



NEW YORK CITY AUDUBON
CELEBRATING 30 YEARS OF CONSERVATION

NEW YORK CITY AUDUBON'S HARBOR HERONS PROJECT: 2018 NESTING SURVEY REPORT

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Prepared for:

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Abstract

New York City Audubon's Harbor Herons Project Nesting Survey of the New York/New Jersey Harbor and surrounding waterways was conducted between 15 May and 26 June 2018. This report principally summarizes long-legged wading bird, cormorant, and gull nesting activity observed on selected harbor islands, and also includes surveys of selected mainland sites and aids to navigation. Seven species of long-legged wading birds were observed nesting on eight of fifteen islands surveyed, on Governors Island, and at several mainland sites, while one additional species was confirmed as nesting exclusively at a mainland site. Surveyed wading bird species, hereafter collectively referred to as waders, included (in order of decreasing abundance) Black-crowned Night-Heron, Great Egret, Snowy Egret, Glossy Ibis, Yellow-crowned Night-Heron, Little Blue Heron, Tricolored Heron, and Great Blue Heron. Overall, the 2018 survey count of island wader nests increased 8% over our 2017 survey, to 1,479 nests; when the principal New York City and New Jersey mainland colonies of Yellow-crowned Night-Herons are included in this total, the percent increase over 2017 is 11%.

Species summaries: The most significant changes observed in wader species populations since our 2017 survey included increases in the Great Egret population (29%) and Black-crowned Night-Heron population (10%). Glossy Ibis numbers have fluctuated greatly over the past several years, and showed a decrease of 20% over 2017, while Snowy Egret numbers remained stable. The number of Yellow-crowned Night-Herons nesting on the harbor islands continued a decline evident over the last decade, but this decrease seems to be compensated by an increase in the species' mainland population: When an incomplete census of mainland colonies is included in survey totals, Yellow-crowned Night-Heron numbers increased by 42% over 2017. Tricolored and Little Blue Herons continued to nest in low numbers in the lower harbor and Jamaica Bay. Great Blue Heron and Green Heron, observed nesting in small numbers on the harbor islands in past years, were not observed nesting on the harbor islands in 2018. Great Blue Heron was reported nesting in small numbers at a mainland site in New York City; no survey of Green Heron mainland nesting activity was conducted. Cattle Egret, observed in small numbers in years prior to 2011, was again not observed nesting in NY/NJ Harbor in 2018. A total of 2,093 Double-crested Cormorant nests were observed in 2017, an increase of 12% over 2017, continuing an increasing trend exhibited since 2005. Herring and Great Black-backed Gull nesting activity was observed on nine of fourteen islands surveyed for gull breeding; no nesting activity was observed on Isle of Meadows or Shooters, Prall's, Goose, or Huckleberry Islands, while Governors Island was not surveyed for gull nesting activity. Incidental observations of Common Tern nesting activity were recorded at several sites including Little Egg Marsh and Governors Islands.

Island summaries: In the Upper Harbor and Long Island Sound, South Brother Island continued to be the most productive colony, and the second largest in the harbor. This island again hosted four wader species in 2018, and its nesting wader population increased 23% over 2017. Two other recently productive islands in this area continued to evidence abandonment by nesting waders: Neither Goose nor Huckleberry Islands exhibited nesting activity in 2018. North Brother Island was not surveyed due to lack of recent nesting activity. The wader colony on Mill Rock Island, which appeared to be largely abandoned in 2017, recovered slightly in 2018, while tiny U Thant Island continued to host a growing Double-Crested Cormorant colony. Governors Island in the Upper New York Bay again hosted Yellow-crowned Night-Herons (1 pair) as well as a Common

Tern colony. No waterbird nesting was observed on the three islands in the Arthur Kill/Kill Van Kull complex adjacent to Staten Island, which first hosted nesting waders in the late 1970s and 1980s (Isle of Meadows, Prall's Island, and Shooters Island). In the lower harbor, Hoffman Island continued to host the largest number of breeding waders in the harbor at 581 nesting pairs, a 14% increase in total nests over 2017; the colony included five nesting wader species. Nearby Swinburne Island hosted 468 pairs of Double-crested Cormorants, the largest total yet observed on this island. In Jamaica Bay, Subway Island exhibited an 11% decline in wading pairs but continued to be the third largest colony in the harbor, and hosted 5 wader species. Elders Point East Marsh Island was again the most diverse colony in the harbor in 2018, hosting 6 wader species, but at 63 wader pairs exhibited a third consecutive year of decline—while the nearby Elders Point West Marsh Island colony increased markedly to 60 wader pairs from the 5 pairs observed there in 2017. This island also hosted a new Double-crested Cormorant colony. The wader colony on Little Egg Marsh Island declined sharply (83%) since 2017, to just 10 estimated pairs. Neither Canarsie Pol nor the other Jamaica Bay Islands were surveyed in 2018, due to lack of recently observed nesting wader activity. The mainland nesting colony of Yellow-crowned Night-Herons at Redfern Houses in Far Rockaway exhibited an increase of 12% over 2017 to 65 nests, matching the highest count previously observed in 2010. A second Yellow-crowned Night-Heron colony of 35 nests was discovered in nearby Rockaway Beach. Stable numbers of this same species were reported from the Harmon Cove colony in the New Jersey Meadowlands.

Introduction

New York City Audubon's 2018 Harbor Herons Nesting Survey marks the 34th consecutive year of this project. The primary objective of the survey is to monitor the population status of wading birds (i.e., herons, egrets, and ibis) and other colonial waterbirds on selected islands and mainland sites in New York/New Jersey (NY/NJ) Harbor and surrounding waterways, while also noting the presence of other nesting bird species and current nesting habitat.

In Fall 2004, NYC Audubon made a decision to shift the comprehensive Harbor Herons Nesting Survey from an annual to a triennial schedule, and in intervening years to conduct interim surveys on islands where nesting occurred in the prior year. An interim nesting survey was conducted in 2018; the next comprehensive survey will be conducted in 2019.

The U.S. Army Corps of Engineers and The Port Authority of New York & New Jersey "Comprehensive Restoration Plan for the Hudson-Raritan Estuary" and the Harbor Herons Subcommittee of the Harbor Estuary Program's "Harbor Herons Conservation Plan" provide historical perspective on Harbor Herons and their breeding and foraging habitat, identify threats to the persistence of these species in the Harbor, and lay out a plan of action for protecting these birds in the future.

This report summarizes nesting activity of long-legged wading birds, cormorants, gulls, and terns observed on selected islands, aids to navigation, and at mainland colonies documented during the 2018 field season, between 15 May and 26 June. The objectives of the 2018 survey were to (1) monitor the population status of long-legged wading birds (i.e., herons, egrets, and ibis), cormorants, and gulls on selected islands; (2) document nesting habitat used by long-legged wading birds and cormorants; and (3) record the presence of other important nesting or migratory bird species.

Monitoring long-term trends and short-term conditions in long-legged wading bird and other colonial waterbird nesting populations in NY/NJ Harbor provides both an estimate of the relative health and stability of local colonial waterbird populations, and a valuable indicator of the overall health of the region's natural resources.

Methods

The 2018 survey followed field methods designed for previous Harbor Herons Project nesting surveys [Katherine Parsons (1986–1995), Paul Kerlinger (1996–2004), Andy Bernick (2004–2007), Liz Craig (2008–2013), Tod Winston (2014–current)] and the standard protocol of the New York State Department of Environmental Conservation's Long Island Colonial Waterbird and Piping Plover Survey (Litwin et al. 1993). All island counts were conducted between 6:00am and 4:00pm, and under clear conditions without rainfall, high winds (>8 knots), or temperatures above 80°F. Counts were conducted from 15 May to 26 June 2018.

Islands that were fully surveyed in 2018 (Table 1, Figure 1), using a combination of nest and adult counts, included two in Lower New York Harbor (Hoffman and Swinburne Islands); two in the

Arthur Kill (Prall's Island and Isle of Meadows); one in the Kill Van Kull (Shooters Island); three in the East River/Western Long Island Sound area (U Thant, Mill Rock, and South Brother Islands); two in the Hutchinson River/Long Island Sound area (Goose and Huckleberry Islands); and four in Jamaica Bay (Elders Point East Marsh, Elders Point West Marsh, Little Egg Marsh, and Subway Islands). Structures in the Kill Van Kull were surveyed by boat for cormorant nesting. The following islands, having not exhibited nesting activity in the last three years or more, were not surveyed for wader activity in 2018: Davids' Island in the Hutchinson River/Long Island Sound area; North Brother Island in the East River/Long Island Sound area; and Canarsie Pol and Ruffle Bar in Jamaica Bay. Also presented in this report are observations of Yellow-crowned Night-Heron nesting on Governors Island and at several mainland colonies, Great Blue Heron nesting in small numbers at mainland sites, and Common Tern nesting at several sites including Governors Island. Other waterbird nesting colonies in the survey area that are not surveyed by NYC Audubon are noted, when their location is known to the author.

Each island was surveyed by a research team consisting of the author and/or staff and volunteers from NYC Audubon and other organizations, and/or staff from NYCDPR. Double-crested Cormorant counts were conducted as part of an ongoing study of cormorant population dynamics, habitat use, and foraging ecology in the NY/NJ Harbor. Surveys at Goose and Huckleberry islands were conducted jointly with David Künstler (NYCDPR, Van Cortlandt & Pelham Bay Parks Administrators' Office). Don Riepe of the American Littoral Society/Jamaica Bay Guardian/NYC Audubon provided additional information on colonial waterbird activity in Jamaica Bay. Hugh Carola of the Hackensack Riverkeeper, Inc. and Nellie Tsipoura of New Jersey Audubon coordinated surveys of New Jersey mainland colonies, while Hugh Carola conducted waterbird counts in Newark Bay. Jeff Kolodzinski of the Port Authority of New York & New Jersey provided information on nesting gull populations at Rikers Island.

Surveys were conducted by one to three teams of researchers, led by the author, NYC Audubon staff, and/or trained volunteers. Groups quickly and systematically searched for nests and/or conducted adult counts on each island, initially focusing effort on areas occupied by nesting birds in previous years. Depending on the colony size, each team was composed of two counters (i.e., one person using a telescopic mirror pole to examine contents of nests up to five meters from the ground, and another to record data) and from one to three spotters, who moved slightly ahead to direct the counters to nests and keep multiple teams from re-sampling the same nests. Biodegradable flagging tape and spray paint were utilized in larger colonies to ensure accurate counts. A nest was deemed active if it contained eggs or young, if there was evidence of recent construction (e.g., fresh twigs or vegetation in nest) or use (e.g., a layer of fresh feces underneath a nest), or by direct observation of adults on or within one meter of a nest with the above characteristics. Whenever possible, nests were identified to species by the presence of young, eggs, and clearly discernible nest structure. Nests beyond the reach of the mirror pole were examined with binoculars. If nest contents and structure could not be discerned, but other evidence suggested recent activity (e.g., feces, new nest construction), nesting species was noted as "unknown." Old or unused nests were noted in the count as "inactive," but not included in the final tally of active nests. Nesting vegetation (i.e., tree, shrub, or vine species) was recorded for all species whenever possible by observers skilled in plant identification.

Double-crested Cormorant surveys were conducted by ground counts within colonies (as detailed above); biodegradable flagging tape was utilized to mark trees that had been surveyed for nests in larger colonies to avoid double counting.

Adult and/or nest counts of Great Black-backed Gulls and Herring Gulls were conducted at all fully surveyed colonies, and are presented in this report. When adults were counted in the vicinity of selected colonies, a nest was assumed present for each adult observed, as one-half of adults are assumed to be foraging away from the nesting colony during daytime (see Litwin et al. 1993; Kerlinger 2004).

Transportation and Permits

Boat access to islands was provided by NYC Audubon, Don Riepe of the American Littoral Society/Jamaica Bay Guardian/NYC Audubon, Thomas Heinimann and staff from USDA/APHIS, and Willis Welkins of Newtown Creek Alliance.

Permits were issued by NYCDPR and NPS to conduct surveys on protected islands under city and federal jurisdiction, and permission to access the privately owned Huckleberry Island was provided by the Huckleberry Indians, Inc.

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We sincerely thank all volunteers (noted by name in the island profiles), organizations, and agencies that participated in the 2018 surveys.

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surveys. Jeff Kolodzinski of the Port Authority of New York & New Jersey provided information provided information on nesting gull populations at Rikers Island. Rita McMahon and staff of the Wild Bird Fund have provided skilled assistance in our survey work. Hugh Carola of the Hackensack Riverkeeper, Inc. and Nellie Tsipoura of New Jersey Audubon provided valuable expertise in surveying New Jersey areas. The Palisades Interstate Park Commission provided access to Hazard's Boat Launch, Fort Lee, NJ. The New York Police Department Harbor Unit has generously supported this project through access to their facilities and expert staff. The author would like to particularly thank Elizabeth Craig (Shoals Marine Laboratory) and Susan Elbin (NYC Audubon) for their expertise and guidance.

