MASSACHUSETTS WATER RESOURCES COMMISSION

HYDROLOGIC CONDITIONS IN MASSACHUSETTS

DECEMBER
2024

The Commonwealth of Massachusetts

Maura T. Healey, Governor

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

DECEMBER 2024 HYDROLOGIC CONDITIONS

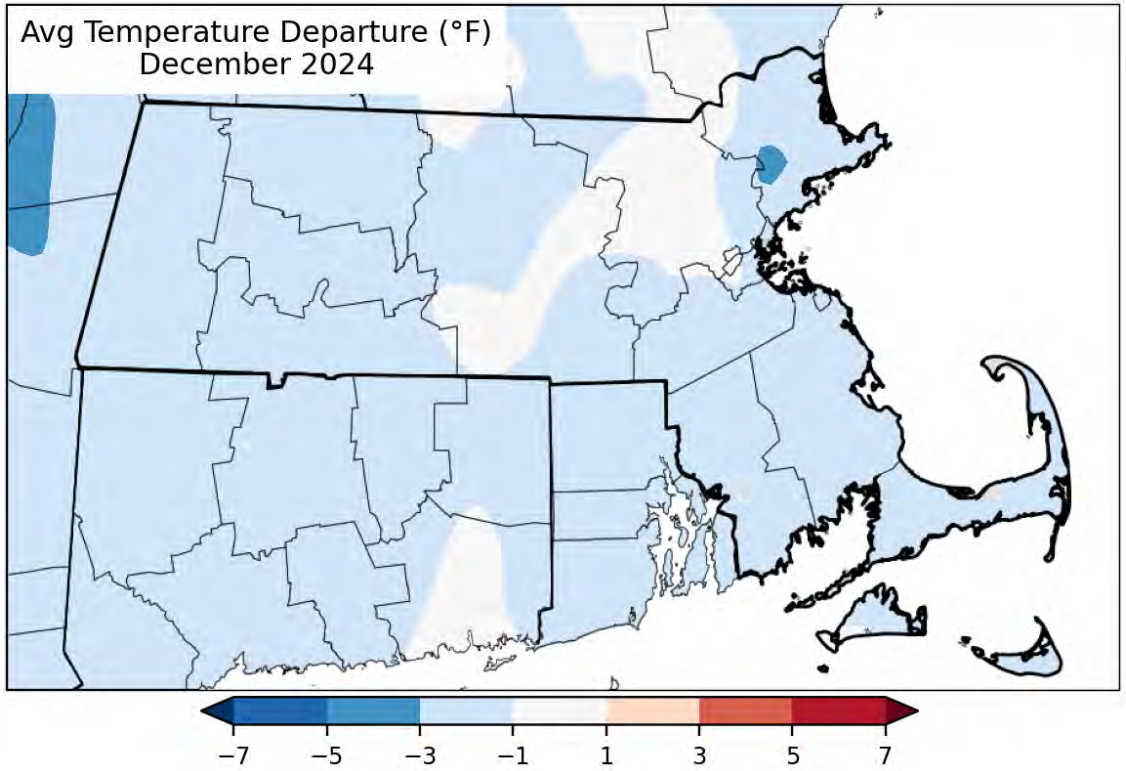
SUMMARY OF CONDITIONS

- Monthly average temperatures were near normal.
- Precipitation was normal to above normal.
- There was no snow cover at the end of December.
- The Evaporative Demand Drought Index is not reported in December.
- The Keetch-Byram Drought Index is not reported in December.
- Streamflow Regional medians were normal to below normal. The Central Region is at ISL 2 and the CTRV and Northeast Regions at ISL 1. A December 11th storm brought heavy rain and snowmelt. The Hoosic River in Williamstown reached minor flood stage.
- Groundwater Regional medians were below normal to normal. The Central, Northeast, and Islands Regions are at ISL 1.
- Lake and impoundment levels ranged from below normal to normal. All Regions except Cape Cod are at elevated ISLs.
- NOAA's January outlook outlook shows equal chances for above-normal, normal, or below-normal temperatures and chances leaning for above-normal precipitation.
- NOAA's 3-month outlook shows chances leaning for above-normal temperatures 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.

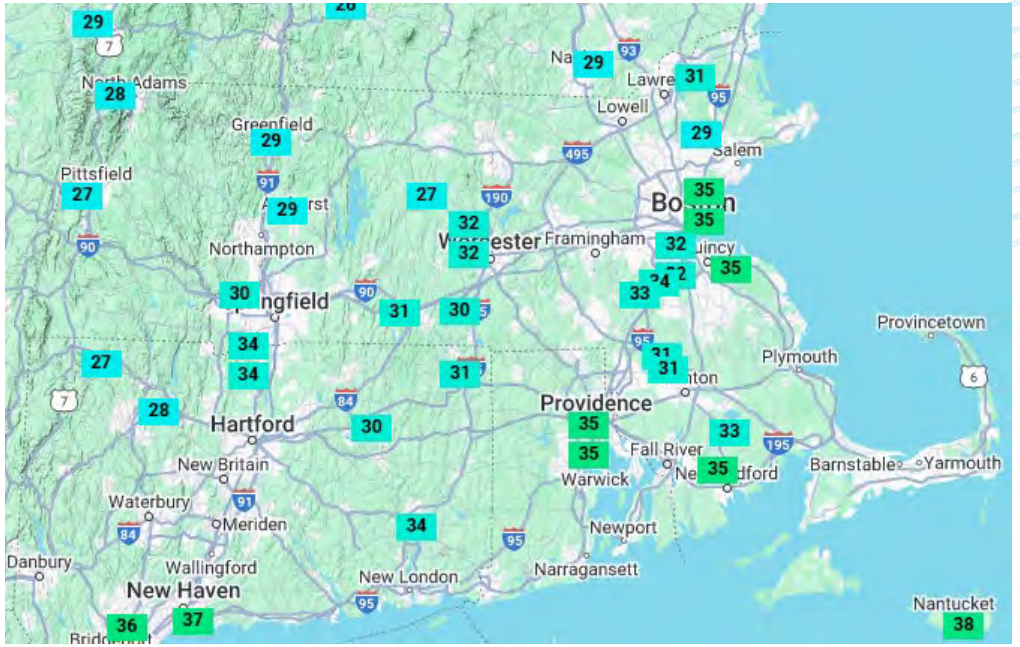
This report was prepared by the Massachusetts Department of Conservation and Recreation. Data may be preliminary. Analysis reflects automated calculations done 01/07/2025. Additional information, previous reports, and the Massachusetts Drought Dashboard with weekly updates to the drought indices can be found at: https://www.mass.gov/drought-monitoring

Monthly average temperatures were near normal. According to the Northeast Regional Climate Center (NRCC), the Boston major climate site had its 5th warmest year on record (since 1872), and the Worcester major climate site its warmest (since 1892).

