

 **THE GLOBE PROGRAM**
A Worldwide Science and Education Program


Introduction to GLOBE




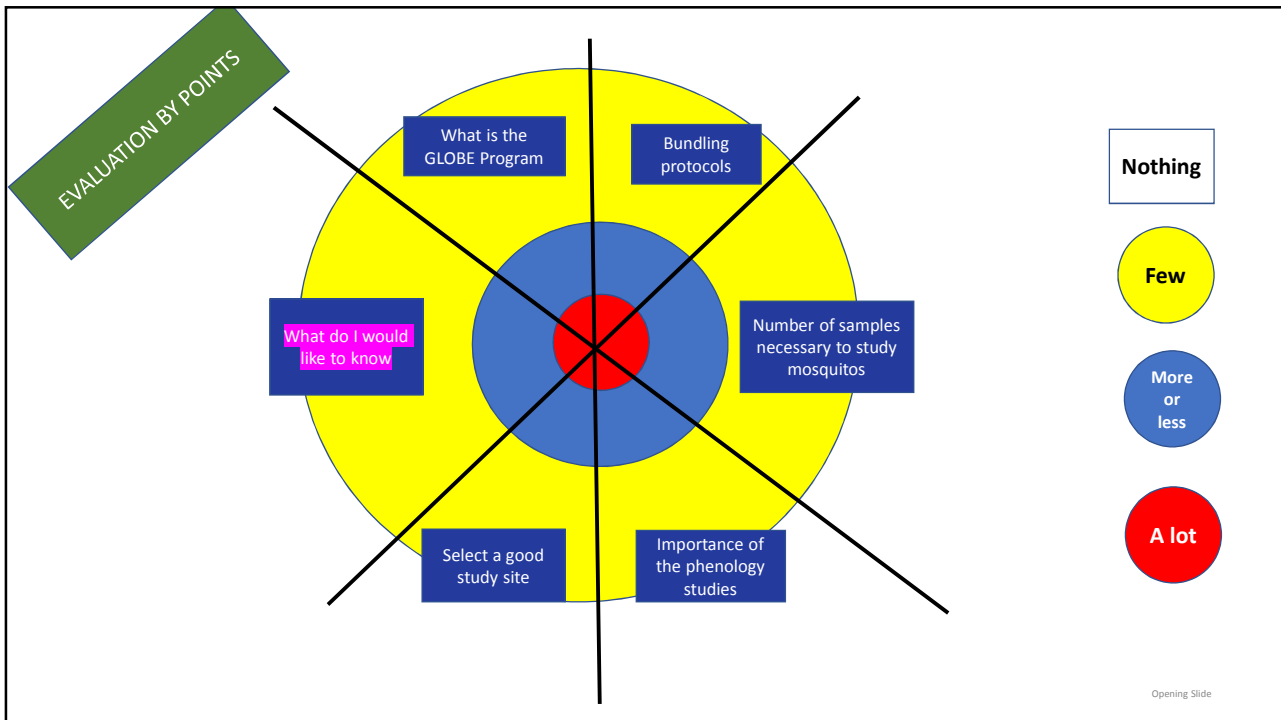
- G** Global
- L** Learning and
- O** Observations
- B** to Benefit the
- E** Environment



Introduce yourself!

My name  **Why am I here?**

 **What do I expect of this session?**



Objectives

Remember the importance of the GLOBE Program

Improve knowledge about Mosquitos and Phenology GLOBE Protocols

Share ideas about how to incorporate the GLOBE Program in the classes

Dreaming to become a scientist



Scientific projects
research-based learning

Significative learning



Why do I learn?

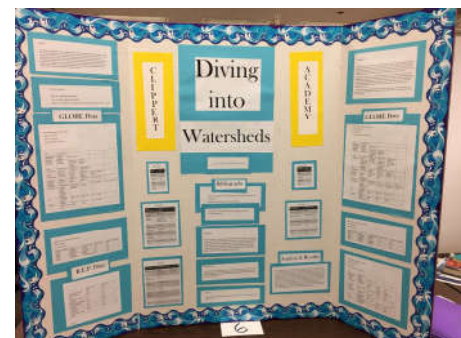
Making real field observations you discover what you learn

Take measurements / gathering data Producing information



Data collected in the field helps to better understanding of the world
Data makes sense in a context

Sharing information



More science, more cultures, more languages

Africa	Asia and Pacific	Europe and Eurasia	Latin America and Caribbean	Near East and North Africa	North America
25 Countries	18 Countries	41 Countries	20 Countries	13 Countries	2 Countries

Take action

- Give sense to the data
- Generate information
- Share information
- Make informed decisions
- Take actions

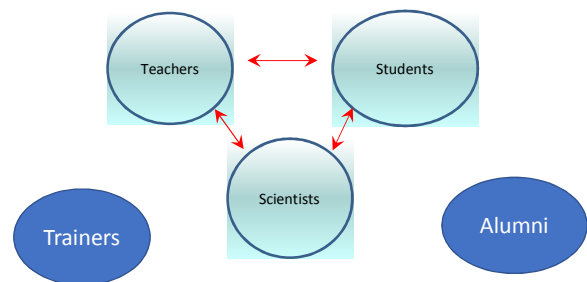


GLOBE

Hands on program of
Science and education to
Improve environmental awareness

Around the World

- To create identity with the local environment
- Applying valid scientific research methods: Protocols
- Reporting information
- From local to global environment: Systems



Network



Global



Regional



Local

Different levels



Improve student performance across the curriculum

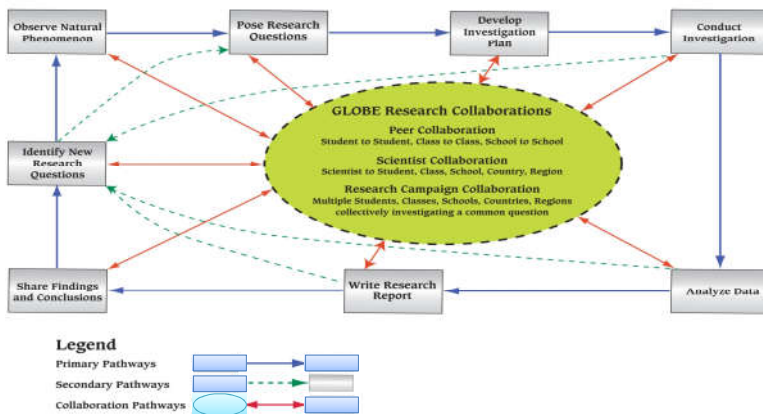
Promote knowledge and support for people's activities, for the benefit of the environment

Contribute to the scientific understanding of the Earth

Inspire the next generation of scientists in the world

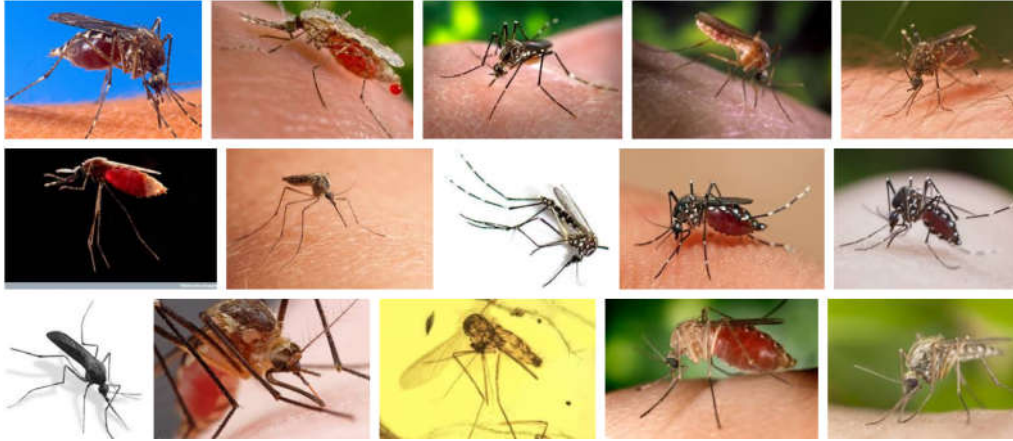
Build an environmentally informed generation.

 **GLOBE Model for Student Scientific Research**



- Curiosity
- Make questions
- Looking for answers
- Hypothesis
- Take notes, data
- Built knowledge

Mosquitos

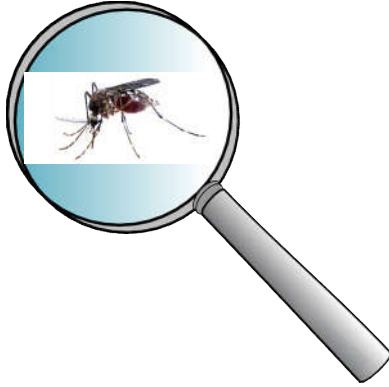


Who they are?



