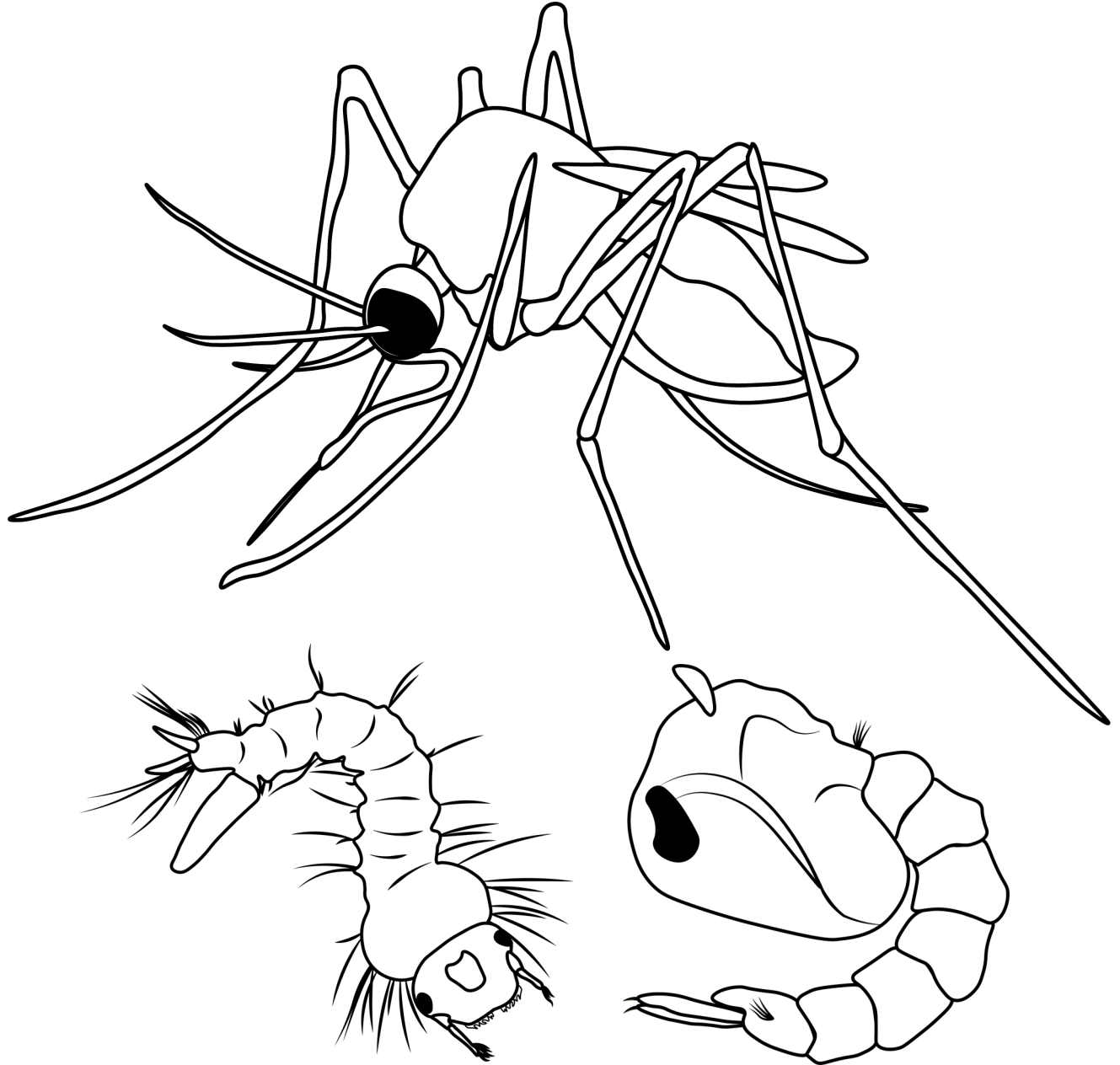


Let's Learn About Mosquitoes!



Teacher Guide

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Program Overview

Purpose:

The purpose of the Vector Control Program (VCP) school program is to educate students about mosquitoes and the diseases they can transmit. Mosquitoes in San Diego County can transmit potentially harmful diseases including West Nile virus. The program is designed to be engaging and interactive and is primarily aimed at students in grades 4 and 5. The combination of an in-class activity and a presentation makes the program more memorable to students and gives them the chance to do some hands-on learning! Classroom kits are provided to teachers, and the live presentations can be done in person or virtually depending on requirements of the classroom.

