

U.S. Geological Survey (USGS) Maryland-Delaware-District of Columbia Monthly Water Conditions Summary

August 2014 – A record high groundwater level was observed in one observation well in Baltimore County, Maryland for the fourth consecutive month. Monthly mean streamflow at Piscataway Creek was at a record August high.

Why is it important for the USGS to collect and analyze water-resources data?

USGS water data are valuable to the public, researchers, water managers, planners, and agricultural users, especially during floods and droughts. These data can be used to assess how water resources respond to changes in climate. Scientists at the USGS have measured streamflow and groundwater levels in wells to assess water resources for over 125 years.

In addition to providing the most extensive set of historical streamflow and groundwater data available to the public, the USGS collects water data and quality-assures the data by employing standardized techniques across the country. The uniformity of the dataset allows for multi-state comparisons and other comparative statistical analyses that better inform policy makers of the possible water resources conditions they might encounter in the future.

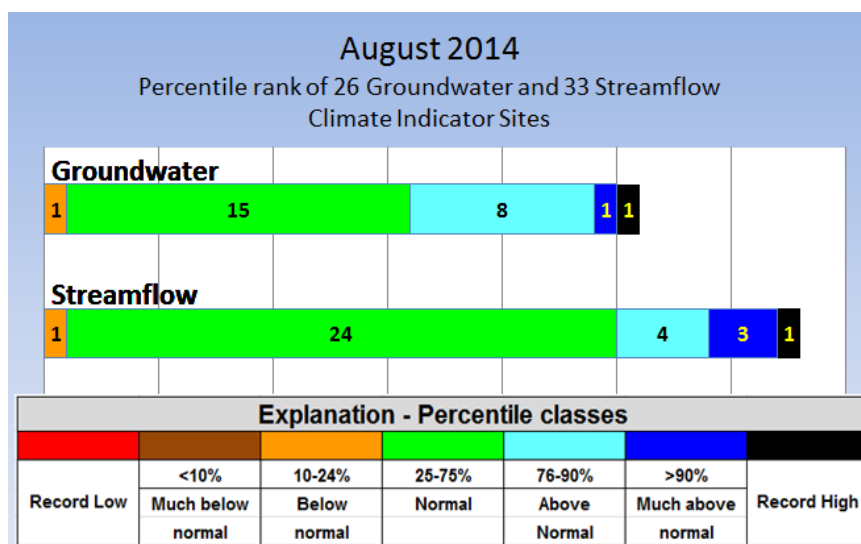
The sites used in this water summary were carefully selected to show the response of streamflow and groundwater levels to weather conditions. Ideally, these sites will show no effects from human influences. The streamflow and groundwater data are ranked in comparison to the historical record and summarized. Precipitation and reservoir data are also presented to give a more complete picture of the region's water resources.

USGS August 2014 Water Conditions Summary

Fifty-eight percent of the groundwater levels and 73 percent of the monthly mean streamflow values at sites used to monitor the response of water resources to changes in climatic conditions in Maryland, Delaware, and the District of Columbia were normal (between the 25th and 75th percentiles) in August.

Groundwater levels in 10 of 26 wells were above normal in August. The groundwater level at an observation well in Baltimore County was at a record August high. In Prince George's County, the groundwater level was above the 90th percentile in one observation well. The groundwater level was below normal (between the 10th and 24th percentiles) in a well in Somerset County, Maryland.

August monthly mean streamflows were above normal at 8 streamgages, which included a record high monthly mean streamflow in Prince George's County. Streamflow was normal at 24 streamgages, and below normal at a streamgage in Dorchester County, Maryland.



A **percentile** is a value on a scale from 0 to 100 that indicates the percent of a distribution that is equal to or below it. A percentile between 25 and 75 is considered normal.

