

# Hydrologic Conditions in Massachusetts for mid-July 2022

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DCR Office of Water Resources

## **Drought Management Task Force**

July 21, 2022

Meeting Co-Chairs: EOEEA, MEMA



# MA Drought Management Plan Indices

Numbers in parentheses indicate number of data points across the state



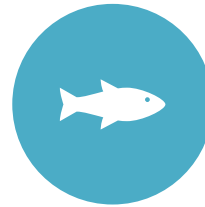
Precipitation (93)



Streamflow (59)



Groundwater (63)



Lakes and  
Impoundments (20)



KBDI - Fire Danger  
(16)



Crop Moisture  
(national map)

# MA Drought Management Plan

## Index Severity Levels

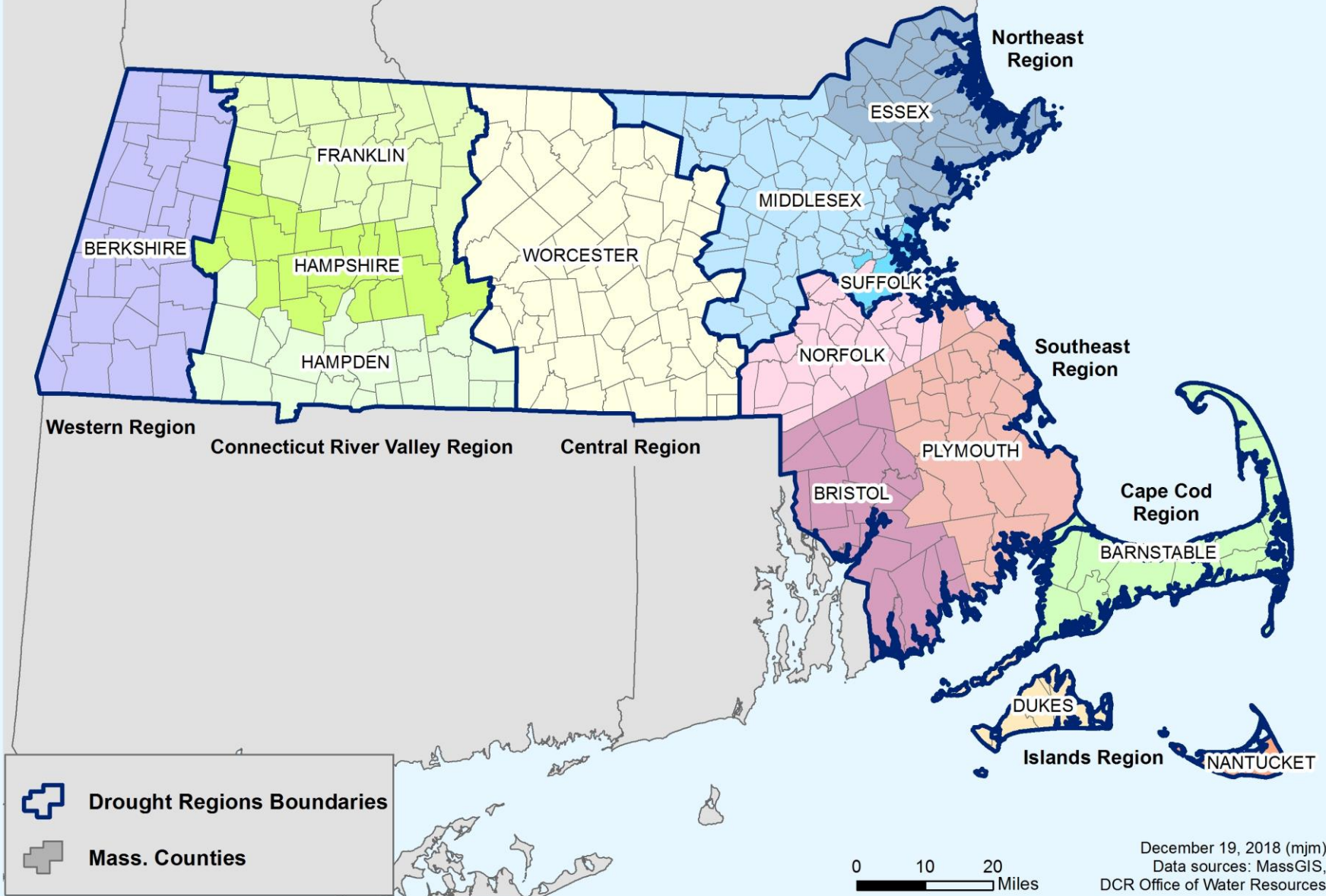
Index Severity Level	Percentiles for: Precipitation, Streamflow, Lakes and Impoundments and Groundwater	Keetch-Byram Drought Index	Crop Moisture Index
0	>30 <sup>th</sup> percentile	< 200	> -1.0
1	≤30 and >20	200-400	≤-1.0 and > -2.0
2	≤20 and >10	400-600	≤-2.0 and < -3.0
3	≤10 and >2	600-700	≤ -3.0 and > -4.0
4	≤2	700-800	≤-4.0

