

# Management Plan for the Barrow's Goldeneye (*Bucephala islandica*), Eastern Population, in Canada

## Barrow's Goldeneye, Eastern Population



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## PREFACE

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996) agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of management plans for listed Special Concern species and are required to report on progress within five years.

The Minister of the Environment and the Minister responsible for the Parks Canada Agency are the competent ministers for the conservation of the Barrow's Goldeneye, Eastern Population, a species listed as special concern in Schedule 1 of SARA. This management plan was prepared in accordance with section 65 of SARA. It was developed in cooperation with the following jurisdictions:

- Government of New Brunswick
- Government of Newfoundland and Labrador
- Government of Nova Scotia
- Government of Prince Edward Island
- Government of Quebec
- Hunting, Fishing and Trapping Coordinating Committee
- Nunavik Marine Region Wildlife Board
- Nunavut Wildlife Management Board

Success in the conservation of the Barrow's Goldeneye, Eastern Population, depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this management plan and will not be achieved by Environment Canada, Parks Canada Agency, Fisheries and Oceans Canada or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this management plan for the benefit of the Barrow's Goldeneye, Eastern Population, and Canadian society as a whole. Implementation of the plan is subject to the appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

## ACKNOWLEDGMENTS

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## EXECUTIVE SUMMARY

The Barrow's Goldeneye is a sea duck that occurs in three distinct populations in North America and Iceland. The Eastern population of Barrow's Goldeneye in North America was assessed in 2000 by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as a species of special concern and was listed as such in Schedule 1 of the *Species at Risk Act* (SARA) in 2003.

The Eastern population comprises approximately 6800 individuals, which is equivalent to 2100 pairs. The species breeds primarily in the boreal forests of Quebec, north of the Estuary and Gulf of St. Lawrence. While most of the population also winters in the Estuary and the Gulf, its wintering range extends to the coast of the Atlantic provinces and Maine.

The main threats to the Barrow's Goldeneye, Eastern population, are logging, the stocking of fishless lakes, and oil spills. Hunting and sediment contamination may also pose threats to this population.

The management objective is to maintain and, if possible, increase the current population size and range of the Barrow's Goldeneye, Eastern population. In order to achieve this objective, the size of the population must be maintained for the next ten years at not less than 6800 individuals across the species' range. General strategies and management activities designed to achieve this objective are set out in section 6.2.

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## 1. COSEWIC SPECIES ASSESSMENT INFORMATION

**Date of Assessment:** May 2011

**Common Name (population):** Barrow's Goldeneye, Eastern Population

**Scientific Name:** *Bucephala islandica*

**COSEWIC Status:** Special Concern

**Reason for Designation:** Numbers of individuals in this eastern population are limited. Although threats such as limited habitat availability and oil spill potential have been identified, none is currently at a scale that would impact negatively on the population.

**Canadian Occurrence:** Quebec, New Brunswick, Prince Edward Island, Nova Scotia, Newfoundland and Labrador

**COSEWIC Status History:** Designated Special Concern in November 2000. Status re-examined and confirmed in May 2011.

## 2. SPECIES STATUS INFORMATION

The Barrow's Goldeneye (*Bucephala islandica*), Eastern population, was added to Schedule 1 of the *Species at Risk Act* (S.C. 2002, c. 29) (SARA) in 2003. In Quebec, it is designated vulnerable under the *Act Respecting Threatened or Vulnerable Species* (R.S.Q. c. E-12.01). In Newfoundland and Labrador it is listed as vulnerable under the *Endangered Species Act* (NL ESA E-10.1, 2001). Elsewhere in the Atlantic provinces the species has no legal protection under New Brunswick's *Endangered Species Act* (S.N.B., 1996, c. E-9.101), Nova Scotia's *Endangered Species Act* (S.N.S. 1998, c. 11) or Prince Edward Island's *Wildlife Conservation Act* (RSPEI 1988, c. W-41).

Barrow's Goldeneye (three populations) has a global conservation rank of G5 (secure) owing to its abundance throughout its global range (NatureServe 2010). Its Eastern population has a rank of G5T3 (vulnerable). The species has a rank of N5B (secure) in Canada whereas the Eastern population has a rank of N3 (vulnerable) in Canada. In Quebec, the latter has a rank of S3B, indicating that the population that breeds there is ranked as vulnerable. Provincial ranks (S) have not been established in the Atlantic provinces. Almost all of the Eastern population spends its entire life cycle in Canada.

