

MASSACHUSETTS WATER RESOURCES COMMISSION

MAY 2022 HYDROLOGIC CONDITIONS IN MASSACHUSETTS



The Commonwealth of Massachusetts
Charles D. Baker, Governor
Bethany A. Card, Secretary, Executive Office of Energy and Environmental Affairs

MAY 2022 HYDROLOGIC CONDITIONS

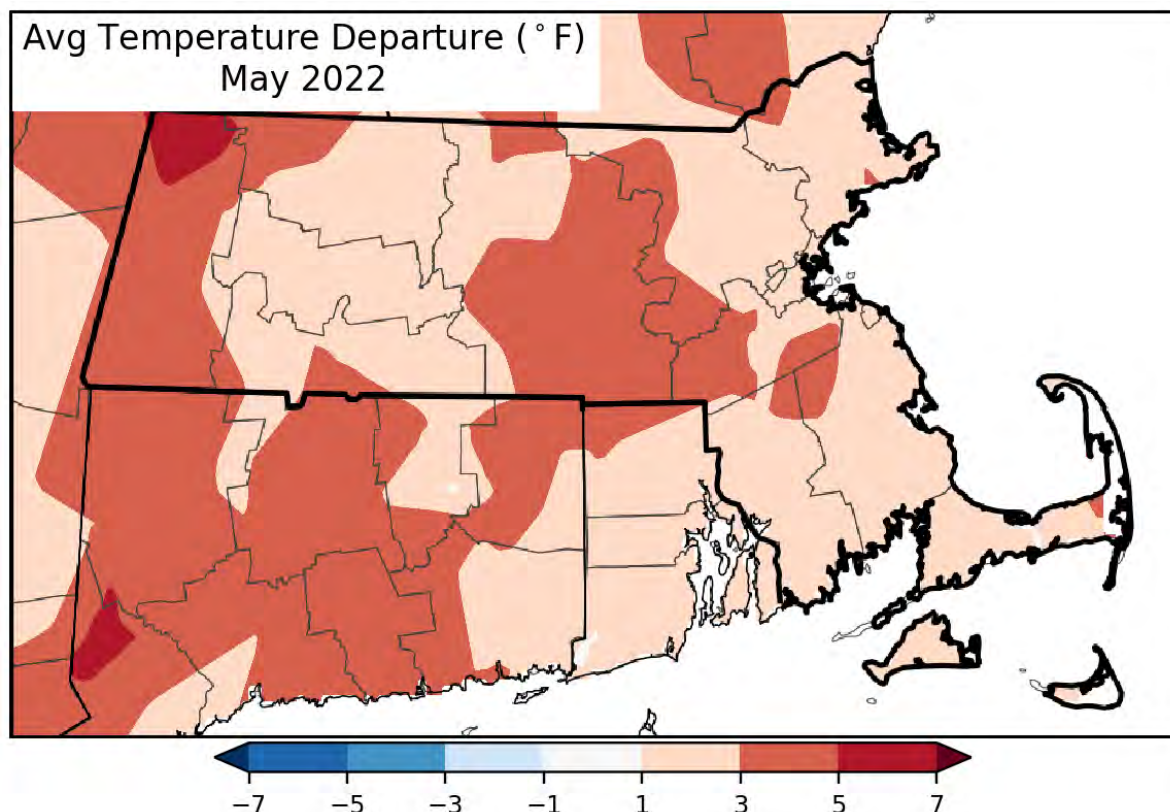
SUMMARY OF CONDITIONS

- Monthly average temperatures were mostly above normal.
- May precipitation was overall below normal for the Central, Northeast, and Southeast Regions. Other Regions also had areas of below-normal precipitation. The Central, Northeast, Southeast, Cape Cod, and Islands Regions are at elevated Index Severity Levels for look-back periods 2-months and greater.
- Streamflow was mostly in the below-normal range. All regions except the Cape are at elevated Index Severity Levels.
- Groundwater levels were mostly in the normal to below-normal range across the state. All regions except the Western and Cape Cod are at Index Severity Level 1.
- Lakes & Impoundments levels varied with some below normal but only the Northeast Region is at Index Severity Level 1.
- Keetch Byram Drought Index is at Level 1 for the Central, Northeast, and Southeast Regions.
- Evaporative Demand Drought Index was elevated for most of the state.
- NOAA's June outlook shows chances leaning for above-normal temperatures and equal chances of below-normal, normal, or above-normal precipitation.
- NOAA's 3-month outlook shows likely chances for above-normal temperatures. For precipitation, the outlook shows equal chances of below-normal, normal, or above-normal precipitation for the northern quarter of the state, and chances leaning for above-normal precipitation for the rest of the state.
- Appendices II provides information on the Massachusetts Drought Management Plan (DMP).

