

The USGS Streamgaging Program and Related Activities



Rio Grande at Embudo, NM 1889

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USGS National Streamgaging Program

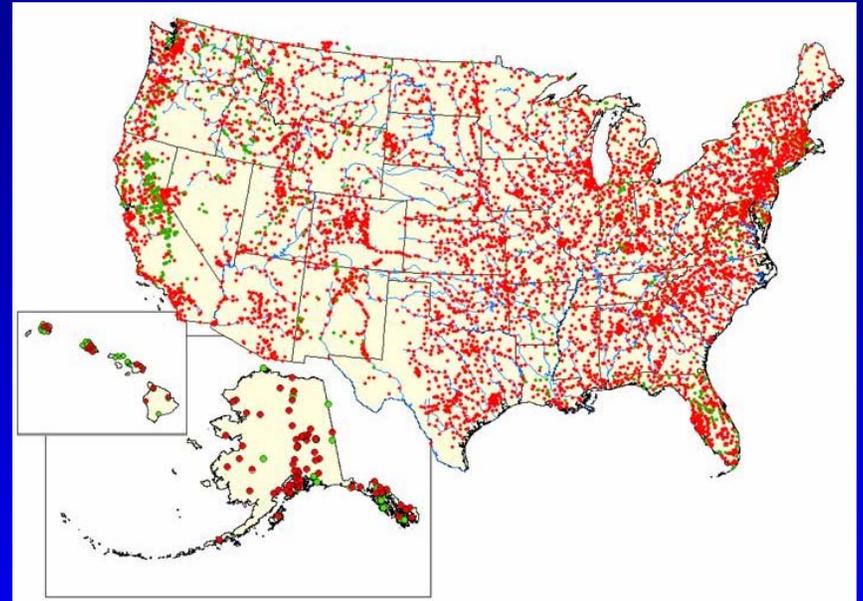
Streamgauge Network

7,500 streamgages

97 % real-time

\$136.6M per year

850+ Cooperators



Funding Sources (2008)

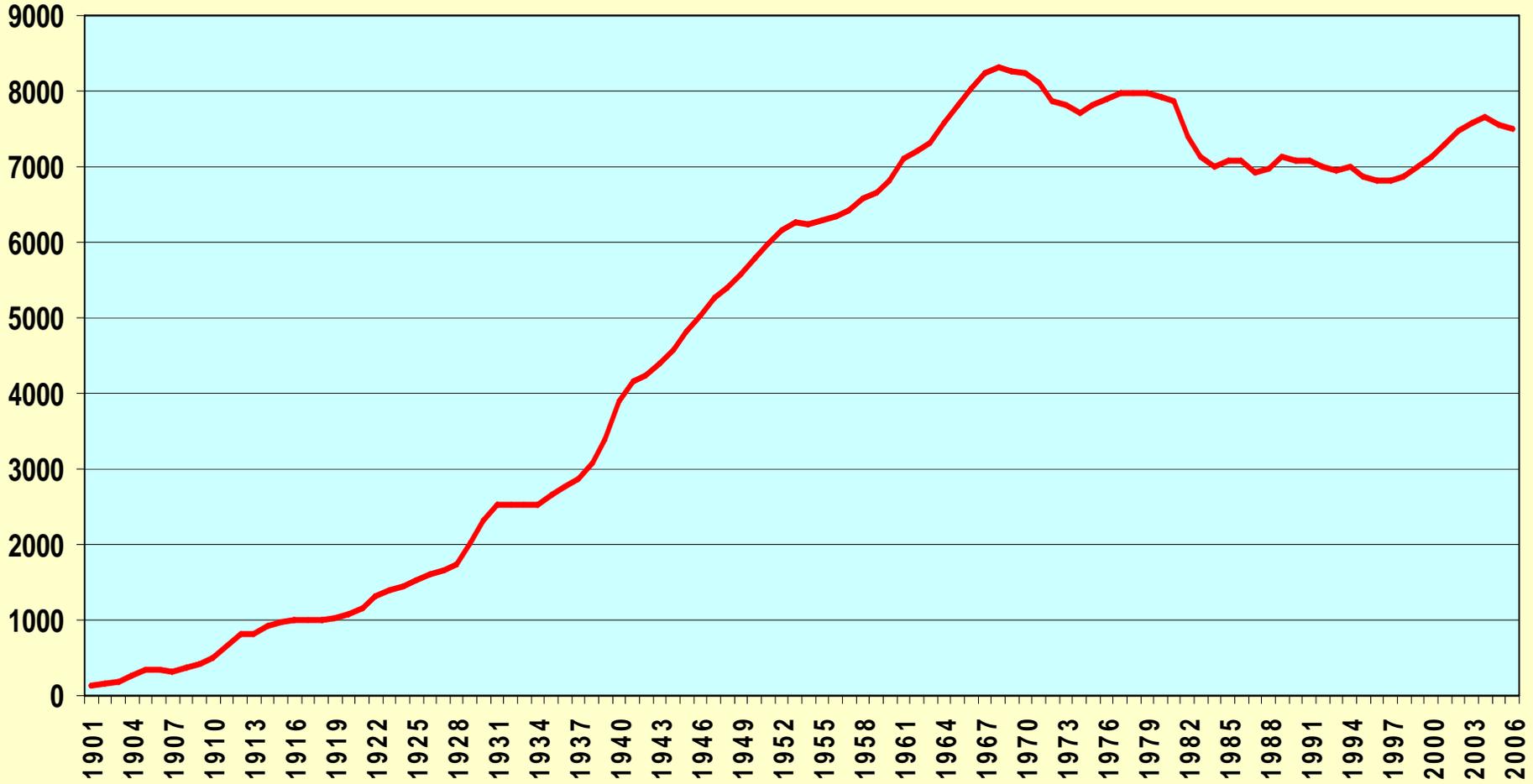
State / Local agencies (\$63.8M) 46%

Other Federal agencies (\$28.5M) 21%

USGS Cooperative Water Program (\$24.2M) 18%

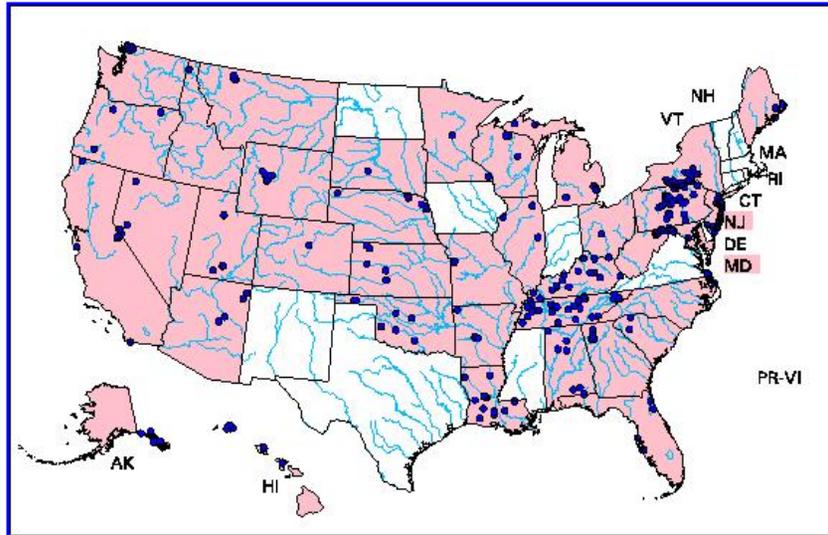
USGS NSIP (\$20.1M) 15%

Number of Active USGS Streamgages 1901 - 2006



USGS Nationwide List of Threatened Streamgages

The following streamgages have been discontinued or are being considered for discontinuation or for conversion from continuous record discharge to stage-only streamgages due to the lack of funding to support the continued operation of the streamgages. Funds for these streamgages are from the U.S. Geological Survey and other Federal agencies. For streamgages that have already been discontinued, extensive efforts were made to find another funding source; however, when no funding was made available the streamgages were discontinued. For those streamgages at risk for discontinuation, the current funding source has indicated that it can no longer fund the streamgage. Efforts are currently underway to secure funding for the operation of these streamgages; however, if no funding is identified, then these streamgages will have to be discontinued also. If you have questions about specific streamgages, please contact the individual identified for each State. If you have questions about the US Geological Survey National Streamflow Information Program in general please contact mnorris@usgs.gov or Steve Blanchard (703-648-5629; sfblanch@usgs.gov).



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- [Pennsylvania](#)
- [South Carolina](#)
- [South Dakota](#)
- [Tennessee](#)
- [Utah](#)
- [Washington](#)
- [Wisconsin](#)
- [Wyoming](#)

Click on a State to see State map.

Pennsylvania

If you have questions about specific streamgages or would like additional information, please contact Bob Hainly (717-730-6971, rahainly@usgs.gov).

Gage Number	Stream Gage Name	Length of Record	Comment
01516350	Tioga River near Mansfield, PA	33 years	May be discontinued October 1, 2008 due to funding reductions from partner agencies.
01518000	Tioga River at Tioga, PA	71 years	May be discontinued October 1, 2008 due to funding reductions from partner agencies.
01518420	Crooked Creek at Middlebury Center, PA	23 years	May be discontinued October 1, 2008 due to funding reductions from partner agencies.
01519200	Cowanesque River at Elkland, PA	28 years	May be discontinued October 1, 2008 due to funding reductions from partner agencies.
01520000	Cowanesque River near Lawrenceville, PA	58 years	May be discontinued October 1, 2008 due to funding reductions from partner agencies.
01531500	Susquehanna River near Towanda, PA	96 years	May be discontinued October 1, 2008 due to funding reductions from partner agencies.
01534300	Lakawanna River near Forest City, PA	51 years	May be discontinued October 1, 2008 due to funding reductions from partner agencies.
01536500	Susquehanna River at Wilkes-Barre, PA	110 years	May be discontinued October 1, 2008 due to funding reductions from partner agencies.
01540500	Susquehanna River at Danville, PA	104 years	May be discontinued October 1, 2008 due to funding reductions from partner agencies.
01541000	West Branch Susquehanna River at Bower, PA	96 years	May be discontinued October 1, 2008 due to funding reductions from partner agencies.
01541200	West Branch Susquehanna River near Curwensville, PA	54 years	May be discontinued October 1, 2008 due to funding reductions from partner agencies.
01541500	Clearfiled Creek at Dimeling, PA	96 years	May be discontinued October 1, 2008 due to funding reductions from partner agencies.
01542500	West Branch Susquehanna River at Karthaus, PA	59 years	May be discontinued October 1, 2008 due to funding reductions from partner agencies.

National Streamflow Information Program

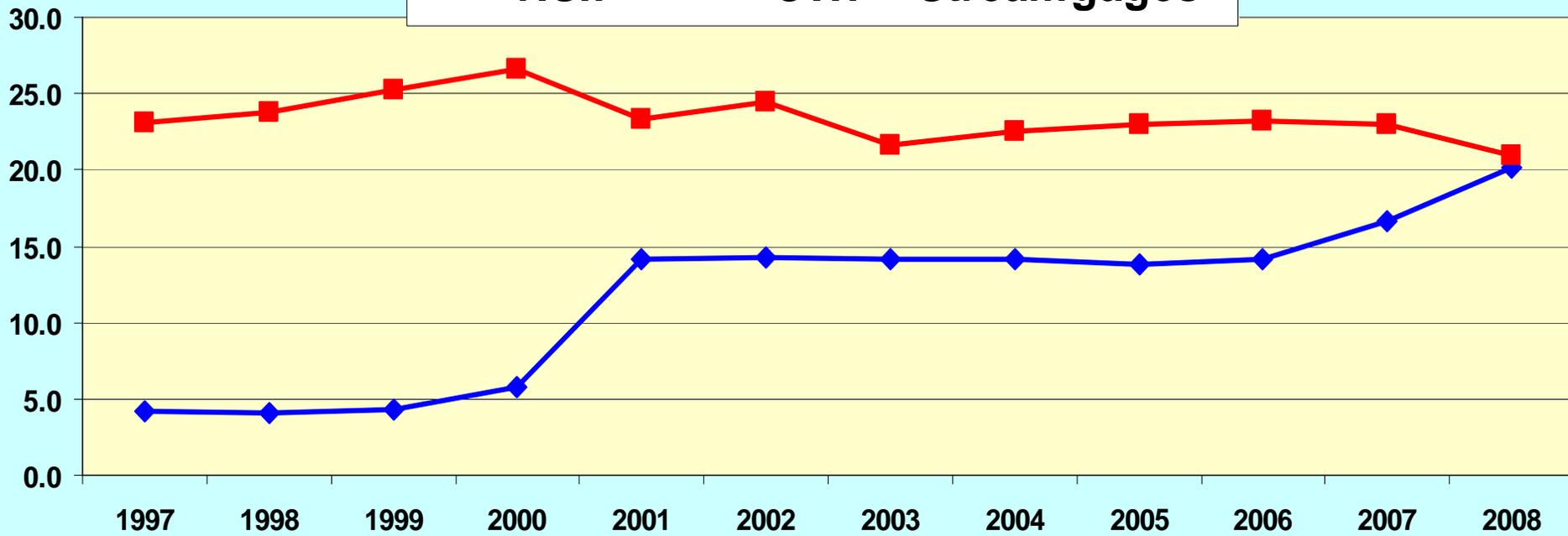
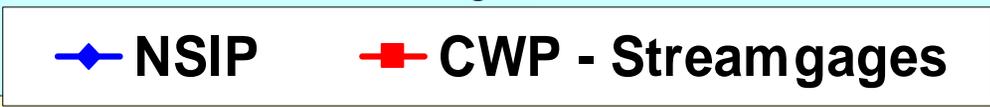
Designed by USGS in Response to Stakeholder & Congressional Concerns

- 1. Enhance network – 4,400 gage backbone**
- 2. Intensify monitoring of floods & droughts**
- 3. Assess regional characteristics and streamflow trends**
- 4. Improve information delivery and reliability**
- 5. Improve gaging methods - research**

USGS Federal Funding for Streamgages

1997 - 2008

Full NSIP Funding = \$108M/Year



FY09 Appropriations

- **FY08 National Streamflow Information Program (NSIP) enacted \$20.16 M**
 - > \$1.368 M one time congressional add
- FY09 Presidents Budget Request \$23.812 M
 - > + \$5 M above FY08 Water for American Initiative
 - <http://water.usgs.gov/wsi/>
 - \$2.0 M for High Data Rate DCPs
 - \$725K Reactivate 50 discontinued NSIP gages
 - \$2.275 M for regional water census studies
- **FY09 Enacted**
 - > \$22.4M +\$2M to the field to directly support gages
- **FY10 Looks promising**

Stakeholder Support for the Streamgaging Network

ICWP Interstate Council on Water Policy

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Streamgaging Funding
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Streamgaging Funding

In March 2005, a group of 26 representatives of the 1400+ cooperating agencies met with USGS officials to discuss the progress and capabilities of the USGS Cooperative Water Program and National Streamflow Information Program. One of the results of this groundbreaking meeting was a clear recognition that, among the non-federal Cooperators, we share a strong concern that restoring federal funding to match the non-federal share 50:50 is essential if we are going to assure sufficient science to plan for and avoid the most damaging impacts of future floods, droughts and violent storms and to protect water quality, wildlife and the ecosystems associated with our lakes, rivers, streams and wetlands.

