

STATUS AND BREEDING ECOLOGY OF THE BLACK TERN (*Chlidonias niger*) IN NEW YORK

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The Black Tern population has declined in many parts of its range. Although no surveys have been conducted to determine the exact number of Black Terns and Black Tern colonies now in New York, available information indicates that this tern has declined significantly. An intensive survey of Black Tern colonies and studies of productivity and causes of its decline are strongly recommended.

DISTRIBUTION

The Black Tern breeds in North America throughout most of the Canadian provinces south to south-central California, northern Nevada, northern Utah, Colorado, Nebraska, Iowa, south-central Illinois, Indiana, Ohio, Pennsylvania, New York, Vermont, and Maine. It formerly bred farther south to Missouri and Kentucky (A.O.U. 1983). According to Bent (1921) it was one of the most common species of the marshes, wet meadows, and sloughs of the plains with its center of abundance in Manitoba. In New York, which is at the southern edge of its range, it is found mainly along the Erie-Ontario and St. Lawrence plains (Andrle and Carroll 1988). The wintering grounds of the Black Tern are from Panama south to Peru and Surinam (A.O.U. 1983).

MIGRATION

In the fall Black Terns migrate to the Atlantic and Pacific coasts, then south to their wintering grounds. Concentrations of about 2,000 to 5,500 Black Terns were observed in the 1950s and 1960s along the upper Niagara River in New York (Beardslee and Mitchell 1965, R. Andrle *pers. comm.*). Few are observed there today (R. Andrle *pers. comm.*). Numbers of Black Terns observed in the area of the upper Niagara River during fall migration for the period 1965 through 1987 appear in Table 1. Large numbers of Black Terns were also observed during the fall on Long Island (Bull 1964). Observers there no longer regularly report this species, and Long Island observers consider the Black Tern rare in migration (C. Safina *pers. comm.*). Records from *American Birds* indicated that Black Terns are usually seen in migration along the coast from late August to mid September, and in the spring beginning in early April.

HISTORY IN NEW YORK

The Black Tern has nested in New York since at least the early 1900s. Eaton (1910) indicated that 150 pairs were breeding near the mouth of Big Sandy Creek (now Lakeview Wildlife Management Area [WMA]) in Jefferson County in 1903. He also mentioned a breeding colony at

Table 1. Numbers of Black Terns observed during fall migration along the upper Niagara River, Ontario and New York, 1965-1987.

Date	Number of Black Terns Reported
8/28/65	5,500
8/30/65	3,500
9/4/65	2,000
7/30/66	2,000
8/12/67	5,000
8/22/70	1,550
8/28/70	4,000
9/3/70	3,000
9/17/72	200
8/16/73	60
8/17/75	350
8/23/78	250
8/26/78	200
9/1/78	750
8/7/82	300
8/18/84	60
8/31/86	41
9/4/86	30
8/22/87	60

Data from *Prothonotary*, the newsletter of the Buffalo Ornithol. Soc. (R. Andrie pers. comm.).

the Montezuma marshes (Seneca and Cayuga counties). *Kingbird records*, Genesee Ornithological Society records (R. Spahn pers. comm.), and Bull (1974) documented a total of 52 colony locations in the state. In addition to the two already mentioned, large colonies were known to occur at Eightmile Creek and at North Pond near Sandy Pond (Oswego County), Wilson Hill WMA (St. Lawrence County), Perch River WMA (Jefferson County), and Buck Pond (Monroe County). It is likely that other large colonies existed as well. The locations of all known colonies in existence prior to 1980 and the highest number of individuals in each, if numbers were found in the literature, are shown in Table 2. Colony locations since 1980 and their estimated population, if known, are also shown in Table 2.

FIGURE 1. BREEDING DISTRIBUTION OF THE BLACK TERN.

