

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



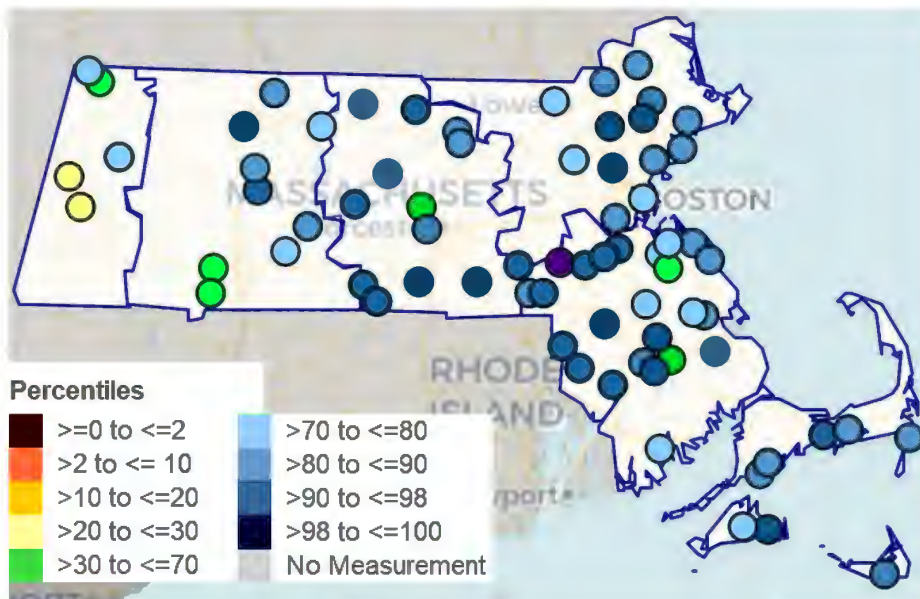
The Commonwealth of Massachusetts  
Charles D. Baker, Governor  
Kathleen A. Theoharides, Secretary, Executive Office of Energy and Environmental Affairs

# DECEMBER 2020 HYDROLOGIC CONDITIONS

- Monthly average temperatures were near- to above-normal.
- Precipitation was mostly above normal.
- Monthly median streamflows were normal to above-normal.
- Groundwater levels varied, but were mostly normal. A few wells are still recovering.
- Lakes & Impoundments levels continue to recover and all regional medians are above the 30th percentile.
- The NOAA January outlook shows chances for above-normal temperatures and above-normal precipitation. The 3-month outlook shows 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



December brought final relief from the drought - precipitation was above average for all regions except for the Western Region, which was average. The 6-month to 24-month look-back periods still show lingering deficits in some regions (see Appendix I).

Index Severity Level
1
2
3
4

REGION	NUMBER OF SITES REPORTING FOR DEC.	ACTUAL MONTHLY AVERAGE (IN)	DEPARTURE FROM HISTORICAL (IN)	DMP SPI * 1-MONTH	DMP SPI 3-MONTH	DMP SPI 6-MONTH
WESTERN	5	3.64	0.05	-0.10	-0.30	-0.52
CT RIVER VALLEY	9	5.32	1.63	1.07	0.97	0.13
CENTRAL	13	7.04	2.93	1.37	1.01	0.14
NORTHEAST	13	6.38	2.39	1.02	0.74	-0.08
SOUTHEAST	24	7.30	2.89	1.23	0.92	-0.23
CAPE COD	5	7.80	3.25	1.18	0.15	-1.25
ISLANDS	3	5.79	1.55	0.87	0.64	-1.46

