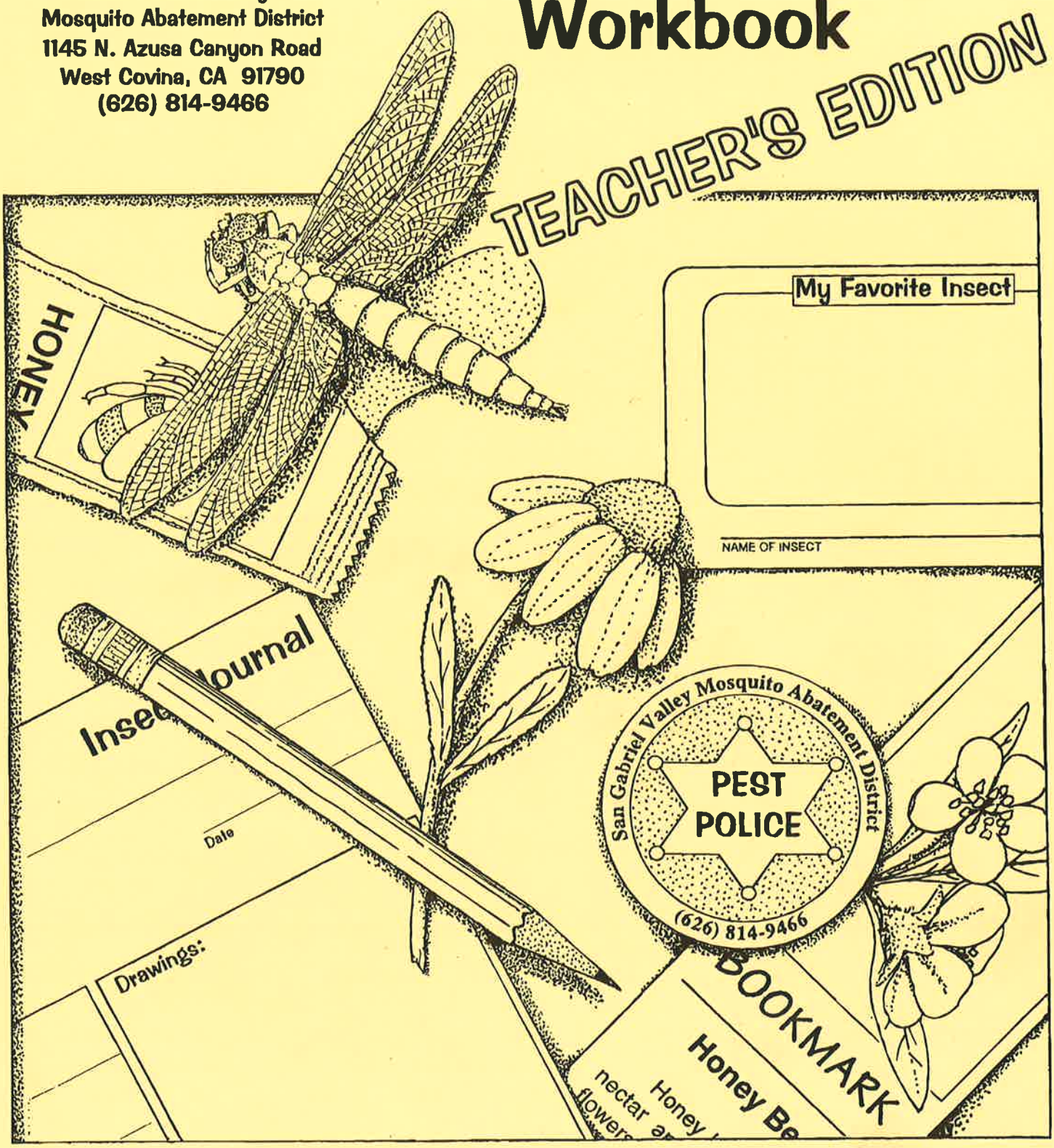
San Gabriel Valley
Mosquito Abatement
District

INSECT PROGRAM

Student Workbook

TEACHER'S EDITION

San Gabriel Valley
Mosquito Abatement District
1145 N. Azusa Canyon Road
West Covina, CA 91790
(626) 814-9466



Student's name

School name

Teacher's name

A NOTE TO TEACHERS:
This guide will provide the answers to the activities in the Student Workbook along with additional information and ideas for an expanded life science program on insects. Although the Student Workbook is written for 4th grade students, you may find information that is appropriate for other grades as well. For this reason, you are welcome to photocopy pages of either the Student Workbook or Teacher's Guide to share with other teachers and educators. We hope that you and your students find the Insect Program useful and fun. If you have any comments or questions, you can reach us at the address and phone number on the back of the Workbook.

TEACHER'S EDITION

INSECT PROGRAM

Student Workbook

San Gabriel Valley Mosquito Abatement District

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People who study different animals or plants have different titles. What do these people study?
Botanists (plants)
Zoologists (animals)
Mammologists (mammals)
Herpetologists (reptiles)
Icthyologists (fish)
Ornithologists (birds)

What do your students want to study when they grow up? Will they have a special title? Invite people with different job titles to your classroom to tell the students about their work.

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INSECTS

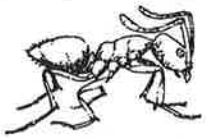
They were on the Earth before the dinosaurs. They come in different shapes, sizes, and colors. They creep, crawl, fly, swim, bite, sting, and suck. There are more of them than of all the other animals on the Earth, combined. They are *the insects.*

Insects have been on the earth over 350 million years. The first types of insects included cockroaches, dragonflies, and ants. And if you had to estimate how many different kinds of insects are known about so far, what would you guess? The answer is *over one million*!

Insects are all around us. It's pretty easy to find a trail of ants walking along the edge of a sidewalk or see a ladybug on a plant in the garden. Perhaps you've watched butterflies or bees visiting flowers in the springtime or shooed at a fly that tried to land on your lunch at a picnic.

Learning about insects can be the start of a great adventure. Did you know that there is a tiny wasp only1/90 inch (0.3 mm) long? Or that there is an insect called a walking stick that is about 1 foot (30.5 cm) long? People who like insects and study them as part of their job are called *entomologists*. Maybe you'll be an entomologist some day. Meanwhile, have fun exploring the amazing world of the insects around you.

In order to make learning about these incredible and sometimes bizarre animals as fun as possible, you need to know the basics. First, you need to know what makes an insect an insect:



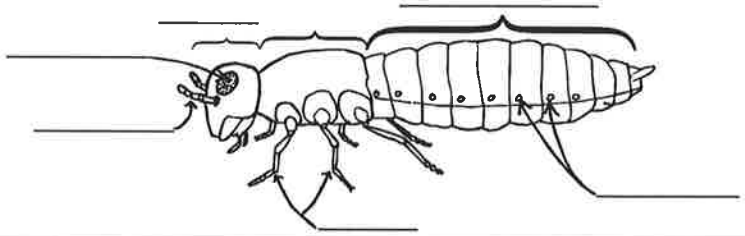
All adult insects have some things in common:

- They all have 6 **legs.**
- They all have three body parts: the **head**, the **thorax** where the wings and legs are attached, and the **abdomen.**
- They all have two **compound eyes.**
- They all breathe from openings on the side of the abdomen called **spiracles.**
- They all have two **antennae.**

Draw an imaginary creature. Label its body parts and write what those parts are used for.

Activity

Label the parts of the insect's body. Use the words written in bold above.

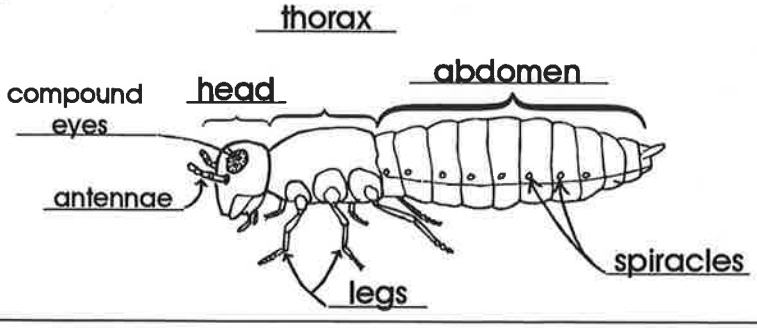


Draw a picture of another kind of animal, like a bird or a fish. Label its parts.

Answer to labels on insect.

Activity

Label the parts of the insect's body. Use the words written in bold above.



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Visit "insect zoos" or other places where live and pinned insects are on display. Arrange for school visits from organizations that bring live insects and other animals.
Possible information source:
Los Angeles County Museum of Natural History, "Insect Zoo," (213) 763-3558.

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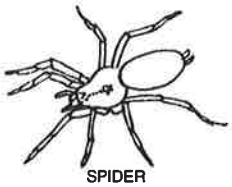
ARTHROPODS - Insects and Their Relatives

Arthropods is the name given to a large group of animals more accurately called ***ARTHROPODA*** which means *jointed* ("arthro") *foot* or *leg* ("poda"). All the animals in this group have legs which are jointed like those of a lobster or a grasshopper.