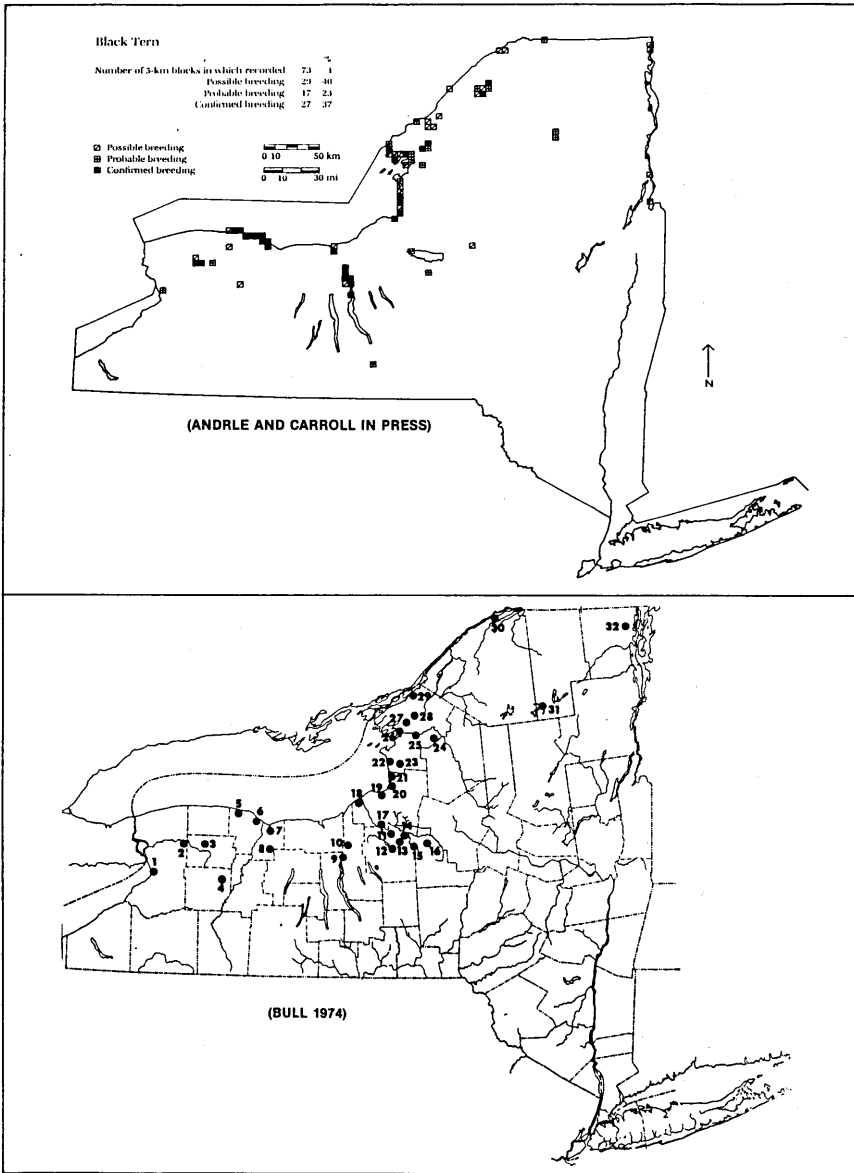


Table 2. Pre-1980 and Post-1980 Black Tern colonies in New York.

Location	Pre-1980 Historic High Numbers (Pairs)	Post-1980 Estimated Colony Size (Pairs)
Erie County:		
Tifft Street Marsh	6 (1978)	none
Near Tonawanda Creek	unknown	none
Genesee County:		
Iroquois NWR	unknown	few
Oak Orchard WMA	unknown	few
Wyoming County:		
Prairie Slough	unknown	none
Monroe County:		
Ling Road	10	none
Braddock Bay WMA	unknown	20
Mouth of Genesee River	6-10	none
Buck Pond-North	30-40	1-5
Buck Pond-Southwest	40+	12
Salmon Creek	unknown	30 ad & yg
Round Pond	20	10
Yanty Creek	unknown	14
Cranberry Pond	10	5-6
Brush Creek	unknown	5
Shore Acres	2	few
Bald Eagle Creek	unknown	few
Northeast corner Irondequoit Bay	6	none
Tryon Park	30	none
Mendon Ponds	unknown	none
Rose's Marsh	10	none
Seneca County:		
Montezuma NWR	200 (1960)	few
Howland Island WMA	8 (1972)	none
Pond S. of Seneca Falls	unknown	10
Onondaga County:		
Clay Swamp	15 (1955)	none
North Syracuse	22 (1966)	none
Marsh east of Syracuse	1 (1958)	none
Cicero Center	8 (1957)	none
Madison County:		
Bolivar Swamp	3 (1971)	none
Canastota	unknown	none
Wayne County:		
Sodus Bay - South end	20-30	few

