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AN INTEGRATED APPROACH TO
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CANADA GOOSE DEPREDATIONS

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ABSTRACT: Canada geese (*Branta canadensis*) in the Reno-Sparks, Nevada urban area have become a problem of increasing significance. Nuisance complaints from city parks, golf courses, and housing developments augment the bird hazard to aircraft operations at the local airport. Eleven goose collisions with commercial aircraft, between January 1986 and April 1989, caused \$250,000 in structural damages but no injuries or loss of human life. The Federal Aviation Administration required action be taken to reduce the hazard if airport certification was to continue. A multi-agency task force was formed to develop and implement an integrated pest management plan. Population surveys and daily observations were conducted to quantify the problem and evaluate results of control methods. Short term controls included disruption of roosting and feeding sites adjacent to the airport, hazing, public education, and gosling relocation. Development of a suburban goose refuge was proposed as a long term control. Long term management ramifications of this integrated approach were improved agency services to constituents, vigor of the local goose population, and quality of life for people through mutual coexistence with the birds.

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INTRODUCTION

Canada geese in the Reno-Sparks metropolitan area along with surrounding subdivisions of Washoe County (hereafter referred to as the Truckee Meadows) have become a problem of increasing significance over the past 5 years. Increased depredations have developed on turf and pastures located in city parks, golf courses, private housing developments, and farms. Walkways, roads, and lawns have been increasingly despoiled by geese. Contamination of municipal water supplies, transmission of bacterial infections from goose feces, and collisions between geese and commercial aircraft represent potential human health and safety hazards. These depredations and potential hazards represent a nuisance associated with Canada geese that is offensive to both residents and visitors.

The annual number of urban Canada goose depredation complaints received in the Reno Animal Damage Control (ADC) office has increased from 3 to 47 over the past 5 years. Nuisance problems occur throughout the year but most depredation complaints coincide with the arrival of migrant birds in November and December. Truckee Meadows citizens enjoy Canada geese and accept the associated nuisance until the numbers of birds increase beyond their threshold of acceptance. A difference was noted in the amount of associated nuisance acceptable among citizens. Most people found the presence of geese desirable provided control methods were available to keep the associated nuisance within their threshold of acceptance.

Although urban problems were severe, the most serious of these was seasonal and occurred at Reno-Cannon International airport. Geese presented a significant aircraft collision hazard because of their daily flight path from roosting sites in city parks on the west side of the valley to feeding sites at the University of Nevada Farm on the east side of the valley. This flight path was a hazard because it intersected the north-south approach corridor to the airport located in the center of the valley. The problem was compounded by the creation of a lake (hereafter referred to as the Casino lake) adjacent to the airport on property owned by a prominent Hotel and Casino (hereafter referred to as the Hotel). The Casino lake was initially a gravel pit used in constructing the Hotel and adjacent freeway. As the gravel pit deepened, water began to seep in

and was pumped into the nearby Truckee River. Construction was completed in June 1978, and the pumps were removed allowing water to fill the pit to a depth of 37 m with a surface area of 13 ha. Subsequent surveys and legal opinions determined that the pit had intersected an underground river. Nevada law defines rivers as navigable waterways and assigns the water rights to the local Indian tribe. Although the Hotel owned the land, the water could not be utilized without monetary compensation to the tribe which made any recreational use of the lake economically unfeasible. The Hotel cemented the banks and built a perimeter fence leaving the lake essentially undisturbed. The geese soon found this isolated lake and it became a major roost for migrant birds.

The aircraft hazard became more pronounced with the seasonal arrival of migrant birds. Goose collisions with aircraft only occurred during the months when migrant birds were present (Fig. 1). From January 1986 through September 1990, 11 collisions caused approximately \$250,000 damage but fortunately, no injuries or loss of human life (Walker 1985). The seasonal influx of migrant birds significantly increased the safety threat at the airport especially with the presence of the roost on the Casino lake. The problem was severe enough that Federal Aviation Administration (FAA) certificate inspectors, in July 1987, required action be taken to reduce the bird hazard if airport certification was to con-

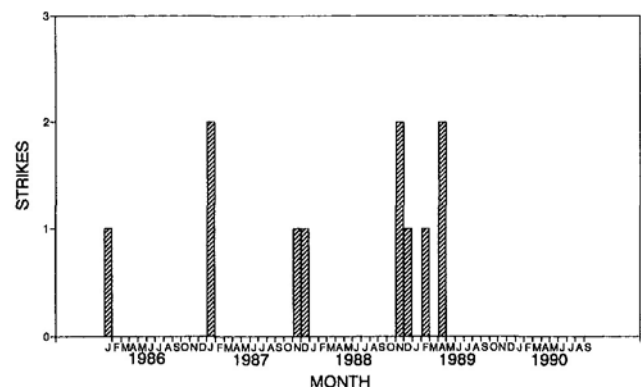


Figure 1. Goose aircraft collisions at Reno-Cannon International Airport from January 1986 to September 1990.

tinue. As a result the airport and ADC officials formed a multi-agency task force to design, coordinate, and implement an integrated pest management (IPM) plan with objectives of reducing airport and urban goose problems. The task force's goal of mutual coexistence could be realized with accomplishment of these objectives.

