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# U.S. Geological Survey Streamflow Monitoring

Toby Feaster

April 14, 2022

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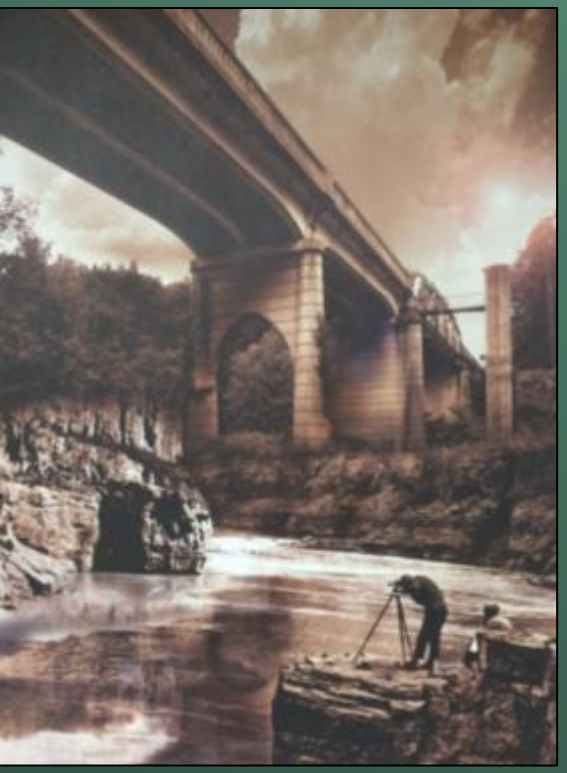
# Bureaus & Offices in the U.S. Department of the Interior



- Bureau of Indian Affairs
- Bureau of Indian Education
- Bureau of Land Management
- Bureau of Ocean Energy Management
- Bureau of Reclamation
- Bureau of Safety and Environmental Enforcement
- Bureau of Trust Funds Administration
- National Park Service
- Office of Surface Mining Reclamation and Enforcement
- U.S. Fish and Wildlife Service
- U.S. Geological Survey

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# USGS Mission Areas


## Core Science Systems

CSS leads USGS's mission as the civilian mapping agency for the Nation. We conduct detailed surveys and develop high quality, highly accurate topographic, geologic, hydrographic, and biogeographic maps and data. Our maps allow precise planning for critical mineral assessments; energy development; infrastructure projects; urban planning; flood prediction; emergency response; and haz

## Ecosystems

The USGS Ecosystems Mission Area provides science to help America achieve sustainable management and conservation of biological resources in wild and urban spaces, and places in between.


## Energy and Minerals

The Energy and Mineral Resources Mission Area conducts research and assessments that focus on the location, quantity, and quality of mineral and energy resources, including the economic and environmental effects of resource extraction and use.


## Natural Hazards

Every year in the United States, natural hazards threaten lives and livelihoods and result in billions of dollars in damage. We work with many partners to monitor, assess, and conduct targeted research on a wide range of natural hazards so that policymakers and the public have the understanding they need to enhance preparedness, response, and resilience.

## Water Resources

Water information is fundamental to national and local economic well-being, protection of life and property, and effective management of the Nation's water resources.

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# Water Mission Area

**The USGS works with partners to monitor, assess, and conduct targeted research on the wide range of water resources and conditions, including streamflow, groundwater, water quality, and water use and availability.**

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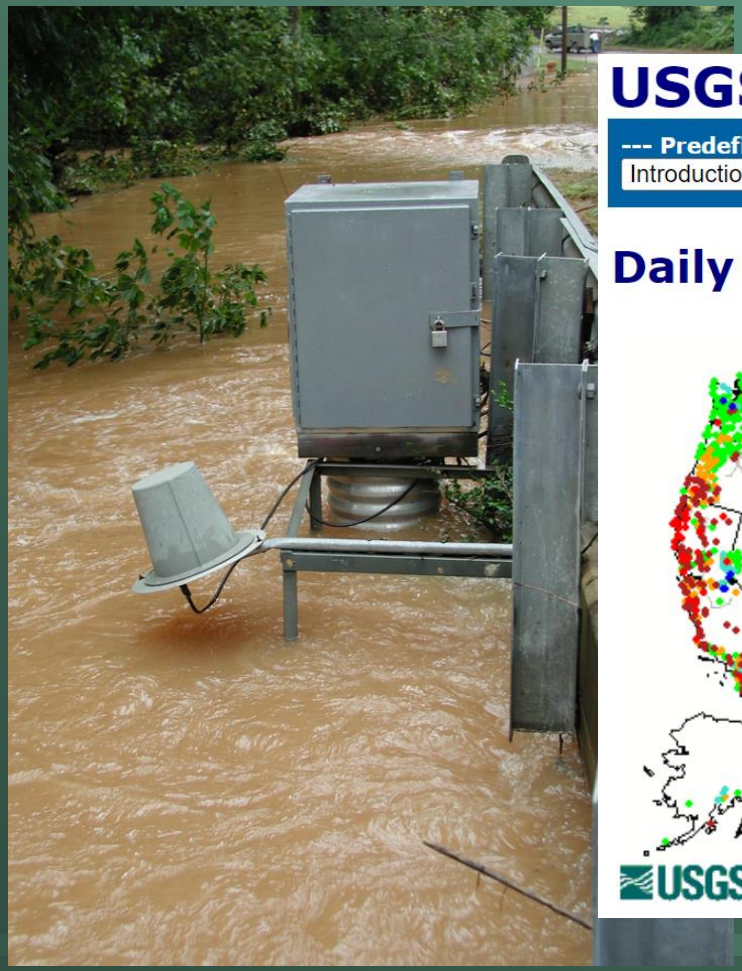
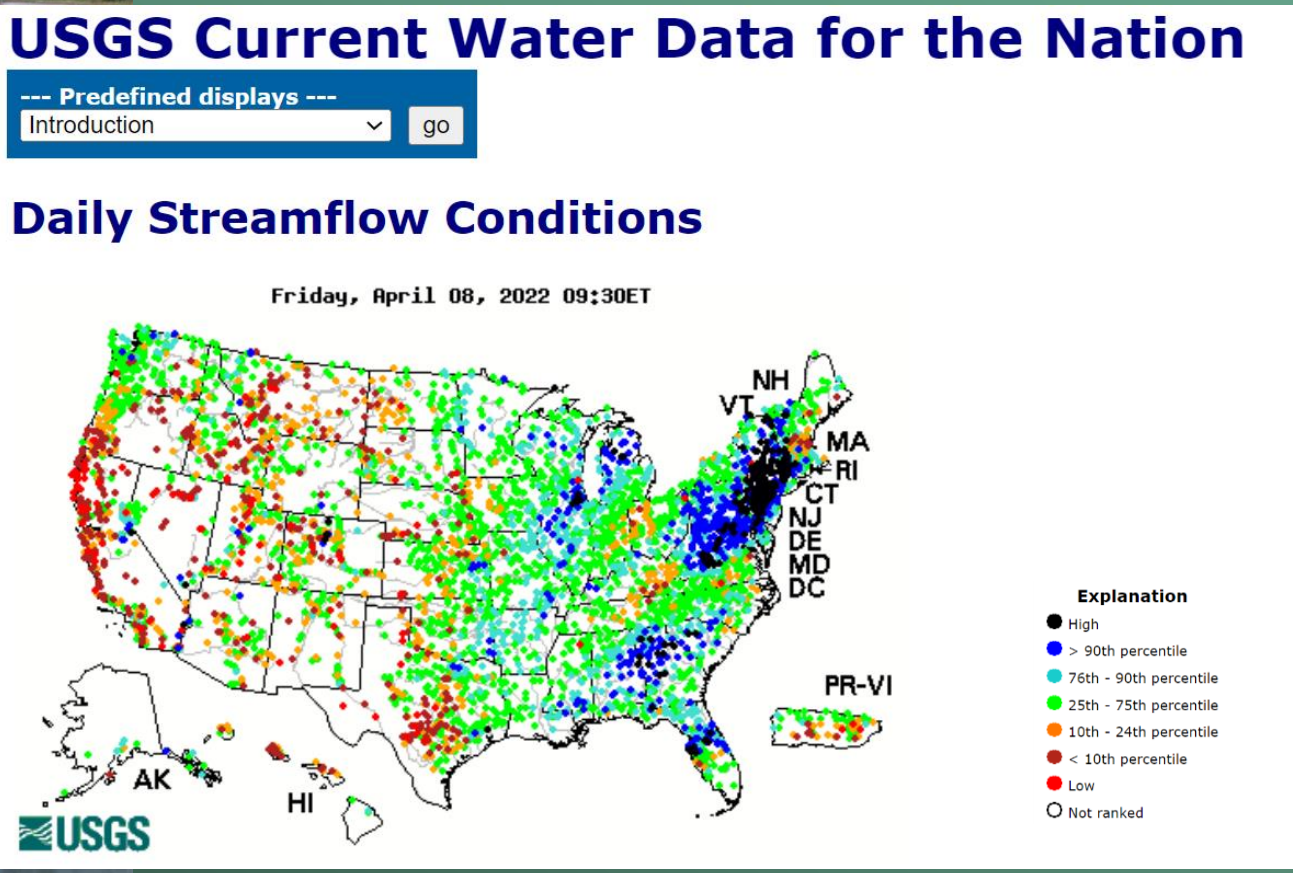
# USGS National Water Information System (NWIS)



