PRESQU'ILE ISLANDS

2022 Resource Management and Monitoring

March 2023

Ontario

Cover Photo: Common Tern predator exclusion grid (Ontario Parks photo).

Prepared by: Don Tyerman, Biodiversity Specialist, Presqu'ile Provincial Park

This document is available by contacting:
Park Superintendent
Presqu'ile Provincial Park
R.R. 4
Brighton, Ontario K0K 1H0
(613) 475-4324

ISBN 978-1-4868-6829-2 PDF Presqu'ile Island 2022 Resource Management and Monitoring

Overview

Resource management on High Bluff and Gull Islands at Presqu'ile Provincial Park is prescribed by the 2011 *Presqu'ile Islands Resource Management Implementation Plan* (Islands RMIP). The overall purpose of resource management is to maintain representative diversity of species and their habitats using an ecosystem-based adaptive management approach.

As described in the Islands RMIP, the treed portions of High Bluff Island (HBI) have been affected in the past decades by Double-crested Cormorants (*Phalacrocorax auritus* – herein referred to as cormorant or DCCO) and White-tailed Deer (*Odocoileus virginianus*). Gull Island (GI) formerly supported trees and shrubs but is now bare due to past impacts of cormorants. The Islands RMIP describes resource management actions to address cormorant and deer impacts on specific park values and to maintain habitat for other species.

During the era of cormorant nesting of the Presqu'ile islands they have hosted colonies of three other tree-nesting colonial waterbird species: Great Blue Heron (GBHE, *Ardea herodias*), Great Egret (GREG, *Ardea alba*) and Black-crowned Night-heron (BCNH, *Nycticorax nycticorax*). These three species are collectively referred to as "herons". Cormorants and the heron species nest in the remaining scattered areas of woody vegetation on the islands and have been closely monitored since 2003.

Several specific woody habitat areas on the Presqu'ile Islands are identified as management areas in the Islands RMIP. These sites typically contain live woody vegetation and other resource values (e.g. heron nesting sites). **Figure 1** is an overview of High Bluff Island identifying the management areas where monitoring and management occurred, as well as heron nesting and vegetation monitoring locations.

This report describes the annual monitoring and management that was done on the Presqu'ile islands in 2022 in accordance with the Islands RMIP. Similar reports have been prepared in previous years. Waterbird nesting status and management activities are summarized in **Appendix A**.
Each section of the 2022 report answers a number of monitoring questions.

1. **Double-crested Cormorant**
    - How many DCCO nests are there in trees and on the ground? How does this change from year to year?
    - What areas are DCCO nesting in?
    - What cormorant management activities were conducted in 2022?
    - How is cormorant management affecting the amount and location of cormorant nesting and roosting?

2. **Herons** – great egret, and black-crowned night-heron
    - How successful are the nesting herons? How does this change from year to year?
    - What areas are herons nesting in?

3. **Summary of regional trends** in tree-nesting colonial waterbirds for 2022.
    - What are the trends for these species across Lake Ontario and elsewhere?
    - How does Presqu'ile contribute to the regional populations of these species?

4. **Other wildlife** – terrestrial colonial waterbird predators, White-tailed Deer and other birds.
    - How are the woody vegetation and other habitat on HBI being used by other wildlife species?

Figure 1. Management areas (from Islands RMIP), heron nesting locations from 2022, and vegetation monitoring plots. The treed areas that are not encompassed by management areas are referred to as Unmanaged Area East and West.

1. Double-crested Cormorant Monitoring and Management

DCCO nest counts are conducted annually to determine how many nests are in the trees and on the ground, what areas are being used, and how these change from year to year. Detailed methods for conducting DCCO monitoring and management are described in the ***Presqu'ile Islands 2011 Resource Management and Monitoring Report.***

1.1. DCCO Nest Counts

Methods

- DCCO established ground nests on both GI and HBI. In addition to ground nests, tree and nesting-platform nests were also found on HBI
- DCCO ground, tree and platform nests and the number of trees containing DCCO nests on High Bluff Island were counted on June 23,2022.
  - In each tree all nests are counted, the tree is identified to species, and its health is assessed.
- The HBI Lighthouse ground colony and the unmanaged area east ground colony were counted on June 23. Each nest was marked with a dot of spray paint to avoid counting errors.
- Gull Island ground nests were counted by drone flyover and the nests were counted from the photos taken (**Figure 2**).
- The GI ground colony was counted by drone to avoid displacing flightless DCCO chicks from their nests which could also displace the chicks of Caspian Terns nesting adjacent to the DCCO. See **Figure 6.** for a flight path diagram
- Prior to 2021 and 2022 DCCO ground nest counts on Gull Island had been done in August by staff to prevent excessive disturbance. It is likely that those August counts underrepresented the actual peak number of nests since the nests deteriorate and are deconstructed by late-nesting DCCO making them difficult to see.

Results

- There was a 2.7% decrease in the total DCCO nests (both islands - ground and tree nests combined) between the nest counts in 2021 and 2022 **(Table 1).**
- DCCO used 37.5% fewer trees in total in 2022 (n=5) than 2021 (N=8) **(Table 3).**
- 6 live shrubs containing 14 nests were recorded in 2022 **(Table 3).**

Figure 2. Aerial photo of the Gull Island cormorant colony taken from a drone in 2022. The entire colony was photographed, and the photos were stitched together before nests were counted. The use of a done prevented disturbance to cormorants, gulls and terns by counting without people entering the colonies. None of the colonial birds reacted to the drone.

Table 1. 2022 management area use by DCCO, based on the June nest counts. The total nest count for 2022 includes tree and shrub nests, ground nests and nests in artificial nesting platforms.

Management area	# nests in live trees	# live trees used	# nests in dead trees	# dead trees used	TOTAL DCCO NESTS	TOTAL TREES USED
Basswood Grove	0	0	0	0	**0**	**0**
Bluff Thicket North – Trees	7	1	18	2	**25**	**3**
Bluff Thicket South	0	0	0	0	**0**	**0**
Red Ash Swamp Forest	0	0	0	0	**0**	**0**
Ridge Forest North	0	0		0	**0**	**0**
Ridge Forest South	0	0	0	0	**0**	**0**
Shingle Beach Thicket (north and south)	0	0	0	0	**0**	**0**
Shrub Thicket	0	0	0	0	**0**	**0**
Upland Forest Grove A	0	0	0	0	**0**	**0**
Upland Forest Grove B	0	0	0	0	**0**	**0**
Upland Forest Grove C	0	0	0	0	**0**	**0**
Upland Forest Grove D	0	0	0	0	**0**	**0**
Upland Forest Grove E	0	0	0	0	**0**	**0**
Upland Forest Grove F	0	0	0	0	**0**	**0**
Unmanaged Area - East (tree nests)	0 in live trees, 14 nests in 6 live shrubs	0 live trees, 6 live shrubs	8	2	**22**	**2 trees and 6 shrubs**
Unmanaged Area – West	0	0	0	0	**0**	**0**
Large East Platform	-	-	-	-	**426**	**-**
Small East Platform	-	-	-	-	**22**	
West Platform	-	-	-	-	**0**	**-**
High Bluff Lighthouse Ground	-	-	-	-	**2130**	**-**
High Bluff - East Ground	-	-	-	-	**2090**	
High Bluff - Shoreline Ground	-	-	-	-	**0**	
Gull Island Ground	-	-	-	-	**2214**	**-**
2022 Total	**7 nests in 1 live tree** (14 nests in 6 live shrubs)*	**1 live tree** (+6 live shrubs)*	**26 nests**	**4 dead trees**	**6929**	**1**
2021 Total	**46**	***5***	**17**	***3***	**7012**	**8**

*in addition to 1 live tree used by nesting DCCO, 6 live shrubs were also used in 2022

Table 2. Cormorant tree and ground nest counts from 2002 to 2022.

