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

Bob Hainly
Assistant Director

USGS science for a changing world

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

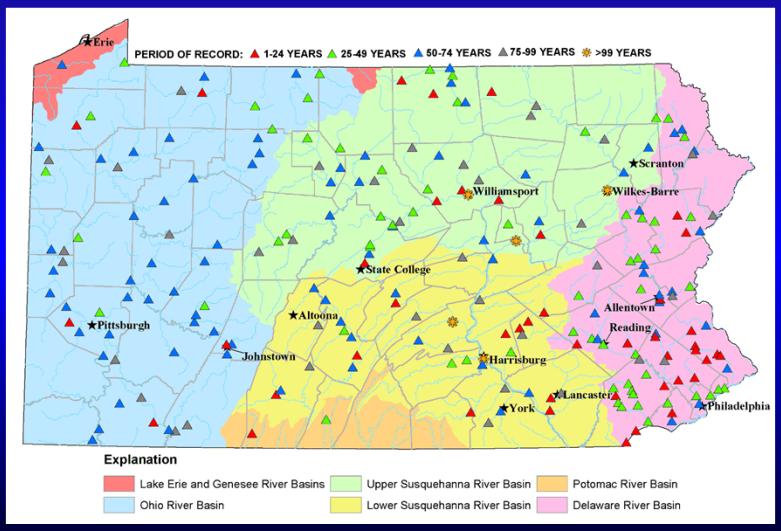
USGS

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

USGS

PA Streamgaging Network



USGS

Common uses of USGS Streamflow Data

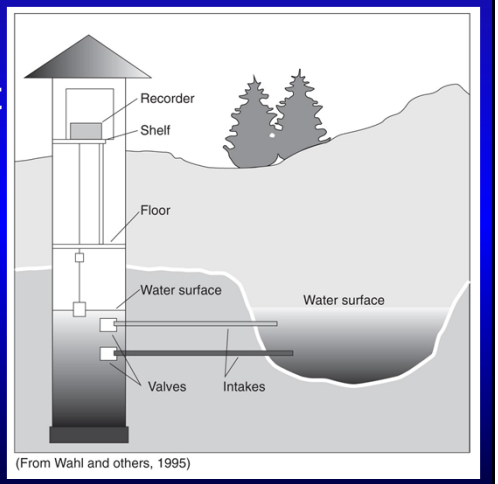
- Flood forecasting and flood warning by National Weather Service and other emergency managers
- Estimate flood annual exceedance probabilities for designing bridges, dams, flood control structures & flood plain designation
- Determine stream discharge and withdrawal limits
- Water supply planning &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

USGS

Gaging Station Design

Traditional:

Mechanical Equipment

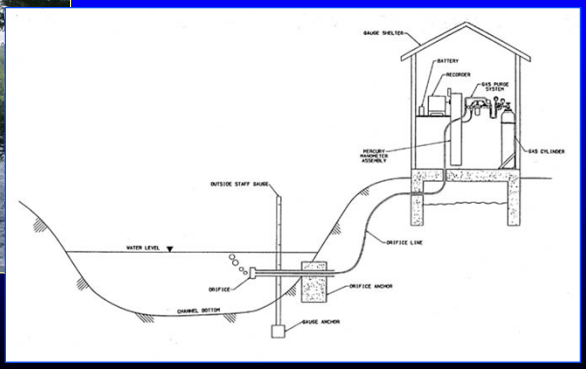


(From Wahl and others, 1995)

USGS

Gaging Station Design

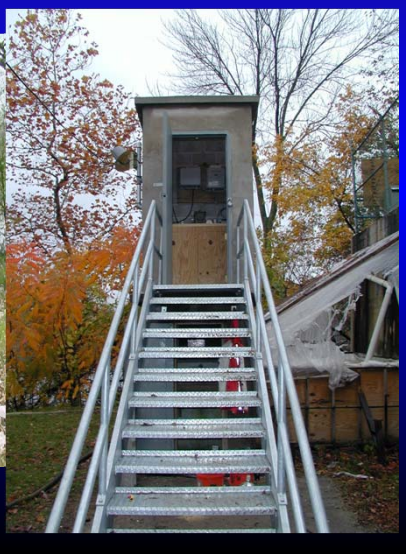
Modern: Pressure Transducer and Electronic Equipment



USGS

Flood Hardened Gages

Delaware River at Trenton, NJ



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Flood Hardened Gages

Lehigh River at Glendon, PA (old)

USGS

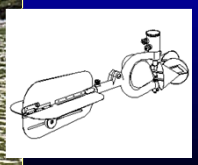
Flood Hardened Gages

Lehigh River at Glendon, PA (new)