TEMPERATURE

Monthly average temperatures were mostly above normal across the state. According to the Northeast Regional Climate Center (NRCC), it was the 13th warmest May on record overall for Massachusetts.

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

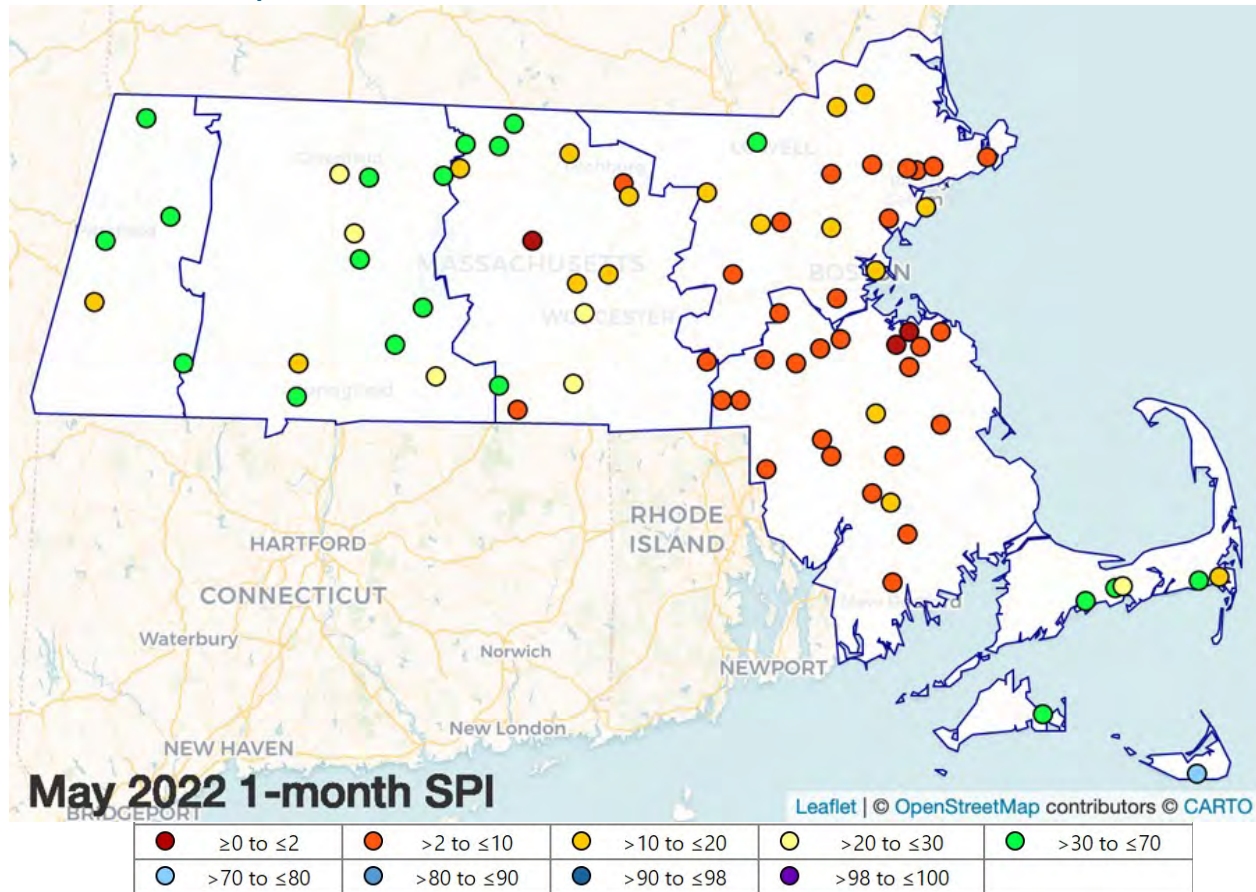


PRECIPITATION

May precipitation varied across the state. The Central, Northeast, and Southeast Regions were overall below normal for the month. The Islands Region was normal, and the Western, CT River Valley, Central, and Cape Regions overall were normal, but with areas of below-normal precipitation.

