A Critical Analysis of Point Pelee National Park's Rationale for Killing the Middle Island Cormorants

by Cormorant Defenders International

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In response to information provide by Parks Canada to justify the management of cormorants on Middle Island including:

1. October 5 & 22, 2007 Parks Canada public presentations
2. December 3, 2007, telephone conversation with the Biodiversity Office staff
3. January 2007 Aquila Report; and
4. December, 2007 Parks Canada Management Directive 4.4.11.

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1.0 **Recommendations:**

Cormorant Defenders International recommends the following:

1. **That the Pelee National Park management plan not include any reference to lethal management of the cormorant population on Middle Island;**

2. **That Middle Island be left to evolve as an unmanaged ecosystem allowing all species, plant and animal to impact their environment; and**

3. **That Parks Canada develop a wildlife viewing opportunity of a wild, unmanaged waterbird colony and island wilderness.**

2.0 **Executive Summary:**

The purpose of the report, *A Critical Analysis of Point Pelee National Park's Rationale to Kill the Middle Island Cormorants* by Cormorant Defenders International (CDI) is to demonstrate that Parks Canada is violating its own principles of maintaining ecological integrity and protecting biodiversity in order to justify cormorant population management on Middle Island. Parks Canada staff justify management actions against cormorants who are native birds in a federally protected park by: misusing the concepts of ecological integrity and biodiversity; misrepresenting the available literature; claiming to be able to conduct lethal management actions humanely; and presenting wildlife management reports as "scientific". In this report CDI refutes the claims made by Parks Canada staff that cormorants are destroying the island, reducing the biodiversity and putting endangered species at risk. CDI demonstrates that Parks Canada does not acknowledge the significant cormorant management costs as was incurred by the Ontario Ministry of Natural Resources (ONMR) and state wildlife managers for similar lethal management initiatives.

2.1 **Misusing Concepts of Ecological Integrity:**

Parks Canada staff misuse ecological concepts and rely on faulty methodologies and biased principles to justify lethal management of Double-crested Cormorants (DCCO) on Middle Island. Parks Canada asserts that there is no absolute proof that cormorants nested on Middle Island prior to the mid-20th century and therefore the presence of cormorants compromises the ecological integrity of Middle Island.

What Parks Canada fails to acknowledge is that while there is no clear physical evidence that cormorants nested on Middle Island neither is there evidence that they did not. In addition, Parks Canada has provided no empirical evidence that Black-crowned Night-Herons, Great Blue Herons, Great Egrets, Herring Gulls, Ring-billed Gulls or Caspian Terns nested there either, yet the presence of these birds is not questioned.

Contrary to Parks Canada's theory, Double-crested Cormorants were actually recorded in the Great Lakes region prior to the beginning of the 20th century and there is good reason to assume they were present at numbers approximately equal to, and possibly greater than, those now present.

Supporting ecological integrity and biological diversity is about allowing the evolution of dynamic natural environments without human intervention, including the impact on the Middle Island environment by the waterbird colony.

2.2 **Misrepresenting the available literature:**

Parks Canada staff should draw upon wildlife literature not to justify a course of action but to assist in protecting natural systems. The current scientific literature does not support the reduction of cormorants on Middle Island; political expediency does and the result is that Parks Canada itself has deviated from its goals and mandate.

Parks Canada staff have misrepresented Wires and Cuthbert 2006 paper by claiming that the interior population of cormorants was never as numerous as it is now. However, Wires and Cuthbert state, “While precise counts are not available for most colonies prior to the twentieth century, records located for each population zone suggest historic populations of DCCO were very large.”

Parks Canada staff claim that because there are no known records of cormorants nesting on Middle Island or in Lake Erie very few or no cormorants nested in this area prior to the 20th century. Yet Wires and Cuthbert state, “In many parts of the Interior region, the early breeding history of the DCCO is well known. Pre-1900 records document nesting by the species across most of the region...”

Parks Canada asserts that the Carolinian habitat currently on on Middle Island is "natural". Yet the habitat has been directly impacted by human disturbance and indirectly impacted by a human induced absence of cormorants from persecution and pollution for over 100 years. CDI highlights the fallacy of Parks Canada’s claim that the “natural” environment on Middle Island must be protected from the “unnatural” presence of so many cormorants. Many of the plants Parks Canada claims must be protected from the cormorants are present as a direct result of and dependent upon human disturbance.

Parks Canada staff have declared cormorants as hyperabundant. Yet their definition of “hyperabundance” makes no biological sense. They fail to explain what they mean by the "upper range of natural variability", "characteristic of the ecosystem" or "long-term negative impact on ecological integrity". CDI demonstrates that hyperabundance is a politically driven term and shows how Parks Canada’s staff use the term to vilify cormorants in order to justify lethal management intervention.

2.3 **Presenting wildlife management papers and actions as “scientific:**

CDI is concerned that Parks Canada applies the word “science” inappropriately in order to justify the management cormorants on Middle Island. CDI demonstrates that Parks Canada does not clearly distinguish between “science”, which is supposed to be an objective and non-judgmental examination of reality, and “active management”, which Parks Canada defines as any prescribed course of action directed towards maintaining or changing the condition of cultural, physical or biological resources to achieve Parks Canada objectives. In Directive 4.4.11, Parks Canada Management does not indicate what scientific papers were used, to guide, the development of the definitions or the entire management directive.

2.4 **Claiming to be able to conduct lethal managements humanely:**

Culling is being considered as a management option and is described by Parks Canada staff as the most effective tool in reducing the cormorant population on Middle Island. Parks Canada claims that the cruelty documented by CDI in lethal culling conducted by the Ontario Ministry of Natural Resources in Presqu’ile Provincial Park in 2004, 2005 and 2006 was a function of the Ministry’s procedures, and have no bearing on what is being planned by Parks Canada. Yet CDI shows that Parks Canada staff have no plan as to how culling

would occur, how injured birds would be handled, how live orphaned chicks would be "dispatched" and therefore cannot demonstrate how they could prevent pain and suffering. CDI asserts that birds with ruptured tissue from bullet wounds are in pain, that nestlings exposed to the elements, deprived of food or experiencing physical trauma, suffer accordingly. CDI also asserts that adult birds suffer when they are suddenly rendered flightless, are forced to drown, die of starvation, exposure or prolonged exsanguination.

3.0 **Introduction:**

The purpose of this report is to demonstrate that Parks Canada is violating its own principles of maintaining ecological integrity and protecting biodiversity in order to justify cormorant population management on Middle Island.

Cormorant Defenders International (CDI) intends to show that the very agency whose mandate is to *"protect and present nationally significant examples of Canada's natural and cultural heritage, and foster public understanding, appreciation and enjoyment in ways that ensure the ecological and commemorative integrity of these places for present and future generations"* on behalf of the people of Canada (<http://www.pc.gc.ca/agen/chart/chartr_E.asp>) is justifying population management actions against a native bird in a federally protected park by:

1. misusing the concepts of ecological integrity and biodiversity;

2. misrepresenting the available literature;

3. claiming to be able to conduct lethal managements humanely; and

4. presenting reports by management consultants hired by Parks Canada and other wildlife management papers and actions as "scientific.

4.0 **Overview:**

In order to write this brief, CDI examined Parks Canada's mandate to protect and restore Canada's natural protected areas. We have reviewed the literature used by Parks Canada to justify its decision to manage the population of Double-crested Cormorants nesting on Middle Island. We have examined other available literature, and we have drawn on the knowledge and resources of scientists, ornithologists and naturalists outside the mandate of Parks Canada.

Parks Canada and Cormorant Defenders International have examined most of the same research and wildlife management papers on Double-crested Cormorants and have come to opposite conclusions.

It is our assertion that Parks Canada either misunderstands the terminology of ecological restoration and biological diversity or is intentionally misusing the terminology to justify their decision to manage the cormorant population on Middle Island. In either case, the decision by Parks Canada's staff to manage cormorants reflects a subjective bias in favour of managed environments instead of protecting these environments against human intervention.

We have reached this conclusion based on our literature review, on the information provided by Parks Canada during our telephone conversation with staff from the Ecological Integrity Branch of Parks Canada on December 3, and from the Power Point presentations

by Parks Canada staff, particularly the presentations to Cormorant Defenders International (CDI) on October 5, 2007, and to the Toronto Ornithological Club and the Ontario Field Ornithologists on October 22, 2007. Therefore it is important to include both the definitions and descriptions of key terms used by both Parks Canada and in this paper.

In all our research we found that virtually none of the management papers ever indicated where or when cormorants could simply be left to exist without disturbance. Wherever Double-crested Cormorants are returning from reduced numbers, if wildlife management considers, it is as a species that creates "impact" that must be mitigated. Only in areas where there was no significant decline in the species does there seem to be tolerance for its presence in whatever numbers the habitat supports. Even then, usually there are concerns if any species of fish the cormorant consumes has experienced real or imagined decline, or if there is aquaculture.

4.1 **Definitions or descriptions for key terms:**

4.1.1. **Ecological Restoration** from the "Draft Principles and Guidelines for Ecological Restoration in Canada's Protected Natural Areas" (Draft Principles) is described as follows: "Through intervention, the process of ecological restoration attempts to return an ecosystem to its historic trajectory – that is, to a state that resembles a known prior state or to another state that could be expected to develop naturally within the bounds of the historic trajectory (Society for Ecological Restoration International Science & Policy Working Group, 2004). However, although ecological restoration should be anchored in an understanding of the past (e.g., historical ranges of variability in ecosystem attributes), the goal is not to reproduce a static historic ecosystem state. Restored ecosystems may not necessarily recover their former states, since contemporary constraints and conditions can cause them to develop along altered trajectories. Thus, the goal of ecological restoration is to initiate, re-initiate, or accelerate processes that will lead to the evolution of an ecosystem that is characteristic of a protected area's natural region."

4.1.2. **Ecological Integrity:** With respect to Pelee National Park and Middle Island, the Draft Principles describe Ecological integrity as follows: "a condition that is determined to be characteristic of its natural region and likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rates of change and supporting processes."

4.1.3. **Biodiversity:** The United Nations Earth Summit (1992) defined the term to mean the following: "…the variability among living organisms from all sources, including `inter alia', terrestrial, marine, and other aquatic ecosystems, and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems."

Environment Canada's definition of biodiversity in the document titled, "Vision and Framework for a Canadian Biodiversity Index" is as follows: "The variety of species and ecosystems on Earth and the ecological processes of which they are a part. This includes diversity within species, between species and of ecosystem."

4.1.4. **Hyperabundance:** In addition to the definitions, Parks Canada addresses the management of hyperabundant populations in its "Principles and Guidelines for Ecological Restoration in Canada's Protected Natural Areas". The following recommendations are made in that document:

Recommended:
Identifying and treating the cause of population hyperabundance such as altered food-web interaction or habitat limitations.
Using management methods for hyperabundant populations that duplicate the role of natural processes as closely as possible.
Evaluating the impact of reduced populations on protected area ecosystems.
Engaging the public and other stakeholders prior to, during and following the active removal (culling) of hyperabundant organisms.

Not recommended:
Focusing on achieving a fixed population density or steady state condition rather than maintaining or restoring key ecological processes.
Culling of hyperabundant organisms without prior consideration of other options.
Failing to adequately inform and engage the public and other stakeholders.

In addition to the "Principles and Guidelines", Parks Canada has issued Management Directive 4.4.11, titled, "Management of Hyperabundant Wildlife Populations in Canada's National Parks" in which "hyperabundance" is defined as, "A wildlife population that clearly exceeds the upper range of natural variability that is characteristic of the ecosystem, and as a result, there is a demonstrable long-term negative impact on ecological integrity."

5.0 **Efforts made by CDI to understand the "scientific" decision by Parks Canada to manage the cormorants on Middle Island:**

During the public consultation, Parks Canada demonstrated a definite bias in favour of lethal management of cormorants. Parks Canada's PowerPoint presentation emphasized "destruction" of the island vegetation by the birds and added that the only effective way to save the vegetation was to reduce the cormorant population through culling. Virtually no socially positive or "ecologically" positive characteristics were attributed to the cormorants.

We have made every attempt to understand why Parks Canada is biased against the cormorants on Middle Island in favour of the vegetation.

i. We have attended most of the PowerPoint presentations made by Parks Canada.

ii. We requested copies of the PowerPoint presentation, which we have never received. When CDI video taped Parks Canada's presentation, the Park Superintendent wrote:

As set out in my e-mail of October 2, 2007 and your subsequent e-mail acknowledgement of October 4, 2007, the stakeholder consultation session was intended to be an opportunity for dialogue between Parks Canada and Cormorant Defenders International and thus a private consultation session.

My collegues (sic) and myself were therefore surprised by the presence of the video camera. In the interest of focusing on the value of the stakeholder consultation session itself, we quietly (sic) made a decision that we would not immediately object to the use of the video camera to record the consultation and proceeded. I do now, however, want to take this opportunity to express objection to the use of the video camera. The videotape of the stakeholder consultation session is considered to be bound by the same agreed stipulation as to privacy. I would be grateful if you could provide me with a copy of the videotape. For future reference, Parks Canada would be happy, in most cases, to provide consent for use of the taped consultation session beyond the scope outlined above. CDI would need to provide an indication of the intended use of the tape and an assurance that the taped session would be shown or distributed in its entirety and not edited or altered in any way.

iii. We have made every effort to acquire all the papers cited on the bibliography from Parks Canada. The bibliography referenced papers used to develop cormorant management strategy options. We have reviewed most of those papers.
iv. We have made numerous phone calls to the superintendent of the southwestern field office unit to assist us in clarifying the decision making process and have never had a return call.
v. We have had a conference call with the staff at the Ecological Integrity Branch of Parks Canada in order to understand the "scientific" parameters of the decision to manage cormorants on Middle Island.
vi. We requested a meeting between the staff at the Ecological Integrity Branch of Parks Canada and ornithologists, naturalists and conservationists who do not support the cull. This meeting would allow for a more detailed discussion about the "scientific conclusion" to manage cormorants on Middle Island. This request was denied. Instead, we were invited to submit our concerns in writing to the staff at Point Pelee National Park. This paper is our response to the invitation, and will be distributed broadly and made available to any interested party.

As a result of this research, it is our assertion that Parks Canada has given no solid ecological or conservation reason to manage or kill these birds.

6.0 Main Body of the Paper:

6.1 Misusing the concepts of ecological integrity and biodiversity to justify cormorant management:

6.1.1. **General comments:** Why does Parks Canada see the current number of nesting cormorants as an "ecological integrity challenge"?

The answers hinge on the misuse of ecological concepts, faulty scientific methodologies and biased principles. For example, Parks Canada asserts that because "science" provides no absolute proof of occupation of Middle Island by nesting Double-crested Cormorants prior to the mid-20th century, either they did not previously nest there or they did so at numbers too low to reduce significantly or eliminate the growth of certain plant species. Therefore, Parks Canada argues that the ecological integrity of Middle Island is compromised because of the "unnatural" presence of large numbers of cormorants.

It is not possible for Parks Canada to say whether Double-crested Cormorants were present on Middle Island or whether they were not. However, Parks Canada staff state with such certainty that cormorants, a species native to the region and now nesting on the island, were absent in the past because no one recorded the species prior to its extirpation. Parks Canada staff call this "scientific" reasoning, but it is not. There is no clear physical evidence one way or the other, given the virtual impossibility of subfossil or archaeological remains being found on the island, given the possibility that early observations or other records were overlooked or were hidden in an undiscovered journal entry or other record from the 19th century or earlier.

Parks Canada has not presented any empirical evidence of such colonial nesting species as Black-crowned Night-Herons, Great Blue Herons, Great Egrets, Herring Gulls, Ring-billed Gulls or Caspian Terns nesting on Middle Island prior to the 20th century because all these birds were absent when the first competent attempt was made at identifying nesting bird species on the island, in 1908. Yet the lack of evidence of the presence of cormorants on Middle Island is singled out by Parks Canada as a rationale to manage the birds.

Bird populations are dynamic and range expansion natural. If this were not the case as Parks Canada is arguing in the case of the cormorants, virtually all birds found in Ontario would be unnatural, most having been absent during the last ice age, which ended within relatively recent times.

But there have been much more recent arrivals. For example, the Little Gull was exclusively a Eurasian species during the childhoods of several CDI members. The first Little Gull to nest in North America was discovered by a friend when we were young adults. It is now a well established North American species. Northern Cardinals were not known to nest in Ontario prior to the 20th century. The first nest was reported at Point Pelee, in 1901. It is now a common breeding species throughout all of southern Ontario. Mourning Doves were rare north of the Great Lakes in winter during living memory. Now they are among the most abundant wintering species. Northward expansions of such species as the Red-bellied Woodpecker and the Great Egret are being documented currently.

There are numerous other examples of such range expansions of birds documented in Ontario because they occurred recently enough to be subjected to the level of documentation missing in the Great Lakes prior to the 20th century.

Contrary to Parks Canada's theory, Double-crested Cormorants were actually recorded in the Great Lakes region prior to the beginning of the 20th century and there is good reason to assume they were present at numbers approximately equal to, and possibly greater than, those now present.

Supporting ecological integrity and biological diversity is about allowing the evolution of dynamic natural environments without human intervention, including the impact on the Middle Island environment of the waterbird colony.

6.1.2. **Biodiversity – General Comments:** Of all the terms and concepts used by Parks Canada to justify their desire to reduce the number of Double-crested Cormorants nesting on Middle Island, perhaps the most difficult to deal with is "biodiversity".

It has become a buzz-word, used by wildlife managers to justify virtually every wildlife management action, including hunting, trapping and fishing activities, culling and the introduction of both native and non-native species by government wildlife departments.

Biodiversity is generally used as a measurement of variety of life, as manifested by number of species world-wide, or within a given ecosystem, or as the diversity within a species (genetic diversity).

The United Nations Earth Summit (1992) defined the term to mean "…the variability among living organisms from all sources, including `inter alia', terrestrial, marine, and other aquatic ecosystem, and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems".

Put simply, the greater the number of organisms, and/or the greater the number of taxa, the greater the biodiversity. More broadly, it is seen as an interaction between organisms and the abiotic matrix in which they occur. Climate and terrain contribute to biodiversity.

Contrived environments may have a greater number of species than the natural environment. The interior of a greenhouse in the desert may contain several hundred plant species, in contrast to a few dozen to be found on the other side of its glass walls, but that does not enhance the "biodiversity" of the desert or of the planet. An old growth forest logged of all trees more than 50 years old will open the canopy to increases opportunities for other plant and wildlife species. However, such actions would not be seen as enhancing biodiversity. At the beginning of the 20th century there were only two species of parrots native to North America (excluding Mexico); one, the Carolina Parakeet was exterminated, the other, the Thick-billed Parrot, was extirpated. Now there are self-sustaining, wild populations of at least a dozen different species of parrot nesting in North America, including species from Africa, Asia and the neotropics. None have eliminated a native species. Therefore, a number of species of birds in North America have significantly increased as a result of a contrived environment. But biodiversity is not enhanced.

Currently Middle Island is a contrived environment. Human actions resulted in an extirpation of the cormorant population from the Great Lakes both in the middle to late 1800s, and again following the widespread use of DDT after World War II. Their absence from the environment allowed for the presence of vegetation on Middle Island that would not be present in its current form today had cormorants been present and impacting the environment as they are today. Ironically, they presumably also contributed to the soil enrichment deposited prior to the time of persecution that made it possible for the island to take the appearance it had prior to the recent recovery of cormorants.

It is understood by ecologists that biodiversity is not, and cannot be, evenly distributed across the planet. On the contrary, the variations of ecosystems to be found on the planet means that there is greater biodiversity than is possible when we select for one naturally occurring species or suite of species over another.

At the superficial level, it might seem otherwise. Continental tropical rainforests are seen as "hotbeds" of biodiversity by virtue of containing a much greater number of "niches" in which species can evolve. Thus they host a far greater number of species than might occur in the arctic, where there may be large numbers of animals, large fluctuations within the sizes of those populations, but very few species. This ecosystem has very little biodiversity as defined by the number of species present.

However, the impact of global warming is no less significant to the arctic than to the tropical rainforest ecosystem just because the arctic has fewer species than the former. Biodiversity does not refer to the parts, but to the whole, and it is a whole that includes a vast variety of ecosystems (by whatever name or however defined) each with its own composition of species, both endemic and widespread.

Parks Canada seems to have misunderstood the concept by emphasizing the importance of selectively protecting some species over others thereby implementing anthropogenic change. As is true of clearing out trees over fifty years age in an old growth forest, or of building and stocking with lots of moisture-dependent plants a greenhouse in the desert, or of establishing non-competitive species from other continents, any anthropogenic change, both past and present will impact the Middle Island environment and may result in an increase in the number of species on the island. It does not, emphatically, mean an increase in biodiversity.

There is one possible exception to this observation. Biodiversity, because it does refer to the whole, includes species with extremely limited ranges, or at risk. Somehow, in the time since Middle Island came into existence, there may be a taxon distinct to it. The closest match to this exception is the Lake Erie Watersnake. It is not a species, but a subspecies. It is not a Middle Island endemic, but endemic to the Lake Erie island archipelago. It is endangered and that makes it a very legitimate concern within Parks Canada's mandates and guidelines.

But there is no evidence that the presence of cormorants, and the effects they have on their environment, in any way threatens the snakes. Parks Canada speculates that cormorants

impact the snake but an equally speculative argument could be made that the presence of cormorants enhances the island's ability to sustain the snakes. The variables are simply too many and too little understood to say.

Cormorants do not eat snakes. Herons, including night-herons and egrets, do. Great Blue Herons often feed on dry land, and are not only efficient predators of snakes, but the prey species upon which the snakes depend. Small fish, frogs (including larvae), small rodents, baby birds and large insects are all potential prey items that the snake must compete with the herons for food, while avoiding becoming the herons' prey. It could be argued that to enhance survival of the snake, it would be best to reduce the numbers of herons of all species on the island.

We do not advocate reducing herons because they too belong. We just wish to illustrate the fallacy of single-species management when it is not justified in terms of supporting biodiversity. It is not "scientific" to favour herons and vilify cormorants in the interest of biodiversity.

6.1.3. **Biodiversity – Plants:** Part of the vilification of cormorants depends on portraying them inaccurately:

- as somehow "alien";
- as an increasing population that is "out of control";
- as destructive to native species of fauna or flora.

Almost invariably the argument is made that the desire is not to eliminate or extirpate cormorants, but only to "control" them, to obtain some contrived state of balance between cormorants and other species of fauna and flora.

The argument is no different with regard to Middle Island. Parks Canada has decided that the desired state is not this evolving Carolinian environment, including the existing waterbird colony, but one where cormorants are controlled to maintain a static Carolinian environment. In the "Principles and Guidelines for Ecological Restoration in Canada's Protected Natural Areas", Parks Canada sets out management actions not recommended in handling hyperabundant populations. They include, "Focusing on achieving a fixed population density or steady state condition rather than maintaining or restoring key ecological processes. Culling of hyperabundant organisms without prior consideration of other options."

While wildlife managers argue that the cormorant population is exploding, no paper we have reviewed has objectively demonstrated that the population is in fact "hyberabundant". "Hyperabundance" does not exist in nature. It is a term manufactured by wildlife managers to justify unpopular wildlife control measures such as culling. Populations of any given species reflect the carrying capacity of its environment, remembering that such capacity will fluctuate, both seasonally, and through time. According to the evidence provided by Wires and Cuthbert in 2006 (Historic Populations of the Double-crested Cormorant (*Phalacrocorax auritus*): Implications for Conservation and Management in the 21st,

Century by Linda R. Wires and Francesca J. Cuthbert**,** Department of Fisheries, Wildlife, and Conservation Biology, University of Minnesota) the "Canadian and U.S. Interior" population of cormorants, to which the Great Lakes population belongs, appears to currently exist at a lower size than it did in previous times.

We repeat therefore, that Parks Canada, by virtue of considering lethal culling or any other control measures of Double-crested Cormorants on Middle Island, is violating its own mandate. CDI does not oppose all interventions if it were possible to "return an ecosystem to its historic trajectory – that is, to a state that could be expected to develop naturally…" However, such an objective is not possible for a variety of reasons not the least being the number of species from the region that are now extinct. But if it were possible to return the ecosystem to its historic trajectory, such changes would include the removal of alien fish species including Alewives and Round Gobies, and the elimination of aquaculture on the cormorants' wintering grounds. The changes would also reverse all those actions that have been detrimental to the survival of cormorants, such as the destruction of overall fish biomass in North American fresh and salt water, the centuries of persecution of the "Canadian and US Interior" population of cormorants and the destruction of so many interior and coastal wetlands.

In Draft Principles, Parks Canada states that "However, although ecological restoration should be anchored in an understanding of the past (e.g., historical ranges of variability in ecosystem attributes), the goal is not to reproduce a static historic ecosystem state." In their consideration of the Middle Island ecosystem, Parks Canada staff do not acknowledge the ecological impact of a 100 year absence of cormorants from the Middle Island and Lake Erie ecology because the species was so severely affected by human caused persecution and pollution.

Also, in the Draft Principles, Parks Canada states that "Restored ecosystems may not necessarily recover their former states, since contemporary constraints and conditions can cause them to develop along altered trajectories."

This is true, specifically with regard to Middle Island where its former state is unknown and its nature continually changing through time. Some ecosystems such as tropical rainforests, oceans, deserts, alpine summits and high polar regions tend to change relatively slowly if not subjected to anthropogenic pressures. The same cannot be said of the post-glacial Great Lakes basin.

The Draft Principles state that "Thus, the goal of ecological restoration is to initiate, re-initiate, or accelerate processes that will lead to the evolution of an ecosystem that is characteristic of a protected area's natural region."

While "natural" is not defined, it probably means environments that are least influenced by human effort. We believe that Parks Canada ought to be guided by something close to this definition of "natural", particularly in instances where lands are to be protected from human intervention.

6.1.4. **Biodiversity – Species at risk:**

a: Plants: The ever-changing variety of plant species and species composition on Middle Island occurs because of a combination of past anthropogenic and "natural" situations. Past environmental events have created present ecological conditions. On Middle Island, like most parts of the world, they include earlier events that were non-anthropogenic and were followed by events that were a combination of "natural" and anthropogenic events.

First Nations people may have visited the island prior to the arrival of people of Eurasian and African origin, but probably had relatively little impact on native fauna and flora prior to the arrival of advanced forms of technology.

It is likely that prior to any significant human intervention bird colonies would have existed in ever-varying numbers and species mixes on the southern Lake Erie island archipelago given that there is a variety of colonial, island-nesting birds native to Lake Erie, including Double-crested Cormorants. The lasting influence of these colonies would include the deposits of guano and the development of organically enriched soil.

