

MASSACHUSETTS WATER RESOURCES COMMISSION

HYDROLOGIC CONDITIONS
IN MASSACHUSETTS

JUNE

2021



The Commonwealth of Massachusetts
Charles D. Baker, Governor

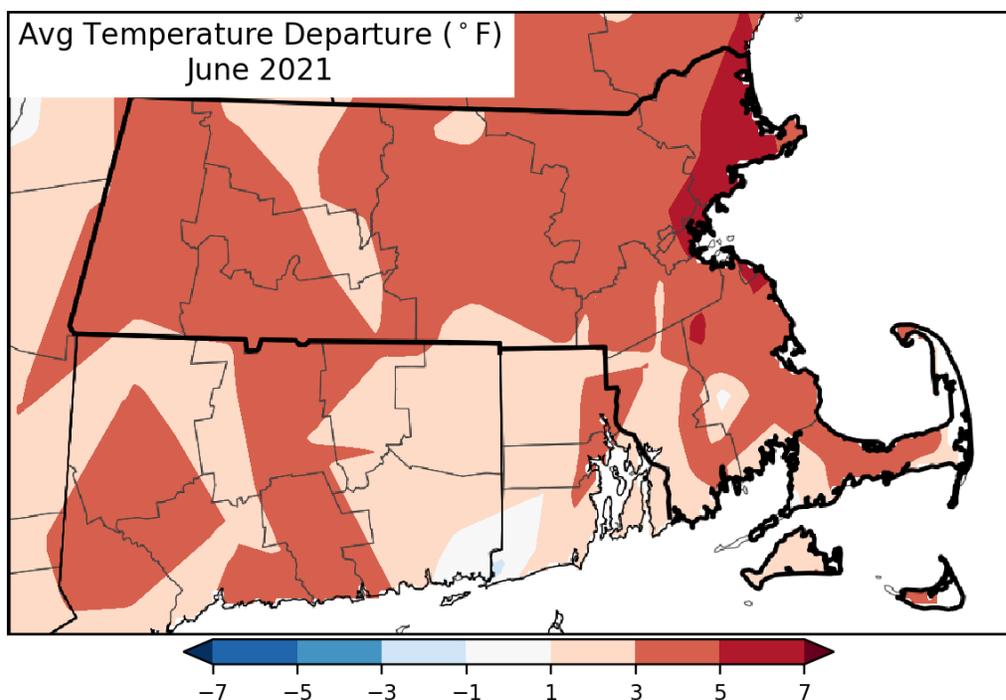
Kathleen A. Theoharides, Secretary, Executive Office of Energy and Environmental Affairs

JUNE 2021 HYDROLOGIC CONDITIONS

SUMMARY OF CONDITIONS

- Monthly average temperatures were above normal.
- Monthly regional precipitation was below normal to normal. The June SPI Index Severity is at Level 1 for Cape Cod and the Islands Regions and Level 2 for the CT River Valley and Central Regions.
- Monthly median streamflows were above the 30th percentile for all parts of the state except for the CT River Valley, which is at Index Severity Level 1, and the Cape Cod Region, which is at Index Severity Level 3.
- Groundwater percentiles of individual wells varied across most regions. The Cape Cod Region is at Index Severity Level 1.
- Lakes & Impoundments levels were mostly above 30th percentile levels. The Western Region is low for this time of year.
- NOAA's July 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