Results

Overview:

In 2018, seven species of long-legged wading birds were observed nesting on eight of fifteen islands surveyed and on Governors Island in New York Harbor, and at several mainland colonies (Table 2); one additional species was observed nesting exclusively at a mainland site. These eight species, hereafter collectively referred to as waders, included (in order of decreasing abundance) Black-crowned Night-Heron, Great Egret, Snowy Egret, Glossy Ibis, Yellow-crowned Night-Heron, Little Blue Heron, and Tricolored Heron; Great Blue Heron nested exclusively at mainland sites. (Green Heron is also believed to nest at freshwater sites in the survey area, but no survey of this species' mainland nesting activity was conducted.) Overall, the total number of island wader nests observed (1,479) increased 8% over our 2017 survey. The overall pattern of island nesting observed in 2017 remained unchanged in 2018: The four most active nesting colonies, with the greatest number of nests and diversity of nesting species, continued to be Hoffman, South Brother, Subway, and Elders Point East Marsh Islands. Elders Point East Marsh Island, while hosting the smallest total pairs of these four, was again the most diverse colony in the harbor in 2018, with six species of nesting waders present—though it appears this island may have not been productive this year, and that birds may be shifting to nearby Elders Point West Marsh Island. Also in line with 2017 survey observations, five wader species nested on Hoffman Island, the largest colony in the harbor, while South Brother and Subway Islands each hosted four species of nesting waders. Two recently productive islands in the East River and Long Island Sound continued to evidence sharp decline or abandonment by nesting waders: Neither Goose nor Huckleberry Islands exhibited nesting activity in 2018. The wader colony on Mill Rock Island, however, which appeared to be largely abandoned in 2017, recovered slightly in 2018. No waterbird nesting was observed on the three islands in the Arthur Kill/Kill Van Kull complex (Isle of Meadows, Prall's Island, and Shooters Island), which were the core of NY/NJ Harbor's breeding wader community from the 1970s until the late 1990s. Two additional formerly productive islands were not surveyed in this interim year due to lack of recent breeding activity: North Brother Island and Canarsie Pol. Double-crested Cormorants continued to nest on seven islands in the harbor, as they have in recent years—though in 2018 the Shooters Island colony appeared to be abandoned after several years of decline, while a new, substantial colony was established on Elders Point West Marsh Island. Cormorant numbers in island colonies increased 12% over 2017, continuing a decade-long trend of population increase in the survey area.

2018 was an interim survey year, and the majority of comparisons noted in this report are between the 2018 and 2017 surveys—but both shorter- and longer-term trends are noted when deemed relevant. Figure 2 illustrates the nesting activity of wader species on the NY/NJ harbor islands over the history of these surveys; years with lacking and/or uncertain data are indicated with gray bars. Figure 3 illustrates the shifting patterns of nesting island use over the same time period.

Island Accounts:

Hutchinson River/Long Island Sound

Huckleberry Island (10 acres)

24 May 2018, 9:00am-10:00am

By the author, Susan Elbin, Emilio Tobon (NYC Audubon); David Künstler (NYCDPR); John Burke (Huckleberry Indians, Inc.)

For the second consecutive year since nesting waterbirds were observed here in 1986, the Huckleberry Island nesting survey revealed no nesting wader or cormorant activity (see Table 2 and Figure 4). This colony abandonment follows a continuing recent trend of low numbers of nesting waders on Huckleberry Island, since a 20-year high of 140 nests observed in 2001, and a survey-period maximum of 311 pairs in 1990. Double-crested Cormorants were absent; their numbers have fallen quickly from the 215 nests counted in 2013 (and more gradually from a survey-period maximum of 830 pairs observed in 1995). Continuing a decline over the past 20 years, no Herring Gull or Great Black-backed Gull nests were observed for a second straight year, though a Great Black-backed Gull pair was observed flying low over the island during the survey; gulls have been found to be nesting in very low numbers or absent for the past six years. Two American Oystercatcher pairs were observed on the island, consistent with low numbers over the past decade, while four Spotted Sandpipers were sighted, possibly representing several nesting pairs. Four empty Canada Goose nests were observed, but it was unclear whether any had fledged young; while approximately 18 adults were observed, no young were seen. A Mallard pair was also observed in the water nearby. One Great Egret was observed foraging nearby. Other probable or possible nesting bird species observed on or near the island included Crow sp. (probable Fish Crow), Tree Swallow, American Robin, Gray Catbird, Cedar Waxwing, European Starling, Yellow Warbler, American Redstart, Song Sparrow, Red-winged Blackbird, Common Grackle, and American Goldfinch. Wintering species Atlantic Brant was observed foraging nearby.

The wader and cormorant colonies on Huckleberry Island appear to have been abandoned due to the presence of predators (rats and raccoons); no signs of rats were encountered on this visit and the raccoons living on the island have reportedly been recently trapped and removed since the 2017 survey. NYC Audubon and NYCDPR will continue to work closely with the Huckleberry Indians to insure necessary researcher access to this island, and to understand and address any potential factors contributing to the colony abandonment. Huckleberry Island has been a critical nesting site for both waders and cormorants in the New York City area.

Dauids' Island (78 acres): not surveyed in 2018; no nesting activity observed in recent surveys.

Goose Island (1 acre)

24 May 2018, 11:05am-11:40am

By the author, Susan Elbin, Emilio Tobon (NYC Audubon); David Künstler (NYCDPR)

Goose Island, abandoned shortly before our 2013 survey was conducted, exhibited no active nesting wader activity for the fifth consecutive year. Six active Canada Goose nests were found, several containing eggs, while 22 adults were seen on or near the island. Mallard and Herring Gull

were observed nearby, but no sign of nesting was observed. Other probable or possible nesting species observed on or near the island in 2018 included Barn Swallow, American Robin, Gray Catbird, Cedar Waxwing, and Common Grackle (1 nest).

It is unclear whether predators such as rats or raccoons, which were thought to be the cause of colony predation and abandonment in 2013, are still present on Goose Island. Its proximity to the mainland makes this island vulnerable to access by both predators and human visitors. Additional signage was posted on the shoreline of Goose Island in an effort to reduce unwanted visitation in 2015, and this signage needs to be repaired and replaced. Outreach efforts to the local community to raise awareness may be helpful in allowing a healthy wader colony to reestablish itself here.

East River

North Brother Island (19 acres): not surveyed in 2018; no nesting activity observed in recent surveys. NYCDPR concluded habitat restoration activities on North Brother Island in 2016. Continued monitoring during full survey years will determine the effectiveness of this restoration in improving the island's habitat for nesting waders.

South Brother Island (12 acres)

21 May 2018, 9:15am–12:45pm.

By the author, Susan Elbin (NYC Audubon); Novem Auyeung, Ryan Baker-Urzoa, Michael Feller, Carla Garcia, Marit Larson, Ellen Pehek (NYCDPR); Stefan Guelly (USDA/APHIS); Rita McMahon (Wild Bird Fund)

The South Brother Island colony was the second largest wader colony in the NY/NJ Harbor in 2018, though not as diverse as several smaller colonies. A total of 412 nests of four wader species was observed throughout the island (in order of decreasing frequency, Black-crowned Night-Heron, Snowy Egret, Great Egret, and Yellow-crowned Night-Heron; see Table 2). This total represents an increase of 23% over 2017, and the highest count registered since 2010. Black-crowned Night-Heron nesting pairs held stable since 2017 with 194 pairs, while Snowy Egret numbers increased by 73% to 130 pairs, the largest number observed there in the past decade. Great Egret numbers increased by 50% to 87 pairs. Only one Yellow-crowned Night-Heron pair was estimated, continuing a decline of this species' island nesting over the past five years (though harbor-wide, the species appears to have increased its nesting population via mainland nesting). For the seventh consecutive year, no evidence of Glossy Ibis nesting activity was observed on this island; Glossy Ibis had maintained a small breeding population over the previous 20 years. The number of Double-crested Cormorant nests increased compared to 2016 (376 nests, a 9% increase), the highest count reported since 2005. Cormorant numbers have rebounded steadily in the last four years, marking a break in a declining trend observed on this island over the previous 20 years.

Gull counts on the island produced a total of 5 Herring Gull nests and 8 Great Black-backed Gull nests. One American Oystercatcher was observed on the island shore. Laughing Gull was observed, but is not believed to nest here. Other probable or possible nesting bird species observed included Canada Goose (2 nests), Mallard (1 nest), Fish Crow (1 nest), Barn Swallow, Gray

Catbird, American Redstart, Yellow Warbler, and Boat-tailed Grackle. Probable migrants observed included Black-throated Blue Warbler.

Note: Herring and Great Black-backed Gulls are nesting on roof tops on neighboring Rikers Island. Because of its close proximity to a major New York City airport (LaGuardia), the population is being controlled via egg addling. USDA/Aphis/Wildlife Services biologists counted 280 Herring Gull nests and 3 Great Black-backed Gull nests this year.

Mill Rock Island (3 acres)

21 May 2018, 1:33pm-3:10pm

By the author, Susan Elbin (NYC Audubon); Ellen Pehek (NYCDPR); Rita McMahon (Wild Bird Fund)

This colony, first established in 2004, reached a maximum of 203 wader pairs in 2012 but declined rapidly starting in 2015, with little or no activity observed in 2017. A slight recovery was observed in 2018, however: A total of 17 nests was observed, including 17 Black-crowned Night-Heron nests and 3 Great Egret nests, many containing eggs. No Snowy Egret nests or individuals were observed, though this species had sustained breeding populations here until three years ago. An increase in both nesting gull species was also observed over 2017: Two Herring Gull nests (up from 0 nests in 2017) and 22 Great Black-backed Gull nests (up from 14 nests in 2017) were confirmed. Our count of Double-crested Cormorants (69 nests) represented a 68% increase over last year's survey. Cormorant nest counts have increased steadily since the species was first found nesting here in 2011. Cormorants continue to nest on the margin of the wader colony, but have not appeared to be competing with waders for nesting territory. In 2016, the success of cormorant nesting on this island was unclear, as few adults were seen despite signs of recent nesting activity; in 2017 and 2018, adults were seen on and around nests, and some eggs and young were observed. One owl pellet was observed, most likely of Great-horned Owl. Other probable or possible nesting bird species observed on the island included Canada Goose (8 nests), Gadwall (pair and possible nest), Barn Swallow, Fish Crow, Cedar Waxwing, European Starling, and Common Yellowthroat. Probable migrants observed included Swainson's Thrush, Magnolia Warbler, and Blackpoll Warbler.

Human disturbance continued to be evident on Mill Rock Island, and may be at least partially responsible for the decline of this wader colony. Man-made structures including benches and tables have persisted over the last few years. There is evidence of visitation from kayaking clubs. Future efforts to discourage human disturbance should include increased signage on the island, particularly at the north harbor. Kayaking clubs known to visit Mill Rock Island and other Harbor Herons nesting islands should be contacted and educated about the importance of maintaining zero human disturbance during the critical nesting period.

U Thant Island (1/4 acre)

29 May 2018, 10:28am-10:45am

By the author, Gerardo Vildostegui (NYC Audubon); Willis Welkins (Newtown Creek Alliance)

This island was surveyed by ground counts in 2018 for the third consecutive year. A total of 56 Double-crested Cormorant nests was observed on the island, on the collapsed metal arch sculpture,

in trees, and on the ground. This total is the highest yet observed on this small island, continuing an increasing trend over the past 20 years. A total of 7 Great Black-backed Gull nests was counted. No Herring Gull nests or individuals were observed.

Upper New York Bay

Governors Island (172 acres)

One pair of Yellow-crowned Night-Herons was reported on 23 June 2018 to be nesting on Governors Island, by NYC Audubon volunteer Annie Barry; one or two pairs of this species have nested here since 2015.

