



# EXPLORING POLLINATOR PATHWAYS



AN ACTIVITY GUIDE







# ABOUT THIS PROJECT



**General Biology** (BIOL101) and **Plants, Food, & Medicine** (BIOL315) students at the **University of St. Thomas** developed interactive activities to inspire people of all ages to observe pollinators and flowers along the Pollinator Path and beyond. **Sustainable Communities Partnership (SCP)** Artist-in-Residence **Sarah Nelson** collaborated with students to illustrate their activities and integrate them into this activity guide.

The **St. Thomas Pollinator Path** and **SCP** are partnering to enrich the ecological and educational value of the Pollinator Path through course-based projects across disciplines.

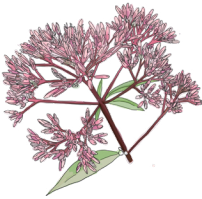
**The Pollinator Path** ([www.stthomas.edu/pollinator](http://www.stthomas.edu/pollinator)) transforms parts of the St. Thomas campus into an open-air lab for observing pollinators in action and enriching pollinator habitat. Anyone can walk the path—students, neighbors, visitors, and kids on field trips!

**SCP** ([www.stthomas.edu/osi/scp](http://www.stthomas.edu/osi/scp)) collaborates with campus and government partners to integrate partner-identified projects into courses across disciplines, engaging students in applied learning to promote human and environmental well-being.

**Sarah Nelson** ([www.sarahnelson.art](http://www.sarahnelson.art)), a visual artist in St. Paul, MN, is SCP's Artist-in-Residence. Her drawings focus on place and nature, engaging environmental challenges and the beauty and resilience of the planet.

# WHAT IS A FLOWER?

A flower is a plant's reproductive organ. It has different parts that provide different functions.



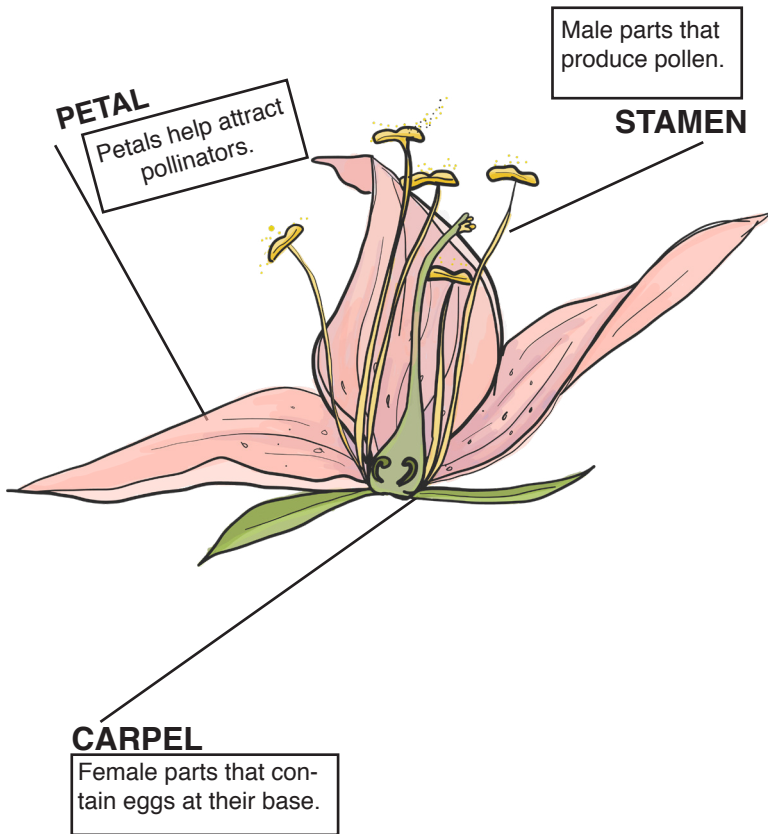
**The petals** of a flower are often bright and showy and help attract pollinators to the plant.

**The stamens** of the flower are the **male reproductive parts** that produce pollen containing sperm to be carried to other flowers. These usually stick out from the flower so the pollen will catch onto the legs/backs of pollinators.

**The carpels** of the flower are the **female reproductive parts** that contain eggs deep within the base of the flower. Pollen, which contains sperm, finds its way to the eggs, which grow into embryos (baby plants) within the seed of the new plant.