Arthropods also have other things in common such as an **exoskeleton**, a hard shell-like covering or skeleton on the outside ("exo" means *outside).*


SPIDER

All insects are arthropods, but not all arthropods are insects. How do you think they are different? Two of the easiest ways to figure out if you are looking at an insect or some other kind of arthropod is to count the legs and the body parts. Look at the drawing of the spider ↗. Count the number of legs on the spider. **Insects have 6 legs**, but spiders have 8 legs. Count the number of body parts. **Insects have 3 body parts**, but spiders have only 2. So, the spider is *not* an insect. However, both insects and spiders have jointed feet or legs and both insects and spiders have exoskeletons, so they are *both arthropods*.

Arthropods live in all types of places. Crabs and lobsters live in the ocean. Pill bugs live in loose leaves and dirt. Mosquitoes and dragonflies live part of their life in water and part of their life in the air. Insects and their relatives, the Arthropods, make up over 80% of all the known animals on the earth. Look around your school and neighborhood for arthropods that live near you.

Activity

What Looks Like an Insect, but is Not?

Write the **name** of the animal under the word **INSECT** or the words **OTHER TYPE OF ARTHROPOD**, according to where it belongs.


Spider


Centipede

INSECT


House Fly


Crab


Lady Bug


Pill Bug


Scorpion


Cockroach


Cricket


Mosquito


Ant


Honey Bee

OTHER TYPE OF ARTHROPOD

How many more animals can the students list under the headings "INSECT" and "OTHER TYPE OF ARTHROPOD"? You can make other lists for Reptiles, Amphibians, Birds, Mammals, Fish, etc.

Answers to Matching Game:

INSECT	OTHER ARTHROPOD
House Fly	Spider
Lady Bug	Centipede
Cockroach	Crab
Cricket	Pill Bug
Mosquito	Scorpion
Ant	Lobster
Honey Bee	

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An Important BIG Word to Know:

CLASSIFICATION

Classification -

WHERE DO INSECTS BELONG?

All animals living on the Earth have some things in common with each other. For example, you and a mosquito are both *animals*, but it is obvious that not everything about you is the same as a mosquito, or you would **be** a mosquito. Scientists group animals and plants by the things about them that *are the same*. This type of ***grouping*** of animals and plants is called ***Classification***.

The lists to the right show how people (like you) and a mosquito are classified.

	People	Mosquito
KINGDOM	Animalia (All animals)	Animalia (All animals)
PHYLUM	Vertebrata (All animals with a backbone or spine)	Arthropoda (All arthropods)
CLASS	Mammalia (All mammals)	Insecta (All insects)
ORDER	Primates (Humans, monkeys, and gorillas)	Diptera (All true flies)
FAMILY	Hominidae (Ancient-modern man)	Culicidae (All mosquitoes)
GENUS	Homo (Primitive-modern man)	Culex
SPECIES	sapiens (Modern man)	tarsalis (Western encephalitis mosquito)

Activity

How do you Classify Yourself?

1. Pick a partner. It can be the person sitting next to you in class or your best friend or teacher or whomever.
2. Compare yourself and the other person. (You must only consider things that you can easily see or measure). For example: Are you both boys or girls? Do you have the same color hair? Does one or the other of you wear glasses? Are you both wearing tennis shoes? Are you the same height or is one of you taller? How tall are you and the other person? Do you both have t-shirts on or does one of you have a button shirt? What other things are the same or different?
3. Make two lists: one with the things about you that are the same and one with the things about you that are different.
4. Do the same thing with a group of three people. Then four. Compare your whole classroom if you have time.

You will find that in some ways everyone is the same; for example, you may all have a head, two arms, and two legs. But there will be other things about you that will be unique. Maybe only one of you has red hair and is wearing glasses, earrings, and tennis shoes with green shoelaces. That is what **Classification** is all about.

Carolus Linnaeus, a botanist from Sweden, is the "Father" of the modern system of classification for all plants and animals. He lived from 1707-1778. Even though Linnaeus was Swedish, he wrote the names of the plants and animals in Latin, the language used by the educated people of the time. The use of Latin for many of the scientific names of plants and animals continues today. Find Sweden on a map. Do any of the students have relatives in Sweden?

Find out about other scientists who have made significant contributions to the way modern science is done. Look up Gregor Mendel, for example. He was an Austrian botanist who lived from 1833-1884 and is the "Father" of genetics.

Try to classify or group non-living things in the classroom such as things made out of wood or made out of plastic or...?

Have students classify themselves along with their pet dog, cat, fish, bird, or snake.

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Write a story about an alien life form you recently discovered on Earth that goes through complete metamorphosis. Draw pictures of it in its different stages.

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Another One of the BIG Words to Know:
METAMORPHOSIS

HOW DO INSECTS DEVELOP?

Insects hatch from eggs and most then begin to change form as they develop into adults. This changing of their form is called *metamorphosis* ("meta" is the Greek word for *change* and "morpho" is the Greek word for *form* or *shape*).

Insect metamorphosis occurs in one of two different ways depending upon the kind of insect:

INCOMPLETE or SIMPLE METAMORPHOSIS - Some insects hatch out of an **egg** looking a lot like the adult except for their smaller size. If they have wings as adults, there may be wing buds (undeveloped wings) in the pre-adult or **immature** stages. These insects will look more and more like adults as they grow until they have developed into their **adult** form.

COMPLETE METAMORPHOSIS - Other insects hatch out of an egg and then go through stages of growth that are *completely unlike* their adult form. First, they develop from **egg** to **larva** (often looking a bit like a worm and eating constantly). Then, they will turn into a **pupa** during which the amazing change into their adult form takes place (they do not eat in this stage). Finally, the **adult** insect comes out.

Incomplete or Simple Metamorphosis
Cockroach
Grasshopper
Giant Water Bug

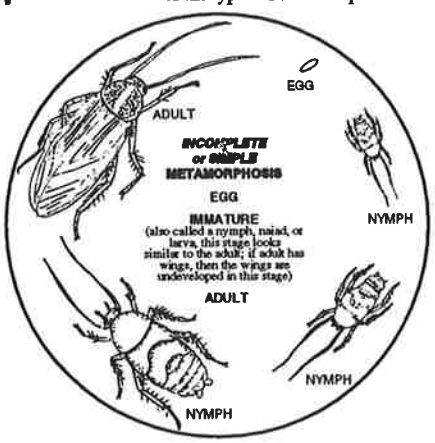
Complete Metamorphosis
Butterfly
Honey Bee
Ladybug
Mosquito

What are some other examples of insects that go through a type of metamorphosis?

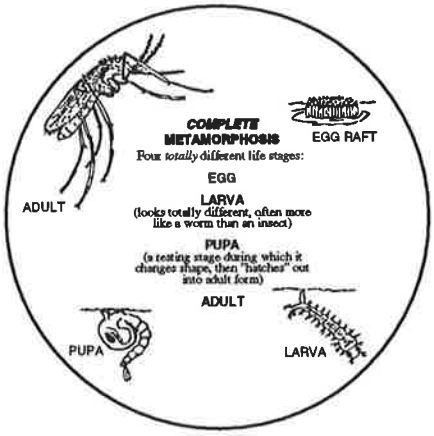
NOTE: There are cases where certain types of insects experience **no metamorphosis** of any kind. Silverfish, for example, *do not change shape* at all. Once they have hatched out of their egg, all they do is grow bigger in size.

Activity

Draw arrows in a CLOCKWISE direction showing the development of the insects in each of the types of Metamorphosis shown below.



Cockroach



Mosquito

Find a book or illustration of the life cycle of a butterfly or moth with the stages of complete metamorphosis. The students can make a drawing, including the labels "egg, larva (caterpillar), pupa (chrysalis or cocoon), and adult. "

Teacher's Edition

There are problems inherent to living in an aquatic environment, such as getting oxygen and escaping the warm summer water temperatures. Some animals have gills to absorb oxygen found in the water, other animals come to the surface to breathe. To escape the heat of the summer sun, some animals stay in the cooler areas under water vegetation and others stay near the deeper areas where the water is cooler. What other ways do animals of different habitats cope with the hardships inherent to their environment?

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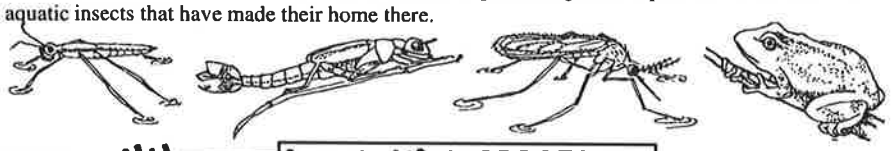
Aquatic Life

Insects can be found all over the world and in many different kinds of places. They are divided into two groups: those that live on land are called **terrestrial insects**, and those that live in the water are called **aquatic insects**. (Note: "terra" means *earth* and "terrestris" means *of the earth*; "aqua" means *water*).

An animal's habitat is the environment around it that provides the special things it needs to survive. For aquatic insects, their habitat might be a creek or a river; a lake, pond, or marsh; it might even be a tree hole filled with water or water caught in the leaves of some plants. Different insects live in all of these places. Most of them don't spend their entire lives in water. For example, mosquitoes and dragonflies live the first part of their lives in water and then, as adults with wings, they spend the rest of their lives out of the water flying in the air or resting on plants.

