

MASSACHUSETTS WATER RESOURCES COMMISSION

HYDROLOGIC CONDITIONS IN MASSACHUSETTS

NOVEMBER
2024

The Commonwealth of Massachusetts

Maura T. Healey, Governor

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



NOVEMBER 2024 HYDROLOGIC CONDITIONS

SUMMARY OF CONDITIONS



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



- There was snow cover in the western and north-central parts of the state at the end of November.



- The 2-mos Evaporative Demand Drought Index at the end of November was at an Index Severity Level (ISL) 4 in all Regions.



- The Keetch-Byram Drought Index was elevated at the end of the month in all Regions except in the Cape Cod and Islands Regions. Wildfires continued into November.



- Streamflow Regional medians were much below normal except in the Cape Cod Region and all Regions are at elevated ISLs except Cape Cod. There were no flood warnings or reports.



- Groundwater Regional medians were below-normal except for the Cape Cod Region, and all Regions are at elevated ISLs except the Cape Cod Region.



- Lake and impoundment levels ranged from below normal to normal. The CTRV, Central, Northeast, and Southeast Regions are at elevated ISLs.



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

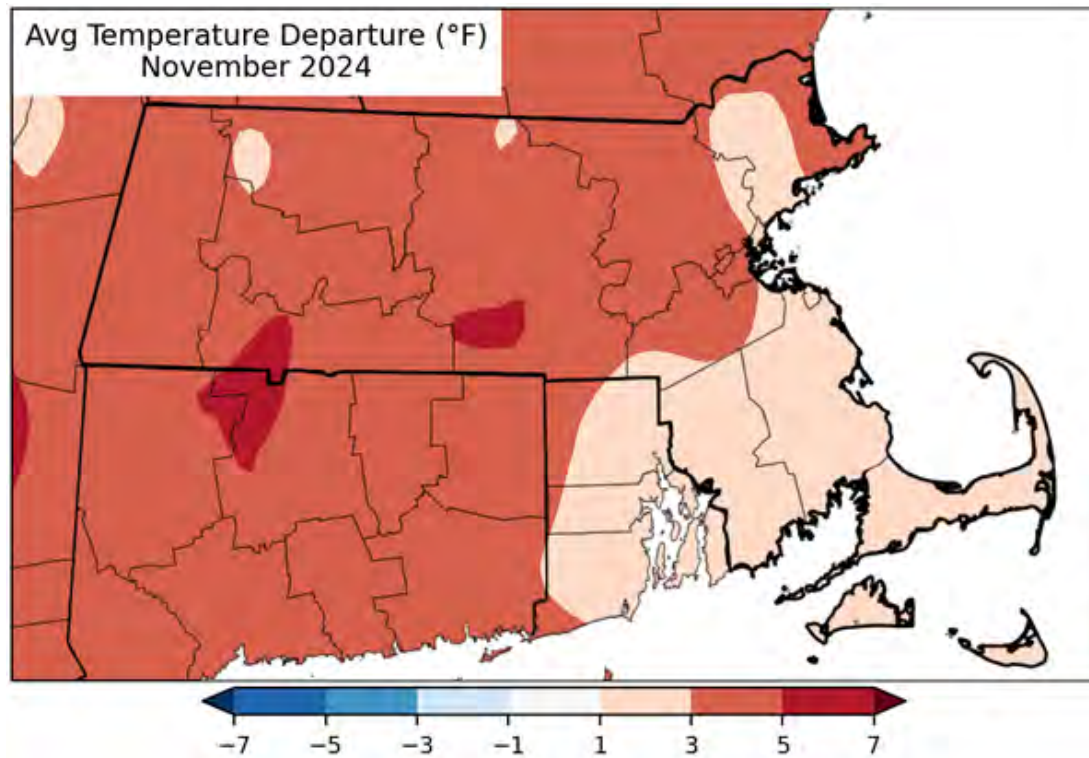


- Appendix II provides information on the Massachusetts Drought Management Plan (DMP) including ISL thresholds used in this report.

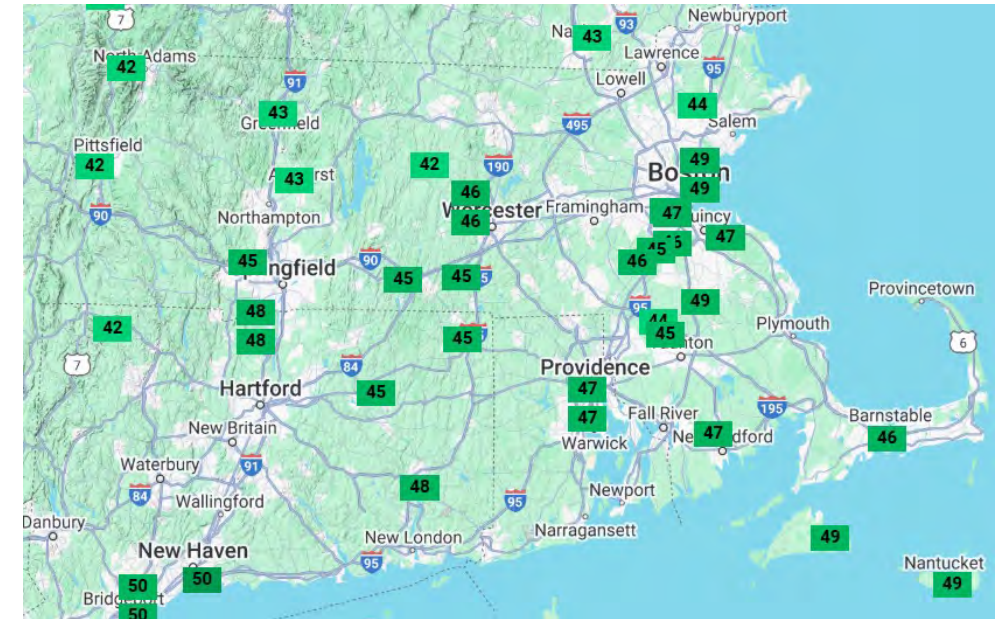
This report was prepared by the Massachusetts Department of Conservation and Recreation. Data may be preliminary. Analysis reflects automated calculations done 12/09/2024. Additional information, previous reports, and the Massachusetts Drought Dashboard with weekly updates to the drought indices can be found at: <https://www.mass.gov/drought-monitoring>

Monthly average temperatures were above normal. According to the Northeast Regional Climate Center (NRCC), the Worcester climate site had its 3rd warmest November on record and Boston had its 8th. The Worcester climate site had its warmest fall on record and the Boston climate site its 10th.