Year	HBI tree nests	HBI ground nests	Gull I. ground nests	Artificial Platforms	Total nests
2002	6893	3491	1698	**-**	**12082**
2003	4631	2948	1117	**-**	**8696**
2004	3656	1683	1601	**-**	**6940**
2005	1976	1305	1328	**-**	**4609**
2006	2108	498	213	**-**	**2819**
2007	2233	1562	60	**-**	**3855**
2008	3478	664	0	**-**	**4142**
2009	3756	116	0	**-**	**3872**
2010	4523	0	0	**-**	**4523**
2011	3854	0	0	**-**	**3854**
2012	2323	68	55	**8**[1]	**2462**
2013	2013	1378	1459	**20**[1]	**4890**
2014	1151	0	2720	**25**[1]	**3921**
2015	830	440	4128	**37**[1]	**5435**
2016	578	0	3984	**71**[1]	**4704**
2017	457	2207	2898	**121**[2]	**5804**
2018	168	656	4847	**133**[2]	**5937**
2019	251	3261	3050	**190**[2]	**6752**
2020	120	3935	2116	**179**[2]	**6350**
2021	63	3650	2956	**343**[2]	**7012**
2022	47*	4220	2214	**448**[2]	**6929**

[1]one artificial nesting platform
[2] two artificial nesting platforms
* includes 14 nests in shrubs (33 nests in trees)

- The overall number of tree nests decreased by 25.4% between 2021 and 2022 (**Table 2**).
- If the shrub nests are removed from the tree nest total, then the number of tree nests decreased by 47.6% between 2021 and 2022a
- In 2022 the number of nests in live trees was the lowest it has been since this information has been recorded – from a peak of almost 3500 nests in 556 live trees in 2010 to 7 nests in 1 live tree in 2022
- 14 nests were also located in 6 live shrubs in 2022
- There were 26 DCCO nests in 4 dead trees in 2022: 17 nests in 3 dead trees in 2021

Table 3. Number of DCCO nests and trees used for nesting on HBI from 2006 to 2022, based on the June count. Live and dead trees were not recorded separately until 2008. Management occurred in 2006, 2007 and 2011 to 2022.

Year	# live trees used	# nests in live trees	# nests/ live tree	# dead trees used	# nests in dead trees	# nests/ dead tree	Total trees used	# nests/ tree
2006	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	377	5.6
2007	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	432	5.2
2008	449	2743	6.1	121	735	6.1	570	6.1
2009	571	3408	6.0	84	348	4.1	655	5.7
2010	556	3486	6.3	168	1037	6.2	724	6.2
2011	448	2596	5.8	190	1258	6.6	638	6.0
2012	164	1163	7.1	179	1168	6.5	343	6.8
2013	36	412	11.4	206	1621	7.9	242	8.4
2014	11	152	13.8	150	1024	6.8	161	7.3
2015	7	107	15.3	105	788	105	112	8.0

2016	8	50	8.5	91	599	9.1	99	6.6
2017	6	129	21.5	63	449	7.1	69	9.4
2018	4	72	18.0	29	229	7.9	33	9.1
2019	7	88	12.6	14	163	11.6	21	12.0
2020	5	58	11.6	9	62	6.9	14	8.6
2021	5	46	9.2	3	17	5.7	8	7.9
2022*	1	7	7.0	4	26	6.5	5	6.6

* In addition to 5 trees containing 33 nests, 6 shrubs containing 14 nests were used by nesting cormorants in 2022

Discussion

The most notable characteristics of DCCO nest distribution in 2022 were:

- 33 DCCO nests were in 5 trees in 2022
- Only one live tree was used for nesting and the remaining four trees used were dead
- 14 DCCO nests were in 6 shrubs (5 Elderberry and one Chokecherry) in 2022
- The DCCO nesting in shrubs were on the perimeter of the High Bluff ground colony in the Unmanaged Area-East
- DCCO ground nesting at Presqu'ile in 2022 was near the 2021 historic high record with 6434 ground nests (6606 nests in 2021)

High Bluff Island and Gull Island Ground Colonies

The High Bluff Island ground nesting colony of DCCO has fluctuated widely over the years ranging from over 4000 nests to zero nests. This variation is largely a response to predator presence. In years of high predator activity, the colony has shrunken or disappeared while in years of predator scarcity it flourishes.

Evidence of Coyote activity (scat and tracks) was only seen on HBI when work commenced in April 2022, and trail cameras yielded no pictures of these predators during the breeding season. It is likely that the coyote sign seen in the spring was from animals that spent at least some of the winter on the island and departed in the early spring.

Other terrestrial predator species (raccoons, foxes, mink etc.) were not noted on High Bluff Island during the breeding season. One trail camera photo of a raccoon was recorded in September.

The Gull Island ground colony declined by around 700 nests while the High Bluff Island ground colony increased by a similar amount. There was no clear explanation such as evidence of terrestrial predators on Gull Island to explain this shift in ground nesting.

Overall, the DCCO ground nesting population was the second highest on record with 6434 nests (verses 6606 nests in 2021). The scarcity of trees on the Presqu'ile Islands combined with DCCO management in most of the remaining trees has encouraged significant ground nesting.

93% of nesting cormorants at Presqu'ile are now ground nesters. In 2022 less than one percent of the park's cormorant population nested in trees and shrubs. At times in the past all the park's cormorants have been tree-nesters. The change in nest distribution has been caused by the death, rot and dropping of former DCCO nesting trees combined with management activities that prevent DCCO from nesting in the live trees found within the designated management areas.

Many more cormorants now use artificial platform nesting platforms than naturally occurring woody vegetation with 6.5% of the park's nesting cormorants using the two nesting platforms (n=448 nests).

It is essential that DCCO be prevented from nesting in the remaining trees and shrubs on High Bluff Island to maintain the habitat it provides for other species.

1.2. Tree Nest Removal

Methods

- From April 25 until June 08, 2022, cormorant tree nests were removed from specific management areas so that those areas were no longer attractive for nesting DCCOs. This is the “no nest establishment technique”. This approach has proven to be very effective in preventing potentially explosive growth of tree-nesting DCCO at Presqu’ile.
- Nests are knocked from trees using sectional fiberglass poles, and their contents are recorded
- DCCO may attempt to re-nest when they lose their nest, so in some cases, the nest removal number represents multiple nesting attempts by the same pair of birds. Areas are revisited to remove new nests when required.

Results

- A total of 25 tree nests were removed from 2 of the 14 management areas (**Table 4)**.
- DCCO did not try to build nests in the 12 other management areas in 2022.

Table 4. The total number of DCCO nests removed from each managed area in 2022 and the number of DCCO tree nests present during the 2022 June nest count.

Management Area	DCCO tree nests Early-Summer 2022	DCCO tree nests removed 2022
Ridge Forest North	0	15
Bluff Thicket North	25	10

Discussion

The “no nest establishment technique” has resulted in dramatically fewer DCCO nests requiring removal than in the early days of DCCO management at Presqu’ile. At total of 25 nests were removed in 2022. This low number is similar to recent years (52 nests removed in 2021, 6 in 2020 and 29 nests removed in 2019) and is a very favourable when compared to earlier years of DCCO management when as many as 3000+ nests were removed.

Of the 25 DCCO nests knocked from trees in 2022 none contained full clutches. Only seven nests contained eggs and none contained more than 2 eggs (a typical full-clutch size is 4 eggs). 18 of the nests that were removed were at the initial stage of development – not fully constructed with zero eggs.

25 DCCO nests were intentionally not removed from Bluff Thicket North in 2022. They were in two ash trees and an elm along the north shoreline of HBI adjacent to Gull Island. These trees are isolated from other living trees and do not provide suitable nesting habitat for other bird species. In addition, the invasive Emerald Ash Borer is now very established at Presqu’ile and will cause the ash trees to die soon regardless of management activity (one ash and the elm were already dead in 2022). It was decided to allow the DCCO nests in these trees to develop naturally and focus management efforts on other areas.

