

MASSACHUSETTS WATER RESOURCES COMMISSION



# HYDROLOGIC CONDITIONS IN MASSACHUSETTS

JANUARY  
2024

The Commonwealth of Massachusetts

*Maura T. Healey, Governor*

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



# DECEMBER 2023 HYDROLOGIC CONDITIONS

## SUMMARY OF CONDITIONS



- Monthly average temperatures were above normal.
- Precipitation was well above normal. There was snow cover remaining at the end of January.



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



- The Keetch-Byram Drought Index is not reported in January.
- Streamflow was well above normal except for the gages in the Cape Cod Region. Ten rivers crested above flood stage on the 10<sup>th</sup> through the 15<sup>th</sup>.



- Groundwater regional medians were much above normal except for the Cape Cod Region, which is normal, and the Islands Region, which is elevated at ISL 3.



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



- NOAA's February outlook shows chances leaning for above-normal temperatures in the western part of the state, equal chances for above-normal, normal, or below-normal temperature in the rest of the state, and chances leaning for below-normal precipitation.



- NOAA's 3-month outlook shows chances leaning for above-normal temperatures, chances leaning for above-normal precipitation in southeastern parts of the state, and equal chances for above-normal, normal, or below-normal precipitation in the rest of the state.



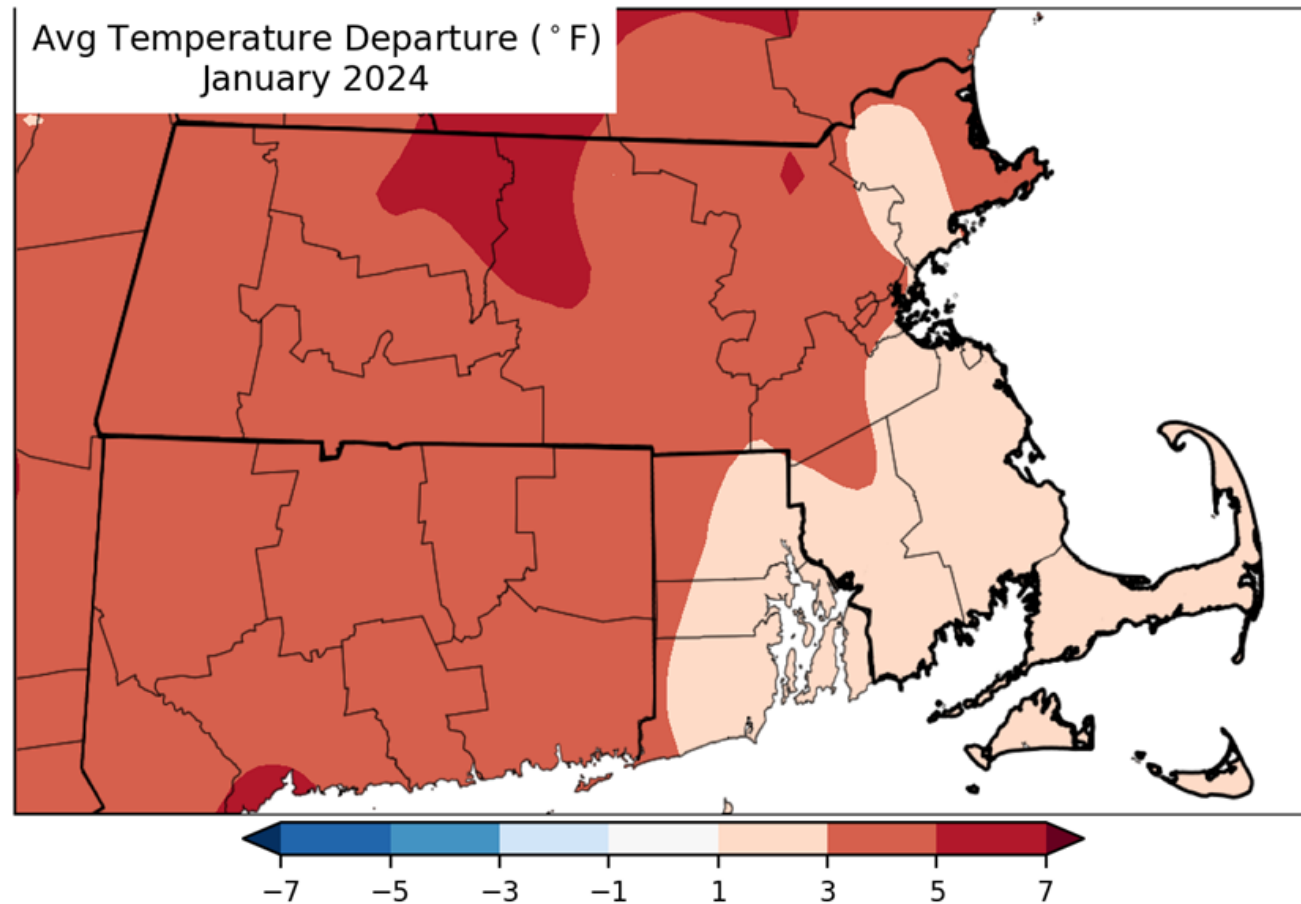
- Appendix II provides information on the Massachusetts Drought Management Plan (DMP) including ISL thresholds used in this report.



This report was prepared by the Massachusetts Department of Conservation and Recreation. Data may be preliminary. Analysis reflects automated calculations done 02/06/2024. 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.

