

MASSACHUSETTS WATER RESOURCES COMMISSION



# HYDROLOGIC CONDITIONS IN MASSACHUSETTS

APRIL  
2024

The Commonwealth of Massachusetts

*Maura T. Healey, Governor*

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



# APRIL 2024 HYDROLOGIC CONDITIONS

## SUMMARY OF CONDITIONS



- Monthly average temperatures were mostly normal.
- Precipitation was normal. Snow cover did not remain at the end of April.



- The Evaporative Demand Drought Index was normal except for slightly lower demand in the Western Region.



- The Keetch-Byram Drought Index was in the normal range at the end of April.



- Streamflow regional medians ranged from normal to above normal.



- Groundwater regional medians ranged from normal to above normal.



- 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 temperatures and equal chances for above-normal, normal, or below-normal precipitation.



- NOAA's 3-month outlook shows chances likely for above-normal temperatures, chances leaning for above-precipitation in the southeastern parts of the state, 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.

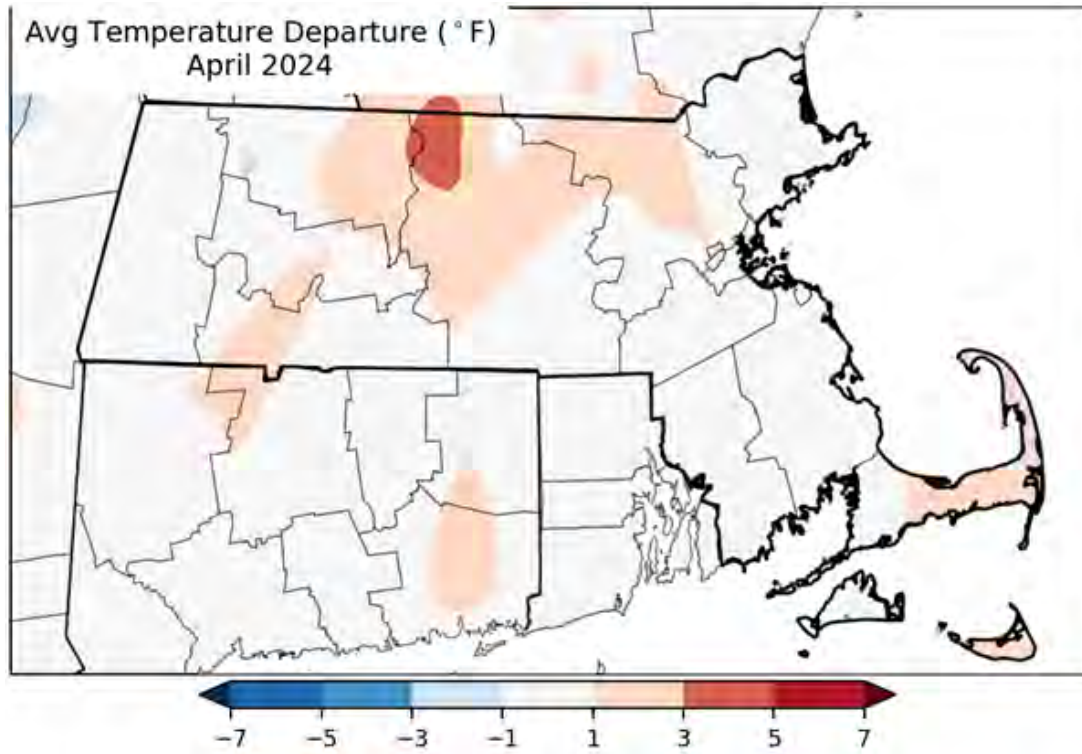


This report was prepared by the Massachusetts Department of Conservation and Recreation. Data may be preliminary. Analysis reflects automated calculations done 05/07/2024. Additional information, previous reports, and the Massachusetts Drought Dashboard with weekly updates to the drought indices can be found at: <https://www.mass.gov/drought-monitoring>

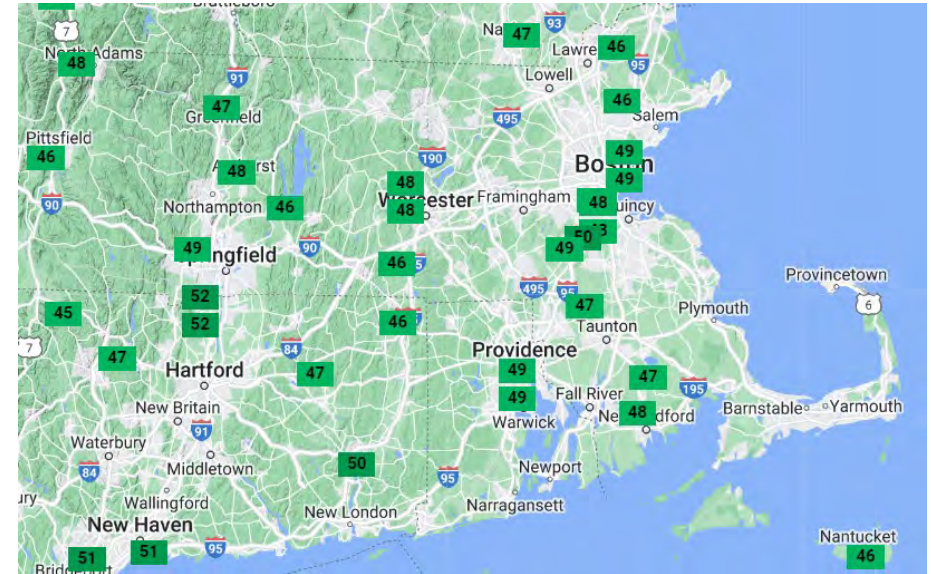


Monthly average temperatures were mostly normal with some areas, particularly in the central part of the state, above normal.

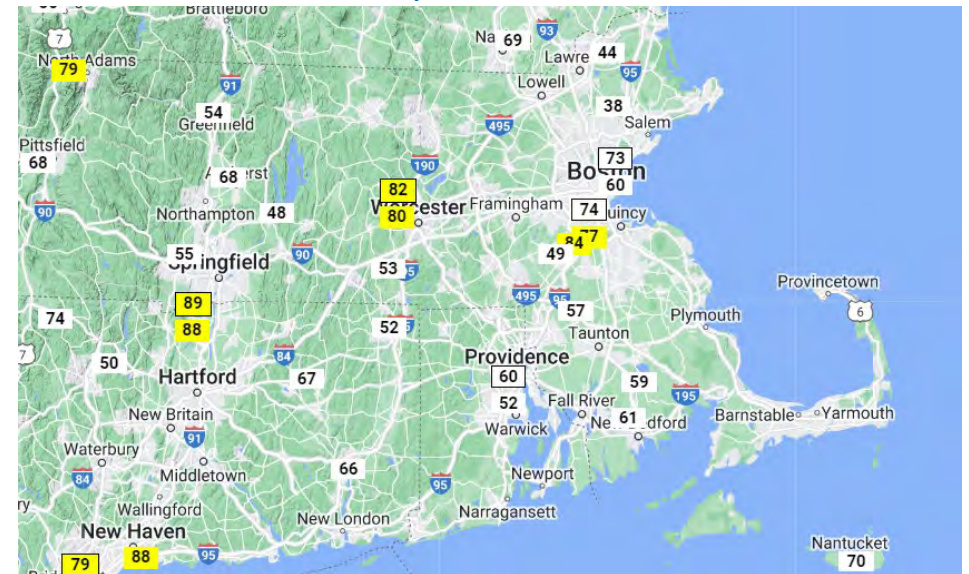
<http://www.nrcc.cornell.edu/regional/monthly/monthly.html>