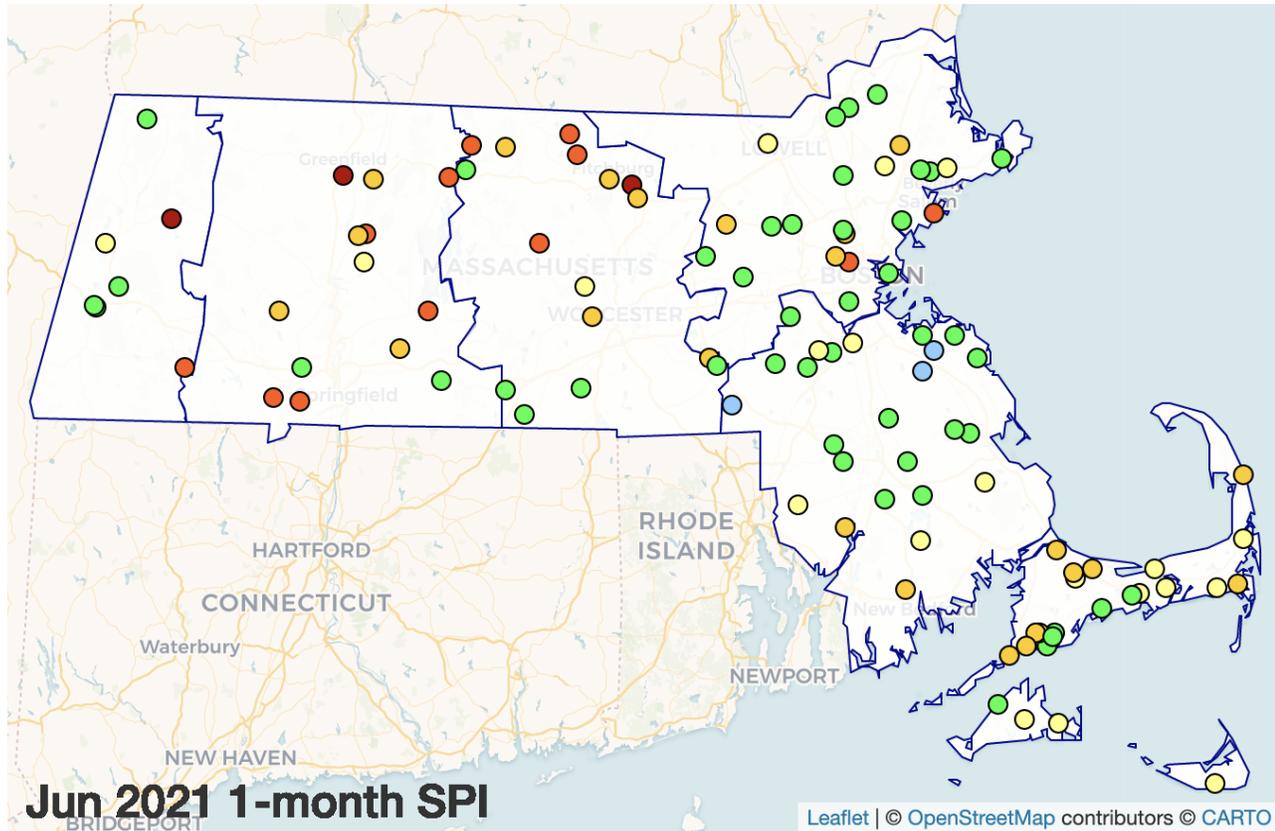


Monthly average temperatures were above normal for most of the state. According to the Northeast Regional Climate Center, Boston experienced its hottest June on record (6.4°F above normal) and Worcester experienced its second hottest June on record (4.8°F above normal).

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

PRECIPITATION

Precipitation varied across the state and within some regions. Precipitation was on the lower end of normal in the Western, Northeast, and Southeast Regions with most stations above the 30th percentile. The CT River Valley, Central, Cape Cod, and the Islands Regions received overall below normal amounts of rain and had most stations below the 30th percentile. 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	JUNE MONTHLY AVERAGE (IN)	DEPARTURE FROM HISTORICAL (IN)	SPI* PERCENTILE 1-MONTH	SPI PERCENTILE 3-MONTH	SPI PERCENTILE 6-MONTH
WESTERN	7	3.35	-1.13	35	60	36
CT RIVER VALLEY	13	2.09	-1.99	11	46	23
CENTRAL	16	2.00	-1.98	16	55	27
NORTHEAST	24	2.60	-1.00	38	72	44
SOUTHEAST	25	3.16	-0.60	48	57	33
CAPE COD	20	1.82	-1.61	22	40	19
ISLANDS	4	1.61	-1.38	29	44	25

