

MASSACHUSETTS WATER RESOURCES COMMISSION  
OCTOBER  
**2020**      **HYDROLOGIC CONDITIONS  
IN MASSACHUSETTS**



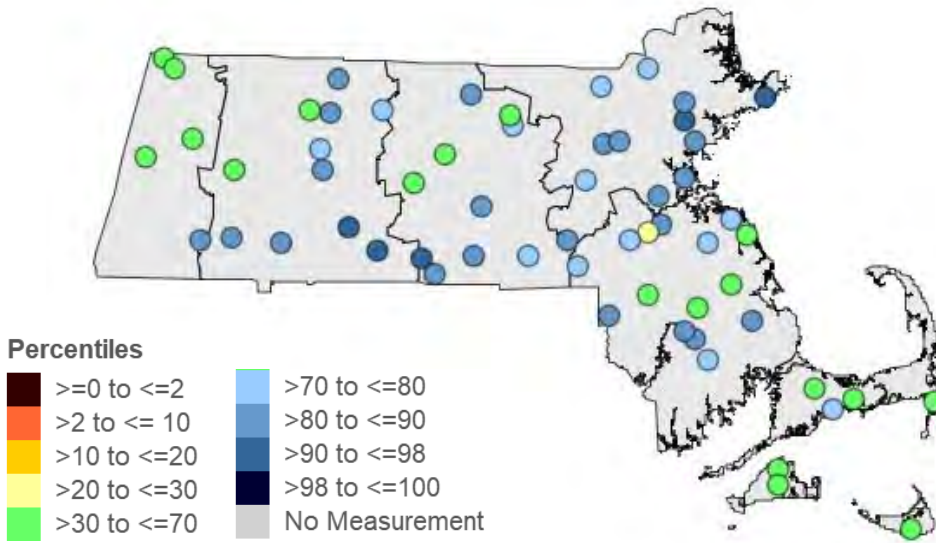
The Commonwealth of Massachusetts  
Charles D. Baker, Governor  
Kathleen A. Theoharides, Secretary, Executive Office of Energy and Environmental Affairs

# OCTOBER 2020 HYDROLOGIC CONDITIONS

- Monthly average temperatures were above normal.
- Precipitation was normal to above normal. Longer-term deficits still remain, especially in the Cape Cod Region.
- Monthly median streamflow improved in October; the Southeast Region is at Index Severity Level 2 and the Central Region is at Level 1.
- Groundwater levels varied across the state. While there was improvement in some Regions, there are wells still below normal; the Western and Northeast Regions are at Index Severity Level 1, and the Southeast at Level 2.
- The NOAA Climate Prediction Center November outlook and 3-month outlook show chances for above normal temperatures and equal chances for below-normal, normal, or above-normal precipitation.
- Appendices I and II provide additional precipitation data and information on the Massachusetts Drought Management Plan (DMP).



## PRECIPITATION



Precipitation was normal to above normal across MA for the month of October. While the 1-mo SPI did not trip, longer-term deficits still remain for the 2-mos to the 12-mos look-back periods (see Table II in the Appendices). The 6-mos SPI tripped for all regions, and is at level 4 for the Cape Cod Region.

| Index Severity Level |
|----------------------|
| 1                    |
| 2                    |
| 3                    |
| 4                    |

| REGION          | NUMBER OF SITES REPORTING FOR OCT | ACTUAL MONTHLY AVERAGE (IN) | DEPARTURE FROM HISTORICAL (IN) | DMP SPI * 1-MONTH | DMP SPI 2-MONTH | DMP SPI 3-MONTH |
|-----------------|-----------------------------------|-----------------------------|--------------------------------|-------------------|-----------------|-----------------|
| WESTERN         | 5                                 | 4.58                        | 0.14                           | -0.40             | -0.24           | -0.55           |
| CT RIVER VALLEY | 11                                | 5.65                        | 1.35                           | 0.81              | 0.18            | -0.05           |
| CENTRAL         | 11                                | 5.21                        | 0.92                           | 0.72              | -0.30           | -0.32           |
| NORTHEAST       | 11                                | 5.69                        | 1.88                           | 0.84              | 0.03            | -0.38           |
| SOUTHEAST       | 15                                | 5.39                        | 0.87                           | 0.50              | -0.37           | -0.63           |
| CAPE COD        | 4                                 | 4.67                        | 0.22                           | 0.22              | -0.69           | -1.17           |
| ISLANDS         | 3                                 | 4.19                        | 0.15                           | 0.29              | -0.43           | -1.05           |

