

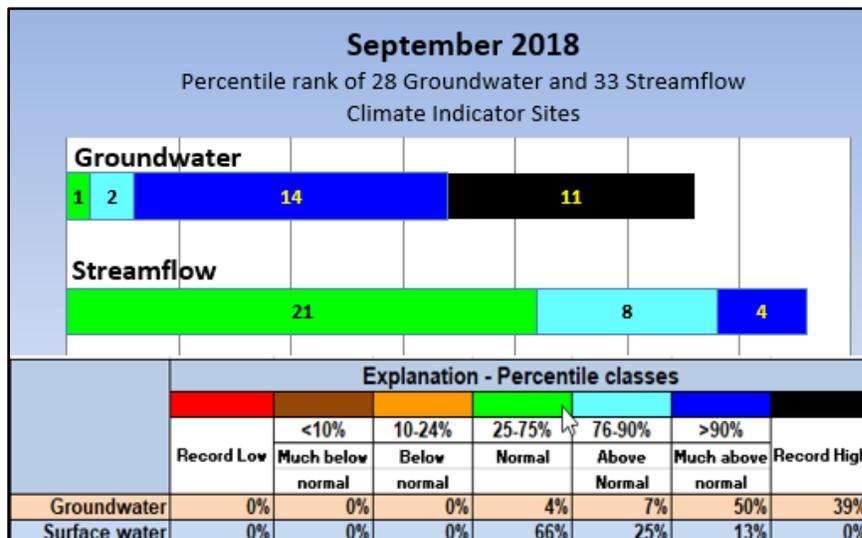
U.S. Geological Survey (USGS) Maryland-Delaware-District of Columbia Monthly Water Conditions Summary

USGS September 2018 Water Conditions Summary

Hydrologic data from 28 wells and 33 streamgages were used to monitor the monthly groundwater and streamflow response to weather conditions in Maryland, Delaware, and the District of Columbia. In September 2018, groundwater levels and monthly mean streamflows were at record September highs at 11 wells and two of these records were all-time record high groundwater levels. Groundwater levels and streamflow ranged from normal to above normal in September.

The freshwater flow to the Chesapeake Bay was at a September record high. This was the second consecutive month of record setting highs.

The number of groundwater and surface-water sites, and the percentage of the total number of groundwater and surface-water sites that fall within each percentile range, are shown in the graphic for September 2018.



*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.*

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 extreme conditions like floods and droughts. The USGS is known for its consistent measurement techniques and the most extensive set of historical groundwater and streamflow data available to the public. Since these long-term data were collected during wet and dry periods, they can be used to assess how water resources respond to changes in weather, and to evaluate how current data compare to the historical data. The uniformity of the dataset enables multi-state comparisons and other comparative statistical analyses that can better inform policy makers of possible water-resources conditions they might encounter in the future.

The sites used in this water summary were carefully selected to include long-term datasets and show the response of streamflow and groundwater levels to weather conditions, rather than the effects of human influences. Of the USGS sites presented in this summary, 13 wells and 32 streamgages have more than 50 years of data. The current streamflow and groundwater data are ranked in comparison to the historical record and summarized. In addition to groundwater and streamflow data, this summary includes precipitation data to give a more complete picture of the region's water resources and the monthly freshwater flow to the Chesapeake Bay. Hydrologic and weather data have not been reviewed and are therefore provisional and subject to revision.

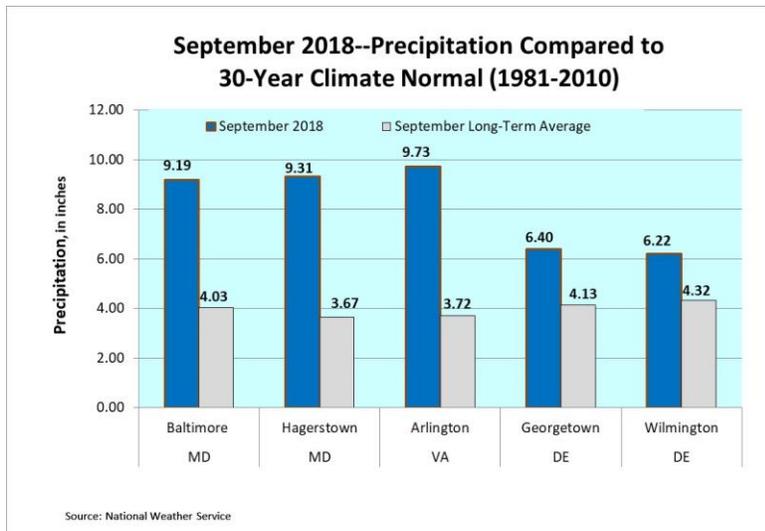
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Precipitation