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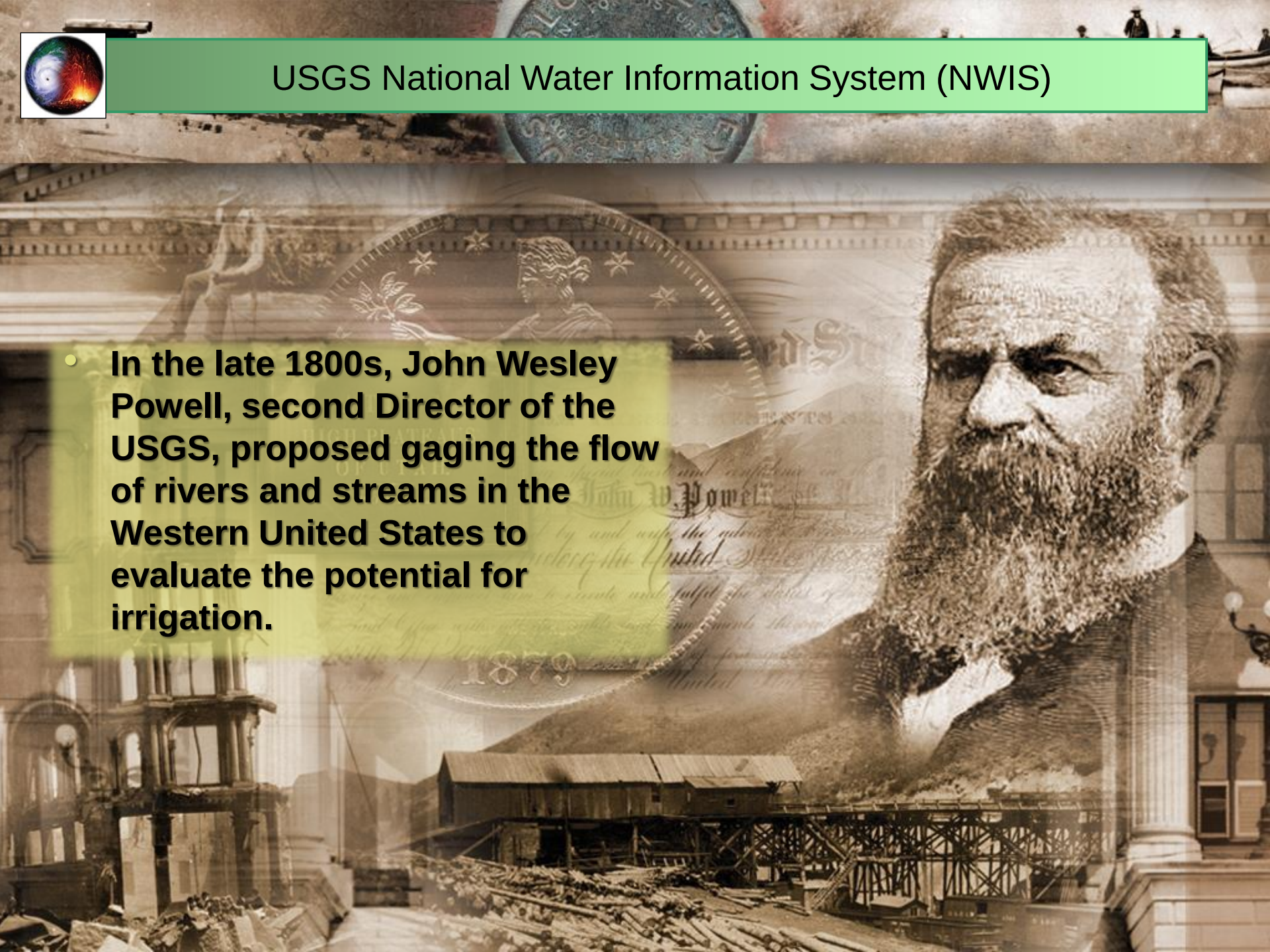
http://waterdata.usgs.gov/usa/nwis/rt

# USGS National Water Information System (NWIS)



- **In the late 1800s, John Wesley Powell, second Director of the USGS, proposed gaging the flow of rivers and streams in the Western United States to evaluate the potential for irrigation.**

# The First USGS Streamgage on the Rio Grande at Embudo, NM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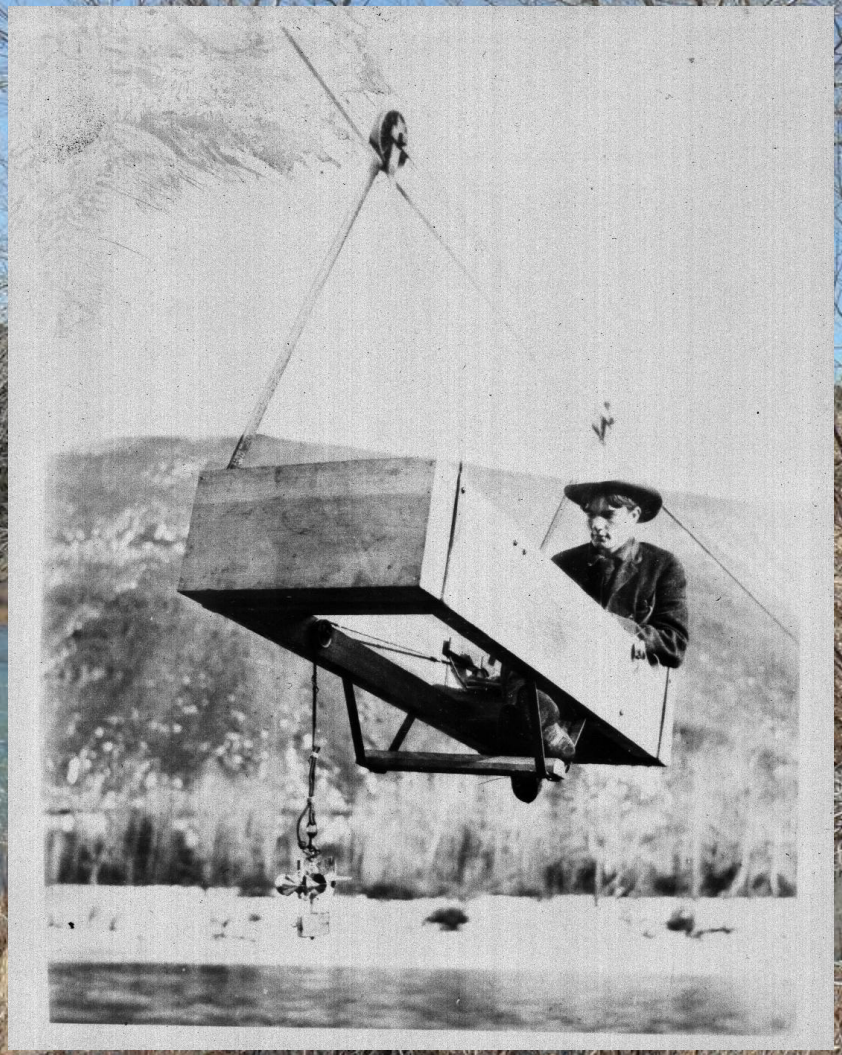
# The First USGS Streamgage on the Rio Grande at Embudo, NM