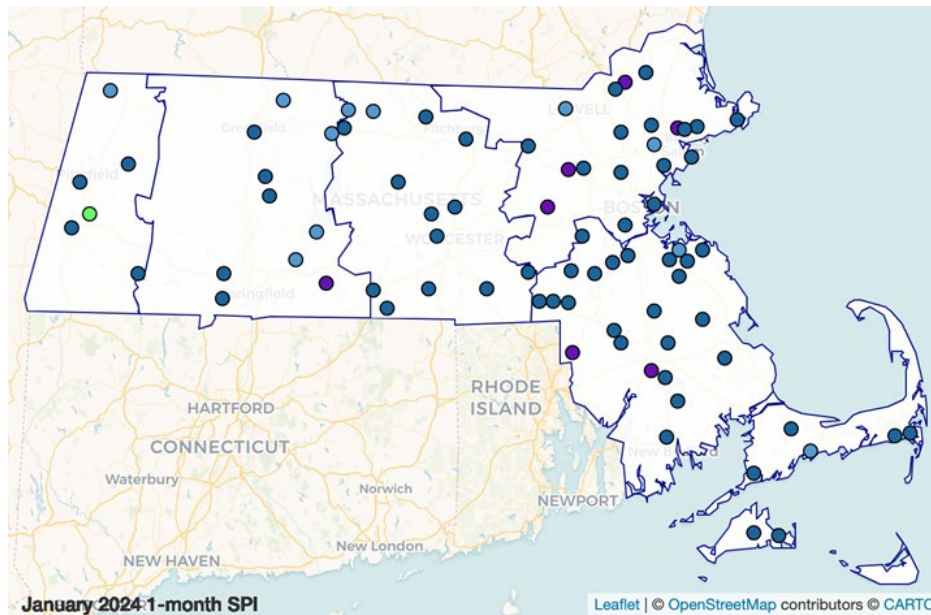
<http://www.nrcc.cornell.edu/regional/monthly/monthly.html>





## STANDARDIZED PRECIPITATION INDEX (SPI) AS A PERCENTILE

January precipitation was well above normal. According to the NRCC, Massachusetts had its 7<sup>th</sup> wettest January on record. In addition to the table below, Appendix I provides all the look-back periods.



● $\geq 0$ to $\leq 2$	● $> 2$ to $\leq 10$	● $> 10$ to $\leq 20$	● $> 20$ to $\leq 30$	● $> 30$ to $\leq 70$
● $> 70$ to $\leq 80$	● $> 80$ to $\leq 90$	● $> 90$ to $\leq 98$	● $> 98$ to $\leq 100$	

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	6	5.38	2.32	95	90	89
CTRV	10	6.45	3.15	95	90	88
CENTRAL	14	7.21	3.56	96	92	94
NORTHEAST	20	7.12	3.56	96	92	97
SOUTHEAST	24	8.26	4.20	96	89	89
CAPE COD	5	7.30	3.10	92	58	65
ISLANDS	2	6.38	2.52	94	55	69

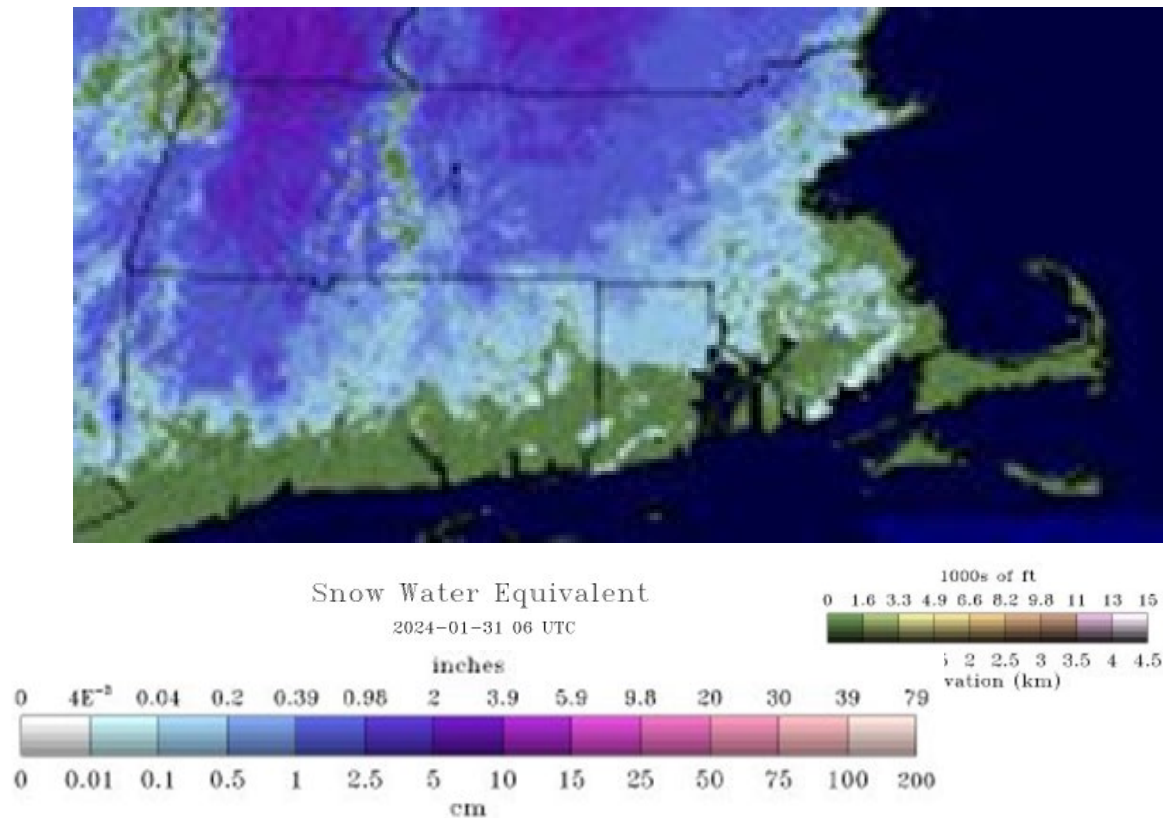
SPI is the Standardized Precipitation Index used in the Drought Management Plan (DMP) expressed here as a percentile and represents the variation from long-term precipitation.