\*The Standardized Precipitation Index (SPI) values represent the variation, in standard deviations, from long-term precipitation averages.

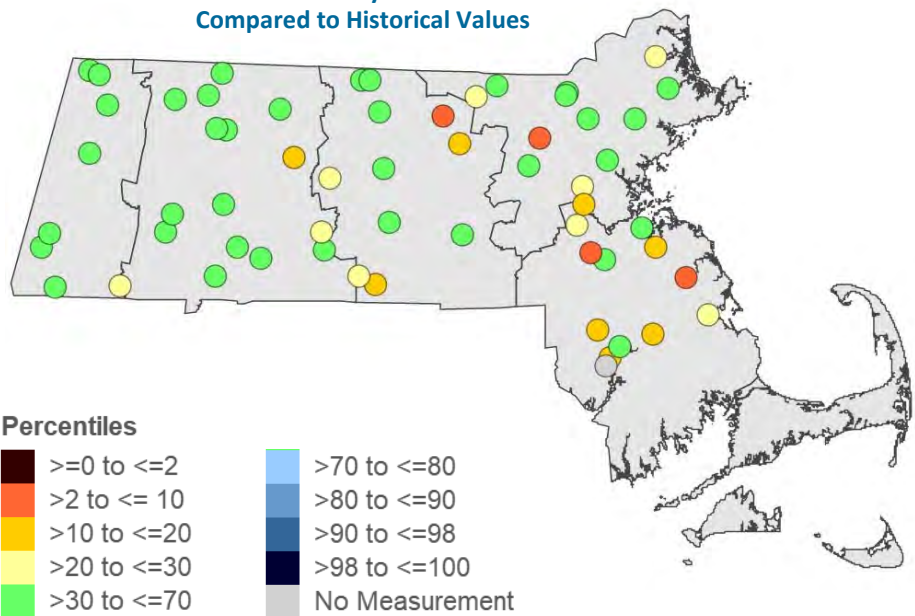
# STREAMFLOW

Streamflow Index Severity levels improved in October due to mid-month precipitation, but still tripped in the Central (Level 1) and Southeast (Level 2) Regions.