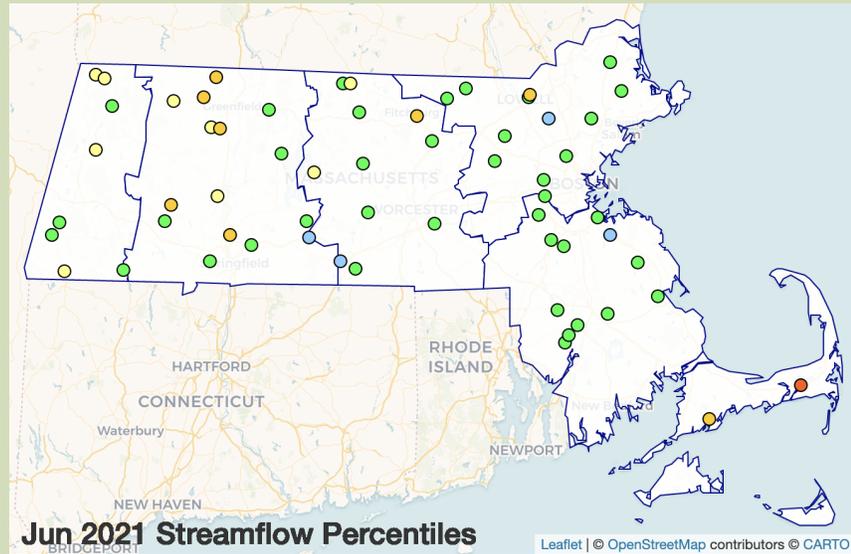
DMP Index Severity Levels			
1	2	3	4

*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

Rain at the end of May with some June precipitation kept regional medians above the 30th percentile except for the CT River Valley Region, which is at Index Severity Level 1, and the Cape Cod Region which is at Index Severity Level 3.

Median Monthly Streamflow Percentiles



Jun 2021 Streamflow Percentiles

Leaflet | © OpenStreetMap contributors © CARTO

● ≥ 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 JUN	≥ 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	4	0	33
CT RIVER VALLEY	15	0	0	5	3	0	28
CENTRAL	11	0	0	1	2	0	39
NORTHEAST	13	0	0	1	0	0	55
SOUTHEAST	12	0	0	0	0	0	56
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.

