

MASSACHUSETTS WATER RESOURCES COMMISSION

HYDROLOGIC CONDITIONS IN MASSACHUSETTS

AUGUST
2024

The Commonwealth of Massachusetts

Maura T. Healey, Governor

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



AUGUST 2024 HYDROLOGIC CONDITIONS

SUMMARY OF CONDITIONS



- Monthly average temperatures were normal.



- Precipitation was below normal in the Cape Cod Region and was normal to above normal in all other Regions.
- The 2-mos Evaporative Demand Drought Index at the end of August was normal in all Regions.



- The Keetch-Byram Drought Index was elevated at the end of August in all Regions except the Western Region.



- Streamflow regional medians were normal to above normal. Two gages were below normal including the Parker River gage, whose monthly median was at the 16th percentile. A few flash flood warnings and events occurred in the Southeast, Cape Cod, and Islands Regions.



- Groundwater regional medians were in the normal to above-normal range.



- Lake and impoundment regional medians were in the normal range except for the Northeast Region, which is at Index Severity Level (ISL) 1.



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



- NOAA's 3-month outlook shows chances likely for above-normal temperatures and chances leaning for above-normal precipitation.

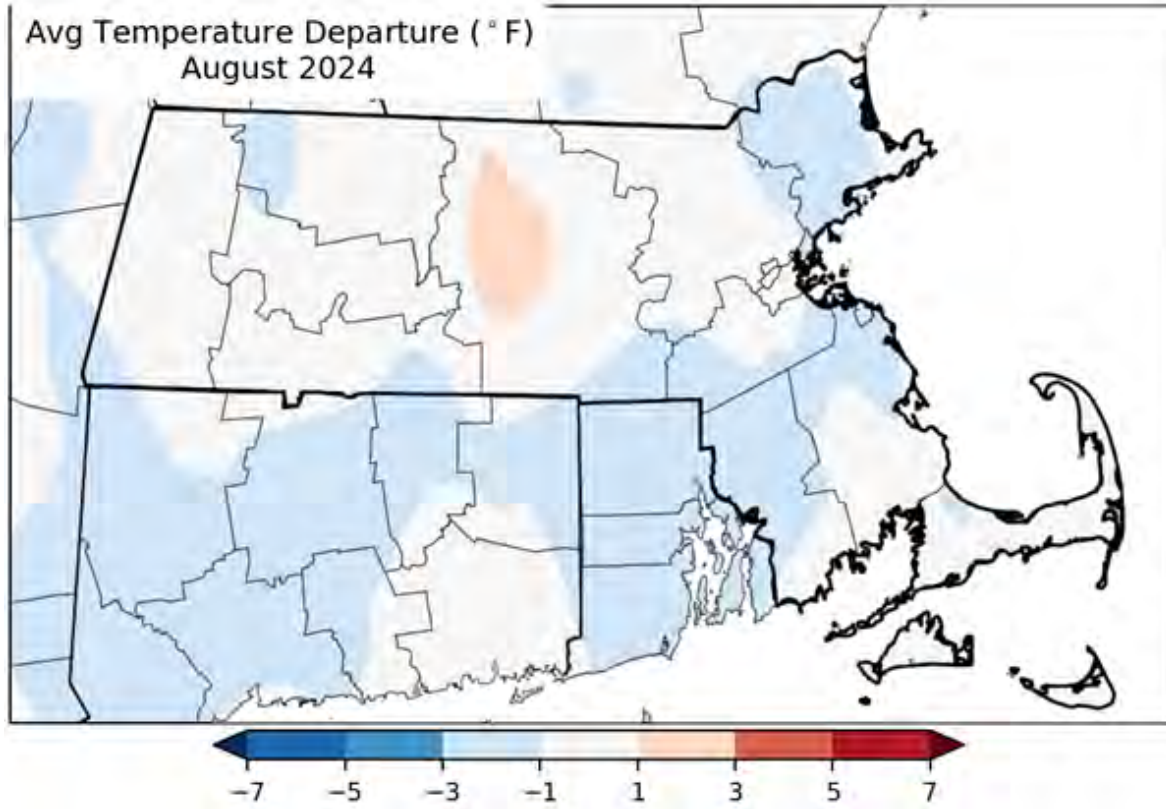


- Appendix II provides information on the Massachusetts Drought Management Plan (DMP) including ISL thresholds used in this report.

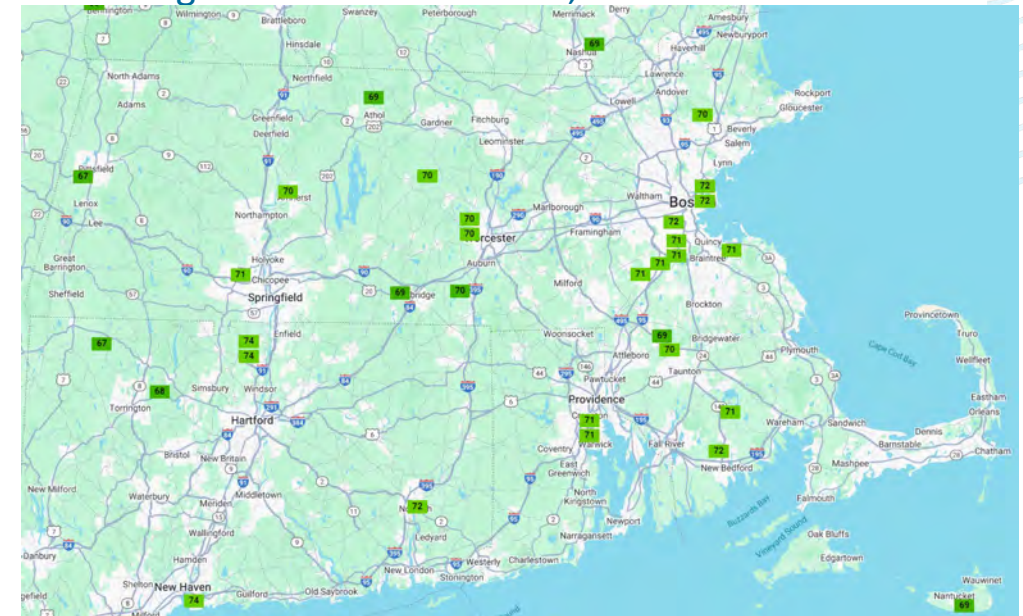
This report was prepared by the Massachusetts Department of Conservation and Recreation. Data may be preliminary. Analysis reflects automated calculations done 09/09/2024. Additional information, previous reports, and the Massachusetts Drought Dashboard with weekly updates to the drought indices can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

Monthly average temperatures were mostly normal. According to the Northeast Regional Climate Center (NRCC), the Worcester climate site had its 4th warmest summer (June 1st to Aug. 31st) on record, and the Boston climate site its 12th warmest. This was driven by high temperatures in June and July.

