

MASSACHUSETTS WATER RESOURCES COMMISSION

JANUARY
2023 **HYDROLOGIC CONDITIONS
IN MASSACHUSETTS**



The Commonwealth of Massachusetts
Maura T. Healey, Governor
Rebecca L. Tepper, Secretary, Executive Office of Energy and Environmental Affairs

JANUARY 2023 HYDROLOGIC CONDITIONS

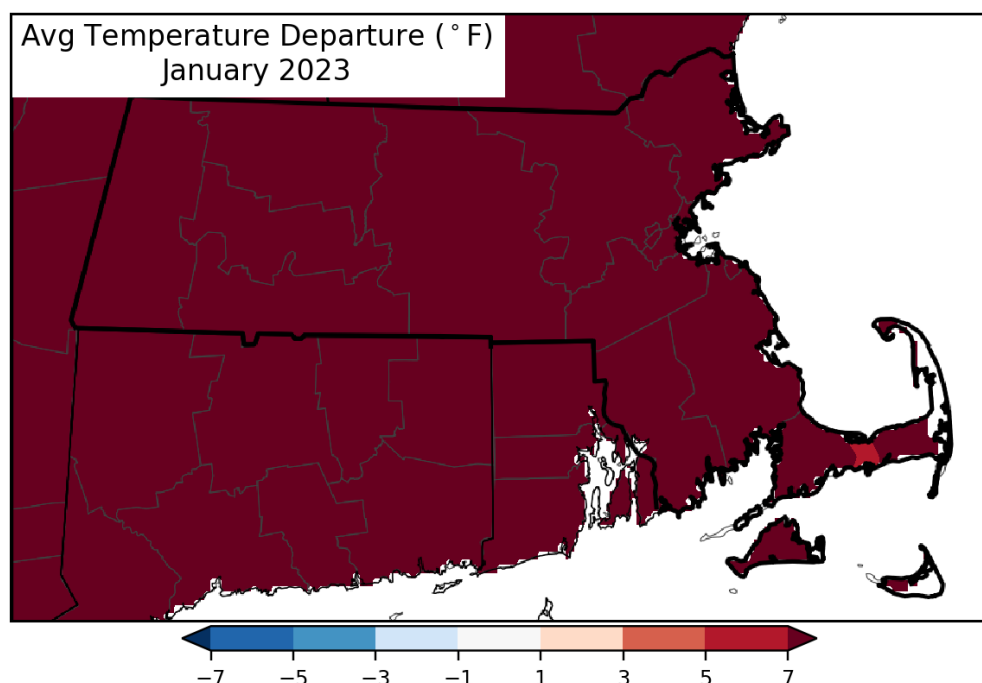
SUMMARY OF CONDITIONS

- Monthly average temperatures were above normal.
- Precipitation was significantly above normal in January. Index Severity Levels (ISLs) are normal for lookback periods through the 6-month time frame for all Regions.
- Streamflow was significantly above normal in all Regions except for Cape Cod, which was in the normal range.
- Groundwater levels ranged from below normal to above normal. The Islands Region is at ISL 1.
- Lake and impoundment levels were above their 30th percentiles except for a water body in the Cape Cod Region, which remained at ISL 2.
- Keetch Byram Drought Index and Evapotranspiration Index are outside of their reporting seasons.
- Seasonal snowfall is below average across the state. At the end of January, snow cover remained in the Western Region and the northern parts of the CTRV and Central Regions.
- NOAA's February outlook shows chances leaning for above-normal temperatures, chances leaning for above-normal precipitation in the wester half of the state, and equal chances for below-normal, normal, or above-normal precipitation in the eastern half.
- 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 above normal across the state. According to the Northeast Regional Climate Center (NRCC), the Worcester climate site had its warmest January on record, the Boston climate site had its 5th warmest January, and Massachusetts had its warmest January on record.

