Pollinators

Learn what makes a bee a bee and how to tell them apart from flies or wasps! You'll learn about native pollinators, focusing specifically on the Rusty Patched Bumble Bee, and you'll explore native plants that benefit the Rusty Patched Bumble Bee and other pollinators!

Watch a video demonstration at: https://youtu.be/U0JwVq67Wwc

Grade range

This guide is designed for 3-8th grade.

Why it matters

Pollinators play an essential role in our ecosystems. They are responsible for pollinating plants—about 35% of the world's food crops depend on bees and other animals (like butterflies, birds, bats, and beetles) to pollinate them.[1]

Learn about pollinators!

A pollinator is anything that helps carry pollen from flower to flower. Some birds, bats, butterflies, moths, bees, and other insects are pollinators. This guide is going to focus on bees. So *how* do bees pollinate plants? Bees collect both pollen and nectar from flowers as a food source, either to feed themselves or to bring back to the hive. While visiting a flower, a bee may leave behind pollen from a different flower, thus pollinating that flower which then can fruit and seed. Those are the basics. Explore below to learn more!

Activity 1: Identify Bees, Wasps, and Flies, Oh My!

Gather materials

- Scissors
- Tape or Glue
- Writing utensil
- Colored pencils, crayons, or paint
- Nature Journal
- **Optional:** phone or camera

[1] Insects and Pollinators - Natural Resources Conservation Service, USDA

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Try it out!

While we might think we know what a bee looks like, the animal kingdom is full of insects that also look like bees. Can you think of why it might be beneficial for a fly to look like a bee?

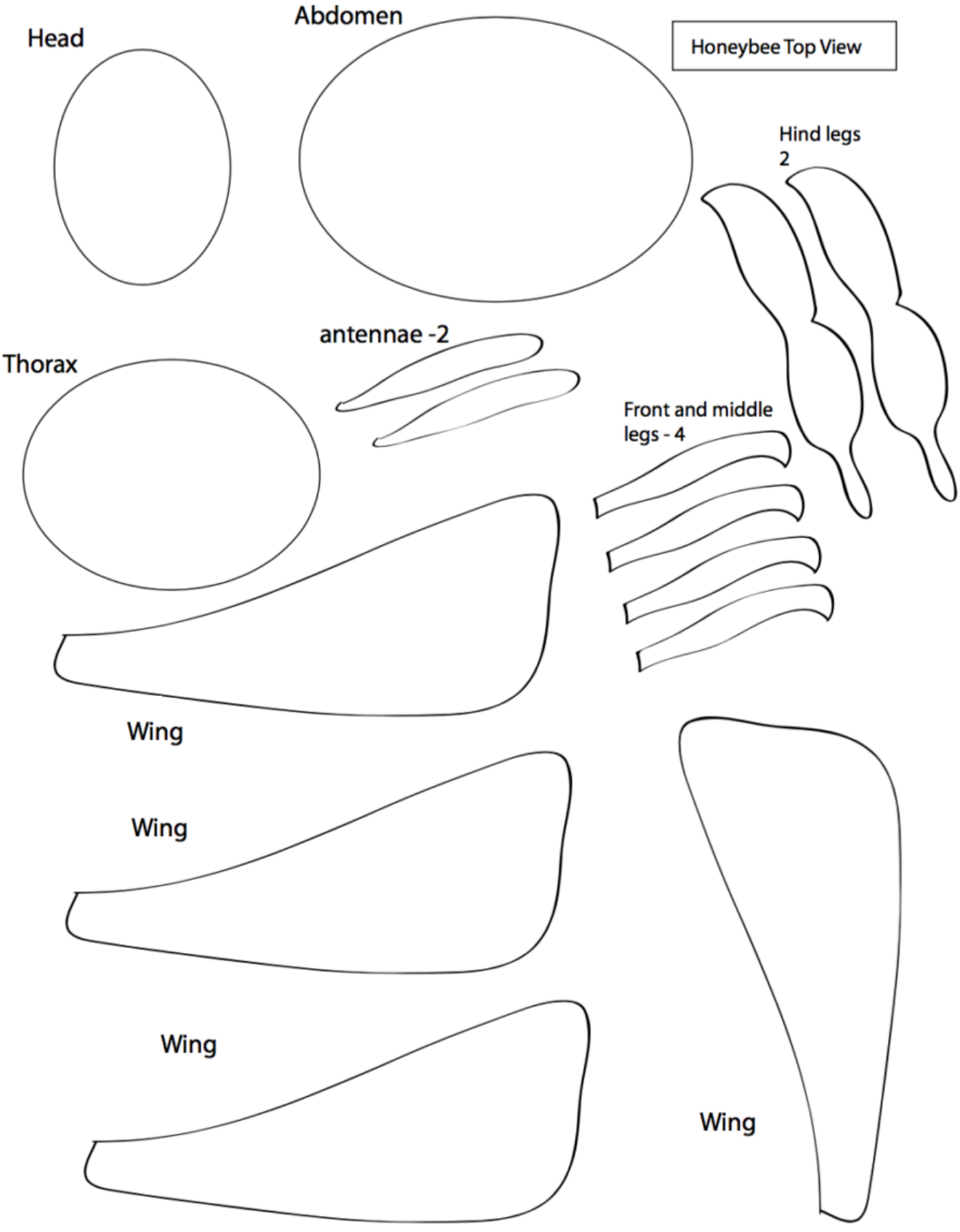
If you guessed that some flies look like bees because some bees sting, you are right! The scientific term for this is called **Batesian mimicry**, which just means that something harmless is imitating something dangerous.[2] Flies can only nip or bite, so looking like a bee that could sting (ouch!) is beneficial to them for protection. Other animals, and people too, tend to avoid bees—so looking like a bee can keep a fly from being eaten by a predator.