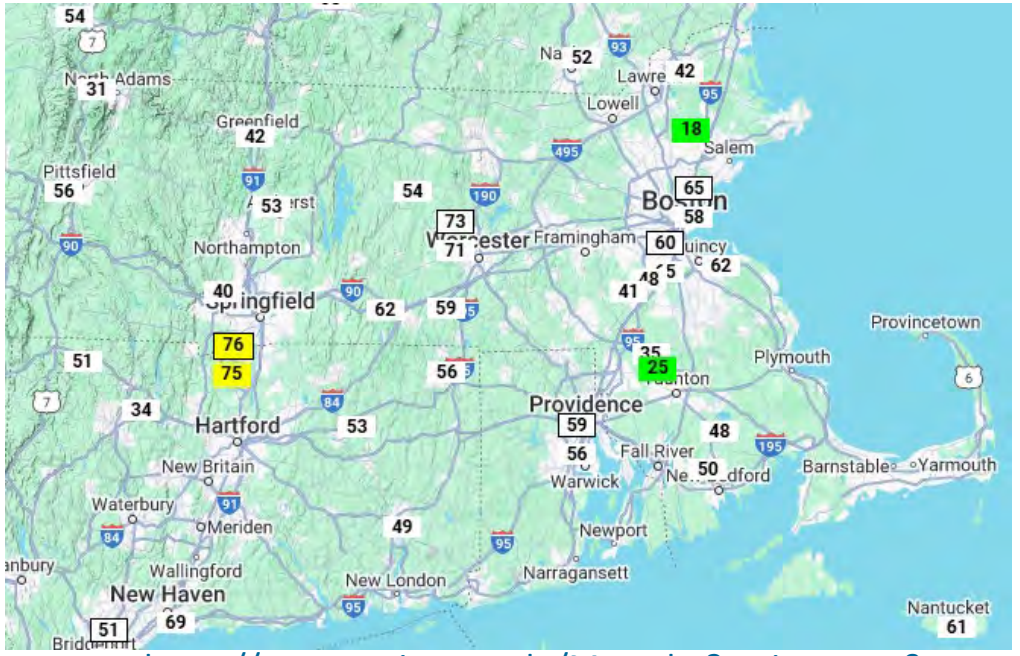
http://www.nrcc.cornell.edu/regional/monthly/monthly.html



Observed Average Mean Temperatures for Dec. 1st- 31st



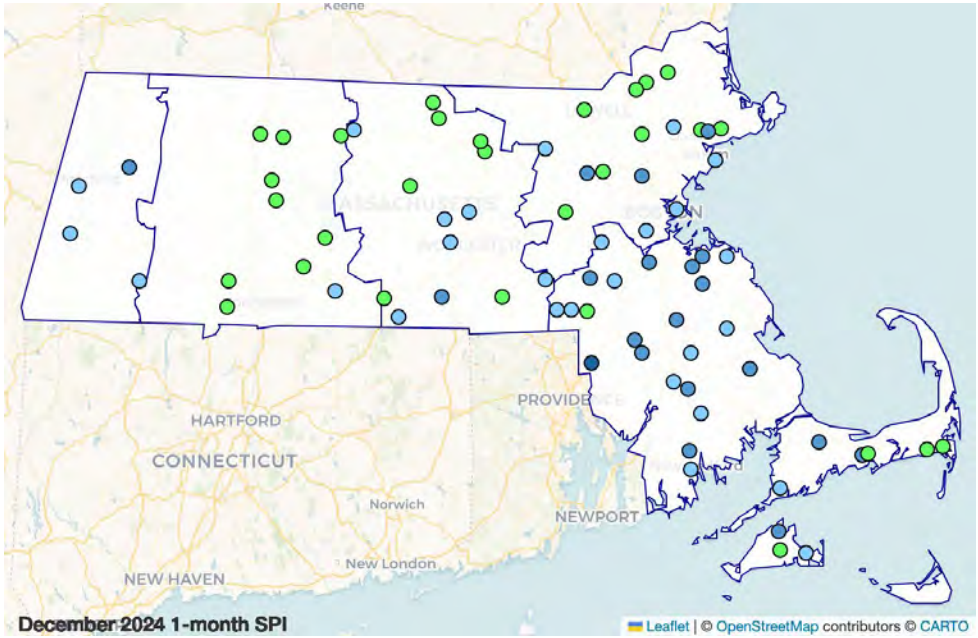
Observed Average Mean Temperature as Percentiles for Dec. 1st to 31st



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

STANDARDIZED PRECIPITATION INDEX (SPI) AS A PERCENTILE

December precipitation was normal to above normal. The 3-month and 6-month look-backs for most Regions still show deficits. 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	

