

# Project Wild – Insect Inspection

## Research Activity



This unit expands on the explorations in “Insect Inspection” through a field investigation of mosquitoes. Mosquitoes are an engaging and relevant context for exploring fundamental biological concepts, ecological principles, and societal issues, while also promoting critical thinking, scientific inquiry, and awareness of global health challenges. In this investigation, part A, students will conduct a field investigation, identifying potential mosquito habitats in and around their school. In part B, students will build mosquito larvae traps, and examine and photograph larvae. Optionally, the mobile app, GLOBE Observer Mosquito Habitat Mapper can be used to upload data for future work in a research project.

*Review the following ecological concepts.*

### **The mosquito’s ecological niche**

Mosquitoes serve as both predators and prey within ecosystems. Mosquito larvae are consumed by various aquatic organisms such as fish, tadpoles, and aquatic insects, contributing to nutrient cycling and energy flow within food webs. Additionally, adult mosquitoes are preyed upon by birds, bats, spiders, and other insects.

### **Mosquito habitats**

Mosquitoes inhabit a wide range of environments, including freshwater habitats such as ponds, marshes, swamps, and slow-moving streams where they lay their eggs. However, some species can adapt to urban environments, breeding in artificial containers like discarded tires, flowerpots, and gutters. Mosquitoes spend the first three stages of their lifecycle in water. Mosquitoes lay their eggs in or around water. Anything that collects water could become a mosquito habitat - a place in which eggs, larvae, and pupae can live and grow. If you find standing water sources and dump or cover them, you can help reduce the local mosquito population and increase the safety and enjoyment of your outdoor spaces. In this activity, you will be looking for the habitats used by mosquito larvae and pupae.

To prepare for this activity, review the kinds of places where mosquitoes lay their eggs by playing the game, Mosquito Habitats and Hideouts

<https://observer.globe.gov/documents/19589576/81766661/1-Hideouts-Guide.pdf>

**Activity A: Mosquito Habitat Audit.** Data can be recorded on this form, or in the GLOBE Observer data collection tool, Mosquito Habitat Mapper.

<https://observer.globe.gov/documents/19589576/9a7ca2de-8582-4dcf-ba0f-48bf0a0990d6>

**Activity B: Mosquito Larvae Trap Experiment** Once you have trapped larvae, you can use the GLOBE Observer app to identify them. You can also use the following resources to identify your mosquito larvae specimens, or you can use the built-in mosquito key in the GLOBE Observer Mosquito Habitat Mapper.

<https://strategies.org/wp-content/uploads/2021/05/MLH-5-10-2021.pdf>

<https://strategies.org/wp-content/uploads/2021/07/1-MLH-SecondEntry-Final-7-27-2021.pdf>



# Mosquito Habitat Audit

## Activity A



**Lead participants on an outdoor walk. Identify and eliminate potential mosquito habitats along the way.**

### Introduction

Mosquitoes need a source of water to breed. Anything that collects water could become a mosquito habitat, increasing your risk of mosquito-borne diseases, like West Nile virus and Zika. By identifying and eliminating mosquito habitats, you are helping your community and increasing the safety and enjoyment of your outdoor spaces. When you monitor mosquitoes using GLOBE Observer, you are also helping scientists identify the conditions in which mosquitoes thrive so that they can help forecast disease outbreaks.

### Time

15 minutes – 1 hour

### Materials

- Smartphone or tablet with GLOBE Observer downloaded
- Gloves
- Habitat Tally Sheets and pens or pencils

### Before the Program

Scout out potential habitats prior to your program. Considering the duration of your program, determine a route in advance to keep your group on schedule. Remember to allow time for introductions and late arrivals.

Determine how many smart devices you wish to use for the program. At least one person should have a smartphone or tablet to report observations using GLOBE Observer. You may wish to use a tablet with the group, so that everyone can see the screen. Ask volunteers to take turns so that everyone has a chance to participate. Make sure that the app is downloaded and updated before your program. If participants will be using their own devices, ensure that they will have access to the internet or ask them to download the app prior to their arrival. Provide copies of the Habitat Tally Sheet, so that participants can keep track of the habitats that they have found. Consider printing extra copies for people to use at home.

If possible, ask visitors to wear long sleeves and insect repellent in program announcements. While larvae cannot bite people, adult mosquitoes can.

## During the Program

When your visitors arrive, remind them of safety considerations.

### Potential Hazards

- Adult Mosquitoes: Visitors should wear insect repellent and long sleeves, if possible.
- Contaminated Water: Visitors should not touch water with their bare hands.
- Site-Specific Hazards: Warn visitors of hazards specific to your location, such as traffic and uneven terrain.

Lead a discussion about the mosquito life cycle. Visitors may be familiar with the butterfly life cycle, which is very similar. However, unlike butterflies, mosquitoes spend the earliest stages of their lives in water (although there are some aquatic species of moths). Anything that collects water could become a mosquito habitat. Ask visitors to think of things that could become mosquito habitats.

Lead the walk, allowing visitors to point out habitats. Use GLOBE Observer to document the habitats you find. If you only have one device, allow participants to take turns documenting habitats. Optionally, distribute the Habitat Tally Sheet for participants to use.

### Examples of Potential Habitats

- Can or Bottle
- Puddle
- Bird Bath
- Toy Truck
- Tire

Eliminate habitats once you are done observing. Participants should use gloves when handling trash or coming into contact with water. Explain to visitors that, by eliminating potential habitats, they are helping their community.

Regroup and ask visitors to share what they found. Were they surprised by anything? Explain that they can do this same activity at home, work, or school.

Optionally, collect a sample and bring it inside to count and identify the larvae.

# Mosquito Habitat Tally Sheet

Look for places where water has collected. Anything that collects water could become a mosquito habitat, increasing your risk of mosquito-borne diseases, like malaria and Zika. By identifying and eliminating mosquito habitats, you are helping your community and increasing the safety and enjoyment of your outdoor spaces.

Still Water	
Lake	
Pond	
Ditch	
Swamp or Wetland	
Puddle, Vehicle or Animal Tracks	
Reservoir	
Bay or Ocean	
Other:	
Flowing Water	
Still Water Beside a Stream or River	
Estuary	
Other:	
Natural Container	
Plant Husk	
Animal Shell	
Tree Holes	
Plant Clumps	
Other:	

Artificial Container	
Water Storage Container	
Cement, Metal or Plastic Tank	
Well or Cistern	
Animal Trough or Water Bowl	
Jar	
Fountain or Bird Bath	
Dish or Pot	
Other:	
Discarded Item or Trash	
Can or Bottle	
Tire	
Old Car or Boat	
Trash Container	
Other:	

Did you see any mosquitoes while looking for potential habitats?

- Larvae   
  Pupae   
  Adults



**Share your observations with scientists.**

By combining ground observations of potential habitats with satellite observations of temperature, vegetation and precipitation, scientists can better predict when and where mosquito-borne disease outbreaks might occur.