Oswego County:		
Peter Scott Swamp	unknown	none
Wilson Swamp (e. of Oswego)	unknown	none
Sage Creek	9 (1972)	2
Grindstone Marshes	few (1969)	few
North Pond/Sandy Pond	45 (1969)	7
South Pond/Sandy Pond	14-25 (1948-55)	unknown
Deer Creek WMA	14 (1976)	5-10
Selkirk Shores State Park	10 (1977)	6
Ramona Beach	7 (1976)	5
Eightmile Creek (w. of Oswego)	100 (1960s)	none
East End of Oneida Lake	70 birds	none
Jefferson County:		
Black Pond (Eldorado)	7 (1981)	1-2
Renshaw Bay	unknown	4-5
Lakeview WMA (mouth of Big Sandy)	150 (1903)	5
Wilson Bay	unknown	50
Perch Lake WMA	100 (Bull)	20-30
Mouth of Perch River	unknown	3-4
Ives Street Marsh	few	none
Pt. Vivian	unknown	2-3
St. Lawrence County:		
Upper and Lower Lakes WMA	unknown	few
Wilson Hill WMA	large colony (1961)	few
Black Lake	unknown	PO
Oneida County:		
Utica Marsh	2 (1969)	PO
Franklin County:		
Tupper Lake	3 (1968)	few
Clinton County:		
Lake Alice	6 (1964)	none

ADDITIONAL POTENTIAL COLONY SITES:

Mud Bay, Jefferson County
Dexter Marsh WMA, Jefferson County
Keuka Lake, Yates County

unknown = no information available on colony size

few = less than ten

PO = listed as "Possible breeder" in Andrie and Carroll (1988)

Sources of information: *The Kingbird* Vols 1-37, Bull (1974), R. Spahn *pers. comm.* (colonies west of Rochester along Lake Ontario), J. Weeks *pers. comm.* (Eightmile Creek colony), G. Smith *pers. comm.* and L. Chamberlaine *pers. comm.* (colonies in St. Lawrence, Jefferson, and Oswego counties).

The current distribution of the Black Tern in New York as documented by the Breeding Bird Atlas (Andrle and Carroll 1988) indicated a shrinking range within the state as compared to the historic range identified by Bull (1974) (Fig. 1). At least 22 former colonies no longer exist and many of the still viable colonies have very few nesting pairs; most have less than ten. Based on an informal survey of individuals familiar with Black Tern colonies, there are now estimated to be only 31 colonies remaining in New York, with a "best guess" estimate of 200 to 300 breeding pairs. The decline in numbers at the North Pond, Montezuma National Wildlife Refuge (NWR), and North Syracuse colonies are shown in Table 3. Today there are only three known colonies where sizeable numbers of Black Terns breed. These are Wilson Bay, Jefferson County, with approximately 50 pairs noted in 1984 (R. Walker *pers. comm.*), Perch River WMA with 20 to 30 pairs (L. Chamberlaine *pers. comm.*), and Braddock Bay WMA with approximately 20 pairs (R. Spahn *pers. comm.*). Due to uncertainty about its status the Black Tern has been listed as a species of special concern in New York since 1983. As a result of this review this tern is proposed for relisting as either threatened or endangered.

Table 3. Black Tern colony declines at three locations in New York (numbers in pairs except where otherwise indicated).

North Pond	<u>1956</u> 40-45	<u>1969</u> 45	<u>1970</u> 15	<u>1976</u> 4	<u>1982</u> 7			
Montezuma NWR (birds)	<u>1958</u> 2000	<u>1960</u> 200	<u>1966</u> 100+	<u>1967</u> 50	<u>1971</u> 100	<u>1972</u> 60	<u>1973</u> 50	<u>1975</u> 70
	<u>1976*</u> 150	<u>1979*</u> 200- 300	<u>1983</u> 6	<u>1987</u> few				
North Syracuse	<u>1966</u> 22	<u>1968</u> 15	<u>1969</u> 12	<u>1971</u> 3	<u>1976</u> 0			

*Figures considered unreliable by current Montezuma NWR staff.

