

MASSACHUSETTS WATER RESOURCES COMMISSION



# HYDROLOGIC CONDITIONS IN MASSACHUSETTS

OCTOBER  
2024

The Commonwealth of Massachusetts

*Maura T. Healey, Governor*

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



# OCTOBER 2024 HYDROLOGIC CONDITIONS

## SUMMARY OF CONDITIONS



- Monthly average temperatures were normal to above normal.
- Precipitation was much below normal.



- The 2-mos Evaporative Demand Drought Index at the end of October was at elevated Index Severity Levels (ISLs) in all Regions except Cape Cod and the Islands.



- The Keetch-Byram Drought Index was elevated at the end of October in all Regions except in the Cape Cod and Islands. This has contributed to an increase in wildfires.



- Streamflow regional medians were below normal except in the Cape Cod Region. There were no flood warnings or reports.



- Groundwater regional medians were in the below-normal to normal range. The Western Region is at ISL 1 and the CTRV and Northeast Regions are at ISL 2.



- Lake and impoundment levels ranged from below normal to normal. The Central and SE Regions are at ISL 1, and the Northeast Region at ISL 2.



- NOAA's November outlook shows chances likely for above-normal temperatures and chances leaning for below-normal precipitation.



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



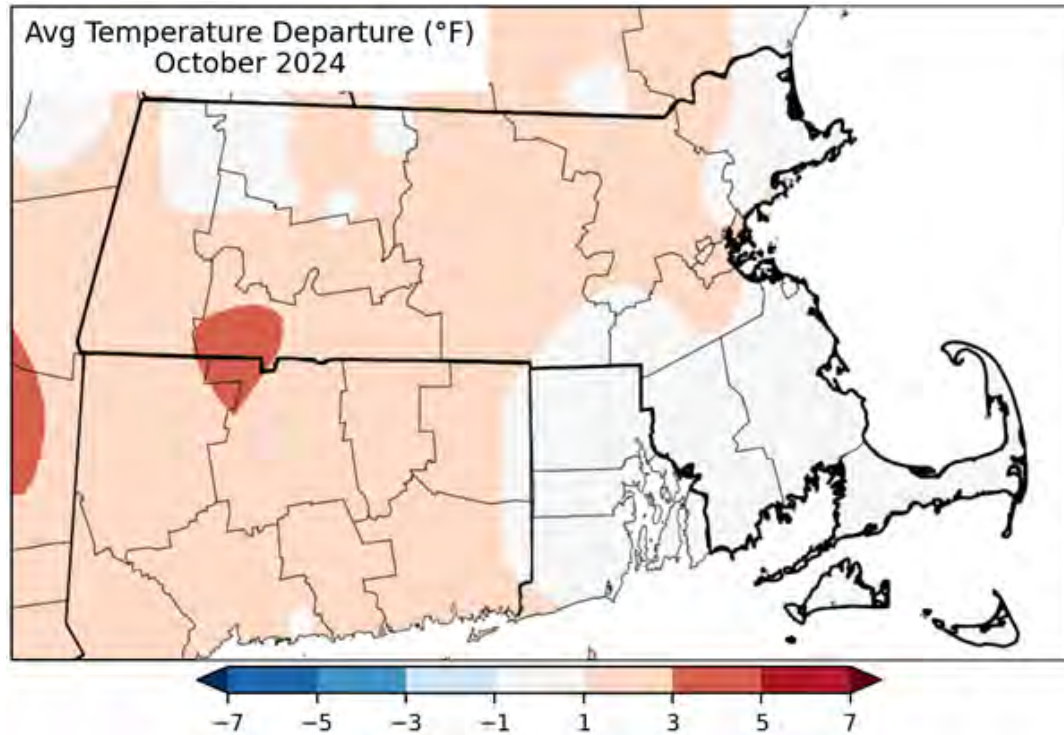
- Appendix II provides information on the Massachusetts Drought Management Plan (DMP) including ISL thresholds used in this report.



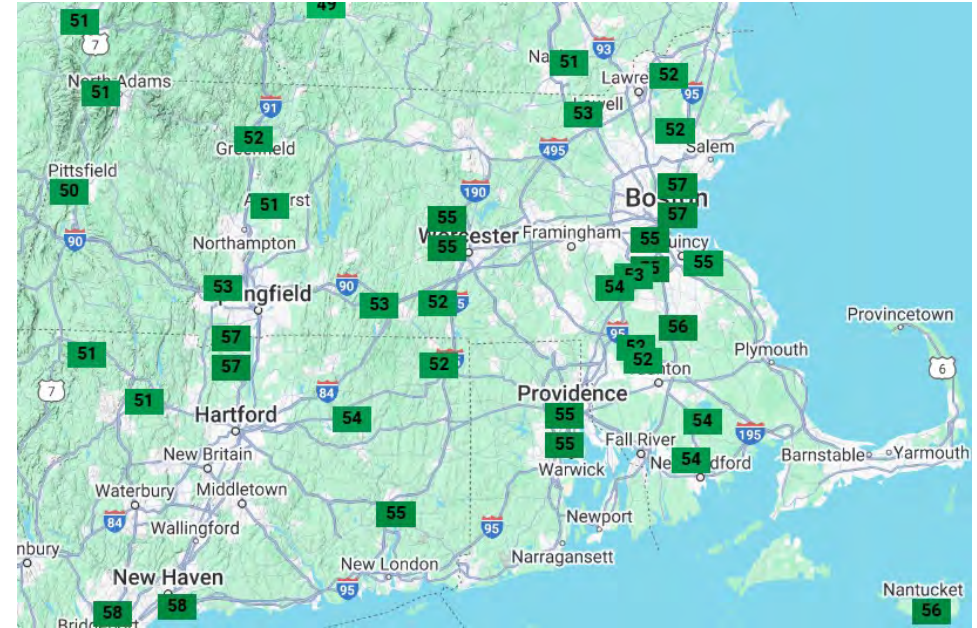
This report was prepared by the Massachusetts Department of Conservation and Recreation. Data may be preliminary. Analysis reflects automated calculations done 11/08/2024. Additional information, previous reports, and the Massachusetts Drought Dashboard with weekly updates to the drought indices can be found at: <https://www.mass.gov/drought-monitoring>

Monthly average temperatures were normal to above normal.

