Recent national science and tools from the USGS, with a focus on data delivery changes

Dave Rus, Hydrologist, USGS Nebraska Water Science Center

Joint meeting of the Nebraska Surface Water Monitoring Council and Nebraska Groundwater Monitoring Advisory Committee

November 1, 2022

U.S. Department of the Interior
U.S. Geological Survey

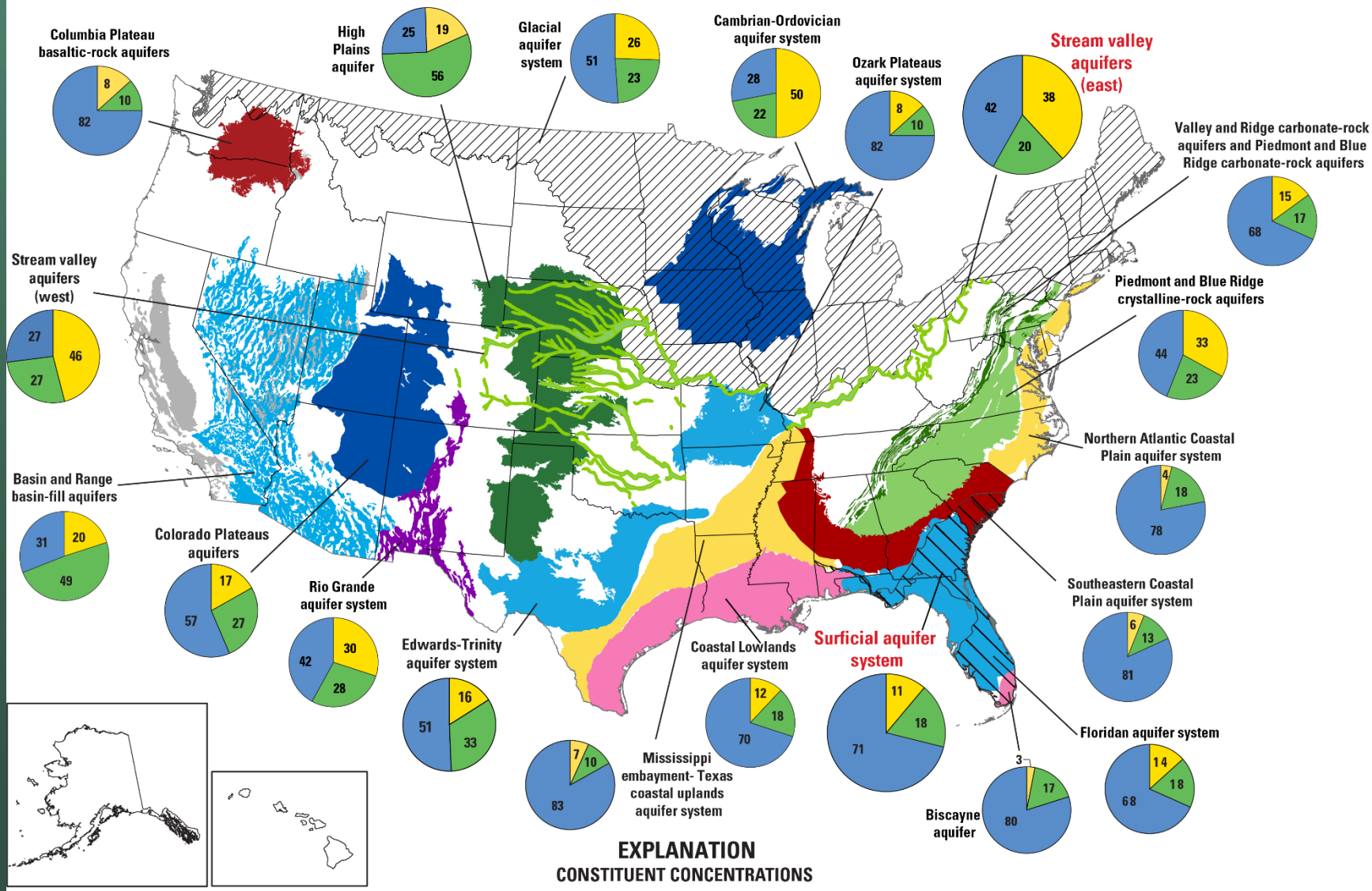
Outline

- Recent regional/national USGS GW science
- Recent regional/national SW quality science
- USGS water-data strategy and data delivery changes

USGS

OVERVIEW OF WATER QUALITY IN PRINCIPAL AQUIFERS

Exceedances of human-health benchmarks by one or more inorganic contaminants



EXPLANATION

CONSTITUENT CONCENTRATIONS

Values represent the proportion of the study area with groundwater that falls into one of three defined categories for inorganic constituents.
Percentages might not sum to 100 because of rounding.

- High: Concentration of at least one inorganic contaminant exceeds a human-health benchmark.
- Moderate: Concentration of at least one inorganic contaminant is greater than one-half a human-health benchmark.
- Low: Concentrations of all inorganic contaminants are less than half of a human-health benchmark for inorganic constituents or are not detected.

Concentrations of organic constituents (not shown) did not exceed human-health benchmarks in samples from any of the Principal Aquifers shown.

The two principal aquifers described in the new fact sheets are shown with larger graphics and named in red text.

GW Quality

- USGS Fact Sheet 2021-3011
- https://doi.org/10.3133/fs20213011
- Data available at: Datasets of Groundwater-Quality and Select Quality-Control Data from the National Water-Quality Assessment Project, January 2017 through December 2019 (ver. 1.1, January 2021) - ScienceBase-Catalog

USGS

USGS
science for a changing world

National Water Quality Program
National Water-Quality Assessment Project

Groundwater Quality in Selected Stream Valley Aquifers, Western United States

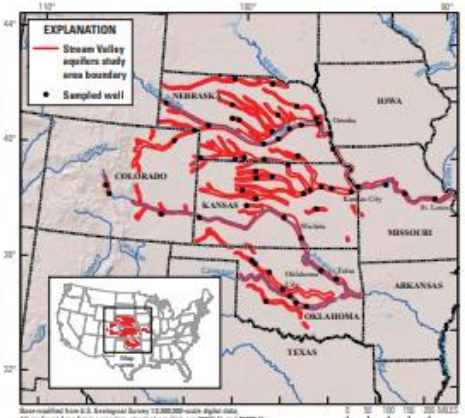
Groundwater provides nearly 50 percent of the Nation's drinking water. To help protect this vital resource, the U.S. Geological Survey (USGS) National Water-Quality Assessment (NAWQA) Project assesses groundwater quality in aquifers that are important sources of drinking water. The Stream Valley aquifers constitute one of the important aquifer systems being evaluated.

Background

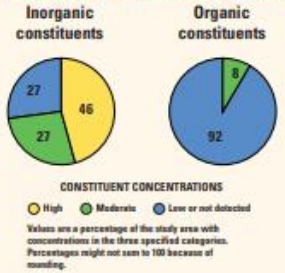
The Stream Valley aquifers sampled for this study underlie an area of about 41,200 square miles in the sedimentary deposits of the Arkansas, Missouri, and Red River drainages. The study area includes parts of Oklahoma, Nebraska, Kansas, Missouri, and Colorado. About 4.5 million people live in the area overlying these aquifers, and about 167 million gallons per day were withdrawn for public supply in these states from Stream Valley aquifers in 2000 (Sargent and others, 2008; Kingsbury and others, 2021). Most of the area overlying the aquifer is undeveloped (54 percent). Agricultural and urban land use make up about 39 and 7 percent of the study area, respectively. Major cities in the study area include Omaha, Nebraska; Kansas City, Missouri; and Tulsa, Oklahoma.

The Stream Valley aquifers are associated with sand and gravel deposited in the valleys of streams or rivers. Typically, the streams are hydraulically connected to the aquifers (Miller and Appel, 1997). Consequently, these aquifers are limited in extent compared to most principal aquifers and usually are only up to a few miles wide, but they can extend over long distances (Ryder, 1996). These aquifers typically are no more than 100 feet thick, but along some of the large rivers may be as much as 160 feet thick (Miller and Appel, 1997). Groundwater in these aquifers usually is unconfined and under water-table conditions; however, locally, confined conditions may exist where coarse-grained sediments are overlain by low permeable silt or clay (Miller and Appel, 1997). Recharge to the aquifer is from infiltration of precipitation and surface-water drainage from the streams and rivers adjacent to these aquifers (Ryder, 1996; Miller and Appel, 1997).

Groundwater quality in the Stream Valley aquifers was evaluated by sampling 59 public-supply wells that were randomly distributed in an equal-area grid. Water-quality data collected from wells in a network designed in this way are representative of the spatial distribution of the water quality in the study area (Belitz and others, 2010). Groundwater-quality data from these wells were used to estimate the percentage of the study area with concentrations that are high, moderate, and low with respect to constituent benchmarks. The accuracy of the estimates depends upon the distribution and number of wells, not on the size of the area (Belitz and others, 2010). Wells ranged from about 30 to 200 feet (ft) deep with an average depth of about 85 ft. Samples were collected between June and September of 2018, and the samples were analyzed for a large number of water-quality constituents derived from natural and human sources.



Overview of Water Quality



Principal Aquifer Studies (Burow and Belitz, 2014) are designed to evaluate untreated groundwater used for public supply. Groundwater quality is assessed by comparing concentrations to benchmarks established for drinking-water quality. Benchmarks and definitions of high, moderate, and low relative concentrations are discussed in the inset box on page 3.

