

MASSACHUSETTS WATER RESOURCES COMMISSION

MAY

2021

HYDROLOGIC CONDITIONS IN MASSACHUSETTS



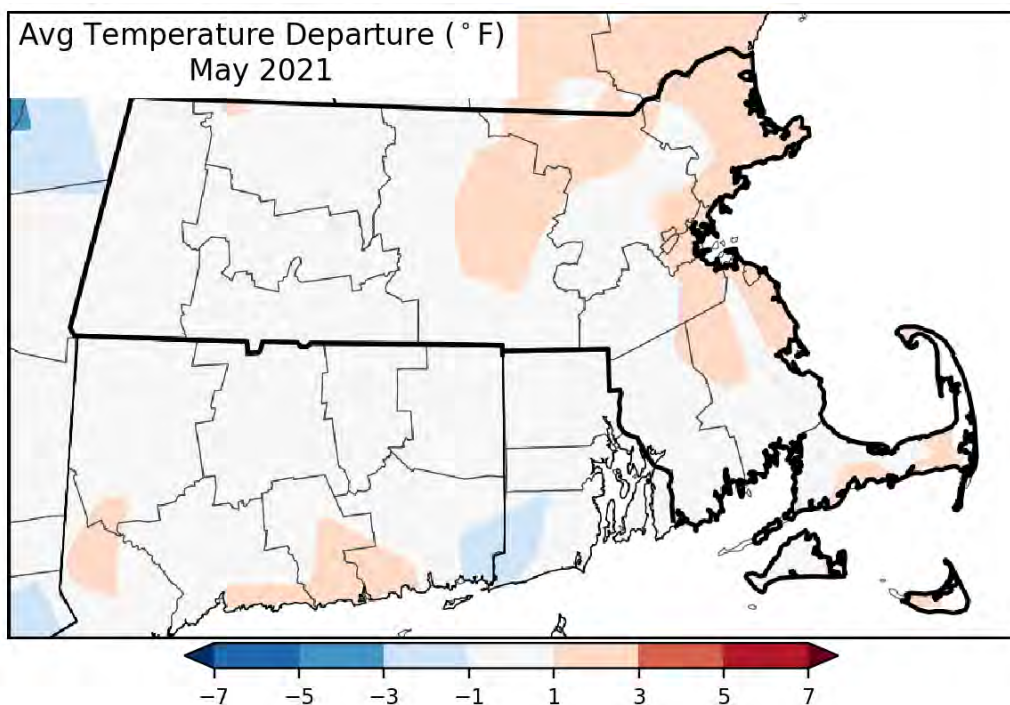
The Commonwealth of Massachusetts
Charles D. Baker, Governor

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

MAY 2021 HYDROLOGIC CONDITIONS SUMMARY OF CONDITIONS

- Monthly average temperatures were normal to above normal.
- Monthly regional precipitation was above normal.
- Monthly median streamflows were above the 30th percentile for all parts of the state except for the Cape Cod Region, which is at Index Severity Level 2.
- Groundwater percentiles of individual wells varied across regions. The Western, Southeast, and Cape Cod Regions are at Index Severity Level 1.
- Lakes & Impoundments levels were mostly in the normal range. Two natural water bodies are low for this time of year, including one on the Cape.
- NOAA's June outlook projects above-normal temperatures and equal chances for below-normal, normal, or above-normal precipitation.
- NOAA's 3-month outlook projects above-normal temperatures and above-normal precipitation.
- Appendices I and II provide additional precipitation data and information on the Massachusetts Drought Management Plan (DMP), respectively.

