

*Scientific name and taxonomic authority: **Andrena angusticrus**, LaBerge, 1971*

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

Common name(s):

Taxonomic notes : This species is only known from females - no males have been identified.

Distribution

Andrena angusticrus is known from fewer than 20 observations, from 1890 through 1976. It occurs on the western edge of California, United States, from San Francisco south to San Diego. Using all known records for the species, the extent of occurrence (EOO) is 40,215 km² (Chesshire et al. 2023). This species has not been observed anywhere in its range since 1976. Using all observations, the area of occupancy (AOO) is 44 km². There have been limited survey efforts for bees across the range of this species. Therefore, there is a high degree of uncertainty about the true AOO.

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 observations of the species come from the species description (Laberge 1971).

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’.

EOO: 40,215 km²

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).

Country Occurrence: United States (California).

AOO: Unknown

Elevation range: 85 - 985 m

Map notes: The map was generated by displaying all known observations as points.

Severely Fragmented: No

Number of Locations: N/A

“Population” Size

There are many variables that factor into a given species’s detectability, including survey period, sampling method, sampling location, and sampling effort. Data for some of these variables rarely accompany publicly available digitized specimen records, and make it difficult to determine the parameters of a survey that resulted in the detection of a given species. In order to determine if absence of recent records is due to limited search effort, we examined the search effort required to detect the species historically (before 2013), to assess if search effort in the recent time period (2013 and later) has been sufficient to detect it. To do this, we divided the total number of historic *Andrena* records from the species EOO during the appropriate phenological window (3,198 records) by the total number of historic *Andrena angusticrus* records (14 records) to generate a relative abundance metric. For each *Andrena angusticrus* detected within the EOO, 228 *Andrena* of all species were sampled. In the recent time period, 63 *Andrena* of all species were recorded in the EOO during the appropriate phenological window (the period of *Andrena angusticrus* adult activity). This is only 28% of the search effort required to detect this species prior to 2013. As such, we suggest that the absence of recent *Andrena angusticrus* records from its EOO may be due to insufficient search effort.

Overall, 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 year

Habitats and Ecology

Because there are limited records of this species, little is known about its habitat or ecology. This species has been recorded from the shrublands and urban areas of the western coastal hills and mountains of California. Of the 14 records for this species, seven were collected from *Platystemon californicus*, a spring annual from the family Papaveraceae. In a study of the pollination biology of this plant species, four *Andrena angusticrus* pollen loads were examined, and found to contain 99% *Platystemon californicus* pollen (Hannan 1981). It is possible that this bee species is a dietary specialist, but more information is needed to determine the dietary breadth of this species. This species likely nests underground like all other *Andrena* (Danforth et al. 2019), but nests from 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 (J. H. Cane 1981) that serves to both isolate the provision from pathogens in the surrounding soil and to regulate water uptake from the soil atmosphere (James H. Cane and Love 2021). Females provision each cell with a ball of pollen moistened with nectar on which they lay a single egg (Michener 2007). Records of this species come from March through May, with most records from April (Chesshire et al. 2023). Adults are assumed to emerge annually (Danforth et al. 2019).

3. Shrubland

3.4. Shrubland –Temperate

3.8. Shrubland – Mediterranean-type shrubby vegetation

14 Artificial - Terrestrial

14.5 Urban Areas

Use and Trade

This species is not known to be utilized commercially.

Threats

Since 2000, the Southwest U.S. has seen the worst drought in 1,200 years (A. P. Williams, Cook, and Smerdon 2022). Drought can reduce the abundance of flowering plants on a landscape scale, and also reduce pollen and nectar quality (Wilson Rankin, Barney, and Lozano 2020). Drought conditions have been shown to reduce the diversity and abundance of native bees (Minckley, Roulston, and Williams 2013; Hung et al. 2021). Because *Andrena angelesia* has a short adult life stage, emerges in spring, and appears to be a narrow pollen specialist of the plant *Platystemon* which blooms in response to winter rain, it may be at further risk from winter droughts within its range.

This species occurs in California coastal sage scrub habitat, one of California's most threatened vegetation types, which is globally imperiled (NatureServe 2024). This habitat is highly threatened by modification, fragmentation, and loss due to urban and suburban growth. Nearly half of California's residents live in the coastal California counties where this habitat occurs, which is less than 10% of the state's land area (Riordan and Rundel 2013). Less than 20% of this habitat remains (Davis, Stine, and Stoms 1994), and the existing fragments are considered some of most valuable real estate in California. This contributes to considerable development pressure on remaining fragments, and their high real estate value makes their conservation costly. Coastal sage scrub has also been modified significantly in the past 100 years due to exotic annual grass invasion, which has been facilitated by increased wildfire frequency (Minnich and Dezzani 1998; Talluto and Suding 2008). These factors also contribute to a feedback where increased grass cover increases fire frequency, leading to grassland conversion. This habitat conversion may limit the availability of host plants used by *Andrena angusticrus* and alter other abiotic factors important for this species.

