



# MISSION MOSQUITO SCIENCE NOTEBOOK

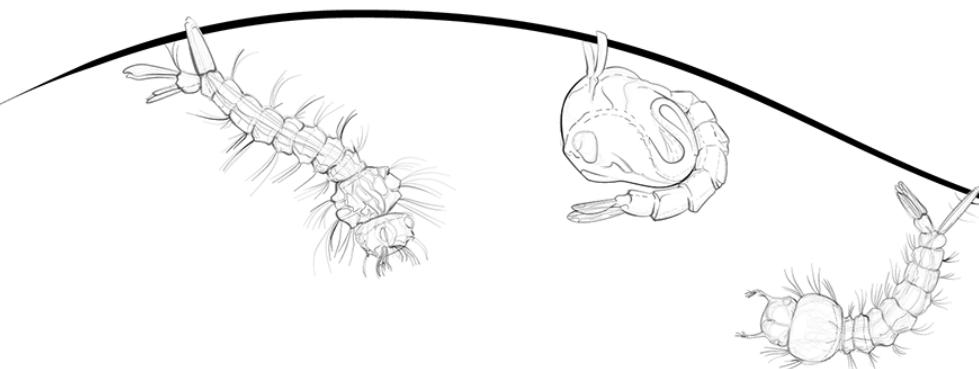
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Name

---

Date

... what is that  
*buzzing* sound?



# Mission Mosquito Science Notebook

## TABLE OF CONTENTS

**Introduction • 1**

**Meet the Mosquito • 2**

**Your Science Questions About Mosquitoes • 2 / 3**

### **Background Builders**

Mosquito Life Cycle • 4

Meet an Adult Mosquito • 5

Meet the Other Three Life Cycle Stages • 7

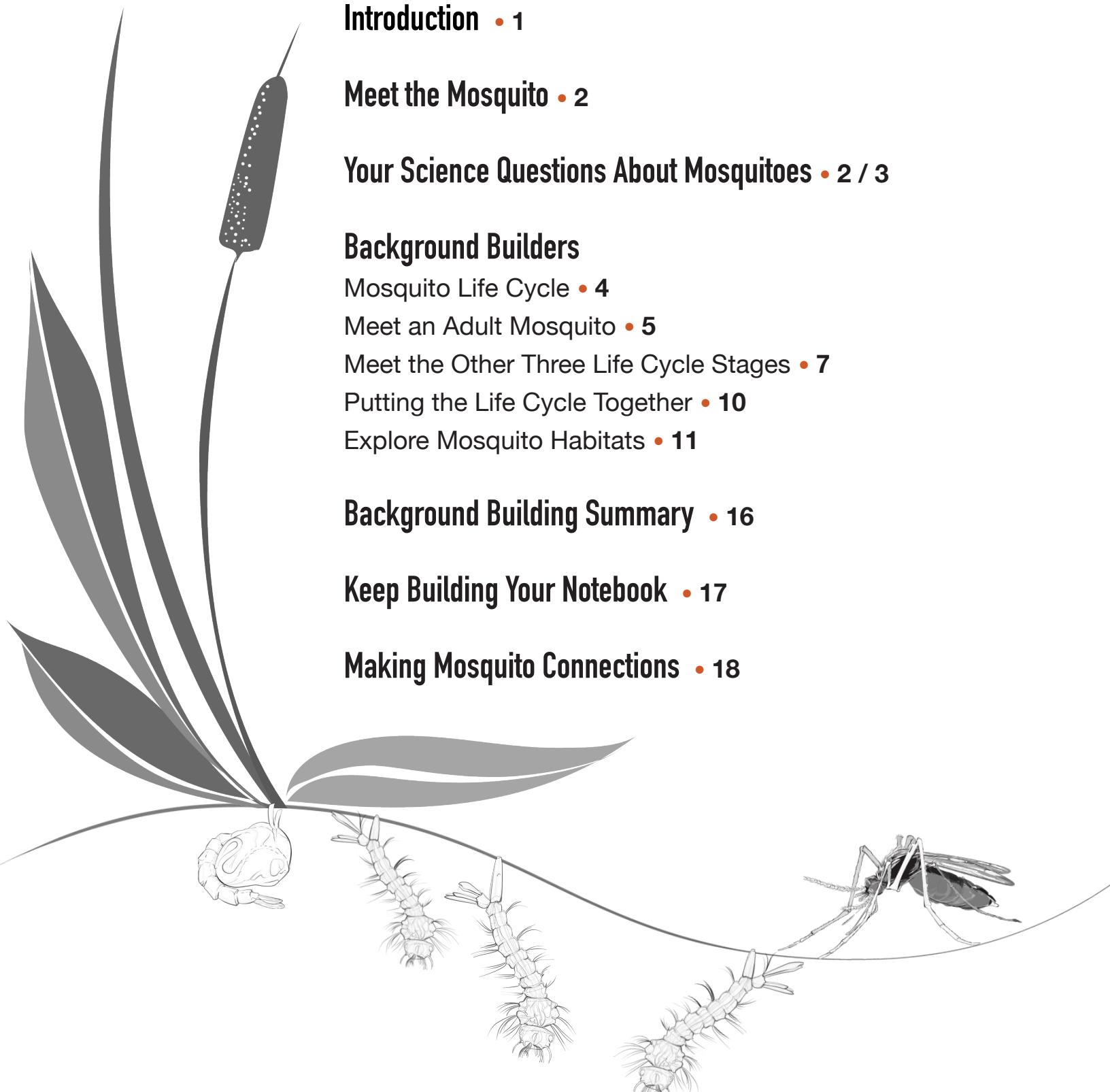
Putting the Life Cycle Together • 10

Explore Mosquito Habitats • 11

**Background Building Summary • 16**

**Keep Building Your Notebook • 17**

**Making Mosquito Connections • 18**



# ADD TO YOUR TABLE OF CONTENTS



# KEEP YOUR NOTEBOOK UPDATED!

- **Check** for new notebook sections at:  
<https://strategies.org/mosquito-notebook>
  - **Add** new sections to your notebook.
  - **List** new sections and page numbers in the **Table of Contents** on this page.