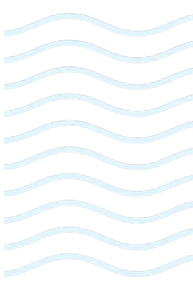


## Observed Average Mean Temperature, °F April 1 to 30, 2024



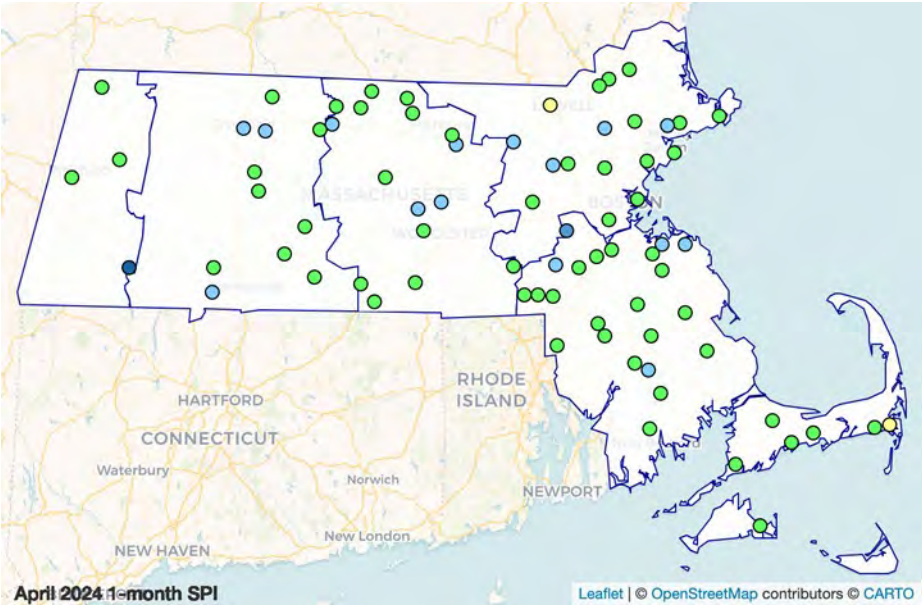
## Observed Average Mean Temperature as Percentiles for April 1 to 30, 2024





# STANDARDIZED PRECIPITATION INDEX (SPI) AS A PERCENTILE

April regional precipitation was normal across the state. In addition to the table below, Appendix I provides all the look-back periods.



<span style="color: red;">●</span> $\geq 0$ to $\leq 2$	<span style="color: orange;">●</span> $> 2$ to $\leq 10$	<span style="color: yellow;">●</span> $> 10$ to $\leq 20$	<span style="color: lightgreen;">●</span> $> 20$ to $\leq 30$	<span style="color: green;">●</span> $> 30$ to $\leq 70$
<span style="color: lightblue;">●</span> $> 70$ to $\leq 80$	<span style="color: blue;">●</span> $> 80$ to $\leq 90$	<span style="color: darkblue;">●</span> $> 90$ to $\leq 98$	<span style="color: purple;">●</span> $> 98$ to $\leq 100$	

REGION	NUMBER OF SITES REPORTING	APRIL MONTHLY AVERAGE (IN)	DEPARTURE FROM HISTORICAL (IN)	SPI PERCENTILE 1-MONTH	SPI PERCENTILE 3-MONTH	SPI PERCENTILE 6-MONTH
WESTERN	4	4.14	0.58	59	81	92
CTRV	11	3.94	0.24	54	83	92
CENTRAL	16	4.44	0.52	65	85	96
NORTHEAST	18	4.02	0.21	57	79	93
SOUTHEAST	23	4.54	0.36	58	86	94
CAPE COD	6	3.40	-0.69	39	60	57
ISLANDS	1	3.91	-0.25	51	76	77

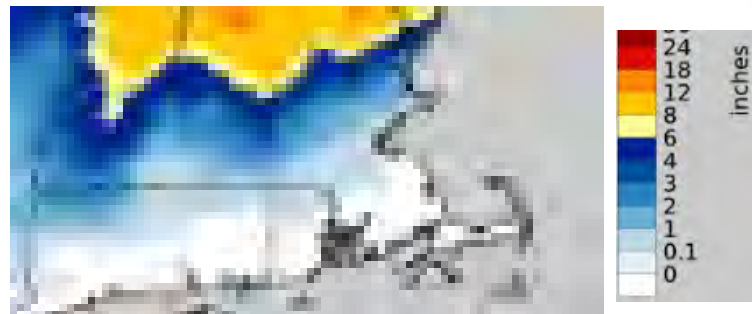
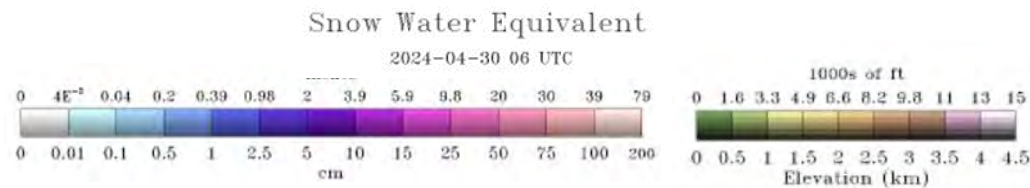
SPI is the Standardized Precipitation Index used in the Drought Management Plan (DMP) expressed here as a percentile and represents the variation from long-term precipitation.

DMP Index Severity Levels			
1	2	3	4



# SNOW COVER

At the end of April, there was no snow cover remaining. <https://www.nohrsc.noaa.gov/nsa/>

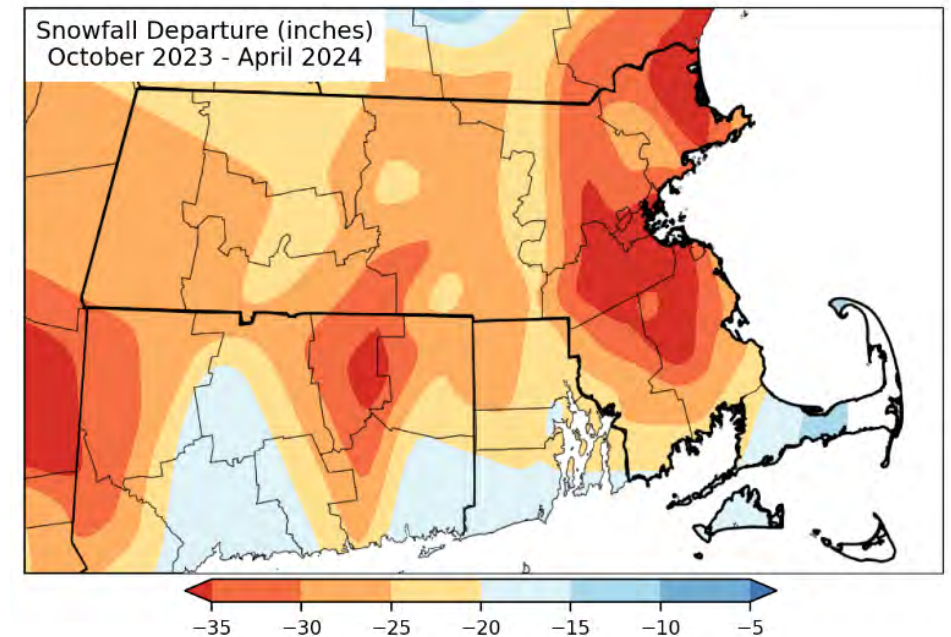


National Snowfall Analysis: 24-hour accumulation ending 2024-04-05 00 UTC  
10863 reports; issued 2024-04-10 11:40:21 UTC

[https://www.nohrsc.noaa.gov/snowfall\\_v2/](https://www.nohrsc.noaa.gov/snowfall_v2/)

A spring nor'easter April 4<sup>th</sup>  
brought snow to MA.