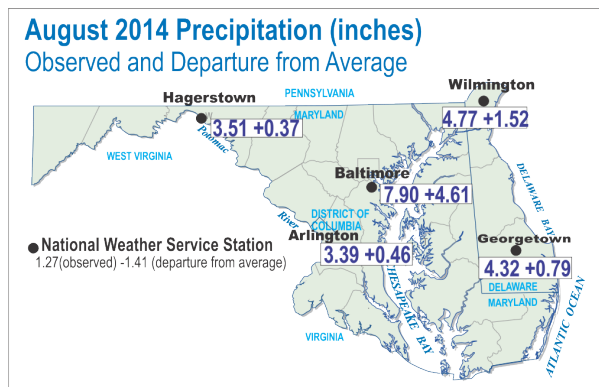
For example, a groundwater level in the 90th percentile is equal to or greater than 90 percent of the values recorded for that month.

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August 2014 Precipitation and Weather

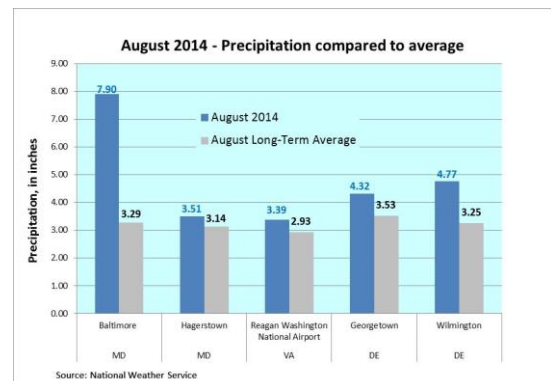
Record-setting rainfall caused flash flooding, road closures, flooded vehicles, and stranded motorists that needed to be rescued in the Baltimore, Maryland region in August. According to the National Weather Service (NWS), precipitation on August 12 was 6.30 inches at the Baltimore Washington International Thurgood Marshall (BWI) Airport NWS station in Baltimore, Maryland, which was a daily high rainfall record (breaking the August 12 record of 4.91 inches set in 1955). This value ranks as the second highest daily rainfall total ever reported for any day in Baltimore, and the highest in 80 years. The highest amount was 7.62 inches, set on August 23, 1933. Daily precipitation has been recorded since 1871 in Baltimore.

August rainfall was above the long-term average at the five NWS Mid-Atlantic weather stations. The highest monthly amount of rainfall was in Baltimore, Maryland with 7.90 inches and the lowest was in nearby Arlington, Virginia with 3.39 inches. The Baltimore rainfall was 4.61 inches above the long-term average. The large difference in rainfall is typical of summer weather with localized storms covering smaller areas, instead of large, broad regional weather patterns. The map below shows the departure from average at each of the five NWS weather stations.



National Weather Service Stations

Baltimore = Baltimore/Washington International Thurgood Marshall Airport (BWI)
Georgetown = Georgetown, Sussex County Airport
Hagerstown = Hagerstown Regional Airport
Arlington = Ronald Reagan Washington National Airport
Wilmington = New Castle Airport



The NWS Middle Atlantic River Forecast Center's 365-day precipitation data showed that all counties in Maryland, Delaware, and the District of Columbia were classified as average to above average. Four counties in Maryland were more than 10 inches over the 365-day average from August 2013 to August 2014. See the links below to view the NWS data.

August air temperatures were below normal at all five NWS Mid-Atlantic weather stations and ranged from 77.7 degrees Fahrenheit, or 0.4 degrees Fahrenheit below the long-term average, in Arlington, Virginia, near the District of Columbia, to temperatures in the low 70s, or 2 or more degrees Fahrenheit below normal at the remaining weather stations.

Sources:

National Weather Service
MD and DC: <http://www.weather.gov/climate/index.php?wfo=lmx>
DE: <http://www.weather.gov/climate/index.php?wfo=phi>
Middle Atlantic River Forecast Center (MARFC): <http://www.erh.noaa.gov/marfc/Precipitation/Departures/>

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Groundwater

The USGS monitors groundwater levels in unconfined aquifers, providing observations that can be compared to both short-term and long-term changes in climatic conditions. Twenty-six groundwater wells were selected based on the following criteria:

- Located in an unconfined (water-table) aquifer;
- Open to a single, known hydrogeologic unit/aquifer;
- Groundwater hydrograph reflects changes in climatic conditions;
- No indicated nearby pumpage and likely to remain uninfluenced by pumpage, regulated streamflow, or changes related to human activities;
- Minimum period of record is 10 years of continuous/monthly records;
- Minimally affected by irrigation, canals, drains, pipelines, and other potential sources of artificial recharge;
- Well has casing – dug wells are generally not used;
- Water levels show no apparent hydrologic connection to nearby streams;
- Well has never gone dry; and
- Long-term accessibility likely.

