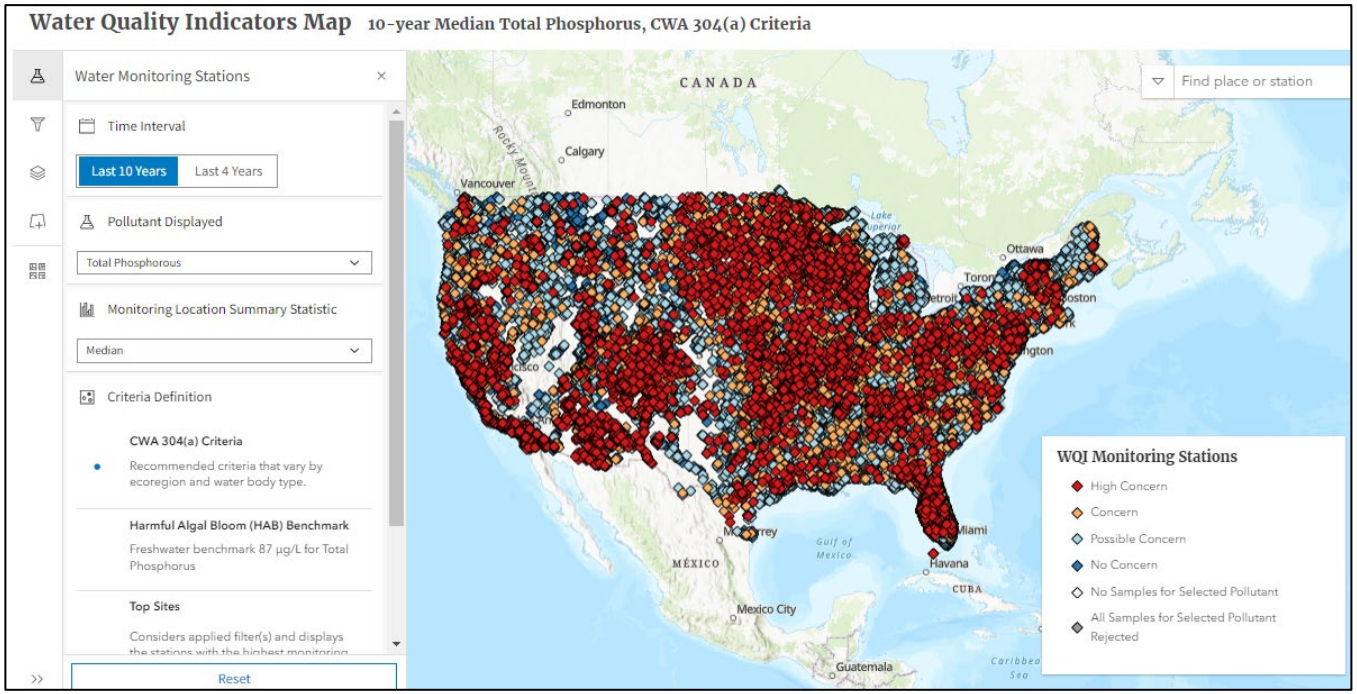
How to Use the Water Quality Indicators Tool (WQI)

