

USGS Streamgages: Data Collection and Delivery

U.S. Geological Survey
Pennsylvania Water Science Center
New Cumberland, Pennsylvania

Flood Warning User Forum
Delaware River Basin
Easton, Pennsylvania
September 21, 2010

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Assistant Director



*Providing reliable, impartial, and timely data to
assess the quantity and quality of our nation's water
resources*

USGS Streamgages: Data Collection and Delivery

- USGS Streamgaging History
- Streamgaging Networks
- Common Uses of Streamflow Data
- Gaging Station Design and Operation
- Gaging Station & Operation Improvements
- Data Types & Data-delivery Methods

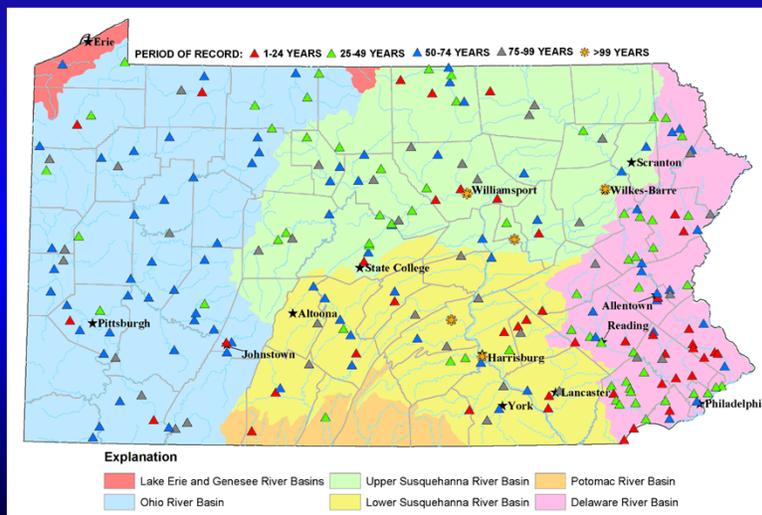


USGS Streamgaging History

- 1889 - First streamgaging station on Rio Grande River in NM
- 1897 - First documented streamflow measurements in PA on Susquehanna River at Harrisburg
- 1910 - 72 streamgages were operating in PA; 20 were located in the Delaware River Basin
- 2010 - Operating about 250 streamgages in PA; 82 are located in PA within the Delaware River Basin



PA Streamgaging Network



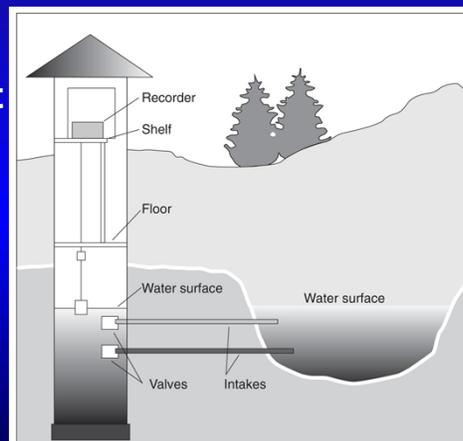
Common uses of USGS Streamflow Data

- Flood forecasting and flood warning by National Weather Service and other emergency managers
- Estimate flood annual exceedance probabilities for designing bridges, dams, flood control structures & flood plain designation
- Determine stream discharge and withdrawal limits
- Water supply planning & drought management
- Compute loads to develop water-quality standards and TMDL's
- Study trends in water quantity and quality
- Plan recreational activities



Gaging Station Design

Traditional:
Mechanical Equipment



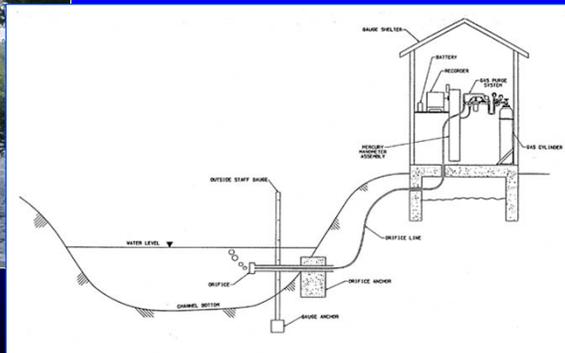
(From Wahl and others, 1995)



