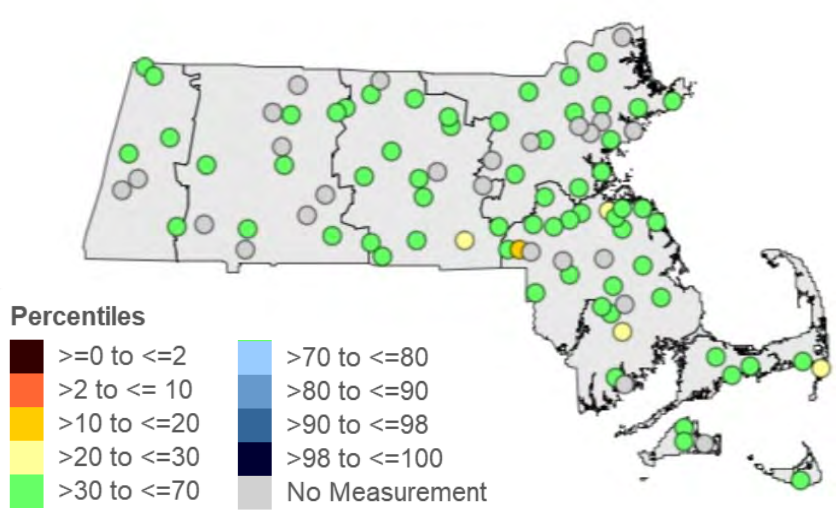
MASSACHUSETTS WATER RESOURCES COMMISSION

March 2020 Hydrologic Conditions in Massachusetts

SUMMARY OF CONDITIONS

- Monthly temperatures were above average for March.
- Precipitation was below to near average for March. The index severity levels for the 3-month SPI are at Level 1 or Level 2 for five out of seven drought regions.
- Streamflow was low for most of March. Both the Northeast and Southeast are at index severity level 2.
- Groundwater medians were greater than 30th percentile values. Index severity levels are 0.
- Lakes and Impoundments: All regions are at index severity level 0.
- For April, NOAA projects a 33% -40% chance 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), respectively.

PRECIPITATION



Precipitation ranged from 1.09" below normal to about normal in March. However, the low January, February, & March precipitation amounts are affecting the 3-month SPI values; three regions are at Severity Level 1 and two regions are at Severity Level 2. All other look-back periods for the SPI are at Severity Level 0.

Region	Number of Sites	March Average (inches)	Departure from Historical (inches)	DMP SPI 1-month	DMP SPI 2-month	DMP SPI 3-month
Western	5	3.11	0.02	0.21	0.17	-0.41
CT River Valley	6	3.61	0.01	0.19	0.20	-0.26
Central	14	3.52	-0.31	-0.01	-0.20	-0.70
Northeast	13	3.61	-0.48	0.05	-0.02	-0.75
Southeast	22	4.03	-0.59	0.04	-0.19	-0.91
Cape Cod	5	3.56	-1.09	-0.26	-0.26	-0.84
Islands	3	3.33	-0.46	0.26	0.56	-0.53

