

Hydrologic Conditions in Massachusetts for November 2023

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DCR Office of Water Resources

Drought Management Task Force

December 11, 2023

Meeting Co-Chairs: EOEEA, MEMA



MA Drought Management Plan Indices

Numbers in parentheses indicate number of data points across the state



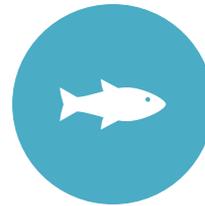
Precipitation (93)



Streamflow (59)



Groundwater (63)



Lakes and
Impoundments (20)



KBDI - Fire Danger
(16)



Crop Moisture
(national map)

MA Drought Management Plan

Index Severity Levels

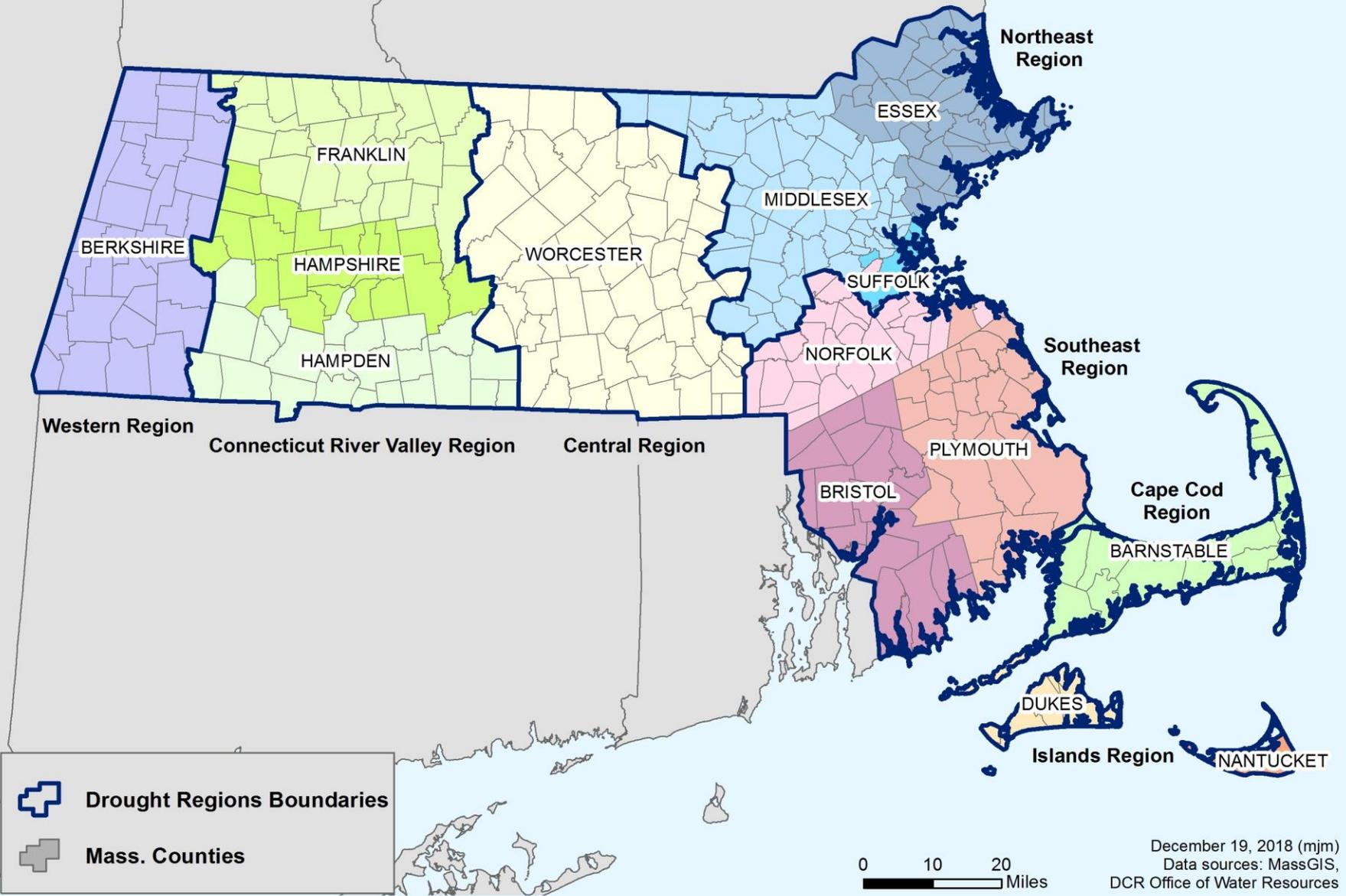
| Index Severity Level | Percentiles for: Precipitation, Streamflow, Lakes and Impoundments and Groundwater | Keetch-Byram Drought Index | Crop Moisture Index |
|----------------------|--|-------------------------------|------------------------|
| 0 | >30 th percentile | < 200 | > -1.0 |
| 1 | ≤30 and >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 |