Some aquatic insects must live in running water like a stream or river because they need the flowing water to bring them food particles that they could not get otherwise. Other insects that are able to swim around to find their own food can live in the still water of a pond or lake.

The next time you are hiking near a stream or picnicking near a pond or lake, look for the aquatic insects that have made their home there.



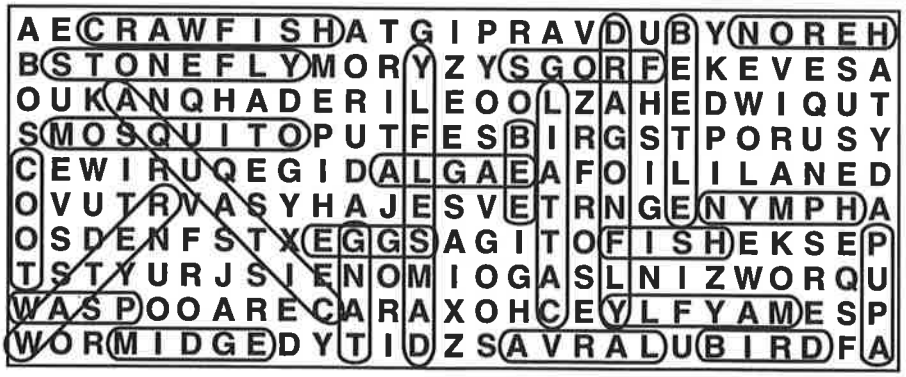
What are some other plants or animals that live part or all of their lives in water?

Activity — Aquatic Life WORDSEARCH

Find the words written at the bottom of the page. Look forwards and backwards, horizontally, vertically, and diagonally. (Note: some letters are used in more than one word.)

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

ALGAE, AQUATIC, BEE, BEETLE, BIRD, CATTAIL, COOT, CRAWFISH, DAMSELFLY, DRAGONFLY, EGGS, FISH, FROGS, GNAT, HERON, LARVA, MAYFLY, MIDGE, MOSQUITO, NYMPH, PUPA, STONEFLY, WASP, WATER.



Answers to Aquatic Life WORDSEARCH.

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The aquatic habitat is just one of many different kinds of animal and plant habitats. Have students draw pictures of the plants and animals of other habitats such as the seashore, backyard garden, or mountain forest.

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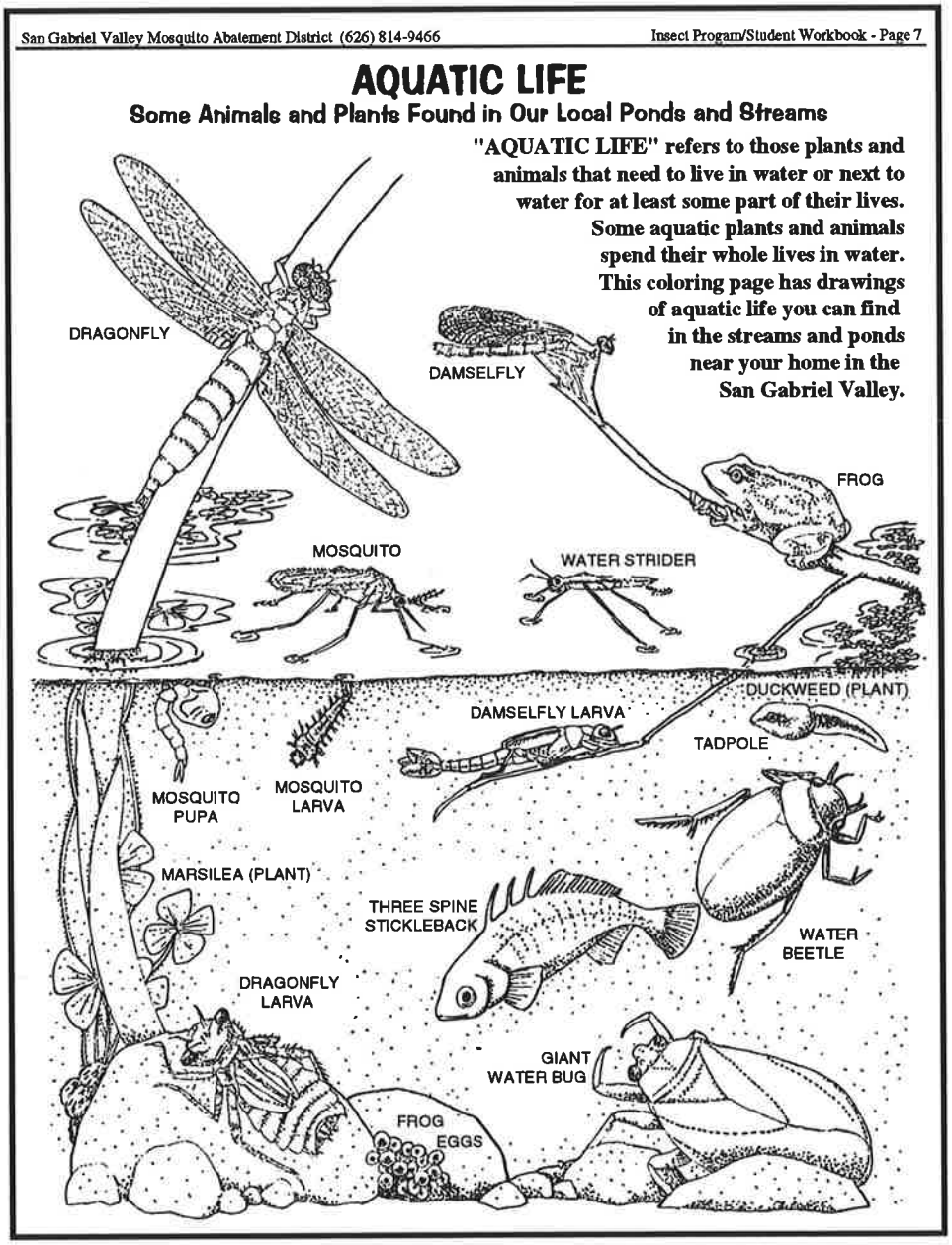
AQUATIC LIFE

Some Animals and Plants Found in Our Local Ponds and Streams

"AQUATIC LIFE" refers to those plants and animals that need to live in water or next to water for at least some part of their lives. Some aquatic plants and animals spend their whole lives in water. This coloring page has drawings of aquatic life you can find in the streams and ponds near your home in the San Gabriel Valley.



Start an indoor water garden in your classroom. Visit a plant nursery and buy some aquatic plants. Put water in an aquarium or other large glass container. Add animals such as water snails. Place near light but not in direct sunlight or the heat may kill the plants and animals.

Many aquatic insects have different forms in their immature stages - they go through a complete or incomplete metamorphosis (pg. 5 of this workbook). Even the frog has different forms: egg, tadpole, and adult. This coloring page has drawings of some of the life stages of the mosquito, dragonfly, damselfly, and frog. What other animals go through different forms as they mature? Use your classroom and library books to help with the answer. A group of 2-4 students could make an oral classroom presentation with drawings showing the different stages or forms of the animal they chose.

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MOSQUITOES

The mosquito is an insect whose name means "little fly." There are over 3,500 different kinds of mosquitoes found all over the world (except on the continent of Antarctica and parts of Greenland where there are no mosquitoes). The San Gabriel Valley (where we live) has about 11 different kinds.

Our most common mosquito is called the Southern House Mosquito. The adult female mosquito will lay a bunch of eggs that are glued together and float on the water like a raft. (There're really tiny and very hard to see at this stage.) These hatch into larvae in a couple of days and grow and grow in the water for about one week until they're about 1/4 inch (7mm) long. Then they develop into pupae that look like fat commas ("❩") floating under the surface. After about two more days, the adult mosquito comes out and flies away.

Both male and female mosquitoes look for some high energy food as soon as they've begun to fly. This is usually nectar from plants that they suck up throught their straw-like mouths. But the female needs more than energy - she needs protein for developing eggs. She needs blood. And guess where she gets it? From people...and birds, and some other animals.

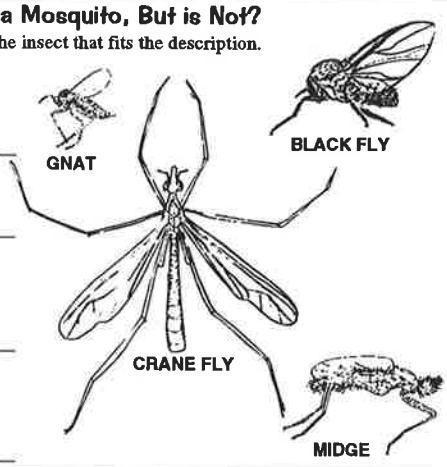
She needs to land and feed quickly before the bite starts to hurt or we would probably squish her to death. So the female mosquito uses stuff in her saliva to help her tiny mouth parts find and suck up the blood. Just about the time the bite starts to hurt a little bit, she's finished and ready to fly away. Your body doen't like this strange saliva the moquito left behind and responds by making a reddish bump that itches.

Activity

What Looks Like a Mosquito, But is Not?

Write in the name of the insect that fits the description.