TEMPERATURE

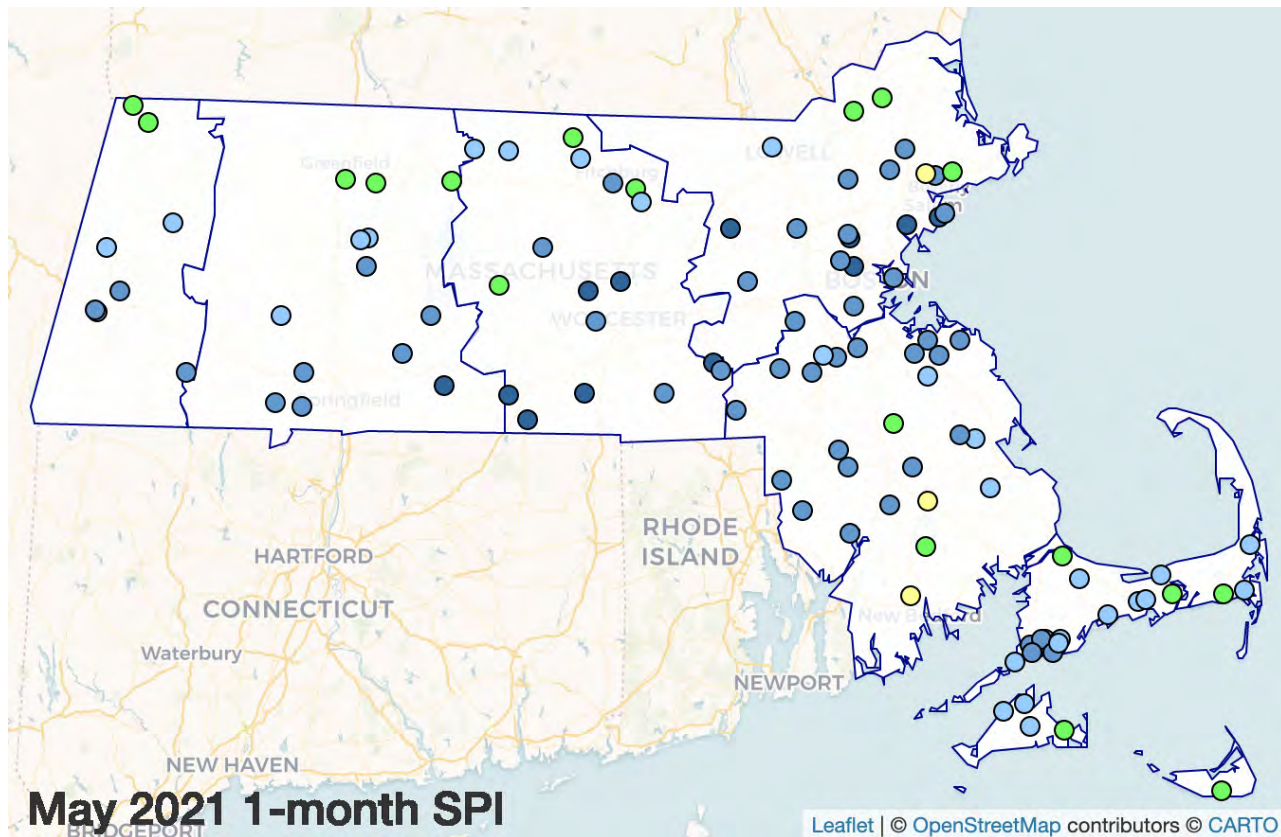


Monthly average temperatures were normal to above normal in some areas.

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

PRECIPITATION

May started out with some rain events, but midmonth there was a dry stretch. The end of May brought significant rain and the month ended with regional precipitation above normal. 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	MAY MONTHLY AVERAGE (IN)	DEPARTURE FROM HISTORICAL (IN)	SPI* PERCENTILE 1-MONTH	SPI PERCENTILE 3-MONTH	SPI PERCENTILE 6-MONTH
WESTERN	8	5.24	1.25	77	74	45
CT RIVER VALLEY	13	5.33	1.52	81	57	54
CENTRAL	18	5.53	1.73	86	49	68
NORTHEAST	21	5.19	1.72	87	62	68
SOUTHEAST	26	5.03	1.42	84	45	60
CAPE COD	18	4.70	1.10	76	37	48
ISLANDS	5	4.73	1.06	74	33	56

