



USGS

science for a changing world

U.S. Geological Survey Streamflow Monitoring

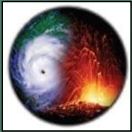
Toby Feaster
April 14, 2022



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**



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.



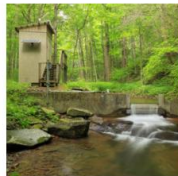
Energy and Minerals

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.



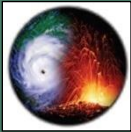
Water Resources

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.

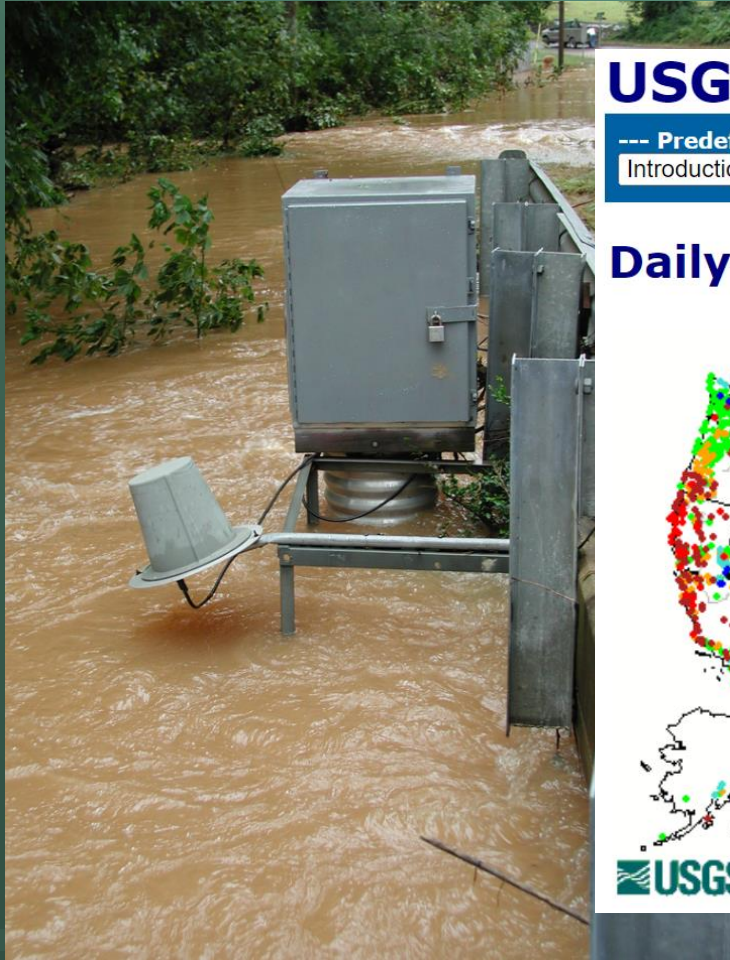


Water Mission Area

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.



USGS National Water Information System (NWIS)



USGS Current Water Data for the Nation

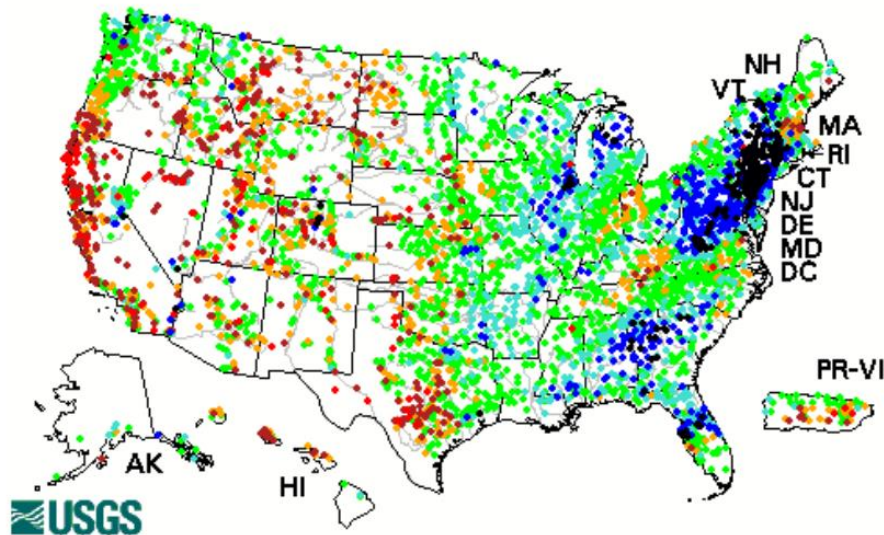
--- Predefined displays ---

Introduction

go

Daily Streamflow Conditions

Friday, April 08, 2022 09:30ET



Explanation

- High
- > 90th percentile
- 76th - 90th percentile
- 25th - 75th percentile
- 10th - 24th percentile
- < 10th percentile
- Low
- Not ranked





