

# **Current Hydrologic Conditions in Massachusetts**

## **Drought Management Task Force**

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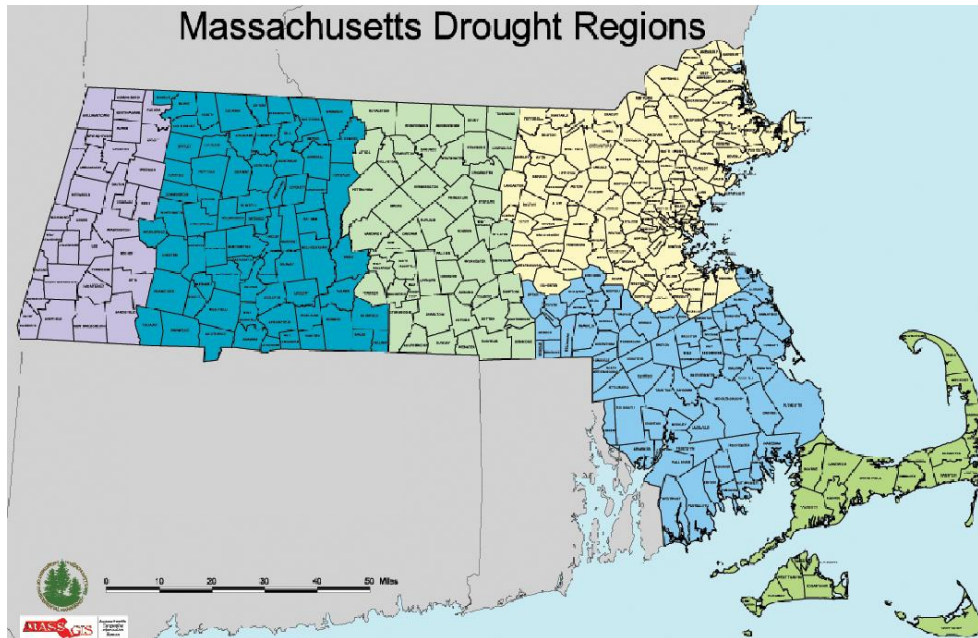
July 12, 2018

# MA Drought Management Plan

Drought Indicators
Precipitation
Precipitation
Streamflow
Groundwater
Reservoirs
Crop Moisture
Fire Danger



Drought Levels
Normal
Advisory
Watch
Warning
Emergency



Western
Connecticut River Valley
Central
Northeast
Southeast
Cape and Islands

# Precipitation Indices

Drought Level	Standardized Precipitation Index	Precipitation
Normal	3-month > -1.5 <u>or</u> 6-month > -1.0 <u>or</u> 12-month > -1.0	1 month below normal
Advisory	3-month = -1.5 to -2.0 <u>or</u> 6-month = -1.0 to -1.5 <u>or</u> 12-month = -1.0 to -1.5	2 month cumulative below 65% of normal
Watch	3-month < -2.0 <u>or</u> 6-month = -1.5 to -3.0 <u>or</u> 12-month = -1.5 to -2.0	1 of the following criteria met: 3 month cum. < 65% <u>or</u> 6 month cum. < 70% <u>or</u> 12 month cum. < 70%
Warning	6-month < -3.0 <u>or</u> 12-month = -2.0 to -2.5	1 of the following criteria met: 3 month cum. < 65% and 6 month cum. <65%, <u>or</u> 6 month cum. <65% and 12 month cum. <65%, <u>or</u> 3 month cum. <65% and 12 month cum. <65%
Emergency	12-month < -2.5	Same criteria as Warning and previous month was Warning or Emergency

# Streamflow Index

Drought Level	Streamflow Index*
Normal	1 month below normal
Advisory	At least 2 out of 3 consecutive months below normal
Watch	At least 4 out of 5 consecutive months below normal
Warning	At least 6 out of 7 consecutive months below normal
Emergency	Greater than 7 months below normal

\*Below normal = within the lowest 25<sup>th</sup> percentile of the period of record for a given month

# Groundwater Index

Drought Level	Groundwater Index*
Normal	2 consecutive months below normal
Advisory	3 consecutive months below normal
Watch	4 to 5 consecutive months below normal
Warning	6 to 7 consecutive months below normal
Emergency	Greater than 8 months below normal