Sources of information: Goodwin (1960), *Kingbird* spring and summer issues, G. Hocutt *pers. comm.*

CAUSES OF DECLINE

The Black Tern has suffered from loss of freshwater marsh habitat and human disturbance throughout its range (Office of Migratory Bird Management 1987). In some areas in Wisconsin and Indiana the Black Tern has disappeared from marshes where habitat is still available (Mossman 1981, Rabenold 1988). Draining of marshes for agriculture was noted in California as one cause for a decline there; more recent declines were thought to have been due to pesticides (Cogswell 1977). In the prairie pothole region of Canada, contamination of wetlands from aerial spraying of pesticides, insecticides, and herbicides may be having a direct impact on Black Terns since these activities have been shown to cause reproductive failure in birds (Sheehan *et al.* 1987). They may also be affecting the Black Tern indirectly by killing the invertebrate prey base (Sheehan *et al.* 1987). Insects can make up as much as 94% of the diet of young Black Terns (Cuthbert 1954), and are always a major source of food during the breeding season (Goodwin 1960, Dunn 1979, Firstencel 1987).

One problem Black Terns experienced on their wintering ground in Panama was competition for food with the introduced game fish, Peacock Bass (*Cichla ocellaris*). During the 1960s this piscivore was introduced into the Gatun Lake system where it fed on small fish like the Silverside (*Melaniris chagresi*), one of the major prey items of immature Black Terns which spend their first winter and summer in Panama. As the Peacock Bass spread through the Gatun Lake system, the Black Terns could not compete for food and were forced to move away (Zaret and Paine 1973).

In New York many of the colony losses were caused by draining of wetlands for agriculture or other purposes. One wetland in North Syracuse, where 22 pairs had been counted in 1966, is now the site of a shopping center. Mossman (1983) felt that the Black Tern had declined in some areas below a "threshold" density at which nesting is attractive or productive. Such a density factor could be significant in New York, which is at the edge of the Black Tern's range and where most colonies now have few Black Terns.

Decreases in colony sizes in areas along Lake Ontario such as those at North Pond may be caused by the increased lake water level, destruction of shoreline marshes, and the building of marinas in bays, streams, and wetlands with increased boat traffic which in turn causes disturbance and may even wash out nests.

Organochlorines were found in Black Tern tissues and eggs collected from a colony at Yanty Creek marsh west of Rochester along the shore of Lake Ontario (Firstencel 1987). Levels of PCBs ranged from 2.07 to 6.39 ppm and DDE from 0.30 to 4.83 ppm. In addition the following