Combined with previous months deficits, the Central, Northeast, Southeast, Cape Cod, and Islands Regions are showing elevated Index Severity Levels. Appendix I provides additional details for precipitation data, including all look-back periods.

Standardized Precipitation Index as a Percentile



| REGION | NUMBER OF SITES REPORTING | MAY MONTHLY AVERAGE (IN) | DEPARTURE FROM HISTORICAL (IN) | SPI PERCENTILE 1-MONTH | SPI PERCENTILE 3-MONTH | SPI PERCENTILE 6-MONTH |
|-----------|---------------------------|--------------------------|--------------------------------|------------------------|------------------------|------------------------|
| WESTERN | 5 | 2.89 | -1.05 | 35 | 61 | 60 |
| CTRV | 10 | 2.78 | -1.01 | 33 | 38 | 34 |
| CENTRAL | 15 | 2.25 | -1.51 | 18 | 24 | 41 |
| NORTHEAST | 18 | 1.38 | -2.09 | 9 | 9 | 18 |
| SOUTHEAST | 22 | 1.24 | -2.34 | 6 | 7 | 14 |
| CAPE COD | 5 | 2.64 | -0.95 | 40 | 15 | 16 |
| ISLANDS | 2 | 3.90 | 0.28 | 63 | 30 | 21 |

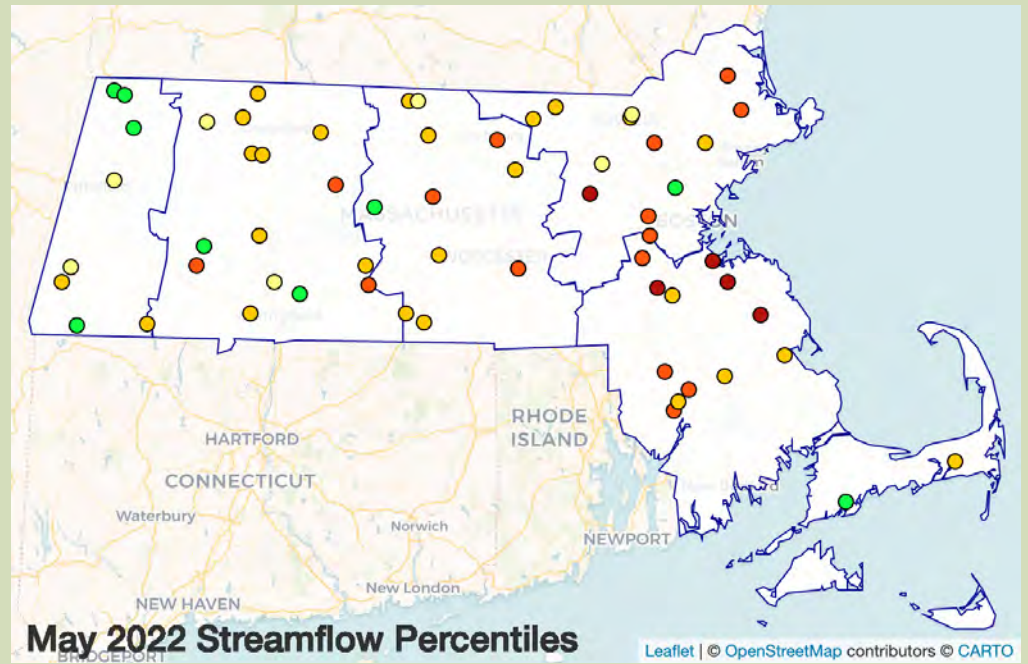
SPI is the Standardized Precipitation Index used in the Drought Management Plan (DMP) expressed here as a percentile and represents the variation, in standard deviations, from long-term precipitation averages.

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

STREAMFLOW

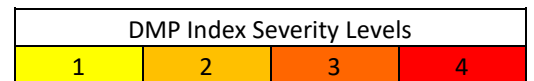
Median Monthly Streamflow Percentiles Compared to Historical Values

During May, most percentiles of individual streamflow gages were in the below-normal range across the state with relatively few gages in the normal range. Regional monthly streamflow medians were below normal for all regions except the Cape, which was at the low end of normal.



