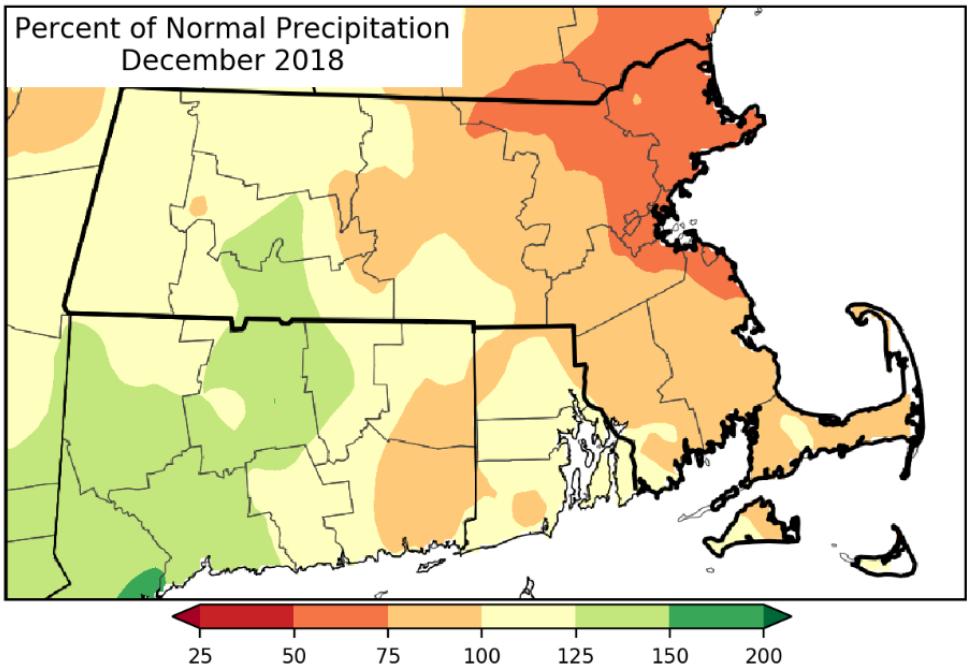
MASSACHUSETTS WATER RESOURCES COMMISSION

December 2018 Hydrologic Conditions in Massachusetts

SUMMARY OF CONDITIONS

- Temperatures were 2-3 degrees higher than average December values.
- Both Precipitation Indices are Normal for all regions.
- Streamflow, Groundwater, and Reservoir Indices are Normal for all regions with continued high values.
- Crop Moisture Index indicates wet conditions. Data for the Fire Index are not collected during the winter.
- NOAA's forecast for January projects a 33-40% probability of below normal temperatures and equal chances for below normal, normal, or above normal precipitation.
- Appendix I presents indices not shown in the main report and additional details about precipitation. Appendix II presents the drought level thresholds for all indices.

PRECIPITATION



For the first time since mid-July, precipitation fell less than half the days of the month and totaled at near average for most of the State.

Map from the Northeast Regional Climate Center. http://www.nrcc.cornell.edu/regional/monthly/monthly.html

Region	Estimated Rainfall (inches)	Departure from Average Dec. (inches)	MA Drought Plan Levels	
			Standardized Precipitation Index (SPI)	Percent of Normal Index
Western	3.48	0.08	Normal	Normal
CT River Valley	4.87	1.15	Normal	Normal
Central	4.33	0.46	Normal	Normal
Northeast	3.26	-0.45	Normal	Normal
Southeast	3.79	-0.25	Normal	Normal
Cape Cod & Islands	3.78	-0.37	Normal	Normal

