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Successful use of Alarm and Alert Calls to reduce emerging crop damage by resident Canada geese near Horicon March Wisconsin

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Abstract: Increased populations of resident Canada geese create major crop loss problems for farmers, especially in those areas which become traditional sites for brood rearing. Such sites concentrate geese and goslings in locations where food is abundant and escape safety provided flightless adults and young by adjacent lakes or rivers. Emerging corn, winter wheat, and soy beans are favorite foods and sustain extensive crop damage when near water and brood rearing sites. From 16 May – 28 August, 2007, alarm and alert call playback from GOOSEBUSTER@ call units, Bird –X Inc, Chicago Il., was used with and without other scare reinforcement to assess efficacy of different methods at reducing crop damage at multiple sites near Horicon Marsh, Wisconsin. Test sites were recommended by USDA, APHIS, Wildlife Services personnel, Waupun, Wisconsin, as sites with heaviest early summer crop damage reported in prior years. Criteria of success were based upon goose/hours/month or goose/hours/per week of field use before and after treatment, using frequent counts of geese on properties, weekly farmer interviews and dropping counts in fields to estimate number and number of hours geese were present. Crop damage assessment by USDA compared current year to prior years assessment or used visible signs of damage and extent. On demand use of call units, coupled with firing screamer and banger shells was found to be the most effective method for inducing long term crop avoidance. Crop damage reduction ranged from a low of 94.7%, at one site 17 bushels lost 2007 versus 297 bushels in 2006, to a high of several fields declared to have “no significant goose damage” by USDA crop evaluation personnel this year. Goose hours/month on the largest field data collection decreased from >36000 to < 200 goose/hr/month, a 99.45% reduction. No sign of habituation to reinforced “on demand” alarm call use was found over the course of the 100 days of the study.

Key Words: alarm call playback, Branta canadensis, Canada geese, crop damage reduction

INTRODUCTION

Expanding resident Canada goose, Branta canadensis, populations have led to increased human/goose conflicts in business and municipal parks, and increased damage to rural and suburban agricultural crops. These geese are difficult to displace and keep away. Short, highly

fertilized grass near ponds and parks (Whitford 2002), and young corn or soybeans near gosling brooding areas, attract geese to these environs. Most non-lethal Canada goose dispersal techniques have provided limited long-term success in these settings. A summary of control techniques was published by Smith, et al (1999). Live trapping and relocation or euthanasia programs provide some reduction in local problem areas (Cooper and Keefe 1997). Castelli and Sleggs (2000) reported on efficacy of Border Collies at dispersing nuisance geese. Recently Blackwell et al, (2002) tested lasers on this species for dispersal potential, and VerCauteren and Marks (2004) tested potential for use of Nicarbazin as a fertility inhibiting drug for Giant Canada geese, B. c. maxima, in Green Bay, Wisconsin. Unpublished results of a continuing study at Bay Beach Wildlife Sanctuary, Green Bay, WI. have found hand-held, high intensity spotlights effective at reducing night roosting geese on ponds there (Baumann, pers. com.). Yet, these works fail to address increasing problems of emergent crop damage resulting from large congregations of resident geese/goslings at rural agricultural sites which have become traditional brood rearing and molting sites. Zicus (1981) reported molt migrations of resident Giant Canada Geese from Wisconsin to James Bay, Canada. Yet, Mercer (1999), Mott and Timbrook (1988) and Conover and Chasko (1985) all report that large numbers of Giant Canada geese congregate near large bodies of water in the central and eastern U.S. when molting. White and Combs (2004) report high levels of site fidelity for molting and brood rearing by resident Canada geese, leading to annual reuse of specific sites by large concentrations of geese and increased nuisance goose and crop damage problems. This research attempts to address these problems.

