

MASSACHUSETTS WATER RESOURCES COMMISSION



HYDROLOGIC CONDITIONS IN MASSACHUSETTS

MARCH
2024

The Commonwealth of Massachusetts

Maura T. Healey, Governor

*Rebecca L. Tepper, Secretary
Executive Office of Energy and Environmental Affairs*



Photo by Alexander Surreira

MARCH 2024 HYDROLOGIC CONDITIONS

SUMMARY OF CONDITIONS



- Monthly average temperatures were above normal.
- Precipitation was above normal. There was minimal snow cover remaining at the end of March in the western part of the state.



- The Evaporative Demand Drought Index is not reported in March.



- The Keetch-Byram Drought Index is not reported in March.



- Streamflow was above normal across the state except one gage in the Cape Cod Region that was below normal. Three river forecast points reached flood stage.



- Groundwater regional medians ranged from normal to above normal except the Islands Region, which is at Index Severity Level (ISL) 1.



- Lake and impoundment levels were above their 30th percentile and/or were at or near 100% full.



- NOAA's April outlook shows chances leaning for above-normal temperature and precipitation.
- NOAA's 3-month outlook shows chances leaning for above-normal temperatures and equal chances for above-normal, normal, or below-normal precipitation.



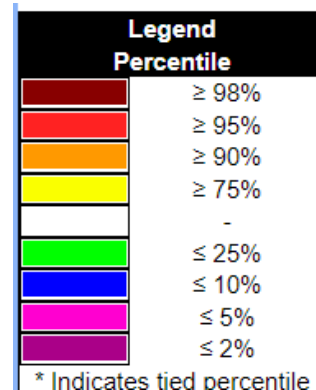
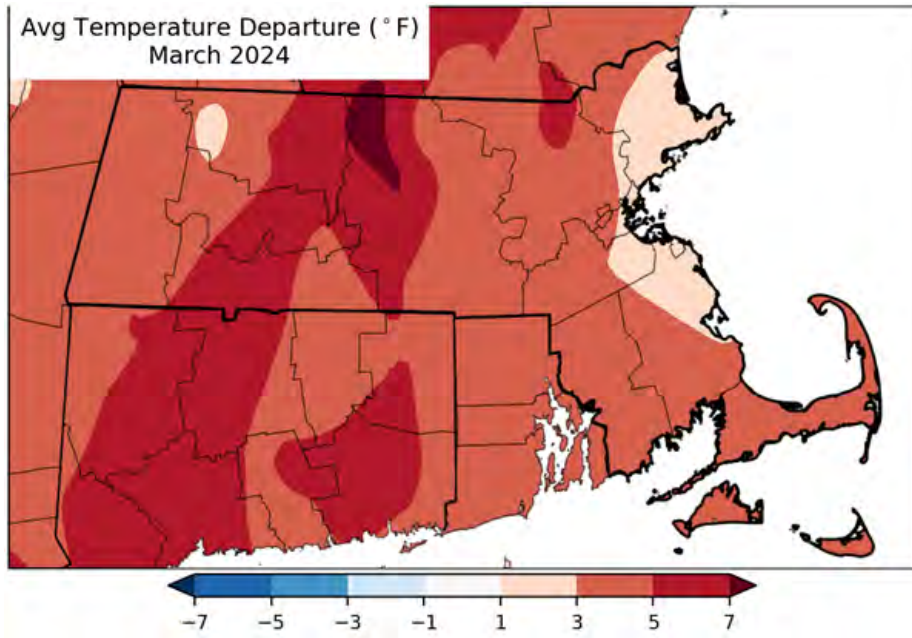
- Appendix II provides information on the Massachusetts Drought Management Plan (DMP) including ISL thresholds used in this report.



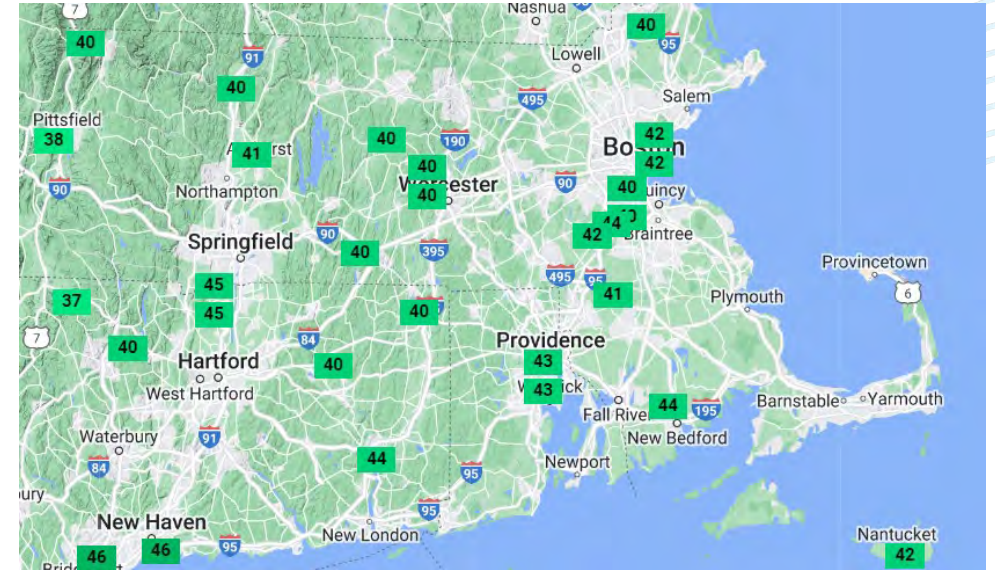
This report was prepared by the Massachusetts Department of Conservation and Recreation. Data may be preliminary. Analysis reflects automated calculations done 04/09/2024. Additional information, previous reports, and the Massachusetts Drought Dashboard with weekly updates to the drought indices can be found at: <https://www.mass.gov/drought-monitoring>

Monthly average temperatures were above normal. According to the Northeast Regional Climate Center (NRCC), Massachusetts had its 9th warmest March on record.

