

Recovery Strategy for the Wolverine (*Gulo gulo*), Eastern population, in Canada

Wolverine, Eastern population



2014



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¹ <http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1>

PREFACE

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#) agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies for listed Extirpated, Endangered, and Threatened species and are required to report on progress five years after the publication of the final document on the SAR Public Registry.

The Minister of the Environment is the competent minister under SARA for the Wolverine, Eastern population and has prepared this strategy, as per section 37 of SARA. To the extent possible, it has been prepared in cooperation with First Nations, Aboriginal communities and the governments of Quebec and Newfoundland and Labrador.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment Canada, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Wolverine, Eastern population and Canadian society as a whole.

This recovery strategy will be followed by one or more action plans that will provide information on recovery measures to be taken by Environment Canada and other jurisdictions and/or organizations involved in the conservation of the species. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

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EXECUTIVE SUMMARY

The Wolverine (*Gulo gulo*) is a mammal of the mustelid family found primarily in Scandinavia and northern North America. There are two distinct Wolverine populations in Canada, the Western and the Eastern. The latter, found in Quebec and Labrador, was designated Endangered by COSEWIC in 2003 and listed according to the same status in Schedule 1 of the *Species at Risk Act* (SARA) in 2005. The last authenticated capture of an individual occurred in 1978 although unconfirmed sightings and tracks are regularly reported.

Uncertainty concerning the persistence of the Wolverine, Eastern population or, at best, extremely low population numbers combined with the negative perception of the species among some First Nations pose a significant challenge for its recovery. Accordingly, any one of the following threats can have profound effects on the survival of the species: land development, availability of prey (variation in prey populations), incidental take, opportunistic harvesting, climate change, the fur trade, availability of prey (wolf population control), and road/rail kill.

There are unknowns regarding the feasibility of recovery of the Wolverine, Eastern population. In keeping with the precautionary principle, a recovery strategy has been prepared as per section 41(1) of SARA as would be done when recovery is determined to be feasible.

The short-term population and distribution objectives consist of determining if individuals of the Wolverine, Eastern population, still persist in Quebec and Labrador and to establish to what degree, if any, a rescue effect from dispersing individuals of the Western population in Ontario may assist in the recovery of the species. The long-term objectives should aim at having naturally-established, self-sustaining² populations of this species while keeping interactions with trapping activities for other species to a minimum. To reach these objectives a sustained dialogue with First Nations, Aboriginal organizations and other northern communities is essential to work towards finding a path forward that is scientifically sound and socially acceptable to all parties. General strategies to address threats to the species' survival and recovery are presented in the section on Strategic Direction for Recovery.

The critical habitat of the Wolverine, Eastern population, is not identified in the current version of the recovery strategy pending further surveys to determine if the species still persists in Quebec and Labrador and studies on habitat requirements of the eastern population. A schedule of studies is proposed to that effect.

One or more action plans for the Wolverine, Eastern population, will be posted on the Species at Risk Public Registry before the end of 2019.

² Self-sustaining : a population that has a high ($\geq 90\%$) probability of persistence and is capable of sustaining itself while under the influence of stressors and in the absence of mitigative intervention.

RECOVERY FEASIBILITY SUMMARY

Based on the following four criteria outlined by the Government of Canada (2009), there are unknowns regarding the feasibility of recovery of the Wolverine, Eastern population. Therefore, in keeping with the precautionary principle, a recovery strategy has been prepared as per section 41(1) of SARA, as would be done when recovery is determined to be feasible. This recovery strategy addresses the unknowns surrounding the feasibility of recovery.

1. Individuals of the wildlife species that are capable of reproduction are available now or in the foreseeable future to sustain the population or improve its abundance.

Unknown. Although the persistence of individuals of the Eastern population is uncertain in Quebec and Labrador, a rescue effect³ from dispersing individuals of the Western population in northwestern Ontario could possibly contribute to the natural re-establishment of the species. If the recovery of the Eastern population is dependent on this expansion, it may take many decades before self-sustaining populations can be established in Quebec and Labrador.

2. Sufficient suitable habitat is available to support the species or could be made available through habitat management or restoration.

Yes. Extensive, largely undisturbed natural spaces still exist in northern Quebec and Labrador and would likely be sufficient for the remaining breeding individuals (if any). The availability of adequate food resources (e.g., caribou populations) is likely sufficient in northern Quebec and Labrador but their spatial distribution may pose problems at critical periods of the Wolverine's life cycle. It should be noted that if recovery of the Eastern population depends on a rescue effect from the Western population, the availability of suitable dispersal habitat between the two populations may pose a challenge. The terrestrial landscapes in that area are fragmented by an increasing number of roads, energy corridors, villages and other land uses (forestry, hydroelectricity, mining, trapping, etc.).

3. The primary threats to the species or its habitat (including threats outside Canada) can be avoided or mitigated.

Unknown. It is possible to attenuate many of the threats, especially those related to harvesting, through a dialogue with First Nations and other northern communities including targeted stewardship efforts. It is important to acknowledge that these efforts will be effective only if maintained over the long-term. The vastness of the territory for intervention as well as the cumulative impact of historical and ongoing threats, including climate change, in relation to the extremely low densities of the species will pose a significant challenge for recovery.

