

# **Current Hydrologic Conditions in Massachusetts**

## **Drought Management Task Force**

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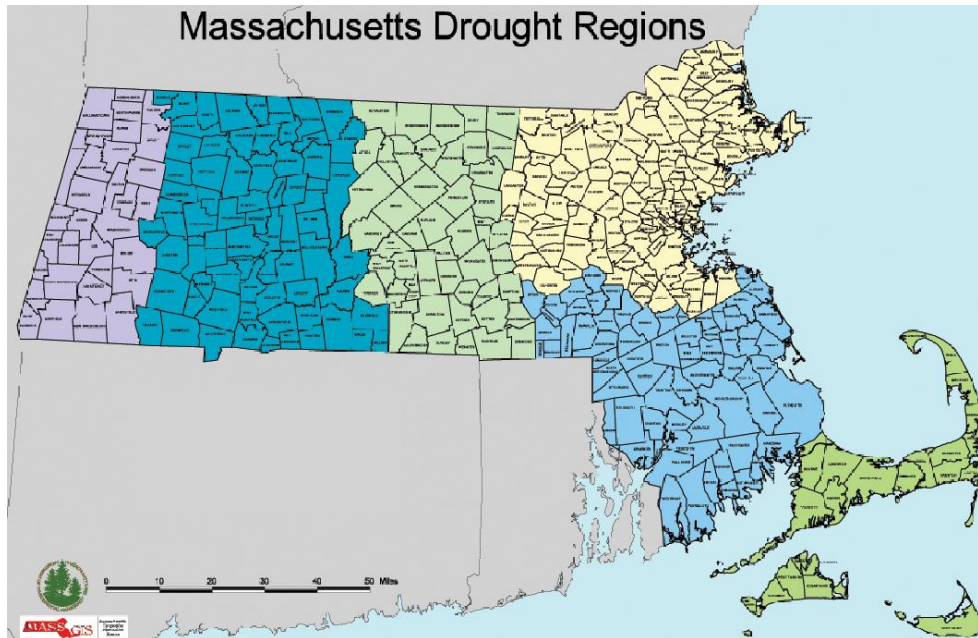
March 7, 2017

# 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

Region	Estimated Rainfall (inches)	Departure from Average February (inches)	MA Drought Plan Levels	
			Standardized Precipitation Index (SPI)	Percent of Normal Index
West	2.82	-0.57	Normal	Normal
CT River Valley	3.18	-0.22	Watch (12 mo)	Normal
Central	3.51	-0.84	Advisory (12 mo)	Normal
Northeast	3.31	-0.06	Advisory (12 mo)	Normal
Southeast	3.55	-0.75	Advisory (12 mo)	Normal
Cape Cod & Islands	3.52	-1.01	Advisory (12 mo)	Normal

