

Cormorant Management Activities in Lake Ontario's Eastern Basin

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Double-crested cormorants (*Phalacrocorax auritus*, DCC) on the Great Lakes have undergone a tremendous population increase in the past 30 years (Hatch 1995). The Great Lakes population had declined throughout the 1960s and early 1970s, from a peak of about 900 nests in 1950 to 114 in 1973 (Weseloh and Collier 1995, Weseloh et al. 1995, Weseloh and Pekanic 1999). This decline, along with that of other fish-eating birds, was associated with high levels of toxic contaminants, particularly DDE and PCBs, found in the Great Lakes ecosystem (Miller 1998). Due to pollution control programs, contaminant levels were reduced and cormorant numbers made a remarkable recovery in the Great Lakes and elsewhere (Price and Weseloh 1986). In 2004, there were over 9,800 pairs of cormorants in Lake Ontario's eastern basin, on six active Canadian sites and Little Galloo Island (nests were removed from three other potentially active American sites).

Little Galloo Island, in the eastern basin of Lake Ontario, was first colonized by DCC in 1974. It currently supports the largest DCC colony (and the only Caspian tern (*Sterna caspia*) colony) in the state. Concerns about the impacts DCCs have on fish populations, other colonial waterbird species, private property and unique ecological sites followed this population and range expansion

Research by New York State Department of Environmental Conservation (NYSDEC) and the U.S. Fish and Wildlife Service (USFWS) to determine the impacts of DCCs began in 1992. In 1998, NYSDEC and United States Geological Survey (USGS) research identified a connection between cormorant numbers and increased mortality of young smallmouth bass (*Micropterus dolomieu*) (Adams et al. 1999, Lantry et al. 2002).

Implementation of a cormorant management plan for U.S. waters of the eastern basin of Lake Ontario began in 1999. The goal of this management plan was to improve the benefits people derive from Lake Ontario's eastern basin ecosystem by:

- 1) restoring the structure and function of the warmwater fish community,
- 2) reducing the negative impacts of double-crested cormorants on nesting habitats and other colonial waterbird species,
- 3) improving the quality of smallmouth bass and other fisheries, and
- 4) fostering a greater appreciation for Great Lakes colonial waterbird resources.

Significant progress has been made toward reaching a target cormorant population associated with 1,500 breeding pairs (including chicks and non-breeding birds) on Little Galloo Island, and achievement of this goal is anticipated in the next few years.

Methods

Cormorant management activity in the eastern basin of Lake Ontario has focused on Bass, Calf, Gull and Little Galloo Islands. All four islands are located in Jefferson County, New York. Gull and Little Galloo Islands are owned by NYSDEC. Bass and Calf Islands are privately owned. The islands contain several colonial waterbird colonies (Table 1). Management and monitoring activities were carried out by Region 6 NYSDEC staff with assistance of USDA Wildlife Services.

Nest removal began on Gull and Bass Islands in 1994. In 1997, Calf Island was included in removal activities following an attempt by cormorants to establish a colony. Nest removal and culling teams included two to four people. Ground nests were removed by hand while tree nests were removed with a telescoping pole or shotgun. Each nest removed was scattered as much as possible to discourage rebuilding. Cormorants nesting too high in trees for nest removal, or that persisted in rebuilding destroyed nests were culled using .22 or .17 cal. rimfire rifles (Table 3).

Annual treatment of accessible cormorant nests on Little Galloo Island with food grade vegetable oil began in spring 1999 following methods similar to

those of a study conducted in Ontario in 1998 which used mineral oil (Shonk 1998). Oil was applied from a backpack sprayer unit in sufficient volume to cover the exposed surface of each egg, approximately 0.2 oz (6ml)/egg. The oiling process was conducted four or five times per season, at roughly two week intervals. Application of oil at two week intervals ensured that each nest would be treated at least twice during the incubation period. Each nest or group of nests treated was marked with spray paint to ensure treatment of all nests accessible from the ground. Two or three teams of two to three persons each completed the spraying in three hours or less (not including travel time). Each team could effectively oil 500 to 700 nests per hour, depending on nest density. Oiling teams recorded the number of nests treated, the number of eggs in each nest, the number of chicks observed and the number of nests not treated (tree or control nests).

Limited culling of cormorants was conducted in 2004 in order to determine the efficacy of the technique, assess non-target species disturbance and add to the effect of non-lethal removal efforts. Beginning in 2005 culling was used as a full scale management technique. Most culling was done using .22 or .17 caliber rimfire rifles. Culling teams consisted of at least two people. Carcasses were disposed of by burial or composting.

In addition to nest removal, oiling and culling activities, NYSDEC continued cormorant diet studies, begun in 1992, by collecting regurgitated pellet samples biweekly at Little Galloo Island from mid-April through mid-October. All samples were analyzed by the U. S. Geological Service Great Lakes and Leetown Science Centers (Johnson et al. 2006, Ross et al. 2006).

