

# AN INTRODUCTORY GUIDE TO GREAT LAKES FIELDSCOPE

[greatlakes.fieldscope.org](http://greatlakes.fieldscope.org)



MICHU-14-502



# WELCOME TO GREAT LAKES FIELDSCOPE!

FieldScope is a tool built for exploring, sharing and analyzing real-world data sets, including observations from students and scientists studying the world around them.

## Overview

Great Lakes FieldScope is a collaborative effort of National Geographic Education, Michigan Sea Grant, the Great Lakes Observing System (GLOS) and the U.S. Geological Survey (USGS) - Great Lakes Science Center.

FieldScope was built to provide rich geographic context for scientific investigation — through maps, mapping activities and a rich community where fieldwork and data of peers and professionals are integrated. It is intended to be used both in the classroom and in outdoor settings.

This web-based interactive platform for data sharing provides a variety of learners with centralized access to data and encourages comparison of citizen, student and scientist data. FieldScope:

- Uses cutting-edge technology to make interactive mapping and geospatial data analysis tools accessible to students via the web in an intuitive package that is free and **does not** require software installation.
- Enables students and classrooms to upload their own field data — including quantitative measurements, field notes and media, such as photos — and to see it in relation to data from peers and professional scientists.
- Fosters collaborative sharing and analysis of data among the FieldScope community and beyond.

This educational guide was created to help introduce you and your students or citizen scientists to FieldScope and to help demonstrate how it can be used.

## Contents

- Basic steps for getting started with FieldScope.
- How to explore map data.
- A breakdown of the different types of base maps and layers available.
- Tables showing the main tools to help you navigate within a FieldScope map.
- Basic steps for entering data and uploading photos.
- Basic steps for creating graphs.
- A few exercises to get you oriented in FieldScope.

# Let's Get Started!

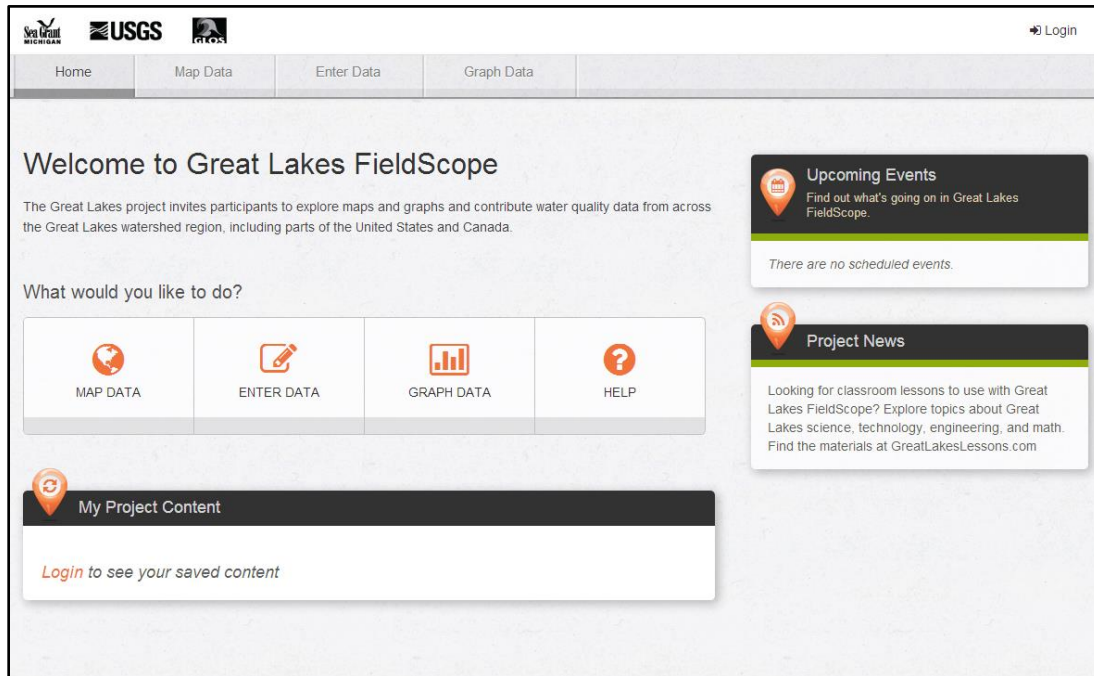


Figure A. Great Lakes FieldScope homepage

## What Would You Like to Do?

From the Great Lakes FieldScope homepage, shown in Figure A, you can select from a few options to explore maps, data and graphs or contribute water quality data you have collected. Log in to view or edit any maps or graphs you have saved, or click **Help** to learn basic information before getting started. Below we outline the basic steps for exploring map data, entering data and graphing data to get you oriented in FieldScope.

Use this guide to:

- Familiarize yourself with FieldScope before getting started.
- Follow along as you go through the steps.
- Refer back to if you have any questions about a step or tool.

Let's start exploring maps and data from across the Great Lakes watershed region!

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# Chapter 1: Let's Explore Map Data

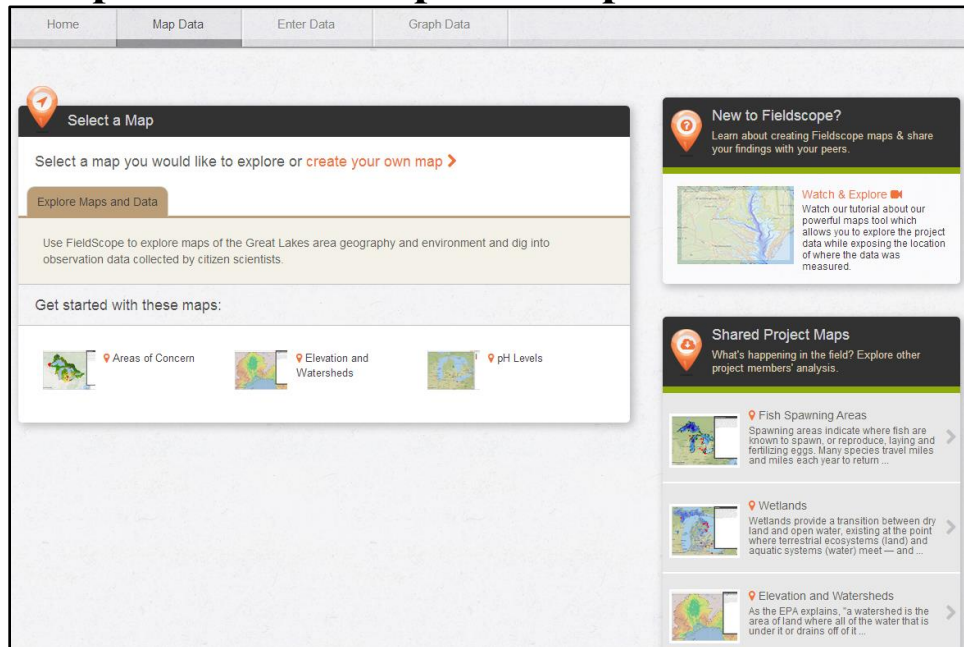


Figure 1. Map Data homepage

Once you have selected **Map Data** from the homepage, you can choose from a few starter map options with preselected layers, observation data and descriptions or create your own map, as shown in Figure 1. The following steps take you through the process of selecting a base map, observation data and layers to create and personalize your own map!

## 1.1 Select Base Map

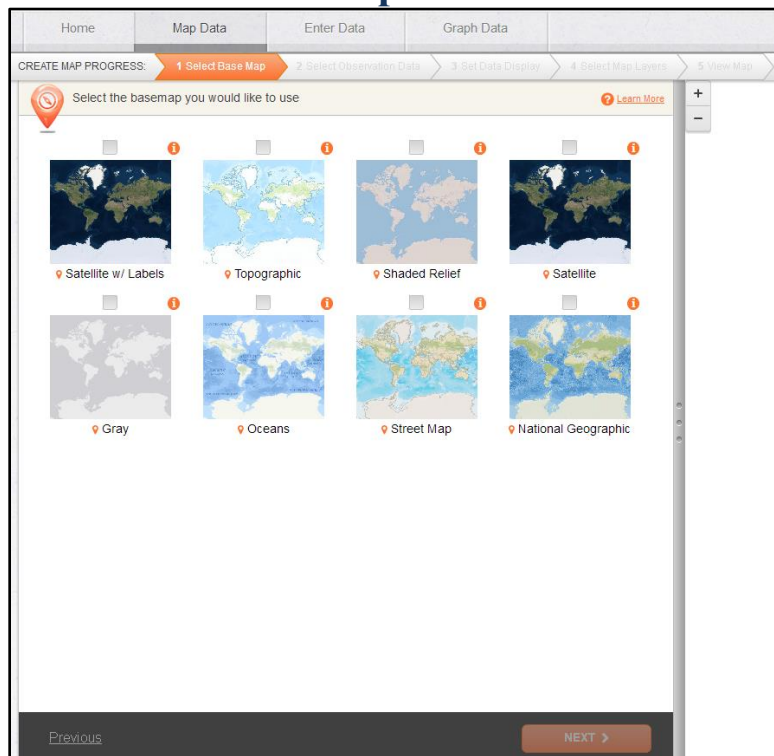


Figure 1.1a. Step 1 under Map Data: Select Base Map

When creating a map in FieldScope, you can choose from different styles of base maps as shown

in Figure 1.1a above, including topographic, satellite, shaded relief, oceans and a custom National Geographic view.

### What is a Base Map?

A base map is a customizable starting point that may show limited information and is ready for you to build upon by adding layers of information. When you log in to FieldScope to create your own map, the first step is to select a base map. There are several basic layers that you can apply within FieldScope to help focus your experience before you begin looking at the data and other interactive elements.

For example, the Street Map base map has highway-level data for the world and street-level data for many places including the United States, much of Canada, Japan, Australia and most countries in Europe. Someone interested in viewing transportation routes may not be interested in hydrography or National Park boundaries so these layers are excluded from this base map.

**Note:** When in FieldScope map view, you will see a list of options on the left part of the screen. Click **Map Layers** to open more base map layer options and select a new base map layer while in map view as shown below in Figure 1.1b.

