

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

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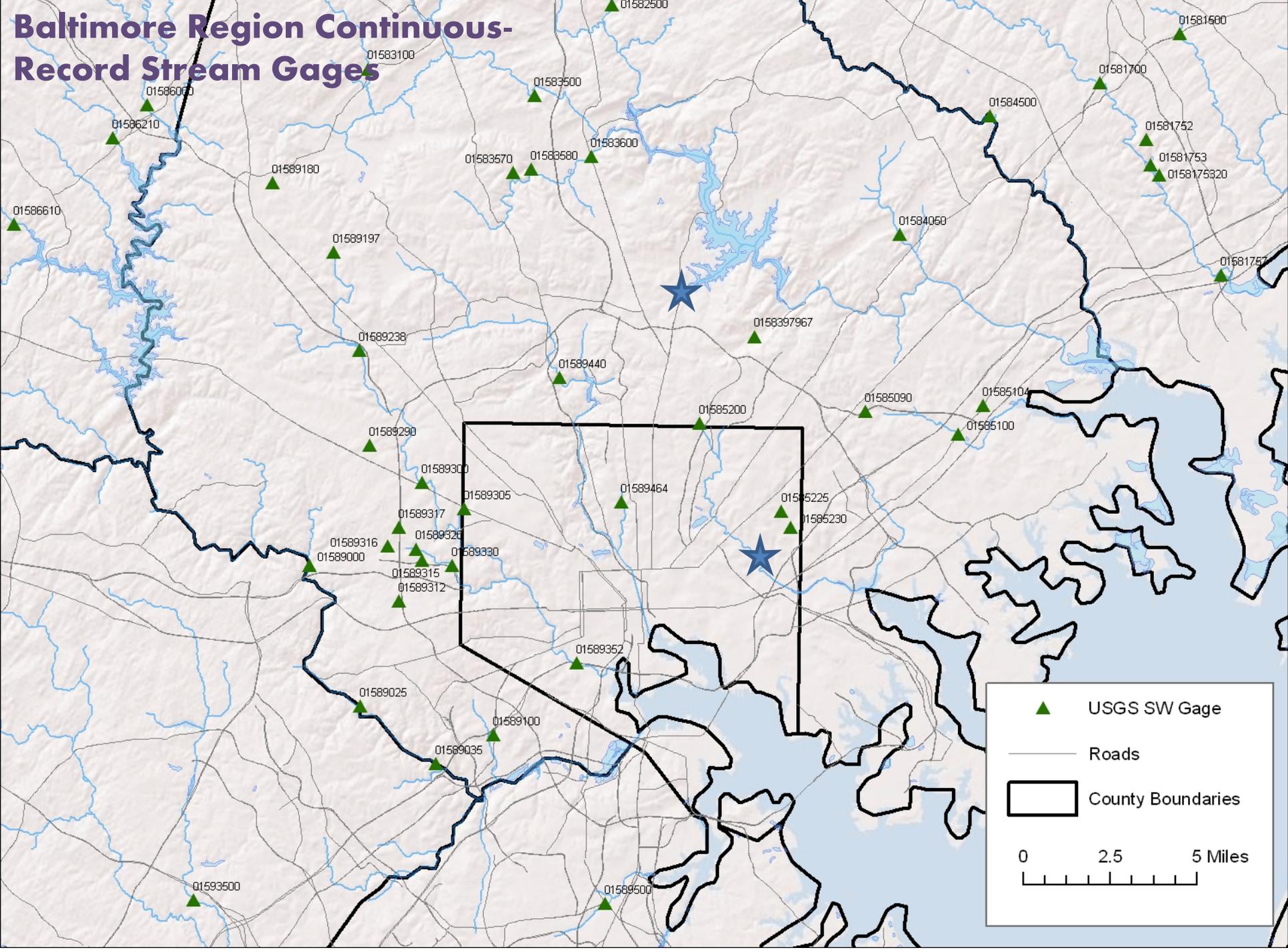
Sustainability and Water Resources

- **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.

