

MASSACHUSETTS WATER RESOURCES COMMISSION

JUNE 2022 HYDROLOGIC CONDITIONS IN MASSACHUSETTS



The Commonwealth of Massachusetts
Charles D. Baker, Governor

Bethany A. Card, Secretary, Executive Office of Energy and Environmental Affairs

JUNE 2022 HYDROLOGIC CONDITIONS

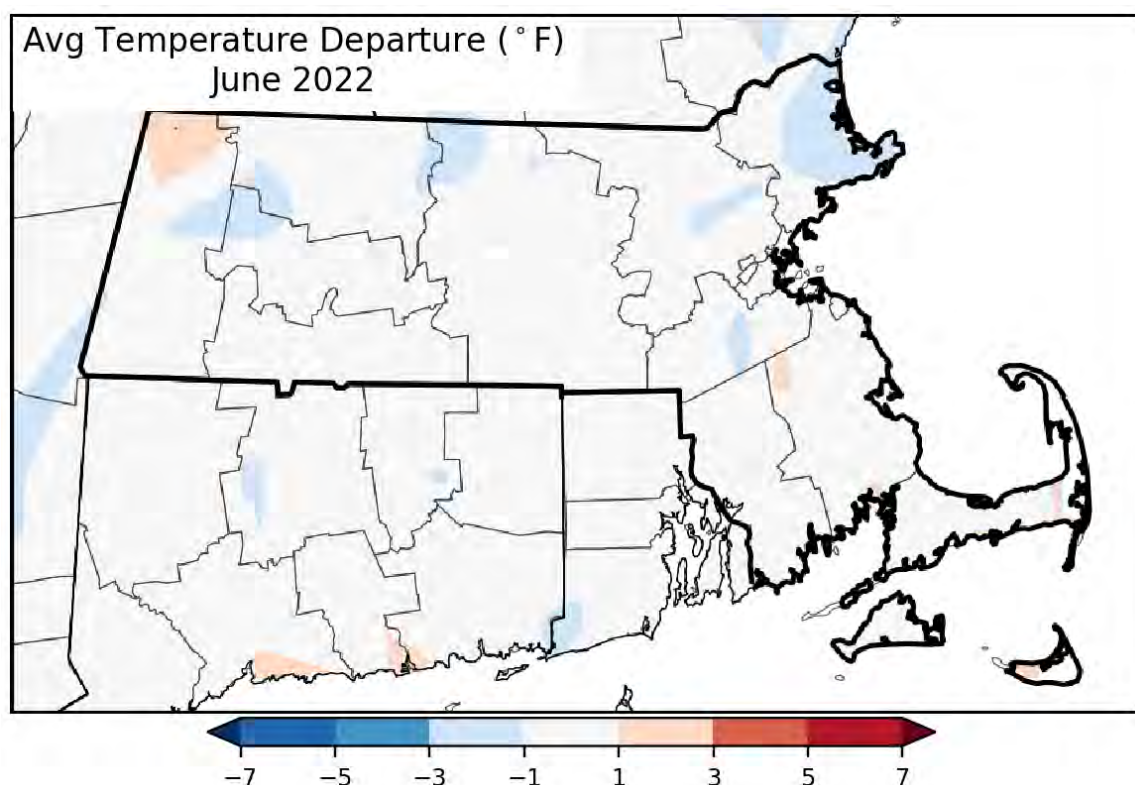
SUMMARY OF CONDITIONS

- Monthly average temperatures were mostly near normal.
- June precipitation was overall below normal for the Western and CTRV Regions. The Central and Northeast also had areas of below-normal precipitation. All Regions are at elevated Index Severity Levels for the 2-month look-back period except for the Cape Cod and the Islands Regions.
- Streamflow was mostly in the below-normal range. All Regions are at elevated Index Severity Levels except for the Cape Cod Region, which is at the lower end of normal.
- Groundwater levels were mostly in the normal to below-normal range across the state. The CTRV, Central, Northeast, and Islands Regions are at Index Severity Level 1.
- Lakes & Impoundments levels varied with some levels below normal. The Northeast Region is at Index Severity Level 2 and the Central Region is at Level 1.
- Keetch Byram Drought Index is at Index Severity Level 1 for all Regions except Cape Cod and the Islands.
- Evaporative Demand Drought Index was elevated across the state.
- NOAA's July outlook shows chances leaning for above-normal temperatures. For precipitation, there are chances leaning for above-normal precipitation in the southeastern parts of the state and equal chances of below-normal, normal, or above-normal precipitation for the rest of the state.
- NOAA's 3-month outlook shows likely chances for above-normal temperatures and chances leaning for above-normal precipitation.
- Appendix II provides information on the Massachusetts Drought Management Plan (DMP).