³ A rescue effect is a reduced risk of local extinction through the migration of individuals that have the potential to increase the reproductive success of a wildlife species.

4. Recovery techniques exist to achieve the population and distribution objectives or can be expected to be developed within a reasonable timeframe.

Yes. Although specific habitat requirements of individuals of the Wolverine, Eastern population need to be clarified, sufficient information from studies on individuals of the Western population can be used, in keeping with the precautionary approach, to guide habitat management. Discussions relating to the timing and implementation of various recovery measures that are scientifically sound and socially acceptable to all parties need to continue on a regular basis in the coming years.

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1. COSEWIC⁴ SPECIES ASSESSMENT INFORMATION

Date of Assessment: May 2003

Common Name (population): Wolverine, Eastern Population

Scientific Name: *Gulo gulo*

COSEWIC Status: Endangered

Reason for designation: There have been no verified reports of this species in Quebec or Labrador for about 25 years, but there are unconfirmed reports almost every year. Any remaining population would be extremely small and therefore at high risk of extinction from stochastic events such as incidental harvest. The apparent lack of recovery despite the recent high local abundance of caribou suggests that this population may be extirpated.

Canadian Occurrence: Quebec, Newfoundland-Labrador

COSEWIC Status History: Canadian range considered as one population in April 1982 and designated Special Concern. Split into two populations in April 1989 (Western population and Eastern population). Eastern population was designated Endangered in April 1989 and confirmed in May 2003.

2. SPECIES STATUS INFORMATION

The global population of the Wolverine is not known, but the proportion of individuals living in Canada has been estimated at 35% or more (COSEWIC 2003; Abramov et al. 2009), the eastern population is unlikely to contribute significantly to the total Canadian population. The Wolverine, Eastern Population, was added to Schedule 1 of the *Species at Risk Act* (S.C. 2002, c. 29) (SARA) in 2005. In Quebec, it was designated as Threatened under the *Act respecting threatened or vulnerable species* (R.S.Q., c. E-12.01) in 2000. In Newfoundland and Labrador, it was listed as Endangered under the *Endangered Species Act* (S.N.L. 2004, c. L-3.1, c. 36) in 2002.

NatureServe has yet to complete its evaluation of the conservation ranks for the Wolverine, Eastern population. Currently, the global conservation rank has not been attributed. At the national level (Canada), it is considered critically imperilled (N1). In Quebec and Labrador, it is also considered critically imperilled (S1). The General Status Rank (CESCC, 2010) for Quebec and Newfoundland and Labrador is "1: At risk"

⁴ COSEWIC: Committee on the Status of Endangered Wildlife in Canada.

3. SPECIES INFORMATION

3.1 Species Description

The Wolverine is the largest member of the weasel family (Carnivora: Mustelidae). It weighs between 8 and 18 kg and measures approximately one metre in length (tail excluded). It has a stocky body, strong, elongated legs, highly developed claws, a high, rounded back, a bushy tail and a large head with a short, wide muzzle and round, prominent ears. Its fur is long and coarse, ranging in colour from almost blond to very dark brown, often with a pale facial mask and yellowish or tan stripes running laterally from the shoulders, crossing just above the tail (COSEWIC 2003). Large feet enable Wolverines to move with relative ease in deep snow. A highly developed sense of smell allows them to detect carcasses over long distances and also beneath one to two metres of snow (Hornocker and Hash 1981). Except for its tail, the species bears a closer resemblance to a small Black Bear (*Ursus americanus*) than to other mustelids, which generally have a tubular body shape.

3.2 Population and Distribution

The Wolverine has a holarctic distribution. Two subspecies are currently recognized: the Eurasian Wolverine (*Gulo gulo gulo*), found from Scandinavia to Asia, and the North American Wolverine (*Gulo gulo luscus*), found in northern Canada and the northwestern United States, with the 37th parallel considered to be the southern limit of its distribution (Moisan 1996). The Wolverine's North American range has diminished considerably over time (Figure 1). In Canada, two distinct Wolverine populations are recognized mainly on a geographic basis (Dawson 2000; COSEWIC 2003). The largest of these is the Western population, designated Special Concern in Canada by COSEWIC but not listed under Schedule 1 of SARA. It occupies the three territories (Northwest Territories, Nunavut, Yukon), and all the provinces from British Columbia to Ontario (COSEWIC 2003). The Eastern population, which is the focus of the present strategy, is found in Quebec and Labrador. Historically, the ranges of the two populations were contiguous (Fortin et al. 2005).