# 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

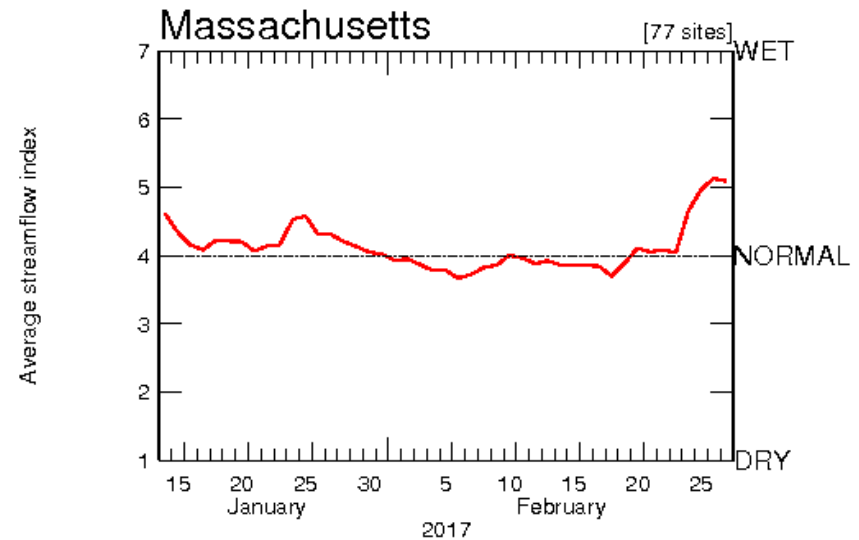
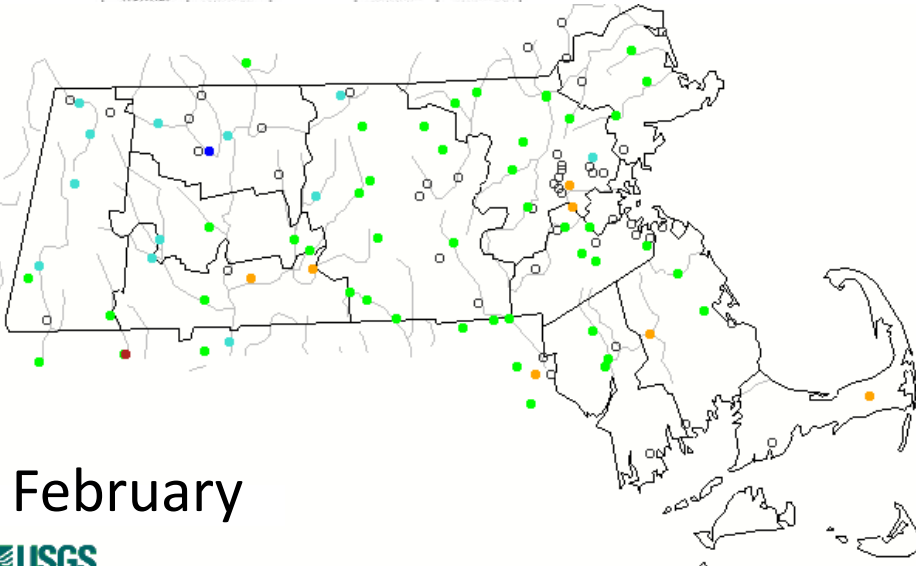
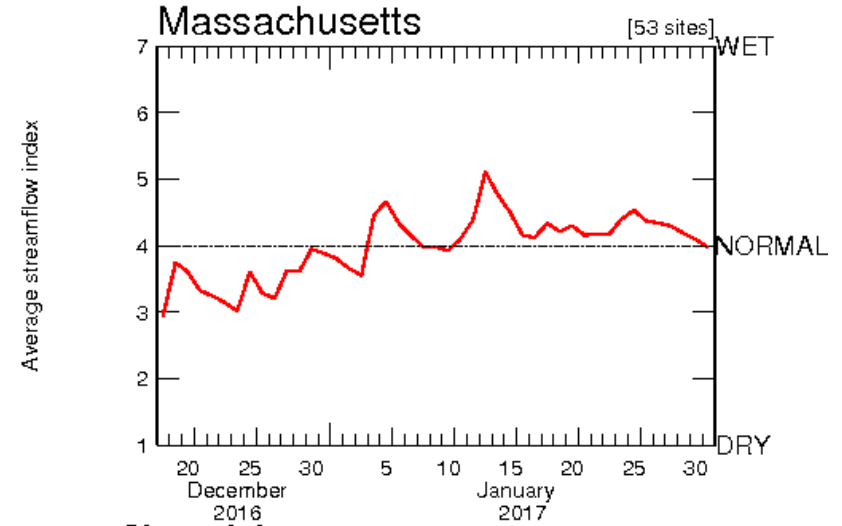