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

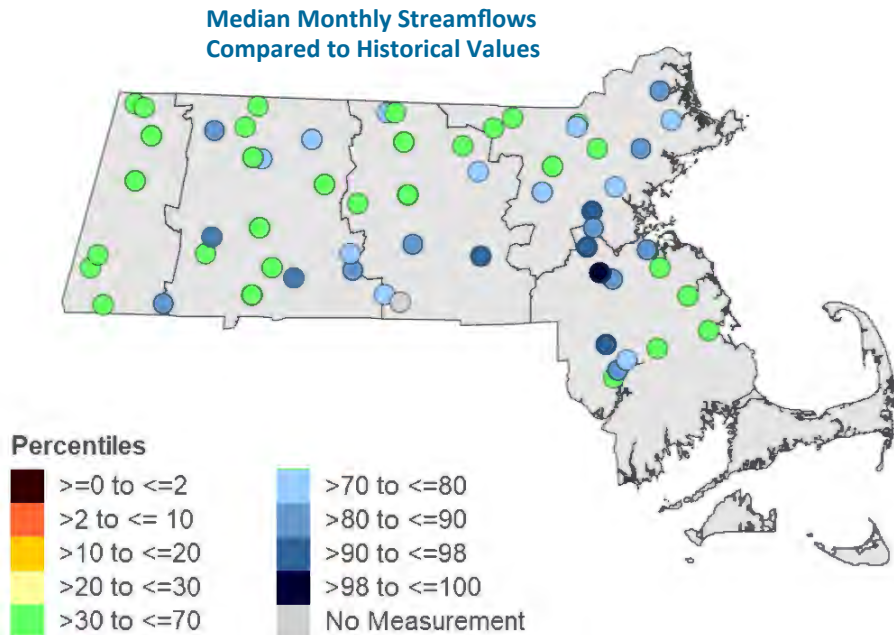


## STREAMFLOW

Precipitation and snowmelt pushed all individual streamflow gage medians above the 30th percentile and even above the 90th percentile for some gages.

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

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



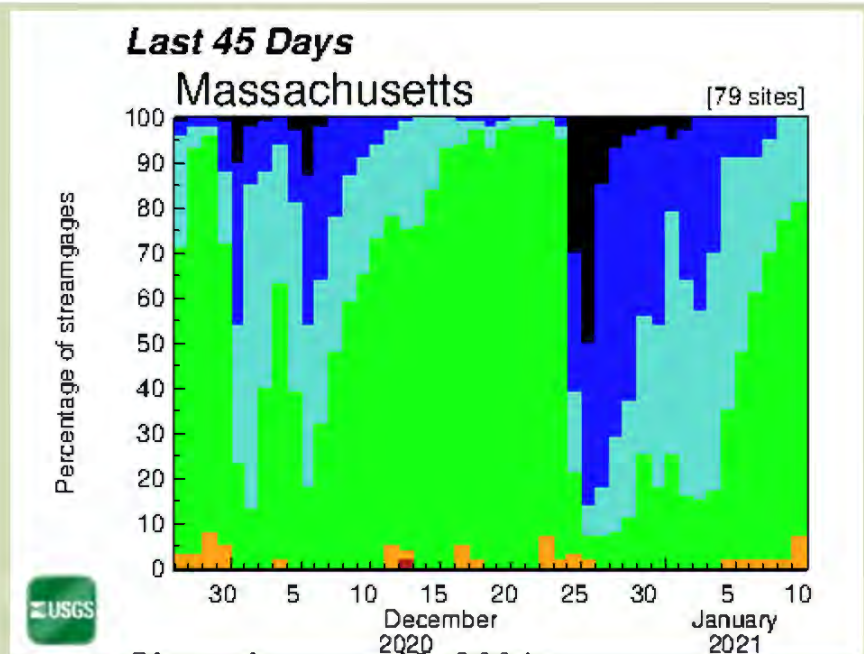
REGION	TOTAL GAGES REPORTING FOR DEC.	≥0 TO ≤2 PERCENTILE	>2 TO ≤10 PERCENTILE	>10 TO ≤20 PERCENTILE	>20 TO ≤30 PERCENTILE	>90 PER-CENTILE	MEDIAN OF INDIVIDUAL GAGE PERCENTILES	DMP INDEX SEVERITY
WESTERN	8	0	0	0	0	0	59	0
CT RIVER VALLEY	15	0	0	0	0	0	70	0
CENTRAL	10	0	0	0	0	1	70	0
NORTHEAST	13	0	0	0	0	1	79	0
SOUTHEAST	12	0	0	0	0	3	78	0