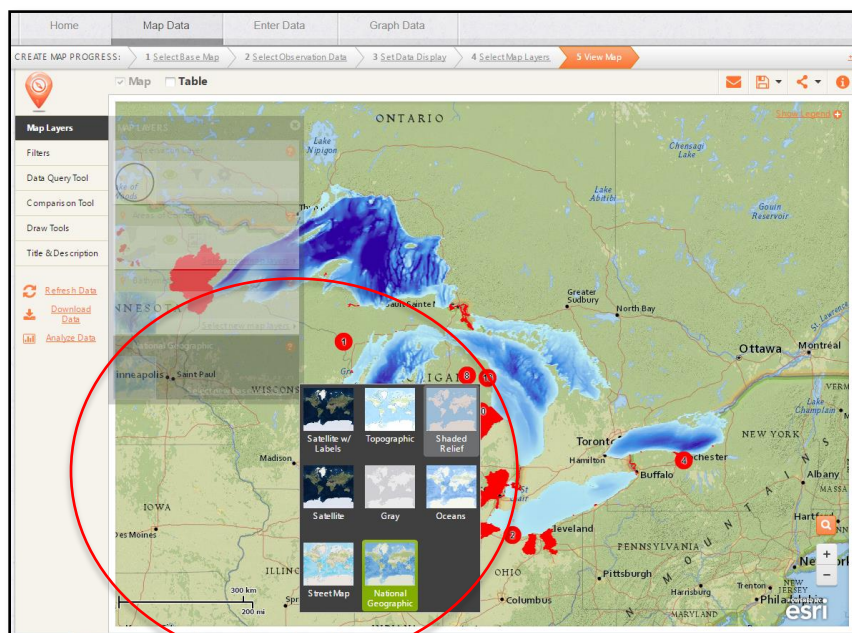


Figure 1.1b. Selecting a base map while viewing the map

## 1.2 Select Observation Data

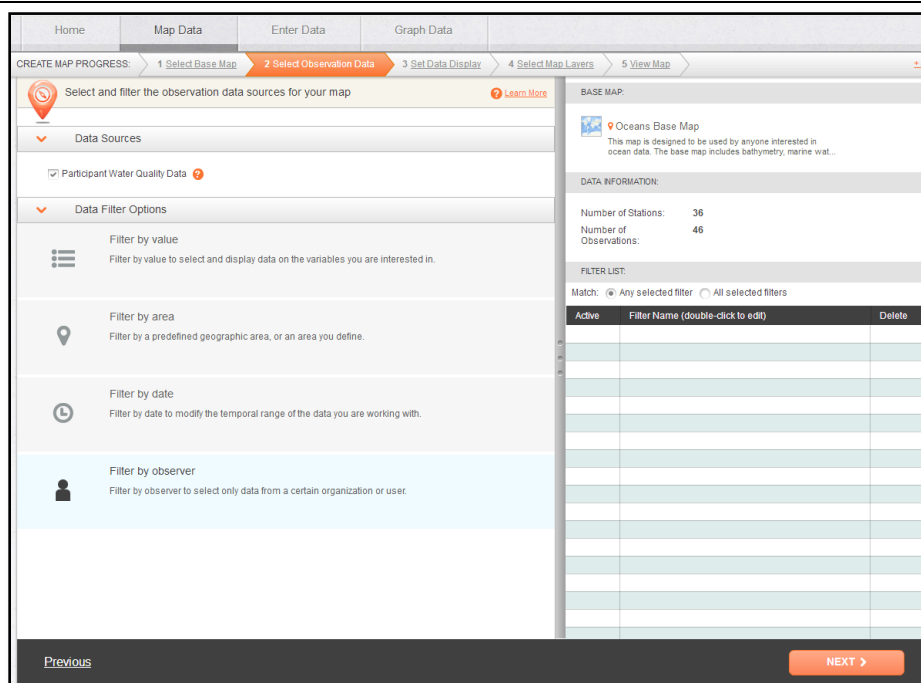


Figure 1.2a. Step 2 under Map Data: Select Observation Data

The observation data sources consist of **Participant Water Quality Data**. This data includes observations such as secchi depth and water temperature that have been entered by others and comes from schools, river keeper organizations, nature centers and other groups and individuals across the Great Lakes watershed.

For Step 2 shown in Figure 1.2a, click to check the box to select the data source. Use the **Data Filter Options** to filter the observations by value, geographic area, temporal range or data entered by a specific organization or user.

After applying a filter, check to make sure your filter is correct, check the **Filter Name** to make sure your filter has a unique descriptive name, and edit your filter name if necessary. Click to add your filter to the observation data shown on your map. Your filter should then appear under **Filter List** on the right-hand side of the screen. Click the **X** to delete your filter or click to uncheck the box under **Active** to view the observational data without your filter.

Below is a brief overview of the **Data Filter Options** that you can use to select a subset of the available data for your map.

### Filter by Value

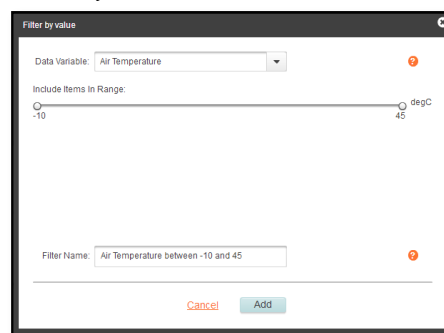


Figure 1.2b. Filter by value window

### Filter by Area

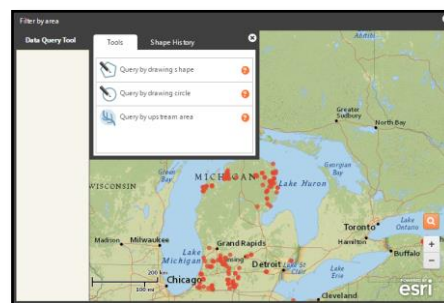


Figure 1.2c. Filter by area window

### Filter by Date

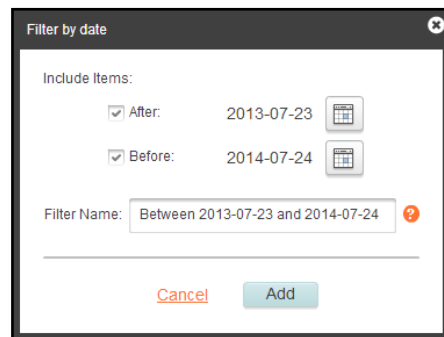


Figure 1.2d. Filter by date window

### Filter by Observer

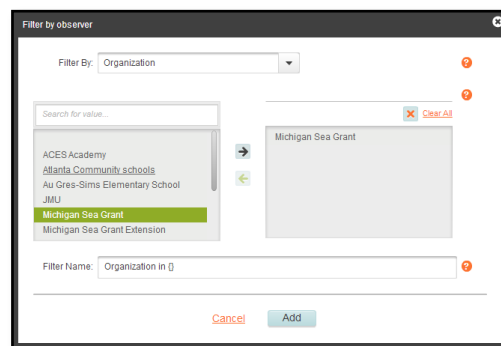


Figure 1.2e. Filter by observer window


#### *Filter by Value:*

- Select **Filter by Value**, shown in Figure 1.2b, to select and display data on the variables you are interested in. Click on this data filter option and a pop-up box will appear with a drop down menu of data variables to choose from for your filter.
- Select a variable, such as **Air Temperature**, and a control bar with sliders you can move back and forth will appear to select the range of data to display on the map. The data filter method will vary depending on the variable you select.

#### *Filter by Area:*

- Select **Filter by Area**, shown in Figure 1.2c, to filter either by a predefined geographic area or an area you define. Click on this data filter option and a pop-up box will appear with query tool options.
- Select a tool to filter the data observations by area by drawing a circle, shape or delineating an upstream watershed. Once you have selected and applied a filter tool, a new pop-up box will appear detailing the number of stations and observations in your filter.
- Click **Create Filter** to add your filter to the observation data shown on your map, or click **Choose Another Shape** to create a different filter.

#### *Filter by Date:*

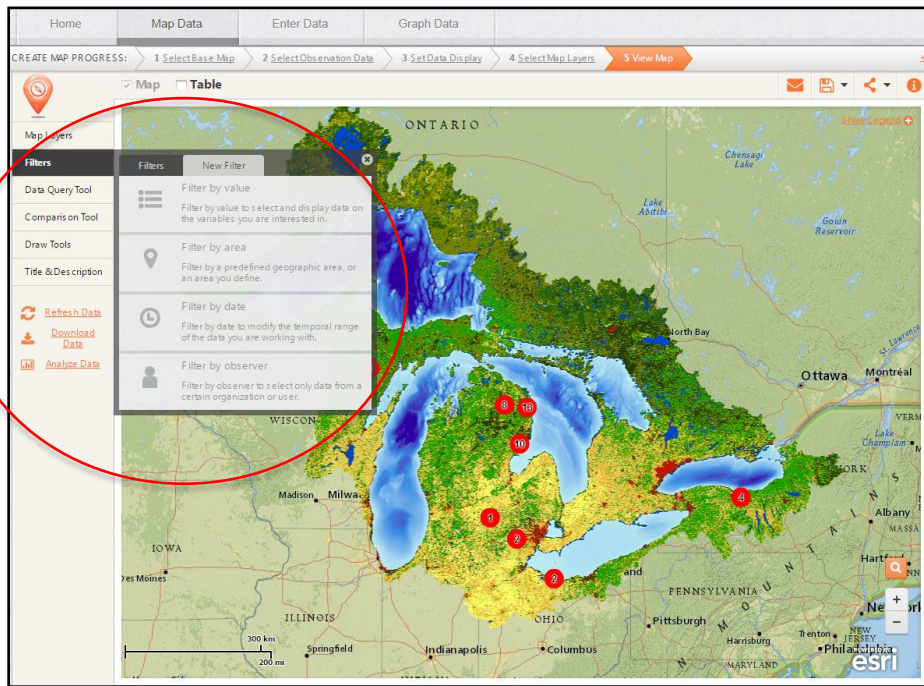
- Select **Filter by Date**, shown in Figure 1.2d, to adjust the range of the data. Click on this data filter option and a pop-up box will appear with options to adjust the time frame of the observation data shown on your map. Click to check the boxes next to **After** and/or **Before** and a calendar  icon will appear from which to select dates to alter the temporal range of the observational data.

