

The U.S. Geological Survey Stream Gage Network in Maryland: Data for Assessment, Management, and Protection of Water Resources

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Baltimore Data Day, July 25, 2014



Sustainability and Water Resources

- **Defining Sustainability:** Meeting the current environmental, social, and economic needs of a community, without compromising the ability of future generations to meet these needs.
- Sustainability goals include both improvements in today's quality of life and passing on these improvements to the next generation.
- Sustainability can be illustrated by a “three legged stool”, comprised of: (1) social equity (people), (2) economic health (prosperity), and (3) environmental stewardship (planet).
- Water-resource issues (availability, use, quality, recreation) provide a critical link to the issue of sustainability in a given community.
- The USGS stream-gage network provides a foundation for addressing water-resource issues in the Baltimore region.

Water Resources Protection and Management

- Monitoring streamflow is a fundamental need in managing and protecting water resources.
- To quantify streamflow in rivers and streams and how it varies over time, it must be measured by use of stream gages.
- Without streamflow data, water-management decisions are made based on rough estimates or un-calibrated models.
- A critical goal for any stream gage network is for different physiographic regions, watershed sizes, and land use types to be represented, because we can't monitor everywhere.

Why Do We Need Stream Gages?

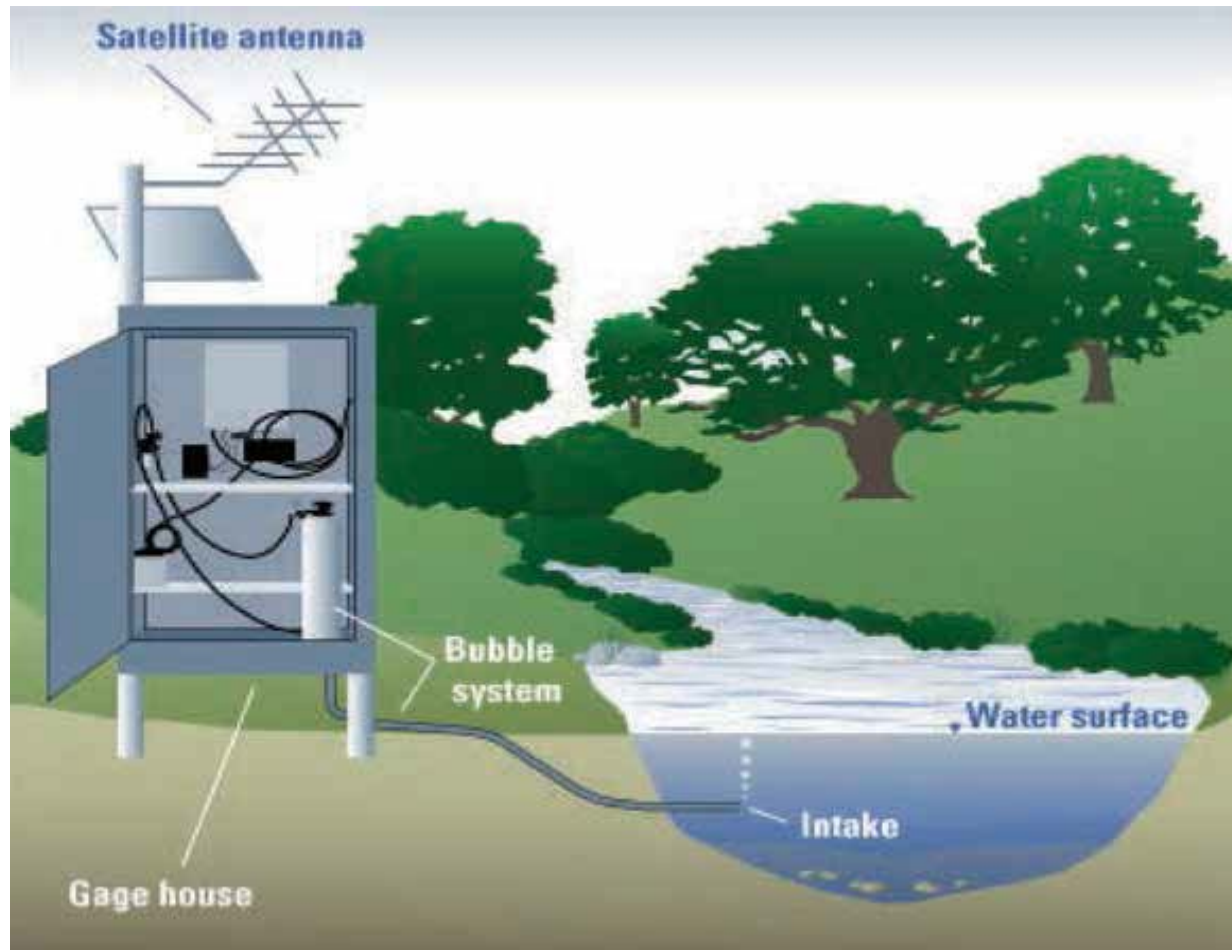
- Flood probabilities/flood plain boundary delineation
- Water supply/flow into and out of reservoirs
- Bridge/culvert design
- Stream restoration/channel retrofits
- Model calibration
- Water quality studies, TMDLs, computing contaminant loads
- Watershed management, or evaluating impacts of changes in the watershed
- Minimum flow-by requirements
- Evaluating current hydrologic conditions and long-term trends
- Regional/area assessments
- Recreation



