

September 2017 Hydrologic Conditions in Massachusetts

SUMMARY OF CONDITIONS

- Precipitation indices in all regions are Normal, except the Southeast where the 2-month Percent of Normal indicator is at Advisory level.
- Average monthly streamflows were mostly normal except in the Southeast where for the second month flows are below normal resulting in Advisory level for streamflow.
- Groundwater levels are below normal in parts of all regions except the Northeast and Cape & Islands. Some wells are at less than their 10th percentile value.
- Reservoirs are Normal.
- The US Drought Monitor as of October 3rd has increased the area of abnormally dry conditions to include not only the Southeast but most of the state except for the Cape & Islands.
- NOAA projects above normal temperatures and normal precipitation for the remainder of the year, making for continued dry conditions.

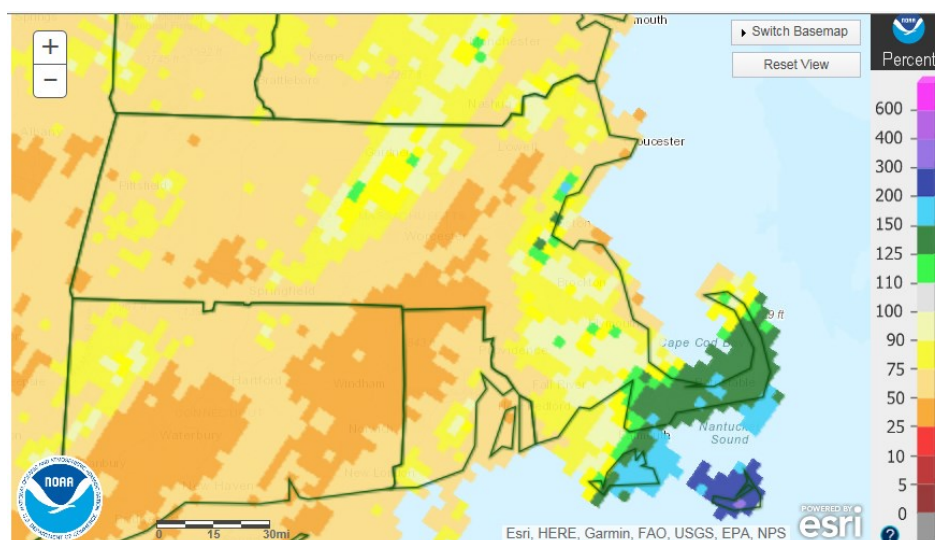
PRECIPITATION

This is the second month of below normal precipitation in most regions (except the Cape Cod and Islands); The Southeast is in Advisory for the 2-month Percent of Normal, and the Northeast and CT River Valley regions were close to the Advisory level. (see Appendix II for definition of normal).

Region	Estimated Rainfall (inches)	Departure from Average Sept.(inches)	MA Drought Plan Levels	
			Standardized Precipitation Index (SPI)	Percent of Normal Index
Western	2.64	-1.43	Normal	Normal
CT River Valley	2.60	-1.34	Normal	Normal
Central	3.00	-0.79	Normal	Normal
Northeast	3.72	0.25	Normal	Normal
Southeast	3.11	-0.61	Normal	Advisory
Cape Cod & Islands	6.35	2.55	Normal	Normal

September 2017 Precipitation, Percent of 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 for September	<25th to 10th percentile	<10th percentile to above record low	Record low	
Western	7	1	0	0	0/Normal
CT River Valley	14	1	0	0	0/Normal
Central	11	0	0	0	0/Normal
Northeast	18	5	0	0	0/Normal
Southeast	5	2	2	0	2/Advisory