Many inorganic constituents are present naturally in groundwater; however, concentrations can be affected by human activities. One or more inorganic constituents with human-health benchmarks were present at high concentrations in about 46 percent of the study area and at moderate concentrations in about 27 percent.

Organic constituents are found in products used in the home, business, industry, and agriculture. Organic constituents can enter the environment through normal use, spills, or improper disposal. Organic constituents were detected infrequently, and when detected, concentrations typically were low. One or more organic constituents with human-health benchmarks were detected at moderate concentrations in about 8 percent of the study area.

U.S. Department of the Interior
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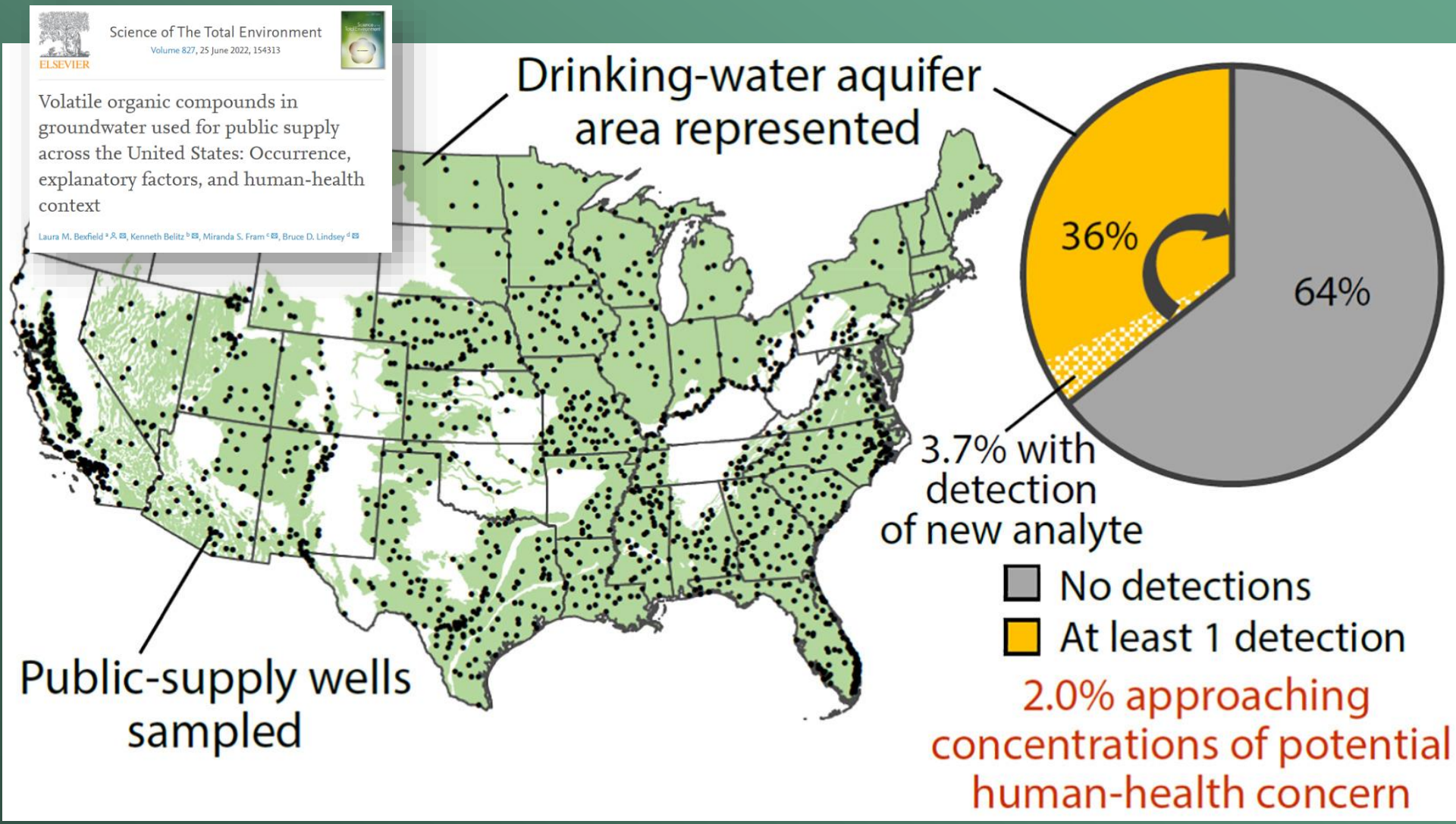
Fact Sheet 2021–3011
April 2021



- **VOC's detected in 36% of sampled area, but only exceeded human-health benchmarks in 2%**
- **https://doi.org/10.1016/j.scitotenv.2022.154313**

USGS

Environmental Science & Technology

pubs.acs.org/est

Article

Perfluoroalkyl and Polyfluoroalkyl Substances in Groundwater Used as a Source of Drinking Water in the Eastern United States

Peter B. McMahon,* Andrea K. Tokranov, Laura M. Bexfield, Bruce D. Lindsey, Tyler D. Johnson, Melissa A. Lombard, and Elise Watson

Cite This: *Environ. Sci. Technol.* 2022, 56, 2279−2288

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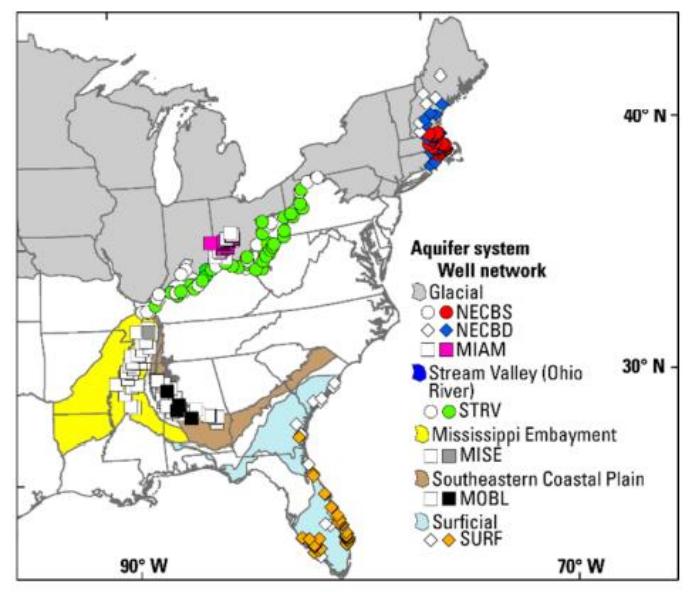
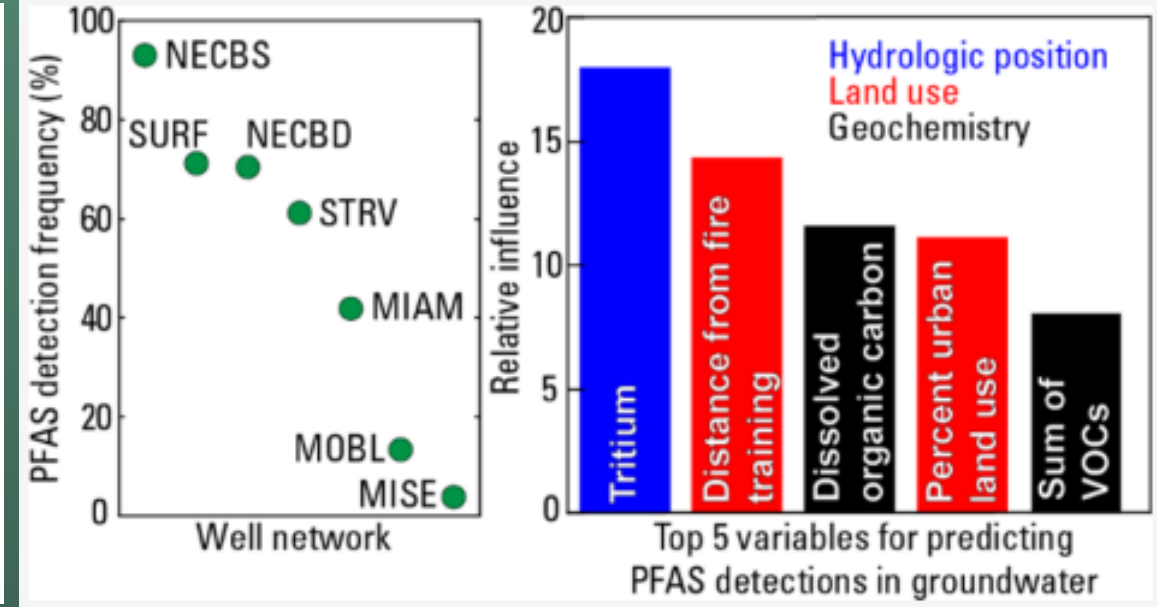




USGS

- **60% of Eastern US Supply wells had a PFAS detection**
- **https://doi.org/10.1021/acs.est.1c04795**

JOURNAL OF SOIL AND WATER CONSERVATION
The science and art of natural resource management for sustainability
SOIL AND WATER CONSERVATION SOCIETY