METHODS

The task force composed of federal, state, county, city, and private (including animal welfare) organizations was formed in December 1987 to develop an IPM plan. This broad-based political coalition provided maximum effectiveness with minimum controversy. It also provided a large pool of manpower and money to support control activities. The task force coordinated dissemination of information to the media through proactive news releases and press conferences.

To gain a better understanding of the population dynamics and movement patterns of Canada geese in the Truckee Meadows, visual surveys and counts were conducted. Numbers of geese crossing the main approach corridor to the airport were recorded daily by members of the airport staff from 21 November 1988 through 17 February 1989. Observers were stationed at the north end of the main runway from sunrise to sunset Monday through Friday. The 5 daily counts were used to calculate a weekly average. All observers were trained in standard census techniques during the first week of the project. Goose numbers were counted or estimated with the aid of binoculars. A goose crossing was defined as one goose passing through the main approach corridor one time.

Daily counts were conducted prior to initiation of control activities in order to document the problem. Fiscal constraints, however, did not allow the continuation of these daily counts throughout the entire project. Subsequent to the project's first year, intermittent visual surveys were conducted monthly at 8 locations in the Truckee Meadows by personnel from Animal Damage Control, Nevada Dept. of Wildlife, Reno-Cannon International Airport, and Sierra Pacific Power from 1 July 1988 through 30 June 1990. Numbers of adults were recorded to document population trends and numbers of goslings were recorded to document production.

Molting geese were captured at 5 locations in the Truckee Meadows during roundups in June 1989 and 1990 using drive traps (Addy 1956). Birds were aged, sexed, banded with U.S. Fish & Wildlife Service leg bands, and collared with white alpha-numeric plastic collars. Captured geese were relocated to California and Idaho to initiate new flocks and supplement prior transplants.

In an attempt to eliminate the roost on the Casino lake and achieve safe aircraft operation in the valley, the Hotel constructed an experimental wire grid designed by the ADC staff biologist. The entire grid was attached to the existing perimeter fence. A 61 m grid framework of 10 gauge solid plastic wire was constructed. A 9 m grid of 15 gauge plastic wire was attached to the top of the framework. Wires were approximately 6 m above the water at the shoreline and 1 m above the water at the lake's center. The Hotel expended a total of \$11,050 to install the grid. Material and labor costs were approximately \$2,550 and \$8,500 (386 man hours) respectively. Construction began in December 1988 but completion was delayed by weather until April 1989.

Pyrotechnics and mechanical scare devices used to reduce urban depredations included: whistle bombs, bird

bombs, cracker shells, plastic flags, mylar tape, and eye-spot balloons. The ADC staff biologist conducted 4 demonstration projects annually in the Truckee Meadows to educate citizens in the correct techniques for using scare devices and provide sources of supply. Citizens purchased their own scare devices or pyrotechnics to harass geese on their property.

The Reno Airport purchased 2 radio controlled (RC) airplanes in July 1989. Personnel from the Operations Division received flight instructions and used the radio controlled airplanes to harass geese on the University of Nevada Farm the week of 4 December 1989. An RC helicopter and pilot, provided by the local radio controlled aircraft club, was used to harass geese at the University of Nevada Farm during the week of 18 December 1989.

RESULTS

In order to resolve the airport problem and reduce urban depredations, the task force composed an IPM plan which provided biologically sound and publicly acceptable management alternatives. First, the plan acknowledged the aesthetic and nonconsumptive values of Canada geese. The significance of these values was evident in the large number of city park visitors feeding and taking pictures of geese. The task force identified public education projects which provided information on the benefits and impacts of Canada geese. This information allowed Truckee Meadows citizens to coexist with birds by encouraging or discouraging geese according to their individual needs and interests.