# FLOWER STRUCTURE!



# CAN YOU FIND THE PETALS, STAMENS, AND CARPELS?

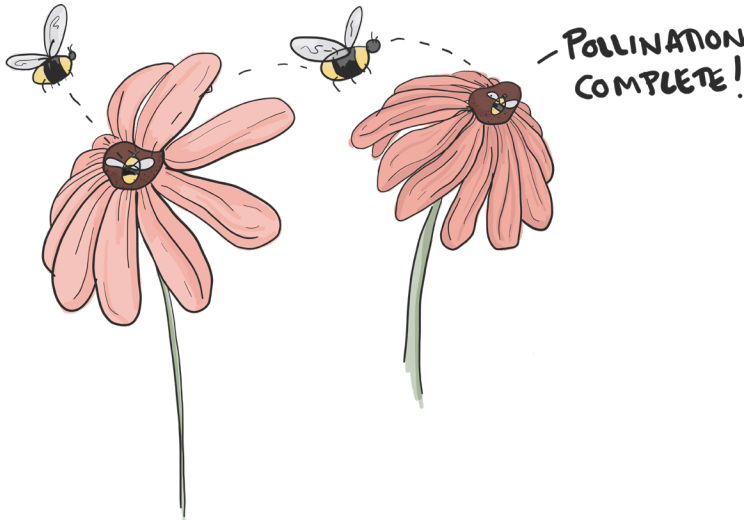


**Can you find the different flower parts on some real flowers?** Note that flowers vary a lot in the numbers of petals, stamens and carpels that they have.

# WHAT IS POLLINATION?

Since plants are rooted in the ground, they need to recruit animals (or the wind) to help them find a mate. The flowers package male reproductive cells (sperm) in pollen that insects or other animals pick up when they visit the flower looking for food such as nectar or pollen. They deliver the pollen to the next flowers that they visit. The pollen finds its way to the egg and new seeds are created for the next generation of plants.

In order to entice insects into visiting and delivering pollen, the flowers offer a reward, which is often in the form of sugary nectar and/or protein-rich pollen.



The stamens produce \_\_\_\_\_ which contains \_\_\_\_\_.  
Likewise, the carpels contain \_\_\_\_\_. When eggs are fertilized by sperm, they become \_\_\_\_\_ inside seeds.

# COLOR IN THESE BEAUTIFUL FLOWERS AND POLLINATORS!

Use the bingo cards to see what color each flower and insect really is!





# HOW TO IDENTIFY DIFFERENT TYPES OF POLLINATORS

**BUMBLE BEES** are very hairy and much bigger than other types of bees! You can often hear their loud buzzing before you see them!



**HONEY BEES** are less hairy and smaller than Bumblebees. Honey Bees are very golden, unlike Bumble Bees which are more yellowish.



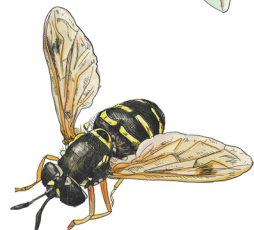
**WASPS** are large and completely hairless. They are also easily recognized by their itty-bitty waist!



**SYRPHID FLIES** are very small. They come in a variety of colors, their antennae are shorter than bee antennae, but the biggest giveaway are their BIG eyes that meet in the middle of their head!



**SWEAT BEES** Sweat bees can come in different colors! Some types of bees are green or blue! They are smaller and smooth like honey bees.

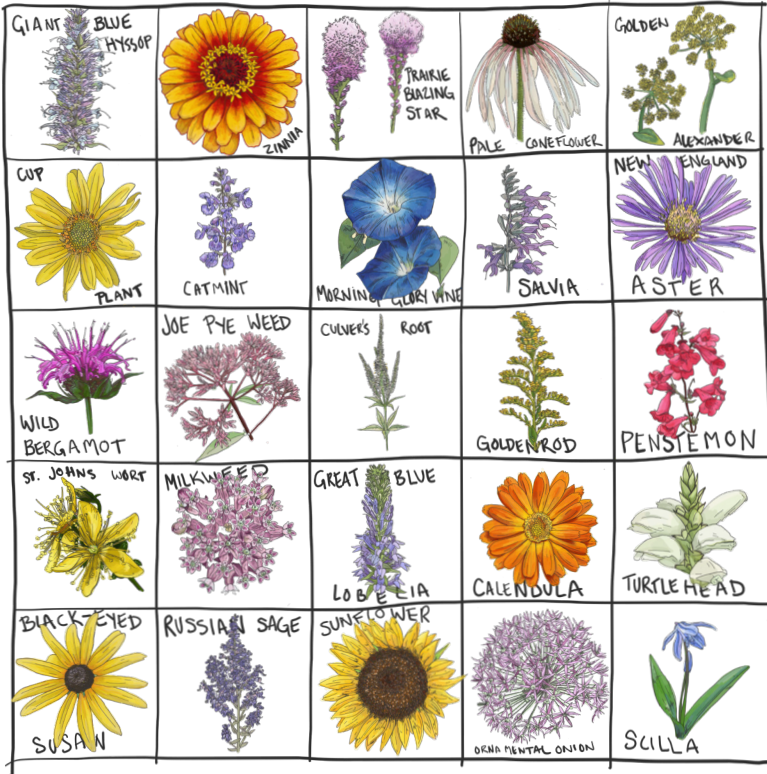


# POLLINATING FLOWER BINGO

Use this bingo to roam and learn about flowers in the Pollinator Path at the University of St. Thomas, your backyard, or at the park! See if you can spot these beautiful flowers!

If you spot 5 in a row you get a bingo!

Play with your friends and family!




























