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Population Growth and Movements of Canada Geese in New Haven County, Connecticut, during a 25-Year Period

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Abstract.—In the last few decades, Canada Geese (*Branta canadensis*) have become established in metropolitan areas throughout North America. From 1984 through 2009, Canada Geese in New Haven County, Connecticut, were banded as goslings (HY geese) and adults (AHY), and their movements and recruitment into the local breeding population were documented. During this period, the number of Canada Geese increased several fold in Connecticut. Geese were non-migratory; most recoveries (85%) of banded Canada Geese came from Connecticut, and 76% came from New Haven County. Dispersal rates outside of Connecticut peaked during 1990–1994 when 23% of all reported geese were shot outside of the state; more recently (2005-2009) only 3% of reported geese were shot outside of Connecticut. The proportion of dispersing geese that moved northward in the Atlantic Flyway has increased in recent years. Similar proportions of AHY females (23%) and AHY males (22%) were recruited into the local breeding population. Among HY geese, more females (22%) than males (5%) were recruited because HY males were more likely to disperse out of the county than HY females. Non-migratory populations of geese in metropolitan areas are causing nuisance problems; the restricted movements of these geese indicate that efforts to reduce their populations will have to be conducted at the local level. *Received 17 May 2011, accepted 10 July 2011.*

Key words.—*Branta canadensis,* Canada Geese, dispersal, migratory behavior, non-migratory geese, recruitment.

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In the last few decades, non-migratory populations of Canada Geese (*Branta canadensis*) have become established in metropolitan areas across North America. Initially, these geese were encouraged by urban residents, who enjoyed seeing these birds in their neighborhoods, and by wildlife agencies, which hoped the geese would provide new recreational opportunities for waterfowl hunters. These non-migratory populations in North America have been so successful that their numbers have increased 16-fold during the last three decades and reached 5.5 million during 2008 (Dolbeer and Seubert 2009). Indeed, they now outnumber migratory Canada Geese in all North American flyways (Dolbeer and Seubert 2009). Unfortunately, high densities of Canada Geese in metropolitan environments have created numerous nuisance and public health concerns (Conover and Chasko 1985) and are a threat to human safety when aircraft collide with them (Dolbeer 2009; Seamans *et al.* 2009). The result is that many people have lost their tolerance of Canada Geese and believe that their numbers should be reduced. Concomitantly, other people still enjoy feeding, watching, or hunting these birds and want goose numbers to increase. Such diverse opinions make it difficult for wildlife agencies to make decisions about to manage goose populations in metropolitan areas. The problem is compounded due to a lack of knowledge about the movements of metropolitan Canada Geese and their recruitment into the local breeding population. The objectives of this study were to provide such information for a population of Canada Geese located in New Haven County, Connecticut over a period of 25 years.

METHODS

Study Area

Canada Geese nested in the numerous ponds and lakes scattered throughout New Haven County, Connecticut but many geese brought their broods to one of three brood-rearing areas, sometimes traveling several kilometers through closed-canopy forests to reach them (Conover 1998; Gosser and Conover 1999). Each brood-rearing area was a complex of three to twelve ponds, reservoirs, and lakes clustered together and within a single watershed. The three complexes were 1) Lake Dawson, Lake Waltrous, Lake Glen and Konolds Pond; 2) Whitney Lakes; and 3) Maltby Lakes (Fig. 1). Adjacent to these lakes were golf courses, shopping centers, homes, and apartment buildings; broods usually foraged on the lawns associated with these areas.

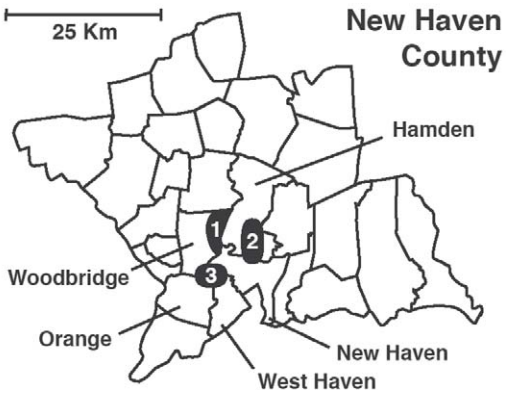

Figure 1. New Haven County, Connecticut, showing the location of the three brood-rearing areas where Canada Geese were banded: 1) Lake Dawson, Lake Waltrous, Lake Glen, and Konolds Pond; 2) Whitney Lakes; and 3) Maltby Lakes.

