

Water Quality Assessment Tool (WQAT) User's Guide

Link: www.exploremetrodenverwaterquality.org

Urban water use in the Denver metro area impacts water quality of surrounding streams and lakes, particularly the South Platte River. Urban pollutants include E. coli (bacteria from fecal matter), excess nutrients (usually phosphates and nitrates), suspended and dissolved solids, as well as “Contaminants of Emerging Concern” (CECs) which are pharmaceuticals, personal care products, hormones, plastics, chemicals, and pesticides. These pollutants affect plants, aquatic life, wildlife, and people.

This on-line tool allows anyone who isn't familiar with these pollutants to learn about them and how they impact our ecosystem. WQAT also provides accurate, easily accessible data of contaminant levels for 2009 through 2015. Data can be viewed in tables, on maps, or even graphed. WQAT's purpose is to further understanding of pollution and to assist in devising strategies to improve water quality. It is meant to bridge the gap between water quality science and environmental decision-making in a conveniently navigable manner.

This user's guide demonstrates how to use the Water Quality Assessment Tool and the functionality of the storyline, map and data sections.

About WQAT

Storyline: This feature contains informational storylines on the below subjects with pictures, charts, and videos. It describes what the pollutants are, how the pollutants get into the water, how the pollutants impact the ecosystem, regulations and standards of the pollutants, and what you can do to help reduce pollution. (Click on a link to jump to that section.)_

- Water Quality
- [E. coli](#)
- Nutrients
- Contaminants of Emerging Concern (CECs)
- Total Suspended Solids (TSS)
- Total Dissolved Solids (TDS)

Map: Search water quality information based on location via map display of the Denver metro area. Makes it easy to view water quality in a certain area over a specific timeframe.

- [Street map view or aerial map view available](#)
 - [Map filters include year and a wide array of pollutants as search parameters](#)
 - [Able to zoom in on a specific location or river reach](#)
 - [Click on a sampling location or river reach to view a graph and table for that location](#)
-
- [Summary statistics provided](#)

Data: Consists of databank for water quality data collected in the Denver metro area from 2009-2015. More likely to be used for research, academic, or professional purposes.

- [Search through data by location, date, and/or pollutant parameter](#)
- [Includes scatterplot graphs, column charts, or box plot graphs](#)
- [Downloadable data sets](#)

Welcome/Home Page

Denver Metro WQAT

Home Storyline Map Data

Welcome to the Water Quality Assessment Tool!

The South Platte Urban Waters Partnership is excited to present the updated water quality assessment tool for exploring the health of rivers and streams in the Denver metro area. This online tool combines data from 2009 through 2015 for pollutants including E. coli, contaminants of emerging concern, total dissolved and suspended solids, and nutrients. Use maps, graphs and narratives to explore water quality in the South Platte River basin. Take the tool into the field with the new mobile application and learn how you can protect water quality!

Continued population and water use growth in the Denver metro area impact water quality in streams and rivers. Water pollution from urban areas affects plants, aquatic life, wildlife, and people. Decision-makers, researchers and the public can use the water quality assessment tool to better understand pollution and to devise strategies for improving water quality. There is a limited amount of water on the planet for our use; learning about and actively protecting it is a responsibility we all share.

STORYLINE

Learn more about water quality by exploring the storyline. Each storyline contains a wealth of resources and illustrations. Subjects range from an overview of water quality to nutrients.

[Read it!](#)

MAP

Explore spatial trends in water quality data across the Denver Metro Area. Use the interactive map to examine water quality by monitoring location or river reach.

[Map it!](#)

DATA

Take a deep dive into water quality data for the Denver Metro Area. Explore available data through a variety of data visualizations or download the data for your own use.

[Graph it!](#)

Storyline Feature

The Storyline feature is useful for reading about water quality in general and a good place to start building an understanding of the major types of water pollutants. You can start by reading through the storylines and looking at the charts and videos. This feature contains information on the following subjects: Water Quality, *E. coli*, Nutrients, Contaminants of Emerging Concern (CECs), Total Suspended Solids (TSS), Total Dissolved Solids (TDS). The stories describe what the pollutants are, how the pollutants get into the water, how the pollutants impact the ecosystem, regulations and standards of the pollutants, what you can do to help stop the pollution, and more. If you want more information, then you may click on the additional links provided.

Navigating to Storyline Feature

The screenshot shows the Denver Metro WQAT website interface. At the top, there is a navigation bar with links for Home, Storyline, Map, and Data. A red arrow points to the Storyline link. Below the navigation bar is a large banner with a blue and white wavy background on the left and a dark grey text area on the right. The text area contains a welcome message and two paragraphs of introductory text. Below the banner are three main navigation sections: STORYLINE, MAP, and DATA. Each section has an icon, a brief description, and a button. A red arrow points to the 'Read it!' button under the STORYLINE section.

Denver Metro WQAT

Home Storyline Map Data

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STORYLINE

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Read it!

MAP

Explore spatial trends in water quality data across the Denver Metro Area. Use the interactive map to examine water quality by monitoring location or river reach.

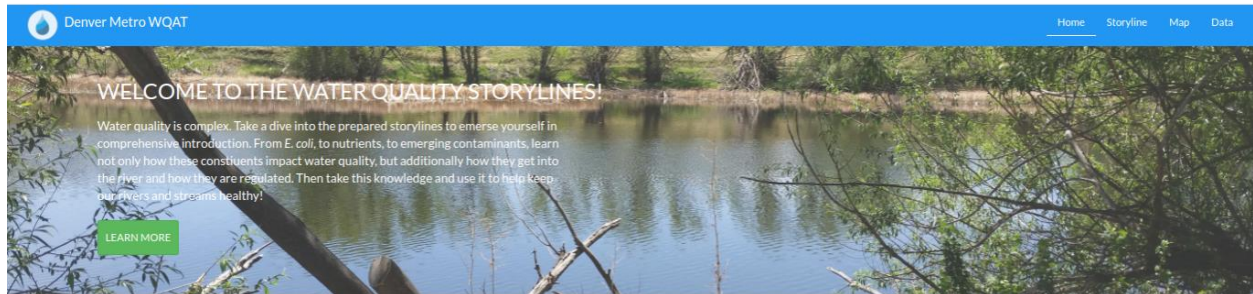
Map it!

