



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

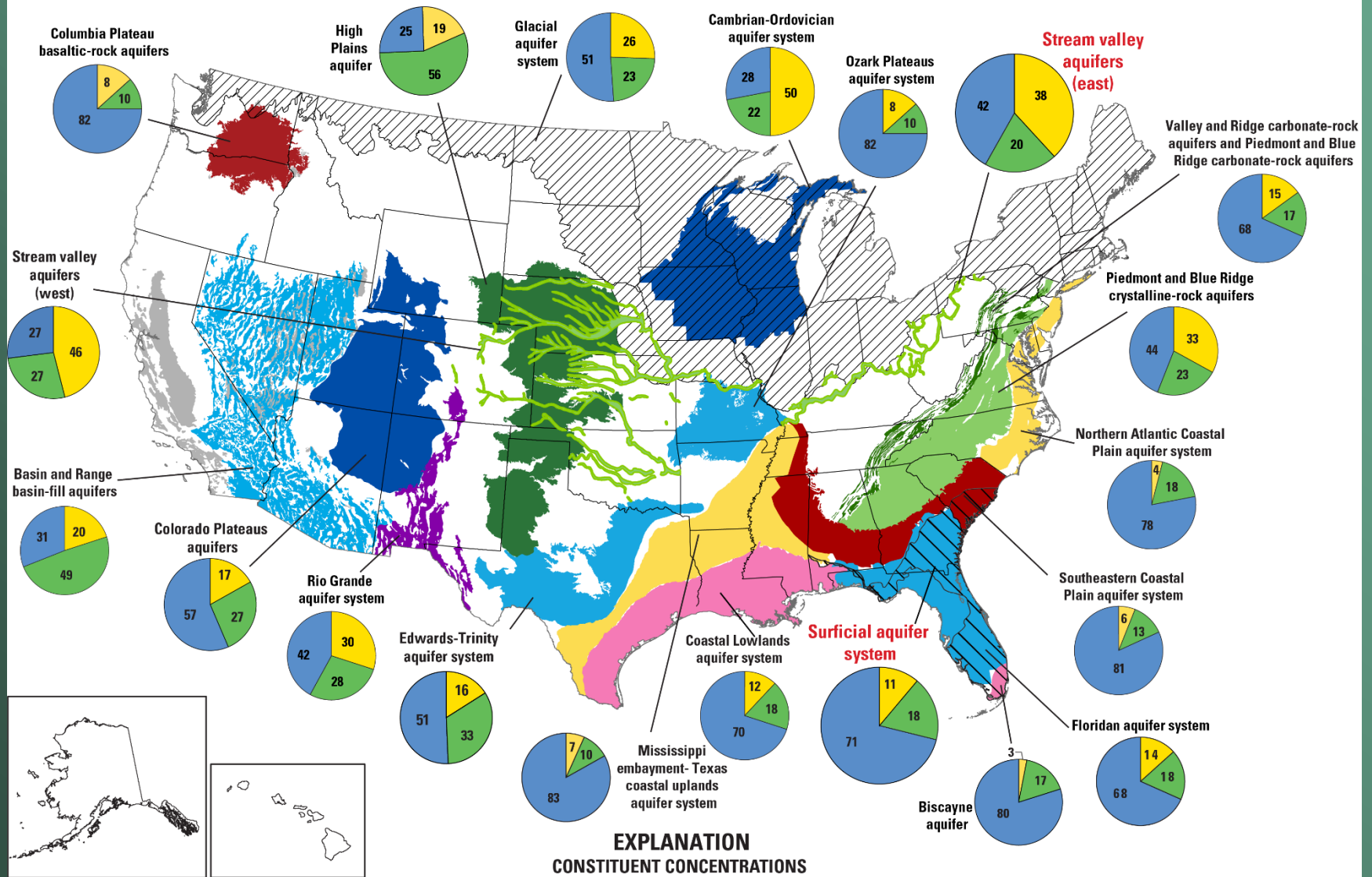
U.S. Department of the Interior
U.S. Geological Survey

Outline

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

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](#)**

National Water Quality Program
National Water-Quality Assessment Project

Groundwater Quality in Selected Stream Valley Aquifers, Western United States



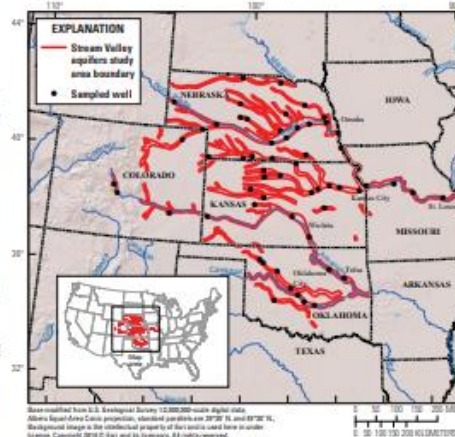
Groundwater provides nearly 50 percent of the Nation's drinking water. To help protect this vital resource, the U.S. Geological Survey (USGS) National Water-Quality Assessment (NAWQA) Project assesses groundwater quality in aquifers that are important sources of drinking water. The Stream Valley aquifers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

Background

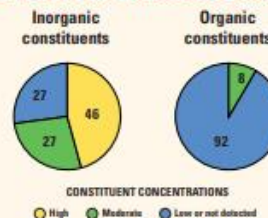
The Stream Valley aquifers sampled for this study underlie an area of about 41,200 square miles in the sedimentary deposits of the Arkansas, Missouri, and Red River drainages. The study area includes parts of Oklahoma, Nebraska, Kansas, Missouri, and Colorado. About 4.5 million people live in the area 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



Values are a percentage of the study area with concentrations in the three specified categories. Percentages might not sum to 100 because of rounding.

Principal Aquifer Studies (Burov 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.