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

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

Median Monthly Streamflows Compared to Historical Values



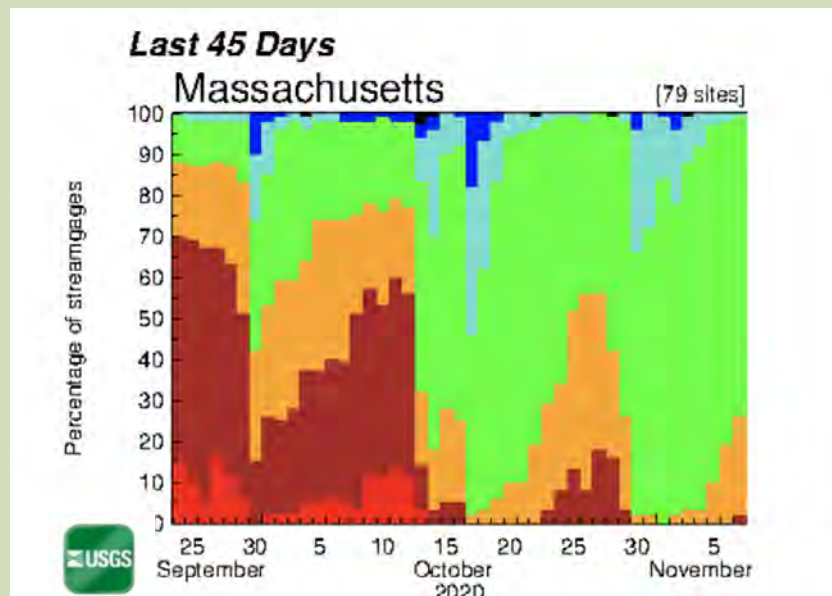
| REGION          | TOTAL GAGES REPORTING FOR OCT | ≥0 TO ≤2 PERCENTILE | >2 TO ≤10 PERCENTILE | >10 TO ≤20 PERCENTILE | >20 TO ≤30 PERCENTILE | >90 PERCENTILE | MEDIAN OF INDIVIDUAL GAGE PERCENTILES | DMP INDEX SEVERITY |
|-----------------|-------------------------------|---------------------|----------------------|-----------------------|-----------------------|----------------|---------------------------------------|--------------------|
| WESTERN         | 8                             | 0                   | 0                    | 0                     | 1                     | 0              | 36                                    | 0                  |
| CT RIVER VALLEY | 15                            | 0                   | 0                    | 1                     | 1                     | 0              | 37                                    | 0                  |
| CENTRAL         | 11                            | 0                   | 1                    | 2                     | 2                     | 0              | 30                                    | 1                  |
| NORTHEAST       | 13                            | 0                   | 1                    | 1                     | 3                     | 0              | 33                                    | 0                  |
| SOUTHEAST       | 12                            | 0                   | 2                    | 4                     | 2                     | 0              | 18                                    | 2                  |

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

## Time Series of Average Daily Streamflows Compared to Historical Values

[https://waterwatch.usgs.gov/index.php?id=pa01d&sid=w\\_plot\\_sum&r=ma](https://waterwatch.usgs.gov/index.php?id=pa01d&sid=w_plot_sum&r=ma)

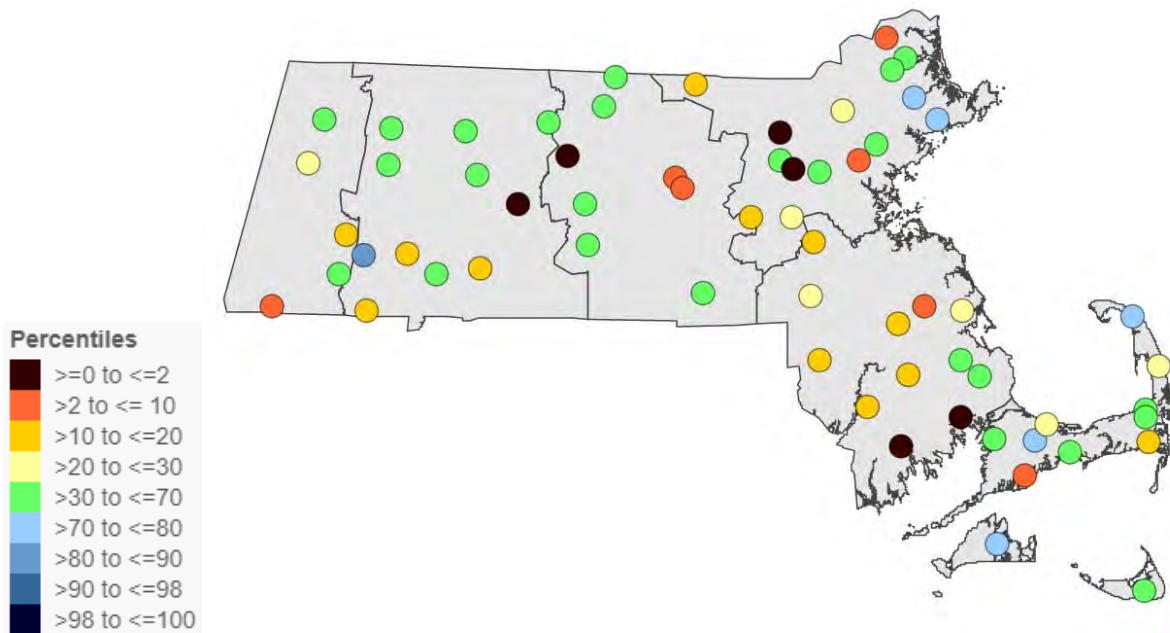
| Explanation - Percentile classes |                   |              |        |              |                   |      |         |
|----------------------------------|-------------------|--------------|--------|--------------|-------------------|------|---------|
| Low                             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



