RES.#A23/10 - **DOUBLE-CRESTED CORMORANTS**
Management Strategy for 2010. Management of Double-crested Cormorants at Tommy Thompson Park.

Moved by: Lois Griffin
Seconded by: Bonnie Littley

THAT Toronto and Region Conservation Authority (TRCA) staff be directed to continue to work with the cormorant advisory group in addressing management concerns regarding colonial waterbirds at Tommy Thompson Park (TTP);

THAT staff be directed to work with the Ontario Ministry of Natural Resources (MNR), Canadian Wildlife Service and any other required regulatory agency to seek approval for the 2010 management strategy for colonial waterbirds at TTP;

THAT staff be directed to implement the proposed management strategy for 2010;

THAT staff be directed to continue to actively participate in local, regional and binational committees/working groups addressing the management and protection of colonial waterbirds;

THAT staff be directed to present and promote the 2010 cormorant management strategy to local, regional and binational committees and working groups that are addressing the management and protection of colonial waterbirds, as an alternative to lethal management;

AND FURTHER THAT staff report back to the Authority annually regarding the management of Double-crested Cormorants at Tommy Thompson Park.

BACKGROUND
Double-crested Cormorants (DCCO) have been nesting at Tommy Thompson Park (TTP) since 1990. The colony started with six nests in trees on the tip of Peninsula B, and has since expanded to 7,564 nests, as recorded in 2009, on three of the four peninsulas at TTP. In 1990, the four peninsulas were cottonwood forest habitat, however due to DCCO colonization on Peninsulas A, B and C, the forest canopy has been significantly reduced: no forest is left on Peninsula A; only a portion of forest remains on Peninsulas B and is in poor health; and the forest on Peninsula C in declining health.

In addition to the largest DCCO colony in the lower Great Lakes basin, TTP supports diverse communities of bird, fish, reptile, amphibian, mammal and vegetation species. It has been formally designated as a Globally Significant Important Bird Area (IBA) and an Environmentally Significant Area (ESA #120). The master plan that guides the development of TTP includes the goal of conserving and managing the natural resources and environmentally significant areas of the park. While the DCCO colony adds to the diversity of the park and is environmentally significant, there are concerns about the impacts of DCCO on tree health and biodiversity in other areas at TTP.

Monitoring of DCCO colony growth and expansion, impacts on vegetation cover, and the dynamic interactions with other colonial bird nesting species has occurred since 1990. Conclusions drawn from the data include:

- DCCO nesting has resulted in the loss or degradation of approximately 24 per cent of the forest habitat available at TTP.
- Peninsula A is now devoid of forest. Only three standing trees remained in 2009, two of which are dead and the third in very poor health.
- Peninsula B has lost all the trees at the tip and most of the remaining trees inland are in poor health and expected to die within the next few years.
- Tree health is rapidly declining on Peninsula C.
- Average annual population increase was 15.5 per cent between 1998 and 2009.
- DCCO have expanded into the traditional Black-crowned Night-Heron (BCNH) nesting area and in 2009 it is estimated that fewer than 50 BCNH nests persisted to the end of the season. The expansion of DCCOs has displaced BCNH from their primary nesting areas into marginal areas which are prone to disturbance.
- Based on the rapid growth of the DCCO colony since 1990, it is expected that if no management measures are undertaken, the population will continue to expand their nesting areas into new areas such as Peninsula D.

To ensure the TTP Master Plan goals and objectives are maintained and the concerns are addressed, TRCA initiated the involvement of stakeholders and the public, including an advisory group, to create a management strategy for DCCO at TTP. The process guiding the management strategy started in November 2007 with the establishment of the Cormorant Advisory Group. This group is comprised of various stakeholders and experts from across the spectrum whose mandate is to provide input and advice, to ensure that all perspectives are considered, and to provide linkages with other stakeholders. Since establishment in early 2008 the advisory group has met eight times, including a public meeting in April 2008. 2010 is the third consecutive year of cormorant management at TTP, however little management occurred in spring 2008 due to timing. The Cormorant Strategy Chronology (Attachment 1) summarizes the consultation process, including the development of the strategic approach of the management strategy undertaken in 2008 as per Authority Resolution #A110/08 and in 2009 as per Authority Resolution #A22/09.

