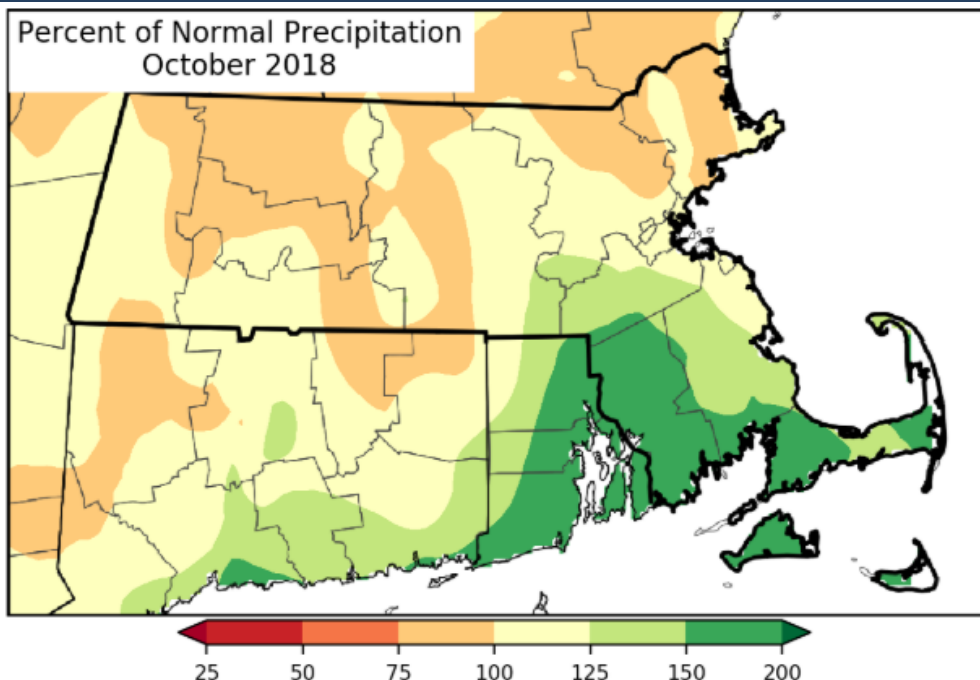


October 2018 Hydrologic Conditions in Massachusetts

SUMMARY OF CONDITIONS

- Average monthly temperature was within a half degree of average over all recorded Octobers.
- Both Precipitation Indices are Normal for all regions. A Nor'easter on the 27th and 28th caused minor flooding on the 29th.
- Streamflow, Groundwater, and Reservoir Indices are Normal for all regions with many significantly above average.
- The Fire Index and the Crop Moisture Index were not available but given the unusually wet conditions both are estimated to be Normal.
- NOAA's forecast for November projects equal chances for below normal, normal, or above normal temperatures and slight chance (33-40 percent probability) of below normal precipitation across the State.
- 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



October precipitation was within an inch of average across the State except in the Southeast and the Cape and Islands where significantly more rain fell.

State stations recorded slightly more rain than NWS stations causing a discrepancy between the map and the tables shown here.

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

Region	Estimated Rainfall (inches)	Departure from Average Oct. (inches)	MA Drought Plan Levels	
			Standardized Precipitation Index (SPI)	Percent of Normal Index
Western	4.37	0.77	Normal	Normal
CT River Valley	4.69	0.85	Normal	Normal
Central	4.65	0.70	Normal	Normal
Northeast	4.45	0.82	Normal	Normal
Southeast	6.92	3.11	Normal	Normal
Cape Cod & Islands	6.94	3.05	Normal	Normal

Key to Drought Plan Levels

Normal

Advisory

Watch

Warning

Emergency

STREAMFLOW

Streamflows were above normal for the entire month of October. 34 of 56 gages averaged 90th percentile or greater flows. All gages remained above normal, that is, above the 25th percentile flow for the second month in a row.

