

Interim Core Map Documentation for Rusty Patched Bumble Bee

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Developed by US Environmental Protection Agency, Office of Pesticide Programs

Species Summary

The rusty patched bumble bee (***Bombus affinis***; Entity ID #10383) is an endangered terrestrial invertebrate. This species occurs in a variety of habitats, including prairies, woodlands, marshes, agricultural landscapes, residential parks, and gardens. The rusty patched bumble bee requires areas that support sufficient food (nectar and pollen from diverse and abundant flowers), undisturbed nesting sites in close proximity to floral resources, and overwintering sites for hibernating queens. Additional information is provided in **Appendix 1**. This species is currently included in the Vulnerable Species Action Plan.

Description of Core Map

The core map for the rusty patched bumble bee is the range, which was last updated in August 2024. The range represents high potential zones (HPZ) for rusty patched bumble bee distribution identified by FWS based on the population grid monitoring program that is updated regularly. Known location data compiled by Fish and Wildlife Service (FWS) aligns with data compiled by iNaturalist, NatureServe and Global Biodiversity Information Facility (GBIF). **Figure 1** depicts the interim core map for rusty patched bumble bee (pink outlined areas on map). The core map represents approximately 5,090,000 acres spread out in the following states: Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Minnesota, Ohio, Virginia, West Virginia, and Wisconsin. Given that (1) the range represents high potential zones for the species based on species monitoring, (2) the range is an aggregation of small patches (not a large, contiguous area), and (3) occurrence data are consistent with the range, additional mapping refinements based on habitat or landcover were not pursued.

The rusty patched bumble bee has been observed in a variety of habitats, including prairies, woodlands, marshes, agricultural landscapes, and residential parks and gardens. Landcover categories within the core map area are included in **Table 1**.

The core map developed for the rusty patched bumble bee is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the rusty patched bumble bee. This core map incorporates information developed by FWS and made available to the public; however, the core map has not been formally reviewed by FWS. This interim core map may be revised in the future to incorporate expert feedback from FWS. This interim core map has an “average” best professional judgment classification with respect to biological data and GIS data interpretation.

This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.

