

January 2017 Hydrologic Conditions in Massachusetts

SUMMARY OF CONDITIONS

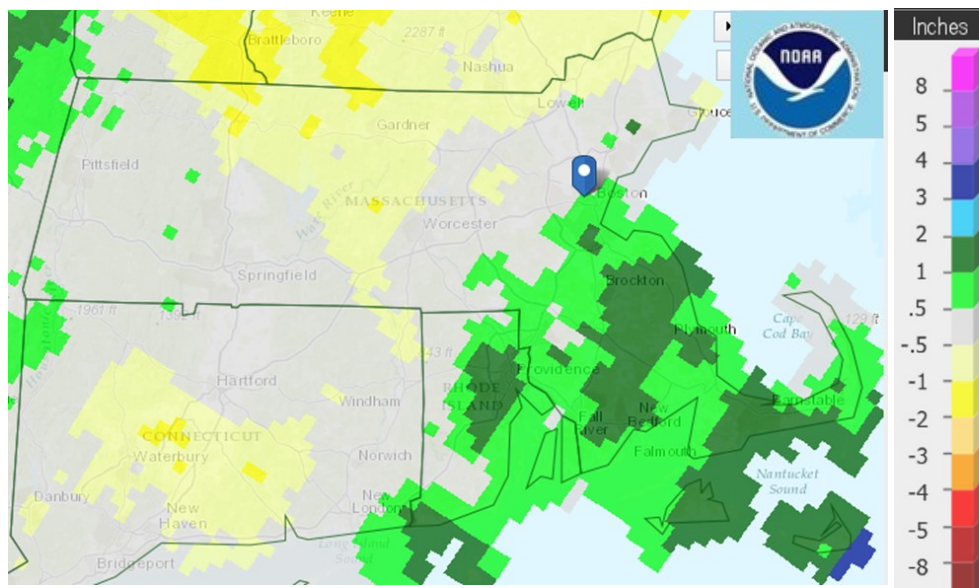
- Precipitation was normal or near normal.
- Average monthly streamflows have improved to normal or near normal in all regions.
- Groundwater levels continue to recover with the Connecticut River Valley, Southeast and Cape & Islands slightly lagging in improvements.
- Reservoir levels are recovering. Impacts are still seen in the Connecticut River Valley, Central and Southeast regions.
- NOAA projects normal precipitation and temperatures for February.
- Drought effects continue to show in all regions. 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 January (inches)	MA Drought Plan Levels	
			Standardized Precipitation Index (SPI)	Percent of Normal Index
Western	3.71	0.61	Normal	Normal
CT River Valley	3.08	-0.33	Advisory (12 mo)	Normal
Central	3.44	-0.32	Advisory (12 mo)	Normal
Northeast	4.21	0.64	Advisory (12 mo)	Normal
Southeast	5.30	1.40	Normal	Normal
Cape Cod & Islands	6.26	2.39	Normal	Normal

January 2017 Precipitation Departure from Normal

Map from the National Weather Service (NWS) Advanced Hydrologic Prediction Center (<http://water.weather.gov/precip/>)
 The map is generated based on radar data correlated to NWS rainfall gauge reports



STREAMFLOW

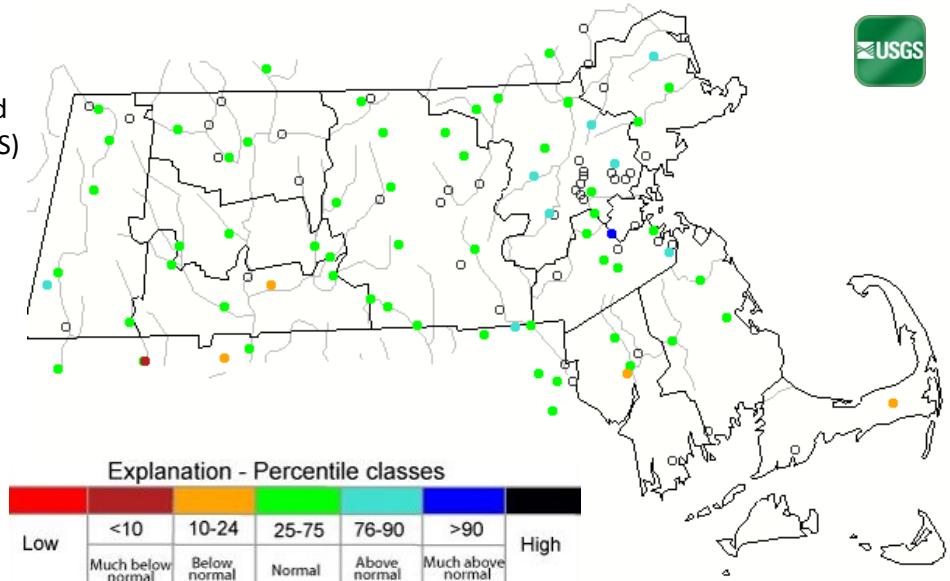
Region	Number of Gages			MA Drought Plan Index (# consecutive months majority below 25th percentile)	
	Total Reporting	Below 25th percentile	Below 10th percentile		At Record Low
Western	6	0	0	0	
CT River Valley	11	1	0	0	
Central	16	0	0	0	
Northeast	19	0	0	0	
Southeast	6	1	0	0	6 of 7

Notes: Not all gages report in all months potentially due to ice, beaver dams or other conditions.
Streamflow conditions for individual streamflow-gaging stations may differ from general conditions.