# MA Drought Management Plan

## Drought Levels



# MASSACHUSETTS DROUGHT REGIONS with Counties



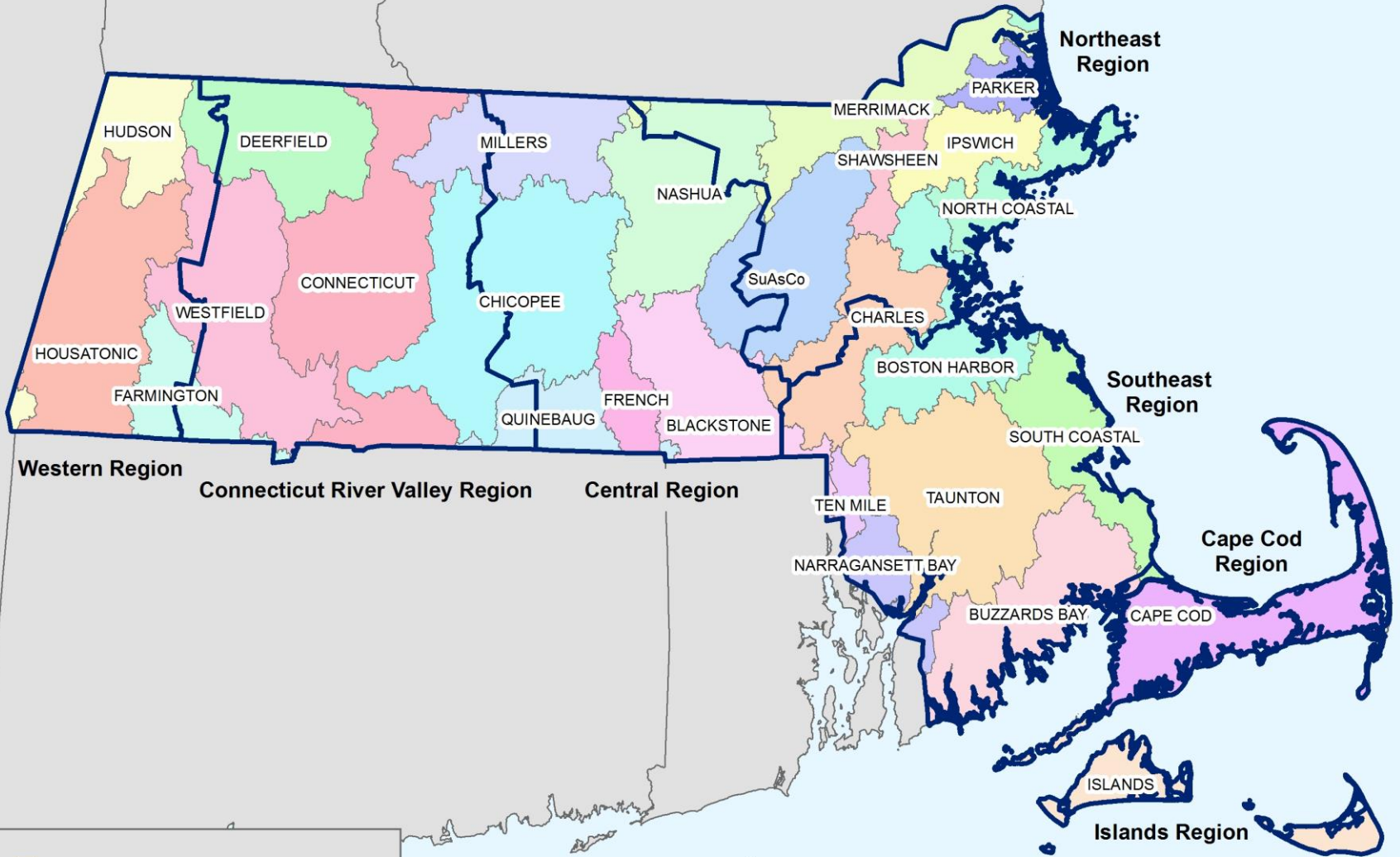
-  Drought Regions Boundaries
-  Mass. Counties

0 10 20  
Miles

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

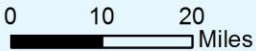


# MASSACHUSETTS DROUGHT REGIONS with Watersheds



 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



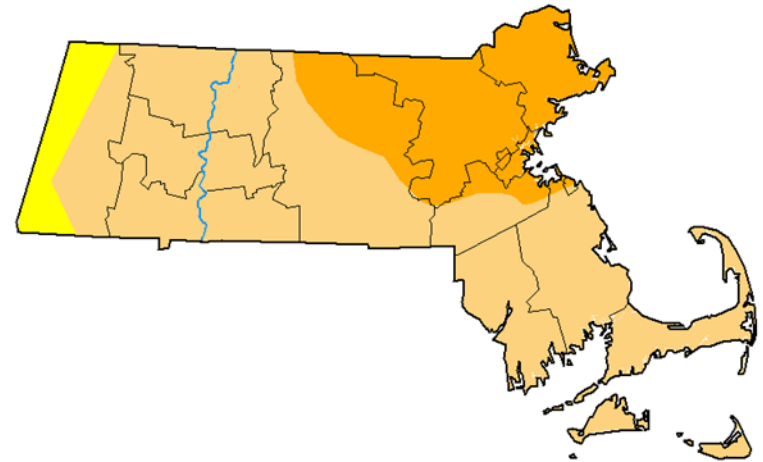
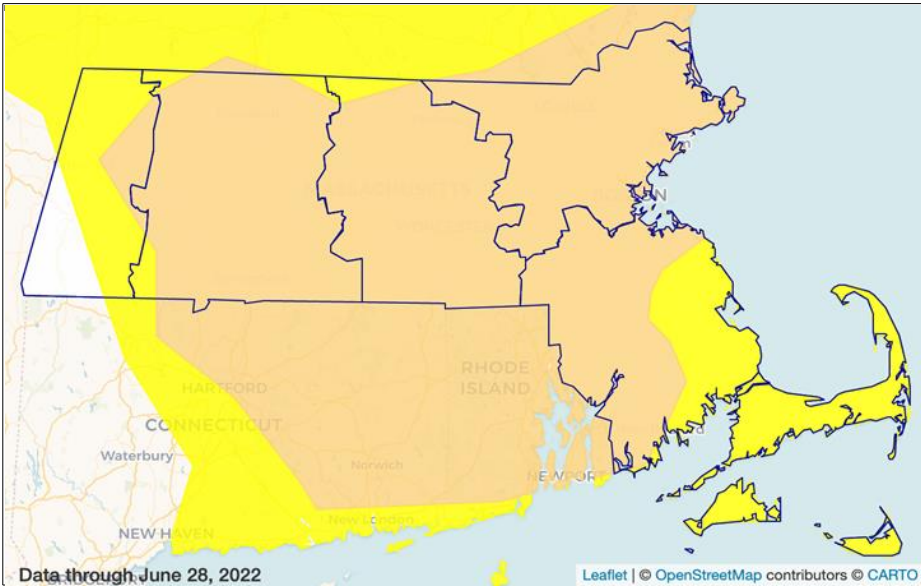
Public Health  
Impacts

