

MASSACHUSETTS WATER RESOURCES COMMISSION

HYDROLOGIC CONDITIONS IN MASSACHUSETTS

SEPTEMBER
2024

The Commonwealth of Massachusetts

Maura T. Healey, Governor

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



SEPTEMBER 2024 HYDROLOGIC CONDITIONS

SUMMARY OF CONDITIONS



- Monthly average temperatures were normal.



- Precipitation was below normal in much of the state except the Cape Cod Region, Islands Region, and the southern part of the Southeast Region.



- The 2-mos Evaporative Demand Drought Index at the end of September was normal in all Regions.
- The Keetch-Byram Drought Index was elevated at the end of September in all Regions except in the Cape Cod and Islands Regions.



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



- Groundwater regional medians were in the normal range but multiple wells are below normal in the Northeast Region.



- Lake and impoundment regional medians were in the normal range although some levels were below the 30th percentile.



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



- NOAA's 3-month outlook shows chances leaning for above-normal temperatures in the western half of the state, chances likely for above-normal temperatures in the eastern half, and chances leaning for above-normal precipitation for the entire state.



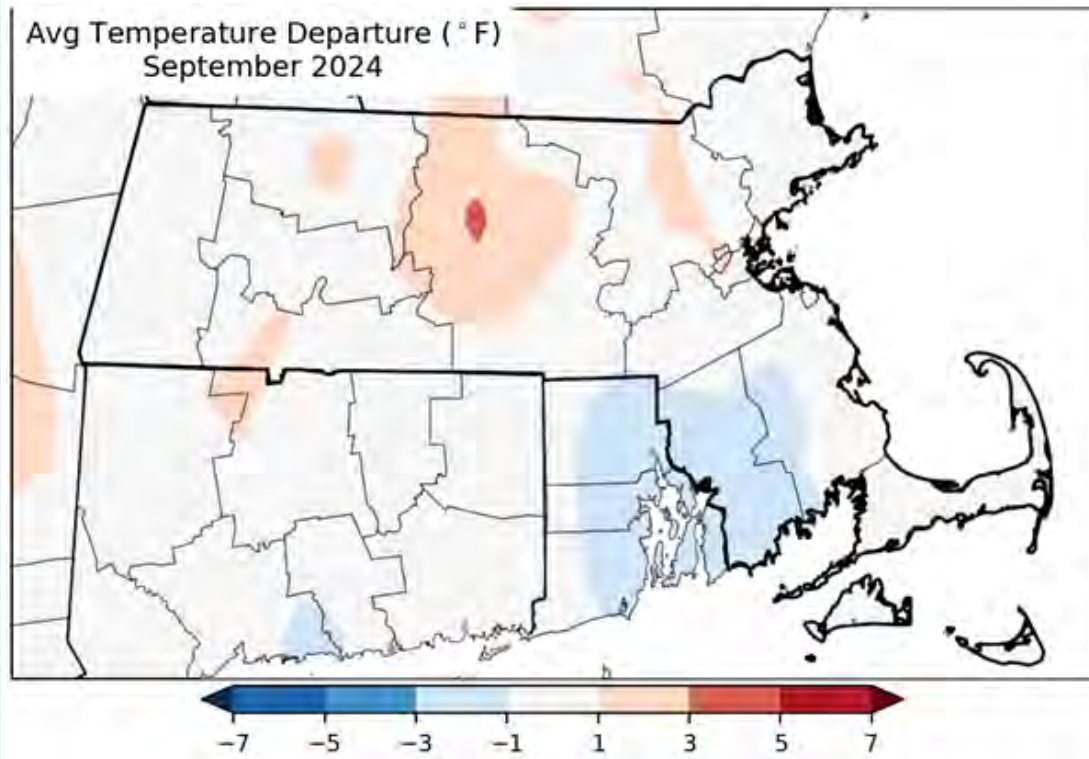
- Appendix II provides information on the Massachusetts Drought Management Plan (DMP) including ISL thresholds used in this report.



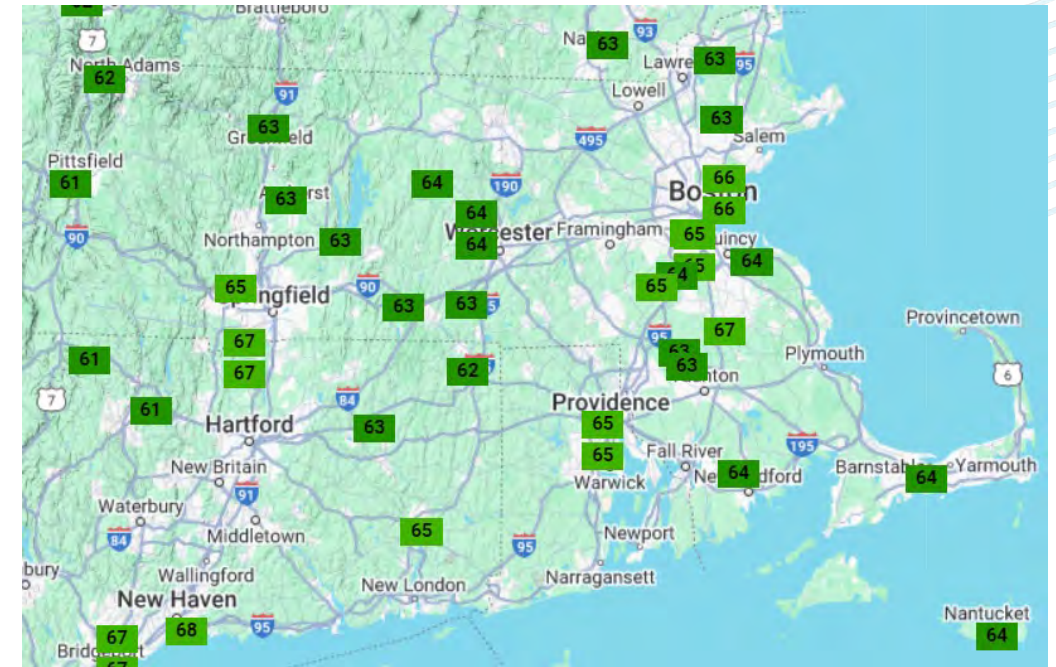
This report was prepared by the Massachusetts Department of Conservation and Recreation. Data may be preliminary. Analysis reflects automated calculations done 10/07/2024. Additional information, previous reports, and the Massachusetts Drought Dashboard with weekly updates to the drought indices can be found at: <https://www.mass.gov/drought-monitoring>

Monthly average temperatures were mostly normal.