DMP Index Severity Levels			
1	2	3	4

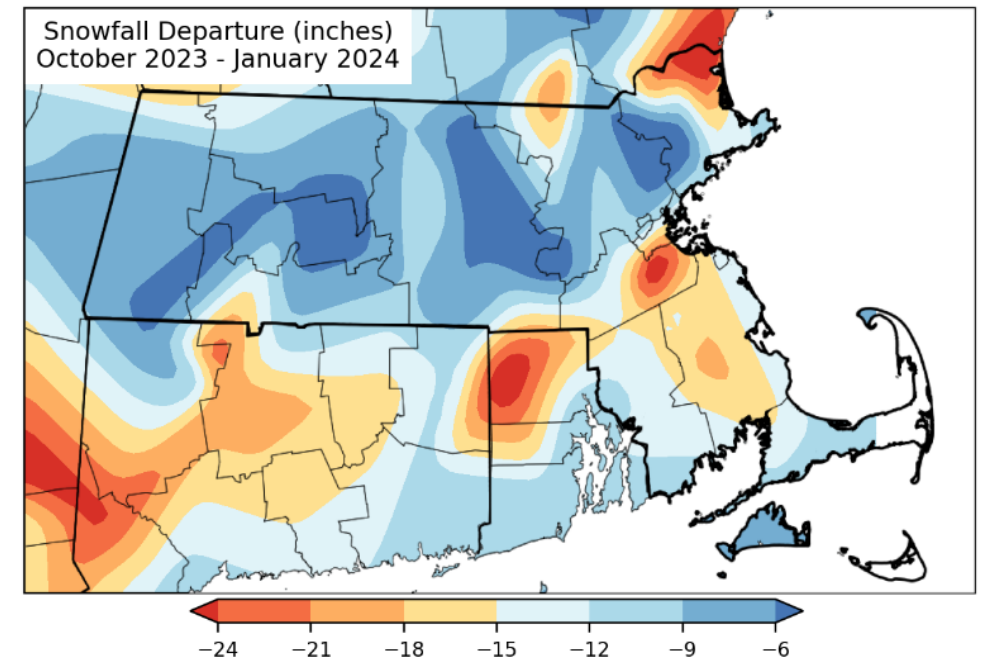
## SNOW COVER

At the end of January, there was snow cover in much of Massachusetts. According to the Northeast Regional Climate Center, the Worcester climate site had above normal snowfall in January.

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



## SEASON-TO-DATE SNOWFALL DEPARTURE

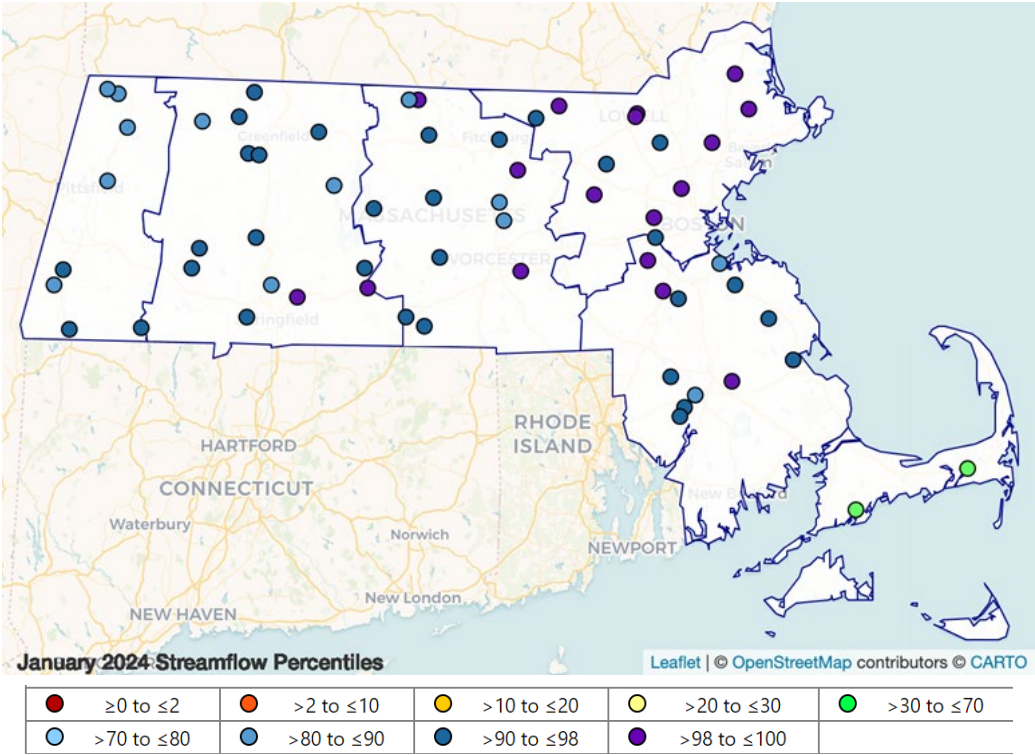






During January, streamflow was well above normal across the state except the gages in the Cape Cod Region.

# MEDIAN MONTHLY STREAMFLOW PERCENTILES COMPARED TO HISTORICAL VALUES



REGION	NUMBER OF GAGES REPORTING	$\geq 0$ TO $\leq 2$ PERCENTILE	$> 2$ TO $\leq 10$ PERCENTILE	$> 10$ TO $\leq 20$ PERCENTILE	$> 20$ TO $\leq 30$ PERCENTILE	$> 90$ PERCENTILE	MEDIAN OF INDIVIDUAL GAGE PERCENTILES
WESTERN	8	0	0	0	0	3	86
CTRV	15	0	0	0	0	12	97
CENTRAL	13	0	0	0	0	10	95
NORTHEAST	13	0	0	0	0	13	99
SOUTHEAST	12	0	0	0	0	10	97
CAPE COD	2	0	0	0	0	0	50