**Insects of six legs, two antennas and 4 wings,
with body divided in head, tórax and abdomen**

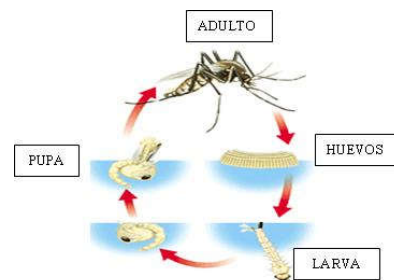
In detail: music



Taxonomía	
Domain	Eukaryota
King	Animalia
Phylum	Arthropoda
Class	Insecta: 6 long legs, 2 pair of wings , body divided in three parts and 1 pair of antennas
Order	Diptera: halterios (2 reduced wings)
Family	Culicidae: long proboscis, long and thin legs, filiform antenna, prominent eyes, life cycle with 4 stages which larvae are in water
Genus	Aedes, Cúlex, Anopheles
Specie	<i>Aedes aegypti</i>

Some interesting information

- Life cycle in water: Eggs, larvae, pupae. Working with eggs and larvae is safe: eggs and larvae do not transmit diseases.
- Lifecycle earth – air: Adult
- Each female can lay 100 to 120 eggs that can resist droughts up to for 6 months (in water that hatch in 24 hours)
- The females need blood to produce the eggs. Mostly in the presence of light
- Only the bite of flying female mosquitoes that feed on blood from an infected person is the one that transmits diseases
- The males feed on nectar and the females can also do it
- The mosquito protocol focuses on the collection and identification of larvae in the water.
- They perceive heat and CO₂: Attractiveness



Proboscis





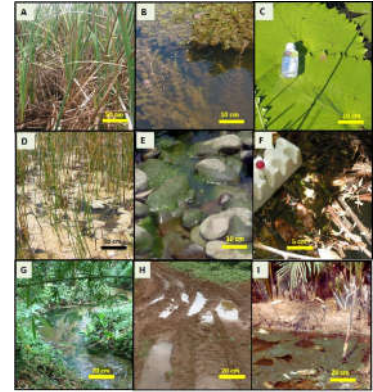
The dreamed house: Habitat and Niche

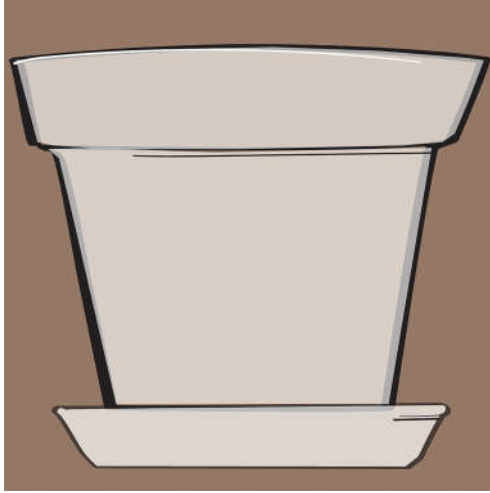
- Where? : Light, temperatura, ... anything else?
- How is that?
- Who live with you?



Conditions for mosquitoes surviving

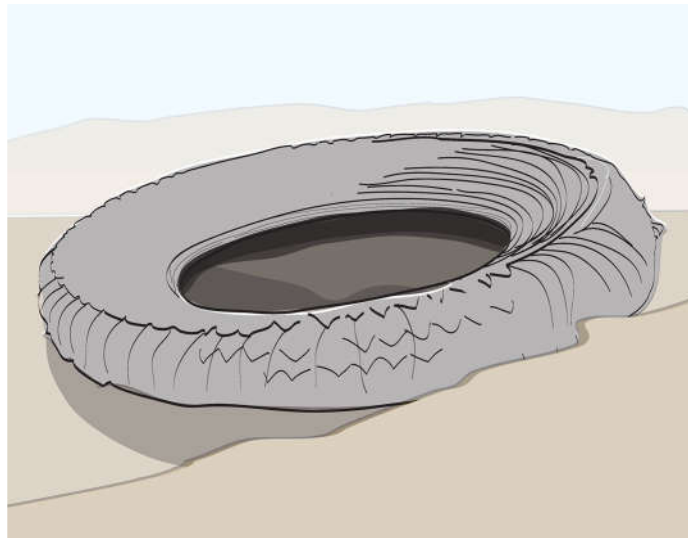
- Heat and humidity
- The larvae prefer stagnant and shallow waters. It is possible to find them in clear water
- There may be eggs on leaves of plants
- Note: Carbon dioxide attracts mosquitoes and sometimes this information is used to trap them





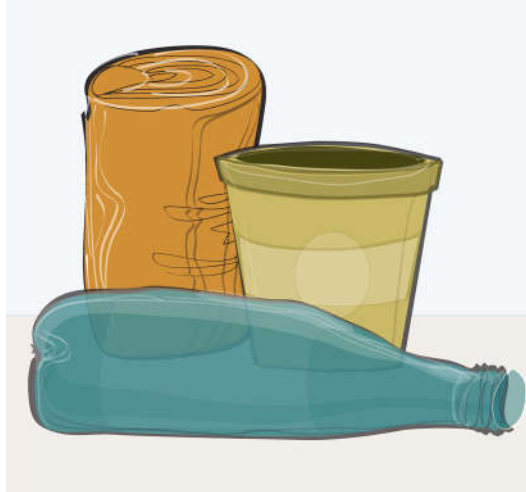
Flower pot or other container

20



Discarded tire

21



Can or bottle

22



Water storage container

23



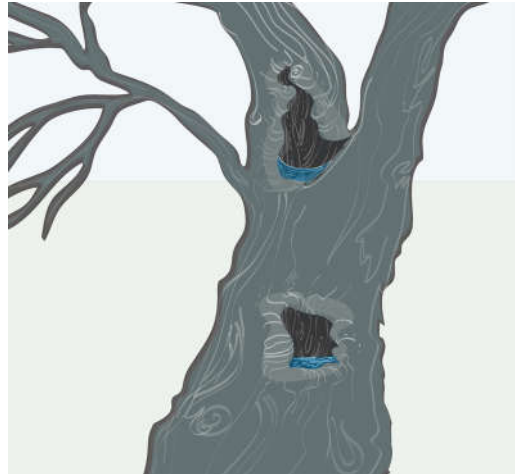
Stagnant water on plant, such as bromiliad, bamboo, puddle on leaf

