

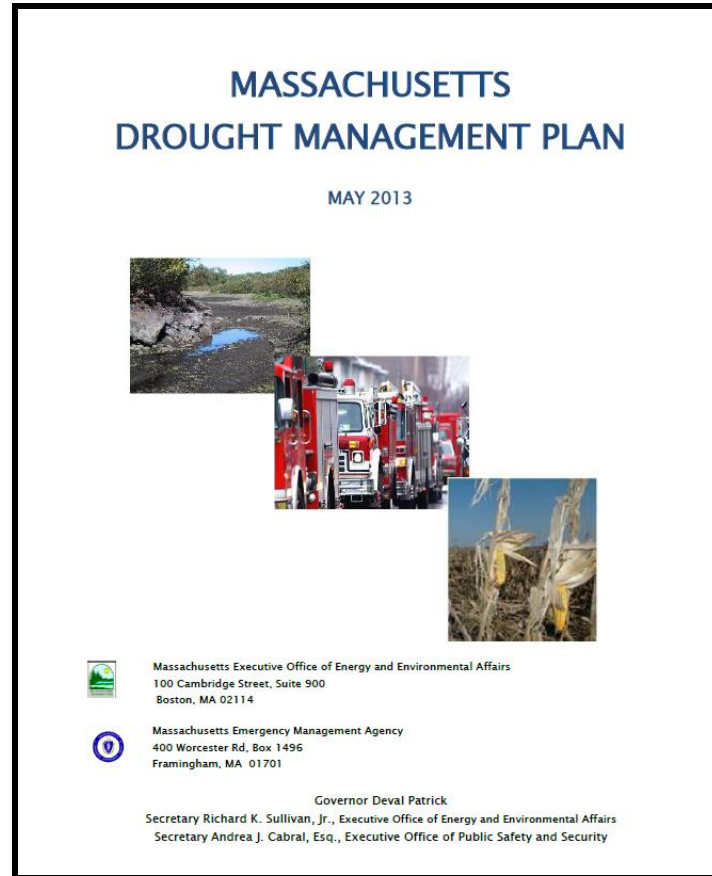
Current Hydrologic Conditions in Massachusetts

Drought Management Task Force

Jonathan Yeo and Anne Carroll
DCR Office of Water Resources
Division of Water Supply Protection

