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Use of overhead wires to deter waterfowl from sewage treatment ponds

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16. Abstract

Deterring birds from water on or near airports is an important part of a bird strike reduction program. Overhead wires of various materials and in a variety of patterns can reduce bird use of specific areas. It has been suggested that widely spaced wires can be as effective as narrowly spaced wires and therefore more economical due to decreased material and initial labor costs. However, when a 50-foot design was placed over waste-water ponds in North Carolina, the total number of waterfowl using the ponds increased when compared to the year prior to placement of the wires. Canada goose numbers declined, whereas mallard, ring-necked duck and ruddy duck numbers increased. It is possible that waterfowl using the wired areas perceived the overhead grids as protection from avian predators. Also, the ponds may have provided refuge from hunting since no hunting was allowed at this location. An integrated bird hazing approach is therefore necessary at these overhead wire locations and we anticipate that hazing would be required at other overhead wire locations as well.

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EXECUTIVE SUMMARY

Deterring birds from water on or near airports is an important part of a bird strike reduction program. Overhead wires of various materials and in a variety of patterns can reduce bird use of specific areas. It has been suggested that widely spaced wires can be as effective as narrowly spaced wires and therefore more economical due to decreased material and initial labor costs. However, when a 50-foot design was placed over waste-water ponds in North Carolina, the total number of waterfowl using the ponds increased when compared to the year prior to placement of the wires. Canada goose numbers declined, whereas mallard, ring-necked duck and ruddy duck numbers increased. It is possible that waterfowl using the wired areas perceived the overhead grids as protection from avian predators. Also, the ponds may have provided refuge from hunting since no hunting was allowed at this location. An integrated bird hazing approach is therefore necessary at these overhead wire locations and we anticipate that hazing would be required at other overhead wire locations as well.

1. INTRODUCTION.

From 1990 to 2008, bird strikes annually caused an estimated $614 million in losses to civil aviation in the United States (Dolbeer et al. 2009). Most strikes (80%) occur at or below 1,000 feet above ground level (AGL) (Dolbeer et al. 2009) while 66% of strikes resulting in substantial damage to the aircraft occur ≤ 500 feet AGL (Dolbeer 2006). Although total air operations have declined about 4.5% since 2004, the Federal Aviation Administration predicts that operations will increase about 1% every year to 2030 (Federal Aviation Administration 2010). At the same time populations of bird species hazardous to aircraft (see Dolbeer et al. 2000) are generally increasing (Sauer et al. 2008). Therefore, bird control at or around airports is critical to safe aircraft operation.

Airports must control the movement of storm water away from runways, taxiways, and aprons to ensure the safety of aircraft operations. Six of the 21 most hazardous species groups to aircraft (Dolbeer et al., 2000) are commonly associated with water and therefore could be attracted to water impoundments on an airport. The FAA recommends that such runoff be held for a maximum of 48 hours, by use of detention ponds, so as to reduce use by wildlife (Advisory Circular No: 150/5200-33A; *Hazardous Wildlife Attractants On or Near Airports*). However, many of these detention ponds may hold water that is at least 15 cm deep even after the water has been drained away and this habitat is attractive to many species of birds.

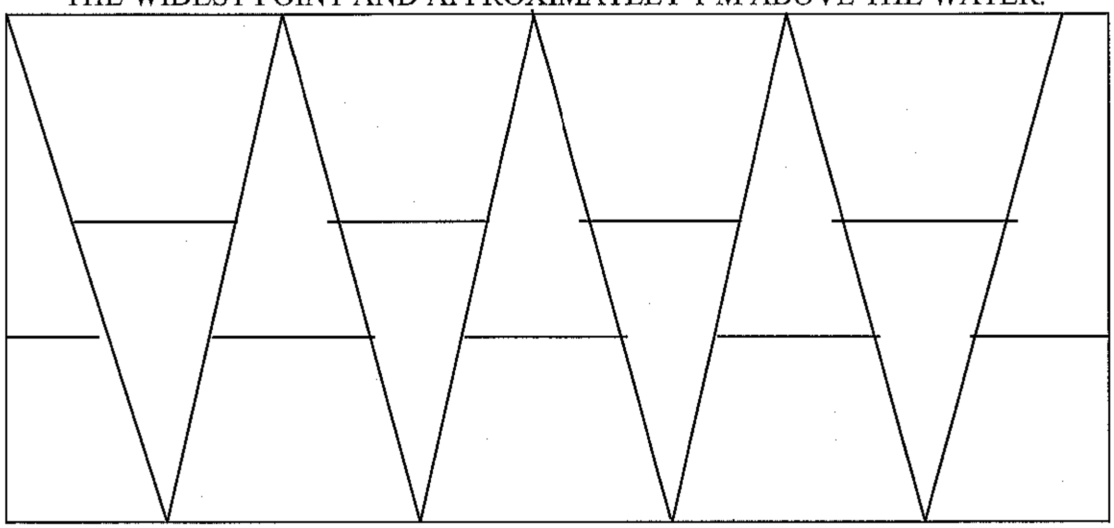
Lethal control to solve wildlife conflicts is often undesirable or impractical (Dolbeer 1986, Dolbeer et al. 1997, Dolbeer 1998). Frightening techniques to keep birds away from airports are available (Marsh et al. 1991, Booth 1994, Cleary and Dolbeer 1999), but may be untested, only temporarily effective or cost-prohibitive (Dolbeer et al. 1995). Overhead wires or lines, in various arrangements, have been effective in repelling a variety of birds from specific sites (McAtee and Piper 1936, Amling 1980, Blokpoel and Tessier 1983, 1984, Forsythe and Austin 1984, McLaren et al., 1984, Dolbeer et al., 1988, Aguero et al., 1989, Pochop et al., 1990, Keller 1997). Based on the literature there is agreement that narrowly spaced, parallel lines are effective for many species. However, Duffiney (USDA/WS, Michigan program, unpublished data) indicated that wider spaced grid lines may also be effective for similar species. If a wide grid pattern is as effective as a parallel system then it would be possible to protect a similar sized area with less material by using a wide grid system, thus saving costs.