WE NEED YOUR HELP! We will focus on key Congressional Committee members, of course, but we want your help now to inform all 435 Members of the House of Representatives and all 100 Senators in the process. When the Congress reviews the President's proposed budget next spring (announcement expected the first week in February 2006), we intend to demonstrate the powerful assistance that these relatively inexpensive streamgaging programs provide in all 50 states based on the great benefits that so many communities derive and the risks that recent funding limits are causing.

OVERVIEW: Water supply and flood protection issues are becoming increasingly important as pressure on existing supplies and land use along our rivers continues to grow. Increasing population and recurrent drought in many areas, combined with increasing demand for water for recreation, scenic value, and to meet fish and wildlife needs, have resulted in conflicts throughout the country. Streamflow and groundwater measurements are essential to intelligent water resource and community planning decisions, affecting countless lives and the economy in all 50 states.

With the monitoring, prediction and prevention programs that we currently have in place, on average, we suffer between \$6B - \$8B in damage and loss due to drought every year in the US, primarily in our agriculture, transportation, recreation and tourism, forestry, and energy sectors. Flooding is estimated, on average, to cause another \$4B - \$6B in damage and loss each year despite our best efforts with the available science. These cost estimates don't take into account a long list of social and environmental losses, but they demonstrate the importance of maintaining our data collection networks.

The future value of this crucial information, collected at over 7000 streamgaging stations and monitoring wells operated by the US Geological Survey (USGS), is threatened by federal, state and local budget limitations. These measurements are

ICWP National Water Policy Charter (.pdf) [click here](#)

Chako John, President
Association of American State Geologists

Lori Spragens, Executive Director
Association of State Dam Safety Official

Al Goodman, President
Association of State Floodplain Managers

Linda Eichmiller, Executive Director
Association of State & Interstate Water Pollution Control Administrators

Katherine Andrews, Executive Director
Coastal States Organization

James H. Steele Jr, Tribal Council Chairman
Confederated Salish & Kootenai Tribes

Carol R. Collier, Executive Director
Delaware River Basin Commission

Roger L. Gauthier, Interim Executive Director
Great Lakes Observing System

John Seebach, Chair
Hydropower Reform Coalition

Hal Beecher, President
Instream Flow Council

Sue Lowry, Chair
Interstate Council on Water Policy

Deborah Hamlin, Executive Director
Irrigation Association

Derek Guthrie, President
National Association of Flood and Stormwater Management Agencies

John M. Johnson, Executive Director
National Association of State Boating Law Administrators

Streamgaging Fact Sheets

U.S. Geological Survey Streamgaging

...from the National Streamflow Information Program

This Fact Sheet is one in a series that Streamflow Information Program (NSIP) nationally consistent streamgaging n quality assurance, management, arch information that is readily accessible



From the River to You: USGS Real-Time Streamflow Information

...from the National Streamflow Information Program

This Fact Sheet is one in a series that highlights in Streamflow Information Program (NSIP). The invest sistant streamgaging network with stable long-tem ment, archiving, and synthesis. NSIP produces mul

Introduction

As part of the National Stream flow Information Program, the U.S. Geological Survey (USGS) operat more than 7,400 streamgages nat wide to provide streamflow infor tion for a wide variety of uses. Th uses include prediction of floods, management and allocation of wa resources, design and operation of engineering structures, scientific research, operation of locks and dams, and recreational safety and enjoyment. These streamgages are operated by the USGS, in partnerships with more than 800 Federal, State, Tribal, and local cooperating agencies. In 2007, about 91 percent of these streamgages electronically record and transmit streamflow information to the World Wide Web in near real-time (<http://waterdata.usgs.gov/twini>). Most of these streamgages transmit the information by satellite, although telephone and radio telemetry also are used in some streamgages.

The purpose of this report is to describe how the USGS obtains streamflow information. Streamgaging generally involves (1) obtaining a continuous record of stage—the height of the water surface at a location along a stream or river, (2) obtaining periodic measurements of discharge (the quantity of water passing a location along a stream), (3) defining the natural but often changing relation between the stage and discharge, and (4) using the stage-

Collecting and delivering stream flow information from the stream to the World Wide Web in real time by satellite involves numerous steps and the simultaneous activities of a large army of computer hardware and software. These processes wo together to ensure the prompt deliv of streamflow information to man diverse users.

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Recent Improvements to the U.S. Geological Survey Streamgaging Program

This Fact Sheet is one in a series that highlights in Streamflow Information Program (NSIP). The invest sistant streamgaging network with stable long-tem ment, archiving, and synthesis. NSIP produces mul

Introduction

The U.S. Geological Survey (USGS) established its first streamgaging in 1859 on the Rio Grande River at Embudo, N.M. As the need for stream-flow information increased, the USGS streamgaging network expanded to its current (2007) size of approximately 7,400 streamgages nationwide.

The USGS streamgaging network, for most of its history, required mechanical measuring and recording devices to collect station data. Time-consuming and labor-intensive site visits were required to gather the recorded data for processing in the office. Eventually the data were published in paper reports. The USGS has progressively improved the streamgaging program by incorporating new technologies and techniques that streamline data collection, data delivery, and records processing while increasing the number and quality of product types that can be derived from the data. Improvements in recent decades that have expanded and broadened the streamgaging program are highlighted below.

Streamflow Data Collection and Processing

Streamgaging generally involves (1) obtaining a continuous record of stage (height of water), (2) obtaining periodic measurements of discharge, (3) defining the relation between the stage and the discharge, (4) using the stage-discharge relation to convert the continuous record of stage into a record of discharge, and (5) disseminating the streamflow information to a multitude of users, including water managers, scientists, engineers, and the general public.

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Figure 1
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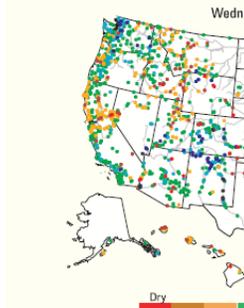


WaterWatch—Maps, Graphs, and Tables of Current, Recent, and Past Streamflow Conditions

WaterWatch (<http://water.usgs.gov/waterwatch/>) is U.S. Geological Survey (USGS) World Wide Web site t displays maps, graphs, and tables describing real-time, rec past streamflow conditions for the United States. The r information generally is updated on an hourly basis. We provides streamgage-based maps that

- Show the location of more than 3,000 long-term (or more) USGS streamgages;
- Use colors to represent streamflow conditions or historical streamflow;
- Feature a point-and-click interface allowing users review graphs of stream stage (water elevation) a flow; and
- Highlight locations where extreme hydrologic eve as floods and droughts, are occurring.

The streamgage-based maps show streamflow con for real-time, average daily, and 7-day average streamf real-time streamflow maps highlight flood and high flo



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National Streamflow Information Program Implementation Status Report

...from the National Streamflow Information Program

This Fact Sheet is one in a series that highlights information National Streamflow Information Program (NSIP). The invest sistant streamgaging network with stable long-tem ment, archiving, and synthesis. NSIP produces mul

Introduction

The U.S. Geological Survey (USGS) 7,500 streamgages designed to provide information to meet the multiple needs users. The National Streamflow Informal to Congressional and stakeholder conce streamgages, including a disproportionate (2) the inability of the USGS to contin reduced funding through partnerships; a due to emerging resource-management i mission is to provide the streamflow inf regional, state, and local needs.

Most of the existing streamgages at Federal, state, tribal, and local agencies, to the World Wide Web in near-real time whereas some lags by about 4 hours). IT is used for many purposes:

- In water-resource appraisals and how it being allocated;
- To provide streamflow informab decrees;
- For engineering design of reserv
- For the operation of reservoirs, t and power production;
- To identify changes in streamflo climate;
- For streamflow forecasting, floo
- To support water-quality prograr fluxes; and
- For characterizing and evaluatir stream-flow requirements; and

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Acoustic Doppler Current Profiler Applications Used in Rivers and Estuaries by the U.S. Geological Survey

The U.S. Geological Survey (USGS) has collected streamflow information for the Nation's streams since 1859. Streamflow information is used to predict floods, manage and allocate water resources, design engineering structures, compute water-quality loads, and operate water-control structures. The current (2007) size of the USGS streamgaging network is over 7,400 streamgages nationwide. The USGS has progressively improved the streamgaging program by incorporating new technologies and techniques that streamline data collection while increasing the quality of the streamflow data that are collected. The single greatest change in streamflow measurement technology during the last 100 years has been the development and application of high frequency acoustic instruments for measuring streamflow. One such instrument, the acoustic Doppler current profiler (ADCP), is rapidly replacing traditional mechanical current meters for streamflow measurement (Munne and others, 2007). For more information on how an ADCP works see Simpson (2001) or visit <http://www.nauticadp.org/>.

The USGS has used ADCPs attached to manned or tethered boats since the mid-1990s to measure streamflow in a wide variety of conditions (fig. 1). Recent analyses have shown that ADCP streamflow measurements can be made with similar or greater accuracy, efficiency, and resolution than measurements made using conventional current-meter methods (Oberg and Mueller, 2007). ADCPs also have the ability to measure streamflow in streams where traditional current-meter measurements previously were very difficult or costly to obtain, such as streams affected by backwater or tides.

In addition to streamflow measurements, the USGS also uses ADCPs for other hydrologic measurements and applications, such as computing continuous records of streamflow for daily or backwater affected streams, measuring velocity

fields with high spatial and temporal resolution, and estimating suspended-sediment concentrations. An overview of these applications is provided below.

Streamflow Measurements

The first attempt to use an ADCP to measure streamflow was made in 1982 on the Mississippi River by Christensen and Herdick (1982) as part of work contracted for the USGS. In 1985, the USGS purchased an ADCP and developed software for making streamflow measurements (Simpson, 2001). Since then, ADCPs have proven to be useful tools for measuring streamflow throughout the country. For many measurement conditions, the ADCP samples more of the flow (spatially), as compared to traditional mechanical current-meter measurements, resulting in more detailed streamflow information. Typically, it takes 45–60 minutes to make a mechanical current-meter streamflow measurement using the two-point method (Rantz and others, 1982), a 40-second velocity sampling interval, and approximately 25 vertical measurement sections. An ADCP streamflow measurement can be made at the same section in 15–30 minutes. This increase in efficiency results in cost savings with improved safety conditions, and more detailed streamflow data. ADCP streamflow measurements have been shown to have an uncertainty of 4.5 percent or less (Oberg and Mueller, 2007). Traditional current-meter measurements with a 40-second sampling interval and approximately 25 vertical measurement sections and uniform flow are estimated to have an uncertainty of about 5.5 percent (Friedler 1988).

An example of how personnel from the USGS Indiana Water Science Center were able to make more streamflow measurements with fewer personnel using ADCPs during a recent flood in central Indiana is given in table 1. Because ADCPs can be used to make streamflow measurements within minutes, they often are used to measure unsteady flows, such as locally affected streams, or unsteady flows near dams or other control structures (Simpson, 2001). ADCPs also are able to measure extreme low-flow conditions that could not have been measured by using conventional methods.

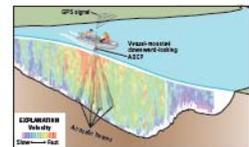


Figure 1. An ADCP attached to a manned boat for use in measuring streamflow.

