007). Regulated hunting offers a means to harvest resident geese and to reduce their breeding populations. However, resident geese that remain in urbanized areas where regulated hunting is neither safe nor practical cannot be harvested (Conover and Chasko 1985). In the absence of regular predation and other mortality factors, local populations of resident Canada geese grow annually and may chronically exceed cultural carrying capacity. An integrated approach to minimizing damage by resident Canada geese has been utilized for decades, including destroying eggs and nests, non-lethal harassment, and removal of localized populations. However, additional techniques are required to further minimize damage caused by resident Canada geese (Conover and Kania 1991, Smith et al. 1999, Conover 2011).

Geese prefer to feed and loaf in areas near water to avoid danger (Conover and Kania 1991). Typically, drainage basins in residential areas and farm ponds fulfill life requisites to sustain local populations of the species. Modifying habitat to make geese feel they are at risk of predation may decrease their presence on a site to reduce damage. Non-lethal harassment (e.g., pyrotechnics, dogs, lasers) can be effective at reducing habitat use by geese; however, geese may continue to use key areas intermittently if harassment is not persistently conducted (Conover and Chasko 1985, Aguilera et al. 1991, Smith et al. 1999, Holevinski et al. 2007).

Canada geese nest almost exclusively near a source of water, as it affords protection from predators. Female geese construct a nest bowl prior to laying eggs, and once the full clutch of eggs is laid, the female incubates the eggs for 28 days while the male goose remains on watch for intruders (USDA 2011b). Both the male and the female goose will actively defend their nesting territory from potential threats, including other geese (Kossack 1950, Fabricius et al. 1974). The area of the nesting territory is variable with some geese nesting in colonies with individual nests ≤90 feet of each other (Kossack 1950). However, in southeastern Pennsylvania, resident Canada geese nesting on small ponds ≤5 acres tend to defend the entire pond and adjacent areas (USDA, unpubl. data). Generally, Canada geese are monogamous and philopatric, returning to the same nesting site to hatch their offspring every year (CLO 2012). However, Kossack (1950) documented that geese may select new mates if their initial mate dies early in the breeding season. The timeframe between a mate dying during the onset of nesting and the amount of time it takes the surviving mate to select a new partner was not well documented.

In areas where hunting is not feasible or effective in balancing the abundance of Canada geese abundance within goals, managers destroy eggs to prevent hatching. Techniques used to prevent hatching include vigorous shaking of the egg, poking a hole in the shell to drain the egg, and coating the shell with food-grade corn oil to prevent air movement through the eggshell. On average, one treatment using any of the above-mentioned techniques will successfully prevent the embryo from developing and the egg from hatching (Smith et al. 1999, USDA 2011b). However, if treatment is applied before the full clutch was laid, untreated eggs will hatch. Typically, the nests of individual pairs of geese are treated repeatedly per nesting season over multiple years to ensure that no reproduction occurs. Depending on the characteristics of the nesting site, time required to search for one nest and treat the eggs may be minutes or hours.

Other methods used to control reproduction in resident Canada goose populations continue to be investigated. OvoControl® G, a nicarbazin-based substance, can be administered to Canada geese through the use of bait to prevent embryo development (Caudell et al. 2010). When implementing reproductive control on local Canada goose populations ≤35 nesting pairs, the costs associated with application of OvoControl® G are higher than traditional practices used to addle eggs (Caudell et al. 2010). Additional strategies are needed to provide managers with alternative methods to control reproduction by resident Canada geese.

In our study area, much of the breeding by resident Canada geese occurs on small ponds (<5 acres), and anecdotal observations suggested that social pressure among breeding pairs of Canada geese typically dictated that only one aggressive breeding pair establishes a territory on small ponds (G. J. D'Angelo, unpubl. data). Using this logic, managers allow a single nesting pair on small ponds and destroy their eggs, while deriving the perceived benefits of the sentinel geese excluding other nesting geese. However, a single pair of geese may also cause damage, decimating plants and depositing accumulations of feces in the localized area. We hypothesized that removal of single nesting pairs of Canada geese on small ponds after the onset of breeding activity would result in a void of geese for the remainder of the reproductive season, thus providing an alternate lower-cost management strategy. We further hypothesized that if the male goose was not removed, he would continue to defend the territory, excluding other nesting geese.

STUDY AREA

Our study was conducted throughout suburban Bucks County, southeastern Pennsylvania. Upper Bucks County lies in the Piedmont physiographic region with gently rolling hills and broad valleys. Lower Bucks County lies in the Atlantic Coastal Plain physiographic region, is flat, and near sea level (PADCNR 2012). Bucks County totals 605 square miles including 16 square miles of water (BC 2012). The Delaware River is the entire eastern border of Bucks County. The major drainages of Tohickon Creek and Neshaminy Creek empty into the Delaware River. A multitude of small water bodies are associated with state, county, and municipal parks, golf courses, residential communities, business complexes, farms, and sewer and drinking water plants.