The goal of the 2009 management strategy did not change from 2008. It was to achieve a balance between the continued existence of a healthy, thriving DCCO colony and the other ecological, educational, scientific and recreational values of TTP. The specific objectives of the strategy were to:

a) increase public knowledge, awareness and appreciation of colonial waterbirds;
b) deter DCCO from nesting on Peninsula D;
c) limit further loss of tree canopy on the peninsulas beyond the existing DCCO colonies;
d) continue research on colonial waterbirds in an urban wilderness context.

The 2009 Strategic Approach (Attachment 2) was formulated based upon the 2008 Strategic Approach and the comments and views expressed at the advisory group meetings. It was adopted at Authority Meeting #2/09, held on March 27, 2009, as part of Resolution #A22/09.

In order to solicit additional input from the public about the DCCO colonies at TTP, staff prepared fact and comment sheets for participants at the Spring Bird Festival, held on May 23, 2009. Park users had the opportunity to view the DCCO colonies and learn more about DCCO at TTP from TRCA staff. Visitors then had the opportunity to express their views via a survey and comment sheet. The survey was given to 25 people who had just taken a tour of the Peninsula C colony or who had listened to staff interpret the TTP colony. Every person surveyed supported the overall goal of the strategy and supported management of the DCCO colony at TTP. Four participants indicated that they are in favour of the management plan because it strives for a behavioural change, not lethal population management. 84% of participants agreed that they are concerned about the amount of tree canopy at TTP.

The overall DCCO population at TTP continues to rise. In 2009 the increase in nest numbers was due to a 94 per cent increase in ground nesting on Peninsula B. The overall tree nesting population experienced a decrease for the first time since colonization. The decrease in the number of tree nests and the significant increase in ground nesting is in line with the 2009 strategy where cormorants were deterred from nesting at the tip of Peninsula C and encouraged to nest on the ground on Peninsulas A and B. In summary:

- overall DCCO nests increased from 6,717 nests in 2008 to 7,564 nests;
- ground nests on Peninsula B increased from 948 in 2008 to 1957 nests in 2009, a 94 per cent increase;
- tree nests on Peninsula A and B decreased by 27 nests and 133 nests respectively; and tree nests on Peninsula C increased from 4,609 nests in 2008 to 4,668 in 2009;
- the number of trees cormorants occupied decreased by 16 trees in 2009 for a total of 1,045 nest trees;
- cormorants occupied 51 per cent of all surveyed trees at the site including trees that were surveyed in the past, but not used for nesting in 2009;
- at peak nest count Black-crowned Night-Heron nests were recorded as 617, however most of the night-heron colony abandoned breeding attempts by mid-June. It is estimated that less than 50 nests persisted until the end of the season. The cause for the abandonment is unclear and staff will continue to monitor night-heron nesting activities in 2010.

Human presence (researchers and the public) on Peninsula D was successful at deterring DCCO from nesting and escalating the level of deterrence beyond human presence was not required. DCCO were documented on Peninsula D a total of nine times during spring 2008, but no nesting attempts were witnessed. DCCO were only documented roosting once on Peninsula D during the fall, and again human presence was adequate to deter the birds.

York University completed the egg oiling study to examine nest desertion, behavioural effects, and disturbance effects on ground nesting cormorants. The monitoring portion of this project was concluded in the 2009 breeding season to determine if there is any difference in nest occupancy of the 2008 treatment nests. Initial data analysis indicates there is no significant difference in nest occupancy. This study has also produced a variety of valuable biological data including productivity, fledging success, nest attendance, hatching dates and social behaviours on the TTP DCCO colony. This data will enable TRCA staff to better manage and understand the TTP DCCO colony and provides a better understanding of the effects of disturbance on nesting attempts and success. York University researchers have already presented the research at one conference and are currently in the process of completing the report for peer reviewed scientific publication.

RATIONALE

An extremely high level of concern has been expressed regarding DCCO populations and their management. Concerns have been raised from both extremes, on the one hand calling for management and the preservation of forest canopy, and on the other hand for protection of the birds and their nesting colonies. TRCA has an obligation to manage Tommy Thompson Park as directed by the Master Plan for Tommy Thompson Park as approved under the Environmental Assessment Act. To meet the intent of the master plan, TRCA staff feel that there is a strong rationale for undertaking a strategic approach to the management of Double-crested Cormorants at Tommy Thompson Park.