**Download GLOBE Observer and report potential mosquito habitats using the Mosquito Habitat Mapper Tool.**



# Mosquito Larvae Trap

## Experiment Protocol

### Activity B



#### Simple Trap Experiment

In this experiment, you will create a mosquito trap. The trap will have a dual purpose: you can experiment with the preferred breeding habitat sought out by mosquitoes in your area, and you will also trap mosquito larvae specimens for inspection and identification. Gravid (pregnant) mosquitoes seek out a safe, dark, still water source where they can lay their eggs. It should be a shaded location so it does not get too hot. They tend to go to larger water containers when given a choice.

When possible, work in pairs.

#### Materials:

To build the traps you will need to assemble the following materials:

- A container to hold water, like a bucket, half 2 L soda bottle or large cup. In our experience, a 5-gallon bucket or an old tire tend to be productive traps.
- Several rocks (to put in the bottom of the container so it does not blow over)
- A piece of wood, such as a paint stirring stick (free at dept stores), that can stick out of the top of the water.
- Bait (such as fish food, grass or leaf clippings, or rice water that has fermented in water 3-5 days)
- Water (ditch or creek water, or tap water), enough to fill the bottom of the trap by at least 2”.
- Sign, identifying the trap as a scientific experiment conducted as part of a GLOBE experiment with your contact information.

#### For larvae sampling and photography:

- Turkey baster (bulb pipette) to extract water from the breeding site (trap)
- Plastic bag or small jar for water sample containing larvae
- Small plastic pipette (to select larva from bag or jar and transfer to plate)
- White paper plate (to place your larvae sample in a drop of water)
- Hand sanitizer (to euthanize larvae for examination)
- Toothpick or probe (to gently manipulate larva, so you can see all features)
- Smartphone or tablet (to take pictures and upload data to GLOBE Observer Mosquito Habitat Mapper)
- Clip-on macrolens, for use with smartphone, or digital microscope

### Design your Experiment:

Determine the kind of trap you wish to use. If you are working in pairs, both use the same kind of trap. One trap should be the control, and the other will have one changed variable (your choice).

Kind of trap	variable	control
Safe bottle trap	Bait: fermented grass clippings, fish food, water from cooking rice, other?	Any trap type
Bucket trap	Trap color: black, clear, white, colors	Black trap
Discarded tire	Trap placement in at least partial shade , near trees, under or next to bushes, next to a building	In partial shade, next to a building
Large plastic cup	Water depth (1-12")	2" of water
Other?	water quality (tap water, ditch or pond water, stagnant water	Tap water

### Build Trap:

1. Put rocks in the bottom of a dark-colored container. The container should hold at least a cup of water.
2. Add water and bait.
3. Place the stick in the container. Depending on the species, the mosquitoes will lay their eggs either on the stick or on the water's surface. The top of the stick should stick out of the water.
4. Position the trap in a shady place where it is unlikely to be disturbed. Use rocks or other means to ensure it doesn't tip over easily.

### Data collection protocol:

Collect data weekly from your traps and upload it to the MHM app weekly for each trap location. Record your experimental data in a science notebook or on this page. For best results, record at least three weeks of data.

If there are larvae or pupae, remove them, count, and photograph them. If there aren't any, you may need to add a bit more water. Don't pour the water out, there might be eggs! Be sure to upload your data to the GLOBE Observer Mosquito Habitat Mapper weekly. What if there are no larvae? Zeros are important data- still upload your data and enter 0 for no larvae. Sometimes the trap will be disturbed by an animal, or it might blow over in the wind. Data for that week will be invalid- just record the problem you had as an "experimental error."

### Control Trap Data Sheet:

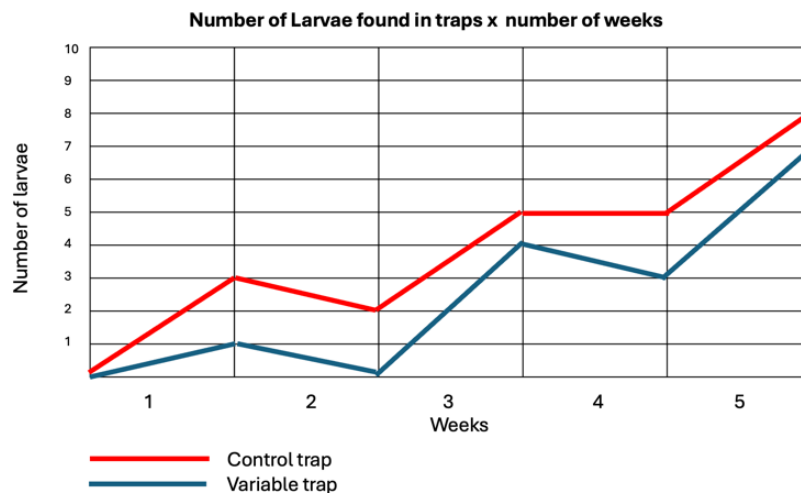
Week	Trap # 1/treatment	Larvae Count	Larva identification?	Experimental error?	Notes and observations
2					
3					
4					
5					
6					
7					
8					

### Variable Trap Data Sheet:

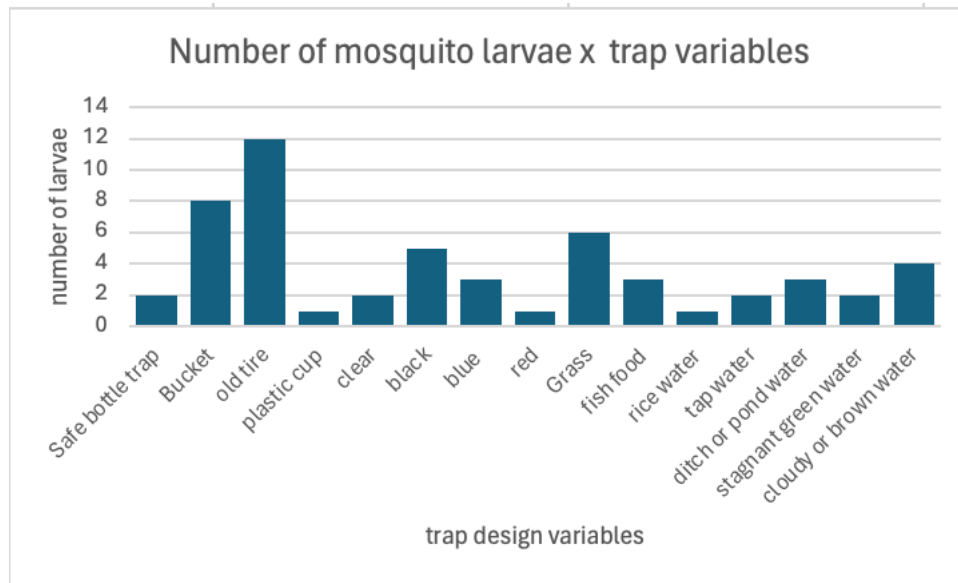
Week	Trap # 2/treatment	Larvae Count	Larva identification?	Experimental error?	Notes and observations
2					
3					
4					
5					
6					
7					
8					

### Analysis:

Plot your data as a line graph for the control trap and the variable trap, see below for an example. In pairs, discuss how each trap performed over time. What conclusions can you draw about the traps? What conclusions can you draw About the number of mosquitoes trapped each week? Do you see trends?