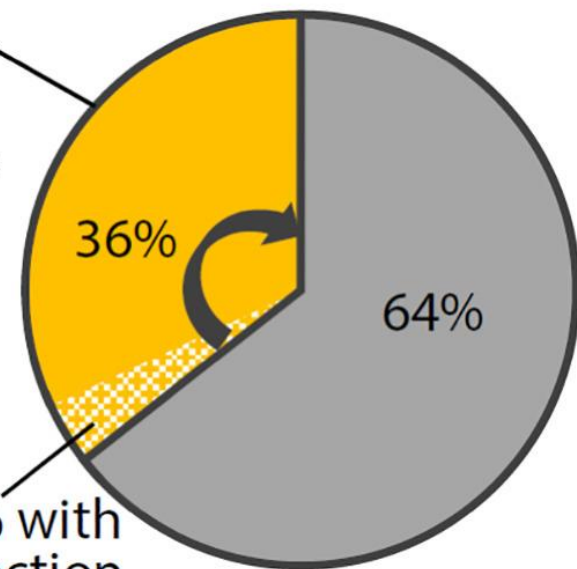
Organic constituents are found in products used in the home, business, industry, and agriculture. Organic constituents can enter the environment through normal use, spills, or improper disposal. Organic constituents were detected infrequently, and when detected, concentrations typically were low. One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



Volatile organic compounds in groundwater used for public supply across the United States: Occurrence, explanatory factors, and human-health context

Laura M. Bexfield ^a, Kenneth Belitz ^b, Miranda S. Fram ^c, Bruce D. Lindsey ^d

Drinking-water aquifer area represented



3.7% with detection of new analyte

■ No detections

■ At least 1 detection

2.0% approaching concentrations of potential human-health concern

Public-supply wells sampled

- 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>

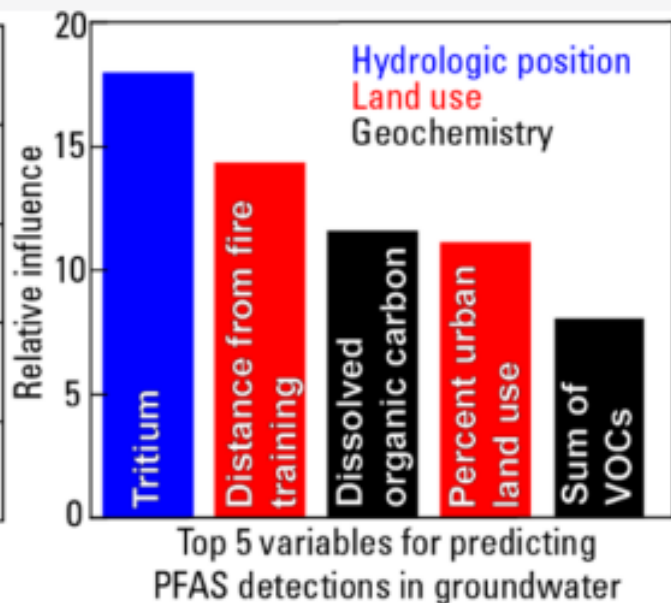
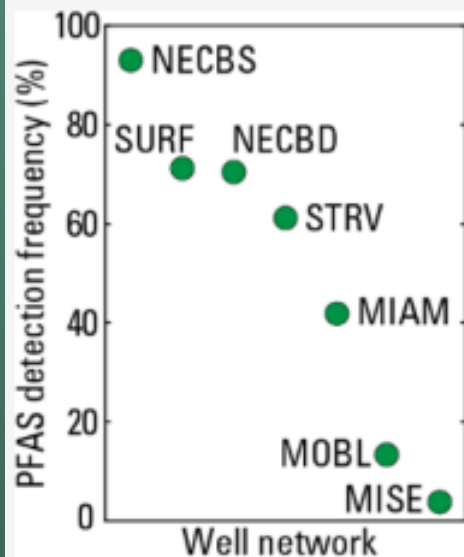
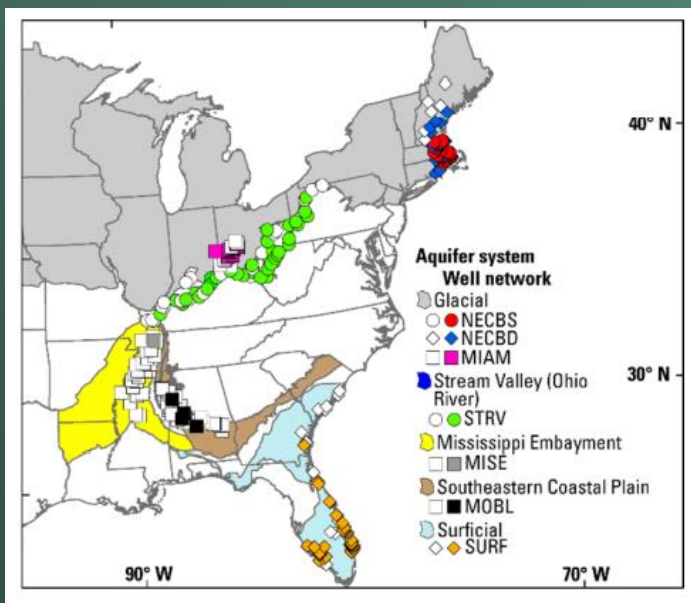


Perfluoroalkyl and Polyfluoroalkyl Substances in Groundwater Used as a Source of Drinking Water in the Eastern United States