# Recent Hydrologic History

- 2022
  - January through April
    - variable precipitation with scattered, minimal impacts until April when first drought levels called
  - May
    - continued low precipitation plus increased ET especially in NE and SE
    - flash drought in NE with 2 category jump?
  - July
    - minimal precipitation with high temperatures



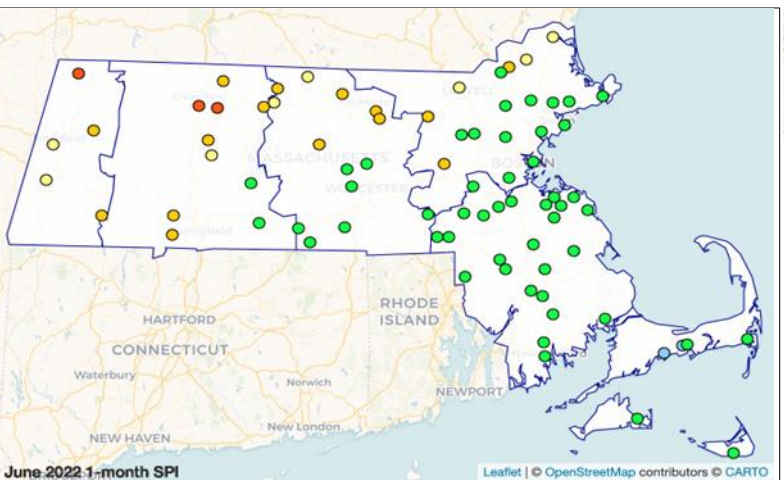
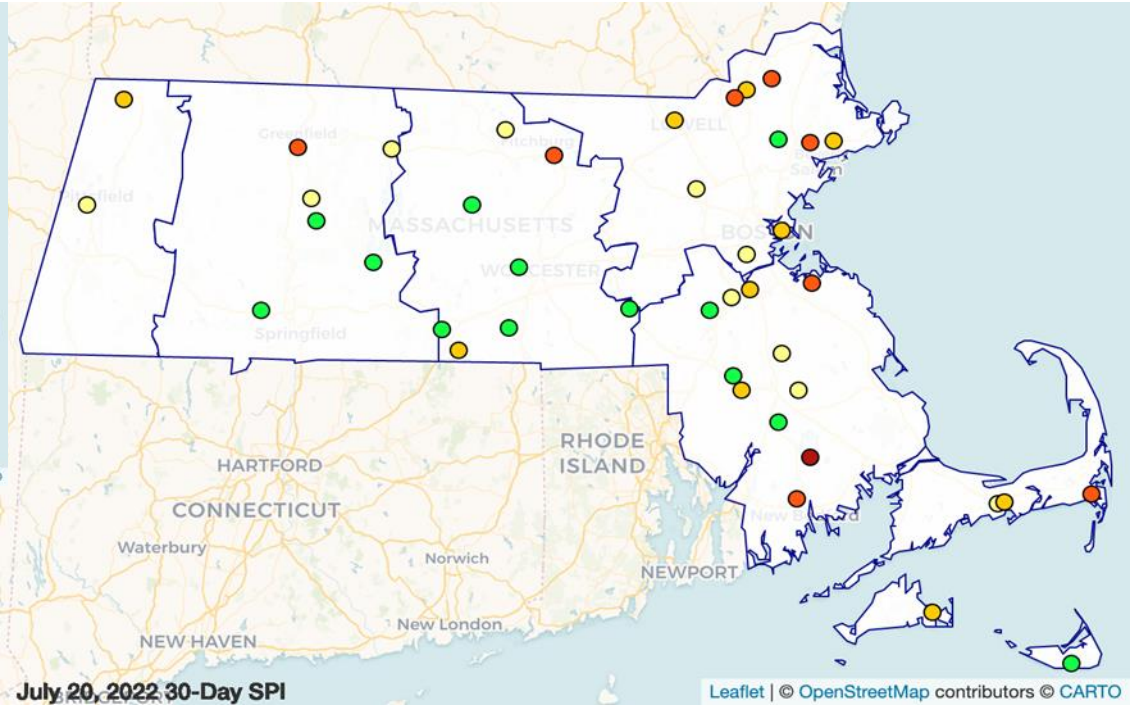
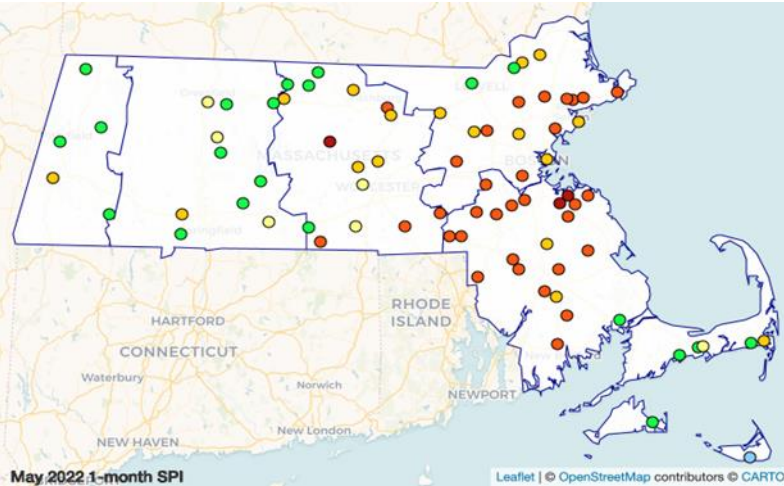
# US Drought Monitor



