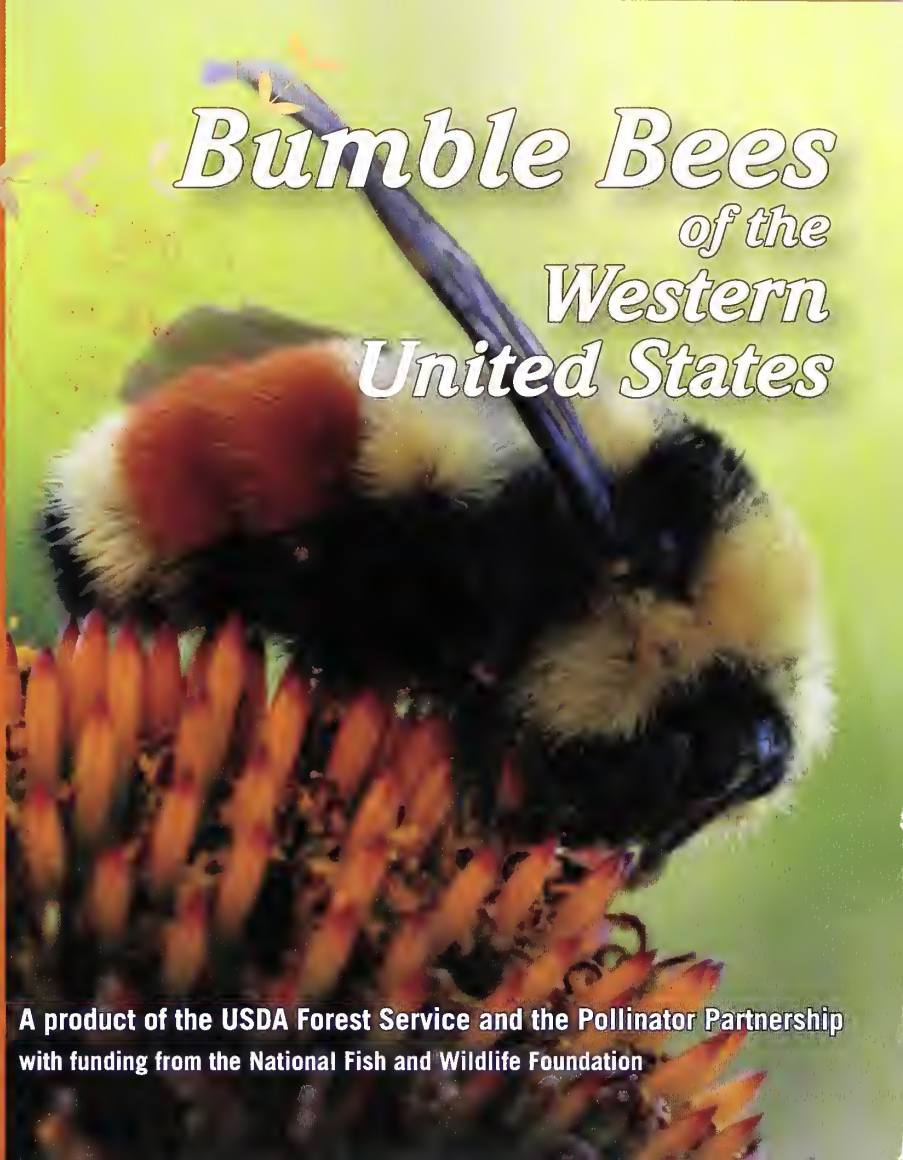

Bumble Bees of the Western United States

By

Jonathan Koch

James Strange

Paul Williams

A product of the USDA Forest Service and the Pollinator Partnership
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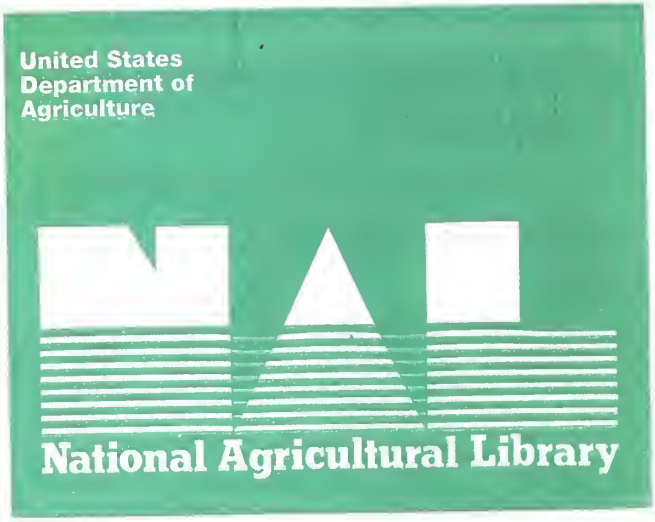

Cover. *Bombus huntii* foraging.
Photo Leah Lewis

ce to Species

Guide to Bumble Bees of the Western United States

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Foreword

Bumble bees are among the most important and conspicuous of native pollinators, both for wildflowers and agriculture, yet they are not well known by non-scientists. This is in part because there have not been accessible field guides for identifying them. This situation was recently remedied for the eastern U.S., with the publication of *Bumble Bees of the Eastern United States*. Now residents of the western U.S. have access to a similarly valuable resource, with the appearance of this new guide to *Bumble Bees of the Western United States*.

Bumble bees have been the subject of many important ecological studies in the western U.S., including research on foraging behavior, floral resource competition, and pollination. They have also provided some of the first information about how altitudinal distributions of animals are changing due to the changing climate (moving up hundreds of meters in the Colorado Rocky Mountains since the 1970s). This guide will be a valuable resource for scientists conducting these kinds of research involving bumble bees.

A growing audience for information about bumble bees are people interested in their value as pollinators of commercial crops of fruits and vegetables, as well as backyard gardens. The information about the tongue length of each species may help growers figure out what the most economically valuable species are for their particular crops, and the ability to identify different species will help to develop appreciation for them.

The growing audience of people who are interested in natural history will also find this guide a valuable resource. The ability to identify bumble bees is a challenging skill to develop, but the information and photographs in the guide will help facilitate this goal. People who develop this skill will be valuable collaborators for scientists seeking to refine our knowledge about the distribution and abundance of bumble bees.

Unfortunately several bumble bee species are also the subject of concern by conservation biologists and growers. In California and Oregon, *Bombus franklini* may be on the brink of extinction, while *Bombus occidentalis* is experiencing dramatic declines in abundance and range. This is most likely due to the introduction of some European parasites and diseases during the international commercial trade in bumble bees for their use in greenhouse pollination of plants such as tomatoes. This guide will hopefully help both non-scientists and scientists track the distribution and abundance of these important pollinators, providing valuable information about their conservation status.

David Inouye, Ph.D.

Co-author of *Techniques for Pollination Biologists*,
and a long-time bumble bee researcher

About the Authors

Jonathan B. Koch M.S. is a graduate student at Utah State University in Logan, Utah where he studies bumble bee decline and conservation biology. He applied species distribution modeling techniques and geographic information systems (GIS) to specimen data from natural history collections during his Master's program to estimate distributional changes of western bumble bees. His extensive mapping experience is reflected in this guide. Jonathan is now working towards his Ph.D. studying the evolution and ecology of the bumble bees of the intermountain west.
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James P. Strange Ph.D. is a Research Entomologist with the USDA-ARS Pollinating Insect Research Unit in Logan, Utah where he conducts research on various aspects of bumble bee biology. He focuses on the conservation of declining bumble bee species as well as the domestication and breeding of bumble bees for commercial pollination. His current research interests include bumble bee hibernation and the genetic diversity of populations in fragmented habitats.
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Paul Williams Ph.D. studied the distribution and decline of British bumble bees for a Ph.D. at Cambridge University in 1985. Since then he has continued to work on this as a Research Entomologist at the Natural History Museum, London, United Kingdom, but is looking increasingly at bumble bee ecology and systematics worldwide, with field sites in North America, the Himalaya, and China. Larger taxonomic publications have included faunal revisions of the bumble bees of Kashmir and recently on the bumble bees of the Sichuan, a world checklist of bumble bee species, and a series of papers on bumble bee phylogeny and subgenera.
Overview: www.nhm.ac.uk/bombus
Publications on bumble bees: www.nhm.ac.uk/bombus/publications.html

Authors are listed in alphabetical order. Each contributed equally.

What are Bumble Bees?

There are over 3,000 described bee species in the United States, and all but a handful are native to North America. Of these, about 40 species belong to the genus *Bombus*, these are the bumble bees. Bumble bees are corbiculate (they have pollen baskets on their hind legs) social bees that live and work in colonies headed by a single queen who is the mother of all the other nest residents. Cuckoo bumble bees in the subgenus *Psithyrus* are parasites that invade the nests of other bumble bee species, kill the resident queen, and use the existing worker force to rear their young. Relative to other bees, bumble bees have large bodies, although body size in some species can vary greatly from workers to queens. They are generally furrier than most other bees and have other physiological adaptations that allow for flight in cold and cloudy conditions when other bees are inactive.

Classification: Animalia > Arthropoda > Insecta > Hymenoptera > Apidae > *Bombus*

There are currently about 250 described bumble bee species worldwide. There is considerable morphological, physiological, and behavioral diversification in the genus, and currently 15 subgenera are recognized. Of importance for identification, the color pattern of their pubescence (i.e. hair) is perhaps the most easily recognized and widely used trait. However, this trait can be confusing, especially for the beginner, as it can vary greatly within a species, so other traits must be considered as well. Some bumble bee species have evolved longer faces and tongues to extract nectar from flowers with long corollas; whereas others have evolved shorter faces and tongues to extract nectar from flowers with short corollas. This morphological character provides a primary separation of several groups and is relatively easy to diagnose with a hand lens and a little practice. Other informative morphological characters include the location of the ocelli (simple eye) relative to the supraorbital line (page 12), as well as the presence of a spine on the mesobasitarsus. Thus, the best approach in identifying a bumble bee to species is to consider multiple traits, as color mimicry is common and some species can look nearly identical, especially when flying.

Color plates of male bumble bees are provided, but hair coloration in males is not the most reliable character. Thus questionable identifications of a male may require an expert as the main morphological differences are found on the male genitalia.

Habitat

While they are closely related to the non-native European honey bee (*Apis mellifera*), bumble bees do not produce commercial quantities of honey, and are used less often in commercial pollination. However, bumble bees are arguably more important in the pollination of native flowers in natural ecosystems of the United States, and have evolved in a broad array of habitats, from the Puget Sound in Washington to the deserts of the Southwest.

As a genus, bumble bees inhabit temperate regions worldwide and several species are even known from the equatorial regions of the Neotropics. However, bumble bees dominate the pollination landscape in northern climates. They are important in boreal forests, cold prairies, coastal plains, and mountain habitats. Their ability to survive in cold climates makes them the primary pollinators of alpine flowering plants and some of the few organisms that can survive in an arctic environment or at high elevations where temperatures drop well below freezing in the winter.

When looking for bumble bees it is best to go to where flowers are blooming. Do not expect to find a nest as they are often underground in abandoned rodent burrows; instead focus on bumble bees visiting flowers. In forested areas, we most commonly encounter bumble bees along stream courses, in meadows, recently burned or logged areas, or on flowers by roadsides. Each different micro-habitat provides different resources and a greater chance to encounter a new species of bumble bee. For example in Cache Valley, Utah we find several species of bumble bees in the agricultural fields at the valley floor (1400m or 4600'), another group of species in the mountain canyons of the Cache National Forest (1500-2500m or 5000'-8000') and a third group of species in the high meadows (above 2500m or 8000'). Furthermore, we find that two field sites at the same elevation located 1km apart can have very different fauna if the flowering plants in bloom are different.

Bombus terarius foraging on Asteraceae.

Diet

Bumble bees are generalist foragers, feeding on a diverse suite of pollen and nectar resources. In the course of foraging for floral resources for the nest, an individual bumble bee will move pollen within a plant (for self-fertile plants), or from one plant to another (for out-crossing plants), affecting pollination success. For the bumble bee this is incidental but ecologically important nonetheless. The bumble bee collects extra pollen and consumes nectar which it transports back to the nest to feed the developing larval bees. A nearly constant supply of dietary resources is critical to colony growth and development. In the laboratory a nest of 100 bumble bees will consume nearly 2g of pollen and over 40ml of sugar syrup a day requiring nearly constant foraging. The nests of some species have been observed to reach a size of over 1000 individuals, while other species rarely exceed 50 individuals. The available floral resources in a habitat will determine what type of bumble bee species can survive in an area as well as the density of nests an ecosystem can support.

Bumble bees are important pollinators of wild land plants and are the primary pollinators for crops in greenhouses. Bumble bees are especially effective at pollinating plants in the nightshade family (Solanaceae) which includes pepper, tomato, and eggplant. While these plants are self-fertile, they benefit from bumble bee visits which help release pollen within the flowers. In addition many berry (blueberry, cranberry, currant, and raspberry), fruit (apricot, apple, melon, and squash), and seed crops (alfalfa, clover, and onion) are benefitted by bumble bees.

Bombus huntii foraging on *Echinacea sp.*

Life Cycle

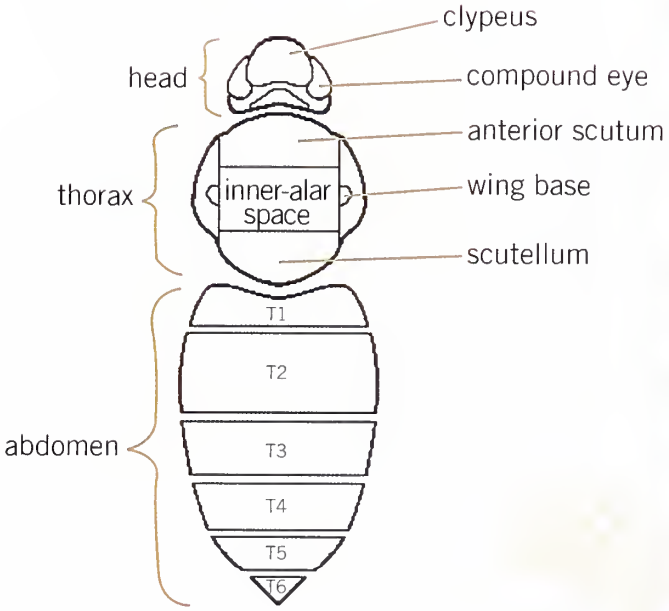
Bumble bees are considered primitively eusocial because they form colonies founded by a solitary queen in the spring of each year. A queen lives only one year, but some species can produce over a thousand offspring in that time. The solitary queen typically overwinters in the ground in a small cavity she excavated termed a hibernaculum. As the snow melts and the soil warms in the spring, the queen emerges and begins flying around looking for a nest site, while stopping to feed on nectar-producing flowers. Most bumble bees nest in the ground in cavities such as abandoned rodent burrows, holes in building foundations, or stacks of firewood. Once the queen finds a suitable site, she will begin preparing the nest space by building a small wax cup, called a honey pot, and collects pollen which she will use to feed her developing brood. When the nest is sufficiently provisioned, she will lay eggs on the pollen lump and begin incubating the eggs by laying her abdomen over the brood to keep the eggs or larvae warm. At this point the queen remains in the nest unless she needs to collect more food. Nearly four weeks after laying the first eggs her first workers will emerge as adults and begin the jobs of foraging, nest cleaning, and brood care. The colony will grow throughout the summer and the workers will help the queen produce a clutch of male offspring, followed soon by new queen bees. These reproductive bees will leave the nest and find mates. After mating, the males die and the queens feed briefly before digging their individual hibernacula and become dormant for the winter. Each species is a little different in optimal colony conditions, the size of the colony, the number of new queens they produce, and the seasonality (phenology) of these events.

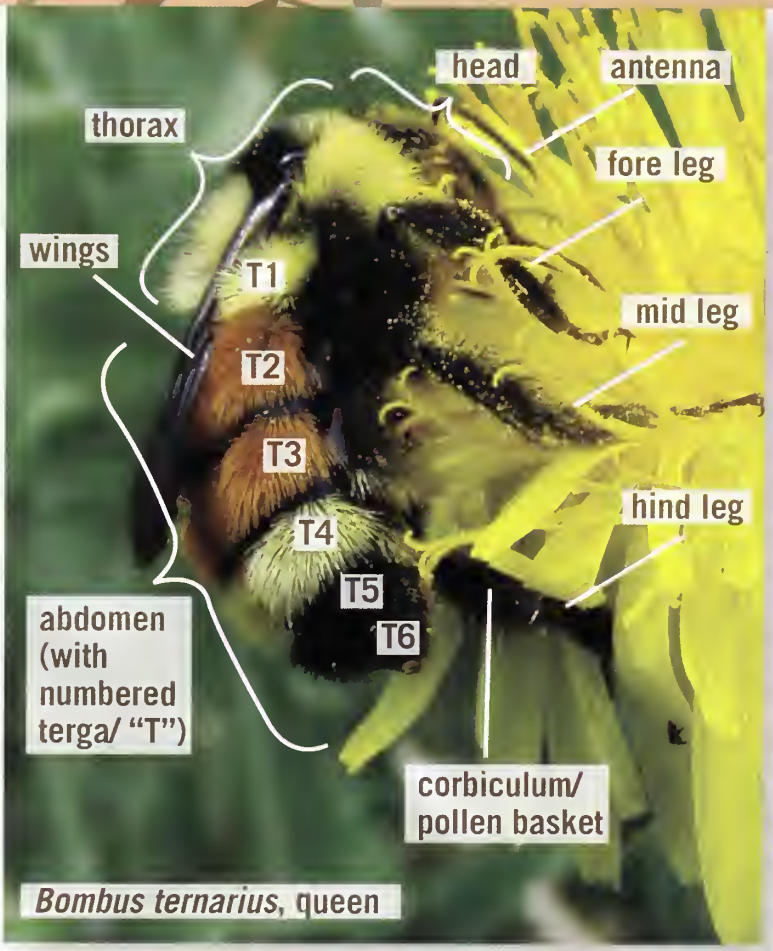
Bees and Allergies

About 3% of adults are truly allergic to bee stings. For most of these people, a sting will result in hives, itching and swelling (not just at the sting site, but everywhere) and, rarely, anaphylactic shock. It is a good idea to keep an EpiPen® on hand if you are handling bumble bees. Most bee stings can be treated with ice and an antihistamine, if needed. For more information about ways to avoid stings, please visit http://www.pollinator.org/nappc/brochures.htm for the NAPPC publication *No Fear!*

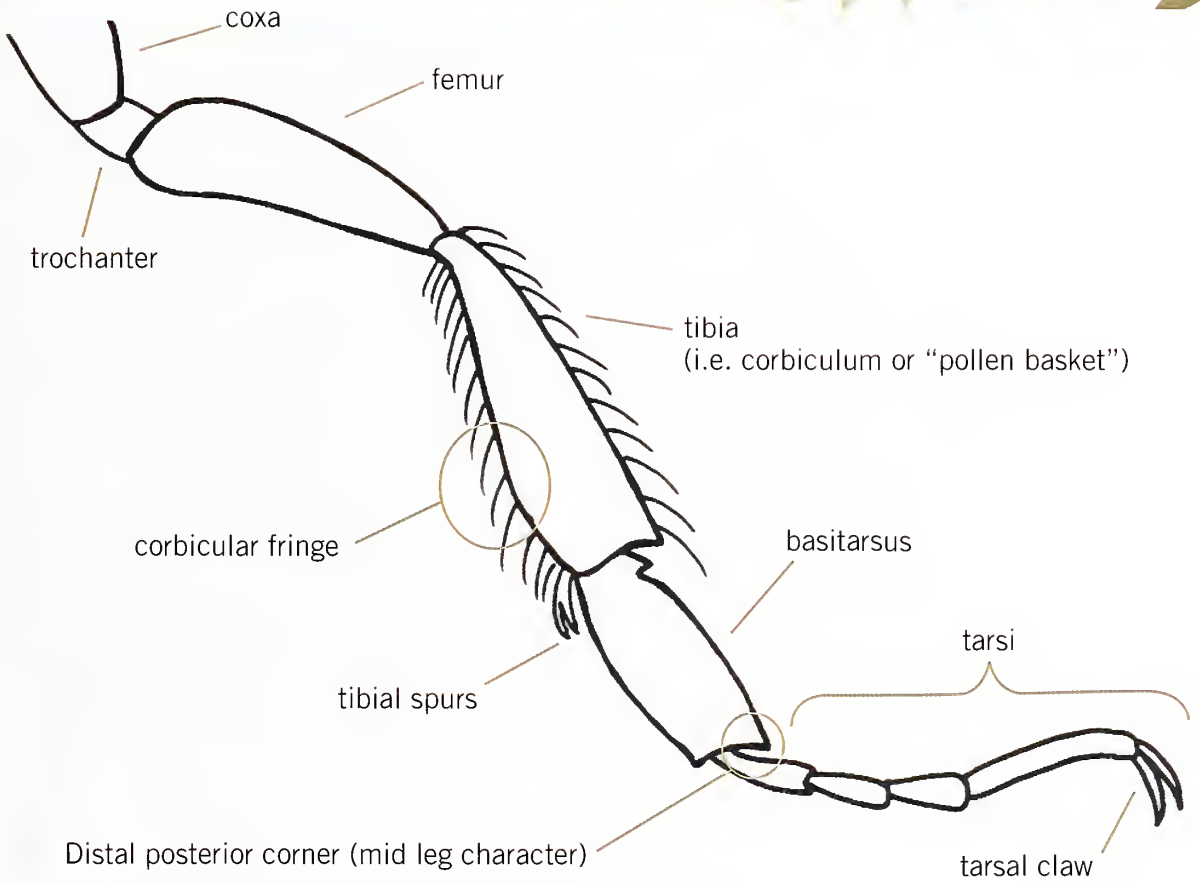
Bombus griseocollis nest.

Bumble Bee Body Diagram

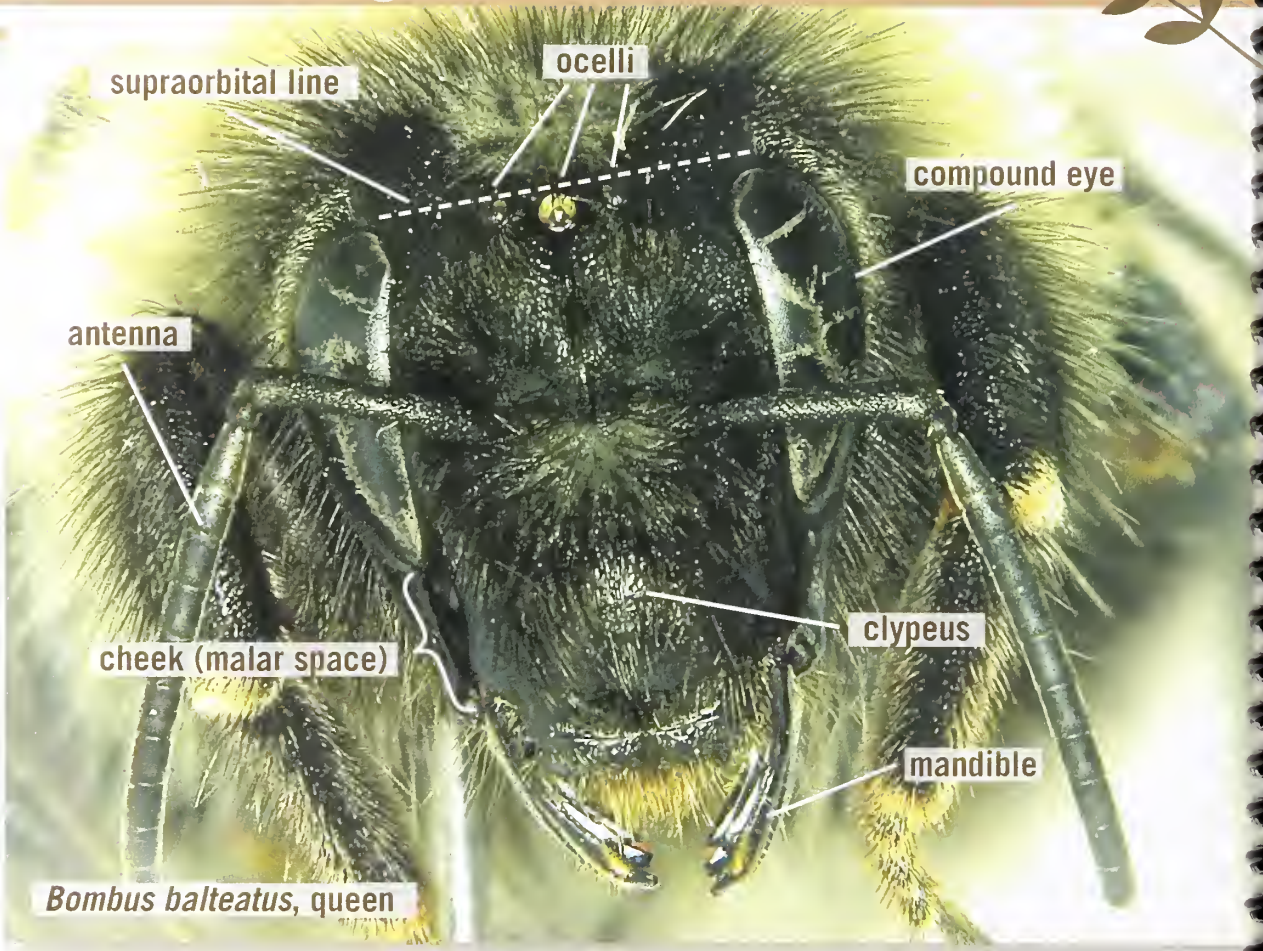




Bumble Bee Hind Leg Diagram



Bumble Bee Face Diagram



Map Methodology

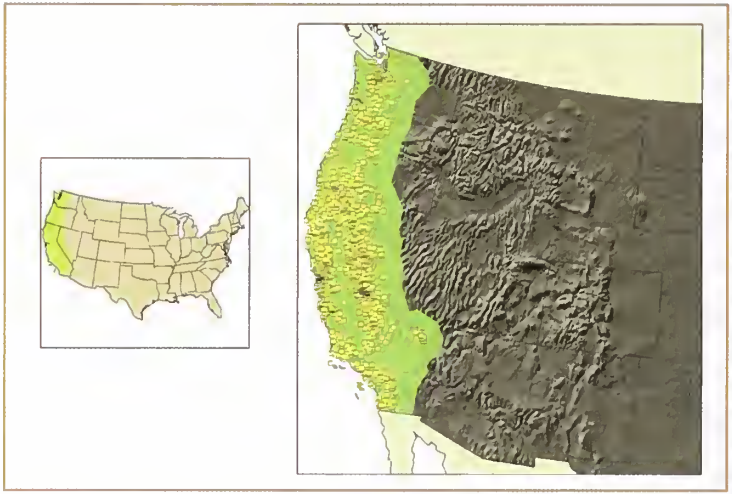
The maps produced for this guide provide two sets of information about the range of each bumble bee species: (1) points that represent actual bumble bee collections within the past 100 years, and (2) generalized range polygons meant to inform the geographic extent of a bumble bee's distribution in areas where we lack specimen collection data. Many natural history collections and individuals have contributed their digitized, georeferenced data to this effort, as well as curatorial expertise. The dots on each map represent collections held by the following:

Jason Weintraub, Academy of Natural Sciences, Philadelphia
John Ascher, American Museum of Natural History
Shepherd Myer, Bernice Pauahi Bishop Museum
Sean Clark and Kimberly Huntzinger, Brigham Young University
Norm Penny and Vince Lee, California Academy of Sciences
Stephen Gaimari, California State Collection of Arthropods
David Ward Jr. and William Clark, College of Idaho
Michael Rose and Michael Ivie, Montana State University
Terry Griswold and Harold Ikerd, National Pollinating Insect Collection (USDA-ARS)
Brian Brown, Natural History Museum of Los Angeles County
Jeff Knight, Nevada Department of Agriculture, Plant Industry Division
Christopher Marshall, Oregon State Arthropod Collection
Pamela Horsley and Michael Wall, San Diego Natural History Museum
Elizabeth Elle, Simon Fraser University
David Furth and Sèan Brady, Smithsonian Institution
Paul Johnson, South Dakota State University
Cheryl Barr and Robert Zuparko, University of California, Berkeley
Robbin Thorp and Steve Heydon, University of California, Davis
Doug Yanega, University of California, Riverside
Crystal Boyd and Virginia Scott, University of Colorado, Boulder
Frank Merickel, University of Idaho
Michael Engel and Jennifer Thomas, University of Kansas
David Golick, University of Nebraska
Steven Krauth, University of Wisconsin, Madison
Richard Zack, Washington State University
Lawrence Gall, Yale University

Many other natural history collections exist that have not been digitized or checked for identification accuracy. These maps can thus be improved as more data become available.

Maps are at a scale of 1:12,000,000 using the WGS 1984 datum and projected with the North American Lambert Conformal Conic. For each species, a range polygon (shown in green) was produced by buffering specimen collection points (shown in yellow) by 100 kilometers, then merging all buffers together. This was chosen as an arbitrary distance from known locations of occurrence (i.e. sites where specimens have been collected) because in general, it helps describe a bumble bee species' absolute distribution extent. Furthermore, unlike the eastern United States, the western United States has extreme topographic variation, particularly in the Intermountain West (e.g. Idaho, Nevada, Utah), thus limiting some bumble bee species like *Bombus balteatus* to high elevation mountains. Considering the lack of collections and surveys in much of the west, the range polygons presented in this guide will provide the reader with a general idea of a bumble bee species' distribution. Minor changes were made to the resulting layer to connect adjacent polygons where we thought it appropriate, to smooth some edges, and to improve the presentation of the map. The range polygon was then clipped to the western United States. These decisions were based primarily on maps developed by Thorp et al. (1983) *Bumble Bees and Cuckoo Bumble Bees of California* and Stephen (1957) *Bumble bees of Western America* (Hymenoptera: Apoidea).