1) Look at the chart[3] below to learn more about the differences between bees, flies, and wasps.

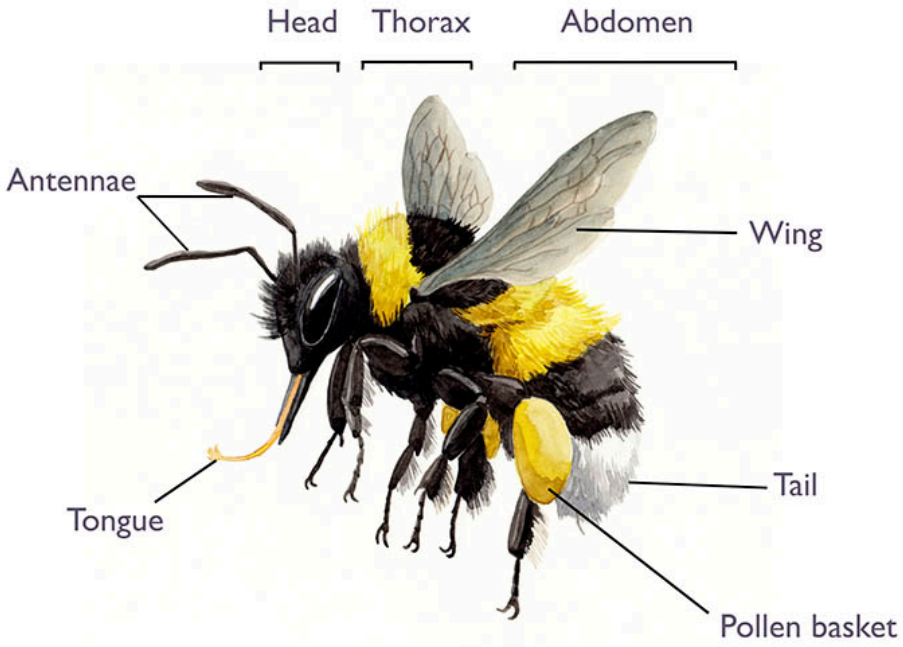
IS IT A BEE? **Look for:**	**IS IT A FLY?** **Look for:**	**IS IT A WASP?** **Look for:**
 **Body shape** hourglass, with "waist" and cylindrical abdomen and thorax **Pollen-carrying hair** (scopa) on legs or abdomen (for females, not all)	 **Eyes** large, round and cover much of the "face" **Short antennae**, often hard to see	 **Body shape** often long and slim, with distinct "waist;" legs often dangle in flight **Eyes** long, oval-shaped, at sid of head, sometimes with a "notch" (emarginate)
 **Long antennae** often with kink/elbow **Eyes** long, oval, at side of "face," often black	 **Body shape** usually "stout" with less obvious "waist" **Wings** one pair only, usually longer than body. Often held out at 45°angle at rest	 **Long antennae** **Wings** usually long and thin, generally shorter than the body (2 pairs)
 **Wings** often on back at rest and shorter than the body (2 pairs) **Head** triangular or tear-shaped	 **Head** round, large **Other**: Some mimic bees & wasps	 **Head** triangular or tear-shaped **Other**: some with visible ovipositor
With more than 4,000 species of bees in North America, these features are typical, but there are also exceptions.	**With at least 16,000 species of flies in North America, these features are typical, but there are also exceptions.**	**With at least 18,000 species of wasps in North America, these features are typical, but there are also exceptions.**

