

**Ontario Species at Risk Evaluation Report for  
Rusty-patched Bumble Bee  
Bourdon à tache rousse  
(*Bombus affinis*)**

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

Assessed by COSSARO as Endangered

January 2024

Final

## Executive summary

Rusty-patched Bumble Bee (*Bombus affinis*) is a large bee with dense, even hairs where workers and males have a characteristic rusty brown patch on the second tergite or abdominal stripe. It is a short-tongued, generalist forager where it has been documented to use more than 50 genera of flowers in Ontario (COSEWIC IN PRESS, 2023).

Rusty-patched Bumble Bee is a generalist found in a variety of landscapes including wooded areas, upland forests, oak-savannah, remnant and restored tallgrass prairie, wetlands, open fields, agricultural, and urban areas. It requires floral, nesting, and overwintering resources (COSEWIC IN PRESS, 2023).

A threats calculator was not prepared considering that mature individuals have not been observed since 2009. Threats with high impact include invasive non-native/alien species/diseases, agricultural and forestry effluents, climate change and severe weather, and housing, urban, commercial and industrial development (COSEWIC IN PRESS, 2023).

Rusty-patched Bumble Bee is classified as Endangered in Ontario based on meeting criteria B2(a)(b)(ii)(iii)(v)+D1.

# 1. Eligibility for Ontario status assessment

## 1.1. Eligibility conditions

### 1.1.1. Taxonomic distinctness

Rusty-patched Bumble Bee (*Bombus affinis*) taxonomy remains distinct since described by Cresson in 1863. It has no recognized subspecific taxa or varieties (COSEWIC IN PRESS, 2022).

### 1.1.2. Designatable units

Rusty-patched Bumble Bee is considered one designatable unit within Canada where it has been found in the Great Lakes Plains and Atlantic Maritime Ecozones (COSEWIC IN PRESS, 2022).

### 1.1.3. Native status

Rusty-patched Bumble Bee is considered native to Canada and Ontario and has been observed in Ontario since 1912 (COSEWIC IN PRESS, 2022; NHIC data).

### 1.1.4. Occurrence

There have been no records of the species in Canada since 2009. In Ontario, from 2000 to 2009, only one individual was seen in the St. Williams Conservation Reserve (Manester Tract), and three individuals at Pinery Provincial Park (COSEWIC IN PRESS, 2022).

## 1.2. Eligibility results

Rusty-patched Bumble Bee (*Bombus affinis*) is eligible for status assessment in Ontario.

# 2. Background information

## 2.1. Current designations

- GRANK: Globally Imperiled G2 (NatureServe, 2023)
- IUCN: Critically Endangered (2015)
- NRANK Canada: Critically Imperiled N1
- COSEWIC: Endangered (December 2022)
- SARA: Endangered Schedule 1
- ESA 2007: Endangered
- SRANK: S1 (ranked in 2015)

## 2.2. Distribution in Ontario

Despite significant search effort, there have been no records of the species in Canada since 2009. In Ontario, from 2000 to 2009, only one individual was seen in the St. Williams Conservation Reserve (Manester Tract), and three individuals at Pinery Provincial Park (COSEWIC IN PRESS, 2022).

## 2.3. Distribution, status and the broader biologically relevant geographic range outside Ontario

Rusty-patched Bumble Bee is native to adjacent jurisdictions, but is either extirpated, presumed extirpated or considered critically imperiled (NatureServe, 2023).

Table 1. Condition of the Species in Adjacent Jurisdictions and Broader Biologically Relevant Geographic Range

<b>Adjacent Jurisdictions</b>	<b>Biologically Relevant to Ontario (n/a, yes, no)</b>	<b>Condition</b>	<b>Notes &amp; Sources</b>
Quebec	yes	SNR	NatureServe
Manitoba	n/a	-	-
Michigan	yes	Possibly Extirpated	NatureServe
Minnesota	Yes	SNR	NatureServe
Nunavut	n/a	-	
New York	Yes	Possibly Extirpated	NatureServe
Ohio	Yes	S1 Critically Imperiled	NatureServe
Pennsylvania	Yes	S1 Critically Imperiled	NatureServe
Wisconsin	Yes	S1 Critically Imperiled	NatureServe
<i>Other Relevant Jurisdiction</i>	n/a	-	-

## 2.4. Ontario conservation responsibility

Ontario's conservation responsibility is low with a presumed less than 1% of the global range occurring in Ontario.

## 2.5. Direct threats

The following threats are presumed and considered high should Rusty-patched Bumble Bee occur in Ontario.

Invasive non-native/alien species/diseases: Pathogen spillover from managed native or non-native bee species have been linked to the declines in many bumble bee species. Pathogen spillover occurs when infected managed species spread infections to wild populations where managed bees have higher pathogen loads than wild bee species. Managed bees include bumble bees used for pollinating greenhouse vegetables or field fruit crops and the Western Honey Bee (*Apis mellifera*). Accidental release of managed bees from greenhouses, or the use of managed bee species in a field setting, can cause pathogen spillover into natural areas when infected managed bee species forage on flowers where wild bees are also foraging. Pathogens include *Crithidia bombi*, *Vairimorpha bombi*, *Apicystis bombi*, and viruses (COSEWIC IN PRESS, 2022).