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

Read Online



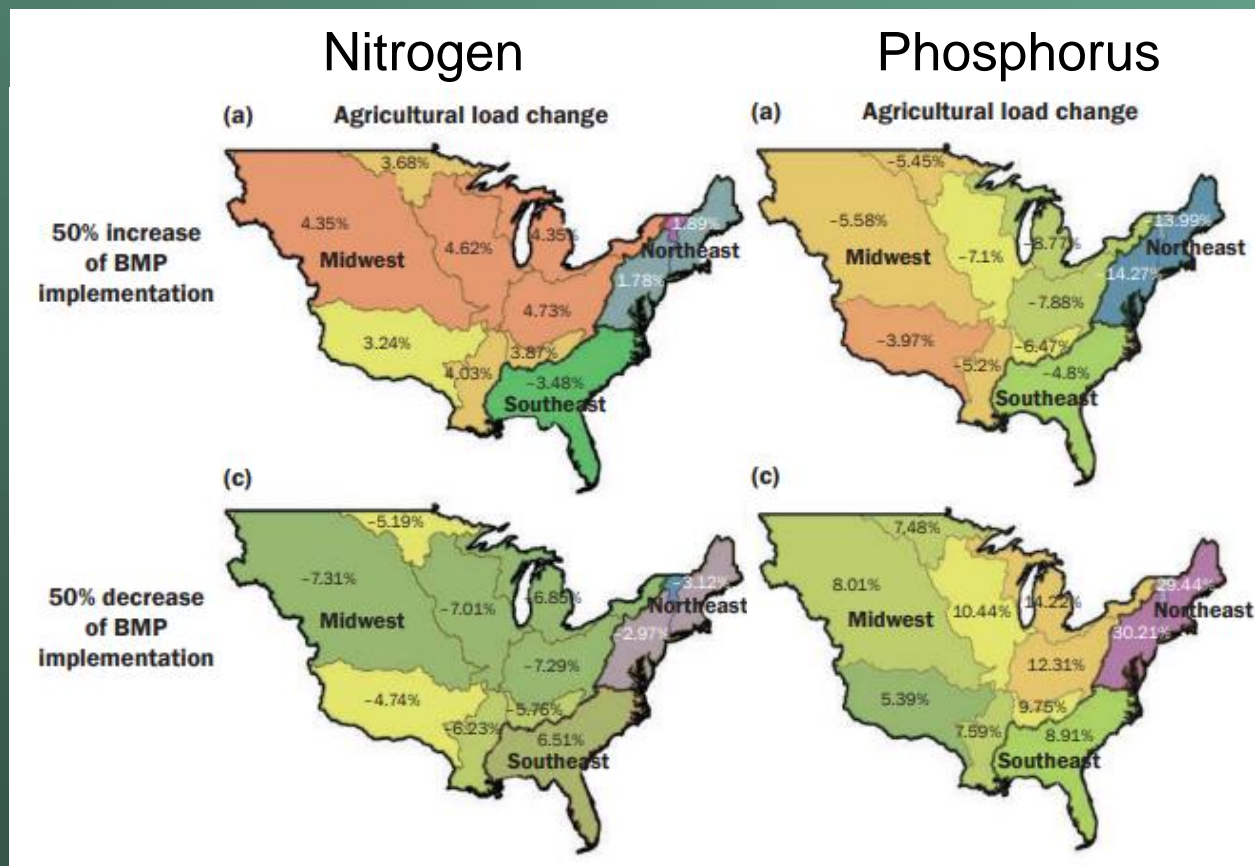
- 60% of Eastern US Supply wells had a PFAS detection
- <https://doi.org/10.1021/acs.est.1c04795>

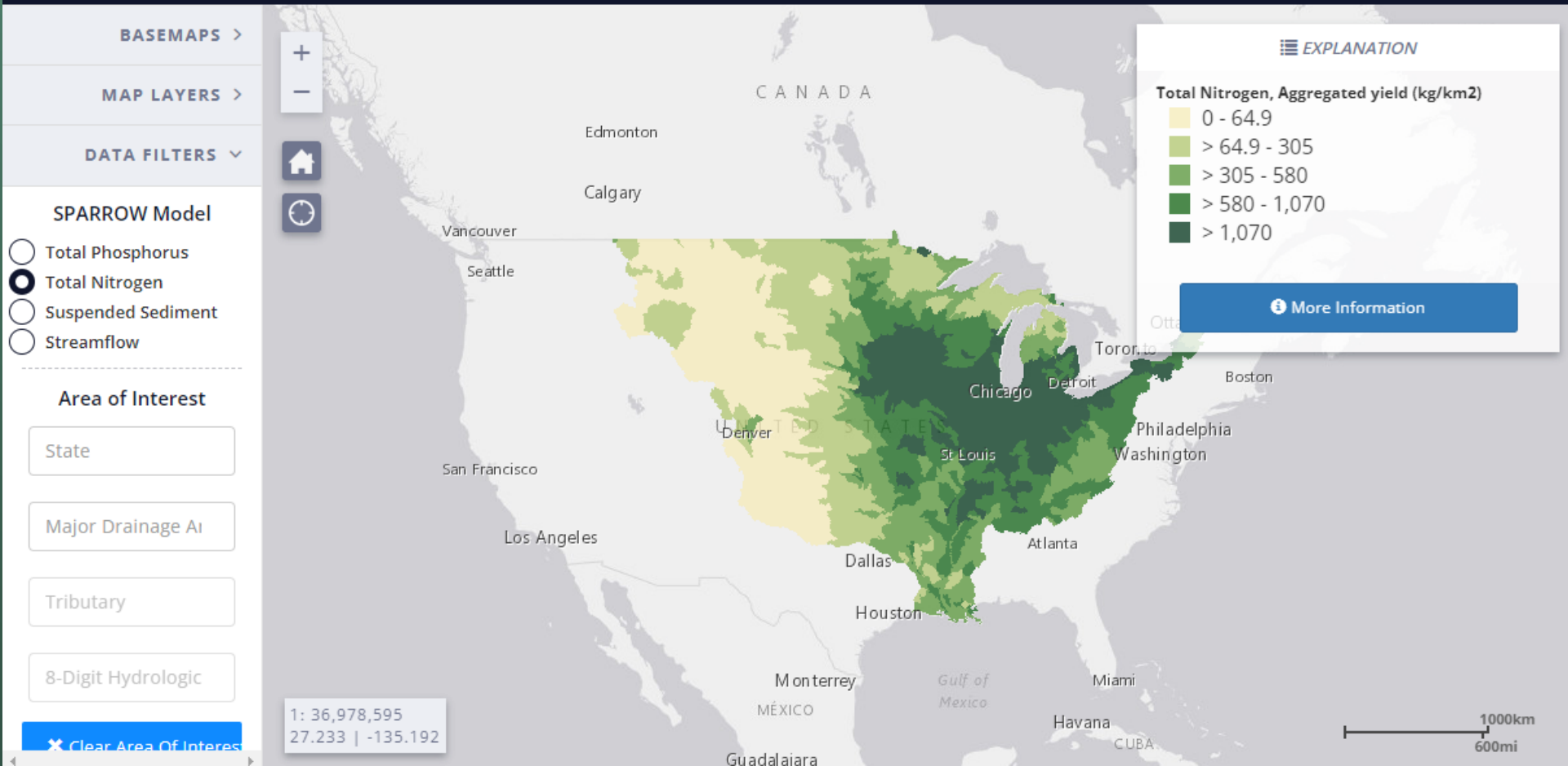
Quantifying regional effects of best management practices on nutrient losses from agricultural lands