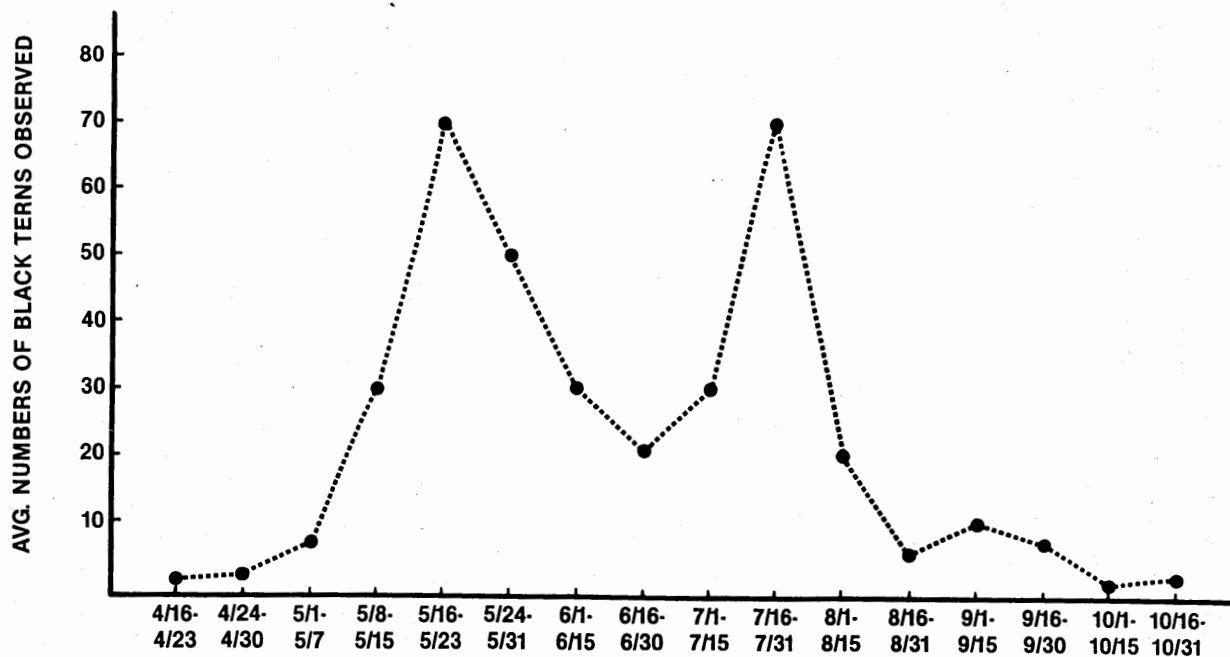
levels of other chemicals were found: hexachlorobenzene 0.002 to 0.06 ppm, octachlorostyrene 0.003 to 0.09 ppm, and mirex 0.01 to 0.04 ppm. Goodwin (1960) and Firstencel (1987) found that Black Terns at Lake Ontario colonies consistently fed on both small fish and insects. Organochlorine contamination of fish in Lake Ontario is well documented, and the presence of mirex, which is found mainly in Lake Ontario, indicates that the organochlorine contamination at least in part came from there (K. Karwowski *pers. comm.*).

At many inland marshes suitable nesting habitat, a mixture of vegetation and shallow, open water (Weller and Spatcher 1965), has been lost. At Montezuma NWR the invasion of Purple Loosestrife into the marsh which began in the late 1950s has diminished the habitat. By 1979 Purple Loosestrife covered 1,200 acres, filling in areas of open water and crowding out the cattail and bulrush. Additionally in the early 1970s the habitat at a major Black Tern nesting area at Montezuma, Tschache Pool, was destroyed by a combination of events with the major damage to the vegetation the result of Hurricane Agnes in 1972. The water levels at Tschache Pool and other parts of the refuge are now kept too high for nesting Black Terns (G. Hocutt *pers. comm.*). At Perch River WMA open areas have filled in with cattail and wild rice reducing nesting habitat. In addition increased fishing activity at the management area may be causing disturbance (J. Lamendola *pers. comm.*). At Wilson Hill WMA the water levels are kept high because of the regulation of the St. Lawrence River; this makes the habitat unsuitable for nesting Black Terns (J. Lamendola *pers. comm.*). At some wildlife management areas water levels are kept high in the spring to attract migrating waterfowl and then lowered during the summer (D. Odell *pers. comm.*). The impact of this management activity on the Black Tern is not known.

NORTH AMERICAN STATUS

The Black Tern is on the U.S. Fish and Wildlife Service list of Migratory Nongame Birds of Management Concern with declines noted in four regions: Region 1-Pacific Northwest, Region 3-Midwest, Region 5-Northeast, and Region 6-Western. The annual rate of decline in the United States for the period 1966 to 1985 from Breeding Bird Survey data was calculated as 8.1%, among the highest of any of the species monitored (Office of Migratory Bird Management 1987). The Black Tern has been on the *American Birds'* Blue List since 1978 (Tate 1986). In the Northeast the Black Tern is listed as endangered in Pennsylvania (D. Brauning *pers. comm.*) and is proposed for endangered status in Ohio (D. Rice *pers. comm.*). There are only three or four colonies still extant in Pennsylvania and two or three in Ohio. As of 1981 Vermont had eight known breeding locations with an estimated population of 180 to 300 breeding pairs; more than half this population was at one marsh complex (Laughlin and Kibbe 1984).