However from the mid 1800s to the 1980s, cormorants were relatively rare or absent from the Great Lakes as a result of over-hunting, pollution and human persecution. Therefore, the plant communities on Middle Island would have been affected by the human-induced absence of the cormorants. Absence of cormorant guano would have resulted in a different soil composition making soil suitable for certain types of plant species over others.

In addition, islands like Middle Island are subject to colonization by plants when seeds or other generative plant parts arrive by water, wind or carried by birds or introduced through human activity.

Life on Middle Island is neither entirely "natural" nor entirely contrived, but the results of both. Why then are cormorants seen as degrading the habitat, but the removal of cormorants not seen as degrading the Middle Island water-bird colony?

Contrary to the assertion made by Parks Canada in the public presentation, there are no flora taxa dependent upon Middle Island. They are there as a result of either past "natural" or past anthropogenic forces. The plant species that are native to the broader ecozone including Middle Island are no more or less "valuable" to the "ecological integrity" or "biodiversity" of the island than any native faunal species, including cormorants and other nesting waterbirds.

The only taxon endemic to the Lake Erie Island archipelago is the Lake Erie Watersnake whose existence is more vital to the maintenance of either "ecological integrity" or "biodiversity" than any other species of fauna or flora to be found on the islands.

Plants are, generally speaking, more easily protected from absolute extinction than are animals, through captive breeding. Where plant species "naturally" belong depends on

"natural" conditions, including the presence or absence of other native fauna and flora. Even if, as is clearly not the case, there was a plant species whose continuation was dependent upon its survival on Middle Island, there are many forms of intervention available to assure such survival short of reducing another, native species.

We will explore, below, the concept of uniqueness, in terms of species floral composition and terrain, in the critique of "Impact of Double-crested Cormorant (*Phalacrocorax auritus*) populations on the biodiversity of islands in western Lake Erie, January, 2007", prepared by Aquila Applied Ecologists.

In this section of our brief, we will examine those species of plant that Parks Canada has emphasized are of concern to them, said concern justifying the reduction of Double-crested Cormorants nesting (and possibly even roosting) on Middle Island.

Parks Canada argues that the presence of cormorants, and possibly other colonial nesting birds, is an impediment to the survival of any given Carolinian plant species on Middle Island. However, it seems very likely that the presence of the current Carolinian plant species is owed to the 19th century destruction of cormorants, an anthropogenic cause. And it also seems likely that the richness of soil required by some of the Carolinian plant species is derived from the early guano deposits by cormorants and/or other colonial bird species, which is a natural cause. But it also seems that many of the plants named as being of concern owe something to the warming climate. In the mid-19th century winters were simply so much colder than now and would have prevented some southern species of plants now found in Ontario from surviving.

It was on March 19th, 1848, that Niagara Falls froze so solidly that people walked out onto the river bed. A similar phenomenon was photographed in 1911. The so-called "Little Ice Age" that effected the northern hemisphere is generally agreed to have started around 1600 and lasted until about 1850, with three particularly cold periods, around 1650, about 1770 and again around 1800 to 1850, and it is unlikely that many of the "Carolinian" plant species now found on Middle Island could have survived those periods of severe winter. Those cold periods were naturally occurring climate changes.

Most of the information about these plants comes from Environment Canada or from the United States Department of Agriculture websites. Time constraints prevent us from thoroughly documenting all sources, but we believe what is significant is that these are Carolinian species that are only rare in areas where their ranges end, and which can, if intervention is warranted, be protected or propagated without destroying other, more typical native species.

(The common name and scientific name of the plant species listed below are written as they appear in Appendix 1 of the January 2007 prepared by Aquila Applied Ecologists for Parks Canada Agency)

- **Red mulberry** *(Morus rubra)*: This has been called Canada's most threatened tree (see, for example, Preserving the legendary mulberry, by Tammy Resendes,

Research News, University of Guelph, 1998.) The biggest threat to the continuation of the Red mulberry is genetic swamping (hybridization) with the non-native White mulberry, an invasive species native to Asia. According to Resendes, "The researchers theorize that the pollen from the white mulberry is creating a type of pollution over the red. The pollen interferes with the ability of the red mulberry to perpetuate itself. Instead, the red and white mulberry trees interbreed and create hybrid seeds. Scientists fear the Red mulberry is being genetically swamped and hybridizing itself into extinction."

The Red mulberry ranges all the way south to Florida and nothing done on Middle Island will have an impact on whether or not the species, as a genetic entity distinct from what is currently emerging, survives. This does not mean that use of technology can't save the Red mulberry. Perhaps it can. But that technology, if developed, will not be in the form of rifles and shotguns, egg-oiling or the destruction of birds' nests. What is required is to identify "pure" Red mulberry from hybrids, and eradication of White mulberries and hybrids. Meanwhile, protection of pure Red mulberry may require protection from pollen from White mulberries – a contrived solution to be sure, and one that has nothing to do with cormorants. There appears to be no action plans for its recovery.

- **Blue ash** *(Fraxinus quadrangulata)*: This species is listed as one of Special Concern under SARA on schedule 1, and by COSEWIC. This is a species native to much of eastern North America, occurring from Northern Georgia and Arkansas north as far as Wisconsin, Ohio and Ontario. Excessive deforestation of southwestern Ontario destroyed most of its habitat in the province. However, there are numerous locations of Blue ash where little or no decline has been observed since the 1980s. There are countless options open to protecting it, and it seems likely that as the effects of global warming continue it will be one of many species whose potential range will spread northward. It likes both shallow soil over dry limestone and well-drained sand and therefore has the potential to grow anywhere along the lower Great Lakes shorelines, as well as in floodplain forests. The latter don't exist on Middle Island, and tend to be widely degraded elsewhere. There seems little reason to assume that nesting birds will eliminate it on Middle Island as it is more likely to grow on the edges, but of course while the Blue Ash has several habitat types available to it, colonial waterbirds do not. There appear to be no action plans for its recovery.

- **Common hoptree** *(Ptelea trifoliate)*: Considered threatened under both SARA, schedule 1, and by COSEWIC, as of 2002, this is another species that can grow on beaches, and has a large range, from southern Canada south to Florida. It prefers sandy soil, and often is found near the edge of beaches, away from where cormorants nest. It also likes disturbed habitat, such as beach edges. There is ample range for it to be protected in Ontario, including along the shorelines of Lake Erie, and possibly Lake St. Clair, and could be transplanted to Lake Huron. Lake edge cottage and resort development, not cormorants, pose the main threat to its continuation, although it is safe within such refugia as the Fish Point Nature Reserve

and the Stone Road Alvar Nature Reserve. There appear to be no action plans for its recovery, and reducing cormorants will not impact on its survival in Ontario.

- **Kentucky coffee tree** *(Gymnocladus dioica)*: This widespread, common tree reaches the northern edge of its range in Ontario, where widespread agricultural development has eliminated or fragmented much of its range. It is listed as threatened by both SARA, on schedule 1, and by COSEWIC. It naturally occurs throughout most of eastern North America, from the Great Lakes south to Kansas and Oklahoma. In Ontario, what are assumed to be "natural" wild populations are largely restricted to the southwestern corner of the province, but it is easily cultivated north as far as the northern shore of Lake Ontario. Indeed, one of the difficulties in assessing the species' conservation needs is the fact that it is not always obvious which is a "wild" tree, in terms of growing where it does without human cause, and which is "unnatural" in terms of being where it is directly or indirectly because of cultivation. It can be and often is cultivated, a way of increasing its numbers no less "natural" than gunfire. It is likely to increase in protected areas because of global warming. There appears to be no recovery strategy at present.

- **Clustered sedge** *(Carex aggregate)*: In its presentations to "stakeholders", Parks Canada staff have emphasized that Middle Island is the only place in Canada where the Clustered sedge grows. This statement is probably not true. When contacted by a colleague of CDI, Mike Oldham, at the Natural Heritage Information Centre, explained why conservationists in Ontario are so unconcerned about this species. While Clustered sedge is identified in one place in the province, it probably grows elsewhere in Ontario, as it is easily overlooked and there would be little incentive to search for it. It is catholic in its choice of habitat. It is globally secure, grows in disturbed soil, and thus is not a priority for the province. There is no indication that it is threatened by cormorants. It does not grow where they are, and is at any rate almost certainly present as a result of anthropogenic changes in the landscape that resulted in appropriate habitat. This habitat will disappear as a result of natural successional change.

- **Miami mist** *(Phacelia purshii)*: This lovely plant, also known as the scorpion weed, has its centre of distribution in Kentucky and Tennessee. Elsewhere it is found in widely scattered locations of suitable habitat, including alluvial soil, wet woods and open meadows. It grows in profusion in a protected area of Pelee Island. It can be cultivated, if necessary, and it is not clear why or how cormorants would negatively impact on it. It is another species which will probably expand its northern range in Ontario as a result of global warming.

- **Big-seeded scorpion-grass** *(Myosotis macrosperma)*: This borage ranges from Ontario south to Texas in the west, and Florida in the east, and also occurs in Alabama, Georgia, Illinois, Indiana, Kentucky, Missouri, North Carolina, South Carolina, Tennessee, Virginia, West Virginia and the District of Columbia. It has been recorded in 18 counties in Ohio and probably occurs in more. There are at

least two or three non-native *Myosotis* borages that may compete with this species, but it can be cultivated, and there seems to be no reason to fear its loss from cormorant activity.

- **Davis's sedge** *(Carex davisii)*: The *Carex* sedges are easily overlooked, but this species has a wide distribution, being found from Manitoba to Quebec and from Ontario south to Texas, being absent in the American southeast, thus not typically, or classically, a Carolinian species. It is, however, a vulnerable species that is considered to be endangered or threatened in Connecticut, Massachusetts, Minnesota and New York State, may be extirpated from Maryland, and is a species of "special concern" in Tennessee. The species can be cultivated. It thrives in wet or moist soil or along streams in full sunlight, as well as partial shade, but requires wetness, and can go dormant in dry periods. It is likely ephemeral on Middle Island.

- **American water-willow** *(Justicia americana)*: This species ranges from Texas to Florida, north to Ontario and Quebec. In the U.S. it is considered endangered only in Iowa, threatened only in Michigan. It is an herbaceous perennial that requires wet soil for its roots. Herbaceous plants that grow in wet soil or water seem resistant to cormorant droppings, and it would appear that succession and possibly weather damage are the greater threat to the survival of the species on Middle Island, where, at any rate, it probably exists due to anthropogenic change.

- **Appendaged waterleaf** *(Hydrophyllum appendiculatum)*: This is another species widely distributed in North America, from Manitoba to North Carolina and from Ontario south to Mississippi and Alabama. It is considered common throughout most of its range and is often cultivated. It lives in mesic conditions in rich soil containing abundant organic matter and dappled sunlight and shade. It probably owes its existence on Middle Island in part to the enriching of soil by colonial waterbirds before they were eliminated in the 19th century, and in part to anthropogenic change creating suitable habitat. At any rate, if contrived parks are desired, it can be cultivated. If natural parks are desired, Middle Island is probably an ephemeral habitat for the species in the long run, although there is no reason that it will not grow elsewhere in Ontario if suitable habitat is protected.

- **Rough-leafed dogwood** *(Cornus drummondii)*: This is a widely spread species in eastern North America, although missing from the far northeastern U.S., the mid-Atlantic region, and Florida. It is found from Texas to New York State and from Ontario south to Texas, Mississippi and Alabama. It is an adaptable species, thus amenable to cultivation if artificial means of maintaining it at the end of its range is desired. It grows in moist soil, but can also grow in quite dry, upland conditions. It is probably not high enough or substantial enough to support cormorant nests, although thick clumps could conceivably support nesting night-herons. It is not rare, endangered or threatened. Like all species, there is an end to its range beyond which it does not occur, and this "edge" will vary through time in response to both anthropogenic and "natural" conditions and changes at the microhabitat level.

- **Harbinger of spring** *(Erigenia bulbosa)*: This woodland flower is a native member of the carrot family, and occurs throughout much of North America, but as is true of so many woodland species is vulnerable to invasive weed species (such as Garlic Mustard and Dog-strangling Vines). It, like so many plant species, requires the kind of richly organic soil not normally found on islands derived from recent glacier actions unless supplied by organic material from colonially nesting waterbirds. It is considered endangered in New York State and Wisconsin, and threatened in Pennsylvania, all Great Lake states, but is commonplace in the centre of distribution in the south-central eastern U.S.

- **Creeping chervil** *(Chaerophyllum procumbens)*: This is another wild, native carrot, also native to the eastern U.S. It is easily cultivated, so if using artificial means to maintain the species is deemed appropriate, there are options to assure its continuation. However, it is really not a candidate for living on a natural small island in the Great Lakes due to its dependence on streams, wetlands, roadside ditches and alluvial meadows. It presumably owes its existence on Middle Island to the contrived, and ephemeral, pond.

- **Burning bush** *(Euonymus atropurpereus)*: This species is not strictly a "Carolinian" species because of its enormous range. It is found from Montana, the Dakotas and Nebraska east to the east coast from New Brunswick to Florida. It is a perennial shrub, thus not a substantial nest site for cormorants, and like its cultivar relatives, could be propagated if artificial means to assure its survival in any given extra-limital range is desired.

- **Trailing wild bean** *(Strophostyles helvola)*: This species requires sand and sun, thus beach conditions. Its range peters out in Ontario. Therefore, it would seem that this is a species that would not be at risk from cormorants. We recognize that cormorants, including post-breeding flocks and resting migrants, will roost on beaches, but this is not an environment where guano accumulations are a problem due to the constant dilution from waves. All being equal, sand bars, logs and shingle are more attractive than soil for roosting, preening or drying. It is widely distributed, having been found in the U.S., in Alabama, Arkansas, Connecticut, the District of Columbia, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Kansas, Kentucky, Louisiana, Massachusetts, Maine, Michigan, Minnesota, Mississippi, Maryland, North Carolina, New England, New Jersey, New York State, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Virginia, West Virginia, Wisconsin and Wyoming, as well as Manitoba east to New Brunswick. It can be cultivated.

- **Spring avens** *(Geum vernum)*: This little plant is widely distributed, from Texas to Vermont, from Nebraska to Georgia, although absent from much of the south-eastern U.S. and nowhere particularly abundant. It requires rich soil in woods, thus probably owes its existence on Middle Island to the enriching qualities of guano but is probably ephemeral, as natural island conditions, on small islands, are not a

favourable habitat. It can be grown from seeds and cultivation would protect it, if that is deemed necessary. It is listed as endangered in New York State.

- **Alumroot** *(Heuchera americana)*: This is another Carolinian species widely distributed through much of eastern North America, from Nebraska to the east coast and from Ontario to Mississippi and Alabama. It is widely and easily cultivated. It likes damp areas and is probably marginal on Middle Island and likely to be so increasingly if climate change results in hotter, drier summers. Fortunately it is common in suitable habitat within its range, and if artificial means to allow it to survive or expand in Ontario are deemed an appropriate activity by Parks Canada, there are more cost-effective and efficacious methods available than by killing native wildlife.

- **Toothed rock cress** *(Arabis shortii)*: This is another widespread Carolinian species found from southern Canada south to Alabama but absent from much of the U.S. southeast, and from the northeast. It is considered endangered in New York State, threatened in Maryland, and a species of special concern in Tennessee. It is another species that likes rich, moist soil, shade, and is not suited to a natural lake island habitat, but fortunately, if it is to be maintained artificially, it is easily cultivated.

- **Yellow corydalis** *(Corydalis flavul)*: This pretty flower is not to be confused with the alien species of the same English name. This is a plant native to much of eastern North America, from Canada south to Florida and the Gulf Coast, and from Nebraska east to the east coast but absent from the far northeastern section of the U.S. It is considered threatened in Connecticut and Michigan. It can grow in coarse to medium textured soil but has low drought tolerance and no salinity tolerance. It is too soon to predict the effects climate change may have but members of the genus can be cultivated if artificial intervention is deemed to be warranted.

- **Standley's goosefoot** *(Chenpodium standleyanum)*: This is another plant species which, by virtue of occurring as far west as Montana and New Mexico, is not "Carolinian" in the narrow sense that the term is selectively used. It is found in most of the continental U.S., apart from the far west, North Carolina and Alabama, and it is listed as endangered in Maryland. It is found in over two dozen counties in Ohio, and can be cultivated if required.

- **Wild hyacinth** *(Camassia scilloides)*: This is another essentially Carolinian species widely distributed through the eastern U.S, west as far as Texas, east to the Atlantic coast, but missing from the northeast, and from Florida. It is considered threatened in Michigan and North Carolina, and endangered in Pennsylvania and Wisconsin. It prefers moderate to wet soil in prairies and open woodlots, and is probably a transitory species as far north as Middle Island, unlikely to survive loss of the small pond, or climate change that leads to less rain, should that happen. The species is perennial and could be cultivated.

- **James' sedge** *(Carex jamesii)*: This is another of the *Carex* sedges, and one found throughout much of eastern continental U.S. apart from the northeast, and the extreme south. It is considered endangered in Minnesota and New Jersey, and threatened in Nebraska, however is common in much of its range. It requires fertile, loamy soil and partial sun to medium shade, although tolerant of a reasonably wide range of moisture. The culms are fertile, and so like other sedges its main requirement is habitat in wetland, woodland or prairie environments.

- **Sedge** (Shoreline) *(Carex hyalinolepis)*: This is yet another *Carex* sedge with a very wide range throughout much of the eastern U.S., north as far as southern Canada, and south to Texas in the west, and Florida in the east. It is apparently extirpated from Pennsylvania, but in core parts of its range, it is an abundant species and may form the dominant understory of open, wet floodplain, forests and bottomland meadows, and can quickly colonize wet ditches and other disturbed habitat. It will, if wetlands are given higher priority as a protected environment than is current in Ontario, probably spread northward in response to climate change. It can be cultivated.

- **Frank's sedge** *(Carex frankii)*: This is still another *Carex* sedge that has very wide distribution and does not fit the narrow definition of "Carolinian", being found as far west as New Mexico. It occurs throughout the entire eastern U.S., except the extreme northeast, and is listed as endangered in New York State, but is common elsewhere. It likes openings in floodplain woodlands, prairie sloughs, wet dolomite prairie, fens and seeps, sedge meadows, soggy ditches and river edges and thrives in disturbed habitat. As a wind-pollinated species it is likely to spread if wetlands are protected. As with other *Carex* sedges, it is no more likely to be influenced by cormorants than by other bird species on Middle Island, with the possible exception of shoreline habitat. It probably owes its appearance there to the contrived wetland, which could be expanded if so desired.

- **Honey locust** *(Gledatsia triacanthos)*: This is a hardy tree, widely cultivated, tolerant of a variety of soil types and of cool temperatures and is distributed throughout most of the eastern U.S., west of the Alleghenies. It is more likely to host night-heron nests than cormorant nests but at any rate is easily replaced if artificial means of protecting it in any given location are deemed desirable. It is widely cultivated, but may be susceptible to frost damage, and winter conditions would limit its spread in Ontario. Its seeds can pass undigested through birds and mammals and so it has a good dispersal potential.

b: **Insects:** Nowhere is the extent of the bias of Parks Canada more apparent than its rationale to manage cormorants on Middle Island to protect the insects. The only insects mentioned are butterflies. Our assertion is that Parks Canada is focusing on butterflies because they are much more popular with the general public than other insect species.

Insects, like birds, are rapid dispersers. The Pine Beetle of western North America is a good example of an insect which quickly moved east in response to very slight warming conditions, and a "naïve" population of trees to utilize. If left alone ultimately resistant strains of trees will evolve, just as they did further west, and a stasis supportive of both predator and prey will be established, given the beetles' species-dependency. Unfortunately political and economic forces will almost certainly mitigate against letting this happen, due to the relatively long time frames involved.

Given proper habitat and the right climate, many insect species can rapidly move into new regions. Many species, including butterflies, are dependent on one or a small range of specific plant species, thus their range is tied to where those plants occur. Most species are not as conspicuous, nor as admired and noticed, as butterflies.

- **Giant Swallowtail Butterfly** (*Papilio cresphontes*): This unmistakable species has a huge range, common in the southern U.S., but rarer northward, although it certainly occurs throughout southern Ontario, with records as far north as the boreal forest. It is one of a large suite of wildlife species likely to increase in numbers in southern and central Ontario in response to climate change. Its habitat preferences include sandy regions, pine flats, relatively arid or well drained areas and stream sides. The presence of Common hop tree might benefit it on Middle Island, but it can also occur to the exclusion of this species. The population on Pelee Island is small and probably not permanent from time to time.

- **Hackberry Butterfly** (*Asterocampa celtis*): This species has a vast range from Canada to Mexico and from the plains to the east coast, with a resident population well established in southwestern Ontario, and with extra-limital occurrences in the Ottawa Valley and southern Quebec. In much of its range it is one of the most common of the *Asterocampa* Emperor butterflies. It feeds on hackberry and sugarberry, species easily cultivated, and also the food of the somewhat similar Tawny Emperor (*A. clyton*), another Carolinian species that reaches the northern edge of its range, as a less common species, in southern Ontario.

- **Monarch Butterfly** (*Danaus plexippus*): Arguably the best known and most popular of our native species, the Monarch has a vast range that extends well up into the boreal forest. While it can subsist on dogbane, it is well known for its dependence on milkweed species, considered noxious weeds whose destruction is obligated in many regions under law. There have been numerous conservation concerns raised about this species as a result of perceived declines both in food plants and in the supportive wintering habitat in Mexico. The importance of Middle Island for this species is, at most, only as a resting location part way across Lake Erie, not as a breeding ground, nor as the wintering grounds. Even in the unlikely event of significant defoliation due to cormorants, there is no reason to assume that survival of individuals of this butterfly, which is unpalatable to birds, would be significantly compromised. Interestingly, when one member of CDI sought reasons why the essential food source of this species, milkweed, was not protected, he was

told that there was enough milkweed to assure the species' survival and so removing the milkweed's noxious weed status was not justified.

- **Scalloped (Hayhurst's) Sooty-wing** (*Staphylus hayhurstii*): This northernmost sooty-wing barely reaches extreme southwestern Ontario, and if it has ever occurred there, it would be as an exceptional event, and is almost certainly gone, now from Ontario, its loss having nothing to do with cormorants. Its survival in Ontario depends not on Middle Island, nor on its food, lamb's quarters, which is an abundant noxious weed found throughout much of Canada, nor habitat, which includes weed lots and disturbed areas, but on mean temperature, which is slowly but demonstrably rising on average and will thus probably lead to increased sightings of this southern butterfly in Ontario.

- **Pipevine Swallowtail Butterfly** (*Battus philenor*): This species is unpalatable to birds because of its larval food sources, and it occurs irregularly along the northern shorelines of Lake Erie and Lake Ontario with at least one extra-limital occurrence in Manitoba. This is a tropical and subtropical, as well as a Carolinian species, that ranges as far north as southern Canada, and will probably extend its range northward in the decades to come if warming trends continue. Meanwhile, if there is any record of it on Middle Island, it would be as an exceptional, non-breeding, stray. Its seasonal occurrence benefits from the planting of food plants, such as Pipevine on walls of houses, not from reducing any bird populations.

- **Acadian Hairstreak Butterfly** (*Satyrium acadicum*): This is not a Carolinian species and has a wide range across southern Canada and the northern U.S. Its larvae feed on willows, and it is abundant. If there are any records from Middle Island, it would involve non-breeding stray. It is common throughout southern Ontario, and there is no concern about it that justifies killing any native wildlife species.

c: **Reptiles and Amphibians:** As stated elsewhere, the only species of fauna or flora endemic to the Lake Erie islands is the Lake Erie Watersnake, a race of the Northern Watersnake. There is simply no evidence that the cormorant poses any threat to it. Indeed, if one must scapegoat a native species, the herons would pose a greater threat through direct predation and competition for prey.

The Eastern Fox Snake's fate rests on the mainland, and on Middle Island the species is not at risk by virtue of the presence of cormorants. Indeed, the Eastern Fox Snake is not a forest species, but an inhabitant of open areas with abundant sunshine and thickets, thus probably benefits from any ability cormorant have to reduce forest canopy.

The Blue Racer is only on Pelee Island, and while it is an endangered race, and a species that is vulnerable to human activities, nothing done on Middle Island will effect its survival.

Amphibians that may occur on Middle Island are dependant on the artificial wetland, which will ultimately be lost to succession, and would also be at risk from the herons, gulls and other predatory birds, not the cormorants.

d: **Mammals:** Middle Island is too small to sustain populations of larger mammal species but may be visited by mammals from time to time, via ice, swimming, or artificial introductions, or, in the case of bats, as flying migrants. The Eastern Fox Squirrel is probably gone from the island and was probably artificially introduced at any rate. It is an abundant species throughout its range.

e: **Birds:** It seems to have been more or less implied in Parks Canada presentations that some bird species, such as the Yellow-breasted Chat, the Black-crowned Night-Heron, the Great Egret, the Carolina Wren and the Eastern Bluebird, may be at risk from the presence of cormorants on Middle Island.

The chat is a "special concern species". It has a huge range throughout most of the continental U.S., and is steadily moving north into Ontario where there is ample habitat. It likes thickets, and it is inconceivable that there would be any decline in it, or any other bird species in Ontario, as a result of cormorants on Middle Island. The chat would not become established on Middle Island, and if it has occurred there, it would be as a stray.

Black-crowned Night-Herons have one of the largest ranges of any birds world wide and are increasing in Ontario, and they co-habit mixed colonies with cormorants, and live in colonies on their own.

The Great Egret has an even larger range than the Black-crowned Night-Heron (it has been deemed the most photographed of all bird species) and is rapidly expanding its range into Ontario. Mixed egret and cormorant colonies occur everywhere the two species overlap, without loss to either.

The Carolina Wren is expanding northward and occurs on breeding grounds throughout much of southern Ontario north of Lake Ontario. There is one or two pair on Middle Island, and the presence or absence of cormorants does not effect them.

Non-migrating southern bird species, such as the Carolina Wren, Tufted Titmouse and Northern Cardinal, have slower dispersal potential than most migratory birds, but they are all expanding northward and are not threatened or rare.

Eastern Bluebirds have staged a remarkable comeback thanks to wildlife management, virtually all of it by the private sector, in the form of the provision of suitable nest-boxes placed in appropriate habitat. It is increasing dramatically and cormorants do not threaten its existence anywhere. Warming climate apparently favours this species, which is increasingly wintering in southern Ontario. It is a species of open meadow areas, not a habitat type Parks Canada wants to maintain on Middle Island.

