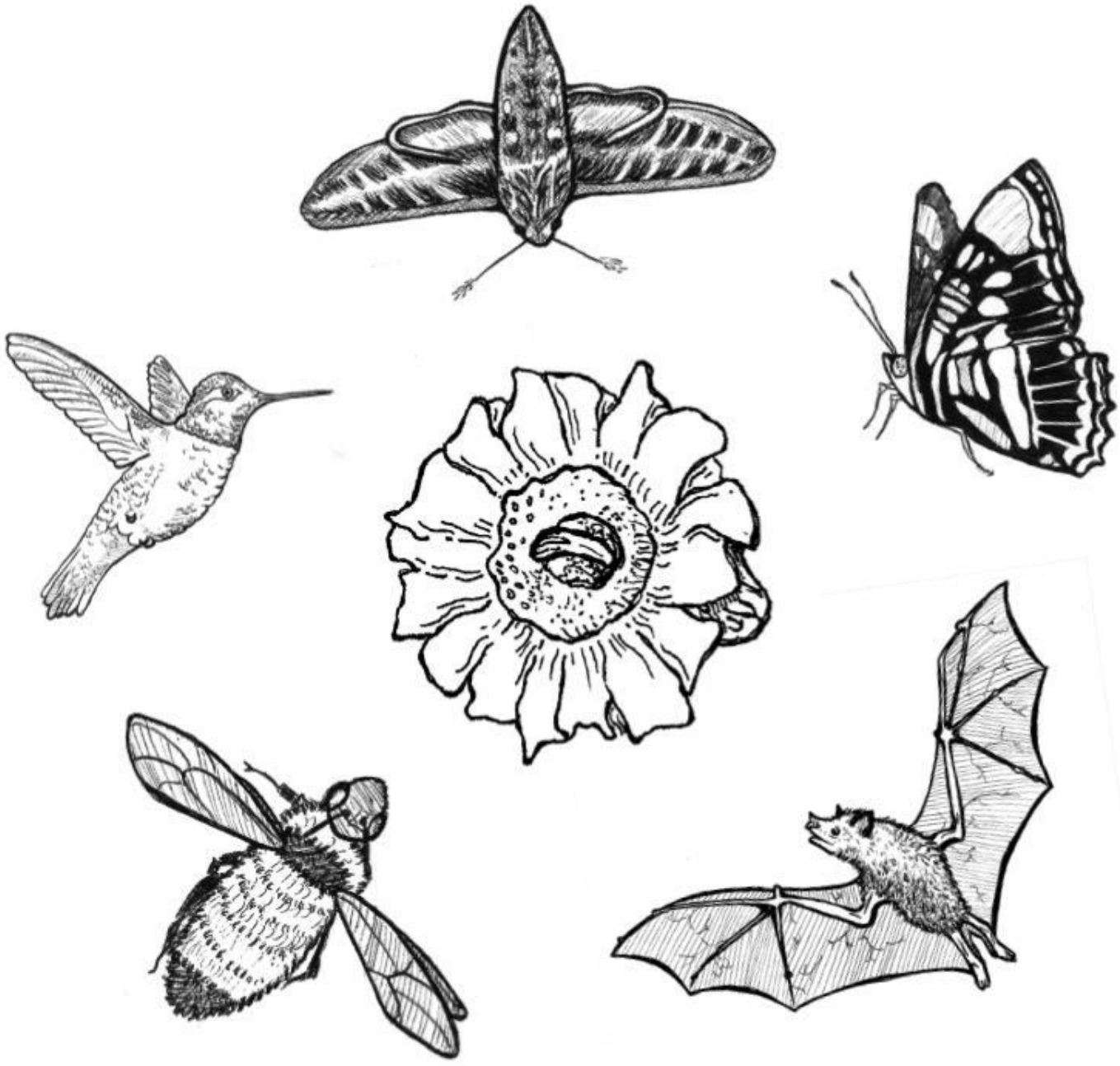
Saguaro

U.S. Department of the Interior
National Park Service

Saguaro National Park

Pollinator Workbook



What is a pollinator?