Rusty Wasem EPA/OECA/OC

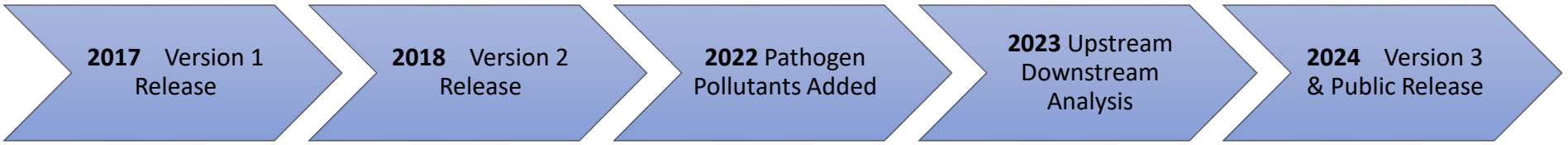


https://echo.epa.gov/maps/water-quality-indicators

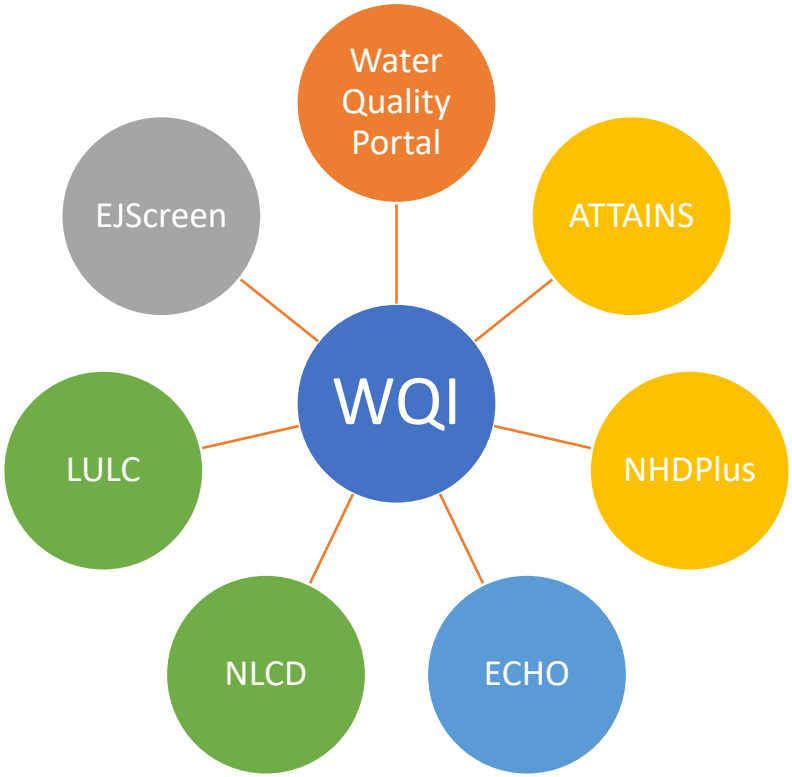
ECHO Enforcement and Compliance History Online

WQI Background

- The WQI Tool is a supplement for state water quality assessments that can help fill gaps in evaluating waters in a nationally consistent approach.
- Uses surface water monitoring data from the US Water Quality Portal.
- Will identify hotspots and provide an upstream look for possible causes.
- The tool directs users to where water quality is degrading between point A to B and shows potential contributors between those points.
- The tool has matured through 8 years of development, and state use.



WQI Data Sources



Many stove-piped data sources with useful information are integrated in this tool.

Ambient Water Monitoring Data
Water Quality Portal

Compliance Data
U.S. EPA Enforcement and Compliance History Online (ECHO) - Facility Data

Water Data
U.S. EPA's National Hydrography Dataset Plus (NHDPlus)
U.S. EPA's Assessment, TMDL Tracking and Implementation System (ATTAINS)

Land Use Data
U.S. Geological Survey National Land Cover Database (NLCD)
Chesapeake Conservancy Land Use Land Cover Database (LULC)

Other Sources
U.S. EPA's EJScreen – Environmental Justice Data

Currently, the WQI includes data for nutrients and several pathogen parameters. In the future we hope to expand and include other parameters.

WQI Data Details

- First, an algorithm that normalizes water quality data.
- Then, the GIS interface visualizes the water quality monitoring dataset.
  - The map interface visualizes the water monitoring data with facility & land cover data.

1. Gathers Publicly Available Monitoring Data

- Water Quality Portal - 10 years of nutrient and pathogen data
  - 198k monitoring stations
  - 12.5m water samples
- **Refreshed in April and October**

2. WQI Algorithm Normalizes Monitoring Data to Create WQI Dataset

- QA/QC data
- Combine subspecies of nitrogen into a total nitrogen value.
- Calculate representative statistics for each monitoring station.
- Identify river and stream segments where water quality is dramatically changing.