It should perhaps be noted that many numbers about breeding birds on Middle Island have been bandied about, but in a real sense the numbers are irrelevant. The surveying that has been done there has been fragmented, sometimes involving only a single visit, thus it can be hard to gauge what the numbers really mean. For example, Parks Canada recorded 19 breeding species whereas an experienced birder found 16. It could mean that the latter missed three species, but it could also mean that there was a different interpretation of "breeding". In any case, there is roughly twenty species of birds breeding on an island of limited carrying capacity, and that number has remained relatively steady year to year, both before and after the arrival of cormorants and in spite of how many cormorants.

7.0 Misrepresenting the available literature - Cormorants and the Great Lakes:

7.1. Misrepresentation #1: Parks Canada staff claim that there was no indication in Wires and Cuthbert's paper that the Canadian and U.S. interior population of cormorants has ever been as numerous as it is currently.

What Wires and Cuthbert, McIlwraith and others wrote:

Wires and Cuthbert state that "Prior to 1900, cormorants were widely distributed across North America, and occurred in all five of the hypothesized breeding zones. Approximately 80% of the locations shown [in a figure presented in the paper] are documented breeding sites (i.e., have records of nests, eggs, or young); we designated the remaining 20% as probable or possible breeding locations based on circumstantial or anecdotal information… Systematic surveys for birds were not formalized at most locations prior to the twentieth century; thus, the number of records within each breeding zone does not reflect abundance of breeding birds or extent of distribution. In some areas (e.g., Pacific and Atlantic coasts), multiple records prior to 1900 are available; in others (e.g., some parts of the Interior and Gulf Coast), little effort was made to survey avifauna prior to the twentieth century." (IBID Wires and Cuthbert, 2006)

Clearly the Wires and Cuthbert paper does not preclude Lake Erie or any of the Great Lakes from the pre-20th century range of Double-crested Cormorants. In terms of inadequately surveyed areas, Middle Island was one such location. It was not visited by a competent recorder of bird populations until as late as 1908. In addition, there was very little documentation of any bird species in Ontario prior to the 20th century, and relatively little evidence of many species whose status as native breeding species of long duration is not questioned. But the literature that references birds in Ontario prior to the 20th century, indicates the presence of cormorants. For example, Charles Fothergill (1782 – 1840), the so-called "Father of Ontario Ornithology", collected and sketched birds in the province in the 18th century. While most of his specimens were either destroyed by fire, or, in the case of his journals, located in Scotland, there are existing sketches. One sketch is of a Double-crested Cormorant. He spent most of his time in Ontario at Toronto and Rice Lake. He may have sketched this bird as it migrated through or as it nested in a colony. We don't know. But we cannot, as Parks Canada does, assume he drew from a migrant bird than a more approachable breeding or post-breeding bird.

Wires and Cuthbert also state, "While precise counts are not available for most colonies prior to the twentieth century, records located for each population zone suggest historic populations of DCCO were very large." They provide evidence of individual assemblies of Double-crested Cormorants at numbers significantly higher than any that occurred in those respective regions subsequently.

There is little or no archeological evidence of most native Ontario birds, including cormorants, ever existing in Ontario. However, one cormorant specimen was found in a midden of the Late Woodland, Neutral cultural group, dating from approximately 1540 A.D., on the Niagara Peninsula, between Lake Ontario and Lake Erie…the "epicenter" of the Lower Great Lakes. This record and the following records, were in a document not examined by Wires and Cuthbert, 2006. It is a book called *Birds From the Ground: The Record of Archaeology in Ontario*, by Doug Sadler and Howard Savage, Occasional Papers in Anthropology Number 15, Department of Anthropology, Trent University, 2003.

Birds from the Ground's records demonstrate that many common species of birds that were not game birds either appear in very small numbers or don't appear at all in archeological records. There are only four sites were the American Bittern, a widely distributed marsh bird of similar size to the cormorant, has been found; one site for the very small Least Bittern; only two for the Black-crowned Night-Heron; and five for the Lesser Scaup. Even the Brant, which was one of the most abundant game birds in the Great Lakes, is recorded from only one site.

For raptors, not very edible but likely to be killed for cultural or ceremonial reasons, there are remarkably few archeological sites. Only one site was found for the widely distributed and easily located Northern Harrier; four for the very abundant Sharp-shinned Hawk; five for the Broad-winged Hawk, which occurs in flocks of thousands of birds at a time; two for the abundant and easily found American Kestrel, and only one for the Merlin.

The Common Moorhen, an edible species found in marshes throughout southern Ontario, shows up in a single site, near Lake St. Clair. The American Coot, another edible game-bird species that is also at times abundant in Ontario (although currently in decline here and in much of its range) also showed up, like the cormorant, in but a single site.

Shorebirds, while both edible and very easily killed in significant numbers, also show up in very small numbers. For example, only one site was found for the abundant Killdeer, one for the very common migrant Lesser Yellowlegs, one for the widely spread Spotted Sandpiper, one for the Ruddy Turnstone, one for the once abundant and very edible Red Knot, one for the Short-billed Dowitcher and one for the Common Snipe. Even the most abundant and arguably one of the most edible and easily killed of all native shorebirds, the now extinct Eskimo Curlew, is listed from a single site.

One can see tens if not hundreds of thousands of migrant Bonaparte's Gulls in the Niagara Gorge in early winter, a "blizzard of gulls" as it has been called, but the species occurs at only one archeological site. The Ring-billed Gull, another species currently tagged with the

"super abundant" label and most certainly a native species, occurs in only two sites. The Common Tern, whose presence on Middle Island as a breeding species was established in 1908, appears in only two archeological sites, Georgian Bay and the St. Lawrence River. The Caspian Tern, a larger tern that often occurs in the same sites as Double-crested Cormorants in the Great Lakes, does not occur in any sites, as of the publication of our source material.

The above examples counters the misrepresentation used by Parks Canada staff who claim that the archeological absence of cormorant remains means that cormorants did not nest in the Lower Great Lakes, including Lake Erie and Middle Island.

The first effort to create a complete accounting of the birds of Ontario is Thomas McIlwraith's *The Birds of Ontario, Being a Concise Account of Every Species of Bird Known to Have been Found in Ontario, with a Description of Their Nests and Eggs.* In discussing the Double-crested Cormorant, McIlwraith states that the species: "…occasionally visits inland lakes…"

He describes collecting a specimen, and then writes, "All the Cormorants have the reputation of being voracious feeders, and they certainly have a nimble way of catching and swallowing their prey, but it is not likely that they consume more than other birds of similar size." The prejudice we now see against cormorants was present back then, as it was against herons, loons, kingfishers, mergansers, grebes, ospreys, and other birds that eat fish, along with the bias that was directed against hawks, owls, wolves and so many more. As indicated below, he recorded it as a breeding species.

7.1.1. **Misrepresentation #2: Because there are no known records of cormorants nesting on Middle Island or in Lake Erie, Parks Canada concludes therefore that very few or no cormorants nested in this area prior to the 20th century.**

What the research papers say:

Wires and Cuthbert state, "In many parts of the Interior region, the early breeding history of the DCCO is well known. Pre-1900 records document nesting by the species across most of the region and suggest it had been a long-time and abundant breeder in several areas, particularly in the Prairie Provinces and the mid-western states where many large colonies were documented. In Minnesota, Hatch (1892) reported DCCOs bred in nearly all parts of the state, and was "occasional to innumerable" depending on how close one was to breeding colonies." Minnesota borders on the upper Great Lakes, and it seems incomprehensible that for some reason, the species, which no one argues ranged from Alaska east to Labrador, somehow did not nest in the Great Lakes, simply because observers of Hatch's competence and inclination were not present to document them.

In fact, cormorants were documented in the state of Ohio, which is literally only meters away from Middle Island. Wires and Cuthbert state, "In Ohio `boatloads' were killed at St. Mary's Reservoir (Longdon 1878)". Ohio abuts Lake Erie. The Double-crested Cormorant is an obligate piscivore. It is therefore inconceivable, and not supported by what evidence

does exist, that the species would be so close to, and yet avoid, 10,000 square miles of prime nesting and feeding habitat.

The Wires and Cuthbert quote highlights the fact that cormorants were common enough for "boatloads" to be taken within approximately 100 miles as the crow flies from Middle Island.

McIlwraith writes: "The preparations for incubation are made about the 10th of May, in large communities, on islands and lakes and almost impenetrable marshes, where there are some large old trees, in which they most frequently build their coarse but substantial nests. These are usually bulky from having been added to every year, and consist of weeds, vines and sticks piled carelessly around a deep depression, in which is deposited the three pale greenish or bluish eggs. It is not an uncommon sight to see one or more of these nests on the same tree in which there are a number of heron nests, and the owners seem to live in harmony."

Clearly he was familiar with Double-crested Cormorants nesting in Ontario sometime prior to 1894, treating them as a breeding species unlike the Great Cormorant, which he distinguishes as a "straggler" and for which he gives no such detail of breeding information.

He concludes his section on Double-crested Cormorants by saying: "When the young are sufficiently grown, they gather into immense flocks in unfrequented sections, and remain until the ice-lid has closed over their food supply, when they go away, not to return till the cover is lifted up in the spring."

7.1.2. **Misrepresentation #3: Parks Canada asserts that the Carolinian habitat that has evolved on Middle Island is "natural"; that the habitat must be protected despite the human induced absence of cormorants from the later part of the 1800s to the 1980s; and that the Carolinian habitat on Middle Island is "natural" but the large number of cormorants are not.**

What the literature says:

Cormorants, like so many other wildlife species in earlier centuries, were extirpated by aggressive killing campaigns, the very killing that would have produced those "boatloads" of birds in Ohio. The "All About Birds" article by the Cornell Lab of Ornithology documents the "double attack" on cormorant populations – first, the human persecution, and second, the pollution. The article states, "Cormorant populations greatly decreased in the 19th and early 20th centuries from human persecution. They recovered after the 1920s, with an interruption in the recovery during the pesticide era of the 1950s and 1960s. The National Audubon Society considered it a species of special concern in 1972." (http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/Double-crested_Cormorant.html)

The type of 19th century persecution cited in the Cornell Lab of Ornithology article was rampant, not only against cormorants, but against many wildlife species of the region. Some of the most abundant species were reduced, extirpated or altogether exterminated before

legislative protection came into being. A society that could extirpate or exterminate the Lake Ontario Atlantic Salmon, originally so common that it was "harvested" with pitchforks, the Blue Walleye, the Heath Hen, the Passenger Pigeon, the Carolina Parakeet, the Eastern Elk, the Eastern Cougar, the Wild Turkey and various other species would have had little trouble eliminating a species as vulnerable and as vilified as the Double-crested Cormorant from the Great Lakes.

When Mr. Jones landed on Middle Island in 1908, he found no Double-crested Cormorant nests. He found no Herring or Ring-billed Gulls, no Black-crowned Night-Herons, no Great Blue Herons, and no Great Egrets. All these species are present on Middle Island today.

Vegetation that would have been kept in abeyance was able to flourish due to the human induced absence of cormorants and other colonial waterbirds.

Wires and Cuthbert, 2006, also state, "Human efforts to reduce numbers and eliminate populations [of Double-crested Cormorants] have been documented throughout European settlement, and species history during the latter part of the 19th and the first quarter of the 20th centuries has been described as 'a history of persecution and gradual abandonment of one breeding place after another' (Lewis 1920)." Certainly that is true of the Great Lakes region where the species was present but gone as a breeding species well before 1908.

7.2. **Hyperabundance/Superabundance/Overabundance:**

7.2.1. **General Comments on hyperabundance:**

Parks Canada's definition of "hyperabundance" as set out above is more remarkable by the absence of information than in the definition itself. Parks Canada staff make no attempt to explain what they mean by the "upper range of natural variability" or how they determine what the upper range might be. They claim that Middle Island can sustain a maximum of 1200 nesting pairs of cormorants. Yet they present no scientific papers that show how they arrived at 1200. They make no attempt to explain what is meant by "characteristic of the ecosystem". And finally, they make no attempt to describe what they mean by "long-term negative impact on ecological integrity".

The term "hyperabundance" does not exist in most scientific literature. *Population Limitation in Birds*, written by Ian Newton and published by Academic Press in 1998, is an excellent and readily available source of information on the dynamics of population sizes among birds. It is a referenced and academically sound text suitable to the needs of the science teacher but accessible to the informed lay person, and nowhere does it contain the word "hyperabundance". Similarly we can look at the third edition of Ornithology, by Frank Gill, published by W.H. Freeman in 2007. According Gill the book was designed to"…capture the vital features of the biology of birds from a contemporary perspective…" and intended primarily for undergraduates in ornithology, it, too, is easy for the informed lay person to comprehend, and has a 37 page chapter on "Populations" that nowhere uses the term "hyperabundance". There are other, more academic examinations of population size that also do not use the term: See Lack, David, 1954, *The Natural Regulation of Animal*

Numbers, Oxford University Press; and Lack, David, 1964, Population Dynamics, in *A new dictionary of birds*, ed. A. L. Thomson, McGraw-Hill Book Company; and von Haartman, 1971, *Population Dynamics in Avian Biology*, ed. D.S. Farner, J.R. King and K.C. Parkes, Vol 1, Academic Press; and Dorst, J. 1974, *The Life of Birds*, Vols. 1 and 2, Columbia University Press; and Pettingill, Jr., O.S., ed., 1972, Seminars in Ornithology, Cornell University of Ornithology, for earlier, classic but not necessarily easily accessible or current discussions of avian population dynamics.

"Hyperabundance" is a politically driven term in wide use, primarily by wildlife managers, to justify wildlife management interventions and to demonize particular wildlife. It refers to a social concept, not a factual state of being. It, along with similar phrases such as "over-abundant and super-abundant", is commonplace in wildlife management terminology and is used predominately to address political, economic and other social concerns.

Wildlife managers attribute "hyperabundance" to populations of animals that have increased in size recently, dramatically and within a relatively short time-frame. Such population increases often reflect a dramatic, anthropogenic change in the environment that subsequently alters the carrying capacity of that environment, potentially to the detriment of other species. There are two such changes frequently cited in the wildlife management literature. The first is a decrease in predators. The second is an increase in food, either as a result of introduced species or because of the "agricultural subsidy", such as the catfish farms on the wintering grounds of the cormorant in the American south. In the case of Double-crested Cormorants, both these factors have been suggested as resulting in "hyperabundance."

Wildlife managers often disregard historical increases in wild populations as anecdotal, since the increases predate the more modern census techniques. However, the research by Wires and Cuthbert, in their 2006 paper, calls into question the accuracy of wildlife management assertions that cormorants are now more numerous than in the past. As we have discussed above, Wires and Cuthbert state that "Prior to 1900, cormorants were widely distributed across North America, and occurred in all five of the hypothesized breeding zones." (IBID Wires and Cuthbert, 2006). And again, they state that, "In Ohio `boatloads' were killed at St. Mary's Reservoir (Longdon 1878)". (IBID Wires and Cuthbert, 2006).

Despite the information presented by Wires and Cuthbert, wildlife managers, including Parks Canada staff, continue to state with certainty that the cormorant population is significantly higher now than in the past and, therefore, are hyperabundant.

7.2.1a. **Hyperabundance, exotic fish and agricultural subsidy:**

There is no doubt that there have been changes in the food supply for cormorants throughout their range, including Lake Erie. Species of fish once abundant are now rare or absent; species once rare or absent are now abundant, either in the form of non-native exotics, or through the relatively recent proliferation of fish farms, particularly catfish aquaculture in the southern U.S.

The main limiting factor in cormorant colony size, apart from presence of suitable nesting sites, is food availability.

Parks Canada and other North American wildlife managers argue that the combination of exotic species of fish, such as Alewives which are well-suited to cormorants' needs, plus the agricultural subsidy presented by fish farms on their wintering grounds have enhanced carrying capacity over what would have historically occurred.

On a continental basis these contentions have been refuted by Wires and Cuthbert, 2006. Since they demonstrated that there were more cormorants prior to the arrival of these exotic fish species and the development of aquaculture, it cannot be argued that there was less food for more cormorants.

The Wires and Cuthbert paper presents Parks Canada staff with a difficult problem because it refutes their argument that cormorants "exceed the upper range of natural variability" and undermines their justification for the cull. Parks Canada's approach is to ignore the inconvenient information presented in the Wires and Cuthbert paper.

- **Dependancy on Alewives:** According to Wayne Grady, in *The Great Lakes, the Natural History of a Changing Region*, Greystone Books, 2007, "Alewives and Atlantic salmon…both salt water species that had invaded Lake Ontario and become landlocked as the lake's outlet at the St. Lawrence rose above sea level about 6,000 years ago, remained solely in Lake Ontario until the opening of the Welland Canal, in the early 1800s." In fact, most experts agree that Alewives did not reach even Lake Ontario until sometime in the second half of the 19th century.

  No one questions that Alewives are ideally suited for nesting cormorants by virtue of size and behaviour. Alewives spawn in shallow waters at the time when cormorants are nesting and are an important food source at the time when it most benefits the cormorants' ability to reproduce. If we believe that Alewives are vital to cormorants in the Great Lakes then it could be also argued that only Lake Ontario could support cormorants, and then only for a period beginning late in the 19th century.

  However, the contention that cormorants are so significantly "Alewife-dependent" is absurd. There are numerous fish species that cormorants eat in Lake Ontario that nest or spawn in shallow water. As Environment Canada's paper titled *The Rise of the Double-crested Cormorant on the Great Lakes: Winning the War Against Contaminants* states, "Studies have repeatedly shown that in a natural environment, cormorants feed primarily on small, largely non-commercial, shallow-water fish. On the Great Lakes, these include abundant species such as Alewife (*Alosa pseudoharengus*), Rainbow Smelt (Osmerus mordax) and Yellow Perch (*Perca flavescens*). The birds also take much smaller numbers of White Suckers (*Catostomus commersoni*), Pumpkinseed, crappie, bass (Centrarchidae) and sticklebacks" (http://www.on.ec.gc.ca/wildlife/factsheets/fs_cormorants-e.html)

  Cormorants have thrived in areas where there were no Alewives, such as Lake of the Woods, so these fish are not requisite to the presence of large numbers of cormorants.

Alewives displace native fish species, but they do not reduce fish biomass. The physical volume of fish biomass is driven by the ever changing and, in the case of the Great Lakes, ever diminishing carrying capacity of the environment.

Indeed, Alewives contribute to the Great Lakes biomass that was affected by overfishing and resulted in the elimination of the Lake Erie blue walleye and the Lake Erie Lake Trout and the decline in many other species. In his book, the *History of Changes in the Lake Erie Fishery*, in *The Great Lakes Erie*, 2003, Andrew M. White writes, "The Fish fauna of Lake Erie and its tributaries consists of 139 species and subspecies. The fauna of Lake Erie is a collection of fishes from more than 18 states, Canada, Europe and Asia. People had blocked fishes' migrations, drained their spawning grounds, muddied their waters, captured them by the billions for food and people had taken away their oxygen, but still they persisted."

- **Effect of other exotic species:** To support our contention that the carrying capacity of Lake Erie was significantly greater prior to the 20th century, we must examine the critical foundation of the food chain. Diporeia, a tiny arthropod, used to be the most abundant macroinvertebrate zooplankton in the cooler waters of the Great Lakes. In some places Diporeia made up nearly 70 percent of all benthic organisms, forming the foundation of the food chain for the Lake Whitefish and other fish species, many of which were "harvested" in vast tonnages, through the mid-19th century, until thoroughly depleted.

  Diporeia, the very basis of the Great Lakes food chain, has also been lost because of the introduction of such non-native species as Zebra Mussels and Round Goby (with an estimated Lake Erie population of nearly 9.89 billion Round Gobies – according to Jim Johnson, MNR – See Johnson, *et. al*. in Journal of Great Lakes Research 31:27-86.)

  We cannot predict the impacts of the numerous exotics now found in the Great Lakes, adjoining wetlands and drainages that connect with the Great Lakes. Exotic amphipods, the aquatic weevil, the Japanese and Chinese banded mystery snails, black-grass rush, bristly lady's thumb, brown algae, exotic bryozoans, exotic fresh-water calanoid copepods, cocco-lithophoroids, curlyleaf pondweeds, exotic diatoms, digenean flukes, Eurasian water milfoil, European ear snail, European fingernail snail, European frogbit, European valve snail, European water clover, European water horehound, faucet snails, fish-hook waterfleas, exotic flegellates, exotic flatworms, flowering rush, freshwater jellyfish, greater European pea clam, exotic green algae, harpacticoid copepods, Henslow's pea clam, humpback pea clam, the New Zealand mud snail, exotic mussels, the narrow-leaved cattail, the parasitic copepod, Quagga mussel, purple loosestrife, red algae, reed sweet-grass, salmonid whirling disease-causing organisms, exotic sedges, spiny water flea, water cress, garlic mustard and phragamites are just some of the non-native organisms that have intentionally or accidentally reached the Great Lakes or its shores, or have arrived as a result of range extensions.

  We have a better understanding of newly arrived but historically absent fish species. These include, in alphabetical order, the Alewife, the Blueback Herring, the Blue-

spotted Sunfish, the Brown Trout, the Chinook Salmon, the Coho Salmon, the Common Carp, the Eurasian Ruffe, the Goldfish, the Kokanee Salmon, the Margined Madtom, the Orange-spotted Sunfish, the Oriental Weatherfish, the Pink Salmon, the Rainbow Salmon, the Rainbow Trout, the Round Goby, the Rudd, the Sea Lamprey, the Tubenose Goby and, it is feared, may soon include the highly predatory Asian Carp. Ironically, some of these exotic fishes are intentionally placed in the Great Lakes by wildlife managers. Some of the intentionally introduced species, like the Coho Salmon, are voracious predators with major impact on the population size and composition of native species and therefore purposefully and negatively impacting the biodiversity and ecological integrity of the Great Lakes.

- **Pollution:** The input of toxic chemicals in the Great Lakes was recognized as early as 1951, when the International Joint Commission published its findings in *On the Pollution of Boundary Waters*. At that time, private companies were already dumping 7.6 million cubic meters of industrial waste into the Great Lakes, each day, including 3,600 kilograms of cyanides, 5,900 kilograms of phenols, and 11,400 kilograms of ammonium compounds, plus various oil-related compounds. The diluting effects of the vast volume of the Great Lakes was deemed sufficient to safeguard public interests in the absence of the understanding we now have of the effects of bioaccumulation of certain toxins, a threat thoroughly documented in the now famous book, *Silent Spring*, by Rachel Carson, first published in 1963.

  The carrying capacity for the Great Lakes fish biomass was greater prior to the 19th century than it is today. Fish populations in the Great Lakes were far more abundant because the lakes were less disturbed, cleaner and non-toxic.

- **Commercial fishing – over-fishing and persecution:** The ravages of commercial fishing did not take hold in the Great Lakes until after the War of 1812, and we suspect that at that time there were still cormorants nesting in the Great Lakes. But from about 1820 onward there was significant growth in the commercial fishery, about 20 percent per year (http://www.great-lakes.net/teach/envt/fish/fish_2.html). This fishery, with access to all islands in the Great Lakes, would have eliminated Double-crested Cormorants as a breeding species in short order, if not by McIlwraith's time, certainly not long after that.

  Numerous papers are available discussing this persecution. The Michigan Department of Natural Resources Report No. 2 August 2005, titled *Double-crested Cormorants in Michigan: A review of history, status, and issues related to their increased population*, states, "Commercial fisherman viewed cormorants as competitors for fisheries resources. Lewis (1929) identified accounts of cormorants being trapped during commercial fishing operations and destruction of nests and eggs during the 1800s and early 1900s." **(**http://www.michigan.gov/documents/Cormorant_Report_136470_7.pdf)

  In addition, Wires and Cuthbert, 2006, state "By the late 19th and early 20th centuries, however, the abundance of cormorants Champlain and others observed across much of North America had greatly diminished. As early as 1634, cormorants were reported "to

destroy abundance of small fish" (Wood 1634); since this time, the perception of cormorant diet and foraging behavior has changed little and has been a significant factor affecting the distribution and abundance of the DCCO in North America. Human efforts to reduce numbers and eliminate populations have been documented throughout European settlement, and species history during the latter part of the 19th and the first quarter of the 20th centuries has been described as "a history of persecution and gradual abandonment of one breeding place after another" (Lewis 1929)."
(http://www.bioone.org/perlserv/?request=get-document&doi=10.1675%2F1524-4695(2006)29%5B9%3AHPOTDC%5D2.0.CO%3B2&ct=1)

- **Agriculture subsidy:** Wildlife managers evoke the "agricultural subsidy" argument to justify claims of "hyperabundance". Wildlife managers argue that the carrying capacity of the Double-crested Cormorant has been greatly enhanced by the advent of aquaculture, particularly catfish farms, allowing for greater survivability, particularly with inexperienced young of the year.

  However, wildlife managers face a significant problem - that there is no evidence connecting significant mortality of wintering birds, including young of the year prior, to the relatively recent practice of turning wasted farm fields in the southeastern U.S. into large fish farms. Further, they fail to explain why larger numbers of cormorants were encountered prior to the widespread development of aquaculture (see Wires and Cuthbert, 2006). We argue that the vast destruction and degradation of wetlands, mangrove swamps and coastal waterways, in addition to overfishing, in the wintering grounds of cormorants has reduced the carrying capacity, likely significantly below any level compensated by aquaculture.

7.2.1b. **Hyperabundance and predation:**

Humans are the greatest cormorant predator today. Thanks to the vilification by wildlife managers, including Parks Canada staff, the cormorants face increasing persecution throughout North America. Some are even proposing a discussion on a continent flyway cull, such as the US Fish and Wildlife Service in its Alternative E. Alternative E is described as follows: "Under this alternative, the United States would be divided into an unspecified number of regions, and in each region a committee would develop Double-crested Cormorant population goals. These goals would be based on 'multi agency reviews', and 'other' values would be considered in setting population targets. Control efforts would be fairly open-ended, allowing lethal techniques to be used anywhere – nesting, roosting, and wintering sites, aquaculture facilities, and apparently anywhere else cormorants might be found; non-lethal techniques would be allowed, but would be voluntary. The objective would be to achieve the population goal as quickly as possible." (*Review of the Double-Crested Cormorant Management Plan, 2003:Final Report of the AOU Conservation Committee's Panel*; J. Michael Reed1, Douglas Causey2, Jeremy J. Hatch3, Fred Cooke4, and Larry Crowder5
http://www.torontobirding.ca/pdf/CormorantsAOU07ConservationAddn5.pdf)

Predation by other wild animals does not appear to be a limiting factor in population size of Double-crested Cormorants. As long as they can nest on islands, on lake or sea side cliffs,

in trees, or on headlands, they seem to have little to fear from predators. Clearly they select for such sites. This is not to say that the odd adult bird might not be opportunistically taken by predators, including avian raptors, sharks and alligators. But, in balance, adult birds display relatively little vulnerability to natural predators.