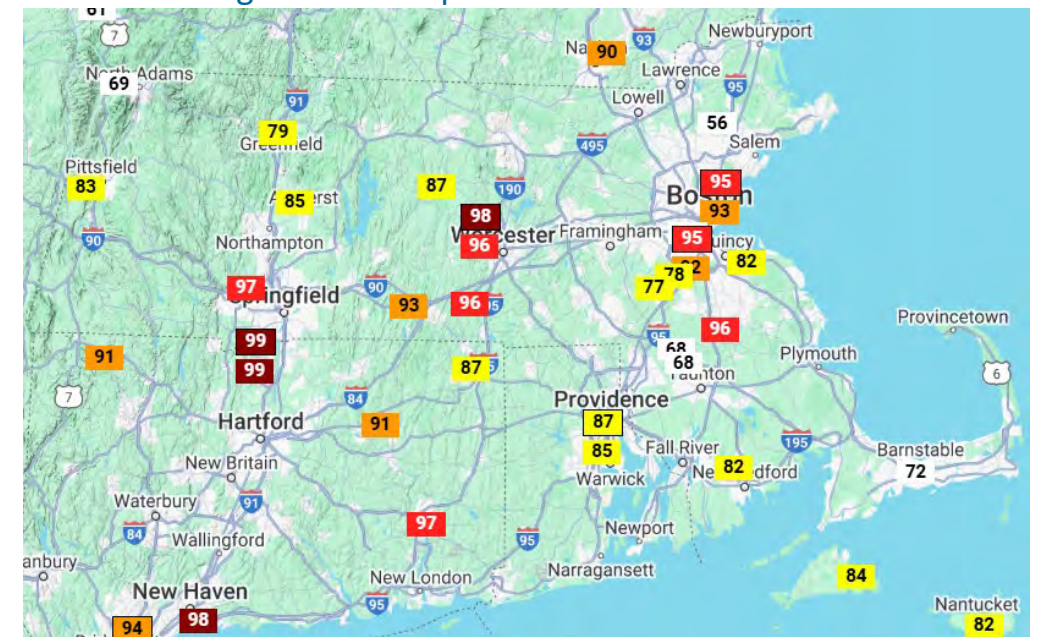
<http://www.nrcc.cornell.edu/regional/monthly/monthly.html>



Observed Average Mean Temperatures for Nov. 1st- 30th

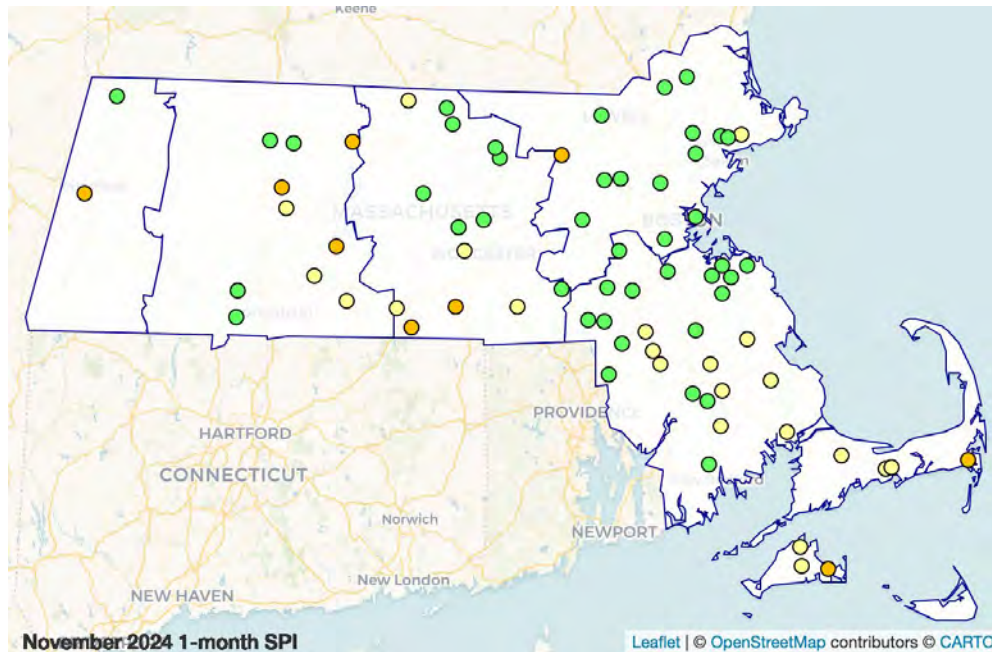


Observed Average Mean Temperature as Percentiles for Nov. 1st to 30th



STANDARDIZED PRECIPITATION INDEX (SPI) AS A PERCENTILE

November precipitation was below normal to normal with much of the precipitation coming in the later half of the month. While the one-month precipitation has improved, the 3-mo and 6-mo lookback still show the severe lack of recent months' precipitation. In addition to the ISLs shown in the table below, Appendix I provides all the look-back periods.



● ≥ 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	

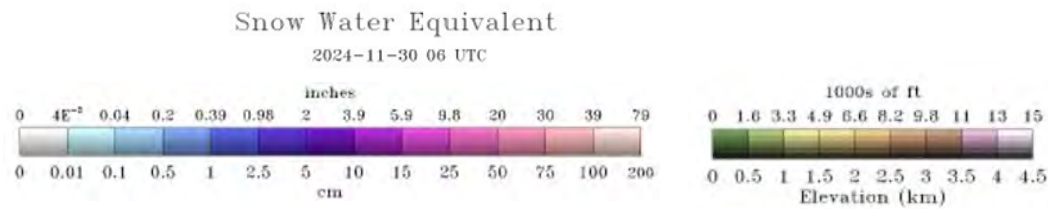
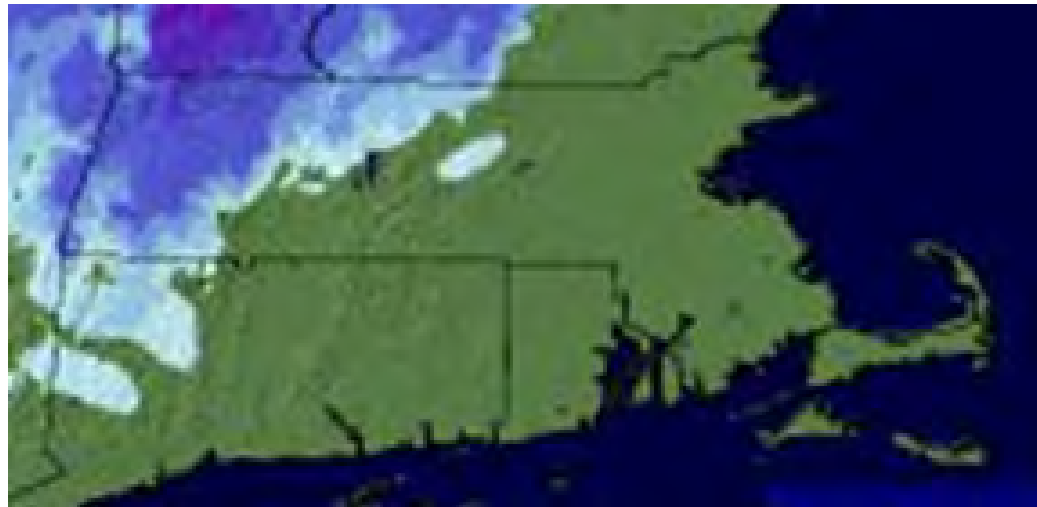
REGION	NUMBER OF SITES REPORTING	NOVEMBER MONTHLY AVERAGE (IN)	DEPARTURE FROM HISTORICAL (IN)	SPI PERCENTILE 1-MONTH	SPI PERCENTILE 3-MONTH	SPI PERCENTILE 6-MONTH
WESTERN	2	2.32	-1.17	27	0	9
CTRV	10	2.34	-1.26	26	1	19
CENTRAL	14	2.91	-1.11	35	1	5
NORTHEAST	15	3.34	-0.65	48	3	6
SOUTHEAST	26	3.23	-1.06	36	6	9
CAPE COD	4	2.48	-1.55	26	37	16
ISLANDS	3	2.13	-2.04	21	16	18

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.