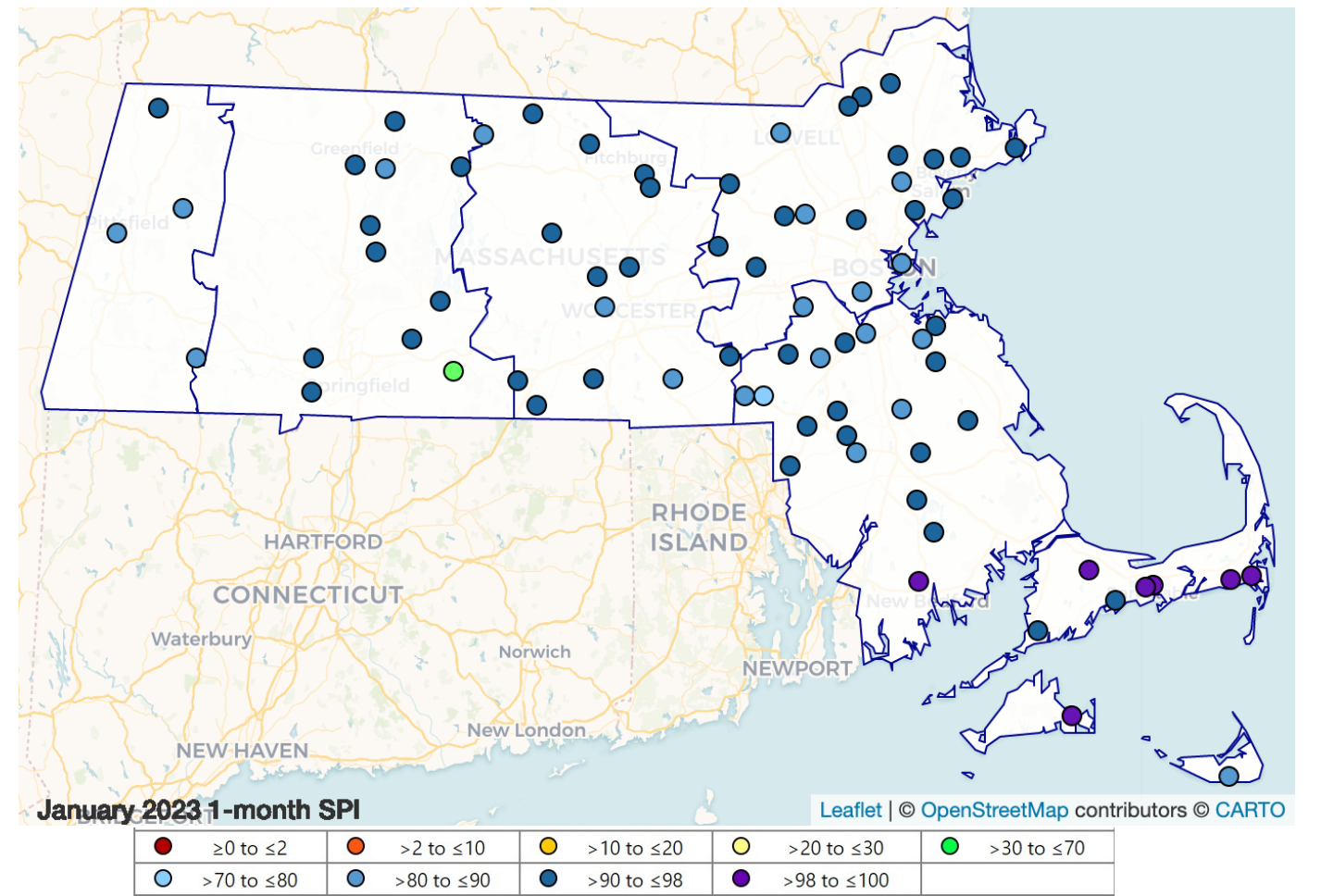
<http://www.nrcc.cornell.edu/regional/monthly/monthly.html>



PRECIPITATION

January precipitation was significantly above normal and no Regions are elevated at the 1-month through 6-month look-back period. According to the NRCC, it was the fourth wettest January on record for Massachusetts. Three longer look-back periods that are monitored are still showing deficits in two Regions and ISLs remain elevated at Level 1 at the 9-month and longer look-back periods. In addition to the table below, Appendix I provides all look-back periods.