1. What looks like a HUGE mosquito, but actually does not have mouthparts that can bite people? _____
2. What is a very small, dark-colored fly, that bites people and other animals and leaves an itchy bump behind? _____
3. What looks just like a mosquito, but has no biting mouthparts and will sometimes be in such great numbers that they look like a small gray cloud? _____
4. What are tiny flies that will fly around your face and sometimes get stuck on wet surfaces like the edge of your cereal bowl or wet paint? _____



Find Antarctica and Greenland on a map. What reason might there be for the absence of mosquitoes in these two places?

←

←

These animals look similar because they are all types of flies - members of the order Diptera. But some animals look like other animals or objects because it makes hiding and/or escaping easier or helps the animal sneak up on prey. This is called *mimicry*. What are some examples of mimicry by animals?

Plants will also use mimicry...some are pollinated by flies and will emit an odor of rotten flesh to attrack the flies.

↑

Answers to Activity.

1. What looks like a HUGE mosquito, but actually does not have mouthparts that can bite people? CRANE FLY
2. What is a very small, dark-colored fly, that bites people and other animals and leaves an itchy bump behind? BLACK FLY
3. What looks just like a mosquito, but has no biting mouthparts and will sometimes be in such great numbers that they look like a small gray cloud? MIDGE
4. What are tiny flies that will fly around your face and sometimes get stuck on wet surfaces like the edge of your cereal bowl or still-wet paint? GNAT

Teacher's Edition

What can the mouthparts of different animals tell you about the food they eat? Look at the teeth of people. We have some teeth for tearing, some for cutting, and some for chewing. What about bird beaks or the mouths of snakes?

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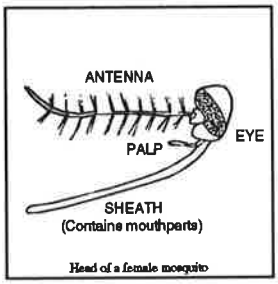
MOSQUITO BODY PARTS

The Mouthparts

When you think of the last time you were around a mosquito, what do you remember? Most people probably remember being bitten (or being afraid they *would be* bitten). Since the female mosquito needs blood to develop her eggs, it's important that she has mouthparts that are good at piercing (like a needle) and sucking up blood.

The mouth of the female mosquito has 4 parts:

1. Cutters to cut through the skin.
2. A straw-like tube used to spit saliva into the cut. (The saliva helps prevent the blood from drying up before the mosquito can drink it.)
3. Another straw-like tube used to suck up the blood.
4. A type of covering or "sheath" that protects the other mouthparts when they are not in use.



Head of a female mosquito

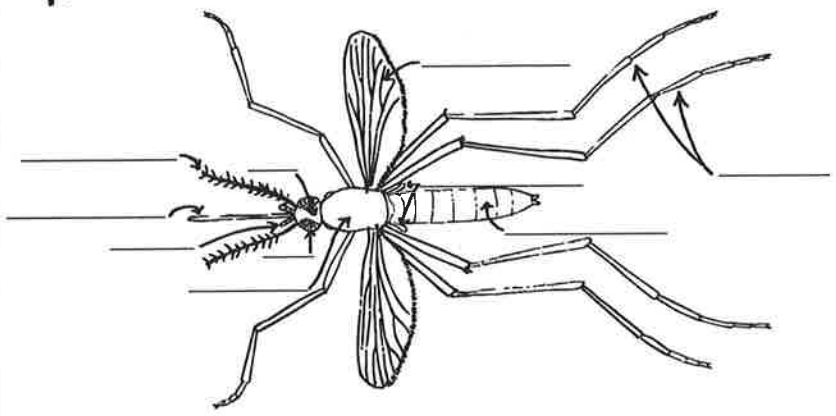
The Rest of the Mosquito Body

Mosquitoes are insects, so they have a **head**, **thorax**, and **abdomen** just like other insects. They also have 6 **legs** and 2 **wings**. (Most other insects have 4 wings, but mosquitoes are a type of fly and flies only have 2 developed wings. The other 2 "wings" are little club-shaped things called **halteres** that stick out behind the real wings and help the fly's balance).

The mosquito's **head** has the piercing, spitting, sucking **mouthparts**, large compound **eyes**, hairy **antennae**, and palpi (plural for **palp**). Both the antennae and palpi are used to sense the environment around them when looking for things like food or a mate.

Activity

Label the parts of the mosquito. Use the words from the list below.

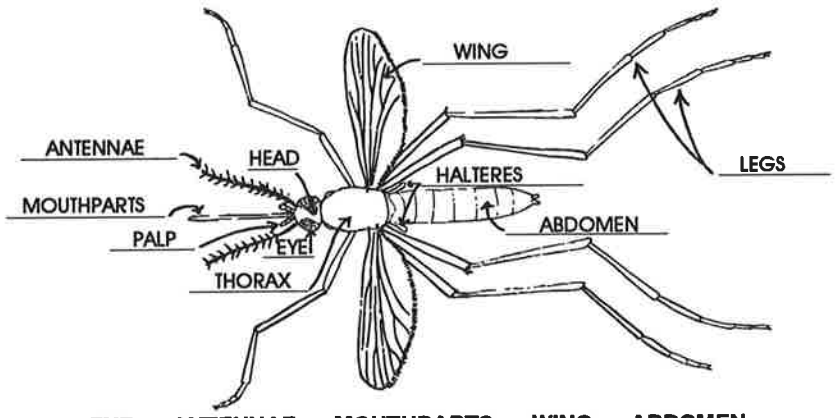


EYE ANTENNAE MOUTHPARTS WING ABDOMEN
HEAD THORAX LEGS PALP HALTERES

If you were an insect that could only eat food through a sucking mouthpart, it might be like eating food through a straw. What would your food be like if you could only eat it through a straw? What are some examples of human food that could be eaten this way? (Juices, baby food, puddings, mashed potatoes?)

Activity

Label the parts of the mosquito. Use the words from the list below.



EYE ANTENNAE MOUTHPARTS WING ABDOMEN
HEAD THORAX LEGS PALP HALTERES

Answers to labeling.

Teacher's Edition

Watch the mosquito life cycle by raising mosquitoes in the classroom. Set out either yucky water (mix some grass clippings and/or rabbit food in a container of water and set it out in a semi-shady location) or ask the students to check ornamental ponds or other standing water sources at their homes. Larvae are harmless and can be gathered in a jar and brought into the classroom. Put the water and the larvae into a large glass or plastic jar (that has a lid; poke small holes in the lid for air) and set it out of direct sunlight. Put in 1-2 rabbit pellets a day to feed the larvae. In about 7-10 days, some of the larvae should have turned into pupae. Adult mosquitoes should emerge from pupae in 2-4 days, so don't open the jar anymore to put food in or adult mosquiotes may fly out. They do not carry disease at this point (they have to bite a diseased animal first), but the females will seek a blood meal and it may be you or one of the students.

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THE LIFE CYCLE OF THE MOSQUITO

ADULT

The adult female mosquito looks for still water to lay her 150-250 little eggs. The eggs of some mosquitoes stick to each other and float on the surface of the water like a little raft. Two to three days later, tiny larvae hatch out of the eggs. The larvae need air to breathe, so they must remain at the water surface most of the time. Each larva grows from egg to pupa by shedding its skin 4 times as it grows. These stages of growth are each called "instars." After the last instar, the mosquito larva changes into a new form - the pupa. Just like the chrysalis of a butterfly or the cocoon of a moth, the mosquito is changing form inside the pupa. When it comes out two to three days later, it will be a fully formed adult mosquito.

PUPA

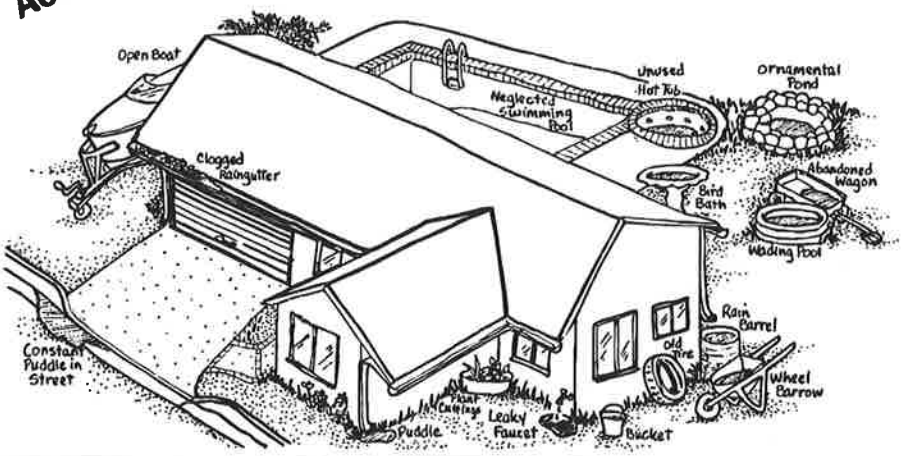
EGGS

The mosquito life cycle - ***egg*** ▸ ***larva*** ▸ ***pupa*** ▸ ***adult*** - is an example of ***complete metamorphosis.***

LARVA - 4 INSTARS

Activity

Circle all the places that can hold water and attract mosquitoes. Use a colored marker, pencil, or crayon.