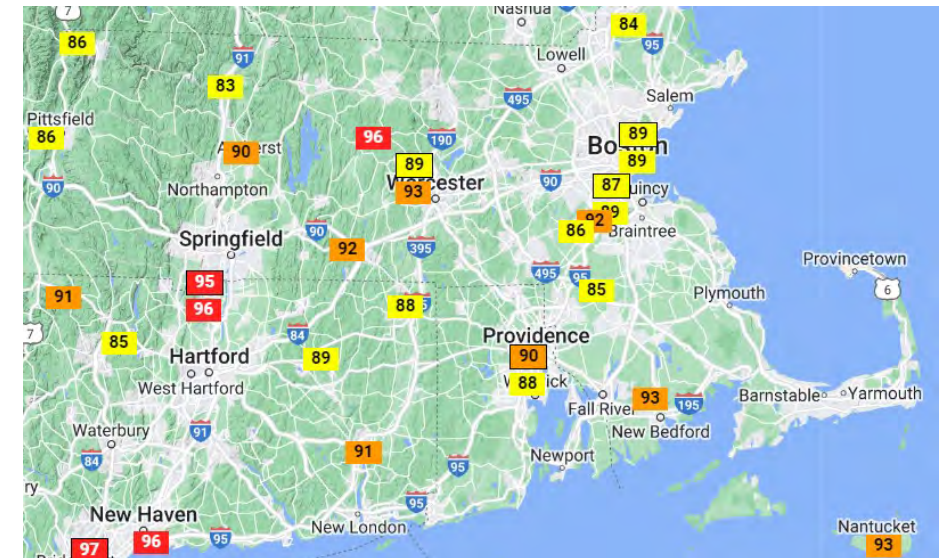
<http://www.nrcc.cornell.edu/regional/monthly/monthly.html>



Observed Average Mean Temperature, °F March 1 to 31, 2024



Observed Average Mean Temperature as Percentiles for March 1 to 31, 2024

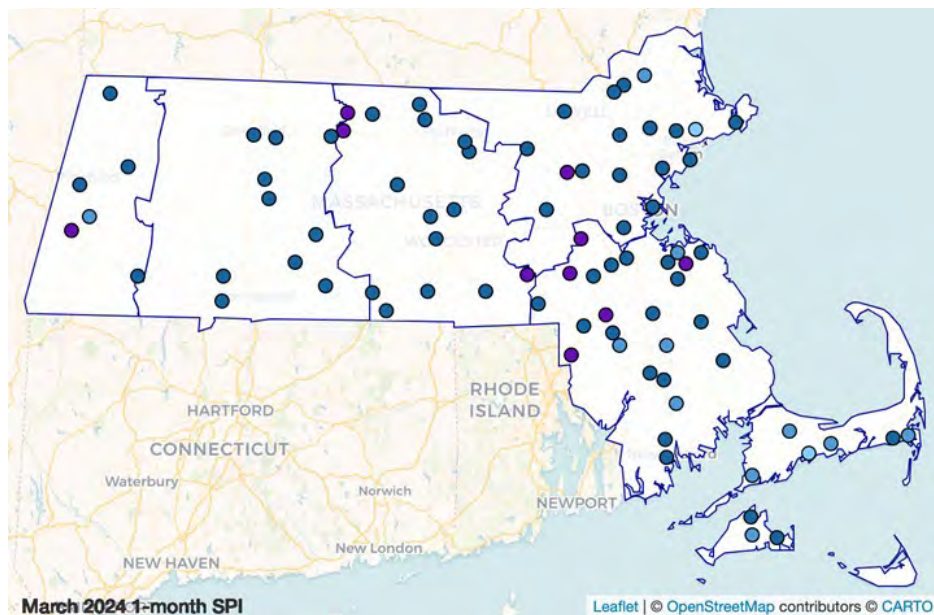


<https://sercc.oasis.unc.edu/Map.php?region=nrcc&>



STANDARDIZED PRECIPITATION INDEX (SPI) AS A PERCENTILE

March precipitation was well above normal across the state. According to the NRCC, Massachusetts had its 3rd wettest March on record. In addition to the table below, Appendix I provides all the 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	MARCH MONTHLY AVERAGE (IN)	DEPARTURE FROM HISTORICAL (IN)	SPI PERCENTILE 1-MONTH	SPI PERCENTILE 3-MONTH	SPI PERCENTILE 6-MONTH
WESTERN	6	6.74	3.39	97	96	94
CTRV	10	8.01	4.36	98	97	90
CENTRAL	16	8.36	4.43	97	97	92
NORTHEAST	19	8.62	4.65	96	95	87
SOUTHEAST	25	10.53	6.00	97	97	91
CAPE COD	6	7.01	2.64	86	90	49
ISLANDS	3	7.43	3.28	93	94	45

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

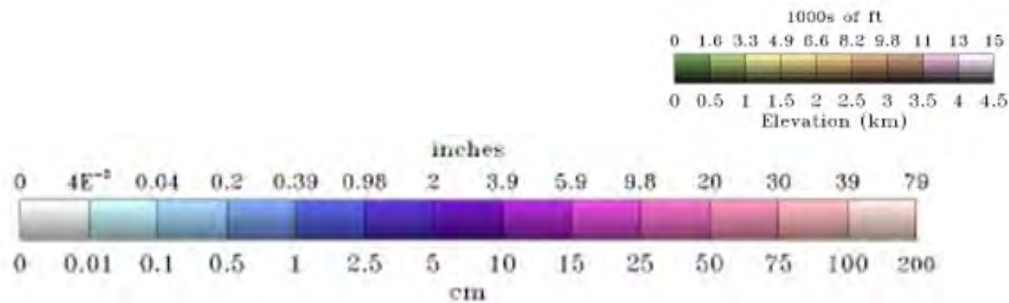
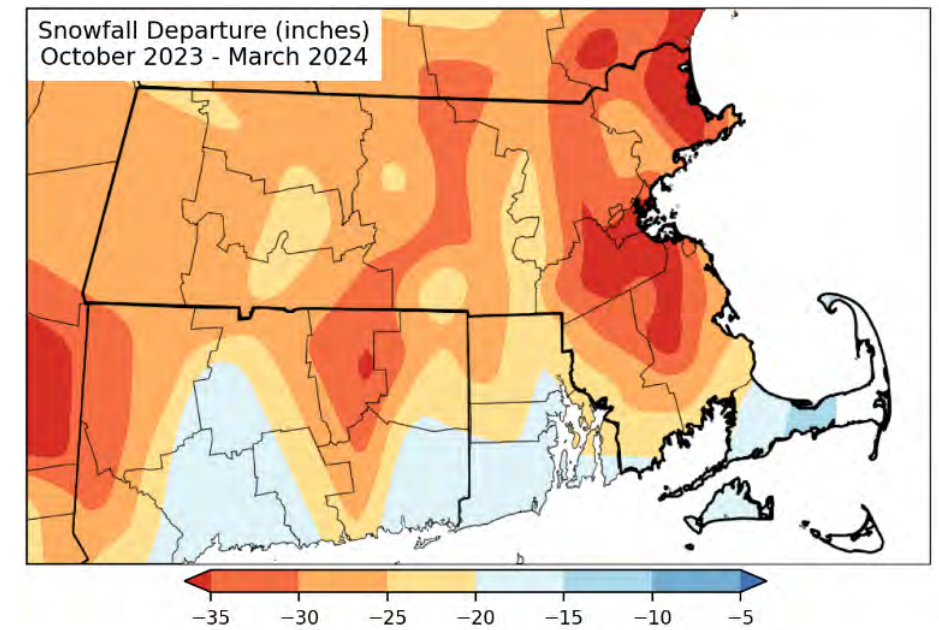
DMP Index Severity Levels			
1	2	3	4