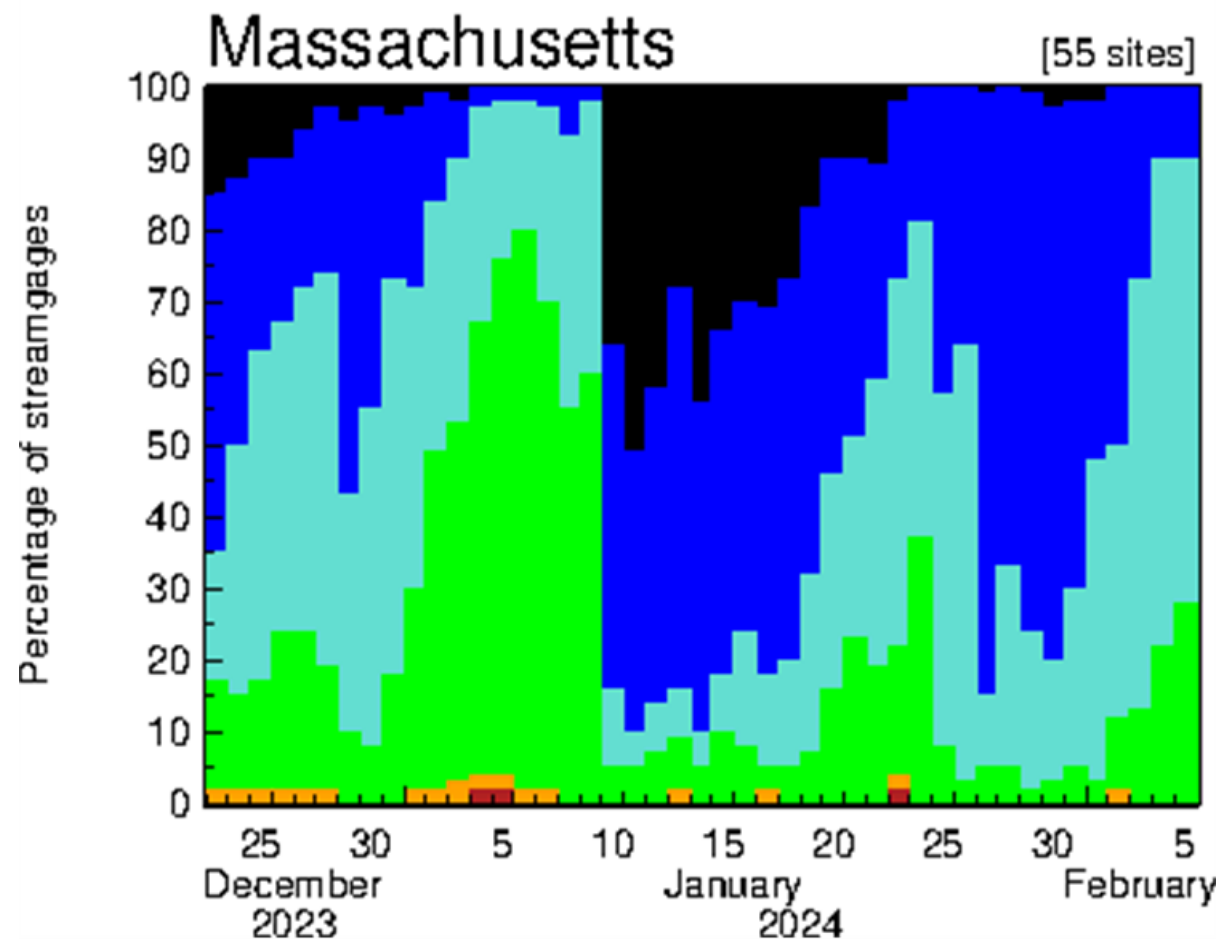
**Note:** Not all gages report in all months due to ice, beaver dams or other conditions. Streamflow index is not applicable to the Islands.

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 Conditions indicated river flooding occurred in Massachusetts during January. The Albany NWS Office January E-5 has not been received as of the writing of this report, but no river forecast point flood warnings were issued in Berkshire County during January.

As in December, January streamflows were already high and two storms (January 9<sup>th</sup>-10<sup>th</sup> and 13<sup>th</sup>) with heavy precipitation resulted in flood warnings and river forecast points cresting at flood stage. Overlapping effects from the storms extended flood warnings for forecast points; warnings were issued on six days from 1/10 to 1/19 expiring 1/11 to 1/19. Searches of the Iowa State University Iowa Environmental Mesonet for Massachusetts also produced storm reports in addition to flood warnings.

January 10-12<sup>th</sup>: Eight forecast points reached flood stage in the Shawsheen, Taunton, Blackstone, Neponset, Assabet, Concord, and Sudbury river basins. There were five areal flood warnings in Bristol, Hampden, Plymouth, Hampshire, and Middlesex Counties and ten flood storm reports in Middlesex, Hampshire, Plymouth, Worcester, Bristol, and Hampton Counties mostly for closed roads (one was for a stream).

January 13-15<sup>th</sup>: Two rivers forecast points reached flood stage in the Nashua and Merrimack River Basins.