Monthly data from five Mid-Atlantic National Weather Service (NWS) stations were used to show the relationship between monthly precipitation and monthly groundwater levels and streamflows. The NWS uses averages of data over the 30-year climate normal period from 1981 through 2010.

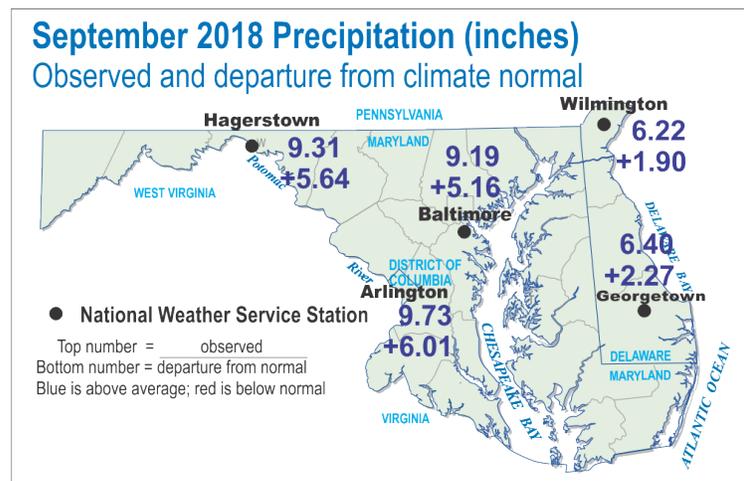
September 2018 Precipitation

Precipitation was above normal at the five Mid-Atlantic NWS weather stations. At the two weather stations in Maryland and the weather station in Arlington, Virginia, precipitation was more than double the September average value. The long-term average September 2018 precipitation for the five Mid-Atlantic NWS weather stations is shown next to the September 2018 precipitation in the graph and map below.



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



Source: National Weather Service
 DC and MD: <http://w2.weather.gov/climate/index.php?wfo=lwx>
 DE: <http://www.weather.gov/climate/index.php?wfo=phi>
 MARFC: http://www.weather.gov/marfc/Precipitation_Departures

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Groundwater

The USGS monitors groundwater levels in surficial or unconfined aquifers, providing observations that can be compared to both short-term and long-term changes in weather conditions. The groundwater wells used for the monthly water summary were selected based on the following criteria:

- Located in a surficial or unconfined (water-table) aquifer
- Open to a single, known hydrogeologic unit/aquifer
- Groundwater hydrograph generally reflects response to weather
- No indicated nearby pumpage, and likely to remain uninfluenced by pumpage 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 a casing – dug wells are generally not used
- Water levels show no apparent hydrologic connection to nearby streams
- Well rarely goes dry
- Long-term accessibility likely, such as on public land

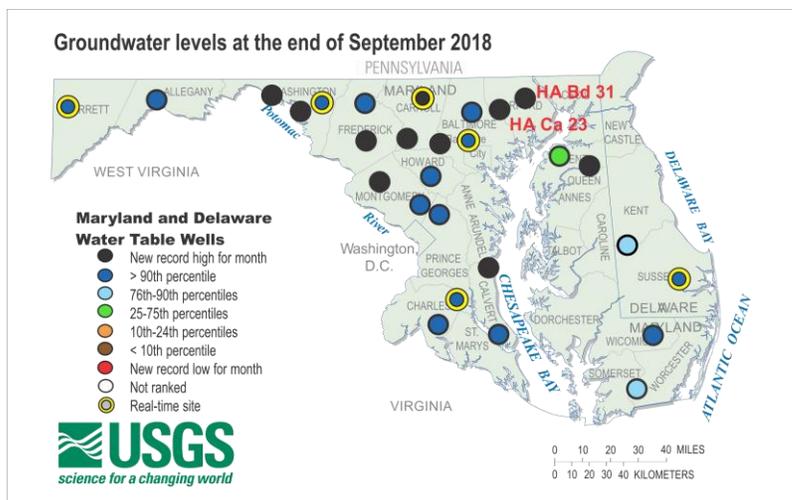
In the Maryland, Delaware, and District of Columbia region, it is useful to compare current data to historical data, such as data from the droughts of 1999-2002 and the 1960s. There are 12 wells that have over 60 years of groundwater data, and 26 wells that have more than 30 years of groundwater data as of October 2018.