SNOW COVER

At the end of March, there was minimal snow cover in the western part of the state.



Snow Water Equivalent
2024-03-31 06 UTC

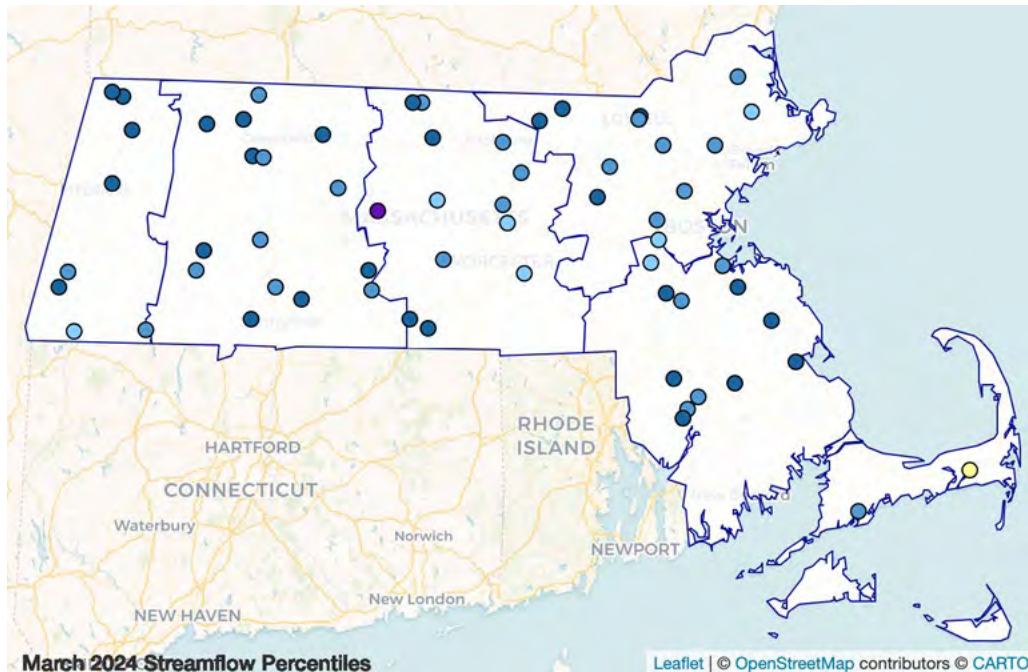
SEASON-TO-DATE
SNOWFALL DEPARTURE

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



During March, streamflow was above-normal across the state except for one gage in the Cape Cod Region that was below normal. Numerous gages across the state were above their respective 90th percentile values.

MEDIAN MONTHLY STREAMFLOW PERCENTILES COMPARED TO HISTORICAL VALUES



● ≥ 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	5	91
CTRV	15	0	0	0	0	7	90
CENTRAL	13	0	0	0	0	5	90
NORTHEAST	13	0	0	0	0	4	87
SOUTHEAST	12	0	0	0	0	7	91
CAPE COD	2	0	0	0	1	0	54