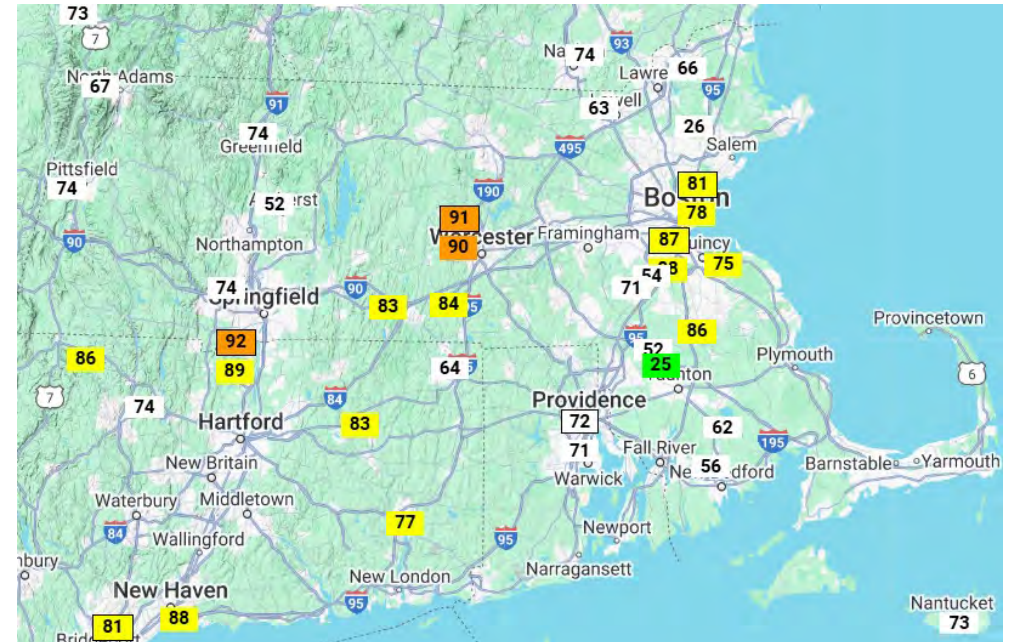
<http://www.nrcc.cornell.edu/regional/monthly/monthly.html>



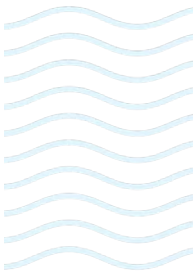
Observed Average Mean Temperatures for October 1<sup>st</sup> to 31<sup>st</sup>



Observed Average Mean Temperature as Percentiles for October 1<sup>st</sup> to 31<sup>st</sup>

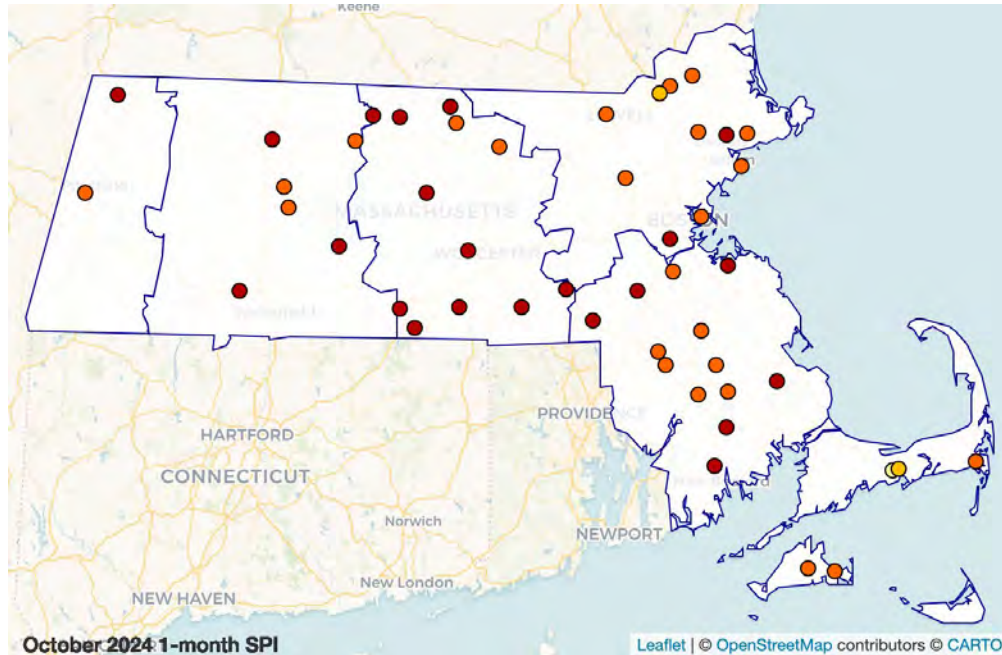


<https://sercc.oasis.unc.edu/Map.php?region=nrcc&>



# STANDARDIZED PRECIPITATION INDEX (SPI) AS A PERCENTILE

October precipitation was much below normal across the state. According to the NRCC, Massachusetts had its second driest October on record. In addition to the ISLs shown in the table below, the Western, CTRV, Central, and Northeast Regions are at ISL 4 and the Southeast at ISL 2 for the 2-mos lookback period.



● $\geq 0$ 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	OCTOBER MONTHLY AVERAGE (IN)	DEPARTURE FROM HISTORICAL (IN)	SPI PERCENTILE 1-MONTH	SPI PERCENTILE 3-MONTH	SPI PERCENTILE 6-MONTH
WESTERN	2	0.65	-3.19	4	14	13
CTRV	6	0.97	-3.06	2	8	22
CENTRAL	12	0.72	-3.51	1	4	16
NORTHEAST	11	0.94	-2.97	5	10	10
SOUTHEAST	13	0.86	-3.44	3	9	25
CAPE COD	3	1.84	-2.12	18	34	40
ISLANDS	2	1.28	-2.80	6	21	42

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.