MA Drought Management Plan

Drought Levels



MASSACHUSETTS DROUGHT REGIONS with Counties

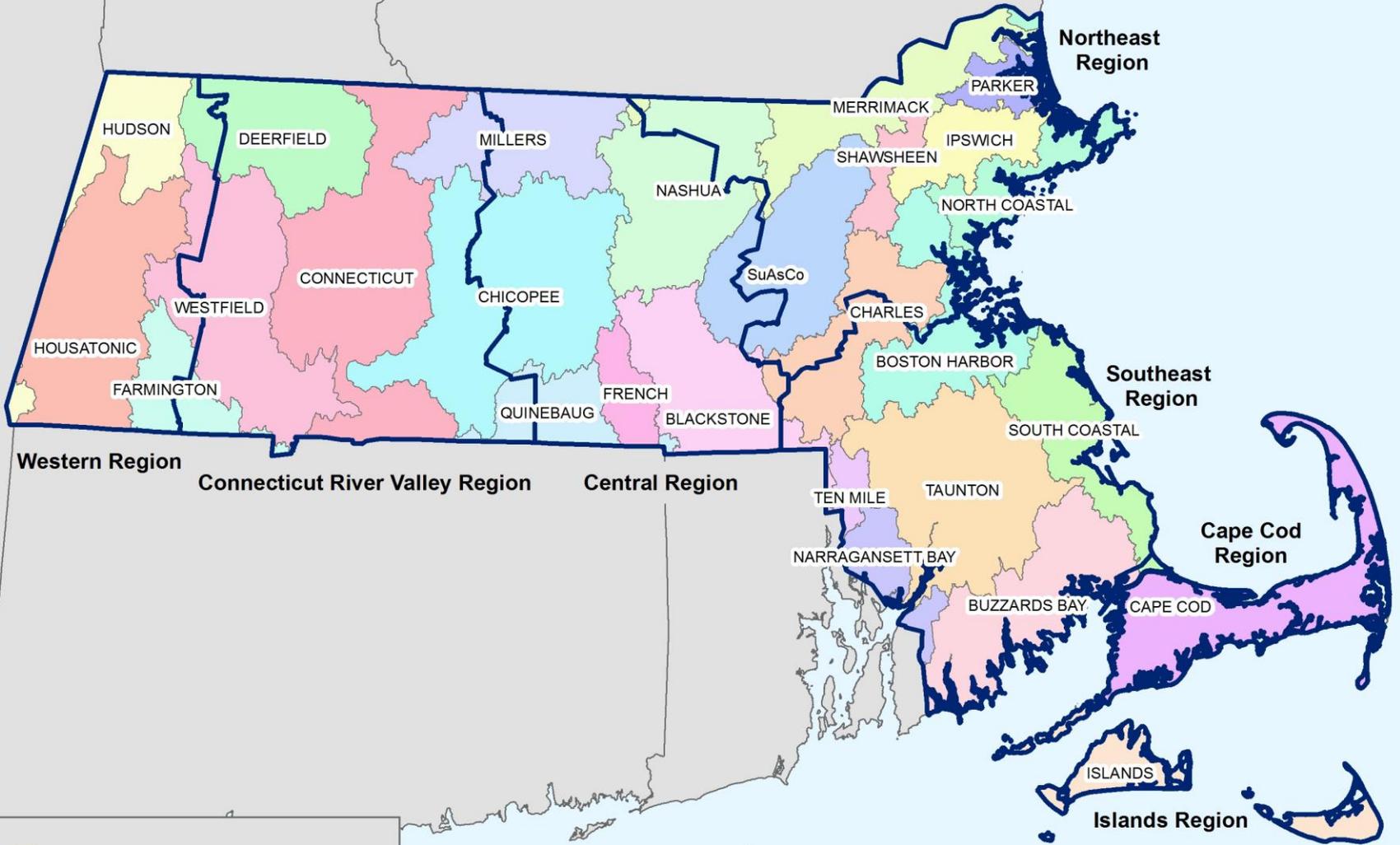


-  Drought Regions Boundaries
-  Mass. Counties

0 10 20
Miles

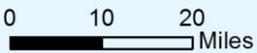
December 19, 2018 (mjm)
Data sources: MassGIS,
DCR Office of Water Resources

MASSACHUSETTS DROUGHT REGIONS with Watersheds



 Drought Regions Boundaries

 Mass. Counties



October 11, 2019 (mjm)
Data sources: MassGIS,
DCR Office of Water Resources

Task Force Member Updates



Hydrologic
Conditions



Weather &
Forecast



Water Supply
Impacts



Environmental
Impacts



Agricultural
Impacts



Fire Danger



Engineering/
Infrastructure
Impacts



Public Health
Impacts

Recent Hydrologic History

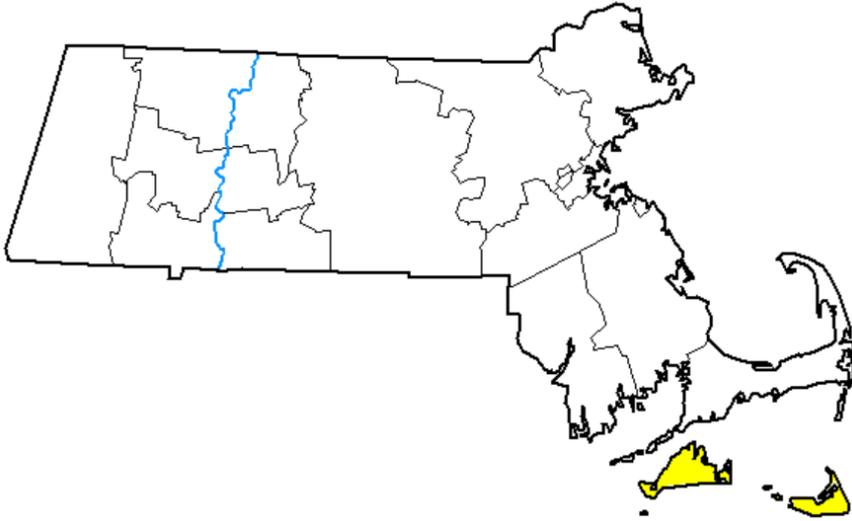
2022 Drought

- *April - January*
 - Drought in varying regions across the state
 - Islands is only region with drought declarations the entire time