\*Below normal = within the lowest 25<sup>th</sup> percentile of the period of record for a given month

# Reservoir Index

Drought Level	Reservoir Index*
Normal	Reservoir levels at or near normal for the time of year
Advisory	Small index reservoirs below normal
Watch	Medium index reservoirs below normal
Warning	Large index reservoirs below normal
Emergency	Continuation of previous month's conditions

Below normal = 1 standard deviation from the average value in the same months in other years in the period of record

\*Water suppliers should be consulted to determine if below normal reservoir conditions are due to operational issues

# Crop Moisture and Fire Danger Indices

Drought Level	Crop Moisture Index*	Keetch-Byram Drought Index (KBDI)
Normal	0 to -1.0 Slightly dry	less than 200
Advisory	-1 to -1.9 Abnormally dry	200 to 400
Watch	-2 to -2.9 Excessively dry	400 to 600
Warning	< -2.9 Severely dry	600 to 800
Emergency	< -2.9 Severely dry	600 to 800

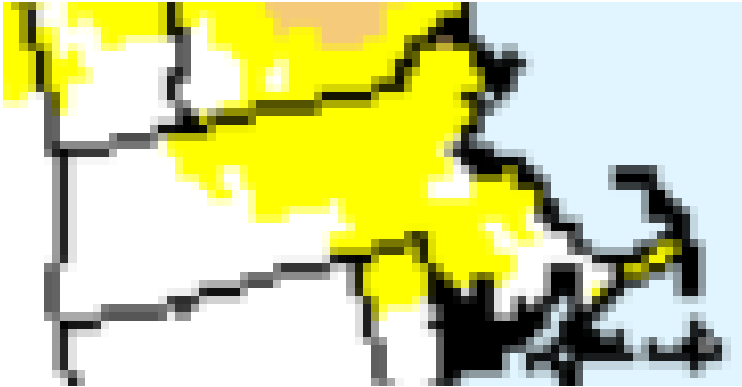
\* The Crop Moisture Index is subject to frequent change. The drought level for this indicator is determined based on the repeated or extended occurrence at a given level.

# Overview

- Mid-April: start of drying conditions
- Mid-May to mid-June: record high temperatures and low precipitation led to below normal conditions for streamflow and groundwater
  - Some captured in end of May reporting but more so in current reporting for end of June
- July: high temperatures and low precipitation returned, dry conditions continue
  - West, Central and Cape at 25% of normal
- Greatest impact on groundwater
  - However at onset of drought expect other indices such as precipitation and streamflow to trigger first
  - High temperatures and growing season preventing recharge?
- Scattered areas of less than 10th percentile values, even a couple of record lows