Class data can be collected together, and a class bar graph can be created; see the example below. Examine the class graph and draw conclusions about the most productive trap variables. Based on this data, what would be the ideal trap system (kind of trap, color, bait, water, etc.?)

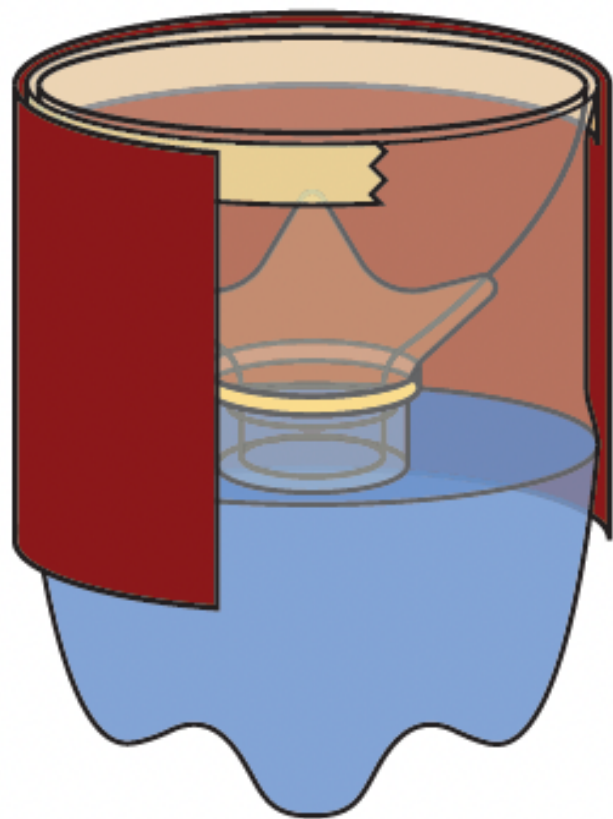




# Build a Mosquito Larvae Trap

## Materials

- clear plastic bottle
- netting
- rubber band
- tape
- scissors or craft knife
- dark paper or fabric
- water
- a few small rocks



## What does the trap do?

Container-breeding mosquitoes lay their eggs in standing water that collects in plant pots, water storage jars, cisterns, buckets, and even trash! This trap tricks mosquitoes into laying their eggs in a container that the larvae can't escape. You can then report the larvae using the GLOBE Observer app.

**Remember, this trap isn't for trapping adult mosquitoes. But you should still protect yourself from bites by wearing long sleeves and applying effective insect repellent.**

## Building the Trap

1. Cut the top off of the bottle using scissors or a craft knife. Put a few small rocks in the bottom to keep the trap in place.
2. Use the rubber band to attach the netting to the mouth of the bottle.
3. Invert the top and tape it to the bottom.
4. Fill the trap with water until the water is right below the netting.
5. Wrap with dark paper or fabric.

## Using the Trap

1. Put the trap in a protected place outside.
2. Check the trap every few days.
3. If there are adult mosquitoes in the trap, shake gently to drown them.
4. Share your observations using the GLOBE Observer app. Select Larvae/Adult Trap as the habitat type.



Download the GLOBE Observer app to share your observations with a global community of citizen scientists.



[observer.globe.gov](https://observer.globe.gov)

## Check Your Trap on a Regular Basis

It is important to check your mosquito larvae trap regularly. While the netting helps to keep any adults that develop from flying out, you won't be able to identify the larvae if they aren't larvae anymore!

**Scientists want to know the environmental conditions associated with mosquito breeding. By checking the trap at least twice a week, you can help study when mosquitoes begin to appear.**

## I will check the trap on:

*Check two or more.*

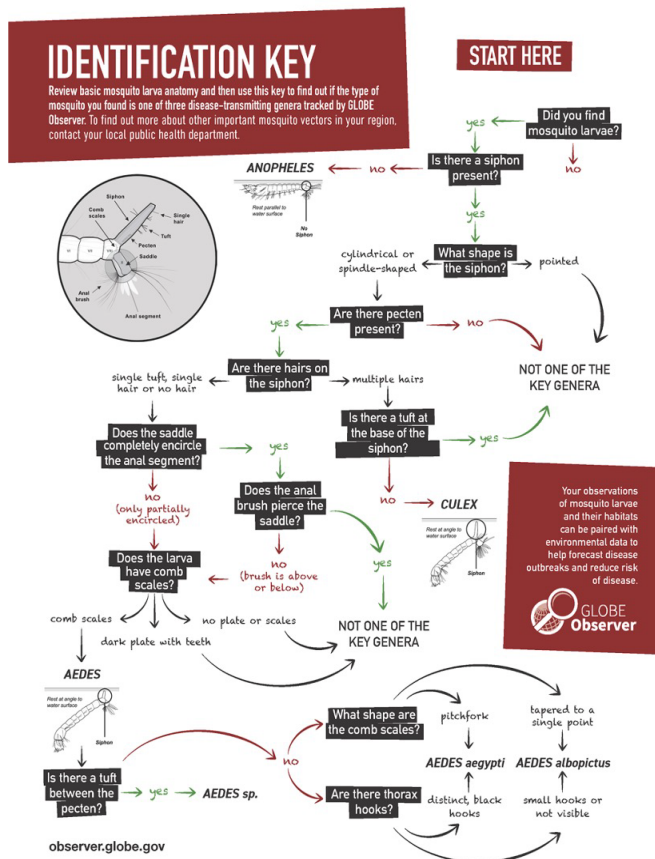
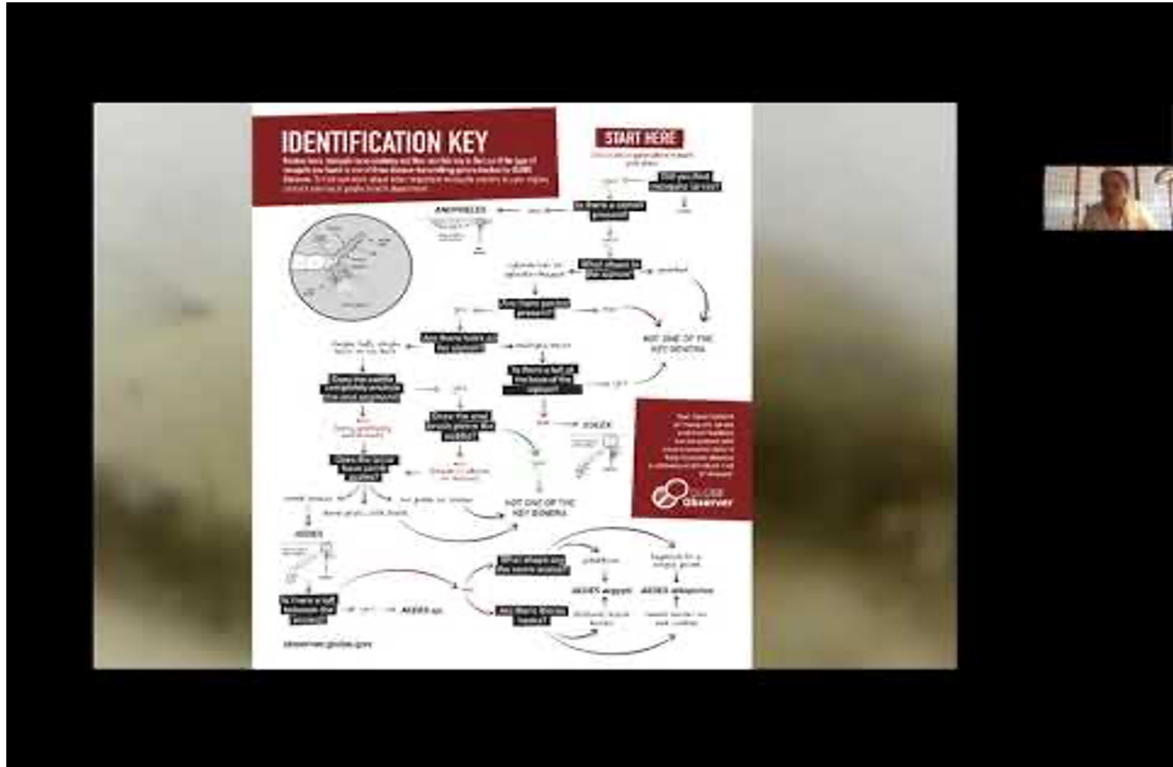
- Sunday
- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday

Date	I saw...	The weather has been...
4/22	<input checked="" type="checkbox"/> Eggs <input checked="" type="checkbox"/> Larvae <input type="checkbox"/> Pupae <input type="checkbox"/> Adults	<b>Warm and Sunny. Evening Showers.</b>
	<input type="checkbox"/> Eggs <input type="checkbox"/> Larvae <input type="checkbox"/> Pupae <input type="checkbox"/> Adults	
	<input type="checkbox"/> Eggs <input type="checkbox"/> Larvae <input type="checkbox"/> Pupae <input type="checkbox"/> Adults	
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	<input type="checkbox"/> Eggs <input type="checkbox"/> Larvae <input type="checkbox"/> Pupae <input type="checkbox"/> Adults	
	<input type="checkbox"/> Eggs <input type="checkbox"/> Larvae <input type="checkbox"/> Pupae <input type="checkbox"/> Adults	

## Do More

Experiment by placing two or more traps in different locations or by adding grass clippings, yeast, or rice water to the bottle.

## Larvae Under a Microscope with Dr. Low



Link to the video: <https://youtu.be/-r-lAnR7yqY>

Link to download the key: <https://bit.ly/MosIDkey>

# How to use a Clip-on Microscope and Pro Tips

## Using a Clip-on Magnifier\*

**Picking larva:** Mosquito larvae are small (growing up to 1/2 inch). Pick the largest larva in your sample and use a clip-on magnifier (capable of at least 60-100x) with a smartphone to photograph.

**\* Note:** If your magnifier is different from the one shown in this graphic, follow its directions for use.

**Yes**

**No**

**1** Remove phone case and clip on the lens (retracted position).

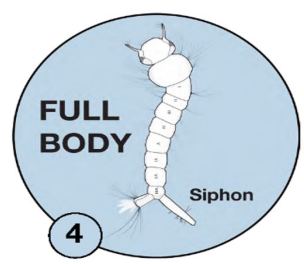
**3** Keeping perfect circle, lower phone until clear plastic collar rests directly on your plate's surface. Ready, set ... snap your photo!

**2** Align clip-on to camera lens to find a perfect circle view (you won't see larva specimen yet).

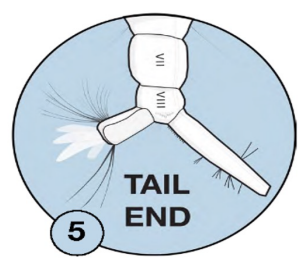
## TIPS Six Pro Tips for Photographing Your Larva Specimen

Remember to upload your observations!

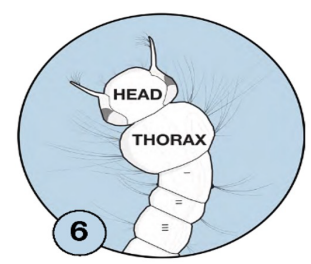
- 1** Use a pipette (or dropper, straw, spoon) to obtain one larva. Pour small water sample on white plate.
- 2** Isolate one larva. Make sure it is suspended and completely covered in a drop of water so its hairs float and extend naturally. Too little water will make the hairs stick to the sides of the larva and may also cause it to dry out. A drop of hand sanitizer will slow larva activity.
- 3** Phone Focus Tips  
Clip macro lens over camera lens, lining them up to see a perfect circle of light on phone screen. Digitally zoom on the phone (e.g., pinch-drag on screen). Tap screen to refocus. Repeat zoom (pinch-drag) process for your six larva photos (see steps 4-6 below).



Take **TWO PHOTOS** of larva's **FULL BODY**, including all **HAIRS** ("setae") - *in focus*.



Tap screen again to *refocus*. Take **TWO PHOTOS** of the **TAIL END+HAIRS** - *in focus*.



Move lens to the head. Tap screen to *refocus*. Take **TWO PHOTOS** of **HEAD+HAIRS** - *in focus*.

**Learn More**  
[observer.globe.gov/mosquito-challenge](http://observer.globe.gov/mosquito-challenge)



# Storytelling with Graphs

Do you still have your data from your work with the mosquito trap you built? You should have gathered some data on the number of eggs, larvae, pupae, and adults in and around your trap, as well as the air temperature at your trap site over several days. You can graph that data and use it to tell a story.

If you do not have that data or that trap, you can build another one and start anew. But you can learn the steps involved by using the examples provided in this next section.

The data you collect is more than a list of numbers. It can tell a story. Putting mosquito stories together from pieces of data has been done for a long time. Many of those stories have led to important discoveries about mosquitoes such as the range of different mosquito species, the seasonality of species, and their populations; the data over time has also shown changes in each of those areas. In addition, data on mosquito vectors has led to many insights and discoveries regarding mosquito-borne diseases. You can read some of these stories in the books we recommend (see below).

Do we already know everything about mosquitoes? No. Lots of questions remain. The focus of existing questions changes as new observations are made and new data are collected and analyzed. In addition, new questions arise as mosquito behaviors, habitats, breeding, and disease transmission change over time. Any of the questions that arise from your data could lead to new answers.

You can use your mosquito research and the accompanying data to

- develop a school science fair project
- create and submit a project to the GLOBE International Virtual Science Symposium (IVSS).
- create a public service poster/announcement for your school and/or community
- create a story about mosquitoes in your area to share with your classmates or friends.