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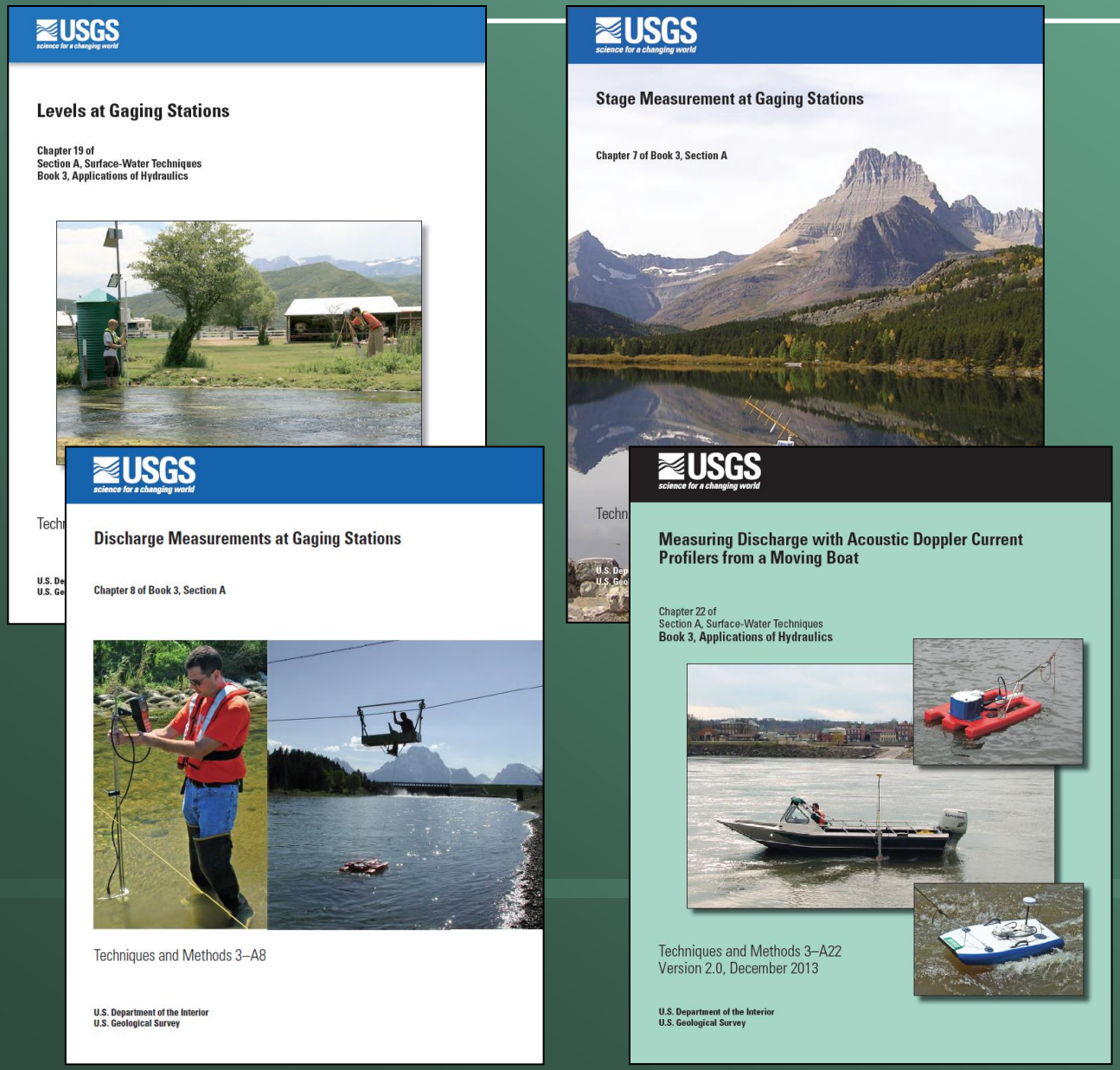
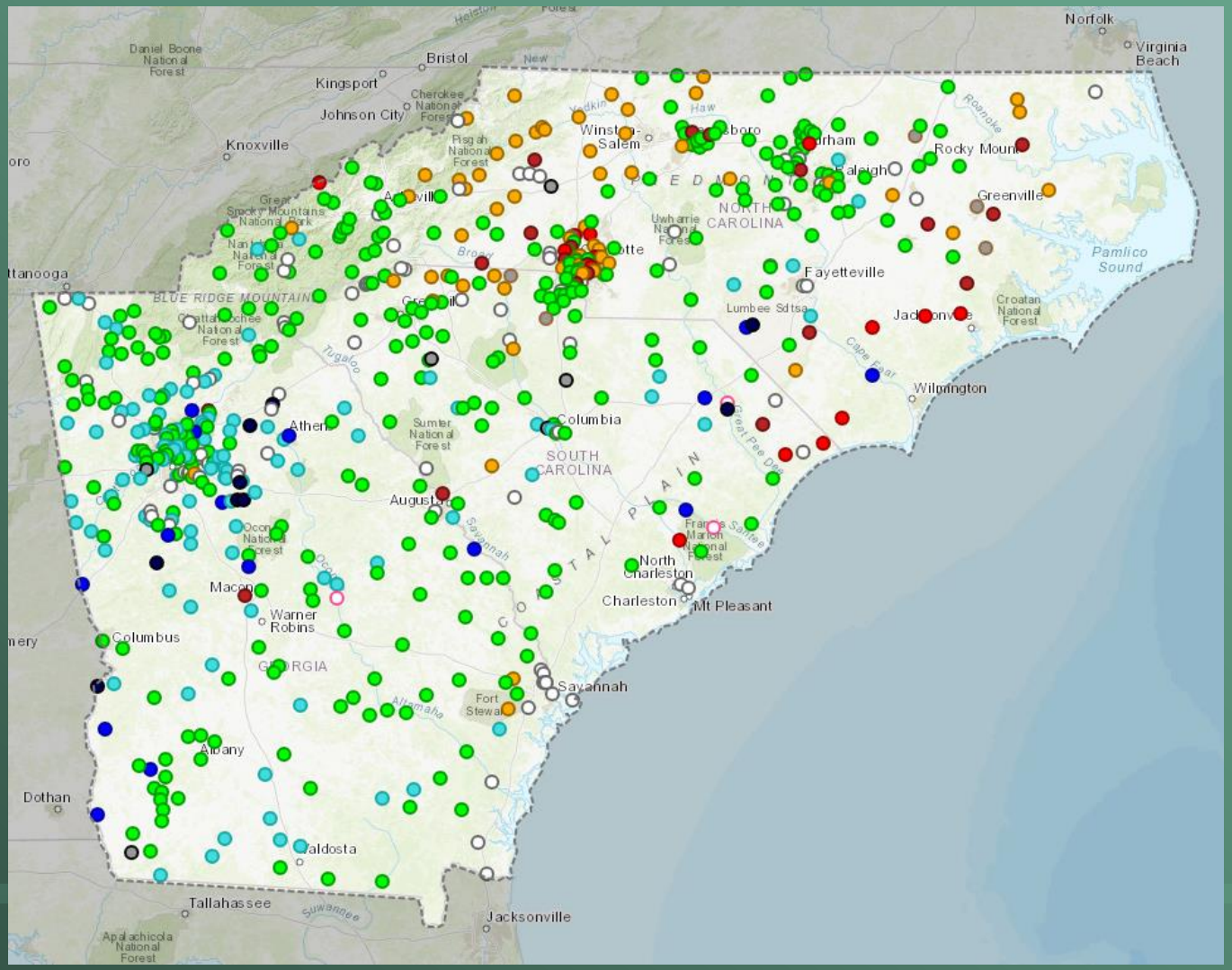
# USGS National Water Information System (NWIS)




- The USGS continues to improve streamflow monitoring techniques and uses consistent methods throughout the United States.
- The data are quality controlled, electronically stored, and publicly available.

# USGS South Atlantic Water Science Center (SAWSC)

USGS SAWSC operates approximately 900 real-time streamflow gaging stations using satellite telemetry



# From the River to You…



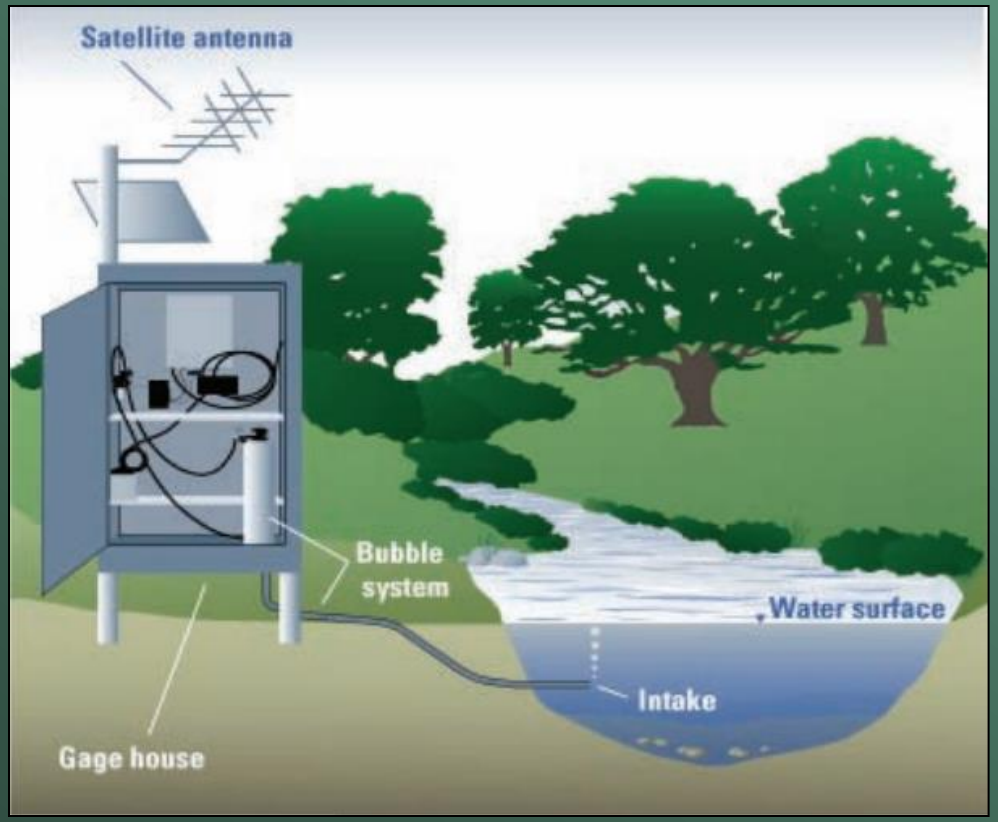





Satellite telemetry was pioneered in SC in the late 1980's due to the need for monitoring saltwater intrusion along the coast to protect freshwater intakes.