Results

After the nest removal program began in 1994, there was no successful DCC reproduction on Gull, Bass and Calf Islands until 2003 when 35 nests high in trees produced young. Twelve nests produced young on Bass Island in 2004. Nesting attempts (including re-nests) on these islands have varied from year to year with a dramatic peak of 1,367 nests in 2000 (Table 2).

In 2008 nest removal was not necessary on Bass Island due to landowner activities and the presence

of domestic pigs. Nests were removed from Gull Island five times in May and June with 671 nests removed and two birds were culled (Table 2). Cormorant nests were removed from Calf Island once in June and once in July. A total of 161 nests were removed and eight birds culled (Table 2.)

Egg oiling treatment at Little Galloo Island was conducted four times between May and July 2008. The peak number of nests oiled on Little Galloo Island was 1,804, the lowest recorded since the project began in 1999 (Table 2). Peak nest count was 2,492, including tree and empty nests (Table 1). Hatching success (number of chicks hatched per eggs counted) for oiled nests was less than 1%. This meets the objective of reducing the number of successful cormorant nests on Little Galloo Island by 90%. In 2008 only 382 birds were culled, the fewest since full scale culling began in 2005. Because last year's feeding day estimate (a measure by which we assess fish consumption using a model by Weseloh and Casselman, unpublished report) was near the target level, some nests were deliberately left unoiled in 2008. We estimate that approximately 550 cormorants fledged on Little Galloo Island this year, mostly from control subcolonies, but a few from incidentally untreated ground and tree nests.

Discussion

In April 2000, NYSDEC adopted a Final Environmental Impact Statement (NYSDEC 2000) regarding eastern basin cormorant management activities. The statement outlined a five year process of reducing the Little Galloo Island cormorant population to a target level described as a population associated with 1,500 pairs. The target population would produce 720,000-780,000 feeding days, including contributions of subadults and young-of-the-year. Less intensive control would then maintain the population at or near the target level. Because of constraints on available techniques, we did not reach population objectives within the five years projected. Under the management authority provided by the U.S. Fish and Wildlife Service 2003 federal public resource depredation order (USFWS 2003), lethal control was used to reduce cormorant numbers more rapidly, beginning in 2004.

Site-specific management is a moderately labor

intensive undertaking, although not particularly expensive in comparison to other predation pressure management projects, such as sea lamprey (*Petromyzon marinus*) management (Schiavone and Adams 1995). These management actions can be effectively implemented to resolve conflicts on the local scale. The efforts undertaken in New York over the past few years have been operationally successful, exceeding expectations for limiting production of cormorants on Little Galloo Island. Management has moved towards meeting objectives for protecting waterbird and fish communities by maintaining nesting populations of Black-crowned night herons on Bass and Gull Islands and by substantially reducing consumption of smallmouth bass by cormorants on Little Galloo Island (Johnson et al. 2006).

Reduced population levels at Little Galloo Island, probably related to egg oiling, became noticeable in 2002 as predicted. Johnson et al. (2004) reported a substantial decline in fish consumption at this colony due to lack of consumption by chicks and lower numbers of feeding adults resulting from reduced recruitment. This reduction has continued (Johnson and Farquhar 2008). Radiotelemetry studies indicate that nest oiling also reduces the residence time of nesting adults on the colony, further reducing consumption.

Managing by nest oiling only, nesting pairs of cormorants on Little Galloo Island were reduced by about 15% annually due to attrition. The use of adult culling reduced the breeding population more quickly, by increasing the rate at which adults are removed from the population (Figure 1). In addition to the direct effect of removing adults, recent experience with culling at Presqu'île Provincial Park (Ontario), the Niagara River, and on Bass Island in the eastern basin of Lake Ontario, suggests that about half of nests will be abandoned and not re-occupied after removing one or both adults, increasing the overall rate of population reduction.

Many variables can influence the results of cormorant management over time (NYSDEC 2000). Immigration and emigration rates to and from sites within the eastern basin (particularly emigration from Little Galloo) are perhaps the most likely factors to consider. Although Little Galloo Island cormorant numbers have generally followed levels

predicted by models developed in 1999 and 2000, for Little Galloo, Calf, Bass and Gull Islands collectively, immigration appears to slightly exceed emigration within New York waters of the basin.

Target levels of fish consumption by DCCs, as measured by the Weseloh and Casselman feeding day model, were very nearly reached beginning in 2006 (Figure 1). Since target levels were approached, management was adjusted to keep fish consumption within the target range. This involved reducing overall management effort and rebalancing the effort devoted to the oiling, nest removal, and culling. Impacts on fish species of interest have declined faster than fish consumption as a whole since cormorant diet has become dominated by round goby (*Neogobius melanostomus*) (Johnson et al. 2009).