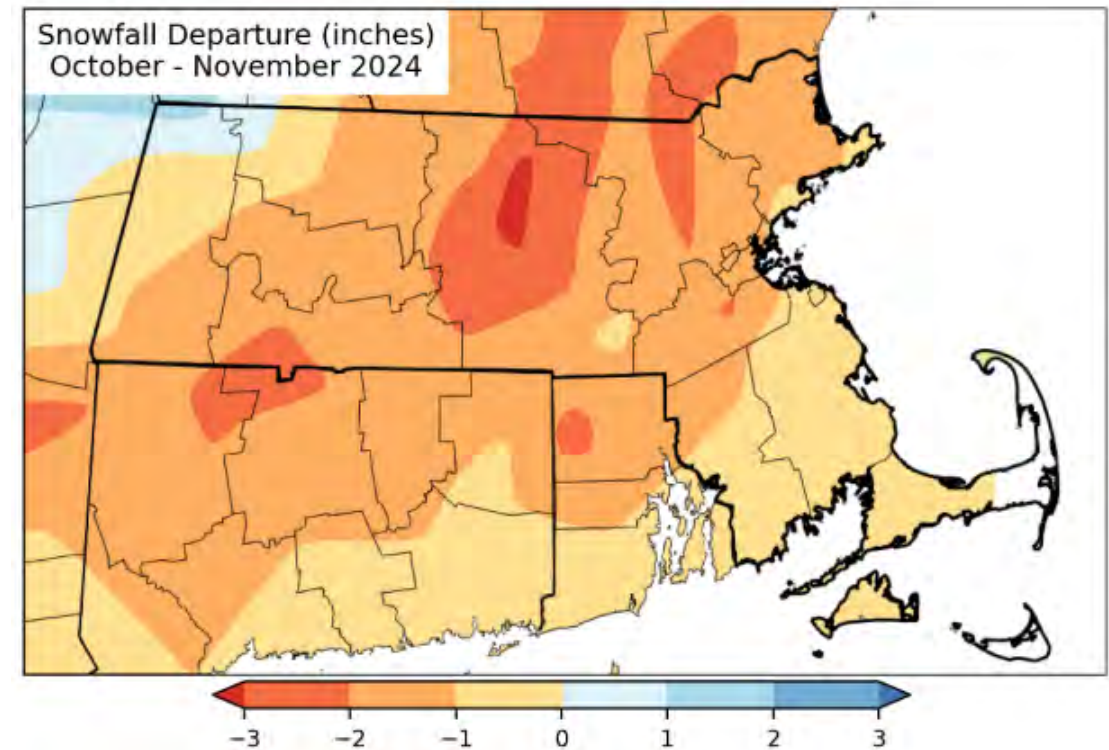
DMP Index Severity Levels			
1	2	3	4

SNOW COVER

At the end of November, there was snow cover in the western and north-central parts of the state. <https://www.nohrsc.noaa.gov/nsa/>



SEASON-TO-DATE SNOWFALL DEPARTURE

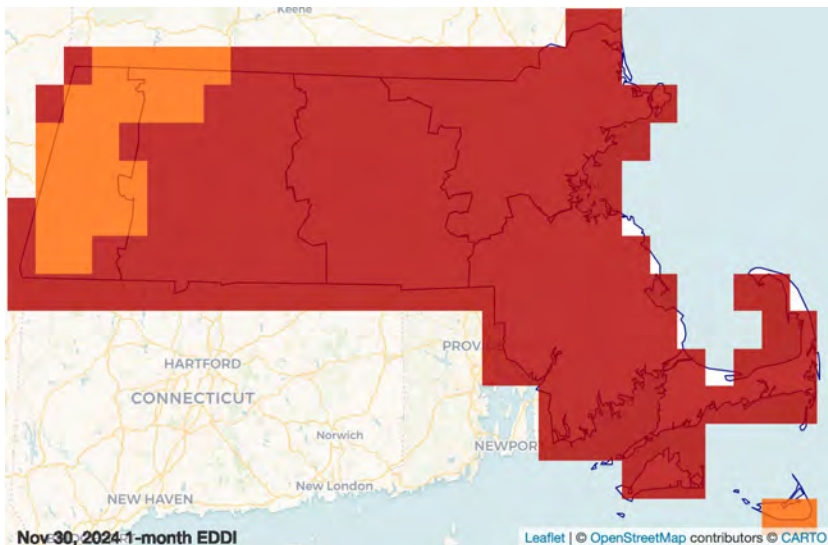


<http://www.nrcc.cornell.edu/regional/monthly/monthly.html>

EVAPORATIVE DEMAND DROUGHT INDEX (EDDI)

As of November 30th, 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 ISL 4 for all Regions.

