GLOBE Mission EARTH

Mini-Tutorial:

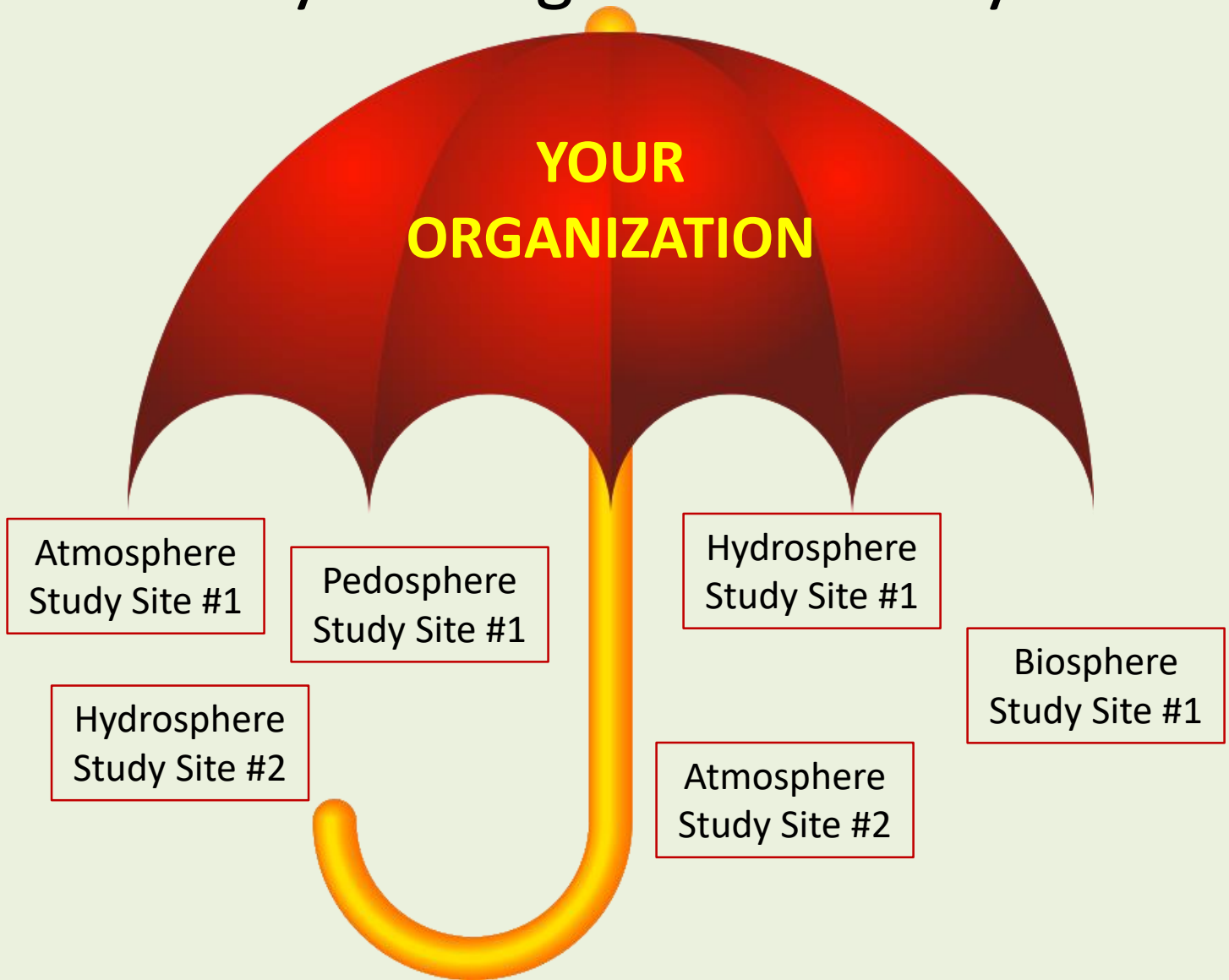
Using Google Maps to Set up a Hydrosphere Study Site and Set it up in GLOBE

By Sara Mierzwiak

In this training, you will learn how to:

- Locate potential locations for GLOBE Hydrosphere Study Sites using Google Maps
- Collect the field data needed for site set up
- Enter the data on the GLOBE website to set up a Hydrosphere Study Site

You can add as many Study Sites under the umbrella of your Organization as you'd like!



Beginning with geospatial technologies

Using geospatial technologies is a great way to get students to start thinking spatially, and to get everyone oriented about their school grounds before heading outside.

Examples of geospatial technologies online:

- Google Earth (https://www.**google**.com/**earth**),
- Google Maps (www.maps.google.com),
- Bing Maps* (www.**bing**.com/**maps**),
- Other mapping websites, or
- ArcGIS Online (www.arcgis.com).

*Hint: If you use Bing Maps, try using “Bird’s Eye View” for more detailed aerial imagery of your school grounds, and try rotating around, viewing from each direction.

In this example, we'll use Google Maps…

STEPS:

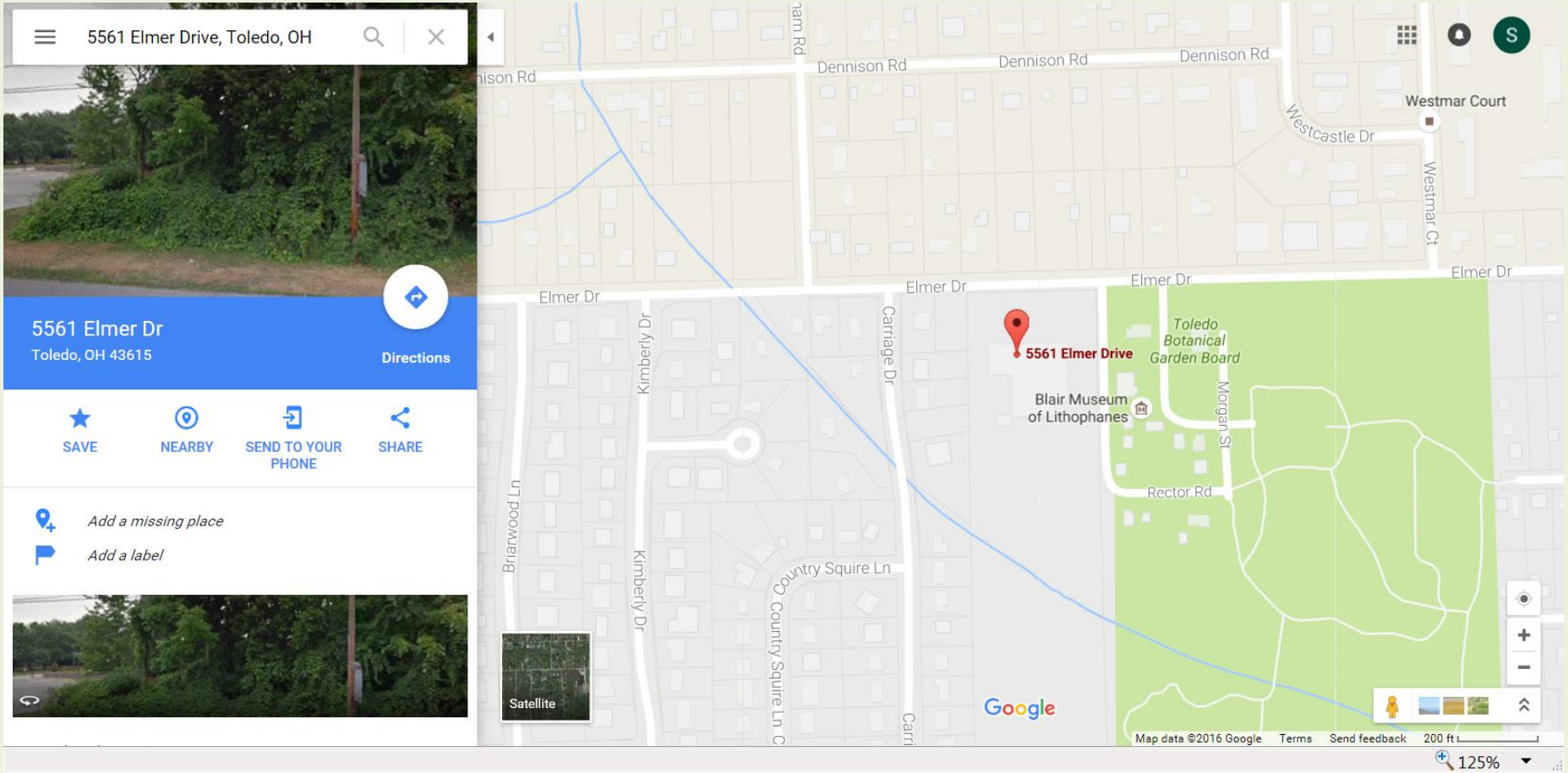
1. Go to www.maps.google.com and zoom in to your school.
2. Change the view back and forth from "Road" to "Satellite" and discuss with your students the layout of your school grounds. *Ex. "What direction is North?"* Have students point to what direction they think North is.
3. HIGHLY RECOMMEND : do a review/quick lesson of Latitude and Longitude with students.
4. If you have a stream, pond, lake or other water body on or near your school grounds, zoom in to the area where you will most likely collect water samples.
5. Right click on the location, and select "What's here?". The latitude and longitude of the location shows up. Confirm outside using the GPS Field Guide and GPS Investigation Data Sheet (discussed later).
6. Record hydrosphere site-specific data: ex. stream width, depth, substrate.
7. Use this information to fill out the GLOBE Site Definition sheet: http://www.globe.gov/documents/348614/8c79fb1e-7c89-49c9-ba29-4a1ca05c5191.

A good GLOBE Hydrosphere Study Site will be…

- Easily accessible to students – SAFETY FIRST!
- Free of hazards such as thorny or thick bushes, dangerous wildlife, etc.
- On your school grounds or in a public area.
  - If on private land, obtain permission first.
  - If a stream, ideally sample in a riffle area (as opposed to a stagnant area).
- Used to connect local water issues to global water issues!

Open www.maps.google.com

We'll use the Toledo Public Schools Natural Science Technology Center as an example (GME Teacher Laura Schetter's school).