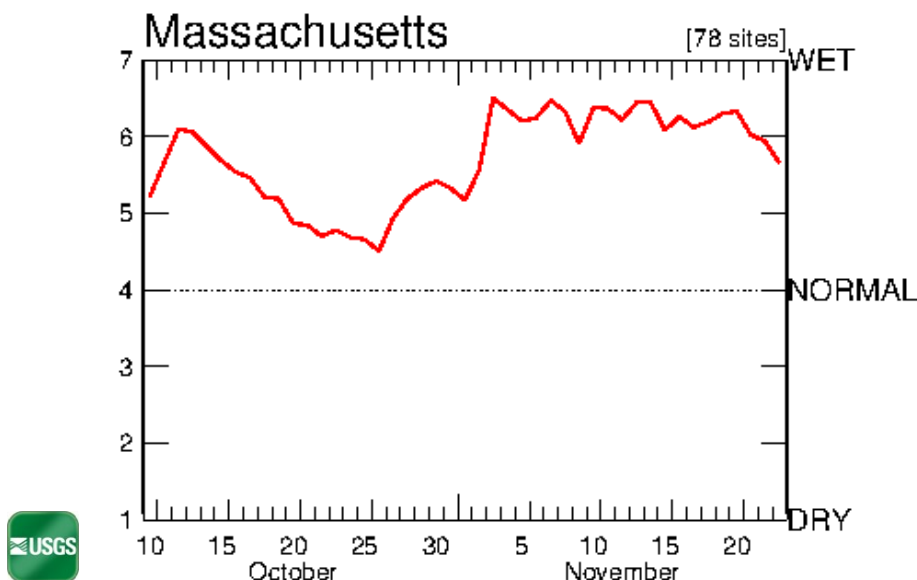
Average Daily Streamflow Compared to Historical for the Day of the Year

This plot depicts data for the 45-day period starting October 10.

<http://waterwatch.usgs.gov/index.php?>

KEY:

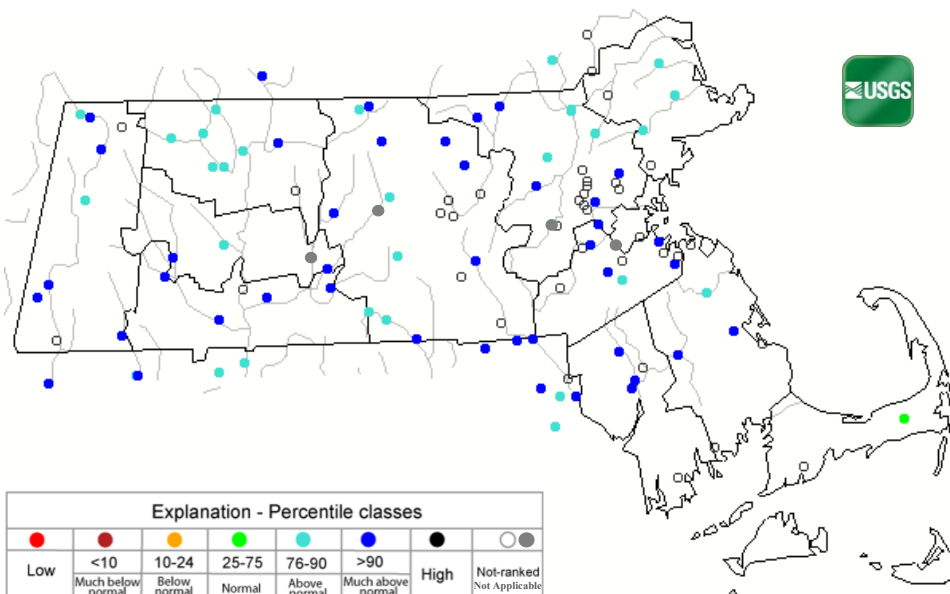
- 1 = New record low for day
- 2 = < 10th percentile
- 3 = 10th – 24th percentile
- 4 = 25th – 74th percentile
- 5 = 75th – 89th percentile
- 6 = > 90th percentile
- 7 = New record high for day



Average October 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 October	<25th to 10th percentile	<10th percentile to above record low	Record low		
Western	7	0	0	0	5	Normal/0
CT River Valley	14	0	0	0	7	Normal/0
Central	11	0	0	0	7	Normal/0
Northeast	18	0	0	0	10	Normal/0
Southeast	6	0	0	0	5	Normal/0

