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

July 2014 – Record high groundwater levels were observed in Baltimore County, Maryland for the third consecutive month. More than 85% of groundwater levels and monthly mean streamflows were normal or above normal in July.

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

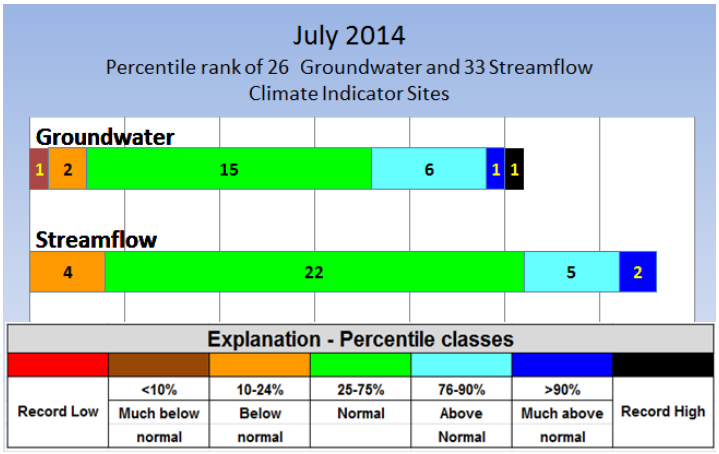
USGS water data are valuable to the public, researchers, water managers, planners, and agricultural users, especially during floods and droughts. These data can be used to assess how water resources respond to changes in climate. Scientists at the USGS have measured streamflow and groundwater levels 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 July 2014 Water Conditions Summary

Fifty-eight percent of the groundwater levels and 67 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 percentile) in July.



Water levels in eight of 26 wells were above normal in July. The groundwater level at an observation well in Baltimore County was at a record July high. In Howard County, the groundwater level was above the 90th percentile in one observation well.
There were two groundwater levels below normal (between the 10th and 24th percentiles) and one below the 10th percentile.

July monthly mean streamflows were below normal at 4 streamgages, normal at 22 streamgages, and above normal at the remaining 7 streamgages in Maryland and Delaware.

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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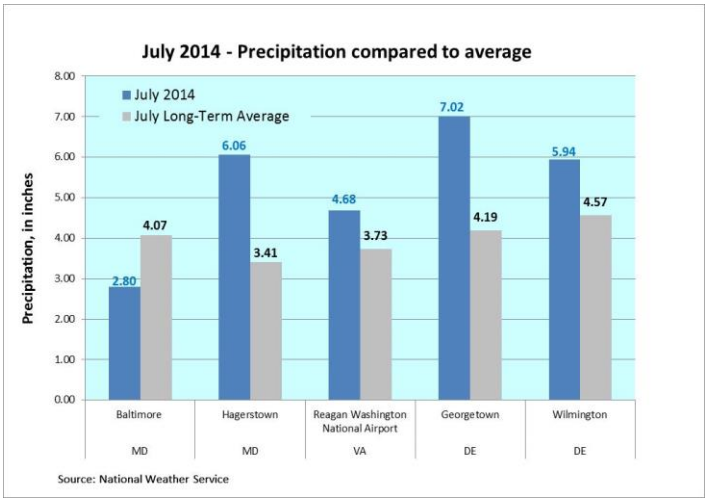
July 2014 Precipitation and Weather

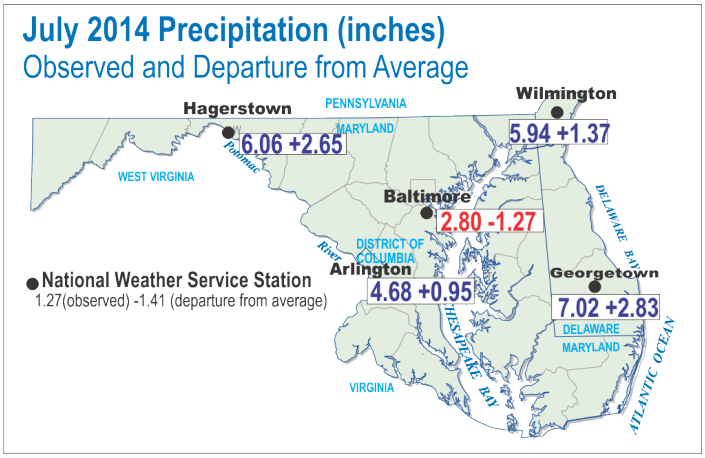
Precipitation in July was variable, which is typical of summer weather with localized storms instead of large, broad regional weather patterns. The long-term monthly average precipitation for July ranged from 2.80 inches at the National Weather Service (NWS) station in Baltimore, Maryland, which was 1.27 inches below normal, to 7.02 inches at the NWS station in Georgetown, Delaware, which is 2.83 inches above normal.