Objectives

Students will learn:

- ★ The life cycle and habitat of the mosquito
- ★ How mosquitoes spread diseases (and which diseases are present in San Diego County)
- ★ Actions they can take to protect themselves against mosquitoes
- ★ What the VCP does and what services it provides

Classroom Kits

As part of the program, each teacher will be provided with a classroom kit. This kit contains the following:

Teacher Guide

Each Student Receives:

- 1 Pre/Post Test
- 1 Lab Notebook
- 1 Take home activity
- 1 Magnifying glass

Mosquito Life Cycle samples (4 samples per set)

Swag (pencils, magnets, stickers) - these items will be provided after the presentation for in person presentations and in the kit for virtual presentations. We encourage giving the swag to the students as a reward for completing the program.

Make sure to let Vector Control Staff know how many students are in your classroom when signing up for the program so that we can pack each kit accordingly. Vector Control Staff will deliver or mail the kits the week before the classroom program is scheduled to begin. The magnifying glasses, lab notebooks, and any swag (stickers, pencils, etc.) are for the students to keep. The Mosquito life cycle samples and the pre/post tests will need to be returned to Vector Control Staff. This can be done at the time of the presentation, or Vector Control staff can come pick up the materials from the school front office.

Program Overview

Program Activities

The program consists of three activities to be completed within one to two weeks. The first activity is an in classroom activity. All necessary supplies will be provided in the classroom kit. The second activity is a take-home activity for the students to do around their own homes. Alternatively, this activity can be completed on school grounds. The third activity is a live presentation given by Vector Control staff in person or virtually depending on the needs of the classroom. Activities 1 and 2 need to be completed prior to Activity 3.

Activity 1—The Mosquito Life Cycle (1 hour)

First, the students will take a quick pre-test to see what their baseline knowledge about mosquitoes is. Then the students will watch a video about the mosquito life cycle, and then use what they learned to examine real insect specimens in the classroom. In addition to learning about the mosquito life cycle, students will learn about mosquito habitat and anatomy.

Activity 2— Mosquito Breeding (30 min)

In activity two, students will look for potential mosquito habitats in their own yards or alternatively on school grounds. Students will learn about simple measures they can take to protect their environment and to prevent mosquito breeding. This activity can be completed either by sending the activity sheet home with students or by having students explore their own school for potential sources of mosquito breeding.

Activity 3—Mosquitoes and Diseases (1 hour)

In activity three, Vector Control staff will give a live presentation to students. Students will learn about different types of mosquitoes, the diseases they can transmit to people, actions they can take to protect themselves against mosquito bites, and about the Vector Control Program and careers in mosquito control. Students will then complete their lab notebooks and have a Q&A session with VCP staff. When possible, live mosquitofish and mosquito larvae will be available for observation after the presentation.

Wrap-up

After the program is over, please return the mosquito life cycle samples, pre/post quizzes, and the mosquito breeding charts to Vector Control Staff. The pre/post tests and the mosquito breeding charts provide important data to help us improve our program. They can be returned either directly to Vector Control staff or by leaving the items at your school office's front desk for pick-up. Please return these items promptly so that we can get the mosquito kits ready for the next classroom!

If you have any questions, please call (858) 694-2888.

NGSS Science Standards

Standard	How Standard is Addressed
3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.	Students will learn about the mosquito life cycle as a model to compare to the life cycles of other organisms.
3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.	Students will learn about mosquito habitat and what conditions can affect mosquito survival.
4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	Students will learn about various anatomical features of the mosquito and how those structures support their survival, growth, behavior, and reproduction.
4-LS1-2 Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways	Students will learn how mosquitoes use several different senses to find food sources, and how mosquito repellent can disrupt those senses and cause them to respond with avoidance behaviors.
5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.	Students will learn about what and how mosquitoes eat and their place in the food web in their environment.
5-PS3-1 Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.	Students will draw a food web in their journal where they will be able to trace the energy gained back to the sun
5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.	Students will learn about the ways in which the VCP as well as individual communities can use science to protect their environment and themselves against mosquitoes.

Activity 1: Mosquito Life Cycle (In class activity)

Please begin the activity by having the students complete Quiz number 1. This pre-test helps us track the effectiveness of our education program. The post test may be printed on the back to save paper. Please only have the students complete the pre-test at this time.