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

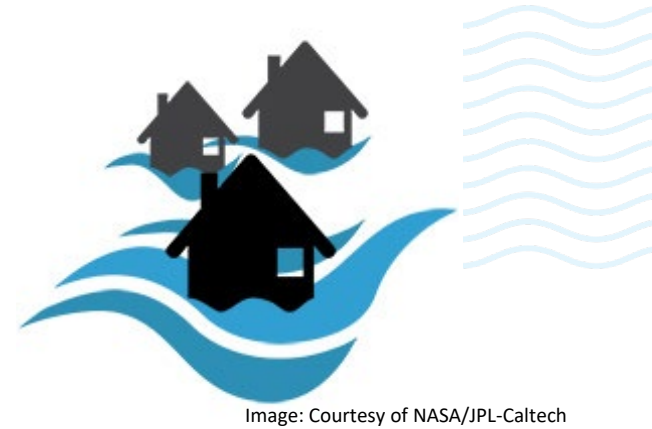


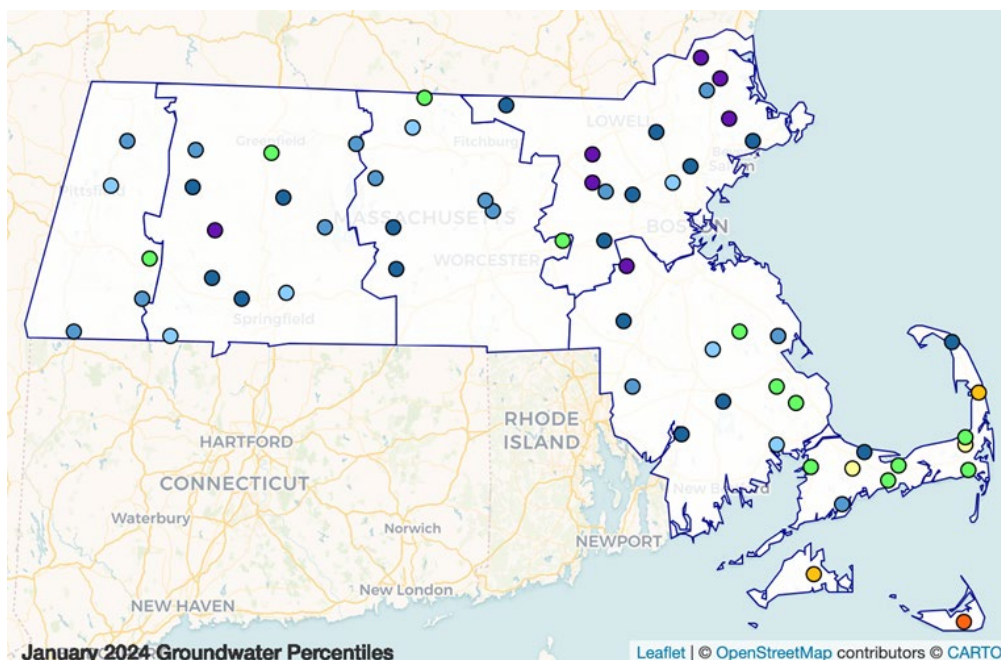
Image: Courtesy of NASA/JPL-Caltech





January groundwater levels ranged from below normal to much above normal. Regional medians were above normal except for Cape Cod in the low-end of normal and the Islands Region, which is at ISL 3.

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



● $\geq 0$ to $\leq 2$	● $> 2$ to $\leq 10$	● $> 10$ to $\leq 20$	● $> 20$ to $\leq 30$	● $> 30$ to $\leq 70$
● $> 70$ to $\leq 80$	● $> 80$ to $\leq 90$	● $> 90$ to $\leq 98$	● $> 98$ to $\leq 100$	

REGION	NUMBER OF WELLS REPORTING	$\geq 0$ TO $\leq 2$ PERCENTILE	$> 2$ TO $\leq 10$ PERCENTILE	$> 10$ TO $\leq 20$ PERCENTILE	$> 20$ TO $\leq 30$ PERCENTILE	$> 90$ PERCENTILE	MEDIAN OF INDIVIDUAL WELL PERCENTILES
WESTERN	5	0	0	0	0	0	84
CTRV	11	0	0	0	0	5	90
CENTRAL	8	0	0	0	0	2	85
NORTHEAST	14	0	0	0	0	11	98
SOUTHEAST	12	0	0	0	0	4	83
CAPE COD	11	0	0	1	2	2	39
ISLANDS	2	0	1	1	0	0	10

DMP Index Severity Levels			
1	2	3	4



At the end of January, reporting lake and impoundment levels were above their 30th percentile and/or were at or near 100% full.

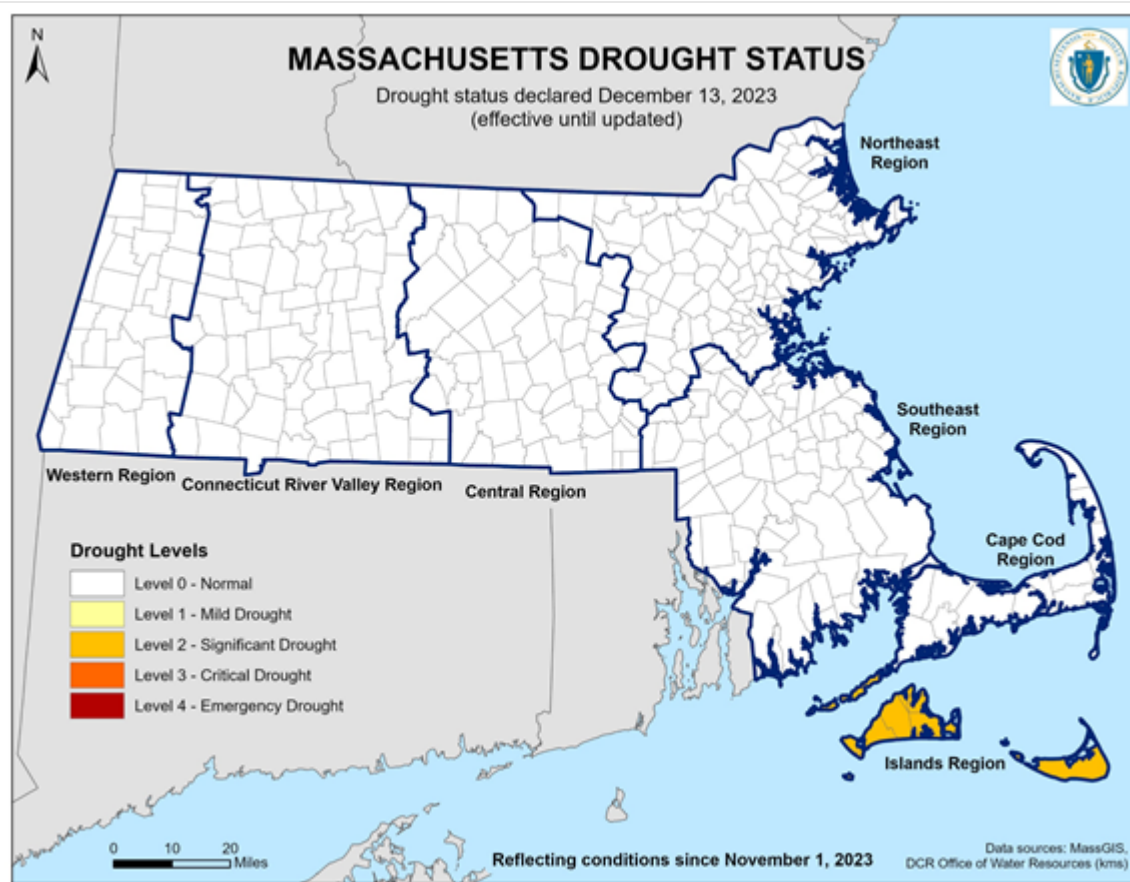
REGION	NUMBER OF SITES REPORTING	MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT FULL
WESTERN	0	No data
CTRV	2	93rd
CENTRAL	2	60th
NORTHEAST	4	95th, 100%
SOUTHEAST	2	100th
CAPE COD	1	42nd

