

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

**December 2015 Highlights:** Seventy-seven percent of groundwater levels and 94 percent of streamflow levels were normal at sites monitored by the U.S. Geological Survey across Maryland, Delaware, and the District of Columbia.

### 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 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 continues to collect water data and quality-assures the data using standardized techniques across the country. The uniformity of the dataset enables 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.

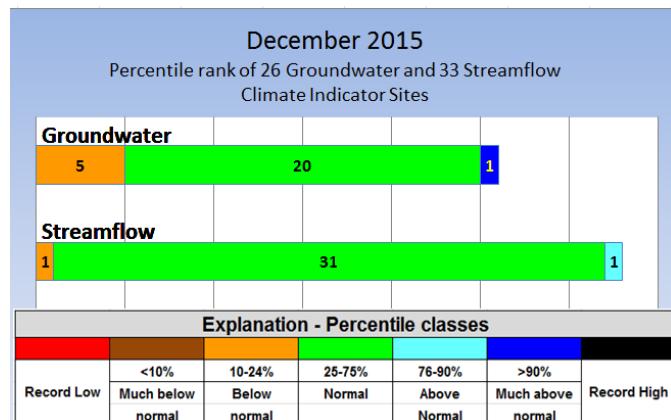
The sites used in this water summary were carefully selected to show the response of streamflow and groundwater levels to weather conditions. Ideally, these sites will show no effects from human influences. The streamflow and groundwater data are ranked in comparison to the historical record and summarized.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

### USGS December 2015 Water Conditions Summary

In December, 77 percent of the groundwater levels and 94 percent of the monthly mean streamflows were normal at sites used to monitor the response of water resources to changes in climatic conditions in Maryland, Delaware, and the District of Columbia.

Groundwater levels were normal (between the 25<sup>th</sup> and 75<sup>th</sup> percentiles) in 20 of 26 USGS monitoring wells in Maryland and Delaware. In the remaining wells, the groundwater levels were above normal in one well and below normal in five wells.

December monthly mean streamflow levels were normal at 31 of 33 streamgages in Maryland and Delaware. Streamflow was below normal at one streamgage and above normal at one streamgage.



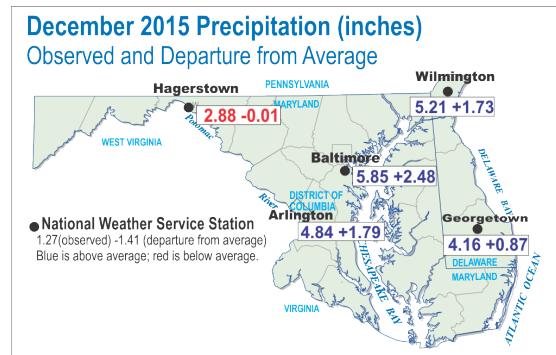
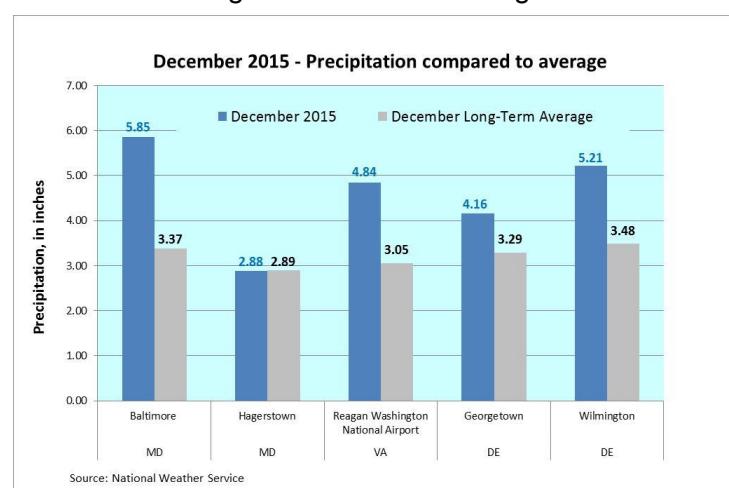
A **percentile** is a value on a scale from 0 to 100 that indicates the percent of a distribution that is equal to or below it. A percentile between 25 and 75 is considered normal. For example, a groundwater level in the 90th percentile is equal to or greater than 90 percent of the values recorded for that month.

