

DRAFT RE-DESIGNATION REPORT

OCTOBER 2022

BENEFICIAL USE IMPAIRMENT 3B

DEGRADATION OF WILDLIFE POPULATIONS

IN THE HAMILTON HARBOUR AREA OF CONCERN



HAMILTON
HARBOUR
REMEDIAL ACTION PLAN



DRAFT
RE-DESIGNATION REPORT: DEGRADATION OF WILDLIFE
POPULATIONS (BUI 3B) IN THE HAMILTON HARBOUR AREA OF
CONCERN.

OCTOBER 2022

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Cover page photo credit: G. Barrett



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REMEDIAL ACTION PLAN

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EXECUTIVE SUMMARY

Over the past several decades, the Hamilton Harbour Area of Concern has supported one of the largest and most diverse assemblages of nesting colonial waterbirds on the Great Lakes, which includes breeding colonies of black-crowned night-herons, common terns, Caspian terns, herring gulls, ring-billed gulls, and double-crested cormorants. Our assessment indicates that there is a sustainable mixed community of colonial waterbirds in Hamilton Harbour and a status change to 'Not Impaired' is being recommended.

Stakeholders and the public were given the opportunity to provide input into the re-designation process. To incorporate the suggestions from the review, a change in delisting criteria is being recommended alongside the status change. Key feedback and advice recommended the removal of the nesting targets as strict criteria while maintaining them as adaptive management objectives (as achieving these targets are influenced by factors beyond the RAP's control such as fluctuating water levels affecting nesting space), and removal of the statement on "Other wildlife including waterfowl" which is being remediated through habitat restoration targets for Hamilton Harbour. Other broad topics addressed were erosion of bird island habitat due high-water levels, development of Pier 27, and future monitoring. Experts believe the current nest counts are sustainable with continued adaptive management using the 10 years of funding that has been secured for these activities. This document provides a summary of the status assessment, outreach opportunities, and how feedback was implemented into the re-designation process.

Updated Delisting Criteria for Degradation of Wildlife Populations (2022)

The overall objective is to have a sustainable mixed community of colonial waterbirds. In general, are aiming for an increase of the rarer species and a reduction in the number of over-abundant species. Management of colonial waterbirds and achieving specific populations of particular species requires an adaptive management approach to ensure sustainable populations continue to the extent possible after delisting.

Photo Credit: G. Barrett



OVERVIEW

Hamilton Harbour was designated as one of 43 Areas of Concern (AOC) on the Great Lakes by the International Joint Commission in 1987. The Great Lakes Water Quality Agreement identifies 14 Beneficial Use Impairments (BUIs) or significant environmental challenges that constitute a reduction in the chemical, physical, or biological integrity of the waters of the Great Lakes. A Remedial Action Plan (RAP) is a locally developed, partnership-driven plan to address these challenges that were created by historical human activities at the local level. BUIs are identified and assessed within each Remedial Action Plan and are used to guide restoration efforts and track progress in a local AOC. Degradation of Fish and Wildlife Populations (BUI 3) is one such BUI identified in the Hamilton Harbour AOC.

Colonial Waterbird Targets, Monitoring, and Remedial Actions

In the mid-1980s, when the Hamilton Harbour Remedial Action Plan was formed, the bird community of Hamilton Harbour was dominated by a few abundant species, primarily ring-billed gulls, that thrive in the presence of human activity. Remediation efforts to restore the Wildlife Populations BUI were directed at creating and adaptively managing colonial waterbird nesting habitat which was limiting in Hamilton Harbour. Colonial waterbirds are birds that nest in groups and generally return to the same nesting spot every year. In Hamilton Harbour, they include black-crowned night-herons, Caspian terns, common terns, double-crested cormorants, herring gulls, and ring-billed gulls (following left to right, top to bottom below).

Top left and middle photos: G. Barrett. Top right and bottom left photos: B. Curry



The International Joint Commission (IJC) provided guidance for listing and delisting Areas of Concern. The original delisting guideline in 1991 specified that the Degradation of Fish and Wildlife Beneficial Use Impairment (BUI 3) would not apply,

When environmental conditions support healthy, self-sustaining communities of desired fish and wildlife at predetermined levels of abundance that would be expected from the amount and quality of suitable physical, chemical and biological habitat present. An effort must be made to ensure that fish and wildlife objectives for Areas of Concern are consistent with Great Lakes ecosystem objectives and Great Lakes Fishery Commission fish community goals. Further, in the absence of community structure data, this use will be considered restored when fish and wildlife bioassays confirm no significant toxicity from water column or sediment contaminants.

Remedial Action Plans develop “delisting criteria” as a measure of what remediation looks like when it is complete and are created in consultation with the local community. In Hamilton Harbour, criteria were developed separately for Fish Populations (BUI 3a) and Wildlife Populations (BUI 3b). The first set of criteria for the Wildlife Populations BUI was created in 1992 and was subsequently updated in 2012 as more knowledge was gained from hands-on adaptive management techniques and more colonial waterbird habitat was created. All iterations mirrored the original IJC delisting guideline with the objective of a self-sustaining mixed community of colonial waterbirds generally with an increase of the rarer species and a reduction in the number of ring-billed gulls that generally thrive in urbanized areas.

Specifically, the 2012 delisting criteria mirrored the IJC delisting guidance with the general ideas of habitat enhancement, a sustainable mixed community, and tracking community structure/targets through time:

(1) Colonial waterbirds: The overall objective is to have a sustainable mixed community of colonial waterbirds. In general, are aiming for an increase of the rarer species and a reduction in the number of over-abundant species. Management of colonial waterbirds and achieving specific populations of particular species requires an adaptive management approach to ensure sustainable populations continue to the extent possible after delisting.

(2) Targets (Number of Nests)

Ring-billed Gulls < 10,000

Common Terns 300-600+

Herring Gulls 200-300+

Caspian Terns 400-600+

Double-crested Cormorants < 2,500 Black-crowned Night Herons 100-200+

(3) Other wildlife including waterfowl: No target will be suggested for other species of birds or animals, but a target for habitat (BU 14) has been suggested which will enhance wildlife populations generally. In addition, management of some species may be necessary as a result of habitat enhancement.

To reach these goals, the Hamilton Harbour Remedial Action Plan set out to:

(A) create nesting habitat, and

(B) use adaptive management to deter overabundant species that cope better, or even thrive, in the presence of human land use and reserve nesting space for the more vulnerable or rarer species.

Habitat was created along the Harbour's northeastern shoreline by converting two old 1920s hydro transmission line islands into nesting space (Neare and Farr Islands) and through the creation of three more islands (North, Centre, and South Islands) in 1995-1996 (bottom left photo). Farr Island has since been converted into fish habitat and was dismantled in 2010. In 2012, three additional islands and a spur dyke were created in the newly remediated Windermere Basin to further support Caspian terns and common terns (bottom right photo).

Photo credit: Conservation Halton and City of Hamilton



Monitoring of the six colonial waterbird species (black-crowned night-herons, common terns, Caspian terns, herring gulls, ring-billed gulls, and double-crested cormorants) began in 1997 and is conducted every spring between mid-May and the end of June, by counting the number of active nests. Management has occurred since 2007 and is a joint effort between the Hamilton-Oshawa Port Authority (HOPA), the City of Hamilton, the City of Burlington, building management from the Canada Centre for Inland Waters, a private consulting firm which provides its services for the control of ring-billed gulls, and a research lab from McMaster University that manages sub-colonies on the bird islands. Tactics to deter overabundant species (double-crested cormorants and ring-billed gulls) include perching of raptors, removal of nests, use of animated motion-detecting mannequins, and placement of tarps. Tarps reserve nesting space and are removed upon arrival of the rarer birds (e.g., Caspian and common terns). From the outset, there was no set recipe for a sustainable mixed community of colonial waterbirds, only best judgement. Nesting targets have been updated through time as on the ground experience and knowledge was gained about non-lethal methods of bird control.



Photo credit: J. Quinn (left) and G. Barrett (right)

The management of colonial waterbird nesting at Hamilton Harbour is a success story for the Great Lakes. While four species (i.e., black-crowned night-heron, ring-billed gull, herring gull, and common tern) have declined across the Great Lakes region during the last four decades, Hamilton Harbour has sustained colonies every year. The creation of the Northeast and Windermere Islands to support colonial waterbird nesting, due to limited habitat in Hamilton Harbour, has proven successful in establishing nesting habitat for a mixed community of colonial waterbirds through the adaptive management efforts of the Hamilton Harbour RAP partners. The status assessment in Appendix 6 shows the nesting trends up until 2017 and an updated summary including 2018-2021 can be found under *Current Nesting Trends* in Appendix 7. The results of the status assessment confirms that the colonial waterbird community is no longer 'Impaired' and recommends the status of the beneficial use should change to 'Not Impaired'.

Engaging on Results

The Hamilton Harbour Remedial Action Plan (HHRAP) initiated the re-designation process in 2019, which began with a peer review by RAP partners and technical experts, followed by a public review (Figure 1). A summary of the steps taken towards rehabilitation, assessment, and the re-designation process is provided below. An more in depth overview of the engagement opportunities and participants can be found in Appendices 2 and 4. Indigenous engagement is still underway.

A total of 52 participants attended the Public Forum on Dec 12, 2019 featuring the Wildlife Populations status assessment presentation given by Dr. Jim Quinn (McMaster University), the lead expert in managing the colonial waterbird populations. Overall, the in-person feedback was generally positive towards the change in status from 'Impaired' to "Not Impaired". The status assessment along with supporting documents (e.g., factsheets) were posted online on hamiltonharbour.ca for a 45-day commenting period from December 3, 2019 – January 17, 2020. An extensive in-person, digital, and print advertising campaign was undertaken by the HHRAP. The advertising campaign included a boat tour, social media posts, YouTube videos, TV ads, bus and newspaper ads, and news articles (See Appendix 2 for a full description and Appendix 4 for examples). A total of 18 respondents submitted comments: twelve online, two handwritten

Lifespan of BUI 3b

Degradation of Wildlife Populations in Hamilton Harbour

1992

ORIGINAL TARGETS SET

Targets adapted from the IJC delisting guideline focused on a sustainable mixed community of colonial waterbirds.

1995-1996

NORTHEASTERN BIRD ISLANDS CREATION

Two old 1920s hydro transmission line islands were converted into nesting space (Neare and Farr Islands) and three more islands (North, Centre, and South Islands) were constructed.

1997

MONITORING BIRD NESTING

Monitoring is conducted every spring between mid-May and the end of June by counting the number of active nests.

2007

ADAPTIVE MANAGEMENT

Tactics to deter overabundant species include perching of raptors, removal of nests, use of animated motion-detecting mannequins, and placement of tarps. Tarps reserve nesting space and are removed upon arrival of the rarer birds.

2010

FARR ISLAND SUNK

Farr Island was dismantled and converted into fish habitat.

2012

WINDERMERE WETLAND CREATION

Three additional islands and a spur dyke were created in the newly remediated Windermere Basin to further support colonial waterbirds.

2012

NESTING TARGETS REFINED

Nesting targets were updated as more knowledge was gained from hands-on adaptive management techniques and more colonial waterbird habitat was created.

2019

STATUS ASSESMENT

Recommended status change to 'Not Impaired'.

2019

AGENCY REVIEW

Internal stakeholders complete a review of the status assessment.

2019-2020

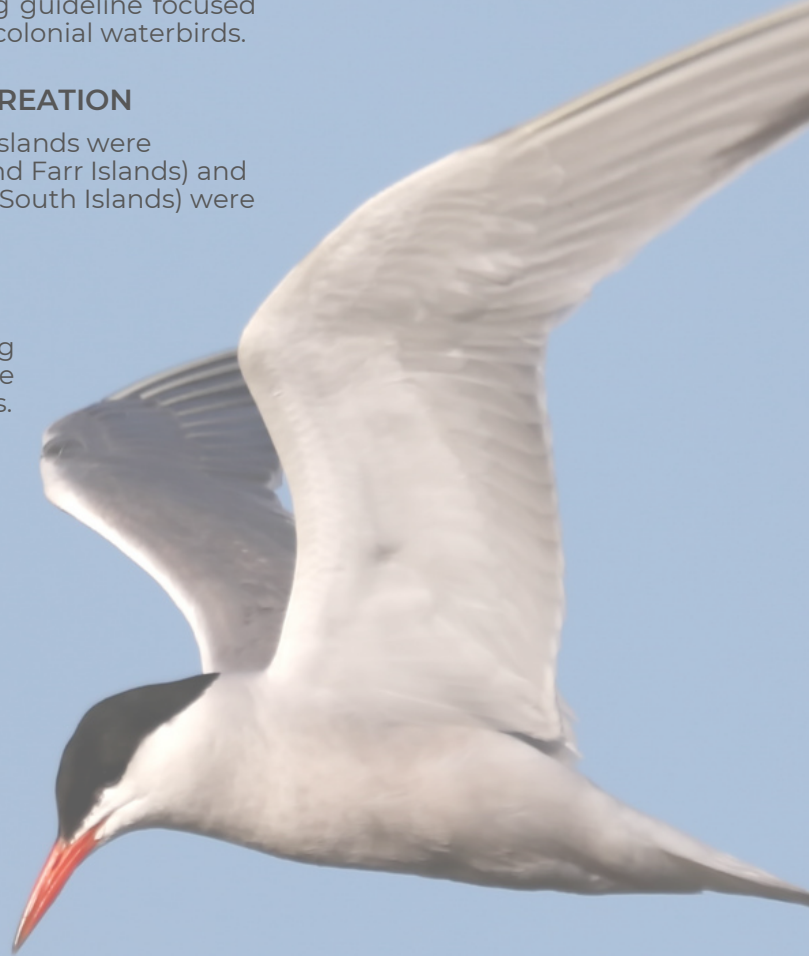
PUBLIC REVIEW

Public Forum is held on December 12, 2019 and status assessment is posted online for a 45-day commenting period.

2022

REDESIGNATION REPORT PUBLIC REVIEW

A criteria change is recommended alongside the status change to 'Not Impaired' after incorporating feedback from the public and internal stakeholders. Redesignation Report is posted online for 45-day commenting period.



in-person, one email submission, and three from an agency technical review. Most online/in-person respondents agreed with the status change (64%), whereas 21% were not sure and only 14% disagreed with the change.

Response to Public and Stakeholder Feedback

Adjustments are being proposed to the Wildlife Populations delisting criteria alongside the status change to 'Not Impaired' in order to address written feedback received from the stakeholder and public reviews. Recommendations included removing nesting counts as delisting criteria and removing the 'Other wildlife including waterfowl' statement as remediation efforts are being addressed through the Degradation of Fish and Wildlife Habitat BUI 14. Several reviewers also requested clarity on impacts of high-water levels, the future development of Pier 27, and long-term management. Below is an overview of the comments and responses. The full suite of comments that led to the recommended changes in delisting criteria can be found in Appendices 1 (stakeholders) and 3 (public).

Nesting Targets

Stakeholders recommended removing the nesting targets as delisting criteria and maintain them as adaptive management objectives because of factors outside the RAP's influence such as climate change and fluctuating water levels that change the amount of space the birds have to nest on in any given year.

Achieving population targets for specific species was expected to be highly speculative when the original criteria were set (Stage 2 Report), as well as the experimental nature of colonial waterbird management. As a result, the two Hamilton Harbour Remedial Action Plan Committees that oversee the management (Fish and Wildlife Advisory Committee and Colonial Waterbird Management Sub-Committee) have agreed to remove the nesting targets as delisting criteria, while maintaining them as adaptive management objectives. The current nesting trends reflect what is achievable based on available colonial waterbird nesting habitat in Hamilton Harbour, with continued management by HHRAP partners. Experts believe the Harbour has a sustainable, managed mixed community of colonial waterbirds that satisfies the original goal.



Photo credit: G. Barrett

Response: Delisting criteria updated.

Other Wildlife

Some reviewers commented that support for 'Other wildlife including waterfowl' (criterion #3) should be actioned under Degradation of Fish and Wildlife Habitat (BUI 14) rather than BUI 3b. Little can be done for other wildlife species (e.g., waterfowl and shorebirds) in the same manner in which was done for the colonial waterbirds (e.g., reserving nesting space with tarps). Wildlife beyond the colonial waterbirds would benefit by the creation of quality habitat, especially marsh and meadow marsh habitat in Cootes Paradise. Since the RAP's original intent was to support restoration of other wildlife through habitat creation, the 'Other wildlife including waterfowl' criterion has been removed here as it is being actioned through Degradation of Fish and Wildlife Habitat BUI. A status assessment for the Habitat BUI is planned for 2022/23.

Response: Delisting criteria updated.

Impact of High-Water Levels and Island Erosion

Several commenters raised concern with the increasing erosion of the Northeastern bird islands affecting the habitat quality and square footage especially with the higher water levels seen in 2017 and 2019. Smaller island footprints put increased pressure on the colonial waterbirds to compete for space and potentially push out the less aggressive species. Water levels are not expected to reach the same record-breaking levels every year.



At the time of the status assessment's publication, the consequences of higher water levels in Hamilton Harbour were not as well known. Currently the Hamilton Harbour Remedial Action Plan and partners are investigating funding for refurbishment of the Northeastern bird islands to replace eroded materials and potentially raise them. A minimum of 1.5 hectares of nesting space for the colonial waterbirds is part of the delisting criteria for BUI 14 Fish and Wildlife Habitat.

Response: Addressed through wildlife habitat quantity targets in the Habitat BUI.

Nesting Location: Pier 27

Pier 27 is owned by the Hamilton-Oshawa Port Authority (HOPA) and is a plot of space used to store sediments dredged from the Harbour, which can be seen from Eastport Drive south of the shipping canal along the eastern shore (shown below). It currently consists of dirt berms and is partially infilled by the Hamilton-Oshawa Port Authority (HOPA). HOPA projects that complete infilling and development of this confined disposal facility (CDF) will occur in 10-15 years' time. This would displace thousands of ring-billed gulls and double-crested cormorants, adding pressure for habitat in other areas of the Harbour and/or displacement of the birds to other area in the Great Lakes Basin.

Pier 27 was never intended as habitat, although a large amount of Hamilton Harbour's colonial waterbirds return to that location (primarily ring-billed gulls and double-crested cormorants). Continued development on Pier 27 should happen slowly and experts are anticipating increased competition from cormorants and ring-billed gulls on the wildlife islands as they are pushed off the HOPA properties. Displacement of the ring-billed gulls and double-crested cormorants may require increased management to handle extra pressure on available breeding habitat elsewhere in the Harbour, likely requiring continued management of the established nesting islands.

Response: Addressed through ongoing management of established nesting areas.

Future Monitoring

Several commenters asked for clarity on how colonial waterbirds will be managed beyond a status change. The long-term management strategy for the colonial waterbirds consists of three letters of commitment dedicating financial support for 10 years of management from the Hamilton-Oshawa Port Authority, and Cities of Hamilton and Burlington (contingent on annual budget approval). Year 2022 is the fifth year of the 10-year commitment. The colonial waterbird community will likely

Photo credit: Hamilton Harbour Remedial Action Plan



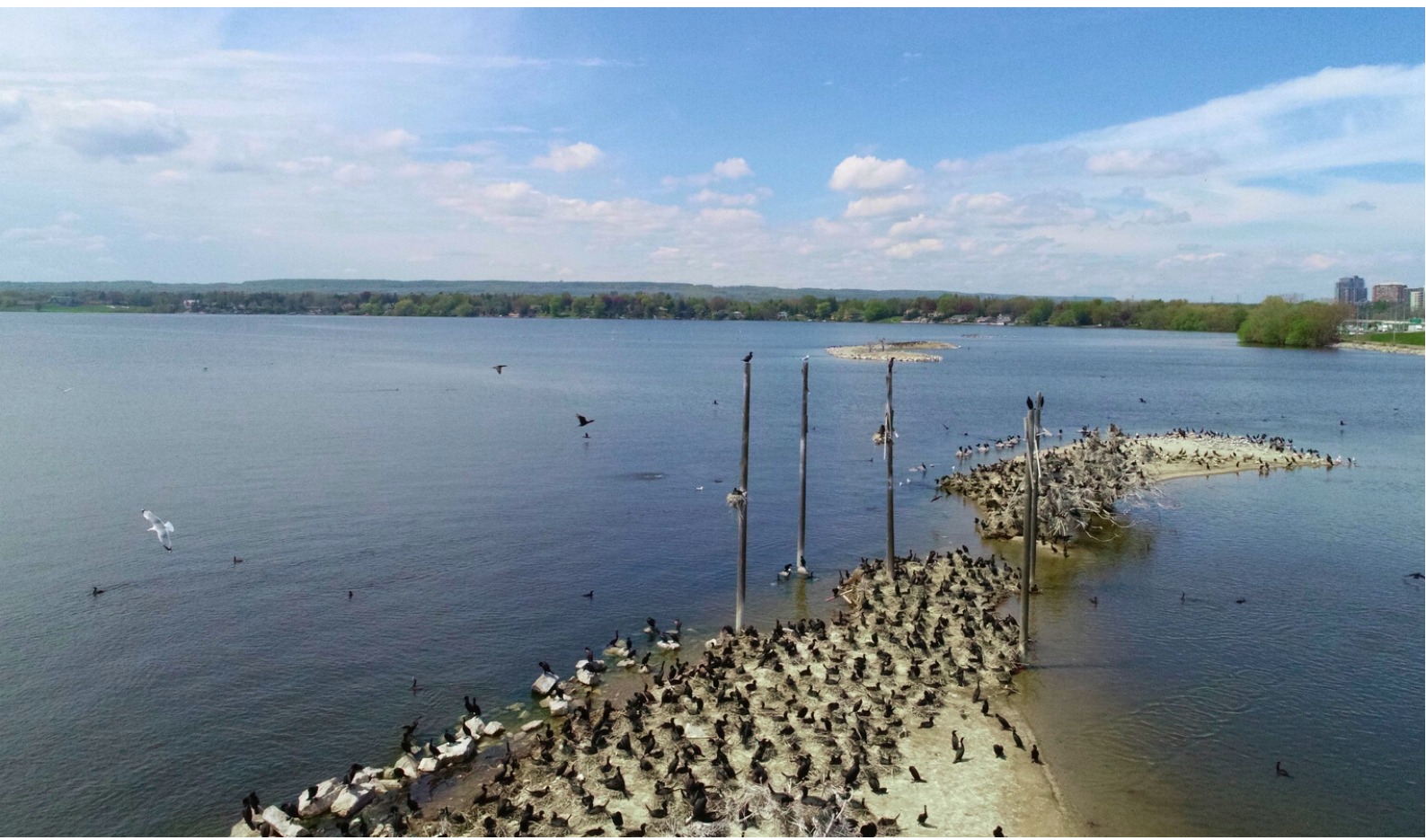
require continued management into the future to maintain current nesting levels, beyond the RAP program. We can expect bird populations to fluctuate across the Great Lakes, especially in urbanized areas under development, and an adaptive management approach will be integral to the management of these species in an urban setting. With continued stewardship, the colonial waterbirds will be a unique and key component of Hamilton Harbour's wildlife diversity.

Response: Continued monitoring and adaptive management with dedicated financial support.

Conclusion

Our assessment indicates that there is a sustainable mixed community of colonial waterbirds in the Hamilton Harbour Area of Concern. Stakeholders and the public were given opportunities to provide input to the re-designation process and 18 reviewers formally submitted written comments (3 from an internal technical review by stakeholders and 15 from a public review). To incorporate the suggestions from the review, a change in delisting criteria was required alongside the status change to 'Not Impaired'. The changes consist of removing nesting targets as strict criteria (maintaining them as adaptive management objectives) in addition to supporting 'other wildlife' through habitat creation. Other comments addressed included impacts of high-water levels, development of Pier 27, and future monitoring. Since the status assessment in 2019, nesting trends have generally stayed the same, except for a noticeable improvement for ring-billed gulls (showing a reduced population) and a one-year dip in common tern nest counts. With continued stewardship, the colonial waterbirds will be a unique and key component of Hamilton Harbour's wildlife community.

Photo credit: Environment and Climate Change Canada



APPENDIX 1

RESULTS OF AGENCY TECHNICAL REVIEW



Appendix 1: Results of Agency Technical Review

Below is a summary of the feedback received from an agency technical review by the Hamilton Harbour Remedial Action Plan committee members. Several staff from the Ministry of Environment, Conservation and Parks provided written comments. The main feedback involved potentially removing or revising the nesting target numbers as criteria (criterion 2), supporting ‘other wildlife’ (criterion 3) through habitat creation under the Degradation of Habitat BUI 14, as well as the impacts of high-water levels, gull food sources, terns nesting in previously contaminated areas (Windermere Wetland), and the impact of Pier 27 on nesting space when it is developed by the Hamilton-Oshawa Port Authority (HOPA) in the future.

Table 1. Condensed summary of the technical feedback received on the proposed status change of BUI 3b Wildlife Populations for the Hamilton Harbour Area of Concern and response.

Comment	Response
Delisting Criteria	
<p>Nesting Targets (Criterion 2) There were concerns that numerical nesting targets have not been met for two populations from 2016-2018 (herring gulls and black-crowned night-herons) as set in the delisting criteria. The report identifies that the goals are “met” with the caveats provided.</p> <p>The Great Lakes Water Quality Agreement stipulates that all criteria must be met to redesignate a beneficial use impairment (BUI) to ‘not impaired’.</p> <p>It is risky tying delisting criteria to specific population numbers because of factors outside the RAP’s influence such as climate change and fluctuating water levels that change the amount of space the birds have to nest on in any given year.</p> <p>Overall, the reviewers suggested removing the numerical targets from the delisting criteria and/or using improved trend data.</p> <p>Frequency Clarity was requested on how often/frequently the revised targets are required to be met in order for the populations to be considered not impaired. The reviewer expected it to not be 100% of the time due to natural variability in the numbers, but thought in order to delist it should be clear if the revised target needs to be met 1x, 50% of the time, for 3 consecutive years, etc.</p>	<p>Nesting Targets (Criterion 2) From the outset of the HHRAP, the overall objective was to have a self-sustaining mixed community of colonial waterbirds generally with an increase of the rarer species and a reduction in the number of ring-billed gulls which currently nest in the Harbour (Criterion 1). The nesting targets (Criterion 2) set in 1992 were revised once general levels had been reached (2012) to better reflect what was achievable, given the breeding habitat that would be available with the addition of wetlands in the Windermere Basin and population trends on a wider scale (Stage 2 Report and Zanchetta et al., 2016).</p> <p>Achieving population targets for specific species was known to be highly speculative when the original criteria were set (Stage 2 Report), as well as the experimental nature of colonial waterbird management. As a result, the two Hamilton Harbour Remedial Action Plan committees that oversee the management (Fish and Wildlife Advisory Committee and Colonial Waterbird Management Sub-Committee) have agreed to remove the nesting targets as criteria, but keep them as reflected in the science report to be used as a guide.</p> <p>Since no further additions to habitat are planned, the current nesting trends reflect what is possible under current conditions, and these general patterns are achievable in Hamilton Harbour with continued management. Following 20 years of management, experts believe the Harbour has a sustainable,</p>

<p>Qualifiers It was asked that the numerical targets for this BUI to be clarified (i.e. the range of values with a “+” tacked onto the end). They thought it was not clear what number of nests is desired, whether it should be between the range of values, or greater than the upper value.</p> <p>Other Wildlife (Criteria #3) A reviewer disagreed that Criteria #3 should be included here as a criterion. Suggested removal of reference to target for habitat as a criteria and include as a note. The RAP already has a committee dedicated to habitat targets for other wildlife (BUI 14).</p>	<p>managed mixed community of colonial waterbirds that satisfies the original goal.</p> <p>Nest Count Trends Since the status assessment in 2019, nesting trends have generally stayed the same, except for a noticeable improvement for ring-billed gulls (showing a reduced population), a rebound in herring gull nest counts to just below the targeted range, and a one-year dip in common tern nest counts. See individual species’ columns below.</p> <p>Frequency The 2012 targets are considered feasible as they have been met at some point in time (including post-report production), just not all simultaneously due to factors outside the Remedial Action Plan’s control, such as natural population fluctuations, black-crowned night-herons not being site tenacious and easily spooked, as well as changing water levels. Continuing to use the nesting targets is desired because they are specific, measurable, and achievable.</p> <p>Having further time-related targets on these already specific and measurable goals would be difficult to fulfill for all species in tandem and could make the goals unachievable, just due to natural fluctuations in breeding. However, each of the suggested timeframes (1x, 50% of the time, for 3 consecutive years) have been achieved by most if not all the species at some point since program inception.</p> <p>Qualifiers A nest target range followed by a ‘+’ (e.g., 200-300+) indicates a value above that targeted range would also be welcome. In other words, these are species that do not have obvious negative impacts on others and are species that experts hope to promote.</p> <p>Other Wildlife The original intent to support other wildlife was through habitat creation, especially along the shoreline. As such, the ‘other wildlife’ criterion will be removed here and addressed through the Habitat BUI. A status assessment for the Habitat BUI is planned for 2022/23.</p>
Black-crowned Night-herons (BCNHs)	
<p>Reviewers noted that black-crowned night-heron nest counts were below the target range, indicating in the two recent reporting years, the targets were not met. It</p>	<p>Monitoring and Management Limiting cormorant presence to preserve living trees is all that can be done to encourage black-crowned</p>

is unclear if data from those two years were anomalous or could be “explained” as to why that was not concerning to the numerical criteria. They suggested either revising the numbers to an expected range and removing the target numbers as criteria, or to specify why there may be an issue with the target numbers in the report if removed as criteria. One reviewer thought the overall target number could be met depending on how the assessment methods were outlined.

Given the report identifies finding/monitoring sites is also a challenge, reviewers wondered if there is a proposal for additional monitoring using other methods.

Another reason for the low numbers in 2017 was high water levels. Water levels were even higher in 2019, and overall, water levels in the Great Lakes are predicted to increase in the long-term due in part to increasing precipitation in the basin. As such, if population targets are to be achieved for a colonial waterbird species that are sensitive to high water levels, active management to find these species a long-term nesting habitat will be needed, as current nesting sites are not likely sustainable if water levels in 2017 were an issue.

night-heron nesting at Hamilton Harbour sites. This species is not site tenacious (site-specific) and has frequently abandoned sites due to competition by cormorants, causing them to find other nesting sites within the Harbour, and occasionally requiring time and effort to find them. The presence of time lags between site abandonment and identification of new nesting sites could explain the variability in the monitoring data. Pursuing censuses in these areas will be important to determining the status of this species.

While it is true that some black-crowned night-herons that select nest sites among rocks at the edge of some islands rather than nesting in trees are susceptible to high water levels, they are also not at all site tenacious and are difficult to find every year irrespective of the water level. They may experience a great deal of disturbance in the Harbour. For example, kitesurfers have been observed racing by South Island and unknowingly disturbing the nesting birds. These birds are also shyer than the other species. In a disturbed area like Hamilton Harbour, a quiet spot that is not going to face some disturbance is hard to come by, and even when they are in such a spot, they seem to up and move without obvious cause. Low numbers are also the result of birds known to be nesting on shoreline property that cannot be accessed by researchers. The relative contribution of each issue to current population levels is not known.

In the last several years black-crowned night-heron nest counts in Hamilton Harbour have risen from 41 nests (2017), to 80 nests in 2018, and 126 nests in 2019, which is within the numerical goals for the Harbour, but dropped to 69 and 44 nests in 2020 and 2021. The nest counts rebounded even with the high-water levels in 2019, which signals that site tenacity and time lags to find the nests contributes to more variability in the counts. In the future, experts hope to establish better communication with the Hamilton Naturalists’ club to increase the likelihood of finding nesting black-crowned night-herons in new nesting areas.

Currently the Hamilton Harbour Remedial Action Plan and partners are investigating refurbishment of the northeastern bird islands to replace eroded materials and raise them. This is a multi-year project that is at the stage of seeking funding.

	<p>Nesting Targets</p> <p>The criteria were based on educated guesses about possible stable population sizes in the face of multiple factors affecting populations. The two Hamilton Harbour Remedial Action Plan committees that oversee the management (Fish and Wildlife Advisory Committee and Colonial Waterbird Management Sub-Committee) have agreed to remove the nesting targets as criteria, but keep them as general guides.</p>
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Herring Gulls

<p>Management and Nesting Targets</p> <p>There was concern for herring gull nest counts being on a downward trend in Hamilton Harbour, most notably in the past three years. One reviewer wanted a recommendation for further long-term management despite the decline being representative of overall Great Lakes Basin declines. Another questioned how consistently a target has to be met for a status change to be justified or not.</p> <p>Food Sources</p> <p>It was questioned whether the decline in herring gull nests is the result of improved garbage practices (food availability lowered for this species) and therefore would be in line with the natural order of things. Achieving a target of 300 nests for this species should not be imperative if it is dependent on poor garbage practices. Reviewers wanted rationale on why ring-billed gulls are being discouraged while herring gulls encouraged, given they seem to be in a similar niche.</p>	<p>Management</p> <p>Limiting cormorant nests is the primary strategy to encourage herring gull nesting in Hamilton Harbour. It is possible that herring gulls are nesting on rooftops and that has contributed to the decline at the island sites; however, this would be difficult to track and report on. Roof nesting would likely lead to low reproductive success, so local scaring of herring gulls from roof tops during egg laying may be worth encouraging.</p> <p>The natural fluctuation of populations was not considered when the original numerical goals were created and remain difficult to predict. After 20 years of studying the colonial waterbird community it has become clear that it is unlikely a population will consistently stay within a desired range indefinitely. Factors outside the Remedial Action Plan’s control such as water levels can affect nest counts in any given year. Nonetheless, high water levels and competition for nesting habitat by cormorants are factors to consider and manage where possible.</p> <p>Nesting Targets</p> <p>The main reason for encouraging herring gulls to nest at the Harbour is that they are a native species at much lower abundance than ring-billed gulls. As stated in Zanchetta et al. (2016): ring-billed gulls, the most abundant colonial waterbird on the Great Lakes, have increased by 135.1% from 1976–80 to a peak of ~720,000 nests in 1989–1990, but then declined by 18.5% during the last (fourth) census period (2007–2009). In Hamilton Harbour, numbers declined by 70.3% over the same period (1990–2008). The number of herring gulls breeding on the Great Lakes has fluctuated slightly, but remained around 66,000 nests as of a decade ago. Recent data suggests that nest numbers are declining across the Great Lakes, including locations in Lake Superior and Niagara Region (Hebert et al., 2020). After the initial period of</p>
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	<p>increase (up to the early 1990s), herring gull nests in the harbour have generally fluctuated within or just below the 200–300 nest range.</p> <p>Nest counts since production of the status assessment have rebounded from 109 nests in 2017 to 164, 153, 170, and 171 nests from 2018 -2021, respectively, just shy of the targeted range.</p> <p>Food Sources Fortunately, few garbage surfing opportunities exist in that area, but the suggestion that they may be limited by modern dump practices suggests room for future research using telemetry.</p>
<p>Ring-Billed Gulls (RBGUs)</p>	
<p>Concern was expressed that there is only one year (2007) where the ring-billed gull population appeared to be at the <10,000 nest target. The shaded area representing the target in the report graphs was questioned for accuracy. Page 18/19 references a target of 10,000-12,000 birds for the goal of the 2007 adaptive management plan and an apparent discrepancy between the goal of the plan and the revised target. A reviewer questioned how a target could be met if it is less than the goal of an adaptive management plan. Based on this they did not think a status change is warranted.</p>	<p>The target was <10,000 nests. The adaptive management plan is the overall active management of nesting colonial waterbirds by humans (i.e., using tarps to save nesting space), which initially brought nest counts down to 10,000-12,000 and demonstrates how human management successfully decreased the number of nesting ring-billed gulls. Moreover, the decline in nesting ring-billed gulls is mostly due to the Hamilton-Oshawa Port Authority excluding gulls from more and more of Pier 27. This location was never intended as habitat.</p> <p>Ring-billed gull nest counts in the years following the status assessment have dropped from 10,519 nests in 2017 to 6,964 nests in 2020 and 7,987 nests in 2021, well within the targeted range of <10,000 nests.</p> <p>The line plus the arrow is depicting the goal of 10,000 nests (line) or less (arrow).</p>
<p>Double-Crested Cormorants (DCCOs)</p>	
<p>Suggested changing the target from <2,500 double-crested cormorant nests to 3,500-4,500 nests as there is an increasing trend in nests counts and only one year since 2005 when the target was met (2008). Also noted that there would need to be justification for this change and assurance that it wouldn't affect the other populations negatively. Requested explanation of the lowered double-crested cormorant nest counts in 2008 and 2015 (when the target was met and nearly met, respectively).</p>	<p>In 2008 cormorants were prevented from nesting on South Island for the first time. The largest declines in nest numbers that year were on South Island (670) and Farr island (354). In 2015 cormorants nested later than usual and in lower numbers. Numbers of cormorant nests were down on all sites, so this may have been related to weather conditions or other large-scale factors. While it has not been tested, it is certainly possible that the relatively lower numbers of cormorant nests were not statistically significantly lower.</p>

<p>The report noted that the existing nest numbers reflect basin-wide populations. One reviewer recommended that the target be revised to reflect the basin-wide population, if it is indeed the goal and the current nesting target cannot be met.</p>	<p>In the years following report production cormorant nest counts decreased from 4520 nests in 2017 to 3490 nests in 2018 and rose back up and hovered around the 4600 mark from 2019-2021, so there were large fluctuations followed by plateauing.</p> <p>The targets were set over 20 years ago as a best guess at what was achievable for the Harbour and was the first large scale management of its kind in the Great Lakes. Achieving specific populations of species as well as the experimental nature of colonial waterbird management was highly speculative. As a result, the two Hamilton Harbour Remedial Action Plan committees that oversee the management (Fish and Wildlife Advisory Committee and Colonial Waterbird Management Sub-Committee) have agreed to remove nesting targets as criteria, but keep them as general goals for future adaptive management. Following 20 years of management, experts believe the Harbour has a sustainable, managed mixed community of colonial waterbirds that satisfies the original goal.</p>
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Common Terns (COTE) and Caspian Terns (CATE)

<p>Agreed that the common tern target has been achieved from 2009-2017 and that the population is not impaired.</p> <p>Agreed that with the exception of 2003, the Caspian tern population is within the revised target from 1997-2017 and is the most stable colonial bird population in the Harbour.</p>	<p>The Caspian tern population is one of the most stable of the Harbour’s colonial waterbird community. Nest counts in the previous 5 years have spanned 595 to 824, all within or exceeding the desired range of 400-600+ nests. In 2020 there was a dip in the number of nests due to great-horned owl predation at the Windermere Basin Islands and the colony has since moved to the North Islands and north end of Centre Island in 2021. Management teams are working with qualified contractors to reduce the impact of owl predation at the Windermere sites.</p> <p>Common terns are very site-specific (site tenacious) and tend to nest on the Windermere Basin islands. For most of the past decade, the nest counts have been in or even exceeded the desired range of 300-600+ nests. The recent dip in numbers resulted from low reproductive success due to predation by great-horned owls as well as nesting at the perimeter of the islands, which is not ideal nesting and fledging space. With the relocation of Caspian terns to the Northeastern Islands in 2021 and efforts to relocate and repel the owls, high-quality nesting space is available for common terns. However, continued pressure by nocturnal predators in Windermere Basin (particularly the great-horned owls, but also including racoons) is putting the tern colonies at risk and will require some innovative management.</p>
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Further Monitoring or Action Required

Requested wording that a long-term management strategy is undertaken as a note in the report for future actions and deleted as a criteria (If it is a criteria, how do you demonstrate it is met? Is it the letters of commitment – if it is a criteria, it needs to be “measurable” and “met”).