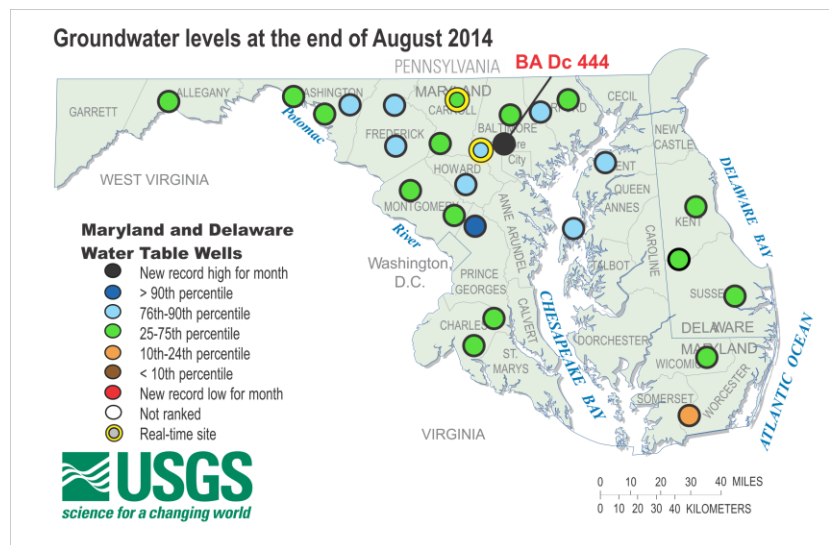
August 2014 Groundwater Levels

For the fourth consecutive month, the groundwater level at USGS observation well BA Dc 444 in Baltimore County, Maryland set a monthly record high. In Prince George's County, the groundwater level in a USGS observation well was above the 90th percentile.

Groundwater levels were normal (between the 25th and 75th percentiles) in 15 of the 26 wells used to monitor climatic conditions in Maryland and Delaware in August.

Groundwater levels were above normal at 10 of 26 wells. Water levels were below normal at only one well in Somerset County on the southern Delmarva Peninsula.

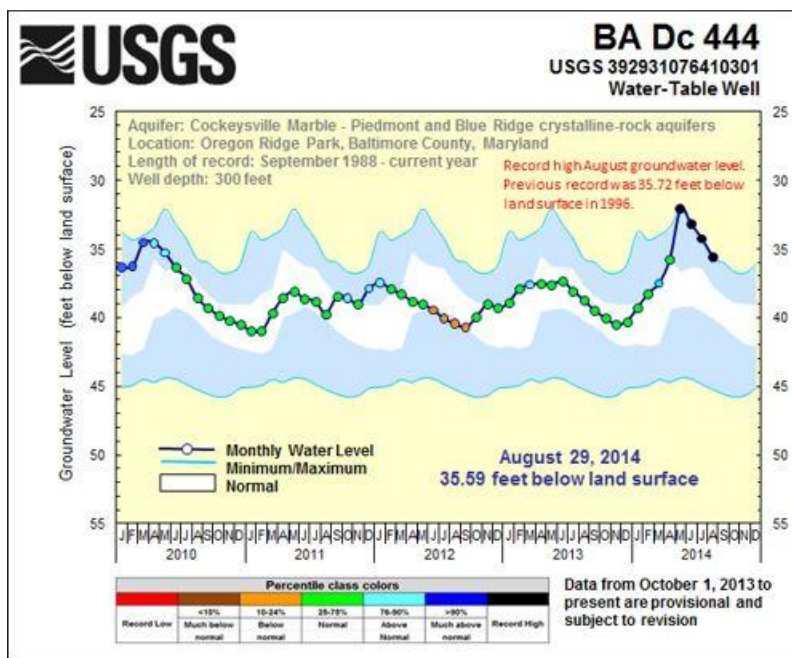
Groundwater levels were normal at the three observation wells in Delaware.