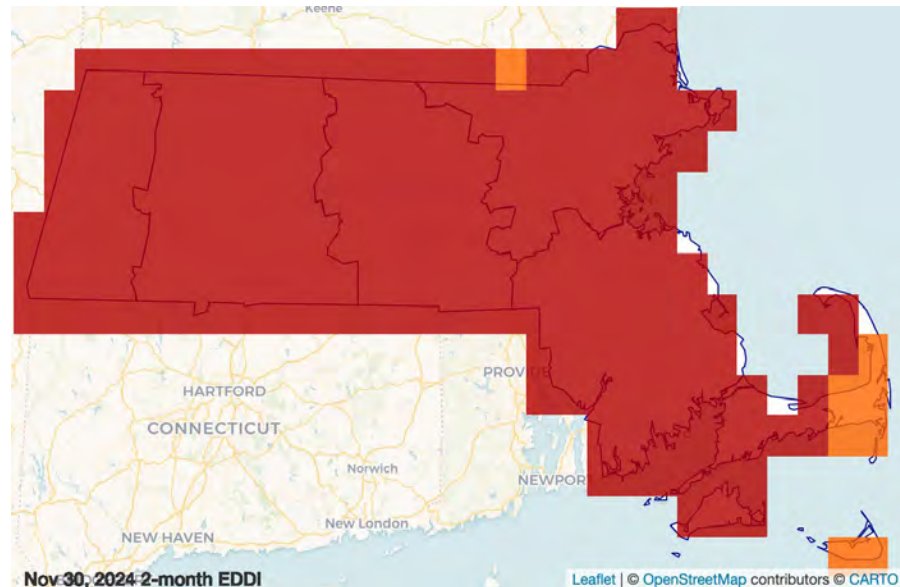
1-month EDDI



● ≥ 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	

DMP Index Severity Levels			
1	2	3	4

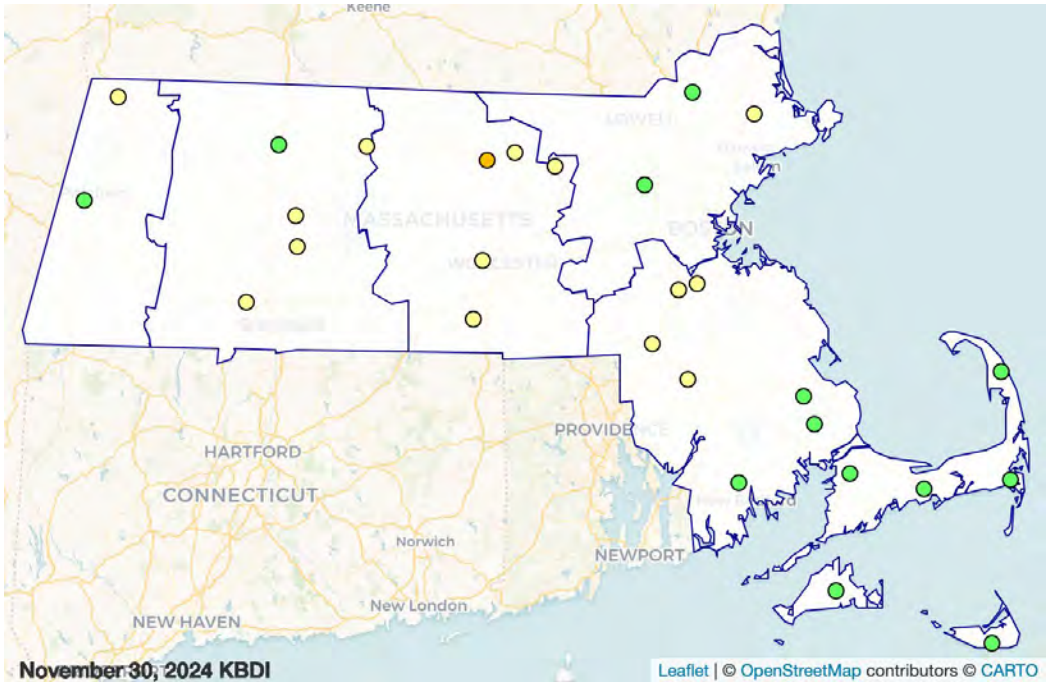
2-month EDDI



REGION	MEDIAN 2-MONTH EDDI (2024-11-30)
WESTERN	2
CTRV	2
CENTRAL	0
NORTHEAST	2
SOUTHEAST	2
CAPE COD	0
ISLANDS	0

At the end of November, the Keetch Byram Drought Index (KBDI) was at ISL 1 in the Western, CTRV, Northeast, and Southeast Regions, and at ISL 2 in the Central Region. Wildfire activity continued into the month of November.

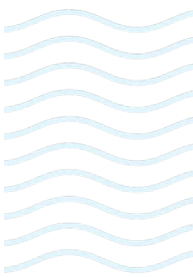
<https://www.wbur.org/news/2024/11/22/massachusetts-drought-rainy-weather-brushfire-conditions>
<https://commonwealthbeacon.org/environment/2024-fire-season-in-massachusetts-burns-more-acres-in-2-months-than-previous-2-years/>
<https://www.wamc.org/news/2024-12-02/great-barrington-fire-department-declares-butternut-fire-controlled-after-almost-two-weeks-1-700-acres-of-burning>
<https://www.wgbh.org/news/local/2024-12-06/rain-has-put-out-wildfires-but-the-drought-persists-across-most-of-massachusetts>



REGION	NUMBER OF SITES REPORTING	HIGHEST OF SITE VALUES
WESTERN	2	262
CTRV	5	337
CENTRAL	5	418
NORTHEAST	3	376
SOUTHEAST	7	379
CAPE COD	4	2
ISLANDS	2	98

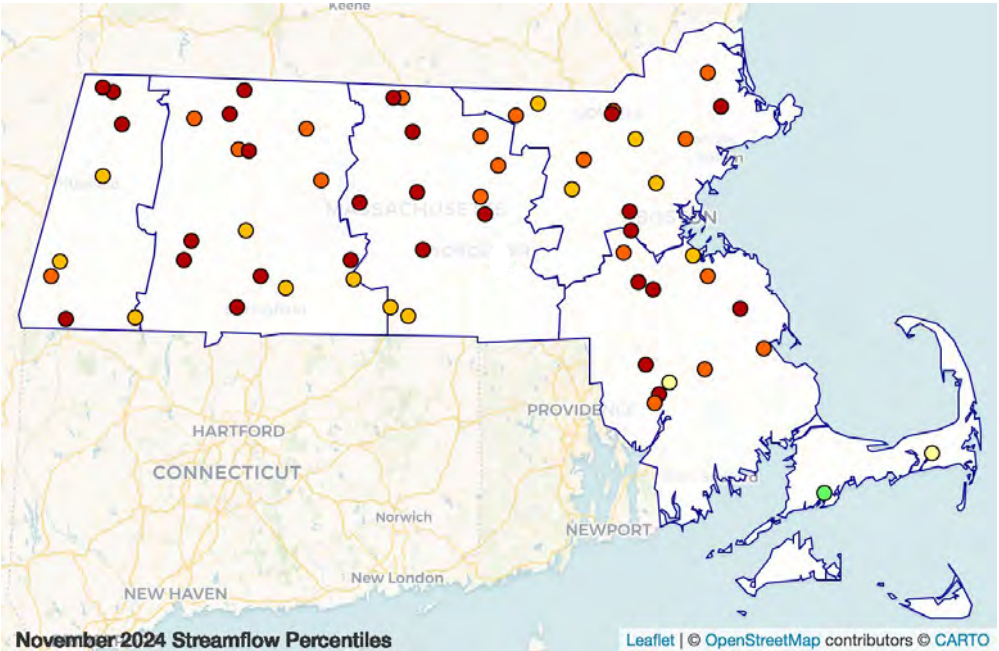
Point Values - KBDI Range				
● ≥700 to ≤800	● ≥600 to <700	● ≥400 to <600	● ≥200 to <400	● ≥0 to <200

DMP Index Severity Levels			
1	2	3	4



November streamflow ranged from much below normal to below normal with only one gage with a monthly median in the normal range. Regional medians were all below normal except in the Cape Cod Region. All Regions except Cape Cod had at least one gage at record low. The Western, Central, Northeast, and Southeast Regions are at ISL 3, and the CTRV Region at ISL 4.

