

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

November 2012 – Mixed response in streamflows and groundwater levels to very dry November following extremely wet October

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

USGS water data is 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 resource conditions they might encounter in the future.

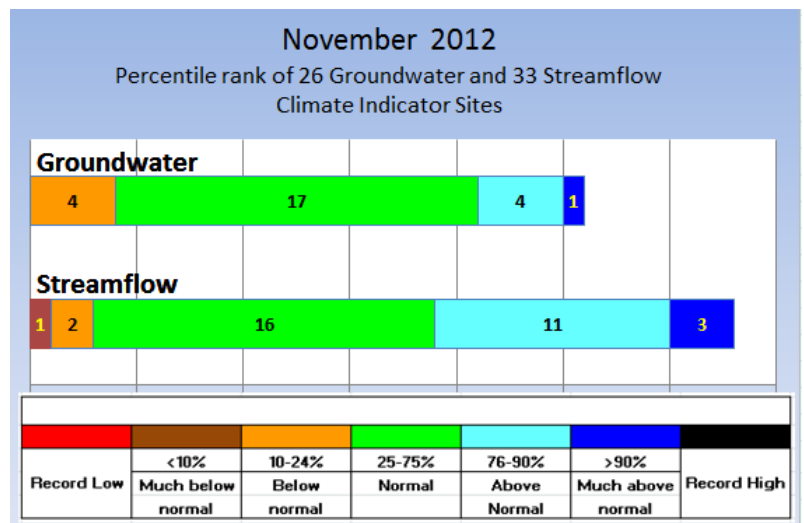
The sites used in this water summary were carefully selected to show the response of streamflow and groundwater levels to weather conditions. Ideally, these sites will show no effects from human influences. The streamflow and groundwater data are ranked in comparison to the historical record and summarized.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

USGS November 2012 Water Conditions Summary

After a very wet October, caused in part by Superstorm Sandy, November rainfall was less than an inch throughout the Maryland, Delaware, and District of Columbia region. In November, many streamflow levels dropped from their elevated levels after Superstorm Sandy, which would be expected since rainfall was less than an inch. The average monthly rainfall in the area is about 3.5 inches. Had the region not had double the monthly precipitation in October (because of Superstorm Sandy), there would likely be more sites with below normal levels.

Groundwater levels were normal to above normal in 22 of the 26 USGS monitoring wells in November. One site had a groundwater level in the highest 10th percentile. Groundwater levels were below normal at four observation wells.

There were 3 sites with below normal monthly mean streamflow, and the remaining 30 sites in the Maryland, Delaware, and District of Columbia region had normal to above normal monthly mean streamflow. Two sites in western Maryland and one on the lower Delmarva in Maryland were in the highest 10th percentile.



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.