24



trash can

25



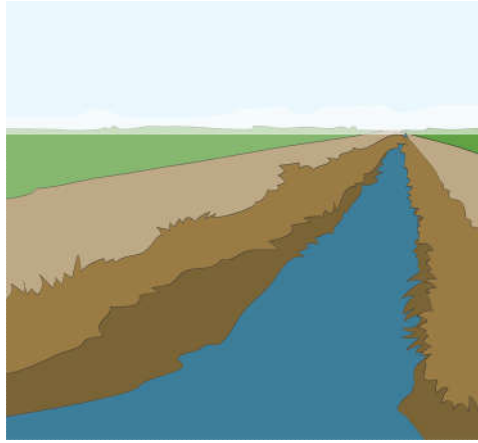
Tree holes or natural hollows in wood

26



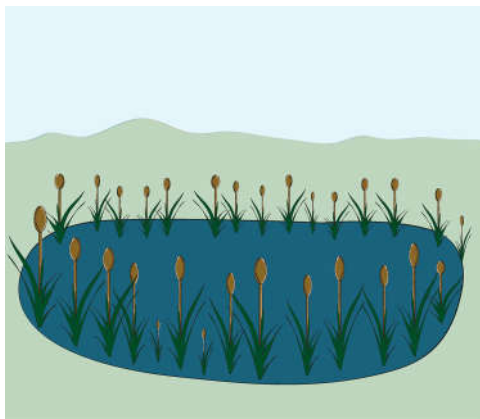
Mosquito trap- adult mosquito trap

27



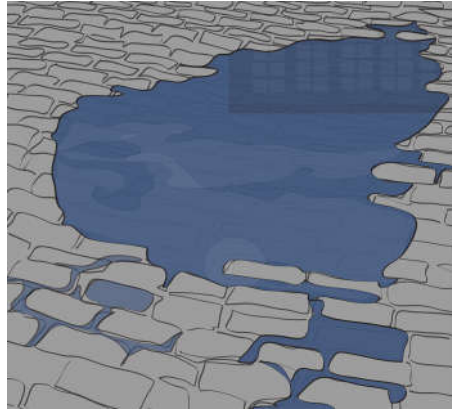
curbside or irrigation ditch in field

28



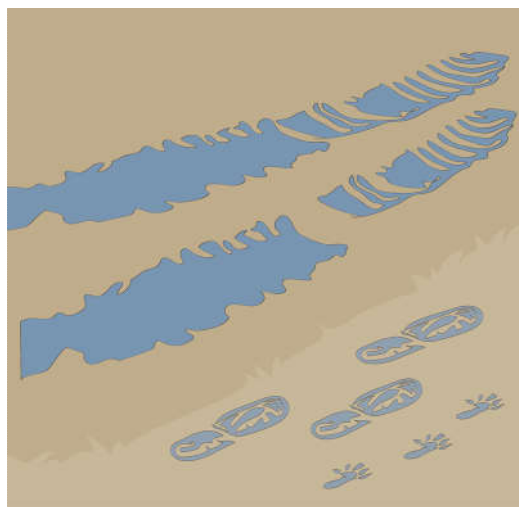
Wetland or swamp

29



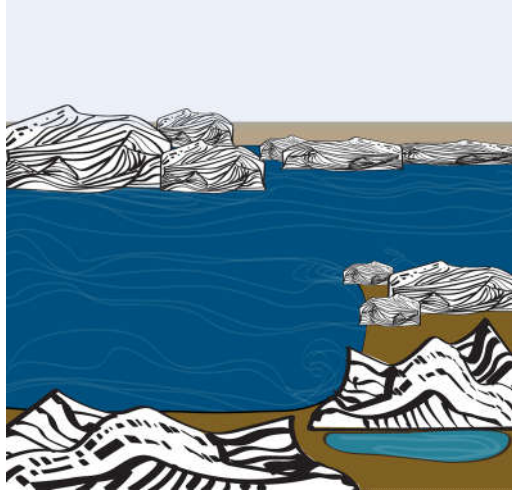
puddle

30



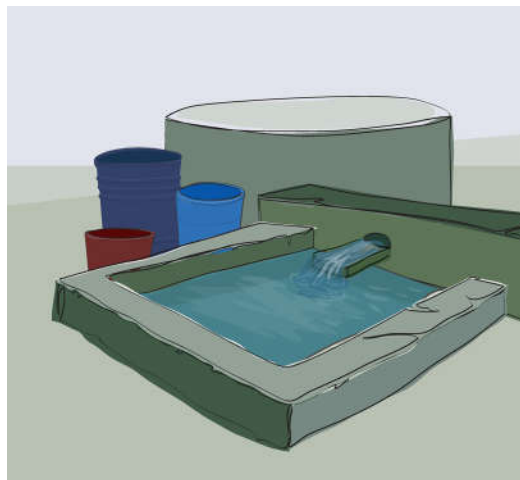
Animal, people or tire tracks

31



Pooled still water next to flowing stream

32



Cistern or built water storage

33



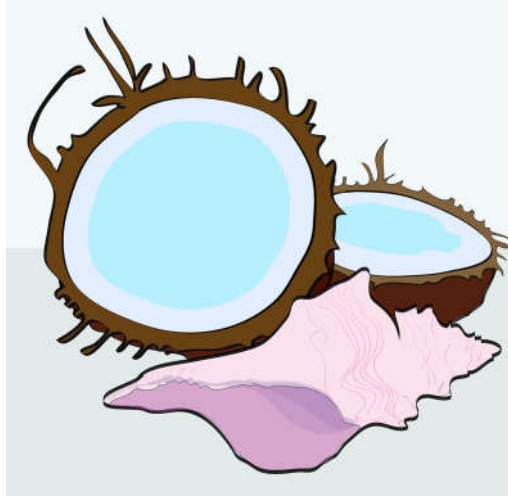
trash

34



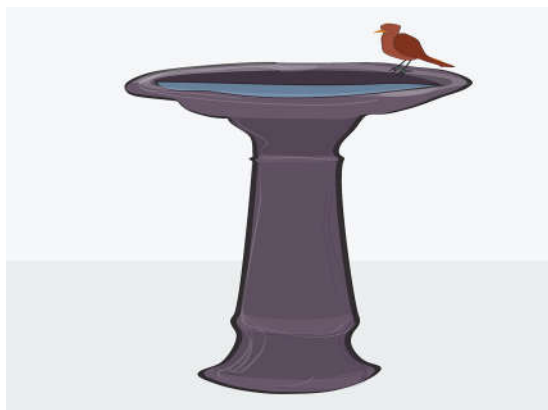
Abandoned vehicle, like a car or boat

35



plant or animal shells

36



birdbath

37



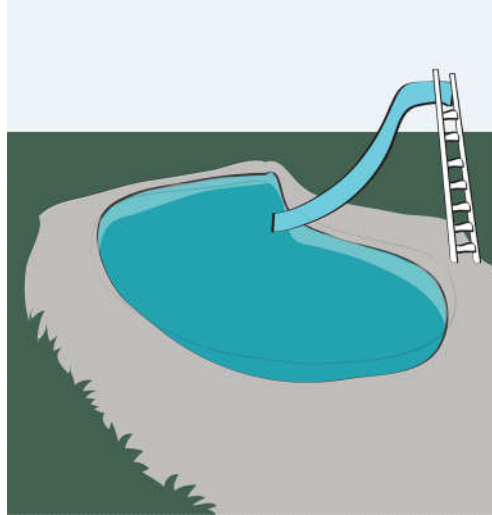
Animal trough or water bowl

38



well

39



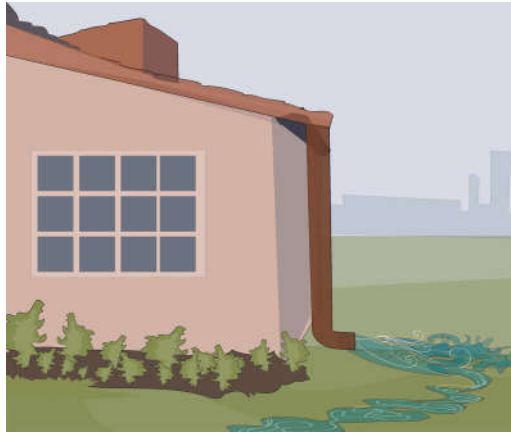
Pool

40



Bridges, culverts, public works structures

41



Gutters, downspouts

42



Grill, outdoor appliance

43



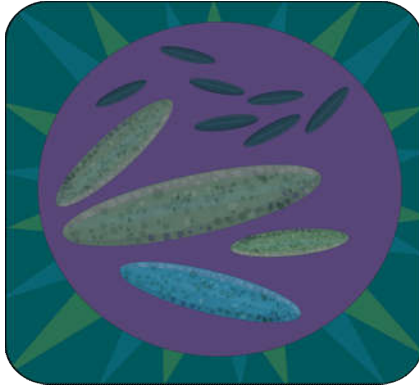
ovitrap

44



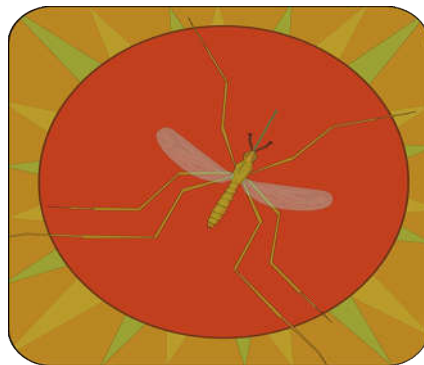
estuary

45



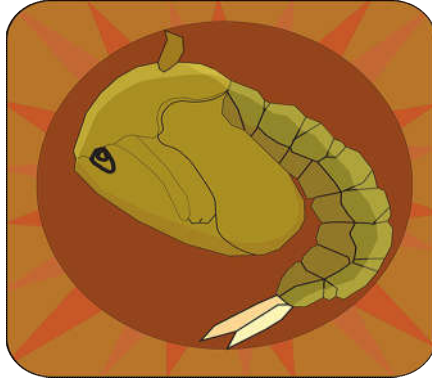
Mosquito eggs

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Mosquito adult

47



**Mosquito
pupa**

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Mosquitoes diseases vector

Anopheles (malaria)

Aedes, (Chikungunya, Dengue, Zika, yellow fever)

Culex (Nile virus, avian malaria, filariasis, avian encephalitis)

Identifying mosquito breeding sites will help prevent them from spreading.

Genus under study



Aedes spp.



Culex spp.

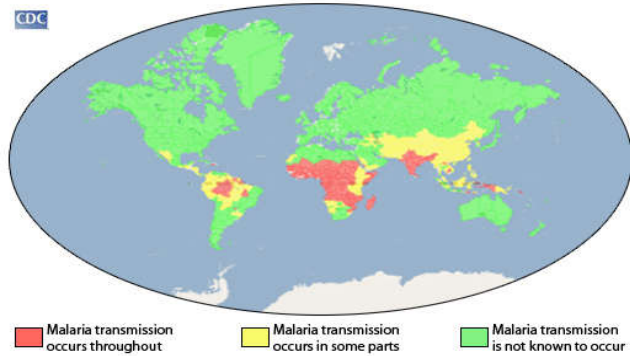


Anopheles spp.

- Note: In Latin America, dengue went from having a rate of 16.4 cases per 100,000 people in the 1980s to 430.8 per 100,000 in 2013
- The better substance to faze mosquitos is DEET. Wash surfaces that store water with detergent or chlorine.



Malaria (*Anopheles mosquito*)



Number of cases per year: 214 million.

Prevention: Anti-malaria medication, netting and screens, bug repellent, long clothing, and eliminating breeding sites.

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Yellow fever (*Aedes aegypti*/*Aedes albopictus mosquito*)



- **Symptoms:** fever, headache (mild) to organ failure (severe)
- **Prevention:** Vaccination, repellents, long clothing, , netting and screens, eliminating breeding sites.



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Dengue

(*Aedes aegypti*/ *Aedes albopictus* mosquito)



- 40% of the world's populations lives in areas where there is a risk of dengue transmission.
- **Number of cases per year:** ~400 million (CDC).
- **Symptoms:** fever, headache, joint pain, rash... can be fatal
- **Prevention:** Repellants, long clothing, netting and screens, eliminating breeding sites. (No vaccine)

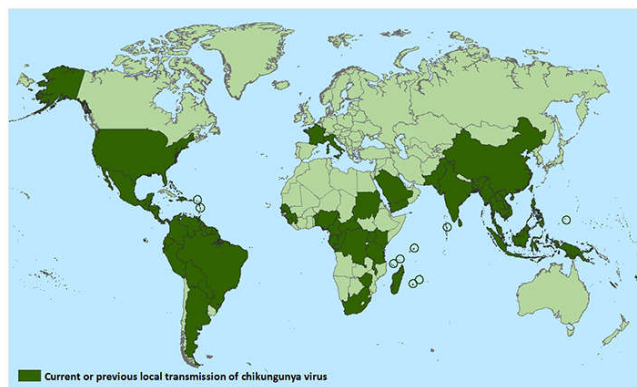
52



Chikungunya

(*Aedes aegypti*/ *Aedes albopictus* mosquito)

Countries and territories where chikungunya cases have been reported* (as of April 22, 2016)



- **Symptoms:** fever and rash – similar to dengue and Zika.
- **Prevention:** Repellant, long clothing, netting and screens, eliminating breeding sites.