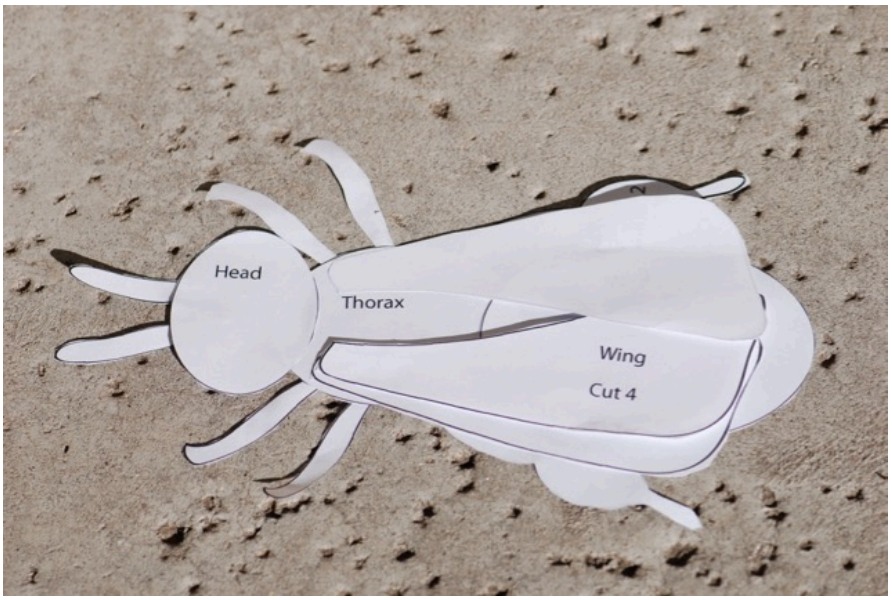
[2] Britannica, T. Editors of Encyclopaedia (2011, October 13). Batesian mimicry. *Encyclopedia Britannica*.
[3] Chart is adapted with permission from *Pollinator Insects Identification Tips* by Wild Pollinator Count.

2) Cut out the pieces of this generic diagram of bee parts[4] and assemble your bee! What features can you add to make it more realistic? Go ahead and cut the parts into more accurate shapes based off of what you learned from the chart above. See p. 4 for a sample of what your model may look like.



Bee Diagram[5]





3) Now draw on coloration to make your bee look like a bee! Use the Bee Diagram above to see the labeled parts of a bee.

[5] Bee Diagram image from *Bumblebees* from BloomsforBees.co.uk.