USGS

Streamflow Data Collection

Transitioning from mechanical means ……



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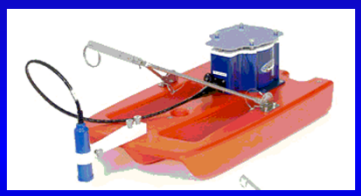
Streamflow Data Collection

To acoustic means ……



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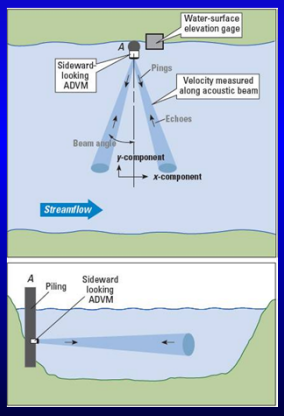
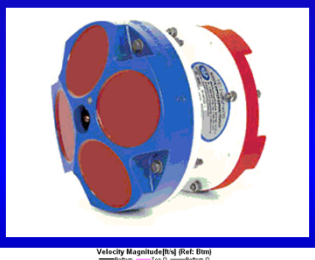
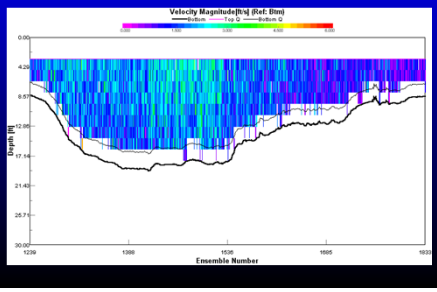
Streamflow Data Collection

Using acoustic technology







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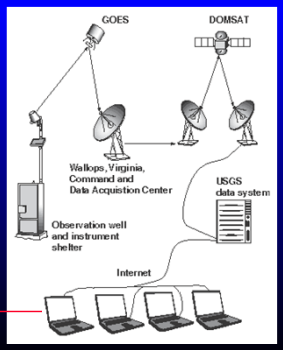
Data-Delivery Methods: Satellite Telemetry

- 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



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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

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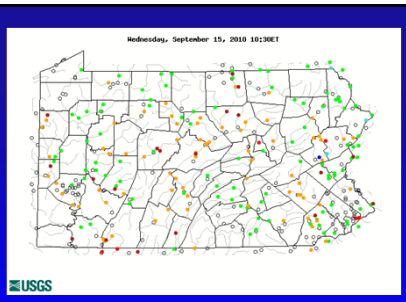
Data-Delivery Methods: Internet and E-mail Applications

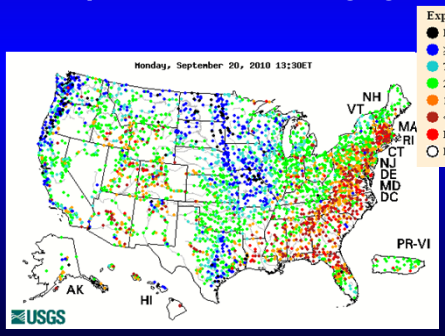
- Real-time data
- Historical data
- Annual data summaries
- Instantaneous and daily data
- Peak stage and streamflow data
- Stage-discharge rating data
- Streamflow statistics
- Alert systems

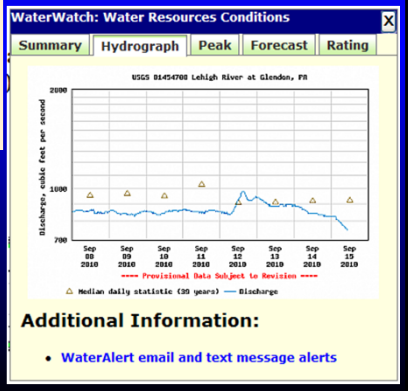
USGS

Water Watch Real-time Streamflow Data

http://waterwatch.usgs.gov/







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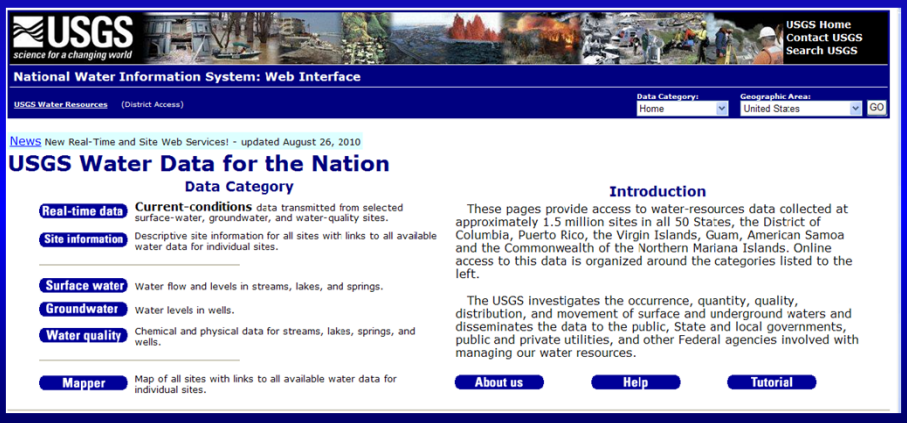
National Water Information System (NWIS WEB)