There is a clear benefit of the “no nest establishment technique” in terms of vegetation protection. Using this approach, potential nesting trees suffer little or no damage from branch and leaf removal by nest-building DCCO. The trees are also not subjected to the harmful effects of cormorant guano since they are not perched upon by cormorants.

1.3. Roost Monitoring and Disturbance

After the breeding season DCCO become transient and hundreds or thousands of individuals from across a large region can congregate in locations with feeding and roosting opportunities. DCCO roost overnight in trees or on the ground. Guano deposition from these large communal roosts can have a pronounced negative effect on woody vegetation.

Methods

- Roost-monitoring occurred on three occasions in 2022 between September 02 and September 15
- Evening counts of arriving DCCO (and herons and egrets) began one hour before sunset and ended 30 minutes after sunset.
- In years when significant DCCO roosts were developing, roost disturbance activities – human presence, yelling, arm-waving and the firing of blank shells have been employed at the onset of darkness.
- While one staff person was conducting roost disturbance activities, another person observed the reaction of the DCCO and their destination after they had left the roost area.
- Due to lack of large-scale roosting, disturbance activities have not been undertaken for several years including 2022

Results

Date	Total # of DCCO	Majority of DCCO Arriving From
September 02	611	East
September 09	1116	West
September 15	367	West

Discussion

In 2022 observations indicated that the number of fall roosting DCCO at Presqu'ile was low. The birds seen were likely late-nesting local birds returning to their breeding colony. In recent years at Presqu'ile ground-roosting has been favoured over tree-roosting mostly at the western end of Gull Island, especially Sebastopol Point.

In the mid-summer of 2022 large numbers of DCCO were noted roosting along High Bluff Island's western shoreline. In the space of a few days significant amounts of foliage was clipped from the trees and dropped to the ground. The canopies of these trees were thinned by 20 to 40%. Staff focussed their work activities in this area for a few days and the roosting birds departed. If this unusual mid-summer roosting had not been noticed in 2022 then many trees on the western shoreline of High Bluff Island would have suffered significant harm. This is a serious concern since trees in this area are also being used as nesting sites by herons and egrets.

1.4. Nesting and Roosting Deterrence

Experience has shown that in many circumstances nest removal is not required if DCCO nests are prevented from becoming established in the first place. Nesting deterrence early in the nesting period discourages DCCO from using managed areas before they become firmly established, reducing nest removal effort overall. Similarly, DCCO appear to avoid roosting in areas where they detect human presence, so roosting deterrence may also decrease the need for active roost disturbance.

Methods

- Within the management areas staff walking trails discourage DCCO nest establishment and roosting.
- Temporary trails have been established through the herbaceous ground cover and they allow fast, frequent, and regular human presence within management areas, while avoiding disturbance to nesting herons (**Figure 3**).

- Logs and debris are cleared to allow for efficient walking. In areas of heavy vegetation, paths were kept clear by mowing.
- Trails were maintained in the following management areas: Upland Forest Grove A, C, D; Basswood Grove; Bluff Thicket South; Ridge Forest North.

Results

- Staff trails proved to be effective DCCO nesting deterrence, as there was no DCCO nesting near the trails.

Discussion

The establishment of staff trails within management areas has proven in the past to be an effective way to discourage DCCO nesting. In low-pressure sites, staff walking along the trail is enough of a deterrent to prevent DCCO nesting. In desirable sites, staff walking the trails augments nest removal. Walking alone will not cause DCCO to abandon a well-established nesting area.

In 2022 staff disturbance by trail walking began just as tree-nesting cormorants were beginning to search for tree-nesting locations. Fortunately, the ground colonies on both islands proved to be attractive to nesting cormorants allowing for the success of this “soft” management technique.

Figure 3. Footpath located on HBI to provide access to management areas. These trails were routed to provide access to the management areas and keep human activity away from herons and egrets.

1.5. Ground-Nesting Habitat Enhancement

The objective of enhancing the ground-nesting habitat is to provide suitable nesting sites outside of the management areas. In some years woody debris has been placed in areas where DCCO are desired to nest providing an alternative to tree-nesting locations.

In 2022, DCCO were noted early in the breeding season on the ground in the areas they have traditionally used (HBI: Unmanaged Area – East; the Lighthouse DCCO ground colony area and on Gull Island). Due to the early strong start to DCCO ground nesting on HBI no extra ground-nest habitat enhancement was placed in the colony in 2022.

1.6. Alternative Tree-nesting Habitat Enhancement

Within a few seasons, trees used by nesting DCCO die, their branches break off and, in a few years, they rot and fall down. As a result, tree nest sites become limited, and this puts increased pressure on all remaining live trees of which the majority are now located within management areas. The objective of alternative tree-nesting habitat is to provide additional nesting opportunities for DCCO in unmanaged areas where there is no conflict with other values such as woody vegetation used as heron nesting habitat.

Methods

- In 2012 a large, modular, self-supporting structure was built in the Unmanaged Area – East using 2” x 6” x 7’ boards salvaged from discarded picnic-tables. This structure is two-tiered, with the lower level sitting approximately 1.5 meters off the ground and upper level 3 meters above the ground (**Figure 4)**.

The overall structure was built in a "zig-zagging" configuration to provide support from wind and has been expanded several times.

- In 2017 a second modular structure was established in the Lighthouse DCCO ground colony adjacent to the fallen trunks of trees killed by nesting cormorants. This smaller nest platform was built in a similar manner to the larger platform but the 2017 structure consisted of only a single tier approximately 1.5 meters above the ground. In the autumn of 2018, a second tier was added to it.
- In 2019, a third, single tier artificial nesting platform was established in the southeastern corner of the Unmanaged Area East.
- In 2021 the Lighthouse artificial nesting structure was dismantled and added to the smaller structure located in Unmanaged Area – East. In its original location it had been blown over by winter winds and had not been used by nesting DCCO since 2017.

Figure 4. Artificial DCCO nesting platform in the Unmanaged Area East. This structure supported 426 DCCO nests in 2022. An additional smaller structure supported 22 nests. In 2022, a total of 448 DCCO nests were located on 2 platforms outnumbering the 47 cormorant nests found in trees and shrubs.

Results

- In 2022, 426 DCCO pairs nested on and under the large artificial structure in the Unmanaged Area - East.
- In 2022, 22 DCCO nests were built on the smaller artificial structure in the Unmanaged Area - East.

Discussion

Artificial nest structures encourage DCCO to nest where their activity will not damage vegetation. These structures host a substantial number of successful nesting pairs – in 2022 there were almost ten times as many times DCCO nesting on the artificial structures (448 nests) than in the trees and shrubs (47 nests).

2. Heron Monitoring

Overview

General methods, results, and discussions are provided for each species individually and for heron roost monitoring in the following sections. Detailed methods for heron monitoring are described in the ***Presqu'ile Islands 2011 Resource Management and Monitoring Report.*** General heron nest monitoring information is below. Distribution of heron nests in the various management areas and unmanaged areas is summarized in **Table 5** and shown in **Figure 1**.

- Four measures of breeding activity and success are monitored and reported:
  - Maximum number of active nests – the largest number of individually identified nests known to be active during the breeding season (not all will produce young)
  - Number of successful nests – the number of nests that produced at least one chick that survived to fledging (i.e. leaving the nest)
  - Number of fledged young – the number of hatched birds that survived to fledging; *and,*
  - Number of fledged young per nest – a measure of nest productivity (only successful nests were used to calculate the number of fledged birds per nest).