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## December 2015 Precipitation and Weather

Precipitation was above the long-term average at four of the five National Weather Service (NWS) Mid-Atlantic weather stations in Delaware and Maryland in December. The lowest precipitation for the third consecutive month was in Hagerstown, Maryland with 2.88 inches, which was 0.01 inches below the long-term average. The highest precipitation of the five Mid-Atlantic weather stations was in Baltimore, Maryland with 5.85 inches, which was 2.48 inches above average and was the 10<sup>th</sup> highest December precipitation on record according to the National Weather Service.

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 (MARFC) 365-day precipitation data for Maryland, Delaware, and the District of Columbia showed that precipitation in all counties in Maryland and Delaware was above normal, except for the three western Maryland counties (Allegany, Garrett, and Washington), which were normal. The largest departures from average were New Castle County, Delaware, and Kent County, Maryland; each were 2.2 inches above average. The largest precipitation deficit was in Garrett County, Maryland, which was approximately 0.1 inches below average.

December temperatures set several record highs. Monthly average air temperatures were 11.5 to 12.9 degrees Fahrenheit above the long-term average at the five Mid-Atlantic weather stations in December. The warmest monthly average temperature and the largest departure from average was at the Georgetown, Delaware weather station, which was 52.1 degrees Fahrenheit, and 12.9 degrees Fahrenheit above average. Numerous daily record highs and daily high minimums were set at all five Mid-Atlantic weather stations.

At the Baltimore weather station, the NWS ranked the December average temperature of 49 degrees Fahrenheit as the warmest on record, breaking the previous record of 46.0 degrees Fahrenheit set in 1889 by 3.0 degrees Fahrenheit. Record-keeping began in 1870 in Baltimore.

Sources: National Weather Service and Middle Atlantic River Forecast Center (MARFC)  
MD and DC: <http://www.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](http://www.weather.gov/marfc/Precipitation_Departures)

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

## Groundwater

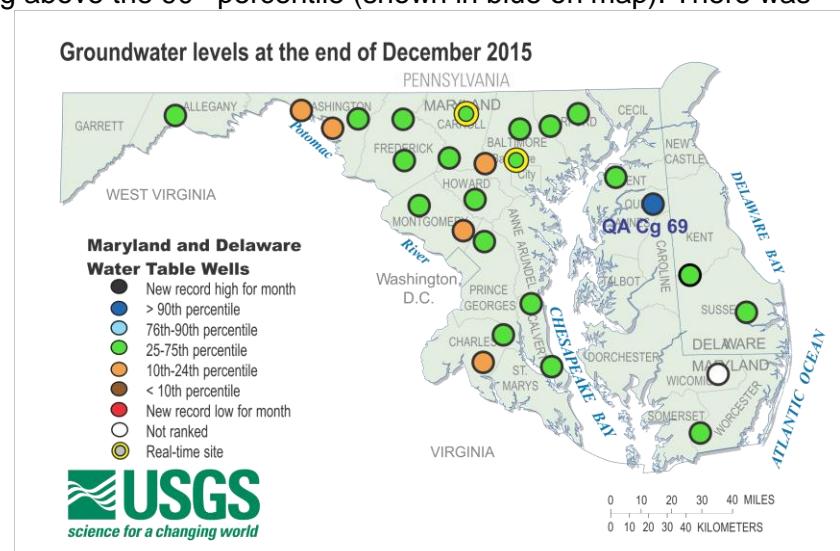
The USGS monitors groundwater levels in unconfined aquifers, providing observations that can be compared to both short-term and long-term changes in climatic conditions. Twenty-six groundwater wells were selected based on the following criteria:

- 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 a 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.

## December 2015 Groundwater Levels

In Maryland and Delaware, seventy-seven percent (20 of 26 wells) of the groundwater levels were normal (25<sup>th</sup>-75<sup>th</sup> percentiles, shown in green on map) in December at USGS wells used to monitor climatic conditions. The only USGS observation well with an above normal groundwater level was in Queen Anne's County, Maryland, ranking above the 90<sup>th</sup> percentile (shown in blue on map). There was no groundwater level available in December for the observation well in Wicomico County, Maryland.