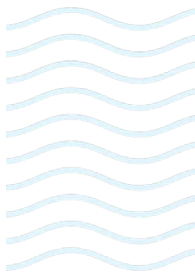
## SEASON-TO-DATE SNOWFALL DEPARTURE



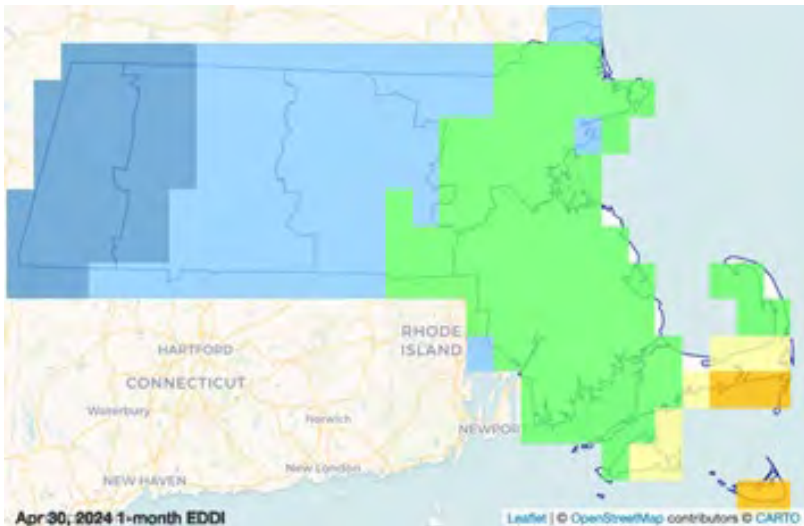
<http://www.nrcc.cornell.edu/regional/monthly/monthly.html>

# EVAPORATIVE DEMAND DROUGHT INDEX (EDDI)

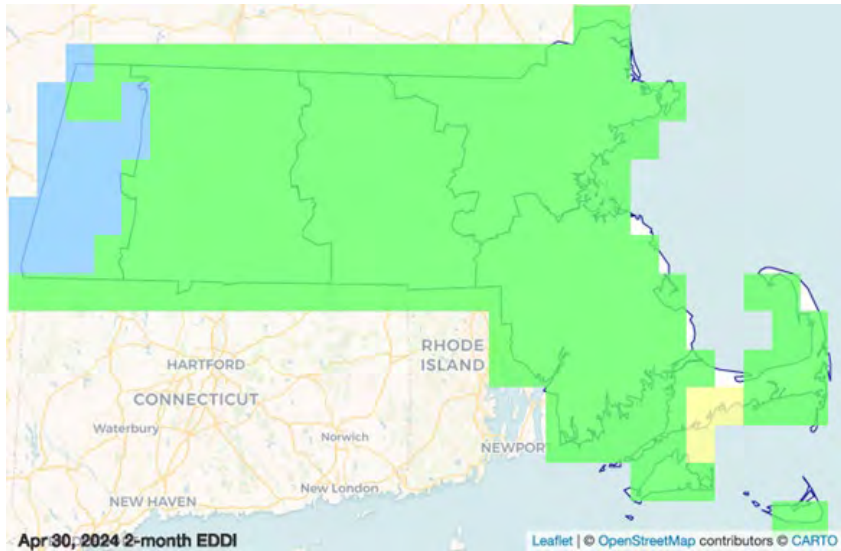
As of April 30, 2024, the 1-month EDDI categories were normal except for the Western Region, which had less demand than normal, and the Islands Region, which had more demand than normal. The 2-month EDDI categories, which are used in the MA Drought Plan monitoring, were normal except for the Western Region, which had less demand than normal.



1-month EDDI



2-month EDDI



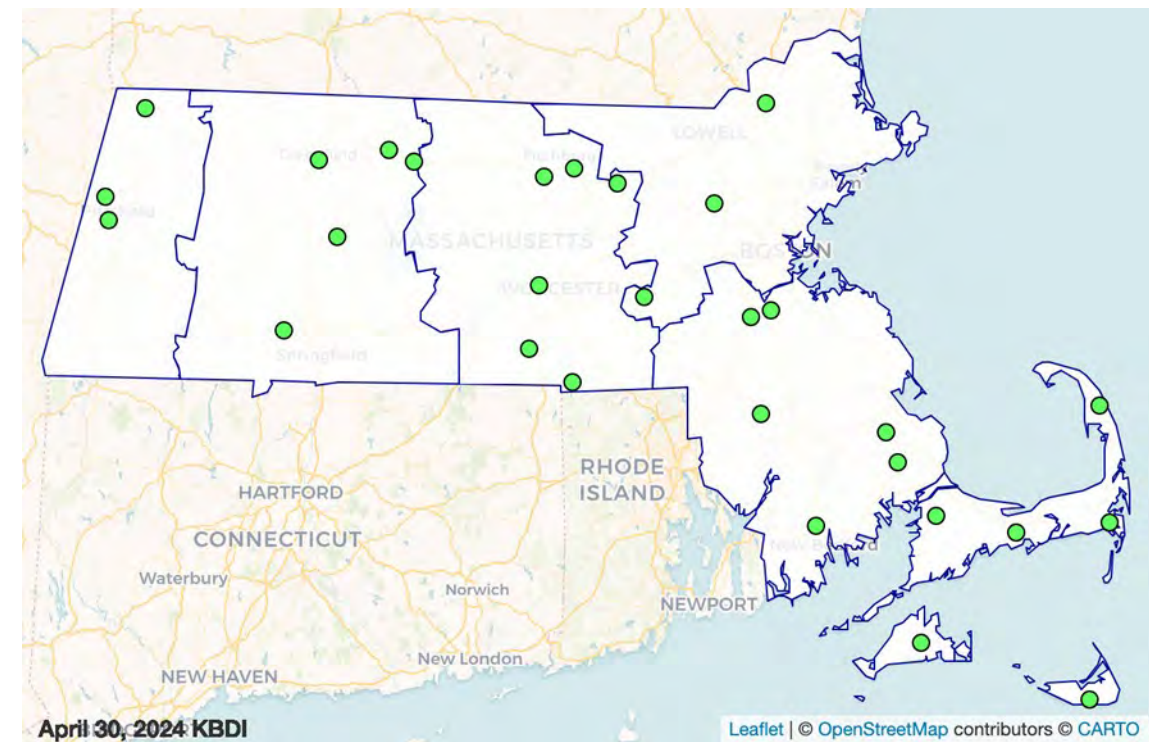
<span style="color: red;">●</span> $\geq 0$ to $\leq 2$	<span style="color: orange;">●</span> $> 2$ to $\leq 10$	<span style="color: yellow;">●</span> $> 10$ to $\leq 20$	<span style="color: lightgreen;">●</span> $> 20$ to $\leq 30$	<span style="color: green;">●</span> $> 30$ to $\leq 70$
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REGION	MEDIAN 2-MONTH EDDI (2024-04-30)
WESTERN	72
CTRV	56
CENTRAL	49
NORTHEAST	49
SOUTHEAST	40
CAPE COD	41
ISLANDS	38

DMP Index Severity Levels			
1	2	3	4



At the end of April, the Keetch Byram Drought Index (KBDI) was in the normal range in all Regions.