DATA

Take a deep dive into water quality data for the Denver Metro Area. Explore available data through a variety of data visualizations or download the data for your own use.

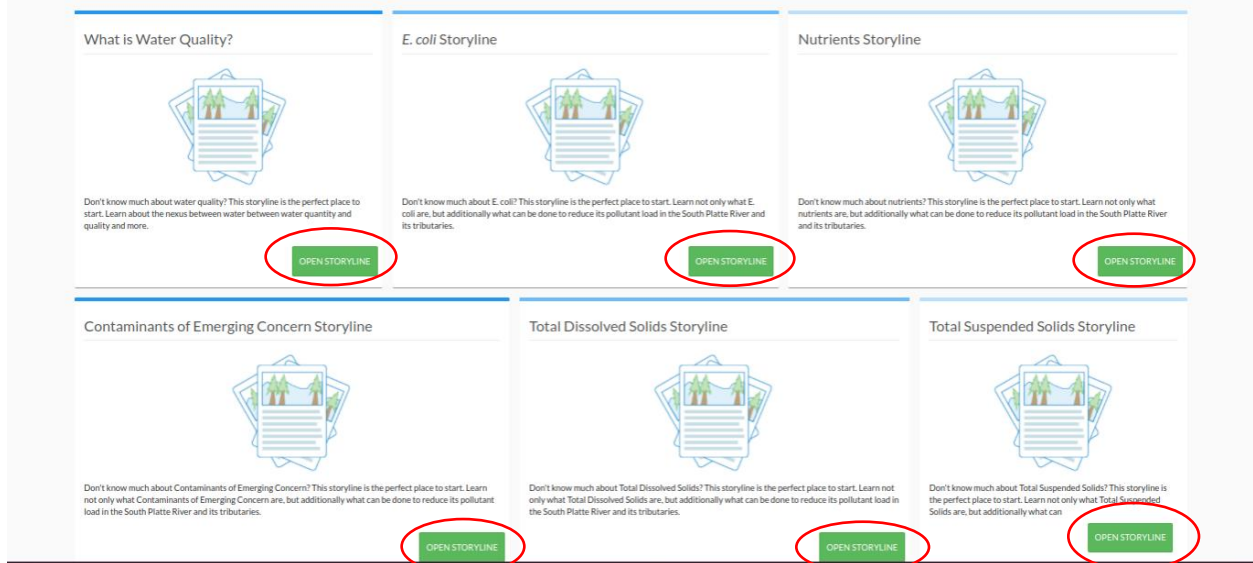
Graph it!

The initial storyline page should be identical to the screen below.