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

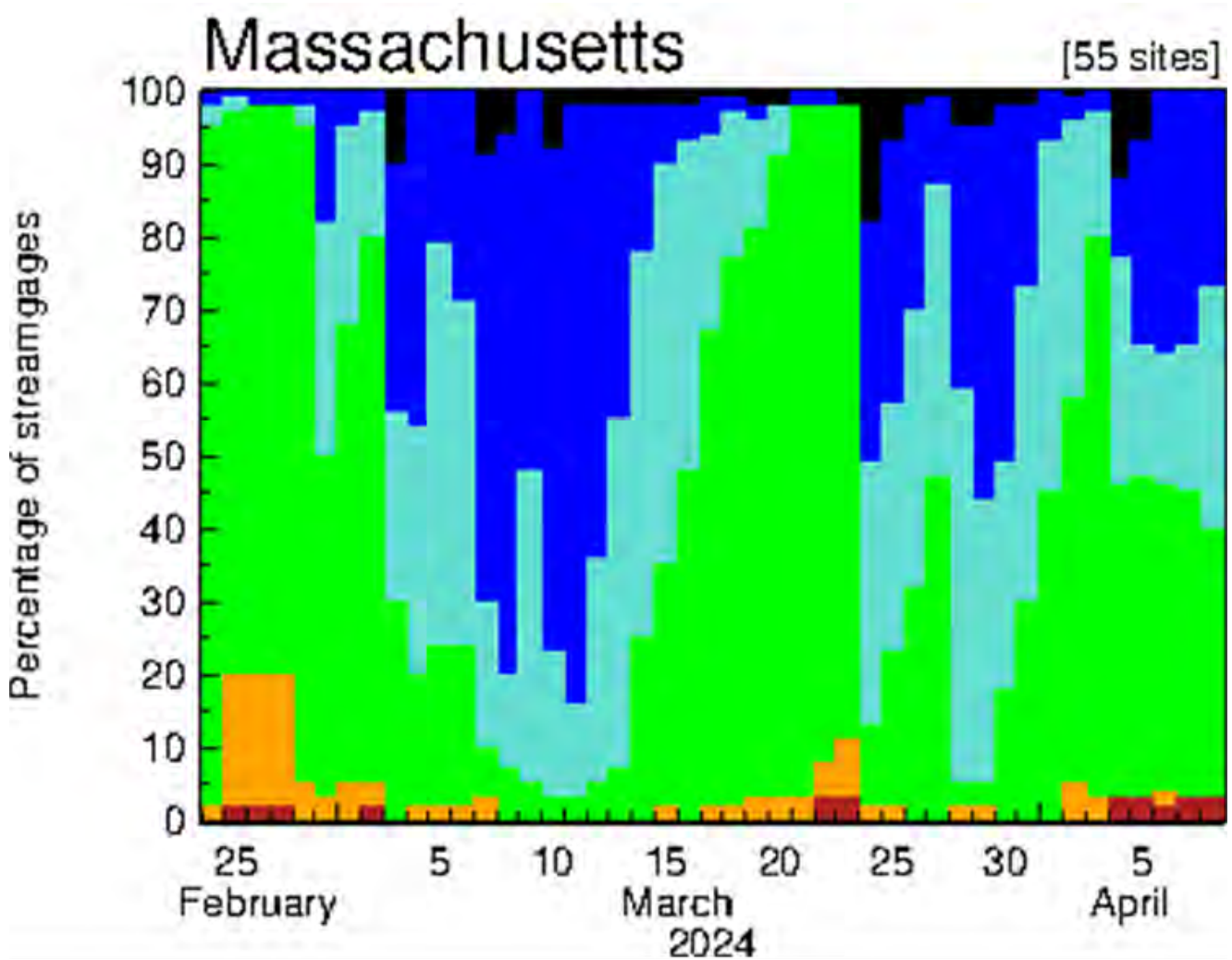
DMP Index Severity Levels			
1	2	3	4



USGS TIME SERIES OF THE PERCENT OF GAGES AT THEIR RESPECTIVE PERCENTILE FLOWS FOR AVERAGE DAILY STREAMFLOWS COMPARED TO HISTORICAL VALUES

<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		



The Norton/Boston NWS E-5 Monthly Report of Hydrologic Condition indicated river flooding at forecast points occurred in Massachusetts during March in addition to warnings that were issued. The Albany NWS E-5 Monthly Report has not been received as of the writing of this report, but no flood warnings were issued for Berkshire County during March. Overall March was a very wet month and, with streamflows already in the normal to above-normal range, there were several storms that resulted in flood warnings and three forecast points reaching flood stage.

March 7th: Four flood warnings were issued for forecast points in Bristol, Franklin, and Hampden Counties of which two crested above flood stage: the Connecticut River at Montague and the Connecticut River at Northampton.

March 10th: Two flood warnings were issued in Middlesex and Hampden Counties at forecast points that did not result in cresting above flood stage.

March 23-24th: There were two flood warnings issued in Worcester and Plymouth Counties at forecast points of which one crested at flood stage: the Taunton River at Bridgewater. In addition, there was one areal flood warning in Bristol County.

March 30th: One flood warning was issued in Middlesex County (Charles River at Dover).

There were no inland flood storm reports or flash flood warnings in the month of March.

<https://mesonet.agron.iastate.edu/vtec/search.php#eventsbypoint/-93.6530/41.5300>

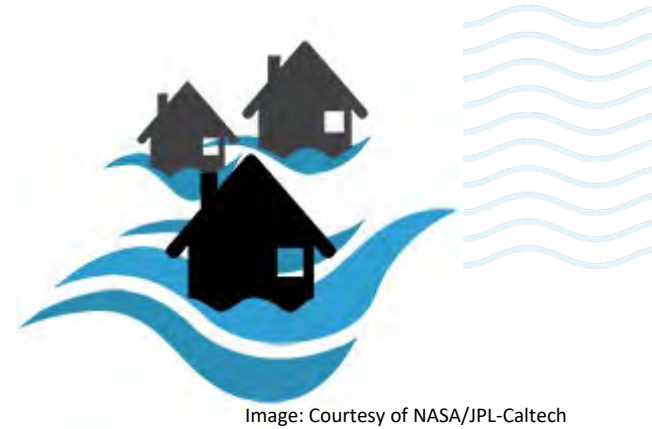
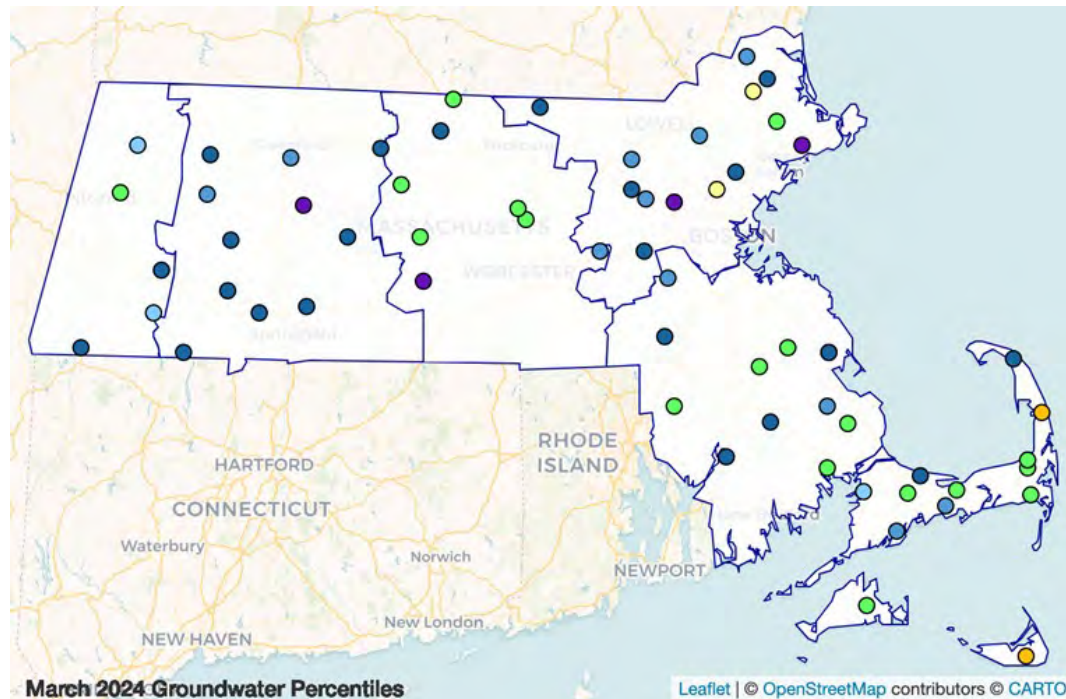


Image: Courtesy of NASA/JPL-Caltech



March groundwater levels ranged from below normal to much above normal. Regional medians were normal to above normal except for the Islands Region, which is at ISL 1.

