# Non-Lethal Management to Reduce Conflicts with Winter Urban Crow Roosts in New York: 2002 - 2007

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**Abstract:** American crow populations have increased steadily since 1966 in many parts of the U.S. Large winter congregations of crows in urban environments have resulted in an increased number of requests for assistance in managing nocturnal roosts in New York. In 2002, the USDA APHIS Wildlife Services program initiated a large-scale non-lethal winter roost dispersal program in Troy, New York. Since that time, similar programs have been implemented in 4 other cities in New York to manage crow roosts ranging in size from 8,000 - 63,000 individuals. The goals of the programs were to minimize noise, accumulations of crow feces around residences, strong odors associated with droppings, property damage, clean-up costs, and potential threats to human health and safety. The primary management strategy relied on dispersing concentrated crow populations from high-impact high-conflict areas, to low-impact low-conflict areas. An integrated management program using pyrotechnics, amplified recorded crow distress calls, and hand-held lasers was implemented to successfully disperse local crow roosts, reducing populations at the majority of core roost sites each year by more than 98%. In some instances, significant reductions in crow numbers and associated damage persisted >8 weeks after management without additional interventions, although most sites required multiple additional "spot treatments." High-profile urban wildlife management projects of this type require multiple meetings with key stakeholders and the public and often attract intense media interest, adding complexity to these programs. We provide summary information from 5 cities in New York documenting crow management techniques, intensity of effort, number of interventions required to relocate crow populations, and key lessons learned regarding science-based project documentation, project transparency, communication, and the need for long-term adaptive management strategies to meet project goals.

**Key Words:** *Corvus brachyrhynchos*, crows, crow distress calls, hazing, lasers, New York, pyrotechnics, roosts

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"*As it is every citizen's right to breath* (sic) *clean air and walk clean streets, free of unsanitary and potentially harmful 'debris' and without fear of said harmful 'debris' raining down upon us pedestrians, we respectfully request the necessary assistance to put an end to the vexatious fowls' 'rain of terror'.*"

– from a November 29, 2001 petition sent to Albany New York Mayor Gerald Jennings, requesting assistance in managing an urban winter crow roost

## INTRODUCTION

American crows (*Corvus brachyrhynchos*) are common throughout most of their North American range (Verbeek and Caffrey 2002), and populations have increased in many parts of the U.S., including New York, since 1966 (Sauer et al. 2007). However, recent regional declines in crow populations of up to 45% have been documented by LaDeau et al. (2007), compared to population levels prior to the emergence of West Nile virus (WNV) in 1999 in New York City. In contrast, McLean (2004) reported no detectable population impacts beyond the local level. Fish crow (*Corvus ossifragus*) populations are also reported to be increasing throughout their range and may be found in New York, particularly along the coast (Lauro and Tanacredi 2003), and in some cities.

Crows roost in large congregations at night during the fall and winter months in many locations (Gorenzel and Salmon 1992, 1995). In New York State, populations begin to increase in the fall, reach peak population size during December and January (Chamberlain 1964), and begin dispersing in early March prior to nesting season (Simpson 1972). Statewide, New York

mid-winter crow populations were estimated in 1932-1933 at "about 225,000" in 20 population units (15 of which were previously documented in a 1911-1912 survey), with estimates ranging from 1,000 to 55,000 crows per unit (Emlen 1938). Winter surveys conducted in New York in the 1960s estimated 40,000 to 50,000 crows in 15 roost sites (Chamberlain 1964). A number of researchers have noted the urbanization of crows in the later half of the 20th century, as crow roosting sites shifted from more rural areas to highly developed urban areas with dense human populations (Fitzwater 1988, Gorenzel et al. 2000).

Although large winter congregations of crows have been found in urban environments for several decades, the number of complaints regarding damage associated with these large (2,000 - 60,000 crow) roosts appears to be increasing (Gorenzel et al. 2000). In an effort to assist the public in reducing impacts of urban crow roosts, USDA APHIS Wildlife Services (WS) in New York implemented large-scale non-lethal winter roost dispersal programs (2002 - 2007). The goal of these programs was to minimize associated noise, accumulations of crow fecal droppings on and around residences and commercial properties, odors from feces, property damage, clean-up costs, and potential threats to human health and safety (Gorenzel et al. 2000, Peh and Sodhi 2002). Non-lethal hazing programs in 5 New York State cities involved a combination of population surveys and direct management targeting crows (primarily American crows, with some fish crows). The primary strategy involved human-facilitated dispersal of crows from the site of damage ("high-impact areas") to sites where there was a lower risk of conflict ("low-impact areas"), using an integrated approach with a variety of hazing methods.