# GROUNDWATER

Groundwater levels varied across the state and within some Regions. Monthly medians improved in the Western, CT River Valley, Central, and Northeast Regions, but not all wells have recovered. The CT River Valley and Central Regions improved to Index Severity Level 0, the Western and Northeast Regions improved to Index Severity Level 1, and the Southeast stayed at Level 2. While the median of Cape Cod Region wells is still above the Index threshold, there are now wells below the 20th percentile.

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



| REGION          | TOTAL WELLS REPORTING FOR OCT | ≥0 TO ≤2 PERCENTILE | >2 TO ≤10 PERCENTILE | >10 TO ≤20 PERCENTILE | >20 TO ≤30 PERCENTILE | >90 PERCENTILE | MEDIAN OF INDIVIDUAL WELL PERCENTILES | DMP INDEX SEVERITY |
|-----------------|-------------------------------|---------------------|----------------------|-----------------------|-----------------------|----------------|---------------------------------------|--------------------|
| WESTERN         | 5                             | 0                   | 1                    | 1                     | 1                     | 0              | 28                                    | 1                  |
| CT RIVER VALLEY | 11                            | 1                   | 0                    | 3                     | 0                     | 0              | 36                                    | 0                  |
| CENTRAL         | 9                             | 1                   | 2                    | 1                     | 0                     | 0              | 31                                    | 0                  |
| NORTHEAST       | 14                            | 2                   | 2                    | 1                     | 2                     | 0              | 30                                    | 1                  |
| SOUTHEAST       | 12                            | 2                   | 1                    | 5                     | 2                     | 0              | 15                                    | 2                  |
| CAPE COD        | 10                            | 0                   | 1                    | 1                     | 2                     | 0              | 41                                    | 0                  |
| ISLANDS         | 2                             | 0                   | 0                    | 0                     | 0                     | 0              | 67                                    | 0                  |

# LAKES AND IMPOUNDMENTS

At the end of October, many lakes and impoundments were lower than usual, resulting in an Index Severity Level of 1 for the CT River Valley, Level 2 for the Central Region, and Level 4 for the Southeast. Several systems are at or near drought levels and still have mandatory watering restrictions. Four systems are below 2016 levels.