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

DMP Index Severity Levels			
1	2	3	4



## MASSACHUSETTS DROUGHT STATUS



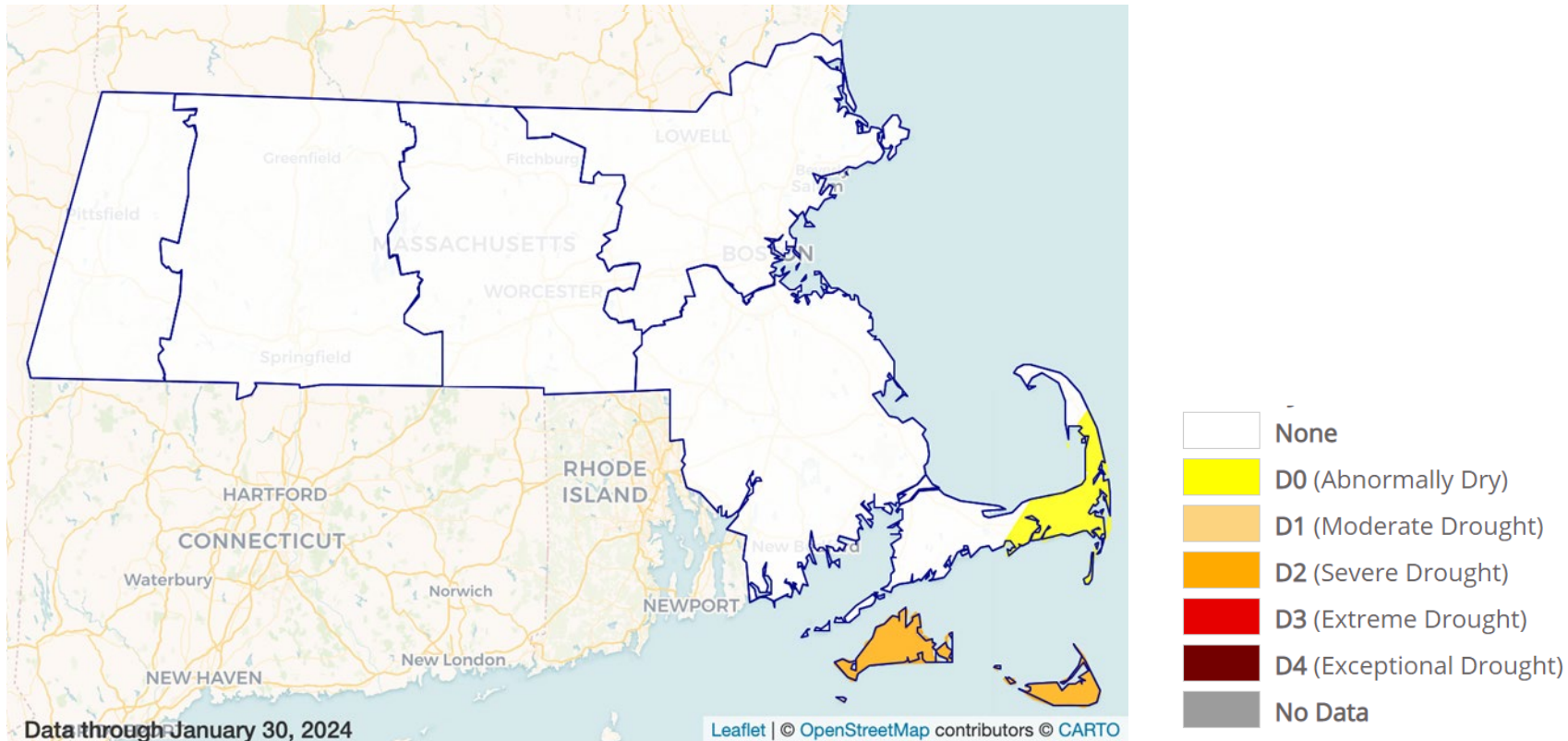
On December 13, 2023, Massachusetts Energy and Environmental Affairs (EEA) Secretary Rebecca L. Tepper declared that starting from November 1, 2023, the Islands Region is at Level 2 Significant Drought. This status remains in effect until further updated.



## U.S. DROUGHT MONITOR (USDM)

At the end of January, the USDM showed areas of D1 on the Islands and D0 in the mid-Mid to the Outer Cape.