Next, play for the students a short video (6 minutes) about the mosquito life cycle. In the video we cover the stages of the mosquito life cycle (Egg, larva, pupa, and adult), mosquito adaptations, and mosquito habitat).

Next, we recommend walking the students through observing the mosquito eggs. They should hold the magnifying glass about an inch away from the sample for best results. As they observe each sample, they should complete each corresponding section in their notebook. Most of our samples are of eggs stuck together in an egg raft. Egg rafts allow the eggs to float at the surface of still or standing water. Ask the students why they think mosquitoes won't lay their egg rafts in moving water like in a stream or a running fountain. (Possible answers include : the movement of the water would wash them away, mosquito couldn't stay still on the surface long enough to lay eggs, the eggs might sink and get eaten by a fish).

The students can then use the magnifiers to observe the other three stages of the mosquito life cycle.

Have the students complete pages 2-4 in the lab notebook. Further discussion questions could include:

What adaptations does an adult mosquito have to drink blood?

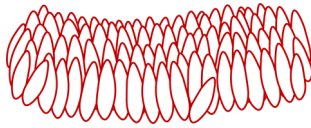
What adaptations does a larval mosquito have to breathe?

What kind of habitats would be good or bad for mosquito larvae?

The answers to the lab notebook questions are on the following pages.

Eggs

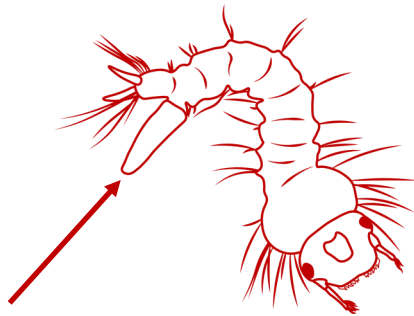
Draw what you see in sample A



1. Where does a mosquito lay its eggs? in water
2. Were these eggs laid (circle one) one by one in an egg raft
3. These eggs would have been laid (circle one) floating on water stuck to the side of a container

Larva

Draw what you see in sample B



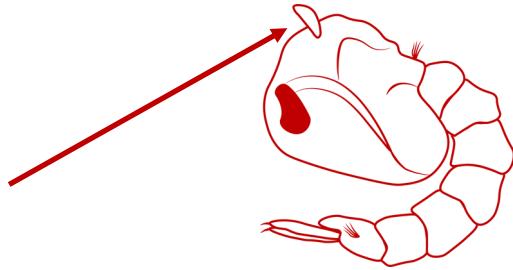
1. Mosquito larvae live completely in W A T E R
2. Can you find the siphon that the larva uses to breathe? Draw an arrow pointing to it on your drawing.
3. Mosquito larvae use their mouth B R U S Hes to filter food like algae out of the water

The mosquito larvae will probably look a little different than the example picture here—the preservation process dehydrates the mosquito larvae’s soft tissues. Students may notice a line down the center of the larva—this is the larva’s digestive system!

The siphon is located at the tail end of the mosquito. It will look darker than the rest of the mosquito’s body. The hairs on the mouth part may be visible—students might remember that they use these mouth brushes to filter feed on algae. You can ask students if they know of any other animals that filter feed (humpback whales, whale sharks, clams, etc.).

Pupa

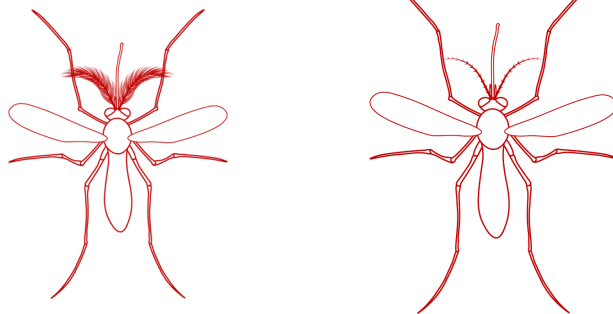
Draw what you see in sample C



1. What is something that larvae can do but pupae can't? E A T
2. Can you find the siphons that the pupa uses to breathe? Draw an arrow pointing to them on your drawing.
3. The process of turning from a pupa to an adult is called (circle one) Metamorphosis Switcheroo Transfiguration

Adult

Draw what you see in sample D



1. Male (boy) mosquitoes have fluffy antennae—circle which mosquito in your sample is male: 1 2
2. Which mosquitoes drink blood (circle one) Male Female
3. Describe the color of your mosquito
brown, black, many acceptable answers

The pupa stage is similar to the cocoon stage of a moth or the chrysalis stage of a butterfly life cycle. In mosquitoes, as in moths and butterflies, the pupa stage does not eat. Other insects with a similar life cycle include: beetles, ants, bees, and wasps.