Reviewers proposed that future management efforts be directed at limiting cormorant presence and efforts to locate night-herons following site abandonment.

More information was requested on other colonial nesting water birds in Hamilton Harbour, beyond the islands.

The long-term management strategy is represented by the letters of commitment dedicating financial support for 10 years of management. Although it is being removed as a strict goal that needs to be ‘met’ for this BUI by way of moving the assessment of ‘other wildlife’ to the Habitat BUI (wording is in the same paragraph), the letters remain in place.

Future Colonial Waterbird Management

Page 32 of the status assessment (Appendix 6) outlines the future commitments for the waterbird colonies, notably that funding for the long-term management strategy has been secured. There is a ten-year funding commitment for McMaster University’s management, monitoring & reporting program, supervised by Dr. Jim Quinn, Biology Department, to ensure the sustainability of the program:

- Hamilton-Oshawa Port Authority: \$6,000 per year,
- City of Hamilton and City of Burlington: \$5,000 per year each (contingent on annual budget approval), and

And ten-year funding commitment for continuation of management contract:

- Coordinated contract for springtime ring-billed gull control (& tern encouragement) with Hamilton-Oshawa Port Authority (Pier 27) and City of Hamilton (Windermere Basin).

Limiting cormorant presence and continuing efforts to locate black-crowned night-herons following breeding site relocations by the birds will be part of the ongoing management.

Colonial Waterbirds Outside the Islands

The RAP monitors all colonial nesting birds in Hamilton Harbour. Beyond the northeastern bird islands, Hickory Island as well as the headlands and on the mainland throughout the Harbour and Cootes Paradise are monitored. Island monitoring is the focus because most of the management efforts are directed at the islands as they were designed specifically for the species that the RAP set goals to bring back.

When Pier 27 is developed, intensified protection of the bird island habitat may be needed. At the moment, it is unknown how much extra pressure for habitat there will be in 10-15 years and whether the displaced cormorants and ring-billed gulls will move to Lake Ontario.

Other Factors: Climate Change, Lake Levels, Algal Blooms	
<p>Address water level conditions, which could be a challenge for islands and habitat, as part of the future management strategy.</p> <p>Page 34, Paragraph 2: I disagree that the conditions in 2017 were "exceptional". Water levels were even higher in 2019, and the prediction is that water levels are increasing across the Great Lakes basin due to a changing climate (increase in precipitation).</p>	<p>Water Levels:</p> <p>Elevated water levels are a Great Lakes basin-wide phenomena. At the time of publication, the consequences of higher water levels in Hamilton Harbour were not as well known. Currently the Hamilton Harbour Remedial Action Plan and partners are investigating refurbishment of the northeastern bird islands to replace eroded materials and raise them. This is a large-scale project that requires funding.</p> <p>At the time of publication, the conditions in 2017 were exceptional. Water levels across the Great Lakes are primarily the result of natural, uncontrolled water supplies into the basin. Lake Ontario experienced a record-high water level in 2017 of 75.88 meters. It then exceeded that just two years later in 2019, with a new record of 75.92 meters (excerpt from <i>Vol. 4, Issue 7 - Great Lakes Connection monthly newsletter - IJC - October 2019</i>). Water levels have not been as high since. Climate change is a great risk factor that will affect many colonial nesting populations throughout the Great Lakes. It is possible that water level changes can overwhelm the controls that organizations have at their disposal.</p>
Other Factors: PCBs	
<p>It is noted that both species of terns are now dependent on habitat in Windermere Basin. Suggest to identify if anyone has looked into any changes in contaminant burden of these species coinciding with this change in nesting location in the harbour. These species are nesting in one of the most PCB-contaminated areas of the Harbour.</p>	<p>The tern nests are largely located in the Windermere Basin wetlands where they feed on fathead minnows. Before the wetland's creation, the contaminated sediments were dredged and capped in cells. Flow into the wetland is through a small fishway supplied primarily by the Red Hill Creek. Contaminant burdens are beyond the scope of this BUI and are examined through BUI 5: Animal Deformities or Reproductive Issues.</p>
Other Factors: Pier 27	
<p>The impending development of Pier 27 puts additional pressure on the terns and night herons as the gulls and cormorants that had been nesting at Pier 27 will be looking for new nesting sites. Given the statement in the report that "the presence of competition for available nesting habitat is not specific to Hamilton Harbour" (p.33), there is a sense that colonial waterbird populations in the HH AOC are not entirely in line with</p>	<p>We can expect bird populations to be in constant flux especially in urbanized areas under development and the Hamilton Harbour colonial waterbird populations need management in perpetuity. The Hamilton-Oshawa Port Authority predicts that Pier 27 will be developed in the next 10-15 years. Continued development on Pier 27 should happen slowly and experts are anticipating increased competition from</p>

<p>the RAP’s desire for sustained achievement of current target numbers, particularly while current populations are still in flux. This should be noted as an item to be addressed for the long-term monitoring and management.</p>	<p>cormorants and ring-billed gulls on the wildlife islands as they are pushed off the port authority properties. The decrease in available nesting habitat at Pier 27 may exert additional pressure at other locations throughout the Harbour, and possibly Lake Ontario.</p>
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References:

Gilroy, E. 2019. Status Assessment Report of the Beneficial Use Impairment “Degradation of Wildlife Populations” for the Hamilton Harbour Area of Concern. Report submitted to the Colonial Waterbird Subcommittee, Hamilton Harbour Remedial Action Plan, and Great Lakes Areas of Concern Section, Environment and Climate Change Canada. 59 pp. (see Appendix 6)

Hamilton Harbour Remedial Action Plan. 2002. Remedial Action Plan for Hamilton Harbour: Stage 2, 306 pp.

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Zanchetta, C., Moore, D., Weseloh, D., and J. Quinn. 2016. Population trends of colonial waterbirds nesting in Hamilton Harbour in relation to changes in habitat and management. *Aquatic Ecosystem Health & Management* 19:192-205.

APPENDIX 2

PUBLIC REVIEW AND ENGAGEMENT OPPORTUNITIES



Appendix 2: Public Review and Engagement Opportunities

Introduction

In the thirty-year history of the Hamilton Harbour Remedial Action Plan, the Stakeholder Forum was used as the primary means of public outreach and the public decision-making body for BUI changes. It consists of around 40 agencies that have a “stake” in the remediation of the Harbour and the meetings are publicly open to anyone interested in attending. It has been involved in the development and review of all RAP guiding documents (Stage 1, Stage 2, and Stage 2 update reports) and reviews of BUI criteria and status changes. The last time the Forum convened was 2012. At that time, the Wildlife Populations BUI was spotlighted with proposed changes to refine the numerical targets following habitat creation in Windermere Basin and expanded knowledge of population management.

In 2018/2019, the federal and provincial governments requested a review of remediation criteria and status updates on the issues using the latest knowledge. In 2019/2020, the Hamilton Harbour Remedial Action Plan (HHRAP) hosted a series of three Public Forums (including stakeholders) to seek input on proposed criteria changes and to provide status updates. This time, the Remedial Action Plan focused on increasing public awareness and engagement opportunities while continuing traditional stakeholder engagement. This was the largest public outreach of its kind arranged by the HHRAP and included numerous new outreach methods as described below.

Digital Engagement: Website

The media campaign for the Forum centered on directing traffic towards the HamiltonHarbour.ca website. The banner on the main page and event postings on the side of all pages linked visitors to a dedicated Public Forum landing page (hamiltonharbour.ca/forum). Viewers would find public-friendly information on each BUI that had proposed changes, agendas, science reports and fact sheets, as well as an Eventbrite invitation to RSVP. A YouTube video on the Hamilton Harbour Wildlife Populations BUI was also inserted on the page for educational purposes. The landing page went live approximately 1 week before the Forum presentation to give interested participants time to review the information.

There were several ways to submit comments. Links to the online feedback form (hosted by Survey Monkey) were available on the website for 45 days (see form and results in Appendix 3). Interested persons could also submit in-person comments at the Public Forum event orally or through a paper copy of the feedback form. Emailed responses were also received and accepted, although the HHRAP did not solicit public responses via this method.

Traffic from the commenting period December 3, 2019 – January 17, 2020 included 394 landing page views (258 unique) of 2,806 total visits to the website. Users spent on average 02 min 38 seconds on the landing page, one of the highest for the website. Website views were primarily from Canada at 97%, but reached as far as the USA, Costa Rica, and United Kingdom. Of the views from Canada, 40% were local Hamilton viewers, 7% Burlington, 22% Toronto, 11% Gatineau and remaining 10% were from Kitchener, London, Vaughan, Pelham, Mississauga, and unknown.

Digital Engagement: Social Media (Facebook, Twitter, and YouTube)

The HHRAP created Facebook and Twitter posts to promote the Public Forum event and direct traffic to the HamiltonHarbour.ca website where the scientific and event information could be found. Partners such as Conservation Halton, Hamilton Conservation Authority, the City of Hamilton, and the Hamilton Port Authority retweeted and shared the posts to their media feeds to help reach a larger audience. Other

public-interest groups also shared the posts to their pages including the Sherman Hub, Northend Information, Bayfront Neighbourhood Hamilton, Hot fishing spots around Hamilton, Hamilton Harbour Squad, Canadian Carp Anglers of Ontario, Ontario Fishing Club, and numerous personal pages.

In collaboration with Mohawk College students, the HHRAP also created and posted YouTube videos advertising the Public Forum (30 seconds) as well as a longer 2.5-minute video specific to the wildlife populations BUI as a short snapshot of the proposed changes. The longer video was featured on the Forum landing page and both videos were shared through Facebook posts.

Table 2: Social media metrics illustrating the reach and interaction of Facebook, Twitter, and YouTube posts during the review of the BUI 3b Wildlife Populations proposed status change.

Social Media Metric	Facebook	Twitter	YouTube Videos
Total Followers	1,327	2,123	3
Number of Posts	3	3	2
Total Impressions (people reached)	2,355	4,338	397
Total Engagements (post interactions)	126	49	N/A

Note: Metrics are for BARC generated & shared content only. Metrics for organizations that created their own content based on these posts are not included (e.g., Conservation Halton).

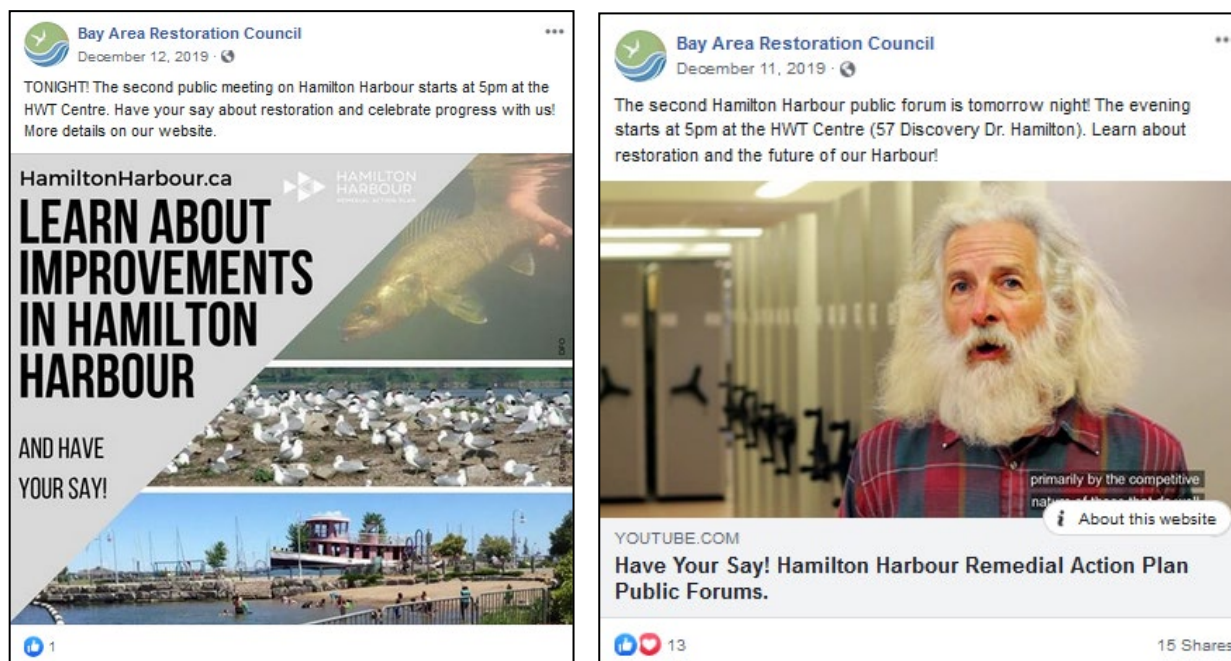


Figure 1. Two examples of Facebook posts advertising the Public Forum on the Bay Area Restoration Council’s news feeds. Partners shared posts to gain widespread attention from Hamilton and Burlington viewers.

Digital Engagement: Local Television

The Public Forums were advertised on two local Cogeco television channels: Cable 14 in Hamilton and Cable 23 in Burlington and Oakville. The static advertisements aired from late October through January. The ads briefly described the public meetings, date, and time, as well as directing interested persons to the website where they could find information to submit comments and/or RSVP through Eventbrite. At the same time,

the events were featured on the local YourTV Community Bulletin Boards several weeks preceding the Public Forum.

Digital Engagement: Eventbrite

The Eventbrite listing for the Public Forum events could be found through a site search for Hamilton or Burlington events as well as on HamiltonHarbour.ca, and through hashtags #Hamilton, #Burlington, #Hamilton_Harbour, #Burlington_Bay, #Remedial_Action_Plan. The basic event information was posted as well as a brief description and link to free tickets that would provide an automatic reminder a couple days before the event. It also provided a mechanism to RSVP to the Public Forum events. A total of 25 guests RSVP'd to the December 12th event using Eventbrite, which allowed staff to gauge the number of attendees for seating, printing, and food planning purposes. Stakeholders were invited and RSVP'd via email.

Offline Engagement: Bus Advertising

To engage Hamiltonians by non-digital means, the HHRAP created 20 interior bus ads that were posted for minimum 4 weeks through Street Seen Media. The bus ads were not targeted to any specific route as the physical buses switch routes every day. The ad pointedly directed riders to the website where they could have their say on improvements to Hamilton Harbour and find the Public Forum information.

Offline Engagement: Newspapers

Public Forum advertisements were purchased for the two largest local newspapers as a second means of print engagement. The 1/8 sized ads were featured in both the Hamilton Spectator (Saturday delivery) and the Burlington Post (Thursday) about a week and a half before each Forum. In addition, small classified-styled ads were placed in the free "too good to miss" community events section of the Hamilton Spectator. The papers are delivered to over 300,000 households in Burlington and Hamilton as well as the surrounding areas.

The Hamilton Spectator also featured an article on the Wildlife Populations BUI in their newspaper on Dec 12, 2019 (online) and December 13, 2019 (in print; see Appendix 4 for copies). The online version advertised the Public Forum event.

Outreach Event: Boat Tour

As a kickoff to the Public Forum, the Hamilton Harbour Remedial Action Plan (HHRAP) arranged a boat tour to see recent progress in the Harbour's remediation and showcase the Northeastern bird islands where the Colonial Waterbirds reside in the spring and early summer.

The HHRAP offered complimentary tickets. A total of 25 stakeholders attended the tour and the remaining 45 free tickets were given to interested members of the public. Beyond this, the cruise company opened the event to the public, so more people attended than were directly invited by the HHRAP. The Hamilton Harbour Queen embarked on Sunday September 22, 2019 from Pier 8 or 47 Discovery Drive in Hamilton and cruised from 2:00 – 3:30 pm.

The tour route featured the Northeastern bird islands where the colonial waterbirds reside in the spring and early summer. It also ventured past the Randle Reef Environmental Containment Facility (ECF) while in construction (walls were built), Canada Centre for Inland Waters, La Salle Park and Marina, Carrol's Bay, the entranceway to Cootes Paradise and the Fishway, the western Harbour and Waterfront Trail, as well as Pier 4 Beach. Positive feedback was received after the event for the opportunity to see the Harbour from a unique vantage point.



Figure 2. Photograph of the Hamilton Harbour Queen that hosted the Pubic Forum Boat Tour in September 2019.

Outreach Event: Remedial Action Plan Public Forum

The Hamilton Harbour Remedial Action Plan hosted a series of three public forum events for an opportunity to hear feedback on proposed changes for several BUIs. The feedback would be used to either make further adjustments or confirm that the public agrees with the proposed changes. The venue of the event was purposefully chosen to be at the Harbour's edge (The Hamilton Waterfront Trust's Discovery Center, 57 Discovery Drive or Pier 8 in Hamilton) to honour an Indigenous tradition to have the water present when being spoken about, in addition to having the location easily accessible by bus.

The second of the three forum events on December 12th, 2019 (5:30-8:30 PM) featured the Wildlife Populations BUI proposed status change from 'Impaired' to 'Not Impaired'. A total of 52 people attended this event and were provided with paper or electronic copies of the science documents and short summary, a paper feedback form and submission box, 2018 Fact Sheets on all BUIs, a chance to sign up for E-Blast updates from the Bay Area Restoration Council (BARC), and promotions for the HHRAP Fishing Survey. The first 30 minutes of the 2.5-hour meeting was a chance to mingle and ask questions to the scientists and HHRAP Staff before the presentation. Light refreshments, appetizers, and sandwiches were provided.

In the first half of the evening, the lead scientist and subject-matter expert, Dr. Jim Quinn from McMaster University presented on Hamilton Harbour's Wildlife Populations BUI. He described the proposed status change from 'Impaired' to 'Not impaired' and supplied supporting information including a short history, habitat creation, attracting and managing the colonial waterbird populations, emerging issues, the ongoing monitoring of the birds, and 10 years of dedicated support. There was over half an hour for follow-up questions, most of them centering around algal blooms and climate change. Dr. Quinn verified that he has not seen colonial waterbird deaths resulting from algal blooms, as birds are autopsied at the University of Guelph. Overall, the in-person feedback seemed positive towards the change in status.

There was media presence from the largest local newspaper, the Hamilton Spectator, at the event (Matthew Van Dongen). Information about the colonial waterbirds and Public Forum was highlighted in the newspaper (see above).

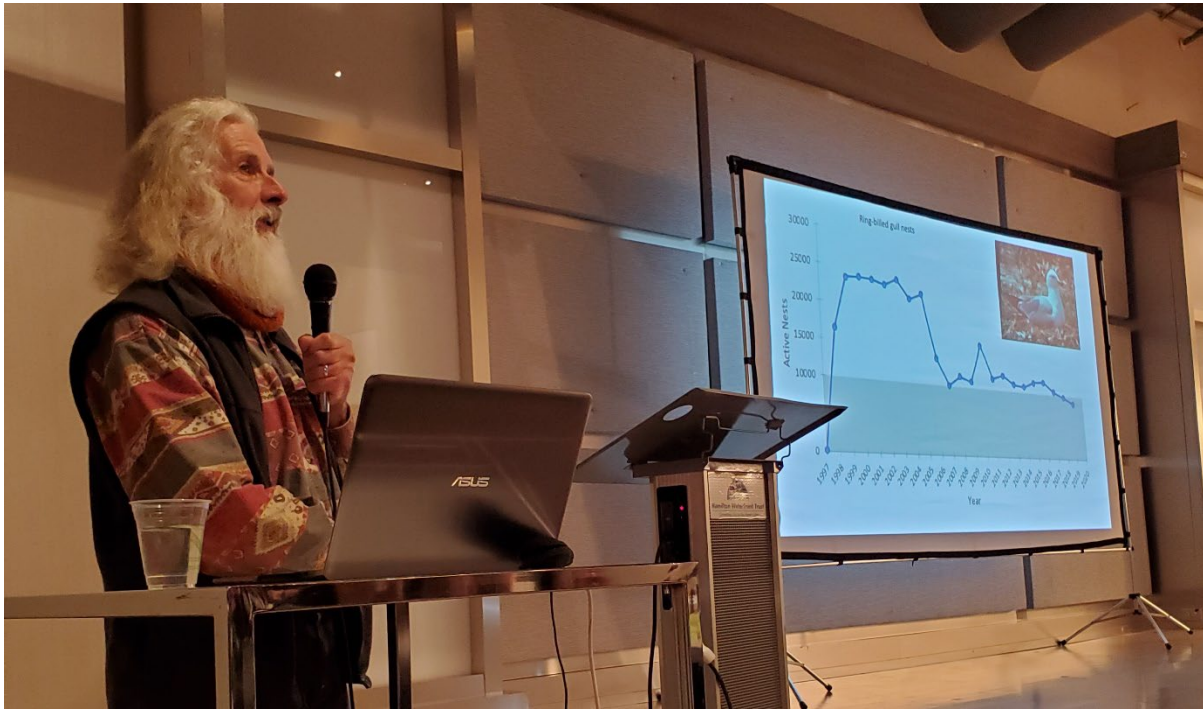


Figure 3. Dr. Jim Quinn presenting on the Wildlife Populations BUI at the December 12, 2019 Public Forum.

Outreach Contact List

Below is a list of groups and agencies invited to participate in outreach opportunities (boat tour and December 12, 2019 Public Forum). Those in bold are agencies that participated in either event.

Ainslie Wood Westdale Community Association of Resident Homeowners (AWWCA)
ArcelorMittal Dofasco
Bay Area Restoration Council
 Burlington Chamber of Commerce
 Burlington Golf & Country Club
Burlington Sustainable Development Committee
 City of Burlington
 City of Hamilton
 Conservation Halton
 Environment and Climate Change Canada
 Environment Hamilton
 Fisheries and Oceans Canada
 Green Venture
Hamilton Bay Sailing Club
 Hamilton Beach Community Council
Hamilton Conservation Authority
Hamilton Industrial Environmental Association
 Hamilton Naturalists' Club

Hamilton-Oshawa Port Authority
Hamilton Waterfront Trust
 Keith Neighbourhood Hub
 Leander Boat Club
Macassa Bay Yacht Club
McMaster University
Ministry of Natural Resources and Forestry
Ministry of the Environment, Conservation and Parks
 Mississaugas of the Credit First Nation
North End Neighbourhood Association
Ontario Federation of Agriculture
Royal Botanical Gardens
 Stelco
Stelco Fishing Club
Stewards of Cootes Watershed
 Strathcona Community Council
Swim Drink Fish
 The Regional Municipality of Halton
 United Steelworkers of America

APPENDIX 3

RESULTS OF PUBLIC REVIEW



Appendix 3: Results of Public Review

A total of 15 respondents submitted feedback from the public review: twelve online, two handwritten in-person, and one email submission. Most online/in-person respondents indicated that they agreed with the status change (64%), whereas 21% were not sure and only 14% disagreed with the change. Almost all participants had read both the provided factsheets and the status assessment (Appendix 7). A summary of the feedback can be found in the table below, with comments and responses grouped into similar themes. The main concerns were the status of wildlife other than colonial waterbirds, climate change/high water levels and resulting erosion of the bird islands, algal blooms, and the abundance of cormorants, as well as the future development of Pier 27 potentially influencing habitat at the bird islands.

Table 3. Summary of the feedback received on the proposed status change of BUI 3b Wildlife Populations for Hamilton Harbour.

Comment	Response
Proposed Status Change	
<p><u>ROYAL BOTANICAL GARDENS</u> Wildlife Populations – A difficult one for sure. 1. Most wildlife species (excluding colonial birds) have significantly impaired populations, partially because most the habitat is still missing, but perhaps for other reasons as well this is not within the factsheet. The colonial birds have yet to be resolved as having secure habitat is not clear, and currently populations only continue to exist through ongoing intensive management activity (they exist and that is wonderful!). The agreements put in place for this management are definitely wonderful, however also as noted in the supporting report there are several thousand cormorants that will be looking for a new home in the future as the home gets redeveloped by the port authority which will then also have implications for the other species and perhaps locations that we are not yet aware of.</p> <p><u>HAMILTON INDUSTRIAL ENVIRONMENTAL ASSOCIATION</u> I believe the people involved have done an exceptional job in working towards this goal to change the status to Not Impaired and want to congratulate them on a job well done. I realize that this does not mean the work is over as there is a need to continue monitoring and managing the efforts.</p>	<p>Progress Towards a Status Change Over the past four decades, Hamilton Harbour has supported one of the largest and most diverse assemblages of nesting colonial waterbirds on the Great Lakes, which includes breeding colonies of ring-billed gull, double-crested cormorant, herring gull, common tern, Caspian tern, and black-crowned night-heron.</p> <p>The management of colonial waterbird nesting at Hamilton Harbour is a success story for the Great Lakes. While four species (i.e., black-crowned night-heron, ring-billed gull, herring gull, and common tern) have declined across the Great Lakes region during the last four decades, Hamilton Harbour has sustained colonies every year. For example, black-crowned night-heron nest numbers declined by 40% since the late 1970s, whereas nest numbers at Hamilton Harbour have generally increased since the early 1980s and hover around 200 nests per year (Zanchetta et al., 2016). A sustainable, mixed community of colonial waterbirds has been achieved in Hamilton Harbour, contrasting the declines seen across the Great Lakes for these species.</p> <p>There were several challenges to achieving a sustainable, mixed community of colonial waterbirds. The harbour is a highly industrialized setting with competing land-use priorities and there have been</p>

RESILIENT CONSULTING

Populations appear to meet the targets with ongoing management. I consider it important that ongoing management remains a priority in perpetuity.

PUBLIC

Degradation of Wildlife (waterbirds) Efforts, some heroic, have had much success and have achieved all that can be expected at this time as well as indicating future management directions. I agree with the report.

Congratulations!

Glad to hear the updates and see populations moving in the right direction with targets -Concerned about the rising water levels impacting the nesting islands in the future and hope there will be funding available to build up the habitat with plans for climate resilience -Hopeful that the fluctuations in BCNH numbers will stabilize and grow, and that fluctuations are due to secretive nesting more than competition.

My initial reaction to the reports I have read is to agree that the wildlife is no longer impaired. However, I have reservations about that partly because the populations still have to be managed at their colonies. In a healthy, stable system, wildlife populations should be self regulating and not need outside management. I think there is an element to the wildlife populations within the harbour that hasn't been dealt with. For one thing, since all of the species monitored in the harbour are piscivores, until the fish community is healthy the fish eating bird community can't be considered unimpaired.

considerable changes over time in the amount of "available" habitat. While distribution and abundance of waterbirds within the harbour is largely influenced by population trends across the Great Lakes region, competition between species for nesting space adds additional complexity and uncertainty for managing the islands. The Hamilton Harbour Remedial Action Plan response has been adaptive management, where specific techniques are implemented, assessed, and refined on an annual basis (Zanchetta et al., 2016).

Habitat Pressure

Experts believe the current nest counts are sustainable with continued management using the 10 years of funding that has been secured for these activities. Currently the Hamilton Harbour Remedial Action Plan and partners are investigating refurbishment of the northeastern bird islands to replace eroded materials and raise them. This is a multi-year project that is at the stage of seeking funding.

Pier 27 was never intended as habitat, although a large amount of Hamilton Harbour's colonial waterbirds return to that location. Displacement of the ring-billed gulls and double-crested cormorants would require increased management to handle extra pressure on available breeding habitat elsewhere in the Harbour. The island colonies need to be managed in perpetuity, even if the potential development of Pier 27 has an impact.

With the management of the Northeastern bird islands and maintenance of the Windermere Basin islands, the physical habitat created for the waterbirds is secure. Without intensive management, the community of colonial waterbirds within Hamilton Harbour would revert to being unbalanced. Adaptive management is all that can be done to maintain the waterbirds in an urban area with pressure from Great Lakes populations, which is outside the scope of the local Remedial Action Plan.

Self-Regulation of Colonies & Fish Health

Given the complexity of community and site dynamics for the populations of six waterbird species in industrial Hamilton Harbour, and the influence of extrinsic factors, an adaptive management approach has been integral to the management of these species in an urban setting. This is especially true given the fact that some species cope better, or even thrive, in the presence of human land use, while others do not. Achieving a self-regulating community that does not

	<p>collapse to two species of colonial nesting waterbirds (likely cormorants and ring-billed gulls) may not be possible without management or elimination of human influence (writ large).</p> <p>Fish health is addressed within another beneficial use impairment (BUI). BUI 1a Restrictions on Fish Consumption addresses fish contaminant burden for human consumption, whereas BUI 4 Fish Tumours or Other Deformities and BUI 5 Bird or Animal Deformities or Reproductive Problems focus on the health of fish, birds, and other wildlife in relation to contamination. Two status reports were recently released for BUI 5 showing no issue with waterbird health or reproduction.</p> <p>Thank you for the congratulatory comments.</p>
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Double-crested Cormorants (DCCOs)

<p><u>MACASSA BAY YACHT CLUB</u> With respect to the cormorant population, had heard that about 6-7 years ago, to combat cormorants in the east end of the Harbour, raccoons were used throughout winter and they ate the eggs of the cormorants. If true, cormorant populations were quite low the next year. Is this a possibility on the islands?</p> <p><u>PUBLIC</u> While all documentation indicates that targets have been met, as a casual observer of the harbour bird population, I feel that there still is an over abundance of the cormorants in the harbour. There needs to be continued management of this bird. I have not seen many dark headed heron around the harbour near Pier 4 - 8 this season but that may be because of the construction on Pier 8. Further efforts are required to encourage all birds to utilize the harbour whether they are native or migratory birds.</p>	<p>Management Cormorant nesting is being excluded in areas where black-crowned night-herons and herring gulls are being encouraged mainly by using long poles to push nests out of trees or by tossing ground nests under permit. This is taking place twice to thrice a week during nesting season on all islands except Centre Island from mid May to early July before cormorants give up trying to re-build their nests. This is the primary management for double-crested cormorants.</p> <p>There will be continued management of the colonial waterbird community within Hamilton Harbour beyond any change in status. Ten years of funding has been secured for these activities and the committee tasked with overseeing the management of the birds will ensure the ongoing management through time.</p> <p>Predation Raccoons will eat eggs of any species. Cormorants were once nesting on Carol's Point in large numbers for one season and failed the next year likely because raccoons could climb the trees and take the eggs. One or more great-horned owls and at least one raccoon recently accessed the Windermere Basin islands where the terns primarily nest. However, racoons have not been used deliberately in any management efforts.</p>
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Further Monitoring or Action Required

ROYAL BOTANICAL GARDENS

Throughout the entire HHRAP process, the Royal Botanical Gardens has regularly put forward that the needed wildlife population indicators are not established and are not reflective of the habitat areas for wildlife. The wildlife populations continue to be largely missing. In addition, several species of wildlife, particularly amphibians are demonstrated to be having reproductive issues, with one species extirpated during the time of the HHRAP. The exact nature of the causes of the issues have yet to be determined, and no studies have been planned to resolve the nature of the issues. If asked publicly about the status of wildlife associated with the wetland habitats, the Royal Botanical Gardens answer will be reflective of the known wildlife populations, information formerly regularly reported at HHRAP workshops and committees. The wildlife populations are conservatively estimated to be 90%+ missing with several species studied having measurable reproductive issues. Further study would be required to answer how extensive the wildlife population impairment issues are. In addition, one species of turtles has also been extirpated from the system, with several more species in significant population decline and will be extirpated without action. The Royal Botanical Gardens has implemented a variety of programs and engaged a number of organizations and individuals to assist with stopping the loss of the turtle populations associated with Cootes Paradise and Grindstone Marsh independent of the HHRAP.

Have you noticed any really great areas that could benefit from habitat enhancement that would provide habitat for any of these colonial birds?

ONTARIO FEDERATION OF ANGLERS AND HUNTERS

Since duck hunting within the Hamilton Harbour doesn't factor in to the BUI. Recall a report from Bird Studies Canada Dr Scott Petrie et al concerning a possible link to possible Selenium toxicity regarding scaup spp. pop decline which was concerning some time ago.

BURLINGTON SUSTAINABLE DEVELOPMENT COMMITTEE

The proximity of these islands to a major freeway must have a major effect on the bird populations. If you could do it all over again, would there be a better location for the islands?

Other Wildlife

Turtle and amphibian reproduction is a large component of BUI 5: Animal Deformities and Reproductive Issues. The science report has indicated no issues for turtle reproduction and the frog report is pending and will be released to the hamiltonharbour.ca website when available.

Support for 'other wildlife' will be addressed through the Degradation of Fish and Wildlife Habitat BUI 14. The original intent was to support 'other wildlife' through habitat creation, especially along the shoreline and through marsh and meadow-marsh habitat creation in Cootes Paradise. There will be a status assessment for the Habitat BUI in 2022/23.

Scaup are diving ducks that feed on zebra mussels that filter the water and are migratory, spending only part of their lifecycle in the Great Lakes. The criteria for the Wildlife Populations BUI outlines a sustainable mixed community of colonial waterbirds and the metrics for the assessment are six species of representative colonial waterbirds in the Harbour.

Colonial Waterbirds Outside the Islands

Experts monitor all colonial nesting birds in Hamilton Harbour. Beyond the northeastern bird islands, Hickory Island as well as the headlands and on the mainland throughout the Harbour and Cootes Paradise are monitored. The reason islands are the focus is that most of the management efforts go to the islands because they were designed specifically for the species that the RAP set goals to bring back.

Habitat Locations

The freeway is not currently causing direct harm to the waterbirds. Efforts were made to reduce car strikes on Eastport Drive by encouraging relocations and installation of sign with a flashing light indicating low flying birds. Gulls in that area have shifted a bit further from the road.

Hamilton Harbour is limited in available habitat and colonial nesters mostly need islands. The Hamilton Harbour Remedial Action Plan is not aware of any additional habitat that might be available.

Northeastern Island Refurbishment

Currently the Hamilton Harbour Remedial Action Plan and partners are investigating refurbishment of the

	northeastern bird islands to replace eroded materials and raise them. This is a large-scale project that requires funding.
Other Factors: Climate Change, Lake Levels, Algal Blooms	
<p><u>HAMILTON NATURALISTS' CLUB</u> I agree with the status change but am concerned about the habitat islands from the ongoing raising water levels and what will happen to the populations if/when these islands disappear? I also wonder if there is a plan to raise the level of the islands to accommodate the raising water levels and maintain the habitat?</p> <p><u>ENVIRONMENT HAMILTON</u> With respect to climate change, and the high water levels, even though this is a good news story right now, are you concerned with what the future might hold in terms of stability that has been reached at this point?</p> <p><u>PUBLIC</u> Hamilton Harbour and Lake Ontario water levels are heavily controlled by dams at the outlet. Based on the Control Board's Facebook page, they are considering lowering Lake Ontario this winter more than they ever have before in anticipation of water coming downstream. So, while water levels might go up and down, we do have some control over lake levels in Lake Ontario and Hamilton Harbour. Congratulations to all those involved in making a successful balance of colonial waterbirds. It has been a special project for many people in this room.</p> <p>...This brings me to the requested comments to changing the status of (BUI 3b) from Impaired to Not Impaired. Under absolutely no condition do I believe that "Not Impaired" status should be allowed. At November meeting, it was stated that blue-green algae can cause death to humans. To be certain that I had heard correctly, I asked for this to be repeated, which it was. How is it possible that a condition like this can be safe for wildlife? and more importantly for humans??, but the topic here is about wildlife. There was an article and photo in the Spectator that says it all, showing a swan floating on a sea of emerald green blue green algae in the Bay with its head feeding in the water (article/photo by Kathy Renwald who lives by the Bay). I will look out our copy and have it for next stakeholder meeting. Re sewage in the harbour, in 2018 there was an article, again in Spectator (reporter Matthew Van Dongen) that boat owners were complaining to the effect that marina was little more than a sewage pond,</p>	<p>Water Levels: Elevated water levels are a Great Lakes basin-wide phenomena, and not within the control of the Hamilton Harbour Remedial Action Plan. At the time of publication, the consequences of higher water levels in Hamilton Harbour were not as well known. The Hamilton Harbour Remedial Action Plan and partners are looking into the possibility of refurbishing the bird islands to raise them and replace eroded materials. This is a large project that would need funding and time to design and construct.</p> <p>Water Quality/Cyanobacteria Blooms: To our knowledge, blue-green or cyanobacteria blooms have not affected colonial waterbird populations in Hamilton Harbour. In the rare event of bird deaths, experts have sent specimens to the University of Guelph for autopsy. Results have indicated either botulism or Newcastle Disease, both unrelated to algal blooms.</p> <p>Cyanobacteria blooms are beyond the scope of this beneficial use impairment. Instead, they are the focus of ongoing projects within BUI 8: Eutrophication and Undesirable Algae, as well as BUI 12: Phytoplankton and Zooplankton. The Hamilton Harbour Remedial Action Plan acknowledges there is still work to do to combat the blooms. There are many interacting factors leading up to a bloom, but it is clear that excessive phosphorus input is a main instigating factor. Upgrades to the wastewater treatment plants are expected to decrease the amount of phosphorus discharging to the water. The biggest project is Hamilton's Woodward Wastewater Treatment Plant upgrades from secondary to tertiary treatment, which are expected to be complete in 2022/2023 and is projected to reduce the phosphorus input by over half. Burlington's Skyway Wastewater Treatment Plant upgraded to tertiary sand filters in 2016 and the City of Hamilton intends to upgrade the Dundas Wastewater Treatment Plant that outlets to Cootes Paradise in the near future.</p> <p>The City of Hamilton website has the latest updates and studies following the Chedoke Creek sewage spill</p>

so I took a trip down to William's Pub Area, and sure enough there was stinking raw sewage collecting in the newly rebuilt area beside where the luxury up-scale condos are slated to be built.

Blue-green algae (fed by sewage) did not exist to any noticeable extent 40 years ago, therefore was not considered to be included in RAP term of references as problem areas that had to be corrected (as I have been informed). Surely we must update criteria to today's standards? I believe that if we change the status to "Not Impaired" because we are using 1980 criteria, then we are complicit in the cover-up of this issue. Like most people, for years I have politely kept quiet and not spoken out much as I prefer attention is given to facts. After "Sewergate", believe it is now time to speak up, still polite and factual. I prefer no publicity, but would like my comments to be part of the public record.

At the last meeting it was stated that blue green algae would kill people and e. coli isn't as harmful to people as blue green algae. Does blue green algae have the same effect on birds?

Temperature of water is increasing and sewage discharge into Harbour is occurring. Is this increasing blue green algae?

Worked in the steel industry and, over the years, worked to eliminate many of the toxic chemicals that went into the Harbour. Find it unsettling that 40 years ago pollution was attributed to industry, which has cleaned up much of its discharge but find it disturbing that we simply accept additional sewage going into the Harbour. Authorized sewage, not just the leaks. Are there records available of how much sewage has been released into the Harbour?

Seem to be more concerned about birds but, at the last meeting, it was stated that people should not be in the water if blue-green algae is present. This will be seen by the general public as glossing over the issue and allowing Hamilton Harbour to be seen as we are doing great things but I don't think that we are addressing today's problems. Not just Chedoke Creek, authorized discharge from WWTPs are also the problem.

as well as dates/volumes of releases from the combined sewer overflows:

<https://www.hamilton.ca/government-information/chedoke-creek-spill-remediation-activities>

<https://www.hamilton.ca/home-property-and-development/water-sewer/monitoring-wastewater-overflows-and-bypasses>

The Remedial Action Plan produces a Loadings Report that tracks overall inputs of phosphorus and other contaminants into the Harbour and it can be accessed from the library on our website: hamiltonharbour.ca. Note that the data only go to 2016 and contributions from the Chedoke Creek spill are not accounted for because the spill was not known at the time of publication. It will be included in the next update of the report (2017-2023).