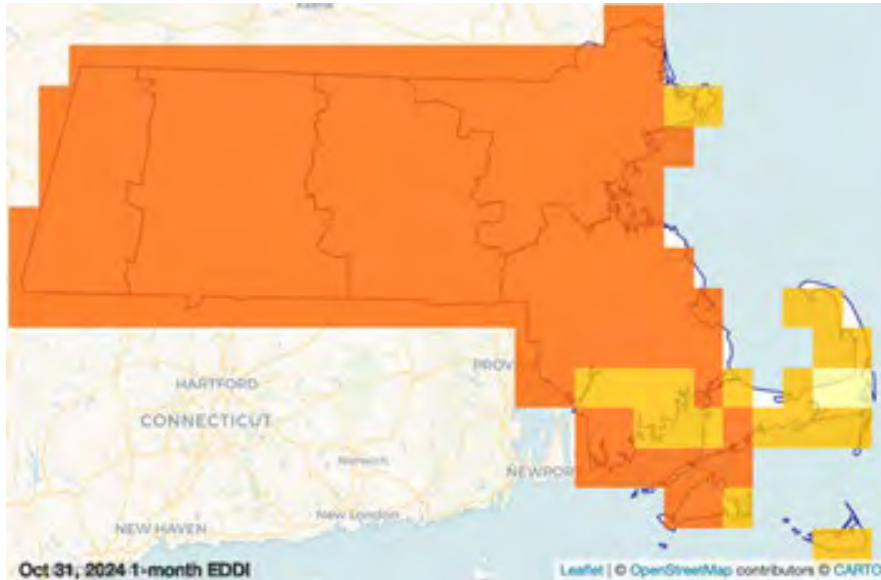
DMP Index Severity Levels			
1	2	3	4



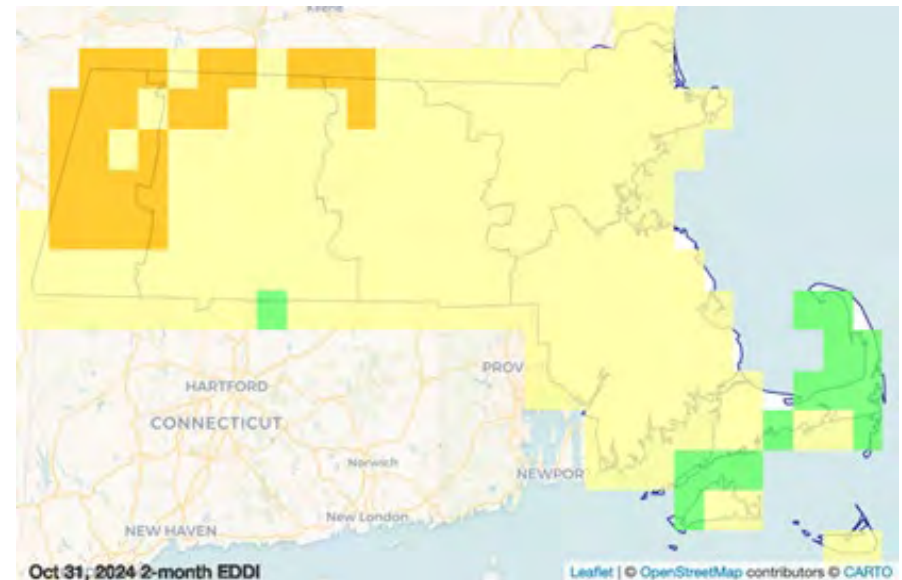
# EVAPORATIVE DEMAND DROUGHT INDEX (EDDI)

As of October 31st, 2024, the 1-month EDDI percentiles were below normal in all Regions. The 2-month EDDI percentiles, which are used in drought monitoring, were at elevated ISLs in all Regions except Cape Cod and the Islands.

**1-month EDDI**



**2-month EDDI**



● $\geq 0$ 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	MEDIAN 2-MONTH EDDI (2024-10-31)
WESTERN	19
CTRV	23
CENTRAL	26
NORTHEAST	23
SOUTHEAST	26
CAPE COD	33
ISLANDS	31

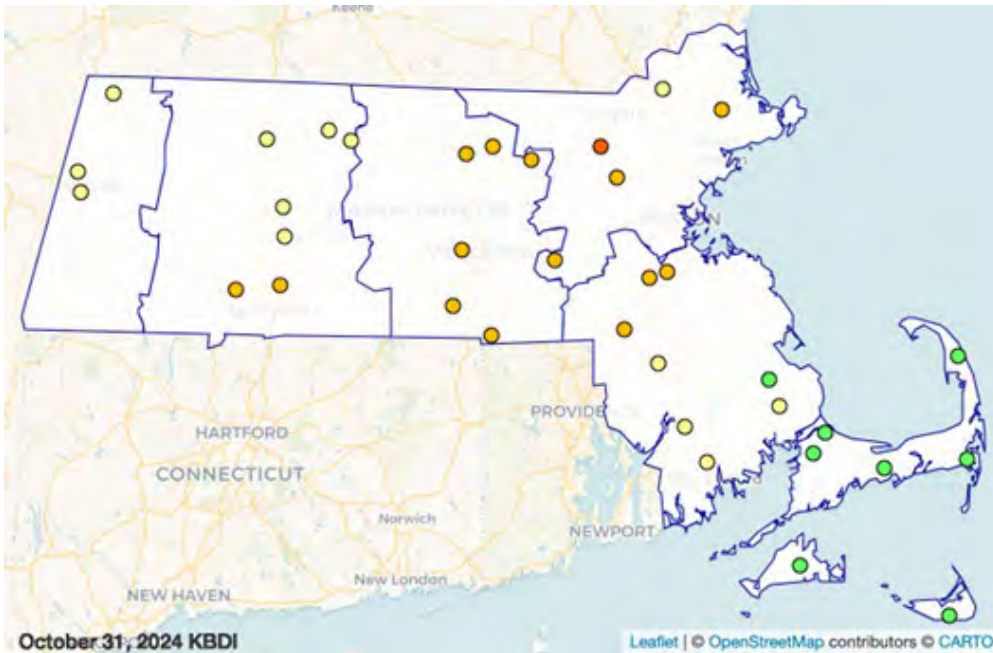
DMP Index Severity Levels			
1	2	3	4



At the end of October, the Keetch Byram Drought Index (KBDI) was at ISL 1 in the Western Region, at ISL 2 in the CTRV, Central, Southeast Regions, and at ISL 3 in the Northeast Region. There has been an increase in wildfires. According to David Celino, there were 206 wildfires and a total of 623 acres burned in October.

<https://www.wgbh.org/news/local/2024-11-04/dozens-of-wildfires-continue-to-burn-across-massachusetts-as-dry-conditions-fuel-blazes>

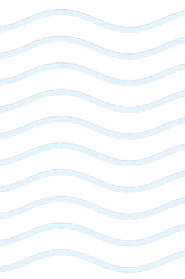
<https://www.wgbh.org/news/local/2024-10-30/dave-epstein-dry-october-high-pressure-systems-behind-spike-in-brush-fires>



REGION	NUMBER OF SITES REPORTING	HIGHEST OF SITE VALUES
WESTERN	3	355
CTRV	7	481
CENTRAL	6	576
NORTHEAST	5	616
SOUTHEAST	8	588
CAPE COD	5	126
ISLANDS	2	145

