

MASSACHUSETTS WATER RESOURCES COMMISSION



# HYDROLOGIC CONDITIONS IN MASSACHUSETTS

MARCH  
2023

The Commonwealth of Massachusetts

*Maura T. Healey, Governor*

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



# MARCH 2023 HYDROLOGIC CONDITIONS

## SUMMARY OF CONDITIONS



- Monthly average temperatures were above normal.



- Precipitation in March was normal to above normal except for the Islands Region where precipitation was below normal.



- Snow cover was present at the end of the month in the western part of the state. Season-to-date snowfall is below normal except for the northern central part of the state.



- Streamflow was mostly normal to above normal, with some minor flooding observed mid-month.
- Groundwater was normal to above normal.



- Lake and impoundment levels were above their 30th percentile and/or were 100% full except the pond on Cape Cod, which is at Index Severity Level (ISL) 1.



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



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

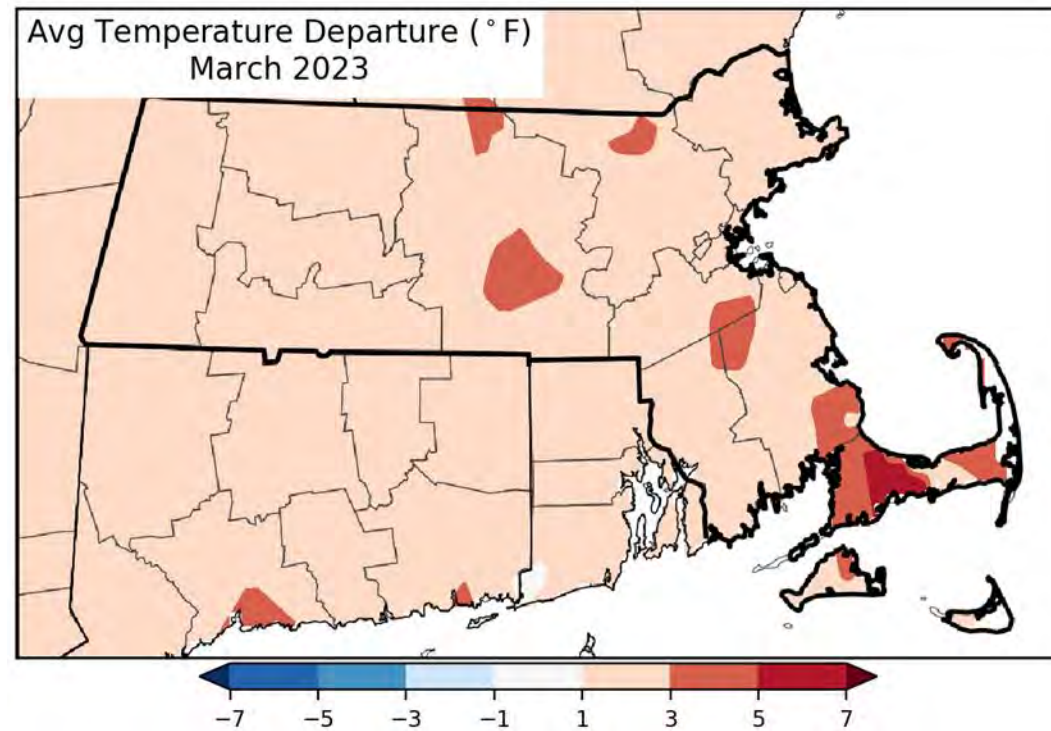


- Appendix II provides information on the Massachusetts Drought Management Plan (DMP) including ISL thresholds used in this report.

Monthly average temperatures were above normal across the state.