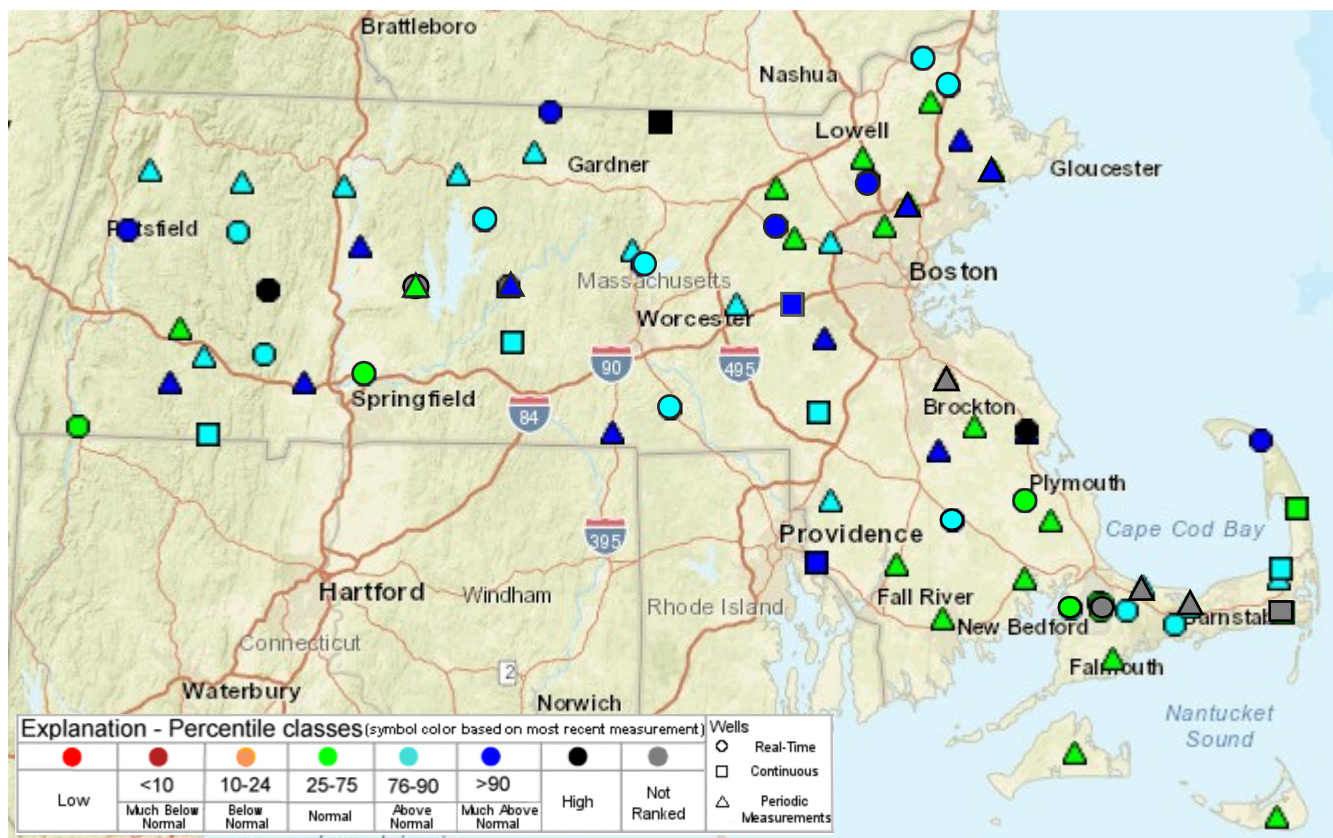
Notes: Gage counts are non-cumulative except for "total reporting". Not all gages report in all months due to ice, beaver dams or other conditions. Streamflow index is not applicable to Cape Cod and the Islands.

GROUNDWATER

The majority of wells continue to show high groundwater levels relative to average October conditions. 19 wells are at or higher than the 90th percentile water level with 3 record highs. Zero wells are below normal.

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

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



Region	Number of wells					MA Drought Plan Index /# consecutive months majority below 25 th percentile
	Total Reporting for October	<25th to 10th percentile	<10th percentile to above record low	Record low	> 90th percentile	
Western	5	0	0	0	2	Normal/0
CT River Valley	11	0	0	0	2	Normal/0
Central	10	0	0	0	4	Normal/0
Northeast	16	0	0	0	7	Normal/0
Southeast	12	0	0	0	3	Normal/0
Cape and Islands	10	0	0	0	1	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 October all reporting reservoirs were above the threshold of one-standard-deviation-below-average.

