MASSACHUSETTS WATER RESOURCES COMMISSION

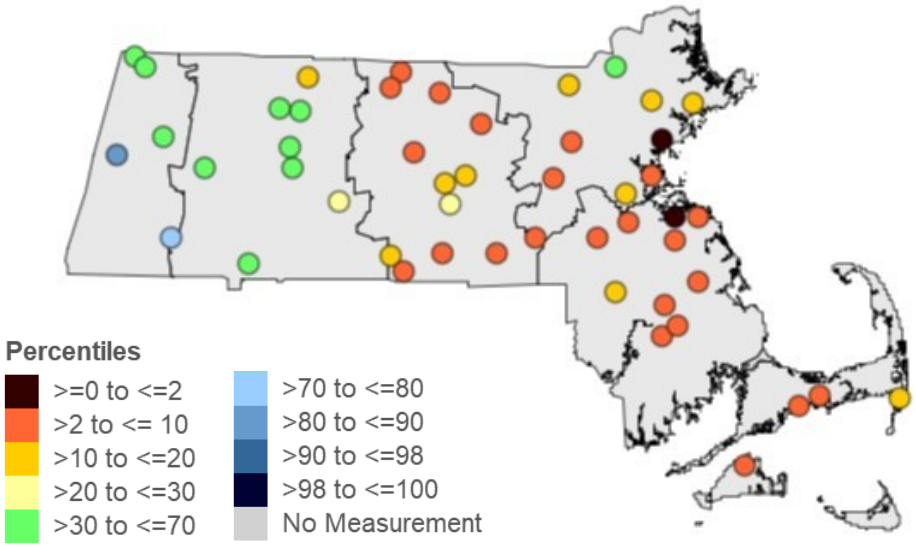
SEPTEMBER 2020 HYDROLOGIC CONDITIONS IN MASSACHUSETTS

The Commonwealth of Massachusetts
Charles D. Baker, Governor
Kathleen A. Theoharides, Secretary, Executive Office of Energy and Environmental Affairs

SEPTEMBER 2020 HYDROLOGIC CONDITIONS

- Monthly average temperatures were mostly within three degrees above normal for September.
- Precipitation was below normal in the Central, Southeast, Northeast, Cape Cod, and Islands Regions.
- Monthly median streamflow continued to be low in September. The Southeast Region is at Index Severity Level 3 and the rest of the Regions are at Level 2.
- Groundwater levels varied across the state. Overall, monthly medians continued to be low except for Cape Cod and the Islands.
- The NOAA Climate Prediction Center outlook for October shows the state split between equal chances for below-normal, normal, or above-normal and 33%-40% chances of below normal precipitation; and shows above normal temperature for the entire state.
- Appendices I and II provide additional precipitation data and information on the Massachusetts Drought Management Plan (DMP).

PRECIPITATION



Precipitation was uneven across MA for the month of September. The Western and CT River Valley Regions did not trip the 1-month SPI and received more rainfall than the eastern part of the state. The Cape and Islands received much below average rainfall and the 1-mo SPI tripped at Index Severity Level 3 for both Regions. The Central, Northeast, & Southeast Regions are at Index Severity Level 2 for the 1-mo SPI. Longer-term look-back periods tripped for all Regions.

Index Severity Level
1
2
3
4

REGION	NUMBER OF SITES REPORTING FOR SEPT	ACTUAL MONTHLY AVERAGE (IN)	DEPARTURE FROM HISTORICAL (IN)	DMP SPI * 1-MONTH	DMP SPI 2-MONTH	DMP SPI 3-MONTH
WESTERN	5	4.14	-0.14	0.03	-0.10	-0.07
CT RIVER VALLEY	8	2.93	-1.13	-0.22	-0.52	-0.55
CENTRAL	13	1.59	-2.29	-1.18	-0.98	-1.05
NORTHEAST	9	1.65	-1.82	-0.88	-1.15	-1.24
SOUTHEAST	10	1.26	-2.59	-1.23	-1.12	-1.39
CAPE COD	3	1.38	-2.45	-1.48	-1.68	-2.59
ISLANDS	1	1.13	-2.70	-1.34	-1.59	-1.94