Each sample of adult mosquitoes should have two adults. The male antennae will look fluffier, or like a feather. The hairs on their antennae help them listen for female mosquitoes.

Color may vary between samples as they will have been made with different species of mosquito. Answers may include brown, black, stripes, etc.

Challenge Questions

Answer the following questions. Use the pictures as hints!



Mosquito larvae and pupae cannot survive outside of
_____ water _____



Mosquitoes use their siphons at the surface to
breathe _____ air/oxygen _____



Female mosquitoes need this to lay healthy eggs:
_____ blood _____



Mosquito larvae digest food better and grow faster
in _____ warmer _____ water



What kind of predators would eat mosquito larvae?
_____ fish, dragonfly larvae _____



Can you think of another insect that has a life
cycle similar to the mosquito life cycle?
_____ Butterfly, (also beetle, ants, bees) _____

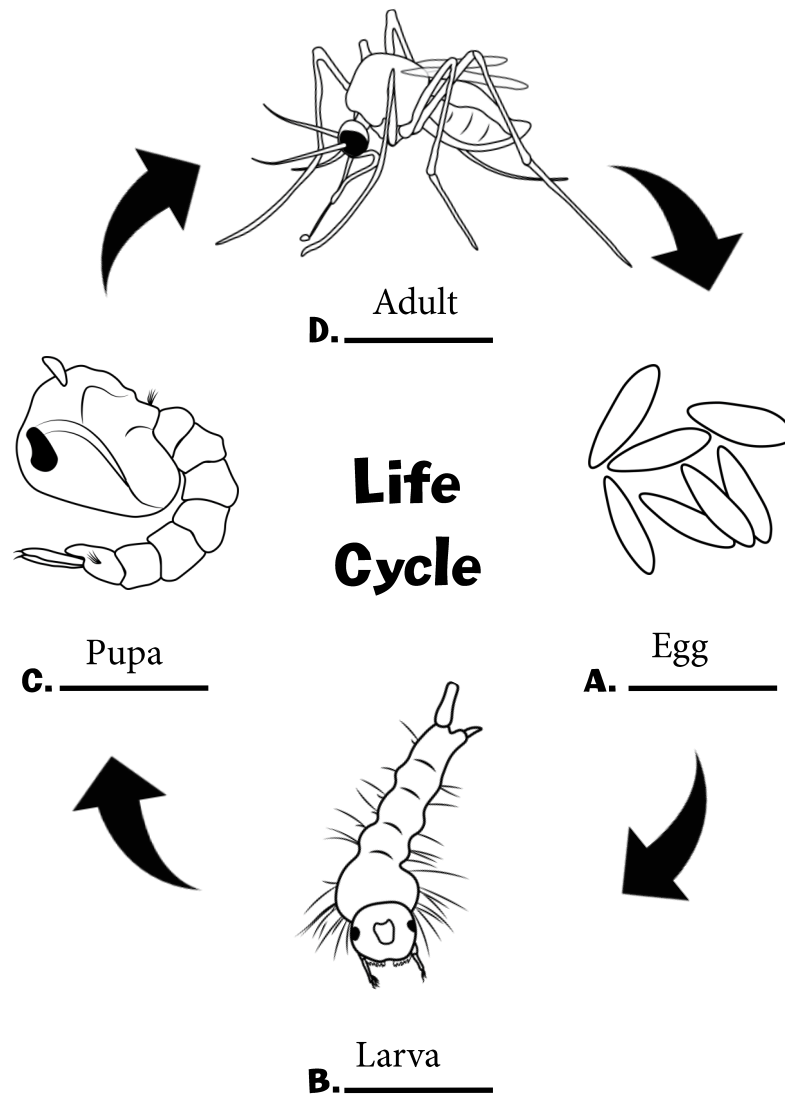
The answers to these questions come from the mosquito life cycle video that the students will watch before the activity.

Mosquito Life Cycle

Fill in the labels on the mosquito life cycle diagram below.

Challenge yourself to fill in all the answers without checking your notes! Though be sure to refer back if you need a hint!