Rainfall was above normal at four of the NWS Mid-Atlantic weather stations: Ronald Reagan Washington National Airport in Arlington, Virginia, Hagerstown, Maryland, and Georgetown and Wilmington in Delaware. 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. Two counties in Maryland were more than 10 inches over the 365-day average from July 2013 to July 2014. See the links below to view the NWS data.

July air temperatures were below normal at all five NWS Mid-Atlantic weather stations and ranged from 0.8 degrees Fahrenheit below the long-term average in Wilmington, Delaware to 1.4 degrees Fahrenheit below the long-term average in Baltimore and Hagerstown, Maryland. In Baltimore, five daily record low temperature records were set, and it was the 17th coolest July on record.

*The NWS normal (long-term average) period used for determining records is from 1981–2010.

Sources:
National Weather Service
MD and DC: http://www.weather.gov/climate/index.php?wfo=lwx
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

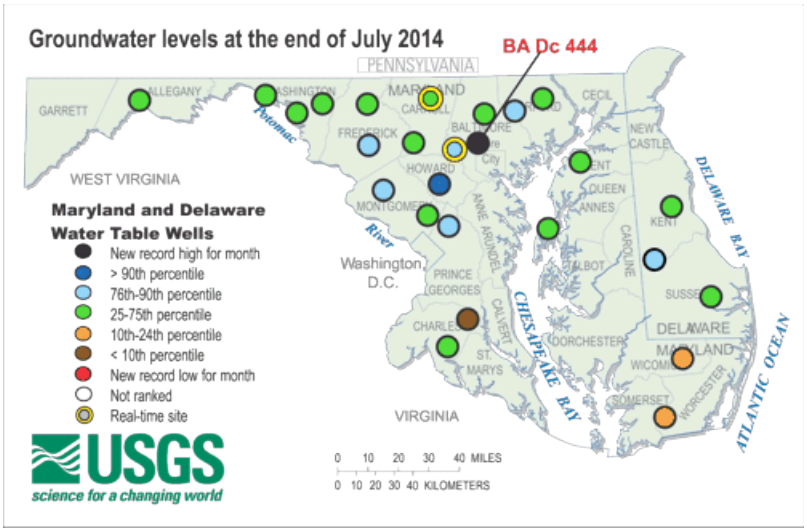
The USGS monitors groundwater levels in unconfined aquifers, providing observations that can be compared to both short-term and long-term changes in climatic conditions. Twenty-six groundwater wells were selected based on the following criteria:

- 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.

July 2014 Groundwater Levels

The groundwater level at one of the USGS observation wells in Baltimore County, Maryland set a July record high. In Howard County, 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 July. Groundwater levels were normal to above normal at 23 of 26 wells. Water levels were below normal at only 3 wells – at one well in Charles County, Maryland and at two wells on the southern Delmarva Peninsula.



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

Groundwater levels in Delaware were normal at two observation wells and above normal at an observation well in Kent County.

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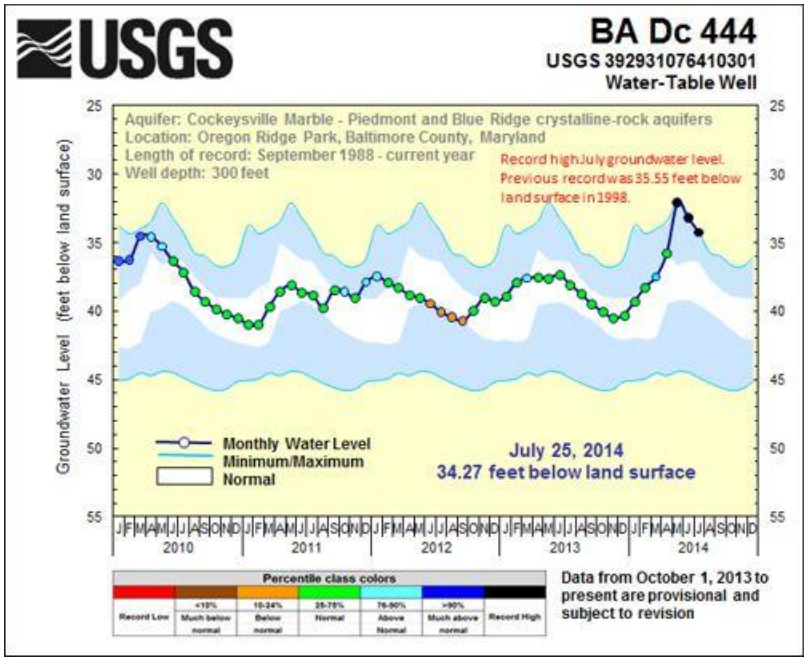
The groundwater level in observation well BA Dc 444 in Baltimore County, Maryland, set a new record high for July at 34.27 feet below land surface. The previous record was 35.55 feet below land surface in 1998. Data collection began at this site in 1988. This is the third consecutive month of record high groundwater levels at this observation well.



