

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

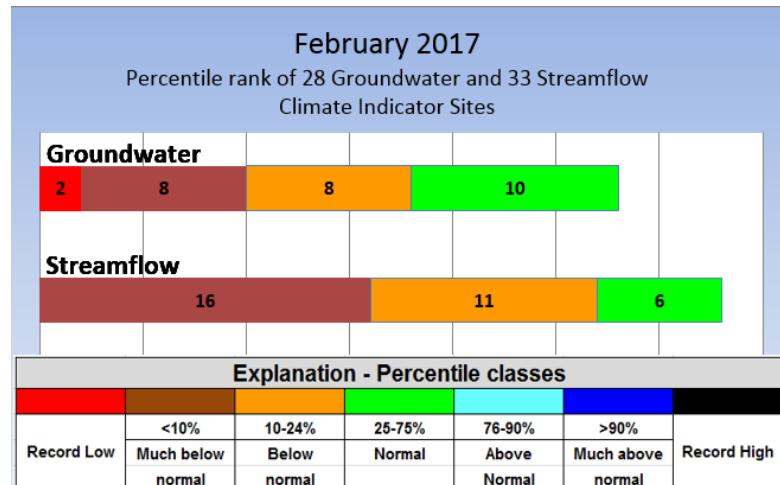
USGS February 2017 Water Conditions Summary

In February 2017, groundwater levels in two wells were at a record February low, and one of them exceeded the record set during the historic drought in 2002. At sites used to monitor the response of water resources to changes in weather conditions in Maryland, Delaware, and the District of Columbia, 64 percent of groundwater levels and 82 percent of monthly mean streamflows were below normal. Between January and February, groundwater levels decreased at all wells except one, and streamflows decreased at all streamgages except one.

In February, 36 percent of the groundwater levels (10 of 28 USGS observation wells) were in the normal range (25th-75th percentiles). Groundwater levels were below normal at the remaining 64 percent of the wells, with eight wells below the 10th percentile and two of them at record February lows.

Monthly mean streamflows were in the normal range at 18 percent (6 of 33 selected USGS streamgages). Streamflow was between the 10th and 24th percentiles at 11 streamgages, and less than the 10th percentile at 16 streamgages.

Freshwater flows to the Chesapeake Bay were in the normal range, and precipitation was below average in February at five Mid-Atlantic weather stations. Air temperatures were more than 8 degrees above normal. Hydrologic and weather data have not been reviewed, and are therefore provisional and subject to revision.



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 temperature and precipitation, 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 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 29 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 and temperature data, reservoir levels, and freshwater streamflow to the Chesapeake Bay to give a more complete picture of the region's water resources.

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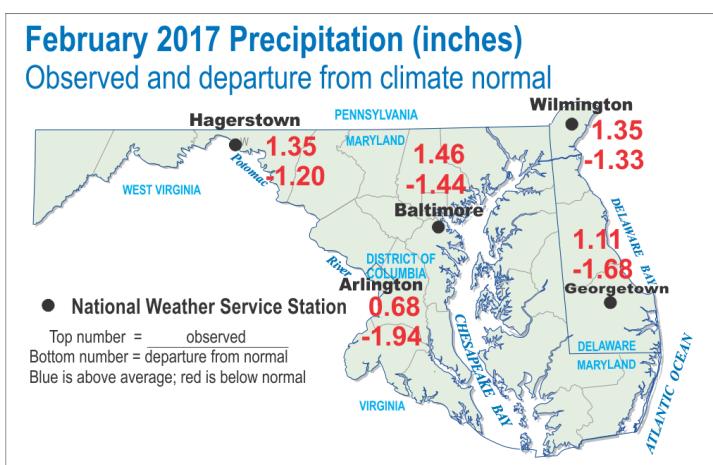
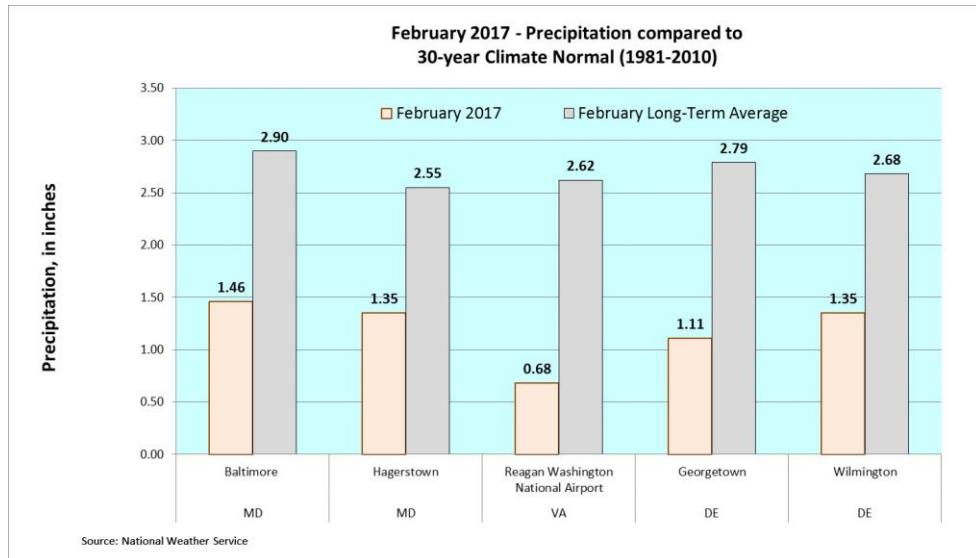
Weather Conditions

