

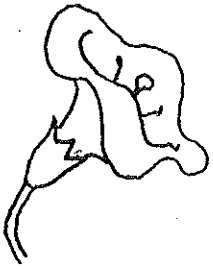


CONTENTS

Basic concepts	1
The story of flowers	2
Vocabulary words	6
Pre-visit activities	7
Post-visit activities	11
Bibliography	15



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Illustrations by Nancy Baron.



Flowers Walk

The San Francisco Botanical Garden in Golden Gate Park contains over seven thousand different kinds of plants from around the world. Throughout the year, flowers are in bloom in different parts of the garden. We look forward to guiding your class as you explore the rich variety of the gardens.

This teacher's guide is designed to help you and your students make the most of your visit. It includes some general background information for you to share with your class before your visit, activities to help prepare for the walk, and a brief bibliography. We strongly encourage you to prepare your class by making use of these materials, especially if you are just beginning your exploration of these concepts.

Basic concepts

The walk is designed to illustrate four key concepts:

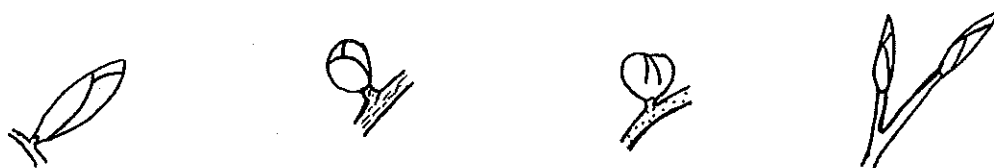
1. For many plants, a flower is an important part of the life cycle.
2. A bud can turn into a flower, and a flower can turn into a fruit with a seed inside.
3. A flower can turn into a fruit if it gets pollen from another flower like it.
4. Some flowers get help from animals to move their pollen around. They attract animal helpers with colors, smells, shapes and rewards, like nectar.

The Story of Flowers

Flowers are a beautiful part of nature, filling the world with all kinds of colors, shapes, and scents. Why are so many flowers colorful, and why do some of them smell so good? Plants don't make their flowers for us – they have a much more important reason for making flowers.

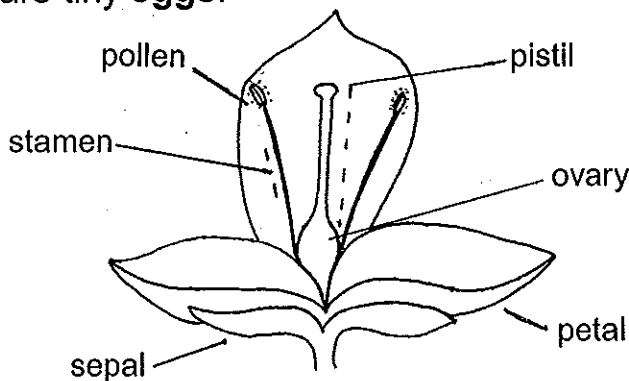
A flower's life

When a flower first starts growing, it is curled up tight in a small **bud** growing on the plant. Sometimes the bud is round like a tiny basketball, sometimes pointy like a tiny football, but whatever shape it has, the flower is tucked safe inside the **sepals** which protect it.



As the bud gets older, the sepals open up and the **petals** of the flower spread out. A lot of flowers look pretty when they have their petals spread out, and sometimes they have a nice smell too. Sometimes people pick flowers because they like the way they look and smell. We like to decorate our homes with flowers, but the flowers we pick won't be able to do their job for the plant they grew on. They won't be able to make seeds.

In the middle of the flower is where the **male** and **female** parts grow. The male parts are called **stamens**, and they make a dusty powder called **pollen**. The stamens grow around the female part, which is in the very middle of the flower and is called the **pistil**. The bottom of the pistil is the ovary, and inside are tiny **eggs**.



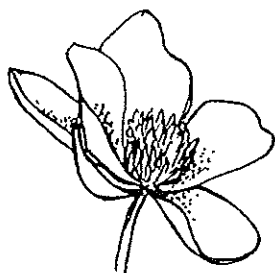
The eggs that are inside the female part can turn into seeds if they get some pollen from the male parts of a different flower. Since the pollen has to come from a different flower, a flower needs some help! Somehow the powdery pollen has to travel from the stamens of one flower all the way to the pistil of another flower.