Since 2008, a colony of Common Terns has nested on three decommissioned piers on the southeast end of Governor's Island, extending into Buttermilk Channel. The entire colony was last officially surveyed in 2013. In 2014, survey access was allowed to only one pier (Lima) due to structural instability of the other two piers. That year, the number of nesting pairs on Lima Pier was found to have increased by 200% over 2013; this increase may have been attributable to the addition of oyster shell nesting substrate to the pier by Elbin and Craig prior to the 2014 breeding season. In 2015, we were again only able to access Lima Pier, which hosted 24 nesting pairs, a slight decrease from 2014. No habitat enhancement was done in 2015 or 2016. Birds were observed nesting on the other two piers, Tango and Yankee, in 2014, 2015, and 2016, but we have not been able to get a reliable count due to lack of access. No terns nested on Lima in 2016. In 2017, the section of Yankee Pier used by nesting terns collapsed into Buttermilk Channel. In 2017 we enhanced the eastern end of Lima Pier by adding oyster shells, grasses, and gull excluders. A total of 35 successful nesting pairs were counted, as compared to zero in 2016. In 2018, there were 18 nests on Lima. Plans were made to have NYS DEC Region 2 survey the remaining, inaccessible pier (Tango) by drone, but the flight was grounded and the count was cancelled. At the end of the nesting season, a webcam was also installed overlooking Tango Pier. Only portions of the pier are visible, so the webcam will provide public outreach rather than survey information.

Staten Island – Arthur Kill and Kill Van Kull

Isle of Meadows (101 acres)

22 May 2018, 9:00am-2:00pm

By Carla Garcia, Brady Simmons (NYCDPR)

This year no evidence of wader or other waterbird nesting activity was observed on Isle of Meadows, which has not been found to host breeding wading birds since 2001. No evidence of raccoons was noted on the island. Isle of Meadows contains habitat suitable for breeding wading birds and may be a good candidate for recolonization by colonial nesting birds in the future. Other possible nesting bird species observed on or near the island included Black-billed Cuckoo, Yellow-billed Cuckoo, White-breasted Nuthatch, and Red-tailed Hawk.

Prall's Island (88 acres)

15 June 2018, 8:00am-12:15pm

By Robin Rodier, Alex Summers (NYCDPR)

No evidence of wader nesting activity was observed on Prall's Island in 2018. Several large inactive nests of unidentified species were noted, possibly Red-tailed Hawk or Osprey. Great Egret and Herring Gull were observed foraging nearby. Other probable or possible nesting bird species observed on or near the island included Osprey, Wild Turkey, Mourning Dove, Willow Flycatcher, Tree Swallow, Barn Swallow, House Wren, Marsh Wren, American Robin, Northern Mockingbird, Gray Catbird, European Starling, Yellow Warbler, Common Yellowthroat, Song Sparrow, American Goldfinch, Baltimore Oriole, Common Grackle, and Red-winged Blackbird. Turkey Vulture was also observed. Loss and degradation of saltmarsh (*Spartina alterniflora*) areas bordering this island was noted during the survey.

Prall's Island, the site of the most recent Black- and Yellow-crowned Night-Heron nesting attempts in the Arthur Kill/Kill Van Kull complex, has continued to be inactive since 2005. Efforts to control an Asian Long-horned Beetle infestation on the island in March and April 2007 resulted in the removal of most suitable nesting trees (approximately 3,000 trees in total), and the resulting habitat does not seem optimal for nesting waders, despite restoration efforts in the intervening years. Unidentified mammal dens were found on the island during the 2016 survey, and evident browsing by abundant white-tailed deer may limit regeneration of trees and shrubs that could create a substrate suitable for wader nesting. This combination of variables may make recolonization of Prall's Island by waders unlikely in the absence of further restoration efforts combined with methods to control deer browsing and predator access to tree-nesting birds.

Shooters Island (48 acres)

14 May 2018, 9am-12:00pm

By Carla Garcia, Brady Simmons (NYCDPR)

26 May 2018

By Hugh Carola (Hackensack Riverkeepers)

No evidence of wader nesting activity was observed on Shooters Island during a full survey on 14 May. With the exception of 2011, 2014, and 2017, this island has been surveyed every year since 1985; no wader nesting has been noted since 1999. Three waders were observed on or near the island in 2018, however: One Great Blue Heron, one Great Egret, and one unidentified egret. On 26 May, Hugh Carola noted a total of 3 unoccupied but newly constructed Double-crested Cormorant nests on dry docks and other wreckage west of the island, indicating possible abandonment. This cormorant colony has exhibited a continuous decline over the past 20 years, and this is the first year during that period that occupied cormorant nests have not been observed during the survey. The structures upon which the birds nest continue to collapse, offering fewer nesting sites than in the past. Other probable nesting bird species observed on or near the island during the May survey included Red-winged Blackbird; a mixed flock of passerines was also noted.

Large metal structures were found to have been recently dumped on the island during the 2016 survey, and evidence was also found of possible camping or human habitation on the island. Continued disturbance may discourage recolonization of this formerly productive nesting island.

Lower New York Harbor

Hoffman Island (10 acres)

20 May 2018, 11:20am-1:30pm; 23 May 2018, 10:15am-1:55pm

By the author, Susan Elbin, Kaitlyn Parkins, Emilio Tobon (NYC Audubon); Don Riepe, Lisa Schepke (American Littoral Society); Ellen Pehek (NYCDPR); Ariel Cordova-Rojas (Wild Bird Fund)

Hoffman Island was the largest wader colony in the harbor in 2018, as it has been since 2009. A total of 581 nests of five wader species was observed (in order of decreasing frequency, Black-crowned Night-Heron, Great Egret, Snowy Egret, Glossy Ibis, and Little Blue Heron; see Table 2). This total constitutes a 14% increase over 2017; numbers have fluctuated in this range since the wader population reached an all-time high of 824 pairs in 2011, and the island's nesting wader population has been stable over the past 15 years. Great Egret numbers increased slightly over 2017 to 211 pairs, while Snowy Egret numbers fell to 75 pairs (a total consistent with most counts over the past decade) after an exceptionally high count of 130 pairs in 2017. Both Black-crowned Night-Heron and Glossy Ibis numbers increased since 2017, by 77% and 22%, respectively. Populations of both these species have declined on the island in recent years. Waders primarily nested in mulberry species, multiflora rose, box elder, black locust, hackberry, oriental bittersweet, wild grape and/or porcelain-berry, and Virginia creeper.

A total of 865 Double-crested Cormorant nests was observed on Hoffman Island in 2018, a 1% increase over 2016, marking the highest surveyed cormorant population since this island's cormorant colony first became established in 2002.

Totals of 103 Herring and 73 Great Black-backed Gull nests were counted during the survey, both increases over counts in 2017, though nesting populations of both species are substantially below the peaks they achieved in past decades. Three American Oystercatcher adults were observed. Additional probable nesting species observed included Canada Goose (3 nests), Mallard (3 nests), Fish Crow (2 nests), Common Yellowthroat, Song Sparrow, Seaside Sparrow (pair), and Red-winged Blackbird. Probable migrants observed included Magnolia Warbler.

Swinburne Island (4 acres)

20 May 2018, 9:13am-10:31am

By the author, Susan Elbin, Kaitlyn Parkins (NYC Audubon); Ariel Cordova-Rojas (Wild Bird Fund)

No waders were found nesting on Swinburne Island in 2018. (One Black-crowned Night-Heron adult was observed nesting in the cormorant colony in 2016, as well as in the period from 2006-2011.) A total of 468 Double-crested Cormorant nests was observed this year, an increase of 30% over 2017, and the highest nest count recorded since this colony was first surveyed in 1998. This

increase has occurred despite significant transformation of the habitat in 2012 by Hurricane Sandy, which removed topsoil and completely or partially felled all the standing buildings. Nests in 2018 were located on the remains of buildings, on the ground, and in several hackberry and black locust trees. A total of 145 Herring Gull nests was observed, an increase over the 69 nests observed in 2017; a Great Black-backed Gull count of 51 nests was consistent with last year's survey. One American Oystercatcher adult was observed, indicating one likely nesting pair; adults or nests of this species have been observed on the island for the past three years. Additional probable nesting species observed included Canada Goose (2 nests), Mallard, Fish Crow, and Red-winged Blackbird.

Jamaica Bay

Elders Point East Marsh Island (40 acres)

15 May 2018, 9:05am-9:35am

By the author (NYC Audubon); Don Riepe (American Littoral Society); Georgina Cullman, Mike Feller (NYCDPR); Melissa Malloy (USDA/APHIS); Andrew Garn (Wild Bird Fund)

Restoration of Elders Point East Marsh Island was begun ten years ago as part of a marsh restoration project undertaken in Jamaica Bay by the U.S. Army Corps of Engineers (USACE). 2018 was the ninth year since the restoration in which colonial waterbirds had the opportunity to nest on this low-lying island, and while it continues to be the most diverse colony in the harbor, its total population has declined in the past three years. A total of 63 wader nests of six wader species was estimated in 2018 (in order of decreasing frequency, Black-crowned Night-Heron, Snowy Egret, Great Egret, Glossy Ibis, Little Blue Heron, and Tricolored Heron). This total represents a 22% decrease from 2017, and a continued decline from a high count of 158 nests found in 2015. Counts decreased for Snowy and Great Egret since 2017 (19% and 88%, respectively), but increased for Black-crowned Night-Heron (42%). Glossy Ibis have been found nesting on the island in low single digits since 2011; 6 nests were estimated in 2017. A single nest of both Little Blue Heron and Tricolored Heron was estimated, consistent with counts in recent years. The growth of the Elders Point East Marsh Island colony since 2010 coincided with the decline and abandonment of nearby Canarsie Pol—but declines on Elders Point East in the past two years have likewise coincided with a population increase on nearby Subway Island in 2017 and Elders Point West Marsh Island in 2018.

In recent years, most waders at this colony were nesting in a broad expanse of high-tide bush on the southern part of the island, at a height of two feet or less. The colony seems particularly vulnerable to disturbance by recreational boating activity in Jamaica Bay, as well as to storms and sea-level rise. This vulnerability to flooding was evidenced during both the 2017 and 2018 surveys, as several dead Great Egret chicks were found on each occasion, apparently drowned during recent high tides.

Double-crested Cormorant numbers decreased by 26% since 2017, to 160 pairs in 2018. In past years, cormorants have nested in mulberry and ailanthus trees on the northern part of the island formerly occupied by waders, but many of these trees have died and deteriorated and no longer provide an adequate nesting substrate; increasing numbers of cormorants nest on the ground.

Totals of 200 Herring Gull adults and 7 Great Black-backed Gull adults were observed during this year's survey, indicating a recovery in the Herring Gull population since last year's count of 105 adults, and a stable population of Great Black-backed Gulls. A total of 13 American Oystercatcher adults was observed on the island, indicating a continuing breeding presence of this species. Forster's Tern was observed foraging in the area; this species is known to nest in nearby Joco Marsh. Other probable nesting bird species observed on or near the island included Song Sparrow, Seaside Sparrow (pair), and Red-winged Blackbird. Wintering species Atlantic Brant was also observed.

Elders Point West Marsh Island (40 acres)

30 May 2018, 9:45am-10:02am

By the author (NYC Audubon); Don Riepe (American Littoral Society)

Elders Point West Marsh Island, like its eastern counterpart, was restored as part of a marsh restoration project undertaken in Jamaica Bay by USACE. In 2018, 60 wader nests were estimated to be present on the island, including 29 Snowy Egret nests, 19 Great Egret nests, 10 Black-crowned Night-Heron nests, and 2 Little Blue Heron nests. This count represents a sharp increase in colony numbers over the single-digit numbers observed here in the past two years, and from 2007 to 2009. A total of 99 Double-crested Cormorants nests were observed on the island, the first time this species was observed breeding here since small numbers were found from 2007 to 2009. A total of 155 Herring Gulls and 12 Great Black-backed Gulls were observed in 2018, consistent with the last gull count conducted here in 2016. Forster's Tern and Laughing Gull were observed foraging in the area; these species are known to nest in nearby Joco Marsh. Willet were observed, indicating likely nesting. One occupied Osprey nest was observed. Additional probable nesting species observed included Barn Swallow, Fish Crow, and Red-winged Blackbird. Wintering and migrant species observed included Atlantic Brant and Semipalmated Sandpiper.

Subway Island (40 acres)

15 May 2018, 10:06am-11:26am

By the author (NYC Audubon); Don Riepe (American Littoral Society); Georgina Cullman, Mike Feller (NYCDPR); Melissa Malloy (USDA/APHIS); Andrew Garn (Wild Bird Fund)

The Subway Island colony was the third-largest nesting colony in NY/NJ Harbor in 2018. This year was the ninth consecutive year in the history of these nesting surveys in which a large group of waders was found nesting on this island. A total of 335 wader nests was observed, representing five species of waders (in order of decreasing frequency, Great Egret, Black-crowned Night-Heron, Glossy Ibis, Snowy Egret, and Little Blue Heron). This total represents a decrease of 11% since 2017. The count of Great Egrets increased 77% to 122 pairs, the largest total yet recorded for this island, while counts of Black-crowned Night-Heron, Snowy Egret, and Glossy Ibis pairs declined since 2017 (by 25%, 34%, and 37%, respectively). One pair of Little Blue Herons was observed, after not being recorded on the island for several years. A total of 288 Herring Gull adults was observed, a decline from a high count of 407 in 2017, while 48 Great Black-backed Gull adults were observed, a slight increase over the 2017 total. A total of 56 American Oystercatcher adults was observed, the highest count yet observed on this island, and 5 Willet adults (1 nest) were observed. Six adult Canada Geese (2 nests), 1 Mallard, and 2 Black Ducks were observed. Laughing gull and Osprey were observed foraging; both species nest elsewhere in

the Bay. Other probable nesting bird species observed on or near the island included Fish Crow, Gray Catbird, Yellow Warbler, Common Yellowthroat, Song Sparrow, Boat-tailed Grackle, and Red-winged Blackbird. Wintering and/or migrant species observed included Red-throated Loon, Brant, Dunlin, Ruddy Turnstone, a "peeps" flock (probable Semipalmated Sandpiper), and Ring-billed Gull.