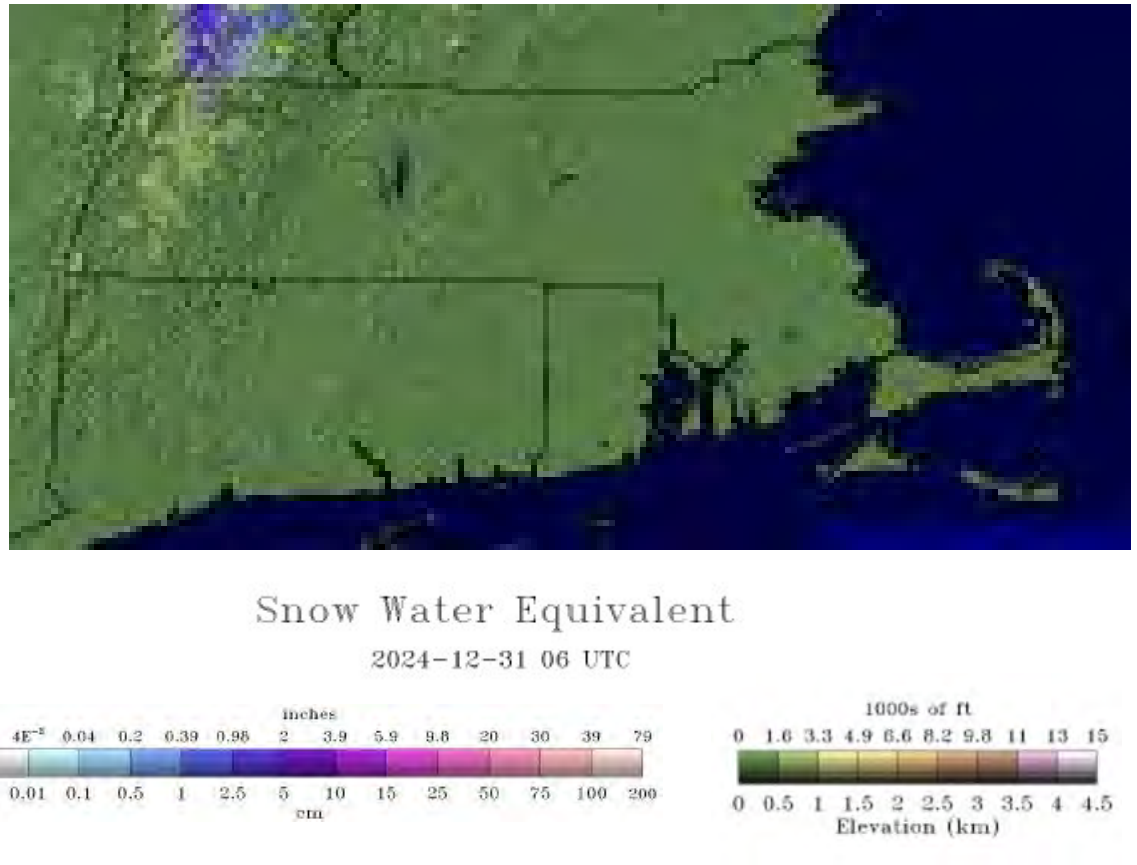
REGION	NUMBER OF SITES REPORTING	DECEMBER MONTHLY AVERAGE (IN)	DEPARTURE FROM HISTORICAL (IN)	SPI PERCENTILE 1-MONTH	SPI PERCENTILE 3-MONTH	SPI PERCENTILE 6-MONTH
WESTERN	4	4.83	1.31	77	33	30
CTRV	10	4.08	0.30	63	11	18
CENTRAL	14	4.82	0.65	70	10	10
NORTHEAST	17	4.84	0.89	70	21	13
SOUTHEAST	23	6.46	1.99	81	26	16
CAPE COD	6	5.28	0.89	74	24	30
ISLANDS	3	5.38	1.14	78	16	34

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.

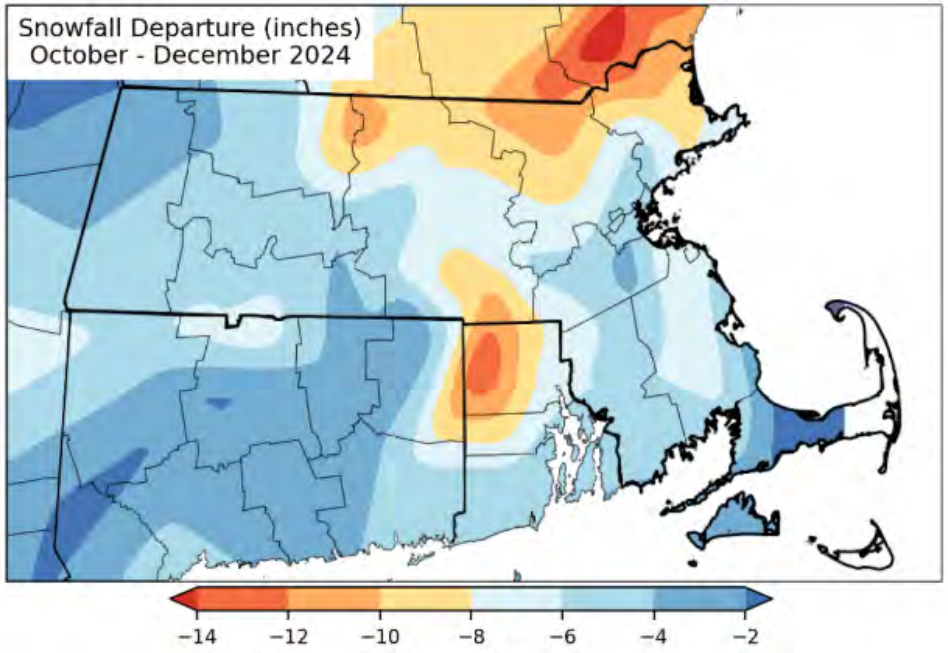
DMP Index Severity Levels			
1	2	3	4

SNOW COVER

At the end of December, there was no snow cover.
https://www.nohrsc.noaa.gov/nsa/



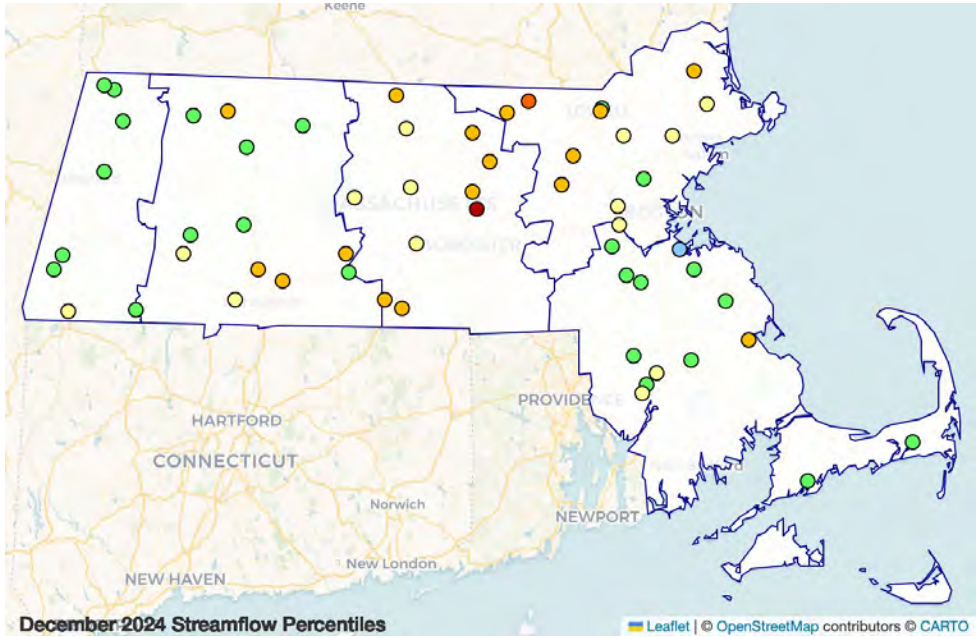
SEASON-TO-DATE SNOWFALL DEPARTURE



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

December streamflow ranged from much below normal to normal. All Regions had at least two gages in the normal range, except for the Central Region where all gages were below normal. The Central Region is at ISL 2 and the CTRV and Northeast Regions at ISL 1.