For instance, the broods from Maltby Lakes spent most of their time on Yale University Golf Course, which offered both rich foraging grounds (lawns) and sanctuaries (water hazards and ponds). Such open sites also proved ideal for keeping track of individual geese and their goslings (Conover and Kania 1991).

Field Methods

Several techniques were employed to assess how Connecticut's goose population has changed in recent decades including the Audubon Christmas Bird Count, midwinter aerial surveys, waterfowl breeding-pair counts, and hunter surveys. Hundreds of volunteers in Connecticut took part annually in the Audubon Christmas Bird Count by counting birds from late December through early January. These data provided a useful index of how the state's non-migratory population of Canada Geese has changed across time because most migratory Canada Geese had already migrated through Connecticut before December when the Christmas Bird Counts were conducted. Data from the 1950 through 2009 Christmas Bird Counts were used to estimate how the non-migratory goose population changed since the 1950s (Audubon 2010). A problem with historical data from the Audubon Christmas Bird Count is that the number of observers has increased across time due to the Count's popularity with birders. To correct for this potential bias, the number of geese observed every year was divided by the number of hours that observers spent in the field counting birds; these data were available at Audubon (2010).

Data collected by Connecticut's Department of Environmental Protection (DEP) were used to assess how goose abundance has changed across time. Since 1955, DEP conducted mid-winter aerial surveys along Connecticut's coast. During the spring, DEP also counted breeding pairs of waterfowl that were located within breeding waterfowl plots (Klimstra *et al.* 2009). Information on the number of Canada Goose pairs seen in Connecticut during the breeding-waterfowl surveys conducted prior to 1988 was available in Chasko and Conover (1988) and from 1993 to 2009 in Klimstra *et al.* (2009). During the breeding-waterfowl surveys, DEP also counted the total number of geese (i.e., singles, pairs, and groups) observed in the plots. These data provided another indication of how Connecticut's population of Canada Geese has changed across time.

Data on the number of Canada Geese shot by hunters in Connecticut was used as another measure of how goose abundance had changed since 1962 (Serie *et al.* 2003; Klimstra *et al.* 2009). From 1962 to 2001, numbers of geese harvested annually were estimated by mailing questionnaires to duck stamp purchasers. Because of problems with this survey method, a new survey method, called the Harvest Information Program (HIP) was initiated during 1999. Hunters had to complete the HIP survey before they could legally hunt migratory birds. Because the survey methods differed, harvest estimates derived from them were not directly comparable. Fortunately, there were three years (1999, 2000, and 2001) when both survey methods were employed allowing a comparison of results obtained by the two methods.

In late June, adult geese in Connecticut molt their primary feathers and become flightless. This molt occurred before goslings gained the ability to fly. During the molt, goslings and adults were caught at brood-rearing sites by herding them into funnel traps. Thereafter, this event will be called the round-up. The round-up was conducted in late June or early July and was timed to occur before the oldest goslings could fly and adults regained the ability to fly. Most of the adults and goslings at a round-up site were captured, but some geese always managed to elude capture. When first caught, each bird was weighed and its sex determined through a cloacal examination. A U.S. Fish and Service (USFWS) aluminum leg band was placed on each bird along with a large leg band. Each leg band was black and had 1.3-cm-high letters and numbers, which were white. Each large leg band had a unique combination of letters and numbers, which allowed me to individually identify geese from a distance. The large leg bands were made of plastic by Spinner Plastics (Springfield, Ill.). Beginning in 1994 and continuing to the study's end, neck collars were placed on approximately half of the geese in lieu of the large leg bands. Each collar had a unique combination of 3-cm-high numbers and letters so that the bird could be individually recognized at a distance. There were made from soft plastic by Spinner Plastics and were identical to those used extensively throughout the Atlantic Flyway (Hestbeck and Malecki 1989). Any USFWS leg bands, large leg bands, or neck collars were replaced when they wore out or were lost.

Subjects for this study were geese that had been banded as goslings (hatching year or HY geese) or as adults (after hatching year or AHY geese) prior to 2001. The terms, HY and AHY, refer to when the bird was first banded and not to the bird's age; that is, an HY goose remains an HY goose its entire life.