MEDIAN MONTHLY STREAMFLOW PERCENTILES COMPARED TO HISTORICAL VALUES



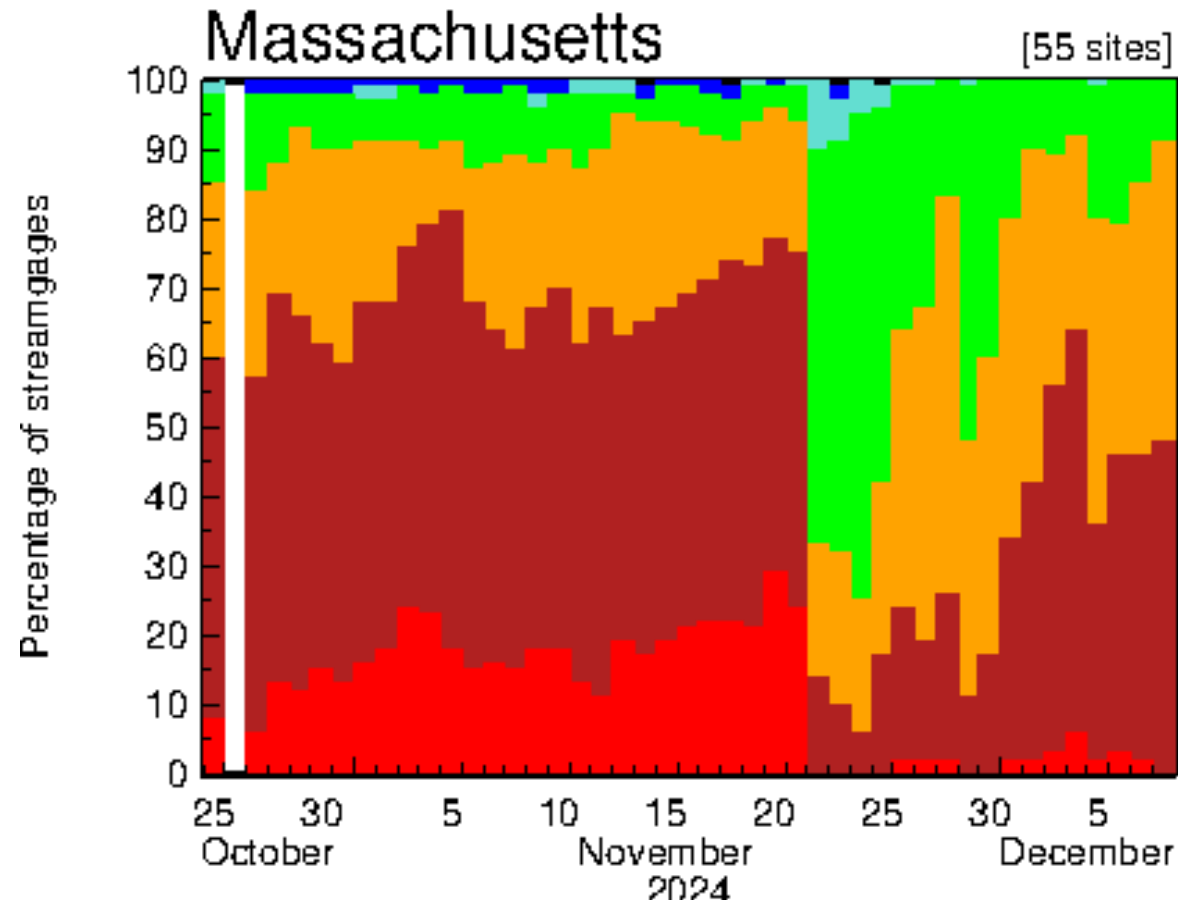
● ≥0 to ≤2	● >2 to ≤10	● >10 to ≤20	● >20 to ≤30	● >30 to ≤70
● >70 to ≤80	● >80 to ≤90	● >90 to ≤98	● >98 to ≤100	

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	8	0	0	3
CTRV	15	15	0	0	2
CENTRAL	12	12	0	0	3
NORTHEAST	13	13	0	0	4
SOUTHEAST	12	12	0	0	4
CAPE COD	2	1	1	0	31

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	No Data
	Much below normal	Below normal	Normal	Above normal	Much above normal	

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

The Boston/Norton and Albany NWS E-5 Monthly Reports of Hydrologic Conditions did not indicate river flooding at forecast points in Massachusetts during November 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 find any flood warnings or flood reports.



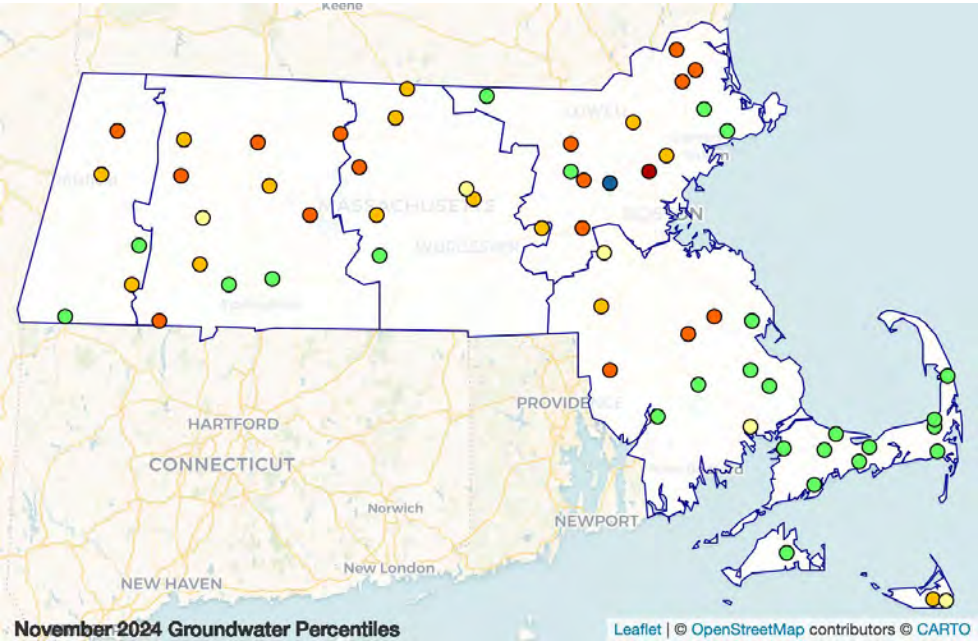
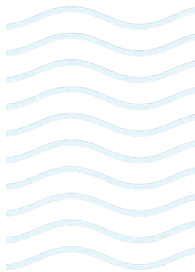
Image: Courtesy of NASA/JPL-Caltech

<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/>

November groundwater levels ranged from much below normal to normal. The Western, CTRV, Central, and Northeast Regions are at ISL 2, and the Southeast and Islands Regions are at ISL 1.

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



<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
≥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	3	2	0	14
CTRV	11	9	2	0	11
CENTRAL	8	7	1	0	16
NORTHEAST	13	9	4	0	12
SOUTHEAST	12	7	5	0	22
CAPE COD	10	0	10	0	46
ISLANDS	3	2	1	0	23

DMP Index Severity Levels			
1	2	3	4

At the end of November, ten 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 CTRV is at ISL 1, the Central and Southeast Regions at ISL 2, and the Northeast Region at ISL 3.

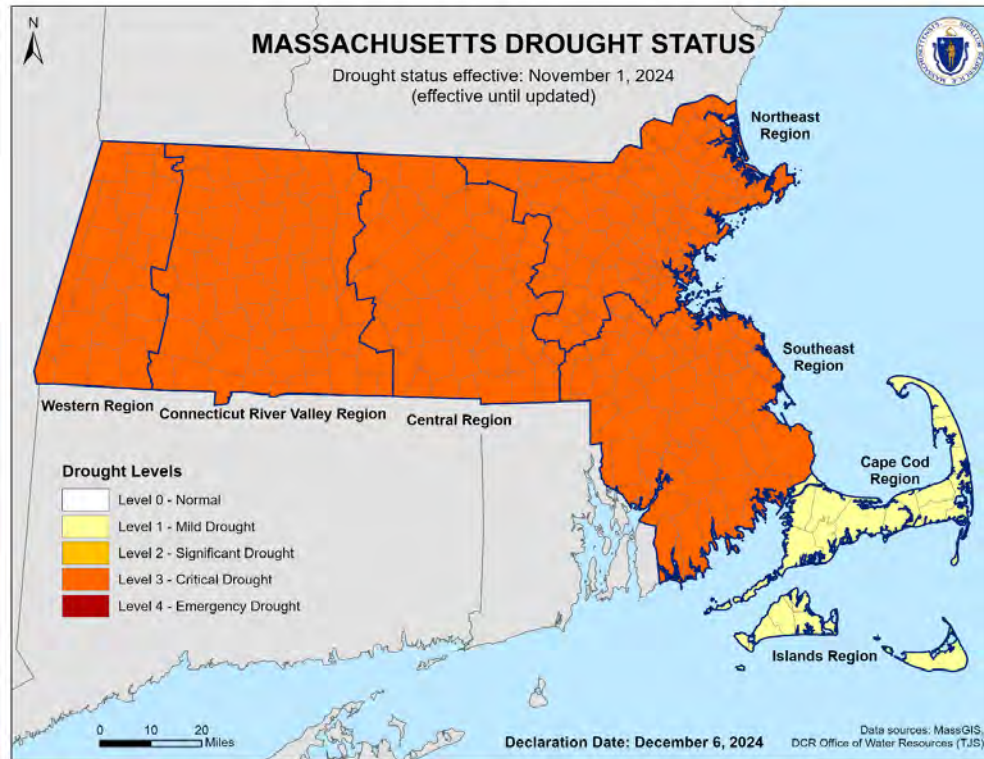
REGION	NUMBER OF SITES REPORTING	MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT FULL
WESTERN	2	36th
CTRV	2	28th
CENTRAL	4	13th
NORTHEAST	5	9th
SOUTHEAST	2	19th
CAPE COD	1	41st