*Does not include countries or territories where only imported cases have been documented. This map is updated weekly if there are new countries or territories that report local chikungunya virus transmission.

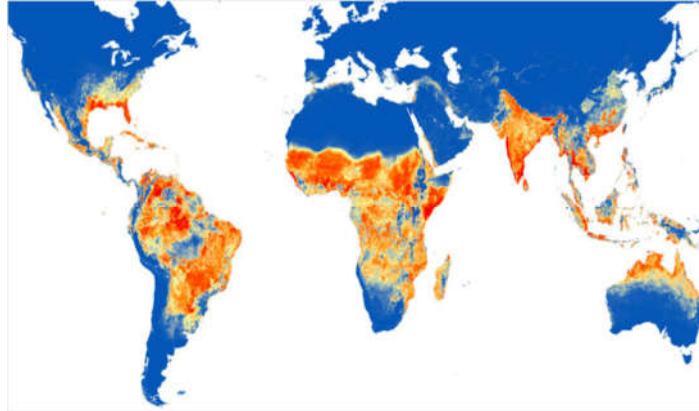
53



Zika (*Aedes aegypti*/*Aedes albopictus* mosquito)

Symptoms:
fever, rash,
headache,
joint/muscle
pain.

Prevention:
Repellant, long
clothing, netting
and screens,
eliminating
breeding sites.



Global map of the predicted distribution of *Ae. aegypti*. The map depicts the probability of occurrence (from 0 blue to 1 red).

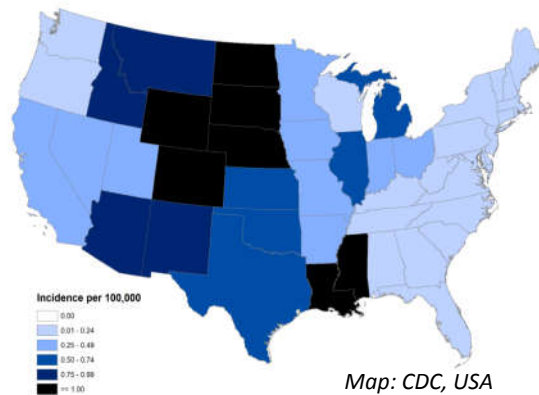
DOI.org.

54



West Nile virus (*Culex* mosquito)

Average annual incidence of West Nile virus neuroinvasive disease reported to CDC by state, 1999-2015



- **Symptoms:** none in most people; 1 in 5 get fever, headache; <1% get encephalitis/meningitis.
- **Prevention:** Repellant, long clothing, netting and screens, eliminating breeding sites.

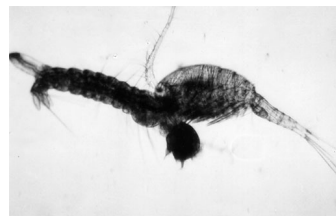
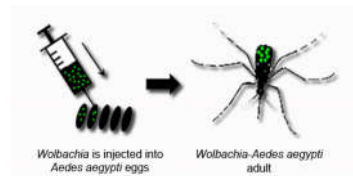
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Role of Mosquitos in the Ecosystem

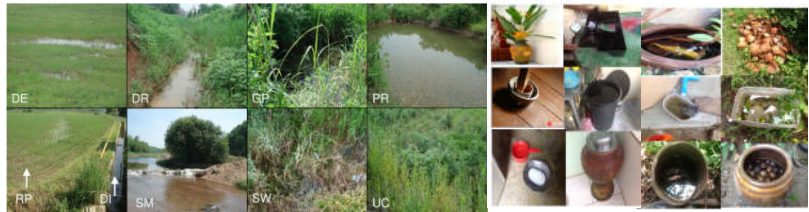
- Food of various animals: Bats, birds, crustaceans, other arthropods, amphibians and lizards
- The larvae of mosquitoes are fish food
- Plant pollinators
- Help to process leaf's decomposition and of other organisms

Biological controlers

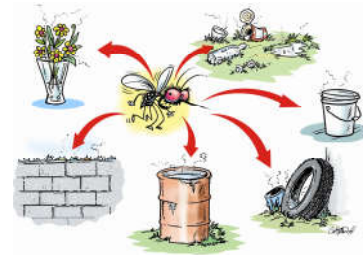
- Fishes
- Hemiptera: *Backswimmer maculata*.
- Hydras
- Crustaceans: Copepods
- Dragonfly larvae
- Amphibians turtles
- Birds (adults)
- Bats (adults)
- Bacteria



It is important to know where mosquitos live.



- Permanent hábitats
- Temporal hábitats
- Natural places
- Artificial places
- Indoors
- Outdoors



Hydrosphere



Mosquito Protocol

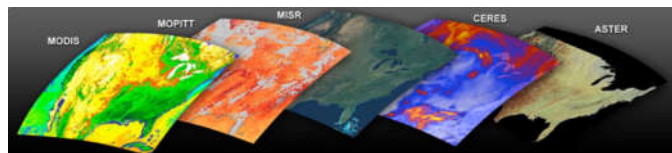


Satellite Data and Ground Verification

Remotely sensed data collected by instruments on planes and satellite can be used to estimate the probability of mosquito breeding and disease transmission / Habitats


You Can't See Mosquitoes from Space!


Seasonal patterns of temperature and precipitation could affect the spread and intensity of mosquito borne diseases. As well as the land cover change affect the distribution of suitable habitats for mosquitoes.



NASA's Terra and Aqua satellites carry sensors used by researchers to measure mosquito-favoring environmental conditions on Earth. Image Credit: NASA. [Read more here](#)

- A. What is the mosquito protocol ?
- B. Why collect mosquito data?
- C. How your measurements can help
- D. How to collect your data.
- E. Entering data on GLOBE Website.
- F. Understand the data.
- G. Quiz yourself
- H. Additional resources



Hydrosphere  Mosquito Protocol

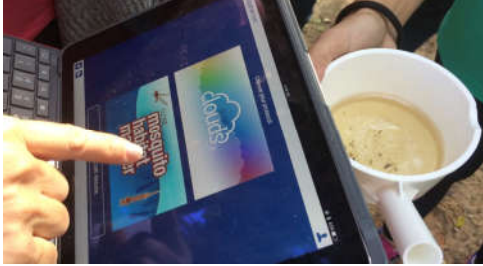
WHY
Collect
mosquito
data?

Why Collect Mosquito Data?

Vaccines are not available for most mosquito diseases, including dangerous diseases such as Zika, chikungunya, malaria, and West Nile virus.

Where there are no vaccines available, there are only 3 ways to protect a community from mosquito vector borne disease. These are:

- Surveillance
- Habitat mitigation
- Public education



The GLOBE Observer Mosquito Habitat Mapper supports all three!

A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

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E. Entering data on GLOBE Website.


F. Understand the data.

G. Quiz yourself

H. Additional resources

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Hydrosphere  Mosquito Protocol

How to
collect your
DATA

Mosquito Protocol: What do you need to start?

	Ideally, weekly during the mosquito season, and three weeks before and after
Where	Neighborhoods, school grounds, parks, wetland sites, and around the home
Time Needed	1-2 hours weekly
Prerequisites	none
Key Instruments	Dipper, magnifier, macro pipette (turkey baster), mobile device with GLOBE Observer Mosquito Habitat Mapper downloaded. A clip-on macro lens (60-100x) for your mobile device is recommended (available online)
Skill Level	Intermediate
References you need	GLOBE Observer Mosquito Habitat Mapper. Download at no cost from your app store to a mobile device.

A. What is the mosquito protocol ?

B. Why collect mosquito data?

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Hydrosphere Mosquito Protocol

How to collect your DATA

Assemble Field Equipment

A. What is the mosquito protocol ?

B. Why collect mosquito data?

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E. Entering data on GLOBE Website.

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H. Additional resources

- GLOBE Observer Mosquito App
- Measuring tape
- Dipper, Net or Bulb Syringe (baster)
- Bucket
- Plastic zip bags
- Permanent marker and pencil
- White plastic plate
- Forceps
- Rinse bottle
- Paper towels
- Camera (phone camera is good)
- Ethanol alcohol
- Hand lens, magnifying glass or magnifying attachment for mobile device



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Hydrosphere Mosquito Protocol

How to collect your DATA

Start your Fieldwork with Safety Steps

A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

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E. Entering data on GLOBE Website.

F. Understand the data.

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H. Additional resources

Safety is important:


- Students should wear protective **gloves and goggles** when handling water samples
- Protect students from exposure to biting mosquitoes. Ask your students to wear clothes that cover the body so little bite area is exposed. Apply insect repellent.
- The best time to collect samples is at the heat of the day, near solar noon, when mosquitoes are least active. Women who are pregnant or are planning to become pregnant should not participate in this activity.




SAFETY be sure students wear gloves and goggles during your investigations



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Hydrosphere  **Mosquito Protocol**

How to collect your **DATA**

Meaningful Sampling

A. What is the mosquito protocol ?

B. Why collect mosquito data?

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H. Additional resources

WHERE: Artificial or Natural places?