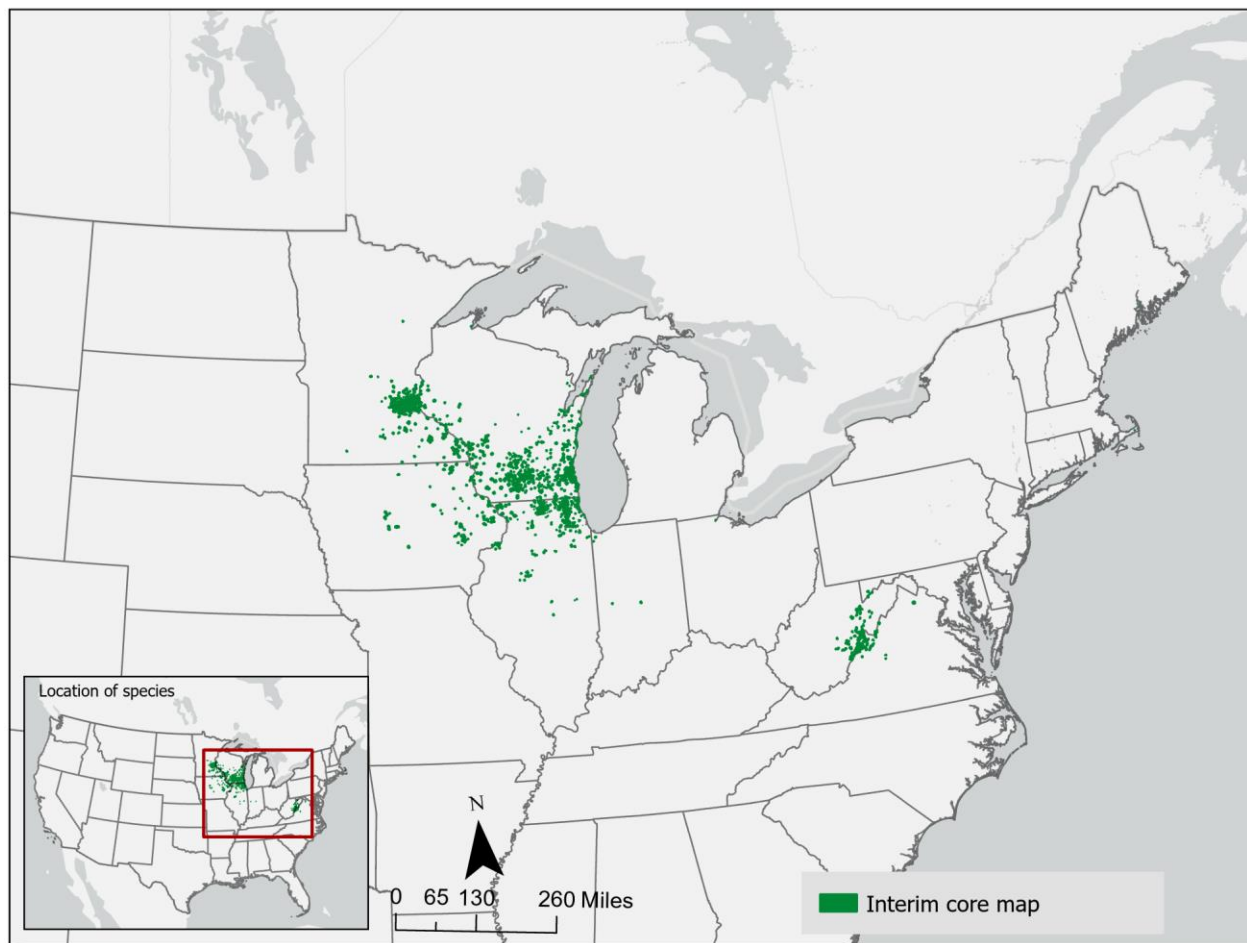


Figure 1. Interim core map for Rusty Patched Bumble Bee.

Table 1. Percentage of Interim Core Map Represented by NLCD¹ Land Covers and Associated Example Pesticide Use Sites/Types.

Example pesticide use sites/types	NLCD Landcover (Value)	% of core map represented by landcover	% of core map represented by example pesticide use
Forestry	Deciduous Forest (41)	23	28
	Evergreen Forest (42)	1	
	Mixed Forest (43)	4	
Agriculture	Pasture/Hay (81)	14	32
	Cultivated Crops (82)	18	

¹ Dewitz, J., 2023, National Land Cover Database (NLCD) 2021 Products: U.S. Geological Survey data release, <https://doi.org/10.5066/P9JZ7AO3>

Mosquito adulticide, residential	Open space, developed (21)	9	30
	Developed, Low intensity (22)	11	
	Developed, Medium intensity (23)	7	
	Developed, High intensity (24)	3	
Invasive species control	Woody Wetlands (90)	3	10
	Emergent Herbaceous Wetlands (95)	3	
	Open water (11)	2	
	Grassland/herbaceous (71)	2	
	Scrub/shrub (52)	0	
	Barren land (rock/sand/clay; 31)	0	
Total Acres	Interim Core Map Acres	~5,090,000	

Evaluation of Known Location Information

There are five datasets with known location information:

- HPZModel Update (from Minnesota-Wisconsin FWS);
- Occurrences provided in iNaturalist;
- Occurrences provided in GBIF; and
- Occurrences provided in NatureServe.

EPA evaluated these sets of data in developing the core map. The range map provided by FWS (RPBB HPZModel Update or ECOS range map) captures the available known locations available in the FWS literature, iNaturalist (3,916 observations), GBIF (4,655 observations), and NatureServe. Therefore, the known location information supports using range as the core map. **Appendix 1** includes more information on the available known location information.

Approach Used to Create Core Map

The core map was developed using the Process EPA Uses to Develop Core Maps for Draft Pesticide Use Limitation Areas for Species Listed by the U.S. Fish & Wildlife Service (FWS) and their Designated Critical Habitats² (referred to as “the process”). This core map was developed by EPA using the 4 steps described in the process document:

1. Compile available information for a species;
2. Identify core map type;
3. Develop the core map for the species; and
4. Document the core map (reflected in this document).

For step 1, EPA compiled available information for the rusty patched bumble bee from FWS (the Minnesota-Wisconsin file created by the USFWS Field Office that depicts high potential zones (HPZ) and the ECOS range file) as well as observation information available from various publicly available sources

² Dated 2024, available online at: <https://www.epa.gov/endangered-species/process-epa-uses-develop-core-maps-draft-pesticide-use-limitation-areas>

(including iNaturalist, NatureServe, and GBIF). The information compiled for the rusty patched bumble bee is included in **Appendix 1**. Influential information that impacted the development of the core map includes:

- The species' range is refined based on survey information and includes only high potential zones for the species.
- The available occurrence data from iNaturalist, NatureServe, and GBIF is consistent with the core map;
- The species habitat is varied (e.g., prairies, woodlands, marshes, agricultural landscapes, and residential parks and gardens). Therefore, habitat refinements would not likely refine the core map to any meaningful extent.