Which parts of the life cycle would you find in standing water?



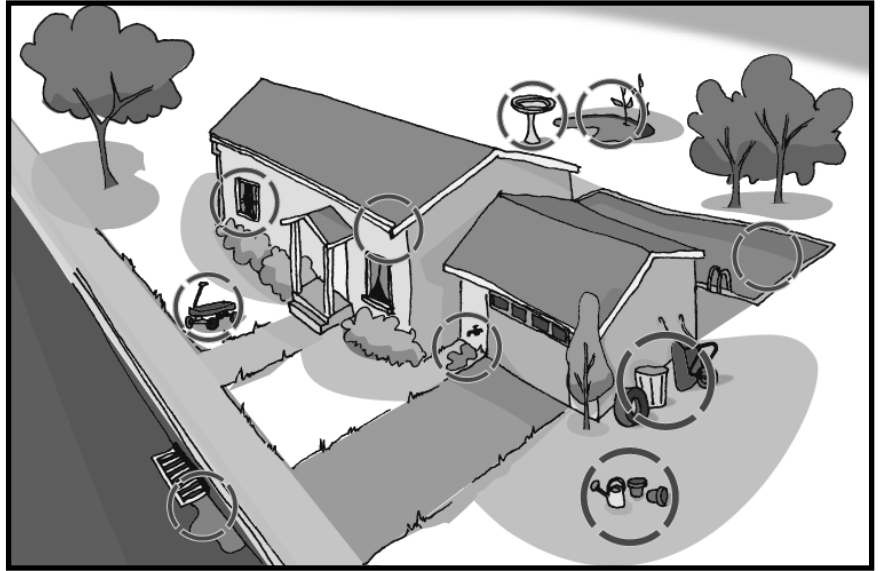
Students can complete this page after the mosquito life cycle activity or later in the week as a refresher before Vector Control staff come to give their presentation.

Life cycle stages A, B, and C are found in standing water.

Activity 2: Mosquito Breeding—Take Home Activity

Now that the students have learned all about the mosquito life cycle, and where mosquitoes live when they are young, it's time for them to put it into practice!

Students can complete this activity as a take home activity or on school grounds. The goal is for students to look around their home or school for places mosquitoes might lay their eggs. They should look for anything that has water in it or could hold water.



Things that could hold water can range from the saucers under a potted plant to a green swimming pool. Below are a list of places where students can look for mosquitoes, but the possibilities are endless. Mosquitoes can lay their eggs in containers that are holding as little as 1/4" of water.

Saucers under potted plants	Flower vase	Kiddie Pool
Toys	Fountains	Yard Drains
Pond	Bird bath	Tires
Clutter	Trash cans	Green Swimming Pool
	Buckets	

Students should write down each object they find in the mosquito breeding source chart. They can use the magnifying glasses from Activity 1 to check for mosquito larvae in any water they find. For students who are really interested, a flashlight can also help them peek into water to look for larvae. If students find standing water, they should dump it out if they can (with their parent's permission, we don't want to ruin anyone's fancy bouquet by dumping out a clean flower vase!)

Please collect these forms and give them to Vector Control staff along with the pre/post tests at the end of the program. We use this data to improve the effectiveness of our school program as well as to inform our mosquito control and outreach staff about what types of breeding sources may be more common in different parts of the county.

Taking what we've learned home:

Now that you've learned all about the mosquito life cycle, and where mosquitoes live when they are young, it's time to look around your home for places mosquitoes might be hiding. Look around your home (or the home of a relative) inside and outside, in your yard or your balcony, and around the neighborhood for anything that has water in it or could hold water. Write down each thing that you find in the chart. Use your magnifying glass to look for mosquito larvae. When you're done, dump out any water if you can!

Breeding Source		Did you find		Did you dump it out?	
	Water?	Larvae?			
Saucer under a potted plant	Yes	No	Yes		
Fountain	Yes	No	No		
Yard Drain	Yes	No	No		
Kiddie Pool	Yes	No	Yes		
Buckets	Yes	Yes	Yes		
Flower vase	Yes	No	No		
Clutter	No	No	No		

Challenge Questions

Answer the following questions. Use the pictures as hints!