#### *Filter by Observer:*

- Select **Filter by Observer**, shown in Figure 1.2e, to select only data from a certain organization or user. Click on this data filter option and a pop-up box will appear with a drop down menu of 3 options to choose from for your filter.
- Select **Organization**, for example, and a list of organizations to choose from will appear. Scroll to find and select an organization or search for an organization name by typing in the search box, and then click to select and highlight the appropriate name. Click on the right-arrow to move the organization into the selected organizations list on the right and click on the left-arrow to remove an organization from your selected organizations list. The data filter method will vary depending on the type of observer you select.

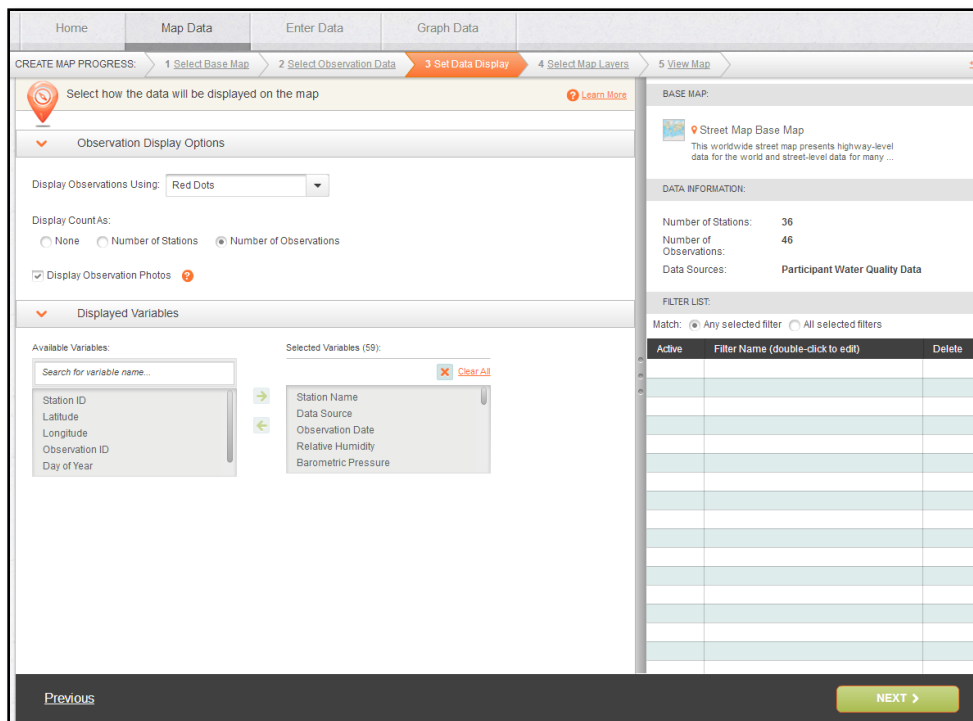


**Note:** When in FieldScope map view, you will see a list of options on the left part of the screen. Click **Filters** to open data filter options and filter the observations you would like to display on the map while in map view, as shown in Figure 1.2f below.



**Figure 1.2f. Filtering data while viewing the map**

### 1.3 Set Data Display



### Figure 1.3. Step 3 under Map Data: Set Data Display

In Step 3 shown in Figure 1.3 above, select the settings you would like for displaying the data on your map. Choose from a list of options for displaying the point observations, such as **Number of Observations** or **Number of Stations** and **Red Dots** or **White Dots**.

Select the variables you would like displayed and available for exploration on your map, such as **Latitude** and **Month**. Scroll to find and select a variable or search for a variable name by typing in the search box, and then click to select and highlight the appropriate name. Click on the right-arrow to move the variable into the **Selected Variables** list and click on the left-arrow to remove a variable from your selected variables list to control the variables displayed as observation data on your map.

Project data participants can add photos to the FieldScope project as individual entries or to accompany data entered. Click and check the box next to **Display Observation Photos** to see these participant photos.

## 1.4 Select Map Layers

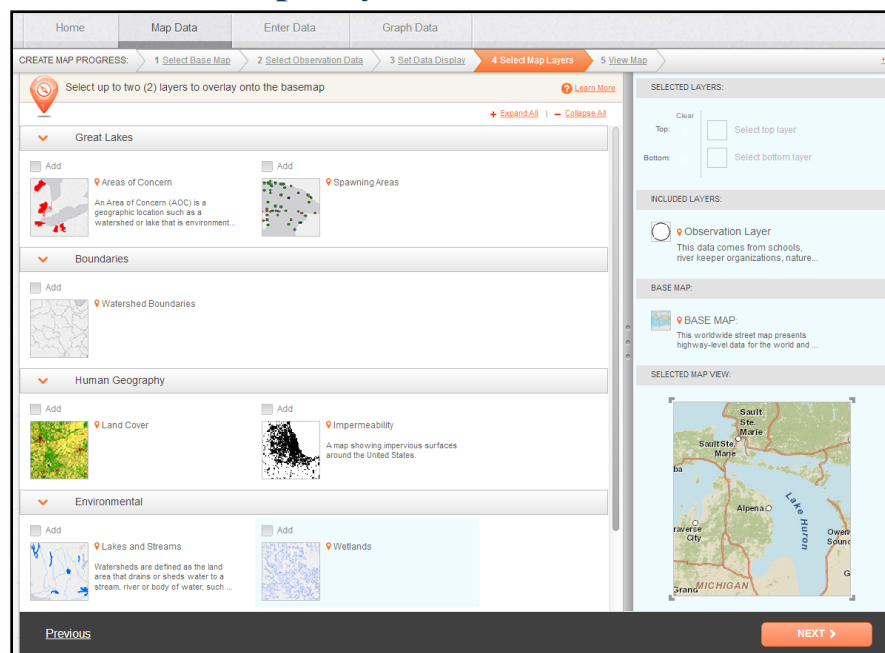


Figure 1.4a. Step 4 under Map Data: Select Map Layers

In Step 4 shown in Figure 1.4a, select the map layers you want to view in your map. Only two map layers can be selected at a time. On the right hand side, select which layer you would like to be displayed as the top layer. You can access this menu at any time to switch the map layers you select.

**Note:** When in FieldScope map view, you will see a list of options on the left part of the screen. Click **Map Layers** to open more map layer options and select new layers to display on the map while in map view, as shown in Figure 1.4b below. Clicking **Select new map layers** will take you back to the menu shown above so that you can switch the map layers you select.

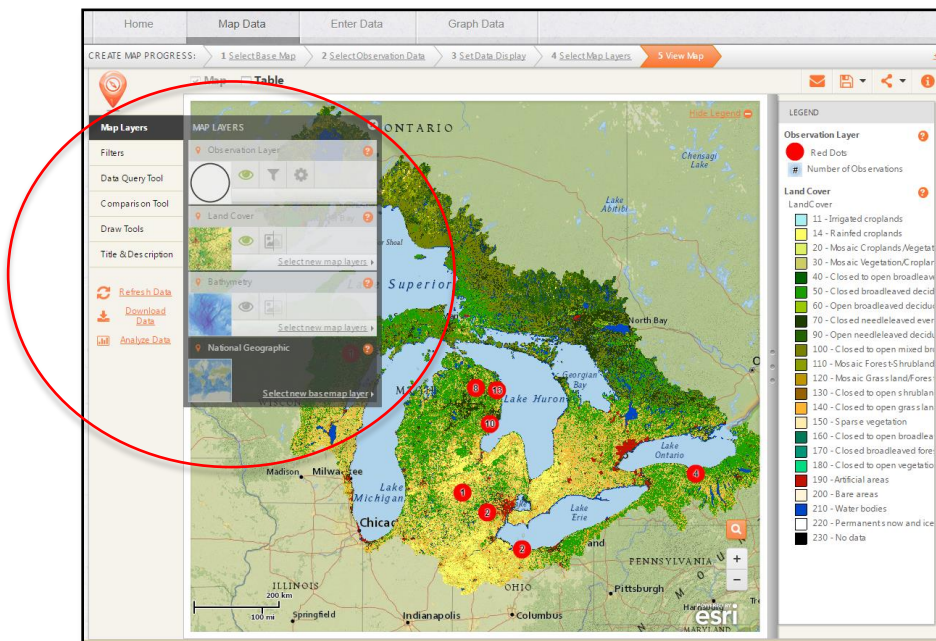


Figure 1.4b. Selecting map layers while viewing the map

### 1.4.1 Map Layer Options

The following sections briefly describe the layers available to select and display in your map.

## Great Lakes

### Areas of Concern

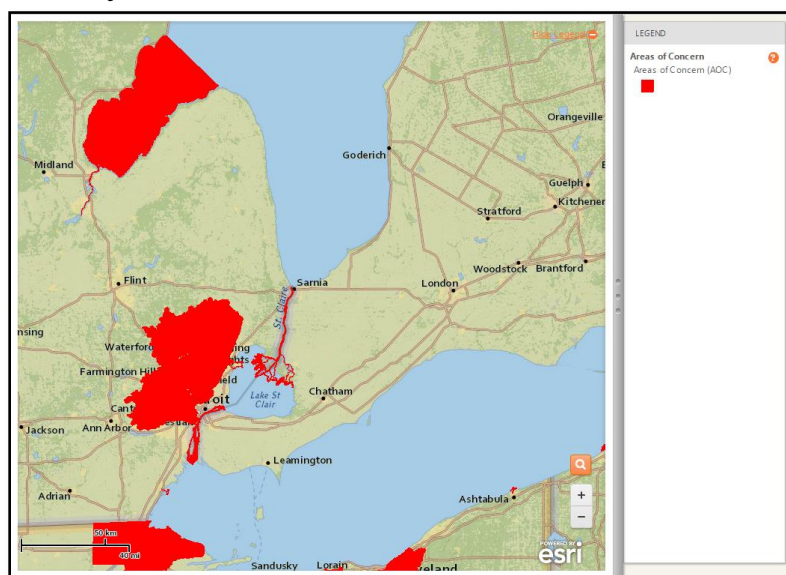


Figure 1.4.1a. Areas of Concern layer

**Areas of Concern** – This layer in Figure 1.4.1a above shows the AOCs within the Great Lakes Basin. Areas of Concern, or AOCs, are locations that have experienced a high level of



environmental degradation and have been designated under the U.S.-Canada Great Lakes Water Quality Agreement as potential sites for remediation efforts. There are currently 39 AOCs identified in the Great Lakes area.