Complete descriptions from sonographic studies of call form, duration, and frequency of alarm and alert calls and associated behaviors of giant Canada geese have been published

(Whitford 1987, 1998). Preliminary research using alarm calls for Canada goose dispersal have shown mixed results (Whitford 1987, Mott and Timbrook 1988, Aguilera etal.1991). To date, only one study of use of alarm and alert call playback reports a long-term success at resident goose dispersal and also shows promise of preventing re-colonization of areas after resident geese dispersal, or removal by transplanting, or lethal methods (Whitford 2003). No large scale published studies exist investigating efficacy of alarm and alert calls for preventing spring emerging crop damage by resident Canada geese or removing geese from water/wastewater treatment facilities. To address these areas, initial study plans were to use alarm/alert call playback on areas of young winter wheat adjacent to the Beaver Dam River, Lowell, Wisconsin. These fields were recommended as test sites by USDA/APHIS/Wildlife Services personnel based on past heavy winter wheat loss from resident geese/goslings there. That plan was modified when the wheat rapidly grew beyond goose/gosling preferred height due to the combination of early warm weather and delayed gosling hatching. USDA personnel identified other sites that had histories of heavy emerging crop losses to high concentrations of molting/brood rearing resident Canada geese. The study changed to testing efficacy of alarm and alert calls at reducing emerging soybean, corn and alfalfa damage from geese/goslings at long-term brood rearing and molt sites in Dodge County, Wisconsin. Preliminary counts indicated >200 geese/goslings within .5 Km of each study site before project inception.

Goals were: 1) to test efficacy of GOOSEBUSTER unit alarm/alert call playback at reducing crop damage using set times of play and no other reinforcement; 2) test call units when reinforced with human harassment and/or screamer/banger shells; 3) determine when or if habituation occurred with each study method; 4) determine whether call and reinforcement

techniques would be successful at study site 3 when the majority were to be carried out by resident farmers, instead of wildlife specialists- a real world test of efficacy for crop protection.

My hypothesis, based on prior research (Whitford 2003), was that playback of alarm/alert calls would make resident geese apprehensive, and easier to displace via human and other harassment at the study sites. If successful, the technique would offer a new and more effective means to reduce goose crop damage and fecal contamination problems.

METHODS

GOOSEBUSTER call playback units used in this study were provided by Bird-X Inc, Chicago IL 60607, along with 5 watt "SOLPAN" 33 X 33 cm solar panels (ICP Global Technologies Model 1009) and 24 hour DC timers (Grasslin Controls Corp, Mahwah, NJ FM/1 series). All units were powered by 14 volt "WERKER" deep cycle marine batteries from Batteries Plus of Madison. Playback units had three internal timer settings, "test," "short," and "long," providing call playback at randomized times within base intervals of 1-3, 5-10, or 10-20 min, respectively. The volume controls for all units were set to make call playback consistent with natural goose alarm call and alert call volumes. Alarm and alert call playback used digitized forms of calls recorded from captive giant Canada geese live trapped at Rochester, Minnesota, for my dissertation research (Whitford 1987). Original calls were copied and digitally elongated and/or compressed 0.01-0.05 second, and rerecorded onto microchips to produce varied call frequency and duration series that geese would perceive as produced by different individuals. Temporal and frequency changes creates the impression that different individuals are giving alarm or alert calls (Whitford 1987). Call units play up to 4 different call series, mixes of varied alarm and/or alert calls, in randomized sequence, one series via each of four dispersed speakers,

each time playback is initiated. These call and unit modifications are thought to enhance goose response and reduce/delay habituation to the calls (Whitford 2004).

Methods of call playback, harassment, dates of initiation and intervals between observations varied at each of the three study sites selected and are presented with descriptive information for each of the sites. Methods of determining pre-study and study goose populations, crop damage by geese, and goose hours/day/site were consistent for all study sites. Pre-study counts of geese used glassing, walking and counting all geese visible on the study site and for .5 km in all directions for fields, water and crop lands. Few geese could still fly, so all present were assumed to remain on site 24 hr/day, 7days/week, unless forced to leave by dispersal actions. Total geese/goslings observed at each site was multiplied by 168 (number of hours in a week) to estimate pre-study goose hours/week. Later counts were based on daily or alternate day counts of geese present during 6 hour observation blocks. Weekly interviews of resident farmers and treatment plant personnel about number of geese seen on the study site, where and for how long, were coupled with weekly dropping counts in corn and soybean fields, grass and alfalfa feeding areas, and along water edges where geese rested, to help calculate site use goose/hours/week. I applied an estimate one goose hour use for every four droppings 3 cm or longer found. This is far less feces than an average feeding goose produces (Whitford 2002) and I intentionally used it to produce an inflated estimate of post-treatment numbers/hour of geese presence for the sites, rather than risk underestimating. A large pile of water side “night droppings” was estimated to represent nine goose hours, since geese rise early to begin feeding. Crop damage estimates were based on direct USDA reports comparing damage on same fields between prior year and study year for fields where possible. Fields not enrolled in crop damage programs prior years, had no