For step 2, EPA used the compiled information to identify the core map type. EPA compared the range data to the known location data and found that they were consistent with one another. FWS recently proposed a critical habitat for this species. The proposed critical habitat includes 14 areas that are primarily focused on the urban areas (e.g., Minneapolis, MN; St. Paul, MN; Madison, WI) of the range. These areas are included in the range and the resulting core map. The proposed critical habitat does not include all parts of the range where this species occurs.

For step 3, EPA used the best available data sources to generate the core map. For this core map, EPA used the RPBB HPZModel Update range map (ARCGIS Hub, [RPBB database](#)), which is identical to the ECOS range map (ARCGIS, ECOS Entity ID #10383).

Discussion of Approaches and Data that were Considered but not Included in Core Map

EPA considered whether the habitat of this species could be used to refine the core map (i.e., a biological information core map); however, this species uses a wide variety of habitats (e.g., residential, forest, grassland, agriculture). Therefore, very few, if any, landcovers would be removed from the core map using a refinement process that removed unsuitable habitat.

Appendix 1. Information compiled for species during Step 1

1. Recent FWS Documents

- June 2016, *Rusty Patched Bumble Bee (Bombus affinis) Species Status Assessment* (<https://ecos.fws.gov/ServCat/DownloadFile/120109>)
- January 2017, *Endangered Species Status for Rusty Patched Bumble Bee, Final Rule*, 82 FR 3186 (<https://www.govinfo.gov/content/pkg/FR-2017-01-11/pdf/2017-00195.pdf#page=1>)
- September 2020, *Determination that Designation of Critical Habitat is Not Prudent for the Rusty Patched Bumble Bee*, 85 FR 54281 (<https://www.govinfo.gov/content/pkg/FR-2020-09-01/pdf/2020-17093.pdf#page=1>)
- July 2021, *Recovery Plan for Rusty Patched Bumble Bee (Bombus affinis)* (https://ecos.fws.gov/docs/recovery_plan/Final%20Recovery%20Plan%20Rusty%20Patched%20Bumble%20Bee_2021.pdf)
- August 2022, *Rusty Patched Bumble Bee (Bombus affinis) Status Review: Summary and Evaluation (5-Year Review)* (https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3911.pdf)
- October 2022, *Recovery Implementation Strategy for the Rusty Patched Bumble Bee (Bombus affinis)* (https://ecos.fws.gov/docs/recovery_plan/RPBB%20RIS_v1_112022_3.pdf)
- November 2024, *Proposed Designation of Critical Habitat for the Rusty Patched Bumble Bee* (<https://www.govinfo.gov/content/pkg/FR-2024-11-26/pdf/2024-27316.pdf#page=1>)

2. Background Information

- Status: Federally listed as **endangered** in **2017**
- Resiliency, redundancy, and representation (the 3Rs)
 - “The number of occurrences, % occupancy of grids, and relative abundance has declined. Data available on 25 of the 69 extant populations suggest that many of the persisting populations are experiencing threats. Along with the loss of populations, there has been a marked loss of range and spatial extent, with occurrences currently in 13 states/provinces and 6 ecoregions. This expansive reduction has likely led to loss of spatial heterogeneity (ability to withstand environmental stochasticity) and adaptive diversity (ability to adapt to physical and biological changes in its environment). Similarly, the loss of occurrences within ecoregions has increased the risk of extirpation due catastrophic events.” (2016 Species Status Assessment)
- Habitat, Life History, and Ecology
 - Observed and collected in a variety of habitats, including prairies,

woodlands, marshes, agricultural landscapes, and residential parks and gardens

- Requires areas that support sufficient food (nectar and pollen from diverse and abundant flowers), undisturbed nesting sites in proximity to floral resources, and overwintering sites for hibernating queens
- Nests are typically in abandoned rodent nests or other similar cavities, one to four feet below ground. Nests have also been occasionally observed above ground.
- Little is known about the overwintering habitats of *B. affinis* foundress queens, but other species of *Bombus* typically form a chamber in soft soil, a few centimeters deep and sometimes use compost or mole hills to overwinter.
- Lives in temperate climates and are not likely to sustain prolonged periods of high temperatures.
- Able to fly in cool temperatures and low light levels, particularly in comparison to other bees, which can extend daytime foraging times.