Range information is shown for states west of the 100° longitude line. As several species also occur in the eastern United States

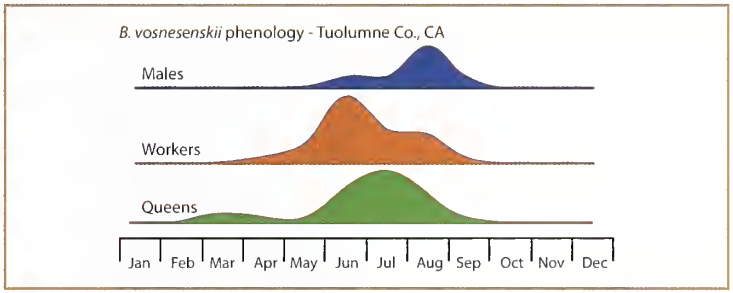


Bombus vosnesenskii range map, as example of a map indicating range of species in green, specimen collection points in yellow.

(e.g. *Bombus fervidus*), an inset map of the entire United States is also provided for each species as well. This map will provide the user with an idea on the patterns of bumble bee distribution. For species distributed in the eastern United States, please refer to the complimentary eastern field guide *Bumble Bees of the Eastern United States* by Sheila Colla, Leif Richardson, and Paul Williams. Finally, bear in mind that several of the bumble bees documented in the western United States also occur in parts of adjacent Canada and Mexico and as far north as Alaska; however, ranges outside the contiguous United States are not presented.

Phenology Methodology

The annual colony phenology of each bumble bee species is estimated with data captured from the USDA-ARS National Pollinating Insect Database (NPID). Seasonal phenology was calculated by comparing the relative abundance of each caste within a single month of a specific geographic region and the monthly relative abundance was plotted onto a graph. As many western bumble bees are distributed across a wide variety of latitudes and elevations, estimates of seasonal phenology in queens, workers, and males of a species were limited to the following states and counties: (1) California = Madera, Mariposa, Mono, Siskiyou, and Tuolumne; (2) Idaho = Latah; (3) Oregon = Jackson; (4) Washington = Clallam, Coos, King, Skagit, Snohomish, and Whitman; (5) Utah = Box Elder and Cache. For *Bombus crotchii* and *Bombus pensylvanicus* subsp. *sonorus*, all records found in California and Arizona were utilized to estimate their seasonal phenology, respectively. *Bombus frigidus* phenology was calculated with data from Fairbanks-North Star Borough, Alaska due to the paucity of data points in the contiguous United States. These graphs are meant to show the relative phenology of the various species and considerable adjustments may need to be made depending on the latitude and elevation where you are looking for a given species.



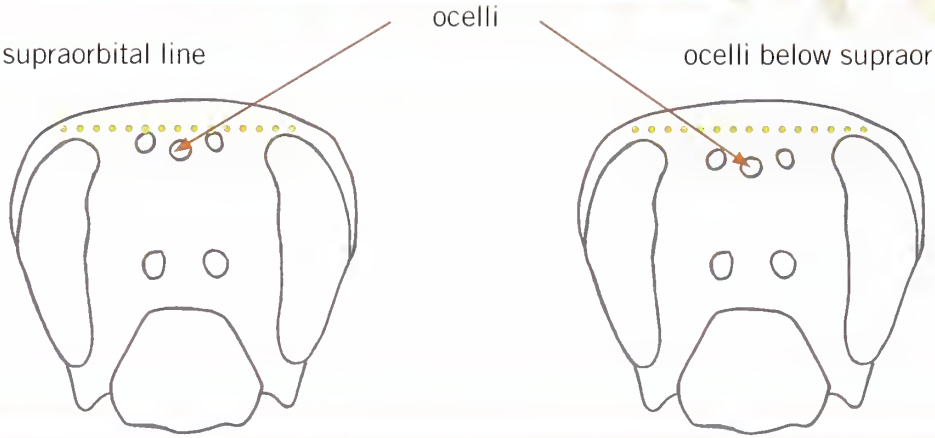
Bombus vosnesenskii phenology chart, as example of a chart indicating relative abundance of each caste throughout the year.

Floral Resource Methodology

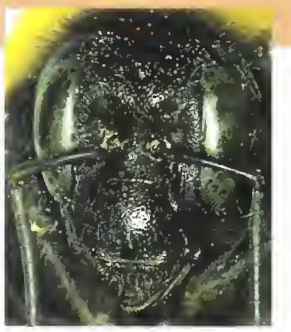
The floral hosts presented in this field guide for each bumble bee species were selected by querying the USDA-ARS NPID. The six flower genera associated with each species were the most commonly associated genera in the NPID (i.e. the bumble bee was detected on the flower). However, as bumble bees are floral generalist, the flowers you find them on will vary with the time of year and the place you are searching for them. For bumble bees that primarily occur in the eastern United States such as *Bombus terricola* and *Bombus vagans*, the floral associations suggested by *Bumble Bees of the Eastern United States* are maintained.

Measuring the Supraorbital Line in Bumble Bees

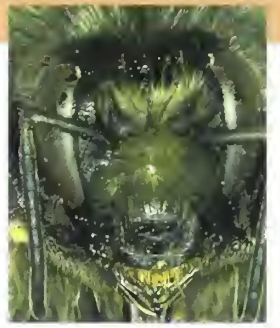
Supraorbital line is depicted by dotted yellow line. For additional reference to cheek (malar) length and ocelli see page 12 (Bumble Bee Face Diagram)



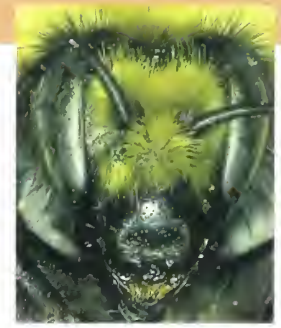
Color Characteristics in Bumble Bees



Predominantly black hairs
B. pensylvanicus subsp. *sonorus*

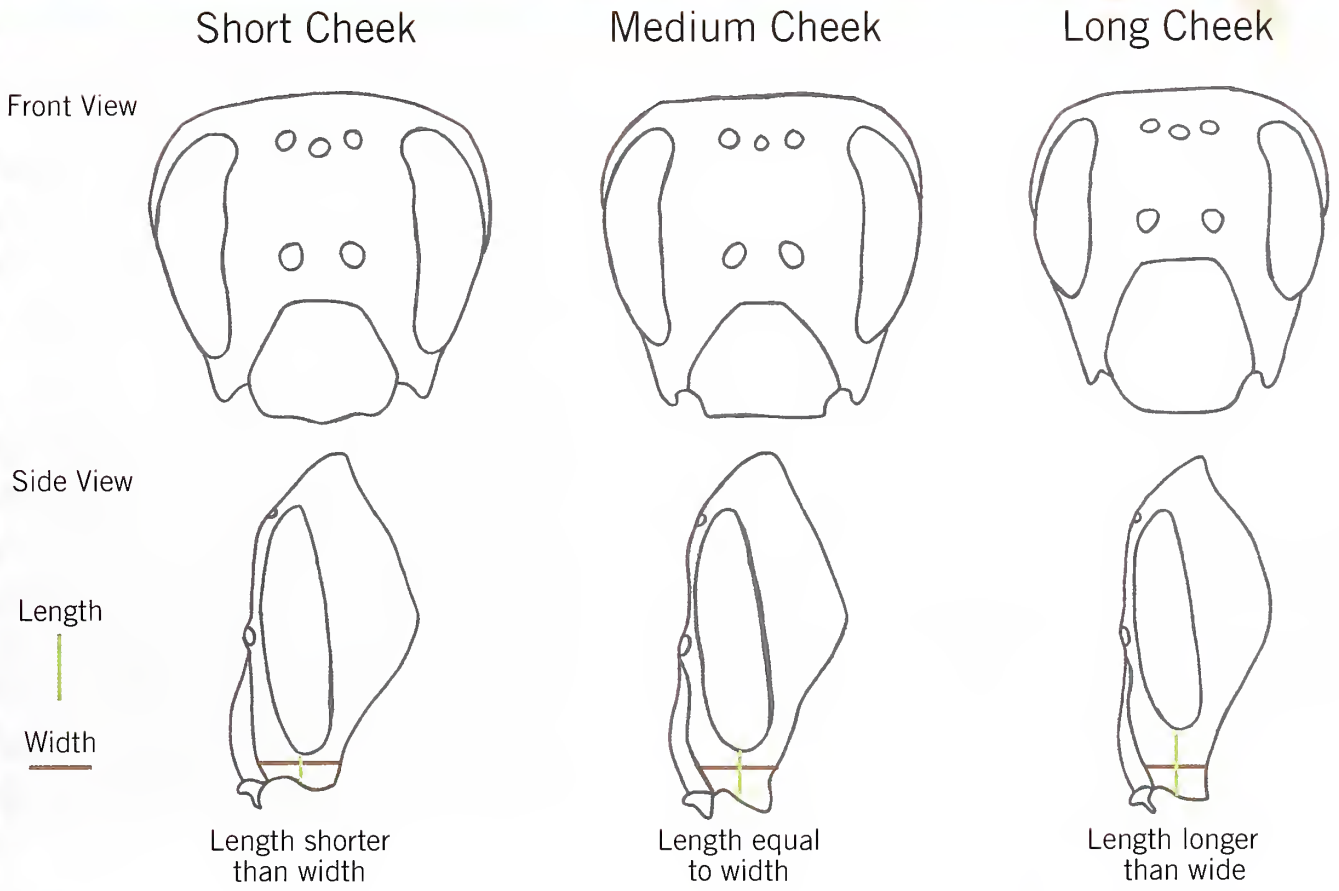


Black and yellow hairs intermixed (cloudy)
B. melanopygus



Predominantly yellow hairs
B. huntii

Measuring the Cheek (Malar) Length in Bumble Bees

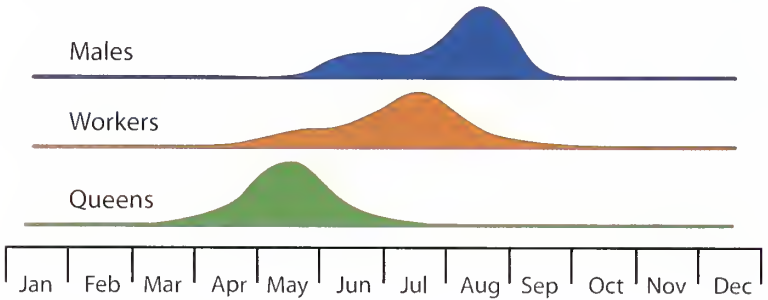


Bombus nevadensis

Nevada bumble bee

- Status: Common
- Select food plant genera: *Astragalus, Balsamorhiza, Ceanothus, Cirsium, Helianthus, Melilotus, Ribes, Vicia*
- Tongue Length: Long
- Distribution: Pacific coastline east to the Plains States, from Mexico to Canada; occurs across a variety of environmental gradients
- Can be confused with *B. griseocollis* and *B. morrisoni*

B. nevadensis phenology - Cache Co., UT



Bombus nevadensis queen.
Photo Leah Lewis

Bombus nevadensis continued

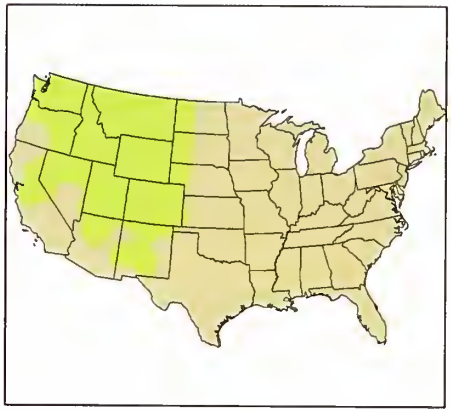
Lateral image of *Bombus nevadensis* female.
Photo Jonathan Koch

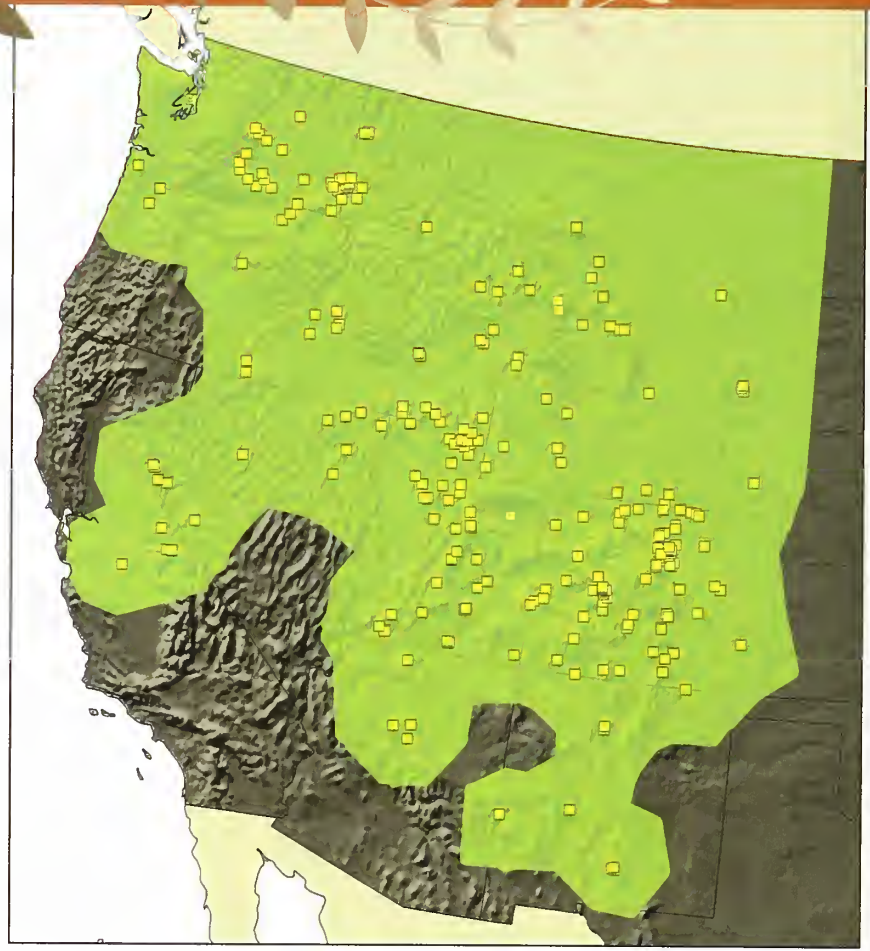
Face of *Bombus nevadensis* female.
Photo Jonathan Koch

Bombus nevadensis males on thistle.
Photo Joyce Knoblett

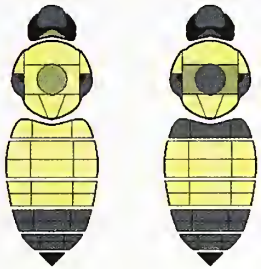
Bombus nevadensis queen.
Photo David Drons

Bombus nevadensis *continued*

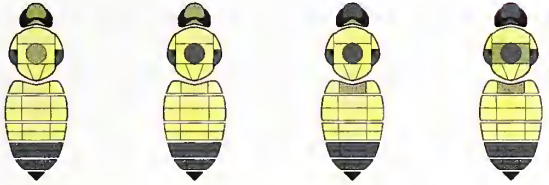




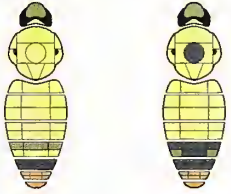
queen



worker



male



Females (queens and workers, colors refer to 'hair')

- Thorax predominantly yellow sometimes black between wing bases, T1 yellow or black, T2-3 yellow, T4-5 black, face long.
- Mid leg basitarsus with the distal posterior corner acute, but not spinose. Cheek length longer than broad. Hair of the face and top of head predominantly black. On the side of the thorax, the lower anterior surface with predominantly black hair*, corbicular fringes black. Hair length short and even. Large bodied.

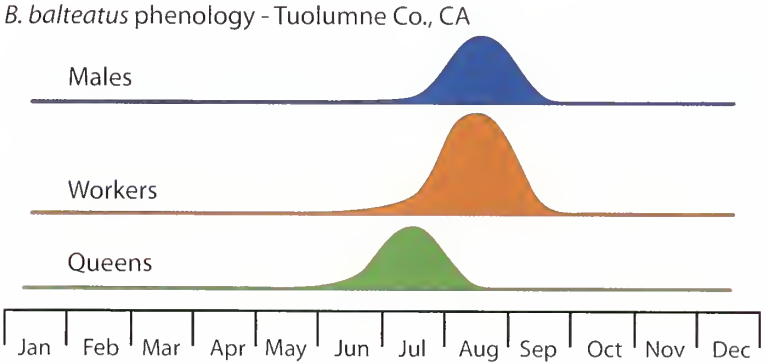
*This body region (also known as the mesopleura) is identified on the adjacent diagram of *B. nevadensis* with an orange box. This hair color character will be referenced throughout the rest of this guide for other bumble bee species.

Bombus balteatus

High country bumble bee

- Status: Rare
- Select food plant genera: *Chamerion (Epilobium), Mertensia, Aster, Castilleja, Penstemon, Geranium*
- Tongue Length: Long
- Distribution: Found in high latitude regions of Alaska and Canada; in the contiguous U.S. it is associated with high elevation sites of Colorado, Wyoming, Montana, and California
- Can be confused with *B. frigidus*

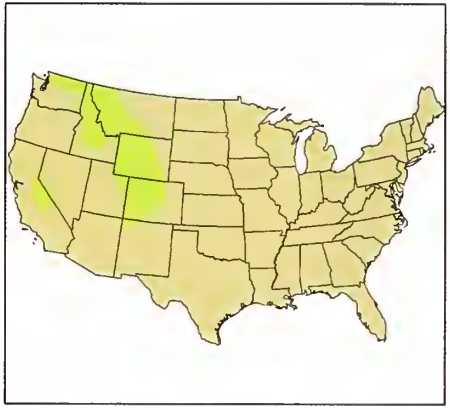
Bombus balteatus worker.
Photo Diane Wilson

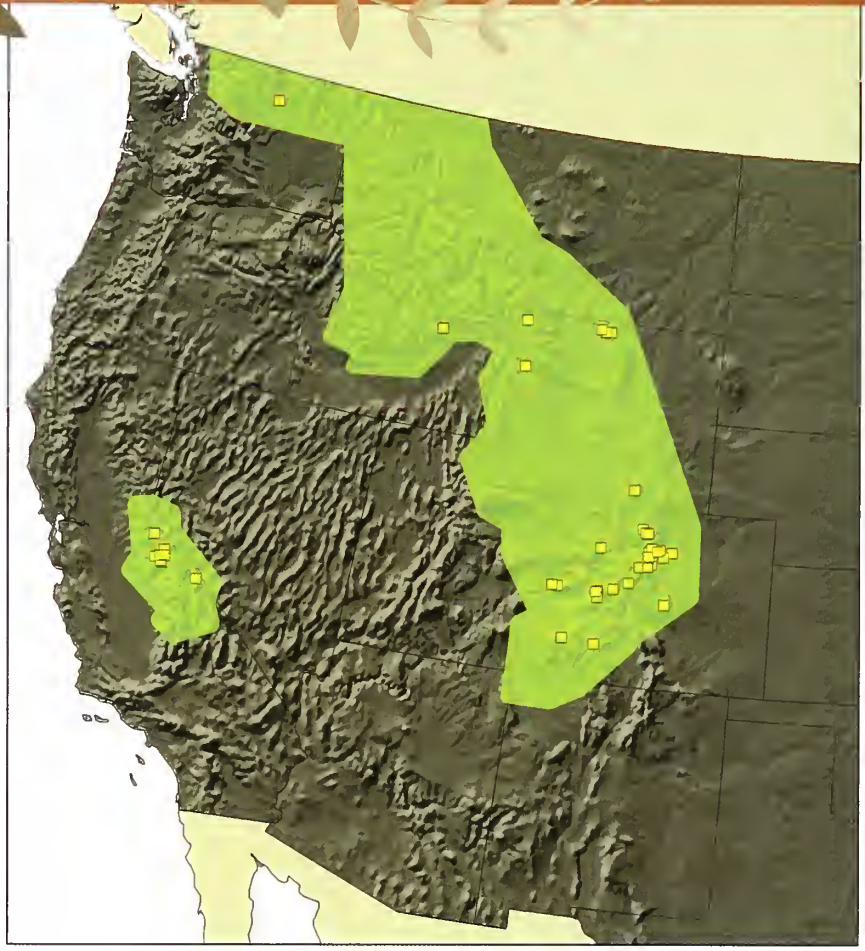


Lateral image of *Bombus balteatus* queen.
Photo Jonathan Koch

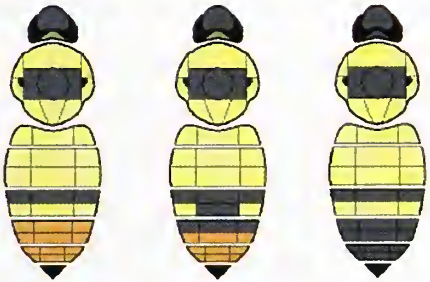
Face of *Bombus balteatus* queen.
Photo Jonathan Koch

Bombus balteatus *continued*

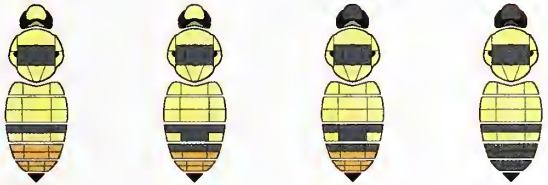




queen



worker



male

Females (queens and workers, colors refer to 'hair')

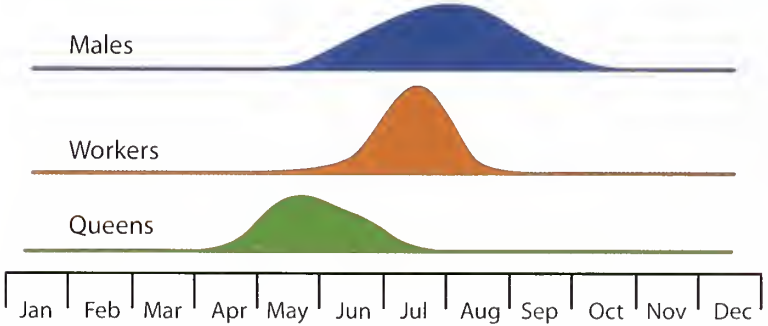
- Thorax anterior to black band between wing bases predominately yellow, scutellum yellow, T1-2 yellow, T3 yellow at least apicolaterally, T4-5 orange or black, face very long.
- Mid leg basitarus with the distal posterior corner rounded. Cheek much longer than broad, clypeus with irregular punctures. Hair of the face and top of head predominantly black, often with patches of yellow hair. On the side of the thorax, the lower anterior surface with yellow hair, corbicular fringes red. Hair length long and uneven.

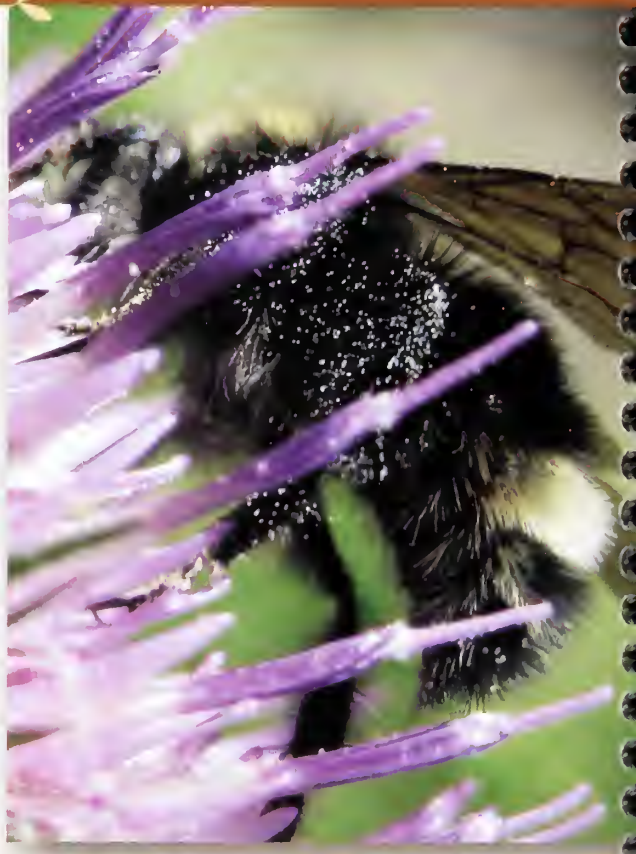
Bombus caliginosus

Obscure bumble bee

- Status: Uncommon
- Select food plant genera: *Baccharis, Cirsium, Lupinus, Lotus, Grindelia, Phacelia*
- Tongue Length: Medium
- Distribution: Coastal areas from northern Washington to southern California
- Easily confused for *B. vosnesenskii* or *B. vandykei*

B. caliginosus phenology - Western Oregon



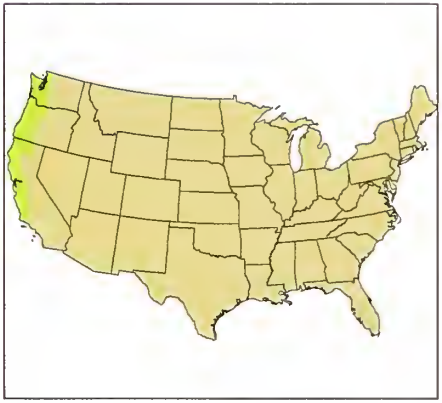


Bombus caliginosus foraging for pollen.
Photo Armen Armaghanyan

Lateral image of *Bombus caliginosus* female.
Photo Jonathan Koch

Face of *Bombus caliginosus* female.
Photo Jonathan Koch

Bombus caliginosus continued



queen

worker

male

Females (queens and workers, colors refer to 'hair')

- Thorax anterior to black band between wing bases yellow, scutellum black, T1-3 black, T4 yellow, T5 and T6 black, S3* and S4 with long yellow hairs apically, face square.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek length as long as broad. Hair of the face and top of head yellow. On the side of the thorax, the lower anterior surface with predominantly black hair, corbicular fringes black. Hair length medium and uneven.

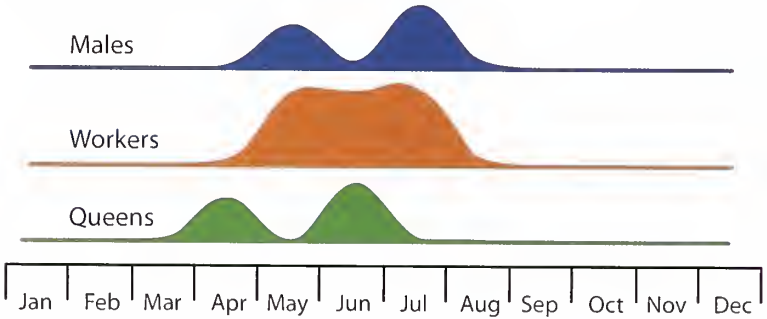
*S refers to the sternites of the bumble bee, which are found on the ventral side of the abdomen. They are analogous to the tergites (i.e. "T") that are found on the dorsal side of the abdomen. Therefore S3 translates to "sternite 3". See page 26 for an example of this color character.

