

Cormorant Management Activities in Lake Ontario's Eastern Basin

Russell D. McCullough¹, James F. Farquhar² and Irene M. Mazzocchi²

*Bureau of Fisheries¹, Bureau of Wildlife²
New York State Department of Environmental Conservation
Watertown, New York 13601*

Double-crested Cormorants (*Phalacrocorax auritus*) 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, D.V. and C. 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). Cormorant numbers in the eastern basin declined to 7,400 breeding pairs in 2006 (Weseloh personal communication).

Little Galloo Island, in the eastern basin of Lake Ontario, was first colonized by cormorants in 1974. It currently supports the largest Double-crested Cormorant colony (and the only Caspian Tern (*Sterna caspia*) colony) in the state. Concerns about the impacts Double-crested Cormorants 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 Double-crested Cormorants 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. 1999).

Implementation of a five year 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.
- 4) fostering a greater appreciation for Great Lakes colonial waterbird resources.

A target cormorant population associated 1,500 breeding pairs (including chicks and non-breeding birds) on Little Galloo Island is expected to allow achievement of this goal.

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 activities on Gull and Bass Islands have been conducted annually beginning 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. In 2006, all 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 2).

Annual treatment of accessible cormorant nests on Little Galloo Island with food grade vegetable oil began in spring 1999. Oil was applied from a backpack sprayer unit in sufficient volume to cover the exposed surface of each egg, approximately 0.2 oz./egg . The oiling process was conducted four or five times per season (Table 2), 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 (Table 2.) 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. In 2005 and 2006, 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. Since 1999, NYSDEC also collected pellet samples at Snake and Pigeon Islands in Canadian waters, under permit from the Ontario Ministry of Natural Resources. Samples were collected from these islands monthly from early May through September. 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 Double-crested Cormorant 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 and 5 did so in 2005. Nesting attempts (including re-nests) on these islands have varied from year to year with a dramatic peak of 1,368 nests in 2000.

Nests were removed from Bass Island between 1 May and 14 July 2006. Repeated visits were necessary to discourage nesting at Bass Island (Table 2). Nests were removed from Gull Island on 13 June and 5 July. Cormorants did not attempt to nest on Calf Island in 2006.

The eighth year of egg oiling treatments at Little Galloo Island occurred in 2006. The number of nests oiled on Little Galloo Island ranged from 674 to 2519 per trip (Table 2). Peak nest count was 2,692, including tree and empty nests (Table1). Hatching success (number of chicks hatched per eggs counted) for oiled nests was less than 1% . This meets the objective to reduce the number of successful cormorant nests on Little Galloo Island by 90%. These results are comparable to those of a study conducted in Ontario in 1998 using mineral oil (Shonk 1998). We estimate that no more than 250 cormorants fledged on Little Galloo Island in 2006, mostly from untreated tree nests and control sub-colony nests.

A total of 170 cormorants were culled by shooting at Bass Island and 620 at Little Galloo Island (Table 2).

Cormorants in tree or ground nests were effectively culled using .22 or .17 caliber rimfire rifles. In low gull density areas, local gulls were initially disturbed but acclimated to unsuppressed firing within 3 to 4 shots. In high density Ring-billed Gull colonies, flushing of local birds caused spreading waves of disturbance which frequently affected the target cormorant sub-colonies. Use of suppressed rifles corrected this problem. Night-herons were disturbed by human presence regardless of the activity.

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 of a population associated with 1,500 pairs. The target population would produce 720,000-780,000 feeding days (a measure by which we assess fish consumption using a model by Weseloh and Casselman, unpublished report), including contributions of subadults and young-of-the-year. Less intensive control could later maintain the population at 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 2003 federal public resource depredation order, lethal control could be used to reduce cormorant numbers more rapidly.

Site-specific management is a moderately labor intensive undertaking, although not particularly expensive in comparison to other mortality control 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, for example, exceeding expectations for limiting production of cormorants

on Little Galloo Island. Management has moved towards meeting objectives for protecting waterbird and fish communities, maintaining nesting populations of Black-crowned Night Heron 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, first became noticeable in 2002, as predicted. Johnson et al. (2004) report 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. Nest oiling also reduces the residence time of nesting adults on the colony, as determined by local radio tracking, further reducing consumption.