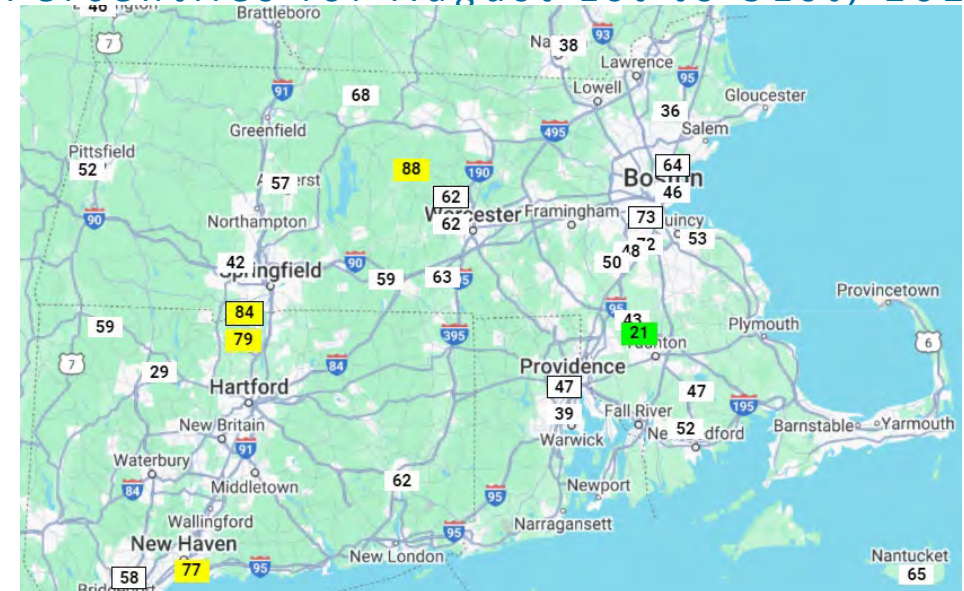
<http://www.nrcc.cornell.edu/regional/monthly/monthly.html>

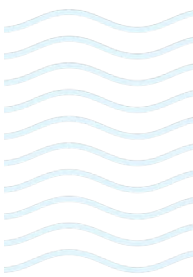


Observed Average Mean Temperature, °F for August 1st to 31st, 2024



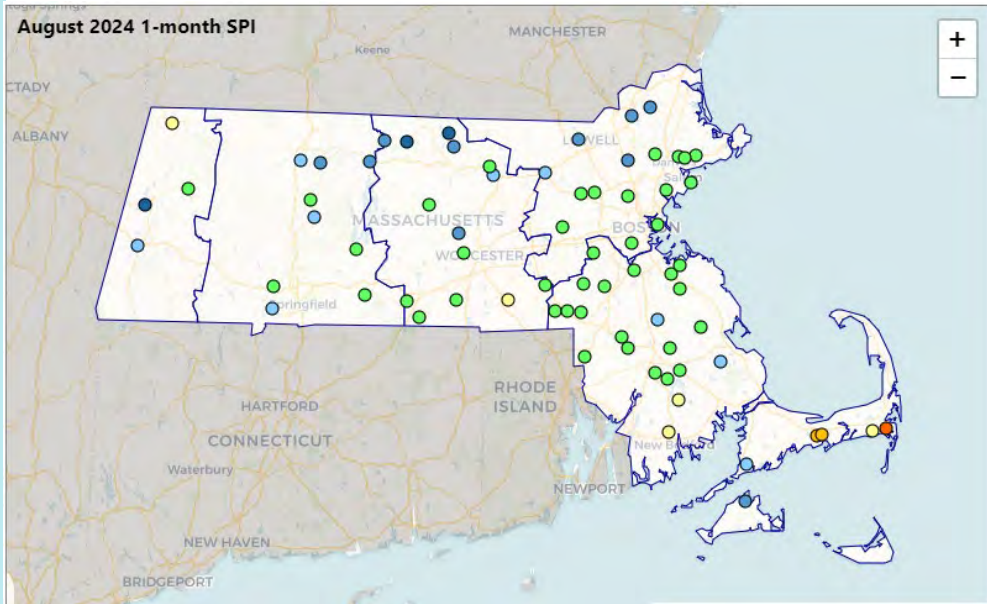
Observed Average Mean Temperature as Percentiles for August 1st to 31st, 2024





STANDARDIZED PRECIPITATION INDEX (SPI) AS A PERCENTILE

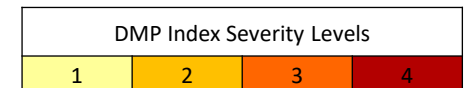
August regional precipitation was below normal in the Cape Cod Region and was normal to above normal in all other Regions. The Cape Cod Region is at ISL 1 for the 2-mos and 3-mos lookback periods and ISL 2 for the 1-mos lookback period. The Southeast Region is at ISL 1 for only the 2-mos lookback period.



| | | | | |
|------------------------|-----------------------|-----------------------|------------------------|-----------------------|
| ● ≥ 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 | AUGUST MONTHLY AVERAGE (IN) | DEPARTURE FROM HISTORICAL (IN) | SPI PERCENTILE 1-MONTH | SPI PERCENTILE 3-MONTH | SPI PERCENTILE 6-MONTH |
|-----------|---------------------------|-----------------------------|--------------------------------|------------------------|------------------------|------------------------|
| WESTERN | 4 | 5.02 | 0.88 | 69 | 61 | 70 |
| CTRV | 9 | 5.02 | 0.98 | 71 | 65 | 89 |
| CENTRAL | 14 | 4.95 | 0.94 | 67 | 50 | 85 |
| NORTHEAST | 17 | 3.83 | 0.24 | 58 | 33 | 70 |
| SOUTHEAST | 22 | 3.46 | -0.48 | 45 | 34 | 86 |
| CAPE COD | 5 | 2.03 | -1.46 | 19 | 25 | 52 |
| ISLANDS | 1 | 6.08 | 2.32 | 84 | 75 | -999 |