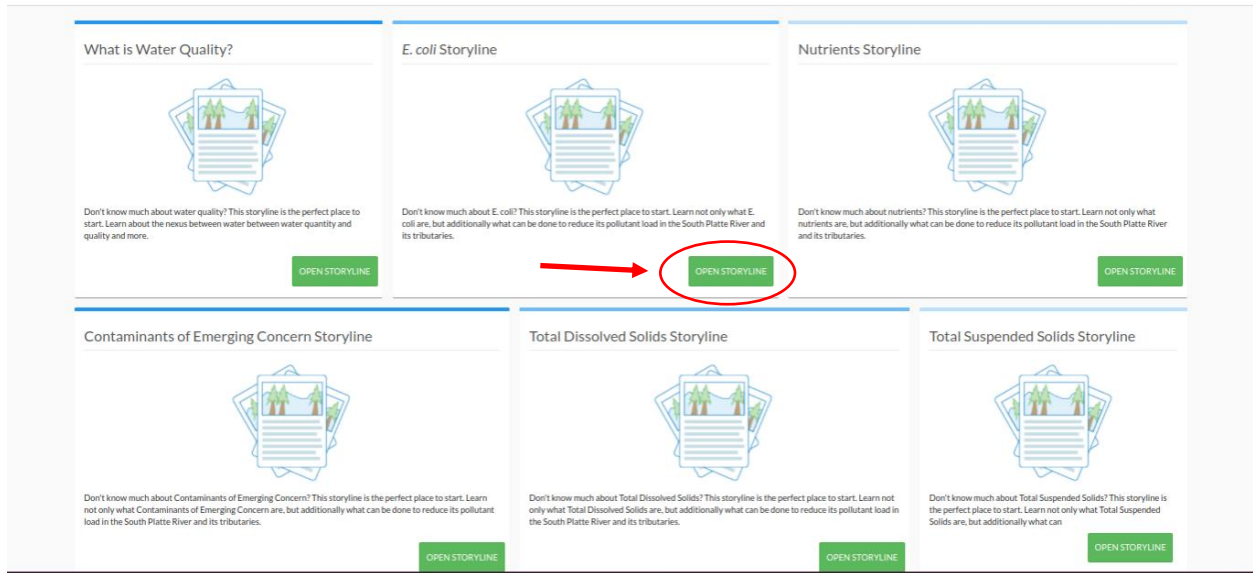


How to Operate the Storyline Feature

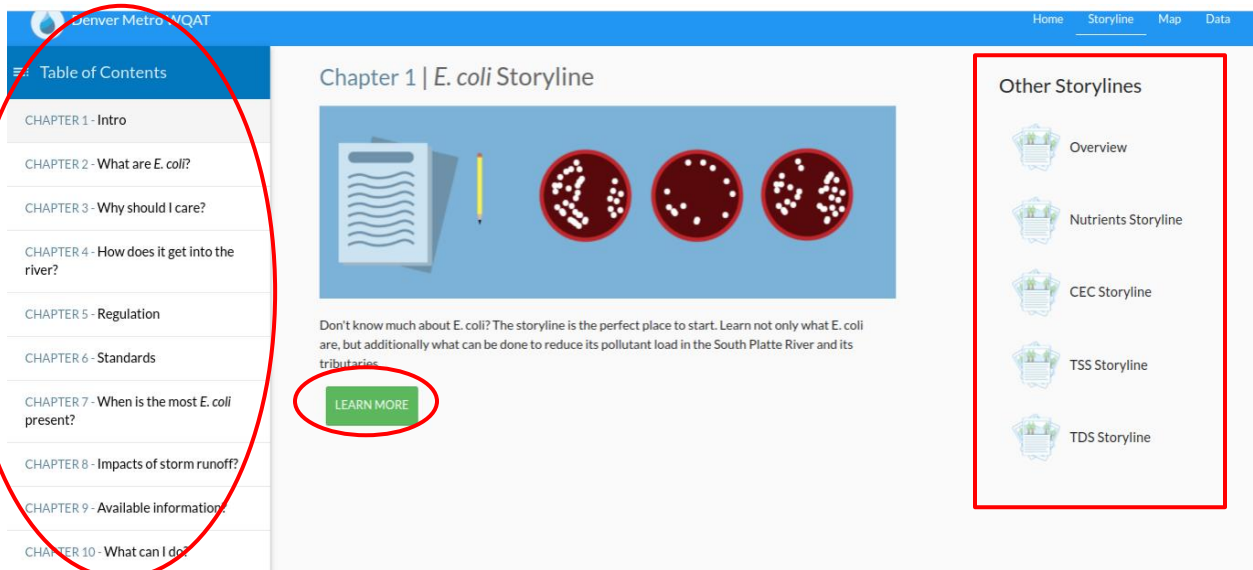
Scrolling down on that page will reveal the other storyline subjects. Clicking on any of the green “OPEN STORYLINE” buttons will lead you to multiple chapters on that subject. Navigating through each story is the same process, so this guide will only walk you through navigating one storyline.



We will use the *E. coli* storyline for the guide's example. You will first need to click on the green "OPEN STORYLINE" button in the *E. coli* storyline section as indicated below.



After doing so, the resulting screen should be identical to the one below.



Clicking on the green "LEARN MORE" button will take you to Chapter 2. On the far left, clicking on any of the chapters under the table of contents will take you to the corresponding chapter. On the far right, clicking on any of the options under "Other Storylines" will take you to one of the other five story options (they are the same story subjects from the last page where we selected *E. coli*). The other storylines will present themselves in the same manner as this one with a table of contents on the left, and other storylines on the right.

In Chapter 2 of the *E. coli* storyline, you will notice there is a video. Click the play button in the middle of the video and watch it on this page. On the far right, clicking on any of the links under “More information” will redirect you outside of this site to a recommended source for additional information on that chapter’s topic.

The screenshot shows a webpage layout for Chapter 2. On the left is a blue sidebar with a 'Table of Contents' menu listing 10 chapters. The main content area has a title 'Chapter 2 | What are Escherichia coli (E. coli)?' followed by a paragraph of text explaining that *E. coli* are bacteria normally found in intestines, and their presence in recreational waters is an indicator of fecal contamination. Below the text is a video player showing a green rod-shaped bacterium against a reddish background. The video title is 'E. coli Video' and it includes 'Watch later' and 'Share' buttons. A caption at the bottom of the video reads: 'E. coli O157:H7 causes most food outbreaks of the bacteria in the U.S.'. On the right side of the page, there is a 'More information' section with three external links: 'CDC, E. coli', 'Wikipedia, E. coli', and 'EPA, E. coli in drinking water'. This section is highlighted with a red border in the image.

Other storylines and/or chapters will also include external sources under a “More information” section on the right of the screen. Not all chapters will contain videos, but some will contain charts, graphs, or pictures.

Map Feature

This tool allows you to search water quality information based on location using a map of the Denver metro area. Use the filters to select a water quality parameter and year to display on the map, then zoom to a specific location or river reach (river section). Clicking on a sampling location or river reach will allow you to view a graph and table of information for that location.

Navigating to Map Feature

Clicking on either of the indicated data buttons will take you to the map page.

The screenshot shows the Denver Metro WQAT website interface. At the top, there is a navigation bar with links for Home, Storyline, Map, and Data. A red arrow points to the 'Map' link. Below the navigation bar is a large banner with a blue background and a white illustration of water ripples. The banner contains the text: 'Welcome to the Water Quality Assessment Tool!' followed by a paragraph about the South Platte Urban Waters Partnership and another paragraph about water quality in the Denver metro area. Below the banner are three main sections: 'STORYLINE', 'MAP', and 'DATA'. Each section has an icon, a brief description, and a button. A red arrow points to the 'Map It!' button in the 'MAP' section.

Denver Metro WQAT

Home Storyline **Map** Data

Welcome to the Water Quality Assessment Tool!

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STORYLINE

Learn more about water quality by exploring the storyline. Each storyline contains a wealth of resources and illustrations. Subjects range from an overview of water quality to nutrients.

Read It!

MAP

Explore spatial trends in water quality data across the Denver Metro Area. Use the interactive map to examine water quality by monitoring location or river reach.

Map It!