**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		

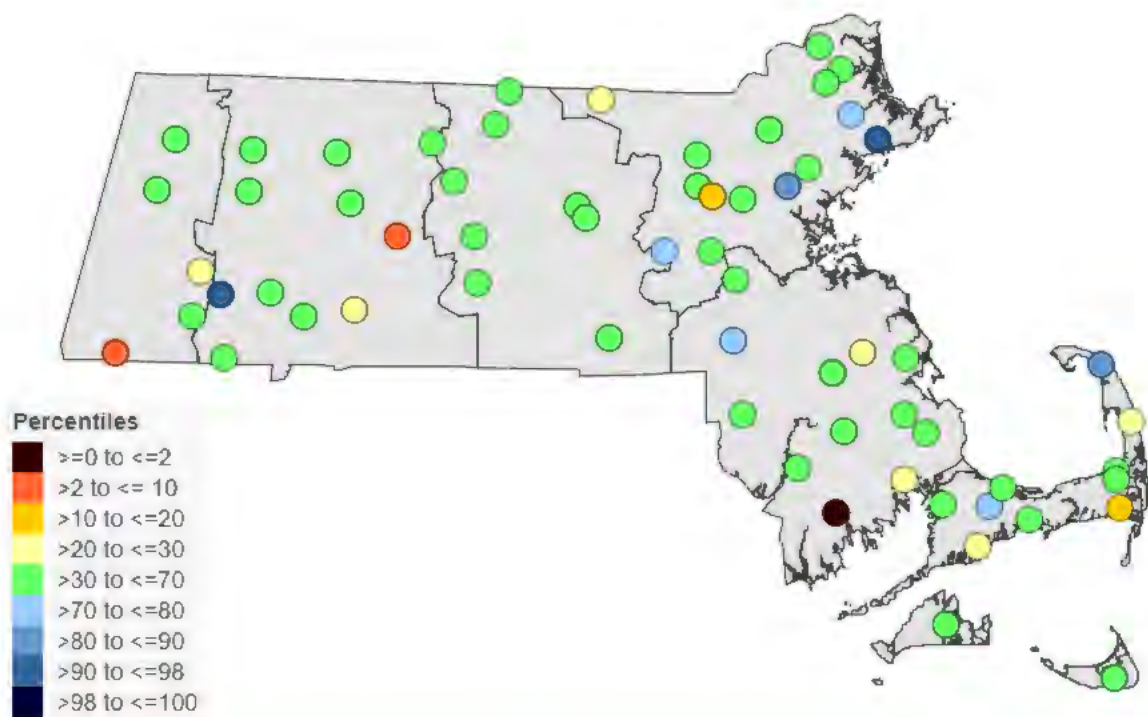


# GROUNDWATER

Groundwater levels have shown improvement and all regional medians are above the 30th percentile. Only a few wells are lagging in recovery.

<https://groundwaterwatch.usgs.gov/NetMapT1L2.asp?ncd=crn&sc=25>

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



REGION	TOTAL WELLS REPORTING FOR DEC.	≥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	0	1	0	47	0
CT RIVER VALLEY	11	0	1	0	1	1	44	0
CENTRAL	9	0	0	0	0	0	58	0
NORTHEAST	14	0	0	1	1	1	54	0
SOUTHEAST	12	1	0	0	2	0	34	0
CAPE COD	10	0	0	1	2	0	52	0
ISLANDS	2	0	0	0	0	0	53	0

# LAKES AND IMPOUNDMENTS

At the end of December, Lakes and Impoundments showed continued recovery from low levels in the early fall.