reports available for direct comparison. I relied then on USDA field personnel knowledge of approximate prior losses (gained assisting these farmers with propane cannons, supplying screamer and banger shells and/or kill permits). Current crop damage estimates used weekly field transects, recording all crop damage with any goose droppings associated with it (deer damage was very common, but tracks and droppings easily identified it).

Study Site 1

Study site 1 was a 2.1 ha soybean field, 3 km NW of Lowell, WI.., with goose access to the Beaver Dam River and an adjacent >150 ha. marsh/riverine forest complex. Two call units were placed along the river and marsh edge 16 May, when cotyledons/leaves of soybeans appeared. Call units were set for "short" 5-10 minute, random time call playback for two hours, then reduced to the "long" 10 - 20 minutes random interval with DC timers set to permit play only 15 minutes every other hour, 0500 - 2200 hours per day for each unit. No reinforcement of calls by any harassment form was used at this site. Daily 6 hour observation blocks were done 17 May - 31 May, 2007. .

Study Site 2

Study site 2 was the Hustisford Sewage Treatment plant, a 3.4 ha, fenced complex with three treatment ponds, 2.27 ha total surface area, and 1.13 ha of grass (mowed weekly) and a central drainage ditch flowing south to the Rock River, .3 km distant. Plant personnel had used exploders, banger and screamer shells in past years, and had the village apply for a lethal round-up permit for 2008. On my first arrival 162 geese and goslings were present, piles of night droppings covered the grass along every pond for 3-4 m from the rip-rapped water edge. Scattered droppings from feeding in grass farther from the water evidenced > 20 droppings/m2,

in random samples at inception. Personnel that tested water from each pond 4 times daily had complained about the droppings, contamination of clothing, and smell, which is why this site was suggested for my study by USDA/APHIS. Wisconsin DNR had drive trapped and banded 292 and 228 geese in Hustisford (most at the treatment plant) in July 2006 and 2005, respectively (pers com. B. Hill). Ms. Hill further indicated that not all geese in the village were attempted to be banded in these efforts. In addition, fields to the east beween the plant and Rock River, south of Hy 60, had heavy crop damage in prior years from > 200 geese brood rearing and molting on the sewage plant property. Another 30-40 geese used the river bank/front yard grasses of this farm daily for resting/brooding areas and access to corn fields along the river, prompting that farmer to request USDA/APHIS assistance removing those geese in 2007.

Goose removal efforts began 16 May, with continual call playback on shortest "test" setting from two call units placed on opposite sides of the largest pond. No reinforcement other than walking toward geese and waving arms to drive them off the property was used that day. After 45 minutes the call units were shut off because three nesting geese were discovered just off the property (past work indicated nesting geese habituated to alarm calls if continually exposed to them (Whitford 2003)). Call playback was restarted 5 June using only "On Demand" call playback, meaning - I used call units on "Test" mode for only as long as needed to remove geese and never used DC timer activated play settings for the duration of the study. Call playback was always reinforced thereafter by firing banger/screamer shells launched from Model RJ 1 Scare-Away launcher (Reed- Joseph International Company, Greenville, Mississippi) as needed to move geese- a change in planned method suggested by Rich Christian, Wildlife Specialist, USDA/APHIS/Wildlife Services. In "On Demand Playback and Reinforcement" one or both call units were turned on using test mode setting, and allowed to play for 1- 3 minutes. If any

geese were still present, noise producing shells were fired toward them until they left the property.