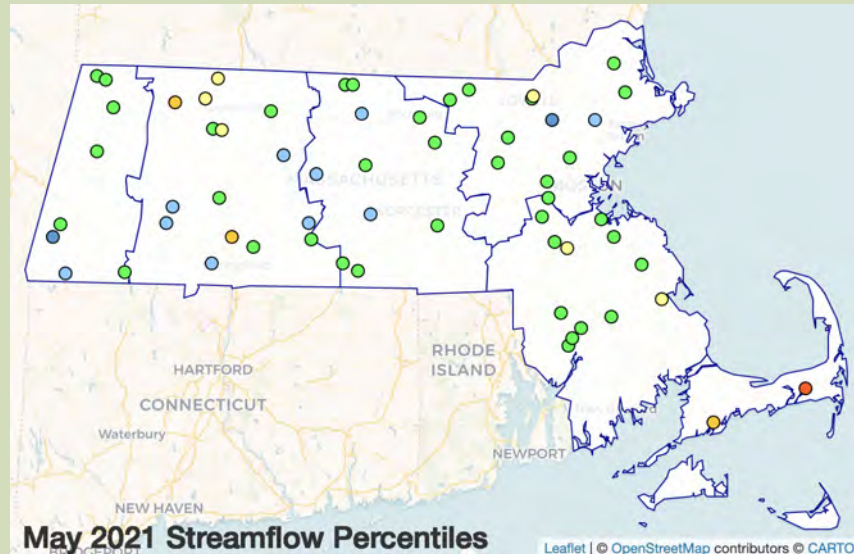
DMP Index Severity Levels			
1	2	3	4

*SPI is the Standardized Precipitation Index used in the Drought Management Plan (DMP) expressed here as a percentile and represents the variation, in standard deviations, from long-term precipitation averages.

STREAMFLOW

Streamflow varied throughout May. A dry stretch in the middle of the month resulted in below-normal flows at most gages across the state. Precipitation at the beginning and end of May kept regional medians above the 30th percentile except for Cape Cod, which is at Index Severity Level 2.

Median Monthly Streamflow Percentiles



● ≥ 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 MAY	≥ 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	0	65
CT RIVER VALLEY	15	0	0	2	3	0	59
CENTRAL	11	0	0	0	0	0	62
NORTHEAST	13	0	0	0	1	0	58
SOUTHEAST	12	0	0	0	1	0	39
CAPE COD	2	0	1	1	0	0	10

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

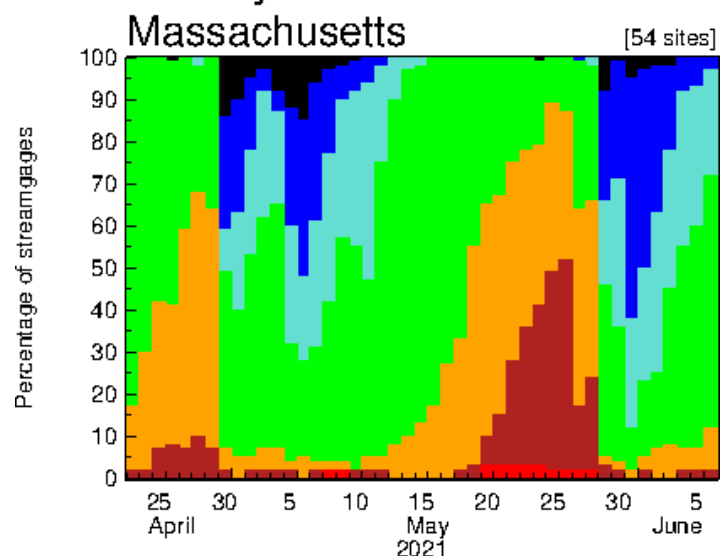
Time Series of the Percent of Gages at Their Respective Percentile Flows for Average Daily Streamflows Compared to Historical Values

