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EC 00-1564-S Bumble Boosters: A Guide To Identifying Nebraska Bumble Bee Species

Doug Golick

University of Nebraska-Lincoln, dgolick2@unl.edu

Marion D. Ellis

University of Nebraska - Lincoln, mellis3@unl.edu

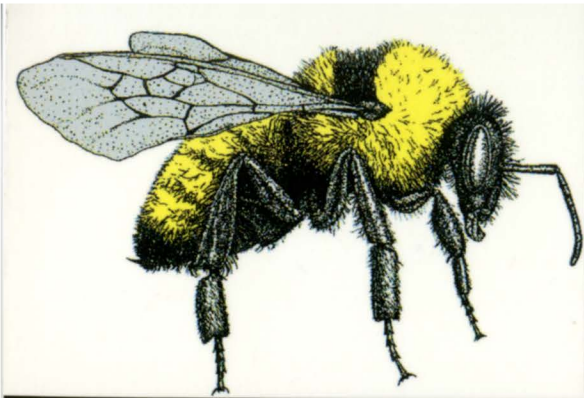
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University of Nebraska
Cooperative Extension EC 00-1564-S

**A Guide
To Identifying
Nebraska
Bumble Bee
Species**

BUMBLE BOOSTERS

BUMBLE BOOSTERS

By Doug Golick, Graduate Research Assistant
Marion Ellis, Extension Entomologist
University of Nebraska Department of Entomology

All illustrations by Doug Golick

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BUMBLE BOOSTERS

on the Web:

<http://bumbleboosters.unl.edu>

For more information on bumble bee biology, distribution, identification and links to related sites, visit the **Bumble Boosters** Web site. Links are also included to schools cooperating to conduct research on Nebraska bumble bees.

Anyone interested in natural history can make original discoveries about bumble bees. The **Bumble Boosters** Web site provides ideas and guidance for investigating bumble bees and plants they visit.

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Why Bumble Bees are Important

For most people, pollen means allergies and bees mean stings. However, you should thank a bee, butterfly, bat, bird, or other pollinator for one out of every three bites of food you eat. *Pollination* is the transfer of pollen from one flower to another. It is a critical step in fruit and seed production. Some plants produce generous quantities of pollen and rely on the wind to transfer pollen. Many plant species, however, produce smaller amounts of pollen and have elaborate mechanisms to attract pollinators. There are 95 crops grown in the United States that require insect pollinators. In addition, many bee-pollinated plants provide food for

wildlife, increase soil fertility, and beautify our landscapes.

In an era when human activities have reduced nesting habitat and forage plants, we need to consider the impact we have on plant/pollinator relationships. Pollinators are a critical link in the ecosystems of both wild and agricultural lands and play an important role in the interconnectedness of life in general. Bumble bees are a great place to begin. They are beautiful native insects whose distribution and abundance can be nurtured by providing suitable nesting habitat and forage plants.

Capturing Bumble Bees

Bumble bees of one species or another are active in Nebraska from April to October, but they are most abundant in summer. They can be easily collected from flowers, areas near their nests, or as they fly along at ground level in search of a suitable nesting site. Bumble bees can be captured in an insect net and then transferred to small glass jars. They also can be captured on flowers by placing a glass jar over them and quickly covering it with a lid. A captive bumble bee will always try to escape rather than use its stinger; however, females can and will sting if touched or

handled carelessly. Males do not have a stinger.

For observation, captured bumble bees should be chilled in a small cooler with an ice block for 30 minutes. When chilled to the point that they are unable to fly, specimens can be transferred to a magnifying box or placed on a flat surface for observation with a hand lens. They should not be taken far from the point of capture and should be released when you are finished observing them. Capture and release is recommended in the early spring when overwintered queens are establishing their nests.

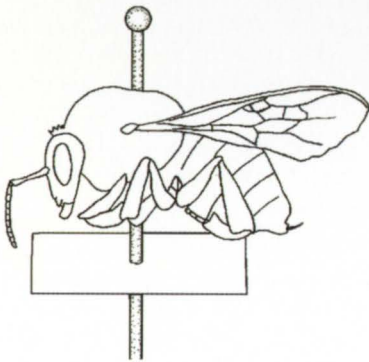
Making a Reference Collection

When making a reference collection, capture bumble bees in a kill jar charged with ethyl acetate or in a net, and transfer them to a kill jar. Specimens should remain in kill jars for 30 minutes. Jars must be protected from sunlight to prevent condensation because excess moisture may cause body hair to become wet or matted. This can make the specimen difficult to identify. Reference collections should be made in late spring and summer when queens have established their nests. Pin specimens by inserting an insect pin through the top of the thorax.

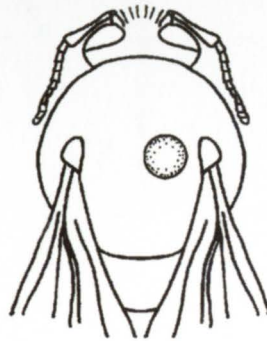
All specimens should be labeled with the date, place of capture and the collector's name. The data label should be placed on the pin beneath the specimen.

After two or three days, specimens will dry and become brittle. They should be handled carefully to avoid breaking appendages.

Reference collections will remain in good condition indefinitely if protected from insects that damage stored products. This can be achieved by placing a few moth crystals in storage boxes.



Lateral view of pinned bumble bee specimen.



Top view of pinned bumble bee specimen.

The Bee Family Tree

There are approximately 20,000 species of bees worldwide. About 3,500 species occur in North America. Most are solitary and nest in soil or hollow plant stems.

Bees feed on pollen and nectar and have branched body hairs for pollen collection. Most other insects lack body hairs or have a few unbranched hairs. Careful examination for the presence of branched hairs is usually sufficient to identify an insect as a bee. A dissecting microscope is needed to

clearly see the branched hair as shown in the illustration.

