

U.S. Geological Survey Streamflow Monitoring

Toby D. Feaster, P.E.
September 27, 2022

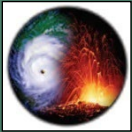
02/28/2013



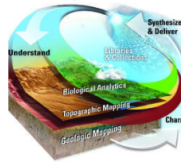
Bureaus & Offices in the U.S. Department of the Interior



- **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**

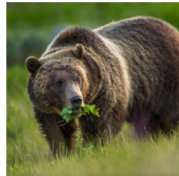


USGS Mission Areas



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.



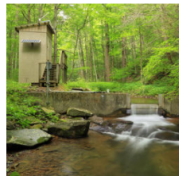
Energy and Minerals

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.



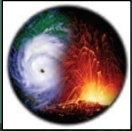
Natural Hazards

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

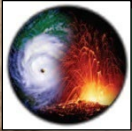
Water information is fundamental to national and local economic well-being, protection of life and property, and effective management of the Nation's water resources.



Water Mission Area

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





USGS National Water Information System (NWIS)

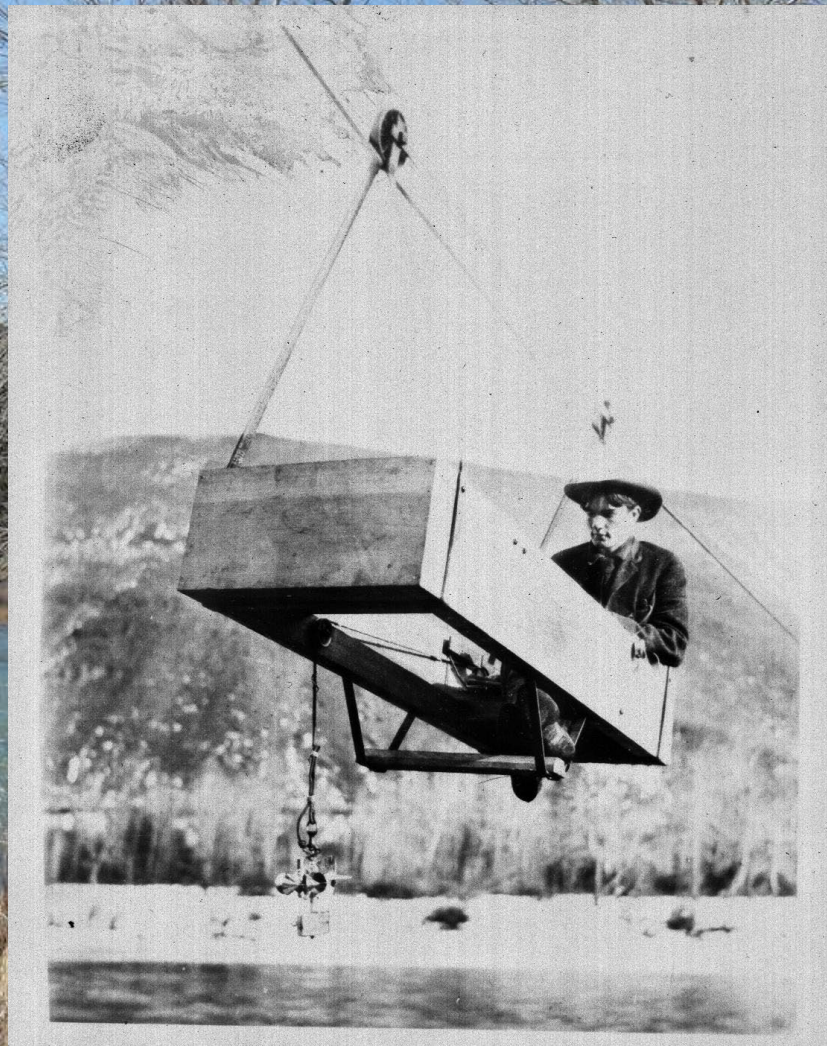
- In the late 1800s, John Wesley Powell, second Director of the USGS, proposed gaging the flow of rivers and streams in the Western United States to evaluate the potential for irrigation.

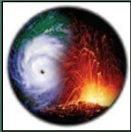


The First USGS Streamgauge on the Rio Grande at Embudo, NM



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





USGS National Water Information System (NWIS)



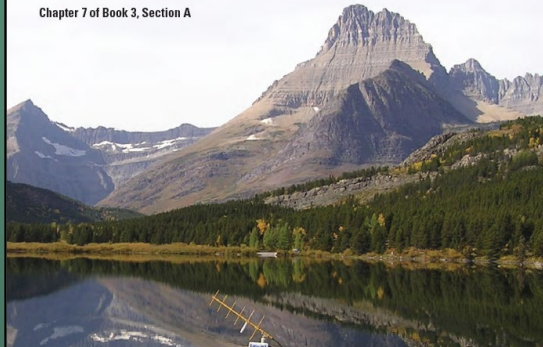
Levels at Gaging Stations

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

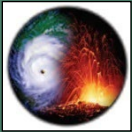
Chapter 22 of
Section A, Surface-Water Techniques
Book 3, Applications of Hydraulics