Certain aspects of this species' biology may make it more vulnerable to some threats. *Andrena angusticrus* 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 (N. M. Williams et al. 2010). This species may be a dietary specialist, 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).

Threat: Timing: Scope: Severity: Impact Score:

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

Timing: Ongoing

Scope: Majority (50-90%)

Severity: Slow, significant declines

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

Timing: Ongoing

Scope: Majority (50-90%)

Severity: Slow, significant declines

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

Timing: Ongoing

Scope: Minority (<50%)

Severity: Slow, significant declines

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

Timing: Ongoing

Scope: Minority (<50%)

Severity: Slow, significant declines

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

Timing: Ongoing

Scope: Minority (<50%)

Severity: Slow, significant declines

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

Timing: Ongoing

Scope: Majority (50-90%)

Severity: Slow, significant declines

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

Timing: Ongoing

Scope: Minority (<50%)

Severity: Slow, significant declines

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

Timing: Ongoing

Scope: Minority (<50%)

Severity: Slow, significant declines

Conservation Actions

Conservation needs

No known conservation actions are in place for this species. Observations of this species are known from Bureau of Land Management (BLM) 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 existing threats.

Specific conservation needs for this species have not been identified. Because this species occurs in a California coastal sage scrub, which has experienced loss, degradation, and fragmentation, conservation efforts geared toward protecting and restoring this threatened habitat type.

Populations of *Platystemon* should be protected and included in restoration efforts. 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 needs

Surveys targeting this species are needed throughout its range to determine its persistence throughout its historic range. More information is needed about the population status, range limits, habitat, and ecology of this species.

Research Needed

1. Research -> 1.2. Population size, distribution & trends
 - 1.3. Life History and Ecology
 - 1.5. Threats
 - 1.6 Conservation actions
3. Monitoring -> 3.1. Population trends
 - 3.4. Habitat trends

Assessment

Date of assessment (month-day-year): 10/1/2024

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

Reviewer(s):

Contributors(s): 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: **Data Deficient**

Justification:

Andrena angusticrus is a solitary bee species that occurs in the shrublands of the western coastal mountains in California, United States. This species is known from 14 records, all of which are female. There is currently no male description. Using all known records of the species, the extent of occurrence is 40,215 km². The species has not been detected since 1976, therefore it is unclear if it is extant. Since 2013, there has only been 28% of the search effort as was required to detect this species historically, so lack of recent records may be due to insufficient search effort. In part of its range, *Andrena angusticrus* occurs in the California coastal sage scrub, a habitat type that is threatened by loss and modification due to urbanization, exotic species invasion, and altered fire regime. These factors, as well as pesticide exposure and climate change and drought may be acting on the species rangewide. Additionally, *Andrena angusticrus* may be a dietary specialist, using pollen from the plant *Platystemon californicus*, a resource that may become less common or predictable under climate change scenarios. Although this species does not meet the threshold for imperilment due to EOO size, it may be threatened by extinction, especially if it no longer occurs throughout its entire known range. For now, it is assessed as data deficient, but should be re-evaluated after surveys specifically targeting this species are carried out.

NatureServe Specific Text:

For Rank Calculator:

1. Element occurrences (using separation distance of 5,000 m): 11 (B)
 - A. Estimated Number of Element Occurrences Comments: There are limited element occurrences of this species overall, and none since 1976.
2. Population size: Unknown
3. 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
4. Environmental Specificity: B. Narrow. Specialist or community with key requirements common.
 - A. Environmental specificity comments: This species may be a dietary specialist, using pollen from the plant *Platystemon californicus*, which likely restricts its distribution and phenology.
5. 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).
6. 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