Gaging Station Design



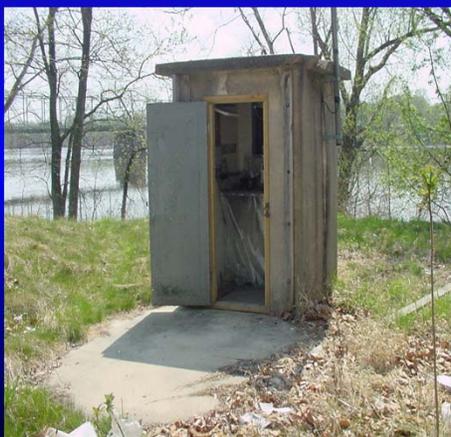
Modern: Pressure Transducer and Electronic Equipment



USGS

Flood Hardened Gages

Delaware River at Trenton, NJ



USGS

Flood Hardened Gages

Lehigh River at Glendon, PA (old)



 USGS

Flood Hardened Gages

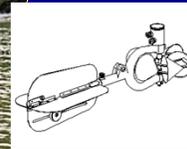
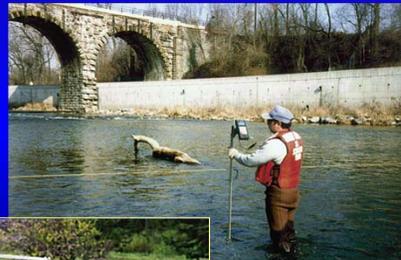
Lehigh River at Glendon, PA (new)



 USGS

Streamflow Data Collection

Transitioning from mechanical means



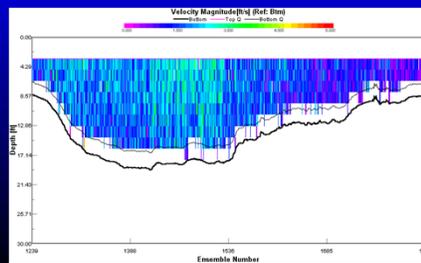
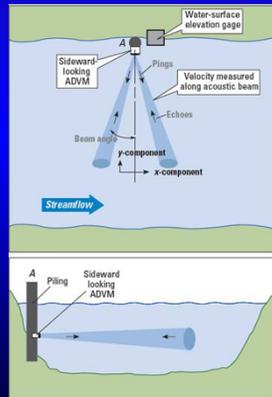
Streamflow Data Collection

To acoustic means



Streamflow Data Collection

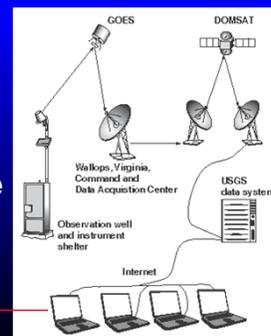
Using acoustic technology



Data-Delivery Methods:

Satellite Telemetry

- Geostationary Operational Environmental Satellite (GOES)
 - Operated by NOAA (National Oceanic and Atmospheric Administration)
 - Reliable
 - Automatic switchover during primary failure
- Timed transmissions every hour
- Random transmissions when selected thresholds are exceeded
- Data transmitted to computer base stations and USGS archival database



Your computer

Data-Delivery Methods: Other Telemetry

Telephone Telemetry

- Dial-in, dial-out capability

Radio Telemetry

- Data delivered to specific site

Station Visits

- Observations of outside gages



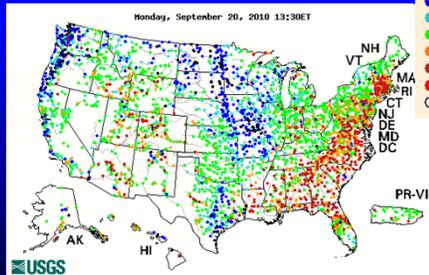
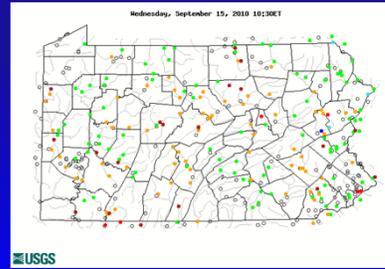
Data-Delivery Methods: Internet and E-mail Applications

- Real-time data
- Historical data
- Annual data summaries
- Instantaneous and daily data
- Peak stage and streamflow data
- Stage-discharge rating data
- Streamflow statistics
- Alert systems



