

November 2017 Hydrologic Conditions in Massachusetts

SUMMARY OF CONDITIONS

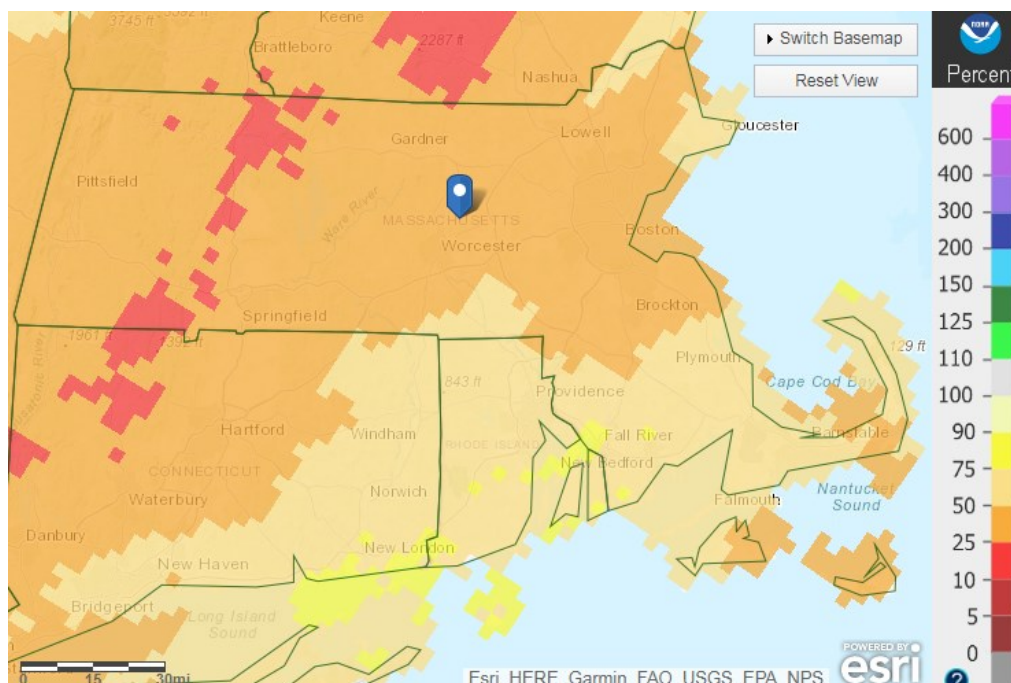
- Both precipitation indices remain Normal in all regions; however, November ended with 1.5 to over 2.5 inches of deficits across the state.
- Average monthly streamflows are Normal in all regions.
- Groundwater indices are Normal in all regions but individual wells across the state range from normal to below the 10th percentile. More than half the wells were below normal in the West and Connecticut River Valley regions but since this is the second and first month, respectively, they do not trigger the index.
- Reservoirs are Normal in all regions.
- The US Drought Monitor as of November 30 removed all dry conditions from the state.
- NOAA's three-month outlook projects above normal temperatures and normal precipitation.

PRECIPITATION

Region	Estimated Rainfall (inches)	Departure from Average November (inches)	MA Drought Plan Levels	
			Standardized Precipitation Index (SPI)	Percent of Normal Index
Western	1.30	-2.33	Normal	Normal
CT River Valley	0.98	-2.88	Normal	Normal
Central	1.61	-2.43	Normal	Normal
Northeast	1.93	-1.96	Normal	Normal
Southeast	2.59	-1.51	Normal	Normal
Cape Cod & Islands	2.46	-1.86	Normal	Normal

November 2017 Precipitation, Percent of Normal

Map from National Weather Service's Quantitative Precipitation Estimates. <http://water.weather.gov/precip/>



