COSEWIC
Assessment and Status Report

on the

Ross's Gull
Rhodostethia rosea

in Canada

ENDANGERED
2021

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada

COSEPAC
Comité sur la situation
des espèces en péril
au Canada

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

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COSEWIC 2001. COSEWIC assessment and update status report on the Ross's Gull *Rhodostethia rosea* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 13 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

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COSEWIC
Assessment Summary

Assessment Summary – April 2021

Common name
Ross's Gull

Scientific name
Rhodostethia rosea

Status
Endangered

Reason for designation
This small little-known gull nests at 1-3 known colonies in the Canadian High Arctic and likely winters in the Labrador Sea. Fewer than 20 mature individuals are known to breed in Canada, although roughly similar numbers may occur undetected. Large numbers of fall migrants seen annually off northern Alaska likely come from a separate large population in eastern Russia. This species has low productivity in Canada, with frequent breeding deferral, nest abandonment, and no chicks fledged over a period of 14 years at the only known active Canadian colony. These factors contribute to inferred continuing population decline. The abandonment of Low Arctic nesting sites since the last assessment has reduced its range and number of locations in Canada, and its breeding range is now limited to the High Arctic. Major threats impeding reproductive success include the killing of chicks by Arctic Terns at colonies, and contamination from airborne toxic chemicals. Effects of ongoing climatic changes on food availability, reproductive success, and adult survival are largely unknown.

Occurrence
Nunavut, Manitoba, Newfoundland and Labrador, Arctic Ocean, Atlantic Ocean

Status history
Designated Special Concern in April 1981. Status re-examined and confirmed in April 1996. Status re-examined and designated Threatened in November 2001 and in April 2007. Status re-examined and designated Endangered in May 2021.

COSEWIC
Executive Summary

Ross's Gull
Rhodostethia rosea

Wildlife Species Description and Significance

Ross's Gull is a small Arctic gull with light, buoyant flight and quick, shallow wingbeats, characterized by a unique wedge-shaped tail. Breeding adults have a distinctive black collar, and the pale head and body feathers take on a light pink cast. Juvenile birds have black outer primaries and a broad black diagonal band across the inner wing.

Ross's Gull is the only member of the genus *Rhodostethia,* and its plumage, vocal repertoire, courtship behaviour, and general ecology are unique among gulls. Scientific studies are largely limited to opportunistic observations at small colonies in Russia and Canada and of migrating gulls at Point Barrow, Alaska. Its winter ecology is largely unknown, although its winter range likely overlaps with pelagic gulls and alcids in subarctic waters. Ross's Gull is known to Inuit in Nunavut and Indigenous residents of Barrow, Alaska, and sought by birdwatchers as a rare winter visitor to lower latitudes.

Distribution

Ross's Gull's breeding stronghold is assumed to lie in eastern Russia, with scattered nesting records from Canada and Greenland. Large flocks of Ross's Gull that annually migrate past Point Barrow each fall are thought to originate in eastern Russia. Birds from the very small Canadian Arctic breeding population likely overwinter in the Labrador Sea.

Habitat

Ross's Gull typically nests in flat, low-lying areas with low vegetative cover, and has nested in two habitat types in Canada. Ross's Gull is now most frequently encountered on High Arctic islands in Queens Channel, Nunavut, on small sparsely vegetated gravel islands adjacent to marine open-water polynyas. Small numbers formerly nested in marshy Low Arctic floodplain habitat near Churchill, Manitoba, where it has not been confirmed breeding since 2005.

Biology

Ross's Gull likely first breeds after 2 years, with a generation time of about 5 years. It lays 1-3 eggs in a scrape on the ground, in loose colonies, typically of 2-10 pairs. Ross's Gull frequently defers or abandons nesting, or relocates to a different nesting site, in response to snow cover, prolonged inclement weather, or terrestrial predators. Studies of tagged birds have shown very low overall breeding success and mate fidelity.

Adult Ross's Gulls feed on small invertebrates in freshwater environments, and on zooplankton and small fish on migration and when overwintering at sea. Its eggs and chicks are vulnerable to terrestrial and avian predators. Sympatrically nesting Arctic Terns have been observed killing Ross's Gull chicks at High Arctic colonies, and are likely an important cause of breeding failure in Canada.

Population Size and Trends

Little is known about the population status of Ross's Gull in Canada. It has only been monitored regularly at Nasaruvaalik Island, in High Arctic Nunavut, where 1-6 pairs nest annually. It is likely that much fewer than 250 mature individuals breed in Canada. Extensive areas of apparently suitable habitat may host small undetected colonies. Migration counts and extrapolations from breeding surveys in Siberia suggest a global population of about 50,000 mature individuals.

The number of breeding Ross's Gull in Canada has varied over the past three generations, and has been relatively stable or declining slightly over the short-term. A projected continuing population decline is inferred from lack of reproductive output in 14 years of study at the only known Canadian colony. Ross's Gull is no longer known to breed near Churchill, in Low Arctic Canada, resulting in a significant decline in apparent extent of occurrence. However, surveys of Ross's Gull migrating past Point Barrow do not suggest that global populations have declined overall.

Threats and Limiting Factors

Threats to Ross's Gull in Canada are poorly understood. High rates of chick mortality as a result of attacks by Arctic Terns in shared colonies, and predation and disturbance by Polar Bear and Arctic Fox are major threats. Low hatching rates may be a result of egg infertility linked to high levels of mercury and persistent organic pollutants from airborne sources. Most Ross's Gulls nest in remote areas where human activity is limited or absent. Shipping activity in the Labrador Sea poses a low risk to birds that winter there. Many climate-related changes in terrestrial High Arctic breeding habitats are unlikely to affect this species within three generations, and effects of shifts in marine conditions in breeding and wintering areas are unknown.

Protection, Status and Ranks

Ross's Gull, its eggs and nests are protected in Canada under the *Migratory Birds Convention Act 1994*, and the species was listed as Threatened under the *Species at Risk Act 2002*. It is listed as Endangered under Manitoba's *Endangered Species Act*. Internationally, Ross's Gull is listed as a Threatened or Endangered Species in Russia's Red Book, and is fully protected in Russia and Greenland against deliberate harm or disturbance. It is protected in the United States under the *Migratory Bird Treaty Act*. Ross's Gull is assessed by the IUCN in Canada as Critically Imperilled/Imperilled, and globally as a species of Least Concern.

TECHNICAL SUMMARY

Rhodostethia rosea

Ross's Gull

Mouette rosée

Range of occurrence in Canada: Nunavut, Manitoba, Newfoundland and Labrador, Arctic Ocean, Atlantic Ocean

Demographic Information

Generation time (usually average age of parents in the population)	5.35 years (Bird *et al.* 2020).
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	Yes, continuing population decline inferred from declines in EOO, IAO and productivity.
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations, whichever is longer up to a maximum of 100 years]	Unknown.
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations, whichever is longer up to a maximum of 100 years].	Unknown.
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations, whichever is longer up to a maximum of 100 years].	Projected future decline inferred from observed lack of reproductive output at the only known Canadian colony in past 14 years.
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any period [10 years, or 3 generations, whichever is longer up to a maximum of 100 years], including both the past and the future.	Projected future decline inferred from observed lack of reproductive output at the only known Canadian colony in past 14 years.
Are the causes of the decline a. clearly reversible and b. understood and c. ceased?	a. No b. Partly c. No
Are there extreme fluctuations in number of mature individuals?	No

Extent and Occupancy Information

Estimated extent of occurrence (EOO)	1,268 km²; based on minimum convex polygon around recent known nesting sites.
Index of area of occupancy (IAO) (Always report 2x2 grid value).	12 km²; based on 2 x 2 km grid over recent known nesting sites.
Is the population "severely fragmented" i.e., is >50% of its total area of occupancy in habitat patches that are (a) smaller than would be required to support a viable population, and (b) separated from other habitat patches by a distance larger than the species can be expected to disperse?	a. Unknown b. No

Number of locations* (use plausible range to reflect uncertainty if appropriate)	1-3 known locations. One (Queens Channel) is currently active, and two (Foxe Basin, Churchill) were recently occupied and may possibly be active.
Is there an [observed, inferred, or projected] decline in extent of occurrence?	Yes, observed decline, as this species is no longer confirmed breeding at Low Arctic sites.
Is there an [observed, inferred, or projected] decline in index of area of occupancy?	Yes, observed decline, as this species is no longer confirmed breeding at Low Arctic sites.
Is there an [observed, inferred, or projected] decline in number of subpopulations?	No.
Is there an [observed, inferred, or projected] decline in number of "locations"*?	Yes, observed decline, as this species is no longer confirmed breeding at Low Arctic sites.
Is there an [observed, inferred, or projected] decline in [area, extent and/or quality] of habitat?	Inferred decline in quality of breeding habitat due to increased predation by native competitors, and projected future decline in quality of marine habitat due to climate change.
Are there extreme fluctuations in number of subpopulations?	No.
Are there extreme fluctuations in number of "locations"*?	No.
Are there extreme fluctuations in extent of occurrence?	No.
Are there extreme fluctuations in index of area of occupancy?	No.

Number of Mature Individuals (in each subpopulation)

Subpopulations (no subpopulations)	N Mature Individuals
Total	<20 mature individuals known to breed in Canada. Total Canadian population estimated to be much fewer than 250 mature individuals.

Quantitative Analysis

Is the probability of extinction in the wild at least [20% within 20 years or 5 generations whichever is longer up to a maximum of 100 years, or 10% within 100 years]?	Unknown; analysis not conducted.

* See Definitions and Abbreviations on COSEWIC website and IUCN (Feb 2014) for more information on this term

Threats (direct, from highest impact to least, as per IUCN Threats Calculator)

Was a threats calculator completed for this species? Yes, on 18 June 2019 (See Appendix 1 for participants). The assigned overall threat impact is **Very High-High**, and the following contributing threats were identified, listed in decreasing order of impact: 8.2. Problematic native species (High) 9.5. Air-borne pollutants (High-Medium) 11.1. Habitat shifting and alteration (Unknown) What additional limiting factors are relevant? Key limiting factors for Ross's Gull in Canada include: extremely low fecundity, low nesting density, low pair-bond fidelity, unpredictable and often severe climatic conditions, and high rates of breeding deferral or abandonment, all of which contribute to low reproductive success.