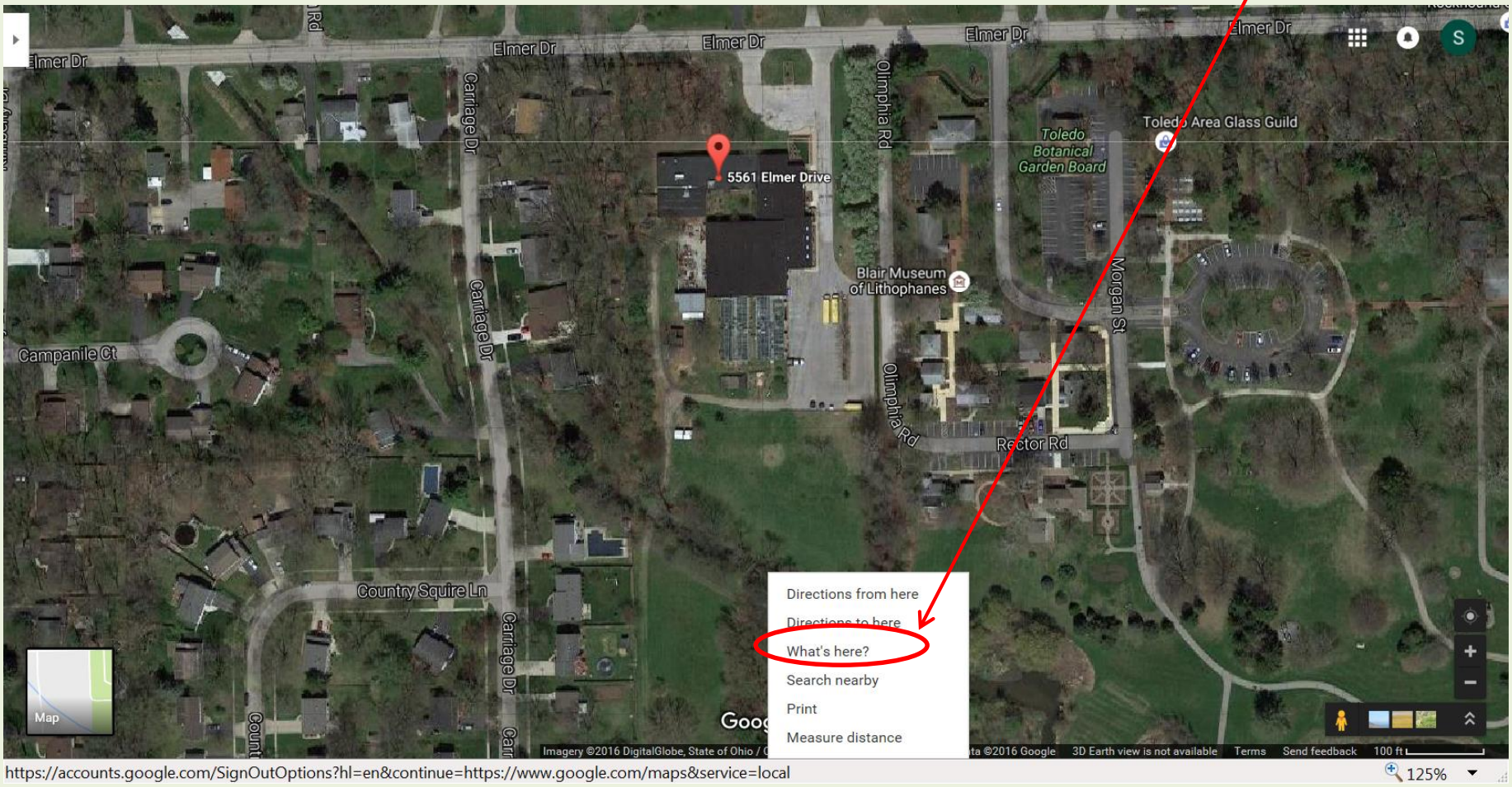


Ask students: *"What water bodies do we have around our school?"*

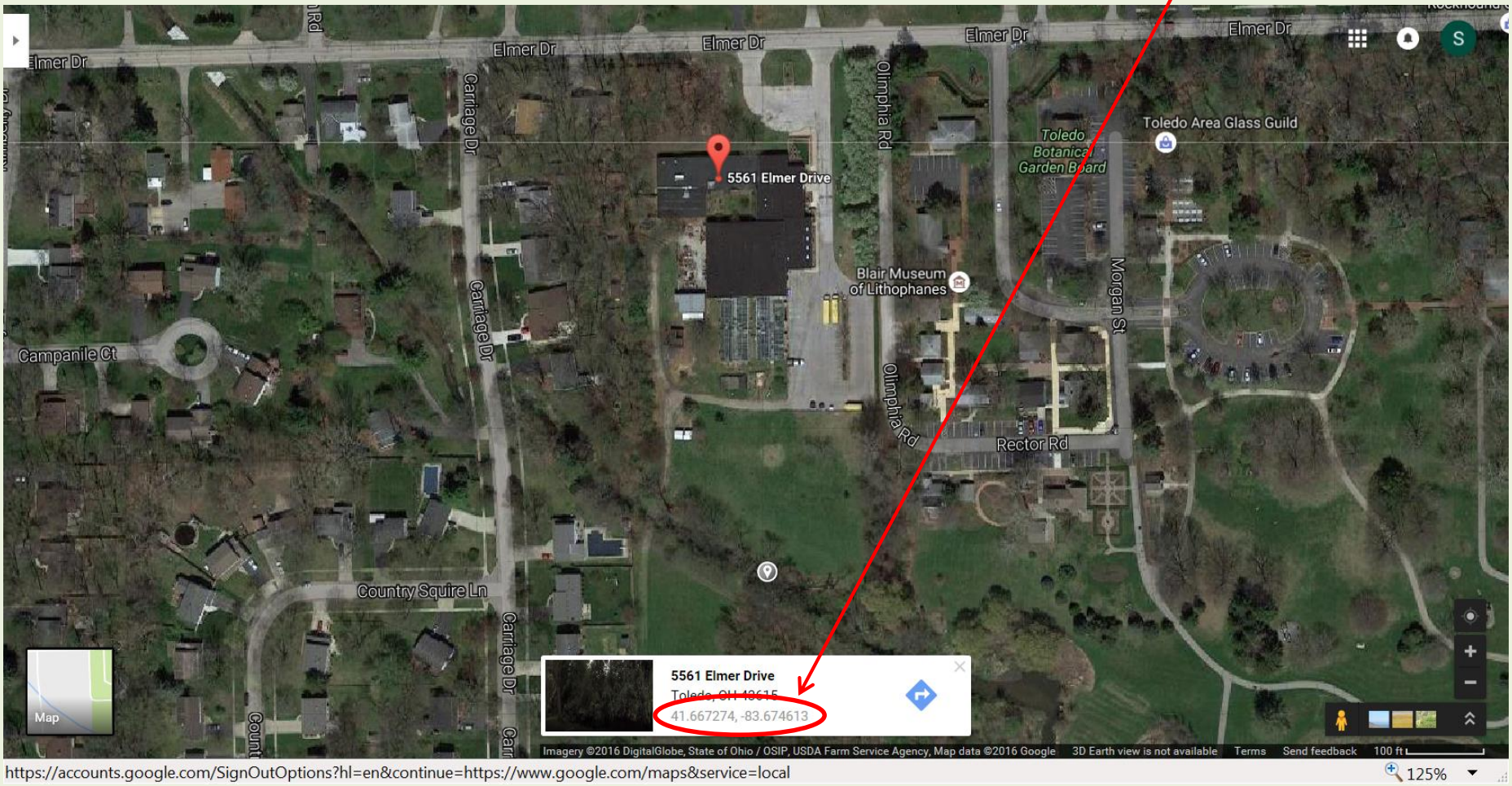
Zoom in to the stream on site and switch to Satellite view…

Switch between Map and Satellite Views back and forth to get students oriented.

Right click on the location you will most likely sample from and select “What’s here?”

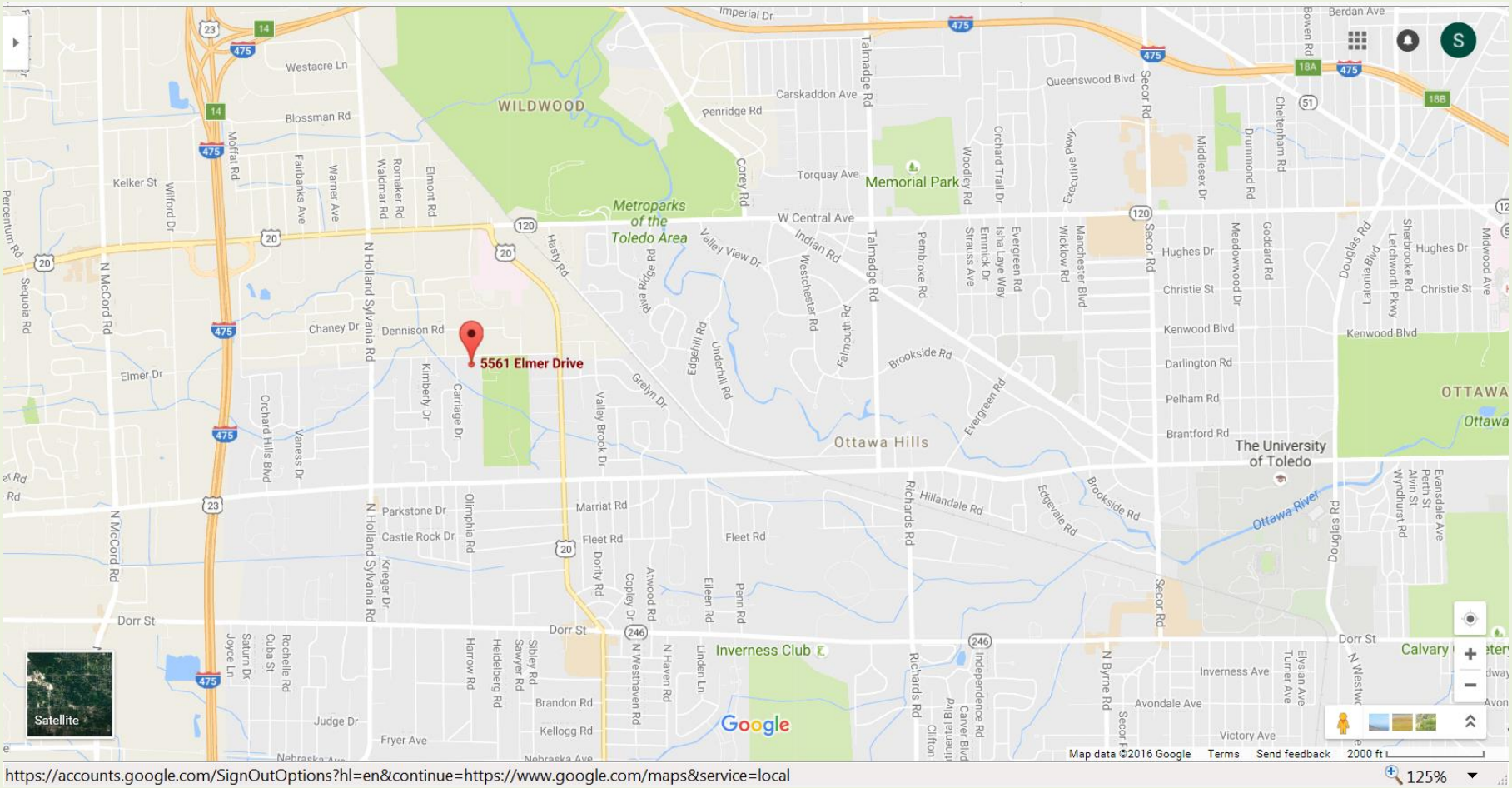


The Latitude and Longitude appear



Record this data in your notebook and on the GLOBE Site Definition Sheet.