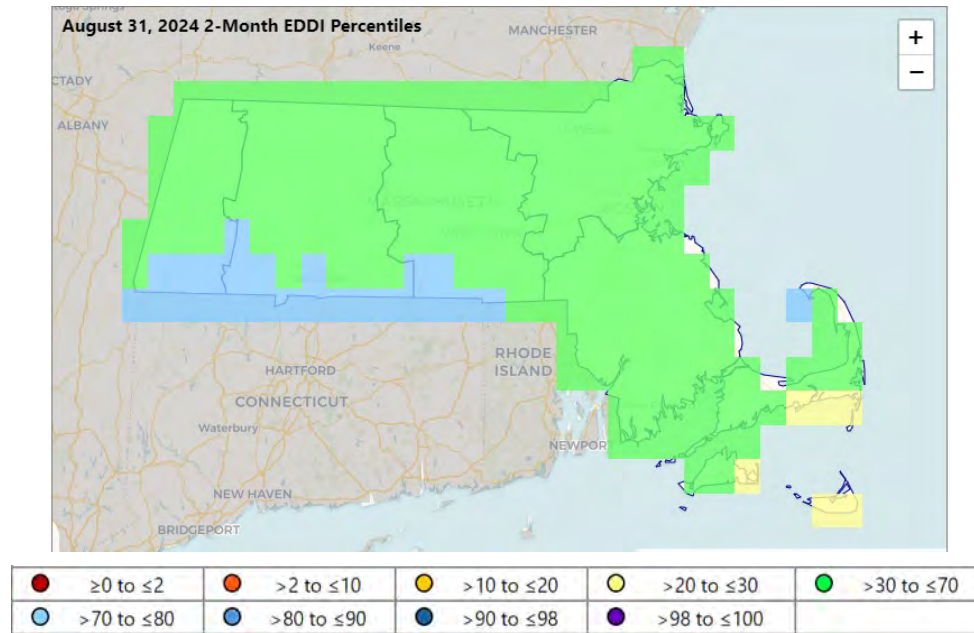
SPI is the Standardized Precipitation Index used in the Drought Management Plan (DMP) expressed here as a percentile and represents the variation from long-term precipitation.



EVAPORATIVE DEMAND DROUGHT INDEX (EDDI)

As of August 31, 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.

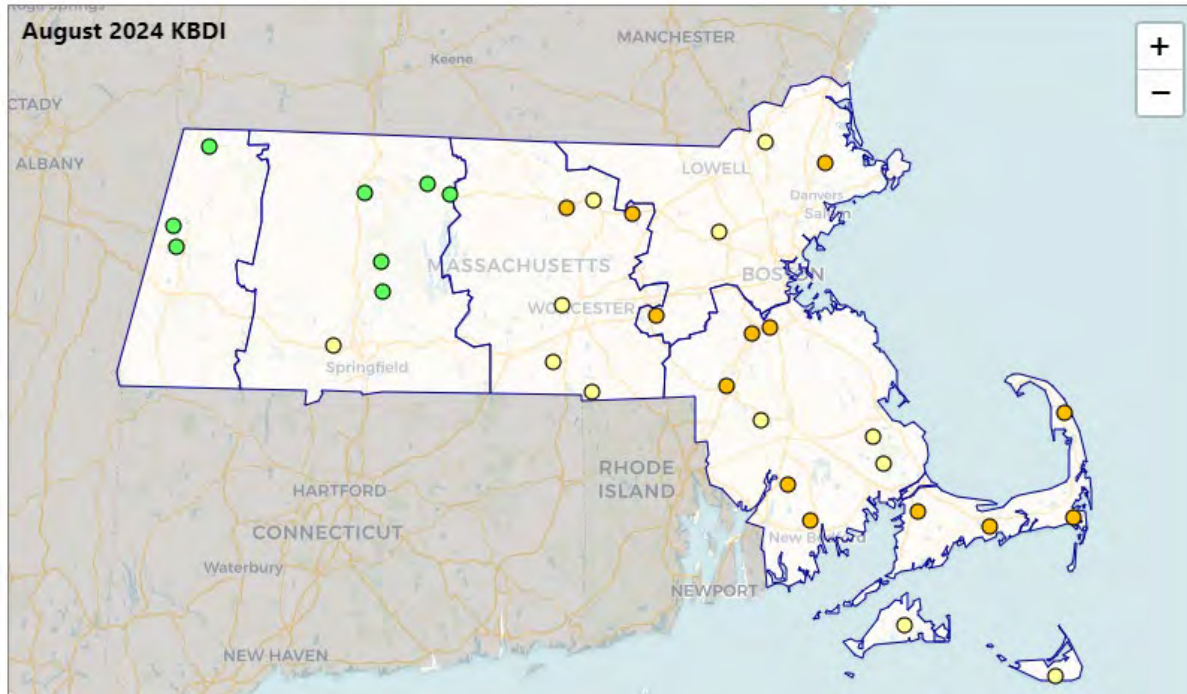
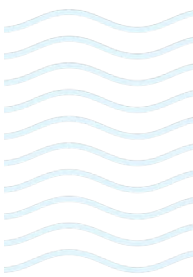
2-month EDDI



| REGION | MEDIAN 2-MONTH EDDI (2024-08-31) |
|-----------|----------------------------------|
| WESTERN | 67 |
| CTRV | 65 |
| CENTRAL | 63 |
| NORTHEAST | 60 |
| SOUTHEAST | 63 |
| CAPE COD | 53 |
| ISLANDS | 47 |

| DMP Index Severity Levels | | | |
|---------------------------|---|---|---|
| 1 | 2 | 3 | 4 |

At the end of August, the Keetch Byram Drought Index (KBDI) was at ISL 1 in the CTRV and Islands Regions and was at ISL 2 in the Central, Northeast, Southeast, and Cape Cod Regions.



| REGION | NUMBER OF SITES REPORTING | HIGHEST OF SITE VALUES |
|-----------|---------------------------|------------------------|
| WESTERN | 3 | 185 |
| CTRV | 6 | 266 |
| CENTRAL | 6 | 455 |
| NORTHEAST | 4 | 504 |
| SOUTHEAST | 8 | 547 |
| CAPE COD | 4 | 495 |
| ISLANDS | 2 | 378 |

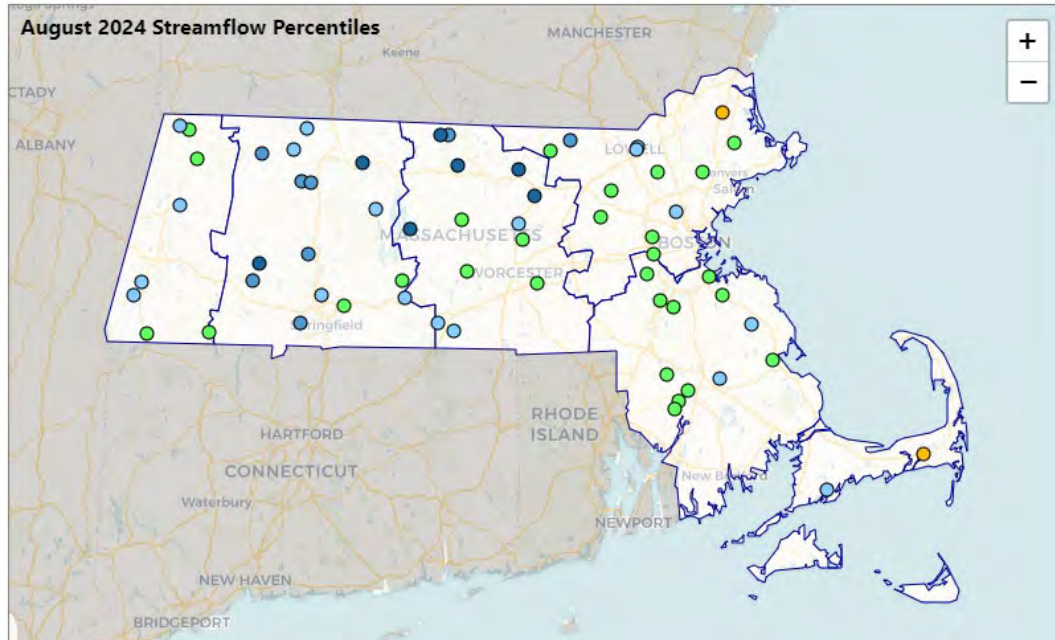
| DMP Index Severity Levels | | | |
|---------------------------|---|---|---|
| 1 | 2 | 3 | 4 |