Rescue Effect (immigration from outside Canada)

Status of outside population(s) most likely to provide immigrants to Canada.	Large population in Russia may be relatively stable, but is likely genetically and geographically distinct from Canadian population. No trend information available for very small Greenland population.
Is immigration known or possible?	Unknown, but possible.
Would immigrants be adapted to survive in Canada?	Likely.
Is there sufficient habitat for immigrants in Canada?	Likely.
Are conditions deteriorating in Canada?[+]	Unknown.
Are conditions for the source (i.e., outside) population deteriorating?[+]	Unknown.
Is the Canadian population considered to be a sink?[+]	Possible.
Is rescue from outside populations likely?	No.

Data Sensitive Species

Is this a data sensitive species?	No. All current known active nest sites are in extremely remote and almost inaccessible sites. Ross's Gull that previously nested near Churchill, Manitoba were disturbed, with a nest and clutch of eggs taken illegally by a collector, and birds attempting to nest there again may be vulnerable to similar harassment.

[+] See Table 3 (Guidelines for modifying status assessment based on rescue effect)

Status History

COSEWIC Status History: Designated Special Concern in April 1981. Status re-examined and confirmed in April 1996. Status re-examined and designated Threatened in November 2001 and in April 2007. Status re-examined and designated Endangered in May 2021.

Status and Reasons for Designation:

Status:	**Alpha-numeric codes:**
Endangered	B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v); C2a(i,ii); D1

Reasons for designation:
This small little-known gull nests at 1-3 known colonies in the Canadian High Arctic and likely winters in the Labrador Sea. Fewer than 20 mature individuals are known to breed in Canada, although roughly similar numbers may occur undetected. Large numbers of fall migrants seen annually off northern Alaska likely come from a separate large population in eastern Russia. This species has low productivity in Canada, with frequent breeding deferral, nest abandonment, and no chicks fledged over a period of 14 years at the only known active Canadian colony. These factors contribute to inferred continuing population decline. The abandonment of Low Arctic nesting sites since the last assessment has reduced its range and number of locations in Canada, and its breeding range is now limited to the High Arctic. Major threats impeding reproductive success include the killing of chicks by Arctic Terns at colonies, and contamination from airborne toxic chemicals. Effects of ongoing climatic changes on food availability, reproductive success, and adult survival are largely unknown.

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Not applicable. Insufficient data to assess the rate of population decline.
Criterion B (Small Distribution Range and Decline or Fluctuation): Meets Endangered, B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v). EOO of 1,268 km² and IAO of 12 km² are below Endangered thresholds; the population is known to exist at <5 locations; and is undergoing an observed continuing decline in EOO, IAO, and number of locations, an inferred decline in habitat quality due to predation, and an inferred and projected decline in number of mature individuals.
Criterion C (Small and Declining Number of Mature Individuals): Meets Endangered C2a(i,ii). Fewer than 20 known mature individuals and total population estimated to be much fewer than 250 mature individuals, with an inferred and projected continuing decline in numbers; and the only subpopulation having fewer than 250 mature individuals and 100% of all mature individuals.
Criterion D (Very Small or Restricted Population): Meets Endangered D1. The number of known mature individuals is fewer than 20, and the total number is estimated to be much fewer than 250.
Criterion E (Quantitative Analysis): Not applicable. Analysis not conducted.

PREFACE

Since the most recent COSEWIC status report (COSEWIC 2007), ongoing studies of Ross's Gull in Canada and Alaska have provided additional information on the general biology and ecology of the species in North America. Two new High Arctic breeding sites were discovered in Queens Channel, Nunavut, and breeding biology was studied in detail at Nasaruvaalik Island (Maftei *et al.* 2012). The fall census of Ross's Gull migrating past Point Barrow, Alaska conducted over three years during the 1980s (Divoky *et al.*1988) was repeated in 2011 (Maftei *et al.* 2014). Satellite-tracking of individual birds through their annual cycle has provided a better understanding of distribution in Canada and movements during the non-breeding period (Maftei *et al.* 2015). Despite the collection of these new data, sample sizes remain low and key aspects of the ecology and status of Ross's Gull remain largely unknown. The known Canadian range of the species has also decreased, with recent breeding only recorded at one High Arctic site, and no breeding confirmed at Low Arctic areas near Churchill, Manitoba since 2005. A national Recovery Strategy prepared in 2007 identified research and conservation priorities and recovery objectives (Environment Canada 2007).

COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS (2021)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.

Environment and Climate Change Canada
Canadian Wildlife Service
Environnement et Changement climatique Canada
Service canadien de la faune
Canada

The Canadian Wildlife Service, Environment and Climate Change Canada, provides full administrative and financial support to the COSEWIC Secretariat.

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Figure 2. Breeding sites of Ross's Gull in Canada, including extant (occupied between 2009 and 2018), recent (occupied between 1974 and 2008) and unconfirmed sites, and the historical extent of occurrence (EOO; 1974-2018). Map prepared by R. Soares, COSEWIC Secretariat, based on information in Table 1. 9

Figure 3. Wintering ranges of three tagged Ross's Gulls in the Labrador Sea from 2011 to 2013, showing 25, 50, and 75% occupancy contours. Inset map shows all winter records, and star in inset shows tagging site at the breeding colony on Nasaruvaalik Island, Nunavut (from Maftei *et al.* 2015; used with permission). 10

Figure 4. Extant breeding sites of Ross's Gull in Canada (occupied between 2009 and 2018), current extent of occurrence (EOO) and current index of area of occupancy (IAO). Map prepared by R. Soares, COSEWIC Secretariat, based on information in Table 1. 11

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WILDLIFE SPECIES DESCRIPTION AND SIGNIFICANCE

Name and Classification

Scientific name: *Rhodostethia rosea*

English name: Ross's Gull

French name: Mouette rosée

Inuktitut name: Nasaruvaalik

Classification: Class: Aves

Order: Charadriiformes

Family: Laridae

Ross's Gull is the only member of the genus *Rhodostethia*. It has been shown to be significantly divergent from other gulls, and its plumage, vocal repertoire, courtship behaviour, and general ecology are unique among gulls (Maftei 2014). A genetic analysis concluded that Ross's Gull and Little Gull (*Hydrocoloeus minutus)* form a monophyletic group, but nonetheless differ significantly in plumage, ecology, and behaviour (Pons *et al.* 2005).

Morphological Description

Ross's Gull is a small gull, similar in shape and size to Bonaparte's Gull (*Chroicocephalus philadelphia*). Adults average 190 g in mass, with a wingspan of 90-100 cm. Ross's Gull has a dove-like shape with a small, rounded head, short stubby bill, and upright posture (cover photo). It is sexually monomorphic, and adults are distinctive in all plumages. Breeding birds have a white head and underparts which take on a light pinkish cast in breeding season, against which a black collar is visible. The mantle is a soft bluish-grey. The outermost primaries have dark outer webs, while the tertials are white. The bill is black, while the eye-ring and feet are bright red. The collar is faded or absent in non-breeding plumage, when birds show a dark smudge in front of the eyes and towards the back of the head. Birds appear much pinker in non-breeding plumage, and may take on a slightly orange hue. Juveniles are strikingly patterned with bold black arches across the wings and a black wedge on the rump. The tail is white with a black tip. Ross's Gull matures at two years, and transitions directly from juvenile to adult plumage (Howell and Dunn 2007).

Ross's Gull is distinctive in adult plumage and unlikely to be mistaken for other species, although it appears white when seen from above and can be mistaken for Arctic Tern (*Sterna paradisaea*). Juveniles resemble young Black-legged Kittiwakes (*Rissa tridactyla*) or Sabine's Gulls (*Xema sabinii*), but are smaller and fly with more buoyant wingbeats.

Population Spatial Structure and Variability

Ross's Gull has no clinal morphological differences across its range, and no subspecies have been described. However, a recent analysis of genetic samples showed differences in the composition of mitochondrial genetic groups between presumed Siberian and Canadian breeders (Royston and Carr 2014). Observed differences are consistent with the Canadian population having been produced by a bottleneck from a small founding population from Siberia (Royston and Carr 2014; Toews pers. comm. 2019).

Designatable Units

As Ross's Gull is considered a monotypic species with no evidence for discrete genetic or morphological differences among birds in Canada, the species is considered here as one designatable unit, as in previous status reports (e.g., COSEWIC 2007). Given the genetic differences between presumed Siberian and Canadian breeders (Royston and Carr 2014), and apparent differences in their wintering areas (see **DISTRIBUTION**), the Canadian population of Ross's Gull could be considered an endemic designatable unit.

Special Significance

Ross's Gull has a somewhat mythical status among birdwatchers and ornithologists due to its beauty and scarcity. It is one of the least-known seabirds in North America, and research to date has highlighted unique features of its life history and ecology. Ross's Gull is known to Indigenous groups across the Arctic as a rare or occasional visitor, and many Canadian Inuit know of the species they call *Nasaruvaalik* ("the one who wears a scarf" in Inuktitut), but rarely see it. Only limited Aboriginal Traditional Knowledge of Ross's Gull is available, including Inuit community knowledge on its occurrence in southern Baffin Island, Nunavut (Mallory *et al.* 2001), although Ross's Gull is part of marine ecosystems that are important to Indigenous people who recognize the interrelationships of all species.

DISTRIBUTION

Global Range

The breeding range of Ross's Gull is not well known, and <1% of the estimated global population can be accounted for at known breeding areas. It breeds at scattered sites across the circumpolar Arctic (Figure 1), with the majority presumed to nest in northeastern Russia, particularly in shrub tundra with sedge meadows and ponds on the floodplains of the larger rivers draining into the East Siberian Sea (Densley 1999). Breeding was historically suspected on Spitsbergen Island in Svalbard (Norway), and has been confirmed at a few islands in Greenland (Egevang and Boertmann 2008) where the numbers are estimated at 0-5 pairs (BirdLife International 2015), and in northern Canada (Béchet *et al*. 2000; Mallory *et al*. 2006; Maftei *et al*. 2012).