# POLLINATOR BINGO

Use this bingo to roam and make new discoveries in the Pollinator Path at the University of St. Thomas, your backyard, or at the park! See if you can spot these insects!

If you spot 5 in a row you get a bingo!

Play with your friends and family!

See if you can get bingo together!

<p>MONARCH  BUTTERFLY</p>	<p>RED-BELTED  BUMBLE BEE</p>	<p>GREAT YELLOW  BUMBLE BEE</p>	<p>STRIPED SWEAT  BEE</p>	<p>RED ADMIRAL  BUTTERFLY</p>
<p>RUSTY-PATCHED  BUMBLE BEE</p>	<p>SOLDIER  BEETLE</p>	<p>SPRING AZURIE  BUTTERFLY</p>	<p>GREAT BLACK  WASP</p>	<p>CELOPHANE  BEE</p>
<p>SYRPHID  FLY</p>	<p>COMMON EASTERN  BUMBLE BEE</p>	<p>HONEY BEE  HONEY BEE</p>	<p>PAINTED LADY  BUTTERFLY</p>	<p>WOOL CARDER  BEE</p>
<p>EASTERN TIGER SWALLOWTAIL  BUTTERFLY</p>	<p>LEAF CUTTER  BEE</p>	<p>TRI-COLORED  BUMBLE BEE</p>	<p>METALLIC GREEN SWEAT  BEE</p>	<p>BLACK AND GOLD  BUMBLE BEE</p>
<p>BROWN-BELTED  BUMBLE BEE</p>	<p>MASKED  BEE</p>	<p>HUMMINGBIRD  CLEAR WING MOTH</p>	<p>TWO SPOTTED LONGHORNED  BEE</p>	<p>BLACK SWALLOW-TAIL  BUTTERFLY</p>

# BIODIVERSITY

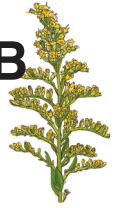
**Biodiversity** refers to the variety of organisms that live in the world, including plants, animals, fungi, and microorganisms. It also refers to the habitats in which these organisms live and the communities that live together.

## **Why is biodiversity important?**

Healthy ecosystems rely on a large variety of organisms with each playing an important role, such as making food through photosynthesis or decomposing organic material. Diverse ecosystems are better able to survive challenging changes in the environment. They also provide services such as protecting water and soils as well as allowing for production of food, wood products, and medicinal resources. All these products rely on pollination of plants.



# THE IMPORTANCE OF BIODIVERSITY MAD LIB



Once upon a time, there was a/an \_\_\_\_\_ (insect) who lived alone in a \_\_\_\_\_ (adjective) \_\_\_\_\_ (flower). She was terribly sad because she didn't have any \_\_\_\_\_ (noun). The \_\_\_\_\_ (insect) woke up one day determined to change her loneliness and find \_\_\_\_\_ (noun). She \_\_\_\_\_ (verb) out of the \_\_\_\_\_ (flower) on a \_\_\_\_\_ (adjective) journey. She packed up her \_\_\_\_\_ (noun) and \_\_\_\_\_ (verb).

Her first stop was a lawn which was not very fun for \_\_\_\_\_ (insect) because there was still no \_\_\_\_\_ (noun). The \_\_\_\_\_ (insect) \_\_\_\_\_ (verb) on the grass but her feet got burned due to harmful chemicals put on the lawn. The \_\_\_\_\_ (insect)

quickly \_\_\_\_\_ (verb) for a different place.

Her next stop was at a flower bed with many \_\_\_\_\_ (adjective) \_\_\_\_\_ (plural noun). She looked around and could not find any \_\_\_\_\_ (plural noun).

There were so many \_\_\_\_\_ (non-native flowers) but none of them had her \_\_\_\_\_ (noun).

With great \_\_\_\_\_ (feeling)

she picked up her \_\_\_\_\_ (noun) and \_\_\_\_\_ (verb).

Finally, after the \_\_\_\_\_ (insect) was very \_\_\_\_\_ (adjective), she saw a patch of flowers with all the \_\_\_\_\_ (noun).

She found the University of St. Thomas Pollinator Path! The \_\_\_\_\_ (insect) was so \_\_\_\_\_ (adjective) that she \_\_\_\_\_ (verb) for joy. There were so many flowers and insects that she could \_\_\_\_\_ (verb) and \_\_\_\_\_ (verb) with.

The insect had found a diverse and native Minnesota flower bed.

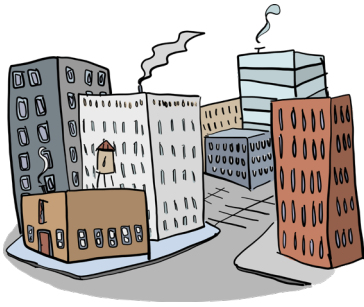
# BIOPHILIA

**Biophilia** means the love of life.

We are naturally drawn to other living things. Humans, plants and animals are all a part of nature and together we form a functional circle of life!

