MASSACHUSETTS WATER RESOURCES COMMISSION

December 2017 Hydrologic Conditions in Massachusetts

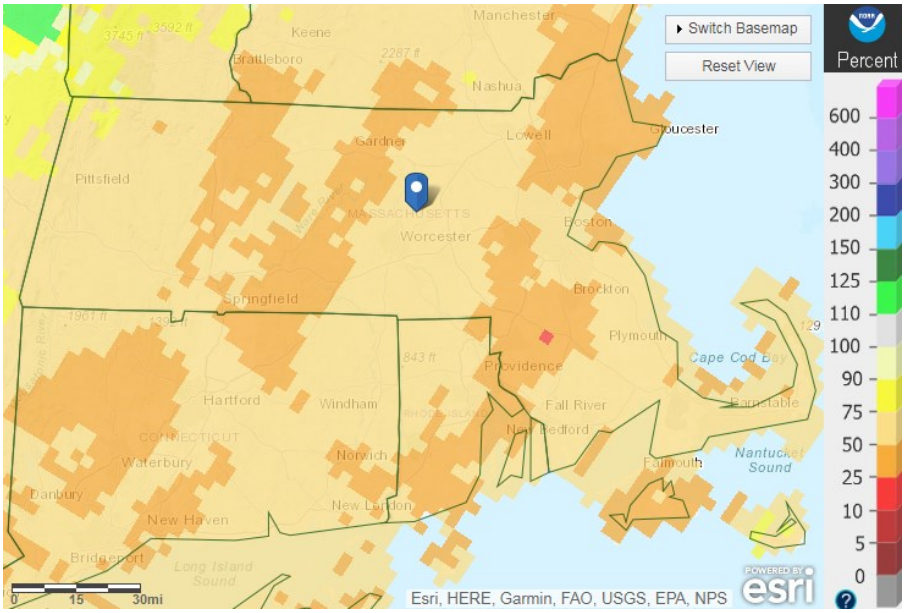
SUMMARY OF CONDITIONS

- For precipitation, the two-month Percent of Normal index is at Advisory level for all regions except the Southeast. The standardized precipitation index, which is calculated for three-month and greater time periods, remains normal for all regions.
- Average monthly streamflow is Normal in all regions but numerous individual gages are below normal. The West, Northeast and Southeast had the majority of their gages below normal, but this is the first month; and, therefore does not trigger the index.
- The groundwater index is Normal in all regions but numerous wells are below normal. More than half the wells were below normal in the Connecticut River Valley and Southeast regions but since this is the second and first month, respectively, they do not trigger the index.
- The reservoir index is Normal in all regions. The Northeast and Southeast regions have one or more reservoirs at or below normal and close to triggering the index.
- NOAA's three-month outlook is a slight probability for above normal temperatures and precipitation.

PRECIPITATION

Region	Estimated Rainfall (inches)	Departure from Average December (inches)	MA Drought Plan Levels	
			Standardized Precipitation Index (SPI)	Percent of Normal Index
Western	2.18	-1.22	Normal	Advisory
CT River Valley	2.60	-1.12	Normal	Advisory
Central	2.91	-0.97	Normal	Advisory
Northeast	2.20	-1.52	Normal	Advisory
Southeast	2.80	-1.25	Normal	Normal
Cape Cod & Islands	2.65	-1.51	Normal	Advisory