2. METHODS.

The Goldsboro, NC wastewater treatment plant (35° 20′ N, 77° 59′ W) is located a minimum of 0.6 km from the end of runway 03/25 at the Seymour-Johnson United States Air Force base. The treatment plant has a water reclamation facility and 5 adjacent equalization ponds (Pond 1, 16.1 – 17 hectares; Pond 2, 9.8 – 10.1 hectares; Pond 3, 14.6 – 15.4 hectares; Pond 4, 14.1 – 15.4 hectares; Pond 5, 14.2 – 15.4 hectares) which always have a water depth of at least 1 m and could have water up to 3 m deep.

We made spot counts at each pond at least 3 times each month from points adjacent to each pond that presented a clear view of the majority of the pond. Pre-treatment counts were conducted from December 2006 to March 2007 and April 2008. Treatment counts covered the period from September 2008 – March 2009. Although the time frame differs some we believe that both periods covered the peak migration period for that part of North Carolina. We began work on line installation in September 2007 but due to unanticipated problems with line installation we did not complete all ponds until May 2008. The line was made of white PowerPro Spectra® (Innovative Textiles, Inc., Grand Junction, CO) braided fishing line that had a 113.4 kg-force [250 pound] breaking strength and was 0.89 mm (0.035 inches) in diameter. The lines were attached to t-posts driven into the tops of the banks surrounding the ponds so that the lines were 15.2-m apart at the banks and about 1 m above the water. Three-meter metal rods which were 1.3-cm diameter with electric fence caps on top were also placed in the ponds to support the wires and keep them about 1 meter from the surface of the low water level. The lines made a regular pattern that resembled a printed capital "A" with every other "A" being inverted (Figure 1.) This design allowed us to span the water while minimizing the number of poles put into the bank.

FIGURE 2-1. REPRESENTATION OF THE OVERHEAD LINE PATTERN USED ON THE GOLDSBORO, NORTH CAROLINA WASTEWATER TREATMENT PONDS FROM SEPTEMBER 2007 – MARCH 2009. THE LINES WERE 15.2 M APART AT THE WIDEST POINT AND APPROXIMATELY 1 M ABOVE THE WATER.



At Greensboro, NC (36° 5′ N, 79° 56′ W) overhead white PowerPro Spectra lines were placed on 3 ponds that were 0.3 – 3.4 hectares. A 15.2-m grid was placed over 2 ponds and a 7.6-m grid was constructed over the remaining pond. Due to inconsistent data recording we are not able to report on the efficacy of the Greensboro pond grids.

Statistical analysis. Our response data were not normally distributed nor were we able to successfully transform them. Therefore, we used the nonparametric Wilcoxon Rank Sum Test to compare bird use between the times without overhead lines and with lines. We evaluated our comparisons at alpha = 0.05.

3. RESULTS

At the Goldsboro site more ($W = 4.07$, $P = 0.00$) waterfowl were observed during each observation period in the treated (mean ± standard deviation = 46.9 ± 46.9 birds) than the pretreatment period (34.1 ± 51.8 birds). Fewer ($W = 1.97$, $P = 0.05$) Canada geese (*Branta canadensis*) were observed while more mallards (*Anas platyrhnchos*; $W = 3.89$, $P = 0.00$), ring-necked ducks (*Aythya collaris*; $W = 3.22$, $P = 0.00$) and ruddy ducks (*Oxyura jamaicensis*; $W = 2.08$, $P = 0.04$) were observed (Table 1). Northern shovelers (*Anas clypeata*) had the highest numbers using the site, but no difference ($W = 0.33$, $P = 0.74$) in numbers after the grid was installed (Table 1).