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

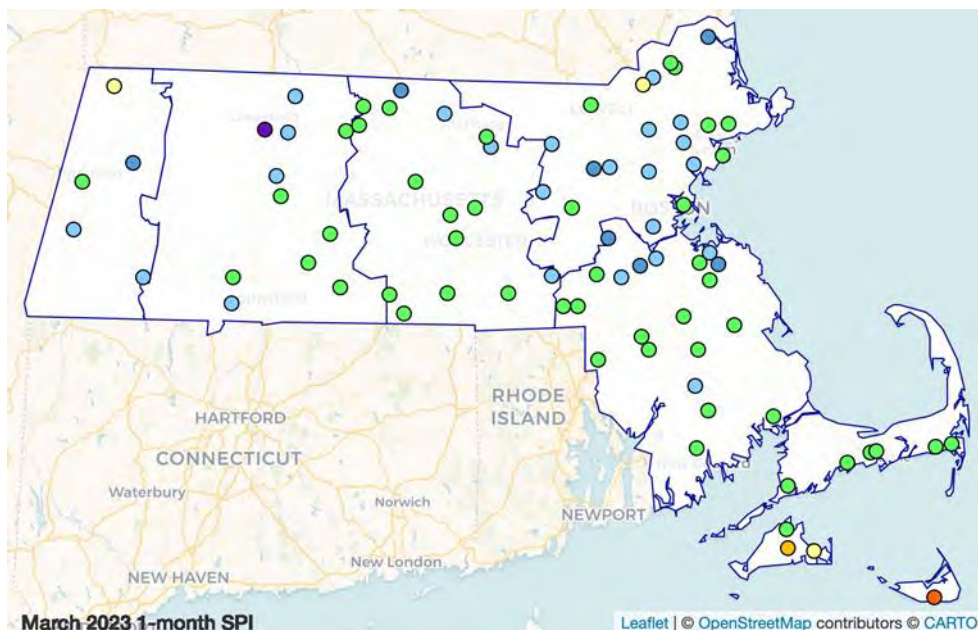
## AVERAGE TEMPERATURE DEPARTURE





## STANDARDIZED PRECIPITATION INDEX (SPI) AS A PERCENTILE

March precipitation was mostly normal to above normal except for the Islands, which is the only Region at an elevated ISL for March. Both the Islands and Central Regions are at elevated ISLs for the two month look-back period. In addition to the table below, Appendix I provides all 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	MARCH MONTHLY AVERAGE (IN)	DEPARTURE FROM HISTORICAL (IN)	SPI PERCENTILE 1-MONTH	SPI PERCENTILE 3-MONTH	SPI PERCENTILE 6-MONTH
WESTERN	5	3.67	0.42	71	77	80
CTRV	11	4.50	0.93	69	80	73
CENTRAL	16	4.32	0.47	67	71	79
NORTHEAST	21	4.82	0.91	74	71	66
SOUTHEAST	21	5.16	0.74	64	68	73
CAPE COD	6	3.80	-0.38	51	87	90
ISLANDS	4	2.51	-1.49	22	71	77

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 averages.

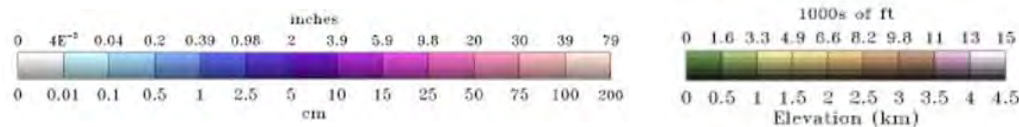
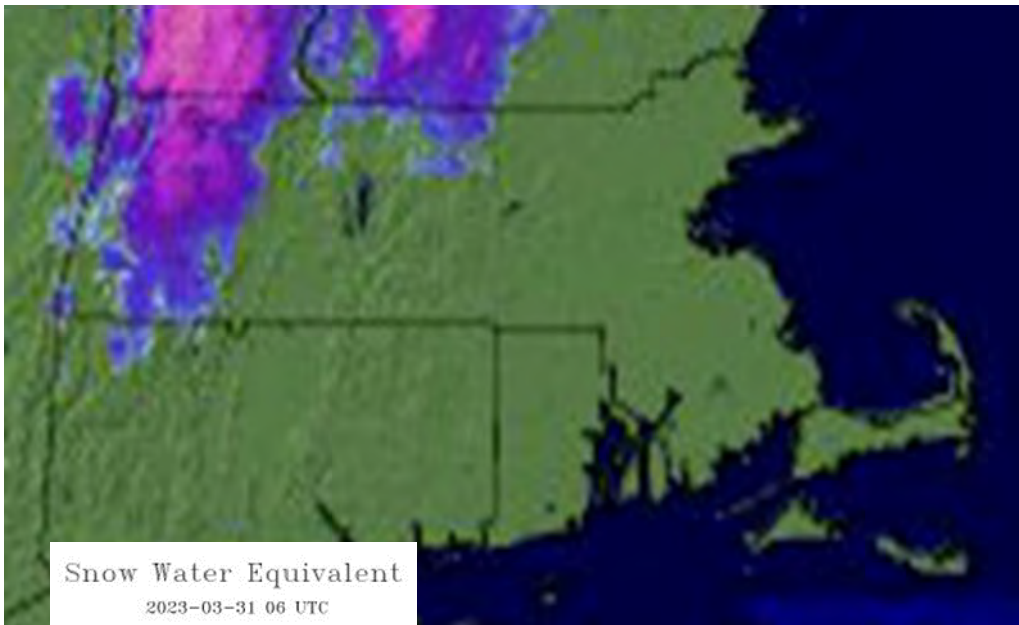
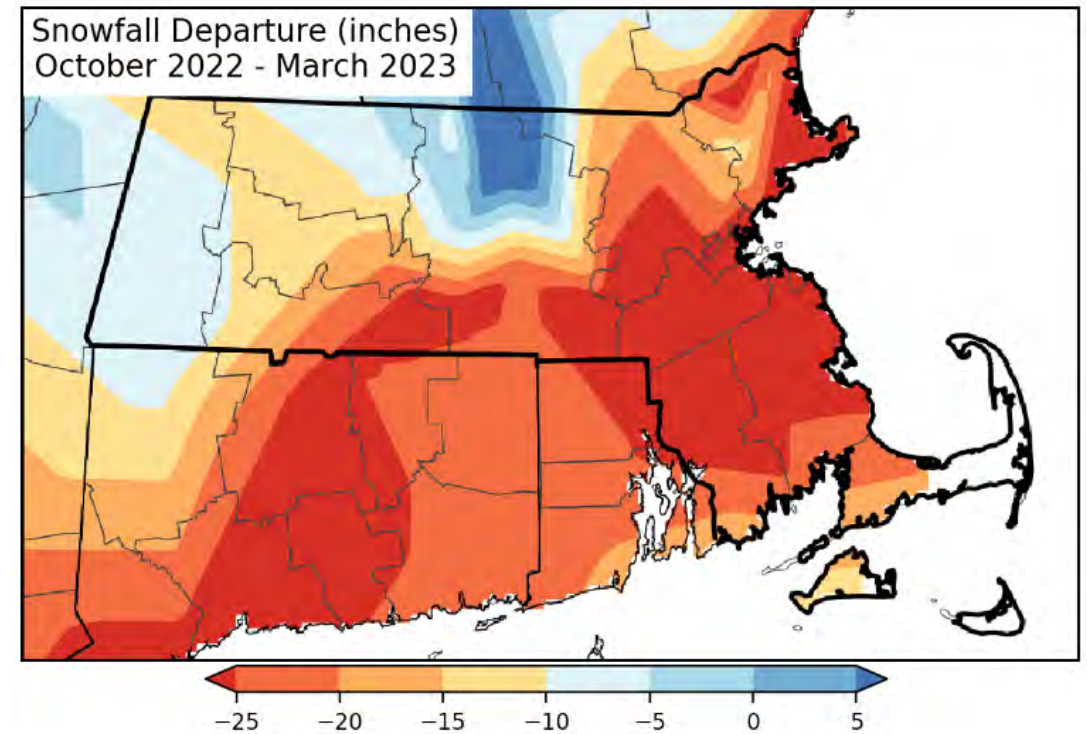
DMP Index Severity Levels			
1	2	3	4