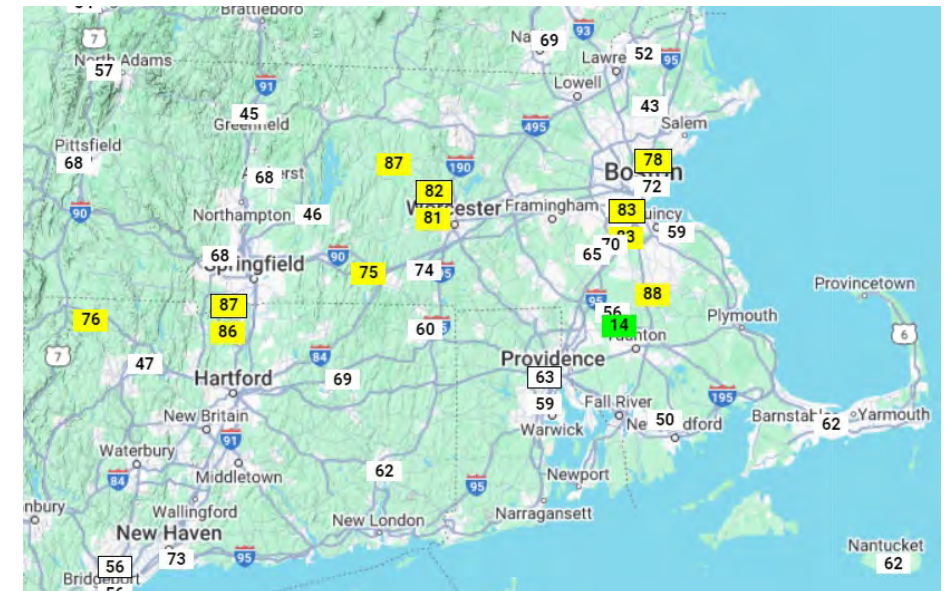
<http://www.nrcc.cornell.edu/regional/monthly/monthly.html>



Observed Average Mean Temperature for September 1st to 30th

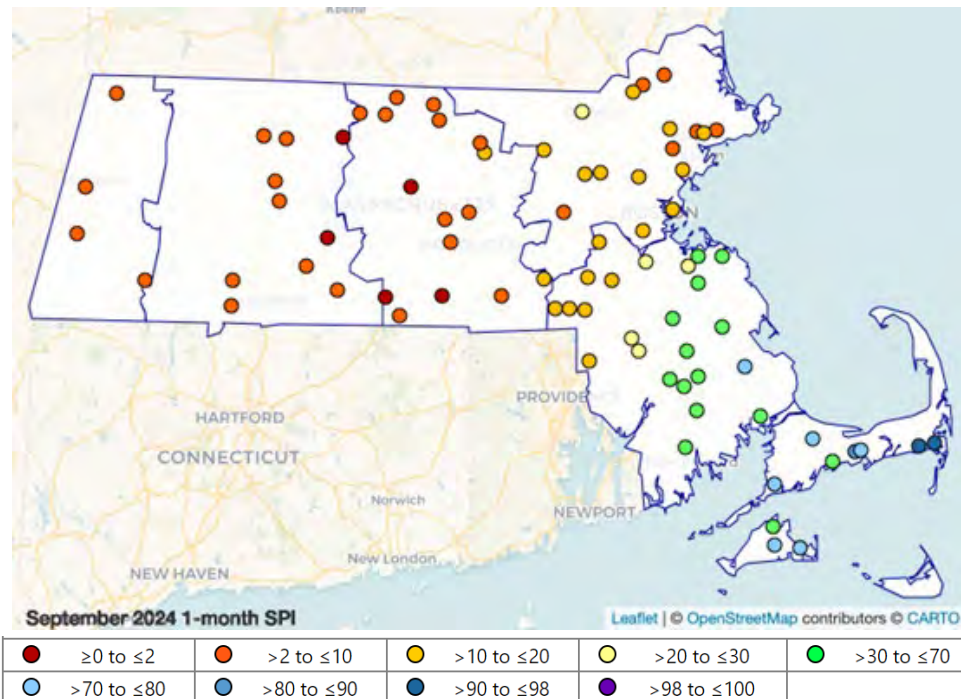


Observed Average Mean Temperature as Percentiles for September 1st to 30th



STANDARDIZED PRECIPITATION INDEX (SPI) AS A PERCENTILE

September precipitation was much below normal in the Western, CTRV, Central, and Northeast Regions, below normal in the northern Southeast Region, and was normal to above normal in the Cape Cod, Islands, and southern Southeastern Regions. According to the NRCC, the Worcester climate site had its 6th driest September on record. During mid-August to mid-September, the Boston area broke its longest dry stretch in the past 25 years (<https://www.wbur.org/news/2024/09/13/boston-rain-dry-stretch-weather-newsletter>). According to the NWS, from September 19-22, 5-10" of rain fell across Cape Cod and Nantucket while other areas of the state received much less from the same slow moving coastal storm. In addition to the ISLs shown in the table below, the CTRV, Central, and Northeast Regions are at ISL 1 for the 2-mos lookback period.



REGION	NUMBER OF SITES REPORTING	SEPTEMBER MONTHLY AVERAGE (IN)	DEPARTURE FROM HISTORICAL (IN)	SPI PERCENTILE 1-MONTH	SPI PERCENTILE 3-MONTH	SPI PERCENTILE 6-MONTH
WESTERN	4	1.31	-2.93	6	33	43
CTRV	10	0.81	-3.22	3	44	48
CENTRAL	16	0.94	-3.05	5	29	45
NORTHEAST	17	1.21	-2.33	12	18	25
SOUTHEAST	24	2.72	-1.23	34	24	50
CAPE COD	7	6.46	2.66	78	56	60
ISLANDS	3	4.25	0.45	71	68	59

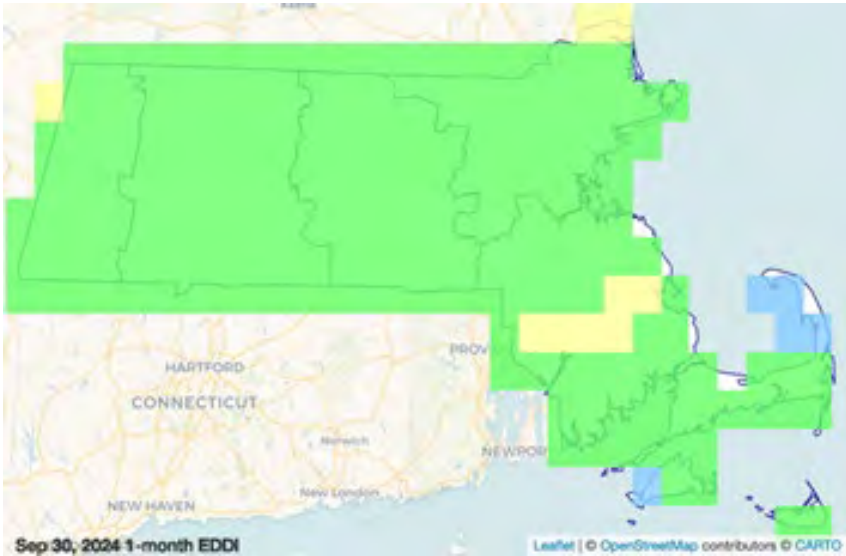
SPI is the Standardized Precipitation Index used in the Drought Management Plan (DMP) expressed here as a percentile and represents the variation from long-term precipitation.

