

***Bombus franklini* Frison, 1921**  
**Franklin's Bumble Bee**  
**(Hymenoptera: Apidae: Apinae: Bombini)**

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## SUMMARY

Known only from southern Oregon and northern California between the Coast and Sierra-Cascade Ranges, Franklin's Bumble Bee has the most restricted range of any bumble bee in the world. Its entire distribution can be covered by an oval of about 190 miles north to south and 70 miles east to west. However, there has been a precipitous decline in numbers and localities of occurrence since 1998. No Franklin's Bumble Bee were observed during surveys in 2004. Threats include: 1) Exotic diseases introduced via trafficking in commercial bumble bee queens and colonies for greenhouse pollination of tomatoes; 2) Habitat loss due to destruction, degradation, conversion; and 3) Pesticides and pollution.

### CONSERVATION STATUS

**Xerces Red List Status: Critically Imperiled (Possibly Extinct)**

#### Other Rankings:

Canada – Species at Risk Act:	N/A
Canada – provincial status:	N/A
Mexico:	N/A
USA – Endangered Species Act:	Species of Concern
USA – state status:	None
NatureServe:	GNR
IUCN Red List:	N/A

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## SPECIES PROFILE

### DESCRIPTION

**Queens & workers:** Face round with area between bottom of compound eye and base of mandible (= malar space) shorter than wide; hair predominantly black with some shorter light hairs intermixed above and below antennal bases. Hair on top of head (= vertex) yellow. Hair of thorax (= mesosoma) on anterior two-thirds above (= scutum) yellow extending rearward laterally inside and beyond the wing bases (= tegulae) to rear third (= scutellum), but interrupted medioposteriorly by inverted U-shaped patch of black; hair on

posterior third above (= scutellum) black; hair of thorax laterally (= mesopleura black, except for small patch of yellow in upper anterior corner in area of pronotal lobes. Hair of abdomen (= metasoma) black except for whitish or silvery hair at sides and apex of 5<sup>th</sup> plate above (= tergum 5, = T-5).

**Males:** As for female, except malar space as long as wide, face below antennae with predominantly yellow hair, and T-6 with some pale hair laterally.

*Bombus franklini* is readily distinguished from other bumble bees in its range by the extended yellow on the anterior thorax, lack of yellow on the abdomen, and predominantly black face with yellow on top of the head. Other bumble bees with similar color patterns in the range of *B. franklini* have the yellow extending back to the wing bases or only slightly beyond and usually have one or more bands of yellow on the middle or slightly behind the middle of the abdomen (most on T-4). Females of most species listed below have yellow hair on the face, in contrast to black on *B. franklini*. Females of *B. occidentalis* and *B. californicus* that have black hair on the face also have black hair on the vertex in contrast to the yellow hair on the vertex in *B. franklini*. Females of *B. californicus* have a long face in contrast to the round face of *B. franklini* and *B. occidentalis*.

Sympatric bumble bees that might be confused with *B. franklini* include:

*Bombus (Bombus) occidentalis* Greene  
*Bombus (Fervidobombus) californicus* Smith  
*Bombus (Psithyrus) insularis* (Smith)  
*Bombus (Psithyrus) fernaldae* Franklin  
*Bombus (Pyrobombus) caliginosus* (Frison)  
*Bombus (Pyrobombus) vandykei* (Frison)  
*Bombus (Pyrobombus) vosnesenskii* Radoszkowski

Keys to and illustrations of color patterns of *B. franklini* and species that might be confused with it are presented in Thorp et al. (1983).

#### **TAXONOMIC STATUS**

*Bombus franklini* Frison, 1921.

Questions as to the taxonomic status of *Bombus franklini* as a valid species taxon were raised by Milliron (1971). Without presenting any evidence for his taxonomic decision, Milliron (1971) placed *B. franklini* in synonymy under *B. occidentalis* Greene and then placed *B. occidentalis* in synonymy as a subspecies of the northern and eastern *B. terricola* Kirby on the basis of presumed overlapping color variation. If this action were accepted, *B. franklini* would have no taxonomic status at all. This question has been addressed through studies of morphometrics by Plowright and Stephen (1980), the lack of intergradation (color/morphological) in areas of sympatry with *B. occidentalis* by Thorp et al. (1983), structure of the male genitalia by Williams (1991), and genetics (allozymes) by Scholl et al. (1992). All three studies between 1980 and 1992, concluded that *B. franklini* was indeed a valid species and very distinct from *B. occidentalis*. It appears to

be most closely related to *B. tunicatus* Smith of Asia and *B. affinis* Cresson of eastern North America (Williams 1991, A. Bertsch personal communication).