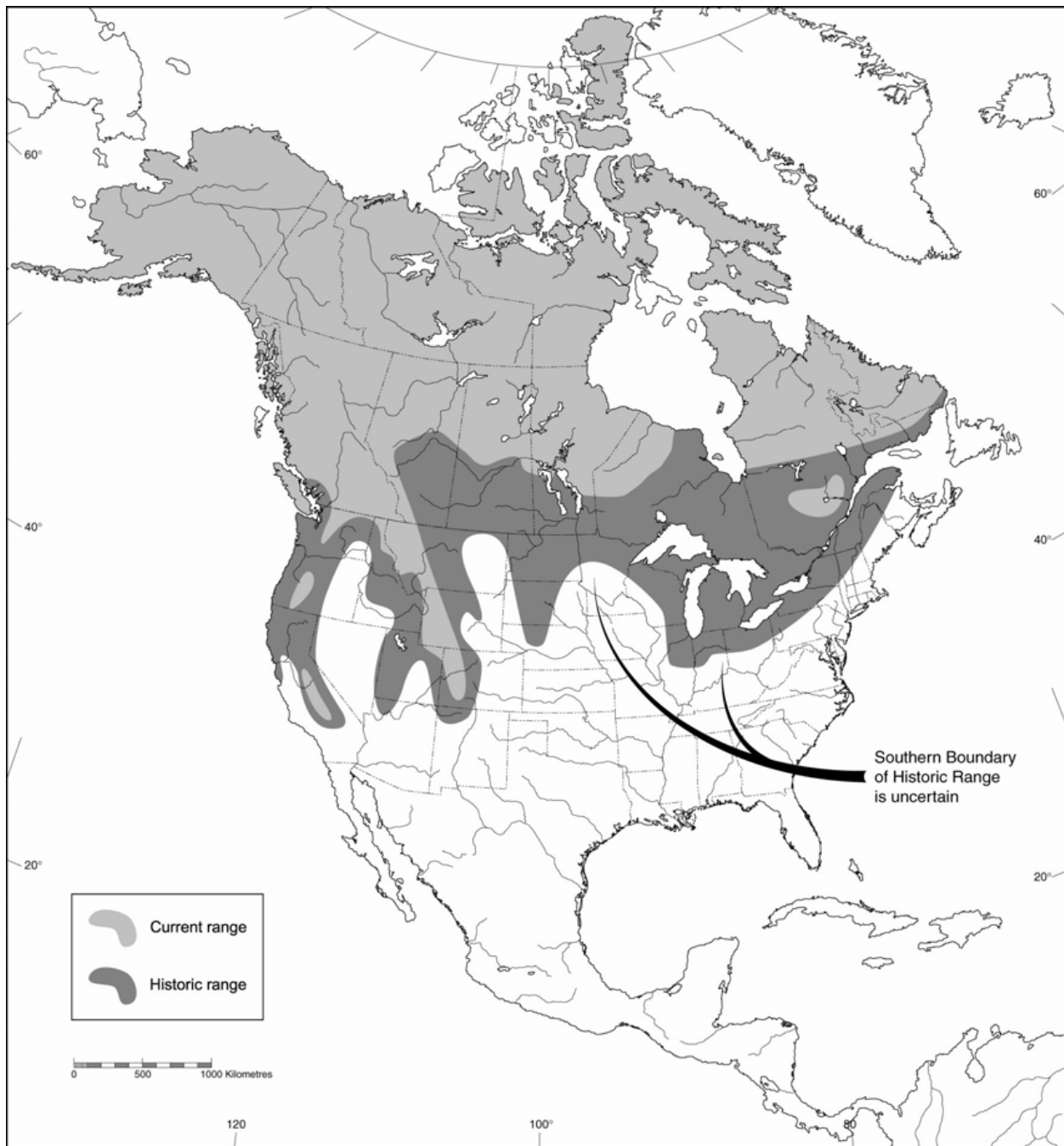


Figure 1. Potential current and historic distribution of the Wolverine in North America (from COSEWIC 2003). The Eastern population occupies Quebec and Labrador; the Western population occupies the other provinces and territories.

Historical Confirmed Records

Although there are no population numbers available, the Wolverine has never been very abundant in Quebec or in Labrador, but was traded regularly through its eastern range into the mid-1900s (Schmelzer 2012). In Quebec, the trapping records show a maximum of 24 pelts in 1922 (Canac-Marquis and Dubois 2000) At Fort Chimo (considered the most important Hudson's Bay Company post in the Labrador-Ungava region), the average number of pelts traded between 1868-1929 was 22 (Schmelzer 2012). The maximum number was 77, which were traded in 1885 (Schmelzer 2012). It is clear that wolverine abundance was not as low as sometimes reported given that the ratio of wolf to wolverine pelts in trade was only around 2:1 (Schmelzer 2012). According to these records, the population began to decline in the late 1800s (Isabelle Schmelzer 2012) possibly as a result of the increasing scarcity of migratory Woodland Caribou (*Rangifer tarandus caribou*) and the intensification of Grey Wolf (*Canis lupus*) and Wolverine hunting (Banfield 1974; van Zyll de Jong 1975; MLCP 1992). Two Wolverines captured in Labrador in 1965 and a single individual captured in 1978 near Schefferville (Quebec) constitute the last official captures of this population (Dagenais 1988). In Quebec, no captures have been reported for the past 40 years in the three Aboriginal communities that use the historical ranges of the Wolverine. The Cree have stated with certainty that no captures or kills have taken place since at least 1972 and that if a Wolverine were to be harvested by a hunter or fur trader, the news would spread quickly throughout the territory, given the species' scarcity (Rick Cuciurean, Cree Trappers' Association, personal communication, 2007). Similarly, the Naskapi of Quebec, who occupy the territory near Schefferville, have not harvested any Wolverines for 40 or 50 years (John Mameamskum, Naskapi Nation of Kawawachikamach, personal communication, 2007). The Essipit Innus have not observed the species in recent years (Jessie Moreau, personal communication 2012). Currently compiled information from Labrador aboriginal communities indicate a similar situation.