Standardized Precipitation Index (SPI) as a Percentile



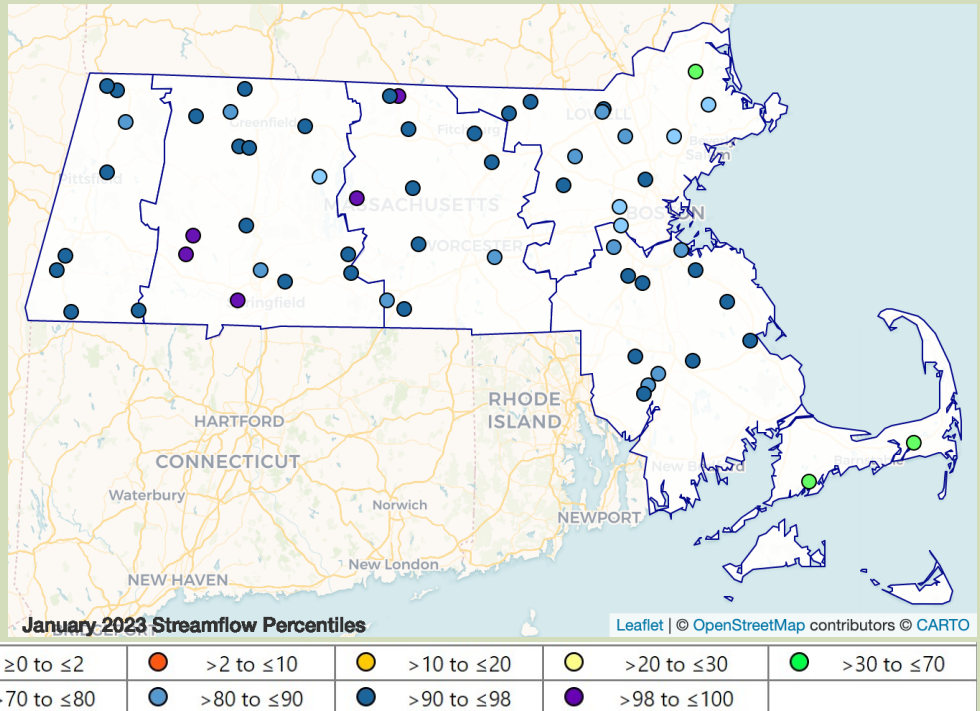
REGION	NUMBER OF SITES REPORTING	JANUARY MONTHLY AVERAGE (IN)	DEPARTURE FROM HISTORICAL (IN)	SPI PERCENTILE 1-MONTH	SPI PERCENTILE 3-MONTH	SPI PERCENTILE 6-MONTH
WESTERN	4	4.80	1.77	90	84	64
CTRV	11	5.69	2.42	92	86	77
CENTRAL	14	6.52	2.91	92	90	82
NORTHEAST	19	6.15	2.62	93	84	59
SOUTHEAST	21	7.11	3.13	93	79	85
CAPE COD	7	9.75	5.71	99	92	91
ISLANDS	2	7.05	3.18	90	68	66

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

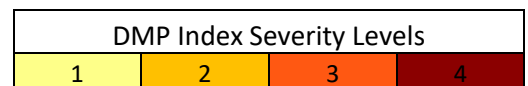
Median Monthly Streamflow Percentiles Compared to Historical Values

During January, percentiles of individual streamflow gages were significantly above normal except for two gages in the Cape Cod Region that were in the normal range.



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	7	97
CTRV	15	0	0	0	0	12	96
CENTRAL	11	0	0	0	0	9	95
NORTHEAST	13	0	0	0	0	5	83
SOUTHEAST	12	0	0	0	0	8	93
CAPE COD	2	0	0	0	0	0	56

