

# March 2017 Hydrologic Conditions in Massachusetts

## SUMMARY OF CONDITIONS

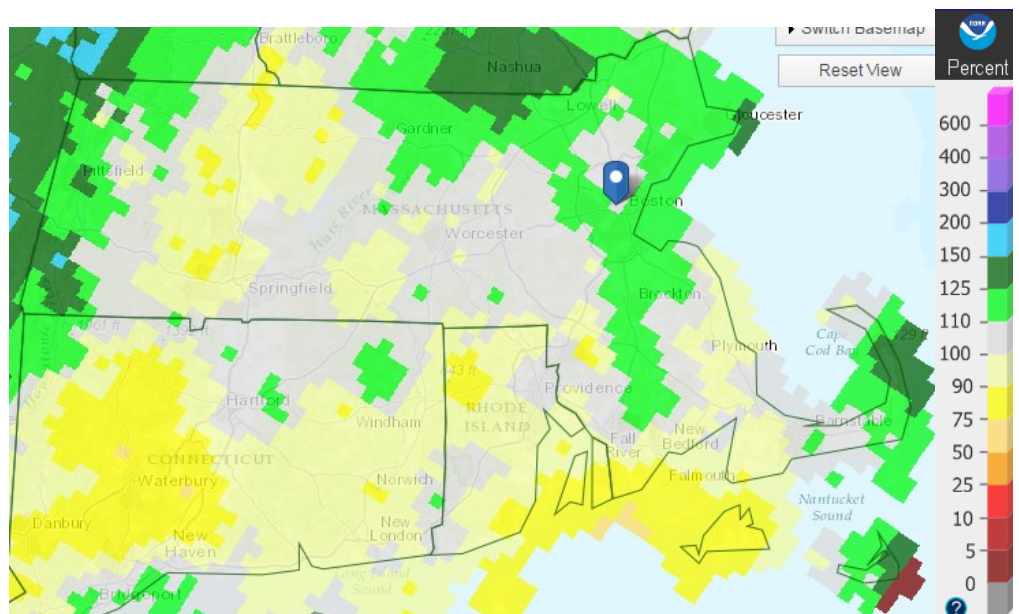
- Precipitation for the month was below average in all regions except the Northeast. The 12-month precipitation deficit remains in all regions except the West.
- Average monthly streamflows were below normal except in the West.
- Groundwater levels stagnated in recovering with the majority of wells below normal in the Southeast and Cape and the Islands.
- At least one reservoir is below normal in Central, Northeast, Southeast and Cape and Islands.
- NOAA projects normal precipitation and above normal temperatures for April.
- Appendix I provides values of indices not presented in the main report. Appendix II provides a description of the indices from the Drought Management Plan.

## PRECIPITATION

Region	Estimated Rainfall (inches)	Departure from Average March (inches)	MA Drought Plan Levels	
			Standardized Precipitation Index (SPI)	Percent of Normal Index
Western	2.62	-0.76	Normal	Normal
CT River Valley	3.26	-0.47	Watch (12 mo)	Normal
Central	3.39	-0.76	Advisory (12 mo)	Normal
Northeast	4.12	0.20	Advisory (12 mo)	Normal
Southeast	3.74	-0.49	Advisory (12 mo)	Normal
Cape Cod & Islands	2.75	-1.52	Advisory (12 mo)	Normal