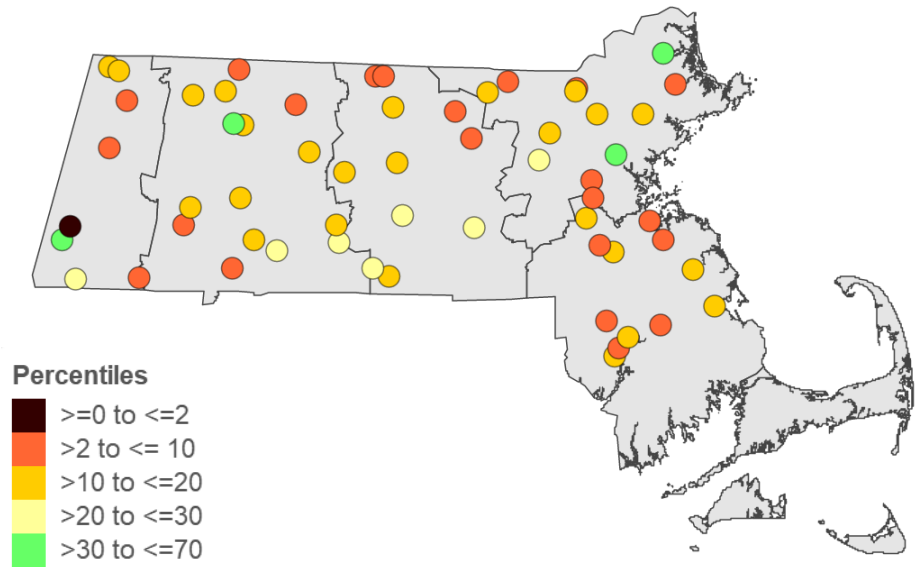
*The Standardized Precipitation Index (SPI) values represent the variation, in standard deviations, from long-term precipitation averages.

STREAMFLOW

Streamflow Index Severity levels increased as much of the State had below normal streamflow for most of September.

Streamflow is monitored by the Commonwealth of Massachusetts and United States Geological Survey (USGS) cooperative stream gaging program.
https://waterdata.usgs.gov/nwis/sw

Median Monthly Streamflows Compared to Historical Values

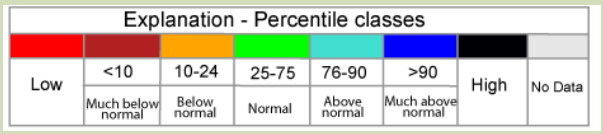


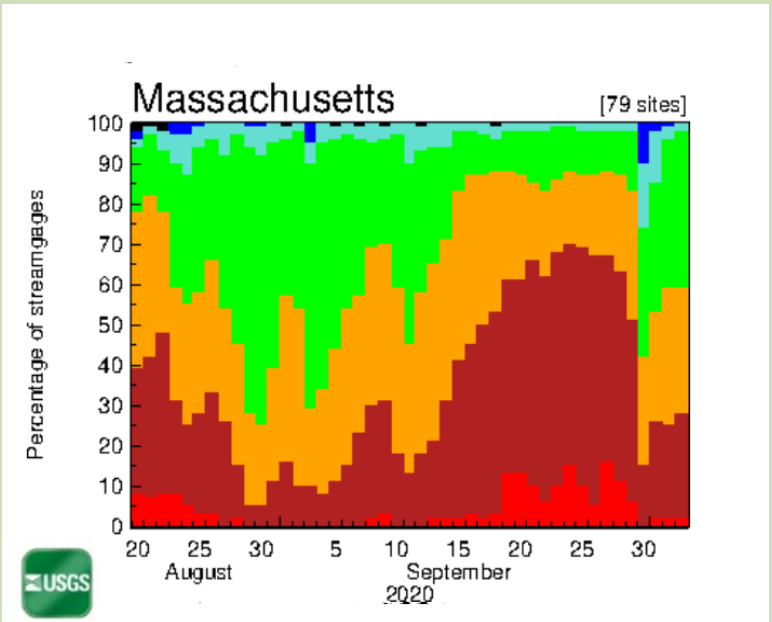
REGION	TOTAL GAGES REPORTING FOR SEPT	≥0 TO ≤2 PERCENTILE	>2 TO ≤10 PERCENTILE	>10 TO ≤20 PERCENTILE	>20 to ≤30 PERCENTILE	>90 PERCENTILE	MEDIAN OF INDIVIDUAL GAGE PERCENTILES	DMP INDEX SEVERITY
WESTERN	8	1	3	2	1	0	11	2
CT RIVER VALLEY	15	0	4	8	2	0	14	2
CENTRAL	11	0	4	4	3	0	11	2
NORTHEAST	13	0	5	5	1	0	12	2
SOUTHEAST	12	0	6	6	0	0	10	3