Since November 2007, TRCA has involved stakeholders and the public in assessing the need for management and developing a strategy for cormorants at TTP. Generally, throughout the process there has been agreement that some form of management is appropriate, providing that the methods are humane to cormorants and do not affect other wildlife.

Based on the success of the 2009 strategy, ground nest enhancements and pre and post nesting deterrents will continue. While cormorants did not ground nest on Peninsula A, birds frequented the enhancement area loafing and gathering nesting material. Peninsula C is the traditional nesting area to the majority of the BCNH colony and is part of the park's largest forest block. This area continues to see a further reduction in forest health. TRCA has therefore developed the following strategic approach to the management of cormorants at TTP for the 2010 season.

DETAILS OF WORK TO BE DONE

Goal and Objectives

The goal of the 2010 management strategy has not changed from 2009. It is to achieve a balance between the continued existence of a healthy, thriving cormorant colony and the other ecological, educational, scientific and recreational values of Tommy Thompson Park. The specific objectives of the strategy are to:

a) increase public knowledge, awareness and appreciation of colonial waterbirds;
b) deter cormorants from nesting on Peninsula D;
c) limit further loss of tree canopy on the peninsulas beyond the existing cormorant colonies;
d) continue research on colonial waterbirds in an urban wilderness context.

Increasing Public Knowledge, Awareness and Appreciation

TRCA will seek all opportunities to increase public awareness and appreciation of Double-crested Cormorants and other colonial waterbirds at TTP. A varied approach will be used including, but not limited to:

- public meetings;
- TRCA website;
- annual Spring Bird Festival (May 8, 2010);
- development of interpretive signage;
- improving opportunities to view colonial waterbirds, including cormorants using viewing blinds and platforms;
- conducting tours with schools and interest groups;
- presenting information at conferences and forums;
- participation in working groups on colonial waterbirds.

Informational signs at strategic locations that request people to refrain from entering the colonial waterbird colonies during the nesting season are already in place to discourage the public from disturbing the bird colonies. Additional interpretive signs will be installed to educate park visitors on colonial waterbirds and their habitats. Researcher disturbance associated with TRCA and partner research programs will be controlled to reduce overall disruption.

In order to solicit more input from the public about the cormorant colonies at TTP, staff will prepare a fact sheet and comment sheet targeting park users at the Spring Bird Festival on May 8, 2010. Park users will have the opportunity to view the cormorant colonies and learn more about cormorants at TTP from TRCA staff. Anyone interested will be given the opportunity to express their views via the comment sheet and the results of the survey will be summarized for inclusion into the summary report for the 2010 season.

Proposed 2010 Strategic Approach

As with the 2009 strategy, TRCA proposes to utilize a variety of techniques in an integrated adaptive management approach to achieve the goals and objectives for the 2010 strategy. The 2010 Strategic Approach matrix (Attachment 3) outlines the techniques and strategies at specific locations of the site, and will help provide insight regarding the interactions of the different techniques. Management techniques do not include lethal culling.

The TTP cormorant colony currently occupies three of the four peninsulas of the park comprising three cormorant sub-colonies (Attachment 4). Peninsula A and the current nesting area of Peninsula B are considered Cormorant Conservation Zones where cormorant nesting and roosting is encouraged and enhanced. Within the Cormorant Conservation Zones efforts will be made to minimize disturbances so that cormorants will continue to use the areas and nesting remains productive. Peninsula C is the most recently colonized area containing the largest cormorant sub-colony and the largest Black-crowned Night-Herons population at the site. Peninsula D is the only forested peninsula not occupied by colonial waterbird species.

The 2010 Strategic Approach will focus on pre-nesting deterrents in the unoccupied forested areas of Peninsulas B, C and D to reduce stress on the trees and encourage ground nesting on Peninsulas A and B. Post-breeding deterrents in the forested areas of Peninsulas C and D will be used to reduce stress on living trees; and ground nest enhancements on Peninsulas A and B will encourage cormorants to nest on the ground instead of in trees. Habitat restoration efforts will continue to delineate and buffer the colonies from other park uses as well as provide habitat for other bird and wildlife species. Finally, continued research will be encouraged and will focus on raccoon predation on cormorant and night-heron nests; and the use of social attraction techniques to persuade cormorants to nest on the ground.