We document the results of 5 urban crow management programs in New York and analyze the effectiveness of our integrated approach for meeting crow damage management objectives. We also discuss key lessons learned from conducting high-profile non-lethal programs to reduce crow damage associated with winter roosts in urban environments.

## STUDY AREAS

The New York WS program provided crow damage management services to reduce conflicts associated with urban winter crow roosts under cooperative agreements with the cities of Albany, Auburn, Troy, Watertown and Utica, New York, from 2002 - 2007.

### Albany City, Albany County, New York

New York WS conducted a program to reduce urban crow conflicts in Albany, New York from 2004 - 2007. Albany is the capital of New York and is located about 241 km north of New York City. Albany is the largest city in which WS conducted a crow hazing program. Albany had the highest human population, with an estimated 95,658 human inhabitants in a total area of 56.5 km$^2$. The population density was 1,693/km$^2$ (U.S. Census Bureau 2000). The primary winter crow roosts in Albany targeted for management were located in three main areas: 1) the tree line between New Scotland Avenue and Hackett Boulevard; 2) University Drive on the State University of New York, Albany campus; and 3) behind buildings near the end of Samaritan Road.

### Auburn, Cayuga County, New York

New York WS conducted a program to reduce urban crow conflicts in Auburn, New York in 2005 and 2006. The city of Auburn is located in central New York about 35 km west of Syracuse. Auburn is the smallest city where WS conducted crow management (21.8 km$^2$). Prior to implementing a crow management program in the winter, crows (63,000) outnumbered people (28,574) by more than 2 to 1. The population density was 1,311/km$^2$ (U.S. Census Bureau 2000). The core crow roost targeted by the WS damage management program was located primarily in small groups of trees lining the Owasco Outlet, which runs through the center of the city.

### Troy, Rensselaer County, New York

Troy is the first city where New York WS attempted to manage a winter urban crow roost in 2003, and again in 2005-2007. The city of Troy is located 241 km north of New York City. Troy has an estimated 49,170 human inhabitants located in a total area of 28.5 km$^2$. The population density was 1,725/km$^2$ (U.S. Census Bureau 2000). Troy had the highest human population density where crow management was conducted. The primary crow roosts targeted for management occurred in three locations: 1) the tree line behind the Rensselaer County Office between 6th and 8th Streets; 2) River Street Park along the Hudson River; and 3) on Adams Island in the Hudson River, just off the shoreline along River Road.

### Utica, Oneida County, New York

New York WS conducted a crow damage management program in Utica from 2004-2007. The city of Utica is located in the Mohawk Valley in central New York, 89 km east of Syracuse. The city has an estimated 60,651 human inhabitants located in a total area of 43.0 km$^2$. The population density was 1,410/km$^2$ (U.S. Census Bureau 2000). The core winter crow roosts where WS initiated crow management were located near St. Elizabeth Medical Center off Genesee Street, and also in trees along the arterial roadway.

### Watertown, Jefferson County, New York

New York WS conducted a program to reduce urban crow conflicts in Watertown in 2006 and 2007. The city of Watertown is located in Central New York, 113 km north of Syracuse, and 48 km south of the Canadian border. The city has an estimated 26,705 human inhabitants located in a total area of 24.1 km$^2$. The population density was 1,108/km$^2$ (U.S. Census Bureau 2000), making it the least densely populated of the 5 cities where crow damage management was conducted. The primary winter crow roost where crow management was initiated was located near the Jefferson County Historical Society on Washington Street. Subsequently, management shifted to an area near the "JBY" parking and the intersection of Washington Street and Court Street, along the Black River.

## METHODS

The process of developing and implementing a crow hazing program was similar in each of the 5 cities. Wildlife Services would typically receive a request for assistance from county or city government officials regarding concerns expressed by the public, related to conflicts with roosting crows near residential or commercial properties. Requests from the public to government officials (including congressional representatives) came in the form of phone calls, letters and signed petitions, or during public meetings.

### Cooperation with Municipalities and Public Involvement

Prior to establishing a crow damage management program in each city, WS conducted multiple meetings with key local officials and stakeholders to discuss crow management options in terms of the scope of the problem, state and federal regulations, projected program costs, the potential limitations and effectiveness of various hazing methods, and public acceptance of proposed methods. Management options considered were: no action, public information and education, habitat management (tree thinning and removal), roost dispersal (non-lethal hazing) and limited shooting to reduce roosting populations. Toxicants were not considered during negotiations with cities because there were no avicides registered in New York at that time that could be used to target crows at roosting locations in cities.