END OF MONTH GROUNDWATER COMPARED TO HISTORICAL IN THE CLIMATE RESPONSE NETWORK WELLS



● ≥ 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 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	2	77
CTRV	11	0	0	0	0	9	97
CENTRAL	8	0	0	0	0	2	69
NORTHEAST	14	0	0	0	2	7	91
SOUTHEAST	12	0	0	0	0	4	85
CAPE COD	11	0	0	1	0	2	57
ISLANDS	2	0	0	1	0	0	28

DMP Index Severity Levels			
1	2	3	4

At the end of March, reporting lake and impoundment levels were above their 30th percentile and/or were at or near 100% full. On March 9th the Quabbin started spilling over the upper spillway.

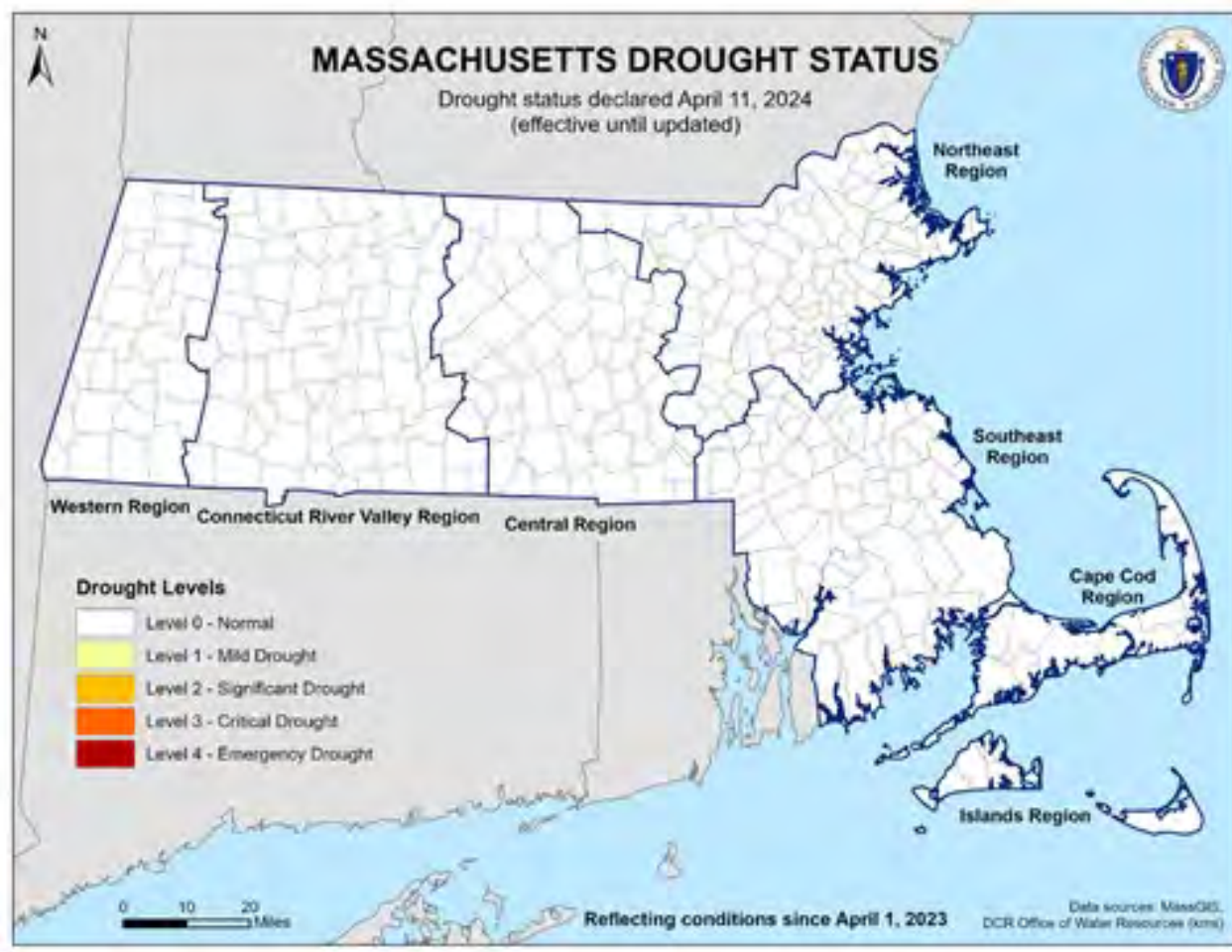
REGION	NUMBER OF SITES REPORTING	MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT FULL
WESTERN	1	100% full
CTRV	2	93rd
CENTRAL	4	78th
NORTHEAST	5	89th
SOUTHEAST	2	98th
CAPE COD	1	55th