Baltimore Region Continuous-Record Stream Gages



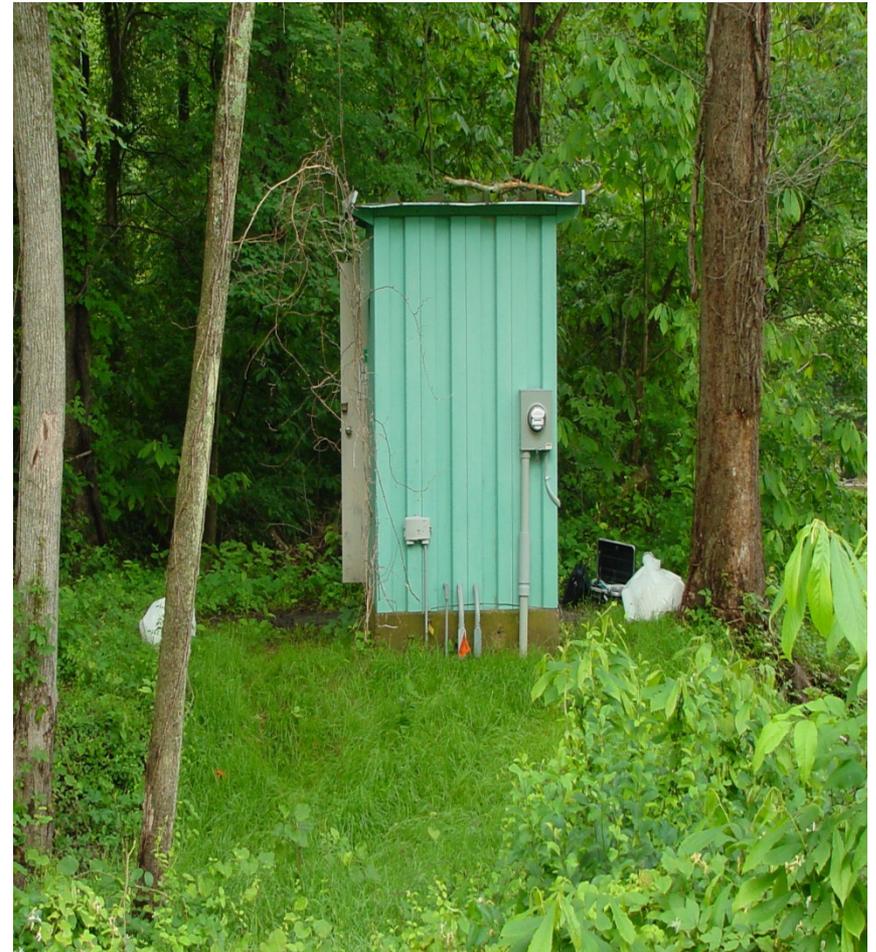
-  USGS SW Gage
-  Roads
-  County Boundaries

0 2.5 5 Miles



Why Do We Need Stream Gages?