The original description by Frison (1921) was based on two queens sent to him by a commercial collector, E. J. Oslar and labeled by Oslar as having been collected at Nogales, Arizona in July 1917. Subsequently, Frison (1923) found additional specimens in the collections of the U.S. National Museum from “Oregon” (without more specific locality data) collected by C. F. Baker which he designated as a worker “Morphotype” and a male “Allotype.” Thus, producing an enigmatic disjunct distribution if the locality records were all valid. In 1926, Frison published additional records of one worker each from Roseburg and Gold Hill, Oregon collected by H. A. Scullen. The same two records were published by Scullen (1927).

Subsequently, evidence was marshaled by Thorp (1970) to dispute the putative Arizona records of *B. franklini* and to propose Gold Hill, Jackson County, Oregon as a more realistic type locality. Evidence included finding specimens of many other west coast bumble bee species labeled by Oslar as having been collected in southern Arizona about the same time, but representing a great disjunction for each of the species. Field studies by R. W. Thorp also failed to turn up *B. franklini* or of any of the other dozen species of bumble bees also labeled by Oslar as having been collected in southern Arizona. This is supported by evidence presented on species of *Andrena* by LaBerge (1980, 1986) and the lack of specimens from the area in major bee collections (J. Ascher, personal communication).

### **LIFE HISTORY**

Franklin’s Bumble Bee is a typical primitively eusocial bumble bee. Females are generalist foragers for pollen, especially from lupine (*Lupinus*) and California poppy (*Eschscholzia*), and for nectar, especially from horsemint (*Agastache*) and mountain penny-royal (*Monardella*). They may collect both pollen and nectar from vetch (*Vicia*) and rob nectar from it (P. Schroeder personal communication). Its nesting biology is unknown, but it probably nests in abandoned rodent burrows as is typical for other members of the subgenus *Bombus* sensu stricto (Hobbs 1968). Its flight season is from mid-May to the end of September (Thorp et al. 1983).

### **DISTRIBUTION**

Franklin’s Bumble Bee has the most limited geographic distribution of any bumble bee in North America and possibly the World (Williams 1998). It is known only from southern Oregon and northern California between the Coast and Sierra-Cascade Ranges. Stephen (1957) recorded it from the Umpqua and Rogue River Valleys of Oregon. Thorp et al. (1983) also recorded it from northern California and suggested its restriction to the Klamath Mountain region of southern Oregon and northern California. Its entire distribution, including recent range extensions (Thorp unpublished), can be covered by an oval of about 190 miles north to south and 70 miles east to west between 122° to 124° west longitude and 40° 58’ to 43° 30’ north latitude. It is known from Douglas, Jackson, and Josephine counties in Oregon and Siskiyou and Trinity counties in California.

Elevations of localities where it has been found range from 540 feet (162 m) in the north to above 7800 feet (2340 m) in the south of its historic range.

### **THREATS**

Threats include: 1) Exotic diseases introduced via trafficking in commercial bumble bee queens and nests for greenhouse pollination of tomatoes (Thorp 2003, Thorp et al. 2003); 2) Habitat loss due to destruction, degradation, conversion; and 3) Pesticides and pollution.

At least two of the disease organisms mentioned under Research Needs are known to occur in commercially produced bumble bee colonies and have been introduced from Europe into Japan (Goka et al. 2000; Goka et al. 2001; Niwa et al. 2004). It is likely that the *Nosema* outbreak in commercial bumble bee production facilities in the North America reported in 1998 (Flanders et al. 2003) is also responsible for the severe declines seen in *B. franklini* and *B. occidentalis* since that time from central California to southern British Columbia (R.W. Thorp unpublished data). Declines of the other two species of *Bombus* sensu stricto in eastern North America, *B. affinis* and *B. terricola*, (J. Ascher personal communication) probably have the same root cause. (See Red List profiles for these two bees for more details.)

### **CONSERVATION STATUS**

There has been a precipitous decline in numbers and localities of occurrence since 1998. No *B. franklini* were observed during surveys in 2004 (R.W. Thorp unpublished).

Evidence for this decline is based on intensive and extensive surveys, primarily by me (R.W. Thorp unpublished) from 1998 through 2004 with variable assistance from others. I revisit historic *B. franklini* sites each year, and in addition many sites throughout its range where it might be expected to occur. Over the first three years, *B. franklini* was found at seven new sites, some extending the perimeter of the range, but only up to 10 miles in any direction. During each of the past six years I surveyed from 9 to 17 historic sites (average 13.8 sites) with an average of 30.7 visits per year. I also surveyed from 6 to 19 additional sites (average 12.8 sites) each year, some of which were visited more than once in a year and some were revisited in different years. Most of these sites have not become unsuitable habitat as evidenced by the constant abundance of other bumble bee species.

