MASSACHUSETTS WATER RESOURCES COMMISSION

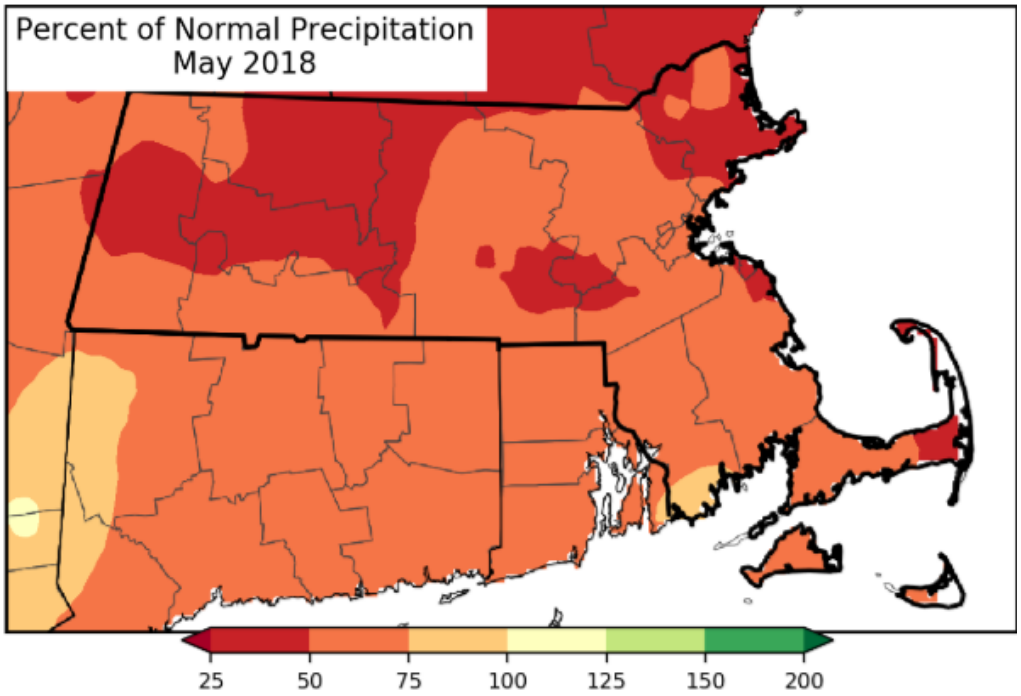
May 2018 Hydrologic Conditions in Massachusetts

SUMMARY OF CONDITIONS

- Although Precipitation, Streamflow, Groundwater, Reservoir and Crop Moisture Indices are Normal for all regions, precipitation deficits and unusually warm temperatures are quickly leading to dry conditions.
- Fire Danger Index is slightly elevated and at the Advisory level for all regions except the Cape & Islands.
- NOAA's forecast for June projects equal chances for below normal, normal or above normal temperatures and slight chance for above normal precipitation. The three-month outlook shows slight to moderate chances for above normal temperatures and precipitation.
- 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

All regions were below average for May precipitation with some areas significantly below normal. However, the Index considers 3 months or longer time periods and remains Normal for all regions. Additional precipitation data are in Appendix I.



Map from the Northeast Regional Climate Center's Monthly Maps.

http://www.nrcc.cornell.edu/regional/monthly/monthly.html

Region	Estimated Rainfall (inches)	Departure from Average May (inches)	MA Drought Plan Levels	
			Standardized Precipitation Index (SPI)	Percent of Normal Index
Western	2.76	-1.21	Normal	Normal
CT River Valley	1.87	-2.12	Normal	Normal
Central	2.05	-1.62	Normal	Normal
Northeast	1.94	-1.49	Normal	Normal
Southeast	2.12	-1.27	Normal	Normal
Cape Cod & Islands	2.10	-1.47	Normal	Normal