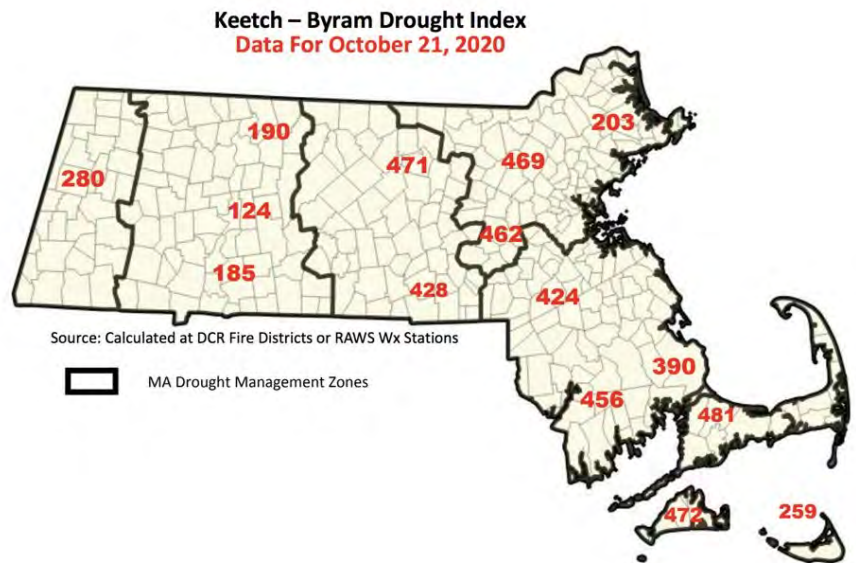
| REGION          | TOTAL REPORTING FOR OCTOBER | MEDIAN OF INDIVIDUAL PERCENTILES | DMP INDEX SEVERITY |
|-----------------|-----------------------------|----------------------------------|--------------------|
| WESTERN         | 2                           | 31                               | 0                  |
| CT RIVER VALLEY | 2                           | 24                               | 1                  |
| CENTRAL         | 3                           | 14                               | 2                  |
| NORTHEAST       | 7                           | 33                               | 0                  |
| SOUTHEAST       | 2                           | 2                                | 4                  |
| CAPE COD        | 1                           | 59                               | 0                  |
| ISLANDS         | N/A                         | N/A                              | N/A                |

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

## KEETCH BYRAM DROUGHT INDEX (KBDI)

Precipitation combined with cooler and more seasonable temperatures have brought the index down across most of the state through the later part of October.

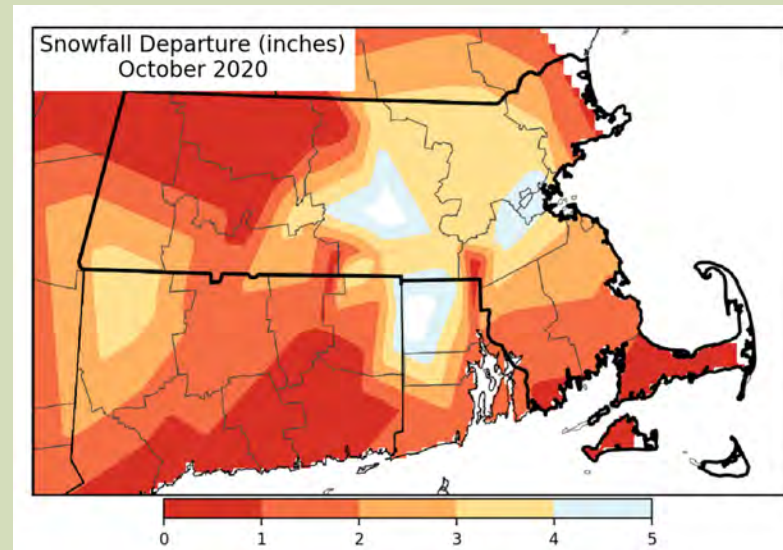
| REGION          | TOTAL REPORTING FOR OCT 21 | DMP INDEX SEVERITY |
|-----------------|----------------------------|--------------------|
| WESTERN         | 1                          | 1                  |
| CT RIVER VALLEY | 3                          | 0                  |
| CENTRAL         | 2                          | 2                  |
| NORTHEAST       | 3                          | 2                  |
| SOUTHEAST       | 3                          | 2                  |
| CAPE COD        | 1                          | 2                  |
| ISLANDS         | 2                          | 2                  |



## CROP MOISTURE INDEX (CMI)

## SEASON-TO-DATE SNOWFALL DEPARTURE

The weekly CMI for the period ending October 31, 2020 was Abnormally Moist for the Western Region and Slightly Dry/Favorably Moist for the remainder of the state resulting in an Index Severity Level 0 for all Regions.



