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Mark C. Shieldcastle

Larry Martin

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Colonial Waterbird Nesting on West Sister Island National Wildlife Refuge and the Arrival of Double-Crested Cormorants

By Mark C. Shieldcastle and Larry Martin

Abstract: Recent survey data have shown the importance of West Sister Island National Wildlife Refuge, Lake Erie, to nesting waders. About 40 percent of all herons and egrets nesting in the U.S. Great Lakes are found there, including the Great Lakes' largest colonies of great blue heron (*Ardea herodias*), great egret (*Ardea alba*), and black-crowned night-heron (*Nycticorax nycticorax*), and the largest of two snowy egret (*Egretta thula*). West Sister Island's importance to Ohio has grown in recent decades with the loss of smaller mainland colonies of waders, especially the black-crowned night-heron. The double-crested cormorant (*Phalacrocorax auritus*) returned to Ohio as a successful nester in 1992 for the first time in more than a century. The effects of this species on wading bird colonies have been well documented in Canadian Lake Erie. Cormorants have successfully competed against great blue herons for nesting space and eliminated black-crowned night-herons through habitat destruction. Nest estimates made at the island since 1991 indicate that the night-heron has fallen to 37 percent of its

historic numbers on the island and is dropping dramatically in the region. That species has been affected negatively as canopy height has increased with vegetative succession. A second concern is the cormorant, whose nest counts have increased from 0 to ~1,500 in 5 years. This rate of increase mirrors that on East Sister Island, a few kilometers northeast in Canada. To date, competition has not been a significant problem, but habitat degradation has been documented, with major leaf loss noted in 1995 on trees having cormorant nests and along the perimeter of West Sister Island. The Ohio Division of Wildlife and the U.S. Fish and Wildlife Service are concerned, both biologically and esthetically, about the future status of the island's colonies in light of habitat succession and the addition of the cormorant.

Keywords: black-crowned night-heron, breeding colonies, double-crested cormorant, great blue heron, great egret, habitat degradation

West Sister Island (WSI), located in the western basin of Lake Erie, has been identified as an important nesting colony for wading birds according to a recent survey by the U.S. Fish and Wildlife Service (FWS) (Scharf et al. 1992). About 40 percent of all the nests of herons and egrets on the U.S. side of the Great Lakes are located on WSI. The island hosts the largest colonies for the great blue heron (GTBH), great egret (GREG), and black-crowned night-heron (BCNH), and the largest of two colonies of snowy egret, and the only colony of little blue heron (*Egretta caerulea*) in the Great Lakes.

The island's importance has grown in recent decades with the loss of smaller mainland wader colonies, especially those of the BCNH. Currently, only two island BCNH colonies remain in Ohio's western Lake Erie basin, where colonies appear to favor areas of low human disturbance and specific tree heights for nesting (author Shieldcastle, unpubl. data). The

concern about declining heron populations resulted in the initiation of a study looking at factors influencing nest site selection by herons on WSI (Shieldcastle 1988 unpubl.).

A second concern developed in the 1990's, when double-crested cormorants (DCCO's) began nesting on WSI. In 1992, cormorants nested successfully in Ohio for the first time in more than a century. The effects of this species on colonial wading birds have been well documented in Canadian Great Lakes colonies (Moore et al. 1995, Weseloh and Collier 1995). On East Sister Island, located 15 km northeast of WSI, cormorants have successfully competed against GTBH's for nesting space and have eliminated BCNH's (P. J. Ewins, Canadian Wildlife Service, unpubl. data).

We estimated the number and distribution of nesting colonial wading birds on WSI and changes in the number and distribution of these colonies following the establishment of nesting DCCO's there.

Study Area

West Sister Island consists of 34 ha located 14 km from the south shore of Lake Erie and approximately 25 km east of Toledo, OH. The only manmade structure on the island was a lighthouse that workers occupied until it was automated in 1938. The island was designated as a national wildlife refuge in 1938 and a national wilderness area in 1975. More than 75 percent of the island surface is a near-pure stand of hackberry (*Celtis occidentalis*) 20–35 m tall. The western quarter of the island was open grassland when the lighthouse was occupied and has since gradually reverted to pole-size timber dominated by hackberry 8–15 m in height. Kentucky coffeetree (*Gymnocladus dioica*), chokecherry (*Prunus virginiana*), and wild plum (*P. americana*) make up the majority of other tree species. Understory is dense herbaceous cover dominated by sweet cicely (*Osmorhiza claytoni*) and bedstraw (*Galium* spp.). The southwestern shore is gravel beach; cliffs 3–15 m high form the remaining shoreline.

We saw no mammalian predators or scavengers, but at least one pair of great horned owls (*Bubo virginianus*) resided on the island throughout the study period.

Methods

We established a permanent point grid on 50-m centers across the entire island, resulting in 190 grid points. Each grid point consisted of a 15-m-diameter plot in which nests were counted in all trees originating from within the circle. These plots represented 15 percent of the island surface. Plots were surveyed every June from 1997 through 1997, when young were 2 to 5 weeks old. This delay from nest building and egg laying may result in a slight underestimation of breeding pairs owing to nest losses from storm events but likely reduced the potential for nest abandonment caused by research activities. One or two observers surveyed each plot until all nests had been recorded.