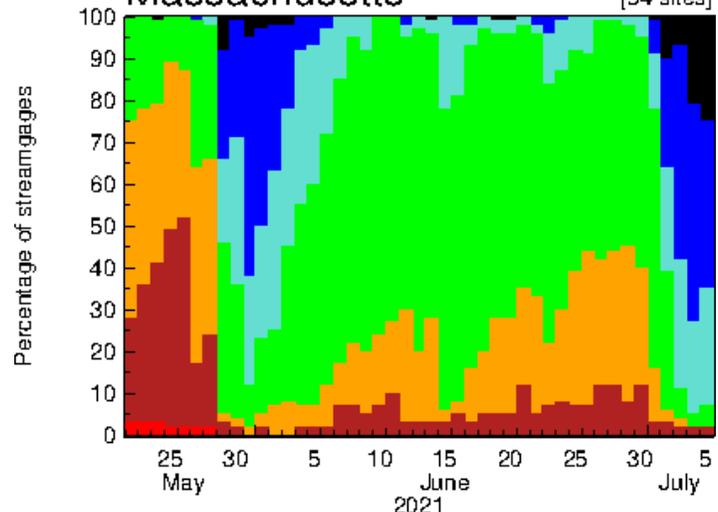
<https://waterdata.usgs.gov/nwis/sw>

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

Massachusetts

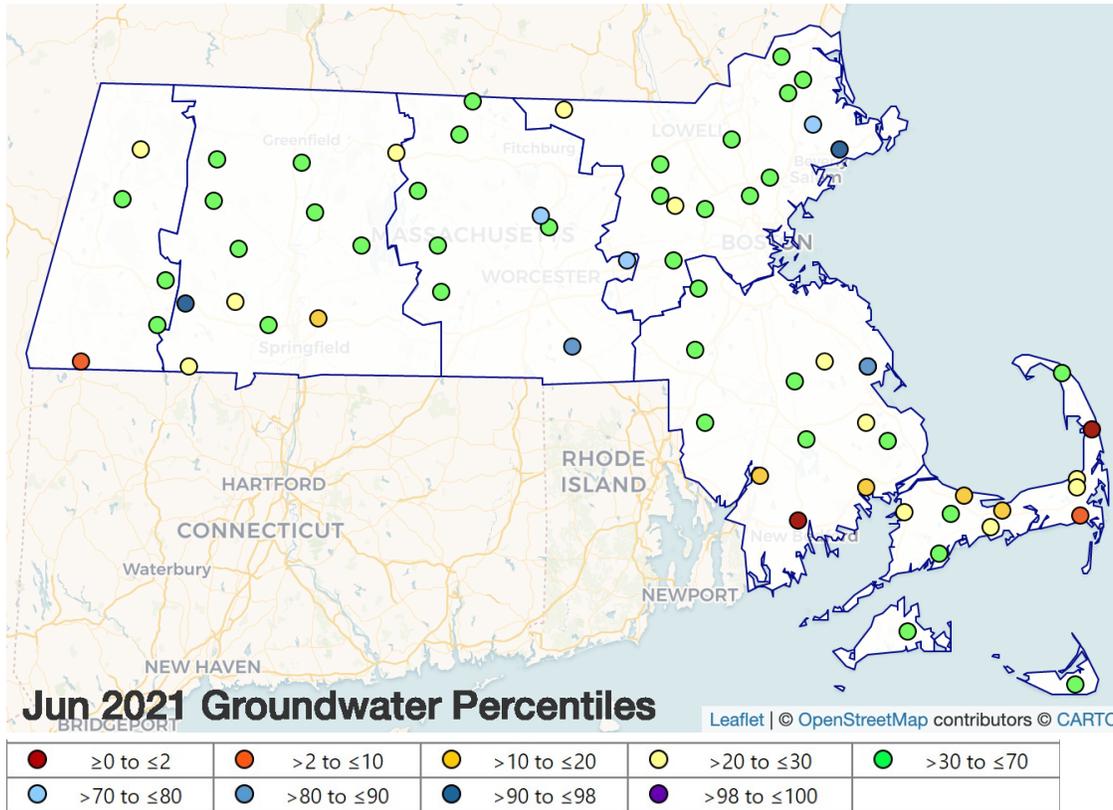
[54 sites]



GROUNDWATER

Groundwater percentiles varied across the state and within some regions. The median of individual well percentiles showed improvement in most regions from May. The Cape Cod Region didn't show much improvement and remains at Index Severity Level 1.

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



REGION	TOTAL WELLS REPORTING FOR JUN	≥ 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	1	0	43
CT RIVER VALLEY	12	0	0	1	3	1	43
CENTRAL	9	0	0	0	0	0	61
NORTHEAST	14	0	0	0	2	1	61
SOUTHEAST	13	1	0	2	2	0	36
CAPE COD	11	1	1	2	4	0	23
ISLANDS	2	0	0	0	0	0	39