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>





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

Total Nitrogen Aggregated yield (kg/km²)

Show Full Chart

Chart Table

Chart Download / Chart Options

Click on legend elements to toggle on/off sources

- Municipal Wastewater Treatment Discharge
- Farm Fertilizer
- Nitrogen Fixing Crops
- Canada
- Urban Land
- Manure
- Atmospheric Deposition

- Total Phosphorus
- Total Nitrogen
- Suspended Sediment
- Streamflow

Area of Interest

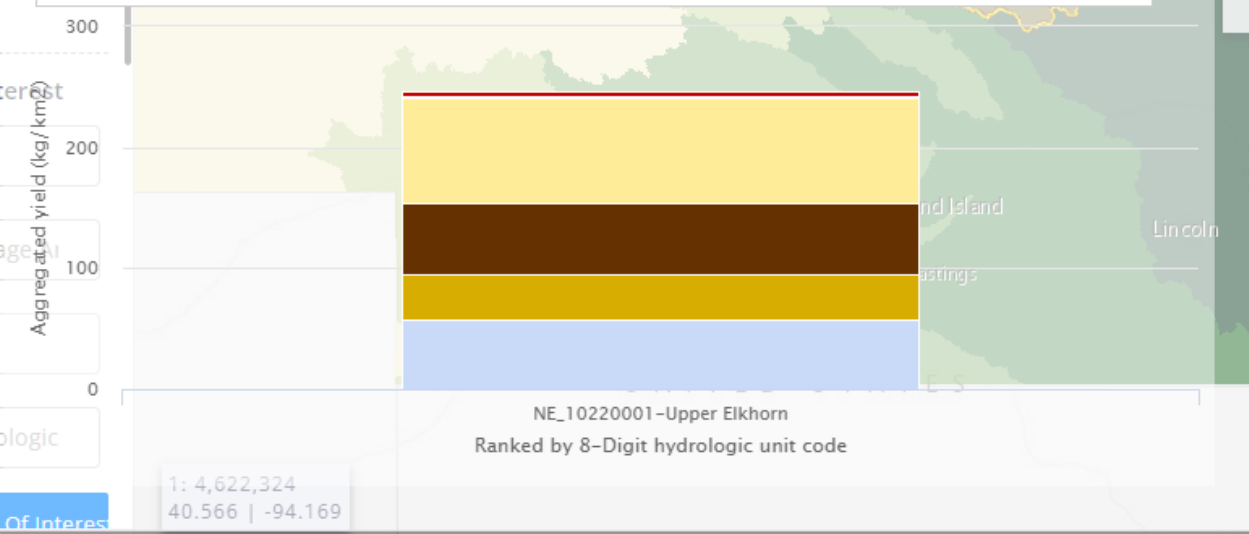
NE

Major Drainage

Tributary

8-Digit Hydrologic

Clear Area Of Interest



EXPLANATION

- Total Nitrogen, Aggregated yield (kg/km²)
- 18.4 - 41.1
 - > 41.1 - 90.9
 - > 90.9 - 271
 - > 271 - 573
 - > 573

More Information

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

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

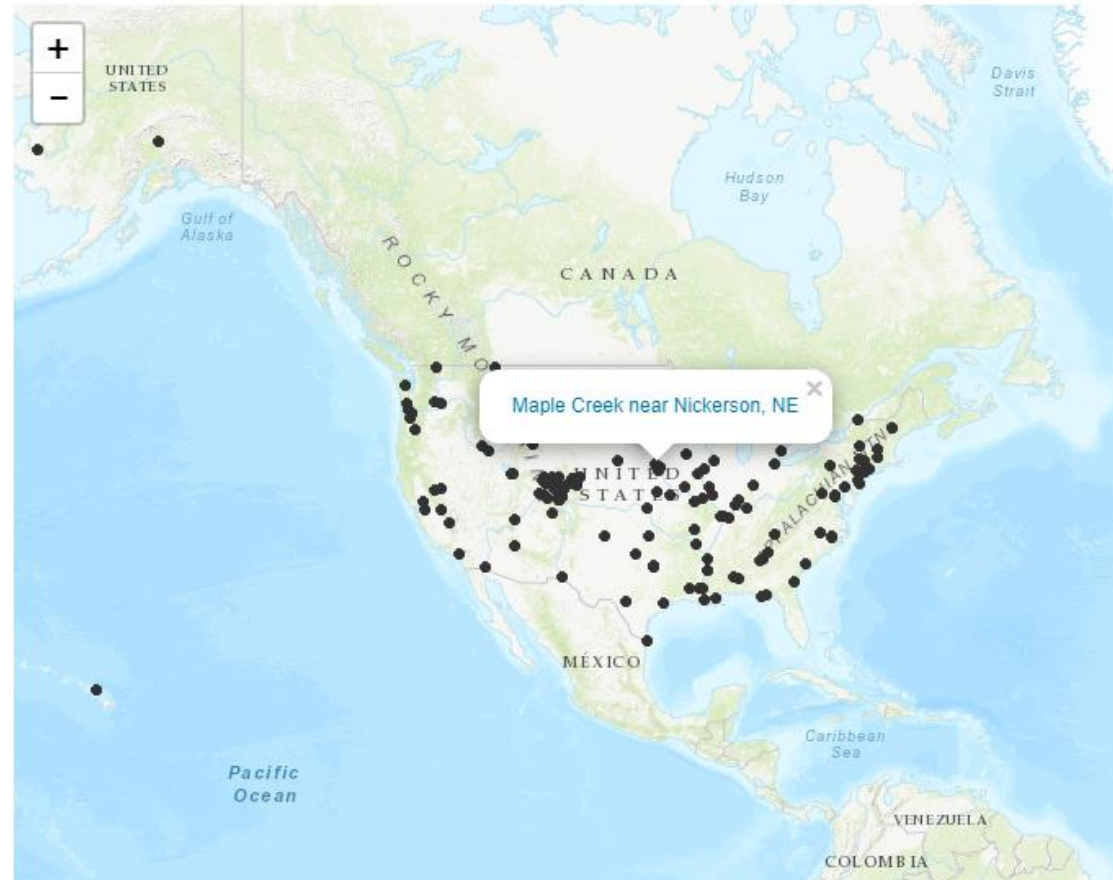
Download data

- All published NWQN data
- Data from sites in the Mississippi/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



*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.