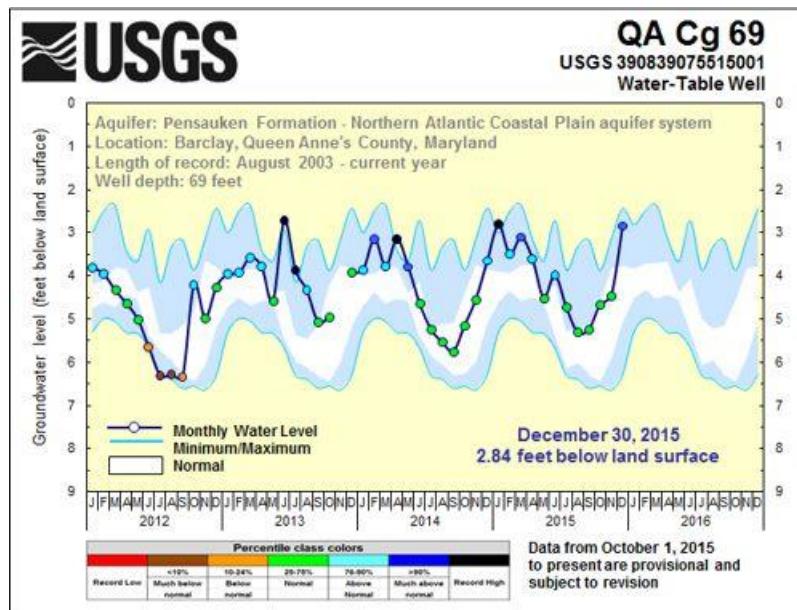
Five USGS observation wells in Maryland had below normal groundwater levels (between the 10<sup>th</sup> and 24<sup>th</sup> percentiles, shown in orange on map). Data are provisional and subject to revision.



To access the clickable groundwater map, go to:  
[http://md.water.usgs.gov/groundwater/web\\_wells/current/water\\_table/counties/](http://md.water.usgs.gov/groundwater/web_wells/current/water_table/counties/)

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

The groundwater level in observation well QA Cg 69 in Queen Anne's County, Maryland was above normal in December. The groundwater level at this well had been normal for the previous 5 months. Precipitation at the nearest weather station in Georgetown, Delaware was 0.87 inches above normal.



Five-year groundwater hydrographs can be viewed at:  
[http://md.water.usgs.gov/groundwater/web\\_wells/current/water\\_table/counties](http://md.water.usgs.gov/groundwater/web_wells/current/water_table/counties)

The 5-year hydrograph shows groundwater levels as a dark blue line, the minimum and maximum monthly values, and the normal range (between the 25<sup>th</sup> and 75<sup>th</sup> 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.

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

## Streamflow

Streamflow data are used for many purposes. A few of the most common 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.

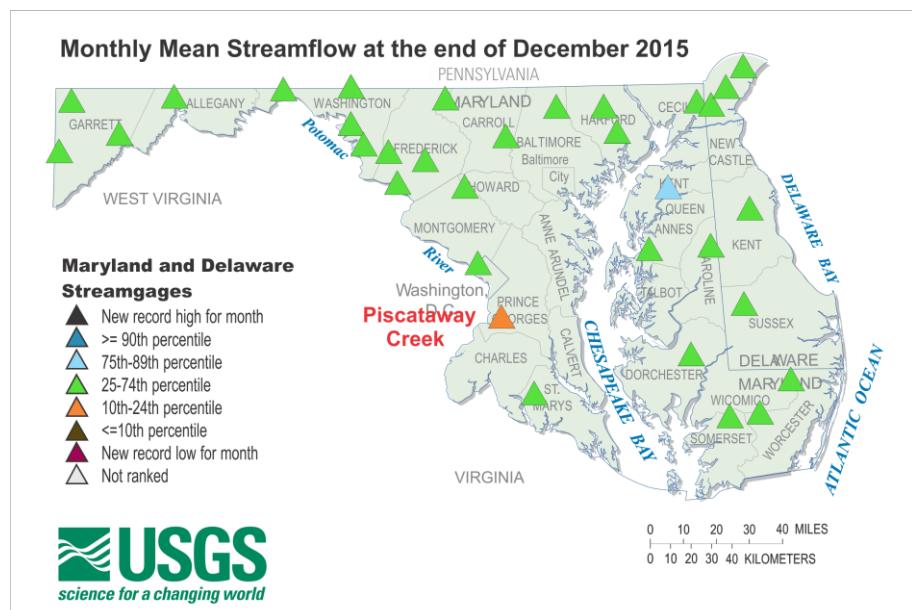
The streamflow locations chosen for the monthly water summary were selected based on the following criteria:

- 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.

## December 2015 Streamflow

December monthly mean streamflow was normal (shown in green on map) at 94 percent (31 of 33) of the USGS streamgages used to monitor climatic response in Maryland, Delaware, and the District of Columbia. Monthly mean

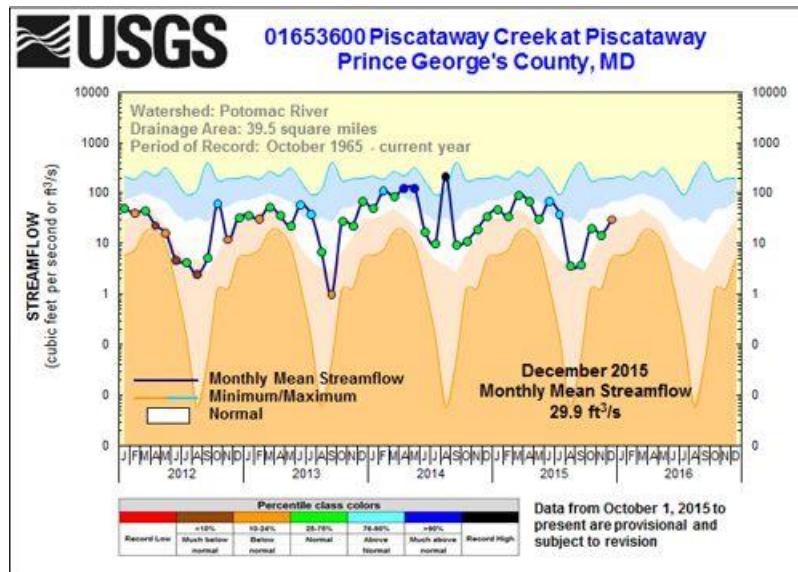
streamflow was below normal (10<sup>th</sup>-24<sup>th</sup> percentiles, shown in orange on map) at the Piscataway Creek streamgage and above normal (75<sup>th</sup>-89<sup>th</sup> percentiles, shown in cyan on map) at the Morgan Creek streamgage in Maryland. Data are provisional and subject to revision.



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

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

The monthly mean streamflow on Piscataway Creek in Prince George's County, Maryland is below normal (10<sup>th</sup>-24<sup>th</sup> percentiles), yet the level increased since November. Monthly mean streamflow typically increases at this time of year when runoff increases and plants become dormant during the cold fall and winter seasons.



