

MASSACHUSETTS WATER RESOURCES COMMISSION

AUGUST 2021 HYDROLOGIC CONDITIONS IN MASSACHUSETTS



The Commonwealth of Massachusetts
Charles D. Baker, Governor

Kathleen A. Theoharides, Secretary, Executive Office of Energy and Environmental Affairs

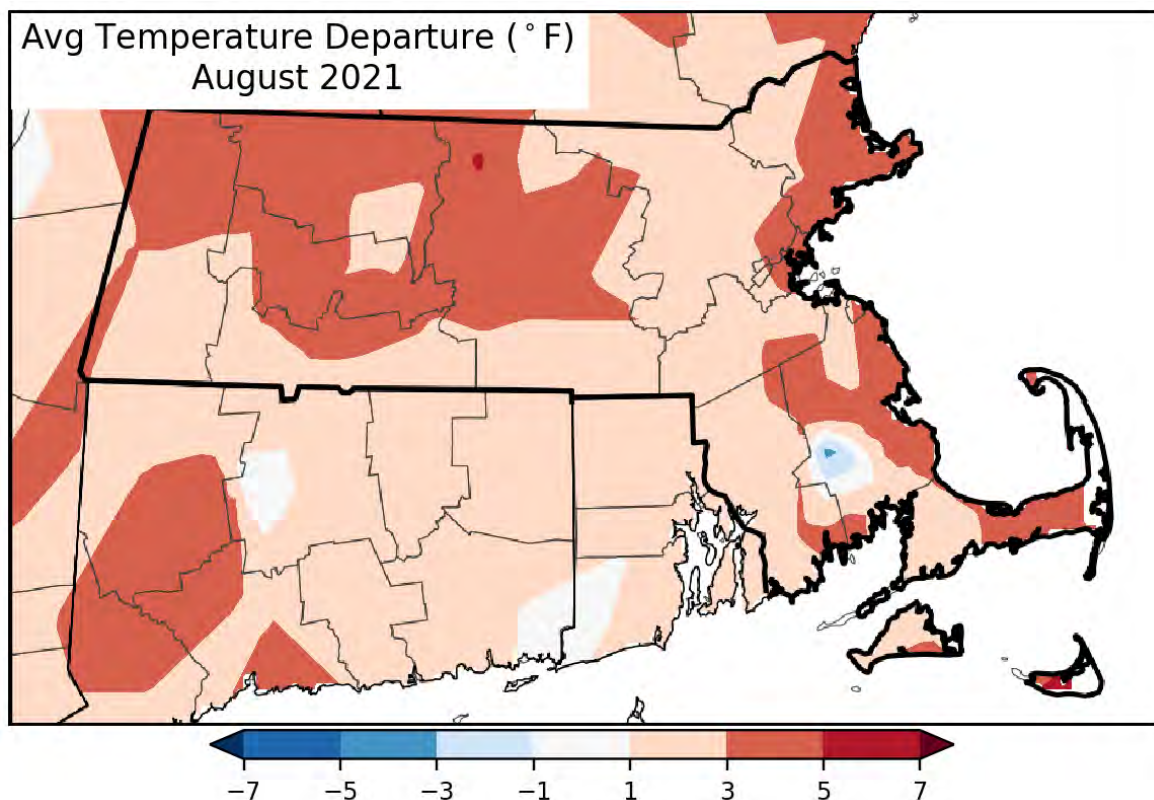
AUGUST 2021 HYDROLOGIC CONDITIONS SUMMARY OF CONDITIONS

- Monthly average temperatures were above normal.
- Several large storm events, including the remnants of Tropical Storm Fred and Tropical Storm Henri, contributed to precipitation near to above normal for the month. The August 1-month SPI Index Severity is at Level 0 for all regions.
- Streamflow was mostly above normal throughout much of August. Monthly median streamflows were at the 87th percentile and higher for all parts of the state except for the Cape Cod Region, which is at Index Severity Level 2.