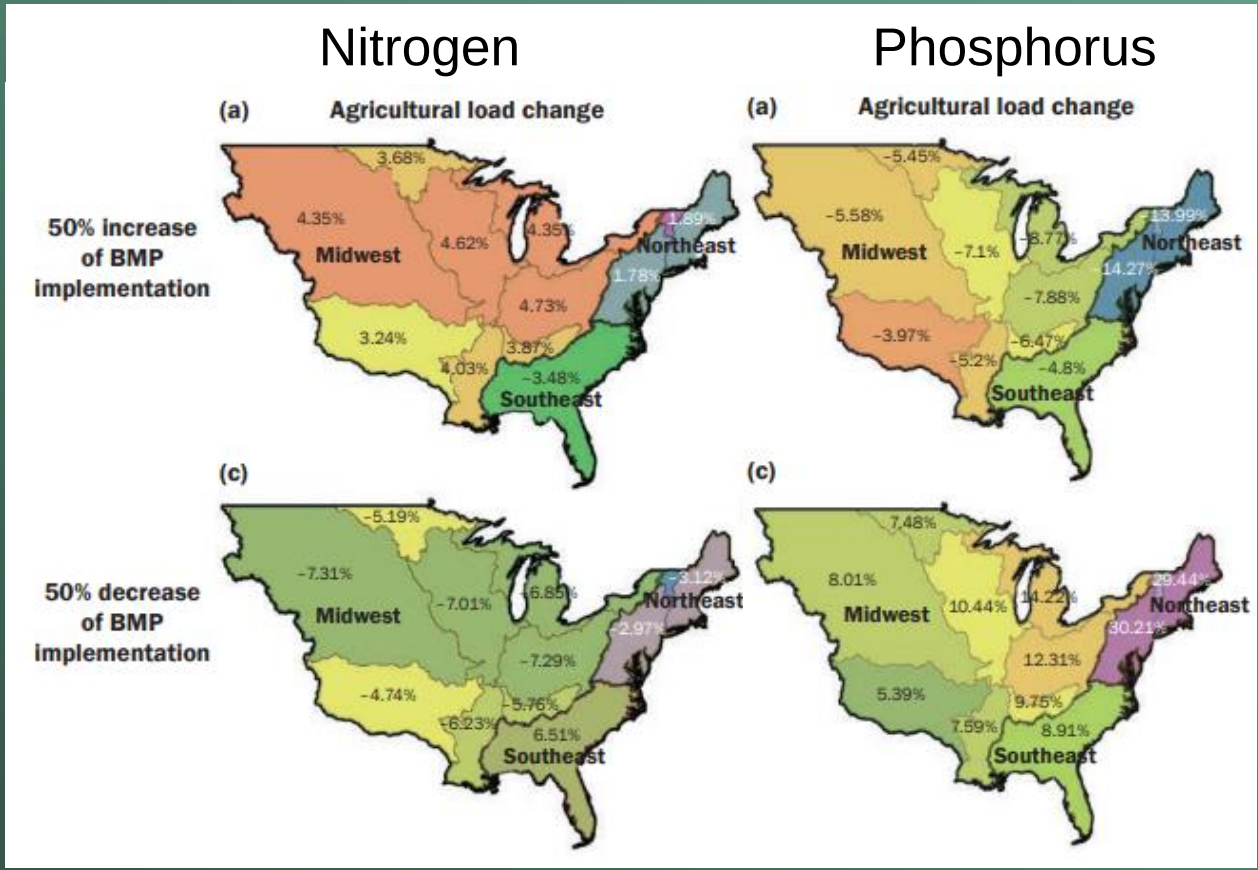
Research Article | RESEARCH SECTION

Quantifying regional effects of best management practices on nutrient losses from agricultural lands

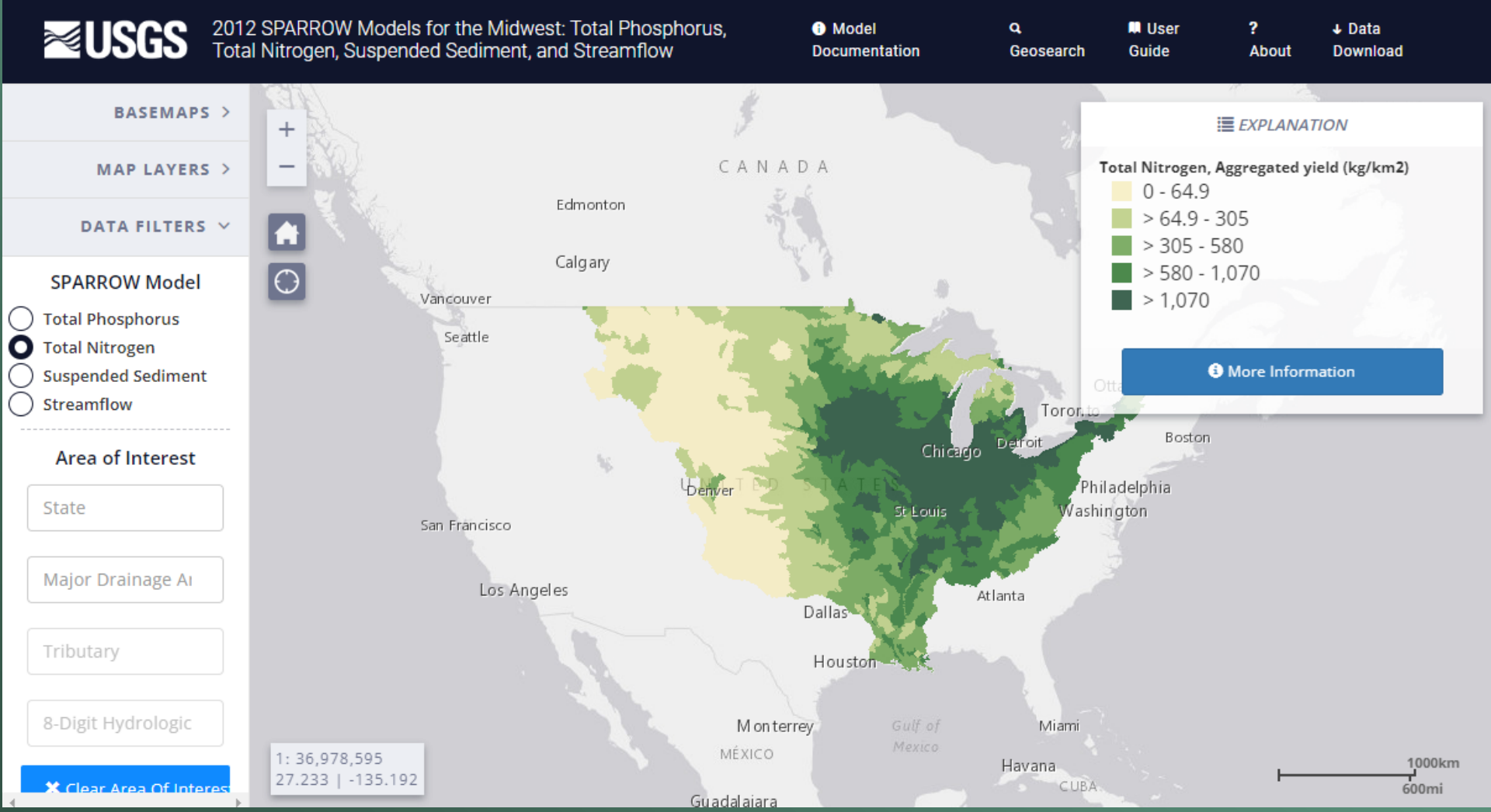
V.L. Roland, A.M. Garcia, D.A. Saad, S.W. Ator, D. Robertson and G. Schwarz

Journal of Soil and Water Conservation January 2022, 77 (1) 15-29; DOI: https://doi.org/10.2489/jswc.2022.00162