USGS National Water Information System (NWIS)

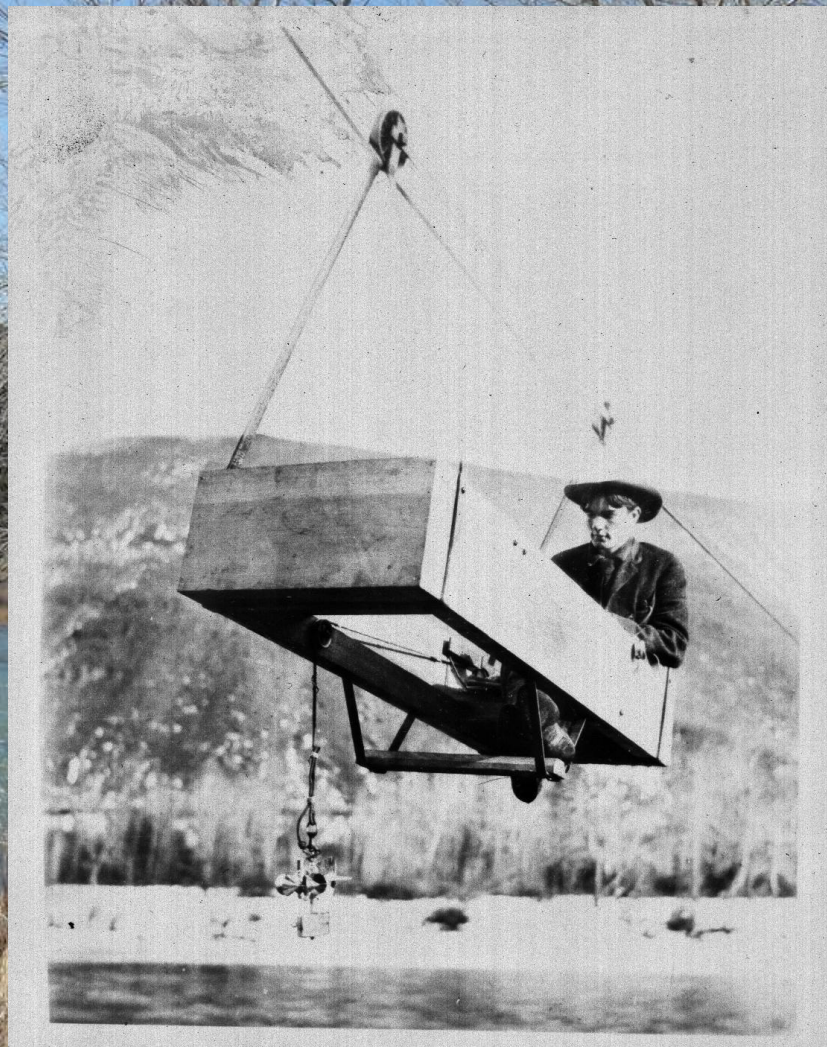
- In the late 1800s, John Wesley Powell, second Director of the USGS, proposed gaging the flow of rivers and streams in the Western United States to evaluate the potential for irrigation.

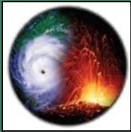


The First USGS Streamgage on the Rio Grande at Embudo, NM



The First USGS Streamgauge on the Rio Grande at Embudo, NM



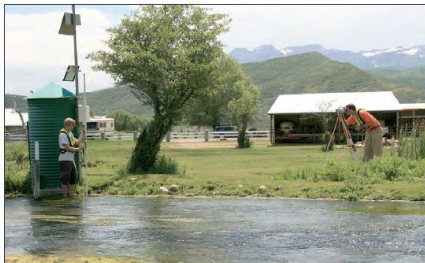


USGS National Water Information System (NWIS)



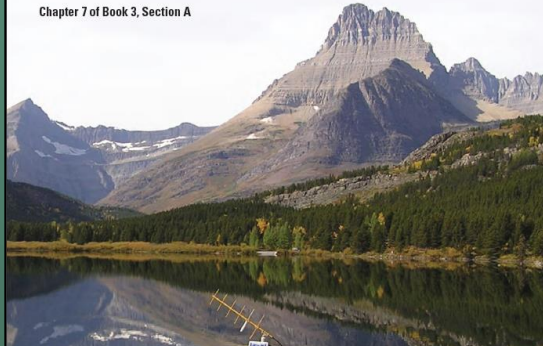
Levels at Gaging Stations

Chapter 19 of
Section A, Surface-Water Techniques
Book 3, Applications of Hydraulics



Stage Measurement at Gaging Stations

Chapter 7 of Book 3, Section A



Discharge Measurements at Gaging Stations

Chapter 8 of Book 3, Section A



Techniques and Methods 3–A8

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



Measuring Discharge with Acoustic Doppler Current Profilers from a Moving Boat

Chapter 22 of
Section A, Surface-Water Techniques
Book 3, Applications of Hydraulics