All bees belong to the super family Apoidea. They are classified into nine families based largely on tongue length and how they transport pollen.



Branched hair of bee.

The Bumble Bee Family Tree

There are approximately 265 species of bumble bees worldwide. They are most abundant in temperate zones of Europe, North America and Asia. They occur within the Arctic Circle; however, they are virtually absent from the tropics.

There are two distinct types of bumble bees. The truly industrious genus (*Bombus*) and the nonindustrious genus (*Psithyrus*) which lacks a worker caste and

depends on the true bumble bees in whose nest they are reared.

Bumble bees belong to the family Apidae. Bumble bees and honey bees are the only members of this family found in North America. The family is characterized by females having a pollen basket (corbicula) on their hind legs for transporting pollen. Members of the genus *Psithyrus* are an exception to the rule and do not have pollen baskets on their hind legs.

Bumble Bee Mimics

When one animal resembles another living in the same locality, it is called a mimic. Mimicry is common in the insect world. Many bumble bees in a region share a similar appearance. Their sting protects them from predators, who learn to avoid them based on their color patterns. This type of mimicry is called "Mullerian" mimicry. Mullerian mimicry is why careful observation is required to identify bumble bee species.

Another common type of mimicry is "Batesian" mimicry. In Batesian mimicry, one species has a stinger or other defensive mechanism and another, similar-appearing species lacks the defensive mechanism. In Batesian mimicry, although only one species has a defensive mechanism, both are protected.

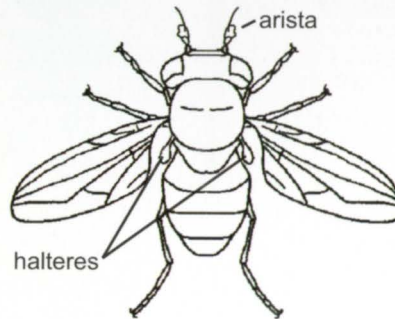
The insects likely to be confused with bumble bees are: 1) bees in the genus *Anthophora*; 2) bee hawkmoths; and 3) several species of hairy flies. Female *Anthophora*, or digger bees, carry pollen along the entire length of their hind legs rather than in a distinct pellet in a pollen basket. Bee hawkmoths will have long siphoning mouthparts coiled under their head. The best bumble bee mimics are flies. Flies that mimic bumble bees only have one pair of wings. They have club-shaped organs called halteres in the position where bumble bees have hind wings. Their antennae are called aristae and are much smaller than the long-elbowed antennae of a bumble bee.



Anthophora hind leg.



Bee hawkmoth with siphoning mouthparts (side view).



Top view of fly.

How to Use the Identification Guide

This guide (pages 17-51) is designed for identifying Nebraska bumble bees. Most specimens will clearly match one of the drawings; however, some species exhibit slight variations in appearance across their range. The most common appearance is represented in the illustrations. The exoskeleton of all bumble bees is black. Color patterns are due to variations in hair color. Color illustrations in the identification guide reflect the hair color of each body region. Always confirm your identification by verifying the characteristics listed on the page below the illustration.

Drawings on pages 52-55 illustrate the external morphology of bumble bees and can be used as identification aids. A hand lens may be needed to observe some structures. A glossary of terms used in the identification guide will also aid you in learning key characteristics.

In most cases, you will be able to quickly narrow the identity of your specimen down to a few possibilities; however, careful observation is required to correctly identify some specimens. Your skills will grow with practice, and you can gain confidence by having an expert confirm your identifications.

Steps to Using the Identification Guide

1. Collect and chill specimen for observation or kill and pin for a reference collection.
2. Make sure your specimen is a bumble bee by checking for branched body hairs and two pair of wings, elbowed antennae and mandibles. (*See illustrations, pages 10 and 13.*)
3. Determine gender by counting antennal segments (12 for females, 13 for males) and checking for pollen basket (present on *Bombus* females, absent on *Bombus* males and *Psithyrus*). (*See illustrations, pages 53 and 55.*)
4. If specimen is a female, determine if it is *Bombus* or *Psithyrus* by checking for pollen basket (not present in *Psithyrus*). (*See illustration, page 55.*)
5. Compare the illustrations and descriptions on pages 17-51 with your specimen. (To best use the illustrated section, open this book flat, so that the illustration and matching description for each species appear together.)
6. Match the color patterns of your specimen to the color picture that best matches your bee. Start with the thorax, then observe the abdomen and head.

Steps to Using the Identification Guide (con't)

The identification guide is organized with similar appearing bees grouped together and indicated by the color bar on the right.

7. Look at the descriptive information related to the picture you select as the best fit and check to see if all the characteristics described match your specimen. If not, try matching the characteristics with similar specimens.


8. Warm and release chilled specimens. Specimens killed for a reference collection should be pinned and labeled with the date, location collected, and the collector's name.



9. To verify your identification, send your specimen to an expert for confirmation.





Bumble Bee Identification Guide


Checklist of Nebraska Species

 *Bombus impatiens*
Bombus griseocollis
Bombus bimaculatus
Bombus vagans
Bombus nevadensis nevadensis
Bombus morrisoni

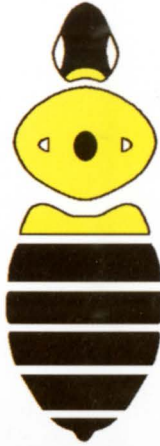
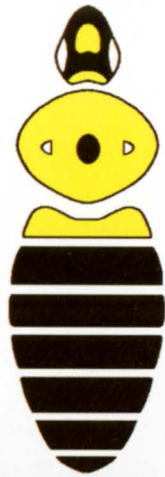
 *Bombus fraternus*
 *Bombus fervidus*
Bombus appositus

 *Bombus nevadensis auricomus*
Bombus pennsylvanicus
Bombus occidentalis

 *Bombus huntii*
Bombus bifarius
Bombus rufocinctus
Bombus centralis

 *Psithyrus variabilis*
Psithyrus insularis (rare, ID illustration not included)
Psithyrus citrinus (rare, ID illustration not included)
Psithyrus suckleyi (rare, ID illustration not included)

<i>Bombus impatiens</i> male	<i>Bombus impatiens</i> female
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<i>Bombus impatiens</i> male	<i>Bombus impatiens</i> female
------------------------------	--------------------------------

Head: Face and vertex with yellow hairs; ocelli on supraorbital line; malar space slightly shorter than width of mandible.