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

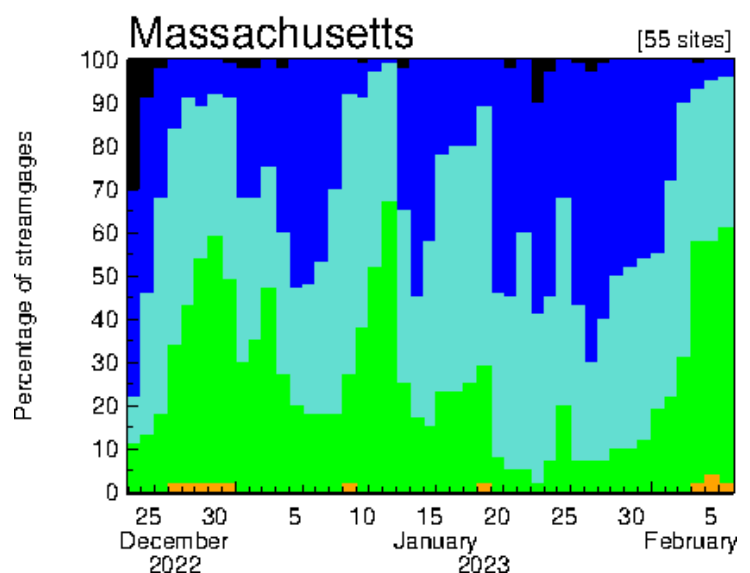


Time Series of the Percent of Gages at Their Respective Percentile Flows for Average Daily Streamflows Compared to Historical Values

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

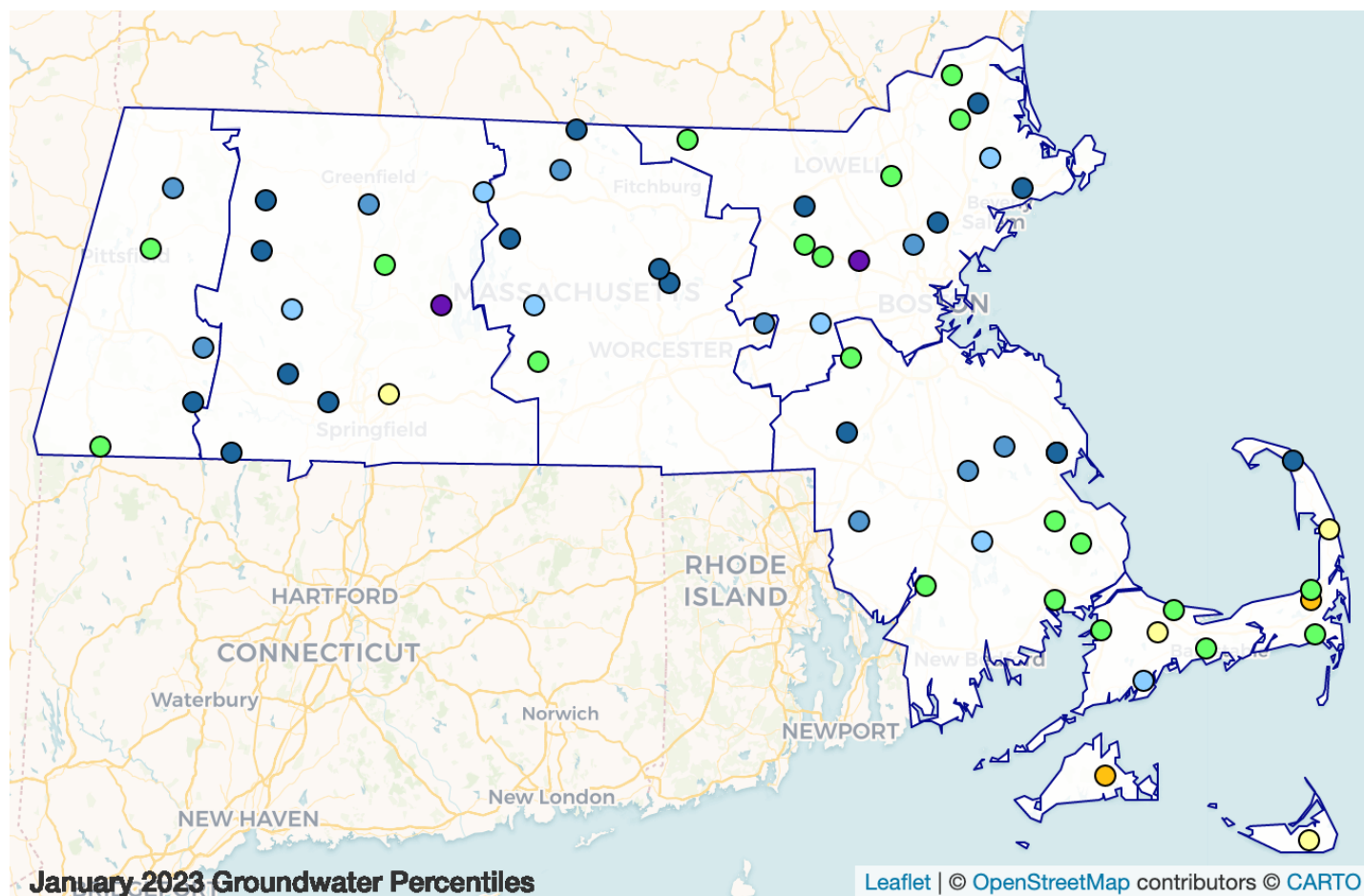
<https://waterdata.usgs.gov/nwis/sw>

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



GROUNDWATER

January groundwater levels ranged across the state from below to above normal. Regional medians of individual well percentiles improved as compared to January in all Regions. All Regions are in the normal range except for the Islands which is at ISL 1.