Following removal of all geese 5 June, I was the only person to carry out use of call units or harassment at this site until the study ended. I had access dawn to dusk 7 days per week and began with daily 6 hour alternating am and pm observations. I extended that to every second day once no geese were seen there for 5 consecutive days. Weekly interviews with treatment plant manager and employees continued to provide accurate counts of when, where and how many geese were seen on the property 6 days/week, even when I was not present. Dropping counts continued until the study ended, in case not all geese were not observed or reported.

Study Site 3

This study site consisted of two farms 1 km NW of the town of Hustisford. The larger farm, > 45 ha total area, was surrounded on three sides by Lake Sinissippi and its extensive cattail marsh to the west of the property. The farm had 22.25 ha. Alfalfa; 9.2 ha of soybean field, both heavily damaged by molting/brood rearing resident geese in prior years despite use of propane cannons, screamer and banger shells, and kill permits used for > 4 years by the farmer. No official USDA past reports of crop loss existed, for the owner had not sought compensation for losses. Yet, USDA personnel provided materials and assistance for goose dispersal and, so were familiar with extent of past crop damage. The farmer said he had patrolled the property 3-4 times most days on a golf cart to drive geese off fields in prior years. There also was 1 ha. mowed lawn and boat landing, heavily used by geese for feeding and night roosting. Soybeans were not yet planted 16 May, when I met the farmer. During a tour of this and the following property I counted some 70 geese/goslings on lawns/boat landings, and 20-22 pair of adults with

goslings (120-140 total birds) feeding in alfalfa, on soybean stubble or on waters of the marsh and lake within 100-200 m of the farm shoreline. On 30 May, four call units were set up on this farm, two on the soybean field 300m WNW of the house, one 250 m north of the house, where the alfalfa came nearest the water edge. The last was placed on the lawn below the house for the owner expressed a desire to be rid of the geese and droppings on his lawn and boat landing. No unit was set to play calls, and only the last was connected to its battery. The farmer was instructed to turn on the call play back for 1-2 minutes if he saw geese on the lawn/boat landing, and always to follow the calls with screamer or banger shells if geese didn't leave. This 83 year old farmer and I both participated in goose dispersal efforts on the property for the remaining 90 days of the study. We used only "on demand" mode of playback with exception of two nights, 7 and 8 July, when I set the DC timer to play calls at 2 am to scare off several geese night roosting on the lawn and dock following fireworks 7 July in Hustisford town park.

The second farm was >50 ha abutting the south line of the first. Only two fields, both with shoreline contact, 4.85 ha each, one corn, one soybeans, and a .5 ha grassy boat landing area with large shade trees were considered for protection based on prior years losses and request of the land owner. Corn and soybeans on these fields were already 8-12 cm high and showing minor goose feeding damage at sites nearest the lake at unit installation 30 May. Two call units were placed on near water areas of those fields. The property owner was instructed to only turn them on briefly, when geese were present and to chase geese away when they were used (he had no launcher for banger shells). These fields were rented out and the resident owner who had requested assistance was not as active in removal efforts as the other farmer at site 3.

RESULTS

Study Site 1

Once all units were set up and turned on 16 May, all geese within visible range on the water and field assumed alert postures, began to call and coalesce, moving together to make a block of 15 to 20 pairs of adults with goslings and single or paired adults moving away on the river. In 20 minutes they swam out of vision around a bend 300 m to the southeast, toward a distant expanse of marsh. Only one pair with 5 young entered the field from the river in the following 6 hours of observation. Three sets of adults and young were seen to run across the length of the field from the northwest corner to the river, coming from ponds 2-300 m across the road, disappearing up the river where the others had gone. The following morning at 6:00 I was unable to find any geese within .5 km of the treated field, searching on foot and by car. The next 7 days I heard distant geese call from the marsh to the south of the test field but only 2 pair entered the field with young to feed. Flying geese approached the field but left immediately after the call units went off. On 24 May I saw 15 to 20 geese milling at the far bend of the river. By the 26 May, more geese were seen congregated at the far bend. Each day thereafter they came 40-50 meters nearer the field, swimming in tight bunches and turning away when call played. I found the first evidence of night feeding on soybeans 29 May with many rows of 6 cm soybeans cropped off and goose droppings in the rows. I set the call units for night playback at alternate hour intervals. On 31 May over 100 geese and goslings swam down river and entered the field with the alarm calls still playing. Habituation was considered complete and I removed the call