Cormorant management, whether implemented locally, regionally, or across the species' entire range, should be considered in a broad, long term context to ensure that management actions remain sound, integrated and effective.

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Table 1. Estimated breeding pair numbers for colonial waterbirds on eastern basin Lake Ontario islands. Numbers for cormorants are for active nests after management activity (dash indicates not checked for given species).

Species	Island	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Double-crested Cormorant	Little Galloo	5,681	5,119	5,440	4,780	4,251	3,967	3,401	2,692	2,959	2,492
	Gull Island	0	0	0	0	0	1	0	0	0	0
	Bass Island	0	0	0	0	35	12	5	5	5	0
Ring-billed Gull	Little Galloo	53,000	-	-	-	60,000	-	-	-	-	37,500
	Gull Island	0	-	-	-	0	-	-	-	-	0
	Bass Island	2,300	-	-	-	2,500	-	-	-	-	0
Herring Gull	Little Galloo	275	-	-	-	313	-	-	367	0	375
	Gull Island	45	-	-	-	42	-	-	40	67	58
	Bass Island	10	-	-	-	10	-	-	10	16	0
Great Black-backed Gull	Little Galloo	8	-	19	15	12	-	-	4	0	1
	Gull Island	0	-	0	1	0	-	-	0	0	9
	Bass Island	0	-	0	0	0	-	-	0	0	9
Caspian Tern	Little Galloo	1,440	1,350	1,590	1,585	1,658	1,560	1,788	1,589	1,580	1,376
	Gull Island	-	-	-	-	-	-	-	-	-	-
	Bass Island	-	-	-	-	-	-	-	-	-	-
Black-crowned Night Heron	Little Galloo	1	1	1	1	3	3	4	0	0	1
	Gull Island	46	20	50	24	35	78	81	77	127	78
	Bass Island	9	36	13	36	44	17	46	32	0	0

Table 2. Number of cormorant nests removed or oiled and adults culled (nests with no intact eggs were not oiled).

Island	Activity	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Little Galloo Island	Peak nests oiled	5,627	4,301	3,865	3,707	3,389	3,359	2,896	2,275	2,502	1,804
	Nests removed	0	0	0	0	0	0	0	0	0	0
	DCCO culled	-	-	-	-	-	18	686	620	709	382
Bass Island ²	Peak nests oiled	0	0	0	0	0	0	0	0	0	0
	Nests removed	37 (37)	793 (757)	0 (0)	986 (279)	260 (117)	959 (348)	935 (600)	477 (174)	470 (110)	0 (0)
	DCCO culled	-	-	-	-	-	167	281	200	124	0
Gull Island ²	Peak nests oiled	0	0	0	0	0	0	0	0	0	0
	Nests removed	146 (111)	574 (478)	21 (21)	157 (77)	1,427 (486)	485 (188)	0 (0)	113 (110)	273 (137)	671 (266)
	DCCO culled	-	-	-	-	-	3	0	0	20	2
Calf Island ²	Peak nests oiled	0	0	0	0	0	0	0	0	0	0
	Nests removed	0	0	0	0	0	415 (539)	0	0	0	161 (111)
	DCCO culled	-	-	-	-	-	37	0	0	0	6

²Cumulative nests removed. Number in () is peak one day count.

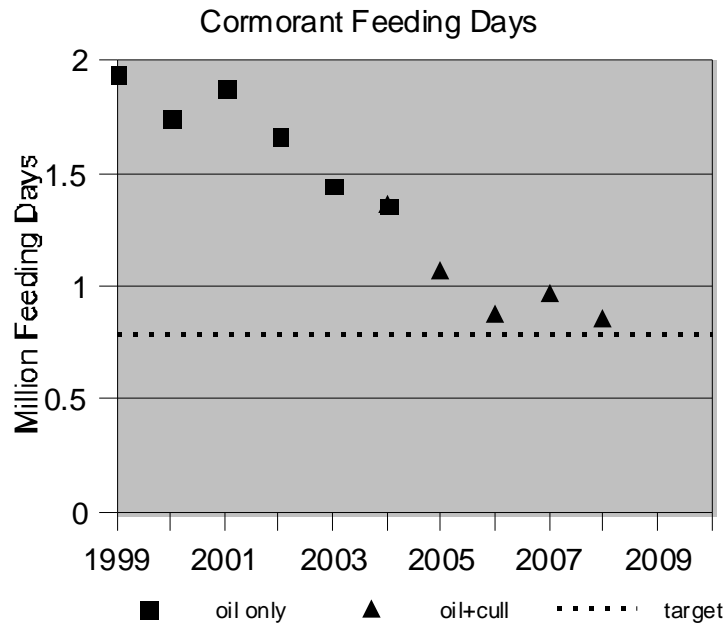


Figure 1. Trend in cormorant feeding days at Little Galloo Island.