# INTRODUCTION

A notebook is a tool used by professional scientists and volunteer scientists (also called citizen scientists). As a tool, it is used to help accomplish a task. That task involves gathering and organizing observations, information, and data to solve a problem or answer a question.

## This is your science notebook

Your mission is to learn about, investigate, and contribute to science research on mosquitoes. To do this, you will need to think and work like a scientist. That means you need a notebook to record your questions and answers, develop and use diagrams and graphs, record and analyze data, write explanations and support your ideas, and gather, evaluate and communicate information.

## Your **Mission Mosquito Science Notebook** provides a space to:

- Learn mosquito science
- Collect relevant vocabulary
- Make drawings
- Generate questions
- Write about your ideas and experiences
- Plan investigations
- Record and analyze observations and data
- Construct explanations

Your goal is to begin this important research with some background information on mosquitoes in the front of your notebook. The notebook will grow as your work progresses. There will be many observations, investigations, and activities along the way.

## Have fun and be safe!

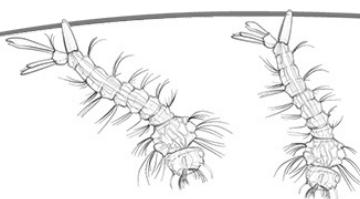
The one thing about mosquitoes that you probably know from experience is that they bite humans. Anytime you are outside with mosquitoes around:

- Protect yourself by wearing a long-sleeved shirt, long pants, and closed-toe shoes.
- Use an approved insect repellent (for example, one containing DEET or Picaridin).
- Always follow guidelines from your local officials.

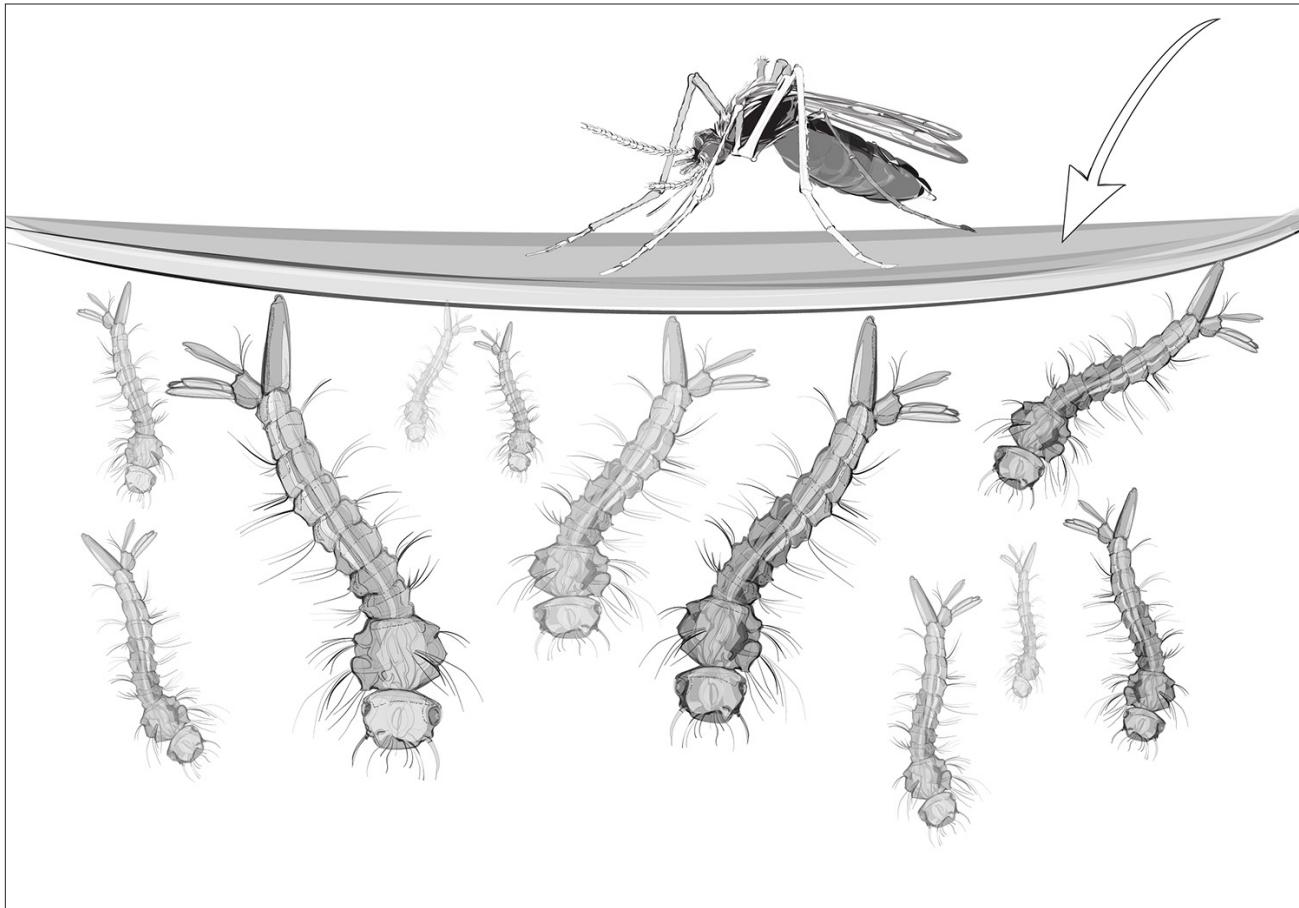
**For more guidelines on protecting yourself,** visit the Centers for Disease Control (CDC) at  
<https://www.cdc.gov/dengue/prevention/prevent-mosquito-bites.html>



Photo courtesy Otrell Edwards, Esq.