- https://doi.org/10.2489/jswc.2022.00162

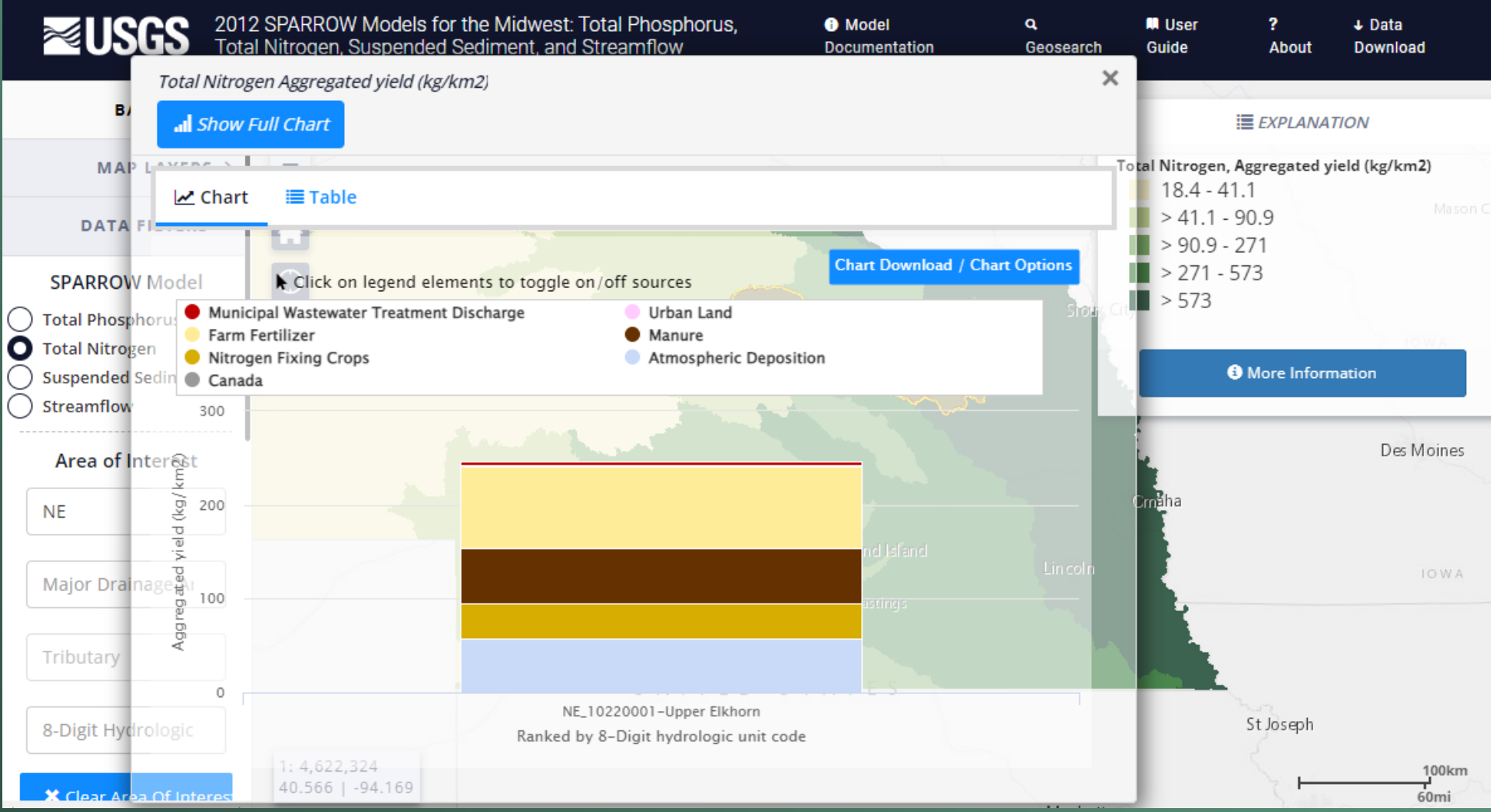


USGS



- Google USGS SPARROW Mapper
- https://sparrow.wim.usgs.gov/sparrow-midwest-2012/

USGS



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Tracking Water Quality in U.S. Streams and Rivers

USGS National Water Quality Network Data, Water-Quality Loads, and Trends

Network information

- NWQN site list
- National maps of water-quality trends
- Network objectives and scope
- Methods and glossary
- Previous network information
- Stakeholder feedback form

Water-quality loading to the Gulf of Mexico

- Trends in annual water-quality loads to the Gulf of Mexico through 2021
- Monthly nutrient loads used to estimate the size of the Gulf Hypoxic Zone (Preliminary Estimates)

Water-quality trends in the Delaware River Basin

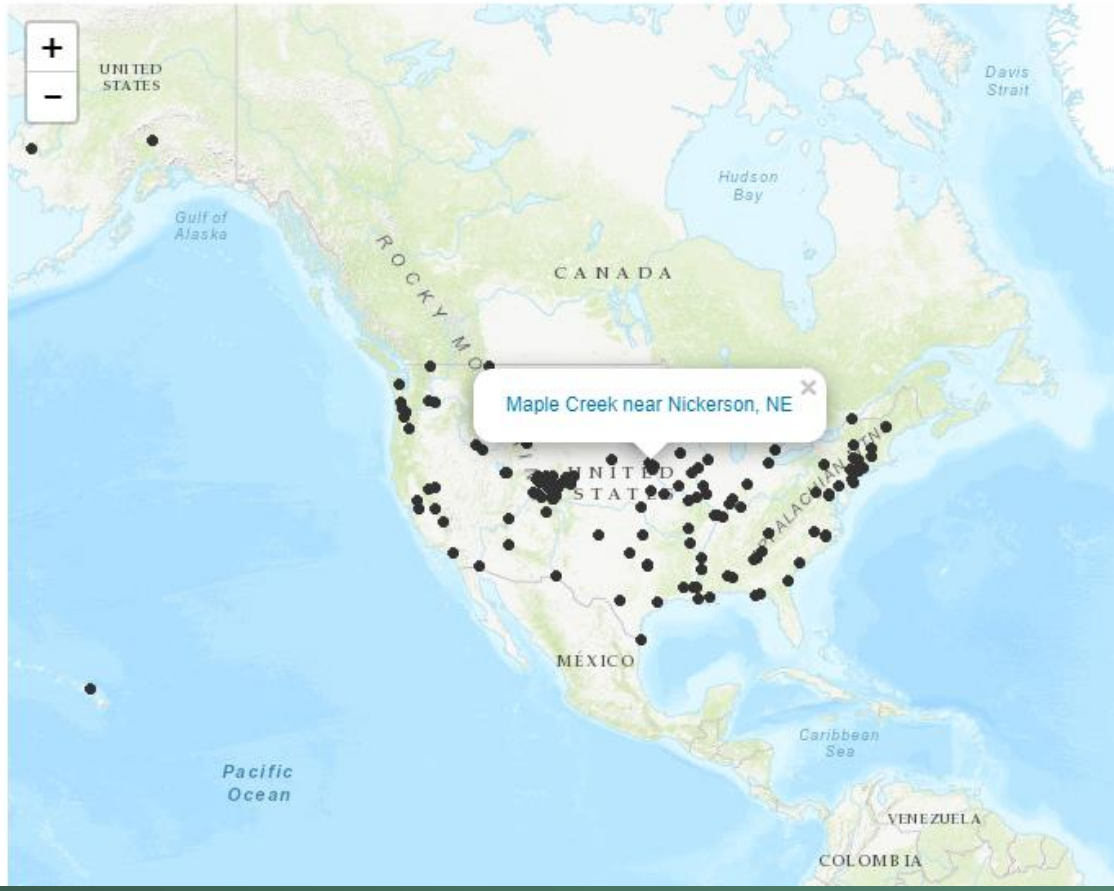
Download data

- All published NWQN data
- Data from sites in the Mississipppi/Atchafalaya River Basin

Related USGS Links

- Tracking Progress: Long-term Trends in Stream and River Quality
- Nutrient Sources and Transport in the Mississippi River Basin--SPARROW Nutrient Mapper
- Water Quality Watch - Real-time water-quality data
- USGS National Water Information System

Hover on a circle and click on the site name to get site-specific information



USGS

https://nrtwq.usgs.gov/nwqn/#/

Google USGS NWQN

*Note that starting in the fall of 2022, loads will be computed exclusively using WRTDS and WRTDS-K methods. LOADEST-computed loads will no longer be published along with WRTDS-computed loads. Please contact Casey Lee (cjlee@usgs.gov) with any questions or concerns.

NWQN Home

Maple Creek near Nickerson, NE

Agriculture site

Graphs of annual loads and trends (WRTDS)

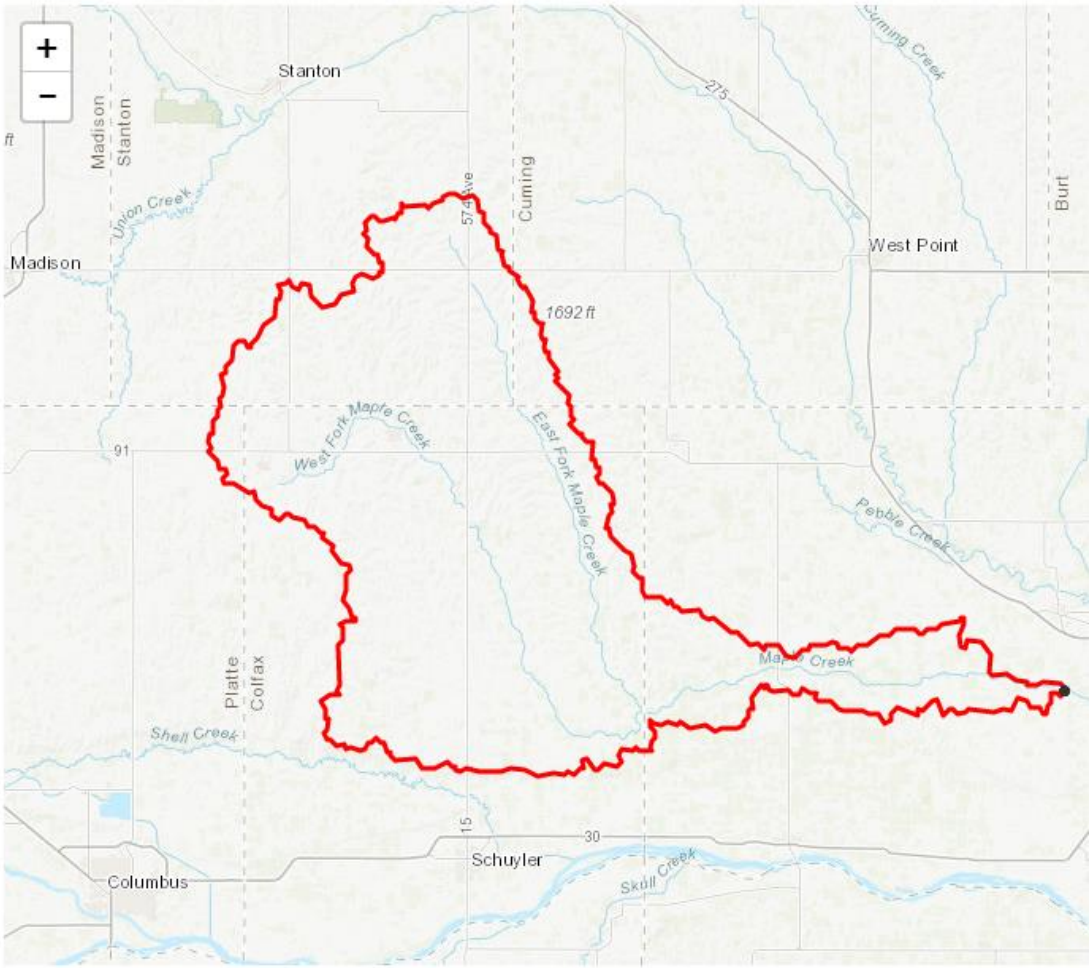
Graphs of observed concentrations and trends (WRTDS)