- Groundwater levels were high except for Cape Cod, the Islands, and parts of the Southeast region. Regional monthly median groundwater percentiles were above normal for all parts of the state except the Cape Cod region, which is at Index Severity Level 1, and the Islands, which was at the low side of normal.
- Lakes & Impoundments levels were much above 30th percentile levels or at 100% capacity except for the monitored pond on Cape Cod, which is at the 11th percentile.
- NOAA's September outlook projects above-normal temperatures and above-normal precipitation.
- NOAA's 3-month outlook projects above-normal temperatures and equal chances for below-normal, normal, or above-normal precipitation.
- Appendices I and II provide additional precipitation data and information on the Massachusetts Drought Management Plan (DMP), respectively.

TEMPERATURE

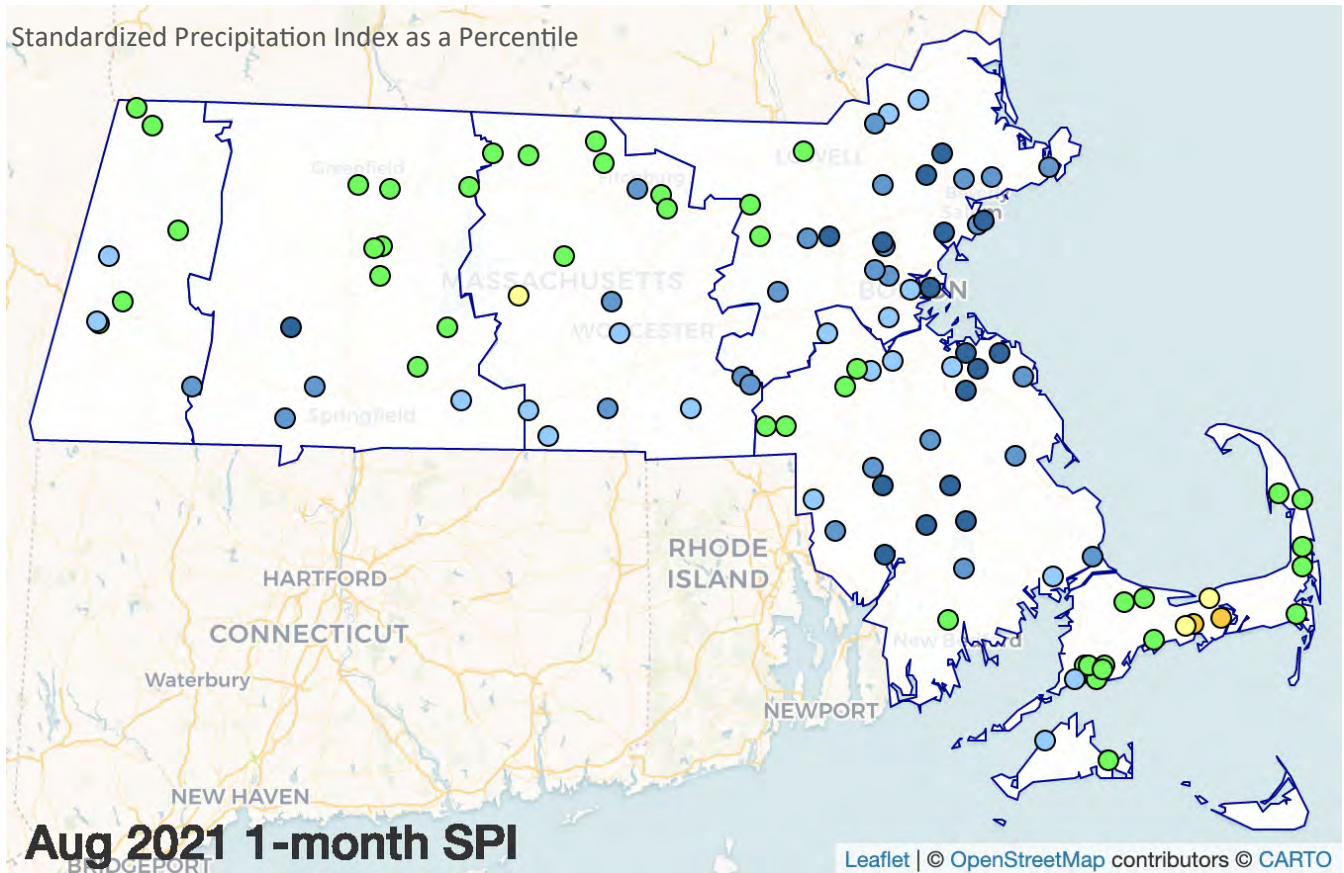
Monthly average temperatures were above normal.