units. They had provided almost complete protection to the field for 12 days before failing. Since I could hear geese calling on the marsh .5 km away all 14 days, I assume they heard the call units for that time. Lacking any reinforcement, they habituated. Few other brood feeding site options existed along that stretch of the river for several km in either direction, most of those fields planted to winter wheat already too tall for goose consumption before this study began. So, hunger may have contributed to the habituation. Had my goal been to protect young winter wheat from geese/goslings, as originally planned, a 10-14 day window of protection would have caused a substantial decrease in crop damage from grazing at it's most vulnerable stage of growth.

Study Site 2

Initial estimate figures used an arbitrarily low estimate of 86 geese counted/day, range 68 – 162, for the week prior to the study. Numbers went up daily, as more broods arrived. The 16 May use of the call playback and human harassment, continued until nearly all geese/goslings were gone from the sewage plant. Units were shut down when nesting geese were found. Rich Christian, Wildlife Specialist for USDA/APHIS/Wildlife Services, and I returned at 1400 hr 5 June, and began the "On Demand call use, with banger/screamer shell reinforcement" protocol. When alarm call playback was followed by these shells, geese gave alarm calls of their own and ran off the property with goslings in tow. Small goslings and adults with them ran to the ponds. Flighted birds present flew off instantly. All geese except 5 young goslings that refused to leave the ponds were removed from the property. I remained until dark. The 5 goslings left 20 minutes after calls were shut off. Grass was closely mowed 1700-1830 hrs that evening, destroying all prior goose droppings. Estimated Goose hrs/wk at the sewage plant dropped from 14,445 to hold at roughly 10,800 from 17 May - 6 June while units were off and dispersal efforts stopped. From 6 June to 28 August the plant averaged 53.6 goose/hr/week once "on demand" reinforced call use

began (Figure 1). Crop loss on the adjacent field fell from 297 bu. in 2006, to 17 bu. in 2007, a 94.7 % reduction. Most loss occurred on < .2 ha corn nearest the treatment plant fence 17 May - 5 June when the call units were shut off. An area of > 190 ha around the plant was largely goose free June- 28 August. Between 6 June - 18 July only 93 geese/goslings were observed on/removed from the plant, the largest group reported being 26 geese/goslings seen by APHIS personnel 11 June while collecting several geese for contaminant testing. Goose dispersal area (hence crop protected) was much larger than the 3-8 ha per 1 and 2 call units, respectively, reported for urban settings (Whitford 2003). Between 18 July and 28 August, only two sets of flighted geese were seen on treatment ponds and left readily. Dropping counts 6 June – 28 Aug found only 8 night dropping piles and roughly 1340 small scattered droppings (counted in groups of tens for tally) supporting a total 80 day estimate of 590 goose hours on the property. a 99.6 % decrease vs prestudy figures. Results were accomplished with only 11 activations of the alarm call units, and 16 screamer and banger shells used. Total time spent removing geese after initial clearing of property was less than 1.3 hours over 80 days. It would have been less than 20 minutes if a few goslings had not refused to leave the ponds while alarm calls played. Goose removal can easily be done by treatment plant personnel as they check water chemistry of ponds four times per day.

Study Site 3

Beginning May 31 with first use of the lawn based call unit and shells, goose presence on the two farms dropped from the pre-study estimate of 36,000 to < 200 goose/hours/month in less than 3 days. It remained <200g/hr/m until study completion (Figure 2). As at site 2, no sign of habituation or loss of effectiveness was found using “on demand call play back and reinforcement.” For the two farms < .3 ha of corn was damaged by geese, roughly 60 soybean

plants showed goose nibbling evidence, and alfalfa loss was limited to 1-2 hours feeding by 20 geese over the duration of the study as indicated by droppings, interview and observation. There were no prior year loss records, but both farmers had complained of significant past losses of all crops. There is no doubt a 99.45 % reduction in goose hours on the property reduced 2007 losses to near zero levels.