Answer to Activity.
All the labeled areas can hold water and potentially attract mosquitoes.

Teacher's Edition

Look up stories of Greek and Roman mythology. Some of the constellations are supposed to be gods sent up to remain forever in the sky. Pandora, first mortal woman of Greek mythology, opened a box and released disease and other bad things upon the earth. Give a group of 2-4 students a natural phenomenon to explain through a story with words and pictures. Have the group present their "myth or legend" to the class.

San Gabriel Valley Mosquito Abatement District (626) 814-9466 Insect Progam/Student Workbook - Page 11

MOSQUITO LEGENDS AND MYTHS

Why are there Mosquitoes?

(From the Tsimshian Indians of British Columbia, Canada)

"In ancient times, blood sucking animals in human form used to invite travellers to their village and then drain their victims' blood by stabbing their long crystal noses into the unsuspecting people's necks while they slept.

One young man awoke in time to discover the villagers' secret and save himself. He fled from the village with the chief in hot pursuit. The chief tracked the young man to a lake where the man had hidden in a tree on the shore. The chief, exhausted and soaked, tried to attack the man's reflection in the water and then, while resting on the shore, the chief froze solid.

Mythical Insect Person

The young man and his people took the frozen chief and burned him to ashes. When the fire had burned out, a wind came up and blew the ashes in the air where they turned into clouds of mosquitoes."

Translated by William Benyon in 1954.

Why Mosquitoes Buzz in People's Ears ~ A West African Folktale ~

A mosquito told an iguana that she saw yams as big as mosquitoes. The iguana did not want to hear such nonsense, so he stuck twigs in his ears and went away. Later, the python said "Hello" to the iguana but when the iguana did not answer, the python thought the iguana was angry with him and was going to plot some mischief against him.

Afraid of this, the python went into the first hole in the ground he saw - and scared out a rabbit that thought the python was coming after her! A crow saw the rabbit running for her life and started to issue an alarm call to warn the other animals. A monkey heard the alarm call and was sure it was because some dangerous animal was hunting nearby. As the monkey ran through the trees to warn the other animals, he knocked a dead tree limb into the nest of an owl, killing one of her babies. This made the mother owl so sad that she did not hoot to wake up the sun the next day.

The forest animals became very frightened when the sun did not come up and King Lion called a meeting to find out what had happened. That was how the Lion figured out that the mosquito annoyed the iguana, who frightened the python, who scared the rabbit, who startled the crow, who alarmed the monkey, who killed the baby owl, whose mother was so sad she would not wake up the sun. It was the mosquito's fault! Meanwhile, the mosquito heard all this but was hiding under a leaf so she would not have to explain herself in front of King Lion.

Because of this, the mosquito feels guilty to this day and still goes around whining in people's ears: "Zeee! Is everyone still angry at me?" Then she gets an honest answer: SWAT!

From the book *Why Mosquitoes Buzz in People's Ears* by Verna Aardema

Activity

Write Your Own Legend or Myth:

Pick insects that you think are interesting or unusual in some way. Then, **make up a story** about them that helps explain why they act a certain way or look the way they do. Don't forget to **include a drawing** with your story. (Use a separate piece of paper.)

HERE ARE SOME IDEAS TO HELP YOU START:

Why do dragonflies eat mosquitoes?

Why do mosquitoes only have 2 wings, not 4 wings like most of the other insects?

Why do some insects live their whole lives in water?

Why do almost all insects have wings?

Why is the monarch butterfly orange and black?

How did the ladybug get its name?

Why is the honey bee fuzzy?

Why do insects have 6 legs?

Look for other Native American legends and myths.

Ask parents and/or grandparents for "stories" they were told while they were growing up.

Librarians from schools and community libraries should know of other stories that attempt to explain the workings of nature. You could set up a classroom display of these books/stories as inspiration for the activity on this page. Students could put their own insect legend or myth into book form to be included in the classroom display.

Why Mosquitoes Buzz in People's Ears, was written by Verna Aardema and illustrated by Leo and Diane Dillon. This book is a retelling of a west African folktale and was the winner of the 1976 Caldecott Medal. (Penguin Books, Dial Books for Young Readers, New York).

Teacher's Edition

Using a world map and the map provided on this page, have the students write down the continents in which malaria occurs today. In which countries does malaria occur?

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MOSQUITOES and DISEASE

Spread of malaria in the world today. Over one million people die each year from this mosquito-transmitted disease.

About 85 years ago, here in California, thousands of people were dying each year from a **disease** called **malaria**. This disease is spread from person to person by the bite of a type of mosquito called *Anopheles*. A lot of work was done to control these mosquitoes and now malaria is no longer a problem here. But in some parts of the world, malaria still occurs and millions of people still die from it. (See the map above)

Some mosquitoes can be **vectors** of diseases, like the disease malaria. A vector is an animal that can **transmit** or transfer a disease from one animal to another. Different mosquitoes can be vectors of different kinds of disease. Here in our area, our most common mosquitoes can transmit a disease called **Saint Louis encephalitis**. People that get sick with Saint Louis encephalitis may feel that they have the flu or they may get dizzy or get a headache. But some people can get very sick and have to go to the hospital. Another disease that can occur in our area is **dog heartworm**. Tiny worms are transmitted to a dog by a mosquito. These worms find their way to the dog's heart where they grow to their adult size of 8-14 inches (20-36 cm). The dog will get very sick and will probably die. Veterinarians have medication that can prevent the dog heartworms from developing inside a dog.

Preventing the spread of disease is the most important reason for controlling mosquitoes.

Activity

HELP CONTROL MOSQUITOES

Help control mosquitoes by checking your neighborhood and school for places that mosquitoes may be breeding such as in puddles that almost never dry up and pools that are green and yucky. Check your home for screens on all the windows. Screens will prevent mosquitoes from flying in and biting you while you're sleeping. Become a member of the **Pest Police** (page 19 of this workbook) and get grownups to help you keep your neighborhood free of breeding mosquitoes that can spread disease. If you need help getting rid of mosquitoes, call the San Gabriel Valley Mosquito Abatement District at (626) 814-9466.

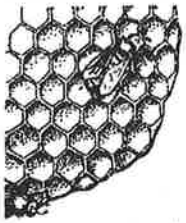
There are other mosquito-transmitted diseases besides malaria, encephalitis and dog heartworm - diseases like yellow fever and dengue. Make a list of as many mosquito-borne diseases as possible and draw where they occur on a map.

Contact the Centers for Disease Control and Prevention (CDC) for additional educational information:
CDC
Division of Vector-Borne Infectious Diseases
P.O. Box 2087
Fort Collins, CO 80522

Teacher's Edition

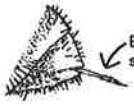
HONEY BEES

If a contest is held for the **insect** that is the most beneficial to humans, the honeybee would probably win. Do you eat peanut butter and jelly sandwiches? The peanuts and the fruit in the jelly are both possible because honey bees pollinate plants. (Without pollination, plants couldn't produce seeds, so there would be no new plants). Honey bees also create **honey** (**that's** easy to remember...*honey* bees make *honey*) and a kind of wax called (are you ready?) ***bees*wax**. A whole bunch of what we eat and use is possible because of these amber-colored, fuzzy, buzzing insects.



The life of a honey bee centers around the **colony** where thousands of bees live together. Each colony has one **queen** that lays all the eggs, hundreds of **drones** (male bees) to mate with the queen, and thousands of **workers** (female bees) to do all the rest of the work.

The honey bees you see flying around your plants are the workers. In addition to collecting food and water for the colony, the workers make the **honeycomb**, feed the developing young, clean the **hive**, and defend the colony. If a colony is threatened, worker honey bees will attack using the **stinger** in the end of their abdomens. They sting once and die because hook-like barbs on the stingers get caught in the victim and the entire stinger, along with part of the bee's body, is pulled out during the attack.



Sometimes, a colony will get to be too big for its living area. When this happens, about one half of the hive will create a **swarm**, flying off to find a new site for their home.

Activity — SCRAMBLED WORDS

Unscramble these words about bees. Some of the words can be found above, on this page.

GRIENST	_____	VIHE	_____
EHNYO	_____	WOFREL	_____
EBSE	_____	AXEWEBS	_____
ROWREK	_____	CISNET	_____
NORDE	_____	RSAWM	_____
EQNEU	_____	GISNW	_____
LOLPNE	_____	TECRAN	_____

List as many crops as possible. These can be just those grown in California and/or those in other states. How many of those crops are pollinated by honey bees? How important are honey bees to California crops in particular? Since agriculture is an important part of our State's economy and since many crops are pollinated by bees, honey bees are very important. For more information, contact the California Department of Food and Agriculture at:

1220 "N" Street,
Sacramento, CA 94271.

What flowers do bees visit? Using a plain white sheet of paper, have the students draw pictures of flowers found around the school or their home that may attract bees. (If they actually saw certain bees around these flowers, ask the students to include the honey bee or bumble bee or whatever kind of bee it was in the drawing).

Answers to SCRAMBLED WORDS. →

Activity — SCRAMBLED WORDS

Unscramble these words about bees. Some of the words can be found above, on this page.