DMP Index Severity Levels			
1	2	3	4

LAKES AND IMPOUNDMENTS

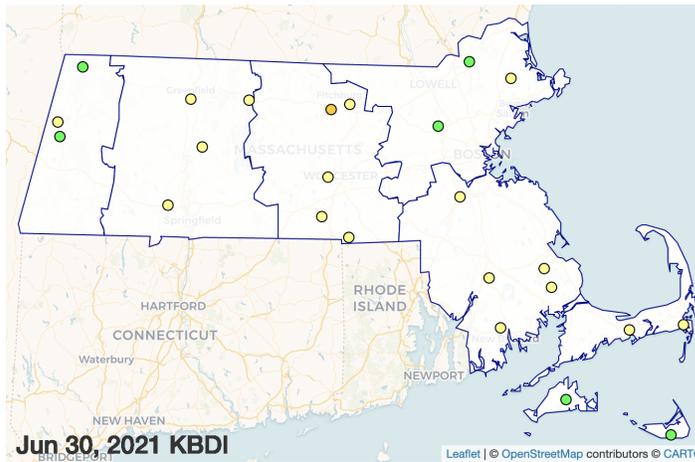
REGION	TOTAL REPORTING	MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT FULL
WESTERN	2	97% & 95%
CT RIVER VALLEY	2	35
CENTRAL	2	43
NORTHEAST	6	37
SOUTHEAST	1	64
CAPE COD	1	11

At the end of June, most lakes and impoundments were greater than their 30th percentile value. In the Western Region, one system was on the low side of normal at approximately 97% full, and the other was low for this time of year at 95% full; the overall regional Index Severity Level is 2, but this doesn't necessarily reflect water supply status. The pond on Cape Cod is at the 11th percentile.

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

DMP Index Severity Levels			
1	2	3	4

KEETCH BYRAM DROUGHT INDEX (KBDI)



Jun 30, 2021 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	231
CT RIVER VALLEY	4	351
CENTRAL	5	417
NORTHEAST	3	360
SOUTHEAST	5	281
CAPE COD	2	219
ISLANDS	2	184

DMP Index Severity Levels			
1	2	3	4

CROP MOISTURE INDEX (CMI)

CMI weekly values for the period ending June 26th ranged from -0.07 to 0.00 (Slightly Dry/Favorably Moist) across the state. All regions are at Index Severity Level 0.

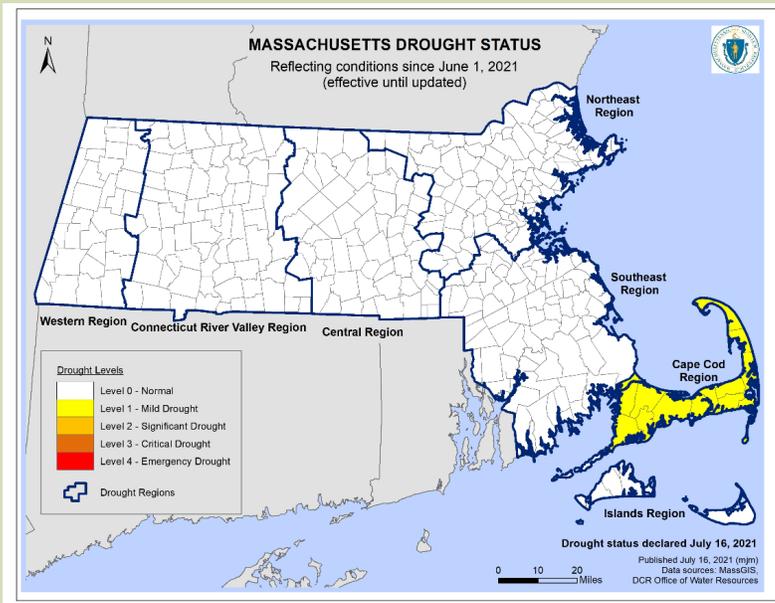
SNOWFALL

Snowfall is provided seasonally.

DROUGHT CONDITIONS AND FORECASTS

Massachusetts Drought Status

In effect from June 1, 2021 until updated, on July 19, 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.



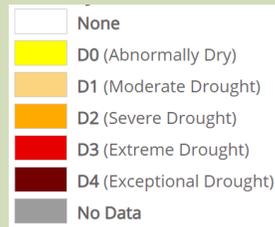
Data through June 29, 2021; map released Jul 1, 2021



U.S. Drought Monitor (USDM)

At the end of June, the USDM showed an area of D1 across the mid to outer Cape, and areas of D0 from the mid to upper Cape, the Islands, and northern portions of the Western and CT River Valley Regions.

