

MASSACHUSETTS WATER RESOURCES COMMISSION

HYDROLOGIC CONDITIONS
IN MASSACHUSETTS

OCTOBER
2022



The Commonwealth of Massachusetts
Charles D. Baker, Governor

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

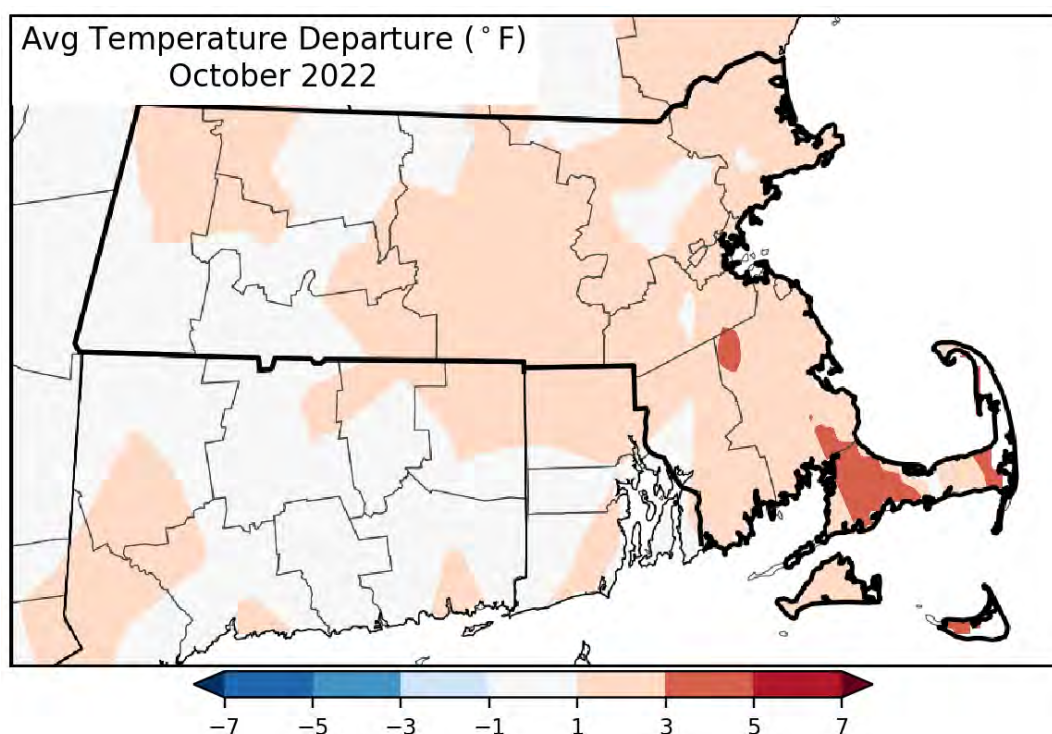
OCTOBER 2022 HYDROLOGIC CONDITIONS SUMMARY OF CONDITIONS

- Monthly average temperatures were normal to above normal.
- Precipitation was mostly normal to above normal. Index Severity Levels (ISL) remain elevated at look-back periods beyond 3-month for several Regions.
- Streamflow varied with some gages still below normal. Monthly regional medians were only elevated for the Cape Cod Region at ISL 1.
- Groundwater levels ranged from below normal to above normal. The Cape Cod Regions is at ISL 1 and the Islands Region is at ISL 2.
- Lake and impoundment levels varied across the state with levels below the 30th percentile. The CTRV, Northeast, and Cape Cod Regions are at elevated Index Severity Levels.
- The Keetch-Byram Drought Index at the end of October was only elevated in the Northeast Region at ISL 1.
- The Evaporative Demand Drought Index for October was elevated in the Western Region.
- NOAA's November outlook shows chances likely for above-normal temperatures and chances leaning for below-normal precipitation.
- NOAA's 3-month outlook shows chances leaning for above-normal temperatures and equal chances for below-normal, normal, or above-normal precipitation.
- Appendix II provides information on the Massachusetts Drought Management Plan (DMP).

TEMPERATURE

Monthly average temperatures were normal to above normal across the state.