In February 2004, an individual was accidentally captured in Saint-Côme, 100 km northeast of Montreal. However, the presence of an implanted microchip confirmed that it had escaped captivity (Michel Huot, personal communication, 2007).

Recent Sightings and Track Networks

Despite the lack of captures, some recent unconfirmed sightings and track networks have been reported in Quebec. A systematic survey carried out in 2006 over 100,000 km² in the natural province of the Abitibi and James Bay Lowlands of Quebec identified two potential networks of Wolverine tracks a few hundred kilometres from La Sarre and Matagami (Fortin 2006). An opportunistic inventory performed by two experts who flew over parts of Quebec at low altitude did not uncover any trace of the Wolverine's presence (Audrey J. Magoun, personal communication, 2007).

In Labrador, reports of Wolverines (including fur collection), some as recent as 2013, have also been compiled (Isabelle Schmelzer, personal communication). None of these have been confirmed as Wolverine through photos or genetics. In 2005, an extensive, systematic aerial survey over a distance of more than 6,630 km was performed in Labrador (Schmelzer 2006). Although this type of survey may have low probabilities of detection (see Magoun et al. 2004), smaller species such as the American Marten (*Martes americana*) were observed. No Wolverine tracks and no individuals were sighted during this survey.

According to habitat models developed for the Eastern population (Gallais and Messier 2012), the areas that are the most likely to host Wolverine populations are the northern regions of Quebec and Labrador (e.g., Torngat mountain, Groulx mountain, Otish mountain). These areas are frequented by large caribou herds (George River and Rivière-aux-Feuilles) that range over several hundred thousand square kilometres (Couturier et al. 2004). Farther south in Quebec, a few largely undisturbed coniferous forests with high Moose (*Alces alces*) and White-tailed Deer (*Odocoileus virginianus*) densities and Wolf populations may also meet the needs of the Wolverine (e.g., wildlife reserves and national parks; Larivière et al. 2000). Despite this potential, the few aerial surveys that have been performed have not generated direct Wolverine sightings (Monts-Torngat-et-Rivière-Koroc National Park project; Fortin 2004). In fact, the closest confirmed sightings are distant by thousands of kilometers from these regions (Gallais and Messier 2012).

Residual Populations in Quebec and Labrador and Possibilities of a Rescue Effect

Considerable uncertainty remains as to the persistence of the Eastern population. The vastness of the northern territory combined with the difficulty of detecting the presence of the species because of its highly secretive habits and naturally-low densities (Kelsall 1981; Prescott and Richard 1982; Dauphiné 1989; Poole 1991) favours caution relating to any definitive position on the species' continued presence. If the species has disappeared, individuals of the Western population in Ontario (which appears to be extending eastward according to the Far North Aerial Wildlife Surveys in Ontario 2009-2011) (Dauphiné 1989; Dawson 2000; Magoun et al. 2004; Ontario Wolverine Recovery Team 2011) could be expected to occasionally disperse into Quebec, thereby generating a rescue effect. This possibility should be considered in light of the following limiting factors:

- The Wolverine population in Ontario is roughly estimated at 300 individuals (Slough 2007), mostly found in the northwest near the Manitoba/Ontario border;
- The Ontario population (including in its core) may itself be dependent on individuals dispersing from Manitoba (Ontario Wolverine Recovery Team 2011);
- Trapping pressure from both directed and incidental harvest in the depleted eastern recovery region in Ontario is suspected of being too high to allow a population to be maintained in this area (2.6 Wolverines/year caught in Gray Wolf, Canada Lynx, American Marten and River Otter traps) (Ontario Wolverine Recovery Team 2011);

- Experts believe that individuals observed outside of the core and peripheral range of the Western population in Ontario as well as unconfirmed records in the Abitibi region of Quebec are likely dispersing individuals rather than established breeding individuals (Louis Imbeau, personal communication);
- Aboriginal hunters have indicated that individuals (likely from the Western population) are relatively common on Charlton Island (Nunavut), which is located in James Bay near Waskaganish, Quebec (Clayton Jolly, Cree hunter, Waskaganish, personal communication).
- Although mustelids are capable of dispersing over very long distances (Banci 1994; Fortin 2006), recent sightings in Quebec and Ontario are separated by thousands of kilometers of developed land (forestry, roads, mines, villages, etc.) that are generally avoided by the species (see Needs section).

3.3 Needs of the Wolverine, Eastern Population

Almost all of the existing knowledge on the biology of the Wolverine comes from studies of the Western population.