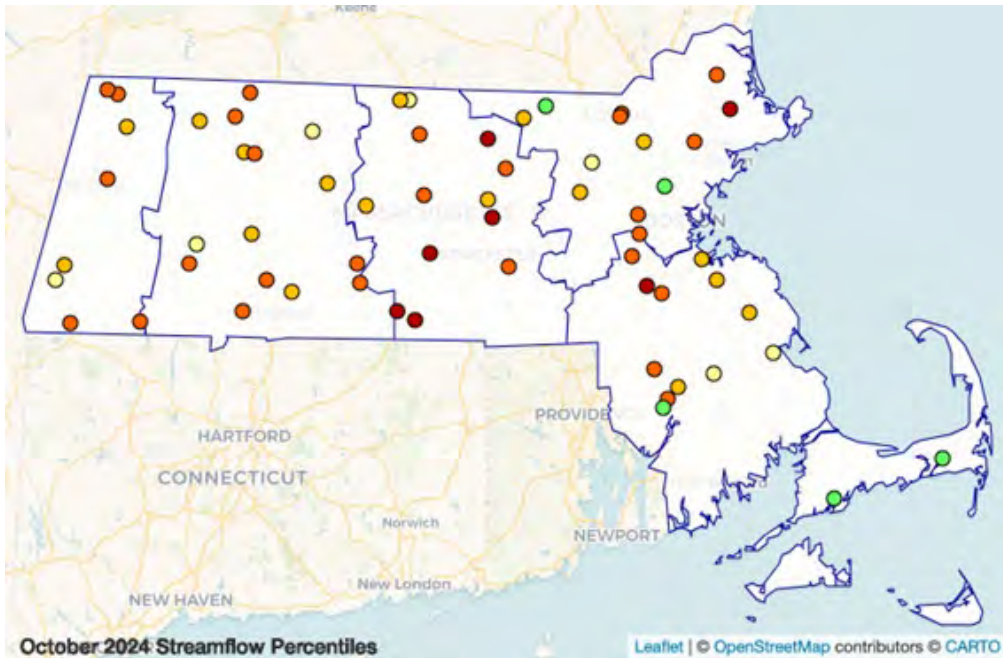
Point Values - KBDI Range				
● ≥700 to ≤800	● ≥600 to <700	● ≥400 to <600	● ≥200 to <400	● ≥0 to <200

DMP Index Severity Levels			
1	2	3	4



October streamflow ranged from much below normal to normal. Regional medians were below normal to normal. Several gages reached record lows. The Western, Central, and Southeast Regions are at ISL 2, and the Northeast Region is at ISL 1.

## 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 $\leq 100$	

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

REGION	NUMBER OF GAGES REPORTING	NUMBER OF GAGES BELOW NORMAL $\geq 0$ TO $\leq 30$ PERCENTILE	NUMBER OF GAGES NORMAL $> 30$ TO $\leq 70$ PERCENTILE	NUMBER OF GAGES ABOVE NORMAL $> 70$ TO $\leq 100$ PERCENTILE	MEDIAN OF INDIVIDUAL GAGE PERCENTILES
WESTERN	8	8	0	0	7
CTRV	15	15	0	0	11
CENTRAL	13	13	0	0	4
NORTHEAST	13	11	2	0	9
SOUTHEAST	12	11	1	0	14
CAPE COD	2	0	2	0	51

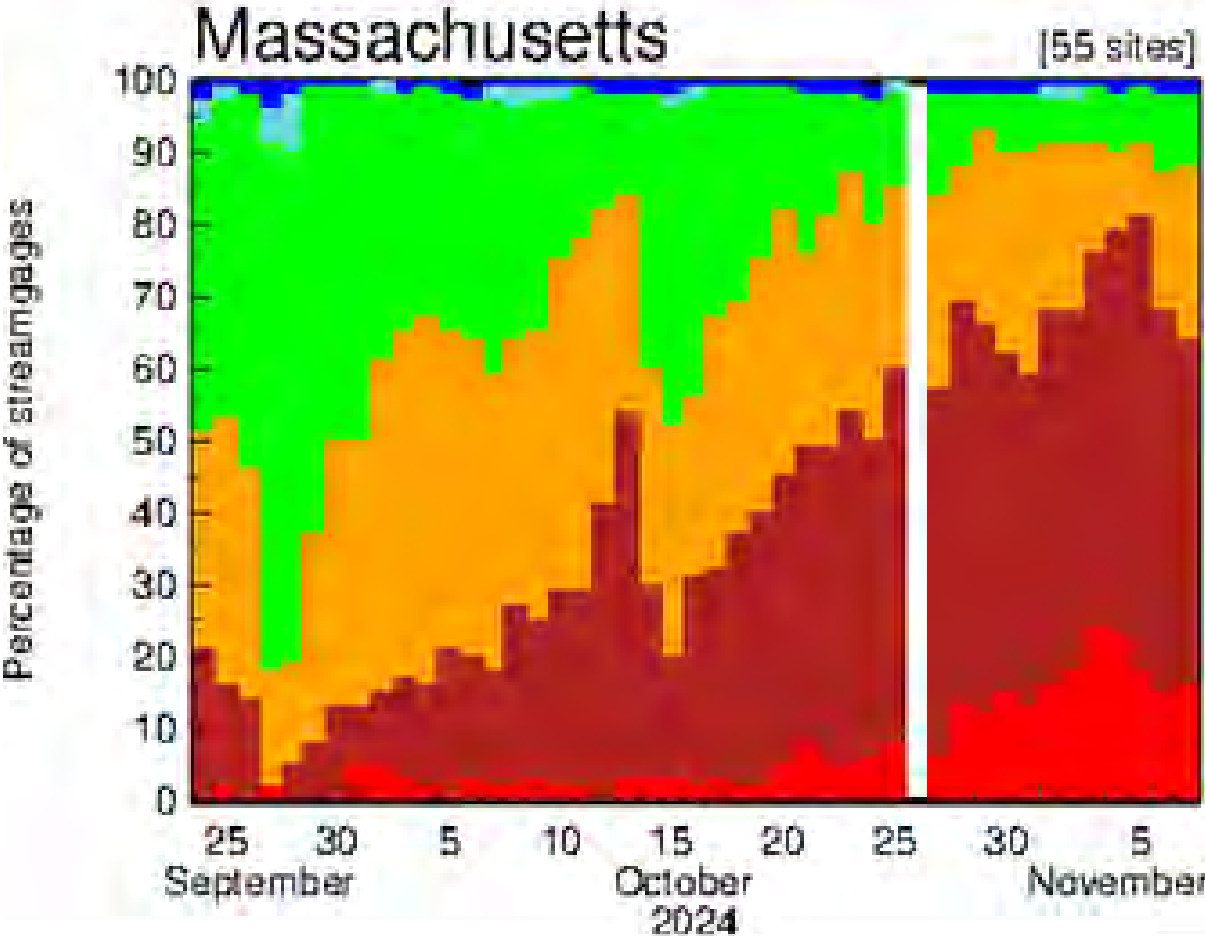
DMP Index Severity Levels			
1	2	3	4



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

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		

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





Both the Boston/Norton and Albany NWS E-5 Monthly Report of Hydrologic Conditions did not indicate river flooding at forecast points in Massachusetts during October nor were there any warnings issued for forecast points.