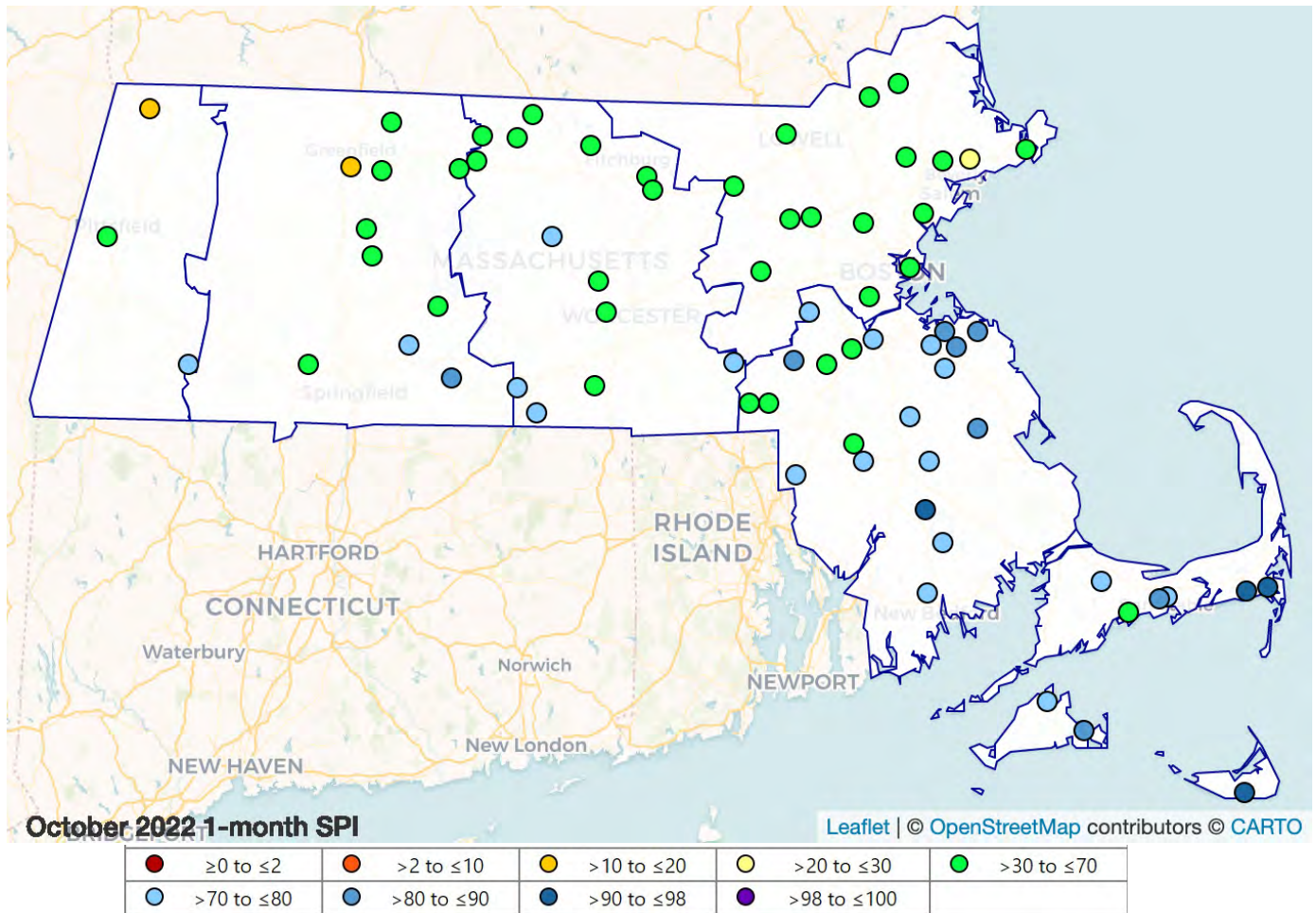
<http://www.nrcc.cornell.edu/regional/monthly/monthly.html>



PRECIPITATION

October precipitation was mostly normal to above normal. Most stations in the Southeast, Cape Cod, and Islands Regions received above-normal precipitation. While the above-normal precipitation furthered drought improvement in these Regions as well as areas with normal precipitation, longer look-back periods are still showing deficits. Index Severity Levels remain elevated at look-back periods beyond the 3-month for several Regions. In addition to the table below, Appendix I provides all look-back periods.