## Spawning Areas

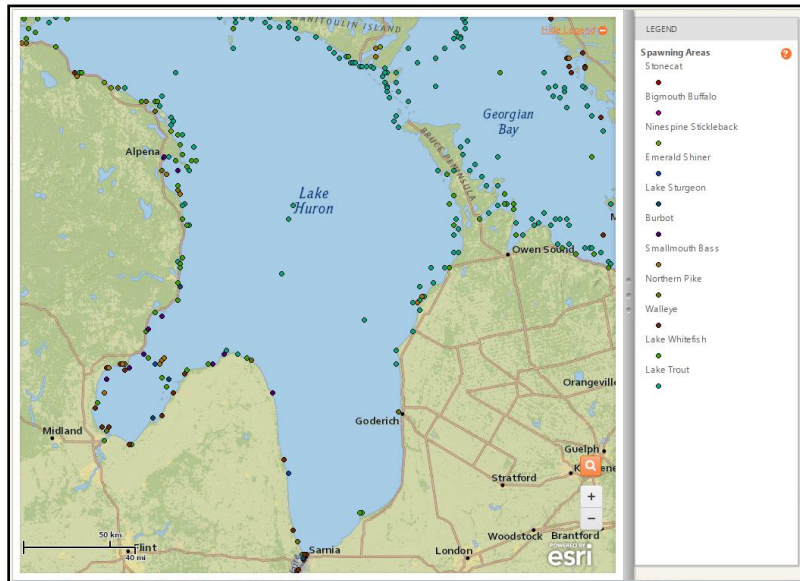


Figure 1.4.1b. Spawning Areas layer

**Spawning Areas** – This layer in Figure 1.4.1b shows where particular species of fish are known to spawn in Great Lakes waters. Spawning areas are locations in the water where fish produce their eggs. Many species undertake migrations each year to reach their spawning grounds. It is important to know the locations of these areas to help protect species of fish in our Great Lakes.

## Boundaries

### Watershed Boundaries

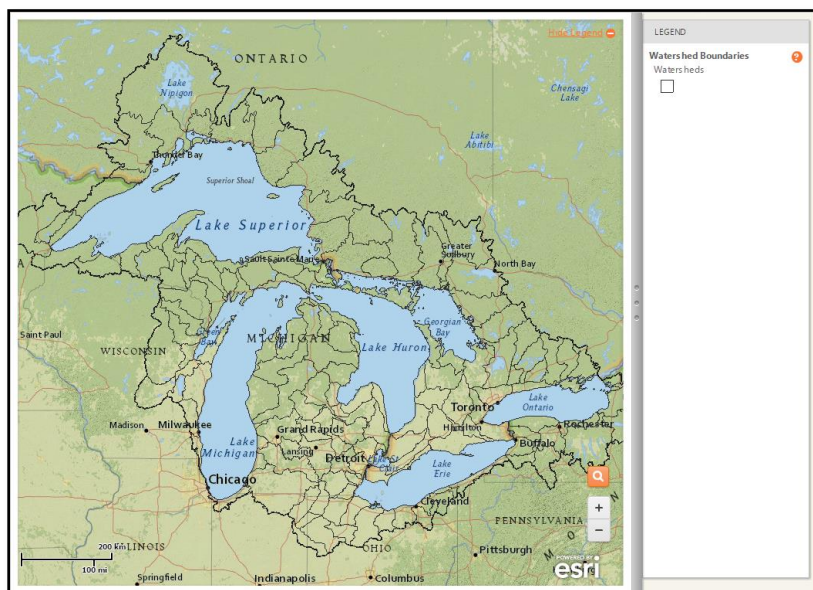


Figure 1.4.1c. Watershed Boundaries layer

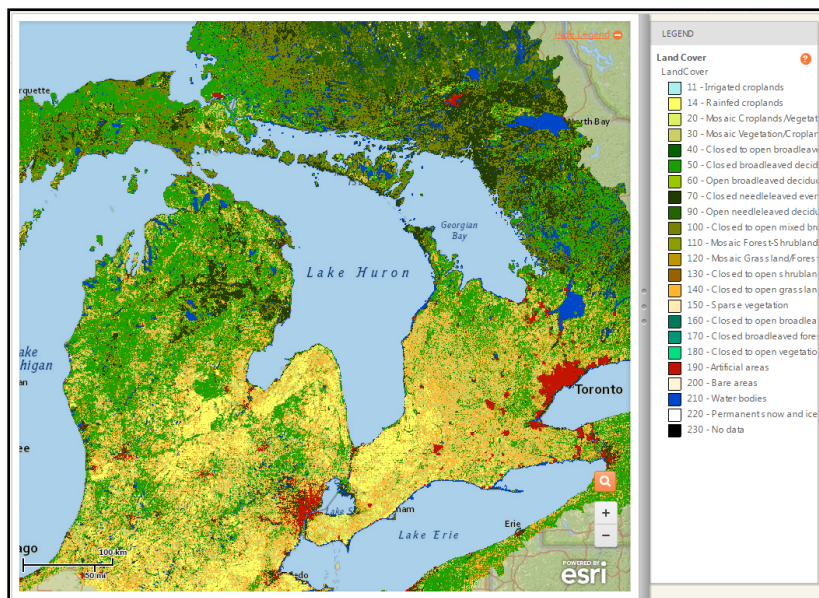


**Watershed Boundaries** – This layer in Figure 1.4.1c shows the watershed boundaries within the larger Great Lakes watershed. A watershed is an area of land that drains to a river and its tributaries. When it rains or snow melts, water soaks into the ground and becomes part of the groundwater or runs off of the land or through storm drains into the nearby streams or rivers. Watersheds connect us. Every one of us lives in a watershed — and because much of the water that falls within a watershed as precipitation “drains” into streams and rivers that eventually flow out to one of the Lakes — what we do upstream has an impact on not just nearby waters, but downstream too.

Check out the **Query by Upstream Area** tool in section 1.6 **What Does That Do?** later in this guide to learn how you can delineate smaller watersheds within these larger watershed boundaries.

## Human Geography

### *Land Cover*



**Figure 1.4.1d. Land Cover layer**

**Land Cover** – This layer in Figure 1.4.1d shows how much of a region is covered by forests, wetlands, impervious surfaces, agriculture and other land and water types. Land cover is not to be confused with land use — which shows how people use the landscape (i.e., development, conservation or mixed uses). The various types of land cover can be used and managed quite differently.

Land cover can be determined by analyzing satellite and aerial imagery. Land cover maps provide information to help managers best understand the current landscape. To see change over time, land cover maps for several different years are needed.

# Environmental

## *Lakes and Streams*

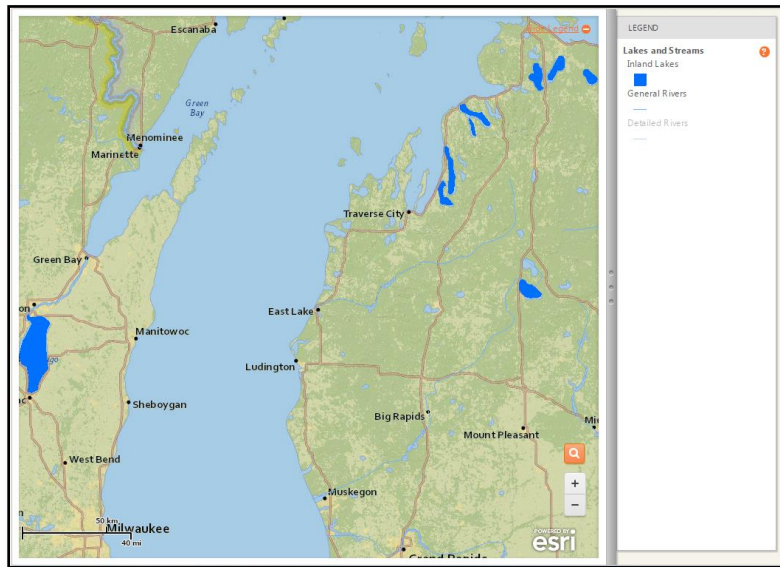


Figure 1.4.1e. Lakes and Streams layer

**Lakes and Streams** – This layer in Figure 1.4.1e shows some of the other freshwater resources within the Great Lakes Basin. Michigan itself has greater than 36,000 miles of streams and over 11,000 inland lakes and ponds. These freshwater resources provide aesthetic, recreational and economic value and opportunities for the residents of the Great Lakes Basin, as well as critical habitat for hundreds of freshwater species.