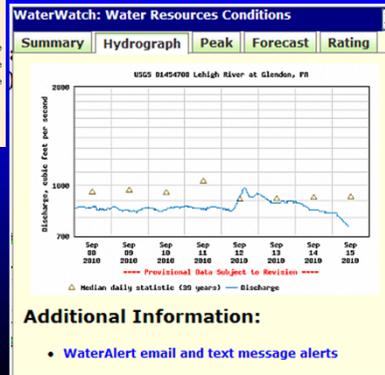
Water Watch Real-time Streamflow Data

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



Explanation

- High
- ≥ 90th percentile
- 75th - 89th percentile
- 25th - 74th percentile
- 10th - 24th percentile
- < 10th percentile
- Low
- Not ranked



National Water Information System (NWIS WEB)

- Much of the hydrologic data collected by the USGS is available through the NWIS Web interface
- Surface water - Water flow and levels in streams, lakes, and springs ,
- Ground water - Water levels in wells
- Water quality data - Chemical and physical data for streams, lakes, springs, and wells

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

USGS

National Water Information System (NWIS WEB)

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National Water Information System: Web Interface

USGS Water Resources (District Access) Data Category: Home Geographic Area: United States GO

News New Real-Time and Site Web Services! - updated August 26, 2010

USGS Water Data for the Nation

Data Category

- Real-time data** **Current-conditions** data transmitted from selected surface-water, groundwater, and water-quality sites.
- Site information** Descriptive site information for all sites with links to all available water data for individual sites.
- Surface water** Water flow and levels in streams, lakes, and springs.
- Groundwater** Water levels in wells.
- Water quality** Chemical and physical data for streams, lakes, springs, and wells.
- Mapper** Map of all sites with links to all available water data for individual sites.

Introduction

These pages provide access to water-resources data collected at approximately 1.5 million sites in all 50 States, the District of Columbia, Puerto Rico, the Virgin Islands, Guam, American Samoa and the Commonwealth of the Northern Mariana Islands. Online access to this data is organized around the categories listed to the left.

The USGS investigates the occurrence, quantity, quality, distribution, and movement of surface and underground waters and disseminates the data to the public, State and local governments, public and private utilities, and other Federal agencies involved with managing our water resources.

[About us](#) [Help](#) [Tutorial](#)

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



Annual Data Report and Other Data

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National Water Information System: Mapper

USGS Home Contact USGS Search USGS

Year filter: Active Sites Zoom to: Pennsylvania Enter a Place or Address Go NWIS Home | Instructions | Disclaimer

Legend:

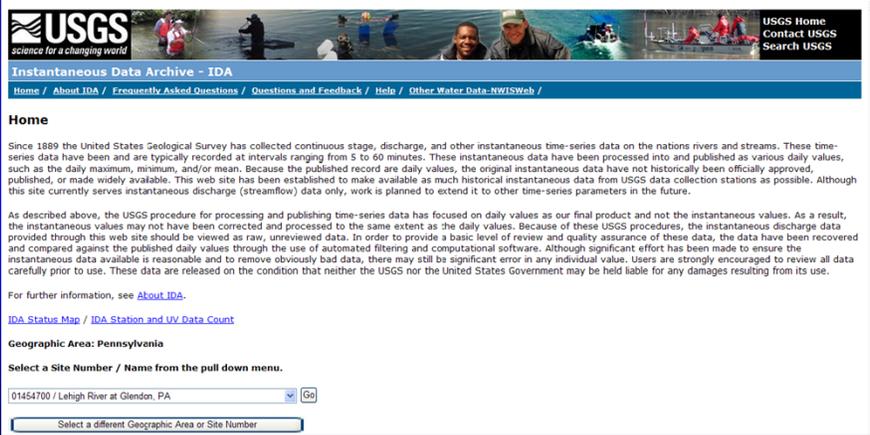
- Surface-Water Sites**
(streams, lakes, wetlands, estuaries, ocean, diversions, canals)
▲ Any data (not reliable)
- Groundwater Sites**
(wells, any subsurface)
- Spring Sites**
- Atmospheric Sites**
(climate, weather)
- Other Sites**
(ponds, water use, any other)

* References to non-U.S. Department of the Interior (DOI) products do not constitute an endorsement by the DOI. By viewing the Google Maps API on this web site the user agrees to these [TERMS of Service](#) set forth by Google.