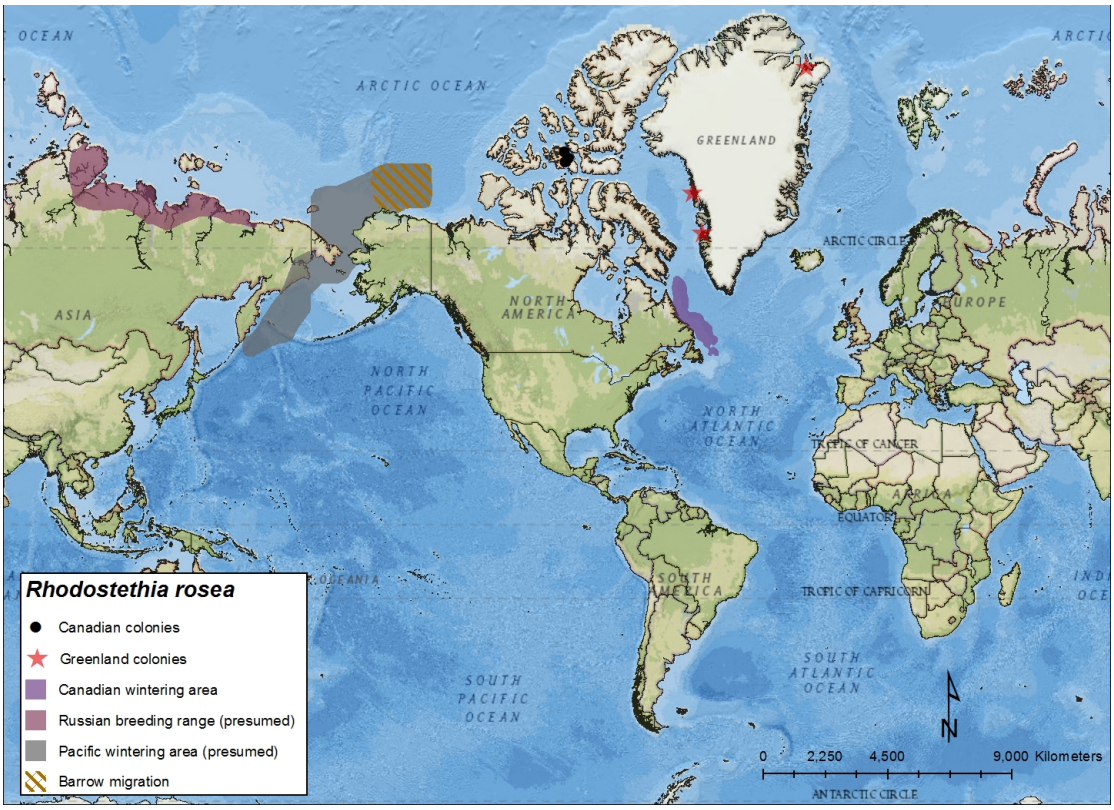

Figure 1. Global range of Ross's Gull, showing known colonies and presumed areas used for breeding, in winter, and on migration north. Map prepared by R. Soares, COSEWIC Secretariat, based on IUCN (2018), and modified using documented expert knowledge.

Ross's Gull has only been confirmed nesting in three areas of Canada: near Churchill, Manitoba, and in Queens Channel and Foxe Basin in Nunavut (Table 1). All breeding records from Canada and Greenland are summarized in Maftei *et al.* (2012) and Table 1. Ross's Gull has not been documented breeding elsewhere in Canada or in Alaska, and the closest known breeding sites outside of North America lie in southwestern Greenland (Egevang and Boertmann 2008; Table 1).

Table 1. Summary of breeding records of Ross's Gull in Canada, ordered by colony site and year of first observations.

Site	Year	Number of birds/pairs/nests	Information Source
Seymour Island, NU 76°48"N, 01°16'W	1974	3 birds, breeding unconfirmed	Maftei *et al*. (2012)
Cheyne Islands, NU 76°18'N, 97°31'W	1974	>1 bird	Mallory and Gilchrist (2003)
Cheyne Islands, NU	1976	3 pairs	MacDonald (1978)
Cheyne Islands, NU	1978	6 pairs	MacDonald (1978)

Site	Year	Number of birds/pairs/nests	Information Source
Cheyne Islands, NU	2006	8 birds, breeding unconfirmed	Mallory *et al*. (2006)
Cheyne Islands, NU	2011	No birds, no nests	Maftei *et al*. (2012)
Cheyne Islands, NU	2012	4 birds, 2 nests	Maftei unpubl. data
Churchill, MB 58°42”N, 94°10'W	1978	1 bird	Chartier and Cooke (1980)
Churchill, MB	1980	3 pairs	Chartier and Cooke (1980)
Churchill, MB	1982	>10 birds, 5 nests	Hamel (2002)
Churchill, MB	1992	>4 birds	Environment Canada (2007)
Churchill, MB	1993	4 birds	Environment Canada (2007)
Churchill, MB	1994	6 birds, 1 nest	Environment Canada (2007)
Churchill, MB	1995	3 birds, breeding unconfirmed	Environment Canada (2007)
Churchill, MB	1997	1-2 birds	Environment Canada (2007)
Churchill, MB	1998	Birds seen, numbers unknown	Environment Canada (2007)
Churchill, MB	1999	1 bird	Environment Canada (2007)
Churchill, MB	2000	2 birds	Environment Canada (2007)
Churchill, MB	2001	2 birds, at least 1 nest, 1 juvenile	Environment Canada (2007)
Churchill, MB	2002	5 birds	Environment Canada (2007)
Churchill, MB	2004	2 birds	Environment Canada (2007)
Churchill, MB	2005	4 birds, 1 nest, 1 juvenile	Environment Canada (2007)
Milne Island, NU 75°39'N, 96°43'W	1981	7 birds, breeding unconfirmed	Maftei *et al*. (2012)
Prince Charles Island, NU 68°13”N, 76°29'W	1997	2 birds	Béchet *et al*. (2000)
Nasaruvaalik Island, NU 75°50’N, 96°19’W	2005	9 birds, 5 nests	Mallory *et al*. (2006)
Nasaruvaalik Island, NU	2006	2 birds, 1 nest	Mallory *et al*. (2006)
Nasaruvaalik Island, NU	2007	12 birds, 2 nests, 1 chick	Maftei *et al*. (2012)
Nasaruvaalik Island, NU	2008	6 birds, 2 nests	Maftei *et al*. (2012)
Nasaruvaalik Island, NU	2009	6 birds, 1 nest	Maftei *et al*. (2012)
Nasaruvaalik Island, NU	2010	5 birds, 2 nests	Maftei *et al*. (2012)
Nasaruvaalik Island, NU	2011	8 birds, 1 nest	Maftei *et al*. (2012)
Nasaruvaalik Island, NU	2012	12 birds, 4 nests	Maftei unpubl. data

Site	Year	Number of birds/pairs/nests	Information Source
Nasaruvaalik Island, NU	2013	5 birds	Maftei unpubl. data
Nasaruvaalik Island, NU	2014	7 birds, 2 nests	Maftei unpubl. data
Nasaruvaalik Island, NU	2015	Birds seen, numbers unknown, breeding unconfirmed	Maftei unpubl. data
Nasaruvaalik Island, NU	2016	7 birds, 1 nest	Maftei unpubl. data
Nasaruvaalik Island, NU	2017	5 birds, 1 nest	Maftei unpubl. data
Nasaruvaalik Island, NU	2018	Birds seen, numbers unknown, no nests	Maftei unpubl. data
Kalivik Island, NU 75°32'N, 97°12'W	2011	1 bird	Maftei *et al*. (2012)
Emikutailaq Island, NU 75°29'N, 97°14'W	2011	4 birds, 1 nest	Maftei *et al*. (2012)
Emikutailaq Island, NU	2012	2 birds, breeding unconfirmed	Maftei unpubl. data

In North America, Ross's Gull has been recorded outside the breeding season only as a rare but regular vagrant in widely scattered sites in southern Canada and the United States (Bledsoe and Sibley 1985; eBird 2019), with the exception of a well-known movement of birds migrating past Point Barrow, Alaska each September and October (Divoky *et al.* 1988; Maftei *et al.* 2014). The origins and destinations of these birds remain unknown, although they are likely from breeding sites in northeastern Russia, and Ross's Gull is rarely seen in Alaska during the rest of the year.

Canadian Range

In Canada, Ross's Gull was first documented breeding in Queens Channel, Nunavut in 1974 (Macdonald 1978), and then near Churchill, Manitoba in 1978 (Chartier and Cooke 1980; Table 1; Figure 2). It was last recorded breeding in Manitoba in 2005, although a single bird was seen along the Churchill River, south of Churchill, on 13 June 2016 (Koes 2019). There is a single breeding record from Prince Charles Island, in Foxe Basin, Nunavut in 1997 (Béchet *et al.* 2000), and the type specimen of the species was collected in the same general area in early spring of 1823 (Parry and Hooker 1825). Since the previous status report (COSEWIC 2007), Ross's Gull has only been recorded breeding on several small islands in a restricted area of Queens Channel, Nunavut. Most nesting records there are from Nasaruvaalik Island (Maftei *et al.* 2012), which was named after Ross's Gull by seabird researchers, and is also known as Tern Island. There is one unconfirmed report of a breeding pair from near Eureka, Nunavut since 2007 (exact date unknown), and individual Ross's Gull are occasionally seen at sea within the Canadian Arctic archipelago during summer (Genevois pers. comm. 2018). A Ross's Gull in fresh juvenile plumage seen at Herschel Island, Yukon from 21-25 July 1991 (Sinclair *et al.* 2003) suggested possible nesting in Canada's western Low Arctic.