## *Wetlands*

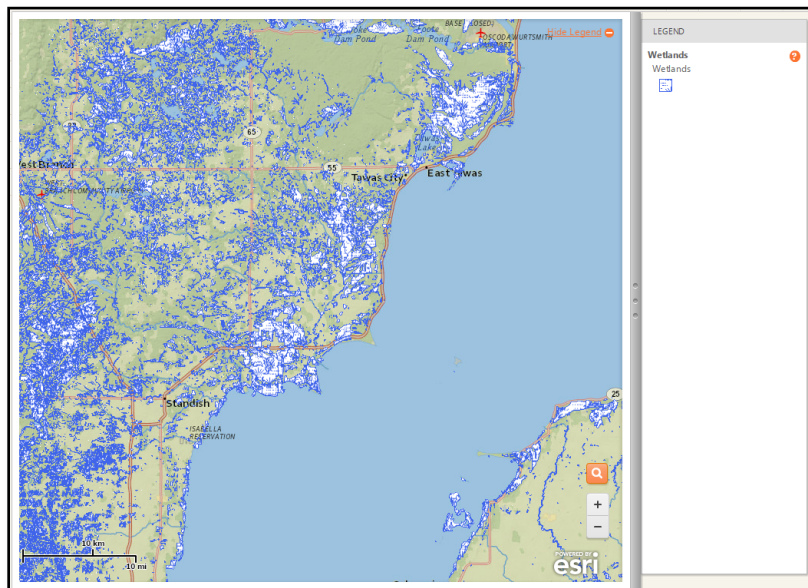
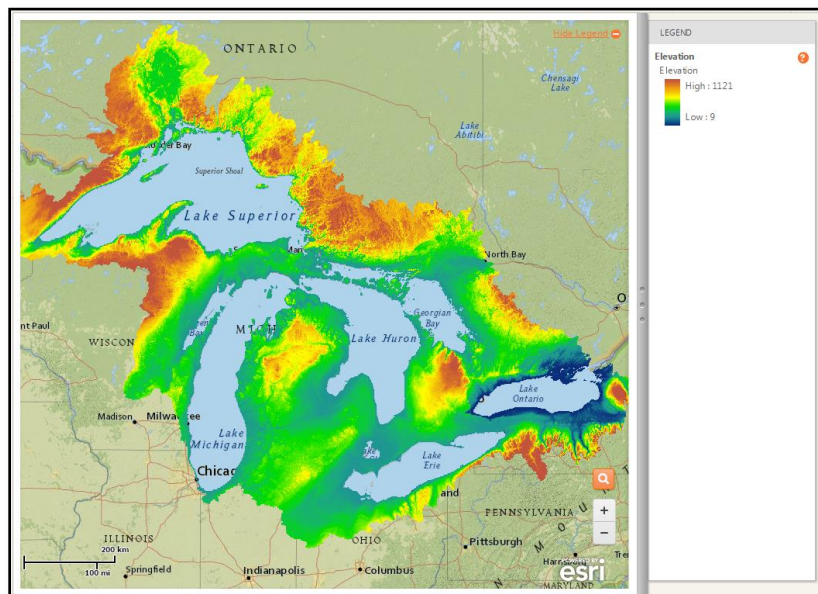


Figure 1.4.1f. Wetlands layer

**Wetlands** – This layer in Figure 1.4.1f indicates the presence of wetlands in an area. Wetlands are among the most ecologically valuable and productive habitats. Fish and wildlife depend on wetlands for food, shelter, spawning and reproduction. Wetlands also play an important role in maintaining the health of the Great Lakes ecosystem by providing functions such as filtering

pollutants and sediment, storing and cycling nutrients and organic material and reducing flooding and erosion. Wetlands are all connected to the Great Lakes by surface water or groundwater.

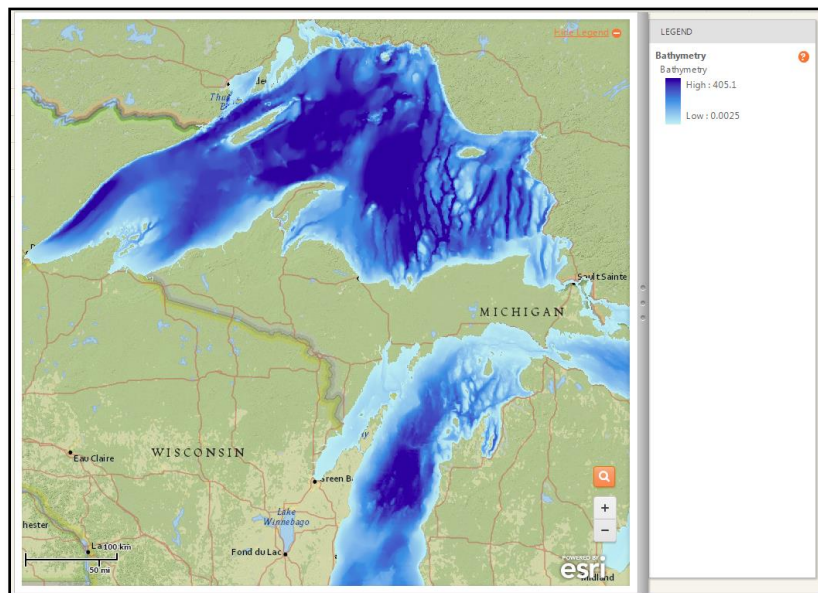
### *Elevation Layer*



**Figure 1.4.1g. Elevation layer**

**Elevation** – This layer in Figure 1.4.1g shows the different elevations of land found across the basin. Elevation and topography across the basin shape the Great Lakes watersheds and how water drains across the landscape. The elevation of an area also affects environmental factors such as temperature and the plants that can grow in that region.

### *Bathymetry*



**Figure 1.4.1h. Bathymetry layer**

**Bathymetry** – This layer in Figure 1.4.1h displays the water depths for the Great Lakes. About 20,000 years ago, retreating continental glacial ice sheets formed the Great Lakes water depths. The water depths of each Great Lake impact factors such as temperature and light penetration and what aquatic species can grow and survive there.



## Additional Layers:

**Photos** – Allows you to see photos that others have uploaded to the map. See **Chapter 2: Let's Enter Data** later in this guide to learn how to add your own photos!

### *Observations*

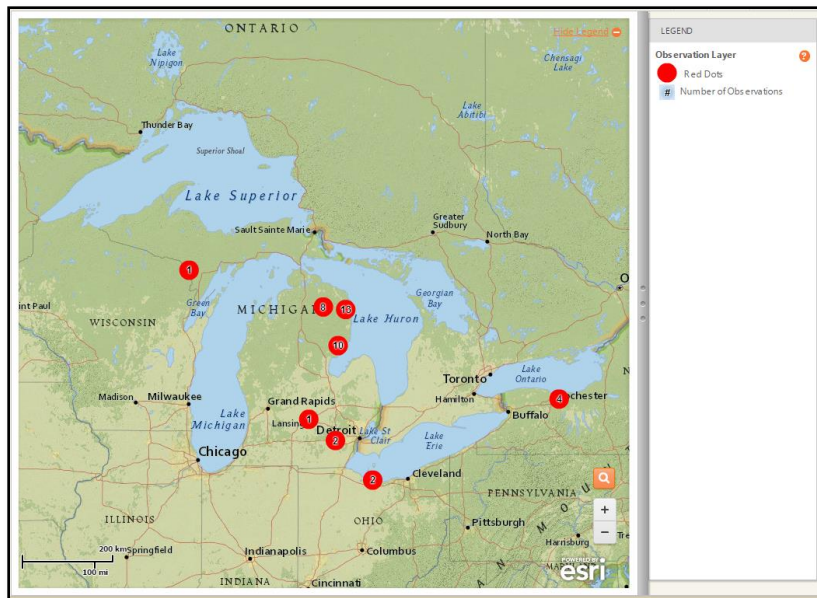



Figure 1.4.1i. Observations layer

**Observations** – This layer in Figure 1.4.1i includes observations that have been entered by others, including data and notes from fieldwork and research. When you click on the observation dots on the map, a summary is provided in a pop-up box.

For more detail, click on **Show in Table** in the **Data Summary** pop-up box to see data for your selected dot, or click to check the box next to **Table** above the map. You can also filter the observations you would like to display on the map by selecting the **Filter** tab on the left-side of

the screen or by clicking on the **Filter Data** icon  below **Observation Layer** in the **Map Layers** tab.



## 1.5 View Map

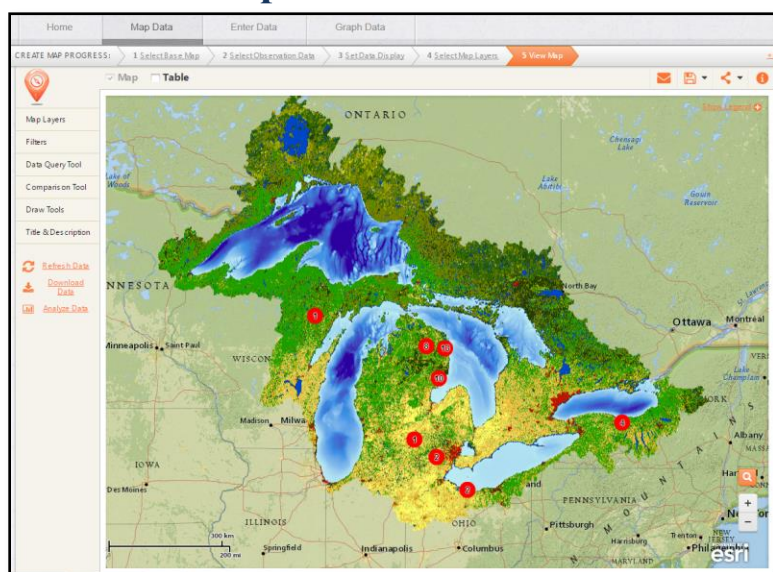


Figure 1.5. Step 5 under Map Data: View Map (Land Cover and Bathymetry layers, National Geographic base map)

Once you have selected your base map, observational data and two map layers, it is time to explore your map! Use the tools on the left-hand side of the screen, as shown in Figure 1.5, to query and compare data, and call out locations and observations with shapes, lines and labels. Personalize your map by giving it a title and short description, and don't forget to log in to your account to save your map to view and edit it later. Below we provide a brief overview of the tools that will help you explore your map data.

## 1.6 What Does That Do?

The following tables briefly explain the tools that will help you explore your FieldScope map.

### Map Layer Tools

Use these tools to manipulate the layers on your map.



#### Layer Visibility

Turn the different layers on your map on or off to hide the observation marks or to focus on one map layer. Click this tool and watch the layer disappear from the map view.



#### Filter Data

Filter the observation layer to examine certain ranges, regions, dates and observations added by certain organizations or individuals within the dataset.



#### Data Settings

Edit the settings and selected variables for the observation layer. Click on this tool and a window will appear to change the data settings.



#### Transparency

Control how light or dark your two selected layers show on the map over your base map layer. Click on this tool and a control bar will appear with a slider you can move back and forth horizontally to change the transparency.

### Data Query Tools

Use these tools to query observations and layers you have selected for your map.



#### Query by Drawing Shape

Create a shape (or polygon) on the map to query observations and available map layers within that shape.



#### Query by Drawing Circle

Create a circle on the map to query observations and available map layers within that circle.

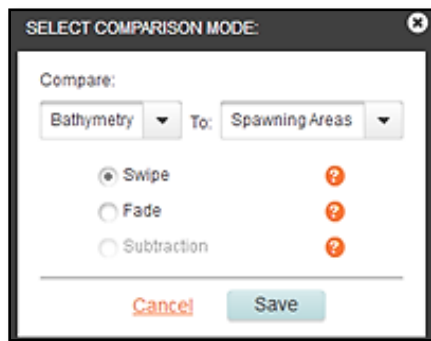


#### Query by Upstream Area

Delineate an upstream watershed. Select the tool then click on the map to see the watershed that is upstream of the point you clicked on.