March 2017 Precipitation Departure from Normal

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



## STREAMFLOW

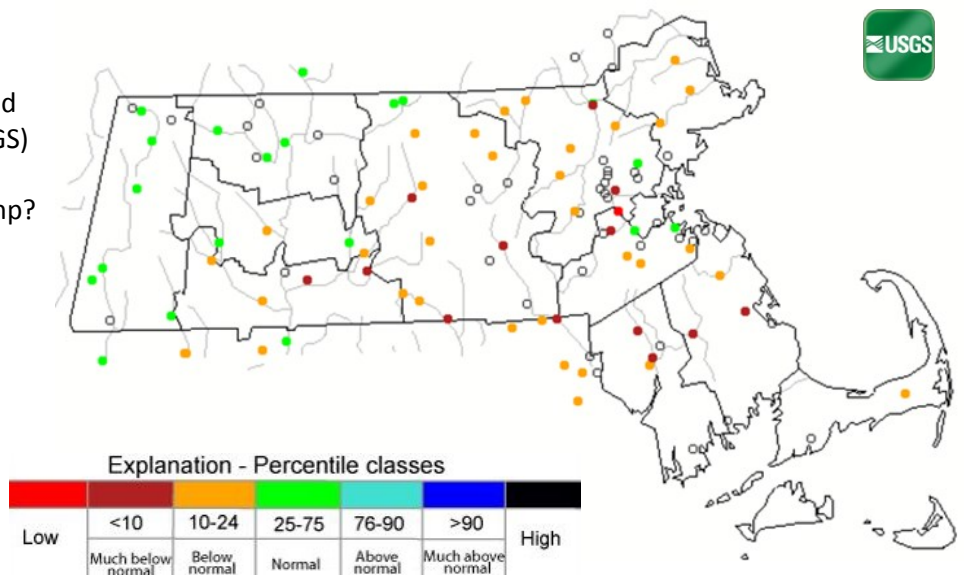
Region	Number of Gages				MA Drought Plan Index (# consecutive months majority below 25th percentile)
	Total Reporting	<25th to 10th percentile	<10th percentile to above record low	Record low	
Western	6	0	0	0	0/ Normal
CT River Valley	10	4	1	0	1/ Normal
Central	12	8	2	0	1/Normal
Northeast	19	12	3	1	1/Normal
Southeast	6	2	4	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>

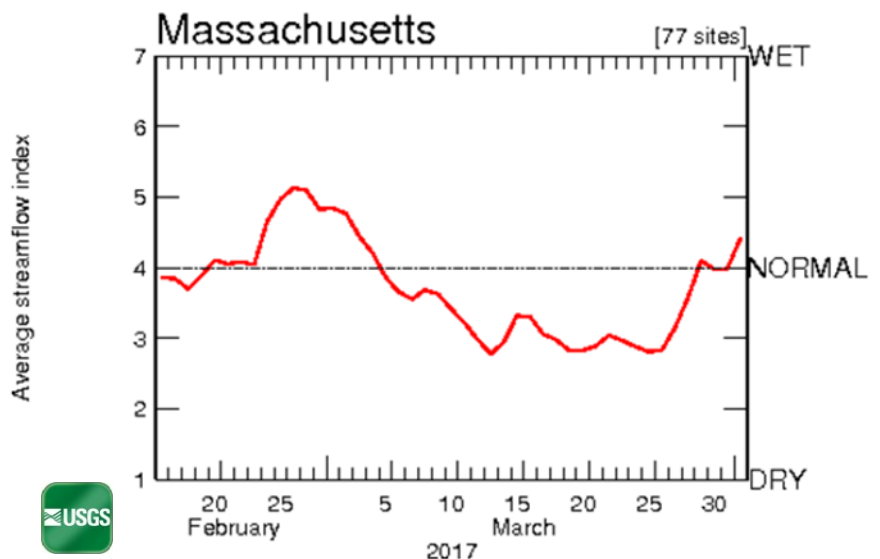


### Average Daily Streamflow Compared to Historical for the Day of the Year

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

[http://waterwatch.usgs.gov/index.php?id=real&sid=w\\_\\_plot&r=ma](http://waterwatch.usgs.gov/index.php?id=real&sid=w__plot&r=ma)