# EDDI = PE



- Apr 10 to July 10

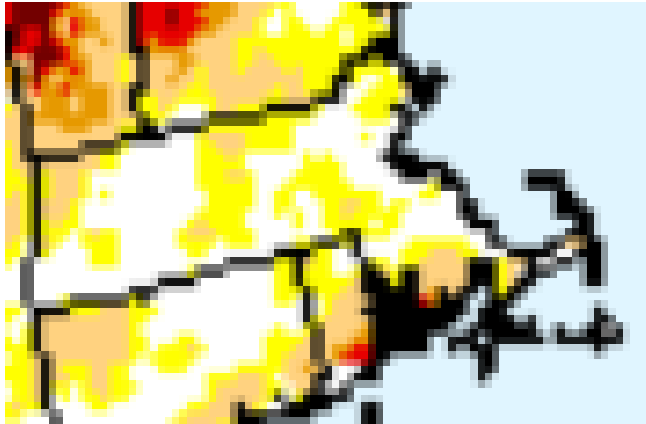


- May 10 to July 10

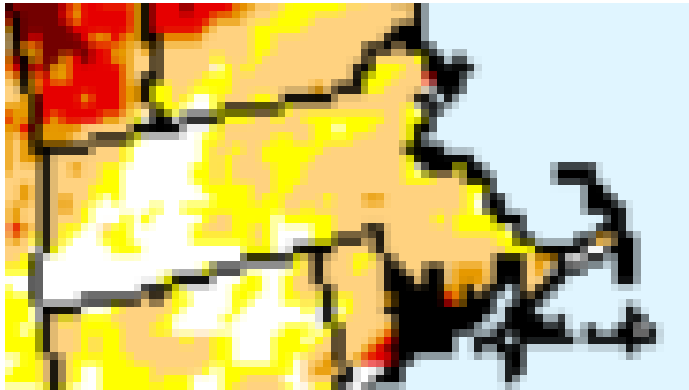


- Jun 10 to July 10

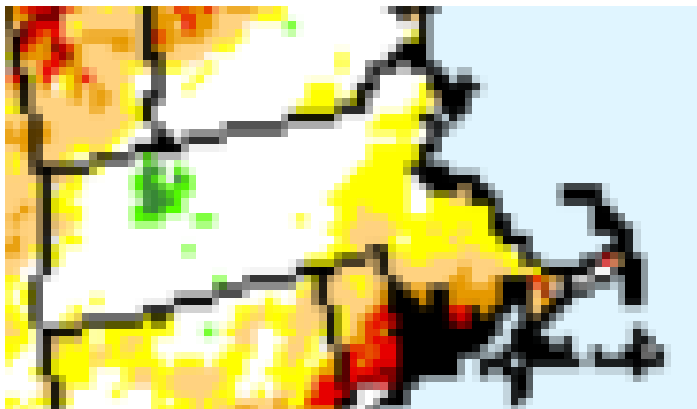
# SPEI = P-PET



- Apr 10 to July 10

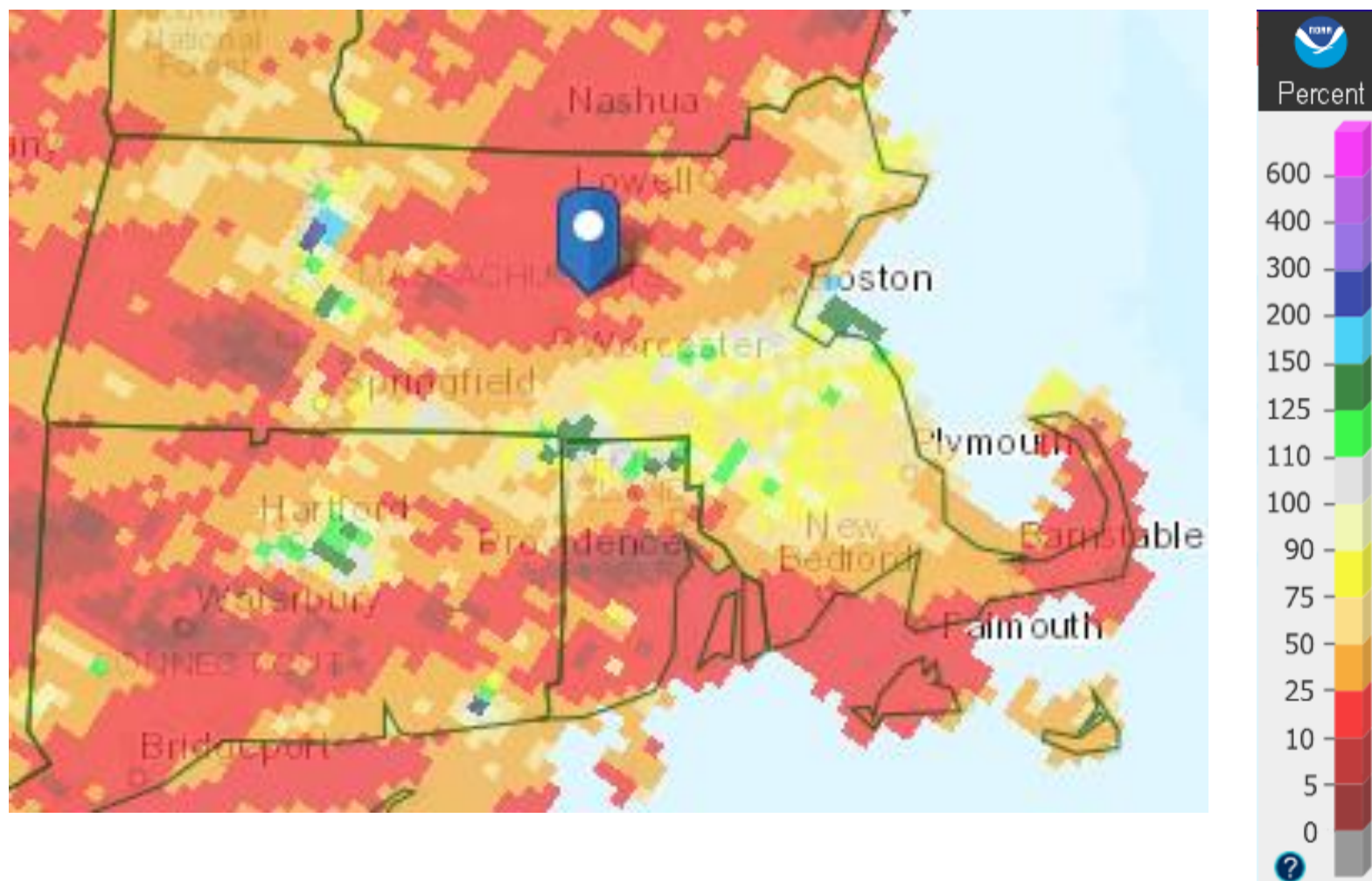


- May 10 to July 10

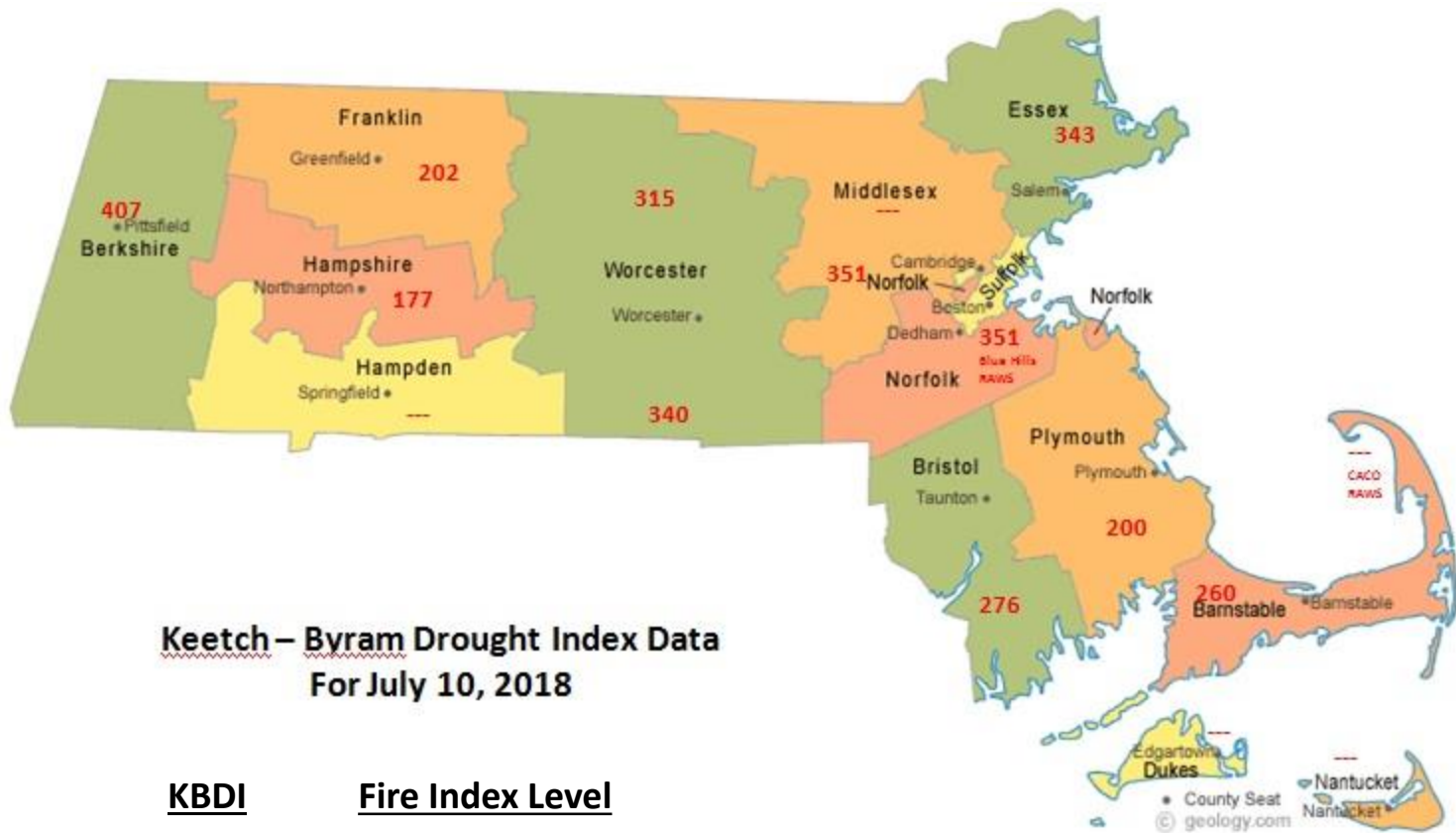