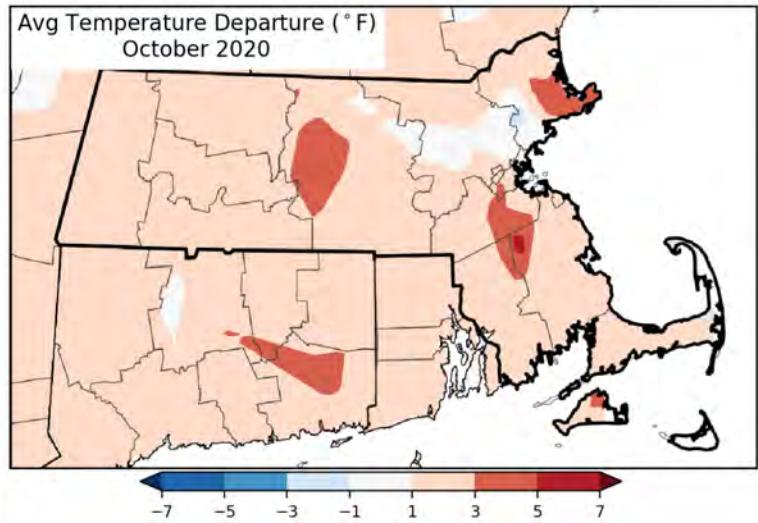
# TEMPERATURE

Monthly average temperatures were above normal for most of the state. According to the Northeast Regional Climate Center, this October ranked as the 19th warmest for Massachusetts.

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

Daily average temperatures ranged from 35° to 67° Fahrenheit (°F). Daily departures from historical averages ranged from +10.2 to -14.3 ° F.

<https://w2.weather.gov/climate/xmacis.php?wfo=box>



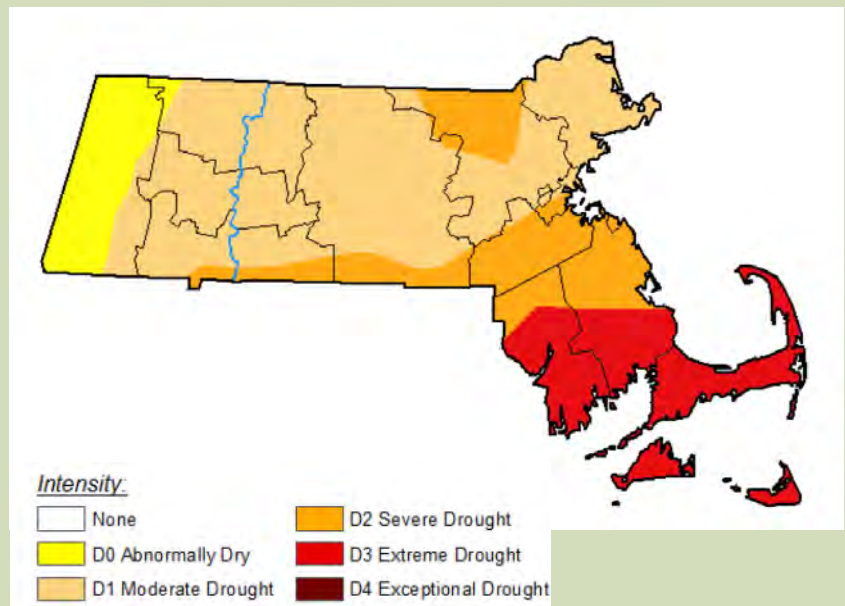
# DROUGHT CONDITIONS AND FORECASTS

USDM Map updated Oct. 27 2020; released Oct. 29, 2020

## U.S. Drought Monitor (USDM)

At the end of October, the USDM showed D3 (Extreme Drought) in the Southeast, Cape Cod, and Islands Regions; D0 (Abnormally Dry) in the Western Region; and D1 (Moderate Drought) to D2 (Severe Drought) throughout the remainder of the state. Over the course of the month, drought levels improved except for parts of the Southeast, Cape Cod, and Islands Regions, which stayed D3, and the West, which stayed at D0 for all of October.