REGION	TOTAL REPORTING FOR DECEMBER	MEDIAN OF INDIVIDUAL PERCENTILES	DMP INDEX SEVERITY
WESTERN	2	39	0
CT RIVER VALLEY	2	50	0
CENTRAL	4	56	0
NORTHEAST	6	50	0
SOUTHEAST	2	59	0
CAPE COD	1	50	0
ISLANDS	N/A	N/A	N/A

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

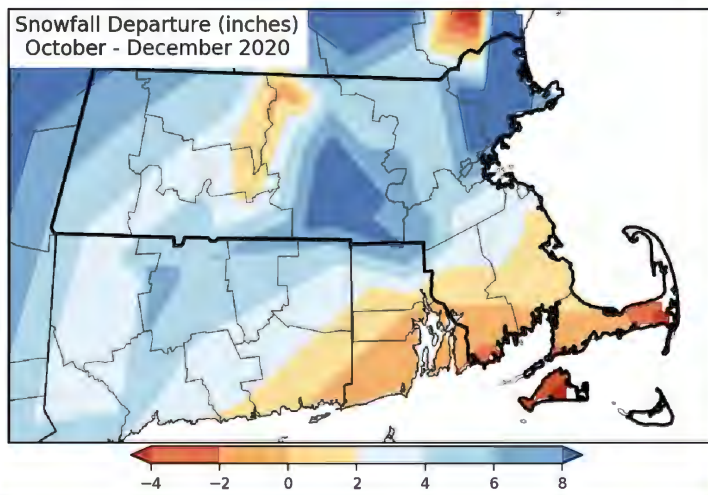
## KEETCH BYRAM DROUGHT INDEX (KBDI)

KBDI is provided seasonally.

## CROP MOISTURE INDEX (CMI)

CMI is provided seasonally.

Snowfall Departure (inches)  
October - December 2020



## SEASON-TO-DATE SNOW-FALL DEPARTURE

<http://www.nrcc.cornell.edu/>

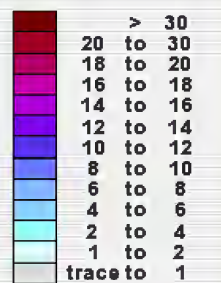
## MODELED SNOW WATER EQUIVALENT, END OF MONTH

Modeled Snow Water Equivalent for 2020 December 31, 18:00 UTC



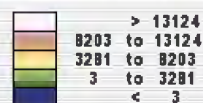
<https://www.noahrs.noaa.gov/technology/>

### Inches of water equivalent



Not Estimated

### Elevation in feet





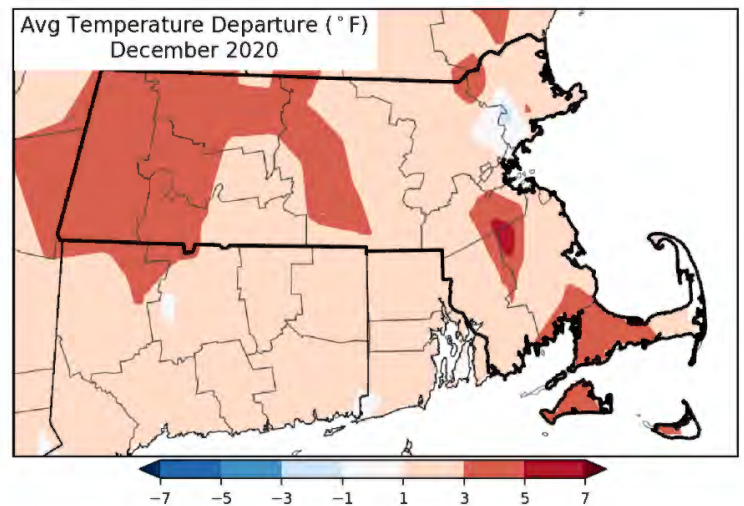
## TEMPERATURE

Monthly average temperatures were near to above normal. <http://www.nrcc.cornell.edu/regional/monthly/monthly.html>

According to the Northeast Regional Climate Center, all northeast major climate centers had average temperatures warmer than normal in 2020, including Worcester, which had its 2nd warmest year, and Boston, which had its 5th warmest year.