# Meet the Mosquito



**Do you recognize the creature at the top of this image?** It is standing on the surface of the water (the surface is marked by the arrow).

**Here is a big hint:** it is absolutely the deadliest creature on the planet.

Look at those things hanging down below the water surface. What are THOSE things?

**What are your scientific questions about the image?**

Write your scientific questions about the image by finishing the following sentences:

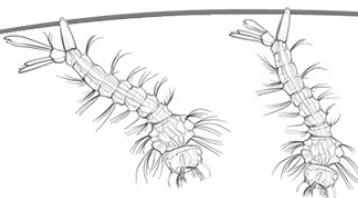
**1. I wonder** \_\_\_\_\_

\_\_\_\_\_

**2. I also wonder** \_\_\_\_\_

\_\_\_\_\_

*More questions on Page 3*



## ***More scientific questions about the Page 2 image***

**3. What if** \_\_\_\_\_

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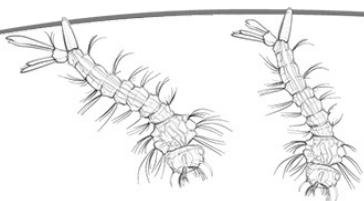
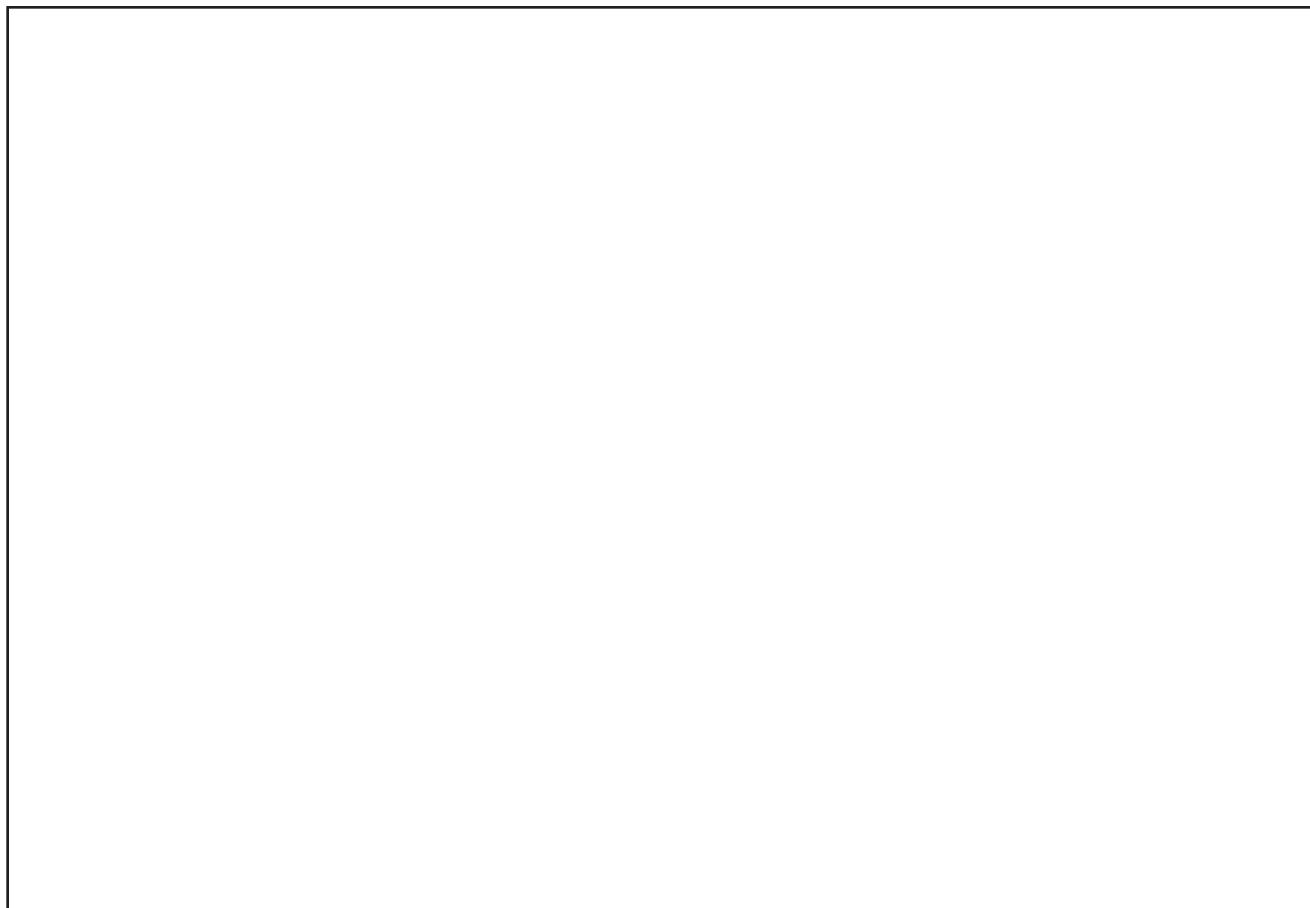
**4. Is it possible that** \_\_\_\_\_

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**5. They remind me of** \_\_\_\_\_