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

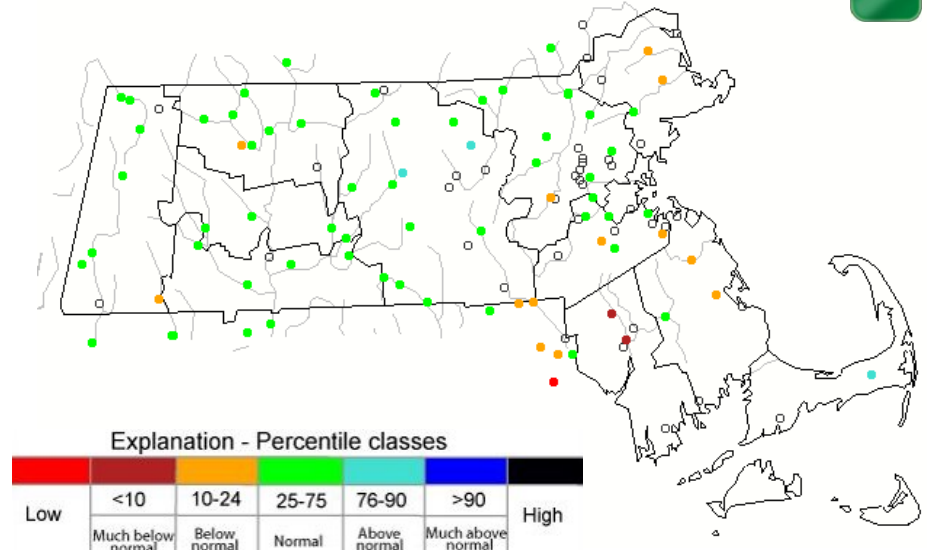
Average Monthly Streamflow Compared to Historical for the Month of the Year

September 2017



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

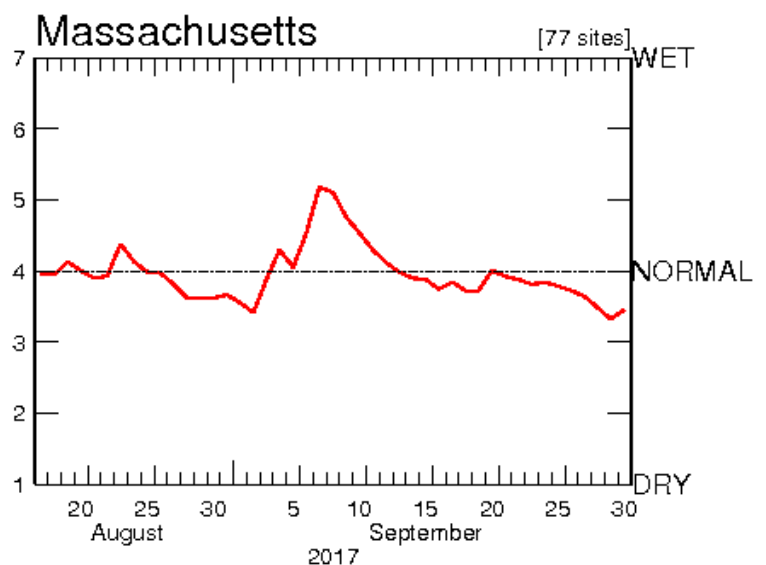
This plot depicts data for the 45-day period ending in early September.