Data from five Mid-Atlantic National Weather Service (NWS) stations are used to present monthly precipitation and temperature data. The NWS uses averages of data over the 30-year climate normal period between 1981 and 2010. During drought periods, the status from the National Drought Mitigation Center (U.S. Drought Monitor) is included.

February 2017 Precipitation

February precipitation at all five Mid-Atlantic NWS weather stations (tan bars on graph) average was considerably less than the 30-year averages for February (gray bars on graph).

The precipitation map shows the February precipitation and the departure from climate normal as red text for below normal. Precipitation was lowest in Arlington, Virginia with 0.68 inches, which is 1.94 inches less than average for February.



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

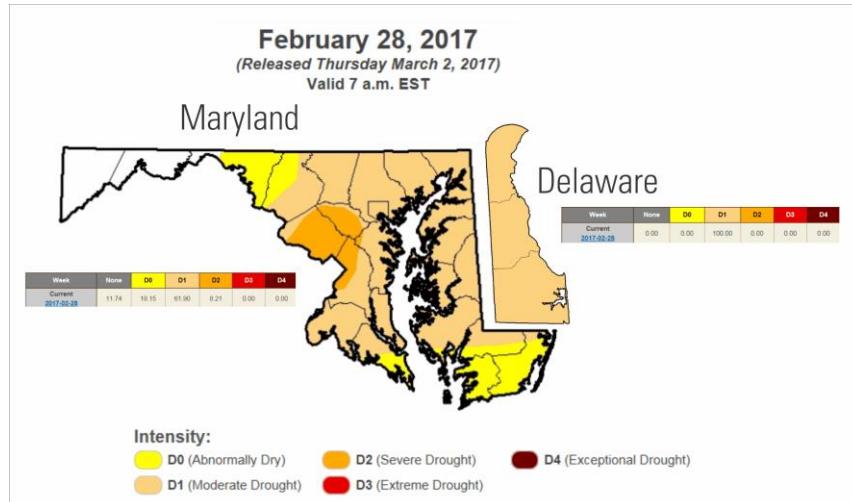
Wilmington =
New Castle Airport

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

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Drought Status

According to the U.S. Drought Monitor, as of February 28, 2017, 61.90 percent of Maryland and 100 percent of Delaware were at the moderate drought level (D1), which is almost double what it had been the previous week. In Maryland, an additional 8.21 percent was in the D2 or severe drought category, covering most of Howard and Montgomery Counties and some of Prince George's County. Another 18.15 percent of Maryland was abnormally dry.