To explain what Pollinators are first we must talk about why plants have flowers.
Plants have flowers to attract pollinators. Pollinators help plants reproduce by spreading pollen from one flower to another. When plants reproduce, they create fruit and seed. In fact, **pollinators help create one in every three bites of food you eat and about one in every four bites of food for birds and mammals**! Sadly, the number of pollinators is decreasing but there are many things you can do to help. The first step is to learn about what helps pollinators stay active and healthy and then sharing what you have learned with your friends and family. This workbook will help you on your journey to help save pollinators!

Before you get started, we have some tips for using this workbook:

*On your quest you will learn new words. These new words are highlighted in green and their definitions are given to you in the glossary** on page 17. Click on the word you do not know, and it will bring you to the glossary. When you are done, click the word in the glossary and it will bring you back to your activity. Try clicking the word "pollinators" above and see what happens.

**Words that are underlined in green are links that will bring you to the corresponding section in this workbook. Try clicking the word "glossary" underlined in green above and see what happens.

Some of these activities are harder than others. You will know how hard an activity is by the number of butterflies next to the activity's title. We encourage you to challenge yourself and try activities even if they are categorized as medium or hard!

 One butterfly means the activity is **easy** and good for grades 2-5

 Two butterflies mean the activity is **medium** and good for grades 5-8

 Three butterflies mean the activity is **hard** and good for grades 8-12

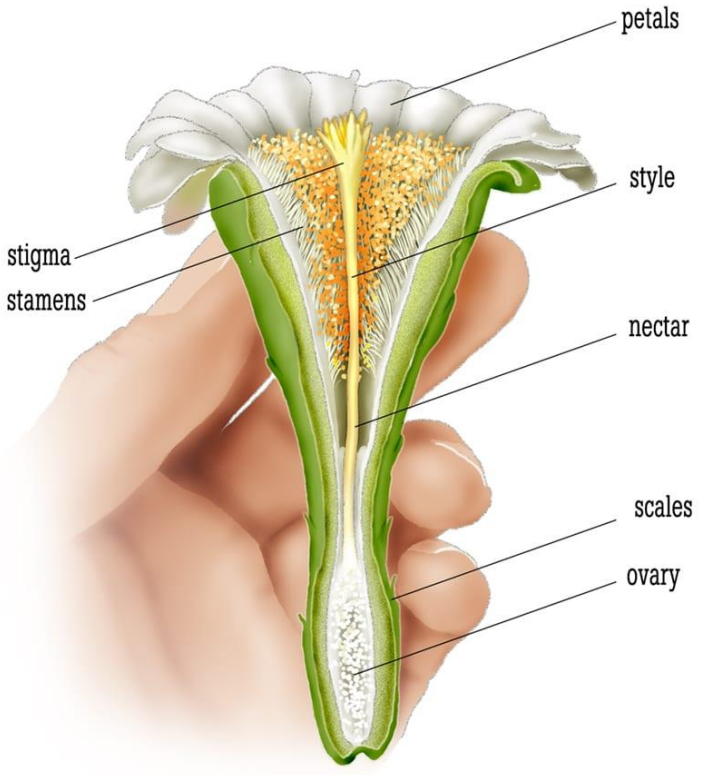
We hope you have fun on your adventure! We would love to see your findings and creations, so ask your guardian if you can share your work by tagging @saguaronationalpark on Instagram!

Flower Anatomy

What is your favorite flower? Why are flowers so colorful? Are plants trying to win a beauty contest? Why are there so many different types of flowers?

Plants have flowers for reproduction. At least 75% of flowering plants depend on pollinators in order to reproduce and create fruit and seed. In fact, pollinators help create one in every three bites of food you eat! Pollen is produced and stored in the anther (male part) of the flower. When pollen is moved from the anther of one flower to the stigma (female part) of another flower, Pollination occurs.

Study the definitions and the diagram of a saguaro flower below.