2023

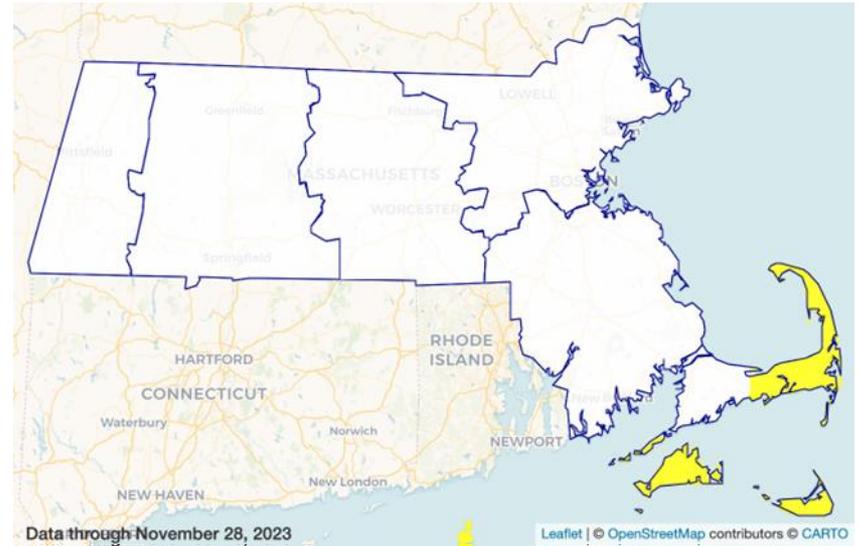
- *February - May*
 - Variable precipitation across the state w/ below-normal on the Islands
 - Some above-normal temperatures including multiple heat waves
 - Fluctuating impacts on streamflow and groundwater in some regions
 - Western and Cape Cod regions declared at Level 1 drought in May
- *June - September*
 - Above-normal precipitation across state w/ mostly normal on the Islands
 - Consistently declining and below-normal groundwater on the Islands and some on the Cape
- *October-November*
 - Below-normal precipitation throughout most of the state
 - Below-normal groundwater on Islands and some on the Cape continue

US Drought Monitor



Data August 9

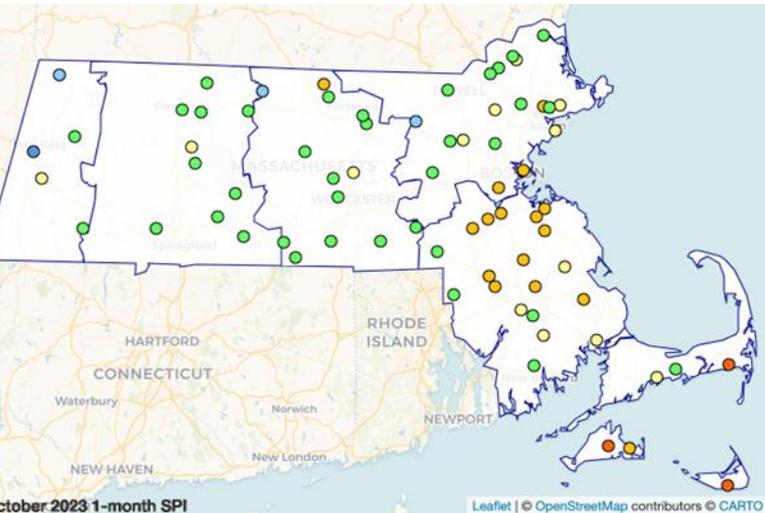
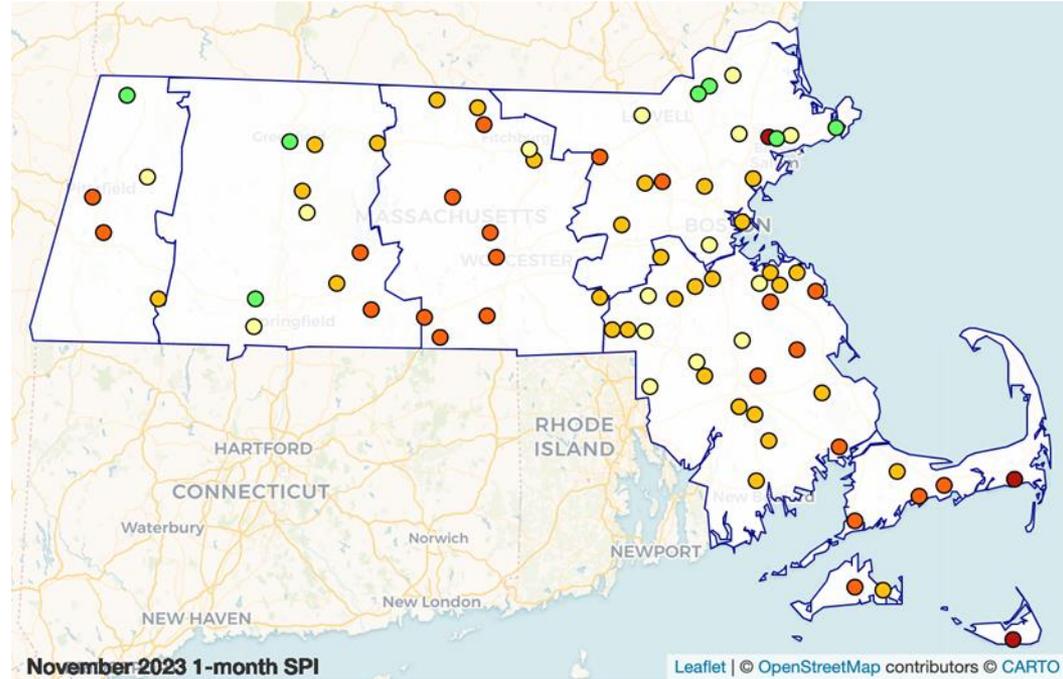
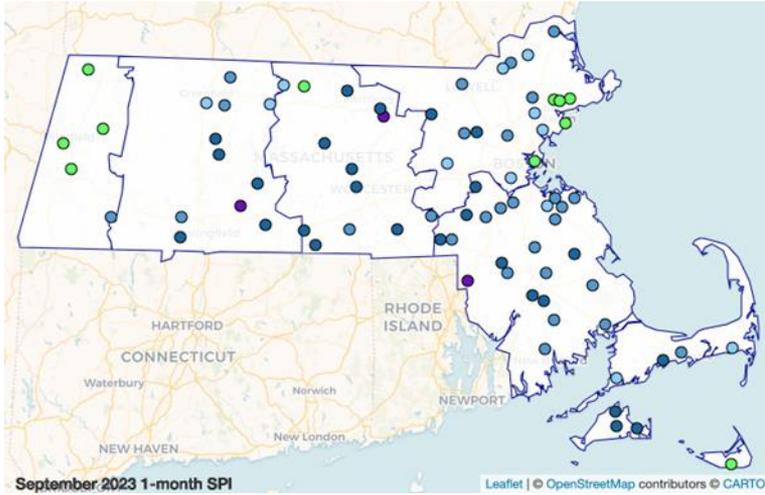
(April 25-July 4 Islands and other regions of state at D0)