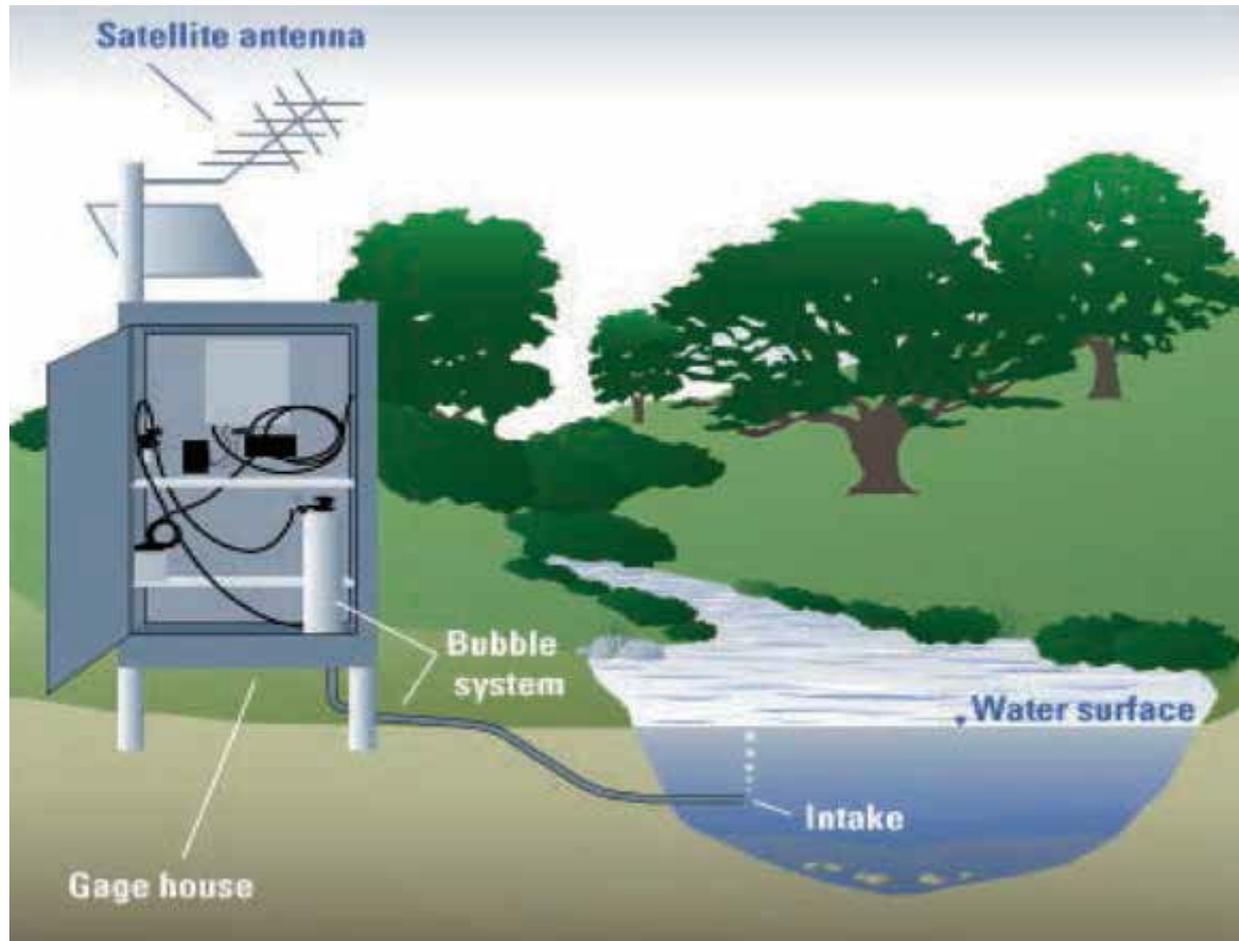
- Flood probabilities/flood plain boundary delineation
- Water supply/flow into and out of reservoirs
- Bridge/culvert design
- Stream restoration/channel retrofits
- Model calibration
- Water quality studies, TMDLs, computing contaminant loads
- Watershed management, or evaluating impacts of changes 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.