Key to Drought Levels
Normal
Advisory
Watch
Warning
Emergency

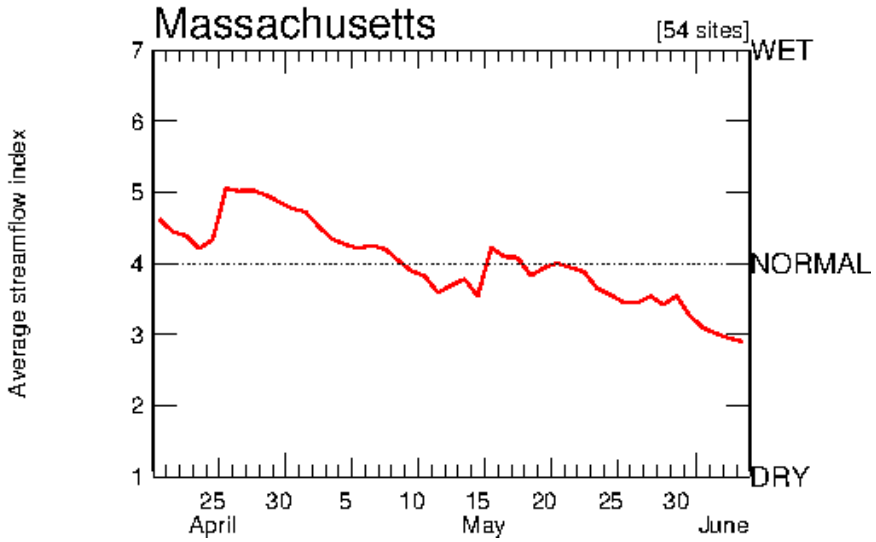
STREAMFLOW

In general, flows have been steadily declining since the end of April except for one storm event in mid-May. Flows remained normal in the eastern half of the State but the Central region and westward experienced some below normal flows. None of the regions had a majority of gages below normal. The index for all regions remains Normal.

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

This plot depicts data for the 45-day period ending June 4th.

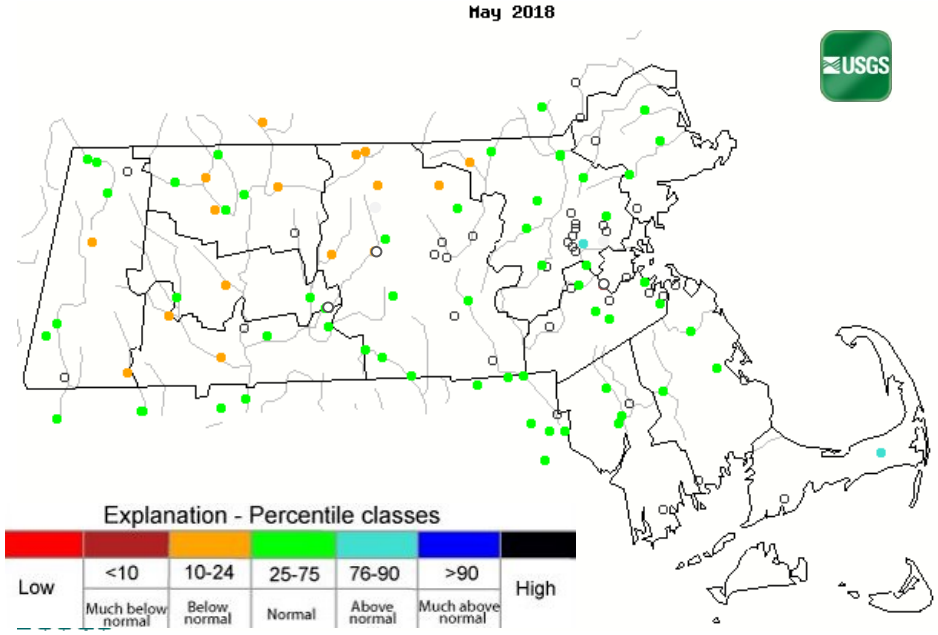
KEY:
1 = New record low for day
2 = < 10th percentile
3 = 10th – 24th percentile
4 = 25th – 74th percentile
5 = 75th – 89th percentile
6 = > 90th percentile



Average May 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 May	<25th to 10th percentile	<10th percentile to above record low	Record low		
Western	7	**2**	0	0	0	Normal/0
CT River Valley	14	**6**	0	0	0	Normal/0
Central	11	**5**	0	0	0	Normal/0
Northeast	18	**1**	0	0	0	Normal/0
Southeast	6	0	0	0	0	Normal/0