Information provided on USFWS leg bands requested that anyone finding the band or banded bird notify the U.S. Bird Banding Lab in Laurel, Maryland. Respondents were asked where and when the bird was found and how the bird was recovered (e.g., shot or found dead). Band return reports were used to determine which geese were shot and retrieved by hunters (i.e., harvested) and where and when a goose was collected. The reports contained information about the state or Canadian province and the latitude and longitude where the goose was recovered. When a goose was harvested in Connecticut, latitude and longitude coordinates were used to determine the county and town where the goose was collected. Some ambiguity resulted from this when the coordinates fell along the border of two towns. In such situations, birds were assigned to the most likely town based on which town had a public hunting area or suitable goose habitat near the coordinates. I evaluated whether geese from the three brood-rearing sites differed in where they were harvested. Also, I examined how the distribution of harvested geese varied across months (August to February) and across years.

I predicted *a priori* that HY geese would disperse or migrate further than AHY geese and that males would disperse or migrate further than females. These predictions were tested by using records from the U.S. Bird Banding Lab to track the movements of geese. A chi-square test was used to determine if a higher proportion of HY geese than AHY geese were recovered outside of Connecticut. An identical test was used to determine if males were more likely than females to be recovered outside of Connecticut.

I predicted *a priori* that as local goose numbers increased, more geese would disperse from the area because they were unable to find suitable nesting sites in the area. This was tested by determining the proportion of reported geese that were shot outside of the state during five-year periods (1984-1989, 1990-1994, 1995-1999, 2000-2004, 2005-2009). A chi-square test was then used to determine if there was a difference in proportions among time periods. A similar test was conducted to assess whether there had been a change in the direction of dispersal across time periods. For this test, the proportion of geese that were harvested north than Connecticut (Rhode Island, Massachusetts, Vermont, New Hampshire, Maine, and Canada) were compared to those harvested south of the Connecticut. Geese shot in New York were considered to be south of Connecticut because most were collected in New York's Westchester County or on Long Island. Too few geese were shot outside of Connecticut during 1980-1984 and 2005–2009 to include these time periods in the analysis.

To locate Canada Goose nests, all water bodies appearing U.S. Geological Survey maps of New Haven County were search either from a boat or on shore. Additional goose nests were located during flights by Connecticut Department of Environmental Protection and by reports from citizens. All known nesting sites in New Haven County were checked during the nesting season to locate nests and to identify which geese were paired together or defended territories. Nests were found by systematically searching the shore and islands for nests. Nests were also located by watching for single males; their presence usually meant that a nest was nearby. Females were considered to have reproduced during any year that they were observed incubating a nest or were seen with a brood. Males were considered to have reproduced during any year that they were observed escorting a brood or defending a territory in which a female was observed incubating a nest. These were the same criteria used by Craighead and Stockstad (1964). Geese were considered to have been recruited into the local breeding population if they nested at least once during their lives (henceforth called recruited geese). Non-recruited geese were those that died before they were observed nesting. The recruitment proportion was defined as the proportion of all banded geese that became recruited geese (i.e., number of recruited geese divided by the number of banded geese).

RESULTS

Numbers of Canada Geese have increased substantially in Connecticut since 1950 based on several measures of abundance. Numbers of Canada Geese observed in Connecticut during the Audubon Christmas Bird Count have increased steadily since the 1950s when <500 were observed annually to >16,000 by the start of my study (1984), and to >52,000 by the end of my study (2009). When goose numbers were standardized for observer effort by dividing goose numbers by the number of hours that observers spent in the field, numbers of Canada Geese increased from one goose/hour during the 1950s, to 9/hour during 1984, and to 29/hour during 2009 (Fig. 2). During the mid-winter waterfowl surveys, DEP counted <1,000 Canada Geese annually from 1955 to 1970. Between 3,700 and 9,000 geese were counted annually during the 1980s; goose numbers have remained relatively stable since then (Fig. 3). During its annual breeding-waterfowl survey, DEP counted about 100 breeding pairs of Canada Geese during the late 1950s and 4,500 pairs by the late 1980s (Chasko and Conover 1988); during 1994, >10,000 pairs of Canada Geese were counted. Since then, the number of breeding pairs observed increased until 2001 and then declined.