Little Egg Marsh Island

30 May 2018, 8:05am-9:33am

By the author (NYC Audubon); Don Riepe (American Littoral Society)

The number of nesting waders observed in this small colony, first detected in 2013, fell sharply (83%) to 10 estimated nests in 2018, following a peak of 59 nests estimated in 2017. Black-crowned Night-Herons have made up the majority of this island's nesting wader population, and this year nine nests were estimated, along with one Yellow-crowned Night-Heron nest. No Great Egrets or Snowy Egrets were observed; these two species have also nested in very small numbers in recent years. A total of 371 Herring Gull adults and 251 Great Black-backed Gull adults were observed, indicating increases of 44% and 10%, respectively, over 2017. A Common Tern colony has been observed on the island in two of the three last years; 23 nests were estimated in 2018. A total of 23 American Oystercatchers (including 4 young), 8 Willets, and 2 Canada Geese were observed; all appeared to be nesting. Mallard was also observed. Laughing gull and Osprey were observed foraging; both species nest elsewhere in the Bay. Other probable or possible nesting bird species observed included Tree Swallow, Barn Swallow, Fish Crow, European Starling, Song Sparrow, Red-winged Blackbird, and Common Grackle. Wintering and/or migrant species observed included Red Knot, Dunlin, Semipalmated Sandpiper, and Black-throated Green Warbler.

Recreational boaters have been observed walking on the island during the Jamaica Bay surveys; increased signage and increased Park Service presence would be helpful to prevent disturbance of nesting colonies during the breeding season.

Canarsie Pol (220 acres): not surveyed in 2018; no nesting activity observed in recent surveys

Ruffle Bar (143 acres): not surveyed in 2018; no nesting activity observed in recent surveys

Other Jamaica Bay islands

No evidence of nesting waders has been noted by Jamaica Bay Guardian Don Riepe on other islands in Jamaica Bay such as White Island, which have not been known to host nesting waders in the time period of this project. Joco Marsh, an extensive, tidally flooded salt marsh adjacent to the runways of John F. Kennedy International Airport, hosts a large waterbird colony that in recent years has included Laughing Gull, Common Tern, and Forster's Tern, but this colony is not known to have included breeding waders or cormorants, and has not traditionally been surveyed as part of this study. Joco Marsh is surveyed periodically by a collaborative group of agencies and organizations including NPS, NYCPDR, the American Littoral Society, the Port Authority of New York & New Jersey, USDA/APHIS, and NYC Audubon.

Mainland and Aids to Navigation (ATON) Accounts

New York City Audubon's Harbor Herons Project has traditionally reported nesting activity on island colonies only. Three species of waders are known to have nested in recent years in mainland areas: Yellow-crowned Night-Heron, Great Blue Heron, and Green Heron. These mainland colonies are noted here to the extent they are known, but are not included in report island totals or in accompanying figures, unless noted. Several mainland colonies of non-wader waterbirds are also noted below, though they are not surveyed as part of the Harbor Herons Project. Double-crested Cormorants are known to nest on aids to navigation (ATONs) in the harbor, but our survey is not comprehensive. As mainland and ATON nesting has not been consistently or comprehensively surveyed for the duration of the Harbor Herons Nesting Survey, valid comparisons between years cannot be made if these colonies are included in year-to-year analyses.

Mainland New York Accounts:

NYC Audubon has conducted regular surveys of the Yellow-crowned Night-Heron colony at Redfern Houses in Far Rockaway, Queens. A report on this colony and the survey of a newly discovered nearby colony are included below. Several other small mainland colonies of Yellow-crowned Night-Herons in New York City have been reported in recent years, including small colonies at Bushwick Housing Project, Brooklyn; Sheepshead Bay, Brooklyn; Throggs Neck, Bronx, and Brookville Park, Queens. An official survey of these colonies was not conducted in 2018 and no reports were received, but a small colony was reported for a second consecutive year in Lindenwood, Queens (2 nests).

One pair of Great Blue Herons nested for a sixth consecutive year in Staten Island's Clove Lakes Park. Though several Green Heron pairs have nested in recent years in Brooklyn's Prospect Park, no nesting activity was noted by local birders in 2018. This species is believed to nest at freshwater sites in the survey area, but no survey of this species' mainland nesting activity was conducted and no confirmed nesting was reported in 2018.

Redfern Houses, Far Rockaway

28 May 2018, 8:15am-9:40am

By the author, David Spawn (NYC Audubon)

A total of 65 Yellow-crowned Night-Heron nests was observed (Table 2), a 12% increase over 2017, and matching the colony high count observed in 2010. Nest count numbers have continued to recover since a sharp decline was documented in 2011, following possible predation by Red-tailed Hawks in 2010. This remarkable colony, located between the buildings of a New York City Housing Authority community, was first detected in 2006. Nests are located primarily in tall interior Willow Oak, Black Locust, and Honey Locust Trees, close to the community buildings. NYC Audubon was given the opportunity by NYC Parks to review construction and tree removal planned by the community for 2018 and 2019; it appears that the affected area and trees are not part of the principal nesting colony. Continued monitoring will clarify whether the planned work will have any negative repercussions.

Local residents and workers are often a good source of information on the behavior and location

of these local, distinctly urban colonies. During the Redfern Houses survey, maintenance workers alerted the survey team to another nearby nesting colony, in the Hammel Houses community in Rockaway Beach, summarized below.

Hammel Houses, Rockaway Beach

28 May 2018, 11:45am-12:00pm

By the author, David Spawn (NYC Audubon)

A total of 35 Yellow-crowned Night-Heron nests was observed in this newly detected colony in New York City House Authority's Hammel Houses community. All nests were located in Willow Oak trees, also the preferred nesting tree species in the nearby Redfern Houses colony.

Other Mainland New York Non-Wader Waterbird Colonies

Several mainland waterbird colonies within the NJ/NJ harbor are not surveyed by NYC Audubon as part of the Harbor Herons project:

Beach Colonies: Colonies of several non-wader waterbird species including Common Tern, Least Tern, Black Skimmer, American Oystercatcher, and Piping Plover are known to exist, or to have recently existed, on New York City beaches including those on the Rockaway Peninsula. While NYC Audubon conducts research on nesting American Oystercatchers at some of these sites, these waterbird colonies are monitored primarily by NYCDPR.

Rooftop Colonies: Herring and Great-blacked Gulls are known to nest on mainland rooftops in New York City, but these colonies are not regularly surveyed by NYC Audubon.

Mainland New Jersey Accounts:

Hugh Carola of Hackensack Riverkeeper, Inc. and Nellie Tsipoura of New Jersey Audubon have regularly presented information on nesting activity of Yellow-crowned Night-Herons in the Meadowlands and northern New Jersey at Harbor Estuary Program Harbor Herons Subcommittee meetings. Known nesting sites for this species have included Laurel Hill County Park, Schmidt's Woods Park and Harmon Cove in Secaucus. A survey was conducted of the Harmon Cove colony in 2018. A more methodical survey of local New Jersey colonies is being considered for future surveys.

Harmon Cove, Secaucus

26 June 2018, 5:00pm-7:00pm

By Taleen Demirjian (New Jersey Audubon), Ray Duffy, Lynn Kramer (Hackensack Riverkeeper)

A total of 14 active nests were found at Harmon Cove, similar to numbers found there in recent years. Nest checks indicated a productive year; most nests contained young.

Aids to Navigation:

Hugh Carola (program director, Hackensack Riverkeeper) observed 45 nesting pairs of Double-crested Cormorants on aids to navigation in Newark Bay and in the Kill Van Kull adjacent to the Bayonne Bridge. This total is a slight increase over the 42 nests observed at these sites in 2017.

Species Accounts:

The species trends discussed below are based primarily on comparisons of nesting numbers between the 2017 and 2018 surveys, though longer-term comparisons are made where considered relevant.

Black-crowned Night-Heron (605 pairs): Black-crowned Night-Herons were observed on seven islands in 2017 (in order of decreasing colony size, Hoffman, South Brother, Subway, Elders Point East Marsh, Mill Rock, Elders Point West Marsh, and Little Egg Marsh Islands; see Table 2) and were the numerically dominant species both harbor-wide and in several mixed-species colonies including Hoffman, South Brother, Elders Point East Marsh, Mill Rock, and Little Egg Marsh Islands. Total observed island nesting activity increased 10% compared to 2017. The harbor's Black-crowned Night-Heron population has increased slightly over the past four years, but this increase is in the context of a longer-term decline: its numbers are substantially below populations recorded in previous decades. This species has also shifted somewhat in the harbor in recent years; its population recovered this year on Hoffman Island from a decline last year, while declining somewhat on South Brother and Little Egg Marsh Islands. A small new population was established on nearby Elders Point West Marsh Island (See Figure 5.)

Yellow-crowned Night-Heron (119 total pairs comprising 3 pairs on islands; 102 New York City mainland pairs; and 14 Secaucus, NJ, pairs): One nesting pair of Yellow-crowned Night-Herons was observed or estimated on each of three harbor islands in 2017: South Brother, Little Egg Marsh, and Governors Islands. Numbers of island-nesting Yellow-crowned Night-Herons have increased and declined several times over the last thirty years. As the island population of this species has decreased over the past decade, numbers have increased at mainland colonies in Queens and Secaucus, NJ, resulting in a possible slow increase in the total surveyed nesting population. Though surveying of the smaller mainland colonies has not been methodical or consistent, our limited data indicates that harbor-wide the surveyed breeding population increased 42% over 2017. The largest colony in the survey area continued to be the mainland colony at Redfern Houses (65 nests), which exhibited a 12% increase since 2017 (matching the previous colony high count recorded in 2010); a new colony of 35 nests was discovered in the nearby Hammel Houses community in Rockaway Beach. The colony located in a housing development near Secaucus, NJ, remained stable at 14 pairs.) Additional small colonies have been reported and not consistently surveyed in recent years in Brooklyn, the Bronx, and Queens. One colony of 2 nesting pairs was confirmed this year in Lindenwood, Queens. One pair of Yellow-crowned Night-Herons nested on Governors Island. See the description of these colonies as well as the New York City mainland colonies above in the mainland accounts section. (See Figure 6.)

Great Egret (444 pairs): Great Egrets were observed on six islands in NY/NJ Harbor (in order of decreasing colony size, Hoffman, Subway, South Brother, Elders Point West Marsh, Mill Rock, and Elders Point East Marsh Islands; see Table 2). This species' population increased 29% compared to 2017, continuing a positive trend in its population over the time of the survey and a recovery from a slight decline over the past decade. During the survey period, Great Egrets have shifted their breeding locations around the harbor. No nesting activity was observed this year on the previously productive Huckleberry and Goose Islands. Populations increased slightly over 2017 on Hoffman, Subway, South Brother, and Mill Rock Islands. A decline on Elders Point East

Marsh and Little Egg Marsh Islands was accompanied by an increase on nearby Elders Point West Marsh Island. (See Figure 7.)

Snowy Egret (291 pairs): Snowy Egrets nested on five islands in NY/NJ Harbor in 2018 (in order of decreasing colony size, South Brother, Hoffman, Subway, Elders Point East Marsh, and Elders Point West Marsh Islands; see Table 2). This year's count of 291 pairs is little changed from the 2017 count of 290 pairs. Despite year-to-year fluctuations, the population of this species has remained fairly stable over the history of this survey. The Snowy Egret, like the Great Egret, has continued to move its centers of nesting activity throughout the harbor; several formerly productive colonies (Huckleberry, Goose, and Mill Rock Islands) remained abandoned in 2018. The pair count on South Brother Island increased 73% this year, while the Hoffman Island population decreased 42%, following a survey-period high count in 2017. In Jamaica Bay, the population on Subway and Elders Point East Marsh Islands also decreased in size, while no pairs were observed on Little Egg Marsh Island. This decline was offset however by an increase in the Elders Point West Marsh Island colony. (See Figure 8.)