Predation of nests and young are also not a limiting factor in population size. Colonial birds benefit from the size of the colonies in defending against nest predation. Larger colonies are less vulnerable than small clusters of nests. Studies of some large colonies of Sulids, such as our own Northern Gannet, show that the least "reachable" cliff face sites, where predation is least likely to happen, are chosen preferentially; the gannets will nest first on the cliff face, and only when those sites are not available will they spill over onto the tops of the cliffs and onto shallow upper slopes and tablelands where they can be more easily reached by predators. (See, for example, *The Gannet*, by Bryan Nelson, Buteo Books, 1978, for discussions of such nesting strategies.)

7.2.1c. **Hyperabundance and subjective impressions:**

We form lasting impressions early on in life. We view what we see as the "normal" world and subsequent changes are measured against what we remember as "normal".

North Americans have grown up in an environment where large numbers of species are rarely or never again encountered. We know from historic records that there were once vast herds of bison. Because we never experienced their numbers, we view a few bison as the norm. We read about the enormous flocks of Passenger Pigeons, blocking the sun and descending into forests in such huge numbers as to break branches and befoul the ground. Of course the species is extinct and none of us ever experienced such a thing. Our norm is a world without Passenger Pigeons. Our eastern forest is free of their excrement, their smells, and the impacts they had on vegetation.

We know that early explorers to our east coast had their progress impeded by schools of cod. But our concept of cod is of a common fish, once the backbone of the Atlantic fishery and now a species at risk.

Africa has its vast (if diminishing) herds of ungulates, and there are images many of us have seen, perhaps personally experienced, of huge assemblies of Mexican Free-tailed Bats from Texas or the teeming masses of krill in the cold waters of the southern ocean, but for most of us, the largest numbers of animals we have ever seen of a single species of animal in the wild is very small, perhaps a few thousand waterfowl, or, more likely, swarms of some insect species.

Thus, when animals do manage to assemble in large numbers, it is often seen as wrong, an aberration when measured against our norm.

We do not have vast populations of Double-crested Cormorants. We have a number of colonies nesting on islands and peninsulas throughout the Great Lakes, but the actual

number found throughout all of Canada, the U.S., Mexico and the West Indies, a vast region, is actually less than the number of humans now living in the Greater Toronto Area.

Wildlife managers, including Parks Canada staff, exploit visual images that show large numbers of nesting cormorants to demonstrate their "hyperabundance". Wildlife managers generally, and Parks Canada staff specifically, prey on the public's lack of experience with large bird colonies. They fail to explain that the sheer number of cormorants in a successful colony, such as High Bluff Island near Brighton, Ontario, or on Middle Island, is entirely normal. They fail to explain that it is entirely normal for cormorant numbers to be much greater than other colonial species. They fail to explain that it is entirely normal for animals who assemble in large numbers to impact on other species of fauna and flora. They fail to explain that colonial waterbirds and other native species have co-evolved and, in some cases, are inter-dependant.

The Double-crested Cormorant exists at the level that its environment allows, its carrying capacity. Cormorant populations are not out of control. On the contrary, they are subjected to the same laws of the universe as any other species. This heavily persecuted and vulnerable species belongs in numbers that the environment now sustains.

Human activities have altered the environment and reduced its ability to sustain the numbers of organisms, the sheer biomass, that once existed. Despite a depleted environment, some species survive and some thrive. We should support, not vilify those species that are both surviving and thriving. Terms, "hyper" and "super" abundant reflect subjective, political, economic or other considerations. They are not "scientific" terms. They do not belong in the serious ecologist's vocabulary, and they most certainly do not apply to the Double-crested Cormorant.

7.3. Presenting reports by consultants hired by Parks Canada and other wildlife management papers and actions as "scientific.

We are concerned with Parks Canada's loose application of the word "science" in attempting to justify the management cormorants on Middle Island. Parks Canada must clearly distinguish between "science", which is supposed to be an objective and non-judgmental examination of reality, and "active management", which Parks Canada defines as, "Any prescribed course of action directed towards maintaining or changing the condition of cultural, physical or biological resources to achieve Parks Canada objectives." (westinstenv.org/wp-content/Can_ Mgt_%20Dir_4.4.11_Hyperabundant_Wildlife.pdf).

In Directive 4.4.11, Parks Canada Management does not indicate what scientific papers were used, to guide, the development of the definitions or the entire management directives. The word science appears only twice in a paper whose scope "applies to the management of hyperabundant species".

Wildlife managers should draw upon the scientific literature not to justify a course of action, as Parks Canada staff are doing, but to assist in protecting natural systems. Science does not dictate a reduction of cormorants on Middle Island; political expediency does and the result is that Parks Canada itself has deviated from its goals and mandate.

8.0. **Cruelty:** In this section CDI refutes the claim made by Parks Canada that disruptive and lethal management interventions to reduce the cormorant population on Middle Island can be done humanely.

8.1. **General Comments on Culling and Cruelty:** In any discussion CDI has had with Parks Canada with regard lethal culling of Double-crested Cormorants on Middle Island, it has been implied that the degree of cruelty observed and documented by CDI in lethal culling conducted by the Ontario Ministry of Natural Resources in Presqu'ile Provincial Park in 2005 and 2006 was a function of the Ministry's procedures, and have no bearing on what is being planned by Parks Canada.

Since culling is being considered as a management option and since it seems inevitable that culling will be used against the cormorants on Middle Island, we will discuss our humanitarian concerns.

8.2**.** **What is cruelty:** Impressions of what constitutes cruelty varies historically, legally, socially, and from individual to individual. An activity directed against a sentient individual (human or non-human) that can reasonably be expected to cause pain will educe very different reactions from different people. Reactions may change over time. People assured that a pain-causing procedure is "necessary" will be more inclined to accept that it causes pain, than if it is deemed "unnecessary". Some people who are exposed to seeing a great deal of suffering may become more desensitized than those protected from such experiences. On the other hand, some people who have witnessed a great deal of pain may develop increased aversion to the suffering in others. What has been called "the Lucifer effect" by Dr. Philip Zimbardo of Stanford University, creator of the now infamous "Stanford Prison Experiment" and author of The Lucifer Effect: Understanding How Good People Turn Evil, demonstrates that the humane standards people normally manifest will often not prevail when those same people are permitted to act in a more cruel manner against other people and certainly against different species.

As well, how much one individual suffers from any given stimulus is something no other individual can determine with precision. It may well be that the same stimulus produces less pain in a bird than in a human; it may well be that it produces more.

Birds have well-developed nervous systems, respond to tactile stimuli, and show stress under circumstances that threaten their well-being.

On the other hand, some of the symptoms of pain we associate when manifested by mammals cannot be displayed by birds. They lack an ability to manifest exaggerated facial expressions, and generally have a narrow range of vocalizations that typically include a response to fear, but not necessarily to pain or discomfort, particularly in non-passerines.

CDI asserts that birds with ruptured tissue from bullet wounds are in pain or that nestlings exposed to the elements, deprived of food or experiencing physical trauma, suffer

accordingly. CDI also asserts that adult birds suffer when they are suddenly rendered flightless, are forced to drown, die of starvation, exposure or prolonged exsanguination.

As a federal agency, Parks Canada ought to be very concerned with actions that will result in the suffering of other species, in this case the Middle Island cormorants. The Canadian Council on Animal Care attempts to describe categories of invasiveness or levels of discomfort, distress and suffering. The Categories of Invasiveness are as follows:

> *CCAC Guidelines: We are guided to some degree by Categories of Invasiveness in Animal Experiments (1991), produced by the Canadian Council on Animal Care (CCAC). These can be found at: http://www.ccac.ca/en/CCAC_Programs/Guidelines_Policies/POLICIES/CATEG.HTM.*
>
> *The least invasive Category, A., involves "Experiments on most invertebrates or on live isolates". Live isolates generally refers to tissue cultures, eggs and simple, one-celled organisms.*
>
> *Category B refers to procedures that cause "little or no discomfort or stress". A great deal of wildlife research arguably falls into this category (life studies, for example, of wildlife in natural habitat). This category allows for such techniques as blood sampling, or studies where an animal is anesthetized but not allowed to recover. Culling could, in theory, fall into this category, but in practice it is, as we discuss below, it is not possible for a cull of any magnitude to be conducted on cormorants while remaining within this category of invasiveness, as defined by CCAC.*
>
> *Category C involves procedures causing "minor stress or pain of short duration" and notes that "During or after Category C studies, animals must not show self-mutilation, anorexia, dehydration, hyper increased recumbency or dormancy, increased vocalization, aggressive-defensive behavior or demonstrate social withdrawal and self isolation."*
>
> *Category D involves procedures which "cause moderate to severe distress or discomfort" and thus may involve "induction of behavioral stresses such as maternal deprivation, aggression, predator-prey interactions' and "procedures which cause severe, persistent or irreversible disruption of sensorimotor organization". Other examples include "induction of anatomical and physiological abnormalities that will result in pain or distress" and also can include "exposure of an animal to noxious stimuli from which escape is impossible." The CCAC notes that "Procedures in Category D studies should not cause prolonged or severe clinical distress".*
>
> *Category E is the most invasive category of invasiveness recognized by CCAC and involves "Procedures which cause severe pain near, at, or above the pain tolerance threshold of unanesthetized, conscious animals."*

The senior author and other contributors to this brief have sat on CCAC assessment panels and from those experiences can state that the higher the category, the more important it is for the researcher to demonstrate the importance of the anticipated results to the human good, and the inability to achieve sought results via a less invasive methodologies.

The CCAC guidelines, cited above, provide us with an exemplar of what scientists, trying to be as objective as possible, have determined is invasive, with Category A being the least invasive form of experiment and Category E, the most. From the viewpoint of the animals involved, the purpose of their suffering is irrelevant. They are simply forced to endure the pain. We believe that Parks Canada staff must consider both ethical and legal ramifications to their actions. Past culling actions have shown that a percentage of cormorants during a cull would experience Category D and E levels of "invasiveness", as described by the CCAC. Those are levels of invasiveness that the CCAC would reserve only for the highest level of social need.

The CCAC also has produced "Guidelines on: the care and use of wildlife, 2003", which states, under Guideline B, on page 19, "Procedures likely to have lasting negative effects on a population or to affect the existence of a population should not be undertaken, except under extraordinary circumstances. When such impacts are likely, the investigator must demonstrate, through the concurrence of recognized experts, that the procedure is necessary."

How an agency like Parks Canada determines what is "necessary" the paramount question. We believe we have demonstrated in this brief, with regard to Middle Island, that it is not necessary to cull cormorants on a somewhat remote, uninhabited island in a federal park known for it resident and migratory bird population. As we have demonstrated throughout the paper, this cull is driven by a hatred of the birds, is fueled by the misinformation circulated by organizations such as Parks Canada, the Ontario Ministry of Natural Resources and the Ontario Federation of Anglers and Hunters resulting in political pressure to kill them. The decision by Parks Canada staff to manage the cormorants on Middle Island does not meet the requirements as set out above.

The CCAC states, under Guideline B, "Unless the design of a study entails manipulation of local populations (e.g., studies designed to lower density, alter sex ratio, or to study certain aspects of physiology or behavior), permanent removal of animals for experimental purposes may be permitted only if there are no lasting effects on the population."

Parks Canada staff have failed to state clearly what their long term objectives involve. Are the actions against the cormorants strictly management or are they research based? If this is simply a management action, why is the Animal Care Committee being consulted? If the actions are considered to be research, two questions arise. First, why would the Animal Care Committee of Parks Canada approve a cormorant management programme on Middle Island when essentially the same research is being conducted on High Bluff Island, given that the CCAC is committed to reducing duplication of research? Second, how would the Animal Care Committee approve such management programme under current CCAC guidelines?

At the very least Parks Canada should wait the results from the first such experiment before considering another such endeavour. However, as the goal of the proposed culling of cormorants on Middle Island and elsewhere appears to be to permanently reduce the density of the species in its native habitat, it is not justified under CCAC guidelines.

The CCAC has produced "CCAC species-specific recommendations on: BIRDS", in draft form. With regard to birds that are captured, these guidelines state: "A plan for dealing with birds that are injured or killed during the trapping process must be in place prior to any trapping taking place. The plan should include specific endpoints, such as criteria for euthanasia, and how euthanasia will be performed."

At Presqu'ile Provincial Park, the OMNR claimed they would follow this protocol. Even so, CDI documented a large number of wounded birds left to suffer, some for a full week. During the meetings with Parks Canada staff, very little consideration was given as to how to deal with the wounded and dying birds who are trapped in their nests in the tall trees or have fallen into the water. No consideration had been given as to how to deal with chicks whose parents had been killed.

8.3. **Criminal Code of Canada:**

Under the Criminal Code of Canada (Criminal Code Part XI: Wilful and forbidden acts in respect of certain property: cruelty to animals) everyone commits an offence punishable on summary conviction who, "(a) wilfully causes or, being the owner, wilfully permits to be caused unnecessary pain, suffering or injury to an animal or a bird".

To prosecute animal cruelty under the Criminal Code, it is necessary to demonstrate to the court's satisfaction that birds have suffered as a result what was done to them, and that what was done to them was both wilful and unnecessary.

The language is archaic and the law outdated, but CDI, after legal consultation, believes that the Criminal Code would apply to cormorant culling activities as they were conducted by OMNR staff culling on High Bluff Island. Given the amount of planning involved, and given that Parks Canada has been informed of the cruelty inherent to the practice as it has been documented by CDI, any culling would easily be demonstrated as being "wilful".

In addition CDI would have to prove that the cruelty derived from the act of culling is not "necessary". This brief provides information that demonstrates to an objective third party that culling cormorants by Parks Canada at Middle Island is not "necessary". One of the flaws of the Criminal Code is that "necessary" is not defined. Therefore, all being equal, the court would favour Parks Canada's word that culling is necessary, over that of a non-government, outside interest or stakeholder. However, if it can be shown that in justifying why culling is necessary, Parks Canada provided misinformation, misdirection and false assertions, we believe that an objective third party, the court, would conclude that culling, thus the cruelty that derives from culling, is not necessary.

8.4. ***Ontario Society for the Prevention of Cruelty to Animals (OSPCA) Act*:**

Ontario's provincial legislation, the *OSPCA Act* (R.S.O. 1990, Chapter 0.36) is relevant in defining cruelty to animals. It does include birds, and defines "distress" as "…the state of being in need of proper care, water, food or shelter or being injured, sick or in pain or suffering or being abused or subject to undue or unnecessary hardship, privation of neglect."

The neglect of wounded birds documented at the cormorant culling at Presqu'ile Provincial Park would be defined as cruel under the *OSPCA Act*, a view shared by the OSPCA upon reviewing the documentation presented by CDI.

The OSPCA has said that if birds are left injured, it would be an offence under law (see letter from Mindy Hall, Senior Inspector, Central Ontario and GTA and Judith Wilson, Programme Manager, Animal Care Department, OSPCA to Parks Canada, dated 32 October, 2007).

8.5. **Culling Methodologies:**

During public consultations, Parks Canada failed to reveal culling methodologies beyond saying that theirs will not result in the cruelty documented by CDI during culling at Presqu'ile Provincial Park in 2005 and 2006.

The term "culling" has more than one meaning. Historically it has perhaps more often referred to the selective removal of individuals of domestic animals from a captive population in order to select for, or against, specific heritable traits. However, for our purposes, and those of Parks Canada, culling refers to the reduction of a specific population of animals by physically removing individuals from that population.

8.5.1. **Crushing nests, eggs and nestling:**

The Aquila report, critiqued in Section 7 of this report, provides the only information we have seen, to date, as to how culling might proceed on Middle Island. The Aquila report mentions "…crushing nests, eggs and nestlings with rocks, feet or other objects…" There apparently are no ground nesting cormorants on Middle Island, but if there were this method would require significant disruption of the colony. Ground nests are structurally sound enough to withstand anything less than a significant effort to "crush" to the point where destruction of eggs and/or chicks was assured. The degree of suffering inherent to such a crude methodology would, of course, vary. A chick stomped upon by a heavy boot might die instantly, but first it would have to be removed from the nest and placed on solid ground. If stomped upon while in the nest the resilience of the substrate, and the unevenness of pressure applied, could result in less than instantaneous death. Past experience some members of CDI have had with the kind of person willing to perform such activity leads us to be concerned about degree of compassion such an individual would have. As the purpose is to invalidate the chick's ability to survive, instant death is not a requisite, and in the absence of adequate supervision we fear that there would be chicks who would not die in a "humane" fashion. To assure a "humane" death would require a

significant amount of time within the colony, disrupting both cormorants and other colonially nesting species.

Crushing the nests, eggs, and nestlings of tree nesting cormorants, arguably that part of the population most offensive to Parks Canada's sensibilities would require far more time and effort and greater disruption of the colony and all species within the colony. The trees, many of them insubstantial in terms of supporting the weight of ladders and climbers, would have to be scaled, the nests disentangled from supportive branches and lowered to the ground. Nests that were knocked to the ground would result in trauma to the chicks prior to the stomping procedure. Once more, many chicks and eggs would not expire in "humane" fashion and in balance there would be quite massive disturbance of other nesting species nearby.

8.5.2. **Drowning:** The Aquila report also mentions "…throwing nest contents into the water…". Although apparently there are currently no ground-nesting cormorants on Middle Island ground nesting is possible and if it occurs this methodology could, with regard to nests close to the shoreline, have the advantage of reducing the time that Parks Canada's staff or agents are within the colony. This could reduce disruption of other birds, since all that would be involved would be to scoop up the eggs and baby birds and toss them into the lake. However, this would mean that the chicks would die by drowning, be attacked by gulls, or suffer other trauma before dying. However, the further the nests are from the water, the greater the traffic through the colony causing increased disruption of other birds. The alternative would be to take baby birds out of nests and stack them in containers to be dumped into the lake. This approach would cause terrible stress to the infant birds with risk of suffocation or physical trauma, prior to drowning. We believe such tactics would not only have low levels of social acceptability in general, they would be a violation of the Criminal Code of Canada and represent Level E of invasiveness as measured by CCAC. If ground-nesting occurs, this method on its own would select against that behaviour, which is conceivably heritable, and presumably less obnoxious to Parks Canada's sensibilities.

8.5.3. **Cervical Dislocation or Asphyxiation:** The Aquila report also mentions "…using asphyxiation or cervical dislocation to dispatch older young…" Asphyxiation could be conducted several ways, including digital compression of the thorax (ribs) to compromise or prevent heartbeat and inhalation. Generally speaking, the larger the bird the longer it takes for this procedure to produce unconsciousness. It works fastest on birds that are under 100 grams. They will still struggle for many seconds. Young cormorants would suffer longer. The CCAC guidelines for birds state: "There has been considerable discussion about the use of thoracic compression for euthanasia for small birds. This method is rapid and maximizes carcass use for analytical/contaminant studies. However, the degree of stress associated with the procedure is unknown, and it should be used only where other methods are not acceptable for the scientific goals of the study, and with the approval of the local ACC. Thoracic compression must not be used for larger birds or diving species that can tolerate high blood levels of carbon dioxide and relative anoxia for longer periods of times than other species."

The respiratory systems of birds are fundamentally different both physically and functionally from those of mammals. One such difference is one-way air-flow, as opposed to the in and out respiration of mammals. Another is the presence of air-sacs which can make oxygen available to drive metabolism for longer periods of time than is generally true of mammals, although diving mammals have important physiological adaptations that can prolong the time they can survive without breathing compared to terrestrial species. Another difference is the presence of hollow bones in birds, which contain oxygen that may be accessible for metabolism. It is possible at times for birds with the trachea closed that have survived by breathing through a broken bone.

All these variables in physiology translate into greater time spans in causing death by asphyxiation, especially an aquatic species evolved for diving, than is true for mammals. Put another way, birds achieve a more efficient gas exchange than do terrestrial mammals and so are far more efficient at breathing than are terrestrial mammals. Killing birds by asphyxiation thus can produce prolonged suffering over what it true of terrestrial mammals.

"Cervical dislocation" can produce virtually instant death if done correctly, by literally causing a break in the spinal column just below the skull. The CCAC recommendations for birds state: "Cervical dislocation may be used on birds up to 2kg." Double-crested Cormorants weigh approximately 2 kg (some individuals heavier, some lighter). But the term "cervical dislocation" is defined as "…quickly stretching the neck to cause separation of the cervical vertebrae from the skull." However, in terms of killing birds it is all too often used as a euphemism for wringing the bird's neck, which requires the bird's body to be spun around an axis while the head remains stable. Such procedure never causes truly instantaneous death, but may cause a quick death, or at least unconsciousness, if done correctly. In the experience of the senior author, who has often witnessed this method, the body of the bird fails to make the complete circuit the first time it is spun, resulting in trauma and a more prolonged lead-up to unconsciousness and/or death. In addition, the procedure presupposes that the injured cormorants are compromised, so staff dispatching the birds can easily apply cervical dislocation or neck wringing. This procedure does not take into account those birds who are less compromised and struggling to escape. Nor does it take into account how tiring such procedures are when conducted repeatedly.

The Aquila report states that such methods as those discussed above "…legitimately inflames public opinion and poses a serious public relations problem for Parks Canada." We agree with that assessment and we would argue that such methodologies are morally reprehensible, and could be deemed illegal under the Criminal Code of Canada (see 6.3, above).

8.5.4. **Shooting:** On page 50, the Aquila report states that "If population objectives are established for these forested islands where birds nest in trees, lethal control (shooting) is probably the most efficient way to reduce cormorant numbers, since most other actions that could be taken are likely to be inefficient and may result in substantial disturbance to other colonial species and non-target cormorants."

Shooting normally is the method, along with egg-oiling, most often used for culling cormorants. But shooting is, under conditions that prevail in cormorant culling, too often an inhumane way to dispatch the birds. In addition it creates other problems, including the disturbance of other birds.

8.5.4a. **Shotguns:** Shotguns are inherently ill-suited for killing selected birds that appear in concentrated numbers, due to the fact that shot patterns spread out and the velocity of the pellets diminishes rapidly in relation to the distance they travel. The thinner the pattern the less likely the target bird will be struck in a vital area. The lower the velocity of the pellet the less likelihood it will penetrate deep enough to reach a vital area.

Shotgun ammunition manufacturers go to great lengths to determine what combination of shot size, barrel length, gauge, degree of choke (constriction of the barrel at the end) and distance from target of a given size and density produces the optimal likelihood of scoring a kill. Suffice to say that these factors will vary enormously under field conditions. Certainly a shotgun can kill a bird instantly, if fired accurately at relatively close range, but even then a variable percentage of the pellets will miss the target and may strike an untended victim in the background (or, at absolute point-blank range, penetrate the targeted bird with enough velocity to wound an unintended victim in the background.) Shots fired at birds on branches overhead risk wounding distant birds of any species whose flight takes them into the shot pattern.

The noise shotguns make, even with noise suppressors, is still more than loud enough to disturb other birds, indeed all birds, in the colony.

8.5.4b. **Rifles:** We think it more likely that if culling occurs, Parks Canada will choose to use rifles, and will base most of our comments concerning cruelty on that assumption.

One advantage a rifle has over a shotgun in seeking to kill birds of one species within a mixed bird colony is its accuracy. This is, however, also a disadvantage. It requires no real skill to hit a relatively stationary target with a shotgun, but a number of pellets will miss the target overall. It requires considerable skill to hit even a relatively stationary but small target with a rifle, but if the target is a cormorant and it is hit squarely, as defined below, there is little real chance of a non-target bird being struck and wounded.

But experience did show a high wounding rate during actual culling observed and documented by CDI at Presqu'ile Provincial Park, specifically between May 8 and May 30, 2006. A report on wounding rates during that cull is being prepared by Rob Laidlaw of Zoocheck Canada Inc.

But Parks Canada claims that whatever wounding rates were documented at Presqu'ile, they have no bearing on what wounding rates will be at Middle Island, in the event of lethal culling of cormorants at that site. Because there has been no explanation of how wounding is to be avoided, we cannot comment on whatever differences in procedure Parks Canada has in mind.

Therefore, we will focus here on the problems generally associated with using rifles to cull cormorants in making our case that it is an inherently cruel procedure if it is conducted in any way likely to produce the goals of Parks Canada.

The most commonly bullet used diameter (calibre) for killing small animals is the .22, meaning a bullet that has a diameter of .22 inches. This is the size that has been used in culling cormorants in Ontario and the U.S., and is often used by hunters shooting small game and "vermin". The noise produced by a .22 calibre low velocity shell is low compared to larger calibres. Marksmen will debate its overall accuracy, but most would concede that it has a flat trajectory at least up to 75 meters, the maximum distance the Ontario Ministry of Natural Resources allowed marksmen to use it in culling cormorants at Presqu'ile Provincial Park.

Instead of scattering shot over an ever-widening diameter, a .22 calibre rifle bullet focuses enormous kinetic energy into a very small space – literally less than a quarter inch wide at point of entry, although the density of cormorant plumage and thickness of subcutaneous fat layers can absorb a variable percentage of that energy before muscle or organs are reached. What happens next depends on a myriad of factors, some under control of the shooter, some not. Some bullets, for example, are designed to essentially maintain their form when hitting soft tissue (muscle), while others are designed to "mushroom" and expand their diameter upon meeting resistance. The former have greater penetrating ability, but may thereby create less trauma overall. On the other hand, the latter may cause more trauma near point of entry, but by virtue of less penetration, may cause less trauma overall.

A bullet piercing the heart, brain or a major artery will likely cause death within a very short period of time. But there are numerous factors mitigating against such a relatively "humane" outcome, hence the large number of wounded birds encountered at culls. For example, if a cormorant is facing the shooter it is possible that a perfectly aimed bullet will strike the leading edge of the sternum, which, in a cormorant, is a large, well formed keel-like structure, quite capable of causing deflection from the mid-line, although such an eventuality would, at the very least, probably cause sufficient trauma to the pectoral muscle (required for flight) to bring the bird to the ground, but not necessarily. A bullet piercing a lung, or perhaps the intestines, will not necessarily bring the bird to ground, let alone cause a quick kill.