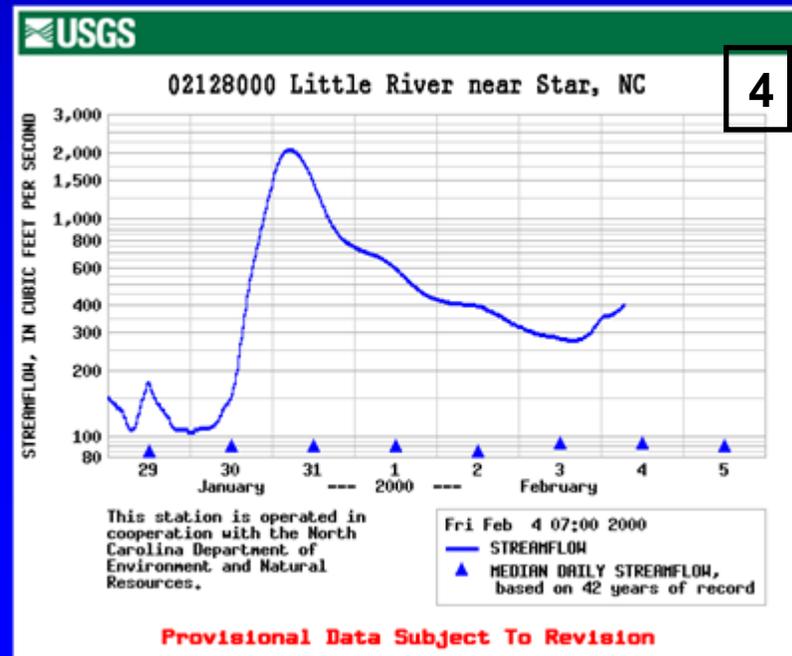
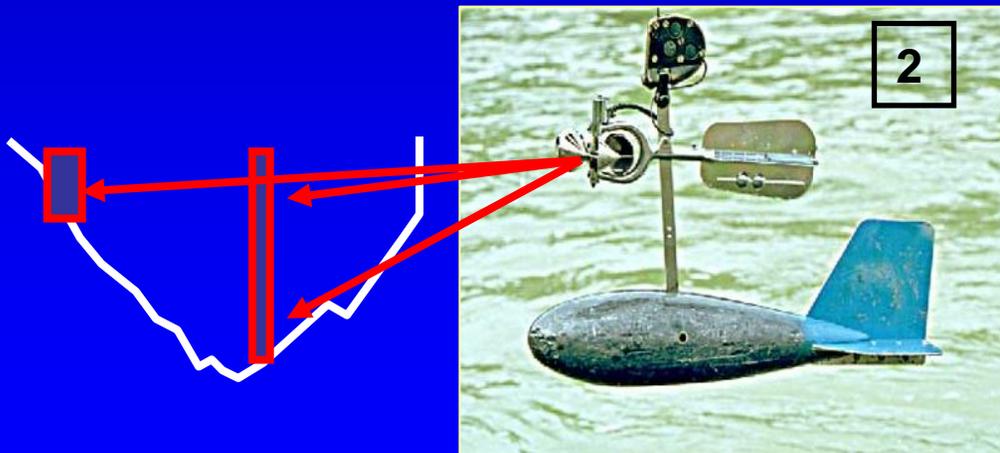
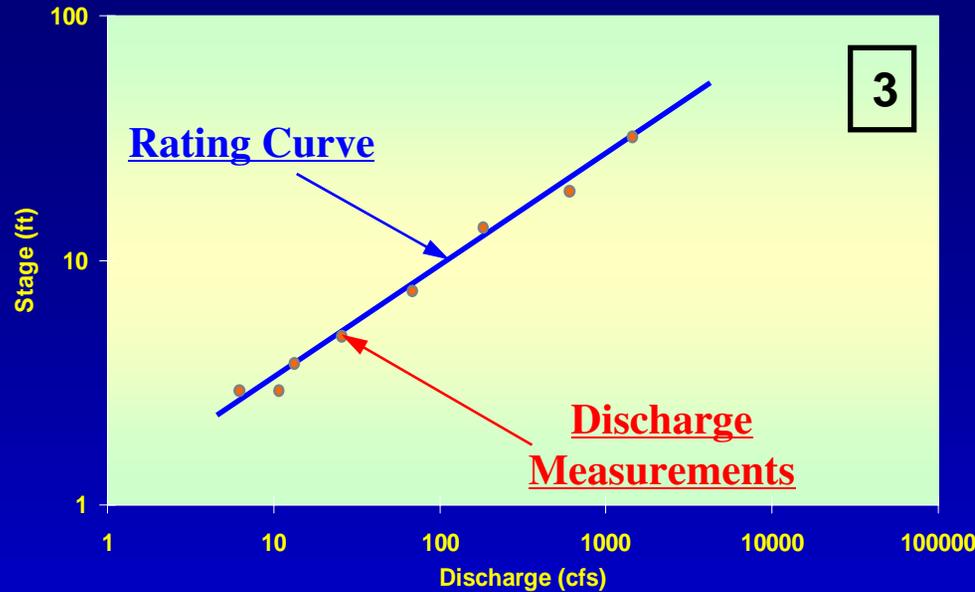
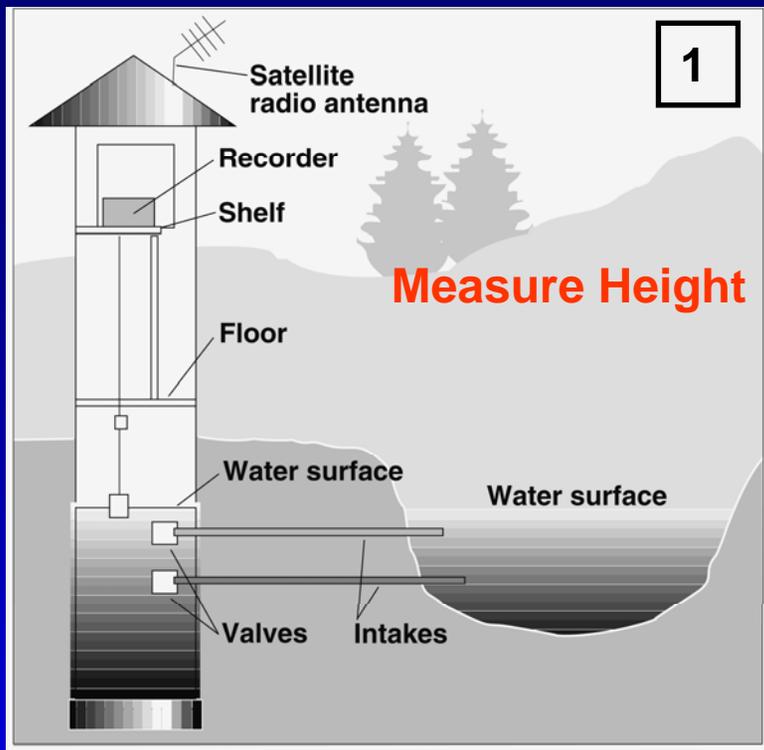
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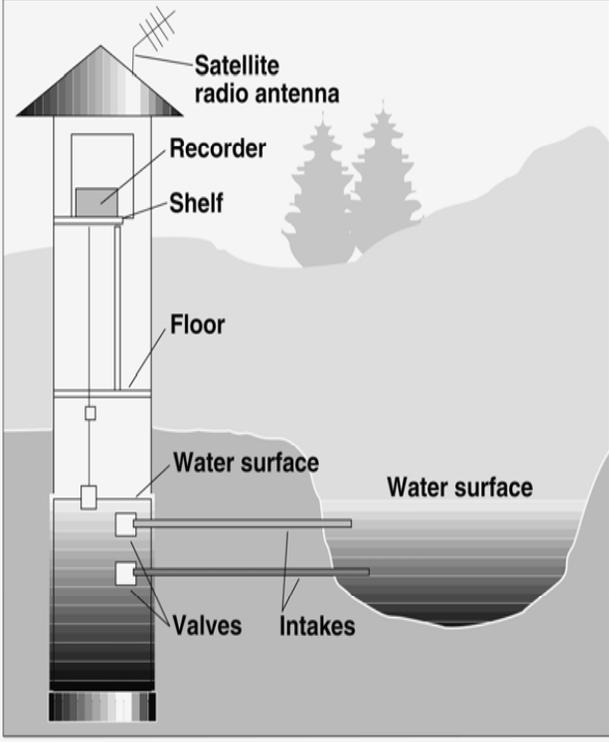
Stimulus Funding

- \$15M for Streamgaging upgrades to new technologies
 - \$10M for HDR DCPs
 - \$5M for other new technologies –hydroacoustic equipment
 - Purchases only through the HIF; limited set of equipment
- \$15M for Deferred Maintenance
 - Removal of discontinued streamgages, cableways, and wells in DM-CI database



Stream Gage - Measures Stage

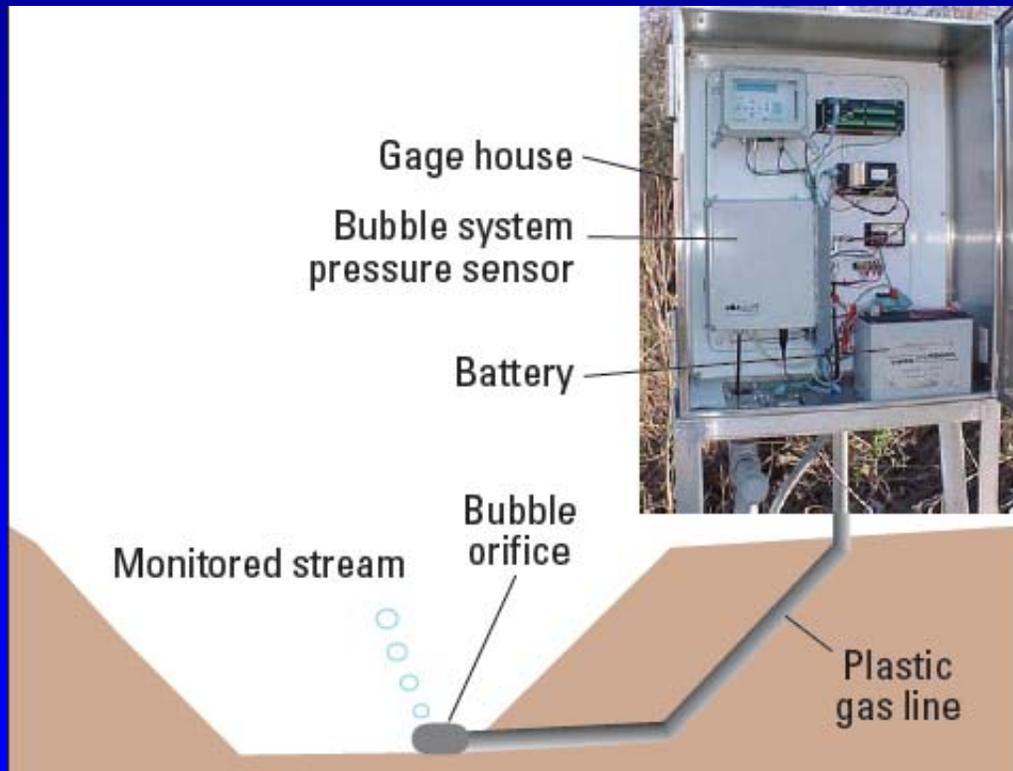
Stilling Wells



- Produces very accurate stage record
- Expensive to install
- Expensive to maintain
- Creates a confined space
- Subject to channel changes and debris
- Difficult to get above flood stage



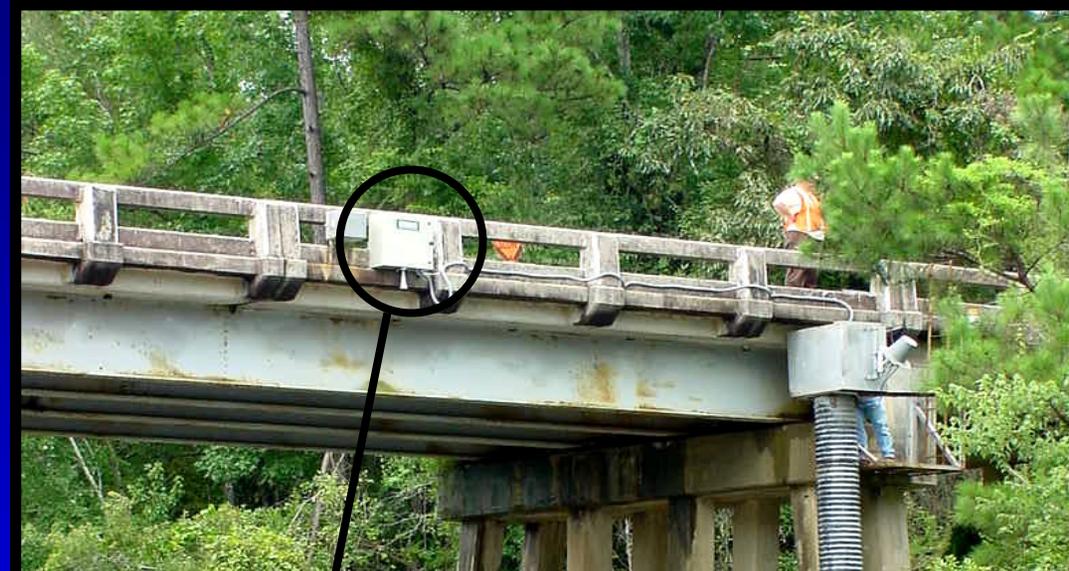
Stage Measurement - Pressure Sensors



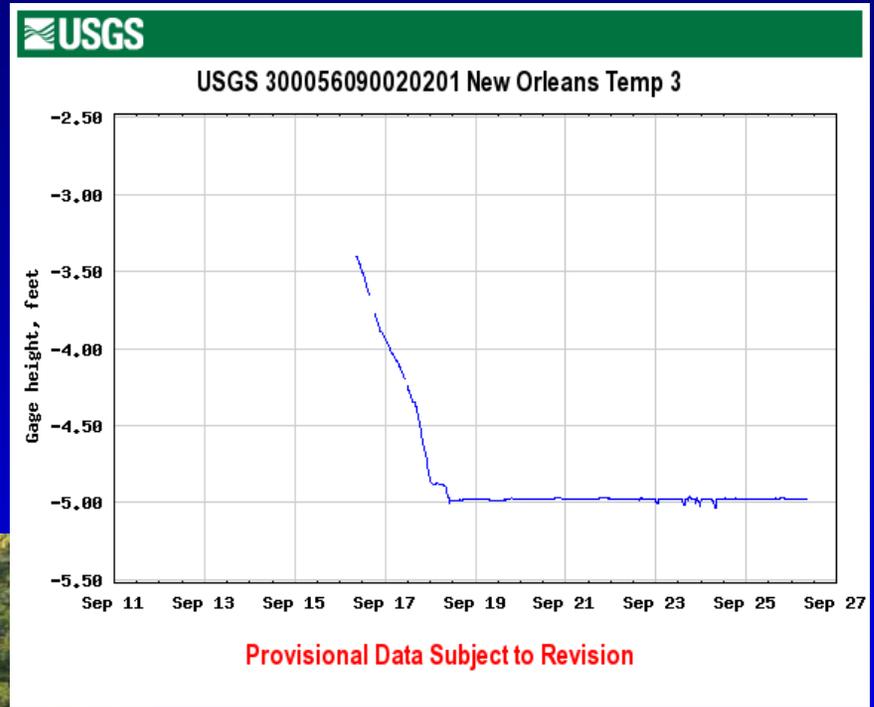
- Easier to install
- Easier to maintain
- Easier to get above flood stage
- No confined space
- Subject to channel changes and debris

