Ontario Species at Risk Evaluation Report for Caribou (*Rangifer tarandus*) Eastern Migratory Population

Committee on the Status of Species at Risk in Ontario
(COSSARO)

Assessed by COSSARO as Special Concern

November 2017

Final

Caribou (population migratrice de l’Est) (*Rangifer tarandus*)

Plusieurs écotypes de caribous (Rangifer tarandus) vivent au Canada, dont deux en Ontario : la population boréale (des bois) et la population migratrice de l’Est (toundra forestière). Les territoires respectifs de ces deux populations se chevauchent en Ontario, et particulièrement en hiver, mais les distinctions biologiques et écologiques de ces deux écotypes semblent valides. La population migratrice de l’Est forme une partie de la sous-population du Sud de la baie d’Hudson, qui déborde dans le Nord du Manitoba et constitue l’une des quatre sous-populations de l’unité désignable (UD) de la population migratrice de l’Est. La portion de cette sous-population qui vit en Ontario représente environ 68 % de la zone d’occurrence, et 14,1 % de toute l’UD. Le caribou migrateur de l’Est habite dans les basses terres de la baie d’Hudson, dans une zone qui s’étend de la frontière du Manitoba à la côte de la baie James vers l’est, et de la côte de la baie d’Hudson vers le sud, jusqu’à mi-chemin de la côte de la baie James.

Le caribou migrateur de l’Est se déplace vers un habitat côtier au printemps et à l’été, puis retourne à la forêt, vers le sud, en automne et en hiver. Les aires d’hivernage (qu’il occupe de janvier à mars) ont très peu changé dans les 50 dernières années, mais la distribution estivale s’est déplacée de façon marquée vers l’est. En été, le nombre de caribous dans le secteur de l’île Penn et de Fort Severn a chuté de façon draconienne ces dernières décennies, mais a augmenté dans la même mesure dans les régions plus à l’est, près du cap Henrietta Maria. Les principales menaces à l’UD, qui s’appliquent aussi à cette sous-population, sont les diverses perturbations et le développement industriel, particulièrement l’exploitation minière et les réseaux routiers connexes. L’utilisation de véhicules tout-terrain dans les parties Ouest et centrale des basses terres de la baie d’Hudson, du moins celle liée à la chasse, a explosé. De plus, les activités de chasse par les peuples autochtones se sont poursuivies et semblent avoir pris de l’ampleur avec le temps, du moins jusqu’en 2011. Les changements climatiques seraient une autre menace susceptible, à long terme, de modifier la végétation de la toundra et de réduire les quantités de lichen. Les menaces à la sous-population dans la partie ontarienne demeurent.

En dehors de certains signes de déclin, les données relatives aux tendances pour la sous-population du Sud de la baie d’Hudson en Ontario sont difficiles à obtenir vu l’insuffisance des activités de surveillance récentes et la variabilité des mesures employées. Toutefois, rien n’indique que le déclin de cette population est aussi important que celui des sous-populations de l’Est du Québec.

La sous-population du Sud de la baie d’Hudson de caribous migrateurs de l’Est est considérée comme une espèce préoccupante en Ontario, compte tenu des déclins apparents mais non quantifiés, des menaces croissantes et persistantes et des baisses importantes observées ailleurs dans l’Est du Canada. Ce statut contraste avec celui attribué par le COSEPAC, qui considère la population migratrice de l’Est comme étant en voie de disparition en raison du déclin général de 80 % du nombre d’individus depuis

trois générations (18 à 21 ans), déclin qui, selon les prédictions, devait se poursuivre en raison de l'excès de récolte et de la baisse de la qualité de l'habitat attribuable aux changements climatiques et aux activités d'aménagement. C'est que deux sous-populations migratrices de l'Est de l'UD au Québec, qui comprend la grande majorité de la population, montraient des signes de déclin encore plus importants, ce qui a influencé la détermination finale du statut par le COSEPAC. La sous-population du Sud de la baie d'Hudson est toutefois clairement exposée à certaines des menaces qui guettent l'ensemble de la population migratrice de l'Est.

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Executive summary

Several Caribou (*Rangifer tarandus*) ecotypes occur across Canada, two of which occur in Ontario - the Boreal Population (forest-dwelling) and the Eastern Migratory (EM) Population (forest-tundra). There is some geographical overlap between the Boreal and Migratory Caribou populations in Ontario, particularly in winter, although the ecotype distinctions appear biologically and ecologically valid. Ontario's Eastern Migratory Caribou form part of the Southern Hudson Bay subpopulation, which is also shared with northern Manitoba, and is one of four subpopulations in the EM Designatable Unit (DU). The Ontario portion of the subpopulation represents approximately 68% of the subpopulation's extent of occurrence, and 14.1% for the entire EM DU. Eastern Migratory Caribou occur across the Hudson Bay Lowlands from the Manitoba border east to the James Bay coast, extending from the Hudson Bay coast as far south as mid-way down James Bay.

Eastern Migratory Caribou move to coastal habitat in spring and summer, returning to more forested and more southerly habitat in fall and winter. The location of wintering areas (January-March) has changed little over the past half-century, although summer distribution has shifted markedly eastward. Summer Caribou numbers in the Penn Island/Fort Severn area have decreased dramatically in recent decades, and numbers have correspondingly increased markedly further eastward near Cape Henrietta Maria.

Major threats to this DU that are also applicable to this subpopulation include disturbance from industrial disturbance and development, particularly mining and associated road networks. ATV use in the western and central portions of the Hudson Bay Lowlands, at least in part for hunting, has increased substantially. Aboriginal harvest is ongoing, and appeared to be gradually increasing at least until 2011. Climate change appears to be a long-term threat that may cause changes to tundra vegetation that reduces lichen availability. Threats have not ceased in the Ontario portion of the subpopulation.

Trend data for the Southern Hudson Bay subpopulation in Ontario are difficult to obtain, due to insufficient recent monitoring and variable monitoring measures, although there are indications of decline. However there is no evidence to suggest that the population decline is as severe as that for subpopulations to the east in Québec.

The Southern Hudson Bay subpopulation of Eastern Migratory Caribou is designated as Special Concern in Ontario because of apparent but unquantified declines, ongoing and increasing threats, and dramatic declines elsewhere in eastern Canada. This contrasts with COSEWIC's designation of the Eastern Migratory Caribou population as Endangered based upon an 80% overall decline in number over three generations (18-21 years), which was predicted to continue because of overharvest and a decrease in habitat quality associated with climate change and development. However, two declining subpopulations of the Eastern Migratory DU in Québec which comprised the vast majority of the population exhibited a much more dramatic decline and heavily influenced the final COSEWIC status determination. The Southern Hudson Bay subpopulation clearly shares a number of the same threats as the rest of the Eastern Migratory Caribou population.

1. Eligibility for Ontario status assessment

1.1. Eligibility conditions

1.1.1. Taxonomic distinctness

Caribou (*Rangifer tarandus*) is a distinctly recognized circumpolar species that occurs in many northern countries. It is typically referred to as Reindeer in Russia and Scandinavia, and as Caribou in North America and Greenland. Banfield (1961) recognized several subspecies, including Woodland Caribou (*Rangifer tarandus caribou*), which was considered the only subspecies in Ontario. The subspecies designation has subsequently been seen as problematic and not supported by more recent taxonomic and genetic studies, and a taxonomic revision was seen as required (COSEWIC 2011). As a result, there has been a growing trend to refer to Caribou according to ecotype, which classifies animals by their habitat type and migratory behaviour (Thomas 1992, Harris 1999). Ontario was one of the first Canadian jurisdictions to assess Caribou status by ecotype (see Harris 1999).