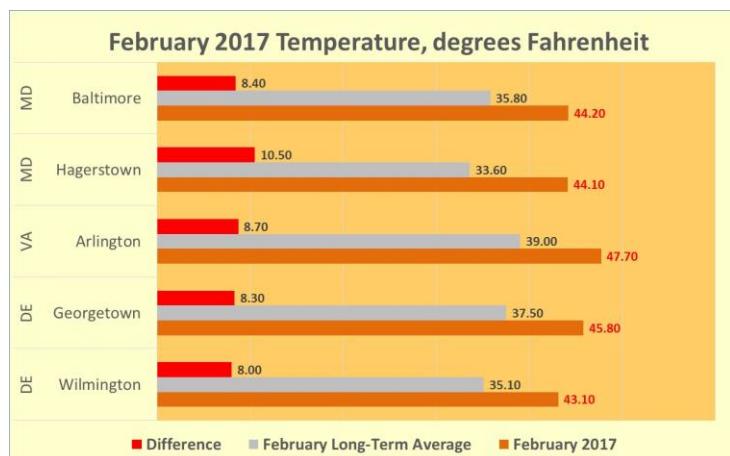
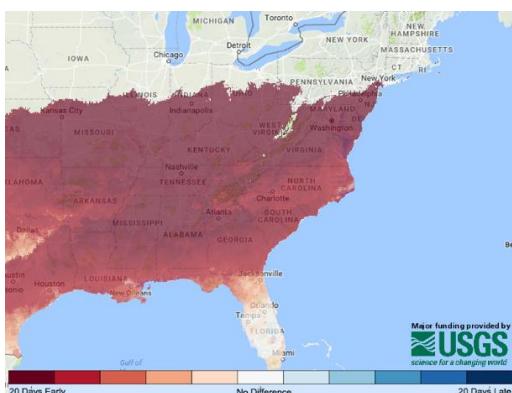


For the most recent drought status, visit: <http://droughtmonitor.unl.edu/Home/RegionalDroughtMonitor.aspx?northeast>

February 2017 Temperatures

February temperatures from the NWS were 8 degrees Fahrenheit or more above average at all five Mid-Atlantic NWS weather stations, with a temperature range from 8.0 degrees to 10.5 degrees Fahrenheit above average. The largest departure from average (for 8 consecutive months) was at the weather station in Hagerstown, Maryland, where the average temperature was 44.1 degrees, which is 10.5 degrees above the February average.

Higher than normal temperatures during the winter can mean that less groundwater is frozen and in storage for spring and summer, and with the spring index averaging 20 days earlier than usual this year for most of Maryland and all of Delaware, there is more water lost to evapotranspiration. Source: https://www.usanpn.org/data/phenology_maps



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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:

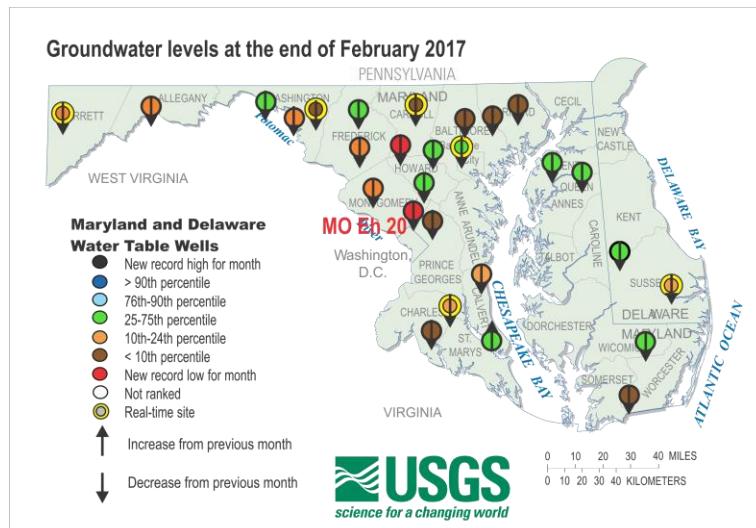
- Located in a surficial or unconfined (water-table) aquifer
- Open to a single, known hydrogeologic unit/aquifer
- Groundwater hydrograph generally reflects response to weather
- No indicated nearby pumpage, and likely to remain uninfluenced by pumpage or changes related to human activities
- Minimum 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 the District of Columbia region, it is useful to compare current data to data collected during the historical droughts of 2002 and the 1960s. There are 11 wells that have over 60 years of groundwater data, which allows comparison to both of these drought periods. Of the 28 USGS observation wells used for this summary, 23 have more than 30 years of groundwater data as of 2017.

February 2017 Groundwater Levels

Between January and February, groundwater levels decreased at 27 of 28 wells. An observation well in Calvert County, Maryland was the one location where groundwater levels increased over the previous month. On the groundwater map, arrows on the well symbol indicate whether the groundwater level increased or decreased over the past month.