Artificial: Small or Big? Use all the container as a sample

- If this is small use all the content
- If this is big, use a net to gather a sample


Natural: running or standing water? Sampling 5 times each 3 minutes


- Running water: Use a bucket to sample or a Bulb Syringe
- Standing water: Use a net or a Bulb Syringe

**If you use a net it is important to have a rinse bottle to clean the net*


**After collection, you will identify the mosquito larvae using keys and count the number of larvae within each genus or species.*


**Note: if the breeding site is a natural hydrology site, it is recommended that you establish it as a hydrology study site. Then you can examine changes in the water parameters in conjunction with mosquito data, and record changes over time.*





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Hydrosphere  **Mosquito Protocol**

How to collect your **DATA**

Mosquito Larvae Sampling Method: Small Containers

A. What is the mosquito protocol ?

B. Why collect mosquito data?

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H. Additional resources

Pour sample water in container through net into a bucket. In the photo to the right, GLOBE students found an abandoned bucket that collected rainwater and created a sheltered habitat where mosquitoes could lay their eggs.


Or, you can use a dipper or a bulb syringe (turkey baster) to sample larvae. Here a bulb syringe is used to sample water puddled on a leaf in the Amazon.


Tip: when using a bulb syringe, depress the bulb before inserting and quickly pull in the water- don't give the larvae a chance to swim away and escape!





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Hydrosphere  Mosquito Protocol

How to collect your **DATA**


Mosquito Larvae Sampling: Natural Hydrology Sites

Using the mosquito dipper or net, skim the surface of the water. The net is maintained at an acute angle with respect to the water surface, see figure:

Take 5 samples. Wait 3 minutes between each sample. If you use a net, do the washing step next.

Larvae rest on the surface of the water but if they are disturbed they swim below the surface for safety. By waiting 3 minutes, the larvae will have returned to the surface to breathe

Tip: sample quickly! Try to not cast a shadow, because the larvae will dive to safety.



A. What is the mosquito protocol ?

B. Why collect mosquito data?

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E. Entering data on GLOBE Website.


F. Understand the data.

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H. Additional resources

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Hydrosphere  Mosquito Protocol

How to collect your **DATA**

Mosquito Larvae Sampling- washing

After collecting a sample with a net, use a squirt bottle with water to gently remove the debris caught in the net into a bucket.

If you have used a dipper or a bulb syringe/macro pipette/baster, skip this step.



A. What is the mosquito protocol ?

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Hydrosphere



Mosquito Protocol

How to collect your **DATA**

Mosquito Larvae Sampling

A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

D. How to collect your data.

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Pour sample in labeled plastic bags.

Leave air in bags so that larvae can breathe, and keep bags cool and in the shade. If they warm up in the sun, the larvae may die.


Identify the larvae soon after collection. If left overnight, any pupae in the sample may become adult flying mosquitoes.

If you find adult mosquitoes in your sample bag, shake the bag to drown the adult mosquitoes.


Tip: When you are done, your sample can be poured on the ground, any larvae will not survive. Do not pour samples into sinks or toilets where they might survive in a sewer.

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Hydrosphere



Mosquito Protocol

How to collect your **DATA**

Mosquito Larvae Identification

A. What is the mosquito protocol ?

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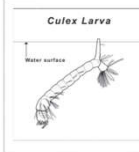
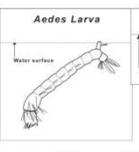
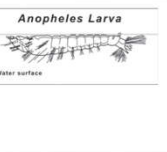
G. Quiz yourself

H. Additional resources

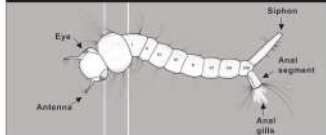
Familiarize yourself with the general anatomy of the mosquito larvae and the key features that distinguish those genera or species that are found in your locality.

In particular, key features are often found on the anal segment at the siphon. Consult with mosquito experts or mosquito identification keys for your locality.

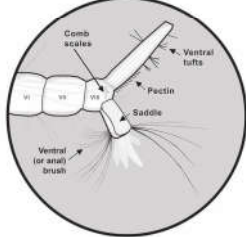
Behavior is important: You can place the larvae in vials to see how they suspend from the surface of the water to help with identification.

MOSQUITO LARVA ANATOMY



GENERAL ANATOMY



IDENTIFICATION FEATURES

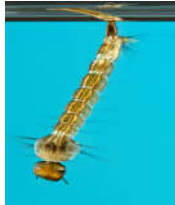
Anopheles

- Absence of respiratory siphon
- Spiracles (breathing holes) in parallel
- Little photophobia
- Rapid movement in the form of a whip
- Horizontal position
- Eggs with floats that prevent them from submerging
- Small eggs deposited in clean or dirty water



Aedes

- Short respiratory siphon
- Hang from the water with the head below perpendicular
- Movement in the form of viper
- Eggs with an elongated polygonal structure
- Eggs deposited in clean water



Culex

- Long respiratory siphon
- They hang with the head down obliquely
- They move in the form of a whip
- Eggs arranged as in a crown or "floating raft"
- Eggs usually in dirty water



Clave de identificación GLOBE

ANOPHELES	AEDES	CULEX
<p><i>Traza Borbollar</i></p> <p>Depositados individualmente</p>	<p><i>No Borbollar</i></p> <p>Depositados individualmente</p> <p style="text-align: center;">Huevos</p>	<p><i>No Borbollar</i></p> <p>Depositados en grupo formando una balsa</p>
<p>Van oculto a la superficie del agua</p> <p>Tubo respiratorio rudimentario</p>	<p>Van en ángulo a la superficie del agua</p> <p>Tubo respiratorio grueso y corto</p> <p style="text-align: center;">Larva</p>	<p>Van en ángulo a la superficie del agua</p> <p>Tubo respiratorio fino y largo</p>
<p style="text-align: center;">Pupa</p>	<p style="text-align: center;">Pupa</p>	<p style="text-align: center;">Pupa</p>

© 2000 Richard C. Russell

Aedes spp.
Anopheles spp.
Culex spp.



Hydrosphere



Mosquito Protocol

How to
collect your
DATA

Mosquito Identification using a clip-on macro lens

A. What is the mosquito protocol?

B. Why collect mosquito data?

C. How your measurements can help

D. How to collect your data.

E. Entering data on GLOBE Website.

F. Understand the data.

G. Quiz yourself

H. Additional resources

Follow these instructions to make sure you get a clear view of your specimen.

For best results, use a clip-on macro lens on a mobile device. This will allow you to identify your specimen to species. Use a lens 60x-100x for best results.

The 60x is very easy to use and is recommended, especially working with students

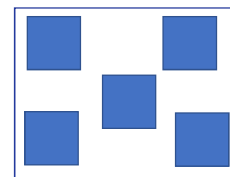
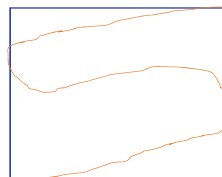
the 100x version, seen on the right, will provide sufficient resolution to see the comb scales, however it can be frustrating to learn to focus



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Counting Mosquitos

- Put the bag content in a plate and count all the mosquito larvae that you find, it could be done in parts
- In natural places, this estimation could be considered as number of mosquitos by m². If you have used a net or bulb consider this dimensions at time to gather the sample.
- Totalizing the total of larvae got by sample
- Explain methodology



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Hydrosphere  Mosquito Protocol

Enter data on GLOBE website

Submitting your data to GLOBE

A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

D. How to collect your data.

E. Entering data on GLOBE Website.

F. Understand the data.

G. Quiz yourself

H. Additional resources

- You will use the GLOBE Observer Mosquito Habitat Mapper mobile application to submit your data.
- The app will walk you through the steps.



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Hydrosphere  Mosquito Protocol

Enter data on GLOBE website

These are the steps

A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

D. How to collect your data.

E. Entering data on GLOBE Website.

F. Understand the data.

G. Quiz yourself

H. Additional resources

Breeding site!



Locate and describe

1

how many larvae?



sample & count

2

Vectors of disease?



identify

3

No breeding site!





decommission

4

75

38



Hydrosphere  **Mosquito Protocol**

Enter data on
GLOBE
website

Provide the date, time and location of your sample

A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

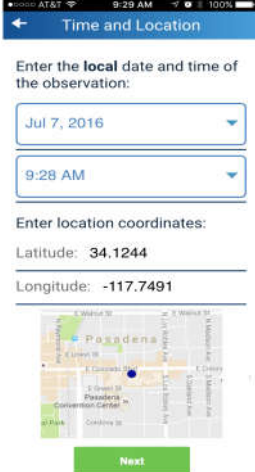
D. How to collect your data.

E. Entering data on GLOBE Website.

F. Understand the data.

G. Quiz yourself


H. Additional resources




Tip: If you don't see your latitude and longitude, Make sure you have enabled "location services" on your mobile device.

Tip: You can manually adjust your position on the map by moving the location. Don't touch the map unless you need to adjust your location- otherwise, you might accidentally provide the wrong coordinates.