Field crews determined the bird species for each nest by examining the young or, in the absence of juveniles, the shape and size of the nest.

We plotted observed nests on maps to show colony locations by species. We developed colony distribution maps by plotting boundaries around plots that recorded nesting pairs of the given species. Then we compared these maps over time to establish colony location and expansion or contraction.

Finally, we derived population estimates from sample means and variances (SAS Institute, Inc. 1988) from the plots for each species and extrapolated them to the entire island.

Results

The number of GTBH's peaked in 1992, after which it steadily declined (table 1). This species nested only in the eastern portion of the island in mature hackberry. The number of GREG pairs fluctuated between 700 and 1,100, and the species appears to be more of a nesting generalist where nests are predominantly located in the successional and mature hackberry

Table 1. Estimated number of breeding pairs of Ciconiiformes and double-crested cormorants on West Sister Island National Wildlife Refuge, Lake Erie, Ohio 1991–97

Species ¹	Number of pairs ²						
	1991	1992	1993	1994	1995	1996	1997
GTBH	1,547 (332)	2,444 (490)	2,393 (269)	1,591 (366)	1,380 (327)	1,225 (245)	920 (141)
GREG	1,047 (258)	774 (182)	742 (167)	1,036 (208)	1,120 (227)	687 (181)	705 (112)
BCNH	1,113 (445)	844 (303)	746 (266)	726 (306)	560 (210)	500 (187)	480 (106)
SNEG	10	7	8	19	10	10	13
DCCO	0	186 (137)	307 (163)	580 (209)	1,480 (375)	1,467 (341)	1,380 (195)

¹GTBH = great blue heron, GREG = great egret, BCNH = black-crowned night-heron, SNEG = snowy egret, DCCO = double-crested cormorant.

²Figures in parentheses denote standard error.

stands. GREG's nested in treetops in the successional areas and along the trunks or limbs of the lower half of mature timber. BCNH numbers steadily declined after 1991, and nesting gradually became limited to small trees and shrubs on the west end of the island. DCCO's were first recorded in 1992, when 180 nests

were counted, and rapidly increased to an estimated 1,400 pairs by 1995. Cormorant numbers stabilized between 1995 and 1997, and the species' range expanded from the north and east portions of the island to the west and southeast. Colony distribution maps are shown in figures 1–4.

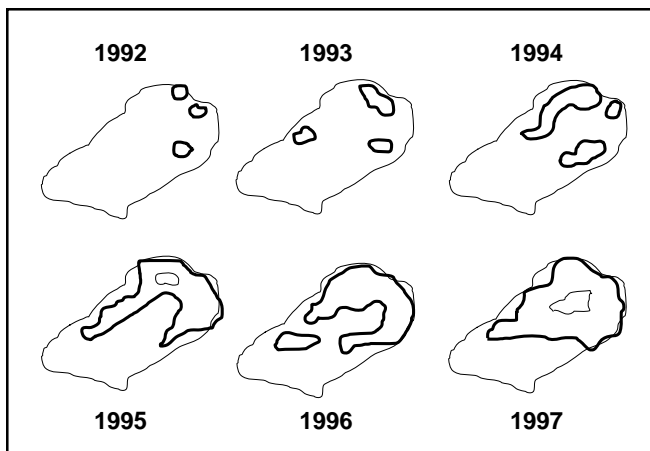


Figure 1—Distribution of double-crested cormorant colony on West Sister Island, Lake Erie, 1992–97.

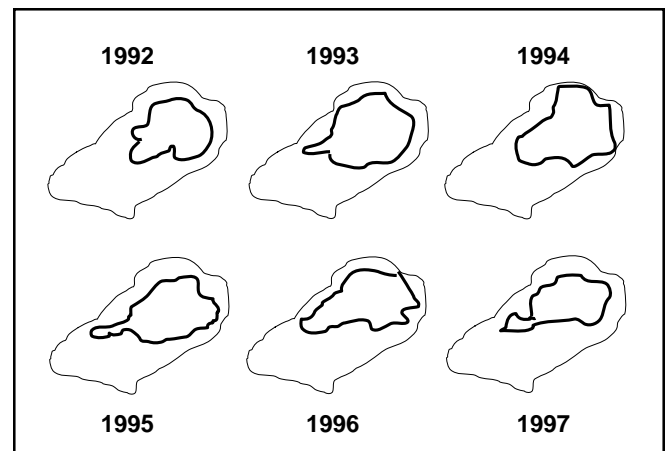


Figure 3—Distribution of great blue heron colony on West Sister Island, Lake Erie, 1992–97.