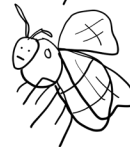
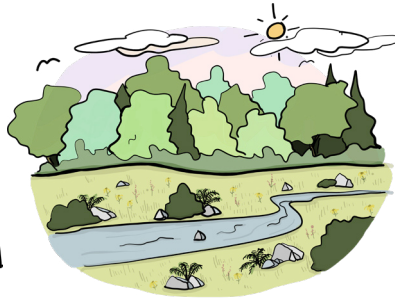
How do you feel when you imagine being in a place like this?

**Color in the bee that looks the way you feel.**

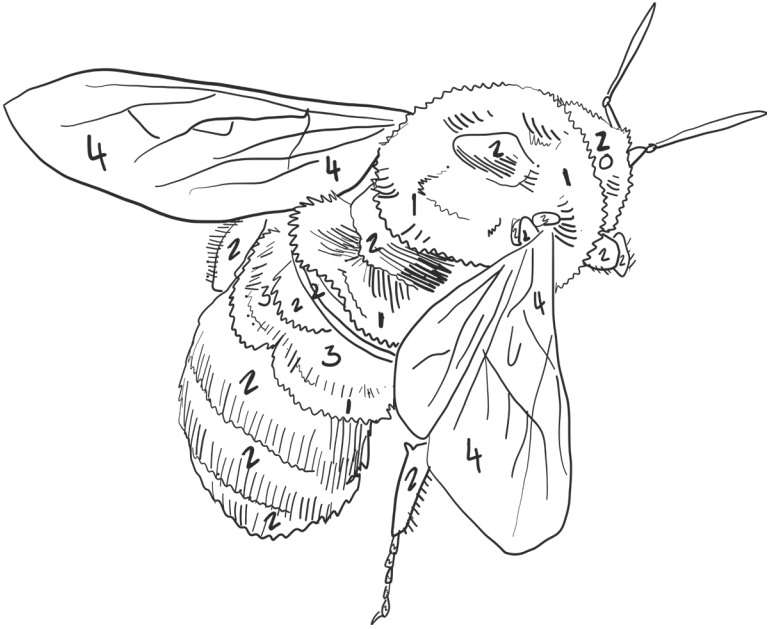


How do you feel when you imagine being in a place like this?

**Color in the bee that looks the way you feel.**



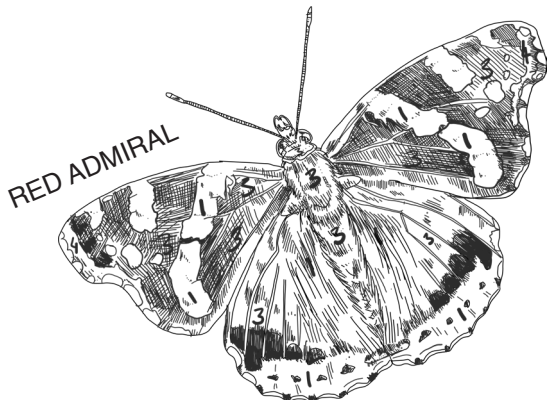
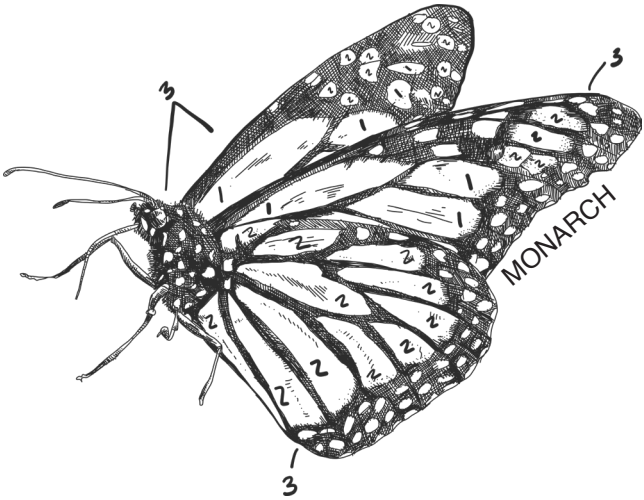
# COLOR BY NUMBERS



Use the color code below to color in the  
**RUSTY-PATCHED BUMBLE BEE.**

1. Yellow
2. Black
3. Orange
4. Light Blue

# COLOR BY NUMBERS



Use the color code below to color in the **RED ADMIRAL AND MONARCH BUTTERFLIES.**

- 1. Orange
- 2. Light Orange
- 3. Black
- 4. Light Blue



# CONNECT THE DOTS



Follow the numbers and connect them with lines to finish drawing the **BUMBLE BEE!**

## **FUN FACT:**

Bumble bees live in hives of up to 400 individuals, which is very small compared to honey bees whose hives can house more than 50,000 bees!

# FUN FACTS



The **BLACK SWALLOWTAIL** looks like its poisonous cousin, the pipeline swallowtail. This helps to keep predators away!

**SOLDIER BEETLES** are closely related to fireflies but lack the light producing organs!



**SYRPHID FLIES** are helpful in two ways! The adults are important pollinators of flowers and the larvae eat plant pests like aphids. A single larva can eat hundreds of aphids in 2 to 3 weeks.