Thorax: Notum yellow with a small patch of black hairs medially; sides yellow.

Abdomen: T1 yellow; T2-7 black.

Other: Only Nebraska *Bombus* species with T1 yellow and T2-7 black.

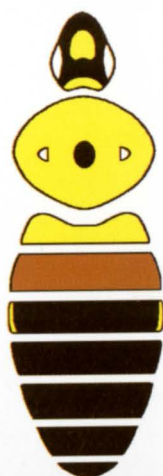
Head: Face with black hairs; vertex with yellow hairs; ocelli on supraorbital line; malar space slightly shorter than width of mandible.

Thorax: Notum yellow with a small patch of black hairs medially; sides yellow.

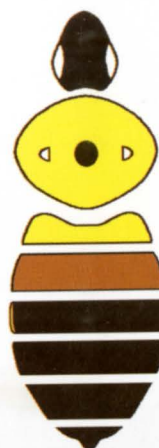
Abdomen: T1 yellow; T2-6 black.

Other: Only Nebraska *Bombus* species with T1 yellow and T2-7 black.

Bombus griseocollis male



Bombus griseocollis female



Bombus griseocollis male

Head: Face and vertex with yellow hairs; eyes greatly swollen; ocelli well-below supraorbital line; malar space much shorter than width of mandible.

Thorax: Notum yellow with small patch of black hairs medially; sides yellow.

Abdomen: T1 yellow; T2 brown (occasionally yellow) with posterolateral corners black, lateral sides of T2 brown or yellow; T3 black, with lateral sides having brown or yellow hairs; T4-7 black.

Other: *B. griseocollis* similar to *B. morrisoni*; *B. morrisoni* has large medial patch of yellow hairs on T3; *B. griseocollis* T3 is entirely black.

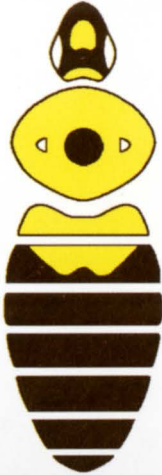

Bombus griseocollis female

Head: Face and vertex with black hairs; ocelli 1 ocellar diameter below supraorbital line; malar space shorter than width of mandible.

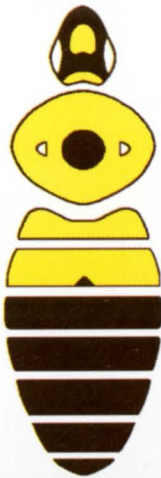
Thorax: Notum yellow with small patch of black hairs medially; sides yellow.

Abdomen: T1 yellow, T2 brown occasionally completely yellow, T3-6 black.

Other: *B. griseocollis* similar in appearance to *B. bimaculatus* and *B. vagans*; *B. bimaculatus* and *B. vagans* with long malar space; *B. griseocollis* with a short malar space.

<i>Bombus bimaculatus</i> male	<i>Bombus bimaculatus</i> female
	
<i>Bombus bimaculatus</i> male	<i>Bombus bimaculatus</i> female
<p>Head: Face and vertex with yellow hairs; ocelli on supraorbital line; malar space longer than width of mandible.</p> <p>Thorax: Notum yellow with a small patch of black hairs medially; sides yellow.</p> <p>Abdomen: T1 yellow; T2 black with two anteromedial patches of yellow hair; T3-7 black, occasionally T3-7 black with scattered yellow hairs.</p> <p>Other: <i>B. bimaculatus</i> similar in appearance to <i>B. vagans</i>; <i>B. vagans</i> T2 entirely yellow, <i>B. bimaculatus</i> T2 black with two anteromedial patches of yellow hair, and lateral edges of T2 black.</p>	<p>Head: Face hairs black; vertex with yellow hairs; ocelli on supraorbital line; malar space longer than width of mandible.</p> <p>Thorax: Notum yellow with a small patch of black hairs medially; sides yellow.</p> <p>Abdomen: T1 yellow; T2 black with two anteromedial patches of yellow hair; T3-6 black.</p> <p>Other: <i>B. bimaculatus</i> similar in appearance to <i>B. vagans</i>; <i>B. vagans</i> T2 entirely yellow; <i>B. bimaculatus</i> T2 black with two anteromedial patches of yellow hair, and lateral edges of T2 black.</p>

Bombus vagans male



Bombus vagans female



Bombus vagans male

Head: Face and vertex with yellow hairs; ocelli on supraorbital line; malar space longer than width of mandible.

Thorax: Notum yellow with small patch of black hairs medially; sides yellow.

Abdomen: T1 yellow; T2 yellow with a small posteromedial notch; T3-7 black, occasionally T3-7 black with scattered yellow hairs.

Other: *B. vagans* similar to *B. bimaculatus*; *B. bimaculatus* T2 black with two anteromedial patches of yellow hair and lateral edges black, *B. vagans* T2 entirely yellow with a posteromedian notch.

Bombus vagans female

Head: Face with black hairs; vertex with yellow hairs; ocelli on supraorbital line; malar space longer than width of mandible.

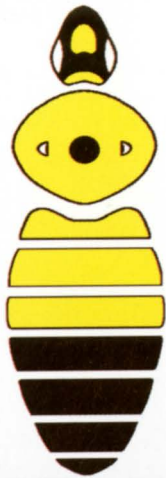
Thorax: Notum yellow with a small patch of black hairs medially; sides yellow.

Abdomen: T1 yellow; T2 yellow with a small posteromedial notch; T3-6 black.