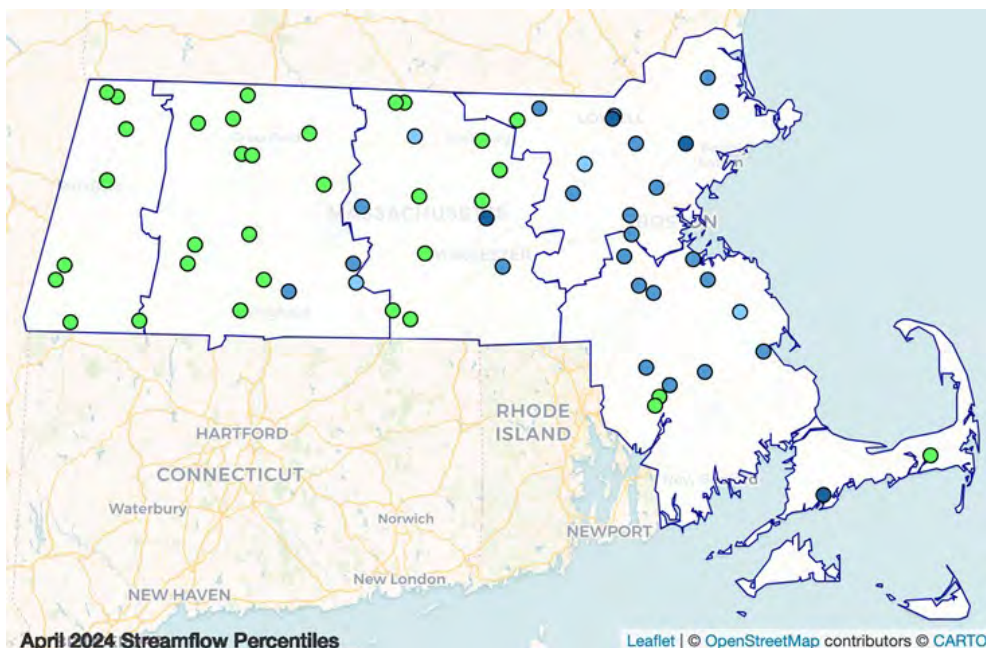
REGION	NUMBER OF SITES REPORTING	HIGHEST OF SITE VALUES
WESTERN	2	0
CTRV	4	4
CENTRAL	3	0
NORTHEAST	2	5
SOUTHEAST	4	0
CAPE COD	2	0
ISLANDS	2	0

DMP Index Severity Levels			
1	2	3	4

Point Values - KBDI Range				
≥700 to ≤800	≥600 to <700	≥400 to <600	≥200 to <400	≥0 to <200

The median of individual stream gages were normal to above normal. Four gages were above their respective 90<sup>th</sup> percentile values.

## MEDIAN MONTHLY STREAMFLOW PERCENTILES COMPARED TO HISTORICAL VALUES



● $\geq 0$ 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 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	0	55
CTRV	15	0	0	0	0	0	61
CENTRAL	13	0	0	0	0	1	66
NORTHEAST	13	0	0	0	0	2	85
SOUTHEAST	12	0	0	0	0	0	84
CAPE COD	2	0	0	0	0	1	80

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

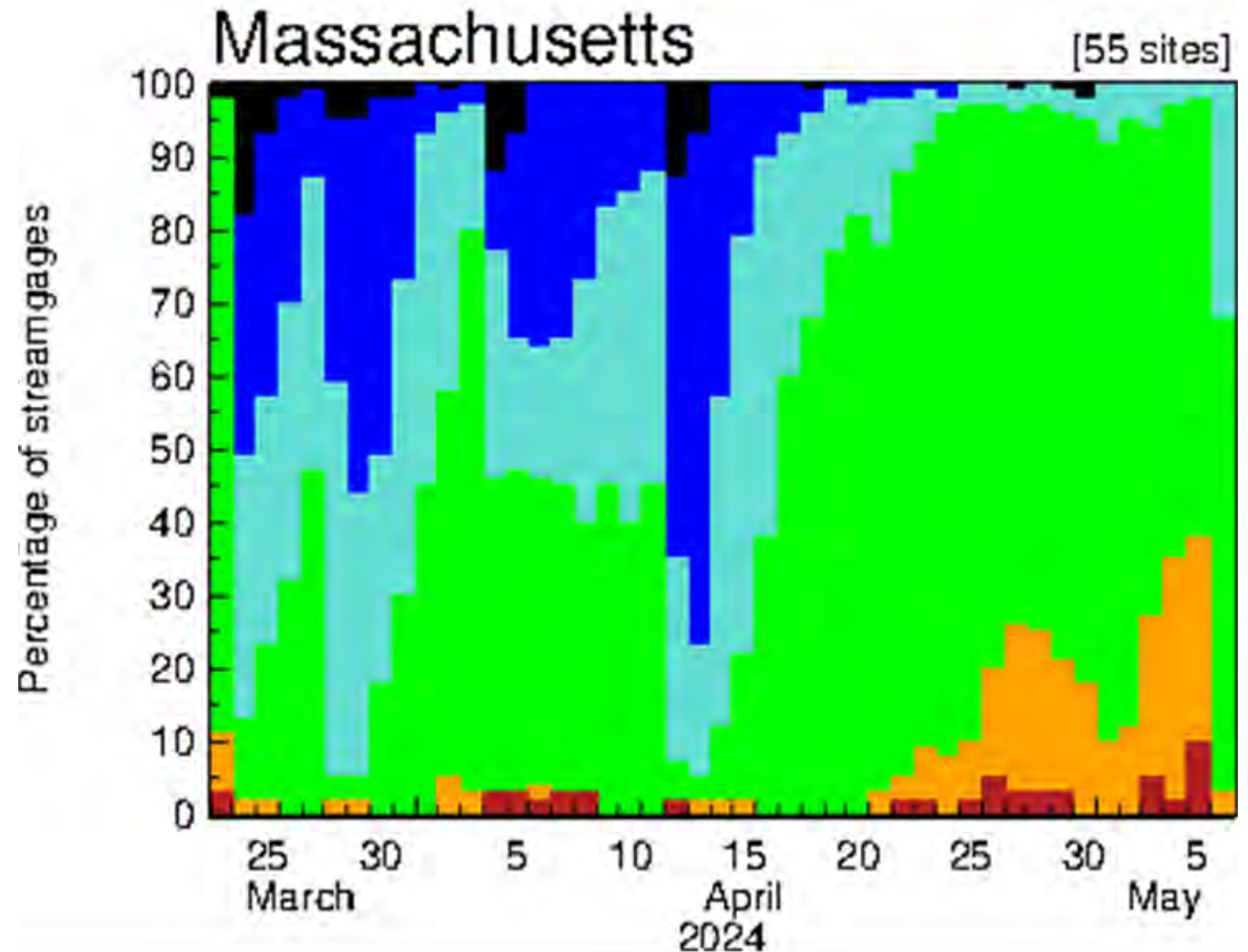
DMP Index Severity Levels			
1	2	3	4



# 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 and Albany NWS E-5 Monthly Reports have not been received as of the writing of this report. Overall, precipitation was normal in April. Streamflow was already in the normal to above-normal range from a storm in late March, and there were two storms in April that resulted in flood warnings.

