Trapping Mosquitoes

Almost everyone in the world has been bitten by a mosquito. Although most species of mosquitoes are just a nuisance, some spread pathogens, like **viruses** or **parasites**, that cause **infectious diseases**. For most **viruses** spread by mosquitoes, no vaccines or specific medicines are available.

Terms to Know

Citizen scientists	people — young or old — who help collect data for research projects conducted by professional scientists
Epidemiologist	a scientist who studies how disease spreads and can be controlled
Infectious disease	any disease caused by a pathogen (germ) such as a **virus**, bacteria, **parasite**, or fungus
Outbreak	a sudden occurrence or increase of something
Parasite	a small organism that gets its food and shelter from others
Public health	the science of protecting and improving the health of people and their communities
Vector	an insect that transmits disease
Virus	a tiny, infectious particle that lives inside living organisms

Understanding Mosquitoes

Mosquitoes bite during the day and night, live indoors and outdoors, and search for warm places as temperatures begin to drop. To survive cold temperatures, some mosquitoes hibernate in enclosed spaces, like garages, sheds, and under (or inside) homes. Except for the southernmost states in North America, mosquito season starts in the summer and continues into fall.

Think About It

1. What attracts mosquitoes?
2. At what times of day have you seen mosquitoes?
3. Where do you see mosquitoes most in your community?

Mosquitoes and the Centers for Disease Control and Prevention (CDC)

CDC has been on the frontlines of mosquito population control for over 75 years. In fact, it was the need to protect the public from the mosquitoes that carry malaria that gave CDC its start.

Malaria is an infectious disease caused by the *Plasmodium* **parasite**. The **parasite** is carried by mosquitoes, which act as **vectors** by transferring the **parasite** to humans through mosquito bites. Malaria enters a person's bloodstream and causes the person to experience flu-like symptoms, including fevers and chills. Untreated, people with the disease can experience more severe symptoms and die.

Back in the 1940's, states in the southern United States were experiencing a significant **outbreak** of malaria. The timing could not have been worse; the United States was in the middle of World War II, and soldiers from the United States trained in the southern states where the disease was spreading. Previous research had shown that the disease was carried by mosquitoes, so the federal government was desperate for a way to control these insects.

Dr. Joseph Mountin of the Public Health Services Bureau of State Services (now known as the United States Public Health Service), was given the job of creating a task force to battle the mosquito populations. He chose Atlanta as a base since it had been hit hard by the disease and served as a transportation hub for the country. The department, the Malaria Control in War Areas (MCWA) unit, was extremely effective in ridding the southern states of the mosquitoes causing the disease.

Realizing there was a need to have a unit dedicated to researching and reducing the spread of **infectious diseases** like malaria, Dr. Mountin pushed to continue and expand the program, and from his efforts, CDC was born! Today, CDC continues to work with local, state and national health officials to provide advisement, protocols and ground support for **public health**.

Think About It

1. What is the goal of the United States Public Health Service?
2. Why was it important that the MCWA be located in the southern United States?
3. How did controlling malaria change the way we handled **public health** issues?

From the Expert:

Listen to a breakdown of how mosquitoes are bred and used in tests to determine if they are becoming resistant to the insecticides used in nets and spray to prevent malaria. CDC's malaria expertise and global partnerships have helped save millions of lives. https://youtu.be/xabI2Oxl6-k

Call to Action

As a **citizen scientist**, you can assist CDC in monitoring the mosquito populations in your community by following these three steps:

1. Create and implement a mosquito management plan. Mosquito management plans outline the steps a person or communities can take to reduce disease carrying mosquitoes in the area. Your plan could help reduce disease carrying mosquitoes, which in turn could reduce levels of **vector-**borne disease. Your plan can be a combination of activities, like removing places mosquitoes can breed or creating a plant friendly spray that wards off the mosquitoes.

2. Build a mosquito trap. By building a mosquito trap, you will be able to collect and count the eggs laid by mosquitoes over a set period of time. You can then share this data with **epidemiologists,** who will use the information to determine the growth and location of mosquito populations.

3. Share your findings. The data you collect from your traps will inform CDC and its partners of the levels of mosquito populations in your area. Your plan can also give CDC ideas to share with the public, so that other **citizen scientists** can follow in your footsteps.