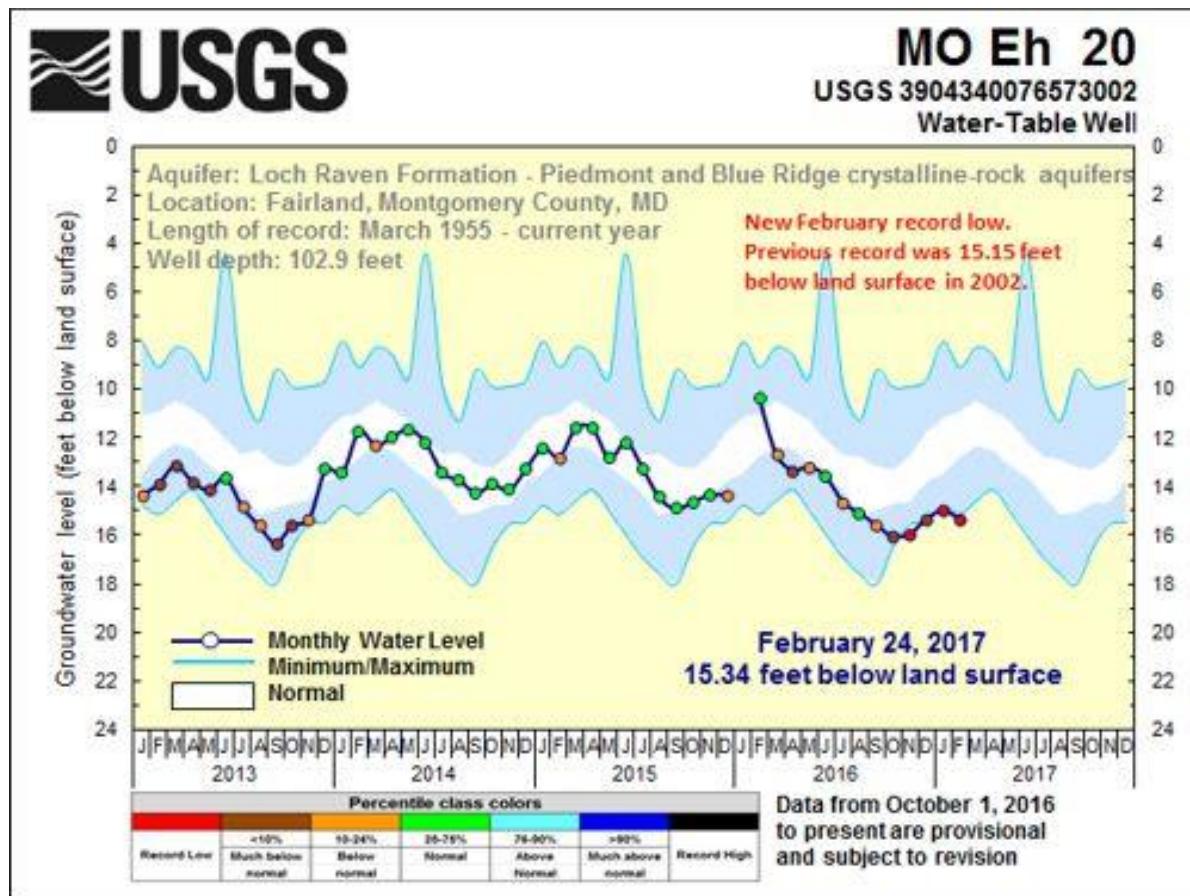
Thirty-six percent of the groundwater levels were within the normal range and the remaining 64 percent were below normal. Groundwater levels at eight wells were in the 10th-24th percentiles, and eight were below the 10th percentile. Wells in Carroll and Montgomery Counties in Maryland were at record February lows. Many of the low groundwater levels were in central Maryland, which is consistent with the current drought status reported by the U.S. Drought Monitor.



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 at USGS observation well MO Eh 20, in Montgomery County, Maryland has been below normal for the last 6 consecutive months and set a record February low at 15.34 feet below land surface. The February 2017 groundwater level exceeded the February record low from 2002 by 0.19 feet. Normal February groundwater levels at this well range from 10.97 to 12.31 feet below land surface.



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

The 5-year hydrograph shows groundwater levels 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.