From the book, *Frequently Asked Questions about the Saguaro*, by Janice Emily Bowers

Structure	Function
Nectar	A sugary liquid that attracts animals.
Ovary	Produces the ovules (becomes the fruit/seed).
Petals	The colorful part of the flower that helps attract pollinators.
Scales	A part of a plant that protects it.
Stamens	The male part of the flower and has an anther held up by a filament.
Stigma	Collects pollen grains.
Styles	A long, slender stalk that connects the stigma and ovary of the plant.

Flower Scavenger Hunt

Now that you know a bit about the anatomy of flowers, go outside in your backyard or neighborhood and find a plant that is blooming. Are its anthers, petals, and stigmas shaped like a saguaro flower?

Draw and label a diagram of your flower below.

Pollination Syndromes

As you may have noticed, flowers come in many different colors, shapes, and sizes. Why are there so many different types of flowers? Different flowers attract different pollinators.

Pollinators visit flowers to feast on their nectar. There are many different types of pollinators including bees, butterflies, beetles, birds, flies, moths, bats, and wind. Just like us, these pollinators have preferences on what they like to eat. Pollination Syndromes describes the traits a flower has that attract pollinators. Pollination syndromes can be used to predict which pollinators will visit which flowers. Flowers and their pollinators have Mutualistic Relationships. The pollinator gets access to nutrition, while the plant ensures that its pollen is carried to another flower of the same species so it can reproduce.

Below are tables showing how four different pollination syndromes (flower color, shape, bloom time, and odor) vary by pollinator.

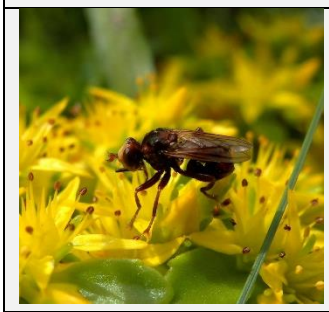
Flower Color

Bees	Butterflies	Beetles	Birds	Flies	Moths	Bats	Wind
• Bright white • Yellow • Blue • Ultraviolet	• Orange • Bright red • Purple	• Dull white • Green	• Orange • Red • White	• Often veined and brown	• Pale red • purple • Pink • White	• Dull white • Green • Purple	• Dull green • Brown

Flower Shape

Bees	Butterflies	Beetles	Birds
			
• Shallow with landing platform • Tubular	• Narrow tube shape • Wide landing pad	• Large • Bowl shaped	• Large • Funnel shaped • Strong perch support

Flower Shape Continued

Flies	Moths	Bats	Wind
			
• Shallow • Funnel shaped • Trap-like	• Tubular • No lip	• Bowl shaped	• Small stigmas • Small or no petals

Flower Bloom Time

Bees	Butterflies	Beetles	Birds	Flies	Moths	Bats	Wind
 Day	 Day	 Day	 Day	 Day & Night	 Night	 Night	 Day & Night

Flower Odor

Bees	Butterflies	Beetles	Birds	Flies	Moths	Bats	Wind
 • Mild • Fresh • Pleasant	 • Faint • Fresh	 • None • Strongly fruity • Foul	 None	 Rotten	 • Strong • Sweet	 • Strong • Musty • Fruity	 None

Pollination Syndrome Questions

A saguaro flower typically blooms at night until mid-morning the next day. It is bright white, bowl shaped, emits a pleasant, fruity odor, and has platforms on which to perch. What do you think pollinates a saguaro flower? Name at least two. Hint: the answer can be found in the Design Your Own Pollinator Garden activity starting on page 12.

Go back to the flower diagram you drew for the Scavenger Hunt on page 3. Now that you know some pollinators and their favorite flower types, what do you think pollinates your flower?

Pollinator Bingo

Take a break from the internet and indoors and enjoy the lovely spring weather! Go on a walk around your backyard or neighborhood and bring a few bingo cards. Choose a card based on a pollinator and find flowers they would like. Invite a family member or share them virtually with a friend (social distancing is important to keep us safe) and see who gets a bingo first!