Ecotypes can play a key role in understanding ecology and life history requirements in support of conservation (Pond *et al.* 2016). There are two Caribou ecotypes in Ontario, the more southern forest-dwelling or boreal population, and the more northern forest-tundra Caribou ecotype (Harris 1999, Abraham et al. 2012), comparable to the Eastern Migratory Caribou recognized by COSEWIC (2011, 2017). There is some overlap in distribution between the two ecotypes in Ontario, with the annual ranges of some forest-dwelling Caribou extending as much as 95 km north of the Northern Taiga Ecoregion boundary (Berglund et al. 2014, Amec Foster Wheeler Environment & Infrastructure 2016). Recent studies have confirmed the validity of ecotypes as a basis for classifying Caribou, following COSEWIC criteria of discreteness and significance (Pond *et al.* 2016). The ecotypes showed clear bimodal patterns in both the percentage of observations within the Hudson Bay Lowlands and average distance south of the treeline at calving (Figure 1) (Pond *et al.* 2016), although clearly there is a great deal of seasonal range overlap that complicates ecotype designation (Hazel and Tylor 2011, Amec Foster Wheeler Environment & Infrastructure 2016). These ecotypes clearly overlap during the winter (Amec Foster Wheeler Environment & Infrastructure 2016, Pond *et al* 2016), but “geographic separation during the rest of the year is remarkable”, particularly during calving and breeding periods (Pond *et al* 2016).

The southern range boundary of the Eastern Migratory Caribou population has been refined since the publication of range maps in Environment Canada (2011) and COSEWIC (2011, 2014). The current southern boundary in Ontario, as portrayed in Figure 2, reflects the southern boundary of the Northern Taiga Ecoregion (1E), and has an ecological basis for its location based upon Caribou movements and ecology (Berglund et al. 2014).

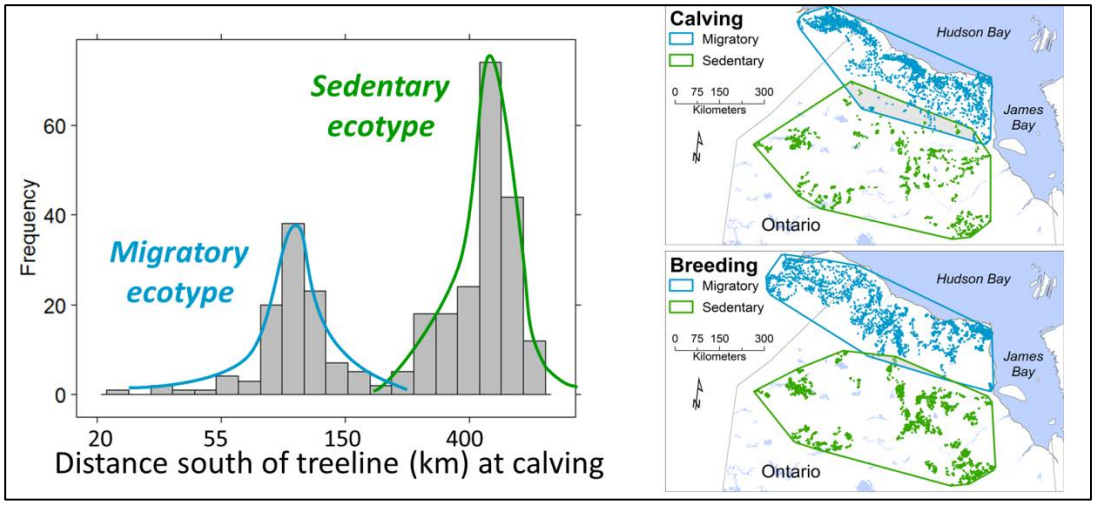

Figure 1. Spatial separation of Caribou ecotypes in Ontario during reproductive periods (from Pond *et al.* 2016).

1.1.2. Designatable units

One DU in Ontario. COSEWIC (2011) recognized 12 Caribou DUs in Canada, including the Eastern Migratory DU (DU 4). The Eastern Migratory DU is identified based upon behavioural and genetic distinctiveness, as it represents the only group of migratory Caribou that originated mostly from the North American lineage (COSEWIC 2011, COSEWIC 2017). The Eastern Migratory DU represents four subpopulations: Cape Churchill and Southern Hudson Bay west of James Bay, and Leaf River and George River subpopulations east of James Bay (Figure 2; COSEWIC 2017). The eastern and western subpopulations are separated by the southern James Bay area, which is occupied by the Boreal population of Caribou. The Southern Hudson Bay subpopulation occurs in both Ontario and Manitoba, and is the only subpopulation of migratory Caribou that occurs in Ontario. There is some slight overlap between the Cape Churchill and Southern Hudson Bay subpopulations of the Eastern Migratory DU, but only within Manitoba (Figure 2, COSEWIC 2017).

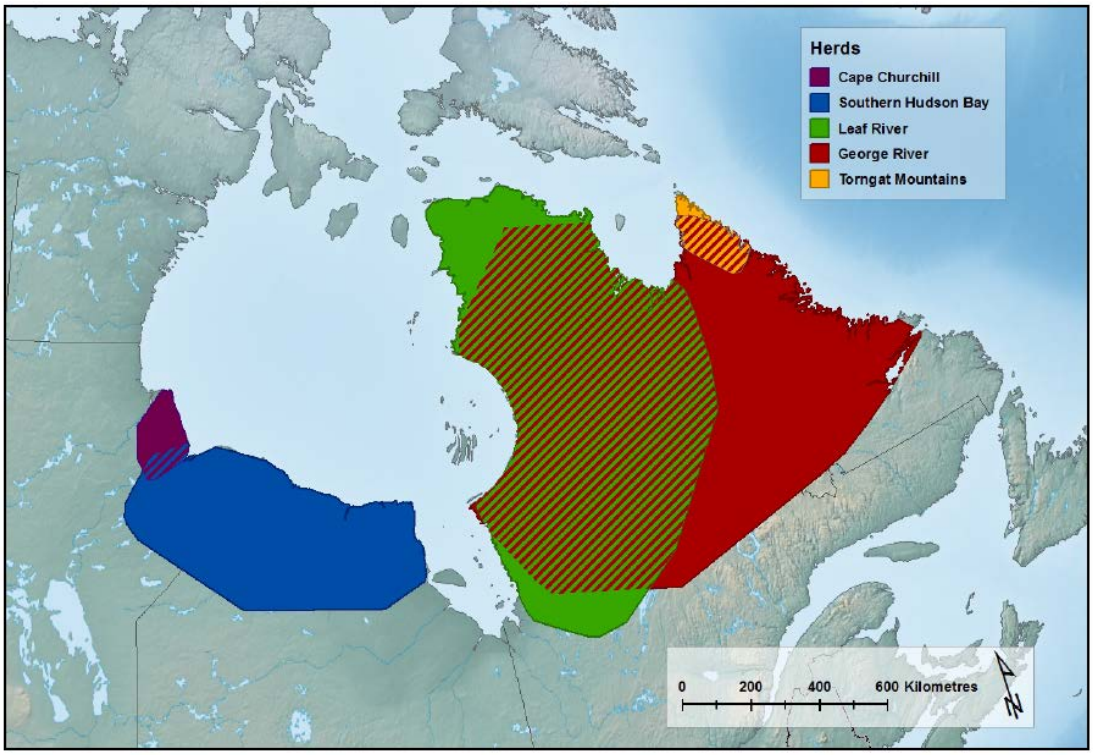

Figure 2. Approximate range of the Eastern Migratory population of Caribou, including the four subpopulations. Polygons are based on 100% minimum convex polygons of satellite-tagged animals. Dashed lines indicate overlap of subpopulations. Note that the Torngat Mountains population is a separate DU. From COSEWIC (2017).