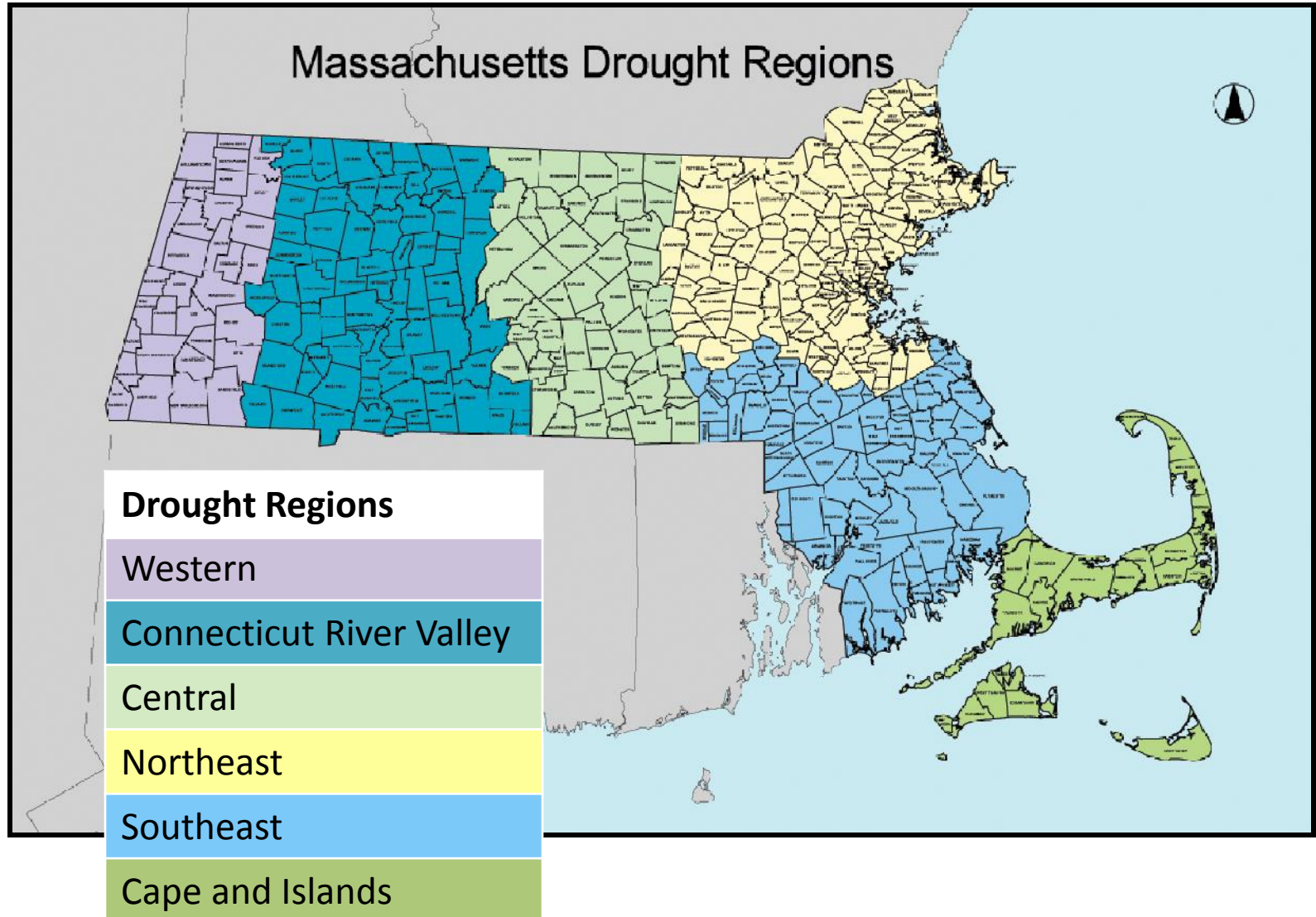
November 8, 2016

MA Drought Management Plan Summary / Review



www.mass.gov/eea/wrc-dmtf

Massachusetts Drought Regions



Massachusetts Drought Indicators and Levels

Drought Indicator	Indicator Type
Standardized Precipitation Index	Precipitation
Precipitation Percent Below Normal	Precipitation
Streamflow Months Below Normal	Streamflow
Groundwater Level Months Below Normal	Groundwater
Size of Reservoir (S, M, L) Below Normal	Reservoirs
Crop Moisture Index	Crop Moisture
Keetch-Byram Drought Index	Fire Danger