## SNOW COVER

At the end of March, there was snow cover in the western part of the state. Snowfall was below normal for the season except in northern central part of the state.

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

SEASON-TO-DATE  
SNOWFALL DEPARTURE

## CROP MOISTURE INDEX (CMI) - 2019 DROUGHT MANAGEMENT PLAN

Provided for the months of April through November.

[https://www.cpc.ncep.noaa.gov/products/monitoring\\_and\\_data/drought.shtml](https://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml)



## EVAPORATIVE DEMAND DROUGHT INDEX (EDDI) - PROPOSED FOR THE DROUGHT MANAGEMENT PLAN

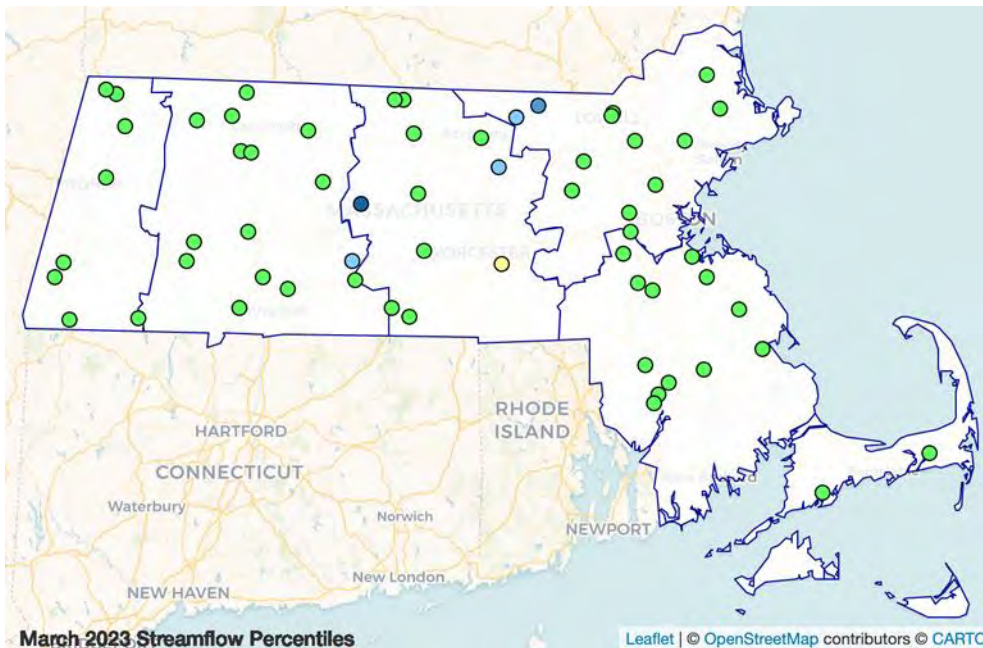
Provided for the months of April through November.





During March, percentiles of individual streamflow gages varied across the state from one below normal to above normal but the vast majority were in the normal range.

## 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	>30 TO ≤70 PERCENTILE	MEDIAN OF INDIVIDUAL GAGE PERCENTILES
WESTERN	8	0	0	0	0	0	42
CTRV	15	0	0	0	0	0	48
CENTRAL	11	0	0	0	1	1	64
NORTHEAST	13	0	0	0	0	0	55
SOUTHEAST	12	0	0	0	0	0	45
CAPE COD	2	0	0	0	0	0	53