1.1.3. Native status

Yes. Caribou are clearly native to Ontario, recolonizing the province after the most recent ice age, approximately 14,000 to 22,000 years ago (COSEWIC 2017).

1.1.4. Occurrence

Yes. Eastern Migratory Caribou are currently extant in the province.

1.2. Eligibility results

Yes. Eastern Migratory Caribou (*Rangifer tarandus*) is eligible for status assessment in Ontario.

2. Background information

2.1. Current designations

- GRANK: G5 (Species level - *Rangifer tarandus).* Several subspecies and populations are ranked by NatureServe, but Eastern Migratory Caribou is not specifically ranked (NatureServe 2017).

- NRANK Canada: N4 (Species level - *Rangifer tarandus).* Several subspecies and populations are ranked by NatureServe, but Eastern Migratory Caribou is not specifically ranked (NatureServe 2017).
- COSEWIC: Endangered (April 2017, Government of Canada 2017).
- SARA: No status.
- ESA 2007: Not ranked. The “forest-tundra” ecotype of Woodland Caribou was considered Not in Any Category when first evaluated by COSSARO in the early 2000s (see Harris 1999).
- SRANK: S4 (*Rangifer tarandus).* Several subspecies and populations are ranked by NatureServe, but Eastern Migratory Caribou is not specifically ranked*.* (NatureServe 2017). NHIC has recently assigned a rank of S4 to Eastern Migratory Caribou in Ontario (M. Burrell pers. comm.).

2.2. Distribution in Ontario

Eastern Migratory Caribou occur across the Hudson Bay Lowlands from the Manitoba border east to the James Bay coast, extending from the Hudson Bay coast as far south as mid-way down James Bay (Figure 2). The range of this Southern Hudson Bay subpopulation partially overlaps with the range of Boreal Caribou in winter (COSEWIC 2011, 2017; Amec Foster Wheeler Environment & Infrastructure 2016). This subpopulation moves to coastal habitat in spring and summer, returning to more forested and more southerly habitat in fall and winter (Figure 1). The location of wintering areas (January-March) (Figure 3) has changed little over the past half-century, although summer distribution has shifted markedly eastward (Figure 4) (Newton *et al.* 2015).

For each subpopulation, COSEWIC (2017) considered the Area of Occupancy to be the entire range because there is very little unused range within each subpopulation. For the Southern Hudson Bay subpopulation, some animals can be found in each seasonal range regardless of season (e.g. see Figure 6, Pond *et al.* 2016), and this same rationale appears appropriate.

There are many locations in the DU (COSEWIC 2017). According to COSEWIC (2017) there is no single threat potentially impacting the entire DU, and known threats vary across a large area. Recently (2009-2011), Newton *et al*. (2015) recognized three distinct but overlapping subareas of collared Caribou within Ontario based upon both winter and summer minimum convex polygons (Figure 5). These areas are considered to be too broad to be locations based upon identified threats such as human disturbance, harvest, and industrial development (see section 2.5).

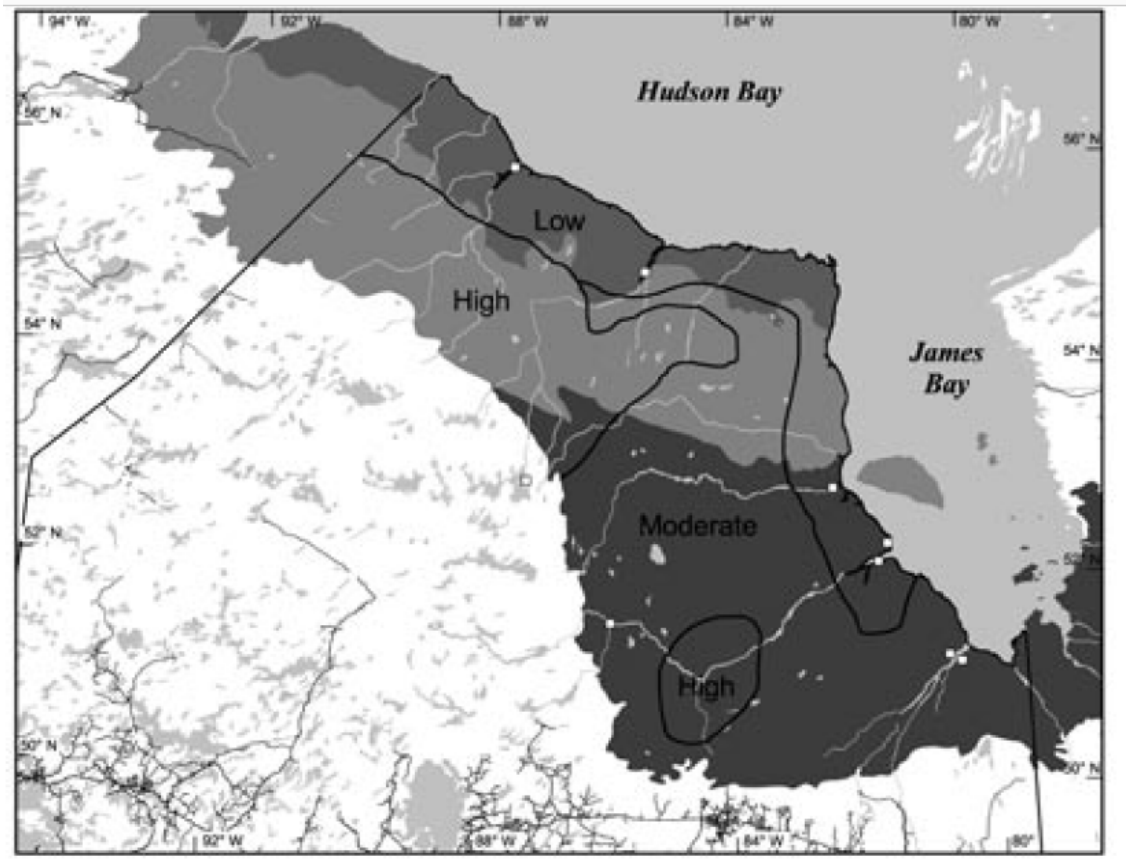

Figure 3. Relative winter (January-March) distribution of Caribou in the Hudson Plain Ecozone, based upon compilation of aerial surveys from 1959-2003. Note that this ecozone includes an area of overlap between the ranges of both Eastern Migratory and Boreal Caribou. From Magoun *et al.* (2005).