Bee Bingo

A flower that blooms during the day	An Ultraviolet flower	A flower with a fresh, pleasant scent
A bright white flower	FREE	A blue flower
A bee	A yellow flower	A tubular flower

Butterfly Bingo

An orange flower	A butterfly	A flower with a faint, fresh scent
A tubular flower	FREE	A purple flower
A flower with a wide landing pad	A red flower	A flower that blooms during the day

Bird Bingo

A white flower	A flower with no scent	A flower that blooms during the day
A funnel-shaped flower	FREE	An orange flower
A bird	A red flower	A large flower

Beetle Bingo

A beetle	A dull white flower	A flower with no scent
A flower that blooms during the day	FREE	A green flower
A flower with a strong fruity scent	A ladybug	A large flower

Create Your Own Pollinator

Study the pictures and facts about these pollinators who live in the Sonoran Desert.

Image 1. Lesser Long-Nosed Bats are mammals who pollinate pale colored or white flowers, use Echolocation to find objects, eat nectar, and are Nocturnal meaning they are active at night.

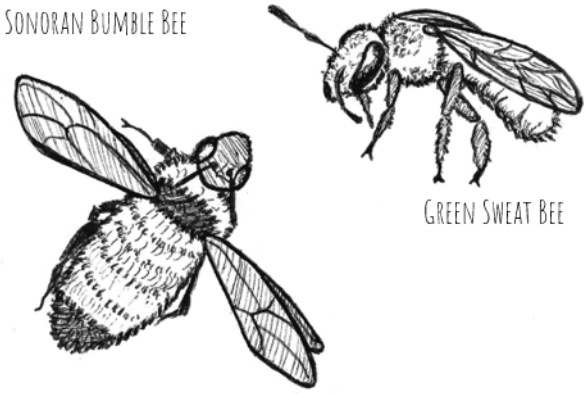


Image 2. Sweat Bees are small insects who nest in the ground, are graceful fliers, and are Diurnal meaning it they are active during the day. Bumble Bees are big insects who live in colonies, produce small amounts of honey, and are diurnal.

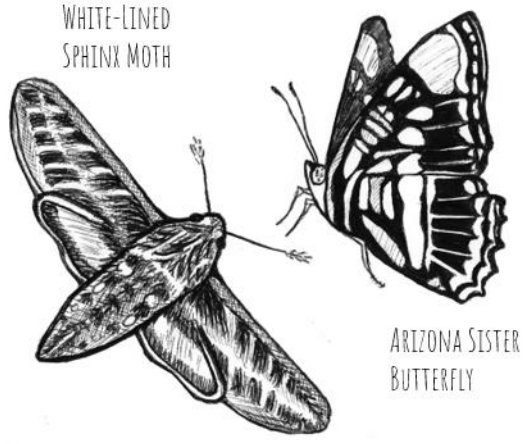


Image 3. Moths are Insects who are Metamorphose, can fly over 12 mph, and are nocturnal. Butterflies are Insects who are metamorphose, "taste" with their feet, have tube-shaped tongues, and are diurnal.

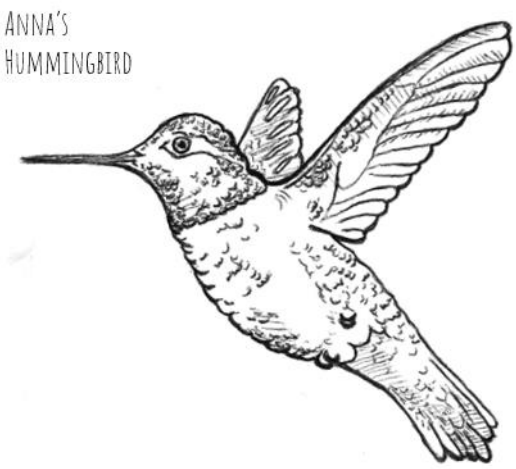


Image 4. Hummingbirds are birds who can consume 50% of their body weight in nectar per day, their eggs are the size of jellybeans, and they are diurnal.

Bonus: Color the images! Are the pollinators dull or brightly colored?

Create your own pollinator by putting together parts of at least three of the pollinators featured on the previous page. Draw your creation in the box below and give it a new name! We would love to see what you come up with so tag @saguaronationalpark on Instagram when you're done (ask your guardian, of course)!