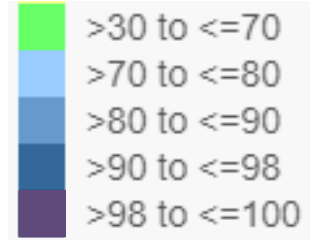
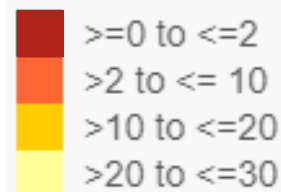
- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)

USDM	=	MA DMP
0	=	1
1	=	2
2,3	=	3
4	=	4

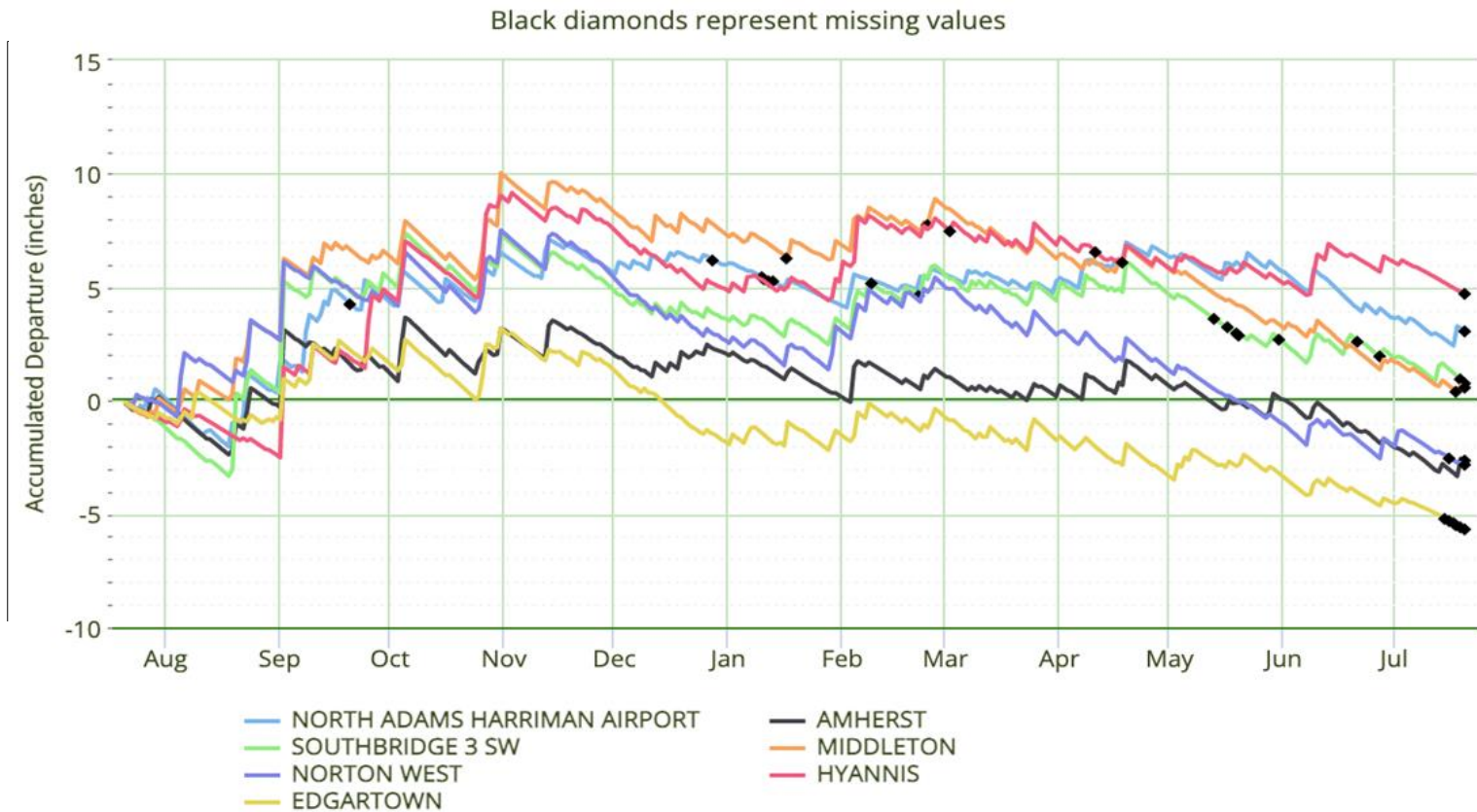
# Standardized Precipitation Index, 1 month



## Percentiles



# Accumulated Precipitation Departure from 30-Year Average in inches



- 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.