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.

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 streamgage 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.

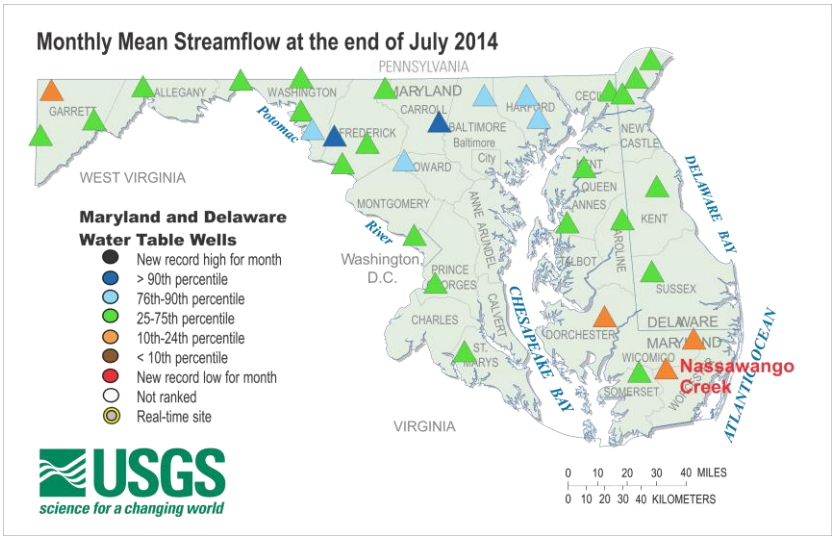
July 2014 Streamflow

Monthly mean streamflows were normal at 22 of the 33 USGS streamgages used to monitor climatic response in Maryland, Delaware, and the District of Columbia in July. Normal is considered to be between the 25th and 75th percentiles.

Monthly mean July streamflow was above the 75th percentile at seven streamgages, including two USGS streamgages that were above the 90th percentile--one in Carroll County, Maryland and one in Frederick County, Maryland.

Monthly mean streamflow was below normal at four streamgages in Dorchester, Garrett, and Worcester Counties in Maryland.

In Delaware, all monthly mean streamflows were in the normal range in July.



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

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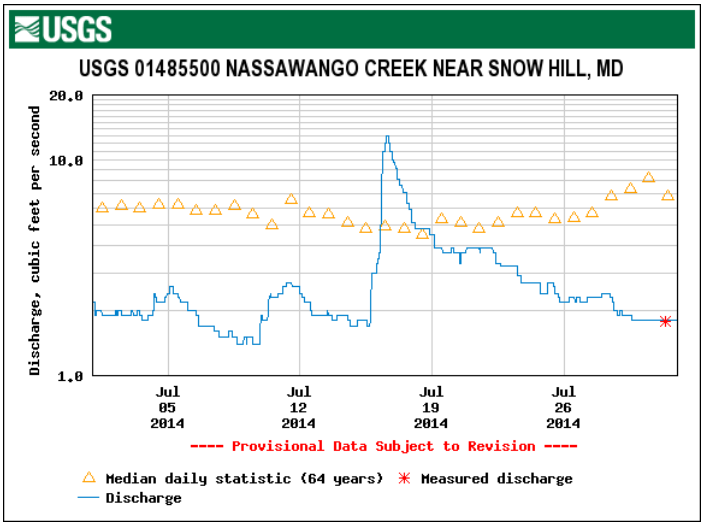
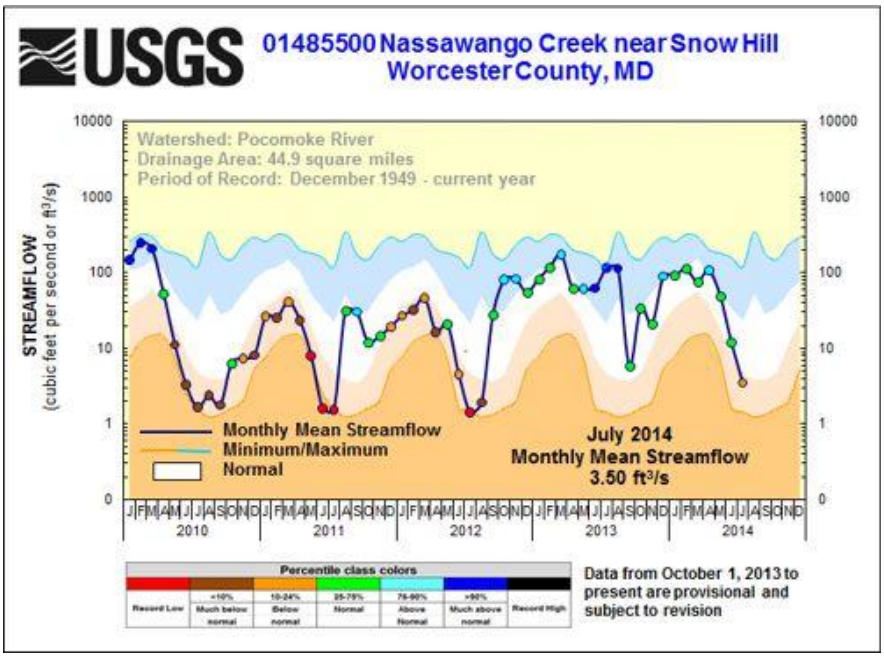
Real-time streamflow on Nassawango Creek in July was below normal for most of the month, except during the middle of the month, when it climbed above normal for 2 days, then continued to be below normal for the remainder of the month.