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	0	1	85
CTRV	11	0	0	0	1	6	91
CENTRAL	8	0	0	0	0	4	88
NORTHEAST	14	0	0	0	0	5	72
SOUTHEAST	12	0	0	0	0	3	78
CAPE COD	10	0	0	1	2	1	53
ISLANDS	2	0	0	1	1	0	22

LAKES AND IMPOUNDMENTS

REGION	NUMBER OF SITES REPORTING	MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT FULL
WESTERN	1	100%
CTRV	2	72nd
CENTRAL	2	69th
NORTHEAST	4	41st
SOUTHEAST	2	94th
CAPE COD	1	17th

At the end of January, lake and impoundment levels were above their 30th percentile except for the one monitored water body in the Cape Cod Region, which remained at ISL 2.

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

DMP Index Severity Levels			
1	2	3	4

KEETCH-BYRAM DROUGHT INDEX (KBDI)

KBDI is reported seasonally.

EVAPOTRANSPIRATION (ET) INDEX

Crop Moisture Index (CMI) - 2019 Drought Management Plan

CMI is reported seasonally. https://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

Evaporative Demand Drought Index (EDDI) - proposed 2023 Drought Management Plan

EDDI is reported seasonally. <https://psl.noaa.gov/eddi>

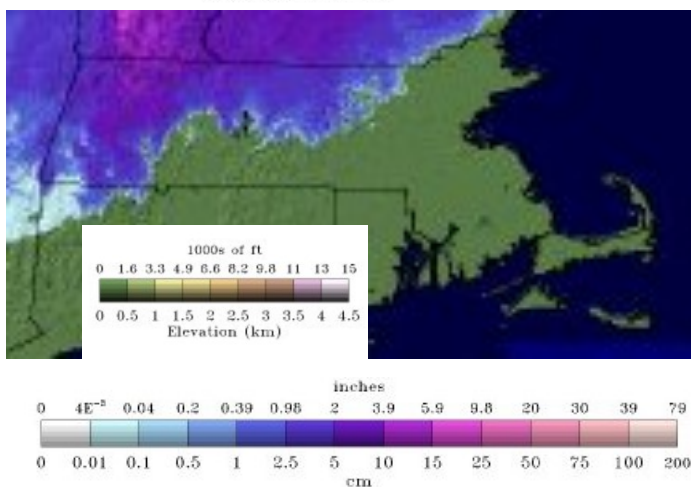
FLOODING According to the NWS E-5 Monthly Report of Hydrologic Conditions for the Boston/Norton service area, on January 25th-26th substantial rainfall fell across southern New England. Antecedent conditions were favorable for areal flooding, and the heavy rainfall over southeastern MA resulted in the Taunton River gage at Bridgewater reaching minor flood stage on January 27th. Impacts were very limited with no reports of flood damage.

SNOWFALL Minimal snow cover remained in the Western and northern parts of the CTRV and Central Regions at the end of the month. Negative snowfall departures exist across the state for the season.

