# Andrena canadensis IUCN Red List Pre-Assessment Draft Form with definitions

*Scientific name and taxonomic authority:* ***Andrena canadensis, Dalla Torre, 1896***

*Synonym/s (over the last 5 years or if widely used): This will be blank if no synonyms*

Common name(s): Canadian miner bee

Taxonomic notes (a. any taxonomic concerns about the validity of the species? b. any taxonomic revisions underway that would require a species reassessment?

Distribution

The Canadian miner bee is known from approximately 470 records, from 1887 through 2021. Historic records for this species span from the Mountain West, across the northern Great Plains of the United States and Canada, across the Great Lakes region, across the Northeastern United States, and southeastern Canada. There are some scattered records peripheral to the main distribution in Tennessee, Mississippi, and California. Using all records for the species, the extent of occurrence is 6,226,241 $km^2$. There are few recent observations of this species in the western part of its range, however, this may be an effect of limited search effort in this region. Because of the limited western observations, the status of the species in the Mountain West and Northern Great Plains is unclear. There have been limited survey efforts for bees across the range of this species. Therefore, the area of occupancy is unknown.

Occurrence records for this and other bee species native to the U.S. were compiled by researchers using digitized bee data from 162 institutions or data repositories (Chesshire et al. 2023)). The resulting database, which contains nearly 2 million records for 3,158 bee species, includes records from the Global Biodiversity Information Facility (GBIF) and the Symbiota Collection of Arthropod Network (SCAN). This dataset is currently the most comprehensive and accurate bee occurrence dataset available for the U.S. These records were systematically cleaned by removing duplicate records and records where specimens were not identified to species level. Additionally, the database was examined by a geodata expert, who corrected inaccurate coordinates and removed records with vague or no geodata, and examined by bee taxonomy experts, who revised scientific names for specimens with synonymy issues, removed observations with invalid names, and removed implausible records and species outliers. Additional data points come from May (2015) and Emily Purvis (2021).

The accuracy of conservation status assessments for bees is limited by the quantity and quality of available data. Although there are over 2 million digitized bee records, there are an estimated 4.7 million bee specimens housed in U.S. museums that are undigitized (Chesshire et al. 2023). Error rates in data transcription from museum specimen to digitized records can be high. Limited funding for taxonomists means that keys used in identification have not been revised for many

decades, and that many recently collected specimens have not yet been identified. Additionally, few records are accompanied with search effort or sampling method data, limiting their utility (Rousseau et al. 2024). Lastly, there have been no systematic surveys for bees across much of the United States, contributing to limited understanding of even the most basic aspects of bee biology. The quality and accuracy of species status assessments will increase when funding is made available to digitize existing data and systematically survey the U.S. for bees, as well as to support taxonomists to identify the backlog of specimens collected in monitoring efforts, review specimens in collections, and revise identification keys. Overcoming these challenges with regard to bee data quality and quantity will take enormous time, effort, and funding. Conservation status assessments carried out in the meantime are done using the best available data, with limitations and assumptions clearly articulated, and many species assessments are likely to result in the category 'Data Deficient'.

Country Occurrence: United States (Arizona, California, Colorado, New Mexico, Utah, Wyoming, Montana, Nebraska, North Dakota, South Dakota, Minnesota, Iowa, Wisconsin, Michigan, Illinois, Indiana, Ohio, Tennessee, Mississippi, West Virginia, New Jersey, New York, Connecticut, Massachusetts, Vermont, New Hampshire, Maine); Canada (Alberta, Saskatchewan, Ontario, Quebec, New Brunswick)

EOO: 6,226,241 $km^2$

EOO Justification:
The extent of occurrence was calculated using ArcGIS Pro. The minimum convex polygon was drawn around known occurrence records (Chesshire et al. 2023).

AOO: Unknown

Elevation range: -3 - 2625m

Map notes: The map for this species was generated by creating a polygon around all records, then generalizing and clipping it to the North American continent.