### 3. SPECIES INFORMATION

#### 3.1 Species Description

The Barrow's Goldeneye<sup>1</sup> is a sea duck. On average, males weigh 1150 g, and females weigh 800 g. Adult males have black and white plumage, with an iridescent purplish head and a crescent-shaped white patch at the base of the bill. Adult females have brown and white plumage and, in winter and spring, a bright orange bill (Eadie et al. 2000). In general, it is quite difficult for an observer to distinguish female and juvenile Barrow's Goldeneyes from female and juvenile Common Goldeneyes (*Bucephala clangula*) due to their similarity. However, the Common Goldeneye is much more common in marine environments in eastern Canada.

#### 3.2 Populations and Distribution

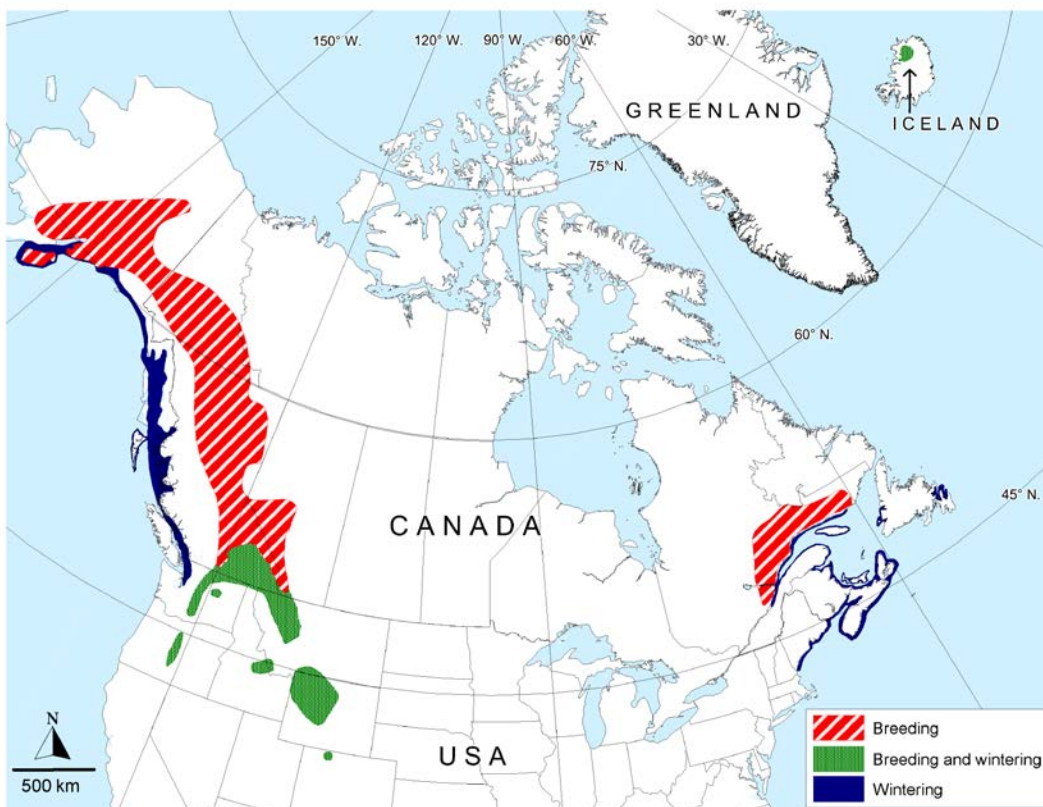
There are three populations of Barrow's Goldeneye in the world, occupying western North America, eastern North America and Iceland (see Figure 1). The global population numbers at least 200 000, and most of these individuals breed and winter in western North America (Eadie et al. 2000). The Icelandic population, which mainly occurs in the northeast of Iceland, is composed of approximately 2000 individuals (Einarsson 2005).

This management plan deals with the eastern North American population of Barrow's Goldeneye, consisting of approximately 6800 individuals, the equivalent of 2100 pairs (Robert 2010). Population trends for this species are unknown, but the Eastern population is believed to have declined in the 20th century and may still be in decline (Robert et al. 2000a, 2000b, 2002, 2003; Robert and Savard 2006).

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<sup>1</sup>Unless otherwise indicated, the name "Barrow's Goldeneye" is used in this document to refer to the "Barrow's Goldeneye, Eastern population."