From 1955 until 1969, hunters harvested <1,000 Canada Geese annually in Connecticut, but goose harvest increased substantially during the 1970s and 1980s (Fig. 4). Five

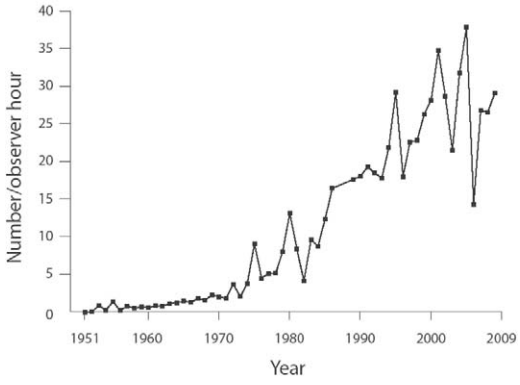

Figure 2. Number of Canada Geese counted annually in Connecticut during the Audubon Christmas Bird Count and corrected for search effort by dividing the number of geese observed by the number of hours that parties of observers spent counting birds (Audubon 2010).

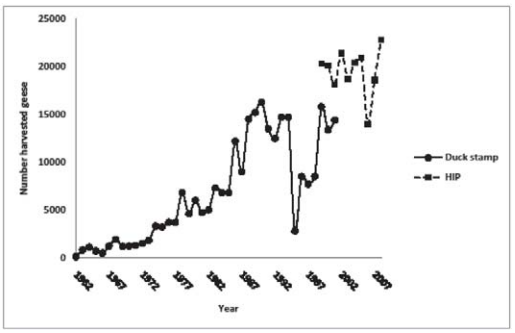

Figure 4. Number of Canada Geese harvested annually in Connecticut by hunters. Estimates from 1962 to 2001 were made from questionnaires mailed to people purchasing duck stamps (Serie et al. 2003) and are shown in the figure by a solid line and closed circles. From 1999 to 2009, estimates came from the Harvest Information Program, which requires bird hunters to report the number of birds they harvested during the prior year (Klimstra et al. 2009) and are shown by a dashed line and squares. Results from the two different sampling methodologies are not directly comparable, but both methods were used for three years (1999, 2000, and 2001).

thousand geese were first harvested during 1978 and ten thousand during 1986. Since then, there has been considerable annual variation in numbers of geese harvested in Connecticut, but the general trend has been downward. In 1984 when I started this study, there were six goose nests at the three brood-rearing sites. I located 43 nests during 1989 and 41 during 1995. Since then, nest numbers have declined to <30.

Prior to 2001, 1,868 geese were banded including 381 HY females, 326 HY males, 545 AHY females, and 616 AHY males. Most of these geese were non-migratory and remained in New Haven County throughout the year. During a cold winter when inland waters froze, geese moved temporally to the nearby Connecticut coast or to a local river where there was open water. The geese returned to inland ponds, lakes, and marshes when these areas thawed. Most Canada Geese in New Haven County built their nests on islands, abandoned muskrat (*Ondatra zibethica*) lodges, and abandoned Mute Swan (*Cygnus olor*) nests that were scattered on ponds and lakes throughout the county. After the goslings hatched, most goose parents in New Haven County moved their broods to golf courses or other sites where there were mowed lawns that provided abundant food for the goslings.

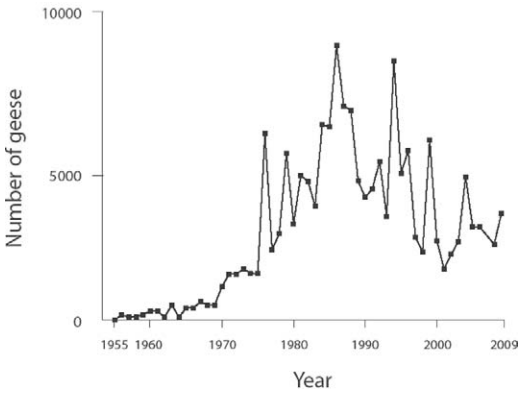

Figure 3. Number of Canada Geese counted by Connecticut Department of Environmental Protection during its mid-winter waterfowl survey conducted along Connecticut's coast (Klimstra *et al.* 2009).

The U.S. Bird Banding Lab received mortality reports for 344 geese, including 146 HY geese and 198 AHY geese. Most of the mortality reports came from 313 geese that were harvested by hunters including 137 HY geese and 176 AHY geese. Additionally, nine HY geese and 22 AHY geese were found dead and were not included in the hunter-recovery proportion.