To reach the cormorant fish consumption objective under oiling-only management, oiling of all nests on Little Galloo Island would need to occur at least through 2008 (Figure 1). The use of adult culling reduces the breeding population more quickly, by increasing the rate at which adults are removed from the population (Figure 1). Managing by nest oiling only, adults have been reduced by about 15% annually due to attrition. In addition to the direct effect of removing adults, recent experience with culling at Presqu'ile, the Niagara River, and on Bass Island in the eastern basin, 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, overall (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 cormorants, as measured by the Weseloh and Casselman feeding day model, were very nearly reached in 2006 (Figure 1). Management will be adjusted in 2007 and in following years to keep fish consumption within the target range. This will probably involve reducing overall management effort and rebalancing the effort devoted to the oiling, nest removal and culling techniques.

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.

References

- Adams, C.M., C.P. Schneider and J.H. Johnson. 1999. Predicting the Size and Age of Smallmouth Bass (*Micropterus dolomieu*) consumed by Double-crested Cormorants, (*Phalacrocorax auritus*) in Eastern Lake Ontario, 1993-1994. In: Final Report: To Assess the Impact of Double-crested Cormorant Predation on the Smallmouth Bass and Other Fishes of the Eastern Basin Of Lake Ontario. NYSDEC Special Report. N.Y.S. Dep. Environ. Conserv. and U.S. Geol. Survey.
- Baille, J.L. 1947. The Double-crested Cormorant in Ontario. Can. Field Nat. 61(4):119-126.
- Hatch, J.J. 1995. Changing populations of Double-crested Cormorants. Colonial Waterbirds 18 (Special Publication):8-22
- Johnson, J.H., Ross, R.M., McCullough, R.D, and B. Boyer, 2006. Diet composition and fish consumption of double-crested cormorants from the Little Galloo Island colony of eastern Lake Ontario in 2005. Section 14 in NYSDEC Annual report 2005, Bureau of Fisheries Lake Ontario Unit and St. Lawrence River Unit to the Great Lakes Fishery Commission's Lake Ontario Committee.
- Johnson, J.H., R.M. Ross and J. Farquhar. 2004. The Effects of Egg Oiling on Fish Consumption by Double- crested Cormorants On Little Galloo Island, Lake Ontario in 2003. In Double-crested Cormorant predation on smallmouth bass and other fishes of the Eastern Basin of Lake Ontario. Special Report N.Y. Dept. Environ. Conservation. Albany, N.Y..
- Lantry, B.F., T.H. Eckert and C.P. Schneider. 1999. The Relationship Between the Abundance of Smallmouth Bass and Double- crested Cormorants in the Eastern Basin of Lake Ontario. In: Final Report: To Assess the Impact of Double-crested Cormorant Predation on the Smallmouth Bass and Other Fishes of the Eastern Basin of Lake Ontario. NYSDEC Special Report. N.Y.S. Dep. Environ. Conserv. and U.S. Geol. Survey
- Miller, R.L. 1998. Double-crested Cormorant. Pages 118-120 in E. Levine, editor, Bull's Birds of New York State. Comstock Publishing Associates, New York. NYSDEC. 2000. Application to the U.S. Fish and Wildlife Service for a Migratory Bird Depredation Permit for the take of cormorants on Lake Ontario Islands, New York.
- NYSDEC. 2000. Final environmental impact statement on proposed management of Double-crested Cormorants in U.S. waters of the eastern basin of Lake Ontario. NYSDEC Watertown NY.
- Price, I.M. and D.V. Weseloh. 1986. Increased numbers and productivity of Double- crested Cormorants, *Phalacrocorax auritus*, on Lake Ontario. Canadian Field Naturalist 100:474-482.
- Ross, R.M., J.H. Johnson, R.D. McCullough, and B. Boyer. 2006. Diet composition and fish consumption of double-crested cormorants from the Pigeon and Snake Island colonies of eastern Lake Ontario in 2003. Section 16 in NYSDEC Annual report 2005, Bureau of Fisheries Lake Ontario Unit and St. Lawrence River Unit to the Great Lakes Fishery Commission's Lake Ontario Committee.
- Schiavone A. Jr. And R.D. Adams. 1995. Movement of sea lamprey past the Dexter Dam complex on the Black River, New York. 1994 Annual Report to the Lake Ontario Committee. NYSDEC
- Shonk, K. 1998. The Effect of Oil Spraying of Double- crested Cormorants, *Phalacrocorax*

auritus, and other egg laying parameters. B.S. Thesis, Wilfrid Laurier Univ., Waterloo, ON.

Weseloh, D.V. and B. Collier. 1995. The rise of the Double-crested Cormorant on the Great Lakes : winning the war against contaminants. Great Lakes Fact Sheet. Canadian Wildlife Service, Environment Canada, Burlington, ON.