April 4<sup>th</sup> nor'easter: Three flood warnings were issued in Middlesex and Bristol Counties at river forecast points.

April 12-13<sup>th</sup>: There were two flood warnings issued in Hampden and Hampshire counties at river forecast points. In addition, there were two areal flood warnings issued in Franklin and Hampshire counties.

There were no inland flood storm reports or flash flood warnings during the month of April.

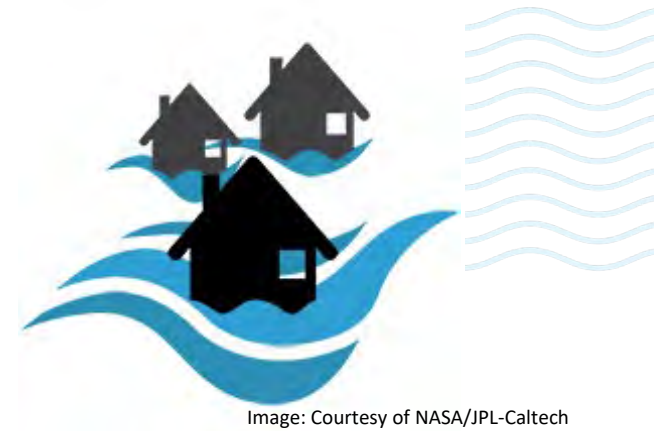


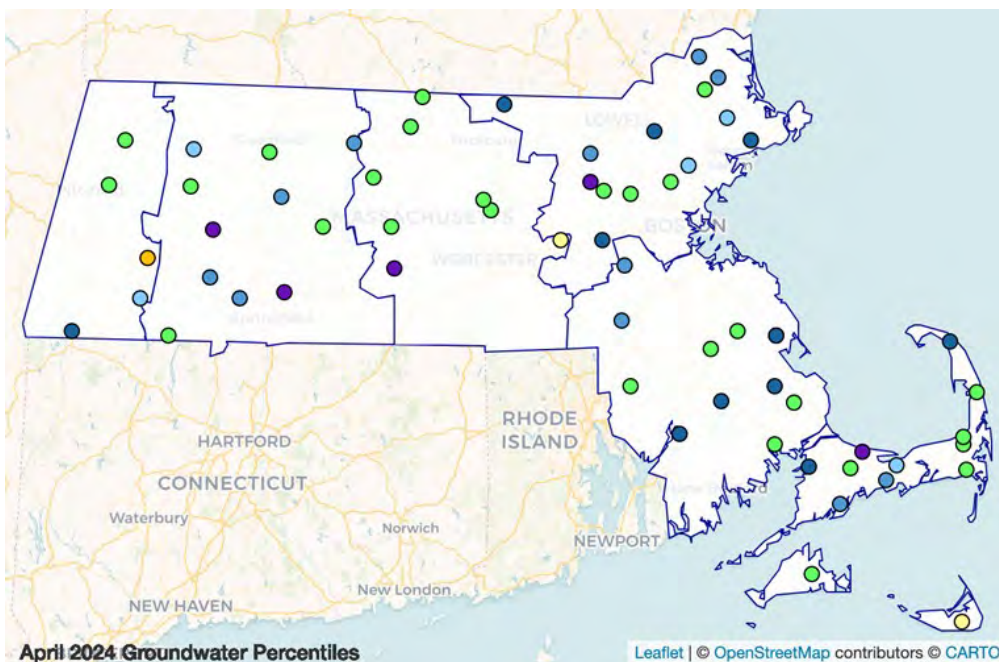
Image: Courtesy of NASA/JPL-Caltech

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



April groundwater levels ranged from below normal to much above normal. Regional medians were normal to above normal.

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

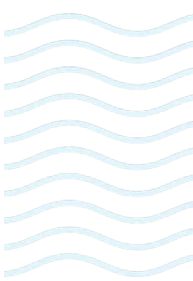


● $\geq 0$ to $\leq 2$	● $> 2$ to $\leq 10$	● $> 10$ to $\leq 20$	● $> 20$ to $\leq 30$	● $> 30$ to $\leq 70$
● $> 70$ to $\leq 80$	● $> 80$ to $\leq 90$	● $> 90$ to $\leq 98$	● $> 98$ to $\leq 100$	

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	1	0	1	57
CTRV	11	0	0	0	0	2	81
CENTRAL	8	0	0	0	1	1	50
NORTHEAST	14	0	0	0	0	5	83
SOUTHEAST	12	0	0	0	0	4	84
CAPE COD	11	0	0	0	0	3	72
ISLANDS	2	0	0	0	1	0	47