December 2017 Precipitation, Percent of Normal



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

STREAMFLOW

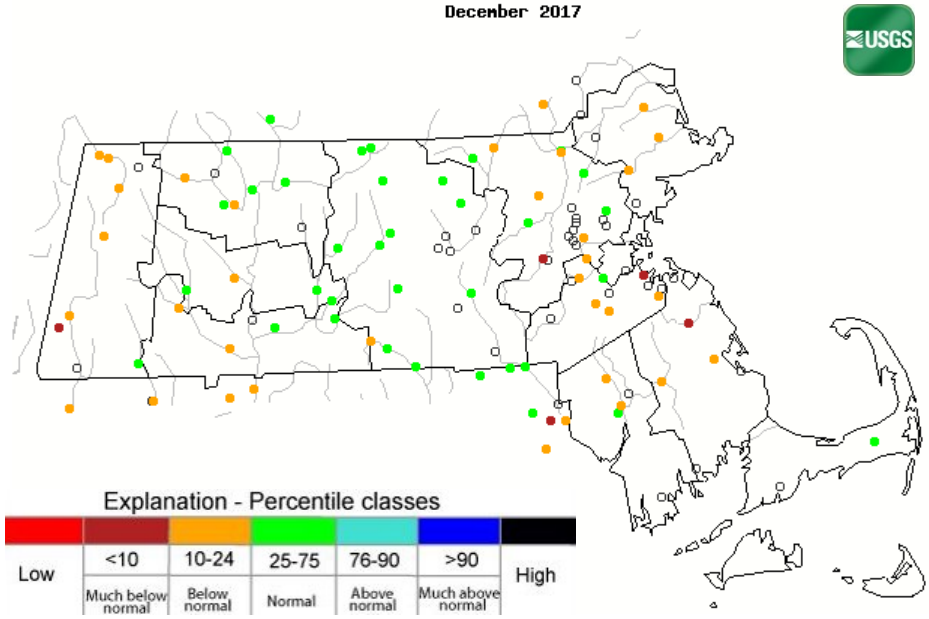
Region	Number of Gages				MA Drought Plan Index (# consecutive months majority below 25th percentile)
	Total Reporting for December	<25th to 10th percentile	<10th percentile to above record low	Record low	
Western	7	**5**	**1**	0	**1**/Normal
CT River Valley	13	**5**	0	0	0/Normal
Central	11	**1**	0	0	0/Normal
Northeast	13	**7**	**1**	0	**1**/Normal
Southeast	11	**9**	**1**	0	**1**/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