Table 5. Use of managed/unmanaged areas by tree-nesting colonial waterbirds in 2022

Management area	Herons Use	DCCO Use	Comments
Basswood Grove	N	N	0 DCCO nests established in 2022
Bluff Thicket North	65 GREG nests 103 BCNH nests	Y	17 DCCO nests removed in 2022; 25 DCCO nests intentionally left – see section 1.2
Bluff Thicket South	2 BCNH nests	N	0 DCCO nests established in 2022
Red Ash Swamp Forest	N	N	0 DCCO nests established in 2022
Ridge Forest North	N	N	8 DCCO nests removed; 0 DCCO nests remaining in DCCO count
Ridge Forest South	N	N	0 DCCO nests established in 2022
Shingle Beach	N	N	0 DCCO nests established in 2022
Shrub Thicket	N	Y	0 DCCO nests removed; 0 DCCO nests remaining in DCCO count
Upland Forest Grove A	N	N	0 DCCO nests established in 2022
Upland Forest Grove B	2 BCNH nests	N	0 DCCO nests established in 2022
Upland Forest Grove C	N	N	0 DCCO nests established in 2022
Upland Forest Grove D	N	N	0 DCCO nests established in 2022
Upland Forest Grove E	N	N	0 DCCO nests established in 2022
Upland Forest Grove F	N	N	0 DCCO nests established in 2022
Unmanaged Area - East	N	Y	2090 ground, tree and platform DCCO nests in June count
Unmanaged Area - West	N	Y	2130 ground nests in 2022
Gull Island	N	Y	2214 ground nests in 2022
Sebastopol Point (Gull I.)	N	N	0 DCCO nests established in 2022

N = no; Y = yes

2.1. Great Egret Nest Monitoring Methods

- Nests were monitored regularly throughout the breeding season 1-3 times per week between May and mid-July (**Figure 5.)**. During these monitoring sessions, adult behaviour was observed to determine nesting status, and the number of chicks seen in each nest was recorded.
- In early-July staff entered the nesting areas and heron nests (GREG and BCNH) were individually observed to determine the exact number of nests and the contents of each nest
- Where possible pole with a mirror was used to observe contents of high nests; however, a significant number of nests contained large chicks and pole-observations were not conducted on these nests in 2022
- In 2022 a Drone was also used to count GREG nests by flying over at approximately 30 meters height. Photographs of the nesting colony were taken and the GREG nests were counted from the photos. This count occurred in early-July after all GREG nests contained chicks. Two observers watched for responses from GREG adults or chicks.

Results

- The results of GREG nest monitoring are provided in **Table 5**.
- A section of the GREG colony was not physically entered due to the density of nests and it was determined unwise to enter that area for fear of causing excessive disturbance. These nests were therefor assessed using aerial photos taken by a drone
- 65 active GREG nests were counted in a dense stand of choke cherries in Bluff Thicket North

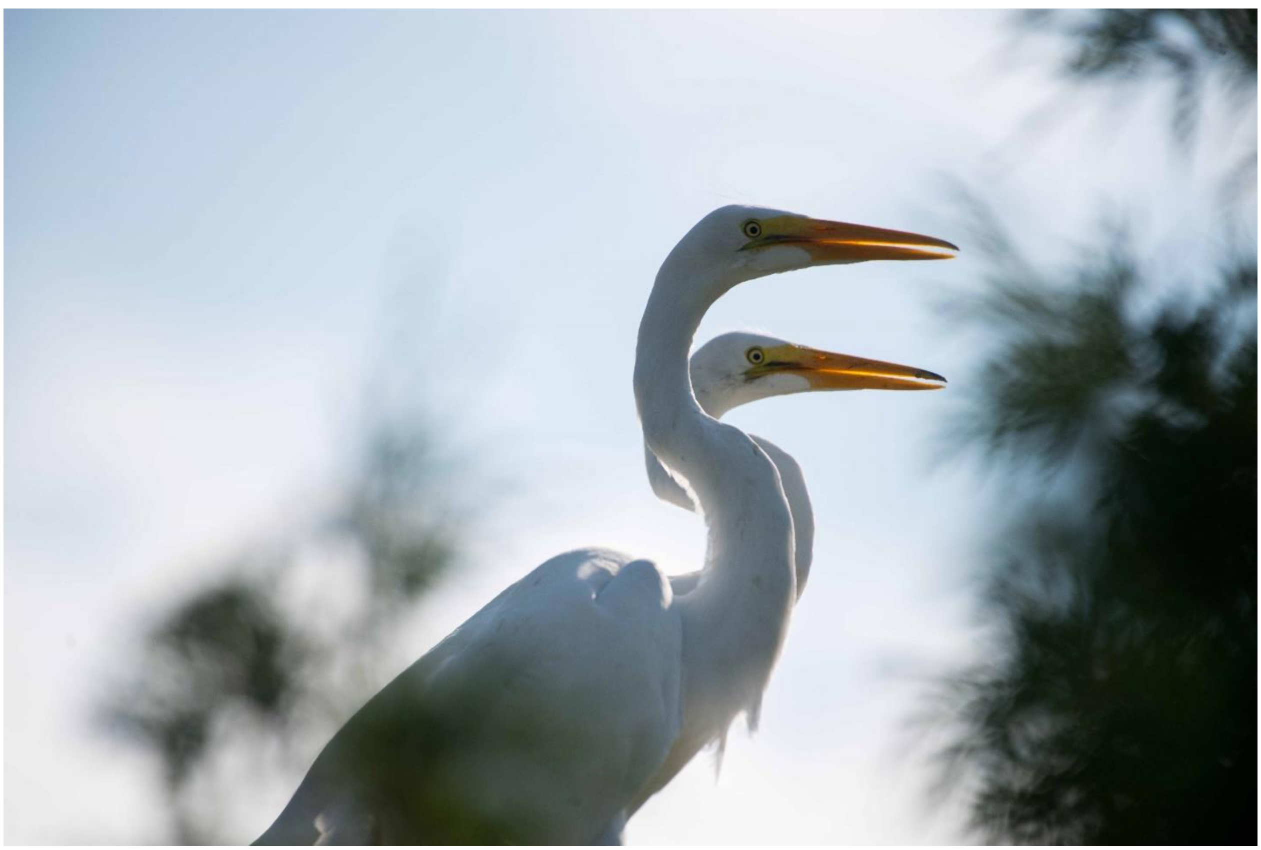

Figure 5. The Presqu'ile Great Egret colony supports more nesting birds than all the other Lake Ontario colonies combined.

Discussion

Since its establishment in 1999 Presqu'ile' s GREG colony has been remarkably successful. It was the first colony for this species on the lake and has been the largest since its establishment. In 2022, most Lake Ontario's GREG nests were located at Presqu'ile.

In 2022 a drone was used as a monitoring tool for colonial waterbirds including egrets using the same methodology employed in 2021.

The drone approached the nesting are at around 100 meters. Once over the colony it dropped to a height of around 30 meters (**Figure 6.)**, photographing the entire colony in a matter of minutes. Two observers and the drone pilot could not detect any reaction from the birds. Since the nests are located in a uniform layer in the tops of low-lying shrubs the photographs taken captured all the GREG nests and their contents (**Figure 7.)**. In fact, there were some locations where traditional ground counting by people could not be conducted due to chicks jumping from their nests. These same nests were successfully assessed with the drone.

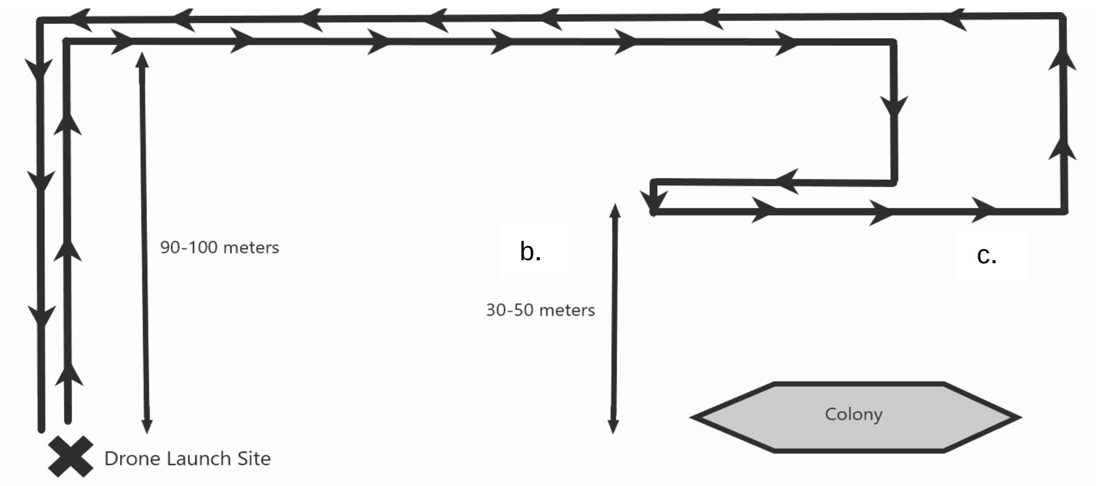

Figure 6. Schematic diagram of the drone flight path. Two observers monitored bird behaviour while the done was in flight.