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

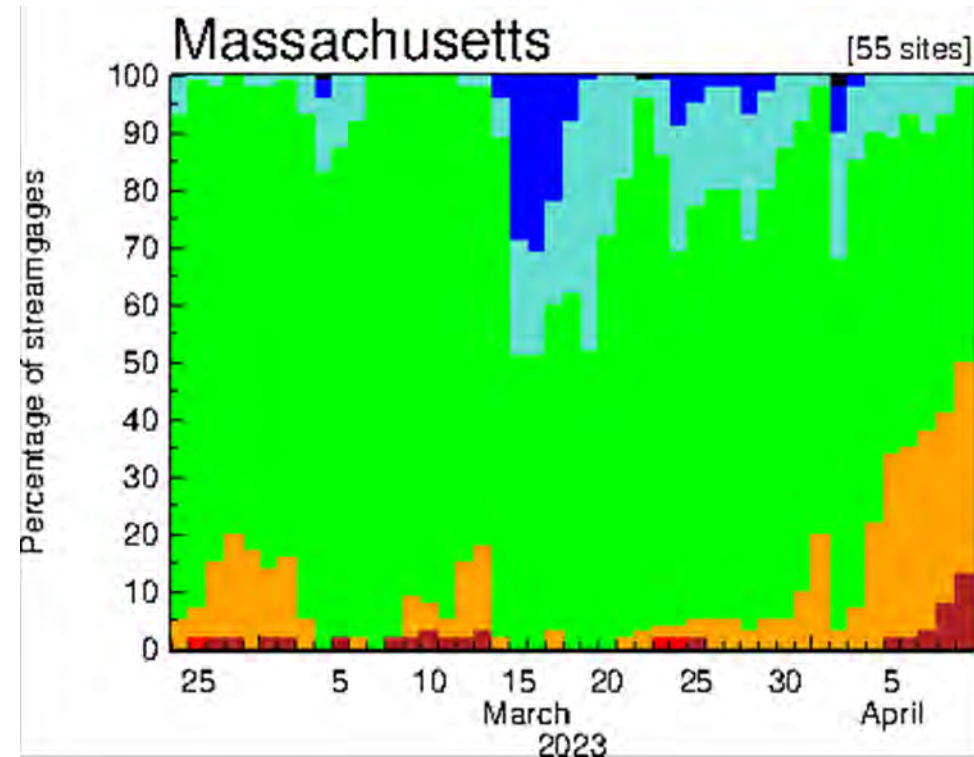
DMP Index Severity Levels			
1	2	3	4



# 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		



According to the NWS E-5 Monthly Report of Hydrologic Conditions for the Boston/Norton service area, on March 14th “a powerful low pressure system brought substantial snow and rainfall to southern New England.”

Antecedent streamflow was high, and the rainfall and snowmelt pushed several rivers into minor flood stage. River flooding was observed on the Assabet River at Maynard, the Taunton River at Bridgewater, and the Shawsheen River at Andover.

No significant impacts occurred as a result of the river flooding.

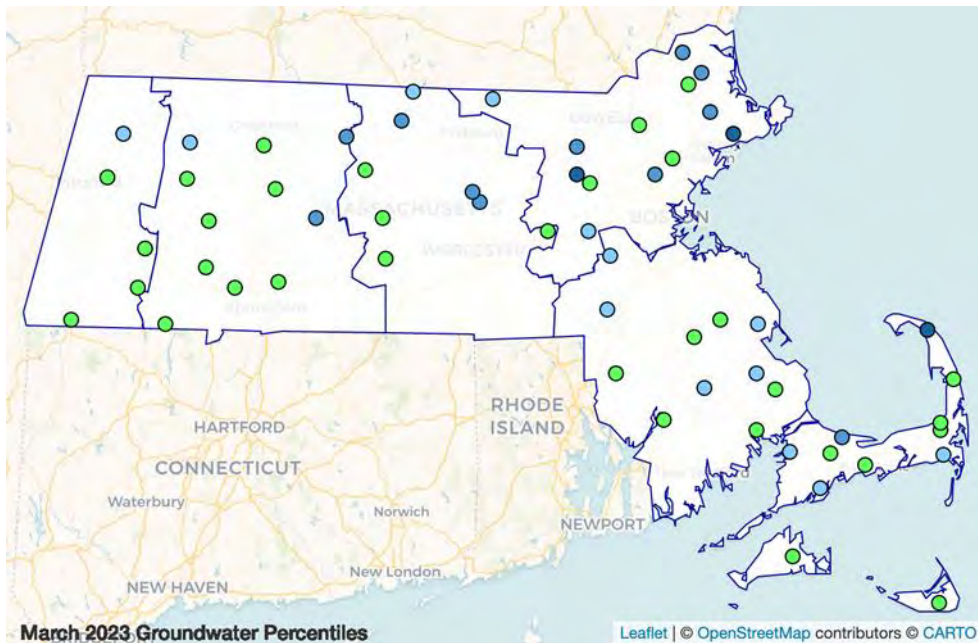


Image: Courtesy of NASA/JPL-Caltech



March groundwater levels ranged from normal to above normal across the state.

## 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	44
CTRV	11	0	0	0	0	0	66
CENTRAL	8	0	0	0	0	0	73
NORTHEAST	13	0	0	0	0	2	81
SOUTHEAST	11	0	0	0	0	0	59
CAPE COD	10	0	0	0	0	1	68
ISLANDS	2	0	0	0	0	0	64

DMP Index Severity Levels			
1	2	3	4



At the end of March, most lake and impoundment levels were above their 30th percentile and/or were 100% full. The monitored pond on Cape Cod is at ISL1.