Maple Creek near Nickerson, NE

[NWQN Home](#)

Agriculture site

[Graphs of annual loads and trends \(WRTDS\)](#)

[Graphs of observed concentrations and trends \(WRTDS\)](#)

[Graphs of discrete pesticide concentrations](#)

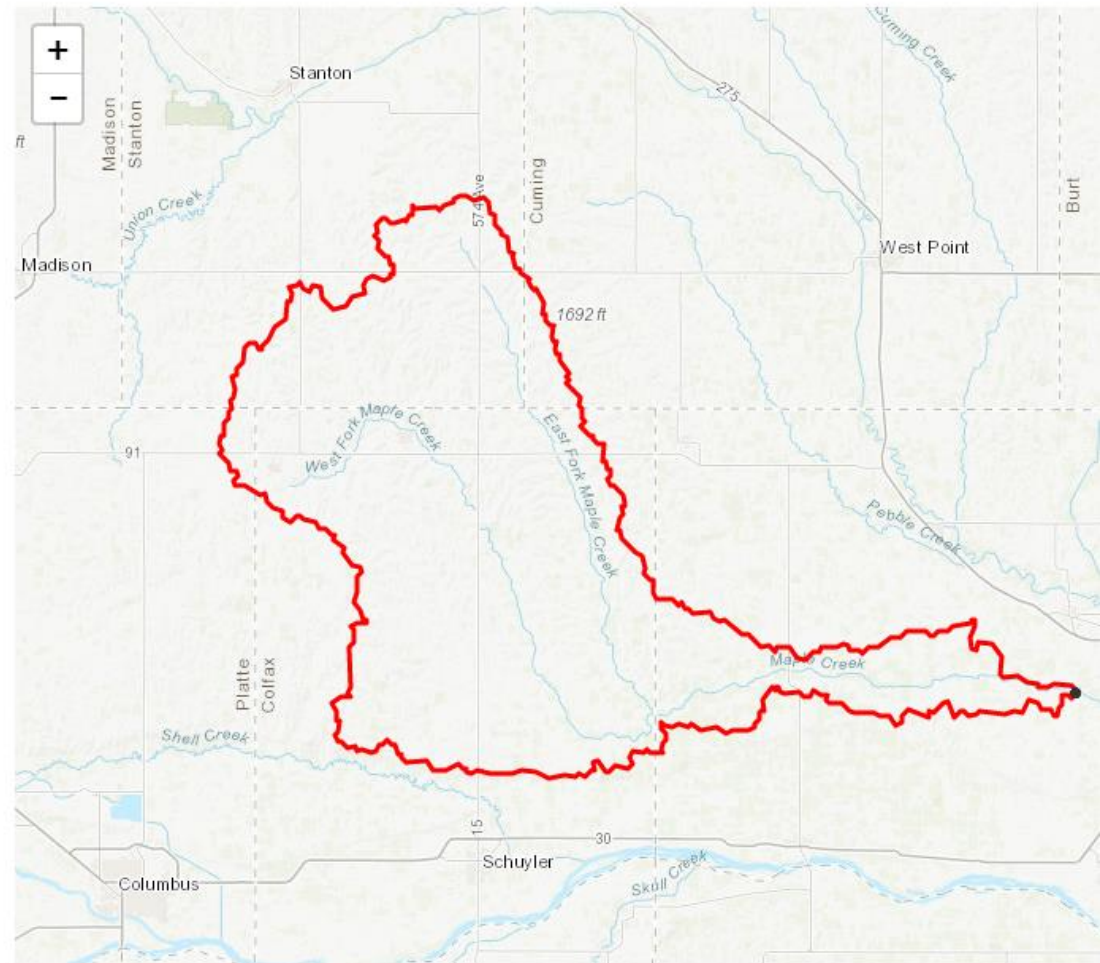
[WRTDS diagnostic graphs](#)

[Summary of available site data \(USGS NWIS\)](#)

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

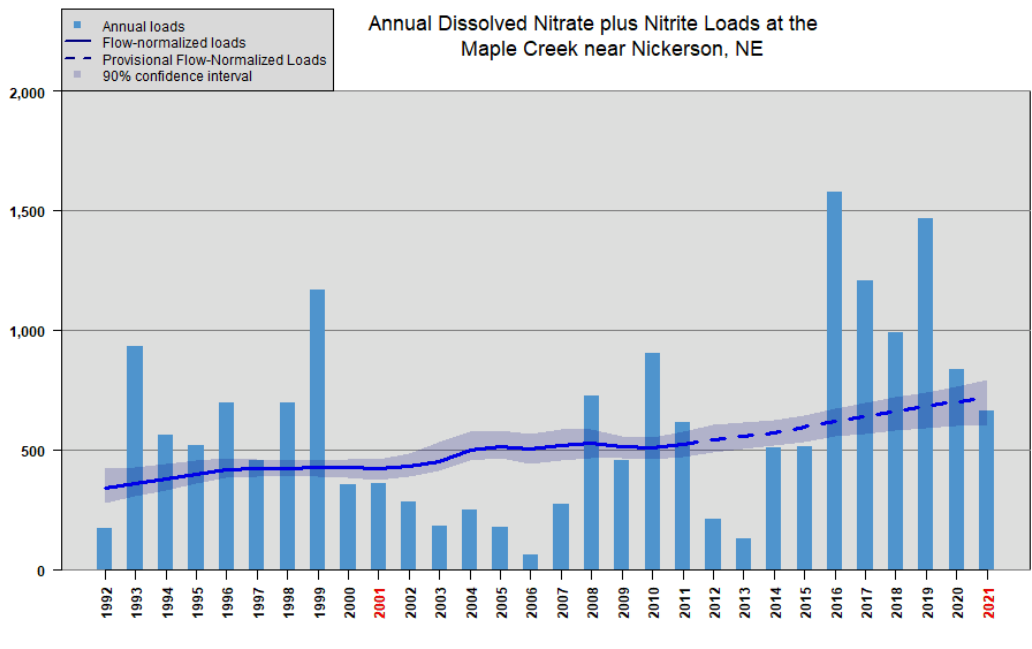
Download data for this site

- 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](#)