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		

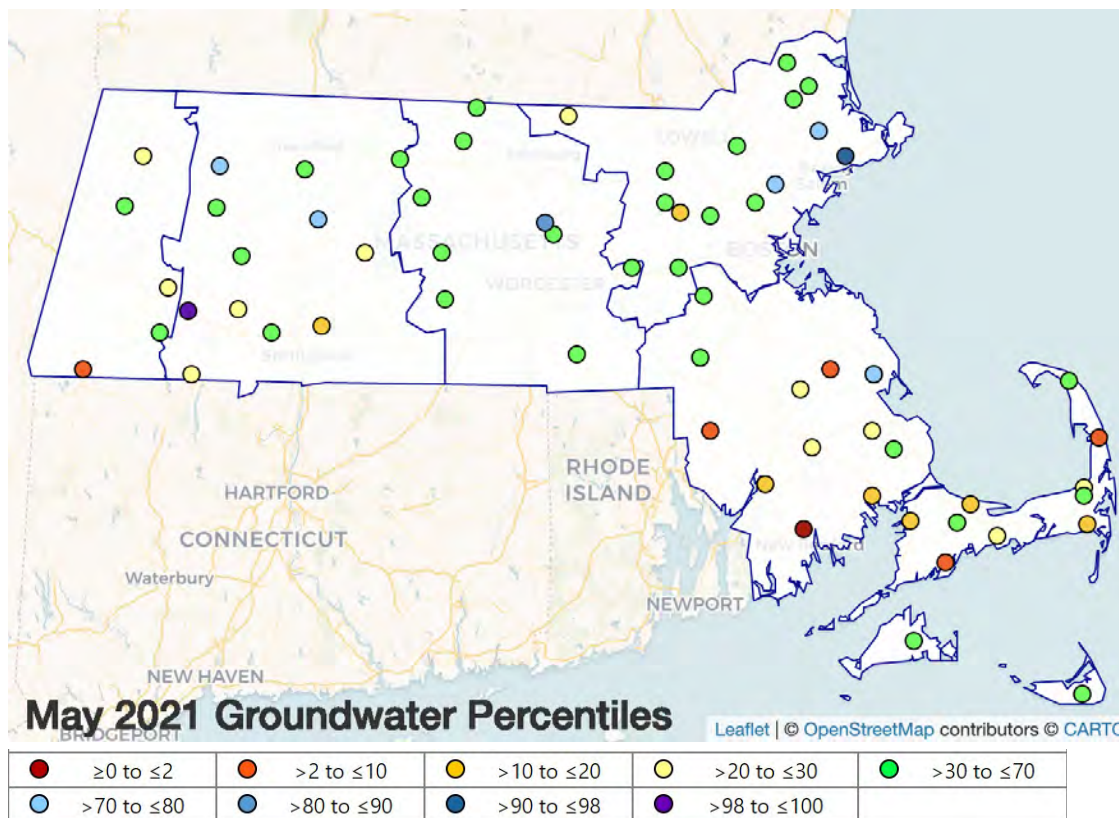
Last 45 Days



GROUNDWATER

Groundwater percentiles varied across and within regions. The Western, Southeast, and Cape Cod Regions are at Index Severity Level 1. The CT River Valley and Islands Regions have medians of individual well percentiles in the mid 30's. While all regions except Central and the Islands have individual wells below the 30th percentile, two regions (CT River Valley and Northeast) also have individual wells above the 90th percentile. The median of individual well percentiles continues to decline in the Cape Cod Region.

End of Month Groundwater Compared to Historical in the Climate Response Network's Automated Wells



REGION	TOTAL WELLS REPORTING FOR MAY	≥ 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	1	0	2	0	28
CT RIVER VALLEY	12	0	0	1	3	1	34
CENTRAL	9	0	0	0	0	0	46
NORTHEAST	14	0	0	1	1	1	56
SOUTHEAST	13	1	2	2	3	0	25
CAPE COD	10	0	2	3	2	0	21
ISLANDS	2	0	0	0	0	0	36

DMP Index Severity Levels			
1	2	3	4

LAKE AND IMPOUNDMENTS

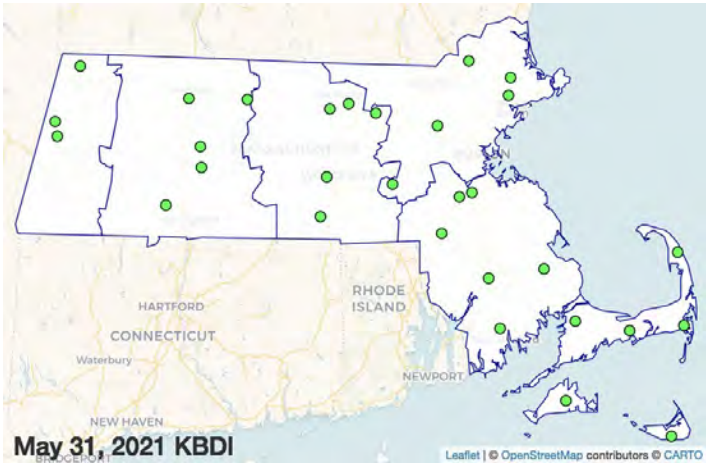
REGION	TOTAL REPORTING	MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT
WESTERN	2	100% & 100%
CT RIVER VALLEY	2	62
CENTRAL	2	53
NORTHEAST	4	64
SOUTHEAST	1	69
CAPE COD	1	12

At the end of May, most lakes and im-poundments were greater than their 30th percentile value and many reservoirs were just below to above 100% full. In the Central Region, one non-regulated waterbody was low at the 8th percentile, and the pond on Cape Cod is at the 12th percentile.