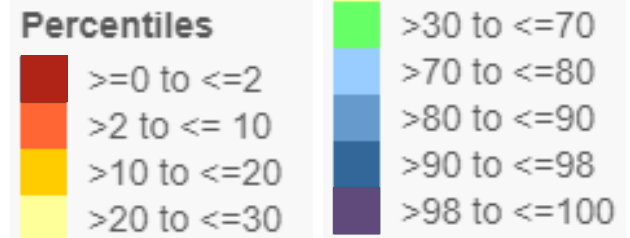
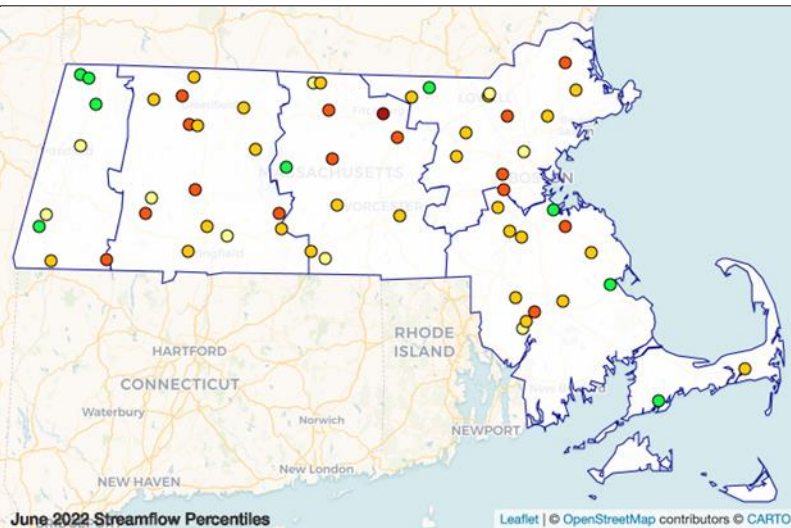
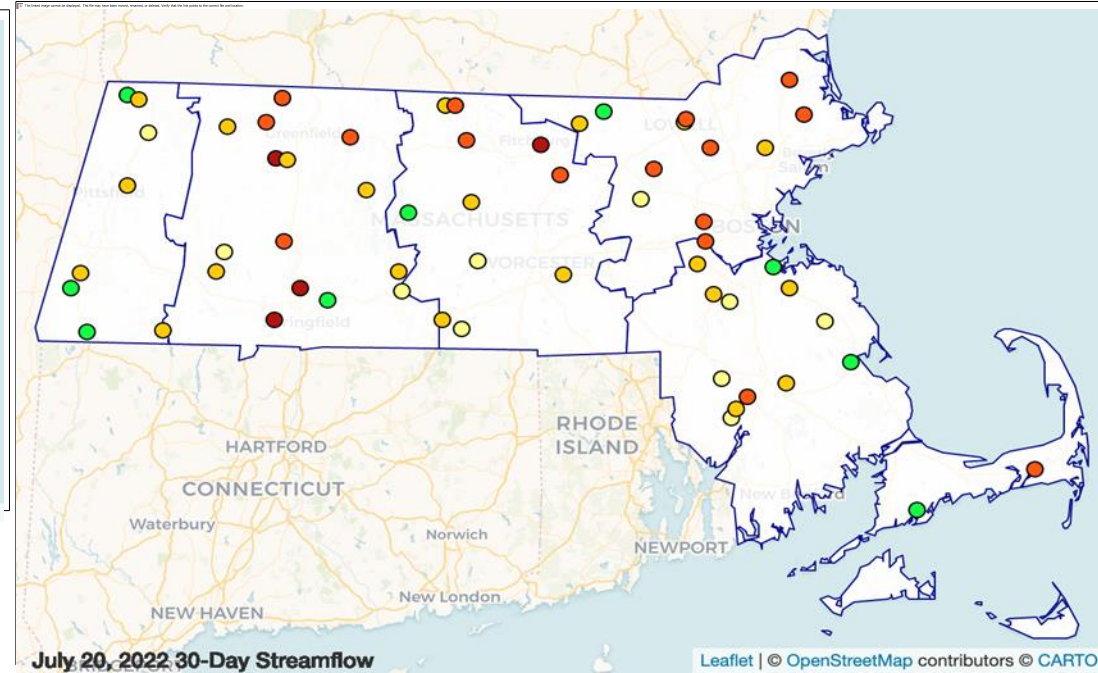
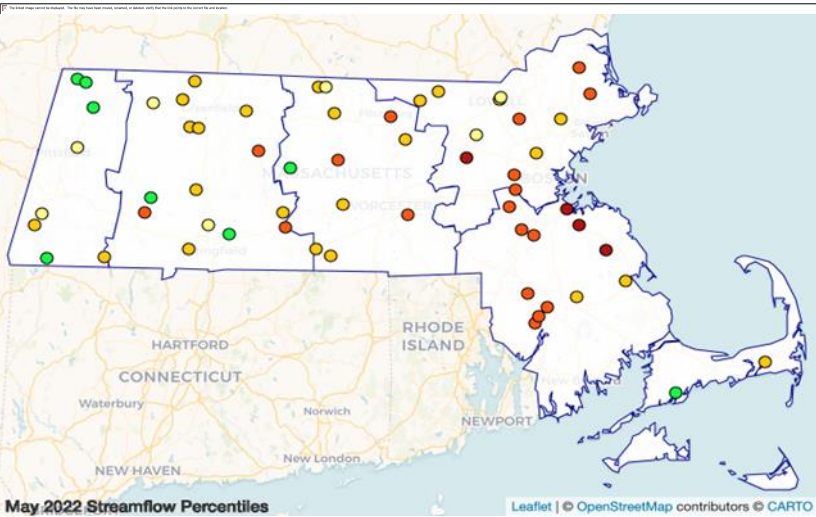
# Standardized Precipitation Index as Percentile, mid-July

REGION	NUMBER OF SITES	30-day	60-day	90-day	180-day	270-day	365-day	730-day	1095-day
WESTERN	2	20	19	13	41	48	79	81	65
CTRV	6	30	21	10	22	27	43	72	64
CENTRAL	8	32	27	7	25	34	58	81	76
NORTHEAST	10	15	18	6	10	18	42	62	63
SOUTHEAST	11	21	22	7	15	19	41	57	43
CAPE COD	3	17	32	10	10	38	66	26	30
ISLANDS	2	30	28	35	32	24	25	22	-999