My pollinator's name is _____

What flowers does your pollinator like to visit?

Is your pollinator nocturnal or diurnal?

Where does your pollinator live?

What type of animal is your pollinator?

Pollinator Word Search

Answer the questions below and look for the answers in the word search on the next page. Answers to the questions are included on the following page.

Word Search Questions

1. One in ____ bites of food we eat are created through the help of pollinators.
2. The part of the plant that gets pollinated is called a _____.
3. Animals that are active during the day.

   D ___ ___ ___ ___ ___ ___
4. Animals that are active during the night.

   N ___ ___ ___ ___ ___ ___ ___ ___
5. A _____ uses echolocation to move around.
6. A _____ can consume half of its body weight in nectar a day.
7. The larva of a butterfly or moth.

   C ___ ___ ___ ___ ___ ___ ___ ___ ___ ___
8. A bat, butterfly, bee, moth, and hummingbird are examples of a _____.
9. A hummingbird's egg is the size of a _____.
10. A small insect that is green, flies, and lives in a nest in the ground.

    S ___ ___ ___ ___ ___ ___ ___

Pollinator Word Search

U C W C V I Y D C N E J H B X

K D A Q R W R L D B E P U O S

B S E T F S M U U W B N M J E

R M U D E E B W B L T M M I Z

B N M T K R S E A P A F I D P

F N A R H T P N T P E J N C W

O O T E M R R I O O W O G B Q

R N N V B U E L L X S P B H V

I O W U I Y L E O L R J I Y J

S J D D O I L E X T A E R B D

T B V W N Z F L O W E R D A N

H Y O A Q N P P E U T J K T K

U S T F P T K R S J Y O F H Z

L O Z I F B N S G M O X C A Y

R L A N R U T C O N X A X X L

Answers (in numerical order): three, flower, diurnal, nocturnal, bat, hummingbird, caterpillar, pollinator, jellybean, sweat bee

Design Your Own Pollinator Garden

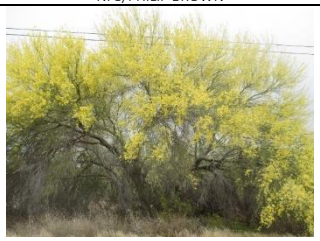
Now you can design your own pollinator garden! Pollinator gardens are important because they are homes for pollinators where they can eat, drink, and rest safely. Below, there is a table that provides the name and photo of a plant native to the Sonoran Desert. The table also includes information about when the plant blooms, the flower color, and who pollinates them. Using the table and the tips below, you can plan and draw your own pollinator garden!

Before you get started, there are a few things to consider when designing a pollinator garden.