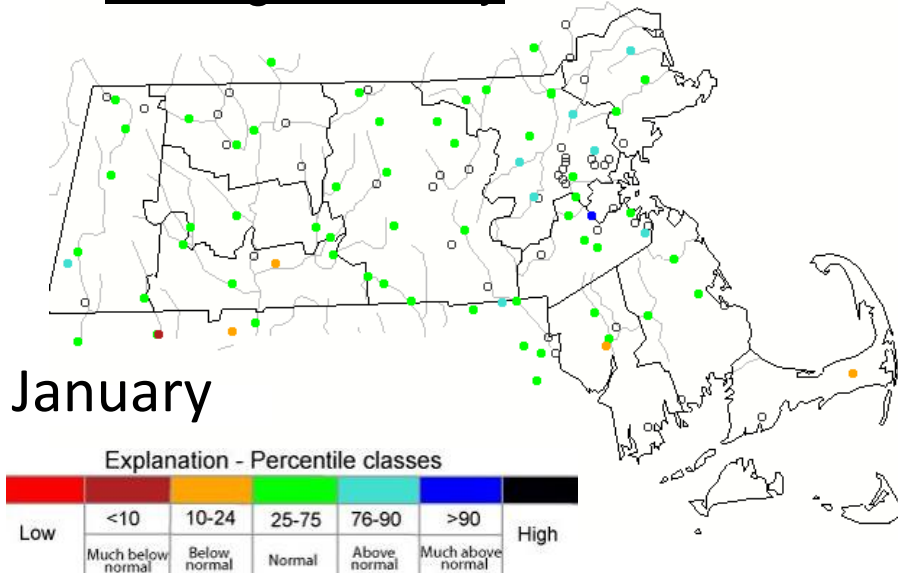
\*Below normal = within the lowest 25<sup>th</sup> percentile of the period of record for a given month