REGION	NUMBER OF SITES REPORTING	MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT FULL
WESTERN	2	100%
CTRV	2	76th
CENTRAL	2	34th
NORTHEAST	3	79th
SOUTHEAST	2	73rd
CAPE COD	1	21st

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

DMP Index Severity Levels			
1	2	3	4



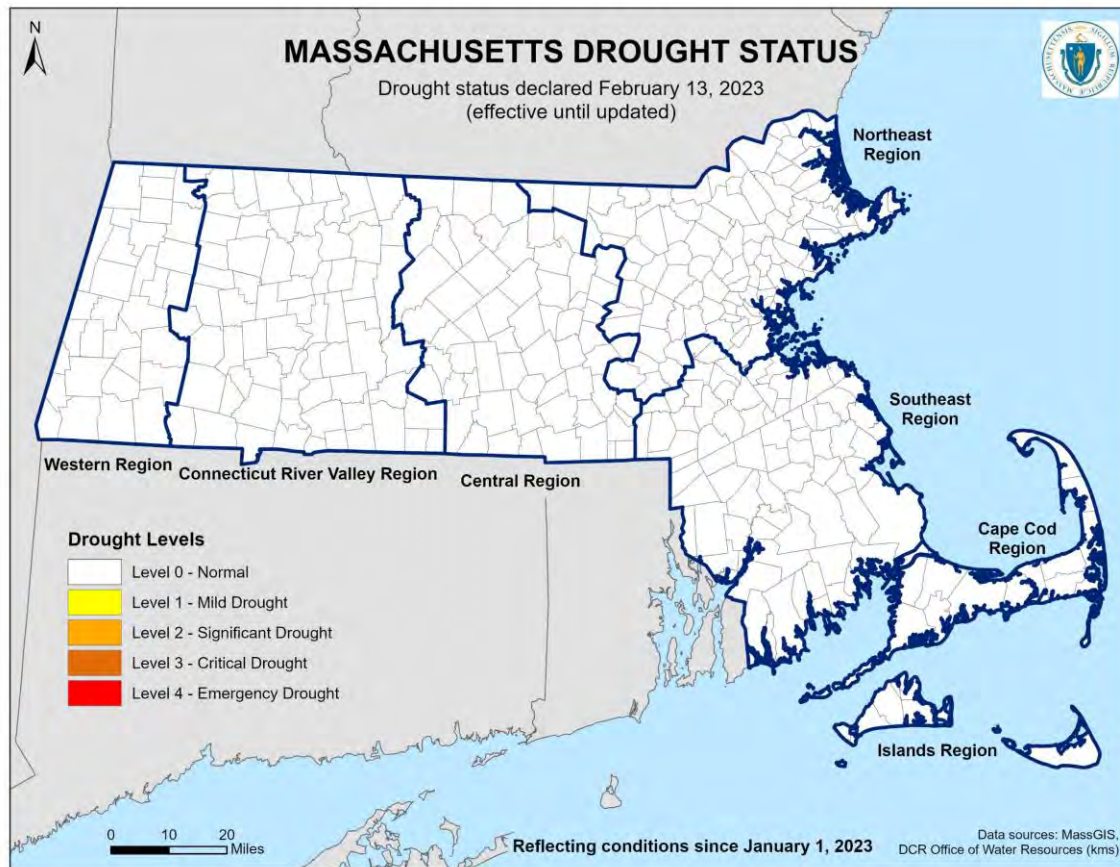
Provided for the months of April through November.





# MASSACHUSETTS DROUGHT STATUS

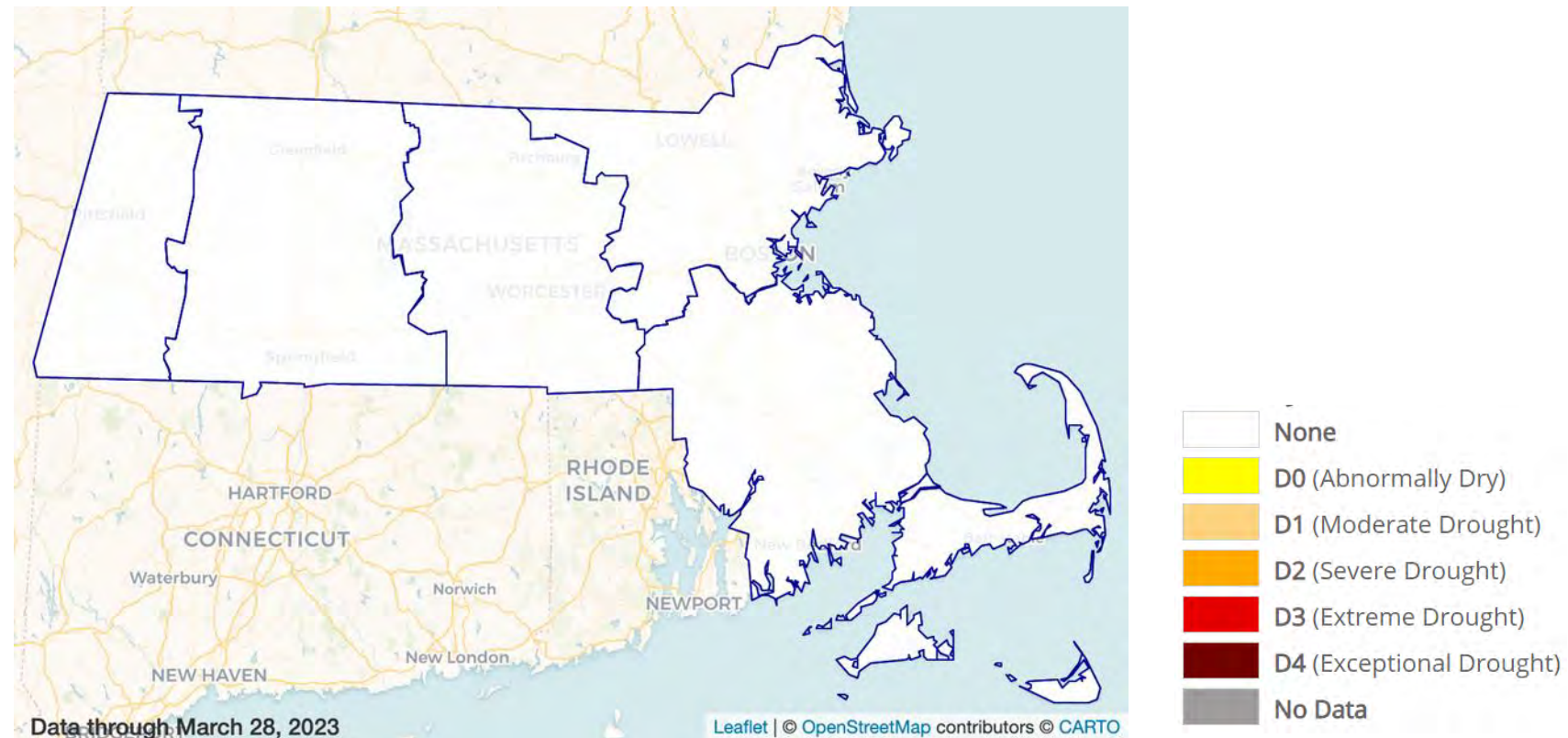
On February 13, 2023, Massachusetts Energy and Environmental Affairs (EEA) Secretary Rebecca L. Tepper declared that starting from January 2023, the Western, Connecticut River Valley, Central, Northeast, Southeast, Cape Cod, and Islands Regions are at Level 0 Normal Conditions. This status remains in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