Notes: 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.

Time Series of Average Daily Streamflows Compared to Historical Values

https://waterwatch.usgs.gov/index.php?id=pa01d&sid=w__plot_sum&r=ma

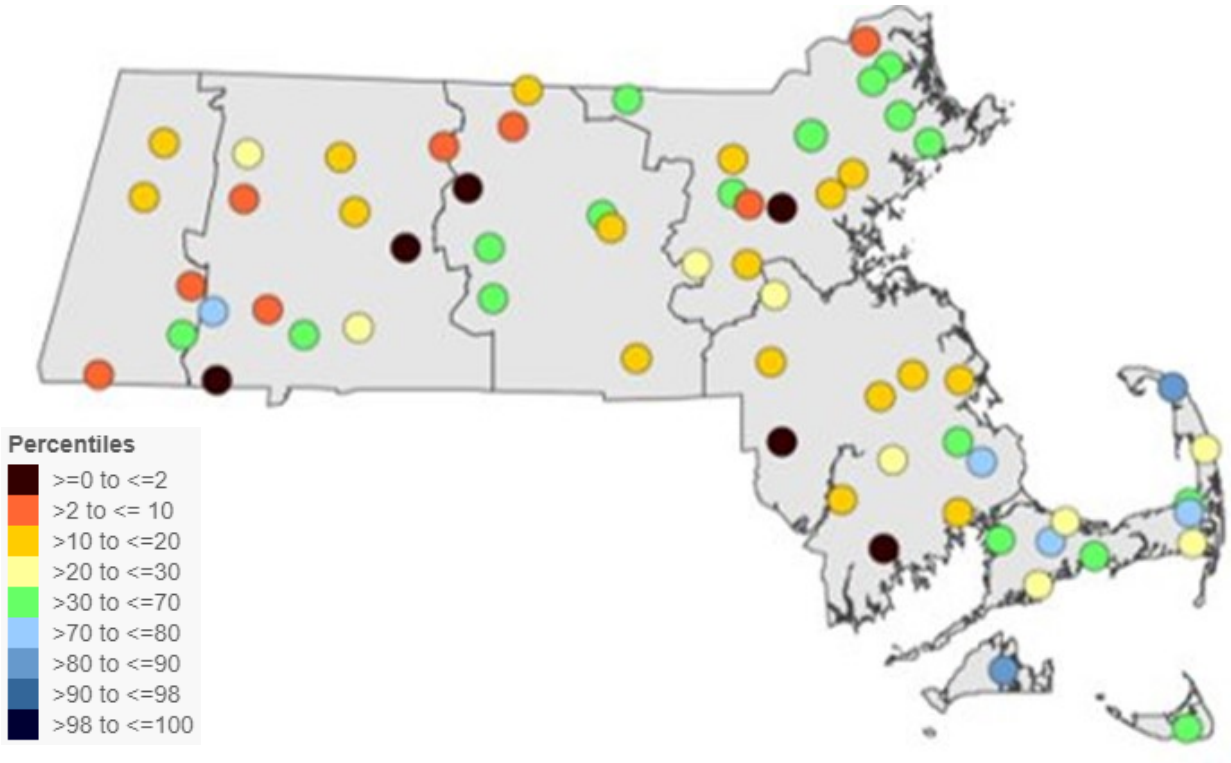




GROUNDWATER

Groundwater levels varied across the state and within some Regions. Overall, end of month levels decreased including numerous below 10th percentile values and six wells below the 2nd percentile. The Western, CT River Valley, Central, and Southeast Regions have deteriorated to Index Severity Level 2.
https://groundwaterwatch.usgs.gov/NetMapT1L2.asp?ncd=crn&sc=25