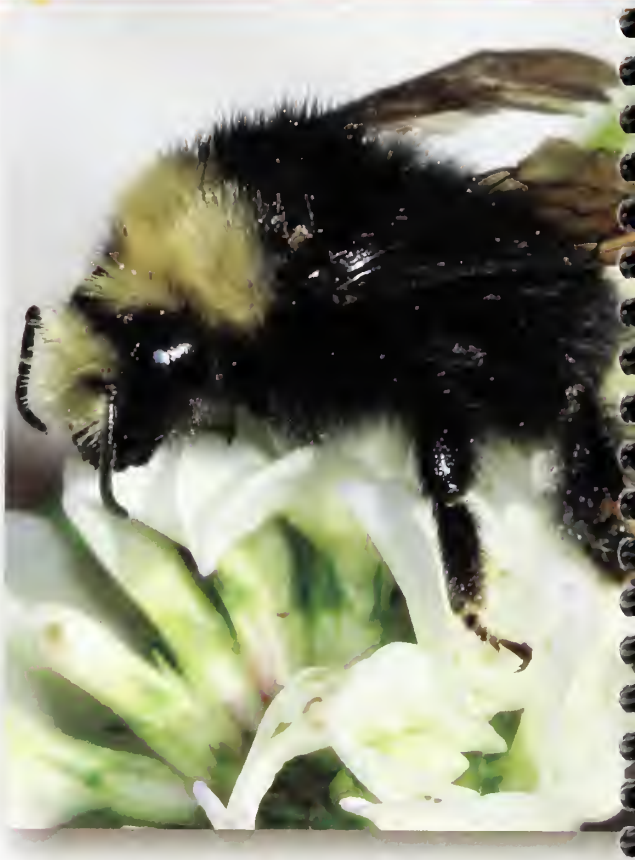
Bombus vandykei

van Dyke bumble bee

- Status: Uncommon
- Select food plant genera: *Phacelia, Collinsia, Clarkia, Streptanthus, Penstemon, Stachys*
- Tongue Length: Medium
- Distribution: Pacific States from Washington to southern California
- Can be confused with *B. vosnesenskii, B. caliginosus,* and *B. californicus*

B. vandykei phenology - Tuolomne Co., CA



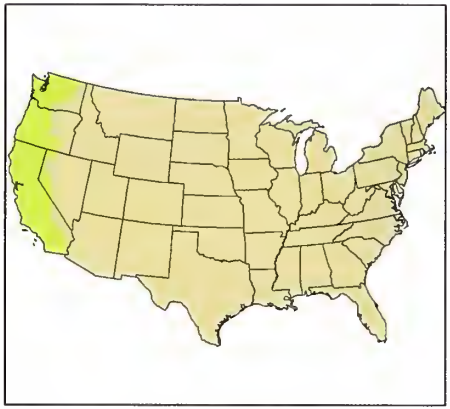


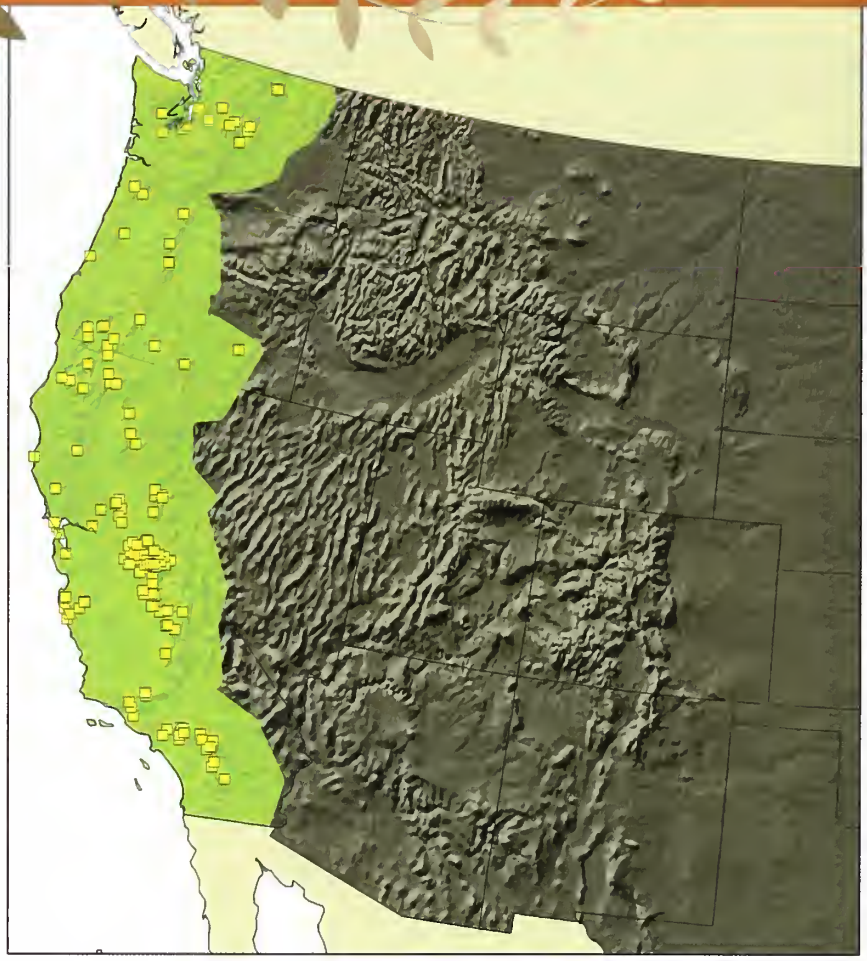
Bombus vandykei.
Photo James Strange

Lateral image of *Bombus vandykei* female.
Photo Jonathan Koch

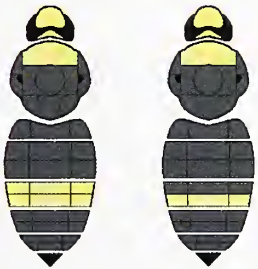
Face of *Bombus vandykei* female.
Photo Jonathan Koch

Bombus vandykei *continued*



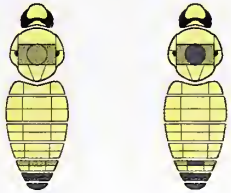


queen



worker

male



Females (queens and workers, colors refer to 'hair')

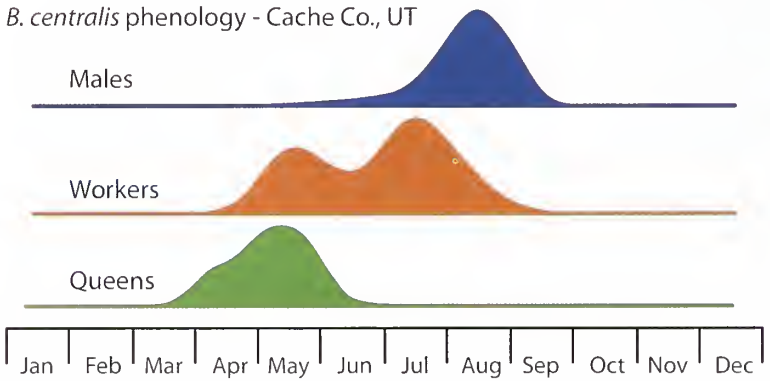
- Thorax anterior to distinct black band between wing bases yellow, scutellum and T1-2 usually black, T3 yellow at least apically, T4-6 black.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek length longer than broad. Hair of the face and top of head completely yellow. On the side of the thorax, the lower anterior surface with black hair, corbicular fringes black. S2-5* with yellow hair apically. Hair length medium and uneven.

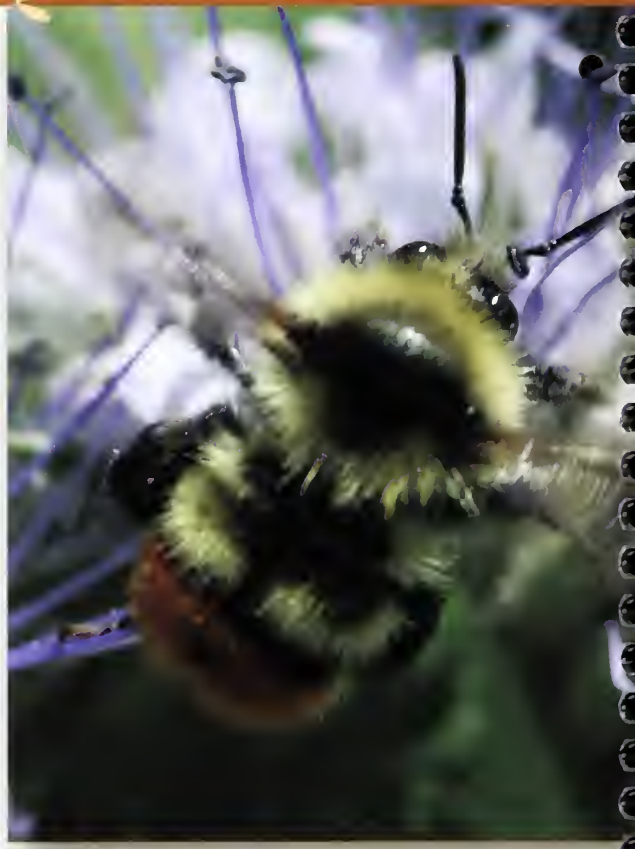
*Refer to page 29 for an explanation of this morphological feature.

Bombus centralis

Central bumble bee

- Status: Common
- Select food plant genera: *Cirsium, Phacelia, Penstemon, Allium, Symphoricarpos, Monarda*
- Tongue Length: Long
- Distribution: Sierra-Cascade Crest east to the Colorado Rocky Mountains and south into the high mountains of New Mexico and Arizona
- Can be confused with *B. flavifrons*





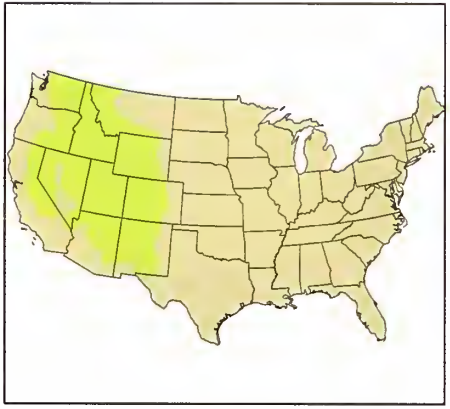
Bombus centralis male.
Photo Leah Lewis

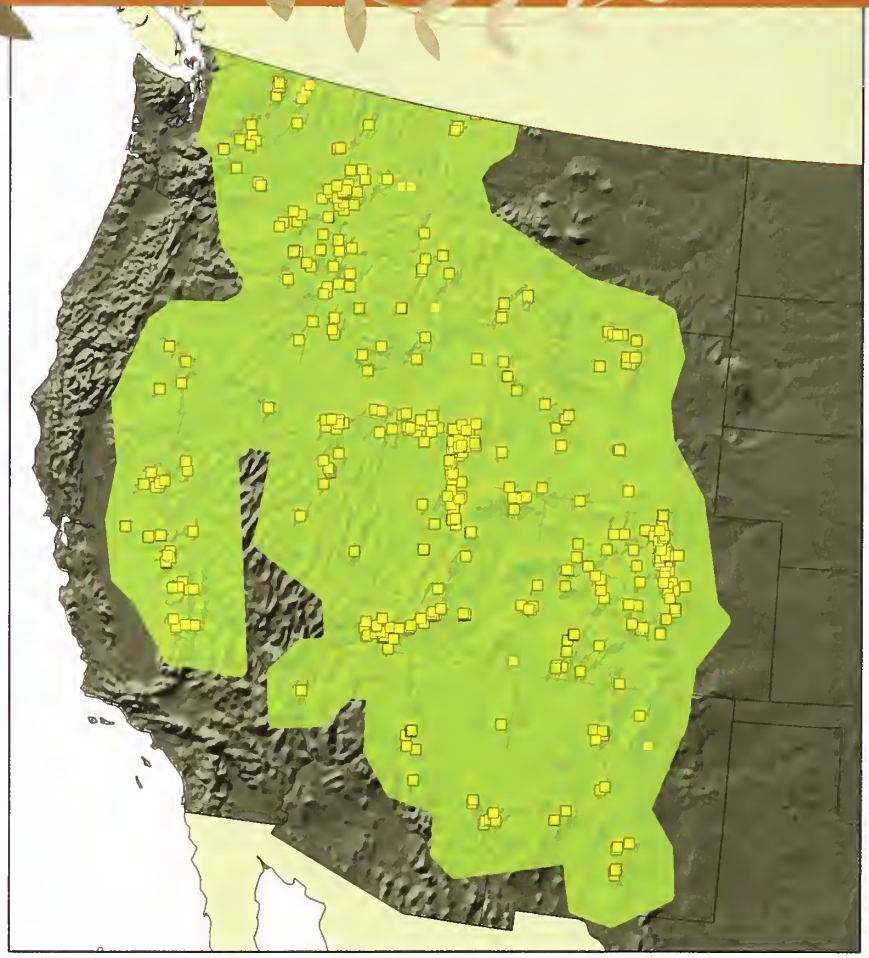
Lateral image of *Bombus centralis* female.
Photo Jonathan Koch

Face of *Bombus centralis* worker.
Photo Jonathan Koch

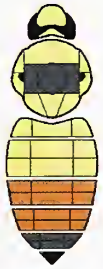
Bombus centralis queen.
Photo James Strange

Bombus centralis continued

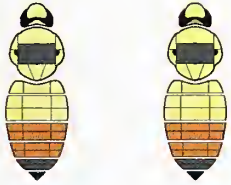




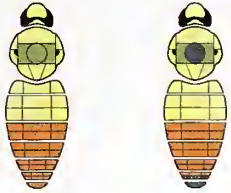
queen



worker



male



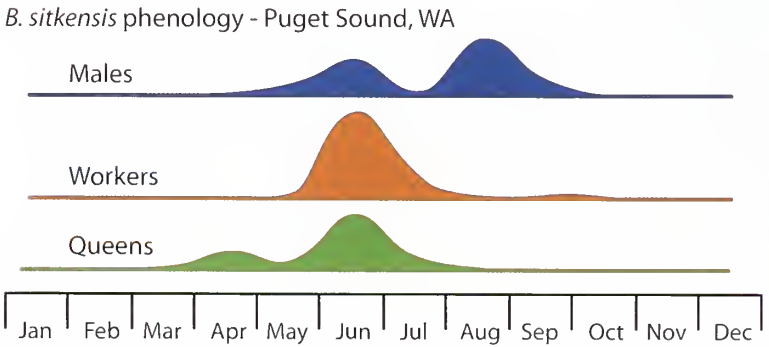
Females (queens and workers, colors refer to 'hair')

- Thorax anterior to distinct black band between wing bases yellow, scutellum and T1-2 yellow, T3-4 orange, T5 black, face long.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek length longer than broad. Hair of the face and top of head predominantly yellow. On the side of the thorax, the lower anterior surface with long, predominantly yellow hair, corbicular fringes black with red admixture along posterior margin. Hair length long.

Bombus sitkensis

Sitka bumble bee

- Status: Common
- Select food plant genera: *Ebilobium, Lupinus, Rubus, Rosa, Vicia, Rhododendron*
- Tongue Length: Medium
- Distribution: Almost exclusive to Pacific coastline in the U.S. except for populations found in the Sawtooth wilderness of northern Idaho
- Can be confused with *B. flavifrons*, *B. mixtus*, and *B. melanopygus*



Bombus sitkensis.
Photo James Strange

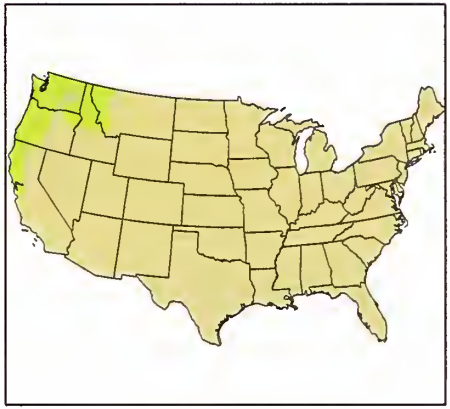
Lateral image of *Bombus sitkensis* female.
Photo Jonathan Koch

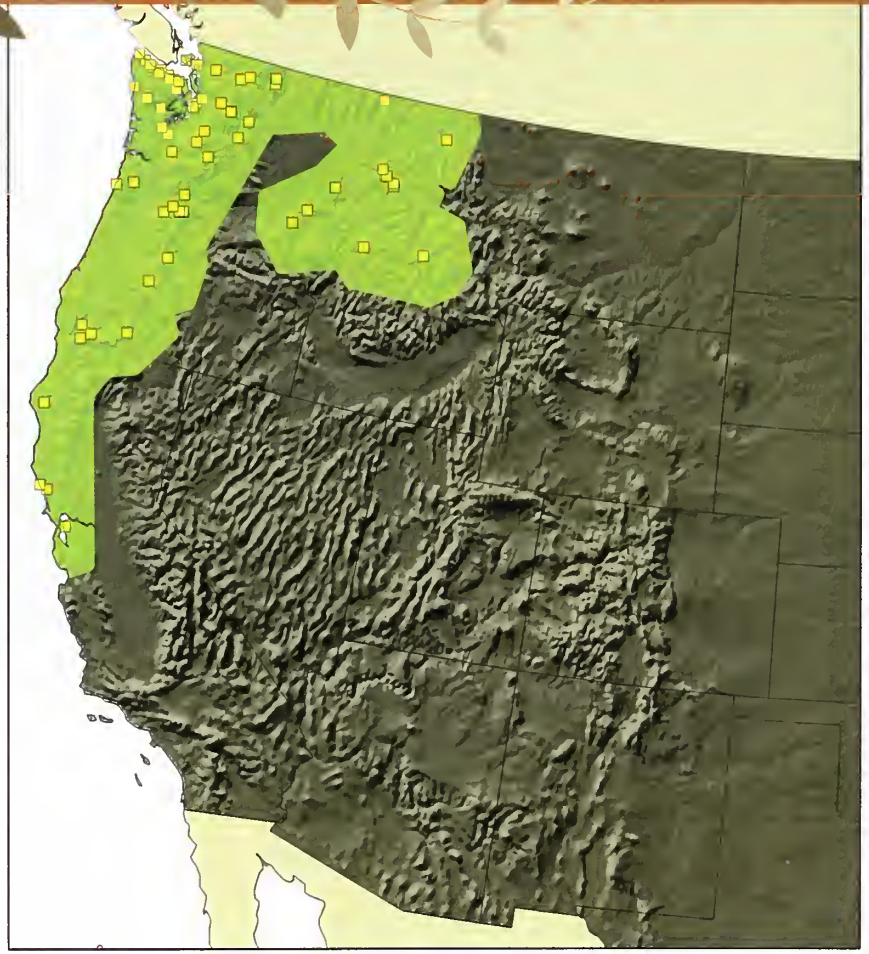
Face of *Bombus sitkensis* female.
Photo Jonathan Koch

Bombus sitkensis worker on daisy.
Photo Don Rolfs

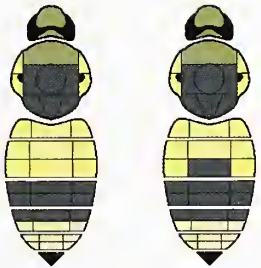
Bombus sitkensis.
Photo James Strange

Bombus sitkensis *continued*



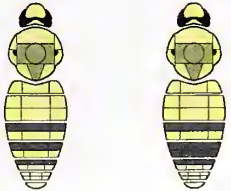


queen



worker

male



Females (queens and workers, colors refer to 'hair')

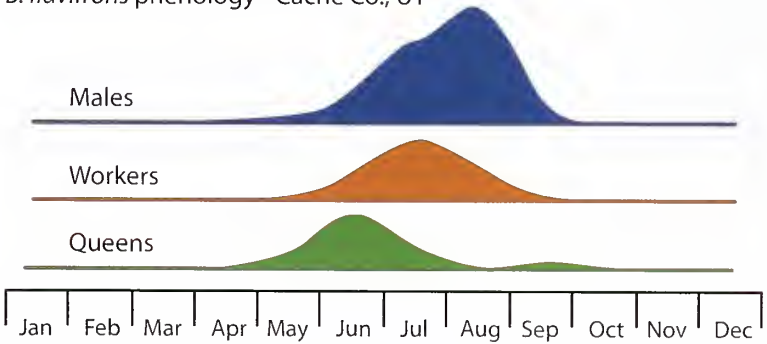
- Thorax anterior to the wing bases black and yellow intermixed (clouded), scutellum black, sometimes with yellow/white intermixed laterally, T1-2 yellow, T3 black, T4-5 with pale hairs, face square.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek length longer than broad. Hair of the face and top of head with black and yellow intermixed, ocelli large and at supraorbital line. On the side of the thorax, the lower anterior surface with black and yellow intermixed (cloudy). Corbicular fringes long and with yellowish-red hairs. Hair length medium and uneven.

Bombus flavifrons

Yellow head bumble bee

- Status: Common
- Select food plant genera: *Epilobium, Vicia, Trifolium, Penstemon, Geranium, Lathyrus*
- Tongue Length: Long
- Distribution: Pacific coastline west to the Colorado Rocky Mountains, associated primarily with high elevations in the Intermountain West; dark form (*B. flavifrons dimidiatus*) found in western portions of the range; red form (*B. flavifrons flavifrons*) in eastern portions of the range
- Can be confused with *B. centralis* and *B. sitkensis*

B. flavifrons phenology - Cache Co., UT

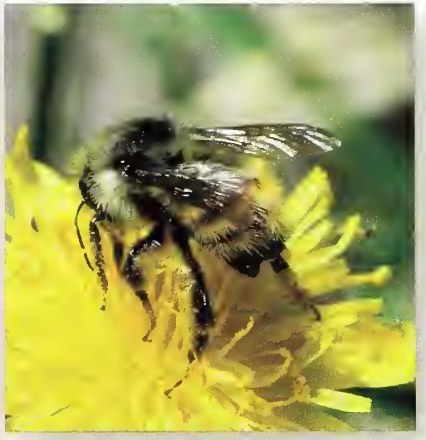


Bombus flavifrons worker.
Photo Elizabeth Elle

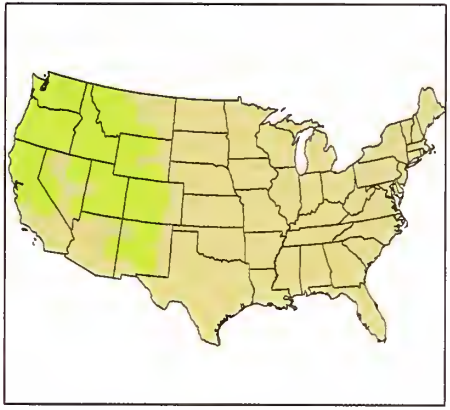
Lateral image of *Bombus flavifrons* female.
Photo Jonathan Koch

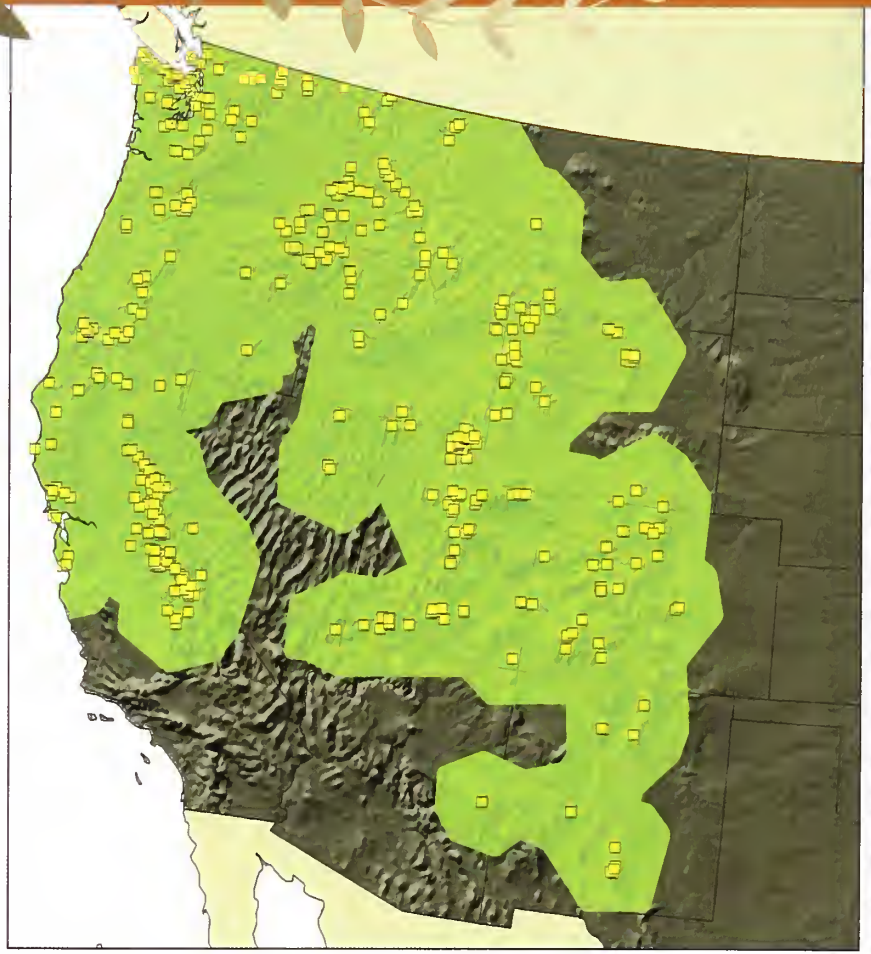
Face of *Bombus flavifrons* female.
Photo Jonathan Koch

Bombus flavifrons worker.
Photo Diane Wilson

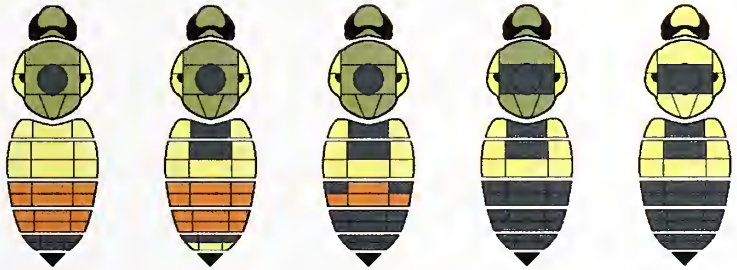


Bombus flavifrons continued





queen



worker

male

Females (queens and workers, colors refer to 'hair')

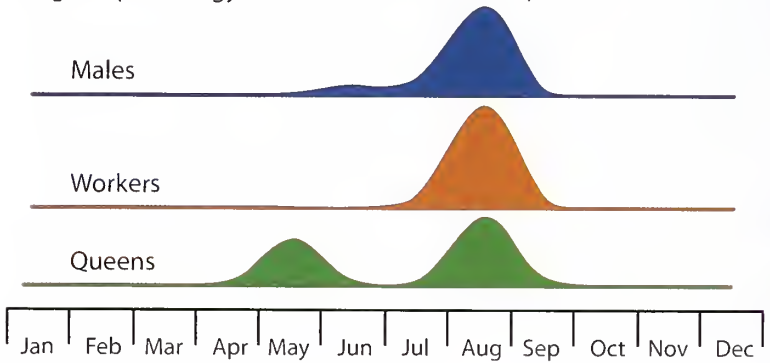
- Thorax with black and yellow hair intermixed especially anteriorly, T1-2 yellow at least apicolaterally, T3-4 red or black, T5 black sometimes with yellow apically.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek length longer than broad. Hair of the face and top of head with black and yellow intermixed. On the side of the thorax, the lower anterior surface with long yellow hairs, corbicular fringes black with red admixture along posterior margin. Hair length long and uneven.

Bombus frigidus

Frigid bumble bee

- Status: Rare
- Select food plant genera: *Chamerion, Lupinus, Geranium, Symphoricarpos, Trifolium, Achillea*
- Tongue Length: Medium
- Distribution: Northern Intermountain West and high elevation Rockies; few records in eastern U.S.
- Can be confused with *B. mixtus* and *B. balteatus*

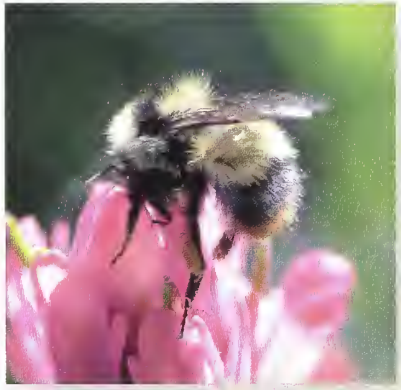
B. frigidus phenology - Fairbanks-North Star Bo., AK



Bombus frigidus worker on *Senecio sp.*
Photo Jessica Forrest

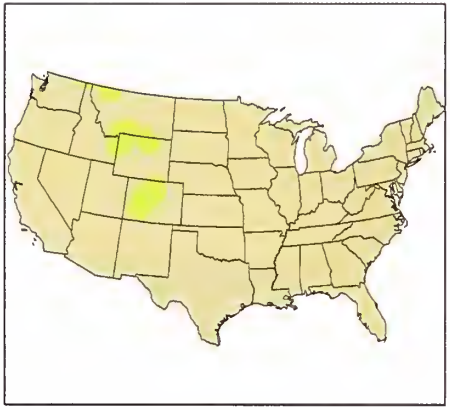
Lateral image of *Bombus frigidus* female.
Photo Jonathan Koch

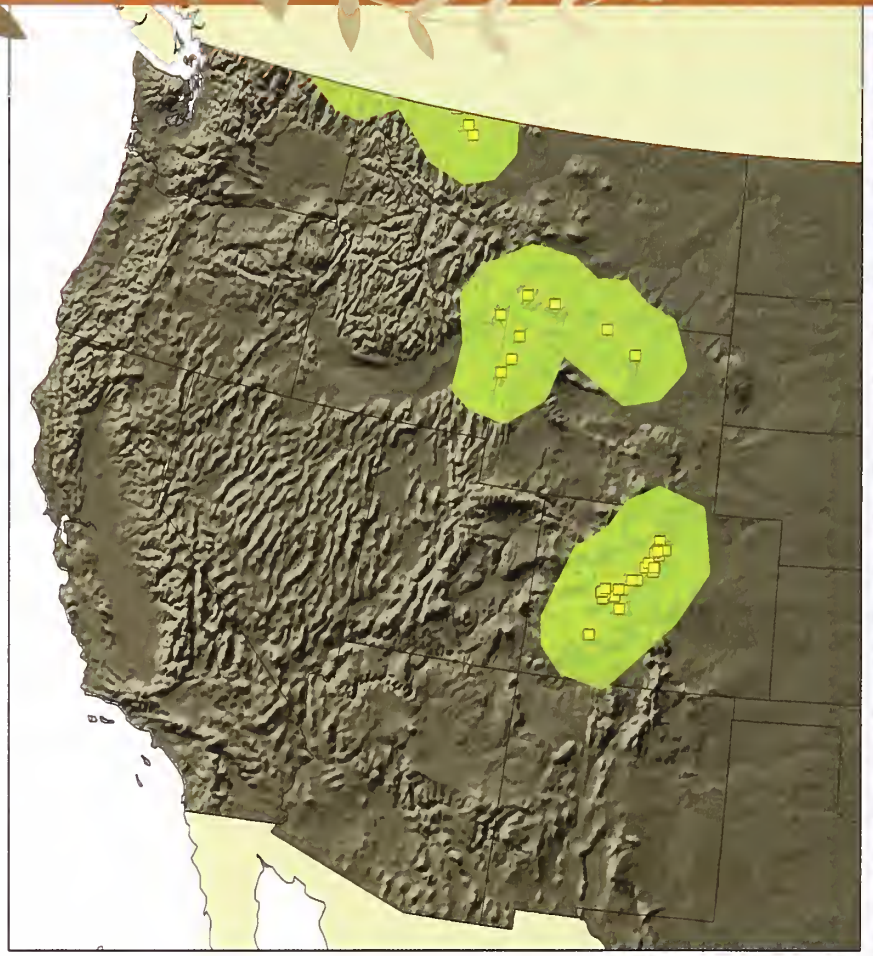
Face of *Bombus frigidus* female.
Photo Jonathan Koch



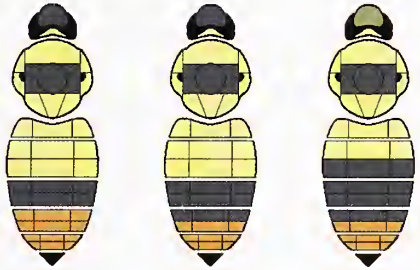
Bombus frigidus worker.
Photo Diane Wilson

Bombus frigidus continued



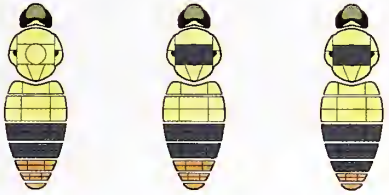


queen



worker

male



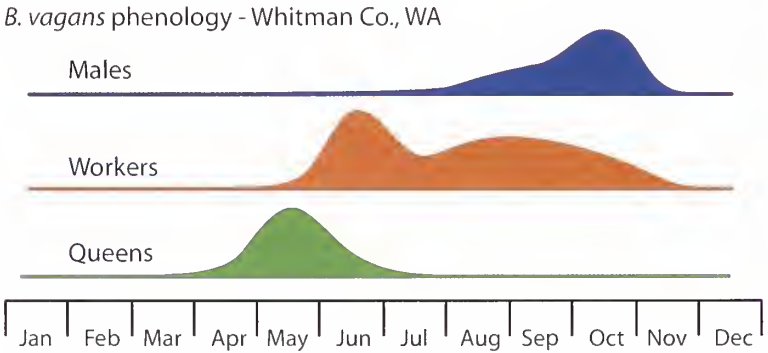
Females (queens and workers, colors refer to 'hair')

- Thorax and T1-2 predominantly yellow, with a black band between the wing bases, sides of the thorax yellow, T4 orange at least apically, T5 orange occasionally faded to yellow.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek as long as broad. Hair of the face black or with some yellow hairs, corbicular fringes extensively pale orange. T2 anterio-laterally without scattered black hairs intermixed. Hair length long.