Cormorant Conservation Zones

Peninsula A and the current nest area of Peninsula B are considered Cormorant Conservation Zones where cormorants will be encouraged to nest, loaf and roost. Efforts will be made to minimize disturbances so that cormorants will continue to use these areas and nesting remains productive.

Pre-Nesting Deterrents

Cormorants will be discouraged from expanding their tree colonies onto Peninsula D, further onto the tip and base of Peninsula C and the base of Peninsula B. Cormorant pre-nesting deterrents will be used in these specific locations as depicted in Attachment 4, and will only be implemented if necessary and in response to cormorant nesting attempts in 2010. Cormorant deterrence at the base of Peninsula B and C may be conducted where the Black-crowned Night-Herons have nested in recent years. Deterrents will only be used in these areas given that they do not adversely impact night-heron nesting.

By discouraging cormorants from nesting in trees in these areas, staff anticipate that forest health and tree canopy will be preserved, further expansion into new trees will be limited, and the enhanced ground nesting areas at the tips of Peninsulas A and B will be more attractive to breeding cormorants. A potential secondary benefit is reduced competition for nest sites and nest material with night-herons and Great Egrets. Deterrents will not occur on Peninsula A or on the majority of Peninsula B. Displaced tree nesting cormorants will be encouraged to ground nest on Peninsulas A and B.

Pre-Nesting Deterrent Methodology

Methods that achieve the goal of deterring cormorants while minimizing disturbance to other species will be utilized. Staff will use targeted techniques that are humane for cormorants and minimize disturbance to other wildlife. The techniques used will be employed on an increasing scale of activity, with preference given to the least intrusive means needed (Attachment 5). Detailed colony observations will take place prior to implementing any deterrent technique, as well as during and post deterrent implementation. These will be conducted to document behavior, locations and densities of cormorants, night-herons, egrets, or other bird and wildlife species. These observations, combined with nesting locations data from recent years, will provide a baseline to help quantify targeted cormorant movement and non-targeted species activity.

Staff presence, and increasing human activity in appropriate areas is favoured over the other techniques, however, human activity and presence alone has not proven to be completely effective in preventing nesting expansion in all deterrent areas. It is therefore expected that deterrent techniques will escalate in 2010 as they did in 2008 and 2009. These techniques are depicted in the 2010 Deterrent Escalation diagram (Attachment 5).

Effective cormorant deterrence requires the use of a suite of techniques. Deterrence at TTP has proven to require escalation beyond simple human presence and would first progress to active techniques including whistling, arm waving, followed by running and shouting. Activity would be further increased to carrying 3 metre poles and waving the poles without tree contact, progressing to moving low tree branches and tapping on trees. Poles would not contact cormorants. If nesting attempts persist, then artificial predators including owls, raccoons, hawks and scarecrows will be placed in the trees in and near the nesting locations. If nesting attempts still persist, additional sections may be added to the poles, increasing their length and used to remove newly placed nesting material.

Inactive nest removal will also be implemented for the 2010 season, and will be completed in winter and early spring of 2010, prior to the return of the nesting cormorants. Inactive nest removal will only take place in the Primary Deterrent Areas as indicated in Attachment 4. These areas represent newly colonized trees in 2009 and/or trees in fair health, and were the sites targeted for pre and post deterrent strategies in 2009. Since all old nests will be removed from the Primary Deterrent Area prior to the 2010 breeding season, any new nests started in 2010 will be obvious and newly placed material will be promptly removed before it becomes an active nest.

Poles will not be used on nests where chicks may be present or where nesting status is not completely documented, and poles will not be used to make direct contact with cormorants. In a situation where cormorants continue to utilize trees within the deterrence area, deterrents will again escalate to utilize noise bangers, in conjunction with the previously described techniques. Noise bangers are not a preferred option and will only be used when non-target species are not present, or will not be affected.

Deterrent techniques will begin with human presence and will progress as indicated in Attachment 5. Deterrent activity will only progress to the next level when staff determine that cormorants are no longer responding to that given technique. Progression to the next level will occur based on documentation that at least two attempts in one day when a given technique fails to flush cormorants.