# Streamflow Compared to Historical



## Average Monthly

## Average Daily



# Streamflow

Region	Month	Number of gages				MA Drought Plan Index (# consecutive months majority <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	
Western	January	6	0	0	0	0/ Normal
	February	6	0	0	0	0/ Normal
CT River Valley	January	11	1	0	0	0/ Normal
	February	11	2	0	0	0/ Normal
Central	January	16	0	0	0	0/ Normal
	February	11	0	0	0	0/ Normal
Northeast	January	19	0	0	0	0/ Normal
	February	18	2	0	0	0/ Normal
Southeast	January	6	1	0	0	6 of 7/ Warning
	February	6	1	0	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. Streamflow index is not applicable to Cape Cod and the Islands.

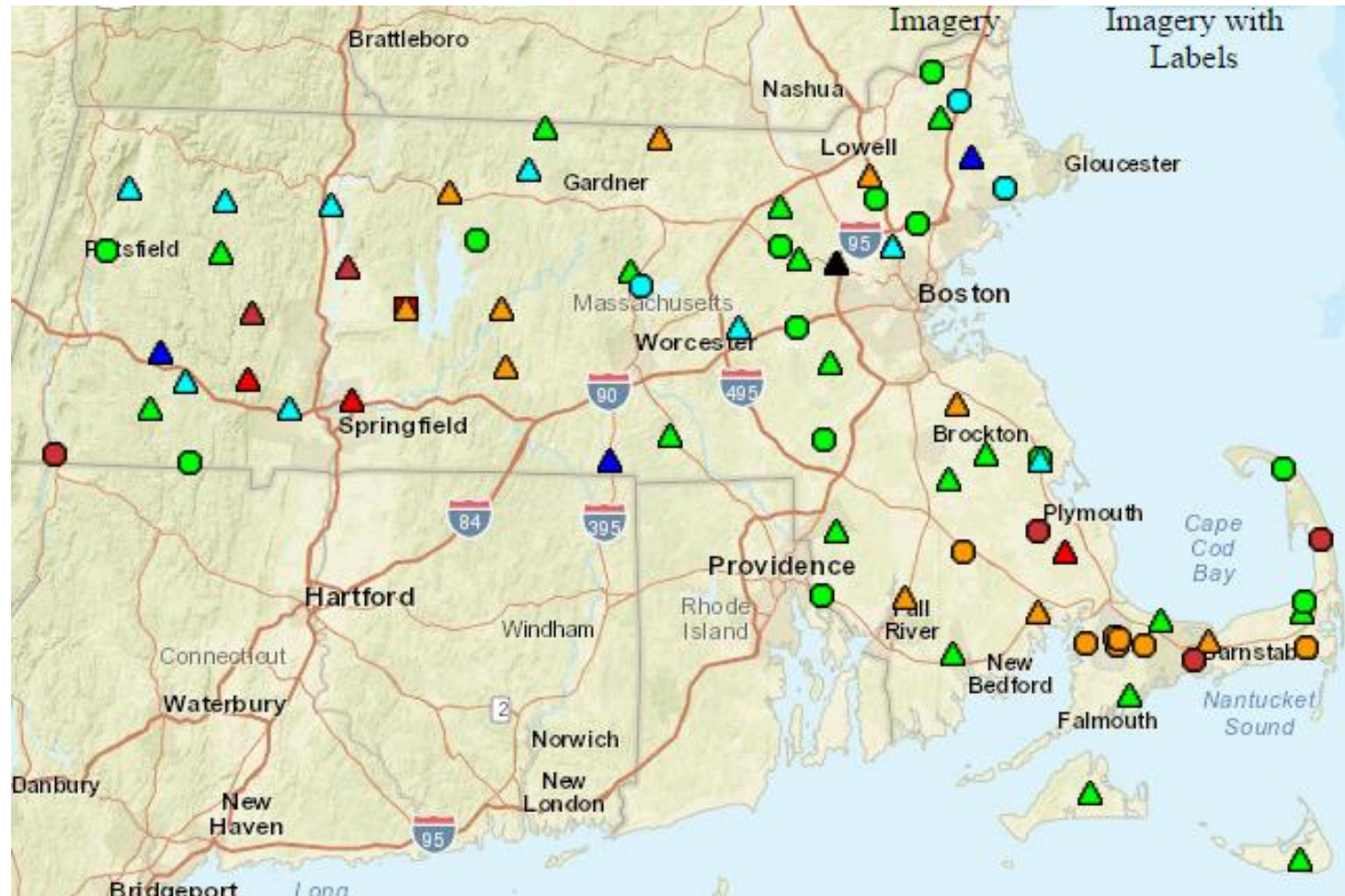
# Groundwater Index

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



# Groundwater





# Groundwater

Region	Month	Number of wells				MA Drought Plan Index (# consecutive months majority below 25 <sup>th</sup> percentile)
		Total Reporting	<25th to 10th percentile	<10th percentile to above record low	Record Low	
Western	January	5	0	0	1	0/Normal
	February	5	0	1	0	0/Normal
CT River Valley	January	11	1	2	2	0/Normal
	February	10	1	1	2	0/Normal
Central	January	10	3	0	0	0/Normal
	February	9	3	0	0	0/Normal
Northeast	January	17	4	0	0	0/Normal
	February	16	2	0	0	0/Normal
Southeast	January	12	0	5	1	0/Normal
	February	12	4	0	1	0/Normal
Cape and Islands	January	12	7	1	0	2/Normal
	February	13	4	1	0	0/Normal

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

# 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

# Reservoirs

Region	Number of Reservoirs Reporting	Reservoir Levels	MA Drought Management Plan Reservoir Index
West	2	Normal	Normal
CT River Valley	2	Near Normal	Normal <sup>1</sup>
Central	2	Normal	Normal
Northeast	6	5 of 6 Normal	Watch <sup>2</sup>
Southeast	3	Normal	Normal
Cape Cod & Islands	1	Below	Advisory

1 Quabbin reservoir is slightly below normal. This is a large reservoir which would jump the index to warning. The other monitored reservoir in the CT River Valley region has returned to normal. It is a medium reservoir system.