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

DMP Index Severity Levels			
1	2	3	4



MASSACHUSETTS DROUGHT STATUS



On December 6, 2024, Massachusetts Energy and Environmental Affairs (EEA) Secretary Rebecca L. Tepper declared that starting from November 1, 2024, the Western, Connecticut River Valley, Central, Northeast, and Southeast Regions are at Level 3 - Critical Drought, and the Cape Cod and Islands Regions are at Level 1 - Mild Drought. This status remains in effect until further updated.

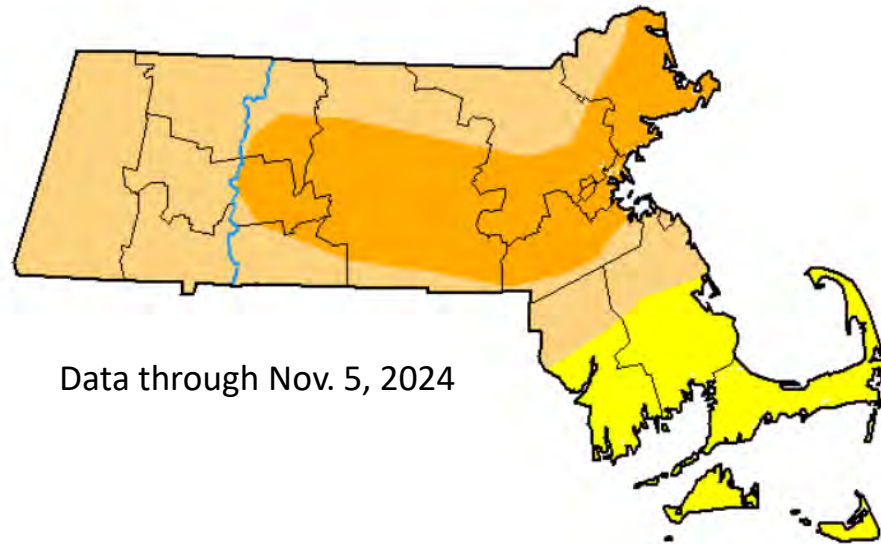
Drought Indices by Region November_2024

Drought Index	Western	CT River Valley	Central	Northeast	Southeast	Cape	Islands
Precipitation (3-mos)	0	1	1	3	6	9 (2-mos)	4 (2-mos)
Streamflow	3	2	3	4	4	31	N/A
Groundwater	14	11	16	12	24	46	23
Lakes/Impoundments	36	28	17	9	19	41	N/A
ET	2	2	0	2	2	0	0
KBDI	262	337	418	376	379	2	98
November	Level 3	Level 3	Level 3	Level 3	Level 3	Level 1	Level 1

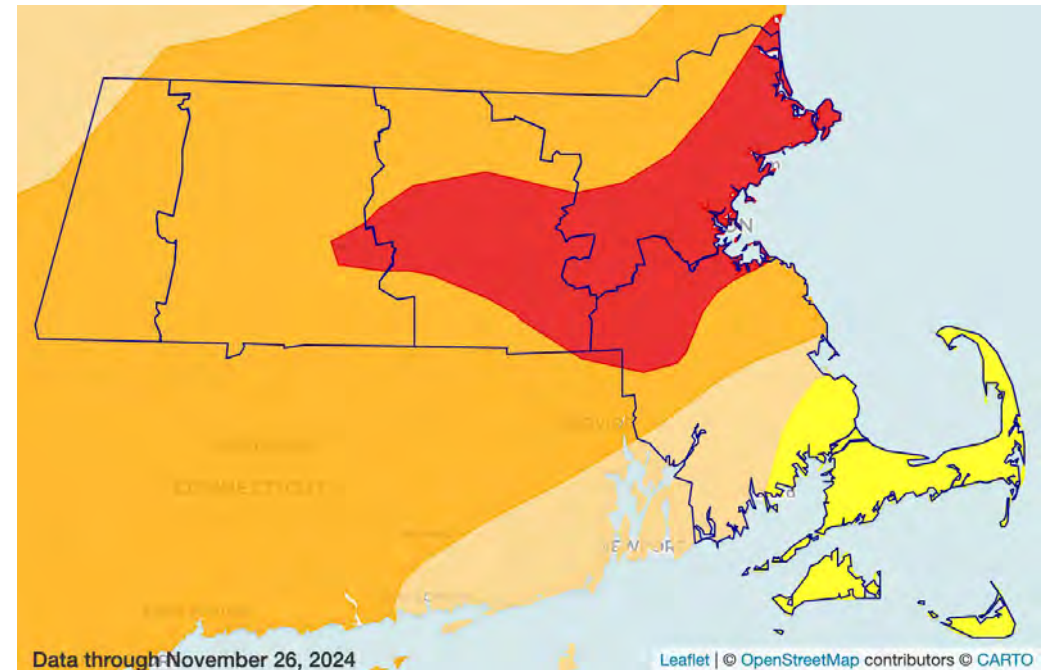
U.S. DROUGHT MONITOR (USDM)

At the end of November, the USDM showed areas of D3 (Extreme Drought), 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>