Some flowers make very light pollen that can blow in the wind. That way the pollen can blow from one flower to another and help make new seeds. This kind of pollen makes some people sneeze when it blows in the air! But many flowers have heavy or sticky pollen which doesn't blow around very well. These flowers need help from animals to move the pollen from one flower to another.

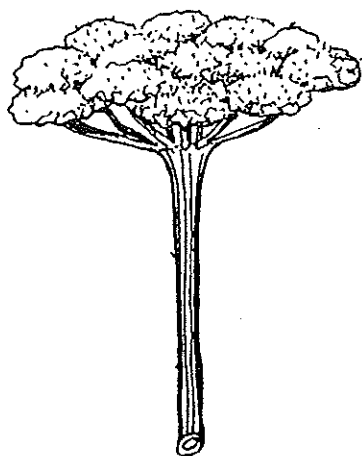
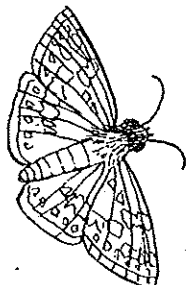
But why would an animal want to help move pollen for a flower? Flowers that need help from animals usually have a reward for their animal helper. Many flowers make nectar, a sweet juice that animals like bees, butterflies, and hummingbirds drink. While the animals are getting the nectar, some pollen from a flower may stick to their bodies. Then when they fly to another flower to get more nectar, some of the pollen may brush off on the next flower. These animals that help flowers are called "pollinators."

Many flowers that need animal partners advertise to the animals that they need. For example, the bright colors of many flowers attract different kinds of animals. Bees especially like yellow, white and blue flowers, but hummingbirds like red flowers better. Some flowers that smell sweet to us attract bees and moths, while some flowers that smell bad to us can attract flies. Flowers that attract only hummingbirds don't bother to make a smell, because hummingbirds can't smell!

Once a pollinator has visited a flower and brought some pollen to the pistil, the flower begins to change. Inside the pistil, the pollen meets the eggs, and the eggs start to turn into seeds. The bottom of the pistil gets bigger, helping to protect the seeds growing inside. The petals fall off, since they have finished their job of attracting a pollinator. But the flower isn't dead, it is just changing. The flower is changing into a fruit with seeds inside it!



Have you ever seen any of these animals visiting flowers?



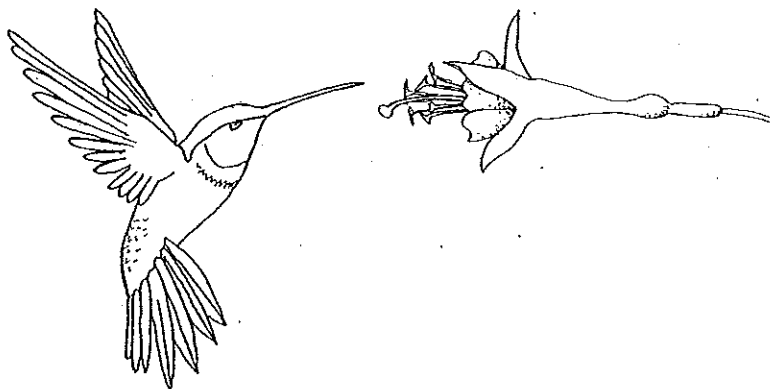
Butterflies – When butterflies are still caterpillars, they eat the leaves of plants and may injure them. But when butterflies grow up, they help plants by moving pollen. Butterflies like sweet nectar, and will roll their long tongues far down into a flower to get it. Sweet smelling flowers attract butterflies, and they like big clusters of small flowers on which they can rest.

Bees – Bees are important pollinators who visit many kinds of flowers as they search for nectar to make honey and pollen to feed their babies. When they visit a flower, pollen sticks to their furry bodies. Bees see yellow, blue and white flowers best, and like flowers with wide petals and sweet scents.

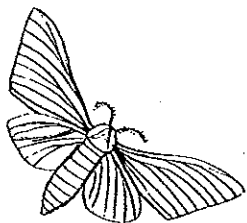


Some flowers have **nectar guides**, patterns that lead bees toward the nectar in the center of the flower.

Hummingbirds – Hummingbirds drink flower nectar, which they suck out of trumpet shaped flowers with their long beaks. They don't have a good sense of smell, so they use their eyes to find flowers. They are especially attracted to red flowers with lots of nectar.



Moths – Moths are relatives of butterflies, but they are out mostly at night. It is hard to see much then, so they are attracted to light colored flowers that bloom at night and that have heavy sweet smells.