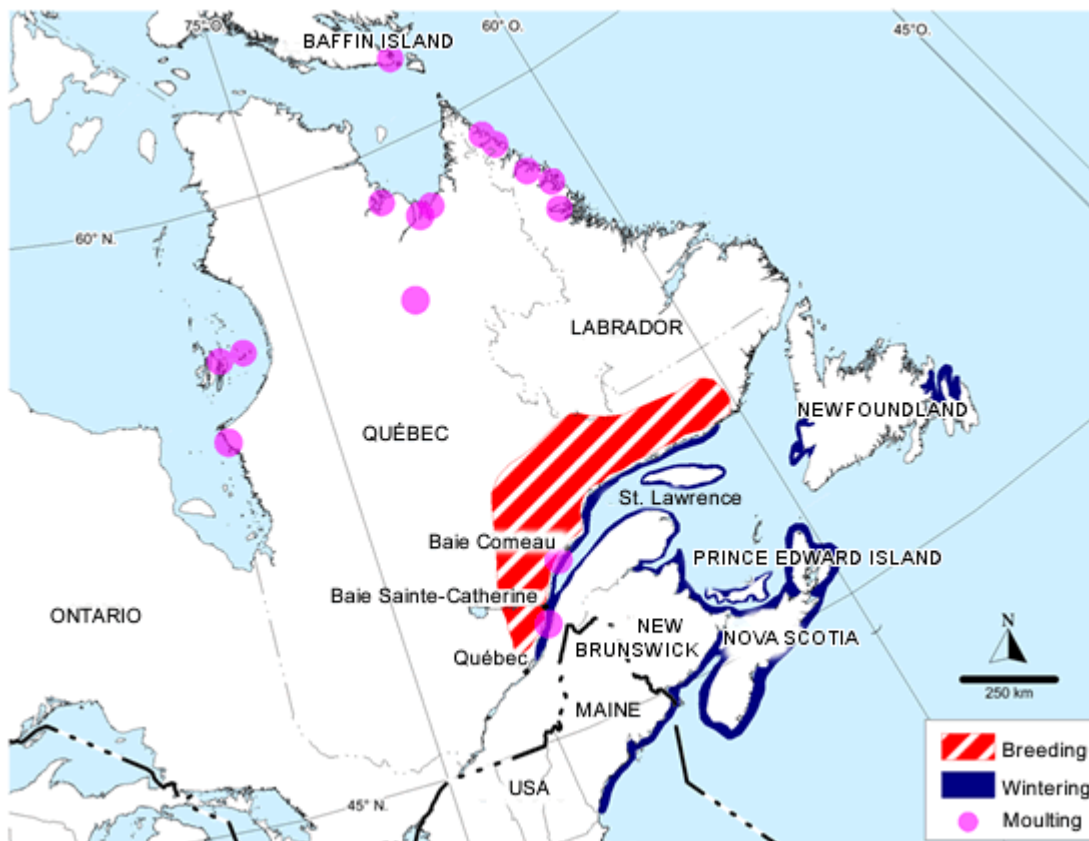


**Figure 1. Global range of Barrow's Goldeneye**

Adapted from Eadie et al. (2000)

*Breeding period* – The Barrow's Goldeneye breeds north of the St. Lawrence Estuary and Gulf in the boreal forest of eastern North America (Robert et al. 2000b, 2002; Figure 2). According to a survey conducted in Labrador and in Quebec's Côte-Nord region, the core of the breeding population is found south of 52° N latitude. The species is also found, in small numbers, in the extreme southern part of Labrador (Robert and Savard 2008). The northern and eastern boundaries of its breeding range are still to be determined (Robert et al. 2008). Recent sightings have confirmed the presence of Barrow's Goldeneye during the reproductive season in the Chic-Choc Mountains, in the Gaspé Peninsula south of the St. Lawrence River (Ouellet *et al.* 2010a).

*Wintering period* – Although the wintering range of the Barrow's Goldeneye extends along the shores of the Atlantic provinces and Maine, most individuals (> 95% of the population) winter in the St. Lawrence Estuary and Gulf (see Figure 2). The species is present there from October to June and is particularly abundant from late October to late April (Robert et al. 2003; Robert and Savard 2006). They congregate in large numbers on tidal flats on the northern shore of the Estuary and in a few areas in the Gulf, including Chaleur Bay and along the southern shore of Anticosti Island (Ouellet et al., 2010b). The rest of the population (fewer than 1000 individuals) winters in the Atlantic provinces (New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador) and in Maine (Daury and Bateman 1996). In the Atlantic region, their main site is in Dalhousie (New Brunswick), in Chaleur Bay, where some 750 individuals have been counted (Robert et al. 2003; Robert and Savard 2006; Robert 2010).