## U.S. DROUGHT MONITOR (USDM)

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

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

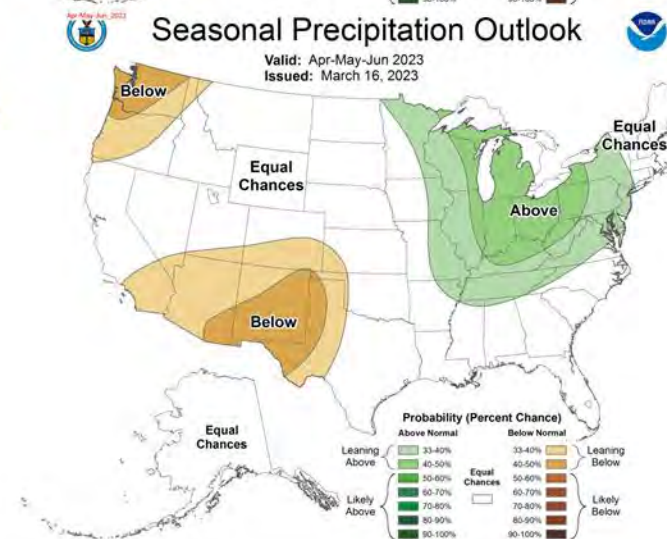
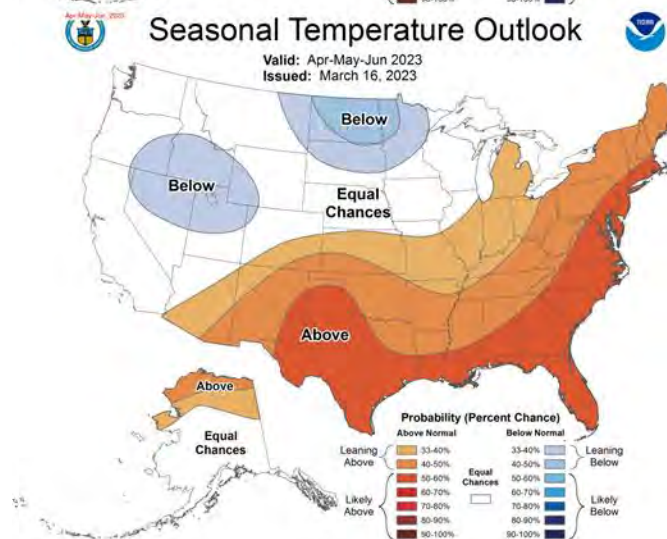
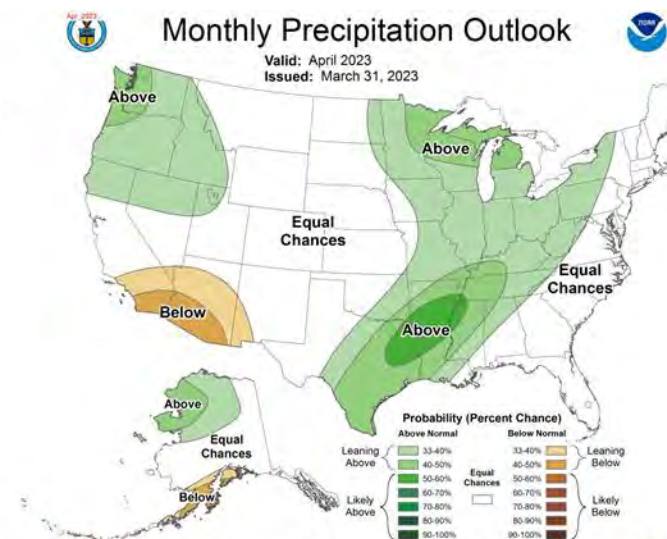
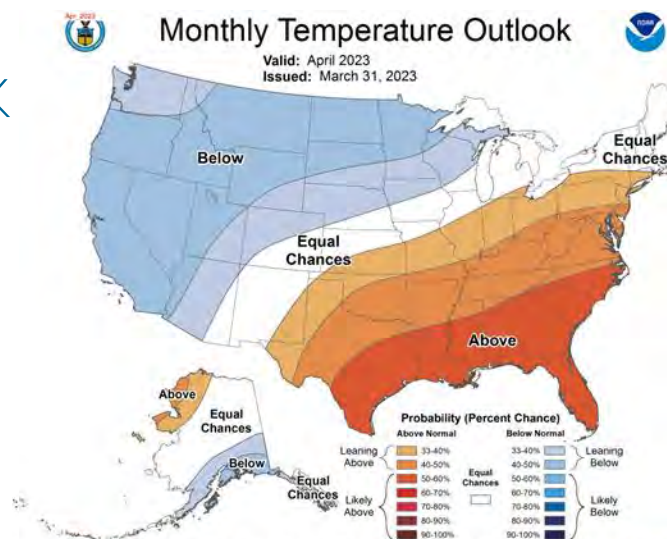