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	26
CT RIVER VALLEY	5	50
CENTRAL	5	85
NORTHEAST	5	174
SOUTHEAST	6	3
CAPE COD	4	2
ISLANDS	2	0

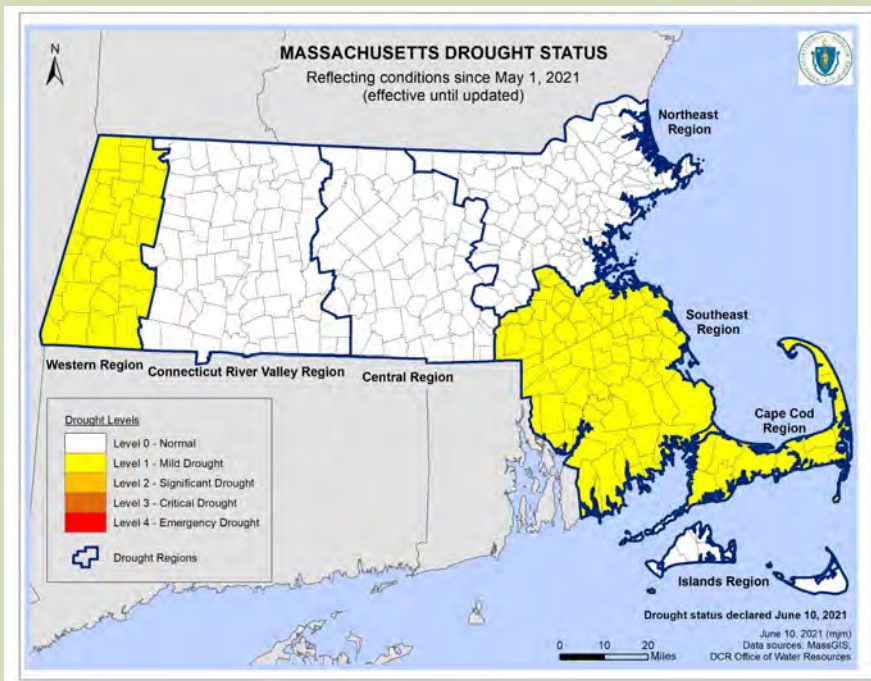
CROP MOISTURE INDEX (CMI)

CMI values ranged from −0.9 to +0.9 (Slightly Dry/Favorably Moist) in the Western, north portion of Northeast, Southeast, Cape Cod, and the Islands Regions. In the remainder of the state (CT River Valley, Central, and east portion of the Northeast Regions) values ranged from +1.0 to +1.9 (Abnormally Moist). All regions are at Index Severity Level 0.

SNOWFALL

Snowfall is provided seasonally.

DROUGHT CONDITIONS AND FORECASTS



Massachusetts Drought Status

In effect from May 1, 2021 until updated, on June 10, 2021 Massachusetts Energy and Environmental Affairs (EEA) Secretary Kathleen Theoharides declared a Level 1-Mild Drought in the Western, Southeast, and Cape Cod Regions and Level 0-Normal Conditions in the Connecticut River Valley, Central, Northeast, and Islands Regions.

Data through May 25, 2021; map released May 27, 2021

U.S. Drought Monitor (USDM)

At the end of May, the USDM showed areas of D0 across the outer and middle Cape, Nantucket, and northern Essex County. The first May USDM map showed D0 across Western through Central MA with some areas in the Southeast and Northeast Regions. The second week of May through the end of month looked like the May 25th map.

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



NOAA Climate Prediction Center

Temperature and Precipitation Outlook

June: The outlook released 5/31 shows a 50-60% probability of above-normal temperatures and equal chances of below-normal, normal, or above-normal precipitation.