TEMPERATURE

Monthly average temperatures were mostly near normal across the state.

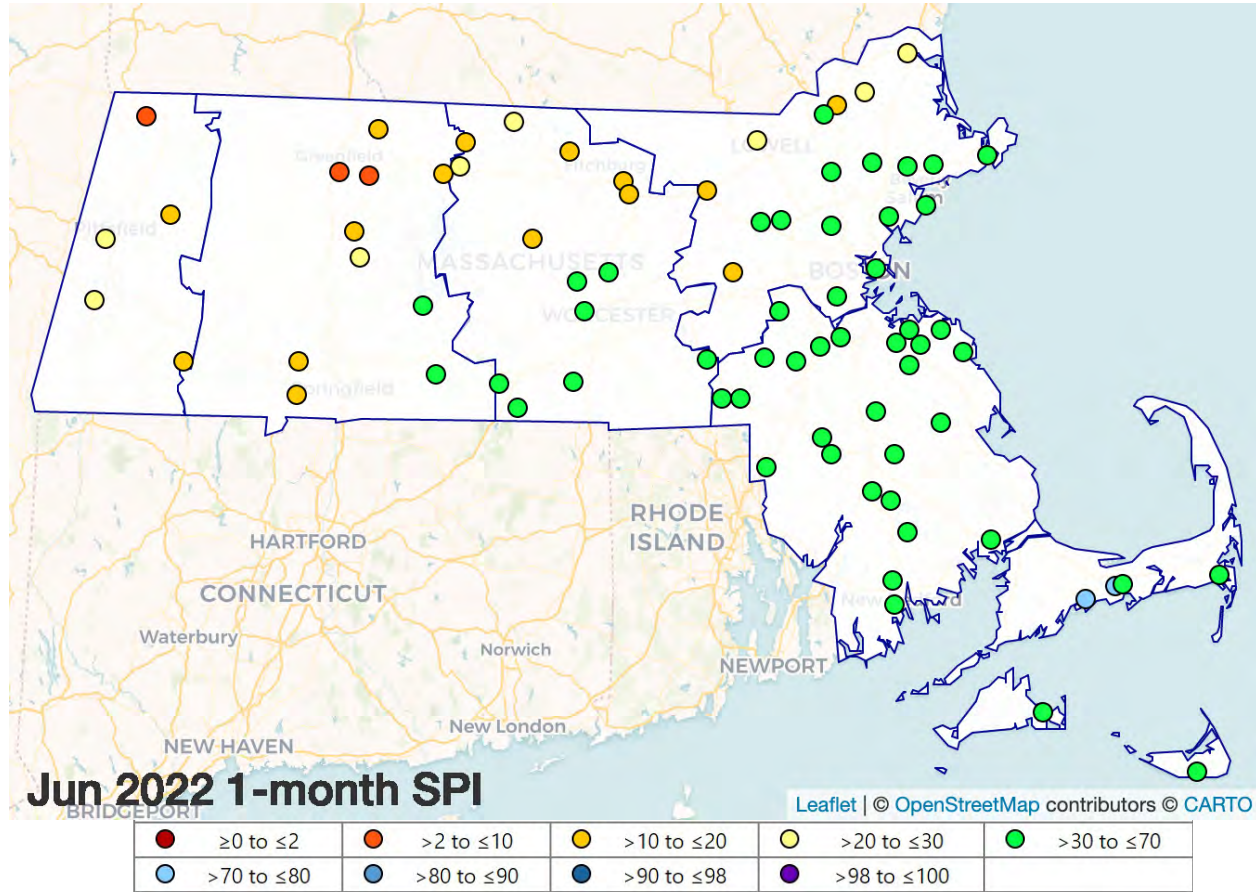
<http://www.nrcc.cornell.edu/regional/monthly/monthly.html>



PRECIPITATION

June precipitation varied across the state. The Western and CTRV Regions were below normal for the month. The Central and Northeast regions were overall normal, but with areas of below-normal precipitation. Combined with May’s deficits, all Regions are showing elevated Index Severity Levels for the two-month look-back period except for the Cape Cod and the Islands Regions. In addition to the table below, Appendix I provides the 2-month and all other look-back periods.