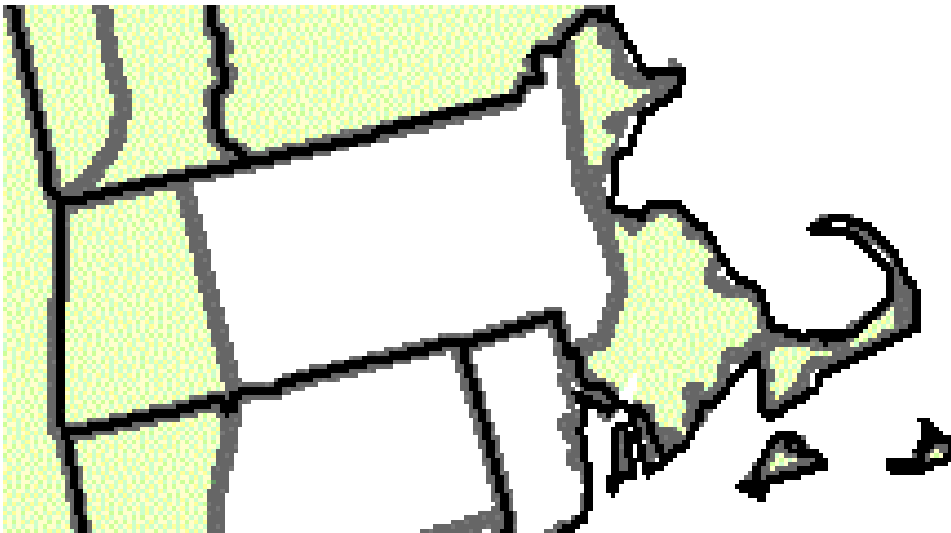
2 All monitored reservoirs except Cambridge have returned to normal. Since Cambridge is a medium reservoir system, it jumps the index to a watch.

# 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.

# Crop Moisture

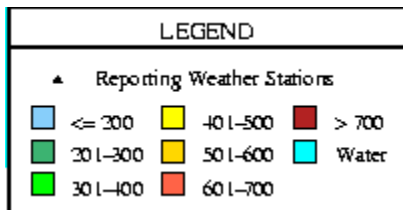


Region	MA Drought Plan Index
Western	Normal
CT River Valley	Normal
Central	Normal
Northeast	Normal
Southeast	Normal
Cape and Islands	Normal



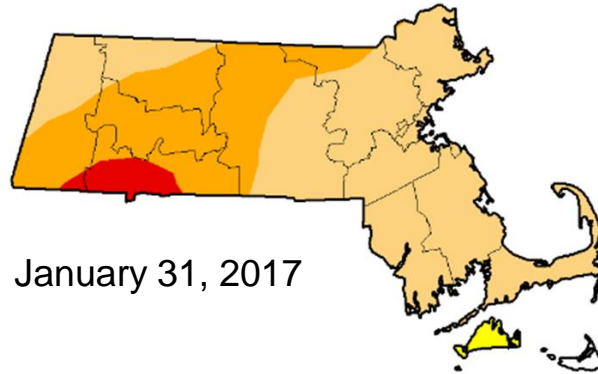
\* The Crop Moisture Index is subject to frequent change. The drought level for this indicator is determined based on the repeated or extended occurrence at a given level. This indicator is most relevant during the growing season.