End of Month Groundwater Compared to Historical in the Climate Response Network



REGION	TOTAL WELLS REPORTING FOR SEPT	≥0 TO ≤2 PERCENTILE	>2 TO ≤10 PERCENTILE	>10 TO ≤20 PERCENTILE	>20 TO ≤30 PERCENTILE	>90 PERCENTILE	MEDIAN OF INDIVIDUAL GAGE PERCEN-TILES	DMP INDEX SEVERITY
WESTERN	5	0	2	2	0	0	16	2
CT RIVER VALLEY	11	2	3	2	2	0	19	2
CENTRAL	9	1	1	3	1	0	19	2
NORTHEAST	14	1	2	4	0	0	25	1
SOUTHEAST	12	2	0	6	2	0	15	2
CAPE COD	10	0	0	0	4	0	46	0
ISLANDS	2	0	0	0	0	0	75	0

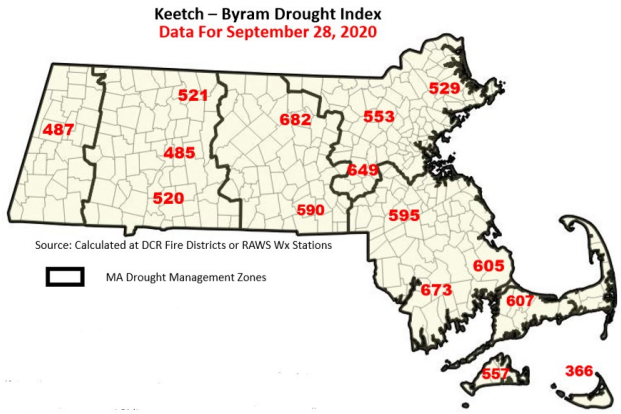
LAKES AND IMPOUNDMENTS

At the end of September, lakes and impoundments in many regions were lower than usual, resulting in an Index Severity Level of 1 for the CT River Valley and Northeast Regions and Level 3 for the Southeast. Although the Western Region did not trip, both communities have mandatory watering restriction. Several reservoirs are below 2016 levels.

REGION	TOTAL REPORTING FOR SEPTEMBER	MEDIAN OF INDIVIDUAL PERCENTILES	DMP INDEX SEVERITY
WESTERN	2	42	0
CT RIVER VALLEY	2	25	1
CENTRAL	4	35	0
NORTHEAST	6	26	1
SOUTHEAST	2	8	3
CAPE COD	1	56	0
ISLANDS	N/A	N/A	N/A

DMP Index Severity Levels do not necessarily reflect water supply status.

KEETCH BYRAM DROUGHT INDEX (KBDI)

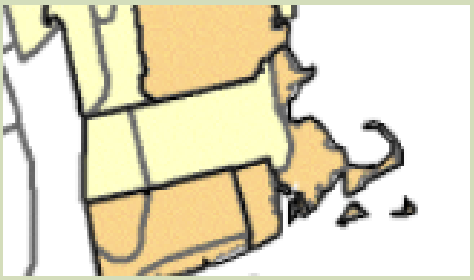


As of September 28th, 2020, KBDI values ranged from 366 to 682 across the state reflecting continued dryness in the top 8 inches of the soil.

REGION	TOTAL REPORTING FOR SEPT	DMP INDEX SEVERITY
WESTERN	1	2
CT RIVER VALLEY	3	2
CENTRAL	2	3
NORTHEAST	3	3
SOUTHEAST	3	3
CAPE COD	1	3
ISLANDS	2	2

CROP MOISTURE INDEX (CMI)

The weekly CMI for the period ending September 26, 2020 was Abnormally Dry for the Western, CT River Valley, and Central Regions, resulting in an Index Severity Level 1 and Excessively Dry for the remainder of the state resulting in an Index Severity Level 2 for the Northeast, Southeast, Cape Cod, and Islands Regions.