Graphs of discrete pesticide concentrations

WRTDS diagnostic graphs

Summary of available site data (USGS NWIS)

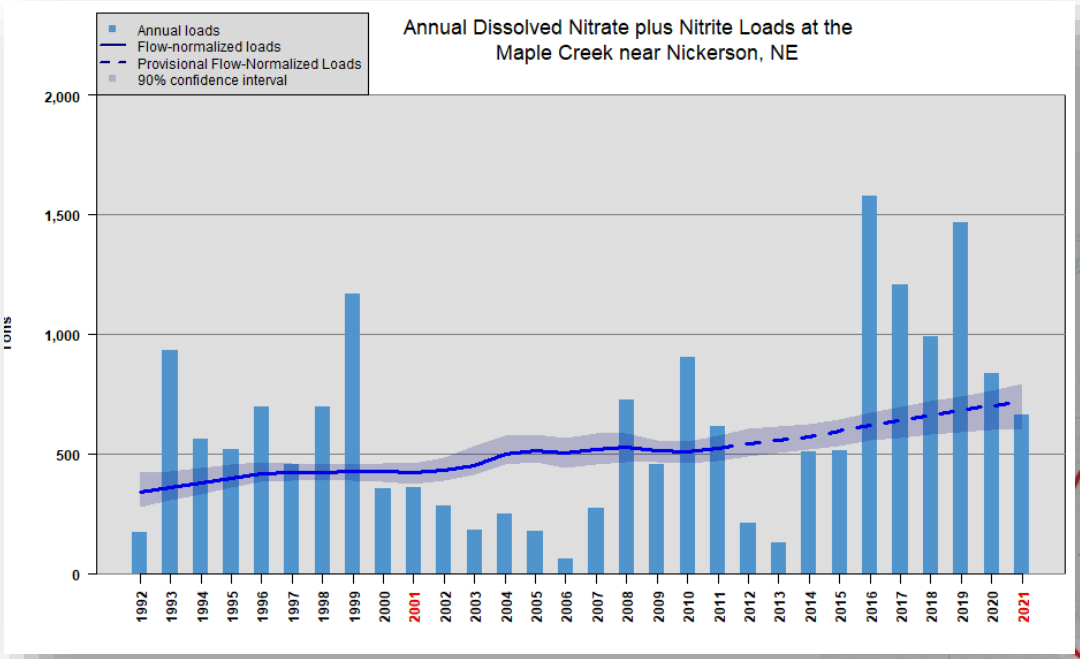
Real-time streamflow and (or) water-quality data (if available; USGS NWIS)



Download data for this site

- All available data
- WRTDS-computed annual water-quality loads and concentrations
- WRTDS-computed annual water-quality trends

*Note that starting in the fall of 2022, loads will be computed exclusively using WRTDS and WRTDS-K methods. LOADEST-computed loads will no longer be published along with WRTDS-computed loads. Please contact Casey Lee (cjlee@usgs.gov) with any questions or concerns.



NWQN Home

Summary of available site data (USGS NWIS)

Real-time streamflow and (or) water-quality data

(if available; USGS NWIS)

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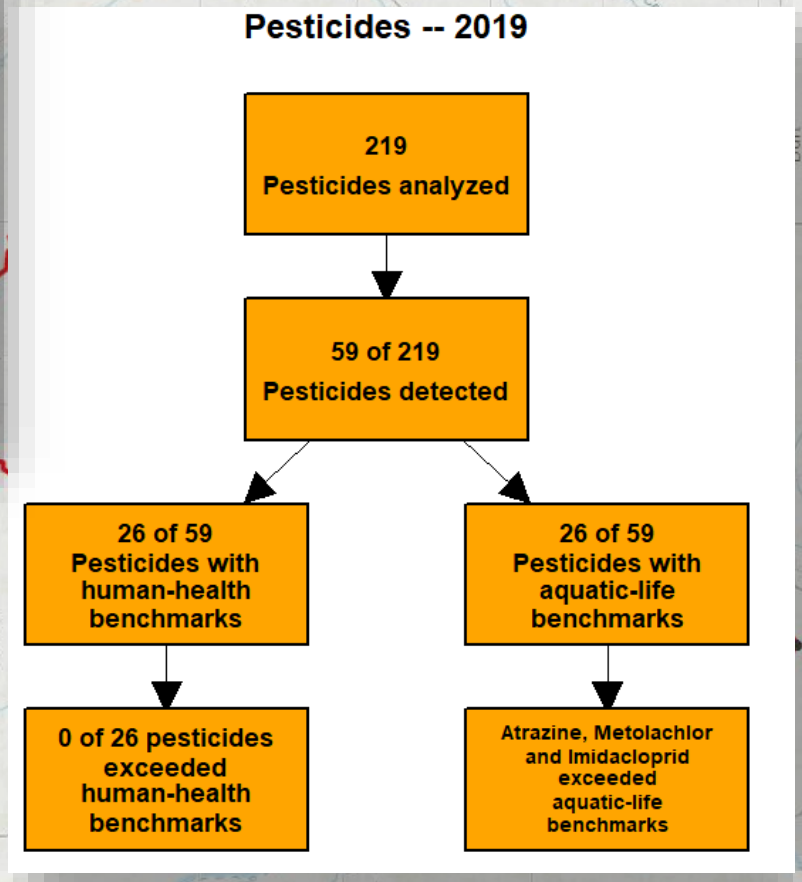
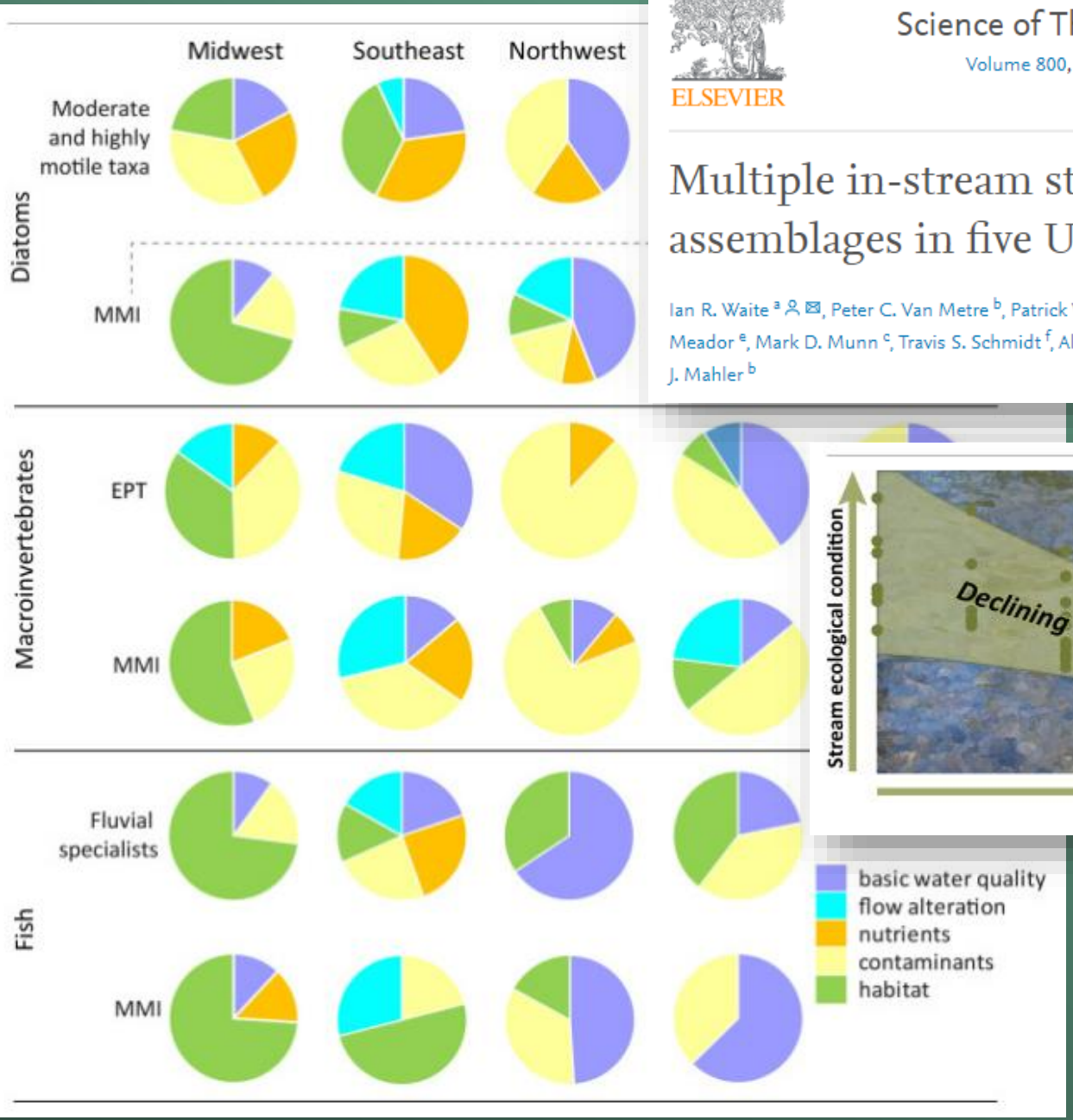
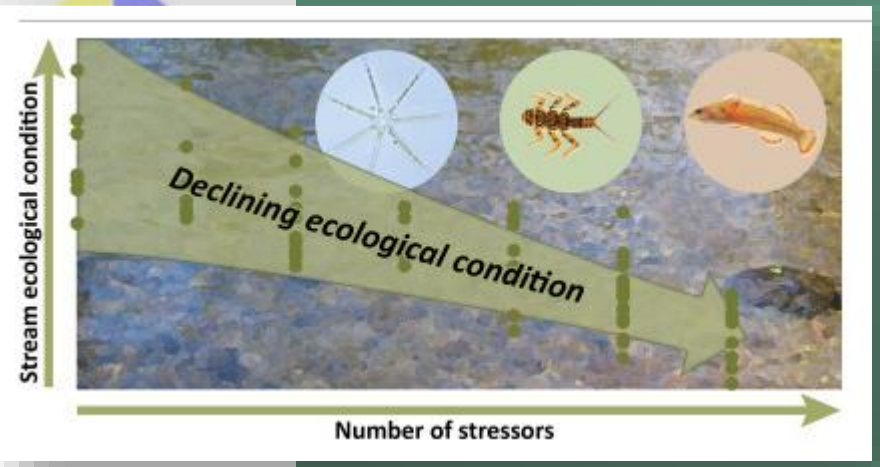