September 2018 Groundwater Levels

Groundwater levels at 11 USGS observation wells were at September record highs, including all-time records at two wells in Harford County, Maryland. Groundwater levels were above normal at 27 wells of 28 wells (96 percent), which included the 11 record highs, 14 wells with groundwater levels greater than the 90th percentile, and 2 wells in the 76th-90th percentile range.

One well in Kent County, Maryland had groundwater levels within the normal range (25th-75th percentiles), however 2.88 inches of rain fell in Baltimore (the nearest NWS station) since the well was measured on September 20, 2018. The groundwater level would likely have been higher if it had been measured at the end of September.

Between August and September, groundwater levels decreased at 3 wells (11 percent) and increased at 25 wells (89 percent).



To access the clickable groundwater map, go to:

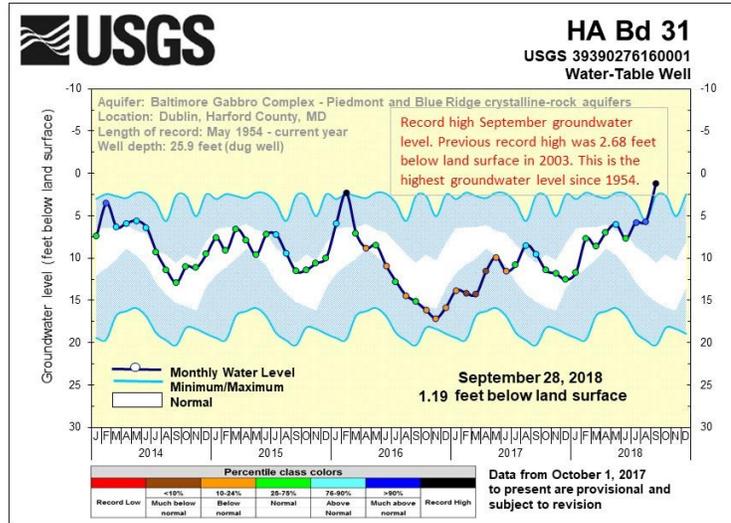
http://md.water.usgs.gov/groundwater/web_wells/current/water_table/counties/

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In the 5-year hydrographs for the selected wells, groundwater levels are shown as a dark blue line. Each monthly measurement is colored according to the percentile rank compared to the historical values at the site for the month. The normal range is displayed as a white band and is 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 area in the graph. The two wells in Harford County that set all-time record highs are featured below.

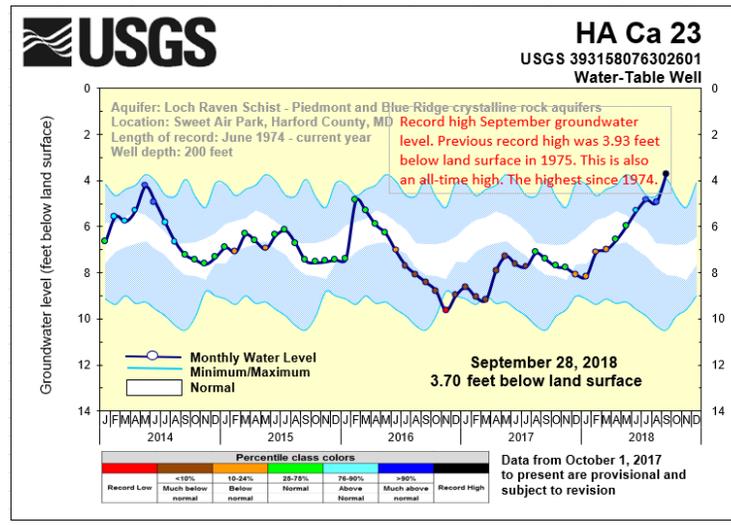
The groundwater level at observation well HA Bd 31, in Harford County, Maryland was 1.19 feet below land surface, which is a September record high. The previous record was 2.68 feet below land surface in 2003. The record high is also the all-time record for this well. Monthly record-keeping at this well began in May 1954.