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Hydrosphere  **Mosquito Protocol**

Enter data on
GLOBE
website

Describe the mosquito larvae habitat site

A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

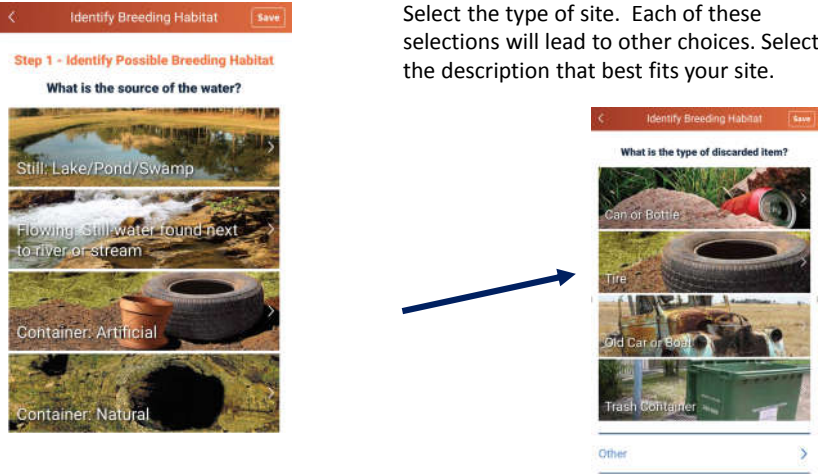
D. How to collect your data.

E. Entering data on GLOBE Website.

F. Understand the data.

G. Quiz yourself

H. Additional resources



Select the type of site. Each of these selections will lead to other choices. Select the description that best fits your site.

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Hydrosphere  Mosquito Protocol

Enter data on **GLOBE** website

Photograph Larvae

A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

D. How to collect your data.

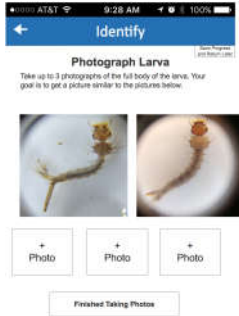
E. Entering data on GLOBE Website.

F. Understand the data.

G. Quiz yourself


H. Additional resources


The app will ask you to take photographs of a representative larval specimen. The app provides a guide how to best photograph your larva. You can make up to 9 photos of your specimen. You will also be asked to photograph the terminal end of the abdomen where diagnostic features for identification can be observed.




Tip: These photos serve as photo voucher specimens and will be uploaded as metadata, so scientists can check the data.

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Hydrosphere  Mosquito Protocol

Enter data on **GLOBE** website

Identify Larvae

A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

D. How to collect your data.

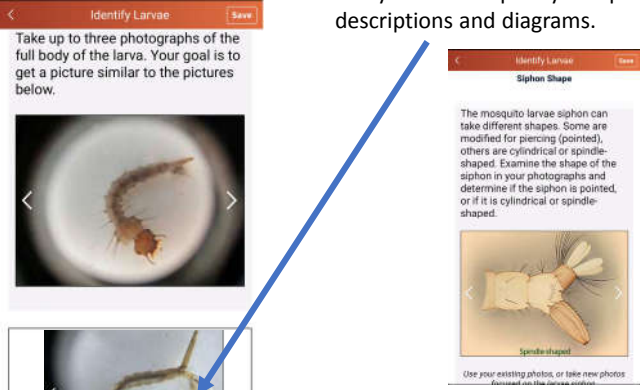
E. Entering data on GLOBE Website.

F. Understand the data.

G. Quiz yourself

H. Additional resources


Your photograph is uploaded in to the app and you can compare your specimen with descriptions and diagrams.



In the example to the left, the uploaded photograph has a cylindrical long siphon, indicative of *Culex*, not spindle shaped, like the example photo.

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Hydrosphere  **Mosquito Protocol**

Enter data on GLOBE website

Count Larvae

A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

D. How to collect your data.

E. Entering data on GLOBE Website.

F. Understand the data.

G. Quiz yourself

H. Additional resources





For container sites, it is best to try and count all the larvae you can see.

For natural sites, you will have to count the number in your sample, totaling all the larvae

You will also be asked to say if you see eggs, adults, and pupae in the sample and environs.

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Hydrosphere  **Mosquito Protocol**

Enter data on GLOBE website

Site mitigation

A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

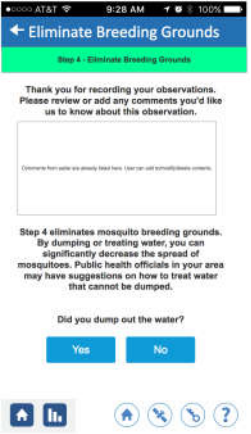
D. How to collect your data.

E. Entering data on GLOBE Website.

F. Understand the data.

G. Quiz yourself

H. Additional resources



Every site that is taken out of use by users is recorded in the app.


If it is a container site, you can take it out of use by mother mosquitoes by dumping out the water and picking up trash.

For water storage containers you can cover the opening with a net or a lid.


For natural breeding sites, such as a pond or lake, you do not mitigate. If you have found a natural habitat with mosquito vectors you can contact your mosquito control agency.

Remember that most mosquito species do not transmit pathogens- they play a vital role in the ecosystem- feeding birds, bats and amphibians, as well as pollenating plants!

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Hydrosphere Mosquito Protocol



Visualize and Retrieve Data-1

GLOBE provides the ability to view and interact with data measured across the world. Select our [visualization tool](#) to map, graph, filter and export data that have been measured across GLOBE protocols since 1995. Here are screenshots of the steps you will use when you use the visualization tool.



[Link](#) to step-by-step tutorial on using the GLOBE Data Visualization Tool

A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

D. How to collect your data.


E. Entering data on GLOBE Website.

F. Understand the data.


G. Quiz yourself

H. Additional resources

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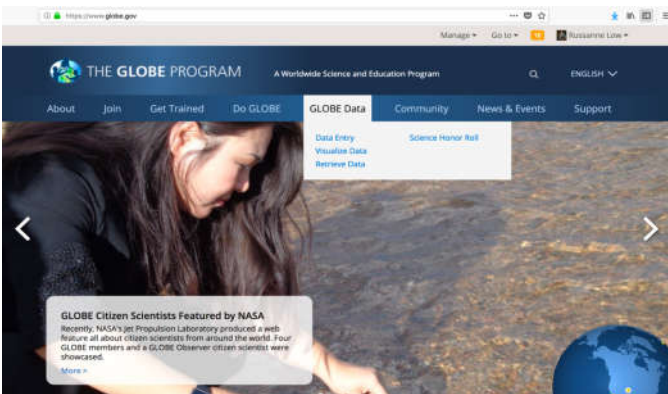


Hydrosphere Mosquito Protocol



Visualize and Retrieve Data-2

Go to globe.gov and on the menu, select GLOBE data and click on “Visualize Data”.



A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

D. How to collect your data.


E. Entering data on GLOBE Website.

F. Understand the data.

G. Quiz yourself

H. Additional resources

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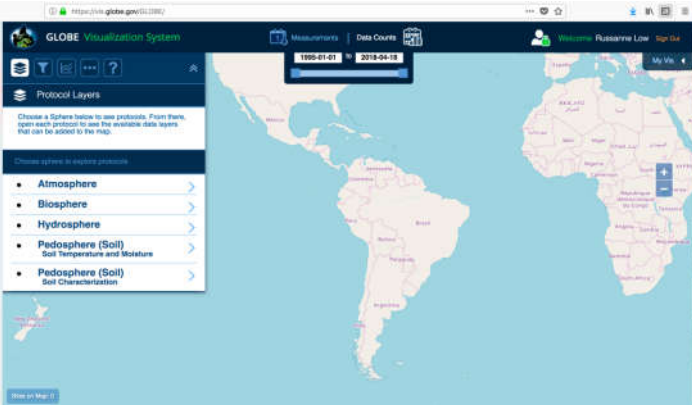
Hydrosphere Mosquito Protocol

Visualize and Retrieve Data-3

Understand
the
DATA

Select the data layer icon, and you will see the protocol layers. Select Hydrosphere.

Select "Data Counts" if you want to see all the data available within a range, or select a single day.



A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

D. How to collect your data.


E. Entering data on GLOBE Website.

F. Understand the data.

G. Quiz yourself

H. Additional resources

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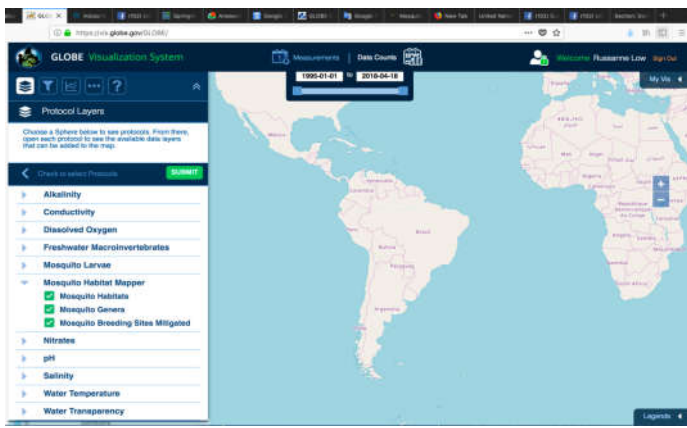


Hydrosphere Mosquito Protocol

Visualize and Retrieve Data-4

Understand
the
DATA

In Hydrosphere, select Mosquito Habitat Mapper and the fields you want to examine.