**Figure 2. Distribution range of the Barrow's Goldeneye, Eastern population**  
Adapted from Eadie et al. (2000).

*Moulting period* – Adult males moult in the Arctic, along the shores of Hudson Bay and Ungava Bay and along the north coast of Labrador and the south coast of Baffin Island (Figure 2; Benoît et al. 2001; Robert et al. 2002). Some spend the moulting period on inland lakes near the shoreline. The males leave the breeding grounds shortly after the incubation period begins in June. They remain on the moulting grounds through summer and early fall and return to the St. Lawrence Estuary and Gulf in October and November to winter. Very little is known about the moulting grounds of female Barrow's Goldeneyes. However, recent work provides initial information on the subject. Some females moult up north, in the Ungava Bay region, and near the shore of James Bay. Others do not undertake long migrations and moult in the St. Lawrence Estuary (Figure 2; Savard and Robert, in press).

### 3.3 Needs of the Barrow's Goldeneye, Eastern population

The biological and habitat needs, as well as the limiting factors of the Barrow's Goldeneye, are described in detail in the COSEWIC status report (Robert et al. 2000a).

### 3.3.1 Habitat and biological needs

*Breeding period* – Barrow's Goldeneyes use small lakes (< 15 ha) located at high altitudes (> 500 m) in areas characterized by rugged terrain for mating and rearing their young. They prefer fishless lakes and lakes at the head of watersheds (Robert et al. 2000b, 2008). Fishless lakes provide ideal conditions for Barrow's Goldeneyes, since they are likely richer in invertebrate species than lakes with fish (since fish prey on invertebrates; see Robert et al. 2008 for references on this subject).

Barrow's Goldeneyes seldom make their nests near water. The nests surveyed by Evans (2003) and Robert et al. (2010) were found in forested areas located anywhere from 90 to 246 metres from water. Nests discovered to date in Quebec were found in apical or lateral cavities of large trees (average DBH<sup>2</sup> of 38 cm; N<sup>3</sup> = 10) in an advanced state of decomposition (Robert et al. 2006a; 2010). The species is also known to use nesting boxes (Eadie et al. 2000; Savard and Robert 2007).

*Wintering period* – Results of a study conducted along the St. Lawrence Estuary (Laforge, 2010; Ouellet et al., 2010b; Ouellet et al., in preparation) indicate that the Barrow's Goldeneye is closely associated with large rocky intertidal areas that support dense populations of brown algae (Fucaceae). In these areas, the birds primarily feed on amphipods (crustaceans) and gastropods, particularly periwinkles (Bourget 2004). In the Atlantic provinces, Barrow's Goldeneyes occur most commonly in winter in open water areas associated with flow constrictions (e.g., bridges or causeways) or in thermal effluent discharge zones (e.g., industrial discharge in Dalhousie Bay) (Environment Canada, Canadian Wildlife Service – Atlantic Region, unpublished data).

*Moulting period* – The moulting habitat of the Barrow's Goldeneye has never been thoroughly studied. According to Benoît et al. (2001), Barrow's Goldeneyes surveyed in the estuary of Rivière aux Feuilles (Nord-du-Québec region) during moulting season were primarily found in rocky tidal flats similar to those in the St. Lawrence Estuary where the birds congregate during fall and winter.

### 3.3.2 Limiting factors

Barrow's Goldeneyes are territorial, which can sometimes limit breeding densities (Eadie et al. 2000). In some locations, Barrow's Goldeneyes and Common Goldeneyes share the same breeding grounds (Robert et al. 2000b; Savard and Robert 2007). Since the two species have very similar habitat and breeding requirements, it is assumed that they sometimes compete for nesting cavities, as well as for feeding and brood rearing habitat.

The availability of nesting cavities can have an impact on the size of the Barrow's Goldeneye population, since it can prevent females from nesting or increase the level of interspecific competition and parasitism (some Barrow's Goldeneye females lay eggs only as brood parasites, not establishing a nest of their own, but rather laying their eggs in the nests of other females)

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<sup>2</sup> Diameter at breast height.

<sup>3</sup> Sample size.

(Eadie et al. 2000). Female Goldeneyes exhibit high fidelity to previous nest sites, returning to the same area or even the same cavity from year to year (Savard and Eadie 1989). This behaviour suggests that species abundance in a given sector may depend in large part on the nest success of females in that sector, regardless of the success of females in other parts of the breeding range.