3. Visualize WQI Dataset in a GIS Interface

- Compare to water quality criteria
- Add data layers for additional context (e.g. ECHO Facility Data, Impaired Waters Data, EJScreen, and USGS Land Use Data).
- Find the 50 highest monitoring locations in a Region/State.

Example Use Cases

- What Does OECA Use the WQI for?
  - Compliance monitoring resource planning (who to inspect or offer compliance assistance)
- Why is it important for the Public?
  - The public can more easily identify water quality problems, identify potential contributors, help prioritize remedies to the problems.

Other Uses Beyond Enforcement?

- Water Quality Monitoring
  - What has been observed at a given water body over last 10 years and are TMDLs having desired impact?
  - Assist states in identifying water bodies that need assessment.
- Nutrient Trading
  - Industries and municipalities can identify potential trading opportunities.
- NPDES Permitting
  - Permit writers and permittees can more easily scope the water quality of the discharge receiving water body.

Live Demo

https://echo.epa.gov/maps/water-quality-indicators

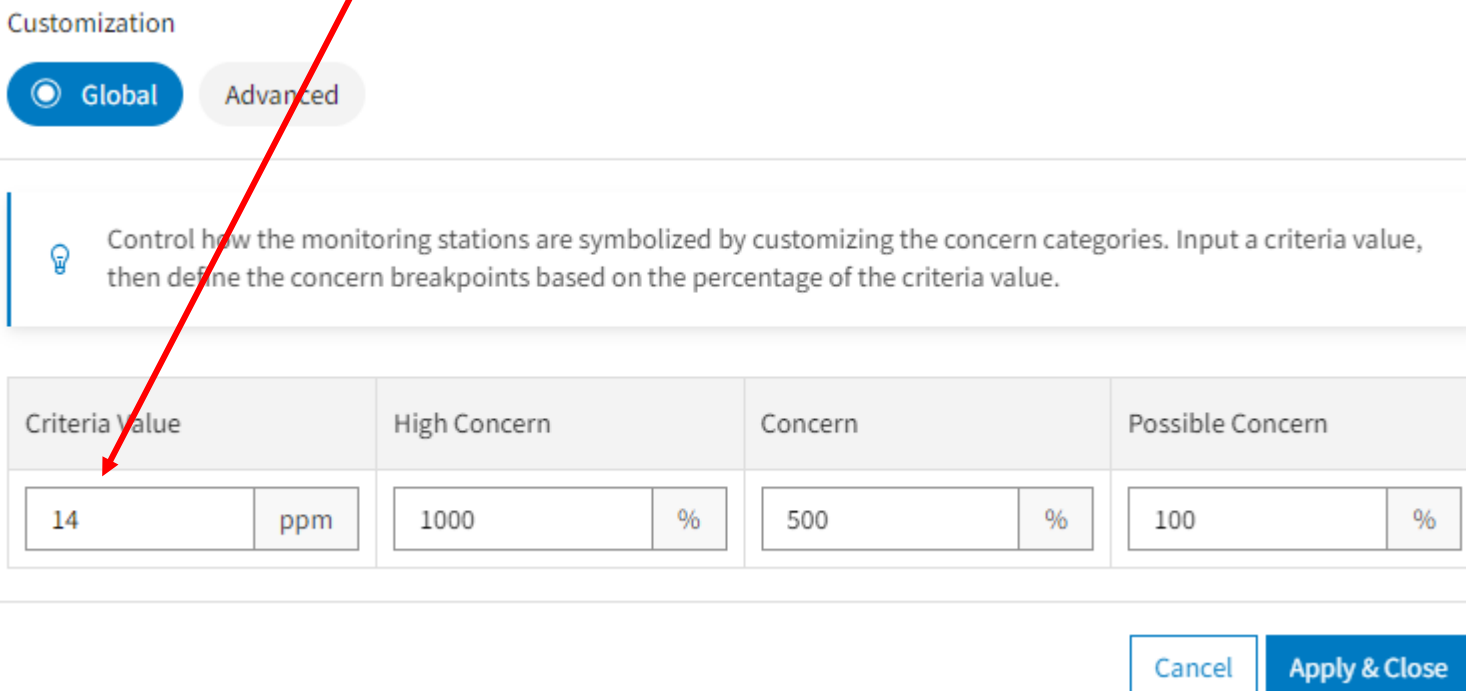
Key Feature: Defining Your Own Criteria

Table 2. Vermont Phosphorus Criteria for Lake Memphremagog and South Bay

Lake Segment / Waterbody ID	Total Phosphorus Criterion (ug/l)*
Lake Memphremagog / VT17-01L01	14
South Bay / VT17-01L02	25