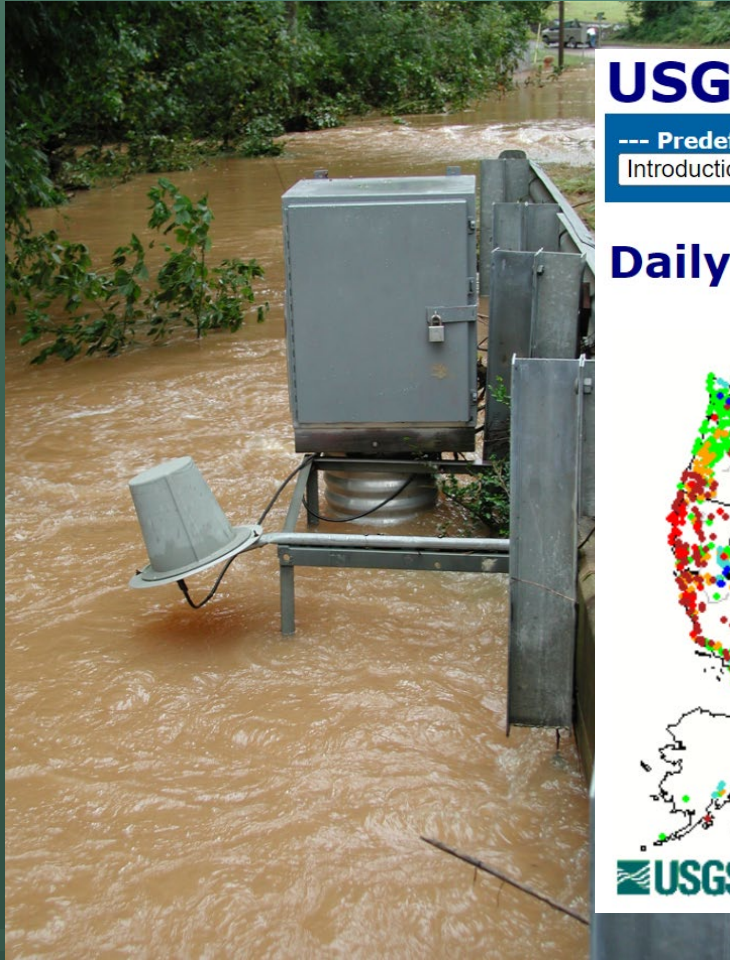
Techniques and Methods 3-A22
Version 2.0, December 2013

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 National Water Information System (NWIS)