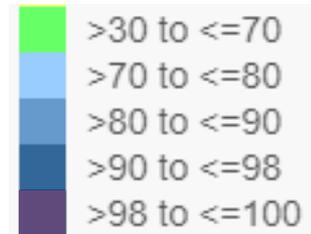
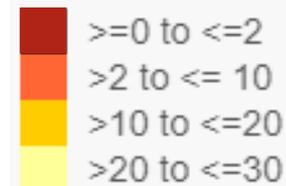
Data through November 14 - December 8, 2023

| | USDM | MA DMP |
|--|-------------|---------------|
| None | 0 | = 1 |
| D0 (Abnormally Dry) | 1 | = 2 |
| D1 (Moderate Drought) | 2,3 | = 3 |
| D2 (Severe Drought) | 4 | = 4 |
| D3 (Extreme Drought) | | |
| D4 (Exceptional Drought) | | |

Standardized Precipitation Index

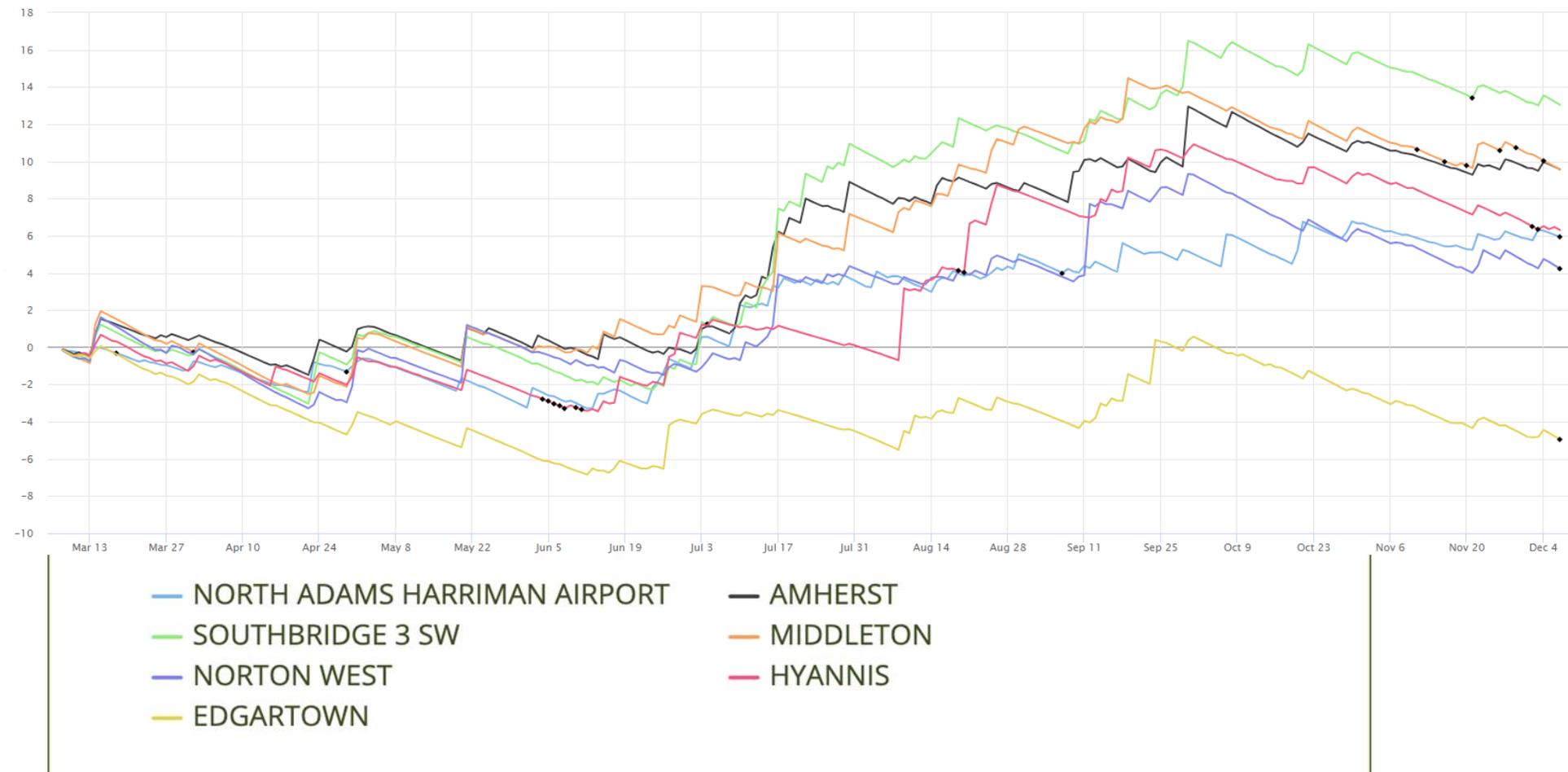


Percentiles



Accumulated Precipitation Departure from 30-Year Average in inches

Black diamonds represent missing values



- Graph does not consider starting condition's wetness/dryness
- Does not show summer heat waves with high ET
- Only 1 station per Drought Region is shown.