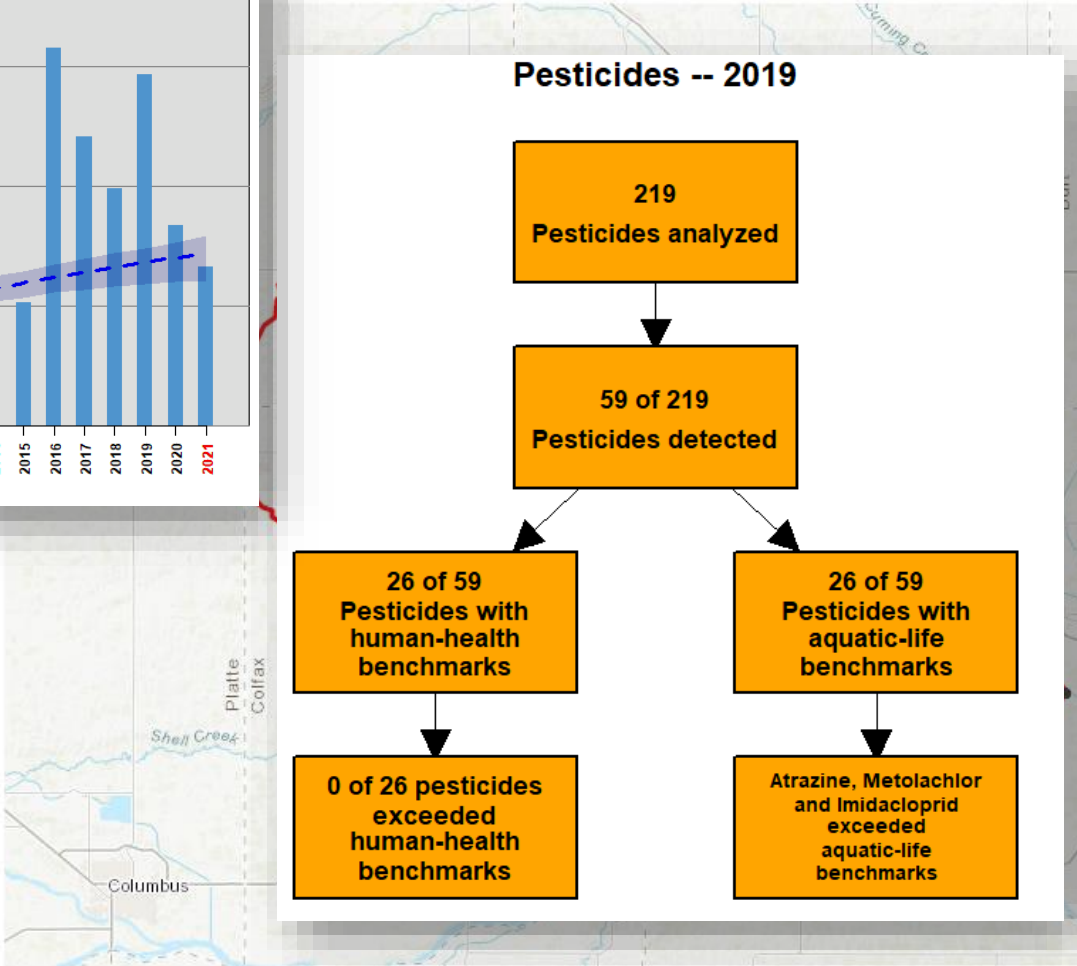


Summary of available site data (USGS NWIS)

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

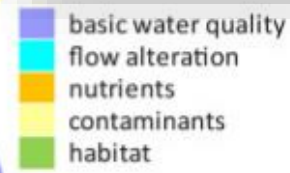
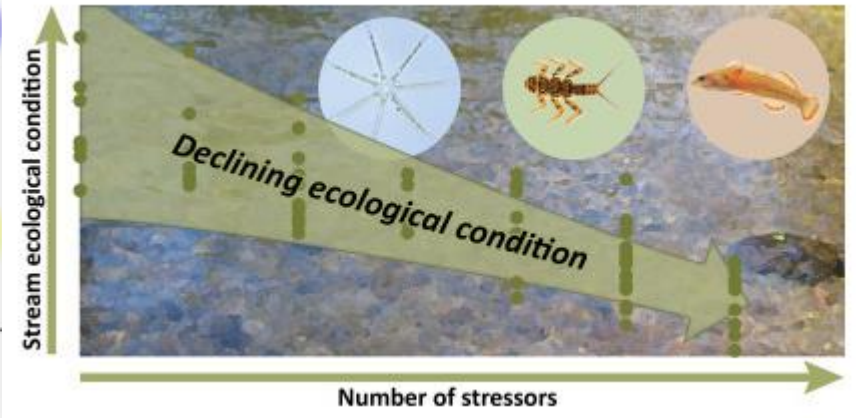
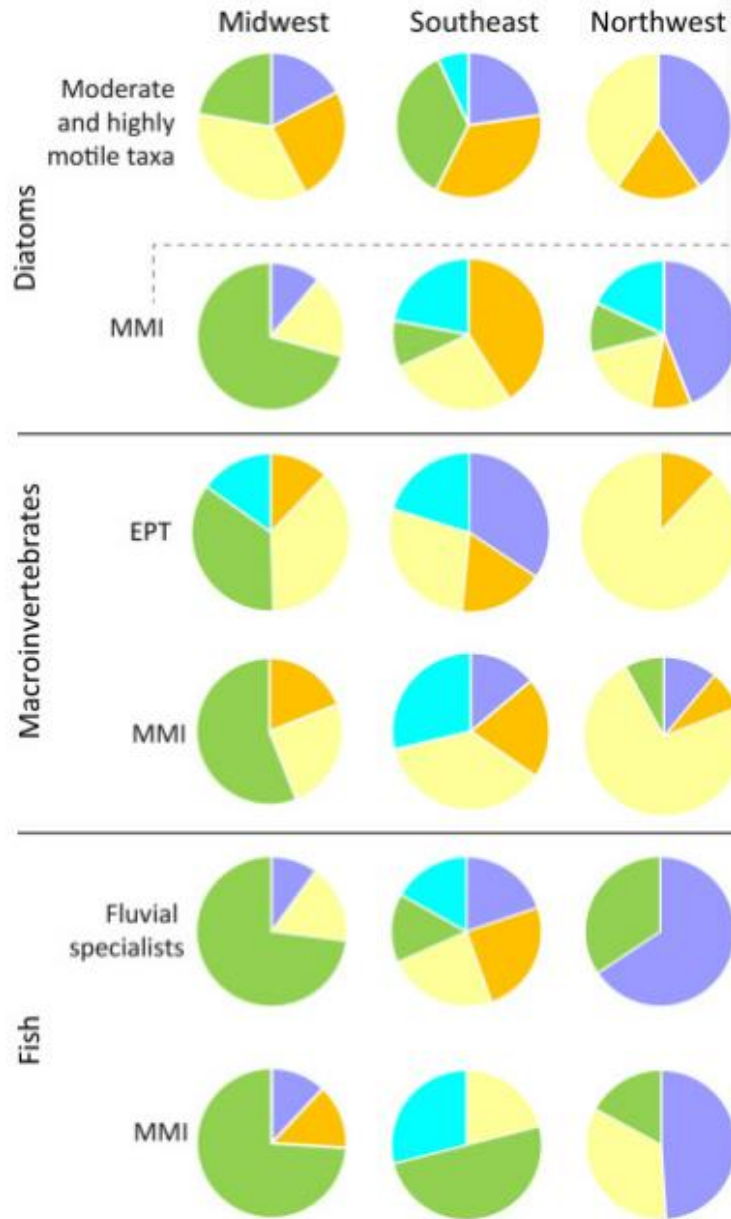
Download data for this site