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



PRECIPITATION

August precipitation was near to above normal throughout most of the state. The August 1-month SPI Index Severity is at Level 0 for all regions. Parts of Cape Cod continue to receive below-normal precipitation and the region has deficits for longer look-back periods. Two tropical systems tracked through the state in August: On August 19th, the remnants of Fred arrived bringing higher rainfall amounts to the CTRV, Central, and Northeast regions (generally 2"-4" especially near Worcester) and lower amounts to the Southeast and Cape & Islands (less than 1"). Tropical Storm Henri brought rainfall Aug 22nd -23rd with the highest amounts in western MA (2"-5") and lower amounts in eastern MA (1"-3") and Cape Cod (less than 1"). Appendix I provides additional details for precipitation data, including longer look-back periods.



● ≥ 0 to ≤ 2	● > 2 to ≤ 10	● > 10 to ≤ 20	● > 20 to ≤ 30	● > 30 to ≤ 70
● > 70 to ≤ 80	● > 80 to ≤ 90	● > 90 to ≤ 98	● > 98 to ≤ 100	

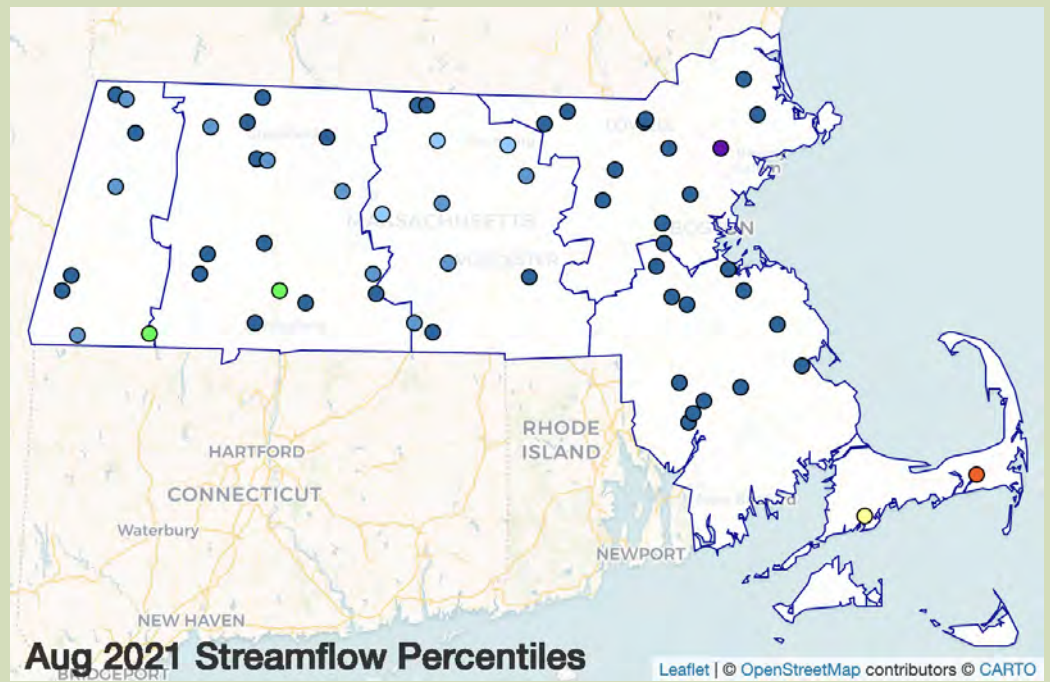
REGION	NUMBER OF SITES REPORTING	AUGUST MONTHLY AVERAGE (IN)	DEPARTURE FROM HISTORICAL (IN)	SPI* PERCENTILE 1-MONTH	SPI PERCENTILE 3-MONTH	SPI PERCENTILE 6-MONTH
WESTERN	8	4.84	0.54	63	96	97
CTRV	12	4.99	0.88	62	93	91
CENTRAL	17	4.98	0.96	74	94	90
NORTHEAST	25	5.90	2.39	88	97	95
SOUTHEAST	27	6.16	2.23	85	95	88
CAPE COD	18	2.60	-0.80	43	27	20
ISLANDS	2	3.89	0.04	63	54	42