FIGURE 2. SEASONAL ABUNDANCE OF BLACK TERNS (JANUARY 1951 TO DECEMBER 1954) WITHIN A 50 MILE RADIUS OF ROCHESTER, NY (INCLUDES BERGEN SWAMP, BUSHNELL'S BASIN, OAK ORCHARD, FINGER LAKES, MONTEZUMA, SODUS BAY). (TANGHE 1955).



BREEDING ECOLOGY

BREEDING SEASON: In the spring Black Terns are observed in New York as early as mid April. Fig. 2 shows the seasonal abundance of Black Terns in the Rochester area for the period January 1951 to December 1954 as described by Tanghe (1955).

Nesting began at Yanty Creek marsh as early as 24 May (Firstencel 1987). At two nests observed by Goodwin (1960) at North Pond egg laying began on 17 June and subsequent eggs were laid a day apart. The clutch size of the Black Tern is from one to four eggs, usually three. Mean clutch sizes have been reported at from 2.3 to 2.9 (Cuthbert 1954, Bergman *et al.* 1970, Bailey 1977, Mossman 1981, Faber and Nosek 1985, Firstencel 1987).

Except where indicated, the following information is from Goodwin's (1960) research at North Pond. For three nests observed the incubation period was about 21 days. Males, as well as females, shared incubation, but there was a tendency for females to incubate for longer periods and to leave the nest less frequently. After the eggs hatched, the shells were carried away from the nest, usually within 15 minutes. The nest site was vacated when the chicks were from a week to two weeks old, although they stayed within about 25 m (82 ft) of the nest until fledging (Bailey 1977). The chicks could swim one to two days after hatching. The first flight of young Black Terns occurred when they were 20 to 24 days old.

NESTS AND NEST SITES: The Black Tern nest is a shallow, cuplike structure made with pieces of emergent vegetation gathered from the area near the nest site (Bergman *et al.* 1970). Most of the vegetation is added to the nest as the eggs are laid (Bailey 1977). According to Goodwin (1960) nest building continues throughout incubation and until the nest site is abandoned. Nesting substrates include inactive muskrat houses, muskrat feeding platforms, floating cattail rootstalks, dead floating emergent vegetation, mats of floating algae, and floating boards (Weller and Spatcher 1965, Bergman *et al.* 1970, Bailey 1977, Rabenold 1986). Most of the nests at Yanty Creek marsh were on cattail rootstalks; the nests were both wet and dry (Firstencel 1987).

NESTING HABITAT: The Black Tern usually returns to the same general location each year to nest, although not always to the same nest site. Stern *et al.* (1985) found that 67% of recaptured terns nested within the same primary wetland areas. Several factors can dramatically change the amount and distribution of emergent vegetation within a marsh habitat, including muskrat activity, drought, winter storms, and floods. Because of the dynamic nature of the marsh, nest sites change from year to year, and nesting may not occur if the habitat becomes unsuitable.

Black Tern colonies in New York are found in marshes at the mouths of rivers, especially those which enter Lake Ontario, in ponds, along

shores of large lakes, and at large inland marsh complexes. The marsh at North Pond was dominated by Narrow-leaf cattail (*Typha angustifolia*). Although the cattail growth was dense, there were many openings probably created by muskrats (Goodwin 1960). The dominant vegetation at Yanty Creek marsh was Broad-leaf cattail (*Typha latifolia*). Yanty Creek marsh is separated from Lake Ontario by a narrow spit of land covered with woody vegetation and is well protected from human disturbance (Firstencel 1987).

Nesting areas were described as having an interspersion of vegetation and open water (Weller and Spatcher 1965, Mossman 1983). Tilghman (1979) found nests in areas where emergent vegetation covered 51 to 75% of the marsh with open water available in 85% of the sites. Emergent vegetation was described as thick (Goodwin 1960, Faber and Nosek 1985), moderate (Dunn 1979), and low and thin (Cuthbert 1954).

The Black Tern was characterized by Brown and Dinsmore (1986) as an area dependent species. They found that the Black Tern nested mainly in marshes larger than 4 ha (9.9 a) and were most frequently found in marshes greater than 20 ha (49.4 a). Yanty Creek marsh where Firstencel (1987) counted 14 nests was 3.6 ha (8.9 a). Black Terns were frequently found at high densities in small marshes within a large marsh complex (Brown and Dinsmore 1986).