Second, the plan identified short term lethal and nonlethal control alternatives. Lethal control methods were not feasible due to federal, state, and city regulations; public opposition to an urban sport hunt; and reluctance of U.S. Fish & Wildlife Service officials to issue kill permits, except in life threatening situations (e.g., airports). Other states such as Minnesota and Connecticut have implemented urban hunts. These hunts operate under special conditions, such as extended seasons and larger bag limits, designed to target depredating geese. The task force will continue to monitor the efficacy of these projects.

Nonlethal controls included: 1) Disruption and relocation of major roosting and feeding sites adjacent to the airport and harassment of geese in urban areas with pyrotechnics and mechanical scare devices; 2) Demonstration of correct and safe techniques for scare device and pyrotechnic operations to the general public; 3) Development and testing of innovative scare devices, such as RC aircraft; 4) relocation of goslings to suitable release sites. This nonlethal control method of live capture and relocation replaced the need for lethal population reduction by removing individual birds from specific depredation sites in the urban area. This technique also augmented objectives of the flyway management plan (Norell 1983).

Third, the plan identified a possible long term control alternative. The task force's primary long term objective was the development of a suburban goose refuge where birds from the metropolitan area could live undisturbed. Airport planners, assigned to the task force, became aware of a U.S. Army Corps of Engineers flood control and sediment retention project along a creek on the east edge of the Truckee Meadows. This project would provide an excellent opportunity to establish a goose refuge complete with feeding sites and a deep water roost. Geese from the urban area could be

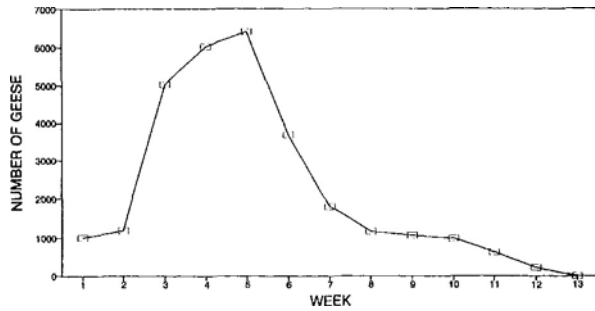


Figure 2. Weekly averages of the number of geese per day crossing the main approach corridor of Reno-Cannon International Airport from 21 November 1988 to 17 February 1989.

attracted to or hazed into this refuge. This suburban refuge could provide recreational and educational opportunities for Truckee Meadows citizens while minimizing depredations in the urban area.

The weekly averages of daily goose crossings showed a peak of 6,414 in late December and a low of 0 in late February (Fig. 2). The daily observations also revealed an average of 2,905 goose crossings per day through the approach corridor. The highest single daily count was 9,499 goose crossings on 13 December 1988. The largest single flock of birds to cross through the corridor was estimated at 1,125. Approximately 3,000 individual birds were responsible for the goose crossings.

The daily counts and subsequent intermittent monthly surveys revealed goose crossings through the approach corridor decreased to zero in March 1989 and have remained at that level through the following 18 months (Fig. 3). The seasonal peak in goose numbers observed in December 1988 occurred again in December 1989 but the Casino lake was never used as a roost. In addition, there have been no aircraft collisions with geese recorded at the airport since the wire grid installation was completed in April, 1989. Subsequent monthly surveys revealed that the geese which had been using the Casino lake, relocated to a new golf course on the east side of the valley.

The monthly population survey data also indicated that the Truckee Meadows supported a base population of geese that was supplemented by winter migrants. The goose population in the Truckee Meadows remained between 500-1000 birds from April through September. This base population

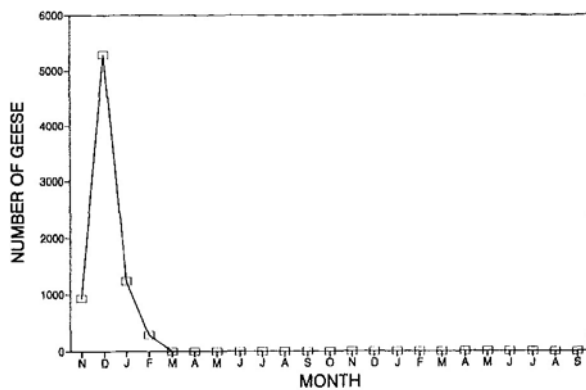


Figure 3. Number of geese roosting on the Casino Lake from November 1988 to September 1990.

increased to 13,000 with the influx of winter migrants (Fig. 4). These data confirmed that the bird hazard to aircraft operations was seasonal and that the potential of a collision increased with the influx of winter migrants.

Production figures were obtained during capture and banding operations in 3 city parks and 2 housing developments. In 1989, 239 goslings were recorded and 483 in 1990. In addition, there were approximately 100 goslings observed each year in areas not subjected to the capture and banding.