June started with D0 on the outer Cape and Nantucket and during the first part of the June the USDM expanded D0 on the Cape and Islands. In mid-June D1 was introduced on the outer Cape and D0 was introduced in northern portions of the Western and CT River Valley



NOAA Climate Prediction Center

Temperature and Precipitation Outlook

July: The outlook released 6/30 shows a 60-70% probability of above-normal temperatures and equal chances of below-normal, normal, or above-normal precipitation.

July through September: The outlook released 6/17 shows a 60-70% 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 July released on 6/30 shows no drought development in the state and “drought removal likely” for the area of D1 on the mid to outer Cape. The seasonal outlook released on 6/17 and valid through September shows no drought development in the state and “drought removal likely” for the area of D1 on the mid to outer Cape.

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 June 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	7	35	52	60	36	40	29	35	72
CT RIVER VALLEY	13	11	34	46	23	46	37	27	80
CENTRAL	16	16	50	55	27	58	42	46	88
NORTHEAST	24	38	63	72	44	57	43	49	80
SOUTHEAST	25	48	62	57	33	54	30	45	81
CAPE COD	20	22	47	40	19	31	10	24	46
ISLANDS	4	29	48	44	25	40	11	37	75

DMP Index Severity Levels			
1	2	3	4

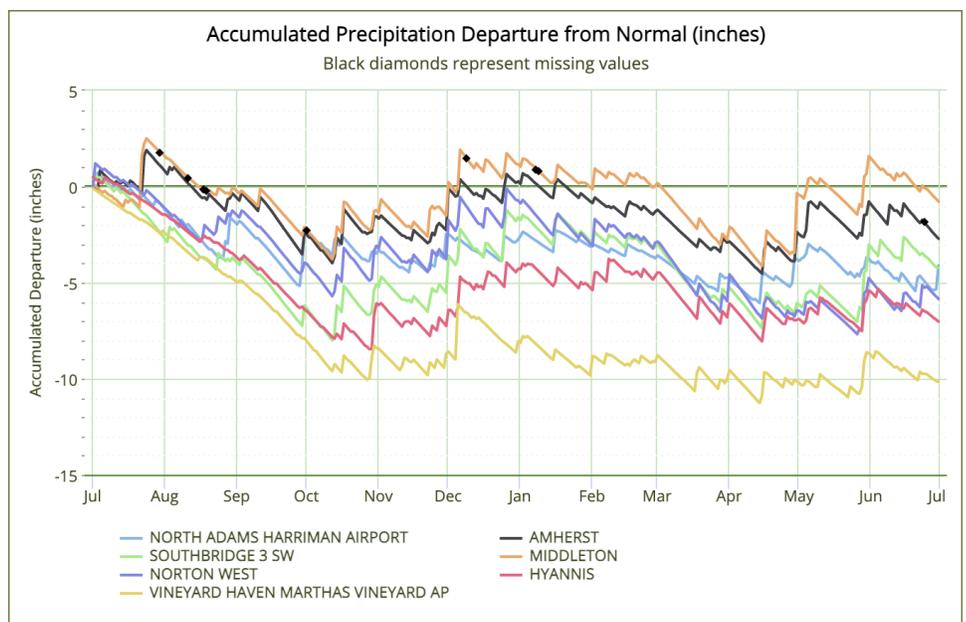
Percent of Average Historical Precipitation June 2021

REGION	NUMBER OF SITES	HISTORICAL AVERAGE	JUNE AVERAGE (IN)	DEPARTURE FROM HISTORICAL AVERAGE (IN)	PERCENT OF NORMAL
WESTERN	7	4.48	3.35	-1.13	75%
CT RIVER VALLEY	13	4.08	2.09	-1.99	51%
CENTRAL	16	3.98	2.00	-1.98	50%
NORTHEAST	24	3.60	2.60	-1.00	72%
SOUTHEAST	25	3.76	3.16	-0.60	84%
CAPE COD	20	3.43	1.82	-1.61	53%
ISLANDS	4	2.99	1.61	-1.38	54%

Accumulated Precipitation Departure shows the previous 12 months (July 2020 — June 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