Prey Availability

The Wolverine is a solitary animal that feeds primarily by scavenging. Consequently, its survival depends on an abundant supply of food resources. In summer, it is essentially an opportunistic feeder, eating small rodents, nesting birds and their eggs, young deer and the carcasses of all kinds of animals (Rausch and Pearson 1972; Magoun 1985; Whitman et al. 1986; Banci 1987). In winter, the Wolverine remains active and feeds primarily on the frozen carcasses of animals (mostly cervids such as Caribou but also Moose; Banci 1994) killed and left by other carnivores (mostly Wolves), animals that died of natural causes, and animals killed by humans or used as bait. During the denning/rearing periods, the availability of small mammals may be particularly important to females as energy demands are high and movements are restricted (Landa et al. 1997). In Ontario (Western population), many records, including those provided by Native elders, point to the importance of the Canadian Beaver (*Castor canadensis*) as a food source for individuals (Ontario Wolverine Recovery Team 2011).

Roaming Habitat

Remote areas with low road density and reduced impact of human activities are selected and support the densest populations (Hash 1987; Dauphiné 1989; Ontario Wolverine Recovery Team 2011). At a finer level however, non-breeding Wolverines appear to have habitat requirements that are relatively independent of biophysical attributes, the presence of food resources being the primary determining factor (Hornocker and Hash 1981; Kelsall 1981; Hatler 1989).

The home range of the Wolverine is very large, with males roaming over much larger areas than females (Banci 1999). According to radio-telemetry studies, the area covered by males during a year varies: 238 km² in the Yukon (Banci 1987), 1,366 km² in

British Columbia (Lofroth 2001) and 2,563 to 3,513 km² in Ontario (Dawson et al. 2010; Ray et al. 2011). The home ranges of adult Wolverines can overlap partly with those of sub-adults or adults of the opposite sex (ex. an adult male may overlap with the home ranges of 2 to 6 females) (Magoun 1985; Banci 1987).

Breeding Habitat (dens)

While the Wolverine frequents a wide variety of landscapes, from the boreal forest to the arctic tundra, the presence of fine-scale habitat structures and sufficient prey base in the vicinity are determining factors during the breeding and rearing periods (Landa et al. 1997; Krebs and Lewis 2000; Lofroth 2001). Dens are located under boulders, fallen/blowdown trees or deadfall or in snowdrifts, often on steeper slopes or at higher elevations (Magoun and Copeland 1998). Magoun and Copeland (1998) described two types of dens – natal and maternal, used from mid-February to mid-March and mid-March to end of April, respectively. These sites, by virtue of their structural features, afford protection from predation and extreme weather. The persistence of spring snow that covers these dens appears to be essential for raising young (Lofroth 2001 and Copeland et al. 2010). There may be multiple dens per female Wolverine and dens may be reoccupied for a number of years (Ontario Wolverine Recovery Team 2011).

Limiting factors

Population densities of the Wolverine are naturally low due to its large home range, solitary habits and scavenger feeding pattern (MRNF 2001). According to Moisan (1996), population numbers in Quebec are extremely low and have likely reached a critical threshold where the likelihood of adult males and females encountering one another during the mating season is problematic. Furthermore, the rate of recruitment is likely hampered by mortality among sub-adults and a low reproductive success of females (Magoun 1985; Copeland 1996, Krebs et al. 2004). These factors limit the species' potential for demographic growth and its ability to recolonize vacant habitats (COSEWIC 2003).

4. THREATS

4.1 Threat Assessment

Table 1. Threat Assessment Table

Threat	Level of Concern ¹	Extent	Occurrence	Frequency	Severity ²	Causal Certainty ³
Habitat loss or degradation						
Land development	High	Widespread	Current	Continuous	High	High
Use of biological resources						
Opportunistic harvest	High	Widespread	Unknown	Recurrent	High	Medium
Capture for the fur trade	Low	Widespread	Historical	Continuous	Moderate	Medium
Accidental mortality						
Incidental take	High	Localized	Unknown	Unknown	High	High
Road/rail kill	Low	Localized	Unknown	Unknown	Low	Low
Natural processes or activities						
Availability of prey (variation in prey populations)	Medium	Widespread	Current/Cyclical	Seasonal	High	Medium
Climate and natural disasters						
Climate change	Medium	Widespread	Current	Recurrent	Unknown	Unknown
Changes in ecological dynamics or natural processes						
Availability of prey (Wolf population control)	Low	Localized	Unknown	Unknown	Low	Low

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

²Severity: reflects the population-level effect (High: very large population-level effect, Moderate, Low, Unknown).

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

4.2 Description of Threats

Threats are described in decreasing order of their level of concern. In the Western population where Wolverine abundance is higher, harvesting (sanctioned or not) is likely a major cause of mortality and is additive to natural mortality factors (Krebs et al. 2004; Saether et al. 2005). In the Eastern population, extremely low numbers of remaining individuals (if any) mean that additive sources of mortality, even the harvesting of a single individual, could have a potentially profound effect on the population's survival and recovery.