STREAMFLOW

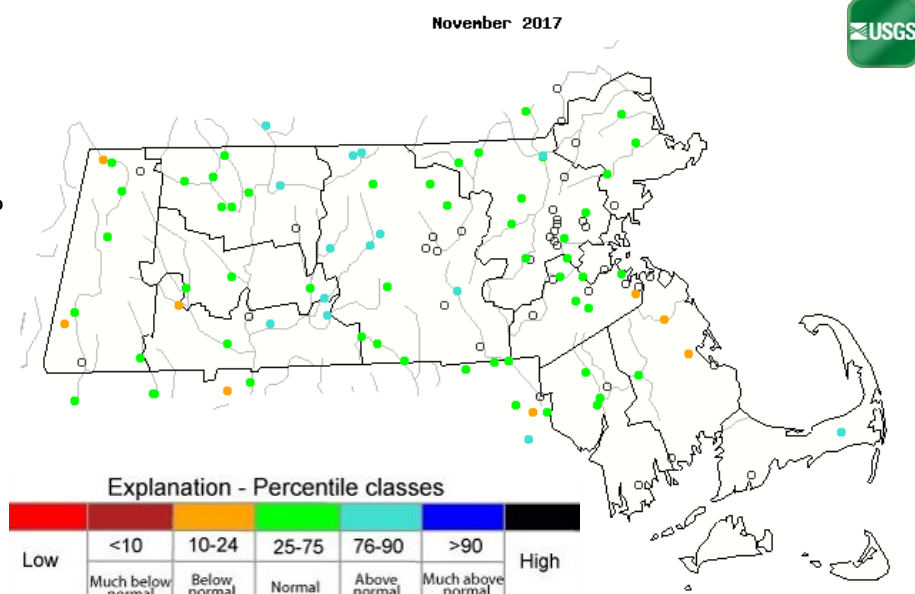
Region	Number of Gages				MA Drought Plan Index (# consecutive months majority below 25th percentile)
	Total Reporting for November	<25th to 10th percentile	<10th percentile to above record low	Record low	
Western	7	2	0	0	0/Normal
CT River Valley	14	1	0	0	0/Normal
Central	12	0	0	0	0/Normal
Northeast	17	1	0	0	0/Normal
Southeast	6	2	0	0	0/Normal

Key to Drought Levels
Normal
Advisory
Watch
Warning
Emergency

Notes: Gage counts are non-cumulative except for "total reporting". Not all gages report in all months due to ice, beaver dams or other conditions. Streamflow index is not applicable to Cape Cod and the Islands.

Average Monthly Streamflow Compared to Historical for the Month of the Year

Streamflow is monitored by the Commonwealth of Massachusetts and United States Geological Survey (USGS) cooperative stream gaging program.
<http://waterwatch.usgs.gov/index.php?r=ma&id=mv01d>



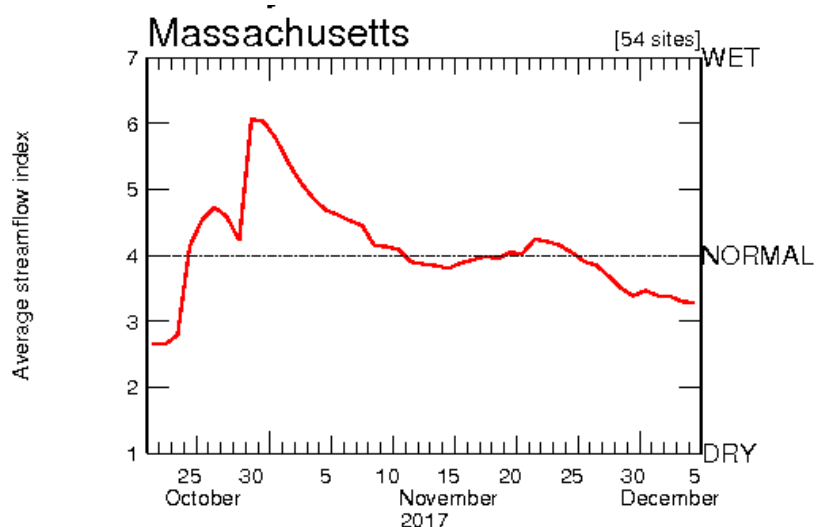
Average Daily Streamflow Compared to Historical for the Day of the Year

This plot depicts data for the 45-day period ending in early December.

http://waterwatch.usgs.gov/index.php?id=real&sid=w__plot&r=ma

KEY:

- 1 = New record low for day
- 2 = < 10th percentile
- 3 = 10th – 24th percentile
- 4 = 25th – 74th percentile
- 5 = 75th – 89th percentile
- 6 = > 90th percentile
- 7 = New record high for day