DMP Index Severity Levels			
1	2	3	4

STREAMFLOW

Median Monthly Streamflow Percentiles Compared to Historical Values

Streamflow was high during much of August for most of the state. Regional monthly streamflow medians were at or above the 87th percentile except for the Cape Cod region, which is at Index Severity Level 2. The remnants of Tropical Storm Fred arrived in Massachusetts on August 19th resulting in urban flooding in Worcester and the North Shore including Lynn, Peabody, and Somerville. Tropical Storm Henri arrived on August 22nd with urban flooding in Springfield and eastern MA including Boston, Braintree, Fall River, Taunton, and Lakeville.



● ≥ 0 to ≤ 2	● > 2 to ≤ 10	● > 10 to ≤ 20	● > 20 to ≤ 30	● > 30 to ≤ 70
● > 70 to ≤ 80	● > 80 to ≤ 90	● > 90 to ≤ 98	● > 98 to ≤ 100	

REGION	TOTAL GAGES REPORTING FOR AUG	≥ 0 TO ≤ 2 PERCENTILE	> 2 TO ≤ 10 PERCENTILE	> 10 TO ≤ 20 PERCENTILE	> 20 TO ≤ 30 PERCENTILE	> 90 PERCENTILE	MEDIAN OF INDIVIDUAL GAGE PERCENTILES
WESTERN	8	0	0	0	0	4	90
CTRV	15	0	0	0	0	10	94
CENTRAL	11	0	0	0	0	4	87
NORTHEAST	13	0	0	0	0	13	97
SOUTHEAST	12	0	0	0	0	12	95
CAPE COD	2	0	1	0	1	0	17

Note: Not all gages report in all months due to ice, beaver dams or other conditions. Streamflow index is not applicable to the Islands.

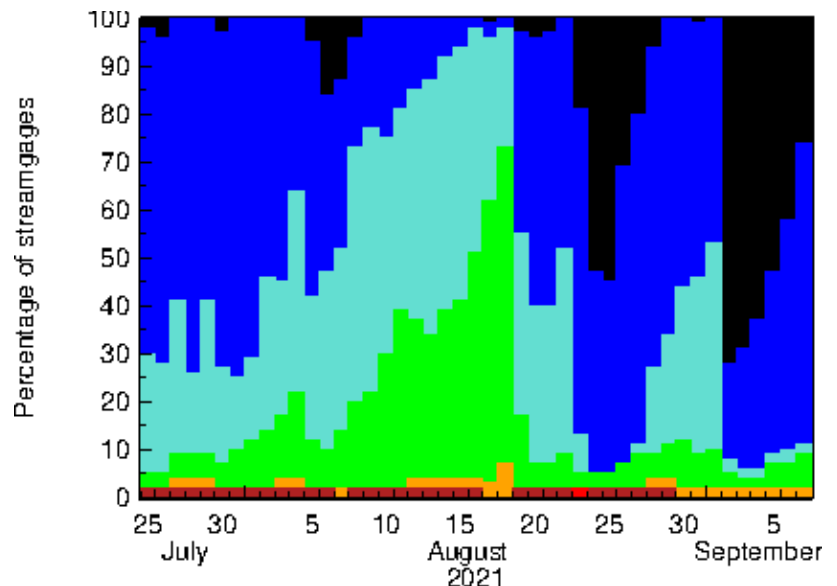
DMP Index Severity Levels			
1	2	3	4

Time Series of the Percent of Gages at Their Respective Percentile Flows for Average Daily Streamflows Compared to Historical Values

Streamflow is monitored by the Commonwealth of Massachusetts and United States Geological Survey cooperative stream gaging program.