Mortality reports for 132 HY geese came from Connecticut (90% of all HY recover-

ies), but six females and eight males died elsewhere. The HY geese that died outside of Connecticut came from Quebec (n = 5), New Jersey (3), New York, (2), Maine (2), Rhode Island (1), and New Brunswick (1). Among HY geese, males and females were equally likely to be recovered outside of Connecticut (χ^2 = 0.61, df = 1, P = 0.44).

Mortality reports for 162 AHY geese came from Connecticut (82% of all AHY recoveries) while reports for 17 females and 19 males came from other states or Canadian provinces. The AHY geese that died outside of Connecticut came from New Jersey (n = 16), New York (6), Pennsylvania (5), Delaware (4), Ontario (2), New Hampshire (1), Virginia (1), and New Brunswick (1). Among AHY geese, both sexes were equally likely to be recovered outside of Connecticut (χ^2 = 1.82, df = 1, P = 0.18). Fewer HY geese (10%) than AHY geese (18%) were recovered outside of Connecticut (χ^2 = 4.99, df = 1, P = 0.03). Most HY geese were harvested north of Connecticut while most AHY geese were harvested west or south of it (Fig. 5). All of the geese harvested in states east or north of Connecticut or in Canada were shot before the first of December while 60% of geese shot in states west or south of Connecticut were shot after that date.

Of the 294 geese shot in Connecticut, mortality reports contained information on when and where the goose was shot for 259 of them. Some were shot in every Connecticut county but 91% were shot in New Haven County where they were banded (Fig. 6). The harvest within New Haven County was concentrated in three areas where there was a combination of good goose habitat, open water during the winter, and most importantly, public hunting grounds where people could hunt without having to obtain landowner permission (Fig. 7). These were 1) New Haven Harbor (including the cities of New Haven and West Haven), 2) Charles E. Wheeler Wildlife Area in Mil-

Figure 5. Location of Canada Geese banded as goslings (HY geese) or as adults (AHY geese) in New Haven County, Connecticut, and later found dead or harvested by hunters beyond the borders of Connecticut (circled numbers indicate the number of geese found dead or harvested in each state or Canadian province).

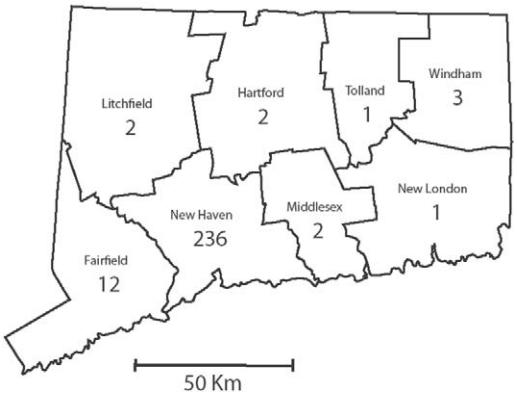

Figure 6. Number of Canada Geese banded either as goslings (HY geese) or adults (AHY geese) in New Haven County, Connecticut and later found dead or harvested by hunters in one of Connecticut's eight counties.

ford where the Housatonic River flowed into Long Island Sound, and 3) Quinnipiac River Marsh Wildlife Area (New Haven, Hamden, and North Haven). The latter two sites contained extensive tidal marshes.

Geese banded at the three brood-rearing sites differed in where they were harvested within Connecticut. Only 12% of harvested geese that were banded at the brood-rearing site of Lake Dawson, Lake Waltrous, Lake Glen, and Konolds Pond (hereafter referred to as Lake Dawson) were shot in New Haven

Figure 7. Number of Canada Geese that were banded either as goslings (HY geese) or adults (AHY geese) in New Haven County, Connecticut and found dead or harvested in one of 28 towns or cities of New Haven County. In the figure, the cities of East Haven and New Haven are combined together because I was unable to differentiate between geese shot in East Haven and geese shot in New Haven.

Harbor compared to 25% and 45% of harvested geese that were banded at Maltby Lakes and Whitney Lakes brood-rearing sites, respectively. These percentages differed from each other ($\chi^2 = 21.26$, df = 2, $P < 0.001$). In contrast, 45% of the harvested Lake Dawson geese were shot in Milford compared to only 35% and 20% of the harvested geese that were banded at Maltby Lakes and Whitney Lakes, respectively. These differences were significant ($\chi^2 = 11.58$, df = 2, $P = 0.003$).