Other: *B. vagans* similar to *B. bimaculatus*; *B. bimaculatus* T2 black with two anteromedial patches of yellow hair and lateral edges black; *B. vagans* T2 entirely yellow with a posteromedian notch.

Bombus nevadensis nevadensis

male



Bombus nevadensis nevadensis

female



Bombus nevadensis nevadensis

Head: Face and vertex with yellow hairs; eyes swollen; ocelli well below supraorbital line; malar space very short.

Thorax: Notum yellow with a small patch of black hairs medially; sides yellow.

Abdomen: T1-3 yellow; T4-7 black, occasionally T4-7 black with scattered yellow hairs.

Other: *B. nevadensis nevadensis* similar to *B. morrisoni*; *B. morrisoni* notum completely yellow, and T3 black with yellow hairs medially, black laterally; *B. nevadensis nevadensis* notum with large posteromedian patch of black hairs and T3 entirely yellow.

Bombus nevadensis nevadensis

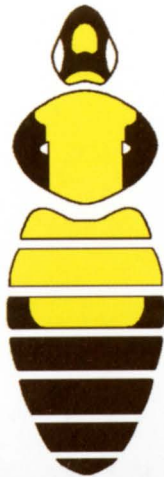
Head: Face with black hairs; vertex with yellow hairs; ocelli 1 1/2 ocellar diameters below supraorbital line; malar space longer than width of mandible.

Thorax: Notum yellow with a small patch of black hairs; sides black except yellow on anterior 1/8th.

Abdomen: T1-3 yellow; T4-6 black.

Other: Found only in western 1/4 of Nebraska; similar to *B. morrisoni*; *B. morrisoni* has short malar space; *B. nevadensis nevadensis* has long malar space.

Bombus morrisoni male



Bombus morrisoni female



Bombus morrisoni male

Head: Face and vertex hairs yellow; compound eyes swollen; ocelli well-below supraorbital line; malar space much shorter than width of mandible.

Thorax: Notum completely yellow; sides with anterior 1/8th yellow the rest with black hair.

Abdomen: T1-2 yellow, T3 yellow medially with sides having black hairs; T4-7 with black hairs.

Other: Very similar in appearance to *B. nevadensis nevadensis*; *B. nevadensis nevadensis* notum yellow with large posteromedian patch of black, and T3 completely yellow; *B. morrisoni* notum completely yellow with T3 having some black hairs.

Bombus morrisoni female

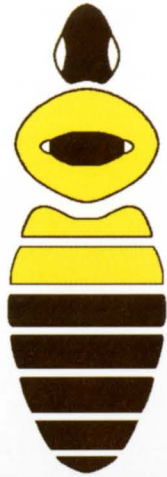
Head: Face with black hairs; vertex with yellow hairs; ocelli 1 ocellar diameter below supraorbital line; malar space slightly shorter than width of mandible.

Thorax: Notum completely yellow; sides with anterior 1/8th yellow the rest with black hair.

Abdomen: T1-2 yellow, T3 yellow with sides having black hairs; T4 black, occasionally having yellow hairs anteromedially; T5-6 completely black.

Other: Very similar in appearance to *B. nevadensis nevadensis*; *B. nevadensis nevadensis* having long malar space with T3 completely yellow; *B. morrisoni* with short malar space and T3 with some black hairs.

Bombus fraternus male



Bombus fraternus female



Bombus fraternus male

Head: Face and vertex hairs black; compound eyes swollen; ocelli well below supraorbital line; malar space much shorter than width of mandible.

Thorax: Pronotum yellow; scutum with broad interalar band of black; scutellum yellow; sides yellow.

Abdomen: T1-2 yellow; T3-7 black.

Other: Only Nebraska *Bombus* male that has swollen eyes, an interalar band, T1-T2 yellow, and T3-6 black; *B. fraternus* usually larger than other *Bombus* species.

Bombus fraternus female

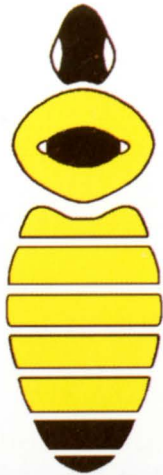
Head: Face and vertex hairs black; ocelli 1 ocellar diameter below supraorbital line; malar space shorter than width of mandible.

Thorax: Pronotum yellow; scutum with broad interalar band of black; scutellum yellow; sides yellow.

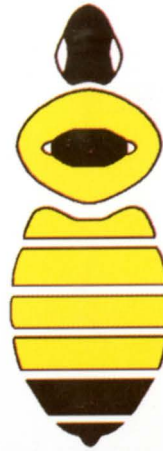
Abdomen: T1-2 yellow; T3-6 black.

Other: Only Nebraska *Bombus* that has an interalar band, T1-T2 yellow, and T3-6 black; *B. fraternus* usually larger than other *Bombus* species.

Bombus fervidus male



Bombus fervidus female



Bombus fervidus male

Head: Face and vertex hairs completely black; ocelli on supraorbital line; malar space much longer than width of mandible.

Thorax: Pronotum yellow; scutum with large interalar band of black hairs; scutellum yellow; sides completely yellow.

Abdomen: T1-5 yellow; T6-7 black.

Other: Males of *B. fervidus* very similar in appearance to *B. appositus*; *B. appositus* only found in extreme western Nebraska; sides of thorax of *B. appositus* grayish-yellow; *B. fervidus* found statewide, sides of thorax are completely yellow.

Bombus fervidus female

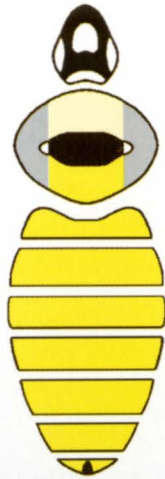
Head: Face and vertex hairs completely black; ocelli on supraorbital line; malar space much longer than width of mandible.