Standardized Precipitation Index (SPI) as a Percentile



REGION	NUMBER OF SITES REPORTING	OCTOBER MONTHLY AVERAGE (IN)	DEPARTURE FROM HISTORICAL (IN)	SPI PERCENTILE 1-MONTH	SPI PERCENTILE 3-MONTH	SPI PERCENTILE 6-MONTH
WESTERN	3	3.99	0.01	70	46	20
CTRV	10	3.88	0.02	50	59	27
CENTRAL	14	4.48	0.36	61	66	38
NORTHEAST	15	3.84	-0.02	57	35	9
SOUTHEAST	21	6.16	1.84	74	76	33
CAPE COD	6	7.15	2.84	81	58	37
ISLANDS	3	6.66	2.66	85	56	53

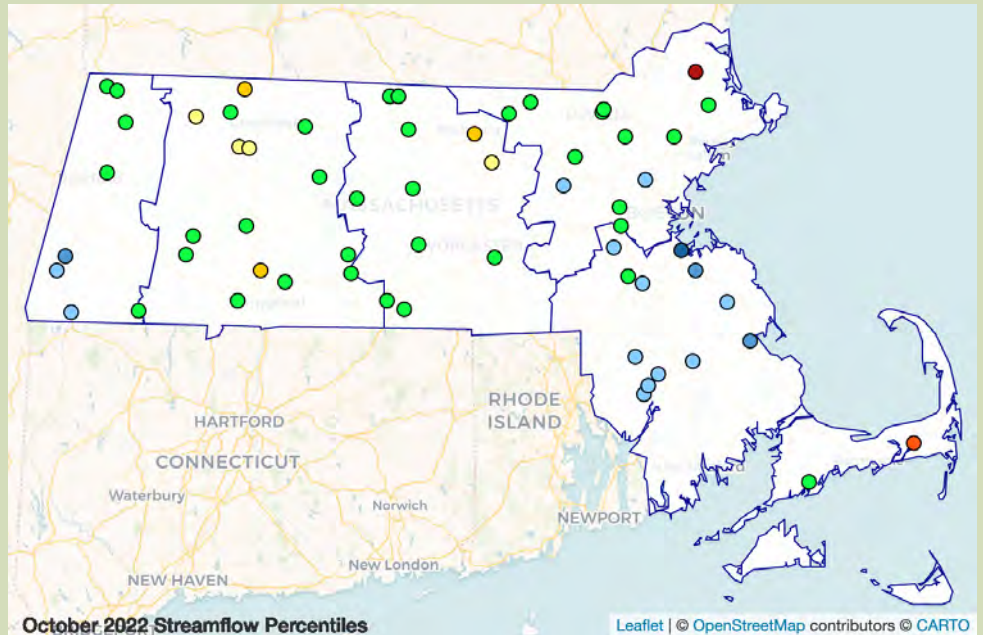
SPI is the Standardized Precipitation Index used in the Drought Management Plan (DMP) expressed here as a percentile and represents the variation, in standard deviations, from long-term precipitation averages.

DMP Index Severity Levels			
1	2	3	4

STREAMFLOW

Median Monthly Streamflow Percentiles Compared to Historical Values

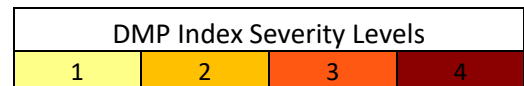
During October, percentiles of individual streamflow gages varied across the state from significantly below normal to above normal. Overall streamflow improved during October, but monthly percentiles were in the below-normal range for gages in the Northeast, Central, CTRV, and Cape Cod Regions. The Cape Cod Region is at Index Severity Level 1, the only elevated region .