In December, daily average temperatures ranged from 23° to 52.5° Fahrenheit (°F). Daily departures from historical averages ranged from +18.2 to -11.5 ° F.

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



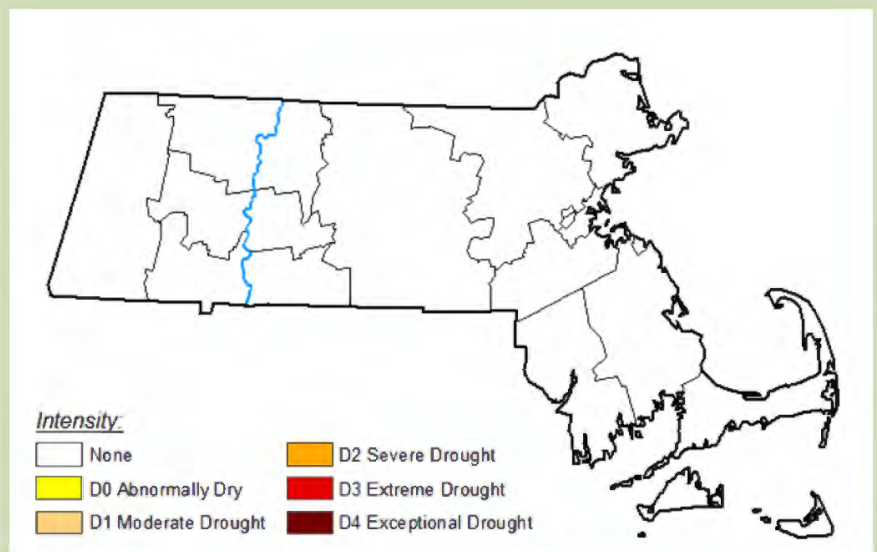
## DROUGHT CONDITIONS AND FORECASTS

### U.S. Drought Monitor (USDM)

At the beginning of December there were still areas of D1 and D0 in MA. Over the course of the month, drought conditions continued to improve such that the USDM map released December 31 was the first to show no D0 or drought conditions since May.

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

USDM Map updated Dec. 29, 2020; released Dec. 31, 2020



### NOAA Climate Prediction Center

#### Temperature and Precipitation Outlook

**January:** The outlook released 12/31 shows a 40-60% chance of above-normal temperatures and 33-40% chance of above-normal precipitation.

**January through March:** The outlook released 12/17 projects a 40-50% chance of above-normal temperatures, and equal chances of below-normal, normal, or above-normal precipitation. <https://www.cpc.ncep.noaa.gov/>

#### Monthly and Seasonal Drought Outlook

The monthly outlook for January released on 12/31 shows no drought development. The seasonal outlook released on 12/17 and valid through March shows no drought development.

<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>

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 I – ADDITIONAL PRECIPITATION DATA

## Standardized Precipitation Index December 2020

REGION	NUMBER OF SITES	SPI1	SPI2	SPI3	SPI6	SPI9	SPI12	SPI24	SPI36
WESTERN	5	-0.1	-0.03	-0.3	-0.52	-1.09	-0.87	-0.78	0.28
CT RIVER VALLEY	9	1.07	0.75	0.97	0.13	-0.44	-0.53	-0.02	1.21
CENTRAL	13	1.37	1.02	1.01	0.14	0.07	-0.24	0.5	1.42
NORTHEAST	13	1.02	0.76	0.74	-0.08	-0.3	-0.63	0.2	0.96
SOUTHEAST	24	1.23	0.97	0.92	-0.23	-0.03	-0.52	0.5	1.22
CAPE COD	5	1.18	0.44	0.15	-1.25	-0.97	-1.3	0.38	0.43
ISLANDS	3	0.87	0.67	0.64	-1.46	-1.05	-1.24	0.5	1.25