# Keetch-Byram Drought Index

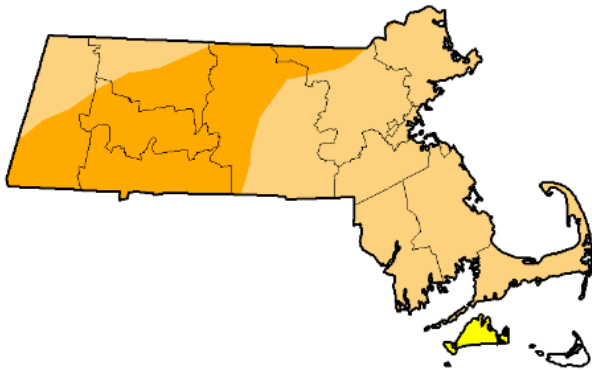


Region	MA Drought Plan Index
Western	Normal
CT River Valley	Normal
Central	Normal
Northeast	Normal
Southeast	Normal
Cape and Islands	Normal

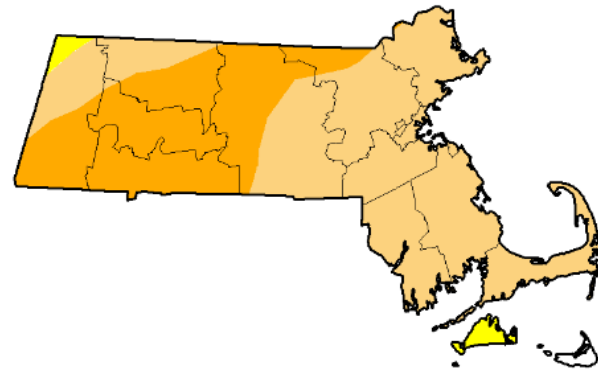
# US Drought Monitor



January 31, 2017



February 7, 2017



February 14 - 28, 2017



# West - Summary of Drought Indices

- 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	
January	6	0	0	0	0/ Normal
<b>February</b>	<b>6</b>	<b>0</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	
January	5	0	0	1	0/Normal
<b>February</b>	<b>5</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0/Normal</b>

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

- Both 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	Normal
<i>January</i>	Watch
<i>Recommended February</i>	Advisory

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# CT River Valley - Summary of Drought Indices

- Below normal precipitation for 12-month look-back period.

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	
January	11	1	0	0	0/ Normal
<b>February</b>	<b>11</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	
January	11	1	2	2	0/Normal
<b>February</b>	<b>10</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>0/Normal</b>

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

- A medium reservoir has recovered to normal. Quabbin remains slightly below normal.

Drought Indicator	Status
Standardized Precipitation Index	Watch
Percent of Normal Precipitation	Normal
Streamflow	Normal
Groundwater	near Normal <sup>1</sup>
Reservoir	Normal <sup>2</sup>
Crop Moisture Index	Normal
KBDI - Fire danger	Normal
	January
	Warning
	Recommended February
	Watch

1 Some wells remain below normal; however, since the majority of wells in the region are not below normal, a drought level is not triggered.

2 Quabbin reservoir is slightly below normal. This is a large reservoir which would jump the index to warning. The other monitored reservoir in the CT River Valley region has returned to normal; it is a medium reservoir.

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# Central - Summary of Drought Indices

- Below normal precipitation for 12-month look-back period.

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	
January	16	0	0	0	0/ Normal
<b>February</b>	<b>11</b>	<b>0</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	
January	10	3	0	0	0/Normal
<b>February</b>	<b>9</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0/Normal</b>

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

- One small reservoir has recovered to normal. A medium reservoir remains normal.

Drought Indicator	Status
Standardized Precipitation Index	Advisory
Percent of Normal Precipitation	Normal
Streamflow	Normal
Groundwater	near Normal <sup>1</sup>
Reservoir	Normal
Crop Moisture Index	Normal
KBDI - Fire danger	Normal
January	Watch
<i>Recommended February</i>	Advisory

<sup>1</sup> Some wells remain below normal; however, since the majority of wells in the region are not below normal, a drought level is not triggered.

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# Northeast - Summary of Drought Indices

- Below normal precipitation for 12-month look-back period.