Key to Drought Plan Levels
Normal
Advisory
Watch
Warning
Emergency

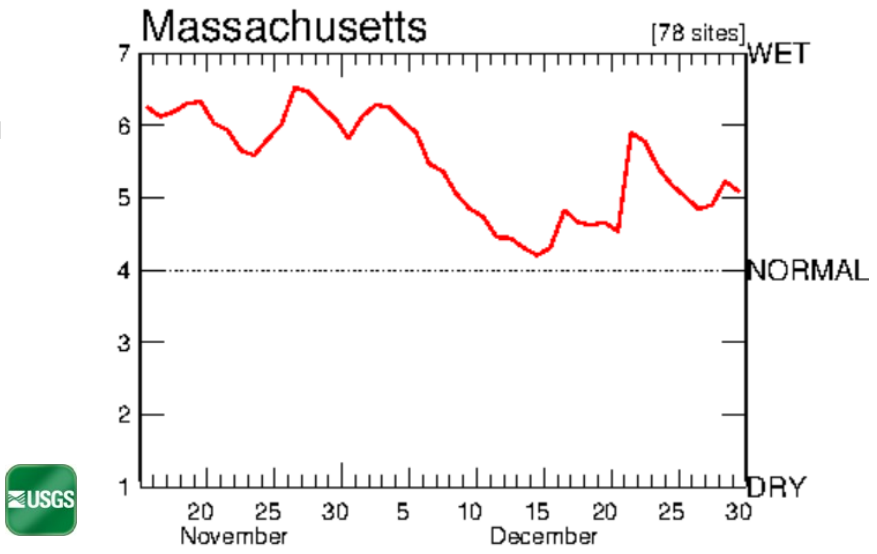
STREAMFLOW

The vast majority of gages recorded above average flows relative to historical data for the fifth month in a row. 29 of 56 gages remain at greater than 90th percentile flow.

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

This plot depicts data for the 45-day period ending December 30.
http://waterwatch.usgs.gov/index.php?id=real&sid=w__plot&r=ma

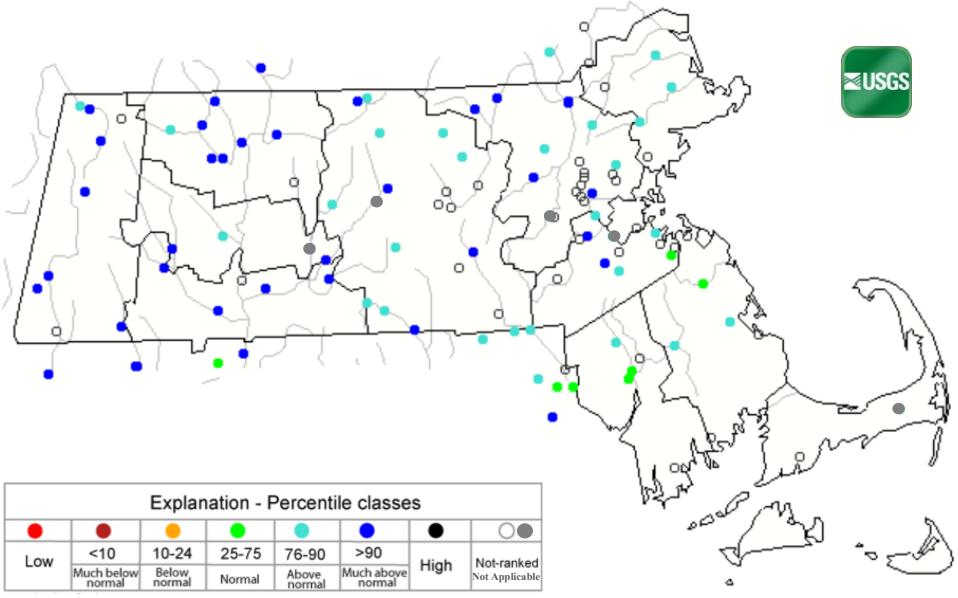
KEY:
1 = New record low for day
2 = < 10th percentile
3 = 10th – 24th percentile
4 = 25th – 74th percentile
5 = 75th – 89th percentile
6 = > 90th percentile
7 = New record high for day



Average December 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



Region	Number of Gages				>90th percentile flow	MA Drought Plan Index/# of consecutive months majority below 25th percentile
	Total Reporting for December	<25th to 10th percentile	<10th percentile to above record low	Record low		
Western	7	0	0	0	**6**	Normal/0
CT River Valley	14	0	0	0	**12**	Normal/0
Central	11	0	0	0	**3**	Normal/0
Northeast	18	0	0	0	**8**	Normal/0
Southeast	6	0	0	0	0	Normal/0