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



## NOAA Climate Prediction Center

### Temperature and Precipitation Outlook

**November:** The outlook released 10/31 shows a 50-60% chance for above-normal temperatures and equal chances for below-normal, normal, or above-normal precipitation.

**November through January:** The outlook released 10/15 projects a 40-50% chance for above-normal temperatures, and equal chances for below-normal, normal, or above-normal precipitation for all of MA. <https://www.cpc.ncep.noaa.gov/>

### Monthly and Seasonal Drought Outlook

The monthly outlook for November released on 10/31 shows drought removal likely for much of the state and improving in the rest of the state. The seasonal outlook released on 10/15 and valid through January shows drought improvement throughout the state.

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

This report was prepared by the Massachusetts Department of Conservation and Recreation. Data may be preliminary. Additional information, previous reports, and drought management information can be found at: <https://www.mass.gov/water-data-tracking>

## APPENDIX I – ADDITIONAL PRECIPITATION DATA

### Standardized Precipitation Index October 2020

| REGION          | NUMBER OF SITES | SPI1  | SPI2  | SPI3  | SPI6  | SPI9  | SPI12 | SPI24 | SPI36 | Key to Drought Plan SPI Severity Levels |                     |
|-----------------|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|---|---------------------|
| WESTERN         | 5               | -0.40 | -0.24 | -0.55 | -1.29 | -0.78 | -0.32 | 0.47  | 0.57  | 0                                       | >-0.52              |
| CT RIVER VALLEY | 11              | 0.81  | 0.18  | -0.05 | -0.78 | -0.77 | -0.64 | -0.05 | 0.61  | 1                                       | ≤ -0.52 and > -0.84 |
| CENTRAL         | 11              | 0.72  | -0.30 | -0.32 | -0.98 | -0.47 | -0.44 | 0.62  | 0.83  | 2                                       | ≤ -0.84 and > -1.28 |
| NORTHEAST       | 11              | 0.84  | 0.03  | -0.38 | -0.84 | -0.65 | -0.59 | 0.46  | 0.74  | 3                                       | ≤ -1.28 and > -2.05 |
| SOUTHEAST       | 15              | 0.50  | -0.37 | -0.63 | -0.64 | -0.47 | -0.17 | 0.76  | 0.91  | 4                                       | ≤ -2.05             |
| CAPE COD        | 4               | 0.22  | -0.69 | -1.17 | -2.08 | -1.15 | -0.39 | 0.94  | 1.20  |   |                     |
| ISLANDS         | 3               | 0.29  | -0.43 | -1.05 | -1.07 | -0.79 | -0.60 | 0.82  | 0.34  |   |                     |

### Percent of Average Historical Precipitation

| REGION          | NUMBER OF SITES | HISTORICAL AVERAGE (IN) | OCTOBER AVERAGE (IN) | DEPARTURE FROM HISTORICAL AVERAGE (IN) | PERCENT OF HISTORICAL |
|-----------------|-----------------|-------------------------|----------------------|--|-----------------------|
| WESTERN         | 5               | 4.44                    | 4.58                 | 0.14                                   | 106                   |
| CT RIVER VALLEY | 11              | 4.30                    | 5.65                 | 1.35                                   | 136                   |
| CENTRAL         | 11              | 4.29                    | 5.21                 | 0.92                                   | 122                   |
| NORTHEAST       | 11              | 3.82                    | 5.69                 | 1.88                                   | 150                   |
| SOUTHEAST       | 15              | 4.52                    | 5.39                 | 0.87                                   | 121                   |
| CAPE COD        | 4               | 4.46                    | 4.67                 | 0.22                                   | 104                   |
| ISLANDS         | 3               | 4.04                    | 4.19                 | 0.15                                   | 104                   |

DCR Precipitation Reports are available at:

<https://www.mass.gov/service-details/precipitation-composite-estimates-1> and  
<https://www.mass.gov/service-details/standardized-precipitation-index-spi-0>

# 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              |