DMP Index Severity Levels			
1	2	3	4

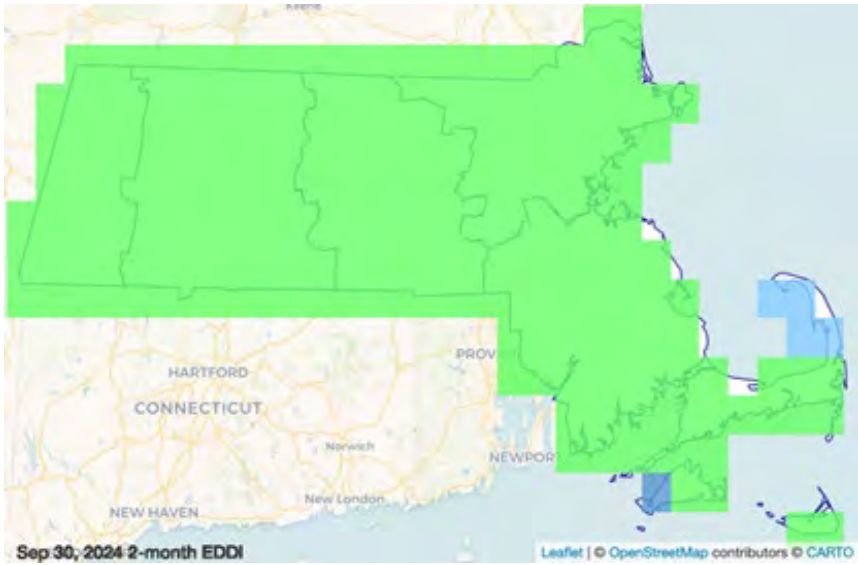
EVAPORATIVE DEMAND DROUGHT INDEX (EDDI)

As of September 30th, 2024, the 1-month EDDI percentiles were normal in all Regions. The 2-month EDDI percentiles, which are used in drought monitoring, were also normal in all Regions.

1-month EDDI



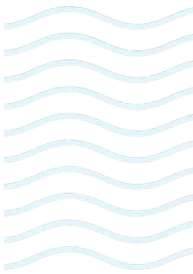
2-month EDDI



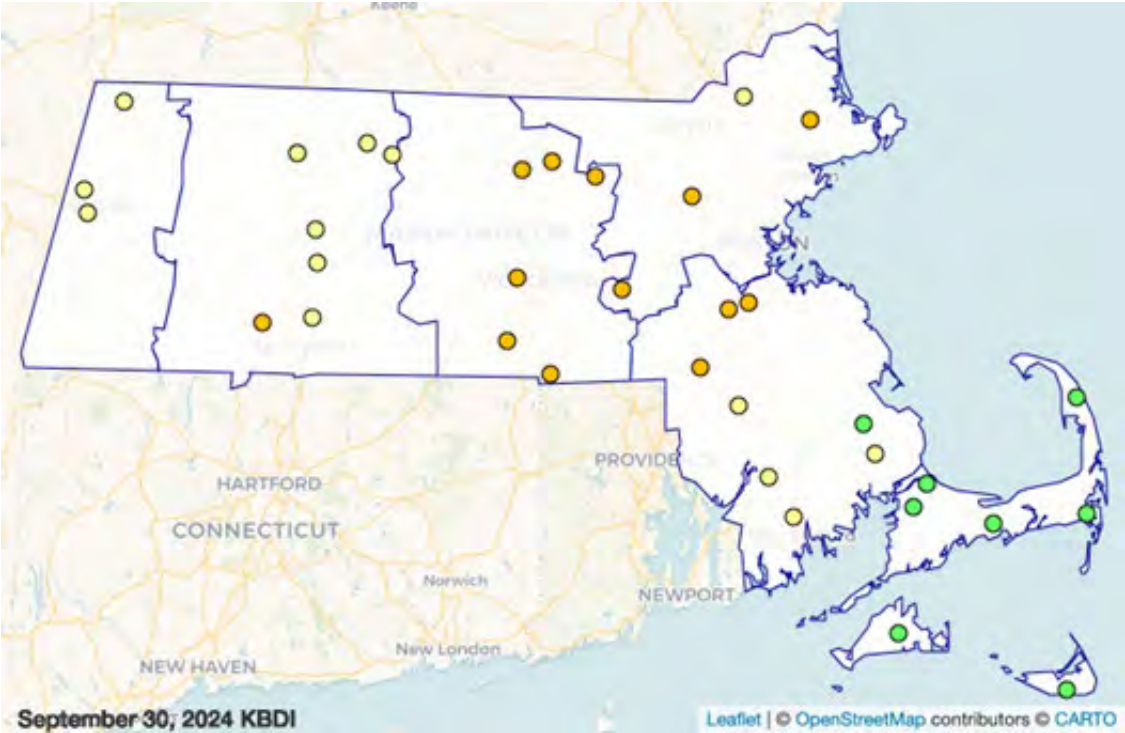
● ≥ 0 to ≤ 2	● > 2 to ≤ 10	● > 10 to ≤ 20	● > 20 to ≤ 30	● > 30 to ≤ 70
● > 70 to ≤ 80	● > 80 to ≤ 90	● > 90 to ≤ 98	● > 98 to ≤ 100	

REGION	MEDIAN 2-MONTH EDDI (2024-09-30)
WESTERN	56
CTRV	58
CENTRAL	58
NORTHEAST	51
SOUTHEAST	49
CAPE COD	55
ISLANDS	52

DMP Index Severity Levels			
1	2	3	4








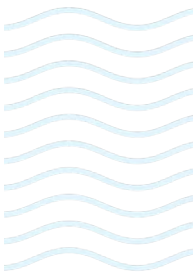
At the end of September, the Keetch Byram Drought Index (KBDI) was at ISL 1 in the Western Region, and was at ISL 2 in the CTRV, Central, Northeast, and Southeast, Regions.