Once a plan of action had been agreed upon among WS and local government agencies and a cooperative agreement had been signed, the public was notified of the proposed action through town meetings, press releases and extensive media coverage in newspapers, radio, and television. In general, the public was in favor of non-lethal hazing programs to manage local crow roosts. Opposition to these programs was limited, although some citizens expressed concern about the additional cost to local taxpayers. Others doubted that the non-lethal program would successfully reduce the damage, and some were philosophically opposed to management and preferred public education programs promoting tolerance of roosting crows.

### Standardized Crows Population Surveys

To estimate city-wide winter crow populations and document impacts of local management programs, crow population surveys were conducted in each city. A "primary" crow roost was defined as a tree or group of trees used by crows throughout the night, which contained the majority of roosting crows in the city and which had been the original source of conflict or complaints from the public (Gorenzel et al. 2002). Standardized pre-treatment crow population surveys were conducted by WS, during November - early January, to establish baseline population information, document flight lines, and identify core roosting sites. Post-treatment surveys were conducted after each 5- to 7-night hazing treatment. Survey methods were similar to those described by Gorenzel and Salmon (1993) and Gorenzel et al. (2002), where up to 4 observers were stationed before dawn with binoculars and hand-held counters at different fixed observation points, where they counted crows leaving roosts along flight lines in different directions. Surveys were completed once crows were no longer observed leaving the roosting area. Crow surveys were frequently conducted in the morning, in conjunction with hazing, to document the establishment of alternate roosting sites.

### Crow Damage Management

Winter crow damage management programs in each of the 5 New York cities consisted of an integrated, non-lethal hazing program. Hazing is defined as the use of non-lethal scaring methods that included hand-held lasers, pyrotechnics, and amplified crow distress calls. The methods implemented for these projects are commonly used for wildlife damage management targeting birds in other conflict situations (Naef-Daenzer 1983, Gorenzel and Salmon 1993, Glahn et al. 2000, Slate et al. 2000, Chipman et al. 2004). Standardized field procedures for crow hazing projects were used for all cities. After pre-treatment crow population surveys were conducted (November to January), hazing projects were initiated. For each city, the initial hazing period ("treatment") lasted 5 to 7 days, during which 1 to 4 mobile teams consisting of 2 biologists each attempted to disperse crows from their assigned area of the city, generally from 1600 to 2000 hours (or until no large flocks of crows could be located), using a combination of pyrotechnics, distress calls, and hand-held lasers. Pertinent data were collected during this time to document the effectiveness of management techniques and the effort required to successfully manage roosting crows. Data collected included the number and location of management "events"/night (an event is defined as any action by biologists to haze crows), methods used (number of times lasers or distress calls were used and number of pyrotechnics fired), hours worked and mileage driven. After the initial 5- to 7-day treatment, post-treatment crow population surveys were conducted to document crow numbers and identify newly established roosting sites. For each city, the number of "re-treatments" needed was determined based on post-treatment crow surveys, input from municipal officials, and the number of complaints received from the public.

Pistol-launched pyrotechnics were one of 3 visual and noise deterrents used in all New York crow hazing projects. Single-shot and revolver-type pyrotechnic launchers were used with 6-mm blank caps to fire 15-mm "Bird Whistlers" (Zink-Feuerwerk GmbH, Germany, 74389 Cleebronn, Auf der Heide 1). Amplified recorded crow distress calls were also used to locate flocks of crows (Gorenzel and Salmon 1993) for more precisely targeted management and to disperse roosts. Several commercially available standard game callers, including the Johnny Stewart MS-512 game caller (Hunter's Specialties, Cedar Rapids, IA) and Cabela's Electronic Game Caller (Cabela's, Oshkosh, NE) were used to amplify crow distress calls in conjunction with the Johnny Stewart tape "CT 201A Death Cry of a Crow." Since 2005, WS teams have used the Prey Master Digital Caller (Cabela's) with a sound chip "crow #1" (crow distress, crow/owl fight, excited crow,

**Table 1. Estimated winter crow primary roost population size for 5 cities in New York, 2002 - 2007.**

| City | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|
| Albany | - | - | 13,230 | 25,740 | 27,960 | 30,500 |
| Auburn | - | - | - | 63,800 | 36,525 | - |
| Troy | 20,240 | - | - | 16,320 | 21,840 | 12,300 |
| Utica | - | - | 7,920 | 12,000 | 11,340 | 10,796 |
| Watertown | - | - | - | - | 5,000 | 9,900 |

crow reveille). Finally, hand-held lasers (Blackwell et al. 2002, Gorenzel et al. 2002) were used in a variety of situations, both as a stand-alone tool in areas where the use of pyrotechnics was difficult or unsafe, and in combination with the other two methods. A low-powered red laser (the Avian Dissuader®; SEA Technology, Inc., Lebanon Junction, KY) was used on perched and roosting crows (U.S. Department of Agriculture 2002). The laser was used at dusk and after dark, when it was visible to the birds and most effective for dispersing roosting crows.

