

Cormorant Management Activities in Lake Ontario's Eastern Basin

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Double-crested Cormorants (*Phalacrocorax auritus*) on the Great Lakes have undergone a tremendous population increase in the past 30 years (Hatch 1995). First reported on Lake Superior in 1913, Double-crested Cormorants expanded eastward throughout the Great Lakes and began nesting on Lake Ontario in 1938 (Baille 1947). Populations increased steadily during the 1930s and 1940s, and by the early 1950s the cormorant was so common that control measures were authorized in some parts of Ontario, Canada to reduce suspected competition with recreational interests (Gross 1950). The first reported breeding in New York State occurred in 1945 at Gull Island, Lake Ontario (Miller 1998).

The Great Lakes population 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). 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 government anti-pollution programs and laws, 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).

In New York State, breeding numbers and locations have increased dramatically over the past two decades. 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. Other areas of New York State that have recently been colonized by Double-crested Cormorants include: Lake Champlain in 1982, Oneida Lake in 1984, and the Niagara Frontier in 1997. 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. There are currently four areas in interior New York State where cormorant control measures are being used.

Research by New York State Department of Environmental Conservation (NYSDEC) to determine the impacts of Double-crested Cormorants began in 1992. In 1994, the NYSDEC adopted recommendations from the Citizens Task Force on Cormorants in an effort to discourage the expansion of cormorants. Cormorants on Little Galloo Island have been a particular focus of both the general public and resource managers. Cormorant numbers on Little Galloo Island increased from 22 nests in 1974 to a peak count of 8,410 nests in 1996. 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
- 3) improving the quality of smallmouth bass and other fisheries.
- 4) fostering a greater appreciation for Great Lakes colonial waterbird resources.

A targeted cormorant population associated with 1,500 breeding pairs on Little Galloo Island, generating 720-780,00 feeding days 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 U.S. Department of Agriculture Wildlife Services .

In 2004 management activity included continuation of egg-oiling on Little Galloo Island, destruction of nests on other islands, and removal (culling) of cormorants nesting in trees too high to remove their nests, or that persisted in rebuilding destroyed nests. In addition, limited culling of birds nesting on Little Galloo Island was conducted to determine if this can reduce cormorant numbers without adversely affecting other waterbirds nesting on the island.

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. All ground nests were removed by hand while tree nests were removed with a telescoping pole or shotgun. Each nest

colonial waterbird species.

removed was scattered as much as possible to discourage rebuilding. Nest removal teams included two to four people.

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 0.21 oz./egg . The oiling process was conducted four or five times per season, at two week intervals. Each nest or group of nests treated was marked with spray paint to ensure treatment of all nests accessible from the ground. In 2002, a control sub-colony of approximately 200 nests was left undisturbed as part of a telemetry study (Mazzocchi 2003), and to provide nest productivity data for a fish consumption model. 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. Application of oil at two week intervals ensured that each nest would be treated at least twice during the incubation period.

Oiling teams also 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 (generally tree 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. Most culling was done using .22 caliber rimfire rifles. Culling teams consisted of at least two people. A few birds were taken by shotgun or cervical dislocation. Nineteen carcasses were sent for necropsy, the remainder were disposed of by burial.

In addition to nest removal, oiling and culling

activities, NYSDEC continued cormorant diet studies by collecting regurgitated pellet samples biweekly at Little Galloo Island from mid-April through mid-October. In 2004, NYSDEC also collected pellet samples at Snake and Pigeon Islands in Canadian waters, under permit from the Ontario Ministry of Natural Resources, for the sixth consecutive year. 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. 2004, Ross et al.2004).

Results

After the nest removal program began in 1994, there was no successful Double-crested Cormorants reproduction on Gull, Bass and Calf Islands, until 2003 when 35 nests high in trees did produce 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 1,368 nests in 2000.

Nests were removed from Gull and Bass Islands between 30 April and 20 July 2004. Repeated visits were necessary to discourage nesting in 2004, particularly at Bass Island (Table 2). Cormorants did attempt to nest on Calf Island in 2004. Calf Island was visited on 2 June 04 at which time 415 nests were removed and 37 birds culled. The landowner also removed some nesting trees on Calf Island.

This was the sixth year of egg oiling treatments at Little Galloo Island. The number of eggs oiled on Little Galloo Island in 2004 ranged from 1,209 to 8,393 per trip (Table 2). Peak nest count was 3,967 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 less than 200 cormorants fledged on Little Galloo Island in 2004,

mostly from untreated tree nests.

A total of 164 cormorants were culled by shooting and three by cervical dislocation at Bass Island. In addition, three birds were shot at Gull Island and 18 at Little Galloo Island.

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 720-780,000 feeding days (a measure by which we assess fish consumption using 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 five years. Under the management authority provided by the 2003 Federal Public Resource Depredation Order, lethal control could be used to reduce cormorant numbers more rapidly. Three options are: 1. continue current program, 2. accelerate population reduction through a moderate level of lethal removal (culling), 3. reduce population rapidly through aggressive lethal removal.