Flies – Flies are usually attracted to dead animals. Flowers that want to attract flies often smell very bad, and are often not brightly colored.



Beetles – Beetles often like to eat the flowers they visit, so flowers pollinated by beetles sometimes have thick petals. The petals are strong enough to hold the heavy beetles and to give them something to eat without destroying the rest of the flower.



Vocabulary

We will use these words during your visit to the gardens. You may wish to share these definitions with your students, or have them use their dictionaries to find other definitions.

botanical garden – a place where different kinds of plants are grown to be studied and enjoyed

bud – a baby flower or leaf wrapped up tight, waiting for the right time to grow

flower – the part of a plant that can make a seed

fruit – the part of a plant that holds and protects the seeds

nectar – a sweet liquid made at the base of many flower petals

ovary – the part of the flower where seeds are formed

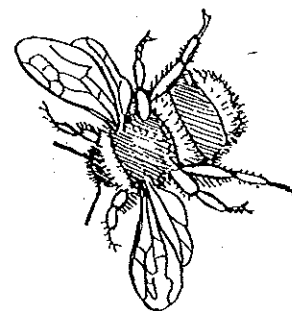
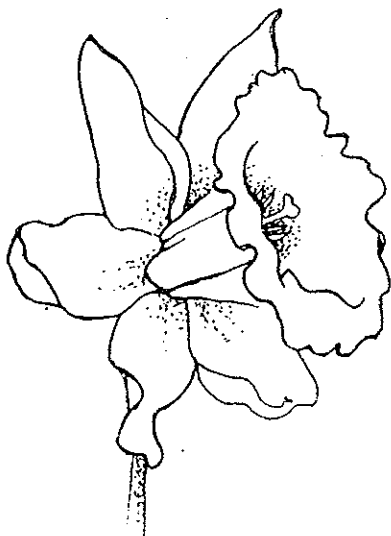
pollen – a dust made by a flower which helps make seeds

pistil – the female part of a flower

pollinator – something that moves pollen from one flower to another

seed – a tiny plant and its food source, tucked in a seed coat, waiting for good growing conditions

stamen – the male part of the flower that makes pollen



Pre-visit activities

Becoming a nature detective

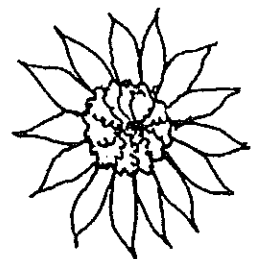
A visit to the San Francisco Botanical Garden is a chance for students to become nature detectives, exploring and discovering the wonders of the natural world around them. Help your students get ready to make the most of their trip with the following activity.

Introduce the concept of a "nature detective" to your students – a nature detective is someone who explores the natural world by observing closely, thinking about what they observe, and coming up with ideas about what they discover. Every one of us can be a nature detective – we all have special tools that can help us investigate the natural world.

Divide children into small groups. Ask them to think about what tools we have *in or on our bodies* that we can use to explore the world around us. Each group can make of a list of the tools they think of, or can draw pictures illustrating their ideas. Have each group share their results with the class, and compile their ideas in a large list or drawing.

Here are some suggestions – you and your class may think of others!

eyes - counters, cameras
noses – scent detectors
fingers – tweezers, feelers
hands- rulers, cups
hair – wind detector
memories – notebooks and pencils
ears – tape recorders
feet – transportation
skin – thermometer



Flowers Word Scramble

Use this word scramble to familiarize your students with some of the terms they will hear on their walk. Student version is on the reverse.

nopell pollen

tapel petal

worfle flower

dese seed

utfir fruit

ebe bee

tarneec nectar

stilpi pistil



Flowers Word Scramble

Can you unscramble these mixed up words?

nopell

tapel

worfle

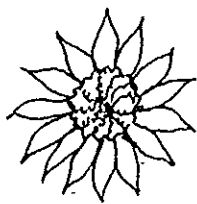
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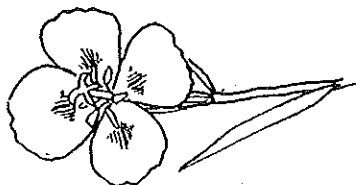
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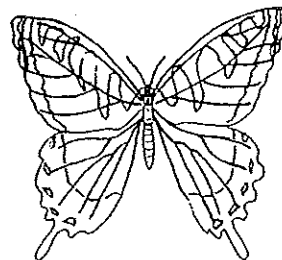


FLOWERS AND POLLINATORS

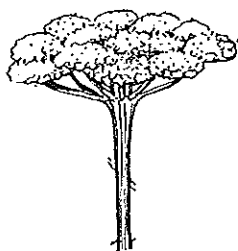
Draw lines to match each flower with a pollinator - then color the pictures!