A significant downside of the rifle's pin-point accuracy is the necessity for accurate aiming. As a general observation, it has been the senior author's experience that people who enjoy shooting, tend to overestimate their skill at hitting small targets. A deviation of just a fraction of a degree can result in a strike several centimeters off the intended target at ranges involved in culling cormorants. Such deviation can be caused by numerous factors, including the natural movements of the birds, of the perch the bird is on (in the case of branches) and the natural movements of the shooter. Telescopic lenses must be calibrated in advance of shooting at intended targets accommodate the exact distance between shooter and target. The normal small but very significant movements of the human body must, in competitive target shooting, be dampened by use of a "bench" (often sand bags are used), weights on the gun's barrel, tying the barrel to a sturdy object and so on. Even the act of

firing the gun can cause the degree of variation that leads to a deviation in aim, thus enhancing the likelihood of wounding. Trained marksmen realize this and seek to control breathing and heartbeat and even the act of squeezing the trigger. This level of precision is simply not practical under field conditions.

Indeed, the ability to fire with the degree of accuracy required to minimize likelihood of wounding is further compromised by the nature of cormorant culling when the birds are overhead, partly obscured by foliage or on nests. Branches moving between the shooter and target may cause distractions, or deflect bullets. It is a practical impossibility for all shooters to fire simultaneously, and observations show that the moment the first shot is fired, the birds take off and fly around erratically, presenting no still, clear targets.

We are not suggesting that because the Ministry of Natural Resources caused such a high level of wounding (approximately 30 percent, with some wounded birds suffering for as long as two weeks before expiring) that it is not possible to reduce wounding rate or the amount of suffering caused by culling. What we are saying is that it would be difficult if not impossible to reduce wounding rate or the amount of suffering caused by culling while at the same time killing the volume of birds required to meet Parks Canada's stated objective on Middle Island within a time frame that would prevent the orphaning of chicks. Stopping to search out and dispatch wounded birds, for example, would reduce suffering compared to that documented at Presqu'ile, but would also significantly reduce the number of birds eliminated within a given time frame. The Ontario Ministry of Natural Resources claims to have done this during culling at Presqu'ile Provincial Park, and there was still a 30 percent wounding rate.

The most humane shooting methodology appears to be that done to obtain a limited number of specimens for stomach contents at Georgian Bay, where one bird was shot, and retrieved, at a time. But that methodology is not suited to culls of significant size.

8.5.4c. **Other shooting-related concerns**: One of the reasons cormorants are so vulnerable to endangerment, as discussed elsewhere in this brief, is their commitment to their nests, eggs and young. This commitment increases from when the birds first begin nest site selection in late March or early April, through incubation and through the earlier stages of caring for the young. During that time frame one or the other, or both, parent birds are in attendance. If shooting begins before this nest site fidelity is well developed, surviving birds will scatter, and will at any rate not necessarily perch where required by the shooters. If shooting lasts too long, it can result in orphaned young, or in the stresses imposed upon single parent birds, and subsequent increased cruelty.

If the birds that are wounded are immediately sought out and euthanized in as humane a manner as possible (one that causes rapid loss of consciousness), the number of birds that can be shot, overall, will fall far below target numbers. If the wounded birds are left for future collection and euthanasia following the day's period of shooting, many will be missed and experience prolonged suffering.

Cormorant plumage lacks the degree of water resistance typically characteristic of many other waterbirds, such as waterfowl, loons and grebes, and this may lead to increased stress in birds who, as a result of being wounded, wind up in the lake, as happened at the Presqu'ile culls. At that point they either drag themselves ashore, to die of hunger, or slowly sink as their plumage absorbs water, to die of hypothermia or drowning.

8.5.4d. **Chicks, Eggs, Egg Oiling, Orphaning**: Birds have well developed brains and nervous systems. They appear to be very sensitive to external stimuli, perhaps more finely attune to such than mammals. However, there is currently no practical way to determine when and to what degree sensitivity to pain occurs in the fetus or neonate.

The public will want Park Canada staff to err on the side of caution, working from the assumption that while suffering is inevitable for any organism capable of suffering, it is morally wrong to be the agent responsible for imposing unnecessary suffering.

Our fear is that egg oiling, if not done with care to determine the degree of development of the egg being oiled, can lead to suffocation of a fully developed chick, and the chick may thus suffer. In recognition of the massive Canada goose egg oiling programme conducted by wildlife managers across North America the Humane Society of the United States (HSUS) has developed a DVD to show managers how to determine whether an air sac is present in the egg, signifying the presence of a developed chick. HSUS recommends oiling only those eggs where air sacs are not present, for humane reasons.

Similarly given the need of hatchlings to have full parental care, we are concerned that the removal of one or both parents can lead to nestlings suffering from the elements or from starvation.

During the Presqu'ile culling, assurances were given that culling would stop when eggs began to hatch. Unfortunately that did not happen, and CDI documented parent birds feeding young while shooting was still in progress, leading to concerns for orphaned young. Indeed, the mere presence of people within the cormorant and heron colony caused the birds to move around in apparent distress, as documented with video by CDI.

8.5.4e. **Ophidiophobia and Phalacrocoraphobia:** The degree of aversion some people express toward cormorants appears to CDI to be so irrational and intense as to resemble a phobia, albeit based on extreme dislike, not fear. We have facetiously named this "phobia", "phalacrocoraphobia" – a hatred of cormorants. Such antipathy is often fueled by wildlife managers across North America wanting to justify lethal actions against the birds.

When wildlife managers seek to reduce antipathy against certain species, the results are often very successful. The OMNR was involved in one such case, encouraging residents to learn to co-habit with native venomous Only two species of venomous snake are native to Ontario. One, the Timber Rattlesnake, has been entirely extirpated from the province, although rumours persist that hobby-herpetologists are seeking to surreptitiously re-introduce the species. The other species, the Massasauga, is endangered, and so listed under provincial and federal legislation.

The challenge to conservationists has been to encourage people, notwithstanding the prevalence of ophidiophobia, to protect the Massasauga. It is a species that occurs in "cottage country" where children, in light summer clothing, are potentially at risk of death, and yet to their credit various conservation and government agencies, including Parks Canada and the Ontario Ministry of Natural Resources, have done a truly splendid job of educating the public, assuaging the irrational nature of some fears and organizing means of assisting people and snakes to co-exist. There is a natural aversion to the snakes, there is validity to the core cause of the fear, and yet through education and a pro-active approach to conservation, including public awareness and education, there has been progress in overcoming the natural aversion such a large percentage of the population feels toward snakes. Even those who cannot suppress a shudder and retreat at the sight of what they know to be a harmless snake species, are known to say that they support protecting snakes, including the Massasauga, as part of the overall environment.

Not only that, but there is a growing awareness that snakes, as predators, form a function within nature, that they are part of the habitats that they inhabit, and that they play an ecological role within the context of the environment overall. It is an uphill battle being fought against a mountain of irrational fear built around a molehill of genuine reason for concern, but it is a battle being fought by conservationists, and must be won if the endangered snakes of Ontario are to be saved, and the commoner species protected against endangerment.

How sadly different is the situation with cormorants. We believe that unlike ophidiophobia, phalacrocoraphobia is not true phobia as psychologically defined. It should therefore be easier to educate people as to the role of the cormorant in nature than is true of snakes, particularly rattlesnakes. But the effort must be made. We believe that if Parks Canada and the Ontario Ministry of Natural Resources were to be more accurate in their portrayal of cormorants, the political pressure to "control" cormorant populations would diminish accordingly.

People can be forgiven for thinking cormorants are an invasive species. Cormorants are a native species. We believe people should be told that since it is true.

People can be forgiven for thinking cormorants are at unprecedented numbers in North America. They are not. We believe that people should be told that latest studies show that cormorants were almost certainly once more abundant than they are now, because it is true.

People can be forgiven for thinking cormorants are at higher numbers in the Great Lakes than ever before. They may or may not be; it is impossible to know. But we believe people should be told that there is evidence for cormorants having been here in significant numbers in the past, because it is true.

People can be forgiven for thinking that cormorants are risking the loss of Carolinian plant or animal species if allowed to nest undisturbed on islands in Lake Erie. But that is not true, and we would prefer that people be told that while it may be possible that some plant species could be lost from one or more of these islands, such changes constantly occur with

or without cormorants, and no species is remotely at risk of extinction because of cormorants. We believe that this should be taught because it is true.

People can be forgiven for thinking that cormorants put native bird or other faunal species at risk. They do not, and people should be told that, because it is true.

People can be forgiven for thinking that there are no social/economical values that can be attributed to cormorants. We would prefer that people be taught that all native species belong and that cormorants are primary predators of alien, invasive fish species such as Alewives, Round Gobies and non-native sticklebacks, and that as predators they may have a function of value to native fish species by selecting against diseased fish.

If people received the same kind of information about cormorants as they do about Massasaugas, they would come to appreciate these birds and see their numbers as indication of health returning to the environment that they inhabit.

People fear what they don't understand, but with understanding often comes appreciation. Many other wildlife species, from loons to Orcas, once feared and vilified, are now appreciated, due to increased familiarity. Many of us already have the good fortune to appreciate cormorants, respect them for what they are, and celebrate their vitality as part of our natural heritage

9.0. Critique of the report prepared for Parks Canada by Aquila Applied Ecologists titled, "Impacts of Double-crested Cormorant (*phalacrocorax auritus*) populations on the biodiversity of islands in western Lake Erie January 2007" (the Aquila Report):

CDI came into possession of this document a month ago. We have examined the report and critique follows the report page by page.

9.1. General Observations of the Aquila Report:

As a response to growing public concern about environmental issues, combined with the legislative requirement for ecological or environmental studies, governments hire companies to conduct assessments and prepare action reports. Often these reports reflect what the client wants, supporting the old adage that he who pays the piper plays the tune.

We do not know what directions the authors of the Aquila report received from Parks Canada, but the report clearly reflects the Parks Canada bias that cormorant populations are unnaturally high and are destroying the ecological integrity of Middle Island and therefore some management actions must be taken. Nowhere in the report do the authors report on the benefits of cormorants and other colonial waterbirds to island habitats.

9.2. Comments on the Abstract (page # 2) of the Aquila Report:

The bias in Aquila Report arises in the very first sentence which reads, "…the impact of cormorants on island vegetation (specifically Middle Island) and ways to mitigate these impacts…". The report does not consider the naturalness of the "impacts" of cormorants.

The authors assume from the very beginning that it is somehow inherently "wrong" for one native species to impact on another native species in a natural environment.

Wildlife management literature referring to Double-crested Cormorants are rife with the term "impact". That such "impact" may be "natural" tends to receive scant attention. The Aquiala Report is no different. While Parks Canada and the Aquila authors acknowledge that cormorants are native, both claim that the size of the cormorant population on Middle Island and in Lake Erie is unnaturally high as a result of anthropogenic activities.

9.2.1 **Cormorant impacts in addition to human disturbance:** Sentence #4 of the first paragraph of the Abstract (pg # 2) states: "In ecozones where vegetation cover has been fragmented and isolated by humans, the additional effect of cormorant nesting may permanently eradicate high valued habitats."

We agree that fragmentation of habitat by humans can leave plant and animal species vulnerable to endangerment, extirpation or extinction. In fact, human activity has been the primary cause for most species at risk. Human activity allowed certain plants to survive on Middle Island. Human activities, such as the building of the pond, buildings and runways, destroyed plant communities. When human activity no longer impacted Middle Island, successional plant and animal communities developed. These too will disappear as the island habitat evolves.

Human activity in the form of a cormorant cull will impact the island ecology in much the same way as did the activities of Middle Island residents decades earlier. The Aquila Report and Parks Canada reflect the same arrogance of most wildlife managers – that certain native wildlife populations are out of control and are destroying ecological integrity.

Island habitats in the Carolinian ecozone should be highly valued, but not as contrivances designed to maintain a subjectively appealing mix of species. Island habitats should be protected in order to preserve what is naturally there and allow natural processes to occur unimpeded. We ask Parks Canada the same question we asked the Ontario Ministry of Natural Resources: If cormorants cannot nest in parks and protected areas, what nesting sites are acceptable?

9.2.2. **Highly valued island vegetation:** In the same paragraph (pg # 2), the Aquila Report goes on to say, "One example [of a highly valued habitat] is the Carolinian vegetation on islands in western Lake Erie, which harbours unique communities, including many threatened plant and animal species."

All islands, no matter the degree or lack thereof of human contrivance in determining the suite of species of plants or animals that live on them, are "unique". Some of the flora and fauna of Middle Island are there because of human endeavour. For example, the internal pond, which was constructed by the inhabitants to protect their boats from the open waters of Lake Erie, have provided habitat for plants dependant on wet conditions. Are these plants naturally occuring? Is this prime, ecologically sensitive Carolinian habitat? Are

these naturally occuring unique communities? Or are they there as a result of human contrivance?

The “unique communities” of flora and fauna have developed largely because of human interference including the introduction of various plant species, the development of open areas, such as the air-strip and the creation of a pond that allows wetland species of plant. In fact, CDI asserts that the entire flora and fauna community on Middle Island is contrived, since human activities and persecution removed cormorants from this ecosystem well over 100 years ago.

The anthropogenic change on Middle Island has rendered the island far more receptive to a greater variety of plant species than would have been the case in the absence of such influence.

However, islands invariably have a reduced fauna compared to natural adjoining mainland areas. The mix of species changes as mainland faunal species, particularly those that can fly, swim, cross ice or float on debris to reach islands. Some survive, others do not, with the mix of species and numbers of individuals varying through time.

The same applies to plant species. Islands invariably have fewer plant species than natural adjoining undisturbed mainland areas. But mainland floral species, particularly those that disperse via wind, water, bird gullets, or attached to mud on birds’ feet or plumage, will reach islands from time to time. Again, some to survive, others not, with the mix of species and numbers of individuals varying through time.

With the exception of the Lake Erie Watersnake, none of the fauna or flora is endemic, and even the watersnake is endemic to the archipelago, not any one island. However, survival of the Lake Erie Watersnake clearly depends on it being protected wherever it occurs. Again cormorants are not a threat.

The statement that there are “many threatened plant and animal species” on Middle Island is simply wrong, and serves to mislead the reader.

All of southern Ontario is “Carolinian”, or at least transitional, with the contiguous forest that once covered southwestern Ontario designated as southern Great Lakes Forest, blending into the Eastern Great Lakes Lowland Forests to the north and northeast, and the Allegheny Highlands Forests to the east, on the American side of Lakes Erie and Ontario. (see, for example, Grady, Wayne, *The Great Lakes, The Natural History of a Changing Region*, Greystone Books, 2007.)

What was left following the deforestation of southwestern Ontario were woodland remnants, characterized by a small suite of tree species whose respective ranges come to an end in Ontario. The protection of those remnant “Carolinian” trees and woodlots are talked about to the exclusion of other natural “Carolinian” habitats that also existed prior to the deforestation and have also been greatly destroyed or fragmented. These include wetlands,

prairies, fields, bogs, white cedar stands, shorelines, dunes, creeks, and shingle beaches and estuaries.

If we include southern Ontario within the overall "Carolinian zone" in North America, we find that the only Great Lakes within that zone are Lakes Michigan (part of one shore), all of Lake Erie, and most of Lake Ontario. Other landforms found within that region are islands. Since the islands are Carolinian, so are the animals and plants that live on them.

If a non-native species, such as Garlic Mustard, poses a significant hazard to a native species, it may be valid to say that the Carolinian habitat is being compromised, and reduction or elimination of the non-native species is justified. But if native species, such as the Red Fox or the Double-crested Cormorant, pose a significant hazard to another native species, it is not accurate to say that the nature of the Carolinian habitat is compromised.

Sugar Maples and American Beech trees grow in but are not exclusive to "Carolinian" forests. They are capable of forming a nearly closed crown canopy that, in turn, compromises the ability of other plants, which may be exclusively Carolinian, from growing. We do not advocate cutting down mature American Beech or Sugar Maples in order to enhance survival of more narrowly defined Carolinian species. We do not believe that Parks Canada would advocate such action either. Indeed, we would argue that the nature of the forest would, by virtue of such destruction of native species, reduce, not enhance its naturally "Carolinian" nature.

In the same way that Sugar Maples and American Beech impact other Carolinian flora and fauna, so do cormorants, similarly impacting the ability of other species from occurring in a given location. Still Parks Canada argues that cormorants are to be controlled while the impacts of Maples and Beech are acceptable. Cormorants do not change the "Carolinian" nature of the site, and so remedial action, according to Parks Canada's own guidelines, is not justified. This would be true even if a native species increased its presence as a function of range expansion, since ranges are not static, and populations expand and contract, particularly in times of climate change.

Middle Island unmanaged is every bit as unique as the island envisioned by Parks Canada and is much more natural, as the term is generally accepted and reflected in Parks Canada's own guidelines.

9.2.3. **Impacts of an expanding cormorant population:** In the second paragraph (pg # 2), the Aquila Report states, "As a result of reduced human persecution, a ban on organochlorine pesticides, and enhanced breeding and overwinter survival due to an abundant food supply, expanding cormorant nesting colonies are destroying island vegetation in some areas."

The above quotation reflects the kind of biased thinking that fuels antipathy against cormorants, and reflects conclusions derived from flawed wildlife management papers. "Human persecution" has been directed against cormorants and other wildlife species around the world. As our earlier evidence shows, Double-crested Cormorants were subjected to human persecution that was greater in magnitude than is now widely realized.

Persecution, combined with the impacts of pollutants, essentially extirpated cormorants from the Great Lakes region as a breeding species for over a century and resulted in massive ecological change.

Given that such abundant eastern North American species such as the Eskimo Curlew, Passenger Pigeon, Heath Hen and Carolina Parakeet, were exterminated, and far more species of wildlife, including such large birds as the Canada Goose and the Trumpeter Swan, were endangered, it is not surprising that the Double-crested Cormorants would be wiped out, as well. Human persecution against cormorants did not begin in the 20th century, but was far more rampant and deadly in previous centuries, and by the time oganochlorine pesticides entered the picture, cormorants were just starting to recover.

The reference to "overwinter survival due to an abundant food supply" is, of course, an allusion to aquaculture and the belief that in some way the relatively new presence of aquaculture has meant that wintering birds who would otherwise starve now live, thus increasing the number of birds returning to breeding grounds. Apart from the lack of records of numbers of starving cormorants on the wintering grounds prior to the massive development of aquaculture in the region, as stated previously the contention fails to explain why, then, there were greater numbers of cormorants before that aquaculture existed, as indicated in Wires and Cuthbert, 2006.

9.2.4. **Middle Island plant community**: On page 3, in the last paragraph of this section we see the same unquestioning acceptance of the concept that the plant community on Middle Island is "special". In a very real way, the plants on Middle Island are no more special than plants in a garden in that both exist as a result of various human activities. These would include not only the physical contrivance of habitat on the island such as the air strip and the wetland but also on the 19th and earlier century removal of nesting colonial birds, almost certainly including the cormorant. Those "special" plant species would not naturally occur but are dependant on human intervention, such as the digging of a pond and the building of an airstrip. In order to make them seem special, Parks Canada must minimize or deny the effects of anthropogenic interference. That is a political tact and is not reflective of scientific process.

9.2.5. **Impacts on vegetation**: In the same paragraph (pg # 3) it is stated, "If no action is taken then it is predicted that within 3 – 7 years vegetation on these islands will become dry, degraded and scrubby, losing its original ecological value."

The term "degraded" reflects a subjective value judgment of the Aquila authors. Scientifically or ecologically speaking, cormorants do not "degrade" the natural environment. They nest in large colonies and change the nature of the landscape, as do other natural forces. Cormorant colonies on islands in lakes are natural and whatever derives from them is natural. There is no ecological "value" in favouring one species over another. We can enhance the likelihood of there being Eastern Bluebirds or Carolina Wrens or Yellow-breasted Chats in Point Pelee National Park by significantly reducing the number of Sharp-shinned Hawks migrating through the park. But modern ecology recognizes the roles of all the species, including those who, by virtue of their presence, reduce the

population sizes of others. There is now a tolerance for Sharp-shinnned Hawks that we intend to create for Double-crested Cormorants. Killing cormorants in a national park and artificially reducing their numbers is degrading to the ecosystem, and to the natural processes that would otherwise unfold.

9.2.6. **Active public education programme:** Finally, in the same paragraph, we read, as we do elsewhere in the Aquila report, that it is "imperative" that "an active public education campaign be prepared in advance of management efforts".

It is our assertion that the "public education campaign" is meant to vilify cormorants because it is the only way for wildlife managers and Parks Canada staff to justify to the public such destructive management interventions as culling. Parks Canada should take the opportunity to educate the park visitors about cormorants and waterbird colonies and celebrate the return of a species that survived human persecution and pollution.

9.3. **Comments on the introduction and background of the Aquila Report (pgs # 3 to # 9).**

The opening sentence states, "When animal populations become super abundant due to their opportunistic use of anthropogenic modifications to the environment, intervention may sometimes be necessary to reduce their populations to prevent economic damage or reductions to biodiversity."

Again, this statement demonstrates a bias against the cormorants. The authors state that the population is hyperabundant without any scientific justification. At the same time, they later cite the Wires and Cuthbert 2006 paper which they say shows that cormorants "…have simply rebounded to historical levels…" The Wires and Cuthbert paper actually shows that current cormorant populations have yet to reach historical levels. This part of the Aquila report is very important because is shows that the Aquila authors accept Wires and Cuthbert research. It presents the Aquila authors with a dilemma because if cormorants are rebounding, they cannot be hyperabundant, as defined by Parks Canada. So they attempt to dismiss this problem by stating, "Regardless of whether the population rebound is anthropogenic or natural, conflicts have arisen in the Great Lakes and elsewhere in relation to rapidly expanding populations of cormorants…" Therefore, the Aquila paper justifies cormorant control based on conflict issues, not on "hyperabundance". The paper removes the very justification Parks Canada has used to vilify the birds and justify proposed management actions.

9.3.1. **The sentence at the top of page 4, reads, "Fauna and flora on small, isolated islands are particularly vulnerable to stochastic events and subsequent extinction (e.g., Kirk and Racey 1992)."**

The assertion made by the Aquila authors, based on the Kirk and Racey study of 1992 is very seriously flawed. The Aquila authors infer that cormorants play the similar negative role on Middle Island as do Black-naped Hares on the Seychelles Islands.

We challenge this inference, because although the island in question is, like Middle Island, part of an archipelago, little else is similar. The differences are as follows:

- The Seychelles Islands are located in the Indian Ocean. The Lake Erie Islands are located in Lake Erie.

- The nearest continental land mass to the Seychelles, Kenya, is located about 16,000 kilometers away. The nearest continental land mass to the Lake Erie Islands, Canada, is located about 25 kilometers away.

- The Seychelles Islands are surrounded by salt water. The Lake Erie Islands are surrounded by fresh water.

- There are 115 (the number most often cited) to 155 (according to the Constitution of the Republic of Seychelles) islands in the Seychelles. There are 27 Lake Erie Islands.

- There are about 75 plant species endemic to the Seychelles. There are no plant species endemic to the Lake Erie Islands.

- The first scientific inventory of flora and fauna in the Seychelles occurred in 1768, about 240 years ago. It appears the first comparable effort on Middle Island did not occur until the early 20th century, about 100 years ago.

- There are 12 to 15 (depending on source and issues of nomenclature and taxonomy) endemic species of birds found in the Seychelles. There are not only no endemic species of birds found in the Lake Erie Islands, there are no species of birds endemic to any of the states or provinces adjoining any of the Great Lakes, even if one includes the states and provinces that adjoin them, with singular exception of the Kirtland's Warbler, whose breeding population is endemic to Michigan and recently to a small part of Ontario.

- There are two endemic species of mammals (both bats) on the Seychelles. There are no endemic species of mammal on the Lake Erie Islands nor are there any species of mammals endemic to any of the states or provinces adjoining the Great Lakes.

- There are 11 endemic species of amphibian in the Seychelles. There are no endemic species of amphibian in the Lake Erie Islands.

- There are two endemic species of snakes in the Seychelles. There are no endemic species of snakes in the Lake Erie Islands, although there is an endemic subspecies of a widely distributed snake in the Lake Erie Islands – the sole example of endemism in the Lake Erie Islands.

- The Seychelles, as islands, date back to the break-up of the original continental mass that joined Africa and Asia, about 110 million years ago. The Lake Erie Islands date back to the last retreat of the glaciers about 10,000 years ago.

- The Seychelles, since their origins, have never been connected to any mainland. The Lake Erie Islands have, since their origins, been connected, often annually, to the mainland by ice sheets navigable to terrestrial mammals.

- There are numerous insect species and other invertebrates endemic to the Seychelles, and scientists believe many more species await discovery. There are no endemic insect or other invertebrate species endemic to the Lake Erie Islands, and very little likelihood of a new species being discovered on the islands.

- There are many introduced species of fauna on the Seychelles, including 10 species of birds, and including rats and monkeys, both notoriously hazardous to nesting birds. Rats could occur on Middle Island, and Fox Squirrels and Raccoons have apparently been there in the past, and possibly some introduced bird species (Rock Pigeon, House Sparrow, Common Starling) could reach Middle Island from time to time, but there is nothing like the suite of introduced species to be found in the Seychelles.

- The Seychelles are surrounded by open seas. The Lake Erie Islands are in the heart of a continent.

In addition, we challenge the inference that the impact of the Black-naped Hare and the Double-crested Cormorant is comparable. The challenge is based on the following:

- The Black-naped Hare is a mammal. The Double-crested Cormorant is a bird.

- The Black-naped Hare is native to southern India and Sri Lanka. It has been introduced into Java, Mauritius, and the Seychelles. Thus, its nearest place of origin would be Sri Lanka, a few thousand kilometers away. The Black-naped Hare could not conceivably reach the Seychelles without human intervention. This species has been introduced elsewhere. The Double-crested Cormorant is native to most of North America, including the Great Lakes.

The Aquila authors have used the Kirk and Racey paper presumably to try to muddy the waters by confusing two very different situations. What Kirk and Racey meant by “small, isolated islands”, were distant islands in oceanic waters, particularly in tropical and subtropical regions, where, because of their extreme isolation, high rates of endemism as defined below, can and do occur.

Endemism occurs in regions where populations of fauna and flora have been separated from founding stock for a very long time. Each "divergence" from the founding stock ultimately becomes two distinct forms.

Endemism is more common on tropical islands than on islands in temperate zones and is more common in temperate zones than in polar zones. Thus, cool temperate islands, like the Lake Erie Islands, have less likelihood of endemism than do islands in warmer climes.