REGION	NUMBER OF SITES REPORTING	HIGHEST OF SITE VALUES
WESTERN	3	306
CTRV	7	409
CENTRAL	6	548
NORTHEAST	4	555
SOUTHEAST	8	532
CAPE COD	5	45
ISLANDS	2	71

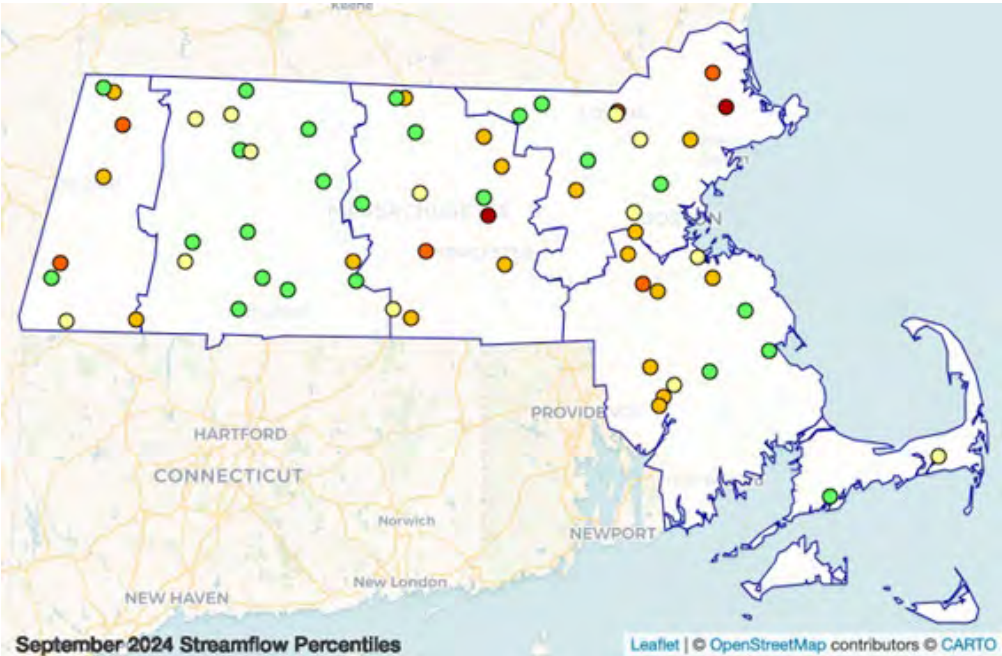
DMP Index Severity Levels			
1	2	3	4

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



September streamflow ranged from much below normal to normal. Regional medians were below normal to normal. 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



● ≥ 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	

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

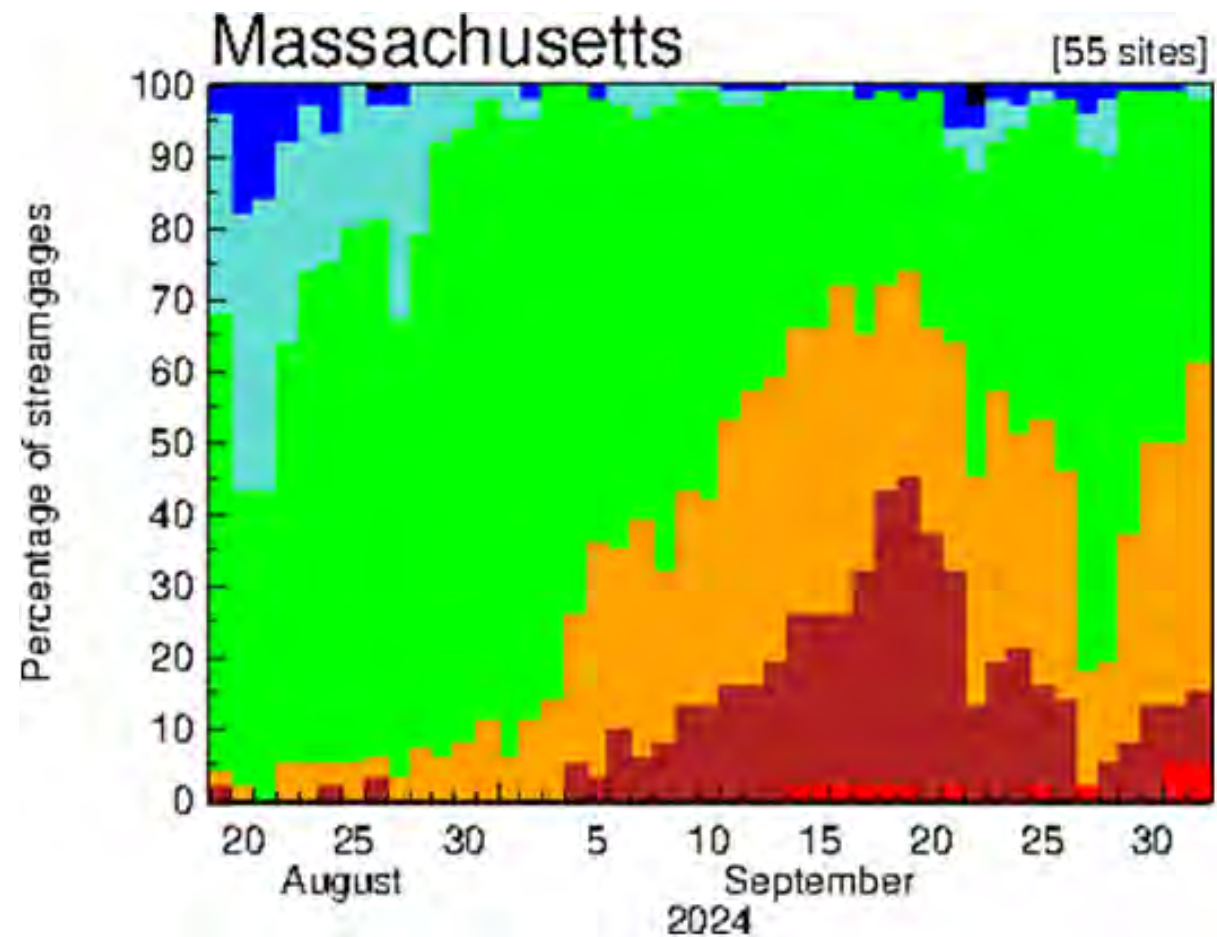
REGION	NUMBER OF GAGES REPORTING	NUMBER OF GAGES BELOW NORMAL ≥ 0 TO ≤ 30 PERCENTILE	NUMBER OF GAGES NORMAL > 30 TO ≤ 70 PERCENTILE	NUMBER OF GAGES ABOVE NORMAL > 70 TO ≤ 100 PERCENTILE	MEDIAN OF INDIVIDUAL GAGE PERCENTILES
WESTERN	8	6	2	0	13
CTRV	15	5	10	0	38
CENTRAL	13	9	4	0	19
NORTHEAST	13	9	4	0	21
SOUTHEAST	12	9	3	0	20
CAPE COD	2	1	1	0	43

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		



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 September 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.