The pink clarkia has dark lines pointing toward the nectar in the flower.



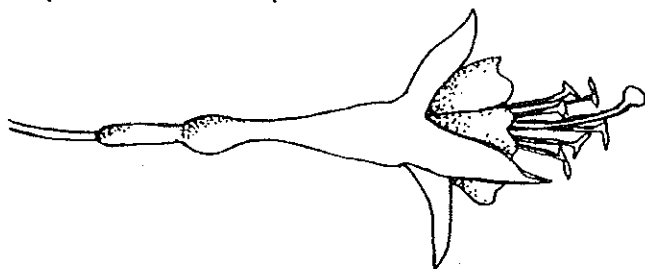
A butterfly likes to rest while it drinks nectar from nearby flowers.



This cluster of white cow parsnip flowers makes a good landing platform for a pollinator.



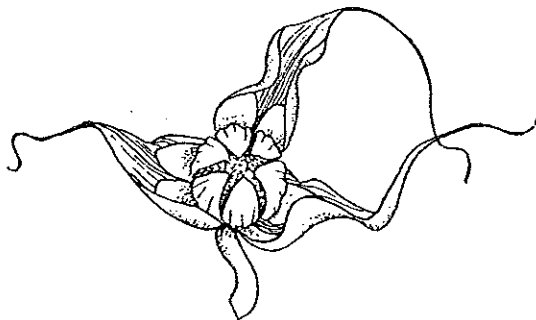
A fly often likes flowers that smell bad to us, and that are reddish, like decaying meat!



This red fuchsia has nectar at the end of a long, narrow tube.



A bee likes light colored flowers that smell sweet and that have a pattern that leads them to the nectar in the middle of the flower.



The wild ginger flower is reddish brown and doesn't smell good to most people.



A hummingbird looks for bright red flowers that it can stick its beak into to drink nectar.

Post-visit Activities



Dissect a Flower

The best way to understand how flowers are put together is to take some apart! For this activity, you will need to collect a number of simple flowers for your students to take apart. While all flowers have the same basic parts, they can be hard to recognize in some more complex flowers. Stick with the flowers suggested below for success with this activity.

Have your students work with partners or in small teams. Each team will need at least one flower to work on. Good flowers include:

Tulips, fuchsias, gladiolus, azaleas

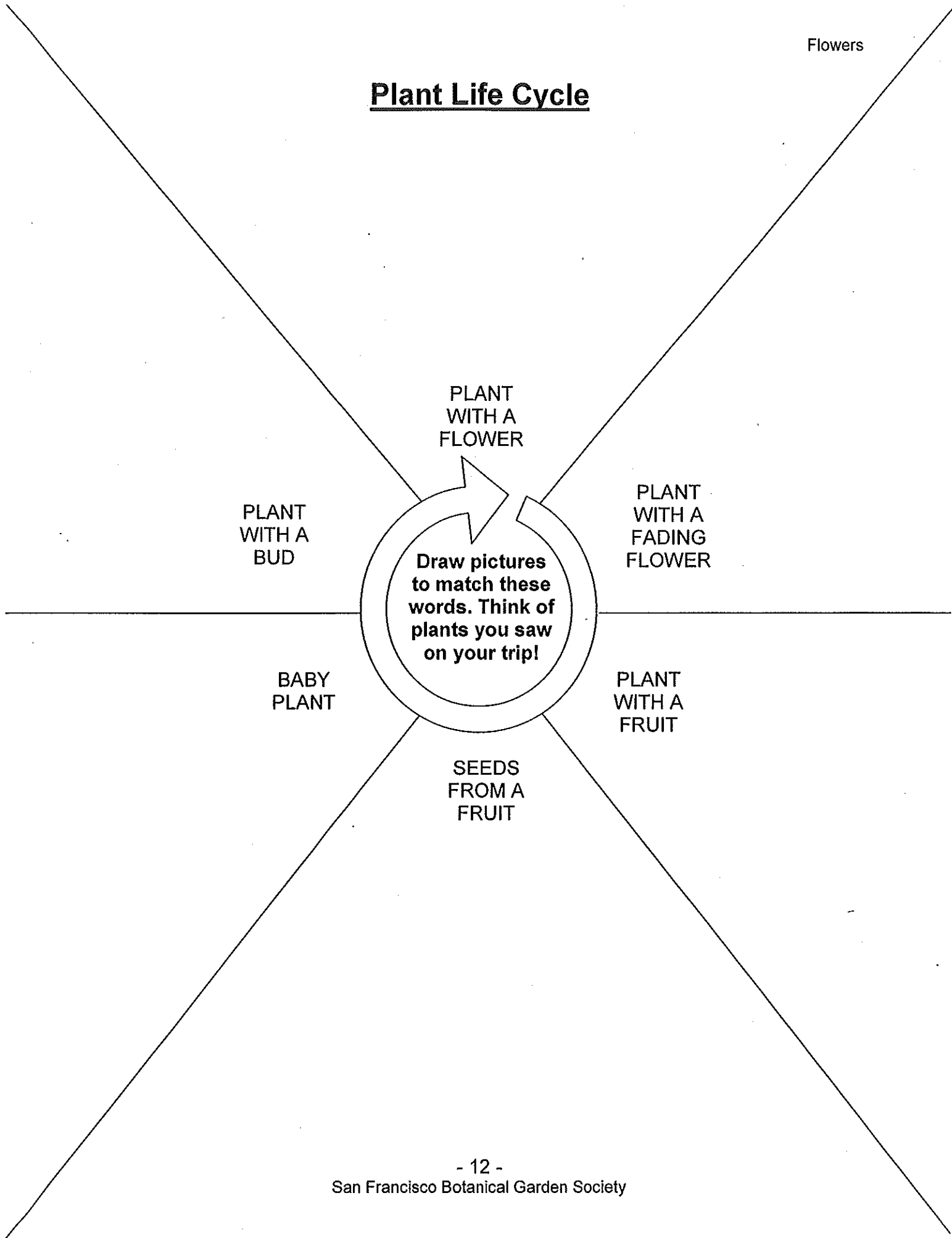
Each group will also need a white sheet of paper to put the flower on, paper for sketching, pencils, a couple of toothpicks, and if available tweezers and magnifying glasses.

Tell your students that they will be taking apart flowers and recording what they see. Pass out the flowers, and ask them to sketch what they see. Once they have finished their sketching, they can begin taking apart the flower. Suggest that they start by taking the flower apart in layers, working from the outside in. They should group like parts together, and keep track of how many of each part they discover. As they take the flower apart, they should sketch the different pieces. They can use toothpicks and tweezers to take the flowers apart, and magnifying glasses to observe.

If they don't do so on their own, ask the students to try to open the ovary (the center part of the flower) to see what is inside. You may wish to use a knife to cut the ovary open for them.

After students have finished, review the names of the different parts with them. If you have a second, different kind of flower available, have them take it apart and group the parts with the parts of the first flower. If you have trouble recognizing the parts of some of your flowers, send your drawings and questions to us here at the Garden – we'd be glad to help!

Plant Life Cycle



Flower Models

In this activity, children will create their own model flowers and then pretend to pollinate the different flowers. This will strengthen their understanding of the basic flower parts while providing an opportunity to show off their creations!

To create your flowers you will need:



- Some simple flowers to look at
- Craft materials to make into flowers (cotton swabs, tooth picks, yarn, construction paper, popsicle sticks, small paper cups, etc.)
- Scissors, tape, glue
- Cornstarch or different colors of powdered tempera for pollen

To create pollinators you will need:

- Black and white (or other dark and light) pipe cleaners, called chenille at craft stores