GRIENST	STINGER	VIHE	HIVE
EHNYO	HONEY	WOFREL	FLOWER
EBSE	BEES	AXEWEBS	BEESWAX
ROWREK	WORKER	CISNET	INSECT
NORDE	DRONE	RSAWM	SWARM
EQNEU	QUEEN	GISNW	WINGS
LOLPNE	POLLEN	TECRAN	NECTAR

Teacher's Edition

Make up questions on bees, ants, and wasps. Submit these questions to the teacher. Divide the class in half and choose a panel of students to represent each side. Choose a "speaker" or "captain" for each panel. Then have the teacher ask questions of the panels. If a panel thinks it knows the answer, the "speaker" raises his/her hand. If the answer is wrong, the other panel gets a chance. If the other panel's answer is wrong, the question goes to the students at large. The point(s) goes to the half of the class that answered correctly.

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BEES GO THROUGH COMPLETE METAMORPHOSIS

The queen lays an **egg** in one of the **cells** in the honeycomb.

After about 3 days, a **larva** that looks like a fat, white worm develops.

About 9 days later, the bee develops into a **pupa** and stays that way for about 9 more days.

Finally, the **adult** bee eats its way through the waxy covering on the cell and begins life in the colony.

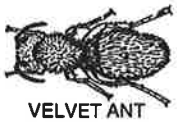
Activity — Guess the BEE FACTS

1. How many sides are there to each cell in a honeycomb?
2. How many eyes do honey bees have?
3. How many flowers do honey bees have to visit in order to make 1 pound (0.5 kg) of honey?
4. How much honey does the average worker honey bee make in her lifetime?
5. What state is called the "Beehive State"?
6. How many wings does a honey bee have?

BEE RELATIVES

Honey bees are related to other **bees**, **wasps**, and **ants**. They are all grouped together in the **Order Hymenoptera**. "Hymen-" is the Greek word for *membrane* and is used to describe the look of the wings. And "-ptera" is the Greek word for *wings*. So, Hymenoptera means "membrane wings."


ARGENTINE ANT


VELVET ANT
(a wingless wasp)


BUMBLE BEE


MUD DAUBER WASP


YELLOWJACKET WASP

Answers to Guess the BEE FACTS.

Activity — Guess the BEE FACTS

1. How many sides are there to each cell in a honeycomb? 6 sides (a hexagon)
2. How many eyes do honey bees have? 2 compound eyes, 3 simple eyes
3. How many flowers do honey bees have to visit in order to make 1 pound (0.5 kg) of honey? 2,000,000*
4. How much honey does the average worker honey bee make in her lifetime? 1/12 teaspoon*
5. What state is called the beehive state? Utah
6. How many wings does a honey bee have? 4 wings

* These answers were from the National Honey Board (on the Internet).

Make up a list of as many insects in the Order Hymenoptera as you can. Group them by Wasps, Ants, and Bees. Make up a poster with labeled illustrations.

Teacher's Edition

San Gabriel Valley Mosquito Abatement District (626) 814-9466 Insect Program/Student Workbook - Page 15

THE AFRICANIZED HONEY BEE

A new honey bee is coming!

Back in 1956, a different type of honey bee was brought to Brazil from the southern part of Africa. People were trying to develop a new breed of honey bee that would be better for the tropical conditions in parts of South America. They were doing this by mating the African bees with the local bees. Unfortunately, before the testing of this new *Africanized* honey bee (AHB for short) could be finished, some were accidently released. What made that accident especially bad was that the AHB's were much more protective of their home and many more bees were likely to sting at any one time.

These bees look just like the European honey bees that are commonly found in gardens and on flowers and their stingers and venom are the same. BUT... ***a lot*** more bees will attack at the same time. Some animals and people have been badly hurt and a few have died from these attacks. Because of this, Africanized honey bees are sometimes called *Killer Bees*.

Slowly, these escaped bees began moving northward through other countries in South America and North America. A few years ago they flew into the United States and are now found in parts of Texas, New Mexico, Arizona, and California. Although the AHB's are not here in the San Gabriel Valley yet, you need to stay away from **all** bees so that there is less of a chance that you will get stung.

Africanized honey bee

THEY LOOK THE SAME

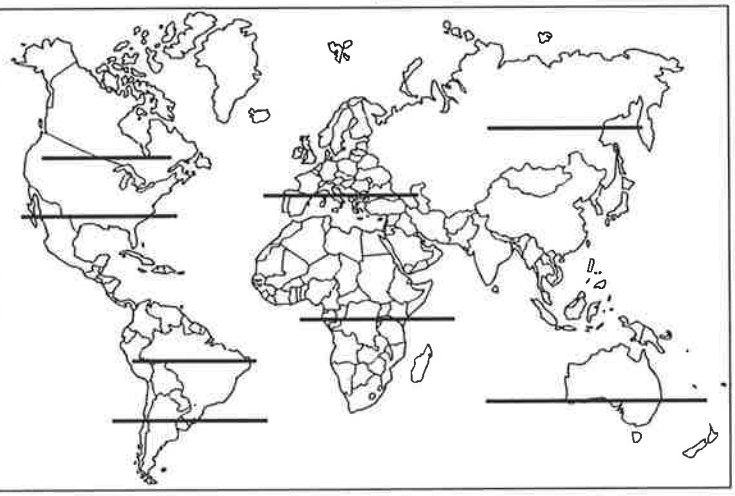
European honey bee

A Bee Bit of History

The honey bees you probably see buzzing around the flowers in your neighborhood are called *European* honey bees. They were brought to North America by the early colonists from Europe in the 1700's. Before that time, the only bees in North America were the native, wild bees.

Activity

1. ***Write the names*** of each continent on the correct lines. (Only six (6) shown.
2. ***Draw a blue arrow*** from Europe to North America to show the introduction of the European honey bee to North America.
3. ***Draw a red arrow*** from southern Africa to South America to show the introduction of the Africanized honey bee to South America. ***Draw another red arrow*** from South America to North America to show how the Africanized honey bee has spread.



For more information on the Africanized Honey Bee, contact the San Gabriel Mosquito Abatement District at 1145 N. Azusa Canyon Rd,. West Covina, CA 91790 (626) 814-9466.

You can also contact the Los Angeles County Agricultural Commissioner's office (3400 La Madera Avenue, El Monte, CA 91732) or the California Department of Food and Agriculture (1220 "N" Street, Sacramento, CA 94271).

Answer to activity on Africanized Honey Bee movement.

Activity

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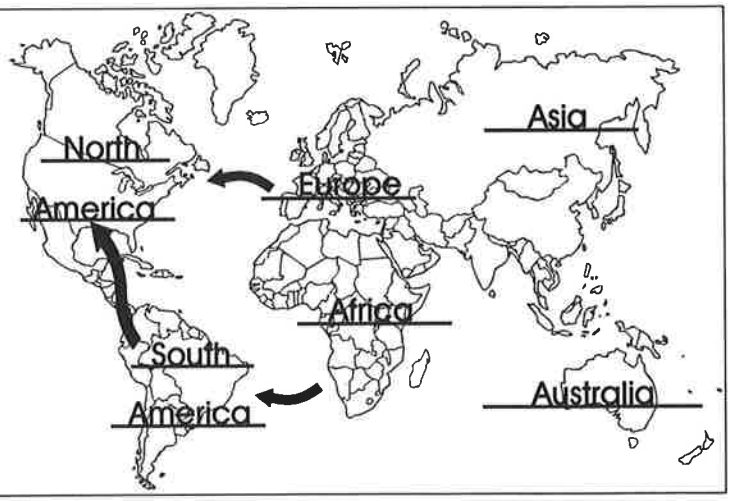

Teacher's Edition

Make a recipe using honey. Make up a recipe book with all the recipes you can find that use honey.

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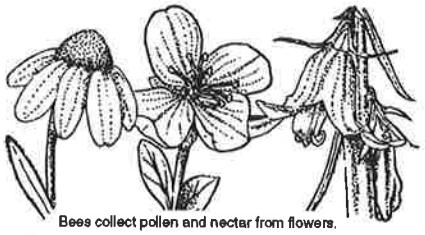
A SWEET TALE -
How Bees Make Honey


Bees collect pollen and nectar from flowers.

The **workers** spend the first half of their lives in the hive doing housework like cleaning, making honeycomb...you know, the usual stuff. The real fun comes during the second half of their lives. That is when they get to fly out among the trees and bushes in search of the **pollen** and **nectar** the hive needs as food. As luck would have it, **flowers** produce *both* pollen and nectar.

Pollen, usually yellow dust-like stuff found in the center of flowers, is gathered and held onto the worker's hind legs by stiff hairs. Nectar is a sweet, water-like liquid also found in the center of flowers that is sucked up and stored in a special place inside the bee's body. When the worker is full, it flies back to the hive. The pollen and nectar are deposited in the hive and the worker flies back outside to get more. But where's the honey? The nectar that the workers gather is spread out in the hive and most of the water in it evaporates to form honey. Then the honey is mixed with pollen to feed to the developing bees. Honey is also eaten by other members of the colony.

How much honey can one worker produce in her lifetime? Only about one twelfth of a teaspoon or about 2 drops.

Look on the label of honey at the supermarket. Sometimes it will list the type of flowers the bees used to make the honey, like *clover* honey or *orange* honey.