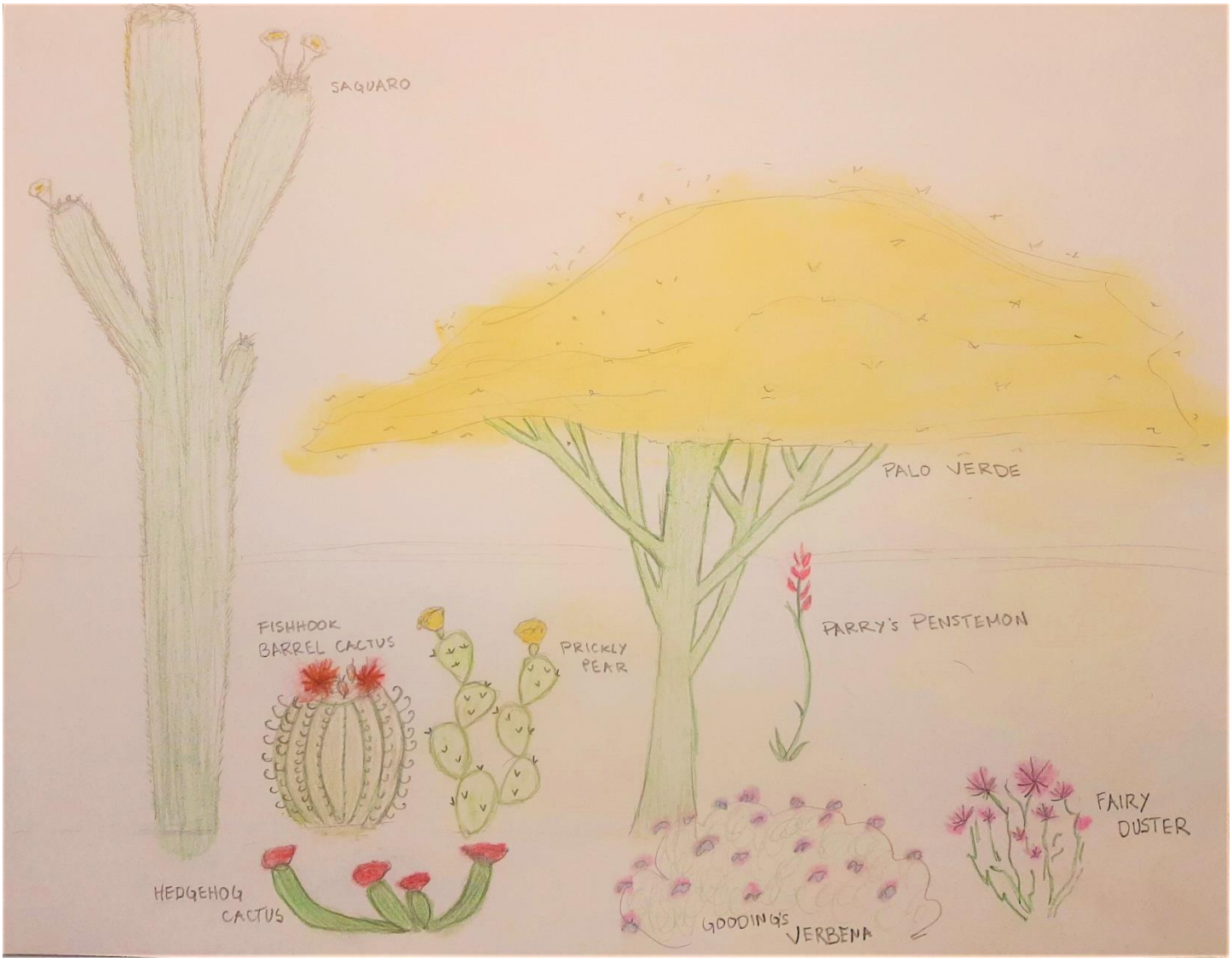
1. **Will it grow in your region without stressing valuable resources?** For example, water is limited in the Sonoran Desert so plants that do not need as much water are preferable.
2. **The kind of pollinators you want to attract**. Do you love butterflies? You will want to choose plants that butterflies like! What characteristics would a plant need in order to attract butterflies?
3. **Timing**. If possible, you want your garden to be working throughout the year, so you will need to provide food (and water) for your pollinators year-round. For example, when does the plant bloom? And do you have a good mix of plants that bloom at different times?
4. **When is your plant active?** Is the plant Deciduous, meaning they shed their leaves seasonally (usually during the summer or winter months)? Or are they an Evergreen which do not shed their leaves.
5. **When is your pollinator active?** Are they active during the day or night? During which seasons are they active? Do they migrate?
6. **Is the plant or pollinator safe for your family or pets?** Is anyone in your family allergic to bees? If so, you might not want to attract bees! Will the plant poison your beloved dog or cat? If so, you might not want to plant it.
7. **Variety!** Choosing plants of different shapes, sizes, and colors is much more exciting. Plus, you will most likely be creating a healthy ecosystem that supports different kinds of life!

We suggest you use the internet to search for photos of the plants listed in the table. We provide a picture of the flower, but you will want to gather more information on the plant such as shape and size. You may also want to check out the pollinator garden we drew for some inspiration.