Water quality modelling for Hamilton Harbour has examined the many interacting factors that can lead to a bloom. Temperature is certainly one of the factors that contributes to a bloom. However, the number one issue is with excessive phosphorus from the wastewater treatment plants, creeks and potentially historical buildup in the sediment.

Both the toxins from cyanobacteria blooms and *E. coli* can be harmful to human health if ingested in large quantities. Swimming and swallowing water with *E. coli* at or above acceptable levels can cause an increased risk of infections in ears, eyes, nose, throat, and skin as well as cause diarrhea. Direct contact with cyanobacteria cells has also been known to cause irritation of varying severity. Allergic reactions are more commonly reported. Learn more here:

<https://www.canada.ca/en/health-canada/programs/consultation-cyanobacteria-toxins-recreational-water/document.html>

The City of Hamilton Public Health unit is responsible for monitoring the public swimming beaches where ingestion could occur. To learn more about how Public Health tests the water and previous years' results visit:

<https://www.hamilton.ca/parks-recreation/parks-trails-and-beaches/beach-water-quality-in-hamilton>

References:

Zanchetta, C., Moore, D., Weseloh, D., and J. Quinn. 2016. Population trends of colonial waterbirds nesting in Hamilton Harbour in relation to changes in habitat and management. *Aquatic Ecosystem Health & Management* 19:192-205.

Hamilton Harbour Wildlife Populations Feedback Form

Proposed Status Change

Your input is important! We want to know what you think about the recommended status change related to Wildlife Populations in Hamilton Harbour.

Comments will be reviewed and addressed by the Hamilton Harbour Remedial Action Plan and will be compiled and shared in the form of a summary report on hamiltonharbour.ca. Personal information (name, email) will remain confidential.

The comment period closes January 17, 2020. Thank you for your feedback.

1. How did you hear about this survey?

- Attended December 12, 2019 Public Forum
- Website
- Social Media
- Newspaper
- E-blast
- Colleague
- Bus ad
- YouTube
- TV ad
- Other (please specify) _____

2. Which supporting documents have you read?

- Fact Sheet
- Wildlife Populations Report
- All of the above
- None

3. Choose the statement that best describes your opinion for the proposed status change of Wildlife Populations in Hamilton Harbour:

- I agree with the recommended status change to Not Impaired
- I do not agree with the recommended status change to Not Impaired
- I don't know

(please turn over)

4. General Comments - Please provide any additional comments related to the recommended status change of Wildlife Populations.

5. Name (comments will remain confidential) _____

6. Email _____

APPENDIX 4

SUPPORTING COMMUNICATION AND OUTREACH MATERIALS



Appendix 4: Supporting Communication and Outreach Materials

Contents:

- 1) Public Forum Handout: Proposed Status Change for BUI 3b: Wildlife Populations
- 2) Public Forum Handout: 2018 Wildlife Populations Fact Sheet
- 3) Public Forum Agenda
- 4) Boat Tour Poster
- 5) Advertising for the December 12 Public Forum
- 6) Media Coverage on Hamilton Harbour's Wildlife Populations



HAMILTON
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REMEDIAL ACTION PLAN



HAMILTON HARBOUR REMEDIAL ACTION PLAN

PROPOSED STATUS CHANGE FOR BENEFICIAL USE 3B:

WILDLIFE POPULATIONS

DECEMBER 2019



HAVE YOUR SAY!

Things are changing in Hamilton Harbour and the Remedial Action Plan would like to know what you think. Our goals for wildlife populations have been achieved and we are proposing a status change from impaired to not impaired. Funding to continue the monitoring and management of colonial waterbirds has been secured.

If you would like to share your thoughts, please submit online on hamiltonharbour.ca/forum

OR

provide comments at a RAP Public Forum. Details and RSVP at hamiltonharbour.ca

All comments will be captured and addressed in a report that will be posted on hamiltonharbour.ca and sent to the Federal and Provincial governments as well as the International Joint Commission (IJC) for consideration. Comments will remain anonymous.

Thank you for your time in providing feedback on the progress in Hamilton Harbour!

OVERVIEW

In the mid-1980s, when the Hamilton Harbour Remedial Action Plan was formed, the waterbird community of Hamilton Harbour was dominated by a few abundant species.

A subset of birds, in particular colonial waterbirds, were chosen to represent remediation efforts. Colonial waterbirds are birds that nest in groups and generally return to the same nesting spot every year. In Hamilton Harbour, they include: Caspian terns, common terns, black-crowned night-herons, herring gulls, double-crested cormorants and ring-billed gulls.

To reach the goal of having a sustainable mixed community of colonial waterbirds, the Hamilton Harbour Remedial Action Plan had to (1) create nesting habitat and (2) use adaptive management to deter overabundant species and reserve nesting space for the rarer species.

Habitat was created along the Harbour's northeastern shoreline in the 1990s by converting two hydro transmission line islands into nesting space (Neare and Farr Islands) and constructing three more nesting islands (North, Centre, and South Islands). Farr Island has since been converted into fish habitat. In 2012, three additional islands and a spur dyke were created in Windermere Wetland to support Caspian terns and common terns.



Monitoring began in 1997 and is conducted every spring between mid-May and the end of June, by counting the number of active nests. Management has occurred since 2007 and is a joint effort between partners. Tactics to deter overabundant species (double-crested cormorants and ring-billed gulls) include perching of raptors, removal of nests, use of animated motion-detecting mannequins, and placement of tarps. Tarps reserve nesting space and are removed upon arrival of the rarer birds (e.g., Caspian and common terns). From the outset, there was no set recipe for a sustainable mixed community of colonial waterbirds, only best scientific judgement. Population targets have been revised through time as knowledge was gained about non-lethal methods of bird control.

Experts support a status change from impaired to not impaired based on the current colonial waterbird community. Caspian terns, common terns, and ring-billed gulls have all achieved or exceeded nesting objectives. Black-crowned night-heron nest numbers fluctuate as the birds are not site tenacious (they move around) and prefer concealed nesting in trees. Double-crested cormorants are actively managed across the Great Lakes and numbers reflect the basin-wide population. Herring gull populations are declining across the Great Lakes, which is not locally controllable. Efforts to maintain nesting space for herring gulls on the northeastern islands will continue into the future.



2018 Hamilton Harbour RAP Fact Sheet

BUI 3b Degradation of Wildlife Populations

IMPAIRED

- i
- ii
- iii
- iv
- v
- vi
- vii
- viii
- ix
- x
- xi
- xii
- xiii
- xiv

Delisting Criteria:

1. Colonial waterbirds: The overall objective is to have a sustainable mixed community of colonial waterbirds. In general, are aiming for an increase of the rarer species and a reduction in the number of over-abundant species. Management of colonial waterbirds and achieving specific populations of particular species requires an adaptive management approach to ensure sustainable populations continue to the extent possible after delisting.



Targets (Number of Nests)

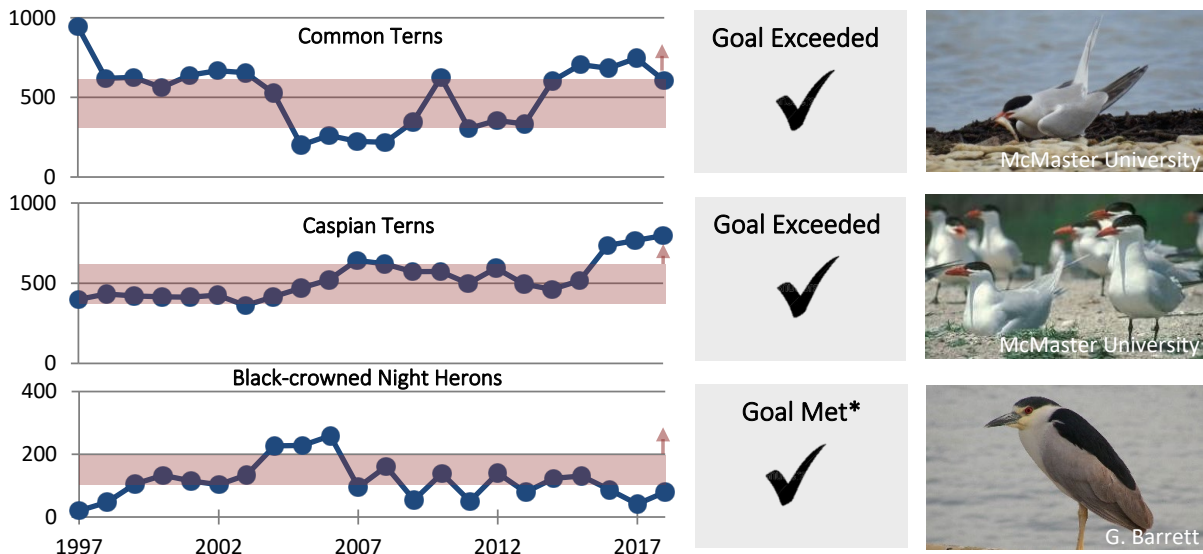
- Ring-billed Gulls < 10,000
- Herring Gulls 200-300+
- Double-crested Cormorants < 2,500
- Common Terns 300-600+
- Caspian Terns 400-600+
- Black-crowned Night Herons 100-200+

2. Other wildlife including waterfowl: No target will be suggested for other species of birds or animals, but a target for habitat (BU xiv) has been suggested which will enhance wildlife populations generally. In addition, management of some species may be necessary as a result of habitat enhancement.

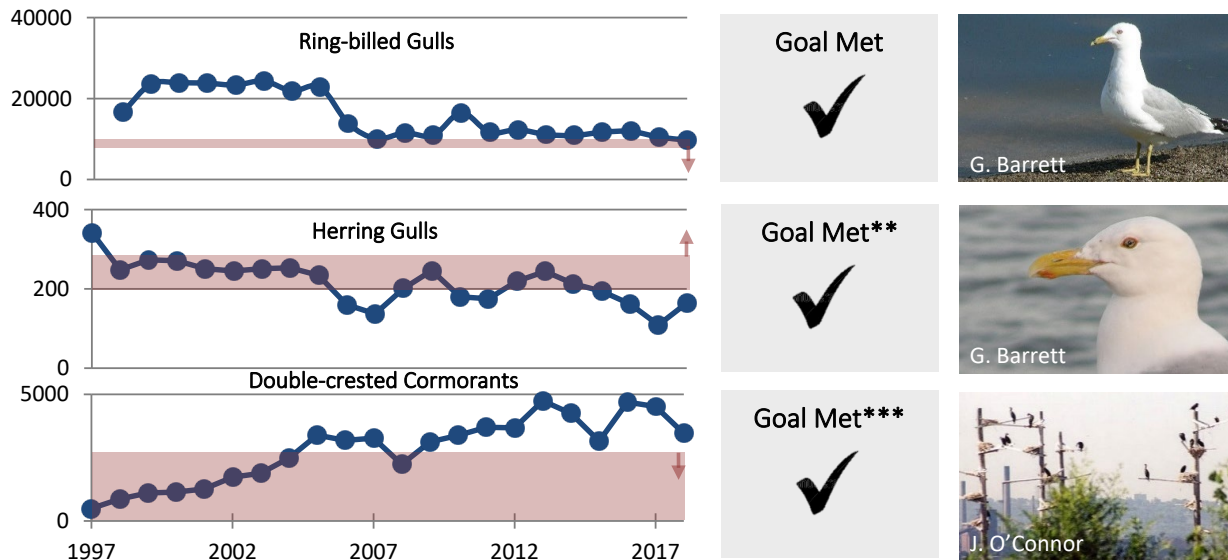
Note: A status change from 'impaired to 'not impaired' is being proposed for this BUI in 2019.

Did you know?

Colonial waterbirds are species that gather in large assemblages when nesting. A recent report (Gilroy 2018) suggests a status change to 'not impaired' as nest targets for a sustainable mixed community have been met and 10-year funding has been secured to continue adaptive management.



*Small fluctuations in numbers reflect the difficulty in finding Black-crowned Night Heron colonies as they are not site-specific. Due to limited access, colonies on industrial property are not counted, but are known to exist every year.



** Herring Gulls are declining throughout the Great Lakes Basin and local nest counts reflect the basin-wide population.
 *** Cormorants are actively managed across the Great Lakes Basin and local nest counts reflect the basin-wide population.

What Was the Original Problem?

Nesting habitat was contaminated or temporary and communities were dominated by a few abundant species; clean, permanent and species appropriate habitat creation and management was required.

Other AOC Comparisons

Most AOCs target “self-sustaining and healthy communities of indicator wildlife species”. Toronto and Region & Niagara River AOCs list specific species, comparison to reference, but no targeted numbers.

How are Improvements Being Made?

1. Islands were constructed to create colonial waterbird nesting habitat (Northeast Islands, Windermere Basin Wetland, LaSalle shoals).
2. Colonial waterbird populations are actively managed by reserving nesting space for rarer species and discouraging overabundant colonies from occupying all available nesting habitat.



What Still Needs to Happen?

- No further actions beyond the long-term management of a sustainable mixed community.
- The Remedial Action Plan will engage the public and Indigenous communities on the recommended status change from ‘impaired’ to ‘not impaired’ as part of an assessment in 2019.

Where Can I Learn More?

Gilroy. 2018. Status Assessment Report of the BUI “Degradation of Wildlife Populations” for the Hamilton Harbour AOC.
BARC. 2017. Toward Safe Harbour Report Card: hamiltonharbour.ca/reportcard
Pynenburg, et al. 2017. Efficacy of decoys and familiar versus unfamiliar playback calls in attracting Common Terns to a rehabilitated wetland on Lake Ontario. *Aquatic Ecosystem Health and Management* 20(3):285-294.
Zanchetta, et al. 2016. Population trends of colonial waterbirds nesting in Hamilton Harbour in relation to changes in habitat and management. *Aquatic Ecosystem Health and Management* 19(2):192-205.

Most references can be provided as a PDF upon request. Visit hamiltonharbour.ca

HAMILTON HARBOUR REMEDIAL ACTION PLAN
2019 STAKEHOLDER AND PUBLIC FORUM
AGENDA: MEETING #2

LOCATION: HWT Centre, 57 Discovery Drive, Hamilton, Ontario
DATE: December 12, 2019
TIME: Registration and Light Refreshments: 5:00 PM – 5:30 PM;
Meeting: 5:30 PM to 8:00 PM

TIME	TOPIC
5:30 PM	1. Welcome and Introductions <ul style="list-style-type: none">▪ Land Acknowledgement▪ Welcome to Stakeholder Members▪ Overview of Meeting Procedure
5:45 PM	2. Hamilton Harbour RAP Background <ul style="list-style-type: none">▪ Presentation by Julie Vanden Byllaardt, Hamilton Harbour Remedial Action Plan (HHRAP) Researcher/Report Writer
6:00 PM	3. BUI 3b Wildlife Populations – Redesignation Proposal <ul style="list-style-type: none">▪ Presentation by Dr. Jim Quinn, McMaster University
7:15 PM	BREAK
7:25 PM	4. BUI 1b Wildlife Consumption – Update <ul style="list-style-type: none">▪ Presentation by Kristin O’Connor, HHRAP
8:00 PM	5. Adjournment <ul style="list-style-type: none">▪ Wrap-Up of Meeting #2▪ Information on Meeting #3▪ Adjourn Meeting

Agenda times listed are approximate and cannot be guaranteed

*Advance RSVP for meetings is requested to ensure enough seating and refreshments
hamiltonharbour.ca/forum*



Come sail with us!

RAP Stakeholder Forum Hamilton Harbour Cruise

Sunday, September 22, 2019
2:00 – 3:30 pm
(Boarding starts at 1:30 pm)

Hamilton Harbour Queen
47 Discovery Drive, Hamilton, ON

RSVP Required by September 12

Complimentary tickets are initially limited to two (2) per Stakeholder Agency/Group

You can request more tickets and we will try to accommodate

Margaret.McIntosh@canada.ca or 905.336.6279



This afternoon sightseeing cruise is open to the public. You are welcome to buy tickets for family/friends to join you. www.hamiltonharbourqueen.ca

Advertising for the December 12 Public Forum

The screenshot shows an Eventbrite event page. The header features the Hamilton Harbour logo and the text "HamiltonHarbour.ca" and "LEARN ABOUT IMPROVEMENTS IN HAMILTON HARBOUR AND HAVE YOUR SAY!". The event title is "Hamilton Harbour Remedial Action Plan Public Forum Meeting #2" by Hamilton Harbour Remedial Action Plan. The date is "DEC 12" and the price is "Free". The event is marked as "Sales Ended". The description states: "A series of public meetings celebrating successes in Hamilton Harbour restoration and engaging the community." The "About this Event" section explains that Hamilton Harbour was once a "rotten stinking quagmire of filth and poisonous waste" but has improved over 30 years. It mentions that 11 of 14 original problems can now pass evaluation. The location is "HWT Centre, 57 Discovery Drive, Hamilton, ON L8L 8K4". The date and time are "Thu, 12 December 2019, 5:00 PM - 8:00 PM EST".

Figure 4. Eventbrite ad and RSVP for the December 12, 2019 Hamilton Harbour Remedial Action Plan Public Forum.



Figure 5. Snapshot of the interior bus advertisements for the Hamilton Harbour Remedial Action Plan Public Forums.

https://www.yourtv.tv/burlington-oakville/bulletin-board

05:15 PM **Hamilton Harbour Remedial Action Plan Public Forum**
05:15 PM — 09:00 PM

A series of public meetings celebrating successes in Hamilton Harbour restoration and engaging the community.

Learn more and RSVP at hamiltonharbour.ca

About this Event

Hamilton Harbour was once described as a "rotten stinking quagmire of filth and poisonous waste". However, if you look around today, that Hollywood-worthy moniker doesn't quite fit. What changed and why? Areas of Concern are scientifically evaluated against a list of 14 issues. In the 1980s Hamilton Harbour was assessed as failing 11 of those 14. Work by the Remedial Action Plan partners to improve conditions has been ongoing and after over 30 years of effort it is time to reassess. We think some of those original 11 problems can now pass the evaluation. We want to celebrate this success and want to know what our community thinks!

Website
<http://hamiltonharbour.ca>

Location/Venue Name
HWT Centre
57 Discovery Drive, Hamilton, L8L 8K4

Figure 6: Example of one of the Cogeco TV and YourTV Community Bulletin Boards advertisements for the Hamilton Harbour Public Forums (November event).

HAMILTON HARBOUR
REMEDIAL ACTION PLAN

LEARN ABOUT IMPROVEMENTS IN HAMILTON HARBOUR AND HAVE YOUR SAY!

Public Forum
December 12, 2019
RSVP at
HamiltonHarbour.ca

Figure 7. Sketch of the 1/8 H Public Forum ads placed in the Hamilton Spectator and Burlington Post.

Media Coverage on Hamilton Harbour's Wildlife Populations

(Hamilton Spectator [Online Article](#), December 12, 2019)

<https://www.thespec.com/news/hamilton-region/2019/12/12/celebrating-a-better-balance-of-birds-in-hamilton-harbour.html>

Celebrating a better balance of birds in Hamilton Harbour

By [Mark McNeil](#) Contributing Columnist

The Hamilton Spectator

Thu., Dec. 12, 2019 2 min. read

Article was updated Mar. 03, 2020

Scientists have restored a better balance of colonial waterbird species in Hamilton Harbour after decades of habitat improvement and unorthodox control methods that included dancing-singing Santa Claus mannequins, according to a new report.

"Our goals for wildlife populations have been achieved and we are proposing a status change from impaired to not impaired," says the 63-page document that will be presented at a Hamilton Harbour public forum on Thursday at the HWT centre on Discovery Drive.

Hamilton Harbour Meeting

Thursday, Dec. 12, 5:30 to 8 p.m., HWT Centre, 57 Discovery Dr.

The development doesn't mean the overall harbour has been returned to health. There is still much to do with improving water quality and fish stocks, as well as controlling sewage and storm water overflows that most recently has become a major controversy after the revelation that 24-billion litres of sewage poured into Cootes Paradise over four and half years.

But the improvement in bird population balance is a positive sign that one aspect of the bay's ecology is better than it was.

Hamilton Harbour, along with 43 other locations on the Great Lakes, was listed as an "area of concern" by the International Joint Commission more than 30 years ago. This led to a massive multi-stakeholder effort, called a Remedial Action Plan, to restore the bay back to ecological health.

One part of that larger effort focused on overpopulations of ring-billed gulls and an emerging population explosion of double-crested cormorants to the detriment of Caspian and common terns, black-crowned night herons and herring gulls.

Waterbird populations in harbour

- Ring-billed gulls: 8,900 pairs — greatly diminished.

- Double-crested cormorant: 4,540 pairs — population explosion greatly controlled.
- Common terns: 400 to 500 pairs — reached goal.
- Caspian terns: 825 pairs — exceeded goal.
- Herring gull: 155 pairs — just short of goal, but part of diminishing numbers across the Great Lakes.
- Black-crowned night herons: 125 pairs — reached goal.

Monitoring began in 1997 by counting the number of active nests each May and June. Later on, researchers developed a series of tactics to dissuade overabundant cormorants and ring-billed gulls, such as using trained falconers, removing nests, laying out tarps and even invoking the services of motion-detecting Santas to act like scarecrows.

The Canadian Tire Santas — one of whom was actually stolen at one point — were successful for about four years, from 2007 onward, until the cormorants "figured out Santa was not much of a threat after all," according to lead researcher Jim Quinn, a biologist from McMaster University.

"So I tried to re-instill the fear. I put on a red poncho and sat on a bucket waiting for the cormorants to come and then I would suddenly jump up waving my arms.

"Unfortunately, it didn't work."

But he thinks now, with the passage of time, moving mannequins might do the trick again. Only now he is thinking Halloween figures would be better.

Anyone who has a scary one they want to sell, is asked to contact Quinn at quinn@mcmaster.ca.

mmcneil@thespec.com

905-526-4687 | @Markatthespec

Celebrating a better balance of birds

Harbour restorers even used dancing Santas to scare away undesirables

MARK MCNEIL
THE HAMILTON SPECTATOR

Scientists have restored a better balance of colonial water bird species in Hamilton Harbour after decades of habitat improvement and unorthodox control methods that included dancing-singing Santa Claus mannequins, according to a new report.

"Our goals for wildlife populations have been achieved and we are proposing a status change from impaired to not impaired," says the 63-page document that was presented at a Hamilton Harbour public forum on Thursday at the HWT centre on Discovery Drive.

The development doesn't mean the overall harbour has been returned to health. There is still much to do with improving water quality and fish stocks, as well as controlling sewage and storm water overflows that most recently has become a major controversy after the revelation that 24-billion litres of sewage released into Cootes Paradise.

But the improvement in bird population balance is a positive sign that one aspect of the bay's ecology is better than it was.

Hamilton Harbour, along with 43 other locations on the Great Lakes, was listed as an "area of concern" by the International Joint Commission more than 30 years ago. This led to a massive multi-stakeholder effort, called a Remedial Action Plan, to restore the bay



CATHIE COWARD THE HAMILTON SPECTATOR

Islands in Hamilton Harbour near Eastport Drive where nesting stands for cormorants have been built.



THE HAMILTON SPECTATOR FILE PHOTO

A seagull sits on a Santa Claus figure on a small island in Hamilton Harbour in 2014. Eventually, the birds lost their fear of Santa.

WATER BIRD POPULATIONS IN HARBOUR

- Ring-billed gulls: 8,900 pairs — greatly diminished.
- Double-crested cormorant: 4,540 pairs — population explosion greatly controlled.
- Common terns: 400 to 500 pairs — reached goal.
- Caspian terns: 825 pairs — exceeded goal.
- Herring gull: 155 pairs — just short of goal.
- Black-crowned night herons: 125 pairs — reached goal.

back to ecological health.

One part of that larger effort focused on overpopulations of ring-billed gulls and an emerging population explosion of double-crested cormorants to the detriment of Caspian and common terns, black-crowned night herons and herring gulls.

Monitoring began in 1997 by counting the number of active nests each May and June. Later on, researchers developed a series of tactics to dissuade overabundant cormorants and ring-billed gulls, such as using trained falconers, removing nests, laying out tarps and even invoking the services of mo-

tion-detecting Santas to act like scarecrows.

The Canadian Tire Santas — one of whom was actually stolen at one point — were successful for about four years, from 2007 onward, until the cormorants "figured out Santa was not much of a threat after all," according to lead researcher Jim Quinn, a biologist from McMaster University.

"So I tried to re-instill the fear. I put on a red poncho and sat on a bucket waiting for the cormorants to come and then I would suddenly jump up waving my arms. Unfortunately, it didn't work."

But he thinks now, with the passage of time, moving mannequins might do the trick again. Only now he is thinking Halloween figures would be better. Anyone who has a scary one they want to sell can reach Quinn at quinn@mcmaster.ca. mmcneil@thespec.com 905-526-4687 | @Markatthespec

APPENDIX 5

**PUBLIC FORUM
PRESENTATION SLIDE
DECK**

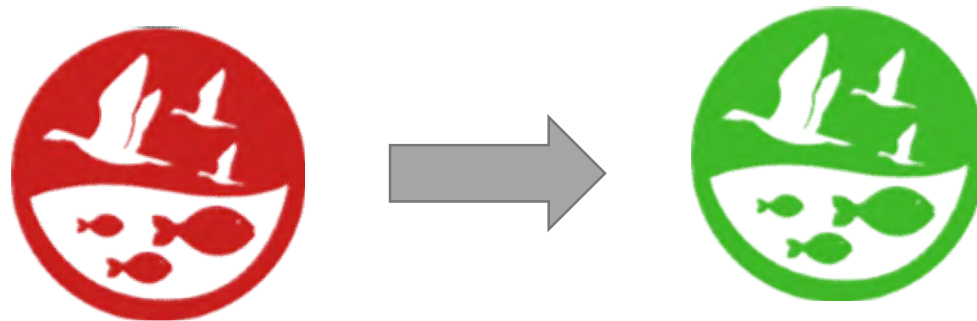


Managing and Monitoring Colonial Nesting Waterbirds in Hamilton Harbour: Proposed Change of Wildlife Populations' status



BUI 3b Degradation of Wildlife Populations

Proposed Status Change





i

ii

iii

iv

v

vi

vii

viii

ix

x

xi

xii

xiii

xiv

Original Problem

- provincially significant colonial water bird colonies
- habitat was contaminated and temporary
- communities dominated by two overabundant species
- clean permanent and species-appropriate habitat needed to be preserved, enhanced and managed

General Outline

- Background
- Habitats
- Management
- Emerging Issues
- Monitoring
- Conclusions



Habitats



Island Habitat

Farr
Neare

Habitat Island
Piers 26 & 27

Habitat Lost





Habitat Lost



Farr Island becomes “fish spawning habitat”



Habitat Gained



Design and management of bird nesting habitat: tactics for conserving colonial waterbird biodiversity on artificial islands in Hamilton Harbour, Ontario

J.S. Quinn, R.D. Morris, H. Blokpoel, D.V. Weseloh, and P.J. Ewins

Abstract: Hamilton Harbour, at the west end of Lake Ontario, supports breeding colonies of six piscivorous waterbirds: double-crested cormorant (*Phalacrocorax auritus*), black-crowned night-heron (*Nycticorax nycticorax*), herring gull (*Larus argentatus*), ring-billed gull (*Larus delawarensis*), common tern (*Sterna hirundo*), and Caspian tern (*Sterna caspia*). Most breeding pairs of all species nest on privately owned mainland locations that are subject to multiple industrial and development activities. The construction of three artificial islands in the eastern basin of Hamilton Harbour in the winter of 1995–1996 presents an opportunity to simultaneously reduce current land-use conflict and maintain the existing avian biodiversity. Accordingly, we used ecological information to determine suitable substrates and vegetation to satisfy nesting habitat preferences and to facilitate the occupation of the islands by nesting waterbirds. Our recommendations for habitat design and management emphasize techniques to prevent displacement of both tern species by ring-billed gulls and of night-herons by cormorants. We propose long-term management procedures based on aspects of the biology and known ecological interactions among the various species.

Résumé : Le havre de Hamilton, situé à l'extrémité ouest du lac Ontario, héberge des colonies reproductrices de six oiseaux aquatiques piscivores : le cormoran à aigrettes (*Phalacrocorax auritus*), le bihoreau gris (*Nycticorax nycticorax*), le goéland argenté (*Larus argentatus*), le goéland à bec cerclé (*Larus delawarensis*), la sterne pierregarin (*Sterna hirundo*) et la sterne caspienne (*Sterna caspia*). Chez toutes ces espèces, la plupart des couples de reproducteurs nichent sur la terre ferme, sur des terrains privés soumis à de multiples activités industrielles ou travaux d'aménagement. La construction de trois îles artificielles dans le bassin est du havre, à l'hiver 1995–1996, est une occasion d'atténuer le conflit qui touche en ce moment l'utilisation des terres et de préserver en même temps la diversité actuelle de la faune ailée. Nous avons donc utilisé les données écologiques pour déterminer quels substrats et quels types de végétation conviennent à la nidification, afin de répondre aux préférences des oiseaux aquatiques et de faciliter l'occupation des îles par ceux-ci. Nos recommandations en matière de conception et de gestion des habitats privilégient les techniques qui permettent d'éviter le déplacement des deux espèces de sternes par le goéland à bec cerclé et du bihoreau gris par le cormoran à aigrettes. Nous proposons un mécanisme de gestion à long terme fondé sur les divers aspects de la biologie des oiseaux et sur les interactions écologiques connues entre les diverses espèces.

[Traduit par la Rédaction]

Introduction

Habitat degradation by humans has reduced biodiversity at global, and often local, levels. Loss of suitable habitat appears

to be the greatest threat to colonial waterbird species in North America (Parnell et al. 1988). In Hamilton Harbour, Lake Ontario (43°16'N, 79°46'W) extensive wetlands along the south shoreline have been lost to industrial development over the past 100 yr (Hamilton Harbour Remedial Action Plan (RAP) 1992²).

Beginning with intermittent breeding colonies in the mid-1970s (Dobos et al. 1988), Hamilton Harbour has become one of the most important colonial waterbird nesting areas in the Great Lakes basin in the 1990s (Blokpoel and Tessier 1991). Largely cut off from human and other mammalian interference by busy fenced highways, the regions locally known as Windermere Basin and piers 25, 26, and 27 (Fig. 1) have provided nesting habitat for several avian colonial species: double-crested cormorants (*Phalacrocorax auritus*), black-crowned

Received November 1994. Accepted May 12, 1995.
J13062

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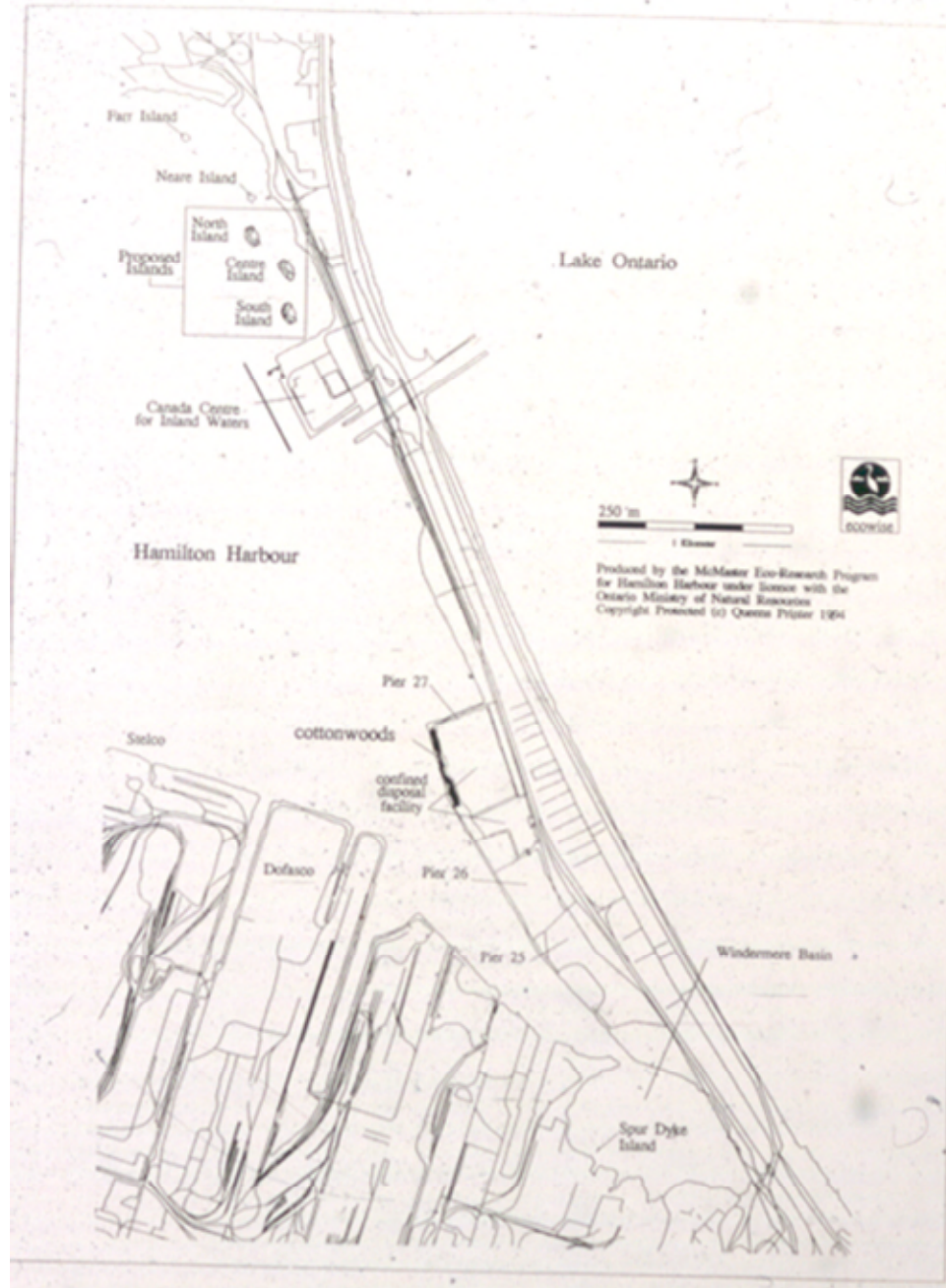
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¹ Author to whom all correspondence should be addressed.

² Hamilton Harbour Remedial Action Plan (RAP) 1992. Environmental conditions and problem definition. Stage I Report. 2nd ed. Available from Library, Canadian Centre for Inland Waters, P.O. Box 5050, 867 Lakeshore Drive, Burlington, ON L7R 4A6, Canada.





Experimental measurement of nesting substrate preference in Caspian terns, *Sterna caspia*, and the successful colonisation of human-constructed islands

James S. Quinn*, Jane Sirdevan

Biology Department, McMaster University, Hamilton, Ontario, Canada, L8S 4K1

Received 7 June 1997; accepted 30 September 1997

Abstract

Caspian terns, *Sterna caspia*, recently bred in Hamilton Harbour, at the western end of Lake Ontario, on private property that is likely to be developed in the next decade. To reduce this land-use conflict and to promote the current level of biodiversity of colonial nesters in the area, artificial islands were built in the winter of 1995–1996 with different areas designated for a variety of nesting waterbirds including Caspian terns. In 1994, prior to island construction, we tested three substrate types for tern nesting preferences so that an appropriate substrate could be placed on the Caspian tern designated portion of the new islands. We found a preference for sand over pea-gravel and crushed stone, and indirect evidence for a preference favouring the experimental substrates over the pre-existing substrate of hard-packed ground. Based on these results, the small area of the island designed for Caspian tern nesting was surfaced with sand and was subsequently colonised successfully. The colony established and reproduced successfully on the designated site in 1996 and grew in numbers of nesting pairs in 1997. © 1998 Elsevier Science Ltd. All rights reserved

Keywords: Habitat preference; Restoration; Colonial nesting waterbirds

1. Introduction

Caspian terns, *Sterna caspia*, have probably never been abundant in North America, but they have nested in the Great Lakes since as early as 1896 (Blokpoel and Scharf, 1991). In 1986, a small colony of 48 nests was established in Hamilton Harbour (43°16'N, 79°46'W; Dobos et al., 1988) at the western end of Lake Ontario. Between 1990 and 1994, the main colony was located on the site of the experiment reported here and numbers in the harbour increased from 184 to 331 pairs, representing over 16% of Lake Ontario's Caspian terns (Moore et al., 1995). This immigration to Hamilton Harbour and subsequent growth of the colony, particularly the increase to 134 pairs in 1987 (Dobos et al., 1988), coincided with the decline and desertion of a Caspian tern colony site at the Eastern Headland, a man-made area extending into Lake Ontario from the Toronto waterfront (Morris et al., 1992). The success of this thriving

new colony in Hamilton Harbour is encouraging given the questionable status of the species, ranging from rare to endangered (proposed) in Ontario and the States surrounding the Great Lakes (Blokpoel and Scharf, 1991).

Development plans for an area of the Hamilton Harbour shoreline included the Caspian tern main colony site. During the winter of 1995–1996 three islands were constructed to provide nesting habitat for the six species of colonial nesters currently in the area, a major component of the remedial action plan for the rehabilitation of Hamilton Harbour (Quinn et al., 1996). The motivation for island construction was to maintain current levels of diversity of colonial nesters in the harbour and to reduce land-use conflict with the current property owners. We tested substrate preferences of Caspian terns on an experimental site on the mainland where the colony had been previously to facilitate the establishment of a colony on one of the new islands.

Little is known about the nesting substrate preferences of Caspian terns. Caspian terns generally nest in dense colonies situated in open and largely unvegetated areas (Peck and James, 1983). Although descriptions

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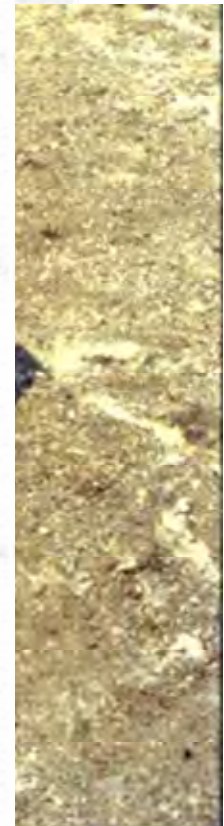
Table 1
 Reproductive parameters for Caspian tern pairs nesting on experimental substrates in 1994

Substrate type	Sand	Gravel	Stone
Clutches (<i>n</i>)	46	15	27
Clutch size (mean \pm 1 SD)	2.17 \pm 0.74	2.00 \pm 0.63	2.07 \pm 0.87
Clutches hatching \geq 1 egg	28	9	10
Hatching success ^a	0.61	0.60	0.37
Clutches fledging \geq 1 Chick	21	6	7
Fledging success ^b	0.75	0.67	0.70
Chicks fledged/pair ^c (mean \pm 1 SD)	0.61 \pm 0.74	0.67 \pm 0.90	0.44 \pm 0.80

^a Number of clutches hatching one or more eggs divided by total number of clutches initiated.




^b Number of clutches fledging one or more chicks divided by total number of clutches hatching one or more eggs. Chicks were considered fledged if they survived to age 24 days.

^c Number of clutches where one or more chicks survived to age 24 days divided by total number of clutches initiated.