A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

D. How to collect your data.


E. Entering data on GLOBE Website.

F. Understand the data.


G. Quiz yourself

H. Additional resources

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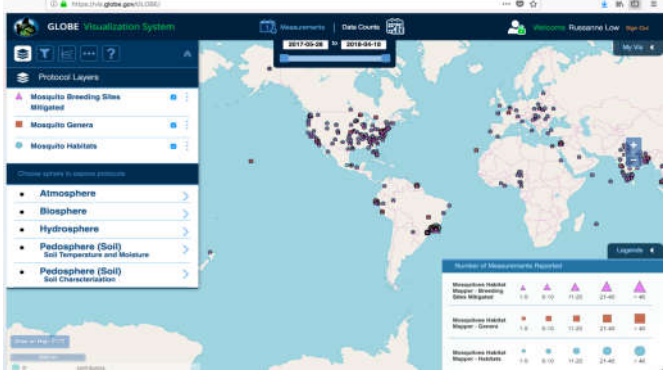


Hydrosphere Mosquito Protocol



Visualize and Retrieve Data-5

The data will populate the map. You can see the legend by clicking on the pull-out legend, lower right. You can zoom in and see on which street the data was found!



A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

D. How to collect your data.


E. Entering data on GLOBE Website.

F. Understand the data.


G. Quiz yourself

H. Additional resources


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Hydrosphere Mosquito Protocol



Visualize and Retrieve Data-6



Above: Data reported by citizen scientists since inception, using the GO MHM app, June-December 2017. See inset image, Rio de Janeiro, Brazil data hub, where an intensive training pilot took place in May-June 2017. N=1523. (<https://vis.globe.gov/GLOBE/>)

A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

D. How to collect your data.


E. Entering data on GLOBE Website.


F. Understand the data.

G. Quiz yourself

H. Additional resources

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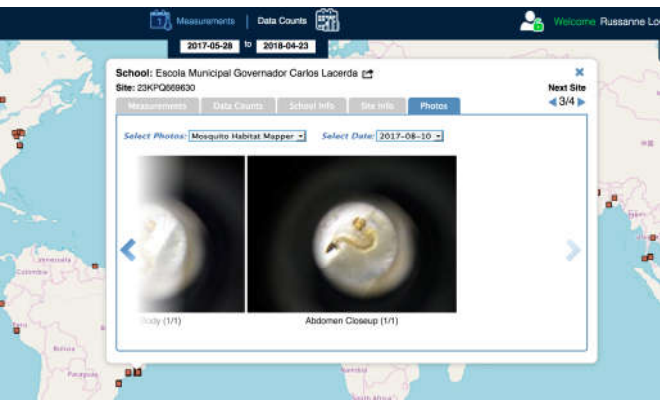


Hydrosphere  Mosquito Protocol

Understand the DATA

Visualize and Retrieve Data-7

Accuracy and data quality: voucher photo can be examined to ensure that the identifications are correct. Click on any data point to retrieve metadata for that location.



A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

D. How to collect your data.

E. Entering data on GLOBE Website.

F. Understand the data.

G. Quiz yourself

H. Additional resources

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Hydrosphere  Mosquito Protocol

Understand the DATA

Accuracy and data quality

Accuracy and data quality: You can search by taxa, to see where different species or genera have been found.



A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

D. How to collect your data.


E. Entering data on GLOBE Website.

F. Understand the data.


G. Quiz yourself

H. Additional resources

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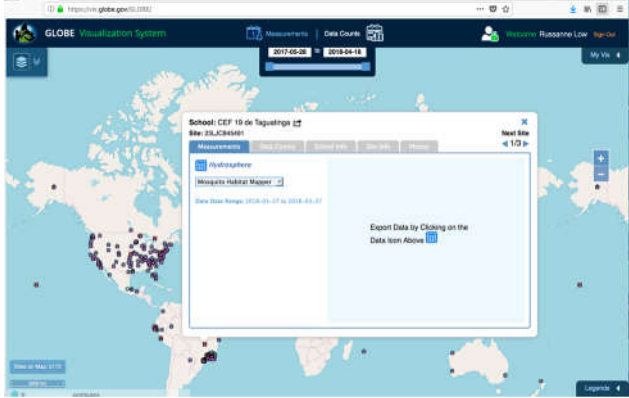


Hydrosphere Mosquito Protocol



Accuracy and data quality

You can download data as a .csv or .kmz file by clicking on a data point and choosing the "Measurements" tab. Follow instructions to download.



A. What is the mosquito protocol ?

B. Why collect mosquito data?

C. How your measurements can help

D. How to collect your data.

E. Entering data on GLOBE Website.

F. Understand the data.

G. Quiz yourself

H. Additional resources

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Preparing a Class

1. Identify the learning objective

4. Literature review

- Scientific information
- GLOBE teacher guide
- Select protocols

2. Post questions:

- What I know
- What I would like to know
- Select EUREKA questions

5. Action

- Get data
- Report data
- Analyze data
- Create knowledge

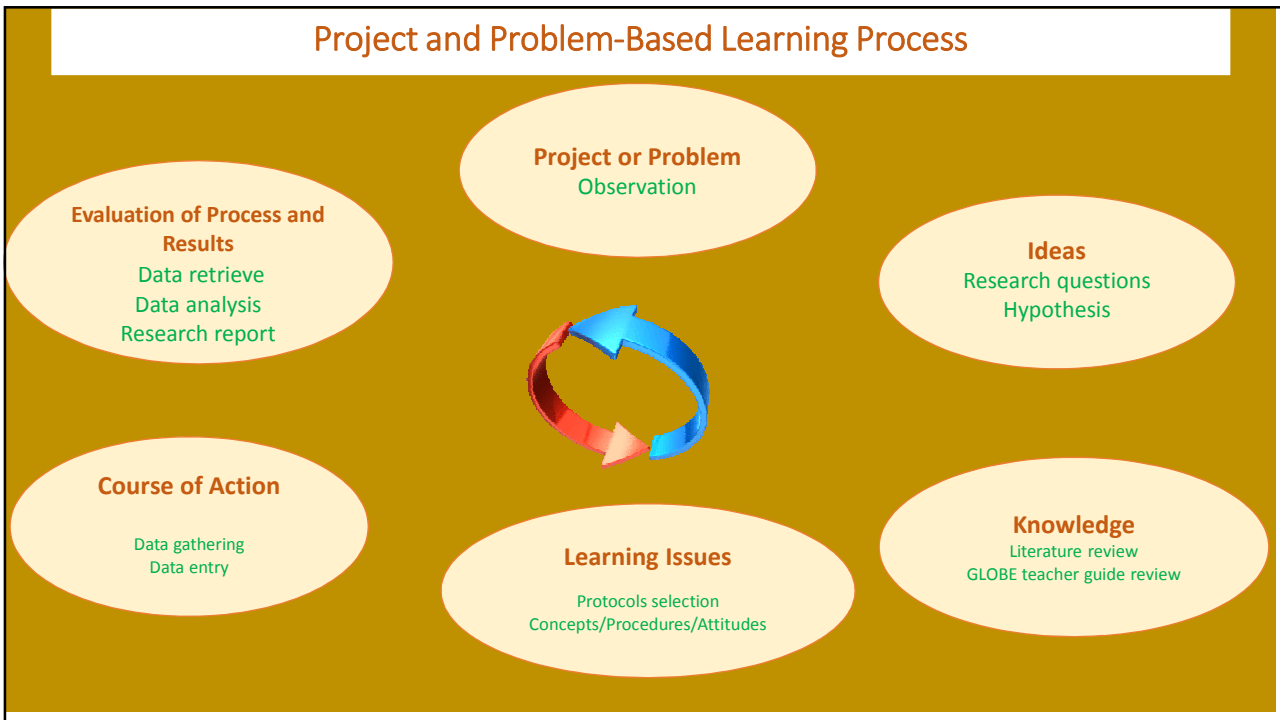
3. Awareness list:

Knowledge	Skills	Attitudes


6. Share

- What do I learn
- Write a report
- Present your results

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STEM and Mosquitos



- Dibujar


Robot Mosquito Casero



<https://www.youtube.com/watch?v=jx1-yI5LmKw>

Fig. 8. Número mensual de casos de dengue, precipitación y promedio de Aedes aegypti colectado por casa en el área metropolitana de Maracay, Noviembre 2000-Diciembre 2001.

Mes	Casos de dengue	Precipitación [mm]	Nº Aedes/casa
Noviembre	40	100	10
Diciembre	20	100	10
Enero	20	100	10
Febrero	20	100	10
Marzo	20	100	10
Abril	20	100	10
Mayo	20	100	10
Junio	20	100	10
Julio	20	100	10
Agosto	20	100	10
Septiembre	20	100	10
Octubre	20	100	10
Noviembre	20	100	10
Diciembre	20	100	10



Solución a un problema

Selecting your Hydrosphere Study Site

All your hydrosphere measurements are taken at the same Hydrosphere Study Site.

Any surface water site that can be safely visited and monitored regularly

Natural waters are preferred. Sites may include (in order of preference):

- 1. Stream or river
- 2. Lake, reservoir, bay or ocean
- 3. Pond
- 4. An irrigation ditch or other water body, if natural body is not available



Hydrosphere



Introduction to the Hydrosphere

Equipment Needed to Document your Hydrosphere Study Site

Assemble Equipment:

- Pencil or pen
- Compass
- GPS receiver
- Camera
- GLOBE Science Log



Assemble Necessary Documents:

[Selecting and Documenting your Hydrosphere Study Site](#)

[GPS Protocol](#)

Time: 10 minutes

Suggested Frequency: one time; update if the site changes



Determining your Location using a GPS Receiver

Collect positional data using a GPS receiver.