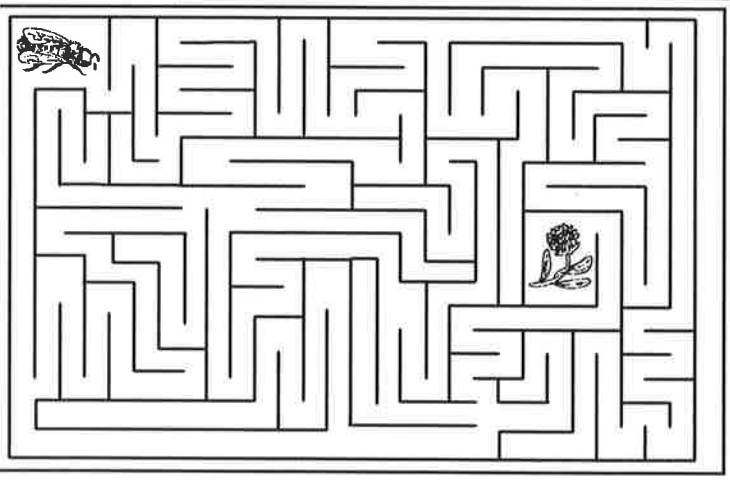
Be careful! When bees are searching for pollen and nectar, they are not usually interested in people and will leave you alone. This changes if you start swatting at them or hitting them. They will try to protect themselves and the nest by attacking and stinging. **NEVER** try to remove a bee's nest or hive by yourself.

Visit the supermarket and write down all the different types of plants that flavor honey.

Activity

Bee AMAZED...

Help the honey bee find the flower by drawing a line along the path the bee would take.



Answer to Bee AMAZED.

Activity

Bee AMAZED...

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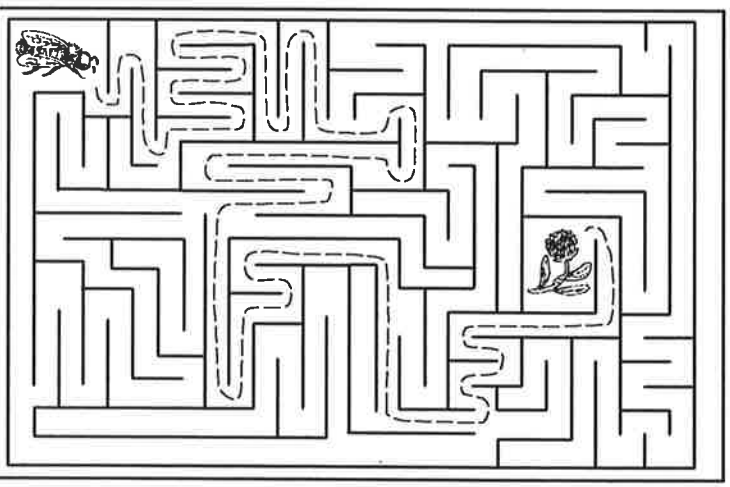

Teacher's Edition

What other animals are beneficial to man?
Cows - milk.
Chickens - eggs.
Horses - used for sport and to carry supplies.
Any more?

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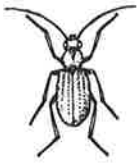
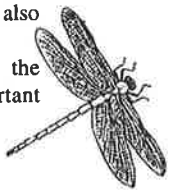
BENEFICIAL INSECTS



Insects that make things or act in ways that benefit people are called **Beneficial Insects**.

Honey bees are good examples of beneficial insects. They make honey that people collect and use for food. They also pollinate flowers that develop into fruit and seeds. *Silk moths* are another example of beneficial insects. The silky threads that make up the silk moth cocoons are collected and woven into fabric for clothes and other items.

Other insects help people by eating pest insects. *Dragonflies* and *damselflies* eat mosquitoes which might be transmitting disease. *Ladybugs*, *lacewings*, and *praying mantids* eat insect pests found in the garden. (Insect relatives like *spiders* are also very good at catching and eating insect pests.)



And all sorts of insects, especially *beetles*, help with the breakdown of dead plants and animals, allowing important nutrients to find their way back into the soil as fertilizer.

Set up a classroom display with products from insects: honey, honey-flavored candy, silk scarf or other silk clothes, beeswax candles, etc.

Activity

CROSSWORD PUZZLE

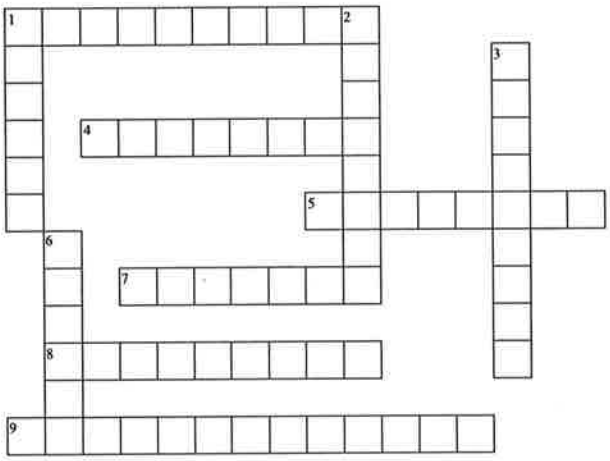
Use the names of the insects drawn above along with other information on this page to fill in the answers below.

ACROSS

1. The word that means insects are a benefit to people.
4. The insect that makes honey. (2 words)
5. People make clothes from the silky threads of this insect's cocoon. (2 words)
7. A beetle, often red with black spots, that eats garden pests.
8. The adult of this insect looks like a skinny dragonfly. Young ones eat mosquito larvae.
9. A garden insect that eats other pest insects. (2 words)

DOWN

1. This insect helps eat up dead plants and animals.
2. This tiny garden insect eats other pest insects.
3. An aquatic insect with large wings that eats mosquitoes and other insects.
6. This 8-legged insect relative spins webs to catch insects.



Answers to CROSSWORD PUZZLE.

Activity

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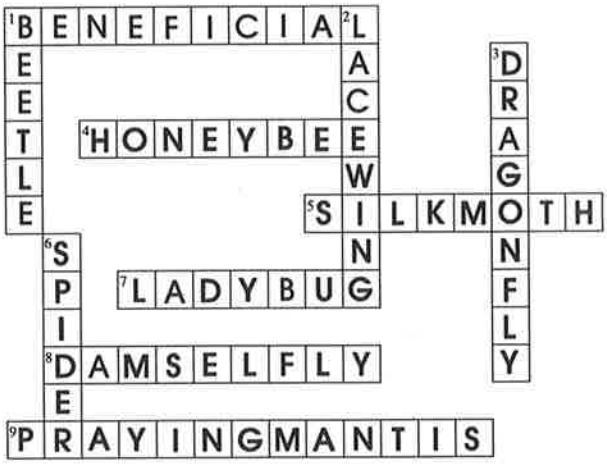

Teacher's Edition

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THE INSECT APPRECIATION SQUAD

A lot of people don't like insects. They will say something like, "Insects? Ugh!" or "Yech!" or "Blech!" or...well, you get the idea.

But, now that you've had a chance to learn a bunch of things about these 6-legged creatures, you can tell **everyone** about the amazing and bizarre world of the **incredibly interesting insects**.

Insect Jokes

What looks just like half a butterfly? *The other half.*

What letter can sting you? *B, of course.*

From *101 Bug Jokes*, Scholastic Inc.

Activity List 5 things that you like about insects or that you learned about them.

1. _____
2. _____
3. _____
4. _____
5. _____

Activity

Membership card for the Insect Appreciation Squad

Be it known that

NAME OF MEMBER

is an official member of the

San Gabriel Valley Mosquito Abatement District

Insect Appreciation Squad

DATE

My Favorite Insect

NAME OF INSECT

Directions:

1. **Cut out card** along solid lines.
2. **Fold** "card" in half and **glue** sides together. Let dry.
3. **Draw** in your favorite insect.
4. **Fill in** insect name, your name, and date.

Ask your class to put together a "Funny Insect Book." Have the students draw cartoon insects, write jokes and riddles, and include funny stories about insects.

Have the students write an illustrated story or report on their favorite insect.

Declare one day in the school year "Insect Appreciation Day." Read insect stories, share insect pets, make snacks using honey, have students bring in insect toys or plastic insects for a display, etc. A good reference book is *Organizing Bug Days and Insect Fairs* by Gary A. Dunn. (Young Entomologists' Society (Y.E.S.), Inc., 1915 Peggy Place, Lansing, MI, 48910-2553. (517) 887-0499. Look for Y.E.S. on the Internet, also).

Teacher's Edition

Are insects the only pests? What other animals might be considered pests? Define "pest." Can plants be pests? What about weeds?

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PEST POLICE

Purpose

The purpose of the PEST POLICE is to help keep our neighborhoods free of places that pest insects like to live.

Job Requirements

1. Use the checklist below to explore possible living sites for mosquitoes and other pest insects.
2. Tell your family and friends what you have learned about helping keep your neighborhood safe and free of insect pests.
3. Call the San Gabriel Valley Mosquito Abatement District at (626) 814-9466 if you need help controlling breeding mosquitoes or if you find wild bee nests outside near your home or school. (There is no additional cost for this service.)