Land development

The Wolverine prefers an undisturbed landscape and requires vast areas to maintain a viable territory. Its historical distribution, which likely encompassed most of Quebec and Labrador, became fragmented and underwent a significant northward contraction between 1840 and 1925 (Fortin et al. 2005). It can be assumed that human encroachment on habitat (agricultural, forestry, urbanization) resulted in greater contact between humans and Wolverines, a species which is particularly vulnerable to disturbance during the birthing season (COSEWIC 2003; Fortin et al. 2005), while also intensifying hunting and trapping of the species.

Hydroelectric development, mining and large-scale logging in northern regions may hamper the recovery of the Wolverine, Eastern population, by causing the cervid population to decline and— to a lesser extent—by reducing the species' suitable habitat. Furthermore, the road network associated with land development leads to a fragmentation of the habitat and facilitates access to the territory which may increase the level of disturbance for the Wolverine, particularly if the use of motorized vehicles increases (Fortin et al. 2005). Magoun and Copeland (1998) reported that almost all breeding dens have been found many kilometers from the closest road.

Incidental take

The fact that Wolverines are scavengers that can travel over long distances to reach carcasses increases their vulnerability to trapping (Hornocker and Hash 1981). For example, Wolf population control through the use of poison baits can have a detrimental effect on Wolverines, especially juveniles (Fortin et al. 2005). Leg-hold traps and snares meant for Beavers, Wolves or Canada Lynx can also pose a threat to the Wolverine (Ontario Wolverine Recovery Team 2011). Although the impact of this threat may be limited (there are no recent reports for the Eastern population), the geographic area over which these activities take place could be sufficient to impede the dispersal of any individuals from the Western population.

Opportunistic harvest

The species' poor reputation, both in Quebec folklore and some Aboriginal beliefs, has caused it to be viewed as undesirable by some inhabitants and users of northern territories. Indeed, hunters and trappers have perceived the Wolverine as a competitor (Wilkinson & Associates Inc. 2009). There have been reports of Wolverines stealing bait or animals caught in traps, robbing food caches and ransacking campsites (Duchesnay 1972). As a result, many hunters would not hesitate to kill any Wolverine they might encounter on their hunting trips (K. Loon, Mistissini, Clayton Jolly, Waskaganish, R. Petagumskum, Whapmagoostui, personal communication, 2007). The harvesting of animals in this vast, isolated territory would remain difficult to monitor by law enforcement officials.

Climate change

Climate change, through its effects on snow cover depth in spring (important for natal and maternal dens) but also on the general behaviour and movements of individuals and their prey is often cited as a cause of decline, including by First Nations (Wilkinson & Associates Inc. 2009; Ontario Wolverine Recovery Team 2011). It is also presumed that climate change is partly responsible for Wolverines abandoning the southern portion of their former distribution (Ontario Wolverine Recovery Team 2011; Ray et al. 2011).

Availability of prey (variation in prey populations)

Starvation is one of the most important natural mortality factors, particularly for young and old Wolverines (Moisan 1996; Krebs et al. 2004). In the Eastern population, Caribou likely constitutes an important food resource. However, migratory Caribou herds show large fluctuations in their abundance and in their spatial distribution over the landscapes, which can limit access to their carcasses at critical times of the year (MRNF 2001), in particular for females with dependent young. Moose represent another food resource with fluctuating populations, but its availability could be very low in the areas likely to be occupied by the Wolverine (MRNF 2001). In Alaska, Dalerum et al. (2009) showed that for both prey species, it is the number of available carcasses rather than the abundance of populations themselves that is relevant to the Wolverine as a single carcass may be sufficient to provide sustenance for many weeks. Wolverines may also switch between these food sources according to their availability.

Capture for the fur trade

It is likely that Aboriginal people trapped the Wolverine before the arrival of Europeans, although the number of pelts harvested was likely low. After colonization, Europeans also began to trap the species (Fortin et al. 2005). Frost does not adhere to Wolverine fur, a property that made pelts appealing for use in making hooded coats. Hunting and trapping of Wolverines for their fur during the 19th century are thought to be potential causes of the initial decline of the species in Quebec and Labrador (Fortin et al. 2005,

Schmelzer 2006). Wolverine hunting and trapping has been illegal since 1950 in Newfoundland and Labrador and since 1981 in Quebec, except in the territory covered by the James Bay and Northern Quebec Agreement (JBNQA), where Agreement beneficiaries continue to hold the right to hunt and trap the species (Fortin et al. 2005). No captures have been reported since 1978 in Quebec and 1965 in Newfoundland and Labrador.

Availability of prey (Wolf population control)

The decline in Wolf populations has reduced the abundance of cervid carcasses available for Wolverines (Fortin et al. 2005). This threat is not cited in the 2003 COSEWIC status report as the analyses showing this link were conducted after its publication. It should be noted that, while Wolves may provide carcasses for Wolverines, Wolverines are capable of taking large prey (even Caribou) and of using alternate food sources (see Needs section).