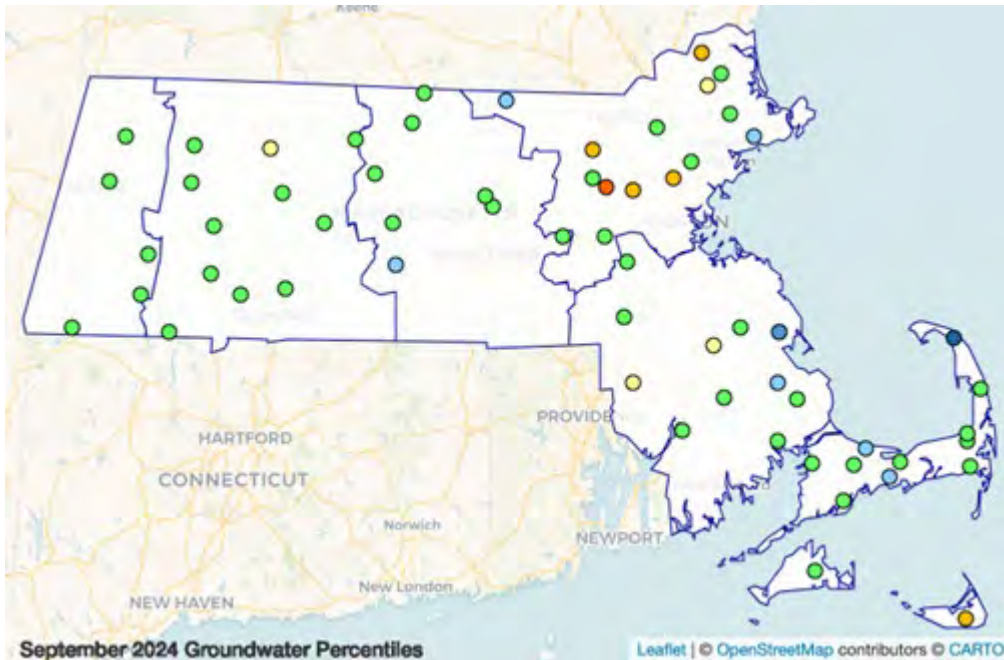
Image: Courtesy of NASA/JPL-Caltech

<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/>

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

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	NUMBER OF WELLS BELOW NORMAL ≥ 0 TO ≤ 30 PERCENTILE	NUMBER OF WELLS ABOVE NORMAL > 30 TO ≤ 70 PERCENTILE	NUMBER OF WELLS ABOVE NORMAL > 70 TO ≤ 100 PERCENTILE	MEDIAN OF INDIVIDUAL WELL PERCENTILES
WESTERN	5	0	5	0	42
CTRV	11	1	10	0	41
CENTRAL	8	0	7	1	57
NORTHEAST	14	6	6	2	36
SOUTHEAST	12	2	8	2	54
CAPE COD	11	0	8	3	57
ISLANDS	2	1	1	0	40

DMP Index Severity Levels			
1	2	3	4

At the end of September, reported lake and impoundment levels were above their 30th percentile except for four systems located in the Central, Northeast, and Southeast Regions.

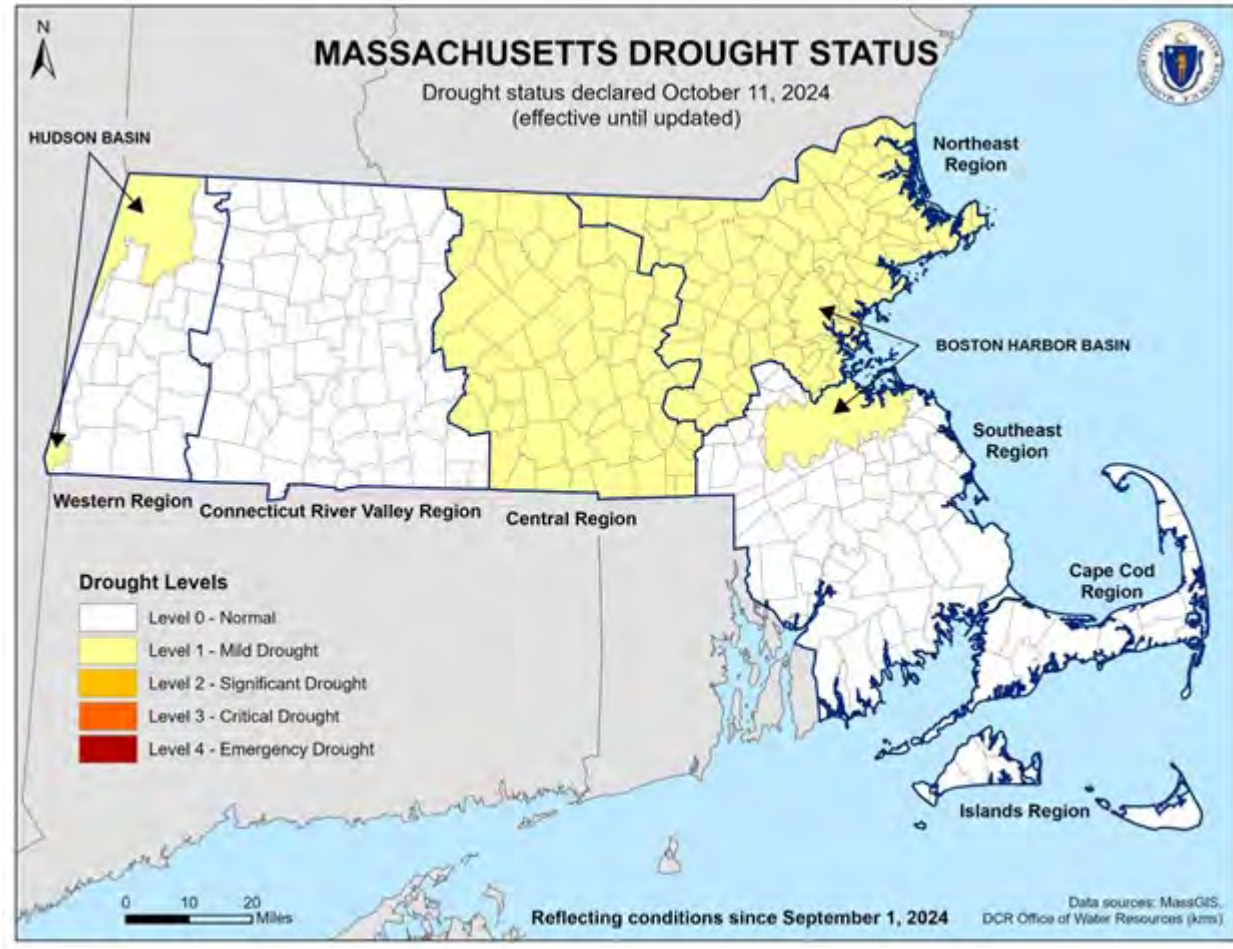
REGION	NUMBER OF SITES REPORTING	MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT FULL
WESTERN	0	ID
CTRV	2	45th
CENTRAL	4	42nd
NORTHEAST	5	36th
SOUTHEAST	2	49th
CAPE COD	1	68th