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

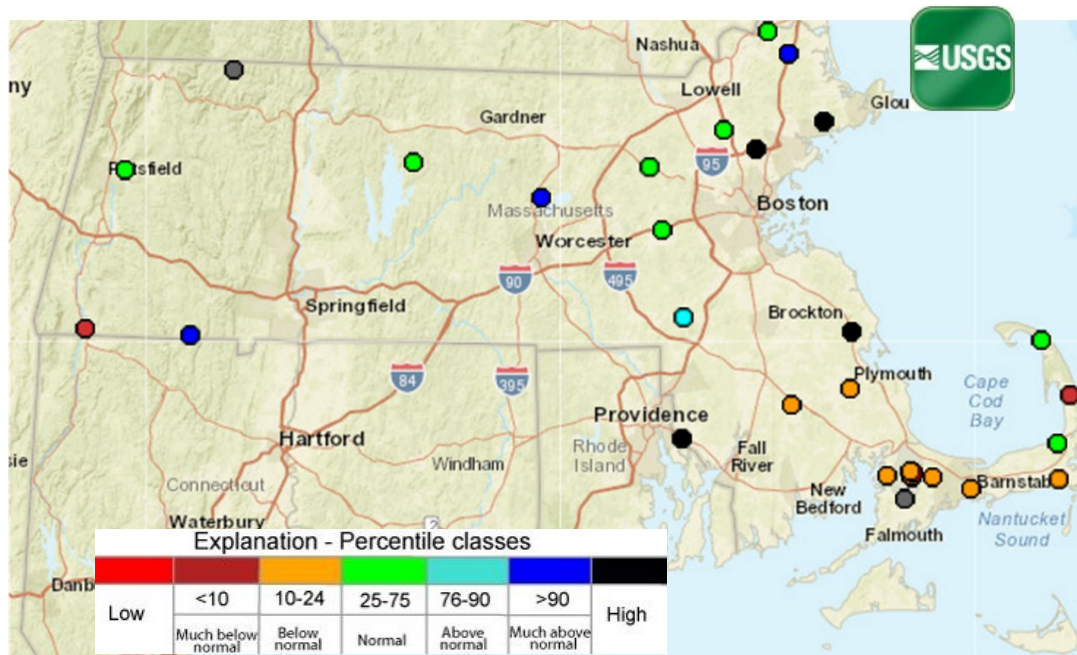


## GROUNDWATER

Region	Number of wells				MA Drought Plan Index (# consecutive months majority below 25 <sup>th</sup> percentile)
	Total Reporting	<25th to 10th percentile	<10th percentile to above record low	Record low	
Western	5	0	1*	0	0/Normal
CT River Valley	10	1	1	1	0/Normal
Central	10	4	0	0	0/Normal
Northeast	16	1	1	1	0/Normal
Southeast	11	5	3	0	1/Normal
Cape and Islands	12	6	1	0	1/Normal

Notes: Well counts are non-cumulative except for “total reporting”. Not all data are available in time for reporting. \*Well is recovering but not fast enough relative to past years.

### Groundwater Conditions in the Real-Time Network at Beginning of April 2017



## RESERVOIRS

Region	Number of Reservoirs Reporting	Reservoir Levels	MA Drought Management Plan Reservoir Index
Western	2	Normal	Normal
CT River Valley	2	Near Normal	Warning <sup>1</sup>
Central	3	Below (Worcester)	Watch
Northeast	6	Below (Cambridge)	Watch
Southeast	3	Below (Milford)	Watch
Cape Cod & Islands	1	Below	Advisory

<sup>1</sup> Quabbin reservoir is below normal. This is a large reservoir which jumps the index to warning. However, the other monitored reservoir in the CT River Valley region has returned to and remains normal. It is a medium reservoir system.