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

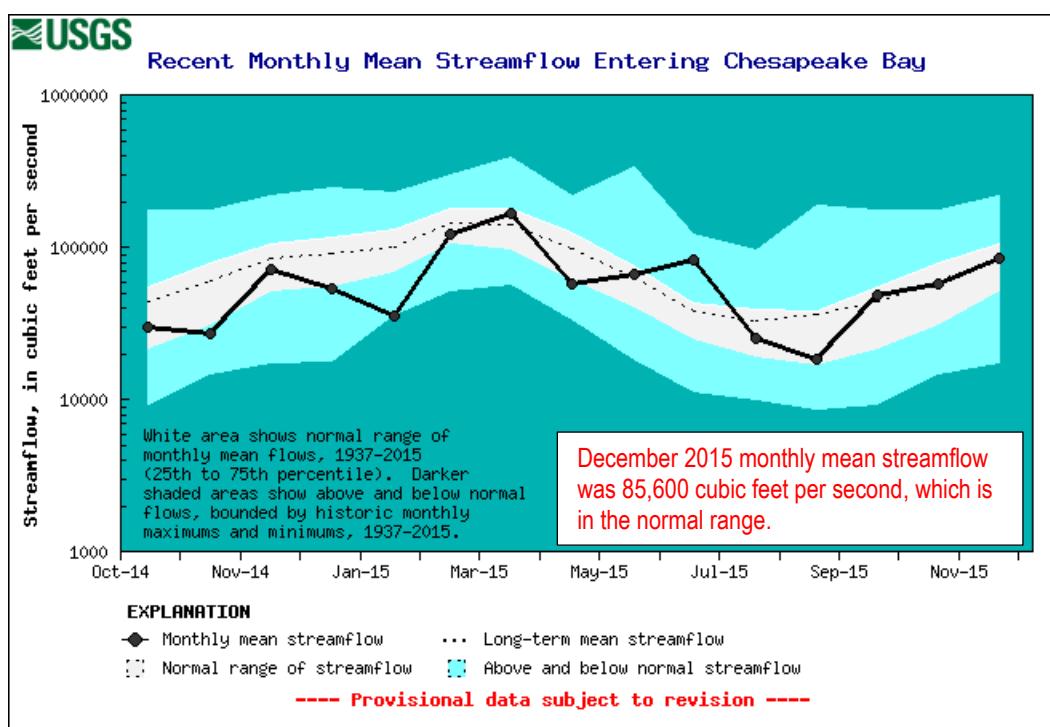
The dark line in the 5-year hydrograph represents the monthly mean streamflow for this period and the white band shows the normal range (25<sup>th</sup>-75<sup>th</sup> percentiles) based on the period of record. The maximum monthly mean streamflow is at the top of the blue shaded section, and the lowest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

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

## Estimated Streamflow to the Chesapeake Bay

The USGS estimates monthly mean freshwater streamflow to the Chesapeake Bay using streamflow measurements from the Susquehanna, Potomac, and James Rivers. In December 2015, the monthly mean freshwater flow to the Chesapeake Bay was 85,600 cubic feet per second ( $\text{ft}^3/\text{s}$ ; provisional, and subject to revision) which is in the normal range. The long-term December average (mean) is 85,200  $\text{ft}^3/\text{s}$ , and the normal range is between 50,800  $\text{ft}^3/\text{s}$  and 107,000  $\text{ft}^3/\text{s}$ , the 25<sup>th</sup> and 75<sup>th</sup> percentiles of all December values. Streamflow to the Bay has also been in the normal range for the previous 4 months. These provisional statistics are based on a 78-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 fish, crabs, and oysters. Generally, as river flow increases, it brings more nutrient and sediment pollution to the Bay.



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

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

### **Reservoir Levels**

Available reservoir storage at the end of December 2015 in the Baltimore reservoirs (Loch Raven, Liberty, and Prettyboy) was 100.00 percent of available storage capacity, or a total of 75.85 billion gallons of water. The Baltimore City Environmental Services Division manages the Baltimore reservoirs.

Total normal storage in the Triadelphia and Duckett Reservoirs, which serve parts of Howard, Montgomery, and Prince George's Counties in suburban Maryland around the District of Columbia, was 75.28 percent of normal storage capacity at the end of December 2015, with 7.94 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. The Washington Suburban Sanitary Commission (WSSC) manages the Patuxent reservoirs.

<b>December 2015</b>	<b>Percent available/normal storage</b>	<b>Volume (billion gallons)</b>
<b>Baltimore Reservoirs</b> <b>Baltimore City – Environmental Services Division</b>		
Liberty	100.00%	36.80
Loch Raven	100.00%	21.20
Prettyboy	100.00%	17.85
<b>Total</b>	<b>100.00%</b>	<b>75.85</b>
 <b>Patuxent Reservoirs</b> <b>Washington Suburban Sanitary Commission (WSSC)</b>		
Triadelphia	66.95%	3.75
Duckett	83.62%	4.19
<b>Total</b>	<b>75.28%</b>	<b>7.94</b>