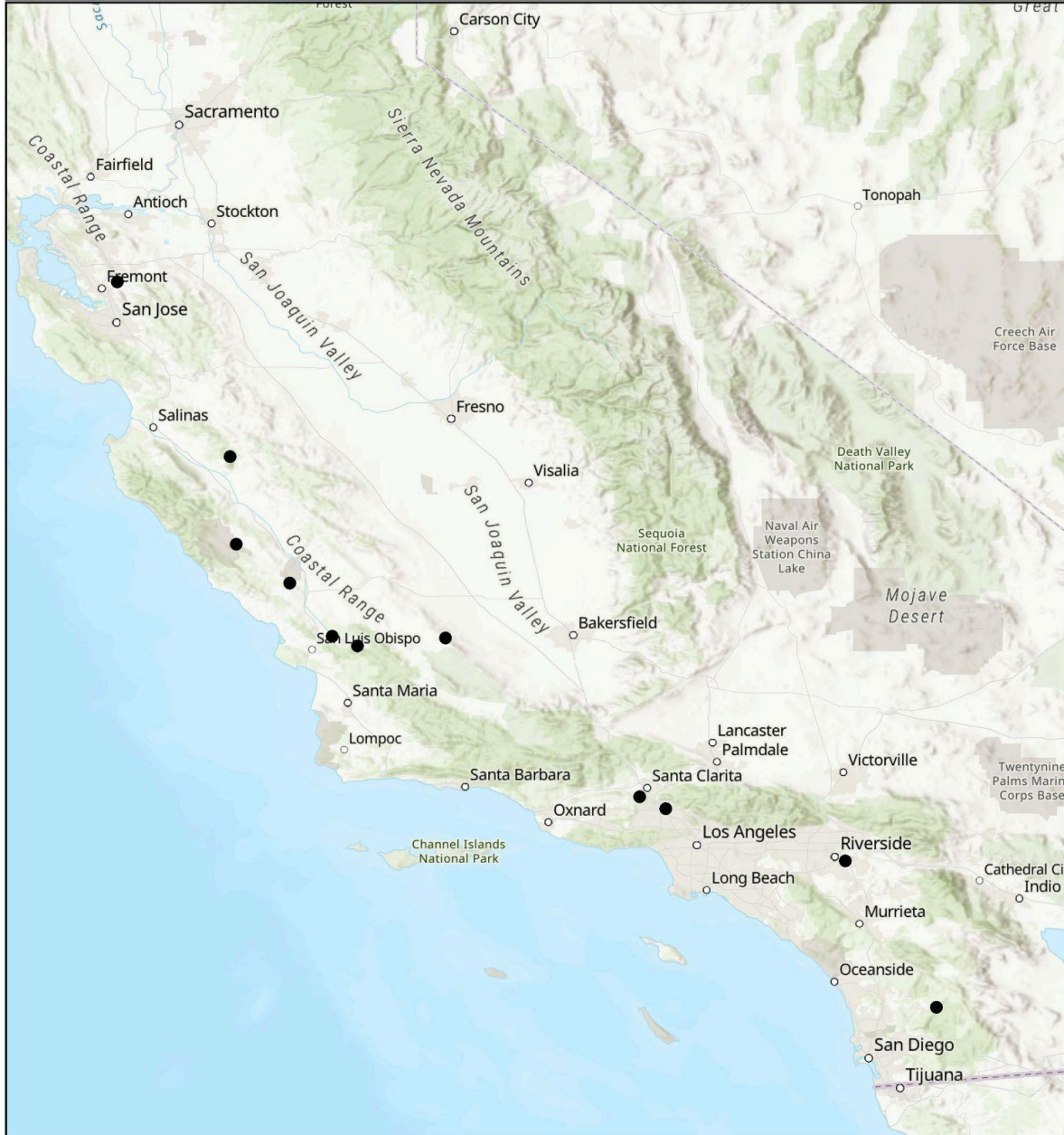
Shrubland/chaparral, Suburban/Orchard

Literature References:

