



Boston Harbor Islands National Recreation Area Coastal Breeding Bird Monitoring

2013 Field Season Summary

Natural Resource Technical Report NPS/NETN/NRTR—2014/863



ON THE COVER

Great Black-backed Gull (*Larus marinus*) colony on Hangman, 2013.

Photograph by: Carol Lynn Trocki

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Introduction

In 2002, Boston Harbor Islands National Recreation Area (BOHA) was designated as a Massachusetts Important Bird Area (IBA) because it provides habitat for a significant number of colonial-nesting waterbirds, including Least Terns (*Sterna antillarum*) and Common Terns (*Sterna hirundo*), which are both listed as Special Concern species in the State of Massachusetts (Massachusetts Natural Heritage and Endangered Species Program 2007). BOHA also provides habitat for breeding wading birds including Snowy Egrets (*Egretta thula*) and Black-crowned Night-Herons (*Nycticorax nycticorax*) which are, respectively, species of high and moderate continental conservation concern (Kushlan et al. 2002). American Oystercatchers (*Haematopus palliatus*) have expanded their range northward into Massachusetts and now have a substantial breeding population in the Boston Harbor Islands (Paton et al. 2005). The North American population of American Oystercatchers is listed as a high priority shorebird species with high conservation concern in the U.S. Shorebird Conservation Plan (U.S. Fish and Wildlife Service 2004). In addition, eiders, cormorants, several other wading and shorebird species, and gulls regularly nest on the islands.

Although much is known about the spatial distribution and abundance of breeding birds in Massachusetts (Veit and Petersen 1993), less has been published on the avifauna of the Boston Harbor Islands. Although not part of a consistent monitoring program until recently, periodic records of breeding waterbirds on the islands do exist (see Andrews 1990, Hatch 1984, Blodget and Livingston 1996, Parsons et al. 2001, Hatch 2001 and Nove 2001).

In 2001-2003, Paton et al. (2005) conducted an avian inventory of BOHA, which in part established the need for a long-term coastal breeding bird monitoring protocol in the park. When compared with previous studies, the Paton et al. (2005) inventory suggested that:

- Common Eiders (*Somateria mollissima*) have a small, but established colony of approximately 70 nests on islands in the Outer Harbor, primarily on Calf Island.
- Double-crested Cormorants (*Phalacrocorax auritus*) have redistributed themselves among the islands of the Outer Harbor, but have maintained fairly stable numbers since the 1980s (Andrews 1990, Hatch 1984).
- Wading birds have experienced a significant decline on Sarah Island where the population declined from 725 nests in 1994 (Parsons et al. 2001) to 112 nests in 2003. The number of nesting wading birds on Middle Brewster Island has varied from 124 nests in 1984-5 (Andrews 1990), to 207 nests in 1994 (Blodget and Livingston 1996), to only 14 pairs present in 2003. Wading birds are no longer present on Spectacle, Peddocks, or Gallops islands (Nove 2001).
- American Oystercatchers have increased from only several pairs in the early 1990s (Veit and Petersen 1993, Nove 2001) to approximately 16 pairs on 14 islands in 2003.

- Herring Gulls (*Larus argentatus*) have declined in BOHA (Andrews 1990), as they have regionally (Rome and Ellis 2004), which may be due in part to the restoration of Spectacle Island, a former landfill and gull nesting site.
- Great Black-backed Gulls (*Larus marinus*) have maintained a stable population in BOHA (Andrews 1990), though regional data suggests they may be increasing (Rome and Ellis 2004).
- Least Terns have a small but relatively stable population (less than 100 pairs), usually on Rainsford or Lovell's islands (Hatch 2001, Nove 2001).
- Common Terns have declined from a peak of 100 pairs in 1993 (Hatch 2001) to approximately a dozen pairs on Snake Island in 2003.

Additional waterbird surveys were conducted in BOHA in 2005 and 2006 using similar techniques and providing generally similar results (Trocki et al. 2007). However, because waterbird populations can fluctuate widely, it was deemed necessary to establish a consistent and comprehensive long-term monitoring protocol in order to accurately measure population trends over time (Trocki et al. 2011). In 2007 and 2008, waterbird surveys were conducted in BOHA in support of the development of a long-term monitoring protocol (Trocki and Paton 2007, Trocki 2009), which was completed in 2010 and revised in 2011 and 2013. Beginning in 2009, monitoring based on the protocol was implemented and annual summary reports are available (Trocki 2010, Trocki 2011, Trocki 2012, Trocki 2013, this report).

Since the establishment of the annual monitoring effort at BOHA, other state-wide and regional surveys have continued. These include a 2006-2007 state-wide survey for gulls, cormorants, and wading birds (Melvin 2010), 2011 surveys of American Oystercatchers (Melvin 2012), 2011 and 2012 tern surveys (Mostello 2012, 2013), and a 2013 regional survey of colonial waterbirds. Melvin (2010) documents declines in most species, including Double-crested Cormorants, Herring Gulls, Great Black-backed Gulls, Black-crowned Night Herons, and Snowy Egrets. Laughing Gulls, Glossy Ibis, and Great Egret appear to be increasing. Tern surveys (Mostello 2012, 2013) indicate that tern numbers have stabilized in recent years.

The following objectives provide the basis for the coastal breeding bird monitoring protocol for Boston Harbor Islands National Recreation Area (Trocki et al. 2013):

1. Determine annual changes and long-term trends in abundance of high priority coastal breeding bird species (Least Terns, Common Terns, and American Oystercatchers).
2. Conduct an annual surveillance program within the park to identify future use by threatened or endangered coastal breeding bird species, such as Piping Plover (*Charadrius melodus*) or Roseate Tern (*Sterna dougallii*). If discovered in the park, these species would be a high priority for monitoring.

3. Determine long-term trends in species composition and abundance of priority coastal breeding bird species (eiders, cormorants, wading birds, shorebirds, and gulls).

In addition to these measurable objectives, we also seek to improve our understanding of breeding waterbird – habitat relationships in BOHA and the effects of habitat changes and management actions (such as invasive plant control, predator control, or visitor restrictions) on waterbird species composition and abundance. Waterbird monitoring data can be correlated with ancillary data on park management actions, rocky intertidal communities, water quality, climate, and other available data to assist park managers in their efforts to protect and, in some cases, encourage the recovery of coastal breeding birds in the park.