<http://wdr.water.usgs.gov/nwisgmap>

Instantaneous (Unit Value) Data



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Instantaneous Data Archive - IDA

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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 ensure 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](#)

Geographic Area: Pennsylvania

Select a Site Number / Name from the pull down menu.

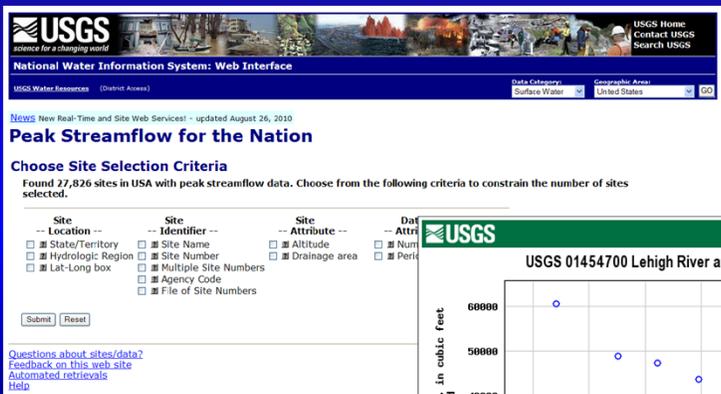
01454700 / Lehigh River at Glendon, PA

Select a different Geographic Area or Site Number

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



Peak Streamflow Data



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National Water Information System: Web Interface

USGS Home
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Search USGS

USGS Water Resources (District Areas)

Data Category: Surface Water Geographic Area: United States

Peak Streamflow for the Nation

News: New Real-Time and Site Web Services! - updated August 26, 2010

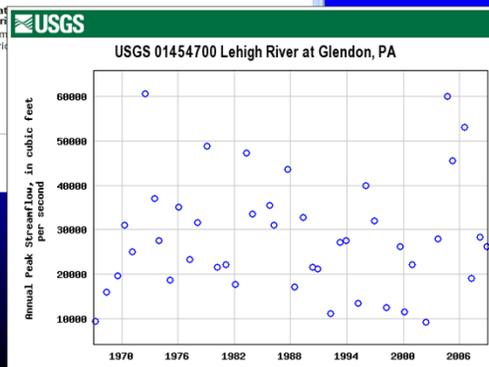
Choose Site Selection Criteria

Found 27,826 sites in USA with peak streamflow data. Choose from the following criteria to constrain the number of sites selected.

Site -- Location --	Site -- Identifier --	Site -- Attribute --	Site -- Attribute --
<input type="checkbox"/> State/Territory	<input type="checkbox"/> Site Name	<input type="checkbox"/> Altitude	<input type="checkbox"/> Number of Sites
<input type="checkbox"/> Hydrologic Region	<input type="checkbox"/> Site Number	<input type="checkbox"/> Drainage area	<input type="checkbox"/> Percent of Sites
<input type="checkbox"/> Lat-Long box	<input type="checkbox"/> Multiple Site Numbers	<input type="checkbox"/> Agency Code	
	<input type="checkbox"/> File of Site Numbers		

[Questions about sites/data?](#)
[Feedback on this web site](#)
[Automated retrievals](#)
[Help](#)

<http://nwis.waterdata.usgs.gov/usa/peak/>

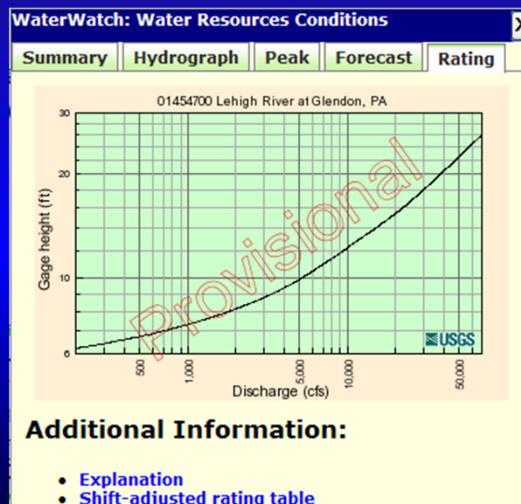


Stage-Discharge Rating Data

- Expanded Base ratings, and latest shift-adjusted rating retrieved from all stage-discharge sites at 8 PM local time
- Available on web by site:
- Tab delimited (rdb) format
- Detailed information on current variable stage shifts included
- http://nwis.waterdata.usgs.gov/nwisweb/data/exsa_ratXXXXXX.rdb/



Stage-Discharge Rating Data



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

StreaMail

- 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 "streamail@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.