USGS Current Water Data for the Nation

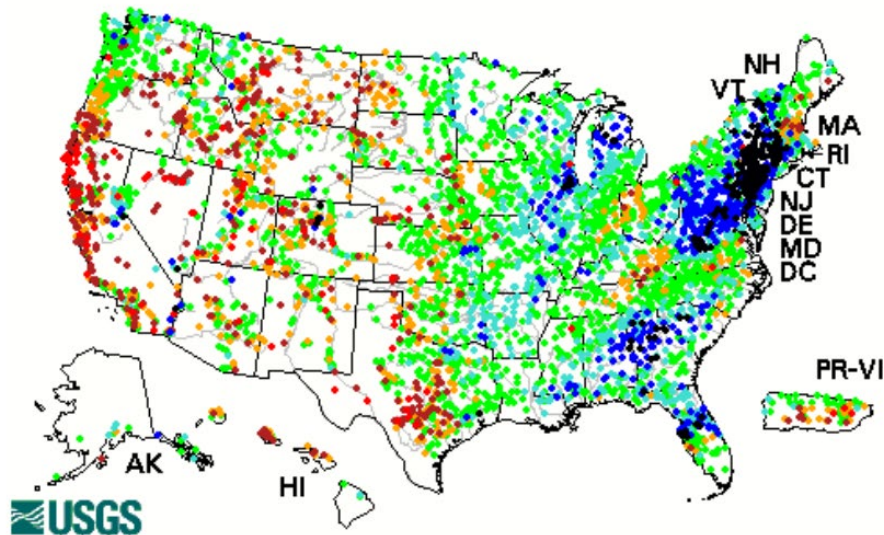
--- Predefined displays ---

Introduction

go

Daily Streamflow Conditions

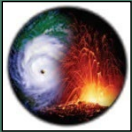
Friday, April 08, 2022 09:30ET



Explanation

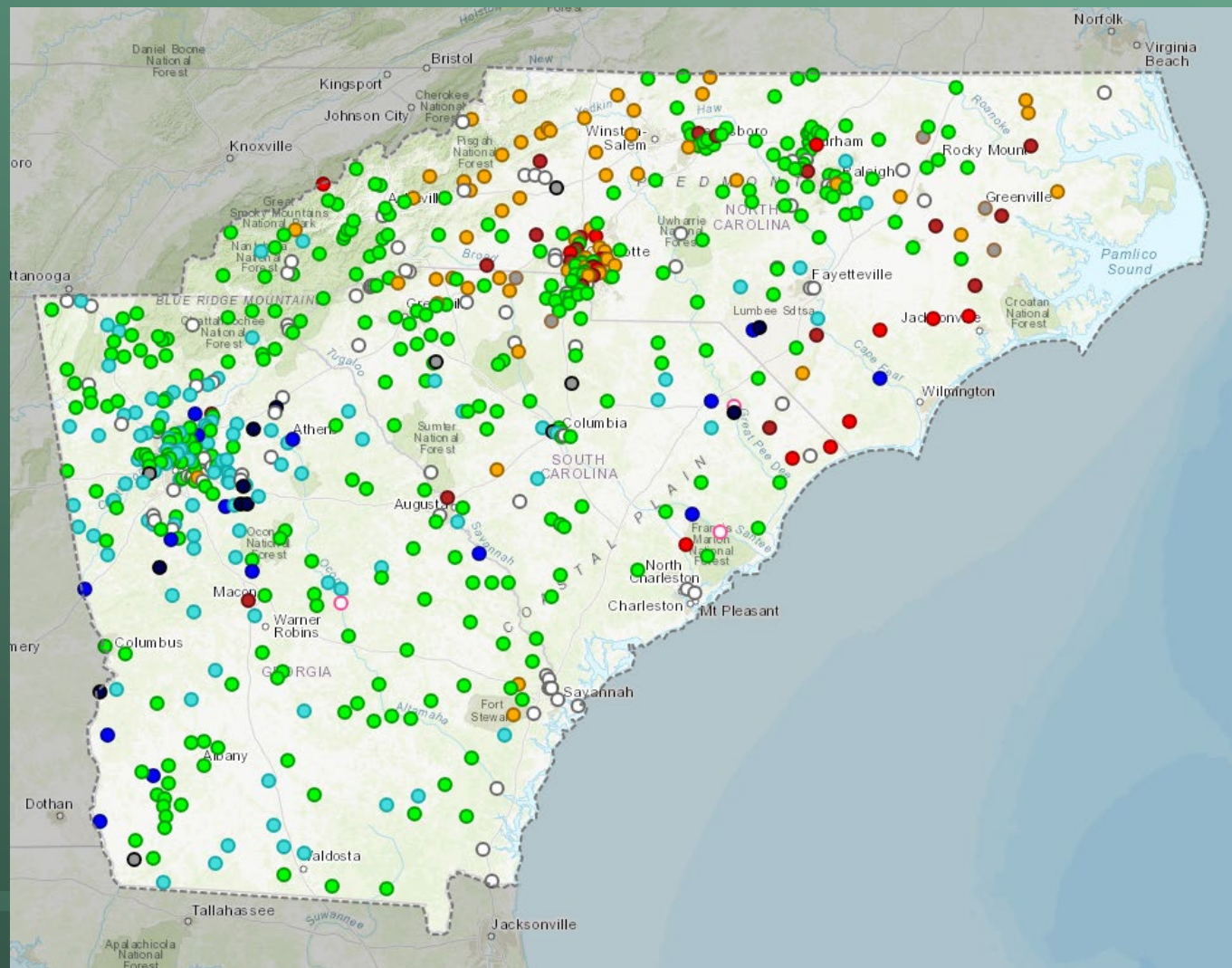
- High
- > 90th percentile
- 76th - 90th percentile
- 25th - 75th percentile
- 10th - 24th percentile
- < 10th percentile
- Low
- Not ranked

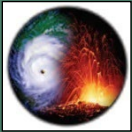




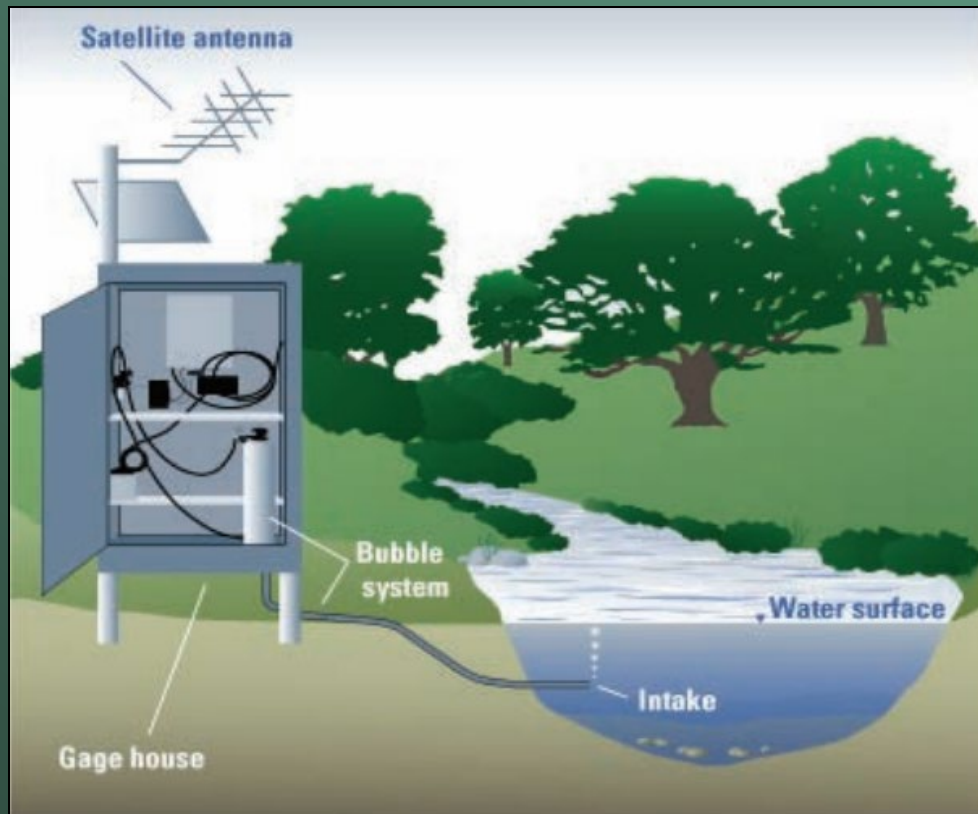
USGS South Atlantic Water Science Center (SAWSC)