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

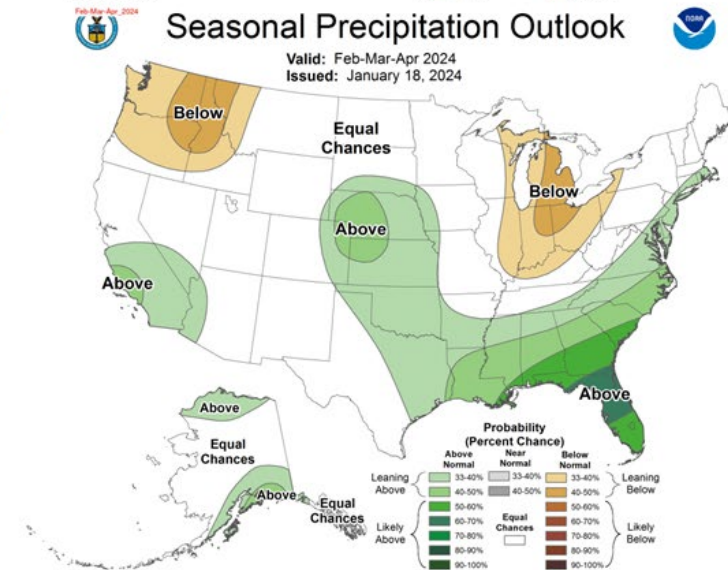
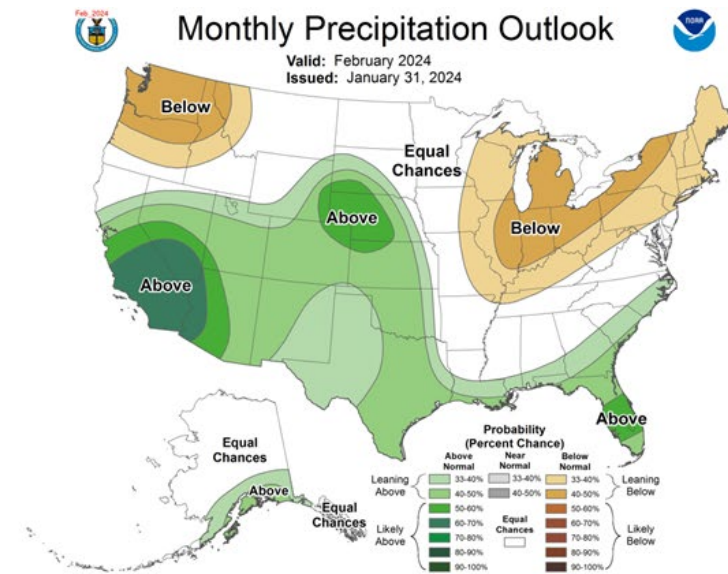
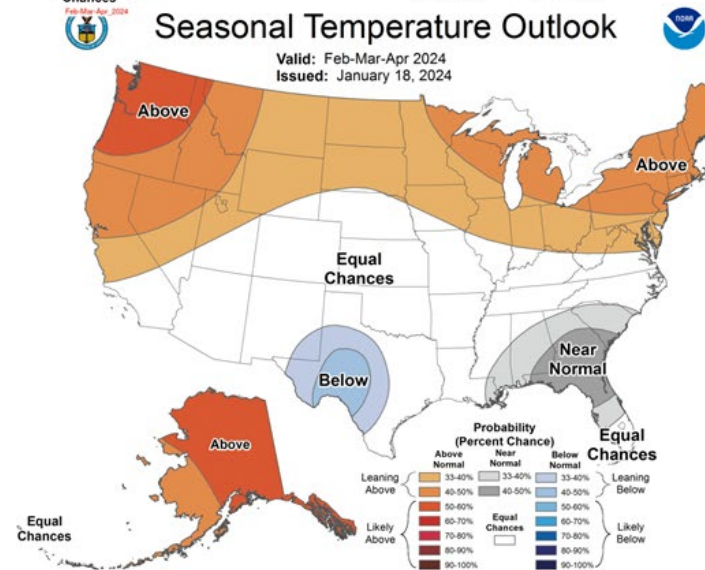
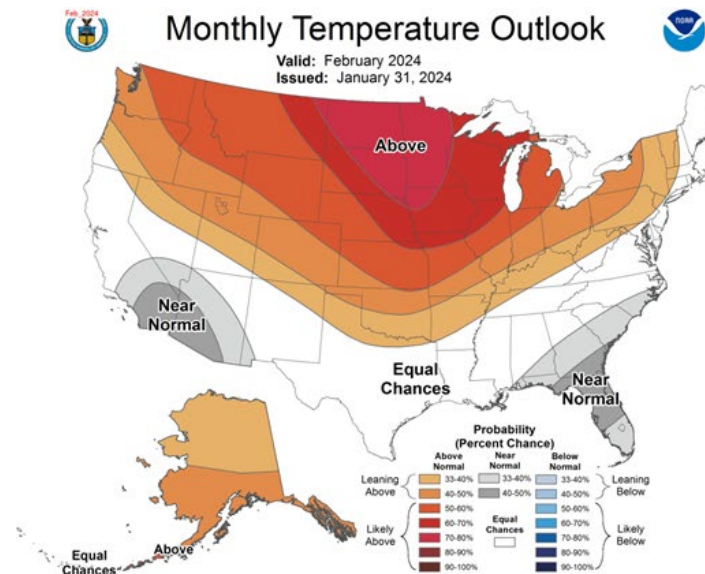


# TEMPERATURE AND PRECIPITATION OUTLOOK

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

**February through April:** The seasonal outlook issued 1/18 shows a 40-50% chance of above-normal temperatures, a 33-40% chance of above-normal precipitation in southeastern parts of the state, and equal chances for above-normal, normal, or below-normal precipitation in the rest of the state.