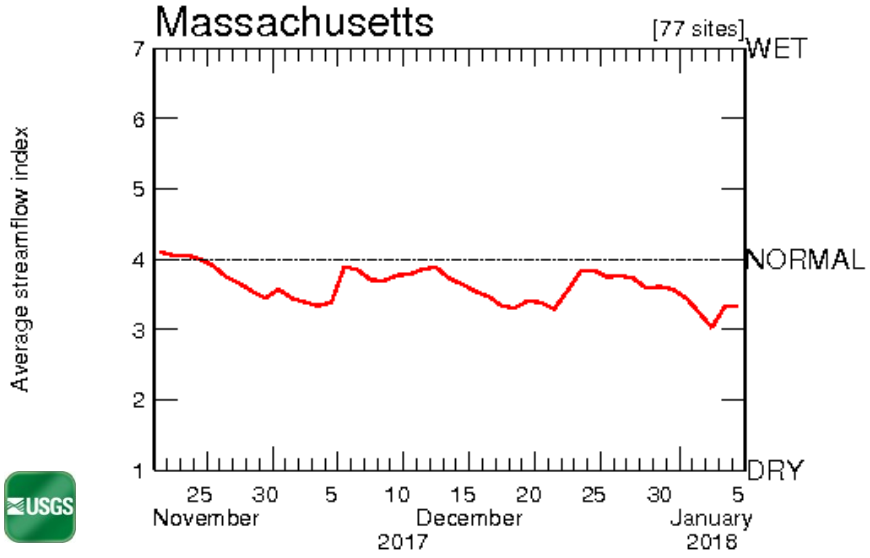


Average Daily Streamflow Compared to Historical for the Day of the Year

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

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



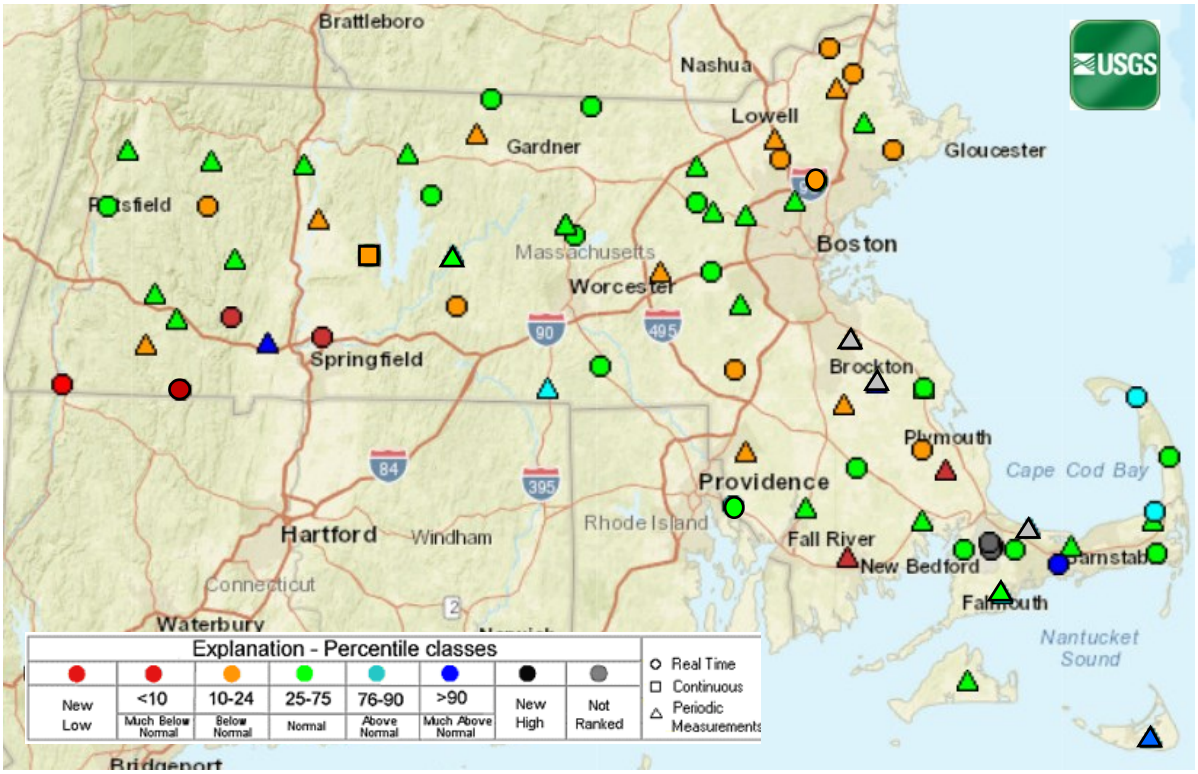
GROUNDWATER

Region	Number of wells				MA Drought Plan Index (# consecutive months majority below 25th percentile)
	Total Reporting for December	<25th to 10th percentile	<10th percentile to above record low	Record low	
Western	5	**1**	0	**1**	0/Normal
CT River Valley	11	**3**	**3**	0	**2**/Normal
Central	10	**2**	0	0	0/Normal
Northeast	16	**8**	0	0	0/Normal
Southeast	11	**4**	**3**	0	**1**/Normal
Cape and Islands	10	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 Climate Response Network at the End of December