## 4. THREATS

### 4.1 Threat Assessment

**Table 1. Threat assessment table**

Threat	Level of concern <sup>1</sup>	Extent	Occurrence	Frequency	Severity <sup>2</sup>	Causal certainty <sup>3</sup>
<b>Habitat loss or degradation</b>						
<b>Logging</b>	High	Widespread	Current	Seasonal <sup>4</sup>	Unknown	Medium to High
<b>Fish stocking</b>	High	Widespread <sup>4</sup>	Currents	Seasonal <sup>4</sup>	Unknown	Medium
<b>Pollution</b>						
<b>Hydrocarbon spills</b>	Medium	Widespread <sup>5</sup>	Anticipated	Seasonal <sup>5</sup>	Unknown	Medium
<b>Sediment contamination</b>	Low	Localized	Current	Seasonal <sup>5</sup>	Low	Low
<b>Use of biological resources</b>						
<b>Hunting</b>	Medium	Localized	Current	Seasonal	Unknown	Low

<sup>1</sup> *Level of Concern: signifies that managing the threat is of (high, medium or low) concern for the management of the species, consistent with the population and distribution objectives. This criterion considers the assessment of all the information in the table.*

<sup>2</sup> *Severity: reflects the population-level effect (High: very large population-level effect, Moderate, Low, Unknown).*

<sup>3</sup> *Causal certainty: reflects the degree of evidence that is known for the threat (High: available evidence strongly links the threat to stresses on population viability; Medium: there is a correlation between the threat and population viability, e.g., expert opinion; Low: the threat is assumed or plausible).*

<sup>4</sup> *Breeding range*

<sup>5</sup> *Wintering range*

### 4.2 Description of Threats

Threats are presented in descending order of concern.

1. *Logging* – Most Barrow's Goldeneye breeding grounds are located on provincial crown land (Government of Quebec) subject to logging. According to the COSEWIC status report (Robert et al. 2000a) and other later studies (Robert et al. 2006a, 2010; Vaillancourt 2007), some logging practices present a serious threat, particularly clearcutting and removing snags. The main

anticipated effects of logging operations would include habitat loss due to the harvesting of nesting trees used by females during the incubation period; the short- and long-term reduction in the number of trees and snags suitable for nesting; and habitat degradation resulting from hunters' and anglers' increased access to pristine lakes that were previously difficult to access by land. A reduction in the number of nesting cavities can also have indirect effects, such as increased competition for existing cavities and a greater risk of predation on females and their young when females are forced to nest further from brood-rearing lakes. It has also been argued that some logging practices logging can degrade remaining habitat due to an increase in beaver populations in regenerating sectors. Specifically, the rise in water level in lakes used by Barrow's Goldeneyes affects aquatic invertebrate populations (food source) (Canadian Wildlife Service – Quebec Region, unpublished data).

2. *Fish stocking* – The introduction of fish in lakes that were formerly fishless poses a threat to Barrow's Goldeneye since this practice reduces the prey populations on which it feeds (Robert et al. 2008). In Quebec, many fishless lakes have been stocked for recreational purposes in recent decades (Robert et al. 2000a, 2008). Logging has indirectly facilitated this practice by providing access to numerous lakes that were once inaccessible by land.

3. *Oil spills* – The St. Lawrence Estuary and Gulf form part of a major waterway in northeastern North America (Robert et al. 2000a). A significant portion of the Barrow's Goldeneye, Eastern population, is concentrated in a few areas along the St. Lawrence Estuary, making the species extremely vulnerable to oil spills. Oil spills constitute a serious threat since a single spill along the St. Lawrence could cause significant mortality within the population. Petroleum products greatly reduce the thermoregulatory and aerodynamic properties of feathers, particularly in seabirds. Oil spills could also pose a threat to Barrow's Goldeneyes in the moulting grounds where they congregate for much of the year (Robert et al. 2002). This risk is considered less severe in Arctic waters than in the St. Lawrence Estuary and Gulf due to lower volume of shipping traffic. However, this reality could change with the increase in shipping traffic associated with industrial development in the Arctic and with the possible opening-up of the Northwest Passage (e.g. the Hudson Strait).

4. *Hunting* – Although the Barrow's Goldeneye has been protected by special federal regulatory measures since 1995 (Robert et al. 2000a; see Section 6.1) that include a hunting prohibition in some districts during some periods, as well as low daily bag and possession limits, the potential impact of hunting remains a source of concern. In October, (coinciding with the hunting season) Barrow's Goldeneyes begin to gather along the St. Lawrence Estuary and Gulf, where they will spend the winter (Robert et al. 2003; Robert and Savard 2006). Due to the high degree of similarity between the Barrow's Goldeneye and the Common Goldeneye and the fact that the two species commonly winter together, hunters often have difficulty distinguishing between the two species from a distance. Consequently, Barrow's Goldeneyes are at risk of being inadvertently shot by hunters of the Common Goldeneye<sup>4</sup>. The behaviour of the Barrow's

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<sup>4</sup> It is precisely to prevent these accidental killings from being illegal that hunting the Barrow's Goldeneye is still permitted in certain hunting districts where the species is rarely found. According to the National Species Composition Survey, the harvest rate of the Barrow's Goldeneye remains marginal from one year to the next (Canadian Wildlife Service, unpublished data).