Figure 7. Aerial drone photograph of the egret nesting area.

2.2. Black-crowned Night-Heron Nest Monitoring

Methods

- Nests were monitored opportunistically throughout during the breeding season during regular work on the island, including GREG monitoring (May to mid-July). During these monitoring events, adult behaviour was observed from a distance to determine general nesting location and status. A full nest count was conducted in mid-June. The number of eggs/chicks seen in each nest was recorded at this time.
- Since BCNH nests are hard to see and the young are prone to jumping from their nests, observations are limited to one annual count which is done as quickly as possible. In addition, in 2022 many nests were not observed with the mirror-pole due to the late stage of development of chicks when observations were made.

Results

- The results of BCNH monitoring are in **Table 5**.
- BCNH nested in chokecherry and white and red cedar, basswood, and hawthorn on HBI
- The information provided in **Table 6** is based on compilations of data collected opportunistically over the breeding season, rather than on regular and continuous monitoring of individual nests.

Table 6. Nesting activity of BCNH on High Bluff and Gull Islands (Sebastopol Point).

Year	Max. nest count	# Active nests – Sebastopol Point	# Active nests – HBI
2003	80	26	54
2004	59	7	52
2005	71	14	57
2006	84	17	67
2007	77	0	77
2008	80	0	80
2009	46	19	27
2010	51	34	17
2011	61	36	25
2012	74	5	69
2013	93	0	93
2014	59	8	51
2015	91	11	80
2016	62	3	59
2017	74	0	74
2018	111	0	111
2019	98	0	98
2020	81	0	81
2021	127	0	127
2022	107	0	107

Discussion

In 2022 BCNH had a successful breeding season attaining the third highest recorded number of nests for this species at Presqu'ile. As other colonies decline, at least partly due to competition with DCCO and the loss of nesting habitat due to tree-loss brought about by DCCO nesting, Presqu'ile's BCNH colony has become the largest colony on Lake Ontario.

98 of the 107 BCNH nests were found in and around the choke cherry thicket in Bluff Thicket North alongside 65 GREG nests. BCNH also nested in three additional locations: 5 nests in Bluff Thicket North apart from the chokecherry and cedar thicket location, 2 nests in Bluff Thicket South and 2 nests in Upland Forest Grove B.

The vulnerability of waterbird colonies to predators and environmental conditions (i.e., flooding) clearly demonstrates the importance of maintaining a number of potential nesting locations. If these locations are available, then birds can shift to new sites when they fail in their traditional locations.

A prime example of this phenomena has occurred at Tommy Thompson Park in Toronto. This site was once the largest BCNH colony in Canada and housed 1235 pairs in 2000. Since that time this colony has steadily declined to finally disappear in 2022. Nest-space competition with DCCO and the loss of nesting trees due to DCCO guano deposition has undoubtably played a key role in the loss of BCNH at Tommy Thompson Park. Fortunately a small colony of 46 nests established on nearby Toronto Islands in 2022. However it too has nesting DCCO and could follow a similar decline as at Tommy Thompson Park.

The decline and loss of the Tommy Thompson BCNH colony (along with others) highlights the importance of protecting suitable habitat for BCNH wherever it still is found. The remaining nesting sites are vulnerable to displacement by the vastly more common DCCO. At Presqu'ile the current BCNH nesting locations were once used by nesting cormorants. If left unmanaged, nesting cormorants will return to these locations and they would suffer the same fate as the Tommy Thompson colony. Management has encouraged the DCCO to nest elsewhere and maintained this habitat in a state that provides critical nesting habitat for Night-Herons and other colonial species.

Figure 8. The Presqu'ile BCNH colony supports more birds than all other Lake Ontario colonies combined.

2.3. Heron Roost Monitoring

Roosting by heron species is monitored to determine if HBI is used as a regional roost and to ensure that possible disturbance of roosting cormorants does not affect roosting herons

Methods

- The number of GBHE, GREG, and BCNH coming to roost, or leaving to forage from HBI was recorded at the same time as the DCCO roost monitoring (**section 1.3 Roost Monitoring and Disturbance - Methods)**

Results

Table 7. Heron species observed arriving or departing HBI during 2021 DCCO roost monitoring

	GBHE		GREG		BCNH	
Date	**Arriving**	**Departing**	**Arriving**	**Departing**	**Arriving**	**Departing**
September 2	0	0	0	0	0	1
September 9	0	0	0	0	0	1
September 15	0	0	0	0	0	0

Discussion

In 2022 there was no evidence of heron roosting on HBI. A few BCNH were seen departing the island presumably to feed in local wetlands. GBHE and GREG were not seen during the roost monitoring dates.

3. Regional Trends in Tree-nesting Colonial Waterbirds

The following information comes from the meetings of the Great Lakes Area Working Group on Colonial Waterbirds, an informal binational group of scientists and wildlife managers who share information relevant to colonial waterbirds nesting on the lower Great Lakes and associated rivers in Canada and the United States. Monitoring in other jurisdictions, and the information available when this report is written, varies from year to year.

3.1. DCCO

- Lake Ontario –nesting population has doubled since early 2000s (small declines in 2012, 2014, 2015, 2020 and 2022), with fluctuations within individual colonies due to a variety of reasons including flooding, sanctioned and unsanctioned management and predators. In 2022 lake-wide numbers declined by 4.1% to 40,425 nests from 42,148 nests in 2021.
- Canadian Wildlife Service Decadal census (Lower Great Lakes area) – increased by 60% between Census 3 (1997 – 1999) and Census 4 (2007 – 2009).

3.2. GREG

- Lake Ontario – 65 GREG nests at Presqu'ile Provincial Park. The Tommy Thompson Park GREG colony was abandoned in 2022 and 4 GREG nests observed at a new colony on the Toronto Islands. 8 nests were counted on two islands in the Kingston region (3 Middle Brother Is., 5 on False Duck Island). Presqu'ile' s GREG colony with 65 nests supports more GREG than all the other colonies on the lake combined.
- Lower Great Lakes area – 48 nests were counted on Lake Erie in the Pelee archipelago (40 at Middle Is., 8 at Middle Sister Is.); 4 pairs in the Niagara River.
- Canadian Wildlife Service Decadal Census (Lower Great Lakes area) – Almost tripled between Census 3 (1997 – 2001) and Census 4 (2007 – 2009), mainly due to increases at Presqu'ile and one of the Lake Erie colonies.

3.3. BCNH

- Lake Ontario – Population is trending downwards mainly due to competition with DCCO for nesting habitat at the former largest Lake Ontario colony (Tommy Thompson Park) which has declined from 1235 BCNH nests in 2000 to 0 nests in 2022). In 2022 a new BCNH colony was discovered at the nearby Toronto Islands with 46 nests. The third Canadian BCNH location is Hamilton Harbour with 37 nests in 2022. On the US side of Lake Ontario there were one active BCNH colony with 6 nests in 2022. Presqu'ile' s BCNH colony with 107 nests supports more BCNH than all the other colonies on the lake combined.
- Lower Great Lakes area –128 nests were counted on Lake Erie in the Pelee archipelago (Middle Island); 16 pairs on Motor Island, Niagara River in 2022.
- Canadian Wildlife Service Decadal Census – Decreased by 20% between Census 3 (1997 – 2001) and Census 4 (2007 – 2009), mainly due to a dramatic decline at Tommy Thompson Park in the 2000's

4. Other Wildlife

Trail cameras (Bushnell Trophy Cam 119436C) and opportunistic encounters by staff were used to detect the presence of mammals on HBI. The cameras took digital photos of an area when triggered by movement. The cameras were set up along known wildlife trails and checked periodically from May to September 2022.