Severely Fragmented: NO

Number of Locations: N/A

<u>"Population" Size</u>

This species appears to be more abundant in the eastern part of its range. Generally, the population size and trend are not known for this species, as no studies have been conducted to examine population trends for this species.

Trend: **Unknown**

Number of Subpopulations: N/A

Extreme Fluctuation: N/A

Generation Length: 1

Habitats and Ecology

The Canadian miner bee is a pollen specialist that visits plants in the family Asteraceae for pollen, especially the genera *Solidago* and *Symphyotrichum* (Stevens 1949; Wood and Roberts 2018). In a study in low-bush blueberry production areas in Maine, the species was associated with emergent wetland habitats (Du Clos, Drummond, and Loftin 2020). The species likely nests underground like all other *Andrena* (Danforth et al. 2019), but nests for this species have not been described. Nest cells from other members of this genus are located at the ends of the lateral burrows, which are typically lined with a waxy Dufour's gland secretion (Cane 1981) that serves to both isolate the provision from pathogens in the surrounding soil and to regulate water uptake from the soil atmosphere (Cane and Love 2021). Females provision each cell with a ball of pollen moistened with nectar before laying a single egg (Michener 2007). The adult flight period is August and September (Stevens 1949). Adults are assumed to emerge annually (Danforth et al. 2019). Maximum foraging distance has been estimated to be 250 - 500 meters (Du Clos, Drummond, and Loftin 2020).

1. Forest and Woodland -> 1.4 Temperate Forest

4. Grassland -> 4.4 Grassland - Temperate

14. Artificial - Terrestrial 14.5 Urban Areas

Use and Trade

This species is not known to be utilized commercially.

Threats

Specific threats to this species have not been identified. However, certain aspects of this species' biology may make it more vulnerable to some threats. *Andrena canadensis* is a ground nesting species, and nests may be harmed by certain agricultural practices such as tilling, which can kill bees nesting close to the surface (Williams et al. 2010). This species is oligolectic, which has been linked to higher risk of extinction due to reduced host plant availability, especially under climate change scenarios (Roberts et al. 2011) and reduced effective population sizes (Packer et al. 2005). Additionally, *Andrena* have been reported to have low reproductive output because of the short adult life span, and a low rate of brood cell provisioning (reviewed in Danforth et al. 2019). Other threats to bees generally include habitat loss or modification, climate change, pesticide use, exposure to pathogens from managed bee species, and competition with honey

bees (Brown and Paxton 2009; Potts et al. 2010; Wojcik et al. 2018; Grab et al. 2019; Raven and Wagner 2021).

This species has had its conservation status evaluated using NatureServe criteria at the U.S. state and Canadian province level in some areas where it occurs. It has been evaluated as Vulnerable in Ontario, Canada and Indiana, U.S., Imperiled in New York and Vermont, and Critically Imperiled in Connecticut.

Threat: Timing: Scope: Severity: Impact Score:

1. Residential & commercial development -> 1.1. Housing & urban areas

1. Residential & commercial development -> 1.2. Commercial & industrial areas

2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming

7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1.Increase in fire frequency/intensity

7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.2. Suppression in fire frequency/intensity

8. Invasive and other problematic species, genes, and diseases -> 8.1 Invasive non-native/alien species/diseases -> 8.1.2. Named species

9. Pollution -> 9.3 Agricultural and forestry effluents -> 9.3.3 Herbicides and Pesticides

11. Climate change & severe weather -> 11.1. Habitat shifting & alteration

11. Climate change & severe weather -> 11.2.Droughts

11. Climate change & severe weather -> 11.3.Temperature extremes

Conservation Actions

No known conservation actions are in place for this species. Observations of this species are known from Bureau of Land Management (BLM), United States Forest Service, Fish and Wildlife Service, and National Park Service land, but this does not confer any specific protections to the species. Further research is needed to determine the overall size of the population and to identify trends and better understand existing threats.