Farmer Bill Germer interviewed 6 June, stated he had used the call unit on his lawn 3 times (with shells) 31 May and 1 June and did not see or hear any geese anywhere for the next 4 days. I heard and saw no geese on the marsh, lake, or land within visible parts of >190 ha. around the call unit that day. Only 79 geese (total) were seen on this property and only 7 intrusions by geese were reported/observed 6 June – 28 August. Two call units put up were never activated; one near alfalfa was used four times; and the lawn unit 13 times, including five times it was used to scare geese from the corn field >250 m south on the second farm in study. Units on the second farm were activated twice by the owner and twice by me. In all, 19 banger and screamer shells were fired, and less than 1.8 hours were expended between the three people involved in goose dispersal for actual goose related activities. Fewer than 500 droppings were found on the property. Short incursions by 20-30 geese/goslings occurred 0500 – 05:45hr 14 and 18 June, both stopped by use of lawn unit on Germer farm. Geese damaged 35m X 10 m area of stunted corn along tree-lined field edge.

DISCUSSION

The primary difference between this research and previous alarm call play back research on geese dispersal (Mott and Timbrook1988, Aguilera et al 1991) is that the alarm calls used in this study were unquestionably alarm and alert calls based on 7 years of sonographic call and behavioral research on B. c. maxima (Whitford 1987). Calls of the other authors were, at best,

distress, flight and alert calls, based on descriptions of goose reactions and call sources. I used on demand call playback coupled with screamer/banger shells rather than comparing effectiveness of the two techniques separately as in Aguilera et al (1991). Theirs was a very short duration study, only 3 tests each per 5 sites with “alarm call” and 2 “alert call” per site. Their conclusions were questionable since their method employed calls played from a distance > 40 m, but fired shells into groups of geese, “continuing to fire shells until all geese left, reporting a maximum of 12 shots in succession.” With a car mounted speaker (Mott and Timbrook 1988) played “alarm calls” while driving towards geese. There is no way to judge whether birds fled the approaching car or the calls. They reported “96% reduction in geese” when using “racket bombs,” versus the 76% success for the car alone. However they defined that geese “left” if they moved >100 m. When used in the manner of the current study, permitting call playback to make birds visibly nervous before firing shells, both alarm/alert calls and the shells appear to have much greater effectiveness than either alone. Geese often gave voice to alarm calls themselves as they ran/flew away, and extremely rare for the species (Whitford 1987). Voicing the call seemed to increase long term avoidance of the area where they made the calls.

Results seen in this study developed faster and lasted longer area avoidance than any goose dispersal method I’ve tried or read of. Geese in this study were effectively gone within 24-28 hours of first use of the combination and stayed gone for weeks or months. My best guess is it results from synergistic effects resulting from “on demand” use of the calls coupled with the screamer/banger shells. At the first study site in my research all geese moved at least .4 km away within an hour of alarm call activation. Habituation followed in 10-12 days without reinforcement. With the screamers and bangers used to reinforce calls at study sites 2 and 3, the

same rapid dispersal was seen, but habituation did not occur. The few birds that were seen at these sites June-5- late July, before geese regained flight ability, were thought to mostly be newly arrived birds, late nesters and molters coming to traditional molt and brood rearing sites as reported in White and Combs (2004), or birds displaced by holiday boating, camping, and park activities. After mid-July, new birds arriving were flighted and did not stay when greeted with alarm calls and shells. No killing of birds was needed to make the process effective and it should work in any area where use of pyrotechnics would be permitted. “On Demand” use of the call eliminates habituation concerns and also means that playback of calls would be far more acceptable to most neighbors than regularly on-going call repetition, and would rarely need to be repeated.