Caspian ter

1996

-  submerged reef
-  topsoil covered area with trees and shrubs
-  cormorant nesting



25 m
100 m



Produce
Program

3 29 '96



ARTIFICIAL
NESTING
STRUCTURES
FOR THE
DOUBLE-CRESTED
CORMORANT

Technical Bulletin No. 126

DEPARTMENT OF NATURAL RESOURCES
Madison, Wisconsin
1981



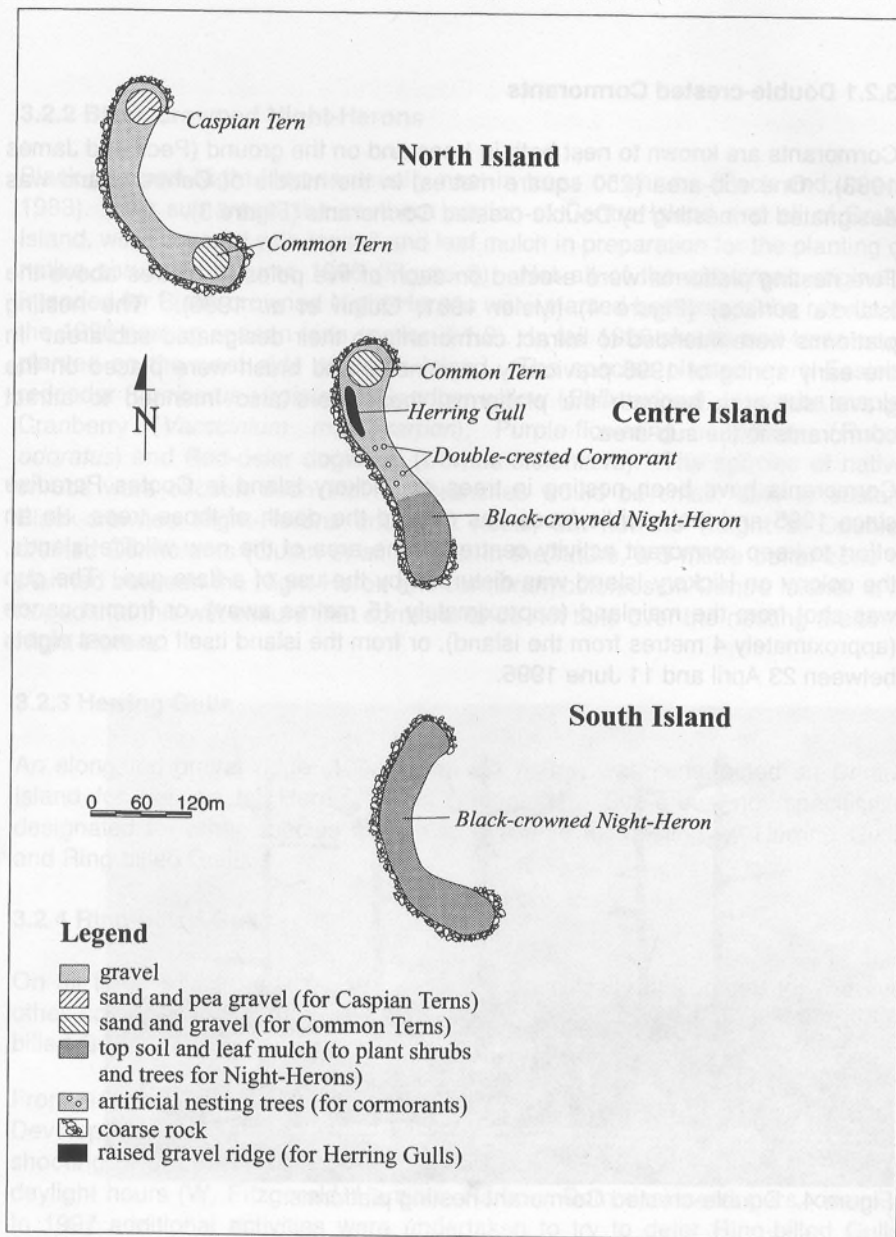


Figure 3. Three new wildlife islands showing the designated sub-areas and substrates for colonial waterbirds at the beginning of the breeding season, 1996. All sub-areas, except those designated for Black-crowned Night Herons were ready for use at the beginning of the 1996 breeding season.

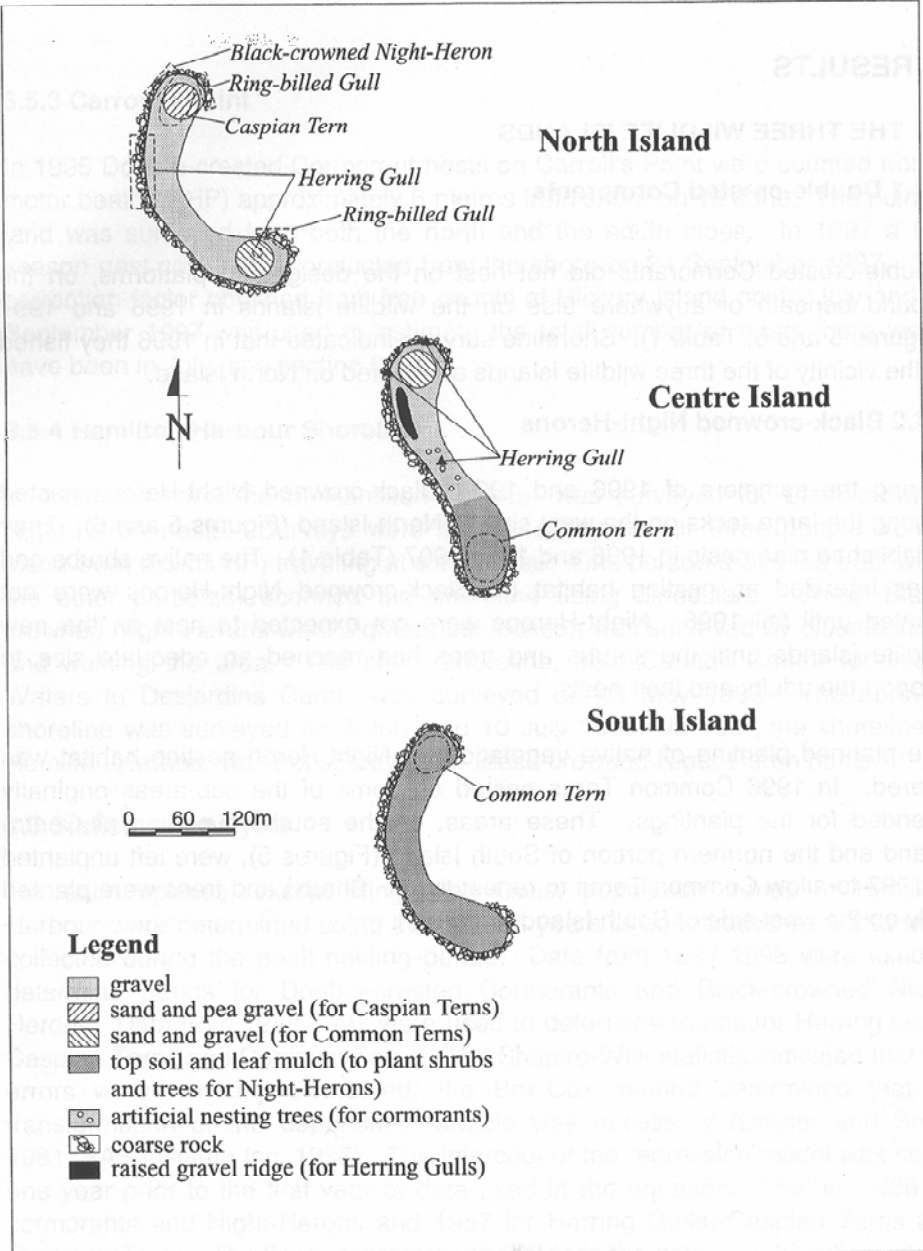


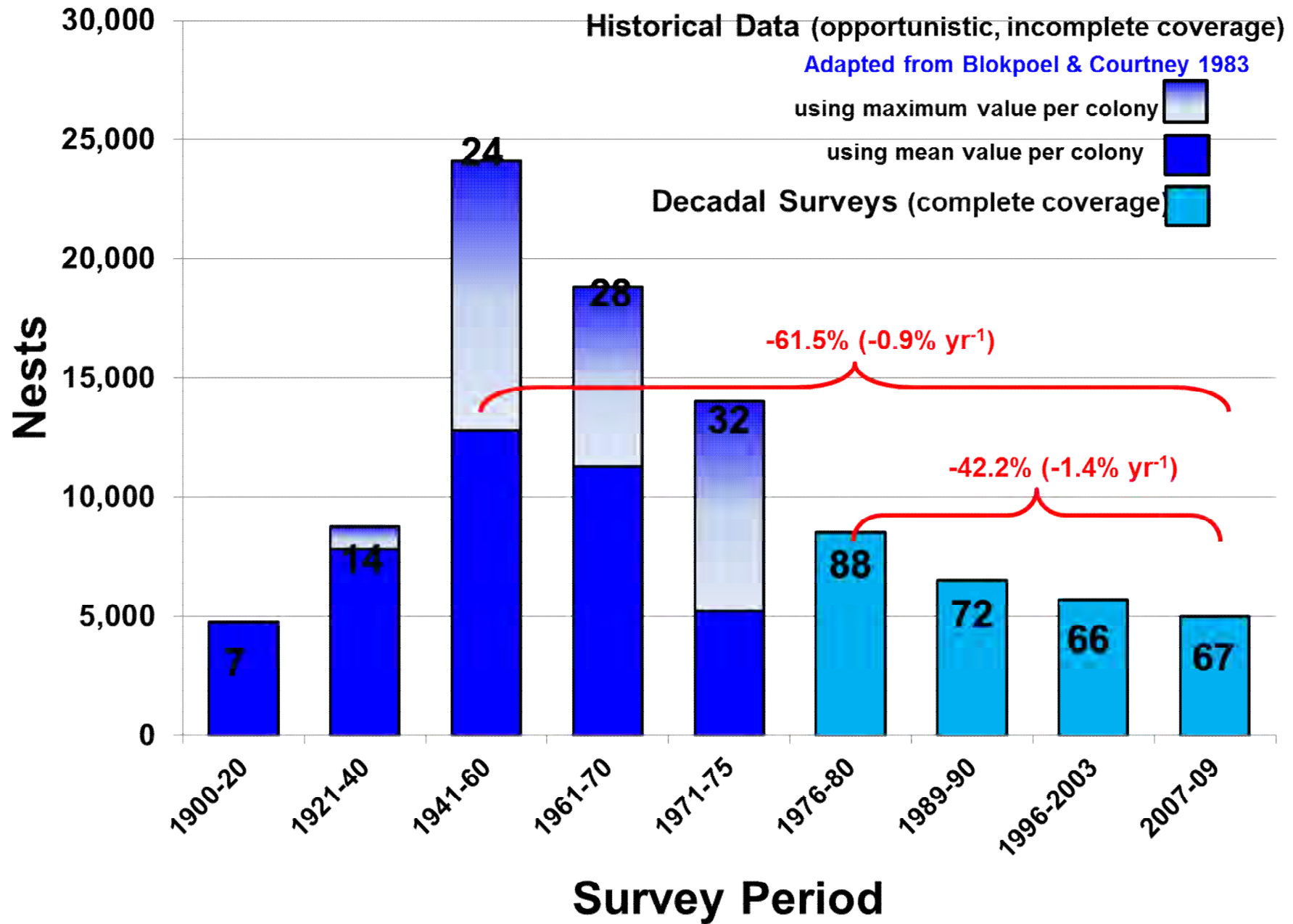
Figure 5. Sketch of the colonial waterbird habitat on the three new wildlife islands showing the actual breeding distribution during the 1996 breeding season. Areas of multiple nests are demarcated by dashed lines, single nests are indicated by triangles.

Habitat Gained



Keeping Terns

- Common terns are declining in the lower Great Lakes.



September 29, 2009



November 15, 2012



December 2010



- Closed off future wetland from Red Hill Creek
- Key for fish exclusion from work area
- Pre-dredged for peat

September 2011



- Constructed internal dykes
- Divided the basin into smaller areas for capping

September 2012 – Complete!



Common Tern Colony Translocation







Management

Efficacy of targeted cormorant scaring on Neare Island:

Santa protecting herring gulls on Neare and North.

By Marcus Vujacic, Safia Mai, and James S. Quinn

October 1, 2007

Wildlife Island Management Summer 2009

The aim of the effort during the 2009 summer season was to manage and monitor the colonial nesting birds in Hamilton Harbour. The management aspect focused on double-crested cormorants as an overabundant species and herring gulls and black-crowned night herons as species that are being compromised by the effects of the cormorants. To this end we removed cormorant nests on South, North and Neare Islands as well as employing a dancing Santa figure to scare cormorants away from North and Neare Islands in hopes that the number of nesting herons and gulls would increase.

Carolyn Zanchetta and Beth Nagai
Summer 2011

Management of Wildlife Islands

South Island

We started removing cormorant tree and ground nests from South Island on April 27, but we did not manage to remove all tree nests possible until May 4. We were able to reach about 95% of the nests due to problems with the extendable poles. One pole was

Michele Wright
Henry Kou

Report on the Management of Hamilton Harbour Wildlife Islands 2013

The management of colonial water birds in Hamilton Harbour was performed during the nesting period from April 29th until July 16th. Management of the wildlife on five human-made islands in Hamilton Harbour had been ongoing since 1996. Presently only four islands remain: South, Central, North, and Neare. In 2010 the fifth, Farr Island, was reduced to a fish shoal. Hamilton Harbour has become a
Hamilton Harbour Colonial Waterbird Management Report – Spring/Summer 2015

Mei-Hua Hwang & Aiden Huynh

During the spring/summer of 2015, we monitored the colonially-breeding waterbird colonies on

Hamilton Harbour Colonial Bird Management Report Spring/Summer 2017

Hannah Clyde and Adam Grottole

Introduction:

During the spring/summer of 2017, we monitored colonial water bird colonies at various locations in Hamilton harbour. Attention was focused on the



Hamilton Harbour Colonial Bird Management Report May to July 2019

Natalie Palumbo & Lucas Eckert

Summer Report 2008

Introduction

Hamilton Harbour is home to five man-made islands. The first two, Neare and Farr Island, were built in the 1960s as a means for hydro wire support. Over time, these islands became colony sites for nesting bird species. In 1996, the other islands, North, Centre, and

Jasmine Farahbakhsh & Janine Wong

Management of Wildlife Islands: Summer 2010

Double-crested Cormorant Management

South Island

Beth Nagai
Shakil Salim

Report on Management of Hamilton Harbour Islands 2012

Management of five man-made islands in Hamilton Harbour and monitoring of Pier 27 was performed this season. Species of interest were Herring Gulls, Ring-billed Gulls, Double-crested Cormorants, Black-crowned Night Herons, Common Terns and Caspian Terns. Double-crested Cormorants are an overabundant species which tend to negatively impact less common species such as

Harbour Management Report — Summer 2014

Brendan Pynenburg & Mei-Hua Hwang

During the summer of 2014, Hamilton Harbour contained four man-made islands

Hamilton Harbour Colonial Waterbird Management Report - Spring/Summer 2016

David Martin & Muhammed Aydin

In the spring of 2016, we monitored colonial waterbird colonies at various sites on the Hamilton waterfront: Pier 27, the man-made islands of Windermere Basin, and the man-made islands

Hamilton Harbour Colonial Bird Management Report Spring/Summer 2018

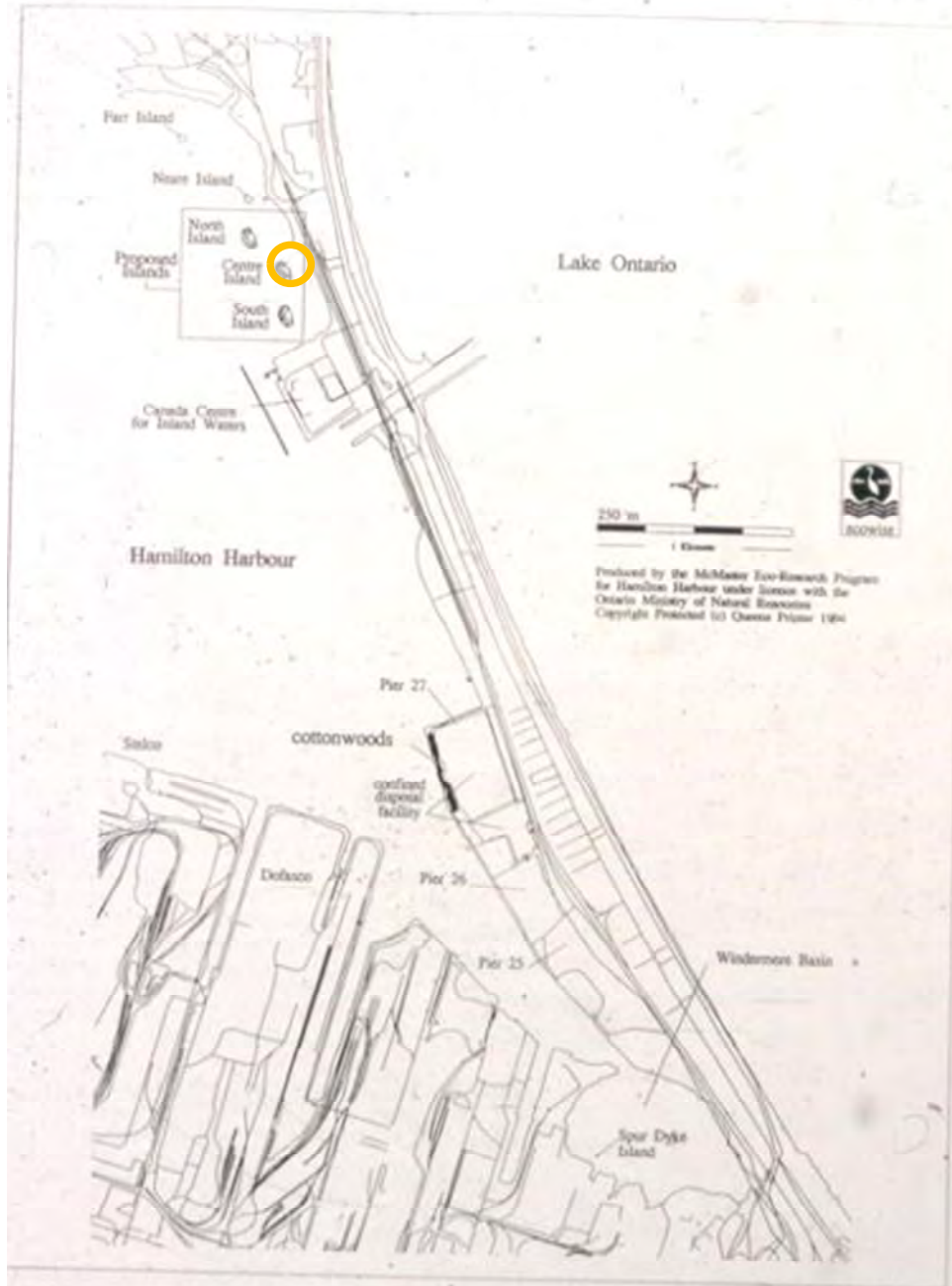
Molly Bradford & Nicole Szabo

Introduction

During the spring and summer of 2018, we monitored and managed colonial waterbird populations throughout Hamilton Harbour. The scope of focus was four man-made islands



Image © 2018 TerraMetrics
© 2018 Google
Image NOAA





Overabundance: An Issue for Conservation Biologists?

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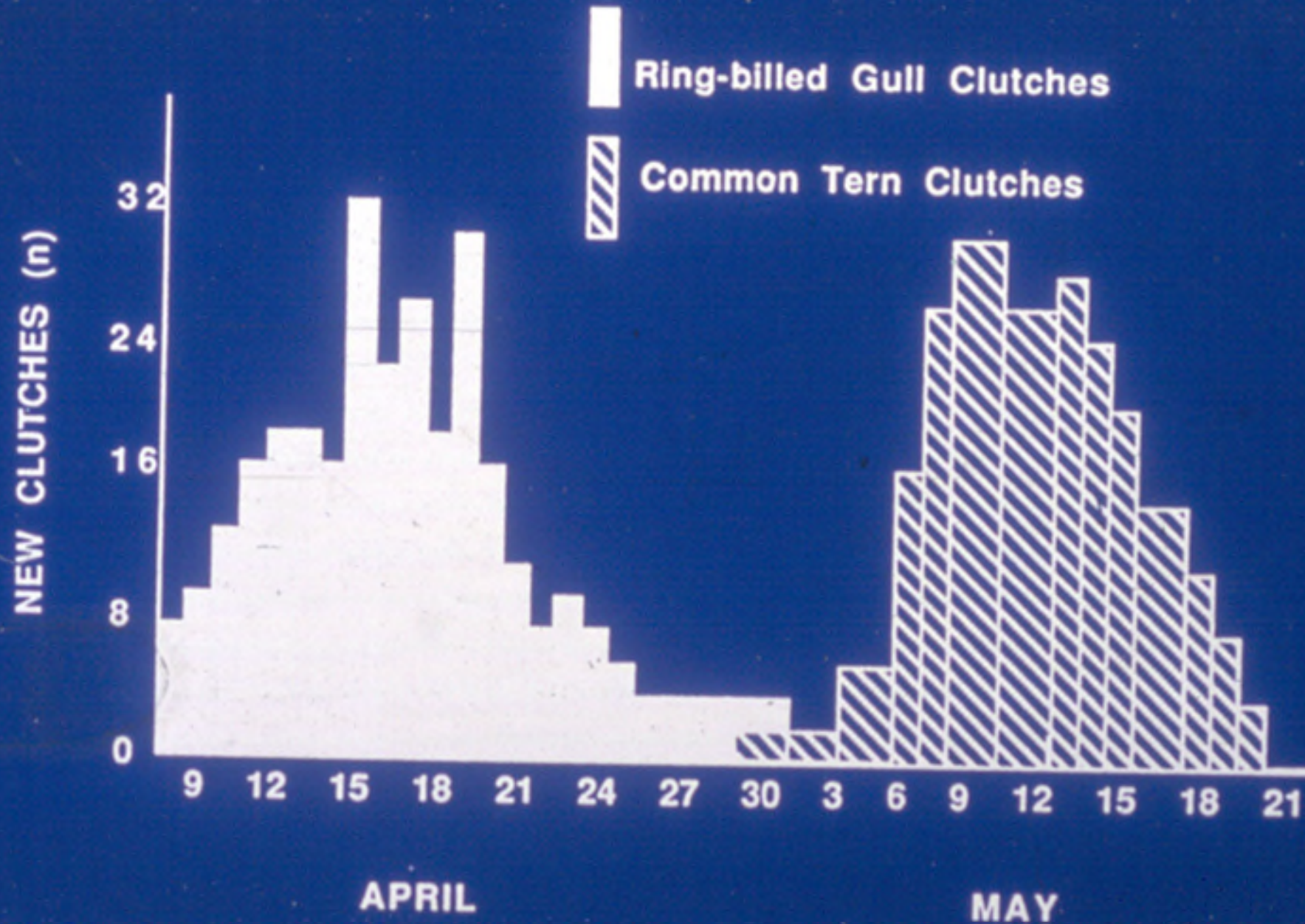
Several recent essays have discussed the inexorable invasion of exotic organisms and urged conservation biologists to take the lead in eradicating exotics where they endanger native biota (Coblentz 1990, Soulé 1990, Temple 1990, Westman 1990). Little attention has been given, however, to the closely related problem of controlling locally overabundant or expanding native species that negatively affect other native species. During the past century, the populations of many native species that are generalists or opportunists have increased, and their distributions have expanded. North American examples include beaver (*Castor canadensis*), Canada Geese (*Branta canadensis*), cattail (*Typha* spp.), Cattle Egret (*Buhtylus ibis*), common sunflower (*Helianthus annuus*), cottontail rabbit (*Sylvilagus* spp.), Brown-Headed Cowbird (*Molothrus ater*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), gray squirrel (*Sciurus carolinensis*), gulls (*Larus* spp.), muskrat (*Ondatra zibethicus*), opossum (*Didelphis virginiana*), pocket gopher (*Thomomys* spp.), prickly pear (*Opuntia* spp.), raccoon (*Procyon lotor*), Common Raven (*Corvus corax*), red fox (*Vulpes vulpes*), red squirrel (*Tamiasciurus hudsonicus*), Red-Winged Blackbird (*Agelaius phoeniceus*), striped skunk (*Mephitis mephitis*), and white-tailed deer (*Odocoileus vir-*

ginianus). The demographic success of these species that have benefited from anthropogenic landscape changes can be devastating for less adaptable, rarer species.

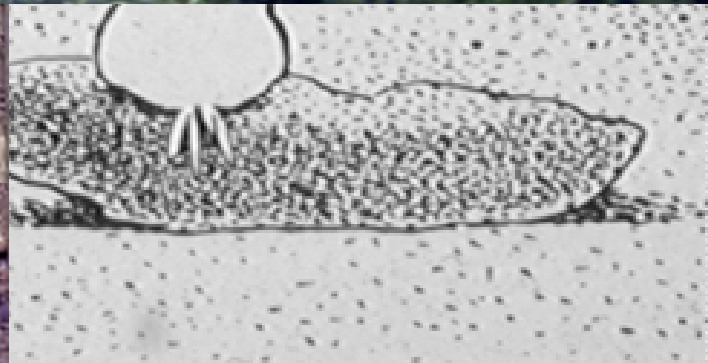
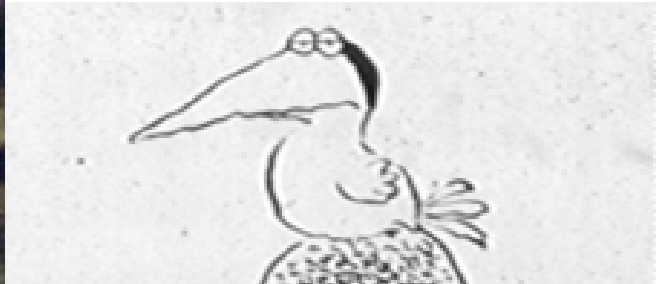
Similar to exotic species, overabundant or expanding native species can reduce natural diversity by monopolizing resources, introducing or spreading infectious diseases and parasites, changing the species composition or relative abundance of sympatric species, and even causing local extinctions (Noss 1990, Soulé 1990, Temple 1990). For example, red foxes have expanded into wetlands in California and have substantially reduced populations of endangered Light-Footed Clapper Rails (*Rallus longirostris*) and California Least Terns (*Sterna antillarum*). In Puget Sound, Washington, predation by California sea lions (*Zalophus californianus*) is threatening the persistence of an endangered run of steelhead (*Oncorhynchus mykiss* [DeMaster & Sisson 1992]). In many areas, overbrowsing by white-tailed deer is preventing the regeneration of palatable components of plant communities, thereby affecting ecosystem diversity and the abundance of several rare species (Alverson et al. 1988). Populations of actively managed and protected species that were once considered rare, but have recovered to the point where the public now perceives them to be locally overabundant, present some distinct socio-ecological problems for conservationists. Many of these species are desirable within reserves but cannot

Paper submitted April 20, 1993; revised manuscript accepted July 1, 1993.











Interactions Between Double-crested Cormorants and Herring Gulls at a Shared Breeding Site

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Internet: Chris.Somers@uregina.ca

Abstract.—The Double-crested Cormorant (*Phalacrocorax auritus*) population in the North American Great Lakes region has increased substantially during the past three decades. Cormorants are likely recovering after a period of human-caused suppression; however, their resurgence has raised concerns regarding potential negative interactions with other waterbirds. To examine this issue, we compared measures of nesting success and aggressive behavior in Herring Gulls (*Larus argentatus*) nesting on two artificial islands in Hamilton Harbour, western Lake Ontario. Only breeding Herring Gulls occupied the first island, whereas a mixed colony of both Herring Gulls and cormorants occupied the second. Over three years, Herring Gulls in the single-species colony had greater nesting success than those in the colony shared with cormorants. Gulls in the mixed colony had more nests that contained cormorant eggs in addition to Herring Gull eggs, or that were usurped by cormorants. Analysis of individual Herring Gull egg fates revealed lower hatching rates and more eggs displaced from nests in the mixed colony. Due to the presence of cormorants, gulls in the mixed colony engaged in more aggressive interactions near their nests than those in the single-species colony. We conclude that at our study site cormorants were competing directly with Herring Gulls for nest sites and nesting material, and contributing to reduced Herring Gull reproductive success in the mixed colony. Our results suggest that interactions between species in mixed colonies may be more subtle than the displacement of breeding adults, and may not be detected by examining nest counts alone. We suggest that further studies examine cormorant interactions with other colonial bird species at additional sites. *Received 20 May 2006, accepted 10 December 2006.*

Key words.—Double-crested Cormorant, Herring Gull, nest site competition.

Waterbirds 30(2): 241-250, 2007

Cormorants displaced all herring gulls from Farr Island, and pushed out herring gulls from $\frac{3}{4}$ of Neare Island, in 2006



Cormorants: more wary than gulls!





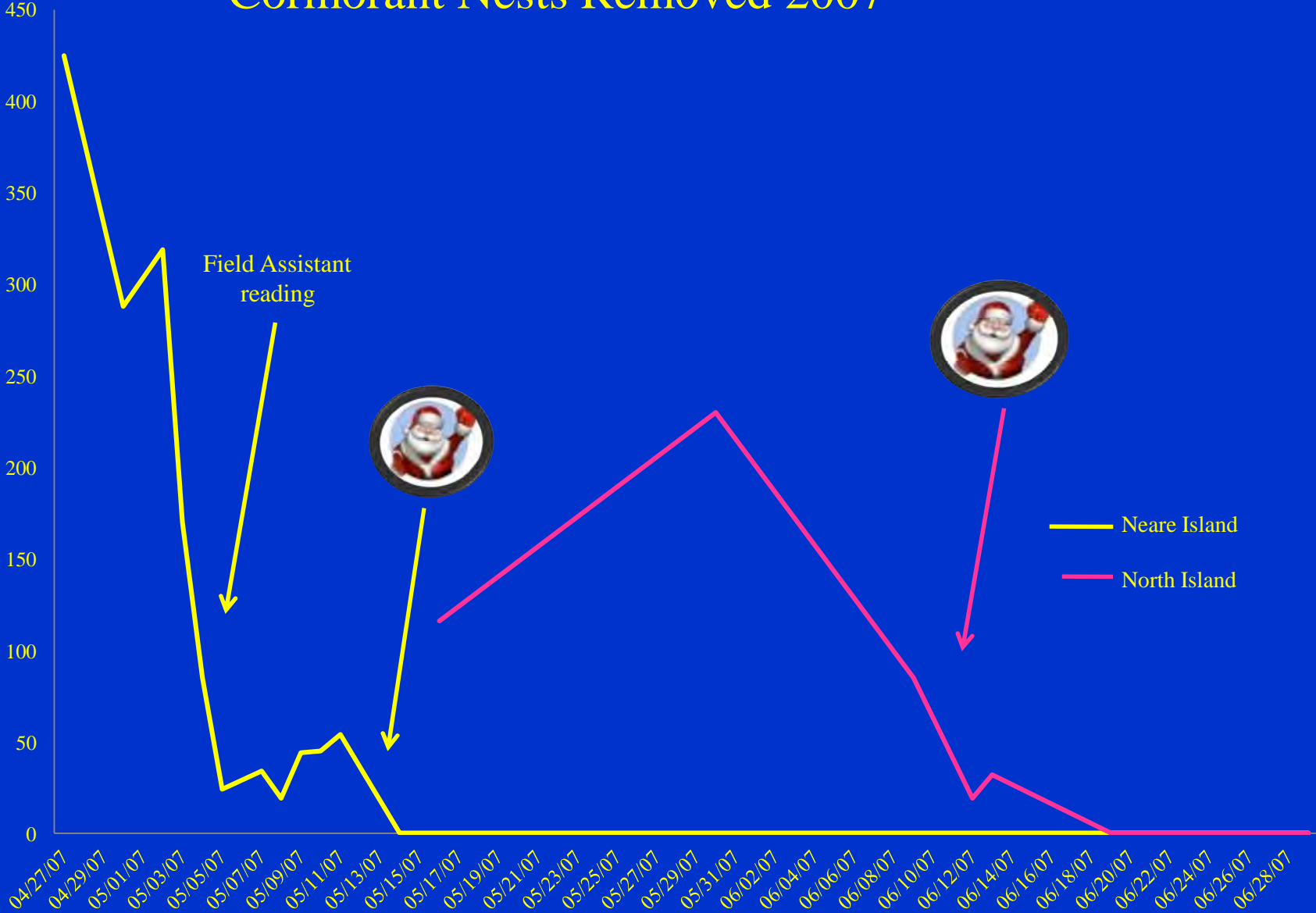








Cormorant Nests Removed 2007





Emerging Issues

Important Emerging Issues:

- Tern competition
- Climate Change

The Problem

- Caspian Terns (CATEs) and Common Terns (COTEs) have similar habitat requirements (Quinn & Sirdevan, 1998 ; Richards & Morris, 1984)
- CATEs arrive earlier to Windermere Basin than COTEs, and exploit suitable nesting space
- COTEs are forced to nest on the rocky sides of the islands

Protecting Nesting Habitat for Common Terns from Caspian Terns



Methods

- Covered half of island 1, 2, and 3
- Assessed hatching and fledging success



Figure 3. Plastic sheeting used to cover one half of island 1, 2, and 3, to deter CATE nesting.





Results: Habitat Management

- Plastic sheeting did not act as a sufficient barrier against CATE nesting





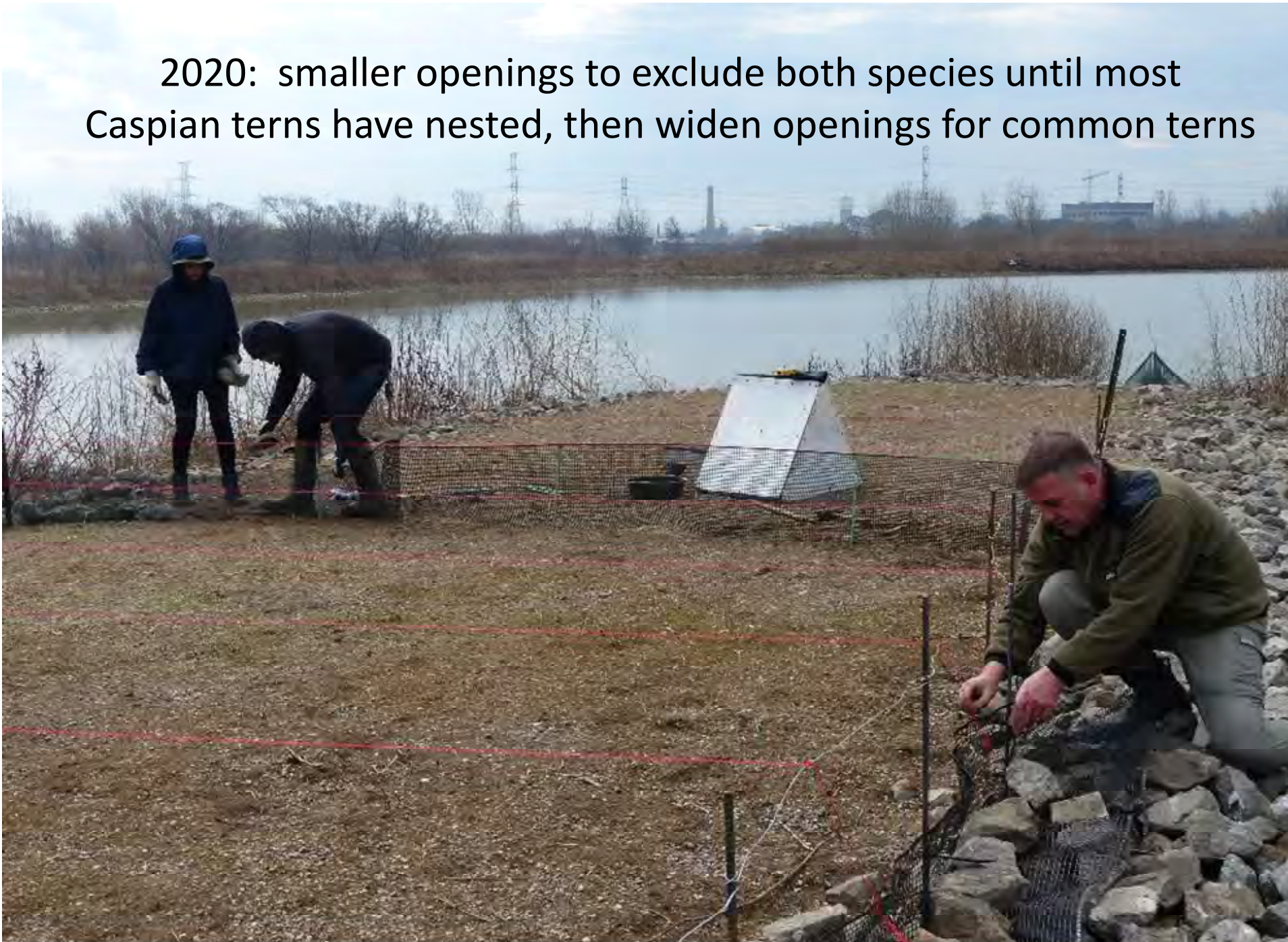


2019: Grid of wire/cord to allow smaller common terns in while excluding the larger Caspian terns





Steve Sturtz

2020: smaller openings to exclude both species until most Caspian terns have nested, then widen openings for common terns



Climate change influence

-  temperatures
-  evaporation and precipitation rates

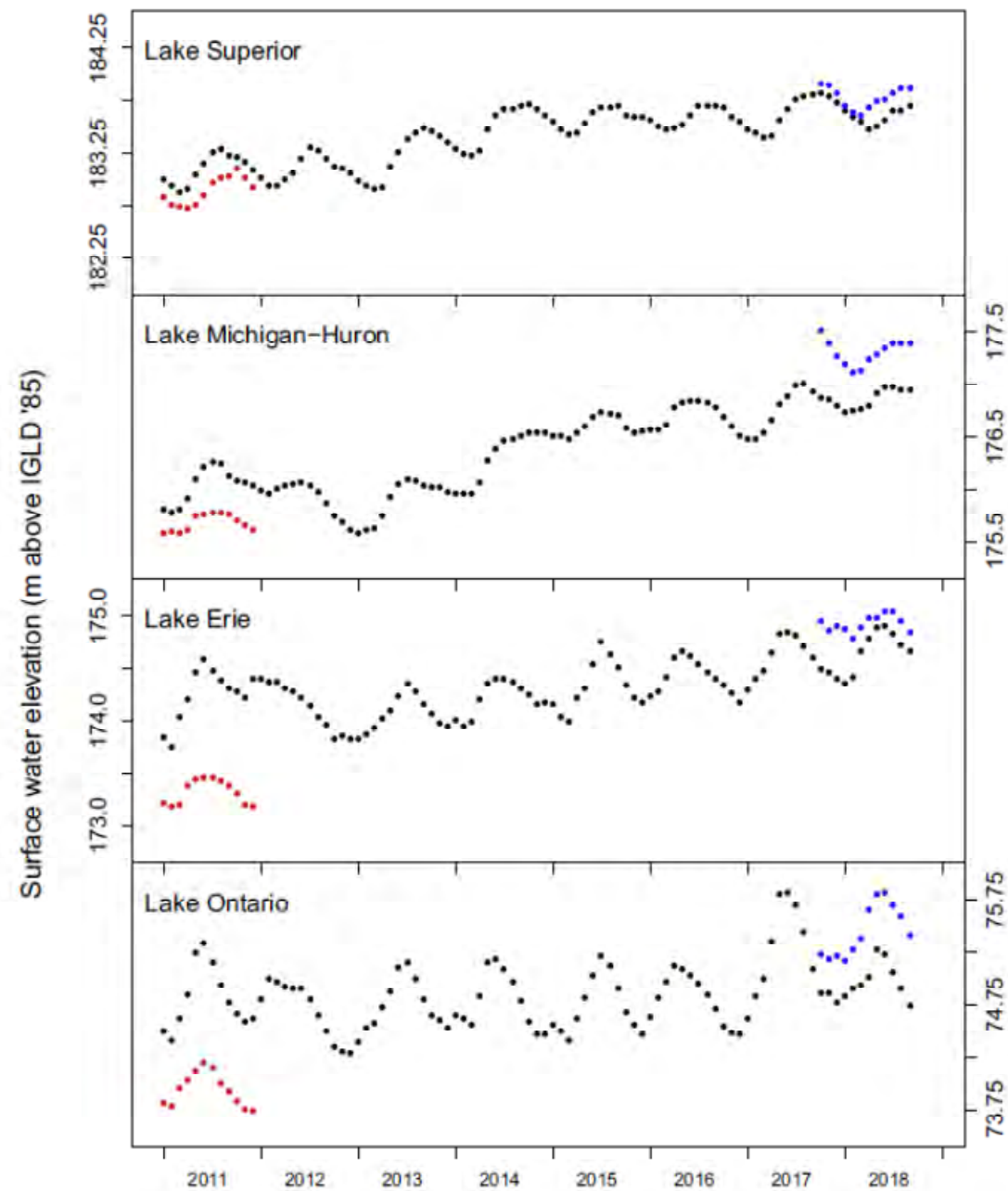


Fig. 1. Monthly average water levels (black dots) for each of the Great Lakes from 2011 through 2018. Historical record low (red dots) and high (blue dots) monthly average water levels for each calendar month are aligned, for clarity, with the calendar months of 2011 and 2018, respectively.