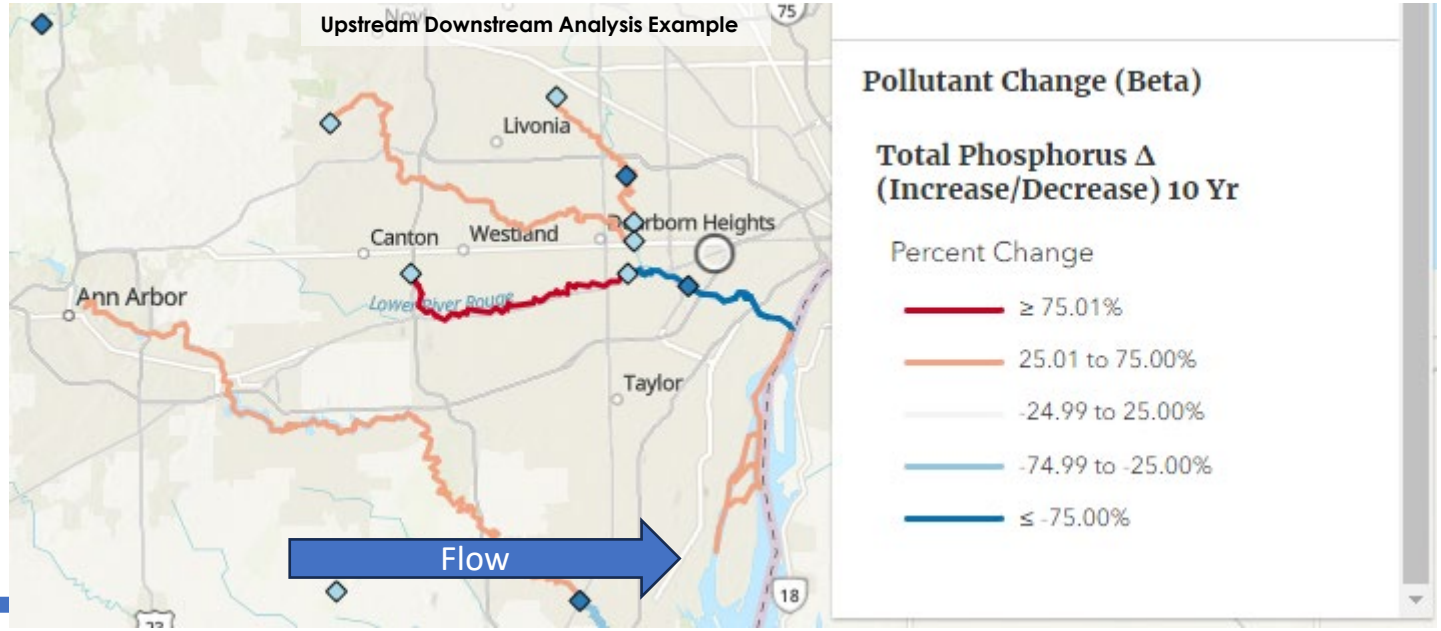
*The Vermont Water Quality Standards specify that these criteria shall be achieved as the annual mean total phosphorus concentration in the photosynthetic depth (euphotic) zone in central, open water areas of Lake Memphremagog and South Bay.

