

# Leafcutter bee deemed possibly extinct rediscovered in a US inland mobile sand dune

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## Introduction

Insect populations worldwide face the impacts of habitat loss and degradation as well as climate and environmental change from anthropogenic activities (Wagner et al. 2021). Consequently, documented declines include reductions in biomass (Hallmann et al. 2017) and species richness (Theng et al. 2020) within local insect assemblages, as well as diminished global range extent (Wood et al. 2019) and population size (Fallon et al. 2021) for individual species. Despite the lack of robust population trend data hindering formal conservation status assessments for most known insect species, the International Union for the Conservation of Nature has deemed 59 insect species globally to be extinct (IUCN 2023), while NatureServe has deemed 177 North American insect species to be “presumed extinct” (GX rank) or “possibly extinct” (GH rank) (NatureServe 2023). Here, we report the rediscovery of a species ranked “possibly extinct” by NatureServe—the solitary leafcutter bee *Megachile parksi* Mitchell (Hymenoptera: Megachilidae), which has not been documented since 1965 (GBIF 2023).

## Results and Discussion

Two adult females of *M. parksi* were collected on 22 June 2022 at Little Sahara State Park (Fig. 1) in Woods County, Oklahoma, USA (Table 1) by KLJH and MEP. VHG and TLG confirmed species-level identification. Both specimens were found on flowers of *Indigofera miniata* Ortega (Fabaceae), along with *Megachile townsendiana* Cockerell and *Nomia fedorensis* Cockerell. These are the first known records of *M. parksi* outside of the state of Texas, USA. The collection site is the largest protected and continuous, inland mobile sand dune in Oklahoma, with at least 181 vascular plant species from 55 families and 145 genera documented in the stabilized and partially stabilized portions (Bowlin Sherwood and Risser 1980). Other plant species observed blooming at the site when the specimens were collected included: *Asclepias arenaria* Torr. (Apocynaceae), *Aphanostephus* cf. *skirrhobasis* (DC.) Trel. ex Coville & Branner, *Croptilon hookerianum* (Torr. & A.Gray) House, *Helianthus petiolaris* Nutt., *Heterotheca stenophylla* (A.Gray) Shinnery, *Gaillardia pulchella* Foug., *Palafoxia sphacelata* (Nutt. ex Torr.) Cory (Asteraceae), *Dimorphocarpa candicans* (Raf.) Rollins (Brassicaceae), *Croton texensis*

(Klotzsch) Müll.Arg. (Euphorbiaceae), *Dalea lanata* Spreng. (Fabaceae), and *Mentzelia nuda* (Pursh) Torr. & A. Gray (Loasaceae).

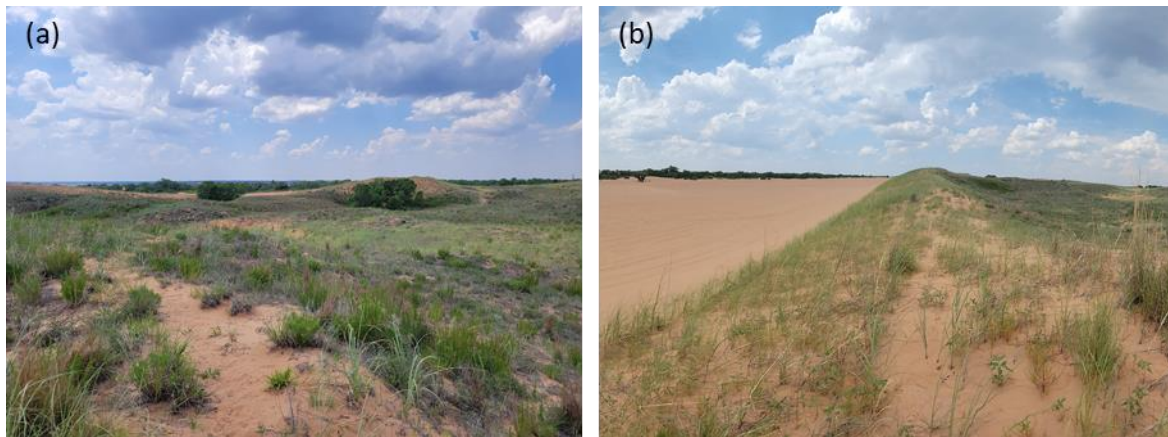


Figure 1. Little Sahara State Park in Woods Co., Oklahoma, where *Megachile parksi* specimens were collected. Panels show (a) stabilized and (b) mobile and partially stabilized portions of the park. Photo credit: KLJ Hung.