Regular and timely communication with the public was a WS priority in order to provide project status updates and to underscore program goals and expected outcomes. Techniques to enhance communication included working with cooperators to produce press releases, give interviews, and make presentations at public meetings.

## RESULTS AND DISCUSSION

Sixteen non-lethal crow hazing projects were conducted in New York from 2002 - 2007. Projects were conducted in Albany (4), Auburn (2), Troy (4), Utica (4), and Watertown (2). Public concern regarding the significant accumulation of crow feces and associated damage to public and private property was the primary conflict expressed to government officials in these 5 cities. Enhanced communication with media and the public by WS led to extensive coverage (sometimes daily project updates) in the local press as well as national media, including National Public Radio's *Living on Earth* series and MSNBC's *Countdown with Keith Olbermann*. The majority of coverage was supportive of program objectives. Opposition to non-lethal crow management was expressed by small but vocal groups in Auburn and Albany, who opposed direct crow management and promoted a reliance on education and volunteer crow feces clean-up in public areas as an alternative solution to crow conflicts.

Pre-treatment crow population surveys documented roosting crow populations that ranged from approximately 5,000 crows in Watertown in 2006 to >63,800 crows in Auburn in 2005. Roosting crow population size appeared to increase each year in Albany (13,230 to 30,500) and Watertown (5,000 to 9,900), but decreased in Auburn (63,800 to 36,525). Median crow roost size for all roosts surveyed across all years was 14,775 crows, and the cumulative mid-winter crow population estimate for the 5 cities in New York in 2006 was 102,665 (Table 1). By comparison, statewide estimates in 1932-33 from 20 locations were of 225,000 crows (Emlen 1938), and a partial estimate of 40,000 to 50,000 crows was reported from 1963-64 (Chamberlain 1964). These previous surveys provide conservative estimates of mid-winter crow populations in New York and do not appear to include crow roosts from any of the 5 cities included in the 2006 surveys, although crows likely roosted in these locations historically, although possibly in smaller numbers.

Urban crow roosts were successfully dispersed in 2002-2007 in 5 New York cities using a combination of pyrotechnics, amplified recorded crow distress calls, and hand-held lasers (Figure 1). The crow population reduction for all roosts across all years after the initial 5-

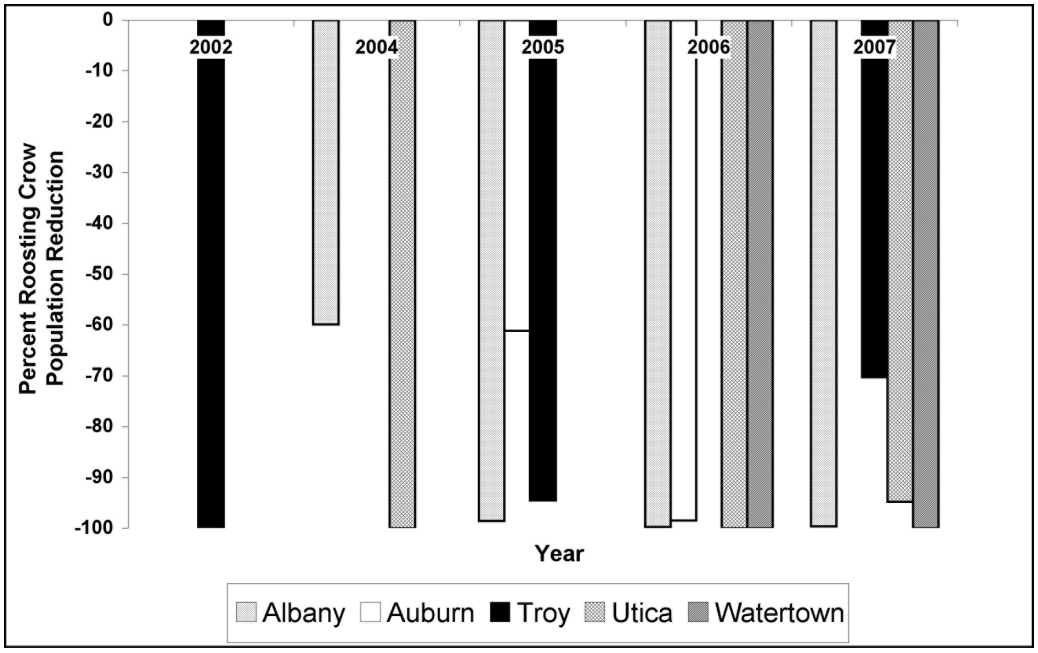


**Figure 1. Percent urban crow roost population size reduction based on USDA APHIS Wildlife Services management activities in 5 cities in New York between 2002 - 2007.**