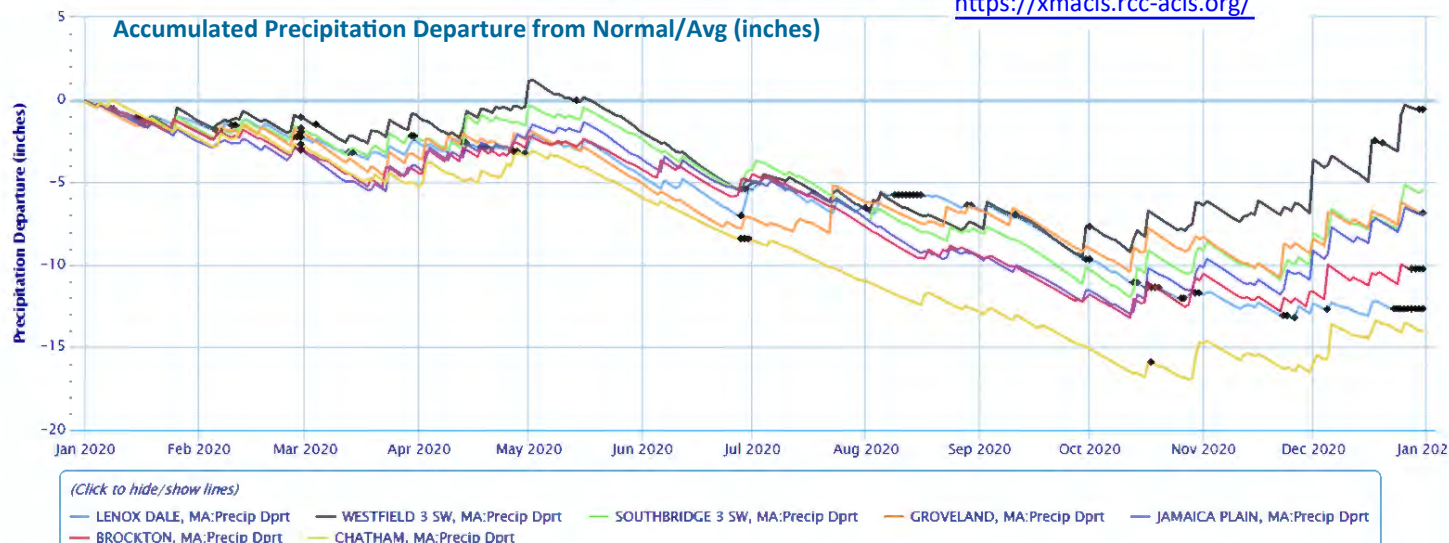
Key to Index Severity Levels
0
1
2
3
4

## Percent of Average Historical Precipitation

REGION	NUMBER OF SITES	HISTORICAL AVERAGE (IN)	DECEMBER AVERAGE (IN)	DEPARTURE FROM HISTORICAL AVERAGE (IN)	PERCENT OF HISTORICAL
WESTERN	5	3.59	3.64	0.05	101
CT RIVER VALLEY	9	3.69	5.32	1.63	144
CENTRAL	13	4.11	7.04	2.93	171
NORTHEAST	13	3.99	6.38	2.39	160
SOUTHEAST	24	4.41	7.3	2.89	166
CAPE COD	5	4.55	7.8	3.25	171
ISLANDS	3	4.24	5.79	1.55	137

Green/black diamonds represent subsequent/missing values

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



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## 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	$\leq 30$ and $> 20$				200-400	$\leq -1.0$ and $> -2.0$
2	$\leq 20$ and $> 10$				400-600	$\leq -2.0$ and $> -3.0$
3	$\leq 10$ and $> 2$				600-700	$\leq -3.0$ and $> -4.0$
4	$\leq 2$				700-800	$\leq -4.0$