Goldeneye also makes it vulnerable to hunting mortality since it is easily attracted by decoys. Hunting of Barrow's Goldeneyes on breeding grounds is another potential threat. The young of the Barrow's Goldeneye, which are quite tame and therefore easily killed, may still be present on breeding grounds during the first weeks of the hunting season. This threat may be even greater in areas that are logged, where greater access to breeding grounds may increase hunting pressure.

Subsistence hunting of sea ducks is a popular activity on the Côte-Nord and in the Gaspé Peninsula and is particularly important for coastal Aboriginal communities (Innu, Inuit, Mi'kmaq and Maliseet). Many of these Aboriginal communities are located in close proximity to coastal areas where Barrow's Goldeneyes congregate. Under the Nunavut Land Claims Agreement and the Nunavik Inuit Land Claims Agreement, Aboriginal communities retain the right to hunt waterfowl for subsistence purposes in Nunavut and Nunavik moulting sites. However, given the timing of the ducks' arrival and departure from these waters and the remoteness of known moulting grounds, the number of Barrow's Goldeneyes harvested on the moulting grounds is probably very small.

5. *Sediment contamination* – In winter, several hundred Barrow's Goldeneyes, Eastern population, congregate during several months in areas known to have highly contaminated sediments, particularly opposite Baie-Comeau (polychlorinated biphenyls (PCB) and polycyclic aromatic hydrocarbons) and Dalhousie (lead and mercury) (Robert et al. 2000a). Very little is known about the effect of this contamination on birds that winter in these areas. A recent study on the contamination of birds wintering in the Baie-Comeau region and in other locations along the St. Lawrence Estuary and Chaleur Bay found higher PCB concentrations in the liver of birds captured in the Baie-Comeau area and other areas. However, these levels were lower than those that could cause harmful effects. Although high, selenium concentrations observed in birds collected in Chaleur Bay are similar to those for other marine species and pose a low risk of harmful effects (Ouellet *et al.*, in press).

## **5. MANAGEMENT OBJECTIVE**

The long-term objective of this management plan is to maintain and, if possible, increase the population size and range of the Barrow's Goldeneye, Eastern population, in Canada. In order to achieve this objective, the size of the population must be maintained for the next ten years at not less than 6800 individuals across the Canadian range of the population.

## **6. BROAD STRATEGIES AND MANAGEMENT ACTIONS**

### **6.1 Actions Already Completed or Underway**

The Barrow's Goldeneye has been the subject of numerous studies since COSEWIC's last status report (Robert et al. 2000a). These studies, most of which were carried out in Quebec, can be grouped under three themes: (1) management, conservation and stewardship of the species and its habitat; (2) research and monitoring; (3) outreach and communication.

*Management, conservation and stewardship of the species and its habitat* – The Quebec government, which owns a large portion of the species' range, has introduced several land management measures in recent years. In terms of conserving fishless lakes, the government introduced a legislative amendment to the *Act Respecting the Conservation and Development of Wildlife* (R.S.Q., c. C-61.1, s. 73.1) in order to authorize the development of fish stocking plans in specific areas. Quebec's Ministère des Ressources naturelles et de la Faune (MRNF) has also taken measures to prohibit the stocking of fishless lakes on Quebec provincial crown lands (within the breeding area). For example, a moratorium was imposed in Saguenay-Lac-Saint-Jean (J. Tanguay, MRNF, pers. comm.), and in the controlled harvesting zones (ZECs) and wildlife reserves in the regions concerned (M. Arvais, MRNF, pers. comm.). The MRNF is also studying the possibility of a complete fishing ban in a zone that occupies a large area in the eastern part of the Côte-Nord (S. Guérin, MRNF, pers. comm.)

Barrow's Goldeneye is also included in the administrative agreement pertaining to threatened or vulnerable plant and wildlife species in Quebec's forests (Deschênes 2004). The protective measures of this agreement are currently being developed. The protective measures under this agreement are currently being developed. Their goal will be to minimize the impact of forest management on Barrow's Goldeneye habitat.