| REGION | TOTAL GAGES REPORTING FOR MAY | ≥0 TO ≤2 PERCENTILE | >2 TO ≤10 PERCENTILE | >10 TO ≤20 PERCENTILE | >20 TO ≤30 PERCENTILE | >90 PERCENTILE | MEDIAN OF INDIVIDUAL GAGE PERCENTILES |
|-----------|-------------------------------|---------------------|----------------------|-----------------------|-----------------------|----------------|---------------------------------------|
| WESTERN | 8 | 0 | 0 | 2 | 2 | 0 | 29 |
| CTRV | 15 | 0 | 3 | 8 | 2 | 0 | 16 |
| CENTRAL | 11 | 0 | 3 | 6 | 1 | 0 | 13 |
| NORTHEAST | 13 | 1 | 5 | 4 | 2 | 0 | 11 |
| SOUTHEAST | 12 | 3 | 6 | 3 | 0 | 0 | 5 |
| CAPE COD | 2 | 0 | 0 | 1 | 0 | 0 | 33 |

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

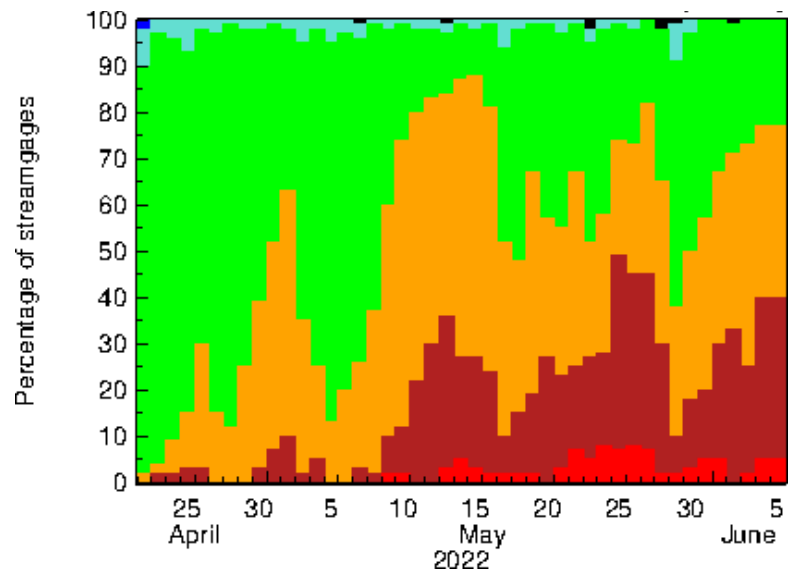


Time Series of the Percent of Gages at Their Respective Percentile Flows for Average Daily Streamflows Compared to Historical Values

Streamflow is monitored by the Commonwealth of Massachusetts and United States Geological Survey cooperative stream gaging program.