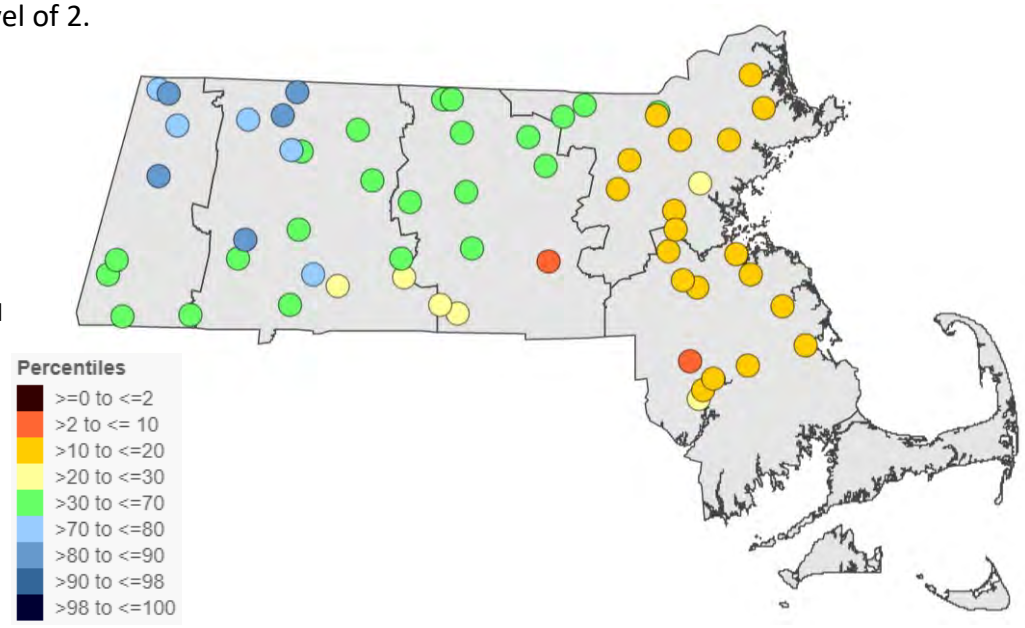
STREAMFLOW

Monthly median streamflows varied across the state. Streamflow was low in the Northeast, Southeast, and parts of the Central and CT River drought regions, including 21 gages below the 20th percentile, 2 of which were also below the 10th (Wading River and Quinsigamond). Both the Southeast and Northeast regions were at a Drought Severity Index Level of 2.

Median Monthly Streamflows Compared to Historical

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

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

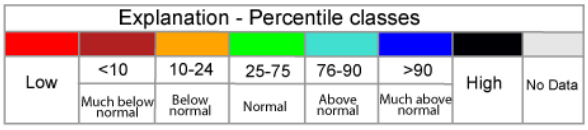


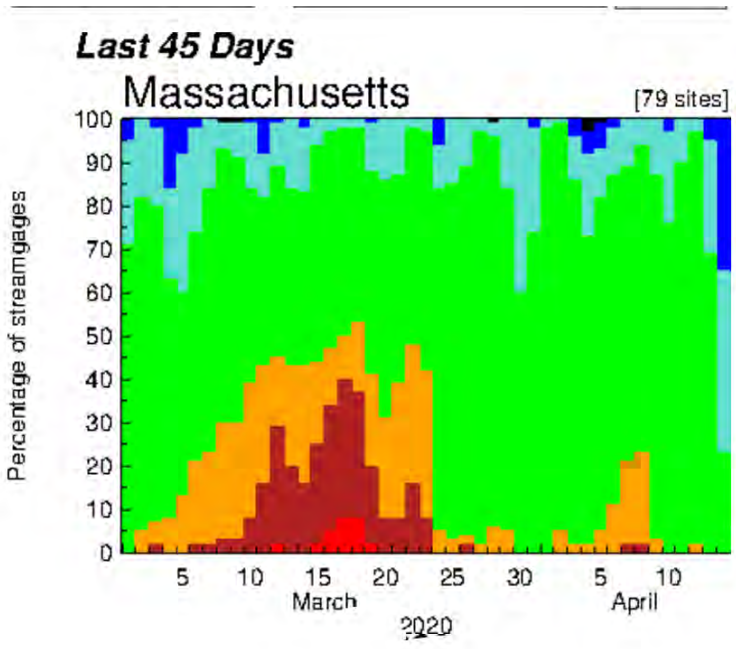
Region	Number of Gages						Median of Individual Gage Percentiles	DMP Index Severity
	Total Reporting for March	≥0 to ≤2 Percentile	>2 to ≤10 Percentile	>10 to ≤20 Percentile	>20 to ≤30 Percentile	> 90 Percentile		
Western	8	0	0	0	0	0	69	0
CT River	15	0	0	0	2	0	68	0
Central	11	0	1	0	2	0	41	0
Northeast	13	0	0	9	1	0	19	2
Southeast	12	0	1	10	1	0	15	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=real&sid=w__plot_sum&r=ma