Non-Contact Radar Stage Measurement

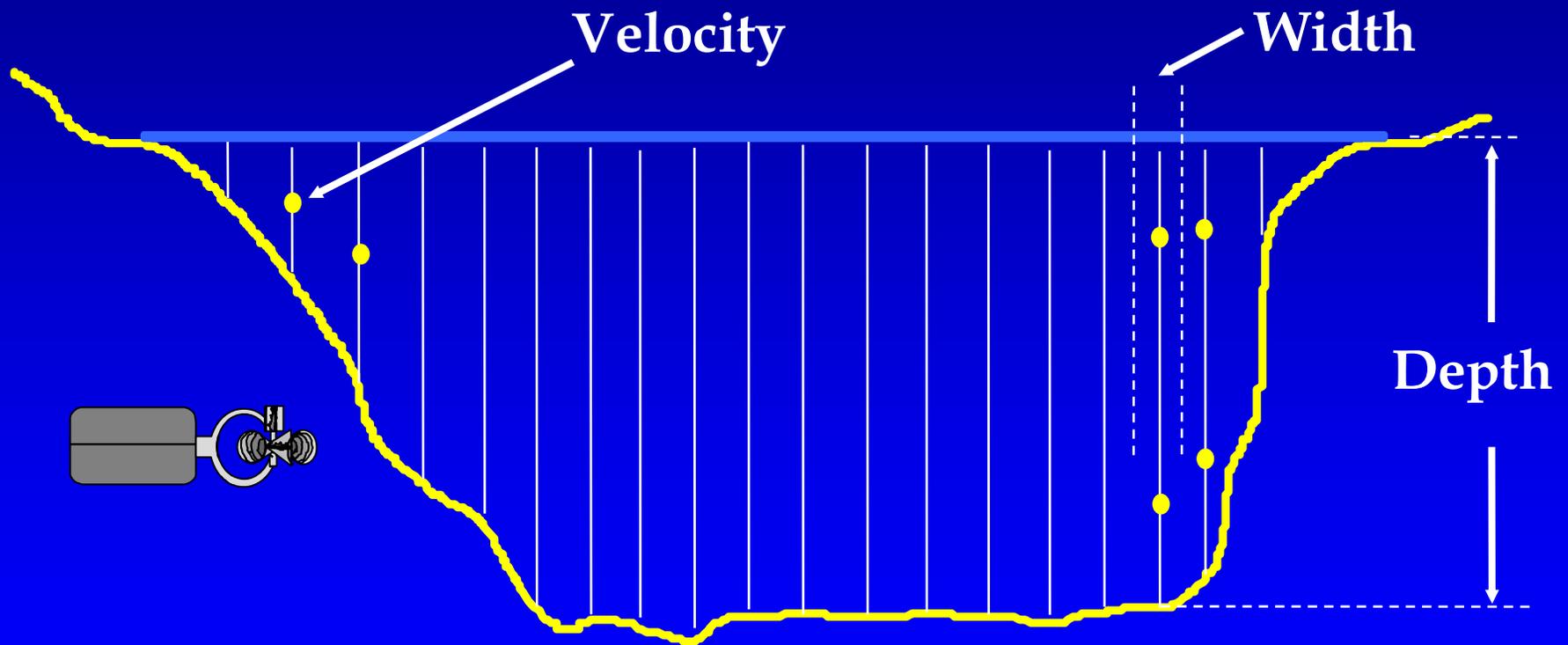
- Easiest to install
- Easiest to maintain
- Easier to get above flood stage
- Least potential impact from channel changes and debris
- No confined space
- Not applicable to ice affected rivers
- Have to have a structure over the river



Rapid Deployment Gages

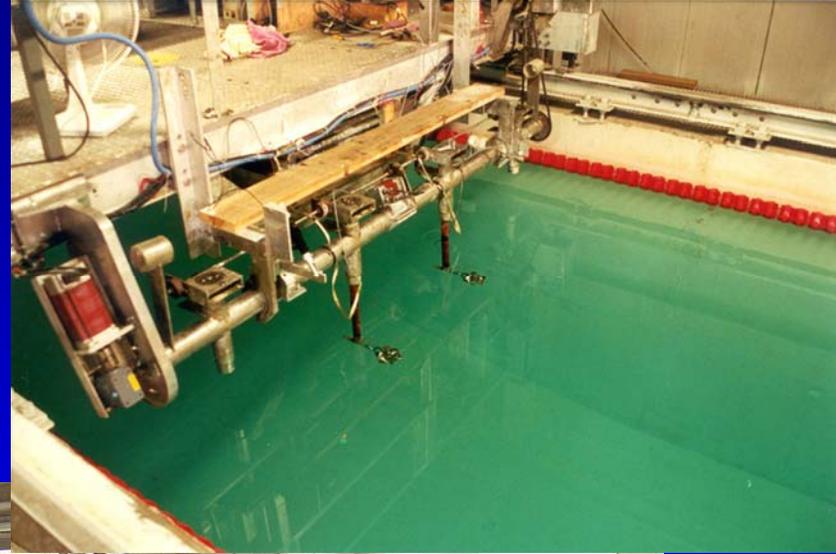


Conventional Discharge Measurement



$$Q = A * V$$

Current Meter to Measure Velocity



450 feet long tow tank

Wading Measurement



Boat Measurement





Crane on 4-wheel base



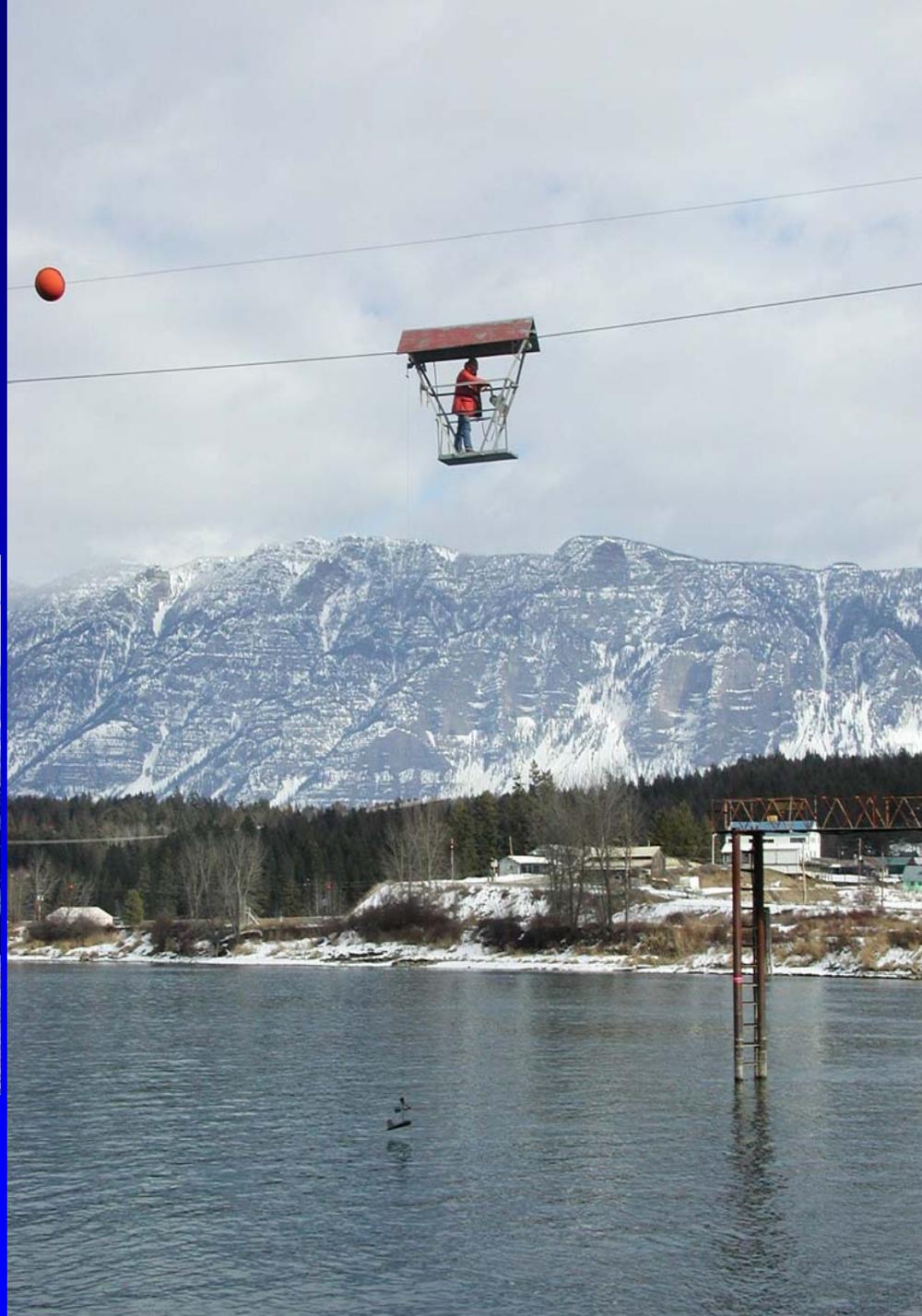
Crane on truck



Bridge Measurements

Photo credit: Patrick Neary
The Olympian

Cableway Measurement



Ice Measurement



Measurement Method Improvements

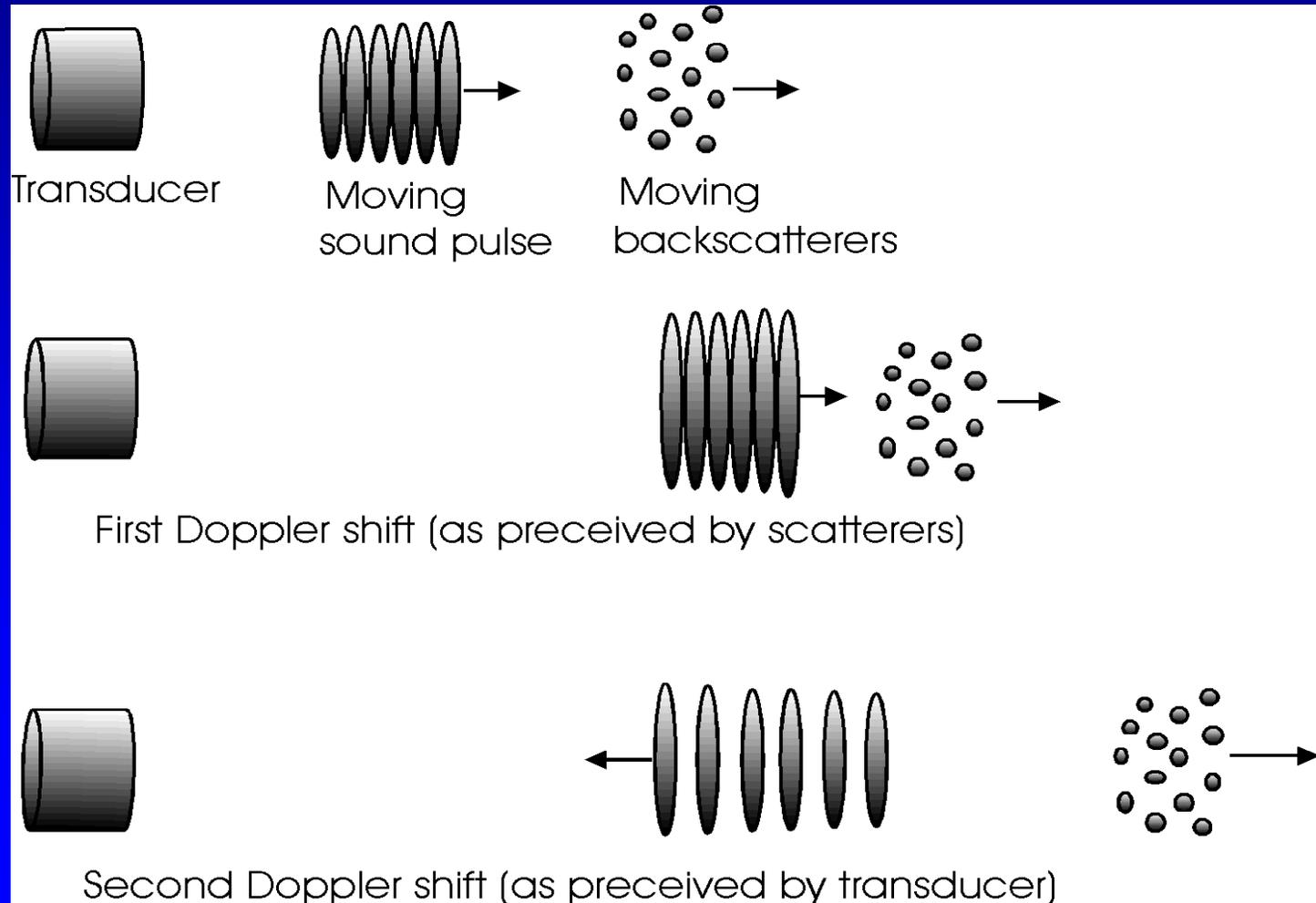
**Traditional method:
mechanical meters
are still in use**