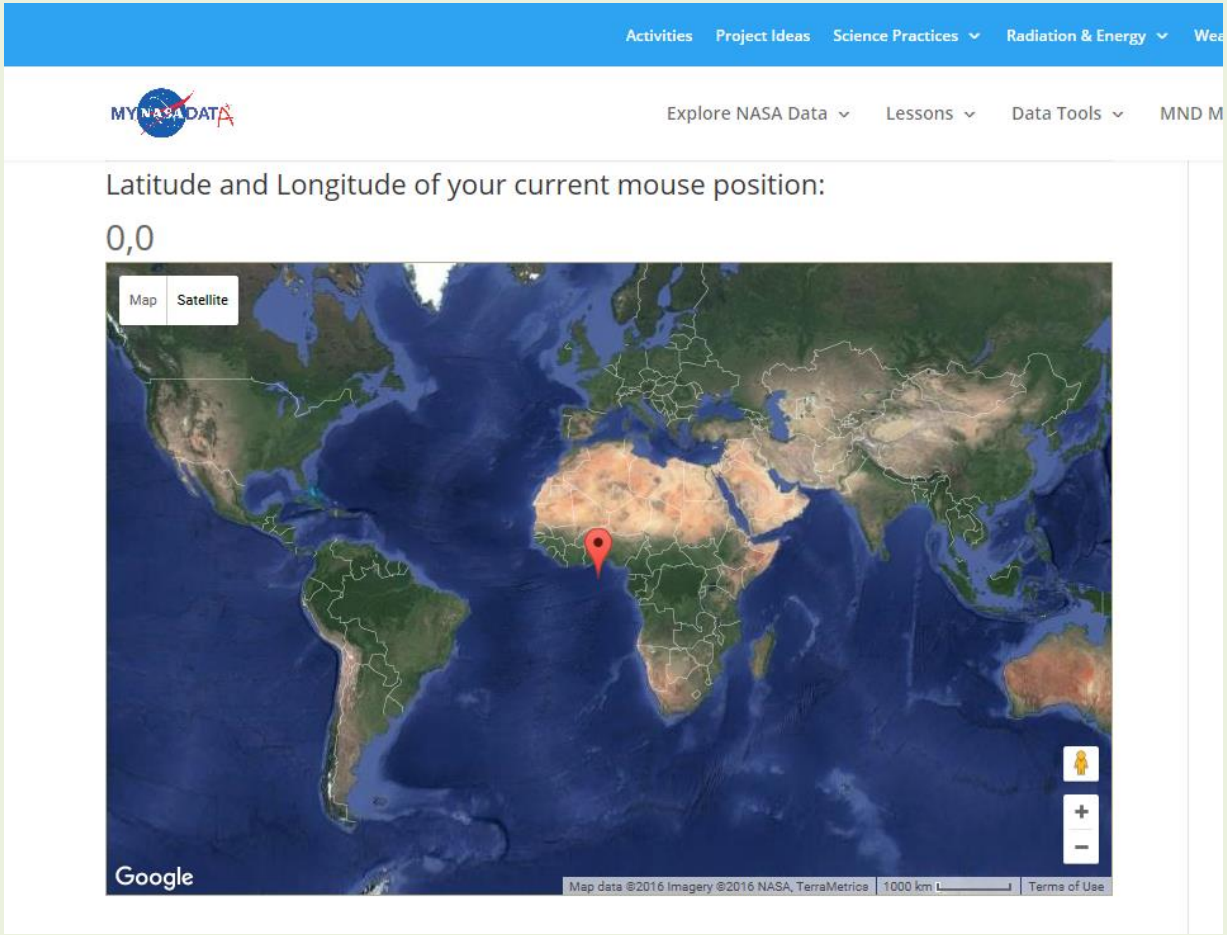
Zoom way out to see where the stream comes from and where it's flowing



If the stream has a name, you can add that to your GLOBE site definition information.

Resources for Latitude and Longitude

- NASA website with a detailed explanation on latitude and longitude: http://www-istp.gsfc.nasa.gov/stargaze/Slatlong.htm
- NASA website “Latitude and Longitude Finder”: http://mynasadata.larc.nasa.gov/latitudelongitude-finder/



Now take your students outside to investigate the potential sampling site

- Ask students to investigate the area for safety issues: What are the hazards?
- Do a safety review on site: where is the school's first aid kit and what are the safety procedures for dealing with incidents?
- Give students the following supplies: reel measuring tape, clipboard with Site Definition Sheet, GPS unit(s), GPS Protocol Field Guide and GPS Investigation Data Sheet.
- Check all GPS units to be sure that they are in decimal degrees for latitude and longitude (not degrees, minutes, seconds). Have the students do this?

GPS Protocol Field Guide

GPS Protocol

Field Guide

Task

Measure the latitude, longitude, and elevation of your school or a GLOBE study site.

What You Need

- ❑ GPS receiver
- ❑ GPS Data Sheet
- ❑ Watch
- ❑ Pen or pencil

https://www.globe.gov/documents/10157/2209c9c4-96d7-46fe-acdd-eba84b73e5df

GPS Protocol Field Guide (continued)

In the Field

1. Take the GPS receiver to the exact location you would like to determine latitude, longitude, and elevation.
2. Turn on the receiver, making sure that you are holding it vertical and you are not blocking the antenna's view of the sky. In most receivers the antenna is internal and is located at the top of the receiver.
3. After an introduction message, the receiver will start to search for satellites. Some receivers may display the previous latitude, longitude, and elevation values while it is locking onto satellite signals.
4. Wait for the receiver to indicate that at least four satellites have been acquired and that a good measurement is available. In most receivers, this is indicated by the appearance of a "3-D" message.
5. At one minute intervals and without moving the receiver more than one meter, make five recordings on a copy of the *GPS Investigation Data Sheet* of all digits and symbols for the following displayed values:
   a. Latitude
   b. Longitude
   c. Elevation
   d. Time
   e. Number of satellites
   f. "2-D' or "3-D" status icons

https://www.globe.gov/documents/10157/2209c9c4-96d7-46fe-acdd-eba84b73e5df

GPS Investigation Data Sheet

GPS Investigation

Data Sheet

Data Recorded By: _____

Date Recorded: Year_____ Month:_____ Day:_____

Circle Site type: School Atmosphere Biosphere
Hydrosphere Soil (Pedosphere) Other _____

Site Name: _____

School Name:_____

School Address:_____

Do not begin recording data until your GPS receiver has "locked in."
Wait at least one minute between recording each observation.
Record the following data from the appropriate screens on your GPS unit

https://www.globe.gov/documents/10157/879787f5-7f35-444a-9d54-9fec59e7175c

GPS Investigation Data Sheet (continued)

Do not begin recording data until your GPS receiver has "locked in."
Wait at least one minute between recording each observation.
Record the following data from the appropriate screens on your GPS unit.