The traditional goose hunting season in the northeastern U.S. occurred from October until early December. After non-migratory goose populations had increased, state and federal wildlife agencies opened special goose hunting seasons in the northeastern states (including Connecticut) during September before migratory Canada Geese had reach these states and during January and February after migratory Canada Geese had migrated through them. Most of my geese were harvested during these special goose seasons; 30% were harvested during September and 31% were harvested during January and February. Among geese that were harvested in Connecticut during January and February, all but one of them came from towns located along Long Island Sound.

The time of year when geese were harvest changed during the 25 years of my study. During the 1980s, no geese were harvested in September; 6% of all harvested geese were shot during September from 1990 to 1995. Since 1995, 62% of all harvested geese were shot during September. The proportion of harvested geese that were shot outside of Connecticut has changed across time ($\chi^2 = 12.04$, df = 5, $P < 0.03$) with the highest proportion (23%) occurring from 1990 to 1994 and the lowest percentage (3%) occurring during the most recent period (2005 to 2009). The proportion of harvested geese that were shot north of Connecticut also changed among years ($\chi^2 = 8.65$, df = 3, $P < 0.03$); 15% of harvested geese were shot north of Connecticut during 1985 to 1989 versus 40% from 2000 to 2004 (the last time period for which I had data).

I observed nesting by 359 banded geese (0.19 recruitment proportion), includ-

ing 99 HY geese (0.14) and 260 AHY geese (0.22). Of 381 HY females, 83 (0.22) were recruited into the local breeding population as were 16 of 326 HY males (0.05); these sexual differences in recruitment proportions were significant ($\chi^2 = 55.04$, df = 1, $P < 0.001$). One hundred twenty-four AHY females (0.23) were recruited as were 136 AHY males (0.22). Once geese were recruited into the local breeding population, they rarely left Connecticut. Band returns for all of the recruited geese came from Connecticut with the exception of one recruited female that was found dead in New York.

DISCUSSION

Several subspecies of Canada Geese (*Branta canadensis maxima, B. c. interior, B. c. canadensis*) contributed to the genetic origins of Connecticut's goose population, including the geese studied here, although they most closely resembled *B. c. maxima* (Pottie and Heusmann 1979). Before 1960, few geese were counted in Connecticut during the Audubon Christmas Bird Count, DEP's breeding-waterfowl survey, or DEP's mid-winter waterfowl count. Also, hunters harvested few geese in Connecticut during the 1950s. During this study (1984 to 2009), Connecticut's goose population increased several fold. The increase in population is not unique to Connecticut. Non-migratory geese now occur in most metropolitan areas of Canada and the U.S. By 2009, numbers of non-migratory geese outnumbered migratory geese in all North American flyways (Dolbeer and Seubert 2009). Most of the increase in goose numbers in Connecticut occurred prior to 1995. Since then, goose numbers have stalled in most in the state and declined in my study sites. The reasons for this are not entirely clear. The proportion of New Haven geese that were harvested by hunters is low; elsewhere hunters account for as much as 90% of all goose mortalities (Chapman *et al.* 1969; Bellrose 1976; Hestbeck and Malecki 1989; Hestbeck 1994). Canada Geese prefer to nest on islands that afford some protection from mammalian predators, such as Raccoons (*Procyon lotor),* Striped Skunks (*Mephitis mephitis*), Red Foxes (*Vulpes vulpes*), and Coyotes (*Canis latrans*), and there are only a limited number of islands in the county. Yet 81% of Canada Goose nests that are located on the mainland are successful in hatching at least one egg (Gosser and Conover 1999). Hence, it is unlikely that the availability of insular nesting sites is limiting reproduction. Instead, what has changed is that many people at brood-rearing sites no longer tolerate Canada Goose broods. Instead, geese are harassed, and a cottage industry has developed for companies using trained dogs to keep broods away. I suspect that any drop in goose abundance has resulted more from the exclusion of geese for optimal habitat for brood-rearing than a lack of secure nest sites or an increase in hunting mortality, but I lack data to test this hypothesis.

Geese in New Haven County were truly non-migratory; I observed geese that I banded all year. Additionally, 85% of all band recoveries came from Connecticut, and 76% came from New Haven County where the geese were banded. New Haven County is on the coast of Long Island Sound; during the coldest parts of winter when the inland waters froze, many of my geese moved from inland parts of New Haven County to its coastline on Long Island Sound but this short trip was the extent of the winter movements for most of the geese.