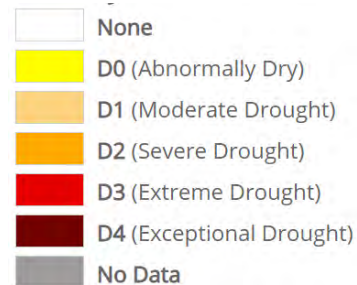


Data through Nov. 5, 2024



Data through November 26, 2024

Leaflet | © OpenStreetMap contributors © CARTO



TEMPERATURE AND PRECIPITATION OUTLOOK

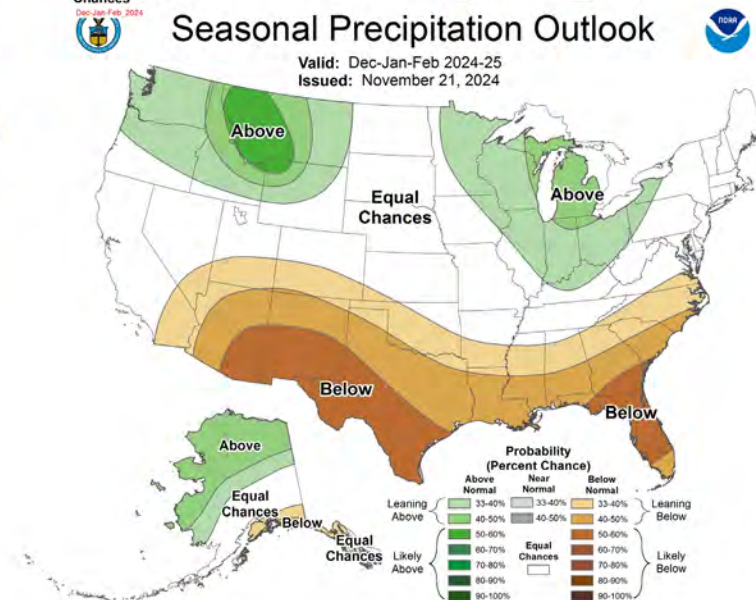
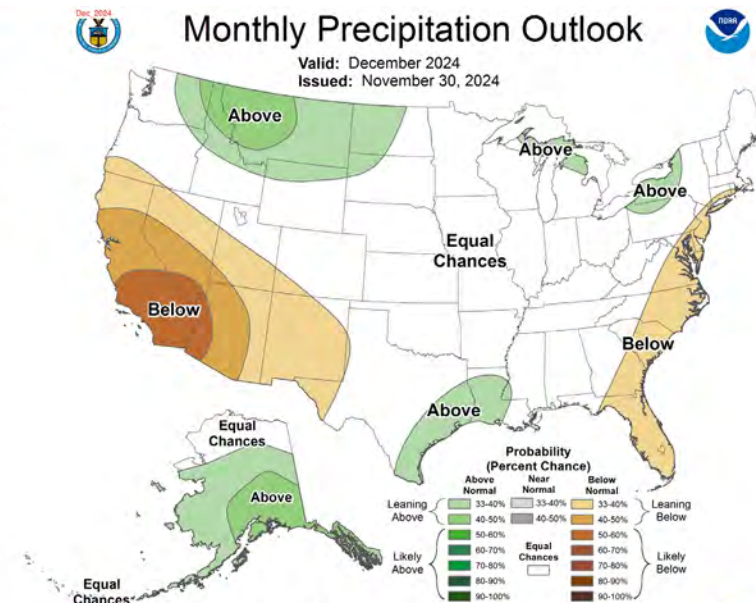
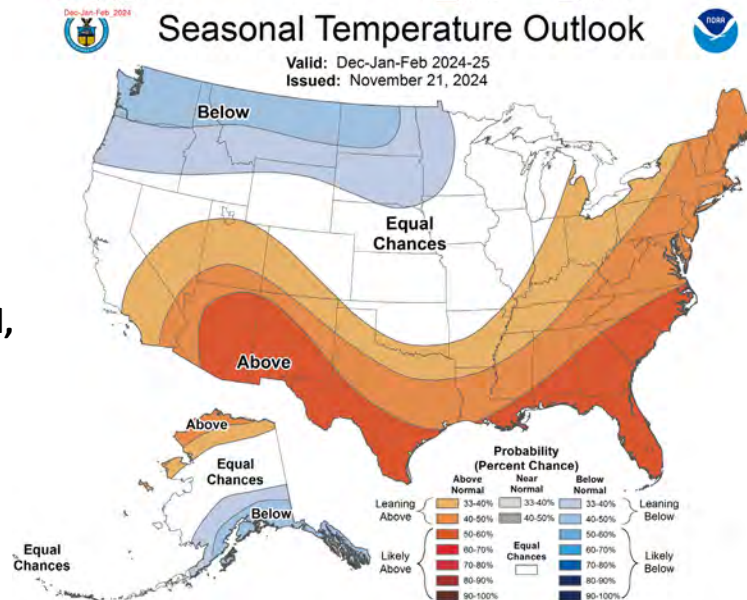
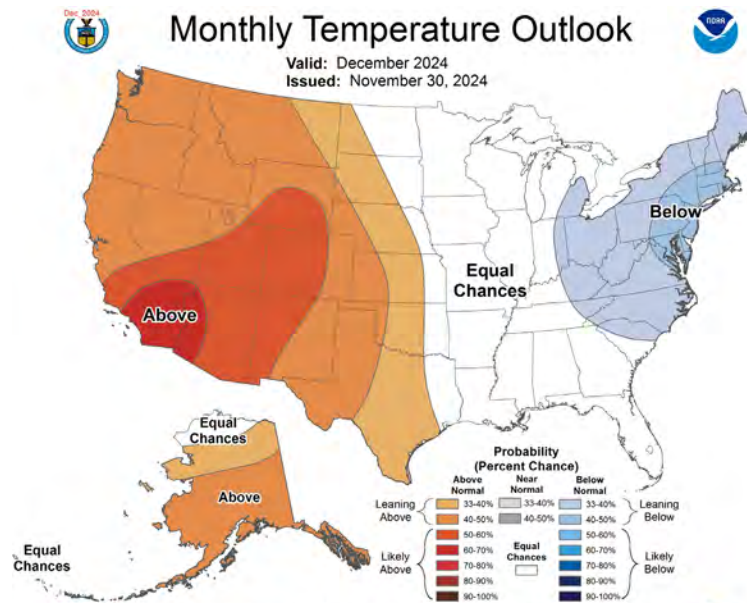
December: The monthly outlook issued 11/30 shows a 40-50% chance of below-normal temperatures and equal chances for above-normal, normal, or below-normal precipitation.

December through February: The seasonal outlook issued 11/21 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/>

Winter 2024-25 Outlook for Southern New England, NWS Boston

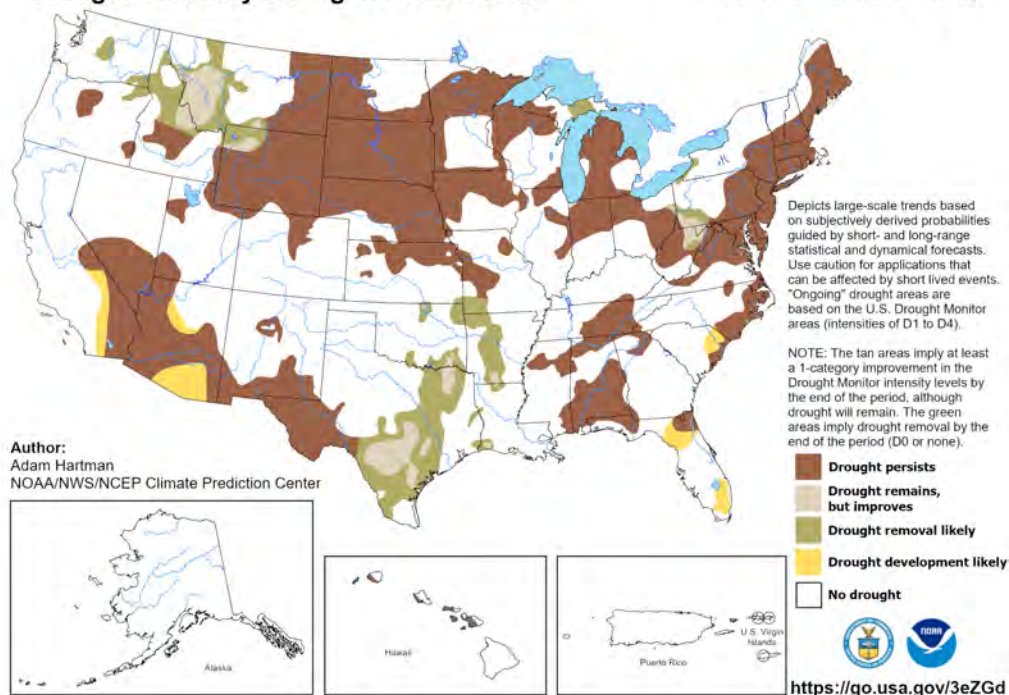
<https://www.youtube.com/watch?v=LZrF9qtb8w>