(*Rusty Patched Bumble Bee (Bombus affinis) Species Status Assessment*, June 2016)

- **Diet:** Generalist foragers. They gather pollen and nectar from a wide variety of flowering plants. Requires a constant and diverse supply of flowers that bloom throughout the colony's long lifecycle from April through September. The nectar from flowers provides carbohydrates and the pollen provides protein.
(*Rusty Patched Bumble Bee (Bombus affinis) Species Status Assessment*, June 2016)
- **Taxonomy:** Terrestrial Invertebrate.
- **Relevant Potential Pesticide Use Sites**
 - The 2016 SSA reports that "Bumble bees are exposed to multiple pesticides throughout their lives, from development to adults (Sanchez-Bayo and Goka 2014, p. 5; Goulson et al. 2015, p. 4)." However, specific use sites were not discussed in the SSA.
 - Exposure routes noted in the 2016 SSA included consumption of contaminated nectar, gathering of contaminated pollen, and direct contact (2016 SSA).
 - The 2016 SSA also discussed neonicotinoid insecticides, noting that "neonicotinoids persist and accumulate in soils, and owing to their systemic property, are found in nectar and pollen of treated crops and landscapes (Goulson 2013, pp. 979-981) and in guttation droplets (drops of xylem sap on the tip or edges of leaves) (Girolami et al. 2009, pp. 1811-1814)." (2016 SSA).
- **Relevant Recovery Criteria and Actions**
 - **Recovery Vision:** To conserve a sufficient number and distribution of populations to ensure the species' long-term viability such that it may be removed from the List of Endangered and Threatened Wildlife.
 - **Recovery Objectives**

- Preventing further loss of populations by (a) identifying and ameliorating the threats driving the declines, (b) increasing the health of individuals and the number of colonies comprising populations, and (c) ensuring appropriate connectivity between populations.
 - Ameliorating pervasive threats, including those from pathogens, pesticides, habitat loss, managed bees, and effects of climate change.
 - Buffering against catastrophes and environmental stochasticity (may require reintroduction into unoccupied areas within the historical range) by increasing the number of genetically and demographically healthy populations and the spatial distribution of those populations.
 - Buffering against novel changes in its physical and biological environment by restoring populations across the breadth of its natural adaptive diversity.
 - Protecting populations and their habitats and abating threats into the foreseeable future.
- **Recovery Criteria – Downlisting Criteria**
 - *Criterion 1* – Maintain healthy populations of the rusty patched bumble bee in each of the 5 Conservation Units (Figure A1-1 below) as demonstrated by each unit having the following:
 - A minimum number of healthy populations (see Figure A1-1 below), and
 - A stable or increasing trend in percent occupancy over a minimum of 5 -10 years.