**Paradigm shift to
Hydroacoustic Methods**



Velocity Measurements using the Doppler Shift



HYDROACOUSTICS



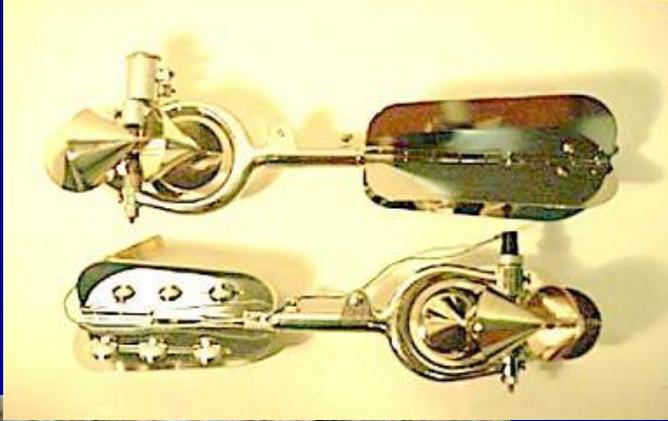
Current Profilers



Wading



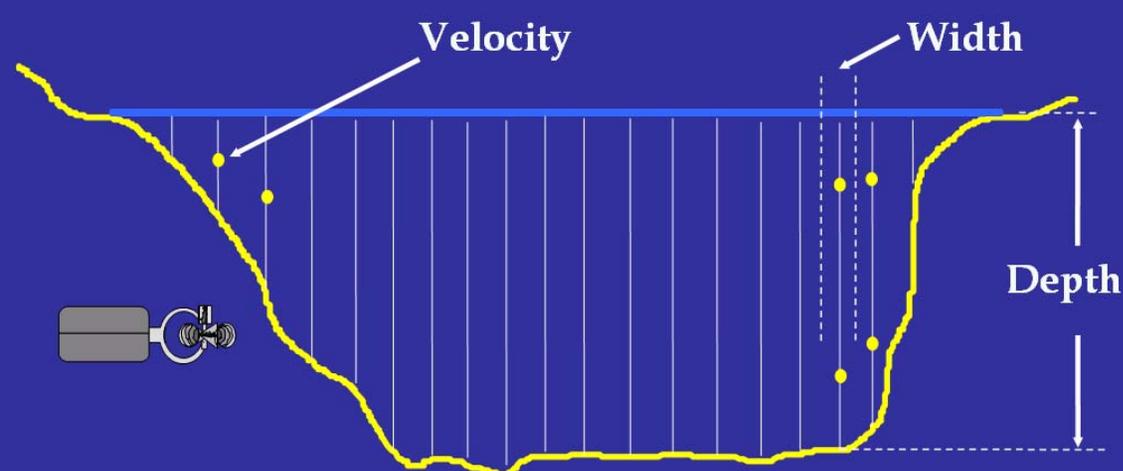
Side Looking



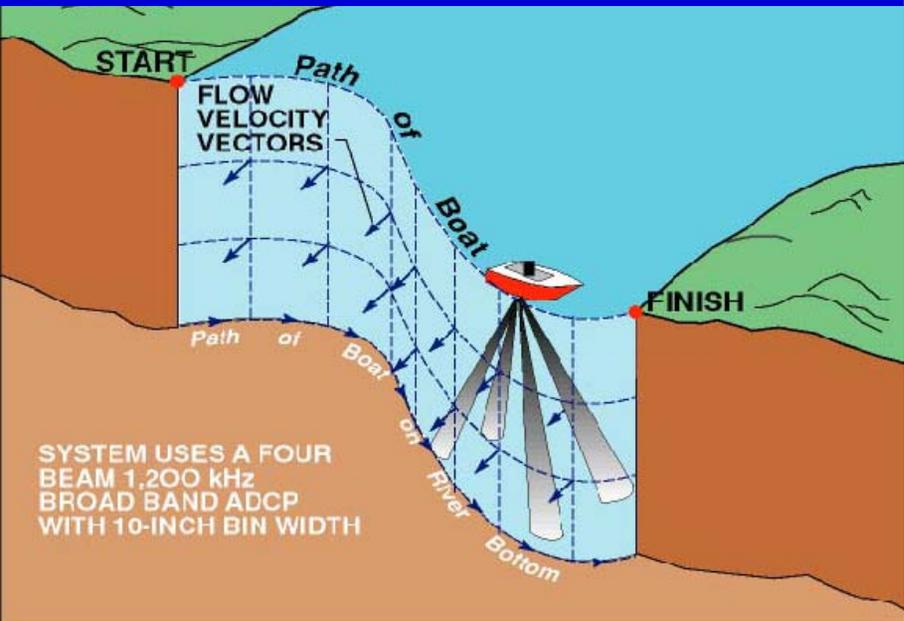
- Better wading measurements at low flow

- More information about the velocity measurement and its uncertainty.





Profiler Measurements



WinRiver Playback Mode [review.wrv] (mrsiuwr.u001) mrsiuwr.u001

File Edit View Settings Playback Window Help

Stick Ship Track

Stick Ship Track (Ref: Btm)

Ship Track Average

Distance North [ft]

Distance East [ft]

Ship Track Distance East [ft] = -204, Distance North [ft] = 186, Average (Current Mag, Dir) = 6.139 [ft/s], 184°

Discharge (Btm) Left to Right

Good Bins 5

Top Q	287128.30	[ft ³ /s]
Measured Q	636508.20	[ft ³ /s]
Bottom Q	122916.51	[ft ³ /s]
Left Q	194.31	[ft ³ /s]
Right Q	13654.30	[ft ³ /s]
Total Q	1060401.62	[ft ³ /s]

Standard Tabular

Ens. #	394	# Ens.	153
Lost Ens.	0	Bad Ens.	8
%Good Bins	97%	Delta Time	2.78
2-Aug-93		16:15:16.12	
Pitch	Roll	Heading	Temp
-2°	-2°	22°	28°C

Average Backscatter [dB]

Bottom Top Q Bottom Q

Ensemble Number

215.0° Projected Velocity [ft/s] (Ref: Btm)

Bottom Top Q Bottom Q

Ensemble Number

F3-Configuration Minus-Previous Ensemble Home-First Ensemble

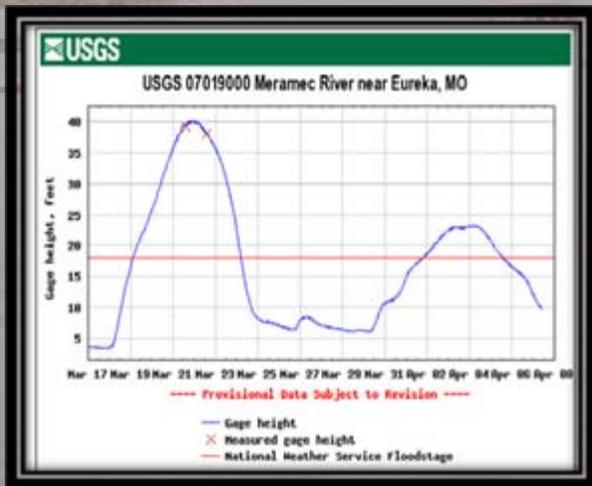
Measure Previously Unmeasurable Flows



Flood Measurements Using ADCPs

- January 1991 flood
(Current Meters)
 - 52 Discharge Measurements in 10 days
 - Average Qm time -- 96 minutes
 - 11 hydrographers
- July 2003 flood
(ADCPs)
 - 62 Discharge Measurements in 10 days
 - Average Qm time -- 18 minutes
 - 6 hydrographers

2008 Flood Qm's



- Iowa

- 63 Qm's from June 8 – July 1
- No indirects despite 20 PoRs!
- Acoustics “saved the day”

- Indiana

- >60 Qm's
- 2-3 times more Qm's than with conventional equipment

- Missouri

- >100 Qm's – nearly all hydroacoustic
- Increased efficiency
- More accurate Qm's



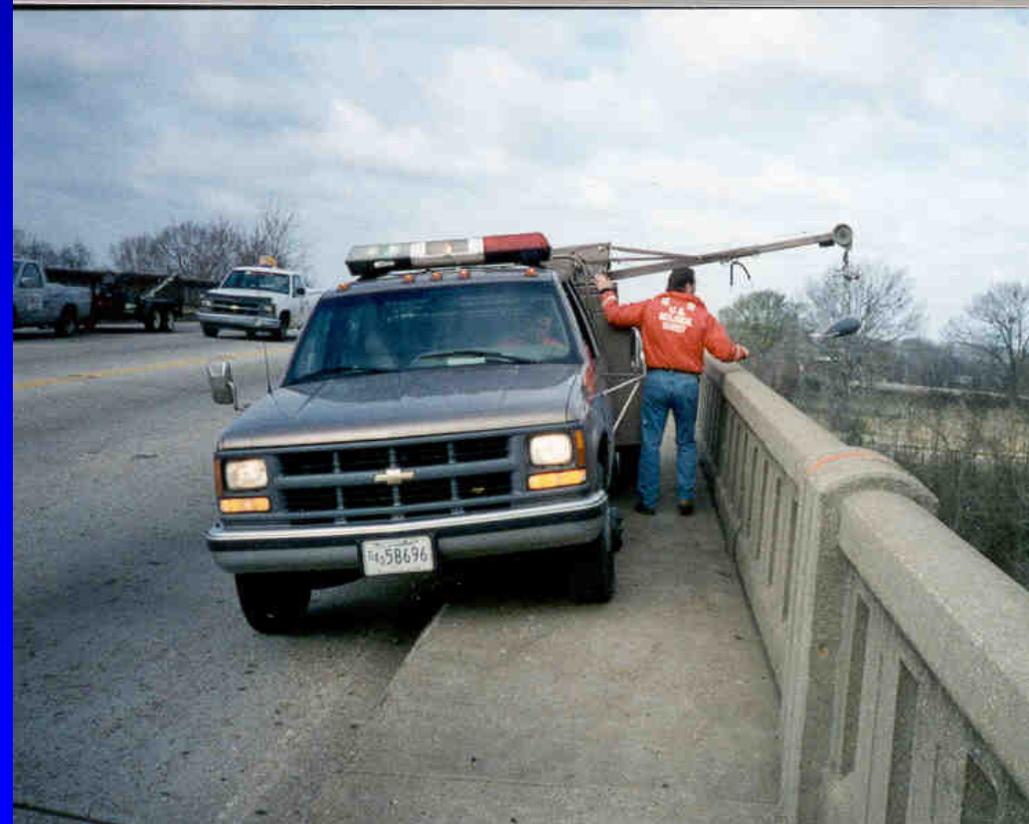
Fewer Indirect Discharge Estimates



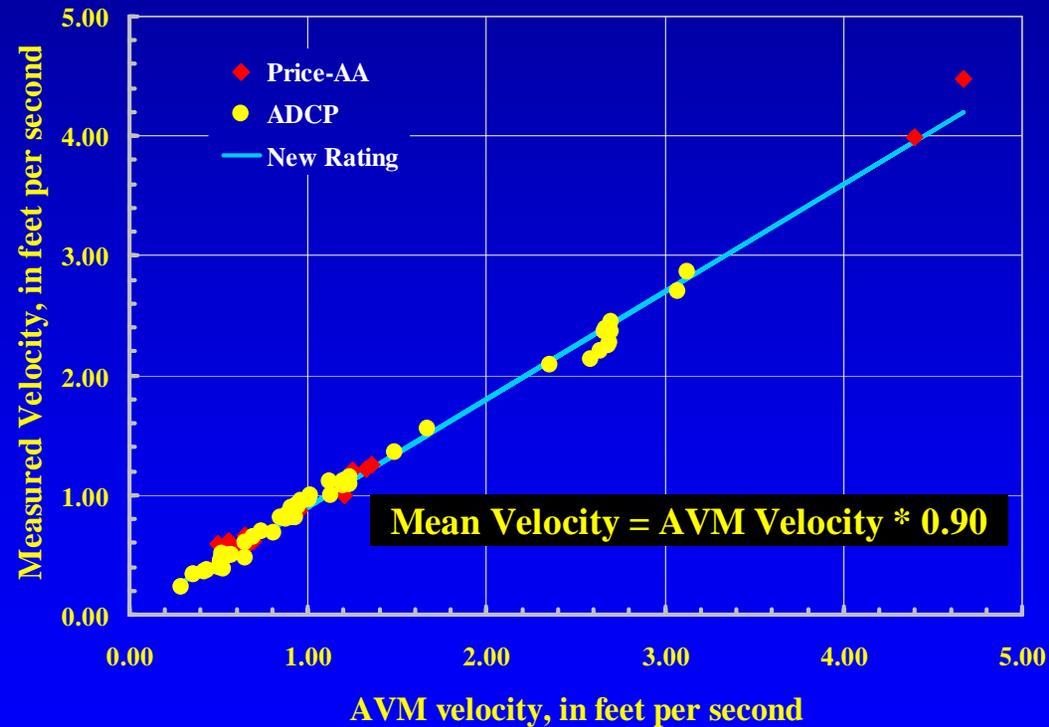
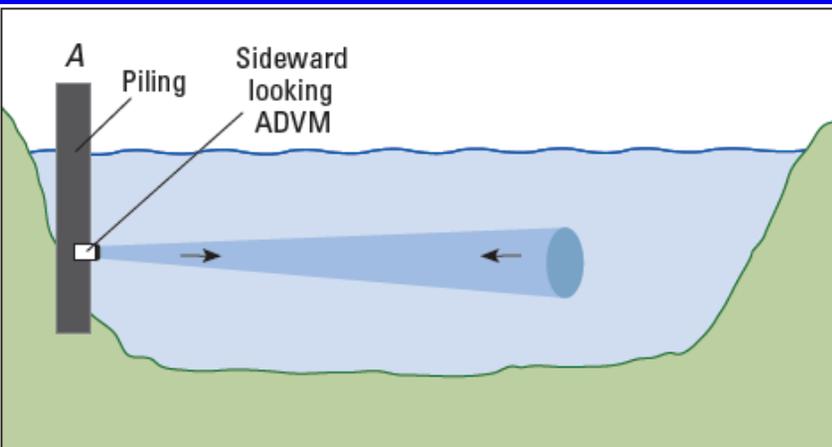
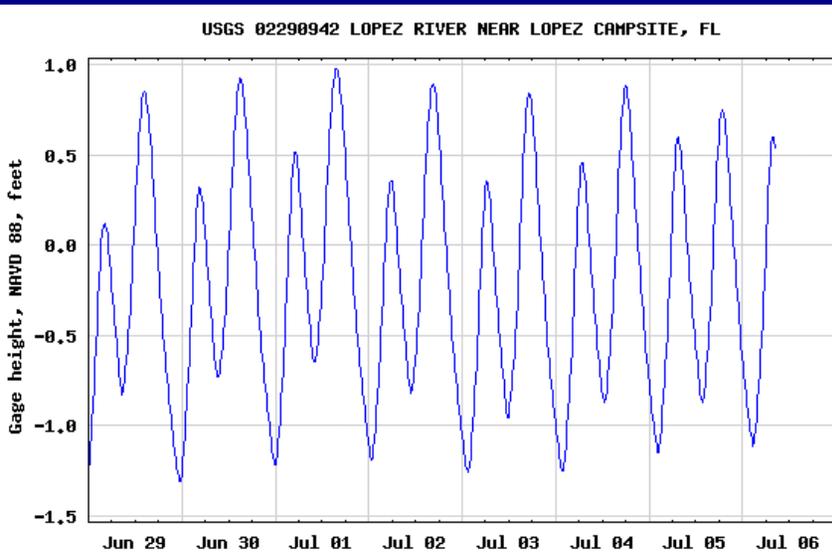
Section by Section Ice Measurement