USGS

# Site Specific Installations: Bubbler/Pressure Sensor

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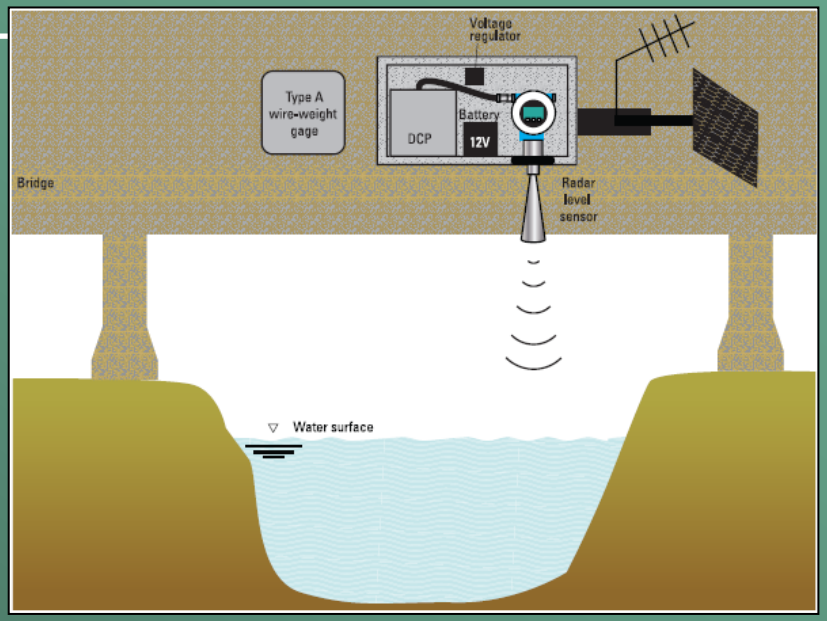
# Site Specific Installations: Non-Contact/Radar

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# Site Specific Installations: Index Velocity

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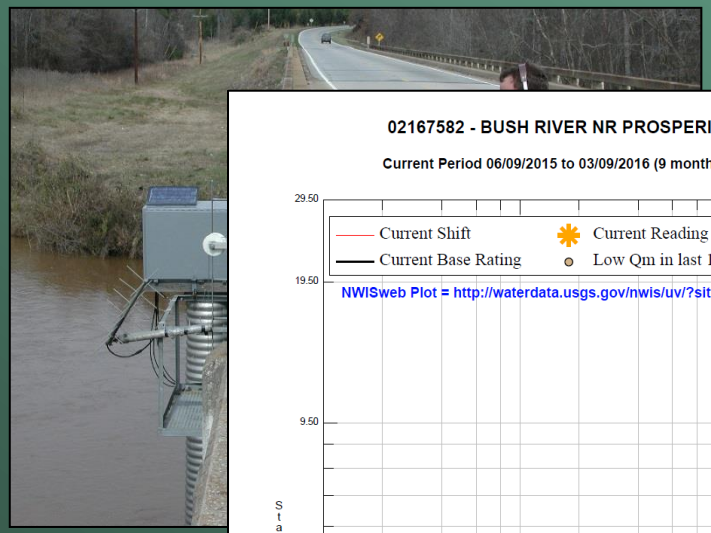
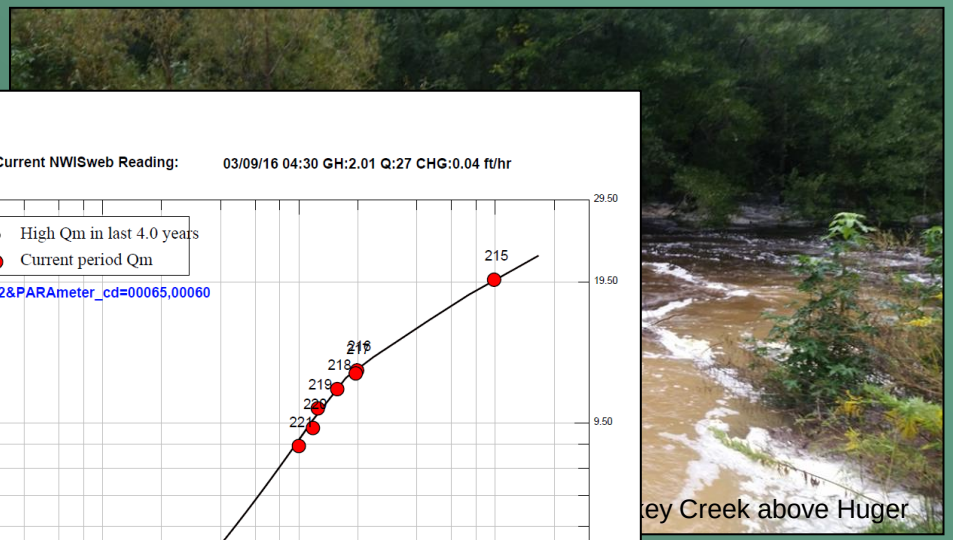
# Operation and Maintenance












02169000 Saluda River near Columbia

# Site Specific Installations

02153525 Broad River below Cherokee Falls

02164000 Reedy River near Greenville

02169500 Congaree River at Columbia

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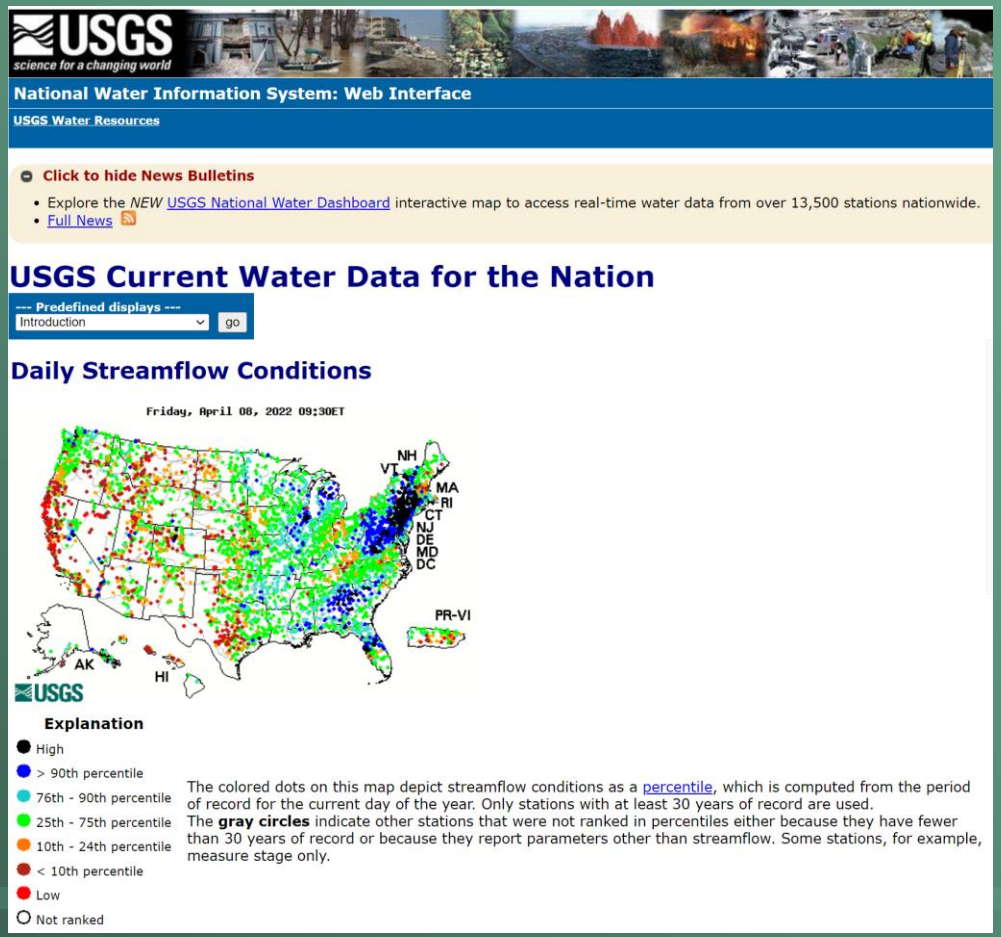
# USGS NWISweb