● ≥ 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 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	0	0	0	0	61
CTRV	15	0	0	2	3	0	44
CENTRAL	11	0	0	1	1	0	53
NORTHEAST	13	1	0	0	0	0	53
SOUTHEAST	12	0	0	0	0	1	77
CAPE COD	2	0	1	0	0	0	28

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

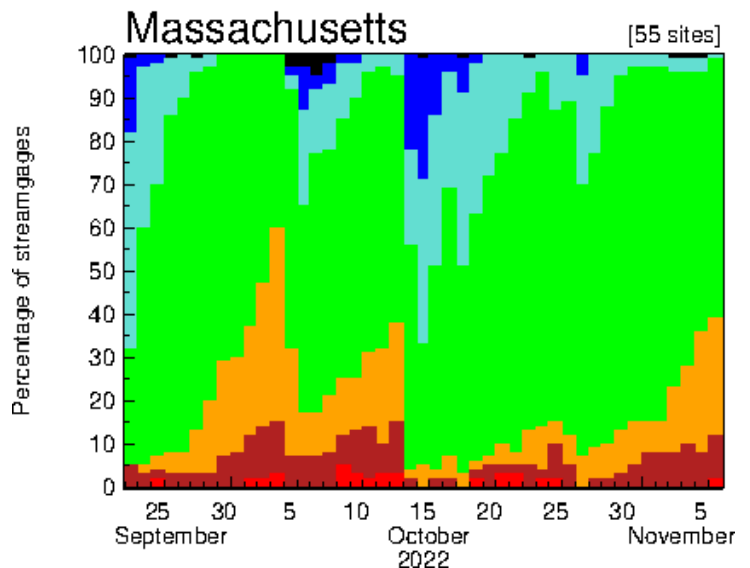


Time Series of the Percent of Gages at Their Respective Percentile Flows for Average Daily Streamflows Compared to Historical Values