Mosquito data has been gathered and analyzed both formally and informally for hundreds of years. Scientific work based on mosquito data has even led to four scientists being awarded the Nobel Prize in Physiology or Medicine.

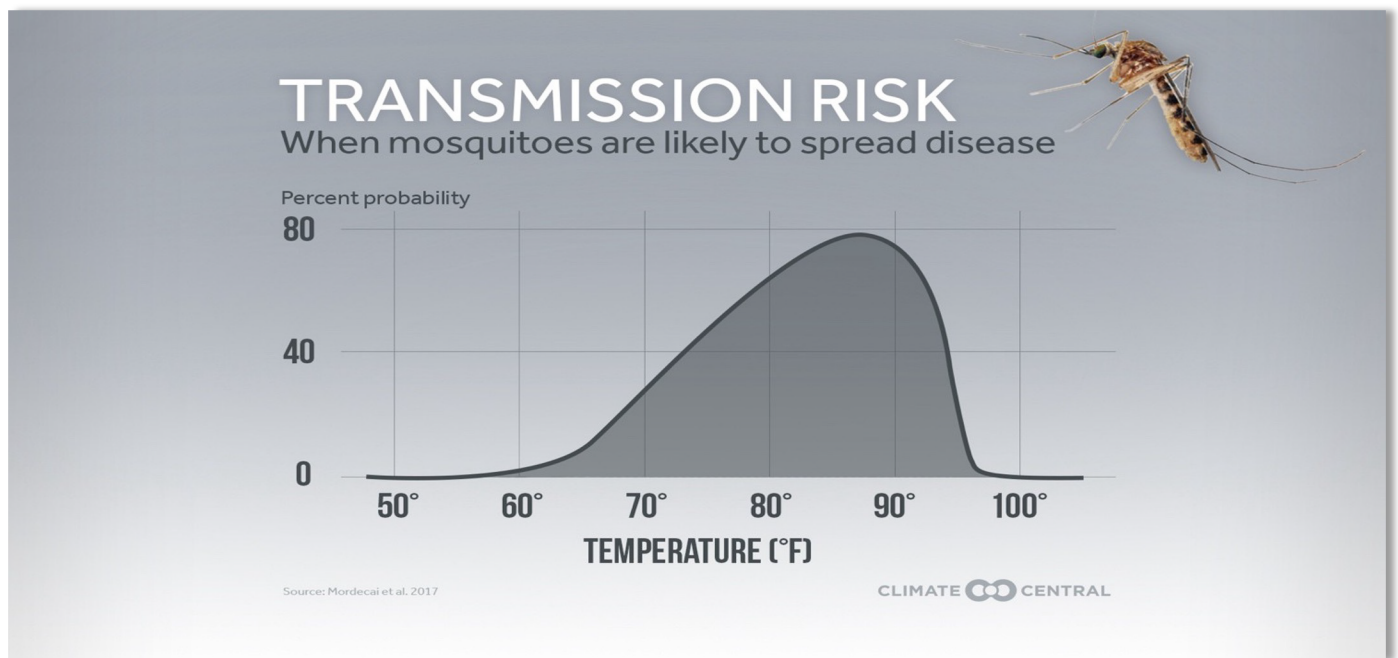
# Storytelling with Graphs

Mosquitoes are cold-blooded organisms, which means they cannot regulate their body temperature; they are sensitive to the highs and lows of air temperature. That's why mosquitoes are called ectotherms, **ecto** meaning *outside* and **therm** meaning *heat*. Mosquitoes rely on sunlight to warm the air and the surfaces they rest on. Because they are an ectotherm, environmental temperatures also affect their capacity for disease transmission: the rate of development of the pathogen hosted inside the mosquito is faster in warmer temperatures.

Once the air temperature stays above 70°F (21°C), we notice mosquitoes because there are more of them, and they are more active. The opposite is true when the temperature starts cooling in the fall (northern hemisphere) to 60°F (15°C), mosquitoes begin to get sluggish and slow. But when it drops below 50°F (10°C), you typically will not see mosquitoes because it is too cold. Some adults may die off, and some may enter **diapause** – a period of suspended development. But when temperatures start to rise again, the cycle begins again. Read more about diapause here:

<https://blogs.scientificamerican.com/observations/how-insects-prepare-for-winter/>

<https://kidsdiscover.com/parentresources/the-science-of-spring/>



Use of this graph is by permission <https://medialibrary.climatecentral.org/resources/mosquito-disease-danger-days-2018>

Examine the graph above. Why do you think mosquito-transmitted diseases are more often transmitted when the temperatures are warmer?

In general, most mosquitoes thrive between 50°F and 100°F. You can identify the beginning and end of your mosquito season by charting the air temperatures.

## Quick Review

As you know, the larva is the second of the four stages in the mosquitoes' life cycle. Depending upon the water/air temperature and food supply, larvae may stay in this stage for 4-10 days before developing into the third stage- the pupa. The pupa stage lasts for 2-7 days before the adult mosquito emerges. Mosquito larvae have features specific to their genus. These features are clues to identifying them. We will use the three genera featured in the [GLOBE Observer Mosquito Habitat Mapper](#) tool. They are *Anopheles*, *Aedes*, and *Culex*

## Data Setup

- Go back to Activity #24: Build a Mosquito Larvae Trap. Use the trap you built earlier or follow the directions to build a new one.
- Place it somewhere where it won't tip or blow over and will be shaded for most of the day. The trap allows the female mosquito to lay her eggs along the trap's sides, fall into the water, and hatch into larvae. The netting will keep any adult mosquitoes from emerging.
- Use the **Mosquito Trap datasheet** page below to track what you see in the trap (larvae) and the air temperature around the trap.

The data you collected will be displayed using a **bar graph**. Bar (column) **graphs** are most frequently used to compare different groups of data. For this example, our graph will show the number of eggs, larvae, pupae, and adults counted over two weeks from your trap.

**Example Dataset:** The example dataset was collected over two weeks and checked daily (**Date**), the number of mosquito eggs, larvae, pupae, and adults counted (**I saw**), and **Temperature** is recorded in degrees Fahrenheit. Notes: when the mosquito eggs hatch, they wiggle in the water; look for this movement when counting larvae. If you see comma shapes in the water, the larvae are now in the third stage called pupae. Count these too. Use either Celsius or Fahrenheit but stay consistent in your reporting.