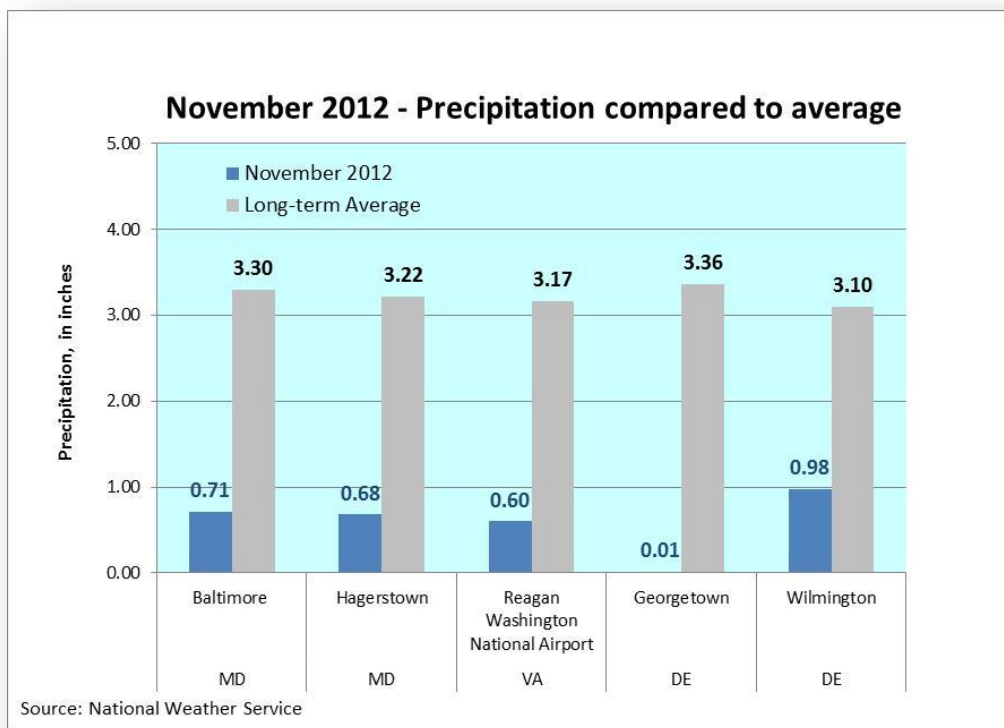
U.S. Geological Survey (USGS) Maryland-Delaware-District of Columbia Monthly Water Conditions Summary

November 2012 Precipitation and Weather

After the extreme rainfall associated with Superstorm Sandy in the Mid-Atlantic region in October, November precipitation was in stark contrast with less than an inch of rain at all five National Weather Service (NWS) stations in Maryland, Delaware, and the District of Columbia. An example of the consecutive month extremes is in Georgetown, Delaware, where only 0.01 inch of rain was recorded at the weather station in November and 9.63 inches in October. The long-term average at Georgetown, Delaware for the climate normal period is about 3.5 inches per month.

In Maryland, rainfall was 0.71 inch in Baltimore, and 0.68 inch in Hagerstown. Rainfall at the Ronald Reagan Washington National Airport near the District of Columbia was 0.60 inch and in Wilmington, Delaware, 0.98 inch. Although November rainfall was extremely low, there is no trace of drought on the map on the U.S. Drought Monitor web site (http://droughtmonitor.unl.edu/DM_northeast.htm) issued on November 27, 2012 for Maryland, Delaware, or the District of Columbia.

Average monthly temperatures were below the long-term average at all five weather stations.



The Middle Atlantic River Forecast Center web site shows that for November, precipitation was greater than 75 percent below average in 16 of the 23 counties in Maryland, and in Sussex County, Delaware. In October 2012, every county in Maryland and Delaware was ranked “greater than 75 percent above” average, except for Garrett and Allegany Counties, which received record snowfall instead of rain.

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

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

Streamflow

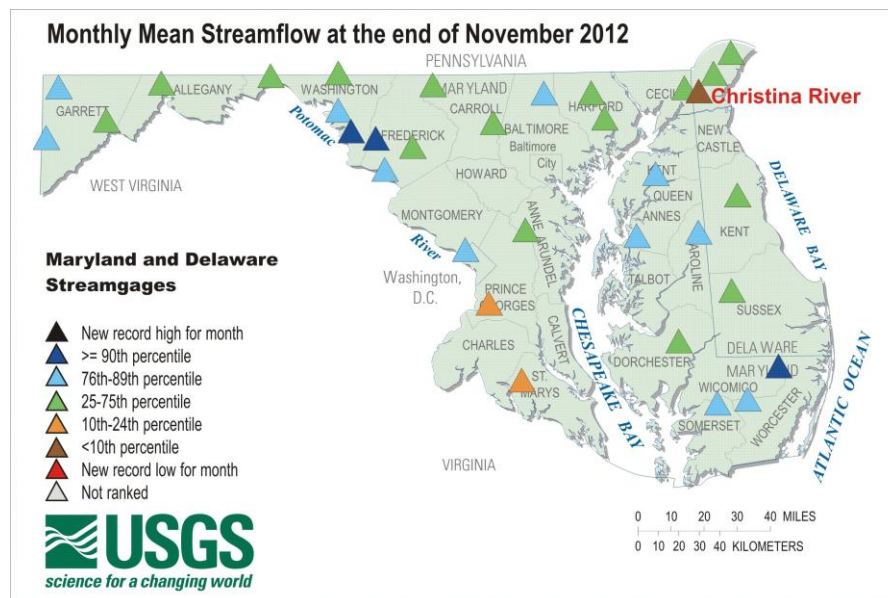
Streamflow data are used for many purposes. A few of the most obvious uses are to assess water supply and the risk of droughts and floods. Streamflow data are also used to calculate loads of chemical constituents and assess how biological communities are affected by hydrologic conditions. The USGS operates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