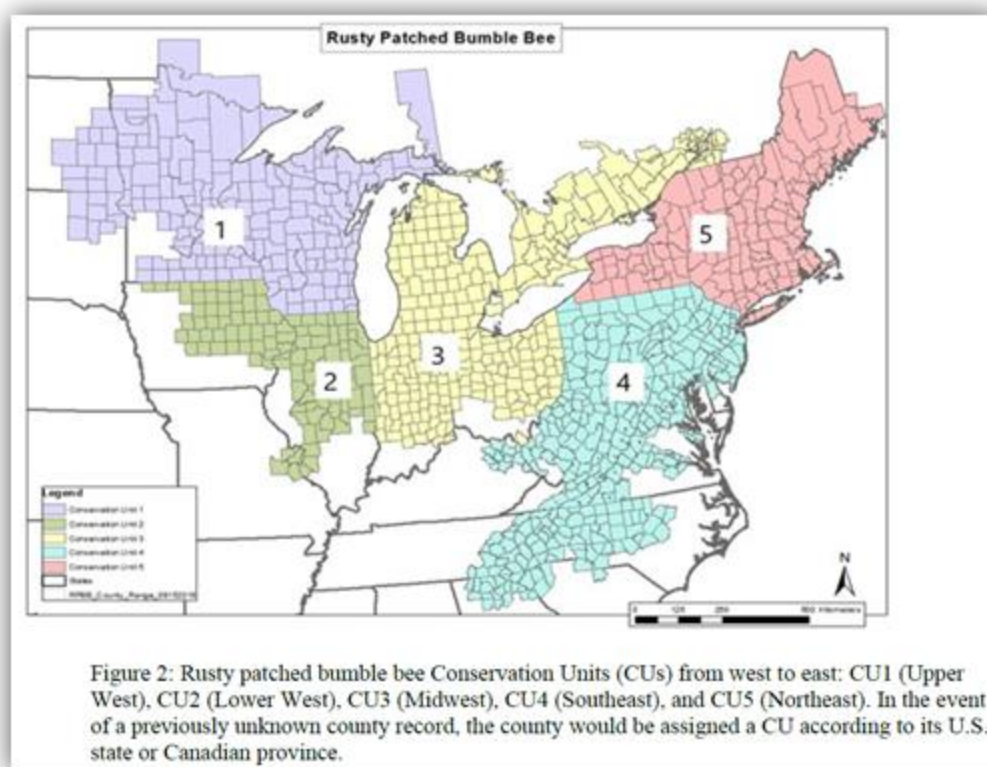


Figure A1-1. Conservation Units for the rusty patched bumble bee

Conservation Unit	Number of healthy populations
Unit 1	42
Unit 2	21
Unit 3	52
Unit 4	52
Unit 5	52

Figure A1-2. Minimum number of healthy populations needed for downlisting

- *Criterion 2* – Ensure population clusters are distributed across a diversity of habitat, ecological, and climate types within each Conservation Unit. A population cluster is three or more healthy populations that are adjacent to each other.
- **Recovery Criteria – Delisting Criteria**
 - *Criterion 1* – Downlisting criteria A1 and A2 have been met.

- *Criterion 2* – Mechanisms are in place that provide a high level of certainty that downlisting criteria will continue to be met into the foreseeable future. Specifically, Conservation Unit-specific mechanisms will ensure that into the foreseeable future:
 - The number and distribution of healthy populations will be maintained at the levels needed to meet downlisting criteria,
 - A sufficient quality and quantity of habitat will be maintained to support those healthy populations, and
 - The negative effects from threats (including but not limited to pathogens, pesticides, climate change, and non-native bees and managed bumble bees) have been reduced such that the population-level effects are negligible.
- Recovery Actions
 - Minimize risks due to disease, pests, pathogens, and parasites.
 - Minimize exposure to harmful pesticides.
 - Manage and protect populations.
 - Assess population and habitat status and trends through monitoring and surveys.
 - Manage, protect, and enhance habitat.

(*Recovery Plan for Rusty Patched Bumble Bee (2021)* and *Recovery Implementation Strategy for the Rusty Patched Bumble Bee (Bombus affinis) (2022)*)

3. **Species Range:** The range for this species is in Figure A1-3 below.

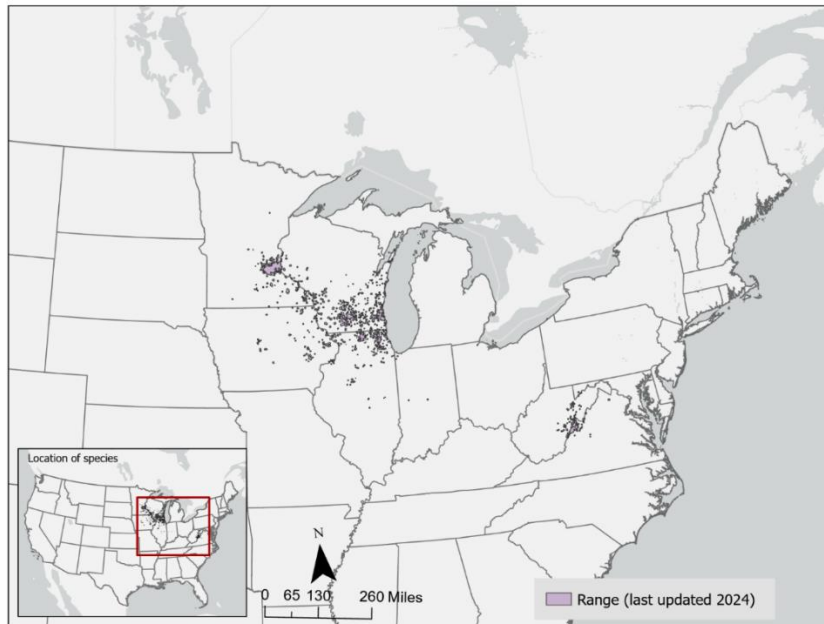


Figure A1-3. Current ECOS range for Rusty Patched Bumble Bee (12/19/2024)