U.S. Monthly Drought Outlook

Drought Tendency During the Valid Period

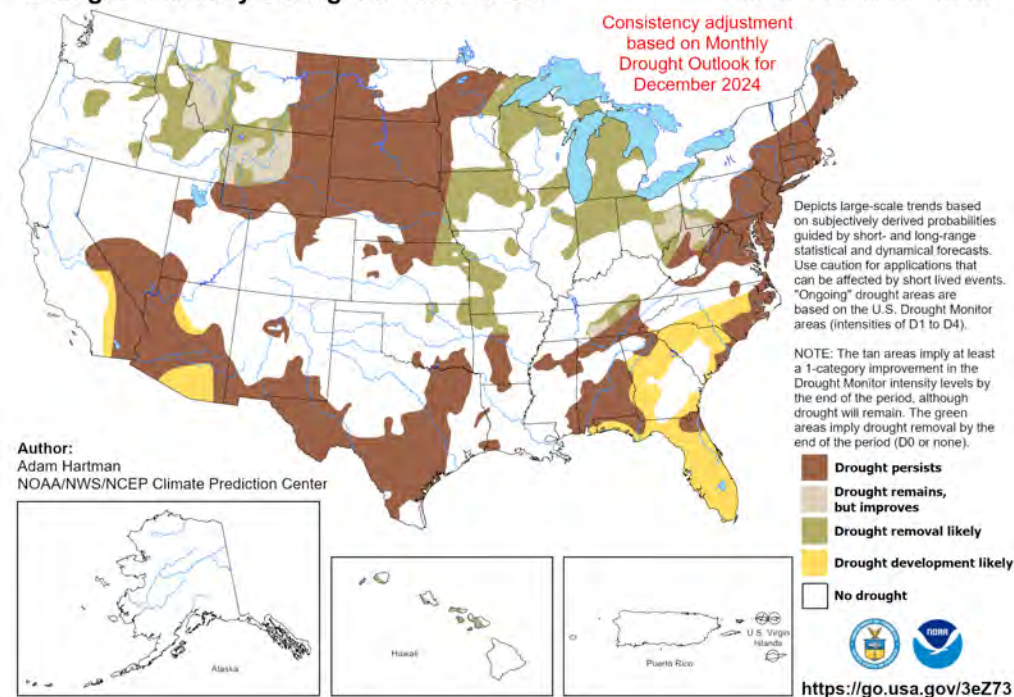
Valid for December 2024
Released November 30, 2024



U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid for December 1, 2024 - February 28, 2025
Released November 30, 2024

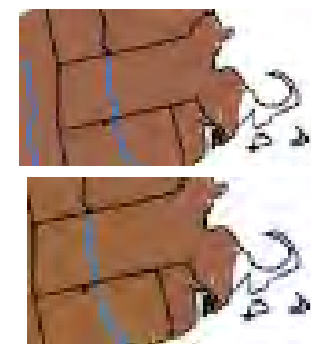


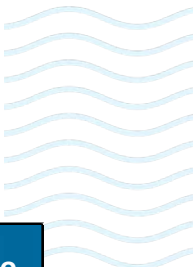
MONTHLY AND SEASONAL DROUGHT OUTLOOK

The monthly outlook for December released on 11/30 shows drought persisting throughout most of the state except on the Cape and Islands.

The seasonal outlook for November through February released on 11/30 shows drought persisting throughout most of the state except on the Cape and Islands. <http://www.cpc.ncep.noaa.gov/products/Drought>

<https://www.vermontpublic.org/local-news/2024-11-29/winter-forecast-shows-drought-could-persist-in-much-of-new-england>

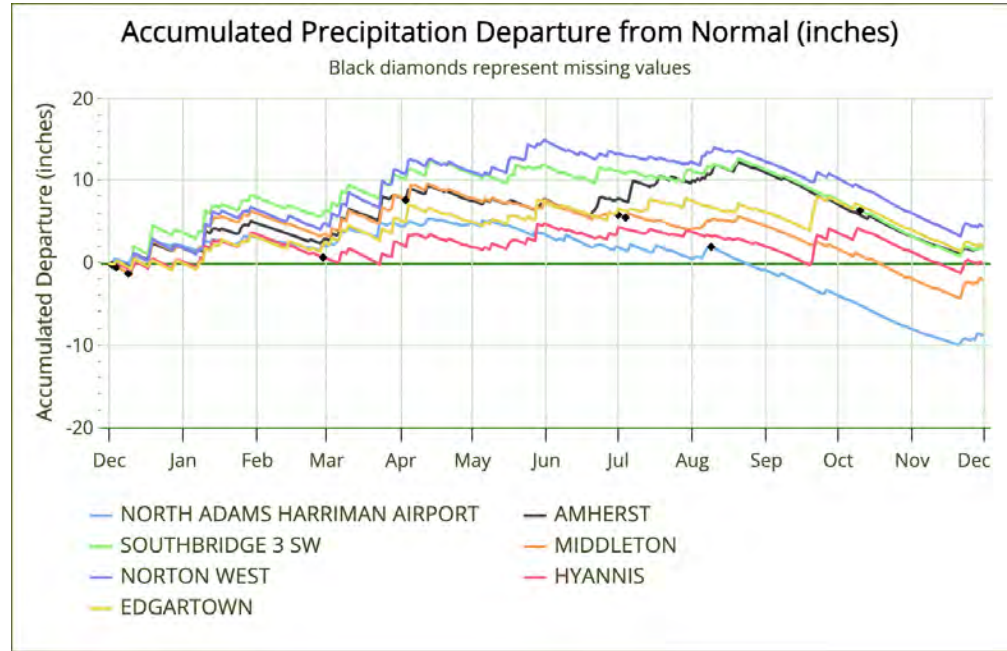




ADDITIONAL PRECIPITATION DATA

Standardized Precipitation Index—
November 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	27	3	0	9	22	32	55	46
CTRV	10	26	4	1	19	45	72	89	68
CENTRAL	14	35	5	1	5	40	70	92	82
NORTHEAST	15	48	12	3	6	32	54	87	63
SOUTHEAST	26	36	6	6	9	56	76	83	62
CAPE COD	4	26	9	37	16	32	46	59	72
ISLANDS	3	21	4	16	18	38	51	38	31



DMP Index Severity Levels			
1	2	3	4

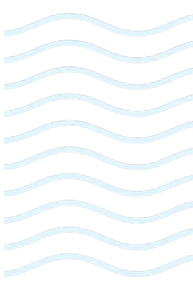
Accumulated Precipitation Departure from 30-Year Normals in Inches

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—November 2024

REGION	NUMBER OF SITES REPORTING	HISTORICAL AVERAGE	NOVEMBER AVERAGE (IN)	DEPARTURE FROM HISTORICAL AVERAGE (IN)	PERCENT OF NORMAL
WESTERN	2	3.49	2.32	-1.17	66%
CTRV	10	3.60	2.34	-1.26	65%
CENTRAL	14	4.02	2.91	-1.11	72%
NORTHEAST	15	3.99	3.34	-0.65	84%
SOUTHEAST	26	4.29	3.23	-1.06	75%
CAPE COD	4	4.03	2.48	-1.55	62%
ISLANDS	3	4.17	2.13	-2.04	51%



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