Why Participate? A Message from CDC

Mosquito control and prevention will work best with public awareness and support. Because of this, CDC uses various ways to educate the public about the role mosquitoes play in transmitting disease, including this activity. It is important for each person to have a good understanding of mosquitoes, the benefits realized from their control and the role people have in preventing certain mosquito-borne diseases.

As a **citizen scientist**, you are now equipped with some of the knowledge CDC shares with the public. You can help further spread information about mosquitoes by sharing what you've learned with your peers, continuing your work to keep down mosquito populations, and leading your peers in their own investigations. Feel you need support to share CDC's message? More information can be found at https://www.cdc.gov/mosquitoes/index.html.

Think About It

1. What location will you use for your trap?
2. How often will you need to check your trap?
3. How will you record the data from your trap?

Create a Mosquito Management Plan

The scientific method is a great tool to use to create a plan to address mosquito populations in your own yard. Within it you can track your investigation. Use the flow chart below to think out your plan. Record your answers in a composition notebook. You can also use this notebook to record your research.

Ask a question

Describe the question you are trying to answer. There are several questions you could use to guide your investigation:

- What does the mosquito population look like in my area?
- Where do mosquitoes gather in my yard?
- What is a way to reduce mosquito populations?

Do background research

Use the internet to find reference materials about the topic. Check out these helpful links from CDC.

- https://youtu.be/5eY2XTQegPM
- https://www.cdc.gov/zika/prevention/controlling-mosquitoes-at-home.html

Construct a hypothesis

Make a prediction about the results from an experiment. Try using an if/then statement format.

- If _____ (I do this), then _____ (this) will happen.
- Ex: If I use eucalyptus oil in a spray, then the mosquito population in my yard will be reduced.

Test with an experiment

Conduct your experiment.

- Part 1: Build a trap and collect mosquito eggs from your trap.
- Part 2: Implement management plan from your hypothesis.
- Part 3: Use the trap again to collect mosquito eggs to count.

Analyze data

Examine your data and look for patterns in the results.

- How many eggs did I trap during the first vs. second week?
- What is the difference between the two?

Draw conclusions

Interpret the patterns in the data to determine what it means.

- Did your mosquito management plan work? Why or why not?
- What parts of your plan would you repeat?
- What parts of your plan would you change?
- What advice do you have for other **citizen scientists**?

Communicate results

Share your information with others!

- Share data with **citizen science** groups.
- Use social media to share with CDC accounts listed.
- Tell others about your experimental results!

Build a Mosquito Trap*

Tools of the Trade

In order to trap mosquitoes, you will need to design and build an ovitrap. The word ovitrap comes from two words - ovi (meaning egg) and trap (meaning, well, trap). You will need the following materials:

Cups: 16 oz party cups (your choice of color or clear)

Ovipaddle: 6" jumbo craft sticks

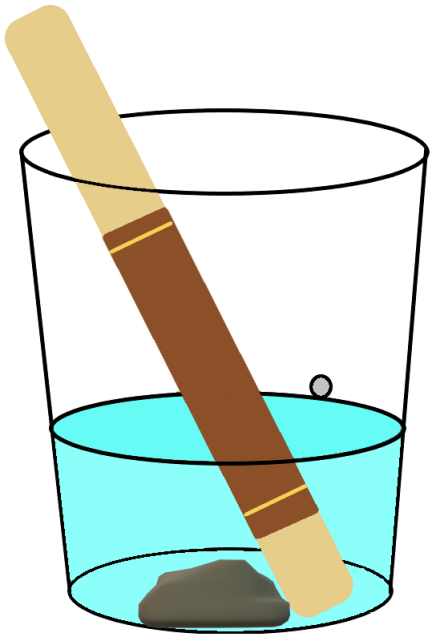
Ovipaper: 8" unbleached paper towel

Water: Ovitraps work best with dechlorinated water. To dechlorinate tap water, collect the tap water and allow it to air out for several days before the experiment.

Other Tools: power drill, ruler, stapler or rubber bands, permanent marker, insect repellant

Prepare the Cup

1. Using a ruler, measure the cup from bottom to top. Use a permanent marker to make a small line at the 3" mark.
2. Creating the trap requires the use of a power drill. You may need an adult's help to drill or on top of the mark. Carefully drill a hole at the mark.