Endemism, particularly at the subspecific level, is more common on large coastal islands than on islands in lakes, rivers or inland waterways, especially in the absence of other geographic isolating mechanisms, such as high mountain ranges. For example, there are some endemic subspecies of birds on the Queen Charlotte Islands, on Newfoundland and on an island off the coast of California.

A species is a population of organisms that tend more to breed with each other, and produce viable offspring, than with other organisms. The individuals within a species tend to resemble each other physiologically, behaviourally and genetically than they resemble other equally distinguishable populations. Subspecies show the early stages of this process but have yet to become as separated as species, thus will randomly interbreed with other subspecies as opportunity provides and produce viable offspring that will be intergrades between the two parental types. The Lake Erie Watersnake perfectly fits this description, which is why it is so important in terms of "biodiversity". What isolates it from the nearest, very similar forms found on the mainland, is water. But water is not an impermeable barrier to any race of the Northern Watersnake. However, the distance that separates the islands from the mainland guarantees very little gene flow will occur between the Lake Erie Watersnake and its mainland relatives. Perhaps even more significant is the increasing rareness of the mainland watersnake, which decreases the probability of mainland snakes reaching the islands.

This situation is in no way analogous to the situation in the Seychelles. The Kirk and Racey 1992 paper examines the effect of rabbits eating vegetation on which endemic species of birds are entirely dependent. There are absolutely no bird species ever recorded from any of the Lake Erie Islands that have that level of dependency on any species of plant found on those islands. If every native and exotic plant species ever recorded on Middle Island were suddenly to go extinct not a single species of bird would follow suit, and indeed, while such loss would be terrible, it is doubtful if a single species of bird (not just on Middle Island, but anywhere) would even experience a decline. In fact, such loss would result in the extinction of no vertebrate species at all.

But the species of concern on Middle Island is the snake, and we would be concerned if it could be demonstrated that the cormorants pose a threat to the existence the Lake Erie Watersnake on Middle, East Sister, or any other Lake Erie Island, said islands constituting its entire range. Not only have we seen no evidence to support such a fear, we think it equally likely that the presence of large numbers of colonial waterbirds, and their ability to transfer organic energy sources to the land, may well benefit the snake. Ironically, if any of the "new" colonial breeding species nesting on Middle Island threaten the snake, it would

be the herons, night-herons and egrets that eat snakes and compete with the snakes for food. Cormorants do neither.

Before leaving this subject we must observe one other difference between the Seychelles and the Lake Erie Islands: Several of the Seychelles are famous among naturalists for hosting some of the largest colonial bird assemblies in the world, of far more species than occur in the Great Lakes, and including populations of some species numbering in the tens of thousands; they are cherished and protected.

9.3.2. **Introduction: 1.1 Size and trends of cormorant populations within the Great Lakes with a focus on western Lake Erie:**

The 100 percent discrepancy between the minimum and maximum Double-crested Cormorant population size estimate for North America (one to two million) by the U.S. Fish and Wildlife Service illustrates how little is actually known about their population size. The Aquila Report states that "Between 1972 – 2005, the average annual growth rate [of Double-crested Cormorants] on Lake Erie was 23%...with an increase of about 25% since 2000. Between 1979 – 2000 the lake-wide cormorant population increased 150-fold."

When our statistician uses the numbers provided in the Aquila Report, he shows a 77-fold increase, not 150-fold as set out in the following table:

1979	1.00		1985	3.46		1991	11.99		1997	41.52
1980	1.23		1986	4.26		1992	14.75		1998	51.07
1981	1.51		1987	5.24		1993	18.14		1999	62.82
1982	1.86		1988	6.44		1994	22.31		2000	77.27
1983	2/29		1989	7.93		1995	27.45			
1984	2.82		1990	9.75		1996	33.76			

We are not really concerned which statistic is correct, as rapid growth is normal both to species that are establishing themselves in new regions, as Parks Canada apparently believes, or re-establishing themselves in regions from which they were formerly extirpated, as CDI believes.

In fact, as mentioned above, evidence shows that the cormorant population growth is leveling off in the Great Lakes. As the OMNR's *Review of the Status and Management of Double-crested Cormorants in Ontario 2006* states, "Throughout the 1990s cormorant populations continued to increase across the Great Lakes and expand into previously unoccupied areas including some inland lakes. The highest recorded cormorant populations in the history of the Great Lakes were recorded during the late 1990s and early 2000s (Weseloh *et al*. 1995, 2002, Wires and Cuthbert 2006). Over the past five years some regions of the Great Lakes have begun to show signs that cormorant populations are levelling off. Some areas of the Great Lakes basin have experienced significant decreases in cormorant numbers over the past five years, which may suggest that a new biological carrying capacity is being reached (OMNR unpublished data, 2005, Weseloh *et al*.

2006)." Of course apart from the Leslie Street Spit, which has only existed for about half a century, we cannot really know that areas where there are cormorants were "previously unoccupied including some inland lakes." McIlwraith specifies "inland lakes" for breeding cormorants in Ontario, but he does not state which ones.

9.3.3. **Introduction – Section 1.2: Factors contributing to increased cormorant populations:**

The first sentence of this section reads: "Previously human persecution, largely to reduce conflicts with fisheries, kept cormorant numbers relatively low, especially in the nineteenth century."

There is a long, dark history of vilification of cormorants. The slaughter of wildlife from the 18th through the early 20th century in North America was vast, with enormous impacts on a wide spectrum of species. While we have found little or no indication that cormorants were shot for meat or feathers, we believe that because they assembled in large numbers, they were easy to slaughter in large numbers.

What made cormorants so vulnerable is a characteristic shared with other species that experienced similar depletions: their inability to escape gunfire. A classic example of a characteristic Carolinian bird species would be the Carolina Parakeet. On April 8, 1834, explorer John K. Townsend wrote about the parakeets, saying, "They seemed entirely unsuspicious of danger, and after being fired at only huddled closer together, as if to obtain protection from each other, and as their companions are falling all around them, they curve down their necks and look at them fluttering upon the ground, as though perfectly at a loss to account for so unusual an occurrence…" (*Hope is the Thing With Feathers: A Personal Chronicle of Vanished Birds*, by Christopher Cokinos; Jeremy P. Tarcher/Putnam. 2000).

These historical accounts bear a resemblance to the notes of CDI member Rob Laidlaw, who watched the killing of cormorants at Presqu'ile Provincial Park, in 2006: "When the cormorants have eggs, or newly hatched young they would make sure that one or the other, if not both, was always in attendance at the nest. We would watch as volleys of shot were fired, causing chaos as cormorants and herons and gulls and terns all flew up and around in fear and confusion, while those cormorants who were hit would fall to the ground or water, or hang from the nest or tree branches, some dead, others wounded. But then the survivors would eventually return. Several times we saw and photographed one cormorant of a pair attending the nest while the mate's dead body hung from the same nest, tangled up in the sticks or rotting on top of the nest."

The American Onithologists' Union (AOU) report indicates that when cormorants are removed from areas particularly suitable to them are culled, other birds from less optimal regions move in, giving the impression that the cull has not reduced local numbers, leading to more killing. And so by particularly killing the birds in optimal regions, earlier cormorant persecutors, lacking any legal or other restraints, could (and obviously did) significantly reduce or eliminate entire populations.

In the same section, the Aquila Report lists "four main events" that contributed to "the recovery of cormorant populations". We certainly agree with the first two: banning of organochlorine pesticides and the reduced persecution following legal protection.

But, as indicated above, we have serious concerns about the second two events: the changes in fish populations in the Great Lakes advantageous to cormorants and the catfish farm agricultural food subsidy. We agree that there have been vast changes to fish populations in the Great Lakes in the last century and that cormorants particularly avail themselves of two invasive species, the Alewife and the Round Goby. However, we do not believe that the Aquila Report and other papers have demonstrated that the overall carrying capacity of the Great Lakes has increased for cormorants given the impacts of the commercial fishery, shoreline habitat destruction and massive technological development. We argue that an examination of existing records show that, in absolute terms, fish biomass in the Great Lakes was far greater two hundred years ago than now, sufficient to maintain cormorant populations at current or higher levels.

Evidence presented by Wires and Cuthbert, 2006, does not support the statement "(mostly) catfish aquaculture in the southern U.S." produces a higher carrying capacity for wintering cormorants than was true historically. Instead they show that the evidence clearly indicates that there were more, not fewer, cormorants "historically" than there are currently. If, as appears to be the case, the interior population's growth rate has peaked (always excepting the population's response to lethal culling – as the top of the growth curve is removed via "management", compensatory mortality will lead to increased growth rate of the surviving population) the current carrying capacity of the continent for this population is now less than it was historically, based on best information available, as presented by Wires and Cuthbert, 2006.

9.4. **Section 2 - Effects of cormorant nesting on vegetation and fauna.**

9.4.1. **General effects of cormorant nesting on vegetation:** In the first paragraph, top of page 10, the Aquila Report states that "Damage to these islands [Lake Erie Islands] by cormorants may irrevocably and completely remove unique vegetation and associated fauna; some of the plant species occur nowhere else in Canada."

This statement is incorrect and typical of the bias that permeates both the Aquila Report, and comments made by Parks Canada. Clustered Sedge is the only plant that Parks Canada claims grows on Middle Island and nowhere else in Canada. If this is the case, Parks Canada has no recovery plan in place except to kill cormorants. There is no reason to assume cormorants would cause its loss. Nor does Parks Canada provide any proof to the contrary. There is also no reason to assume it would remain on Middle Island given the evolving nature of the ecosystem. (See above for more information on Cluster Sedge.)

When Middle Island was first incorporated into the National Parks, then Minister of Canadian Heritage, the Honourable Sheila Copps wrote, "By adding Middle Island to Point Pelee National Park of Canada, we are not only expanding the boundaries of one of Canada's national parks but we are ensuring that Middle Island's fragile habitat and its

significant heritage values will be protected in perpetuity." That quotation ironically occurs on a website that is illustrated by a wonderful photograph of the island showing hundreds of cormorants, with the caption, "Now a wildlife refuge…owned by the Canadian Nature Conservancy, Middle Island is 7 miles due east of Middle Bass, and is the southernmost point in Canada. The island is home to a wide variety of birds in large numbers, and the picture shows cormorants with a few herons also visible."
(http://www.middlebass2.org/Middle_Island_1999.shtml)

We are interested to note that the signatories on the press release, aside from Catherine Gagnaire, the Press Secretary for the Minister of Canadian Heritage, were Marian Stranak, Superintendent, Point Pelee National Park of Canada, Parks Canada and a proponent of cormorant reduction on Middle Island, and Jane Lawton, Director, Corporate Marketing & Communications, Nature Conservancy of Canada, one of the agencies now supporting the cull. Both staff at Parks Canada and the Nature Conservancy knew that there was a robust waterbird colony on the island, and that it included Double-crested Cormorants. Middle Island was purchased to protect its ecosystem in its entirety.

Now Parks Canada staff advocate for the drastic reduction in the number of cormorants on Middle Island. Again they do so by ignoring the Wires and Cuthbert findings that cormorant populations in the past were equal to and more likely greater than they are today by continuing to argue that there are "too many" cormorants as a result of anthropogenic causes. The Aquila Report has dutifully followed suit, seeking to find means to justify its client's views. But, as we have shown throughout this brief, the evidence indicates that cormorant numbers are natural; it is a "fragile" species by any definition, and one dependent on the very ecosystem that the Honourable Sheila Copps was so justifiably proud to see added to our National Parks system.

If the Double-crested Cormorant's native range had been, like that of the Passenger Pigeon, the Heath Hen, the Carolina Parakeet or the Labrador Duck, restricted to eastern North America, it might well be extinct by now. It was and is vulnerable. We understand that to some people cormorants are ugly and trees are pretty, but these are value judgments that should not influence national parks management or trump Parks Canada's own quite valid guidelines.

Also on Page 10, the Aquila Report states, "Although Great Blue Herons usually nest highest in trees, they appear to have far less effects on vegetation than cormorants."

In fact, Great Blue Herons often tend preferentially to nest in trees that are dying, either from having reached their lifespan or as a result of flooding, choosing upper branches that are relatively free of foliage. With their long legs and large wingspread herons require maneuverability, and probably the enhanced sight-lines of thinned out foliage also serve their needs. Dead branches are easier to access for nesting materials. Wherever their ranges overlap Great Blue Herons often co-habit with Double-crested Cormorants, and, where they occur, other species of colonial waterbird occur, such as Black-crowned Night-Herons, egrets, ibises, spoonbills and pelicans.

For all the countless millennia preceding the profession of wildlife management these native species of flora and fauna co-evolved. However, Parks Canada staff claim to know more about the mix of colonial waterbirds than the birds themselves. They intend to reduce the number of nesting cormorant pairs from just below 5000 to 1200 to create a better balance in numbers among the various nesting species.

On page 11, there is a reference to what is done to trees in Australia by cormorants. But if either the Aquila authors or Parks Canada bothered to investigate, they would find that cormorants in Australia face the same bias and are subjected to the same misinformation as cormorants in North America.

On page 12, a reference is made to the culling of cormorants to, of course, "reduce damage on…unique island habitats." The Aquila authors fail to acknowledge that this type of cull does not work in the long run. Only a continent-wide slaughter, such as is supported by the US Department of Agriculture (USDA), will achieve the objective of making cormorant-friendly habitats free of cormorants.

On page 13, the Aquila authors point out that the U.S. culled cormorants on West Sister Island in 2006. The actions by American governments, the Ontario Ministry of Natural Resources and Parks Canada and an answer that all refuse to give is if not on High Bluff, Middles, East Sister, West Sister, Little Galloo, then where is it acceptable for these birds to nest?

Also on page 13, we see another manifestation of the bias inherent to Parks Canada's attitude and its reflection in the Aquila Report. The latter states that vegetation has been "severely affected" by cormorants, and that on Middle Island the understory "changed radically" as a result of cormorants. The Aquila authors and Parks Canada staff fail to acknowledge that cormorants were "severely affected" by persecution causing radical change to the vegetation on prime cormorant habitat in the Great Lakes. Natural changes are not the problem, persecution is. The language in the Aquila Report and in presentations by Parks Canada vilify cormorants and feed into the attitude that drives the persecution of these birds.

Also on Page 13, reference is made to the changes in the understory, from a "relatively diverse herbaceous layer dominated by Woolly Sweet Cicely" to a simpler one dominated by Lamb's Quarters, Garlic Mustard and Pokeweed. The Aquila report infers that cormorants, by reducing other species, open the path for the invasive Lamb's Quarters and Garlic Mustard that would otherwise be out-competed by the relatively diverse herbaceous layer of native species. But, as one can see by visiting woodlots in the Southern Great Lakes Forests not readily, or at all, accessible to cormorants, Garlic Mustard and other invasive species are prevalent in the woodland understory. They do not need cormorants to help them spread. "Garlic mustard invades sites independent of presence or cover of native species, and species-rich sites are more likely to be invaded than species-poor sites…Once established, *A. petiolata* becomes a permanent member of the community, steadily increasing in presence but with large annual fluctuations in cover and density." (http://www.invasive.org/eastern/biocontrol/29/GarlicMustard.html).

In Eurasia, where it is native, there is a suite of natural predators and diseases of Garlic Mustard that are not found in North America. Its spread in North America has coincidentally corresponded with the latter stages of the return of cormorants to the Great Lakes, but the effects of Garlic Mustard are not natural and are widespread across the landscape in regions where cormorants are absent. With or without cormorants, Garlic Mustard will severely impact the vegetation of Middle and other islands, and woodlots on the Lake Erie Islands and other habitats within the newly established and rapidly expanding range.

9.4.2. **The state of vegetation on Middle Island:** The Aquila authors state in the first paragraph, "A strict quantitative comparison between surveys (e.g., pre- and post colonization by cormorants) is not valid because of variability in coverage of the islands (most surveys were informal `walk-about' transects.")." Despite this statement, the authors go on to say that the number of plant species on Middle Island increased from 213 in 1982 to 258 in 1995, corresponding with the increase in numbers of Double-crested Cormorants, a questionable conclusion by their own account.

In fact, the authors note that some species once recorded have not been found since and others newly discovered. In 2000, a hitherto overlooked, or absent, borage, the Big-seeded Scorpion Grass, was found. It is a widely distributed, easily overlooked, cultivatable species that, at any rate, would not appear to be at any particular risks from cormorants.

The Aquila Report states that, "Four forest types occur on Middle Island, all variations of Hackberry forest…". This degree of micro-division of what is a very small land area is absurd given the dynamic nature of the environment, and the successional changes inherent to the species named. For example, the *Fraxinus* ashes are classically early-successional tree species, often the first woody broadleaf trees to dominate a grassland or meadow. But in a hundred years the meadow will no longer be a meadow, and there will be other tree species slowly replacing the surviving ash trees. Add alien invaders, such as Garlic Mustard and the Emerald Ash-borer, and there will be still other changes. Throw in some climate warming, severe winter storms, or the return of a once eliminated species of flora or fauna, and it will be different yet again. The only thing that can be said with certainty is that it will not continue to remain the same as it appears during any given visit.

From an objective perspective there is no one more or less valuable species, but from a political perspective there may be. For example, the Blue Ash (F. quadrangulata), is valued for its rarity in Ontario although it is common in western Ohio. It is not necessary to shoot animals, but it might be necessary to provide protection from invasive insect species, to protect such a species.

9.4.3 **Hackberry forest:** The fact that the hackberry forest of Middle Island "has a well-developed herb layer", that includes the invasive and alien Garlic Mustard, threatens the current flora composition of the forest. But, as we have indicated, even in the absence of Garlic Mustard, the floral composition of any part of Middle Island, including the hackberry forest, will change through time.

Like Parks Canada, but unlike the Natural Heritage Information Centre and other conservationists, the Aquila report places importance on the Clustered Sedge because it "occurs nowhere else in Canada." Apart from the fact that it may well occur elsewhere in Canada and is common to the south, there is no reason to think that it exists "naturally" on Middle Island, as opposed to being there as a result of anthropogenic change (elimination of cormorants, development of open areas). There is, as indicated above, also no reason to assume that its continuation on Middle Island is threatened by cormorants since it does not grow where they are. In addition, it is globally secure, grows in disturbed soil, and thus is not a priority for the province. Finally, if its presence is deemed important enough to resort to massive interference, there are more expeditious methods open than killing native wildlife.

9.4.4. **Hackberry-Kentucky Coffee-tree-Chinquapin Oak vegetation:** On page 22 of this section, the Aquila Report states that, "As the area of savannah type vegetation regenerates into forest, it may become more important from a biodiversity perspective; it was likely previously forested but soils are shallow so regeneration has been slow."

Again both Parks Canada and the Aquila authors make the mistake in assuming that "biodiversity" is served simply by maximizing numbers of species found in any given location. By their nature small areas of savannah tends to be transitional and ephemeral where biodiversity is constantly changing. Fire suppression, commonly practiced as a management strategy, leads to accelerated loss of savannahs. In fact, there may be fewer species in later successional stages than are found in the savannah, but we doubt that Parks Canada would argue that biodiversity is being impaired.

If the slowness of regeneration is an issue, Parks Canada can intervene and augment and deepen the soil. This would be no more or less invasive than using fire-arms, boats, egg-clogging oil and other methods of reducing cormorant numbers.

The section concludes, "Although the density of cormorant nests is quite low in this vegetation type, if the large Kentucky Coffee-trees are killed will have an adverse effect on the ecological value of this area." That would be true if, for some ecologically valid reason, Kentucky Coffee-trees had greater value than the bird colonies. But there is no such greater value. There is nothing inherent to a population of trees that is "better" or more "valuable" than a bird colony. Throughout North America large colonies of nesting cormorants are rarer, and more restricted, than are Kentucky Coffee-trees.

9.4.5. **Bedrock Open Beach/Bar:** In this section, the Aquila Report reads that "Recently, much research has been undertaken to assess damage on Middle and East Sister Island from cormorants." Here, again, we see the inherent bias. When plants colonize they produce "change". When cormorants colonize the create "damage". Successional change through maturation of woody vegetation is seen as normal, but the restoration of cormorants whose excrement, initially, kills vegetation, is seen as something requiring intervention.

9.4.6. **Predicted effects of cormorant nesting on Middle Island vegetation:** The first sentence of this section of the Aquila Report reads that "Critical management questions include:

which vegetation types are currently most degraded; what is the relationship between cormorant nesting density and vegetation impacts, and what will happen if the cormorant population increases and/or the spatial distribution of the colony changes?"

We can categorically say that the current species, their numbers and composition of flora and fauna never occurred historically, as they occur now. To the degree that any species of fauna and flora cannot survive the robust presence of waterbird colonies, we assert that those species were probably reduced or absent prior to recent times. Some of the species of flora or fauna now found on Middle Island are sensitive to extreme cold. Those species would also have been reduced or absent from Middle Island historically.

On what basis does Parks Canada protect one native species of fauna and flora by persecuting another? None of the floral or faunal species are threatened with extinction or extirpation in a major part of their range. Yet Parks Canada continues to foster antipathy toward cormorants because the effects of cormorants on others are widespread.

On page 27, the Aquila Report states that "Weseloh and Brown (1971) found a 46% reduction in plant density in a heron rookery in Minnesota; they found significant reductions of American Germander, Star-flowered Solomon's Seal *Smilacina stellata* and Spotted Touch-me-not."

We have never doubted that this happens. Nature is filled with examples of plant depletions resulting from natural activities. One of the most dramatic examples is lava flow, which has reduced the carrying capacity of an environment for various species to zero. But in all such instances, the effect does not last. When Mount St. Helen's massively erupted in 1980, all life over vast areas was destroyed. But the incident gave scientists an excellent chance to study the recovery period, and in doing so they discovered that many of their preconceptions were simply wrong. They discovered that fauna played a significant role in enhancing the once sterile soil's ability to support flora. The recovery of Spirit Lake was particularly and unexpectedly rapid. Areas completely covered with lava and ash now, once more, host a suite of amphibian species.

Nature works when it is allowed to do so. Whatever situation in the soil derives from the presence of guano, and whatever the subsequent effect on vegetation, it is part of a natural, timeless process. The very "richness" of the guano will, in the long term, continue to be part of the successional processes that unfold on the island.

The Aquila authors acknowledge our point when they write that some species of plants are sensitive to ammonium and others are tolerant. They conclude that "It is clear that more detailed studies are required of the relationship between cormorant nesting densities, soil chemical properties as a result of litterfall and guano deposition, and plant communities."

9.4.7. **Fauna of Middle Island and predicted effects of cormorant nesting:** The first paragraph deals with mammals. Eastern Cottontails are abundant and highly cyclic in population sizes. Their presence on the island is likely to be sporadic. While swimming and ice travel are conceivable ways for them to reach the island, it is unlikely that a colony would survive

for any great length of time, and if it did, it would no doubt trigger concerns about loss of vegetation and concerns about "over abundance".

Muskrats, who are also abundant on the mainland and are efficient dispersers, could easily reach any of the islands via swimming or ice travel. But as the pond area fills in through succession, they are unlikely to thrive permanently on Middle Island.

The Aquila Report opines that carcasses of raccoons have been found and that they may have swum there. It is more likely, if they arrived on their own, that they made ice crossings. It is also possible that they were placed there by local fishermen in the hope that they would destroy eggs and/or chicks of piscivorous birds, or just for hunting purposes. At any rate, the carrying capacity of Middle Island probably could not sustain them through many, if any, winters.

Fox Squirrels were mentioned, but these would likely be introduced in which case the term used by the Aquila Report, "extirpated", is misleading. The species is not known to be native to the Ontario side of the Great Lakes or St. Clair River, a relatively rare instance of this particular political boundary also serving as a geographic barrier. It seems unlikely that Fox Squirrels historically occupied Middle Island naturally, and if they did, they too would have strongly influenced the flora in ways that could not now be detected due to their absence.

The Aquila Report states that there were two "extirpated" species of breeding bird on Middle Island, the Bald Eagle and the Common Tern. Both can be found in the region. Saying that they are "extirpated" is like saying that because there were robins nesting in the garden last year but not this year the species has been extirpated. In the case of the Bald Eagle, the species was "extirpated" from parts of its breeding range as a result of persecution and bioaccumulation of the same pesticides that played havoc with the reproduction of a variety of other bird species, including Ospreys, pelicans and Double-crested Cormorants. They are not endangered and are returning.

Common Tern colonies fluctuate, and while they tend to nest in areas on islands away from ground-nesting cormorants, they can also be displaced by gulls, or by successional stages of vegetation encroaching upon ideal nesting sites.

The Aquila Report states that "Some qualitative information suggests that the number of breeding species [of bird] may have decreased; 25 breeding bird species were recorded in the 1980s, compared to 19 in 2002."

We do not doubt that increasing numbers of nesting cormorants, as well as other colonial waterbird species, will reduce the numbers of other species, particularly songbird species, nesting on Middle Island. But for most other species, particularly songbirds, Middle Island would not represent optimal habitat. Such habitat as would provide accommodation for those species would be widely spread on the mainland. For the cormorants Middle Island is optimal habitat.

The Aquila Report states that "Without data on the relative abundance of other bird species on Middle Island, neighbouring islands, the adjacent mainland, and analysis of trends for those species, it is impossible to quantify the possible effects of cormorant nesting on other non-colonial nesting bird species on the island. However, it is unlikely that a negative impact on regional populations could result from destruction of vegetation by cormorants."

Indeed, we do not think the impact would be quantifiable as it would be so very low. What those two sentences indicate is a grudging awareness that Middle Island is not important to the non-colonial species of birds who may nest there when conditions are favourable. What the Aquila Report does not acknowledge is the importance of islands to cormorants, and other colonially nesting waterbirds.

We congratulate the Aquila authors for striking a semblance of balance by stating that "It is also possible that at some point during degradation of vegetation by cormorants, habitat may be created for some bird species." The word "degradation" for one species can mean "enhancement" for another. For example, loss of nesting trees for Great Blue Herons might, as we have indicated above, reduce food competition and predation of the Lake Erie Watersnake, thus enhancing its survival potential.

The Aquila Report lists "five other colonial waterbird species" that currently nest on Middle Island, and states, "Populations of these species on the island have fluctuated over the years…". None of them were present in 1908.

After noting that one researcher found "no evidence for regional population declines in these [three heron] species attributable to cormorants", the Aquila Report states, "Nevertheless, value judgments may mean that management actions for cormorants need to be considered to protect local populations of other species of colonial waterbirds."

The first question that needs to be asked of the Aquila authors is which local populations of other species of colonial waterbirds need to be protected from cormorants? In addition, the Aquila authors have acknowledged that the decision to manage is not about science but about value judgments. There is nowhere that we can find in either Parks Canada's mandate, nor in its draft principles and guidelines for ecological restoration in Canada's protected natural areas, that allows for culling based on value judgments.