DMP Index Severity Levels			
1	2	3	4





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

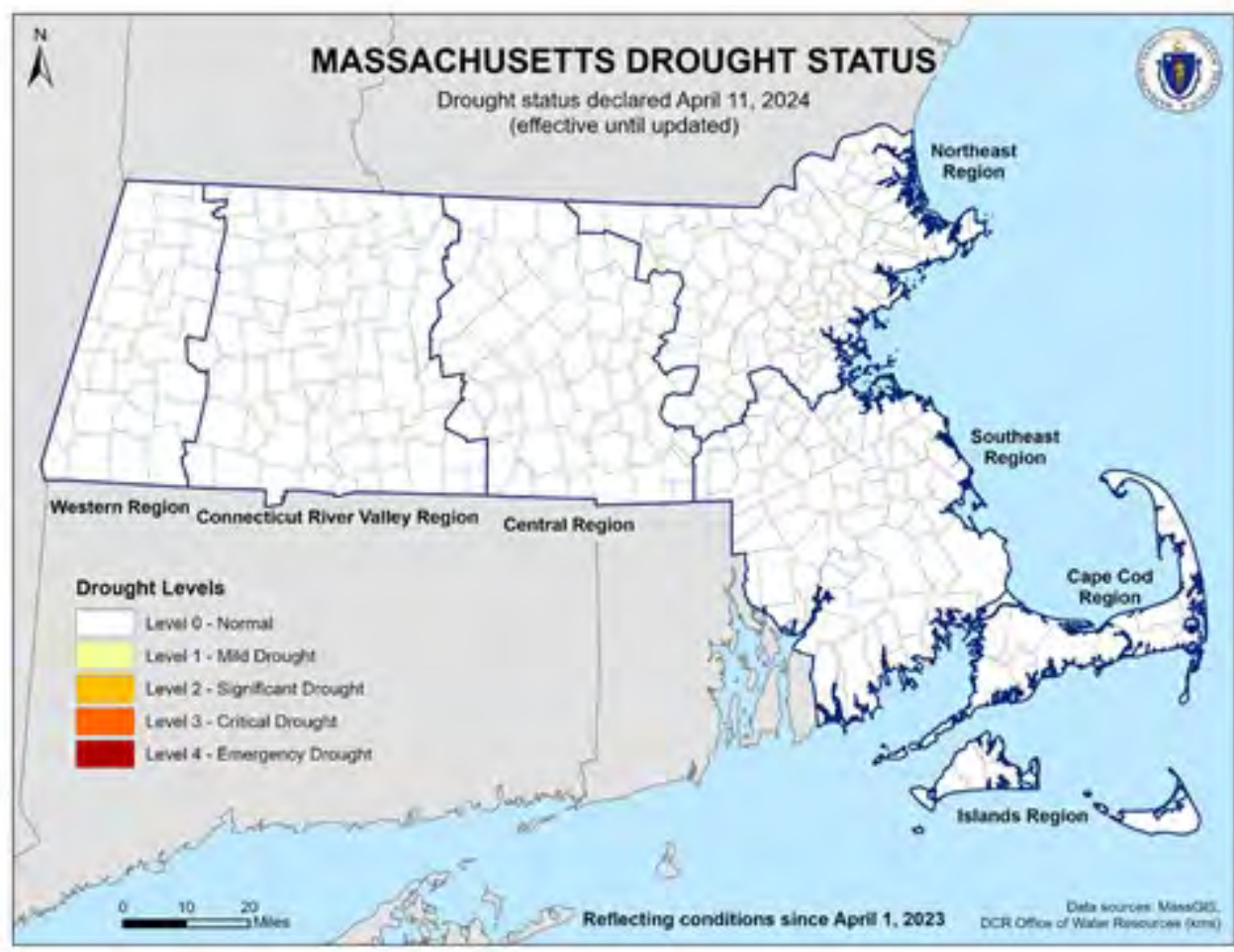
REGION	NUMBER OF SITES REPORTING	MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT FULL
WESTERN	1	100% full
CTRV	2	89th
CENTRAL	2	59th
NORTHEAST	4	84th
SOUTHEAST	2	97th
CAPE COD	1	63rd

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

DMP Index Severity Levels			
1	2	3	4



## MASSACHUSETTS DROUGHT STATUS

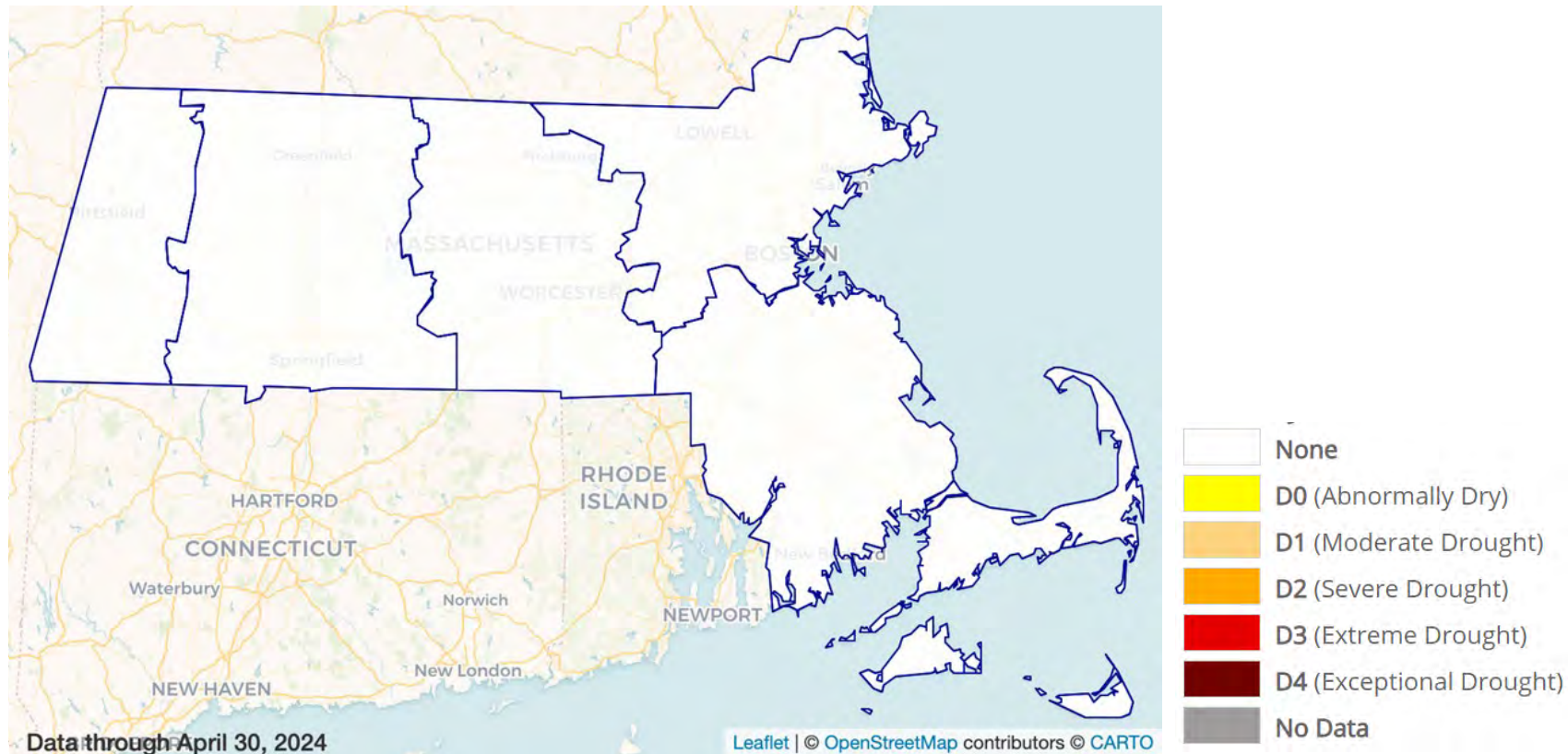




## U.S. DROUGHT MONITOR (USDM)

At the end of April, the USDM showed no areas of drought or abnormal dryness.