4. Critical Habitat

- FWS proposed critical habitat in November 2024. The proposed designated critical habitat is approximately 1,635,746 acres (661,963 hectares) of occupied habitat in 14 units across 33 counties in 6 States, including Minnesota, Wisconsin, Illinois, Iowa, Virginia, and West Virginia. (Proposed Designation of Critical Habitat for the Rusty Patched Bumble Bee, 2024).

5. Known Locations

- Known locations identified by FWS
 - FWS summarizes the known occurrences of rusty patch bumble bee in the recent SSA reports the images below include Figure 1, Figure 2, and Table 2 from the 2021 SSA. In the map below the gray area is the presumed historical county range for the rusty patch bumble bee, the black areas are historical observations (pre-2007) and the green areas are recent observations (2007-2021). Survey in the rest of the species ranges are occurring but there is currently no additional evidence of the rusty patch bumble bee in these areas. Currently the species is known to occur in 10 states.

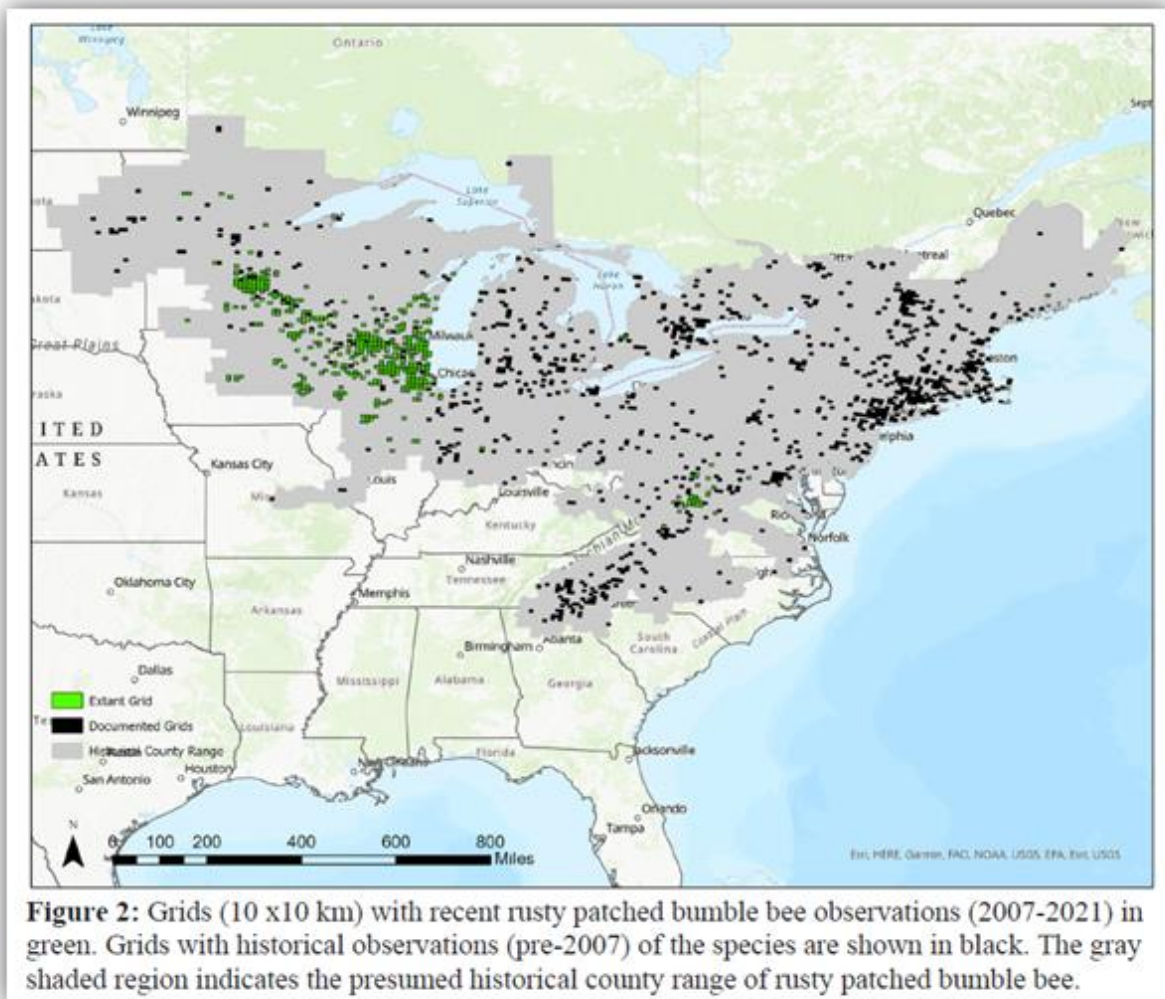


Figure A1-4. Known locations reported in FWS' 2021 SSA

Since the Service developed the species status assessment (SSA, USFWS 2016), there have been several new records of the species, most notably in Iowa, Virginia, West Virginia, and Wisconsin (Figure 2, USFWS 2022 unpublished database). Since listing (2017-2021), only one to two individual rusty patched bumble bees have been observed at most of these locations (USFWS 2022, unpublished database)."

(Rusty Patched Bumble Bee (Bombus affinis) Status Review: Summary and Evaluation (5-Year Review (2022))