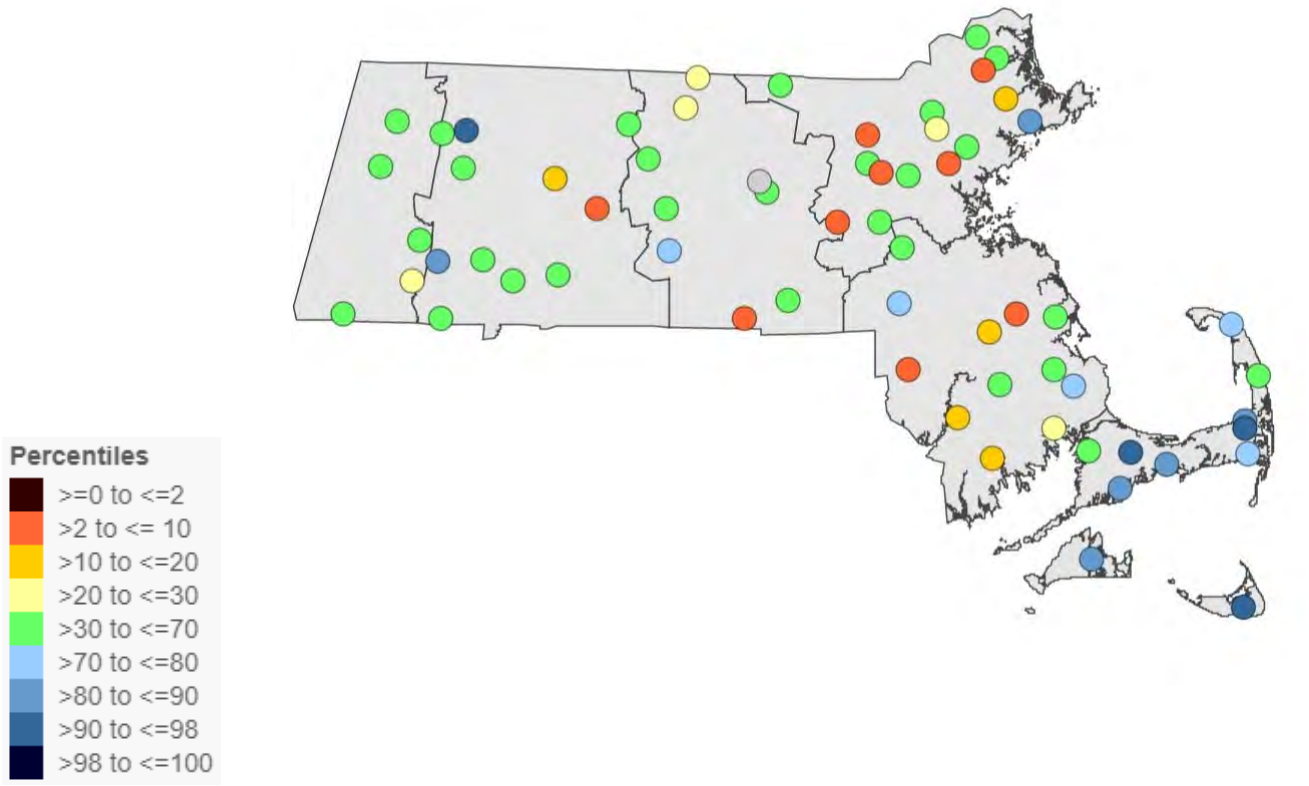
April 17, 2020

GROUNDWATER

All regions except Cape Cod and the Islands had wells below their 30th percentile values, and percentile values were overall lower in the Northeast, Southeast and Central regions. However, all regions are at an Index Severity of Level 0.

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

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



Region	Number of Wells						Median of Individual Percentiles	DMP Index Severity
	Total Reporting for March	≥0 to ≤2 Percentile	>2 to ≤10 Percentile	>10 to ≤20 Percentile	>20 to ≤30 Percentile	> 90 Percentile		
Western	5	0	0	0	1	0	46	0
CT River Valley	11	0	1	1	0	1	48	0
Central	9	0	2	0	2	0	32	0
Northeast	15	0	4	1	1	0	35	0
Southeast	12	0	2	3	1	0	32	0
Cape Cod	9	0	0	0	0	2	84	0
Islands	2	0	0	0	0	1	87	0

LAKES and IMPOUNDMENTS

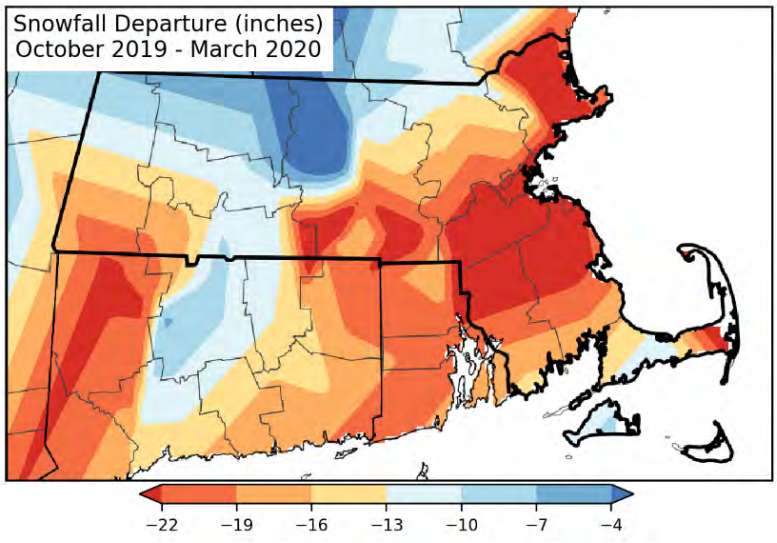
At the end of March, all drought regions were at index severity level 0. Several regions had water bodies spilling.