This **PAINTED LADY** butterfly would love to be your friend! If you see one, stand still because it will want to land on your shoulder!



Did you know that **SUNFLOWERS** (and other asters) are actually made up of hundreds of tiny tubular flowers that have evolved to look like one giant flower? When a pollinator visits it can pollinate all of the flowers at one time!



The **TWO SPOTTED LONG-HORNED BEE** stands out from the crowd because the male has antennae twice as long as other bees!

The **PRAIRIE BLAZING STAR** is GIANT! It can grow to be anywhere from 2-5ft tall. This could be as tall or taller than you!



Yes, it's true, **METALLIC GREEN SWEAT BEES** are called that because they are attracted to the salt in human sweat. Don't worry if one lands on you, just carefully brush it off if it bothers you; the bees are just out collecting food to take back to their underground nests.

# WORD SEARCH: FLOWERS

LSUNFLOWERGLMPTSOFS  
BPXBSKVOITZCNWAZE BY  
IVWIMTRDULHVFPWHBN  
ORNOPWHAJB YRLOLKS LM  
DFSEEDKMPSEIOFIELUD  
IRMCFTESUGHTWEKXZEP  
VGJTXPCNEPRGEFC SRHA  
EBCUPOAUOMTUROOTDYS  
RQKRCLLIMCAQTCXJB SK  
SGZTMLBLOOMYVHPGZST  
EHL LAITUGNATIVEKAO C  
JYFETNPRDEXHACUZWPY  
YDBHCAMBKFJLQZWFABZ  
CXIEPTUTGLSMIPTBCNI  
PETALEVANNOZIFLIKILM  
LAPDHLJXFEALAOGAUR  
SJYKOA WNSEASONSFM TV  
XBCRMQUXNRVCMTACEHK  
GFHJADIZOJFTSBDL FQ  
OTMILKWEEDNAKTCSTEM

SUNFLOWER

PLANT

SEED

BIOPHILIA

TURTLEHEAD

BLUE HYSSOP

POLLINATE

NATIVE

BIODIVERSE

FLOWER

SEASON

BLOOM

STEM

PETAL

ROOT

CONEFLOWER

MILKWEED

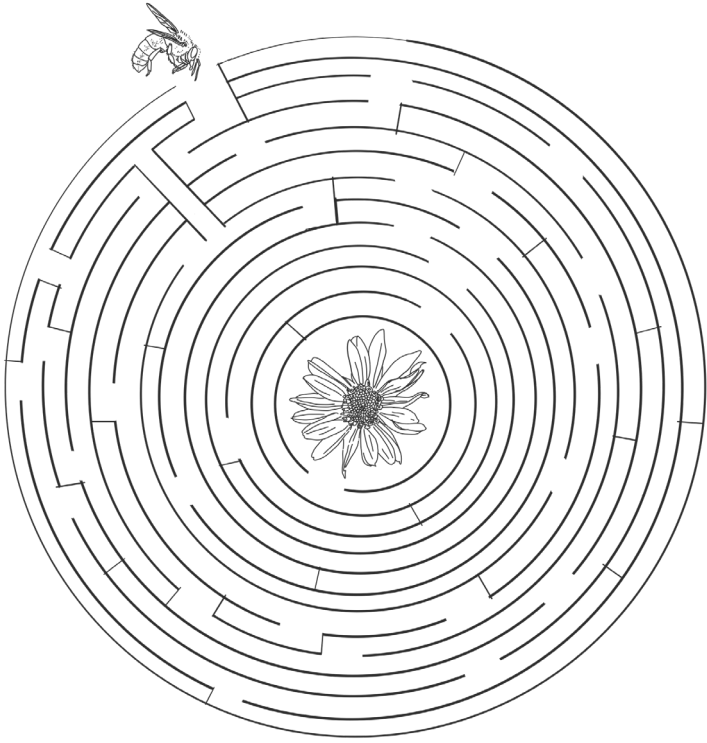
# WORD SEARCH: POLLINATORS

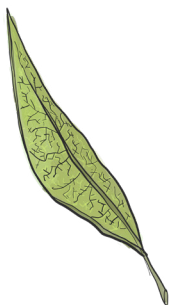
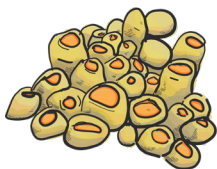
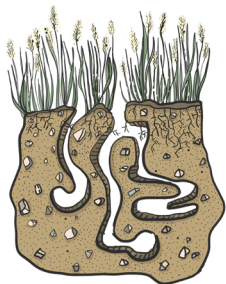
C L P O F O L R C J Z A E W D R E S K  
Z A Y B R A S G S W A L L O W T A I L  
S T N T U G K R H B T T I O W X K C P  
E E O M S D Q T V P E F U L W J P Z G  
S W E A T B E E M S D N E C T A R A R  
X K S F Y E T O P A I A R A Z M A B E  
A G R N I Y L A O O P T A R Q K I S A  
E S V B T D H T L W X I C D V L R U T  
Z O J C P K G F L A S V P E T X I A B  
F L M B U M B L E B E E B R I P E P L  
I D O U D F Q O N I J H K O U G Y J A  
S I H T Y C R R P H M O N A R C H B C  
N E S T B U I A D S L G H V S L A Z K  
H R L E Z A H A C V A E I L Z E P O W  
D B I R E D A D M I R A L T G A W H A  
J E S F B O I U J E D Q S A I R Y H S  
A E M L C S X R H A W F Q Z S W Q V P  
V T S Y R P H I D F L Y E U H I D T O  
B L N I F K G Y A X B U O N M N P S I  
M E E P A I N T E D L A D Y S G M X L