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



August streamflow ranged from much below normal to much above normal. Regional medians were normal to above normal. The monthly median of the Parker River gage in the Northeast Region was at the 16th percentile.

MEDIAN MONTHLY STREAMFLOW PERCENTILES COMPARED TO HISTORICAL VALUES

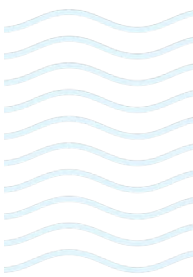


| | | | | |
|------------------------|-----------------------|-----------------------|------------------------|-----------------------|
| ● ≥ 0 to ≤ 2 | ● > 2 to ≤ 10 | ● > 10 to ≤ 20 | ● > 20 to ≤ 30 | ● > 30 to ≤ 70 |
| ● > 70 to ≤ 80 | ● > 80 to ≤ 90 | ● > 90 to ≤ 98 | ● > 98 to ≤ 100 | |

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 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 GAGE PERCENTILES |
|-----------|---------------------------|---|---|--|---------------------------------------|
| WESTERN | 8 | 0 | 4 | 4 | 70 |
| CTRV | 15 | 0 | 2 | 13 | 79 |
| CENTRAL | 13 | 0 | 4 | 9 | 78 |
| NORTHEAST | 13 | 1 | 8 | 4 | 60 |
| SOUTHEAST | 12 | 0 | 10 | 2 | 63 |
| CAPE COD | 2 | 1 | 0 | 1 | 45 |

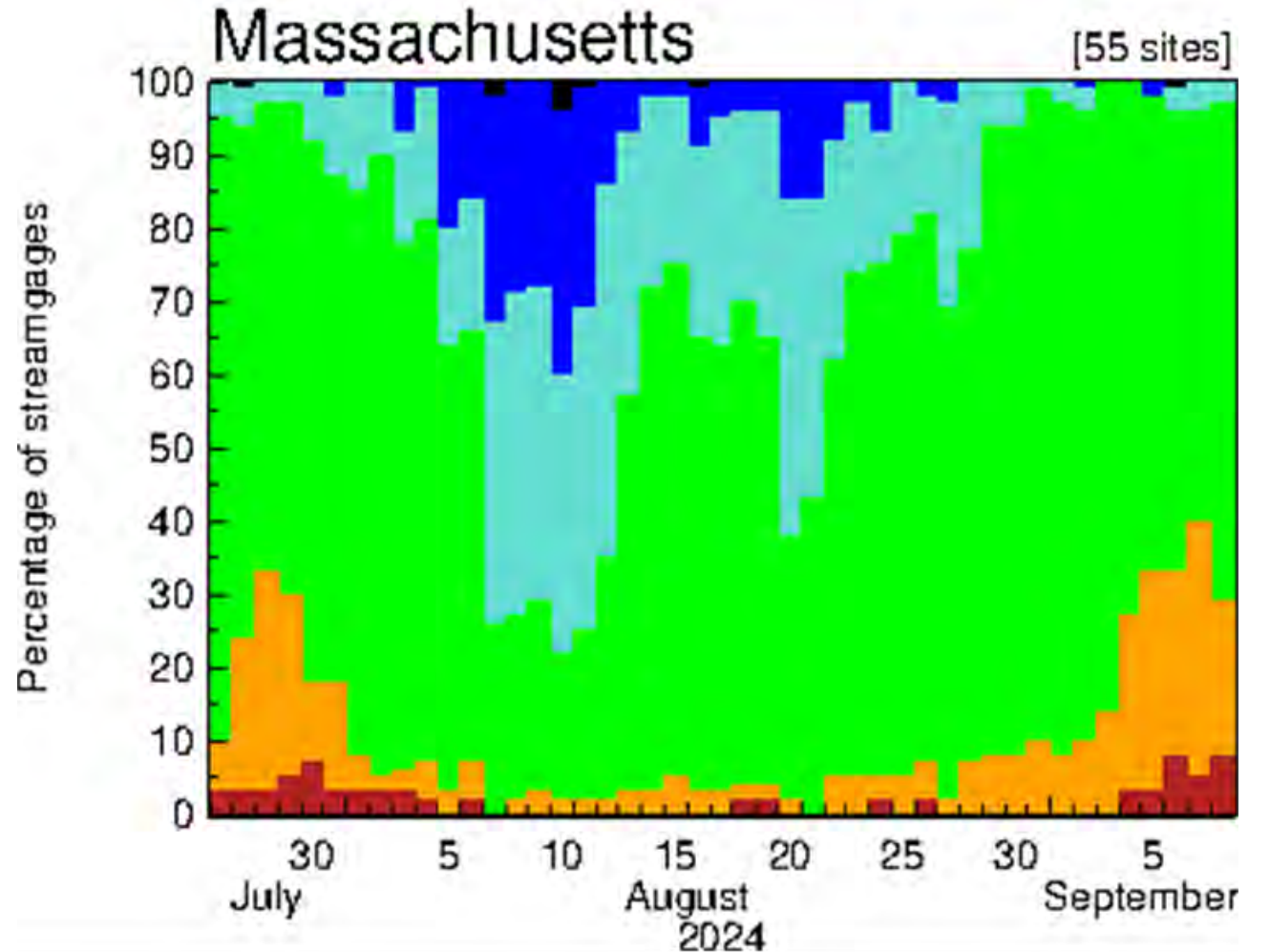
| DMP Index Severity Levels | | | |
|---------------------------|---|---|---|
| 1 | 2 | 3 | 4 |



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 Boston/Norton NWS E-5 Monthly Report of Hydrologic Conditions did not indicate river flooding at forecast points in Massachusetts during August nor were there any warnings issued for forecast points. The Albany NWS E-5 Monthly Reports of Hydrologic Conditions for August has not been received as of the writing of this report.