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



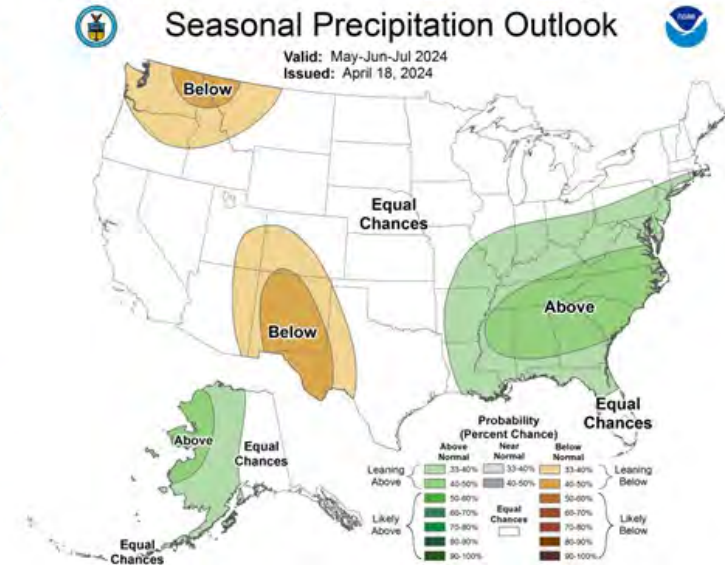
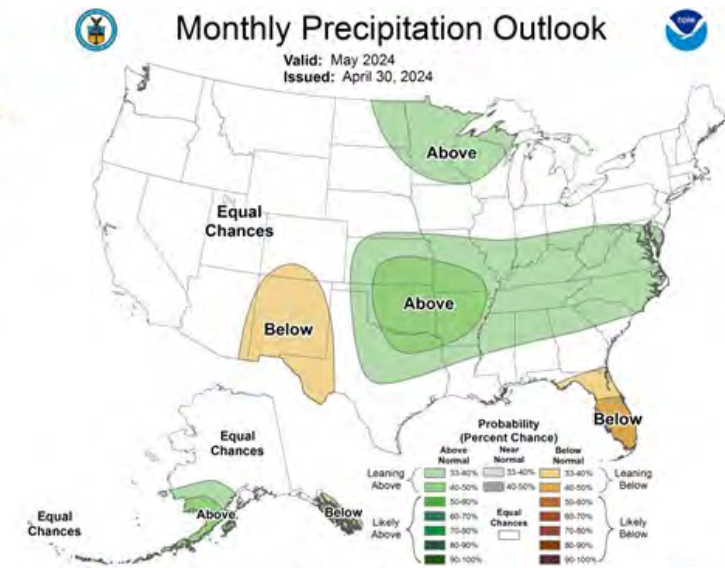
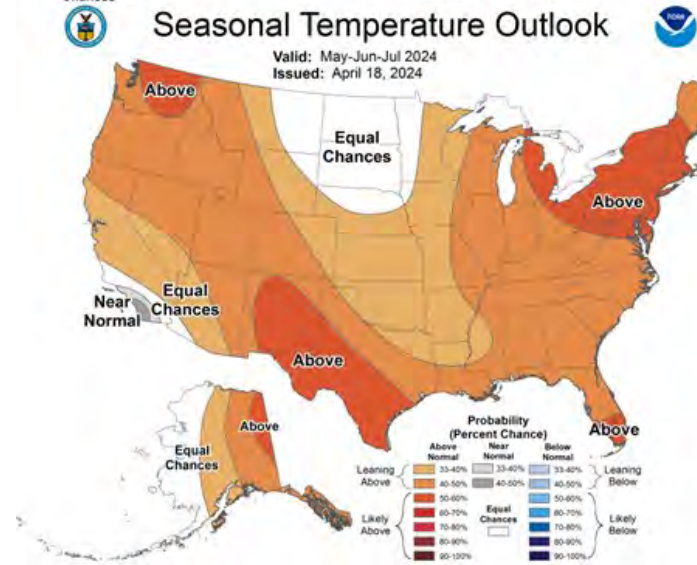
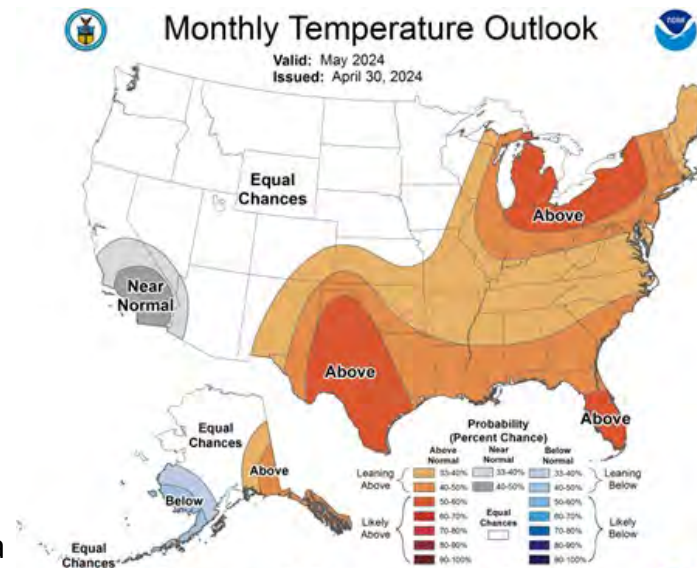


# TEMPERATURE AND PRECIPITATION OUTLOOK

**May:** The outlook issued 4/30 shows a 33-40% chance of above-normal temperatures in the eastern half of the state, a 40-50% chance of above normal temperatures in the western half, and equal chances for above-normal, normal, or below-normal precipitation across the state.

**May through July:** The seasonal outlook issued 4/18 shows a 50-60% chance of above-normal temperatures, a 33-40% chance of above normal precipitation in the southeastern parts of the state, and equal chances for above-normal, normal, or below-normal precipitation in the rest of the state.