<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 streamflow index



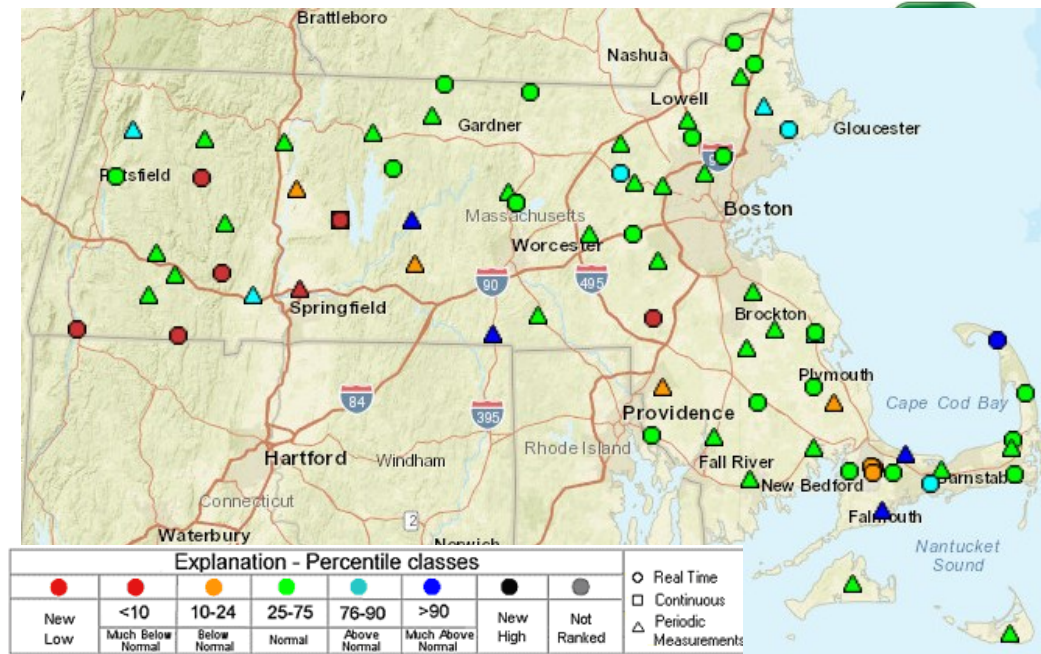
GROUNDWATER

Region	Number of wells				MA Drought Plan Index (# consecutive months majority below)
	Total Reporting for Sept.	<25th to 10th percentile	<10th percentile to above record low	Record low	
Western	5	0	1	0	0/Normal
CT River Valley	11	1	4	0	0/Normal
Central	9	1	0	0	0/Normal
Northeast	17	0	0	0	0/Normal
Southeast	12	5	0	0	0/Normal
Cape and Islands	9	0	0	0	0/Normal

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

Groundwater Conditions: end of September for monthly wells, beginning of October for real-time wells

https://ma.water.usgs.gov/water_statement/2017_08/index.html



RESERVOIRS

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

DROUGHT CONDITIONS AND FORECASTS BY NOAA AND PARTNERS

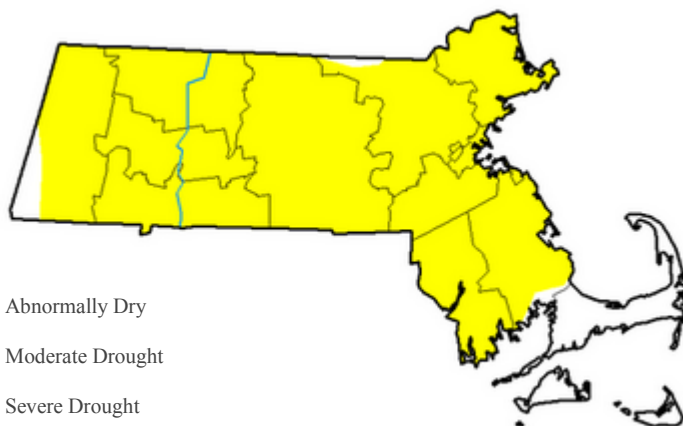
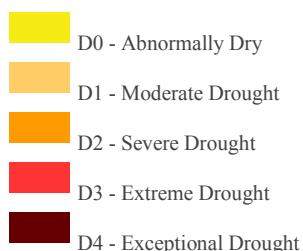
U.S. Drought Monitor: Drought Conditions as of October 3, 2017

Summary: The USDM has increased the area of abnormally dry conditions to include not only the Southeast but most of the state.

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>



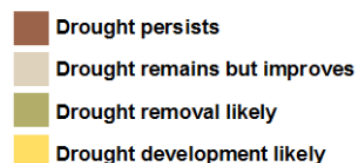
NOAA: Monthly and Seasonal Temperature and Precipitation Outlook

The Climate Prediction Center's outlook for October projects a 60 percent probability of above normal temperatures in Massachusetts. Precipitation has equal chances for below normal, normal and above normal occurrence (<http://www.cpc.noaa.gov/products/predictions/30day/>).

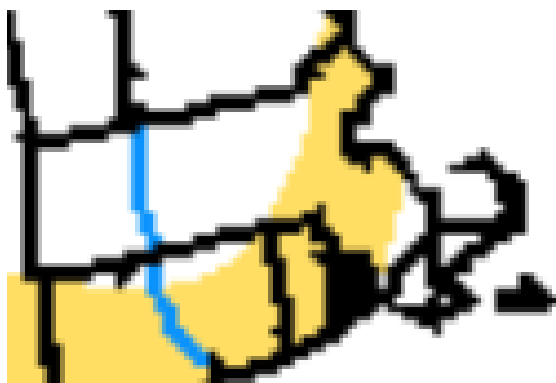
The Center's outlook for October through December projects a 40 percent probability of above normal temperatures and equal chances for below normal, normal and above normal precipitation (http://www.cpc.ncep.noaa.gov/products/predictions/long_range/seasonal.php?lead=1).

NOAA: Monthly and Seasonal Drought Outlook

The Outlook projects drought development in the Northeast and Southeast portions of the state. The three-month projection does not show drought conditions.



Valid for October 2017



Valid through December 31, 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

The fire index was not available as of the time of this report.

Crop Moisture Index for the Week Ending September 30, 2017

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>).