Volunteers assisted the lead scientist in conducting waterbird surveys in the park in 2007-2013. It is the intent of the Northeast Temperate Inventory and Monitoring Network (NETN) and the park to use volunteers to implement this protocol in the future, both to enhance community involvement with park islands and to provide a cost-effective implementation method for long-term monitoring.

Methods

The survey methods recommended in the protocol focus on obtaining information on the relative abundance of coastal breeding species by estimating or directly counting all nests, incubating adults, or territorial nesting pairs (methods vary by species, see Trocki et al. 2013 for details). These methods were selected based on their ability to:

- Accurately detect changes in species richness, relative abundance of nesting pairs, and nesting location for each high priority and priority species.
- Create minimal disturbance to nesting colonies and/or nesting pairs.
- Be implemented by trained volunteers working with a lead scientist and park staff.
- Be carried out with an annual budget of approximately \$17,000.

According to the protocol, long-term monitoring surveys will be conducted annually for high priority species (terns and oystercatchers), while a complete survey, that includes all priority and high priority species, will be conducted within a 3-year rotation (Table 1). The first rotation began in 2008 (the 2007 pilot data did not match the final rotation), and the second rotation began in 2011.

Surveillance surveys for new species and new colony sites are ongoing, in conjunction with all coastal breeding bird monitoring efforts, and there is a special focus on surveillance every third year.

In 2013, the State of Massachusetts coordinated state-wide colonial waterbird breeding surveys as part of a larger region-wide effort to estimate breeding populations throughout the northeast. In a cooperative effort, regularly scheduled park-based surveys were adapted slightly in 2013 to fulfill the requirements for our annual monitoring program while also generating data to contribute to the State's participation in this larger effort.

Table 1. Boston Harbor Islands National Recreation Area coastal breeding bird monitoring 3-year survey rotation schedule, based on annual effort and park priorities.

Survey Tasks ¹	Year 1: 2008 and 2011			Year 2: 2009 and 2012			Year 3: 2010 and 2013		
	May 15 – 31	June 1 – 15	Jun 15 – Jul 15	May 15 – 31	June 1 – 15	Jun 15 – Jul 15	May 15 – 31	June 1 – 15	Jun 15 – Jul 15
common eiders ²	x		x			x			x
cormorants & gulls	x						(x) ³		
wading birds				x	x		(x) ³		
large shorebirds	x	x	x	x	x	x	x	x	x
small shorebirds /surveillance							x	x	x
terns		x	x		x	x		x	x

¹ see Trocki et al. 2013 for complete information on methods and target dates established for this protocol.

² May survey (year 1) is a ground-based nest count, and June-July survey (all years) is a boat-based crèche count.

³ Wading bird colonies not surveyed in 2012 due to weather constraints were surveyed instead in 2013. Ground-based gull and cormorant surveys were conducted in 2013 (one year out of cycle) to generate data for a coordinated multi-state regional effort.

The priority and high priority species surveyed in this protocol are all highly visible and most nest in colonies, which makes them relatively easy to locate. Though coastal waterbirds nest in a variety of habitats, the specific requirements of each individual species are well understood and fairly predictable. Colonial-nesting waterbirds also exhibit a high degree of site fidelity, so colony locations are likely to remain similar from year-to-year. However, to accurately understand long-term trends, it is critical to have periodic and comprehensive surveys of all islands in the park to avoid a sampling bias for known locations. A regular surveillance program ensures that all nesting species are detected and that shifts in colony locations are not incorrectly recorded as losses. A comprehensive approach to sampling also allows for the detection of new colony sites or nesting by new species (such as Piping Plover [*Charadrius melodus*] or Roseate Tern [*Sterna dougallii*]).

A map of BOHA is provided for reference (Figure 1). Survey effort in 2013, which was ‘Year 3’ in the survey rotation, is summarized in Table 2. Unfortunately, spring weather limited our ability to survey all wading bird colonies as planned in 2012, so some colonies were surveyed in 2013. In addition, ground-based gull and cormorant surveys were conducted on some islands to contribute to state-wide survey efforts, though these surveys would generally have taken place in 2014. Descriptions of the methods used to survey priority and high priority species in 2013 are given below.