REGION	DMP INDEX SEVERITY
WESTERN	1
CT RIVER VALLEY	1
CENTRAL	1
NORTHEAST	2
SOUTHEAST	2
CAPE COD	2
ISLANDS	2

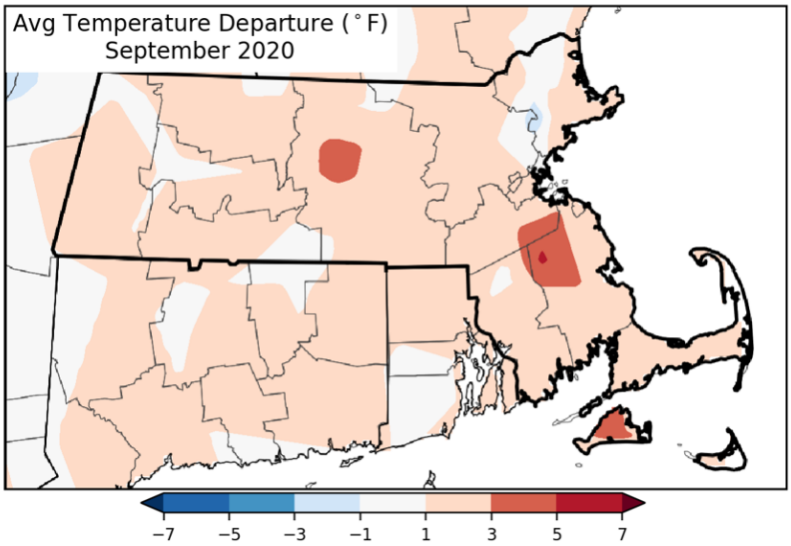
TEMPERATURE

Monthly average temperatures were within 3° F of normal for most of the state.

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

Daily average temperatures ranged from 52° to 76.5° Fahrenheit (°F). Daily departures from historical averages ranged from +11.6 to –11.5 ° F.

https://w2.weather.gov/climate/xmacis.php?wfo=box



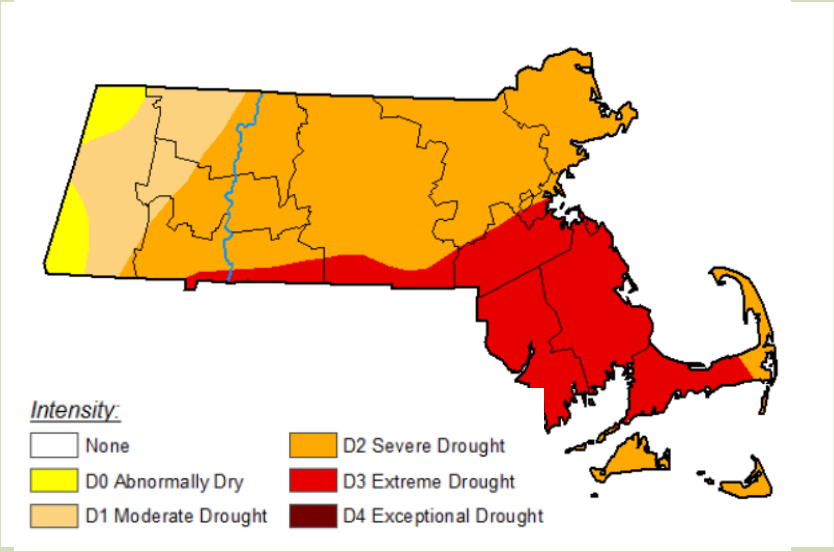
DROUGHT CONDITIONS AND FORECASTS

U.S. Drought Monitor (USDM)

At the end of September, the USDM shows D3 (Extreme Drought) in the Southeast, south central MA, and parts of Cape Cod. The western part of the state shows better conditions in D0 (Abnormally Dry) and D1 (Moderate Drought) conditions, while the remainder of the state is in D2 (Severe Drought). D3 conditions started showing on the map Sept. 15 in the south-southeast and the areas affected have expanded since then.