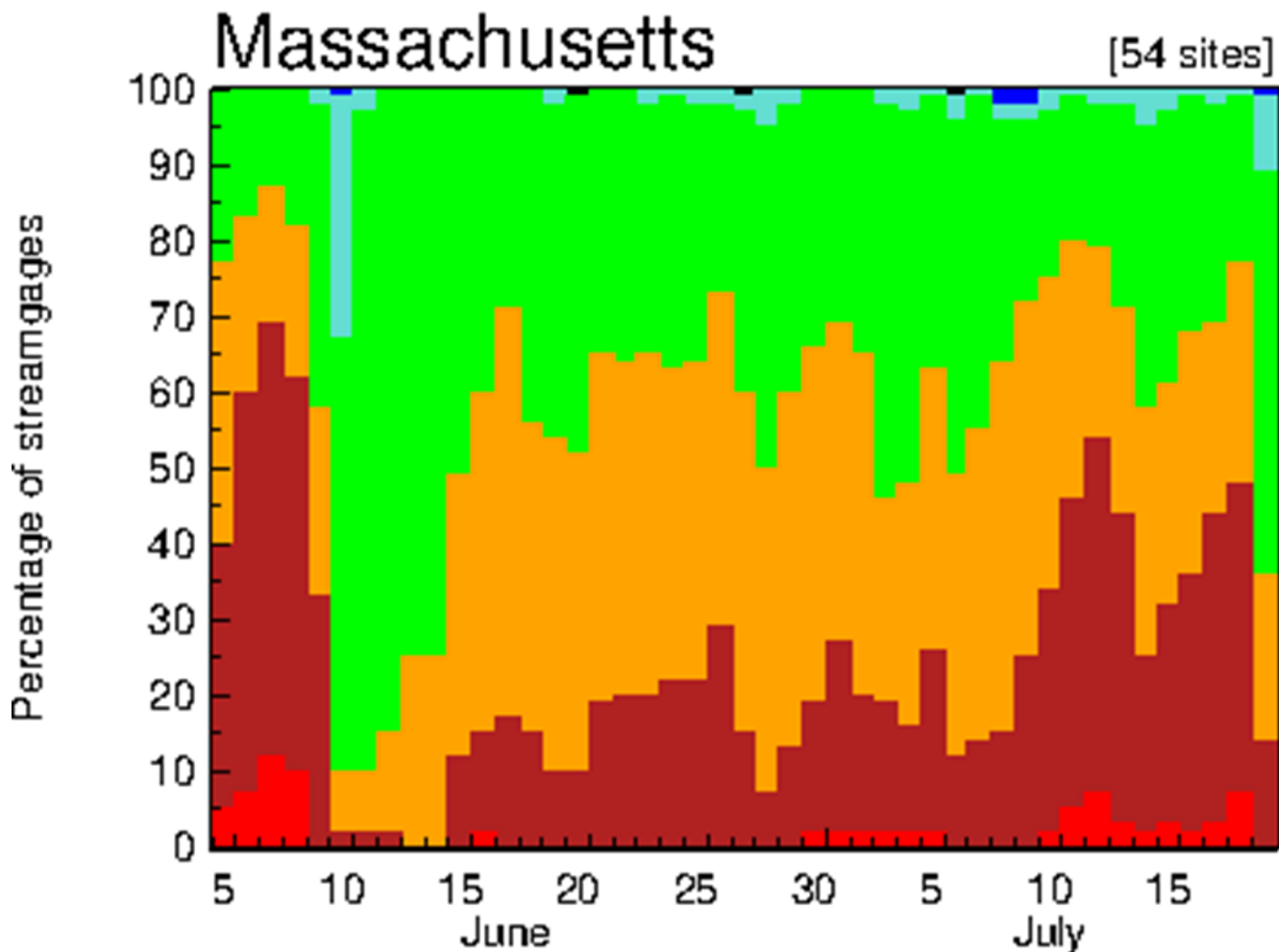
\* 1- and 36-month SPI is for informational purposes only, not for drought determination. Of the 2- to 24-month look-back periods, the most relevant is selected each month depending on the phase of the drought - onset, during or recovery.

Index Severity Levels				
Level 0	Level 1	Level 2	Level 3	Level 4

# Streamflow Percentiles of Monthly Median



# Percent of Gages at Various Percentiles



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			

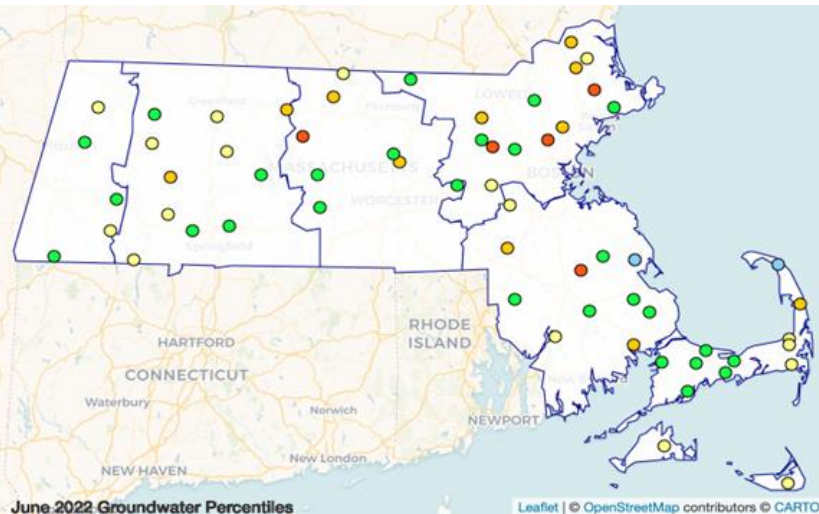
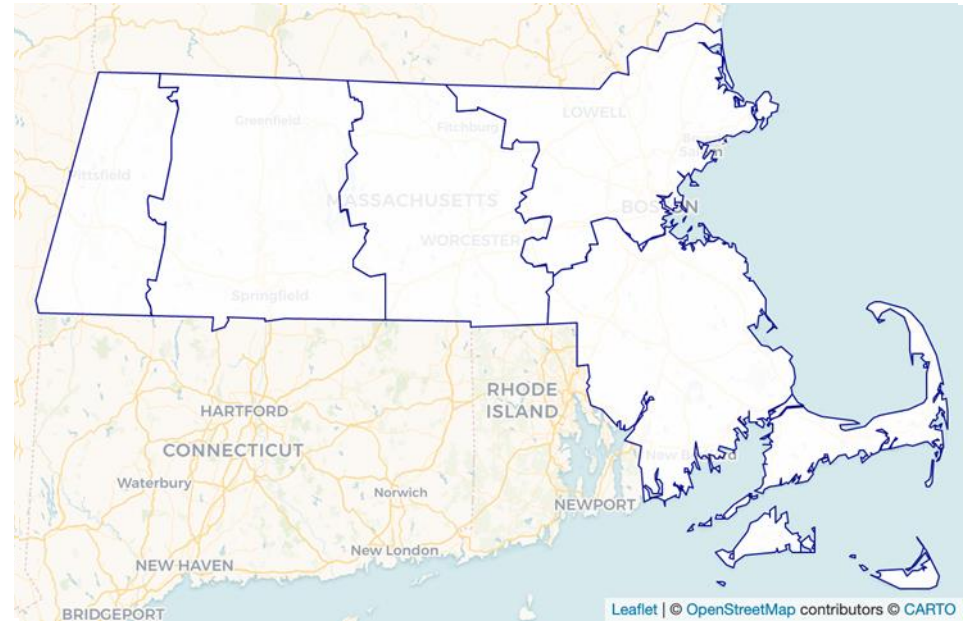
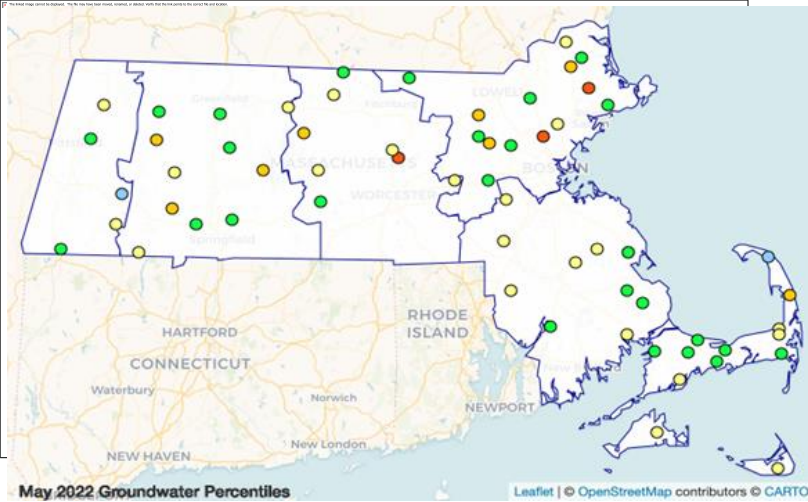
# Streamflow Index mid-July