Activity 2: Scientific names & Minnesota's state bee!

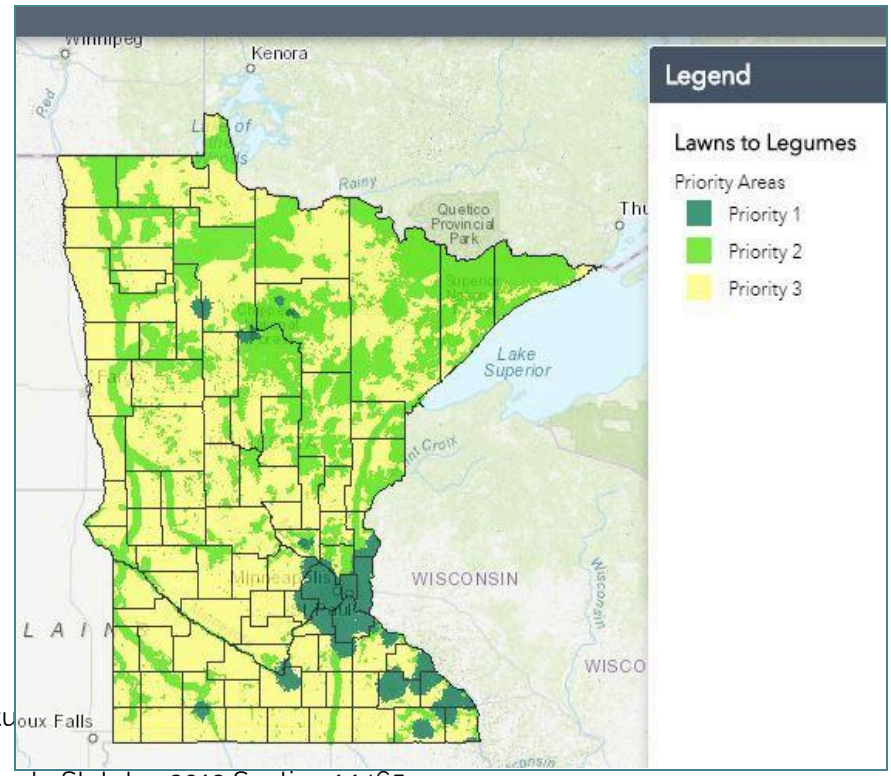


What you need to know

Did you know that Minnesota now has a state bee? The Rusty Patched Bumble Bee (*Bombus affinis*) [Image right[6]] was named the state bee in 2019.[7] Unfortunately, the Rusty Patched Bumble Bee (let's just call 'em Rusty for short) is also listed as an endangered species and has declined by 87% in the past 20 years.[8] Endangered species are any animals and plants that are in danger of becoming extinct!

You can spot Rusty by the brownish orange patch on their abdomen. Bees' abdomens are segmented, so this mark shows up on the second section of the worker bees and male bees. Fun fact: the queen bee doesn't have the patch![9]

Rusty used to be found throughout much of Minnesota, but now is mostly found only in the Twin Cities metro and to the south east. Look at this map[10] —the dark teal color shows Priority 1 areas, which is where Rusty usually lives now. The decline in this species is largely due to habitat loss and degradation. Rusty lives in prairies and grasslands, many of which have been broken up or destroyed altogether to create roads, farms, and cities.



[6] Image by Susan Day, UW-Madison Arboretu… MN350.org.
[7] *State bee: Rusty patched bumblebee.* Minnesota Statutes 2019 Section 1.1465. https://www.sos.state.mn.us/about-minnesota/state-symbols/state-bee-rusty-patched-bumblebee/
[8] Thorp, R.,et.al. (n.d.). *Rusty-patched bumble bee.* Xerces Society for Invertebrate Conservation.
[9] University of Minnesota Extension. (n.d.). *Bombus affinis (rusty-patched bumble bee).* Minnesota Bee Atlas.
[10] MN Board of Water and Soil Resources. Lawns 2 Legumes Rusty Patched Bumble Bee Priority Map

In the next activity, you will learn about native flowers that support Rusty! For the rest of this one, though, we are going to look at **scientific names**.