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

USDM Map updated Sept. 29 2020; released Oct. 1, 2020



NOAA Climate Prediction Center

Temperature and Precipitation Outlook

October: The outlook released on 9/30 splits the state between equal chances for below-normal, normal, or above-normal and 33%-40% chances of below normal precipitation; the outlook shows 50-60% of above normal temperature for the entire state.
September through November: The outlook released 9/17 projects a 60-70% chance for the west and 70-80% chance for the rest of state for above-normal temperatures, and equal chances for below-normal, normal, or above-normal precipitation for all of MA. https://www.cpc.ncep.noaa.gov/

Monthly and Seasonal Drought Outlook

The monthly outlook released on 9/30 for October shows drought removal likely in the west and improving in the rest of the state. The seasonal outlook released on 9/17 and valid through December, also shows drought removal throughout the state except for the Southeast where it will improve.

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

This report was prepared by the Massachusetts Department of Conservation and Recreation. Data may be preliminary. Additional information, previous reports, and drought management information can be found at:
https://www.mass.gov/water-data-tracking

APPENDIX I – ADDITIONAL PRECIPITATION DATA

Standardized Precipitation Index September 2020

REGION	NUMBER OF SITES	SPI1	SPI2	SPI3	SPI6	SPI9	SPI12	SPI24	SPI36
WESTERN	5	0.03	-0.10	-0.07	-0.67	-0.61	0.02	0.45	0.65
CT RIVER VALLEY	8	-0.22	-0.52	-0.55	-0.94	-1.15	-0.56	-0.26	0.66
CENTRAL	13	-1.18	-0.98	-1.05	-0.71	-1.07	-0.20	0.50	1.24
NORTHEAST	9	-0.88	-1.15	-1.24	-1.03	-1.36	-0.61	0.34	0.72
SOUTHEAST	10	-1.23	-1.12	-1.39	-0.64	-1.10	-0.21	0.86	0.87
CAPE COD	3	-1.48	-1.68	-2.59	-1.76	-1.67	-0.45	0.88	1.07
ISLANDS	1	-1.34	-1.59	-1.94	-0.89	-0.91	-0.06	0.96	-0.02

Key to Drought Plan SPI Severity Levels	
0	>-0.52
1	≤ -0.52 and > -0.84
2	≤ -0.84 and > -1.28
3	≤ -1.28 and > -2.05
4	≤ -2.05

Percent of Average Historical Precipitation

REGION	NUMBER OF SITES	HISTORICAL AVERAGE (IN)	SEPTEMBER AVERAGE (IN)	DEPARTURE FROM HISTORICAL AVERAGE (IN)	PERCENT OF HISTORICAL
WESTERN	5	4.28	4.14	-0.14	97
CT RIVER VALLEY	8	4.06	2.93	-1.13	72
CENTRAL	13	3.88	1.59	-2.29	41
NORTHEAST	9	3.47	1.65	-1.82	48
SOUTHEAST	10	3.85	1.26	-2.59	33
CAPE COD	3	3.84	1.38	-2.45	36
ISLANDS	1	3.83	1.13	-2.70	29

DCR Precipitation Reports are available at:

https://www.mass.gov/service-details/precipitation-composite-estimates-1 and
https://www.mass.gov/service-details/standardized-precipitation-index-spi-0

APPENDIX II – DROUGHT MANAGEMENT PLAN INFORMATION

The Massachusetts Drought Management Plan (DMP) can be found at https://www.mass.gov/doc/massachusetts-drought-management-plan/download. The document provides details on the Drought Indices, how Drought Levels are determined, and actions associated with each drought level.

Drought Levels (Section 3.1 of the DMP)

Level 0 Normal

Level 1 Mild Drought

Level 2 Significant Drought

Level 3 Critical Drought

Level 4 Emergency Drought

Index Severity Levels (Section 3.4 of the DMP)

SEVERITY LEVEL	STANDARDIZED PRECIPITATION INDEX (SPI)	STREAMFLOW	LAKES AND IMPOUNDMENTS	GROUNDWATER	KEETCH-BRYAM DROUGHT INDEX (KBDI)	CROP MOISTURE INDEX
0	> 30th percentile				< 200	> -1.0
1	≤ 30 and > 20				200-400	≤ -1.0 and > -2.0
2	≤ 20 and > 10				400-600	≤ -2.0 and > -3.0
3	≤ 10 and > 2				600-700	≤ -3.0 and > -4.0
4	≤ 2				700-800	≤ -4.0