- Access to data from ~1.9 million sites
- Real-time and historical data
- Surface water, groundwater, water quality, water use

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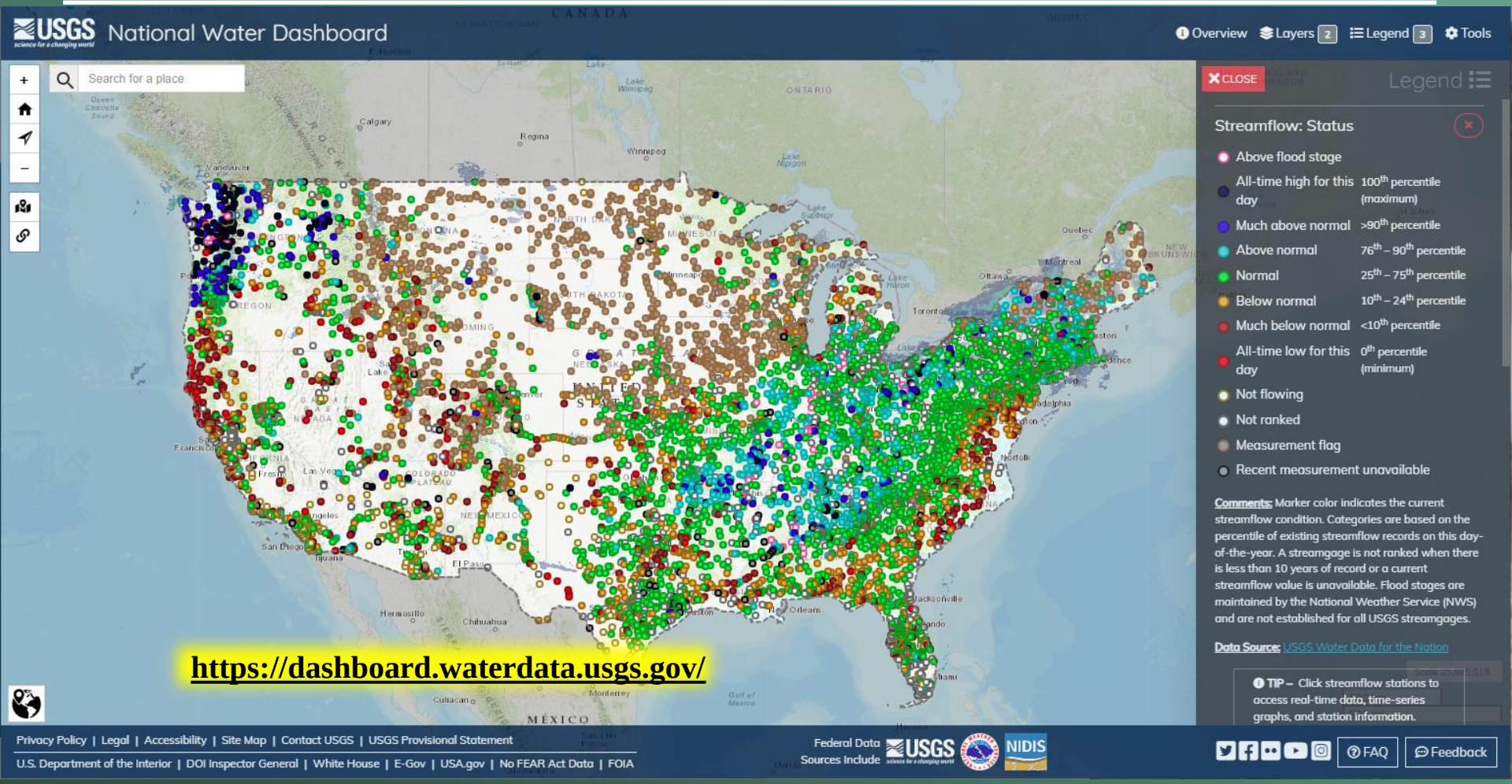
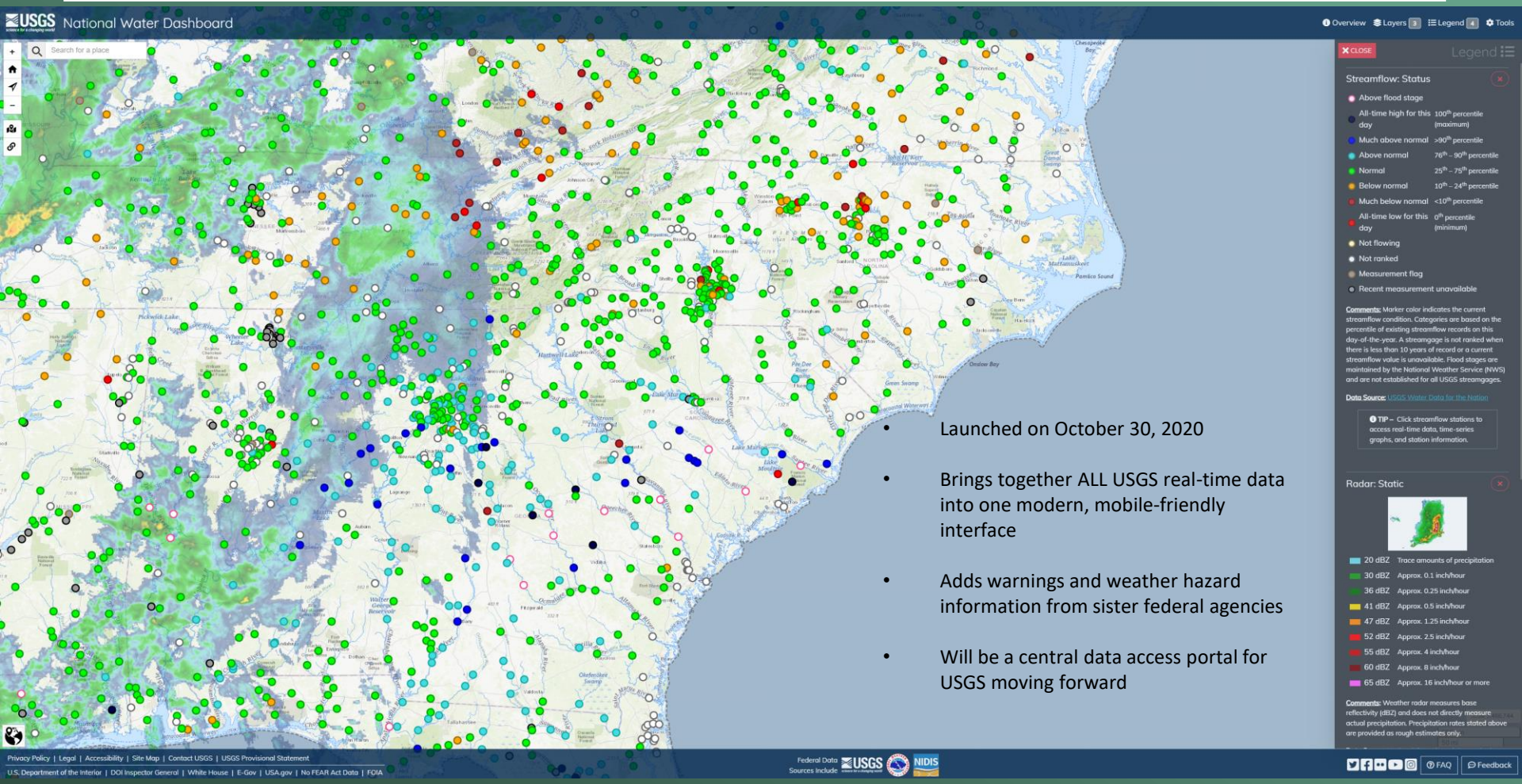
http://waterdata.usgs.gov/nwis/rt

# USGS National Water Dashboard




USGS

# USGS National Water Dashboard




- Launched on October 30, 2020
- Brings together ALL USGS real-time data into one modern, mobile-friendly interface
- Adds warnings and weather hazard information from sister federal agencies
- Will be a central data access portal for USGS moving forward

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**https://dashboard.waterdata.usgs.gov/**