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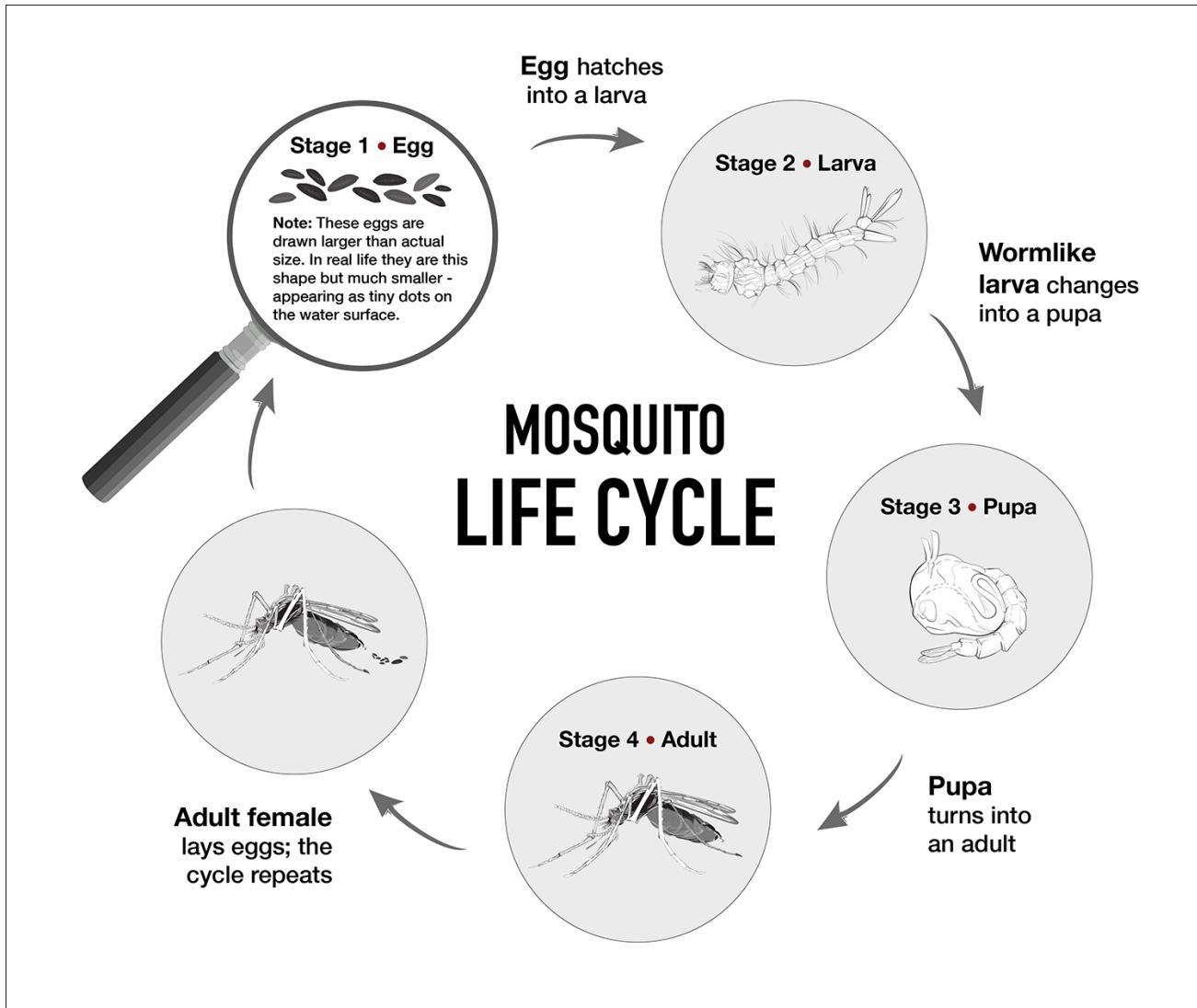
**Sketch something inspired by your scientific questions**



# Background Builders

## 1. MOSQUITO LIFE CYCLE STAGES

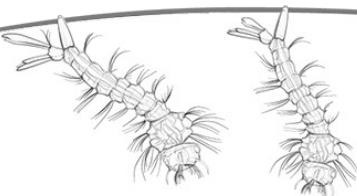
Did you know that mosquitoes go through a multistage (many steps) life cycle?



### VOCABULARY ALERT

**Larva (pronounced lar-vuh):** The immature form of a mosquito that hatches from the egg. It is long, thin, and segmented (looks more like a worm); it does not have legs or wings. It wriggles through the water. It breathes air. Larvae need lots of energy to grow, so they eat constantly - mostly algae and other microorganisms. The plural form of this word is **larvae (pronounced lar-vee or lar-vay)**.

**Pupa (pronounced pyoo-puh):** The immature form between larva and adult. The shape of a pupa resembles a comma. During this short stage (1.5 to 4 days long), the pupa changes into the flying adult mosquito. The pupa does not eat, but continues to breathe air, now through two tubes called "trumpets." The plural form of this word is **pupae (pronounced pyoo-pee or pyoo-pay)**.