On page 33, after indicating that declines in co-habiting species of colonial birds are not necessarily the result of one species displacing another, the Aquila report states, "Night-herons are known to be very sensitive to disturbance and may switch nest sites erratically." This statement raises the concern about the impacts of cormorant management on other species, such as the night-herons. At Presqu'ile, preliminary research indicates that the Great Blue Herons suffered the most during the culling, in terms of flight and abandonment. Wilderness values and naturalness are better preserved in the absence of egg oiling, nest destruction, chick destruction and gunfire.

In the same section, the Aquila authors point out what we have been saying all along, "Shieldcastle and Martin (1999) reported steady declines [in BCNH] since 1991 on West

Sister Island (before the island was colonized by cormorants), formerly the largest Black-crowned Night-Heron in the Great Lakes." The absence of cormorants allowed for successional growth which compromised the habitat of the “desired” Black-crowned Night-heron. The US Fish and Wildlife Service was so concerned about the impact of successional growth on the Black-crowned Night-Herons that they “clearcut areas of forest to ensure that preferred habitat would be available in the future.”

Also on page 34, the Aquila authors state that “Because of its strategic location south of Pelee Island and Point Pelee National Park of Canada, Middle Island is also very important as stopover habitat for migratory songbirds.” In fact, were Middle Island to sink beneath the waves there would not be a statistically measurable decline in any species of migratory songbird. They will “fall out” on any suitable habitat in water including ships, and their migration would be less stressful to them were there no Great Lakes, but the crossing is not a meaningful barrier. Nor will loss of taller trees necessarily impose an impediment to the food and rest interests of such migrants.

The Aquila Report is simply wrong when it claims that the123 bird species observed on Middle Island were species “… most likely dependent on mature forest communities, as well as scrub habitats.” The majority of those 123 species do not even nest in “mature forest communities” or anything like it. It is well known that migratory birds utilize a far broader range of habitats during migration than they do when breeding.

The Aquila Report continues the theme with the observation that “Some plant species, such as Rough-leaved Dogwood (now Drummond’s Dogwood, formerly considered provincially rare), also provide [a] very important food supply for migratory birds.” There are no species of migratory birds who are obligate consumers of the fruit of any dogwood species.

On page 35, the Aquila authors state that “For inexplicable reasons, perhaps related to lake water quality, water snakes have apparently declined.” Our question to the authors is where is the research that shows that the snake is in decline, and where is the information that shows that the decline is due to water quality. Water quality could be a factor, if in fact the decline was real. It could be the result of persecution and habitat destruction on inhabited Lake Erie Islands. However, it could also be a natural fluctuation in the population size of the species, or any combination of factors, both anthropocentric and “natural”. We know that the changes in the Lake Erie ecosystem have been enormous and could have a deleterious effect on the survival of the Lake Erie Watersnake. It is possible that, historically, the island snake has depended on a small but reliable genetic input from the mainland snake in order to remain robust. If the last scenario is valid, that input would now be reduced or eliminated by virtue of the endangerment of the mainland form.

Page 35 also addresses butterflies, that group of insects which have enough political clout, if not ecological impact, to be of concern to Parks Canada. Although we have previously addressed the butterflies, we are concerned when the Aquila report says “Middle Island may be important for Monarch Butterflies (*Danaus plexippus*) on migration.”

Resting Monarchs will perch virtually anywhere, and while there could conceivably be an increase in mortality do to loss of trees and shrubs, it would be of statistical insignificance. Observations of migrating Monarchs easily show that they often cluster in open areas, on rocks and logs or in low vegetation. It seems dubious that the presence of cormorants poses any real threat to the species. In fact, the only trace of breeding habitat for Monarchs during a visit by Alan Wormington in 2002 (personal communciation), when 13 species of butterfly were recorded, was a small patch of milkweed well away from where the cormorants were, and there were only a few Monarch eggs and larvae on them.

The next sentence is important. The authors state that, "Suitable breeding habitat is present as long as thicket and open field habitat with milkweed persists." Milkweed is listed as a noxious weed in Ontario, mandating its destruction wherever it grows. Surely the fate of the Monarch would be better served if milkweed, of obligate importance to the Monarch larvae, were protected. Nothing done in a location as small as the Lake Erie Islands will have a measurable effect on the survival of Monarchs.

9.4.8. **Effects of roosting or staging cormorants on island vegetation:** Even roosting cormorants, or visiting migrants, are suspect, although the Aquila Report provides nothing but speculation that such birds may also cause a problem. Our concern is that the actions of Parks Canada feeds into the discussion by the US government that the cormorant population should be reduced by 50 percent plus of the continental population.

What the Aquila Report states is, "Conversely, numbers of individual birds increase substantially in August-September with the arrival of migrants and the addition of fledglings." This is self-evident. All bird populations of all species peak immediately after nesting. Compensatory mortality will, with the number of adult and young local birds reduced by the magnitude envisioned by Parks Canada, enhance survival of those migrants. Cormorants and other piscivorous birds (loons, mergansers) are currently experiencing significant die-offs in the lower Great Lakes, usually attributed to botulism and to the consumption of Round Gobies carrying botulism. Whether mortality would, in the event of a major cull, be accumulative, or whether mortality of non-culled birds would be enhanced, is not known and certainly not addressed.

9.5 Managing cormorant populations

9.5.1. **Considerations for managing cormorant populations:** The Aquila report states, "Control methods for cormorants are highly controversial and politically sensitive." This sentiment is more explicitly discussed in a paper titled, "Double-Crested Cormorant Culling in the St. Lawrence River Estuary: Results of a 5-Year Program" by J. Bedard, A. Nadeau, M. Lepage. The authors state, "Culling wild animal populations is a sensitive issue, and the problem threatens to become more common as people disrupt nearly every ecosystem on this planet. For instance, the collapse of the ground fisheries in the North Atlantic and Gulf of St. Lawrence has released huge stocks of forage fish species (Rail et al. 1996), which, in turn could have helped sustain the spectacular increase in eastern Canadian populations of many sea birds, including DCCO's. To this day, few populations of wild animals have been the subject of such extensive culls (but see Duncan 1978). Many problems of overabundant

wildlife are lurking on the horizon, however (Garrott et al. 1993), and a philosophical aspect of the question is particularly nagging."

In fact, considerable controversy erupted when CDI – a group of naturalists, conservationists, political activists, animal protectionists, environmentalists and various natural history and animal protection organizations with advice from scientists – made public the actions of Ontario Parks staff who conducted cormorant culling on High Bluff Island over a three year period.

Internal sources within the OMNR have told us that culling of cormorants at Presqu'ile was a costly public-relations disaster. In private conversations with naturalists interested in the cormorant issue, Ministry staff have said that the cull cost approximately $500 per bird, which, if correct, totals about $5,000,000.

Despite illegal arrests, illegal exclusion zones and harassment by the OMNR staff and the OPP, CDI released footage of severely wounded birds left by Ontario Parks for days to die a cruel and inhumane death. CDI was able to demonstrate that Ontario Parks staff were killing adult cormorants who had viable young, even though they committed not to do so. CDI was able to dismantle the arguments made by Ontario Parks staff to justify the cull.

On page 37 the Aquila authors continue, "…the benefits of control should be measurable in the response of the resource for which the control was undertaken." In the case of culls in Quebec and Ontario, the clock did not get turned back to pre-cormorant conditions as a result of "control". Once the shooting stopped the surviving birds returned, and the foliage continued to do what foliage does when doused by cormorant excrement.

It seems Parks Canada's aim is not so much to produce an absolute static environment, as to curtail the influence of one native species, the Double-crested Cormorant, in favour of other native species.

On page 37 the Aquila authors write, "Control measures to decrease impacts to vegetation should halt damage impacts and/or lead to a demonstrable recovery of damaged vegetation within a specified period of time."

Changes caused by cormorants can be stopped by heavy persecution of the birds, but what then? Clearly the island is suitable for cormorants. So why would bachelor cormorants not fill the void left by the cull? Parks Canada staff say they do not want to eliminate "all" cormorants from Middle Island. But what they fail to talk about in detail is the impact of their management on a complex ecosystem.

If Parks Canada staff are determined to manage for biodiversity (as they seem to define the term), they should consider expanding the wetland, planting selectively, removing most of the gulls and judiciously using fertilizer and water and structures, such as martin houses, that will increase species. This would be a contrived environment and one that CDI would not support. But it is no more a contrived environment than one created by a cull of cormorants.

The Aquila Report makes reference (pp 37, 38) to the U.S. Public Resource Depredation Order, which “addresses cormorant impacts on public resources (primarily fish, vegetation, and other birds) in 24 states, including those bordering Lake Erie.”

These depredation orders, which have been issued for other native species, as well, are politically driven as a means of transferring responsibility for federal legislation to more local levels. We would not like to see such a methodology imported into Canada. Cormorants do not “impact natural resources” because they are “natural resources”. Often a natural resource, the forest, is sacrificed for an unnatural resource, farmland.

What we are arguing is both the cormorants and the vegetation, except exotic species such as Garlic Mustard, on Middle Island are natural, and what survives is also “natural”. Just as we would not advocate cutting down a natural forest to enhance another resource, such as meadows, clearings or savannahs, so do we not advocate killing cormorants to enhance a particular colony of plants.

Again, in commenting on the US Fish and Wildlife Service (USFWS) cormorant strategy, the AOU writes, "Consequently, it appears that what the USFWS plans to do constitute persecution of a bird species rather than a solution to the real problems of declining fisheries and depredation.”

On page 39, the Aquila Report briefly reviews the American situation, which demands each state within the Depredation Order to kill over 4,000 cormorants, and then states, “However, lethal control at the local level may have to be ongoing, given the wide-ranging movements typical of cormorants.”

Once more, what the AOU has written, in commenting that the USFWS cormorant strategy appears to constitutes persecution of a bird species rather than a solution to the real problems being addressed, appears to apply to Parks Canada

The Aquila authors continue, “An additional complication [to extensive culling of cormorants] that may impact the effectiveness of control efforts is a lack of information on the segment (breeders, non-breeders etc.) of the population being killed…unless birds are taken on nests.” As we have indicated above, nothing short of massive destruction of these birds will satisfy the lobby that opposes them.

Page 40 is the most significant page in the Aquila Report. The authors review of past culls of cormorants except that they never mention that unless culling becomes a constant or the slaughter takes place on a continent wide basis, wildlife managers will continue to fail in their objective to "protect vegetation".

Then they make the most interesting statement - “Impacts to vegetation due to nesting activity and guano deposition are generally easier to substantiate than impacts to fisheries, and have been documented in multiple areas…”. This statement demonstrates how desperate wildlife managers are to find a plausible excuse to cull cormorants. Wildlife managers exploit the negative visual appeal of many cormorants nesting on dead and dying

trees with guano running down the branches and trunks to vilify the birds and make the "obvious" impacts "easier to substantiate".

In reviewing wildlife management articles, the words “cormorants” and “impact” are used extensively and usually negatively. The Aquila statement promotes the idea that cormorants negatively “impact” on fisheries, the leading concern in antipathy toward cormorants and the driving force of the anti-cormorant lobby. However, numerous studies over the last couple of centuries have continually demonstrated that cormorants do not deplete their prey. In addition, studies show that cormorants do not impact commercial or sport fisheries.

The AOU came to the following conclusion with regard to the impact of cormorants on fish:. "The conclusion that Double-crested Cormorants normally take an insignificant number of game fish is supported by other studies as well (Derby and Lovvorn 1997, Belyea et al. 1999, Trapp et al. 1999, Simmonds et al. 2000, Burnett et al. 2002, Russell et al. 2002, Stapanian 2002), all of which are cited in the FEIS [Final Environmental Impact Statement). There can be local conditions where Double-crested Cormorants cause management problems, but the demands for a change in the current management approach appear to be driven by perception and not by scientific evidence. Many factors contribute to variation in recreational and commercial catches and the systems where perceived problems are the greatest are those where over-fishing, exotic species invasions, stocking of apex predators and perhaps climatic variability are greatest (Siegel-Causey 1999). To single out cormorants as the cause of these perceived problems is not justified by the science reviewed in the FEIS. The FEIS recognizes that the economic importance of commercial fishing in some regions has “experienced a steady decline for reasons unrelated to fish-eating birds” (page 45), and also acknowledges the general lack of documented effects on economies due to cormorant predation of game fish, but concludes nevertheless that action needs to be taken. In fact, in direct response to a question from the Public regarding the DEIS [Draft Environmental Impact Statement], the FEIS states that the USFWS believes that agencies do not need to wait until there is a demonstrated effect before taking action (question 53, p. 130). Consequently, we conclude that the USFWS has not made a strong scientific case for a major change in policy regarding public resources and has responded to stakeholders on weak evidence. Fisheries ecosystems are changing under a plethora of factors, only one of which is cormorant predation, and focusing remediation solely on cormorants does not appear to be justified. In the FEIS it is acknowledged (p.59) that “the information necessary for determining impact, or lack of impact, in even the simplest cormorant-fishery systems is complex and difficult to acquire”. Wires et al. (2003) examined the problem of basing decisions to manage cormorants on data that are scientifically inadequate. The next paragraph of the FEIS states that evaluating other potential impacts to fish populations was beyond the scope of the FEIS. We believe that this should have been central to the EIS."

Parks Canada and the Aquila authors ignore the fact that, as natural predators, cormorants potentially benefit native prey species by selecting sick individuals, competitors, or deleterious exotic species. Human predation is seen as positive. Natural predation is seen as competition and therefore not to be tolerated, even though natural predators are far more

likely to select against the weak, aged, ill or otherwise compromised, to the benefit of the prey species overall.

The Aquila authors make a statement that is at odds with the overall direction of the report. The Aquila authors write, “In relation to the effects of cormorants on vegetation it is important to point out that the pattern of colonization and abandonment following destruction of vegetation is an entirely natural one, typical of seabird colonies…In North Carolina, Great Lake Island was colonized by cormorants, abandoned when vegetation was destroyed, and then re-colonized later…Thus, over the long-term, some have considered that impacts on habitat may be inconsequential…although these impacts may appear to be catastrophic in terms of the short-term perspective of a human lifetime.” The question for us and for Parks Canada is how does this statement fit with the pending decision by Parks Canada to cull cormorants?

Of course the Aquila authors justify the decision to manage cormorants with the statement, “But when the accumulative effects of human activities in modifying landscapes are magnified by the destructive effects of cormorant nesting colonies on vegetation, management may become necessary.”

9.5.2. **Efficacy of measures to control cormorants:** The Aquila authors state that harassment may cause “…disturbance to other colonial-nesting birds thereby perhaps defeating the original purpose of the control operation.” The report continues “In Lake Winnipegosis, it is believed that harassment of nesting cormorants encouraged birds to colonize new, forested islands and actually increased population growth.” While lethal culling might initially mitigate against such a possibility, it still does constitute harassment, and it is possible that in the long term, could have the same effect.

The AOU is of a similar opinion expressed in their Conservation Committee's report which states, "First, controlling cormorants by lethal or non-lethal means has been a very local approach, and every study to date shows that constant and continuing effort must be taken to keep birds off ponds (Glahn et al. 2000). Cormorants habituate to static or automated deterrents quickly, and killed birds are soon replaced from nearby. Second, lethal means of regulating cormorant numbers have not yet met with success (Thompson et al. 1995, Belant et al. 2000, Glahn e t al. 2000). Similar findings have been reported from other parts of the world (Keller and Lanz 2003, Hayama 2002, Bechard and Marquez-Reyes 2003, Parrott et al. 2003)**.** Consequently, killing birds at roosts near aquaculture ponds or on the ponds is likely to create only short-term respite and may also push birds into other areas where they might become a problem. Local reductions on the non-breeding grounds would have a trivial impact on a continental scale, and thus the same problem will recur in the next season when new wintering birds appear."

The Aquila Report does not address what we believe is the foundation of so much antipathy toward cormorants: their “impact” on aquaculture. The evidence does not support the contention that southern U.S. catfish farms have increased the carrying capacity of the Great Lakes or Interior population of Double-crested Cormorants to levels higher than would have existed in earlier centuries. In addition, the AOU raises other concerns in the following

statement: "Cormorants are not the only fish predator on aquaculture ponds; herons and pelicans have similar behaviors but are not as common at present (Glahn et al. 2000). Selectively culling the most numerous species of fish predator, Double-crested Cormorants, from aquaculture ponds could result in an increase in numbers of other piscivorous bird species, shifting the problem to the other bird species rather than reducing fish take. The first two problems [including the AOU quote in the above paragraph] were raised in the FEIS and then were ignored. Double-crested Cormorants are opportunistic feeders, and they are able to range over great distances in search of food, particularly during the non-breeding season, preferentially aggregating at rich food sources (Hatch and Weseloh 1999). As a consequence of localized culling, fish aquaculture and hatchery sites could become large population sinks, where killed birds are replaced by others seeking a rich food source. The continuing influx of new birds means that such aquaculture sites would become the last places for cormorant numbers to decline even if continental numbers were declining rapidly (Bregnballe et al. 1997, van Eerden and van Rijn 1997). The DEIS acknowledged that prime foraging areas might be the last to be abandoned (p. 81) although this acknowledgement was absent from the FEIS."

Curiously, on page 42 the Aquila authors state that “Dislodgement of nests (using long poles – fire hoses) proved largely impractical because nests were structurally too secure and out of reach, was used successfully as part of the cormorant management plan at Presqu’ile Provincial Park on Lake Ontario.” The management at Presqu’ile was, in fact, a disaster. The removal of nesting materials resulted in increased pressure on both cormorants and herons to secure more sticks to replace the nests.

We absolutely agree with the Aquila authors that “Removing trees that are so damaged that they are unsuitable for nesting species may actually encourage cormorants to move to other healthy trees…" We disagree with the remainder of the sentence which states, "and displace other nesting waterbird species.” As well, dead and dying trees are part of the ecological landscape and fulfill important ecological needs for certain species.

Also on page 43, the Aquila Report mentions “…crushing nests, eggs and nestlings with rocks, feet or other objects, throwing nest contents into the water, or using asphyxiation or cervical dislocation to dispatch older young…” Conducting such activities as killing infant birds by asphyxiation, cervical dislocation or crushing them with rocks, feet and other objects legitimately inflames public opinion and poses a serious public relations problem for Parks Canada.

Persecution and culling of cormorants can cause precipitous and dangerous declines in the population. Anything short of massive slaughter, as is being suggested by the USDA, will not have any lasting effect on cormorant numbers.

However, the AOU points out the monitoring problems with the USDA proposed cull numbers of 250,000. The AOU report states that, "The monitoring outlined in the FEIS (4.3.7) lacks four critical components. First, it lacks sufficient details about monitoring methods. We suggest that efforts to develop a monitoring plan would benefit from investigating programs such as that by Bird Studies Canada’s Coastal Waterbirds Survey in

British Columbia. In addition, the monitoring outlined in the FEIS lacks biologically defensible local target goals for population reduction; it lacks a statistical power analysis to determine the intensity, locations, and frequency of counts to demonstrate that target declines can be detected; and it lacks specific management actions that would occur if the target population decline is achieved or exceeded. The monitoring plan needs to include areas where Double-crested Cormorants breed and winter outside of the target areas where cormorant take occurs to determine if this take is having undesired results elsewhere. These "unmanaged" areas should also have biologically defensible target declines in population size below which killing elsewhere would stop."

On pages 44-45, the Aquila authors state that "Recent evidence indicates that adult survival has a greater contribution to growth of cormorant populations than fertility...which strongly suggests that lethal methods will be incorporated as a component of effective control programs. Killing breeding adults is therefore far more effective in reducing population than destroying eggs etc.; killing one young adult has a 3-6 times greater effect than destroying an egg or nesting…"

This is a very simplistic look at a complex ecology. Again we draw on the AOU report. In the section titled *LESSONS FROM EUROPE?*. The AOU authors write, "Current problems with cormorants are not unique to North America; similar issues have arisen in Europe, Asia, and Australia. In Europe the principal cormorant of concern is the 'Continental' subspecies of the Great Cormorant *P. c. sinensis,* and the growth of cormorant numbers as well as the conflicts with fisheries have followed a similar time-course to those involving *P. auritus*...Particular strengths in knowledge of the European cormorants, compared to the North American, lie in extensive demographic information. Much of this is attributable to a long-term study at a large colony in Denmark during a period of rapid growth and then stabilization of numbers (Bregnballe 1996). Recent mathematical modeling of cormorant populations has indicated likely ineffectiveness of culls (killing adults) (Frederiksen et al. 2001) and later work examined local effects, especially winter site-fidelity (Frederiksen et al.2003). The practical failure of culling in situations where there can be a large turnover of individuals was shown by work in Bavaria (Keller and Lanz 2003). As in North America, the evidence that cormorants have major effects on fishery-species is weak and killing of cormorants has been authorized in response to stakeholders' concerns rather than scientific evidence."

The Aquila Report states that "…shooting adult cormorants in nesting colonies can be controversial." We can say categorically that a cull on Middle Island will be controversial. The controversy stems from the gruesome mechanics of killing large numbers of animals. Just as the description of the crushing of the chicks is graphic, so, too, is the discussion of the technical aspects alluded to on page 45 in the killing of large numbers of cormorants. As CDI so effectively demonstrated, even with wildlife professionals conducting the cull on High Bluff Island, 30% of the cormorants shot were injured and not retrieved. CDI filmed many of these injured birds, some of whom were left to die for as long as two weeks. Adult birds with live chicks were shot, leaving the infants to die a long slow death by starvation and exposure. All of these problems present Parks Canada with a serous public relations problem – shooting birds when they are totally vulnerable.

The Aquila authors cite potential firearms including metrogun, a .22 caliber rifle with a low velocity rimfire shell. Shotguns are inherently ill-suited for humane killing by virtue of the shot spread, the density of cormorant plumage (and subcutaneous fat and skin thickness) and the rapid deceleration of shotgun pellets, all of which leads to increased wounding. Metroguns are effectively 20 gauge shot shells (thus fewer pellets than a 12 gauge) inserted into a 20 gauge-sized tube that, in turn, is inserted into a 12 gauge gun. Because the discharge (the emergence of the shot from the barrel, which creates the "bang") from the 20 gauge insert occurs within the 12 gauge barrel, the sound is muffled, compared to simply using a 12 gauge shell in a 12 gauge gun. That might reduce the likelihood of detection by people in a more or less urban setting, but such a consideration is irrelevant to Middle Island, given its isolation. In terms of reducing disturbance it would have very nearly no effect. There is still a "bang" and still disturbance of other birds, reacting either to the bang, or to the other birds reacting to the bang.

Similarly, silencers (noise suppressors) tend, when used on shotguns, to be of limited value in reducing the noises. A company in Finland, Reflex, which manufactures these devices, only claim a 6 decibel reduction, compared to 20 to 30 decibels noise reduction for silencers used on rifles. On rifles, silencers tend to compromise accuracy, already inadequate to prevent a 30% wounding rate during the shooting on High Bluff Island.

The Aquila Report also talks about a .22 caliber rifle with a low velocity rimfire shell. This still produces an audible bang and subsequent pandemonium. But the other issue is that .22 caliber rifles are ill-suited for humane killing of cormorants, and result in much wounding. There is the possibility of a safety factor, as well, given that unlike shot shell, a rifle bullet retains much of its velocity and penetrating power for hundreds of meters. The trajectory is curved, thus can take the bullet below the shooter's sight line, a serious consideration on an island in waters used by boaters. Conceivably rifle shots fired on Canadian soil could enter U.S. territory.

CDI did seek to raise some of these concerns with Parks Canada staff based on experience with the lethal culling by the OMNR on High Bluff Island. But our concerns were condescendingly dismissed with the assurance that what was done by the provincial ministry had no bearing on what was planned by Parks Canada. How Parks Canada would resolve the concerns raised by the High Bluff Island disaster was not explained.

9.6 **Aquila Report Conclusions and management recommendations:** On page 47 the Aquila authors again raise the issue of species at risk without explaining how any species are at risk on Middle Island.

The Aquila authors state that "The modeling approach taken provides a good first attempt to establish a biologically meaningful cormorant population objective and scientifically based recommendations for management."

The phrase "biologically meaningful cormorant population" is a non-sequitor. Populations are determined by the laws of physics working within an endlessly changing ecological matrix of infinite complexity. "Meaningful" to whom? To those of us who cherish nature,

waterbird colonies and the manner in which ecological processes unfold, the most "meaningful" population of cormorants on Middle Island is the one that occurs naturally, or as close to "naturally" as is now possible. This is the objective that Parks Canada itself espouses in "Ecological Restoration from the Draft Principles and Guidelines for Ecological Restoration in Canada's Protected Natural Areas".

Throughout the report, Aquila authors, like Parks Canada staff, do not acknowledge the positive values that cormorants exhibit toward "return to an ecosystem to its historic trajectory." On the contrary, the authors talk about "damage" and "destruction" caused by cormorants. Both the authors and Parks Canada staff, faced with the inconvenient fact that cormorants are returning to their historical numbers, simply choose not to factor this into their conclusions.

The Aquila Report cites unpublished and published references to the effect that the length of time it would take soil to "recover" from the plant-toxic effects of guano, once the cormorant colony has moved on, is variable. Predicting how long such change would take requires further research. Historically, cormorant guano, and that from related species, has been seen as the world's best fertilizer. One article about cormorants states that "Several species of cormorants are extremely abundant off parts of Peru and Chile, such that their excrement and that of other abundant seabirds is collected from desert islands as a phosphorus- and nitrogen-rich fertilizer known as guano." (http://www.answers.com/topic/cormorants-and-anhingas-phalacrocoracidae-biological-family?cat=technology) It must be noted that the islands themselves are treeless (albeit in one of the world's most arid regions where vegetation is sparse or even totally absent); it is the diluted form of the guano that has such value. The Peruvian and Chilean birds (which include Pelicans and Sulids, both in the same Order as cormorants, equally obligate piscivores, and producers of guano which, undiluted, is similarly "toxic" to plant life) exist in numbers that greatly outnumber all the Double-crested Cormorants in the world – that being true of even a single species of South American cormorant, the Guanay. It is dilution of the guano that, in rarer species that form less concentrated colonies of shorter duration, ultimately enriches soil, allowing increased "biodiversity" enhancement, on a time scale that does not appease the impatience of wildlife management agencies.