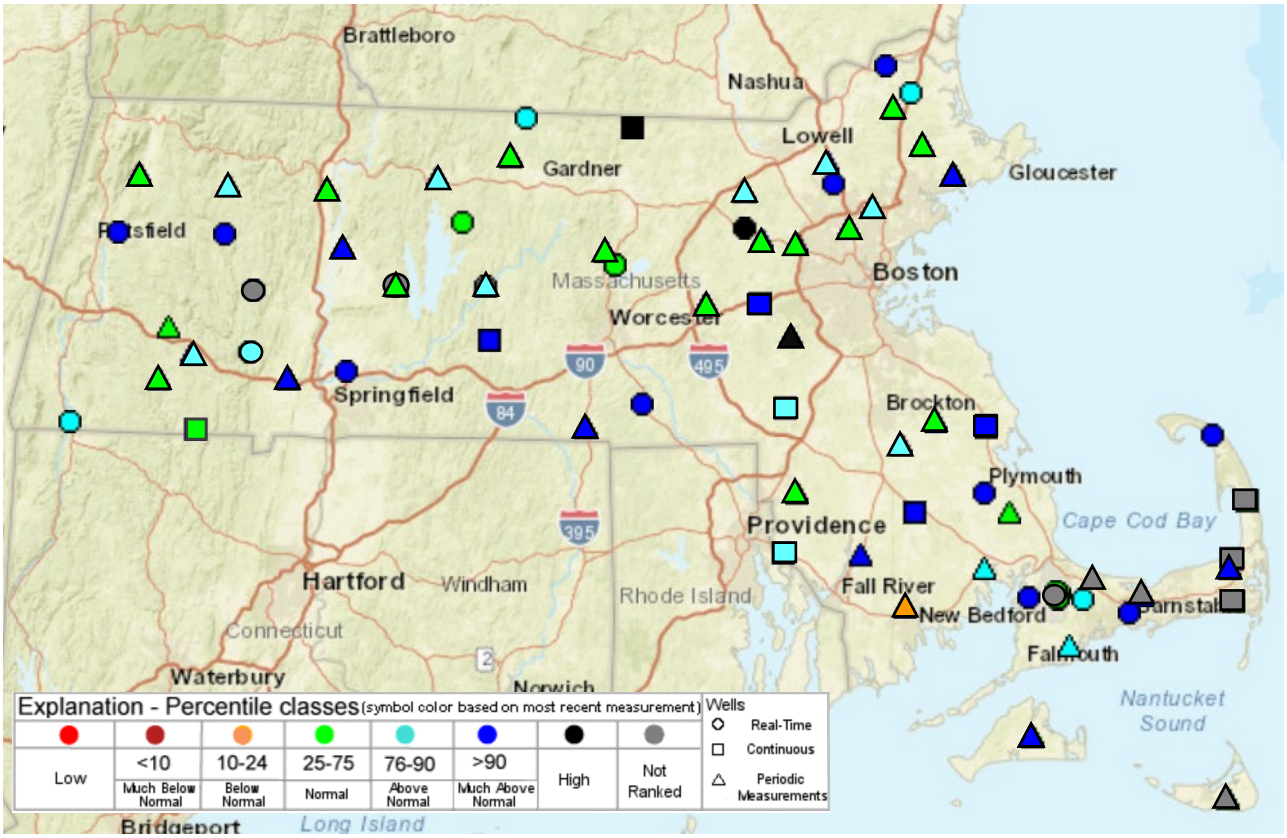
Notes: Gage counts are non-cumulative except for "total reporting". Not all gages report in all months due to ice, beaver dams or other conditions. Streamflow index is not applicable to Cape Cod and the Islands.

GROUNDWATER

Numerous wells continue to show high groundwater levels relative to average December conditions. 21 of 61 wells are higher than their 90th percentile level with 3 record highs. One gage in the Southeast is slightly below the 25th percentile.

Groundwater Conditions in the Climate Response Network at the End of December

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



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	> 90th percentile	
Western	5	0	0	0	**1**	Normal/0
CT River Valley	11	0	0	0	**4**	Normal/0
Central	10	0	0	0	**3**	Normal/0
Northeast	16	0	0	0	**4**	Normal/0
Southeast	12	1	0	0	**4**	Normal/0
Cape and Islands	7	0	0	0	**5**	Normal/0

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

RESERVOIRS

At the end of December, most reporting reservoirs were significantly above normal, with some reservoirs spilling.