Normal September groundwater levels at this well range from 10.43 to 15.17 feet below land surface.



The groundwater level at USGS observation well HA Ca 23, in Harford County, Maryland was 3.70 feet below land surface, which is a September record high. The previous record was 3.93 feet below land surface in 1975. The record high is also the all-time record for this well. Monthly record-keeping at this well began in June 1974.

Normal September groundwater levels at this well range from 6.74 to 8.10 feet below land surface.



Five-year groundwater hydrographs can be viewed at:
http://md.water.usgs.gov/groundwater/web_wells/current/water_table/counties

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Streamflow

Streamflow data are most commonly used for assessing water supply and to determine the risk of droughts and floods. Streamflow data also are used to calculate loads of chemical constituents, and to assess how biological communities are affected by hydrologic conditions.

The USGS streamgages chosen for the monthly water summary were selected based on the following criteria:

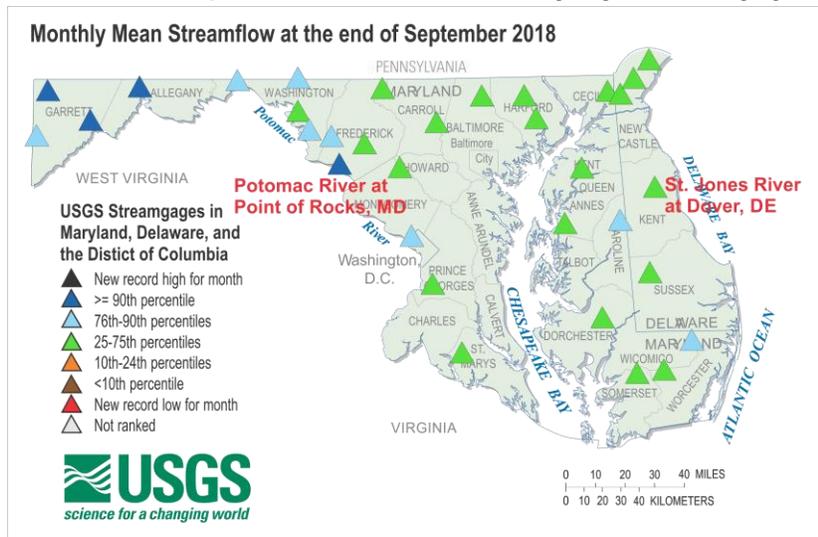
- Minimum period of record is 10 years of continuous data
- Watershed areas greater than 5 square miles
- Streamflow is not regulated, such as by a dam or diversion, and has relatively natural flow
- Streamflow data reflect a response to weather conditions
- Most of the surrounding area and watershed are not urban

Of the 33 streamgages used in this summary, 27 have more than 60 years of data, allowing for comparison to data from the historical droughts of 1999--2002 and the 1960s. All 33 streamgages have at least 30 years of monthly mean streamflow data.

September 2018 Streamflow

Monthly mean streamflows were normal to above normal at all 33 streamgages. Streamflow at 21 streamgages was in the normal range. Streamflow at four streamgages was above the 90th percentile, and was between the 76th and 90th percentiles at the remaining eight streamgages.

Monthly mean streamflow decreased at 28 streamgages (85 percent) and increased at 5 streamgages (15 percent) between August and September.