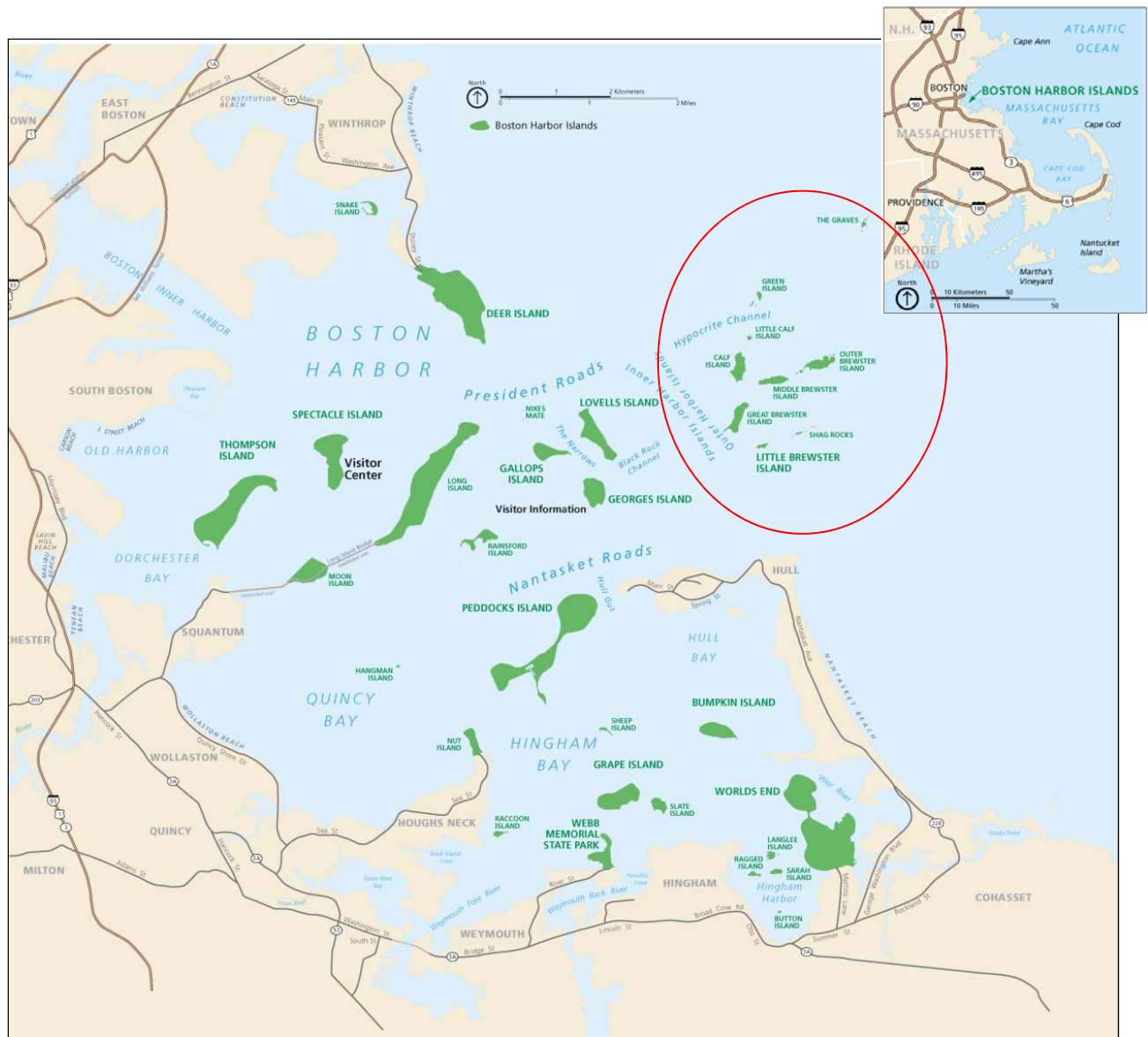


Figure 1. Boston Harbor Islands National Recreation Area (note the red circle enclosing the 'Outer Harbor Islands' which are frequently referred to collectively in the text).

Table 2. Boston Harbor Islands National Recreation Area coastal breeding bird monitoring survey effort in 2013. Note that 'B' indicates boat-based survey, while 'G' indicates ground-based survey. Surveys for eider ducklings included counts of attending females.

BOHA Island	May 13	May 16	May 21	May 28	Jun 5	Jun 21	Jul 10	Jul 19	Jul 30	2013 Species Focus
Calf				B	B	B		B		gulls, cormorants, eider crèches, AMOY ¹
Little Calf				B	B	B		B		gulls, cormorants, eider crèches, AMOY
Green				B	B	B		B		gulls, cormorants, eider crèches, AMOY
Graves				B	B	B		B		gulls, cormorants, eider crèches, AMOY
Middle Brewster				B	B	B		B		gulls, cormorants, eider crèches, AMOY
Outer Brewster				B	B	B		B		gulls, cormorants, eider crèches, AMOY
Shag Rocks				B	B	B		B		gulls, cormorants, eider crèches, AMOY
Little Brewster				B	B	B		B		gulls, cormorants, eider crèches, AMOY
Great Brewster	G						G			gulls, AMOY
Lovells						G/B			G	AMOY, terns
Georges										
Gallops	G								B	Gulls, AMOY
Rainsford				G		G			B	AMOY, terns
Snake					G					AMOY, terns, Willets
Spectacle										
Peddocks									B	AMOY
Thompson										(AMOY surveyed by trained volunteer outside of scheduled group field work)
Sarah		G			B			B		AMOY, gulls, cormorants, wading birds
Ragged					B			B		AMOY, gulls
Langlee					B			B		AMOY, gulls
Button					B			B		AMOY, gulls
Slate			B							AMOY
Grape			G/B							AMOY, surveillance
Bumpkin			B							AMOY
Sheep			G						B	AMOY, gulls, cormorants, wading birds
Hangman			G						B	AMOY, gulls
Spinnaker					B					terns

¹ AMOY = American Oystercatcher

Common Eiders

Common Eiders nest semi-colonially in BOHA and have generally been found nesting in tall grass or under overhanging vegetation, primarily staghorn sumac (*Rhus typhina*), on rocky islands in the Outer Harbor Islands.

Beginning approximately 2-3 weeks following peak incubation, Common Eider ducklings can be observed rafting in crèches offshore near nesting islands, protected by attending females. Ducklings cluster together in this way for protection from predators. The number of female Common Eiders and ducklings on the water were counted by surveyors circling the islands by boat at approximately 5 km per hour from a distance of approximately 9-46 m offshore (or as close as the boat captain felt safe boat operation was feasible). Preliminary boat-based crèche counts were conducted on 5 June and 21 June (Table 2). Figure 2 shows a sample track from a boat-based survey of the Outer Harbor Islands on 21 June.