Neare Island 2015



Neare Island Hamilton Harbour May 9, 2017



Neare Island Hamilton Harbour 2017



Neare Island Hamilton Harbour 2019



Centre Island 2019





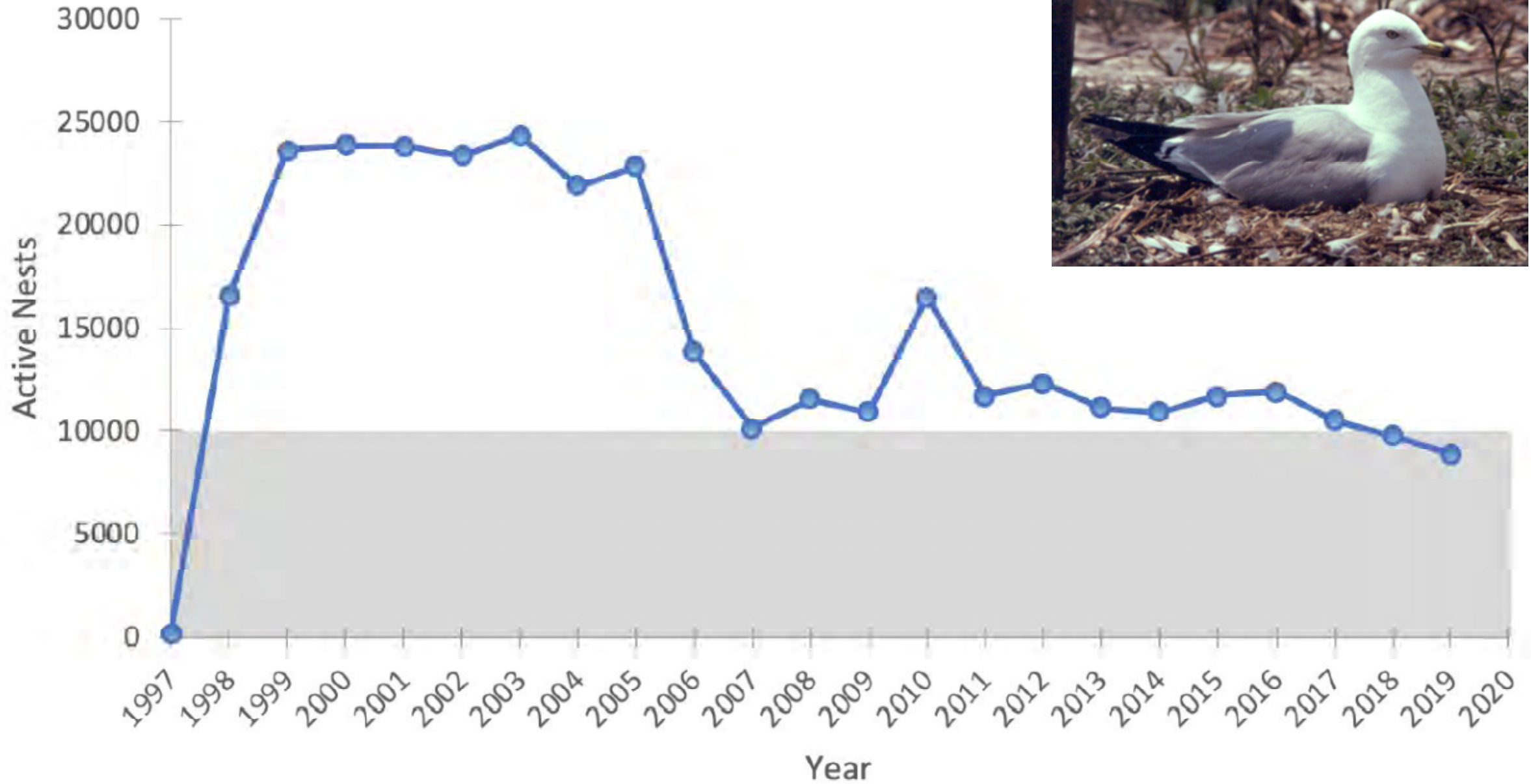
Harbour Water Levels

- 2017 and 2019 were record high water level years for Lake Ontario
- Future levels under climate change → precipitation versus evaporation

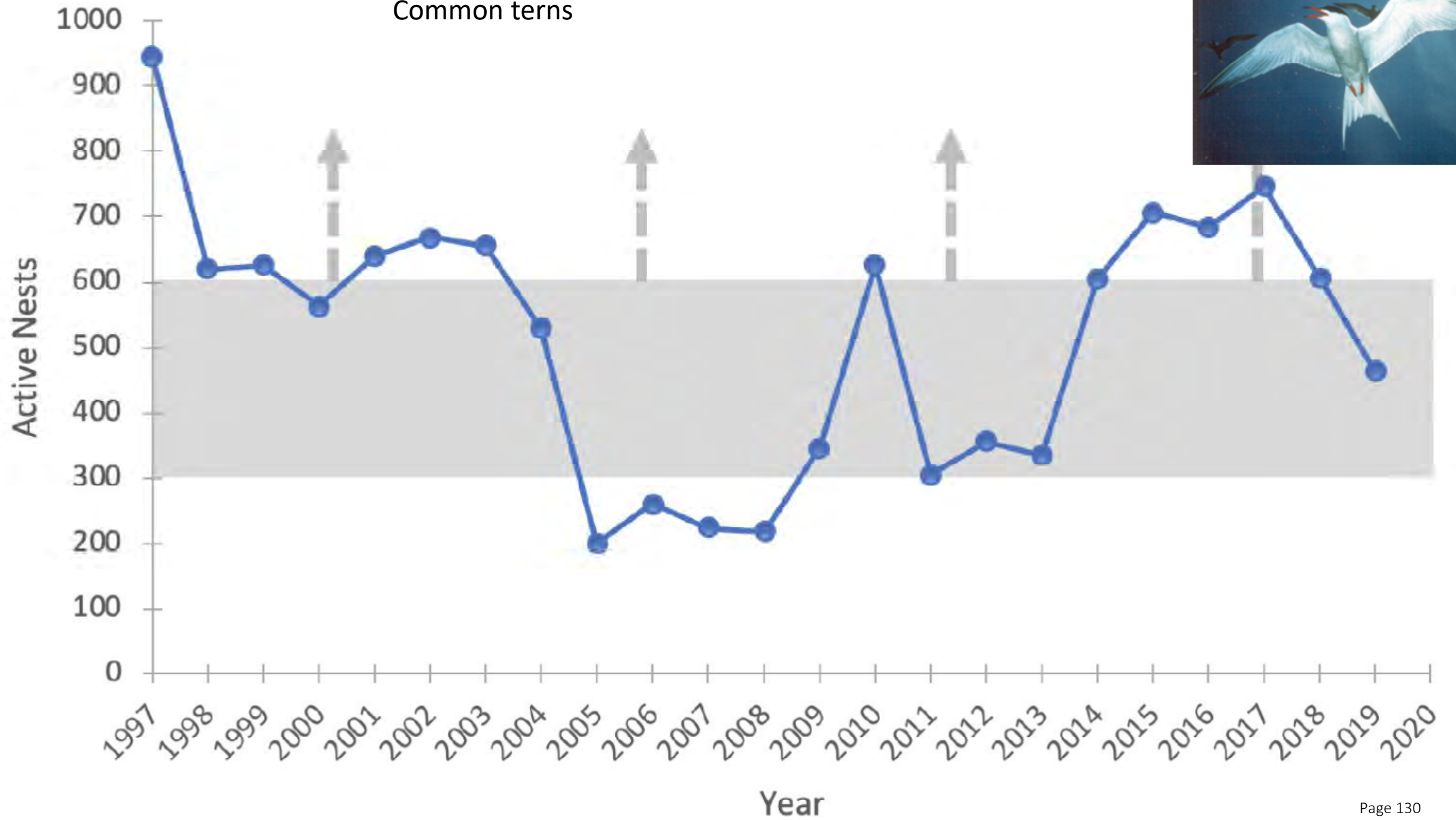
Monitoring

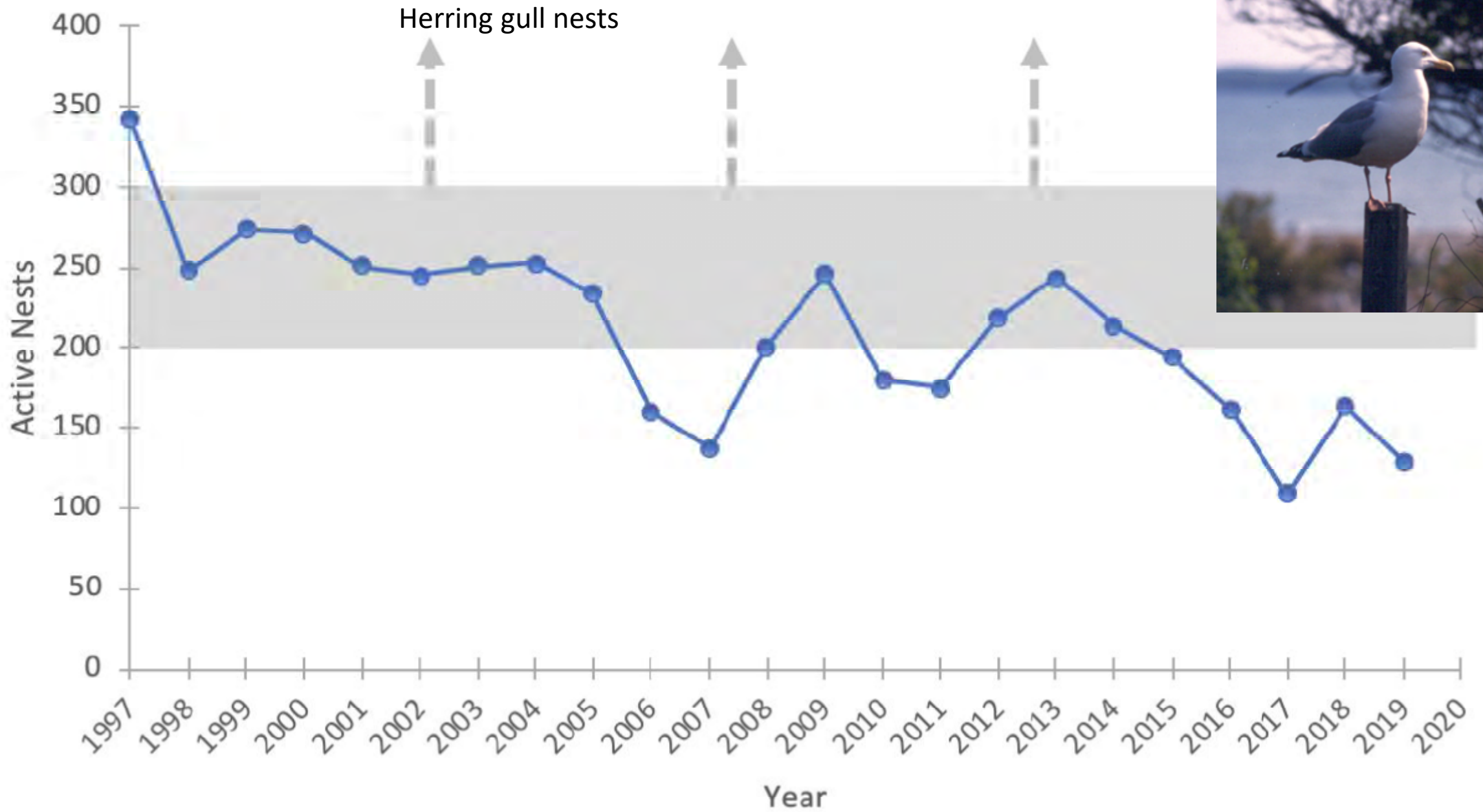
Location	2019	2018	DCCO																				
			2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
REFERENCES TO NOTES					BD, BE, BF, BJ, BK	AZ	AV			AP	AI, AL, AO, AM	AF		Q, R, S, T									
Hickory I.	177	157	134	52	55	65	38	32	42	0	14	7		6	11	68	83	153	183	197	222	218	121
Carroll's Pt.	0	0	0		0	0	0	56	0	0	0	0		103	84	0	16	26	0	0	0	13	19
LaSalle Park Shoal 1 (closest to shore & most westerly)	0	0	0		0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0
LaSalle Park Shoal 2	0	0	0		0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0
LaSalle Park Shoal 3	0	0	0		0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0
LaSalle Park Shoal 4	0	0	0		0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0
LaSalle Park Shoal 5 (furthest from shore & most easterly)	0	0	0		0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0
Sielco- #s in 1997 column counted in 1996, AU	0	0	0	41	0	0	0	0	0	70	416			0	0	0	0	0	0	0	0	0	0
Dofasco	0	0	8	0	0	0	0	3	0	932	132												
MANA	732	153	210	129	0																		
Pier 11 (Vopack)	N/A	N/A	N/A	N/A	N/A		0	0	0	0	0												
Windermere Basin (East & West sides)	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0
Windermere Basin - Island 1	0	0	0	0	0	0	0																
Windermere Basin - Island 2	0	0	0	0	0	0	0																
Windermere Basin - Island 3	0	0	0	0	0	0	0																
Windermere Basin - Spur Dyke	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0
Windermere- mainland on north side close to road.	0	0	0	0	0	0	0	0	0	0	0			included with Windermere total									
Eastport, Pier 27	1797	1600	2103	2553	1982	2620	2401	2159	1461	720	720	489	689	1219	2884	2096	1641	1429	1007	873	820	588	236
LaFarge Short Piles (Between Pier 26 and 27)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Island off Fisherman's Pier	0	0	0	N/A	N/A	0	0	0	0	0	0												
Eastport - raft in southern CDF pond	N/A	N/A	N/A	N/A	N/A	0	0	0	N/A	N/A	Islands side			NV	0	0	0	0	0	NV	0	0	0
Noars I.	0	0	4	203	0	0	0	0	0	0	0	161	0	561	0	0	0	0	0	0	0	0	0
\ (Farr Island)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	888	972	748	1100	1034	351	282	121	97	72	48	40	23	119	
North I.	128	0	17	25	0	82	316	118	117	115	138	110	240	102	32	10	0	0	0	0	0	0	
Center I.	1102	1181	1489	1472	1084	1383	1835	1045	740	595	571	523	530	125	30	26	26	25	28	25	25	25	0
South I.	224	33	159	187	49	136	159	0	32	63	71	43	715	32	0	0	0	0	0	0	0	0	0
Indian Creek Willows (Farr displacement) AR	0	0	0	0	0	0	0	204	992														
Eastport by Noars	0	0	0	0	0	0	0	0	314	0	88	159											
South Shoal btw South I. and Center I.	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Shoal btw South I. and Center I.	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Shoal between Centre & North Is.	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Shoal between Centre & North Is.	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mainland-east of South I.	0	0	0	0	0	0	0	0	1	0	5	0	0	0	0	0	0	0	0	0	0	0	0
Mainland-east of Centre I.	0	366	396	88	0	0	0	81	0	0	0	0	0	0									
CCIW side of canal breakwall AR	0	0	0	0	0	0	0	0	0	0	0												
Hamilton Harbour Breakwall, W of CCIW	0	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0
Mainland-North of CCIW (behind boat storage)	0	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0
CCIW- WTC Building Cobble Roof (East portion of roof)	0	0	0	0	0	0	0	0	0	0	0												
CCIW- Cobble Roof on E side (Front of building)	0	0	0	0	0	0	0	0	0	0	0												
CCIW- Cobble Roof on W side	0	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	NV	NV	NV	NV
CCIW- Cobble Roof on S side	0	0	0	0	0	0	0	0	N/A	N/A	Islands side			0	0	0	0	0	0	NV	NV	NV	NV
Hamilton Terminals Warehouse #2, 1817 Burlington Street	0	0	0	0	0	0	0	0	0	0	0												
TOTALS	4539	3490	4520	4748	3150	4246	4747	3678	3699	3383	3125	2238	3274	3182	3392	2482	1886	1730	1268	1143	1107	867	495

Ring-billed gull nests

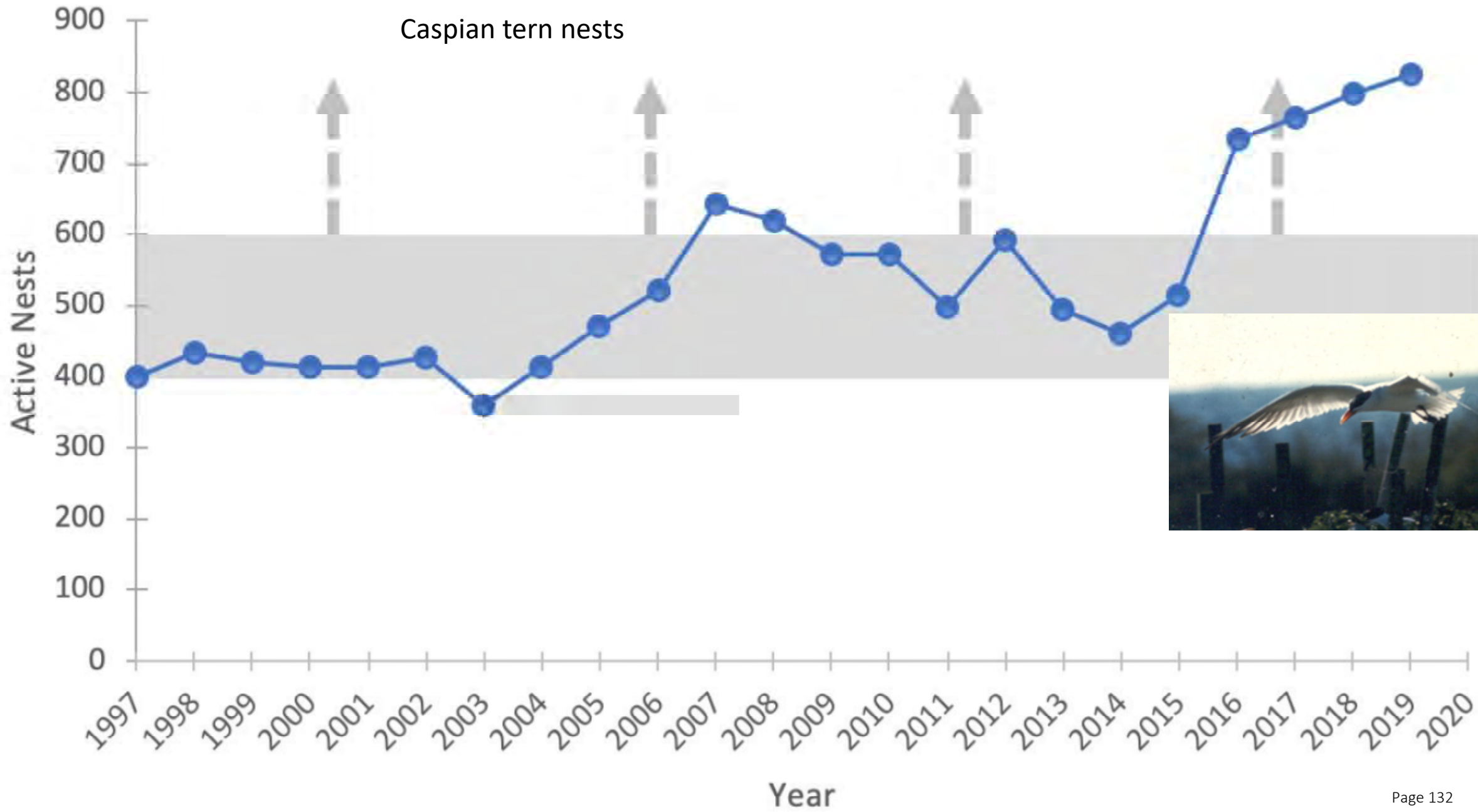


Common terns

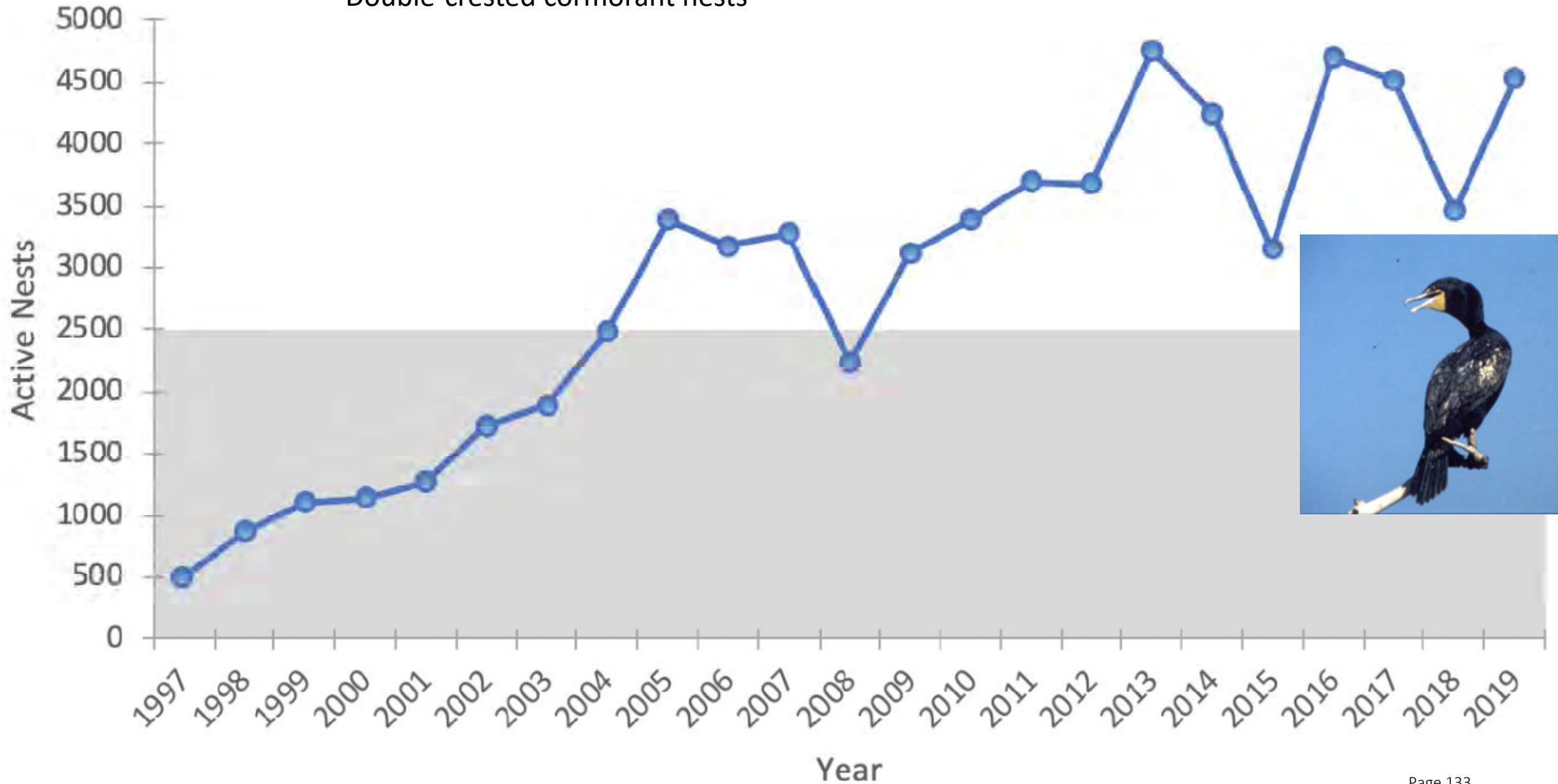




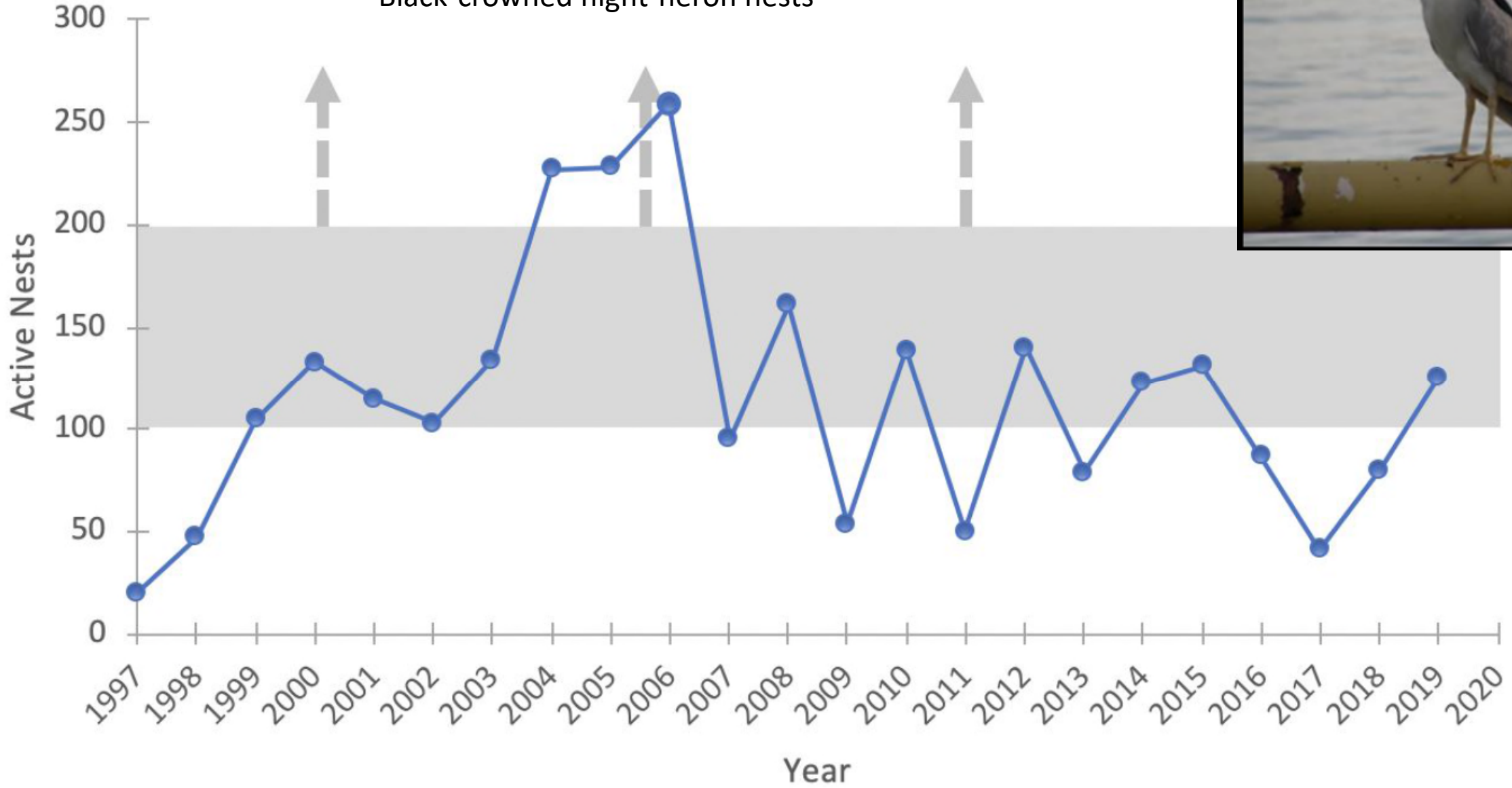
Caspian tern nests



Double-crested cormorant nests



Black-crowned night-heron nests



Delisting Criteria:

1. Colonial waterbirds: The overall objective is to have a **sustainable mixed community of colonial waterbirds**. In general, are aiming for an increase of the rarer species and a reduction in the number of over-abundant species. Management of colonial waterbirds and achieving specific populations of particular species requires an adaptive management approach to ensure sustainable populations continue to the extent possible after delisting.

Targets (Number of Nests)

- Ring-billed Gulls < 10,000 ✓
- Common Terns 300-600+ ✓
- Herring Gulls 200-300+ ↓ Lakes wide
- Caspian Terns 400-600+ ✓
- Double-crested Cormorants < 2,500 ↑ stable Lakes wide
- Black-crowned Night Herons 100-200+ ✓



2. Other wildlife including waterfowl: No target will be suggested for other species of birds or animals, but a target for habitat (BU xiv) has been suggested which will enhance wildlife populations generally. In addition, management of some species may be necessary as a result of habitat enhancement.

Conclusions

Conclusions

- Our efforts have provided local stability
- Great Lakes wide population impacts remain in effect and beyond our control for herring gulls and double-crested cormorants
- We have established good balance of colonial waterbirds in Hamilton Harbour.
- Ongoing monitoring and management is needed....
 - The cities of Hamilton and Burlington and the Hamilton Port Authority have pledged support for the next decade!
- This is what a diverse community of CWBs looks like:



Acknowledgements:

- McMaster Field Assistants: Marcus Vujasic, Sofia Mai, Dan Rei, Catherine Dielman, Florence Gonsalves Prabhu, Kyna Intini, Janine Wong, Jasmine Farahbakhsh, Beth Nagai, Carolyn Zanchetta, Shakil Salim, Henry Kou, Kristin Daoust, Michele Wright, Brendan Pyenberg, Mei-Hua Hwang, Muhammed Aydin, David Martin, Adam Grotolli, Hannah Clyde, Nicole Szabo, Molly Bradford, Lucas Eckert, and Natalie Palumbo.
- Hundreds of McMaster student volunteers
- John Hall, Kristin O'Connor, (and other HHRAP folks)
- Dr. Dave Moore (Environment Canada)
- Marilyn Baxter (Hamilton Port Authority)
- City of Hamilton, City of Burlington, Hamilton Port Authority, Environment Canada.

Questions?

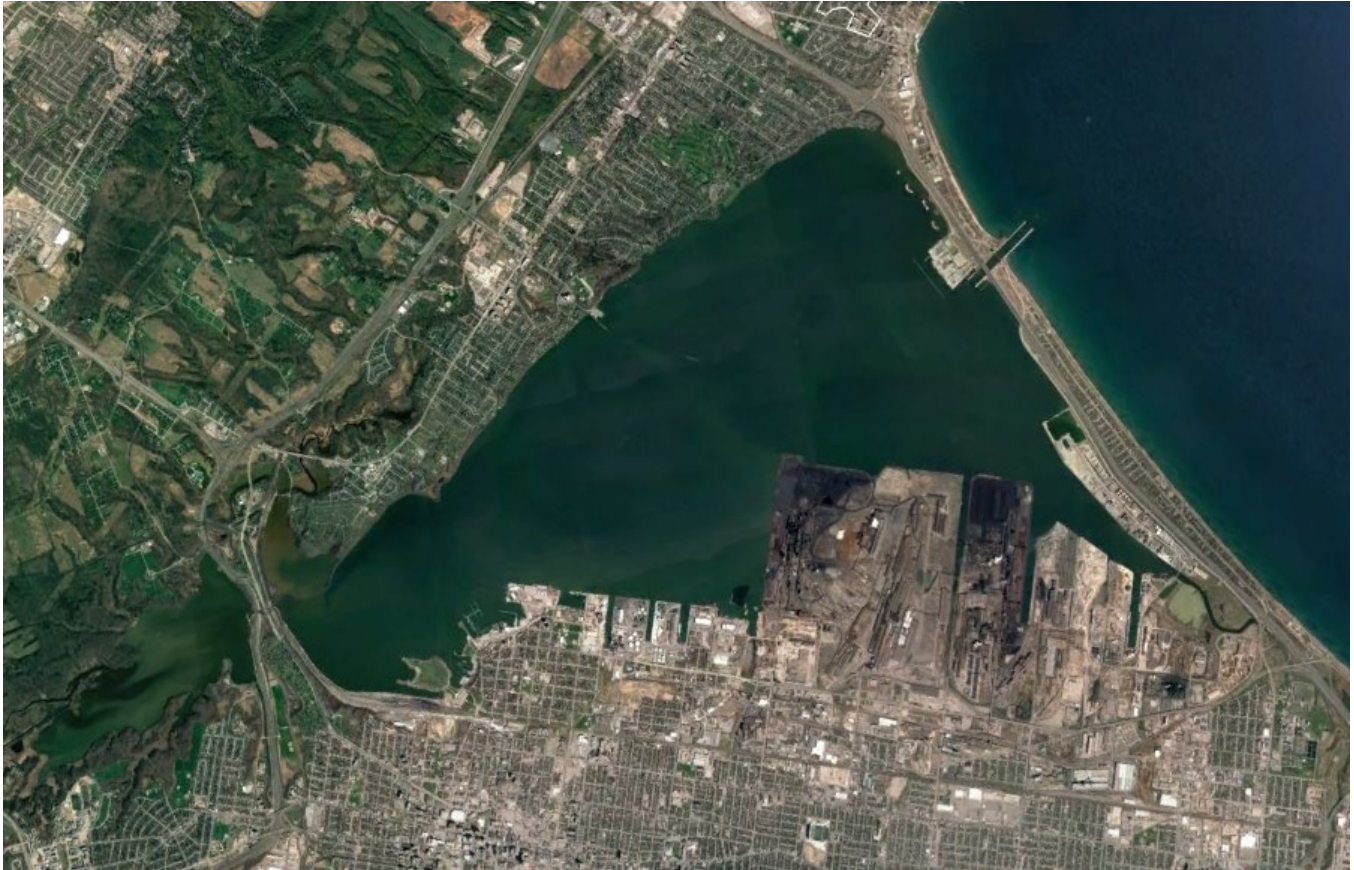


APPENDIX 6

STATUS ASSESSMENT REPORT OF THE BENEFICIAL USE IMPAIRMENT “DEGRADATION OF WILDLIFE POPULATIONS” FOR THE HAMILTON HARBOUR AREA OF CONCERN



Status Assessment Report of the Beneficial Use Impairment “Degradation of Wildlife Populations” for the Hamilton Harbour Area of Concern



Report submitted to the Colonial Waterbird Subcommittee, Hamilton Harbour Remedial Action Plan
and Great Lakes Areas of Concern Section, Environment and Climate Change Canada

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Revised by the Hamilton Harbour Remedial Action Plan on December 2, 2019

EXECUTIVE SUMMARY

To address Hamilton Harbour's Remedial Action Plan Beneficial Use Impairment #3b – loss of wildlife populations, the creation and management of colonial wildlife habitat have been instrumental to the establishment of stable colonial waterbird populations within the Harbour. The creation of the Northeast Shore Islands in the mid-1990s and of Tern Islands in Windermere Basin (2010-2013) have played an essential role in the establishment of diverse and sustainable populations.

Management of the colonial waterbirds has involved the control of the ring-billed gull (*Larus delawarensis*) and double-crested cormorant (*Phalacrocorax auritus*) populations and encouragement of the populations of herring gulls (*Larus argentatus*), common terns (*Sterna hirundo*), Caspian terns (*Hydroprogne caspia*), and black-crowned night-herons (*Nycticorax nycticorax*). Starting in 2007, the implementation of a harbour-wide adaptive management approach was successful in controlling the ring-billed gull populations, maintaining numbers around a target of 10,000 active nests. Efforts to control double-crested cormorants at target numbers of less than 2,500 active nests suggest that this may have been an ambitious and arbitrary target given non-lethal methods of control were sought after and used. Cormorants are actively managed across the Great lakes Basin and local nest counts reflect the basin-wide population. The herring gull monitoring data indicate that the sub-colonies have been declining, mirroring observations made throughout Lake Ontario. Local management efforts cannot fully address issues with this species' decline. Discussion with stakeholders to ensure management practices are aligned with the RAP objectives may ensure this species is given the best chance possible. Efforts to maintain nesting space for herring gulls on the Northeast Shore Islands will continue into the future.

With the creation of Tern Islands in Windermere Basin, efforts to protect the common and Caspian terns have been successful. In contrast, black-crowned night-heron nest counts fluctuate and are difficult to enumerate because of the species' frequent site abandonment and preference for concealed nesting in trees. Due to limited access, colonies on industrial property are not counted, but known to exist every year. Management efforts directed at limiting cormorant presence and locating night-herons following site abandonment may be all that is feasible to ensure as much success as possible for this species.

Data from 2017 have shown that populations from the Northeast Shore Islands are susceptible to extreme water levels, particularly the herring gull sub-colonies at Neare Island. Although these conditions were exceptional, they provide valuable information on the sensitivity of various colonial waterbird species under increased habitat pressure.

After careful review of the data and reports on the Colonial Waterbird Subcommittee’s efforts to balance the populations of each species, the re-designation of the degradation of wildlife populations to not impaired is recommended. It is understood that adaptive management is crucial to maintaining a diverse population of colonial waterbirds in Hamilton Harbour.

Recommended citation: Gilroy, 2019. Status Assessment Report of the Beneficial Use Impairment “Degradation of Wildlife Populations” for the Hamilton Harbour Area of Concern. Report submitted to the Colonial Waterbird Subcommittee, Hamilton Harbour Remedial Action Plan, and Great Lakes Areas of Concern Section, Environment and Climate Change Canada. 59 pp

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INTRODUCTION

The Great Lakes basin has undergone extensive industrial development and population growth over the last century. Consequently, many areas of the Great Lakes have become degraded due to anthropogenic contamination, habitat loss, and eutrophication [1]. In 1987, 43 specific regions of the Great Lakes were designated Areas of Concern (AOCs) under a protocol of the Canada–U.S. Water Quality Agreement (updated in 2012). Through Annex 1 of this Agreement, both countries committed to the development and implementation of remedial action plans (RAPs) [1], to identify and address in Hamilton Harbour eleven of the potential fourteen beneficial use impairments (BUIs), defined as *a reduction in the chemical, physical or biological integrity of the waters of the Great Lakes sufficient to cause any of the following* [2]:

- 1) restrictions on fish and wildlife consumption;
- 2) tainting of fish and wildlife flavour¹;
- 3) degradation of fish and wildlife populations;
- 4) fish tumours or other deformities;
- 5) bird or animal deformities or reproduction problems;
- 6) degradation of benthos;
- 7) restrictions on dredging activities;
- 8) eutrophication or undesirable algae;
- 9) restrictions on drinking water consumption, or taste and odour problems¹;
- 10) beach closings;
- 11) degradation of aesthetics;
- 12) added costs to agriculture or industry¹;
- 13) degradation of phytoplankton and zooplankton populations; and
- 14) loss of fish and wildlife habitat.