# USGS WaterWatch

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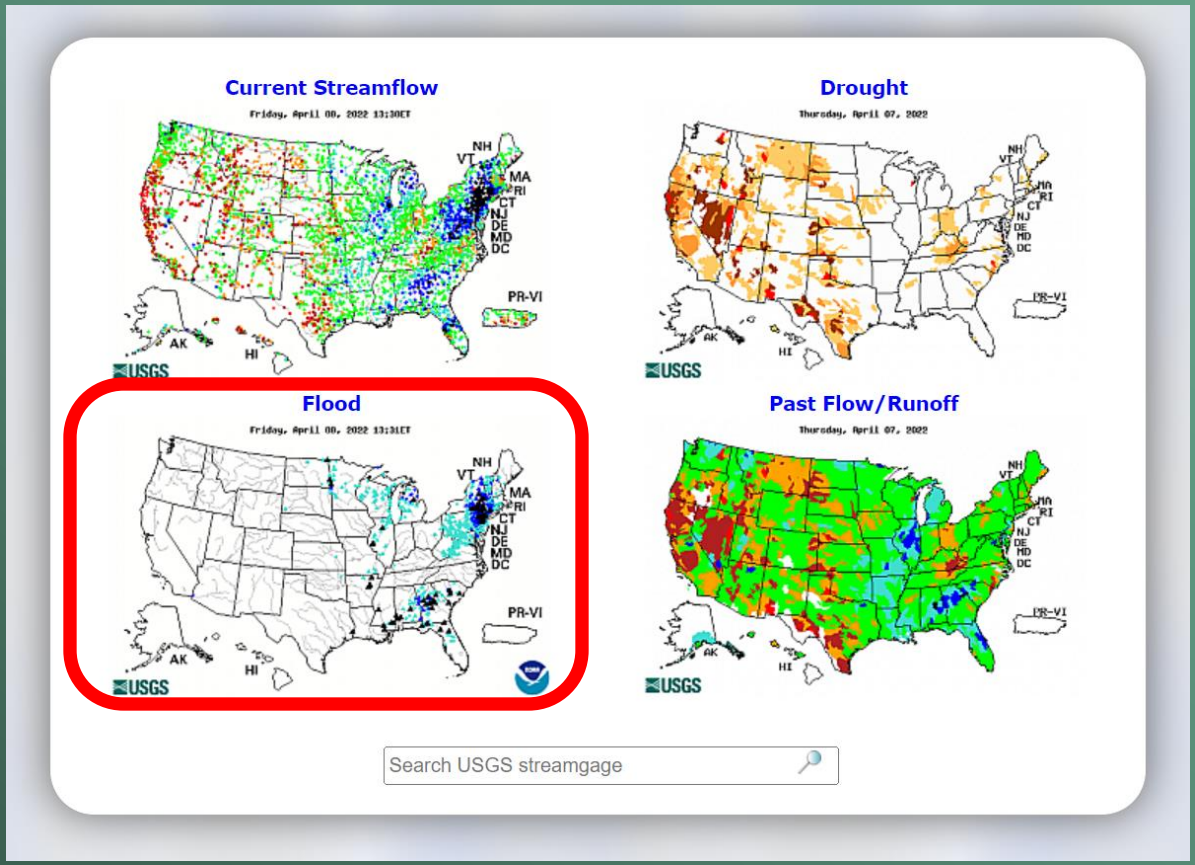
## WaterWatch

- Home
- *Special Features*
- Current Streamflow
- Flood
- Drought
- Past Flow/Runoff
- Animation
- Toolkit
- Toolkit (internal)
- Annual Summaries
- Data Services
- Additional Information
- About WaterWatch

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https://waterwatch.usgs.gov/

# USGS WaterWatch

## Flood

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### WaterWatch

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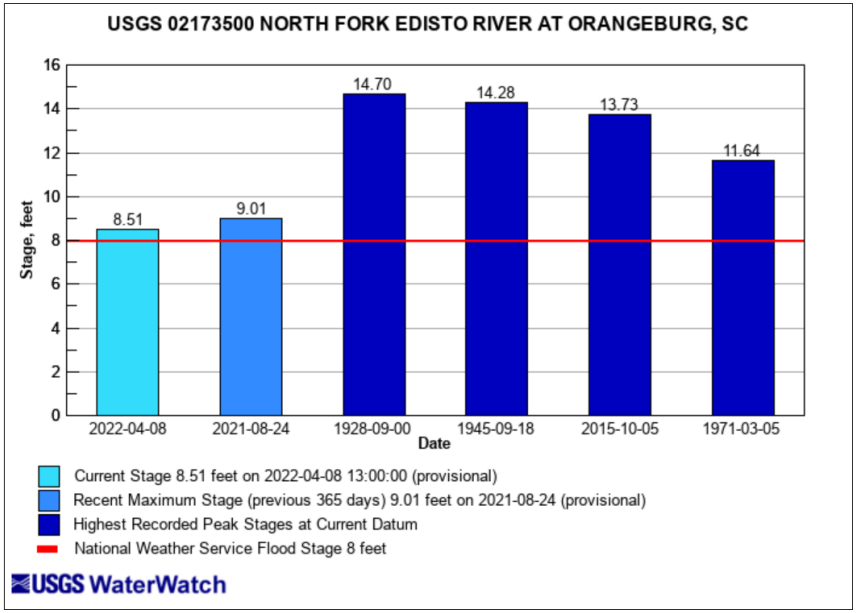
**Flood Tracking Chart Builder**

**Site Number:** 02173500 **Type:** Gage Height **Size:** Big (700x500) Peak Title GO




**Additional Information**

- USGS real-time streamflow data
- USGS peak streamflow

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https://waterwatch.usgs.gov/

# USGS WaterWatch

## WaterWatch

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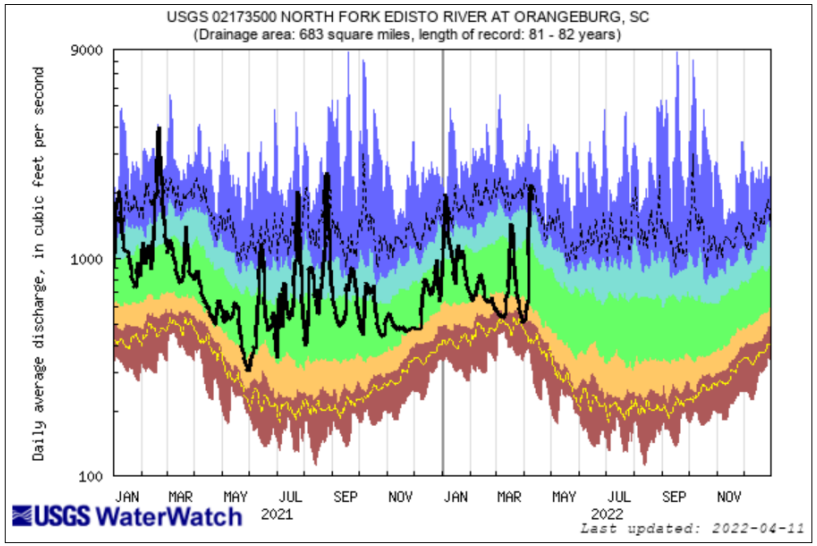
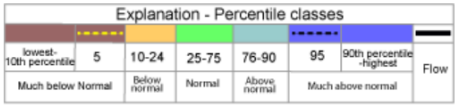
## USGS Streamflow Duration Hydrograph Builder

Site number 02173500 | Year: 2022 | No. of years: 2 | Year type: Calendar Year | GO

Flow: Daily | cfs | Graph type: Regular | Output: Hydrograph | Overlay ⇩

**For some streams, flow statistics may have been computed from mixed regulated and unregulated flows; this can affect depictions of flow conditions.**