Thorax: Pronotum yellow; scutum with large interalar band of black hairs; scutellum yellow; sides yellow.

Abdomen: T1-4 yellow; T5-6 black.

Other: Common bumble bee throughout state; similar in appearance to *B. appositus*; *B. appositus* having T1-5 yellow; *B. fervidus* having T1-4 yellow.

Bombus appositus male



Bombus appositus female



Bombus appositus male

Head: Face and vertex with pale yellow to white hairs; ocelli on supraorbital line; malar space longer than width of mandible.

Thorax: Pronotum pale yellow to yellow-gray, scutum with large interalar band of black; scutellum yellow to yellow-brown; sides with gray hair.

Abdomen: T1-6 pale yellow to yellow-brown; T7 yellow to yellow-brown, with black hairs medially.

Other: Similar in appearance to *B. fervidus*; *B. fervidus* with T1-5 yellow and T6-7 black; *B. appositus* with T1-7 yellow. *B. appositus* collected only in extreme western Nebraska.

Bombus appositus female

Head: Face and vertex with pale yellow to white hairs; ocelli on supraorbital line; malar space longer than width of mandible.

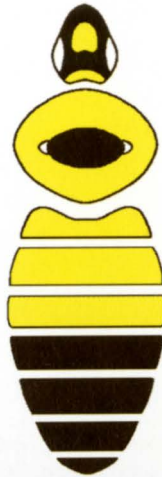
Thorax: Pronotum pale yellow to yellow-gray, scutum with large interalar band of black; scutellum yellow to yellow-brown; sides with black hairs.

Abdomen: T1-5 pale yellow to yellow-brown; T6 yellow to yellow-brown, with black hairs medially.

Other: Similar in appearance to *B. fervidus*; *B. fervidus* has T1-4 yellow and T5-6 black; *B. appositus* has T1-6 yellow and T7 black. *B. appositus* collected only in extreme western Nebraska.

Bombus nevadensis auricomus

male



Bombus nevadensis auricomus

female



Bombus nevadensis auricomus

Head: Face and vertex with yellow hairs; eyes swollen; ocelli well below supraorbital line; malar space much shorter than width of mandible.

Thorax: Pronotum yellow; scutum with interalar band of black; scutellum yellow; sides yellow with black hairs on posterior 1/8th.

Abdomen: T1-3 yellow; T4-7 black.

Other: *B. nevadensis auricomus* similar to *B. nevadensis nevadensis*; *B. nevadensis nevadensis* (found only in western 1/4 of Nebraska) notum with posteromedian patch of black hairs; *B. nevadensis auricomus* (found throughout entire state) notum with large interalar band of black.

Bombus nevadensis auricomus

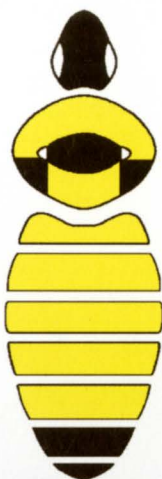
Head: Face with black hairs; vertex hairs yellow; ocelli 1 1/2 ocellar diameters below supraorbital line; malar space longer than width of the mandible.

Thorax: Pronotum yellow; scutum black; scutellum black with a few yellow hairs, to entirely yellow; sides, anterior 1/4 yellow, posterior 3/4 black.

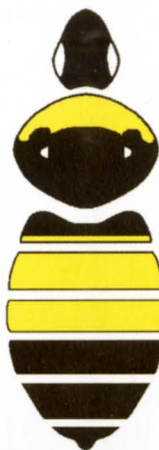
Abdomen: T1 black, sometimes with a few yellow hairs along posterior edge; T2-3 yellow; T4-6 black.

Other: *B. nevadensis auricomus* similar in appearance to *B. pennsylvanicus*; *B. pennsylvanicus* with ocelli on supraorbital line; *B. nevadensis auricomus* with ocelli well below supraorbital line.

Bombus pennsylvanicus male



Bombus pennsylvanicus female



Bombus pennsylvanicus male

Head: Face and vertex with black hairs; ocelli on supraorbital line; malar space equal to width of mandible.

Thorax: Pronotum yellow; scutum with interalar band of black; scutellum yellow; sides anterior 3/4 yellow, posterior 1/4 black or gray.

Abdomen: T1-5 yellow; T6-7 black or black with yellow intermixed, occasionally T6-7 with orange hairs.

Other: *B. pennsylvanicus* males similar to males of *B. fervidus*; *B. fervidus* sides of thorax yellow; *B. pennsylvanicus* anterior portion of the side of the thorax yellow, posterior portion black.

Bombus pennsylvanicus female

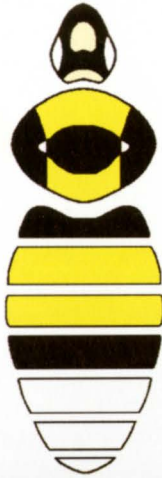
Head: Face and vertex with black hairs; ocelli on supraorbital line; malar space equal to width of mandible.

Thorax: Pronotum yellow; scutum black; scutellum black occasionally with a few scattered yellow hairs; sides black with anterior 1/8th yellow.

Abdomen: T1 black with yellow hairs on the posterior edge, occasionally T1 entirely black; T2-3 yellow; T4-6 black.

Other: Most common bumble bee throughout Nebraska. Similar to *B. nevadensis auricomus*; *B. nevadensis auricomus* ocelli 1 1/2 ocellar diameters below supraorbital line; *B. pennsylvanicus* ocelli on supraorbital line.

Bombus occidentalis male



Bombus occidentalis female



Bombus occidentalis male

Head: Face and vertex hairs yellow or white; ocelli on supraorbital line; malar space slightly shorter than width of mandible.

Thorax: Coloration highly variable; pronotum yellow; scutum black; scutellum yellow with black hairs intermixed; sides of thorax mostly black; occasionally notum completely yellow with posteromedian patch of black hairs.