Obs	**Latitude** Decimal Degrees (N/S)	**Longitude** Decimal Degrees (E/W)	**Elevation** Meters	**Time** H:M:S UTC	**# Sats** Satellites	**Messages** Circle if Displayed
1						2D 3D
2						2D 3D
3						2D 3D
4						2D 3D
5						2D 3D

			← Averages

https://www.globe.gov/documents/10157/879787f5-7f35-444a-9d54-9fec59e7175c

Toledo Natural Science Technology Center

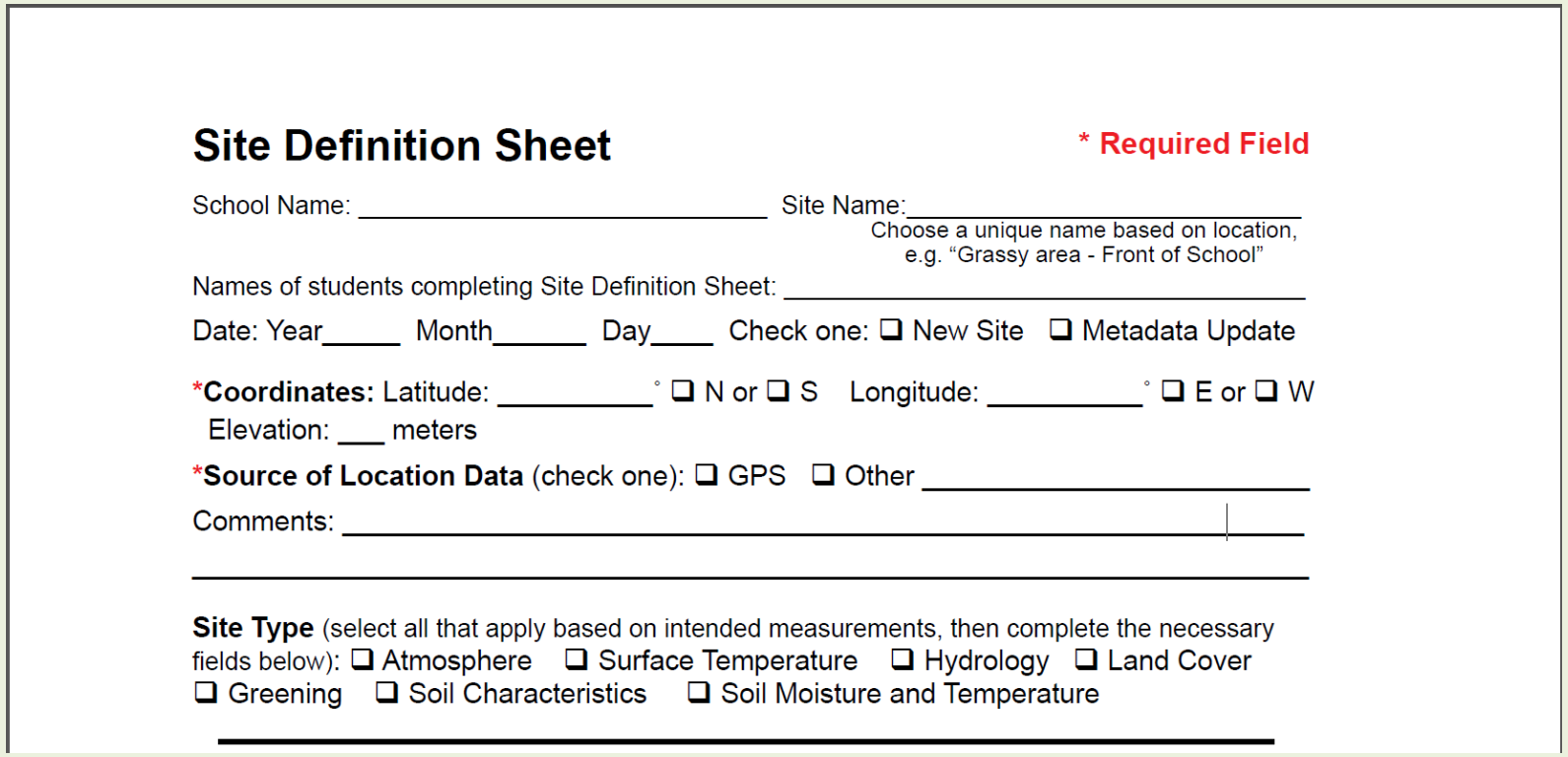
GLOBE Study Sites

Collecting GPS Coordinates

Measuring width of stream

Enter the Information on the GLOBE Site Definition Sheet

http://www.globe.gov/documents/348614/8c79fb1e-7c89-49c9-ba29-4a1ca05c5191



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 ❑ Hydrology ❑ Land Cover ❑ Greening ❑ Soil Characteristics ❑ Soil Moisture and Temperature

Fill out one Site Definition Sheet for each GLOBE Study Site you establish.

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 ❑ Hydrology ❑ Land Cover ❑ Greening ❑ Soil Characteristics ❑ Soil Moisture and Temperature

Atmosphere

List any obstacles (Check one): ❑ No obstacles ❑ Obstacles (describe below)
(Obstacles are trees, buildings, etc. that appear above 14° elevation when viewed from the site)

Description: _____

_____

Buildings within 10 meters of instrument shelter (Check one):
❑ No buildings ❑ Buildings (describe below)

Description: _____

_____

Other Site Data:

Steepest Slope: _____ Compass Angle (facing up slope): _____

Rain Gauge Height ____ cm Ozone Clip Height ____ cm Thermometer Height ____ cm

*Thermometer Type (Check one):

❑ Other, Soil or Air
❑ Liquid-filled Max/Min (U-tube)
❑ Liquid-filled, Current Temperature Only
❑ Digital Single-Day Min/Max
❑ Digital Multi-Day Min/Max
❑ Reset Digital Multi-Day Min/Max Thermometer
Note: reset is required before data collection and entry, when batteries are changed or every 6 months
Date: Year____ Month____ Day____ Universal Time (hour:min): _____
Was this reset due to a battery change? ❑ Yes ❑ No
❑ AWS WeatherBug Station (Automated Station ID _____)
❑ Davis Instrument (Davis Thermometer Type _____)
❑ Data Logger (HOBO)
❑ Rainwise
❑ WeatherHawk
❑ No Thermometer