4.1. Terrestrial predators

- Evidence of coyotes activity (scat) was seen on the first visits to HBI in April but no trail camera images were captured.
- On June 27, 2022 the gull colony "frighted" and took to the air "mobbing" a presumed predator which travelled through the Lighthouse ground colony and then the east HBI ground colony. The predator likely swam to GI where the gulls mobbed it from the west end of GI to the island's east end. Many thousand gulls took to the air during this disturbance which occurred over a period of ten minutes
- A Raccoon (*Procyon lotor*) was photographed on September 8, 2022 (**Figure 9**.) though no other evidence of this animal was seen in 2022. It is likely that this individual crossed from the mainland on a gravel bar that developed in the autumn of 2022.
- No evidence of other terrestrial predators such as Mink *(Neogale vison)* and Red Fox (*Vulpes vulpes)* were observed on HBI in 2022

Figure 9. Trail camera photo of a Raccoon taken on September 8, 2022. Until this autumn date no photos of raccoons or other terrestrial predators were taken. This animal likely waded to High Bluff Island due to exceptionally low water levels in the autumn of 2022. It arrived too late in the breeding season to impact colonial waterbirds breeding success.

4.2. White-tailed Deer

- As many as 3 deer were seen by staff and photographed by trail cameras throughout the spring and summer of 2022 on HBI (**Figure 10. and Appendix B**).
- Sightings occurred in the spring and trail cameras photos were taken periodically throughout the spring, and summer.
- Two does and one yearling deer were observed though no young-of-the-year fawns were seen or photographed in 2022

Figure 10. White-tailed Deer (*Odocoileus viginiana*) were present on HBI throughout the spring, summer and fall including two does and a yearling.

4.3. Monarch Butterfly

- The monarch monitoring methodology developed in 2011 has been conducted in all years since except 2020. (See detailed methods in the ***Presqu'ile Islands 2011 Resource Management and Monitoring Report.)***
- trails of similar length and habitat were walked simultaneously on High Bluff Island and Owen Point
- All the Monarchs observed were counted
- In 2022 the survey dates were August 25, 29 and September 01.
- The results from the 2022 survey are presented in **Table 8.**
- The results from previous counts are presented in **Table 9**.

Table 8. Results of 2022 Monarch Survey Routes on High Bluff Island and Owen Point

Date	Owen Point	High Bluff Island
August 25	6	52
August 29	1	23
September 01	26	87

Table 9. Ratios of numbers of Monarch butterflies (*Danaus plexippus*) observed while simultaneously walking survey routes on the Owen Point Trail and High Bluff Island, 2011 to 2022. Survey not conducted in 2020.

Year	HBI Ratio :Owen Point:
2011	2:1
2012	17:1
2013	13:1

2014	12:1
2015	4.5:1
2016	3:1
2017	12:1
2018	1:1
2019	5.7:1
2020	Survey Not Done
2021	31:1
2022	4.9:1

- Except for 2018 Monarch counts are always higher on HBI than the Owen Point Trail counts.
- Owen Point Trail is considered the best roosting and feeding habitat on the mainland of Presqu'ile for monarch butterflies
- In 2022 the ratio of sightings was 4.9:1. Since 2011 the average ratio between High Bluff Island and Owen Point is 9.6:1. The 2022 lower than average High Bluff : Owen Point ratio is likely a reflection of the relatively few surveys conducted in 2022. Data from September 01 **(Table 8.)** had a large influence average ratio for 2022.
- Monarchs use HBI habitat in two ways: for feeding and egg-laying and as a roosting site (Plantation, Basswood and Upland Forest Groves and Bluff Thicket South.
- HBI provides excellent monarch feeding and egg-laying habitat due to the abundance of flowering plants and milkweed in the open field areas. Without its woody vegetation, HBI would be a less suitable congregation location for migrating Monarchs since trees and shrubs provide shelter from the wind and monarchs typically roost on woody vegetation.

4.4. Other wildlife noted on HBI in 2022

- HBI is a unique environment isolated from many terrestrial vertebrates. Of those that do make it to the island, relatively few are able to persist on such a small landmass and in such a harsh environment.
- Garter Snakes (*Thamnophis sirtalis*) were commonly noted on HBI in 2022 and on occasion they were found after they had been attacked but not eaten by a predator. Based on the frequency of finding mutilated snakes it appears that BCNH on HBI catch Garter Snakes but often do not eat them.
- Red-bellied Snake *(Storeria occiptomaculata)* have an established population on HBI with individuals spotted n 2022.
- Sightings of bird species were made opportunistically throughout the monitoring season (**Appendix C)**. Woody vegetation was heavily used by migrating passerines. The open field areas were also frequented by raptors and field birds during spring and autumn migration. During the breeding season, all the habitats present on HBI were used by various bird species.
- Common Ravens *(Corvus corax)* including young frequented HBI. A total of five birds presumably two adults and three young were regularly seen travelling about the island.
- Although the former breeding colony of Bobolink (*Dolichonyx oryzivorus* – Threatened) did not re-establish in 2022, Bobolinks were observed between May 03 and May 17.
- A Bank Swallow (*Riparia riparia* - Threatened) colony has been noted on High Bluff Island for many years. In 2022, a colony comprised of 20+ nest holes were observed at the island's south-western tip (Proctor Point) with adults actively entering and exiting the nesting holes. An additional colony of around 20 nests was established on the island's northern shoreline near the basecamp and a third similar-sized colony was located in the shoreline in Bluff Thicket North.
- Large mixed-species flocks of swallows (mainly barn, bank and tree) are regularly seen on HBI each year. These aggregations likely consist of resident birds augmented by large numbers of swallows from elsewhere. The swallow flocks, sometimes numbering into the thousands of individuals, occur anytime from May until August, particularly during cold and windy weather. The birds are generally seen flying in the lee of the large trees where they are presumably feeding on flying insects. They are also seen roosting in the branches of the same large trees.
- A family of Orchard Orioles *(Icterus spurius)* consisting of an adult male and female and 2 immature birds seen together on June 28.

5. Conclusion

Very few cormorants attempted tree-nesting at Presqu'ile in 2022. DCCO management combined with the development of strong ground-colonies on both Gull and High Bluff islands (94% of the total nests) resulted in the majority of the park's cormorants not using woody vegetation for nesting. Aside from 25 tree-nests that were intentionally left in one management area, all the park's cormorants nested outside of the management areas.

25 DCCO tree-nests were removed from trees in 2022. All the nests that were removed were in management areas adjacent to large ground colonies. The displaced birds likely moved from their tree-nesting locations to nearby ground colonies. Low-key management such as human presence was enough to maintain most management areas as DCCO-free zones.

At Presqu'ile artificial nesting platforms now support far more non-ground nesting cormorants than do the trees themselves.

Autumn cormorant tree-roosting was inconsequential in 2022 with roosting birds favouring ground-roosting on Gull Island. However, a brief period of roosting occurred in mid-summer which resulted in substantial leaf-stripping of trees along the western shoreline of High Bluff Island. These birds were encouraged to roost elsewhere by human presence preventing further damage to woody vegetation. This is the first occurrence of a mid-summer roost/leaf-stripping event. Careful monitoring is required to prevent similar occurrences in the future.

Regional trends demonstrate that management at Presqu'ile in 2022 had a minimal impact on the larger DCCO population on Lake Ontario and the province.