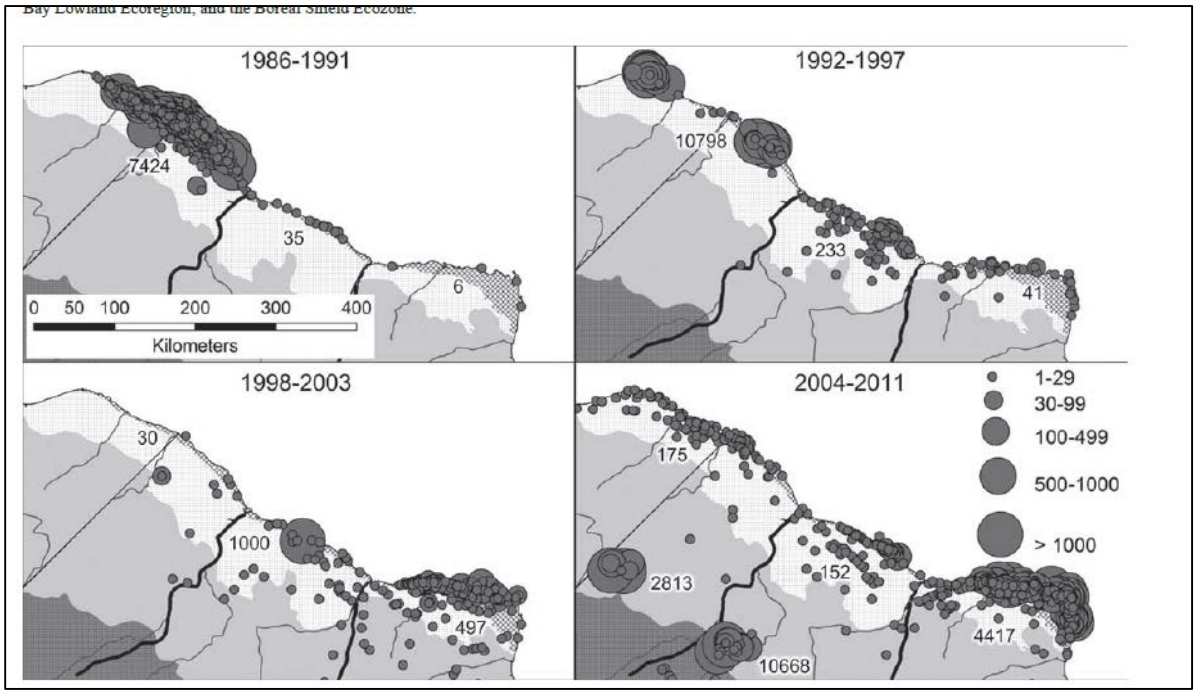

Figure 4. Changes in the summer locations of Caribou along the Hudson Bay coast, from 1966-1991 to 2004-2011. From Newton *et al.* (2015). [1]

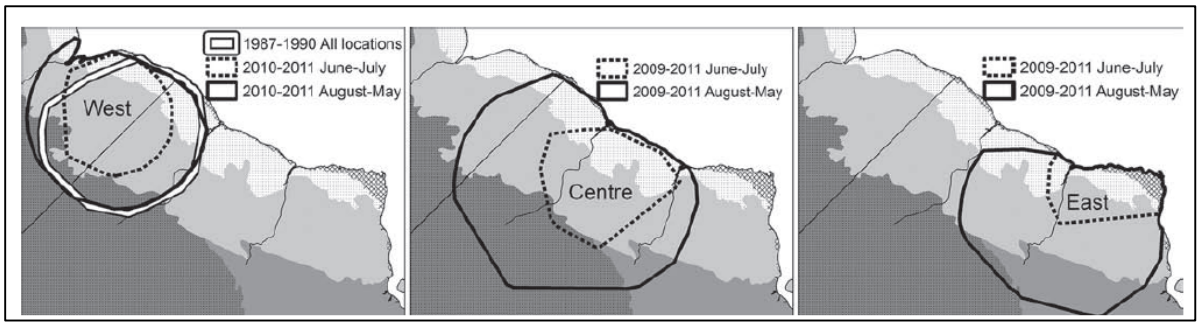

Figure 5. Minimum convex polygons (90%) of collared female caribou for three areas of southern Hudson Bay based on Caribou locations in 1987-1990 and 2009-2011. From Newton *et al.* (2015).

2.3. Distribution and status outside Ontario

The range of the Southern Hudson Bay subpopulation overlaps both Ontario and Manitoba (Figure 2). Many of the same animals can be found in either Ontario or Manitoba, depending upon the year and the season (Figure 6). The Eastern Migratory Caribou DU extends from northeastern Manitoba to northern Quebec and Labrador. The distribution is disjunct, with the area of southern James Bay being occupied by Boreal Caribou populations rather than Eastern Migratory Caribou. Populations have declined significantly in Québec; the George River subpopulation has declined by 99% over three generations, and the Leaf River subpopulation by 68% over two generations (COSEWIC 2017).

[1] The more frequent observations of Caribou in the western zone during 2004-2011 were likely the result of increased survey effort (Newton *et al.* 2015).