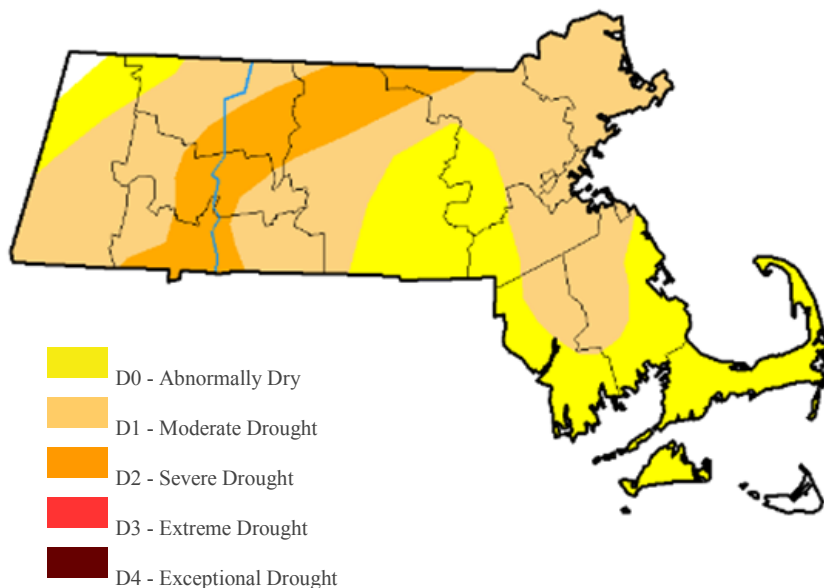
# DROUGHT CONDITIONS AND FORECASTS BY NOAA AND PARTNERS

## U.S. Drought Monitor: Drought Conditions as of March 28, 2017

**Summary:** Massachusetts has 99 percent of its area in a drought with only 15 percent remaining in a severe drought.

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>



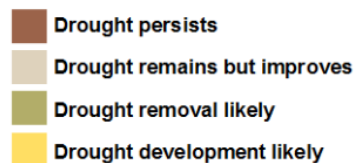
### NOAA: Monthly and Seasonal Temperature and Precipitation Outlook

The Climate Prediction Center one-month outlook for April indicates slight chance of above normal temperatures and likely normal precipitation for Massachusetts (i.e., equal chances for below normal, normal and above normal; <http://www.cpc.noaa.gov/products/predictions/30day/>).

The Center's three-month outlook (April through June) shows a 50 percent probability of above normal temperatures and likely normal precipitation (i.e., equal chances for below normal, normal and above normal; [http://www.cpc.noaa.gov/products/predictions/long\\_range/seasonal.php?lead=1](http://www.cpc.noaa.gov/products/predictions/long_range/seasonal.php?lead=1))

### NOAA: Monthly and Seasonal Drought Outlook

The April and three-month projections show drought improvement and removal across the state.  
<http://www.cpc.ncep.noaa.gov/products/Drought/>



April 2017

March 16 - June 30, 2017



**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

<http://www.mass.gov/eea/agencies/dcr/water-res-protection/water-data-tracking/rainfall-program.html>

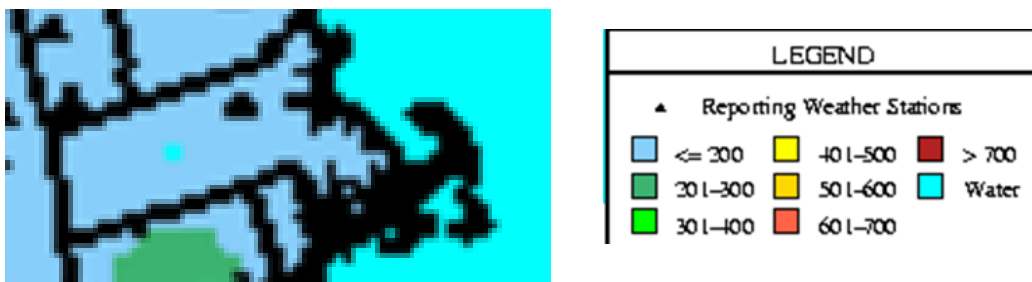
This report was prepared by the Massachusetts Department of Conservation and Recreation. Data may be preliminary in nature. Additional information, previous hydrological conditions reports, and drought management information can be found on our web site:

<http://www.mass.gov/eea/agencies/dcr/water-res-protection/water-data-tracking/>

## Appendix I: Additional Information

### Keetch-Byram Drought Index by DCR Forest Fire Control Districts

The fire index was below 300 in all drought regions which indicates “normal” conditions according to the Massachusetts Drought Management Plan.



### Crop Moisture Index for the Week Ending April 1, 2016

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](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 25<sup>th</sup> 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>).