* Required Field

School Name: _____ Study Site: _____ Date: _____

Surface Cover Description under instrument shelter (Check one): ❑ Pavement ❑ Bare ground ❑ Short grass (< 10 cm) ❑ Long grass (> 10 cm) ❑ Sand ❑ Roof (describe below) ❑ Other (describe below)

Description: _____

Overall comments on the site (metadata): _____

_____

_____

Surface Temperature

Homogeneous site size (Select one): ❑ 90m x 90m ❑ 30m x 30m ❑ Smaller than 30 x 30m (specify size: __ m x __ m)

Cover type (Select one): ❑ Short grass (< 0.5m) ❑ Tall grass (> 0.5m) ❑ Barren land ❑ Shrubs ❑ Dwarf shrubs ❑ Concrete ❑ Asphalt ❑ Open water ❑ Other ❑ Land Cover site

Type of IRT Instrument: ❑ Raytech ST20 ❑ Other (specify instrument manufacturer and model) _____)

Overall comments on the site (metadata): _____

_____

_____

Hydrology

*Name of Body of Water: _____ (the name commonly used on maps; if the body of water does not have a common name, provide a description of the water body it comes from or flows into or both.)

*Water Body Type (Select one): ❑ Unknown ❑ Saltwater ❑ Freshwater ❑ Brackish

Water Body Source (Select one):

❑ Pond (Area of standing water ___ km²; Average Depth of Standing Water ___ m)
❑ Lake (Area of standing water ___ km²; Average Depth of Standing Water ___ m)
❑ Reservoir (Area of standing water ___ km²; Average Depth of Standing Water ___ m)
❑ Bay (Area of standing water ___ km²; Average Depth of Standing Water ___ m)
❑ Ditch (Area of standing water ___ km²; Average Depth of Standing Water ___ m)
❑ Ocean
❑ Estuary (Area of standing water ___ km²; Average Depth of Standing Water ___ m)
❑ Stream (Width of Moving water ___ m)
❑ River (Width of Moving water ___ m)
❑ Other (Width of Moving water ___ m; Area of standing water ___ km²; Average Depth of Standing Water __ m)

http://www.globe.gov/documents/348614/8c79fb1e-7c89-49c9-ba29-4a1ca05c5191

Pages 1 & 2 of the Site Definition Sheet (6 pages total). Note that each "sphere" is separated by a bold horizontal line.

Hydrosphere Site Definition

From the GLOBE Site Definition Sheet

Hydrology

***Name of Body of Water:** _____ (the name commonly used on maps; if the body of water does not have a common name, provide a description of the water body it comes from or flows into or both.)

***Water Body Type** (Select one): ❑ Unknown ❑ Saltwater ❑ Freshwater ❑ Brackish

Water Body Source (Select one):

- ❑ Pond (Area of standing water ___ km^2; Average Depth of Standing Water ___ m)
- ❑ Lake (Area of standing water ___ km^2; Average Depth of Standing Water ___ m)
- ❑ Reservoir (Area of standing water ___ km^2; Average Depth of Standing Water ___ m)
- ❑ Bay (Area of standing water ___ km^2; Average Depth of Standing Water ___ m)
- ❑ Ditch (Area of standing water ___ km^2; Average Depth of Standing Water ___ m)
- ❑ Ocean
- ❑ Estuary (Area of standing water ___ km^2; Average Depth of Standing Water ___ m)
- ❑ Stream (Width of Moving water ___ m)
- ❑ River (Width of Moving water ___ m)
- ❑ Other (Width of Moving water ___ m; Area of standing water ___ km^2; Average Depth of Standing Water __ m)

Hydrosphere Site Definition (continued)

From the GLOBE Site Definition Sheet

Site Definition Data Sheet - Page 3

*** Required Field**

School Name: _____ Study Site: _____ Date: _____

Can you see the bottom? ❑ Yes ❑ No

Channel/Bank Material: ❑ Soil ❑ Rock ❑ Concrete ❑ Vegetated Bank

Bedrock: ❑ Granite ❑ Limestone ❑ Volcanics ❑ Mixed Sediments ❑ Unknown

Freshwater Habitats Present: ❑ Rocky Substrate ❑ Vegetated Banks ❑ Mud Substrate ❑ Sand Substrate ❑ Submersed Vegetation ❑ Logs

Saltwater Habitats Present: ❑ Rocky Shore ❑ Sandy Shore ❑ Mud Flats/Estuary

Overall comments on the site (metadata): _____

_____

Land Cover

MUC Description: Level 1: _____ Level 2: _____

Level 3: _____ Level 4: _____

Note: *Use the MUC Guide to determine the greatest level possible within the MUC system*

***MUC Code:** _____

Overall comments on the site (metadata): _____

How to find the geology of your area

The United States Geological Survey (USGS) website

for [Geologic Maps of US States]

USGS science for a changing world

USGS Home
Contact USGS
Search USGS

Mineral Resources On-Line Spatial Data

Mineral Resources > Online Spatial Data

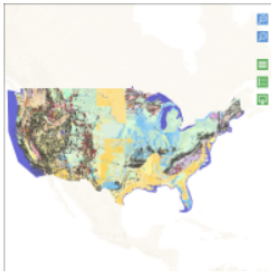
Geologic maps of US states

Digital geologic maps of the US states with consistent lithology, age, GIS database structure, and format

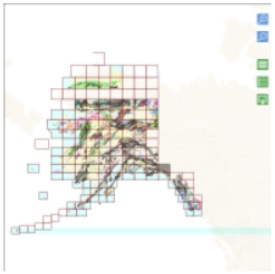
Alaska	Delaware	Indiana	Michigan	Nebraska	Oklahoma	Texas
Alabama	Florida	Kansas	Minnesota	New Hampshire	Oregon	Utah
Arkansas	Georgia	Kentucky	Missouri	New Jersey	Pennsylvania	Virginia
Arizona	Hawai`i	Louisiana	Mississippi	New Mexico	Rhode Island	Vermont
California	Iowa	Massachusetts	Montana	Nevada	South Carolina	Washington
Colorado	Idaho	Maryland	North Carolina	New York	South Dakota	Wisconsin
Connecticut	Illinois	Maine	North Dakota	Ohio	Tennessee	West Virginia
						Wyoming

Data for the District of Columbia is included with Maryland. Puerto Rico is also available.