Date	I saw				Temperature F	Temperature C
July 1	0 Eggs	0 Larvae	0 Pupae	0 Adults	90	32
July 2	0 Eggs	0 Larvae	0 Pupae	0 Adults	91	32
July 3	0 Eggs	0 Larvae	0 Pupae	0 Adults	92	33
July 4	0 Eggs	0 Larvae	0 Pupae	0 Adults	97	36
July 5	0 Eggs	3 Larvae	0 Pupae	0 Adults	97	36
July 6	0 Eggs	5 Larvae	0 Pupae	0 Adults	86	30
July 7	0 Eggs	10 Larvae	0 Pupae	0 Adults	74	23
July 8	0 Eggs	10 Larvae	0 Pupae	0 Adults	77	25
July 9	0 Eggs	10 Larvae	2 Pupae	0 Adults	84	28
July 10	0 Eggs	18 Larvae	5 Pupae	0 Adults	73	22
July 11	0 Eggs	8 Larvae	7 Pupae	0 Adults	85	29
July 12	0 Eggs	3 Larvae	10 Pupae	2 Adults	82	27
July 13	0 Eggs	0 Larvae	4 Pupae	3 Adults	81	27
July 14	0 Eggs	0 Larvae	2 Pupae	2 Adults	84	34

A zero is also important data because a zero allows us to recognize the absence of something.

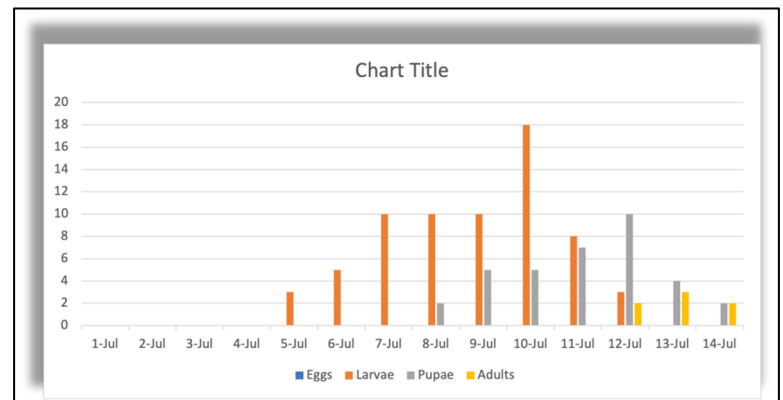
## Turning the numbers into a story

1. Open a spreadsheet (e.g., Google sheets, Excel, or other). In row 1, type Date, Eggs, Larvae, Pupae Adults, and Temperature. These are the variables. Enter the values (date and total) for each from *your* data sheet.

Your spreadsheet should look the one to the right.

	A	B	C	D	E	F
1	Date	Eggs	Larvae	Pupae	Adults	Temperature
2	1-Jul	0	0	0	0	90
3	2-Jul	0	0	0	0	91
4	3-Jul	0	0	0	0	92
5	4-Jul	0	0	0	0	97
6	5-Jul	0	3	0	0	97
7	6-Jul	0	5	0	0	86
8	7-Jul	0	10	0	0	74
9	8-Jul	0	10	2	0	77
10	9-Jul	0	10	5	0	84
11	10-Jul	0	18	5	0	73
12	11-Jul	0	8	7	0	85
13	12-Jul	0	3	10	2	82
14	13-Jul	0	0	4	3	84
15	14-Jul	0	0	2	2	81

2. Click and drag to highlight cells A1 to E15. Click the *Insert* menu, choose *Chart*, and then *Column*. It should look something like this



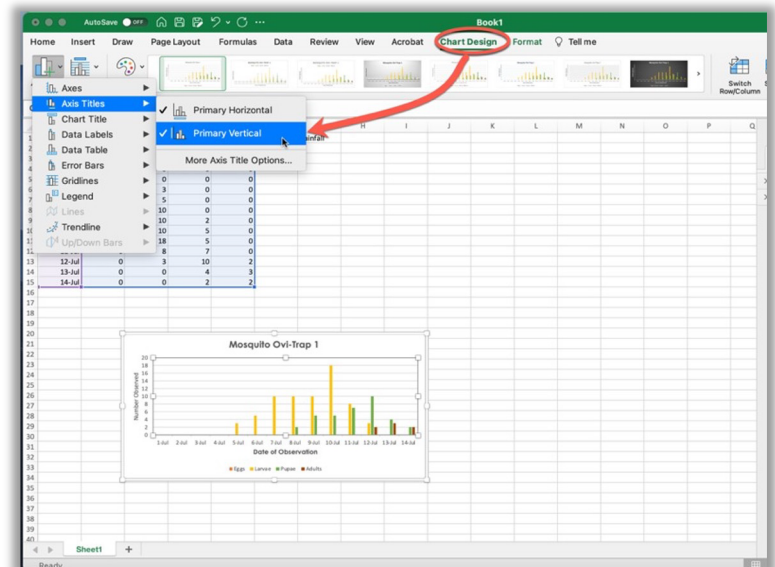
This graph story tells us the following:

- *Something* happened on certain days,
- That *something* had a value,
- And that it involved Eggs, Larvae, Pupae, and Adults.

What values (numbers) are represented in the horizontal (x) axis? 1. \_\_\_\_\_ The vertical or (y) axis? 2. \_\_\_\_\_ What do the headings Eggs, Larvae, Pupae, Adults, and Temperature describe? 3. \_\_\_\_\_ Overall, what would be an appropriate title for this chart?

To make this graph story more informative, we'll clarify a few things.

3. The vertical and horizontal axis need explanation also.
  - With the chart active (see example), click **Chart Design**, **Add Chart Element**, **Axis Titles**
4. Click inside the spreadsheet chart you made earlier on the words **Chart Title**. Double-click and change the title to **Mosquito Trap 1**





## Complete the Graph Story

**Nice Job!** Your Mosquito Trap data is an exciting story and has answered a couple of questions. For example, the graph shows that throughout the two weeks, you collected daily data. Finding mosquito eggs is challenging to the naked eye. They can be as small as a grain of pepper. Therefore, they may be challenging to see, and recording a zero is your valid observation. You observed the water over two weeks, and you first saw and counted three larvae on the fifth day.

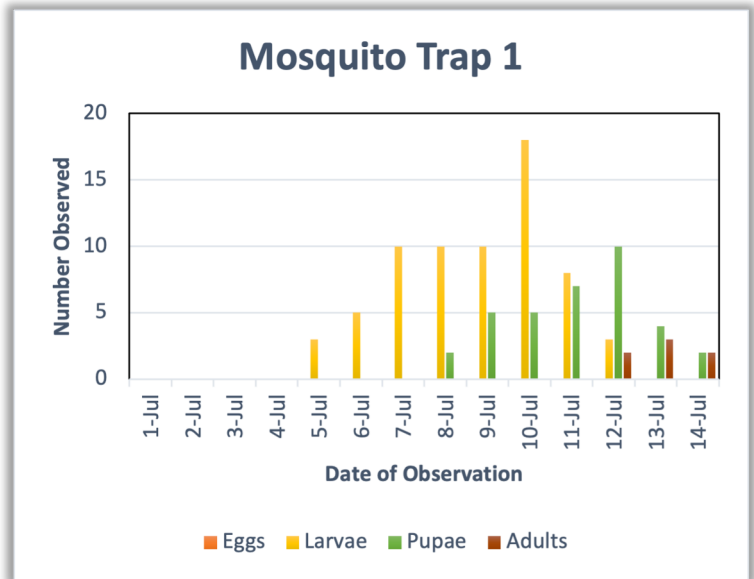
Finish the story of this data. What else does the data tell us?