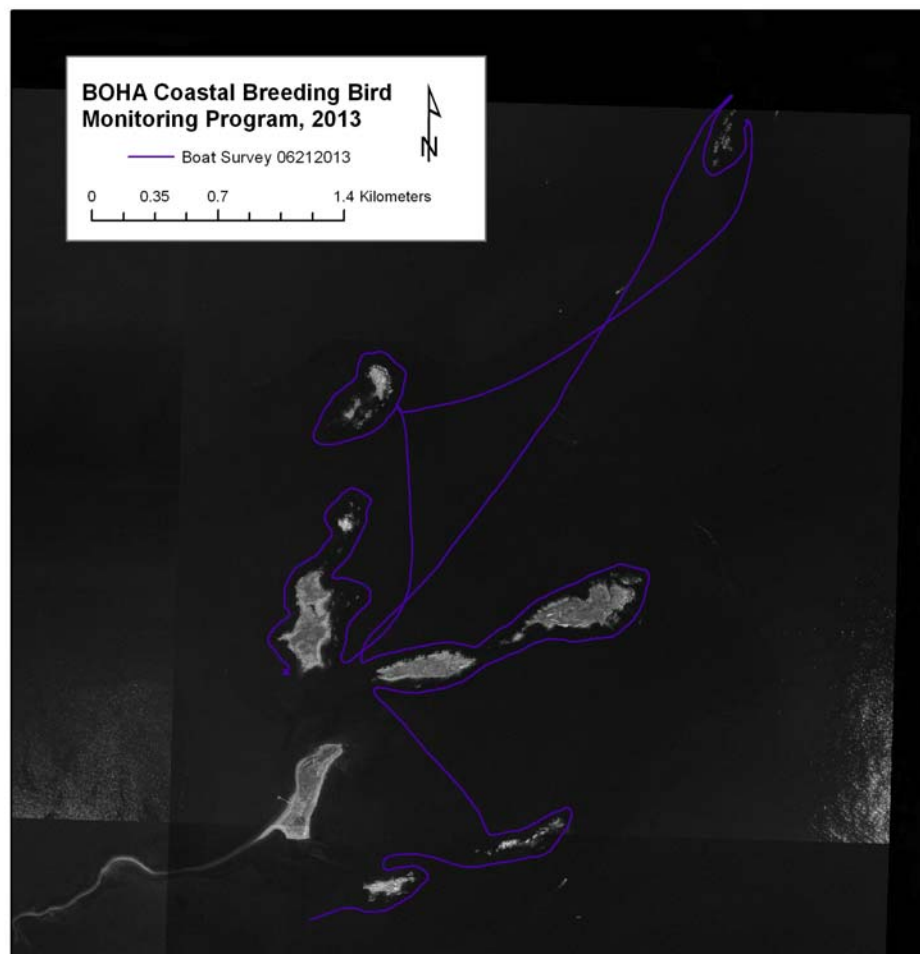


Figure 2. A sample GPS track from boat-based surveys for Common Eider crèches on 21 June during the 2013 monitoring season in Boston Harbor Islands National Recreation Area (BOHA).

Cormorants and Gulls

The majority of gulls and cormorants breeding in the Boston Harbor Islands National Recreation Area nest on islands in the Outer Harbor (Paton et al. 2005). Boat-based surveys of nesting Double-crested Cormorants (DCCO), Herring Gulls (HERG), and Great Black-backed Gulls (GBBG) were conducted on Calf, Little Calf, Green, Middle Brewster, Outer Brewster, and Little Brewster Islands, The Graves and Shag Rocks on 28 May 2013 (Table 2). The boat track was similar to that shown in Figure 2. Visible active nests, as evidenced by the presence of an incubating adult or visible chicks were counted by surveyors circling each island by boat at approximately 5 km per hour from a distance of approximately 9-46 m offshore (or as close as the boat captain felt safe boat operation was feasible). Two independent observers recorded observations of nesting adults simultaneously.

Beginning in 2009, we began exploring the feasibility of using a high-resolution digital camera to photograph nesting colonies from the boat so that numbers of nesting individuals of each species could be verified in the office following boat-based surveys. A photo survey was conducted during the boat-based survey on 28 May, though lighting conditions were not ideal.

In addition, ground-based surveys of nesting cormorants and gulls were conducted on Great Brewster Island and Gallops Island on 13 May, on Sarah Island on 16 May, on Sheep Island and Hangman on 21 May and on Rainsford Island on 28 May. During ground based surveys, all nests and nest contents were recorded to species.

Wading Birds

Wading birds have previously been documented in five mixed-species wading bird colonies in BOHA on Calf, Middle Brewster, Outer Brewster, Sheep, and Sarah Islands (Paton et al. 2005). A complete ground-based survey of each colony site was planned for 2012, but inclement weather during the period of peak incubation precluded surveys on Sarah Island and Sheep Island. These were consequently surveyed on 16 May and 21 May, respectively, in 2013.

Survey methods targeted nesting Great Egrets (*Ardea alba*), Snowy Egrets (*Egretta thula*), Black-crowned Night-Herons (*Nycticorax nycticorax*), and Glossy Ibis (*Plegadis falcinellus*), all of which are known to nest in BOHA. During each colony visit, observers working in teams of two or three worked through the colony systematically, recording species, GPS location, and nest contents, whenever possible.

American Oystercatchers and Willets

Boat-based surveys were used to estimate the number of nesting pairs of adult American Oystercatchers on each island where complete ground-based surveys were not conducted. American Oystercatcher surveys of all islands were conducted simultaneously with cormorant and gull, Common Eider, or tern surveys throughout the breeding season in 2013 (Table 2). When American Oystercatcher nests were detected during ground-based surveys for other species, location (GPS coordinates) and nest contents were recorded. A complete nest search of all islands was not undertaken due to the effort and disturbance involved in finding individual oystercatcher nests. On islands where American Oystercatcher pairs were detected early in the season, repeated boat-based surveys were undertaken to try and gain additional observational information.

Willetts are conspicuously vocal when breeding and have only been detected nesting in BOHA on Snake Island (Paton et al. 2005). We estimated the total number of nesting pairs of Willetts on Snake Island during a ground-based survey on 5 June.

Spotted Sandpipers

Spotted Sandpipers are presumed to be nesting on nine islands in the park (Paton et al. 2005, Trocki 2013), but were not targeted during surveys in 2013.

Terns

In recent years terns have nested on Lovells, Rainsford, and Snake Islands in BOHA (Paton et al. 2005). Earlier in 2013, the south end of Lovells Island was subject to restoration efforts targeting Least Terns as part of a larger off-site mitigation project. As a result, the State of Massachusetts, which owns and manages Lovells Island, contracted with Mass Audubon's Coastal Waterbird Program to conduct intensive monitoring, management, and education efforts on Lovells Island throughout the nesting 2013 season.

Project efforts included a prescribed burn of brushy habitat adjacent to the traditional tern nesting beach and predator abatement prior to the start of the nesting season. During the nesting season, monitoring, symbolic fencing, and education/outreach efforts were significantly increased compared to previous years (Figure 3).

Coastal Waterbird Nest Locations, 2013

Lovells Island, Boston Harbor, MA

Close up-south end, map 4 of 4 Observer: Stephanie Schmidt



Figure 3. Map of tern habitat restoration area on Lovells Island in Boston Harbor Islands National Recreation Area (BOHA) (provided by Mass Audubon).

The lead scientist was in regular communication with Mass Audubon staff regarding the status of the Least Tern colony that formed on Lovells in 2013, and the island was not visited during the height of colony activity in order to limit unnecessary disturbance. Snake Island was visited on 5 June while Rainsford Island was visited on 28 May and 21 June.

In addition, Common Terns are also known to nest on a platform near Spinnaker Island. Although this nesting area is outside of park boundaries, these terns undoubtedly rely on BOHA for foraging habitat. Nesting was confirmed on the Spinnaker platform and the number of adults attending the colony was estimated on 5 June 2013.

Volunteer Training, Recruitment, & Coordination

Volunteers interested in participating in this project were recruited by park staff and asked to attend a training session led by the lead scientist. The training session, held in the BOHA Partnership Office in Boston on 2 May 2013, focused on species identification, survey techniques, and safety protocols.

Park staff coordinated volunteers to participate in field surveys according to a schedule provided by the lead scientist in advance of the field season. Weather make-up days were assigned in advance to allow for some flexibility if weather prevented surveys. The lead scientist trained and supervised participating volunteers while in the field. This program attracts volunteers with varying level of experience; field tasks are thus assigned based on individual skills, with less experienced volunteers assigned to supervised tasks accordingly.