MEDIAN MONTHLY STREAMFLOW PERCENTILES COMPARED TO HISTORICAL VALUES



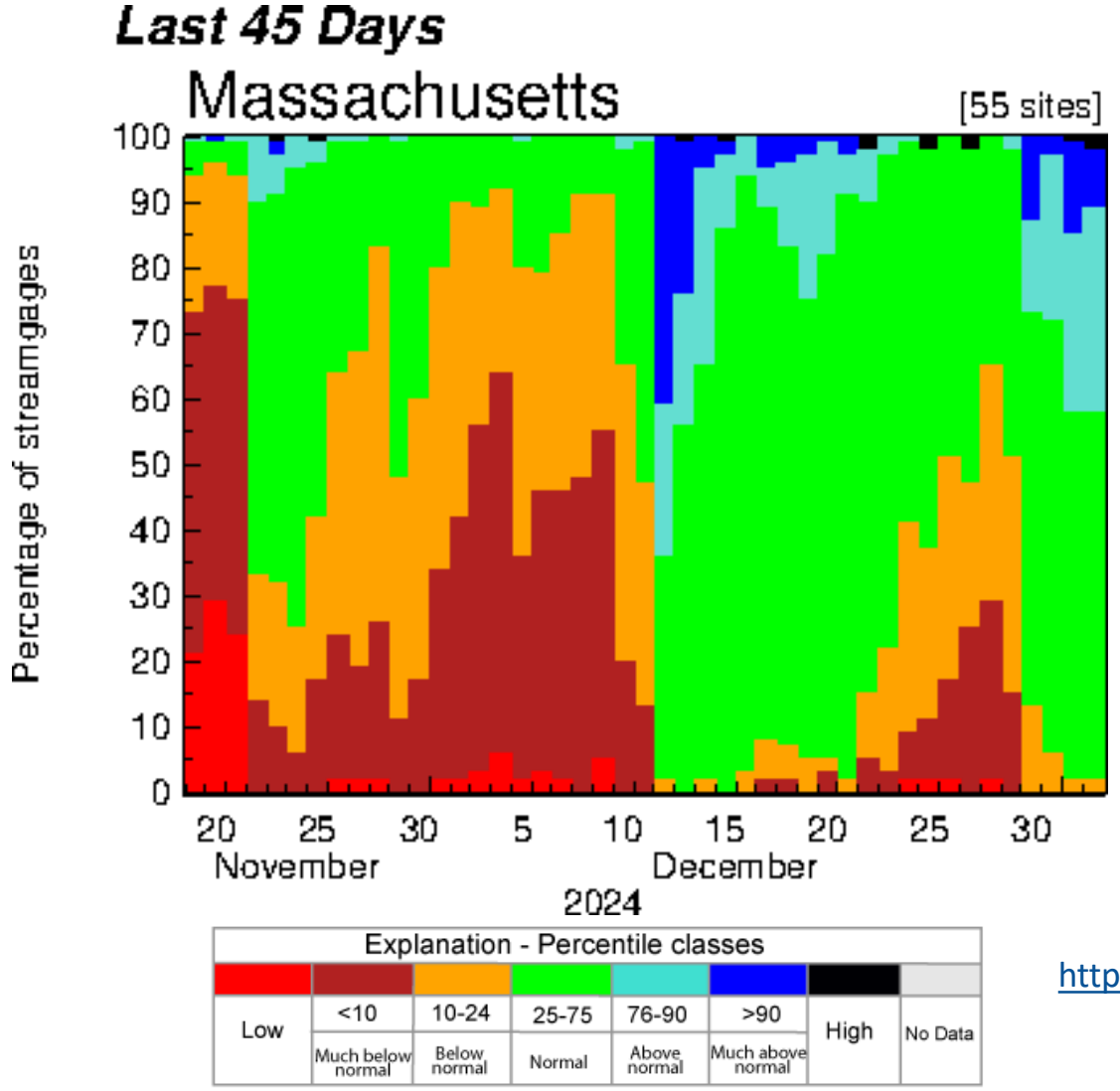
≥0 to ≤2	>2 to ≤10	>10 to ≤20	>20 to ≤30	>30 to ≤70
>70 to ≤80	>80 to ≤90	>90 to ≤98	>98 to ≤100	

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	1	7	0	40
CTRV	12	6	6	0	30
CENTRAL	11	11	0	0	17
NORTHEAST	13	11	2	0	21
SOUTHEAST	12	3	9	0	38
CAPE COD	2	0	2	0	35

DMP Index Severity Levels			
1	2	3	4

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

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

The Boston/Norton NWS E-5 Monthly Report of Hydrologic Conditions did not indicate river flooding at forecast points in its Massachusetts service area, but the Albany NWS E-5 NWS E-5 Monthly Report of Hydrologic Conditions reported two river flood warnings at points on the Hoosic River, which reached minor flood stage in Williamstown on December 11th.

A search of the Iowa Mesonet database did not find any other NWS flood warnings or local storm flooding reports. https://mesonet.agron.iastate.edu/vtec/search.php#eventsbypoint/-93.6530/41.5300

The December 11th storm impacted much of New England including Massachusetts because of heavy rainfall and snowmelt. There were news reports of urban flooding especially in the eastern and southeastern parts of the state. https://www.wbur.org/news/2024/12/11/rain-wind-storm-december-boston

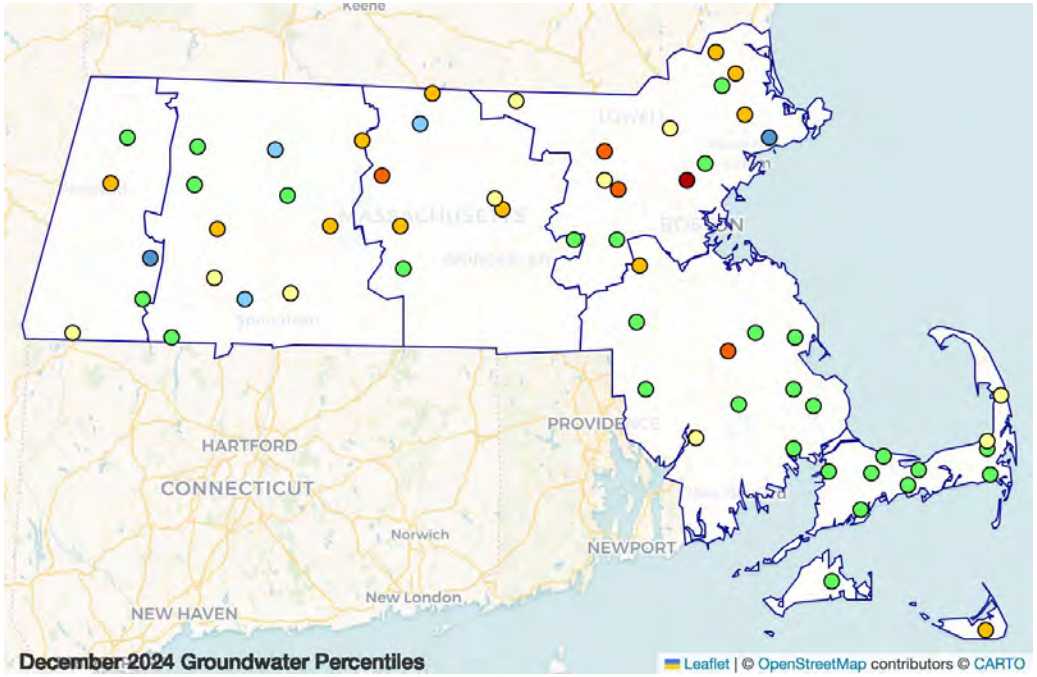
https://www.boston.com/news/weather/2024/12/12/massachusetts-rain-totals-december-11-2024/