Standardized Precipitation Index as Percentile, November

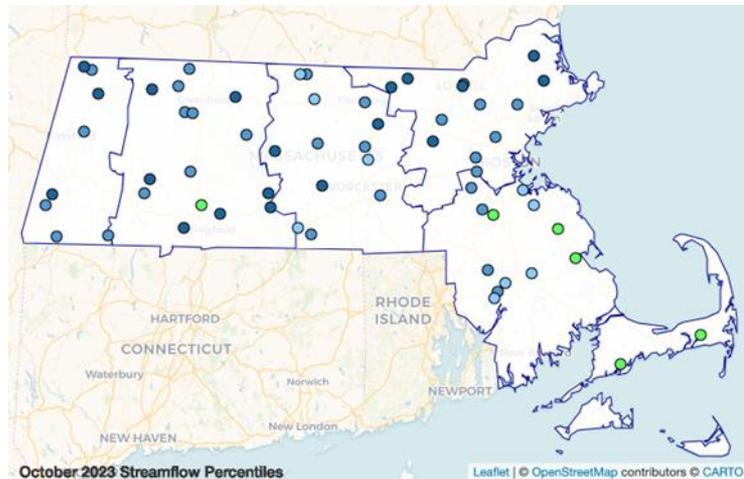
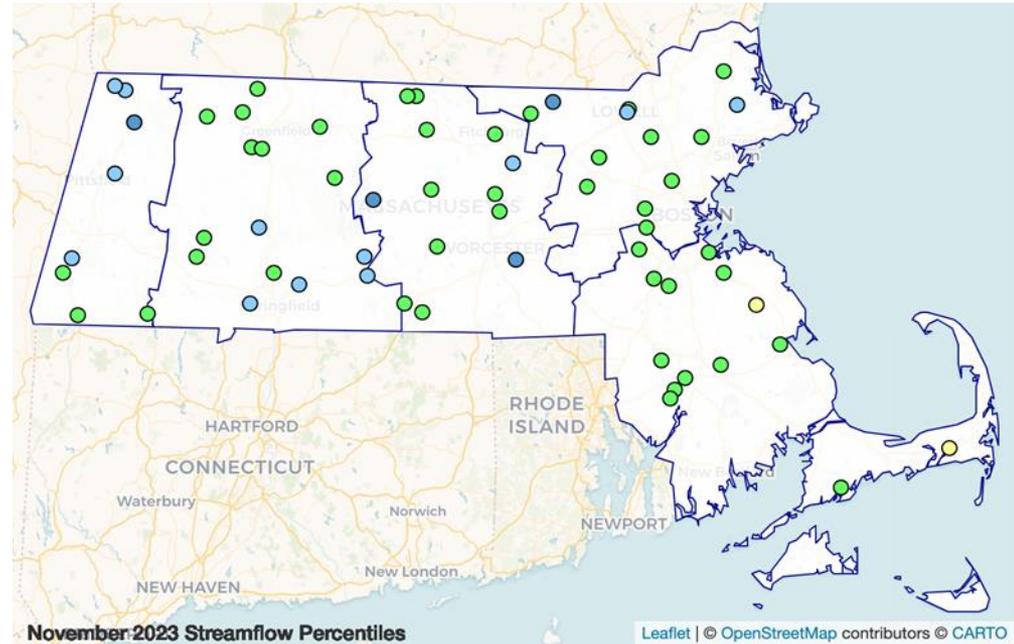
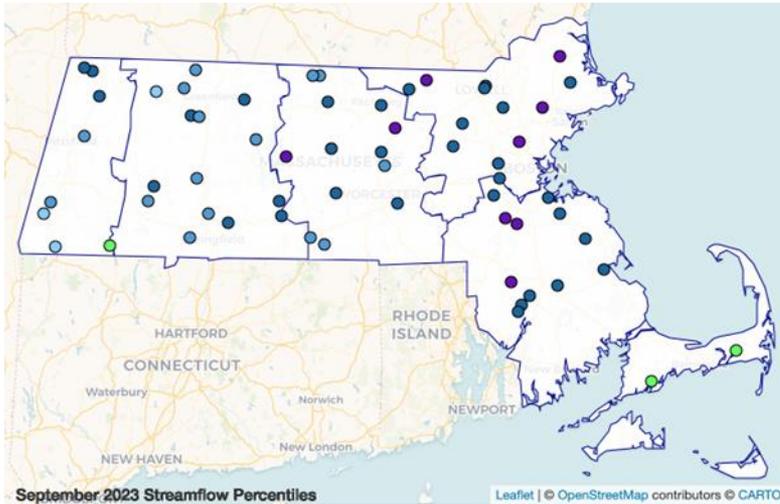
| REGION | NUMBER OF SITES | 1-mo * | 2-mo | 3-mo | 6-mo | 9-mo | 12-mo | 24-mo | 36-mo * |
|-----------|-----------------|--------|------|------|------|------|-------|-------|---------|
| WESTERN | 5 | 12 | 28 | 36 | 87 | 81 | 83 | 65 | 87 |
| CTRV | 10 | 19 | 23 | 63 | 92 | 90 | 91 | 71 | 84 |
| CENTRAL | 12 | 8 | 14 | 67 | 98 | 95 | 97 | 84 | 94 |
| NORTHEAST | 17 | 22 | 17 | 46 | 96 | 95 | 95 | 58 | 86 |
| SOUTHEAST | 26 | 15 | 10 | 46 | 81 | 79 | 82 | 55 | 81 |
| CAPE COD | 5 | 8 | 6 | 30 | 65 | 53 | 74 | 61 | 85 |
| ISLANDS | 3 | 10 | 3** | 38 | 39 | 7 | 18 | 4 | 37 |

* 1- and 36-month SPI is for informational purposes only, not for drought determination. Of the 2- to 24-month look-back periods, the most relevant is selected each month depending on the phase of the drought - onset, during or recovery.