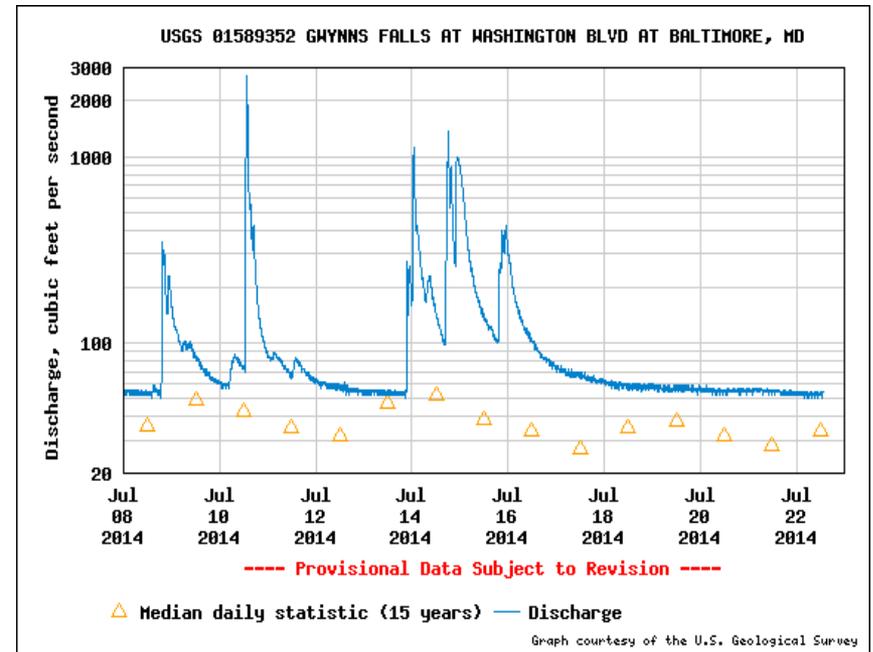
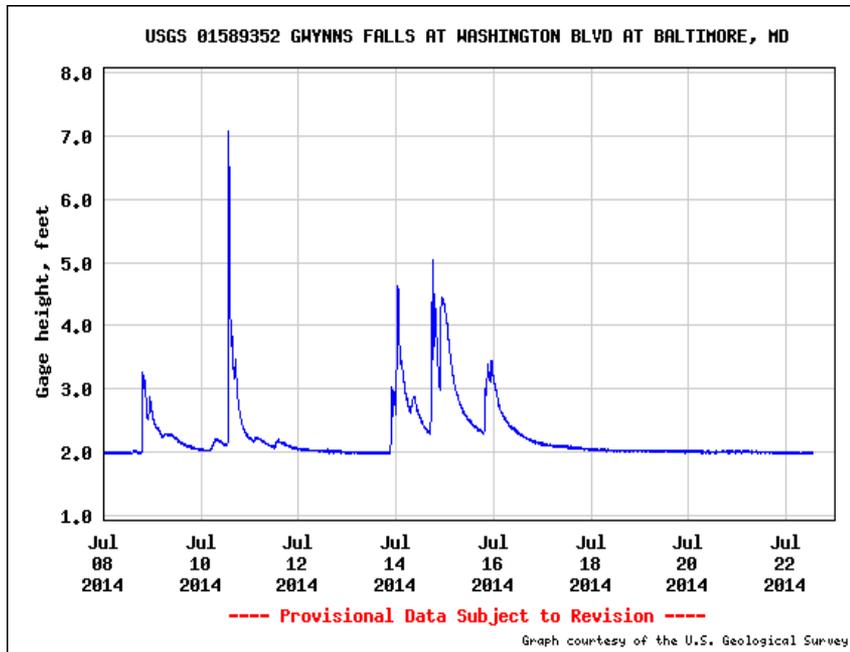


What Data Are Produced From Stream Gage Operations?

- 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.