Table 2: Number of rusty patched bumble bees that were observed each year since listing through 2021(in each state or province that had extant records at the time of listing). No rusty patched bumble bees have been observed in other states within their historical range during this time.

State/Year	2017	2018	2019	2020	2021
Illinois	109	357	111	140	213
Indiana	0	0	0	0	0
Iowa	21	124	52	118	63
Maine	0	0	0	0	0
Massachusetts	0	0	0	0	0
Minnesota	153	344	240	1016	388
Ohio	0	0	0	0	0
Virginia	2	45	47	28	30
West Virginia	3	2	10	11	34
Wisconsin	162	217	128	393	573
Ontario, Canada	0	0	0	0	0
Total number of individual rusty patched bumble bee observations	450	1089	588	1706	1301

Figure A1-5. Number of rusty patched bumble bees observed by state since listing

- iNaturalist: Link for [research grade observation since 2009](#), no additional observations are added when extending the window to 2007 to match the criteria used by FWS in the SSA to define a recent observation. From August 2009 to October 2024 there have been 3,916 research grade observations. These locations are likely within the species range when considering data resolution; see map below.

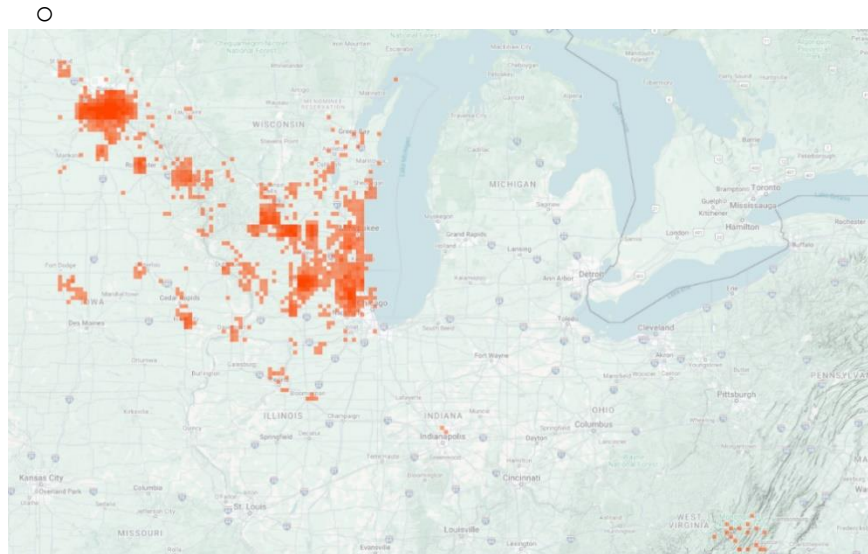


Figure A1-6. iNaturalist occurrences for Rusty-Patched Bumble Bee.

- Global Biodiversity Information Facility (GBIF): [Link for species](#)
GBIF includes [4,655 human observation](#) occurrences from 2009-2024; the majority of which are research grade observations from iNaturalist. Additional sources with coordinates include Xerces Society -Bumble watch. Occurrences from Natureserve are also noted but do not include coordinates. No additional areas are identified by these occurrences, see map below.