Standardized Precipitation Index as a Percentile



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	5	2.73	-1.67	17	37	35
CTRV	10	2.12	-1.91	16	20	23
CENTRAL	14	2.58	-1.38	31	19	36
NORTHEAST	19	2.46	-1.11	38	17	20
SOUTHEAST	25	3.21	-0.50	51	15	26
CAPE COD	4	4.15	0.93	70	31	53
ISLANDS	2	2.32	-0.56	51	32	38

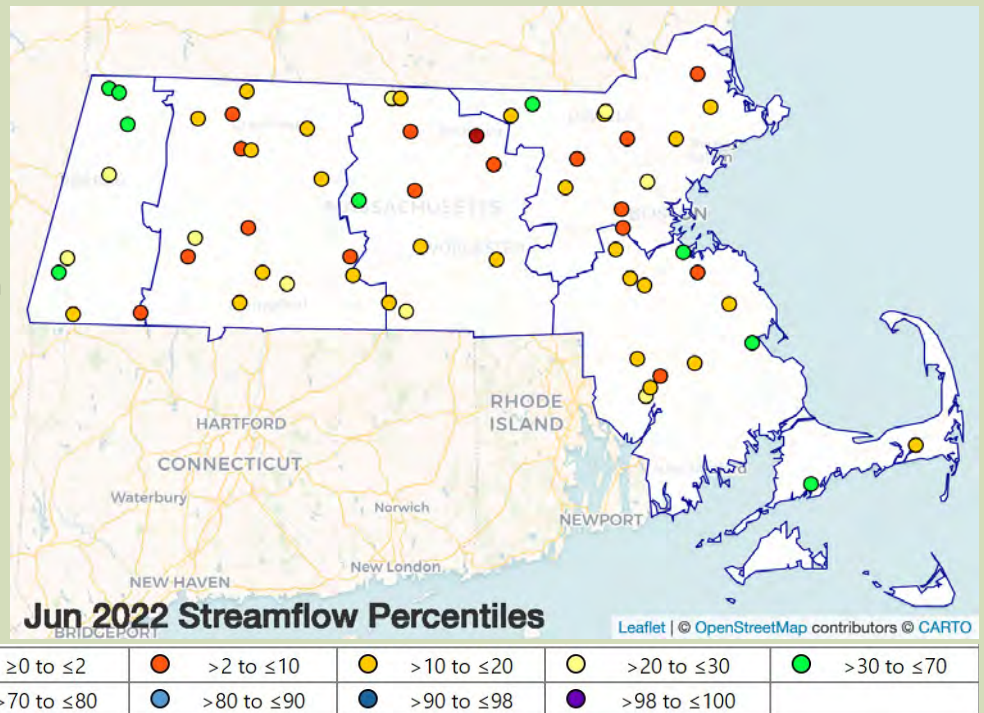
SPI is the Standardized Precipitation Index used in the Drought Management Plan (DMP) expressed here as a percentile and represents the variation, in standard deviations, from long-term precipitation averages.

DMP Index Severity Levels			
1	2	3	4

STREAMFLOW

Median Monthly Streamflow Percentiles Compared to Historical Values

During June, most percentiles of individual streamflow gages were in the below-normal range across the state with relatively few gages in the normal range. Regional monthly streamflow medians were below normal for all regions except the Cape Cod Region, which was at the low end of normal.