Male mosquitoes use this sense to find a mate:

hearing



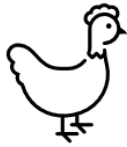
Female mosquitoes use this sense to find a host:

smell



Aedes mosquitoes lay their eggs in:

containers



Culex mosquitoes mostly feed on this type of animal:

birds



To help prevent mosquito breeding, you should dump out or throw away anything that can hold:

standing water



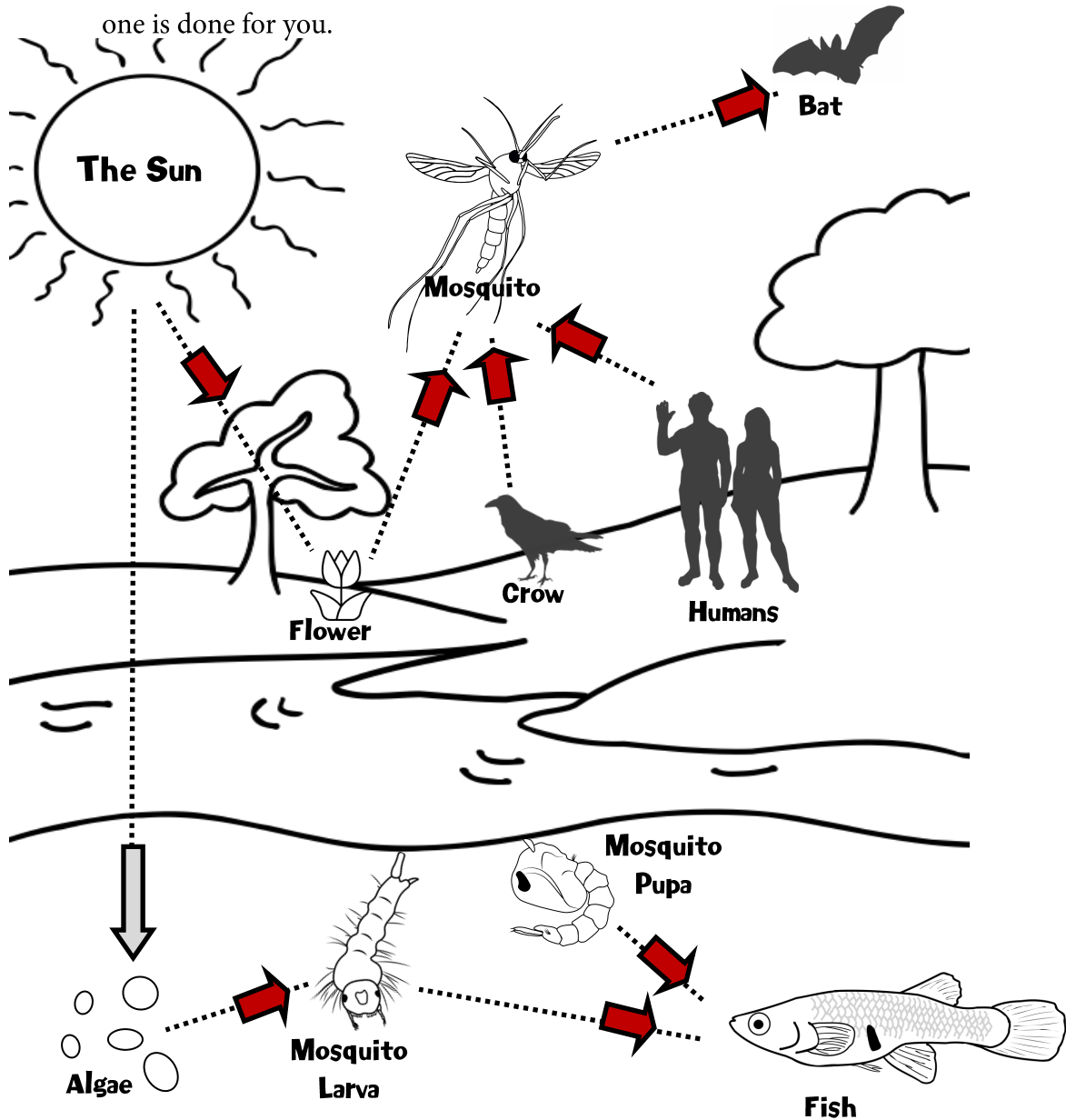
People can use this on their skin to protect against mosquito bites:

repellent

Female mosquitoes can also use sight to detect their hosts. When using smell, the female mosquito may be smelling for carbon dioxide (that we breathe out) or the smell of sweat. Mosquitoes can also sense body heat! *Aedes* mosquitoes lay their eggs in containers, but specific examples may be given here as answers as well. Not all mosquito repellents are created equal! When choosing a repellent, look for one that is EPA registered containing an active ingredient such as DEET, Picaridin, Oil of Lemon Eucalyptus, or IR 3535.