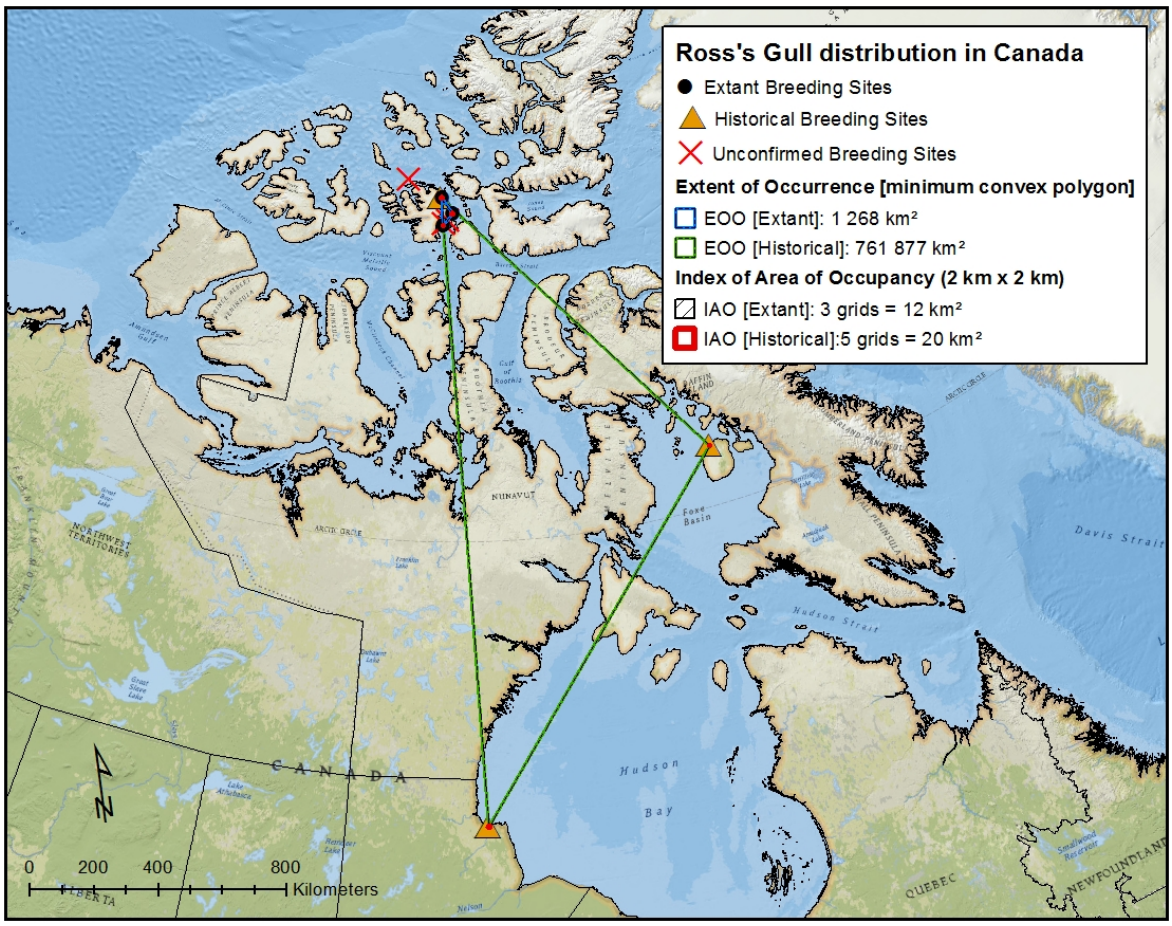

Figure 2. Breeding sites of Ross's Gull in Canada, including extant (occupied between 2009 and 2018), recent (occupied between 1974 and 2008) and unconfirmed sites, and the historical extent of occurrence (EOO; 1974-2018). Map prepared by R. Soares, COSEWIC Secretariat, based on information in Table 1.

Ross's Gull is presumed to be more widely distributed as a breeding bird in northern Canada than can be inferred from confirmed records alone.

A recent tracking study has confirmed that some Ross's Gulls that breed in Canada at Nasaruvaalik Island, Nunavut, overwinter in Canadian waters, in Davis Strait and the Labrador Sea, off the Atlantic coast of Labrador (Maftei *et al.* 2015, Figure 3). The consistency in timing and winter movements shown by individuals tracked over three years, together with reports from local Inuit community knowledge (Mallory *et al.* 2001), suggests that this wintering area in the Labrador Sea may be used by a significant proportion of the Canadian breeding population of Ross's Gull (Maftei *et al.* 2015).

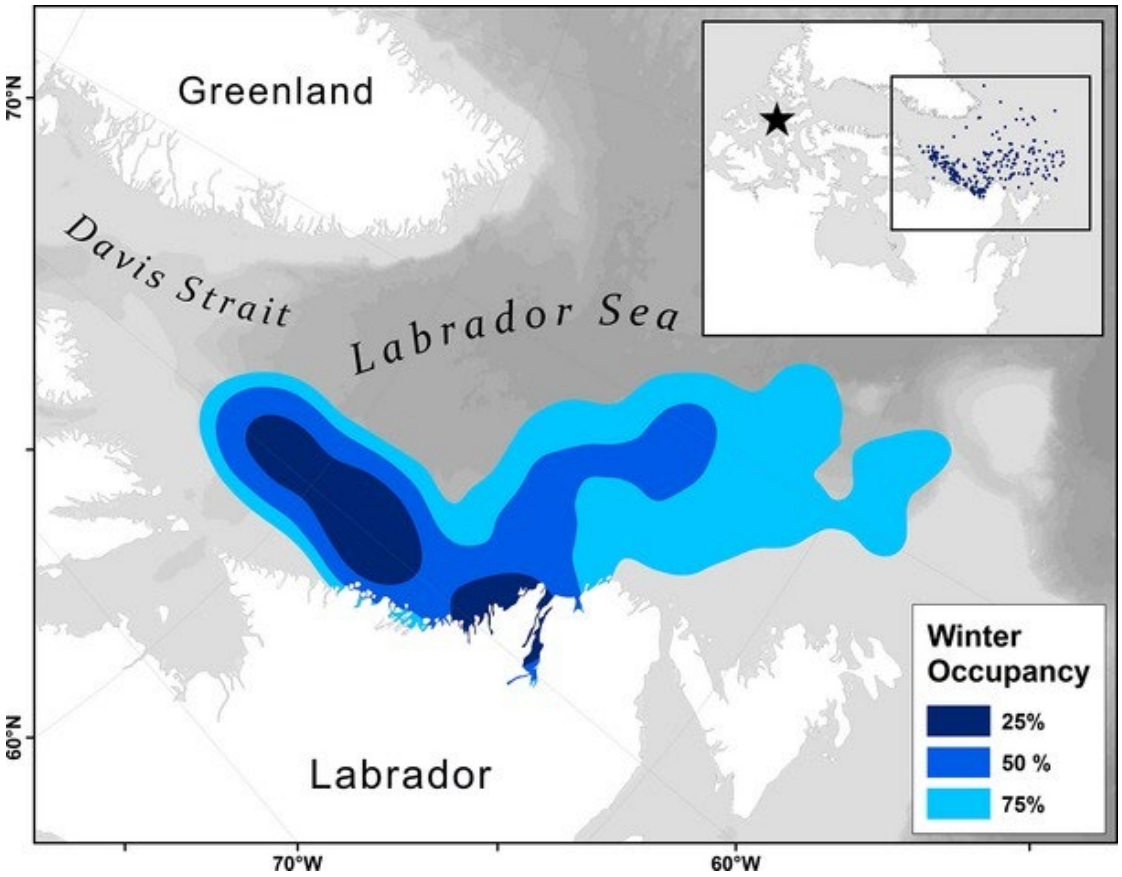

Figure 3. Wintering ranges of three tagged Ross's Gulls in the Labrador Sea from 2011 to 2013, showing 25, 50, and 75% occupancy contours. Inset map shows all winter records, and star in inset shows tagging site at the breeding colony on Nasaruvaalik Island, Nunavut (from Maftei *et al.* 2015; used with permission).

Extent of Occurrence and Area of Occupancy

Extent of occurrence (EOO) within Canada is approximately 1268 km^2, based on a minimum convex polygon drawn around known nesting sites occupied within the ten-year period 2009-2018 (Figure 4), and likely represents a minimum estimate. This represents a considerable decline within less than three generations from its likely historical EOO of 761,877 km^2, calculated in the same way.

The current index of area of occupancy (IAO) within Canada is approximately 12 km^2, based on a 2 km x 2 km grid drawn over known nesting sites occupied within the ten-year period 2009-2018 (Figure 4), and likely represents a minimum estimate. This represents a decline within less than three generations from its likely historical IAO of 20 km^2, calculated in the same way.

Note that these declines in IAO and especially EOO are both a direct result of the apparent abandonment of previously occupied nesting areas at Prince Charles Island in Foxe Basin, Nunavut, and in the Canadian Low Arctic at Churchill, Manitoba. These declines are thus considered to result from distributional changes.

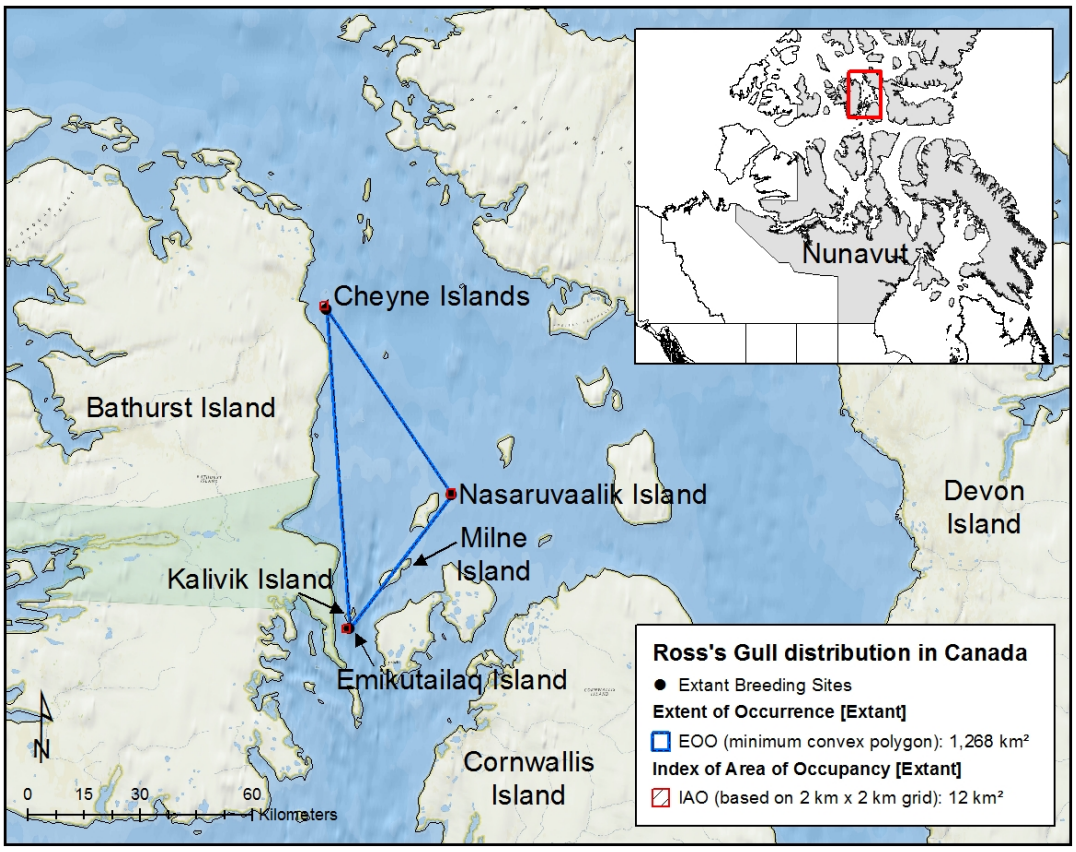

Figure 4. Extant breeding sites of Ross's Gull in Canada (occupied between 2009 and 2018), current extent of occurrence (EOO) and current index of area of occupancy (IAO). Map prepared by R. Soares, COSEWIC Secretariat, based on information in Table 1.