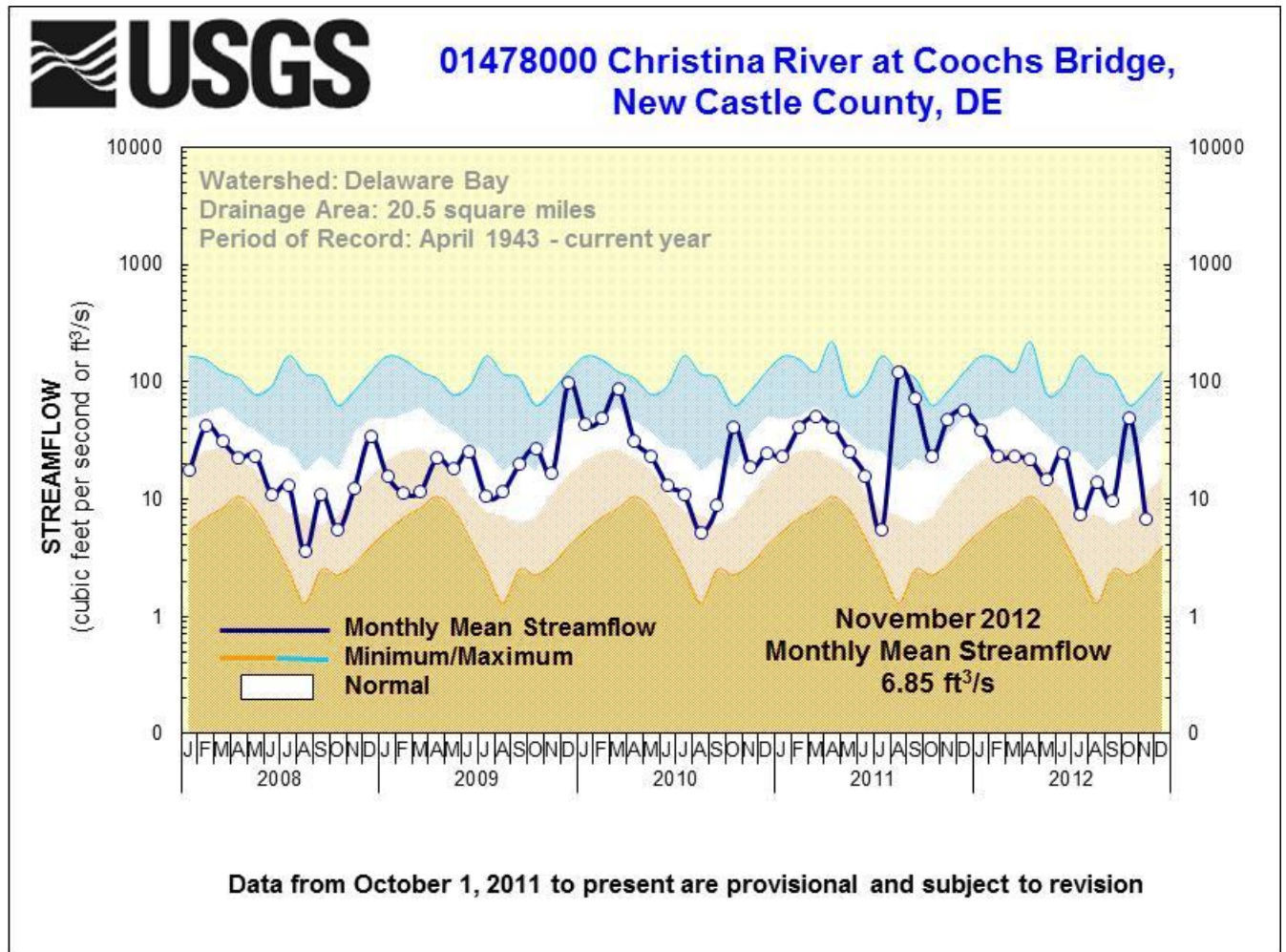
November 2012 Streamflow

Monthly mean streamflow was normal to above normal at 30 of the 33 USGS streamflow-gaging stations used to monitor climatic response in Maryland, Delaware, and the District of Columbia. Normal is considered to be between the 25th and 75th percentiles. Most of the streamflow levels dropped in November, which was expected because the levels were so high after the abundant rainfall from Superstorm Sandy in October. Three sites dropped to below normal monthly mean streamflows: in Prince George's and St. Mary's Counties in Maryland, and in New Castle County in Delaware.