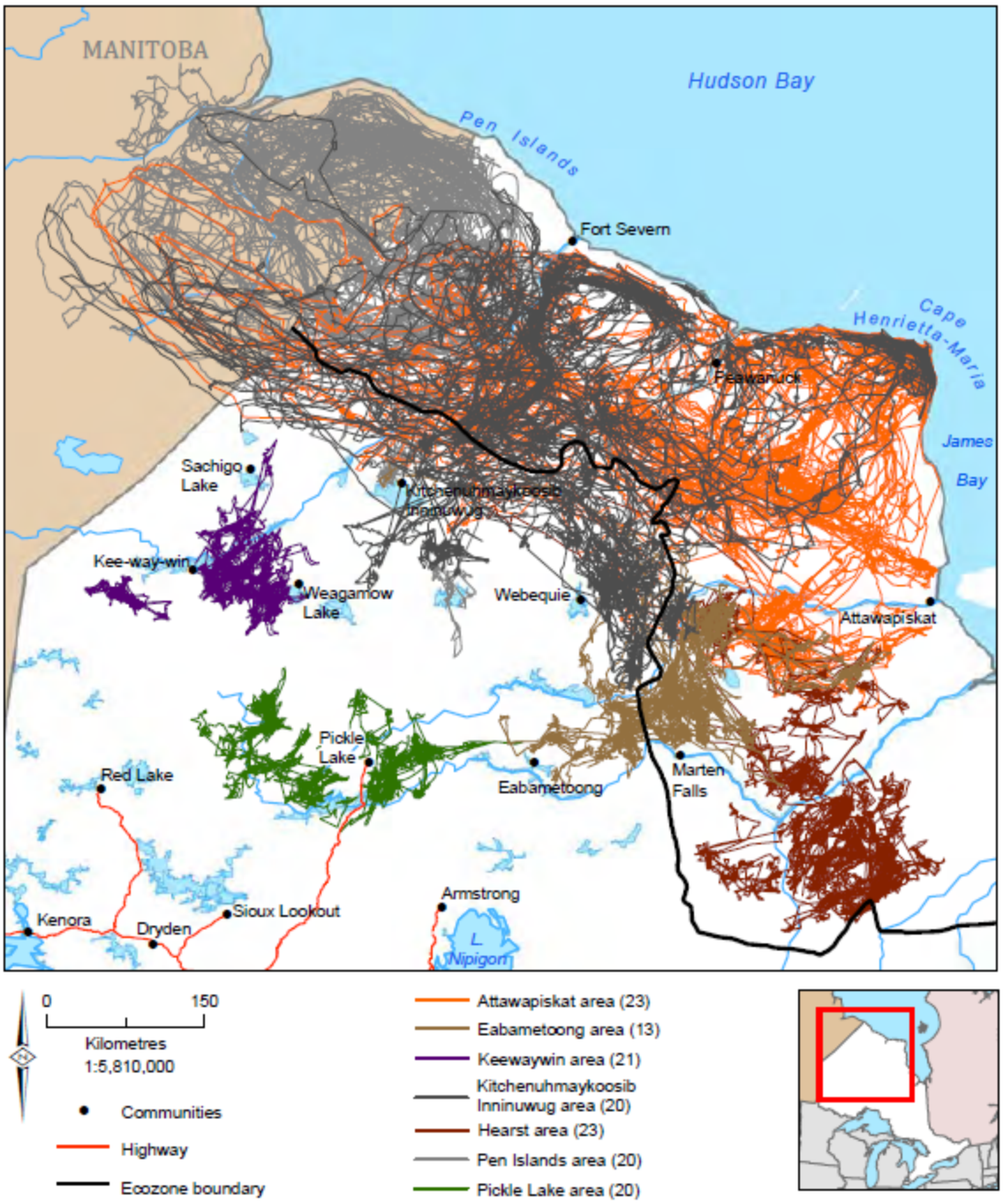

Figure 6. Travel paths used by collared Caribou in the Far North of Ontario between 2009-2011, showing the degree of movement of far northern animals (Eastern Migratory) between Ontario and Manitoba. Caribou are grouped by colour according to collaring location. From Berglund *et al.* (2014).

2.4. Ontario conservation responsibility

The Southern Hudson Bay subpopulation comprises approximately 20% of the total Eastern Migratory Caribou DU based upon the extent of occurrence, and 7.3% based

upon number of mature individuals (data from COSEWIC 2017). The Ontario portion of the subpopulation represents approximately 68% of the subpopulation's extent of occurrence, and 14.1% for the DU.

2.5. Direct threats

The Threats Calculator indicated that the threat level to Eastern Migratory Caribou was Very High to High, although threats to this DU appear to vary by subpopulation across the extent of occurrence.

A major threat to this DU, including the Southern Hudson Bay subpopulation, is sensitivity to industrial disturbance and development, particularly mining and associated road networks. The altered summer distribution of Southern Hudson Bay Caribou from the Fort Severn area eastward represented an almost complete abandonment of the former calving and post-calving grounds in the Pen Islands area (Abraham *et al.* 2012). This appears to reflect a Caribou population response to avoid ATV disturbance and seek better forage (Newton *et al.* 2015). There was a significant negative relationship between the distribution of caribou tracks and ATV tracks, and caribou avoided areas frequented by ATVs by 9.7-14.1 km (Newton *et al.* 2015). ATV use in the western and central portions of the Hudson Bay Lowlands has increased substantially, where motorized travel is facilitated by raised beach ridges and winter roads between Peawanuck (ON), Fort Severn (ON), and Shamattawa (MB). A winter season road was recently built from Fort Severn to Shamattawa and Gillam (MB), bisecting the northern part of the Southern Hudson Bay range (COSEWIC 2017). In this region ATVs have now replaced freighter canoes as the primary means of transportation for summer hunting (Newton *et al.* 2015). Much of the ATV use in the Southern Hudson Bay subpopulation range is for the purposes of hunting, obscuring the effects of hunting and ATV disturbance (COSEWIC 2017). Winter roads appear to facilitate winter harvest of Caribou (Amec Foster Wheeler Environment & Infrastructure 2016).

Populations are generally limited by food availability, but harvest can be limiting at low population size or when populations are in decline (COSEWIC 2017). Overharvest is contributing to population declines in Québec subpopulations, although the extent of harvest in Ontario is unknown. Caribou hunting appears to be widely distributed across the Hudson Bay Lowlands (Figure 7, Berkes *et al.* 1995), and aboriginal harvest is recognized as a source of mortality to adult Caribou in the James Bay Lowlands (Amec Foster Wheeler Environment & Infrastructure 2016). Hunting in the Hudson Bay Lowlands appears to be most common in late winter, when snowmobile access is possible, but can occur along coastal areas in the summer when boat access is feasible (Gray 1978, Amec Foster Wheeler Environment & Infrastructure 2016).

In the 1970s, it was estimated that aboriginal harvest represented about 3.4% of the population annually (Gray 1978). Ontario harvest levels from aboriginal hunting were estimated at 400–500 Caribou/year in the 1980s, > 700/year during the late 1980s–1990s, and appeared to be continuing to increase at least up until 2011 (Abraham *et al*. 2011, COSEWIC 2017). Of 10 Caribou collared in the Victor Mine area west of Attawapiskat in February 2013, one was shot by an aboriginal hunter in May 2013 and another in 2014; this represented 50% of the mortality registered for these collared

Caribou through 2016 (Amec Foster Wheeler Environment & Infrastructure 2016). Of the 41 collars that were deployed throughout the monitoring program to date, three were confirmed mortalities from hunting (M. Hazell pers. comm.).

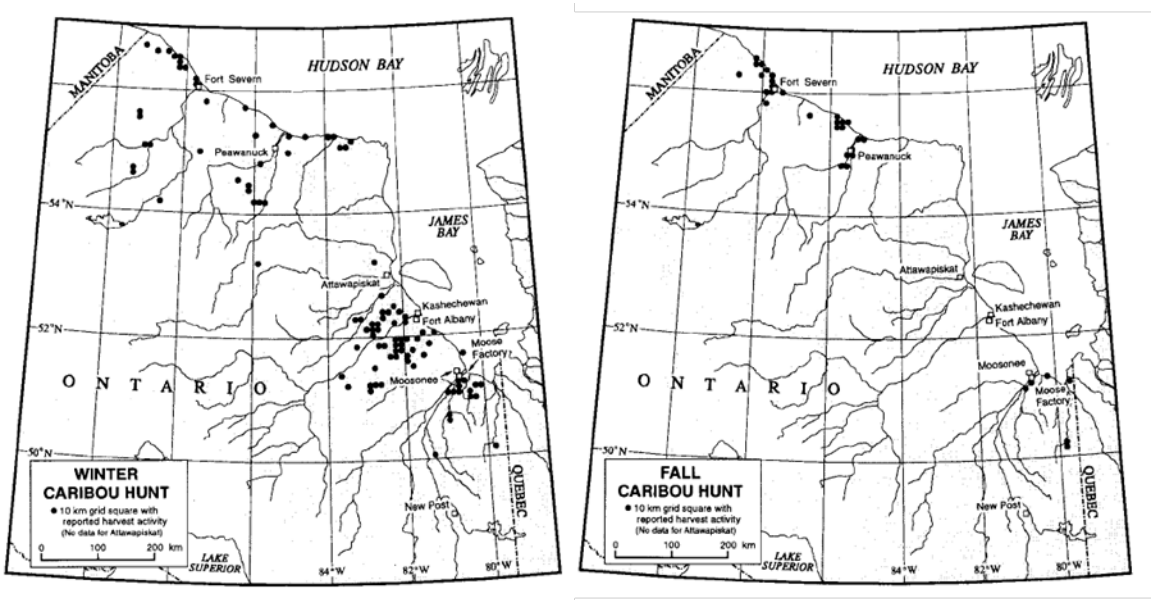

Figure 7. Identified winter and fall First Nations harvesting areas for Caribou in the Hudson and James Bay Lowlands in 1990. From Berkes *et al.* (1995).