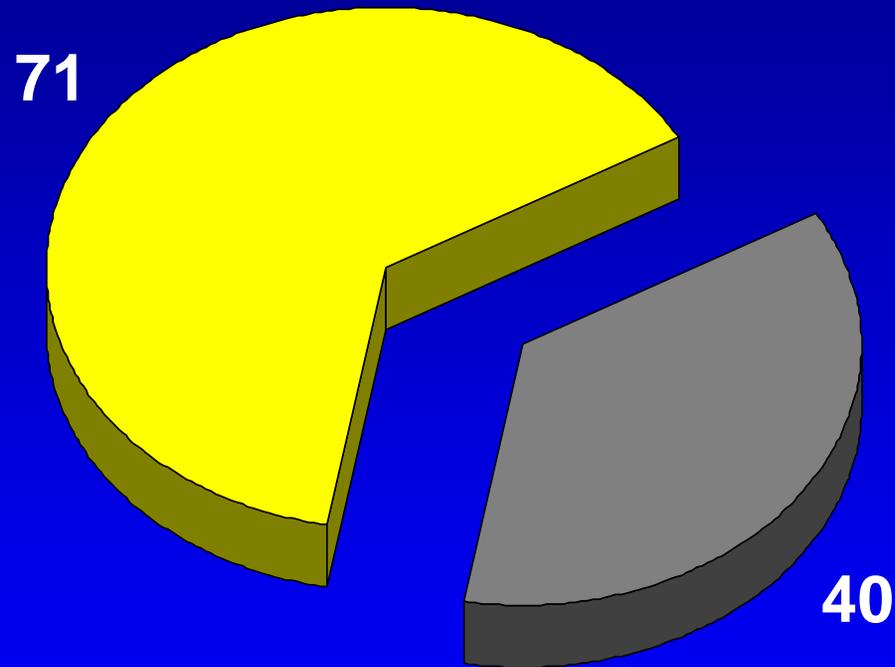
Downsize Vehicles and Other Associated Equipment



Index-Velocity Ratings



47% of Qm's made with Hydroacoustics in 2007!



■ Flowtracker as % of Wading
■ ADCP as % non-wading

97% of Gages are (Near) Real Time

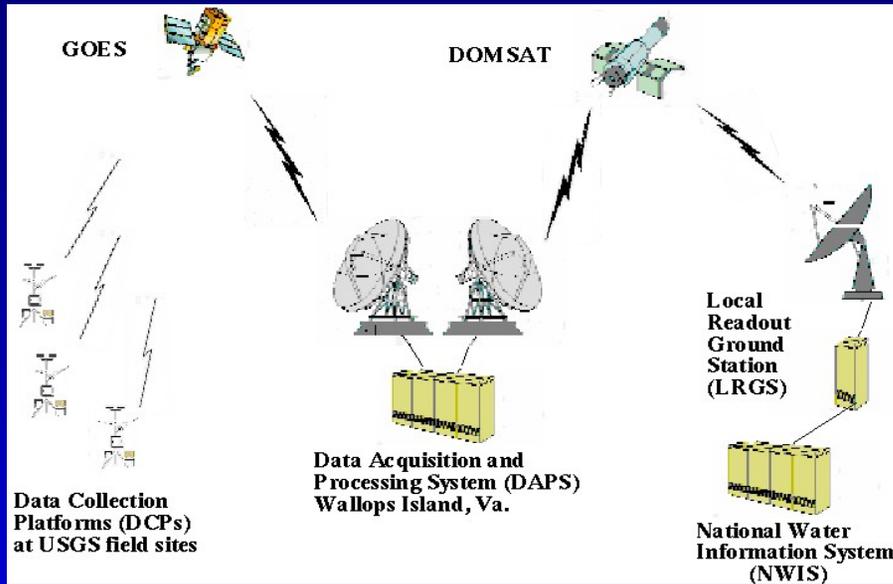
- GOES SATELLITE
- TELEPHONE LINES
- CELL PHONES
- LINE OF SITE RADIOS

4000 Transmit 1x per 1-hour

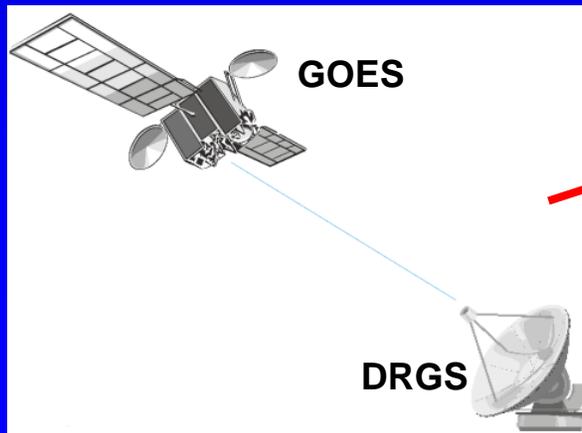
2500 Transmit 1x per 4-hours



Back-Up to Wallops Island



Installation completed and system running Spring 2008



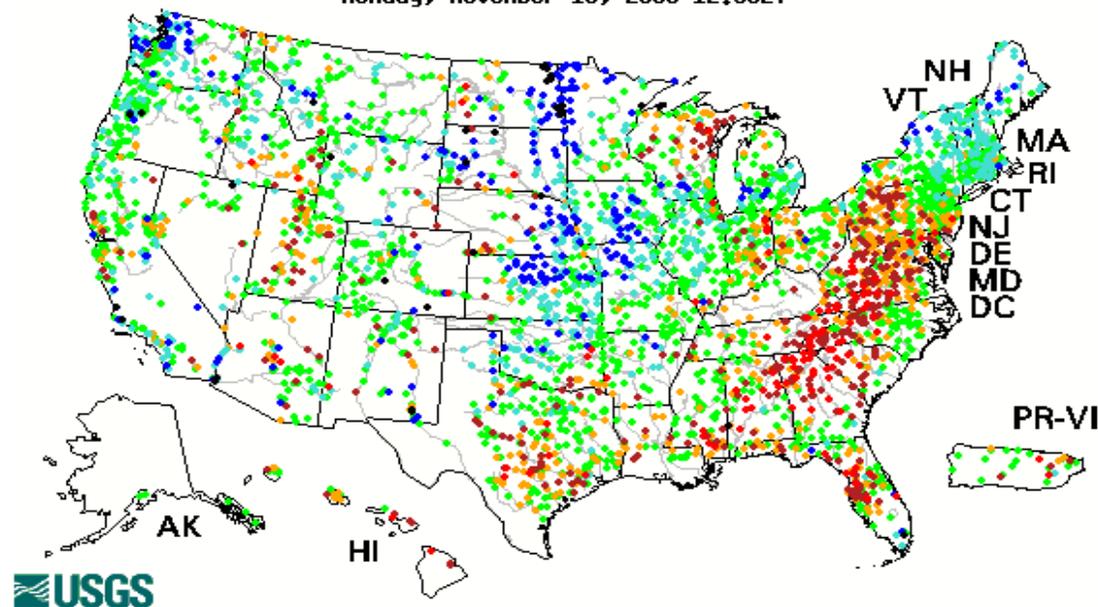
Direct Readout Ground Station (DRGS) at USGS EROS in South Dakota

Our most popular product!

WaterWatch -- *Current water resources conditions*

Map of real-time streamflow compared to historical streamflow for the day of the year (United States)

Monday, November 10, 2008 12:30ET



Choose a data retrieval option and select a location on the map
 List of all stations in state, State map, or Nearest stations

Explanation - Percentile classes						
Low	<10	10-24	25-75	76-90	>90	High
	Much below normal	Below normal	Normal	Above normal	Much above normal	

Available data for this site Time-series: Real-time data GO

Station operated in cooperation with Fairfax County

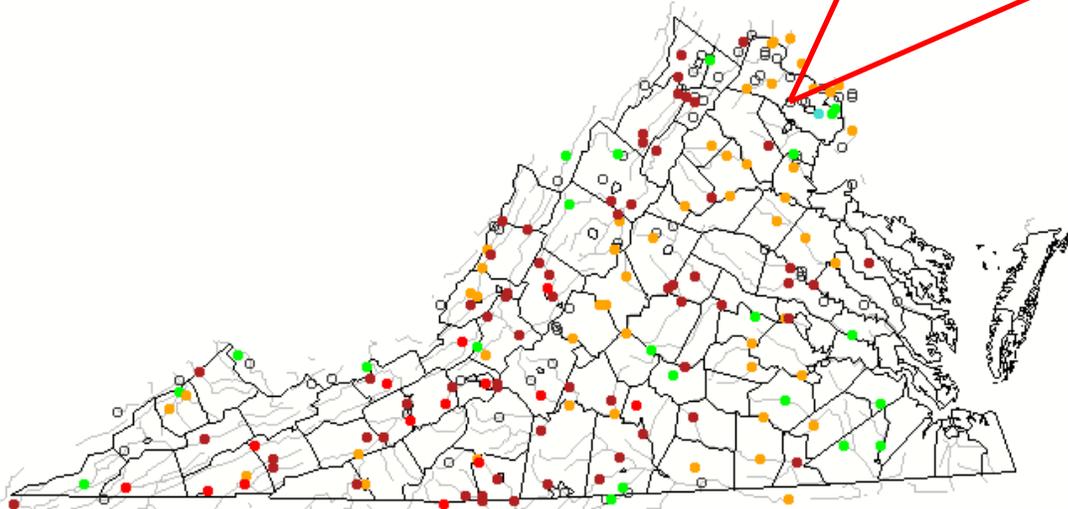
Available Parameters	Output format	Days
<input type="checkbox"/> All 12 Available Parameters for this site	<input checked="" type="radio"/> Graph	7
<input checked="" type="checkbox"/> 00065 Gage height	<input type="radio"/> Graph w/ stats	(1-60)
<input checked="" type="checkbox"/> 00060 Discharge	<input type="radio"/> Graph w/o stats	<input type="button" value="GO"/>
<input checked="" type="checkbox"/> 00010 Temperature, water	<input type="radio"/> Table	
<input checked="" type="checkbox"/> 00095 Specific cond at 25C	<input type="radio"/> Tab-separated	
<input checked="" type="checkbox"/> 00400 pH		
<input checked="" type="checkbox"/> 63680 Turbidity, Form Neph		
<input checked="" type="checkbox"/> 61035 Voltage		
<input checked="" type="checkbox"/> 70969 DCP battery voltage		
<input checked="" type="checkbox"/> 72114 DCP TransmittedPower		
<input checked="" type="checkbox"/> 72112 DCP Sig/Noise ratio		
<input checked="" type="checkbox"/> 72117 DCP DeliveryDelayTime		
<input checked="" type="checkbox"/> 00063 No. of sampling pts.		

Click on any station dot to bring up real-time data

WaterWatch -- Current water resources conditions

Map of real-time streamflow compared to historical streamflow for the day of the year (Virginia)

Monday, November 10, 2008 12:30ET



Gage height, feet

Most recent instantaneous value: 0.71 11-10-2008 13:00

USGS 01656903 FLATLICK BRANCH ABOVE FROG BRANCH AT CHANTILLY, VA



[Create presentation-quality graph](#)

Parameter 00065: DD 01

Discharge, cubic feet per second

Most recent instantaneous value: 4.7 11-10-2008 13:00

USGS 01656903 FLATLICK BRANCH ABOVE FROG BRANCH AT CHANTILLY, VA

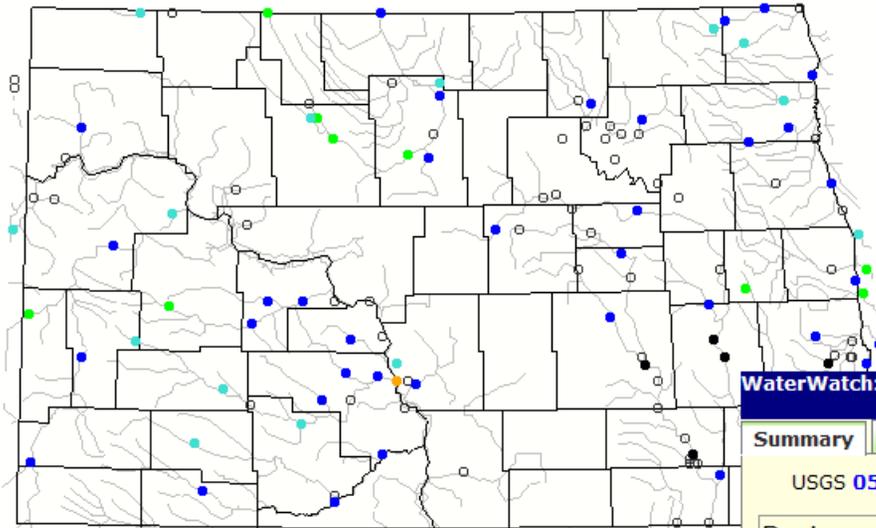


[Create presentation-quality graph](#)

Parameter 00060: DD 02

Map of real-time streamflow compared to historical streamflow for the day of the year (North Dakota) Google Maps version of this map

Wednesday, April 29, 2009 10:30ET



Choose a data retrieval option and select a location on the map
 List of all stations Single station Nearest stations Peak

Explanation - Percentile classes						
●	●	●	●	●	●	●
Low	<10 Much below normal	10-24 Below normal	25-75 Normal	76-90 Above normal	>90 Much above normal	High

The "Real-time streamflow" map tracks short-term changes (over several hours) in rivers and general appearance of the map changes very little from one hour to the next, individual sites may respond to major rain events or to reservoir releases.

The map depicts streamflow conditions as computed at USGS streamgages. The colors represent streamflow compared to percentiles of historical daily streamflow for the day of the year.