REGION	NUMBER OF GAGES REPORTING	≥ 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	1	1	2	0	29
CTRV	15	0	5	8	2	0	13
CENTRAL	11	1	3	4	2	0	13
NORTHEAST	13	0	5	5	2	0	11
SOUTHEAST	12	0	2	7	1	0	17
CAPE COD	2	0	0	1	0	0	33

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

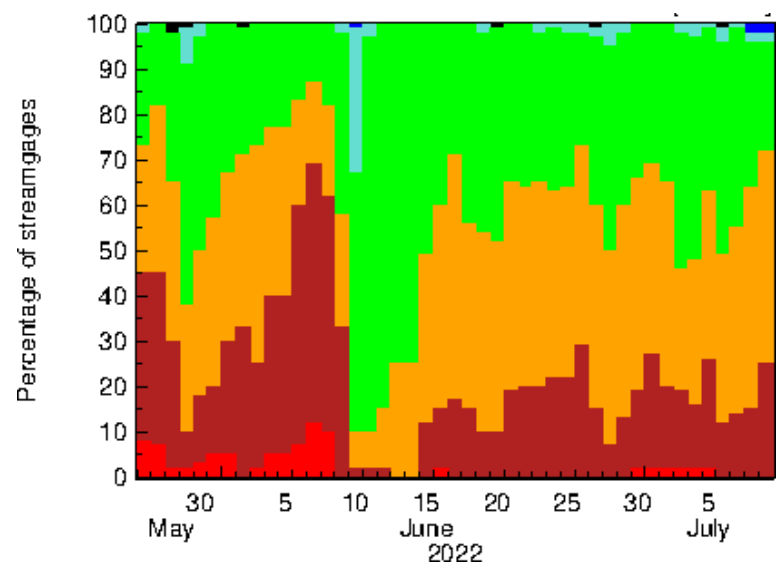
DMP Index Severity Levels			
1	2	3	4

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>

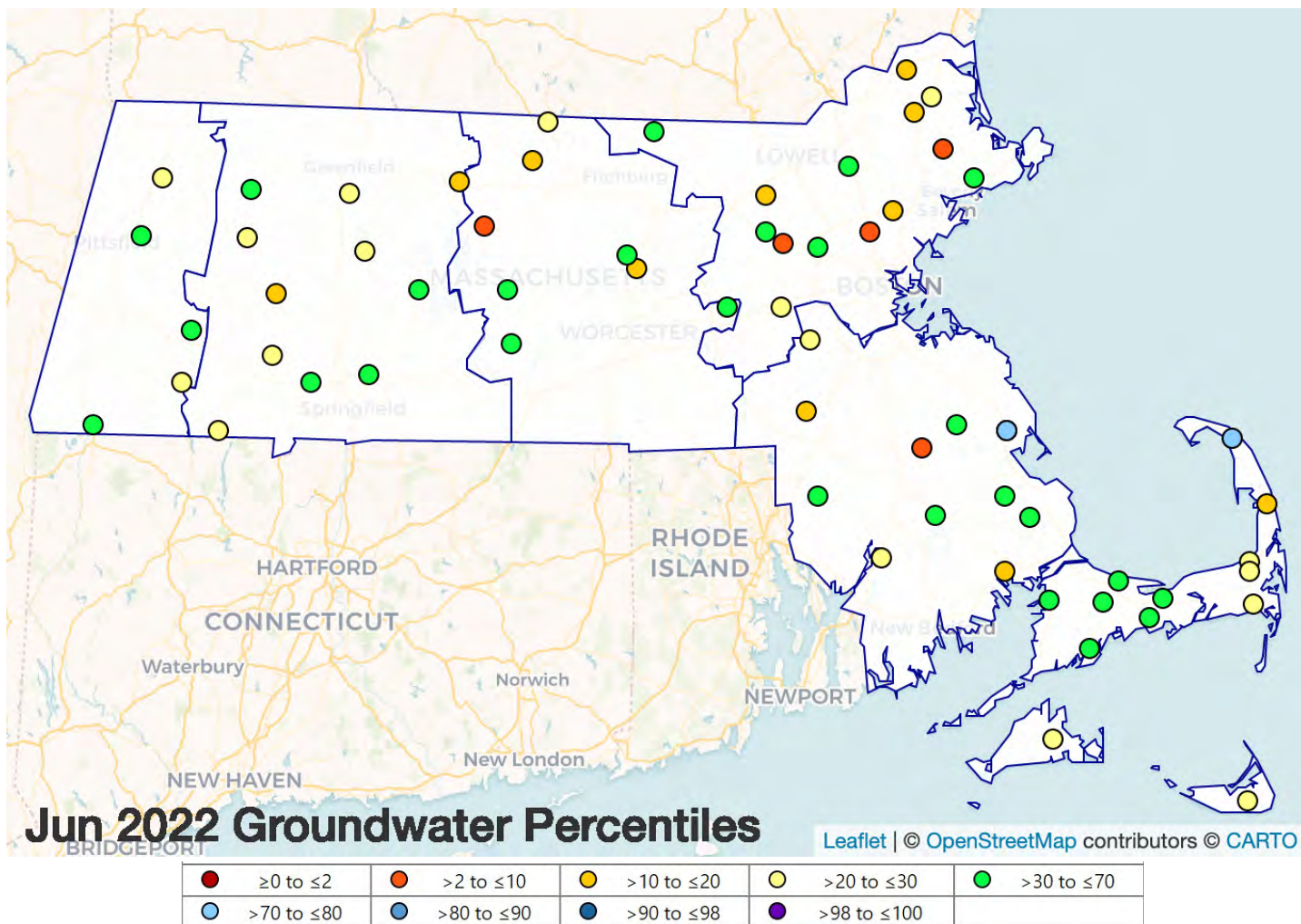
Explanation - Percentile classes							
Low	<10	10-24	25-75	76-90	>90	High	No Data
	Much below normal	Below normal	Normal	Above normal	Much above normal		