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	4	1	0	23
CTRV	15	3	4	5	2	0	14
CENTRAL	11	1	3	4	2	0	18
NORTHEAST	12	0	7	3	1	0	9
SOUTHEAST	12	0	1	5	4	0	21
CAPE COD	2	0	1	0	0	0	26

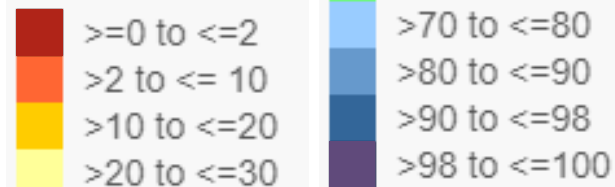
Notes: Not all gages report in all months due to ice, beaver dams or other conditions. The Islands region does not have any streamflow gages.

Index Severity Levels				
Level 0	Level 1	Level 2	Level 3	Level 4

# Groundwater Percentiles



## Percentiles





# Groundwater Index

Region	Index Severity Level
West	0
CTRV	2
Central	1
Northeast	2
Southeast	0
Cape Cod	0
Islands	1

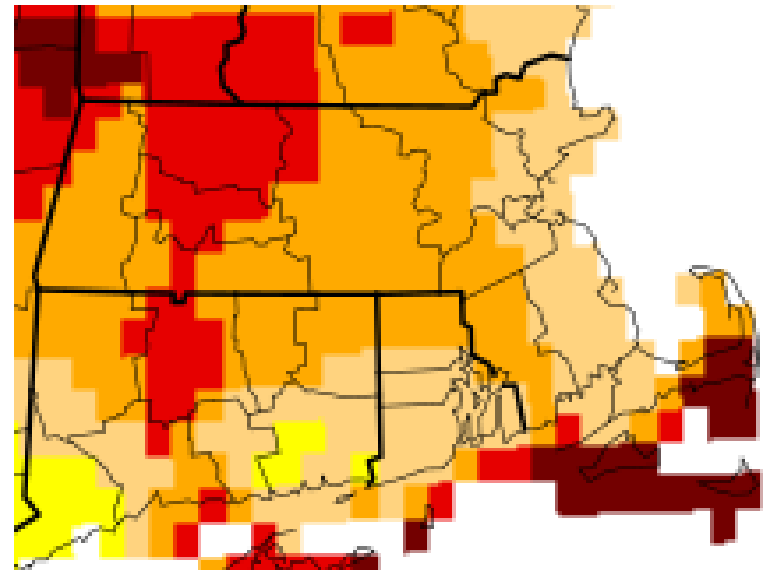
Index Severity Levels				
Level 0	Level 1	Level 2	Level 3	Level 4