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

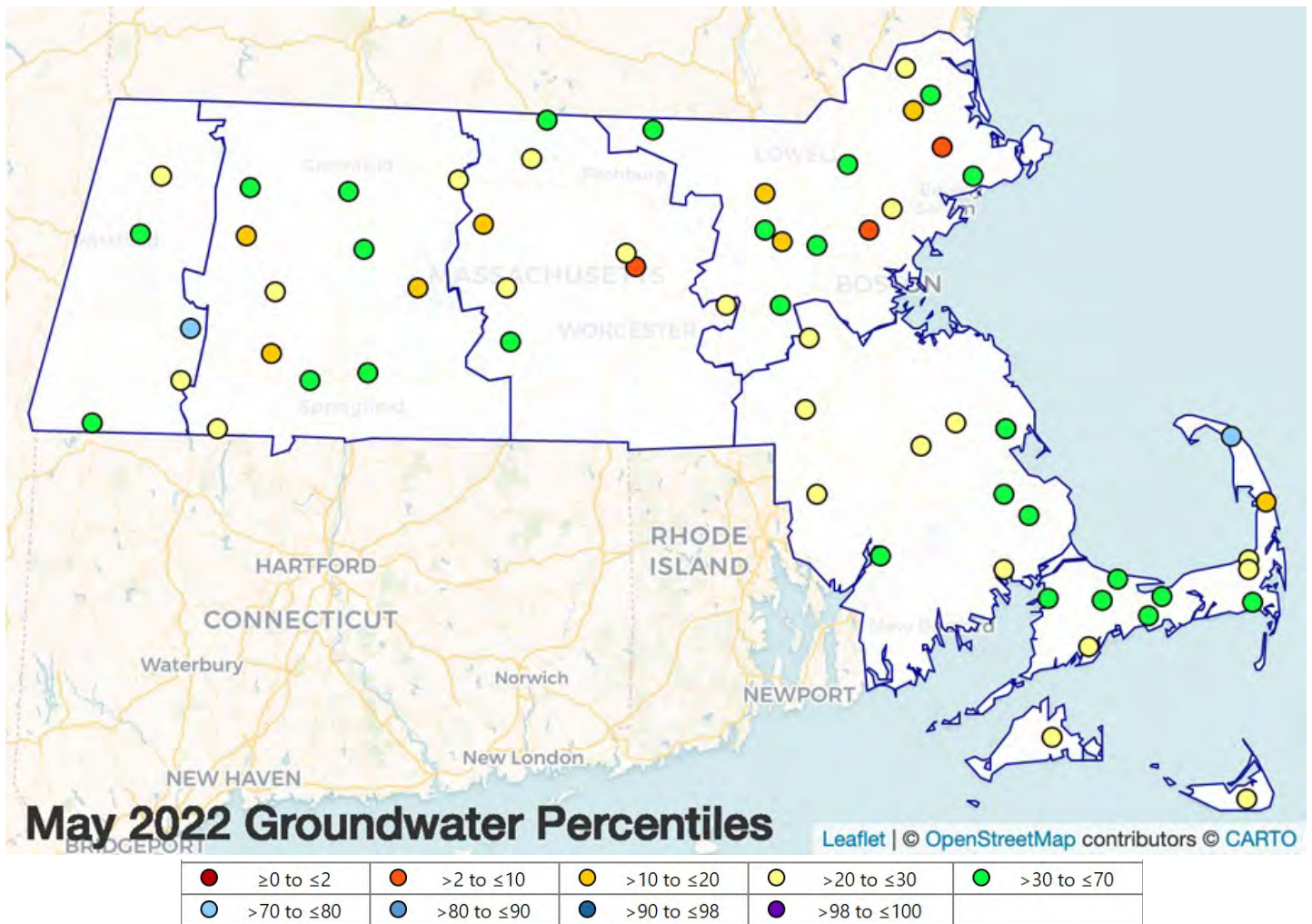
| Explanation - Percentile classes | | | | | | | |
|----------------------------------|-------------------|--------------|--------|--------------|-------------------|------|---------|
| Low | <10 | 10-24 | 25-75 | 76-90 | >90 | High | No Data |
| | Much below normal | Below normal | Normal | Above normal | Much above normal | | |



GROUNDWATER

Percentiles of individual groundwater wells varied across the state from below normal to a few that were above normal. The CTRV, Central, Northeast, Southeast, and Islands Regions are at Index Severity Level 1.

End of Month Groundwater Compared to Historical in the Climate Response Network



| REGION | TOTAL WELLS REPORTING FOR MAY | ≥ 0 TO ≤ 2 PERCENTILE | > 2 TO ≤ 10 PERCENTILE | > 10 TO ≤ 20 PERCENTILE | > 20 TO ≤ 30 PERCENTILE | > 90 PERCENTILE | MEDIAN OF INDIVIDUAL WELL PERCENTILES |
|-----------|-------------------------------|---------------------------------|-------------------------------|--------------------------------|--------------------------------|-------------------|---------------------------------------|
| WESTERN | 5 | 0 | 0 | 0 | 2 | 0 | 41 |
| CTRV | 11 | 0 | 0 | 3 | 3 | 0 | 28 |
| CENTRAL | 8 | 0 | 1 | 1 | 4 | 0 | 24 |
| NORTHEAST | 14 | 0 | 2 | 3 | 2 | 0 | 28 |
| SOUTHEAST | 11 | 0 | 0 | 0 | 6 | 0 | 29 |
| CAPE COD | 11 | 0 | 0 | 1 | 3 | 0 | 41 |
| ISLANDS | 2 | 0 | 0 | 0 | 2 | 0 | 29 |

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

LAKES AND IMPOUNDMENTS

| REGION | TOTAL REPORTING FOR MONTH | MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT FULL |
|-----------|---------------------------|--|
| WESTERN | 1 | 100% full |
| CTRV | 2 | 41st |
| CENTRAL | 3 | 25th; 100% full |
| NORTHEAST | 6 | 26th |
| SOUTHEAST | 2 | 91st |
| CAPE COD | 1 | 33rd |

At the end of May, lake and impoundment levels varied across the state with some levels below their 30th percentile. Regionally, only the Northeast Region is at Index Severity Level 1.