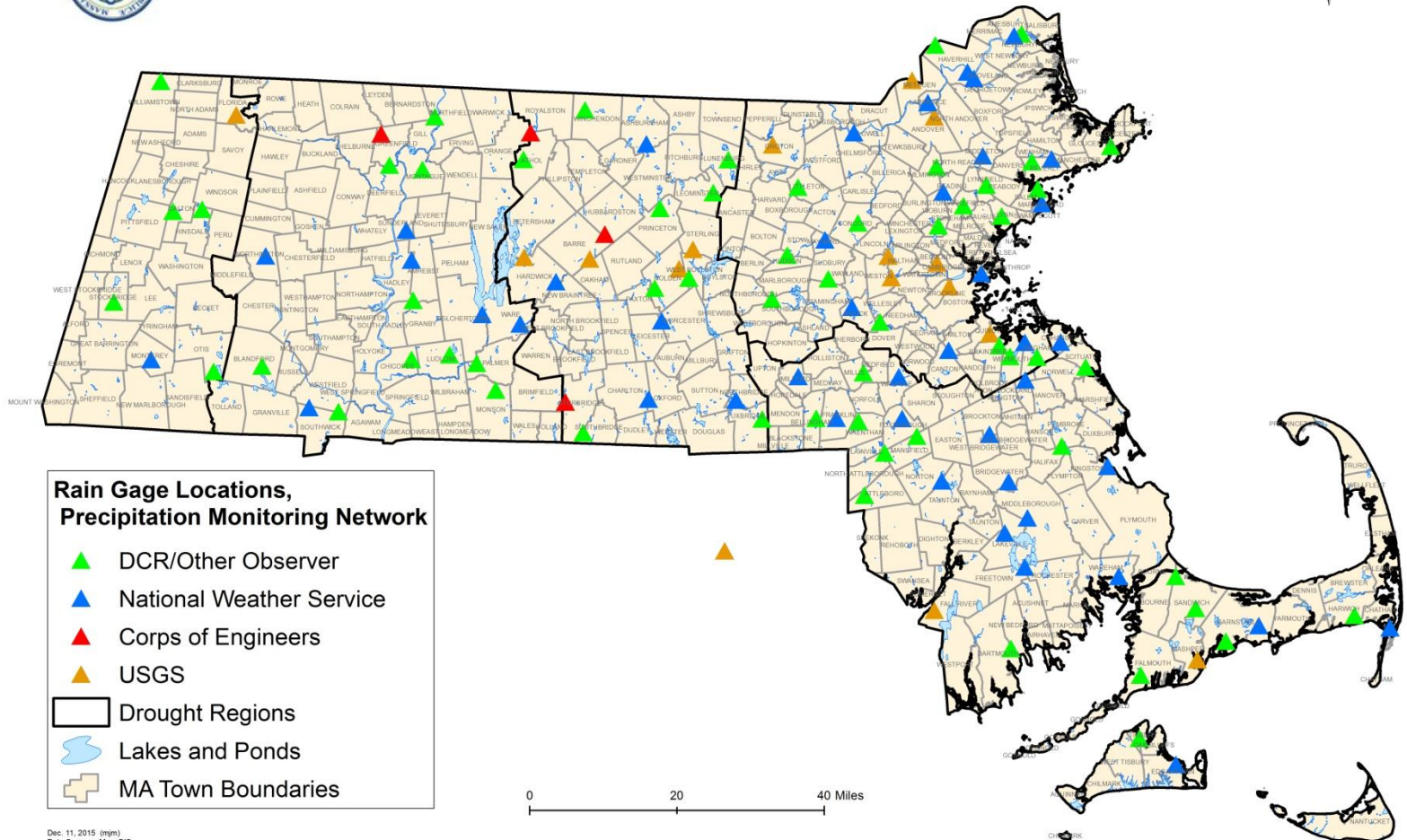
Drought Levels:
Normal
Advisory
Watch
Warning
Emergency

Drought declaration based on majority of indices

Precipitation Data Sources



Massachusetts Precipitation Monitoring Network



Precipitation

Region	Estimated Rainfall (inches)	Departure from Average October (inches)	MA Drought Plan Levels	
			Standardized Precipitation Index (SPI)	Percent of Normal Index
Western	3.2	-0.4	Normal	Normal
CT River Valley	2.9	-1.0	Advisory	Watch
Central	5.1	1.2	Advisory	Normal
Northeast	6.3	2.7	Advisory	Normal
Southeast	6.1	2.3	Normal	Normal
Cape Cod & Islands	6.2	2.3	Advisory	Normal

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

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

Reservoirs

General Reservoir Levels in Massachusetts at the end of October 2016			
Region	Number of Reservoirs Monitored	Reservoir Levels (majority)	MA Drought Management Plan Reservoir Index
Western	2	1 Normal, 1 Below	Watch
CT River Valley	2	1 Normal, 1 Below	Watch
Central	3	3 Below Normal	Watch
Northeast	7	5 Below Normal*	Warning
Southeast	3	3 Below Normal	Watch
Cape Cod & Islands	1	Normal	Normal