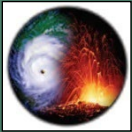
USGS SAWSC
operates
approximately
900 real-time
streamflow
gaging stations
using satellite
telemetry



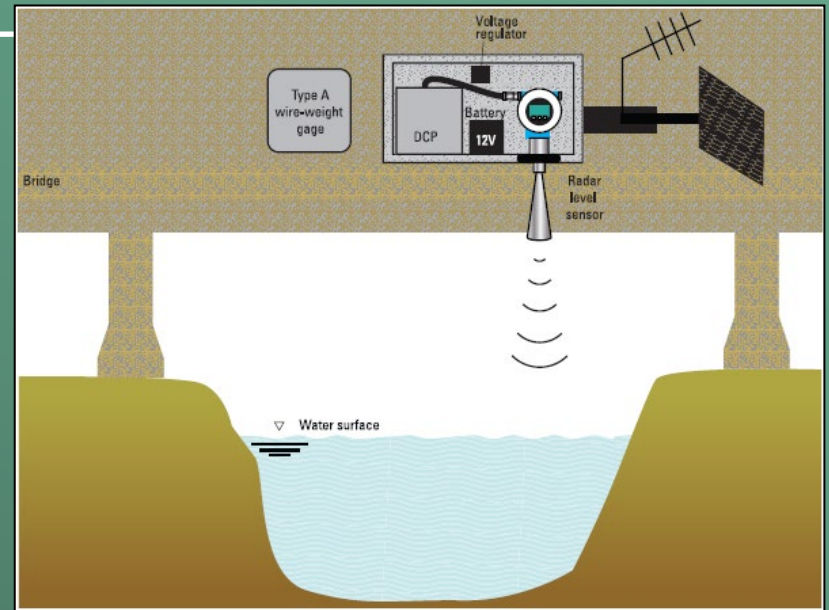


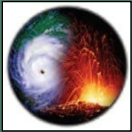
Site Specific Installations: Bubbler/Pressure Sensor





Site Specific Installations: Non-Contact/Radar



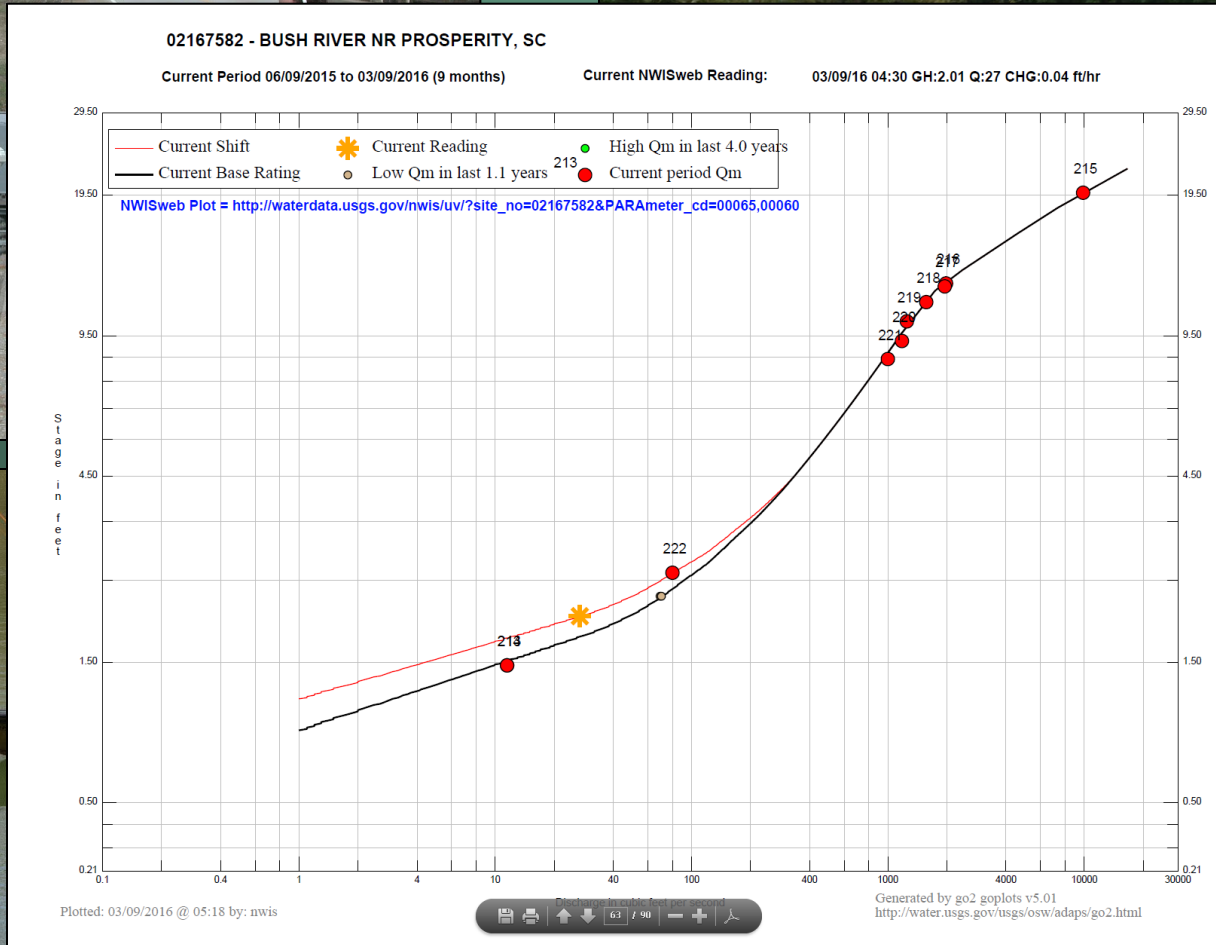


Site Specific Installations: Index Velocity





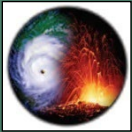
Operation and Maintenance



ey Creek above Huger



02169000 Saluda River near Columbia



Site Specific Installations



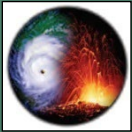
02153525 Broad River below Cherokee Falls