Techniques and Methods 3–A22
Version 2.0, December 2013

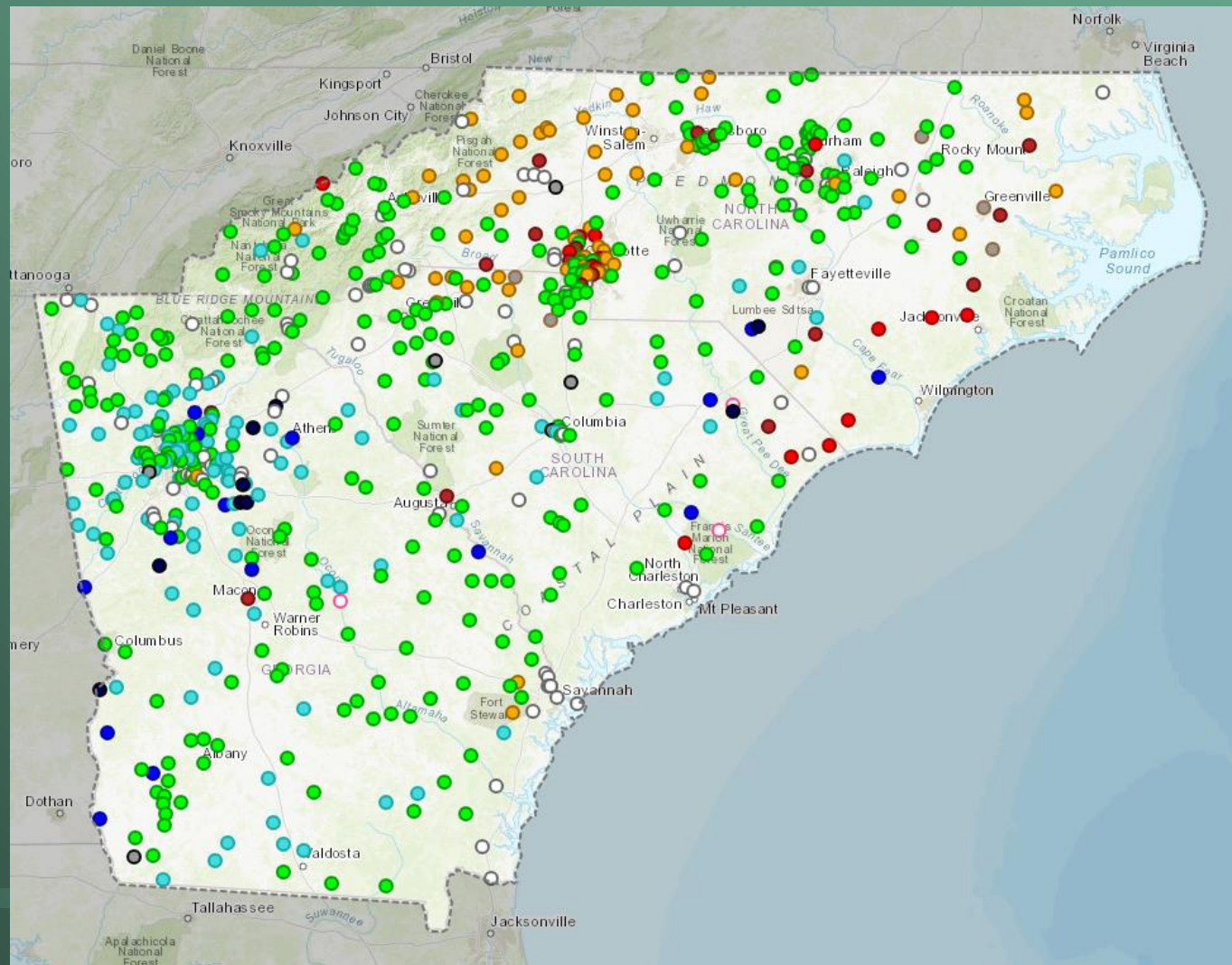
U.S. Department of the Interior
U.S. Geological Survey

- 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...



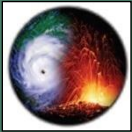
NWIS Web site

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.