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

Image: Courtesy of NASA/JPL-Caltech

December groundwater levels ranged from much below normal to above normal. The Central, Northeast, and Islands Regions are at ISL 1.

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 NORMAL >30 TO ≤70 PERCENTILE	NUMBER OF WELLS ABOVE NORMAL >70 TO ≤100 PERCENTILE	MEDIAN OF INDIVIDUAL WELL PERCENTILES
WESTERN	5	2	2	1	32
CTRV	11	5	4	2	39
CENTRAL	8	5	2	1	22
NORTHEAST	13	9	3	1	24
SOUTHEAST	12	3	9	0	43
CAPE COD	10	2	8	0	35
ISLANDS	2	1	1	0	30

DMP Index Severity Levels			
1	2	3	4

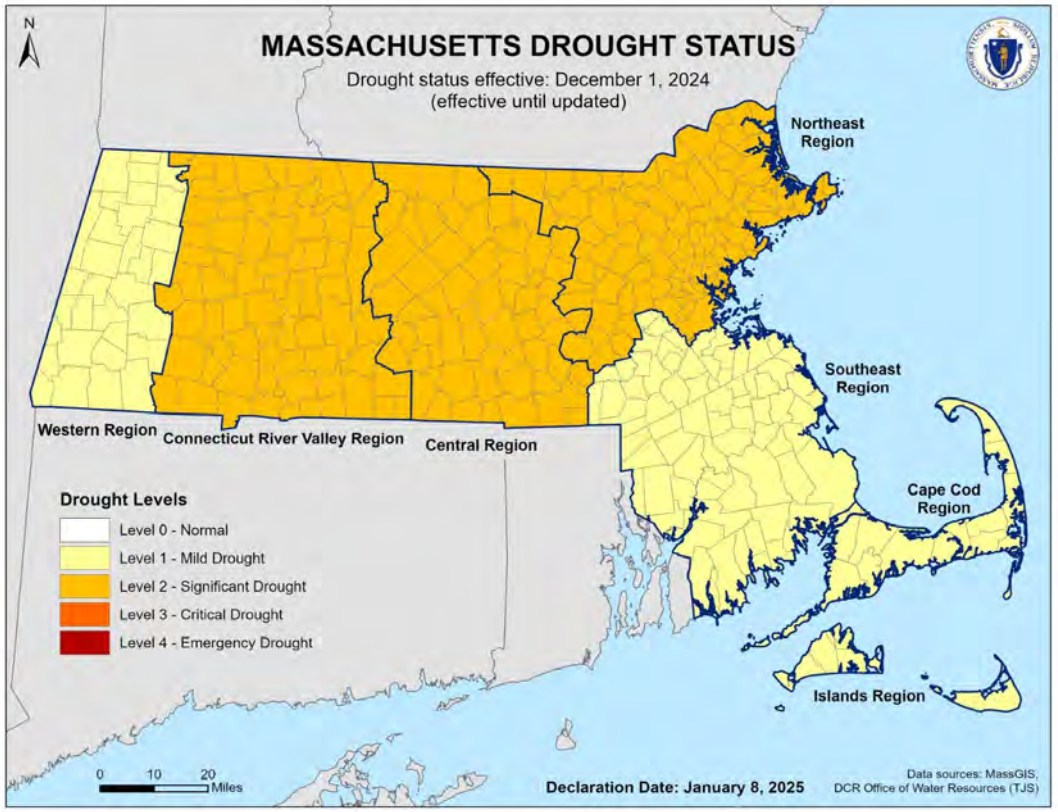
At the end of December, eight of the reported lake and impoundment levels were below their 30th percentile. Every Region except for Cape Cod had at least one lake or impoundment below normal. The Western, CTRV, and Southeast Regions are at ISL 1, and the Central and Northeast Regions are at ISL 2.

REGION	NUMBER OF SITES REPORTING	MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT FULL
WESTERN	2	25th
CTRV	2	27th
CENTRAL	2	17th
NORTHEAST	4	16th
SOUTHEAST	2	30th
CAPE COD	1	40th

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

DMP Index Severity Levels			
1	2	3	4

MASSACHUSETTS DROUGHT STATUS



On January 8, 2025, Massachusetts Energy and Environmental Affairs (EEA) Secretary Rebecca L. Tepper declared that starting from December 1, 2024, the Western, Southeast, Cape Cod, and Islands Regions are at Level 1 - Mild Drought and the Connecticut River Valley, Central, and Northeast Regions are at Level 2 - Significant Drought. This status remains in effect until further updated.