- Brown, Mark J. F., and Robert J. Paxton. 2009. "The Conservation of Bees: A Global Perspective." *Apidologie* 40 (3): 410–16.
- Cane, James H., and Byron G. Love. 2021. "Hygroscopic Larval Provisions of Bees Absorb Soil Water Vapor and Release Liquefied Nutrients." *Apidologie* 52 (6): 1002–16.
- Cane, J. H. 1981. "Dufour's Gland Secretion in the Cell Linings of Bees (Hymenoptera: Apoidea)." *Journal of Chemical Ecology* 7 (2): 403–10.
- Cheshire, Paige R., Erica E. Fischer, Nicolas J. Dowdy, Terry L. Griswold, Alice C. Hughes, Michael C. Orr, John S. Ascher, et al. 2023. "Completeness Analysis for over 3000 United States Bee Species Identifies Persistent Data Gap." *Ecography*, February. <https://doi.org/10.1111/ecog.06584>.
- Danforth, Bryan N., Robert L. Minckley, John L. Neff, and Frances Fawcett. 2019. *The Solitary Bees: Biology, Evolution, Conservation*. Princeton University Press.
- Davis, Frank W., Peter A. Stine, and David M. Stoms. 1994. "Distribution and Conservation Status of Coastal Sage Scrub in Southwestern California." *Journal of Vegetation Science: Official Organ of the International Association for Vegetation Science* 5 (5): 743–56.
- Grab, Heather, Michael G. Branstetter, Nolan Amon, Katherine R. Urban-Mead, Mia G. Park, Jason Gibbs, Eleanor J. Blitzer, Katja Poveda, Greg Loeb, and Bryan N. Danforth. 2019. "Agriculturally Dominated Landscapes Reduce Bee Phylogenetic Diversity and Pollination Services." *Science* 363 (6424): 282–84.
- Hannan, Gary L. 1981. "Flower Color Polymorphism and Pollination Biology of *Platystemon Californicus* Benth. (papaveraceae)." *American Journal of Botany* 68 (2): 233–43.
- Hung, Keng-Lou James, Sara S. Sandoval, John S. Ascher, and David A. Holway. 2021. "Joint Impacts of Drought and Habitat Fragmentation on Native Bee Assemblages in a California Biodiversity Hotspot." *Insects* 12 (2). <https://doi.org/10.3390/insects12020135>.
- Laberge, Wallace E. 1971. "A Revision of the Bees of the Genus *Andrena* of the Western Hemisphere. Part IV. *Scapteropsis*, *Xiphandrena* and *Rhaphandrena*." *Transactions of the American Entomological Society* 97 (3): 441–520.
- Michener, Charles Duncan. 2007. *The Bees of the World*. Vol. 1. JHU Press.
- Minckley, Robert L., T'ai H. Roulston, and Neal M. Williams. 2013. "Resource Assurance Predicts Specialist and Generalist Bee Activity in Drought." *Proceedings. Biological Sciences / The Royal Society* 280 (1759): 20122703.
- Minnich, R., and R. Dezzani. 1998. "Historical Decline of Coastal Sage Scrub in the Riverside-Perris Plain, California." <https://www.academia.edu/download/80941433/p0366-p0391.pdf>.
- Packer, Laurence, Amro Zayed, Jennifer C. Grixti, Luisa Ruz, Robin E. Owen, Felipe Vivallo,

- and Haroldo Toro. 2005. "Conservation Genetics of Potentially Endangered Mutualisms: Reduced Levels of Genetic Variation in Specialist versus Generalist Bees." *Conservation Biology: The Journal of the Society for Conservation Biology* 19 (1): 195–202.
- Potts, Simon G., Jacobus C. Biesmeijer, Claire Kremen, Peter Neumann, Oliver Schweiger, and William E. Kunin. 2010. "Global Pollinator Declines: Trends, Impacts and Drivers." *Trends in Ecology & Evolution* 25 (6): 345–53.
- Raven, Peter H., and David L. Wagner. 2021. "Agricultural Intensification and Climate Change Are Rapidly Decreasing Insect Biodiversity." *Proceedings of the National Academy of Sciences of the United States of America* 118 (2). <https://doi.org/10.1073/pnas.2002548117>.
- Riordan, Erin C., and Philip W. Rundel. 2013. "The Future of California Sage Scrub in an Era of Increasing Urbanization and Global Climate Change." *Fremontia* 41: 2–7.
- Roberts, Stuart, Simon Potts, Koos Biesmeijer, Michael Kuhlmann, William Kunin, and Ralf Ohlemüller. 2011. "Assessing Continental-Scale Risks for Generalist and Specialist Pollinating Bee Species under Climate Change." *BioRisk : Biodiversity & Ecosystem Risk Assessment* 6 (December): 1–18.
- Talluto, Matt V., and Katharine N. Suding. 2008. "Historical Change in Coastal Sage Scrub in Southern California, USA in Relation to Fire Frequency and Air Pollution." *Landscape Ecology* 23 (7): 803–15.
- Williams, A. Park, B. I. Cook, and S. E. Smerdon. 2022. "Rapid Intensification of the Emerging Southwestern North American Megadrought in 2020–2021." *Nature Climate Change* 12 (3): 232–34.
- Williams, N. M., Elizabeth E. Crone, T'ai H. Roulston, Robert L. Minckley, Laurence Packer, and Simon G. Potts. 2010. "Ecological and Life-History Traits Predict Bee Species Responses to Environmental Disturbances." *Biological Conservation* 143 (10): 2280–91.
- Wilson Rankin, Erin E., Sarah K. Barney, and Giselle E. Lozano. 2020. "Reduced Water Negatively Impacts Social Bee Survival and Productivity Via Shifts in Floral Nutrition." *Journal of Insect Science* 20 (5). <https://doi.org/10.1093/jisesa/ieaa114>.
- Wojcik, Victoria A., Lora A. Morandin, Laurie Davies Adams, and Kelly E. Rourke. 2018. "Floral Resource Competition Between Honey Bees and Wild Bees: Is There Clear Evidence and Can We Guide Management and Conservation?" *Environmental Entomology* 47 (4): 822–33.

Andrena angusticrus Records



● *Andrena angustella* records

0 300 600 1,200 Kilometers

Produced by The Xerces Society on 3/26/2024

© The Xerces Society for Invertebrate Conservation 2024