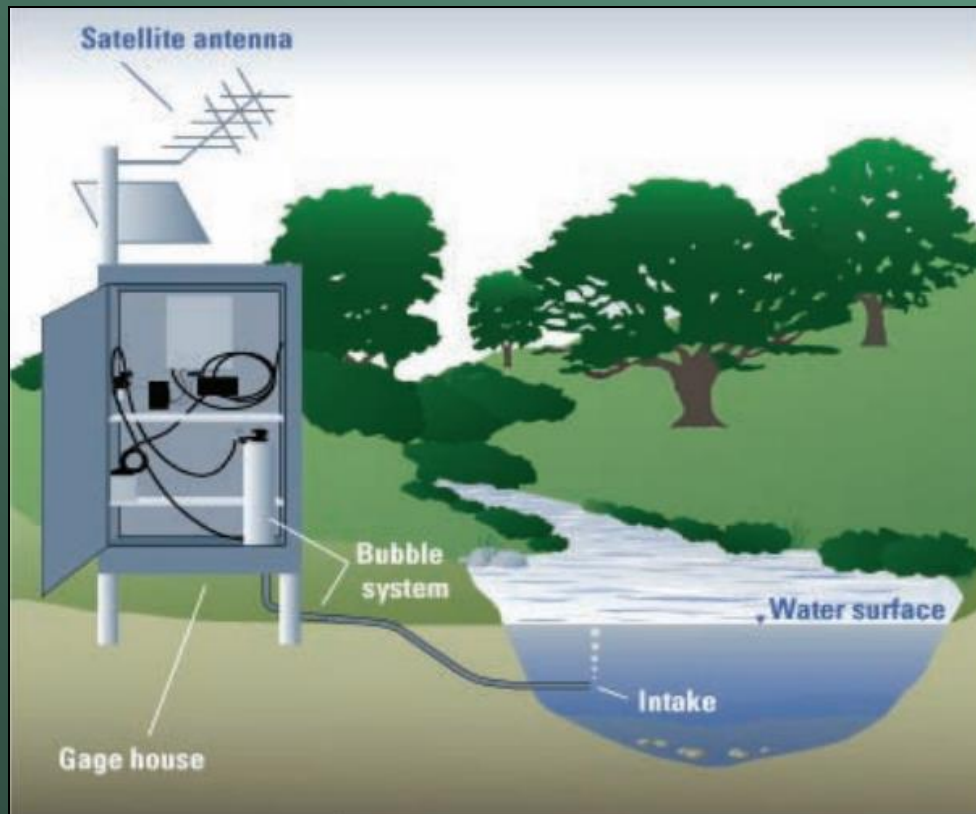


May 2021 Jul 2021 Sep 2021 Nov 2021 Jan 2022 Mar 2022
— daily maximum discharge — Period of approved data
— daily minimum discharge — Period of provisional data
— daily mean discharge