How Does a Stream Gage Work?



How Does a Stream Gage Work?



How Are Stream Gages Paid For?

- Stream gages are paid for through a combination of funds from USGS, and other Federal, State, and Local agencies that need the data for accomplishing their respective agency missions.
- USGS operates the stations, analyzes, approves, and publishes the data annually.
- Stations that are operated in the USGS network are driven by agency needs and available funding.
- Depending on funding availability, USGS can provide up to 50% of the maintenance and operational costs to selected stations (Federal-State Cooperative Matching Funds).
- In addition, USGS provides partial funding to a selected subset of federal interest stream gages through the National Streamflow Information Program (NSIP). <http://water.usgs.gov/nsip/>

Monitoring Frequency and Record Lengths

- Continuous record stream gages (1-15 minute recorded unit values)
- Urban watersheds—recording intervals of 5 minutes or less
- Stations visited every 6-8 weeks for equipment servicing and physical discharge measurements for developing streamflow records.
- Special trips are made to measure above base and storm flows.
- Record lengths in the Baltimore region range from less than 1 year to 70 years.

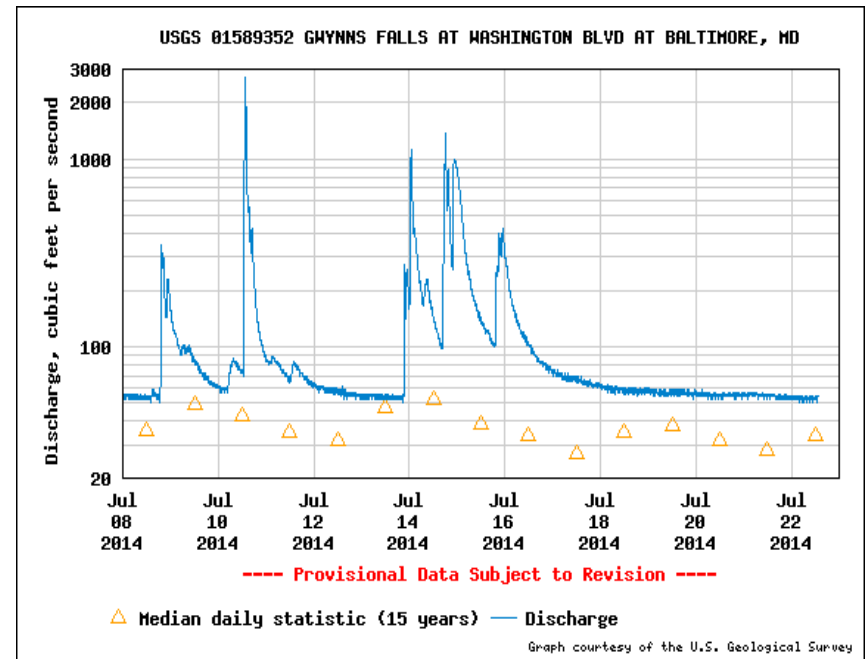
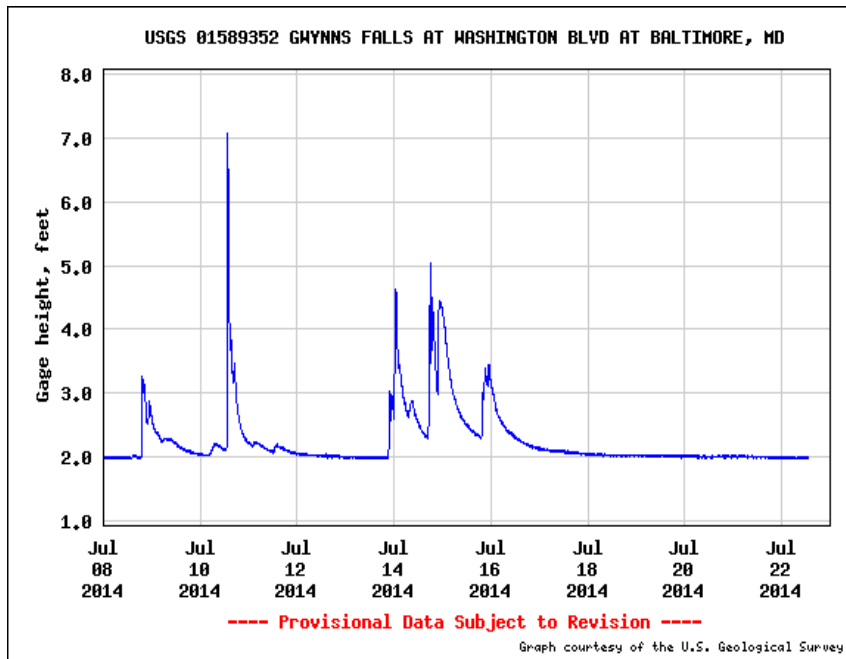