Bombus vagans

Half-black bumble bee

- Status: Common
- Select food plant genera: *Penstemon, Asclepias, Aster, Cirsium, Eupatorium, Spirea*
- Tongue Length: Medium
- Distribution: Eastern Washington east to New England primarily in states bordering Canada
- Can be confused with *B. flavifrons* or *B. rufocinctus*

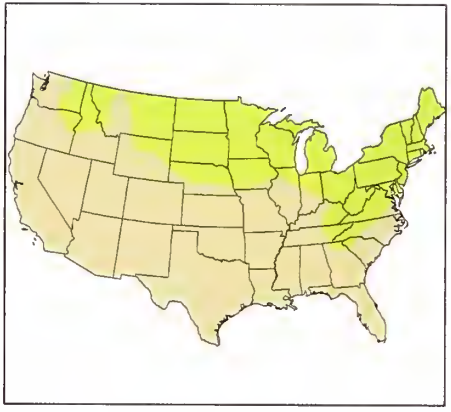


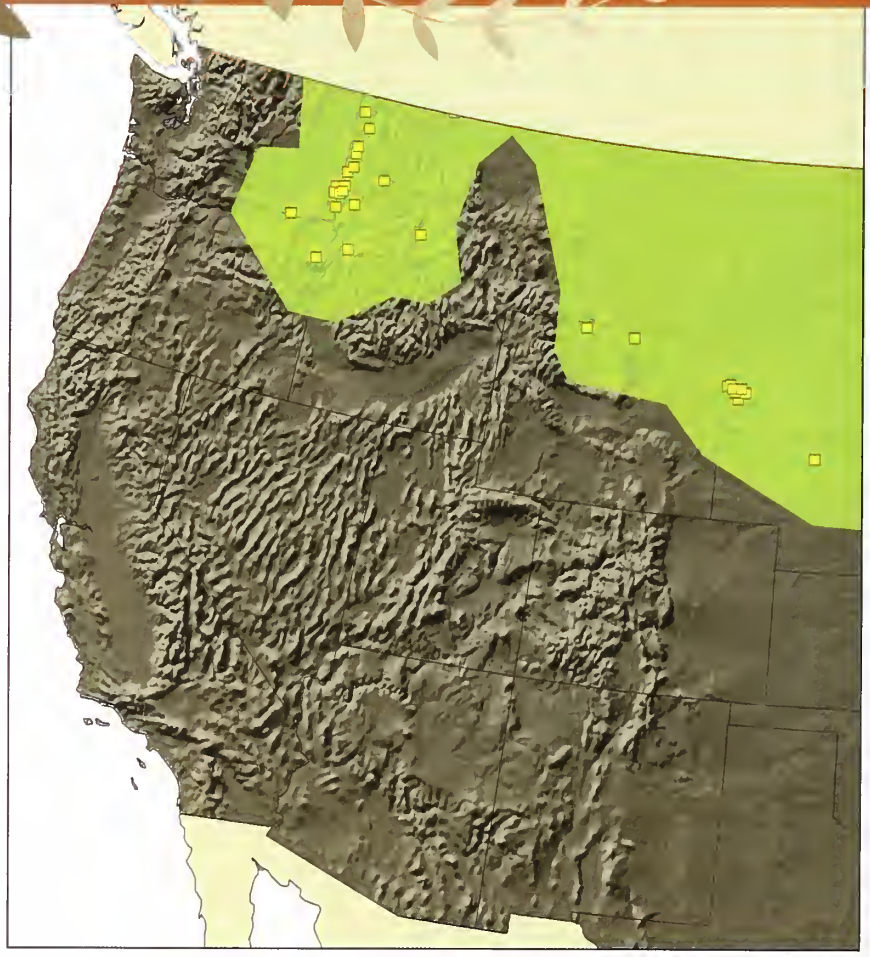
A worker *Bombus vagans* visits red clover.
Photo Leif Richardson

Lateral image of *Bombus vagans* female.
Photo Jonathan Koch

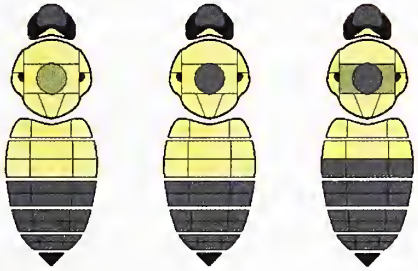
Face of *Bombus vagans* female.
Photo Jonathan Koch

Bombus vagans continued



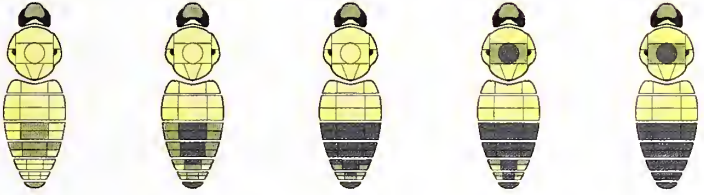


queen



worker

male



Females (queens and workers, colors refer to 'hair')

- Thorax and T1 predominately yellow, sometimes with a black spot between the wing bases, T2 predominately yellow at least anteriorly, T3-6 black, face long.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek length slightly longer than broad. Hair of the top of the head yellow, with variable amounts of yellow on the face. Hair long.

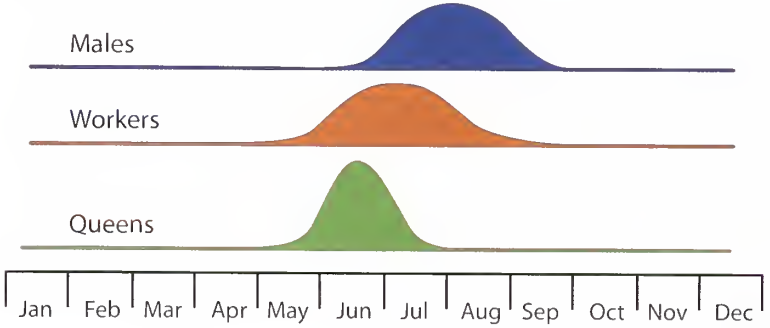
Bombus ternarius

Tri-colored bumble bee

- Status: Common in the eastern U.S. but rare in the western U.S.
- Select food plant genera: *Trifolium, Tanacetum, Chrysothamnus, Monarda, Achillea, Eriogonum*
- Tongue Length: Medium
- Distribution: Eastern Montana and Black Hills east to New England
- Can be confused with *B. rufocinctus*, *B. huntii*, and *B. bifarius*

Bombus ternarius worker.
Photo Nolie Schneider

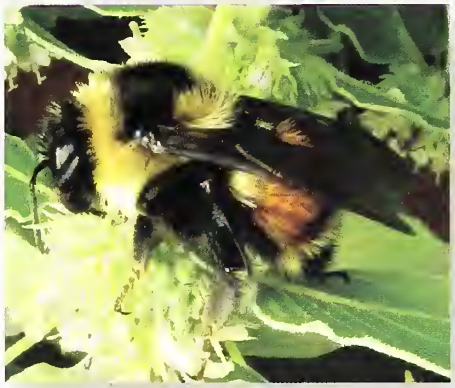
B. ternarius phenology - South Dakota



Lateral image of *Bombus ternarius* female.
Photo Jonathan Koch

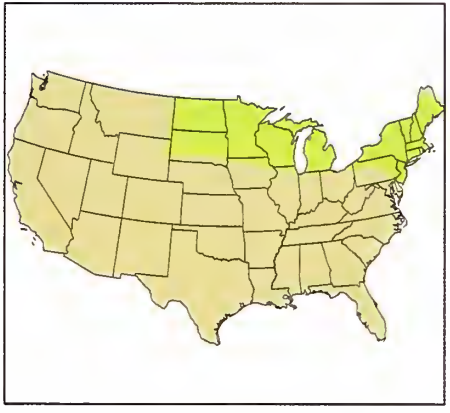
Face of *Bombus ternarius* female.
Photo Jonathan Koch

Bombus ternarius worker.
Photo Gord Harrison

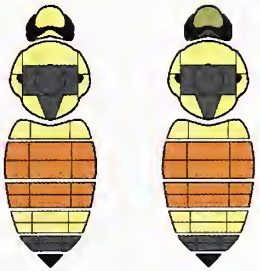


Bombus ternarius worker.
Photo Beatriz Moisset

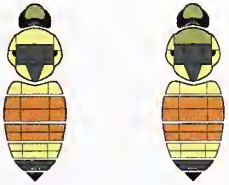
Bombus ternarius continued



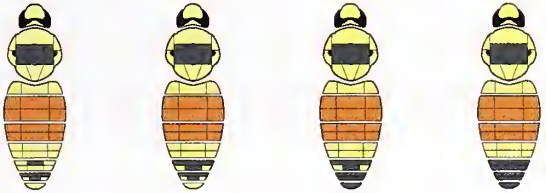
queen



worker



male



Females (queens and workers, colors refer to 'hair')

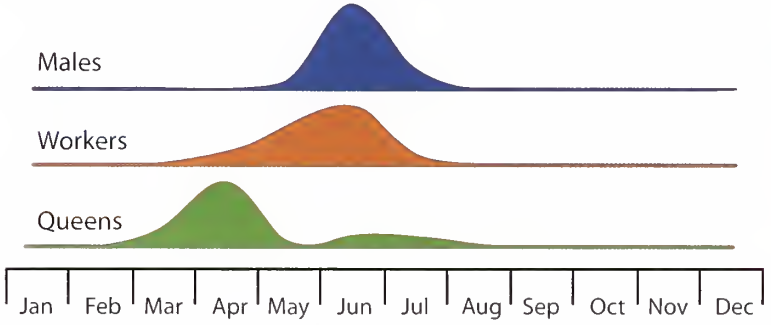
- Thorax and T1 predominantly yellow, with a black band between the wing bases extending posteriorly in the middle of the scutellum, T2-3 orange, T4 yellow, T5 black, face round.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek very slightly shorter than broad. Hair of face and top of the head black with patches of yellow, or sometimes with black more extensively intermixed especially for workers, thoracic anterior band usually yellow without black hairs intermixed except in some workers, which have the anterior margin of the black band between the wing bases always sharply defined, scutellum with yellow patches entirely divided by a black posteriorly directed triangle, T2 red, at most with a few black hairs anteriomedially, T4 yellow, T5 black. Hair length short and even.

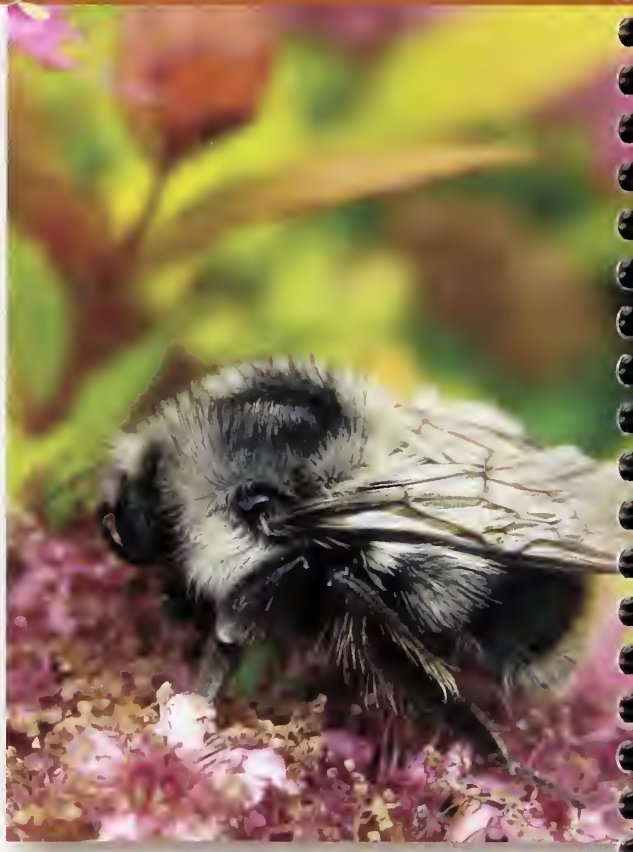
Bombus mixtus

Fuzzy-horned bumble bee

- Status: Common
- Select food plant genera: *Rubus, Symphoricarpos, Trifolium, Lupinus, Senecio, Epilobium*
- Tongue Length: Medium
- Distribution: Pacific coast, east to the Colorado Rocky Mountains; north to Alaska; primarily associated with high elevations and northern latitudes
- Can be confused with *B. frigidus*

B. mixtus phenology - King Co., WA



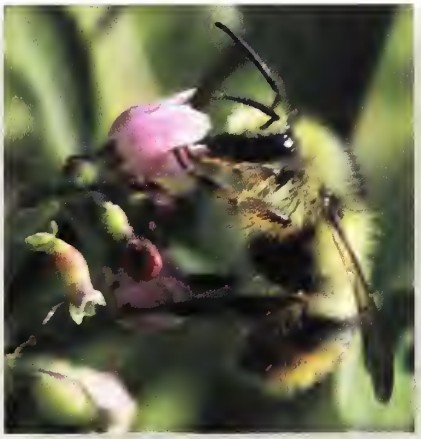


Bombus mixtus female.
Photo Armen Armaghanyan

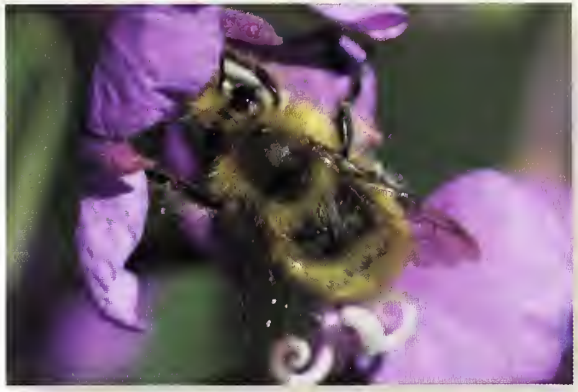
Lateral image of *Bombus mixtus* female.
Photo Jonathan Koch

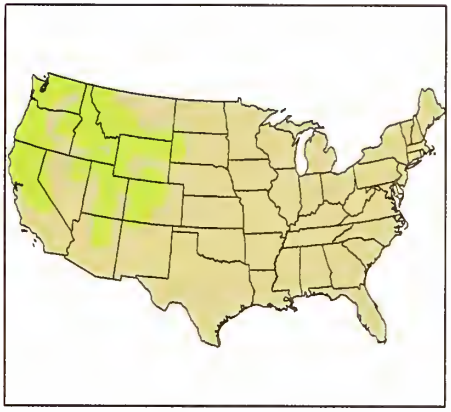
Face of *Bombus mixtus* female.
Photo Jonathan Koch

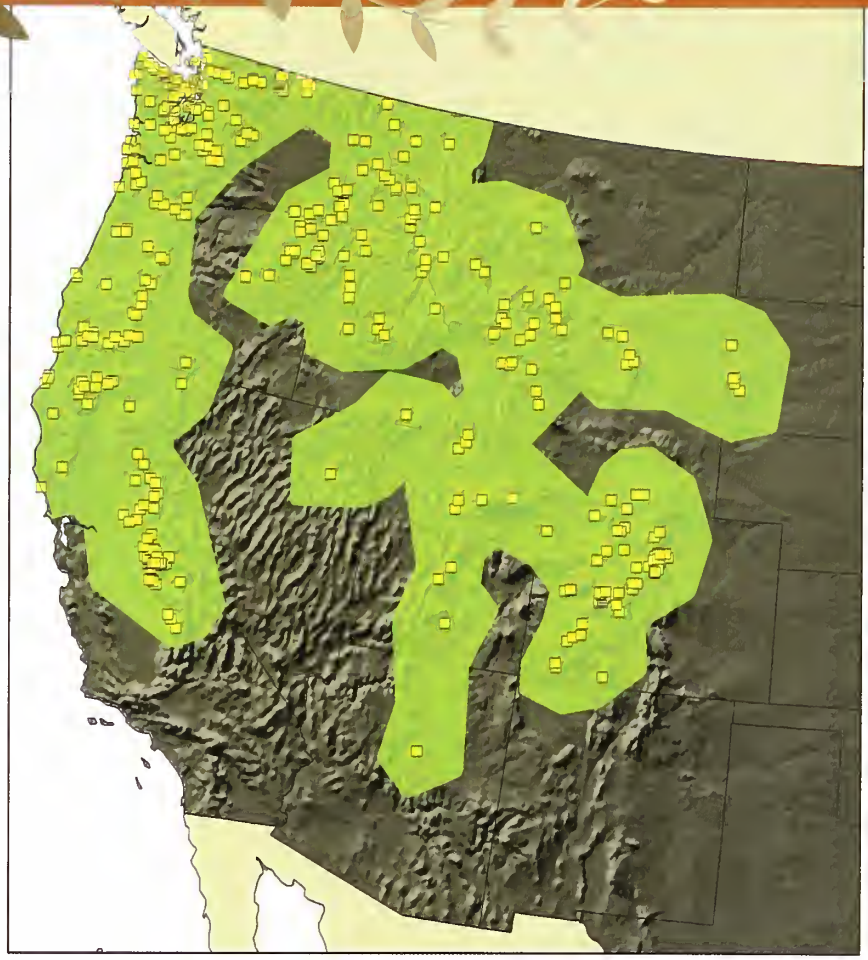
Bombus mixtus male on *Gaultheria* sp.
Photo Don Rolfs



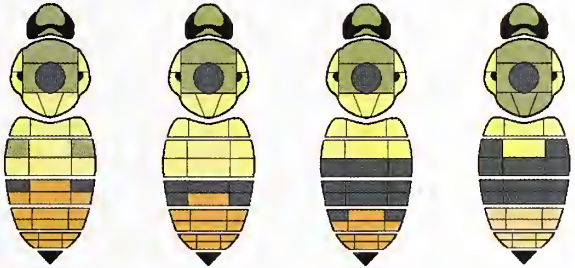
Bombus mixtus male.
Photo Don Rolfs



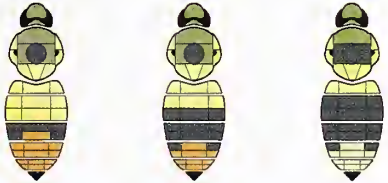




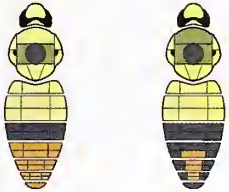
queen



worker



male



Females (queens and workers, colors refer to 'hair')

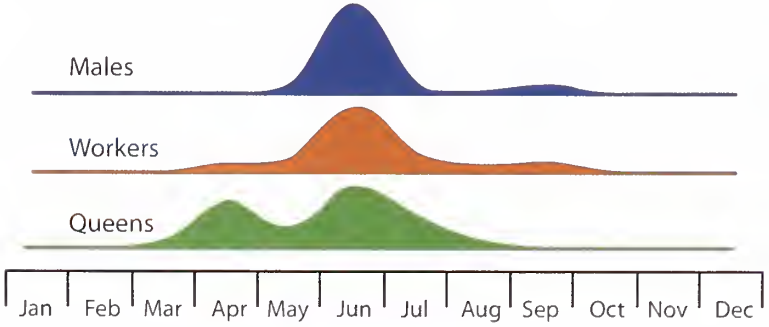
- Thorax predominantly clouded with yellow and black, T1 yellow, T2 yellow sometimes black apically, T3 orange sometimes black basally, T4-5 orange, face square.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek as long as broad. Hair of the face black and yellow intermixed, corbicular fringes extensively pale orange. T2 anterolaterally sometimes with scattered black hairs intermixed. Hair length medium and uneven.

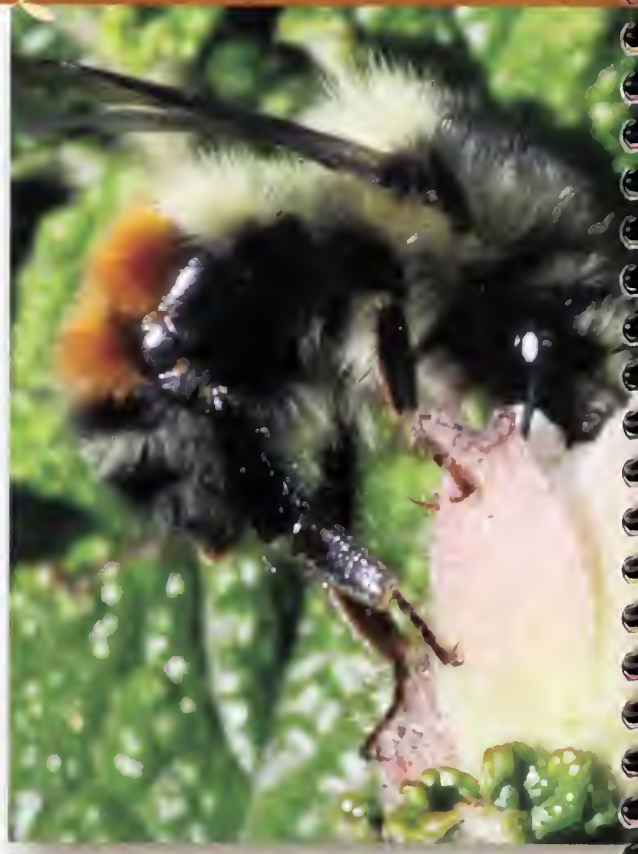
Bombus melanopygus

Black tail bumble bee

- Status: Common
- Select food plant genera: *Lupinus, Trifolium, Chamerion, Rubus, Senecio, Penstemon*
- Tongue Length: Medium
- Distribution: Pacific coast east to the Colorado Rocky Mountains; dark color form (*B. melanopygus edwardsii)* found primarily in California and southern Oregon; red form (*B. melanopygus melanopygus*) found to the north and east
- Can be confused with *B. sylvicola, B. bifarius, B. rufocinctus*, and *B. huntii*

B. melanopygus phenology - King Co., WA





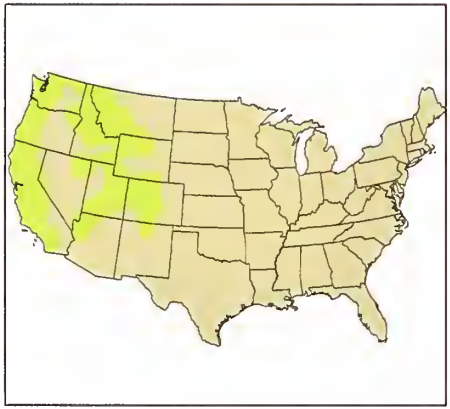
Bombus melanopygus worker on *Gaultheria sp.*
Photo Don Rolfs

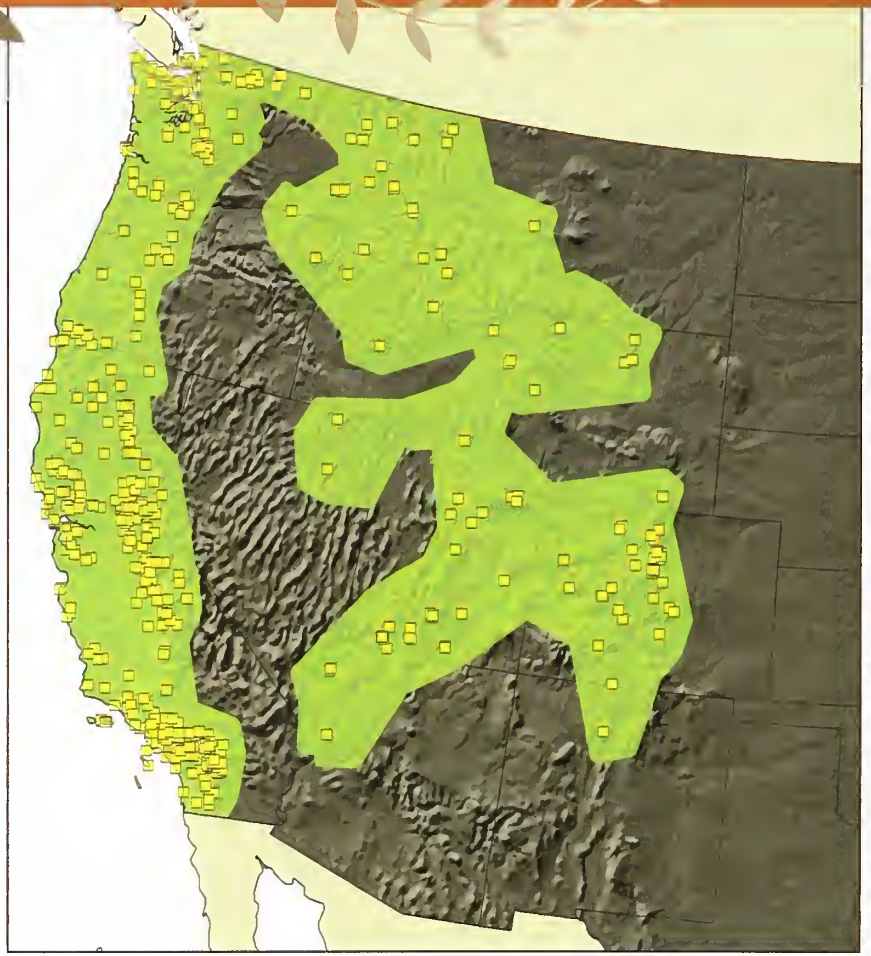
Lateral image of *Bombus melanopygus* female.
Photo Jonathan Koch

Face of *Bombus melanopygus* female.
Photo Jonathan Koch

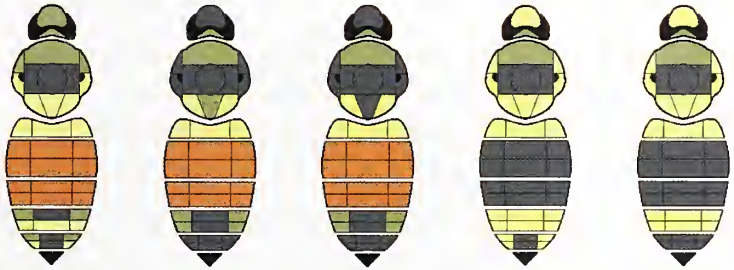
Bombus melanopygus worker.
Photo Elizabeth Elle

Bombus melanopygus continued





queen



worker

male

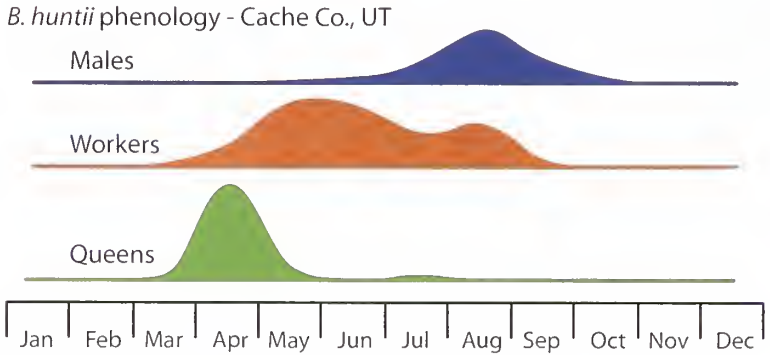
Females (queens and workers, colors refer to 'hair')

- Thorax anterior to black band between wing bases distinctly clouded, scutellum yellow sometimes divided by a black posteriorly directed triangle, T1 yellow, T2-3 orange or black, T4-5 yellow at least laterally or with black hair intermixed (clouded). Face square.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek length as long as broad. Hair of the face and top of head predominately yellow with black intermixed. On the side of the thorax, the lower anterior surface with long, predominantly yellow hair, corbicular fringes red and black. Hair length medium and uneven.