# TEMPERATURE AND PRECIPITATION OUTLOOK

**April:** The outlook issued 3/31 shows equal chances for above-normal, normal, or below-normal temperatures and equal chances for above-normal, normal, or below-normal precipitation.

**April through June:** The seasonal outlook issued 3/16 shows a 40-50% chance in the northwestern part and a 50-60% chance in the remaining part of the state of above-normal temperatures and equal chances for above-normal, normal, or below-normal precipitation.

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

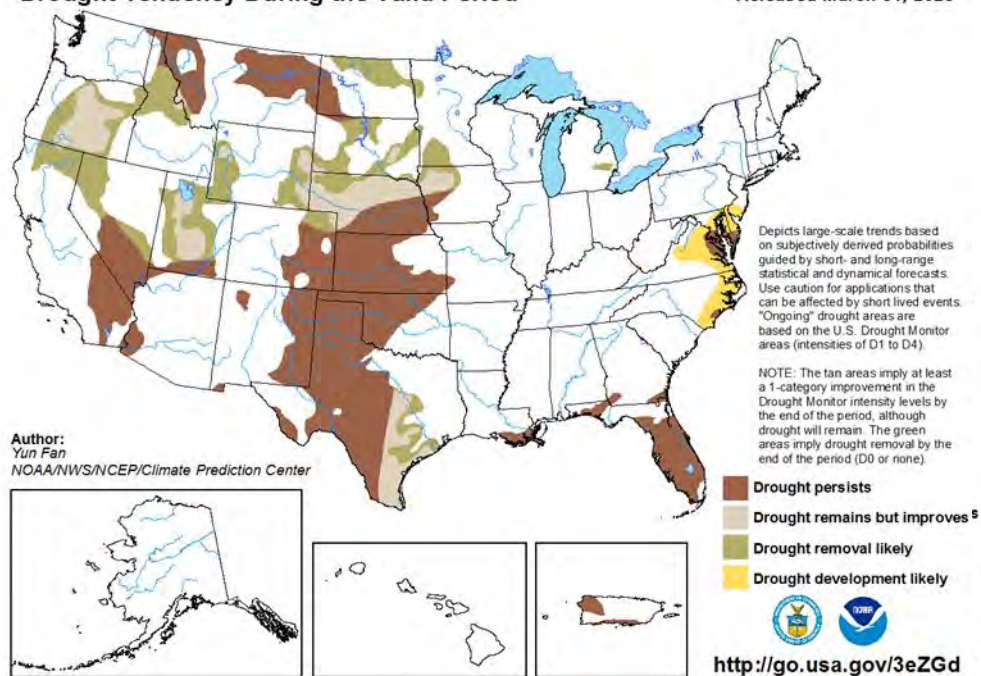




## U.S. Monthly Drought Outlook

### Drought Tendency During the Valid Period

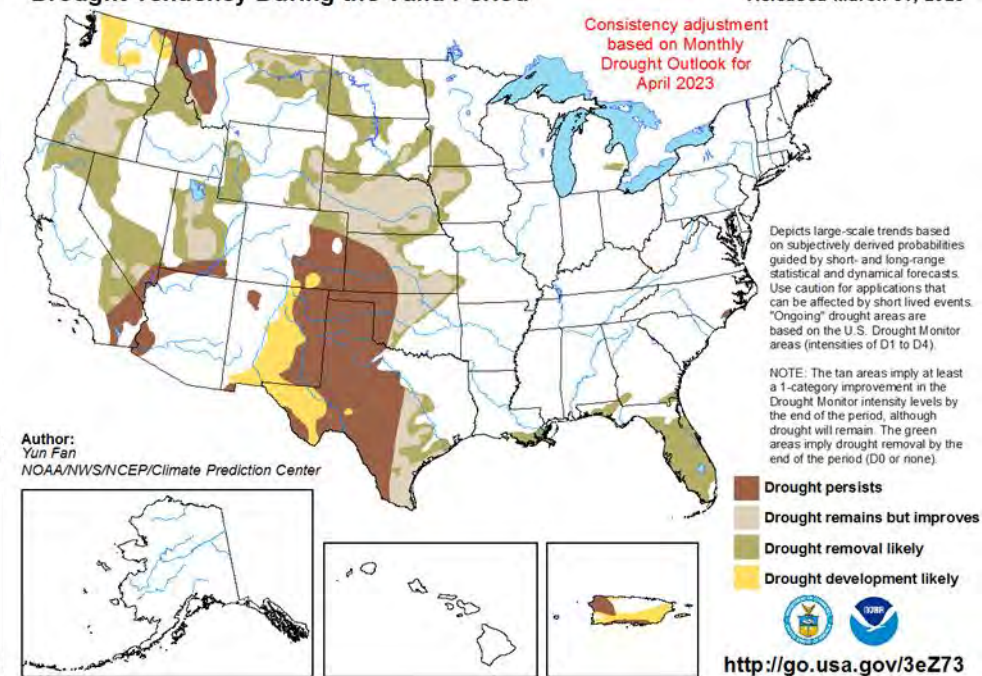
Valid for April 2023  
Released March 31, 2023