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



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 science for a changing world

USGS Home
Contact USGS
Search USGS

National Water Information System: Web Interface

USGS Water Resources (District Access)

Data Category: Current Conditions Geographic Area: United States GO

Click to hide News Bulletins

- Explore the [NEW USGS National Water Dashboard](#) interactive map to access real-time water data from over 13,500 stations nationwide.
- [Full News](#)

USGS Current Water Data for the Nation

Predefined displays: Introduction go

Daily Streamflow Conditions

Tuesday, October 11, 2022 12:30ET

Select a state from the map to access real-time data

Current data typically are recorded at 15- to 60-minute intervals, stored onsite, and then transmitted to USGS offices every 1 to 4 hours, depending on the data relay technique used. Recording and transmission times may be more frequent during critical events. Data from current sites are relayed to USGS offices via satellite, telephone, and/or radio telemetry and are available for viewing within minutes of arrival.

All real-time data are [provisional and subject to revision](#).

Build Current Conditions Summary Table	Show a custom current conditions summary table for one or more stations.
Build Time Series	Show custom graphs or tables for a series of recent data for one or more stations.

Explanation

The colored dots on this map depict streamflow conditions as a [percentile](#), which is computed from the period of record for the current day of the year. Only stations with at least 30 years of record are shown.

- High
- > 90th percentile

USGS science for a changing world

National Water Dashboard

Overview Layers Legend Tools

Find a place

CLOSE Layers

USGS Stations

STREAMFLOW 9698

Status

Station Summary

SURFACE-WATER LEVELS

GROUNDWATER LEVELS

SPRING WATER LEVELS

WATER QUALITY

PRECIPITATION

ATMOSPHERIC

Weather Conditions

Hydrology

Base Map

Clear Layers

1000 km
500 mi



Google USGS NWD

Delivering water data

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

USGS science for a changing world

National Water Dashboard

USGS Home
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Search USGS

Discharge, cubic feet per second, [Discharge from Primary Sensor]

Most recent instantaneous value: 582 10-11-2022 12:15 CDT

USGS 06785000 Middle Loup River at Saint Paul, Nebr.

Discharge, cubic feet per second, [Discharge from Primary Sensor]

Oct 04 2022 Oct 05 2022 Oct 06 2022 Oct 07 2022 Oct 08 2022 Oct 09 2022 Oct 10 2022 Oct 11 2022

----- Provisional Data Subject to Revision -----

△ Median daily statistic (94 years) — Discharge

Create [presentation-quality](#) / [stand-alone](#) graph. Subscribe to [WaterAlert](#) P00060 9

See this graph on the [Monitoring Location Pages](#)

[Share this graph](#) | [f](#) [t](#) [v](#) [e](#)

Daily discharge, cubic feet per second -- statistics for Oct 11 based on 94 water years of record [more](#)

Min (1964)	Most Recent Instantaneous Value Oct 11	25th percentile	Median	Mean	75th percentile	Max (1947)
239	582	803	1040	1080	1270	2360

USGS science for a changing world

National Water Dashboard

Overview Layers Legend Tools

Find a place

Layers MENU

Middle Loup River at Saint Paul, Nebr.

IMPORTANT [Legacy real-time page](#)

Monitoring location 06785000 is associated with a STREAM in HOWARD COUNTY, NEBRASKA. Current conditions of DISCHARGE and GAGE HEIGHT are available. Water data back to 1895 are available online.

7 days 30 days 1 year

Change time span Retrieve data

Streamflow, ft³/s

544 ft³/s - Oct 04, 2022 11:45:00 PM CDT

ft³/s

Oct 05 Oct 06 Oct 09 Oct 10 Oct 11

Questions or Comments

Delivering water data

- USGS WaterAlert can monitor your USGS site for you

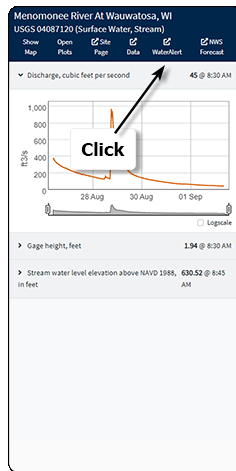
1 Find a monitoring location.

Use [National Water Dashboard](#).