GROUNDWATER

Percentiles of individual groundwater wells varied across the state from below normal to a couple that were above normal. The CTRV, Central, Northeast, and Islands Regions are at Index Severity Level 1.

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



REGION	NUMBER OF WELLS REPORTING	≥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	2	0	39
CTRV	11	0	0	2	5	0	23
CENTRAL	8	0	1	2	1	0	29
NORTHEAST	14	0	3	4	2	0	21
SOUTHEAST	12	0	1	2	2	0	36
CAPE COD	11	0	0	1	3	0	36
ISLANDS	2	0	0	0	2	0	24

DMP Index Severity Levels			
1	2	3	4

LAKE AND IMPOUNDMENTS

REGION	NUMBER OF SITES REPORTING	MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT FULL
WESTERN	1	71st
CTRV	2	33rd
CENTRAL	5	24th
NORTHEAST	5	20th
SOUTHEAST	2	54th
CAPE COD	1	32nd

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

At the end of June, lake and impoundment levels varied across the state with some levels below their 30th percentile. Regionally, the Central Region is at Index Severity Level 1 and the Northeast Region is at Level 2.

DMP Index Severity Levels			
1	2	3	4

REGION	NUMBER OF SITES REPORTING	HIGHEST OF SITE VALUES
WESTERN	3	268
CTRV	6	358
CENTRAL	5	394
NORTHEAST	4	330
SOUTHEAST	7	324
CAPE COD	2	89
ISLANDS	2	101

KEETCH BYRAM DROUGHT INDEX (KBDI)

At the end of June, KBDI values were above 200 in all drought regions except the Cape Cod and the Islands. The Western, CTRV, Central, Northeast, and Southeast Regions are at Index Severity Level 1.

EVAPOTRANSPIRATION (ET) INDEX

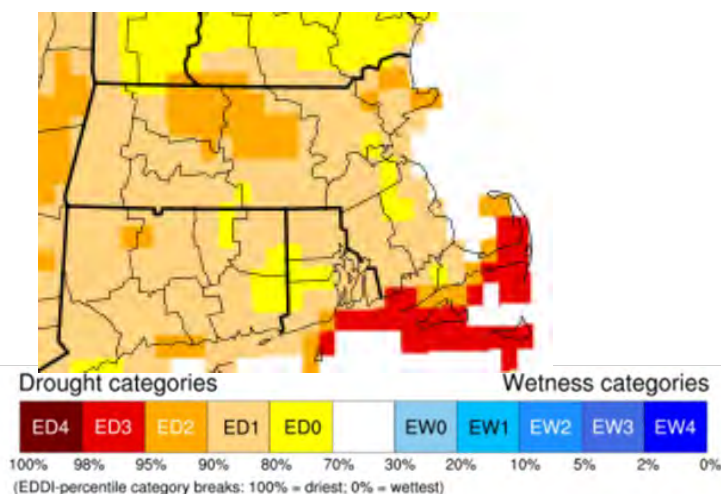
Crop Moisture Index (CMI) - 2019 Drought Management Plan

All CMI values were in the Slightly Dry/Favorably Moist range. All regions are at Index Severity Level 0.

https://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

Evaporative Demand Drought Index (EDDI) - proposed 2022 Drought Management Plan

The 1-month EDDI shows elevated ET across the state.