Federal regulations pertaining to the hunting of migratory birds have been amended several times between since the 1990s. For example, no-hunting zones were put in place (C.R.C. 1997, c. 1035; part IV, 1c). Changes were also made between 2002 and 2008 in order to tighten daily bag and possession limits, as well as to shorten the hunting season for Barrow's Goldeneye, Eastern population. Furthermore, as part of the environmental assessment framework under the *Canadian Environmental Assessment Act* (S.C. 1992, c. 37), Environment Canada issues recommendations to ensure that projects carried out within the distribution range of Barrow's Goldeneye will have no impact on the integrity of the species' preferred habitats (e.g., compensation agreement under the *Fisheries Act* [R.S.C., 1985, c. F-14]). Finally, morphometric markers to differentiate Barrow's Goldeneye from Common Goldeneye are currently being identified by Environment Canada (Canadian Wildlife Service – Quebec Region) and the Université du Québec à Rimouski (Chalopin, 2008).

*Research and monitoring* – Most research and monitoring activities have been carried out by Environment Canada (Canadian Wildlife Service – Quebec Region) in partnership with the academic community.

Breeding period: The main activities carried out during the reproductive period include inventories and telemetry monitoring (Robert et al. 2000b, 2002; Benoît et al. 2001). This work has made it possible to increase knowledge with respect to species distribution, use of the nesting box network (Savard and Robert 2007), the time-budgets of females (Robert et al. 2006b), diet, and comparisons of used and unused lakes according to physicochemical properties and macroinvertebrate biomass. Studies on various habitat characteristics (e.g., availability and description of nesting cavities) have also been conducted (Robert et al. 2006a, 2008, 2010; Vaillancourt 2007; Vaillancourt et al. 2008, 2009).

Moulting period: Telemetric monitoring of birds fitted with satellite transmitters has made it possible to locate certain moulting grounds.

Migratory period: Surveys of hunters in the Lac Saint-Pierre area have made it possible to determine whether the Barrow's Goldeneye uses Lac Saint-Pierre during the migratory period (Environment Canada, Canadian Wildlife Service – Quebec Region, unpublished data from 2001 and 2002).

Wintering period: The main studies carried out during the wintering period include the following: several inventories that have provided a better understanding of the species' range during this period (Robert et al. 2003; Robert and Savard 2006; Robert 2010; Environment Canada, Canadian Wildlife Service – Atlantic Region, unpublished data); university studies on habitat selection (Ouellet et al., 2010b; Ouellet et al., in prep.), diet (Bourget 2004; Bourget et al 2007; Ouellet et al., in prep.), time budget (Laforge, 2010); and a study of bird contamination among individuals that winter in the St. Lawrence Estuary and the Chaleur Bay (Environment Canada, Canadian Wildlife Service – Quebec Region and Wildlife and Landscape Science, Ouellet et al., in press).

*Outreach and communication* – Products have been developed for a variety of clienteles over the past 15 years. These include awareness articles aimed at the general public (Savard and Robert 1997; Robert 2002; Coughlan et al. 2005), interpretive materials (Saguenay-St. Lawrence Marine Park, Comité ZIP Côte-Nord du Golfe), and posters to increase awareness in Aboriginal communities. A symposium on fishless lakes was organized in Chicoutimi in 2002 for scientists and land managers. An information brochure on the importance of fishless lakes was produced, along with a brochure to help hunters and enforcement officers distinguish Barrow's Goldeneye from Common Goldeneye.

## 6.2 Management: Strategic Direction and Implementation Schedule

**Table 2. Implementation schedule\***

Action	Priority	Threats or concerns addressed**	Timeline
<b>Strategy 1: Management, conservation and stewardship of the species and its habitat</b>			
Develop, adopt and implement best forest management practices	High	1	2013-2018
Identify lakes without fish that are suitable for the species and work with responsible authorities to apply the prohibition against stocking these lakes	High	2	2013-2018
Examine the possibility of restoring lakes suitable for the species reproduction that have been stocked in the past	High	2	2013-2018
Prioritize the species in emergency response plans in the event of oil spills, particularly on wintering and moulting grounds	High	3	2013-2018
Introduce measures that allow hunting without negatively affecting the population maintenance (including the development and implementation of methods to estimate harvest numbers) and carry out required revisions to regulations if necessary)	High	5	2013-2018