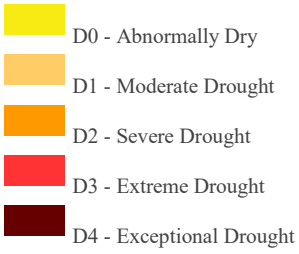
Region	Total Reporting for December	Reservoir Levels	MA Drought Management Plan Reservoir Index
Western	2	Normal	Normal
CT River Valley	2	Normal	Normal
Central	3	Normal	Normal
Northeast	7	Normal	Normal
Southeast	3	Normal	Normal
Cape Cod & Islands	1	Normal	Normal

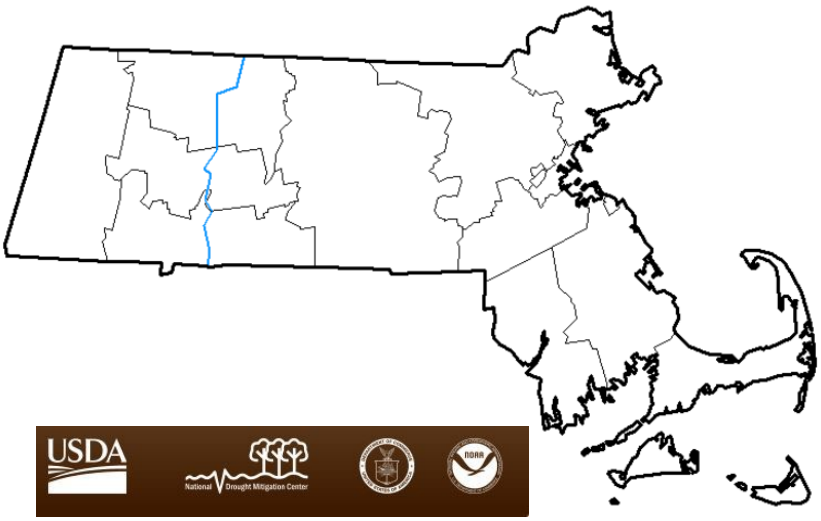
DROUGHT CONDITIONS AND FORECASTS BY NOAA AND PARTNERS

U.S. Drought Monitor: Drought Conditions as of December 25, 2018

Summary: The USDM map shows all regions as normal.

USDM maps are produced by the National Drought Mitigation Center (NDMC). For methods and weekly updates see: http://droughtmonitor.unl.edu





NOAA Climate Prediction Center: Temperature and Precipitation Outlook

January: The outlook projects 33-40% probability of below normal temperatures and equal chances for below normal, normal, or above normal precipitation across the State.

January through March: The outlook projects equal chances for below normal, normal, or above normal temperatures and precipitation.

http://www.cpc.ncep.noaa.gov/products/predictions

DROUGHT CONDITIONS AND FORECASTS BY NOAA AND PARTNERS, cont.

NOAA Climate Predication Center: Monthly and Seasonal Drought Outlook

The outlooks do not project drought conditions.

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

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

Valid for January 2018

Valid December 20, 2018 - March 31, 2019

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

Data for the Fire Index are not collected during the winter.

Crop Moisture Index

The CMI map for the week of December 29, 2018 shows abnormally moist to wet conditions.

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

Appendix I: Additional Information, continued

Percent of Average Historical Precipitation for December 2018

December-18	Normal	Actual	Percent Normal	Excess/ Deficit	Excess or Deficit Since Last--------- 10/1/2018	2 Months	% Norm	3 Months	% Norm	6 Months	% Norm	12 Months	% Norm
State	3.82	3.98	104	0.16	7.05	5.44	170	7.05	161	14.37	163	18.00	140
Western	3.40	3.48	102	0.08	5.57	4.19	160	5.57	152	16.14	170	21.28	148
Connecticut River	3.72	4.87	131	1.15	6.94	6.10	181	6.94	161	19.42	182	21.27	147
Central	3.87	4.33	112	0.46	6.24	5.39	168	6.24	153	16.61	171	18.28	140
Northeast	3.71	3.26	88	-0.45	6.56	5.61	174	6.56	158	12.14	156	15.18	135
Southeast	4.04	3.79	94	-0.25	8.88	5.66	170	8.88	174	13.31	158	18.30	140
Cape Cod and Islands	4.15	3.78	91	-0.37	7.69	4.64	155	7.69	162	4.61	120	12.78	128

Note: Precipitation values are total rainfall and melted snow in inches.
Values are estimated pending receipt of additional data and final calculations.

Standardized Precipitation Index for December 2018

REGION	3-Month SPI	6-Month SPI	12-Month SPI
Western Region	1.59	2.71	2.84
Connecticut River Region	1.77	3.09	2.71
Central Region	1.60	2.72	2.37
Northeast Region	1.71	2.22	2.05
Southeast Region	2.09	2.27	2.25
Cape & Islands	1.95	0.95	1.78

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).