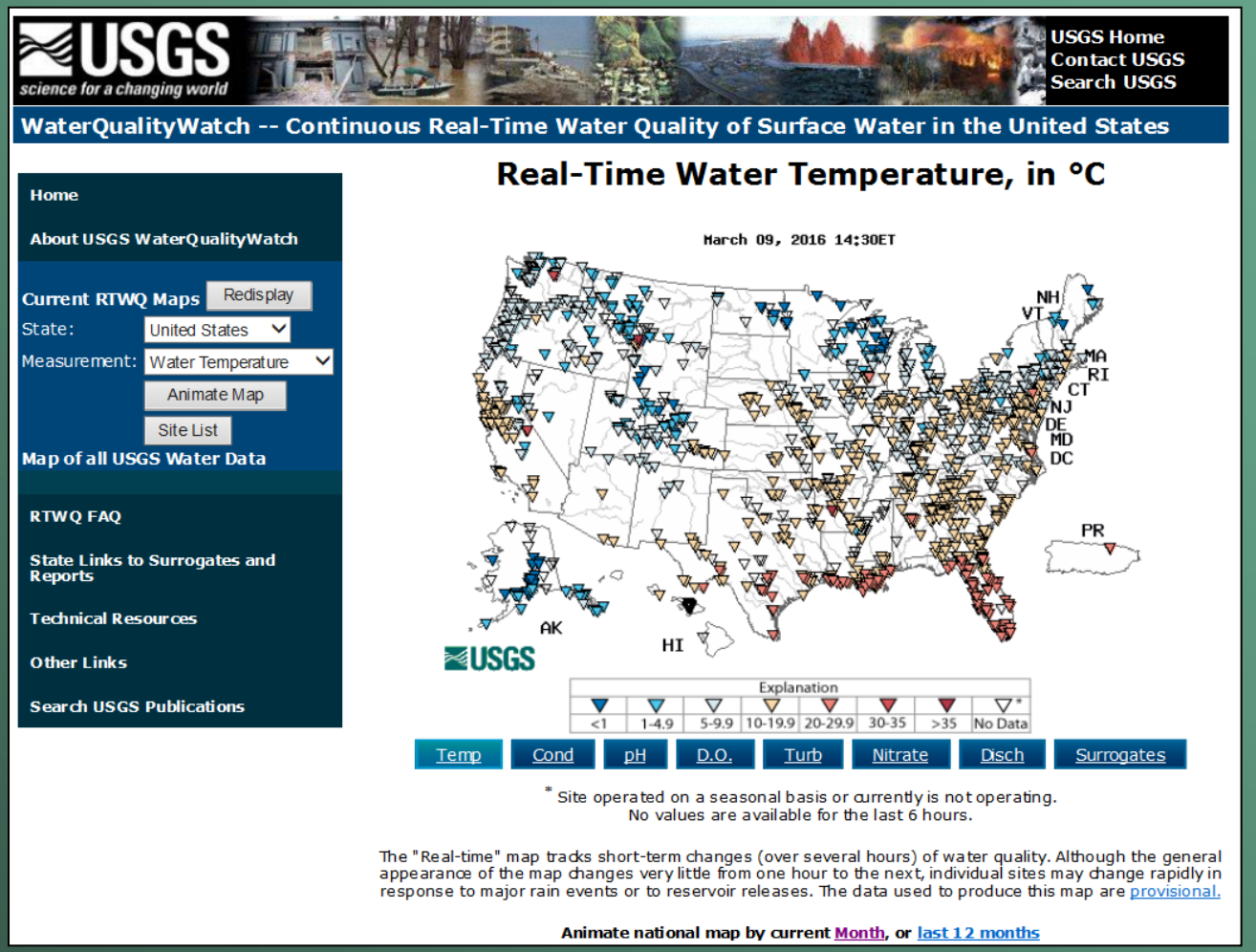

https://waterwatch.usgs.gov/

# USGS WaterQualityWatch

Water-quality data, including:

- Temperature
- Specific Conductance
- pH
- Dissolved Oxygen
- Turbidity
- Nitrate

…from more than 2,000 sites.

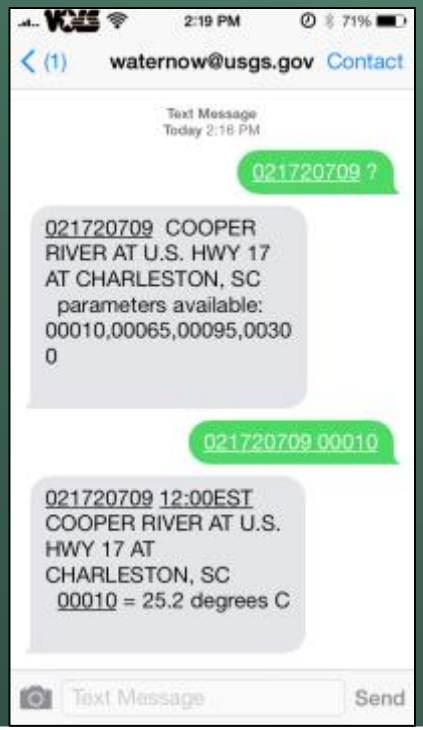


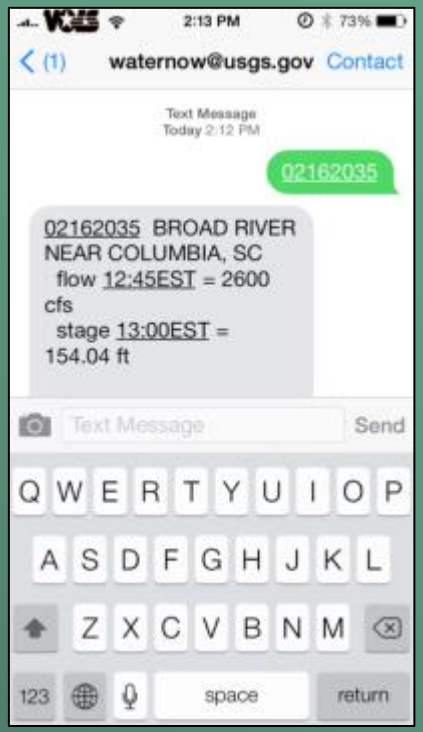

https://www.usgs.gov/tools/waterqualitywatch

# USGS WaterNow

http://water.usgs.gov/waternow/

**Current conditions for water data directly to your cell phone or email**

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**Send email or text message containing USGS station number and quickly receive a reply with its most recent observations**

# USGS StreamStats

## StreamStats is a GIS-based web application

- **Provide streamflow data and other information for data-collection stations.**

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**StreamStats Data-Collection Station Report**

| | |
|---|---|
| **USGS Station Number** | **02153800** |
| **Station Name** | **BULLOCK CREEK NR SHARON, SC** |

Click here to link to available data on NWIS-Web for this site.

**Descriptive Information**

| | |
|---|---|
| Station Type | Low Flow, partial record |
| Location | Lat 34°57'13", long 81°22'58" referenced to North American Datum of 1927, York County, SC, Hydrologic Unit 03050105, on State Highway 211, 2.5 mi northwest of Sharon, and 3.0 mi southeast of Hickory Grove. |

USGS StreamStats

SELECT A STATE / REGION
South Carolina

Exploration Tools

IDENTIFY A STUDY

**Step 1:** Zoom in to level 15 or greater t
the delineation tool

Delineate

SELECT SCENA

BUILD A RE

POWERED BY WIM

USGS Home Contact USGS Sear
Accessibility FOIA Privacy Policy

**Streamflow Statistics**

| Statistic Name | Value | Units | Citation Number | Preferred? | Years of Record | Standard Error, percent | Variance log-10 | Lower 95% Confidence Interval | Upper 95% Confidence Interval | Start Date | End Date | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Peak-Flow Statistics*** | | | | | | | | | | | | |
| 50_percent_AEP_flood | 2230 | cubic feet per second | 162 | Y | | | | | | | | |
| 20_percent_AEP_flood | 4810 | cubic feet per second | 162 | Y | | | | | | | | |
| 10_percent_AEP_flood | 7130 | cubic feet per second | 162 | Y | | | | | | | | |
| 4_percent_AEP_flood | 10800 | cubic feet per second | 162 | Y | | | | | | | | |
| 2_percent_AEP_flood | 14000 | cubic feet per second | 162 | Y | | | | | | | | |
| 1_percent_AEP_flood | 17800 | cubic feet per second | 162 | Y | | | | | | | | |
| 0_5_percent_AEP_flood | 22000 | cubic feet per second | 162 | Y | | | | | | | | |
| 0_2_percent_AEP_flood | 28500 | cubic feet per second | 162 | Y | | | | | | | | |
| Regression_est_50_Percent_AEP_flood | 2820 | cubic feet per second | 162 | Y | | | | | | | | |
| Regression_est_20_Percent_AEP_flood | 4760 | cubic feet per second | 162 | Y | | | | | | | | |
| Regression_est_10_Percent_AEP_flood | 6140 | cubic feet per second | 162 | Y | | | | | | | | |
| Regression_est_4_Percent_AEP_flood | 7890 | cubic feet per second | 162 | Y | | | | | | | | |
| Regression_est_2_Percent_AEP_flood | 9450 | cubic feet per second | 162 | Y | | | | | | | | |
| Regression_est_1_Percent_AEP_flood | 10800 | cubic feet per second | 162 | Y | | | | | | | | |
| Regression_est_0_5_Percent_AEP_flood | 12100 | cubic feet per second | 162 | Y | | | | | | | | |
| Regression_est_0_2_Percent_AEP_flood | 14200 | cubic feet per second | 162 | Y | | | | | | | | |
| Weighted_20_percent_AEP_flood | 4790 | cubic feet per second | 162 | Y | | | | | | | | |
| Weighted_10_percent_AEP_flood | 6680 | cubic feet per second | 162 | Y | | | | | | | | |
| Weighted_4_percent_AEP_flood | 9220 | cubic feet per second | 162 | Y | | | | | | | | |
| Weighted_2_percent_AEP_flood | 11300 | cubic feet per second | 162 | Y | | | | | | | | |
| Weighted_1_percent_AEP_flood | 13300 | cubic feet per second | 162 | Y | | | | | | | | |
| Weighted_0_5_percent_AEP_flood | 15300 | cubic feet per second | 162 | Y | | | | | | | | |
| Weighted_0_2_percent_AEP_flood | 18300 | cubic feet per second | 162 | Y | | | | | | | | |
| Systematic_peak_years | 16 | years | 162 | Y | | | | | | | | |
| Weighted_50_percent_AEP_flood | 2410 | cubic feet per second | 162 | Y | | | | | | | | |
| ***Low-Flow Statistics*** | | | | | | | | | | | | |
| 7_Day_2_Year_Low_Flow_Per_SqMi | 0.15 | cubic feet per second per square mile | 313 | Y | | | | | | | | |
| 7_Day_10_Year_Low_Flow_Per_SqMi | <0.1 | cubic feet per second per square mile | 313 | Y | | | | | | | | |