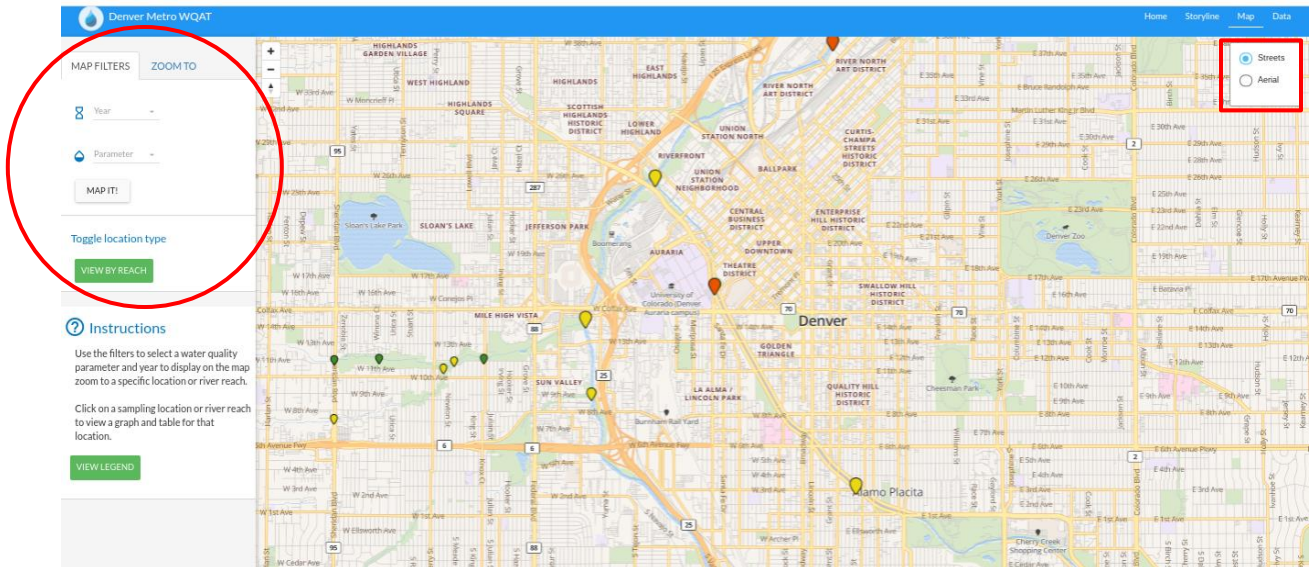
DATA

Take a deep dive into water quality data for the Denver Metro Area. Explore available data through a variety of data visualizations or download the data for your own use.

Graph It!

How to Operate the Map Feature

When you click on either of the above buttons to navigate to the map feature, you will see the screen below. You will need to use the circled filter section for viewing data for different locations over a time period of your choosing. The map location icons represent sampling locations. The default map shown below displays *E. Coli* sampling locations.



Click "Street" or "Aerial" in the upper right corner to switch from street map view or aerial map view. You may zoom in or out on the map by using Ctrl-scroll or Ctrl +/- on your keyboard.

Map Legend

Note: the map legend changes dynamically based on parameter and year selections

Color Guide

	0 - 38 CFU/100mL
	38 - 120 CFU/100mL
	120 - 310 CFU/100mL
	+ 310 CFU/100mL

Size Guide

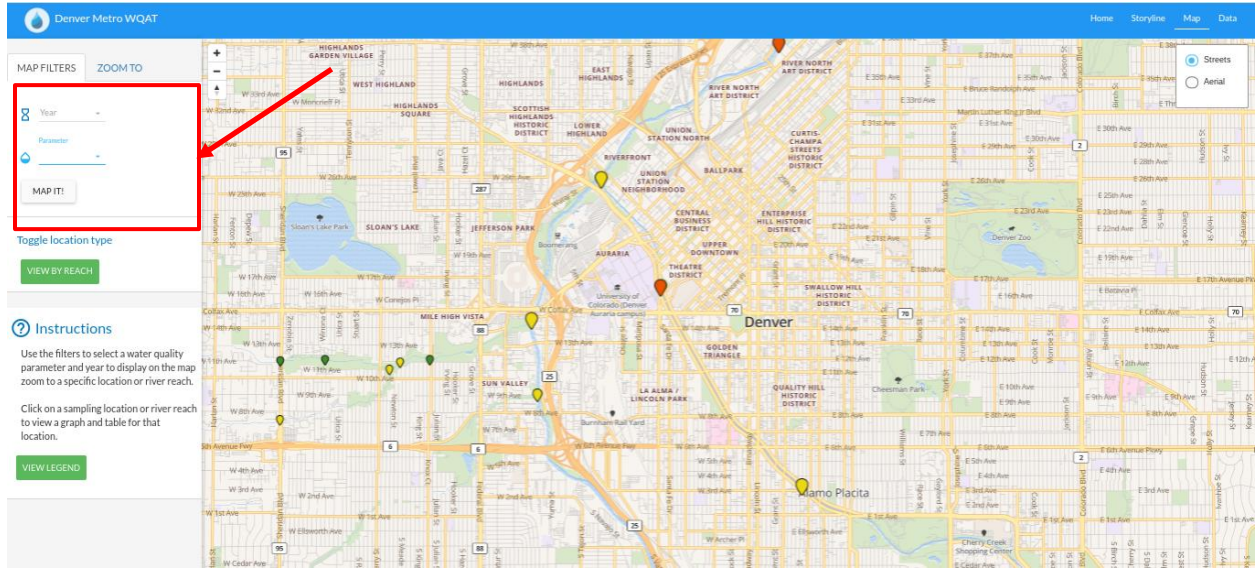
	0 - 18 sampling events
	18 - 57 sampling events
	+ 57 sampling events

Map legend:

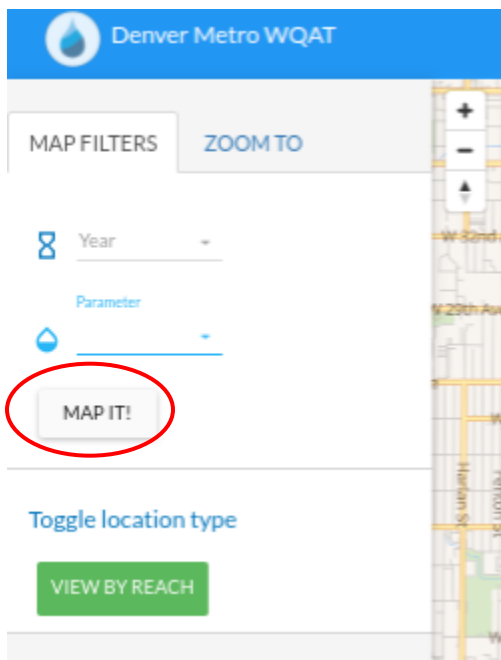
(View by clicking on "View Legend")

Searching with Map Filters

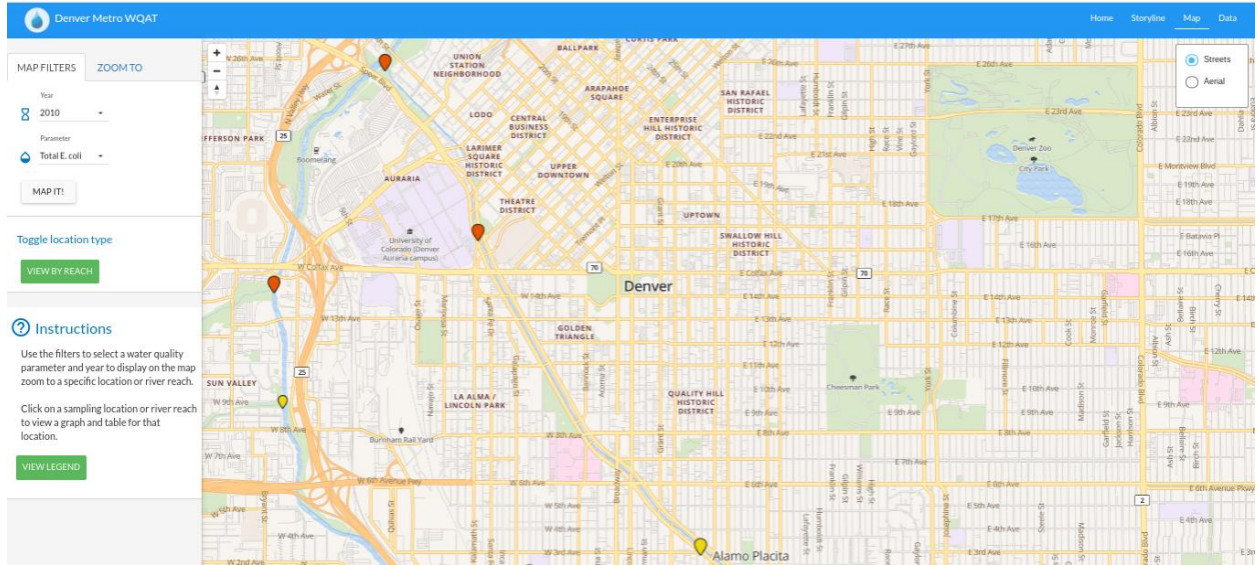
Using the map filters will allow you to sort through data by using the year and parameter filters, which is indicated below.



You can select any year from 2009 to 2015 as well as from the wide array of parameters that are available for search in the data feature. After applying the map filters, you will click the “MAP IT!” button.



The screenshot below is an example of a map after applying the filters and clicking the “MAP IT!” button.



You may click on one of the map location icons that indicate sampling events (see Map Legend if needed) to show you the water quality information from that area. Using the drop-down calendar boxes indicated below will allow you to choose the time period you want information

Denver Metro WQAT

MAP FILTERS ZOOM TO

Year: 2010

Parameter: Total E. coli

MAP IT!

Toggle location type

VIEW BY REACH

Instructions

Use the filters to select a water quality parameter and year to display on the map zoom to a specific location or river reach.

Click on a sampling location or river reach to view a graph and table for that location.

VIEW LEGEND

Total E. coli at CH-2

Concentration (CFU/100mL)

Date Filters

Start Date: 1/1/2009

End Date: 12/31/2015

Metadata

Location Name

If you scroll down, then you will see the full graph and a statistics summary.

Concentration (CFU/100mL)