Little Blue Heron (7 pairs): Little Blue Herons were observed on Hoffman, Elders Point East Marsh, Elders Point West Marsh, and Subway Islands in 2018. This species approaches the northern extent of its range in the NY/NJ Harbor area, and while its populations is considerably below the higher numbers it has sometimes achieved (its highest count in the survey period being 19 pairs in 2011), it maintains a consistent, low-level presence in the NY/NJ Harbor breeding community.

Tricolored Heron (1 pair): One Tricolored Heron was observed this year on Elders Point East Marsh Island in Jamaica Bay, consistent with very low numbers found in Jamaica Bay in recent years. This is a species more typical of southern colonies, and no increasing trends in NY/NJ Harbor have been observed since the first nesting recorded here during this study period, in 1999. The first record of Tricolored Herons nesting in NY/NJ Harbor occurred in 1955 on Ruler's Bar Hassock in Jamaica Bay, and nesting for this species has also been observed in colonies in Long Island's Great South Bay (McGowan and Corwin 2008).

Cattle Egret: Nesting Cattle Egrets were not observed during the 2018 survey, the eighth consecutive year this species has been absent from our survey since it was last observed on South Brother Island, the only site where nesting had been confirmed in recent years. The population has declined to 0 from a high of 266 nests on two islands (Prall's and Shooters islands) in 1985. A possible cause of this decline is closure of local landfills that served as foraging grounds.

Green Heron: No Green Heron nests were observed on the island colonies in 2018, the eighth consecutive year this species has been absent. While this species nested in Brooklyn's Prospect Park in both 2013 and 2014, nesting has not been confirmed there since. Green Heron is believed to nest at freshwater sites in the survey area, but no survey of this species' mainland nesting activity was conducted and no confirmed nesting was reported in 2018. It is likely that, as in other parts of its range, this species may be declining due to habitat development. An effort to assess the population in NY/NJ Harbor would be a worthwhile endeavor.

Great Blue Heron (1 pair): No Great Blue Heron nests were observed on the island colonies this year. One pair of Great Blue Herons nested for a sixth consecutive year at Clove Lakes Park in Staten Island.

Glossy Ibis (128 pairs): Glossy Ibis nests were found on three islands in 2018 (in order of decreasing colony size, Subway, Hoffman, and Elders Point East Marsh Islands). The total of 128 nests represents a 20% decrease since 2017, primarily due to an observed decline in the population on Subway Island. The population of this species has remained fairly consistent over the past decade despite some sharp fluctuations. In the past four years this species has nested exclusively on Hoffman, Subway, and Elders Point East Marsh Islands, though it could historically be found nesting on other islands in Jamaica Bay, as well as on South Brother and Goose Islands in small numbers. (See Figure 9.)

Double-crested Cormorant (2,093 pairs): Double-crested Cormorant nests were observed on seven islands in 2018 (in order of decreasing colony size, Hoffman, Swinburne, South Brother, Elders Point East Marsh, Elders Point West Marsh, Mill Rock, and U Thant Islands. (See Table 2.) For the first time since 1989, no nesting cormorants were observed on Shooters Island in the Kill Van Kull, likely due to deterioration of dry docks and other wooden structures upon which the birds have nested. The peak count for this colony was 140 pairs in 1993, but its numbers have declined steadily over the past 25 years. For the second consecutive year, no cormorants were observed nesting on the previously productive Huckleberry Island, which had declined in the previous three years, possibly due to the frequent presence of raccoons on the Island. A new colony of 99 cormorants was observed on Elders Point West Marsh Island in Jamaica Bay. An additional 45 cormorant nests were observed on aids to navigation in Newark Bay and in the Kill Van Kull, consistent with counts in recent years. Other aids to navigation off the coast of Staten Island, which have hosted nesting colonies in recent years, were not surveyed in 2018.

As pertains to island colonies, a 12% increase in cormorant nests was observed since 2017. This year's island-nesting total of 2,093 pairs is the highest count registered during the period of this survey. Double-crested Cormorant colonies must be carefully monitored to determine the potential impact of cormorant nesting activity on wader nesting populations (See Figure 10). An analysis of Double-crested Cormorant population trends in the NY/NJ Harbor and northeast region is pending.

Herring and Great Black-backed Gulls: Gulls were monitored using adult counts, nest counts, or both whenever possible. Excluding Jamaica Bay and Rikers Island nesting populations, island surveys of gull nests found an increase in nesting pairs of Herring Gulls (63%) since 2017, while numbers of Great Black-backed Gulls were stable (-1%). Adult Herring and Great Black-backed Gull counts in Jamaica Bay (1,014 and 318, respectively) were stable compared to 2016, the last time a complete adult gull count on the surveyed islands was undertaken. (For detail on the Rikers Island gull colony, see the account of South Brother Island.)

Common Tern: Common Terns nested at three known island locations in 2018: Governors Island, Little Egg Marsh Island, and Joco Marsh in Jamaica Bay, in addition to several mainland sites on the Rockaway Peninsula. All of these locations have been active in recent years, but none has been consistently or formally surveyed as a part of the Harbor Herons survey effort. (NPS and NYCPDR conduct surveys of the colonies located at Joco Marsh and on the Rockaway

Peninsula.) The colony on Little Egg Marsh Island was estimated at 23 pairs during the 2018 survey. This colony was not detected during the 2017 survey but consisted of 110 pairs in 2016, and is reported to have been established post-survey in 2015. (For details on the Governors Island colony, see that account above.) The Common Tern is a threatened species in New York State. NYC Audubon has submitted to the New York State Department of Environmental Conservation a plan for all tern species nesting in New York City, to either monitor nesting populations directly or coordinate with others who are monitoring. We recommend continued monitoring and habitat enhancement at Governors Island and increased conservation efforts to protect and improve these New York Harbor colonies.

Conclusions and Recommendations

Our 2018 survey results demonstrate an increase of 8% in the population of nesting waders on the harbor islands since 2017, and a stable population over the last seven years. However, this year's island count of 1,479 pairs is substantially below the survey-period peak count of 2,233 pairs recorded in 1993. While a visualization of survey findings over the last two and a half decades might be interpreted to show an overall decline during that time (see Figure 2), a comprehensive trend analysis (1986-2017) suggests the population is stable over the entire survey period (Tobon unpublished report). Compared to our 2017 survey, Great Egret and Black-crowned Night-Heron numbers increased by 29% and 10%, respectively, while Snowy Egret numbers remained stable. Glossy Ibis numbers, which have fluctuated widely in recent years, declined by 20% since 2017. Yellow-crowned Night-Heron numbers appear to have increased harbor-wide, though this species has shifted its population from island to mainland colonies in recent years, and those mainland colonies are not methodically surveyed.

The pattern of nesting on the harbor islands remained relatively stable since 2017, though some shift in the Jamaica Bay islands was evident from recently established colonies to a growing Elders Point West Marsh Island colony. It is normal for waterbird colonies to move from island to island over time, and we have observed this phenomenon in recent years with abandonment of or decline in formerly productive colonies on Goose, Huckleberry, and Mill Rock Islands—and newly established and fluctuating populations on the Jamaica Bay Islands. However, it is imperative that a large number of suitable nesting islands remain available for these birds to continue to colonize and recolonize, and that when islands are abandoned, other suitable nesting islands continue to remain available. NYC Audubon is currently doing an in-depth nesting population trend analysis to determine statistical significance and environmental correlates of trends. Continued monitoring of wader populations through nesting surveys and banding is a necessary step to comprehend species status, population trends, and overall health and persistence of the system.

At least three areas of the Harbor Herons Project survey protocol need improvement:

1. A repeatable method to survey islands with dense vegetation is required. Many researchers face the somewhat intractable problem of surveying islands heavily colonized by invasive species and/or dense undergrowth. NYC Audubon received a NPS permit in 2018 for implementation of a grid system of directionally marked posts on Hoffman Island, and has been in discussion with NYC Parks to implement a similar system on South Brother Island. We plan to install the Hoffman Island system before or directly after the 2019 breeding season. This system should improve the qualitative and quantitative data collected in these surveys by allowing surveyors to more accurately describe changes in the nesting community and vegetation of a specific colony segment from one year to the next, and add a valuable spatial component to the dataset.
2. A method of quantifying productivity is necessary and should be implemented. Although some reproductive data are collected (e.g., nest counts and contents), repeat visits to the colony by researchers has been discouraged. These data represent only a snapshot of time. The correlation between nest number and number of fledglings is the true measure of productivity. The most effective technique would likely be to mark and monitor a subset of nests within selected colonies over the breeding season.

3. An improved habitat assessment protocol should be developed, including a rapid assessment technique, collaborating with additional botanists during breeding season vegetation surveys, and conducting a non-breeding season vegetation survey.

An additional relevant conservation issue is the presence of mammalian predators, particularly raccoons, on current and former nesting islands. Mammalian predators can have severe impacts on nesting colonial waterbird populations, and evidence of predation on waders, gulls, and other waterbirds has been observed on Ruffle Bar and Goose, South Brother, Huckleberry, and Mill Rock Islands, and others. Efforts to quantify mammalian presence throughout the year using camera trapping should be conducted on all nesting islands, and methods to control the impacts on colonial waterbirds should be considered for island colonies found to support mammalian predators. For nesting islands at a considerable distance from the mainland, appropriate control methods could include live capture and relocation of mammals. For islands that mammals can reach more readily, control methods such as exclosures around nesting trees may be more appropriate.

Human disturbance on island colonies is difficult to manage in a highly urban setting. As mentioned in Bernick (2007), articles and websites that document unauthorized visitation of colonial waterbird nesting island have appeared in recent years. While an increase in waterfront activities by the public is a positive sign of a growing interest in the urban environment, any unauthorized visitation of nesting colonies requires attention and thoughtful solutions.

The first step in addressing unauthorized visitation of islands is through clear signage. Additional signs must be posted on city-owned and federally owned islands, clearly stating the restricted status of the islands and the protected status of colonial waterbirds. (Additional signage is included in the previously mentioned plans for grid systems on Hoffman and South Brother Islands.) In addition to signage, managing agencies and stakeholders should establish a dialogue with law enforcement entities that patrol NY/NJ Harbor waters (US Park Police, New York City Police Department's Harbor Unit, and the US Coast Guard) and inform them of the security and safety threats that this type of activity poses, in addition to the ecological impacts.

Any communication concerning press coverage of NY/NJ Harbor islands should stress that these issues be thoughtfully considered and incorporated in the press coverage. This would reinforce to the public that these islands are unique, wild places that often support large bird populations, and that these birds are sensitive to human disturbance.

Not only does the conservation community need to effectively and publicly express the conservation issues that unauthorized visitation to nesting islands can create for bird populations; we also need to offer programs for the public to learn about, appreciate, and participate in the study of these interesting islands and their birds. NYC Audubon's programming and collaboration with community organizations create opportunities for community and educational outreach through participation in birding events as well as observational wader studies and other conservation projects. Additionally, direct contact with individuals or organizations that have made unauthorized visits to nesting colonies may often be productive and the danger to colonies easily remedied, without resorting to regulatory enforcement.

The Harbor Herons Conservation Plan was published in 2010 (Elbin and Tsipoura, Eds. 2010). Efforts are under way to prioritize and implement recommended actions outlined in this plan. In particular, emphasis needs to be placed on the protection of important foraging areas in addition to nesting habitats.

The New York City Audubon Harbor Herons Project Nesting Surveys are complemented by a suite of research programs, many of which include banding initiatives of multiple species at nesting islands throughout the NY/NJ Harbor. In recent years, color bands have been affixed to young-of-the-year Double-crested Cormorants, Great Egrets, Snowy Egrets, Glossy Ibis, and Herring Gulls, while colored wing tags have been affixed to Great Egrets. USFWS metal bands without color have been used on Herring Gulls, Great Black-backed Gulls, and Black-crowned Night-Herons. Color band re-sightings of any of these species should be communicated to the author (twinston@nycaudubon.org) or to NYC Audubon (bands@nycaudubon.org), giving leg band or wing tag code, color, location, date, and name of observed. All band sightings should be reported to the Bird Banding Laboratory by visiting www.reportband.gov or calling 1-800-327-2263.