<b>Action</b>	<b>Priority</b>	<b>Threats or concerns addressed**</b>	<b>Timeline</b>
Promote the designation of protective status to wintering grounds (e.g., areas where aquatic birds congregate, under the Quebec <i>Act Respecting the Conservation and Development of Wildlife</i> [R.S.Q., c-C-61.1])	Medium	3, 4, 5	2013-2014
Apply necessary regulations under s. 71 of the <i>Species at Risk Act</i> (S.C. 2002, c. 29) to protect important moulting, wintering and breeding grounds	Medium	3	2013-2018
Collaborate with northern authorities to identify and protect important moulting grounds	Medium	5	2013-2018
<b>Strategy 2: Research and monitor the species and its habitat</b>			
Initiate programs to monitor breeding populations and assess annual productivity	High	Knowledge gaps	2013-2018
Develop survey protocols to be used throughout the wintering range of the species, and conduct surveys every three years	High	Knowledge gaps	2014 and 2017
Promote spring surveys on potential breeding grounds	Medium	Knowledge gaps	2013-2018
Assess the relevance of installing nesting boxes to increase species productivity	Medium	Knowledge gaps	2013-2018
Characterize breeding, moulting and wintering habitat	Medium	Knowledge gaps	2013-2018
Encourage other applied research activities to support recovery of the population (e.g., interactions with Common Goldeneye, effects of contaminated sediments)	Medium	Knowledge gaps, 4	2013-2018
Monitor contaminant levels found in the species' main prey in the areas of the St. Lawrence where it is most often found	Medium	Knowledge gaps, 4	2013-2018
Determine the genetic relationships between the Eastern, Western and Icelandic populations	Low	Knowledge gaps	2013-2018
<b>Strategy 3: Outreach and communication</b>			
Develop tools for land managers, hunters and enforcement officers (e.g., identifying the species, reasons for its precarious status, its needs)	Medium	1, 2, 3, 4, 5	2013-2018
Conduct annual patrols in areas where the species is concentrated to ensure that legal bag and possession limits are being respected	Medium	5	2013-2018
Engage key interest groups in efforts to reduce threats faced by the species and encourage the reporting of relevant observations	Medium	1, 2, 3, 5	2013-2018

\* Responsibilities for implementing the actions listed in table 2 will be assigned through a consensus-building process involving the participating jurisdictions and organizations.

\*\* 1: logging; 2: stocking of fishless lakes; 3: oil spills; 4: sediment contamination; 5: hunting.

## 7. MEASURING PROGRESS

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution objectives for Barrow's Goldeneye. Success of the implementation of this management plan will be evaluated every five years against the following indicators:

- In the long-term, the Canadian population and range of the Barrow's Goldeneye, Eastern population, are maintained and, if possible, increased.
- Over the next 10 years, the size of the population is maintained at not less than 6800 individuals throughout its Canadian range.

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## APPENDIX A: EFFECTS ON THE ENVIRONMENT AND OTHER SPECIES

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

Management planning of a species of special concern is intended to benefit species at risk and biodiversity in general. However, it is recognized that management plans may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the management plan itself, but are also summarized below in this statement.

The potential for the plan to inadvertently lead to adverse effects on the environment or other species was considered. Since the recommended activities are limited to non-intrusive measures such as monitoring the population and conducting awareness activities, we may conclude that the management plan will not entail any significant adverse effects.

In all likelihood, some of the measures proposed in this management plan will contribute to the conservation of other species. The implementation of measures designed to reduce the impact of logging on Barrow's Goldeneye, such as the conservation of living or dead trees appropriately sized for nesting, should be beneficial to other animal and plant species associated with this forest feature. The conservation of fishless lakes will likely benefit the conservation of other species, since these lakes are known to contain wildlife with several unique characteristics. The conservation of certain areas where Barrow's Goldeneyes congregate will likely benefit other waterfowl species. In all likelihood, the implementation of an annual population monitoring program during the breeding period will complement monitoring programs for other waterfowl species with similar habitat requirements, such as the Surf Scoter (*Melanitta perspicillata*). Winter surveys along the St. Lawrence Estuary and Gulf will make it possible to inventory and locate birds that winter on these shores, including many other species of waterfowl. Finally, it is likely that the positive impact of communication initiatives will extend well beyond the conservation of the Barrow's Goldeneye.

Many other vertebrate species at risk occur in the boreal forest of eastern North America. These include Woodland Caribou, boreal population (*Rangifer tarandus caribou*), Bicknell's Thrush (*Catharus bicknelli*), Rusty Blackbird (*Euphagus carolinus*) and Olive-sided Flycatcher (*Contopus cooperi*). Although the habitats of these species differ considerably from those of Barrow's Goldeneye, efforts to ensure the conservation and long-term viability of Barrow's Goldeneye may also enhance conservation and awareness efforts focused on these other species at risk.