for *Discharge, cubic feet per

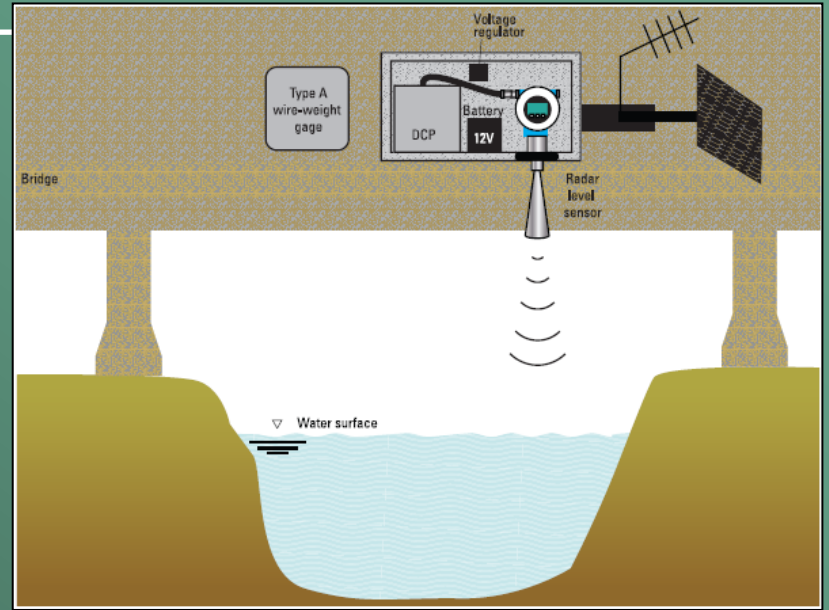


Site Specific Installations: Bubbler/Pressure Sensor





Site Specific Installations: Non-Contact/Radar



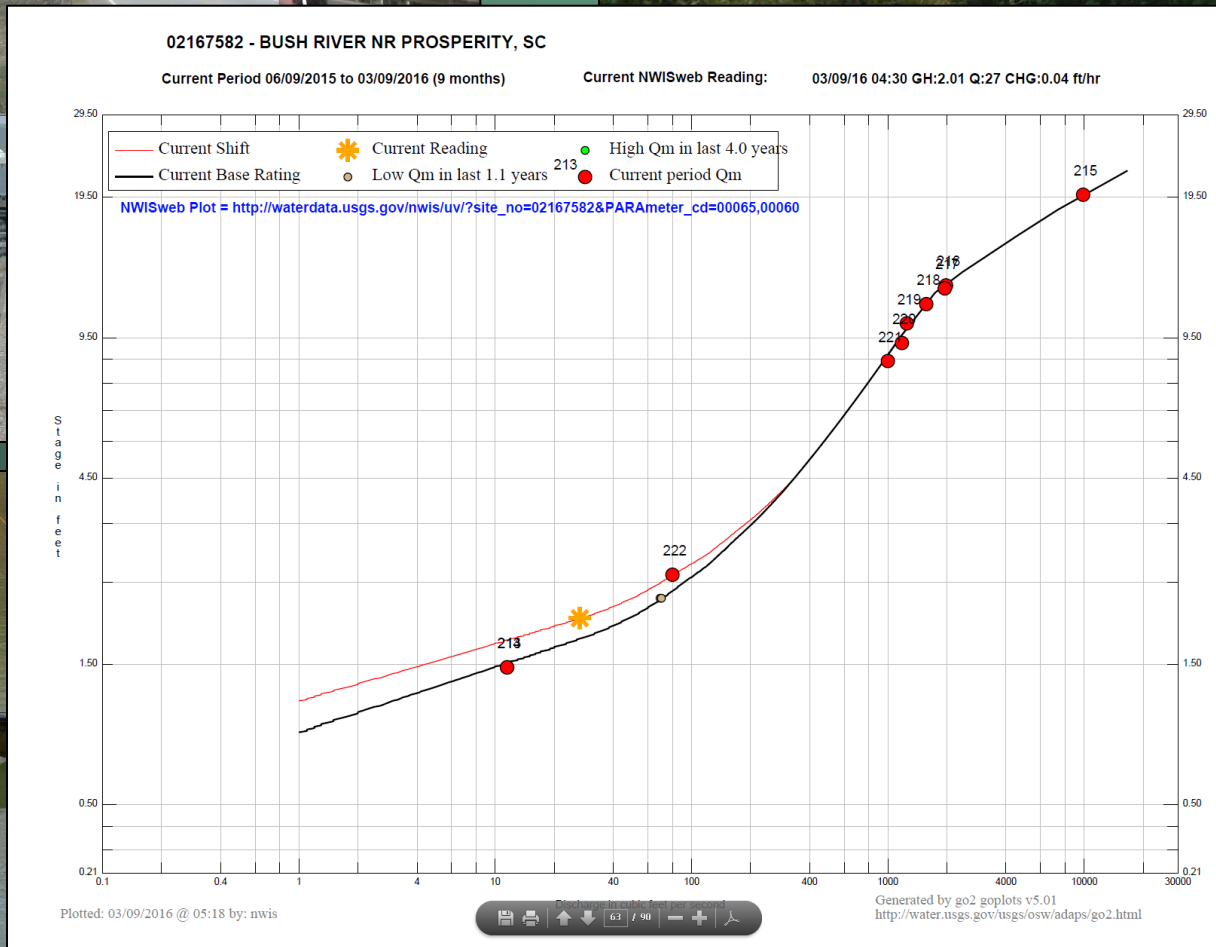


Site Specific Installations: Index Velocity





Operation and Maintenance



ley Creek above Huger



02169000 Saluda River near Columbia



Site Specific Installations



02153525 Broad River below Cherokee Falls



02164000 Reedy River near Greenville



02169500 Congaree River at Columbia



USGS NWISweb

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

USGS
science for a changing world

National Water Information System: Web Interface

USGS Water Resources

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

Friday, April 08, 2022 09:30ET

USGS

Explanation

- High
- > 90th percentile
- 76th - 90th percentile
- 25th - 75th percentile
- 10th - 24th percentile
- < 10th percentile
- Low
- Not ranked

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 used. The **gray circles** indicate other stations that were not ranked in percentiles either because they have fewer than 30 years of record or because they report parameters other than streamflow. Some stations, for example, measure stage only.



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



USGS National Water Dashboard

USGS National Water Dashboard Overview Layers Legend Tools

Search for a place

Streamflow: Status

- Above flood stage
- All-time high for this day (100th percentile (maximum))
- Much above normal (>90th percentile)
- Above normal (76th – 90th percentile)
- Normal (25th – 75th percentile)
- Below normal (10th – 24th percentile)
- Much below normal (<10th percentile)
- All-time low for this day (0th percentile (minimum))
- Not flowing
- Not ranked
- Measurement flag
- Recent measurement unavailable

Comments: Marker color indicates the current streamflow condition. Categories are based on the percentile of existing streamflow records on this day-of-the-year. A streamgauge is not ranked when there is less than 10 years of record or a current streamflow value is unavailable. Flood stages are maintained by the National Weather Service (NWS) and are not established for all USGS streamgages.

Data Source: [USGS Water Data for the Nation](#)

TIP – Click streamflow stations to access real-time data, time-series graphs, and station information.