Specific conservation needs for this species have not been identified. Due to the importance of supporting wild bee populations for pollination services, general conservation practices are recommended including, restoring, creating, and preserving natural high-quality habitats to

include suitable forage and nesting sites; limiting pesticide use on or near suitable habitat, particularly during the adult bee's flight period; promoting farming and urban practices that increase pollinator-friendly plants in margin space; minimizing exposure of wild bees to diseases transferred from managed bees; and lastly, avoiding honey bee introduction to high-quality native bee habitat.

Conservation Actions Needed

1. Land/water protection -> 1.2. Resource & habitat protection

2. Land/water management -> 2.3. Habitat & natural process restoration

4. Education & awareness -> 4.3. Awareness & communications

5. Law & policy -> 5.2. Policies and regulations

Research Needed

1. Research -> 1.2. Population size, distribution & trends

3. Monitoring -> 3.1. Population trends

Assessment

Date of assessment (month-day-year): 5/16/23

Assessors names (use * to indicate primary assessor, typically the participant with most experience/knowledge of the species): Saff Killingsworth

Reviewer(s): Robert Minckley, Sarina Jepsen

Contributors(s): Emily Purvis and Emily May. For a full list of the 162 institutions that contributed to the Chesshire et al. dataset, please see Chesshire et al. 2023, S1.

Facilitator(s) and compiler(s): Paige R. Chesshire, Erica E. Fischer, Nicolas J. Dowdy, Terry L. Griswold, Alice C. Hughes, Michael C. Orr, John S. Ascher, Laura M. Guzman, Keng-Lou James Hung, Neil S. Cobb and Lindsie M. McCabe

Red List Category and Criteria: **Least Concern**

Justification:

The Canadian miner bee (*Andrena canandensis*) is a pollen specialist bee species known from approximately 470 records. It occurs across most of the United States, with a majority of records from the Northeast and the Great Lakes regions. Using all known records of the species, the extent of occurrence is 6,226,241 $km^2$. However, there have been limited recent records in the

western part of the entire range. This is likely an effect of reduced search effort in these regions. However, the persistence of this species throughout its entire range is unknown. Within the range of the species, climate change impacts, increased urbanization and agricultural development have been observed, so it is possible that localized threats are acting on this species. Because this species is widespread and occurs in many different habitats, it may not be threatened with extinction at this time, but more information is needed about the persistence of this species throughout its entire range. For now, it is assessed as Least Concern.

**NatureServe Specific Text**:

For Rank Calculator:

1. Element occurrences (using separation distance of 5,000 m): 150 D
    a. Estimated Number of Element Occurrences Comments: There is only one element occurrence for this species west of the Great Lakes Region since 1974, located near Red Deer, Alberta, Canada. Records in the eastern part of the range since 2013 are more abundant.
1. Population size: Unknown
2. Viability/Ecological integrity (choose one)
    a. Number of occurrences with good viability/ecological integrity: Unknown
    b. Percent of area occupied (For Species with Known AOO): N/A
3. Environmental Specificity: B. Narrow. Specialist or community with key requirements common.
    A. Environmental specificity comments: This species is a dietary specialist within the plant family Asteraceae, although plants in this family are likely common and abundant across the range of the bee.
4. Intrinsic Vulnerability: B. Moderately vulnerable
    a. Intrinsic vulnerability comments: *Andrena* have been reported to have low reproductive output because of the short adult life span, and a low rate of brood cell provisioning (reviewed in: Danforth et al. 2019).
5. Trend
        a. Short Term Trend: Unknown
        b. Comments: Abundance estimates and population trends are not known for this species.
        c. Long Term Trend: Unknown
        d. Comments: Abundance estimates and population trends are not known for this species.

For Biotics Global Element Characterization:

1. Habitat

Forest-Hardwood, Forest-Mixed, Woodland-Mixed, Savanna Grassland/Herbaceous, Cropland/Hedgerow, Suburban/Orchard, Urban/edificarian

Literature References:


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