What Data Are Produced From Stream Gage Operations?

- Continuous stage data (1- to 15-minute recording frequency) delivered in real time (1 hour transmission frequency).
- Direct discharge measurements (6-8 times per year) at each stream gage.
- Stage-discharge relation (or rating), with a record of changes over time.
- Computed continuous discharge data with daily-mean discharge and yearly flow statistic compilations.
- USGS annual water-data report has provided computed, quality-assured discharge data and statistics in a citable format.

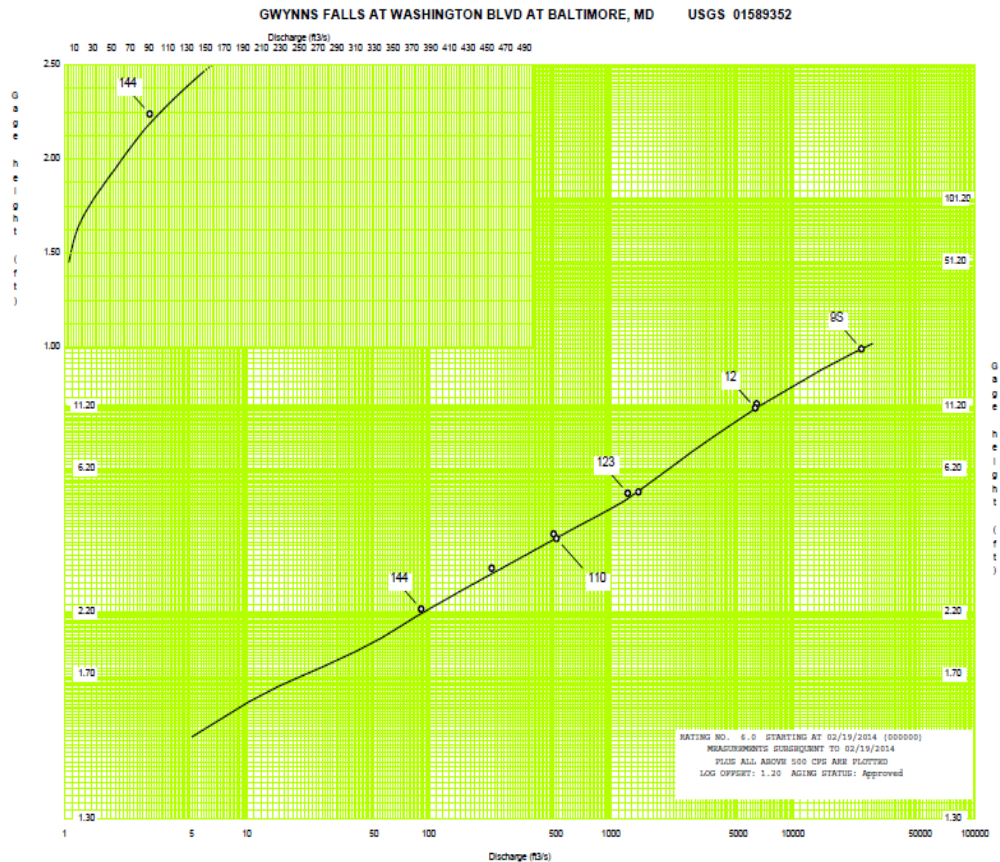
USGS Streamflow Data in Near Real-Time

(<http://waterdata.usgs.gov/md/nwis/current?type=flow>)



Stage-Discharge Rating—Gwynns Falls at Washington Boulevard at Baltimore, MD

- Log-Log relation with discharge on x-axis and gage height on y-axis
- Points and numbers on graph represent physical measurements of discharge.
- Relation is adjusted over time based on plotting position of new discharge measurements
- Rating is used with the continuous record of gage heights (5 minute unit values) to produce continuous streamflow records.