*2 medium reservoirs below 2 standard deviations

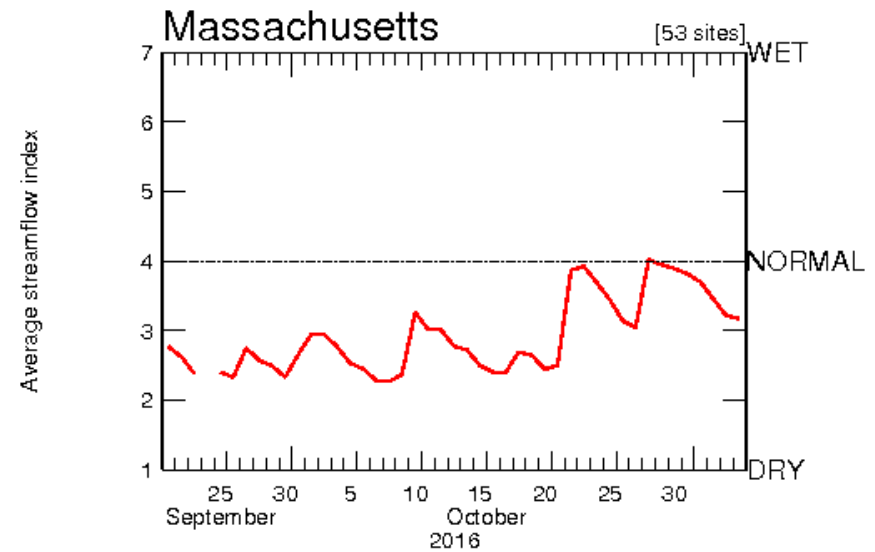
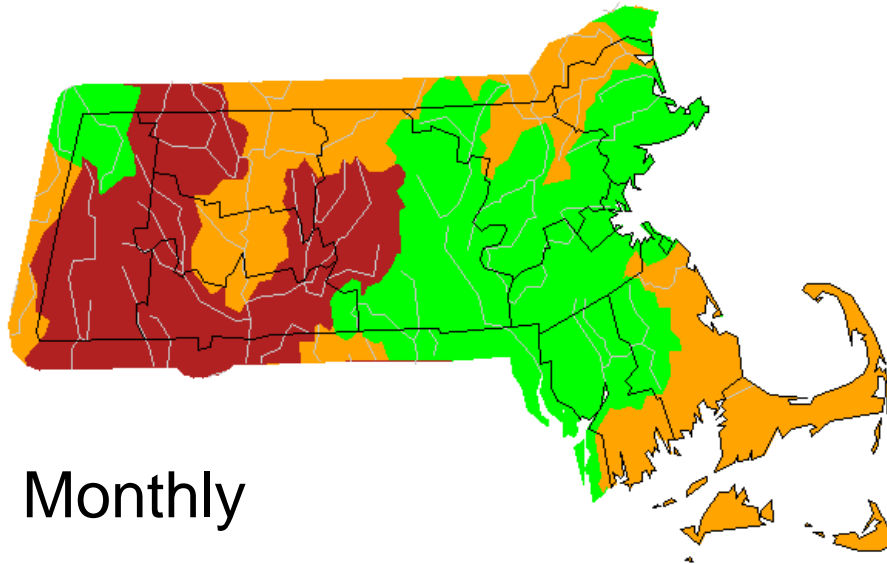
Streamflow Index

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 for streamflow is defined as being within the lowest 25th percentile of the period of record

Streamflow

Monthly and Daily Streamflow Compared to Historical Streamflow for October



Daily

Explanation - Percentile classes						
Low	<10	10-24	25-75	76-90	>90	High
	Much below normal	Below normal	Normal	Above normal	Much above normal	