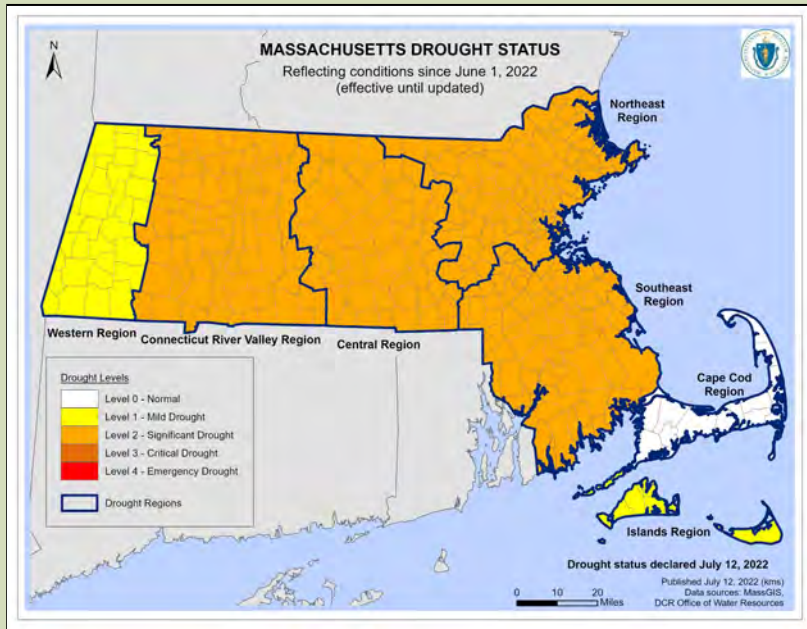


Map dated July 3rd

SNOWFALL

Reported seasonally.

DROUGHT CONDITIONS AND FORECASTS



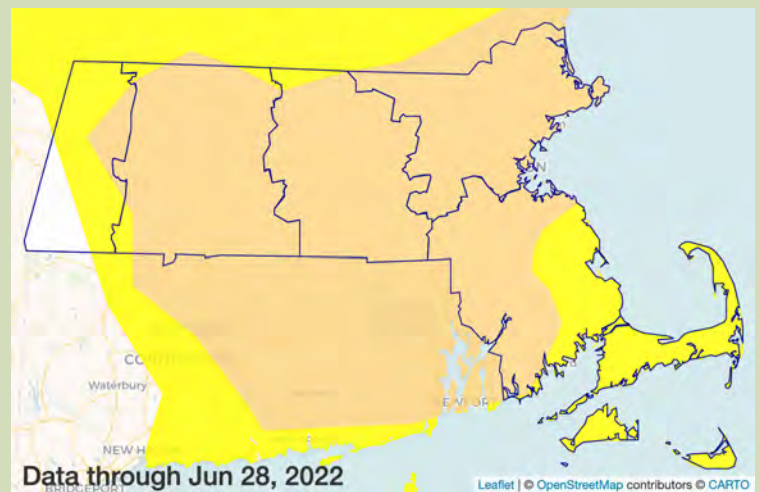
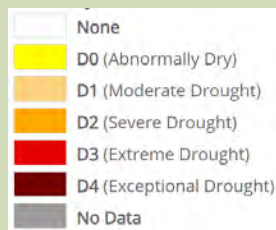
Massachusetts Drought Status

On July 12, 2022 Massachusetts Energy and Environmental Affairs Secretary Bethany A. Card declared a Level 1-Mild Drought in the Western and Islands Regions and a Level 2-Significant Drought in the Connecticut River Valley, Central, Northeast, and Southeast Regions. The Cape Cod Region is at Level 0-Normal Conditions. This status remains in effect until further updated.

U.S. Drought Monitor (USDM)

At the end of June, the USDM showed areas of D0 and D1 drought conditions in Massachusetts. These are equivalent to Massachusetts Drought Levels 1 and 2, respectively.

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

July: The outlook issued 6/30 shows a 40-50% chance of above-normal temperatures for the southeastern parts of MA and 33-40% for the rest of the state. For precipitation, there is a 33-40% chance of above-normal precipitation for the southeastern parts and equal chances of below-normal, normal, or above-normal precipitation for the rest of the state.