The Value of Long-Term Streamflow Data

Patuxent River near Unity, MD, Drought of 1998-1999

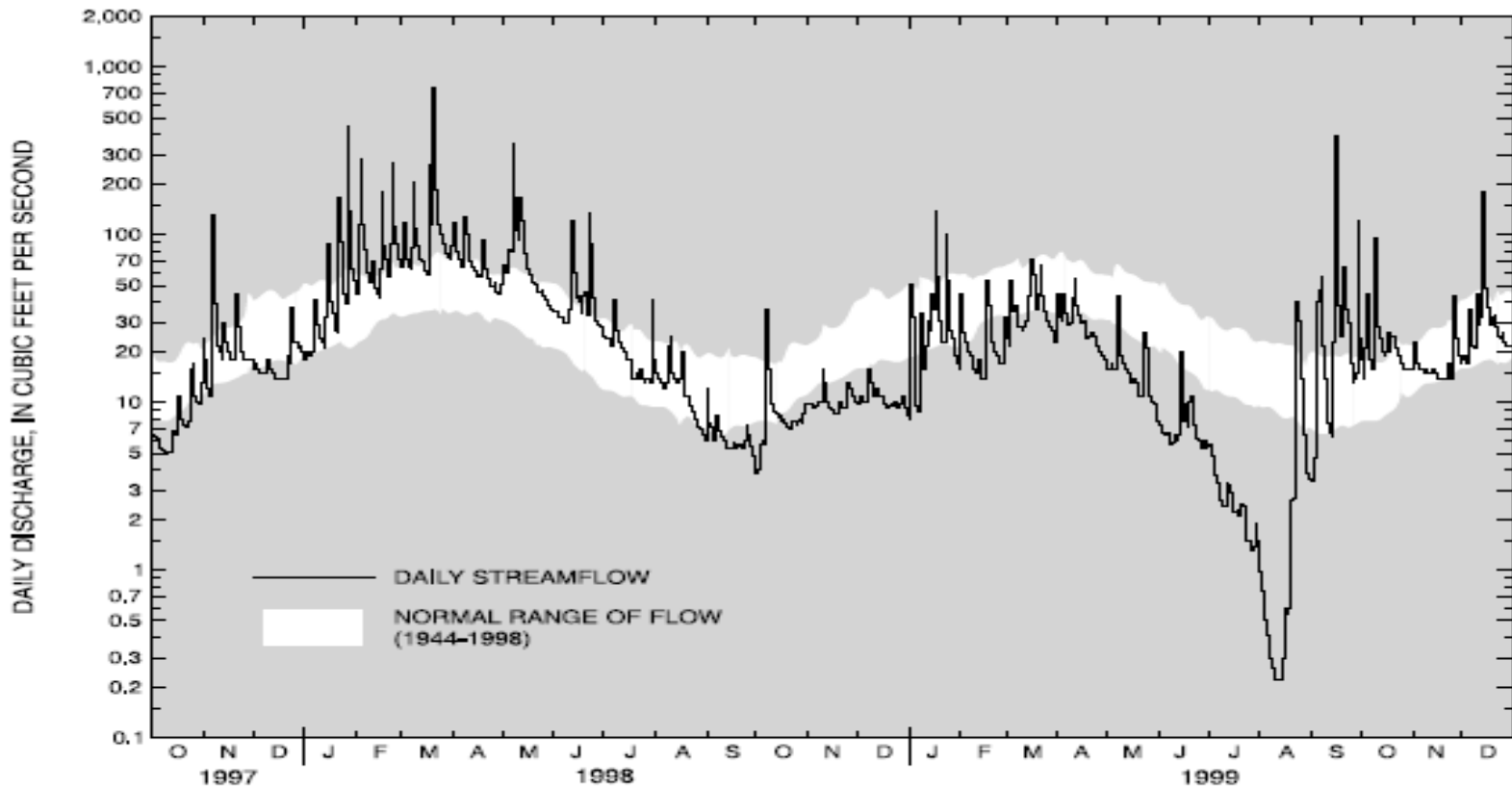
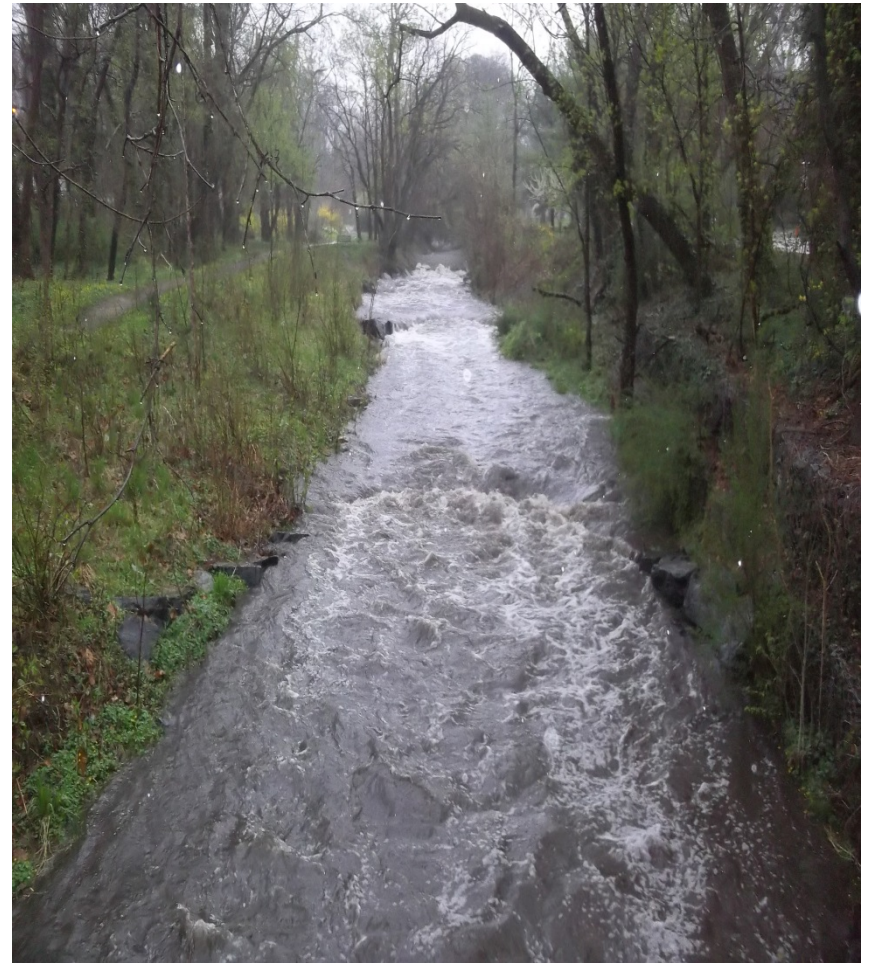