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

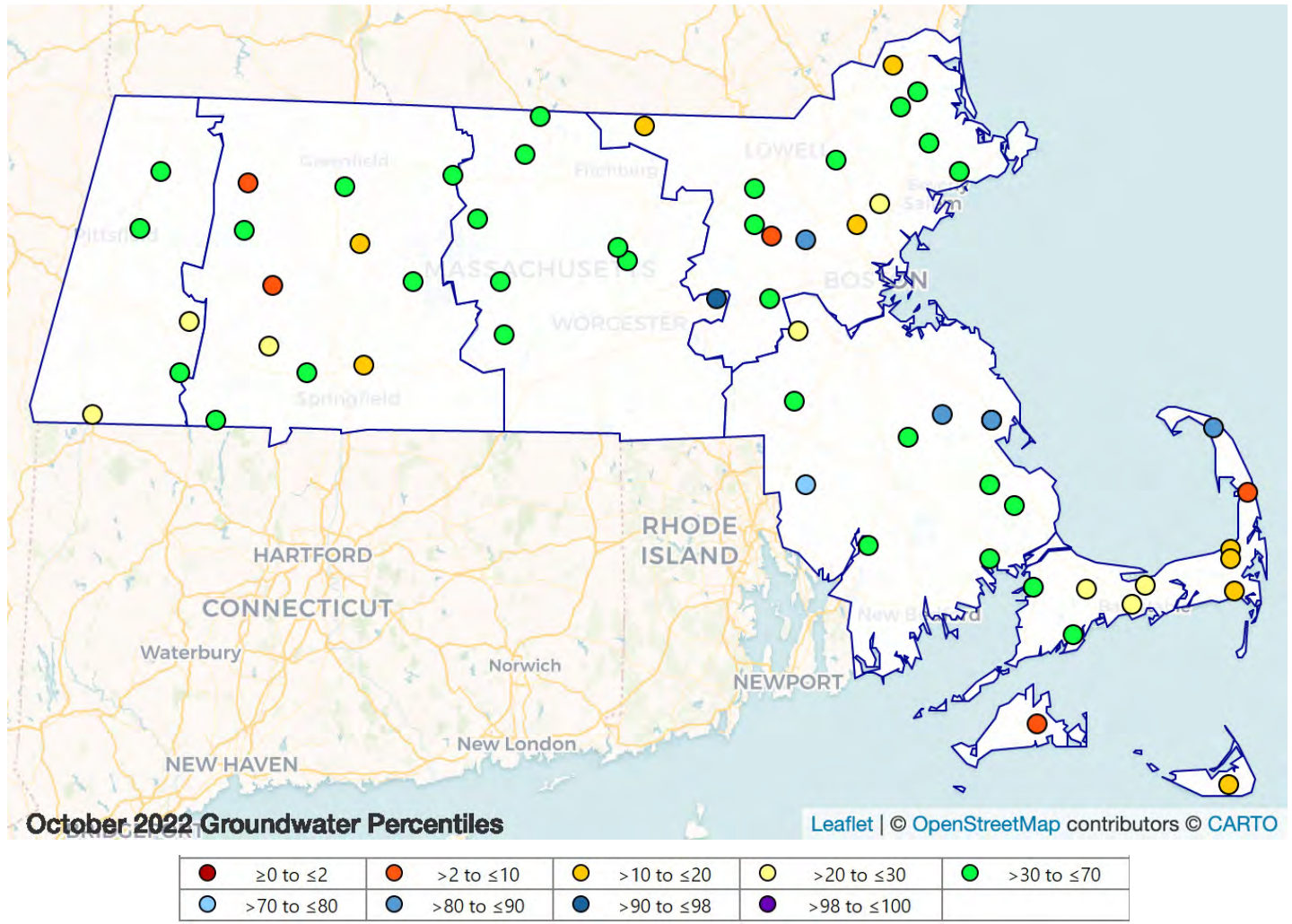
<https://waterdata.usgs.gov/nwis/sw>

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

October groundwater levels ranged across the state from below normal to above normal. Regional medians of individual well percentiles improved as compared to September in all Regions except the Western and Islands Regions. The Cape Cod Region remains at Index Severity Level 1 and the Islands Region remains at Index Severity Level 2.



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	34
CTRV	11	0	2	2	1	0	37
CENTRAL	8	0	0	0	0	1	49
NORTHEAST	14	0	1	3	1	0	34
SOUTHEAST	11	0	0	0	1	0	63
CAPE COD	10	0	1	3	3	0	23
ISLANDS	2	0	1	1	0	0	12

DMP Index Severity Levels			
1	2	3	4

LAKES AND IMPOUNDMENTS

REGION	NUMBER OF SITES REPORTING	MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT FULL
WESTERN	2	45th
CTRV	2	13th
CENTRAL	5	44th
NORTHEAST	6	22nd
SOUTHEAST	2	39th
CAPE COD	1	26th

At the end of October, many lake and impoundment levels were below their 30th percentile. The CTRV, Northeast, and Cape Cod Regions are at elevated Index Severity Levels.

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

DMP Index Severity Levels			
1	2	3	4

REGION	NUMBER OF SITES REPORTING	HIGHEST OF SITE VALUES
WESTERN	3	56
CTRV	5	30
CENTRAL	4	197
NORTHEAST	3	346
SOUTHEAST	5	146
CAPE COD	2	21
ISLANDS	2	22

KEETCH-BYRAM DROUGHT INDEX (KBDI)

At the end of October, KBDI values had fallen across much of the state. The Northeast Region is at an elevated Index Severity Level of 1.

EVAPOTRANSPIRATION (ET) INDEX

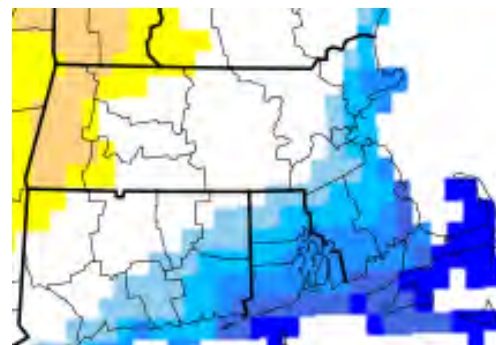
Crop Moisture Index (CMI) - 2019 Drought Management Plan

At the end of October CMI values were in the Slightly Dry/Favorably Moist range across the western and central parts of the state, and Abnormally Moist in the eastern part. All Drought Regions are at Index Severity Level 0.

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

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

The 1-month EDDI shows areas of elevated ET in the Western Region.