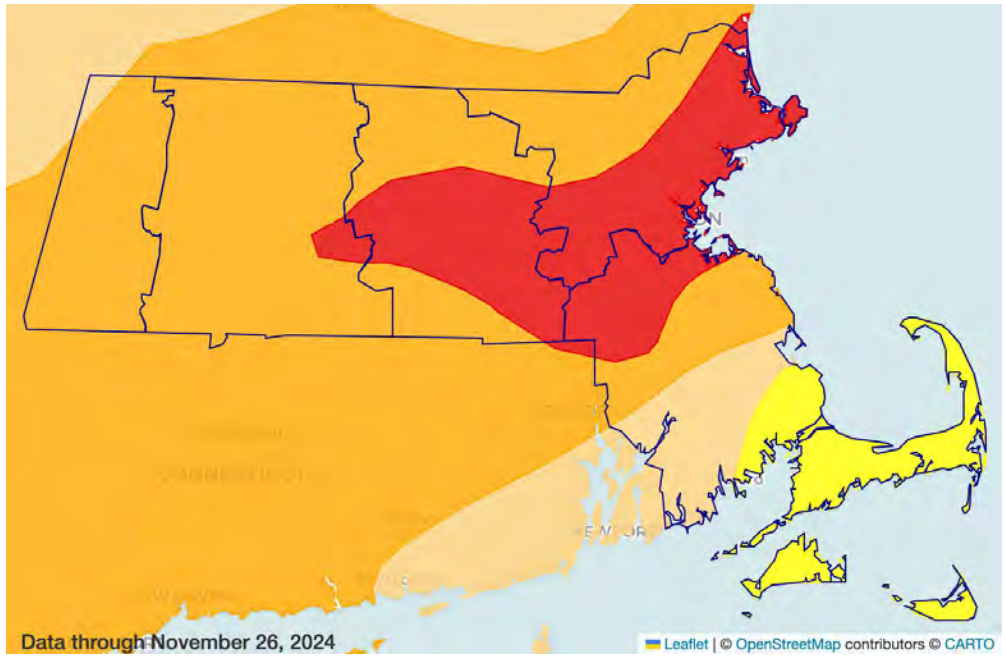
Drought Indices by Region December_2024

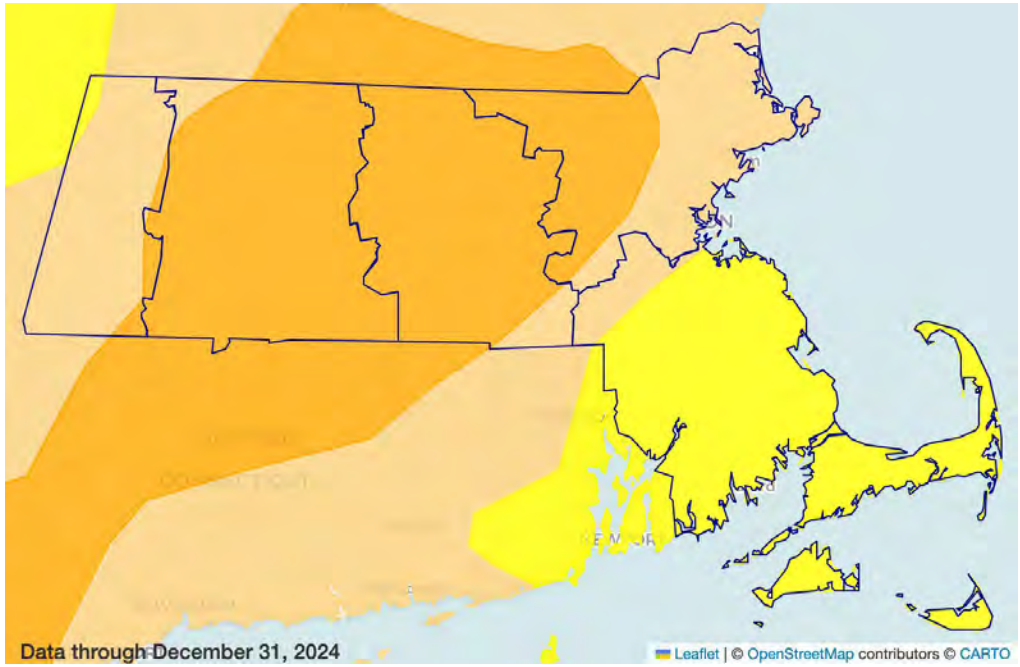
Drought Index	Western	CT River Valley	Central	Northeast	Southeast	Cape	Islands
Precipitation (6-mos)	30	18	10	13	16	24 (3-mos)	16 (3-mos)
Streamflow	40	30	17	21	38	35	N/A
Groundwater	32	39	22	24	43	35	30
Lakes/ Impoundments	25	27	17	16	30	40	N/A
ET*	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KBDI**	N/A	N/A	N/A	N/A	N/A	N/A	N/A

U.S. DROUGHT MONITOR (USDM)

At the end of December, the USDM showed areas of 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





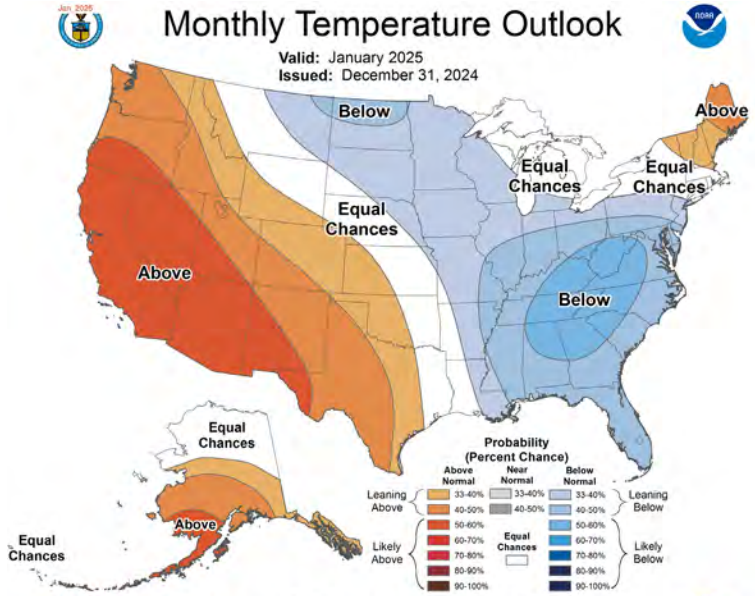
None
D0 (Abnormally Dry)
D1 (Moderate Drought)
D2 (Severe Drought)
D3 (Extreme Drought)
D4 (Exceptional Drought)
No Data