LAKE MEMPHREMAGOG PHOSPHORUS TOTAL MAXIMUM DAILY LOAD

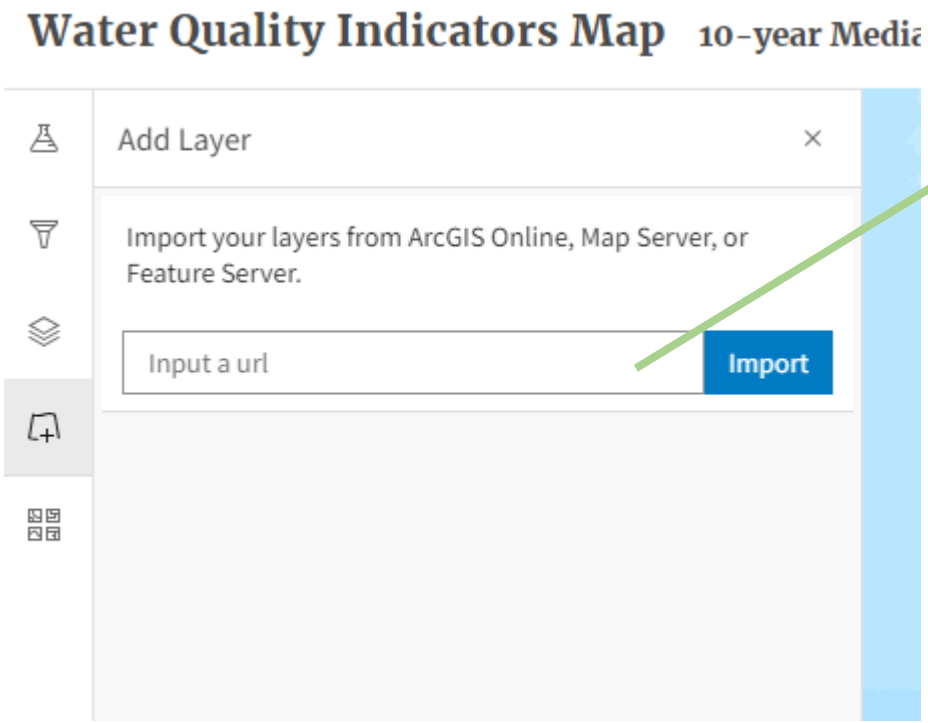


Key Feature: Pollutant Change *Beta* Layer

- The protocol identifies every stream segment where monitoring locations:
  - Are within 0.1 -50 miles (next refresh will be 0.25 – 25 miles) AND
  - Observed changes of more 25%±
- Pathogen change layer combines all three parameters.
- Will be maintained as a map layer in the EPA GeoPlatform and the WQI application.
  - Data will be refreshed 2x annually (April and October)
  - The feature service presenting this analysis is publicly available here.
- Working through how best to handle crowded waterbodies.



Key Feature: Add a Layer

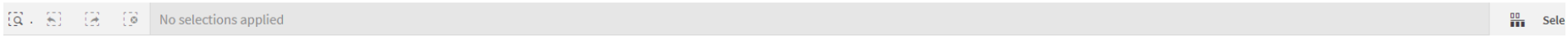


Import your own map or map layer, by adding the service URL in the Add Layer Tab

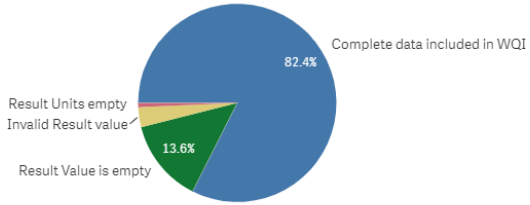
Data Usability Dashboard

Find out why the WQI didn't use your data

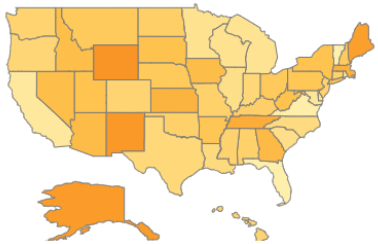
https://echo.epa.gov/maps/water-quality-indicators/dataquality



Overall Record Data Quality Summary



Records with Incomplete Metadata for WQI by State



Summary Pivot Table

Organization | Parameter | WQI Tool Data Q... | State | Monitoring Loca... | Values