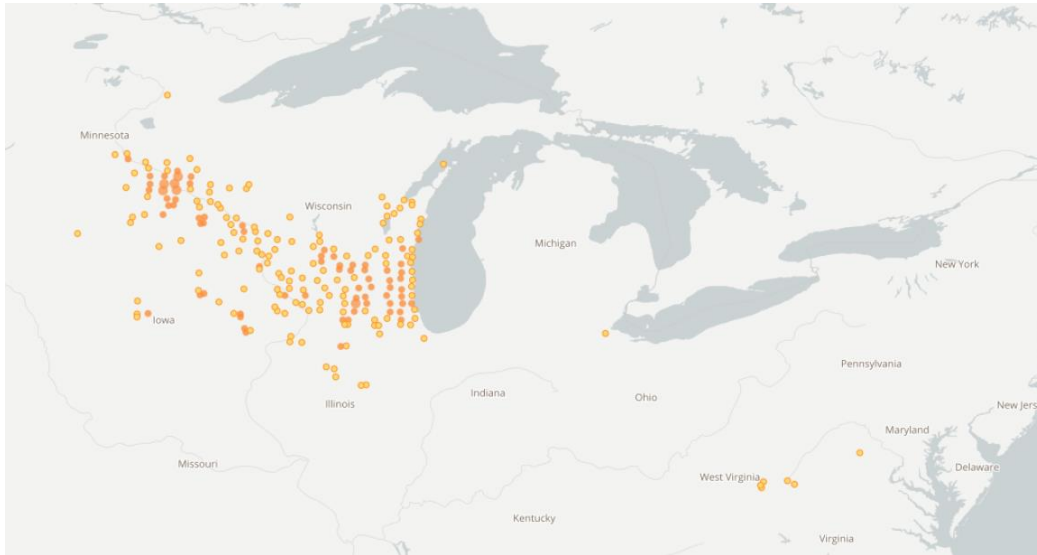


Figure A1-7. GBIF occurrences for Rusty-Patched Bumble Bee.

- NatureServe Explorer Pro³: [Link for Species](#)
 - Available public occurrence information from NatureServe Explorer Pro generally aligns with the information from iNaturalist and does not identify any additional areas; see image below. Some older occurrences are found within the historical range.

³ [NatureServe Explorer Pro](#)

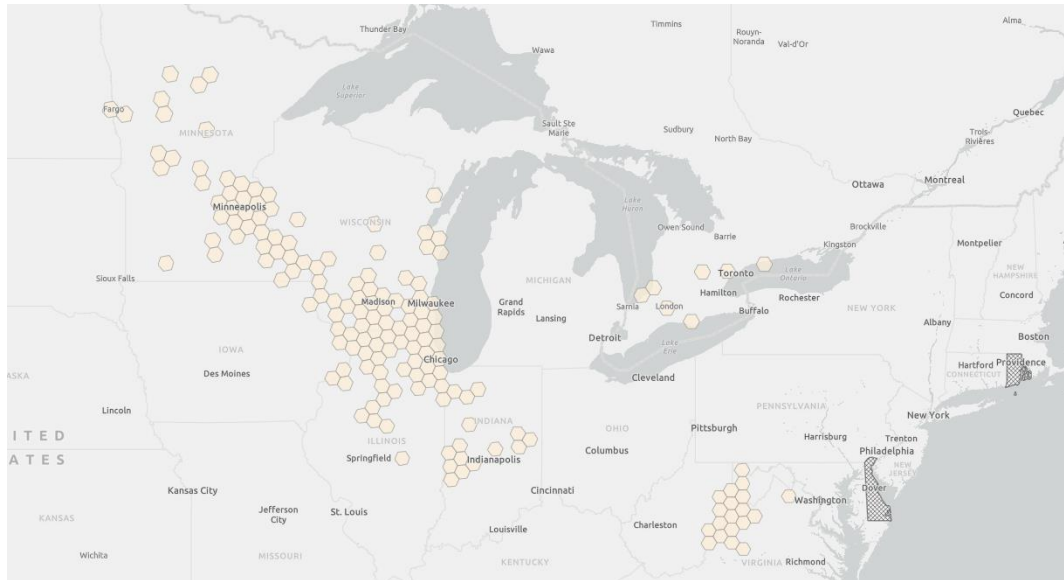


Figure A1-8. NatureServe Explorer Pro occurrences for Rusty Patched Bumble Bee.