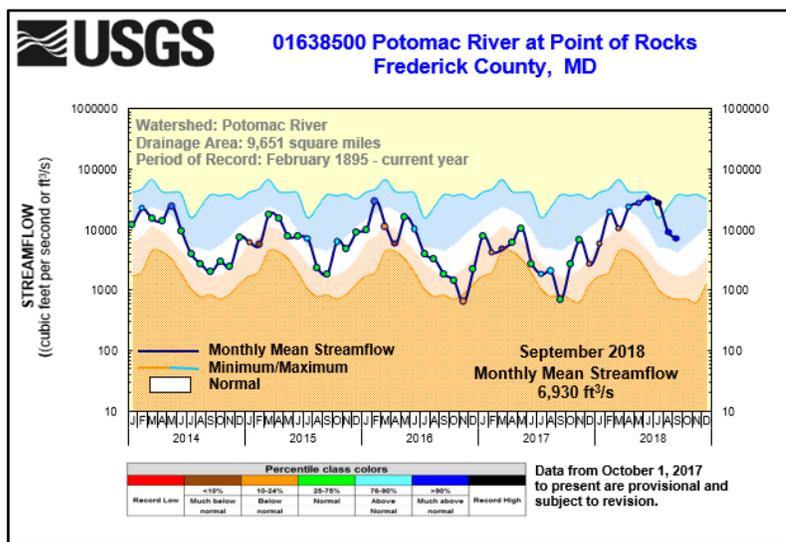
To access the clickable streamflow map, go to:
<http://md.water.usgs.gov/surfacewater/streamflow/>

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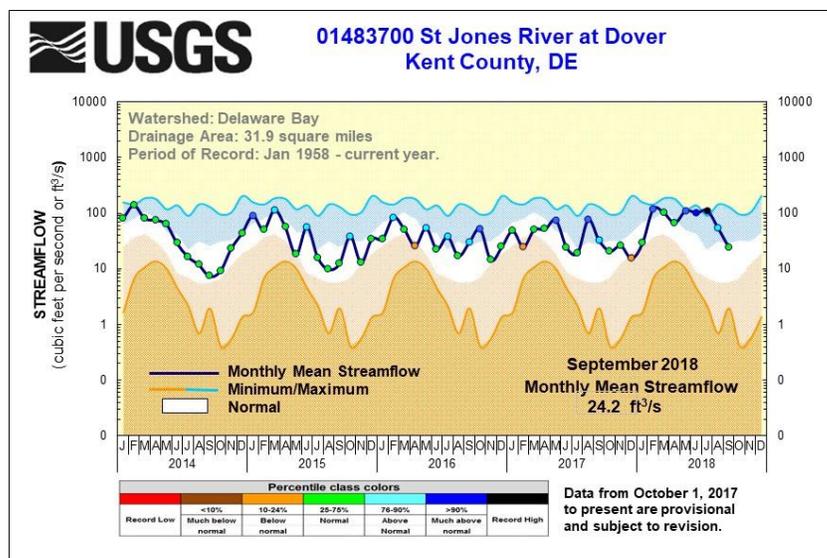
In the hydrograph for the selected streamgages, the dark line in the 5-year hydrograph represents the monthly mean streamflow for this period, and the white band shows the normal range (25th-75th percentiles) based on the period of record. The maximum monthly mean streamflow is at the top of the blue shaded section, and the lowest monthly mean streamflow is at the bottom of the tan area. Each monthly mean streamflow is colored according to the percentile rank compared to the historical data for the month.

Monthly mean streamflow at Potomac River at Point of Rocks, in Frederick County, Maryland, was 6,930 cubic feet per second (ft³/s), which is above the 90th percentile. Streamflow had been above the 90th percentile at this streamgage, including two record highs, over the previous 5 months.

The normal monthly mean streamflow range for September is between 1,720 ft³/s and 4,420 ft³/s. Record-keeping at this streamgage began in February 1895, and it is the oldest streamgage in Maryland.



At St Jones River at Dover, in Kent County, Delaware, the monthly mean streamflow was 24.2 ft³/s, which is in the normal range (between 5.68 and 28.9 ft³/s). Record-keeping at this streamgage began in January 1958.