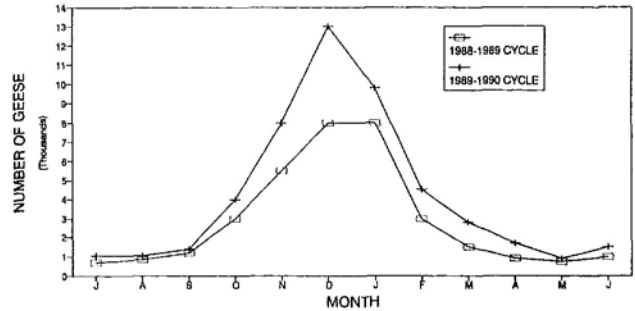


Figure 4. Estimated number of Canada geese residing in the Truckee Meadows for two annual July to June cycles.

The 1990 population estimates of 13,000 and the gosling production estimate of 590 differ significantly from Hummel's (1987) estimates of 4,500 and 230 respectively. A 289% increase in the wintering population, a 257% increase in production, and a 1,566% increase in urban depredation complaints were noted between 1985 and 1990.

The task force became aware of possible relocation sites in Idaho and California and incorporated translocation into the IPM plan. Requests from the California and Idaho Fish & Game Departments for transplant stock, resulted in the capture and relocation of 327 Canada geese in 1989 and 252 in 1990. California Fish & Game placed orange neck collars on 57 birds captured in 1989. The 1990 roundup recaptured 11 of the California birds for a return rate of approximately 19%. None of the birds transported to Idaho have been recaptured in Nevada. An additional 900 geese were banded and released on site in 1989 and 950 in 1990. White neck collars were affixed to 38 birds in 1989 and 1,000 birds in 1990. Mortalities from the trapping and relocation project totaled 5 in 1989 and 6 in 1990. This redistribution of geese helped accomplish management objectives in the urban area by reducing numbers of depredating geese and at out of state wildlife management areas by increasing or initiating populations. This relocation project was readily accepted by the general public as a method of reducing the population to or below the threshold of acceptance. Citizens accepted higher wintering and breeding populations once they realized birds would be removed every summer.

To reduce the threat to aircraft generated by the daily activity of winter migrants using the Casino lake, the task force decided to implement a plastic wire grid. The task force evaluated the stainless steel wire grid system proposed by Terry (1984) and decided plastic wire was preferable because of its lower cost and elasticity. In February 1990, 23 inches of snow fell in the Truckee Meadows causing the plastic wire grid to sag into the water. When temperatures rose and the snow melted, the grid assumed its original position with no breakage of individual wires. The black color probably en-

hanced the thermal properties of the plastic wire thereby reducing the amount of time needed to melt snow and ice deposits. In addition, no bird injuries, due to collisions with the grid, have been recorded during the 18 months that the grid has been in place.

An assortment of mechanical scare devices and pyrotechnics were utilized by Truckee Meadows citizens in attempts to harass geese. Migrant birds responded well to this harassment. Birds which had become accustomed to human interactions throughout the year responded well but required more persistence to achieve desired results. Among the population of birds which had acclimated to humans, differences were noted in fright response to pyrotechnics. Some individuals became accustomed in a short period of time and would no longer respond, while others responded as soon as the vehicle approached. Based on limited feedback and the lack of repeat calls, the task force determined that most citizens were able to resolve individual complaints with technical information provided by ADC.

A radio controlled airplane and helicopter were each used for one week intervals in an attempt to harass geese at the University Farm. Both devices produced an immediate flight response and a conditioned avoidance over time. Observations revealed a 25% reduction in goose numbers on the third day. A 50% reduction in numbers was noted on the fourth day and a 75% reduction on the fifth day. On the fifth day, both devices produced a flight response in the birds as soon as the aircraft left the ground. This reduction in goose numbers was apparent for approximately 10 days before numbers returned to pretreatment levels. These devices appeared effective at harassing geese but were expensive in terms of manpower and acquisition costs.

DISCUSSION

A large increase has been noted in the Truckee Meadows Canada goose population and production. The associated increase in the number of complaints clearly indicated that the urban Canada goose depredation problem also increased. The bird hazard to aircraft operations at Reno-Cannon International airport, however, was reduced.

Replacement of the traditional wintering sites with larger areas of artificial wetlands has probably contributed to the population increase and associated problems. Construction of additional golf courses, parks, and housing tracts has provided increased acreages of water and green grass. The expanded food and water supply in areas protected from hunting has increased the desirability of the Truckee Meadows to Canada geese. Urban development that produces desirable habitat will continue to attract Canada geese and escalate depredation complaints.