Interactive maps



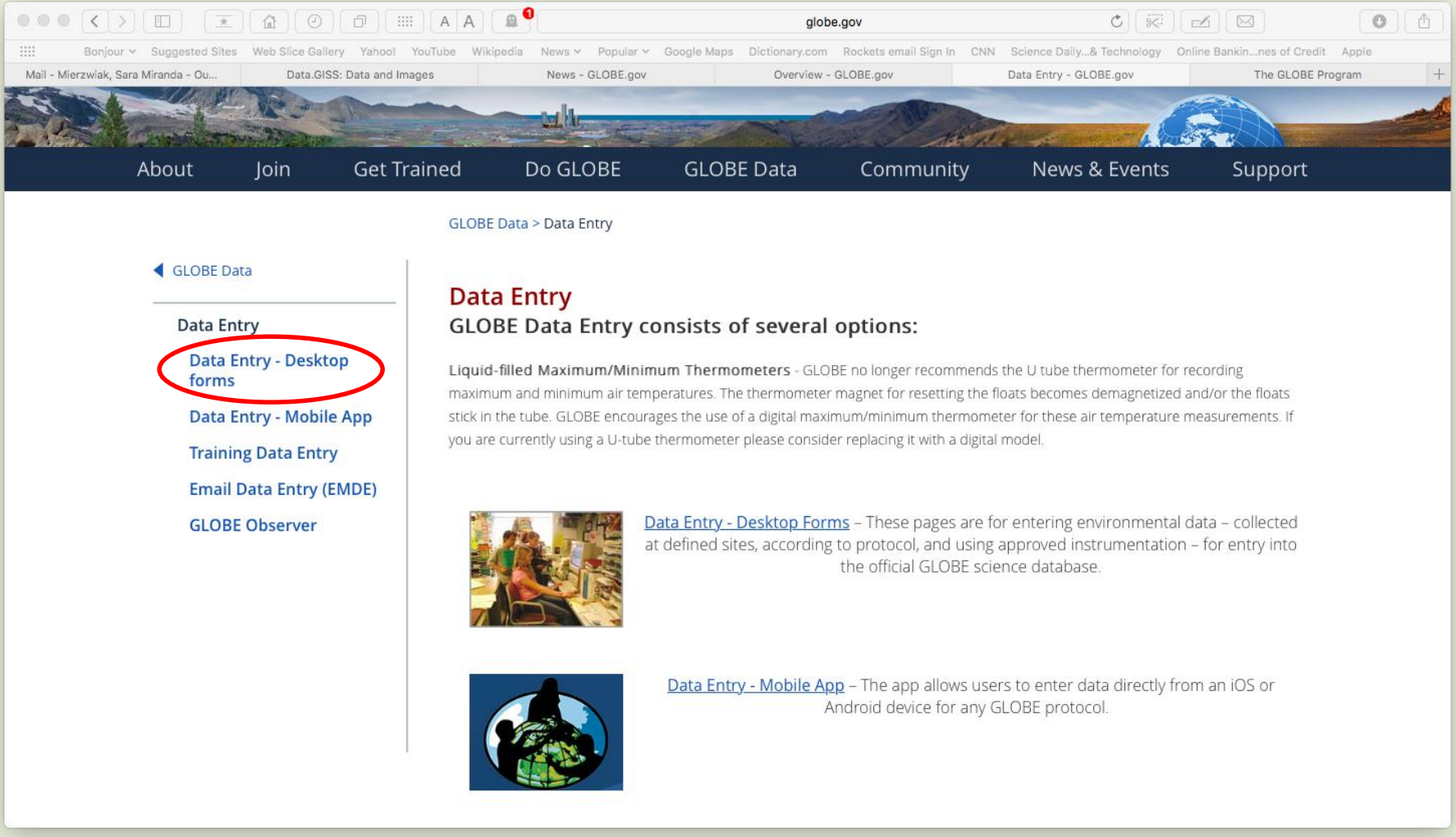
Conterminous US



Alaska

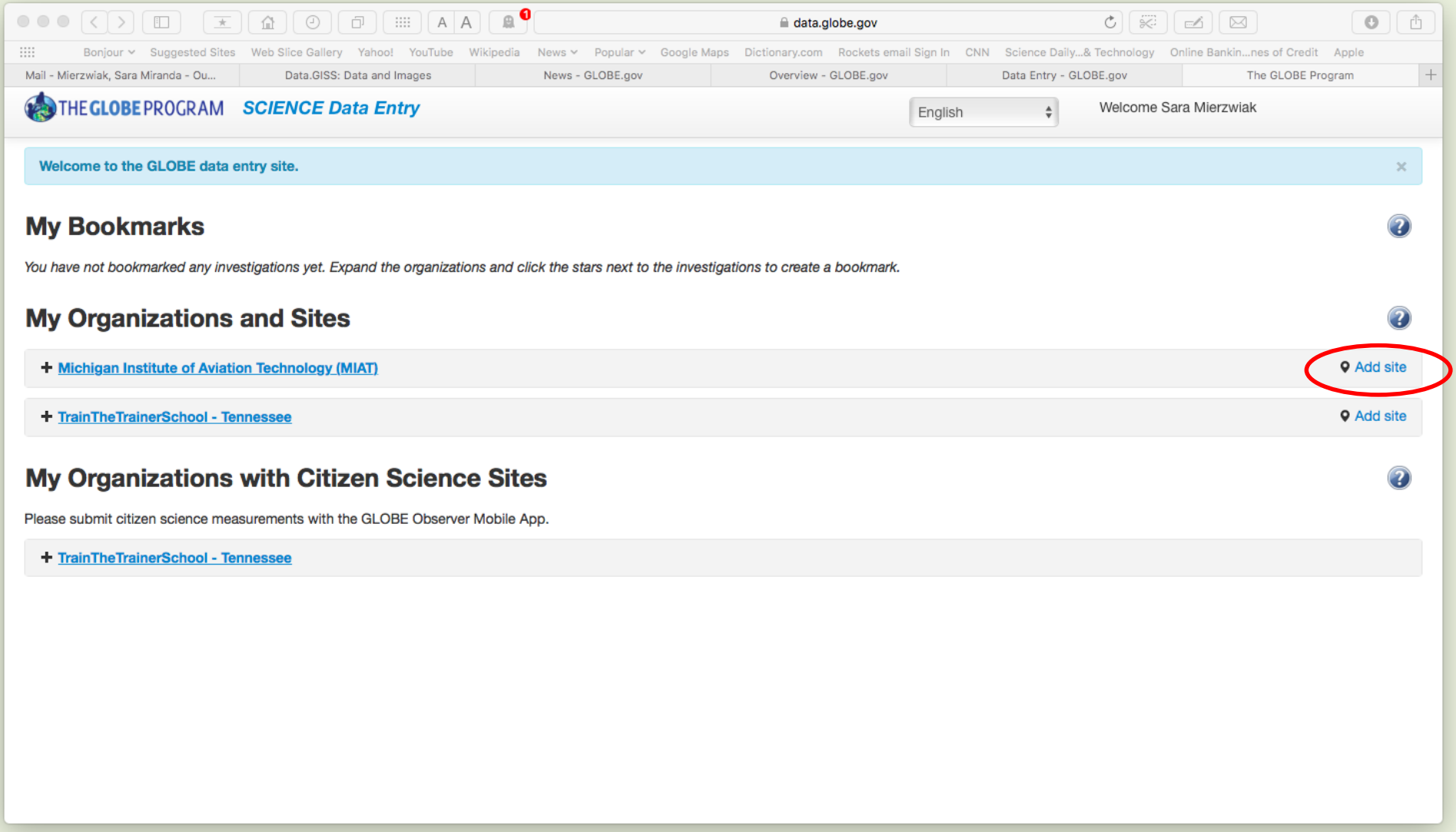
Now Set up Your Study Site(s) in GLOBE

Once you've collected all of the information you need and filled out a Site Definition Sheet, log into your GLOBE account and create each site. From the GLOBE homepage, select GLOBE Data → Data Entry. Choose "Data Entry – Desktop forms".