Monthly mean streamflow on the Christina River in New Castle County, Delaware dropped from above normal to below normal between October and November. The streamflow levels reflect the above normal precipitation associated with Superstorm Sandy at the end of October followed by the dry November with less than an inch of rain throughout the region.

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



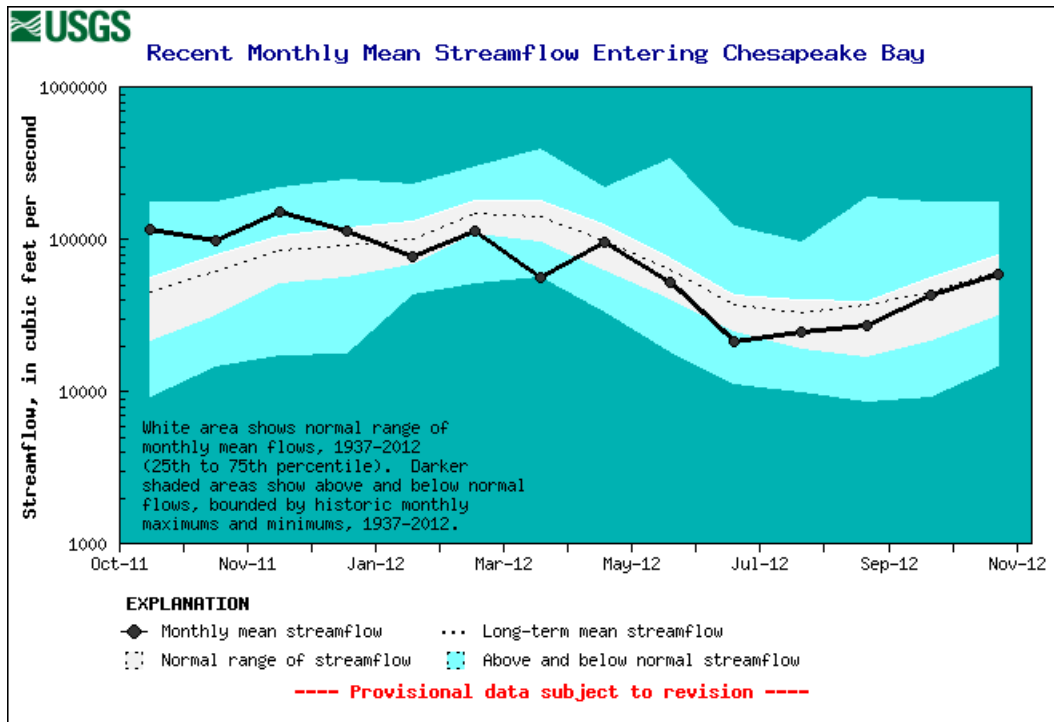
Five-year hydrographs can be viewed at:
<http://md.water.usgs.gov/surfacewater/streamflow/>

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 to 75th percentile) 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.