Historically prime farmland, Bucks County is now dominated by suburban development with ≥1,000 people per square mile (U.S. Census Bureau 2012). Major land uses include single-family residential (23%), rural residential (21%), agriculture (16%), and recreational areas (11%) (Bucks County Planning Commission 2011).

USDA Wildlife Services administered a county-wide program directed at reducing damage by Canada geese during 2002-2012. Direct damage management for Canada geese was conducted on ≥200 properties of public and private ownership. Most effort was directed toward minimizing damage by resident Canada geese with >750,000 harassment events recorded, >9,000 eggs treated, and >4,000 geese removed during population roundups or lethal enforcement of harassment (USDA, unpubl. data).

METHODS

Our study was conducted during the 2011 nesting season for resident Canada geese (late March through May) on properties enrolled in the damage management program administered by USDA Wildlife Services in Bucks County, PA. We used data collected during treatment of nests and eggs in previous years to identify 22 independent sites, which traditionally harbored a single nesting pair of resident Canada geese (focal geese) on ponds ≤5 acres. Using generation of random numbers via Microsoft Excel (Microsoft Corp., Redmond, WA), we randomly assigned one of three treatments to each site: 1) control – neither female nor male goose in the focal pair was removed, the eggs were treated under normal protocols to prevent hatching, and the nest and eggs were removed after the 28-day incubation period; 2) after nest initiation, only the female goose in the focal pair was removed, and the nest and eggs were removed; and 3) both the female and male goose (the focal pair) were removed and the nest and eggs were removed.

We conducted pre-treatment observations at all sites to confirm that only the focal pair of geese was actively nest-

ing. To ensure humane handling and rapid euthanasia, we lethally removed geese under normal protocols established by USDA Wildlife Services Directive 2.505 (USDA 2011a) and within recommendations by the American Veterinary Medical Association (2007). We treated eggs using 100% food-grade corn oil under normal protocols established by USDA Wildlife Services (USDA 2011b) and mandated by U.S. Fish and Wildlife Service. We operated under the auspices of U.S. Fish and Wildlife Service Depredation Permit No. MB068253 and Pennsylvania Game Commission Special Permit No. 141-2010 (Amendment 1).

To evaluate the results of our treatments, we visited sites at intervals of ≤7 days throughout the nesting season and observed sites for ≥20 minutes per session. We deemed treatments successful if no goslings were produced by the focal geese, no other nesting pairs were present, and no other nesting activity was identified (e.g., nest bowls, presence of other geese defending the pond).

Within each treatment, we quantified the number of sites on which treatments were either successful or unsuccessful in preventing reproduction. We reported the percentage of sites deemed successful per treatment and evaluated whether there was a difference among the number of successful treatments using a chi-square contingency table with 2 rows (outcomes) and 3 columns (treatments) (Sokal and Rohlf 1995). Anecdotal observations were provided where necessary to elucidate occurrences outside of the study design.

We selected 22 independent sites for our study. We randomly assigned 8 sites to Treatment 1 (control – no removal), 7 sites to Treatment 2 (remove female only), and 7 sites to Treatment 3 (remove female and male, focal pair). However, discreetly removing geese from some of the sites in urban areas proved difficult. Therefore, one site initially assigned to Treatment 2 and one site initially assigned to Treatment 3 was reassigned to Treatment 1.

We conducted pre-treatment observations beginning 26 March 2011. We applied treatments from 7-26 April 2011, and began post-treatment observations at each site immediately after the treatment was applied. We completed post-treatment observations and removed nests and eggs from sites where Treatment 1 was applied by 31 May 2011.

RESULTS

There was no statistical difference in success among the three treatments ($\chi_2^2 = 2.41$, $P = 0.3$). For Treatment 1, 10 of 10 sites (100%) harbored only the focal pair of Canada geese throughout the nesting season.

For Treatment 2, 5 of 6 sites (83%) harbored no additional nesting pairs. On the one remaining site where Treatment 2 was applied, ≤27 days after the female was removed a second pair of geese nested in the same location as the nest of the focal female that we removed. The focal male remained at the site and was present during post-treatment observations on a total of 2 of 6 sites where Treatment 2 was applied.

For Treatment 3, 3 of 4 sites (75%) were not re-colonized by nesting geese after the focal geese were removed. On one site, ≤14 days after the focal geese were removed a second pair established a nest in the same location where the focal geese had nested.