This map represents conditions relative to those that have historically occurred at this time of

WaterWatch: Water Resources Conditions

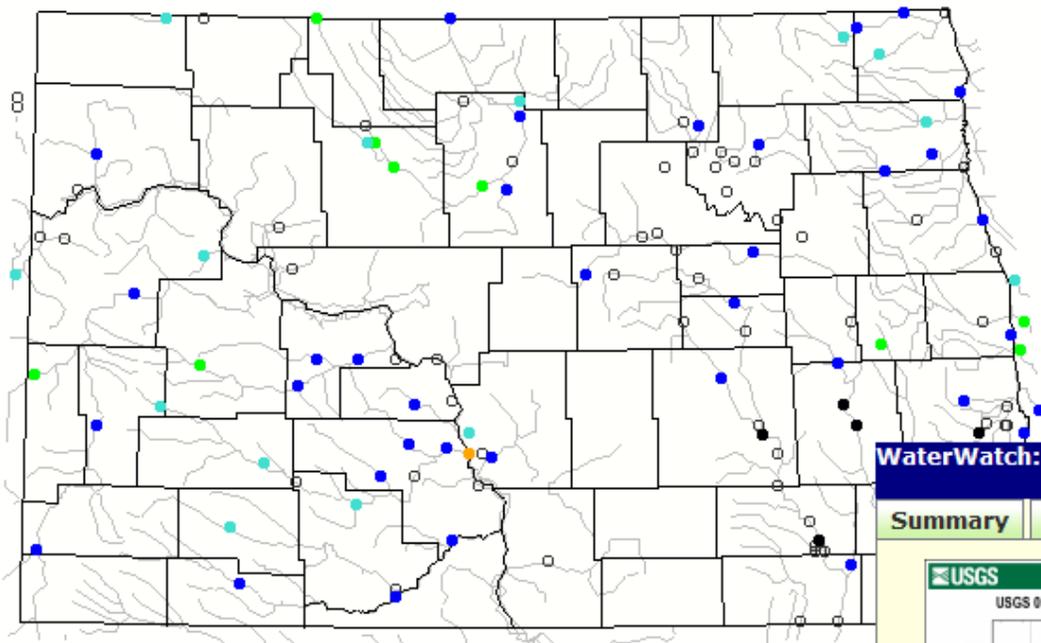
Summary Hydrograph Peak Forecast

USGS 05058500 SHEYENNE RIVER AT VALLEY CITY, ND

Drainage area:	7810 mi ²
Discharge:	4800 cfs
Stage:	16.97 ft
Flood stage:	15.0 ft
Date:	2009-04-29 08:00:00
Percentile:	97%
Class symbol:	●
% of normal (median):	2775%
% of normal (mean):	789%

Map of real-time streamflow compared to historical streamflow for the day of the year (North Dakota) [Google Maps version of this map](#)

Wednesday, April 29, 2009 10:30ET



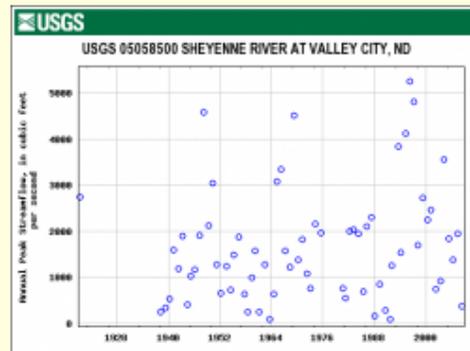
Choose a data retrieval option and select a location on the map
 List of all stations Single station Nearest stations Peak

Explanation - Percentile classes

Low	<10 Much below normal	10-24 Below normal	25-75 Normal	76-90 Above normal	>90 Much above normal	High	Not-ranked

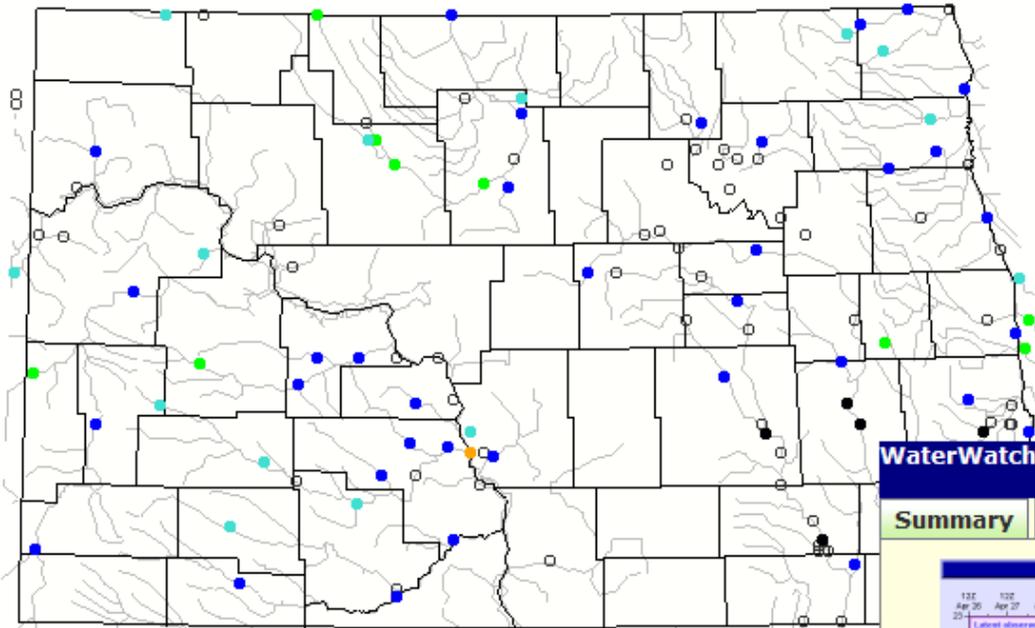
WaterWatch: Water Resources Conditions

Summary Hydrograph Peak Forecast



Map of real-time streamflow compared to historical streamflow for the day of the year (North Dakota) Google Maps version of this map

Wednesday, April 29, 2009 10:30ET



Choose a data retrieval option and select a location on the map
 List of all stations Single station Nearest stations Peak

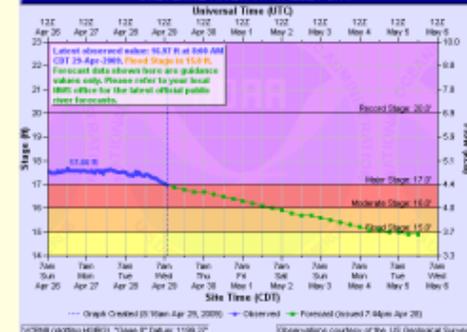
Explanation - Percentile classes

Low	<10 Much below normal	10-24 Below normal	25-75 Normal	76-90 Above normal	>90 Much above normal	High	Not-ranked

WaterWatch: Water Resources Conditions

Summary Hydrograph Peak Forecast

SHEYENNE RIVER AT VALLEY CITY



WaterWatch – lots of new products added



WaterWatch
Water Res

Current Maps/Graphs: **Flood Watch:** **Drought Watch:** **Recent/Historical Maps/Graphs:**

28-day Average Streamflow
28-day Average Streamflow
Current Streamflow
Flood and High Flow
Daily Streamflow
7-day Average Streamflow
14-day Average Streamflow
28-day Average Streamflow

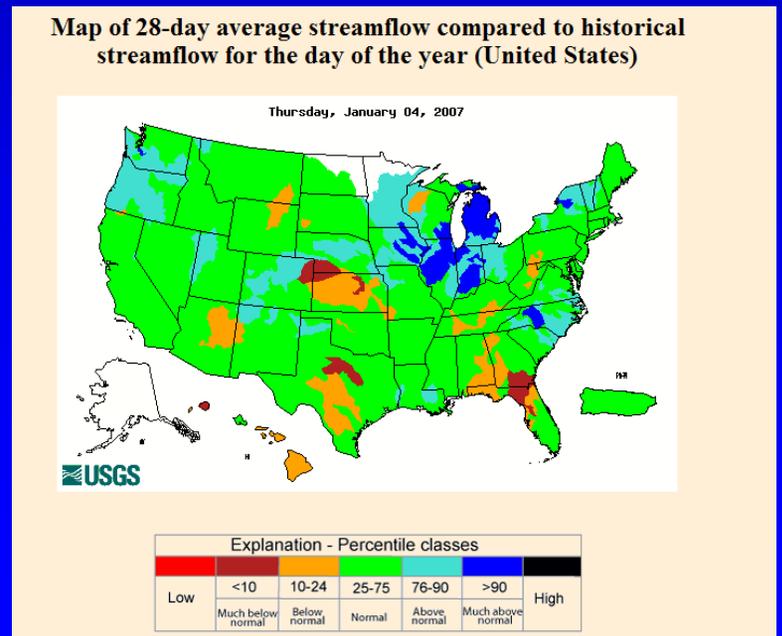
Additional Information

Current water resources conditions

average streamflow compared to historical
for the day of the year (United States)

Map
Map
Map
Summary Plot
Percent Summary Plot
Summary Table
Map Animation -- Day of Year
Locations above Flood Stage
Google Earth KML
Summarize Recent Conditions

- Real-time, 7-day, 14-day, 28 day averages
- Floods and high flows
- Drought conditions
- Google coverage
- Animations
- etc



Surface-Water Data for the Nation

Real-time

Data for selected sites recorded at 5-60 min interval-- may include surface-water, ground-water, water-quality, and meteorological parameters.

Recent

Provisional daily data for the previous 18 months--includes published streamflow.

Streamflow

Daily streamflow data for the period of record at each site.

Statistics

Daily

Monthly

Annual

Computed from published daily data.

Peaks

Annual maximum instantaneous peak streamflow and gage height

Measurements

Field measurements of streamflow and gage height

Tutorial

Tutorial explaining how to perform a surface water retrieval and understand the results

Introduction

Nationally, USGS surface-water data includes more than 850,000 station years of time-series data that describe stream levels, streamflow (discharge), reservoir and lake levels, surface-water quality, and rainfall. The data are collected by automatic recorders and manual [measurements](#) at field installations across the Nation.

Data are collected by field personnel or relayed through telephones or satellites to offices where it is stored and processed. The data relayed through the Geostationary Operational Environmental Satellite (GOES) system are processed automatically in near real time, and in many cases, [real-time data](#) are available online within minutes.

Once a complete day of readings are received from a site, daily summary data are generated and stored in the data base. [Recent provisional daily data](#) are updated on the web once a day when the computation is completed.

Annually, the USGS finalizes and publishes the daily data in a series of water-data reports. [Daily streamflow data](#) and [peak data](#) are updated annually following publication of the reports.

USGS StreaMail

- System for accessing real-time river stage and streamflow from hand-held wireless devices, such as cell phones and Blackberries.
- Send an email or text message to "streamail@usgs.gov" and use a USGS station number in the "Subject" line. In a few minutes you'll get back an email with the most recent stage and streamflow.
- Try it - 01631000 S. F. Shenandoah River at Front Royal, VA



streammail@usgs.gov
11/10/2008 04:11 PM

To: sfblanch@usgs.gov
cc:
bcc:
Subject: USGS site 01631000

**U.S. Geological Survey (USGS) StreamMail:
The latest river stage and streamflow values you requested from StreamMail.**

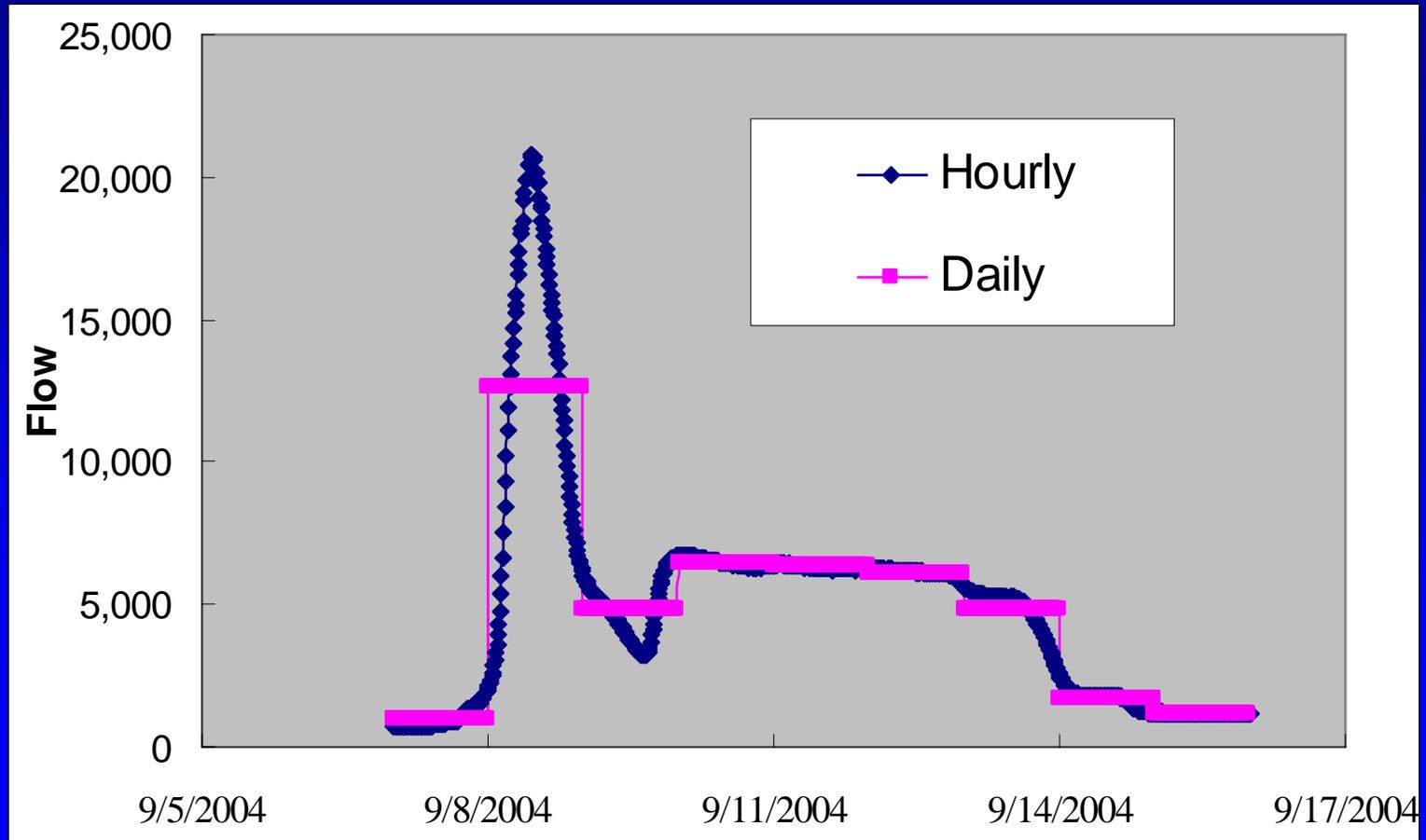
**Site: 01631000
Station name: S F SHENANDOAH RIVER AT FRONT ROYAL, VA
Date: 11/10/2008
Time: 15:15:00
Stage: 1.26 feet
Streamflow: 303 cubic feet per second (cfs)**

**Link to charts for 01631000:
Stage: http://waterdata.usgs.gov/nwis/uv/?dd_cd=09_00065&format=img&site_no=01631000&set_logscale_y=1&begin_date=20081109
Streamflow: http://waterdata.usgs.gov/nwis/uv/?dd_cd=02_00060&format=img&site_no=01631000&set_logscale_y=1&begin_date=20081109**

The U.S. Geological Survey's (USGS) StreamMail system allows you to request, by email, the most recent USGS river stage and streamflow data for streams in the United States. To use the system, send an email to "streammail@usgs.gov" and in the "Subject" line, put in a USGS station (site) number. An email will be sent back to you with the most recent stream stage and flow.