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>

Some gages in the Northwest are not reporting due to ice conditions.

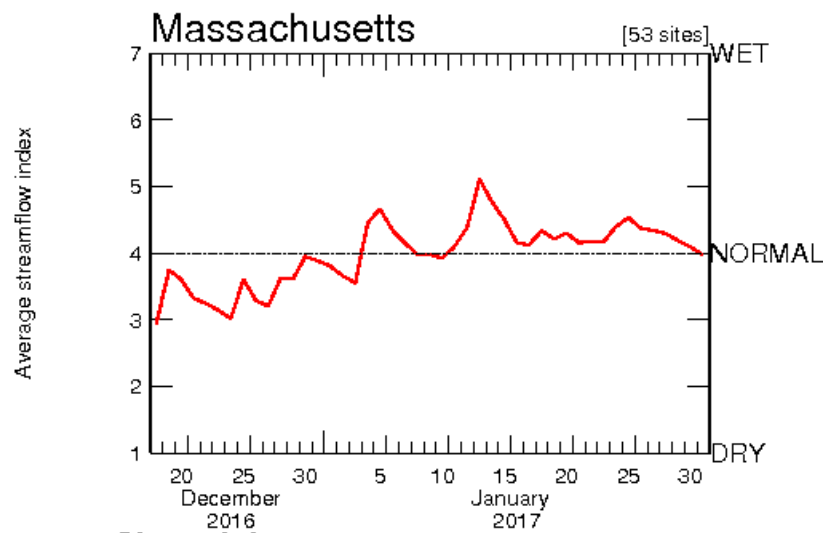


Average Daily Streamflow Compared to Historical for the Day of the Year

This plot depicts data for the 45-day period ending January 31. 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



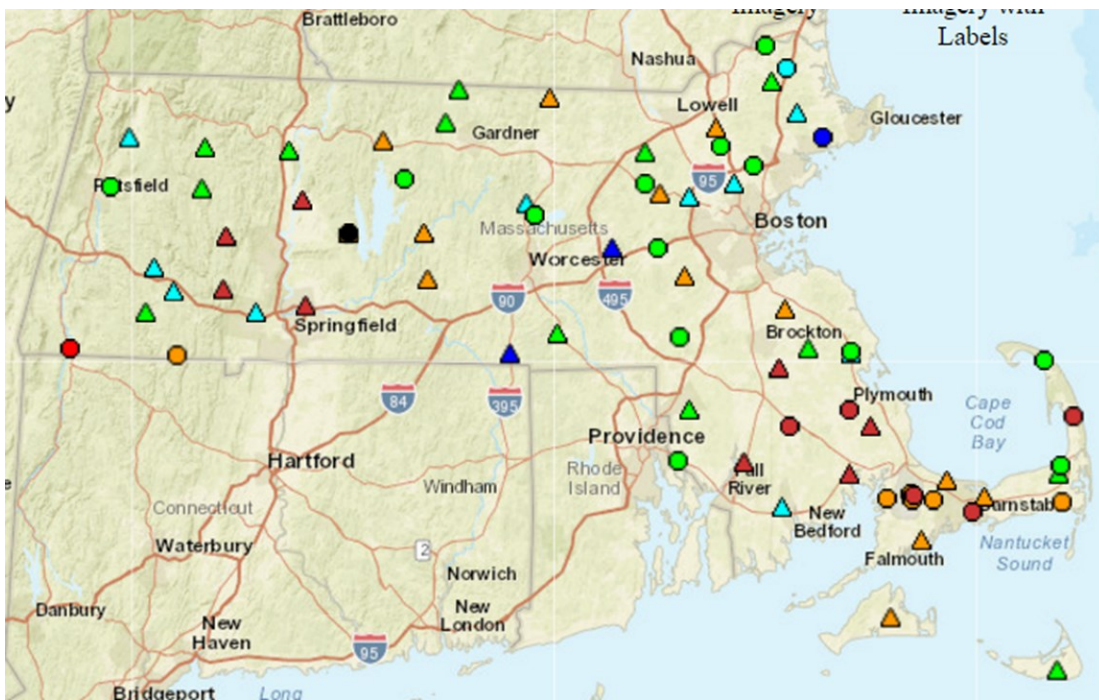
GROUNDWATER

Region	Number of wells*				MA Drought Plan Index (# consecutive months majority below 25 th percentile)
	Total Reporting	10-25 th percentile	Below 10 th percentile	At Record Low	
Western	5	0	0	1	0
CT River Valley	11	1	2	2	0
Central	10	3	0	0	0
Northeast	17	4	0	0	0
Southeast	12	0	5	1	0
Cape and Islands	12	7	1	0	2

Notes: *Number of wells are non-cumulative counts except for "total reporting".