In addition to the planned application of treatments, we had the opportunity to observe how geese responded to alternative conditions on two sites slated for Treatment 3. On a drainage pond in an affluent senior-living community, a pair of geese were observed to nest on top of a concrete culvert during the previous two reproductive seasons. During our first visit to the site for pre-treatment observations, a lone male goose was present. Upon further investigation, a fresh carcass of a goose was found at the nesting location. Apparently, the carcass was the female goose, as the male was observed to remain on the site and defended the nesting area for the entire season.

On a sewage lagoon in a residential community, a pair of geese were observed to nest next to an electrical control unit during the three previous reproductive seasons. After the pair established their nest and full clutch during 2011, we removed the focal male. On multiple subsequent occasions, we attempted to remove the focal female, but because of the location and her tendency to fly upon our approach, we could not safely and discreetly remove her. We treated the eggs under normal protocols, and the female continued to incubate the nest until we removed it at the end of the season.

All geese that were removed were processed for human consumption. We donated 37 lbs of goose meat to City Team Ministries, Chester, PA.

DISCUSSION

Removing geese in urbanized areas proved difficult. We spent additional time at each site to remove the focal geese versus the time required during one visit to treat eggs under normal protocols. We strived to remove geese safely and discreetly to limit detection from the public; therefore, we could not apply all treatments as scheduled.

While there was no statistical difference among our treatments, and post-treatment observations confirmed that treatments varied in success. Although Treatment 1 (control – no removal) was 100% effective at excluding additional nesting pairs of Canada geese, damage caused by single nesting pairs is guaranteed and is often too excessive for property managers to tolerate. On sites where a pair of geese has nested for multiple years, and the property manager is dissatisfied or the geese are aggressive towards people, Treatment 2 or 3 may be more appropriate to provide some reduction in damage. In our anecdotal observation where the female was killed prior to treatment, the focal male remained at the site. Most focal males in our application of Treatment 2 left the pond unguarded after the female was removed. This suggests that our activities had some harassment effect on the male, causing him to leave the site. Therefore, Treatments 2 and 3 were virtually identical. Since removing only the focal female requires less effort, Treatment 2 may be the best option for some sites.

However, Treatment 2 may be the most controversial of our treatments since we only removed the focal female while the male goose remained on site. Some members of the public are adamantly opposed to any form of lethal wildlife management. The application of this treatment may lead to further anthropomorphizing Canada geese, and a reduction in support for goose management efforts. Perceptions of Canada geese by the public are dependent

on how geese impact the daily lives of individual people (Smith et al. 1999). Property managers that expend funds to clean up goose feces have different views on geese than the family that enjoys feeding bread to geese at a park distant from their house. Effective communication can guide acceptance of lethal removal by the public (Loker et al. 1999). However, extra sensitivity should be practiced when lethal removal is applied to ensure rapid euthanasia and to minimize exposure of the public.

The density of resident geese in the surrounding area may impact the success of the treatments. In our study area, multiple bodies of water were in close proximity to each other. When treatments failed, encroachment by geese from adjacent ponds within visible distance of our study ponds was suspected. Treatments 2 and 3 followed by non-lethal harassment for ≥1 week may reduce encroachment. Depending on the site, harassment may be more intensive and costly than treating the eggs of a nesting pair of geese.

We determined that targeted removal of a nesting pair or only the female of a nesting pair of Canada geese could be effective in eliminating breeding on a small pond for the entire nesting season. Likewise, the traditional approach of allowing a single aggressive nesting pair on small ponds reliably excluded additional nesting pairs. Application of Treatment 2 or 3 via shooting geese may not be practical in some urban areas. Also, safety should be paramount when using firearms. Application of Treatment 2 may not be appropriate in public areas (e.g., walking paths, parks), where sensitivity of the public is of concern because only the female is removed. This study provided evidence that all three treatments may satisfy the goal of suppressing reproduction by resident Canada geese, but managers should select treatments on a site-specific basis to best minimize damage.

ACKNOWLEDGMENTS

We thank Bucks County Department of Parks and Recreation for providing funding for this study. As a student presenter, R. P. Lynch received travel funding from the 25th Vertebrate Pest Conference, and we were grateful for their generosity. We thank the Pennsylvania Game Commission and Stuff It Taxidermy, Aston, PA, for providing the avenue to distribute all goose meat to City Team Ministries, Chester, PA.

LITERATURE CITED

Aguilera, E., R. L. Knight, and J. L. Cummings. 1991. An evaluation of two hazing methods for urban Canada geese. Wildl. Soc. Bull. 19:32-35.

American Veterinary Medical Association. 2007. Guidelines on euthanasia. American Veterinary Medical Association, Panel on Euthanasia, Schaumburg, IL.