Communication & Outreach

In 2013, efforts were continued to increase mid-season volunteer communication through regular e-mail updates sent out by the lead scientists and posted on both the park's and the network's Facebook pages. Massachusetts Department of Conservation and Recreation (DCR) park rangers, stationed on islands in BOHA, were also encouraged to participate in monitoring efforts. Data gathered during the 2013 field season were shared with the Massachusetts Division of Fish and Wildlife's Natural Heritage and Endangered Species Program.

Data Management

In 2013, efforts were continued to enhance the electronic data collection process for this project. A Cybertracker database that was developed by the NETN Data Manager in 2011 was refined prior to the start of the field season. In 2013, a geodatabase was created to house spatial data generated within Cybertracker and an SOP for managing these data was added to the protocol. Cybertracker data were downloaded and error-checked periodically during the field season. At the end of the field season, data were reviewed and processed according to the protocol SOPs (Trocki et al. 2013) and sent to the NETN Data Manager for archiving.

Results

Common Eiders

In 2013, boat-based surveys of the Outer Harbor Islands were conducted twice during the latter half of the nesting season to search for adult female eiders tending ducklings. Results are given in Table 3; see Figure 2 for a sample boat-based survey track.

Table 3. Total number of adult female Common Eiders (COEI) and ducklings detected during 2013 boat-based crèche surveys in the Outer Harbor Islands of Boston Harbor Islands National Recreation Area.

Survey Date	Adult Female COEI Tending Ducklings	COEI Ducklings	Average Crèche Size	Total Number of Female COEI Observed ¹
6/5/2013	190	266	6.33	334
6/21/2013	166	231	5.78	352

¹ Indicates the total number of female Common Eiders detected near shore in the Outer Harbor Islands, both those attending ducklings and those without (presumably nesting females whose nests or ducklings were lost).

Cormorants and Gulls

In 2013, ground-based surveys of nesting gulls were conducted on Great Brewster, Gallops, and Hangman Islands. In addition, ground-based surveys of nesting gulls and cormorants were conducted in conjunction with wading bird surveys on Sheep and Sarah Islands. The results of ground-based nest counts are given in Table 4.

Table 4. Gull and cormorant nests detected during 2013 ground-based surveys of Boston Harbor Islands National Recreation Area.

Date Surveyed	Island	HERG ¹	GBBG	DCCO
5/13/2013	Great Brewster	83	14	0
5/13/2013	Gallops	4	35	0
5/16/2013	Sarah	123	20	179
5/21/2013	Sheep	146	14	20
5/21/2013	Hangman	8	49	0

¹ HERG = Herring Gull, GBBG = Great Black-backed Gull, DCCO = Double-crested Cormorant

A boat-based survey of gulls and cormorants was conducted in the Outer Harbor Islands on 28 May. The mean total numbers of nests observed were 983 Double-crested Cormorant nests, 107 Great Black-backed Gull nests, and 379 Herring Gull nests; results are given in Table 5.

During the boat-based survey of gulls and cormorants in the Outer Harbor Islands on 28 May, digital photographs were also obtained. These photos were processed according to the Photo Documentation SOP of the Coastal Breeding Bird Monitoring Protocol (Trocki et al. 2013) and the number of nests was estimated for each species and island. Results are presented in Table 5; Figures 4 and 5 show examples of unmarked and marked photos, respectively.

Table 5. Number of nesting cormorant and gull pairs estimated by observers and from photo mosaics taken during 28 May 2013 boat-based surveys in Boston Harbor Islands National Recreation Area.

Island	Species ¹	Obs1	Obs2	Obs3	Average	STDEV ²	CV ²	Photo Count
Calf	DCCO	19	43	19	27	14	51	35
	GBBG	28	17	12	19	8	43	8
	HERG	103	102	67	91	21	23	110
Little Calf	DCCO	59	107	133	100	38	38	116
	GBBG	20	7	8	12	7	62	8
	HERG	22	10	10	14	7	49	14
Green	DCCO	156	212	182	183	28	15	243
	GBBG	26	20	24	23	3	13	19
	HERG	62	27	18	36	23	65	61
The Graves	DCCO	0	0	0	0	0	-	-
	GBBG	0	0	0	0	0	-	-
	HERG	0	0	0	0	0	-	-
Middle Brewster	DCCO	560	493	341	465	112	24	622
	GBBG	28	27	14	23	8	34	28
	HERG	110	99	49	86	33	38	141
Outer Brewster	DCCO	73	96	83	84	12	14	63
	GBBG	45	14	12	24	19	78	17
	HERG	139	159	152	150	10	7	137
Little Brewster	DCCO	0	0	0	0	0	-	-
	GBBG	1	1	1	1	0	0	-
	HERG	1	1	1	1	0	0	-
Shag Rocks	DCCO	111	93	170	125	40	32	172
	GBBG	8	3	5	5	3	47	3
	HERG	3	0	1	1	2	115	4
TOTAL	DCCO	978	1,044	928	983	58	6	1,251
TOTAL	GBBG	156	89	76	107	43	40	83
TOTAL	HERG	440	398	298	379	73	19	467

¹ DCCO = Double-crested Cormorant, GBBG = Great Black-backed Gull, HERG = Herring Gull

² STDEV = Standard Deviation, CV = Coefficient of Variation



Figure 4. A sample photo mosaic from Green Island taken on 28 May during a boat-based survey of the Outer Harbor Islands in Boston Harbor Islands National Recreation Area (BOHA).



Figure 5. A marked sample photo mosaic from Green Island taken on 28 May during a boat-based survey of the Outer Harbor Islands in Boston Harbor Islands National Recreation Area (BOHA).

Wading Birds

Wading birds were scheduled to be comprehensively surveyed in 2012, but not all colonies were visited during an appropriate survey window, therefore colonies on Sarah and Sheep Islands were a top priority in 2013. Available data for the islands that were surveyed are presented in Table 6.

Table 6. Wading bird nests detected during 2013 surveys of Boston Harbor Islands National Recreation Area.

Survey Date	Colony Location	GREG ¹	SNEG	BCNH	GLIB
5/16/2013	Sarah	86	10	158	2
5/21/2013	Sheep	2	23	44	2

¹ GREG =Great Egret, SNEG = Snowy Egret, BCNH = Black-crowned Night Heron, GLIB = Glossy Ibis

American Oystercatchers and Willets

A combination of boat-based and ground-based surveys detected a total of 20 American Oystercatcher pairs on eleven islands in BOHA (Table 7 and Table 8, Figure 6). Although it was not possible to track productivity for all pairs, repeated surveys indicate that at least one pair was successful in fledging chicks.