Example of StreaMail Response

- U.S. Geological Survey (USGS) StreaMail:
The latest river stage and streamflow values you requested from StreaMail.
- Site: 01463500 Station name: Delaware River at Trenton NJ
Date: 08/05/2010
Time: 10:15:00
Stage: 8.17 feet
Streamflow: 3190 cubic feet per second (cfs)
- Link to charts for 01463500:
Stage:
http://waterwatch.usgs.gov/wwapps/zchart.php?i=nwis2&vt=uv&cd=00065&site_no=01463500
- Streamflow:
http://waterwatch.usgs.gov/wwapps/zchart.php?i=nwis2&vt=uv&cd=00060&site_no=01463500



Water Alert

- Threshold notification system
- User selects station & desired notification settings; i.e. data type, threshold condition, and frequency
- Interactive map with search options
- Subscription form and Confirmation
- Text message or email sent to subscriber

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



Water Alert

USGS WaterAlert

The U.S. Geological Survey WaterAlert service sends e-mail or text messages when **certain parameters** measured by a USGS data-collection station exceed user-definable thresholds. The development and maintenance of the WaterAlert system is supported by USGS and its data-collection partners, including numerous federal, state, and local agencies.

Real-time data from USGS gauges are transmitted via satellite or other telemetry to USGS offices at various intervals; in most cases, once every 1 or 4 dependent intervals.

Instructions

SITE SELECTION

State or Territory (select one or more)

- Alabama
- Alaska
- Arizona
- Arkansas
- California
- Colorado
- Connecticut
- Delaware
- Dist of Columbia
- Florida

Data Type

- Surface Water
- Groundwater
- Water Quality
- Precipitation

Reset Search

* References to non-U.S. Department of the Interior (DOI) products do not constitute an endorsement by the DOI. By viewing the Google Map API on this web site the user agrees to these Terms of Service set forth by Google.



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

Water Alert

Reply to Request for settings Email Subject:

Your USGS WaterAlert request has been processed.

Site Number: 01463500
Station Name: Delaware River at Trenton NJ
Parameter Code: 00065
Parameter Name: Gage height
Agency Code: USGS
Notify when value exceeds subscriber threshold of 13.00 ft
Notification interval, no more often than: Daily
Address: rreiser@usgs.gov
Message type (e=email, t=text msg): e
Notification id: hni-Q6Lhb
For Help: <http://water.usgs.gov/hns?hni-Q6Lhb:01463500>



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

Water Alert

Water Alert's Email Response when threshold reached

- **Streamflow of 3280 cfs is below subscriber threshold of 4200 at 2010-08-05 00:15:00 EDT**
01463500 00060 Delaware River at Trenton NJ
Notification interval, no more often than: Daily
 - **For Realtime Data at this station:**
http://waterdata.usgs.gov/nwis/uv/?site_no=01463500
 - **To Delete this Specific Alert** **To Pause this Specific Alert for 5 days**
reply with Subject: SIGNOFF hni-CrY2s reply with Subject: PAUSE hni-CrY2s 5
 - **To List Settings** **To List Settings for all Notifications of the Same**
reply with Subject: LIST hni-CrY2s Address reply with Subject: LIST ALL hni-CrY2s
 - **For Help**
reply with Subject: HELP hni-CrY2s
 - **To Sign up for New Notifications**
<http://water.usgs.gov/wateralert>
- To Modify a threshold**, set a "new" notification with the same email address, site number and parameter Send Questions to: GS-W_RT-HNS_Feedback@usgs.gov



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

Summary of Available Data Deliveries

- Real-time data
- Historical data
- Annual data summaries
- Instantaneous and daily data
- Peak stage and streamflow data
- Stage-discharge rating data
- Streamflow statistics
- Alert systems



Contact Information

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USGS Pennsylvania Water Science Center Home Page

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