### Comparison Tools

Use these tools to visually compare the two layers you have selected for your map.



#### Swipe

Select this mode to split the map frame in two. A control bar will appear with a slider you can move back and forth horizontally to compare the two map layers.

#### Fade

Select this mode and a control bar will appear with a slider you can move back and forth to fade the top layer in and out. Use this to compare the two map layers.

#### Subtraction

Select this mode to display the difference in value between the two layers. This option is only enabled if the comparison layers use the same variable within both layers.

### Draw Tools

Use these tools to add and edit shapes, lines and labels on your map.

#### Tools



#### Select Tool

Guide yourself through the map to do basic things like expand the observation marks (large red dots with numbers where data has been recorded) on the map.



#### Erase Tool

Remove any additions made to the map with the draw tools such as shapes, lines and labels. Click on a drawing to erase it.



#### Change Color Tool

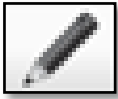
Change the color of any shapes, lines and labels. Choose a new color from the **Color** style tool, select this tool and click on a drawing to change its color.



#### Add Label Tool

Add labels to items on the map like drawings and observations. Click on the map next to the item you would like to label and hit enter when done to add and place text.

## Lines



### **Pencil Tool**

Draw free form lines on the map, calling out data or marking locations and observations. Press down and drag to draw a free form line and then let go to finish the drawing.



### **Line Segments Tool**

Draw straight lines on the map. Click once and drag to start drawing a straight line and click once again and drag to continue drawing the line in a different direction. Double-click to finish the drawing.



### **Measure Tool**

Measure distance. When you click the measure tool, you can draw a line on the map to find the distance of data or physical landscape in miles. Click once and drag to start measuring and click once again and drag to change directions. Double-click to finish measuring.



### **Flow Path Tool**

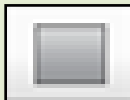
Show the flow path of any specific point on the map. Use it to “see” the shape of the watersheds by how the rivers drain or to map the drainage path from one point to a Great Lake. Click to select the beginning of a flow path and see where the water drains. Works within the Great Lakes basin.

## Shapes



### **Shape Tool**

Draw polygons on the map, calling out data or marking areas and observations. Click once and drag to start drawing and click once again and drag to continue forming a polygon. Double-click to finish the drawing.



### **Rectangle Tool**

Draw rectangles on the map. Press down and drag to draw a rectangle and let go to finish the drawing.



### **Circle Tool**

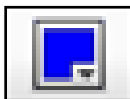
Draw circles on the map. Press down to select the center and drag to form the circle. Let go to finish the drawing.



### **Upstream Area Tool**

This tool helps show where watershed boundaries are found. Simply click in an area and it will show you the watershed outline upstream of the point you clicked on the map. By zooming and clicking within the watersheds, you can use this tool to see detailed, smaller watersheds within larger boundaries.

## Style



### **Color**

Choose a color for any shapes, lines and text you would like to add to the map. Click on this tool to open a grid of colors to select from and click to choose a color.



### **Transparency**

Control how light or dark any shapes, lines and text you draw show on the map. Click on this tool and a control bar will appear with a slider you can move back and forth to change the transparency.



### **Text Size**

Control the font size of any labels or text you add to the map. Click on this tool and a control bar will appear with a slider you can move back and forth horizontally to change the text size.



### Text Font

Control the style of text for any labels you add to the map. Click on this tool and a drop down menu will appear with four font options to select from for your text.

### *Title & Description*

Customize your map and save it to your user account.

TITLE & DESCRIPTION

You must enter a title before saving this map

Title:

Description:

☐ Share this map

Created by:

Created:

Last modified:

Use this tool to personalize your map. Enter a title along with a brief description explaining what your map is trying to show.

Once logged-in, save your map to your FieldScope user account to access it later through the project homepage or your project settings for viewing and editing. Check the box to share your map on social media websites like Twitter and Facebook.



## Chapter 2: Let's Enter Data

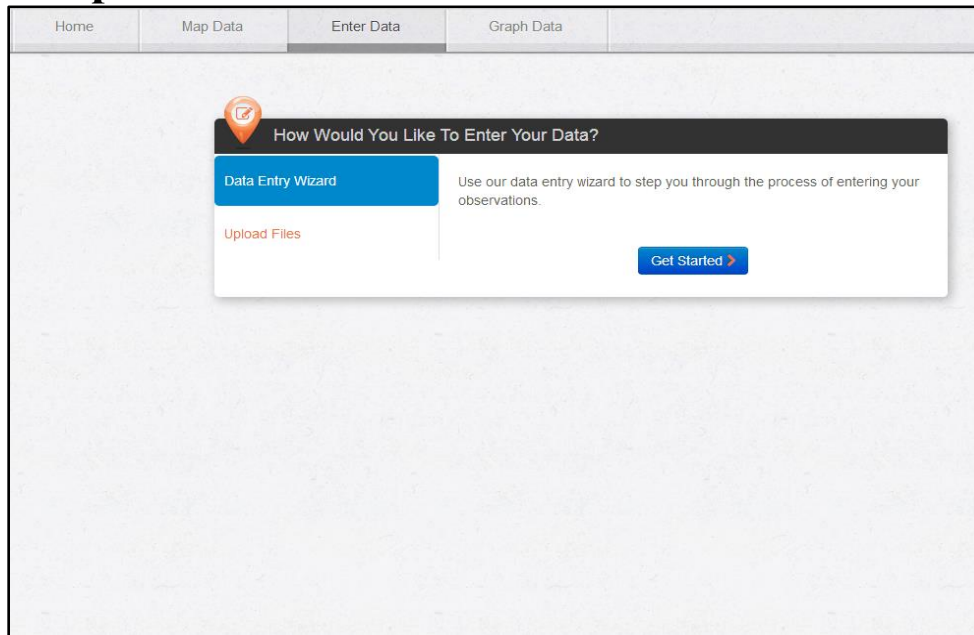


Figure 2. Enter Data homepage

Once you have selected **Enter Data** shown in Figure 2, choose **Data Entry Wizard** to guide you through the process of entering your observations step-by-step. Then, click **Get Started** to begin uploading data to Great Lakes FieldScope.

If you have collected a large amount of water quality data, bulk uploading can be a faster and more convenient way of entering data. If you would like to use **Upload Files** to upload bulk data from a spreadsheet or comma separated value (CSV) file, please email [msgpubs@umich.edu](mailto:msgpubs@umich.edu).

### 2.1 Data Entry Wizard

The following steps take you through the process of entering data through the data entry wizard.

#### 2.1.1a Select Station: Create New Station

This screenshot shows the 'Select Station' step of the data entry wizard. The 'ENTER DATA PROGRESS' bar at the top indicates '1 Select Station' is the current step. The main heading is 'Select or create a station where observations were taken'. Below this, there are two tabs: 'Select Existing Station' and 'Create New Station'. The 'Create New Station' tab is active. The form for creating a new station includes a 'Station ID' field with a red error message 'Value is required', a 'Name' field with a placeholder 'Enter a descriptive name for this station', and a section for placing the station. The 'Click on a point in the map to the right' option is selected, showing latitude (44.396358) and longitude (-83.906126). There is also an 'Enter GPS Coordinates' option and a photo upload section with an 'Add Photo...' button. On the right, a map of the Great Lakes region is shown with several red location pins. At the bottom, there are 'Previous', 'Save Station', and 'NEXT >' buttons.

Figure 2.1.1a. Step 1 under Enter Data: Select Station – Create New Station

If a station for your data does not yet exist, enter a name for your data location. Choose **Click on a point in the map to the right**, as shown in Figure 2.1.1a, and click the location on the map



where you collected your data or use the search icon to enter an address to pinpoint and click to locate your station, and the latitude and longitude will update. OR choose the option to enter the GPS coordinates where you collected your data.

Click the **Add Photo** button to upload any picture taken at your station and a box should appear within the upper left area of the screen. Find your photo file and upload only JPEG or PNG type files. Once you select your photo, an **Upload Photo** pop-up box should appear with a preview of your image.

- Enter a title for your photo: Use something specific and descriptive. Ex: View of Wetmore Landing from the south. If you are working with a class or on a particular project try to use the same title base. Ex: Wetmore Landing Exploration, Ms. McGillacutty's class — Pitchers Thistle Plant.
- Enter a description: Think about what kind of details would be helpful for someone accessing the map and looking at photos. Ex: Photo taken on Oct. 1, 2013. Fall colors in full bloom. Spotted several bald eagles near here. Temps in the mid-50s. Click Save to submit your photo.

**Note:** it may take time for photos to appear. Click to save your station and move on to the next step to enter your data.

### 2.1.1b Select Station: Select Existing Station

Figure 2.1.1b. Step 1 under Enter Data: Select Station – Select Existing Station

If a station for the location where you collected data already exists in the database – either created previously by you or another user – select from a list of stations you or others have created. OR zoom in on the map on the right side of the screen, as shown in Figure 2.1.1b, until each observation dot shows only one station, and then click the observation dot on the map where you collected your data and the station information will update. Check the **Station Details** to make sure the information for your data location is correct.

## 2.1.2 Enter Observations

The screenshot displays the 'Enter Observations' step in the Great Lakes FieldScope web application. The interface is divided into several sections:

- Navigation:** At the top, there are tabs for 'Home', 'Map Data', 'Enter Data', and 'Graph Data'. Below these, a progress bar shows '1 Select Station' and '2 Enter Observations' (the current step).
- Form:** The main area contains a form for entering observation data. It includes fields for 'Observation ID' (5443751) and 'Observation Date' (2014-08-07). The form is organized into sections: 'Atmospheric' (Relative Humidity, Barometric Pressure, Air Temperature), 'Physical' (Water Temperature, Turbidity, Secchi Depth, Stream Width, Stream Depth, Stream Discharge, Surface Water Appearance, Stream Bank Erosion), and 'Chemical' (Salinity). Each field has a text input box and a unit or option dropdown menu.
- Map:** On the right, there is a map showing the location of the observation. Below the map, the 'Station Name' is listed as 'Hartsville Harbor'. There is a link to 'Click date to view observation details'.
- Table:** Below the map, there is a table with columns 'Observation Date' and 'Flag'. The first row shows the date '2014-08-07' and a flag icon.
- Buttons:** At the bottom of the form, there are buttons for 'Previous', '+ New Observation', and 'Save'.