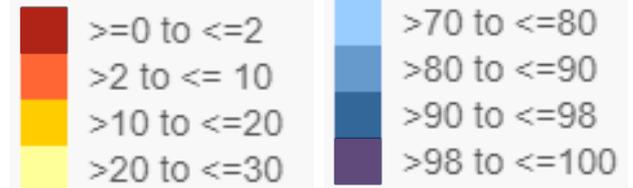
**Two stations are excluded due to uncertainty in the reliability of the data. The State is working with the National Weather Service to resolve these issues.

| Drought Levels | | | | |
|----------------|---------|---------|---------|---------|
| Level 0 | Level 1 | Level 2 | Level 3 | Level 4 |

Streamflow Percentiles of Monthly Median



Percentiles



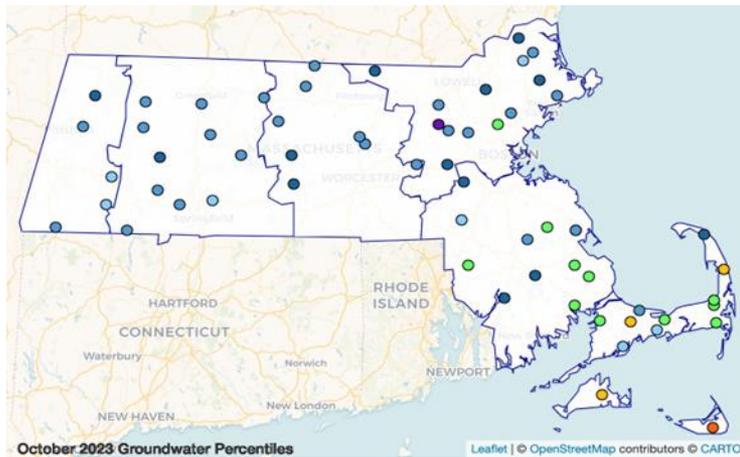
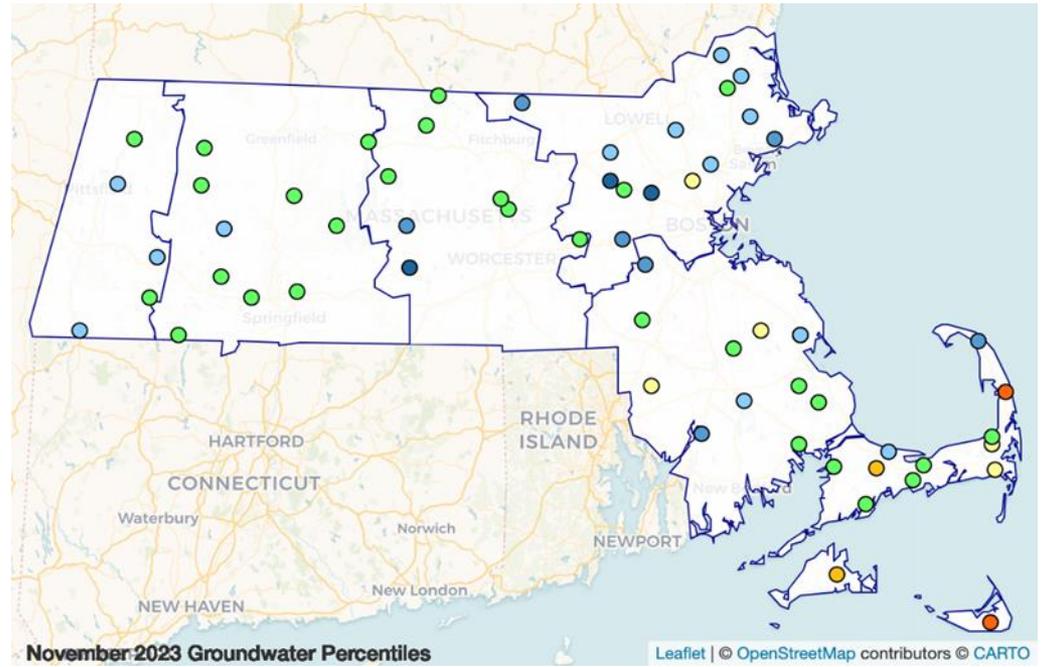
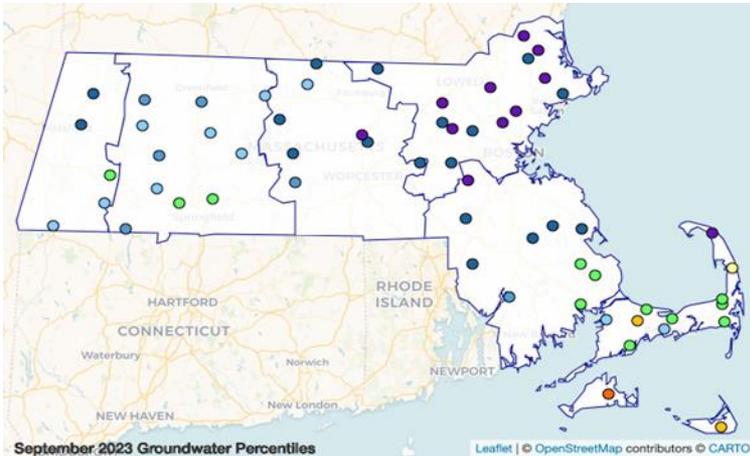
Streamflow Index

| REGION | NUMBER OF GAGES REPORTING | ≥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 | 0 | 0 | 0 | 73 |
| CTRV | 15 | 0 | 0 | 0 | 0 | 0 | 69 |
| CENTRAL | 13 | 0 | 0 | 0 | 0 | 0 | 65 |
| NORTHEAST | 13 | 0 | 0 | 0 | 0 | 0 | 63 |
| SOUTHEAST | 12 | 0 | 0 | 0 | 1 | 0 | 47 |
| CAPE COD | 2 | 0 | 0 | 0 | 1 | 0 | 37 |

Notes: Not all gages report in all months due to ice, beaver dams or other conditions. The Islands region does not have any streamflow gages.

| Drought Levels | | | | |
|----------------|---------|---------|---------|---------|
| Level 0 | Level 1 | Level 2 | Level 3 | Level 4 |

Groundwater Percentiles



Percentiles



Groundwater Index

| REGION | NUMBER OF WELLS REPORTING | ≥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 | 0 | 0 | 75 |
| CTRV | 10 | 0 | 0 | 0 | 0 | 0 | 60 |
| CENTRAL | 8 | 0 | 0 | 0 | 0 | 1 | 62 |
| NORTHEAST | 14 | 0 | 0 | 0 | 1 | 2 | 76 |
| SOUTHEAST | 12 | 0 | 0 | 0 | 2 | 0 | 58 |
| CAPE COD | 11 | 0 | 1 | 1 | 2 | 0 | 47 |
| ISLANDS | 2 | 0 | 1 | 1 | 0 | 0 | 12 |

| Drought Levels | | | | |
|----------------|---------|---------|---------|---------|
| Level 0 | Level 1 | Level 2 | Level 3 | Level 4 |