A search of the Iowa Mesonet database for NWS flood warnings and local storm reports did not yield any areal flood warnings. Flash flood warnings and flooding storm reports in Massachusetts are listed below.

August 15-16: Flash Flood Warnings were issued in Barnstable, Norfolk, and Bristol counties. There were flash flood storm reports of urban flooding in Westport and Fall River.

August 19: Flash flood storm report of urban flooding in Vineyard Haven.

August 26: Flash Flood Warnings were issued in Bristol and Barnstable Counties. There were flash flood storm reports of urban flooding in Fall River, New Bedford, and Falmouth.

<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/>

August 18th precipitation and flooding event in Connecticut:

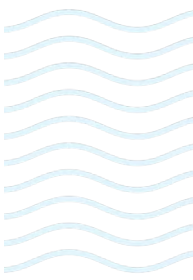
<https://www.climate.gov/news-features/event-tracker/extreme-rainfall-brings-catastrophic-flooding-northeast-august-2024>

<https://portal.ct.gov/demhs/emergency-management/resources-for-officials/disaster-recovery/august-18-2024-severe-flooding-disaster#:~:text=Up%20to%20almost%2016%20inches,year%20flood%20in%20other%20areas.>

<https://www.nytimes.com/2024/08/18/nyregion/connecticut-flooding-southbury.html>

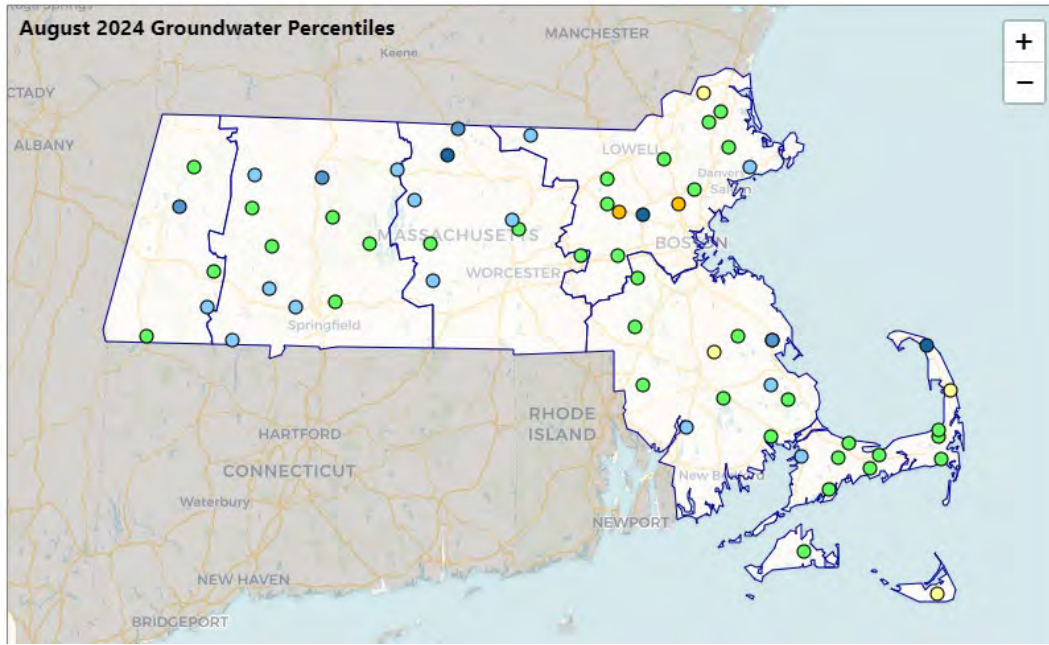


Image: Courtesy of NASA/JPL-Caltech



August groundwater levels ranged from below normal to much above normal. Regional medians were in the normal to above-normal range.

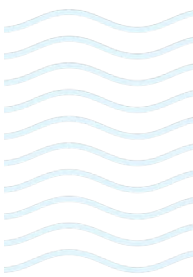
END OF MONTH GROUNDWATER COMPARED TO HISTORICAL IN THE CLIMATE RESPONSE NETWORK WELLS



| | | | | |
|------------------------|-----------------------|-----------------------|------------------------|-----------------------|
| ● ≥ 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 | 3 | 2 | 69 |
| CTRV | 11 | 0 | 5 | 6 | 72 |
| CENTRAL | 8 | 0 | 3 | 5 | 78 |
| NORTHEAST | 14 | 3 | 8 | 3 | 53 |
| SOUTHEAST | 12 | 1 | 8 | 3 | 60 |
| CAPE COD | 11 | 1 | 8 | 2 | 59 |
| ISLANDS | 2 | 1 | 1 | 0 | 42 |

| DMP Index Severity Levels | | | |
|---------------------------|---|---|---|
| 1 | 2 | 3 | 4 |



At the end of August, reported lake and impoundment levels were above their 30th percentile and/or were at or near 100% full except for two systems in the Northeast Region.