<https://dashboard.waterdata.usgs.gov/>

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 U.S. Department of the Interior | DOI Inspector General | White House | E-Gov | USA.gov | No FEAR Act Data | FOIA

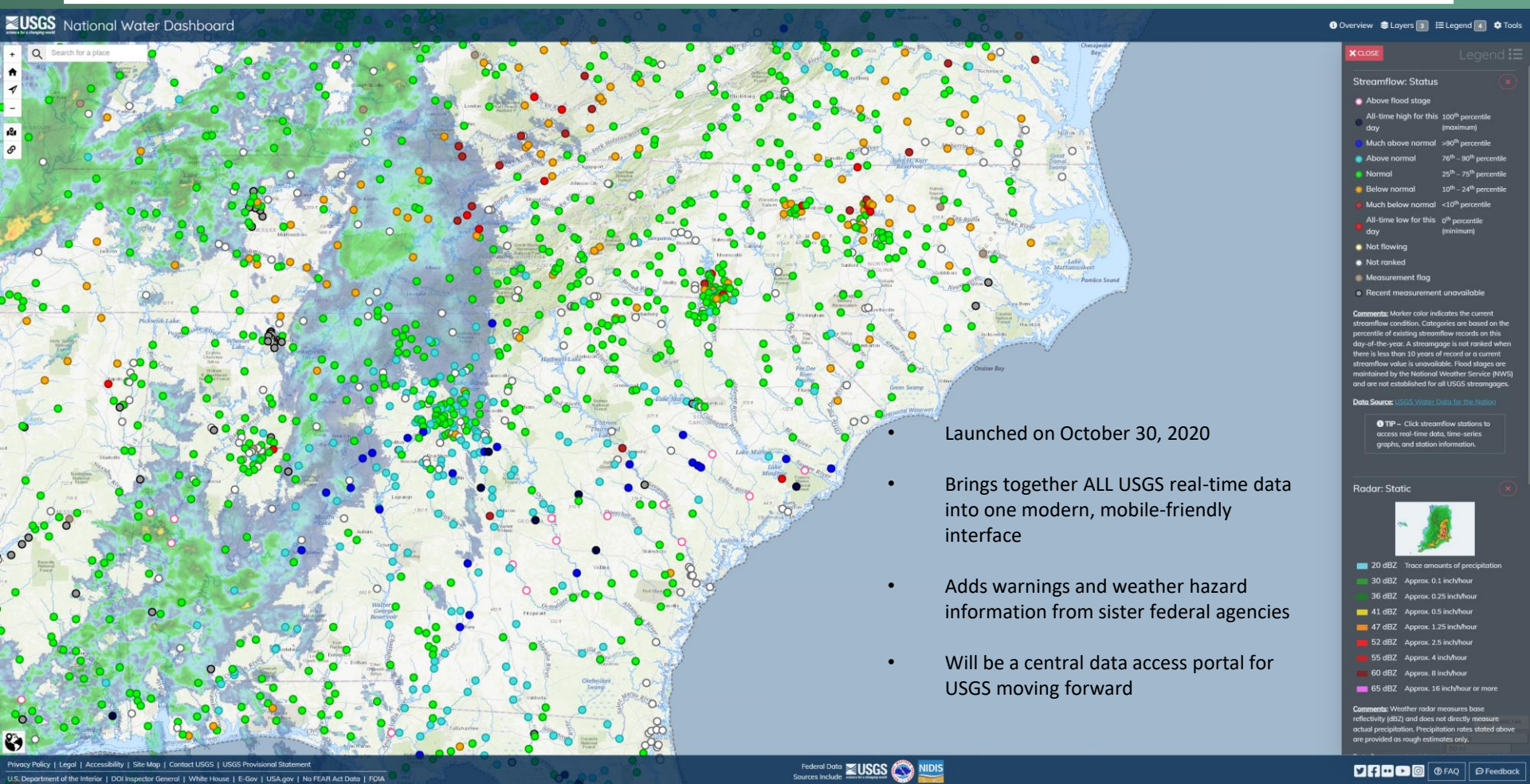
Federal Data Sources Include **USGS** **NIDS**

Facebook Twitter YouTube Instagram FAQ Feedback





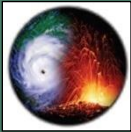
USGS National Water Dashboard



- 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



<https://dashboard.waterdata.usgs.gov/>



USGS WaterWatch



WaterWatch

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[Current Streamflow](#)

[Flood](#)

[Drought](#)

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[Animation](#)

[Toolkit](#)

[Toolkit \(internal\)](#)

[Annual Summaries](#)

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[Additional Information](#)

[About WaterWatch](#)