RUSTY  
BUTTERFLY  
SOLDIER BEETLE  
WOOL CARDER  
SWEAT BEE  
CLEAR WING  
RED ADMIRAL  
NEST  
SWALLOWTAIL  
NECTAR

MONARCH  
PAINTED LADY  
PRAIRIE  
GREAT BLACK WASP  
FLORA  
BUMBLE BEE  
POLLEN  
NATIVE  
SYRPHID FLY

# HELP THE HONEY BEE GET TO THE FLOWER!





## FIND THE HABITAT!

Bees and butterflies all live and sleep in different places!  
Match the Pollinator to their nest by drawing  
a line connecting them!

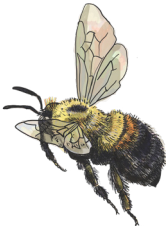
For answers look to the **FUN FACTS** section or check out the St. Thomas  
Pollinator Path website: [www.stthomas.edu/pollinator](http://www.stthomas.edu/pollinator)

# FUN FACTS



The **COMMON EASTERN BUMBLE BEE** is able to fly higher and at colder temperatures than other bumble bees.

The **NEW ENGLAND ASTER** can grow up to 6ft tall!



Although the **BROWN-BELTED BUMBLE BEES** live in colonies of fewer than sixty members, they defend the queen bee aggressively.

**GOLDEN ALEXANDER** often grows in colonies and is able to self-pollinate!



**RED ADMIRAL BUTTERFLIES** lay their eggs on the tips of leaves. Older larvae weave a snug little “house” for themselves from the leaves they’re eating.

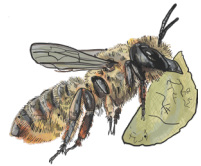


The **MASKED BEE** doesn't carry their pollen externally. They store food in the crop and regurgitate it when they return to their nests.



As a hybrid of Anise Hyssop, the leaves of the **BLUE HYSSOP** smell like licorice when crushed. You can use these leaves in potpourri or to flavor cold drinks!

You've heard of leaf cutter ants in the rainforest? There are leaf cutter bees too! **LEAF CUTTER BEES** use their specialized mouth parts to cut pieces out of plant leaves. Then they use those pieces to line their nests.



**GOLDENROD** is a coast to coast plant! It is found in almost every state in the country!

Groups of **CELLOPHANE BEES** can nest in large numbers, sometimes in the tens of thousands!





Black and Gold



Brown-Belted



Rusty-Patched



Red-Belted



Common Eastern



Tri-Colored



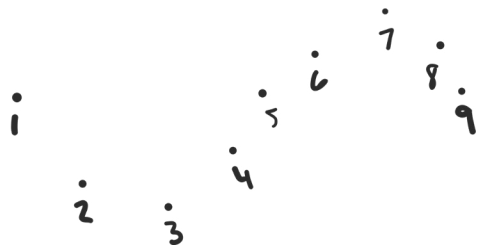
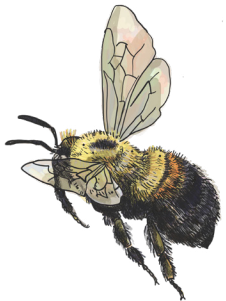
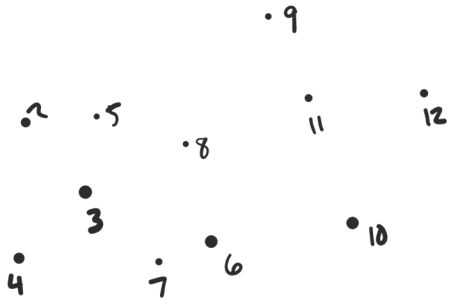
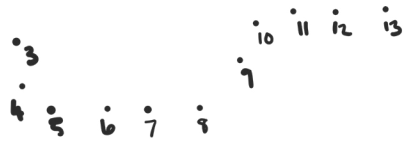
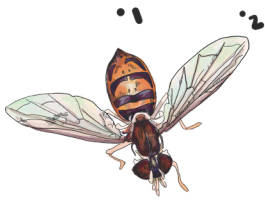
Great Yellow



## MATCH THE BUMBLE BEES!

Did you know that there are many different types of Bumble Bees? You can tell the difference between them based on their color patterns! See if you can match each Bumble Bee to their same type!