Three pairs of territorial Willets were detected on Snake Island on 5 June, but no nests were located and only a limited survey effort was conducted due to disturbance concerns.

Table 7. Territorial pairs of American Oystercatchers observed during 2013 surveys of Boston Harbor Islands National Recreation Area.

Island	AMOY	
	Pairs	Outcomes
Calf	1	not seen after 6/5
Little Calf	0	
Green	0	feeding/loafing adults only
Graves	0	
Middle Brewster	1	One adult only, but in regular nesting area; not seen after 6/5
Outer Brewster	0	
Shag Rocks	0	feeding adult only
Little Brewster	0	
Great Brewster	2	no chicks noted during ground survey 7/10
Lovells	0	feeding adults only
Georges	0	
Gallops	2	Two known nests 5/13; no chicks noted during boat survey 7/30
Snake	5	productivity unknown
Rainsford	2	One pair with one fledged chick 7/30
Thompson	0	some early season activity
Spectacle	0	
Hangman	0	feeding/loafing adults only
Peddocks	1	pair on Prince's Head late season; no chicks noted 7/30
Sheep	3	only one adult noted during boat-survey 7/30
Grape	0	
Slate	1	productivity unknown
Bumpkin	0	
Sarah	1	not resighted 7/19
Langlee	0	One adult 6/5, presumed to be from pair on Sarah
Ragged	0	
Button	1	not resighted 7/19
Total	20	

Table 8. Summary of American Oystercatcher 2013 survey effort in Boston Harbor Islands National Recreation Area. B = boat-based survey, G = ground-based survey, A = adult, P = pair, C = chick.

Island	Survey Date									Productivity Notes
	13-May	16-May	21-May	28-May	5-Jun	21-Jun	10-Jul	19-Jul	30-Jul	
Calf				B, 1P	B, 1P	B*		B		*4A circling between CALF and GRBR
Little Calf				B	B	B		B		
Green				B	B	B		B, 9A		feeding only
Graves				B	B	B		B		
Middle Brewster				B	B, 1A	B		B		not resighted
Outer Brewster				B	B	B		B		
Shag Rocks				B	B	B		B, 1A		feeding only
Little Brewster				B	B	B		B		
Great Brewster	G, 1P, 1A						G, 2P			no chicks noted 7/10
Lovells						G, B, 1A				feeding only
Georges										
Gallops	G, 2P								B, 1P, 1A	two 3-egg nests detected on 5/13; no chicks 7/30
Snake					G, 5P					
Rainsford				G, 2P		G, 2P, 1CH			B, 3P, 1CH	westernmost pair with 1 fledged chick
Thompson										
Spectacle										
Hangman			G						B, 4A	adults only
Peddocks									B, 1P	Prince's Head; no chicks present
Sheep			G, 3P						B, 1A	adult only
Grape			G, B							
Slate			B, 1P							
Bumpkin			B							
Sarah		G, 1P			B, 1A			B		not resighted 7/19
Langlee					B, 1A			B		
Ragged					B			B		
Button					B, 1P			B		not resighted 7/19

B = boat-based survey, G = ground-based survey

A = adult AMOY, P = AMOY pair, CH = 2013 chick

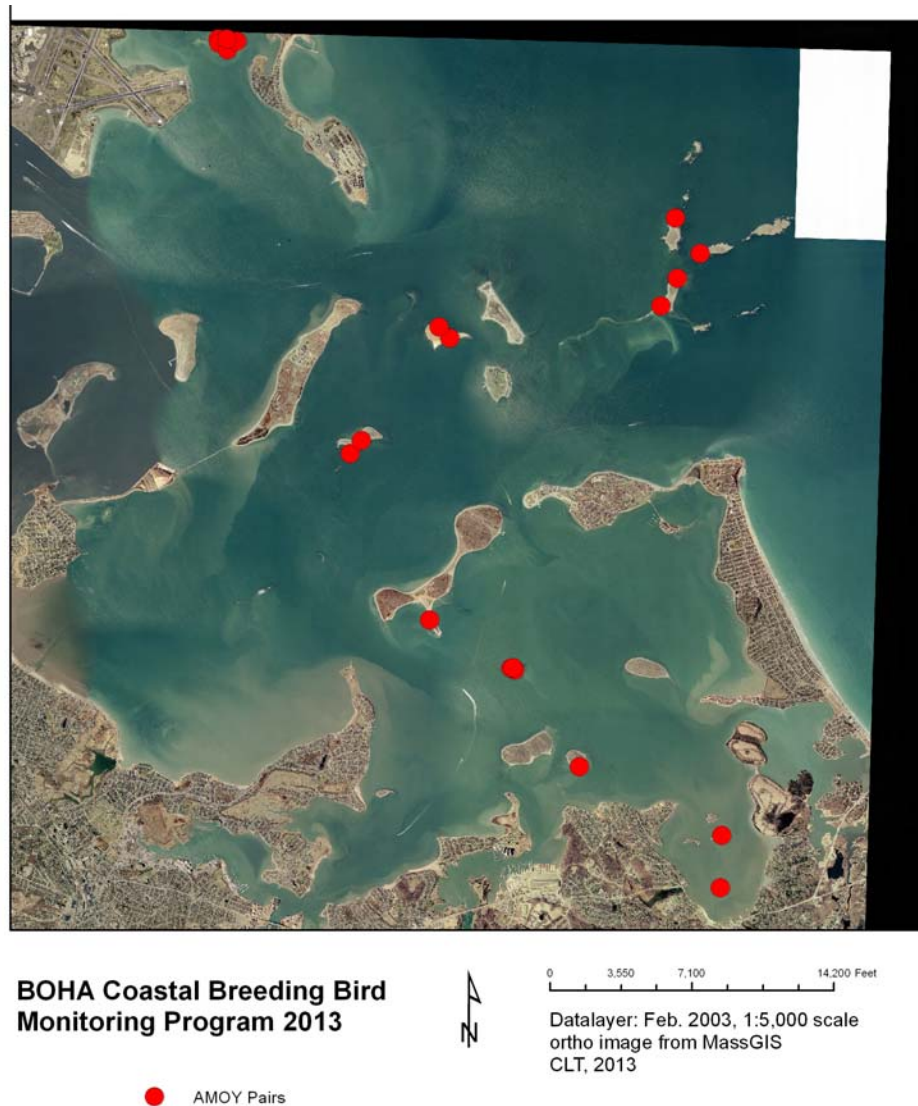


Figure 6. Location of American Oystercatcher pairs detected during 2013 surveys in Boston Harbor Islands National Recreation Area (BOHA).