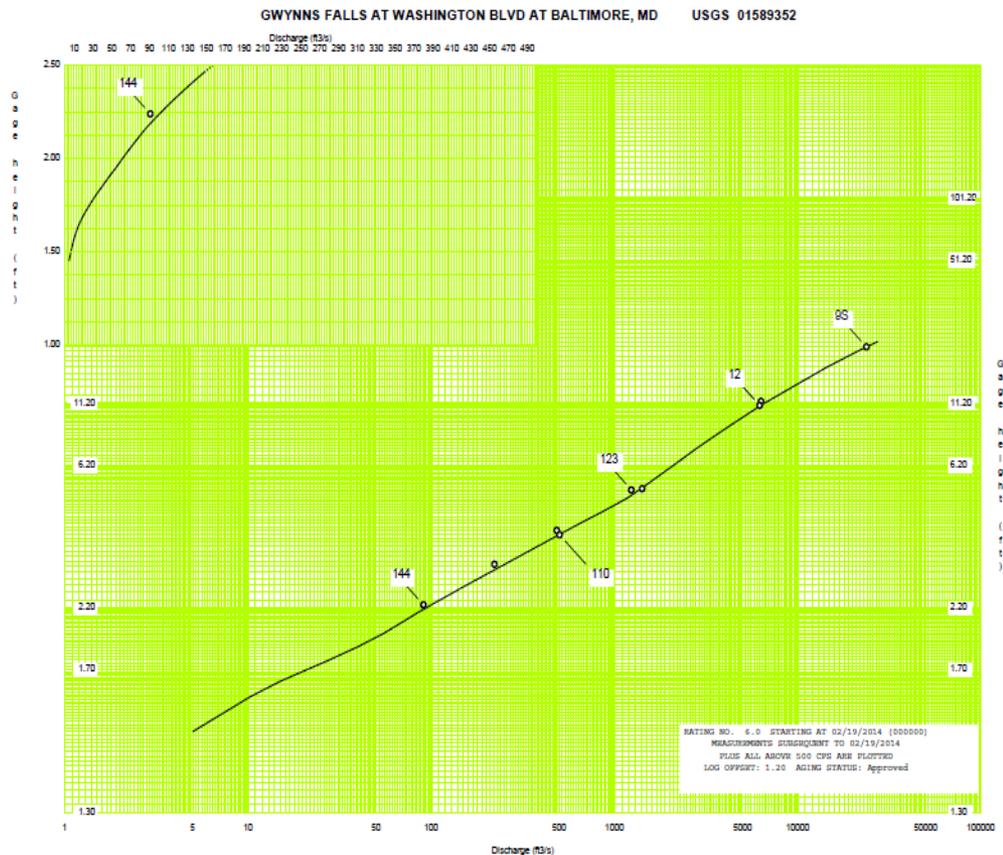
USGS Streamflow Data in Near Real-Time

(<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

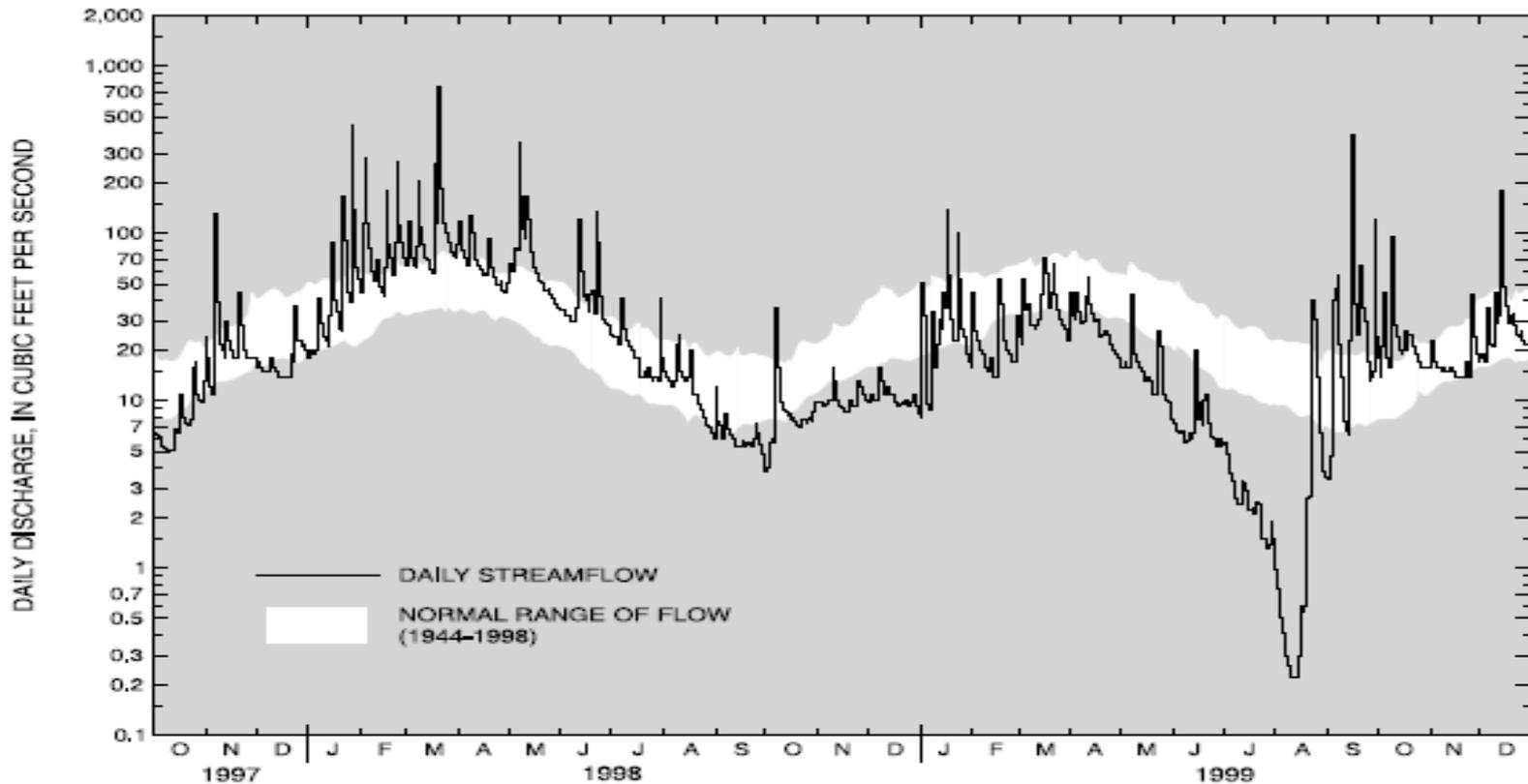
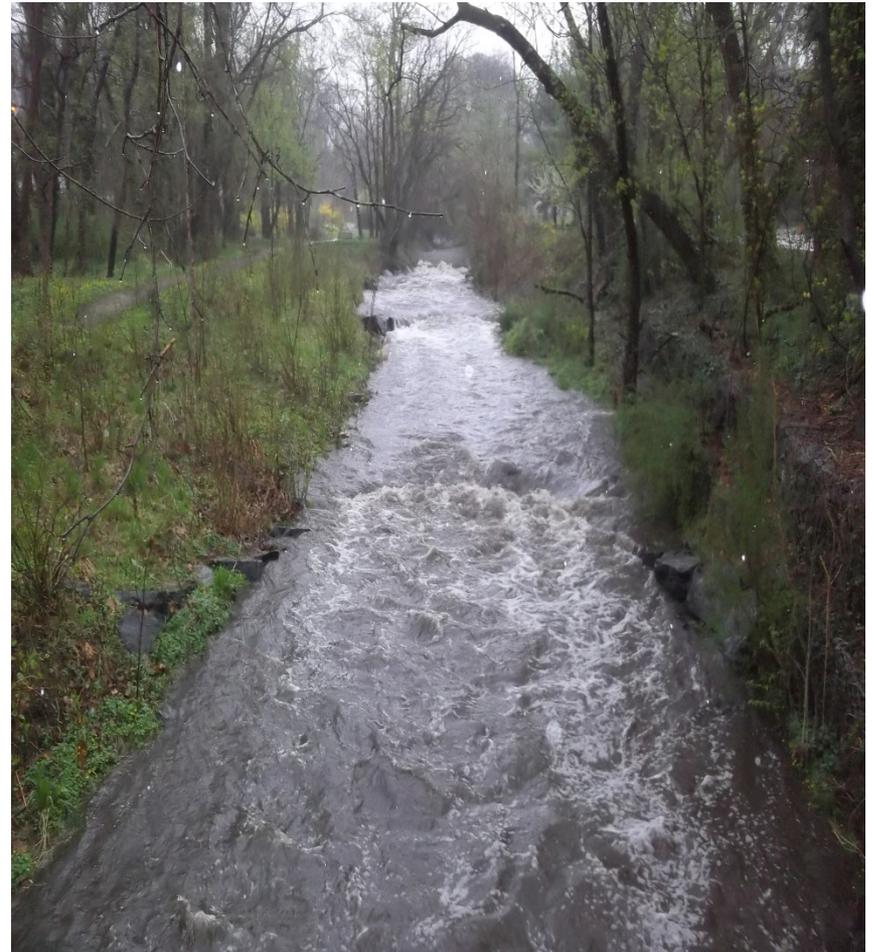


Figure 2. Daily streamflow for the Patuxent River near Unity, Maryland (October 1997-December 1999) (data from U.S. Geological Survey, 2000).

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