In the event that nesting deterrents progress through the methodology depicted in Attachment 5, and escalate to the use of noise makers (Level 7), and cormorants still refuse to leave newly created nests, deterrents will escalate to the final level, active nest removal. Active nest removal is not a preferred option and will only be used in the Primary Deterrence Areas on recently created nests (i.e., less than 10 days old). Active nest removal will not be utilized as a population control technique, and it is not the intent to disturb active nests containing eggs or nestlings.

Active nest removal will not be utilized in the following situations:
1. nestlings (chicks) are present or adult behavior suggests nestlings are present;
2. there is a possibility of nestlings being present or the age of the active nest is not documented;
3. there are eggs present that could be greater than 10 days old;
4. there is a possibility that eggs are present or adult behavior suggests the presence of eggs, and the nest age is unknown or is greater than 10 days old;
5. nests are outside the Primary Deterrent Areas.

The Active Nest Removal Situation and Action Flow Chart (Attachment 6) indicates the typical situations and actions that are anticipated at the site.

In all situations, it is the intent that nests without eggs are removed. Monitoring will include behaviour observations, timeline establishment, spatial nest mapping and tree tagging to provide the highest level of confidence that eggs are not present in a nest, and that nest age is documented. The 10 day incubation used is a conservative estimate based on current scientific literature on embryo development for altricial (i.e., born helpless and requiring parental care) waterbirds (Humane Society of the United States, 2009).

Active nest removal is being used as a deterrence tactic and is complimented with ground nesting enhancements and the other deterrent techniques. This is will be conducted to prevent the expansion of tree nesting into new areas, and to protect recently colonized trees in the specific Primary Deterrent Areas. In the event that eggs older than 10 days in age or nestlings are discovered, deterrent activities will stop in that area.

Pre-Nesting Deterrent Monitoring

During deterrent activities observers will be stationed near the night-heron colonies, within view of the ground nesting areas on Peninsulas A and B and on Peninsula D to determine where the disturbed cormorants go and to monitor behaviours of non-target species, specifically night-herons and egrets. Should staff determine that deterrent activities cause an increase of cormorants moving into night-heron nesting locations or causes non-target species disturbance, deterrent activities will stop. Pre-nesting deterrent activities will commence as soon as cormorants are observed in the deterrent areas in early spring 2010.

Post-Breeding Deterrents

Cormorants will be deterred from roosting in trees on Peninsulas C and D using the least intrusive methods. By discouraging roosting activity the impact of guano on trees is reduced and prospecting for future nest sites in these areas by younger birds is decreased. After the nesting season has ended and fledgling cormorants are feeding independently, post-breeding deterrents will be employed on the tip of Peninsula C and on Peninsula D to reduce the effects of cormorant loafing, or resting, on trees. Deterrents will not be used on Peninsulas A and B, displaced cormorants will be encouraged to loaf in the Conservation Zones of Peninsulas A and B. To help achieve this, disturbance to Peninsulas A and B will be minimized and closely monitored by staff. Since these areas already support cormorant colonies, and field data indicates large loafing areas are currently available, staff anticipate that cormorants will readily use these peninsulas for post-breeding loafing.

A variety of deterrent methods will be utilized that are humane for cormorants and minimize disturbance to other wildlife. The techniques utilized will be employed on an increasing scale of activity, with preference given to the least intrusive means needed. The scale will follow the following order:

- human presence for recreation, research and education purposes;
- active harassment of birds by people;
- predator decoys and scarecrows;
- noise bangers and other auditory techniques.

Human presence is the most favoured technique, however, if presence alone does not deter loafing activities, deterrence would progress to active techniques as stated above in the techniques for pre-nesting deterrents. In all cases deterrents would be humane and minimize the impact to other wildlife.

If loafing still persists, deterrent methods will progress to the use of auditory techniques. Noise bangers are the least preferred technique for post-breeding deterrence and if needed will be used sparingly and with caution in a consistent manner. Staff will monitor the effectiveness of the auditory techniques, as well as their effects on other species and may discontinue use if undesirable effects are documented.