- Wait at least four satellites, this is indicated by the appearance of a “3-D” message.
- At one minute intervals and without moving the receiver more than one meter, make five readings
 - a. Latitude
 - b. Longitude
 - c. Elevation
 - d. Time
 - e. Number of satellites
 - f. “2-D” or “3-D” status icons



Site Definition Sheet

* Required Field

School Name: _____ Site Name: _____
Choose a unique name based on location, e.g. "Grassy area - Front of School"

Names of students completing Site Definition Sheet: _____

Date: Year ____ Month ____ Day ____ Check one: New Site Metadata Update

*Coordinates: Latitude: _____ ° N or S Longitude: _____ ° E or W
 Elevation: ____ meters

*Source of Location Data (check one): GPS Other _____

Comments: _____

Site Type (select all that apply based on intended measurements, then complete the necessary fields below): Atmosphere Surface Temperature Hydrosphere Biosphere (Land Cover) Biosphere (Greening) Soil (Pedosphere) Characteristics Soil (Pedosphere) Moisture and Temperature

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Adding Data to the Hydrosphere Fields

Record the **name of the water body**

Record whether the water is **salt water or fresh water**.

If your water site is **moving water**, record whether it is a stream, river, or other and its approximate width in meters.

If your water site is a **standing water**, record whether it is a pond, lake, reservoir, bay, ditch, ocean or other and whether it is **smaller than, larger than**, or about equal to a 50 m x 100 m area. If known, indicate the approximate area (km²) and depth (meters).

Record whether your **sample location** is an outlet, bank, bridge, boat, inlet or pier.

Record whether you can see the **bottom**.

Record the **material** from which the bank or channel is made.

Record the **type of bedrock**, if known. Sediments

Record the **manufacturer and model number** for each chemical test kit you are using, if any.

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Adding Data to the Hydrosphere Fields

Record in the **Comments Section** any information that may be important for understanding the water at your site. Some possible observations might be: **human activities**

Standing where you will be collecting your water sample, **take four photographs** of your sampling area, one in each cardinal direction (N, S, E, W). Use a compass to determine the direction (five - surface-could be great)

- If you've taken photographs of your site **label each photo**



Mapping your Hydrosphere Study Site

Assemble Equipment:

- Pencil/eraser
- Compass
- Flags (18)
- Measuring tape (50 m)
- 1 cm grid paper

Assemble Necessary Documents:

[Mapping Your Hydrosphere Study Site Field Guide](#)
[Hydrosphere Study Site Mapping Sheet](#)

Time: 30 -45 minutes

Suggested Frequency: one time; update if the site changes





Creating Your Site Map

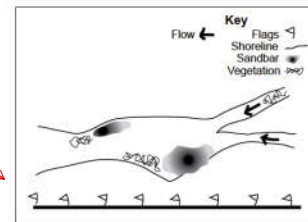
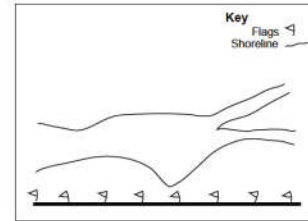
Select a section of the bank at least 50 meters long as your study area. The area should contain the sampling site where you collect your water measurements and representativity of the habitats

50 meters long, parallel to the shoreline, and within 10 meters of the bank. The transect will be varying distances from the water if the bank is not straight.

Place flags at the two ends and at every 2 meters along the transect.

Start drawing your map using the flags to help keep it to scale.

Note: Use the Mapping Field Sheet or graph paper with 1 cm squares, each square should represent 2 meters. Put the scale on your graph.



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Drawing your Site Map

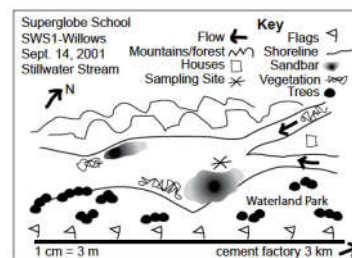
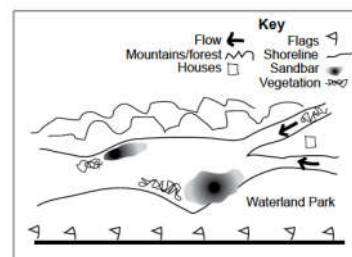
Mark the transect and flag positions on the map.

Draw the waterline or bank by measuring from each flag directly to the water, placing a small dot on the map to show the waterline, then connect the dots with a dotted line to indicate the bank.

Put in the opposite bank or indicate the **approximate distance to the opposite bank** if known.

Use an arrow to indicate the **direction of water flow** or the inlet and outlet of your water body.

Create a key with symbols for special features found at your site.



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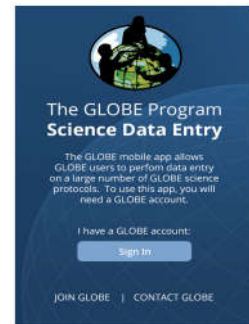
Create a Key for your Map

Within the sampling area: riffle areas, pools, vegetated areas, logs, rocky areas, gravel bars, bridges, docks, jetties, dams, etc.
Around the sampling area: land cover (or MUC codes), geological features such as cliffs or rocky outcrops, man-made features such as houses, parks, parking lots, factories, roads, dumps or debris, etc.

Show the location of your Hydrosphere Sampling Site.

Include the following information on the map:

- Name of site
- Name of water body
- North arrow
- Date
- Scale (e.g., 1 cm = 3 m)
- Key to all symbols used on the map



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Water Transparency Protocols: Should I use a Secchi Disk or a Transparency Tube to measure water transparency?

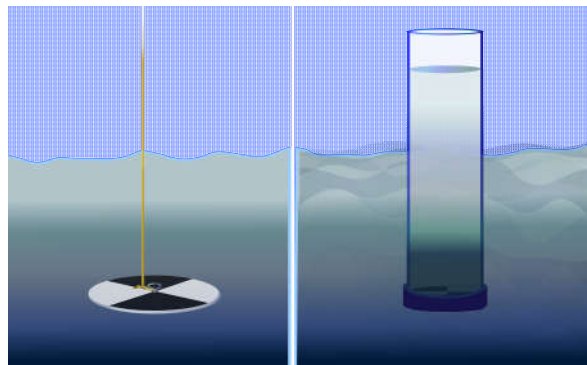
There are two techniques to choose from.

Secchi Disk deep or still water

transparency tube shallow or flowing water.

Both instruments can be built easily using household materials by following instructions in the GLOBE Teacher's Guide.

Require: Description of the Sky Conditions, Cloud Type and Cloud Cover.



Secchi Disk is used with deep and still water

Transparency Tube used with shallow or Flowing water

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Water Temperature Protocol

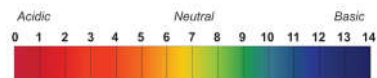
- How hot or cold the water is
- Water has a **higher heat capacity** (specific heat) than air, thus it heats and cools more slowly - thermoregulator
- **Master variable** because almost all properties of water, as well as chemical reactions taking place in it, are affected by it.
- Temperature influences the amount and diversity of aquatic life.
- Electrical conductivity and dissolved oxygen, require water temperature data.



What is Water pH?

pH is a measure of the relative amount of free hydrogen ions there are in the water, which determines the acidity of the water body.


$$\text{pH} = -\log [\text{H}^+]$$





Logarithmic units from 0-14, with 7 being neutral. Each number represents a 10x change in the acidity or alkalinity of the water.

The pH values for your water site will depend on the geology, soil and vegetation of your area as well as other inputs
Most lakes and streams have pH between 6.5 and 8.5. Oceans have a pH value of 8.2.

pH of a water body can be measured using either a pH meter or pH paper. The accuracy of either method depends on the **electrical conductivity** of the water. The electrical conductivity needs to be at least 200 $\mu\text{S}/\text{cm}$ for these methods to report accurately.



Hydrosphere  **Dissolved Oxygen Protocol**



A. What is dissolved oxygen?

B. Why collect DO data?

C. How your measurements can help

D. How to collect your data.

E. Entering data on GLOBE Website.

F. Understand the data.


G. Quiz yourself


H. Additional resources

Dissolved Oxygen (DO)?

- Dissolved oxygen (DO) measures the amount of molecular oxygen (O₂) in the water. It does not measure the amount of oxygen in the water molecule (H₂O).
- DO less than 3ppm could be stressful to most of organisms
- DO of at least 6 pmm could be considered as good
- Factors affecting the solubility of dissolved oxygen include:
 - Water temperature: Colder water can dissolve more oxygen than warmer water
 - Atmospheric pressure: Water at higher elevations holds less dissolved oxygen since the atmospheric pressure is less.
 - Salinity: Saline water can hold less oxygen at the same temperature and pressure than can fresh water

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Hydrosphere  **Introduction to the Hydrosphere**


Freshwater Macroinvertebrates Protocol

Millions of small creatures inhabit fresh waters of lakes, streams, and wetlands.

Macroinvertebrates, consisting of a variety of insects and insect larvae, crustaceans, mollusks, worms, and other small, spineless animals live in the mud, sand, or gravel of the substrate or on submersed plants and logs.

They play a crucial role in the ecosystem: Part of the food chain

Macroinvertebrates offer services as clean water (filter feeders)



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