COLONY SUCCESS: Hatching success (number of eggs hatched/number of eggs laid) has been reported by Faber and Nosek (1985) at 18% and by Firstencel (1987) at 54% in 1983 and 39% in 1984. In the Faber and Nosek study one entire colony was abandoned for unknown reasons and additional egg losses occurred from nest flooding because of heavy rains. In a recent study of marsh nesting common terns on Long Island the hatching success rate was 71% (Safina *et al.* 1988), and in an East German study 86% of 89 Black Tern eggs hatched (Cramp 1985). An estimated fledging success rate (number of young fledged/number of eggs laid) of 25% was calculated in Wisconsin (Mossman 1980). At three colonies in Indiana the fledging rate was calculated at 30% (Rabenold 1988); this included a colony of five nests which failed for unknown reasons. Fledging rates of 17% (Dunn 1979) and 29% (Bergman *et al.* 1970) also have been reported, but it should be noted that determining fledging rates for Black Terns is very difficult because of the mobility of the young birds once they fledge.

Many causes of nesting failure are mentioned in the literature, including avian predation by such species as Great Horned Owls and Black-crowned Night-Herons (Bailey 1977, Rabenold 1988), wind and wave action washing away nests, particularly in open situations (Cuthbert 1954), muskrat activity (Bergman *et al.* 1970), high, rising water and increased current (Faber and Nosek 1985). The floating nature of Black Tern nests predisposes them to many of these losses.

High levels of dioxin and PCBs in marsh nesting Forster's Terns were

correlated with reproductive impairment at a Wisconsin colony (Harris *et al.* 1985). The potential effects of toxic chemicals on breeding success of the Black Tern are not known at this time.

RECOMMENDATIONS

A survey of active and historic colonies is urgently needed in New York in order to more accurately assess the current status of the Black Tern in the state. Reproductive success should be evaluated at both inland and Lake Ontario colonies. Factors affecting productivity such as predation, flooding of nesting areas, pesticides, and human disturbance should be examined at the larger colonies.

Since many of the Black Tern colonies are found on refuges and wildlife management areas, interspersed vegetation in relation to open water should be measured to determine if Black Tern nesting habitat can be enhanced, particularly in view of observed population declines in these areas. Weller and Spatcher (1965) found that changes in water level which affected the amount of emergent vegetation had a dramatic influence on Black Terns in an Iowa marsh. After a drawdown of about two years which allowed for dense growths of emergent vegetation, the marsh was flooded. Black Terns had been absent during the drawdown, but immediately began using the newly flooded marsh. As many as 200 pairs nested there when the emergent vegetation was interspersed with small pools. As the marsh character changed from a small-pool complex to an open marsh, Black Tern numbers declined until finally they disappeared completely. In Wisconsin Black Tern populations were consistently high in managed areas where water levels were regulated to maintain "semi-open tracts of emergent vegetation" (Mossman 1983).

Since Black Terns share freshwater marshes with other species reportedly declining in New York, such as Pied-billed Grebe (*Podilymbus podiceps*), Least Bittern (*Ixobrychus exilis*), American Coot (*Fulica americana*), and Common Moorhen (*Gallinula chloropus*), management actions should be taken to enhance the habitat of these species. In addition proposals for acquisition of wetland habitat should consider size, proximity of nearby marshes, and potential management for species richness which will benefit declining marsh species like the Black Tern. In Iowa Weller and Frederickson (1973) found that marsh bird populations reached their peak of production when the ratio of emergent vegetation cover to open water was about 50:50. In general, bird species diversity was at a maximum in the years when there were many small pools interspersed with vegetation.

CONCLUSION

It is apparent that the Black Tern is declining rapidly in New York and throughout North America. At the present rate of decline, it is not unrealistic to believe that the Black Tern will disappear from New York within the not too distant future. New York observers are encouraged

to report the locations of Black Tern colonies to the Nongame Unit, New York State Department of Environmental Conservation, Wildlife Resources Center, Delmar, NY 12054.

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