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

DMP Index Severity Levels			
1	2	3	4



MASSACHUSETTS DROUGHT STATUS

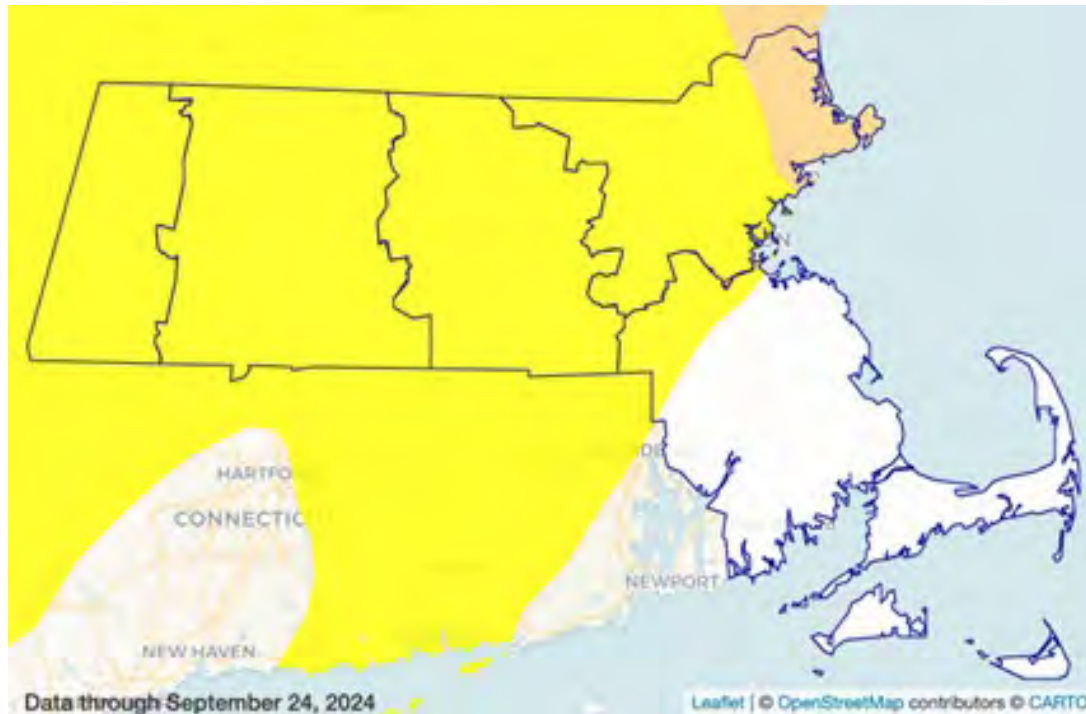


On October 11, 2024, Massachusetts Energy and Environmental Affairs (EEA) Secretary Rebecca L. Tepper declared that starting from September 1, 2024, the Central and Northeast Regions are at Level 1 -Mild Drought. In addition, the Boston Harbor Basin and the Hudson River Basin are at Level 1 –Mild Drought. All other Regions including all other areas of the Western and Southeast Regions remain at Level 0. This status remains in effect until further updated.

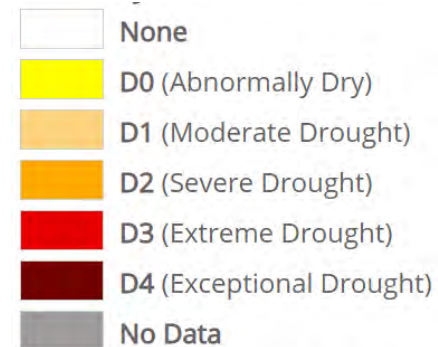
U.S. DROUGHT MONITOR (USDM)

At the end of September, the USDM showed D1 (Moderate Drought) in the northeastern part of the Northeast Region and D0 (Abnormally Dry) in the remaining part of the Northeast Region and in the Western, CTRV, and Central Regions, as well as the northwestern part of the Southeast Region.