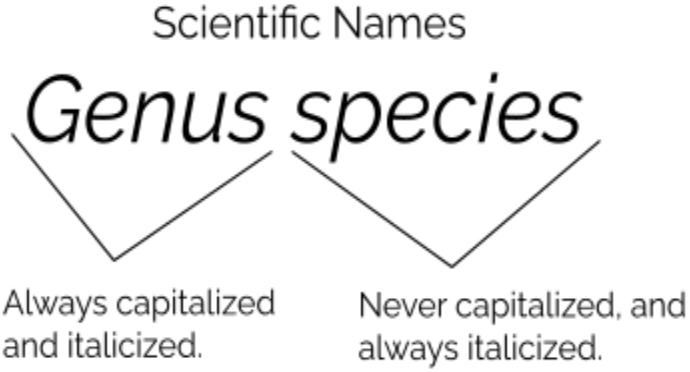
Rusty Patched Bumble Bee is the **common name** for this bee (you can think of it like a nickname). But Rusty is also known by *Bombus affinis*, which is the name that scientists use to identify this species of bee from all of the others. You can think of scientific names like your full name: first, middle, and last. It makes sure we are talking about the same species, regardless of where we are in the world.

Scientific names are usually Latin. They are made up of two parts. The first word tells us about the **genus** or group that this particular species is in, and the second word tells us the specific **species** within that group.

So, just like you and your family probably have the same last name, your first name is what makes you, you! Scientific names also usually describe something about the animal. In Rusty's case, *Bombus* is Latin for "buzzing or humming sound". All bumble bees share *Bombus* as part of their scientific name, because they all buzz! The second part, *affinis*, translates as "closely related to," which doesn't tell us a lot in this case, only that Rusty looks pretty similar to other bumble bees.

Let's look at the American Bumble Bee's scientific name for a minute: *Bombus pensylvanicus*. What do you notice that is similar to Rusty's name? What's different? What do you notice about how the name is written?

Bombus is used here, because both bees are bumble bees. In Latin, *pensylvanicus* means Pennsylvania, which is a state in the eastern USA where American Bumble Bees are commonly found. So this name tells us more about the bee than Rusty's name! You might also have noticed that the first name always starts with a capital letter and that the second name starts with a lowercase letter. Both names are also italicized. This is how you write scientific names, and they usually follow the same form: *Genus species*, like the chart to the right.



Try it out!

1) Make up your own creature using the Latin names given on the next two pages.
2) Once you have your two words picked out, type them out or write them down with the correct capitalization (note: if writing, don't worry about trying to italicize it, just underline the scientific name instead).
3) Now draw your creature!
4) What does the name you picked tell us about your creature? How does that shape what you draw?

Scientific Names Activity[11]

SAN DIEGO ZOO.org kid Territory

games | job profiles | meet the critters | kid art | got questions? | science in action | zoo crafts | sydney & friends

Make Your Own Scientific Name!

Once you know the meanings of some Latin and Greek words and word parts, it's fun to experiment and come up with your own scientific names. In order to combine the words, sometimes you need to drop letters, like an "s" on the end. Sometimes you need to add letters, like *e, i,* or *o,* in the middle, or an *us* or *um* at the end.

Check out our list of words and word parts, and try combining them to make up your own creatures. Once you've made up some names, try drawing pictures of your new creations! (By the way, did you figure out the meanings of the scientific names for the cheetah and the koala?)



giant anteater Myrmecophaga tridactyla *("eater of ants, with three fingers")*

Example: a *Cerobates dynatos* would mean a "strong horned walker." What might that creature look like? An *Erythrofloris dicordis* would be a "two-hearted red flower." Can you imagine a plant like that? Okay, here's one for you: what would an *Orninoctis leptoglossus* be?