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Streamflow

Streamflow data are used most commonly for assessing water supply and to determine the risk of droughts and floods. Streamflow data are also 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:

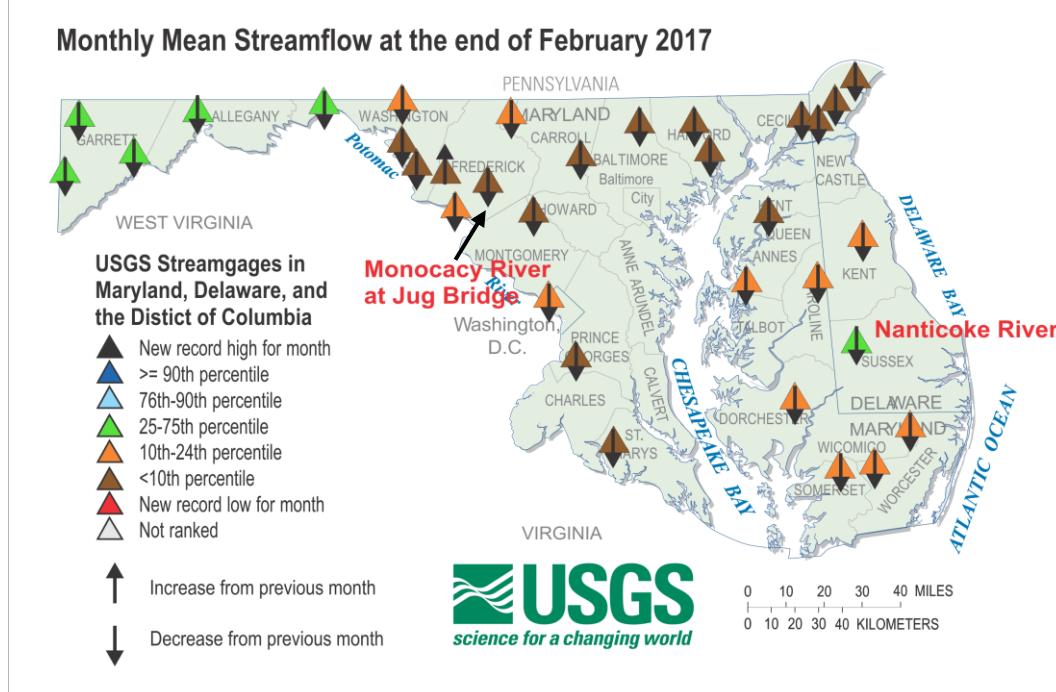
- Minimum period of record is 10 years of continuous data
- Watershed areas greater than 5 square miles
- Streamflow is not regulated, such as by a dam or diversion, and it has relatively natural flow
- Streamflow data reflect a response to weather conditions
- Most of the surrounding area and watershed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

Of the 33 streamgages used in this summary, 22 have more than 60 years of data, allowing for comparison to the historical droughts of 2002 and the 1960s. All 33 streamgages have at least 30 years of monthly mean streamflow data.

February 2017 Streamflow

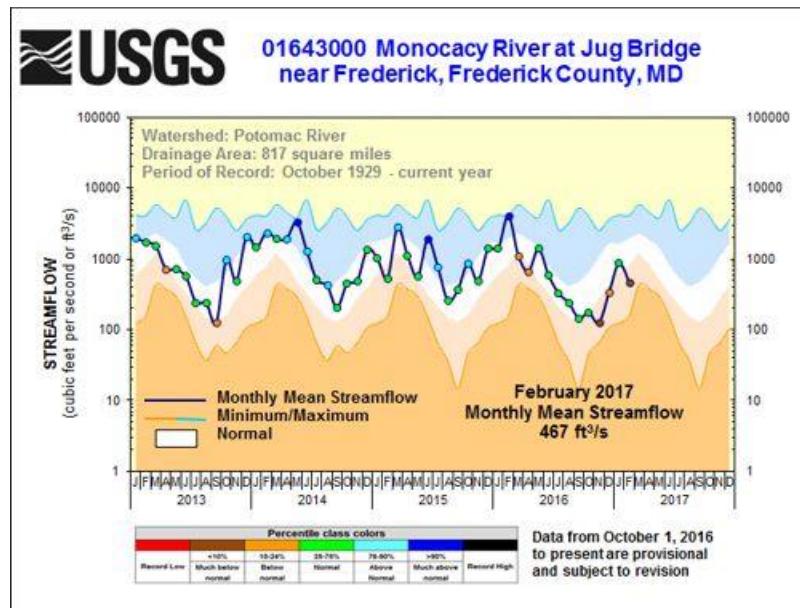
Streamflow decreased at 32 of the 33 streamgages used to monitor response to weather conditions in Maryland, Delaware, and the District of Columbia between January and February. Arrows on the streamgage symbol indicate whether the monthly mean streamflow increased or decreased over the past month.