A search of the Iowa Mesonet database for NWS flood warnings and local storm reports did not yield any flood warnings or flood reports.



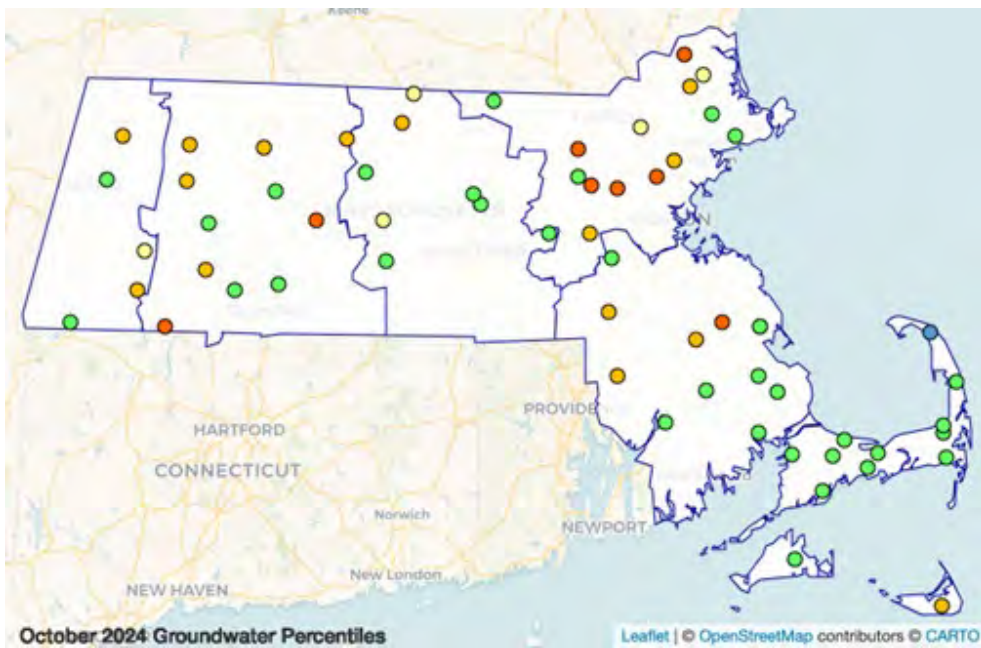
Image: Courtesy of NASA/JPL-Caltech

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

For real-time flood forecasts refer to the Northeast River Forecast Center: <https://www.weather.gov/nerfc/>

October groundwater levels ranged from below normal to normal except for one well on Cape Cod that was much above normal. The Western Region is at ISL 1 and the CTRV and Northeast Regions are at ISL 2.

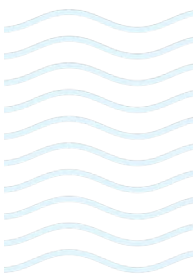
## END OF MONTH GROUNDWATER COMPARED TO HISTORICAL IN THE CLIMATE RESPONSE NETWORK WELLS



● $\geq 0$ 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	NUMBER OF WELLS BELOW NORMAL $\geq 0$ TO $\leq 30$ PERCENTILE	NUMBER OF WELLS NORMAL $> 30$ TO $\leq 70$ PERCENTILE	NUMBER OF WELLS ABOVE NORMAL $> 70$ TO $\leq 100$ PERCENTILE	MEDIAN OF INDIVIDUAL WELL PERCENTILES
<b>WESTERN</b>	5	3	2	0	28
<b>CTRV</b>	11	7	4	0	19
<b>CENTRAL</b>	8	3	5	0	33
<b>NORTHEAST</b>	14	10	4	0	18
<b>SOUTHEAST</b>	12	4	10	2	41
<b>CAPE COD</b>	11	0	10	1	54
<b>ISLANDS</b>	2	1	1	0	37

DMP Index Severity Levels			
1	2	3	4



At the end of October, nine of the reported lake and impoundment levels were below their 30th percentile. Every Region except for Cape Cod had at least one lake or impoundment below normal. The Central and SE Regions are at ISL 1, and the Northeast Region at ISL 2.

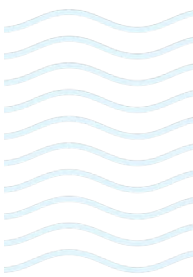
REGION	NUMBER OF SITES REPORTING	MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT FULL
WESTERN	2	37th
CTRV	2	31st
CENTRAL	4	21st
NORTHEAST	4	15th
SOUTHEAST	2	29th
CAPE COD	1	43rd