Bombus huntii

Hunt bumble bee

- Status: Common
- Select food plant genera: *Cirsium, Phacelia, Lupinus, Rudbeckia, Melilotus, Penstemon*
- Tongue Length: Medium
- Distribution: Sierra-Cascade Crest east to the Colorado Rocky Mountains and Black Hills; south into New Mexico and Arizona; north into Canada
- Can be confused with *B. bifarius, B. sylvicola, B. melanopygus,* and *B. rufocinctus*



Bombus huntii queen on *Echineacea sp.*
Photo Leah Lewis

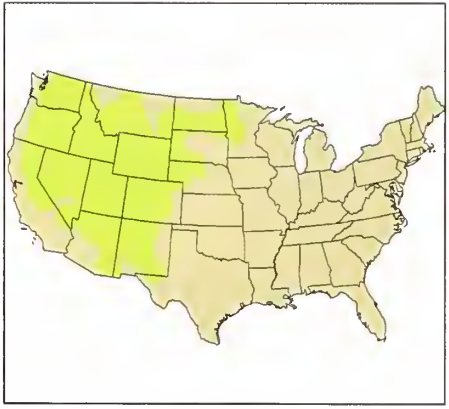
Lateral image of *Bombus huntii* female.
Photo Jonathan Koch

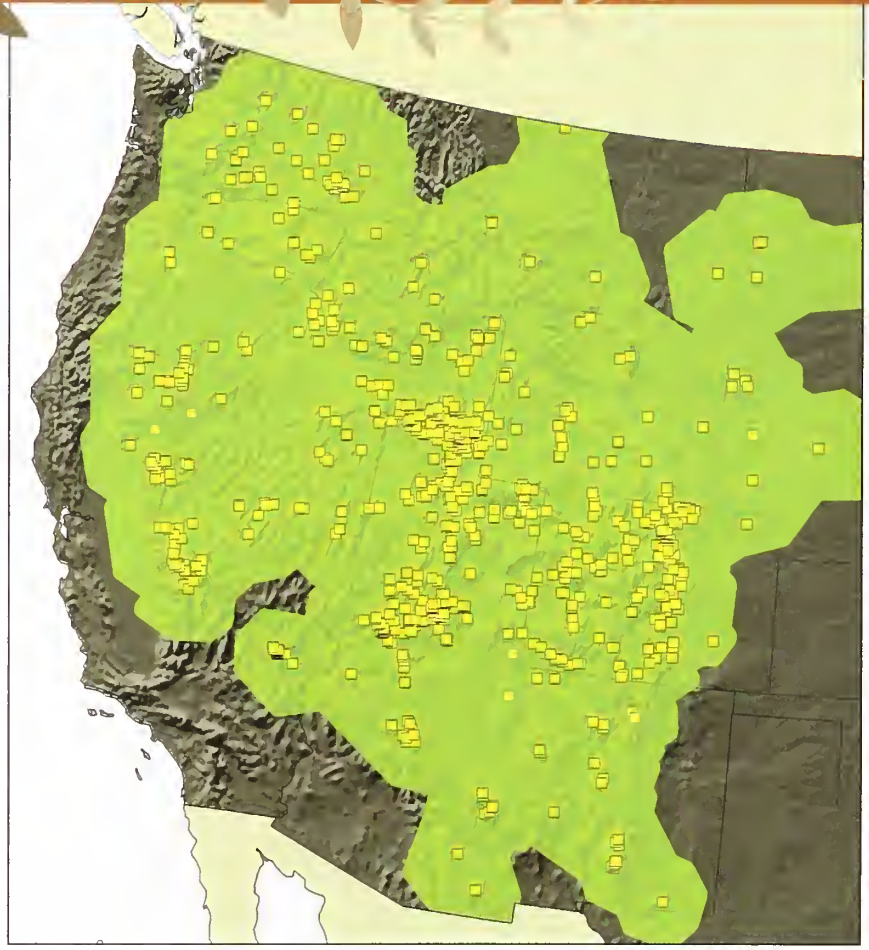
Face of *Bombus huntii* female.
Photo Jonathan Koch

Bombus huntii female.
Photo by JaimeFlorez

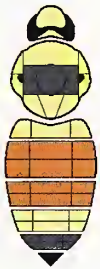
Bombus huntii female.
Photo Christopher Christie

Bombus huntii continued



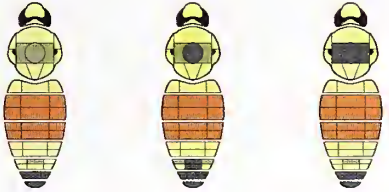


queen



worker

male



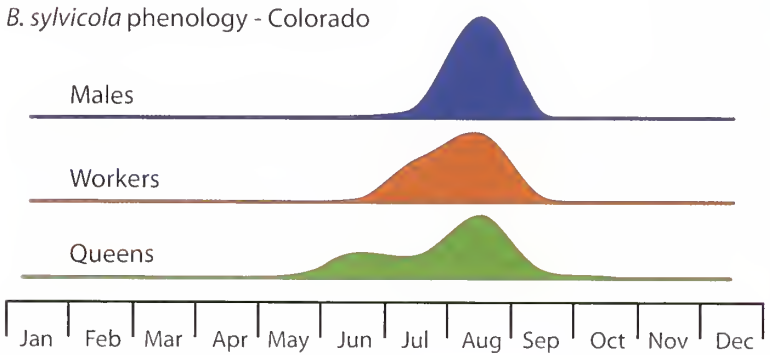
Females (queens and workers, colors refer to 'hair')

- Thorax anterior to distinct black band between wing bases yellow, scutellum, T1 and T4 yellow, T2-3 orange, T5 black.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek length as long as broad. Hair of the face and top of head completely yellow. On the side of the thorax, the lower anterior surface with yellow hair, corbicular fringes black. Hair length medium and even.

Bombus sylvicola

Forest bumble bee

- Status: Uncommon
- Select food plant genera: *Senecio, Chamerion, Lupinus, Melilotus, Arenaria, Raillardella*
- Tongue Length: Medium
- Distribution: High mountains in the western U.S. including the Sierra Nevada, some "Sky Islands" in the Great Basin and the Rocky Mountains
- Can be confused with *B. melanopygus, B. bifarius, B. huntii,* and *B. rufocinctus*

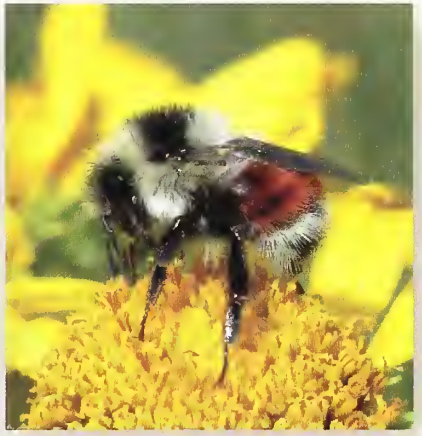


Bombus sylvicola male on Asteraceae.
Photo Joyce Knoblett

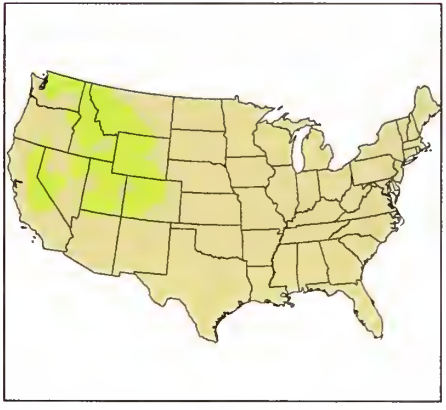
Lateral image of *Bombus sylvicola* female.
Photo Jonathan Koch

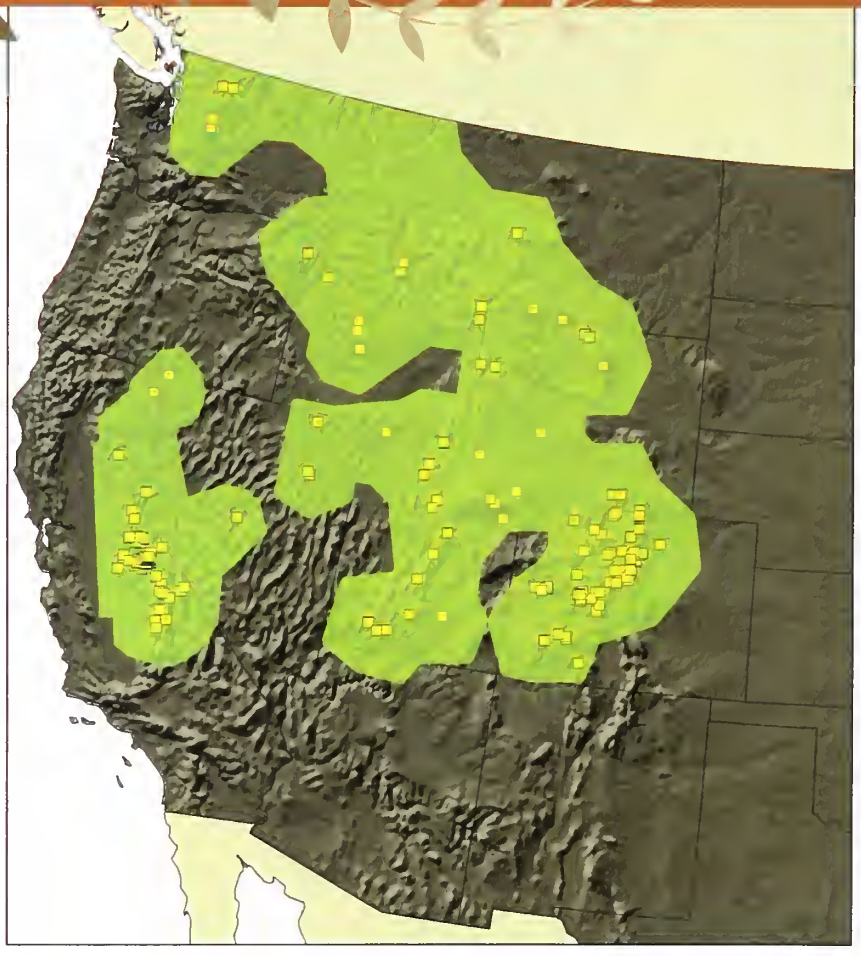
Face of *Bombus sylvicola* female.
Photo Jonathan Koch

Bombus sylvicola female.
Photo Diane Wilson

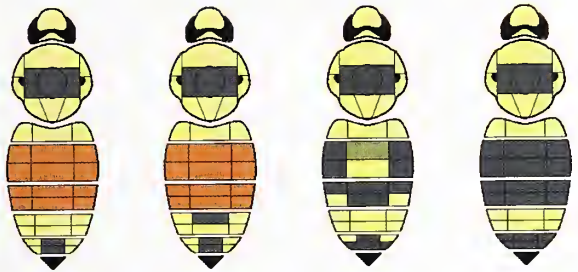


Bombus sylvicola *continued*

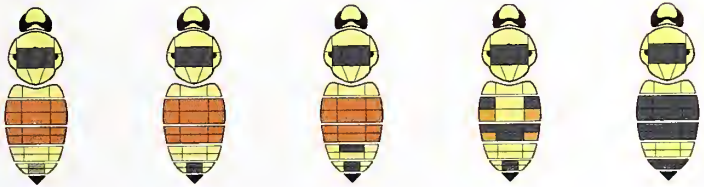




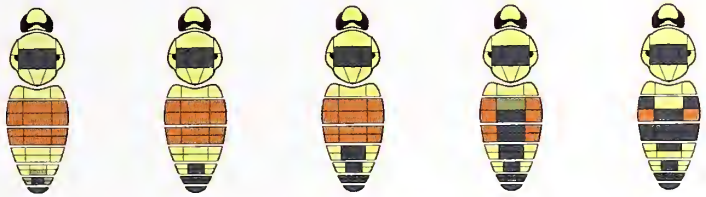
queen



worker



male



Females (queens and workers, colors refer to 'hair')

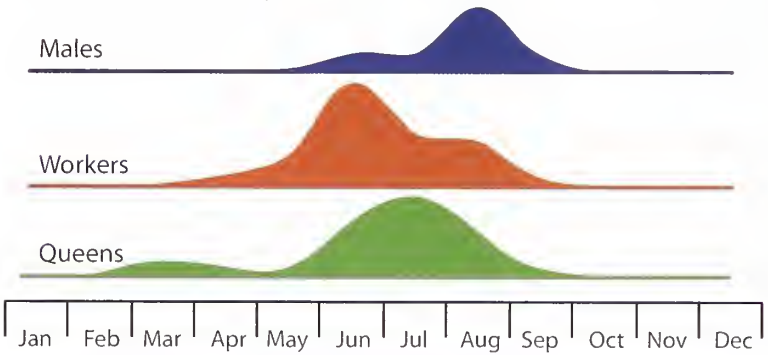
- Thorax anterior to distinct black band between wing bases yellow, scutellum and T1 yellow, T2-3 orange or black, if black sometimes yellow medially, T4 usually yellow, T5 yellow at least apicolaterally, face square.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek length as long as broad. Hair on the center of face yellow with black admixture above the antennal bases. On the side of the thorax, the lower anterior surface with yellow hairs, corbicular fringes black. Hair length long and very uneven.

Bombus vosnesenskii

Vosnesensky bumble bee

- Status: Very common, possibly increasing in abundance
- Select food plant genera: *Lupinus, Cirsium, Eriogonum, Phacelia, Clarkia, Ericameria*
- Tongue Length: Medium
- Distribution: Exclusive to costal California, Oregon and Washington east towards the Sierra-Cascade Crest; uncommon, but present in Nevada
- Can be confused with *B. caliginosus, B. occidentalis,* and *B. vandykei*

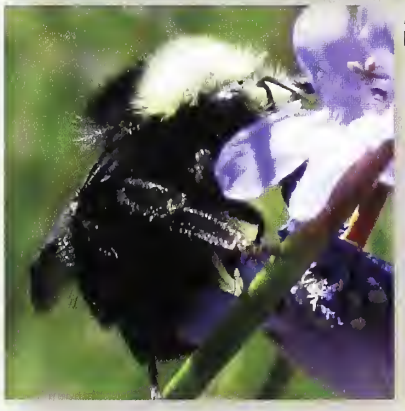
B. vosnesenskii phenology - Tuolumne Co., CA



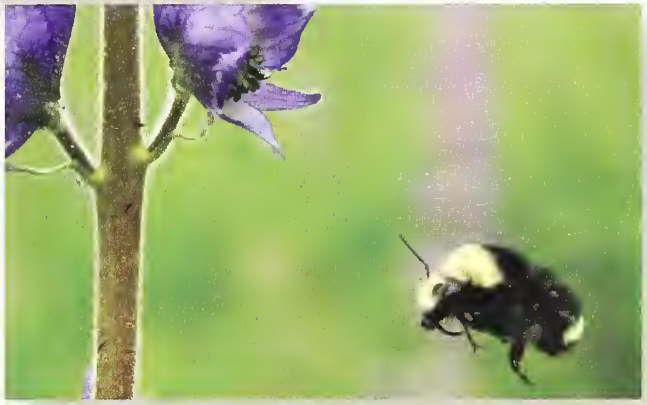
Bombus vosnesenskii worker on *Agastache sp.*
Photo Lee Solter

Lateral image of *Bombus vosnesenskii* female.
Photo Jonathan Koch

Face of *Bombus vosnesenskii* female.
Photo Jonathan Koch

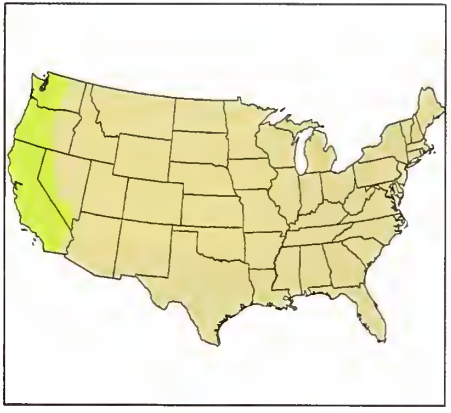


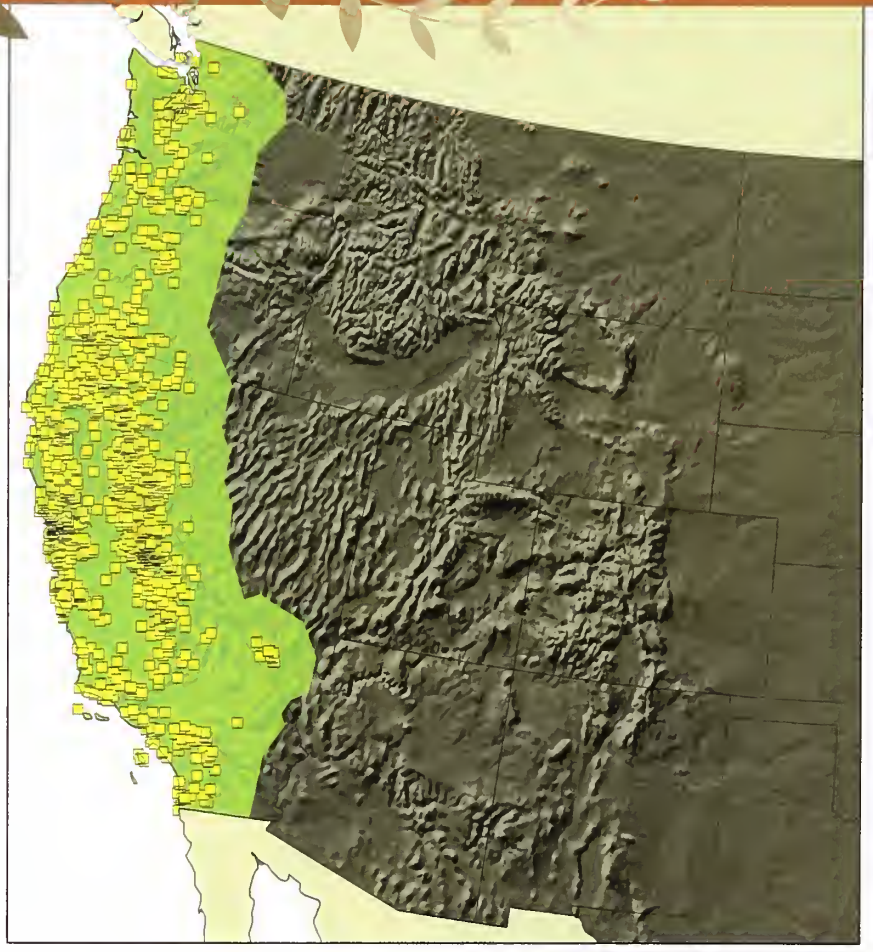
Bombus vosnesenskii.
Photo Armen Armaghanyan



Bombus vosnesenskii on Delphinium.
Photo Lee Solter

Bombus vosnesenskii *continued*

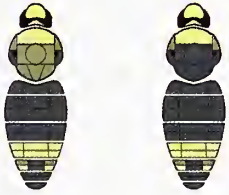




queen

worker

male



Females (queens and workers, colors refer to 'hair')

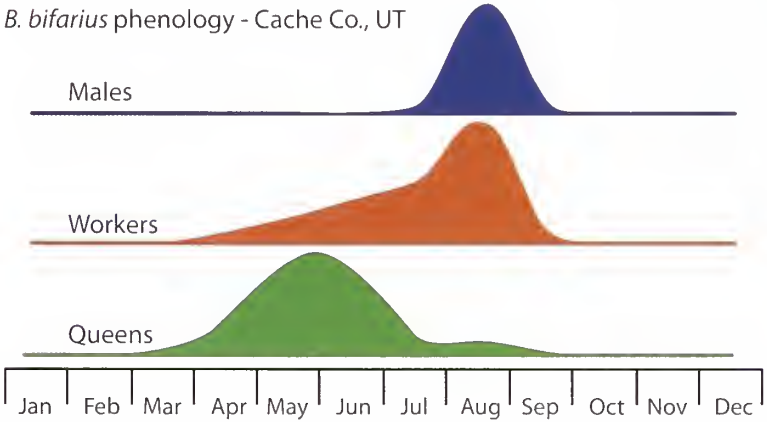
- Thorax anterior to black band between wing bases yellow, scutellum black, T1-3 black, T4 yellow, T5 and T6 black, face square and yellow.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek length as long as broad. Hair of the face and top of head yellow. On the side of the thorax, the lower anterior surface with long, predominantly black hair, corbicular fringes black. Hair length medium and even.

Bombus bifarius

Two form bumble bee

- Status: Very common
- Select food plant genera: *Melilotus, Lupinus, Aster, Senecio, Chrysothamnus, Cirsium*
- Tongue Length: Medium
- Distribution: From the Pacific coast to the Rocky Mountains; from Arizona to Alaska; a dark form (*B. bifarius nearcticus*) in the north and west; a red form (*B. bifarius bifarius*) found in the south and east of the range
- Can be confused with *B. huntii, B. melanopygus, B. mixtus, B. rufocinctus,* and *B. sylvicola*

B. bifarius phenology - Cache Co., UT



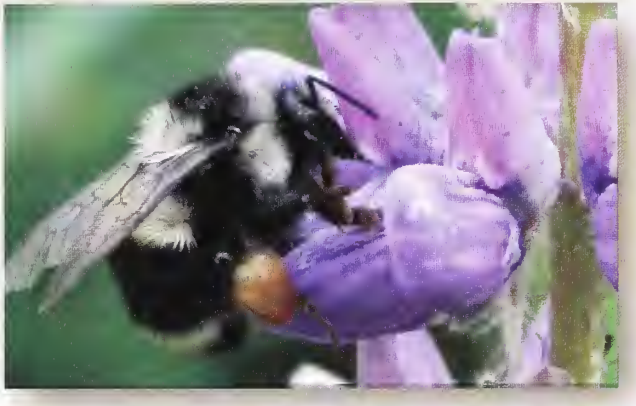
Bombus bifarius.
Photo Don Rolfs

Lateral image of *Bombus bifarius* queen.
Photo Jonathan Koch

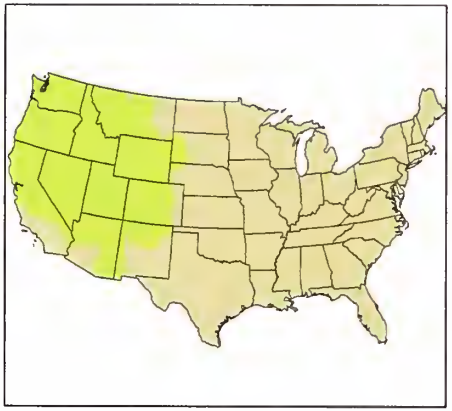
Face of *Bombus bifarius* queen.
Photo Jonathan Koch

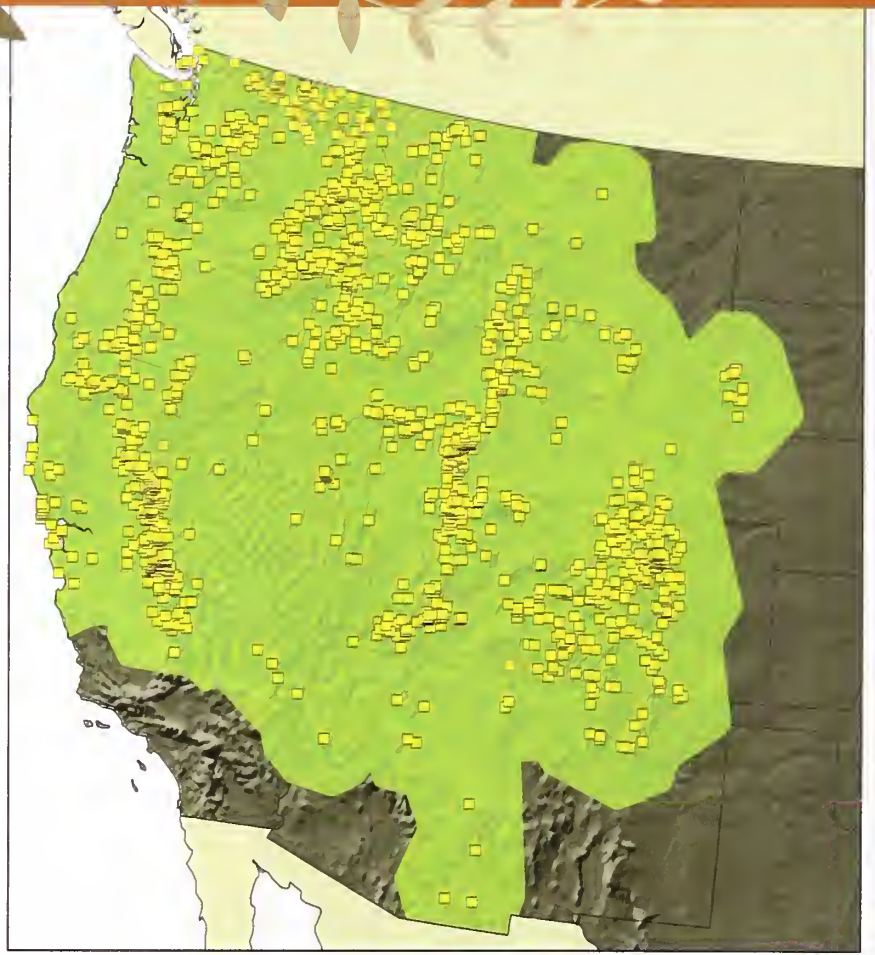
Bombus bifarius.
Photo Don Rolfs

Bombus bifarius queen on *Taraxacum officinale*.
Photo David Inoyue

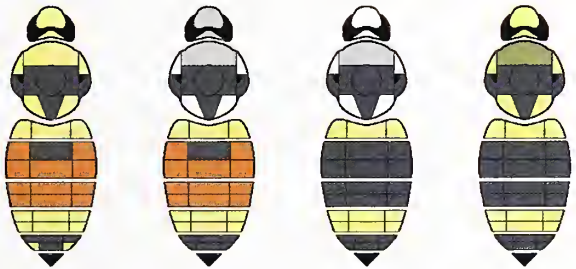


Bombus bifarius worker on *Lupinus sp.*
Photo Lee Solter

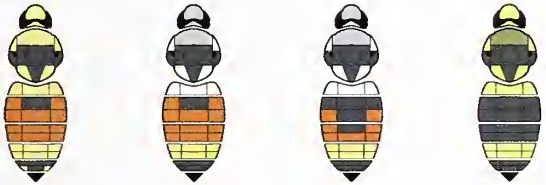




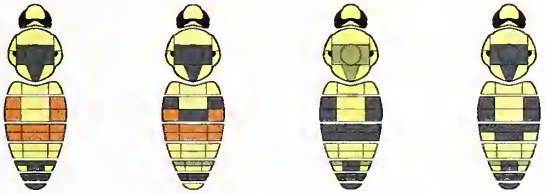
queen



worker



male



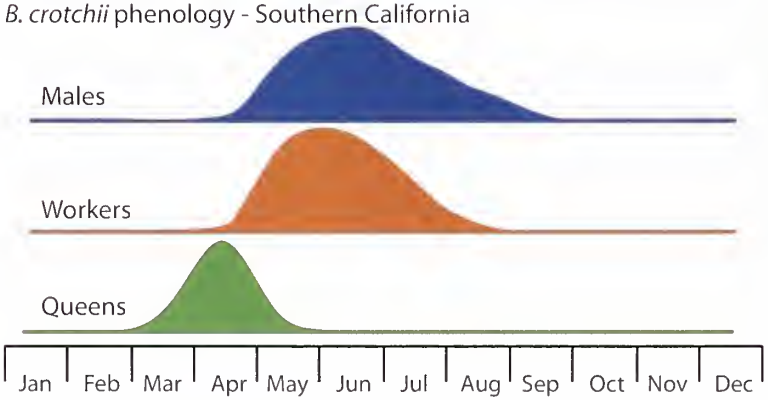
Females (queens and workers, colors refer to 'hair')

- Thorax anterior to black band between wing bases yellow or white and sometimes cloudy in appearance, scutellum with pale or yellow patches entirely divided by a black posteriorly directed triangle, T1 yellow or pale white, T2 and T3 completely black or red, or black and red admixture, T4 yellow, T5 and T6 black. Face square.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek length as long as broad. Hair of the face and top of head predominately yellow or pale sometimes with black admixture. On the side of the thorax, the lower anterior surface with long, predominantly yellow, or pale yellow hair, corbicular fringes red. Hair length medium.

Bombus crotchii

Crotch bumble bee

- Status: Uncommon
- Select food plant genera: *Antirrhinum, Phacelia, Clarkia, Dendromecon, Eschscholzia, Eriogonum*
- Tongue Length: Medium
- Distribution: Exclusive to coastal California east towards the Sierra-Cascade Crest; less common in western Nevada
- Can be confused with *B. caliginosus, B. occidentalis,* and *B. vandykei*

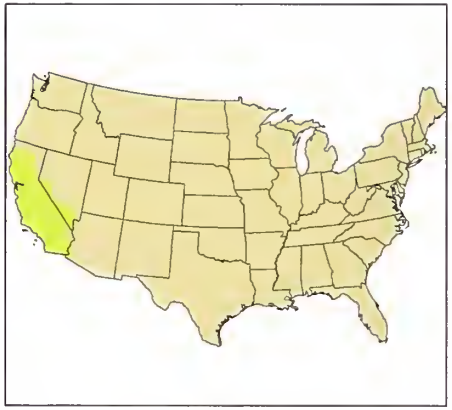


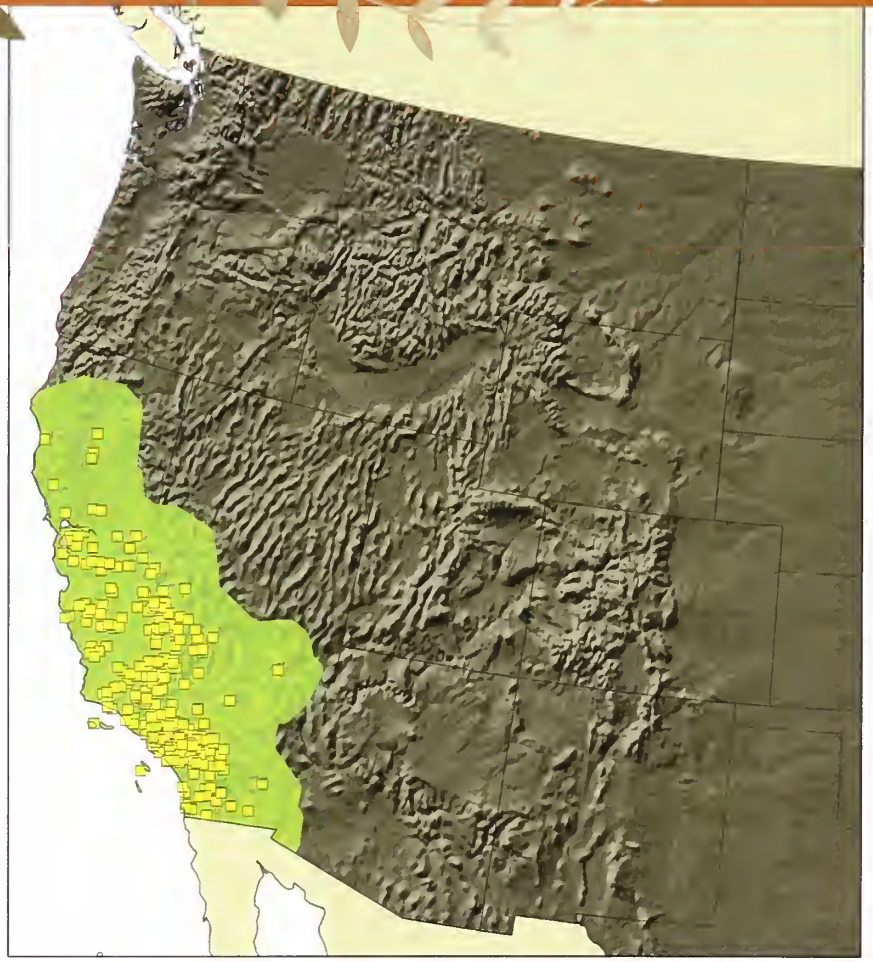
Bombus crotchii male. Photo Native Plants

Lateral image of *Bombus crotchii* female.
Photo Jonathan Koch

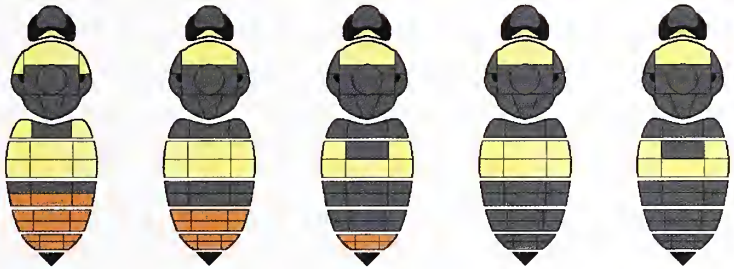
Face of *Bombus crotchii* female.
Photo Jonathan Koch

Bombus crotchii continued





queen



worker

male

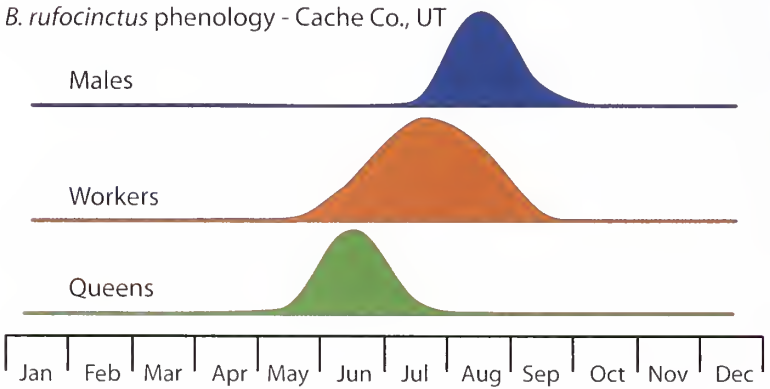
Females (queens and workers, colors refer to pile or 'hair')

- Thorax anterior to black between wing bases yellow, scutellum black, T1 black at least medially, T2 predominantly yellow, T3-5 red or black, face square.
- Mid leg basitarus with the distal posterior corner rounded. Cheek length as long as broad. Hair of the face and top of head black. On the side of the thorax, the lower anterior surface with long black hairs, corbicular fringes black.