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

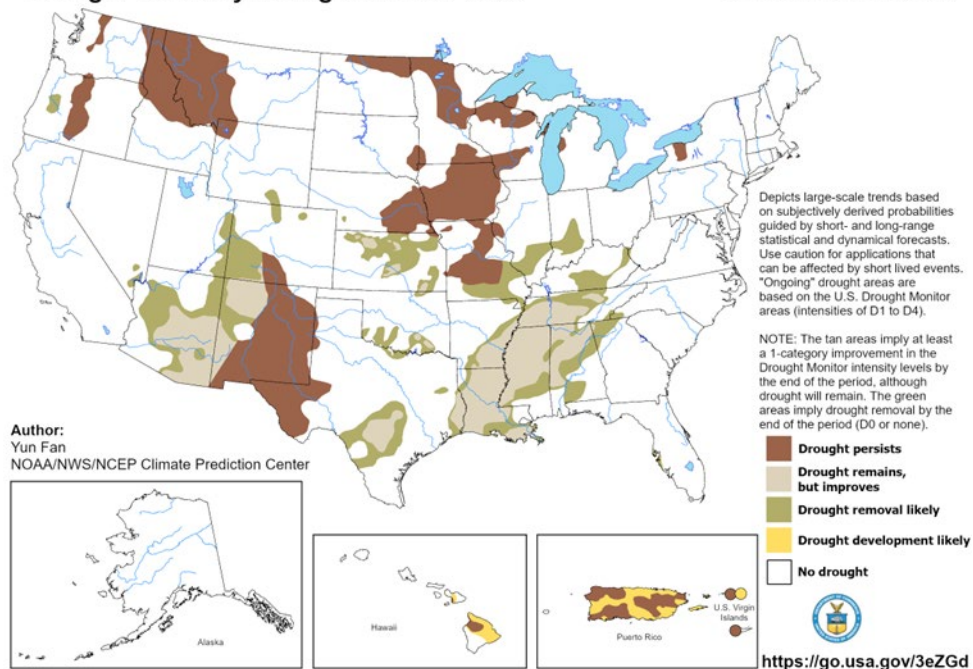




## U.S. Monthly Drought Outlook

### Drought Tendency During the Valid Period

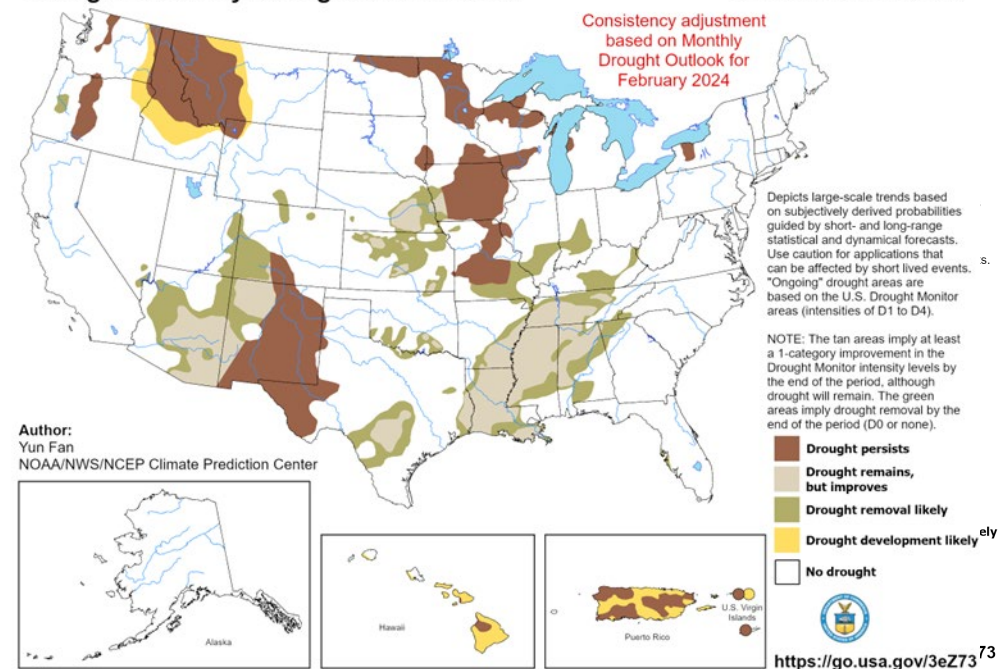
Valid for February 2024  
Released January 31, 2024



## U.S. Seasonal Drought Outlook

### Drought Tendency During the Valid Period

Valid for February 1 - April 30, 2024  
Released January 31, 2024



## MONTHLY AND SEASONAL DROUGHT OUTLOOK

The monthly outlook for February released on 1/31 shows drought persisting on the Islands.

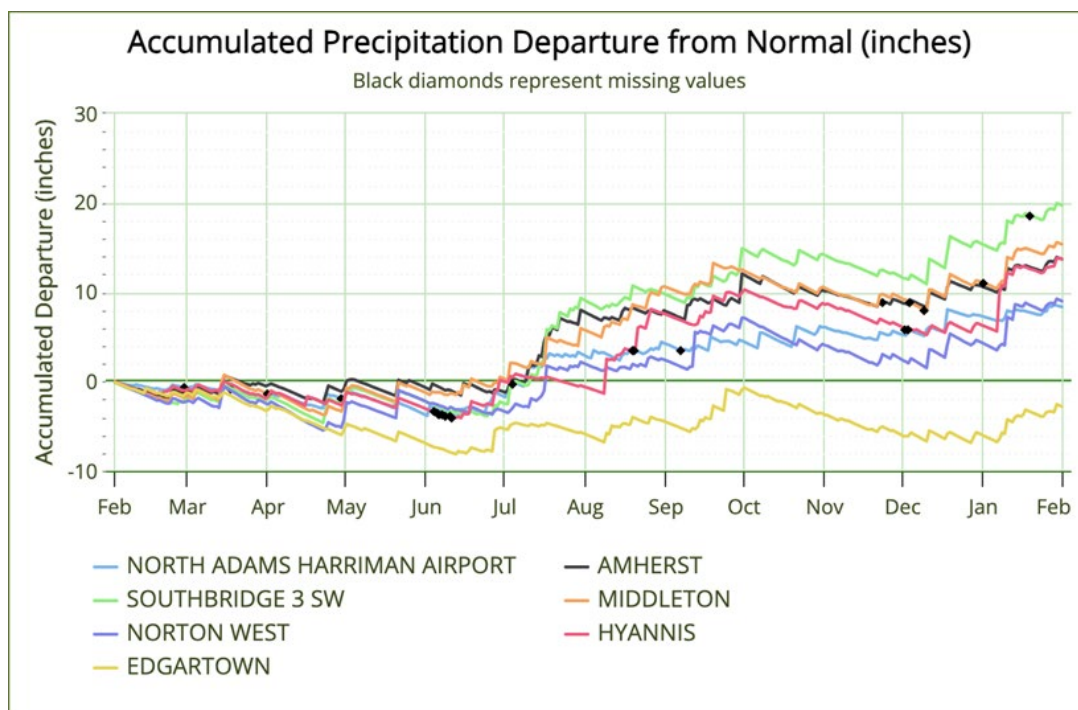
The seasonal outlook for February through April issued on 1/31 shows drought removal likely on the Islands.

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

## ADDITIONAL PRECIPITATION DATA

**Standardized Precipitation Index—  
January 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	95	99	90	89	94	87	85	94
CTRV	10	95	98	90	88	97	94	85	92
CENTRAL	14	96	98	92	94	99	97	93	96
NORTHEAST	20	96	99	92	97	98	97	79	91
SOUTHEAST	24	96	98	89	89	95	88	80	89
CAPE COD	5	92	91	58	65	77	53	65	-999
ISLANDS	2	94	89	55	69	57	25	28	42



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—January 2024

REGION	NUMBER OF SITES REPORTING	HISTORICAL AVERAGE	JANUARY AVERAGE (IN)	DEPARTURE FROM HISTORICAL AVERAGE (IN)	PERCENT OF NORMAL
WESTERN	6	3.06	5.38	2.32	176%
CTRV	10	3.30	6.45	3.15	195%
CENTRAL	14	3.65	7.21	3.56	198%
NORTHEAST	20	3.56	7.12	3.56	200%
SOUTHEAST	24	4.06	8.26	4.20	203%
CAPE COD	5	4.20	7.30	3.10	174%
ISLANDS	2	3.86	6.38	2.52	165%



# 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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**Massachusetts Water Resources Commission**

**Executive Office of Energy and Environmental Affairs**

[www.mass.gov/conservemawater](http://www.mass.gov/conservemawater)

[www.mass.gov/drought-management](http://www.mass.gov/drought-management)