Prepare the Ovipaddle

3. Cut the paper towel to 6" in length.
4. Wrap the cut paper towel around the craft stick. Secure the paper towel to the stick using staples or rubber bands at the top and bottom of the stick.
5. Use the permanent marker to label the ovipaddle with your initials.

Place the Trap

Expert Tip: When setting your trap, be sure to protect yourself from mosquito bites. Wear long-sleeved shirts and long pants and use an EPA-registered insect repellent before beginning.

6. Find a space outside your home where your ovitrap won't be disturbed. It should be a flat, shady spot that you can easily access. *Tip: Add a rock to the bottom of your cup to prevent it from blowing over in strong winds.*
7. Label the ovipaddle with the date. Fill the cup to the hole with water and place the ovipaddle in the cup.
8. Place the ovitrap in your selected spot. The cup will remain in this spot for a week.

**Instructions adapted from Smithsonian's Mosquito!*

Implement a Mosquito Management Plan

You will conduct data collection over two weeks. The first week, you will get a baseline- a measurement of how large the populations were before you implemented your plan. Then you will make some changes to the environment to see how they affect the number of mosquitoes captured in the second week.

Week 1 Data Collection

1. Check the ovitrap once a day to ensure the water level is the same. If the water is below the hole, refill the cup. If the cup has filled past the hole, carefully pour the excess out, being sure not to disturb the paddle.
2. At the end of week 1, remove the ovipaddle from the cup. Take photos of the ovipaddle and count the eggs on the ovipaddle. Print or draw the table below and record the information in the table.

DATA TABLE

Container	Location	Dates	# of Eggs
___Black Cup ___Dark Cup ___Light Cup ___Other (describe)	___Full Sun ___Full Shade ___Partial Shade	Week 1: ___/___/___ - ___/___/___	
		Week 2: ___/___/___ - ___/___/___	

Mosquito Control Measures

At the start of Week 2, you will implement your plan. Some ideas to reduce populations include:

- Get rid of any standing water around your yard.
- Spray outside your house with a safe pesticide- a chemical used to kill insects. You will need to choose wisely if you use this method, because you do not want to kill any beneficial insects.
- Clear areas where mosquitoes make their nests.
- Plant mosquito repelling plants, like lemongrass and marigold.

You will need to determine how often you need to take prevention steps. Be sure to take notes on what your plan includes, how often you do it, and where you do it. This way other **citizen scientists** can follow your steps.

Week 2 Data Collection

When you collect data for week 2, reset your ovitrap.

1. Create a second ovipaddle and mark it with the date.
2. Place the ovitrap back in the same flat, shady spot that you can easily access.
3. Check the ovitrap once a day to ensure the water level has not changed.
4. At the end of week 2, remove the ovipaddle from the cup. Take photos of your ovipaddle. Count the eggs on the ovipaddle and record the information in your data table. Feel free to continue the experiment for several weeks to gather more complete data. You might also choose to repeat the experiment again while changing variables such as cup color, amount of water, sun exposure, etc.

Example Data Table

DATA TABLE

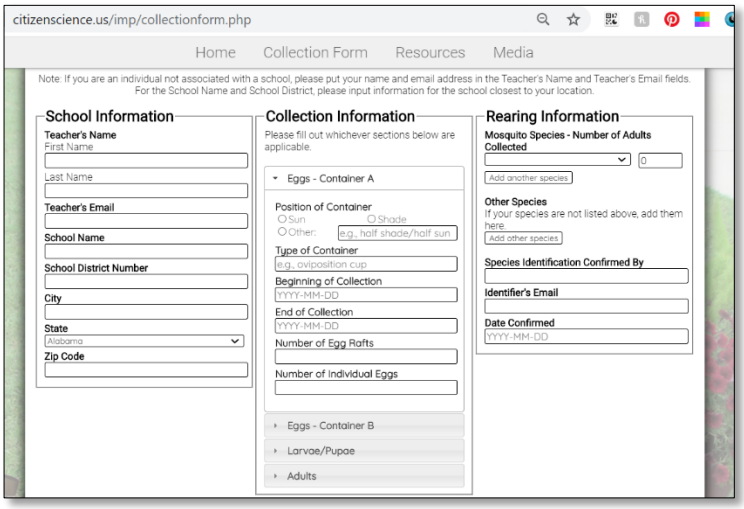
Container	Location	Dates	# of Eggs
X Black Cup ___Dark Cup ___Light Cup ___Other (describe)	___Full Sun X Full Shade ___Partial Shade	Week 1: 6/22/2020 – 6/28/2020	35
		Week 2: 6/29/2020 – 7/5/2020	21