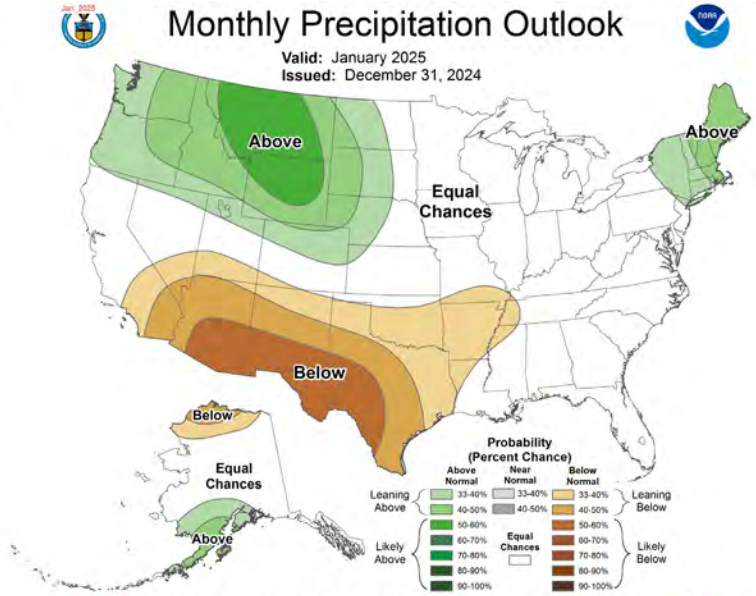
TEMPERATURE AND PRECIPITATION OUTLOOK

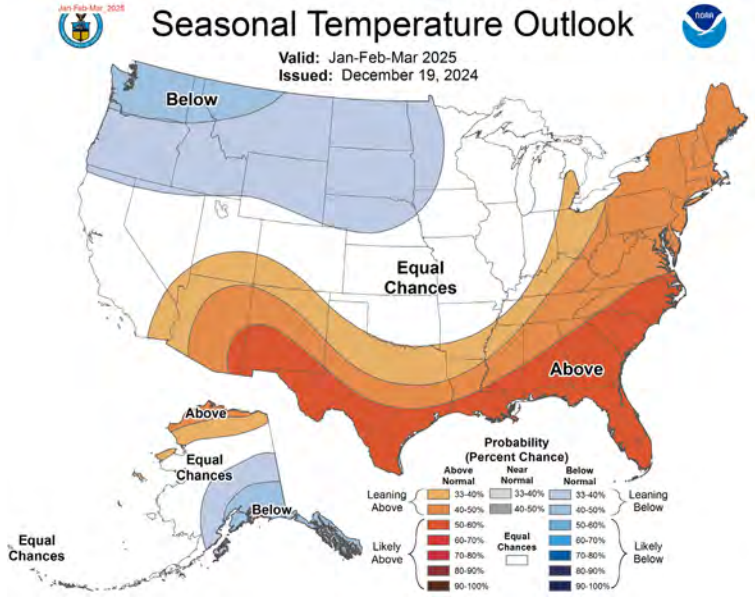
January: The monthly outlook issued 12/31 shows equal chances for above-normal, normal, or below-normal temperatures and chances leaning for above-normal precipitation.

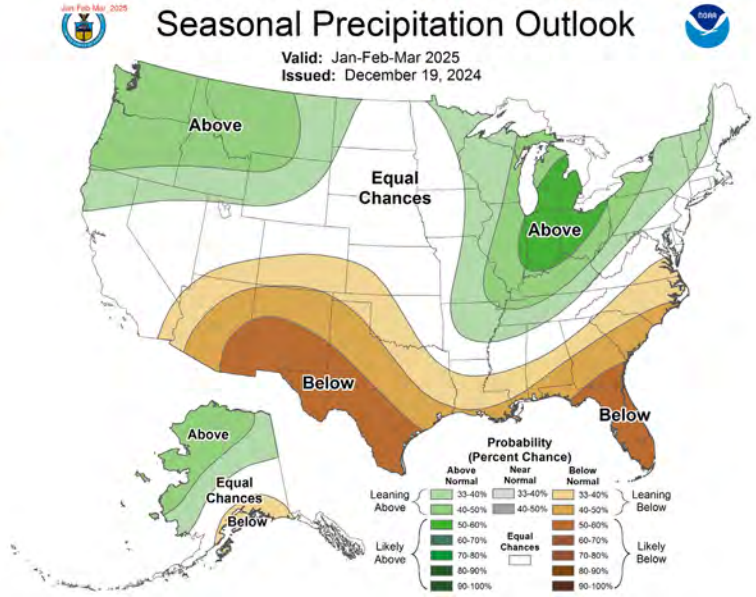
January through March: The seasonal outlook issued 12/19 shows chances leaning for above-normal temperatures and equal chances for above-normal, normal, or below-normal precipitation.