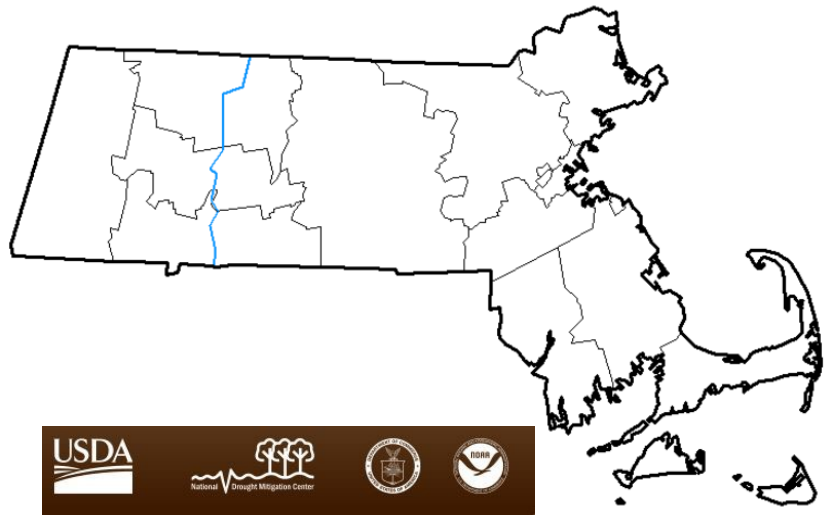
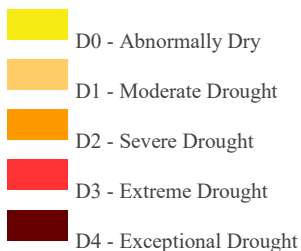
Region	Total Reporting for October	Reservoir Levels	MA Drought Management Plan Reservoir Index
Western	2	Normal	Normal
CT River Valley	2	Normal	Normal
Central	4	Normal	Normal
Northeast	6	Normal	Normal
Southeast	2	Normal	Normal
Cape Cod & Islands	1	Normal	Normal

DROUGHT CONDITIONS AND FORECASTS BY NOAA AND PARTNERS

U.S. Drought Monitor: Drought Conditions as of October 30, 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

November: The outlook projects equal chances for below normal, normal, or above normal temperatures and slight chance (33-40 percent probability) of below normal precipitation across the State.

November through January: 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 Prediction 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 November 2018

Valid November 15 2018 - February 28, 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

The Fire Index data was not available at the time of writing this report. Given the unusually wet conditions since early fall, normal conditions are estimated for all regions.

Crop Moisture Index

The CMI map for the end of October was not available at the time of writing this report. Given the unusually wet conditions since early fall, normal conditions are expected for all regions.

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 October 2018

October-18			Percent	Excess/ Deficit	-----Excess or Deficit Since Last-----								
	Normal	Actual			Normal	10/1/2018	2 Months	% Norm	3 Months	% Norm	6 Months	% Norm	12
State	3.80	5.27	139	1.47	1.47	5.31	170	7.62	166	7.70	134	9.13	120
Western	3.60	4.37	121	0.77	0.77	4.21	155	8.31	170	9.90	141	12.67	129
Connecticut River	3.84	4.69	122	0.85	0.85	5.43	170	9.37	178	12.35	151	10.97	124
Central	3.95	4.65	118	0.70	0.70	5.35	169	9.02	176	10.43	145	9.69	121
Northeast	3.63	4.45	123	0.82	0.82	4.07	157	5.61	153	4.97	124	5.93	114
Southeast	3.81	6.92	182	3.11	3.11	8.47	212	9.12	180	6.51	130	10.31	123
Cape Cod and Islands	3.89	6.94	178	3.05	3.05	2.34	130	1.04	109	-2.06	90	4.28	109

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 October 2018

REGION	3-Month SPI	6-Month SPI	12-Month SPI
Western Region	1.87	1.73	1.80
Connecticut River Region	2.02	2.03	1.51
Central Region	1.96	1.90	1.36
Northeast Region	1.46	1.05	0.86
Southeast Region	2.04	1.21	1.31
Cape & Islands	0.36	-0.33	0.65

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>).