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

Estimated Streamflow to the Chesapeake Bay

The estimated monthly mean freshwater streamflow to Chesapeake Bay remained in the normal range in November 2012, at 59,500 cubic feet per second (ft³/s; provisional and subject to revision). The normal range for average (mean) monthly streamflow for November is between 31,800 ft³/s and 79,200 ft³/s, the 25th and 75th percentiles of all November values. These statistics are based on a 76-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/recent/>

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 casing--dug wells not used;
- Water levels show no apparent hydrologic connection to nearby streams;
- Well has never gone dry; and
- Long-term accessibility likely.

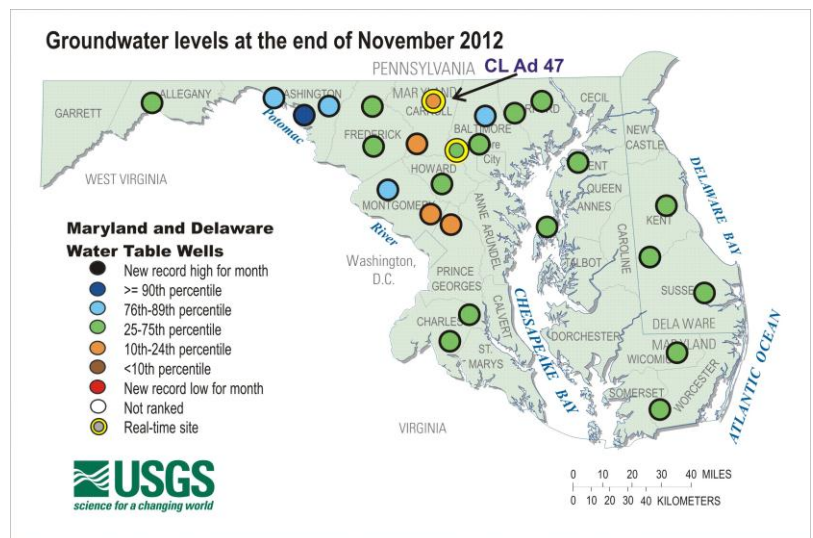
November 2012 Groundwater Levels

November rainfall was less than an inch at the weather stations in Baltimore and Hagerstown, Maryland, but rainfall associated with Superstorm Sandy at the end of October was 6.67 inches in Baltimore and 4.61 inches in Hagerstown. This represents more than a month's rainfall in the last 3-4 days of the month and this end of October rainfall had an effect on some of the groundwater levels in November.

The response in groundwater levels to the weather conditions was somewhat different in each county because of a number of factors, including differences in the geologic settings where the wells are located, relative rates of recharge, and differences in when monthly measurements were made relative to Superstorm Sandy.

Groundwater levels used to monitor climatic conditions in Maryland and Delaware were normal or above normal in 22 of 26 wells. Normal is considered to be between the 25th and 75th percentiles.

Two observation wells in Carroll County, Maryland and two wells in Montgomery and Prince George's Counties, Maryland had below normal groundwater levels in November. Monitoring wells with above normal groundwater levels were located in Baltimore, Montgomery, and Washington Counties.