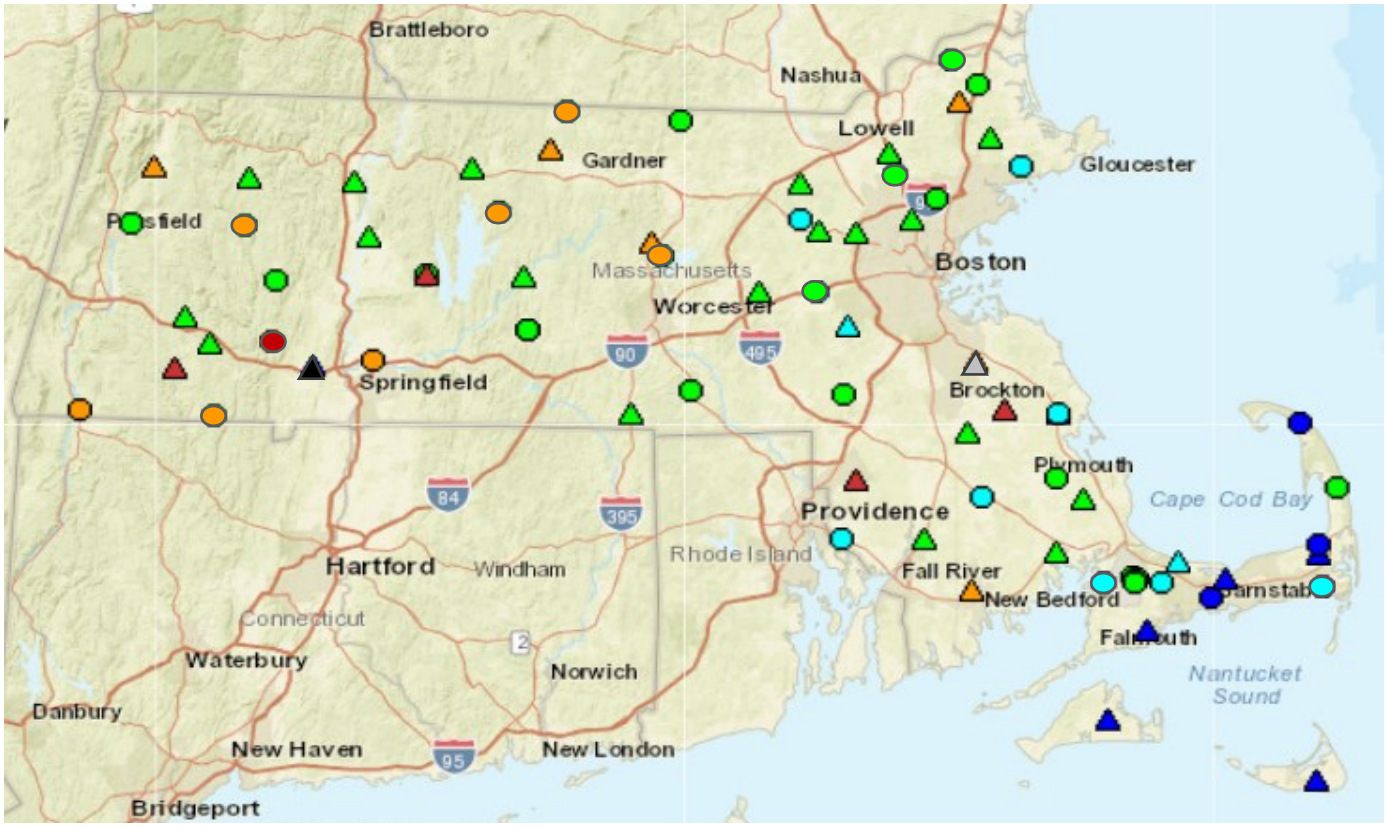
Notes: Gage counts are non-cumulative except for "total reporting". Not all gages report in all months due to ice, beaver dams or other conditions. Streamflow index is not applicable to Cape Cod and the Islands.

GROUNDWATER

Groundwater levels have also declined since April. However, relative to this time of year, the Cape and Islands remain elevated above normal. Northeast and Central have a mix of normal to below normal conditions. Southeast, Connecticut River Valley and Western regions have a scattered mix of groundwater levels from normal to less than the 10th percentile of normal. The Western Region has the majority of wells below normal but the Groundwater Index remains normal until three consecutive months are below normal. Therefore, the index for all regions remains Normal.

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

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 May	<25th to 10th percentile	<10th percentile to above record low	Record low	> 90th percentile	
Western	5	**2**	**1**	0	0	Normal/1
CT River Valley	11	**3**	**2**	0	**1**	Normal/0
Central	10	**5**	0	0	0	Normal/0
Northeast	16	**1**	0	0	0	Normal/0
Southeast	12	**1**	**2**	0	0	Normal/0
Cape and Islands	11	0	0	0	**6**	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 May, all reporting reservoirs were within one standard deviation of average May conditions. The Index is Normal for all regions.