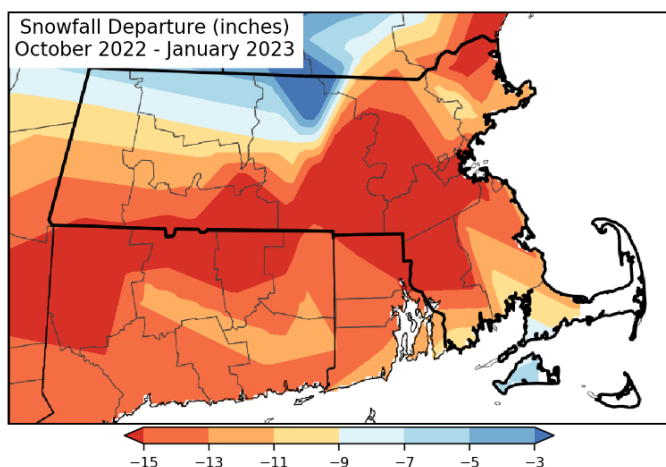
Snow Cover

Snow Water Equivalent

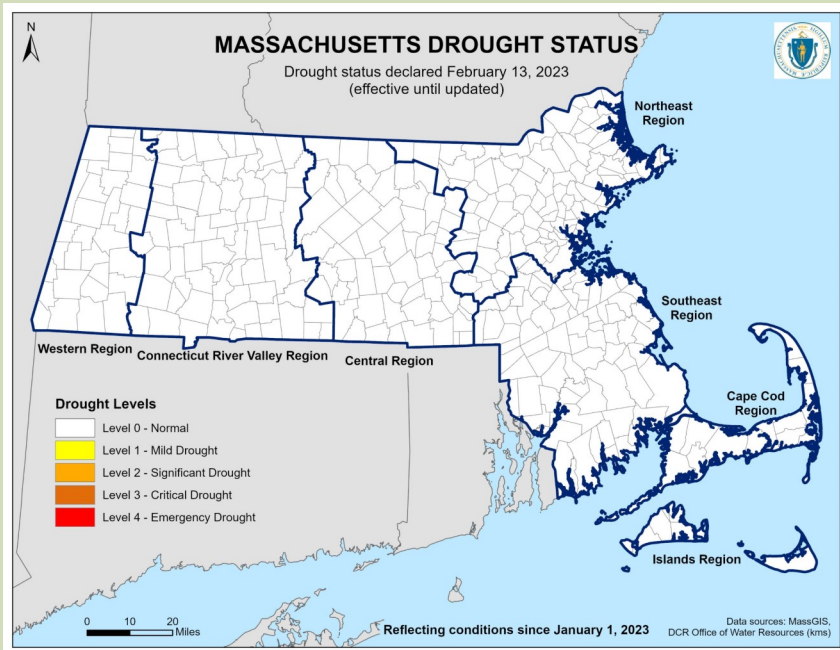
2023-01-31 06 UTC



Season-To-Date Snowfall Departure



DROUGHT CONDITIONS AND FORECASTS



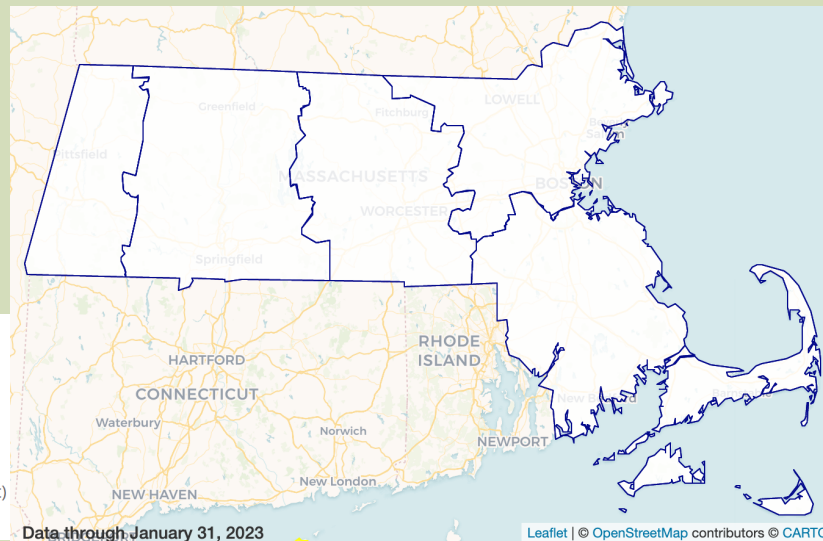
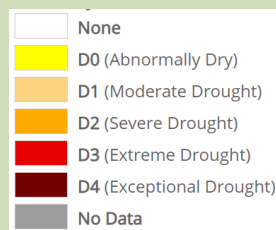
Massachusetts Drought Status

On February 13, 2023 Massachusetts Energy and Environmental Affairs (EEA) Secretary Rebecca L. Tepper declared Level 0 Normal Conditions for the Western, Connecticut River Valley, Central, Northeast, Southeast, Cape Cod, and Islands Regions. This status remains in effect until further updated.