Agricultural and forestry effluents: Agricultural inputs including insecticides, herbicides, and fungicides have been reported to have lethal and sublethal effects on bumble bees. A particular category of insecticides, neonicotinoids, have adverse effects on bumble bees, and these chemicals can persist beyond arable lands through runoff and spraying adjacent non-crop plants. This class of pesticides affects invertebrates' memory, learning, and flight behaviour through actions on the acetylcholine receptor in the mushroom body of invertebrate nervous systems. Bumble bees exposed to neonicotinoids, compared to other bees, flew faster but shorter distances and durations, made more errors and took longer to complete a maze after a training period, took longer to learn how to extract nectar/pollen from flowers, and took longer to forage and returned with less pollen. Most studies of agricultural inputs look at the effects of a single insecticide, herbicide, or fungicide, but bumble bees are likely exposed to multiple chemicals and stressors simultaneously, which can compound the negative impacts (COSEWIC IN PRESS, 2022).

Climate change and severe weather: Bumble bees are adapted to cooler conditions including temperate, alpine, and arctic regions. Warming temperatures and changes in precipitation patterns have caused bumble bee range losses. Extreme climate events including heatwaves, droughts, spring flooding, and spring frosts are predicted to become more frequent and more severe with climate change, with effects to bumble bees including: influencing the number of available foraging resources, and causing low floral abundance during times where the growing season is lengthened (early spring warming periods). Further, bumble bees are unlikely to expand range through dispersal to track shifting climate envelopes where maximum dispersal distances are approximately 10 km/year. This distance is assumed from other bumble bee species (COSEWIC IN PRESS, 2022).

Housing, urban, commercial and industrial development: Development in general decreases the available forage and nesting resources. This can be mitigated somewhat through native plantings curated for pollinator species (COSEWIC IN PRESS, 2022).

## 2.6. Specialized life history or habitat use characteristics

Rusty-patched Bumble Bee is a large bee with dense, even hairs with adult body sizes ranging from 19-23 mm for queens, 9-16 mm for workers and 14-17 mm for males. The

cheek (ocular-malar area) is shorter than broad where workers and males have a characteristic rusty brown patch on the second tergite (T2) or abdominal stripe. Unmated gynes and queens have primarily yellowish hairs for the entire T2 segment (COSEWIC IN PRESS, 2022).

Rusty-patched Bumble Bee is a generalist found in a variety of landscapes including wooded areas, upland forests, oak-savannah, remnant and restored tallgrass prairie, wetlands, open fields, agricultural, and urban areas. It requires floral, nesting, and overwintering resources. It has a long colony cycle where it is active from April to October and requires flowering plants for this entire period to support colony growth. The colony nests underground in abandoned small mammal burrows and may also nest in hollow stumps or logs. Nesting habitat requirements are not well understood. Bumblebee queens overwinter underground, usually in areas that are shaded, well-drained and north facing, with loose soil and fallen dead wood (COSEWIC IN PRESS, 2022).

Rusty-patched Bumble Bee is a short-tongued, generalist forager where it has been documented to use more than 50 genera of flowers in Ontario. It has evolved a somewhat uncommon foraging behaviour called 'nectar-robbing' where it can pierce the corolla of long-tubed flowers to access the nectar directly. Asteraceae are consistently the most frequent plants visited. Other species include willows, clovers and vetches.

Rusty-patched Bumble Bee is a host to at least one socially parasitic bumble bee, the Gypsy Cuckoo Bumble Bee (*Bombus bohemicus*), which is also listed as Endangered. (SARA, Schedule 1).

## 2.7. Existing Conservation and Recovery Actions

Rusty-patched Bumble Bee is considered the first bee species to be listed as Endangered in Canada as well as in the USA and has both federal and provincial Recovery Strategies. The listing sparked movements in North America for bee conservation. Pollinator conservation has become a top environmental issue among Canadians over the past decade which is in part due to the rapid decline of this distinctive and charismatic bee.

## 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

Does not apply. Mature individuals have not been observed since 2009. However, there is an assumed decline.

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

Meets Criterion B2(a)(b)(ii)(iii)(v). IAO (0-16 km<sup>2</sup>) is below threshold for Endangered and

population exists in <5 locations. Since there have been no observations since 2009, there is an inferred ongoing decline in habitat quality and mature individuals based on ongoing threats, pathogens and competition with non-native managed bees.

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

Does not apply. Mature individuals have not been observed since 2009. There is an assumed decline.

### 3.1.4. Criterion D – Very small or restricted total population

Meets Endangered D1. Likely very small and restricted population. Only three observations in Pinery Provincial Park and one observation in St. Williams Conservation Reserve were recorded between 2000 and 2009. There have been no observations since 2009, despite significant survey effort.

### 3.1.5. Criterion E – Quantitative analysis

Does not apply.

## 3.2. Application of Special Concern in Ontario

Does not apply.

### 3.2.1. Ontario's conservation responsibility

Does not apply.