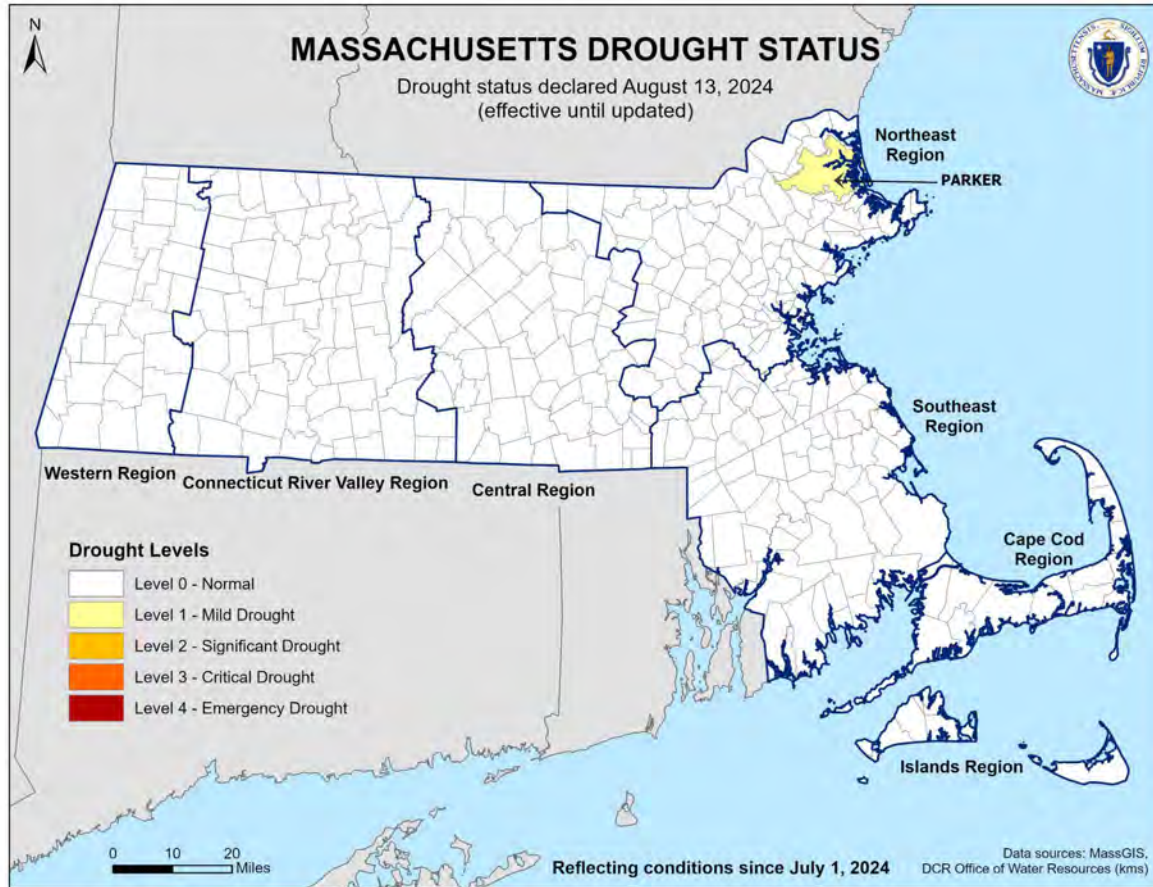
| REGION | NUMBER OF SITES REPORTING | MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT FULL |
|-----------|---------------------------|--|
| WESTERN | 1 | 85th |
| CTRV | 2 | 42nd |
| CENTRAL | 2 | 65th |
| NORTHEAST | 3 | 29th |
| SOUTHEAST | 2 | 56th |
| CAPE COD | 1 | 59th |

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

| DMP Index Severity Levels | | | |
|---------------------------|---|---|---|
| 1 | 2 | 3 | 4 |



MASSACHUSETTS DROUGHT STATUS



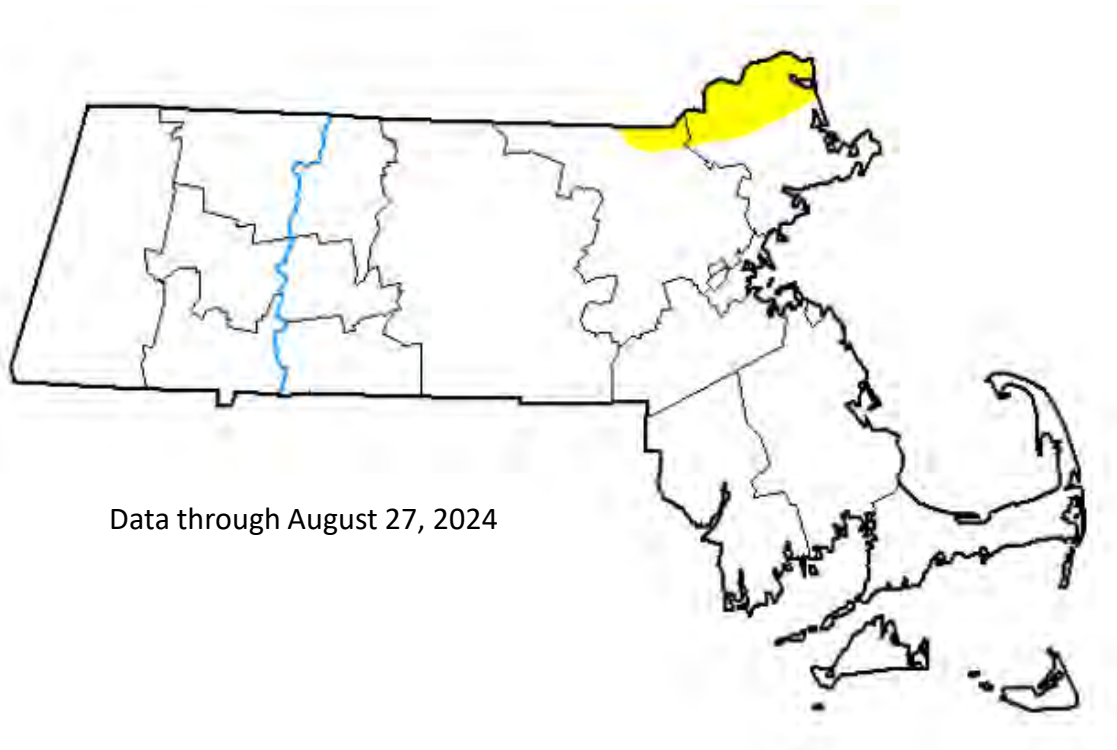
On August 13, 2024, Massachusetts Energy and Environmental Affairs (EEA) Secretary Rebecca L. Tepper declared that starting from July 1, 2024, the Parker River Basin is at Level 1 -Mild Drought. All other Regions including all other areas of the Northeast Region remain at Level 0. This status remains in effect until further updated.










U.S. DROUGHT MONITOR (USDM)

At the end of August, the USDM showed areas of abnormal dryness in northeastern part of the state.