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

DMP Index Severity Levels			
1	2	3	4



MASSACHUSETTS DROUGHT STATUS

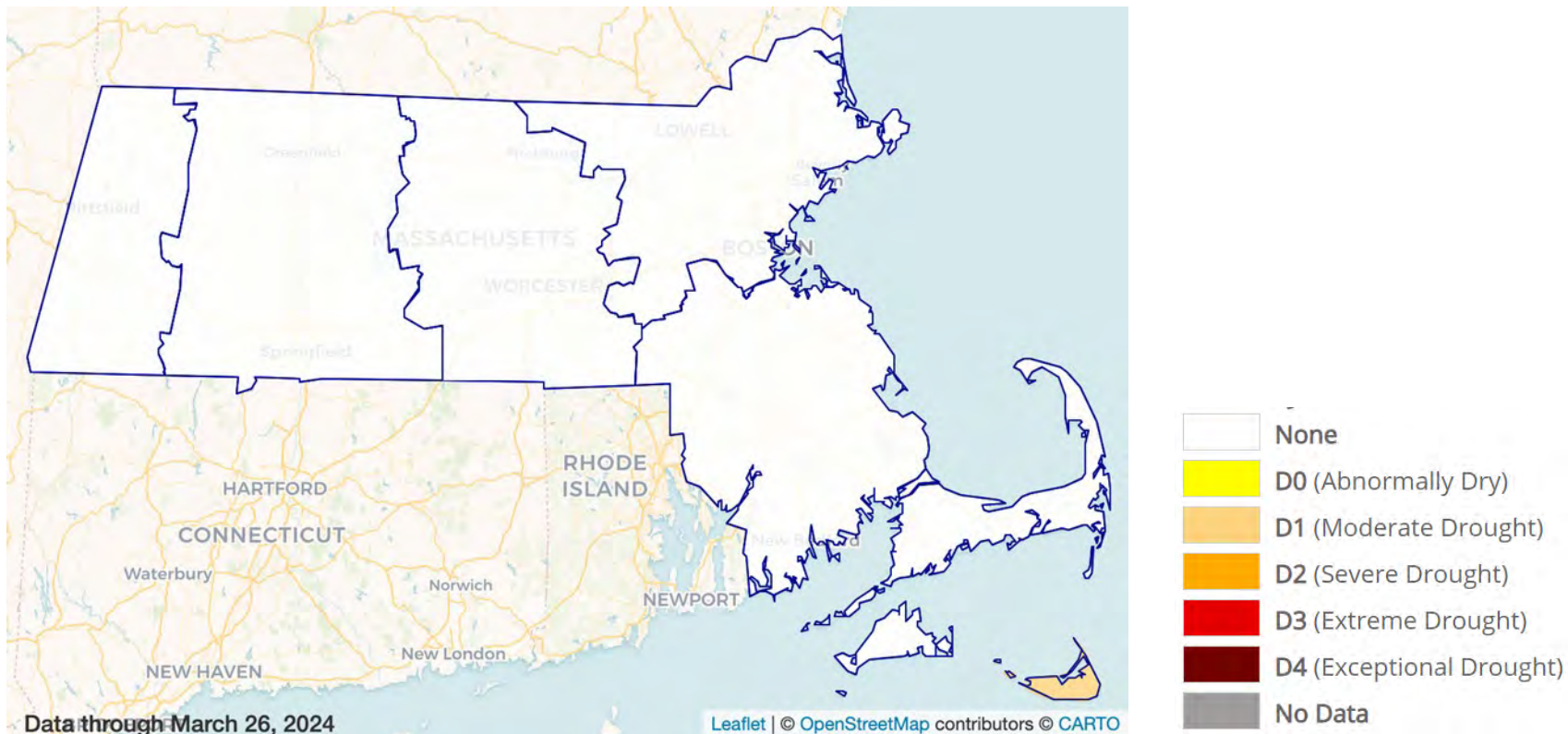


On April 11, 2023, Massachusetts Energy and Environmental Affairs (EEA) Secretary Rebecca L. Tepper declared that starting from April 1, 2023, the Islands Region is at Level 0 Normal Conditions. All other Regions remain at Level 0. This status remains in effect until further updated.

U.S. DROUGHT MONITOR (USDM)

At the end of March, the USDM showed D1 on Nantucket.

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

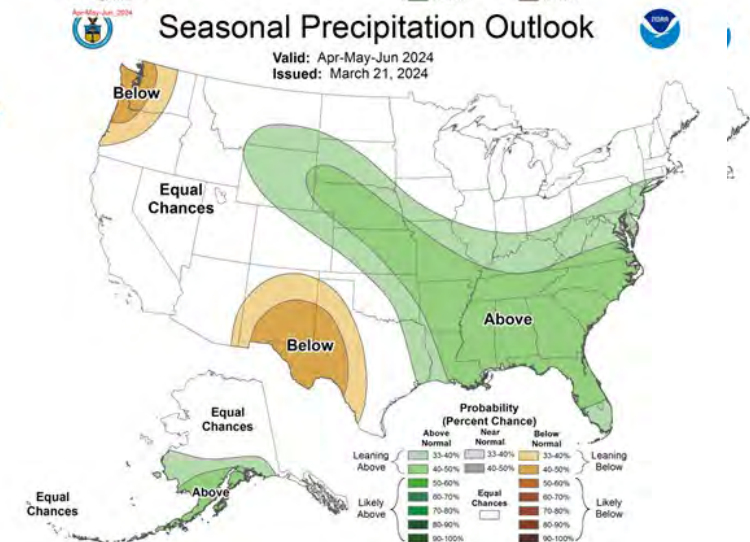
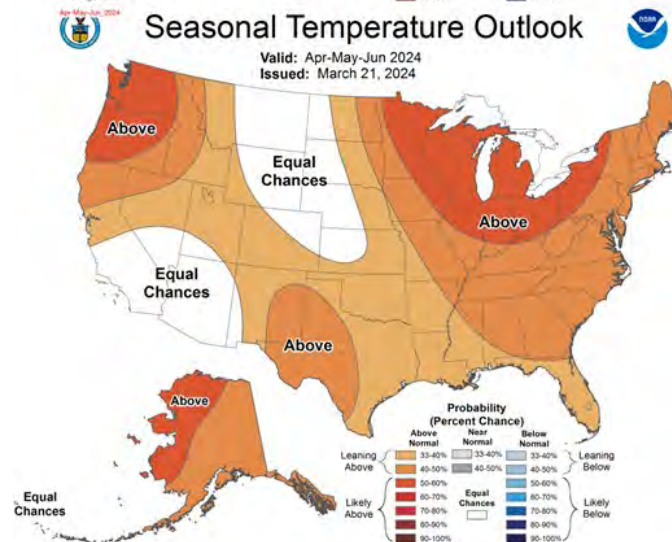
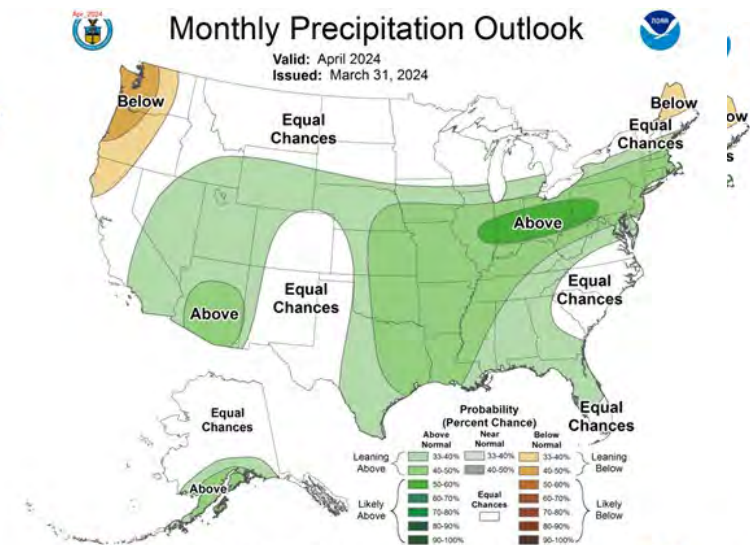
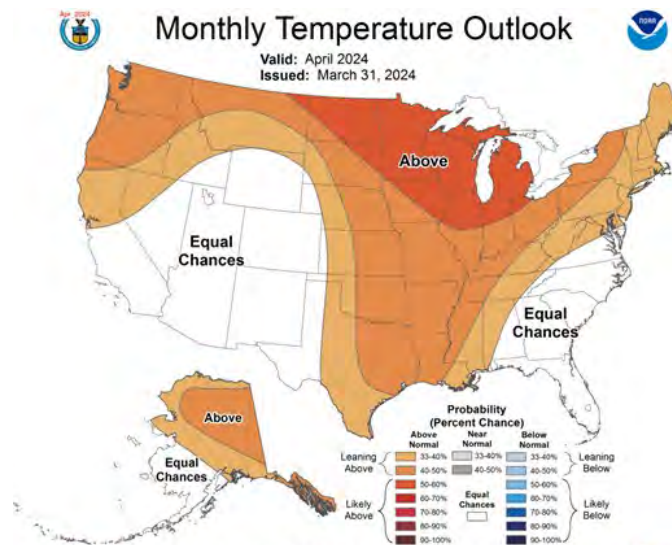