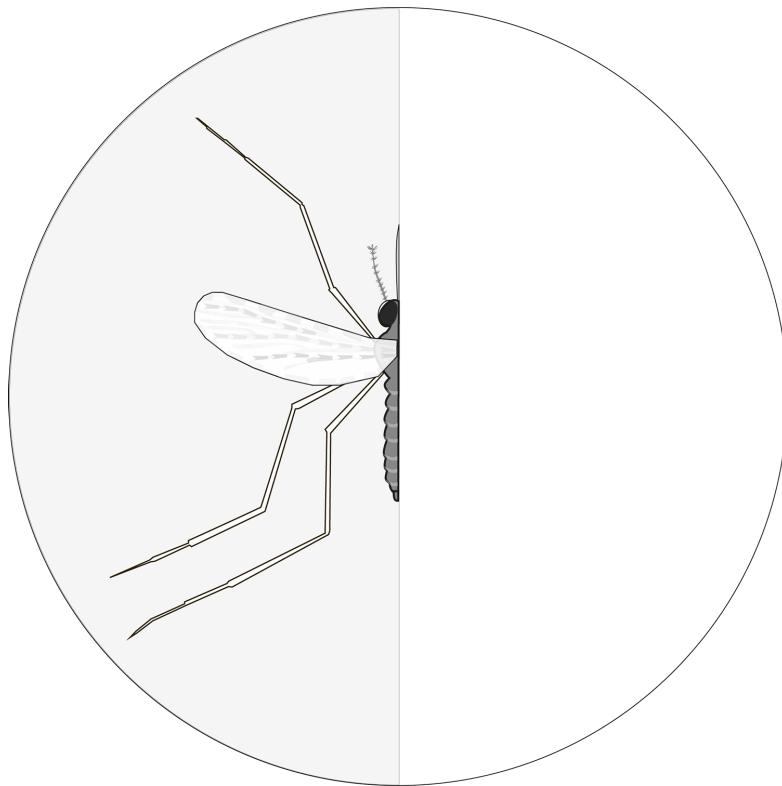


## 2. Meet an Adult Mosquito

You are probably most familiar with this stage. We will start here and work our way backwards.

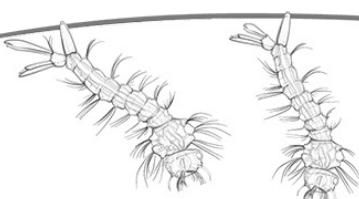
**But wait! Only half of the mosquito is shown in the drawing below!**

- **Take a few minutes to complete the drawing.** Start by paying close attention to the details of the shapes, sizes, colors, spacing, and origins (places where the part comes out of the mosquito's body.) Take your time to show these details in your drawing.
- **Also note the needle-like attachment** coming out of the top of the mosquito. This is the proboscis. It allows the mosquito to eat and to suck blood. It only has one of those. Although you may wish to make it "fatter" in your drawing, you should not draw a second one (you will learn more about the proboscis in an upcoming section of the notebook).
- **The mosquito's body is divided into three main sections:** head, thorax (just behind the head), and the abdomen (long segmented part). **Label the following parts:** wings, antennae, proboscis, legs, head, thorax, and abdomen.



**Now that you've observed and completed the drawing, answer the following questions:**

- How many wings does a mosquito have? \_\_\_\_\_
- To what section of the mosquito's body are the wings attached? \_\_\_\_\_
- How many antennae does a mosquito have? \_\_\_\_\_
- How many sections (or main body parts) does a mosquito have? \_\_\_\_\_
- How many legs does a mosquito have? \_\_\_\_\_
- To what section of the mosquito's body are the legs attached? \_\_\_\_\_
- Mosquitoes are insects. Therefore, all insects must have this number of these characteristics:  
Antennae = \_\_\_\_\_ Body sections = \_\_\_\_\_ Legs = \_\_\_\_\_



# Just like you, mosquitoes must eat to survive.

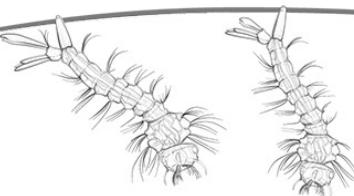
- What do you think mosquitoes eat? \_\_\_\_\_
- You might have written that all mosquitoes drink blood. Only some mosquitoes will bite an animal to get blood. Blood is NOT their food. They need blood because it is important for the development of eggs. So, which mosquito gender (male or female) bites to get blood?  
\_\_\_\_\_
- All mosquitoes (males and females) must eat or drink something to get the energy they need to survive. What do you think all mosquitoes might eat? \_\_\_\_\_
- Mosquitoes depend on plants for food; they eat plant nectar. Can you name any other insects that eat nectar? \_\_\_\_\_



Photo courtesy of James Gathany, CDC Public Health Image Library (PHIL), #7861.

<https://phil.cdc.gov/details.aspx?pid=7861>.

- Is this an image of a male or female mosquito? \_\_\_\_\_
- In the space below, explain how you know (*HINT: If you printed this notebook in black ink, the colors are missing: the mosquito is standing on something skin-toned, the background is green and the lower abdomen of the mosquito is red.*)



# 3. Meet the Other Three Life Cycle Stages

## More about the life cycle

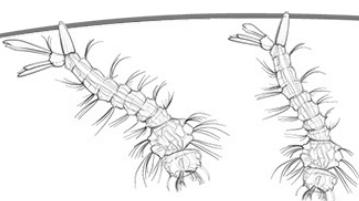
Mosquitoes go through a complete metamorphosis that includes four stages: egg, larva, pupa, and adult. You just learned about the adult stage, now let's look at the other three.

### VOCABULARY ALERT

**Metamorphosis:** *In biology, the process of changing from an immature form to an adult form in two or more distinct stages (breaking down the word: “meta” means change; “morph” means shape.)*

### Answer these questions to learn more about life cycles:

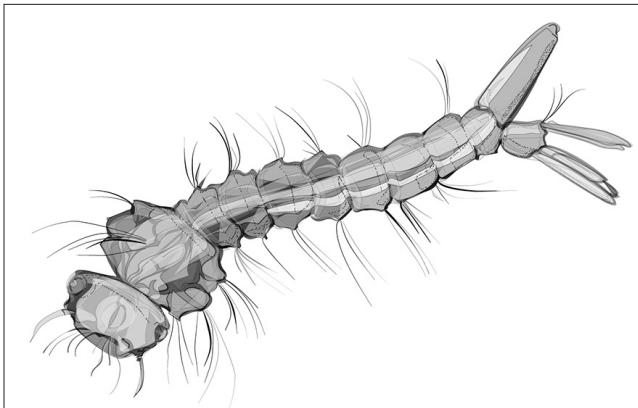
- As with many organisms, the **first stage** of the life cycle of a mosquito begins when an adult female lays an \_\_\_\_\_.
- Based on the image on **Page 2**, where in the environment do you think she lays them?
- Why do you think she needs to lay her eggs in that type of environment?
- Most female mosquitoes lay eggs directly in standing water (water that is not flowing) or just above the surface of the water.  
Why do you think the water must be “standing” (not flowing)?
- She can lay up to 300 eggs at a time. Some species lay their eggs one at a time; some species lay them in groups that look like a raft. Either way, mosquito eggs are very small; you would need a magnifying glass to see them.  
Why do you think that mosquitoes lay so many eggs at a time?