To access the clickable groundwater map, go to:
http://md.water.usgs.gov/groundwater/web_wells/current/water_table/counties/

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The groundwater level in observation well BA Dc 444 in Baltimore County, Maryland, set a new record high for August at 35.59 feet below land surface. The previous record was 35.72 feet below land surface in 1998. Data collection began at this site in 1988. This is the fourth consecutive month of record high groundwater levels at this observation well, but the groundwater level is now following the expected downward trend for this time of year.



Five-year groundwater hydrographs can be viewed at:

http://md.water.usgs.gov/groundwater/web_wells/current/water_table/counties

These 5-year hydrographs show groundwater levels as a dark blue line, the minimum and maximum monthly values, and the normal range (between the 25th and 75th percentiles) as a white band based on the period of record. The maximum water level is at the top of the upper blue section and the minimum water level is at the bottom of the lower blue section in the graph. Each monthly measurement is colored according to the percentile rank in which it falls for the month.

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Streamflow

Streamflow data are used for many purposes. A few of the most obvious uses are to assess water supply and the risk of droughts and floods. Streamflow data are also used to calculate loads of chemical constituents and assess how biological communities are affected by hydrologic conditions. The USGS operates the most extensive network of streamgages in the region.

The streamflow locations chosen for the monthly water summary were selected based on the following criteria:

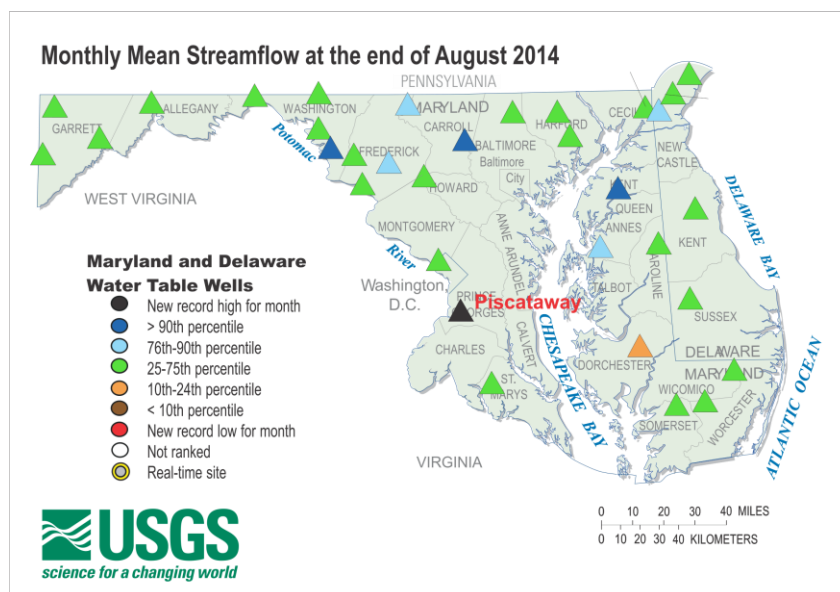
- Minimum period of record is 10 years of continuous data;
- Watershed areas greater than 5 square miles;
- Streamflow is not regulated, or has relatively natural flow;
- Streamflow data reflect climatic conditions; and
- The surrounding area and watershed are not urban.

August 2014 Streamflow

Monthly mean streamflows were normal at 24 of the 33 USGS streamgages used to monitor climatic response in Maryland, Delaware, and the District of Columbia in August. Normal is considered to be between the 25th and 75th percentiles.

Monthly mean August streamflow was at a record high at Piscataway Creek, and was above the 90th percentile at three streamgages. Monthly mean streamflow was below normal at the Chicamacomico River in Dorchester County, Maryland.