Terns

Mass Audubon staff observed a Least Tern colony containing 72 pairs on Lovells Island on 13 June. Sometime around 15 July it is believed that the colony was predated by gulls and was subsequently abandoned. Twenty young are believed to have fledged from the colony prior to this incident.

During a visit to the Spinnaker Island platform on 5 June, 147 adult Common Terns were observed attending the colony. No terns were detected nesting on Snake or Rainsford Islands in 2013 (see Table 2 for survey visit dates).

Spotted Sandpipers

Spotted Sandpipers were not surveyed in 2013, although one territorial pair was detected on Snake Island during the 5 June ground survey. Individual spotted sandpipers were also observed on Calf, Little Calf, Little Brewster, and Middle Brewster Islands during 19 July boat surveys.

Discussion

Common Eiders

Our high count for eider ducklings in 2013 was 266 observed on 5 June, with 231 observed several weeks later on 21 June. In previous years, precipitous declines were evident during the month of June, suggesting that perhaps juvenile survival was unusually favorable this year. Similar numbers of female eider were detected in the area during both surveys in 2013, which lends additional credibility to this proposition. In previous years, high counts have ranged from a low of 155 ducklings in 2008 to 341 ducklings in 2010.

In general, Common Eider experience high annual adult survival rates (over 80% in several studies), but also a highly variable degree of reproductive success in any given year and years of ‘near disaster’ are not uncommon (Goudie et al. 2000). In a stable population, low survival of young is compensated for by their comparatively long average life span (5 to 6 years). The number of ducklings observed in 2013 was within the range generally observed in BOHA in recent years. To obtain more specific information about the productivity of the BOHA eider population, the fate of individual eider ducklings would need to be tracked, which is currently beyond the scope of this monitoring effort.

Cormorants and Gulls

Boat-based surveys of incubating cormorants and gulls are safe and efficient to conduct, but produce highly variable results due to differences in observers and survey conditions (Trocki 2013). Preliminary investigations into the use of high-resolution digital photography to document nesting were promising in 2010, but the methods require additional refinement and weather conditions which were not achievable in 2011 or 2012. Given competing survey priorities in 2013, only a single survey was achieved, rather late in the season on 28 May when many nests had hatched. Nests are easiest to identify during the peak of incubation when a single adult is a near constant presence at each nest. Once eggs hatch, it becomes much more difficult to estimate nests, which may explain the wider range of variability in the numbers observed. In addition, although all observers were well trained and very capable, Observers 1 and 3 were significantly less experienced than Observer 2. Comparisons between photo counts and live observer counts are thus somewhat difficult to interpret.

When photo documentation was undertaken in 2010, it appeared that Herring Gulls in particular were underrepresented in the counts of live observers. That did not appear to be the case in 2013. More investigation and comparison of these two methods is necessary before any substantive conclusions can be reached.

Ground-based nest surveys for gulls and cormorants are more precise than boat-based methods, but require considerably more effort, are not feasible using volunteers at cliff-based colony sites, and cause much greater disturbance to nesting individuals. Ground-based surveys were conducted on islands where colony sites were accessible and where colonies have historically been sampled this way. When compared to prior state-wide surveys conducted in 1994-5 and 2006 (Melvin 2010), it appears that Herring Gulls have declined significantly park-wide, while Great Black-backed Gulls are fairly stable. Double-crested Cormorants have increased significantly on Sheep and Sarah since

counts in the mid-90s. A more in depth trend analysis of existing data is planned for 2014, which should shed more light on emerging trends for these species.

Wading Birds

Wading bird colonies on Sarah and Sheep Islands were comprehensively surveyed in 2013. Compared to numbers observed in 2009, it appears that Black-crowned Night Herons and Snowy Egrets have declined significantly on Sarah, but increased somewhat on Sheep. A more in depth analysis of existing data is planned for 2014, which should shed more light on emerging trends for these species.

Disturbance is always a concern for this group of species. Surveys on Sarah Island, the largest colony in BOHA, were carried out by two teams of experienced observers under ideal weather conditions at the height of incubation on 16 May. No evidence of extreme stress, such as overheated young, branching older young, or harassment by predators, was observed.

American Oystercatchers and Willets

Boat-based surveys were successful in detecting territorial pairs of American Oystercatchers and Willets, but ground-based surveys of beach strand habitat would undoubtedly provide more reliable results by reducing the chance of missing pairs. A combination of annual boat-based surveys and periodic walking surveys is likely the best balance of effort. Although we were not able to systematically track all individual nests, we did conduct repeated boat-based surveys on islands where American Oystercatchers pairs were observed, and thus have some incidental information about nest fate. These efforts should continue in the future. Increasingly, information is being shared throughout the season among park and DCR staff, as well as program volunteers who visit the islands regularly outside of scheduled field surveys, which has increased the lead scientist's ability to prioritize limited boat time more efficiently.

Willetts were once again observed defending territory on Snake Island in 2013, but have not been observed on any of the other islands in the park. Regular surveillance of all islands will be undertaken which should be sufficient to detect new Willet territories elsewhere in the park, given their visible and vocal nature.

Terns

Although Lovells Island was significantly more actively managed in 2013, a gull predation event in mid-July disrupted the nesting season with only approximately 20 young fledged. According to reports by Mass Audubon, a large congregation of gulls formed off of Lovells Island on 13 July, presumably pursuing baitfish. The tern colony was abandoned shortly thereafter with evidence of gull predation on eggs and substantial gull tracks detected throughout the colony site.

No evidence of human disturbance or predation by other species was detected in the colony prior to the gull incident, so there is reason to believe that the extra efforts undertaken were successful at encouraging tern nesting and success at the site. While no terns were detected on Snake or Rainsford Islands in 2013, the variable history of nesting efforts in the park highlights the importance of continuing to manage for terns on these islands, even in years when they may not be present.

Spotted Sandpipers

Spotted Sandpipers were not comprehensively surveyed in 2013.