To reach the cormorant population/fish consumption objective under current management, oiling of all nests on Little Galloo Island would need to occur through 2008. A less intensive maintenance program would begin in 2009. Residual effects would carry into the year 2010, at which time the target population associated with 1,500 pairs would be achieved. From 2010 on, the eastern basin cormorant population would be predicted to again increase slowly if Canadian sites continued to show growth. Cormorant populations have continued to grow on Lake Ontario over the past several years with the

exception of 2003, but less predictably than in the 1980s and early 1990s (Weseloh and Pekanic 1999).

Cormorants in tree or ground nests were effectively culled using .22 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.

Culling of adult birds from tree nests was partially effective in reinforcing the nest removal technique. Based on observations at Bass Island in 2004, about half of tree nests from which adult birds had been culled remained unoccupied on subsequent visits. Tree nests disrupted with a pole or shotgun blast are frequently re-occupied and require multiple treatments before they are abandoned.

Modeling (NYSDEC 2000) suggests that an overall reduction in cormorant numbers within the eastern basin can be expected as a result of egg oiling on Little Galloo Island. There are many variables which can influence the actual results of egg oiling over time. 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. Little Galloo Island cormorant numbers have followed levels predicted by models developed in 1999 and 2000, however 500-600 unaccounted for birds have been observed at Bass and Gull Islands annually for the last three years. Overall, within New York waters of the basin (Little Galloo, Calf, Bass and Gull Islands collectively), immigration appears to slightly exceed emigration.

The use of adult culling would reduce the breeding population more quickly, by increasing the rate at which adults are removed from the population. Currently, we lose adults at a rate of about 15%

annually due to attrition. 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.

Reduced population levels at Little Galloo Island, probably related to egg oiling, first became noticeable in 2002, as predicted. Johnson et al. (2004a) report a substantial decline in fish consumption at this colony due to lack of consumption by chicks. Lower numbers of feeding adults also reduced fish consumption..

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 by 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. 2004a).

Management of Double-crested Cormorants is a controversial topic that requires careful consideration of many issues. Cormorant management, whether implemented locally, regionally, or across their 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.

Gross, A.G. 1950. The Herring Gull-Cormorant Control Project. Proc. 15th Internatl. Ornithl. Congress 532-536.

Hatch, J.J. 1995. Changing populations of Double-crested Cormorants. Colonial Waterbirds 18 (Special Publication):8-22

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.

Johnson, J.H., Ross, R.M., McCullough, R.D, and Edmonds, B, 2004. Diet composition and fish consumption of double-crested cormorants from the Little Galloo Island colony of eastern Lake Ontario in 2003. Section 14 in NYSDEC Annual report 2003, 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. 2004a. 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..

Mazzocchi, I.M.. 2003. Progress report, Double-crested cormorants and VHF telemetry on Lake Ontario, 2002. Section 21 in NYSDEC Annual report 2002, Bureau of Fisheries Lake Ontario Unit and St. Lawrence River Unit to the Great Lakes Fishery Commission's Lake Ontario Committee.

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. Edmonds. 2004. 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 2003, 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. Pekanik.1999. Numbers of double-crested cormorant nests in Lake Ontario colonies, 1995-1999. Canadian Wildlife Service, Downsview, Ontario

Weseloh, D.V., and 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 and Long Point Bird Observatory.

Table 1. Estimated breeding pairs of colonial waterbirds on Little Galloo, Gull, Calf, and Bass Islands, 1999-2004.

	Year	Little Galloo Island	Gull Island **	Bass Island **	Calf Island
Double-crested Cormorant	1999	5,681	0	0	0
	2000	5,119	0	0	0
	2001	5,440	0	0	0
	2002	4,780	0	0	0
	2003	4,251	0	35	0
	2004	3,967	1	12	0**
Ring-billed Gull	1999	53,000*	0	2,300*	0
	2003	60,000*	0	2,500*	0
Herring Gulls	1999	275*	45	10	0
	2003	313	42	10	0
Great Black-backed Gull	1999	8	0	0	0
	2001	19	0	0	0
	2002	15	1	0	0
	2003	12*	0	0	0
Caspian Tern	1999	1,440	0	0	0
	2000	1,350	0	0	0
	2001	1,590	0	0	0
	2002	1,585	0	0	0
	2003	1,658	0	0	0
	2004	1,560	0	0	0

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Black-crowned Night heron	1999	1	46	9	6
	2000	1	20	36	0
	2001	1	50	13	0
	2002	1	24	36	0
	2003	3	35	44	0
	2004	3	78	17	

* estimate ** after nest removal

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

Trip Date	Little Gallo Island (Nests Oiled)	Little Galloo Island (Eggs Oiled)	Little Galloo Island (Birds Culled)	Gull Island (Nests Removed)	Gull Island (Birds Culled)	Bass Island (Nests Removed)	Bass Island (Birds Culled)
30 April 04				137	0	265	0
04 May 04	1,069	3,931	0				
05 May 04	659	1,209	0				
12 May 04						348	10
13 May 04				188	0	208	11
17 May 04	2,910	7,347	2				
19 May 04						0	18
27 May 04						26	20
01 June 04	3,359	8,393	4				
03 June 04				100	0		
07 June 04				39	0	19	25

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16 June 04	2,936	5,878	12				
24 June 04				21	3	23	3
29 June 04						46	30
07 July 04	2,643	4,557	0				
20 July 04						27	50