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

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

| REGION | NUMBER OF SITES REPORTING | HIGHEST OF SITE VALUES |
|-----------|---------------------------|------------------------|
| WESTERN | 3 | 130 |
| CTRV | 6 | 171 |
| CENTRAL | 6 | 284 |
| NORTHEAST | 4 | 238 |
| SOUTHEAST | 8 | 262 |
| CAPE COD | 5 | 116 |
| ISLANDS | 2 | 67 |

KEETCH BYRAM DROUGHT INDEX

At the end of May, some KBDI values were above 200. The Central, Northeast, and Southeast Regions are at Index Severity Level 1.

EVAPOTRANSPIRATION (ET) INDEX

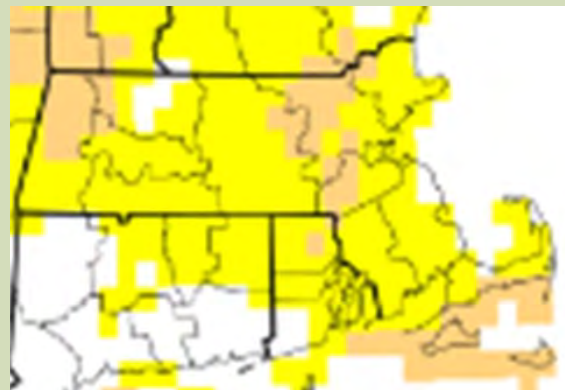
Crop Moisture Index (CMI) - 2019 Drought Management Plan

All CMI values were in the Slightly Dry/Favorably Moist range. All regions are at Index Severity Level 0.

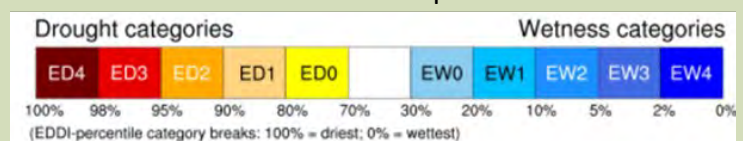
https://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

Evaporative Demand Drought Index (EDDI) - proposed 2022 Drought Management Plan

The 2-month EDDI shows elevated ET across most of the state.



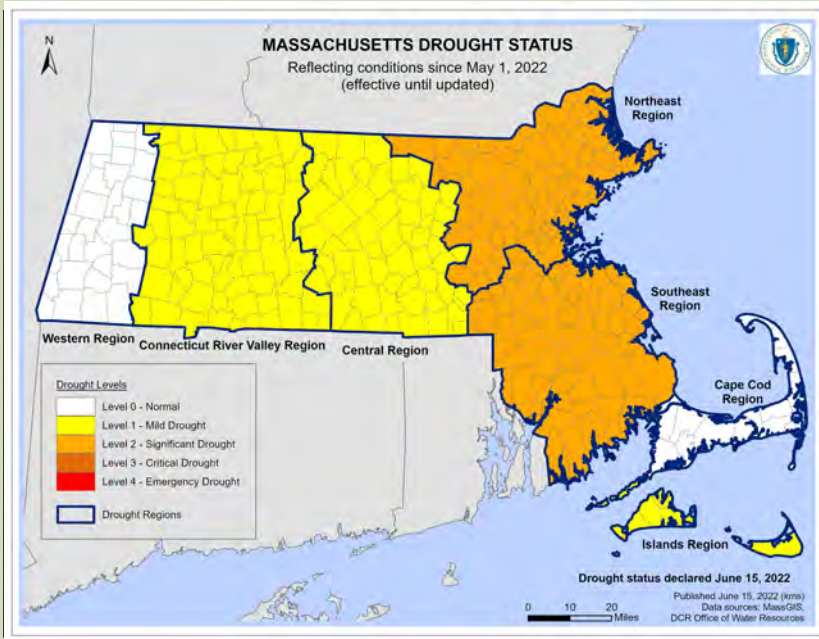
Map dated June 1st



SNOWFALL

Reported seasonally.