Volunteer Training, Recruitment, & Coordination

In 2013, a number of new volunteers joined returning volunteers to make short work of a very full waterbird monitoring season. The enthusiasm, participation, and attention to detail exhibited by all volunteers are the elements upon which this program has been built. A total of 13 volunteers and six staff members participated in waterbird surveys in BOHA in 2013. Of the 13, eight were returning volunteers who had been involved in monitoring in previous years. A volunteer training session was conducted prior to the initiation of the field season to introduce safety protocols, review field survey methods and electronic data collection techniques. Volunteer scheduling and coordination was well orchestrated by park staff.

Literature Cited

- Andrews, R. (Compiler). 1990. Coastal waterbird colonies: Maine to Virginia 1984-85. U.S. Fish and Wildlife Service, Newton Corner, Massachusetts.
- Blodget, B. G., and J. E. Livingston. 1996. Coastal colony-nesting waterbirds: the Massachusetts status report 1994-1995. *Massachusetts Wildlife* **4**:10-20.
- Goudie, R. I, G. J. Robertson, and A. Reed. 2000. Common Eider (*Somateria mollissima*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Online. (<http://bna.birds.cornell.edu/bna/species/546>). Accessed 21 April 2009.
- Hatch, J. J. 1984. Rapid increase of Double-crested Cormorants nesting in southern New England. *American Birds* **38**:984-988.
- Hatch, J. J. 2001. Tern nesting in Boston Harbor: the importance of artificial sites. *Bird Observer* **29**:187-193.
- Kushlan, J. A., M. J. Steinkamp, K. C. Parsons, J. Kapp, M. Acosta Cruz, M. Coulter, I. Davidson, L. Dickson, N. Edelson, R. Elliot, R. M. Erwin, S. Hatch, S. Kress, R. Milko, S. Miller, K. Mills, R. Paul, R. Phillips, J. E. Saliva, B. Sydeman, J. Trapp, J. Wheeler, and K. Wohl. 2002. Waterbird conservation for the Americas: The North American waterbird conservation plan, Version 1. Waterbird Conservation for the Americas, Washington, D.C.
- Massachusetts Natural Heritage and Endangered Species Program. 2007. Massachusetts list of endangered, threatened, and special concern species. Massachusetts Division of Fisheries and Wildlife, Westborough, Massachusetts. Online (<http://www.mass.gov/dfwele/dfw/nhesp/nhrare.htm>). Accessed 1 June 2011.
- Melvin, S. M. 2010. Survey of coastal nesting colonies of cormorants, gulls, night herons, egrets, and ibis in Massachusetts, 2006-2008. Natural Heritage and Endangered Species Program, Massachusetts Division of Fisheries and Wildlife, Westborough, MA.
- Melvin, S. M. 2012. Summary of 2011 census of American Oystercatchers in Massachusetts. Natural Heritage and Endangered Species Program, Massachusetts Division of Fisheries and Wildlife, Westborough, MA.
- Mostello, C. S. 2012. Inventory of terns, Laughing Gulls, and Black Skimmers nesting in Massachusetts in 2011. Natural Heritage and Endangered Species Program, Massachusetts Division of Fisheries and Wildlife, Westborough, MA.
- Mostello, C. S. 2013. Inventory of terns, Laughing Gulls, and Black Skimmers nesting in Massachusetts in 2012. Natural Heritage and Endangered Species Program, Massachusetts Division of Fisheries and Wildlife, Westborough, MA.
- Nove, J. 2001. Birding the Boston Harbor Islands. *Bird Observer* **29**:173-186.

- Parsons, K. C., S. R. Schmidt, and A. C. Matz. 2001. Regional patterns of wading bird productivity in Northeastern U.S. estuaries. *Waterbirds* **24**:323-330.
- Paton, P. W., C, R. J. Harris, and C. L. Trocki. 2005. Distribution and abundance of breeding birds in Boston Harbor. *Northeastern Naturalist* **12**:145-168.
- Rome, M. S., and J. C. Ellis. 2004. Foraging ecology and interactions between Herring Gulls and Great Black-backed Gulls in New England. *Waterbirds* **27**:200-210.
- Trocki, C. L., B. R. Mitchell, and P. W. C. Paton. 2013. Coastal breeding bird monitoring protocol for Boston Harbor Islands National Recreation Area: 2013 Revision. Natural Resource Report NPS/NETN/NRR—2013/646. National Park Service, Fort Collins, CO.
- Trocki CL. 2013. Boston Harbor Islands National Recreation Area coastal breeding bird monitoring: 2012 field season summary. Natural Resource Technical Report. NPS/NETN/NRTR—2013/737. National Park Service. Fort Collins, Colorado.
- Trocki CL. 2012. Coastal breeding bird monitoring in Boston Harbor Islands National Recreation Area: Northeast Temperate Network 2011 summary report. Natural Resource Technical Report. NPS/NETN/NRTR—2012/595. National Park Service. Fort Collins, Colorado. Published Report-2186044.
- Trocki, C. L. 2011. Boston Harbor Islands National Recreation Area coastal breeding bird monitoring: 2010 field season summary. Natural Resource Technical Report NPS/NETN/NRTR—2011/459. National Park Service, Fort Collins, CO.
- Trocki, C. L. 2010. Boston Harbor Islands National Recreation Area coastal breeding bird monitoring: 2009 Field Season Summary. Natural Resources Report NPS/NETN/NRTR—2010/336. National Park Service, Fort Collins, CO.
- Trocki, C. L. 2009. Boston Harbor Islands Coastal Breeding Bird Monitoring: 2008 Field Season Summary. Natural Resources Report NPS/NETN/NRTR—2009/209. National Park Service, Fort Collins, CO.
- Trocki, C. L., and P. W. C. Paton. 2007. Boston Harbor Islands coastal breeding bird monitoring: 2007 field season summary. Natural Resources Report NPS/NER/NRR—2007/16. National Park Service. Boston, Massachusetts.
- Trocki, C. L., N. W. Talancy, P. W. C. Paton. August 2007. An inventory of amphibians, reptiles, nonvolant mammals, and select bird species on islands in Boston Harbor. Technical Report NPS/NER/NRTR-2007/094. National Park Service. Boston, Massachusetts.
- U.S. Shorebird Conservation Plan. 2004. High Priority Shorebirds — 2004. Unpublished Report, U. S. Fish and Wildlife Service, 4401 N. Fairfax Dr., MBSP 4107, Arlington, VA.

Veit, R. R., and W. R. Petersen. 1993. Birds of Massachusetts. Natural History of New England Series. Massachusetts Audubon Society.

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