Road/rail kill

Road/rail kill is a documented source of mortality within the Wolverine's range (COSEWIC 2003; Krebs et al. 2004). Given the low density of transportation infrastructure and the fact that the potential range of the Eastern population is little used, this threat is not considered a major cause of concern.

5. POPULATION AND DISTRIBUTION OBJECTIVES

The short-term population and distribution objectives consist of determining if individuals of the Wolverine, Eastern population, still persist in Quebec and Labrador and to establish to what degree, if any, a rescue effect from dispersing individuals of the Western population in Ontario may assist in the recovery of the species. The long-term objectives should aim at having naturally-established, self-sustaining populations of this species while keeping interactions with trapping activities for other species to a minimum. To reach these objectives, a sustained dialogue with First Nations, Aboriginal organizations and other northern communities is essential to work towards finding a path forward that is scientifically sound and socially acceptable to all parties.

Population and distribution objectives will be revised as information on population characteristics, the likelihood of a rescue effect and an acceptable path forward are gathered.

6. BROAD STRATEGIES AND GENERAL APPROACHES TO MEET OBJECTIVES

6.1 Actions Already Completed or Currently Underway

Scientific Research and Monitoring

In Quebec, sightings are collected, analyzed and compiled annually. Detection stations (cameras, baits, olfactory lures) have been monitored at strategic locations since 2010 in order to document the species' presence, but no individuals have been detected to date (Isabelle Thibault, personal communication).

In Labrador, a large-scale survey was conducted in 2005 (Schmelzer 2006). As a result of the survey results, the midsubarctic forest ecoregion was identified as having the best recovery potential because of a combination of prey distribution and sympatric species (Schmelzer, personal communication). The province has set hair-snagging stations in 3 sites over a 4-year period. The NunatuKavut Community Council (NCC) and the Nunatsiavut government also participated with detection efforts. NCC continues to manage some detection efforts using hair snag stations. Sightings are collected, followed up on (location visits, genetics as appropriate), and compiled on a regular basis.

Awareness and Partnerships

A series of workshops to share different perspectives (aboriginal and non-aboriginal) on the recovery of the species were organized in Labrador in 2005, as well as a joint-workshop by the provincial and Nunatsiavut governments in 2003. A Wolverine workshop was held in Kawawachikamach (Quebec) in March 2009 (Wilkinson & Associates Inc. 2009) and in Val d'Or (Quebec) in March 2012. The concerns expressed by participants to these workshops helped improve the strategic orientation of the Recovery Strategy for the Wolverine, Eastern population. Many First Nation (e.g. Cree, Naskapi) elders believe that the Wolverine populations may naturally rebound, as they have observed with other animals such as Caribou and ptarmigan (Wilkinson & Associates Inc. 2009). Various groups in Labrador have also produced newspaper articles, completed presentations for community and academic groups, and completed other education initiatives.

6.2 Strategic Direction for Recovery

Table 2. Recovery Planning Table

Threat or Limitation	Broad Strategy for Recovery	Priority	General Description of Research and Management Approaches
Low density	Scientific research and monitoring	High	<ul style="list-style-type: none"> • Determine if individuals of the Eastern population are still present • Clarify the current population characteristics, including the degree to which a rescue effect could contribute to the species' recovery • Investigate habitat requirements using data from individuals of the Eastern population
All	Awareness and partnerships	High	<ul style="list-style-type: none"> • Conduct a social acceptance study • Establish recovery measures that are mutually acceptable for all stakeholders
All	Stewardship and management of the species and its habitat	High	<ul style="list-style-type: none"> • After their completion, promptly follow up on scientific and social studies with additional research, stewardship, development guidelines, and/or other priorities as identified
		High	<ul style="list-style-type: none"> • Promote recovery of the species and its habitat by incorporating knowledge from the western population to manage the landscape according to the precautionary approach and to support appropriate stewardship, funding and legal measures

6.3 Comments that Support the Recovery Planning Table

The actual sequence of recovery measures will be determined by the results of demographic studies, the likelihood of a rescue effect, and the ongoing dialogue surrounding social acceptance of the Wolverine's value and the necessity for its recovery. If no resident Wolverine population is confirmed, this will indicate that greater emphasis needs to be placed on natural re-establishment by individuals from Ontario.

Scientific Research and Monitoring

The first and most crucial step in orienting the recovery process for the Wolverine, Eastern population, consists of determining whether the species still persists in Quebec and Labrador. If the presence of a resident population is confirmed, demographic growth and range expansion will be achievable through targeted threat attenuation measures. It will also be important to continue monitoring the eastward expansion of the Ontario population and to evaluate the likelihood of a rescue effect.

Awareness and Partnerships

Social acceptance is a determining factor in the recovery of the Wolverine, Eastern population. Without a high level of support from First Nations and northern territorial users, recovery will not succeed. It is important to understand the underlying concerns about this species' recovery. Although Wolverines do have occasional conflicts with aboriginal/northern communities, mainly centered on interference with trapping activities, greater emphasis should be given to their important role in the cultural beliefs of many First Nations as symbols of strength and determination (Ontario Wolverine Recovery Team 2011). It should be noted that some First Nations both in eastern Canada (Pekuakamiulnuatsh of Mashteuiatsh; Kanawake Mohawks) and western Canada (Old Crow; Paulatuk in the Northwest Territories) support Wolverine recovery (to various degrees) and increased dialogue with these communities could lead to solutions that are mutually acceptable for all parties (Wilkinson & Associates Inc. 2009). Opportunistic harvesting and incidental take will be the threats mostly targeted by this approach.