Bombus rufocinctus

Red-belted bumble bee

- Status: Common
- Select food plant genera: *Cirsium, Melilotus, Arctium, Trifolium, Aster, Tanacetum*
- Tongue Length: Short
- Distribution: Broadly distributed across the northern half of the U.S. and throughout the southern Rocky Mountains and the Sierra Nevada
- Highly variable coloration; can be confused with *B. melanopygus, B. bifarius, B. huntii,* and *B. sylvicola*



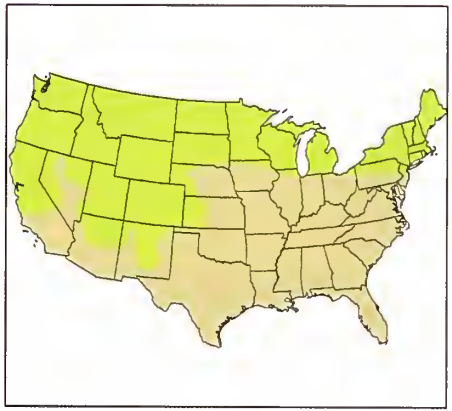
Bombus rufocinctus red morph queen. Photo Leah Lewis

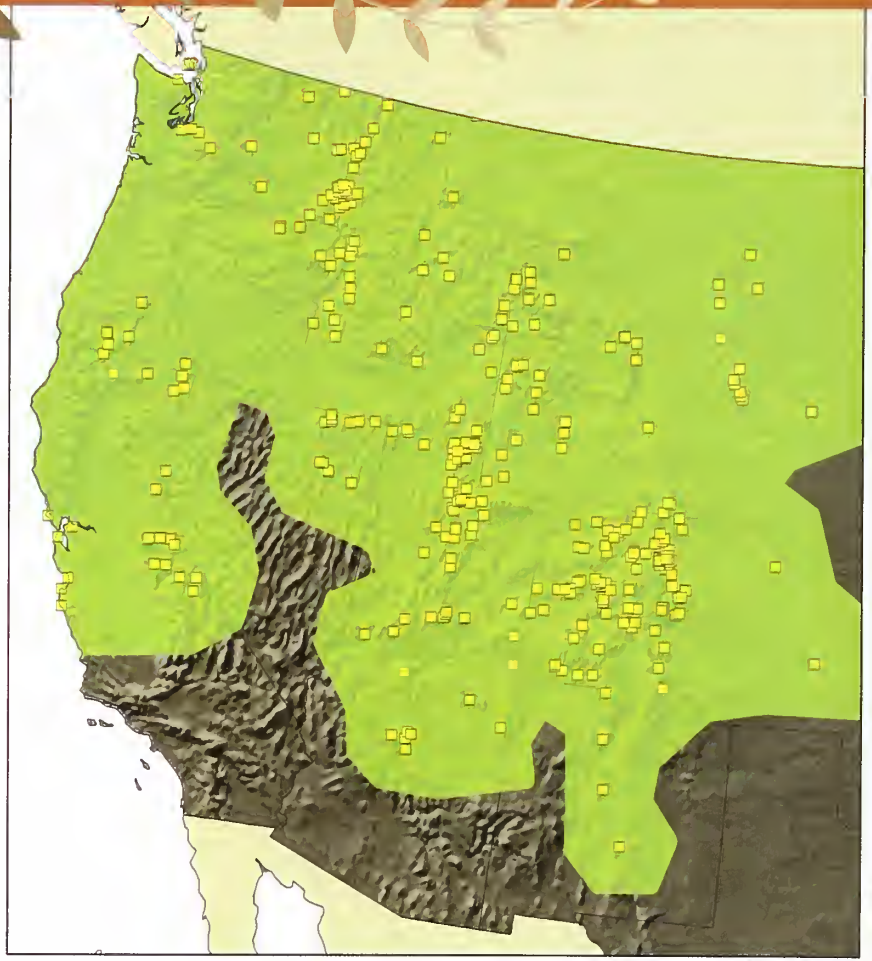
Lateral image of *Bombus rufocinctus* female.
Photo Jonathan Koch

Face of *Bombus rufocinctus* female.
Photo Jonathan Koch

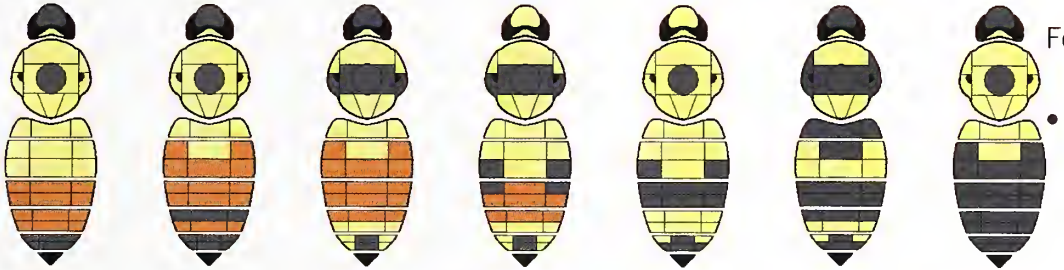
Bombus rufocinctus queen on flower.
Photo Leah Lewis

Bombus rufocinctus continued

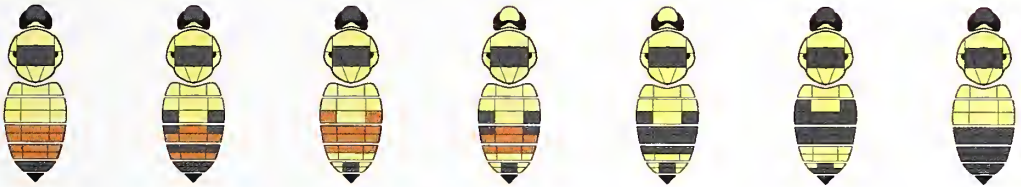




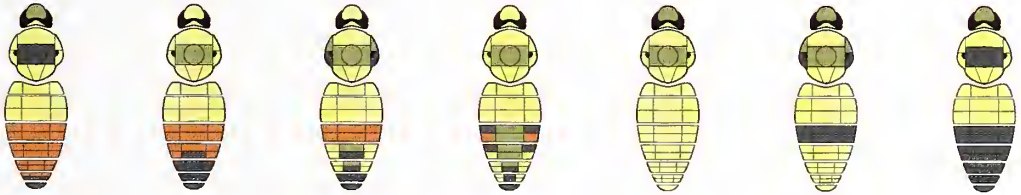
queen



worker



male



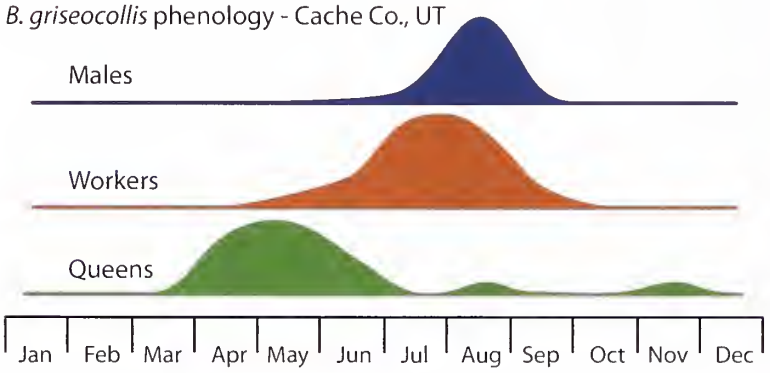
Females (queens and workers, colors refer to 'hair')

- Similar to many color patterns shown by both western and eastern North American bumble bees, but small bodied, short haired and with a very short face.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek length distinctly shorter than broad. Many other combinations of these color patterns are known, but the hair of T2 is almost always with at least a yellow crescent anteriorly (only rarely very much reduced). Hind basitarsus with the posterior margin evenly but not strongly arched. Hair length short and even, body size small.

Bombus griseocollis

Brown-belted bumble bee

- Status: Common
- Select food plant genera: *Phacelia, Medicago, Cirsium, Helianthus, Trifolium, Dipsacus*
- Tongue Length: Medium
- Distribution: Northeastern California and Cascade Crest east to the northern Intermountain West and Rocky Mountains; broadly distributed in the eastern U.S.
- Can be confused with *B. morrisoni*

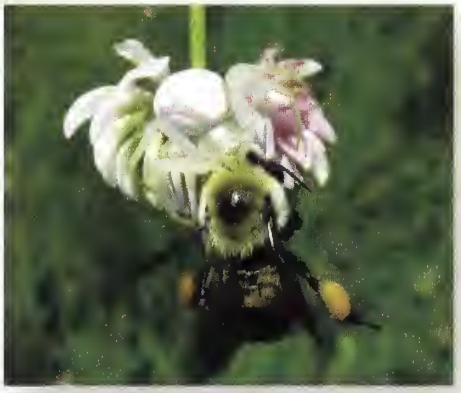


Bombus griseocollis.
Photo Diane Wilson

Lateral image of *Bombus griseocollis* female.
Photo Jonathan Koch

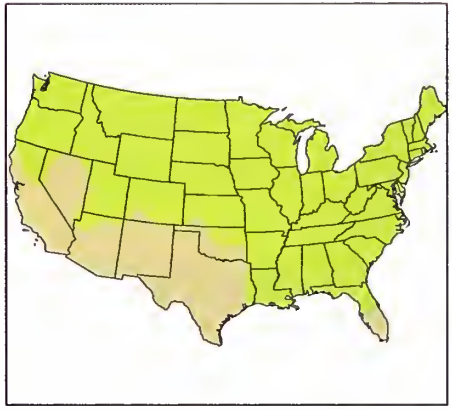
Face of *Bombus griseocollis* female.
Photo Jonathan Koch

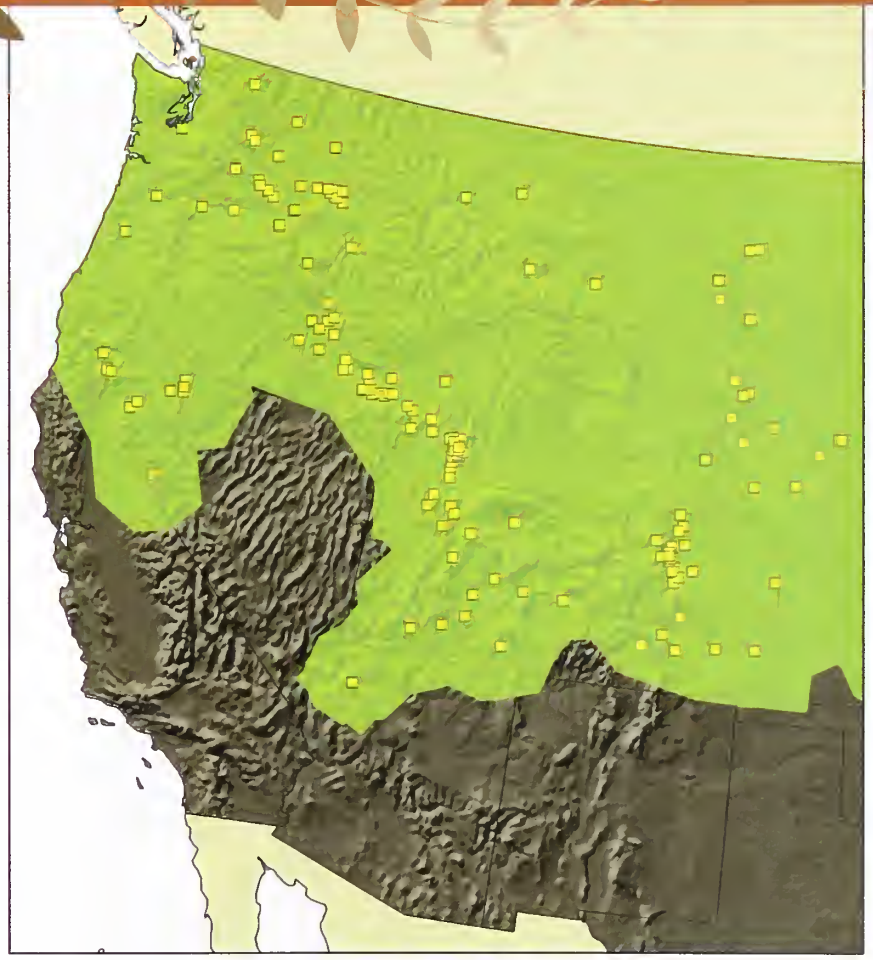
Bombus griseocollis female.
Photo Andrew Williams



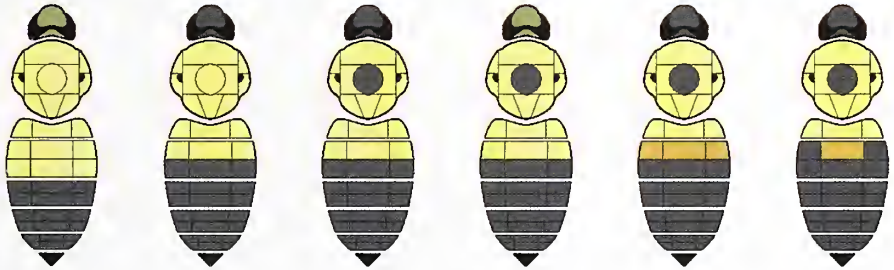
A *Bombus griseocollis* worker captured by a crab spider.
Photo Sheila Colla

Bombus griseocollis *continued*

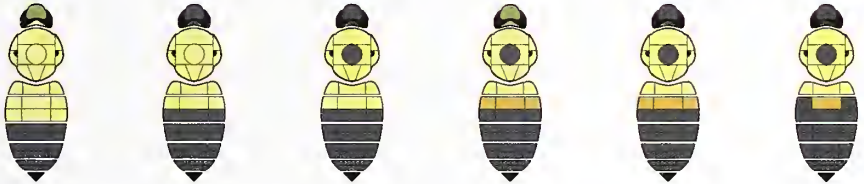




queen



worker



male

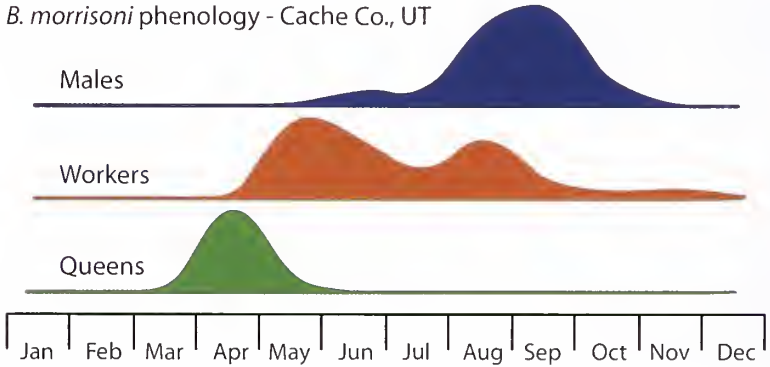
Females (queens and workers, colors refer to 'hair')

- Thorax and T1 predominantly yellow, or with a black spot between the wing bases, T2 with a yellow or brown crescent anteriorly, tail black, hair short.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek length distinctly shorter than broad, ocelli large. Hair of the face and of the top of the head black or with only a few yellow hairs intermixed, black thoracic spot between the wing bases often very small and inconspicuous but dense. Sometimes workers have the yellow on T2 extending for three quarters of the length of T2 and forming a W-shape. Hair length very short and even, the metasoma rectangular and slightly flattened.

Bombus morrisoni

Morrison bumble bee

- Status: Common
- Select food plant genera: *Cirsium, Cleome, Helianthus, Lupinus, Chrysothamnus, Melilotus*
- Tongue Length: Short
- Distribution: Sierra-Cascade Crest east to the Intermountain West and to South Dakota and south into Mexico; associated primarily with arid environments
- Can be confused with *B. griseocollis*



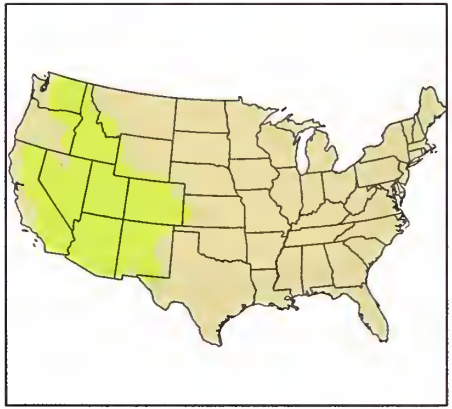
Bombus morrisoni worker on *Aconitum columbianum*.
Photo Hartmut Wisch

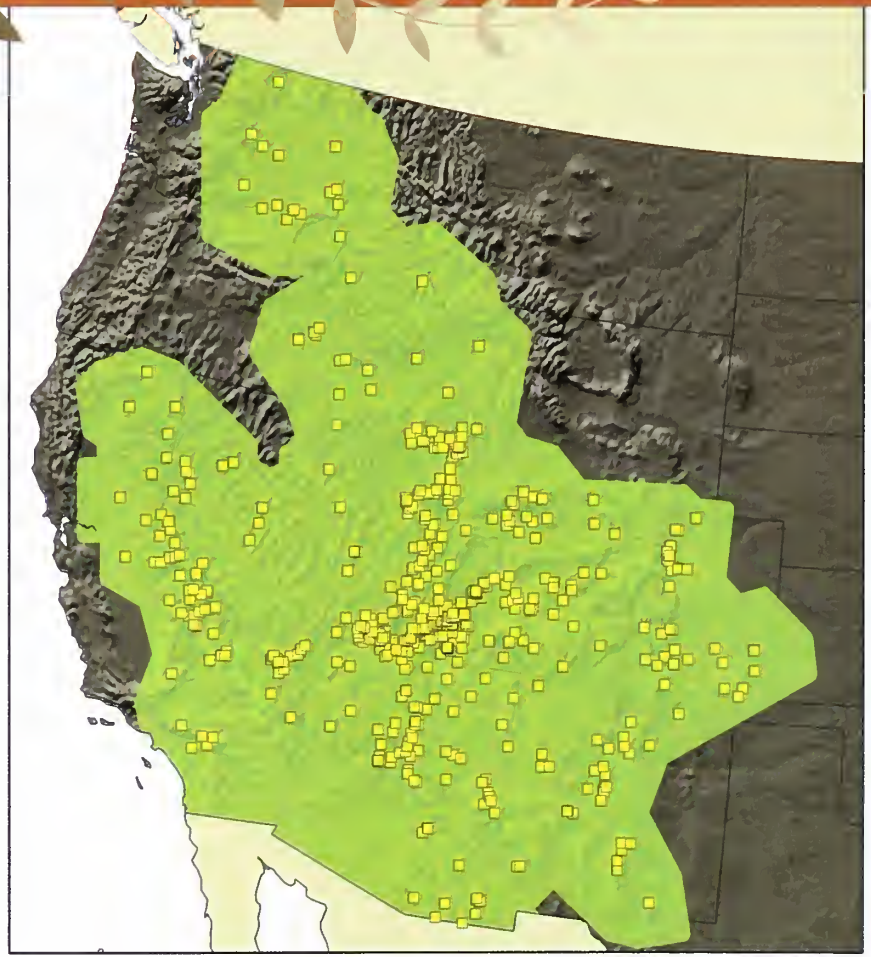
Lateral image of *Bombus morrisoni* female.
Photo Jonathan Koch

Face of *Bombus morrisoni* female.
Photo Jonathan Koch

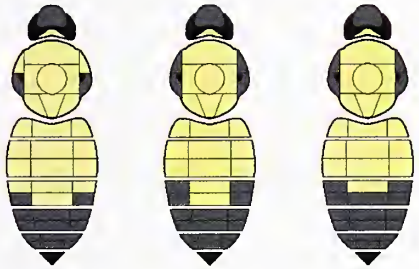
Bombus morrisoni.
Photo James Strange

Bombus morrisoni *continued*





queen



worker

male

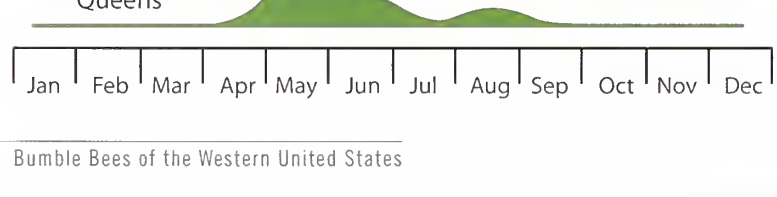
Females (queens and workers, colors refer to 'hair')

- Thorax and T1-2 yellow, T3 yellow at least medially, T4-5 predominantly black, face round.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek length distinctly shorter than broad. Hair of the face black and top of head yellow. On the side of the thorax, the lower anterior surface with medium black hair, corbicular fringes black. Hair length short and even.

Bombus franklini

Franklin bumble bee

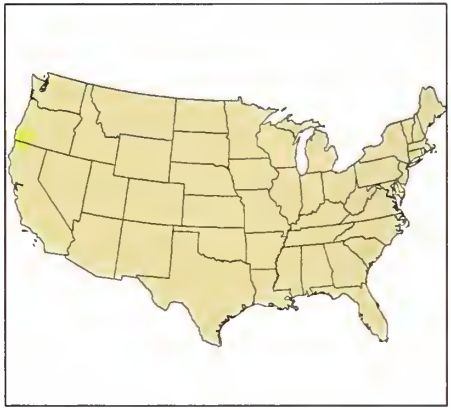
- Status: Rare, possibly extinct; last detected in 2006
- Select food plant genera: *Ceanothus, Centaurea, Eriogonum, Lupinus, Trifolium, Veratrum*
- Tongue Length: Short
- Distribution: Restricted to Klamath Mountains of southern Oregon and northern California
- Can be confused with *B. occidentalis* or *B. vosnesenskii*
- Possibly the most narrowly distributed bumble bee in the world

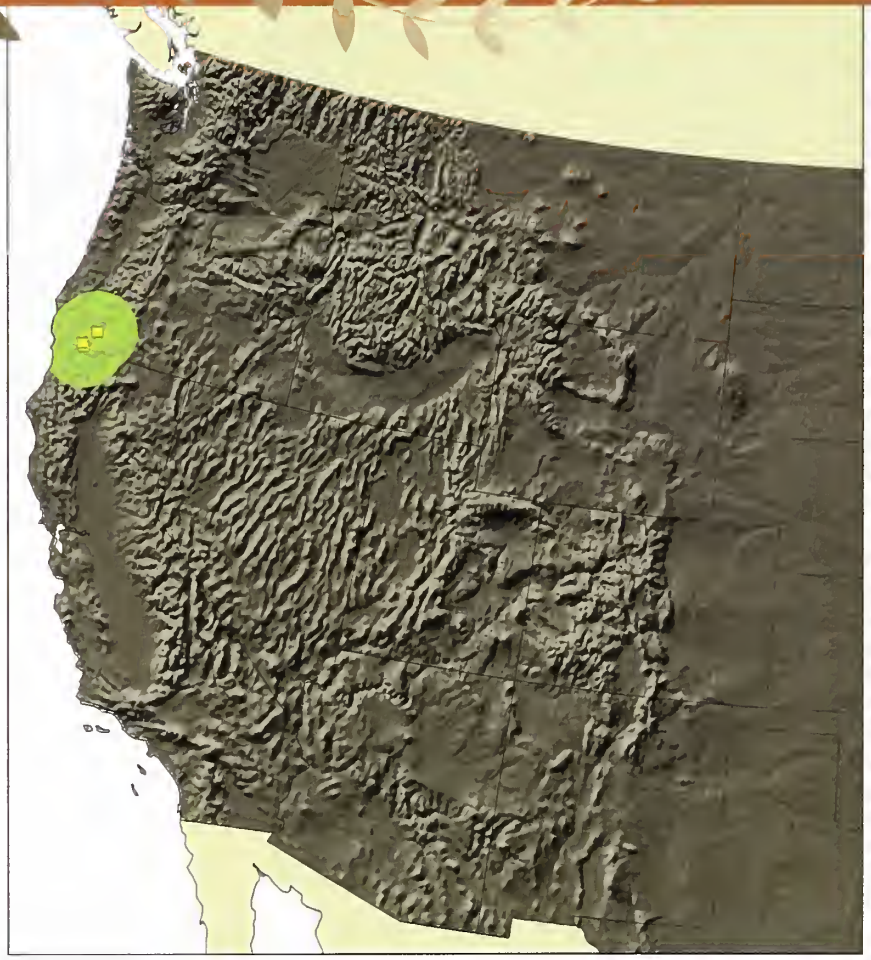


Bombus franklini female.
Photo James Strange

Lateral image of *Bombus franklini*.
Photo Jonathan Koch

Face of *Bombus franklini*.
Photo Jonathan Koch





queen

worker

male

Females (queens and workers, colors refer to 'hair')

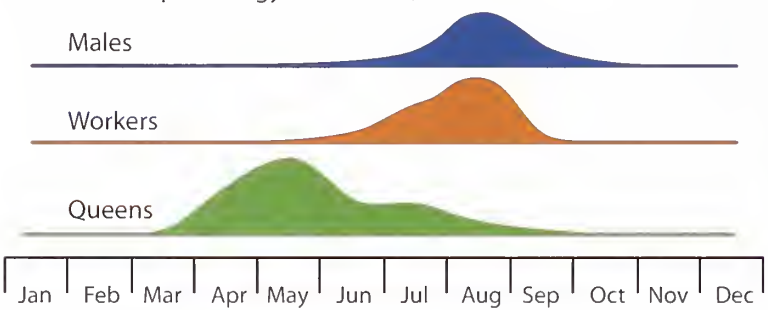
- Yellow hair on thorax extending posteriorly beyond wing bases (U-shaped), scutellum and T1-4 black, T5 black with white hairs at least on extreme lateral margins.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek length distinctly shorter than broad. Hair on the center of face yellow. On the side of the thorax, the lower anterior surface with predominantly black hair, corbicular fringes black. Hair length short and even.