Abdomen: Coloration variable, but always with white or yellow tail; T1 black, T2 yellow with brown or black hairs anteromedially; T3 yellow; T4 black with yellow hairs on the anterior edge and white hairs on the posterior edge; T5-7 white or yellow.

Bombus occidentalis female

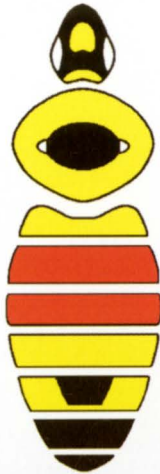
Head: Face and vertex hairs pale yellow or white; ocelli on supraorbital line; malar space slightly shorter than width of mandible.

Thorax: Coloration highly variable; pronotum yellow; scutum black; scutellum yellow with black hairs intermixed; sides of thorax mostly black; occasionally notum completely yellow with posteromedian patch of black hairs.

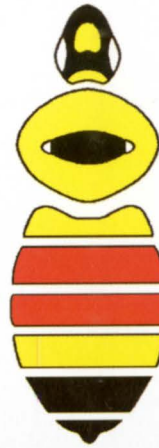
Abdomen: Coloration variable, but always with white or yellow tail; T1 black, T2 yellow with brown or black hairs anteromedially; T3 yellow; T4 black; T5-6 white or yellow.

Other: *B. occidentalis* has the most variation in color pattern of any Nebraska *Bombus* species. *B. occidentalis* found only in western 1/4th of Nebraska.

***Bombus huntii* male**



***Bombus huntii* female**



***Bombus huntii* male**

Head: Face and vertex hairs yellow; ocelli on supraorbital line; malar space slightly shorter than width of mandible.

Thorax: Pronotum yellow; scutum with interalar band of black; scutellum yellow; sides yellow.

Abdomen: T1 yellow; T2-3 orange-red; T4 yellow; T5 yellow with black hairs medially, T6-7 black.

Other: *B. huntii* close in appearance to *B. bifarius*; *B. bifarius* scutellum yellow with distinct patch of black hairs through middle of scutellum, and lateral edge of T3 black; *B. huntii* scutellum entirely yellow, and lateral edges of T3 orange-red.

***Bombus huntii* female**

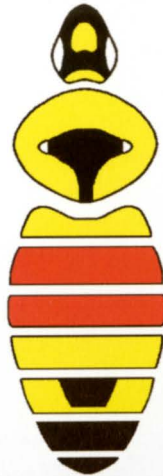
Head: Face and vertex hairs yellow; ocelli on supraorbital line; malar space slightly shorter than width of mandible.

Thorax: Pronotum yellow; scutum with interalar band of black; scutellum yellow; sides yellow.

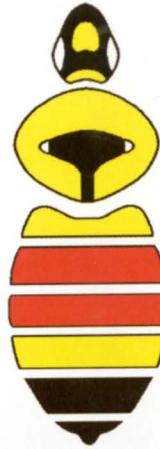
Abdomen: T1 yellow; T2-3 orange-red; T4 yellow; T5-6 black.

Other: *B. huntii* close in appearance to *B. bifarius*; *B. bifarius* hairs along corbicular fringe reddish-yellow, and scutellum yellow with distinct patch of black hairs through middle of scutellum; *B. huntii* corbicular hairs black and scutellum entirely yellow.

Bombus bifarius male



Bombus bifarius female



Bombus bifarius male

Head: Face and vertex with yellow hairs; ocelli on supraorbital line; malar space slightly longer than width of mandible.

Thorax: Pronotum yellow; scutum with interalar band of black; scutellum yellow with distinct anteromedial triangular patch of black hairs through the middle; sides yellow.

Abdomen: T1 yellow; T2-3 orange-red; T4 yellow; T5 yellow with black patch of hairs medially; T6-7 black or black with scattered yellow hairs.

Other: *B. bifarius* close in appearance to *B. huntii*; *B. huntii* with solid yellow scutellum; *B. bifarius* yellow scutellum with distinct anteromedial triangular patch of black hairs through middle of scutellum.

Bombus bifarius female

Head: Face and vertex with yellow hairs; ocelli on supraorbital line; malar space slightly longer than width of mandible.

Thorax: Pronotum yellow; scutum with interalar band of black; scutellum yellow with distinct anteromedial triangular patch of black hairs through the middle; sides yellow.

Abdomen: T1 yellow; T2-3 orange-red; T4 yellow; T5-6 black.

Other: *B. bifarius* close in appearance to *B. huntii*; *B. huntii* with hairs along corbicular fringe black; *B. bifarius* corbicular fringe of hairs reddish-yellow.

Bombus rufocinctus male



Bombus rufocinctus female



Bombus rufocinctus male

Head: Face with black hairs; vertex with yellow hairs; compound eyes swollen; ocelli below supraorbital line; malar space much shorter than width of mandible.

Thorax: Pronotum yellow; scutum with interalar band of black; scutellum yellow; sides yellow.

Abdomen: T1 yellow, T2-4 orange-red or yellow; T5 yellow; T6-7 black.

Other: *B. rufocinctus* males are the only red tails in Nebraska with swollen eyes.

Bombus rufocinctus female

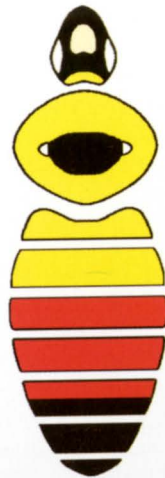
Head: Face with black hairs; vertex with yellow hairs; ocelli on supraorbital line; malar space much shorter than width of mandible.

Thorax: Pronotum yellow; scutum with interalar band of black; scutellum yellow; sides yellow.

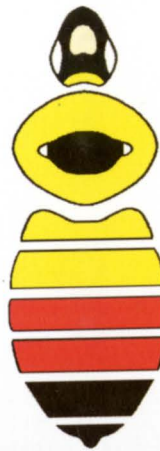
Abdomen: T1 yellow, T2 yellow on anterior 1/2, orange-red on posterior half or completely yellow; T3 orange-red or yellow; T4 yellow; T5-6 black.