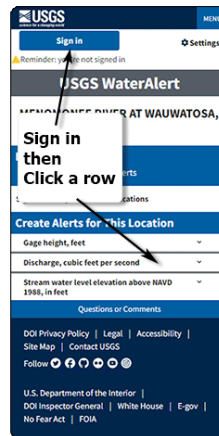
2 Tell WaterAlert which monitoring location.

Use [National Water Dashboard](#) to connect with WaterAlert.



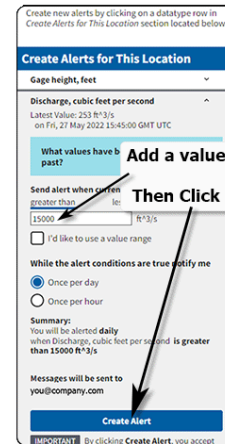
3 Select a water condition in which you have an interest.

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.



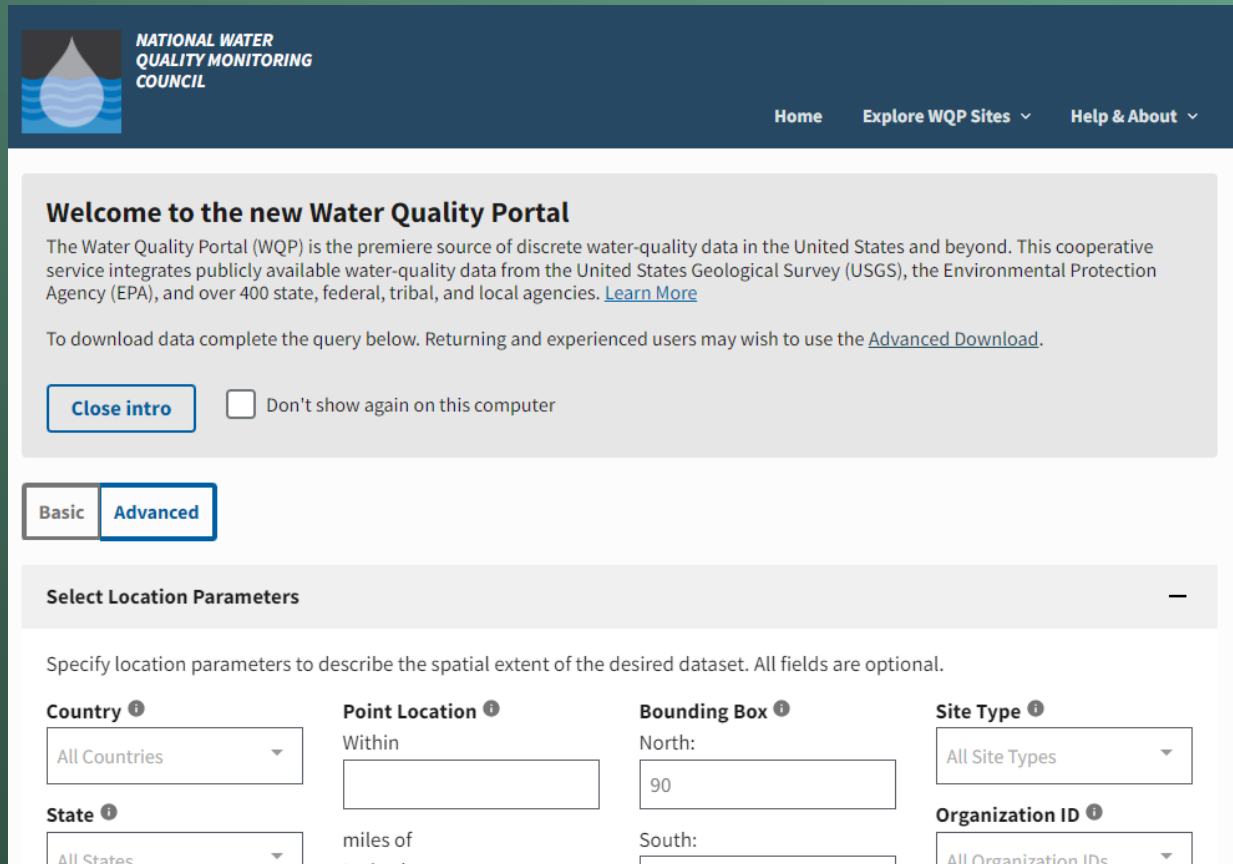
4 Set your thresholds.

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](#).



Delivering water data

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



The screenshot shows the top navigation bar of the National Water Quality Monitoring Council website. It includes the logo on the left and navigation links for Home, Explore WQP Sites, and Help & About on the right. Below the navigation is a welcome message and an introductory text block. At the bottom of the page, there are several form fields for selecting location parameters, including Country, State, Point Location, Bounding Box, Site Type, and Organization ID.

NATIONAL WATER QUALITY MONITORING COUNCIL

Home Explore WQP Sites Help & About

Welcome to the new Water Quality Portal

The Water Quality Portal (WQP) is the premiere source of discrete water-quality data in the United States and beyond. This cooperative service integrates publicly available water-quality data from the United States Geological Survey (USGS), the Environmental Protection Agency (EPA), and over 400 state, federal, tribal, and local agencies. [Learn More](#)

To download data complete the query below. Returning and experienced users may wish to use the [Advanced Download](#).

[Close intro](#) Don't show again on this computer

Basic **Advanced**

Select Location Parameters

Specify location parameters to describe the spatial extent of the desired dataset. All fields are optional.

Country ⓘ All Countries	Point Location ⓘ Within <input type="text"/>	Bounding Box ⓘ North: 90	Site Type ⓘ All Site Types
State ⓘ All States	miles of within	South: <input type="text"/>	Organization ID ⓘ All Organization IDs





Questions?

Close Legend

Water Quality: All Albert Lea Austin

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

CONTACT INFORMATION

USGS Nebraska Water Science Center
5231 South 19th St.
Lincoln, NE 68512-1271

(402) 328-4100
<http://ne.water.usgs.gov>

Dave Rus

(402) 328-4127

dlrus@usgs.gov

Steven M. Peterson
Director
(402) 328-4110
speterson@usgs.gov

Brenda Densmore
Associate Director
for Studies
(402) 328-4120
bdensmore@usgs.gov

Jason M. Lambrecht
Deputy Director for
Hydrologic
Observations
(402) 328-4124
jmlambre@usgs.gov