Bombus occidentalis

Western bumble bee

- Status: Rare throughout much of its range; in decline but may be locally common
- Select food plant genera: *Melilotus, Cirsium, Trifolium, Centaurea, Chrysothamnus, Eriogonum*
- Tongue Length: Short
- Distribution: Historically from the Pacific coast to the Colorado Rocky Mountains; severe population decline west of the Sierra-Cascade Crest, but populations are known from the Great Basin, the Rocky Mountains and Alaska; several subspecies have been suggested
- Can be confused with *B. crotchii, B. mixtus,* and *B. terricola*

B. occidentalis phenology - Cache Co., UT



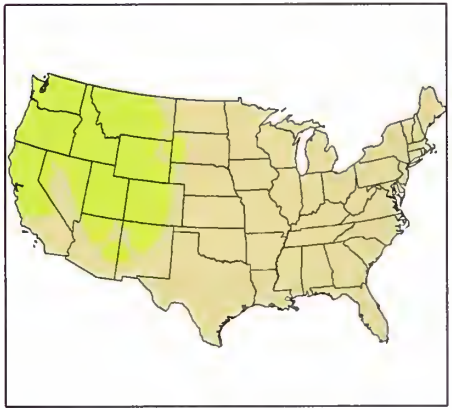
Bombus occidentalis worker nectar robbing *Ipomopsis aggregata*. Photo David Inouye

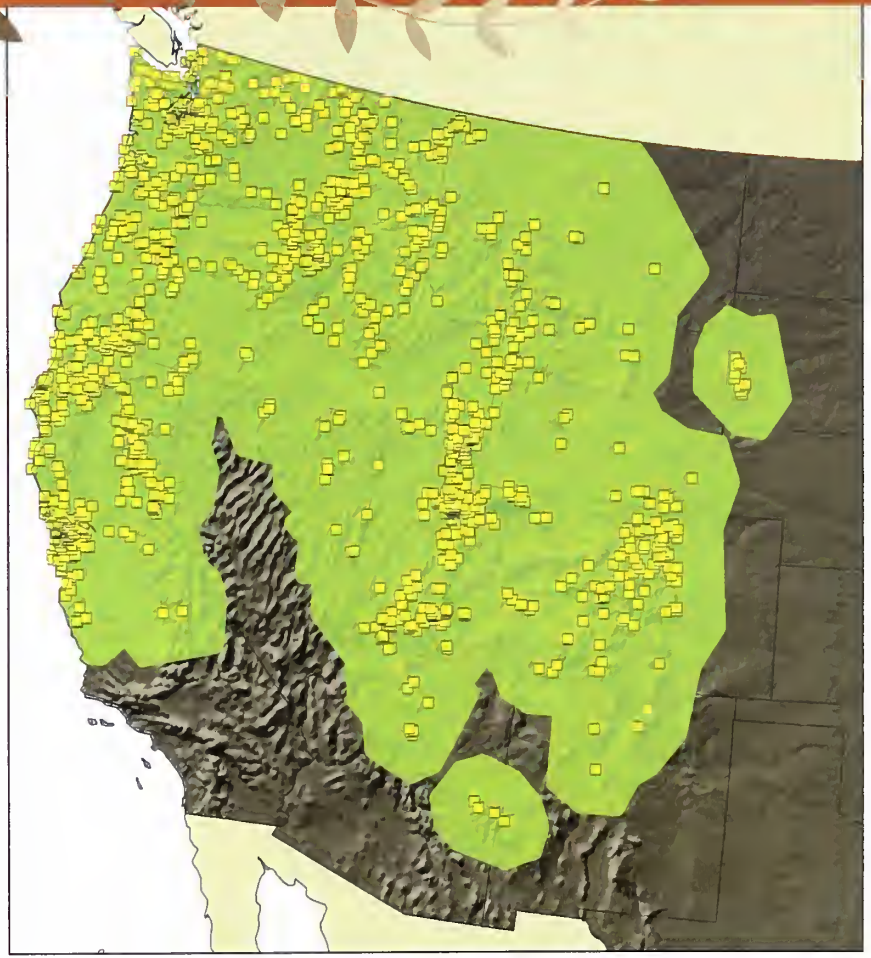
Lateral image of *Bombus occidentalis* female.
Photo Jonathan Koch

Face of *Bombus occidentalis* female.
Photo Jonathan Koch

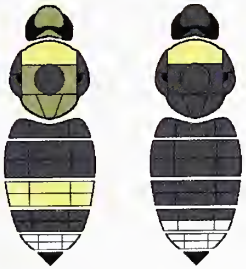
Bombus occidentalis worker on daisy.
Photo Joyce Knobeltt

Bombus occidentalis continued

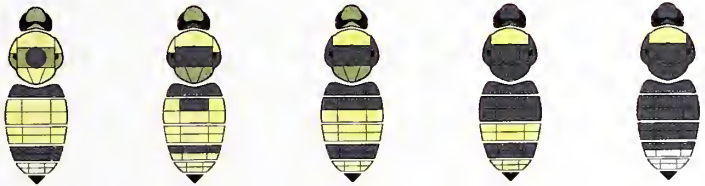




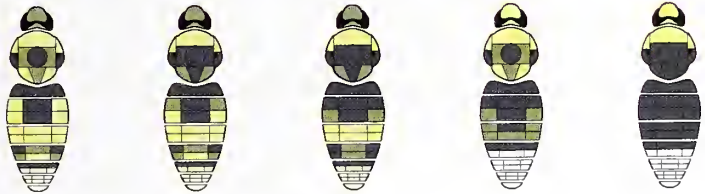
queen



worker



male



Females (queens and workers, colors refer to 'hair')

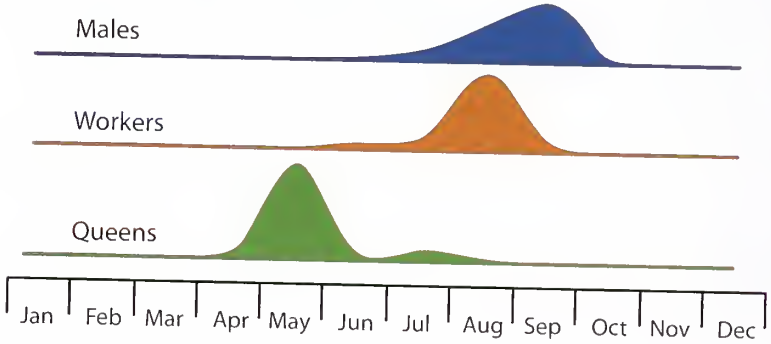
- Thorax anterior to black band between wing bases yellow, scutellum black or yellow, T1 black, T2 and T3 black or yellow, T4 often white at least apicolaterally, T5 white, face round.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek length slightly shorter than width. Hair of the face and top of head predominately black with yellow sometimes intermixed. On the side of the thorax, the lower anterior surface with predominantly black hair, sometimes with yellow intermixed, corbicular fringes red. Hair length medium and even.

Bombus terricola

Yellow-banded bumble bee

- Status: Rare, declining since the mid 1990s
- Select food plant genera: *Vaccinium, Salix, Rosa, Rubus, Lonicera, Solidago, Aster*
- Tongue Length: Short
- Distribution: Eastern Montana and the Black Hills east to New England and throughout the Appalachian Mountains
- Can be confused with *B. pensylvanicus* and *B. occidentalis*

B. terricola phenology - Ransom Co., ND

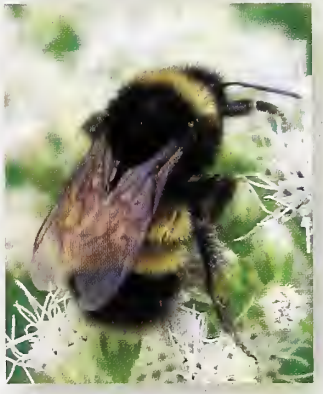


Bombus terricola worker. Photo Leif Richardson

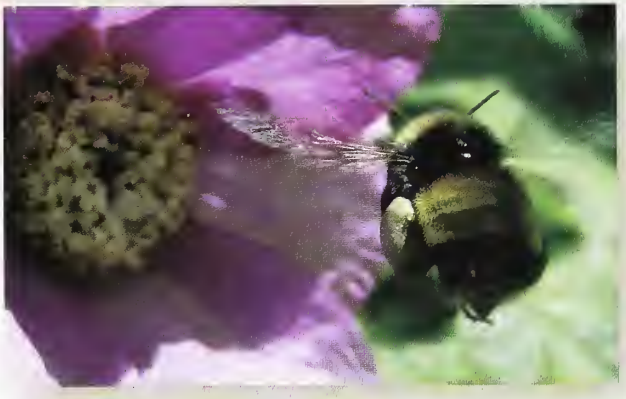
Lateral image of *Bombus terricola* female.
Photo Jonathan Koch

Face of *Bombus terricola* female.
Photo Jonathan Koch

Bombus terricola male.
Photo Leif Richardson

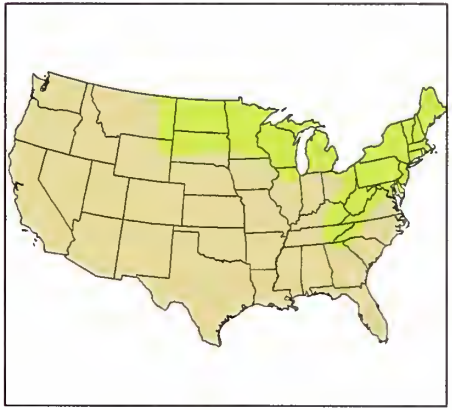


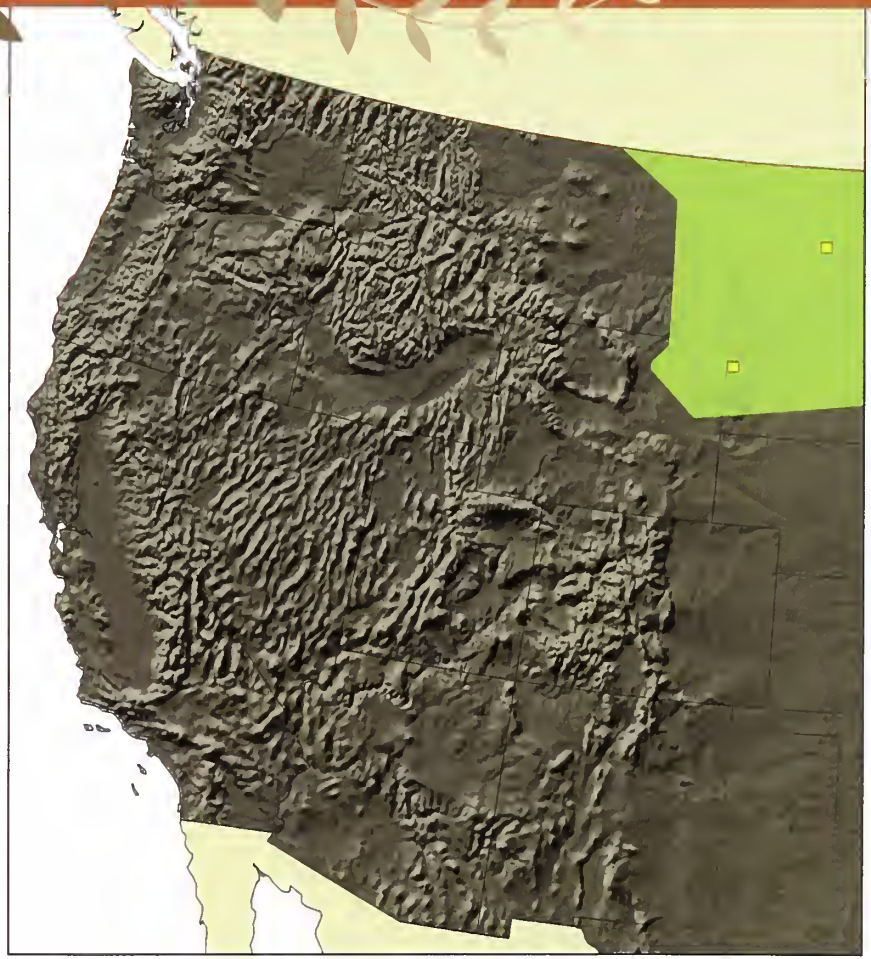
Bombus terricola female.
Photo Nelson DeBarros



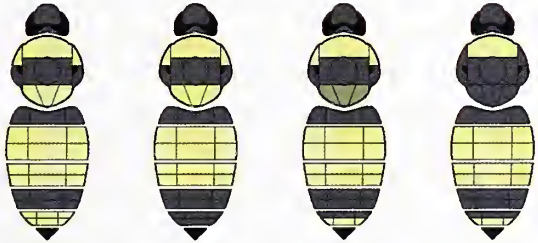
Bombus terricola worker.
Photo Leif Richardson

Bombus terricola *continued*

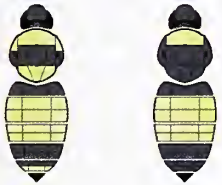




queen



worker



male

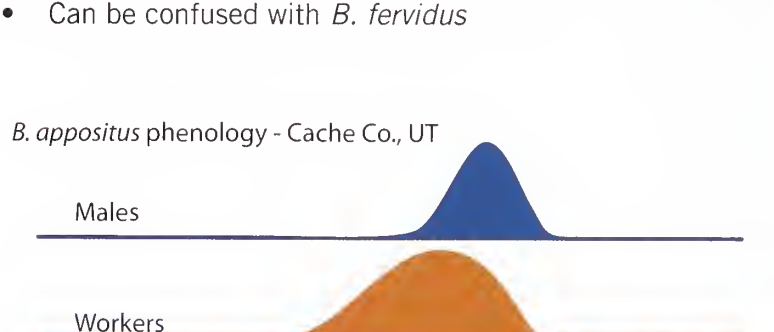
Females (queens and workers, colors refer to 'hair')

- Thorax with yellow band(s), T1 black, T2-3 yellow, T4 black, T5-6 black or yellow, face round.
- Mid leg basitarsus with the distal posterior corner rounded. Cheek length slightly shorter than broad, clypeus strongly swollen in the dorsal half, hind basitarsus with the posterior margin strongly and evenly arched. Hair of the head black or with a minority of short pale hairs intermixed. Hair length short and even.

Bombus appositus

White-shouldered bumble bee

- Status: Common
- Select food plant genera: *Cirsium, Delphinium, Linaria, Trifolium, Geranium, Penstemon*
- Tongue Length: Long
- Distribution: Abundant in higher elevations in the Cascades, Sierra Nevada, Intermountain West and Rocky Mountains; less abundant in the coastal plains of Oregon and Washington
- Can be confused with *B. fervidus*



Bombus appositus worker on *Delphinium sp.*
Photo Lee Solter

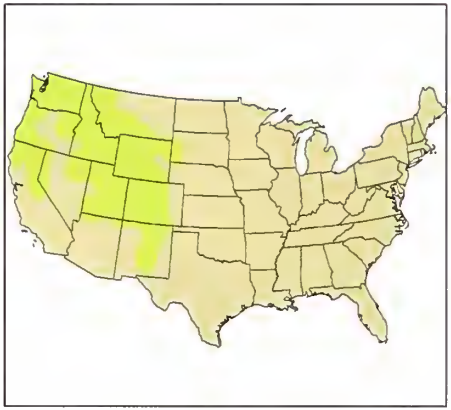
Bombus appositus continued

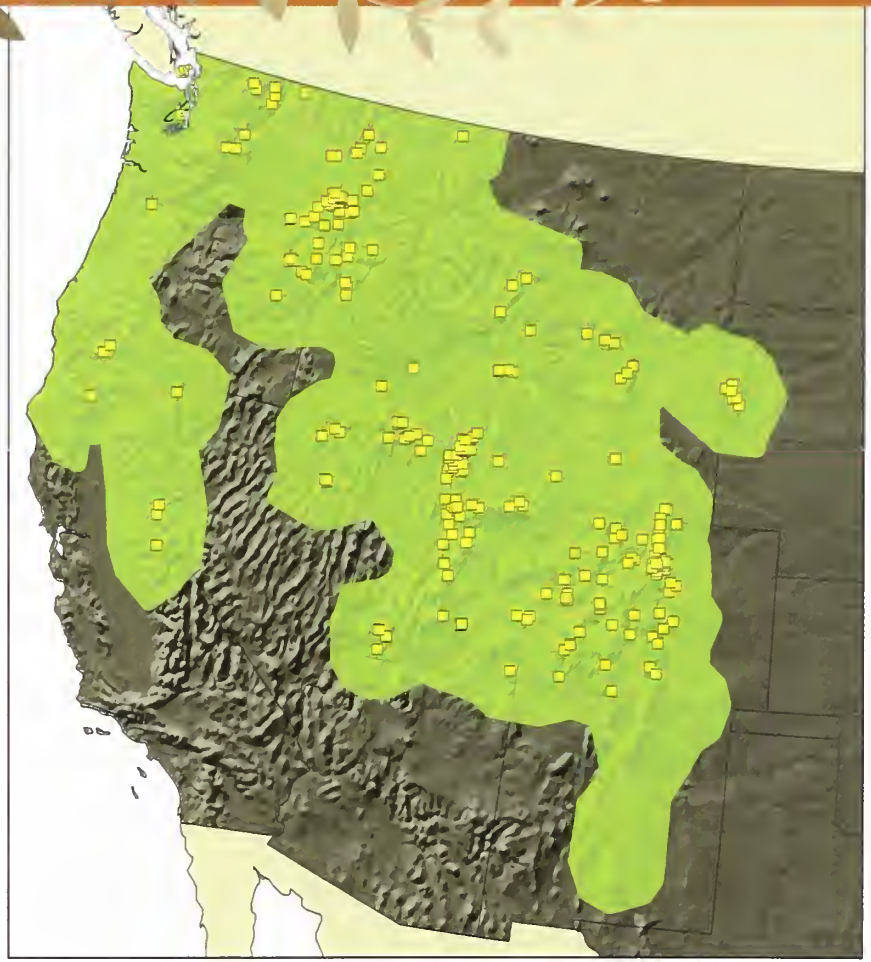
Lateral image of *Bombus appositus* female.
Photo Jonathan Koch

Face of *Bombus appositus* female.
Photo Jonathan Koch

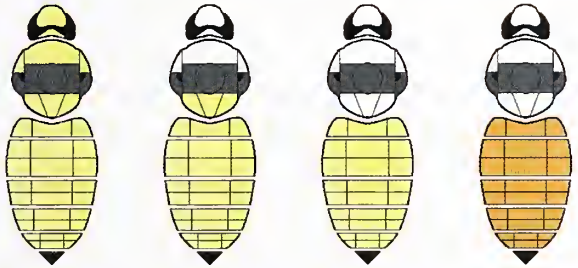
Bombus appositus nest.
Photo Leah Lewis

Bombus appositus continued

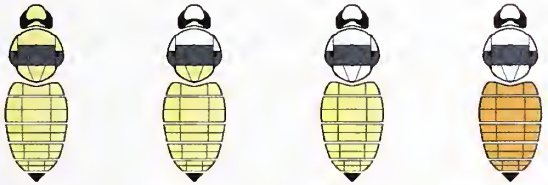




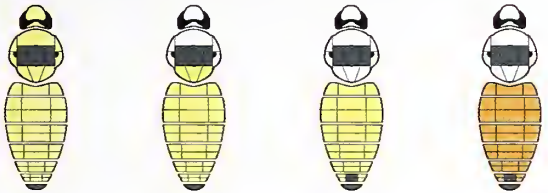
queen



worker



male



Females (queens and workers, colors refer to 'hair')

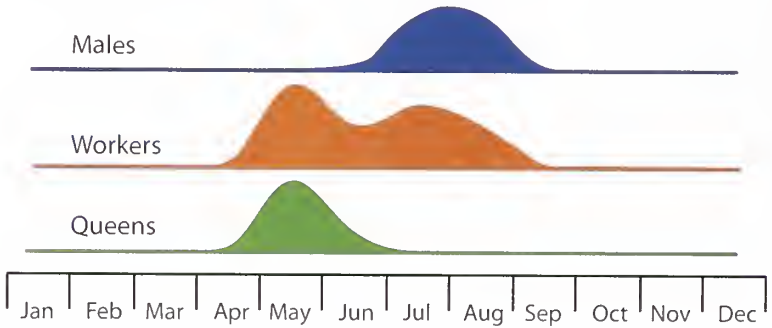
- Thorax anterior to black band between wing bases predominately white, scutellum yellow or occasionally white and T1-5 predominantly yellow or sometimes orange-brown, face long.
- Mid leg basitarsus with the distal posterior corner sharply pointed (may be hidden by hair). Cheek longer than broad. Hair of the face and top of head predominately white or occasionally yellow. On the side of the thorax, the lower anterior surface with predominantly black hair, corbicular fringes black. Hair length short and even.

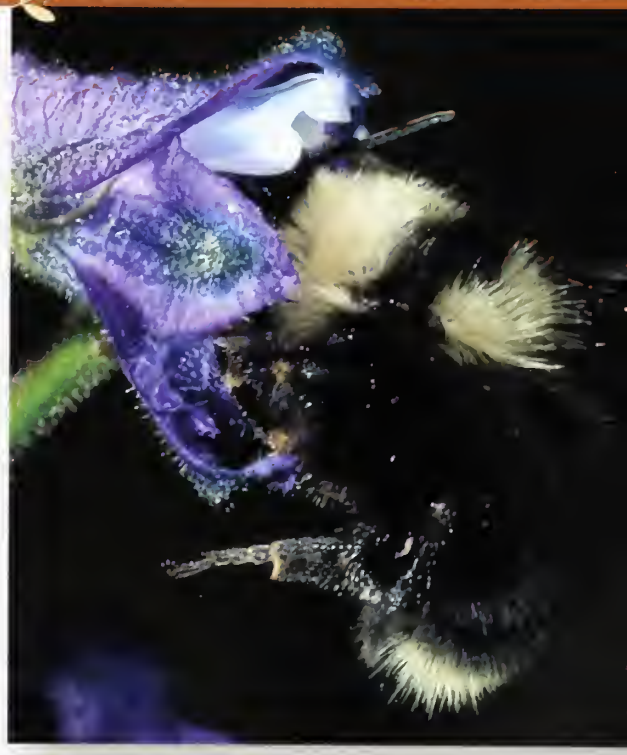
Bombus californicus

California bumble bee

- Status: Uncommon, possibly in decline
- Select food plant genera: *Cirsium, Trifolium, Monardella, Astragalus, Penstemon, Abronia*
- Tongue Length: Long
- Distribution: Dark form distributed throughout coastal California, Oregon and Washington; yellow form primarily distributed throughout the Intermountain West and Rocky Mountains; both forms co-occur in the Intermountain West along with *B. fervidus*, raising questions as to whether they are distinct species
- Dark form can be confused with *B. vosnesenskii*, *B. caliginosus*, and *B. vandykei*

B. californicus phenology - Whitman Co., WA

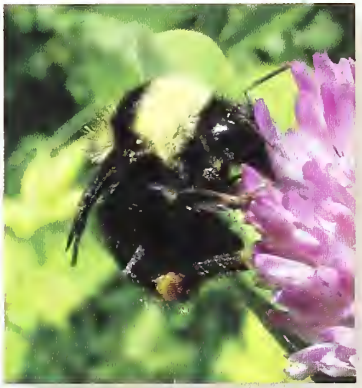




Bombus californicus worker. Photo David Inouye

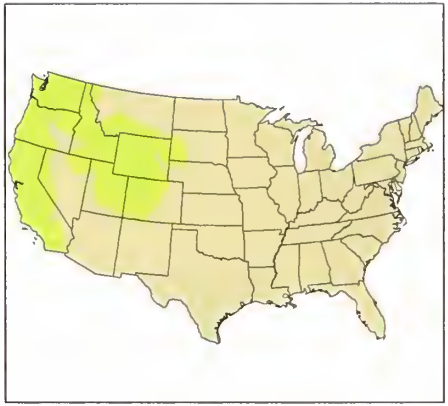
Lateral image of *Bombus californicus* female.
Photo Jonathan Koch

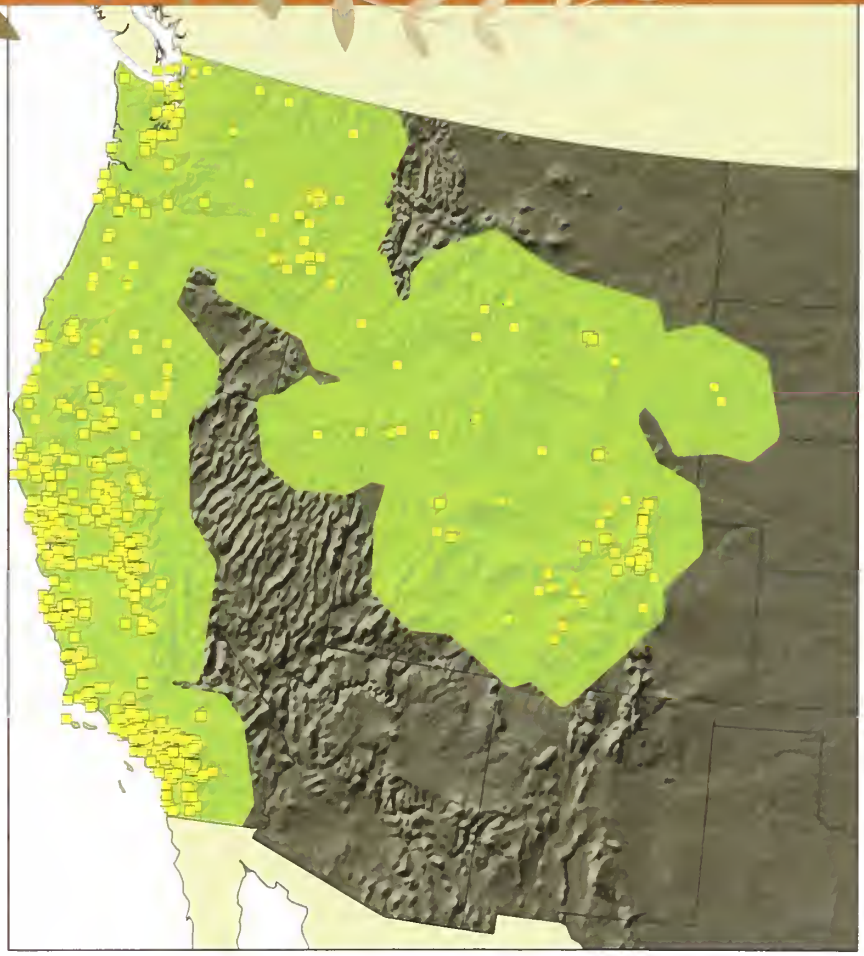
Face of *Bombus californicus* female.
Photo Jonathan Koch



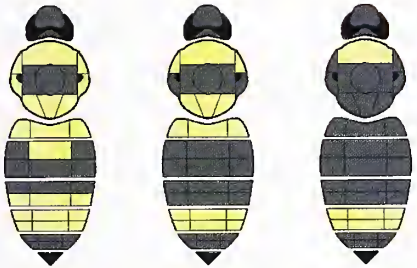
Bombus californicus female.
Photo Cheryl Moorehead

Bombus californicus continued

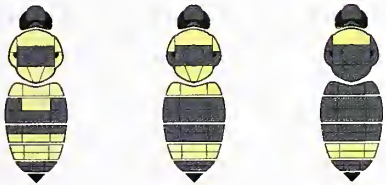




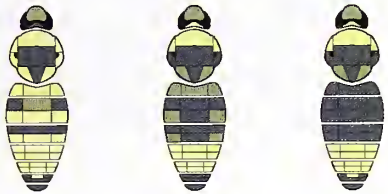
queen



worker



male



Females (queens and workers, colors refer to 'hair')

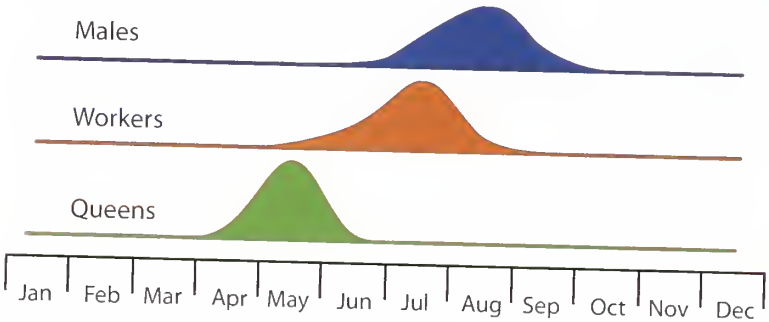
- Thorax anterior to black band between wing bases predominately yellow, scutellum primarily black or occasionally yellow intermixed, T1-3 predominantly black, especially for coastal specimens and may also be completely yellow except for small patches of black on the apicolateral margins of T2 on specimens found in the intermountain west and Colorado Rockies, T4 always yellow, face long.
- Mid leg basitarsus with the distal posterior corner sharply pointed (may be hidden by hair). Cheek longer than broad. Hair of the face and top of head predominantly black with yellow sometimes intermixed. On the side of the thorax, the lower anterior surface predominantly black, sometimes with yellow intermixed, corbicular fringes black. Hair length short and even. Yellow *B. californicus* males can be extremely hard to distinguish from *B. fervidus* males.

Bombus fervidus

Yellow bumble bee

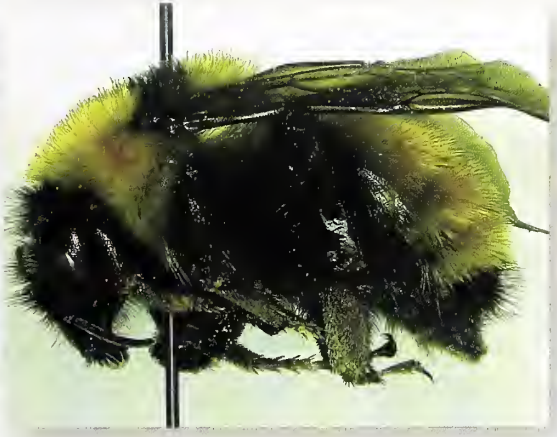
- Status: Common in the western U.S., possibly declining in the eastern U.S.
- Select food plant genera: *Cirsium, Penstemon, Phacelia, Helianthus, Dipsacus, Trifolium*
- Tongue Length: Long
- Distribution: Found throughout most of the continental U.S. except for west of the Sierra-Cascade Crest; may be conspecific with *B. californicus*
- Can be confused with the yellow form of *B. californicus* as well as *B. appositus*

B. fervidus phenology - Cache Co., UT



Bombus fervidus queen. Photo Leah Lewis

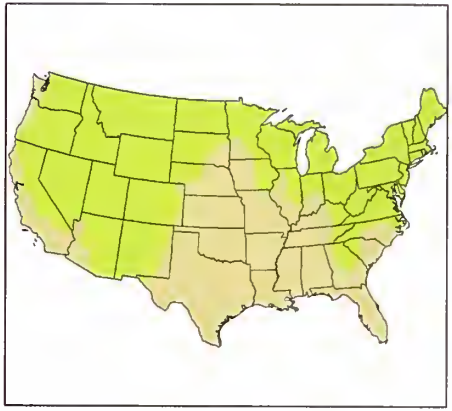
Lateral image of *Bombus fervidus* queen.
Photo Jonathan Koch

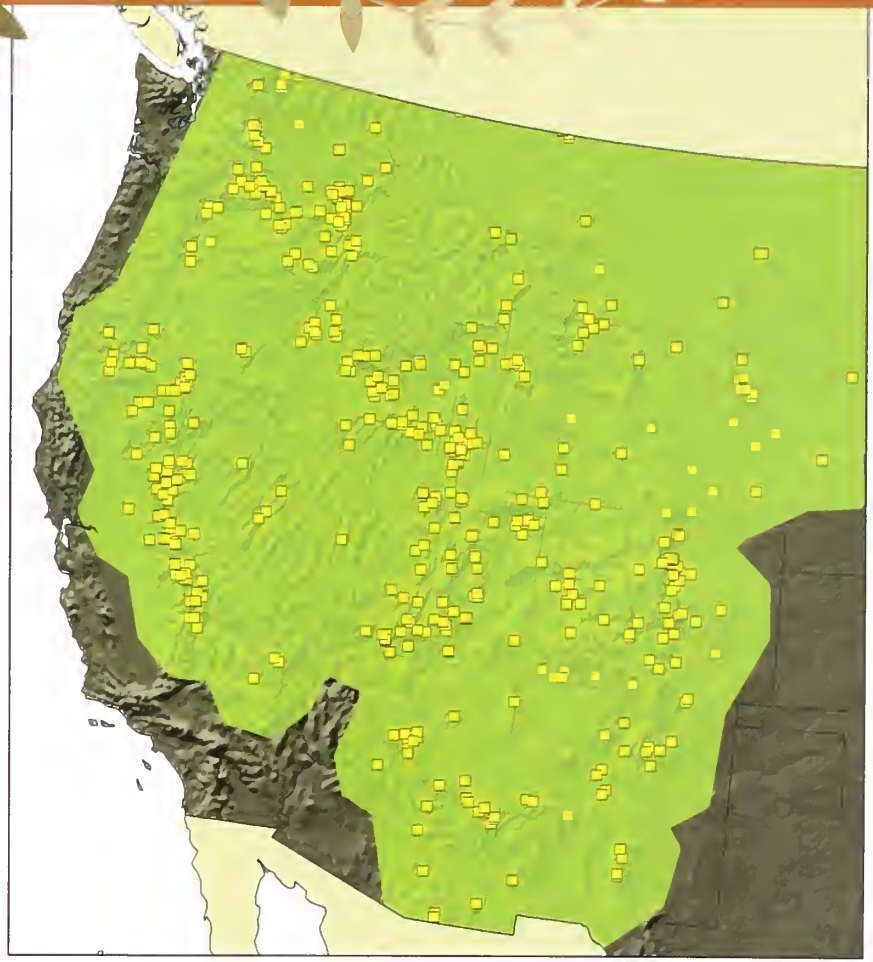


Face of *Bombus fervidus* queen.
Photo Jonathan Koch

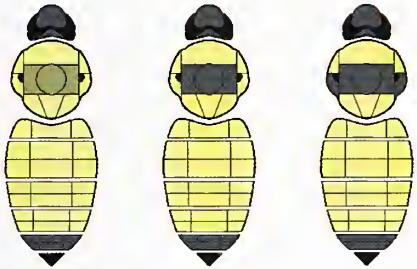
Bombus fervidus male.
Photo Lloyd and Sandy Spitainik

Bombus fervidus continued



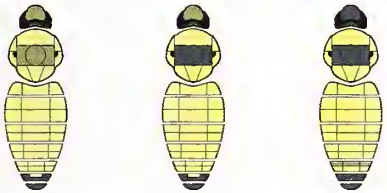


queen



worker

male



Females (queens and workers, colors refer to 'hair')

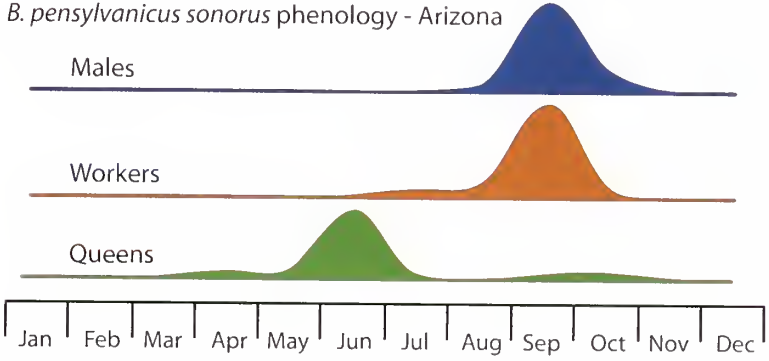
- Thorax anterior to black band between wing bases yellow, scutellum and T1-4 completely yellow, T5 black, face long.
- Mid leg basitarsus with the distal posterior corner sharply pointed (may be hidden by hair). Cheek longer than broad. Hair of the face and top of head predominantly black with yellow sometimes intermixed. On the side of the thorax, the lower anterior surface predominantly yellow, corbicular fringes black. Hair length short and even.