- 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

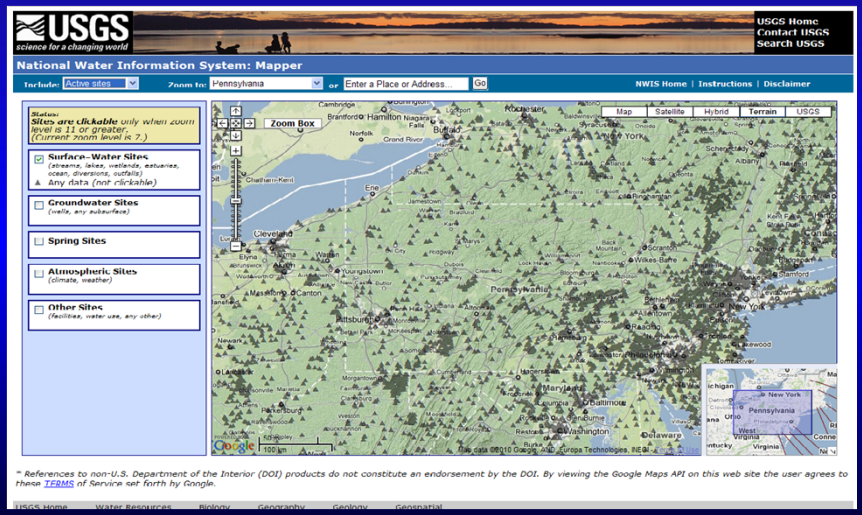
National Water Information System (NWIS WEB)