- Jun 10 to July 10

# July 1 through 11, Precipitation as Percent of Normal

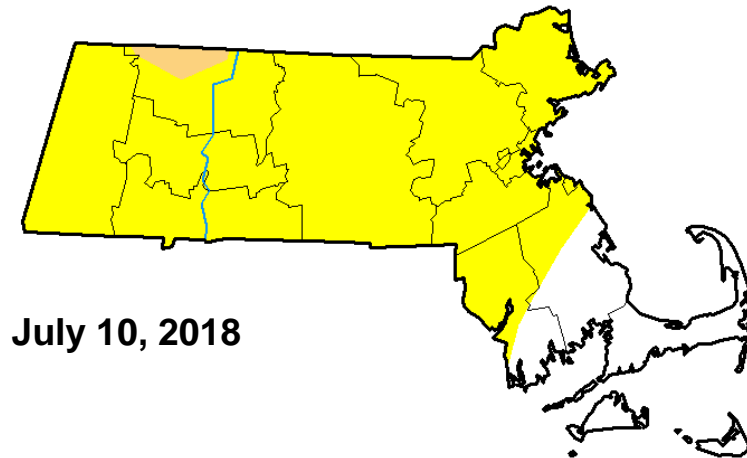
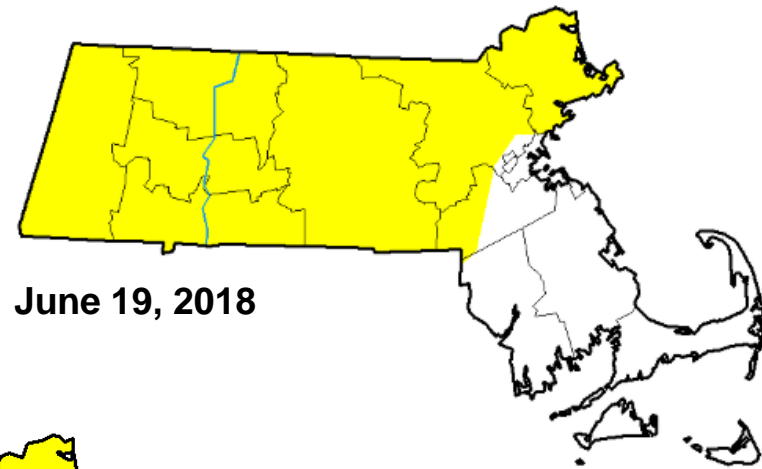
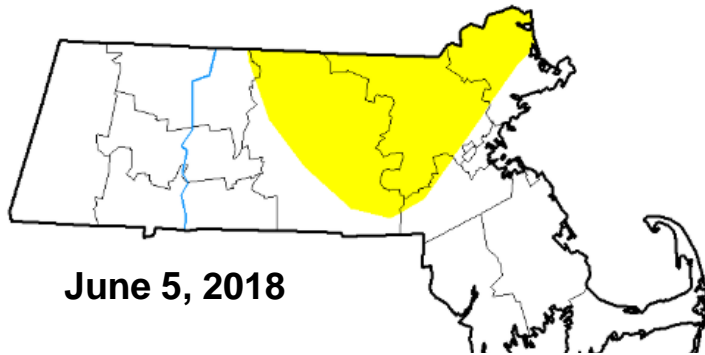


# KBDI, as of July 10, 2018





<u>Region</u>	<u>KBDI</u>	<u>Fire Index Level</u>
West	407	Watch
CT River Valley	200	Advisory
Central	300s	Advisory
Northeast	351	Advisory
Southeast	200s	Advisory
Cape and Islands	high 200s	Advisory

# US Drought Monitor



**intensity:**

 D0 (Abnormally Dry)

 D1 (Moderate Drought)

 D2 (Severe Drought)

 D3 (Extreme Drought)

 D4 (Exceptional Drought)

# Summary of Indices: Western Region

- Normal precipitation for all look-back periods.