Enhanced Ground Nesting

In addition to encouraging post-breeding loafing on Peninsulas A and B, these areas will also be targeted for enhanced ground nesting for the 2010 breeding season. The strategic approach includes enhancement of ground nesting opportunities through the placement of woody nest material, as well as the use of non-traditional nest materials to simulate established natural nests. Further ground nest enhancements may also include the use of cormorant decoys and auditory breeding calls to attract cormorants to the ground nesting area. Predator exclosures may also be created to ensure ground nesting success in certain areas until the establishment of the ground nesting colony. Work will be completed during the winter of 2010 to increase the ground nesting cormorant population in 2010.

Restoration

Habitat restoration activities will occur in areas of the peninsulas that are not currently occupied by colonial nesting waterbirds. The base of the peninsulas, and areas within the peninsulas that are not occupied by colonial birds, will be restored using site appropriate vegetation and soil amendments where necessary. Habitat restoration and enhancement activities will also help delineate the extent of the current cormorant colonies and buffer the colonies from disturbance. Targeted improvements also include the addition of native shrubs along the Embayment B back shoreline area to encourage Black-crowned Night-Heron nesting. Plantings of willow fascines and appropriate shrubs will occur along portions of the shoreline provide additional shoreline stability. Habitat restoration activities occurred in fall 2009 and will continue in early spring 2010, so the bird colonies are not disturbed.

Monitoring, Research, and Reporting

Annual nest census data for cormorants, night-herons and other colonial waterbirds will be undertaken in late May using a combination of staff and volunteers. As in past years, the census will identify the nesting populations of cormorants and other waterbirds, as well as their spatial nesting distribution within the peninsulas at Tommy Thompson Park. Nest counts of the ground nest areas will occur at night in late May; nest counts of tree nest areas will occur during the day in late May. Only the minimum number of staff required to complete nest counts will be present in the colonies in order to minimize disturbance. Staff will also enter the colonies via water or along the shoreline to minimize disturbance when feasible.

Annual tree health surveys will be undertaken in late August/early September to document changes in the health and condition of nest trees within the three peninsulas at TTP.

An annual summary report of all components of the strategic approach will be completed and circulated to all regulatory agencies and the advisory group, and will be posted for public review upon completion of the 2010 season. This report will outline all approaches employed in the 2010 season including the methods used, their relative effectiveness and the results of the annual monitoring program. This information will provide a basis for the development of the 2011 strategy using an integrated adaptive management approach.

The next meeting of the cormorant advisory group will be held in fall 2010, after the completion of the 2010 summary report. This meeting will provide an opportunity to review the results of the 2010 season and discuss whether any changes are needed for 2011. The public will also be informed and consulted before the 2011 season.

FINANCIAL DETAILS
Funds are available in the Tommy Thompson Park Interim Management account 210-19 in the approved 2010 budget.

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Date: March 4, 2009
Attachments: 6

Attachment 1
Cormorant Strategy Chronology

Advisory Group Meeting #1	January 24, 2008	Values and interests of TTP Conditions and concerns of DCCO colony Need for management Strategies to address concerns
Advisory Group Meeting #2	February 19, 2008	Evaluate management options Propose alternative approaches
Cormorant Webpage Launched	March 3, 2008	Includes background materials, Advisory Group meeting notes and presentations, Public Meeting workbook and meeting notes, relevant links
Public Meeting	April 3, 2008	Advertised in Toronto Star, The Mirror, TRCA website, TTP information board, TRCA distribution lists, some Advisory Group member websites Canada Newswire press release, Global TV coverage Presentations, facilitated round table discussion, individual workbooks for commenting
Advisory Group Meeting #3	April 23, 2008	Review public response Discuss 2008 strategy
TTP Spring Bird Festival	May 10, 2008	Guided tours of cormorant colony Public survey on TTP cormorants
Authority Board	May 23, 2008	Present 2008 strategy for Authority action
Advisory Group Meeting #4	December 10, 2008	Review the 2008 population data, and monitoring program Review 2008 strategy and preliminary research results Review the completion of the 2008 Cormorant Management Strategy Begin discussions on a strategic approach for 2009
Advisory Group Meeting #5	February 4, 2009	Develop the 2009 strategy
Authority Board	March 27, 2009	Present the 2009 strategy for TRCA Authority action
TTP Spring Bird Festival	May 23, 2009	Guided tours of cormorant colony Public survey on TTP cormorants
Advisory Group Meeting #6	December 15, 2009	Review the 2009 population data and monitoring program Review 2009 strategy and preliminary research results Begin discussions on a strategic approach for 2010
Advisory Group Meeting #7	February 11, 2010	Develop the 2010 strategy