Search Effort

Ross's Gull breeds only in extremely remote areas of northern Canada which lack regular survey coverage, and much potential breeding habitat has not been surveyed or visited by biologists. One breeding pair was discovered on Prince Charles Island in Nunavut during an exploratory shorebird survey (Béchet *et al.* 2000). A series of targeted aerial surveys of islands near the known Nasaruvaalik Island breeding site found two more breeding sites within one day (Maftei *et al.* 2012). Dedicated surveys of previous and potential breeding areas in Canada could result in additional breeding records, with a clearer indication of overall range and habitat use.

HABITAT

Habitat Requirements

Breeding habitat

Habitat requirements of Ross's Gull are poorly understood, and fewer than about 200 nests have ever been found (Maftei 2014). Ross's Gull appears to nest in two distinct habitat types: marshy floodplain tundra and taiga in the Low Arctic and small sparsely vegetated gravel islands adjacent to polynyas (areas of open water surrounded by ice) in the High Arctic. Low Arctic breeding habitat consists of shrubby tundra, sedge meadows, and open taiga in coastal floodplain wetlands (Densley 1999). Birds typically nest on the shores of lakes and ponds, or on small islands within larger bodies of water. Ross's Gull nesting at Low Arctic sites near Churchill fed on insects, and other small aquatic organisms taken while walking in shallow water (Chartier and Cooke 1980). High Arctic breeding habitat consists of low-lying islands, in areas with shallow bathymetry and current-driven polynyas (Maftei *et al.* 2012), where nesting birds likely feed at sea (Richards and Gaston 2018). High Arctic Greenland nesting sites are in areas near or on the exposed outer coast (Egevang and Boertmann 2008), while Canadian records are confined to more sheltered channels or straits within larger archipelagos. In both High Arctic nesting areas, habitat is characterized by minimal or absent terrestrial vegetation and the year-round presence of pack-ice.

In the presumed core range of the species in Russia, Ross's Gull is confined to Low Arctic habitat (Buturlin 1906; Pearce *et al.* 1998; Densley 1999), while most Nearctic records are from the High Arctic (Maftei *et al.* 2012). Nesting records from Churchill correspond to Low Arctic habitat types, while those from Queens Channel and Prince Charles Island, Nunavut are of the High Arctic type. It is unclear to what extent individual birds or populations nest exclusively within one habitat type, although there are extensive areas of apparently suitable habitat of both types across the range of the species, both nationally and globally.

Migration habitat

Ross's Gull is known as a migrant off the coast of Point Barrow, where up to 30,000 individuals occur during late September and October (Murdoch 1899; Divoky *et al.* 1988; Maftei *et al.* 2014), when many hundreds and even thousands can be seen in one day. Migrants are extremely rare elsewhere, and even during peak movement past Point Barrow, they are absent from adjacent areas of coastline. These migrating gulls typically form small flocks flying over the water near shore, in both northeasterly and southwesterly directions. Although most individuals do not appear to spend much time feeding, birds are occasionally seen dipping in areas of open water, apparently feeding on small zooplankton, particularly in the surf zone (Maftei *et al.* 2014). While Ross's Gull is occasionally encountered over open water further offshore, it appears that most migrants pass close to the coast. It is suspected that this species feeds on zooplankton and small vertebrates in surface waters on migration, and stomachs of Ross's Gull collected off Alaska (n=7) contained amphipods and Arctic Cod (*Boreogadus saida*; Divoky 1976).

Winter habitat

Almost nothing is known of the non-breeding habitat. No significant concentrations of Ross's Gulls have been credibly reported from at-sea winter surveys anywhere in the world. A small sample (n = 3) of birds tracked from Queens Channel, Nunavut, travelled north and then eastwards to winter in the Northwest Atlantic off the northeast coast of Labrador (Maftei *et al.* 2015; Figure 3). A Ross's Gull tagged in Russia moved to the northeast coast of Chukotka before its transmitter failed in early winter; it is unclear where this bird actually overwintered (Gilg *et al.* 2015). Wintering habitats likely include a mix of floating ice and open water. It seems probable that Ross's Gulls from Canada feed on zooplanktonic prey in areas of strong currents or upwelling, or near ice, in the Northwest Atlantic (Figure 3). It has been suggested that Ross's Gull may exploit ice-edge habitats (e.g., COSEWIC 2007; Environment Canada 2007), and some winter records are in areas where winter sea ice occurs (Maftei *et al.* 2015). However, there is little direct evidence that this species is an ice-edge specialist, and wintering Ross's Gulls have been observed in the open ocean of the Northwest Atlantic with pelagic species such as Black-legged Kittiwake (Mactavish pers. comm. 2019).

Habitat Trends

There are insufficient data on the habitats used by Ross's Gull to assess trends in either quality or quantity of habitat used in summer, on migration or in winter, or to consider possible implications for the distribution or abundance of the species. Previous studies of Arctic-nesting seabirds suggest that effects of changing climate may differ across the Canadian Arctic (e.g., Gaston *et al*. 2005). The effects of current and future changes in vegetation and sea ice across Low Arctic habitat associated with climate change are difficult to assess.

BIOLOGY

Life Cycle and Reproduction

It is likely that many demographic parameters (e.g., age at first breeding, generation time) are similar to those of related, better-known small Arctic-nesting gulls, such as Sabine's Gull and Ivory Gull (*Pagophila eburnea*) (Day *et al.* 2001; Mallory *et al.* 2008). It is estimated that Ross's Gull first breeds at 2 years old (Bird *et al.* 2020). Re-sighting of banded birds at known nesting sites in Nunavut indicates that at least one breeding individual was at least 10 years old (Maftei unpubl. data). Bird *et al.* (2020) recently estimated generation time (the average age of parents in the population) to be 5.35 years, modelled on the basis of an annual survival rate of 0.79, age at first breeding of 1.99 years, and maximum longevity of 17.3 years. This is appreciably lower than the previous estimate of 9.8 years (COSEWIC 2007; IUCN 2019).

Although overall reproductive success is difficult to assess given the lack of multi-year studies, breeding success of Ross's Gull appears to often be very low. Fledging success in a study in Siberia was typically about 20% (Kondratyev *et al.* 2000). During 14 years of colony monitoring at Nasaruvaalik Island, only four of 23 Ross's Gull nesting attempts produced any chicks, none of which fledged successfully (Maftei unpubl. data). Most eggs failed to hatch due to likely predation or apparent infertility, while chicks that did hatch were seen being pecked by Arctic Terns, two of which were subsequently found dead with obvious signs of trauma (Maftei unpubl. data). A comprehensive survey of Ross's Gull migrating past Alaska in 2011 revealed that only 0.8% of all birds seen were juveniles (Maftei *et al.* 2014), compared to 5% recorded on surveys during the 1980s (Divoky *et al.* 1988), although there is no indication that this difference represents a trend. These observations are consistent with the conclusion that, at a global level, Ross's Gull has very low reproductive output.

Ross's Gull typically nests in small, loose colonies of 2-10 pairs, although six pairs is the maximum number recorded in one year at a site in High Arctic Canada (Maftei *et al.* 2012), and seven pairs at Churchill (Artuso pers. comm. 2019). Females lay 1-3 eggs in shallow, well-camouflaged scrapes on the ground (Maftei 2014). Both males and females build nests lined with a few bits of dried vegetation, moss and feathers, and may construct several nests before the final site is chosen by the female. Nests are not re-used. Birds show no fidelity to specific nest sites, and occasionally move between different nesting islands (Maftei unpubl. data). A colony of about five pairs appeared at Nasaruvaalik Island in 2005, though none were present there from 2002-2004, and the appearance and disappearance of nesting birds at High Arctic sites suggests that Ross's Gulls may use colonies intermittently, perhaps to avoid predators that have cued in on nesting birds (Environment Canada 2007). Re-sighting of banded birds in Queens Channel indicates that individual birds rarely maintain multi-year pair bonds, perhaps linked to the locally high rate of nest failure, and often defer breeding (Maftei unpubl. data).

Little is known about nesting phenology, although gulls breeding at higher latitudes appear to nest later than those further south (Maftei 2014). Birds typically arrive at breeding sites in Canada in late May or early June, with the first eggs usually laid between 1-18 June (Maftei 2014). In Queens Channel, Ross's Gull is almost invariably the first larid species to lay each year, usually a week before Sabine's Gull and up to two weeks before Arctic Tern (Maftei 2014). Eggs are incubated for 21-23 days, and the semi-precocial chicks fledge after about 20 days (Maftei 2014). Both members of the pair share in incubation and chick-rearing (Chartier and Cooke 1980)

Data on demography, productivity, and survival are limited. Adult survival is estimated globally at about 0.79 (Bird *et al.* 2020). Adult Ross's Gull are likely quite long-lived and appear to reproduce quite slowly. Unpredictable snow and ice conditions at breeding sites, the presence of Arctic Fox (*Alopex lagopus*) trapped on nesting islands after break-up, and colony disturbance associated with Polar Bear (*Ursus maritimus*) are likely causes of deferred or abandoned breeding attempts in some years (Maftei *et al.* 2012). The fact that Ross's Gull does not appear to maintain strong pair bonds, coupled with the low numbers of individuals at breeding sites, may limit the number of pairs attempting to breed each year.