Stream Pictures



Gulf Brook, Pepperell
10/8/16



Martin's Brook, North
Reading 10/8/16

Stream Pictures



May Brook, Holland 10/8/16

Streamflow

Region	Number of Gages	MA Drought Plan Index (# months majority below 25th percentile)	Number of gages below 10th percentile for Oct	Number of gages at Record Low for Oct
Western	7	6 of 7	3	0
CT Valley	16	7 of 7	9	1
Central	16	8 of 8	6	1
Northeast	19	7 of 7	3	0
Southeast	5	7 of 7	2	0

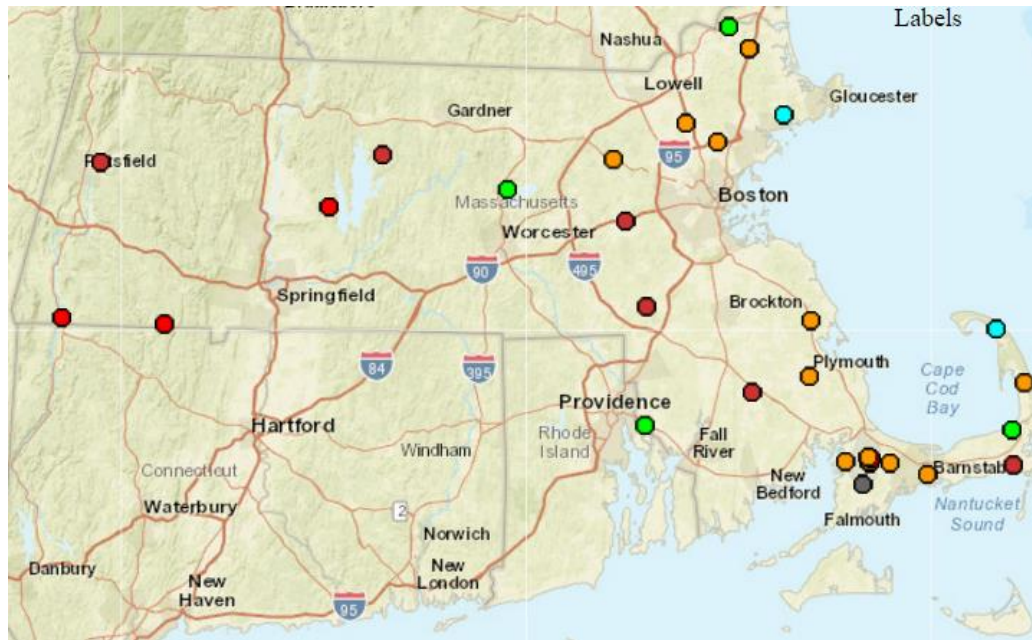
Groundwater Index

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 for groundwater is defined as being within the lowest 25th percentile of the period of record

Groundwater

November 4, 2016 Real-Time Groundwater Conditions



Explanation - Percentile classes								
								○ Real Time
New Low	<10	10-24	25-75	76-90	>90	New High	Not Ranked	□ Continuous
	Much Below Normal	Below Normal	Normal	Above Normal	Much Above Normal			△ Periodic Measurement



Groundwater

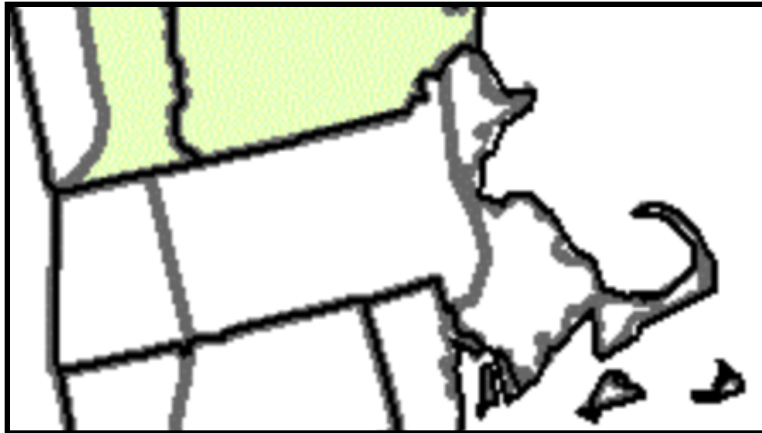
Region	Number of wells	MA Drought Plan Index (# consecutive months majority below 25 th percentile)	Number of wells below 10 th percentile for Oct	Number of wells at Record Low for Oct
Western	5	8	3	1
CT River Valley	11	7	1	9
Central	10	7	2	1
Northeast	17	7	3	2
Southeast	12	6	5	0
Cape and Islands	13	0	1	0

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.