# CONNECT THE DOTS



## CONNECT THE DOTS

to see how the **SYRPHID FLY**,  
the **TIGER SWALLOWTAIL BUTTERFLY**,  
and the **RUSTY-PATCHED BUMBLE BEE** fly!

Different pollinators have different flight patterns for different reasons! Syrphid Flies (Hoverflies) are precise fliers. Butterflies use crazy flight patterns to avoid predators. Bumble Bees fly steadily because they are heavy and it helps them land gently.

# FACTS ABOUT BEE STINGS



Only female bees have stingers. Queens and worker bees only use them as a defense. Male bees never have stingers. Bees are so distracted by searching for and gathering pollen and nectar to be bothered by nearby people!

Bees may exhibit defensive behavior when near their nest or hive. Only honey bees have barbed stingers that get stuck in your skin. Bumble bees have a smooth stinger that does not become detached and can sting repeatedly, similar to wasps and hornets.

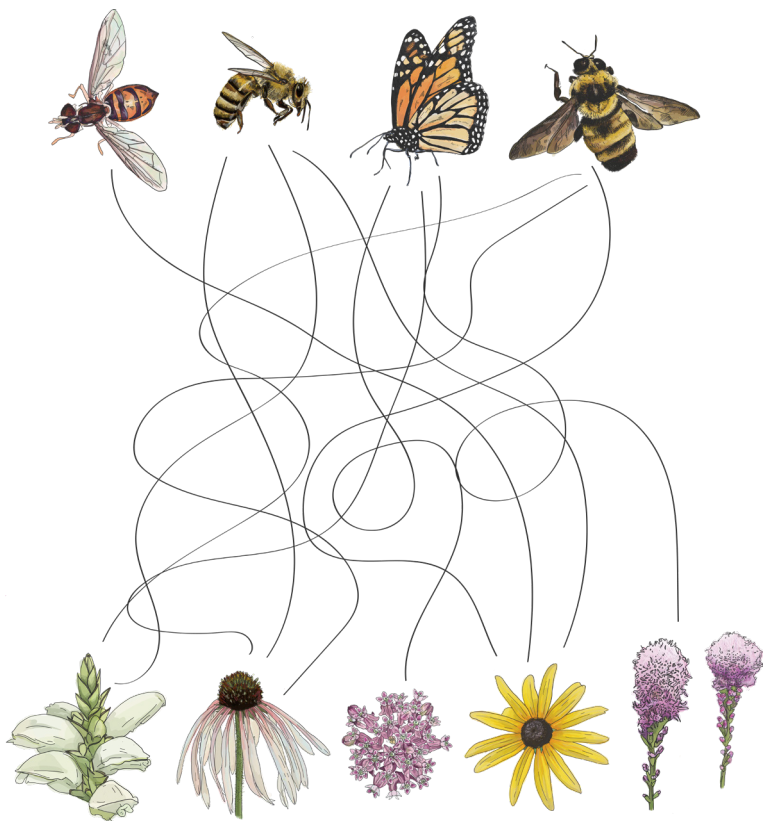


Bees that are foraging rarely sting unless you step on them.

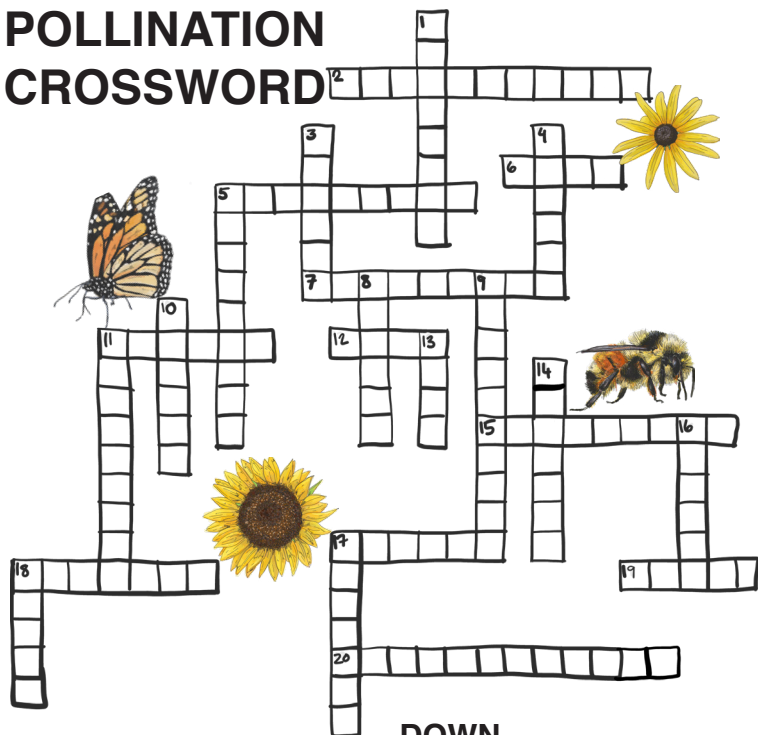


# FOLLOW THE LINES!

Discover which pollinator prefers which flower by following the lines! Choose a different color for each insect and see where the line goes!