The Aquila authors note that none of the variables that were assumed to be fixed (area suitable for nesting habitat, cormorant nest density, tree density) are actually constants. Additionally, the authors acknowledge that the assumption of constancy in all variables across the island needs further refinement, since the island shows strong spatial variation in the distribution of cormorant nests and damage. We urge Parks Canada to acknowledge all the variables, including climate change, changes in species composition, biomass density of prey species and other species influencing prey species, anthropogenic influences, "natural" changes and the impacts of unforeseen disease on cormorants and all species influencing cormorants. Minimizing disturbance to protected areas enhances the likelihood of learning about how an ecosystem works.

The real difficulty is that political pressure to control cormorants and manage ecosystems mitigates against nature's restoration.

On page 49, the Aquila Report again displays the bias that sees “forest cover” or “intact” vegetation as inherently superior to birds nesting. We repeat that we don’t agree. Forest cover is determined by the natural factors impacting an ecosystem and can result in 100% forest cover or no forest cover or anything in between. So ingrained in the minds of wildlife managers is the idea that “forest” is inherently the one and only manifestation of “Carolinian” values, that their language unquestionably uses judgmental terminology. Thus we read, “These changes in cormorant numbers and forest cover should be considered in relation to how much forest cover can be lost without the integrity of the community being severely compromised.”

The antonyms of “integrity” are “duplicity” or “corruption” or “fraud” or other words with similarly negative connotation. There is, we propose, nothing duplicitous or corrupt or fraudulent about a native bird’s nest, a native bird, or what derives from either, or its effect on its environment. There is nothing duplicitous in numbers of native fauna as established by the carrying capacity of the environment they inhabit. There is nothing fraudulent about clearings, openings, fields, or bird colonies.

Still promoting a fundamental myth, the Aquila Report, still on page 49, states, “Additionally, identifying zero-or minimum-tolerance levels [of cormorants] for particular areas of the island, such as areas where significant species are known to occur or where trees are not damaged, is an appropriate strategy to protect resources of high conservation value.”

We categorically disagree with this statement. As we have shown throughout our document there is no species to be found on Middle Island that is "at risk" because of cormorants. And again we have demonstrated that cormorants do not appear to impact the local and endemic subspecies of the Northern Watersnake, and may “benefit” it, indirectly, to the degree, if any, that it controls numbers of its predators and competitors.

At the bottom of page 49, the Aquila authors state that, “For planning purposes, it will be important to identify other special islands that may be highly vulnerable to cormorants.” No island is vulnerable to cormorants. Cormorants have, for something approaching fifty million years (the age of the oldest fossil attributed to the cormorant lineage) nested on islands without damaging them. Of course they change them, and part of that change would be to transfer organic material from the water to the land. And again this statement begs the question, if not Middle Island and the other islands in Lake Erie, then where is it acceptable for cormorants to nest? Followed to the logical conclusion, cormorants are not allowed to nest on any islands if they have the temerity to change them. It seems to us that for humans such as the Aquila authors and Parks Canada staff, to fear the change resulting from a cormorant colony is supremely arrogant given how humans have changed virtually every ecosystem for their own benefit.

On pages 49 and 50 of the Aquila authors state that “Uncolonized islands with important plant communities should be monitored to make sure cormorants do not colonize them, because preventing cormorants from becoming established is more efficient and conservative than trying to reduce their numbers once they are established at a site.” It is

troubling that such thinking persists in Canada into the 21st century and a sad commentary that such bias still drives policy in an agency whose mandate is to protect the environment.

On page 50 the Aquila authors also state that "If population objectives are established for these forested islands where birds nest in trees, lethal control (shooting) is probably the most efficient way to reduce cormorant numbers, since most other actions that could be taken are likely to be inefficient and may result in substantial disturbance to other colonial species and non-target cormorants. However, this option also has the potential to disturb other nesting birds, and if undertaken should be done carefully and sensitively to minimize disturbance impacts."

There is no way to shoot into a densely populated nesting colony of birds carefully and sensitively. The cull will disturb "other colonial species and non-target cormorants" no matter how sensitively and carefully the gunners fire at the birds. But of course shooting is also unnecessary for the reasons we have articulated throughout this brief. Perhaps most importantly, it will not work, either, except in the very short term.

Also on page 50, the Aquila authors state that, "Finally, experiences in the St. Lawrence River estuary and elsewhere suggest it is imperative for an active public education campaign to be prepared in advance of management efforts."

CDI is committed to just such a campaign. At no cost to tax payers we are seeking to educate the public about Double-crested Cormorants and other colonial waterbirds. Judging from what we have seen, Parks Canada is undertaking a propaganda, not education, campaign to justify their inevitable decision to cull the cormorants on Middle Island.

We urge Parks Canada to take a more accurate approach, dropping the misconceptions previously promoted by Parks Canada and the Aquila authors. They might even include information about the positive influences of cormorants instead of citing articles that are absent of anything positive. They should make every attempt to make a clear distinction between objective science and wildlife management, between natural processes and political expediency. Shooting birds, tearing down nests, stomping on baby birds, shooting water cannons into colonies or any other methods mentioned as a means of achieving Parks Canada's goals are not scientific but the heavy-handed actions of wildlife managers implementing wildlife management programmes. Neither Parks Canada nor the Aquila authors even hint that, if anthropogenic solutions are to be imposed upon an otherwise protected ecosystem, there are numerous other, more cost-effective, less cruel and invasive, and far more effective methodologies that could at least be explored. And finally, we believe that Parks Canada should educate the public to understand that, according to such studies as have been done, particularly in Europe as cited in the AOU report referenced above, lethal culling to obtain the objective of reducing local cormorant populations does not work.

The Aquila Report ends by saying, "The fact that potential management of these forested islands is being undertaken for biodiversity conservation should be made clear and distinct from management involving conflict with fisheries." How ironic, given that it is "conflict

with fisheries" that fuels antipathy toward cormorants. It is because such antipathy is so unfounded that in recent years the emphasis has shifted toward concerns about the "impact" cormorants have on vegetation because it is more visible and therefore obvious. As well, however localized the "impact" is, it is real and measurable. (This concern about local "impact" can be something of an obsession with wildlife managers, who have been known to stress at the effects on the "microenvironment" of the nests of Ross's Geese, another increasing species of native wildlife.) "Biodiversity" is not reduced by cormorants. "Bio" means life and "diversity" means multiplicity or assortment or variety. Part of the "bio-variety" or "bio-assortment" is the natural existence of large numbers of animals of one or a few species concentrated in time and space. It happens, or will if allowed to.

10.0 **Conclusion:** In this brief, CDI examined Parks Canada's mandate to protect and restore Canada's natural protected areas. We reviewed the literature used by Parks Canada to justify its decision to manage the population of Double-crested Cormorants nesting on Middle Island.

We have attempted to understand how Parks Canada and CDI have come to polar opposite conclusions having examined most of the same research and wildlife management papers.

Our brief demonstrated that Parks Canada staff has reflected a subjective bias against cormorants and in doing so violate their own mandate to protect natural processes. We hope that our paper will raise sufficient concerns that Parks Canada management staff will reconsider the decision to remove thousand of cormorants from Middle Island and instead implement a no action plan.

Addendum #1

Critique of Management Directive 4.4.11 – Management of Hyperabundant Widlife Populations in Canada's National Parks

While completing this brief, we became aware of "Parks Canada Management Directive 4.4.11, Management of Hyperabundant Wildlife Populations in Canada's National Parks, December, 2007" (hereafter the New Directive).

The New Directive redefines "hyperabundance". Because it has serious ramifications for all wildlife, particularly in Canada's national parks, we believe it is important to comment on it. We will focus on the definitions as they pertain to the controversy about the cormorant colony on Middle Island and because they are cornerstone to the directive.

2.0 **Definitions.**

2.1 **Hyperabundant Wildlife Population**:

The new definition is, "A wildlife population that clearly exceeds the upper range of natural variability that is characteristic of the ecosystem, and as a result, there is a demonstrable long-term negative impact on ecological integrity."

2.1.1. **General comments on the definition of hyperabundant wildlife population:**

What is new about this definition, as compared to other definitions used in wildlife management, is its degree of subjectivity. This definition will likely result in many more species of native fauna and flora being labelled hyperabundant. The labelling of such species is at the sole discretion of Parks Canada, and there is no protection against a label being applied to a species based on political expediency.

Parks Canada staff do not include an explanation of such terminology as "the upper range of natural variability". They do not include an explanation for such phrases as "characteristic of the ecosystem" or "long-term negative impact on ecological integrity". The lack of clarity in the definition provides Parks Canada with the opportunity to provide misinformation to justify culling as they are doing with the cormorants on Middle Island.

When Parks Canada does not like the effect that some wild species have on the environment, the definition of "hyperabundance" in Directive 4.4.11 provides them with the excuse to intervene and to change natural processes to meet their subjective, or politically expedient, values.

Let us examine the impact of one native Ontario species of bird on the "ecological integrity" of a Carolinian forest. The quotation that follows demonstrates the serious problems with Parks Canada's definition of "hyperabundance": "He observed that the ejecta [guano] covered the whole extent of the roosting place, like snow; that many trees two feet in diameter were broken off not far from the ground, and that the branches of many of the

largest and tallest had given way. The birds came in soon after sundown and a noise that sounded 'like a gale passing through the rigging of a close-reefed vessel,' causing a current of air as they passed; and here and there as the flocks alighted the limbs gave way with a crash, destroying hundreds of birds beneath. It was a scene of uproar and confusion. No one dared venture into the woods during the night, because of the falling branches."

The species being described in the quotation meets all the qualifications to be defined as "hyperabundant" under the New Directive. It "exceeds the upper range of natural variability", and it has a "long-term negative impact on ecological integrity" of a Carolinian habitat.

The above quotation was from an early popular bird book, the old *Birds of America*, edited by T. Gilbert Peterson, published in Garden City Books in 1917, and still in print. The "he" referred to was John James Audubon, so the time of observation precluded the possibility of an anthropogenic activity influencing population size. The species, of course, is the Passenger Pigeon.

As a more recent example, relatively few Sharp-shinned Hawks are seen on any one day, unless the day happens to be in September or early October, and the place happens to be at Point Pelee or some similar point of congregation of migrant birds. Then one might well see many hundreds, sometimes even thousands, of them, in a single day. Each hawk will eat one or two songbirds per day, not distinguishing between rare and common species. Should any of those many thousands of hawks swarming through the brush consume a Henslow's Sparrow or a Bewick's Wren, one could conceivably claim that they are negatively impacting "ecological integrity" particularly if the hawks were killing locally breeding birds.

No wonder the species was once shot in huge numbers at Point Pelee, an extremely widespread form of wildlife management that made sense to its proponents up until the present. Most of us now know that such shooting was not necessary in terms of protecting the prey of the hawks overall, although it undoubtedly locally enhanced numbers of rare and common songbirds at the time of the shooting.

The example of the Sharp-shinned Hawk is not entirely analogous with the current desire to shoot Double-crested Cormorants because it is not so much in migration that they appear in large numbers but, as was true, in part, of the Passenger Pigeon, and is true of the Lesser Flamingo, discussed below, they appear in "large" numbers during the breeding season. Historic observations cited by the Wires and Cuthbert 2006 report show that cormorants, like the Passenger Pigeons or the Eskimo Curlew, once appeared in staggering numbers during migration, but those days are in the past, although, unlike the pigeon or the curlew, the species itself survives.

As with the hawks, cormorants have not exceeded the "upper range of natural variability" because they are part of that variability. They are not an alien species; not a human construct; not something unprecedented, bur rather, they are a native bird doing as they have done since long before there were any humans in the western hemisphere.

These examples point to the subjective nature of the definition of "hyperabundance". Just because Parks Canada staff believe that cormorants have exceeded their "upper range of natural variability" does not make it so and begs the question of how Parks Canada would have classified the Passenger Pigeon centuries ago, or the Lesser Flamingo (see below) or the Sharp-shinned Hawk or the huge populations of species such as Northern Cod or Bison that once occurred (see below).

We believe that the Passenger Pigeon, and other species, would qualify as "hyperabundant" as defined by the New Directive, were it politically expedient to do so. However, the "ecosystem" it inhabited was the contiguous mature maple-beech climax forest that covered so much of Kentucky and other regions throughout eastern North America, up to and including southern Ontario. The mature maple-beech climax forest has been largely removed with less than 4% of the original forest cover remaining in the U.S. overall and in southwestern Ontario. The forest was lost by human activity, not by the Passenger Pigeon. Nor was there any significant loss of it known from all the millennia prior to their extinction.

Nevertheless, just as lake islands are habitat for cormorants, so was that forest habitat for the Passenger Pigeon, and there was, beyond doubt, an "impact". In neither case, however, could either species be said to exceed the "upper range of the natural variability" that is characteristic of their respective ecosystems as both are part of that natural variability.

It is not known exactly why the Passenger Pigeon went extinct. While the number directly killed by humans was staggering, bio-statisticians tell us that the slaughter alone could not have been the cause. Various theories, such as disease imported via Rock Pigeons, have been suggested. But the most popular theory seems to be that the Passenger Pigeon was simply one of those species that requires huge numbers as a stimulus to successful breeding. There are many species, such as the Right Whale, the Eskimo Curlew or the Cheetah which, when reduced to a certain number cannot, no matter how much protection is provided, easily or at all recover to former numbers. The Northern Cod may well also prove to be such a species. What is unfortunate is that we do not know with certainty what that lower limit is until the species' population falls below it and fails, when protected, to recover.

Zoologists seeking to breed flamingos in captivity have found that a flock that has failed to breed, will suddenly do so if one wall of their enclosure is a mirror. The mirror doubles the apparent flock size from the birds' perspective, and somewhere between the true flock size and the apparent flock size caused by the mirror is the critical number (population density) needed to stimulate breeding. The population size of the Lesser Flamingo (*Phoeniconais minor*), an African endemic, is informative. The exact number varies, and its winter range is quite extensive, but the sites where it actually breeds are relatively limited in number. However, within those sites numbers can, at times, reach huge absolute numbers, up to one 1,100,000 pairs in a single colony concentrated in a relatively small and specialized ecosystems of mudflats and sandbars in shallow, alkaline inland lakes. Given their concentrated numbers, they cannot help but have a demonstrable impact on "ecological

integrity", rendering the sites unsuited even for them, and so they must nest elsewhere the following breeding season.

Defining the "impact" as "long term" and "negative" is a value judgment that assumes that certain native species are destroying the ecosystems. This is like describing natural processes as being unnatural and destructive. Parks Canada expresses a negative value judgment against species like cormorants and many other species who are adjusting to a changing environment, a warming climate and world, where every part has been altered by human activity.

Those of us who where in England just after the Great Storm of 1987, when, in mid-October, winds of Category 3 hurricane force struck Great Britain, saw dramatically changed venerable woodlands, a change that took a very brief time. In the woodlands we inspected, every tree was damaged, and all that were mature, were so damaged that most would not survive. The storm redefined the fundamental structure and appearance and species complexity of the ecosystem.

A similar event happened in 1703. In the intervening 284 years, the woodlands evolved into mature forests until they were again destroyed. In 1703 the landscape looked different than when the Normans invaded in 1066, and at that time, the UK would have had fewer forests than when the Romans first invaded, in the year 43.

But a remaining patch of woodland, between two and three hundred years after the last storm of the magnitude of the one in 1987, would look "recovered", complete with very old trees that would have been young and supple at the time of the last great blow-down.

The ecosystems of the shallow, alkaline lakes of central Africa maintain their ecological integrity both before the flamingos arrive and after they leave, notwithstanding the impact of their having been there. The ecosystem is merely different, and change is the one constant in nature.

It is unclear to us how Parks Canada staff can define cormorants as overabundant when, by their own research, climate change is shown to impact significantly on national parks. Cormorants make a convenient scapegoat in face of far more serious threats to the stability of plant communities Parks Canada has prioritized as a management objective for Middle Island. In a paper entitled, *Climate change and modelled biome representation in Canada's national park system: implications for system planning and park mandates*, authors Daniel Scott, Jay R. Malcolm, and Christopher Lemieux state, "Results: The proportional distribution of biomes in Canada's national park system was very similar (within 3% of area for each biome) using BIOME3 and MAPSS under the current climate. Regardless of the GVM and climate change scenario used, the modelling results suggest the potential for substantial change in the biome representation in Canada's national park system. In five of six vegetation scenarios, a novel biome type appeared in more than half of the national parks and greater than 50% of all vegetation grid boxes changed biome type. The proportional representation of tundra and taiga/tundra in the national park system declined in each of the vegetation scenarios, while more southerly biomes (temperate forests and

savanna/woodland) increased (in some scenarios doubling to quadrupling). Results for boreal forest varied among the climate change scenarios. A range of potential vulnerabilities in existing policy and planning frameworks were identified, including the national park system plan, individual park objectives, and fire and exotic species management plans. Conclusions: Climate change represents an unprecedented challenge to Parks Canada and its ability to achieve its conservation mandate as presently legislated. Research is needed not only on ecosystem responses to climate change, but also on the capacity of conservation systems and agencies to adapt to climate change."
(http://www.blackwell-synergy.com/doi/abs/10.1046/j.1466-822X.2002.00308.x)

1.1.2. **Comments on the "upper range" part of the hyperabundance definition**:

Parks Canada should explain what is meant by “upper range”. We define upper range as the largest number of individuals of a species of animals or plants that can be maintained by the resources within the environment occupied. The upper range of species is not a steady state environment. Populations ebb and flow depending on food and habitat availability, climate change, presence of predators and numerous other factors. Populations may increase and often “exceed” the typical or average upper range if food availability increases. However, as the population grows, food availability decreases and the population follows. The subsequent die-back of abundant species allows recovery of whatever supportive resource, usually food, “recovers”. This not only applies to natural population fluctuations that happen more or less cyclically through time but to alien species that initially may take advantage of, and overwhelm, a naïve prey source until it too declines. There is no mystique to any of this. It is based on the fundamental laws of physics.

1.1.3. **Comments on the "long-term" part of the hyperabundance Definition**:

The New Directive does not define what is meant by “long-term”, making any decision by Parks Canada subjective, discretionary and open to political influence.

The effects cormorants are having on Middle Island cannot, even under the New Directive's definition, be considered “long-term”. Cormorants have impacted their environment for millennia. There has been no measurement of what changes follow the effects of the current colony size on the island or how long any of those changes may take to occur. In fact, the variability of plant life as cited in the Aquila Report demonstrates that Parks Canada has little understanding of the ecological make-up of Middle Island even prior to the most recent colonization.

It may be, as Parks Canada asserts that the current cormorant colony is unprecedented in size. Or the colony size may be, as common sense and the evidence at hand, would imply, quite normal and nothing more than a return to something closer to primal conditions. Either way, since "long-term" is not clearly defined, Parks Canada can simply say that cormorants will have a long-term effect on Middle Island without having to provide a shred of proof. It may well be that there is a long-term cyclic colonization, followed by abandonment, followed by enhanced plant growth, followed by re-colonization, all of it having happened before any records were kept. But even if records had been kept, and such

a cycle demonstrated, it would mean nothing, given that the ecological parameters are now in such a rapid state of flux.

1.1.4. **Comments on the "ecological integrity" part of the hyperabundance definition**:

We have already explored this concept in the main body of our report. The New Directive does not define "ecological integrity" but uses the words to describe management actions that would maintain a fixed state in nature, even if it requires removing native species and does not maintain ecological integrity. Parks Canada staff have tried to justify the persecution of cormorants based on bogus arguments of "hyperabundance" and absence of Great Lakes nesting evidence. They continue to do so despite the fact that there is ample evidence that cormorant populations were as abundant prior to the mid 1800s as they are today, if not more so and despite reports of presence of cormorants in the Great Lakes region.

2.0. **Definition: native species**:

The New Directive defines "native species" as "Species that naturally occur in a local ecosystem. They have been present in that ecosystem for many decades and originally arrived by normal processes of dispersal and colonization."

2.1. **Comments on the definition of native species:**

This definition strives to exclude the Double-crested Cormorant as a native species and, as we have pointed out in the main body of the paper, would include many other species that now occupy Middle Island, some as a result of direct human intervention on the landscape of the island.

Parks Canada staff apply the term "ecosystem" to Middle Island, an area so small that should any species not previously occur there, it would not be considered native. Thus, in 1920 the Northern Cardinal would not be considered a species native to Ontario and perhaps still would not be considered native.

Parks Canada fails to say how many decades it would take to make "many decades". Depending on how many decades, the Great Egret would be excluded as a "native species" as would any plant species now found on Middle Island. If, for example, a dozen decades would be considered "many", then none of the plants on Middle Island could be deemed "native" to that island, and in many instances, to the province, since they were only discovered there in the last "few" decades.

We know that Double-crested Cormorants are native to the Great Lakes, and have been found in the region at least back as far as 1540 AD, a date that well proceeds when it was described by science. There is no reason to assume that it did not occur in the Great Lakes long before that.

As we have shown in the main body of the text, the species was mostly or completely eliminated in the Great Lakes during the great wildlife persecutions of the 19th century…a century that saw the severe decline or loss of many species…and then started to repopulate the Great Lakes in the early 20th century, only to be stopped after World War II by pesticide pollution. Its absence as a result of human activity does not preclude it from being "native" even by this definition.

Again Parks Canada does not explain what they mean by "…originally arrived by normal processes of dispersal and colonization…". We suspect that in the case of cormorants, Parks Canada staff have determined that "normal processes" exclude anthropogenic causation for "dispersal and colonization". They do not apply the same standard to other species colonizing Middle Island. In fact, plants that are dependent on the man-made pond are to be protected. In addition, for example, Parks Canada does not apply the same standards to the rapid expansion of the Great Egret north through Ontario, assisted through anthropogenic activities, including actions that caused climate change. The late Lester L. Snyder, former curator of ornithology at the Royal Ontario Museum, posited that the planting of non-native lilacs, an alien species, by early settlers facilitated the dispersal of the Northern Cardinal into Ontario by augmenting local, native food sources such as wild cucumber. Are Lesser Black-backed Gulls, Cattle Egrets or Little Gulls "native"? This definition not only does not tell us but allows (depending on definitions of words used) for the possibility they are not. What about a species like the Gadwall, which certainly is native to Ontario, but has only within current lifetimes established itself as a breeding species in so much of the province? Are the ones nesting in such large numbers in the Greater Toronto area native or not?

3.0. **Definitions: natural processes**:

The definition given is "A natural continuing phenomenon marked by a series of changes that succeed one another in a relatively fixed way, e.g., erosion process, biological process, ecological process."

3.1. **Comments on the definition of natural processes:**

While we are not sure that this definition captures severe storms, fires, floods and similar phenomena that might not "succeed one another in a relatively fixed way…" we are confident that it applies to both natural range expansions, as opposed to intentional introductions, and to species recovery. Thus, the method by which the Double-crested Cormorant has come to re-inhabit the Great Lakes as a breeding species, and colonized Middle Island, would be a "natural process".

4.0. **Definitions: naturalized species**.

The definition given is, "A non-native species that has become so well established in a local ecosystem that it would be impossible (or undesirable) to eliminate."

4.1. **Comments on the definition of naturalized species:**

This does not apply to the Double-crested Cormorant, but we include the definition to illustrate the difficulties in trying to impose management doctrines on natural systems. A species such as the House Sparrow would qualify as a naturalized species, but would a House Finch, which occurs in eastern North America via human intervention, but is native to western North America**?** What about a Little Gull? All species of wildlife found in virtually, if not all, Ontario were not here during the height of the ice age, so are they "naturalized species" or native?

We would suggest that a distinction be made between species arriving as a result of being physically transported by humans (intentionally or otherwise) and those arriving as a result of their own dispersal, with the former being candidates for qualification as "naturalized species" but not the latter.

There is so much more in this New Directive we would like to critique within the context of our concern for the ecological integrity of Middle Island, but we have simply run out of time. The New Directive was not published until last month, and did it become known to us until the time when Parks Canada indicated its management plan for Middle Island would be due. We will only add that a large or any other colony of waterbirds, including cormorants, is representative of Canada's natural regions, and that eliminating most of any species in such a natural region that occurs there naturally is not at all representative of a natural region and does not support ecological integrity; quite the contrary.

Addendum #2
Criminal Code, Cruelty to Animals Section

446. (1) Every one commits an offence who

Causing unnecessary suffering

(a) wilfully causes or, being the owner, wilfully permits to be caused unnecessary pain, suffering or injury to an animal or a bird;
(b) by wilful neglect causes damage or injury to animals or birds while they are being driven or conveyed;
(c) being the owner or the person having the custody or control of a domestic animal or a bird or an animal or a bird wild by nature that is in captivity, abandons it in distress or wilfully neglects or fails to provide suitable and adequate food, water, shelter and care for it;
(d) in any manner encourages, aids or assists at the fighting or baiting of animals or birds;
(e) wilfully, without reasonable excuse, administers a poisonous or an injurious drug or substance to a domestic animal or bird or an animal or a bird wild by nature that is kept in captivity or, being the owner of such an animal or a bird, wilfully permits a poisonous or an injurious drug or substance to be administered to it;
(f) promotes, arranges, conducts, assists in, receives money for or takes part in any meeting, competition, exhibition, pastime, practice, display or event at or in the course of which captive birds are liberated by hand, trap, contrivance or any other means for the purpose of being shot when they are liberated; or
(g) being the owner, occupier or person in charge of any premises, permits the premises or any part thereof to be used for a purpose mentioned in paragraph (f).

Punishment

(2) Every one who commits an offence under subsection (1) is guilty of an offence punishable on summary conviction.

Failure to exercise reasonable care as evidence

(3) For the purposes of proceedings under paragraph (1)(a) or (b), evidence that a person failed to exercise reasonable care or supervision of an animal or a bird thereby causing it pain, suffering, damage or injury is, in the absence of any evidence to the contrary, proof that the pain, suffering, damage or injury was caused or was permitted to be caused wilfully or was caused by wilful neglect, as the case may be.

Presence at baiting as evidence

(4) For the purpose of proceedings under paragraph (1)(d), evidence that an accused was present at the fighting or baiting of animals or birds is, in the absence of any evidence to the contrary, proof that he encouraged, aided or assisted at the fighting or baiting.

Order of prohibition

(5) Where an accused is convicted of an offence under subsection (1), the court may, in addition to any other sentence that may be imposed for the offence, make an order prohibiting the accused from owning or having the custody or control of an animal or a bird during any period not exceeding two years.

Breach of order

(6) Every one who owns or has the custody or control of an animal or a bird while he is prohibited from doing so by reason of an order made under subsection (5) is guilty of an offence punishable on summary conviction.

R.S., c. C-34, s. 402; 1974-75-76, c. 93, s. 35.