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## Challenge yourself

On your datasheet, you collected other data, such as the air temperature. Make another graph and incorporate this with your Mosquito Trap graph story. Are there additional questions you may have? Were your temperatures high? Describe the mosquito activity? Were your temperatures hovering below 50°F(10°C)?

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## Extension

Set up another Mosquito Trap in a different location, record and graph your observations as you did previously. When you notice mosquito larvae, take one trap, and place it in your refrigerator for a few hours. What do you notice about the mosquito activity and growth? What other questions do you have?

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Is there more to tell from your data? Here are some example questions you may have • How long did it take for mosquito larvae to emerge between each stage? • How long does it take for them to mature? • By checking the trap daily, you can observe and measure the average length of the life cycle at that temperature. • Make more than one trap and compare the life cycles at other temperatures

# Sample Student Poster Template

## Billboard Poster

This style of scientific poster is designed to simplify and make sharing information easier in a shorter amount of time. The poster is distilled into a few key components and focus is on simplicity and readability.

### Key Components

#### 1 Major Takeaway

A **clearly stated** takeaway with key phrases highlighted. Depending on your specific format and research, you may have multiple takeaways or top-level highlights.

#### 2 Supporting Information

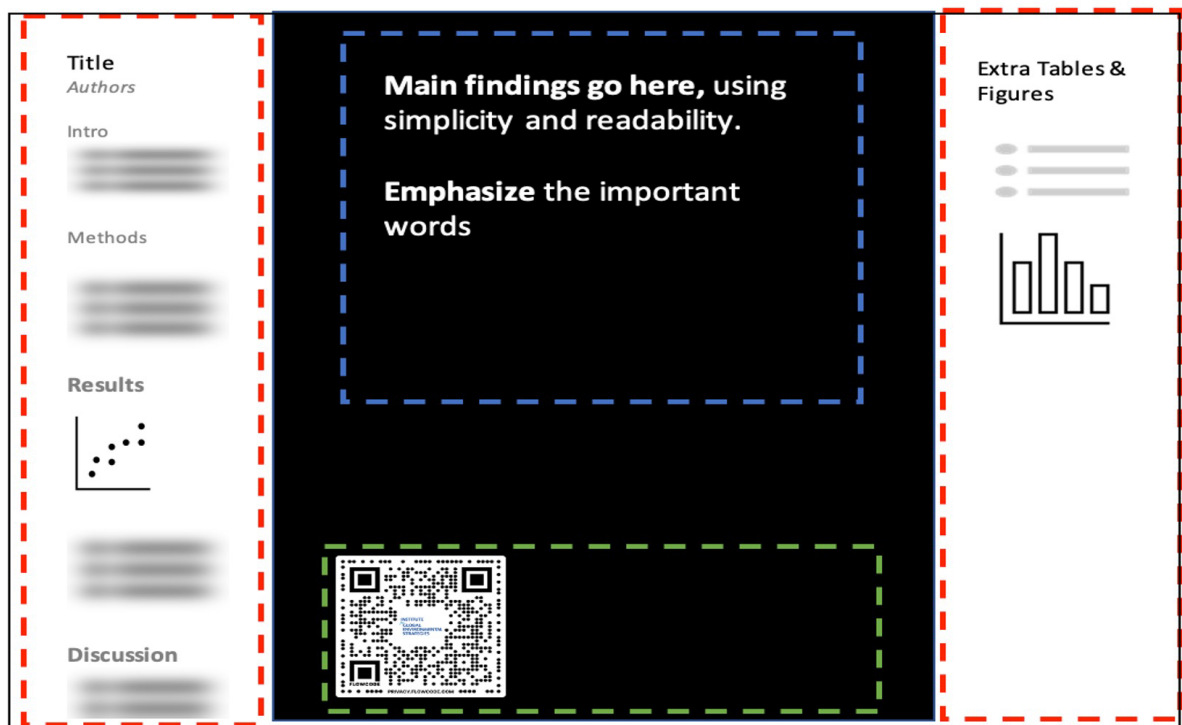
An easily digestible explanation of your methods and results. Again, the format here is largely dependent on your specific research.

#### 3 QR Code

Link to your research to be read later. You can also include contact details or other links to further reading in this section.

#### 1 Major Takeaway

#### 2 Supporting Information



#### 3 QR Code

# GLOBE Observer



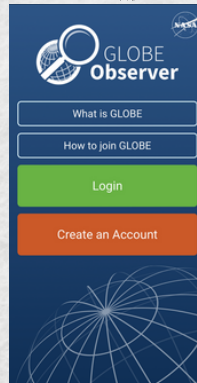
**01**

## Download & Install

Download the app and install on your smartdevice.

<https://observer.globe.gov/about/get-the-app>

Launch the app from your smart device.



**02**

## Launch the app

Open the GLOBE Observer app and enter your email and password.

**03**

## Home Screen

Make environmental observations that complement NASA satellite observations to help scientists studying Earth and the global environment.



**04**

## Clouds

Photographing clouds and recording sky observations help scientists gain a new perspective on clouds that satellites just can't provide: from the ground looking up!



## Mosquito Habitat Mapper

Identify potential breeding sites for mosquitoes by sampling and counting mosquito larvae. This enables scientists to verify predictive models of mosquito population dynamics.



**05**

## Land Cover

Photographing and classifying land cover over an area the size of a soccer field will assist scientists working to enhance global maps of land cover use.



## Trees

Tree height is the most widely used indicator of an environment's ability to grow trees. Measure tree height to track the growth of trees over time.

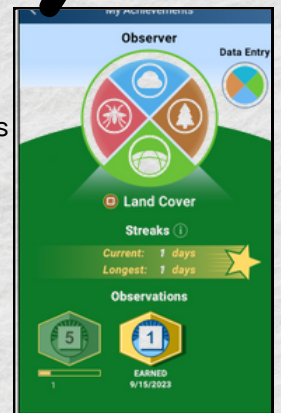


**06**

## Achievements and Streaks

Keep track of your contributions to GLOBE!

This feature shows milestone badges and streaks for all data you have submitted to GLOBE. You can access My Achievements from the GLOBE Observer home screen.



# Creating a GLOBE Observer Account

01

## Create your account

New GLOBE members can sign up for an account that best meets their needs depending on their desired level of interaction with GLOBE and user type.

The GLOBE Observer account is generally quicker and easier to set up. However, it limits your ability to create student accounts that are useful for informal and informal settings.

When you create your account, choose the option that's best for you. If desired, you can change from a GLOBE Observer to a GLOBE Educator account.

<https://www.globe.gov/about/ready-to-join/create-an-account>



02

## Account information

### Four questions:

1. What country do you reside in?
2. Your email address
3. Are you a GLOBE Alumni
4. Choose a password

03

## Screen Name

For privacy, all users are given a screen name that is not publicly associated with identifying information.

Choose either Create your Own or Use a System Name.



04

## Select a GLOBE Organization

Use the Default unless you know the School or Organization referral code.