June through August: The outlook released 5/20 shows a 50-60% probability of above-normal temperatures, and a 40-50% probability of above-normal precipitation. <https://www.cpc.ncep.noaa.gov/>

Monthly and Seasonal Drought Outlook

The monthly outlook for June released on 5/31 shows no drought conditions in the State. The seasonal outlook released on 5/20 and valid through August shows no drought conditions in the State.

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>

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 I – ADDITIONAL PRECIPITATION DATA

Standardized Precipitation Index May 2021 (expressed as percentiles)

REGION	NUMBER OF SITES	1-mo	2-mo	3-mo	6-mo	9-mo	12-mo	24-mo	36-mo
WESTERN	8	77	85	74	45	43	27	28	72
CT RIVER VALLEY	13	81	78	57	54	59	34	32	85
CENTRAL	18	86	77	49	68	56	41	49	90
NORTHEAST	21	87	87	62	68	58	33	48	71
SOUTHEAST	26	84	70	45	60	46	32	49	82
CAPE COD	18	76	63	37	48	16	4	32	49
ISLANDS	5	74	58	33	56	27	9	54	81

DMP Index Severity Levels			
1	2	3	4

Percent of Average Historical Precipitation May 2021

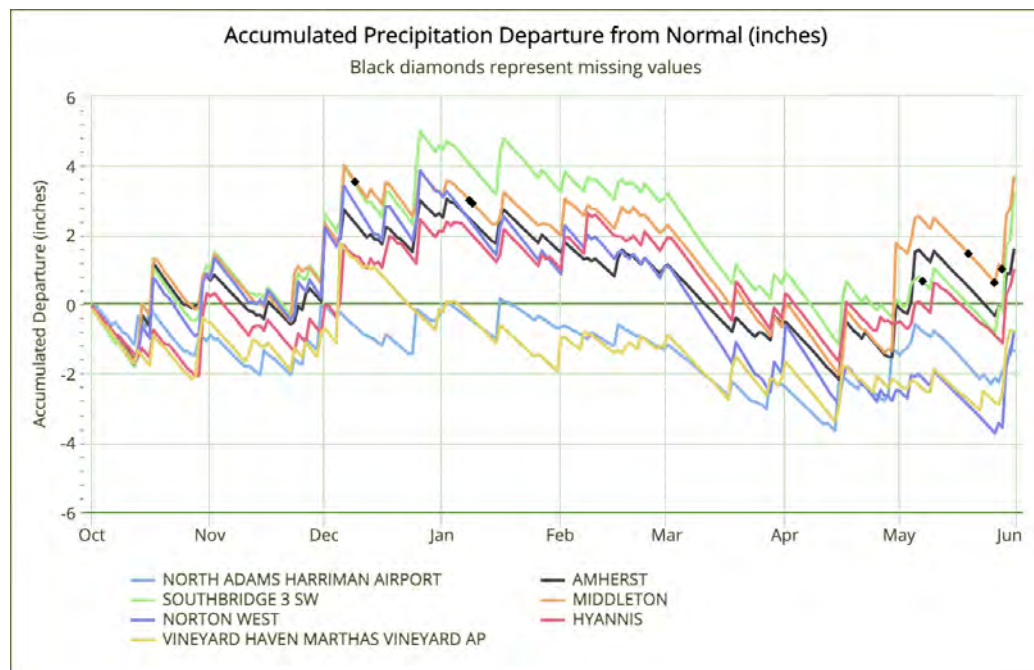
REGION	NUMBER OF SITES	HISTORICAL AVERAGE	MAY AVERAGE (IN)	DEPARTURE FROM HISTORICAL AVERAGE (IN)	PERCENT OF NORMAL
WESTERN	8	3.99	5.24	1.25	131%
CT RIVER VALLEY	13	3.81	5.33	1.52	140%
CENTRAL	18	3.80	5.53	1.73	146%
NORTHEAST	21	3.47	5.19	1.72	150%
SOUTHEAST	26	3.61	5.03	1.42	139%
CAPE COD	18	3.60	4.70	1.10	131%
ISLANDS	5	3.67	4.73	1.06	129%

Accumulated Precipitation Departure

starting at the beginning of Water Year 2021 (Oct. 1, 2020) through May.

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