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

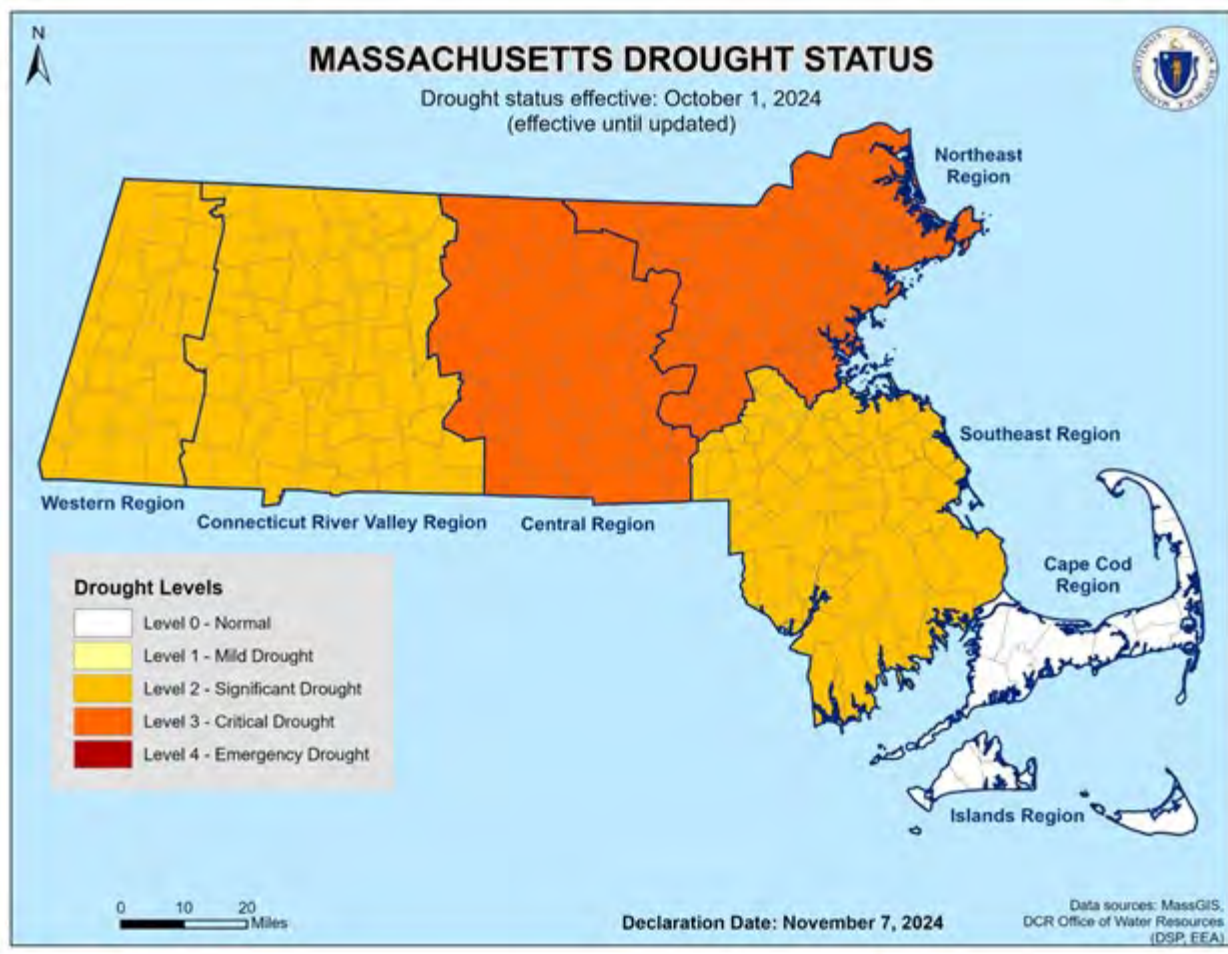
DMP Index Severity Levels			
1	2	3	4



# MASSACHUSETTS DROUGHT STATUS



DROUGHT



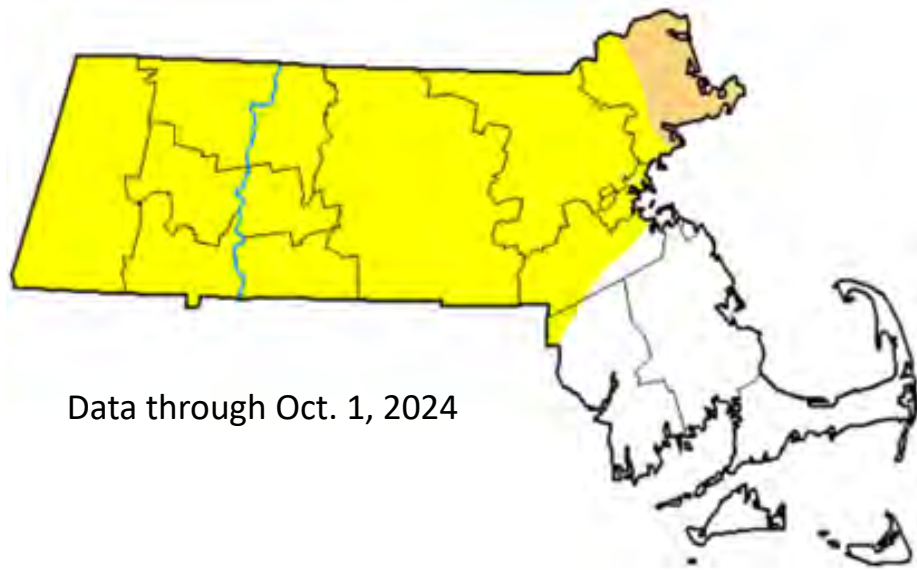
On November 7, 2024, Massachusetts Energy and Environmental Affairs (EEA) Secretary Rebecca L. Tepper declared that starting from October 1, 2024, the Western, Connecticut River Valley, and Southeast Regions are at Level 2 - Significant Drought and the Central and Northeast Regions are at Level 3 – Critical Drought. The Cape Cod and Islands Regions remain at Level 0. This status remains in effect until further updated.



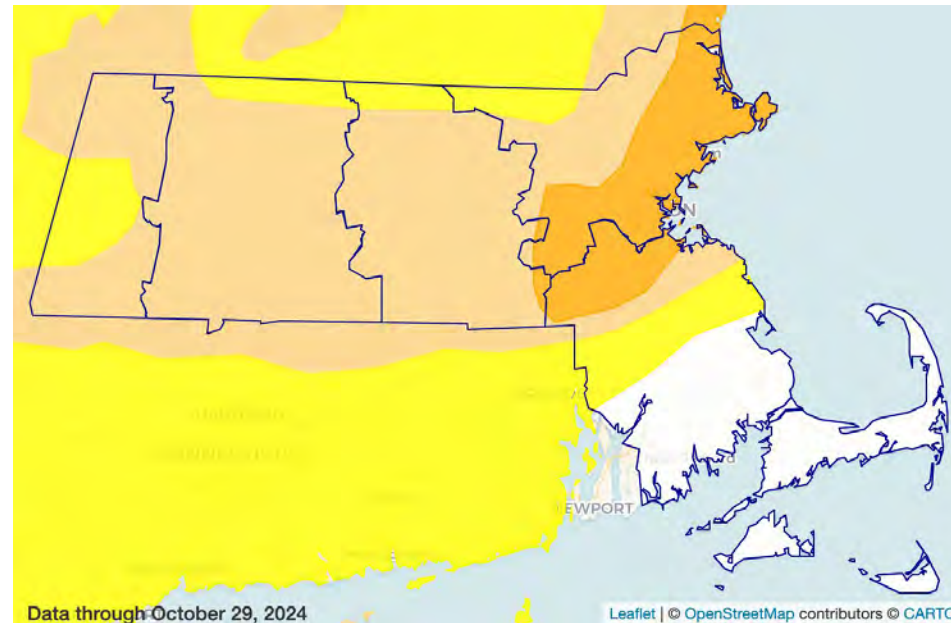
# U.S. DROUGHT MONITOR (USDM)

At the end of October, the USDM showed D2 (Severe Drought), D1 (Moderate Drought), and D0 (Abnormally Dry).