Weseloh, D.V., P.J. Ewins, J. Struger, P. Mineau, C.A. Bishop, S. Postupalsky and J.P. Ludwig. 1995. Double- crested Cormorants of the Great

Lakes: changes in population size, breeding distribution and reproductive output between 1913 and 1991. Colonial Waterbirds 18 (Special Publication):48-59.

Weseloh, D.V. and C. Pekanic.1999. Numbers of double-crested cormorant nests in Lake Ontario colonies, 1995-1999. Canadian Wildlife Service, Downsview, Ontario

Table 1. Estimated breeding pairs of colonial waterbirds on eastern basin islands.

Species	Island	1999	2000	2001	2002	2003	2004	2005	2006
Double-crested Cormorant	Little Galloo	5,681	5,119	5,440	4,780	4,251	3,967	3,401	2,692
	Gull Island	0	0	0	0	0	1	0	43
	Bass Island	0	0	0	0	35	12	5	110
Ring-billed Gull	Little Galloo	53,000	-	-	-	60,000	-	-	-
	Gull Island	0	-	-	-	0	-	-	-
	Bass Island	2,300	-	-	-	2,500	-	-	-
Herring Gull	Little Galloo	275	-	-	-	313	-	-	367
	Gull Island	45	-	-	-	42	-	-	40
	Bass Island	10	-	-	-	10	-	-	10
Great Black-backed Gull	Little Galloo	8	-	19	15	12	-	-	4
	Gull Island	0	-	0	1	0	-	-	0
	Bass Island	0	-	0	0	0	-	-	0
Caspian Tern	Little Galloo	1,440	1,350	1,590	1,585	1,658	1,560	1,788	1,589
	Gull Island	0	0	0	0	0	0	0	0
	Bass Island	0	0	0	0	0	0	0	0
Black-crowned Night Heron	Little Galloo	1	1	1	1	3	3	4	0
	Gull Island	46	20	50	24	35	78	81	77
	Bass Island	9	36	13	36	44	17	46	32

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

Date	Little Galloo Island (Nests Oiled)	Little Galloo Island (Birds Culled)	Bass Island (Nests Removed)	Bass Island (Birds Culled)	Gull Island (Nests Removed)	Gull Island (Birds Culled)
01 May 06			100	0		
03 May 06	1,300					
09 May 06			90	14		
13 June 06					90	0
16 May 06	2,519					
18 May 06			0	15		
24 May 06			120	28		
25 May 06	0	620				
31 May 06	1,841	0				
02 June 06			136	53		
13 June 06			9	11		
14 June 06	2,255	0				
05 July 06			17	14	23	0
06 July 06	2,275	0				
14 July 06			5	35		
19 July 06	674	0				
27 July 06						

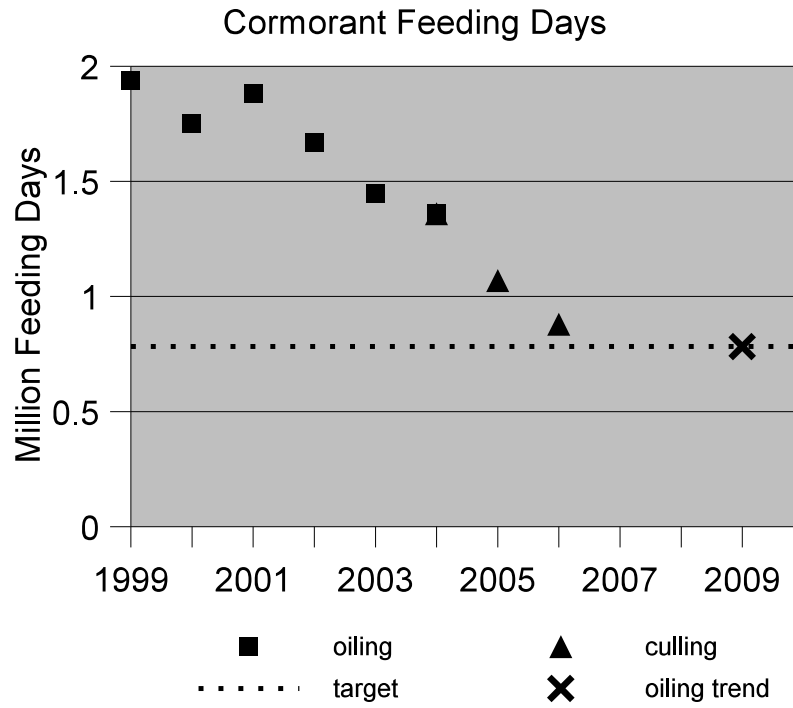


Figure 1. Trend in cormorant feeding days at Little Galloo Island colony