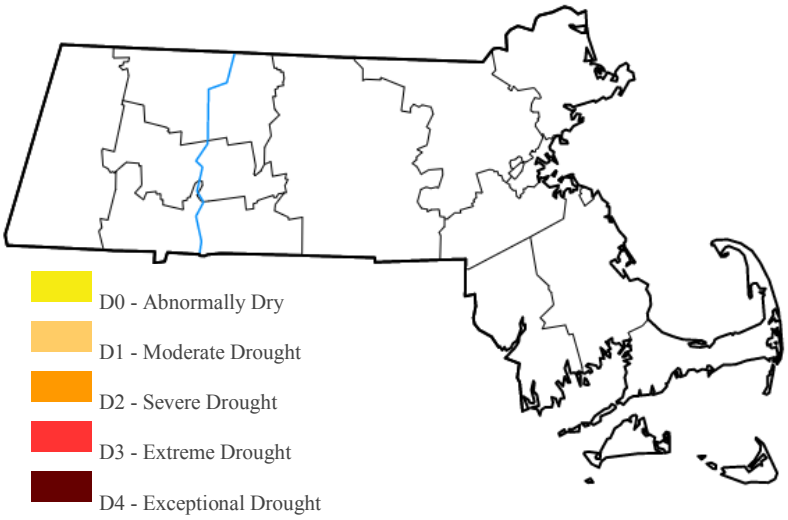
Region	Total Reporting for May	Reservoir Levels	MA Drought Management Plan Reservoir Index
Western	2	Normal	Normal
CT River Valley	2	Normal	Normal
Central	3	Normal	Normal
Northeast	8	Normal	Normal
Southeast	3	Normal	Normal
Cape Cod & Islands	1	Normal	Normal

DROUGHT CONDITIONS AND FORECASTS BY NOAA AND PARTNERS

U.S. Drought Monitor: Drought Conditions as of May 29, 2018

Summary: The USDM map does not show any dry or drought conditions in the state.

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 (CPC): Temperature and Precipitation Outlook

June: The outlook projects equal chances for below normal, normal or above normal temperatures and slight chance for above normal precipitation in Massachusetts.

June through August: The outlook projects 40 - 60 percent probability for above normal temperatures and 40-50 percent probability for above normal precipitation in Massachusetts.

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

DROUGHT CONDITIONS AND FORECASTS BY NOAA AND PARTNERS, cont.

NOAA CPC: Monthly and Seasonal Drought Outlook

Both the short and long term outlooks project normal conditions.
http://www.cpc.ncep.noaa.gov/products/Drought/

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

Valid for June 2018

Valid May 17 through August 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

DCR data as of June 11,2018 showed all regions but the Cape and Islands with slightly elevated fire danger. All regions but the Cape and Islands are at an Advisory level for this index.

Region	KBDI
West	203
CT River Valley	200, 203, 125, 202
Central	223,
Northeast	284, 261, 249
Southeast	87, 115, 220
Cape and Islands	40

Crop Moisture Index for the Week Ending June 2, 2018

At the beginning of June, the index is Normal 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 May 2018

May-18	Normal	Actual	Percent Normal	Excess/ Deficit	Excess or Deficit Since Last								
					10/1/2017	2 Months	% Norm	3 Months	% Norm	6 Months	% Norm	12 Months	% Norm
State	3.65	2.08	57	-1.57	3.10	-0.21	97	0.67	106	2.04	109	2.35	105
Western	3.97	2.76	70	-1.21	4.12	-0.57	92	-0.49	95	3.38	117	2.52	106
Connecticut River	3.99	1.87	47	-2.12	0.51	-0.92	88	-2.10	81	-0.64	97	-1.68	96
Central	3.67	2.05	56	-1.62	3.06	-0.32	96	-0.51	96	-0.01	100	2.00	104
Northeast	3.43	1.94	57	-1.49	1.81	0.47	107	1.79	116	1.56	107	1.27	103
Southeast	3.39	2.12	63	-1.27	3.83	0.46	106	2.82	124	4.24	118	2.44	105
Cape Cod & Islands	3.57	2.10	59	-1.47	8.39	-0.93	88	3.18	127	6.72	129	12.91	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 May 2018

REGION	3-Month SPI	6-Month SPI	12-Month SPI
Western Region	-0.07	0.91	0.42
Connecticut River Region	-0.65	-0.14	-0.23
Central Region	-0.08	0.05	0.33
Northeast Region	0.62	0.42	0.23
Southeast Region	0.86	0.95	0.38
Cape & Islands	1.01	1.48	1.81

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).