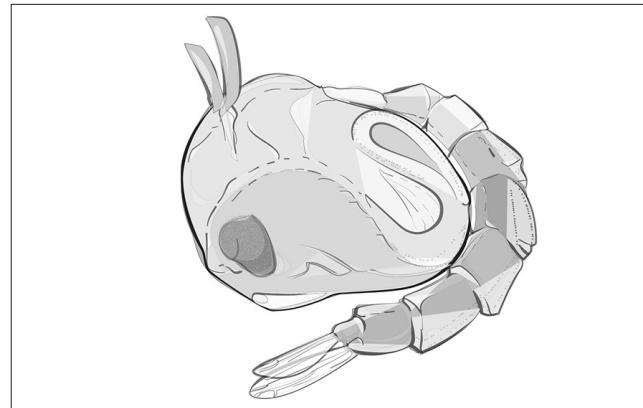
# Make some scientific observations

After a few days, the eggs hatch into larvae - the second stage. You have already seen that stage in the first picture in this notebook (**Page 2**). Depending on the species and air/water temperatures, the larvae will soon (within days) turn into pupae, the third stage.

**Below is a drawing of a larva (second stage); on the right is a drawing of a pupa (third stage).**



Larva



Pupa

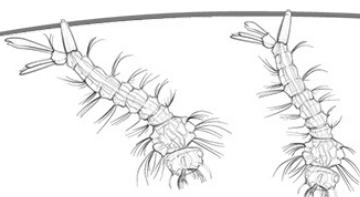
List two ways the larva and pupa look alike	List two ways the larva and pupa look different
1.	1.
2.	2.

A larva needs food to eat and air to breathe. A larva has a mouth; it eats microorganisms that live in the water around it. Most species, or kinds, of mosquitoes have a special tube called a siphon located at the other end of its wormlike body. The siphon looks like a straw; it must be at the surface of the water for the larva to get air.

## VOCABULARY ALERT

**Siphon:** *The siphon is a breathing tube. Because mosquito larvae spend their time underwater, the siphon breaks the surface of the water and allows them to breathe air.*

**Trumpet:** *The breathing tube used by the pupa. They occur in pairs and are found near the head.*



# Make some more scientific observations!

Look again at the image on **Page 2**. Notice that some of the larvae are not floating at the top of the water with their siphon at the surface.

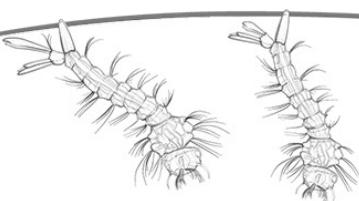
- What do you think would make a larva leave the surface (where it is getting the air it needs to breathe) and go deeper into the water? List two to three ideas.

- After just a few days as a larva, it develops into a pupa. Pupae also live in the water. During this short stage (1.5 to 4 days) it forms the body parts that will allow it to survive in the air as an adult. A pupa does not eat.

If they do not eat, how do you think they survive?