Originally, U.S. federal listings of rare and endangered species classed *B. franklini* as a “Category 2” Candidate Species about which more information was needed before it could be considered for listing. This status was based on the recognition of the narrow endemism of the species and the lack of knowledge on the specific biological characteristics, habitat requirements, potential threats to its existence, and other critical parameters that affect the persistence and viability of its populations. Data were never gathered to document whether or not this species should be proposed for listing. It is currently considered to be a “Species of Concern” or a “Special Status Species” by U.S. Fish and Wildlife Service, Bureau of Land Management, Oregon Department of Fish and Wildlife, and California Department of Fish and Game.

Franklin's Bumble Bee has no legal protection under the U.S. Endangered Species Act and neither Oregon nor California allows listing of insects under their respective state endangered species statutes.

#### **CONSERVATION NEEDS**

*Bombus franklini* habitat should be protected. Habitat should include plentiful food (pollen and nectar resources such as *Lupinus*, *Eschscholzia*, *Agastache*, *Monardella*, *Vicia*), abandoned rodent burrows in which to nest, and probably proximity to water sources (lakes, rivers, streams, seeps) for prolongation of flowering season of plant food sources.

All efforts should be made to prevent the spread of disease from commercially reared and managed bumble bee colonies to native populations.

#### **RESEARCH NEEDS**

To monitor; sample; and make population estimates of extant populations of *B. franklini*. To understand the pathology and control of *Nosema bombi* [Microsporidia] and other potential disease organisms (such as *Locustacrus buchneri* [Acarina] and *Crithidia bombi* [Protozoa]). To understand the virulence and cross-infectivity of strains of these disease organisms, especially *Nosema bombi*, between commercially reared bumble bees and bumble bee species in the wild to better assess the ecological risks of trafficking in these managed crop pollinators.

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## **RESOURCES**

#### **CONTACTS**

U.S. Fish & Wildlife Service: Brendan White, Oregon Fish & Wildlife Office, 2600 SE 98<sup>th</sup> Avenue, Suite 100, Portland, OR 97266. Telephone: (503) 231-6179; email: Brendan\_White@r1.fws.gov.

University of California at Davis: Dr. Robbin Thorp, Department of Entomology, One Shields Avenue, Davis, CA 95616-8584. Telephone (530) 752-0482; email: rwthorp@ucdavis.edu.

#### **REFERENCES**

Flanders, R. V., W. F. Wehling, and A. L. Craghead. 2003. Laws and regulations on the import, movement, and release of bees in the United States. Pp. 99-111. In: K. Strickler and J. H. Cane (eds.). *For nonnative crops, whence pollinators of the future?* Thomas Say Publications in Entomology: Proceedings. Entomological Society of America, Lanham, MD. (204pp.)

Frison, T. H. 1921. New distribution records for North American Bremidae, with the description of a new species (Hym.) *Entomol. News* 32:144-148.

- Frison, T. H. 1923. Systematic and biological notes on bumblebees (Bremidae; Hymenoptera). *Trans. Amer. Entomol. Soc.* 48:307-326.
- Frison, T. H. 1926. Descriptions and records of North American Bremidae together with notes on the synonymy of certain species (Hymenoptera). *Trans. Amer. Entomol. Soc.* 52 (No. 892): 129-145.
- Goka, K., K. Okabe, S. Niwa, and M. Yoneda. 2000. Parasitic mite infection in introduced colonies of European bumblebees, *Bombus terrestris*. *Japanese J. Appl. Entomol. Zool.* 44:47-50 (in Japanese with English abstract).
- Goka, K., K. Okabe, M. Yoneda, and S. Niwa. 2001. Bumblebee commerce will cause worldwide migration of parasitic mites. *Mol. Ecol.* 10:2095-2099.
- Hobbs, G. A. 1968. Ecology of species of *Bombus* (Hymenoptera: Apidae) in southern Alberta. VII. Subgenus *Bombus*. *Canadian Entomol.* 100(2):156-164.
- LaBerge, W. E. 1980. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part X. Subgenus *Andrena*. *Trans. American Entomol. Soc.* 106:395-525.
- LaBerge, W. E. 1986. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part XI. Minor subgenera and subgeneric key. *Trans. American Entomol. Soc.* 111:441-567.
- Milliron, H. E. 1971. A monograph of the Western Hemisphere bumblebees. I. The genera *Bombus* and *Megabombus* subgenus *Bombias*. *Entomol. Soc. Canada, Mem.* 82:1-80.
- Niwa, S., H. Iwano, S. Asada, M. Matsuurra, and K. Goka. 2004. A microsporidian pathogen isolated from a colony of the European bumblebee, *Bombus terrestris*, and infectivity on Japanese bumblebee. *Japanese J. Appl. Entomol. Zool.* 48:60-64 (in Japanese with English abstract).
- Plowright, R. C. and W. P. Stephen. 1980. The taxonomic status of *Bombus franklini* (Hymenoptera: Apidae). *Canad. Entomol.* 112:475-479.
- Scholl, A., R. W. Thorp, and E. Obrecht. 1992. The genetic relationship between *Bombus franklini* (Frison) and other taxa of the subgenus *Bombus* s. str. (Hymenoptera: Apidae). *Pan-Pacific Entomologist* 68:46-51.
- Scullen, H. A. 1927. Bees belonging to the family Bremidae taken in western Oregon, with notes. *Pan-Pac. Entomol.* 4(2):69-76, 121-128.
- Stephen W. P. 1957. *Bumble bees of western America (Hymenoptera: Apoidea)*. Oregon State College Agr. Exp. Sta.: Tech. Bull. No. 40. 163pp.