DROUGHT CONDITIONS AND FORECASTS



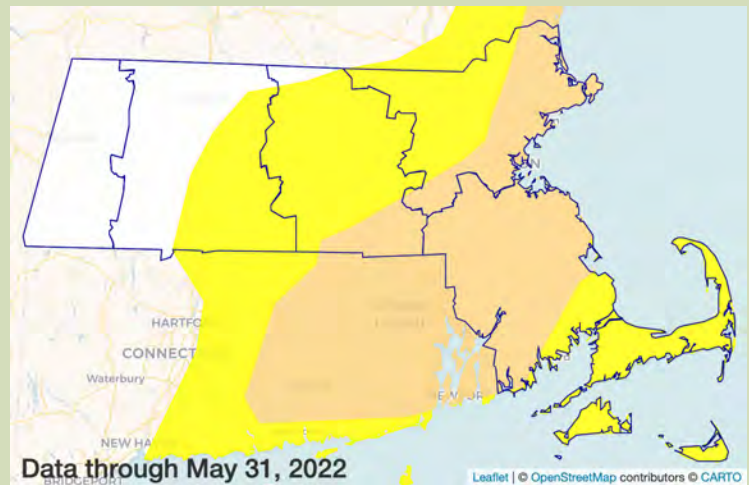
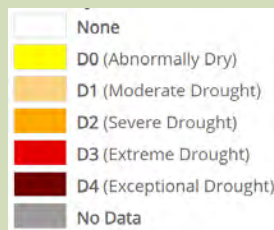
Massachusetts Drought Status

On June 15, 2022 Massachusetts Energy and Environmental Affairs (EEA) Secretary Bethany A. Card declared a Level 1-Mild Drought in the Connecticut River Valley, Central, and Islands Regions and a Level 2-Significant Drought in the Northeast and Southeast Regions. The Western and Cape Cod Regions are at Level 0-Normal Conditions. This status remains in effect until further updated.

U.S. Drought Monitor (USDM)

At the end of May, the USDM showed areas of D0 and D1 drought conditions in Massachusetts. These are equivalent to Massachusetts Drought Levels 1 and 2, respectively.

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



NOAA Climate Prediction Center

Temperature and Precipitation Outlook

June: The outlook issued 5/31 shows a 40-50% chance of above-normal temperatures. For precipitation, there are equal chances of below-normal, normal, or above-normal precipitation.

June through August: The outlook issued 5/19 shows a 50-60% chance of above-normal temperatures. For precipitation, there are equal chances of below-normal, normal, or above-normal precipitation for the northern quarter of the state, and a 33-40% chance of above-normal precipitation for the rest of the state. <https://www.cpc.ncep.noaa.gov/>

Monthly and Seasonal Drought Outlook

The monthly and seasonal outlooks released on 5/31 shows drought removal likely in southeastern and northeastern areas of the state.

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

NOAA 2022 Hurricane Season Outlook Per the May 24th outlook, an above-average season is likely for the Atlantic.

<https://www.cpc.ncep.noaa.gov/products/outlooks/hurricane.shtml>

<https://www.noaa.gov/news-release/noaa-predicts-above-normal-2022-atlantic-hurricane-season>

This report was prepared by the Massachusetts Department of Conservation and Recreation. Data may be preliminary. Analysis reflects automated calculations done 6/08/2022. 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>

APPENDIX I – ADDITIONAL PRECIPITATION DATA

Standardized Precipitation Index—May 2022 as percentiles

| REGION | NUMBER OF SITES | 1-mo | 2-mo | 3-mo | 6-mo | 9-mo | 12-mo | 24-mo | 36-mo* |
|-----------|-----------------|------|------|------|------|------|-------|-------|--------|
| WESTERN | 5 | 35 | 64 | 61 | 60 | 88 | 98 | 84 | 80 |
| CTRV | 10 | 33 | 42 | 38 | 34 | 51 | 86 | 70 | 63 |
| CENTRAL | 15 | 18 | 27 | 24 | 41 | 70 | 91 | 78 | 78 |
| NORTHEAST | 19 | 10 | 19 | 10 | 19 | 52 | 87 | 82 | 86 |
| SOUTHEAST | 23 | 6 | 10 | 7 | 16 | 47 | 80 | 61 | 69 |
| CAPE COD | 5 | 40 | 13 | 15 | 16 | 75 | 56 | 8 | 16 |
| ISLANDS | 2 | 63 | 36 | 30 | 21 | 45 | 41 | 21 | 56 |

*1- and 36-month SPI is for informational purposes only, not for drought determination.