BC (Bucks County). 2012. Bucks County homepage. http://www.buckscounty.org/about/index.aspx. Accessed 02 January 2012.

Bucks County Planning Commission. 2011. Bucks county comprehensive plan 2011, public review draft. Bucks County, Doylestown, PA.

Castelli, P. M., and R. E. Trost. 1996. Neck bands reduce survival of Canada geese in New Jersey. J. Wildl. Manage. 60:891-898.

Caudell, J. N., S. A. Shwiff, and M. T. Slater. 2010. Using a cost-effectiveness model to determine the applicability of OvoControl G to manage nuisance Canada geese. J. Wildl. Manage. 74:843-848.

Conover, M. R. 2011. Population growth and movements of Canada geese in New Haven County, Connecticut, during a 25-year period. Waterbirds 34:412-421.

Conover, M. R., and G. C. Chasko. 1985. Nuisance Canada goose problems in the eastern United States. Wildl. Soc. Bull. 13:228-232.

Conover, M. R., and G. S. Kania. 1991. Characteristics of feeding sites used by urban-suburban flocks of Canada geese in Connecticut. Wildl. Soc. Bull. 19:36-38.

CLO (Cornell Lab of Ornithology). 2012. All about birds, bird guide. Species account for Canada goose. http://www.allaboutbirds.org/guide/Canada_goose/id/ac. Accessed 1 January 2012.

Fabricius, E., A. Bylin, A. Ferno, and T. Radesater. 1974. Intra- and interspecific territorialism in mixed colonies of the Canada goose (*Branta canadensis*) and the Greylag goose (*Anser anser*). Ornis Scandinavica 5:25-35.

Holevinski, R. A., P. D. Curtis, and R. A. Malecki. 2007. Hazing of Canada geese is unlikely to reduce nuisance population in urban and suburban communities. Human-Wildl. Confl. 1:257-264.

Hussong, D., J. M. Damaré, R. J. Limpert, W. J. Sladen, R. M. Weiner, and R. R. Colwell. 1979. Microbial impact of Canada geese (*Branta canadensis*) and whistling swans (*Cygnus columbianus columbianus*) on aquatic ecosystems. Appl. Envir. Microbiol. 37:14-20.

Kossack, C. W. 1950. Breeding habits of Canada geese under refuge conditions. Am. Midl. Nat. 43:627-649.

Loker, C. A., D. J. Decker, and S. J. Schwager. 1999. Social acceptability of wildlife management actions in suburban areas: 3 cases from New York. Wildl. Soc. Bull. 27:152-159.

PADCNR (Pennsylvania Department of Conservation and Natural Resources). 2012. Bureau of Topographic and Geologic Survey. Geology of Pennsylvania. http://www.dcnr.state.pa.us/topogeo/index.aspx. Accessed 2 Jan 2012.

Seamans, T. W., S. E. Clemons, and A. L. Gosser. 2009. Observations of neck-collared Canada Geese near John F. Kennedy International Airport, New York. Human-Wildl. Confl. 3:242-250.

Sheaffer, S. E., R. A. Malecki, B. L. Swift, J. Dunn, and K. Scribner. 2007. Management implications of molt migration by the Atlantic Flyway resident population of Canada geese, *Branta canadensis*. Can. Field Nat. 121:313-320.

Smith, A. E., S. R. Craven, and P. D. Curtis. 1999. Managing Canada geese in Urban Environments. Jack H. Berryman Institute Publication 16, Cornell Cooperative Extension, Ithaca, NY.

Sokal, R. R., and F. J. Rohlf. 1995. Biometry, Third Ed. W. H. Freeman, New York, NY.

United States Census Bureau. 2012. http://quickfacts.census.gov/qfd/states/42/42017.htm. Accessed 2 January 2012.

USDA (U.S. Department of Agriculture). 1999. Final environmental assessment and finding of no significant impact and decision for management of conflicts associated with non-migratory (resident) Canada geese in the Puget Sound area: environmental assessment. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, Washington, D.C.

USDA (U.S. Department of Agriculture). 2011a. Lethal control of animals. Directive 2.505. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, Washington, D.C.

USDA (U.S. Department of Agriculture). 2011b. Management of Canada goose nesting in Pennsylvania. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services Species Fact Sheet, Harrisburg, PA.

USFWS (U.S. Fish and Wildlife Service). 2011. Final environmental impact statement: Resident Canada goose management. U.S. Fish and Wildlife Service, Washington, D.C. 287 pp.

Wobeser, G., and C. J. Brand. 1982. Chlamydiosis in two biologists investigating disease occurrences in wild waterfowl. Wildl. Soc. Bull. 10:170-172.