Month	Number of streamflow gages				MA Drought Plan Index (# months majority below 25 <sup>th</sup> percentile)
	Total Reporting	<25 <sup>th</sup> to 10 <sup>th</sup> percentile	<10 <sup>th</sup> percentile to above record low	Record low	
May	7	2	0	0	0/ Normal
<b>June</b>	<b>7</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0/ Normal</b>

Notes: Gage counts are non-cumulative except for “total reporting”. Not all gages report in all months due to ice, beaver dams or other conditions.

Month	Number of groundwater wells				MA Drought Plan Index (# consecutive months majority below 25 <sup>th</sup> percentile)
	Total Reporting	<25 <sup>th</sup> to 10 <sup>th</sup> percentile	<10 <sup>th</sup> percentile to above record low	Record low	
May	5	2	1	0	1/Normal
<b>June</b>	<b>5</b>	<b>2</b>	<b>2</b>	<b>0</b>	<b>2/Normal</b>

Notes: Well counts are non-cumulative except for “total reporting”. Not all data are available in time for reporting.

- Pittsfield reservoir remains normal.

Drought Indicator	Status
Standardized Precipitation Index	Normal
Percent of Normal Precipitation	Normal
Streamflow	Normal
Groundwater	Normal
Reservoir	Normal
Crop Moisture Index	Normal
KBDI - Fire danger	Watch

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# Summary of Indices: Connecticut River Valley Region

- Normal precipitation for all look-back periods.

Month	Number of streamflow gages				MA Drought Plan Index (# months majority below 25 <sup>th</sup> percentile)
	Total Reporting	<25 <sup>th</sup> to 10 <sup>th</sup> percentile	<10 <sup>th</sup> percentile to above record low	Record low	
May	14	6	0	0	0/ Normal
June	14	5	3	0	1/ Normal

Notes: Gage counts are non-cumulative except for “total reporting”. Not all gages report in all months due to ice, beaver dams or other conditions.

Month	Number of groundwater wells				MA Drought Plan Index (# consecutive months majority below 25 <sup>th</sup> percentile)
	Total Reporting	<25 <sup>th</sup> to 10 <sup>th</sup> percentile	<10 <sup>th</sup> percentile to above record low	Record low	
May	11	3	2	0	0/Normal
June	11	3	3	0	1/Normal

Notes: Well counts are non-cumulative except for “total reporting”. Not all data are available in time for reporting.

- Springfield and Quabbin reservoirs remains normal.

Drought Indicator	Status
Standardized Precipitation Index	Normal
Percent of Normal Precipitation	Normal
Streamflow	Normal
Groundwater	Normal
Reservoir	Normal
Crop Moisture Index	Normal
KBDI - Fire danger	Advisory

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# Summary of Indices: Central Region

- Normal precipitation for all look-back periods.

Month	Number of streamflow gages				MA Drought Plan Index (# months majority below 25 <sup>th</sup> percentile)
	Total Reporting	<25 <sup>th</sup> to 10 <sup>th</sup> percentile	<10 <sup>th</sup> percentile to above record low	Record low	
May	11	5	0	0	0/ Normal
June	11	4	1	0	0/ Normal

Notes: Gage counts are non-cumulative except for “total reporting”. Not all gages report in all months due to ice, beaver dams or other conditions.

Month	Number of groundwater wells				MA Drought Plan Index (# consecutive months majority below 25 <sup>th</sup> percentile)
	Total Reporting	<25 <sup>th</sup> to 10 <sup>th</sup> percentile	<10 <sup>th</sup> percentile to above record low	Record low	
May	10	5	0	0	0/Normal
June	10	1	2	0	0/ Normal

Notes: Well counts are non-cumulative except for “total reporting”. Not all data are available in time for reporting.