Word Lists

How It Looks

acantho- prickly
***aci-, acies, acer* sharp**
acoce- pointed
acro- top
***adustus* brown**
***albus* white**
angustus narrow
barbatus bearded
brevis short
brun brown
cephalos headed
ceros horn
***cinereus* gray**
collis necked
compso- pretty
cornutus horned
di- two
erio- woolly
erythros red
eurys broad, wide
folius leaved
formis shaped
formosus beautiful
gigantos giant
gravos heavy
hapalus soft
hoplitos armored
humidus moist, wet
ignis fire
inermis bare
infectus dyed

How It Behaves



African hedgehog **Atelerix albiventris** *("ineffective fighter with a white belly")*

adephagos greedy
aedes unpleasant
allo- strange
apatelos deceptive
***ateles* imperfect, ineffective**
diligens diligent, careful
dynatos strong
ferox fierce
garrulus talkative, chattering
habros graceful
idris skillful
insignis remarkable
malus bad
necopinus unexpected
neo- new
sophos wise
tardus slow
velox, veloci- fast, speedy
xeno strange

What It Does

altus high
bates walker
blanos blind
carnis meat
edestes eater
frugis fruit
gradus step, walk
hyphantes weaver
indagator hunter
necto- swimming
odorus smelling
pedetes leaper



Papuan hornbill **Aceros plicatus** *("sharp point with wrinkles")*

phago- eat
-phoro, phorus carrier
***sulcata* furrowing, digging**
venator hunter
vorus eating

Where It Lives

amnicus of a stream
aqua water
aerios, aerius of the air or sky
aura gentle breeze
chortinos of the grass
dendron tree
diurnis daytime
geo earth, dirt
hylo wood, branch
marinus of the sea
monti-, montanus of the mountains
noctis night
potamos river
silvanus from the woods
terra land



chuckwalla **sauromalus obesus** *("fat dark lizard")*

[11]Scientific Names activity designed by San Diego Zoo. Retrieved May 2023 from https://www.fcgov.com/naturalareas/mn-res-pdf/make-your-own-scientific-name.pdf

infra underneath
***jubatus* maned**
juxta near
***lasios* hairy**
***lati-* wide**
leptos slender
leuco- white
lopho-, lophus crest, tuft
macro large
maculosus spotted
major greater
***malus* dark**
mega- huge
mela- black
minor small
nefrens toothless
nitidus shining
nodosus lumpy
***obesus* fat**
offella little bit
pachy- thick
penta- five
pictus, picti- colored, painted
pinnatus feathered
***plicatus* folded, wrinkled**
poly- many
protos first
pygmaeus dwarf, little
rhamphos, rhamphus curved beak
rigidus stiff
rotundus round
ruber red
sarco- fleshy
scolio- crooked
syn with
trachys rough
tragulus spear
tri- three
viri-, viridis green

Body Parts

ala wing
cordis heart



Queensland koala
Phascolarctos cinereus adustus *("brown gray pouched bear")*

***dactyl* fingered**
dorsum back
***frons, frondis* forehead**
gamba hoof
glossus tongue
mastax mouth, jaws
naris nostril
-odon toothed
***onyx* claw**
ops eye
ossis bone
oto- ear
pectus, pectoris chest
pedalis footed
pes foot
phascolo- bag, pouch
rhamphos, rhamphus curved beak
***rhinos, rhinus* nose**
***ventris* belly**
vultus face

What It Is, What It Resembles, or Something It Eats

aetos eagle
anthos flower
***arctos* bear**
bestia beast
canis dog
cervus deer
***chelone* turtle**
elaphus deer
entomon insect
equus horse
felis cat
flori- flowering