**Citations**

| *Citation Number* | *Citation Name and URL* |
|---|---|
| 30 | Imported from NWIS file |
| 162 | Feaster, T.D., Gotvald, A.J., and Weaver, J.C., 2009, Magnitude and Frequency of Rural Floods in the Southeastern United States, 2006: Volume 3, South Carolina: U.S. Geological Survey Scientific Investigations Report 2009-5156, 226 p. |
| 313 | Zalants, M.G., 1991, Low-flow characteristics of natural streams in the Blue Ridge, Piedmont, and upper Coastal Plain Physiographic Provinces of South Carolina: U.S. Geological Survey Water-Resources Investigations Report 90-4188, 92 p. |

USGS

# USGS StreamStats

## StreamStats is a GIS-based web application

USGS StreamStats

SELECT A STATE / REGION
South Carolina

| Parameter Code | Parameter Description | Value | Unit |
|---|---|---|---|
| BSLDEM30FT | Mean basin slope, based on slope percent grid | 4.74 | percent |
| CSL10_85fm | Change in elevation between points 10 and 85 percent of length along main channel to basin divide divided by length between points ft per mi | 18.62 | feet per mi |

Peak-Flow Statistics Parameters [Peak Southeast US over 1 sqmi 2009 5156]

| Parameter Code | Parameter Name | Value | Units | Min Limit | Max Limit |
|---|---|---|---|---|---|
| DRNAREA | Drainage Area | 5.96 | square miles | 1 | 9000 |
| PCTREG1 | Percent Area in Region 1 | 100 | percent | 0 | 100 |
| PCTREG2 | Percent Area in Region 2 | 0 | percent | 0 | 100 |
| PCTREG3 | Percent Area in Region 3 | 0 | percent | 0 | 100 |
| PCTREG4 | Percent Area in Region 4 | 0 | percent | 0 | 100 |
| PCTREG5 | Percent Area in Region 5 | 0 | percent | 0 | 100 |

Peak-Flow Statistics Flow Report [Peak Southeast US over 1 sqmi 2009 5156]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

| Statistic | Value | Unit | PII | Plu | ASEp |
|---|---|---|---|---|---|
| 50-percent AEP flood | 505 | ft^3/s | 291 | 877 | 34.5 |
| 20-percent AEP flood | 904 | ft^3/s | 524 | 1560 | 34 |
| 10-percent AEP flood | 1200 | ft^3/s | 684 | 2100 | 35.1 |
| 4-percent AEP flood | 1580 | ft^3/s | 870 | 2870 | 37.5 |
| 2-percent AEP flood | 1930 | ft^3/s | 1030 | 3620 | 39.6 |
| 1-percent AEP flood | 2240 | ft^3/s | 1160 | 4340 | 41.9 |
| 0.5-percent AEP flood | 2550 | ft^3/s | 1270 | 5120 | 44.3 |
| 0.2-percent AEP flood | 3030 | ft^3/s | 1440 | 6390 | 47.7 |

*Peak-Flow Statistics Citations*

Feaster, T.D., Gotvald, A.J., and Weaver, J.C.,2009, Magnitude and Frequency of Rural Floods in the Southeastern United States, 2006: Volume 3, South Carolina: U.S. Geological Survey Scientific Investigations Report 2009-5156, 226 p.

| | | | |
|---|---|---|---|
| SSURGOB | Percentage of area of Hydrologic Soil Type B from SSURGO | 67.4 | percent |
| SSURGOC | Percentage of area of Hydrologic Soil Type C from SSURGO | 8.8 | percent |
| SSURGOD | Percentage of area of Hydrologic Soil Type D from SSURGO | 14.1 | percent |
| STORAGE | Percentage of area of storage (lakes ponds reservoirs wetlands) | 1.5 | percent |

Step 5: Your delineation is now clear, edit, or downlo... choose a state or regional ... (if available). Click continu...

Clear

Edit

State/Region Specific F...

The following additiona... available for South Caro...

Check For Upstr...

Downloa...

GeoJSON
ShapeFile
KML

POWERED BY WIM

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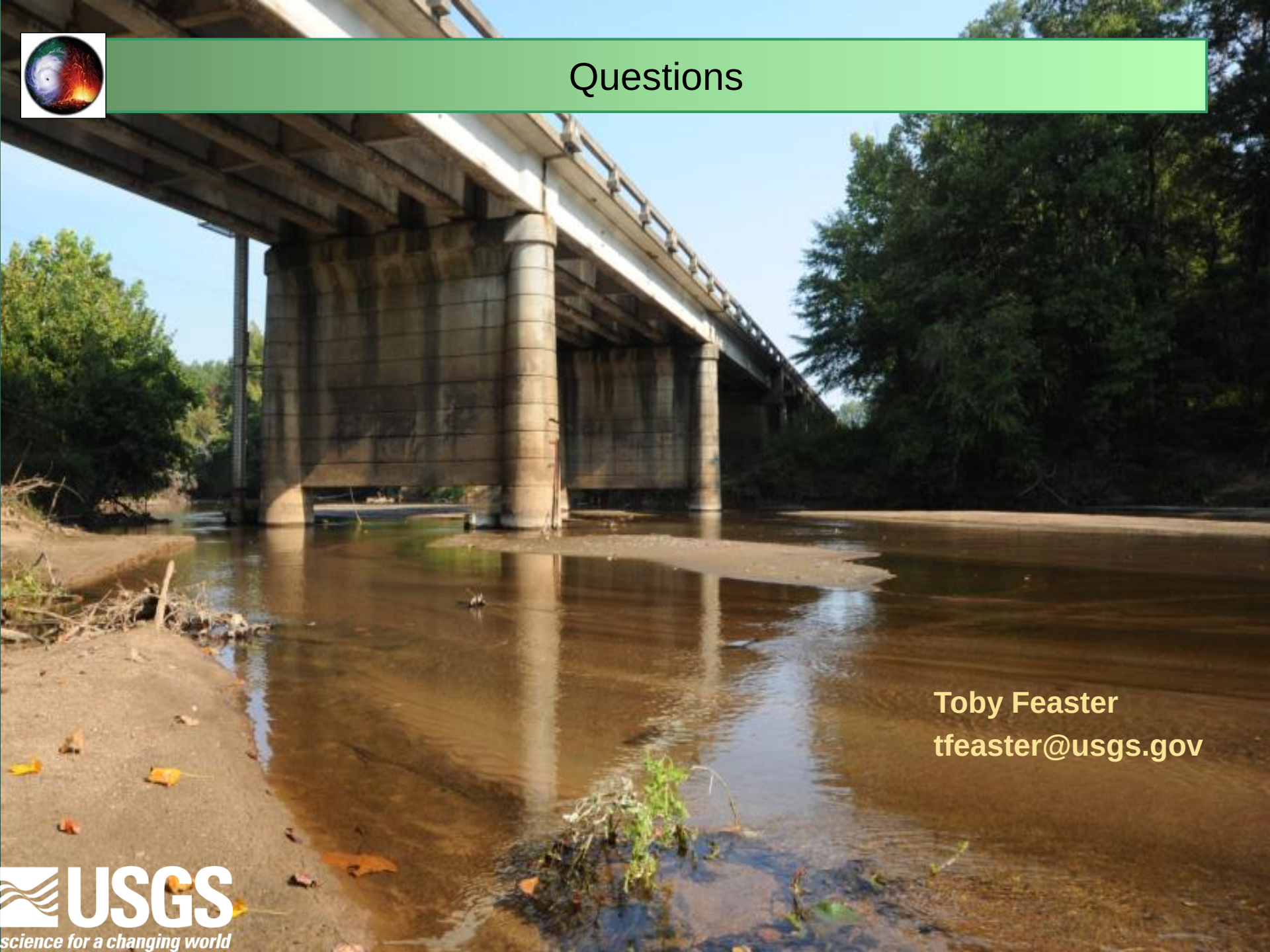
# Questions



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**tfeaster@usgs.gov**

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