Climate change appears to be a threat enacted through potential impacts on tundra vegetation, impacting habitat quality and lichen forage availability as shrub coverage increases (COSEWIC 2017).The peatland habitat of the Hudson/James Bay Lowlands is expected to be severely impacted by climate change (Federal, Provincial and Territorial Governments of Canada 2010). Climate change may also affect fire cycles, including a significant increase in fire severity in parts of central and western Ontario (COSEWIC 2017). However the risk of wildfire may decrease south of Hudson Bay, due to projected significant increases in precipitation (Federal, Provincial and Territorial Governments of Canada 2010). Increases in fire severity or frequency can have significant impacts on lichen-bearing tundra (COSEWIC 2017). Caribou may also be impacted by climate change directly, through effects on thermoregulation (COSEWIC 2017). Increasing temperatures may also influence diseases potentially transmitted by arthropods, but there is inadequate life history information on potential pathogens (Kutz *et al.* 2009).

A parasite, *Besnoitia tarandi*, became evident in the eastern subpopulations of the Eastern Migratory DU in the mid-2000s and may impact Caribou productivity (COSEWIC 2017). This protozoan parasite can induce inflammation mainly in the sclera and subcutaneous tissues, but also in other organs such as lungs and testes, although the significance of these effects is unknown (Ducrocq *et al.* 2011). *B. tarandi* has recently surfaced as a potential disease-causing agent in Caribou from northern Québec, and has been associated with an unusually high number of observations of sick Caribou with poor coats and ulcerated limbs (Kutz *et al.* 2009). There could

potentially be relationships between the intensity of infection and impacts on fertility and tolerance to exercise (Ducrocq *et al.* 2011).

2.6. Specialized life history or habitat use characteristics

Caribou occur in a very sensitive balance with predator populations and do not appear capable of sustaining their population in areas with high predator densities; they are less resilient in the face of predation pressure than other cervid species due to their lower reproductive rate. “The major survival strategy [for caribou] at a broad scale is predator avoidance through habitat selection” (Berglund *et al.* 2014). They typically exist at low densities on the landscape, spacing themselves out across the landscape to maintain low densities, thereby reducing predation pressure and not supporting higher predator numbers. They typically do not breed until their third year (2.5 years old), unlike deer (0.5-1.5 years) or moose (1.5 years), and typically have only one calf per year, while moose and deer may have twins or even triplets (especially for deer). Caribou are thus not able to recover from high predation pressure as rapidly or effectively as other cervid species. Eastern Migratory Caribou have responded to predation pressure by making large movements across the landscape to seasonal habitats, and by calving in large aggregations in areas with low predator densities.

Woody browse is not a dietary staple for Caribou, which rely heavily upon many species of both arboreal and terrestrial lichen during the fall and winter (Darby and Duquette 1986). While some have argued that lichen is not essential to Caribou (see Darby and Duquette 1986), lichens are considered “important in the overwintering ecology of Caribou that face the energetic costs of predator avoidance and migration” (Joly *et al.* 2010). A broad review of the use of lichen by wildlife has similarly concluded that “there is no other forage that can provide the basis for the continued survival of Caribou” (Sharnoff and Rosentreter 1998).

Both forest-tundra (i.e. Eastern Migratory) and forest-dwelling (i.e. Boreal population) Caribou show strong fidelity to calving and post-calving habitat (Amec Foster Wheeler Environment & Infrastructure 2016). Interestingly Migratory Caribou show significantly greater site fidelity to overwintering habitat than do Boreal Caribou (Amec Foster Wheeler Environment & Infrastructure 2016).

In Ontario, spring and summer estimates of the number of calves per 100 cows suggest that reasonable numbers of calves are being born, while correspondingly low estimates of recruitment suggest that calf mortality within the first year of life may be limiting population growth (Berglund *et al.* 2014). The Ontario Southern Hudson Bay subpopulation (Northern Hudson Bay Lowlands ecozone) had the highest recruitment estimates of any ecoregion in Ontario, with 21.5 calves per 100 cows (Berglund *et al.* 2014).

3. Ontario status assessment

3.1. Application of endangered/threatened status in Ontario

3.1.1. Criterion A – Decline in total number of mature individuals

Insufficient Information. The Eastern Migratory DU as a whole has clearly declined substantially. The minimum population size for the DU has declined by 80% over three generations (COSEWIC 2014). However trends are most pronounced, and trend data most available, for the George River (99% over three generations) and Leaf River (68% over two generations) subpopulations outside Ontario, which make up the majority of the DU population.

In 2010, the Southern Hudson Bay subpopulation was identified as decreasing (Figure 8, Federal, Provincial and Territorial Governments of Canada 2010) or possibly declining (Abraham *et al.* 2011). However, indications of decline specific to Ontario are unclear because of the lack of trend data. The Pen Island herd, that portion of the Southern Hudson Bay subpopulation shared by both Manitoba and Ontario, may be in decline, although this interpretation is compounded by an apparent shift in range use (Gunn *et al.* 2011, Abraham *et al.* 2012). There is no evidence to suggest that the population trend for the Southern Hudson Bay Subpopulation is as severe as that for subpopulations to the east in Québec. Similar trend data for Ontario are difficult to obtain, due to insufficient recent monitoring and variable monitoring measures. Monitoring of this population began in 1979 (Newton *et al.* 2015), and there has apparently been no monitoring since 2011.

The most recent population survey in Ontario in 2011 indicated a minimum population size of both coastal and inland forest-tundra Caribou of 16,638 (Berglund *et al.* 2014). COSEWIC (2017) suggested that 12,479 of those would represent the number of mature animals in the Southern Hudson Bay subpopulation, based upon an estimated 75% of the population being comprised of mature animals. However, COSEWIC (2017) indicated that this would represent both the Ontario and Manitoba contributions to the DU, which is in error; this estimate is specific to Ontario (see Berglund *et al.* 2014). The Southern Hudson Bay subpopulation in Ontario (forest-tundra ecotype) was estimated at 15,834 in 1996, based upon knowledge surveys of OMNR staff (Cumming 1998).

Threats have not ceased in the Ontario portion of the subpopulation.

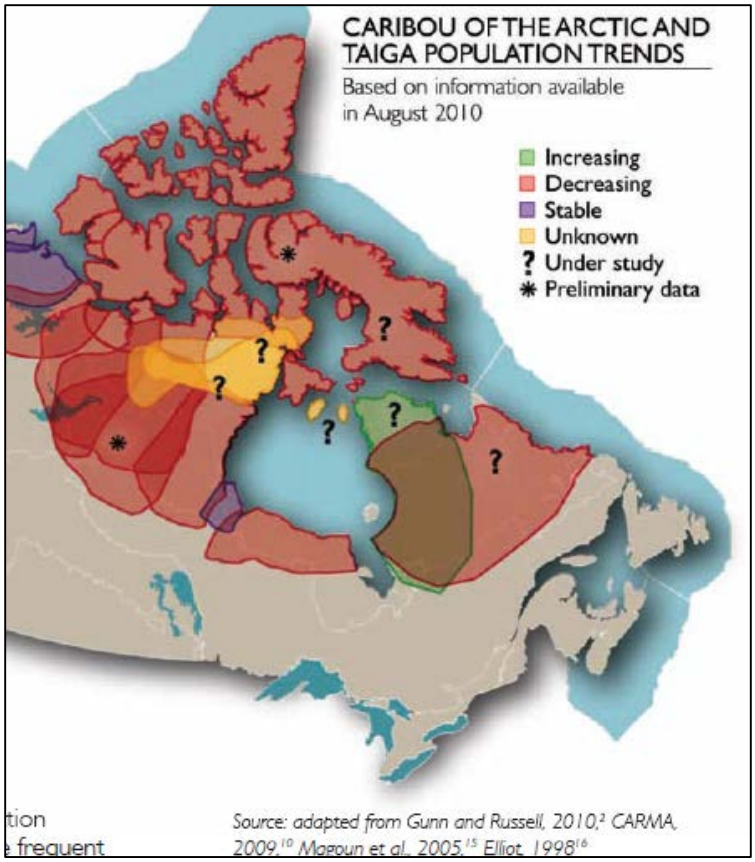

Figure 8. Population trends amongst Caribou of the Arctic and taiga, From Federal, Provincial and Territorial Governments of Canada (2010).