Additional recommendations and goals are as follows:

- Complete the analysis and summary of data from the New York City Audubon Harbor Herons Nesting Surveys (1986-present)
- Continue dialogue with all agencies responsible for colonial waterbird surveys in New York, New Jersey, and Connecticut, in order to establish a working regional perspective on colonial wader and cormorant populations. Coordinating standardized methods to allow for regional comparisons and data analysis will be critical to the success of this effort.
- For privately owned Huckleberry Island, continued communication and collaboration with the current owners should be pursued by parties interested in the persistence of wader and cormorant populations.
- Encourage the development of wader and cormorant research projects in the NY/NJ Harbor area at high school, undergraduate, and graduate levels.
- Examine relationships between or among metropolitan NY/NJ area colonies and colonies in southern New Jersey, Long Island, and Connecticut, including gene flow, post-fledging dispersal, and natal philopatry.
- Design a photographic guide of nests, eggs, and young to aid volunteers in identification during nesting surveys. A reference guide to identify nest trees, shrubs, and vines should also be developed. Guides should be available in PDF format for all volunteers.
- Outreach to the local birding community would be helpful to learn about the location of mainland wader colonies (principally Green Heron and Yellow-crowned Night-Heron) in the NY/NJ Harbor area.
- Provide guidance for continued tern habitat enhancement on Governors Island.

New York City Audubon's Harbor Herons Project has included additional programs in recent years (i.e., the Harbor Herons Foraging Study) that allow for greater public participation and awareness of the "Harbor Herons," and have strengthened NYC Audubon's role as an advocate for conserving NY/NJ Harbor's wader populations. New and vital collaborations between NYC Audubon and other organizations (i.e., New Jersey Audubon) have formed, and the open forum of NY/NJ Harbor

Estuary Program's Harbor Herons Subcommittee has brought organizations and agencies from New York, New Jersey, and Connecticut to discuss issues of regional importance.

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TABLES, FIGURES, AND APPENDICES

Table 1. Survey schedule for wader, cormorant, and gull counts, 15 May-26 June 2018

Location Surveyed	Date	# of Observers	Ownership
<u>Long Island Sound</u>			
Goose Island	24 May	4	NYCDPR
Huckleberry Island	24 May	5	Huckleberry Indians, Inc.
<u>East River</u>			
South Brother Island	21 May	10	NYCDPR
Mill Rock Island	21 May	4	NYCDPR
U Thant Island	29 May	3	NYCDPR
<u>Arthur Kill-Kill Van Kull</u>			
Shooters Island	14 May	2	NYCDPR
Prall's Island	15 June	2	NYCDPR
Isle of Meadows	22 May	2	NYCDPR
<u>Lower New York Bay</u>			
Swinburne Island	20 May	4	NPS
Hoffman Island	20 May	4	NPS
	23 May	6	NPS
<u>Jamaica Bay</u>			
Elders Point East Marsh Island	15 May	6	NPS
Elders Point West Marsh Island	30 May	2	NPS
Subway Island	15 May	6	NPS
Little Egg Marsh Island	30 May	2	NPS
<u>Mainland – Far Rockaway</u>			
Redfern Houses	28 May	2	NYC Housing Authority
Hammel Houses	28 May	2	NYC Housing Authority
<u>Mainland – New Jersey</u>			
Harmon Cove	26 June	3	Harmon Cove



Figure 1: Current and former island nest sites (●) and primary mainland nest colonies (●) surveyed in the NY/NJ Harbor for waders, cormorants, and gulls.

Table 2. Wader, cormorant, and gull nesting activity on selected islands and mainland colonies in NY/NJ Harbor and surrounding waterways. 2018 Species include Black-crowned Night-Heron (BCNH), Great Egret (GREG), Snowy Egret (SNEG), Glossy Ibis (GLIB), Yellow-crowned Night-Heron (YCNH), Little Blue Heron (LBHE), Tricolored Heron (TRHE), Great Blue Heron (GBHE), Double-crested Cormorant (DCCO), Herring Gull (HERG), and Great Black-backed Gull (GBBG).

	Hoffman Island	South Brother Island	Mill Rock Island	Goose Island	Huckleberry Island	Elders Point East Marsh Island	Elders Point West Marsh Island	Subway Island	Little Egg Marsh Island	Swinburne Island	Shooters Island	Prall's Island	Isle of Meadows	U Thant Island	Governors Island	Redfern Houses	Other Mainland Colonies	Total Islands	Total Islands and Mainland	
Wader Species																				
GREG	211	87	3	0	0	2	19	122	0	0	0	0	0	0	0	0	0	0	444	444
CAEG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SNEG	75	130	0	0	0	26	29	31	0	0	0	0	0	0	0	0	0	0	291	291
BCNH	237	194	14	0	0	27	10	114	9	0	0	0	0	0	0	0	0	0	605	605
YCNH	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	65	51	3	119	119
LBHE	3	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	7	7
GLIB	55	0	0	0	0	6	0	67	0	0	0	0	0	0	0	0	0	0	128	128
GRHE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRHE	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1
GBHE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Active Wader Nests	581	412	17	0	0	63	60	335	10	0	0	0	0	0	1	65	52	1479	1596	
Cormorants																				
DCCO	865	376	69	0	0	160	99	0	0	468	0	0	0	56	0	0	0	0	2093	2093
Gulls																				
HERG Nests	103	5	2							145	0	0	0	0	0	0	0	0	255	255
HERG Adults						200	155	288	371										1014	1014
GBBG Nests	73	8	22							51	0	0	0	7	0	0	0	0	161	161
GBBG Adults						7	12	48	251										318	318

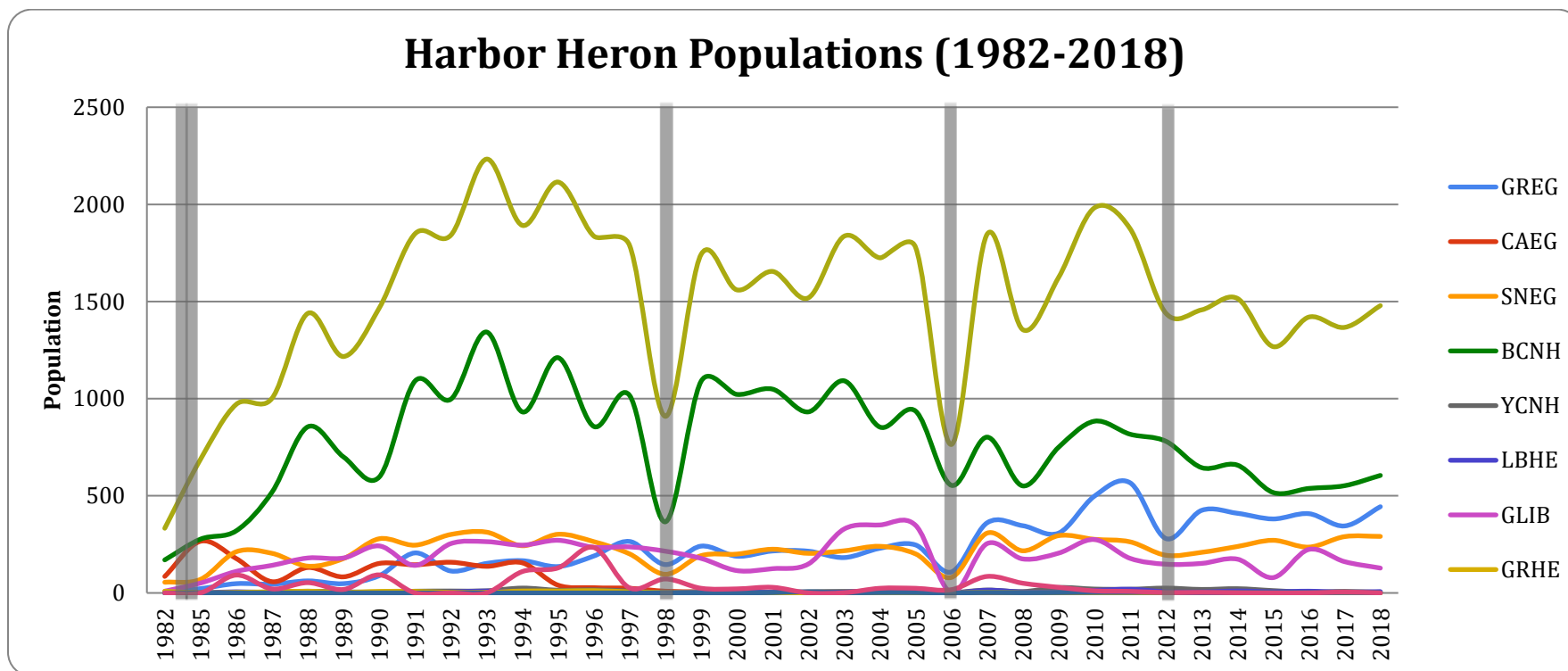


Figure 2: Total number of island-nesting pairs of wader species observed through the New York City Audubon Harbor Herons Nesting Surveys from 1982 to 2018. Gray bars indicate years in which no data is available because no survey was conducted (1983, 1984) and years with substantial uncertainty in the data due to an incomplete survey of one or more of the major breeding colonies (1998, 2006, 2012).

Key:

GREG = Great Egret; CAEG = Cattle Egret; SNEG = Snowy Egret; BCNH = Black-crowned Night-Heron; YCNH = Yellow-crowned Night-Heron; LBHE = Little Blue Heron; GLIB = Glossy Ibis; GRHE = Green Heron

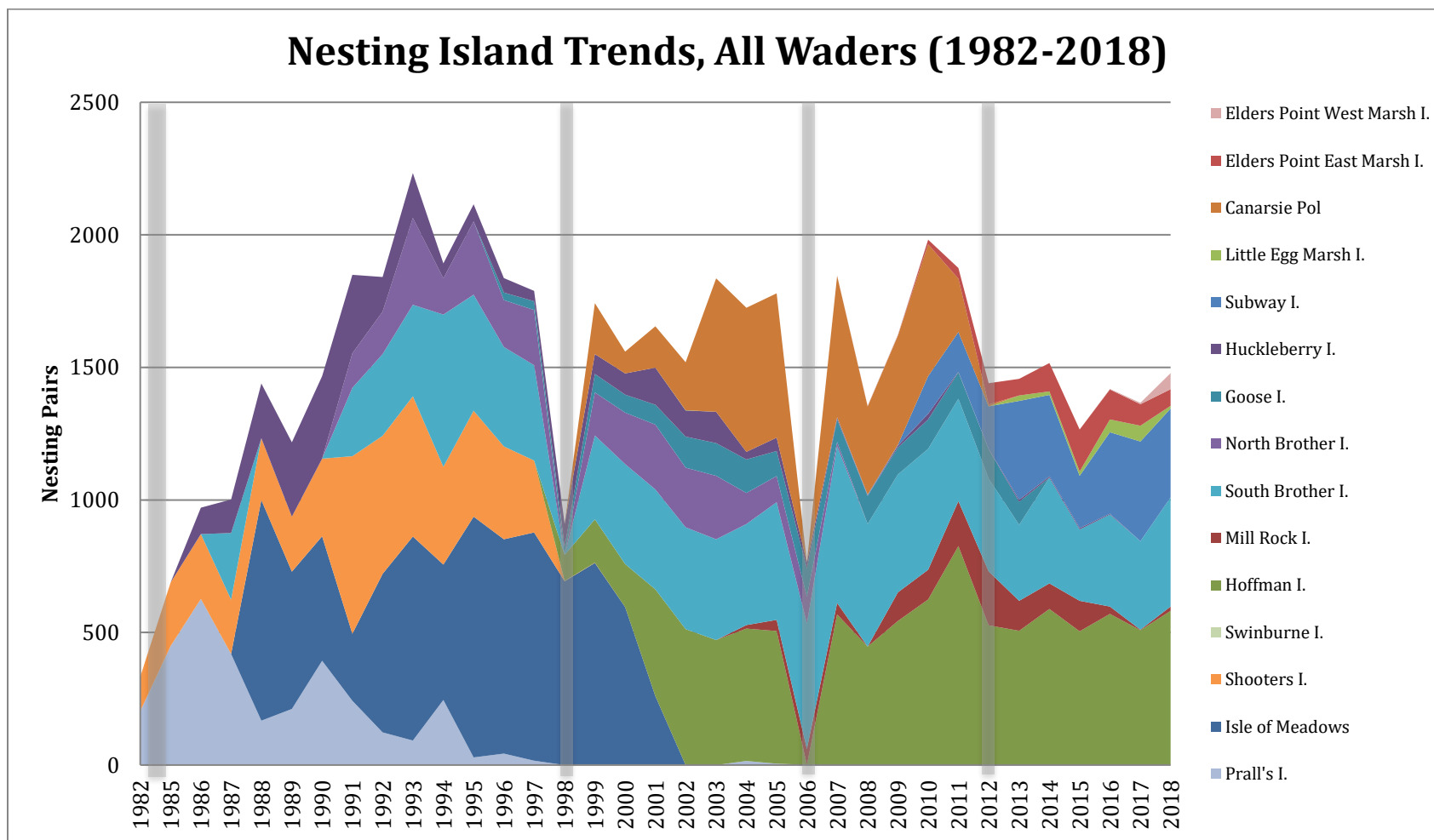


Figure 3: Total number of wader nesting pairs observed through the New York City Audubon Harbor Herons Nesting Surveys from 1982 to 2018, by nesting Island. Gray bars indicate years in which no data is available because no survey was conducted (1983, 1984) and years with substantial uncertainty in the data due to an incomplete survey of one or more of the major breeding colonies (1998, 2006, 2012).