Region	Total Reporting for March	Lakes and Impoundments: Median of Percentiles or Levels	DMP Index Severity
Western	2	levels: 97%; 100%	0
CT River Valley	2	median percentile: 81	0
Central	2	levels: 100%; 104%	0
Northeast	7	levels: 80.2% to 99%	0
Southeast	2	levels: 97%; 100%	0
Cape Cod	1	median percentile: 94	0
Islands	N/A	N/A	N/A

KEETCH BYRAM INDEX (KBDI) and CROP MOISTURE INDEX (CMI)

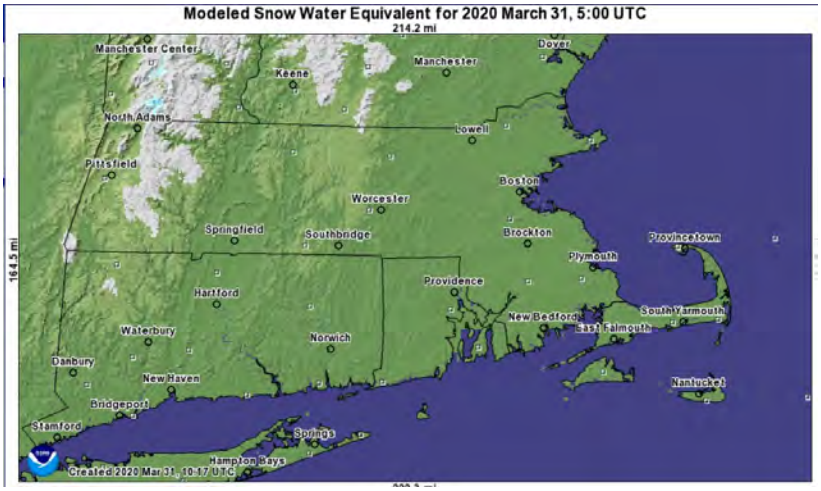
KBDI values were not available. CMI values for the week ending April 4 were Abnormally Moist in the Western Region and Wet across the rest of the state resulting in an index severity level of 0 for all regions.

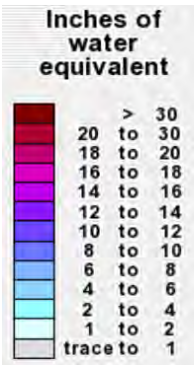
SNOW



Season-to-date snowfall departure

At the end of March the season-to-date snowfall departure ranged from below four inches to below more than 22 inches across the state.
http://www.nrcc.cornell.edu/regional/monthly/monthly.html

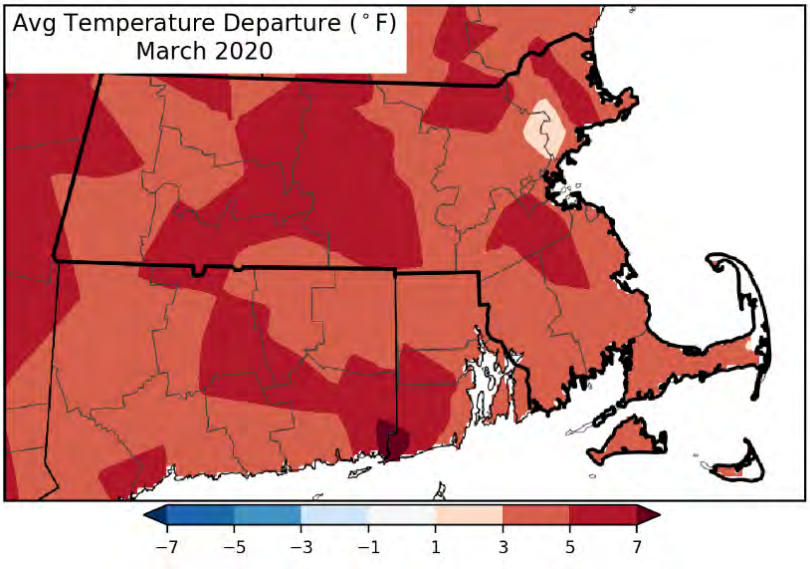




Snow cover

At the end of March, trace amounts of snow remained only in western portion of the state.
https://www.nohrsc.noaa.gov/interactive/html/map.html