TEMPERATURE AND PRECIPITATION OUTLOOK

April: The outlook issued 3/31 shows a 33-40% chance of above-normal temperatures, and 40-50% chance of above-normal precipitation.

April through June: The seasonal outlook issued 3/21 shows a 40-50% chance of above-normal temperatures, and equal chances for above-normal, normal, or below-normal precipitation in the rest of the state.

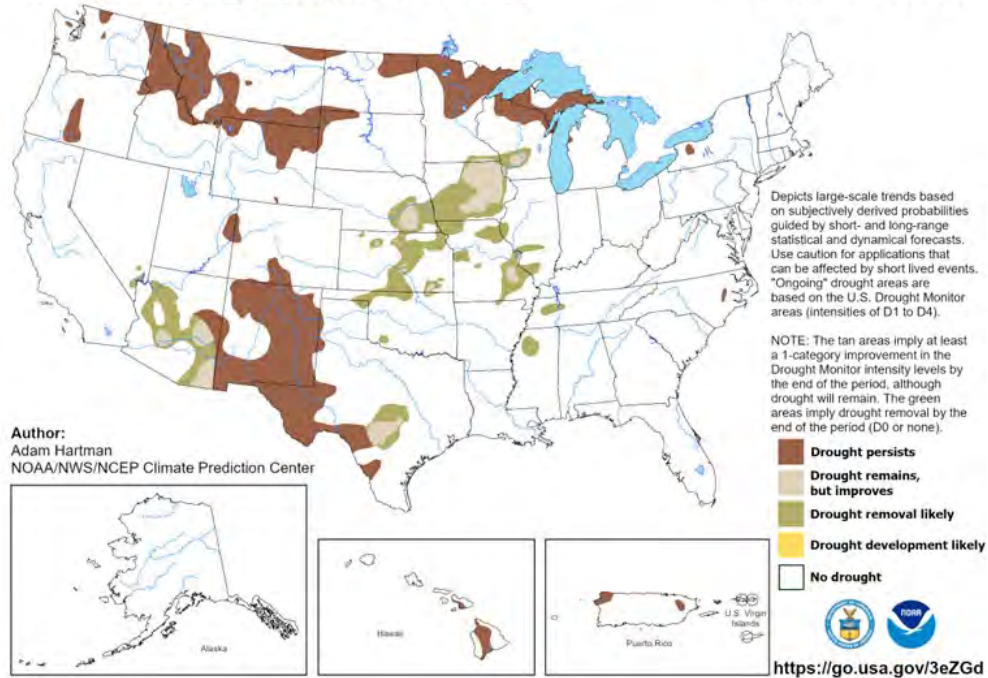
<https://www.cpc.ncep.noaa.gov/>



U.S. Monthly Drought Outlook

Drought Tendency During the Valid Period

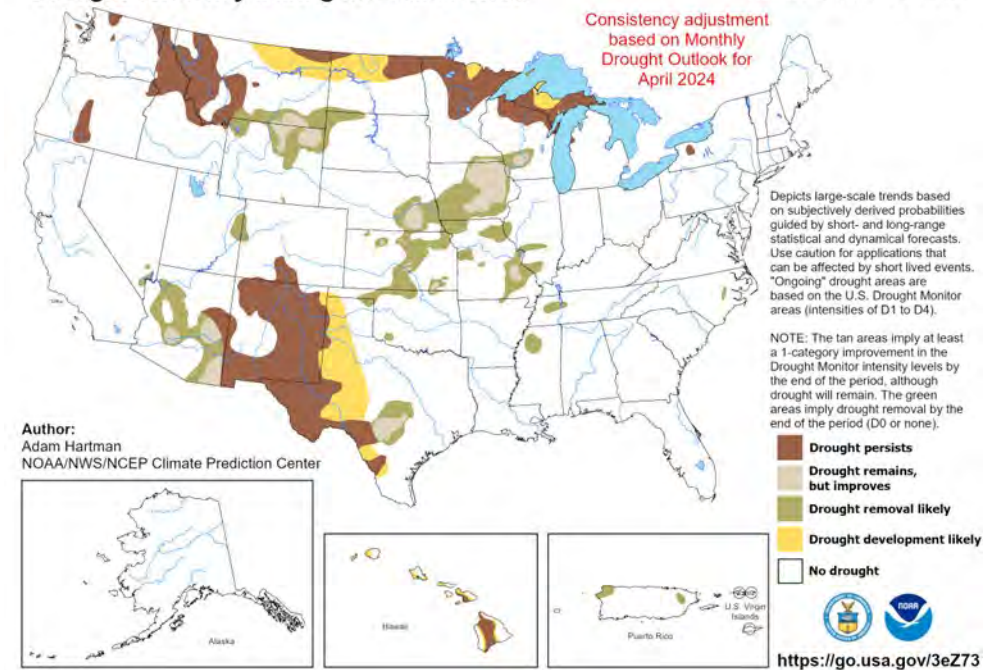
Valid for April 2024
Released March 31, 2024



U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid for April 1 - June 30, 2024
Released March 31, 2024



MONTHLY AND SEASONAL DROUGHT OUTLOOK

The monthly outlook for April released on 3/31 shows drought persisting on Nantucket.

The seasonal outlook for April through June issued on 3/31 shows drought removal on Nantucket.

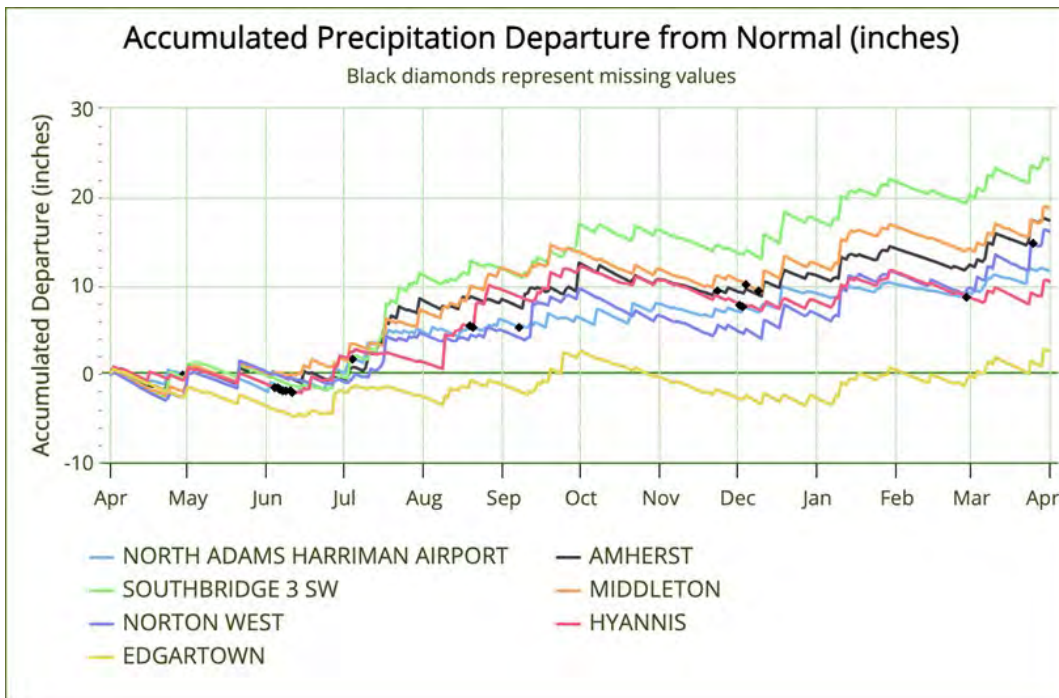
<http://www.cpc.ncep.noaa.gov/products/Drought>



ADDITIONAL PRECIPITATION DATA

Standardized Precipitation Index— March 2024 as percentiles

REGION	NUMBER OF SITES	1-mo	2-mo	3-mo	6-mo	9-mo	12-mo	24-mo	36-mo
WESTERN	6	97	82	96	94	96	94	87	96
CTRV	10	98	87	97	90	99	97	89	96
CENTRAL	16	97	87	97	92	100	99	96	98
NORTHEAST	19	96	81	95	87	99	98	83	94