The distribution of the Southern Hudson Bay subpopulation has clearly shifted eastward as well as inland over the past three decades (Abraham *et al.* 2012) (Figure 9). Generally combining totals for these three areas (west of Fort Severn, Peawanuck to Fort Severn, east of Peawanuck) suggest that aggregate numbers increased from the 1980s to the 1990s, and then declined to the 2000s. Caribou in the Pen Island area herd increased from a minimum of 2,300 animals in 1979 to a high of 10,798 animals in 1994 (Abraham *et al.* 20111). The minimum number of animals estimated in 2008-09 is less than one-third of the estimated peak numbers at the Pen Islands in 1994 (Abraham *et al.* 2012). While this may indicate a substantial population decline, it may also reflect and be influenced by a number of sampling factors and changes in animal distribution (Abraham *et al.* 2012).

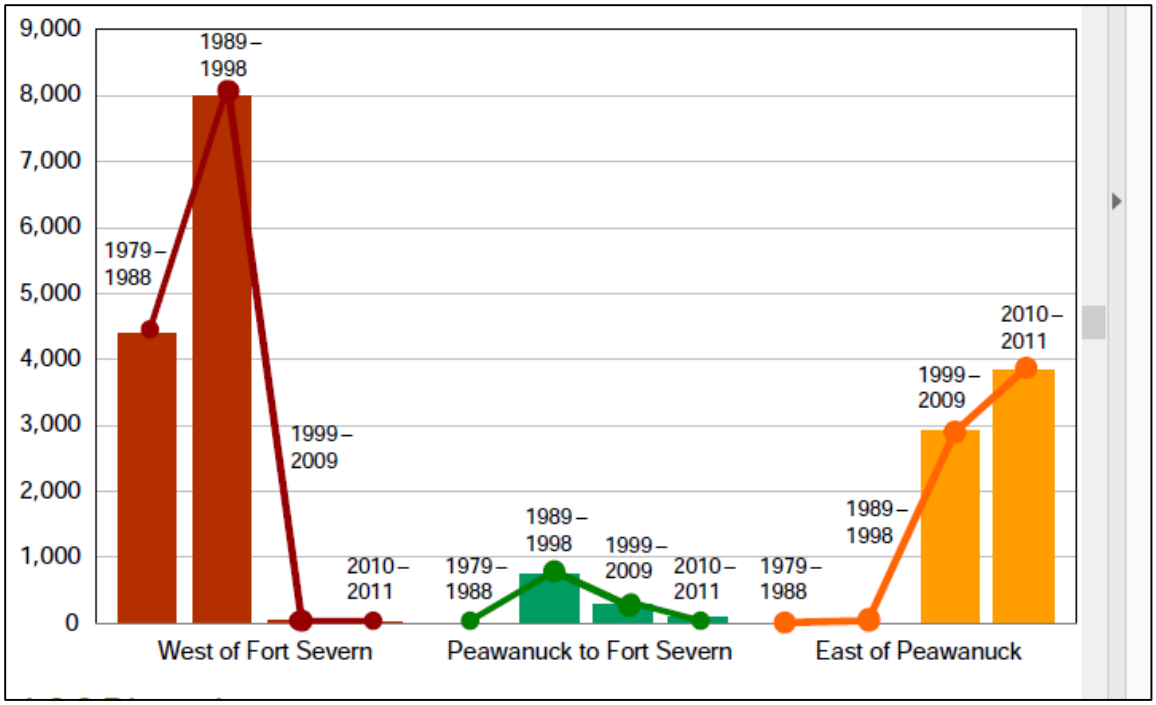

Figure 9. Average number of Caribou observed on southern Hudson Bay coast during summer surveys, by decade. From Abraham *et al. (*2012).

Based upon calf recruitment and adult female survival, a three-year study of Caribou in Ontario's Far North (both Boreal and Eastern Migratory subpopulations) provided evidence for a declining population trend in all ecoregions (Berglund *et al.* 2014).

COSEWIC (2017) designated the Eastern Migratory Caribou population as Endangered based upon criteria A2acd+4acd. The rationale was as follows: "This migratory caribou population exists as four subpopulations from coastal western Hudson Bay to Labrador. The present population estimate of 170,636 mature animals indicates there has been an 80% overall decline in number over three generations (18-21 years). The decline is predicted to continue because of overharvest, and a decrease in habitat quality associated with climate change and development. Two declining subpopulations contain about 99% of the Eastern Migratory population; the George River has declined by 99% over 3 generations, and the Leaf River by 68% over two generations. Although migratory caribou populations fluctuate in abundance, there is concern that recent and predicted threats will limit population growth in a population that presently is at its lowest recorded level. Threats appear to be less prevalent in the two western subpopulations which represent only about 4% of the existing total population. Most of the remaining caribou reside in the Leaf River subpopulation, which continues to decline" (Government of Canada 2017).

3.1.2. Criterion B – Small distribution range and decline or fluctuation

Does not apply. Distribution range is extensive.

3.1.3. Criterion C – Small and declining number of mature individuals

Does not apply. Population size is over threshold, and no clear indication of trend.

3.1.4. Criterion D – Very small or restricted total population

Does not apply.

3.1.5. Criterion E – Quantitative analysis

Does not apply.

3.2. Application of Special Concern in Ontario

Special Concern. Eastern Migratory Caribou do not clearly meet any thresholds for Endangered or Threatened in Ontario. The designation of the DU as Endangered by COSEWIC (2017) was heavily influenced by the precipitous declines of the formerly very large Caribou herds in Québec. Those declines are not as evident in Ontario, although there appears to have been some decline since the 1990s, and recent monitoring has not been carried out to confirm whether or not the decline is real and/or significant. Gunn *et al*. (2011) noted that the Pen Island herd, that portion of the Southern Hudson Bay subpopulation shared by both Manitoba and Ontario, may be in decline. The Southern Hudson Bay subpopulation is subject to all of the same threats identified for the Eastern Migratory Caribou DU by COSEWIC (2017). The Threats Calculator indicated that the threat level to the Eastern Migratory DU was Very High to High (COSEWIC 2017). Although much of the Hudson Bay Lowlands can be considered relatively remote, undeveloped and undisturbed, human disturbance has been increasing, particularly with the growing use of ATVSs, and further industrial development is anticipated. The extent of hunting by Indigenous peoples is unknown but substantial (i.e., at least 4.2% of the known population in 2011), and apparently growing. In the absence of more recent monitoring data, the Southern Hudson Bay subpopulation is considered at risk of becoming Threatened if the identified risks are not reversed or managed with demonstrable effectiveness.

3.3. Status category modifiers

3.3.1. Ontario’s conservation responsibility

Does not apply. Ontario represents an estimated 14.1% of the extent of occurrence for the Eastern Migratory DU.