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 September 24, 2024

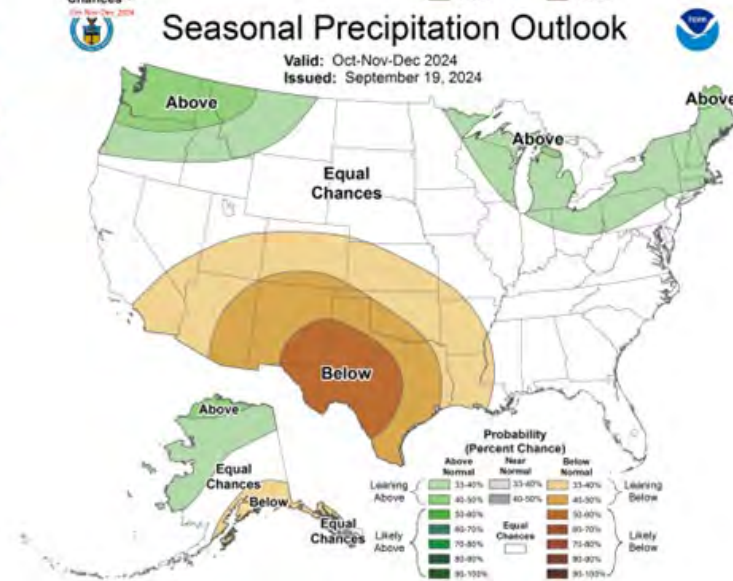
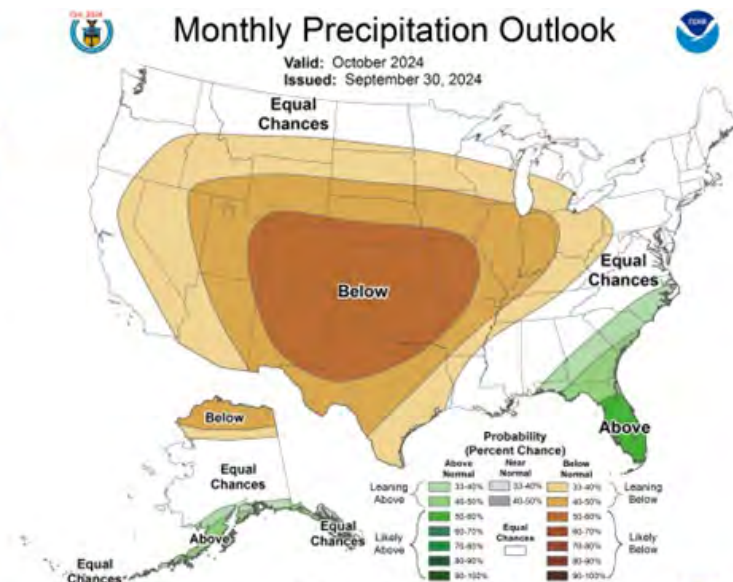
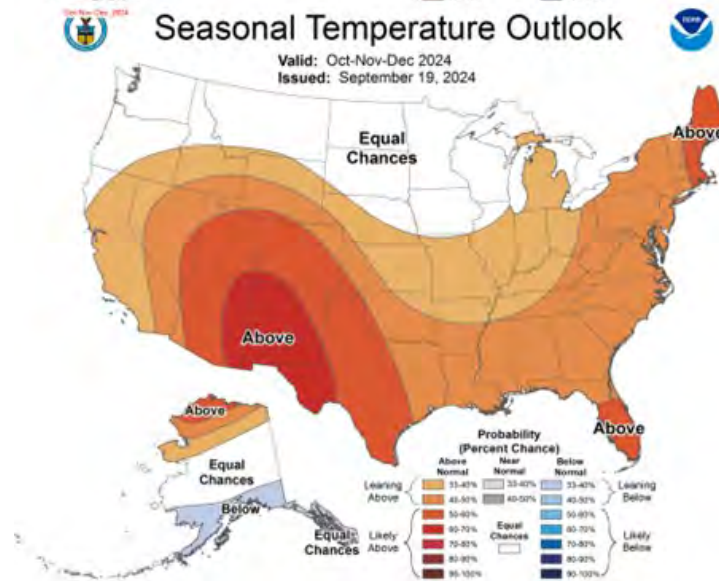
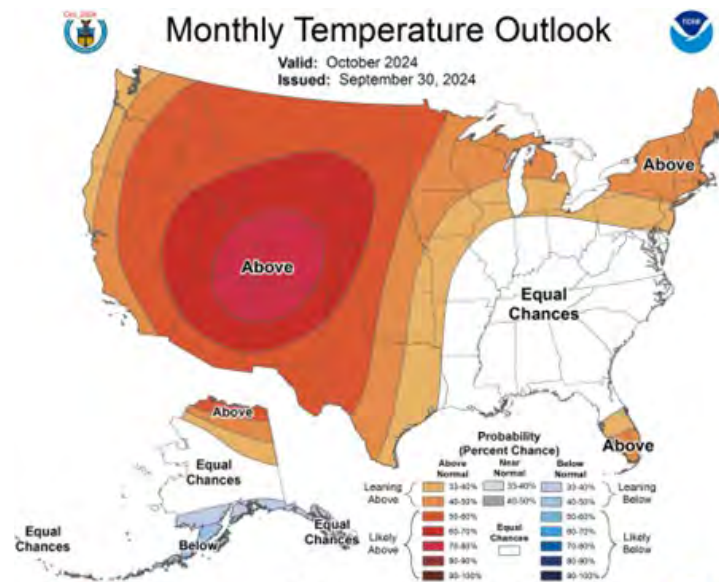


TEMPERATURE AND PRECIPITATION OUTLOOK

October: The monthly outlook issued 9/30 shows a 40-50% chance of above-normal temperatures and equal chances for above-normal, normal, or below-normal precipitation.

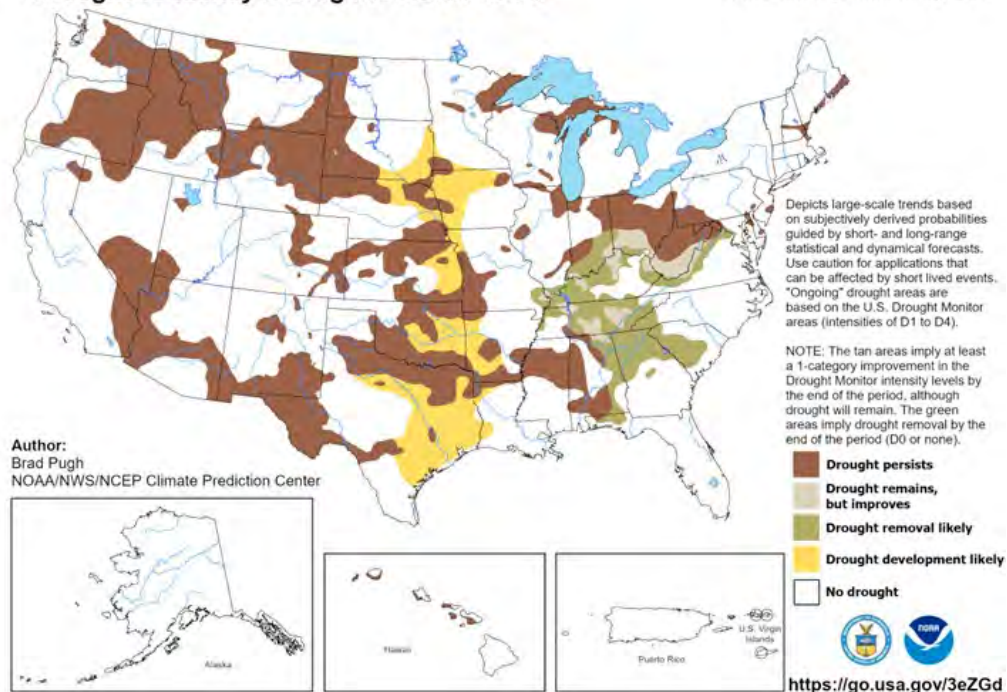
October through December: The seasonal outlook issued 9/16 shows a 40-50% chance of above-normal temperatures in the western half of the state, a 50-60% chance of above-normal temperatures in the eastern half, and a 33-40% chance of above-normal precipitation throughout the entire state.