Monthly mean streamflows were in the normal range at 18 percent or 6 of 33 selected USGS streamgages. Streamflow at the remaining 27 streamgages was below normal with eleven streamflows between the 10th and 24th percentiles, and 16 streamflows in the less than 10th percentile. The lowest streamflows were in central Maryland and northern Delaware, which corresponds with the drought status reported by the U.S. Drought Monitor.

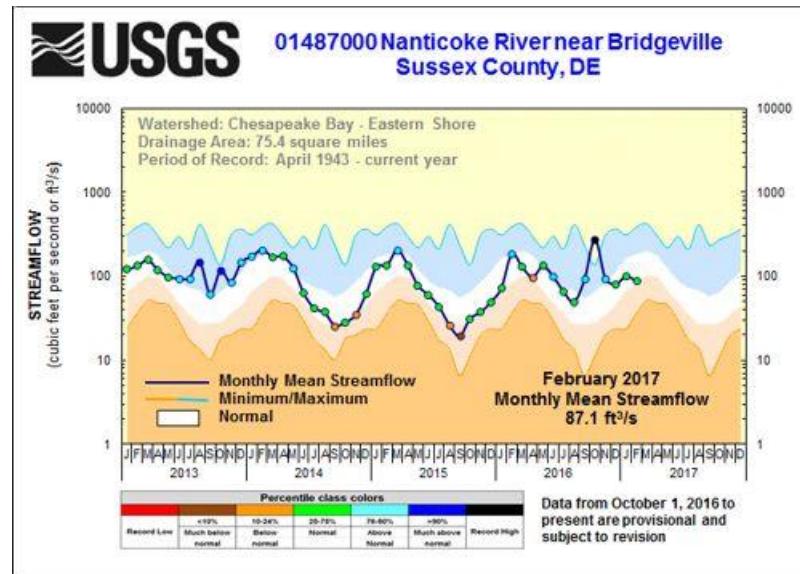


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Two streamgages were selected as examples for February. The monthly mean streamflow dropped at both streamgages, but one ranked normal and the other below normal. At the Monocacy River at Jug Bridge, streamflow dropped from normal in January, to below the 10th percentile by the end of February. February monthly mean streamflow was 467 cubic feet per second (ft³/s). The normal range is between 792 ft³/s and 1,959 ft³/s for February.



Streamflow on the Nanticoke River dropped since January. Although it was 87.1 ft³/s, it ranked in the normal range, but was only 1.9 ft³/s from ranking in the below normal range. The normal range is between 85.2 ft³/s and 1,960 ft³/s for February. Many of the groundwater levels in the surrounding wells were below normal in February.