<https://waterdata.usgs.gov/nwis/sw>

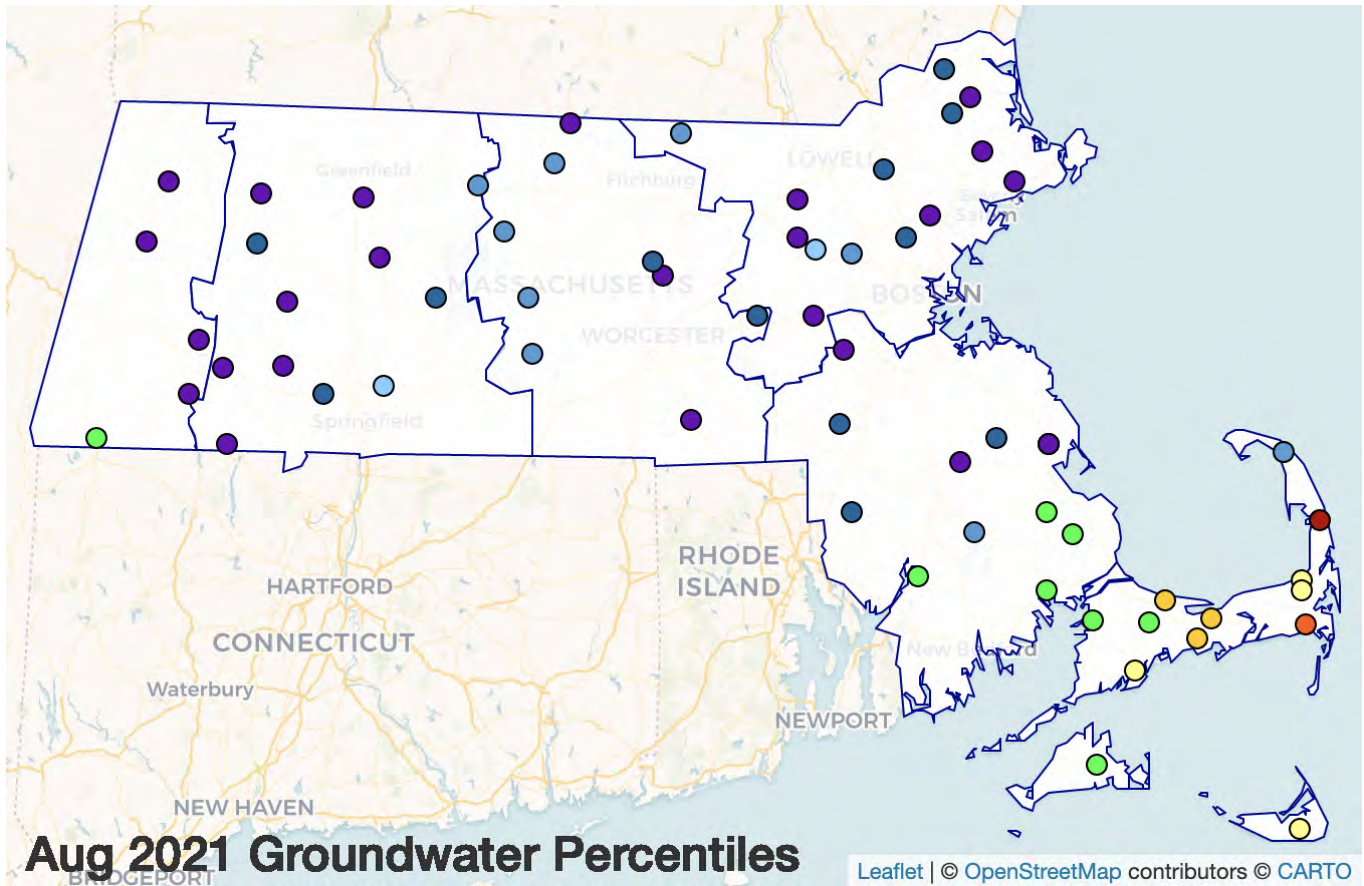
Explanation - Percentile classes							
Low	< 10	10-24	25-75	76-90	> 90	High	No Data
	Much below normal	Below normal	Normal	Above normal	Much above normal		