Start Date: 1/1/2009

End Date: 12/31/2015

Metadata

Location Name: CH-2

Location Description: Cherry Creek at Champa

Stream Name: Cherry Creek

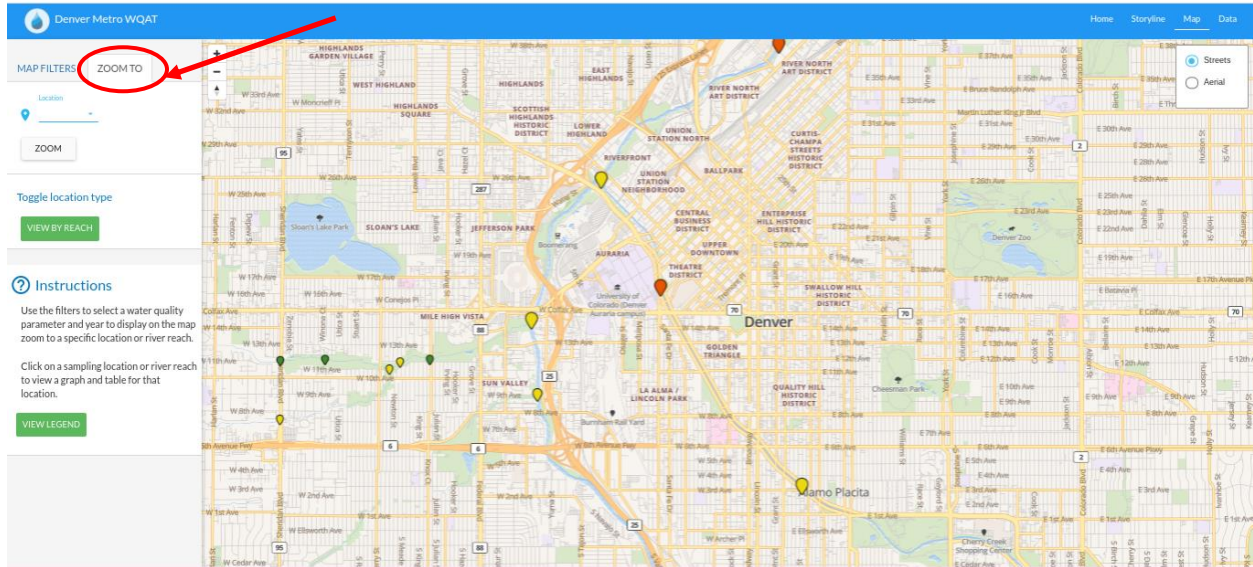
Summary Statistics

	2009	2010	2011	2012	2013	2014
Max Value	2420 CFU/100mL	95.98 CFU/100mL	70 events			
Geometric Mean						
Statistic	2009	2010	2011	2012	2013	2014
Max	790	790	2420	430	500	880
Geometric Mean	122.42	153.88	124.32	60.62	79.82	69.05
Count	12	11	12	11	12	12

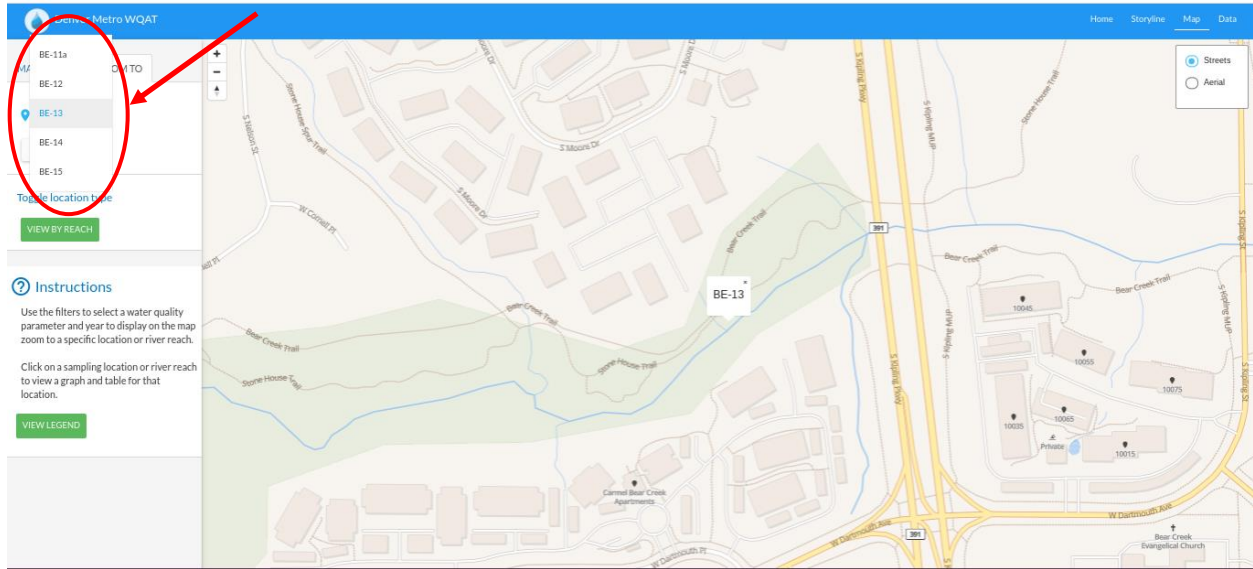
In the scatter-plot above you can see sampling points above and below a red line. The primary contact (wading and swimming) standard for *E. coli* in many streams in Colorado, including the South Platte River in Denver, is 126 CFU/100 mL. That standard is shown in the graph by the red line. Anything above the line does not comply with the standard.

Searching with Zoom

The “zoom to” feature is next to the map filters buttons in the upper left corner. You can use either, but not at the same time. This feature will allow you to zoom directly to a certain location you want water quality information about. To navigate to the zoom feature you will need to click on the “ZOOM TO” button as indicated below.



After clicking the “ZOOM TO” button, select a location using the drop down menu. After clicking on a location, your resulting screen should be similar to the one below.



Then, you may click on the location spot on the map to receive water quality information about it. An example of this is shown below. You may change the time period of water quality information you want on by using the drop boxes indicated below.

The screenshot displays a web interface for water quality data. At the top, a map shows a location on a river. Below the map, a sidebar on the left contains navigation options: 'Toggle location type' with a 'VIEW BY REACH' button, 'Instructions' explaining filter usage, and 'VIEW LEGEND'. The main content area is titled 'Total E. coli at BE-13' and includes a prompt to 'Please select a location or reach on the map'. Below this is a 'Summary Statistics' section with three key metrics: Max Value (2420 MPN/100 mL), Geometric Mean (131.52 MPN/100 mL), and Sampling Events (123 events). A table provides a detailed breakdown of these statistics from 2009 to 2014. On the right, a 'Date Filters' dropdown menu is highlighted with a red box, showing 'Start Date' as 1/1/2009 and 'End Date' as 12/31/2015. Below the date filters is a 'Metadata' section with fields for 'Location Name' (BE-13), 'Location Description' (Bear Creek downstream of Bear Creek tributary and upstream of Weaver Creek confluence), and 'Stream Name' (Bear Creek).