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

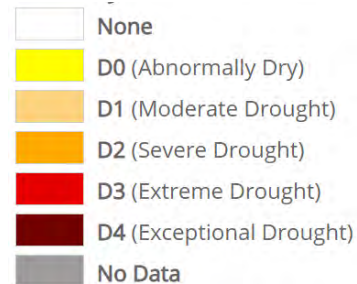


Data through Oct. 1, 2024



Data through October 29, 2024

Leaflet | © OpenStreetMap contributors © CARTO

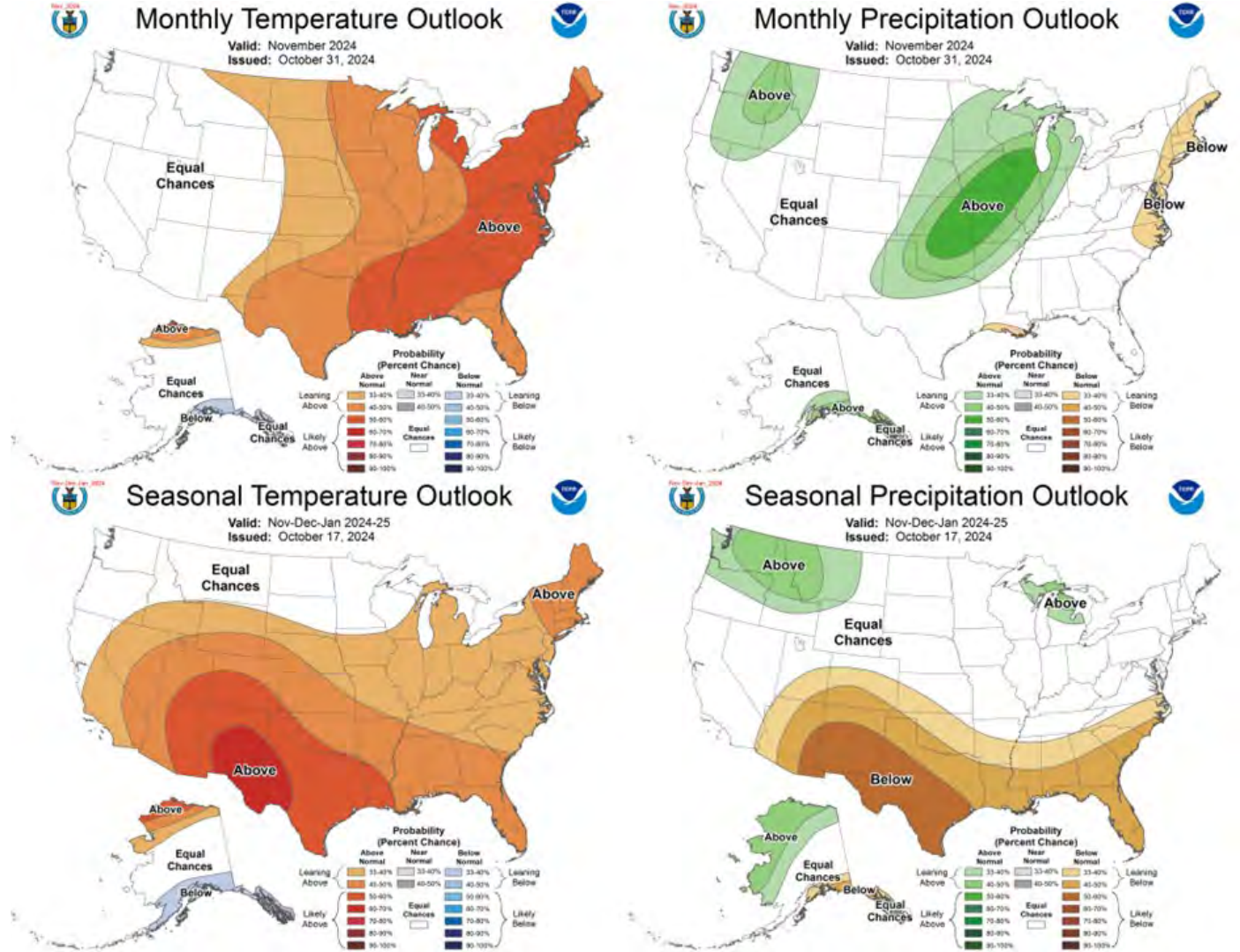


# TEMPERATURE AND PRECIPITATION OUTLOOK

**November:** The monthly outlook issued 10/31 shows a 50-60% chance of above-normal temperatures and a 33-40% chance of below-normal precipitation.

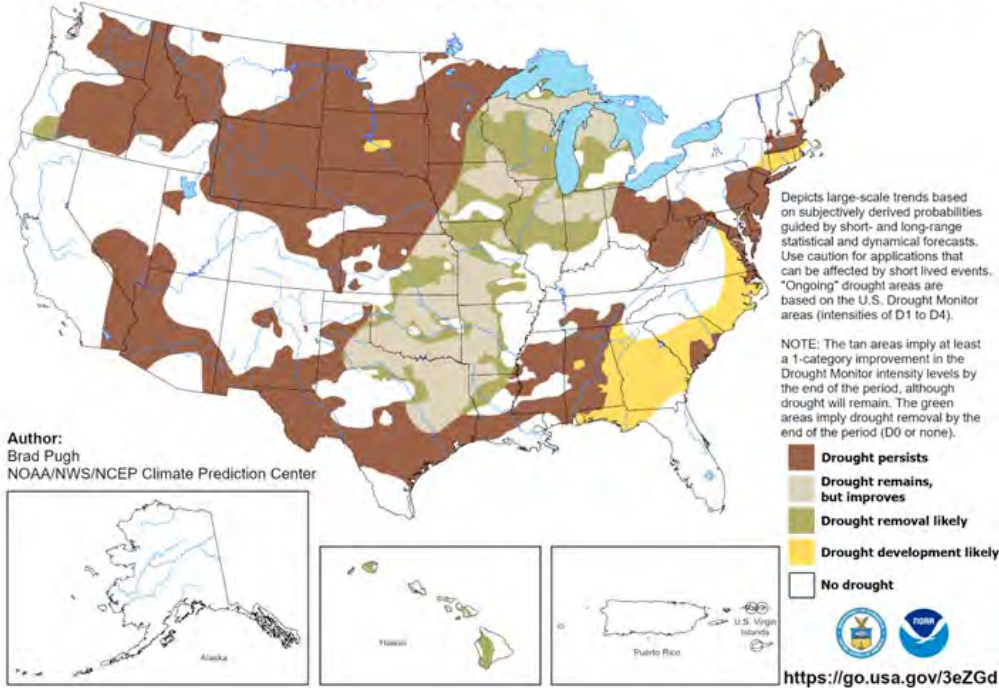
**November through January:** The seasonal outlook issued 10/17 shows a 40-50% chance of above-normal temperatures and equal chances for above-normal, normal, or below-normal precipitation.