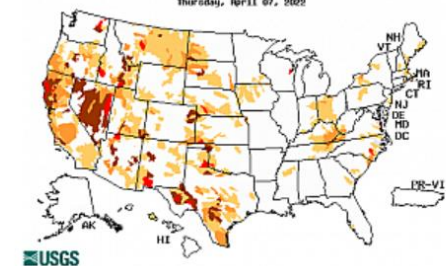
Current Streamflow

Friday, April 08, 2022 13:10ET



Drought

Thursday, April 07, 2022



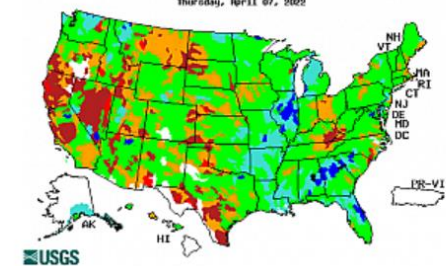
Flood

Friday, April 08, 2022 13:11ET



Past Flow/Runoff

Thursday, April 07, 2022



Search USGS streamgage



<https://waterwatch.usgs.gov/>



USGS WaterWatch

Flood



WaterWatch

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[Data Services](#)

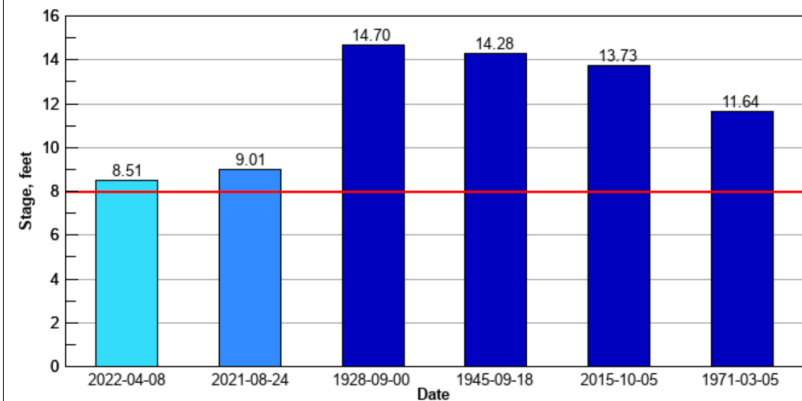
[Additional Information](#)

[About WaterWatch](#)

Flood Tracking Chart Builder

Site Number: Type: Size:

USGS 02173500 NORTH FORK EDISTO RIVER AT ORANGEBURG, SC



- Current Stage 8.51 feet on 2022-04-08 13:00:00 (provisional)
- Recent Maximum Stage (previous 365 days) 9.01 feet on 2021-08-24 (provisional)
- Highest Recorded Peak Stages at Current Datum
- National Weather Service Flood Stage 8 feet



Additional Information

- [USGS real-time streamflow data](#)
- [USGS peak streamflow](#)



<https://waterwatch.usgs.gov/>



USGS WaterWatch

WaterWatch

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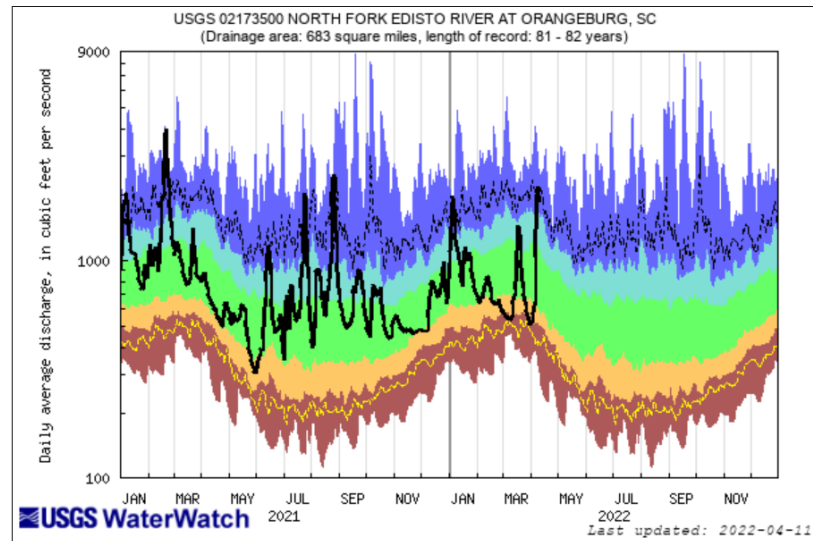
About WaterWatch

USGS Streamflow Duration Hydrograph Builder

Site number Year: No. of years: Year type: GO

Flow: Graph type: Output: Overlay

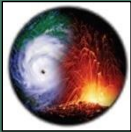
For some streams, flow statistics may have been computed from mixed regulated and unregulated flows; this can affect depictions of flow conditions.



Explanation - Percentile classes						
lowest-10th percentile	5	10-24	25-75	76-90	95 90th percentile -highest	Flow
Much below Normal	Below normal	Normal	Above normal	Much above normal		



<https://waterwatch.usgs.gov/>





USGS WaterQualityWatch

Water-quality data, including:

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

...from more than 2,000 sites.