GROUNDWATER

Groundwater percentiles for individual wells were mostly above 80th percentile throughout the state, except for parts of the Southeast, Cape Cod, and Islands regions. The drought region medians are normal except for Cape Cod, which remains at Index Severity Level 1.

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



● ≥ 0 to ≤ 2	● > 2 to ≤ 10	● > 10 to ≤ 20	● > 20 to ≤ 30	● > 30 to ≤ 70
● > 70 to ≤ 80	● > 80 to ≤ 90	● > 90 to ≤ 98	● > 98 to ≤ 100	

REGION	TOTAL WELLS REPORTING FOR AUG	≥ 0 TO ≤ 2 PERCENTILE	> 2 TO ≤ 10 PERCENTILE	> 10 TO ≤ 20 PERCENTILE	> 20 TO ≤ 30 PERCENTILE	> 90 PERCENTILE	MEDIAN OF INDIVIDUAL WELL PERCENTILES
WESTERN	5	0	0	0	0	4	100
CTRV	12	0	0	0	0	10	100
CENTRAL	9	0	0	0	0	5	96
NORTHEAST	14	0	0	0	0	11	99
SOUTHEAST	12	0	0	0	0	7	95
CAPE COD	11	1	1	3	3	0	21
ISLANDS	2	0	0	0	1	0	35

DMP Index Severity Levels			
1	2	3	4

LAKES AND IMPOUNDMENTS

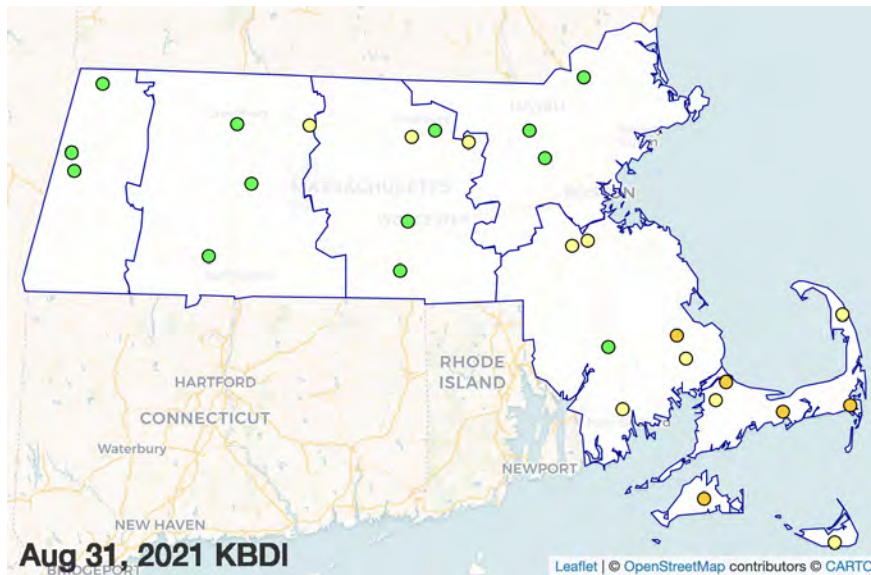
At the end of August, most lake and impoundment levels were much greater than their 30th percentile values or at 100% full capacity. The monitored pond on Cape Cod remained at the 11th percentile.