Thorp, R. W. 1970. The type locality of *Bombus franklini* and notes on putative Arizona records of other Bombini (Hymenoptera: Apidae). *Pan-Pacific Entomologist* 46:177-180.

Thorp, R. W. 2003. Bumble bees (Hymenoptera: Apidae): commercial use and environmental concerns. Pp. 21-40. In: K. Strickler and J. H. Cane (eds.). *For nonnative crops, whence pollinators of the future?* Thomas Say Publications in Entomology: Proceedings. Entomological Society of America, Lanham, MD. (204pp.)

Thorp, R. W., D. S. Horning, Jr., and L. L. Dunning. 1983. Bumble bees and cuckoo bumble bees of California. *Bulletin of the California Insect Survey* 23:1-79.

Thorp, R. W., P. C. Schroeder, and C. S. Ferguson. 2003. Bumble bees: Boisterous pollinators of native California flowers. *Fremontia* 30(3-4):26-31 [Jul/Oct 2002 distributed May 2003].

Williams, P. H. 1991. The bumble bees of the Kashmir Himalaya (Hymenoptera: Apidae, Bombini). *Bull. Natur. Hist. Mus. London (Ent.)* 60(1):1-204.

Williams, P. H. 1998. An annotated checklist of bumble bees with an analysis of patterns of description (Hymenoptera: Apidae, Bombini). *Bull. Natur. Hist. Mus. London (Ent.)* 67(1):79-152.

#### WEBSITES

U.S. Fish & Wildlife Service, Sacramento Fish & Wildlife Office; Animal Species of Concern.

[http://sacramento.fws.gov/es/spp\\_lists/animal\\_sp\\_concern.cfm](http://sacramento.fws.gov/es/spp_lists/animal_sp_concern.cfm)

(Accessed 1/3/05)

U.S. Fish and Wildlife Service, Oregon Fish & Wildlife Office; Species of Concern in Oregon.

<http://oregonfwo.fws.gov/EndSpp/Documents/SOC.pdf>

(Accessed 1/3/05)

California Department of Fish and Game, Natural Diversity Data Base (June 1999).

[http://www.dfg.ca.gov/Endangered/special\\_animals.html](http://www.dfg.ca.gov/Endangered/special_animals.html)

(Accessed 1/3/05)

Invertebrates on Special Animals list

<http://www.dfg.ca.gov/Endangered/invert.html> (Accessed 1/3/05)

Oregon Natural Heritage Program; Threatened and Endangered Invertebrates.

[http://oregonstate.edu/ornhic/T&E\\_Inverts.pdf](http://oregonstate.edu/ornhic/T&E_Inverts.pdf)

(Accessed 1/3/05)

NatureServe.

<http://www.natureserve.org/explorer/>

(Accessed 1/3/05)

University of California at Berkeley, Essig Museum of Entomology; California's Endangered Insects: Franklin's Bumblebee.

<http://essig.berkeley.edu/endins/bombfrnk.htm>

(Accessed 1/3/05)

Natural History Museum (London), Department of Entomology; *Bombus* database.

<http://www.nhm.ac.uk/entomology/bombus/index.html>

(Accessed 1/3/05)

*Bombus franklini* information

<http://www.nhm.ac.uk/entomology/bombus/bo.html#franklini> (Accessed 1/3/05)

*Bombus sensu stricto* male genitalia

[http://www.nhm.ac.uk/entomology/bombus/Bo/mg\\_bo.html](http://www.nhm.ac.uk/entomology/bombus/Bo/mg_bo.html) (Accessed 1/3/05)