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

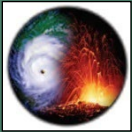
Explanation

- 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.

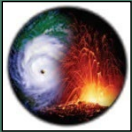
<https://dashboard.waterdata.usgs.gov/>

Privacy Policy | Legal | Accessibility | Site Map | Contact USGS | USGS Provisional Statement
 U.S. Department of the Interior | DOI Inspector General | White House | E-Gov | USA.gov | No FEAR Act Data | FOIA

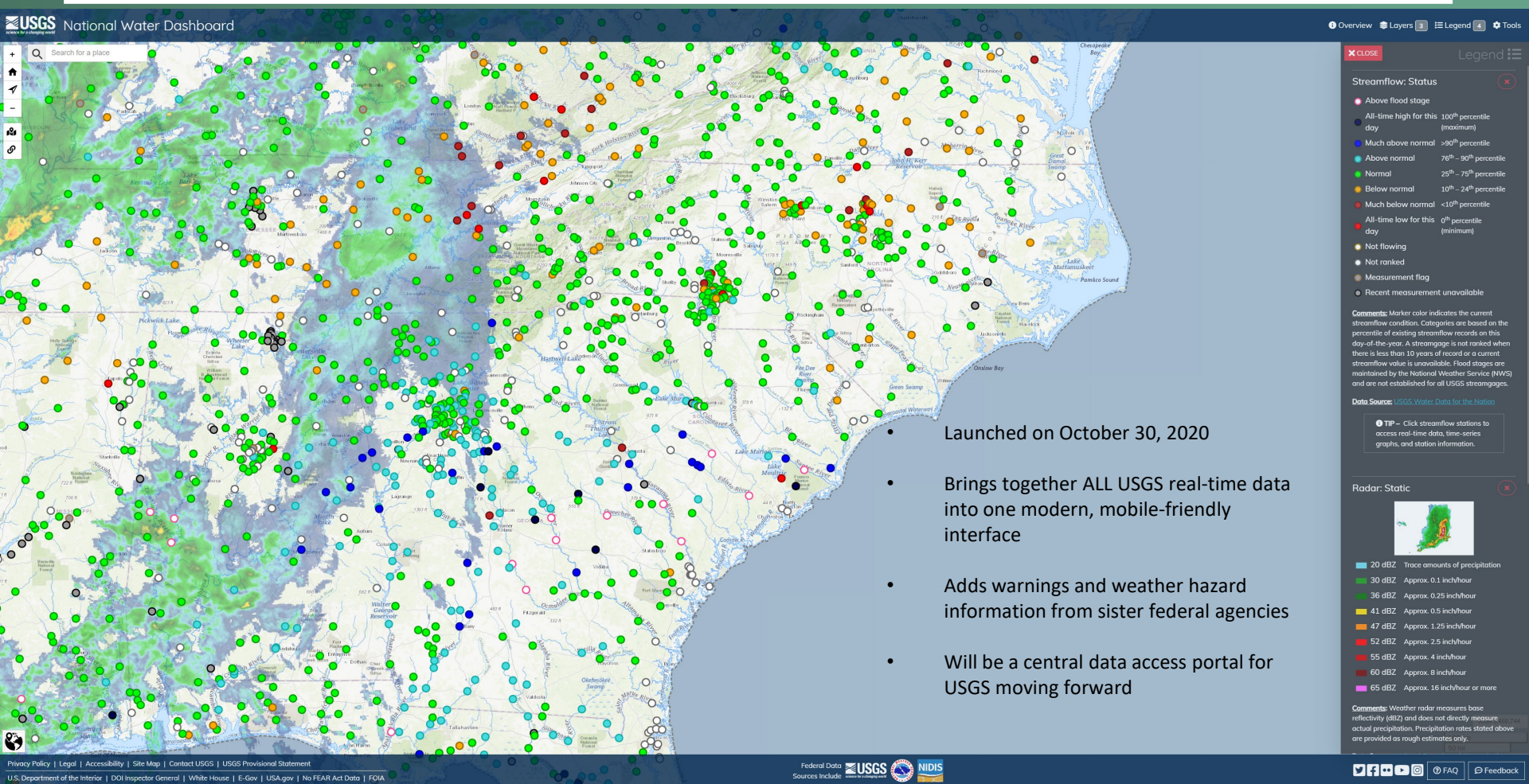
Federal Data Sources Include **USGS** **NIDIS**