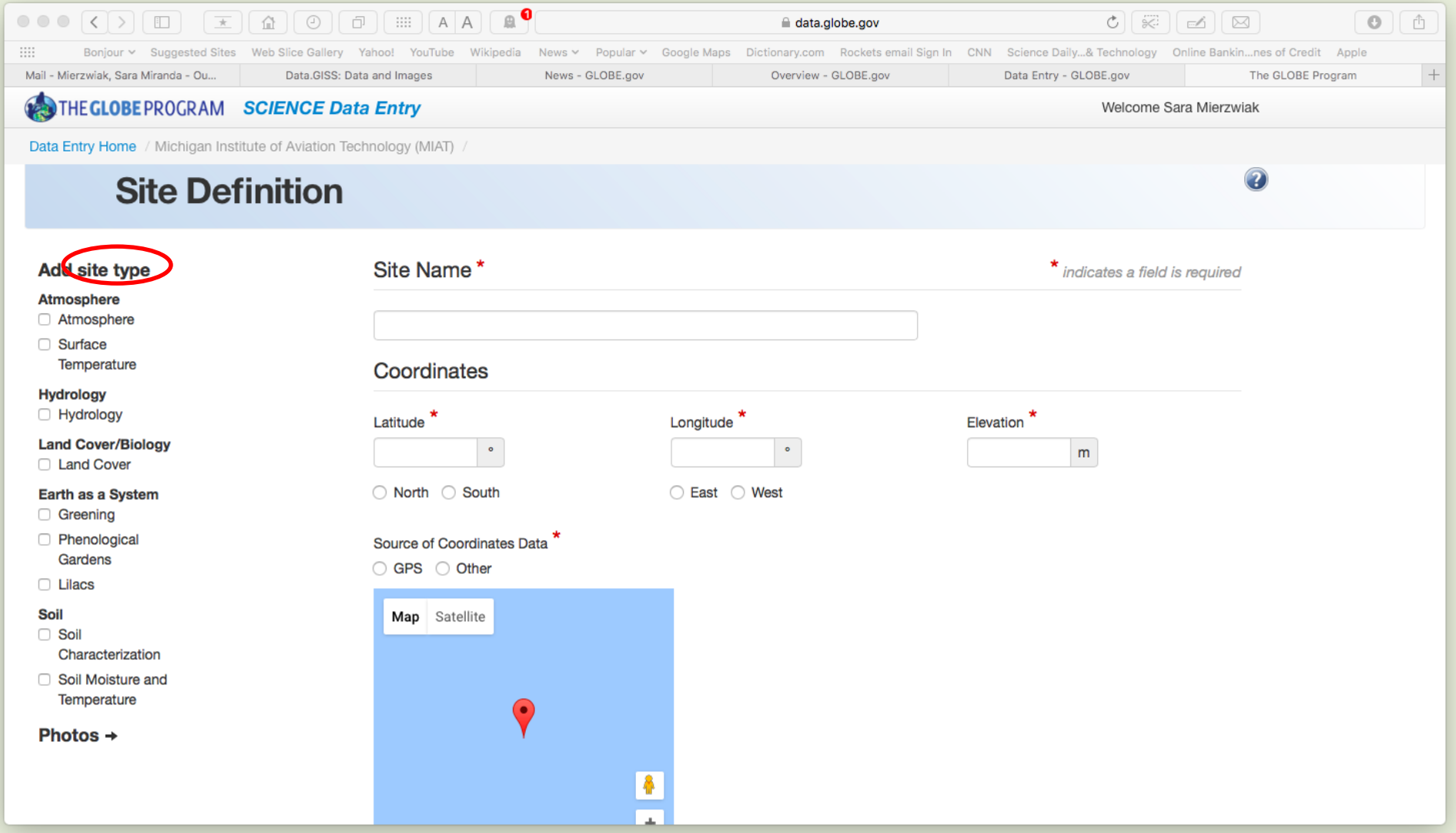
Your Organizations and Sites

To add a new Study Site to your Organization, choose “Add Site”.



Choose Site Type and Enter your info

Click on the site type (ex. Atmosphere or Surface Temperature),
then enter the info from your Site Definition Sheet.



Once your site is set up, have your students log in with their student account, and enter their data.

Master List of GLOBE Protocols -
Page 24 of the Implementation Guide Appendix

https://www.globe.gov/documents/10157/2660220/implementation_guide-appendix.pdf

Investigation Area	Recommended Measurement Frequency Range						
Hydrosphere	Daily	Weekly	Monthly	Seasonally	Semi-Annually	Annually	Once per site
GPS Measurement Protocol							X
Instrument Construction, Site Selection and Sampling Procedures							X
Water Transparency Protocol		X					
Water Temperature Protocol		X					
Dissolved Oxygen Protocol		X					
Electrical Conductivity Protocol		X					
Salinity Protocols		X					
Water pH Protocol		X					
Alkalinity Protocol		X					
Nitrate Protocol		X					
Freshwater Macroinvertebrates					X		
Optional Salinity Titration		X					

For More Information, See: Selecting Your GLOBE Study Sites – Page 21 of the Implementation Guide Appendix

https://www.globe.gov/documents/10157/2660220/implementation_guide-appendix.pdf

Selecting Your GLOBE Study Sites

Initial Considerations

The selection of the local study and sample sites can be an opportunity to begin an inventory of the area around the school, and to discuss criteria for measurement sites. What is a good place to measure water temperature, and why? What do you have to consider when planning where to dig a soil profile? Where can you get representative samples of soil moisture, and what might influence the choice of sampling strategy? How can Landsat imagery help with these decisions? These are only a few of the multiple questions that can serve as catalysts for learning.

For each measurement site within your GLOBE Study Site there will be hard choices to make because no one will have a perfect set of locations. This is an opportunity to work on solving problems with your students in order to come up with the best arrangement

Atmosphere, Biosphere, Hydrosphere, and Soil Moisture as detailed below. Once established, these study sites are locations to which students will return again and again to take measurements. The *Land Cover* and Soil Characterization Protocols involve measurements which are done only once at specific locations which are referred to as sample sites.

Study Site for Atmosphere

Study sites are defined generally and have various protocols associated with them. Typically, you and your students will conduct most of the atmosphere protocols at a site in close proximity to your school, so that students will have easy daily access to the instruments. These protocols may include temperature, precipitation, cloud type and cloud cover, aerosols, or surface ozone. Several siting considerations for these protocols are detailed below.

1. Measurements of cloud cover and cloud type require an unobstructed view of the sky. The middle of a sports

For Even More Information, see: The GLOBE Teacher's Guide Webpage

https://www.globe.gov/do-globe/globe-teachers-guide

Thank you!

For more information…

Connect with GLOBE Mission EARTH!

- Website: https://www.globe.gov/web/mission-earth
- Email: globe.mission.earth@gmail.com
- Facebook: www.facebook.com/globemissionearth
- Twitter: @globemissionear
- YouTube: http:tinyurl.com/globemissionearth