REGION	TOTAL REPORTING	MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT FULL
WESTERN	1	100% full
CTRV	2	79
CENTRAL	4	100 ; 100% full
NORTHEAST	5	100
SOUTHEAST	2	96
CAPE COD	1	11

DMP Index Severity Levels			
1	2	3	4

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

KEETCH BYRAM DROUGHT INDEX (KBDI)



Point Values - KBDI Range				
● ≥ 700 to ≤ 800	● ≥ 600 to < 700	● ≥ 400 to < 600	● ≥ 200 to < 400	● ≥ 0 to < 200

REGION	NUMBER OF SITES REPORTING	HIGHEST OF SITE VALUES
WESTERN	3	111
CTRV	4	221
CENTRAL	5	258
NORTHEAST	3	167
SOUTHEAST	6	463
CAPE COD	5	482
ISLANDS	2	485

DMP Index Severity Levels			
1	2	3	4

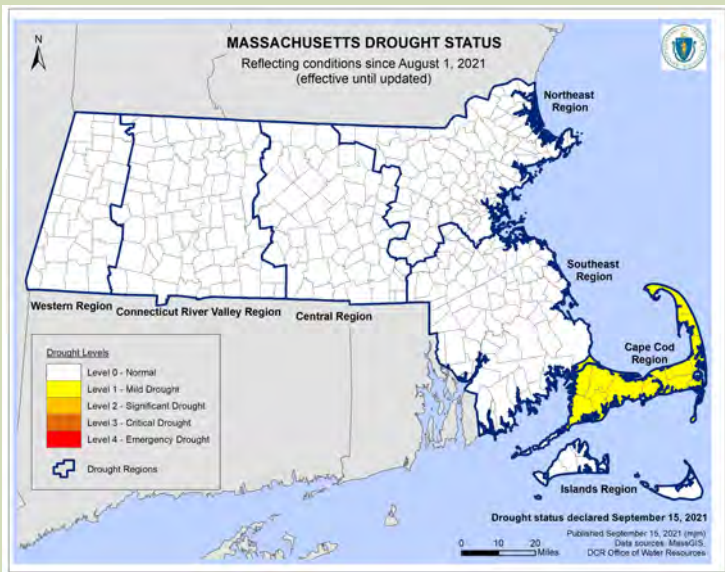
CROP MOISTURE INDEX (CMI)

CMI weekly values for the period ending August 28th ranged from 0.11 (Slightly Dry/Favorably Moist) in the coastal area to 1.17 & 1.94 (Abnormally Moist) in the central and western areas, respectively. All MA drought regions are at Index Severity Level 0. [Climate Prediction Center - Monitoring & Data: Drought Monitoring \(noaa.gov\)](https://www.noaa.gov/climate-prediction-center-monitoring-data-drought-monitoring)

SNOWFALL

Snowfall is provided seasonally.

DROUGHT CONDITIONS AND FORECASTS



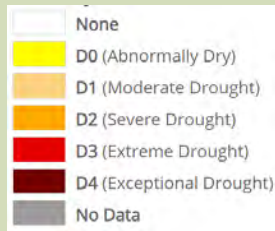
Massachusetts Drought Status

Reflecting conditions since August 1st, on September 15, 2021 Massachusetts Energy and Environmental Affairs (EEA) Secretary Kathleen Theoharides declared a Level 1-Mild Drought in the Cape Cod Region and Level 0-Normal Conditions in the Western, Connecticut River Valley, Central, Northeast, Southeast, and Islands Regions.

U.S. Drought Monitor (USDM)

At the end of August, the USDM showed areas of D0 in the upper and outer Cape, and areas of D1 and D2 in the mid to outer Cape; Nantucket was shown as D1, and part of Martha’s Vineyard was shown as D0.

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



NOAA Climate Prediction Center

Temperature and Precipitation Outlook

September: The outlook released 8/31 shows a 33-40% probability of above-normal temperatures and a 50-60% probability of above-normal precipitation.