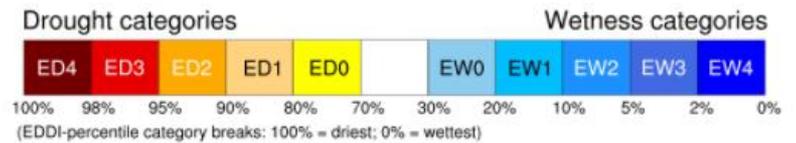
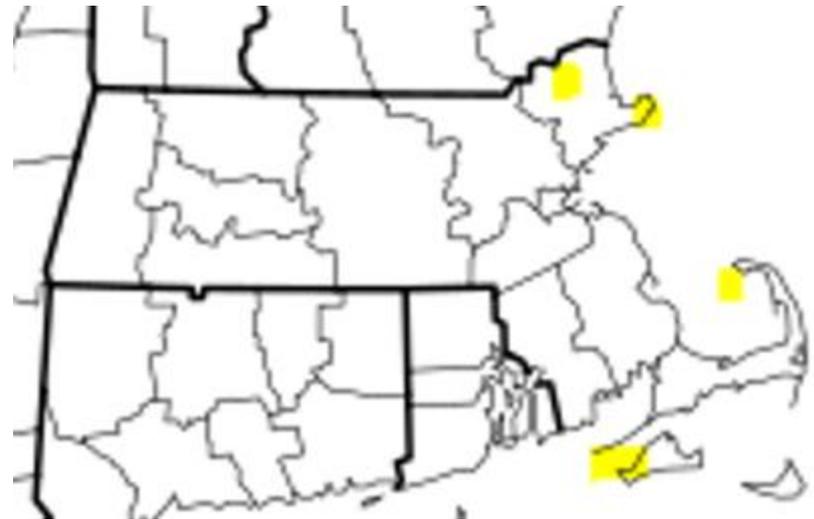
Evapotranspiration

CMI week ending November 25th

| CLIMATE DIVISION | CROP MOISTURE INDEX |
|------------------|---------------------|
| WESTERN | 0.84 |
| CENTRAL | 1.15 |
| COASTAL | 1.06 |