If you need help, contact Howard Perlman (hperlman@usgs.gov)

IDA is here!! -the Instantaneous Data Archive





Instantaneous Data Archive - IDA

[Home](#) / [About IDA](#) / [Frequently Asked Questions](#) / [Questions and Feedback](#) / [Help](#) / [Other Water Data-NWISWeb](#) /

Home

Since 1889 the United States Geological Survey has collected continuous stage, discharge, and other instantaneous time-series data on the nation's rivers and streams. These time-series data have been and are typically recorded at intervals ranging from 5 to 60 minutes. These instantaneous data have been processed into and published as various daily values, such as the daily maximum, minimum, and/or mean. Because the published record are daily values, the original instantaneous data have not historically been officially approved, published, or made widely available. This web site has been established to make available as much historical instantaneous data from USGS data collection stations as possible. Although this site currently serves instantaneous discharge (streamflow) data only, work is planned to extend it to other time-series parameters in the future.

As described above, the USGS procedure for processing and publishing time-series data has focused on daily values as our final product and not the instantaneous values. As a result, the instantaneous values may not have been corrected and processed to the same extent as the daily values. Because of these USGS procedures, the instantaneous discharge data provided through this web site should be viewed as raw, unreviewed data. In order to provide a basic level of review and quality assurance of these data, the data have been recovered and compared against the published daily values through the use of automated filtering and computational software. Although significant effort has been made to insure the instantaneous data available is reasonable and to remove obviously bad data, there may still be significant error in any individual value. Users are strongly encouraged to review all data carefully prior to use. These data are released on the condition that neither the USGS nor the United States Government may be held liable for any damages resulting from its use.

For further information, see [About IDA](#).

[IDA Status Map](#) / [IDA Station and UV Data Count](#)

Select a Geographic Area from the pull down menu to retrieve Site Numbers/Names or input a Site Number.

Geographic Area:

Site Number:

Internal USGS Archive
[UV Archive NWISWeb](#)

Accessibility
[U.S. Department of the Interior](#)
URL: <http://ida.water.usgs.gov>
Page Contact Information: [Contact Us](#)
Last Modified: 10/10/2008

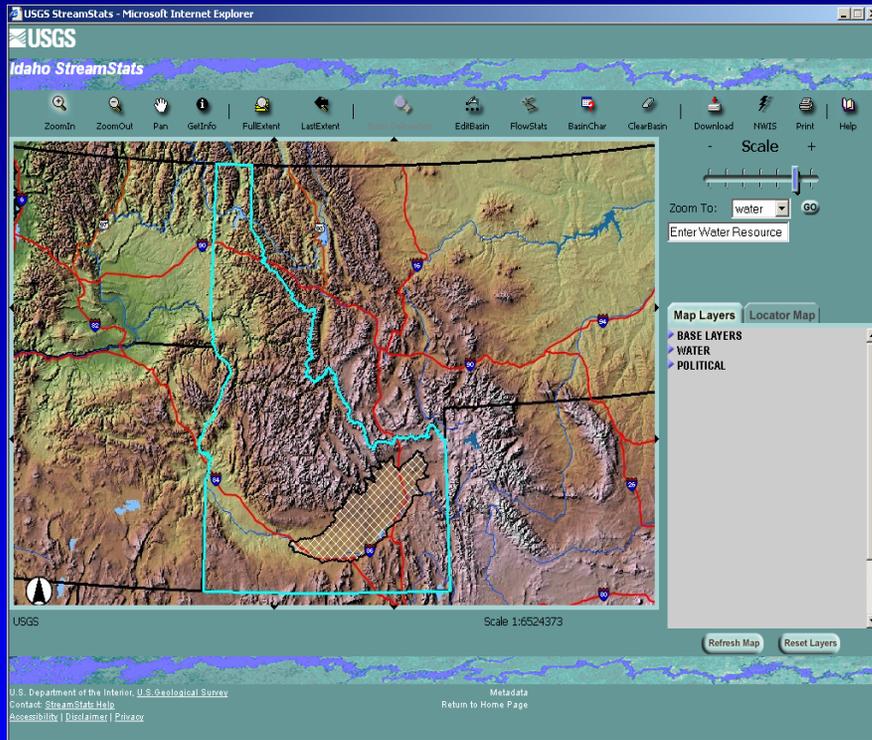
- Alaska
- Arizona
- Arkansas
- Colorado
- Connecticut
- Delaware
- Florida
- Georgia
- Hawaii and Pacific Islands
- Idaho
- Illinois
- Indiana
- Kansas
- Kentucky
- Louisiana
- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Missouri
- Montana
- Nebraska
- Nevada
- New Jersey
- New Mexico
- New York
- North Carolina
- Ohio

[grams](#)

Policies and Notices
[Geological Survey](#)
[us.cfm](#)
[1](#) or GS-W_Help_IDA@usgs.gov

StreamStats Primary Capabilities



- <http://streamstats.usgs.gov>
- Provides estimates of streamflow statistics, basin and climatic characteristics, and other information for user-selected points on ungaged streams
- **Automatically measures basin and climatic characteristics for ungaged sites using GIS**
- Provides published streamflow statistics, basin and climatic characteristics, and other information for data-collection stations

Regression equations take the form:

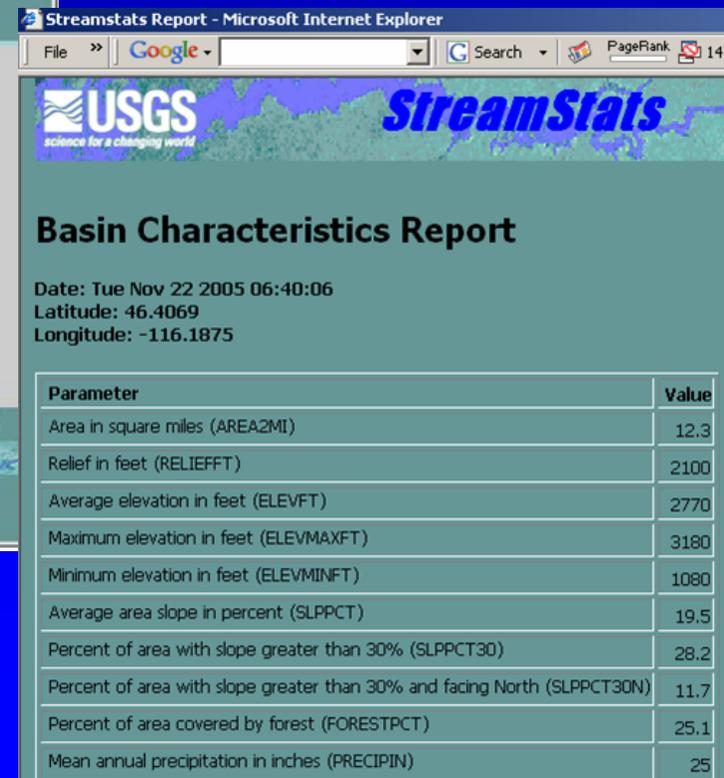
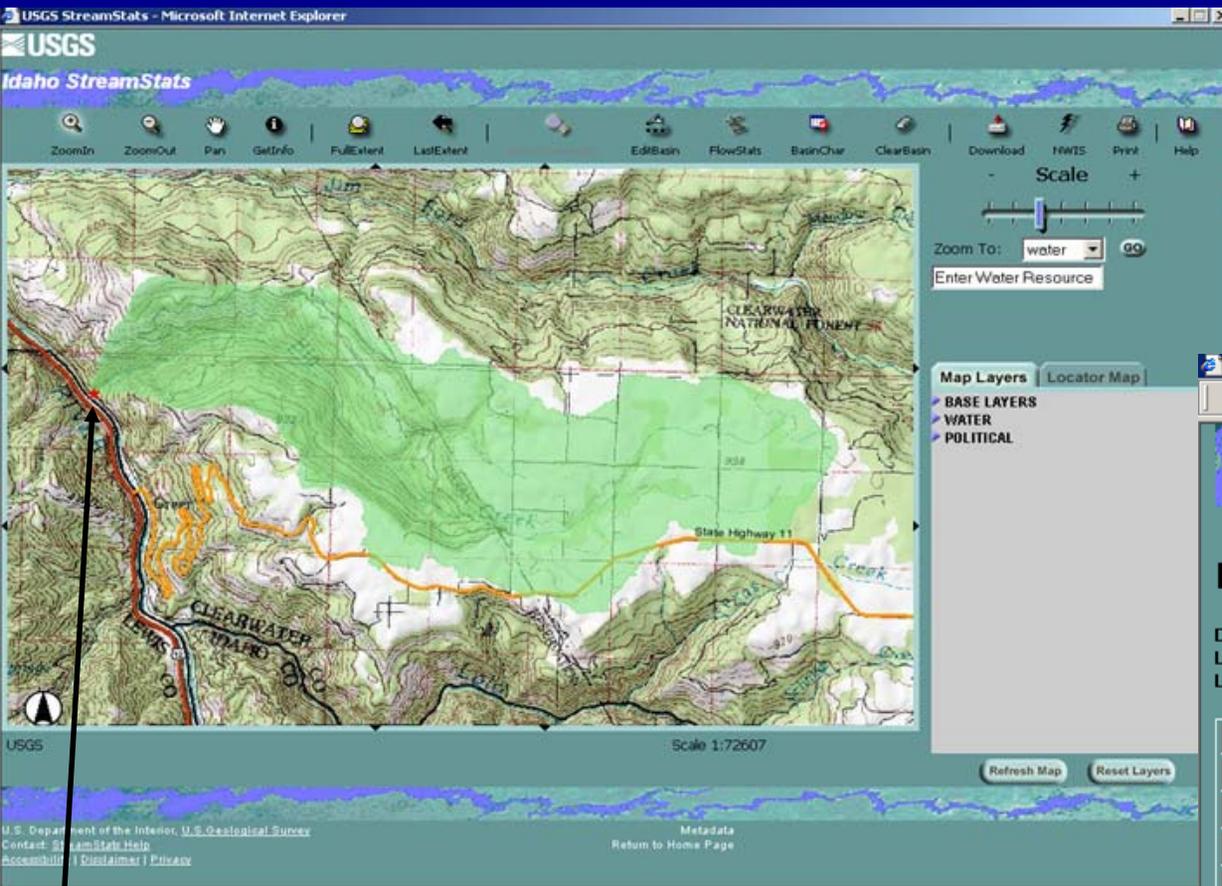
$$Q_{100} = 0.471 A^{0.715} * E^{0.827}$$

where:

A is drainage area, in square miles

E is mean basin elevation, in feet

Example Basin Delineation



Click on any point on the stream network

Example Output for Ungaged Site

Streamstats Report - Microsoft Internet Explorer

File >> Google >> Search >> PageRank >> 147 blocked >> Check >> AutoLink >>



Streamflow Statistics Report

Date: Tue Nov 22 2005 06:41:31
 Site Location: Idaho
 Latitude: 46.4069
 Longitude: -116.1875
 Drainage Area: 12.3 mi²

Peak Flow Basin Characteristics			
100% Peak Flow Region 4 (12.3 mi ²)			
Parameter	Value	Min	Max
Drainage Area (square miles)	12.3	2.3	13418.3
Mean Basin Elevation (feet)	2770 (below min value 2955.8)	2955.8	7461.3

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown error.

Low Flow Basin Characteristics			
100% Low Flow Region 4 (12.3 mi ²)			
Parameter	Value	Min	Max
Drainage Area (square miles)	12.3	4	13418.3
Mean Basin Slope from 30m DEM (percent)	19.5	18.7	57.2
Mean Annual Precipitation (inches)	25	15.9	64.6
Mean Basin Elevation (feet)	2770 (below min value 3528.6)	3528.6	7461.3
Percent Forest (percent)	25.1	4.8	93

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown error.

Streamflow Statistics

Statistic	Flow (ft ³ /s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
Peak-Flow Statistics					
Q1.5	96.8				
Q2	135				
Q2.33	156				
Q5	260				
Q10	364				
Q25	521				
Q50	651				
Q100	797				
Q200	958				
Q500	1210				

Streamflow Statistics

Statistic	Flow (ft ³ /s)	Standard Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
Mean Annual Flow Statistics					
Qa	6.3				
January Flow-Duration Statistics					
Jan_Q20	13.8				
Jan_Q50	3.28				
Jan_Q80	1.63				
February Flow-Duration Statistics					
Feb_Q20	28.6				
Feb_Q50	8.22				

StreamStats Version 2

- Stream Navigation – pick a point on a stream and obtain information about what is going on up and down stream – dams, gaging stations, point discharges, withdrawals, etc
- Obtain estimates of streamflow statistics for ungaged sites located near gaging station based on the flow per unit area for the gaging station (the drainage-area ratio method)



QUESTIONS?



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