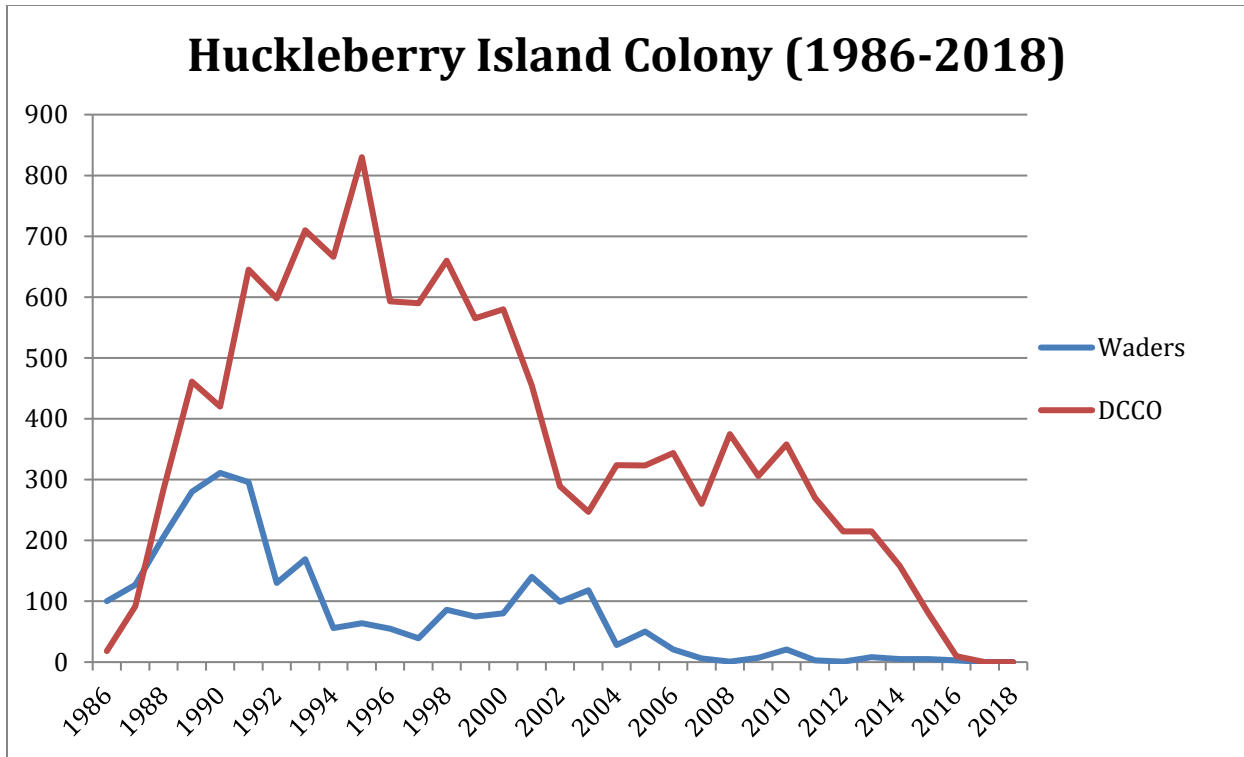


Figure 4: Total number of wader and Double-crested Cormorant (DCCO) nesting pairs observed on Huckleberry Island, 1986-2018. (Note: Huckleberry Island was first surveyed as part of this project in 1986.)

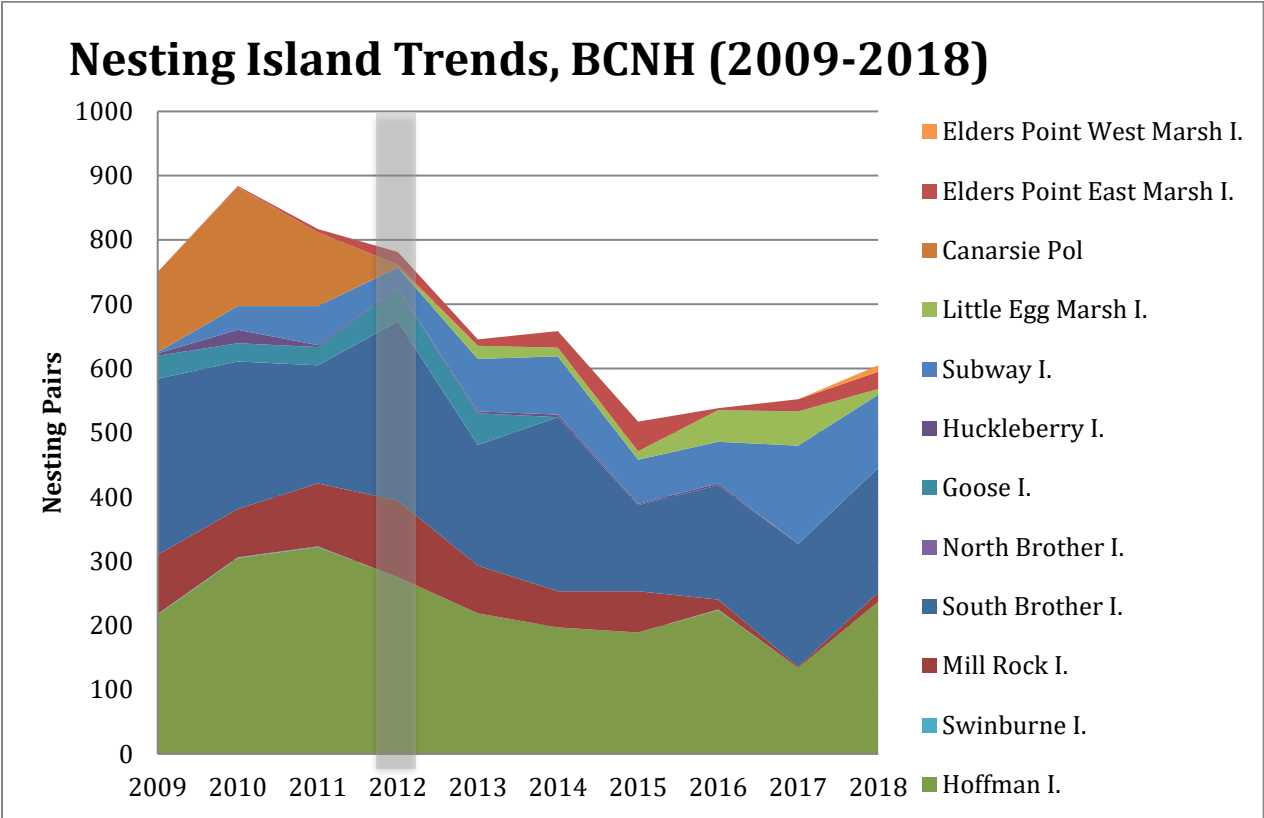


Figure 5: Total number of Black-crowned Night-Heron (BCNH) nesting pairs observed through the New York City Audubon Harbor Herons Nesting Surveys from 2009 to 2018, by nesting island. Years with substantial uncertainty in the data (survey years that did not capture one or more of the major breeding colonies) are indicated with gray bars (2012).

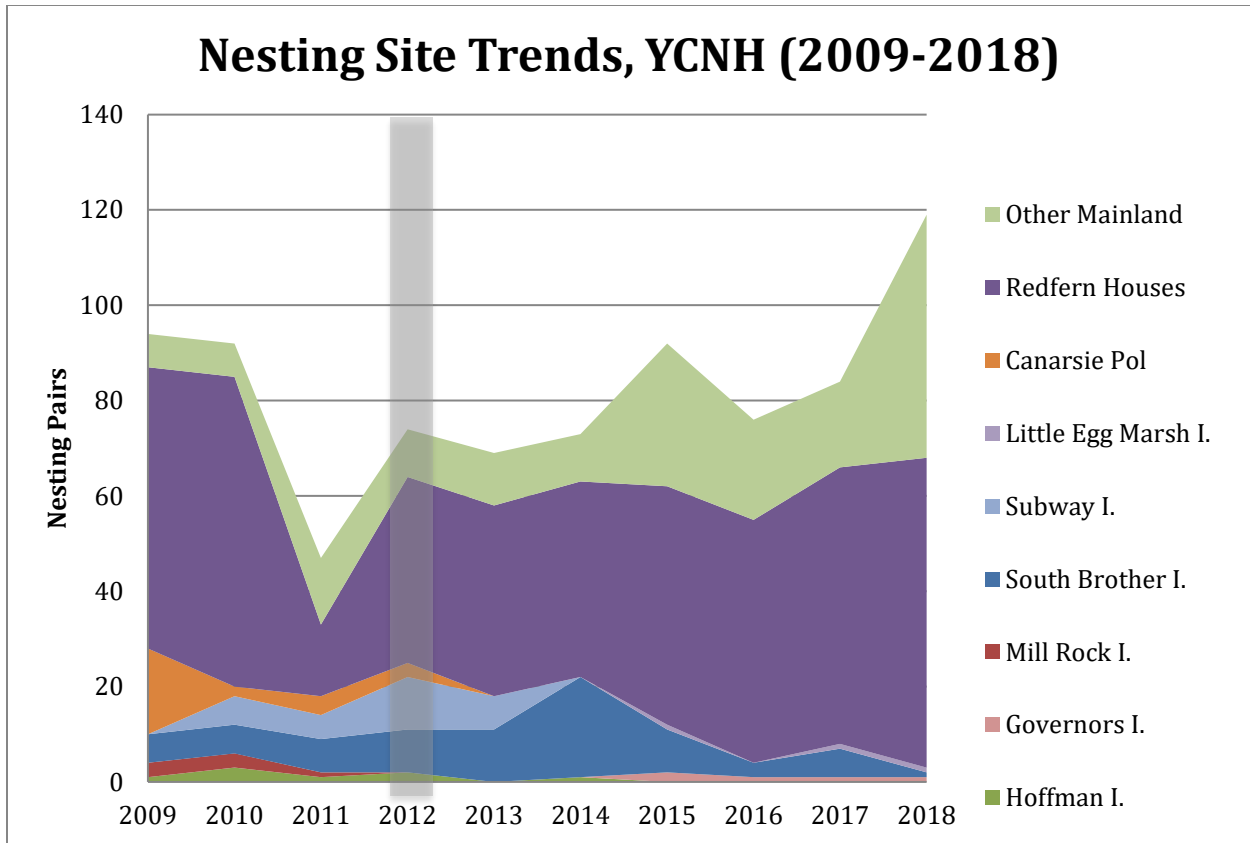


Figure 6: Total number of Yellow-crowned Night-Heron (YCNH) nesting pairs observed through the New York City Audubon Harbor Herons Nesting Surveys from 2009 to 2018, by nesting island and regularly surveyed mainland colony. Years with substantial uncertainty in the island survey data (survey years that did not capture one or more of the major breeding colonies) are indicated with gray bars (2012). “Other Mainland” colony data from the New York City and local New Jersey area is included as available.