2-month EDDI*

Map dated November 30th

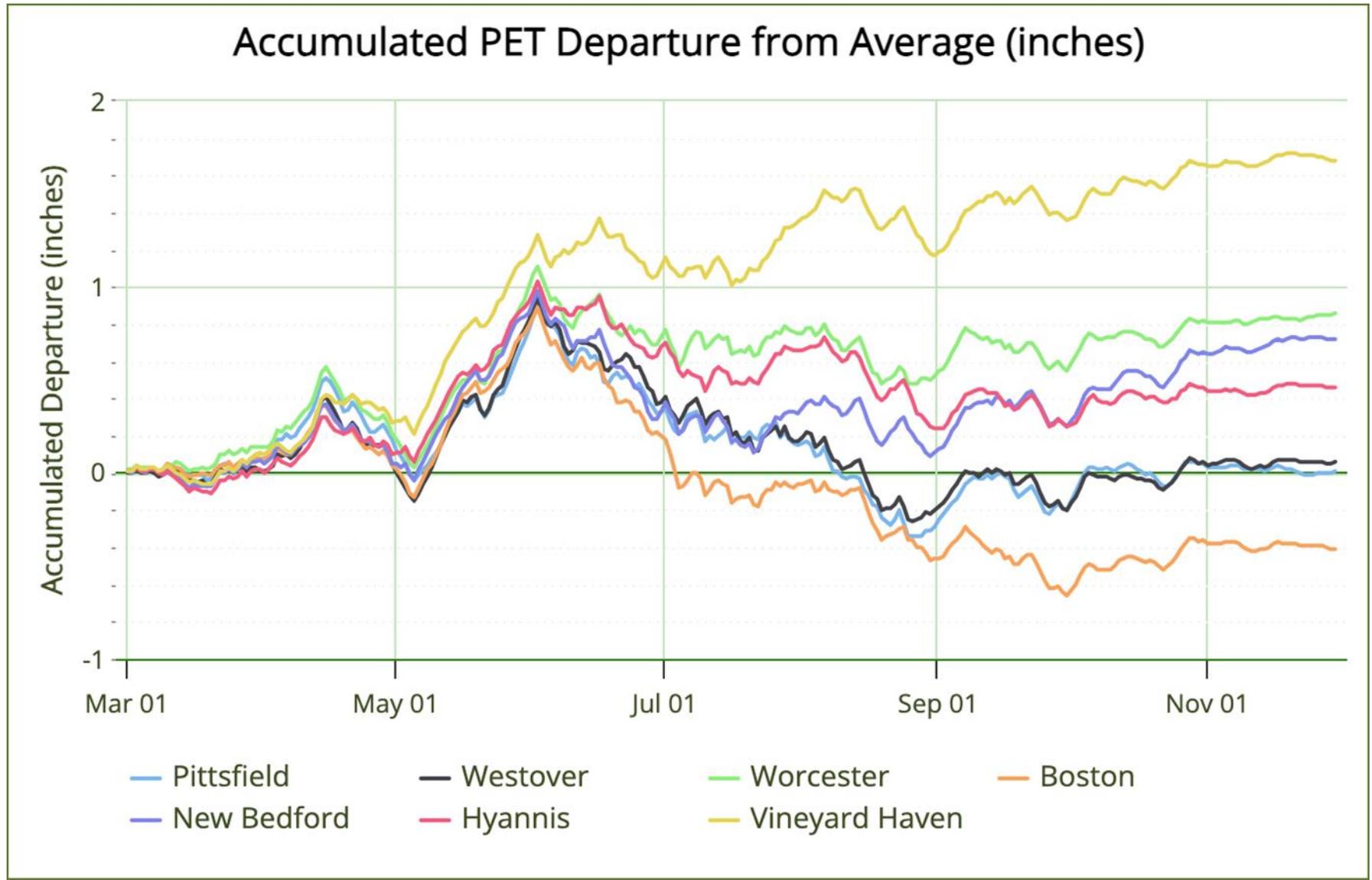


Generated by NOAA/ESRL/Physical Sciences Laboratory

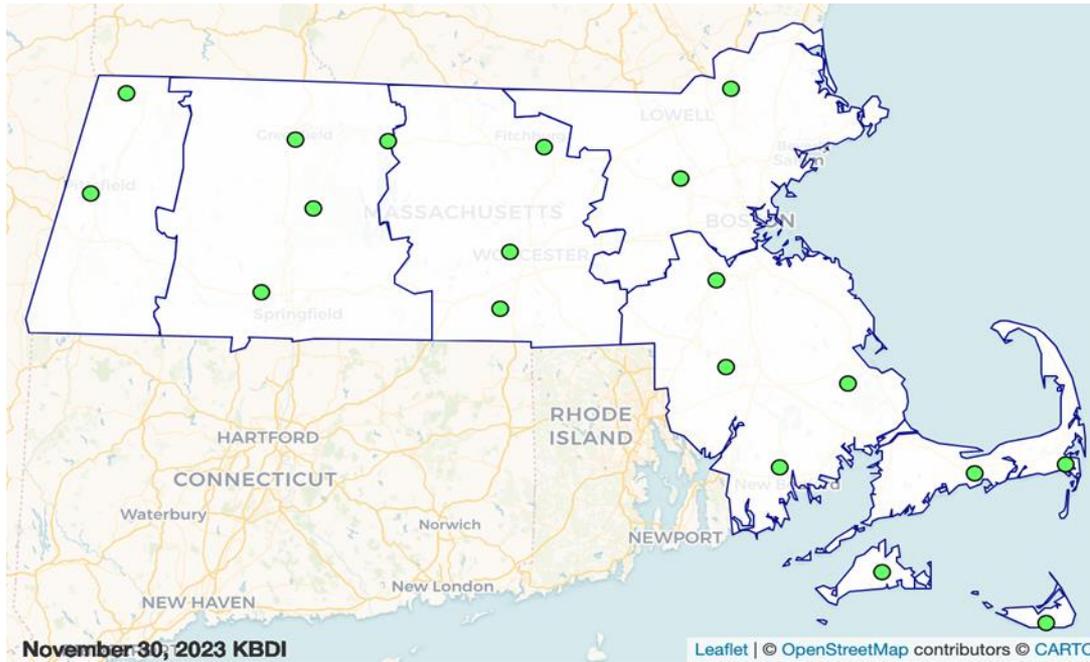
*See warning regarding the potential for EDDI to be showing higher values than observed data. <https://psl.noaa.gov/eddi/warn.html>

Accumulated Potential Evapotranspiration Departure from 30-Year Average in inches

Accumulated Potential Evapotranspiration Departure from Average (Inches) since March 1, 2023



KBDI - Top 8 inches of soil moisture

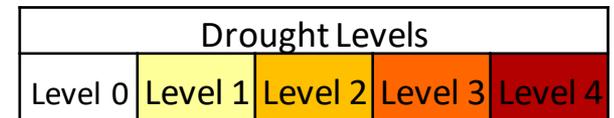


Point Values - KBDI Range



| REGION | NUMBER OF SITES REPORTING | HIGHEST OF SITE VALUES |
|-----------|---------------------------|------------------------|
| WESTERN | 2 | 0 |
| CTRV | 4 | 1 |
| CENTRAL | 3 | 1 |
| NORTHEAST | 2 | 0 |
| SOUTHEAST | 4 | 3 |
| CAPE COD | 2 | 78 |
| ISLANDS | 2 | 93 |

Drought Levels



Lakes & Impoundments

| REGION | NUMBER OF SITES REPORTING | MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT FULL |
|-----------|---------------------------|--|
| WESTERN * | | |
| CTRV | 2 | 80th |
| CENTRAL | 4 | 70th |
| NORTHEAST | 4 | 84th |
| SOUTHEAST | 2 | 66th |
| CAPE COD | 1 | 33rd |

Notes:

DMP index severity levels do not necessarily reflect water supply status.

**Not enough data from regions to allow for the calculation of median values*

| Drought Levels | | | | |
|----------------|---------|---------|---------|---------|
| Level 0 | Level 1 | Level 2 | Level 3 | Level 4 |

Drought Indices by Region, November 2023

| Drought Index | Western | CT River Valley | Central | Northeast | Southeast | Cape | Islands |
|------------------------|---------|-----------------|---------|-----------|-----------|---------|---------|
| Precipitation (2 mos) | 28 | 23 | 14 | 17 | 10 | 6 | 3*** |
| Streamflow | 73 | 69 | 65 | 63 | 47 | 37 | N/A |
| Groundwater | 75 | 60 | 62 | 76 | 58 | 47 | 12 |
| Lakes/ Impoundments | ID | 80th | ID | ID | 66th | 33rd | N/A |
| ET*- CMI EDDI | 0 0 | 0 0 | 0 0 | 0 0 | 0 0 | 0 0 | 0 0 |
| KBDI** | Level 0 | Level 0 | Level 0 | Level 0 | Level 0 | Level 0 | Level 0 |

| | | | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| <i>Recommend (12/11 meeting)</i> | <i>Level 0</i> | <i>Level 2</i> |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|

Lakes & Impoundments Index does not reflect water supply status. This summary is provided for informational purposes. No changes in drought status are official until the Secretary of the Executive Office of Energy and Environmental Affairs makes the final drought declaration for the state after receiving a recommendation from the Drought Management Task Force. Data are preliminary and not final until all data are reported. N/A = not applicable. ID = insufficient data.*ET not reported, Nov-Mar, outside growing season **KBDI not reported, Nov-Mar, outside fire danger season. ***Two stations are excluded due to uncertainty in the reliability of the data. The State is working with the National Weather Service to resolve these issues.

| Drought Levels | | | | |
|----------------|---------|---------|---------|---------|
| Level 0 | Level 1 | Level 2 | Level 3 | Level 4 |