SOUTHEAST	25	97	89	97	91	98	96	88	93
CAPE COD	6	86	72	90	49	81	79	78	88
ISLANDS	3	93	83	94	45	75	56	35	53



DMP Index Severity Levels			
1	2	3	4

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/>

ADDITIONAL PRECIPITATION DATA (CONT.)

Percent of Average Historical Precipitation—March 2024

REGION	NUMBER OF SITES REPORTING	HISTORICAL AVERAGE	MARCH AVERAGE (IN)	DEPARTURE FROM HISTORICAL AVERAGE (IN)	PERCENT OF NORMAL
WESTERN	6	3.35	6.74	3.39	201%
CTRV	10	3.65	8.01	4.36	219%
CENTRAL	16	3.93	8.36	4.43	213%
NORTHEAST	19	3.97	8.62	4.65	217%
SOUTHEAST	25	4.53	10.53	6.00	232%
CAPE COD	6	4.37	7.01	2.64	160%
ISLANDS	3	4.15	7.43	3.28	179%



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.

Index Severity Levels (Section 3.4 of the DMP)

Drought Levels (Section 3.1 of the DMP)

SEVERITY LEVEL	STANDARDIZED PRECIPITATION INDEX (SPI)	STREAMFLOW	LAKES AND IMPOUNDMENTS	GROUNDWATER	EVAPOTRANSPIRATION	KEETCH-BRYAM DROUGHT INDEX (KBDI)
0	> 30th percentile					< 200
1	≤ 30 and > 20					200-400
2	≤ 20 and > 10					400-600
3	≤ 10 and > 2					600-700
4	≤ 2					700-800

- Level 0 Normal
- Level 1 Mild Drought
- Level 2 Significant Drought
- Level 3 Critical Drought
- Level 4 Emergency Drought



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www.mass.gov/conservemawater

www.mass.gov/drought-management