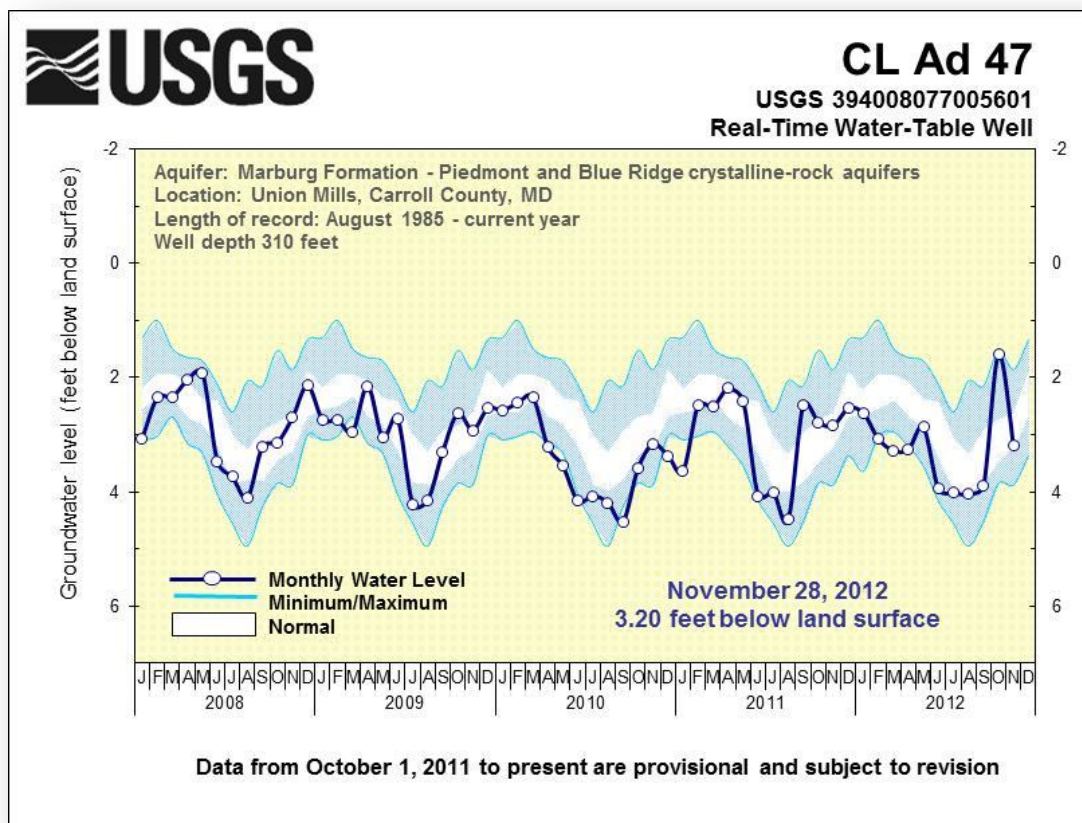


To access the clickable groundwater map, go to:

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

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

The groundwater level in observation well CL Ad 47 illustrates the expected response to rainfall with a sharp rise of 2.79 feet to a near record high in October, then the groundwater level dropped 1.69 feet to below normal in November. Although data collection began in 1985 at this monitoring well, it wasn't until 1999 that monthly measurements were taken. Since 1999, there has not been a rapid rise and fall of groundwater levels similar to what happened in October and November 2012.



Five-year groundwater hydrographs can be viewed at:

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

5-year hydrograph shows 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 blue section and the minimum water level is at the bottom of the blue section in the graph.

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

Reservoir Levels

Reservoir storage at the end of November in the Baltimore reservoirs (Loch Raven, Liberty, and Prettyboy) increased to 100 percent of available storage capacity, with a total of 75.53 billion gallons of water.

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 100 percent of normal storage capacity or 91 percent of capacity at the end of November with 10.66 billion gallons.

November 2012	Percent available/normal storage	Volume (billion gallons)	Source
Baltimore Reservoirs			Baltimore City – Environmental Services Division
Liberty	99%	36.48	
Loch Raven	100%	21.20	
Prettyboy	100%	17.85	
Total	100%	75.53	
Patuxent Reservoirs			Washington Suburban Sanitary Commission (WSSC)
Triadelphia	104%	5.81	Above normal storage; 91% of Capacity
Duckett	97%	4.85	
Total	100%	10.66	