September through November: The outlook released 8/19 shows a 50-60% probability of above-normal temperatures, and equal chances of below-normal, normal, or above-normal precipitation. <https://www.cpc.ncep.noaa.gov/>

Monthly and Seasonal Drought Outlook

The monthly outlook for September released on 8/31 shows no drought development in the state and “drought removal likely” on the Cape. The seasonal outlook released on 8/31 and valid through November shows no drought development in the state and “drought removal likely” on the Cape. <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 August 2021 as percentiles

REGION	NUMBER OF SITES	1-mo*	2-mo	3-mo	6-mo	9-mo	12-mo	24-mo	36-mo*
WESTERN	8	63	99	96	97	92	83	75	81
CTRV	12	62	99	93	91	90	87	58	85
CENTRAL	17	74	99	94	90	91	83	72	92
NORTHEAST	25	88	99	97	95	95	89	72	89
SOUTHEAST	27	85	99	95	88	90	79	66	91
CAPE COD	18	43	42	27	20	29	12	15	49
ISLANDS	2	63	72	54	42	68	49	51	87

DMP Index Severity Levels			
1	2	3	4

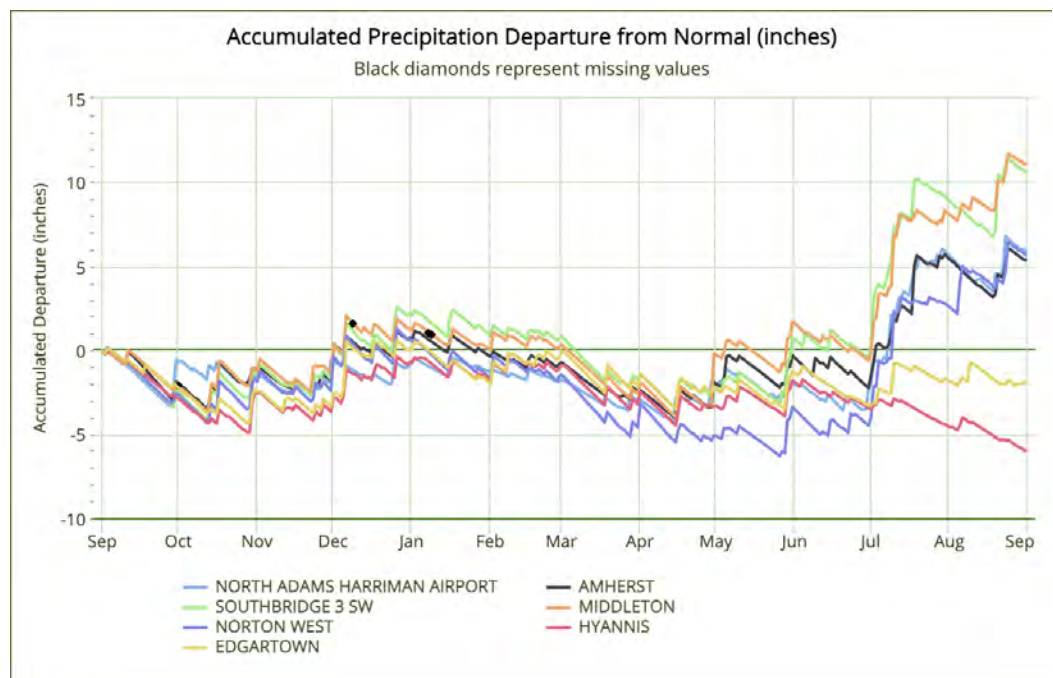
Percent of Average Historical Precipitation August 2021

REGION	NUMBER OF SITES	HISTORICAL AVERAGE	AUGUST AVERAGE (IN)	DEPARTURE FROM HISTORICAL AVERAGE (IN)	PERCENT OF NORMAL
WESTERN	8	4.30	4.84	0.54	113%
CTRV	12	4.11	4.99	0.88	121%
CENTRAL	17	4.02	4.98	0.96	124%
NORTHEAST	25	3.51	5.90	2.39	168%
SOUTHEAST	27	3.93	6.16	2.23	157%
CAPE COD	18	3.40	2.60	-0.80	76%
ISLANDS	2	3.85	3.89	0.04	101%

Accumulated Precipitation Departure shows the previous 12 months (September 2020 — August 2021).

Graph does not consider starting condition's wetness/dryness; does not show summer heat waves with high evapotranspiration; only one station per Drought Region is shown.

<https://xmacis.rcc-acis.org/>



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