Remedial Action Plans are implemented through coordinated efforts between government, community and industry partners, and consist of three stages: Stage 1: Identification of Environmental Challenges, Stage 2: Planning and Implementation of Remedial Action, and Stage 3: Monitoring Actions and Delisting of the AOC.

¹ Not a Beneficial Use Impairment in Hamilton Harbour

Hamilton Harbour AOC is a 12.5 km² embayment drained by a watershed of 500 km² located at the west end of Lake Ontario (Figure 1). Extensive urban and industrial development along the shoreline have contributed to contamination by heavy metals, polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) [3]. Stage 1 of the Hamilton Harbour Remedial Action Plan (HHRAP) was completed in 1989. A second edition was submitted in 1992, along with the Hamilton Harbour Remedial Action Plan Stage 2 [4, 5], which was updated in 2002 [6].

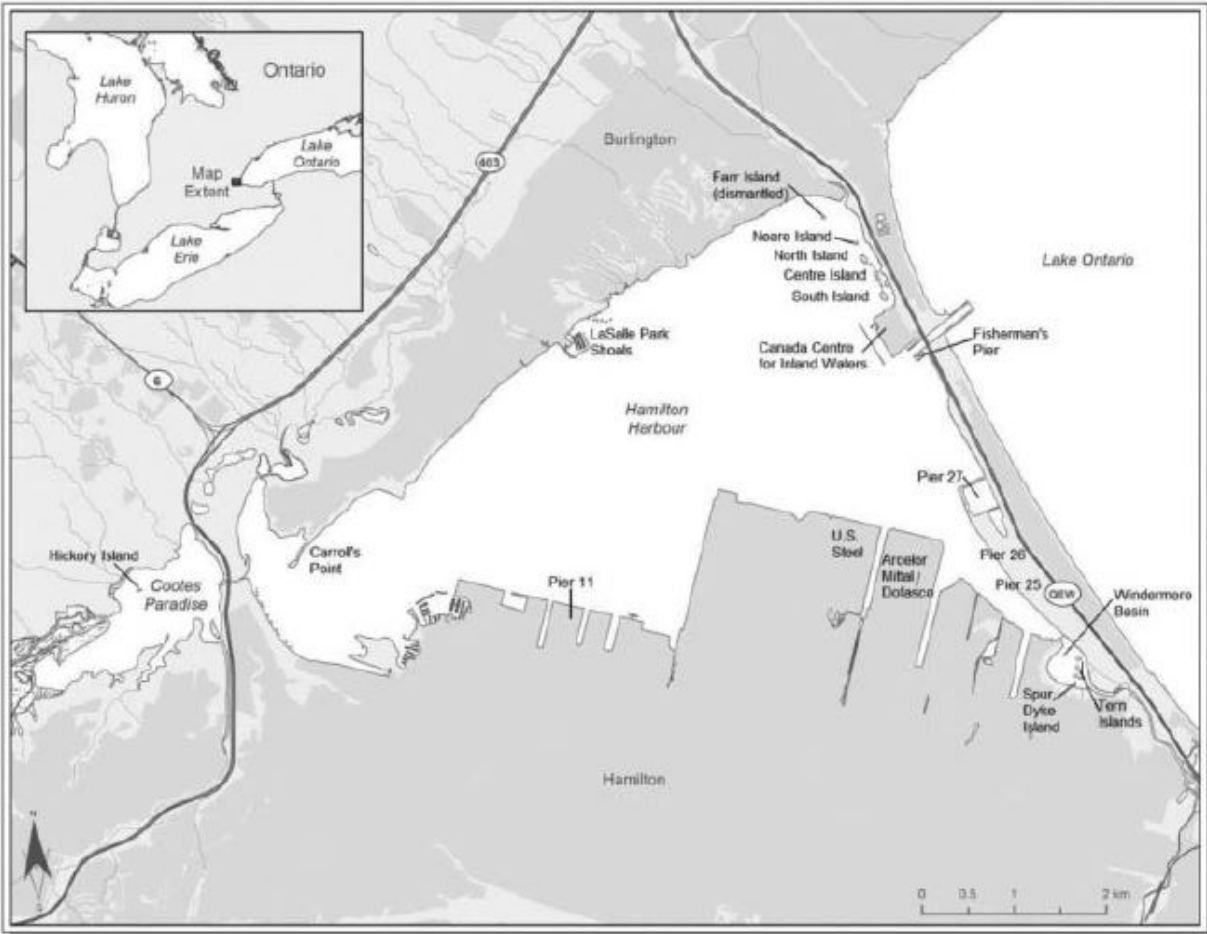


Figure 1: Hamilton Harbour Area of Concern showing the locations of colonial waterbird nesting sites (1959-2013). The insert shows the study area in relation to the Great Lakes region (from Zanchetta et al [7]).

Issues of contamination throughout the harbour were to be addressed through several projects. Upgrades to two wastewater treatment plants and implementation of measures for combined sewer overflows [3], were to address issues of sewage and debris contamination and excess nutrient, and contribute to the reduction of algal blooms and improvement of water quality. The Randle Reef Sediment Remediation project, started in 2015, will dredge and move sediments from the most

contaminated areas of the harbour into an Engineered Containment Facility, which will contribute to improvement of sediment and water quality.

Issues of habitat degradation were to be addressed through the development and implementation of several programs to restore aquatic vegetation along the shoreline and improve water quality and clarity and increase fish habitat and colonial waterbird nesting habitat. This included increasing emergent and submergent aquatic plants habitat to 500 ha, providing 15 km of littoral shore by the creation of 5 km of narrow islands, providing 300 ha of wildlife habitat and 3 ha of colonial nesting bird habitat [5].

Stage 3 in the RAP process involves an evaluation of the remedial measures to determine whether the use of the Harbour has been restored, to eventually lead to delisting of Hamilton Harbour as an Area of Concern [8].

In the present report, we provide a summary of the remedial actions and management efforts to address issues of degradation of colonial waterbird populations (as representatives of wildlife populations), as per Beneficial Use Impairment 3b, and the adaptive management strategy implemented in 2007 to present. Wildlife habitat restoration is discussed in the context of improving limiting habitat for colonial waterbirds to meet sentinel colonial waterbird target populations. Updated monitoring data on the six colonial waterbird populations in Hamilton Harbour are presented, and the changes in their demographics are reviewed in relation to the revised colonial waterbird targets of 2012. Additional information on the sub-colonies of each species at each nesting site is also presented in Appendix B, with a consideration of relations and/or interactions between the management of dominant species and the population responses of the more vulnerable species. The success of the adaptive management to date is assessed, and recommendations are provided on future monitoring and management, including the control and monitoring of ring-billed gull (*Larus delawarensis*) and double-crested cormorant (*Phalacrocorax auritus* or “cormorants”) nesting colonies to ensure sustained RAP achievements.

Habitat Restoration Efforts for Colonial Waterbirds

Historically, the wetlands of Hamilton Harbour and Cootes Paradise supported a diverse and abundant migratory and resident waterbird population [4]. Between 1862 and 1916, industrial and port expansion prompted filling of the abundant marsh habitat on the south shore, and the creation of Windermere basin. By 1976, 22% of the open water area of the harbour was lost in comparison to 1926

[5]. The loss of marshlands, which had declined to 50 ha from the original 150 ha by 1985 [4] has had a profound effect on fish and wildlife. The Hamilton Harbour Stakeholder Forum identified two problems associated with fish and wildlife in the Harbour: a loss of 65% of fish and wildlife habitat from shoreline restructuring and filling, and impaired health and diversity of fish and wildlife communities [6].

The Stage 1 report identified several areas within the basin as having significant wildlife associations, including Cootes Paradise, Hendrie Valley/Carroll's Point, Pier 27's Contained Disposal Facility (CDF), Hydro Islands, Windermere Basin, Hamilton Harbour and Van Wagner's Pond (Red Hill Creek) [5]. The Remedial Action Plan proposed the enhancement of healthy self-sustaining resident and non-resident wildlife populations on a harbour-wide basis through water quality improvements and habitat rehabilitation and protection [5]. Long-term (by 2015) population targets for the six colonial waterbird species were identified in 1992. The objective was to obtain self-sustaining mixed waterbird populations, with a general increase of the rarer species and a reduction of the overabundant species [9]. No targets were suggested for other species of birds and other wildlife; instead, a target for habitat was identified.

Until the mid-1990s, the majority of colonial waterbird nesting habitat was located on lands slated for development [10]. Given the lack of nesting habitat in the harbour at the time, the colonial waterbirds were using man-made islands, Farr and Neare Islands, constructed prior to the 1970s for the purpose of hydro platforms for transmission lines (Appendix A). These islands have been serving as nesting habitat for herring gulls (*Larus argentatus*) since 1988-1989 [11].

To address issues of habitat for colonial waterbirds, several projects were undertaken. In 1990, the end of Spur Dyke, a submerged dyke previously constructed to increase sedimentation in Windermere Basin, was elevated to create a small island providing suitable nesting substrate for common terns (*Sterna hirundo*). In 1993 and 1994, a nesting raft was created on the southwestern corner of the Pier 26 CDF to attract Caspian terns (*Hydroprogne caspia*) [11], and was removed when no longer in use after the creation of additional habitat.

One of the critical Remedial Actions included the expansion of Farr and Neare islands by approximately 1, 250 m through the creation of additional islands, to enhance some of the beneficial uses of the harbour, particularly for fish habitat and waterfowl use [6]. In 1995, the Fish and Wildlife Restoration Project implemented the construction of three wildlife islands, to provide nesting habitat for colonial waterbirds (Appendix A). These islands are commonly referred to as Northeast Shore Islands. The intention was for the raised knoll on the north end of North Island to attract Caspian terns

while the sand/gravel southern end of North Island and the northern portion of Centre Island were to attract common terns. The shrubs and trees on South Island and the southern part of Centre Island were designed to attract black-crowned night-herons (*Nycticorax nycticorax*). Space for cormorants was limited to the centre portion of Centre Island[10]. The steady rise of the cormorant populations, and their aggressive behaviour, has required the use of various techniques to limit their nesting on the Northeast Shore Islands and preserve nesting habitat for other species.

By 2006, Farr Island had been overtaken by cormorants, and no longer supported nesting herring gulls. Farr Island was sunk in the winter of 2010-2011 by the Hamilton Port Authority, and the assistance of a Save Our Great Lakes Grant, and the materials were re-used to create fish spawning habitat, thereby eliminating the cormorant habitat, of which there were already sufficient quantities throughout the harbour, as the 1992 targets had already been surpassed (Table 1).

Windermere Basin is a large 20 ha pond of mean depth of 2 m located at the extreme southeast end of Hamilton Harbour, at the mouth of the Red Hill Creek (Fig. 1). Historically, Windermere Basin was a cattail (*Typha* spp.) marsh, but was altered by filling activities between 1957 and 1972, and the dredging of contaminated sediments in 1989, resulting in the loss of habitat variability and a reduction in the surface area of the pond [8]. Ownership of the Windermere Basin was transferred from the Hamilton Port Authority to the City of Hamilton in 2000, with the intent to rehabilitate it to a recreation area and restore the sediment trap function of the basin. The eastern portion of the basin was re-vegetated in 2006, and a channel was created along the eastern edge of the basin to convey water from the Red Hill Creek and Woodward Sewage Treatment Plant. The area was isolated from the Red Hill Creek with berms and a gate to control carp. Water was then pumped back into the wetland.

In 2010-2012, three islands (Tern Islands) were created into the remaining portion of the basin to provide nesting habitat for terns (Fig. 1), thus contributing additional fish and wildlife habitat and supporting the restoration initiatives within the harbour (Appendix A) [12].

ADAPTIVE MANAGEMENT OF COLONIAL WATERBIRDS

Since the 1980s, Hamilton Harbour has supported one of the largest and most diverse assemblages of nesting colonial waterbirds on the Great Lakes [8]: ring-billed gull, double-crested cormorant, herring gull, common tern, Caspian tern, and black-crowned night-heron. Although the status of the three latter species may, at one point or another, have warranted special concern within Hamilton Harbour [10],

they are not presently considered species at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and hence are not protected under the Species at Risk Act (SARA).

Adaptive management of waterbird populations was identified as necessary to prevent dominant and/or overabundant species from occupying the entire nesting habitat available. As noted in the Stage 2 report, the experimental nature of the management of colonial waterbirds should be noted, hence achieving specific populations of particular species was highly speculative [5].

Until the mid-1990s, management efforts mostly centered on the control of ring-billed gull colonies. These colonies expanded unhindered on private property until about 1986, when control operations began on Stelco property [11]. However, these control operations led to their relocation to other sites within the Harbour, excluding common terns and leading to their abandonment of Neare and Farr Islands, as well as other sites in Windermere Basin [11]. Thus, despite these management approaches [3, 5], the number of breeding pairs in the Harbour remained elevated until 2005. The limited success in reducing the ring-billed gull populations was thought to be due to a site-specific management approach, which resulted in the displacement of gulls from one site to other breeding sites within the Harbour, thus affecting other sites and other species [8].

In addition to issues surrounding the control of ring-billed gulls, cormorant populations had recovered successfully since the identification of population targets in the last 1980s, and this species also needed to be managed actively to achieve the prescribed population targets identified as delisting criteria for the Fish and Wildlife component of the HHRAP. Thus, overabundance of ring-billed gulls and double-crested cormorants, and their early arrival and/or their tenacious and aggressive nesting behaviour causing decreased habitat availability for other more vulnerable species, prompted the implementation of more integrated management practices. In 2006, the Gull Control Subcommittee of the Fish and Wildlife Committee re-evaluated the management and conservation goals, actions required to achieve them, and developed a coordinated harbour-wide management strategy [8], implemented in 2007. Management has been implemented through a joint effort between Hamilton Port Authority, the City of Hamilton, the City of Burlington, building management from the Canada Centre for Inland Waters, a private consulting firm which provides its services for the control of ring-billed gulls, and a group from McMaster University under the direction of Dr. J. Quinn, which manages cormorant sub-colonies on the Northeast Shore Islands, reserves nesting sites for terns, and monitors nest numbers of colonial waterbirds in the harbour area.

These management activities include:

- The use of raptors under permit, to prevent ring-billed gulls from nesting at Pier 27, Windermere Basin land, Spur Dyke and the northern shoreline at CCIW. The ownership of Windermere Basin was transferred from Hamilton Port Authority to the City of Hamilton in 2000. Naturalization projects have changed the profile of the basin and since 2013, raptors are positioned on Tern Islands in early spring to prevent ring-billed gulls from nesting on habitat reserved for the later arriving common and Caspian terns.
- Removal of gull eggs and/or nests at Pier 27, CCIW and Windermere Basin, as required (under Canadian Wildlife Service permit).
- The placement of plastic tarp over Caspian tern nesting areas on North and Centre Islands in the spring to reserve habitat from earlier arriving ring-billed gulls (Fig. 2).
- The use of motion-detecting singing, dancing, mannequins at Neare and North Islands (2007-2013; Fig. 2) to scare cormorants while allowing herring gull nesting, until cormorants became habituated.
- Removal of cormorant ground nests on Neare and North Islands, since 2007, removal of all (ground and tree) cormorant nests from South Island.

Monitoring of all breeding sites within Hamilton Harbour is completed every spring between mid-May and the end of June, by counting the number of active nests (including non-managed locations across Hamilton Harbour and at Cootes Paradise Marsh). A detailed summary of the management activities and trends for each managed site is included in Appendix B.

Following the implementation of the harbour-wide adaptive management plan, target population figures were revised at the HHRAP's Stakeholder forum in 2012 [9] (Table 1).

Table 1: Population Targets for Colonial Waterbirds throughout the implementation of Hamilton Harbour’s Remedial Action Plan

Species	Number of Active Nests		Adaptive Management
	1992 Target [5]	2012 Revised Target [9]	
Ring-billed Gull (<i>Larus delawarensis</i>)	5,000	< 10,000	Scaring tactics, egg removal
Double-crested Cormorant (<i>Phalacrocorax auritus</i>)	200	< 2,500	Scaring tactics, nest /egg removal
Herring Gull (<i>Larus argentatus</i>)	350	200-300+	Exclusion of double-crested cormorants
Common Tern (<i>Sterna hirundo</i>)	> 600	300-600+	Construction of Tern Islands
Caspian Tern (<i>Hydroprogne caspia</i>)	> 200	400-600+	Placement of plastic tarp to reserve habitat; construction of Tern Islands
Black-crowned Night-heron (<i>Nycticorax nycticorax</i>)	200	100-200+	Preservation of trees; exclusion of double-crested cormorants



Figure 2: Management of Hamilton Harbour’s colonial waterbirds (in clockwise order): placement of plastic tarp over tern nesting habitat on a Northeast Shore Island; a motion-detecting, dancing mannequin; controlled vs. not-controlled habitat at Pier 27.

MONITORING OF COLONIAL WATERBIRDS

Between 1976 and 2000, three major decadal surveys of the Great Lakes colonial waterbirds were completed by the Canadian Wildlife Services and the US Fish and Wildlife Service, to monitor nesting populations, and use trends to assist management and conservation decisions [13]. Population censuses reporting the number of active nests (scrapes and nests with eggs) were conducted at the end of May or early June, during the last week of incubation or early chick-rearing stages [11]. The number of active nests is assumed to represent the number of breeding pairs.

In 1997, McMaster University (under the supervision of Dr. J. Quinn) began coordinating the monitoring efforts for Hamilton Harbour colonial waterbirds: first in the Northeast Shore Islands (1997), and throughout the harbour (1998-present). Although monitoring data exist prior to this date, the present report provides a summary of monitoring data encompassing 1997-2017.

Ring-billed gulls (controlled species)

Biology

Although the first ring-billed gull nests were reported in 1961 along the shores of Windermere Basin, their presence was not documented again until 1978, when 17 active nests were recorded at the confined disposal facility on Pier 27 [14]. Their abundance throughout the Great Lakes increased rapidly, and it is suspected that efforts to control populations in Toronto may have contributed to a similarly rapid increase in Hamilton Harbour, which reached 21,207 active nests at Pier 27 by 1987 [14]. By 1996, ring-billed gulls nested at Pier 26, Pier 27, Windermere Basin and Neare and Farr Islands [10].

Ring-billed gull colonies are usually located on islands, on raised mounds or platforms [15]. Nests are typically located in grasses, weeds or shrubs, or on ground adjacent to water (e.g., Pier 27), in dense sub-colonies in areas unoccupied by herring gulls [10]. Egg-laying begins in mid-April [10]. The timing of the migration and nesting activities of the ring-billed gulls is earlier than that of Caspian and common terns, leading to reduced availability of nesting sites for these species. It is suspected that ring-billed gulls are responsible for the abandonment of common tern colonies at numerous sites on the lower Great Lakes, and in Hamilton Harbour [11, 16].

Population Trends

In the late 1990s, ring-billed gulls nested along the east and west sides of Windermere Basin, on Pier 27, and on South and Centre Islands. Despite management since the early 1990s, the number of ring-billed gulls remained above 20,000 pairs until 2005 (Figure 3). The sharp decrease in the number of ring-billed gulls in 2006 was mainly related to displacement of nearly 8,500 nesting pairs from Windermere Basin, and to some extent about 1,800 nesting pairs from Pier 27 due to the development for commercial purposes on the southwest portion of the CDF (Figure 4). Of these, about 2,300 additional nesting pairs relocated to South Island; others may have found nesting sites elsewhere within Lake Ontario (D. Moore, Environment and Climate Change Canada, Burlington, ON, pers. comm.). Ring-billed gull populations from the Great Lakes peaked in the 1980s, slowly declining since [17]; a hypothesis is that poor garbage practices in the 1970s-1980s stimulated gull populations, and that more efficient landfill practices may have subsequently contributed to their slow decline [17].

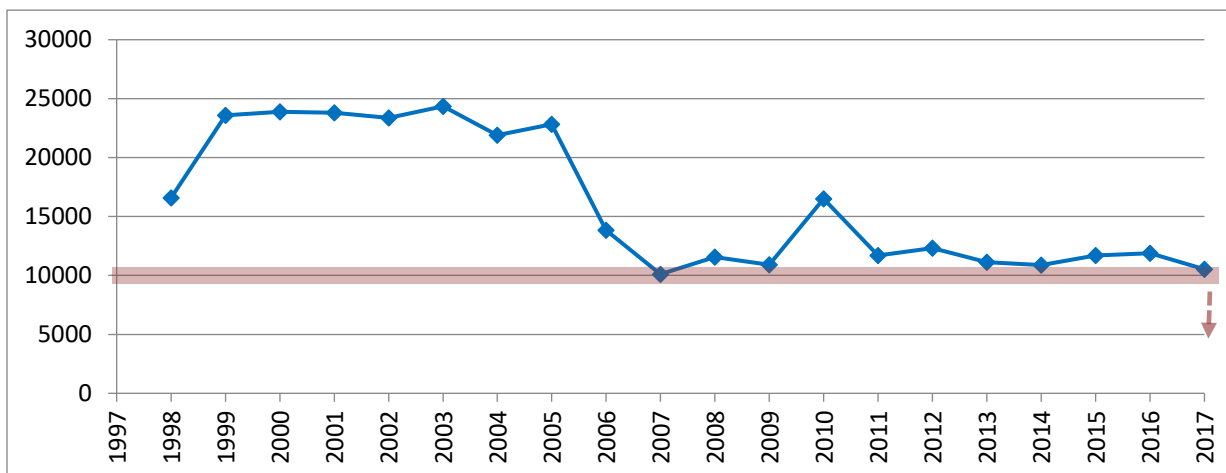


Figure 3: Census counts of active ring-billed gull nests throughout Hamilton Harbour and Cootes Paradise marsh. Data from 1997 were omitted, as several colonies were not counted that year. The shaded area indicates the 2012 target.

The harbour-wide adaptive management plan started in 2007 contributed to decreasing the numbers of ring-billed gulls to 10,000-12,000 for ten of the last eleven years, with the exception of 2010 (16,493 breeding pairs; Figure 3), when 4,493 active nests were counted on Stelco property. Since 2007,

between 388 and 13,390² gull eggs have been removed. In 2014-2017, egg removal averaged 4,435 ± 987. Given the present nesting habitat available and measures undertaken to control ring-billed gulls, target numbers of 10,000-12,000 breeding pairs appear achievable. It should be noted, however, that a large proportion of the ring-billed gull colonies are located on land slated for development (e.g., for the last ten years, between 39% and 67% of ring-billed gulls reported nested at Pier 27), or on other private land (e.g., Stelco, Max Aicher North America). Although the Pier 27 CDF is expected to be operational for the next 15 years, Hamilton Port Authority Land Use Plan includes further land development [18]. Note that the displacement of a third of the ring-billed gull population from Windermere Basin and Pier 27 in 2006 had considerable repercussions on the species distribution of South Island: 20% of the ring-billed gulls nested on South Island, possibly displacing common terns permanently. However, current management approaches include population control of ring-billed gulls and maintenance of nesting habitat for terns in Windermere Basin, which was not in place in 2006. It is anticipated that the majority of ring-billed gulls affected by future land development will relocate to other sites in the Great Lakes, and that the harbour-wide adaptive management plan will successfully continue to control ring-billed gull sub-colonies.

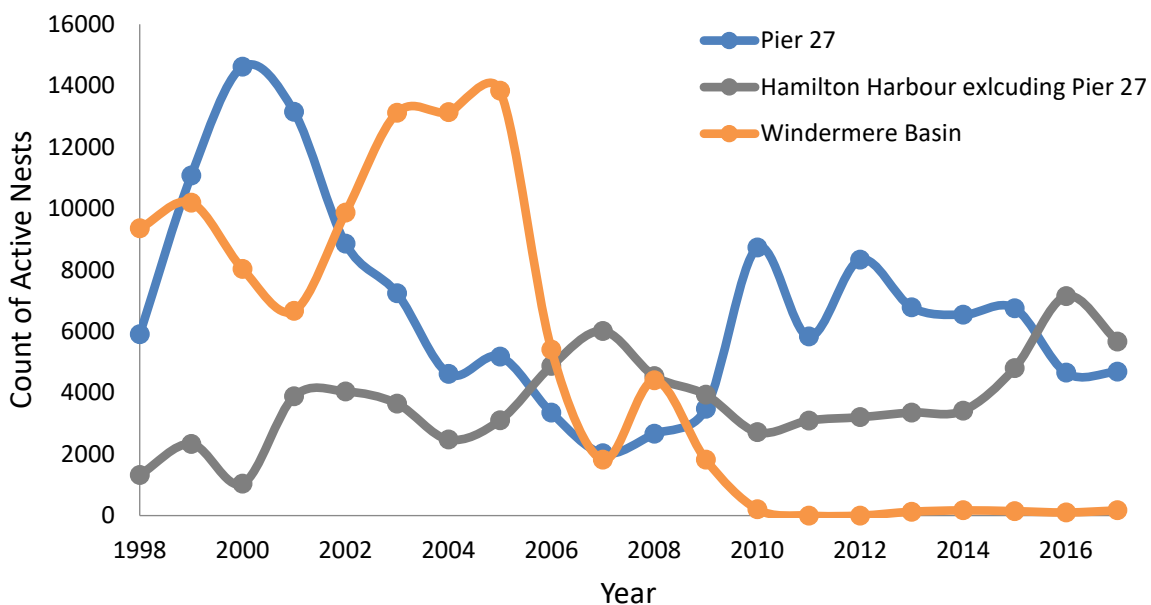


Figure 4: Distribution of ring-billed gull active nests along Hamilton Harbour, 1998-2017.

² A large number of gull eggs was removed from Pier 27 in 2013, which was followed by paving of a large portion of the nesting habitat.

Double-crested cormorants (controlled species)

Biology

Cormorant nests were first reported in Hamilton Harbour in 1984; by 1987, 51 active nests were reported in mature cottonwood trees (*Populus deltoides*) along the northwestern edge of the confined disposal facility of Pier 27 [14]. In 1991, they began nesting in a box elder tree (*Acer negundo*) on Farr Island, and by 1992, some nested on the ground near the cottonwood trees [11]. Cormorants have also been censused on Hickory Island in Cootes Paradise and at Carrols Point on the west end of the harbour, two locations that are not managed. Rapid population growth has been observed throughout the Great Lakes (Moore et al., 1995 [11] and references therein).

Cormorants begin laying eggs in mid- to late April. Nests are built either in trees, or on the ground, preferably on elevated sites (e.g., rock piles, raised beaches, toppled trees), when space becomes limited, or when trees have collapsed or died, most likely due the acidity of cormorant guano, which kills vegetation beneath their nests [10]. They use leaves and small branches as nesting material [10].

Cormorants have been reported to affect other colonial waterbirds in several ways: 1) a dramatic increase in the number of cormorant nests may reduce the space available to other species; 2) cormorants can take over active nests of other species (e.g., herring gulls [19], night-herons), and occupy nesting space that would be used by other species (e.g., occupy shrubs where night-herons would nest); 3) as they occupy to top of the canopy, deterioration of the shrub layer or the continuous dropping of guano and nesting material can also displace night-herons [10, 20].

Population trends

Populations of cormorants plummeted in the 1960s-1970s due to DDT and egg shell thinning [21], but have been rebounding since the mid-1980s, in numbers far exceeding those recorded in the past [17]. As cormorants are very mobile, management activities implemented in other regions of Lake Ontario may have contributed to their relocation and rapid population growth in other regions [22]. Prior to the adaptive management of cormorants, the species nested at a few locations; within Cootes Paradise (Hickory Island, Carroll's Point), on all five of the Wildlife Islands, and at Pier 27. The growth of the cormorant population was such that management was implemented to protect specific locations for the benefit of night-herons and herring gulls (Figure 5). In the process of protecting those islands, several cormorants failed to breed successfully. Hence, management along the north shore was to some

extent successful in slowing down the progression of the cormorant sub-colonies, but the number of active nests has remained above 2,500, the revised 1992 target (Table 1). In 2010-2011, the sinking of Farr Island (on which, by then, only cormorants nested) coincides with increased populations at Pier 27 and Centre Island within two years (Figure B21; Figure B24; **Error! Reference source not found.**). The number of active nests increased in 2016-2017. Double-crested cormorants are actively managed across the Great Lakes Basin and local nest counts likely reflect the basin-wide population.

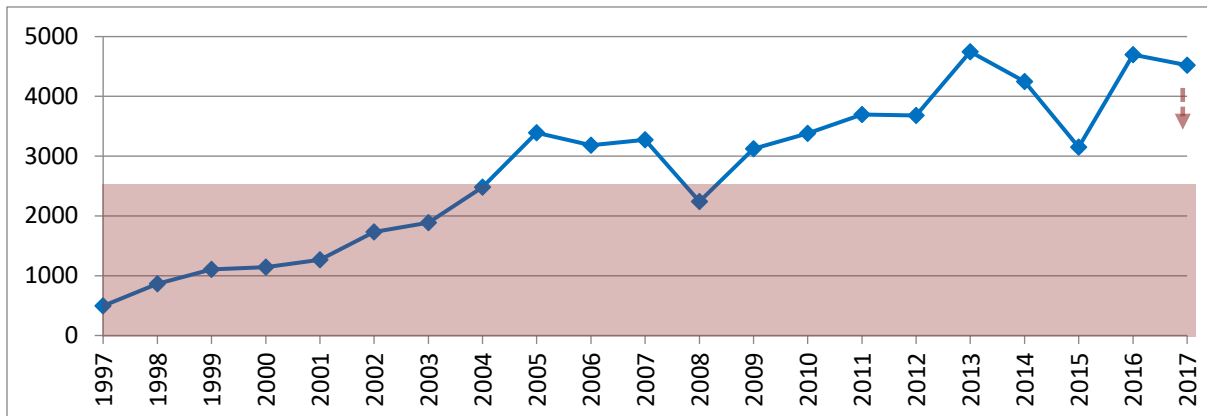


Figure 5: Census counts of active double-crested cormorant nests throughout Hamilton Harbour and Cootes Paradise marsh. The shaded area indicates the 2012 target.

In 2017, abnormally elevated water levels caused the flooding of Northeast Shore Islands, which led to decreased habitat and increased competition for space [23], and had severe effects on sub-colonies of several waterbird species (e.g., herring gulls, Caspian terns and ring-billed gulls). However, these extraordinary circumstances had little effects on the cormorant population – nearly 400 pairs relocated to the trees on the headland east of Centre Island (which due to flooding, had become isolated from the mainland [23]). Presumably, these birds were displaced from South and North Islands by the management efforts and from Centre Island due to high water.

Since the removal of Farr Island, Pier 27 has been habitat for 40-63% of the harbour’s cormorants; future land development at Pier 27 will likely increase habitat pressure at other locations within the harbour and management of cormorants will remain instrumental to maintenance of diverse and well-balanced colonial waterbird populations.

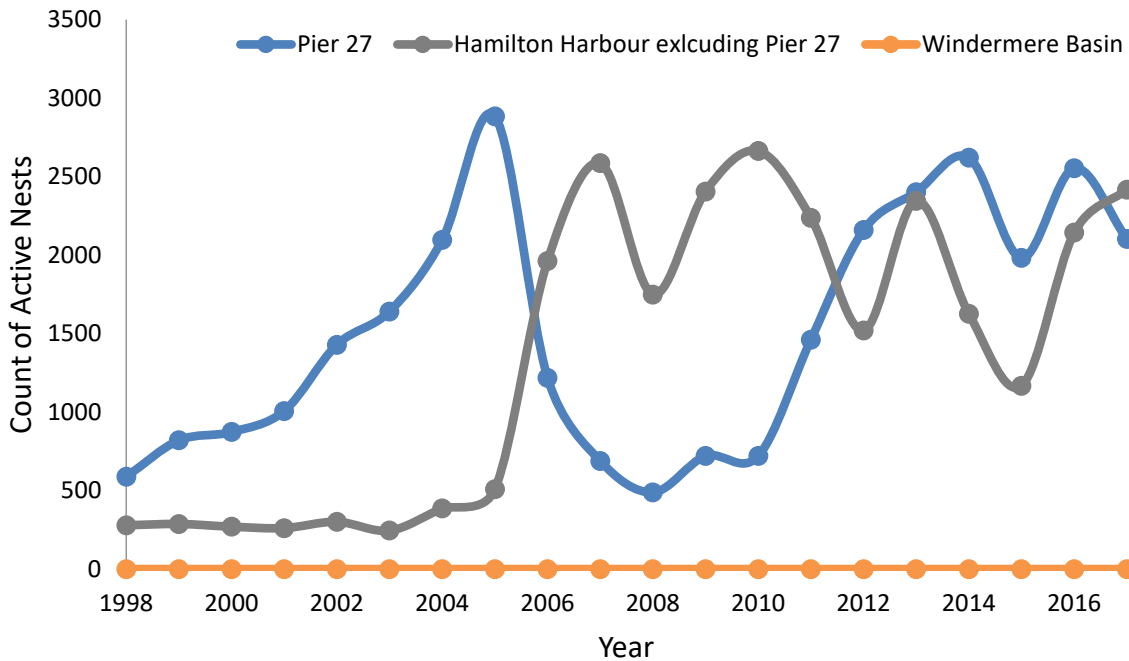


Figure 6: Distribution of double-crested cormorant active nests along Hamilton Harbour, 1998-2017.

Herring gulls (encouraged species)

Biology

Herring gulls first nested along the confined disposal facility (Pier 27) in 1976 [14], and began nesting on Farr and Neare Islands in 1988 and 1989, respectively [11]. Herring gulls preferably nest on islands, although mainland nesting occurs. Nests are built on rocks, sand or gravel, with or without vegetation [15], and occasionally on trees, building and other manmade structures (e.g., discovered on the rooftops of the Canada Centre for Inland Waters in 2002 and Hamilton Terminals Warehouse #2 in 2008). Nesting is usually initiated in mid- to late April [10, 15].

Herring gulls are generalist predators on fish, insects, small mammals and birds, and the eggs and young of co-occurring species, and are omnivorous, opportunistic scavengers of dead animals or human garbage [13]. Herring gulls are known to be aggressive, and predate on other colonial waterbirds, including ring-billed gulls, common terns, as well as eggs and chicks of various colonial piscivorous bird species (discussed in Quinn et al (1996) [10] and references included therein).

Population trends

In 1997, the herring gull colonies included approximately 350 nesting pairs (the 1992 target; Figure 7), located mostly at Pier 27, and Neare, Farr and North Islands. From 1998 and forward, the numbers decreased to approximated 250 nesting pairs, due to a sharp decrease at Pier 27, likely from development of industrial land by Hamilton Port Authority and an influx of cormorant nesting along the west and north sides of Pier 27 (Figure 8). This species maintained their total abundance near 250 active nests until 2006 and 2007, when the number decreased to 160 and 137. This decrease seems to be associated with a decrease in the number of active herring gull nests at Neare Island, and their complete disappearance from Farr Island. These numbers coincide with a sharp increase in the number of cormorant nests on Farr Island (1,034 nesting pairs in 2006 vs. 351 in 2005), and the appearance of 561 cormorant nests on Neare Island where this species had not previously nested. Although the populations appeared to increase back to between 200 and 300 nests between 2008 and 2015 (except 2010 and 2011), numbers have been decreasing steadily starting in 2015.

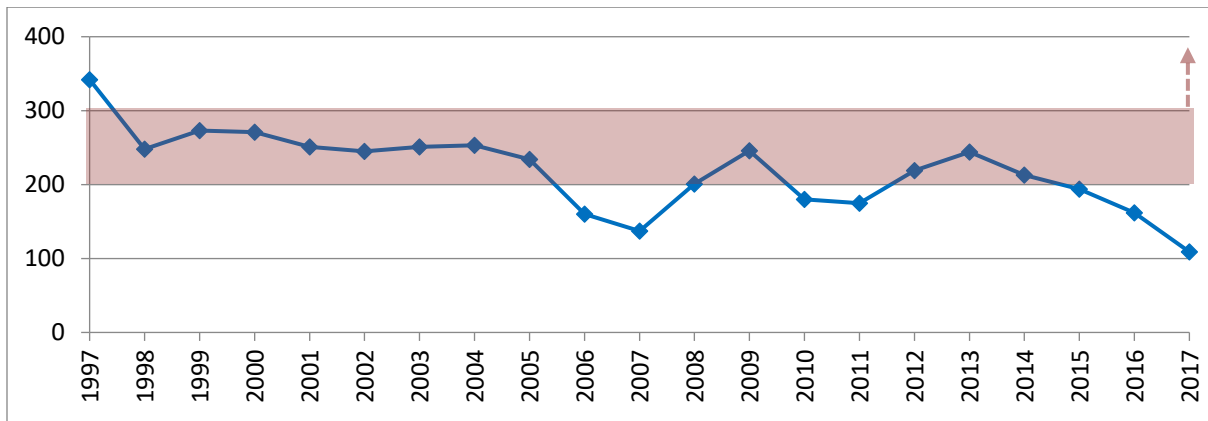


Figure 7: Census counts of active herring gull nests throughout Hamilton Harbour and Cootes Paradise marsh. The shaded area indicates the 2012 target.

Recently, herring gulls have mainly nested at Neare and North Islands and Pier 27, and on rooftops of the Hamilton Terminals Warehouse #2, and Canada Centre for Inland Waters. Moreover, despite the availability of nesting habitat on the Northeast Shore Islands, there appears to be a preference for rooftop nesting (D. Moore, Environment and Climate Change Canada, pers. comm.). In 2017, the flooding of Neare Island from elevated water levels had considerable impacts on the herring gull colony (7 active nests were recorded in contrast with the usual 50-70 nests of the previous years). Although these unusual nesting conditions may not be representative of the general trend, they may be

indicative of species that are likely to be most affected under increased habitat pressure in the future (e.g., development of Pier 27).

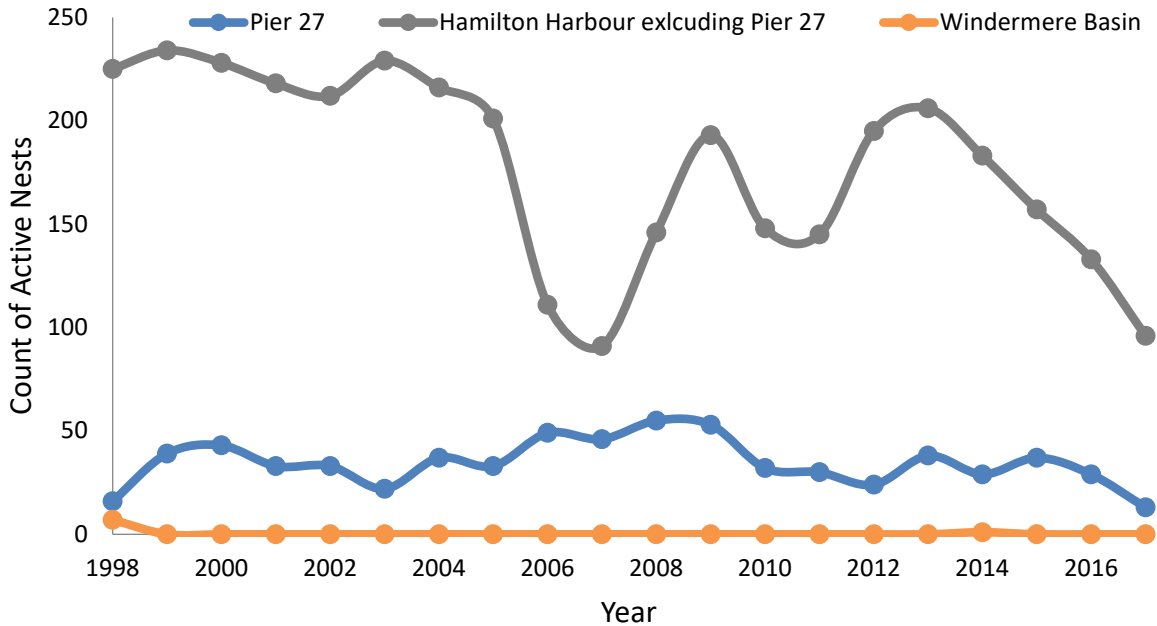


Figure 8: Distribution of herring gull active nests along Hamilton Harbour, 1998-2017.