The Presqu'ile Islands now support the largest breeding colonies for both Great Egret and Black-crowned Night-Heron on Lake Ontario. Competition with cormorants is limiting opportunities for these species elsewhere on the lake. The scarcity of nesting locations for these species on Lake Ontario highlights the importance of protecting nesting sites at Presqu'ile. Cormorant management at Presqu'ile is maintaining important breeding opportunities for both BCNH and GREG and they are using HBI in increasing numbers while many other colonies on the lake decline.

High Bluff Island's unique geographical position as an isolated island on the north shore of Lake Ontario makes it biologically unique. Ongoing tree-planting and maintenance of existing plantations continues to enhance the regeneration of woody vegetation. Preventing further loss of existing mature trees is critical. Large trees provide a structural habitat element to the island and are the seed source that will allow future regeneration of trees on HBI. Migrating monarchs and birds make heavy use of planted and naturally occurring trees on HBI.

Protection and restoration of woody vegetation should remain a priority. Live chokecherry groves and basswoods will persist so long as cormorants are prevented from nesting and roosting in them. Tree species that mature more slowly, like maple, oak, and cedar will take much longer to restore and will not be present to the same extent that they were prior to cormorant nesting for many years. However, surviving trees within the management zones have recovered to the point that they are now significantly contributing to the ecological integrity of High Bluff Island.

Management Area	DCCO nests first noted	Mgmt initiated/ Type(s) conducted	# DCCO nests removed	DCCO nests (June)	GREG nests	BCNH nests	Notes
Basswood Grove	None noted	No mgmt.	0	0	N	N	No DCCO or heron nesting in 2022.
Bluff Thicket North	May 27	June 05 -08 10 DCCO nests removed	10	25	65 nests	103 nests	25 DCCO nests intentionally left in 2022. The nests were in dead or dying ash trees and posed no issues to other waterbirds. 65 GREG nests and 103 BCNH nests in 2022.
Bluff Thicket South	None noted	No mgmt.	0	0	N	2 nests	No DCCO nesting in 2022. 2 BCNH nests in 2022.
Red Ash Swamp	None noted	No mgmt.	0	0	N	N	No DCCO or heron nesting in 2022.
Ridge Forest North	April 27	April 27- June 05 17 DCCO nests removed	15	0	N	N	15 DCCO nests removed in 2022. Zero DCCO nests in June count. No heron nesting in 2022.
Ridge Forest South	None noted	No mgmt.	0	0	N	N	No DCCO or heron nesting in 2022.
Sebastopol Point (Gull Is.)	None noted	No mgmt.	0	0	N	N	No DCCO or heron nesting in 2022. The single willow tree died in 2017 and was washed away in 2019. This location is no longer is attractive to nesting BCNH.
Shingle Beach Thicket	None noted	No mgmt.	0	0	N	N	No DCCO or heron nesting in 2022.
Shrub Thicket	None noted	No mgmt.	0	0	N	N	No DCCO or heron nesting in 2022.
Upland Forest Grove A	None noted	No mgmt.	0	0	N	N	No DCCO or heron nesting in 2022.
Upland Forest Grove B	None noted	No mgmt.	0	0	N	2 nests	No DCCO or nesting in 2022. 2 BCNH nests in 2022.
Upland Forest Grove C	None noted	No mgmt.	0	0	N	N	No DCCO or heron nesting in 2022.
Upland Forest Grove D	None noted	No mgmt.	0	0	N	N	No DCCO or heron nesting in 2022.
Upland Forest Grove E	None noted	No mgmt.	0	0	N	N	No DCCO or heron nesting in 2022.
Upland Forest Grove F	None noted	No mgmt.	0	0	N	N	No DCCO or heron nesting in 2022.

Evidence of White-tailed Deer (*Odocoileus virginianus*) and other mammals on High Bluff Island, 2022.

DATE		# seen	SPECIES BUCK/DOE/YEARLING/FAWN/	NOTES and LOCATION
May 15		3	Deer – 2 Does and 1 Yearling	Basswood Grove
May16		3	Deer – 2 Does and 1 Yearling	Basswood Grove
May 24		1	Deer - Yearling	Basswood Grove
May 25		1	Deer - Yearling	Basswood Grove
June 27		na	Possible Coyote	Gull Fright initiated at the west end of the High Bluff gull/cormorant ground colony and travelled through the entire colony. The fright then moved to the east HBI gull/cormorant ground colony travelling from west to east. The disturbance then shifted to Gull Island and travelled from west to east. The entire disturbance event took around 10 minutes and involved many 1000s of birds.
May–September 2022		Maximum of 3	Does and yearling Trail camera pictures	Numerous photos taken of up to 3 animals.
September 08/22		1	Raccoon	Single adult raccoon captured on HBI trail camera. This animal likely crossed from the mainland due to low water levels in the fall of 2022.

APPENDIX C – 2022 High Bluff Island Bird Sightings

FAMILY	Species[1]	BREEDING EVIDENCE[2]	May 1 - 7	May 8 - 14	May 15 - 21	May 22 - 31	June 1 - 7	June 8 - 14	June 15 - 21	June 22 - 30	July 1 - 7	July 8 - 14	July 15 - 21	July 22 - 31	August 1 - 7	August 8 - 14	August 15 - 21	August 22 - 31
LOONS	COLO	H			**Y**		Y			Y				Y		Y		
GREBES + COOTS	HOGR	MIG.				**Y**												
	RNGR	MIG.																
	AMCO	H																
CORMORANTS + PELICANS	DCCO	NY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	AWPE	MIG.																
HERONS	GBHE	H					Y					Y			Y	Y	Y	Y
	GREG	NY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	GRHE	H																Y
	BCNH	NY		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	WFIB	MIG.																
	CAEG	H																
WATERFOWL	MUSW	X	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	TRUS	H																
	CAGO	NY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	BRAN	MIG.			Y	Y												
	WODU	H						Y										
	MALL	NY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	ABDU	H			Y	Y		Y					Y	Y	Y	Y	Y	
	GADW	NE		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	NOPI	H	Y	Y				Y										
	AMWI	MIG.			Y		Y	Y	Y									
	NOSH	MIG.	Y				Y	Y	Y						Y	Y		
	BWTE	H		Y														
	GWTE	H	Y	Y	Y				Y						Y	Y		
	REDH	MIG.			Y													
	RNDU	MIG.				Y												
	GRSC	MIG.				Y						Y						
	LESC	MIG.								Y								

1 source for alpha bird codes: https://www.pwrc.usgs.gov/bbl/manual/speclist.cfm
2 source for breeding codes: https://www.bsc-eoc.org/dataentry/codes.jsp?page=breeding . MIG indicates birds were likely migrating.

	HADU	MIG.																
	LTDU	MIG.		Y	Y													
	WWSC	MIG.		Y								Y						
	COGO	MIG.	Y															
	BUFF	MIG.	Y	Y	Y													
	COME	MIG.				Y				Y	Y	Y		Y	Y	Y		
	RBME	MIG.		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y			Y	
	HOME	MIG.															Y	
BUTEOS, HARRIERS, ACCIPITERS, VULTURES +EAGLES	BAEA	H												Y		Y		Y
	RTHA	MIG.				Y												Y
	RLHA	MIG.																
	OSPR	H										Y			Y	Y		
	NOHA	P		Y									Y			Y	Y	Y
	SSHA	MIG.																Y
	TUVU				Y											Y	Y	Y
FALCONS	AMKE	MIG.									Y							
	PEFA	MIG.	Y	Y	Y	Y	Y									Y		Y
	MERL	MIG.	Y								Y						Y	Y
RAILS, CRANES, COOTS	SACR	MIG.																
	AMCO	H																
PLOVERS	KILL	NY			Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y		Y
	SEPL	MIG.												Y		Y		
	PIPL	H																
	BBPL	MIG.												Y		Y		
GROUSE	RUGR	H																
SANDPIPERS	GRYE	MIG.		Y	Y							Y		Y	Y	Y	Y	
	LEYE	MIG.			Y	Y						Y	Y	Y	Y	Y	Y	
	SOSA	MIG.					Y	Y	Y									
	SPSA	NY		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	

1 source for alpha bird codes: https://www.pwrc.usgs.gov/bbl/manual/speclist.cfm
2 source for breeding codes: https://www.bsc-eoc.org/dataentry/codes.jsp?page=breeding . MIG indicates birds were likely migrating.