Science of The Total Environment
Volume 800, 15 December 2021, 149350
ELSEVIER

Multiple in-stream stressors degrade biological assemblages in five U.S. regions

Ian R. Waite [a] ✉, Peter C. Van Metre [b], Patrick W. Moran [c], Chris P. Konrad [c], Lisa H. Nowell [d], Mike R. Meador [e], Mark D. Munn [c], Travis S. Schmidt [f], Allen C. Gellis [g], Daren M. Carlisle [h], Paul M. Bradley [i], Barbara J. Mahler [b]



https://doi.org/10.1016/j.scitotenv.2021.149350

USGS national water strategy

Observe

Next Generation Water Observing System (NGWOS) NGWOS collects real-time data on water quantity and quality in more affordable, rapid, and widespread ways than has previously been possible. The flexible monitoring approach enables USGS networks to evolve with new technology and emerging trends.

Assess

Integrated Water Availability Assessments (IWAA) IWAAs examine the supply, use, and availability of the Nation's water. These regional and national assessments evaluate water quantity and quality in both surface and groundwater, as related to human and ecosystem needs and as affected by human and natural influences.

Predict

Integrated Water Prediction (IWP) IWP builds a powerful set of modeling tools to predict the amount and quality of surface and groundwater, now and into the future. These models use the best available science to provide information for more rivers and aquifers than can be directly monitored.

Deliver

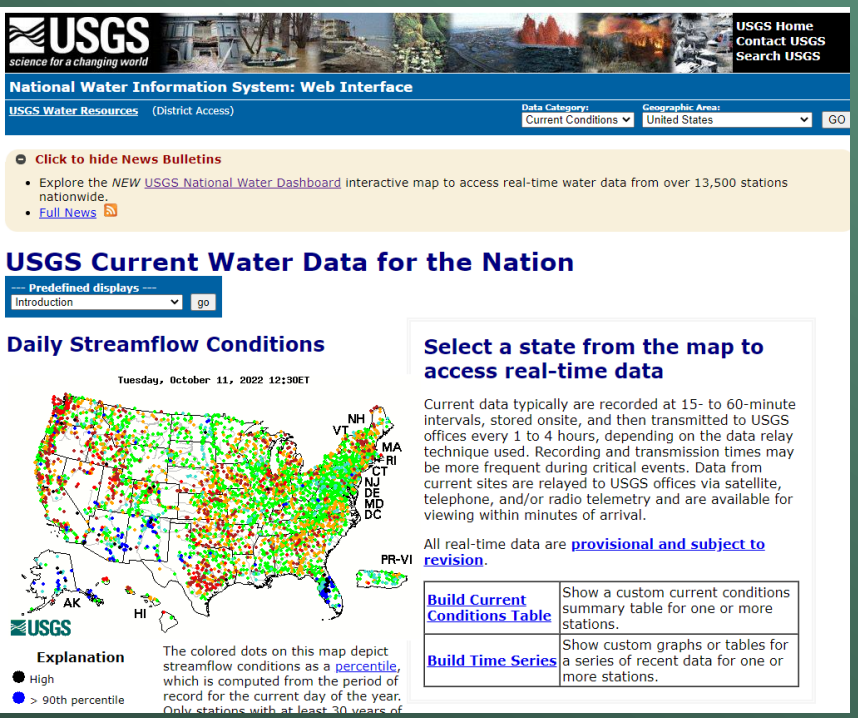
National Water Information System (NWIS) Modernization NWIS data systems that house USGS water information are being modernized to maximize data integrity, simplify data delivery to the general public, and automate early warning to enable faster response times during water emergencies.

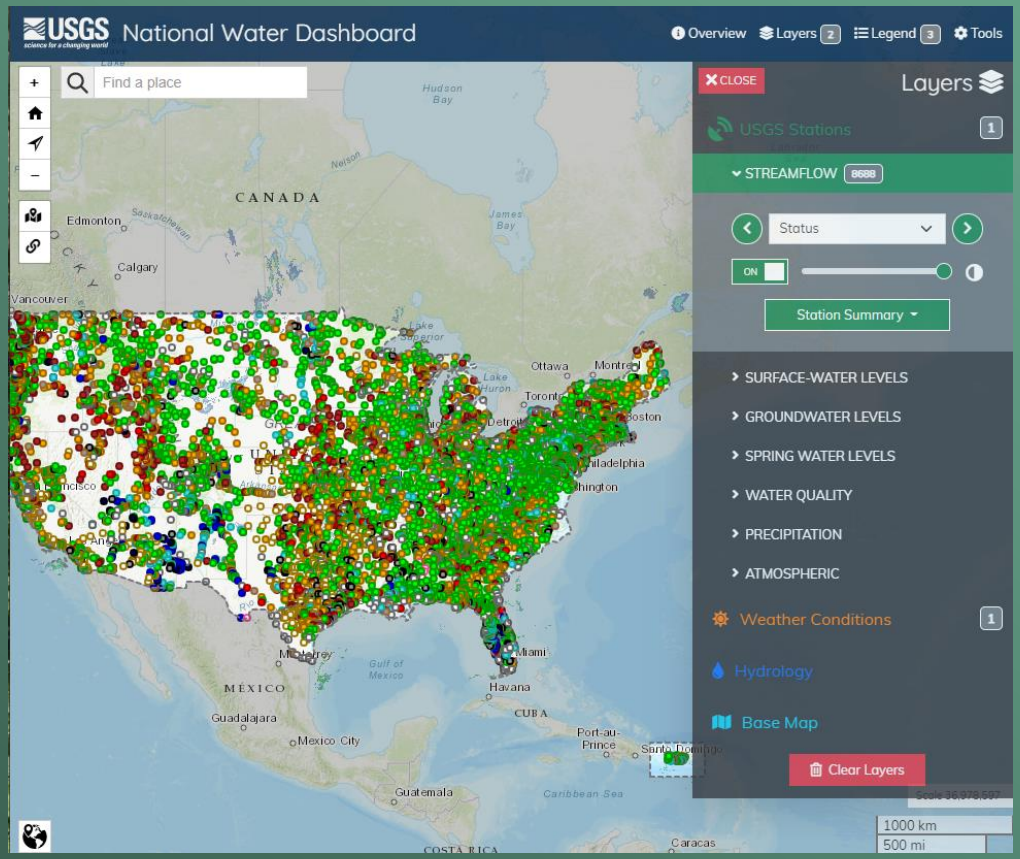
USGS national water strategy

- **Integrated Water Science Basins being used to inform a national-scale assessment of availability**