We also reviewed publicly available records of *M. parksi*, summarized in Table 1 below, with data accessed from the Global Biodiversity Information Facility (GBIF 2023) as well as from the original species description (Mitchell 1936a) and a subsequent report (Mitchell 1938). These previous records, although scant, provide additional context related to the geographic distribution and known floral associations of *M. parksi*.

Table 1. Known records of *Megachile parksi* from publicly available data and this study.

Source	No. individuals	Date	Locality in USA	Coordinates	Floral association
This study	2	22-Jun-2022	OK: Woods Co.	36.538, -98.879	<i>Indigofera miniata</i>
GBIF	1	28-Jul-1965	TX: Brooks Co.	26.9328, -98.0415	N/A
GBIF	1	10-May-1954	TX: Bastrop Co.	30.2836, -97.2375	<i>Tephrosia virginiana</i>
GBIF	1	7-May-1953	TX: Goliad Co.	28.6681, -97.1244	<i>Gaillardia</i> sp.
Mitchell 1938	1	N/A	TX: "May"	N/A	N/A
Mitchell 1938	1	N/A	TX: "Austin"	N/A	N/A
Mitchell 1936a	1 (type)	18-May-1934	TX: Bexar Co.	N/A	N/A
Mitchell 1936a	1 (paratype)	18-May-1934	TX: Bexar Co.	N/A	N/A
Mitchell 1936a	1 (paratype)	6-May-1934	TX: Bexar Co.	N/A	N/A
Mitchell 1936a	1 (paratype)	N/A	N/A	N/A	N/A

Given existing data on *M. parksi* and documented floral associations of other members of subgenus *Megachiloides*, it appears that *M. parksi* may be a pollen specialist either on Fabaceae, as in *M. integra* Cresson (Fowler 2020) which it superficially resembles, or on Asteraceae, as in *M. manifesta* Cresson, *M. soledadensis* Cockerell, *M. subnigra* Cresson, and *M. wheeleri* Mitchell (Fowler 2020); or possibly both. Analysis of pollen loads from preserved specimens should prove instructive. Additionally, it seems plausible that *M. parksi* depends on exposed

sandy substrates for nesting, similar to several other species in *Megachiloides* (Bohart and Youssef 1972; Eickwort et al. 1981; Gordon 2000). The relatively patchy distribution of loose, mobile sand dunes in the known range of *M. parksi* may, in part, explain its rarity (11 total known specimens, including 2 reported in this study) and the extended period of absence prior to our rediscovery.

The rarity and long absence of *M. parksi* appears typical of species of *Megachile* in the subgenus *Megachiloides*. Among the 20 species of *Megachile* deemed “possibly extinct” by NatureServe, 17 belong to this subgenus (NatureServe 2023), constituting approximately 30% of *Megachiloides* species and approximately 13% of all *Megachile* species known to North America. One possible explanation for this pattern is the dearth of taxonomic revision of most members of this subgenus, with a large portion of species described only from one sex (Mitchell 1936a, b). To date, few such cases have been subsequently associated as the same species (Raw 2002; Sheffield et al. 2011). A second explanation that does not preclude the first is that the uncharacteristic life history of this subgenus—including a preponderance of pollen diet specialists and nesting substrate specialists (perhaps especially of open, sandy substrates)—may have predisposed species of *Megachiloides* both to undercollecting and to population declines in the face of habitat loss and environmental change. Thus, future endeavors to document *Megachiloides* species currently deemed “possibly extinct” or data-deficient (NatureServe rank GU, i.e., “unrankable”) may benefit from targeted surveys of intact habitat with exposed sandy substrates. Given that species in the genus *Megachile* are among the most imperiled North American insect groups that have thus far been comprehensively assessed (Young et al. 2016), efforts to rediscover, monitor, and/or preserve species of *Megachiloides*—the most speciose subgenus of *Megachile* in North America—may be especially important for protecting the extant diversity of *Megachile*.

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### **Declarations**

Competing interests: We declare that there are no competing interests.

Availability of data and material: All data are presented in Figure 1 of this study. *Megachile parksi* specimens collected in this study are currently housed at the Oklahoma Biological Survey Invertebrate Collection.

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