Total E. coli at BE-13

Please select a location or reach on the map

Summary Statistics

Max Value: 2420 MPN/100 mL
Geometric Mean: 131.52 MPN/100 mL
Sampling Events: 123 events

Statistic	2009	2010	2011	2012	2013	2014
Max	2420	770	1550	1410	687	1200
Geometric Mean	104.33	126.32	225.63	120.86	120.82	121.69
Count	24	15	21	18	22	23

Date Filters

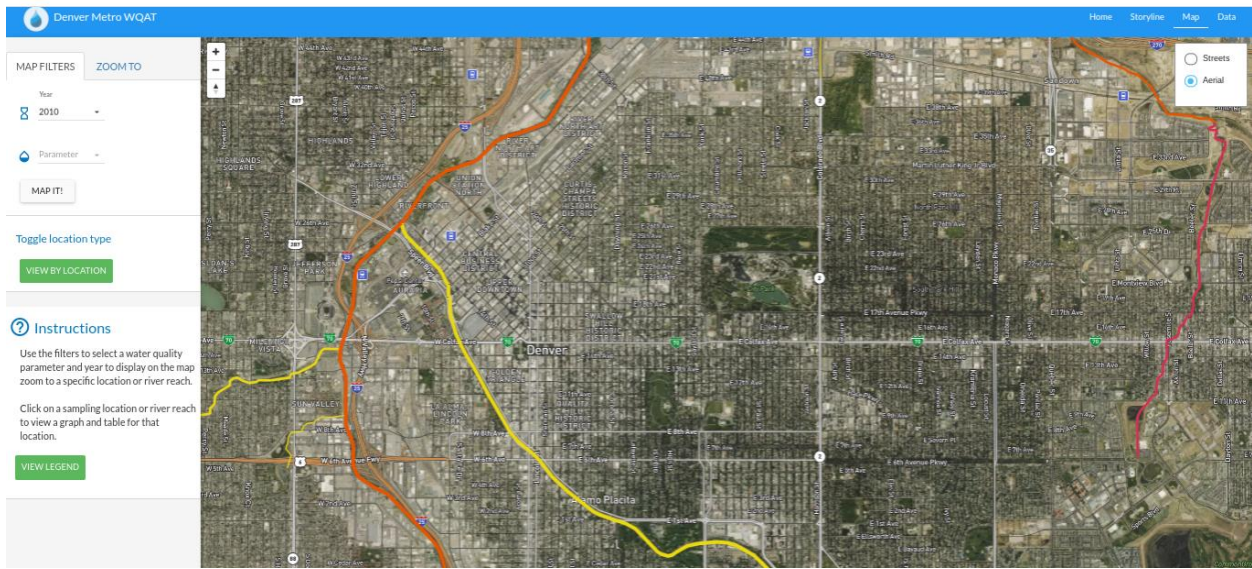
Start Date: 1/1/2009
End Date: 12/31/2015

Metadata

Location Name: BE-13
Location Description: Bear Creek downstream of Bear Creek tributary and upstream of Weaver Creek confluence
Stream Name: Bear Creek

Searching by River Reach (River Section)

Clicking on the “view by reach” button under Toggle Location Type section will make all river reaches more prominent and searchable on the map feature. With the “view by reach” button selected you may click directly on the river reach on the map to receive water quality information on it. The screenshot below is in aerial view with the “view by reach” button selected. The river reaches will also show up in street view.



Clicking on one of the river reaches from the map will display a screen similar to the one below. You can change the time frame of information you want by changing the dates in the section indicated below.

The screenshot shows the data view for 'Total E. coli at BD-1'. The 'Date Filters' section is highlighted with a red box and contains the following information:

Start Date	End Date
1/1/2009	12/31/2015

A red arrow points from the 'Date Filters' section to the 'Summary Statistics' table:

Max Value	Geometric Mean	Sampling Events
2420 MPN/100 mL	131.52 MPN/100 mL	123 events

The left sidebar contains the same filters as the first screenshot, and the top navigation bar is also present.

Data Feature

The data feature is useful for anyone that wants to analyze data about a certain contaminant(s) over time. This tool allows you to download data for your own use or to explore the data with the visual options provided on the site.

Navigating to Data Feature

Clicking on either of the indicated data buttons will bring you to the data page.

The screenshot shows the Denver Metro WQAT website interface. At the top, there is a blue navigation bar with the logo on the left and links for Home, Storyline, Map, and Data on the right. A red arrow points to the 'Data' link. Below the navigation bar is a large banner with a blue and white wavy background on the left and a dark grey text area on the right. The text area contains a welcome message and two paragraphs of introductory text. Below the banner are three main navigation options: 'STORYLINE' with a 'Read It!' button, 'MAP' with a 'Map It!' button, and 'DATA' with a 'Graph It!' button. A red arrow points to the 'Graph It!' button. The 'DATA' section includes a 3D bar chart icon and a description of the data feature.