Delivering water data

- National Water Information System is being modernized



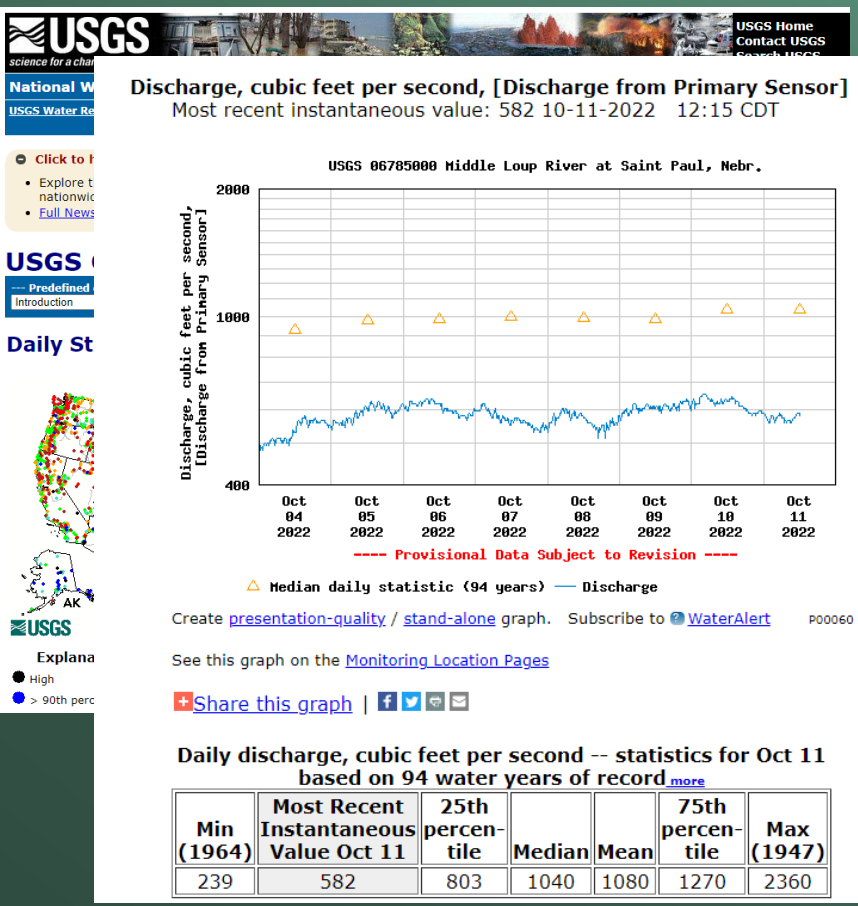


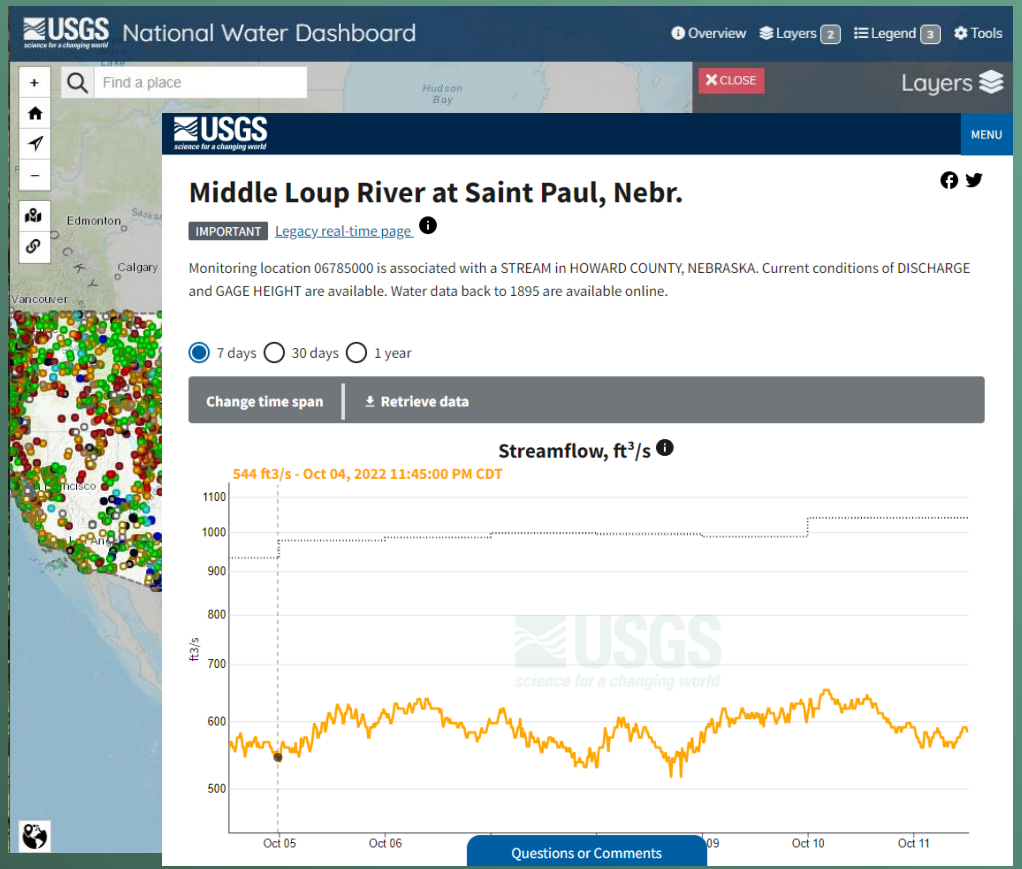
USGS

Google USGS NWD

Delivering water data

- The new platform is designed to be ‘phone-friendly’





Delivering water data

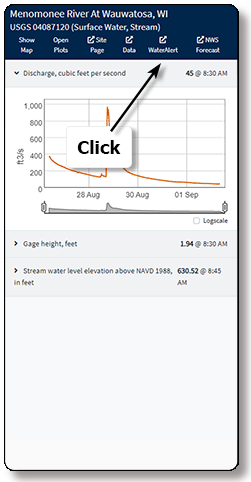
- **USGS WaterAlert can monitor your USGS site for you**

1 Find a monitoring location.

Use National Water Dashboard.

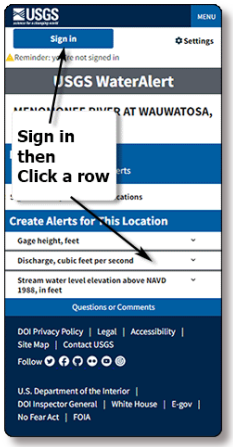
2 Tell WaterAlert which monitoring location.

Use National Water Dashboard to connect with WaterAlert.



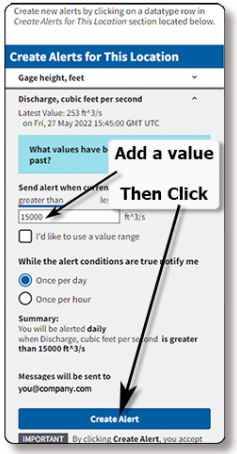
3 Select a water condition in which you have an interest.

In WaterAlert, sign in then click one of the water conditions rows - which water conditions are available is dependent on the sensors at the selected monitoring location.



4 Set your thresholds.

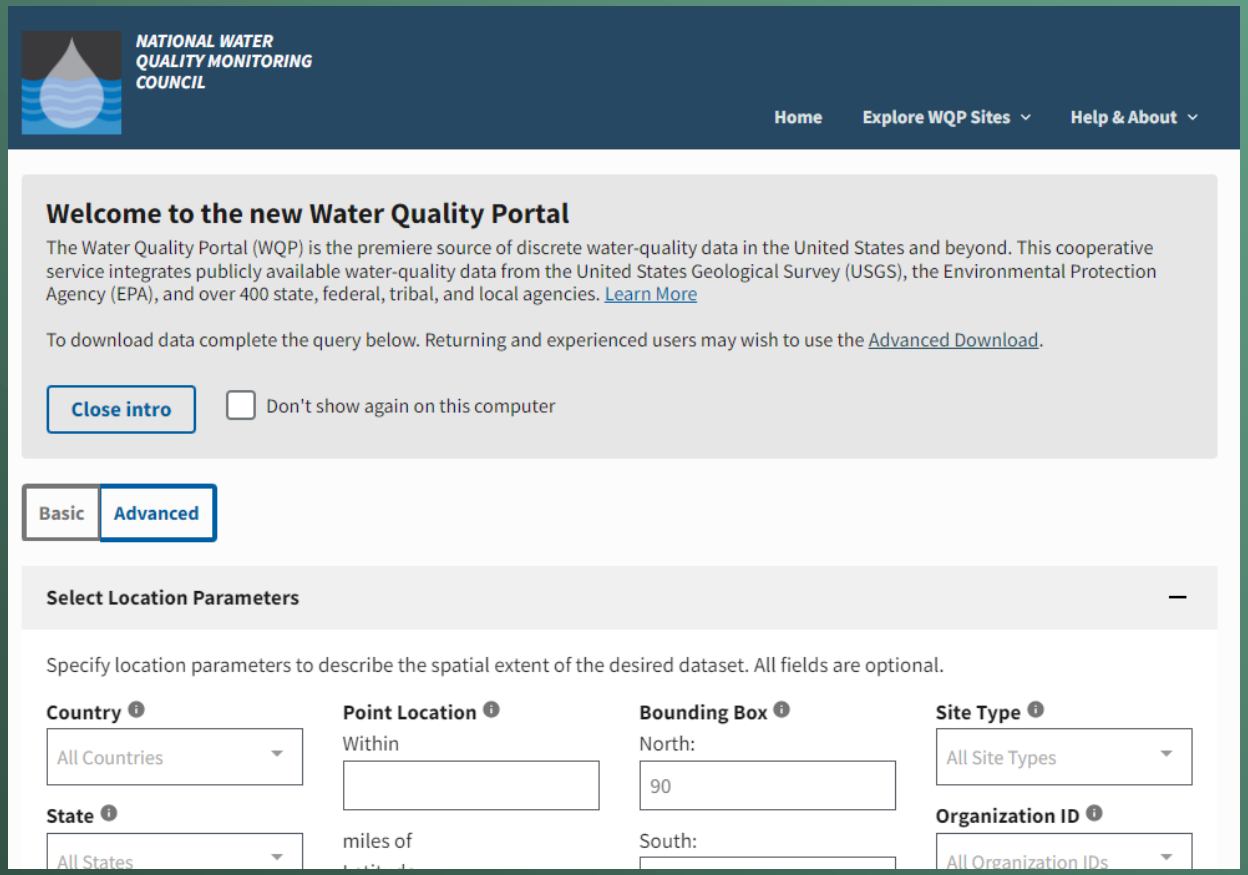
Enter a threshold value, click *Create alert* and you're done! WaterAlert will send you a notification when water conditions match your thresholds. In the meantime, check out the User Guide.