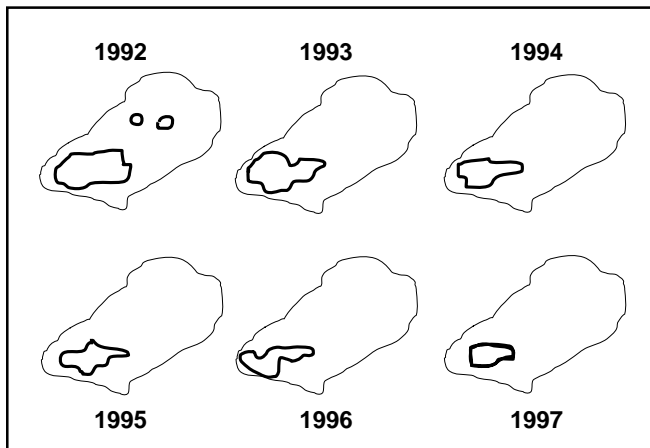


Figure 2—Distribution of black-crowned night-heron colony on West Sister Island, Lake Erie, 1992–1997.

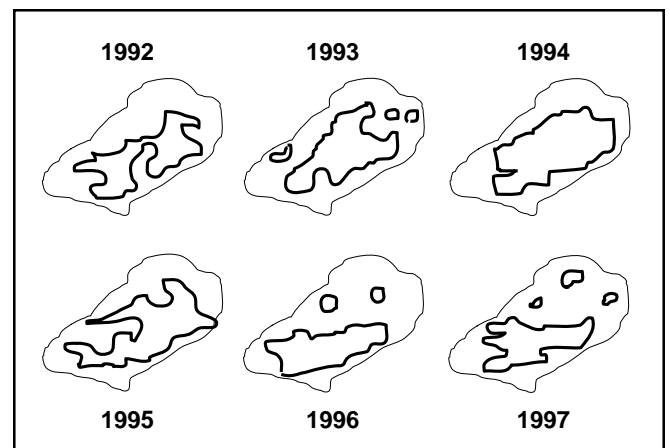


Figure 4—Distribution of great egret colony on West Sister Island, Lake Erie, 1992–97.

Discussion

Two factors are of concern regarding colonial waders of WSI. The BCNH has declined to about half of its historic numbers on the island, and numbers continue to drop dramatically in the region. The first concern is that of habitat loss through successional change. As canopy height increases, there appears to be a negative effect on nesting BCNH's. Their colony has moved westward on the island since the early 1970's and has no room for future expansion. The majority of BCNH nests were in trees with crowns 2–5 m high. Vegetation on WSI is rapidly growing beyond this height. Nests located in trees above this height appeared to be more vulnerable to winds and may have had higher losses of both eggs and young.

The second concern is the arrival of the cormorant. The Canadian Wildlife Service (CWS) has been following the resurgence of cormorants and the possible relation to the "invasion" of Dreissenid mussels (P. J. Ewins, pers. commun.). The cormorant population has exploded on the Canadian islands of Lake Erie and numbered over 7,000 breeding pairs in 1997—a 292-percent increase since 1990 (D. V. Weseloh, pers. commun.). During this same period, a major decline has been noted in the size of BCNH and GREG colonies, especially on East Sister Island, which is the primary colony for colonial waders in Canadian waters (D. V. Weseloh, pers. commun.).

Cormorants only recently returned to Ohio: their first successful nest was recorded on WSI in 1992. In 5 years, the estimated number of nests increased from 0 to 1,500, nearly doubling annually. The rate of increase mirrored that on East Sister Island. Two potential effects of the cormorant on waders are site competition and habitat degradation. Nest site competition may be occurring between the cormorant and the GTBH as heron populations have dropped annually since the DCCO arrived. Another potential effect may be on GREG's that nest in mature trees, but no definite trend can be established with the current data.

East Sister Island and Middle Island (part of the Bass Island archipelago, approximately 20 km east of WSI) have experienced a major loss of mature trees due to "white wash" from nesting and roosting cormorants (P. J. Ewins, pers. commun.). Also affected are lower shrubs and vegetation, which are killed by the highly acidic excrement of cormorants (Moore et al. 1995). Tree loss appears to have affected the subcanopy nesters, such as BCNH's, the most. Once the trees die and fall, GTBH's will be displaced from the island, and cormorants will likely become ground nesters.

The first habitat damage on WSI was noted in 1995 in the form of major leaf loss on trees with cormorant nests. Entire trees were nearly defoliated along the island edge where cormorants roosted. Defoliation continued along the shoreline, but degradation of interior habitat has been limited to trees that hold multiple cormorant nests.

Ohio has major concerns, both biological and esthetic, for all of its Lake Erie islands. WSI is of particular concern because of its importance as the major Great Lakes heron rookery. Although East Sister Island may support Canada's largest Lake Erie heron colony, WSI contains the largest heron colonies in the entire Great Lakes system. The BCNH no longer nests on the Ohio mainland, having been extirpated during the 1940's from 19 known colonies in 14 counties (Hicks 1944). BCNH numbers have been dropping on WSI since 1991, possibly as the result of habitat succession along with additional unknown population problems, and the resurgence of cormorant nesting brings a major unknown variable to continued nesting success.

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Directory of Personal Communications

- P. J. Ewins
[with the Canadian Wildlife Service
when this chapter was written, but
now located at]
World Wildlife Fund
245 Eglinton Avenue East
Suite 410
Toronto, ON M4P 3J1
- D. V. (Chip) Weseloh
Canadian Wildlife Service
Box 5050
Burlington, ON L7R 4A6