# POLLINATION CROSSWORD



## ACROSS

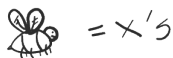
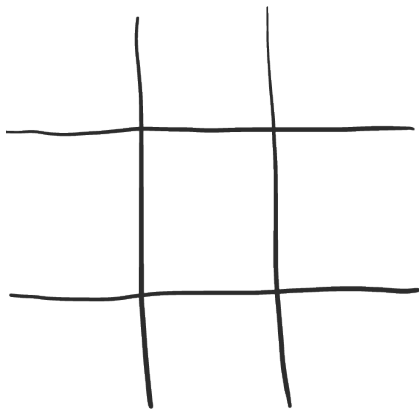
2. This flower shares a name with a burger chain!
5. This insect has beautiful wings and starts its life as a caterpillar.
6. Plant me and I will grow into a flower!
7. I am yellow and I love the sun.
11. An area where vegetables and flowers grow.
12. The part of the plant that the flower grows from.
15. Where we live!
17. I travel from one flower to another by wind or animal.
18. The Golden \_\_\_\_\_ Beetle is a native pollinator.
19. The leader in most hives.
20. An endangered Bumble Bee with a pretty orange spot.

## DOWN

1. The other name for Syrphid Fly
3. The colorful part of most flowers.
4. A tasty treat for pollinators.
5. A big and hairy type of bee.
8. Plants and pollinators from Minnesota.
9. A tasty summer fruit!
10. The Tri-Colored Bumble Bee's 3 colors are black, yellow, and \_\_\_\_\_.
11. Leprechauns love this flower.
13. This type of pollinator looks like a butterfly.
14. A butterfly that is orange and is known for its epic migration!
16. The number of types of native Bumble Bees in Minnesota.
17. Where many flowers and pollinators grow and roam.
18. Black-Eyed \_\_\_\_\_

# TIC TAC TOE

Using bees and flowers instead of X's and O's, find a friend and play a round!

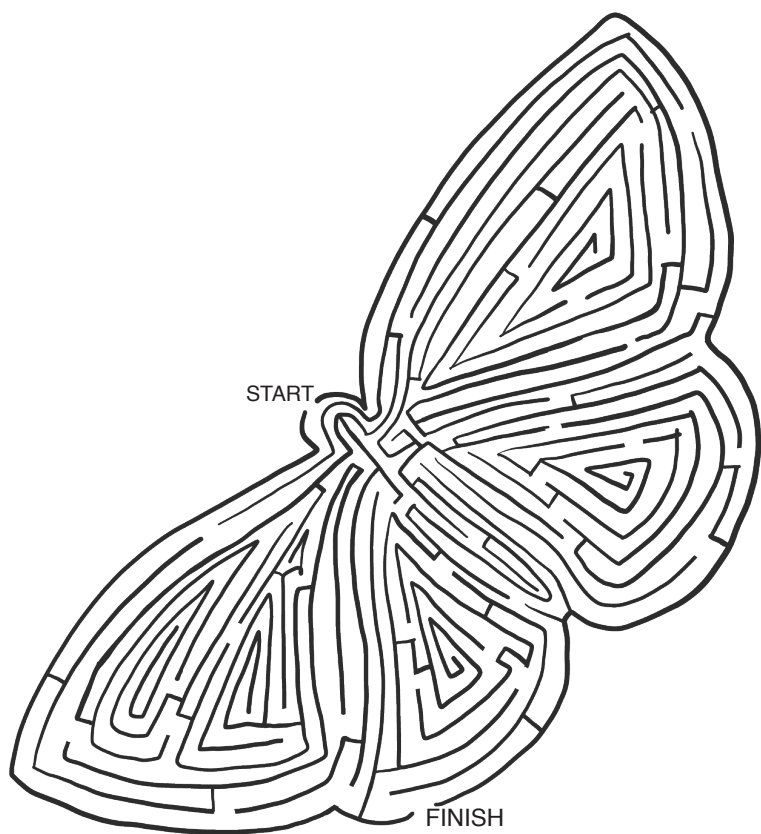


**RED ADMIRAL BUTTERFLIES** can fly up to 25mph!

Circle the things you think could beat a **RED ADMIRAL BUTTERFLY** in a race.



# MAKE YOUR WAY THROUGH THE BUTTERFLY!





# COLOR IN THESE BEAUTIFUL FLOWERS AND POLLINATORS!

Use the bingo cards to see what color each flower and insect really is!





# ACKNOWLEDGEMENTS

This Activity Guide was made possible by  
the **students** from **General Biology (BIOL 101)** and  
**Plants, Food and Medicine (BIOL 315)**  
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**Amy Verhoeven**, Biology Professor  
**Doreen Schroeder**, Lab Manager and  
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**Catherine Grant**, Biology Greenhouse Manager and  
Co-Founder of the Pollinator Path  
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Partnership (SCP) Director  
**Sarah Nelson**, SCP Artist-in-Residence