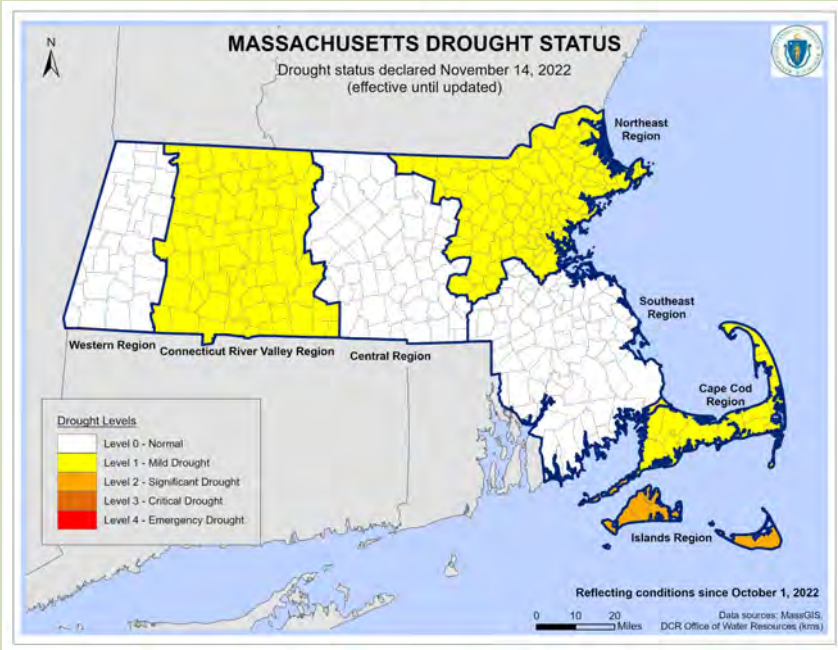
Map dated October 30th



SNOWFALL

Reported seasonally.

DROUGHT CONDITIONS AND FORECASTS



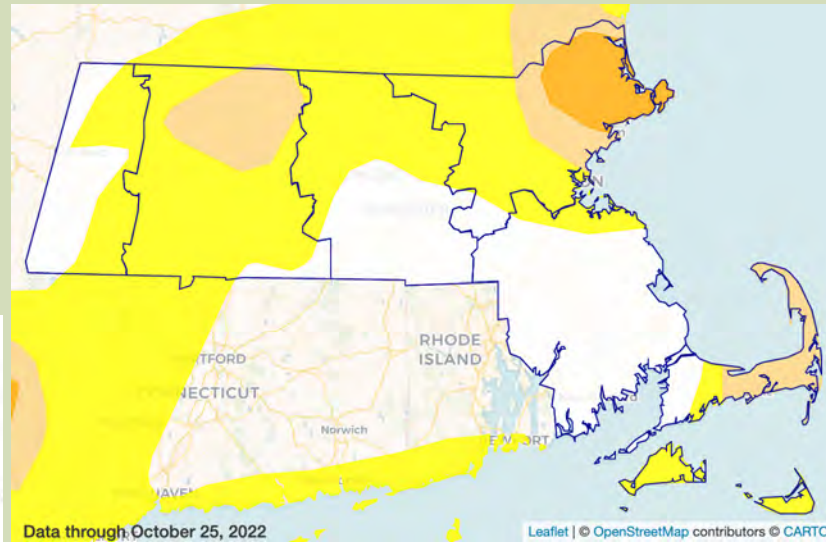
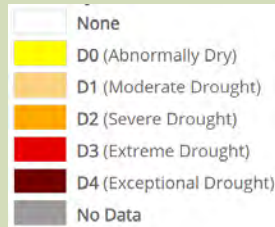
Massachusetts Drought Status

On November 14th Massachusetts Energy and Environmental Affairs (EEA) Secretary Bethany A. Card declared a Level 0 Normal Conditions for the Western, Central, and Southeast Regions; Level 1 Mild Drought for the CTRV, Northeast, and Cape Cod Regions; and Level 2 Significant Drought for the Island Regions. This status remains in effect until further updated.

U.S. Drought Monitor (USDM)

At the end of October, the USDM showed areas of D0, D1, and D2 drought conditions in Massachusetts. These are equivalent to Massachusetts Drought Levels 1, 2, and 3.