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



RESERVOIRS

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

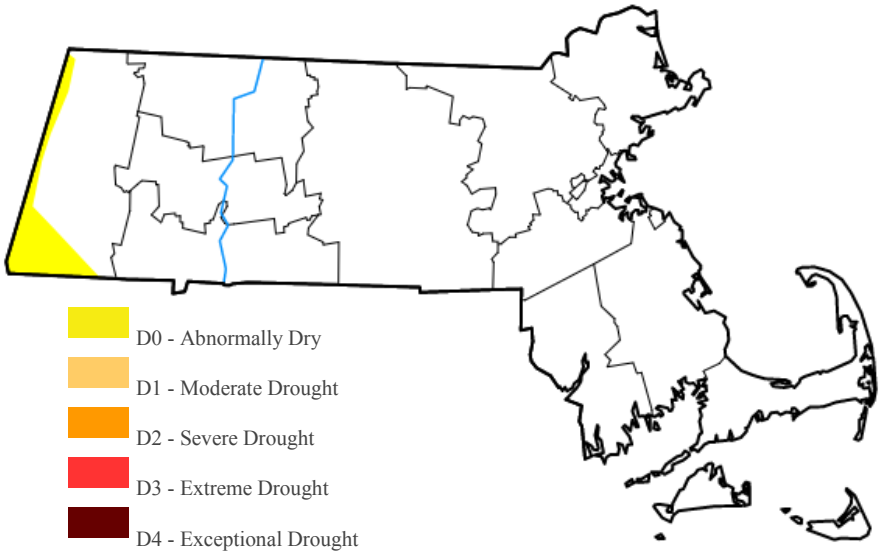
*One or more reservoirs are at or below normal and close to triggering the index.

DROUGHT CONDITIONS AND FORECASTS BY NOAA AND PARTNERS

U.S. Drought Monitor: Drought Conditions as of January 2, 2018

Summary: The USDM has removed dry conditions from over 97 percent of the 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 January 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 January through March projects a 33-40 percent probability of above normal temperatures and the same probability for 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/

Valid for January 2018

Valid Dec. 21 through Mar 31, 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

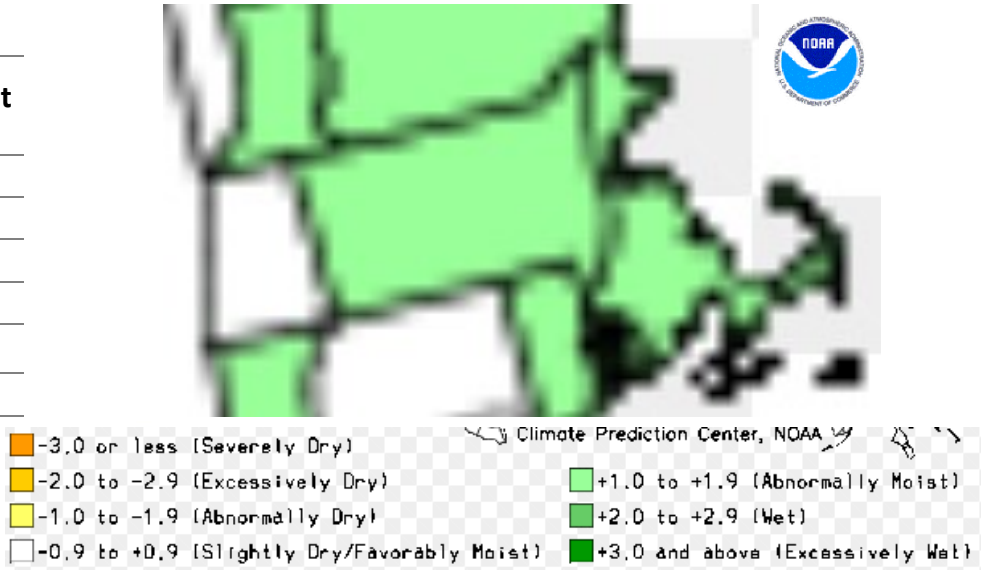
The fire index is not calculated by the state in the winter months. Based on limited Massachusetts data, national modeling by the United States Forest Service showed KBDI values of less than 300 for all regions of the state as of the first week of December. These values put all regions in Normal range for the index.

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

Crop Moisture Index for the Week Ending January 6, 2018

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 **or** 6-month > -1.0 **or** 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 **or** 6-month = -1.0 to -1.5 **or** 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 **or** 6-month = -1.5 to -3.0 **or** 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% **or** 6 month cum. < 70% **or** 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 **or** 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%, **or** 6 month cum. <65% and 12 month cum. <65%, **or** 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).