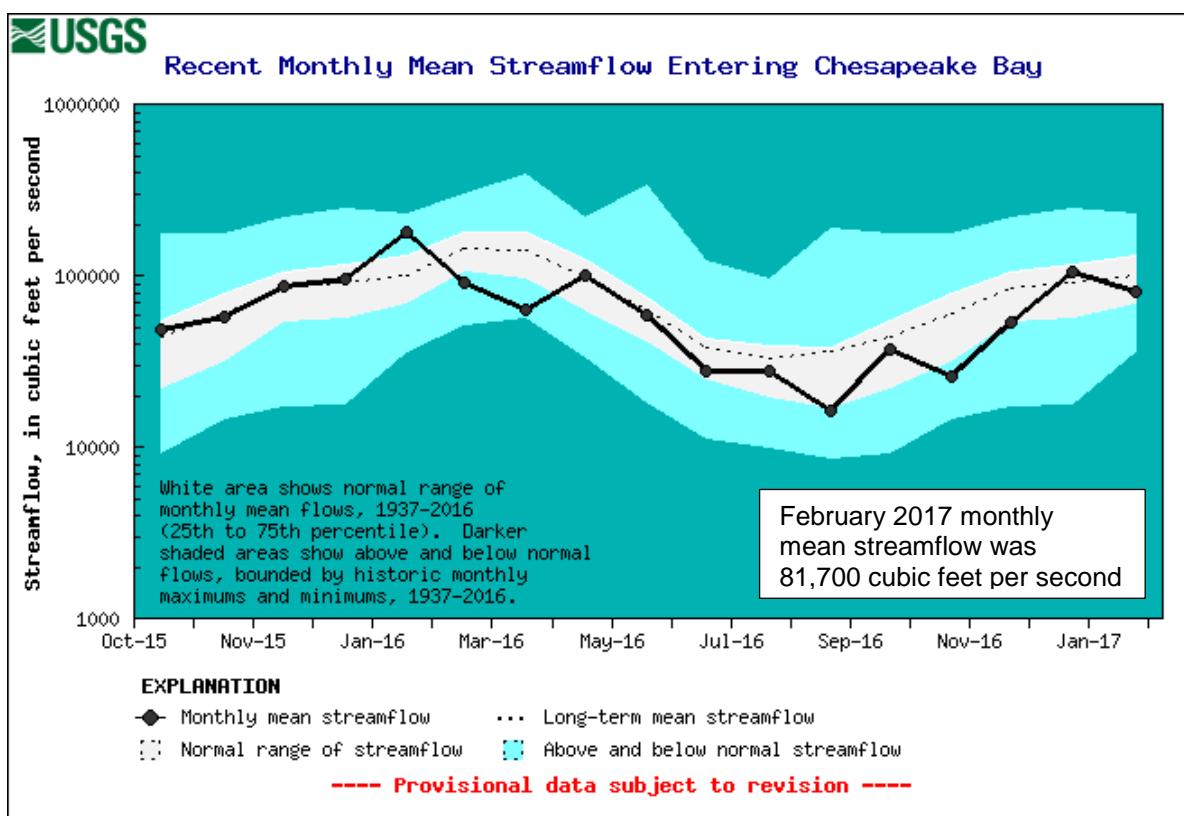
Five-year hydrographs can be viewed at:
<http://md.water.usgs.gov/surfacewater/streamflow/>

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 bottom of the tan area. Each monthly mean streamflow (each circle) is colored according to the percentile rank compared to the historical data for the month.

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

Estimated Streamflow to the Chesapeake Bay

The estimated monthly mean streamflow entering Chesapeake Bay for February 2017 was 81,700 ft³/s. This value, which is provisional and subject to revision, is considered to be in the normal range. Normal February streamflow entering the Bay is between 69,400 and 132,000 ft³/s, the 25th and 75th percentiles, respectively, of all February values. Average (mean) monthly streamflow for February is 102,000 ft³/s. These statistics are based on a 80-year period of record.



Runoff in the Chesapeake Bay watershed carries pollutants, such as nutrients and sediment, to rivers and streams that drain to the Bay. The amount of water flowing into the Chesapeake Bay from its tributaries has a direct impact on how much pollution is in the estuary, and it also affects the salinity levels that are important for the survival of fish, crabs, and oysters, with regard to the location and size of breeding/reproductive zones. Generally, as river flow increases, more nutrient and sediment pollution enters into the Bay.

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

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Baltimore and Patuxent Reservoir Levels

Baltimore City's Department of Public Works provides finished drinking water from three reservoirs (Loch Raven, Liberty, and Prettyboy) to 1.8 million people daily in Baltimore City and parts of Baltimore, Anne Arundel, and Howard Counties in Maryland. Carroll and Harford Counties also receive raw water from the Baltimore reservoirs. At the end of February 2017, available reservoir storage in the Baltimore Reservoirs was 68.77 billion gallons, or about 91 percent of available storage capacity (total or full storage is 75.85 billion gallons of water).

The Triadelphia and Duckett Reservoirs serve 1.8 million residents in parts of Charles, Howard, Montgomery, and Prince George's Counties in suburban Maryland around the District of Columbia, and are managed by the Washington Suburban Sanitary Commission (WSSC).

The stored water quantity at the end of February 2017 was 5.25 billion gallons, which is about 49 percent of normal storage capacity for these reservoirs. Normal storage refers to the volume that is useable for water supply. The full capacity of the two Patuxent reservoirs is 12.09 billion gallons, which is higher than normal storage (10.6 billion gallons), and therefore full capacity values can exceed 100 percent of normal storage.