TEMPERATURE



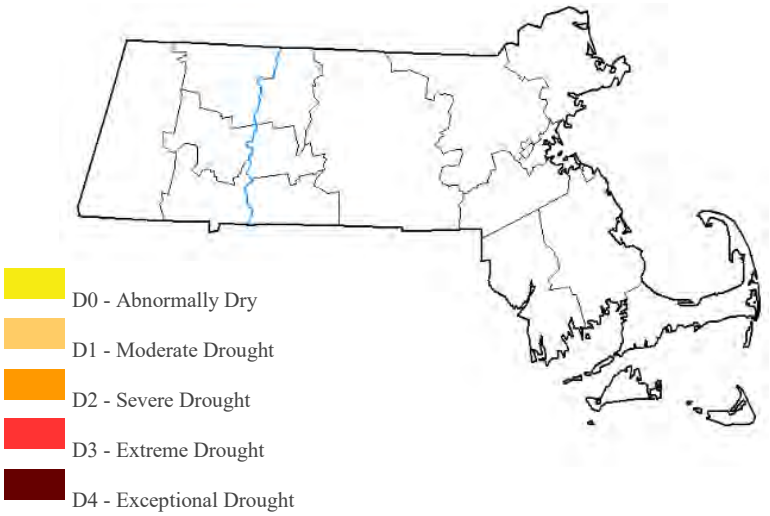
Monthly average temperatures were above historical averages for this time of the year. http://www.nrcc.cornell.edu/regional/monthly/monthly.html Daily temperatures ranged from 19 to 72 degrees Fahrenheit (deg F). Daily departures from historical averages ranged from +20.7 to –10.8 deg F. https://w2.weather.gov/climate/xmacis.php?wfo=box

DROUGHT CONDITIONS AND FORECASTS BY NOAA AND PARTNERS

U.S. Drought Monitor as of March 31, 2020

Summary: The USDM does not show drought conditions at the end of March.

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



NOAA Climate Prediction Center: Temperature and Precipitation Outlook

April: The outlook projects equal chances for above-, below-, or normal temperatures in the east, 33-40% chance of above normal temperatures for the rest of the state, and equal chances for below-normal, normal, or above-normal precipitation for the entire state. **April through June**: The outlook projects 50-60% chance of above normal temperatures and a 33% -40% chance of above normal precipitation.

Monthly and Seasonal Drought Outlook

The monthly outlook released March 31 for April does not project drought conditions. The seasonal outlook issued March 19 valid through June predicts drought development likely in the southeastern region. 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 March 2020

Drought Region	Number of Sites	SPI1	SPI2	SPI3	SPI6	SPI9	SPI12	SPI24	SPI36
Western	5	0.21	0.17	-0.41	0.86	0.18	0.44	1.09	0.96
Connecticut River	6	0.19	0.20	-0.26	0.43	-0.23	0.08	1.57	1.26
Central	14	-0.01	-0.20	-0.70	0.48	0.38	0.71	1.58	1.59
Northeast	13	0.05	-0.02	-0.75	0.36	0.26	0.60	1.15	0.98
Southeast	22	0.04	-0.19	-0.91	0.29	0.17	0.57	1.31	1.18
Cape Cod	5	-0.26	-0.26	-0.84	0.76	0.64	0.95	1.21	2.10
Islands	3	0.26	0.56	-0.53	0.80	0.53	0.87	0.80	1.27

Key to Drought Plan SPI Severity Levels	
0	>-0.52
1	≤ -0.52 and > -0.84
2	≤ -0.84 and > -1.28
3	≤ -1.28 and > -2.05
4	≤ -2.05

Percent of Average Historical Precipitation

Drought Region	Number of Sites	Historical Average (inches)	March Average (inches)	Departure from Historical (inches)	Percent of Historical
Western	5	3.09	3.11	0.02	102
Connecticut River	6	3.60	3.61	0.01	101
Central	14	3.84	3.52	-0.31	92
Northeast	13	4.09	3.61	-0.48	89
Southeast	22	4.62	4.03	-0.59	88
Cape Cod	5	4.65	3.56	-1.09	76
Islands	3	3.79	3.33	-0.46	88

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	Stream-flow	Lakes and Impoundments	Ground-water	Keetch-Byram Drought	Crop Moisture
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