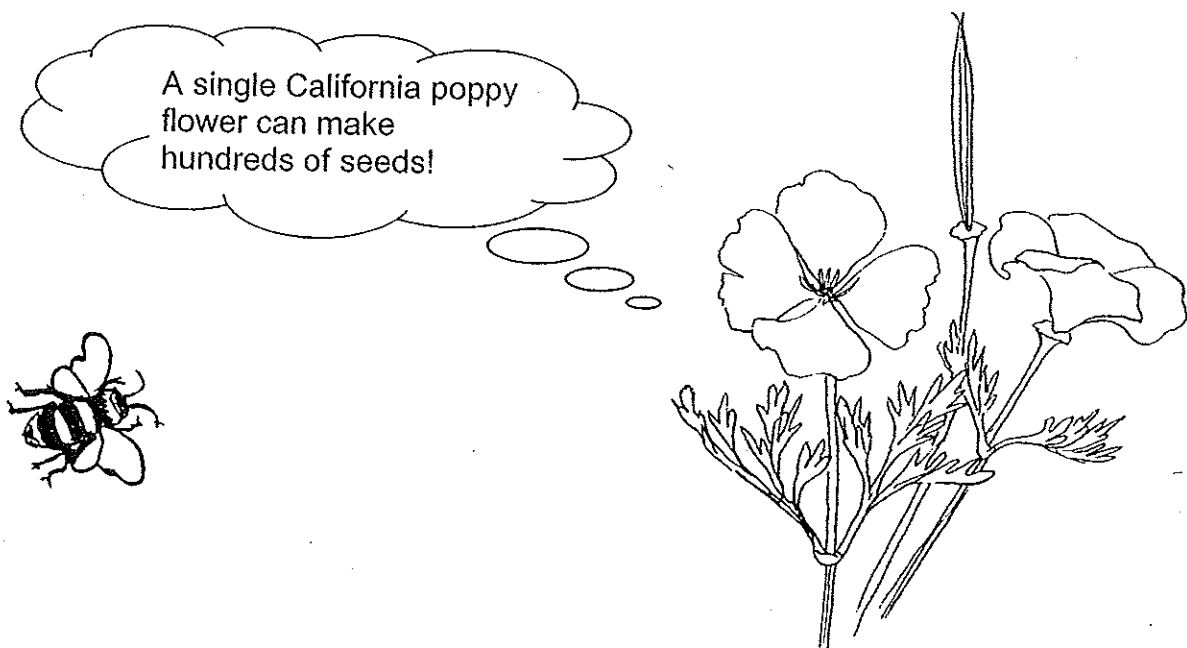
Review with your students what they learned about flowers and flower parts on their visit to the garden. Explain that they will get to create their own flowers, which need to have the same parts as real flowers. They can observe the flowers you have in the classroom to help them design their flowers. If you wish, have students work in small teams to design and create their flowers.

Ask students to design flowers with one of two basic shapes – wide and flat, or narrow and tubular. Then let them select from the craft materials to create their flowers. As the students work, circulate to be sure that they are finding ways to represent the different flower parts. As students finish their flowers, carefully dip the stamens of each model into “pollen” (cornstarch or powdered tempera) or brush the pollen on with a small paintbrush. Then set up the flowers throughout the room.

Distribute one light and one dark pipe cleaner to each student (or team). Have them fold them to connect them together so that the dark pipe cleaner forms a short lump on a stalk formed by the light pipe cleaner. The dark end of this tool represents a bee, while the long light colored one represents the tongue of a butterfly or hummingbird. Once the students

have created their pollinators, have them buzz around the room and choose a flower that attracts them. Have the "bee" land on the flower and pretend to eat some nectar and pollen. Be sure students remember where to look for nectar – at the base of the petals. What happens when the bee visits the flower? Now have the bee fly on to another flower to visit. What happens to the pollen that got onto the bee?

Now have students move their attention to the other end of their pipe cleaner tool. How is it like a hummingbird or butterfly tongue? Have them fly around the room again looking for flowers to visit where they can find nectar to drink. What happens? Do some flower shapes work better for the long-tongued pollinators? Why?



Bibliography and Resources

If these books are not available in your library, you can find them at the Helen Crocker Russell Library at the San Francisco Botanical Garden. This list is still under development – please pass on any suggestions you may have!

Roses Red, Violets Blue: why flowers have color. Sylvia Johnson. Minneapolis: Lerner Publications, Co., 1991.

For older students, describes the messages which flowers send to potential pollinators. Many excellent photos.

The Reason for a Flower. Heller, Ruth. New York: Grosset and Dunlap, 1983.

For younger students, rhyming text with colorful illustrations.

The Life Cycle of a Sunflower. Philip Parker. England: Wayland Publishers Ltd., 1988.

Clear illustrations and text appropriate for all ages.



Flowers. Moira Butterfield. New York: Simon and Schuster, 1992.

For younger students, simple clear text and attractive illustrations describe the plant life cycle.

Wacky Plant Cycles. Valerie Wyatt. New York: MONDO Publishing, 2000.

Illustrations, photographs and activities enhance this entertaining and informative book.

From Flower to Fruit. Anne Ophelia Dowden. New York: T.Y. Crowell, 1984.

Extensive, clear, detailed illustrations accompany text appropriate for older students or teacher.