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 August 27, 2024

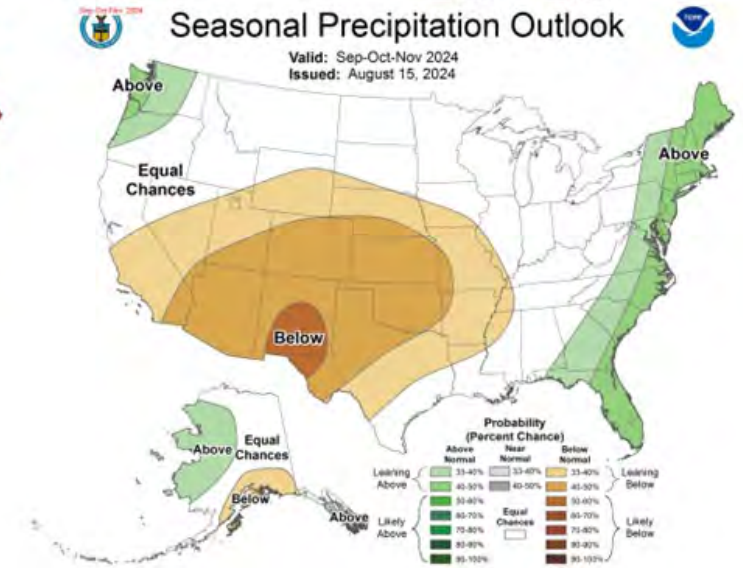
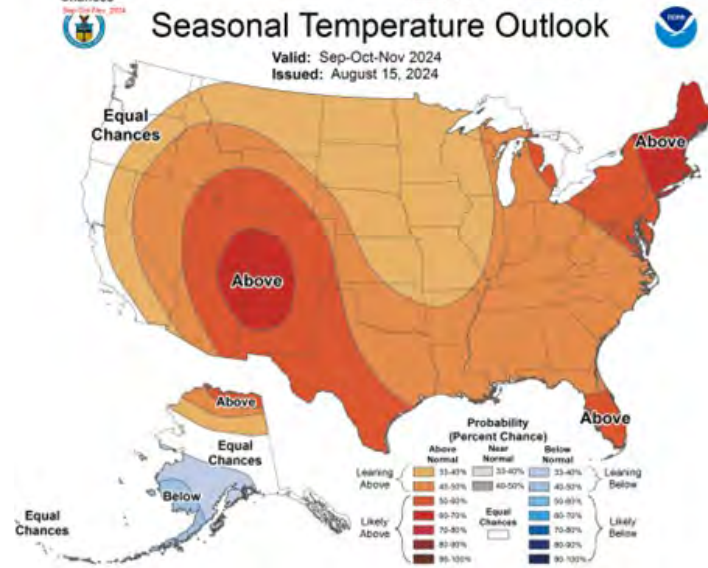
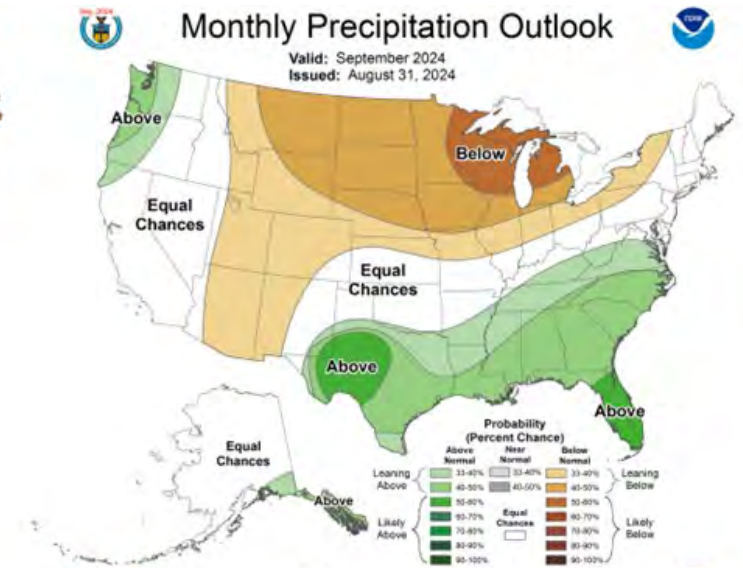
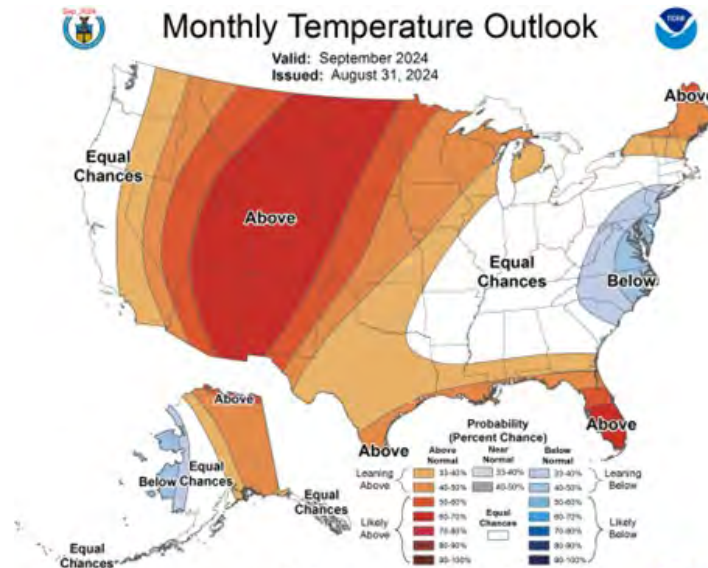
-  None
-  D0 (Abnormally Dry)
-  D1 (Moderate Drought)
-  D2 (Severe Drought)
-  D3 (Extreme Drought)
-  D4 (Exceptional Drought)
-  No Data

TEMPERATURE AND PRECIPITATION OUTLOOK

September: The outlook issued 8/31 shows equal chances for above-normal, normal, or below-normal temperatures and precipitation.

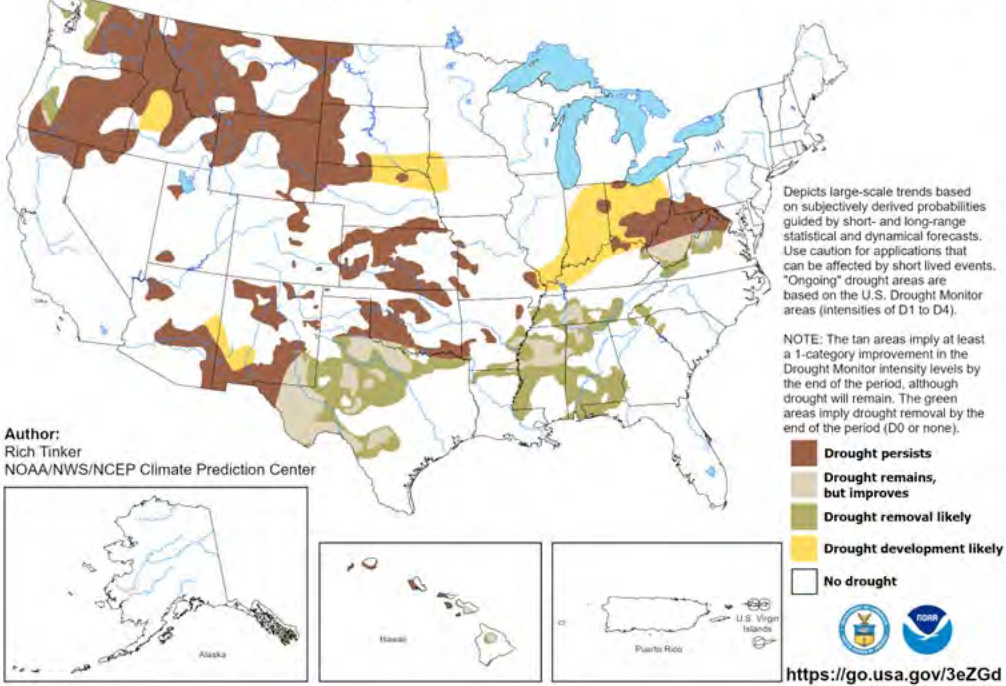
September through November: The seasonal outlook issued 8/15 shows a 60-70% chance of above-normal temperatures, and a 40-50% chance of above-normal precipitation.