## U.S. Seasonal Drought Outlook

### Drought Tendency During the Valid Period

Valid for April 1 - June 30, 2023  
Released March 31, 2023



## MONTHLY AND SEASONAL DROUGHT OUTLOOK

The monthly outlook for April released on 3/31 shows no drought development.

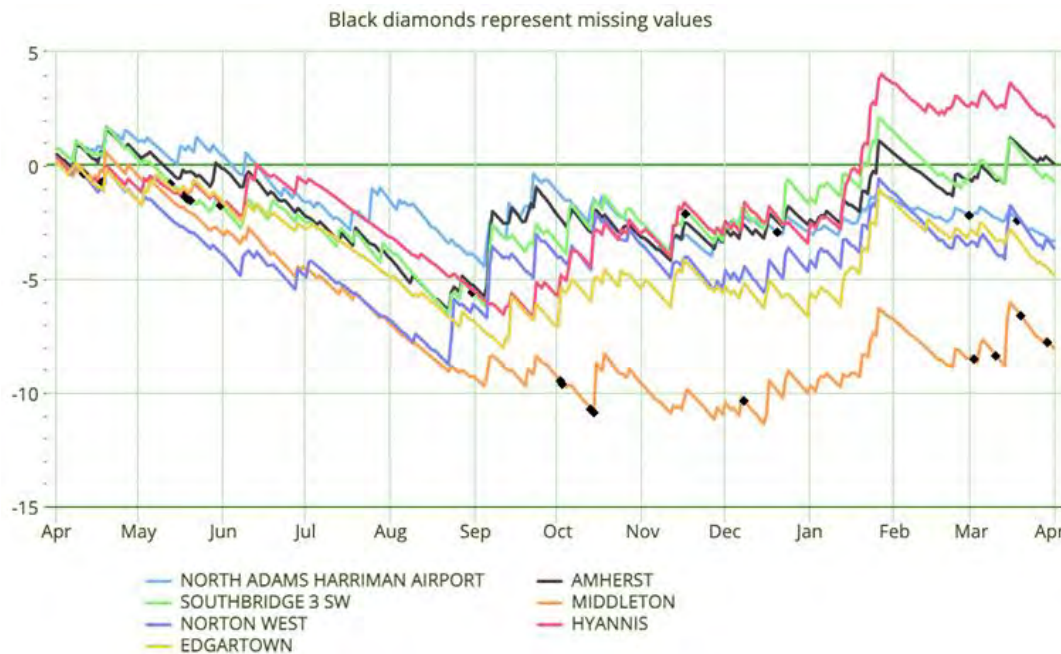
The seasonal outlook for April through June issued on 3/31 shows no drought development.

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

# ADDITIONAL PRECIPITATION DATA

## Standardized Precipitation Index— March 2023 as percentiles

REGION	NUMBER OF SITES	1-mo	2-mo	3-mo	6-mo	9-mo	12-mo	24-mo	36-mo
WESTERN	5	71	46	77	80	60	53	91	72
CTRV	11	69	43	80	73	67	54	84	66
CENTRAL	16	67	30	71	79	69	55	89	77
NORTHEAST	21	74	44	71	66	43	28	73	71
SOUTHEAST	21	64	35	68	73	64	44	78	69
CAPE COD	6	51	31	87	90	69	60	76	58
ISLANDS	4	22	10	71	77	44	24	38	24



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 2023

REGION	NUMBER OF SITES REPORTING	HISTORICAL AVERAGE	MARCH AVERAGE (IN)	DEPARTURE FROM HISTORICAL AVERAGE (IN)	PERCENT OF NORMAL
WESTERN	5	3.25	3.67	0.42	113%
CTRV	11	3.57	4.50	0.93	126%
CENTRAL	16	3.85	4.32	0.47	112%
NORTHEAST	21	3.91	4.82	0.91	123%
SOUTHEAST	21	4.42	5.16	0.74	117%
CAPE COD	6	4.18	3.80	-0.38	91%
ISLANDS	4	4.00	2.51	-1.49	63%



# 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)

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	$\leq 30$ and $> 20$				200-400	$\leq -1.0$ and $> -2.0$
2	$\leq 20$ and $> 10$				400-600	$\leq -2.0$ and $> -3.0$
3	$\leq 10$ and $> 2$				600-700	$\leq -3.0$ and $> -4.0$
4	$\leq 2$				700-800	$\leq -4.0$

## 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



---

**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)