Photo	Name	Growth Form	Bloom Period	Flower Color	Pollinators
 NPS/PHILIP BROWN	Saguaro	Cactus	Apr-Jun	White	Bats, birds, moths, bees, beetles, flies
 NPS/PHILIP BROWN	Fishhook Barrel Cactus	Cactus	Jul-Sep	Red/Yellow	Bees
 NPS/PHILIP BROWN	Engelmann's Prickly Pear	Cactus	Apr-Jul	Bright yellow	Bees
 NPS/PHILIP BROWN	Hedgehog Cactus	Cactus	Apr-Jun	Bright pink	Insects
 NPS/PHILIP BROWN	Fairy Duster	Shrub	Feb-Apr and Sep-Nov	Light pink	Hummingbirds, bees, flies, butterflies
 NPS/PHILIP BROWN	Ocotillo	Shrub	Feb-Apr	Bright red	Hummingbirds
 NPS/PHILIP BROWN	Globemallow	Shrub	Year-round	Orange	Bees, butterflies

 NPS/PHILIP BROWN	Gooding's Verbena	Shrub	Year-round	**Purple**	Butterflies
 NPS/PHILIP BROWN	Palo Verde	Tree	Apr-May	**Bright yellow**	Beetles, flies, bees
 NPS/PHILIP BROWN	Desert Willow	Tree	Apr-Aug	**Purple/pink**	Hummingbirds
 NPS/PHILIP BROWN	Parry's Penstemon	Perennial Wildflower	Mar-May	**Bright Pink**	Hummingbirds, insects
 NPS/PHILIP BROWN	Scorpion Weed	Annual Wildflower	Feb-May	**Purple**	Bees, butterflies, insects

Here is a picture of our pollinator garden!



Many of us cannot build a pollinator garden at home, that is OK! There are lots of other things you can do to protect pollinators.

1. Maybe you have room for some potted plants? Consider growing native flowers.
2. You can make a home for pollinators out of everyday household items. These homes will provide shelter and a place to rest for your pollinator. You can check out how to make your own bee house here.
3. Support National Parks and other places that preserve and protect wildlife.
4. Share your knowledge!

Draw your pollinator garden below.

Glossary

Annual	A plant that completes its life cycle within one growing season.
Deciduous	A plant that loses its leaves seasonally.
Diurnal	An animal who is active during the day.
Echolocation	The location of objects by reflected sound. An animal will make a sound that bounces off an object and back to the animal, like an echo!
Evergreen	A plant that keeps its leaves throughout the year.
Metamorphose	An animal whose immature form, or body, is different from their adult form. They change their forms through a process known as, "metamorphosis."
Mutualistic Relationships	A relationship between two living things that benefits both.
Nectar	A sugary liquid that attracts animals.
Nocturnal	An animal who is active at night.
Ovary	The part of the plant's flower that produces the ovules that become fruit and seed.
Perennial	A plant that survives more than one growing season.
Petals	The colorful part of a flower that attracts pollinators.
Pollination	A system where pollen is transferred to a stigma, ovary, flower, or plant to allow fertilization.
Pollination Syndrome	The flower's characteristics/adaptations that have evolved to attract pollinators.
Pollinator	Something or someone that moves pollen to a stigma, ovule, flower, or plant to allow fertilization.
Scales	A protective coating on a plant.
Stigma	The part of a plant's flower that collects pollen.
Styles	A long, slender stalk that connects the stigma and ovary.

Additional Resources

Western National Parks Association https://www.wnpa.org/

The Western National Parks Association (WNPA) is a nonprofit education partner of the National Park Service. WNPA supports more than 70 parks across the West, developing products, services, and programs that enrich the visitor experience. If you want to learn more about pollinators, or other fun thing about nature, they have an amazing selection of books and games on their website.

iNaturalist https://www.inaturalist.org/

iNaturalist is an online social network where people can share pictures of plants and animals they find in their environment and help each other identify them.

National Phenology Network https://www.usanpn.org/

The National Phenology Network and their app, Natures Notebook, is a place where people can record and keep track of when flowers bloom.

Xerces Society for Invertebrate Conservation https://www.xerces.org/

Xerces Society is a non-profit organization that works to conserve animals like pollinators that keep ecosystems healthy.

Pollinator Partnership https://www.pollinator.org/

Pollinator Partnership is a non-profit organization that helps keep pollinators healthy.