July through September: The outlook issued 6/16 shows a 60-70% chance of above-normal temperatures and a 33-40% chance for above-normal precipitation. <https://www.cpc.ncep.noaa.gov/>

Monthly and Seasonal Drought Outlook

The monthly outlook for July released on 6/30 shows drought removal likely in the western part of southeastern MA and drought persisting in the northeastern, central, and CTRV areas of the state. The seasonal outlook for July through September issued on 6/30 shows drought removal likely.

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

This report was prepared by the Massachusetts Department of Conservation and Recreation. Data may be preliminary. Analysis reflects automated calculations done 7/10/2022. Additional information, previous reports, and the Massachusetts Drought Dashboard with weekly updates to the drought indices can be found at: <https://www.mass.gov/drought-monitoring>

APPENDIX I – ADDITIONAL PRECIPITATION DATA

Standardized Precipitation Index—June 2022 as percentiles

REGION	NUMBER OF SITES	1-mo	2-mo	3-mo	6-mo	9-mo	12-mo	24-mo	36-mo
WESTERN	5	17	16	37	35	51	96	82	71
CTRV	10	16	15	20	23	31	86	70	64
CENTRAL	14	31	15	19	36	38	91	78	77
NORTHEAST	19	38	13	17	20	23	85	73	84
SOUTHEAST	25	51	19	15	26	27	79	60	66
CAPE COD	4	70	51	31	53	48	76	41	37
ISLANDS	2	51	53	32	38	20	44	20	40

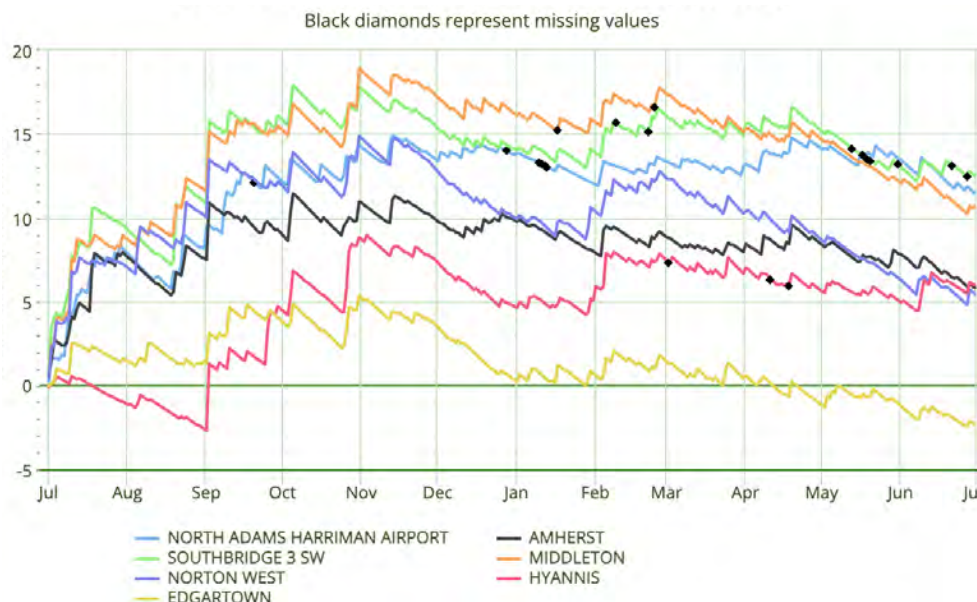
DMP Index Severity Levels			
1	2	3	4

Percent of Average Historical Precipitation—June 2022

REGION	NUMBER OF SITES REPORTING	HISTORICAL AVERAGE	JUNE AVERAGE (IN)	DEPARTURE FROM HISTORICAL AVERAGE (IN)	PERCENT OF NORMAL
WESTERN	5	4.40	2.73	-1.67	62%
CTRV	10	4.03	2.12	-1.91	53%
CENTRAL	14	3.96	2.58	-1.38	65%
NORTHEAST	19	3.57	2.46	-1.11	69%
SOUTHEAST	25	3.71	3.21	-0.50	87%
CAPE COD	4	3.22	4.15	0.93	129%
ISLANDS	2	2.88	2.32	-0.56	81%

Accumulated Precipitation Departure from Normal in Inches

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