Bombus pensylvanicus subsp. *sonorus*

Sonoran bumble bee

- Status: Uncommon
- Select food plant genera: *Gossypium, Viguiera, Helianthus, Linaria, Chrysothamnus, Kallstroemia*
- Tongue Length: Long
- Distribution: California central valley south to Baja California and east to western Texas
- Can be confused with the yellow form *B. crotchii* and *B. nevadensis*

Bombus pensylvanicus sonorus.
Photo Racquel Morris

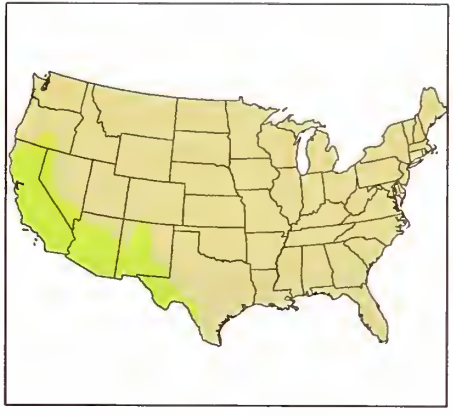


Lateral image of *Bombus pensylvanicus sonorus* female.
Photo Jonathan Koch

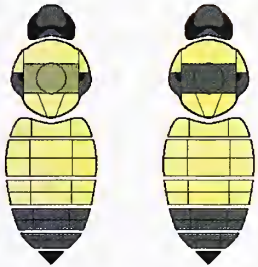
Face of *Bombus pensylvanicus sonorus* female.
Photo Jonathan Koch

Bombus pensylvanicus sonorus.
Photo Ron Hemberger

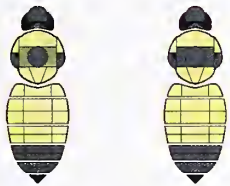
Bombus pensylvanicus subsp. *sonorus* continued



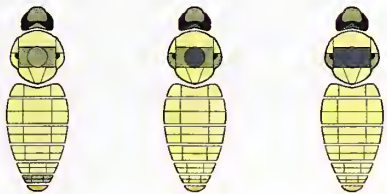
queen



worker



male



Females (queens and workers, colors refer to 'hair')

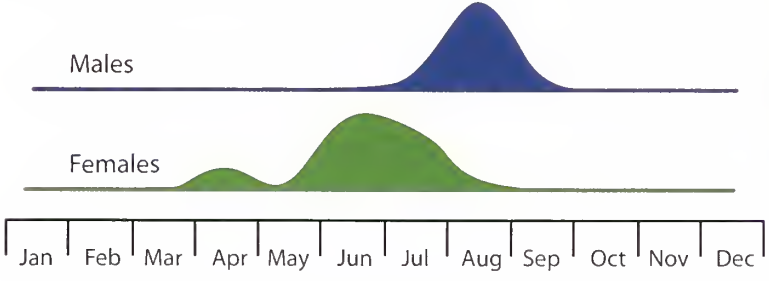
- Thorax predominantly yellow with black usually between wing bases, T1-3 yellow, T4-5 black, face long.
- Mid leg basitarsus with the distal posterior corner sharply pointed (may be hidden by hair). Cheek longer than broad. Hair of the face and top of head predominately black. On the side of the thorax, the lower anterior surface predominantly black, corbicular fringes black. Hair length short and even.

Bombus insularis

Indiscriminate cuckoo bumble bee

- Status: Common
- Select food plant genera: *Erigeron, Solidago, Aster, Wyethia, Senecio, Trifolium*
- Tongue Length: Short
- Hosts: *B. rufocinctus, B. ternarius, B. terricola, B. occidentalis, B. nevadensis, B. californicus*, and *B. appositus*
- Distribution: Pacific coast east to New England; primarily in states bordering Canada
- Can be confused with *B. fernaldae*

B. insularis phenology - Cache Co., UT



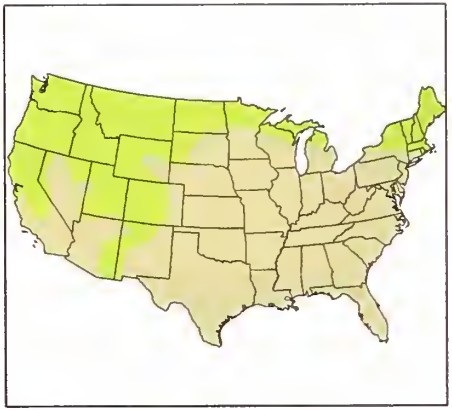
Female *Bombus insularis*.
Photo Sheila Colla

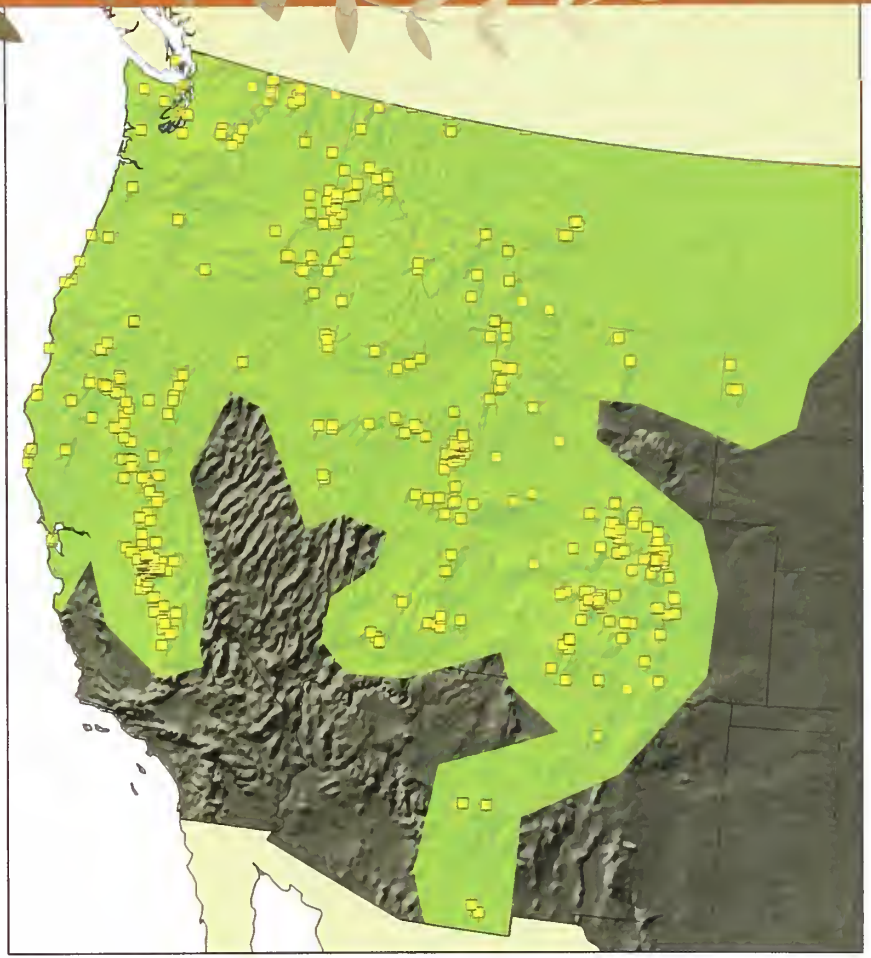
Lateral image of *Bombus insularis* female.
Photo Jonathan Koch

Face of *Bombus insularis* female.
Photo Jonathan Koch

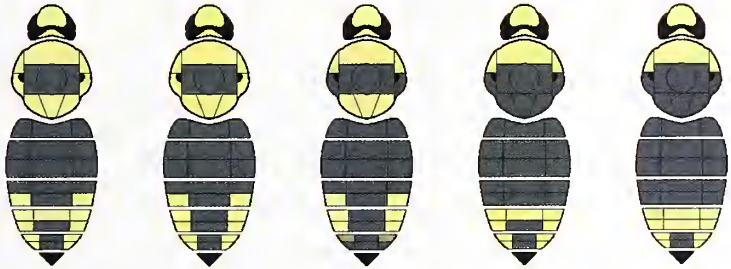
Bombus insularis.
Photo James Strange

Bombus insularis *continued*

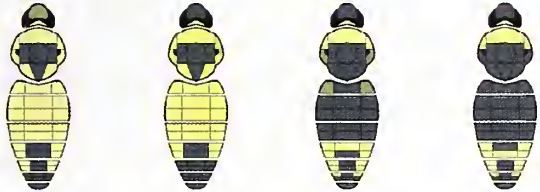




female



male



Females (no workers, colors refer to 'hair')

- Face yellow, a black band between the wing bases, tail with some yellow.
- Hind tibia with outer surface convex and densely hairy. Hair of the face with a dense yellow patch above the base of the antenna, sometimes some yellow below the base of the antenna but predominantly black, black hair forming a band between the wing bases, sides of the thorax yellow anteriorly but black ventrally and posteriorly, T3 usually with black hair along the entire midline but yellow laterally, T4 extensively yellow laterally. Wings light brown.

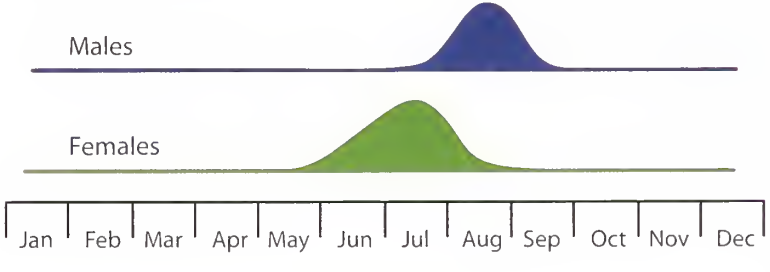
Bombus fernaldae

Fernald cuckoo bumble bee

- Status: Uncommon
- Select food plant genera: *Aster, Senecio, Potentilla, Trifolium, Chamaebatia, Cirsium*
- Tongue Length: Short
- Hosts: *B. rufocinctus*
- Distribution: Pacific coast east to New England
- Can be confused with *B. insularis*

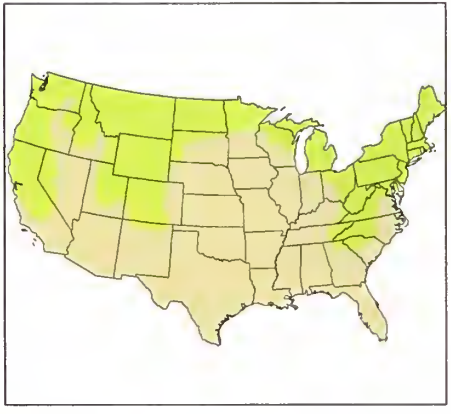
Bombus fernaldae female.
Photo Beatriz Moisset

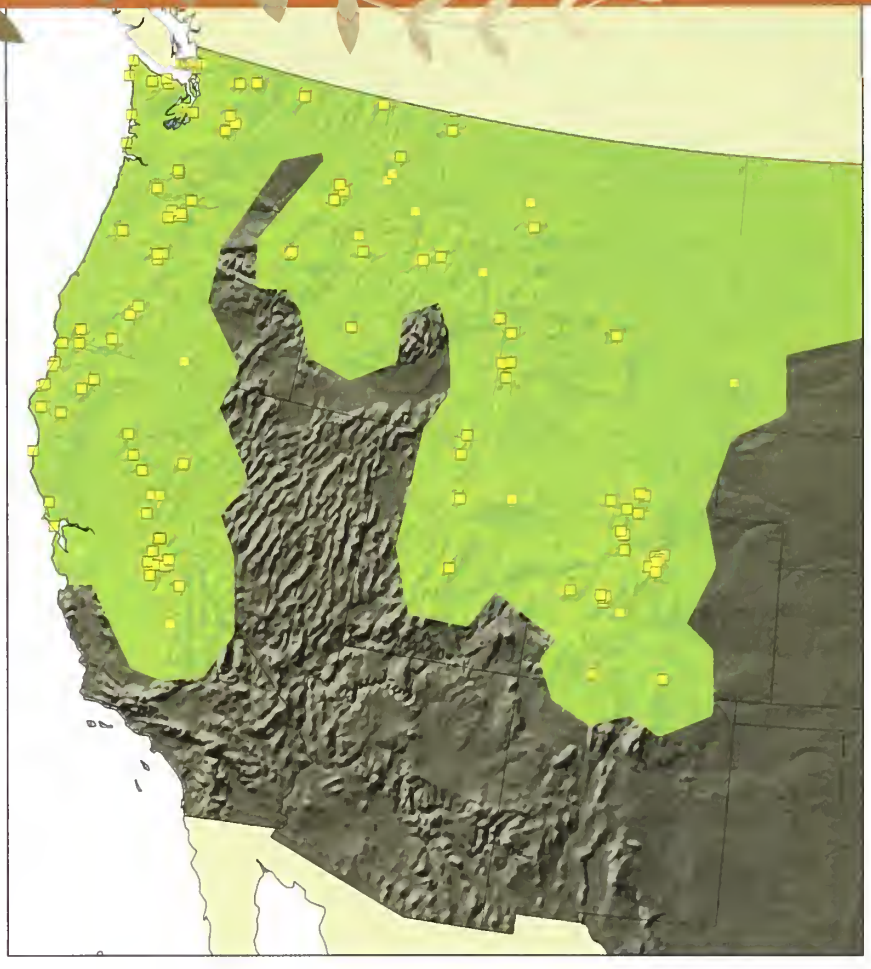
B. fernaldae phenology - UT



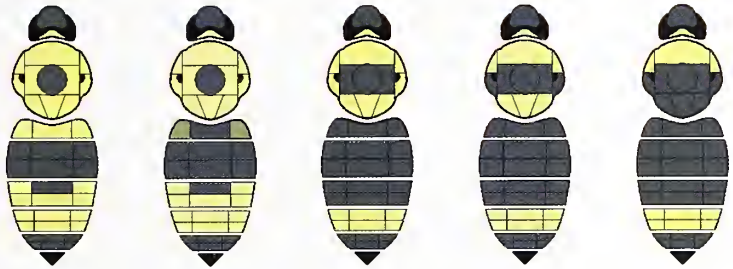
Lateral image of *Bombus fernaldae* female.
Photo Jonathan Koch

Face of *Bombus fernaldae* female.
Photo Jonathan Koch

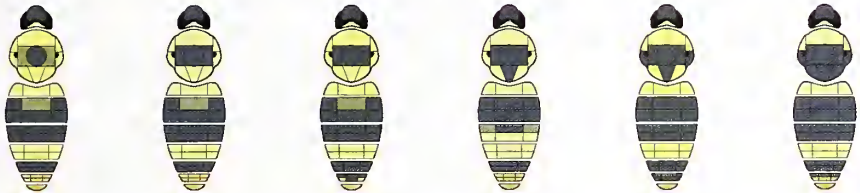




female



male



Females (no workers, colors refer to 'hair')

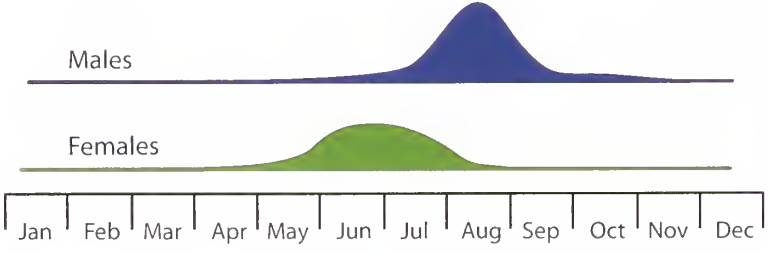
- Face black, top of head yellow or cream, T1 often black, yellow in the east, T2 black, T3 black or yellow, T4 yellow or cream, T5 black.
- Hind tibia with outer surface convex and densely hairy. Hair of the face black. T6 curled very strongly under the abdomen and pointing anteriorly, S6 ending distally with a shiny triangular spine, the lateral keels small. Hair long and uneven.

Bombus suckleyi

Suckley cuckoo bumble bee

- Status: Uncommon
- Select food plant genera: *Aster, Centaurea, Cirsium, Trifolium, Chrysothamnus, Helichrysum*
- Hosts: *B. occidentalis*
- Distribution: Pacific coast east to Nebraska; from New Mexico north to Alaska
- Can be confused with *B. insularis* and *B. fernaldae*

B. suckleyi phenology - Cache Co., UT

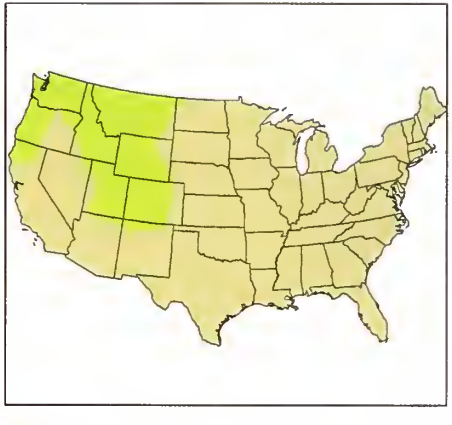


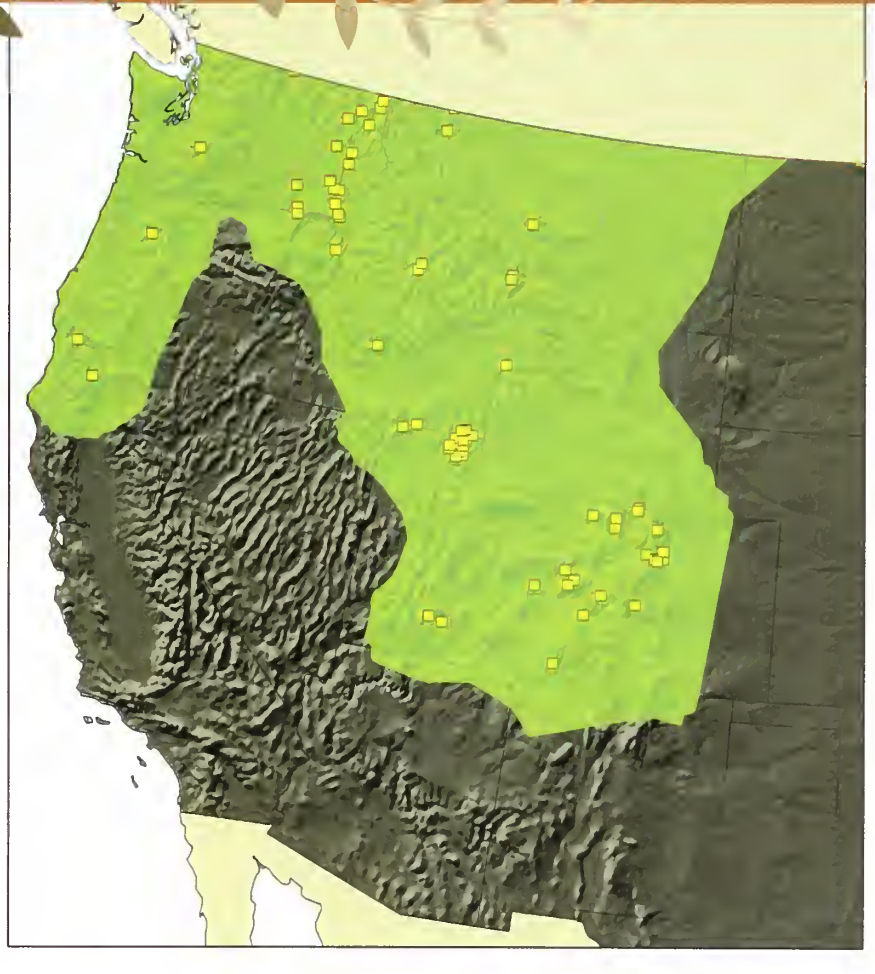
Bombus suckleyi queen.
Photo David Inouye

Lateral image of *Bombus suckleyi* female.
Photo Jonathan Koch

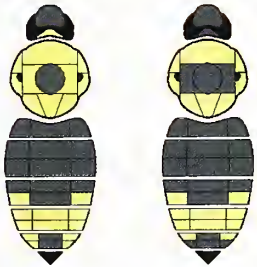
Face of *Bombus suckleyi* female.
Photo Jonathan Koch

Bombus suckleyi *continued*

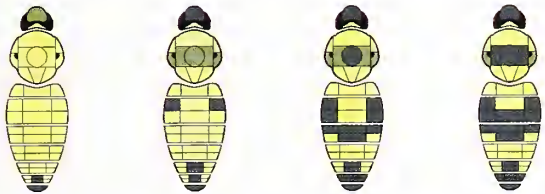




female



male



Females (no workers, colors refer to 'hair')

- Face black, top of head yellow or black, T1-2 black, T3-5 predominately yellow.
- Hind tibia with outer surface convex and densely hairy. Hair of face black. S6 lateral keels strongly produced, clearly projecting beyond T6 laterally from the dorsal view. Hair short and even.

Identification Key

for the female bumble bees of the Western United States

The following dichotomous key designed by Jonathan Koch and James Strange will help you identify female bumble bees to species. Starting at the first set of statements determine which characteristics your specimen has and move to the next appropriate set (numbered at the end of the statement). When in the field a loupe or hand lens might be helpful when identifying characteristics like cheek length (i.e. malar space) and ocelli distances.

1. Females; antennae with 10 flagellomeres; abdomen with 6 visible tergites...2
   - Males; antennae with 11 flagellomeres; abdomen with 7 visible tergites...no key provided

2(1). Outer surface of hind tibia concave and shiny (Pollen baskets present; social species)...3
   - Outer surface of hind tibia convex and hairy (Pollen baskets absent; parasitic species)...34

3(2). T2 and T3 with red or orange hairs, sometimes with yellow hairs intermixed at least medially...4
   - T2 and/or T3 with yellow or black hair...9

4(3). Scutum anterior to wing bases with yellow and black hairs intermixed, giving cloudy appearance (see page 16)...***B. melanopygus***
   - Scutum anterior to wing bases with predominantly yellow or pale yellow hairs...5

5(4). Cheek length (i.e. malar space; see page 17) distinctly shorter than width; face with predominantly black hairs...***B. rufocinctus***

- Cheek length equal to width; face with yellow hairs, at least centrally...6

6(5). Scutellum with yellow hairs only...***B. huntii***
- Scutellum with yellow or pale yellow patches of hair divided by a black posteriorly directed triangle...7

7(6). T5 with yellow hairs on the lateral margins; face with yellow hairs centrally...***B. sylvicola***
- T5 with completely black hairs...8

8(7). T2 with black hairs at least medially... ***B. bifarius* subsp. *bifarius***
- T2 with completely black hairs...***B. ternarius***

9(3). Cheek length longer than width...10
- Cheek length as long as or shorter than width...23

10(9). Face with pale white or yellow hairs, sometimes with black hairs intermixed, giving cloudy appearance (see page 16)...11
- Face with predominantly black hairs...17

11(10). Anterior scutum with dull yellow or whitish hairs; T1-4 with all yellow or brownish hairs... ***B. appositus***
- Anterior scutum with yellow hairs, sometimes with black hairs intermixed; T1-4 with different combinations of hair color...12

12(11). Scutellum and T1-2 with black hairs...13
- Scutellum and T1-2 with yellow hairs...14

13(12). T3 with yellow band of hairs; T4 usually with black hairs...***B. vandykei***

- T3 with black hairs only; T4 with yellow band of hairs...***B. caliginosus***

14(12). T5-6 with pale white hairs...***B. sitkensis***
- T5-6 with black hairs...15

15(14). T3-4 with black hairs...***B. flavifrons* subsp. *dimidiatus***
- T3-4 with orange hairs...16

16(15). Anterior scutum with black and yellow hairs intermixed, giving cloudy appearance (see page 16)...***B. flavifrons***
- Anterior scutum with predominantly yellow hairs...***B. centralis***

17(10). T5-6 with orange or pale orange hairs; distributed primarily in high elevations of the Colorado Rockies, isolated populations found in the Sierra Nevada Mountains, south of Tahoe... ***B. balteatus***
- T5-6 with black hairs; variable distributions in western United States...18

18(17). T3 completely with black hairs...19
- T3 with yellow hairs at least medially...20

19(18). T4 with black hairs...***B. vagans***

- T4 with yellow hairs...***B. californicus***

20(18). Scutum strongly banded with black hairs between wing bases...21
- Scutum not strongly banded, predominantly with yellow hairs...***B. nevadensis***

21(20). T4 with predominantly black hairs... ***B. pensylvanicus* subsp. *sonorus***
- T4 with predominantly yellow hairs...22

22(21). T2 with predominantly yellow hairs...***B. fervidus***
- T2 with yellow hairs and black hairs apicolaterally...***B. californicus* subsp. *consanguineus***

23(9). Ocelli below supraorbital line (see page 16)...24
- Ocelli at supraorbital line...27

24(23). Scutellum and T1 with yellow hairs...25
- Scutellum and T1 with black hairs...***B. crotchii***

25(24). Integument of T1 and T2 dull; scutum and scutellum almost obscured with yellow hairs...26
- Integument of T1 and T2 shiny; scutum and scutellum not completely obscured, much black hair between the wing bases...***B. rufocinctus***

26(25). T3 with hairs all black...***B. griseocollis***
- T3 with yellow hairs at least basiomedially... ***B. morrisoni***

27(23). Cheek length distinctly shorter than width...28
- Cheek length as long as width...30

28(27). Face with completely yellow hairs; only found in Siskiyou County, California and Jackson County, Oregon...***B. franklini***

- Face with black hairs, sometimes yellow intermixed centrally; broadly distributed in the United States...29

29(28). T2 completely covered with yellow hairs; found in the Black Hills of South Dakota...***B. terricola***
- T2 with black hairs at least basally; broadly distributed in western United States...***B. occidentalis***

30(27). T1 with completely black hairs...***B. vosnesenskii***
- T1 with completely yellow hairs...31

31(30). T2 with predominantly black hairs...32
- T2 with predominantly yellow hairs...33

32(31). T5 with lots of yellow hairs on the lateral margins...***B. melanopygus***
- T5 with predominantly black hairs on the lateral margins...***B. bifarius* subsp. *nearcticus***

33(31). Anterior scutum with black and yellow hairs intermixed, giving cloudy appearance; broadly distributed in western United States...***B. mixtus***
- Anterior scutum with predominantly yellow hairs; distributed primarily at the highest elevations of the Colorado Rockies...***B. frigidus***

34(2). Occiput with predominantly black hairs...***B. suckleyi***
- Occiput with predominantly yellow hairs...35

35(34). Face with predominantly black hairs around bases of antennae...***B. fernaldae***
- Face with predominantly yellow hairs around bases of antennae...***B. insularis***

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Web and Other Resources

For additional copies of this publication, *Bumble Bees of the Western United States,* or for copies of the companion volume, *Bumble Bees of the Eastern United States,* visit the Pollinator Partnership at **www.pollinator.org/books**.

Downloadable page versions are available through the U.S. Forest Service at **http://www.fs.fed.us/wildflowers/pollinators/documents/BumbleBeeGuide2011.pdf**

Downloadable page versions also available at **www.pollinator.org/books**.

Colour Key to the *Bombus* of the World by Paul Williams [Online]
http://www.nhm.ac.uk/research-curation/research/projects/bombus/_key_colour_world/worldcolourkey.html

Bumblebee Economics by B. Heinrich, Harvard University Press, 2004.

Bumblebees by D.V. Alford, Davis-Poynter, London, 1974.

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http://www.nhm.ac.uk/research-curation/research/projects/bombus/Williams&Osborne09_review.pdf

Pollinator Partnership www.pollinator.org **for *Bombus* White Paper**

Xerces Society for Invertebrate Conservation [Online]
http://www.xerces.org/bumblebees/

Discover Life Bumble Bee Key [Online]
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