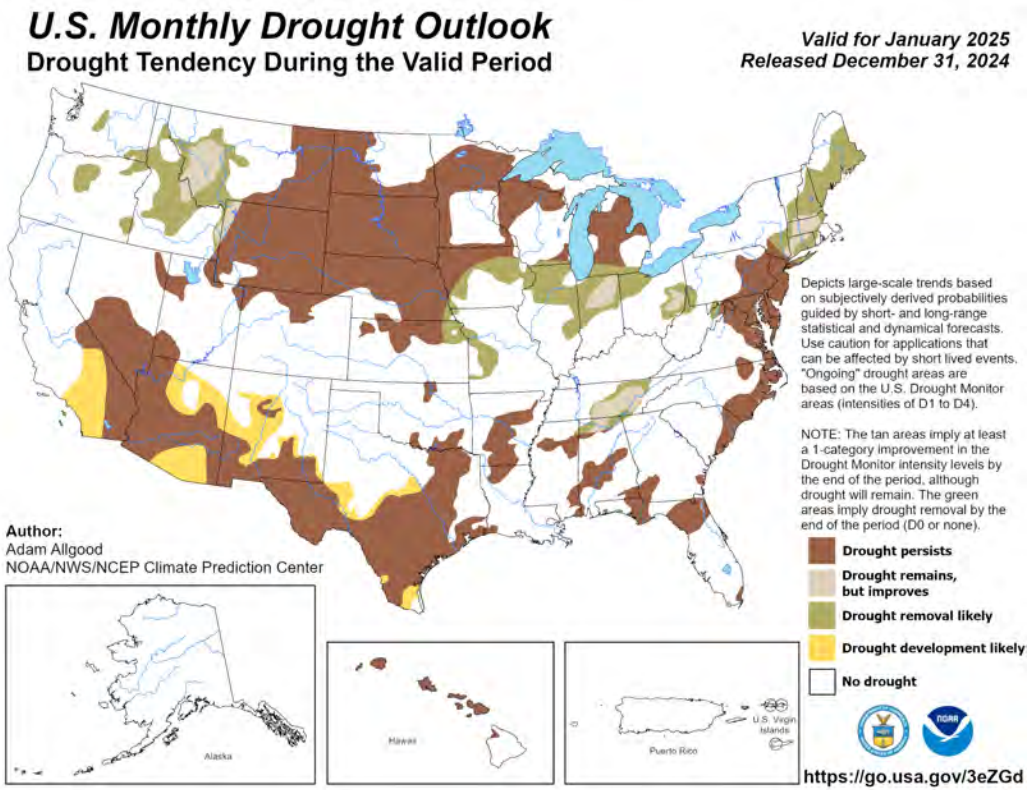
https://www.cpc.ncep.noaa.gov/

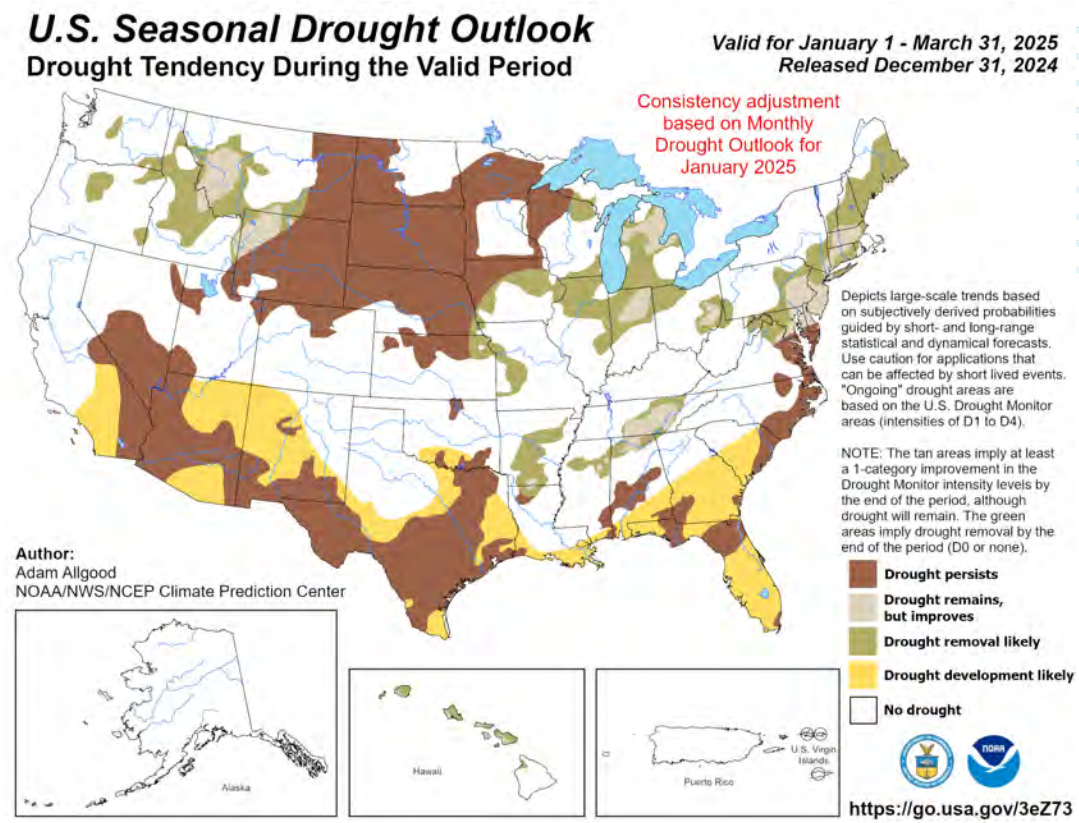












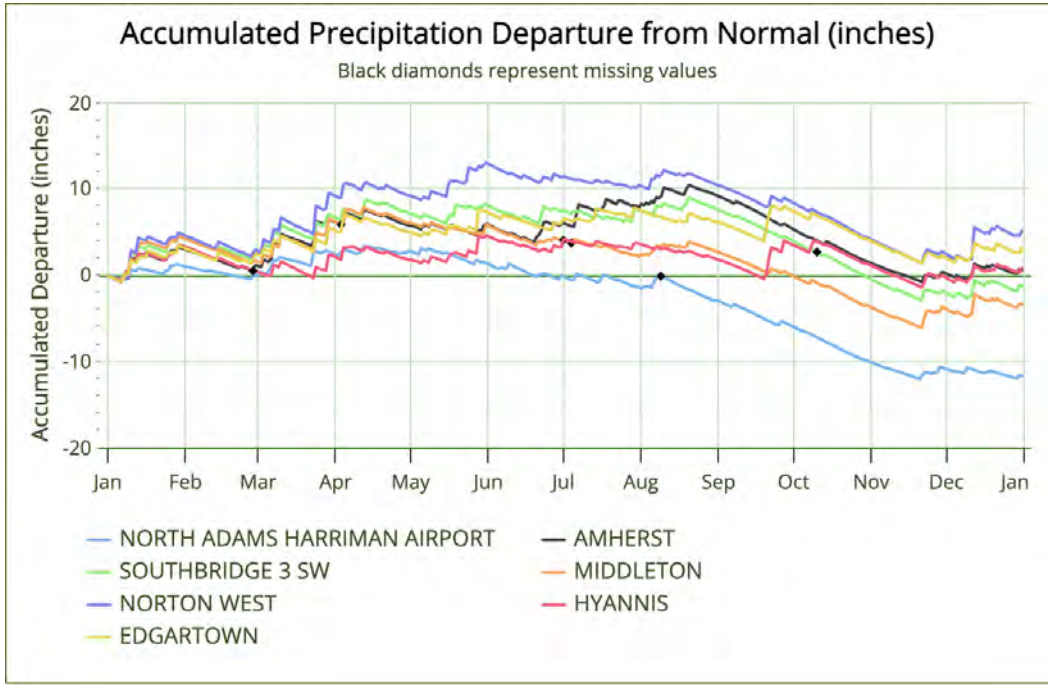
MONTHLY AND SEASONAL DROUGHT OUTLOOK

Both the monthly and seasonal outlooks released 12/31 shows drought remaining but improving in the central parts of the state with some areas of likely removal. http://www.cpc.ncep.noaa.gov/products/Drought

ADDITIONAL PRECIPITATION DATA

Standardized Precipitation Index—December 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	77	61	33	30	36	62	84	76
CTRV	10	63	41	11	18	22	58	87	76
CENTRAL	14	70	48	10	10	19	57	90	85
NORTHEAST	17	70	58	21	13	15	40	85	65
SOUTHEAST	23	81	66	26	16	33	74	84	75
CAPE COD	6	74	46	24	30	25	51	67	80
ISLANDS	3	78	46	16	34	26	52	41	47



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—December 2024

REGION	NUMBER OF SITES REPORTING	HISTORICAL AVERAGE	DECEMBER AVERAGE (IN)	DEPARTURE FROM HISTORICAL AVERAGE (IN)	PERCENT OF NORMAL
WESTERN	4	3.52	4.83	1.31	137%
CTRV	10	3.78	4.08	0.30	108%
CENTRAL	14	4.17	4.82	0.65	116%
NORTHEAST	17	3.95	4.84	0.89	123%
SOUTHEAST	23	4.47	6.46	1.99	145%
CAPE COD	6	4.39	5.28	0.89	120%
ISLANDS	3	4.24	5.38	1.14	127%

APPENDIX II

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	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

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

www.mass.gov/drought-management