Facebook Twitter YouTube Instagram FAQ Feedback





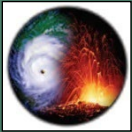
USGS National Water Dashboard



- 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

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

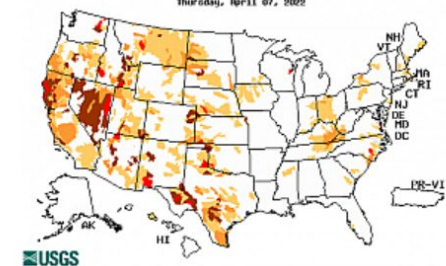
Current Streamflow

Friday, April 08, 2022 13:30ET



Drought

Thursday, April 07, 2022



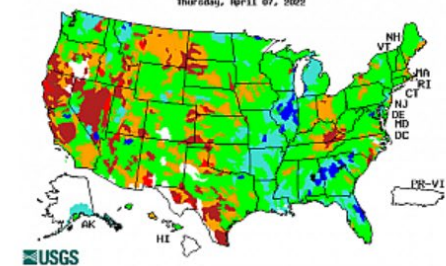
Flood

Friday, April 08, 2022 13:31ET



Past Flow/Runoff

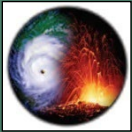
Thursday, April 07, 2022



Search USGS streamgage




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



USGS WaterWatch

Flood

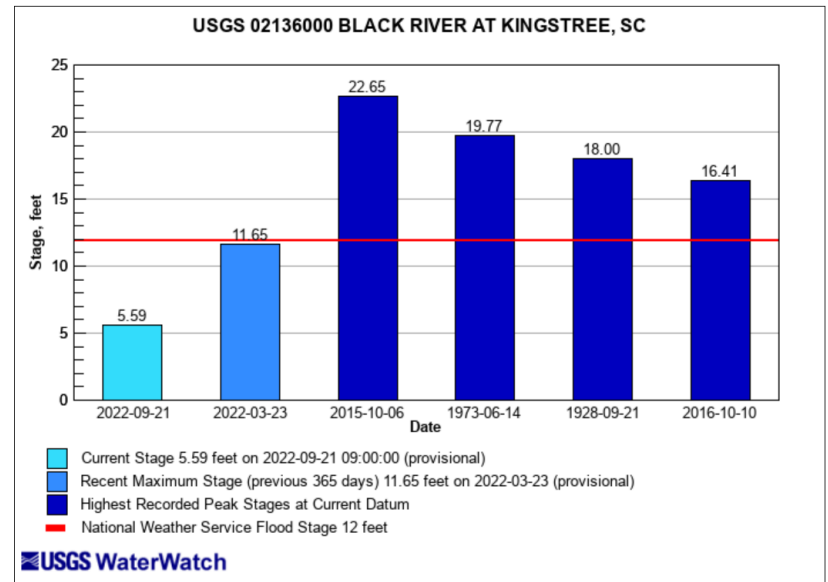

science for a changing world

WaterWatch

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- About WaterWatch

Flood Tracking Chart Builder

Site Number: Type: Size:



Additional Information

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



USGS WaterWatch

WaterWatch

[Home](#)

[Special Features](#)

[Current Streamflow](#)

[Flood](#)

[Drought](#)

[Past Flow/Runoff](#)

[Animation](#)

[Toolkit](#)

[Toolkit \(internal\)](#)

[Annual Summaries](#)

[Data Services](#)

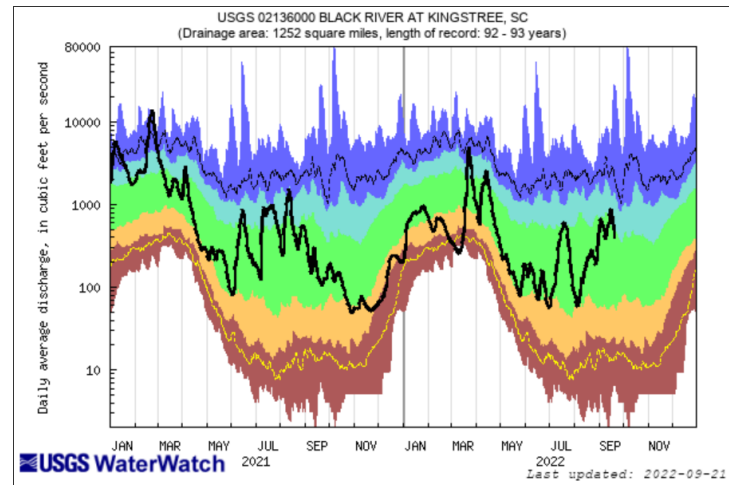
[Additional Information](#)

[About WaterWatch](#)

USGS Streamflow Duration Hydrograph Builder

Site number: 02136000 | Year: 2022 | No. of years: 2 | Year type: Calendar Year | GO
 Flow: Daily | cfs | Graph type: Regular | Output: Hydrograph | Overlay

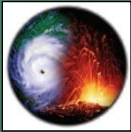
For some streams, flow statistics may have been computed from mixed regulated and unregulated flows; this can affect depictions of flow conditions.



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	

Additional Information

- [USGS daily streamflow data](#)




USGS WaterQualityWatch

Water-quality data, including:

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

...from more than 2,000 sites.