## Join a GLOBE Team

If you have referral code or the team is open to the public.

05

## Communication Settings

You can opt in to receive NASA satellite images matched to your observations, updates for citizen scientists/volunteers, scientists' requests for data or additional information, and notifications of recognition or awards you earn in the GLOBE Observer app.

**Check all.**



06

## Review

Review your information.

- If correct, check the User Verification box.
- If not, edit as needed.
- Click 'Create Account'
- Open your email, click to verify account

Open the GLOBE Observer app on your smart device.

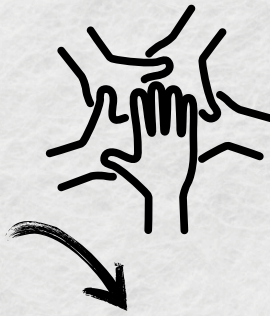


# Creating and Joining a GLOBE Team

**01**

## What is a Team?

- A GLOBE Team is a group of citizen scientists working together as an organization.
- Teams can be open or private.
- Every team has a team page on the GLOBE website.
- The team page includes a summary of how many members are on the team (including screen names), how much data the team has collected, and links to the data collected.



**02**

## Join a Team in the App

1. Click the gear icon along the bottom of the app
2. Select Join a GLOBE Team
3. Enter the Referral Code

## Create a GLOBE Team in the App

1. Click the gear icon in the app
2. Select Create a GLOBE Team
3. Enter a team name in English.
4. You'll receive an email confirming your new team.



**03**

## GLOBE Team Management

Information on Team management can be found on the GLOBE page here: <https://www.globe.gov/get-trained/tutorial-center/globe-teams>



**04**

## Team Information

From the GLOBE website: see your teams **observations**.

The map displays protocol and location for all active members of your team.

<https://www.globe.gov/globe-community/globe-teams>

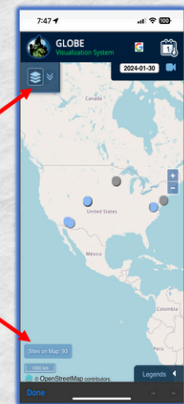
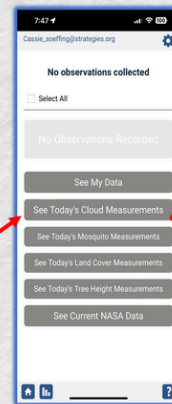
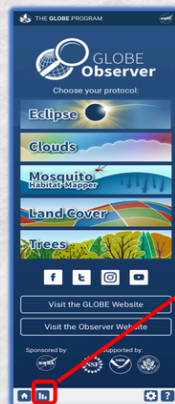


**05**

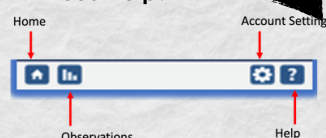
## Your Observations

Connected to WiFi or cellular, Choose from:

- Your data, or
- Today's Cloud, Mosquito, Land Cover, and Tree Height Measurements.
- Use the Graph icon in the lower-left corner of the screen.



## Need Help?



**HELP!**

# Visualization System and ADAT Tools

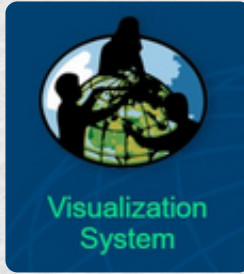


## 01

### GLOBE Viz

GLOBE's various filters are used to find historical data from 1995 to the present. With filters, you can select features and time frames that vary between one day, week, and several years.

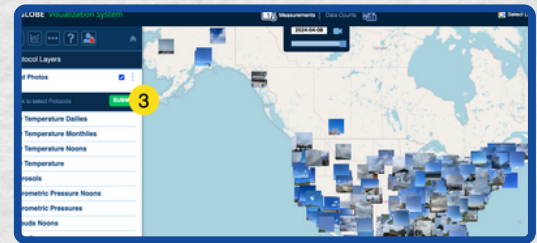
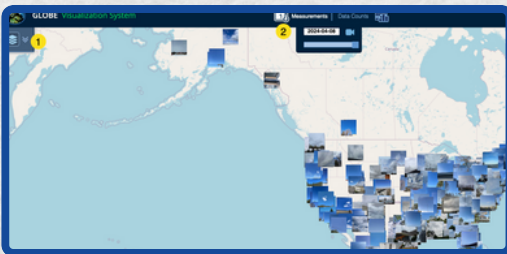
<https://www.globe.gov/globe-data/visualize-and-retrieve-data>



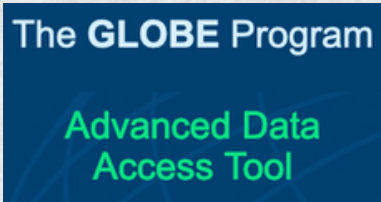
## 02

### In three steps

1. Select the protocol data you would like to visualize.
2. Select Date
3. Click a measurement **Submit** to retrieve the data



All GLOBE data is made freely available to everyone.



### ADAT

## 03

This robust tool allows you to find and retrieve GLOBE data using several different search parameters.

A summary of sites that have data available based on your search parameters appears first, followed by:

Two types of data

1. **Summary** is a .CSV file that summarizes the amount of data for each site.
2. A zipped file of your data request.

## 04

### General Guidelines:

- At least one protocol is selected
- Multiple filters may be used
- Each filter can have various parameters
- The default is that all site data is included in the .CSV file.

If you are in the southern hemisphere latitudes and western hemisphere longitudes, you must use '-'

You must be logged in using your GLOBE Observer account to **save** your search parameters if using the Save and Load functions.



Select a Filter:

- Data Filters
- Select Protocols
- Date Range
- Data Count Range

Site Filters

- Site Name
- Country or State/Territory
- In proximity of a lake or river:
- School/Teacher/Partner/Team
- Elevation Range
- Lat/Long Range
- Proximity to Lat/Long

2414 Sites Found

School Name	Site Name	Latitude	Longitude	Elevation
Intermediate school At Atafu	Intermediate school At Atafu	21.22943	169.5195	1742
AMSTON Academy	AMSTON Academy	43.53381	-73.62576	158.3
AMSTON Academy	AMSTON Academy	43.53381	-73.62576	158.3
Alhambra	Alhambra	44.21111	-72.82111	715
Alexander Ginnista	Alexander Ginnista ATH-01	35.4156	124.457	54.2
Almaden High School	Almaden High School	37.4755	122.4225	96.9
Alexander von Humboldt Gymnasium	Städtisches Gymnasium Strog. ATH-02	47.6169	8.255	258.8
Alexander von Humboldt Gymnasium	Sportplatz Konstanz ATH-05-01	47.6683	8.1745	360.8
Al-Rabaa Secondary School for Girls At Ar-Raqubah	Al-Rabaa Secondary School for Girls At Ar-Raqubah	18.1725	41.3449	30
Al-Rabaa Intermediate and Secondary Girls School At-Raqubah	Al-Rabaa Intermediate and Secondary Girls School At-Raqubah	18.1725	41.3449	30