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



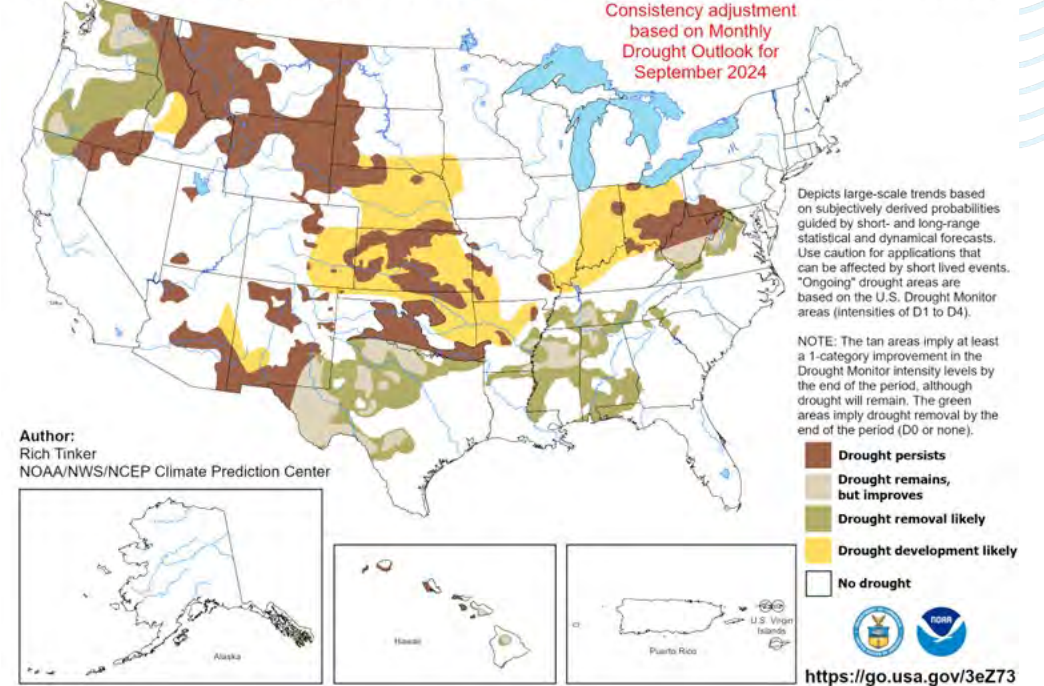
U.S. Monthly Drought Outlook Drought Tendency During the Valid Period

Valid for September 2024
Released August 31, 2024



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

Valid for September 1 - November 30, 2024
Released August 31, 2024



Consistency adjustment based on Monthly Drought Outlook for September 2024

MONTHLY AND SEASONAL DROUGHT OUTLOOK

The monthly outlook for September released on 8/31 shows no drought development.

The seasonal outlook for September through November released on 8/31 shows no drought development.

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

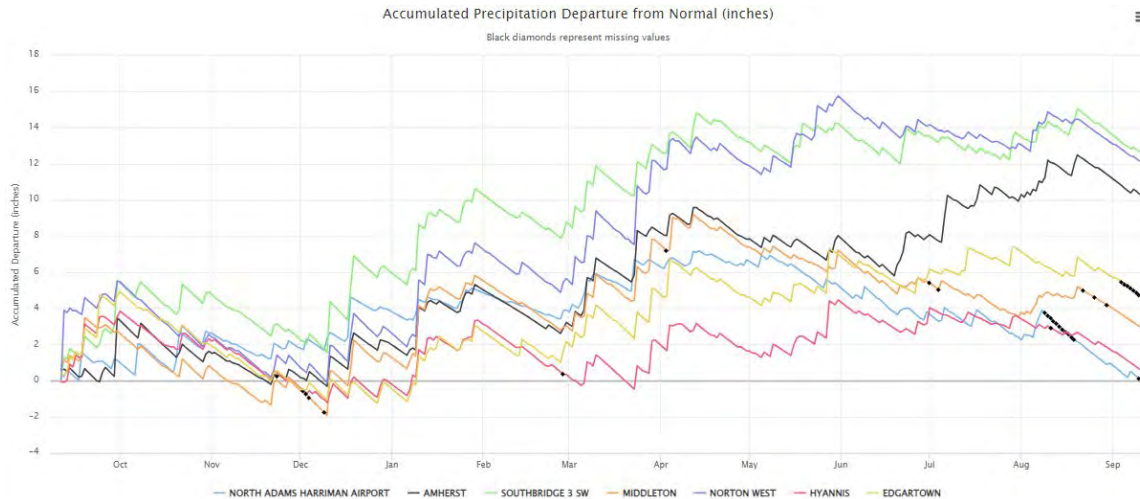
ADDITIONAL PRECIPITATION DATA

Standardized Precipitation Index— August 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 | 69 | 74 | 61 | 70 | 82 | 67 | 83 | 80 |
| CTRV | 9 | 71 | 75 | 65 | 89 | 95 | 93 | 95 | 83 |
| CENTRAL | 14 | 67 | 58 | 50 | 85 | 96 | 93 | 98 | 95 |
| NORTHEAST | 17 | 58 | 35 | 33 | 70 | 84 | 75 | 93 | 79 |
| SOUTHEAST | 22 | 45 | 29 | 34 | 86 | 94 | 90 | 92 | 85 |
| CAPE COD | 5 | 19 | 28 | 25 | 52 | 61 | 32 | 75 | 90 |
| ISLANDS | 1 | 84 | 85 | 75 | | | | | |

The precipitation station reporting on the Islands had faulty data 6-months ago and longer; therefore, no data is available beyond the 3-month lookback.

| 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—August 2024

| REGION | NUMBER OF SITES REPORTING | HISTORICAL AVERAGE | AUGUST AVERAGE (IN) | DEPARTURE FROM HISTORICAL AVERAGE (IN) | PERCENT OF NORMAL |
|-----------|---------------------------|--------------------|---------------------|--|-------------------|
| WESTERN | 4 | 4.14 | 5.02 | 0.88 | 121% |
| CTRV | 9 | 4.04 | 5.02 | 0.98 | 124% |
| CENTRAL | 14 | 4.01 | 4.95 | 0.94 | 123% |
| NORTHEAST | 17 | 3.59 | 3.83 | 0.24 | 107% |
| SOUTHEAST | 22 | 3.94 | 3.46 | -0.48 | 88% |
| CAPE COD | 5 | 3.49 | 2.03 | -1.46 | 58% |
| ISLANDS | 1 | 3.76 | 6.08 | 2.32 | 162% |



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