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

Home

About USGS WaterQualityWatch

Current RTWQ Maps

State:

Measurement:

Map of all USGS Water Data

RTWQ FAQ

State Links to Surrogates and Reports

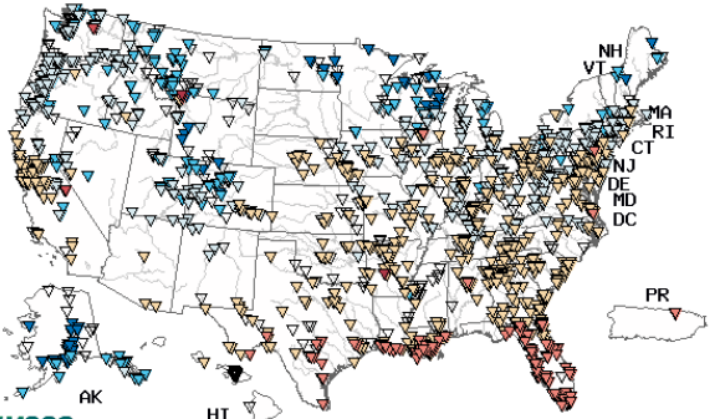
Technical Resources

Other Links

Search USGS Publications

Real-Time Water Temperature, in °C

March 09, 2016 14:30ET



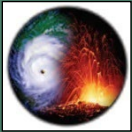
Explanation						
<1	1-4.9	5-9.9	10-19.9	20-29.9	30-35	>35

* 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](#)

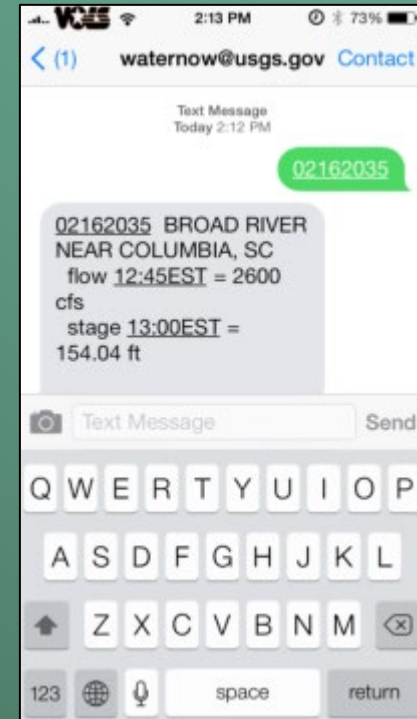
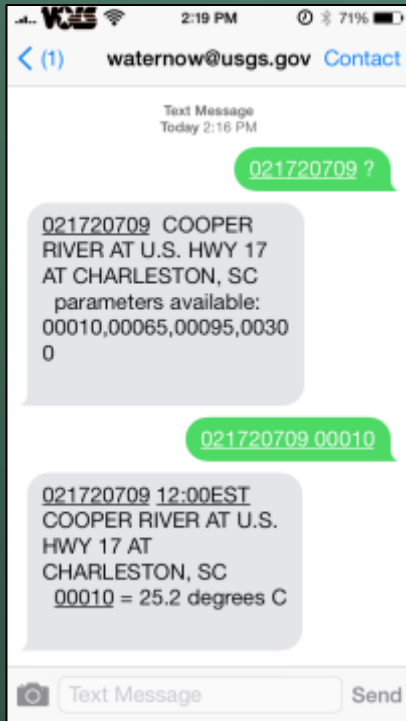




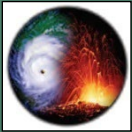
USGS WaterNow

<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

Gage Information

Streamflow Statistics

Filter By Statistic Group: Filter By Citation: Show Only Preferred

Peak-Flow Statistics

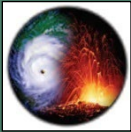
Statistic Name	Value	Units	Preferred?	Years of Record	Standard Error, percent	Citation	Comments
50-percent AEP flood	5400	cubic feet per second	✓			140	
20-percent AEP flood	10600	cubic feet per second	✓			140	
10-percent AEP flood	15200	cubic feet per second	✓			140	
4-percent AEP flood	22300	cubic feet per second	✓			140	
2-percent AEP flood	28600	cubic feet per second	✓			140	
1-percent AEP flood	35900	cubic feet per second	✓			140	
0.5-percent AEP flood	44200	cubic feet per second	✓			140	
0.2-percent AEP flood	56900	cubic feet per second	✓			140	
Regression est 50-percent AEP flo	6130	cubic feet per	✓			140	

Streamflow Statistics

Filter By Statistic Group: Filter By Citation: Show Only Preferred

Peak-Flow Statistics

Record for this site is maintained by the USGS South Carolina Water Science Center
Email questions about this site to [South Carolina Water Science Center Water-Data Inquiries](#)



USGS StreamStats

StreamStats is a GIS-based web application

- Provide streamflow statistics and basin characteristics for user-selected points on ungaged streams.

Step 5: You now clear, choose a st (if available)

State/Reg
The follow available t

USGS Ho
Accessibil

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.83	square miles
I24H50Y	Maximum 24-hour precipitation that occurs on average once in 50 years	7.9	inches
LC06IMP	Percentage of impervious area determined from NLCD 2006 impervious dataset	1.14	percent
PCTREG1	Percentage of drainage area located in Region 1 - Piedmont / Ridge and Valley	0	percent
PCTREG2	Percentage of drainage area located in Region 2 - Blue Ridge	0	percent
PCTREG3	Percentage of drainage area located in Region 3 - Sandhills	0	percent
PCTREG4	Percentage of drainage area located in Region 4 - Coastal Plains	100	percent
PCTREG5	Percentage of drainage area located in Region 5 - Lower Tifton Uplands	0	percent