Figure 2. Daily streamflow for the Patuxent River near Unity, Maryland (October 1997-December 1999) (data from U.S. Geological Survey, 2000).

Station 01589464, Stony Run at Ridgemedede Road at Baltimore, MD

- **Active from May 2005 to present**
- **Small watershed—2.20 square miles**
- **Operated in cooperation with Baltimore City DPW**
- **Streamflow data was used for design of a physical stream restoration project.**
- **Data to complement water-quality sampling efforts by City DPW staff before and after restoration.**



Station 01589352, Gwynns Falls at Washington Boulevard at Baltimore, MD

- **Active from October 1998 to present**
- **Watershed of 65.9 square miles—represents nearly all of the non-tidal Gwynns Falls.**
- **Operated in cooperation with the Baltimore Ecosystem Study (BES).**
- **Monitoring the long-term watershed hydrology of Gwynns Falls.**
- **Data complements weekly nutrient and storm sampling efforts by BES since the project started in 1998.**



USGS Data Resources

- <http://waterdata.usgs.gov/md/nwis/current/?type=flow> to obtain real-time streamflow data in MD-DE-DC, plus instantaneous discharge data from Oct. 1, 2007 to present
- <http://waterdata.usgs.gov/md/nwis/sw> to access NWIS web for Maryland (Real-time data, published daily mean discharges, statistics, peak flows, field measurements)
- <http://ida.water.usgs.gov/ida/> to obtain instantaneous discharge data online (through Sept. 30, 2007)
- <http://wdr.water.usgs.gov> to access the 2006-2013 USGS Water-Data Reports for the United States (new web interactive format starting with 2006 water year data)
- <http://md.water.usgs.gov/publications/wdr.html> to access online USGS MD-DE-DC Water-Data Reports from water years 1997-2005