U.S. Drought Monitor (USDM)

At the end of January, the USDM showed no areas of drought.

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

February: The outlook issued 1/31 shows a 33-40% chance for above-normal temperatures. A 33-40% chance of above-normal precipitation is forecasted for the western half of the state, and equal chances for above-normal, normal, or below-normal precipitation in the eastern half.

February through April: The outlook issued 1/19 shows a 33-40% chance of above-normal temperatures and 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 February and the seasonal outlook for January through March both released on 12/31 show no drought development. <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 02/07/2023. 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—January 2023 as percentiles

REGION	NUMBER OF SITES	1-mo	2-mo	3-mo	6-mo	9-mo	12-mo	24-mo	36-mo
WESTERN	4	90	92	84	64	35	57	88	72
CTRV	11	92	92	86	77	50	57	80	69
CENTRAL	14	92	95	90	82	58	62	84	78
NORTHEAST	19	93	96	84	59	26	23	64	75
SOUTHEAST	21	93	94	79	85	56	49	79	73
CAPE COD	7	99	99	92	91	72	65	77	59
ISLANDS	2	90	67	68	66	57	46	49	30

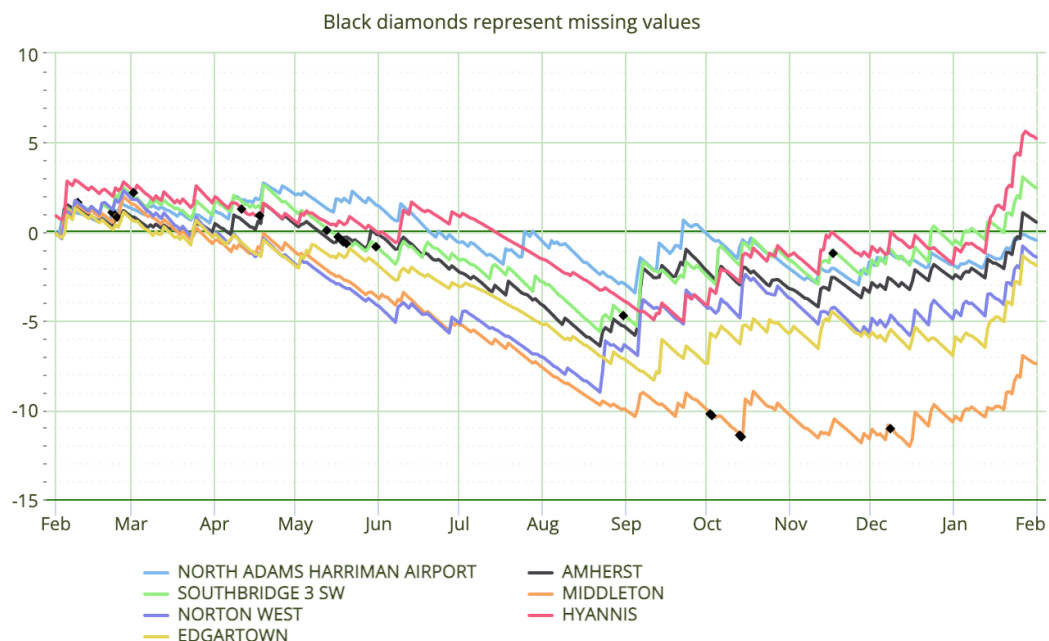
DMP Index Severity Levels			
1	2	3	4

Percent of Average Historical Precipitation—January 2023

REGION	NUMBER OF SITES REPORTING	HISTORICAL AVERAGE	JANUARY AVERAGE (IN)	DEPARTURE FROM HISTORICAL AVERAGE (IN)	PERCENT OF NORMAL
WESTERN	4	3.03	4.80	1.77	158%
CTRV	11	3.27	5.69	2.42	174%
CENTRAL	14	3.61	6.52	2.91	181%
NORTHEAST	19	3.53	6.15	2.62	174%
SOUTHEAST	21	3.98	7.11	3.13	179%
CAPE COD	7	4.04	9.75	5.71	241%
ISLANDS	2	3.87	7.05	3.18	182%

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