Denver Metro WQAT

Home Storyline Map Data

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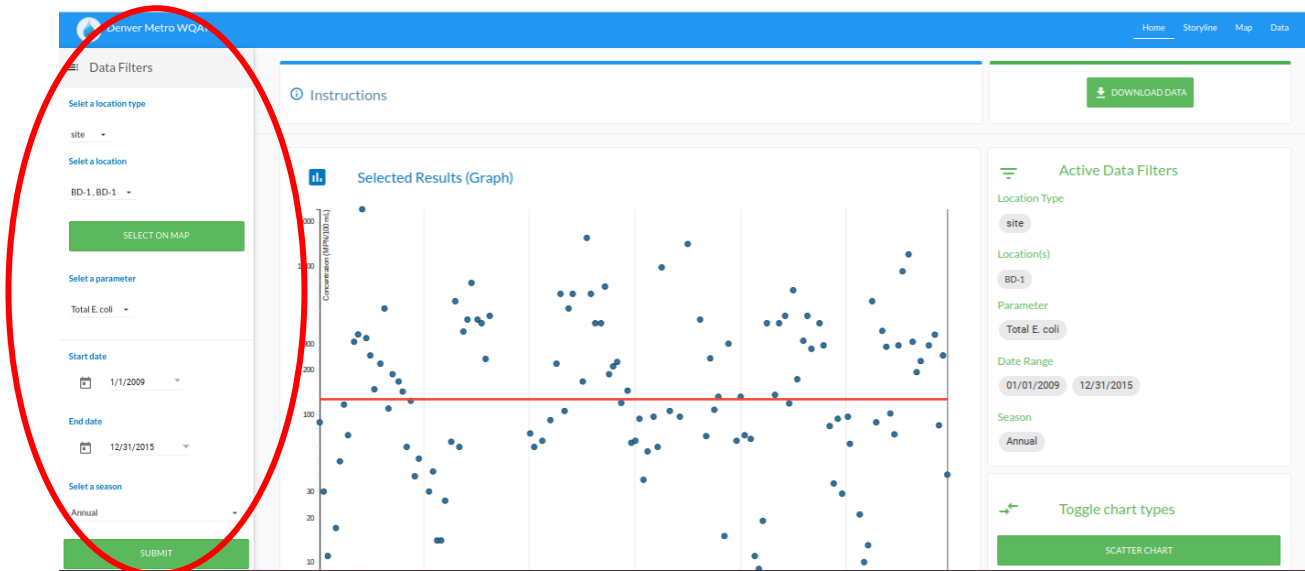
DATA

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Graph It!

How to Operate the Data Feature

When you click on either of the above buttons to navigate to the data feature, this will be the resulting screen. You will need to use the circled filter section for either viewing data on the site or for downloading the data for your use.



Selecting and Viewing Data

Use the drop boxes for the data filters section to select the type of data you would like to analyze. Filters include:

- Location type (i.e. site or river reach)*
- Location
- Parameter
- Start Date
- End Date
- Season

*In addition to selecting locations from the dropdown menus, you can select locations on a map by selecting "Select on map" below the location dropdown menu.

The screenshot displays a 'Data Filters' interface with the following elements:

- Data Filters** (header)
- Select a location type**: dropdown menu with 'site' selected.
- Select a location**: dropdown menu with 'BD-1, BD-1' selected.
- SELECT ON MAP**: a green button.
- Select a parameter**: dropdown menu with 'Total E. coli' selected.
- Start date**: date picker with '1/1/2009' selected.
- End date**: date picker with '12/31/2015' selected.
- Select a season**: dropdown menu with 'Annual' selected.
- SUBMIT**: a green button.

The indicated buttons will allow you to switch between expressing the data through scatter plots, column charts, or box plots.

The screenshot displays a data visualization interface. On the left, there is a sidebar with an 'End date' field set to '12/31/2015', a 'Select a season' dropdown menu currently set to 'Annual', and a green 'SUBMIT' button. The main area features a scatter plot showing data points from 2009 to 2014. The y-axis ranges from 0 to 100. A red arrow points to a 'Toggle chart types' menu on the right, which is highlighted with a red box. This menu contains three options: 'SCATTER CHART' (highlighted in green), 'COLUMN CHART', and 'BOX PLOT'. Below the chart is a table titled 'Selected Results (Table)' with columns for Date, Location, Result, River Reach, and Stream.

Date	Location	Result	River Reach	Stream
01/07/2009	BD-1	88 MPN/100 mL	BD-101900030408	Big Dry Creek (North)
01/21/2009	BD-1	30 MPN/100 mL	BD-101900030408	Big Dry Creek (North)
02/04/2009	BD-1	11 MPN/100 mL	BD-101900030408	Big Dry Creek (North)
02/18/2009	BD-1	6 MPN/100 mL	BD-101900030408	Big Dry Creek (North)
03/04/2009	BD-1	17 MPN/100 mL	BD-101900030408	Big Dry Creek (North)
03/18/2009	BD-1	48 MPN/100 mL	BD-101900030408	Big Dry Creek (North)
04/01/2009	BD-1	116 MPN/100 mL	BD-101900030408	Big Dry Creek (North)

Downloading Data

After selecting a dataset you would like to analyze, you may download the data for further use and analyze it separate from the website. Begin by clicking on the “Download Data” button as the arrow shows below.



In the scatter-plot above you can see sampling points above and below a red line. The primary contact (wading and swimming) standard for *E. Coli* for many streams in Colorado including the South Platte River in Denver is 126 CFU/100 mL. That standard is demonstrated in the graph by the red line. Anything above the line does not comply with the standard.

After clicking on the “Download Data” button, this should be the resulting screen. You will have the option to either download your selected data or download all data. Downloading selected data (the option on the left) will only download the data from the location, parameter, and time period that resulted from your filtered search, whereas downloading all data (the option on the right) will download the entire dataset, which includes all parameters and locations, from the site.

The screenshot shows the Denver Metro WQAT Data Filters interface. On the left, there are filters for 'site' (BD-1), 'parameter' (Total E. coli), and 'start date' (1/1/2009). A 'SELECT ON MAP' button is also visible. The main content area is divided into two panels: 'Download Selected Data' and 'Download All Data'. Both panels have a 'Please specify a file name' label and a 'Download file name *' text input field, which are circled in red. The 'Download Selected Data' panel has a 'DOWNLOAD SELECTED DATA' button, and the 'Download All Data' panel has a 'DOWNLOAD ALL DATA' button. A 'DOWNLOAD DATA' button is also present in the top right corner of the main content area.

After choosing which data you would like to download, you must create a file name and type it into the file name text box. Then click on the button to download the selected data (left option) or all the data (right option).