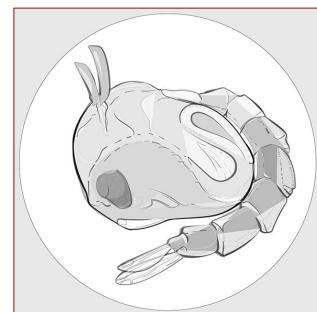
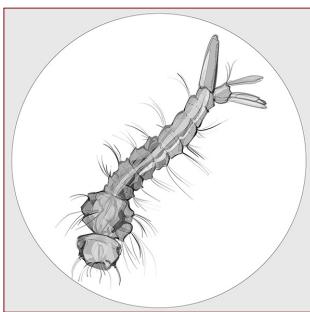
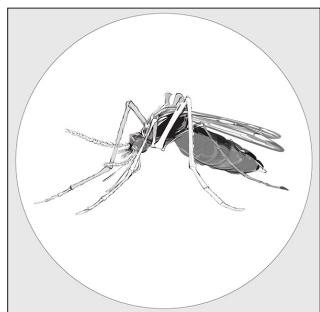
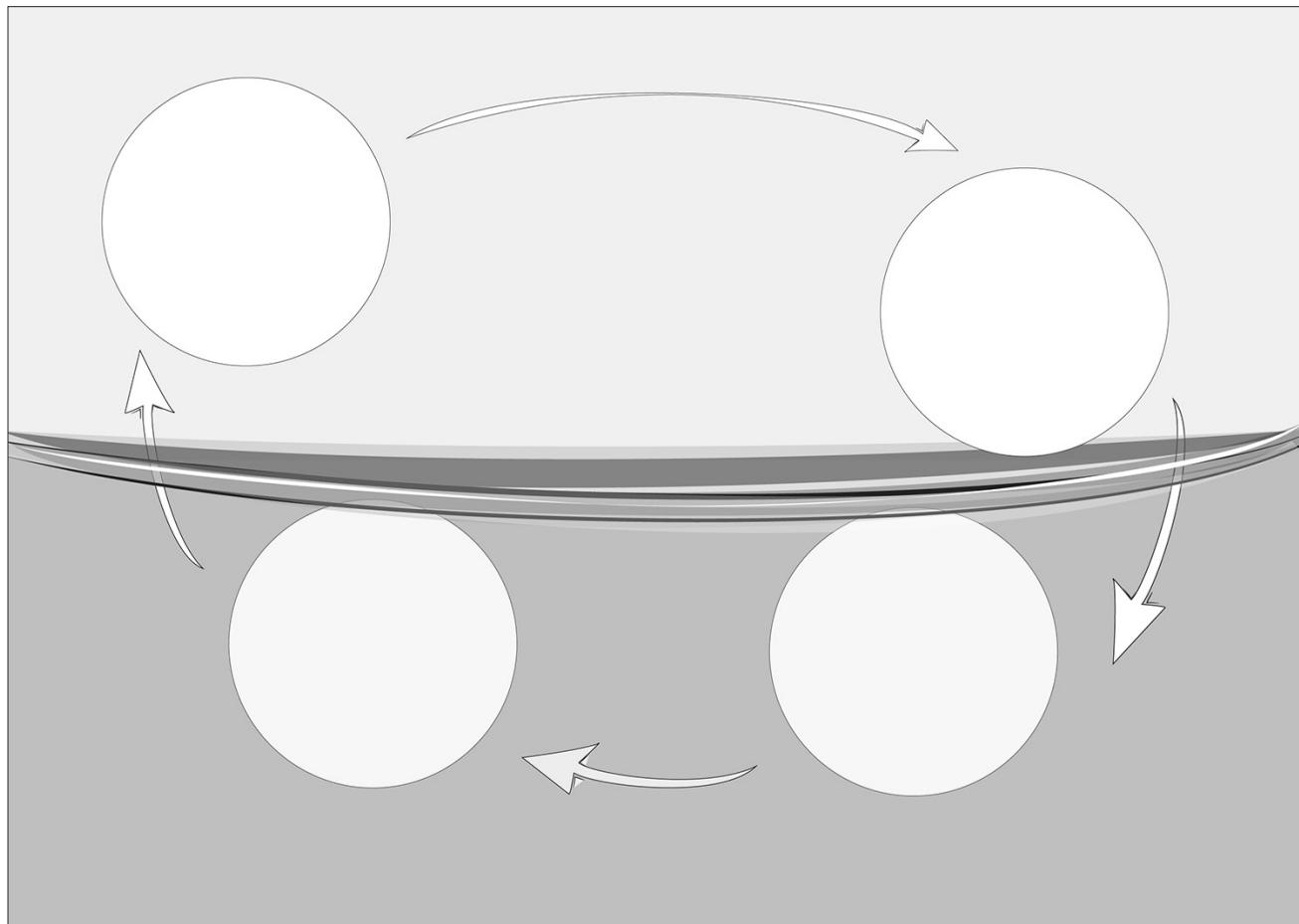
- If you wanted to find out if one of your ideas is the correct reason, what would you do to test it?

**Practice your scientific drawing skills by drawing a pupa and a larva in the box below.**



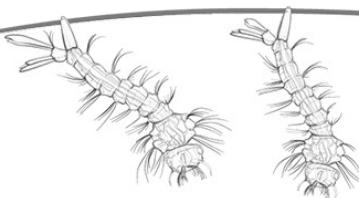
## 4. Putting the Life Cycle Together

The diagram below represents the mosquito life cycle, with arrows showing the sequence of stages and empty circles representing the actual stages. The four circles below the diagram show what the mosquito looks like in each of the four stages. Put the stages of the mosquito life cycle in order, paying attention to the environment where that stage is found.



### Where on land, or in the water, do mosquitoes develop?

Draw a line from the circles at the bottom (with the images of the mosquito) to the empty circle on the diagram in which you would find that stage of the mosquito.



# 5. Explore Mosquito Habitats

Observing (through multiple senses) is an essential science skill - as well as an essential life skill. Observing can be done from great distances (using satellite instruments) to very up-close (using magnifying lenses). For example, NASA scientists observe and analyze land cover and water resources shown in satellite images to discover locations on Earth that might support mosquito populations. You constantly use ground-level observations to learn about your immediate environment. You will soon use those observations to find a place in which mosquito larvae can live. Even female mosquitoes use observations of their surroundings to pick a good spot to lay their eggs.

## Think like a mosquito for a moment.

What would a female mosquito look for in a “good spot” to lay her eggs? List 3-5 characteristics of a place that she might consider.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

## Observe the human habitat images on Pages 12, 13, and 14.

On the next three pages are images of three different human habitats. Take a few moments to observe each image carefully. The observation skills that you are practicing will help you in your upcoming research.

To do research on mosquito larvae, you must know where to find them. You are looking for places within each image (on **Pages 12, 13, and 14**) where a female mosquito could lay her eggs.

After closely examining all three images (do not answer the questions below each image yet), complete these sentences below:

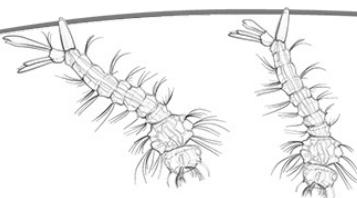
**I wonder ...** \_\_\_\_\_  
\_\_\_\_\_

**What if ...** \_\_\_\_\_  
\_\_\_\_\_

**Is it possible that ...** \_\_\_\_\_  
\_\_\_\_\_

## Hunt for mosquito habitats.

Now go to the individual images on **Pages 12, 13, and 14** and answer the questions listed below each image to complete this notebook mission.



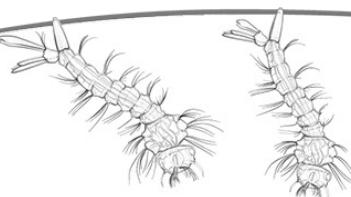
# Where Might You Find Mosquitoes in this place?