Figure 2.1.2. Step 2 under Enter Data: Enter Observations

In Step 2 shown in Figure 2.1.2, enter the data you have collected into the appropriate sections.



Click the calendar icon to change the observation date. Click the drop-down arrows to change the units of a piece of data or to select from a list of options for qualitative data entries, and click to check the boxes next to any sampled macroinvertebrates. Click to save your data and contribute your observations to the Great Lakes FieldScope project!

# Chapter 3: Let's Graph Data

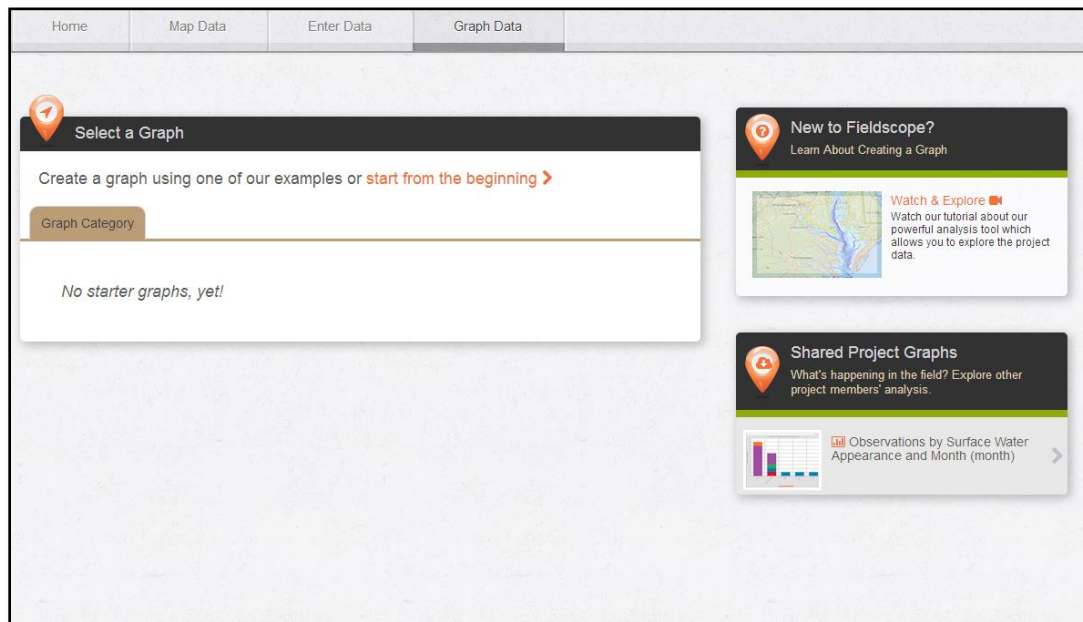


Figure 3. Graph Data homepage

Once you have selected **Graph Data** shown in Figure 3, choose from a list of example graphs to get started, view and edit a saved graph, or start from the beginning and create a new graph of your own. The following steps take you through the process of selecting variables, filtering the data and defining axes and labels to create and personalize your own graph.

## 3.1 Select Variables

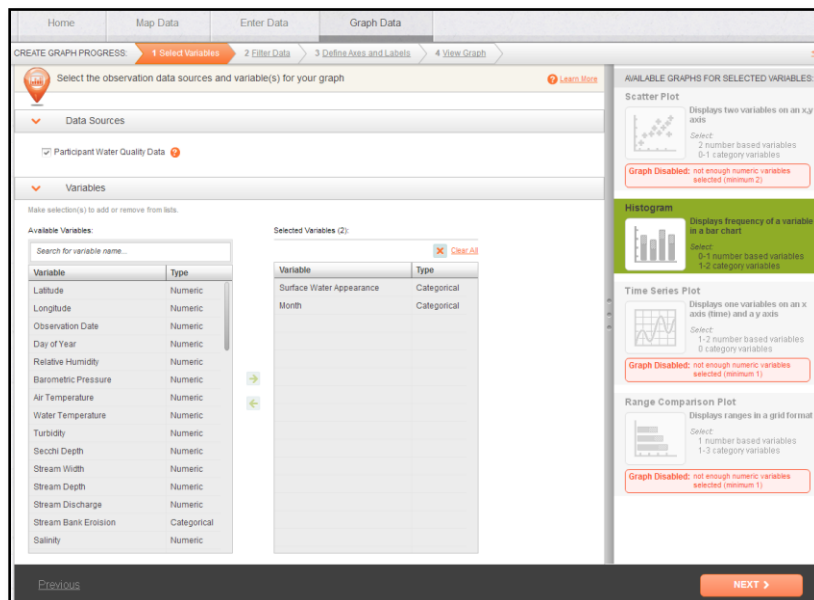


Figure 3.1. Step 1 under Graph Data: Select Variables

In Step 1 shown in Figure 3.1, select the variables you want your graph to show. Click on the **Variable** header to organize the variables alphabetically, or click on the **Type** header to organize the variables by type of variable to help you in your search.



Scroll to find and select a variable or search for a variable name by typing in the search box, and then click to select and highlight the appropriate name. Click on the right-arrow to move the variable into the **Selected Variables** list and click on the left-arrow to remove a variable from your selected variables list.

Look at the **Type** column to see what kind(s) of variable(s) you are working with. The type(s) of variable(s) will determine which graphs are available for you to use to analyze your data. Look to the right-hand side of the screen to see which graphs you can use based on the variables you have selected. Any enabled graphs will appear in black text and will be available for you to click on. A box with **Graph Disabled** will appear next to any unavailable graphs, with an explanation of why the graphs are unavailable for use. Remove or add variables to enable the different graphs.

## 3.2 Filter Data

The screenshot shows the 'Filter Data' step in the 'Graph Data' section of the Great Lakes FieldScope interface. The top navigation bar includes 'Home', 'Map Data', 'Enter Data', and 'Graph Data'. Below this, a progress bar indicates the current step: '1 Select Variables', '2 Filter Data' (highlighted), '3 Define Area and Labels', and '4 View Graph'. The main content area is titled 'Select the type of filter you would like to create' and includes a 'Learn More' link. There are four filter options: 'Filter by value' (with a list icon), 'Filter by area' (with a location pin icon), 'Filter by date' (with a clock icon), and 'Filter by observer' (with a person icon). Each option has a brief description. On the right side, there is a 'GRAPH INFORMATION' panel showing 'Graph Type: Histogram', 'Number-based variables: Surface Water Appearance, Month (month)', and 'Category Variables: Surface Water Appearance, Month (month)'. Below this is a 'DATA INFORMATION' panel showing 'Number of Stations: 21' and 'Number of Observations: 22'. At the bottom right, there is a 'FILTER LIST' table with columns 'Active', 'Filter Name (double-click to edit)', and 'Delete'. The table is currently empty. At the bottom of the interface, there are 'Previous' and 'Next' buttons.

Figure 3.2. Step 2 under Graph Data: Filter Data

In Step 2 shown in Figure 3.2, use the **Filter Data** options to select the observations you would like to display in the graph by value, geographic area, temporal range, or data entered by a specific organization or user.

**Note:** See Section 1.2, **Select Observation Data** under **Chapter 1: Let's Explore Map Data** earlier in this guide for details on each of the data filter options.

### 3.3 Define Axes and Labels

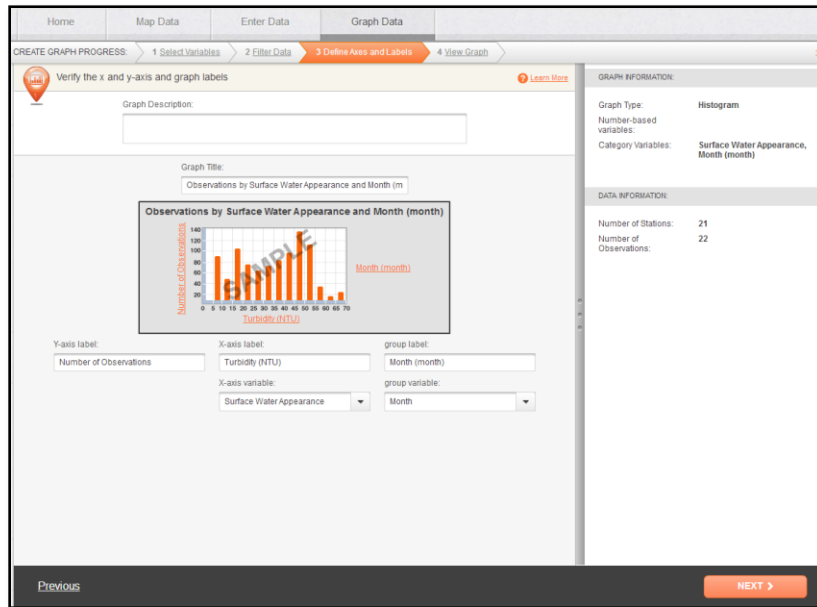


Figure 3.3. Step 3 under Graph Data: Define Axes and Labels

In Step 3 shown in Figure 3.3, format the layout of your graph. Give your graph a title and a brief description explaining what it shows. Verify the x- and y-axis graph labels and variables, and use the drop-down arrows to switch your x- and y-axis variables if necessary.