General trends indicate that herring gull populations from the Great Lakes have been decreasing since the mid-1990s [13]. Similarly to ring-billed gulls, a potential explanation includes improvements in garbage disposal practices, which may have decreased food availability [17].

In summary, data from the last few years appear to indicate that the target numbers of 200-300 active nests may become difficult to achieve in the future. Herring gulls are declining throughout the Great Lakes Basin and this is not locally controllable. However, efforts to maintain nesting space for them in Hamilton Harbour will continue. Given the preference of herring gulls towards rooftop nesting, future efforts could be directed towards public outreach activities, to ensure management on private land is well aligned with the RAP objectives.

Common terns (encouraged species)

Biology

Common terns were reported to nest in Hamilton Harbour between 1961 and 1973, first in Windermere Basin, and on Farr and Neare Islands in 1966. However, poor breeding success and contamination are suspected to have led to the desertion of these colonies from Hamilton Harbour (discussed in Dobos et al [14] and references therein). Common terns recolonized Hamilton Harbour in 1982, and by 1987, had reached a number of 553 active nests [14]. By 1993, 954 nests were reported for the Hamilton Harbour population, which represented 40% of the lower Great Lakes population [10, 11].

Common terns typically initiate nesting three weeks later than the ring-billed gulls, in early- to mid-May [10]. If left unmanaged, nesting habitat is taken by ring-billed gulls. The species nest on islands, shores and in marshes, on rock, sand or gravel, or amongst vegetation; the nests are formed in depressions, though some are flat or raised, and consist in bowls of vegetation (described in Peck and James [15] and Quinn et al [10] and references included therein).

Common terns are usually the victims of interactions with other colonial waterbird species, which include loss of eggs, chicks and nesting habitat and substrate by ring-billed gulls, predation of chicks and adults by herring gulls, loss of young or nocturnal desertion due to disturbance by night-heron (discussed in Quinn et al. [10] and references included therein).

Population trends

In 1997, censuses indicated nearly 1,000 nesting pairs of common terns bred within Hamilton Harbour, half of them nesting on the newly created Northeast Shore Islands. However, this number rapidly decreased to just over 600 by 1998 (Figure 9). These numbers coincided with increased on Centre Island by ring-billed gulls, with numbers of active tern nests decreasing from 531 in 1997 to 166 in 1998. Although the total number of nesting pairs was successfully maintained above 500 until 2004, numbers decreased sharply by more than half to about 200 nesting pairs in 2005-2009. These numbers coincide with the disappearance of common terns from South Island from 218 in 2004 to 68 in 2005, the last year they bred at that location. Again, these numbers coincide with the reappearance of ring-billed gulls, which had been chased from South Island by perched raptors in 2004 and 2005 ([24, 25]), had somewhat reappeared in 2005 (93 active nests), and dominated in 2006 (2,399 active nests, a number maintained thereafter), after the use of perched raptors was abandoned in favour of returning to the use of tarps to reserve space for terns.

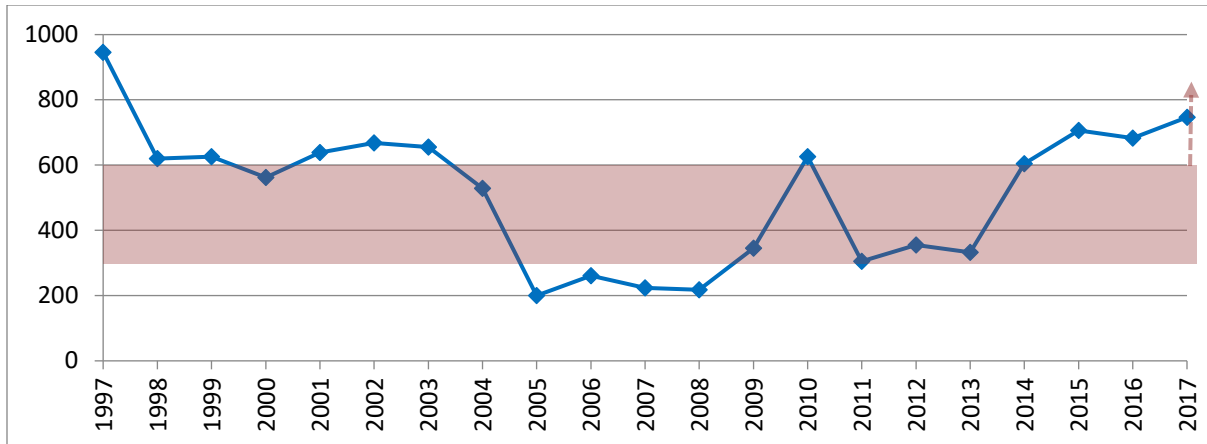


Figure 9: Census counts of active common tern nests throughout Hamilton Harbour and Cootes Paradise marsh. The shaded area indicates the 2012 target.

The distribution of common terns within the three main locations of Hamilton Harbour is shown in Figure 10. Between 2008 and 2013, several of the common terns nested at Pier 27, but again, there were signs of their decreasing numbers starting in 2011, presumably also to the benefit of ring-billed gulls, where the number of nests increased in that time. A similar decline has been observed throughout the Great Lakes since the 1970s [17]. The construction of the Windermere Islands and the preservation of the Spur Dyke exclusively for nesting terns successfully contributed to the recovery of this species: since 2014, the number of active nests within Hamilton Harbour AOC has surpassed 600, and since 2015, above numbers reported before 1998, with 97-100% of nesting occurring at Windermere Basin locations.

In summary, the revised targets of 300-600 active common tern nests have been achieved and surpassed, and as long as active management is maintained in the future, common terns should remain amongst the colonial waterbird species nesting within Hamilton Harbour.

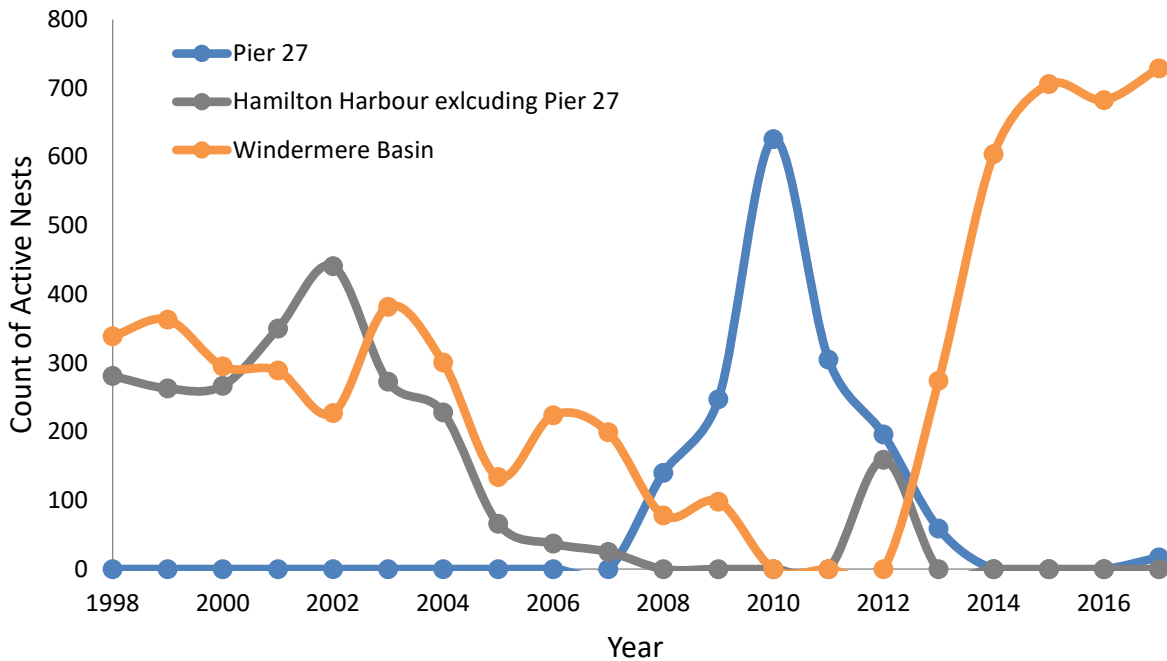


Figure 10: Distribution of common tern active nests along Hamilton Harbour, 1998-2017.

Caspian Terns (encouraged species)

Biology

Caspian terns started nesting in Hamilton Harbour in 1986, in an area within the ring-billed gull colony at Pier 26-27; their arrival coincided with a decrease in the number of active nests at Tommy Thomson Park in Toronto the same year; thus, nesting of this species at Hamilton Harbour was of particular significance [14]. By 1994, Hamilton Harbour appeared to sustain approximately 300 nesting pairs, representing the fourth largest of five colonies in Lake Ontario [11]. Caspian terns were a species of concern in the Great Lakes according to Canadian and U.S. agencies [26].

Nesting of Caspian terns is usually in early May, approximately two weeks after the establishment of ring-billed gull colonies [10]. The species nests in dense colonies, usually near, but not in direct contact with, ring-billed or herring gull colonies. Nests consist of depressions in the substrate (preferably sand [27]) made by their feet, occasionally lined with plant materials, pebbles and fish bones, in flat and poorly vegetated areas [10].

Caspian terns are the victims of egg and chick predation by ring-billed gulls and herring gulls, which can be exacerbated by human disturbance (discussed in Quinn et al. (1996) [10] and references therein).

Population trends

In contrast with common terns, the numbers of Caspian terns did not appear to change drastically since 1997; this species has mostly seen increased numbers from 399 nesting pairs in 1997, located mainly on North and Centre Islands (Figure 11), while a few nests were reported at Pier 27 in 2005, 2008 and 2010 (Figure 12).

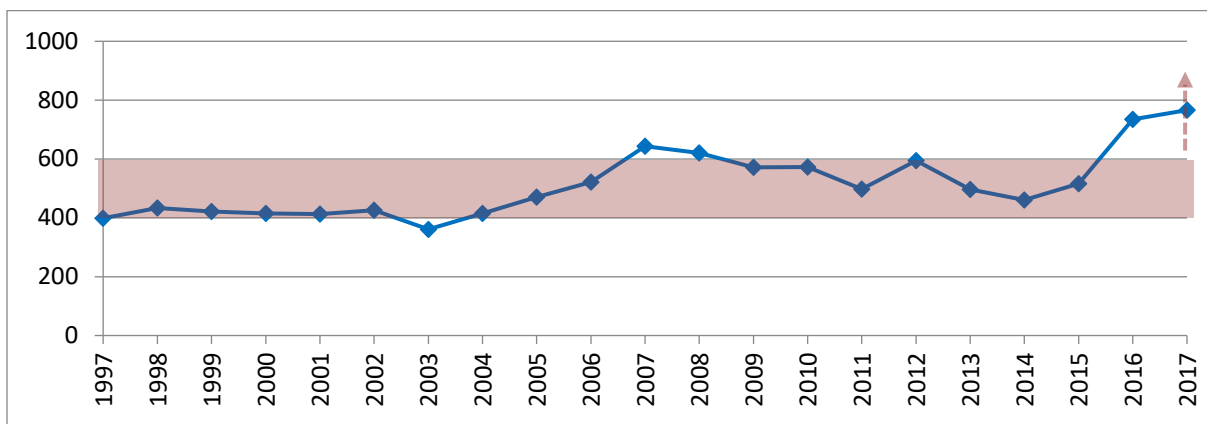


Figure 11: Census counts of active Caspian tern nests throughout Hamilton Harbour and Cootes Paradise marsh. The shaded area indicates the 2012 target.

Although the numbers of active nests seemed to vary from year to year, the overall numbers within the Harbour were maintained around 400 until 2002. A slight decrease to 361 nesting pairs of Caspian Terns in 2003 seemed to be associated with North Island but did not appear to be related to the presence of any dominant species. Increased numbers from 2004-2007 and fluctuating numbers until 2013 were associated with management activities at North and South Island, while 2014 marked the first year where Caspian Terns nested in Windermere Basin (Figure 12). Increases in sub-populations from 2015-2017 reflect the increasing numbers of Caspian Terns nesting at Windermere Islands.

In recent years, Caspian terns have been taking over the flat region of two of the three Tern Islands, pushing the common terns to the rocky edge. In 2018, methods are being tested to control access to the flat region of these islands in favour of common terns (J. Quinn, McMaster University, Hamilton, ON, pers. comm.).

Similarly to common terns, the management goals for Caspian terns have been reached and surpassed, and the continued success of this species will depend on the maintenance of the harbour-wide adaptive management.

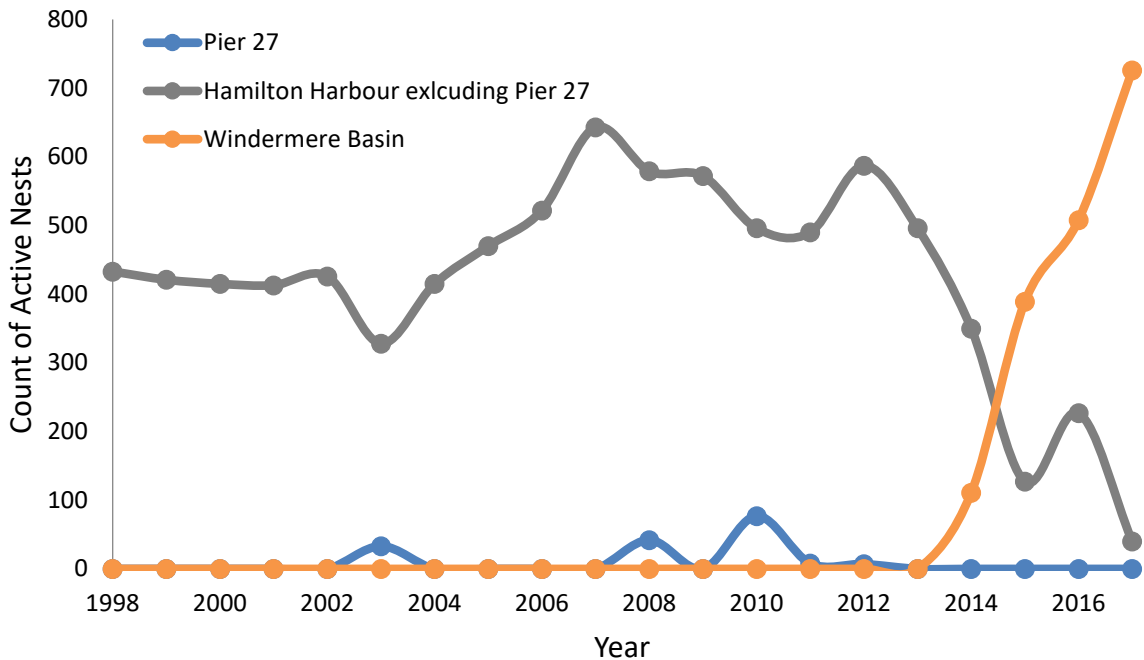


Figure 12: Distribution of Caspian tern active nests along Hamilton Harbour, 1998-2017.

Black-crowned Night-herons

Biology

Night-heron colonies within Hamilton Harbour were observed in the 1930s and 1950s, however they first became established within the Pier 27 colony in 1975, and grew steadily to over 200 nests by 1987 [14]. The eastern population of night-herons are at the northern edge of their range in southern Canada [28]. In 1993 and 1994, the number of nesting pairs had decreased to 134 and 90, respectively, as the numbers of cormorants nesting in the cottonwoods increased. In 1988, the night-herons relocated to sandbar willows (*Salix exigua*) along the west dyke of the confined disposal facility, and started nesting along the shore adjacent to Neare Island and in the box elder tree on Farr Island [11]; by 1994, they started nesting on the ground among rocks on Neare and Farr Islands [10]. They also nested on the west side of North and South/West Centre Islands among the large rocks along the edge of the

islands, sometimes being washed out in high waves (J. Quinn, McMaster University, Hamilton, ON, pers. comm.).

Night-herons start laying eggs in late April [10]. Colonies are situated in areas that are inaccessible to terrestrial predators (e.g., islands, swamps), usually in trees or shrubs, with a preference for concealed sites ([10] and references therein).

Interactions with other colonial waterbird species include the exclusion of night-herons by cormorants, due to competition for nesting space or defoliation of shrubs by cormorant guano [10]. Moore et al. [11] reported that the shift of night-herons from cottonwood trees to sandbar willows coincided with increases in the numbers of cormorants. Night-heron eggs can fall prey to ring-billed and herring gulls; conversely, they are known to predate common tern eggs and nestlings ([10] and references therein), and have been seen eating a cormorant chick (G. Fraser, York University, Toronto, Ontario, pers. comm). Recent observations also appear to indicate that night-herons use the presence of other birds as a cue for safety of habitat, and hence delays in nesting by other species can have an impact on the presence of night-herons at a specific site (J. Quinn, McMaster University, Hamilton, ON, pers. comm.).

Population Trends

Of the six species of colonial waterbirds, the night-heron has been the most challenging species to manage and/or protect. Census counts increased from 1997 through to 2006; the main nesting sites included the Northeast Shore Islands (North, Centre, South), and Pier 27 (Figure 13). However, around 2004-2005, numbers of active nests started decreasing at Pier 27, followed by the Northeast Shore Islands, but with a corresponding increase in active nests at Windermere Basin (Figure 14). This species is not site tenacious and has frequently abandoned sites due to competition by cormorants, causing them to find other nesting sites within the harbour, and occasionally requiring time and effort to find them (J. Quinn, McMaster University, Hamilton, ON, pers. comm.). Similarly, in other locations within the Great Lakes, the populations of night-herons peaked in the 1990s, experience nest take-overs by cormorants at eight sites, four of which have been abandoned [17, 20].

Preference for concealed nesting along with the time lags between site abandonment and identification of new nesting sites could explain the variability in the monitoring data. Nests are known to occur on industrial property with limited access and are not counted; therefore actual nest counts are

likely higher than presented here (J. Quinn, McMaster University, Hamilton, ON, pers. comm.). Pursuing censuses in these areas is important to determining the status of the species.

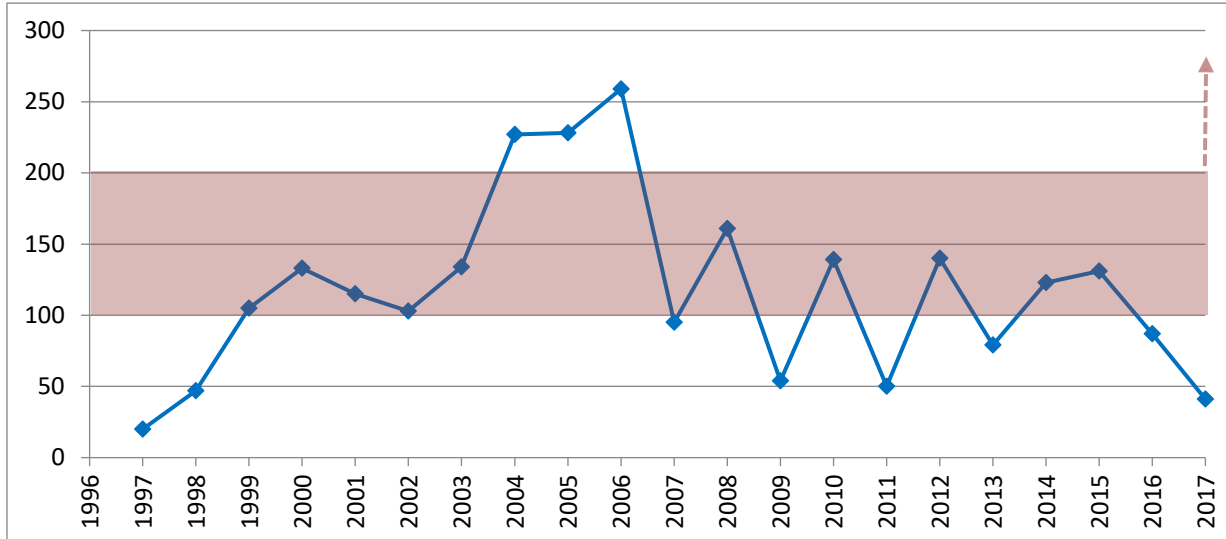


Figure 13: Census counts of active black-crowned night-heron nests throughout Hamilton Harbour. The shaded area indicates the 2012 target.

In 2016, management of cormorants in South Island began after the cormorant colony had already begun nesting. Thus, control of cormorants may have been too late, as the night-herons, which had been observed at the beginning of the breeding season, had been chased away by cormorants, and their nests taken over [29]. In 2017, flooding of the Northeast Shore Islands and resulting increased habitat pressure due to the significant decrease in nesting habitat did not favour this species, which did not breed on the Northeast Shore Islands [23]. Hence, the nest counts from 2016 and 2017, although indicative of detrimental habitat pressure, may not be adequately representing the present status of night-herons. Although the targets of 100-200 active nests have not been reached for those years, numbers could increase in 2018 and subsequent years, if harbour-wide adaptive management practices are maintained.

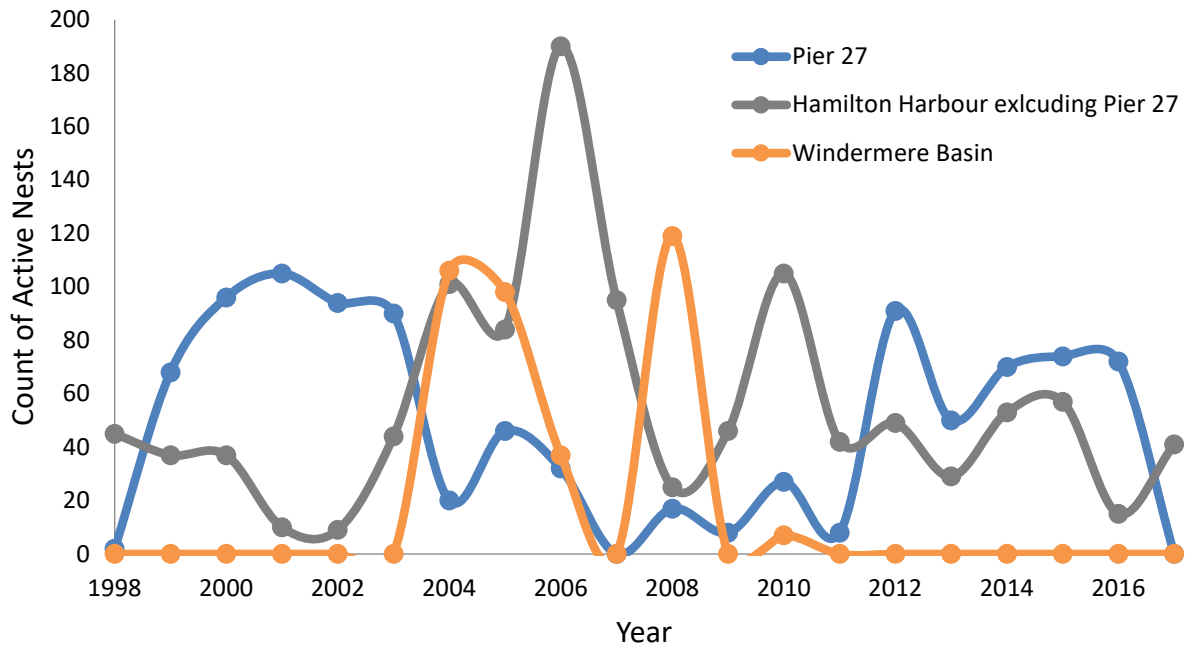


Figure 14: Distribution of Black-crowned night-heron active nests along Hamilton Harbour, 1998-2017.

FUTURE COMMITMENTS

In the winter of 2018, Hamilton Port Authority, the City of Hamilton (contingent on approval of the annual budget), and the City of Burlington (contingent on approval of the annual budget) committed to the continuation of their contribution to the Hamilton Harbour Colonial Waterbird management program, including:

- 10-year funding commitment for McMaster University’s management, monitoring & reporting program, supervised by Jim Quinn, Biology Department, to ensure the sustainability of the program.
 - Hamilton Port Authority: \$6,000 per year
 - City of Hamilton and City of Burlington: \$5,000 per year each (contingent on annual budget approval)
- 10-year funding commitment for continuation of management contract.
 - Coordinated contract for springtime ring-billed gull control (& tern encouragement) with Hamilton Port Authority (Pier 27) and City of Hamilton (Windermere Basin).

It is acknowledged that Pier 27 will likely be developed in the next 10-15 years, thereby decreasing available nesting habitat and exerting additional pressure at other locations. This will likely lead to the relocation of about 7,000 nesting pairs of ring-billed gulls and 2,000 nesting pairs of cormorants to other locations throughout the harbour, and possibly Lake Ontario. Yet, the presence of competition for available nesting habitat is not specific to Hamilton Harbour; similar interactions have been observed throughout the Great Lakes. The potential outcomes of the displacement of these birds are uncertain, however controlling the numbers of cormorant and ring-billed gull nests and protecting more sensitive waterbirds by way of adaptive management will allow the populations to stabilize, acknowledging that natural variability plays a role each year.

SUMMARY AND RECOMMENDATIONS

Since 2007, the colonial waterbird monitoring data have indicated that the implementation of the adaptive management approach combined with loss of nesting habitat through development at Piers 26/27 and exclusion from Windermere Basin successfully controlled the ring-billed gull populations, maintaining numbers around a target of 10,000 active nests (Figure 3).

Double-crested cormorants are actively managed across the Great Lakes Basin and local nest counts reflect the basin-wide population. Efforts to control cormorants at target numbers of less than 2,500 active nests suggest that this may have been an ambitious and arbitrary target given non-lethal methods of control were sought after and used.

The herring gull monitoring data from 2014-2017 indicate that the sub-colonies have been declining, mirroring observations made throughout Lake Ontario (D. Moore, Environment and Climate Change Canada, pers. comm.). Management efforts do not appear to fully address issues with this species' decline, since nesting habitat is available at Northeast Shore Islands, which they do not appear to be using. These declining numbers may reflect the overall observations made throughout the Great Lakes and be beyond the scope of the harbour-wide management, yet discussion with stakeholders to ensure management practices are aligned with the RAP objectives may ensure this species is given the best chance possible. Nesting space for herring gulls will continue to be made available on the islands.

Efforts to protect the common and Caspian terns have been successful, with numbers for the last few years increasing well above the targets from 2012 (300-600+ and 400-600+ active nests, respectively; Figure 9; Figure 11).

Nest counts for black-crowned night-herons fluctuate; the difficulty lies in this species' preference for concealed nesting and frequent site abandonment in favour of yet-to-be-identified locations elsewhere within Hamilton Harbour. Colonies on industrial property cannot be accessed or counted, but are known to exist every year. The management efforts directed at limiting cormorant presence and efforts to locate night-herons following site abandonment may be all that is feasible to ensure as much success as possible for this species.

As the data from 2017 have indicated, populations from the Northeast Shore Islands are susceptible to elevated water levels; particularly the herring gull sub-colonies at Neare Island. Although these conditions were exceptional, they provide valuable information on the sensitivity of various colonial waterbird species under increased habitat pressure.

CONCLUSIONS

After review of the data and reports on the Colonial Waterbird Subcommittee's efforts to balance the populations, and with the understanding that the adaptive management of colonial waterbirds will be pursued for at least another 10 years, the re-designation of the degradation of wildlife populations to not impaired is recommended. Adaptive management is key to maintaining a diverse population of colonial waterbirds in Hamilton Harbour.

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APPENDIX A: MAPS OF HAMILTON HARBOUR'S COLONIAL WATERBIRD NESTING HABITAT

Excluding Cootes Paradise



Figure A15: Nesting sites for the Hamilton Harbour colonial waterbirds – Northeastern shore



Figure A16: Nesting sites for the Hamilton Harbour colonial waterbirds – Pier 26 & 27

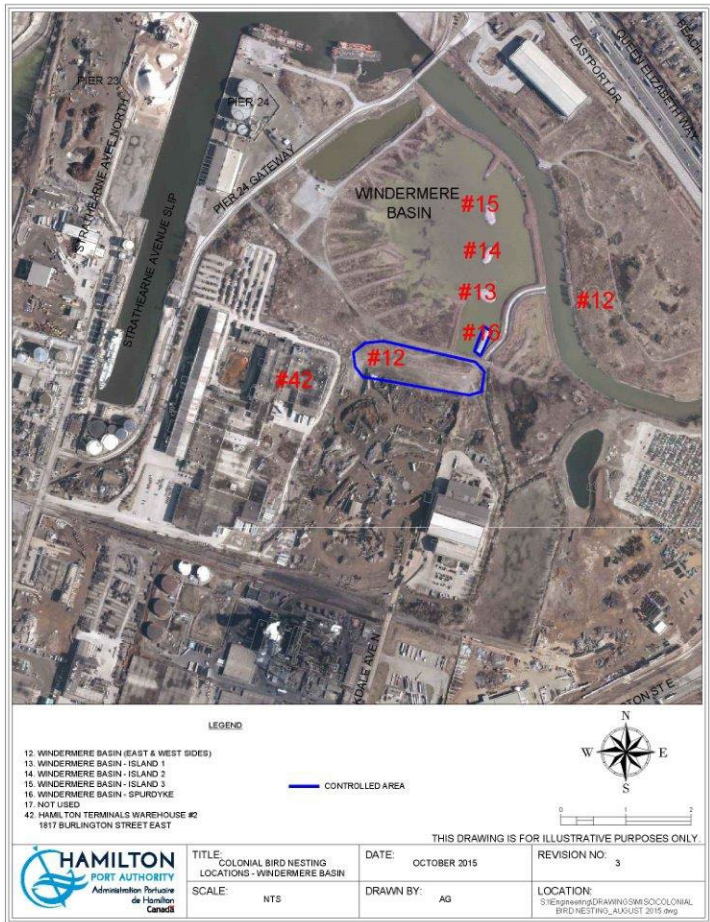


Figure A17: Nesting sites for the Hamilton Harbour colonial waterbirds – Windermere Basin

APPENDIX B: SUMMARY OF THE SPECIFIC MANAGEMENT APPROACHES AND TRENDS FOR EACH SITE

Farr Island

Farr island was originally colonized by herring gulls in 1988; cormorants started nesting on the island in 1991 [11]. By 1997, Farr Island sustained sub-colonies of herring gulls and cormorants, while a single nest of night-heron was reported in 1997. The island supported 30-44 herring gull nests until 2005, however a dramatic increase in the number of nesting cormorants in 2006 (from 351 in 2005 to 1,034 in 2006) displaced the herring gulls (Figure B18). It is suspected that landfilling activities at Pier 27 led to the displacement of more than 1,500 cormorants and 1,200 ring-billed gulls. When the island was removed in 2010-2011 in favour of the creation of fish habitat, only cormorants remained.

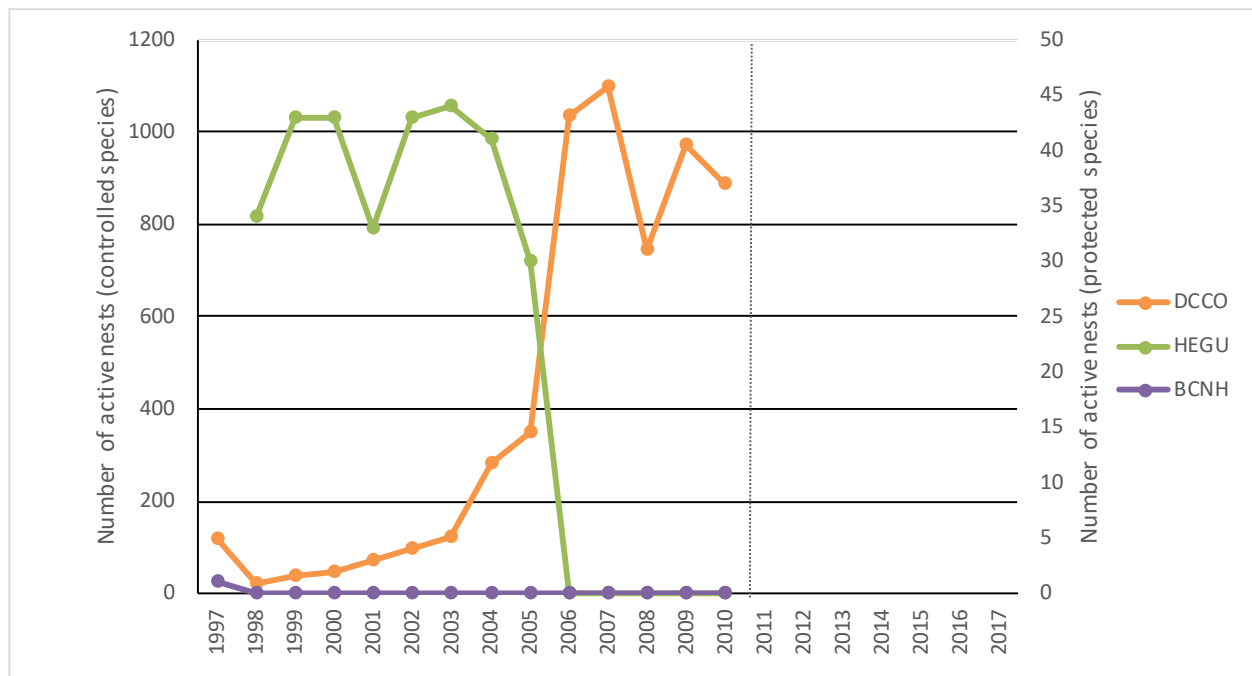


Figure B18: Number of active nests of each colonial waterbird species on Farr Island (1997-2010).

**Primary axis: controlled species - double-crested cormorants (*Phalacrocorax auritus* - DCCO).
Secondary axis: encouraged species - herring gull (*Larus argentatus* – HEGU), common tern (*Sterna hirundo* - COTE), Caspian tern (*Hydroprogne caspia* - CATE) and black-crowned night-heron (*Nycticorax nycticorax* - BCNH). Note: Farr Island was sunk in 2010-2011 in favour of the construction of fish habitat.**

Subsequently, the cormorants temporarily relocated onto Eastport Drive east of Neare Island (which also occurred in 2008 and 2009), and to Indian Creek, at the north eastern part of the harbour,

where they nested in 2011 and 2012 (Appendix A). The displacement of cormorants to other sites throughout the harbour may have temporarily affected other species in the following year (e.g., the herring gull and night-heron censuses were a bit lower at Pier 27 in 2011).

Neare Island

Neare Island was originally nearly exclusively used by nesting herring gulls, which colonized the island in 1989 [11], although early on common terns nested on the island (J. Quinn, McMaster University, pers. comm.). Four active night-heron nests were reported in 1998; cormorants started nesting on the island in 2006, when 561 active nests were reported (Figure B19), presumably from displacement from Pier 27 due to landfilling activities. Management of Neare Island was initiated in 2007 to prevent cormorants from nesting on site. At first, battery-operated dancing Santa mannequins successfully prevented cormorants from nesting on Neare Island, however by 2016, the cormorants had grown accustomed to the mannequins and colonized the west end of the island, requiring the removal of nests. It is suspected that attempts to remove cormorants from North and South Islands may have driven them to nest on Neare Island [8]. In 2017, Neare Island was managed with the removal of cormorant nests, however elevated water levels had significant impacts on available habitat, and only 7 active herring gull nests were counted at the time of the census and following high water. Future management will be instrumental to the preservation of the herring gull colony on the island.

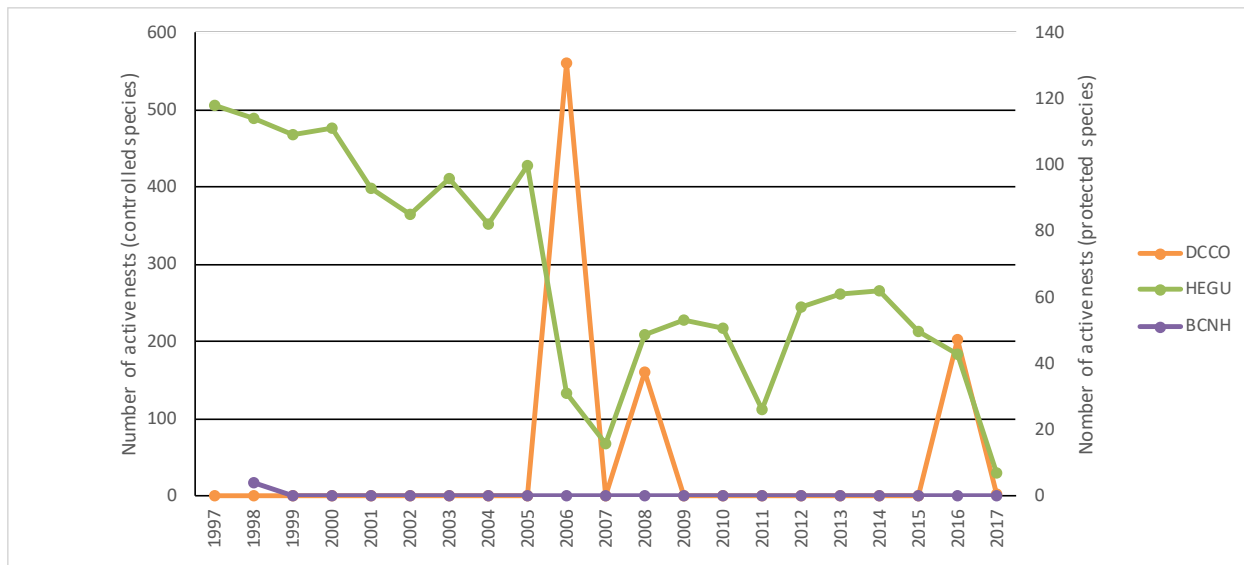


Figure B19: Number of active nests of each colonial waterbird species on Neare Island (1997-2017).

**Primary axis: controlled species - double-crested cormorants (*Phalacrocorax auritus* - DCCO).
 Secondary axis: encouraged species - herring gull (*Larus argentatus* – HEGU), common tern (*Sterna hirundo* - COTE), Caspian tern (*Hydroprogne caspia* - CATE) and black-crowned night-heron (*Nycticorax nycticorax* - BCNH).**

North Island

North Island was originally erected to provide nesting habitat for terns and gulls [10]; by 2007, it was occupied by herring and ring-billed gulls, Caspian terns, night-herons and cormorants (which colonized the island in 2004; Figure B20). Common terns never colonized the island. Cormorants had also started nesting on the ground, in competition with herring gulls [8].

Management of North Island included the placement of plastic tarps on the north and south ends of the island in early spring, until the arrival of Caspian Terns, to discourage nesting by other species (changed to south portion only due to the appearance of a herring gull colony on the north portion); the removal of cormorant nests (originally only ground nests), and; the placement of a battery-operated motion-detecting Santa to deter cormorants from nesting on the island (discontinued in 2014 due to habituation).