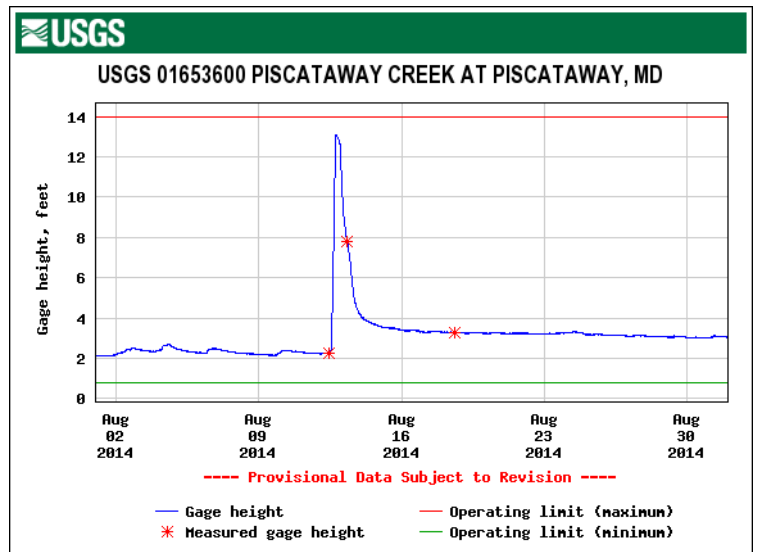
In Delaware, all monthly mean streamflows were normal to above normal in August.



To access the clickable streamflow map, go to:
<http://md.water.usgs.gov/surfacewater/streamflow/>

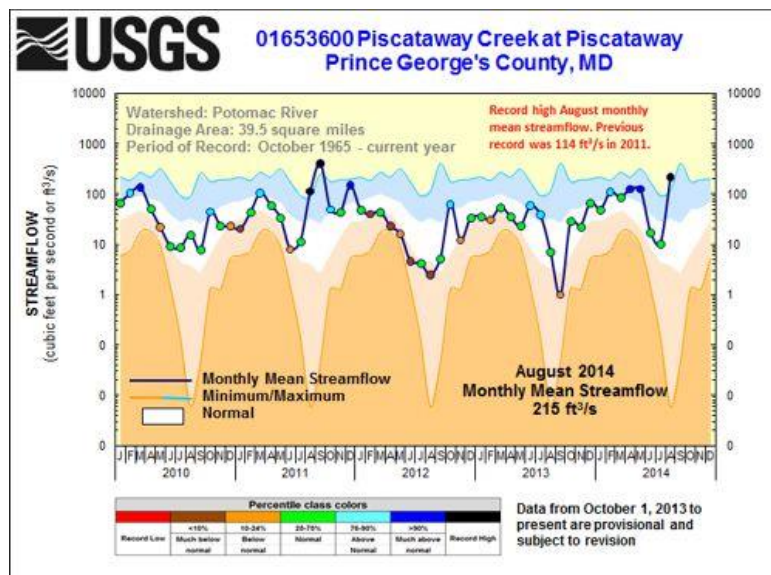
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Rainfall south of Baltimore was as high or greater in some locations as the record-setting 6.3 inches at the NWS Baltimore weather station. Some organizations such as CocoRaHS (<http://www.cocorahs.org>) reported that almost 7 inches of rain fell on August 12. This caused the streamflow at Piscataway Creek to rise over 10 feet from a gage height of about 2.23 feet at 10 a.m. to 13.10 feet at 6:15 p.m. Eastern Daylight Time on August 12, 2014. Streamflow had been steady prior to the event and stabilized below a gage height of 4 feet by August 14, 2014.



Real-time streamflow hydrographs can be viewed at: <http://waterdata.usgs.gov/md/nwis/rt>

The extreme 1-day rainfall caused the monthly mean streamflow at Piscataway Creek in Prince George's County, Maryland to set an August record high, exceeding the previous record set in 2011 by 101 cubic feet per second (ft³/s). (The peak flow recorded at the gage is considered provisional until an indirect discharge measurement is computed based on surveyed high water marks.)