	WHIM	MIG.				Y												
	HUGO	MIG.																
	RUTU	MIG.			Y		Y	Y	Y		Y							Y
	REKN	MIG.					Y											
	SAND	MIG.				Y	Y							Y	Y	Y	Y	Y
	DUNL	MIG.			Y	Y	Y		Y	Y								Y
	SBDO	MIG.											Y			Y	Y	
	LBDO	MIG.														Y		
	PESA	MIG.															Y	
	SESA	MIG.				Y	Y								Y	Y	Y	
	LESA	MIG.				Y	Y		Y				Y	Y	Y	Y		
	WRSA	MIG.															Y	
	STSA	MIG.																
	SBDO	MIG.				Y	Y									Y		
	AMWO	S			Y	Y		Y	Y	Y				Y	Y			
	WISN	H																
	WIPH	MIG.			Y										Y		Y	
	RNPH	MIG.																
GULLS + TERNS	BOGU	MIG.				Y	Y											
	RBGU	NY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	HEGU	NY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	GLGU																	
	GBBG	H																
	CATE	NY		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	COTE	NY		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	LIGU	H																
DOVES	MODO	NY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	RODO	H									Y							
CUCKOOS	BBCU	H				Y		Y										
OWLS	BAOW																	
	GHOW																	
	SNOW																	
NIGHTJARS	CONI																	
	WHIP		Y															

1 source for alpha bird codes: https://www.pwrc.usgs.gov/bbl/manual/speclist.cfm
2 source for breeding codes: https://www.bsc-eoc.org/dataentry/codes.jsp?page=breeding . MIG indicates birds were likely migrating.

APPENDIX C – 2022 High Bluff Island Bird Sightings

SWIFTS	CHSW															Y		
HUMMINGBIRDS	RTHU	H			Y	Y	Y	Y				Y		Y	Y	Y		
KINGFISHERS	BEKI	H				Y	Y					Y			Y		Y	
WOODPECKERS	YBSA	MIG.			Y													
	DOWO	H	Y	Y													Y	
	HAWO	H														Y		
	RBWO	H			Y													
	NOFL	H	Y	Y				Y	Y	Y							Y	
	RHWO	H		Y	Y													
FLYCATCHERS	EAPH	H		Y					Y		Y	Y	Y	Y	Y	Y	Y	
	EAKI	NY		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
	WIFL	T			Y	Y	Y	Y	Y	Y			Y	Y	Y			
	GCFL	H	Y				Y											
	LEFL				Y			Y						Y		Y		
	EWPE	H			Y	Y	Y											
SWALLOWS + MARTINS	NRWS	NY			Y			Y	Y				Y		Y	Y		
	BANS	NY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			
	TRSW	NY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			
	BARS	NY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y
	PUMA	H													Y			
JAYS + CROWS	BLJA	H			Y	Y	Y						Y					
	AMCR	H	Y	Y	Y	Y						Y	Y	Y	Y	Y	Y	Y
	CORA	H			Y	Y		Y	Y	Y	Y			Y	Y	Y		
TITMICE	BCCH	H																
NUTHATCHES	WBNH	H											Y					
	RBNH	H	Y	Y	Y								Y			Y	Y	Y
CREEPERS	BRCR	H	Y															
WRENS	HOWR	NY		Y	Y	Y	Y		Y	Y	Y	Y	Y	Y		Y		
	WIWR	H																

1 source for alpha bird codes: https://www.pwrc.usgs.gov/bbl/manual/speclist.cfm
2 source for breeding codes: https://www.bsc-eoc.org/dataentry/codes.jsp?page=breeding . MIG indicates birds were likely migrating.

APPENDIX C – 2022 High Bluff Island Bird Sightings

KINGLETS	RCKI	MIG.		Y	Y		Y											
	GCKI	MIG.	Y		Y													
	VEER	MIG.			Y													
	HETH	MIG.	Y		Y													
THRUSHES	SWTH	MIG.																
	AMRO	NY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	WOTH	H		Y				Y										
CATBIRDS + THRASHERS	GRCA	S		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	BRTH	S		Y	Y	Y	Y	Y			Y							
WAXWINGS + STARLINGS	CEDW	NY			Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	
	EUST	NY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
OLD WORLD SPARROWS	HOSP	H																
	BHVI	MIG.			Y													
	WAVI	H			Y	Y	Y	Y	Y	Y								
VIREOS	PHVI					Y												
	REVI	MIG.				Y	Y	Y	Y			Y					Y	
	YTVI	MIG.				Y												
	NOPA	MIG.			Y	Y	Y											
	TEWA	MIG.			Y													
	NAWA	MIG.	Y	Y														
	MOWA	MIG.																
	YEWA	NY		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
	CSWA	MIG.		Y	Y													
WARBLERS	MAWA	MIG.		Y	Y													
	CMWA	MIG.		Y	Y												Y	
	BTBW	MIG.			Y	Y												
	BLBW	MIG.				Y												Y
	YRWA	MIG.	Y	Y	Y												Y	
	BTGW	MIG.	Y	Y	Y												Y	
	PAWA	MIG.		Y	Y												Y	

1 source for alpha bird codes: https://www.pwrc.usgs.gov/bbl/manual/speclist.cfm
2 source for breeding codes: https://www.bsc-eoc.org/dataentry/codes.jsp?page=breeding . MIG indicates birds were likely migrating.

	PIWA	MIG.																
	BBWA	MIG.			Y												Y	
	BPWA	MIG.			Y	Y											Y	
	BAWW	MIG.			Y													Y
	AMRE	T			Y	Y	Y	Y	Y	Y		Y					Y	
	OVEN	MIG.		Y														
	NOWA	MIG.			Y												Y	
	COYE	H		Y	Y	Y	Y	Y	Y	Y	Y						Y	
	WIWA	MIG.			Y													
	CAWA	MIG.															Y	
TANAGERS	SCTA	MIG.			Y													Y
BLACKBIRDS ETC.	BOBO	T	Y	Y	Y													
	RWBB	NY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
	EAME	H		Y	Y													
	COGR	NY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	BHCO	NY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	BAOR	NY		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	OROR	NY			Y	Y	Y	Y	Y	Y			Y	Y		Y		
FINCHES + BUNTINGS	INBU	H																
	PUFI	H																
	AMGO	NY		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
	EATO	H	Y	Y														
	FISP	H	Y	Y														
	ATSP	MIG.																
SPARROWS + TOWHEES	CHSP	MIG.	Y		Y		Y											
	CCSP	H																
	SAVS	NY			Y	Y		Y										
	FOSP	MIG.																
	SOSP	NY	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	LISP	MIG.				Y												
	SWSP	H	Y	Y														
	WTSP	MIG.	Y	Y	Y	Y												
	WCSP	MIG.	Y	Y	Y		Y											
	GRSP	H																

1 source for alpha bird codes: https://www.pwrc.usgs.gov/bbl/manual/speclist.cfm

2 source for breeding codes: https://www.bsc-eoc.org/dataentry/codes.jsp?page=breeding . MIG indicates birds were likely migrating.

JUNCOS	DEJU	MIG.	Y	Y														
CARDINALS + GROSBEAKS	NOCA	H	Y	Y	Y	Y	Y											
	RBGR	H			Y										Y			
	EVGR	MIG.		Y														

1 source for alpha bird codes: https://www.pwrc.usgs.gov/bbl/manual/speclist.cfm
2 source for breeding codes: https://www.bsc-eoc.org/dataentry/codes.jsp?page=breeding . MIG indicates birds were likely migrating.