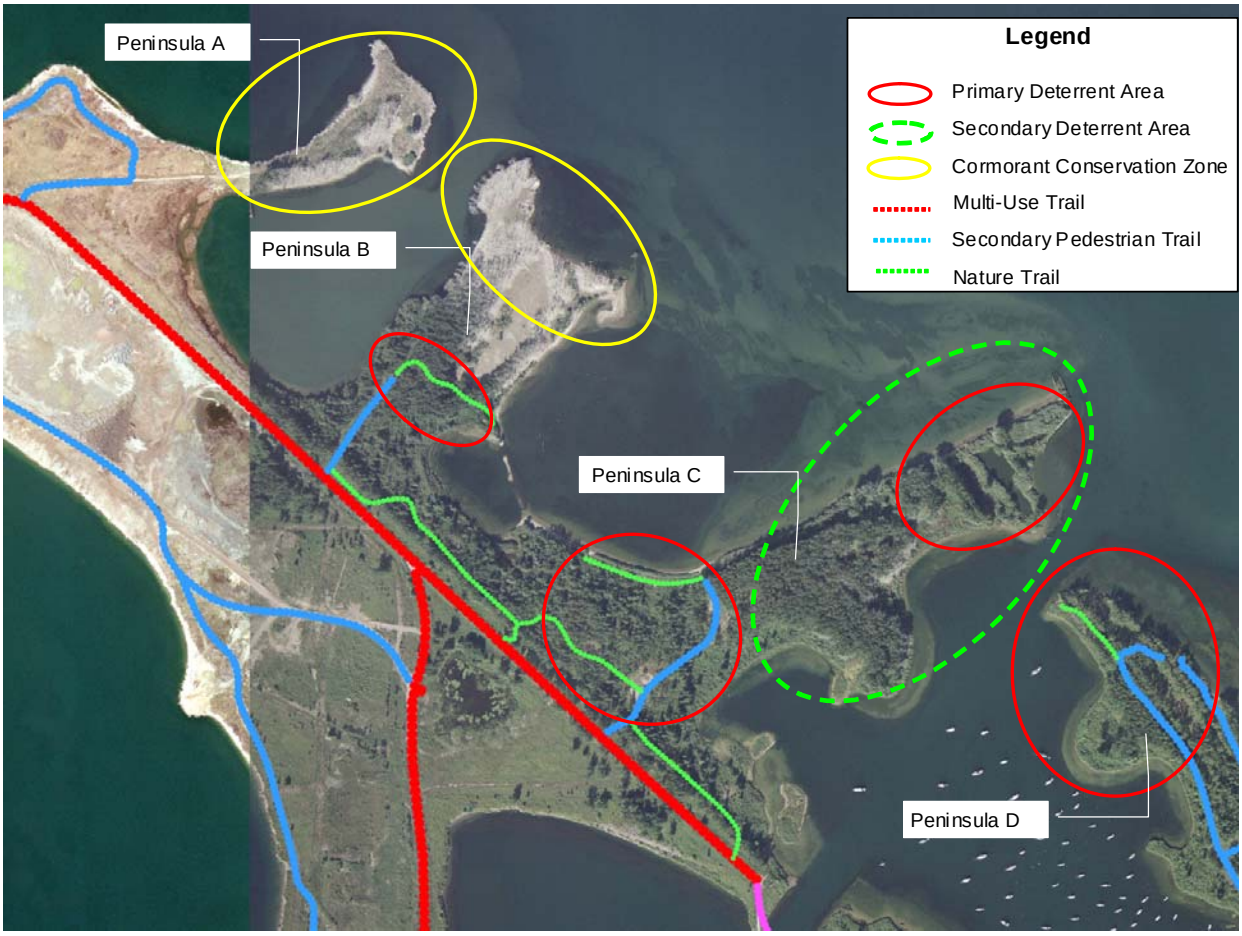
Attachment 2
2009 Strategic Approach

Method	Peninsula A	Peninsula B	Peninsula C	Peninsula D
Pre-nesting Deterrents		*	*	*
Post-Breeding Deterrents			*	*
Enhanced Ground Nesting	*	*		
Egg Oiling Research (follow-up on nest attendance)		*		
Habitat Restoration	*	*	*	*