The reduction of the bird hazard to aircraft operations appeared to be a direct result of the exclusion of geese from the Casino lake. The effectiveness of the wire grid was probably due to 2 factors. First, a perimeter fence prevented the birds from landing on the shoreline and walking into the lake. Second, the birds using the lake were predominantly migrants which tend to respond better to exclusion devices. The airport continues to use various pyrotechnics and mechanical scare devices to prevent goose encroachment into the airdrome. The preliminary tests of the radio controlled aircraft produced such good results that the airport has purchased several additional aircraft and is training all operations staff in their use.

This will become the primary scare device utilized on the airport. Airport staff will continue to utilize a kill permit to permanently remove persistent birds that fail to respond to scare devices. When necessary, lethal control efforts will promptly remove serious safety threats and concurrently reinforce the avoidance reaction produced by scare devices. With the limited use of lethal control, the birds may learn to completely avoid the airport. If a learned avoidance reaction can be produced by sacrificing a few individuals, the need for an overall population reduction will be minimized.

The integrated use of limited lethal and nonlethal control methods directly benefited the goose population by reducing the need for population reduction and benefited human interests by reducing the threat of a goose/aircraft collision. In addition, the gosling relocations benefited the goose population by augmenting flyway management objectives and by reducing the need for lethal population control. Citizens of the Truckee Meadows benefited from relocations through the reduction of geese at specific urban sites. The localized reductions kept the goose population within the communities threshold of acceptance thereby permitting continued appreciation of the aesthetic qualities of this wildlife resource. When people were able to appreciate and enjoy the wildlife resource, they spent more time feeding and watching the birds and less time worrying about their daily routine. Human activities associated with wildlife enjoyment help to reduce the stress of daily life and therefore improves quality of life in the community.

The progress which has been made on the Canada goose problem could not have occurred without the collective efforts of the task force. This group provided a forum for expression of divergent viewpoints which were carefully considered in the successful formulation of an integrated pest management plan. The task force initially attempted to use a classic definition of integrated pest management to formulate a plan. Classic philosophies of IPM use all available methods to suppress a pest population with minimum environmental impacts for the betterment of human interests. As the project developed, 4 important differences between this plan and a classic IPM plan became apparent. First, this wildlife species is protected and continued progress toward accomplishment of management objectives resulted in a population increase. Second, the species represents positive values for many people while representing an imminent hazard for others. Third, both the goose and human populations could benefit through use of the integrated approach. Fourth, concerns for public safety in the urban environment precluded the use of some control methods.

For the purpose of this project, the task force defined integrated pest management as "The coordinated and integrated application of all practical lethal and nonlethal control methods, within legal and administrative constraints, for the betterment of both human and wildlife populations with minimal environmental impacts". Implementation of this definition emphasized damage reduction not population reduction. The goal of the task force was to implement a plan that would successfully resolve conflicts while maximizing the potential for public acceptance of geese in the community.

Implementation of the Pacific Flyway Management Plan has increased the Canada goose population during the past 2 decades. Regional development plans for the Truckee Meadows indicate the human population will continue to ex-

pand. Given the fact that both the human and wildlife populations will increase, it became apparent that an effective IPM plan was essential to ensure mutual coexistence.

The successful implementation of the IPM plan permitted a level of mutual coexistence which resulted in increased population vigor for both geese and humans. This mutual coexistence can be seen as a long term benefit of the integrated approach. Records document cases where people negatively impacted the Canada goose population by illegally destroying nests and birds. Prior to implementation of this IPM plan, agencies were reluctant to provide assistance with depredations because of the possibility of an adverse reaction from special interest groups. This possibility decreased substantially once all interested groups were integrated to formulate a community action plan. As the possibility of adverse publicity was minimized, agencies became more responsive to citizen complaints. Citizens in turn were then less likely to destroy nests and birds when alternatives became available with which to keep depredations within their individual level of acceptance. Therefore, mutual coexistence was facilitated by successful implementation of the IPM plan, which enabled the citizens of the Truckee Meadows to maintain their individual threshold of acceptance while the goose

population prospered.

Even though the number of conflicts may increase as a direct result of population growth, the ability to successfully resolve conflicts can be sustained through the use of an integrated pest management plan. Successful implementation of an IPM plan provides a method for resolving conflicts while benefiting both wildlife and humans. The long term management implication of this type of integrated approach is a means of insuring the continued prosperity of both the wildlife resource and human interests through mutual coexistence.

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