As a final thing learned in this study, use of the alarm call playback to move goslings under two weeks of age will backfire if water is nearby. Goslings innately run to water when they hear alarm calls, and those under 2 weeks old appear to have the strongest instincts to stay in the water. Use of banger and screamer shells with alarm calls at the sewage plant only made the young goslings refuse to follow parents’ attempts to lead them away. In mixed age gosling broods subjected to these calls, older goslings following the parents, the younger remained in the water. I learned to turn off the calls after 2-3 minutes playback, not use screamers, and let the goslings calm down and follow the parents off the ponds and away from the dispersal site. I wasted several periods > 20 minutes ineffectually trying to move goslings that walked out soon after call units were turned off.

CONCLUSIONS

On demand use of alarm/alert call playback effectively induced long term avoidance of emerging crops, and sewage treatment facilities by brood-rearing and molting resident geese within as few a 4 days when coupled with screamer or banger shells reinforcement. And, no evidence of habituation was evidenced in the 90 days of the study using this method. Study site 3 results proved the method could be successfully applied by an 83 year old farmer investing less than 2 hours of his time over the study, and still produce a 99.45 % prevention of crop loss over areas of 30-40 ha or more with only two call units regularly used.

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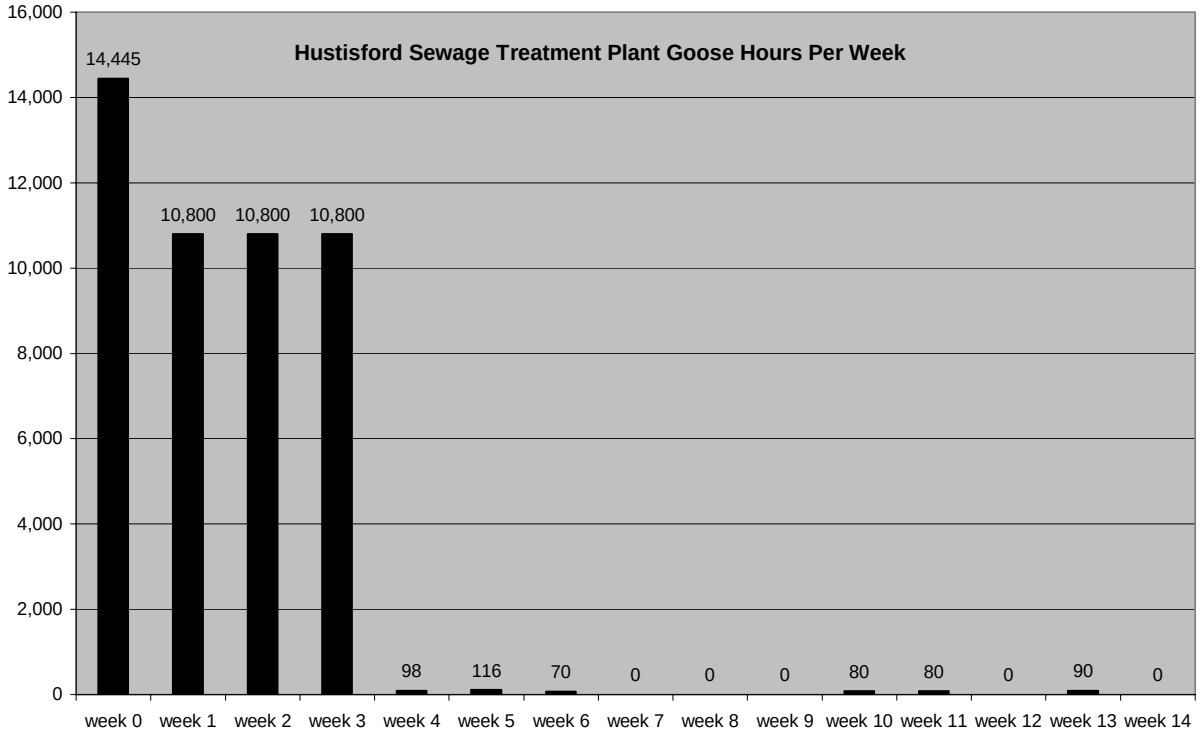
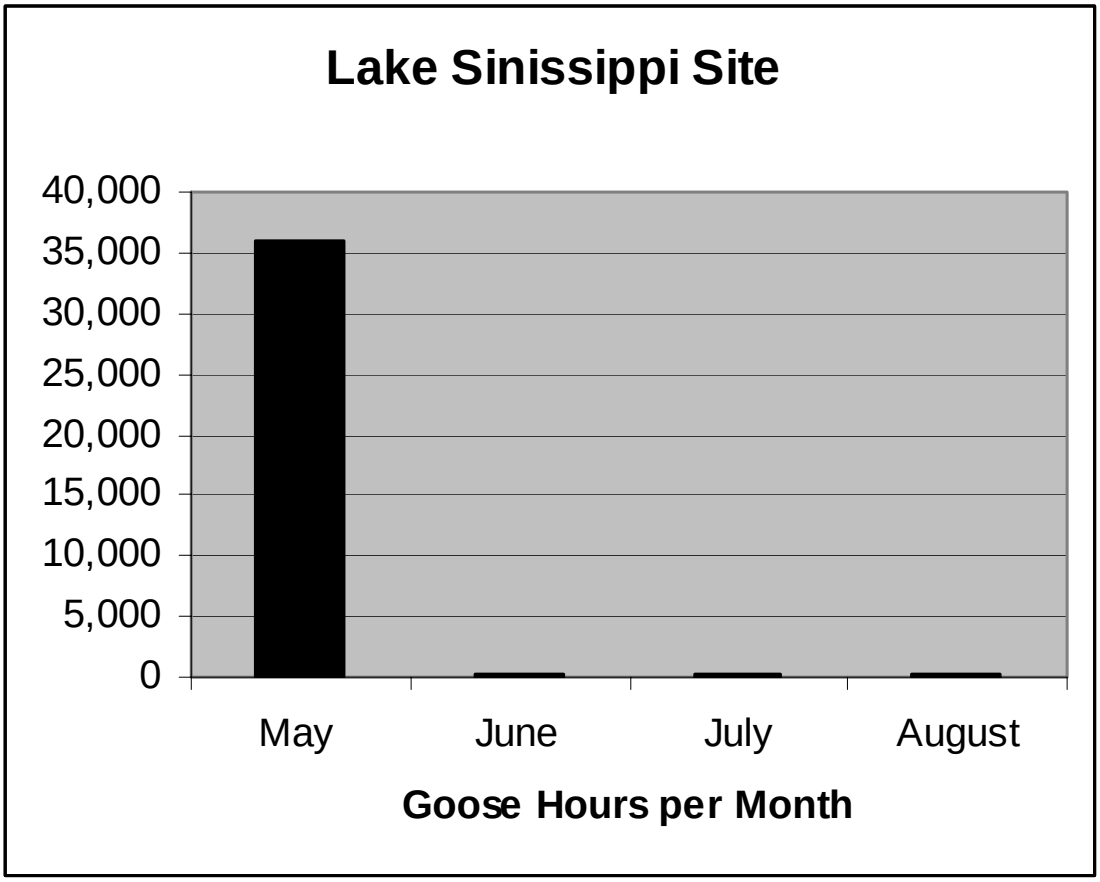
Legends

Figure 1. Reduction in goose hours per week with use of alarm calls and human harassment for 45 minutes, duration and degree of reduction, and further reduction with alarm calls reinforced with screamer and banger shells.

Figure 2. Reduction in goose hours per month by brood-rearing and molting resident Canada geese on two farms on a point in Lake Sinissippi following “on-demand alarm call playback” reinforced with screamer and banger shell use, initiated 5 June 2008.


Hustisford Sewage Treatment Plant Goose Hours Per Week
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
14,445
10,800
10,800
10,800
98
116
70
0
0
0
80
80
0
90
0
week 0
week 1
week 2
week 3
week 4
week 5
week 6
week 7
week 8
week 9
week 10
week 11
week 12
week 13
week 14


Lake Sinissippi Site
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
May
June
July
August
Goose Hours per Month