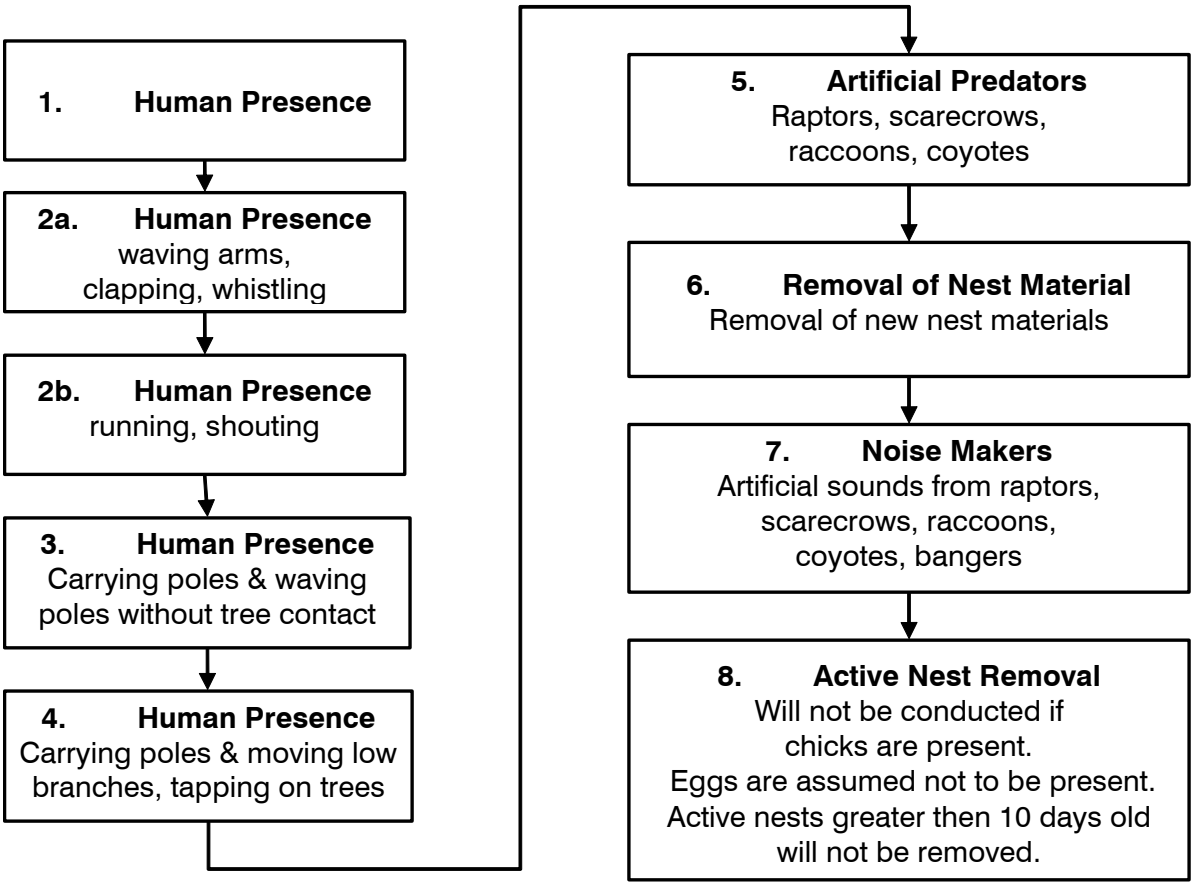
Attachment 3
2010 Strategic Approach

Method	Peninsula A	Peninsula B	Peninsula C	Peninsula D
Inactive Nest Removal (prior to 2010 breeding season)			*	
Pre-nesting Deterrents		* (base)	* (base & tip)	*
Post-Breeding Deterrents			* (tip)	*
Enhanced Ground Nesting	*	*		
Habitat Restoration	*	*	*	*

Attachment 4
Cormorant Conservation Zones and 2010 Pre-Nesting Deterrent Locations



Attachment 5
2010 Deterrent Escalation



Attachment 6
2010 Active nest removal situation and action flow chart