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

November: The outlook issued 10/31 shows a 50-60% chance of above-normal temperatures for the western part of the state, and 60-70% chance of above-normal temperatures for the eastern part. There is a 33-40% chance of below-normal precipitation.

November through January: The outlook issued 10/20 shows a 33-40% chance of above-normal temperatures for the western part of the state, and a 40-50% chance of above-normal temperatures for the eastern part. There are equal chances for above-normal, normal, or below-normal precipitation. <https://www.cpc.ncep.noaa.gov/>

Monthly and Seasonal Drought Outlook

The monthly outlook for November released on 10/31 shows drought persisting in the northeast around Essex County and the Connecticut River Valley along the state line. The seasonal outlook for November through January issued on 10/31 shows drought removal likely in the areas mentioned in the monthly outlook.

<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 11/07/2022. 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—October 2022 as percentiles

REGION	NUMBER OF SITES	1-mo	2-mo	3-mo	6-mo	9-mo	12-mo	24-mo	36-mo
WESTERN	3	70	71	46	20	45	35	83	69
CTRV	10	50	78	59	27	42	28	75	64
CENTRAL	14	61	81	66	38	47	31	84	74
NORTHEAST	15	57	56	35	9	12	6	62	68
SOUTHEAST	21	74	80	76	33	34	20	73	64
CAPE COD	6	81	75	58	37	28	15	44	28
ISLANDS	3	85	77	56	53	34	16	34	22

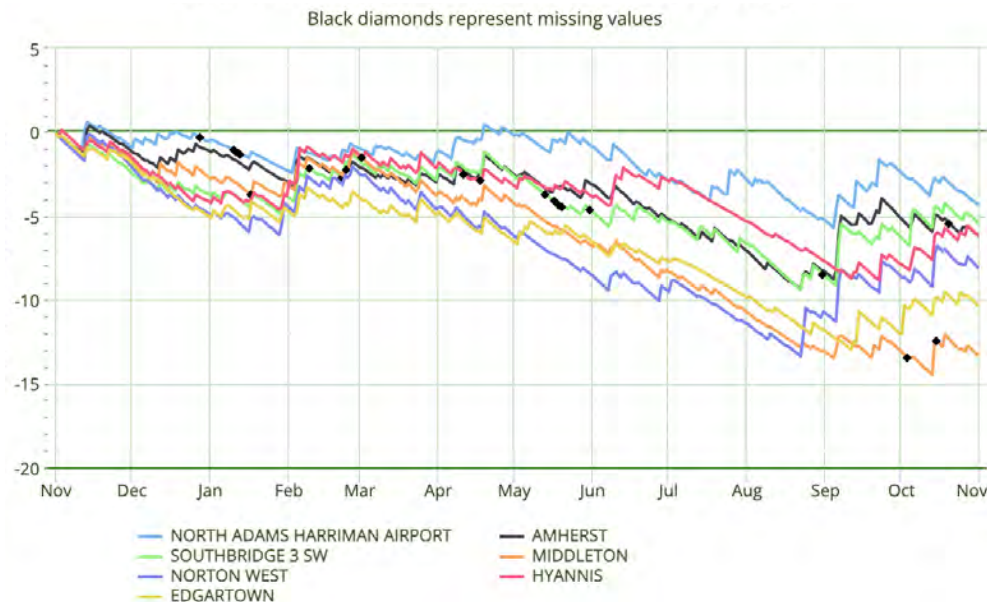
DMP Index Severity Levels			
1	2	3	4

Percent of Average Historical Precipitation—October 2022

REGION	NUMBER OF SITES REPORTING	HISTORICAL AVERAGE	OCTOBER AVERAGE (IN)	DEPARTURE FROM HISTORICAL AVERAGE (IN)	PERCENT OF NORMAL
WESTERN	3	3.98	3.99	0.01	100%
CTRV	10	3.86	3.88	0.02	101%
CENTRAL	14	4.12	4.48	0.36	109%
NORTHEAST	15	3.86	3.84	-0.02	99%
SOUTHEAST	21	4.32	6.16	1.84	143%
CAPE COD	6	4.31	7.15	2.84	166%
ISLANDS	3	4.00	6.66	2.66	167%

Accumulated Precipitation Departure from 30-Year Normals 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