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WaterQualityWatch -- Continuous Real-Time Water Quality of Surface Water in the United States

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[About USGS WaterQualityWatch](#)

Current RTWQ Maps [Redisplay](#)

State: ▼

Measurement: ▼

[Animate Map](#)

[Site List](#)

[Map of all USGS Water Data](#)

[RTWQ FAQ](#)

[State Links to Surrogates and Reports](#)

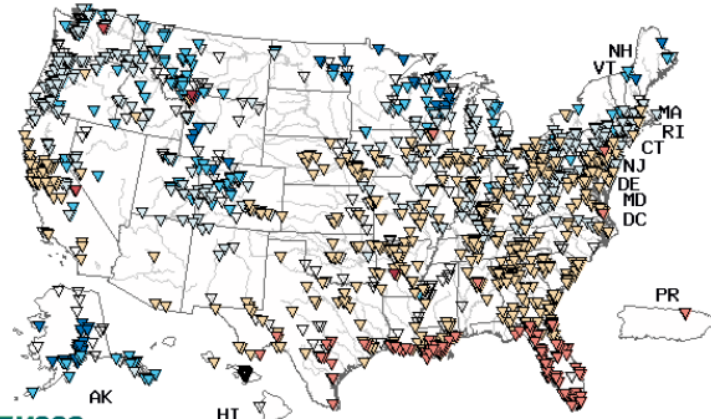
[Technical Resources](#)

[Other Links](#)

[Search USGS Publications](#)

Real-Time Water Temperature, in °C

March 09, 2016 14:30ET



Explanation						
▼	▼	▼	▼	▼	▼	▼*
<1	1-4.9	5-9.9	10-19.9	20-29.9	30-35	>35
No Data						No Data

Temp
Cond
pH
D.O.
Turb
Nitrate
Disch
Surrogates

* Site operated on a seasonal basis or currently is not operating. No values are available for the last 6 hours.

The "Real-time" map tracks short-term changes (over several hours) of water quality. Although the general appearance of the map changes very little from one hour to the next, individual sites may change rapidly in response to major rain events or to reservoir releases. The data used to produce this map are [provisional](#).

Animate national map by current [Month](#), or [last 12 months](#)

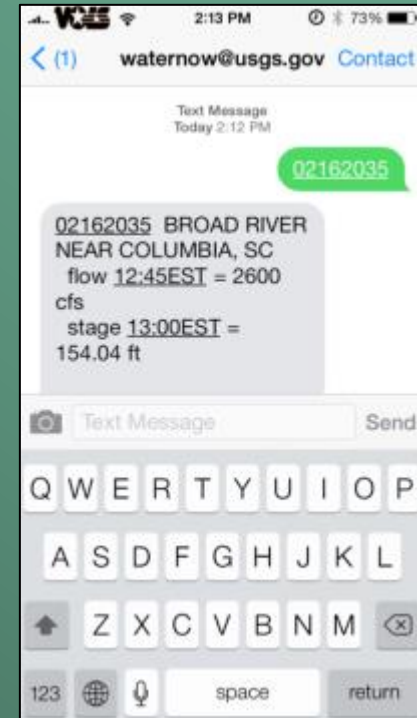
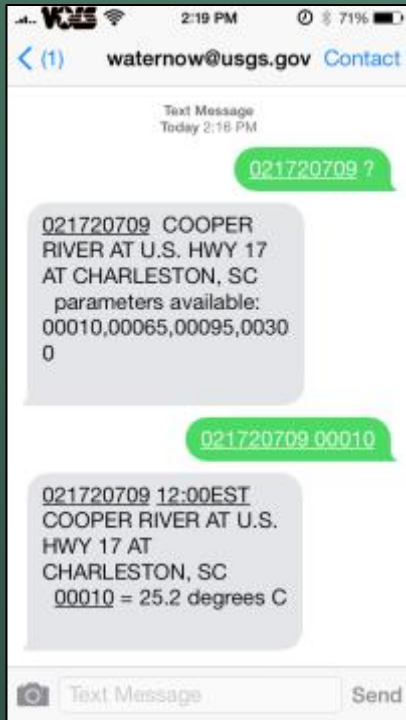
<https://www.usgs.gov/tools/waterqualitywatch>



USGS WaterNow

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

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



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.



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

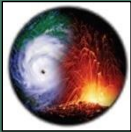
Station Type Low Flow, partial record
 Location Lat 34°57'13", long 81°22'58" referenced to North American Datum of 1927, York County, SC, Hydrologic Unit 03050105, on State Highway 211, 2.5 mi northwest of Sharon, and 3.0 mi southeast of Hickory Grove.

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	Faaster, 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	Zalents, 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 StreamStats

StreamStats is a GIS-based web application



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

Step 5: Your delineation is now clear, edit, or download. Choose a state or regional (if available). Click **continue**

Clear

Edit

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

State/Region Specific F

The following additional statistics are available for South Carolina

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

Statistic	Value	Unit	PIl	PIu	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

Check For Upstream

Download

- GeoJSON
- ShapeFile
- KML

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.

POWERED BY WIM



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





Questions

Toby Feaster
tfeaster@usgs.gov