TABLE 3-1. THE MOST COMMONLY OBSERVED WATERFOWL SPECIES ON THE GOLDSBORO, NORTH CAROLINA WASTE WATER TREATMENT FACILITY, DECEMBER 2006 – MARCH 2009.

	No Grid				Grid in Place			
Species	N	Total	Mean	std	N	Total	Mean	std
Canada Goose	30	249	8.3	10.4	16	58	3.6	2.7
Mallard	14	75	5.4	4.3	49	893	18.2	19.2
Northern Shoveler	28	1535	41.3	51.4	50	2494	49.9	43.0
Ring-necked Duck	17	412	24.2	18.7	47	2744	58.4	42.1
Ruddy Duck	31	2191	70.7	82.4	59	4682	79.4	56.3
Total	218	7441	34.1	51.8	279	11675	41.8	46.9

4. DISCUSSION

Pochop et al. (1990) pointed out that bird reaction to overhead lines varies by species, spacing, attractiveness of sites protected, age of birds, and possibly height of lines above the protected area. Belant and Ickes (1996) reported that gulls abandoned an established nesting colony to move to an adjacent area suitable for nesting. Duffiney (USDA/WS unpublished data) found that the number of mute swans (*Cygnus olor*), gulls, Canada geese and most waterfowl species using containment ponds (largest being 15.4 hectares) at Detroit Metro Airport in Michigan were reduced when a 30.5-m grid using lines similar to ours was put in place. Results from this study with systematically placed lines over similarly sized ponds that served in sewage treatment differed. Overall waterfowl use was not reduced. However, even though Canada goose numbers declined, the geese were not excluded from the ponds and continued to use the ponds to some extent.

There are multiple bodies of water near the Goldsboro sewage treatment facility which serve to attract birds (Blackwell et al. 2008) but it is possible that the sewage enriched waters provided a food source served as an additional attractant for the birds. A similar attraction was observed at sewage treatment ponds near Mexico City, Mexico that were found to be attractive to various waterfowl (Richard Dolbeer, USDA, personal communication). Combined with partial exclusion of geese, these enriched waters at Goldsboro might have been perceived as a higher quality resource by smaller waterfowl resulting in conspecific aggregation or local enhancement (Arengo and Baldassarre 2002). Additionally, the wastewater ponds may have provided a refuge during the waterfowl hunting season, as no hunting is allowed on the wastewater ponds while hunting is ostensibly allowed on surrounding ponds.

Canada geese are a species of concern at airports as they rank third as the most hazardous species related to aircraft strikes (Dolbeer et al. 2000). When using a 9-m grid in Reno-Sparks, Nevada, geese were excluded from a water body that also had a fence surrounding it (Fairaizl 1992). In Chicago, Illinois, Canada goose use of a stream was reduced when overhead lines, approximately 5-m apart, were installed (Gregory J. Martinelli, USDA/Wildlife Services, Illinois, unpublished data). In Goldsboro, North Carolina, Canada geese were observed on three ponds fitted with overhead wires after some of the wires had been vandalized, thus allowing room for geese to enter. Also, geese were observed on ponds with overhead wires at both Goldsboro and Greensboro, North Carolina, walking in from adjacent banks. Placement of a perimeter fence of about a meter in height may reduce the number of birds entering a pond in this manner (Smith et al. 1999).

Although the total number of waterfowl using the sewage ponds increased, the reduction in Canada goose use of the ponds was significant. In Greensboro, NC, one Canada goose was observed hitting overhead wires and breaking a wing as it was attempting to land on a pond (J. Weller, FAA, unpublished data). The subsequent presence of such an injured bird presents issues from an animal welfare point of view and the bird may serve as a live decoy and thereby attract other geese to the pond. Canada geese give alarm calls in situations of a recognized threat (Mott and Timbrook 1988, Aguilera et al. 1991). Considering birds in general, when alarm calls or subsequent behaviors are given in the presence of a recognized threat other flock members will either flee or mob the threat (Lima and Dill 1990, Leavesley and Magrath 2005, Magrath et al. 2007, Fallow and Magrath 2010, Marzluff et al. 2010). Whether an injured goose will give an alarm call is unknown; however, the presence of a dead goose effigy floating on the water, without subsequent management activities to enhance the pretense of danger, will not keep geese from a pond (Seamans and Bernhardt 2004).

Based on the results at the Goldsboro, North Carolina site, the placement of widely spaced lines will not reduce the total number of waterfowl using an area. Canada goose numbers may decline. An integrated harassment program will be necessary to reduce waterfowl use of water areas.

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