Activity

Use the list below to check around your home for areas where pests like mosquitoes may be breeding. Once you've checked for the item or area, put an X in the first box. If you found the item or area and eliminated the potential breeding site (cleaned out the birdbath, dumped the water out of the old bucket, or covered the rain barrel with a screen), put an X in the second box.

	Looked for this	Took care of it.
1. ORNAMENTAL POND (If you need free mosquitofish to control mosquitoes in your pond, ask a grownup to call the Mosquito Abatement District)	☐	☐
2. DIRTY BIRDBATH	☐	☐
3. PLANTS THAT HOLD WATER BETWEEN THEIR LEAVES	☐	☐
4. WATER FOUNTAIN THAT DOESN'T WORK OR ISN'T TURNED ON	☐	☐
5. OLD WATER IN OUTSIDE DOG DISH OR CAT DISH	☐	☐
6. OLD WATER IN BOTTOM OF BUCKET	☐	☐
7. PLASTIC WADING POOL WITH GREEN OR DIRTY WATER	☐	☐
8. UNCOVERED BOAT WITH WATER IN THE BOTTOM	☐	☐
9. PUDDLE UNDER LEAKY FAUCET (Ask a grownup to help fix this)	☐	☐
10. BOTTLES OR CANS SET OUT FOR RECYCLING (If they only have a little bit of water in them, mosquitoes may breed there)	☐	☐
11. RAIN BARREL	☐	☐
12. PLANT POTS WITHOUT A DRAIN HOLE	☐	☐
13. RAIN GUTTERS ALONG ROOF THAT ARE STOPPED UP WITH LEAVES (Have a grownup check this)	☐	☐
14. SWIMMING POOL THAT IS GREEN OR DIRTY	☐	☐

When you have used this checklist to look for pest living areas, have your parent or guardian sign at the bottom. Then show this page to your teacher to receive your **PEST POLICE** button.

Signature of parent or guardian

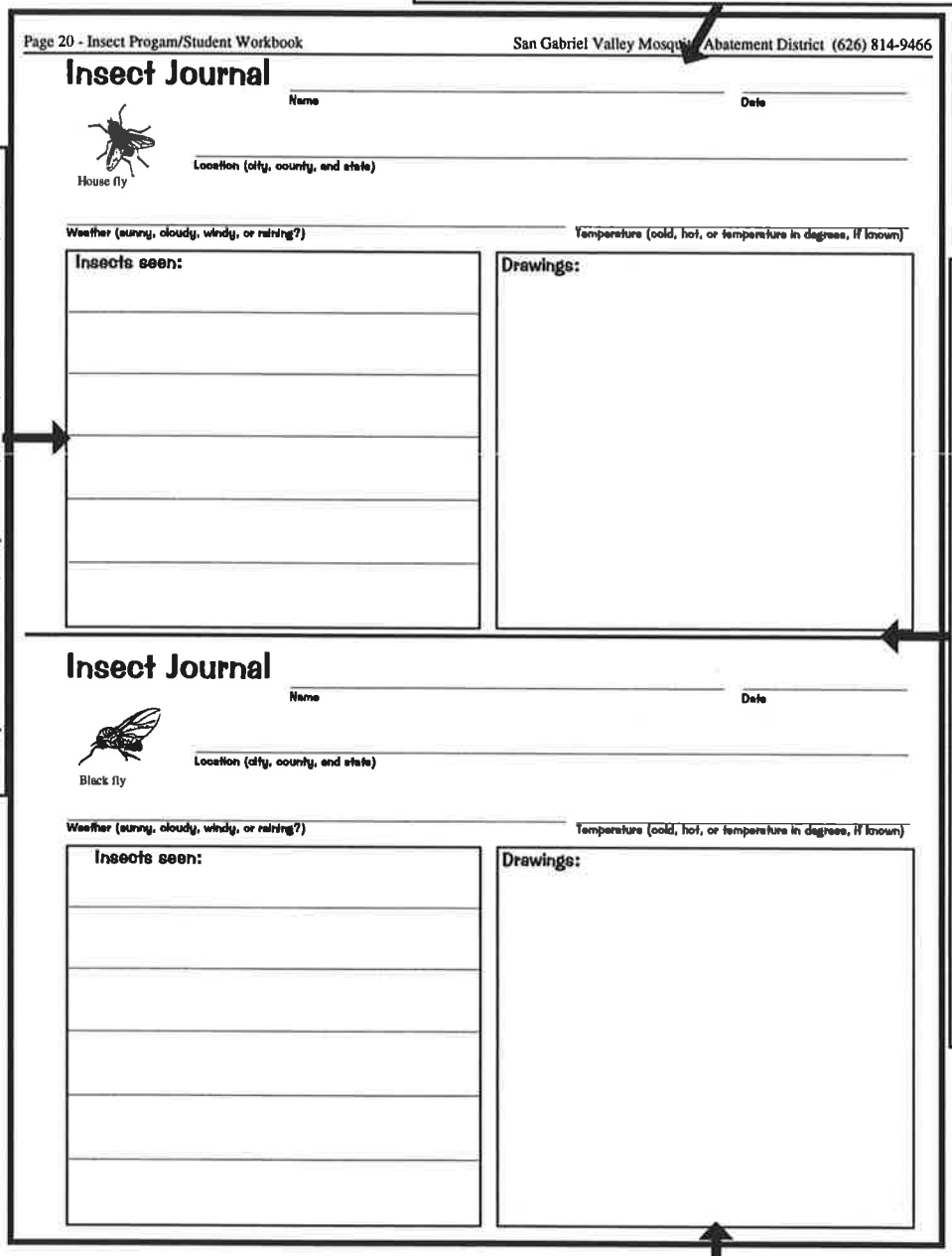
Are there any other places that could be sites for pest insects?

There should be enough Pest Police buttons for each student that receives an original workbook from the San Gabriel Valley Mosquito Abatement District. If you did not receive enough buttons, please call us at (626) 814-9466.

Teacher's Edition

The observer's name, the date, and the location of the observation are the most important pieces of information to include with any natural science journal entry. Weather and temperature data would be a nice addition and may help explain why insects were abundant one day (when it was sunny and warm) and hard to find another day (when it was windy and cold).

Temperature data in °F and/or°C could also tie into lessons in physical science and math. (Note: All accepted scientific measurements are written in *metric*.)



Page 20 - Insect Progam/Student Workbook San Gabriel Valley Mosquito Abatement District (626) 814-9466

Insect Journal

Name _____ Date _____

House fly

Location (city, county, and state) _____

Weather (sunny, cloudy, windy, or raining?) _____ Temperature (cold, hot, or temperature in degrees, if known) _____

Insects seen: | Drawings:

Insect Journal

Name _____ Date _____

Black fly

Location (city, county, and state) _____

Weather (sunny, cloudy, windy, or raining?) _____ Temperature (cold, hot, or temperature in degrees, if known) _____

Insects seen: | Drawings:

This is meant to be a *listing*, not a narrative, but a short description such as "lady bug on rose bush" may provide some insight into the insect's habitat preferences.

If it is a particularly good observation day, an additional page of notebook paper could be added. (Be sure the student's name, the date, and the location are written at the top of the additional page.)

You can photocopy this page and cut it in half. Observations on insects found around the school could be made each day or two by a different student. If you did this for 1-2 weeks at different seasons of the year, you might get a nice accounting of how insects change with the seasons.

Your insect variety will depend greatly upon the plants found at your school site. For example, certain flowers attract honey bees and different types of butterflies. Decaying plant material may yield beetles. Look in insect books in the library to learn more about habitat requirements for different insects.

If you want to photo-copy extra pages of the "Insect Journal' from the student workbook, an extra wide margin has been provided for holes so that it can be put into a notebook.

This space is for drawing one or more insects seen by the students. If it's too hard to draw from life (like, out in the school yard), then they can draw from memory or copy photographs or illustrations from a book. The purpose of doing the drawing is to help learn about insect form and the differences between insect species.

CONGRATULATIONS

Name of Student

has just completed the
San Gabriel Valley Mosquito Abatement District's
INSECT PROGRAM
and is now an Official Member of the
Insect Appreciation Squad and Pest Police

Date

Teacher

District Manager, San Gabriel Valley Mosquito Abatement District

A NOTE TO PARENTS AND GUARDIANS:

This Workbook is being provided at no extra charge to all 4th grade students within the San Gabriel Valley Mosquito Abatement District, a local government agency involved in monitoring and controlling insects that are pests and vectors of disease.

By reading and doing the activities provided, your child will not only gain an appreciation of some of the insects found around them, but learn which insects can cause harm and discomfort and what can be done to lessen the risk of contact.

Please take some time to review this Workbook with your child. Ask them to explain what they have learned and why they think the information contained here is important. If you would like more information about this Workbook or about the other aspects of the San Gabriel Valley Mosquito Abatement District's programs, please call the Education Specialist, at (626) 814-9466.

San Gabriel Valley Mosquito Abatement District
1145 North Azusa Canyon Road
West Covina, CA 91790
(626) 814-9466

For information on our Education Program or to inquire about additional copies of the INSECT PROGRAM/Student Workbook, please write or call us at the address or phone number above.

Created by Marianne D. Wallace for SGVMAD, June 1997