Precipitation at the nearest NWS station in Georgetown, Delaware was 2.83 inches above the long-term average for July. Nassawango Creek does not appear to have been affected by the 7 inches of rainfall in Georgetown, Delaware. Most likely explanation is the Nassawango Creek drainage area did not receive the same amount of rainfall as the weather station.

The monthly mean streamflow at Nassawango Creek in Worcester County, Maryland, dropped from normal to below normal in July. Monthly mean streamflow at this streamgage had been at normal to above normal levels since September 2012.

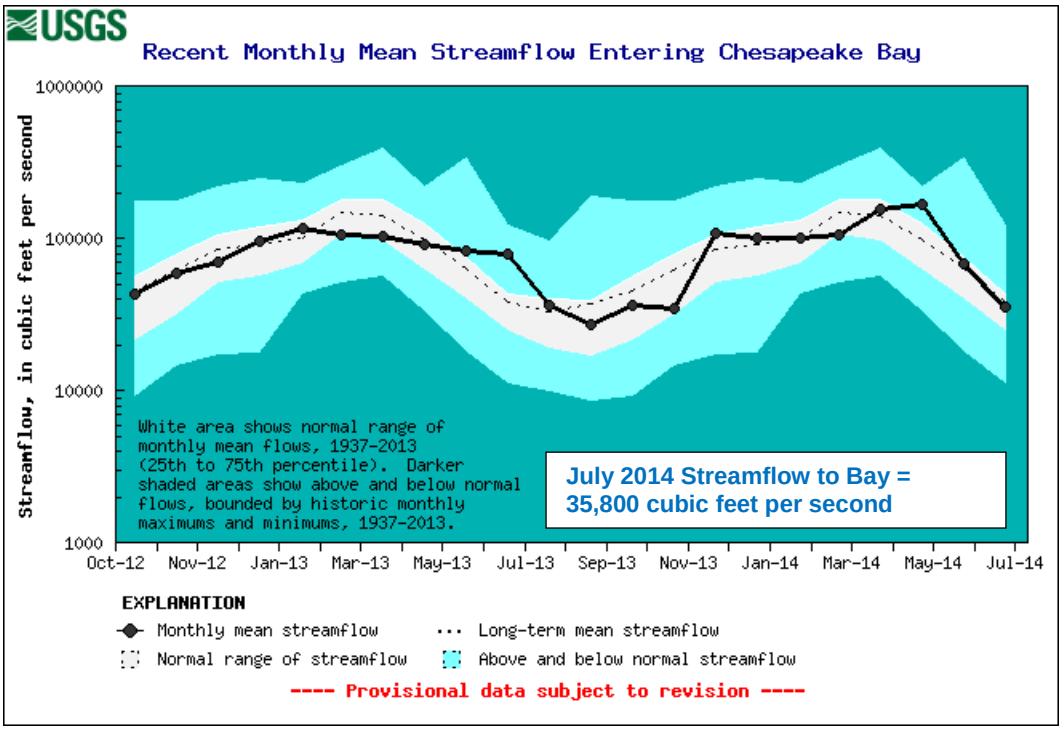


The dark line in the 5-year hydrograph represents the monthly mean streamflow for this period and the white band shows the normal range (25th to 75th percentiles) based on the period of record. The maximum monthly mean streamflow is at the top of the blue shaded section, and the lowest monthly mean streamflow 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/

Estimated Streamflow to the Chesapeake Bay

The estimated monthly mean freshwater streamflow to Chesapeake Bay was normal in July 2014 at 35,800 cubic feet per second (ft^3/s; provisional, and subject to revision). The average (mean) monthly streamflow for July is 38,200 ft^3/s. The normal range for average (mean) monthly streamflow for July is between 24,800 ft^3/s and 43,800 ft^3/s, the 25^{th} and 75^{th} percentiles of all July 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 July 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, dropped 3 percent to 95 percent of normal storage capacity in July, with 10.07 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.

July 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	90	5.07	
Duckett	100	5.00	
Total	95	10.07	