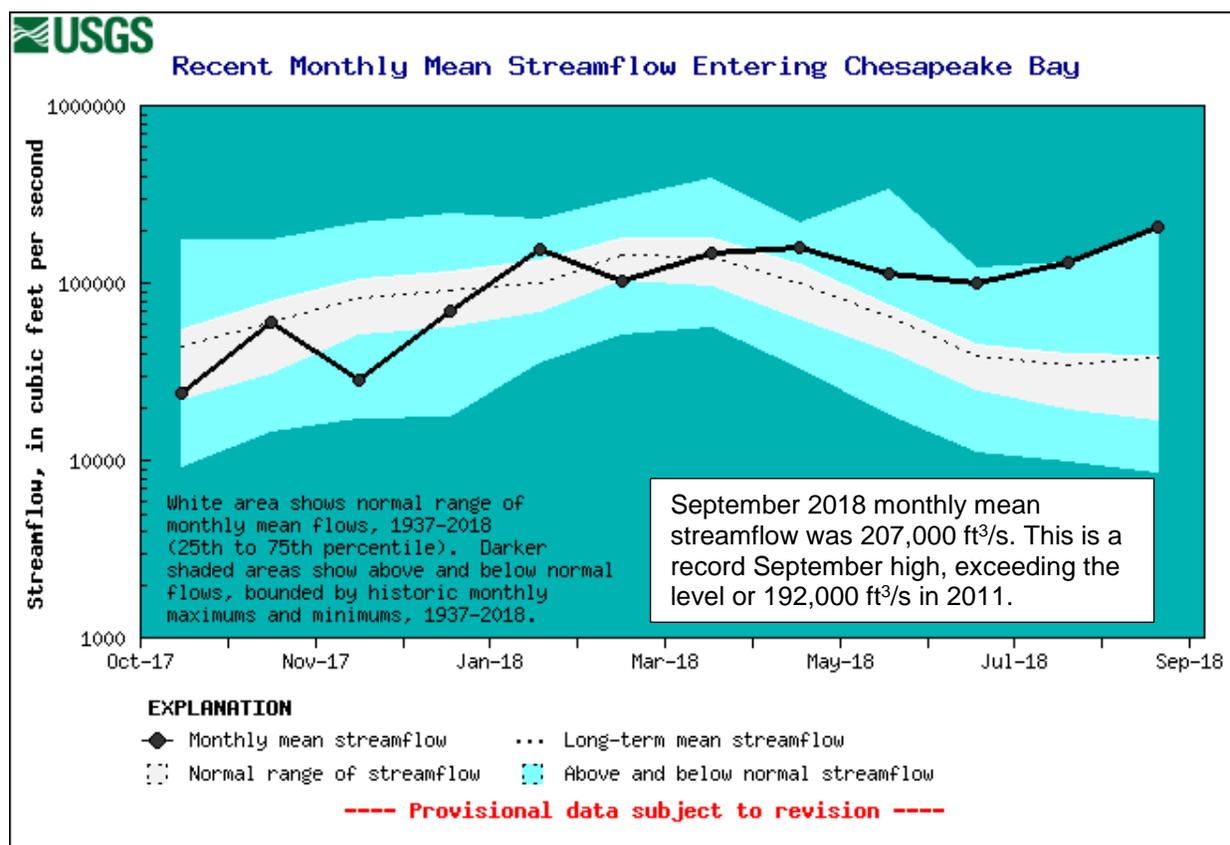
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Estimated Streamflow to the Chesapeake Bay

Estimated streamflow entering the Chesapeake Bay is computed on a monthly and annual basis using streamflow measurements from the Susquehanna, Potomac, and James Rivers. Data are presented in tables and graphs, typically grouped by water year — the natural, annual water cycle used by hydrologists. A water year is the 12-month period beginning October 1 and ending September 30. The water year is designated by the calendar year in which it ends and includes 9 of the 12 months. For example, the year beginning October 1, 2017 and ending September 30, 2018, is called “water year 2018.”

The health of the Chesapeake Bay largely is driven by changes in streamflow and the amount of pollution it contains. Runoff in the Chesapeake Bay watershed carries pollutants, such as nutrients and sediment, to rivers and streams that drain to the Bay. Scientists can use estimated streamflow entering the Chesapeake Bay to assess the health of the Bay and make ecological forecasts.

The estimated monthly mean streamflow entering Chesapeake Bay during September 2018 was 207,000 ft³/s, which is a record high for September, and exceeded the record set in 2011 by 15,000 ft³/s. This value is provisional and subject to revision. Normal September streamflow entering the Bay is between 17,000 and 39,100 ft³/s, the 25th and 75th percentiles, respectively, of all September values. Average (mean) monthly streamflow for September is 38,300 ft³/s. These statistics are based on an 82-year period of record.



More information on freshwater flow to the Bay can be found at:
<http://md.water.usgs.gov/waterdata/chesinflow/>