The only Ross's Gull egg tested for contaminants was shown to contain relatively high concentrations of mercury and persistent organic pollutants (POPs; Peck *et al*. 2016), which may contribute to elevated rates of infertility. In Nunavut, Ross's Gull nests earlier than other ground-nesting birds and presents a target for predators (Maftei 2014). On Nasaruvaalik Island, Arctic Terns have been observed pecking Ross's Gull chicks, and dead chicks have been found with signs of trauma consistent with repeated pecking. This behaviour has also been reported from other sites in Nunavut (Macdonald *in* Chartier and Cooke 1980; Mallory pers. comm. 2018).

Physiology and Adaptability

Ross's Gull likely spends its entire life at high latitudes and appears to be adapted to severe environmental conditions encountered in the Arctic. Although these factors have both direct and indirect negative impacts on reproductive success, and adult survival is presumably affected by harsh winter conditions, the species likely faces minimal competition for food resources and relatively low predation risk during much of the annual cycle (e.g., Spencer *et al.* 2014). It appears that Ross's Gull is a relatively long-lived species, enabling it to defer breeding or abandon nesting attempts in years with high predation risk or severe environmental conditions (Maftei 2014). Colonies are known to form and disperse between years (Densley 1999).

Dispersal and Migration

Ross's Gull is migratory, although little is known about the movements of non-breeding birds. A discrete wintering area used by some Canadian birds has been identified in the Labrador Sea (Maftei *et al*. 2015), while a second study indicates that Ross's Gull from Siberia may winter in the Bering Sea or North Pacific basin (Gilg *et al*. 2015). Migrants are only known to occur regularly at Point Barrow, where post-breeding birds are observed travelling in both eastward and westward directions (Divoky *et al.* 1988; Maftei *et al.* 2014). A significant proportion of the estimated global population passes through this area.

Juvenile Ross's Gulls presumed to originate from the Siberian mainland occur on the New Siberian Islands in late summer (Lindström *et al.* 1998), and birds congregate along the northern coast of Siberia (Ilyichev and Zubakin 1988) and Svalbard before moving east (Meltofte *et al.* 1981). Fall concentrations reported near Wrangel and Herald islands and along the northeastern coast of Chukotka by Densley (1999) have not been reliably documented, and targeted at-sea surveys of this area in 2013 recorded only three Ross's Gulls (Maftei unpubl. data). Incidental reports indicate that non-breeding Ross's Gull congregate in the central Arctic Ocean in July and August, particularly north of Franz Josef Land (Hjort *et al.* 1997). It is likely that birds that defer or fail breeding congregate in areas of high productivity in the Arctic Ocean (Meltofte *et al.* 1981; Hjort *et al.* 1997). It appears unlikely that these concentrations include birds from Canada.

A discrete wintering area used by Canadian birds has been identified in the Labrador Sea (Maftei *et al*. 2015), widely separate from areas in the Bering Sea or North Pacific basin apparently used by Ross's Gulls from Siberia (Gilg *et al*. 2015). Three satellite-tagged birds (failed breeders) from Nasaruvaalik Island first briefly moved north and west into the Arctic Ocean, then all moved southeast during fall through Baffin Bay and Davis Strait, to over-winter offshore in the Labrador Sea (Maftei *et al.* 2015; Figure 3). Ross's Gull is rarely but regularly recorded in more southern latitudes, invariably as single vagrants during the non-breeding season (eBird 2019). There is no regular pattern of occurrence, although multiple reports from the Atlantic provinces, the northeastern US states, and the British Isles suggest that significant numbers may overwinter in the Labrador sea or Northwest Atlantic (Maftei 2014; Maftei *et al.* 2015). The eight Ross's Gull records reported for Newfoundland between 1976 and 2014 occurred throughout the year, and all but one were of adult birds (Mactavish pers. comm. 2019).

Interspecific Interactions

Nest and adult predation

Adult Ross's Gull are known to be killed by Peregrine Falcon (*Falco peregrinus*) and Gyrfalcon (*F. rusticolis*) (Maftei unpubl. data). Eggs are eaten or destroyed by terrestrial predators, including foxes, Polar Bear and domestic reindeer (*Rangifer tarandus*) (Kondratyev *et al.* 2000), as well as avian predators such as Common Raven (*Corvus corax*), gulls (*Larus* spp.), and jaegers (*Stercorarius* spp.; COSEWIC 2007; Environment Canada 2007). Chicks face many of the same predators, as well as nesting Arctic Terns which attack chicks of other nearby ground-nesting species (Macdonald *in* Chartier and Cooke 1980; Densley 1999).

Non-predatory interspecific interactions

Ross's Gull usually nests in association with other ground-nesting seabirds, particularly Arctic Tern, across its circumpolar range (summarized in Maftei *et al.* 2012). Ross's Gull has been observed performing elaborate courtship displays towards members of other species, particularly Black-legged Kittiwake (Maftei *et al.* 2016). This phenomenon was studied in Nunavut over three years, and has been reported from several breeding areas (Densley 1999).

Ross's Gull is not known to associate with other species on migration, and the extent to which it associates with other seabirds during winter is unknown. However, its wintering range and habitats overlap with several other gulls that over-winter in sub-Arctic waters, including Glaucous Gull (*Larus hyperboreus*), Ivory Gull, and Black-legged Kittiwake, as well as several alcid species (Gilg *et al.* 2015; Maftei *et al.* 2015; Mactavish pers. comm. 2019).

POPULATION SIZES AND TRENDS

Sampling Effort and Methods

All nesting records of Ross's Gull found in Canada prior to 2012 were at sites discovered accidentally, although several have been monitored subsequently. In 2012, two new breeding sites were discovered in Queens Channel during targeted surveys for Ross's Gull, informed by a habitat-suitability model (Maftei *et al.* 2012). It seems likely that more sites may exist in the High Arctic of Canada, such as near Queens Channel and in northern Foxe Basin, and perhaps Low Arctic areas. Ross's Gull nest sites are not conspicuous, and the species' low reproductive success suggests that the best time to encounter birds on the ground is early in the breeding season, in early June. However, the logistical challenges and high cost of Arctic fieldwork have discouraged targeted surveys or monitoring efforts for Ross's Gull.

Abundance

Most Ross's Gull breed in eastern Russia, with an estimated Siberian breeding population of about 45,000-55,000 breeding individuals (Degtyarev 1991). However, this estimate is nearly 30 years old and was based on an extrapolation of aerial observations of only 400 individuals over three years, across an area of approximately 236,000 km^2. Less than 1% of this estimated Siberian population can be accounted for at known colony sites, based on published records. Several known colonies in Russia have not been formally described in publications (e.g., Buturlin 1906; Pavlov and Dorogov 1976; Andreev and Kondratiev 1981; Yésou 1994; Kondratyev *et al.* 2000), and the number of documented nesting records in Russia is likely in the low hundreds (Holohan pers. comm. 2013; Tomkovitch pers. comm. 2013).

A more recent estimate put the population in the Russian Far East and Siberia, including most known colony sites, at "not more than 1,000 individuals" (Kondratyev *et al.* 2000). However, this unexplained number seems unrealistically low given the higher numbers observed on migration in Russia and Alaska (Divoky *et al.* 1988; Densley 1999; Maftei *et al.* 2014). Divoky *et al.* (1988) suggested a minimum global population of 20,000-40,000 individuals, based on estimates of birds observed as passage migrants in Alaskan waters during the fall, of which 15,000-25,000 were estimated to enter the Beaufort Sea. Maftei *et al.* (2014) recorded about 27,500 Ross's Gulls on migration at Point Barrow in 2011.

The most realistic means of assessing global population size is through a census of Ross's Gull migrating past Point Barrow, Alaska. Such counts provide a repeatable index of total abundance, and of reproductive success as inferred from the proportion of juveniles. Two such censuses have been undertaken, almost three decades apart (Divoky *et al.* 1988; Maftei *et al.* 2014), although methodology used was sufficiently different that a direct comparison of the results is not possible. It has been suggested that some migrants observed passing Point Barrow in a southwesterly direction could originate from Canadian breeding areas (Maftei 2014), although there is no evidence to support this hypothesis.

Ross's Gull has likely persisted at low numbers at widely scattered breeding sites across the Canadian High and Low Arctic (Environment Canada 2007). Fewer than 10 nests of Ross's Gull have been confirmed in any given year at known nesting sites in Canada (Maftei *et al.* 2012; Figure 2), and only four confirmed breeding records exist over a recent 5-year period (2014-2018), all from Nasaruvaalik Island, Nunavut (Maftei unpubl. data). A maximum of 18 birds has been observed in any given year across all known breeding sites (in 2012; Table 1). Those mature individuals associated with known colonies that defer breeding may not be observed in certain years. It is expected that a few additional Ross's Gull do breed in Canada, although Richards and Gaston (2018) estimated that the population of Nunavut is probably less than 100 birds, and overall abundance of Ross's Gull in Canada is likely to be much fewer than 250 mature individuals.

Fluctuations and Trends

A census of the large numbers of Ross's Gull migrating past Point Barrow provides the best available index of the global population, and the similarity between counts by Divoky *et al.* (1988) during the 1980s, and Maftei *et al.* (2014) in 2011, suggests that global numbers are likely relatively stable. Joiris (2017) documented declines in counts of post-breeding adults in the northern Greenland Sea and Fram Strait conducted during the periods 1988-1994 and 2004-2014, and suggested that these differences could reflect changes in migratory movements rather than population size. These counts are unlikely to include birds from Canadian colonies.

There are insufficient data with which to meaningfully consider trends in the abundance of Ross's Gull in Canada. The number of birds counted at colonies in Canada has varied between about one and 18 mature individuals in a given year, with no apparent trend (counts and breeding records summarized in Table 1). Significant changes in nesting sites used and observer visits to possible breeding areas, together with the tendency of Ross's Gull to defer or abandon nesting, and for colonies to be formed or abandoned, makes it difficult to assess the pattern of population change. The fact that the species is no longer known to breed at Churchill and Prince Charles Island is cause for concern, although some birds may still nest at undetected sites nearby. If the small number of annual breeding records over the last three generations (16 years; Table 1) is indicative, the Canadian population of Ross's Gull may currently nest in only a portion of its former range, perhaps restricted to a single archipelago of small islands in Queens Channel, Nunavut.