Stewardship and Management of the Species and its Habitat

Collaboration with all northern territorial users and managers, building on efforts already in place in other jurisdictions (Ontario, Western Canada, Russia), is essential to the recovery of the Wolverine, Eastern population, and the attenuation of human threats. A range of stewardship projects could be developed in partnership with various agencies, aboriginal groups, and non-governmental organizations. Examples might include refining the existing detection network or a campaign to promote flexible trapping practices. Thought should also be given to the creation of a funding structure specific to the recovery of the Wolverine, Eastern population.

Given the vastness and remoteness of the northern territory in which the species ranges as well as the large number of stakeholders, recovery measures need to focus on those with the highest potential to provide conservation gains. Pending further research on the specifics of the Wolverine's Eastern population demography, knowledge acquired from regions where the Wolverine is more abundant needs to be taken into consideration in managing Wolverines and their habitat in Quebec and Labrador. It should be highlighted that many of the large-scale landscape characteristics that are beneficial for the Wolverine are also required by other species such as the Woodland Caribou.

7. CRITICAL HABITAT

7.1 Identification of the Species' Critical Habitat

The large-scale biophysical attributes (e.g. adequate year-round food supplies, large, sparsely inhabited wilderness areas) as well as some fine-scale elements (e.g. dens, snow depth) of suitable Wolverine habitat are known from studies on Wolverine populations in the western mountainous regions. However, the species' needs may differ in the Eastern population. Although general habitat management

recommendations can be established to promote the maintenance of such attributes⁵, the uncertain status of the Eastern population and lack of demographic knowledge prevents the identification of critical habitat at this time. Identification of the species' critical habitat will take place once the studies outlined in the schedule presented in section 7.2 have been completed.

7.2 Schedule of Studies to Identify Critical Habitat

Table 3. Schedule of Studies

Description of Activity	Rationale	Timeline
Study and survey of the Eastern range and of dispersing individuals from the Western population	Identification of habitat/sectors that show recent occupation ; clarification of the habitat requirements of the Eastern population	2014-2019
If credible records of Wolverines tracks or individuals are obtained, refine the existing habitat suitability model	Identification of suitable habitat for the Wolverine, Eastern population	2014-2019
If habitat models are determined to be dependable and coherent with the results of the social acceptance studies, proceed with critical habitat identification	Critical habitat identification	After 2019

8. MEASURING PROGRESS

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution objectives.

- In the short-term (5 years) surveys increase our confidence in relation to the persistence of individuals of the Wolverine, Eastern population, and in the likelihood of a rescue effect; a path forward for recovery that is both scientifically sound and socially acceptable is established.
- In the long-term, progress towards the establishment of self-sustaining natural populations is made.

9. STATEMENT ON ACTION PLANS

One or more action plans for the Wolverine, Eastern population, will be posted on the Species at Risk Public Registry before the end of 2019.

⁵ In Ontario, a forest management guide for the conservation of biodiversity at the stand and site scales (OMNR 2010) currently recommends a 4 km radius management area centred on the den site combined with a den site specific management plan. To the extent possible, den site attributes should be maintained within larger blocks of unharvested forest without roads at the landscape scale.

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APPENDIX A: EFFECTS ON THE ENVIRONMENT AND OTHER SPECIES

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the [Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals](#). The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or achievement or any of the [Federal Sustainable Development Strategy](#)'s (FSDS) goals and targets.

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

The possibility that this recovery strategy will inadvertently have adverse effects on the environment and on other species has been considered. Since the activities that are initially being recommended are non-intrusive in nature (population studies, stakeholder awareness and the like), it can safely be assumed that the present strategy will have no significant negative effects.

Recovery of the Wolverine, Eastern population, will have little negative impact on other species. The Wolverine is primarily a scavenger and its presence on the territory depends on the availability of cervid carcasses. Although it is recognized that Wolverines may predate live Caribou, a study has shown that targeted individuals appeared to be in poor condition based on bone marrow fat levels (Lofroth et al. 2011). Therefore, the recovery of Wolverines should not pose any significant threat to the recovery of Woodland Caribou. The primary predator of caribou and Moose on the territory that is potentially habitable by the Wolverine is the wolf. Recovery of the Wolverine, Eastern population, may diminish the availability of carcasses for Wolves and for smaller carrion feeders such as the Red Fox (*Vulpes vulpes*) and the American Crow (*Corvus corax*), but these species are relatively abundant and subject to little or no harvesting in northern regions (Larivière et al. 2000 in the case of the Wolf). The effect of Wolverine predation on prey species such as rabbits, ptarmigans and small rodents is considered insignificant given the abundance of these species and the fact that the population density of the Wolverine is likely to be low, even after recovery.