Groundwater Conditions in the Climate Response Network ending January 2017

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



RESERVOIRS

Region	Number of Reservoirs Reporting	Reservoir Levels	MA Drought Management Plan Reservoir Index
Western	2	Normal	Normal
CT River Valley	2	Below	Warning*/Watch
Central	3	Below	Advisory
Northeast	7	Normal	Normal
Southeast	4	Below**	Watch
Cape Cod & Islands	1	Normal	Normal

*Quabbin reservoir is slightly below normal. This is a large reservoir which jumps the index to warning. The other monitored reservoir in the CT River Valley region is below normal and a medium reservoir; therefore, it indicates a watch drought level.

** One medium reservoir is at 2 standard deviations below normal.

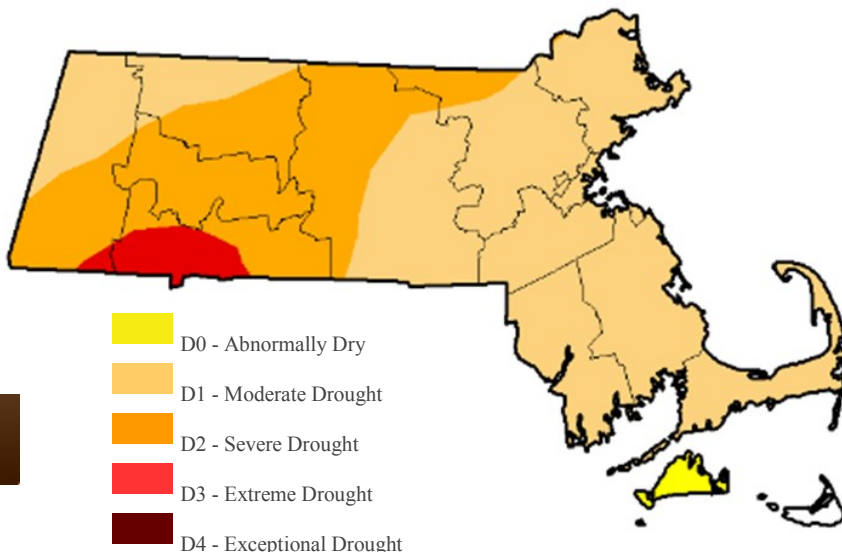
DROUGHT CONDITIONS AND FORECASTS BY NOAA AND PARTNERS

U.S. Drought Monitor: Drought Conditions as of January 31, 2017

Summary: Massachusetts has 99 percent of its area in a drought with 37 percent remaining in a severe or extreme 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>



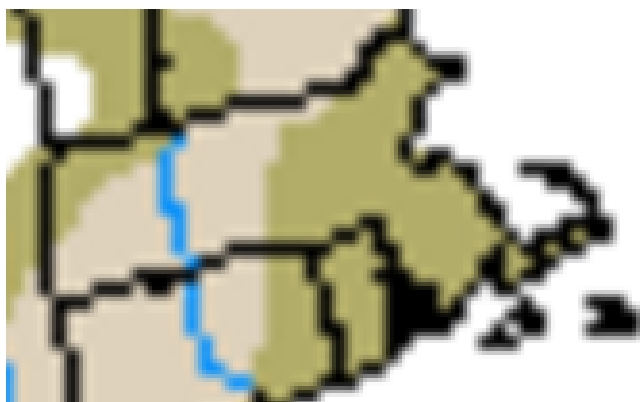
NOAA: Monthly and Seasonal Drought Outlook

The February projection shows drought removal in the northwest and eastern parts of the state. Drought improvement is projected for central and southwestern Massachusetts. The three-month outlook suggests a similar pattern except for the Northeast where rather than drought removal, the drought may improve but remain.

http://www.cpc.ncep.noaa.gov/products/expert_assessment/mdo_summary.php

February 2017

December 15, 2016 - March 31, 2017



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



DROUGHT CONDITIONS AND FORECASTS BY NOAA AND PARTNERS, continued

NOAA: Monthly and Seasonal Temperature and Precipitation Outlook

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

The Center’s three-month outlook (February through April) shows a 33-40 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)

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:

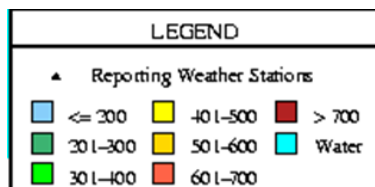
<http://www.mass.gov/eea/agencies/dcr/water-res-protection/water-data-tracking/>

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.

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



Crop Moisture Index for the Week Ending January 28, 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

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>).