Observations of very low reproductive success suggest that Canadian populations may now or soon be in decline. Over a 14-year period (2005-2018), only four of 23 confirmed Ross's Gull nesting attempts at Nasaruvaalik Island produced any chicks, and no chicks were known to survive to fledging. Even though Ross's Gull appears to be a relatively long-lived species, the population at Nasaruvaalik Island will decline without an influx of potential breeders from other source colonies, unless reproductive success improves.

Rescue Effect

There are few data with which to assess whether Ross's Gull from Palearctic breeding sites or Greenland could immigrate to Canada. The closest potential source population in Greenland is very small, estimated at 0-5 pairs dispersed in southwestern and northeastern Greenland (BirdLife International 2015; Figure 1). The species' relatively low nest site fidelity, combined with the wide-ranging movements of tagged individuals and the existence of considerable apparently suitable habitat, suggests that birds from the core breeding range in eastern Russia could reach Canada. Genetic analyses by Royston and Carr (2014) provide evidence of a genetic link with birds presumed to be from the Siberian breeding population, which was likely the initial source population for Canadian birds and may have replenished the Canadian population in the past (Carr pers. comm. 2019). The little information available on eastern Russian population trends suggests that they are likely stable (Maftei *et al.* 2014).

Conversely, recent satellite tracking studies indicate that Ross's Gull breeding in Canada likely overwinter in the Northwest Atlantic Ocean, in the Davis Strait and the Labrador Sea, away from large post-breeding concentrations of presumed Russian birds in the Bering Sea (Maftei *et al.* 2015), exhibiting quite different migratory patterns. Genetic analysis by Royston and Carr (2014) showed differences in the composition of mitochondrial haplotypes between presumed Siberian and Canadian breeders, which would not be expected if there was ongoing gene flow to Canadian populations from Siberia (Toews pers. comm. 2019). Thus, it seems unlikely that rescue could occur.

It is notable that there is no evidence that the small population that formerly nested in Manitoba has been re-established by other Ross's Gull from High Arctic Canada or elsewhere, since breeding was last confirmed there in 2005.

No birds have successfully reproduced over a 14-year period at the only currently known breeding colony in Canada (Nasaruvaalik Island; Maftei unpubl. data), and that colony appears to be maintained by immigration of individuals from other colonies in Canada or elsewhere. The Canadian population may therefore be a sink.

THREATS AND LIMITING FACTORS

Threats

Ross's Gull is likely vulnerable to the cumulative effects of various threats, which are categorized below, following the IUCN-CMP (International Union for the Conservation of Nature – Conservation Measures Partnership) unified threats classification system (based on Salafsky *et al.* 2008). They are listed in order of decreasing severity of impact (greatest to least), ending with those for which scope or severity is unknown. The overall threat impact is considered to be Very High to High, corresponding to an anticipated further decline of between 10 and 100% over the next ten years (Master *et al.* 2012). See **Appendix 1** for further details, including threats considered to have negligible impact.

IUCN 8. Invasive and other problematic species and genes (High threat impact)

8.2 Problematic native species (High threat impact)

In Canada, Ross's Gull usually nests in colonies shared with Arctic Tern, which may provide some protection through group detection of predators and response to them (Nguyen *et al.* 2006). However, from 2005 to 2016, all Ross's Gull chicks produced at Nasaruvaalik Island were apparently killed by the more numerous Arctic Terns nesting nearby (Maftei unpubl. data). This suggests that Ross's Gulls in Canada that nest in close association with aggressive Arctic Terns may be in an "ecological trap", whereby their low reproductive rate is further reduced by this association. This relationship with Arctic Terns has been well documented elsewhere (Densley 1999; Egevang and Boertmann 2008; Maftei *et al.* 2012), and the harassment, injury, and killing of chicks by Arctic Terns has been previously noted (Macdonald *in* Chartier and Cooke 1980; Densley 1999). Chick mortality from attacks by Arctic Tern probably contributes to the low number of fledged young of Ross's Gull, and is likely a major cause of extremely low reproductive success recorded in Canada (Maftei 2014).

Ross's Gull breeding at Nasaruvaalik Island are regularly disturbed by Polar Bear and Arctic Fox (Maftei *et al.* 2012), which cause adults to temporarily leave their nests unguarded, often in inclement weather, and may consume eggs and chicks. This and other High Arctic nesting sites may face increased disturbance and predation by Polar Bears as their behaviour and movements change in response to changing climate and ice regimes (Iverson *et al*. 2014; Prop *et al*. 2015).

IUCN 9. Pollution (High-Medium threat impact)

9.5 Air-borne pollutants (High-Medium threat impact)

The only report of contaminant levels in eggs of Ross's Gull in Canada found relatively high concentrations of both mercury and persistent organic pollutants (POPs; Peck *et al.* 2016), with the single Ross's Gull sample having the highest concentration of legacy POPs among eight species studied. From 2005 to 2016, only 4 of 23 Ross's Gull nesting attempts at Nasaruvaalik Island produced chicks, and many eggs failed to hatch due to apparent infertility (Maftei 2014; unpubl. data). Although sample sizes in both studies were very small, they suggest that egg infertility related to high contaminant loadings may also contribute significantly to very low reproductive success of Ross's Gull at Canadian colonies.

IUCN 11. Climate change and severe weather (Unknown threat impact)

11.1 Habitat shifting and alteration (Unknown threat impact)

Ongoing climate-related changes predicted to take place in terrestrial High-Arctic breeding habitats are likely to have gradual effects on the nesting habitats used by Ross's Gull within three generations, and the loss of permafrost and drying of many Low Arctic wetlands may affect habitats formerly used for nesting in Manitoba. The effects of shifts in marine conditions on food availability in Ross's Gull High Arctic breeding areas and in wintering habitats are unknown, although climate-related shifts in food availability and diet have been demonstrated in the Arctic for other marine bird species (e.g., Ganter and Gaston 2013).

Limiting Factors

Ross's Gull generally has extremely low reproductive success (Kondratyev *et al.* 2000; Maftei 2014). The ability of breeding individuals to reproduce successfully is likely limited by a combination of factors during the nesting season, including low nesting density, low pair-bond fidelity, unpredictable and often severe climatic conditions, high rates of breeding deferral or abandonment, and predation.

Number of Locations

Recent breeding records of Ross's Gull in Canada come from three geographically and ecologically distinct areas: Queens Channel and Foxe Basin in Nunavut, and near Churchill in Manitoba. Although the species is presently only known to nest in Queens Channel, it is possible that very small breeding numbers could nonetheless be present in all three areas. As these areas have different habitats, are separated by at least several hundred kilometres, and are likely exposed to threats from different sources (such as chick mortality from Arctic Terns, enhanced predation, human disturbance, marine pollution, etc.), each area is considered to be a different location. Although there is no evidence that Ross's Gull currently breeds in other parts of Canada, there are large areas of apparently suitable habitat along the maritime coastlines of Manitoba and Nunavut that could represent additional locations if breeding there were confirmed. The present number of locations is therefore estimated to be 1-3, although breeding has only been confirmed at one location (Queens Channel) within the last 15 years.

PROTECTION, STATUS AND RANKS

Legal Protection and Status

Ross's Gull is protected under the *Migratory Birds Convention Act 1994* (Government of Canada 2017), which prohibits the harming of individual birds and the disturbance or destruction of nests and eggs. Ross's Gull was listed under Schedule 1 of the *Species at Risk Act 2002* (Government of Canada 2019) in June 2003 as a Threatened species.

Ross's Gull is also listed as Endangered in Manitoba under the *Manitoba Endangered Species and Ecosystems Act*.

A national Recovery Strategy prepared in 2007 identified four key recovery objectives: 1) maintain known current distribution and number of pairs of Ross's Gull breeding in Canada over a five-year average; 2) encourage further research and surveys that may reveal previously unknown nesting concentrations in the Canadian Arctic; 3) protect breeding habitat through stewardship and conservation agreements and undertake studies to identify critical habitat; and 4) determine the significance of threats at breeding locations and implement management strategies to reduce threats (Environment Canada 2007).

Ross's Gull is protected in the United States, including Alaska, under the *Migratory Bird Treaty Act* (USFWS 2017). It is listed as a Threatened or Endangered Species in Russia's Red Book, and is fully protected in Russia against deliberate harm or disturbance (Kondratyev *et al.* 2000). The species is similarly protected in Greenland (Boertmann 2007).

Non-Legal Status and Ranks

Ross's Gull is globally considered Apparently Secure (G4) (NatureServe 2019), and is listed as a species of Least Concern by the IUCN (IUCN 2018). It is considered Critically Imperilled/Imperilled in Canada, as both a breeder and a migrant (N1N2B, N1N2M) (NatureServe 2019). At the provincial level, Ross's Gull is considered Critically Imperilled as a breeder in Manitoba (S1B), Critically Imperilled as both a breeder and a migrant in Nunavut (S1B, S1M), and is not listed in other provinces and territories. In the United States, it is not ranked at the national level (NNA) (NatureServe 2019), but considered Vulnerable/Apparently Secure as a migrant (S3S4M) at the state level in Alaska (NatureServe 2019). Ranking information is summarized in Table 2.

Table 2. Conservation status of Ross's Gull in Canada and the United States (from NatureServe 2019).

Jurisdiction	IUCN Status*	Country/Province/State Status
IUCN	**Near Threatened**	
Global	G4 NA	
Canada		N1N2B, N1N2N
Manitoba		S1B
Nunavut		S1B, S1N
United States		NNA (not applicable)
Alaska		S3S4N

*N (at start of rank) = National; S = Subnational; B = Breeding; N (at end of rank) = Non-breeding. 1 = Critically Imperilled; 2 = Imperilled; 3 = Vulnerable; 4 = Apparently Secure; NA = Not Applicable.

Habitat Protection and Ownership

Several areas used by Ross's Gull as breeding sites in Canada in recent decades are identified as Canadian Important Bird Areas, including Cheyne Islands (IBA NU049), Prince Charles Island (IBA NU011), and Nasaruvaalik Island (Territorial (NU) IBA) in Nunavut, and Churchill, Manitoba (IBA MB003). These designations do not formally protect the species or its habitat, but as a Schedule 1 SARA-listed species, Ross's Gull and its nests are protected against disturbance or harm. The species is protected under the *Canada National Parks Act 2000* in Wapusk National Park, Manitoba, although it has not been recorded breeding there (Pruss pers. comm. 2019).