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



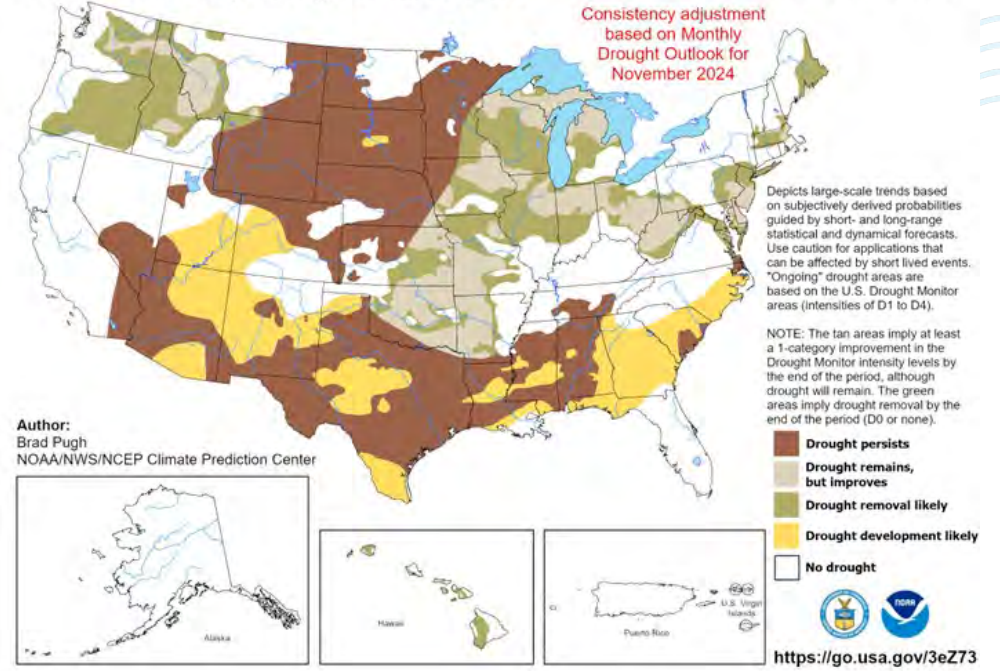
### U.S. Monthly Drought Outlook Drought Tendency During the Valid Period

Valid for November 2024  
Released October 31, 2024



### U.S. Seasonal Drought Outlook Drought Tendency During the Valid Period

Valid for November 1, 2024 - January 31, 2025  
Released October 31, 2024

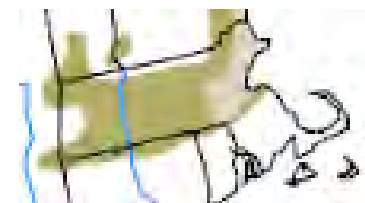
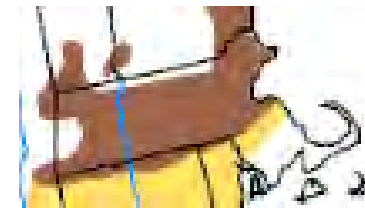


## MONTHLY AND SEASONAL DROUGHT OUTLOOK

The monthly outlook for November released on 10/31 shows drought persisting in the northern parts of the state with some expansion into the southeastern part.

The seasonal outlook for November through January released on 10/31 shows drought removal likely for most of the state except remaining but improving in the northeastern parts of the state.

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

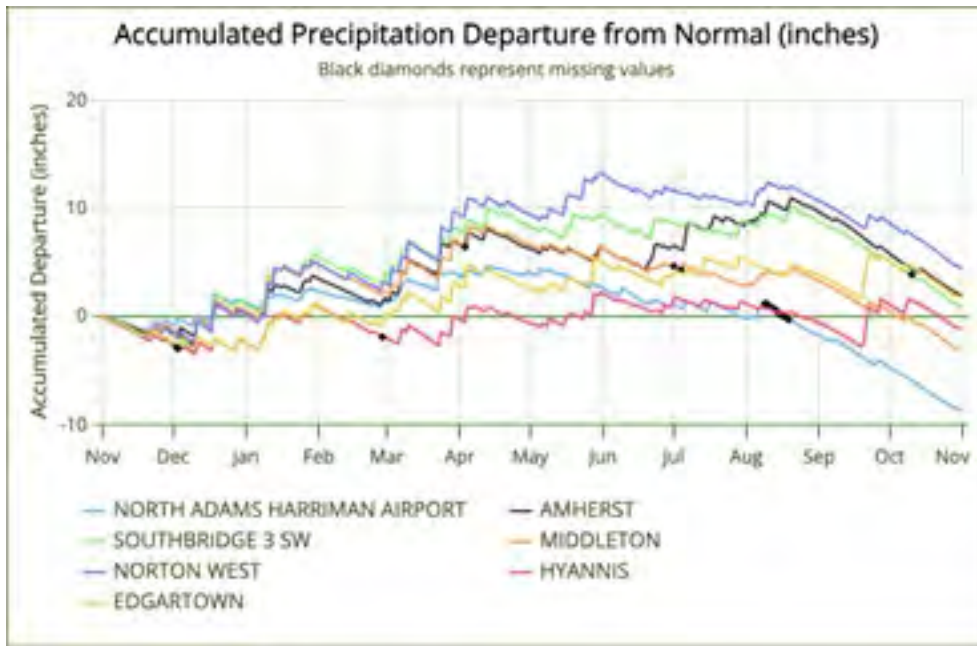


# ADDITIONAL PRECIPITATION DATA

## Standardized Precipitation Index— October 2024 as percentiles

REGION	NUMBER OF SITES	1-mo	2-mo	3-mo	6-mo	9-mo	12-mo	24-mo	36-mo
WESTERN	2	4	1	14	13	22	31	59	47
CTRV	6	2	0	8	22	42	62	86	61
CENTRAL	12	1	0	4	16	36	66	92	77
NORTHEAST	11	5	1	10	10	23	48	83	47
SOUTHEAST	13	3	7	9	25	53	69	81	57
CAPE COD	3	18	59	34	40	36	40	56	72
ISLANDS	2	6	37	21	42	49	49	48	32

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—October 2024

REGION	NUMBER OF SITES REPORTING	HISTORICAL AVERAGE	OCTOBER AVERAGE (IN)	DEPARTURE FROM HISTORICAL AVERAGE (IN)	PERCENT OF NORMAL
WESTERN	2	3.84	0.65	-3.19	17%
CTRV	6	4.03	0.97	-3.06	24%
CENTRAL	12	4.23	0.72	-3.51	17%
NORTHEAST	11	3.91	0.94	-2.97	24%
SOUTHEAST	13	4.30	0.86	-3.44	20%
CAPE COD	3	3.96	1.84	-2.12	46%
ISLANDS	2	4.08	1.28	-2.80	31%



# 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)