Other: *B. rufocinctus* females similar in appearance to *B. huntii* and *B. bifarius*; *B. huntii* and *B. bifarius* lateral ocelli more than 2 ocellar diameters from compound eyes; *B. rufocinctus* lateral ocelli less than 2 ocellar diameters from the inside of each compound eye.

Bombus centralis male



Bombus centralis female



Bombus centralis male

Head: Face with pale yellow or white hairs; vertex with yellow hairs; ocelli on supraorbital line; malar space longer than width of mandible.

Thorax: Pronotum yellow; scutum with large interalar band of black hairs; scutellum yellow; sides yellow.

Abdomen: T1 yellow to yellow-brown; T2 yellow with an anteromedial area of brown hairs; T3-4 orange-red; T5 black with orange-red hairs along anterior edge; T6-7 black.

Other: Found only in western Nebraska.

Bombus centralis female

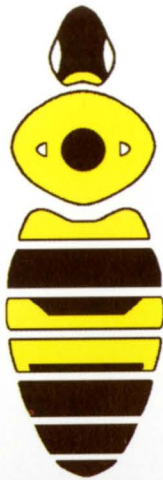
Head: Face with pale yellow or white hairs; vertex with yellow hairs; ocelli on supraorbital line; malar space longer than width of mandible.

Thorax: Pronotum yellow; scutum with large interalar band of black hairs; scutellum yellow; sides yellow.

Abdomen: T1 yellow to yellow-brown; T2 yellow with an anteromedial area of brown hairs; T3-4 orange-red; T5-6 black.

Other: Found only in western Nebraska; only red tail with T3-4 orange-red.

Psithyrus variabilis male



Psithyrus variabilis female



Psithyrus variabilis male

Head: Face with black hairs, vertex with yellow hairs; ocelli on supraorbital line; malar space slightly shorter than width of mandible.

Thorax: Notum yellow with a small patch of black hairs medially; sides yellow.

Abdomen: T1 yellow, T2 black; T3 yellow with black hairs medially; T4 yellow with black hairs on posterior edge; T5-7 black.

Other: *P. variabilis* males are rare and are only found in the fall.

Psithyrus variabilis female

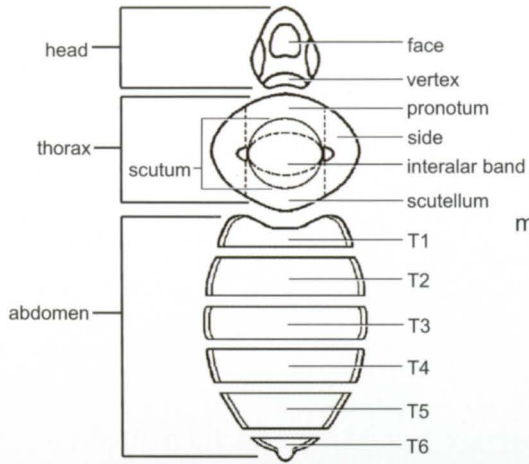
Head: Face with black hairs, vertex with yellow hairs; ocelli on supraorbital line; malar space slightly shorter than width of mandible.

Thorax: Notum yellow, with a small patch of black hairs medially; sides yellow.

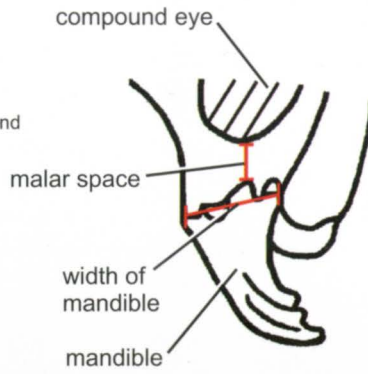
Abdomen: T1-6 entirely black; very few hairs and those present are short and black.

Other: *P. variabilis* is parasitic on *Bombus* species. Rare, found only in or around *Bombus* nesting sites. *P. variabilis* distinguished from *Bombus* species by shiny appearance of abdomen and absence of pollen basket.

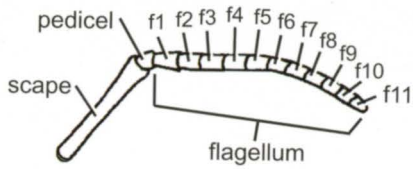
External Morphology of Bumble Bees



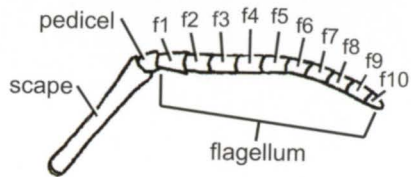
Top view of bumble bee.



Side view of bumble bee head.

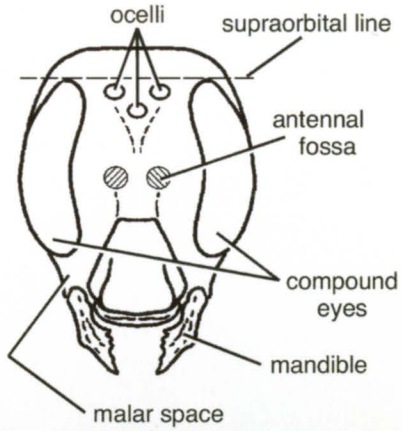


Male antenna.

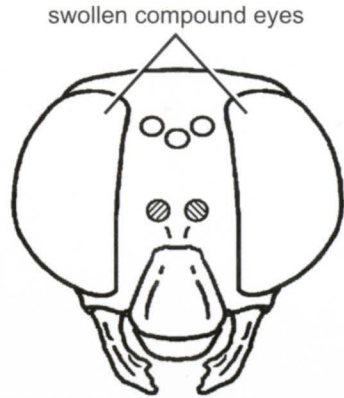


Female antenna.