Based on the extent of apparently suitable habitat, the presumed breeding range of Ross's Gull in Canada may include a mix of protected and unprotected crown lands, as well as land which falls under the Nunavut Land Claim Agreement. No significant areas within this overall range are privately held.

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Mark Maftei has studied Arctic breeding birds for 15 years. He has spent eight years studying Ross's Gulls nesting on Nasaruvaalik Island in Nunavut, Canada, as well as conducting migration counts in Alaska and at-sea surveys in Russia, Alaska and northern Canada. He has published a number of peer-reviewed papers on Ross's Gull, and wrote his M.Sc. thesis on the status of the species in North America. In 2011, Mark founded the High Arctic Gull Research Group, which has conducted a number of research projects with government and academic collaborators across the circumpolar Arctic. He is currently the Executive Director of the Raincoast Education Society in Tofino, British Columbia.

COLLECTIONS EXAMINED

No collections were examined for the preparation of this report.

Appendix 1. Threats Calculator Table for Ross's Gull.

Species or Ecosystem Scientific Name	Ross's Gull *Rhodostethia rosea*			
Element ID		**Elcode**		
Date:	2019-06-18			
Assessor(s):	Mark Maftei (writer), Richard Elliot (SSC co-chair), Dwayne Lepitzki (facilitator), Marie-France Noël (COSEWIC Secretariat), Shanti Davis (High Arctic Research Group), Dave Fifield (ECCC-WLSD), Marcel Gahbauer (Birds SSC), Tom Jung (YK), Piia Kukka, Mark Mallory (Acadia University), Greg Robertson, (ECCC-WLSD), Matthew Webb (PCA), Greg Wilson (BC)			
References:	Draft Ross's Gull status report, SARA Recovery Strategy for the Ross's Gull in Canada (Environment Canada 2007)			
Overall Threat Impact Calculation Help:		**Level 1 Threat Impact Counts**		
	Threat Impact		**high range**	**low range**
	A	Very High	0	0
	B	High	2	1
	C	Medium	0	1
	D	Low	0	0
Calculated Overall Threat Impact:			Very High	High
Assigned Overall Threat Impact:			**AB = Very High - High**	
Impact Adjustment Reasons:				
Overall Threat Comments			Generation time for Canadian Ross's Gull is assumed to be 5.35 years, so time-frame for severity and timing is taken as 16 years. It is assumed that all Canadian birds now breed in the central High Arctic and winter in the Northwest Atlantic, especially in the Labrador Sea. Known population size is <20 mature individuals and total population is assumed to be very small, certainly <250 mature individuals. Breeding has been monitored recently at the only known active Canadian colony, at Nasaruvaalik Island, Nunavut, where numbers are relatively stable but annual productivity is very low to zero.	

Threat		**Impact (calculated)**		**Scope (next 10 Yrs)**	**Severity (10 Yrs or 3 Gen.)**	**Timing**	**Comments**
1	Residential & commercial development						
1,1	Housing & urban areas						
1,2	Commercial & industrial areas						

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
1,3	Tourism & recreation areas						
2	Agriculture & aquaculture						
2,1	Annual & perennial non-timber crops						
2,2	Wood & pulp plantations						
2,3	Livestock farming & ranching						
2,4	Marine & freshwater aquaculture						
3	Energy production & mining						
3,1	Oil & gas drilling						No direct effect of oil and gas drilling activities is expected in either breeding or overwintering areas - effects of oil spills are considered in section 9.2 (Industrial & Military Effluents).
3,2	Mining & quarrying						
3,3	Renewable energy						
4	Transportation & service corridors						
4,1	Roads & railroads						
4,2	Utility & service lines						
4,3	Shipping lanes						Effects of oil spills from shipping activities are considered in section 9.2 (Industrial & Military Effluents).
4,4	Flight paths						
5	Biological resource use		Negligible	Negligible (<1%)	Extreme (71-100%)	Moderate (Possibly in the short term, < 10 yrs)	
5,1	Hunting & collecting terrestrial animals		Negligible	Negligible (<1%)	Extreme (71-100%)	Moderate (Possibly in the short term, < 10 yrs)	Ross's Gull was historically shot opportunistically for food in Barrow, Alaska (e.g., Murdoch 1899) and Newfoundland (in 1976; Mactavish pers. comm. 2019), but not in numbers likely to have a measurable population impact. There is one record of a single bird shot near Pond Inlet, Nunavut within the last decade. It is unlikely that hunting now poses a significant threat to Canadian birds.
5,2	Gathering terrestrial plants						

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
5,3	Logging & wood harvesting						
5,4	Fishing & harvesting aquatic resources						
6	Human intrusions & disturbance		Negligible	Pervasive - Large (31-100%)	Neutral or Potential Benefit	High (Continuing)	
6,1	Recreational activities		Negligible	Negligible (<1%)	Slight (1-10%)	Low (Possibly in the long term, >10 yrs)	Ross's Gull nesting in Canada may attract birdwatchers and egg collectors because of its extreme rarity. It is sensitive to human disturbance (Boadway and Mallory 2010), and one nest with eggs was illegally taken by a collector from near Churchill, Manitoba in 1981 (Artuso pers. comm. 2019). However, all recent Ross's Gull nesting sites are in extremely remote areas with no or extremely limited public access. Anticipated increases in tourist access by ship in the high Arctic may present a future risk to Ross's Gull, beyond 10 years. Vagrant Ross's Gull that occur occasionally in southern Canada attract considerable attention from birdwatchers.
6,2	War, civil unrest & military exercises						
6,3	Work & other activities		Not a Threat	Pervasive - Large (31-100%)	Neutral or Potential Benefit	High (Continuing)	Disturbance by researchers occurs in most years at Nasaruvaalik Island, the only known active Ross's Gull colony in Canada, but it is managed to avoid impacts on survival and productivity, and capture and banding activities are unlikely to deter or prevent breeding attempts (Maftei pers. obs.). The presence of scientists likely has net positive effects overall, by deterring nest predation by Polar Bears and Arctic Foxes and trampling of nests by Caribou. Scope is taken as Pervasive-Large, as individuals nesting at Nasaruvaalik Island may represent between about one third and 100% of all of Ross's Gull breeding in Canada.
7	Natural system modifications						
7,1	Fire & fire suppression						
7,2	Dams & water management/use						

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
7,3	Other ecosystem modifications						Human activities that modify habitats on the breeding grounds are unlikely to affect nesting Ross's Gull or its food resources, and it is unknown whether ongoing oceanographic changes in the Labrador Sea may affect this species.
8	Invasive & other problematic species & genes	B	High	Pervasive - Large (31-100%)	Serious (31-70%)	High (Continuing)	
8,1	Invasive non-native/alien species						
8,2	Problematic native species	B	High	Pervasive - Large (31-100%)	Serious (31-70%)	High (Continuing)	High rates of chick mortality from attacks by aggressive Arctic Terns nesting in shared colonies, such as Nasaruvaalik Island likely contribute significantly to very low fledging rates of Ross's Gull in Canada. Gulls are apparently attracted to nest in large, high-density tern colonies which provide anti-predator defense, but are out-numbered by nesting terns whose subsequent attacks on gull chicks reduce productivity appreciably, and may represent an ecological trap. At the single known active Canadian colony, nesting gulls are regularly disturbed by Polar Bears and Arctic Foxes which consume eggs and chicks, and flush adults from nests. Disturbance and predation by bears may increase in response to changing climate and ice regimes.
8,3	Introduced genetic material						
9	Pollution	BC	High - Medium	Pervasive - Large (31-100%)	Serious - Moderate (11-70%)	High (Continuing)	
9,1	Household sewage & urban waste water						

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
9,2	Industrial & military effluents		Negligible	Negligible (<1%)	Extreme (71-100%)	High (Continuing)	Much of the global Ross's Gull population that occurs along the north coast of Alaska in fall is susceptible to effects of offshore or near-shore oil spills related to shipping activity, and to petroleum exploration or extraction activities at offshore facilities. Late fall or early winter spills would be impossible to contain effectively, due to shifting ice cover. Recent modelling indicates a high likelihood that surface waters used by migrating Ross's Gull would be contaminated (Wilson et al. 2018), although Ross's Gull from Canadian colonies may not occur within these migratory concentrations. Ross's Gull nesting in Canadian High Arctic colonies is not currently exposed to oil spills, although shipping traffic near known colonies may increase with future climate warming. Canadian Ross's Gull wintering in near-coastal portions of the Labrador Sea may be at a slight risk to effects of oil spills from coastal community supply vessels and ore carriers servicing the Voisey's Bay nickel mine in northern Labrador (Fifield pers. comm. 2019).
9,3	Agricultural & forestry effluents						
9,4	Garbage & solid waste						
9,5	Air-borne pollutants	BC	High - Medium	Pervasive - Large (31-100%)	Serious - Moderate (11-70%)	High (Continuing)	Limited data indicate that Ross's Gull eggs contain very high concentrations of mercury and POPS, with the only Canadian sample having the highest concentration of legacy POPs of eight species studied. Scope is scored as large-pervasive as egg infertility, likely related to high contaminant loadings, appears to contribute significantly to very low Ross's Gull productivity at the known active Canadian colony.
9,6	Excess energy						
10	Geological events						
10,1	Volcanoes						
10,2	Earthquakes/tsunamis						
10,3	Avalanches/landslides						
11	Climate change & severe weather		Unknown	Pervasive (71-100%)	Unknown	High (Continuing)	

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
11,1	Habitat shifting & alteration		Unknown	Pervasive (71-100%)	Unknown	High (Continuing)	Climate-related changes in terrestrial High-Arctic breeding habitat may not occur within 30 years, although loss of permafrost and drying of Low Arctic wetlands may effect habitats formerly used for nesting. Effects of shifts in marine conditions on food availability in breeding and wintering areas are unknown.
11,2	Droughts						
11,3	Temperature extremes						
11,4	Storms & flooding						Predictions of increased frequency of extreme storm events (with high winds, rain, ice, or snow) during sensitive periods of the nesting season could increase the frequency of chick mortality, nest abandonment, or breeding deferral, although such effects have not yet been detected in the eastern High Arctic.

Classification of Threats adopted from IUCN-CMP, Salafsky *et al.* (2008).