I predicted that the increasing number of local geese would increase competition for a nesting territory within Connecticut, and that this would force more geese to disperse from the state as time progressed. The proportion of harvested geese that were shot outside of Connecticut changed among years but it reached its peak during 1990 to 1994 and declined since then. These results do not support my prediction that dispersal rates will increase as local goose numbers increase.

In South Dakota, many non-migratory geese made post-molt trips of 40 to 470 km before returning to their original location during the fall (Dieter and Anderson 2009; Dieter *et al.* 2010*a*). These post-molt trips were generally towards the north. Most of the HY geese that were harvested outside of Connecticut were shot in states north of

Connecticut or in Canada. These HY geese may have been making post-molt trips similar to those made by non-migratory geese from South Dakota because most of them were shot during the early fall. In contrast, most of my AHY geese that were harvested outside of Connecticut were shot in states south of Connecticut and during late fall or winter. These AHY geese may have been local birds that migrated south for the winter. Alternatively, they may have originated from states south of Connecticut and made pre-molt trips northwards to Connecticut where they molted and were banded before they returned to their natal areas (i.e., they were molt-migrants). The proportion of harvested geese that were collected north of Connecticut has increased in recent years but the reason for this pattern is unclear.

Wildlife managers have difficulty managing non-migratory populations of geese in metropolitan areas due to the paucity of areas where hunting is permitted or can be conducted safely. In New Haven County, most geese were harvested in three public hunting areas. Elsewhere in the county, hunting rarely occurred because homes or occupied buildings were too close to the site for hunting to be conducted safely or because city ordinances prohibited the discharge of firearms. Another problem with the management of non-migratory geese in metropolitan areas is that the movements of the birds are localized so that goose hunters may over-harvesting one group of geese that frequent a site where hunting occurs while under-harvesting another group of geese that avoid hunting areas. Many of the geese harvested at Milford came from the brood-rearing area of Lake Dawson while many of the geese harvested in New Haven Harbor came from Whitney Lakes brood-rearing area. Yet, Lake Dawson is <10 km from Lake Whitney. This same phenomenon (different uses of space by adjacent goose populations) has been observed in Nebraska (Groepper *et al.* 2008), New York (Seamans *et al.* 2009), and South Dakota (Dieter *et al.* 2010*b*).

Non-migratory geese were released in many states during the 1970s and 1980s in the hope that establishment of non-migratory goose populations would provide more hunting opportunities for local hunters rather than hunters in other states. The hope seems to have been realized regarding the non-migratory geese in New Haven County because 85% of my geese that were harvested were shot in Connecticut. Likewise, 73%, 75%, 78%, and 89% of harvested geese that were banded in South Dakota, Nebraska, Rhode Island, and New Jersey, respectively, were recovered in the state where they were banded (Allin 1980; Castelli and Trost 1996; Powell *et al.* 2004; Dieter *et al.* 2010*b*). Throughout the U.S., non-migratory geese spend most of their time in urban and suburban golf courses, parks, and sports fields where hunting is prohibited (Holevinski *et al.* 2007; Groepper *et al.* 2008; Seamans *et al.* 2009). The situation has challenged waterfowl biologists to find innovative ways to harvest these geese. Since the 1980s, special goose seasons have occurred in Connecticut during late summer and mid-winter when only non-migratory geese were in the state. My results indicate that these special seasons have been successful; more of my subjects were harvested during them than during the regular hunting season. In South Dakota, 45% of all non-migratory geese that were harvested were shot during the September season (Dieter *et al.* 2010*b*).

Within just a few decades, non-migratory populations of Canada Geese have become established in metropolitan areas across North America and now outnumber migratory populations. The present study, which took place in Connecticut over a 25-year period, helps explain why these birds have been so successful. Harvest rates of both HY and AHY geese are low due to the paucity of hunting areas in metropolitan areas and recruitment rates are high. Connecticut created a special hunting season for non-migratory Canada Geese season during late summer before migratory geese reach the state and another one during winter after the migratory geese have passed through the state. These special hunting seasons were successful in that most hunting mortality of non-migratory Canada Geese occurred during these seasons. Despite these special seasons, state

and federal wildlife agencies may find it difficult to manage non-migratory Canada Geese because their populations have become so large that it will not be easy to harvest enough geese to reduce their populations. The task of managing non-migratory goose populations is further complicated because geese that inhabit adjacent brood-rearing sites occupy different areas during the hunting season. For this reason, one flock of geese may be over-harvested while an adjacent flock may experience little hunting mortality.

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