### 3.4 View Graph

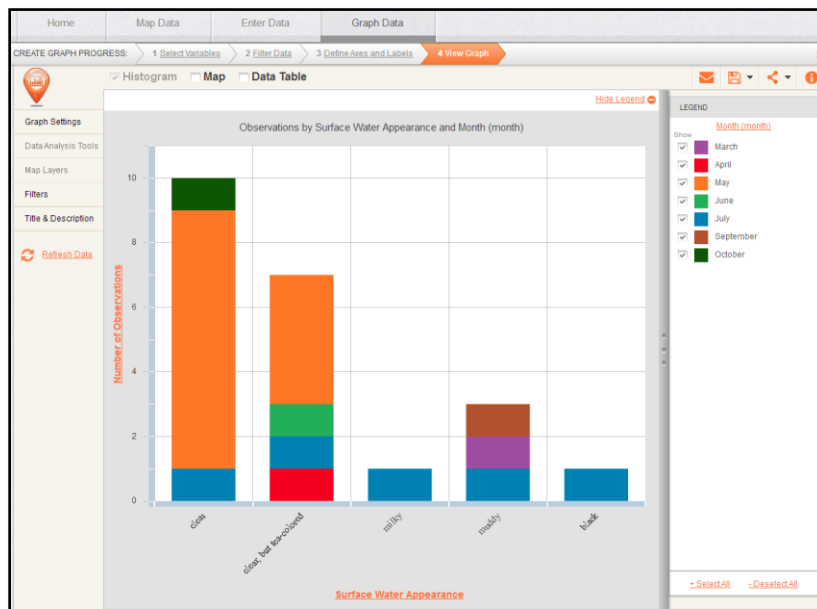
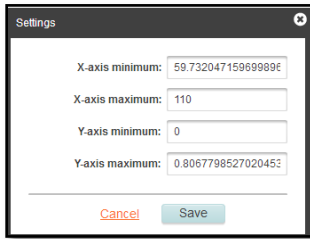


Figure 3.4. Step 4 under Graph Data: View Graph (Surface Water Appearance each month)

Once you have selected variables, filtered data and defined the axes and labels, it is time to explore the graph. Use the tools on the left-hand side of the screen, as shown in Figure 3.4, to customize your graph and analyze the data. Log in to your account to save your graph to view and edit it later. Below is a brief overview of the tools that will help you explore your graph.

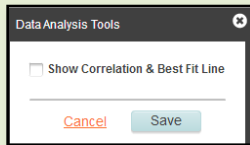
### 3.4.1 Customize your Graph

Use these tools to:

A dialog box titled "Settings" with a close button (X) in the top right corner. It contains four input fields: "X-axis minimum:" with the value "59.73204715969989E", "X-axis maximum:" with the value "110", "Y-axis minimum:" with the value "0", and "Y-axis maximum:" with the value "0.8067798527020452". At the bottom, there are two buttons: "Cancel" (in red) and "Save" (in blue).

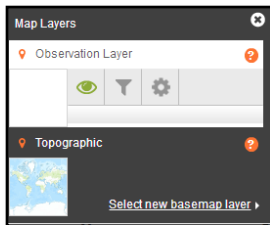
#### Graph Settings

Adjust the x- and y- axes. Enter minimum and maximum values to adjust the range of each axis.

A dialog box titled "Data Analysis Tools" with a close button (X) in the top right corner. It contains a checkbox labeled "Show Correlation & Best Fit Line" which is currently unchecked. At the bottom, there are two buttons: "Cancel" (in red) and "Save" (in blue).

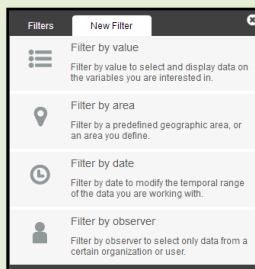
#### Data Analysis Tools

Add a line of best fit (a trend line that best represents the data) to your graph when working with a Scatter Plot. Examine the slope of the line to determine the relationship between your chosen variables. Data analysis tools vary depending on type of graph.

A dialog box titled "Map Layers" with a close button (X) in the top right corner. It shows two layers: "Observation Layer" and "Topographic". Each layer has a set of icons (eye, funnel, gear, and a red circle with a white 'X'). Below the layers, there is a button labeled "Select new basemap layer" with a right-pointing arrow.

#### Map Layers

Manipulate your map layers when the box above the graph next to **Map** is checked and you are viewing your graph and map at the same time. For example, add the **Land Cover** and **AOC** layers while viewing your graph to see how land cover type might impact water quality.

A dialog box titled "Filters" with a "New Filter" tab selected and a close button (X) in the top right corner. It lists four filter types: "Filter by value" (with a description: "Filter by value to select and display data on the variables you are interested in."), "Filter by area" (with a description: "Filter by a predefined geographic area, or an area you define."), "Filter by date" (with a description: "Filter by date to modify the temporal range of the data you are working with."), and "Filter by observer" (with a description: "Filter by observer to select only data from a certain organization or user.").

#### Filters

Filter the data and examine certain ranges, regions, dates and observations added by specific organizations or individuals within the dataset.

A dialog box titled "Title & Description" with a close button (X) in the top right corner. It contains a text input field for "Title:" with the value "Phosphate (mg/L) vs. Secchi Depth (cm)". Below it is a larger text area for "Description:". There is a checkbox labeled "Share this graph" which is currently unchecked. At the bottom, there are two buttons: "Cancel" (in red) and "Save" (in blue).

#### Title & Description

Personalize your graph. Enter a title along with a brief description explaining what your graph is trying to show. Once logged-in, save your graph to your FieldScope user account to access it later through the project homepage or your project settings. Check the box to share your graph on social media websites like Twitter and Facebook.


## Chapter 4: Get Friendly with FieldScope


Use the list of interactions below as a way of getting familiar with the different features of FieldScope.

### Try It: Make a Map and Query Data

- In map view, select a layer and toggle the transparency of the layer on the map by moving the horizontal bar back and forth. Add two layers and experiment with the transparency to view relationships between variables.

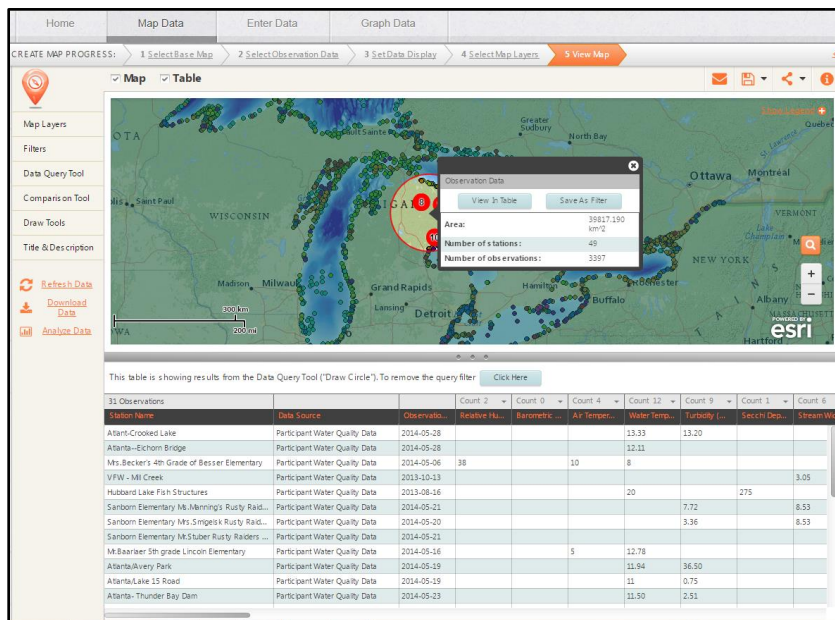
- Choose from different styles of base maps, including topographic, oceans, gray, shaded relief, streets, satellite and a custom National Geographic view.

- Hold your cursor over the orange information icon  beside each base map layer in Section

1.1 and orange question-mark icon  beside each layer in map view to see more information. Click **Show Legend** at the top right-hand corner of the map to view more details about your layers.

- Use the query tools to get information about selected points in your shape or circle on the map. Make sure the layers you are interested in are added to the map, then draw a polygon or circle to get specific data about the enclosed points.

- View data by clicking to check the box next to **Table** above your map. OR click on the observation dots to view data about the number of stations in that dot.



## Try It: Explore Watershed Shapes

*Ask* — Why do you think watersheds are shaped the way they are? Try to picture what the land within the watersheds looks like. If a watershed is large and wide, how might the land be shaped? If a watershed is small and narrow, how might the land be shaped?

*Explain* — Topography is the shape of the surface features of an area. Different watersheds have different shapes because the topography of the land within the watershed is different.

- If a watershed is narrow and small, that probably means that the land within the watershed is steep.
- If a watershed is wide and sprawling, the land within the watershed is flatter.

If students are having a hard time visualizing how topography influences watershed shape, use a piece of paper to demonstrate the concept. To demonstrate a small and narrow watershed with steep topography, have students curl the sides of a piece of paper upward. Ask what would this watershed look like from above? Lay the paper flat to demonstrate a large and wide watershed. Repeat the same question as before, asking again what this watershed would look like from above. The curled paper as viewed from above will look much smaller than the flat paper.

While elevation and topography create the boundaries of watersheds, in some flatter areas those boundaries may be more difficult to distinguish. Sometimes wetlands contribute to the confusion. Add the elevation layer to see how the elevation and wetlands may combine to show watershed boundaries. Can you zoom in and find some places where this may be true?

## Try it: Locate your Watershed and Flow Path



**Step 1:** Identify your geographic position on the map using search icon at the bottom right of the frame. Enter an address, such as your home or school, in the search box to plot and find your location on the map. FieldScope will plot a point at the desired location. You may also search using latitude/longitude coordinates in decimal degrees or degrees/minutes/seconds.

**Step 2:** Once you have a point on the map, you can calculate its watershed. Select the **Upstream Area Tool** under **Draw Tools**, then click as close to your point as possible.

**Step 3:** Get information about your watershed by selecting **Query by Drawing Shape**, clicking to draw a polygon, and then clicking **Continue** to use the selected shape. The **Measure Tool** measures linear distances in miles. Start by clicking at the desired start point, then double click to finish.

**Step 4:** Use the other **Draw Tools** to add labels and markings to the map.

**Step 5:** Use the **Flow Path Tool** to figure out where your watershed drains. Also, click around within the other parts of the watershed to see how neighboring land drains.

**Step 6:** Add a title and description, and save the map you've created to your account.

**Note:** Because of the way watershed data is reported, there may be some discrepancies in the drainages shown. For example, the flow path of land near the edge of a watershed may cross the watershed border (which is inaccurate). Please report these instances to [msgpubs@umich.edu](mailto:msgpubs@umich.edu) so we can improve the information found throughout FieldScope as we move forward.