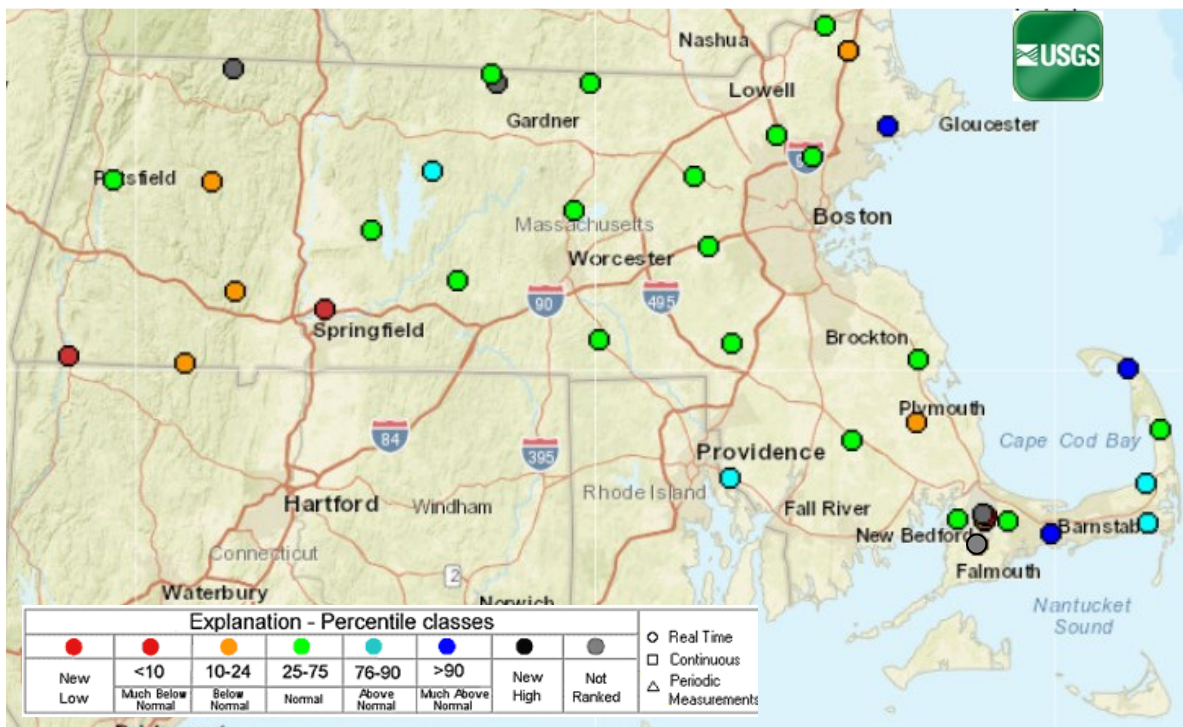
GROUNDWATER

Region	Number of wells				MA Drought Plan Index (# consecutive months majority below 25 th percentile)
	Total Reporting for November	<25th to 10th percentile	<10th percentile to above record low	Record low	
Western	5	2	1	0	2/Normal
CT River Valley	11	5	1	0	1/Normal
Central	10	1	0	0	0/Normal
Northeast	17	3	1	0	0/Normal
Southeast	12	3	0	0	0/Normal
Cape and Islands	9	0	0	0	0/Normal

Notes: Well counts are non-cumulative except for "total reporting". Not all data are available in time for reporting.

Groundwater Conditions in the Real-Time Network at the End of November

<https://groundwaterwatch.usgs.gov/NetMapT1L2.asp?ncd=crn&sc=25>



RESERVOIRS

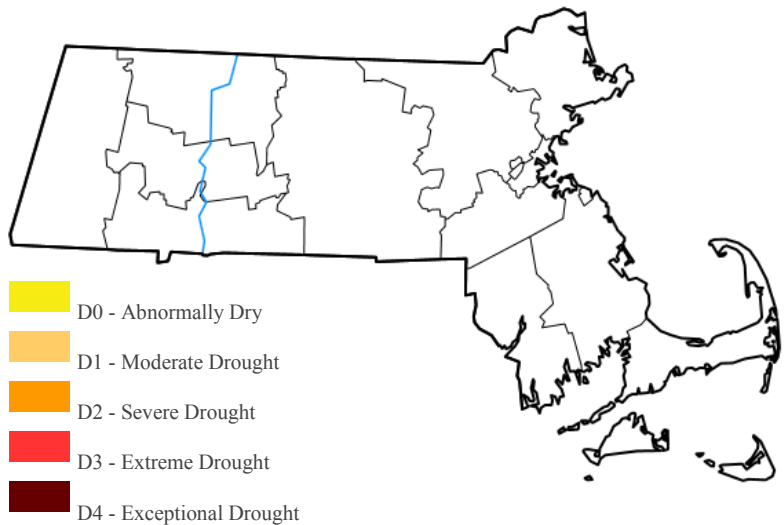
Region	Total Reporting for November	Reservoir Levels	MA Drought Management Plan Reservoir Index
Western	1	Normal	Normal
CT River Valley	2	Normal	Normal
Central	2	Normal	Normal
Northeast	7	Normal	Normal
Southeast	3	Normal	Normal
Cape Cod & Islands	1	Normal	Normal

DROUGHT CONDITIONS AND FORECASTS BY NOAA AND PARTNERS

U.S. Drought Monitor: Drought Conditions as of November 30, 2017

Summary: The USDM has removed all dry conditions from state.

Produced by the National Drought Mitigation Center (NDMC). Intensity based on NDMC criteria. For a weekly updated map see: <http://droughtmonitor.unl.edu/Home/StateDroughtMonitor.aspx?MA>



NOAA: Monthly and Seasonal Temperature and Precipitation Outlook





The Climate Prediction Center's outlook for December projects a 40-50 percent probability of below normal temperatures in Massachusetts. Precipitation has equal chances for below normal, normal and above normal occurrence (<http://www.cpc.noaa.gov/products/predictions/30day/>).