http://waterdata.usgs.gov/nwis

USGS

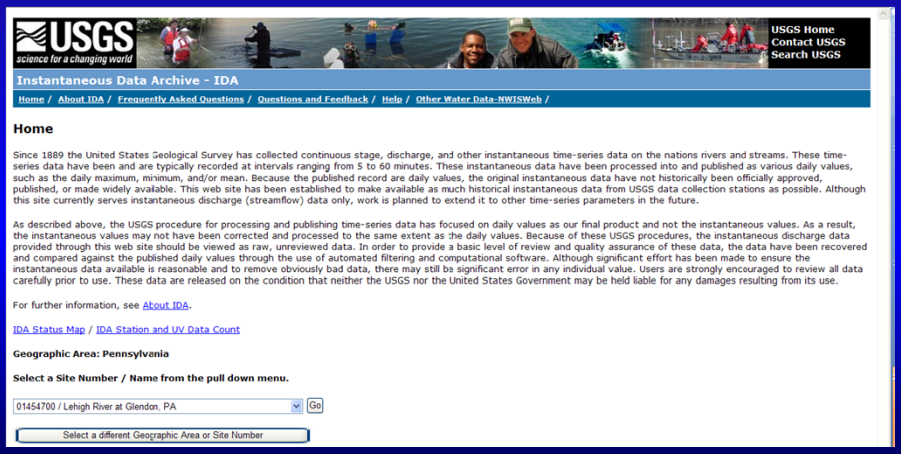
Annual Data Report and Other Data



USGS

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

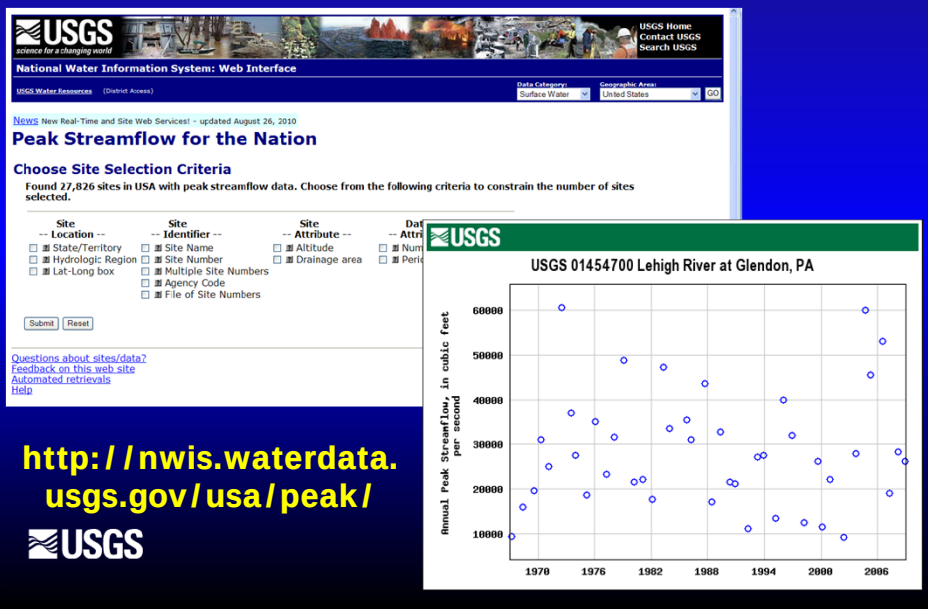
Instantaneous (Unit Value) Data



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

USGS

Peak Streamflow Data



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

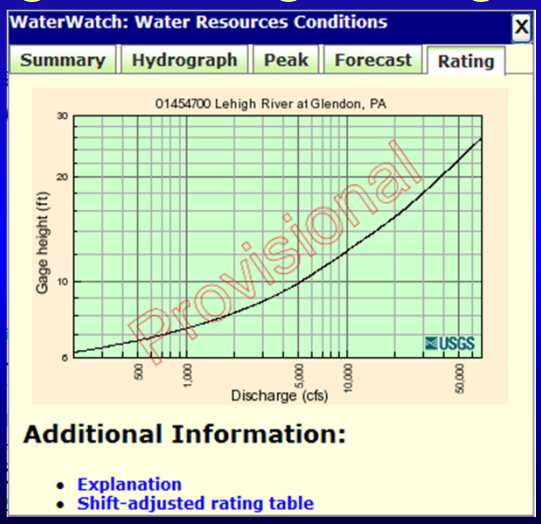
USGS

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/

USGS

Stage-Discharge Rating Data



USGS

http://waterwatch.usgs.gov/

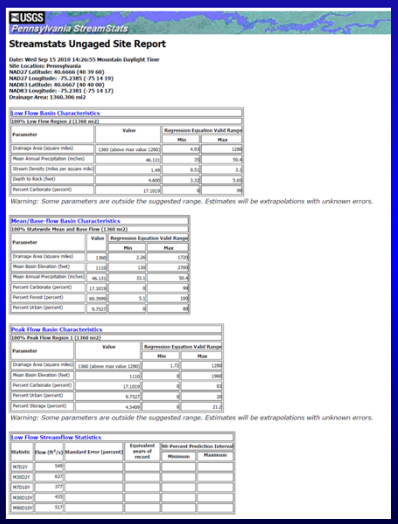
StreamStats

USGS http://water.usgs.gov/osw/streamstats

StreamStats

The following statistics can be determined from regression equations for Pennsylvania:

- Low flows
- Mean annual and harmonic flows
- Base flows
- Flood flows



USGS http://water.usgs.gov/osw/streamstats

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.

USGS

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

USGS

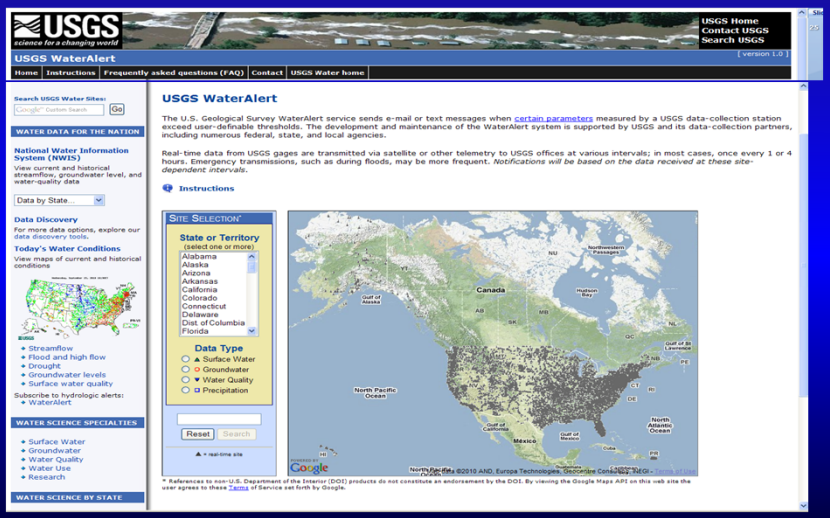
Water Alert

- 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

USGS

Water Alert



USGS

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

USGS

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**
  reply with Subject: SIGNOFF hni-CrY2s
  To Pause this Specific Alert for 5 days
  reply with Subject: PAUSE hni-CrY2s 5
- **To List Settings**
  reply with Subject: LIST hni-CrY2s
  To List Settings for all Notifications of the Same 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

USGS

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

USGS

Contact Information

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USGS Pennsylvania Water Science Center Home Page
http://pa.water.usgs.gov

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