3.3.2. Rescue effect

Feasible. Rescue effect is feasible from Manitoba, as animals move freely across the Ontario-Manitoba border (Berglund *et al.* 2014). Rescue from Québec is less likely as the Southern Hudson Bay subpopulation is disjunct from those in Québec (Figure 2).

3.4. Other status categories

3.4.1. Data deficient

Does not apply. Information on recent population trends not available, but considerable information is available on this population.

3.4.2. Extinct or extirpated

Does not apply.

3.4.3. Not at risk

Does not apply.

4. Summary of Ontario status

Eastern Migratory Caribou (*Rangifer tarandus*) is classified as Special Concern in Ontario. It does not meet any criteria for Threatened or Endangered. However, the DU as a whole is designated as Endangered in Canada and clearly under threat, and the Southern Hudson Bay subpopulation shares a number of the same threats as other DU subpopulations. There is an indication of decline, although the degree of decline cannot be quantified or even confirmed due to the lack of recent monitoring data. There is no indication that the decline has been as precipitous as that for subpopulations further east. The COSEWIC designation of Endangered was heavily influenced by the precarious state of the much larger George River and Leaf River subpopulations in Québec and Labrador.

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Appendix 1: Technical summary for Ontario

Species: Migratory Caribou Subpopulation (*Rangifer tarandus*)

Demographic information

Demographic attribute	Value
Generation time. Based on average age of breeding adult: age at first breeding = X year; average life span = Y years.	6-7 years
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	Possible but uncertain, based on no recent survey data.
Estimated percent of continuing decline in total number of mature individuals within 5 years or 2 generations.	Unknown
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over the last 10 years or 3 generations.	Unknown
Projected or suspected percent reduction or increase in total number of mature individuals over the next 10 years or 3 generations.	Unknown
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over any 10 years, or 3 generations, over a time period including both the past and the future.	Unknown
Are the causes of the decline (a) clearly reversible, and (b) understood, and (c) ceased?	a. In part b. In part c. No
Are there extreme fluctuations in number of mature individuals?	No, although there have been range-level changes in seasonal distribution

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Estimated extent of occurrence (EOO).	COSEWIC (2017) reported that the Area of Occupancy for the Southern Hudson Bay subpopulation was 310,000 km^2 (including both ON and MB). Based upon Figure 2 (from COSEWIC 2017), the

Extent and occupancy attributes	Value
	Ontario portion of the subpopulation is estimated at 211,249 km^2 (D. Lowman, pers. comm.)
Index of area of occupancy (IAO).	Unknown (COSEWIC 2017)
Is the total population severely fragmented? i.e., is >50% of its total area of occupancy is 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. No b. No
Number of locations.	Many according to COSEWIC (2017). Recently (2009-2011), Newton *et al*. (2015) recognized three distinct but overlapping subareas of collared Caribou within Ontario based upon both winter and summer minimum convex polygons (Figure 5). However these areas are considered to be too broad to be locations based upon the threats of human disturbance, harvest, and industrial development.
Number of NHIC Element Occurrences	NHIC has not yet created any EOs for this subpopulation of Caribou
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	No. The range of the Southern Hudson Bay subpopulation increased in the 1990s by approximately 30% (COSEWIC 2017).
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	Unknown
Is there an observed, inferred, or projected continuing decline in number of populations?	Unknown
Is there an observed, inferred, or projected continuing decline in number of locations?	No, although there have been some shifts in the core of summer locations

Extent and occupancy attributes	Value
Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat?	Unknown
Are there extreme fluctuations in number of populations?	No
Are there extreme fluctuations in number of locations?	No, although there have been some shifts in the core of summer locations
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 sub-population or total population (if known)

Sub-population (or total population)	Number of mature individuals
Southern Hudson Bay subpopulation – Ontario portion	12,479. The number of mature individuals in each subpopulation was estimated by COSEWIC (2017) as 75% of the total population estimate. COSEWIC (2017) indicated that 12,479 was the estimate for the entire Southern Hudson Bay subpopulation. However, the number was apparently based upon the minimum number of mature animals observed in Ontario surveys only. This number equates to 75% of the estimated Ontario population.

Quantitative analysis (population viability analysis conducted)

Probability of extinction in the wild is unknown.

Threats

A threats calculator was prepared for this species. The overall threat levels for the Eastern Migratory DU was indicated as “Very High to High”, based upon “concerns over proposed mining development and roads in the eastern subpopulation range, overharvest by people, increased fire events, and an expected decrease in tundra habitat quality associated with climate change. The main limiting factor is summer forage availability” (COSEWIC 2017).

Rescue effect

Rescue effect attribute	Value
Status of outside population(s) most likely to provide immigrants to Ontario	Québec subpopulations have declined dramatically, are isolated

Rescue effect attribute	Value
	from Ontario subpopulation and are unlikely to provide rescue. The Manitoba portion of the Southern Hudson Bay subpopulation, which is shared with Ontario, is faced with the same threats as Ontario and likely has a similar status.
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Possibly
Would immigrants be adapted to survive in Ontario?	Yes
Is there sufficient suitable habitat for immigrants in Ontario?	Unknown but unlikely. Range is apparently fully occupied
Are conditions deteriorating in Ontario?	Unknown, but threats appear to be increasing
Is the species of conservation concern in bordering jurisdictions?	Yes. DU considered Endangered (COSEWC 2017). In severe decline in Québec.
Is the Ontario population considered to be a sink?	No
Is rescue from outside populations likely?	Rescue is potentially feasible from Manitoba. As animals move between Ontario and Manitoba annually and comprise part of the same subpopulation rescue is feasible, although if Ontario Caribou were to decline parallel trends would be expected in Manitoba. Rescue from Québec is not feasible due to disjunct distribution and declining status in Québec.

Sensitive species

Not data sensitive.

Appendix 2: Adjoining jurisdiction status rank and decline

Information regarding rank and decline for Eastern Migratory Caribou (*Rangifer tarandus*)

Jurisdiction	Subnational rank	Population trend	Sources
Ontario	Species level – S4 Eastern Migratory Caribou – S4	Unknown	NatureServe 2017 M. Burrell pers. comm.
Quebec	Species level – S5 Eastern Migratory Caribou – not ranked	Severe decline	COSEWIC 2017 NatureServe 2017
Manitoba	Species level – S4 Eastern Migratory Caribou – not ranked	Unknown	NatureServe 2017
Michigan	Not present	Not applicable	Not applicable
Minnesota	Not present	Not applicable	Not applicable
Nunavut	Not present	Not applicable	Not applicable
New York	Not present	Not applicable	Not applicable
Ohio	Not present	Not applicable	Not applicable
Pennsylvania	Not present	Not applicable	Not applicable
Wisconsin	Not present	Not applicable	Not applicable

Acronyms

COSEWIC: Committee on the Status of Endangered Wildlife in Canada
COSSARO: Committee on the Status of Species at Risk in Ontario
ESA: Endangered Species Act
EO: Element occurrence (as defined by NHIC)
EOO: extent of occurrence
GRANK: global conservation status assessments
IAO: index of area of occupancy
MNRF: Ministry of Natural Resources and Forestry
NHIC: Natural Heritage Information Centre
NNR: Unranked
NRANK: National conservation status assessment
SARA: Species at Risk Act
SNR: unranked
SRANK: subnational conservation status assessment
S1: Critically imperiled
S3: Vulnerable
S5: Secure
IUCN: International Union for Conservation of Nature and Natural Resources
CDSEPO: Le Comité de détermination du statut des espèces en péril en Ontario