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	
January	19	0	0	0	0/ Normal
<b>February</b>	<b>18</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	
January	17	4	0	0	0/Normal
<b>February</b>	<b>16</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0/Normal</b>

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

- Five reservoirs are normal. Cambridge reservoir, a medium system, is below normal.

Drought Indicator	Status
Standardized Precipitation Index	Advisory
Percent of Normal Precipitation	Normal
Streamflow	Normal
Groundwater	Normal
Reservoir	Watch <sup>3</sup>
Crop Moisture Index	Normal
KBDI - Fire danger	Normal
<i>January</i>	Advisory
<i>Recommended February</i>	Advisory

3 All monitored reservoirs except Cambridge have returned to normal. Since Cambridge is a medium reservoir system, it jumps the index to a watch.

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# Southeast - Summary of Drought Indices

- Below normal precipitation for 12-month look-back period.

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	
January	6	1	0	0	6 of 7/ Warning
<b>February</b>	<b>6</b>	<b>1</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	
January	12	0	5	1	0/Normal
<b>February</b>	<b>12</b>	<b>4</b>	<b>0</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.

- Three reservoirs are normal.

Drought Indicator	Status
Standardized Precipitation Index	Advisory
Percent of Normal Precipitation	Normal
Streamflow	Normal
Groundwater	near Normal <sup>1</sup>
Reservoir	Normal
Crop Moisture Index	Normal
KBDI - Fire danger	Normal
	<i>January</i> Warning
	<i>Recommended February</i> Watch

<sup>1</sup> Some wells remain below normal; however, since the majority of wells in the region are not below normal, a drought level is not triggered.

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# Cape & Islands - Summary of Drought Indices

- Below normal precipitation for 12-month look-back period.
- Streamflow – Not applicable

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	
January	12	7	1	0	2/Normal
<b>February</b>	<b>13</b>	<b>4</b>	<b>1</b>	<b>0</b>	<b>0/Normal</b>

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

- One reservoir, a small system, is below normal.

Drought Indicator	Status
Standardized Precipitation Index	Advisory
Percent of Normal Precipitation	Normal
Streamflow	N/A
Groundwater	near Normal <sup>1</sup>
Reservoir	Advisory
Crop Moisture Index	Normal
KBDI - Fire danger	Normal
	<i>January</i> Advisory
	<i>Recommended February</i> Advisory

<sup>1</sup> Some wells remain below normal; however, since the majority of wells in the region are not below normal, a drought level is not triggered.

N/A indicates Not Applicable

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# Summary of Drought Indices

Drought Indicator	West	CT River Valley	Central	Northeast	Southeast	Cape and Islands
Standardized Precipitation Index	Normal	Watch	Advisory	Advisory	Advisory	Advisory
Percent of Normal Precipitation	Normal	Normal	Normal	Normal	Normal	Normal
Streamflow	Normal	Normal	Normal	Normal	Normal	N/A
Groundwater	Normal	near Normal <sup>1</sup>	near Normal <sup>1</sup>	Normal	near Normal <sup>1</sup>	near Normal <sup>1</sup>
Reservoir	Normal	Normal <sup>2</sup>	Normal	Watch <sup>3</sup>	Normal	Advisory
Crop Moisture Index	Normal	Normal	Normal	Normal	Normal	Normal
KBDI - Fire danger	Normal	Normal	Normal	Normal	Normal	Normal
<i>January</i>	Watch	Warning	Watch	Advisory	Warning	Advisory
<i>Recommended February</i>	Advisory	Watch	Advisory	Advisory	Watch	Advisory

1 Some wells remain below normal; however, since the majority of wells in the region are not below normal, a drought level is not triggered.

2 Quabbin reservoir is slightly below normal. This is a large reservoir which would jump the index to warning. The other monitored reservoir in the CT River Valley region has returned to normal; it is a medium reservoir.

3 All monitored reservoirs except Cambridge have returned to normal. Since Cambridge is a medium reservoir system, it jumps the index to a watch.

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