Food Web

Look at the food web below. For each line, draw an arrow on one end showing which way the energy moves in the system. The first one is done for you.

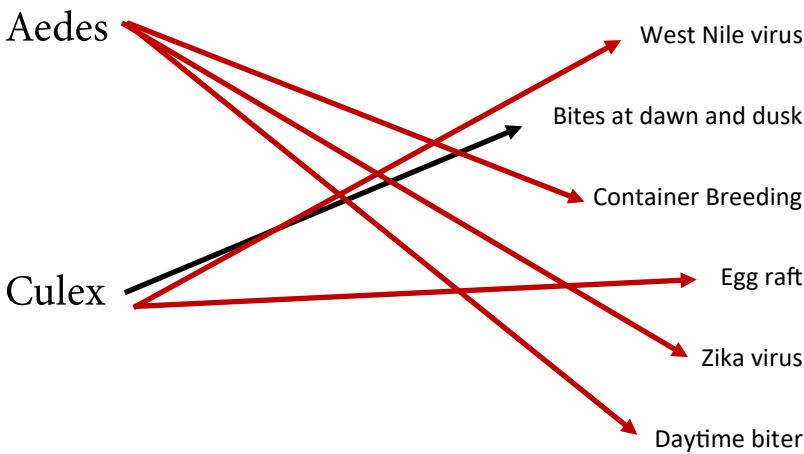


Energy in the food web moves from the sun to plants (and algae) then to herbivores and omnivores (like mosquito larvae). Mosquito larvae are eaten by predators such as fish and predatory insects like dragonfly larvae.

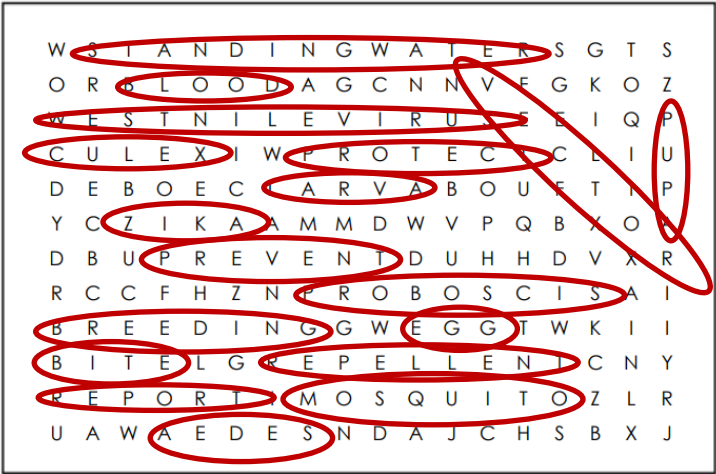
Flowering plants get their energy from the sun. Adult mosquitoes feed on nectar from flowers. Adult females also feed on blood from animal and human hosts to provide nutrients to their eggs. Insectivores such as bats and flycatchers feed on adult mosquitoes.

Matching

Match the type of mosquito (Aedes or Culex) to the correct words on the right



Word Search



Find the following words in the puzzle.
Words are hidden → ↓ and ↘ .

- | | | |
|----------|-----------|-----------------|
| AEDES | MOSQUITO | STANDINGWATER |
| BITE | PREVENT | VECTOR |
| BLOOD | PROBOSCIS | WEST NILE VIRUS |
| BREEDING | PROTECT | ZIKA |
| CULEX | PUPA | |
| EGG | REPELLENT | |
| LARVA | REPORT | |