USGS

Delivering water data

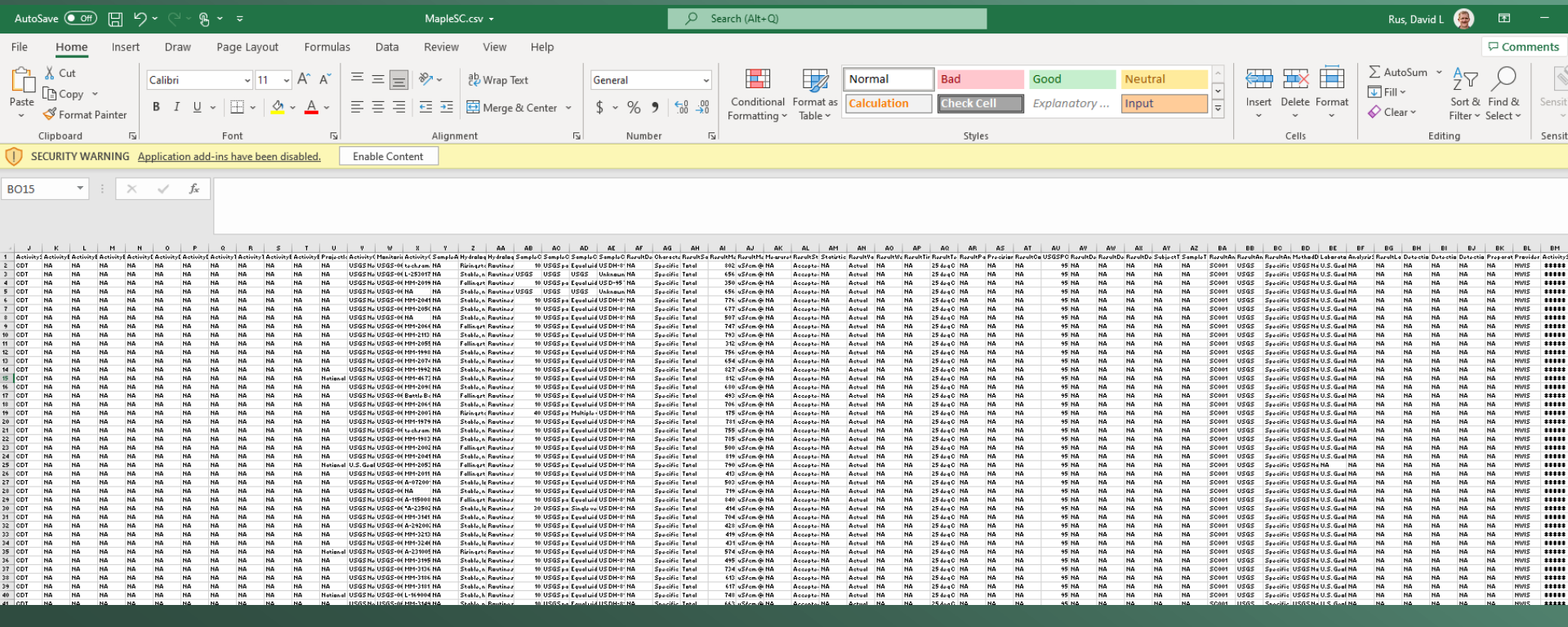
- **Water-quality sample results will be accessed via the Water Quality Portal**
- **https://www.waterqualitydata.us/**

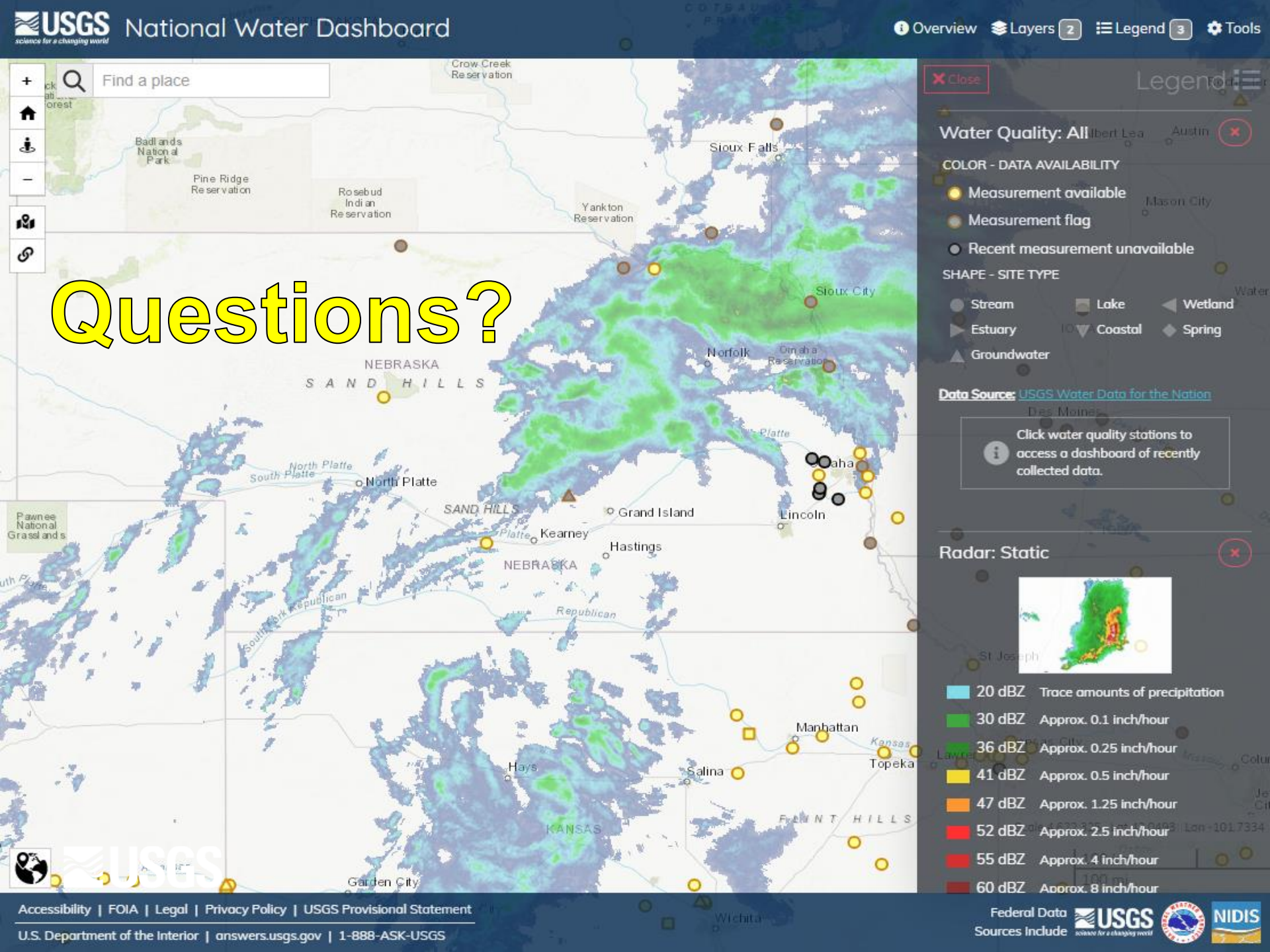


USGS

Delivering water data

- Water Quality Portal data are served 1 row per value with lots of metadata
- Tools can/will be customized to rearrange/consolidate the data based on users needs




USGS National Water Dashboard
Overview
Layers 2
Legend 3
Tools
Find a place
Questions?
Close
Legend
Water Quality: All
COLOR - DATA AVAILABILITY
Measurement available
Measurement flag
Recent measurement unavailable
SHAPE - SITE TYPE
Stream
Lake
Wetland
Estuary
Coastal
Spring
Groundwater
Data Source: USGS Water Data for the Nation
Click water quality stations to access a dashboard of recently collected data.
Radar: Static
20 dBZ Trace amounts of precipitation
30 dBZ Approx. 0.1 inch/hour
36 dBZ Approx. 0.25 inch/hour
41 dBZ Approx. 0.5 inch/hour
47 dBZ Approx. 1.25 inch/hour
52 dBZ Approx. 2.5 inch/hour
55 dBZ Approx. 4 inch/hour
60 dBZ Approx. 8 inch/hour
Crow Creek Reservation
Badlands National Park
Pine Ridge Reservation
Rosebud Indian Reservation
Yankton Reservation
Sioux Falls
Sioux City
Norfolk
Omaha Reservation
NEBRASKA
SAND HILLS
North Platte
South Platte
Platte
Grand Island
Kearney
Hastings
Lincoln
Omaha
Pawnee National Grasslands
Republican
Manhattan
Topeka
Salina
Hays
KANSAS
FLINT HILLS
Garden City
Wichita
Accessibility | FOIA | Legal | Privacy Policy | USGS Provisional Statement
U.S. Department of the Interior | answers.usgs.gov | 1-888-ASK-USGS
Federal Data Sources Include USGS NIDIS

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