Management successfully maintained the number of cormorant pairs to 110-136, except for 2013 (316 nests). Note that these nests were counted as part of the monitoring, however none of the ground nests ever produced young. Further management involved the removal of tree and ground nests, hence there has been no successful nesting of cormorant on the island (J. Quinn, McMaster

University, Hamilton, ON, pers. comm.). The number of ring-billed gull pairs has decreased steadily since 2007, likely due to increases in herring gull nesting; they last nested on the island in 2014. Despite this, the number of Caspian tern nests has decreased since 2007, however this decrease does not appear to be related to competition with ring-billed gulls, which were successfully controlled. Caspian terns stopped nesting on North Island in 2015-2016, in favour of Tern Islands in Windermere Basin, but returned in 2017, when 40 active nests were reported. Although between 1997 and 2007, BCNH nested relatively regularly, albeit with much variability (9-63 active nests), a sharp decrease followed the implementation of the harbour-wide management plan; 0-9 active nests were recorded until 2014, after which BCNH ceased nesting at North Island. It should be noted, however, that nesting only took place in the rocks on the west side of North Island and were at great risk of being washed out when strong westerlies built up large waves (J. Quinn, McMaster University, Hamilton, ON, pers. comm.).

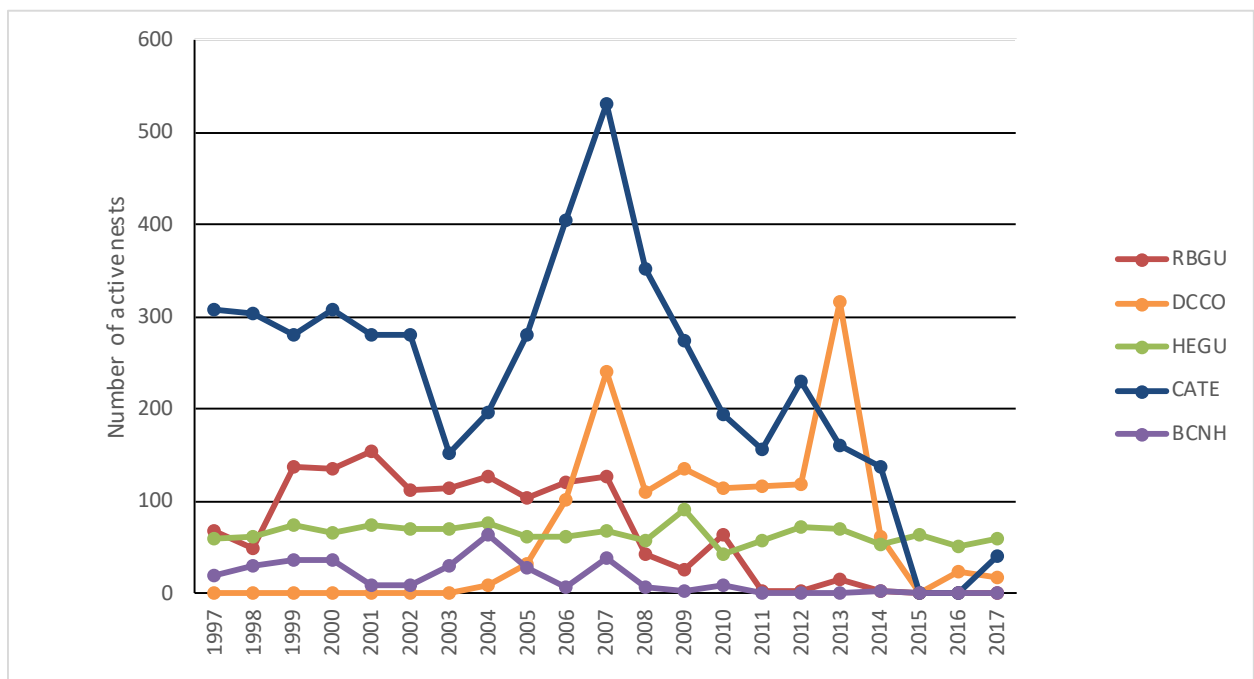


Figure B20: Number of active nests of each colonial waterbird species on North Island (1997-2017).

Primary axis: controlled species – ring-billed gull (*Larus delawarensis* - RBGU), double-crested cormorants (*Phalacrocorax auritus* - DCCO).

Secondary axis: encouraged species - herring gull (*Larus argentatus* – HEGU), common tern (*Sterna hirundo* - COTE), Caspian tern (*Hydroprogne caspia* - CATE) and black-crowned night-heron (*Nycticorax nycticorax* - BCNH).

Centre Island

As part of the Hamilton Harbour RAP, Centre Island was originally designed to provide habitat for nesting terns, gulls, night-herons and cormorants [10, 30]. The management of Centre Island proposed in 2007 included the covering of the north section of the island with plastic tarps to preserve nesting habitat for Caspian terns. Cormorants were permitted to nest on the portion of the island that was not reserved for terns. Ring-billed gulls and herring gulls nest along the periphery of the tern colony.

Although common terns colonized Centre Island to some extent in 1997 and nested in 1998 (3 and 14 active nests, respectively), they did not return in 1999, as the number of ring-billed gull nests quickly increased to 2,000 (Figure B21). Similarly, herring gulls appeared to colonize the island in 1997 and 1998, with 3 and 14 active nests, respectively, but the sub-colony dwindled to a maximum of 6 active nests thereafter (Figure B21). In contrast, Caspian terns successfully colonized Centre Island and maintained 111-336 active nests until 2013.

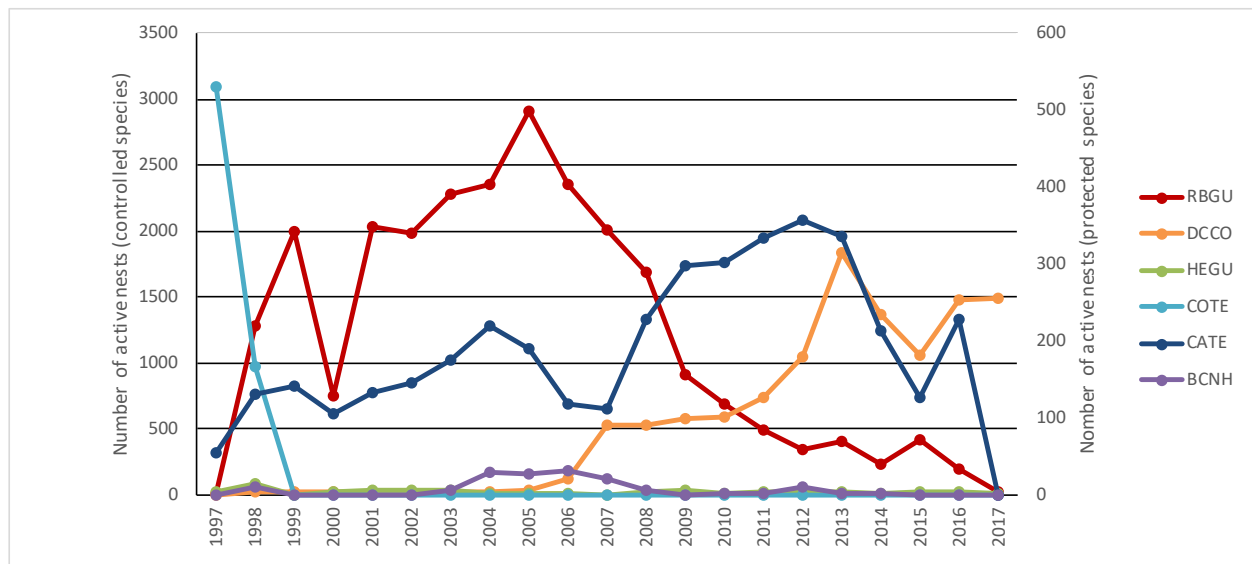


Figure B21: Number of active nests of each colonial waterbird species on Centre Island (1997-2017).

Primary axis: controlled species – ring-billed gull (*Larus delawarensis* - RBGU), double-crested cormorants (*Phalacrocorax auritus* - DCCO).

Secondary axis: encouraged species - herring gull (*Larus argentatus* – HEGU), common tern (*Sterna hirundo* - COTE), Caspian tern (*Hydroprogne caspia* - CATE) and black-crowned night-heron (*Nycticorax nycticorax* - BCNH).

Decreased number of Caspian tern nests from 2014-2017 coincide with access to the newly constructed Tern Islands in Windermere Basin. Although the number of Caspian terns increased again in 2016 (227 active nests), elevated water levels affected nesting in Northeast Shore Islands in 2017; roosting Caspian terns were observed at the beginning of the season, but did not nest on Centre Island [23]. In 2018, Caspian terns nested on the north end of Centre Island (J. Quinn, McMaster University, Hamilton, ON, pers. comm.).

Night-herons nested sporadically on the island, with encouraging numbers of active nests between 2002 and 2008 (six nesting seasons in a row with 5-31 active nests each year). However, numbers dwindled in parallel with the increased population of the cormorant sub-colony, and night-herons abandoned Centre Island in 2015.

Until 2005, the cormorant sub-colony maintained itself around 25 active nests, representing 5 branches on 5 artificial telephone pole trees the number was usually 26 nests as one “branch” had two nests (J. Quinn, McMaster University, Hamilton, ON, pers. comm.). In 2006 and 2007, this number rapidly increased to 125 and 530 active nests (mostly ground nests), presumably after landfilling activities caused the destruction of habitat at Pier 27 and the relocation of numerous nesting pairs. By 2013, 1,835 active pairs of cormorants nested on Centre Island.

Except for a considerable decrease in the number of ring-billed gulls in 2000 (down to 745 active nests from 2,000), the sub-colony maintained numbers above 2,000 active nests until 2007. Decline of ring-billed gull nests to 195 by 2016 is suspected to be mostly due to increased cormorant nesting on the island.

South Island

As part of the Hamilton Harbour RAP, South Island was initially designed as nesting habitat for terns, gulls and night-herons [10, 30], however maintaining tern colonies at the site proved problematic due to difficulties with the control of ring-billed gulls in 2006-2007, when they were displaced from Pier 27 due to landfilling activities (Figure B22). Caspian terns did not colonize the island, and common terns last nested at South island in 2005; in 2007, efforts to maintain nesting habitat for common terns were abandoned [8].

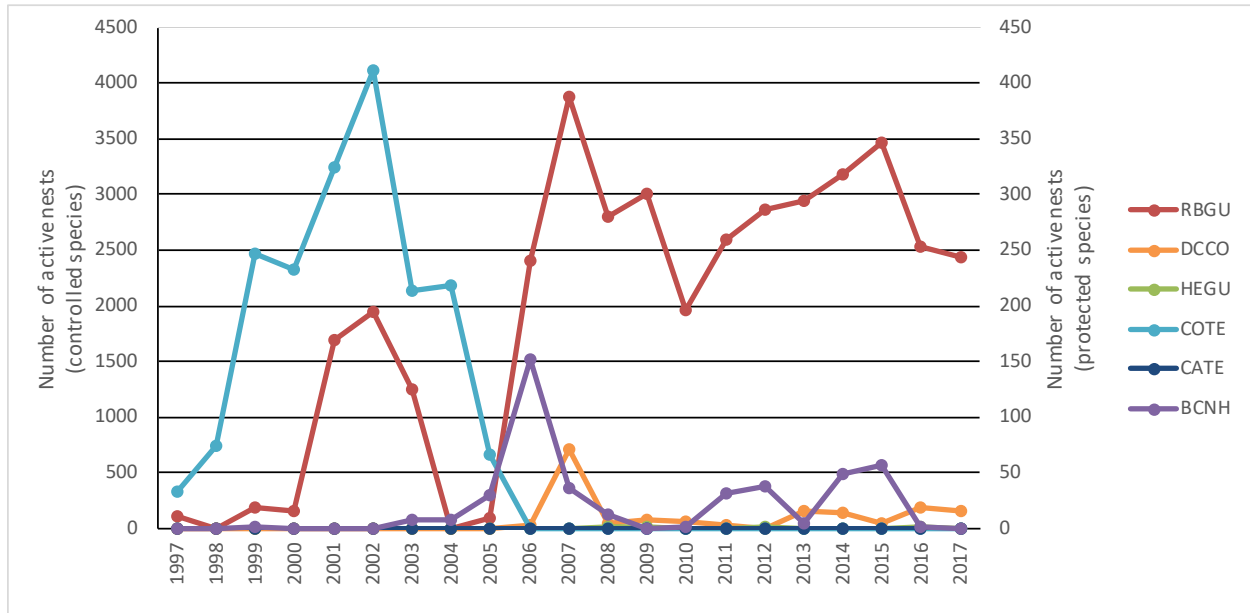


Figure B22: Number of active nests of each colonial waterbird species on South Island (1997-2017).

Primary axis: controlled species – ring-billed gull (*Larus delawarensis* - RBGU), double-crested cormorants (*Phalacrocorax auritus* - DCCO).

Secondary axis: encouraged species - herring gull (*Larus argentatus* – HEGU), common tern (*Sterna hirundo* - COTE), Caspian tern (*Hydroprogne caspia* - CATE) and black-crowned night-heron (*Nycticorax nycticorax* - BCNH).

Cormorants first colonized South Island in 2006 due to their displacement from Pier 27 from landfilling activities, and numbers quickly increased in 2007 (3,879 active nests). The expansion of the cormorant sub-colonies is thought to have displaced night-herons from their nesting sites on South Island, as in multiple locations across the harbour [8]. By 2007, South Island was occupied by ring-billed gulls, night-herons, and cormorants.

Management proposed in 2007 included the use of battery-operated motion detecting mechanical Santas to scare the ground-nesting cormorants, and removal of nests during the breeding season, to prevent cormorants from nesting on South Island and protect the site for night-herons [8]. The mechanical Santas had a limited, localized effect, and their use was eventually discontinued. Management activities have not successfully maintained a continuous night-heron colony; however, this species does not appear to be particularly site-tenacious (J. Quinn, McMaster University, Hamilton, ON, pers. comm.).

Windermere Basin

Until the naturalization of Windermere Basin, several species of nesting birds, particularly ring-billed gulls, occupied the east and western portions of the basin. Between 1998 and 2006, up to 14,000 ring-billed gulls have been nesting at Windermere Basin. As many as 119 night-heron active nests were reported between 2004 and 2008, and up to 350 common terns nested on Spur Dyke, though numbers were decreasing steadily (Figure B23).

From 2010 until 2012, during the construction, waterbirds did not nest at Windermere Basin. Since the construction of Tern Islands, management has involved the use of tethered raptors to deter ring-billed gulls from nesting until the arrival of the terns; ring-billed gull nests are removed from the islands to encourage the nesting of common and Caspian terns. The colonization of Tern Islands by both tern species was successful, with the presence of 274 active common tern nests in 2013, number which has increased yearly to 729 in 2017 (Figure B23). Caspian terns only colonized Tern Islands in 2014, with a more modest number of active nests – 111; however, the population has since increased to 726 in 2017.

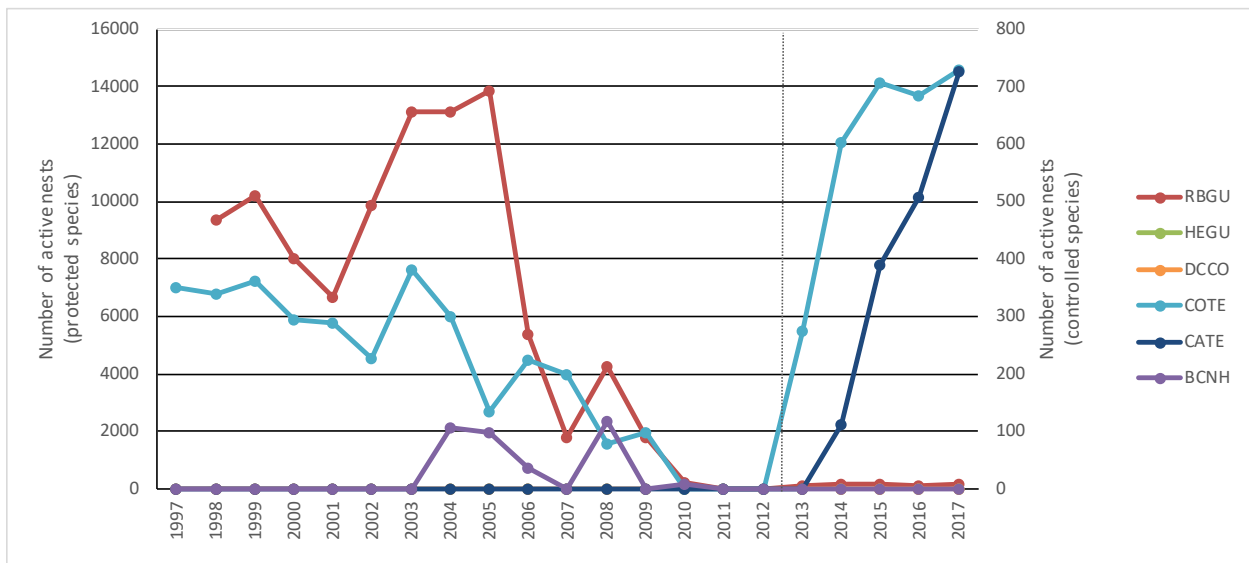


Figure B23: Number of active nests of each colonial waterbird species in Windermere Basin (1997-2017). Number of active nests for the controlled species (ring-billed gulls – RBGU) are on the primary axis, while those for the protected species (herring gulls (HEGU); common terns (COTE), Caspian terns (CATE) and black-crowned night-herons (BCNH) are on the secondary axis. The grey vertical bars represent the beginning and end of the construction of Tern Islands.

Hamilton Port Authority Land (Pier 27)

To respect the Migratory Bird Convention Act (1994), the Hamilton Port Authority obtains a permit to manage ring-billed gulls by scaring during nesting season. This also contributes to the goal of reducing the total number of ring-billed gulls.

Eastport and Pier 27 were created by the filling operations conducted by the Hamilton Port Authority (formerly Hamilton Harbour Commissioners) over the last fifty years. Pier 27 contains a confined disposal facility (CDF) used to store sediments that have been dredged from Hamilton Harbour for navigational purposes [8]. Bird control has been achieved using tethered and flying raptors. Ring-billed gull nests and eggs are removed from susceptible trucking routes and from areas designated for development, as the raptors do not always discourage ring-billed gull nesting.

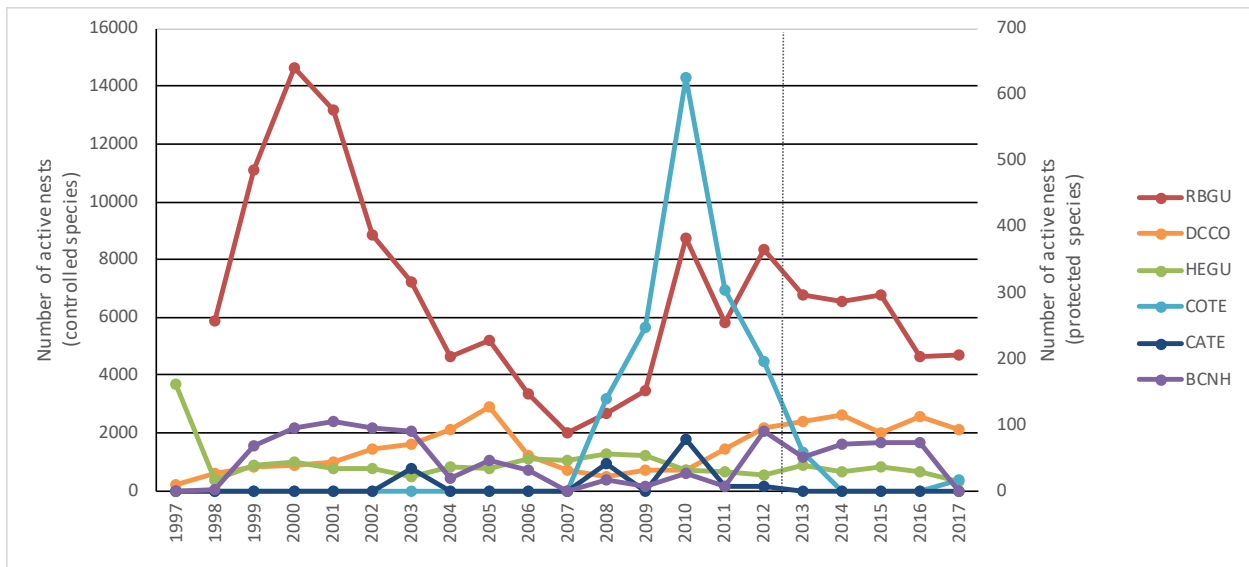


Figure B24: Number of active nests of each colonial waterbird species in Pier 27 (1997-2017). Number of active nests for the controlled species (ring-billed gulls – RBGU) are on the primary axis, while those for the protected species (herring gulls (HEGU); common terns (COTE), Caspian terns (CATE) and black-crowned night-herons (BCNH) are on the secondary axis. The grey vertical bars represent the beginning and end of the construction of Tern Islands.

Since 1997, the site has been used by all six colonial waterbird species, particularly ring-billed gulls and cormorants (Figure B24). As many as 14,616 active ring-billed gull nests were reported in 2000. Loss of habitat combined with raptor placement/flying and nest removal have led to a reduction of numbers at Pier 27 as low as 2,024 active nests in 2007, at the expense of other locations within the harbour, which prompted the development of a harbour-wide management plan for colonial waterbirds. Since 2007, the numbers of active nests have usually remained under 7,000, with peaks in 2010 (8,724) and 2012 (8,335), which coincide with the displacement of ring-billed gulls from Windermere Basin during the construction of Tern Islands and subsequently.

Pier 27 was colonized by cormorants in 1984; until 1991, it was the only cormorant nesting site in Hamilton Harbour [11]. Until the mid-1990s, approximately 150 Eastern Cottonwood (*Populus deltoides*) trees bordered the western edge of Pier 27, however the sustained cormorant activity and guano accumulation eventually killed the trees [8]. In the winter of 2005, landfilling activity removed habitat for cormorants and ring-billed gulls, which caused the displacement of large numbers of cormorant pairs to other areas of the Harbour (e.g., Northeast shore Island, Carroll's Point, Hickory Island) [8]. Their search for new nesting areas within the Harbour intensified conflicts with other species (e.g., herring gulls and night-herons). Since then, numbers have increased to 2,000-2,500 active nests per year.

A number of herring gulls frequent the site but decreased from 162 active nests in 1997 to as low as 13, as the number of ring-billed gulls increased. Terns have also occasionally nested at Pier 27, notably the common tern, displaced from Spur Dyke during the creation of Windermere Basin wetland. Night-heron nests have been reported most years, but in unpredictable numbers.

Other Private Lands

Over the years, colonial waterbirds have established colonies on private lands (e.g., Stelco, ArcelorMittal Dofasco, Max Aicher North America). Both Stelco and ArcelorMittal Dofasco have implemented predatory bird control programs to respect the Migratory Bird Control Act, thereby decreasing the number of birds present in the area. In 2015-2017, substantial numbers of ring-billed gulls have been reported on Max Aicher North America property (Appendix A). Night-herons have also nested on other private lands, hence pursuing censuses in these areas is important to determining the status of the species.

The rooftops of Hamilton Terminals Warehouse #2 have been reported to be nesting habitat to 25-60 active herring gull nests since 2008, representing 10-25% of the harbour-wide population (data not shown). As the herring gull populations have been on a downward trend throughout the Great Lakes, this nesting site may play an important role in conservation efforts.

APPENDIX C: CENSUS OF ACTIVE NESTS FOR COLONIAL WATERBIRDS

Table C2: Census of active nests for ring-billed gulls (*Larus delawarensis*) nesting within Hamilton Harbour (1997-2017).

Location	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
Farr Island	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neare Island	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
North Island & shoals	0	0	0	4	15	7	4	68	26	76	175	160	129	163	119	112	160	159	137	49	69
Center Island	15	197	422	226	405	337	500	685	907	1,688	2,005	2,356	2,905	2,349	2,281	1,979	2,030	745	2,000	1,275	5
South Island & shoals	2,430	2,525	3,496	3,196	2,960	2,863	2,784	1,972	3,014	2,851	3,973	2,462	146	83	1,496	2,007	1,790	210	195	0	110
CCIW land	0	0	16	0	0	0	32	0	15	0	8	0	639	52	32	536	10	125	0	0	0
Island off Fisherman's Pier	506	642	0	755	845	675	673	251	304												
Piers 26/27	4,681	4,651	6,752	6,540	6,782	8,444	5,829	8,724	3,481	2,659	2,024	3,347	5,178	4,617	7,240	8,853	13,150	14,616	11,072	5,902	+
Other private land	2,669	3,781	868	0	0	0	1,875	4,584	1,250	0	101	100	0	1,500	60	0	0	0	0	0	+
Windermere Basin	168	101	144	169	125	0	0	206	1,819	4,274	1,819	5,408	13,839	13,133	13,117	9,864	6,668	8,029	10,186	9,349	+
Hamilton Terminals Warehouse #2	50	0	0	0	0	0	0														
Hickory Island	0	0	0	0	0	0	0	0	0			0	0	4	4	0	0	0	0	0	0
Other harbour locations	0	0	0	0	1	0	1	3	91	6	1	0	0	0	3	6	0	0	0	0	0
Total	10,519	11,897	11,698	10,890	11,133	12,326	11,698	16,493	10,907	11,554	10,106	13,833	22,836	21,901	24,352	23,357	23,808	23,884	23,590	16,575	nc

+ indicates nesting but no census was completed

nc indicates the total was not estimated

Table C3: Census of active nests for double-crested cormorants (*Phalacrocorax auritus*) nesting within Hamilton Harbour (1997-2017).

Location	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
Farr Island	0	0	0	0	0	204	992	888	972	746	1,100	1,034	351	282	121	97	72	48	40	23	119
Neare Island	4	203	0	0	0	0	314	0	88	320	0	561	0	0	0	0	0	0	0	0	0
North Island & shoals	17	25	0	62	316	118	117	115	136	110	240	102	32	10	0	0	0	0	0	0	0
Center Island	1,885	1,558	1,064	1,363	1,835	1,106	740	595	571	523	530	125	30	26	26	25	26	25	25	25	0
South Island & shoals	159	187	49	136	159	0	33	63	76	43	715	32	0	0	0	0	0	0	0	0	0
CCIW land	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Island off Fisherman's Pier	0	-	-	0	0	0	0	0	0												
Piers 26/27	2,103	2,553	1,982	2,620	2,401	2,159	1,461	720	720	489	689	1,219	2,884	2,096	1,641	1,429	1,007	873	820	588	236
Other private land	218	170	0	0	0	3	0	1,002	548	0	0	0	0	0	0	0	0	0	0	0	0
Windermere Basin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamilton Terminals Warehouse #2	0	0	0	0	0	0	0														
Hickory Island	134	-	55	65	36	32	42	0	14	7	-	6	11	68	83	153	163	197	222	218	121
Other harbour locations	0	0	0	0	0	56	0	0	0	0	0	103	84	0	15	26	0	0	0	13	19
Total	4,520	4,696	3,150	4,246	4,747	3,678	3,699	3,383	3,125	2,238	3,274	3,182	3,392	2,482	1,886	1,730	1,268	1,143	1,107	867	495

Table C4: Census of active nests for herring gulls (*Larus argentatus*) nesting within Hamilton Harbour (1997-2017).

Location	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
Farr Island	0	0	0	0	0	0	0	0	0	0	0	0	30	41	44	43	33	43	43	34	+
Neare Island	7	43	50	62	61	57	26	51	53	49	16	31	100	82	96	85	93	111	109	114	118
North Island & shoals	59	52	64	56	72	74	60	43	93	58	68	62	63	80	73	71	76	67	74	62	59
Center Island	2	3	4	2	3	4	3	2	5	3	0	1	1	2	5	5	6	3	0	14	3
South Island & shoals	0	3	0	1	0	3	0	0	2	2	0	1	1	0	2	1	1	0	0	1	0
CCIW land	2	7	12	1	8	10	7	4	9	0	0	5	5	9	3	4	6	3	7	0	0
Island off Fisherman's Pier	0	0	0	0	0	0	0	0	0												
Piers 26/27	13	29	37	29	38	24	30	32	53	55	46	49	33	37	22	33	33	44	40	16	162
Other private land	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Windermere Basin	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	
Hamilton Terminals Warehouse #2	26	25	26	60	60	42	39	37	25	25											
Hickory Island	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Other harbour locations	0	0	0	1	2	5	4	11	6	9	7	11	0	2	6	3	3	0	0	0	0
Total	109	162	194	213	244	219	169	180	246	201	137	160	234	253	251	245	251	271	273	248	342

+ indicates nesting but no census was completed

Table C5: Census of active nests for common terns (*Sterna hirundo*) nesting within Hamilton Harbour (1997-2017).

Location	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
Farr Island	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neare Island	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Island & shoals	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Center Island	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	166	531
South Island & shoals	0	0	0	0	0	0	0	0	0	0	0	0	66	218	213	412	324	232	247	76	33
CCIW land	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Island off Fisherman's Pier	0		0	0	0	0	0	0	0												
Piers 26/27	17	0	0	0	59	355	305	626	247	140	0	0	0	0	0	0	0	0	0	0	0
Other private land	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
Windermere Basin	729	683	706	604	274	0	0	0	98	78	199	224	134	301	382	227	289	295	363	339	350
Hamilton Terminals Warehouse #2	0	0	0	0	0	0	0														
Hickory Island	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other harbour locations	0	0	0	0	0	0	0	0	0	0	25	37	0	10	60	29	26	35	16	39	
Total	746	683	706	604	333	355	305	626	345	218	224	261	200	529	655	668	639	562	626	620	946

Table C6: Census of active nests for Caspian terns (*Hydroprogne caspia*) nesting within Hamilton Harbour (1997-2017).

Location	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
Farr Island	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neare Island	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Island & shoals	40	0	0	137	160	230	157	195	274	352	532	405	281	196	153	281	280	309	280	303	309
Center Island	0	227	127	213	336	357	333	301	298	227	111	117	189	219	175	145	133	106	141	130	55
South Island & shoals	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CCIW land	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Island off Fisherman's Pier	0	0	0	0	0	0	0	0	0												
Piers 26/27	0	0	0	0	0	7	8	77	0	42	0	0	0	0	33	0	0	0	0	0	35
Other private land	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Windermere Basin	726	508	389	111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamilton Terminals Warehouse #2	0	0	0	0	0	0	0														
Hickory Island	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0
Other harbour locations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	766	735	516	461	496	594	498	573	572	621	643	522	470	415	361	426	413	415	421	433	399

Table C7: Census of active nests for black-crowned night-herons (*Nycticorax nycticorax*) nesting within Hamilton Harbour (1997-2017).

Location	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
Farr Island	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Neare Island	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	+
North Island & shoals	0	0	0	2	1	0	1	9	2	8	39	8	28	63	31	9	10	37	36	31	19
Center Island	0	0	0	2	2	11	1	1	0	5	20	31	26	30	6	0	0	0	0	10	0
South Island & shoals	0	2	57	49	4	38	31	2	0	12	36	151	30	8	7	0	0	0	1	0	0
CCIW land	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Island off Fisherman's Pier	0	0	0	0	0	0	0	0	0												
Piers 26/27	0	72	74	70	50	91	8	27	8	17	0	32	46	20	90	94	105	96	68	2	0
Other private land	41	13	0	0	22	0	9	93	44	0	0	0	0	0	0	0	0	0	0	0	0
Windermere Basin	0	0	0	0	0	0	0	7	0	119	0	37	98	106	0	0	0	0	0	0	0
Hamilton Terminals Warehouse #2	0	0	0	0	0	0	0														
Hickory Island	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0
Other harbour locations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	41	87	131	123	79	140	50	139	54	161	95	259	228	227	134	103	115	133	105	47	20

+ indicates nesting but no census was completed

APPENDIX 7

CURRENT NESTING COUNTS



Appendix 7: Current Nesting Counts

Monitoring has continued since the assessment in 2018. Nesting trends have generally stayed the same for most species. There were noticeable improvements for ring-billed gulls (a reduced population) and a decline in common tern nest counts for 2021 only. Outlined below are the current trends as of 2021 (Figure 8).

Black-crowned Night-herons

Black-crowned night-heron counts fluctuate in and out of the targeted range of 100-200 nests. They are the colonial waterbirds most impacted by human disturbance in the Harbour and prefer concealed nesting in trees. This species is shyer than others, not site-specific, and frequently abandons sites due to disturbance by humans and competition by cormorants, causing them to find other nesting sites within the Harbour, occasionally requiring time and effort to find them. They are also known to nest on shoreline property that cannot be accessed by researchers. The presence of time lags between site abandonment and identification of new nesting sites likely explains the variability in the monitoring data. Continuing to limit cormorant presence to preserve living trees is the strategy being used to encourage black-crowned night-heron nesting at Hamilton Harbour sites, alongside working with partners to locate the new and variable nesting areas.

Caspian Terns

The Caspian tern population is one of the most stable of the Harbour's colonial waterbird community. Nest counts in the previous 5 years have spanned 595 to 824, all within or exceeding the desired range of 400-600+ nests. In 2020 there was a dip in the number of nests due to great-horned owl predation at the Windermere Basin Islands and the colony has since moved to the North Islands and north end of Centre Island in 2021. Management teams are working with qualified contractors to reduce the impact of owl predation at the Windermere sites.

Common Terns

Common terns are very site-specific (site tenacious) and tend to nest on the Windermere Basin Islands. For most of the past decade, the nest counts have been in or even exceeded the desired range of 300-600+ nests. The recent dip in numbers resulted from low reproductive success due to predation by great-horned owls as well as nesting at the perimeter of the islands, which is not ideal nesting and fledging space. With the relocation of Caspian terns to the Northeastern Islands in 2021 and efforts to relocate and repel the owls, high-quality nesting space is available for common terns. However, continued pressure by nocturnal predators in Windermere Basin (particularly the great-horned owls, but also including raccoons) is putting the tern colonies at risk and will require some innovative management.

Double-crested Cormorants

In the years following the status assessment's production cormorant nest counts decreased from 4520 nests in 2017 to 3490 nests in 2018 and rose back up and hovered around the 4600 mark from 2019-2021, so there were large fluctuations followed by plateauing. In 2021 the cormorants arrived on South Island early and in more abundance than usual and there was some ground nesting that excluded the ring-billed gulls.

Herring Gulls

Recent data suggests that herring gull nest numbers are declining across the Great Lakes, including locations in Lake Superior and Niagara Region (Hebert et al., 2020). The natural fluctuation of populations was not considered when the original numerical goals were created and remain difficult to predict. Herring gull nests in the harbour have generally fluctuated within or just below the targeted 200–300 nest range. It is possible that they are nesting on rooftops and that has contributed to the decline at the island sites; however, this would be difficult to track. Limiting cormorant nests is the primary strategy to encourage herring gull nesting in Hamilton Harbour. Since the science assessment, the nest counts have rebounded up to 171 nests, just shy of the targeted range.

Ring-billed Gulls

Ring-billed gull nests have recently entered the targeted range of <10,000 in Hamilton Harbour. In the last five years, nest counts have dropped from 10,519 in 2017 to 7987 in 2021. This demonstrates how human management successfully decreased the number of nesting ring-billed gulls since program inception (nearly 25,000 nests). The decline in nesting ring-billed gulls is also due to the port authority excluding gulls from more and more of Pier 27, which was never intended as habitat.

References:

Hebert, C.E., Weseloh, D.V.C., Arts, M.T., de Solla, S.R., Moore, D.J., Paterson, G., and C. Pekarik. 2020. Trends in herring gull egg quality over four decades reflect ecosystem state. *Journal of Great Lakes Research* 46:538-548.

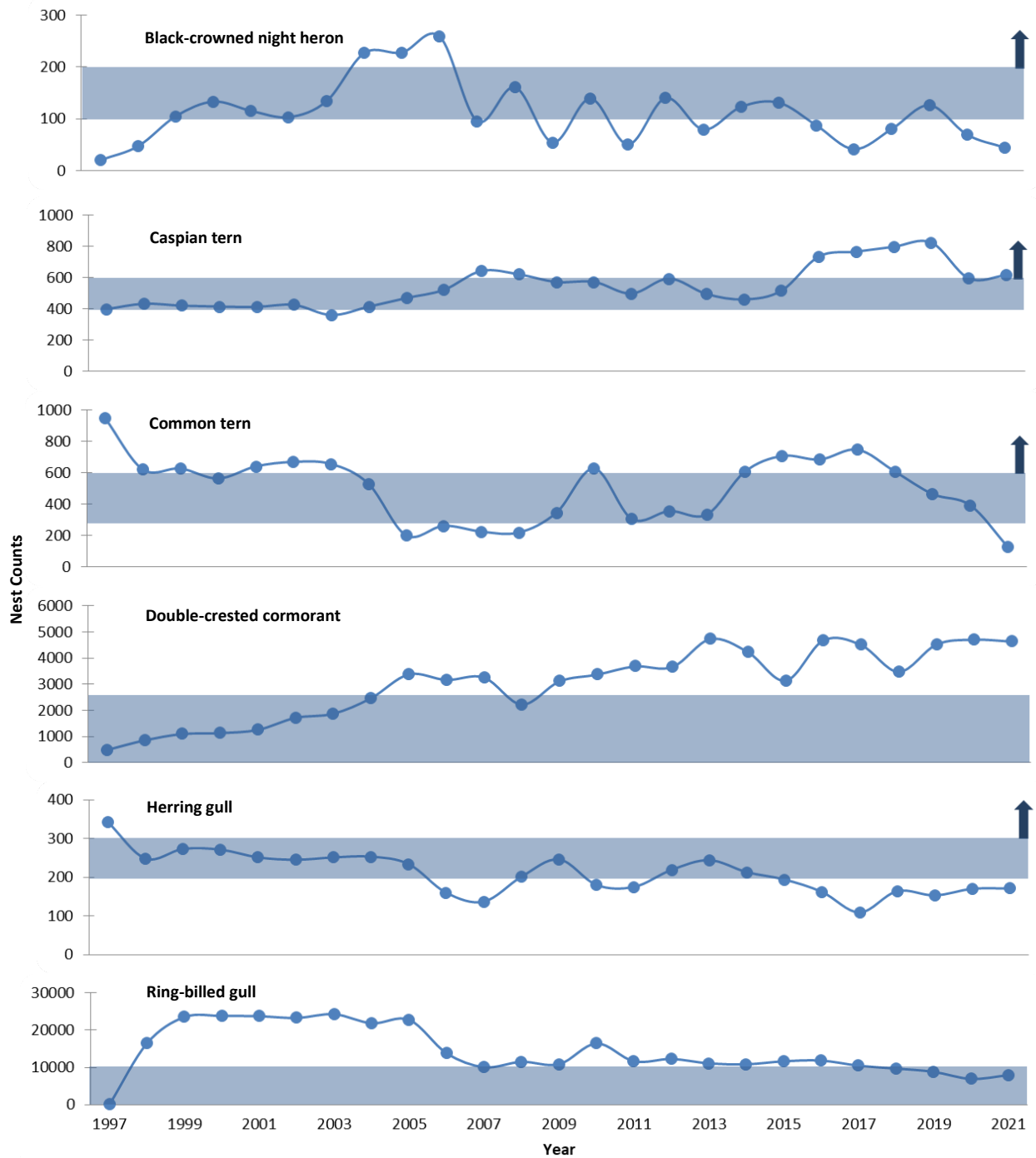


Figure 8. Nest counts of the six colonial waterbird species (black-crowned night heron, Caspian tern, common tern, double-crested cormorant, herring gull, and ring-billed gull) monitored in the Hamilton Harbour Area of Concern. Blue bars represent desired ranges and arrows indicate a value above that targeted range would also be welcome (species that experts hope to promote).