The Center's outlook for December through February projects a 40-50 percent probability of above normal temperatures and equal chances for below normal, normal and above normal precipitation (http://www.cpc.ncep.noaa.gov/products/predictions/long_range/seasonal.php?lead=1).

NOAA: Monthly and Seasonal Drought Outlook

Both the short and long term outlooks project normal conditions.

<http://www.cpc.ncep.noaa.gov/products/Drought/>

-  Drought persists
-  Drought remains but improves
-  Drought removal likely
-  Drought development likely



Valid for December 2017



Valid Nov. 16 through Feb 28, 2018



Key Links: Massachusetts Drought Management: <http://www.mass.gov/eea/agencies/dcr/water-res-protection/water-data-tracking/drought-status.html>

DCR Precipitation Monitoring Composite Reports and SPI

<https://www.mass.gov/service-details/precipitation-composite-estimates-1>

<https://www.mass.gov/service-details/standardized-precipitation-index-spi-0>

This report was prepared by the Massachusetts Department of Conservation and Recreation. Data may be preliminary in nature. Additional information, previous hydrological conditions reports, and drought management information can be found on our web site:

<https://www.mass.gov/water-data-tracking>

Appendix I: Additional Information

Keetch-Byram Drought Index

The fire index based on state data was not available as of the time of this report. Based on limited Massachusetts data, national modeling by the United States Forest Service showed KBDI values of less than 300 for all regions of the state as of the first week of December. These values put all regions in Normal range for the index.

<http://www.wfas.net/index.php/keetch-byram-index-moisture--drought-49>

Crop Moisture Index for the Week Ending December 2, 2017

The Crop Moisture Index shows the short-term need versus available water in a shallow soil profile. This index responds quickly to changing conditions and is subject to frequent change. The drought level for this indicator is determined based on the repeated or extended occurrence at a given level. This indicator is most relevant during growing season. http://www.cpc.noaa.gov/products/analysis_monitoring/regional_monitoring/cmi.gif

Region	MA Drought Plan Index
Western	Normal
CT River Valley	Normal
Central	Normal
Northeast	Normal
Southeast	Normal
Cape and Islands	Normal



Appendix II: Description of Drought Indices

(from Table 3 of Massachusetts Drought Management Plan).

Drought Level	Standardized Precipitation Index	Crop Moisture Index*	Keetch-Byram Drought Index*	Precipitation	Groundwater	Streamflow	Reservoir***
Normal	3-month > -1.5 <u>or</u> 6-month > -1.0 <u>or</u> 12-month > -1.0	0.0 to -1.0 slightly dry	< 200	1 month below normal	2 consecutive months below normal**	1 month below normal**	Reservoir levels at or near normal for the time of year
Advisory	3-month = -1.5 to -2.0 <u>or</u> 6-month = -1.0 to -1.5 <u>or</u> 12-month = -1.0 to -1.5	-1.0 to -1.9 abnormally dry	200-400	2 month cumulative below 65% of normal	3 consecutive months below normal**	At least 2 out of 3 consecutive months below normal**	Small index Reservoirs below normal
Watch	3-month < -2.0 <u>or</u> 6-month = -1.5 to -3.0 <u>or</u> 12-month = -1.5 to -2.0	-2.0 to -2.9 excessively dry	400-600	1 of the following criteria met: 3 month cum. < 65% <u>or</u> 6 month cum. < 70% <u>or</u> 12 month cum. < 70%	4-5 consecutive months below normal**	At least 4 out of 5 consecutive months below normal**	Medium index Reservoirs below normal
Warning	6-month < -3.0 <u>or</u> 12-month = -2.0 to -2.5	< -2.9 severely dry	600-800	1 of the following criteria met: 3 month cum. < 65% and 6 month cum. < 65%, <u>or</u> 6 month cum. < 65% and 12 month cum. < 65%, <u>or</u> 3 month cum. < 65% and 12 month cum. < 65%	6-7 consecutive months below normal**	At least 6 out of 7 consecutive months below normal**	Large index reservoirs below normal
Emergency	12-month < -2.5	< -2.9 severely dry	600-800	Same criteria as Warning and previous month was Warning or Emergency	> 8 months below normal**	> 7 months below normal**	Continuation of previous month's conditions

* The Crop Moisture Index is subject to frequent change. The drought level for this indicator is determined based on the repeated or extended occurrence at a given level.

** Below normal for groundwater and streamflow are defined as being within the lowest 25th percentile of the period of record.

*** Water suppliers should be consulted to determine if below normal reservoir conditions are due to operational issues.

Source: Massachusetts Drought Management Plan. May 2013 (<http://www.mass.gov/eea/docs/eea/wrc/droughtplan.pdf>).