# Evapotranspiration

CMI week ending July 16th

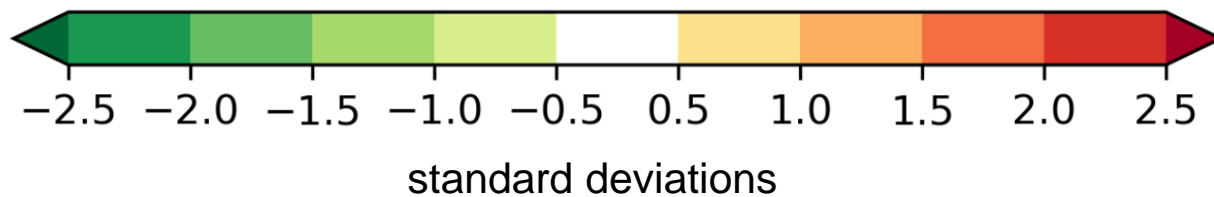


2-month EDDI  
Map dated July 14th

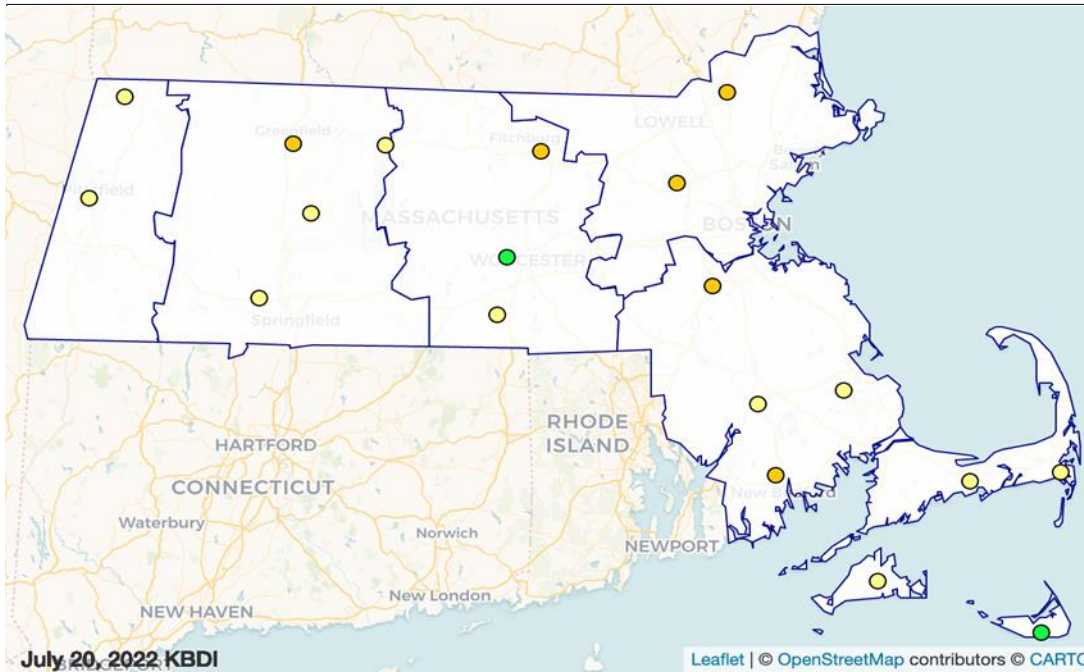


# EDDI Forecast for July and August 2022

<https://www.ncdc.noaa.gov/temp-and-precip/drought/recovery/eddi>



# KBDI - Top 8 inches of soil moisture



**Point Values - KBDI Range**

● ≥700 to ≤800	● ≥600 to <700	● ≥400 to <600	● ≥200 to <400	● ≥0 to <200
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REGION	NUMBER OF SITES REPORTING	HIGHEST OF SITE VALUES
WESTERN	2	328
CTRV	4	461
CENTRAL	3	456
NORTHEAST	2	459
SOUTHEAST	4	454
CAPE COD	2	290
ISLANDS	2	282

**Index Severity Levels**

Level 0	Level 1	Level 2	Level 3	Level 4
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# Lakes & Impoundments

REGION	NUMBER OF SITES REPORTING	MEDIAN OF INDIVIDUAL PERCENTILES OR PERCENT FULL
WESTERN	0	
CTRV	0	
CENTRAL	1	7th
NORTHEAST	1	15th
SOUTHEAST	0	
CAPE COD	1	37th

Notes:

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

Index Severity Levels				
Level 0	Level 1	Level 2	Level 3	Level 4

# Drought Indices by Region – June 2022

Drought Index	Western	CT River Valley	Central	Northeast	Southeast	Cape	Islands
Precipitation	16	15	15	13	19	51	53
Streamflow	29	13	13	11	17	33	N/A
Groundwater	39	23	29	21	36	36	24
Lakes/ Impoundments	ND	Level 0	Level 1	Level 2	Level 0	Level 0	N/A
ET- CMI   EDDI	Level 0   3	Level 0   3	Level 0   2	Level 0   2	Level 0   2	Level 0   2	Level 0   2
KBDI	Level 1	Level 1	Level 1	Level 1	Level 1	Level 0	Level 0
<b><i>Effective 6/1 (7/11 meeting)</i></b>	<b><i>Level 1</i></b>	<b><i>Level 2</i></b>	<b><i>Level 2</i></b>	<b><i>Level 2</i></b>	<b><i>Level 2</i></b>	<b><i>Level 0</i></b>	<b><i>Level 1</i></b>

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 Drought Management Task Force convenes and makes a recommendation accepted by Secretary of the Executive Office of Energy and Environmental Affairs. Data are preliminary and not final until all data are reported.

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

# Drought Indices by Major Basin – mid-July 2022

Basin	Millers	Nashua
Precipitation	3	3
ET (EDDI)	3	3
Streamflow	3	4
Groundwater	2	2
KBDI	2	2
<b>Recommended 07/21/22</b>	3	3

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

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# Drought Indices by Region – mid-July 2022

Drought Index	Western	CT River Valley	Central	Northeast	Southeast	Cape	Islands
Precipitation	13	10	7	6	7	10	35
Streamflow	23	14	18	9	21	26	N/A
Groundwater	Level 0	Level 2	Level 1	Level 2	Level 0	Level 0	Level 1
Lakes/ Impoundments	ND	ND	Level 3	Level 2	ND	Level 0	N/A
ET- CMI   EDDI	Level 0   3	Level 0   3	Level 0   3	Level 1   3	Level 1   3	Level 1   4	Level 1   4
KBDI	Level 1	Level 2	Level 2	Level 2	Level 2	Level 1	Level 1
<b><i>Recommend 7/15 (7/21 meeting)</i></b>	<b><i>Level 1</i></b>	<b><i>Level 2</i></b>	<b><i>Level 2/3</i></b>	<b><i>Level 3</i></b>	<b><i>Level 2</i></b>	<b><i>Level 1</i></b>	<b><i>Level 1</i></b>
<b><i>Effective 6/1 (7/11meeting)</i></b>	<b><i>Level 1</i></b>	<b><i>Level 2</i></b>	<b><i>Level 2</i></b>	<b><i>Level 2</i></b>	<b><i>Level 2</i></b>	<b><i>Level 0</i></b>	<b><i>Level 1</i></b>

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.

***Some indices' data are based on fewer measurements than for typical monthly reporting.***

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