**Table 2. Crow damage management hazing events in 5 cities in New York, 2004 - 2007.**

| City | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|
| Albany | 310 | 316 | 222 | 453 |
| Auburn | - | 986 | 818 | - |
| Troy | - | 229 | 223 | 443 |
| Utica | 219 | 197 | 128 | 230 |
| Watertown | - | - | 212 | 188 |

to 7-night treatment ranged from 60%-100% representing a substantial initial local reduction in crow numbers and associated damage. In all cases, crows eventually relocated (at least temporarily) to lower conflict-lower impact areas within the city or to less-developed areas outside the city, where they often remained until moving back to the original roost site within 2 to 8 weeks post-treatment.. The number of treatments (crow hazing over multiple days for a finite period of time during the implementation of the project) (including re-treatments) required to successfully maintain sufficient reduction in crow damage for all projects ranged from 1 - 6. Re-treatments or follow up "spot-treatments" were necessary every year and in every city (except Utica in 2006), either to disperse crows at the original core roost site or to move birds from an alternate high-impact / high-conflict roost site. Spot treatments typically consisted of 3 additional nights. The range of follow-up treatments required across all hazing projects ranged from 0 - 5. Albany required the most re-treatments each year (4 - 6), with Utica requiring a maximum of 2 additional treatments.

Effective crow hazing requires an integrated management approach with access to all 3 methods that may be used in various combinations; however, in some situations, only one of these methods may be effectively used for a period of time. The number of management "events" (interventions where one or more hazing techniques were used to scare crows) during treatments was highly variable among projects, cities, and years. The range of events required to relocate crows (including the number of events associated with re-treatments) was 128 (Utica, 2006) to 986 (Auburn, 2005) (Table 2). For all recorded events during all projects, pyrotechnics were used 51% of the time, lasers 53% of the time, and amplified distress calls nearly 70% of the time. Pistol-launched pyrotechnics were critical to the success of crow hazing projects, and the number of pyrotechnics fired per project provided an indirect measure of effort required to meet management objectives. The number of pyrotechnics fired during each project ranged from 103 - 868.

Estimated program costs to implement city-wide crow hazing projects in New York, based on WS formal financial planning documents, ranged from $4,950 - $8,575/city, with the exception of Auburn, which required additional resources because of its large roost size (>$30,000). Staff hours and miles driven were calculated for all but one of 16 projects conducted by WS since 2002. Staff hours required to implement these projects ranged from 473 during the first year of the Auburn project, where WS attempted to disperse more than 63,000 crows, to a low of 77 in Troy in 2006. The number of miles driven to successfully complete these projects ranged from 453 - 2,843 miles (729 - 4,575 km). These data provide a context for budget and personnel planning as well as a baseline to assess and compare project cost effectiveness for future crow hazing projects in cities in New York and the northeastern U.S.

## CONCLUSIONS

Urban crow roosts ranging in size from 5,000 to 63,800 crows were successfully dispersed during 2002 - 2007 by WS in 5 cites in New York, using non-lethal methods. Typically, these urban roosts required multiple treatments each winter to successfully relocate crows from high-conflict / high-impact areas to low-conflict / low-impact areas within the city, or to less developed areas outside the city. Public and media interest in these high-profile projects remained intense, even after multiple years in the same cities, and this underscored the need to develop communication strategies that prioritized transparency in project implementation and meeting management objectives. Successful implementation of these crow hazing projects required detailed planning meetings between biologists and municipal officials. These sessions clarified likely program outcomes and underscored a long-term commitment of the resources required, for both annual and within-season treatments needed to maintain a significant reduction in damage.

Conflicts with roosting American crows appear to be increasing during the winter in urban environments in New York. Although the majority of the public is unaffected by crow damage, an increase in requests for assistance by the public to government representatives indicates growing public support and need for crow management. Future crow hazing projects in New York will likely have to contend with habituation to current methods, and program managers will be required to maintain an adaptive management approach to meeting changing local needs associated with crow conflicts.

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