	Total Number of Records	Number of Records with Incomplete Metadata for WQI	Percent of Records with Incomplete Metadata for WQI
21GPBCH - Grand Portage Beaches (ID: 21GPBCH)	2034	397	20%
Absentee Shawnee Tribe of Oklahoma (Tribal) (ID: ABSHAWNEE)	160	94	59%
Adams Rib Ranch (Volunteer) (ID: ARR)	509	8	2%
Adventure Scientists (Volunteer)* (ID: ADVENTURESCIENTISTS)	1100	216	20%
Agricultural Research Service (ID: ARS)	24029	3762	16%
Ak-Chin Indian Community (Tribal) (ID: AK-CHIN_WQX)	561	86	15%

Advance Questions

Hopefully Covered

- Can you go through the layers on the tool. (land use, discharge, ej, etc.)
  - Yes
- Is there a way to export data from the tool?
  - Currently, you can only export results of the upstream/downstream facility search.
- In general, going through the tool and showing all the various functionalities and choices to customize the output would be helpful. Can you go into detail on the various data categories and the types of information that can be used?
  - Yes
- Pollutant parameters: currently the tool includes Total Nitrogen, Total Phosphorus, and several bacteria species. Is there a plan to expand to include other parameters?
- Can you discuss the beta tool for showing increasing pollutant loadings?
  - Yes
- The data is taken from WQX database. Can he go over which data is included in the db and how often it is updated?
  - Yes

Not Covered

- The FAQ page indicates that data from WQX isn't automatically included in the tool. If a state submits data to WQX it is evaluated for inclusion in the WQI map. How does EPA decide which data to use? If a state wants to discuss inclusion of data that has been excluded, what is the procedure?
  - Review the data quality dashboard to identify usability concerns identified by WQI. If desired, correct issues within WQX. If concerns continued, please reach out to me (wasem.Russell@epa.gov) and WQX (WQX@epa.gov).

- Does the tool estimate land use contributions from the pollutant parameter?
  - No

- Is it possible to export the maps that the user creates? In what format?
  - Currently no. A user can access the WQI map feature service to do more custom GIS analysis with the data.

- Criteria used: Can you discuss which WQ criteria are used in the tool and the procedure for the user to add other criteria to the project?
  - Demoed

- Permitted sources: Currently the map shows sources and compliance status. Are there any plans to also include pollutant loading information?
  - Great suggestion! I will explore adding a facility's nutrient and pathogen loading data to the pop-up.

WQI Resources

Support/Documentation

- WQI Project Homepage: https://echo.epa.gov/maps/water-quality-indicators
- WQI Help Page: https://echo.epa.gov/help/wqi-help
- WQI FAQs: https://echo.epa.gov/help/wqi-faq
- Water Quality Indicators (WQI) Project Background and Technical Specifications: https://echo.epa.gov/system/files/WQI_overview11.pdf

Data

- WQI Datasets: https://echo.epa.gov/files/echodownloads/Data-Analytics/WQI/
- WQI GIS Feature Service: https://epa.maps.arcgis.com/home/item.html?id=a8c7231fccb54412b4c4039e31ff7ae0
- WQI Data Usability Dashboard: https://echo.epa.gov/maps/water-quality-indicators/dataquality

Additional EPA Resources for Water Data

Water Quality eXchange – Share your data!
https://www.epa.gov/waterdata/water-quality-data-upload-wqx

Water Quality Portal – Find and use data!
https://www.waterqualitydata.us/

How's My Waterway – Explore more data!
https://mywaterway.epa.gov

General ECHO Resources

- ECHO Tool Guide: https://echo.epa.gov/resources/general-info/tool- guide
- ECHO Quick Start Guide: https://echo.epa.gov/resources/general-info/learn-more-about-echo
- Video tutorials: https://echo.epa.gov/help/tutorials
- Webinars: https://echo.epa.gov/help/training
- FAQ: https://echo.epa.gov/resources/general-info/echo-faq
- ECHO Mailing list: https://echo.epa.gov/resources/general-info/listserv
- **ECHO Notify:** https://echo.epa.gov/tools/echo-notify
- How to Report an Error: https://echo.epa.gov/help/how-to-report-error

Questions / Feedback / Training

Rusty Wasem

wasem.russell@epa.gov