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Region 4 rural under 1 sqmi 2014 5030]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.83	square miles	0.1	1
LC06IMP	Percent Impervious NLCD2006	1.14	percent	0.2	34.8
I24H50Y	24 Hour 50 Year Precipitation	7.9	inches	6.51	10.9

Peak-Flow Statistics Flow Report [Region 4 rural under 1 sqmi 2014 5030]

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

Statistic	Value	Unit	PII	PIu	ASEP
50-percent AEP flood	62.9	ft ³ /s	28.9	137	40.8
20-percent AEP flood	117	ft ³ /s	57.6	238	36.9
10-percent AEP flood	160	ft ³ /s	79.9	320	36.7
4-percent AEP flood	222	ft ³ /s	107	459	38.2
2-percent AEP flood	272	ft ³ /s	127	581	40.2
1-percent AEP flood	326	ft ³ /s	147	725	42.7
0.5-percent AEP flood	386	ft ³ /s	165	905	45.4
0.2-percent AEP flood	466	ft ³ /s	185	1180	49.9

Peak-Flow Statistics Citations

[Feaster, T.D., Gotvald, A.J., and Weaver, J.C., 2014, Methods for estimating the magnitude and frequency of floods for urban and small, rural streams in Georgia, South Carolina, and North Carolina, 2011 \(ver. 1.1, March 2014\): U.S. Geological Survey Scientific Investigations Report 2014-5030, 104 p.](#)

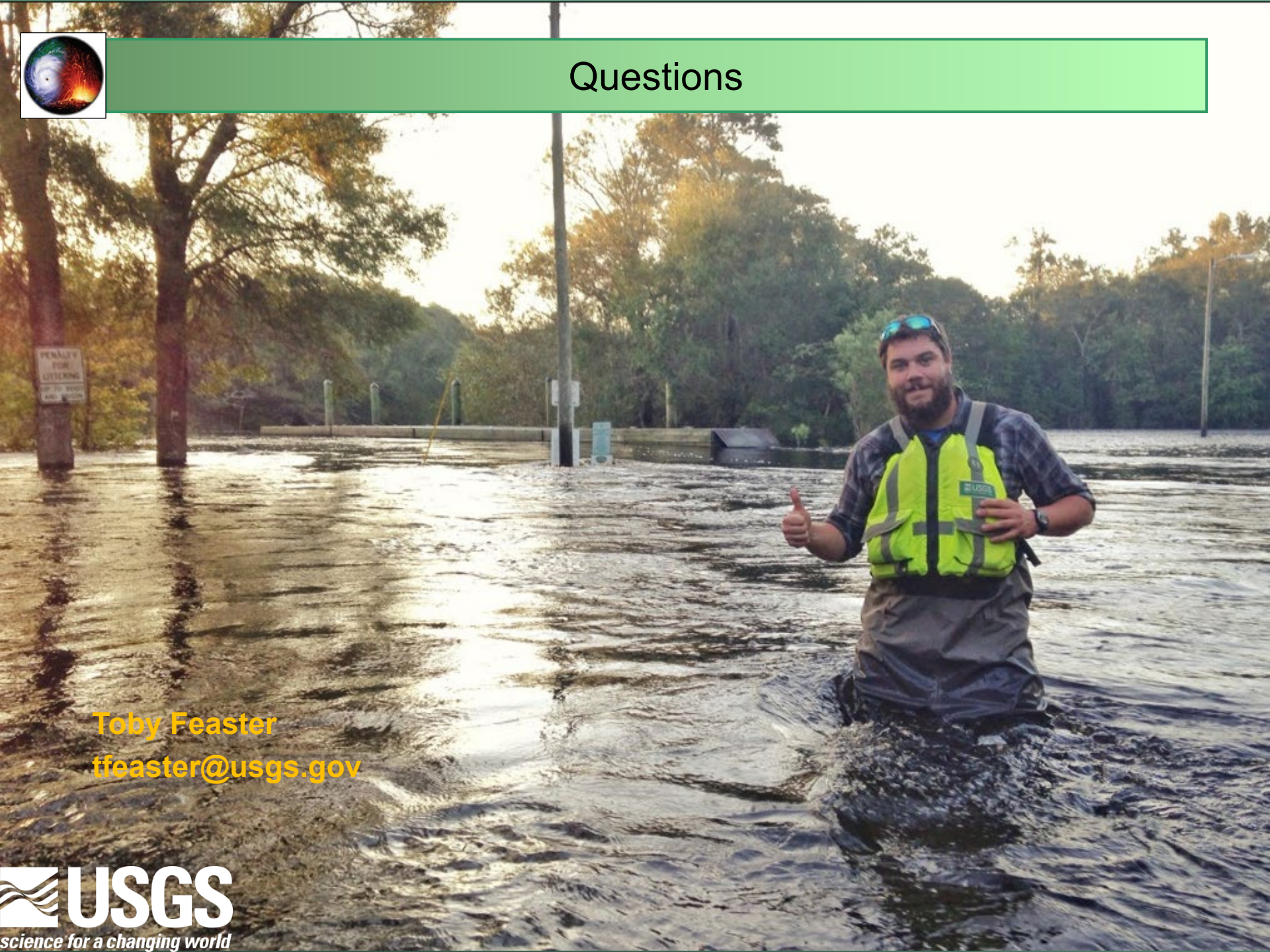
LC11FOREST Percentage of forest from NLCD 2011 classes 41-43

27.4 percent





Questions



Toby Feaster
tfeaster@usgs.gov