- Southbridge and A-1 reservoirs are below normal. Southbridge is a medium reservoir resulting in Watch level.

Drought Indicator	Status
Standardized Precipitation Index	Normal
Percent of Normal Precipitation	Normal
Streamflow	Normal
Groundwater	Normal
Reservoir	Watch
Crop Moisture Index	Normal
KBDI - Fire danger	Advisory

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# Summary of Indices: Northeast Region

- Normal precipitation for all look-back periods.

Month	Number of streamflow gages				MA Drought Plan Index (# months majority below 25 <sup>th</sup> percentile)
	Total Reporting	<25 <sup>th</sup> to 10 <sup>th</sup> percentile	<10 <sup>th</sup> percentile to above record low	Record low	
May	18	1	0	0	0/ Normal
<b>June</b>	19	7	1	0	<b>0/ Normal</b>

Notes: Gage counts are non-cumulative except for “total reporting”. Not all gages report in all months due to ice, beaver dams or other conditions.

Month	Number of groundwater wells				MA Drought Plan Index (# consecutive months majority below 25 <sup>th</sup> percentile)
	Total Reporting	<25 <sup>th</sup> to 10 <sup>th</sup> percentile	<10 <sup>th</sup> percentile to above record low	Record low	
May	16	1	0	0	0/Normal
<b>June</b>	16	6	0	0	<b>0/Normal</b>

Notes: Well counts are non-cumulative except for “total reporting”. Not all data are available in time for reporting.

- All reservoirs remain Normal.

Drought Indicator	Status
Standardized Precipitation Index	Normal
Percent of Normal Precipitation	Normal
Streamflow	Normal
Groundwater	Normal
Reservoir	Normal
Crop Moisture Index	Normal
KBDI - Fire danger	Advisory

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# Summary of Indices: Southeast Region

- Normal precipitation for all look-back periods.

Month	Number of streamflow gages				MA Drought Plan Index (# months majority below 25 <sup>th</sup> percentile)
	Total Reporting	<25 <sup>th</sup> to 10 <sup>th</sup> percentile	<10 <sup>th</sup> percentile to above record low	Record low	
May	6	0	0	0	0/ Normal
<b>June</b>	<b>6</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0/ Normal</b>

Notes: Gage counts are non-cumulative except for “total reporting”. Not all gages report in all months due to ice, beaver dams or other conditions.

Month	Number of groundwater wells				MA Drought Plan Index (# consecutive months majority below 25 <sup>th</sup> percentile)
	Total Reporting	<25 <sup>th</sup> to 10 <sup>th</sup> percentile	<10 <sup>th</sup> percentile to above record low	Record low	
May	12	1	2	0	0/Normal
<b>June</b>	<b>12</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>0/Normal</b>

Notes: Well counts are non-cumulative except for “total reporting”. Not all data are available in time for reporting.

- Cohasset is a small reservoir and is 2 standard deviations below Normal.

Drought Indicator	Status
Standardized Precipitation Index	Normal
Percent of Normal Precipitation	Normal
Streamflow	Normal
Groundwater	Normal
Reservoir	Advisory
Crop Moisture Index	Normal
KBDI - Fire danger	NA

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# Summary of Indices: Cape and Islands Region

- Normal precipitation for all look-back periods.
- No Streamflow Index for this region

Month	Number of groundwater wells				MA Drought Plan Index (# consecutive months majority below 25 <sup>th</sup> percentile)
	Total Reporting	<25 <sup>th</sup> to 10 <sup>th</sup> percentile	<10 <sup>th</sup> percentile to above record low	Record low	
May	11	0	0	0	0/Normal
<b>June</b>	11	0	0	0	<b>0/Normal</b>

Notes: Well counts are non-cumulative except for “total reporting”. Not all data are available in time for reporting.

- Ashumet is a small reservoir and is normal.

Drought Indicator	Status
Standardized Precipitation Index	Normal
Percent of Normal Precipitation	Normal
Streamflow	Normal
Groundwater	Normal
Reservoir	Normal
Crop Moisture Index	Normal
KBDI - Fire danger	<b>Advisory</b>

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