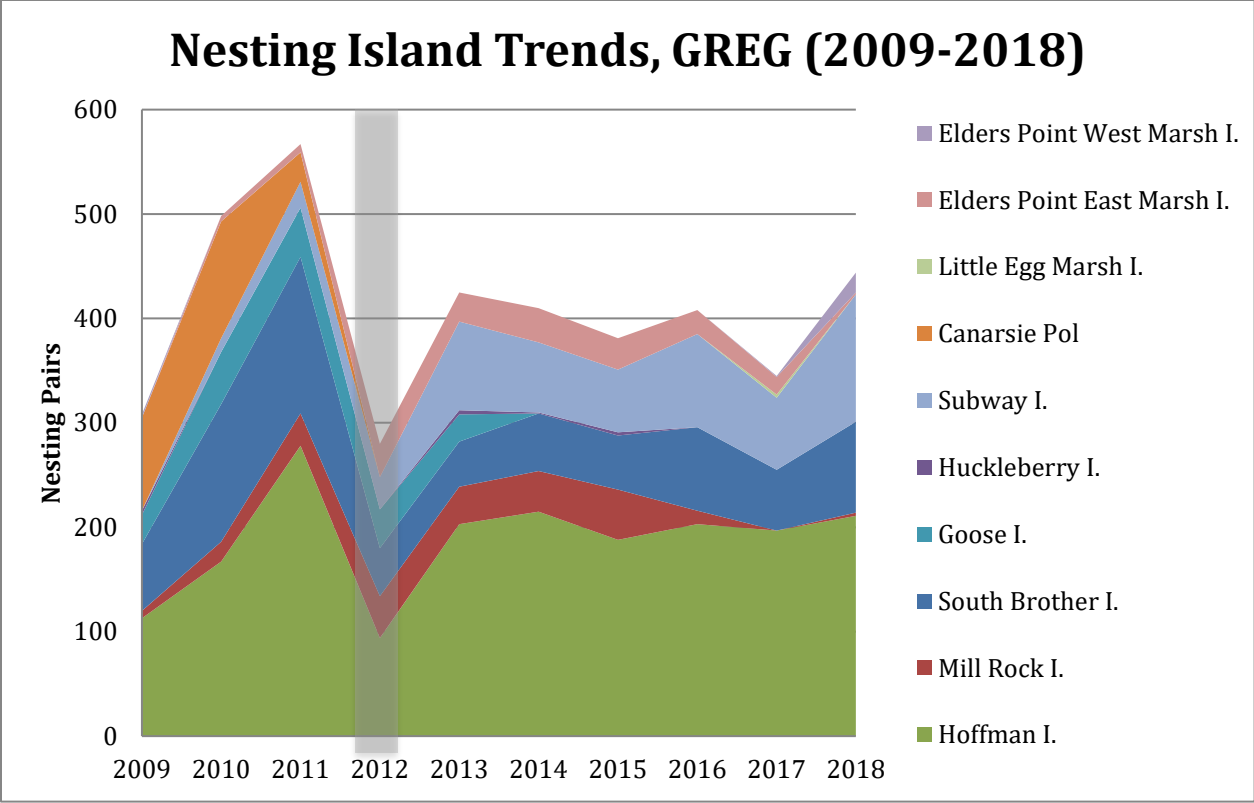


Figure 7: Total number of Great Egret (GREG) nesting pairs observed through the New York City Audubon Harbor Herons Nesting Surveys from 2009 to 2018, by nesting island. Years with substantial uncertainty in the data (survey years that did not capture one or more of the major breeding colonies) are indicated with gray bars (2012).

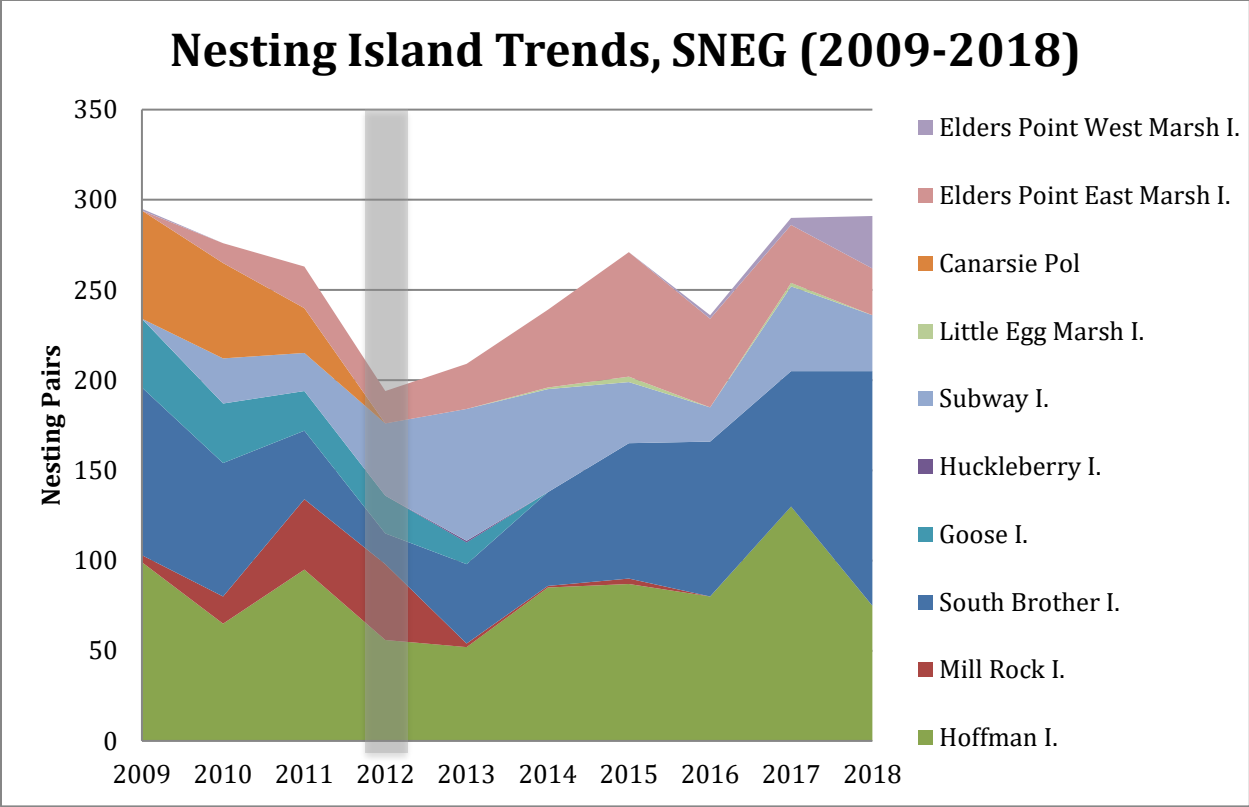


Figure 8: Total number of Snowy Egret (SNEG) nesting pairs observed through the New York City Audubon Harbor Herons Nesting Surveys from 2009 to 2018, by nesting island. Years with substantial uncertainty in the data (survey years that did not capture one or more of the major breeding colonies) are indicated with gray bars (2012).

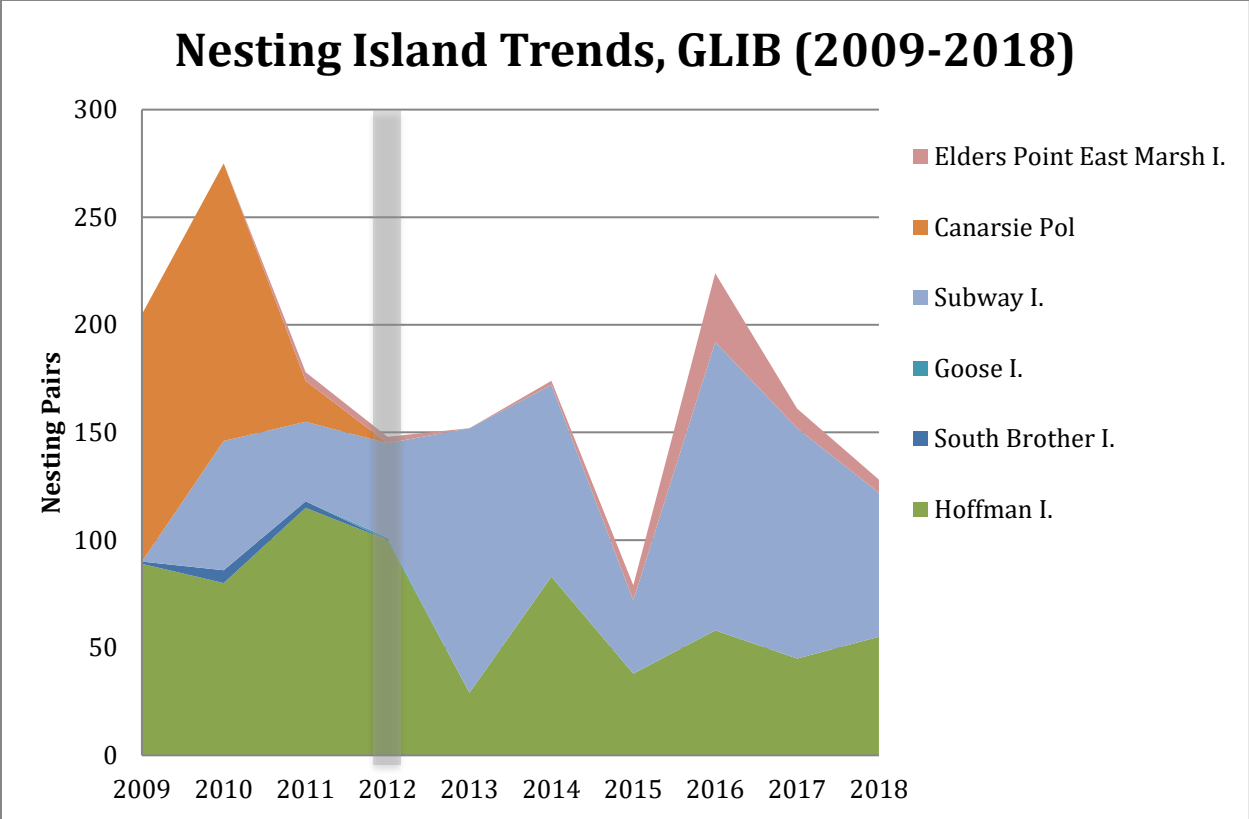


Figure 9: Total number of Glossy Ibis (GLIB) nesting pairs observed through the New York City Audubon Harbor Herons Nesting Surveys from 2009 to 2018, by nesting island. Years with substantial uncertainty in the data (survey years that did not capture one or more of the major breeding colonies) are indicated with gray bars (2012).

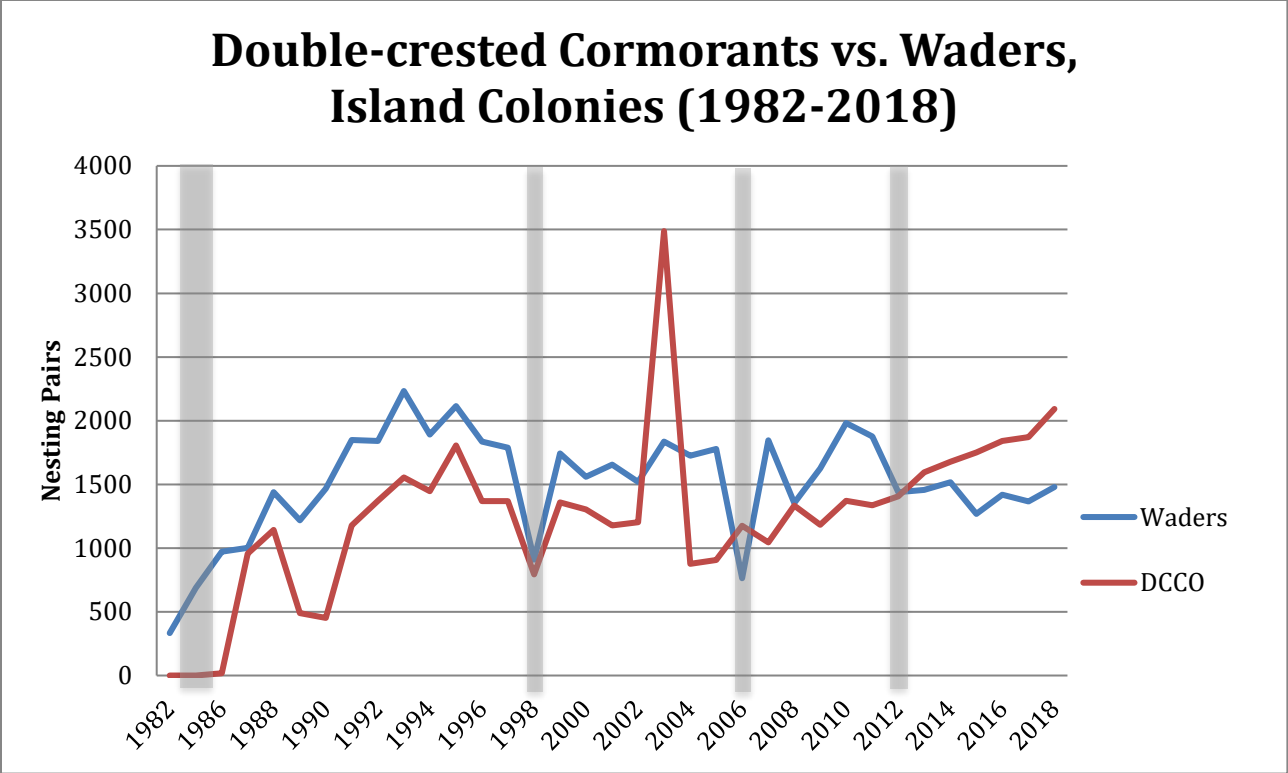


Figure 10: Total number of Double-crested Cormorant (DCCO) and wader nesting pairs observed through the New York City Audubon Harbor Herons Nesting Surveys from 1982 to 2018. Gray bars indicate years in which no data is available because no survey was conducted (1983, 1984) and years with substantial uncertainty in the data due to an incomplete survey of one or more of the major breeding colonies (1998, 2006, 2012).