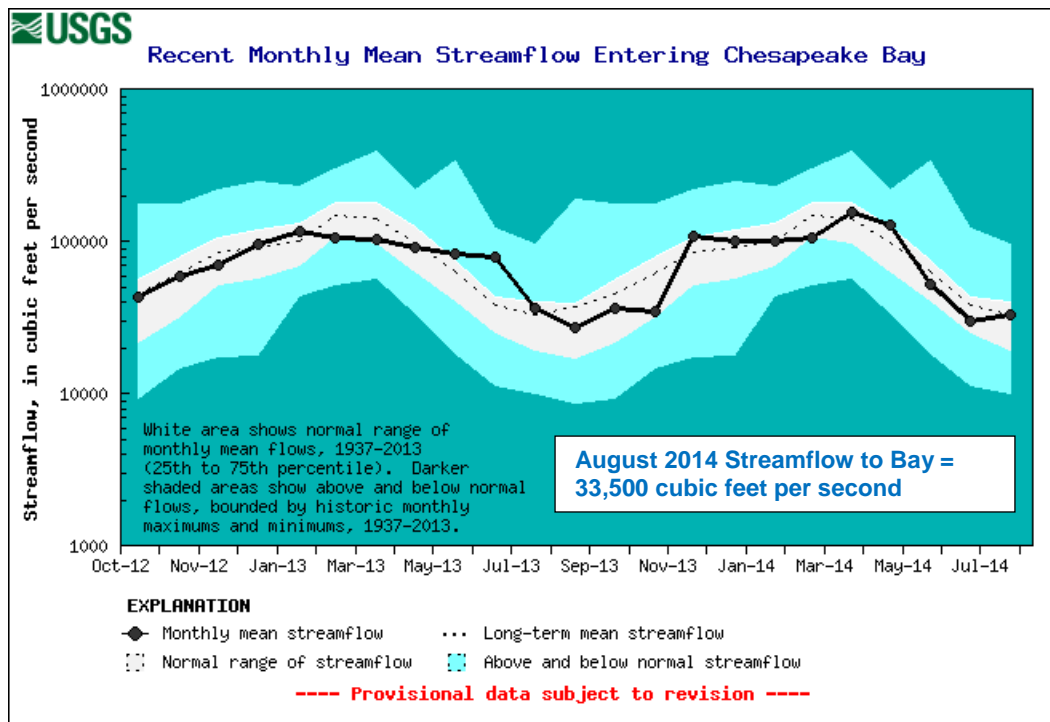
The dark line in the 5-year hydrograph represents the monthly mean streamflow for this period and the white band shows the normal range (25th to 75th percentiles) based on the period of record. The maximum monthly mean streamflow is at the top of the blue shaded section, and the lowest monthly mean streamflow is at the top of the dark orange area. Each monthly mean measurement is colored according to the percentile rank in which it falls for the month.

Five-year hydrographs can be viewed at:
<http://md.water.usgs.gov/surfacewater/streamflow/>

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Estimated Streamflow to the Chesapeake Bay

The estimated monthly mean freshwater streamflow to Chesapeake Bay was normal in August 2014 at 33,500 ft³/s (provisional, and subject to revision). The average (mean) monthly streamflow for August is 33,400 ft³/s. The normal range for average (mean) monthly streamflow for August is between 19,200 ft³/s and 40,300 ft³/s, the 25th and 75th percentiles of all August values. These provisional statistics are based on a 77-year period of record.



Data and more information on the freshwater flow to the Bay can be found here:
<http://md.water.usgs.gov/waterdata/chesinflow/>

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Reservoir Levels

Available reservoir storage at the end of August in the Baltimore reservoirs (Loch Raven, Liberty, and Prettyboy) remained at 100 percent of available storage capacity, or a total of 75.67 billion gallons of water. The Baltimore reservoirs have been full since December 2013.

Total normal storage in the Triadelphia and Duckett Reservoirs, which serve parts of Howard, Montgomery, and Prince George's Counties in suburban areas around the District of Columbia, was at 92 percent of normal storage capacity in August, with 9.77 billion gallons of water. Not all of the water in the Patuxent Reservoirs is usable; for operational purposes, percent of normal storage capacity is used, but this value can exceed 100 percent of the usable storage.

August 2014	Percent available/ normal storage	Volume (billion gallons)	Source
Baltimore Reservoirs			Baltimore City – Environmental Services Division
Liberty	100	36.72	
Loch Raven	100	21.20	
Prettyboy	99	17.75	
Total	100	75.67	
Patuxent Reservoirs			Washington Suburban Sanitary Commission (WSSC)
Triadelphia	91	5.09	
Duckett	93	4.68	
Total	92	9.77	