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



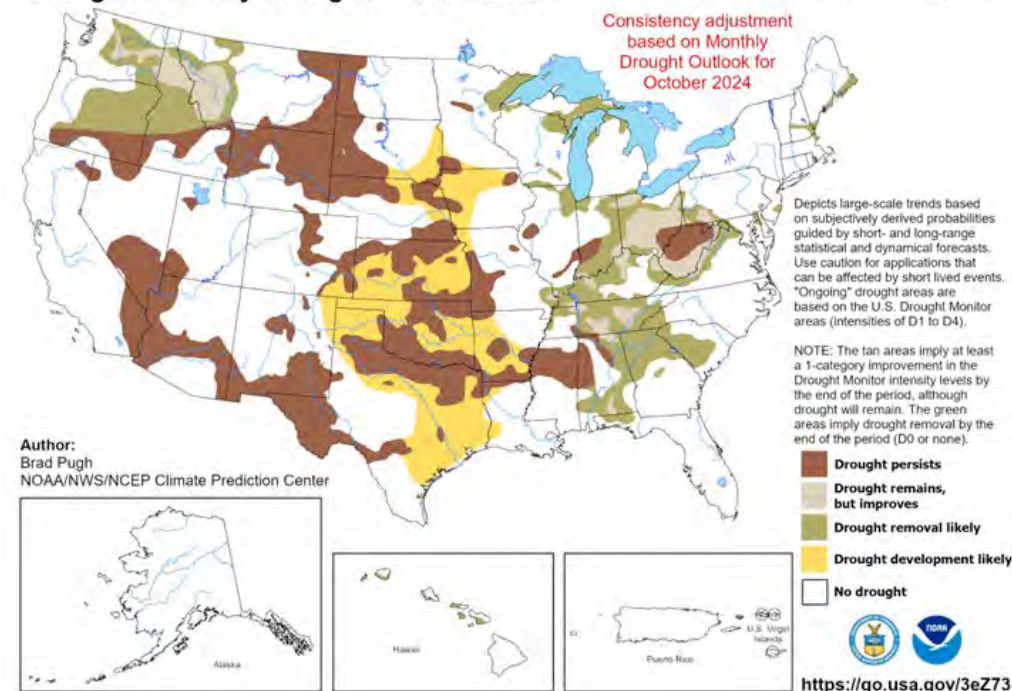
U.S. Monthly Drought Outlook Drought Tendency During the Valid Period

Valid for October 2024
Released September 30, 2024



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

Valid for October 1 - December 31, 2024
Released September 30, 2024



MONTHLY AND SEASONAL DROUGHT OUTLOOK

The monthly outlook for October released on 9/30 shows drought persisting in the northeastern part of the Northeast Region.

The seasonal outlook for October through December released on 9/30 shows drought removal likely in the same northeastern part of the Northeast Region.

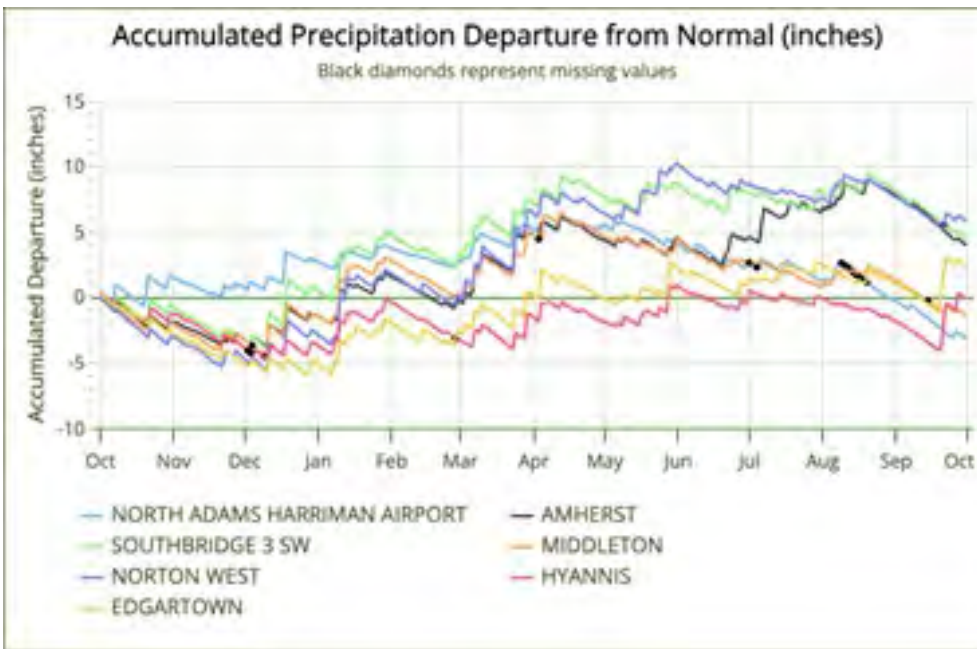
<http://www.cpc.ncep.noaa.gov/products/Drought>



ADDITIONAL PRECIPITATION DATA

Standardized Precipitation Index— September 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	6	32	33	43	72	76	86	80
CTRV	10	3	29	44	48	82	80	93	78
CENTRAL	16	5	30	29	45	81	79	95	88
NORTHEAST	17	12	28	18	25	60	62	90	68
SOUTHEAST	24	34	34	24	50	85	77	90	75
CAPE COD	7	78	56	56	60	82	53	81	83
ISLANDS	3	71	55	68	59	84	53	71	50



DMP Index Severity Levels

1	2	3	4
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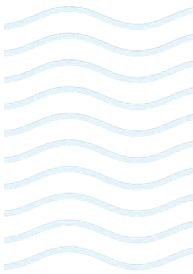
Accumulated Precipitation Departure from 30-Year Normals in Inches

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—September 2024

REGION	NUMBER OF SITES REPORTING	HISTORICAL AVERAGE	SEPTEMBER AVERAGE (IN)	DEPARTURE FROM HISTORICAL AVERAGE (IN)	PERCENT OF NORMAL
WESTERN	4	4.24	1.31	-2.93	31%
CTRV	10	4.03	0.81	-3.22	20%
CENTRAL	16	3.99	0.94	-3.05	24%
NORTHEAST	17	3.54	1.21	-2.33	34%
SOUTHEAST	24	3.95	2.72	-1.23	69%
CAPE COD	7	3.80	6.46	2.66	170%
ISLANDS	3	3.80	4.25	0.45	112%



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



Massachusetts Water Resources Commission

Executive Office of Energy and Environmental Affairs

www.mass.gov/conservemawater

www.mass.gov/drought-management