Share Your Findings

The most important part of this investigation is to share the data you collected. There are several ways you can share your data. Here are a couple of examples:

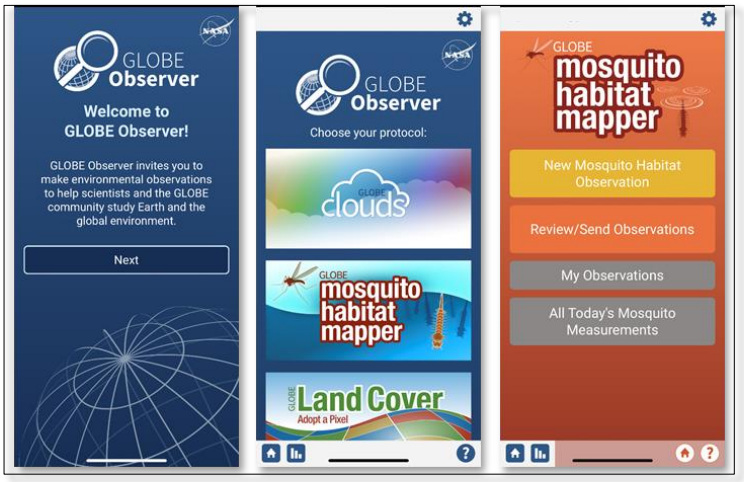
The Citizen Science Invasive Mosquito Project (http://www.citizenscience.us/imp/index.php)

This project was designed to collect data from around the United States about mosquito populations. To share your data, you will need to go to the "Collection Form" page and follow the steps to complete it.



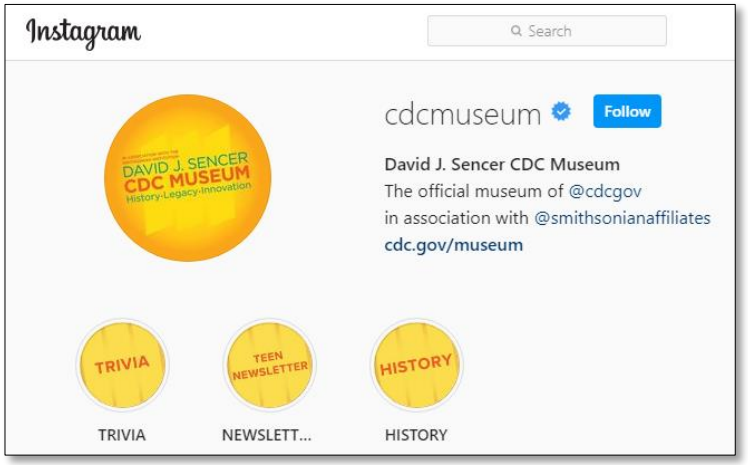
The GLOBE Observer: Mosquito Habitat Mapper (https://observer.globe.gov/do-globe-observer/mosquito-habitats)

This app allows you to upload your information to an international database, keep track of your observations, and review the measurements made by others. To share your data, create an account after downloading the app. The app will then provide step-by-step directions to upload your data.



The David J. Sencer CDC Museum (https://www.cdc.gov/museum)

The David J. Sencer CDC Museum uses award-winning exhibits and innovative programming to educate visitors about the value of public health and presents the rich heritage and vast accomplishments of CDC. Your demonstration could be a valuable contribution! Share your demonstration with the CDC Museum on Instagram using **@CDCmuseum**.



Name: _____

Reflections

Now that you have completed this investigation, think about what you learned from your research and experiment. Answer the questions below.

1. What are **vector-**borne diseases? Why is there a global effort to get rid of these diseases?

2. What is the relationship between mosquito habitats and **vector-**borne diseases?

3. How do the choices you make to address **vector-**borne diseases as an individual affect **public health**?

4. How does reducing mosquito populations affect the environment?

5. Should aerial sprays be used to control mosquitoes? Why or why not?

6. Should all mosquito habitats be eliminated? Why or why not?