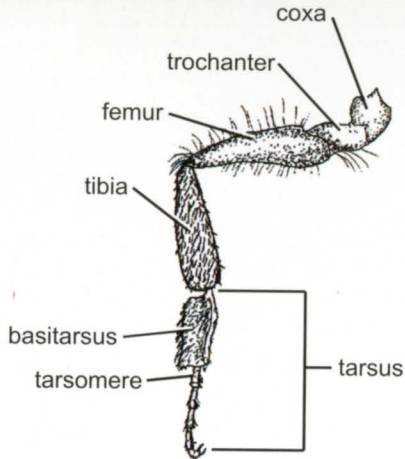
External Morphology of Bumble Bees (con't)



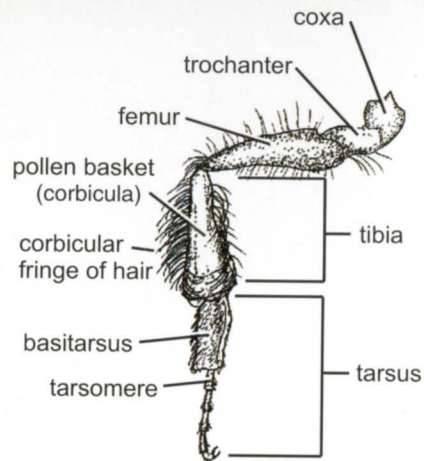
Frontal view of bumble bee head.



Head with swollen compound eyes.



Hind leg of male *Bombus* and male/female *Psithyrus*.



Hind leg of female *Bombus*.

Glossary

Head

Antennae — pair of segmented sensory appendages attached to the head. Female bees have 12 antennal segments, males have 13.

Antennal fossae — base or points where antennae attach to head.

Condyles — points where mandibles attach to the head.

Compound eyes — eyes made of many facets or individual elements.

Face — front of head, area above mouth, between compound eyes and extending to the base of the antennae.

Head — front part of the body bearing the compound eyes, ocelli, antennae and mouthparts.

Malar space — the distance between the bottom of the compound eye and the nearest point of the mandibular width. To identify bumble bees, it is sometimes necessary to compare the width of the mandible with the length of the malar space.

Long malar — means that the malar space is longer than the width of the mandible.

Short malar — means that the malar space is shorter than the width of the mandible.

Mandible — external jaw-like mouthpart.

Mandibular width — distance between the two condyles of a mandible.

Ocelli — set of three simple eyes located on the vertex or between the compound eyes. They are arranged in a triangular pattern. Lateral ocelli refer to the two ocelli closest to the compound eyes (one on each side).

Supraorbital line — imaginary line that stretches across the top edges of the compound eyes. When the top of the head is viewed from above, the position of the two lateral ocelli is above, below, or on this imaginary line.

Vertex — region on the top or crown of the head.

Thorax

Corbicula (pollen basket) — a concave structure surrounded by a fringe of hair on the outer surface of the tibia, located on the hind leg of *Bombus* females.

Interalar band — a band of hairs that stretch from wing-base to wing-base.

Leg — jointed walking appendage attached to the thorax. Bumble bees have three pairs of legs: forelegs, middle legs, and hind legs.

Glossary (con't)

Medial patch of hair — refers to a circular patch of hairs in the middle of the scutum.

Notum — refers to the entire top surface of the thorax.

Pronotum — first segment of the notum, closest to the head. Also called the collar.

Scutellum — last segment of the notum.

Scutum — second or middle segment of the notum.

Side — refers to the lateral aspect of the thorax.

Thorax — middle part of the body between the head and abdomen. Wings and legs are attached to the thorax.

Abdomen

Abdomen — hind part of the body separated from the thorax by a constriction or “waist.”

Tergites — dorsal plates of the abdominal exoskeleton. Each bumble bee species has characteristic abdominal hair color patterns. Tergites are numbered in succession starting with the tergum closest to the thorax. They are designated with the letter **T** followed by a number; for example T1 or T2. There are six abdominal tergites in female bumble bees and seven in males.

Other Terms

Anterior — toward the head.

Dorsal — top side of the specimen.

Lateral — side view of the specimen.

Medial — middle.

Posterior — toward the tail.

Ventral — bottom side of the specimen.

Additional Sources

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Matheson, A. Ed. 1996. *Bumble Bees for Pleasure and Profit*. International Bee Research Association, Cardiff, U.K., 47 pp.

Buckman, S.L. and G.P. Nabham. 1996. *The Forgotten Pollinators*. Island Press, Washington D.C., 292 pp.

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Internet

Bumble Boosters Web Site:

<http://bumbleboosters.unl.edu>

For information on bumble bee biology, distribution, and identification visit the Bumble Boosters Web site. This site also contains links to additional resources and the home pages of the partner schools involved in the Bumble Boosters project.

About Bumble Boosters

Bumble Boosters is a cooperative project of the University of Nebraska Department of Entomology, the Lincoln Public Schools Science Focus Program, and the Folsom Children's Zoo. It is partially funded by a grant from the Nebraska Lottery's Educational Innovation Fund.

The goal of the project is to create a community of student learners to conduct authentic research on bumble bees in Nebraska. A unique aspect of this project is that participating schools will make important contributions to our knowledge of bumble bee distribution and abundance, attractiveness of artificial nesting domiciles, the effect of

excluding pollinators from native and cultivated flora, and plant species visited by bumble bees. Project results will be published to guide Nebraskans who wish to provide nesting habitats and forage plants for these amazing and beautiful pollinating insects. For more information contact:

Bumble Boosters

University of Nebraska
Department of Entomology
202 Plant Industries Bldg.
Lincoln, NE 68583-0816

Bumble Boosters

Zoo School
Folsom Children's Zoo
1222 South 27th Street
Lincoln, NE 68502

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Cooperative Extension
Institute of Agriculture and Natural Resources
University of Nebraska

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