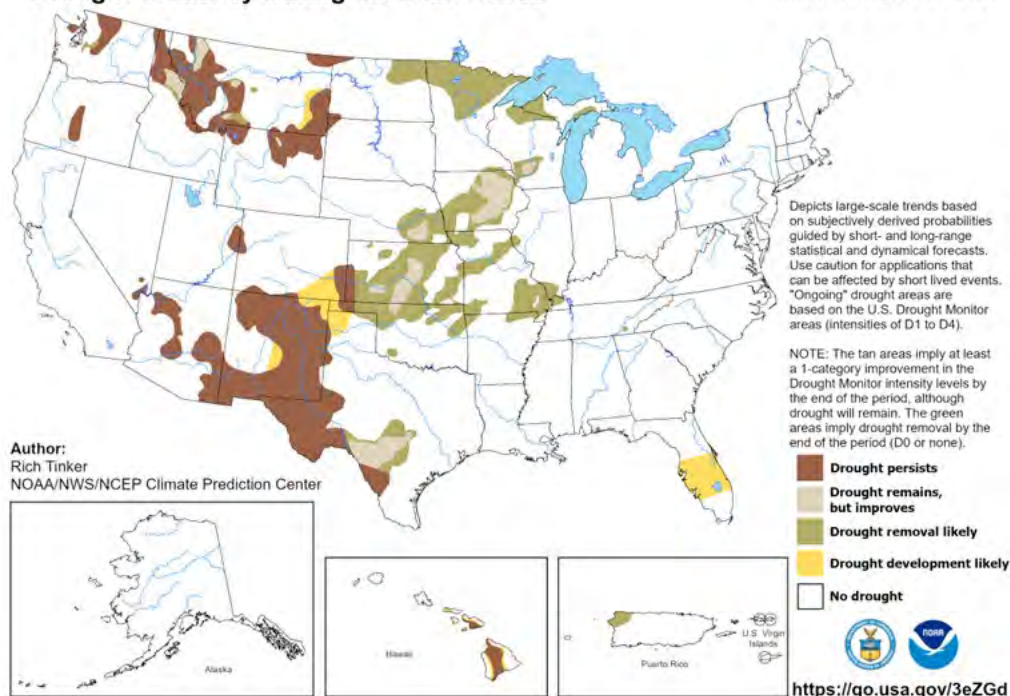
<https://www.cpc.ncep.noaa.gov/>



## U.S. Monthly Drought Outlook

Drought Tendency During the Valid Period

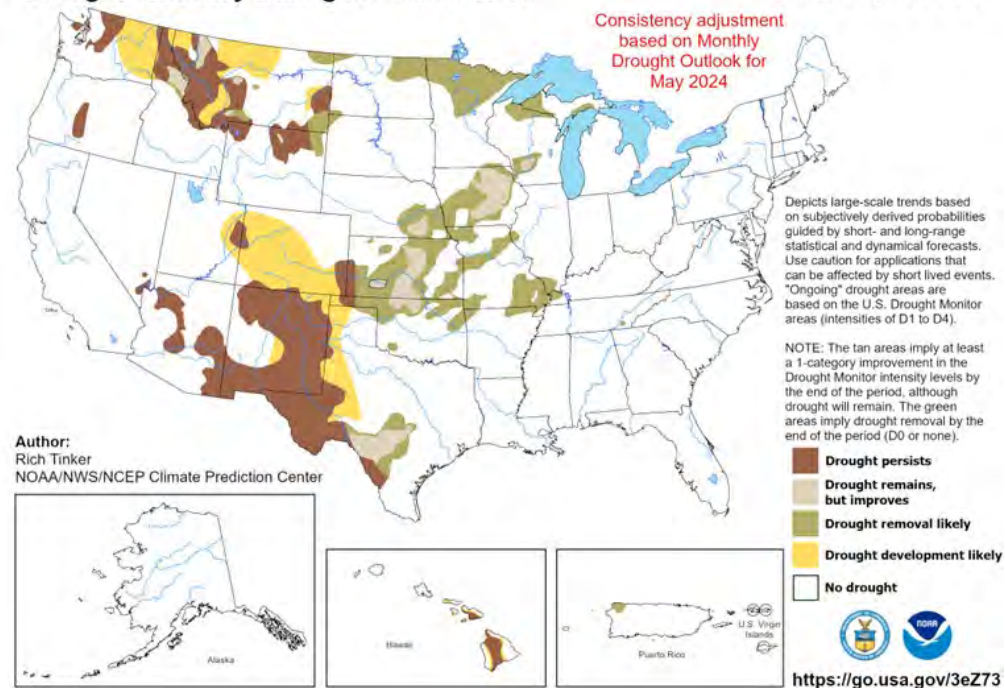
Valid for May 2024  
Released April 30, 2024



## U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid for May 1 - July 31, 2024  
Released April 30, 2024



## MONTHLY AND SEASONAL DROUGHT OUTLOOK

The monthly outlook for May released on 4/30 shows no drought development.

The seasonal outlook for May through July issued on 4/30 shows no drought development.

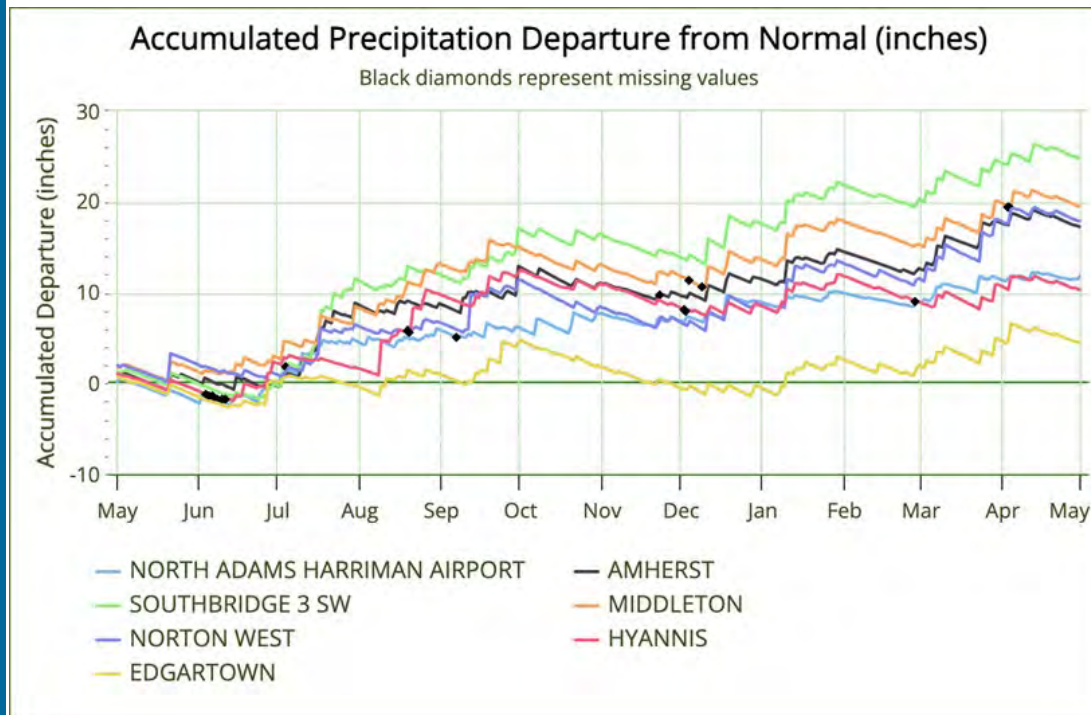
<http://www.cpc.ncep.noaa.gov/products/Drought>



# ADDITIONAL PRECIPITATION DATA

## Standardized Precipitation Index— April 2024 as percentiles

REGION	NUMBER OF SITES	1-mo	2-mo	3-mo	6-mo	9-mo	12-mo	24-mo	36-mo
WESTERN	4	59	95	81	92	92	95	78	94
CTRV	11	54	95	83	92	91	97	89	97
CENTRAL	16	65	95	85	96	97	99	96	98
NORTHEAST	18	57	94	79	93	97	98	85	94
SOUTHEAST	23	58	94	86	94	94	97	89	94
CAPE COD	6	39	76	60	57	74	76	81	88
ISLANDS	1	51	87	76	77	84	80	58	52



DMP Index Severity Levels			
1	2	3	4

## Accumulated Precipitation Departure from 30-Year Normals in Inches

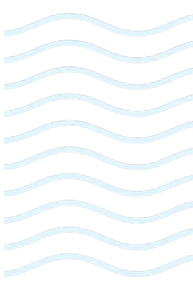
Graph does not consider starting condition's wetness/dryness; does not show summer heat waves with high evapotranspiration; and shows only one station per Drought Region. <https://xmacis.rcc-acis.org/>



## ADDITIONAL PRECIPITATION DATA (CONT.)

## Percent of Average Historical Precipitation—March 2024

REGION	NUMBER OF SITES REPORTING	HISTORICAL AVERAGE	APRIL AVERAGE (IN)	DEPARTURE FROM HISTORICAL AVERAGE (IN)	PERCENT OF NORMAL
WESTERN	4	3.56	4.14	0.58	116%
CTRV	11	3.70	3.94	0.24	106%
CENTRAL	16	3.92	4.44	0.52	113%
NORTHEAST	18	3.81	4.02	0.21	106%
SOUTHEAST	23	4.18	4.54	0.36	109%
CAPE COD	6	4.09	3.40	-0.69	83%
ISLANDS	1	4.16	3.91	-0.25	94%



# 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)