### 3.2.2. Status modification based on level of risk in broader biologically relevant geographic range

Does not apply. The status of Rusty-patched Bumble Bee in adjacent jurisdictions are either assumed or confirmed extirpation or critically imperiled. Assessed by IUCN Red List as critically endangered in its global range where it faces similar threats such as competition with non-native managed bees, agricultural use of insecticides, herbicides and fungicides as well as climate change.

### 3.2.3. Rescue Effect

Most recent USA records of Rusty-patched Bumble Bee are from Wisconsin and Minnesota and are approximately 300 km away from Ontario. Dispersal ability of similar species are approximately 10 km/year. The rarity of Rusty-patched Bumble Bee in adjacent jurisdictions with its low dispersal and extent of habitat modification makes it unlikely that Ontario subpopulations will rebound without human intervention (COSEWIC IN PRESS, 2023).

### 3.3. Other status categories

#### 3.3.1. Data deficient

Does not apply.

#### 3.3.2. Extinct or extirpated

Does not apply.

#### 3.3.3. Not at risk

Does not apply.

## 4. Summary of Ontario status

Rusty-patched Bumble Bee is classified as Endangered in Ontario based on meeting criteria B2(a)(b)(ii)(iii)(v)+D1

*This status of this species is consistent with the definition of Endangered under the Endangered Species Act, 2007.*

## 5. Information sources

COSEWIC. 2022. IN PRESS. COSEWIC assessment and status report on the Rusty-patched Bumble Bee *Bombus affinis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 55 pp.

(<http://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html>).

NatureServe. 2023. Rusty-patched Bumble Bee (*Bombus affinis*). Accessed April 2023. [https://explorer.natureserve.org/Taxon/ELEMENT\\_GLOBAL.2.113123/Nicrophorus\\_americanus](https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.113123/Nicrophorus_americanus)



## Appendix 1: Technical summary for Ontario

Species: Rusty-patched Bumble Bee (*Bombus affinis*)

### 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.	1 year
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	No, but none observed since 2009. Decline assumed.
Estimated percent of continuing decline in total number of mature individuals within 5 years or 2 generations.	Unknown. Decline assumed since none observed since 2009.
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over the last 10 years or 3 generations.	Unknown. Decline assumed since none observed since 2009.
Projected or suspected percent reduction or increase in total number of mature individuals over the next 10 years or 3 generations.	Unknown. Decline assumed to continue.
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. No b. Partially understood c. No
Are there extreme fluctuations in number of mature individuals?	No

### Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Estimated extent of occurrence (EOO). <i>If value in COSEWIC status report is not applicable, then use <a href="http://geocat.kew.org">geocat.kew.org</a>. State source of estimate.</i>	203 km <sup>2</sup> for 2011-2021
Index of area of occupancy (IAO). <i>If value in COSEWIC status report is not applicable, then use <a href="http://geocat.kew.org">geocat.kew.org</a>. State source of estimate.</i>	16 km <sup>2</sup> for 2011-2021
Is the total population severely fragmented? i.e., is >50% of its total area of occupancy in habitat patches that are:	a. Unknown b. Unknown

<b>Extent and occupancy attributes</b>	<b>Value</b>
(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?	
Number of locations. <i>See Definitions and Abbreviations on COSEWIC and IUCN websites for more information on the term "location". Use plausible range to reflect uncertainty if appropriate.</i>	0-3
Number of NHIC Element Occurrences <i>Request data from MNR.</i>	92 from 1912 to 2009
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	Yes
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	Yes
Is there an observed, inferred, or projected continuing decline in number of sub-populations or EOs?	Yes
Is there an observed, inferred, or projected continuing decline in number of locations?	Yes
Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat?	Yes
Are there extreme fluctuations in number of populations?	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 sub-population or total population (if known)

<b>Sub-population (or total population)</b>	<b>Number of mature individuals</b>
<i>Ontario</i>	<i>Four confirmed in 2009</i>

Quantitative analysis (population viability analysis conducted)

Probability of extinction in the wild is unknown.

### Threats

A threats calculator was not prepared considering that mature individuals have not been observed since 2009. Threats with high impact include:

- i. Invasive non-native/alien species/diseases.
- ii. Agricultural and forestry effluents.

- iii. Climate Change and severe weather.
- iv. Housing, urban, commercial and industrial development.

## Rescue effect

Rescue effect attribute	Value
Does the broader biologically relevant geographic range for this species extend beyond Ontario?	Yes
Status of outside population(s) most likely to provide immigrants to Ontario	Status in the United States is extirpated or critically imperiled.
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Unlikely
Would immigrants be adapted to survive in Ontario?	Yes
Is there sufficient suitable habitat for immigrants in Ontario?	Yes, but declining due to land cover changes from development and agriculture as well as pathogen spillover from managed bees.
Are conditions deteriorating in Ontario?	Yes
Is the species of conservation concern in bordering jurisdictions?	Yes
Is the Ontario population considered to be a sink?	No
Is rescue from outside populations likely?	No

## Sensitive species

Not a data sensitive species.

### 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

IUCN: International Union for Conservation of Nature and Natural Resources

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

S2: Imperiled

S3: Vulnerable

S4: Apparently Secure

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