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

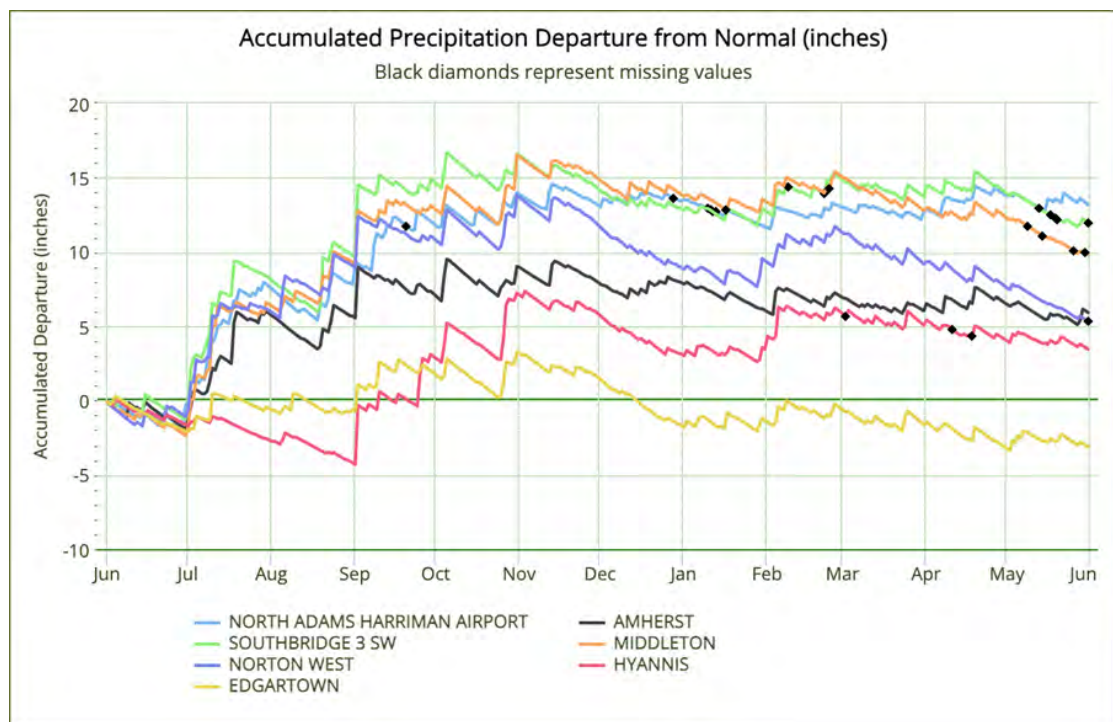
Percent of Average Historical Precipitation—May 2022

| REGION | NUMBER OF SITES | HISTORICAL AVERAGE | MAY AVERAGE (IN) | DEPARTURE FROM HISTORICAL AVERAGE (IN) | PERCENT OF NORMAL |
|-----------|-----------------|--------------------|------------------|--|-------------------|
| WESTERN | 5 | 3.94 | 2.89 | -1.05 | 73% |
| CTRV | 10 | 3.79 | 2.78 | -1.01 | 73% |
| CENTRAL | 15 | 3.76 | 2.25 | -1.51 | 60% |
| NORTHEAST | 19 | 3.45 | 1.47 | -1.98 | 43% |
| SOUTHEAST | 23 | 3.59 | 1.27 | -2.32 | 35% |
| CAPE COD | 5 | 3.59 | 2.64 | -0.95 | 74% |
| ISLANDS | 2 | 3.62 | 3.90 | 0.28 | 108% |

Accumulated Precipitation Departure

Graph does not consider starting condition's wetness/dryness; does not show summer heat waves with high evapotranspiration; only one station per Drought Region is shown.

<https://xmacis.rcc-acis.org/>



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.

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

Index Severity Levels (Section 3.4 of the DMP)

| SEVERITY LEVEL | STANDARDIZED PRECIPITATION INDEX (SPI) | STREAMFLOW | LAKES AND IMPOUNDMENTS | GROUNDWATER | KEETCH-BRYAM DROUGHT INDEX (KBDI) | CROP MOISTURE INDEX |
|----------------|--|------------|------------------------|-------------|-----------------------------------|---------------------|
| 0 | | | > 30th percentile | | < 200 | > -1.0 |
| 1 | | | ≤ 30 and > 20 | | 200-400 | ≤ -1.0 and > -2.0 |
| 2 | | | ≤ 20 and > 10 | | 400-600 | ≤ -2.0 and > -3.0 |
| 3 | | | ≤ 10 and > 2 | | 600-700 | ≤ -3.0 and > -4.0 |
| 4 | | | ≤ 2 | | 700-800 | ≤ -4.0 |