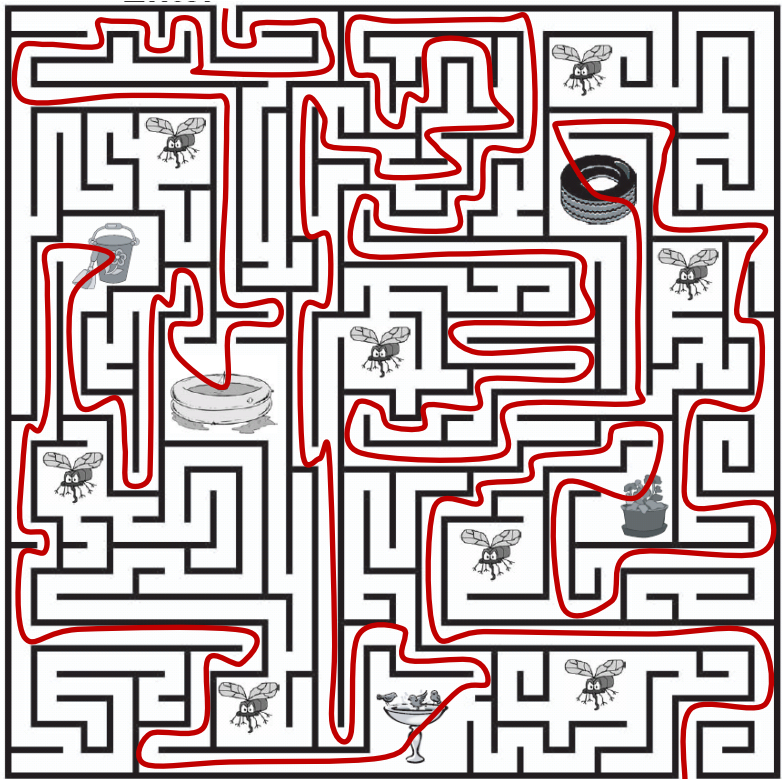
Aedes mosquitoes: Day biting mosquitoes that breed in containers of water and can spread Zika, dengue, and yellow fever viruses

Culex mosquitoes: Bite mostly at dawn and dusk. Lay their eggs in an egg raft floating on the water. Can spread West Nile virus.

Mosquito Maze

Go through the maze, dumping out all the sources of standing water. But try to avoid the biting mosquitoes!

Start



End

Careers in Vector Control

If you could work at the Vector Control Program, which job would you want to have? Why?

- Surveillance
- Control
- Ecologist
- Lab Scientist
- Outreach

Thank You!

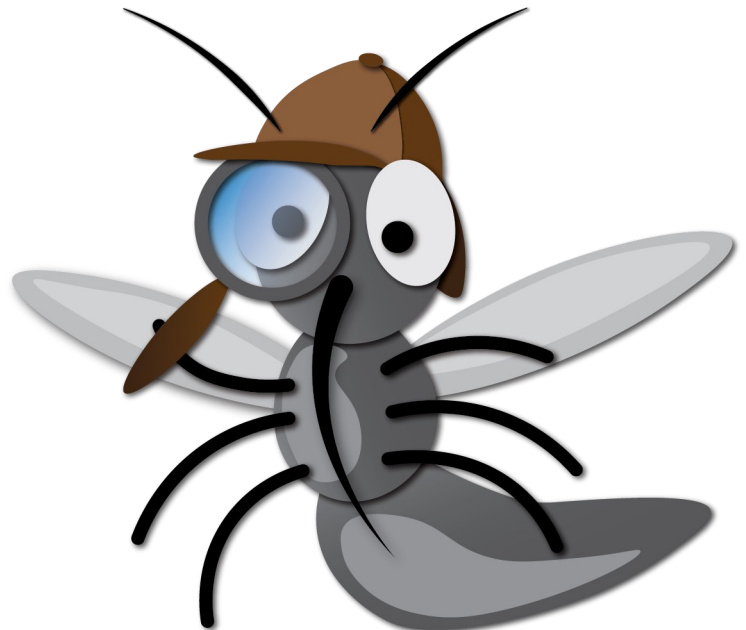
Thank you for participating in the Vector Control Program's "Let's Learn About Mosquitoes" School Program. We greatly appreciate your assistance in educating your students about mosquitoes and the diseases that they can transmit to people.

We would love to hear your feedback on the program. We have a short survey at bit.ly/MosquitoSchoolSurvey where you can let us know what you thought about the program. If you enjoyed our program, please spread the word. Many of our program sign-ups happen through word of mouth!

If you are experiencing mosquito problems at your school or at your home, please let us know! You can call the Vector Control Program at (858) 694-2888 or email us at vector@sdcounty.ca.gov to report mosquito problems or to request an inspection from one of our technicians. You can learn more about our program and services at SDVector.com

Thank you again for all that you do,

*The Vector Control Program
Outreach Team*



San Diego County Vector Control Program
(858) 694-2888 | SDFightTheBite.com