**1. Circle those items or places within the image** that you predict might contain mosquito larvae.

**2. Complete the table below. Note:** At least one of listed must be a natural container, and at least one must be an artificial (human-made) container.

Name of the item or place you circled	Reasons that a female mosquito might choose this place to lay her eggs

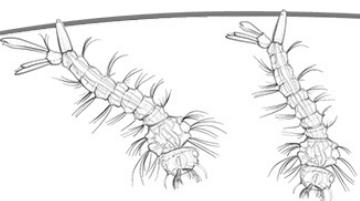


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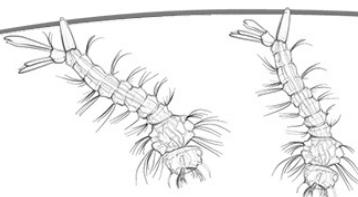


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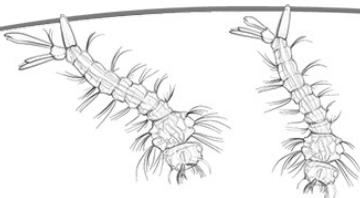
Name of the item or place you circled	Reasons that a female mosquito might choose this place to lay her eggs



# How about mosquitoes in your own home?

In the space below, draw pictures of two items around your own home that could be used by female mosquitoes to lay eggs. Explain why she would use that item.

Drawing	Why would she lay her eggs here?
1.	
2.	



# Background Building Summary

## Your research is just beginning!

You have completed the first stage of your mosquito mission. You have built your background in mosquito biology and related vocabulary. You have analyzed and you have practiced drawing.

You have recorded some observations, ideas, and questions. All of these should inspire even more questions about mosquitoes.

In the table below, write down your questions to record them. We will return to these later.

**What questions do you now have about mosquitoes that you would like to explore?**

1.

2.

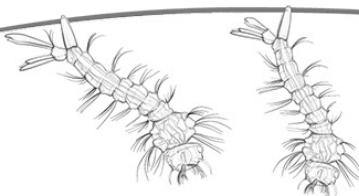
3.

4.

5.

### Share what you've learned!

Be sure to share the work that you've done with others, for example, parents, grandparents, and friends. Check the **GLOBE Mission Mosquito Science Notebook** page for additional investigations: <https://strategies.org/mosquito-notebook>



# Keep Building Your Notebook

Here are some ways that you can continue to build your *Mission Mosquito Science Notebook*, add to your knowledge, and improve your science skills.

- **Discover** additional mosquito investigations at <https://strategies.org/mosquito-notebook>
- **Check** the GLOBE Observer website for other resources related to mosquitoes. Go to <https://observer.globe.gov/do-globe-observer/mosquito-habitats/resource-library> for additional information, along with educational games and videos.
- **Build** your background on mosquitoes by reading or listening to books that feature stories and information about mosquitoes. Here are book suggestions to get started; find more at your local public library or on our list at: <https://www.worldcat.org/profiles/MissionMosquito/lists/3869345>

**Zika Zine: The Story of Three Aedes Mosquitoes and the Zika Within Them** by Lisa S. Gardiner, <https://scied.ucar.edu/zikazine>

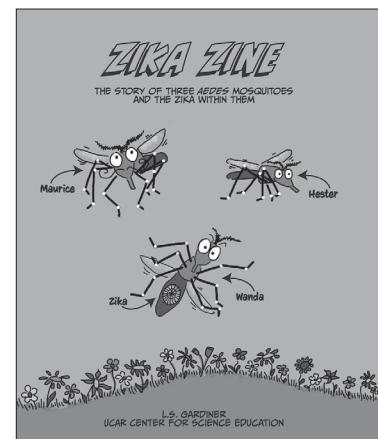
**Mosquitoes Don't Bite Me**, by Pendred Noyce

**Fever 1793**, by Laurie Halse Anderson

**The Fever: How Malaria Has Ruled Humankind for 500,000 Years** by Sonia Shah

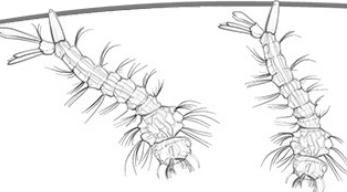
**NASA GLOBE Observer:** The most important tool in your mosquito research is the GLOBE Observer free mobile app. Future investigations will involve using it to document mosquito habitats. GLOBE Observer is part of the international GLOBE Program and is designed for volunteer scientists (like you) who wish to contribute to Earth system science research. **Note:** Those under 13 years old should use the app with an adult.

**Download the app** at <https://observer.globe.gov/about/get-the-app>. The app includes step-by-step instructions. You can also learn more by going to <https://observer.globe.gov/do-globe-observer/mosquito-habitats/taking-observations>



WHY DOES NASA WANT  
**MY MOSQUITO  
OBSERVATIONS?**

**Mosquitoes can't be seen from satellites in space ...** but the warm, moist conditions they prefer can be observed by NASA satellites. Climate and weather conditions can suggest to scientists where to expect spikes in mosquito populations during the year, but your mosquito observations at ground level can verify those population changes. By reporting possible mosquito habitats using the **GLOBE Observer** app, you are helping NASA scientists doing broad scale satellite-based research with local ground-based observations.



# Making Mosquito Connections

Now I understand why \_\_\_\_\_

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I'm changing my mind about \_\_\_\_\_

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I can imagine \_\_\_\_\_

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I'm beginning to think \_\_\_\_\_

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It is worth remembering that \_\_\_\_\_

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The one thing I found most interesting is that \_\_\_\_\_

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The one thing about mosquitoes that matters to me is \_\_\_\_\_

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