African spurred tortoise
Geochelone sulcata *("furrowing earth turtle")*

floris flower
haliaetus sea eagle
herba plant
mus mouse
***myrmeco-* ant**
orni- bird
ovis sheep
petra rock
piscis fish
pithecus monkey
radicis root
***sauros* lizard**
sus hog
tragus goat

Place Names



cheetah **Acinonyx jubatus** *("sharp clawed and maned"*

Africa *africanus, capensis*
Asia *occidentalis*
Australia *australis*
Borneo *borneoensis*
California *californianus*
Canada *canadensis*
Chile *chilensis*
Egypt *aegyptius*
India *bengalensis or indica*
Java *javanicus*
Madagascar *madagascariensis*
Mexico *mexicana*
Siberia *sibiricus*
United States *americanus*



hairy nosed wombat
Lasiorhinus latifrons *("hairy nosed with a wide forehead")*

Activity 3: Native Plants that support the Rusty Patched Bumble Bee!

What you need to know

The Rusty Patched Bumble Bee, which we've already learned is endangered, is largely struggling because of habitat loss. This means that there aren't enough flowers to forage from for food and/or enough places to build a nest and hibernate in the winter to support Rusty. Our best way to conserve the Rusty Patched Bumble Bee is through protecting and restoring habitats.

When it comes to foraging for food, Rusty is a **generalist**[12] and isn't picky about which flowers to get nectar and pollen from. But Rusty still has favorites — here are a few native species that Rusty likes to visit:



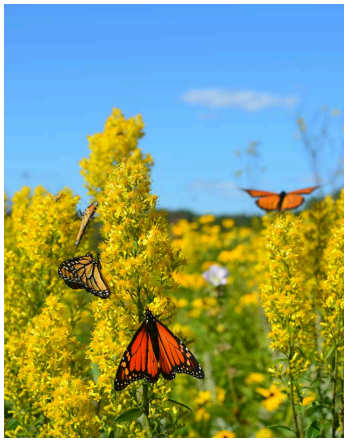
Anise Hyssop
Agastache foeniculum[13]



Purple Prairie Clover
Dalea purpurea[14]



Wild Bergamot
Monarda fistulosa[15]



Showy Goldenrod
Solidago speciosa[16]

Try it out!

1) With your caring adult, take a walk around your neighborhood or a local park. Can you spy any of these flowers? If you aren't sure what flower you are looking at, you can check Minnesota Wild Flower guides or use apps like iNaturalist to help you ID the plant!
2) Write down species that you see in your nature journal, or draw them so you can look them up later (you can also take pictures!).

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[12] University of Minnesota Extension. (n.d.). *Bombus affinis (rusty-patched bumble bee).* Minnesota Bee Atlas.
[13] *Agastache foeniculum (blue giant hyssop).* (n.d.). Minnesota Wildflowers: A field guide to the flora of Minnesota. Additional common name is Anise Hyssop.
[14] *Dalea purpurea: Purple prairie clover.* (n.d.). New Moon Nursery.
[15] *Monarda fistulosa (wild bergamot).* (n.d.). Minnesota Wildflowers: A field guide to the flora of Minnesota.
[16] *Solidago speciosa: Showy goldenrod.* (n.d.). Prairie Moon Nursery.

3) Watch closely for pollinators — can you tell if it is a bee or a fly? Maybe it is a butterfly? Do they seem to be attracted to one flower over another?

Think it over

- What did you learn about bees that you didn't know before? Share this with your caring adult.
- Based on the creature you made in Activity #2, what kind of environment would it need to survive? What does it eat? Where does it live? What predators would it have?
- Take a moment to journal about the life of a bee — imagine yourself as a bee, going from your hive to a flower to another flower and back. What challenges might you face? What flowers might you visit?

Take it Further

- Plant a pollinator garden! Be sure to use native flowers.
- Learn more about insects through studying entomology.
- Ever wonder how some bees communicate? They dance!
- Participate in Citizen Science efforts like the MN Bee Atlas Bumble Bee Survey.
- Take part or look back at 4-H Pollinators at Home.

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