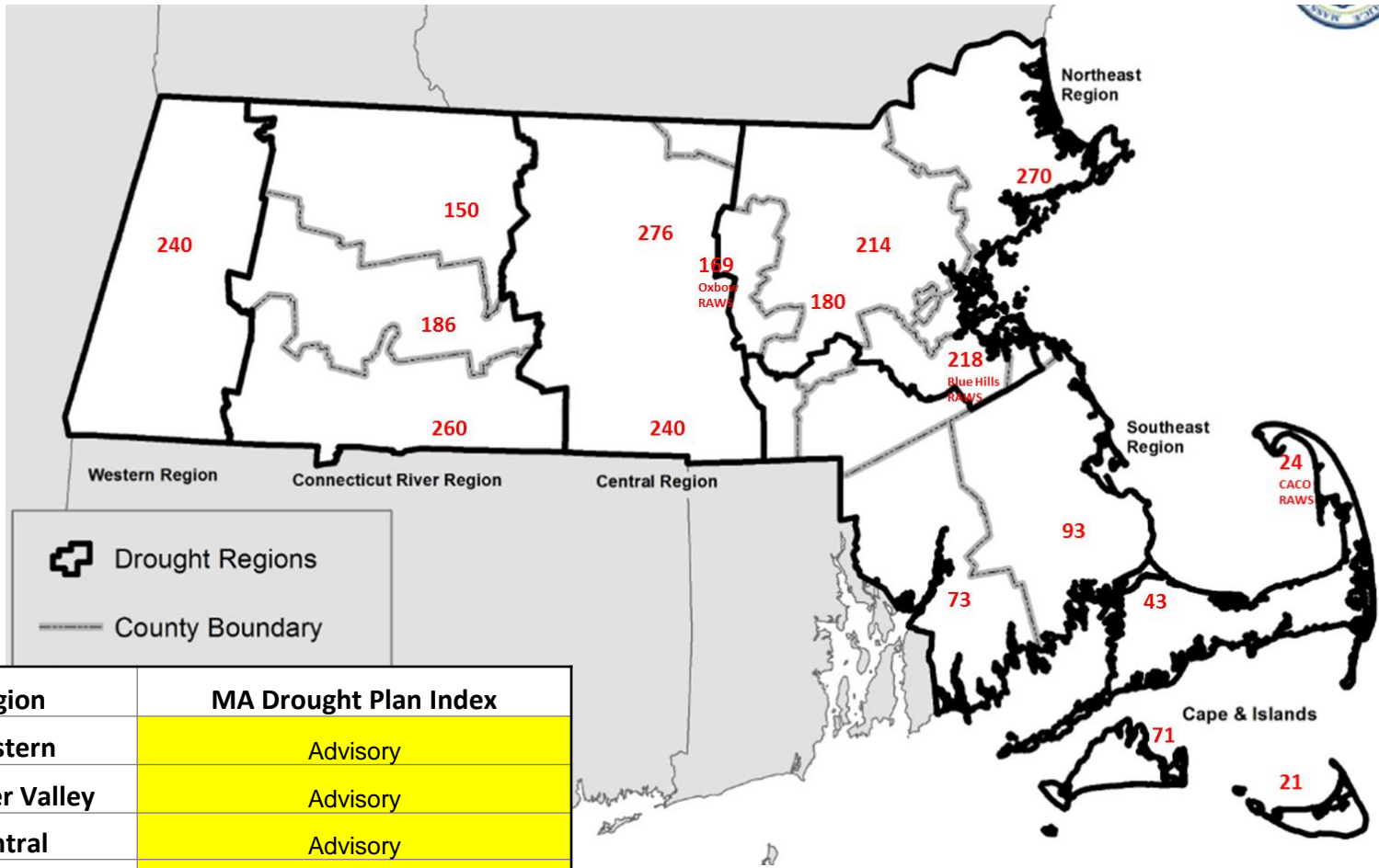
Crop Moisture



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



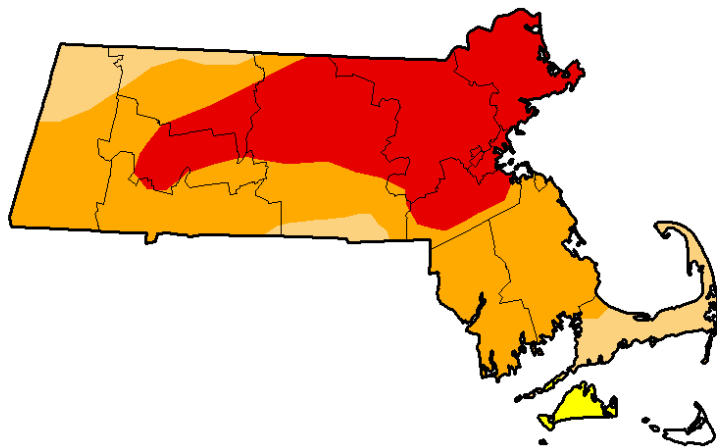
Keetch-Byram Drought Index



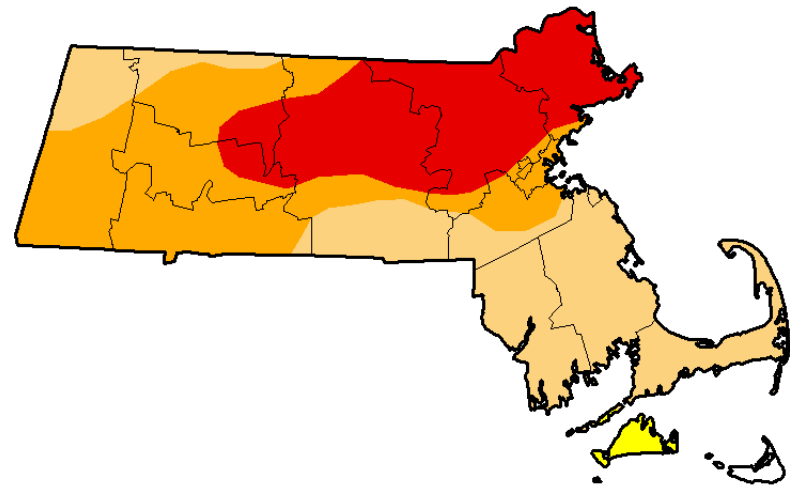
Region	MA Drought Plan Index
Western	Advisory
CT River Valley	Advisory
Central	Advisory
Northeast	Advisory
Southeast	Normal
Cape and Islands	Normal

US Drought Monitor


October 25, 2016




November 3, 2016



Intensity:

 D0 (Abnormally Dry)

 D2 (Severe Drought)

 D4 (Exceptional Drought)

 D1 (Moderate Drought)

 D3 (Extreme Drought)

Avoid Watering During a Drought¹

Limits on outdoor water use are critical to help ensure that enough water is available for essential needs, including drinking water and fire protection, crop irrigation, and our natural resources.

Drought Level	Recommended Water Use Restrictions for Everyone ^{1,2}
Advisory	<i>1 day per week at the most, outside the hours of 9AM – 5PM</i>
Watch	<i>hand-held only or drip irrigation outside the hours of 9AM – 5PM</i>
Warning	<i>Outdoor water use should be banned</i>

1. Certain water uses are not subject to mandatory restrictions, such as water used:

- for health or safety reasons;
- for the production of food and fiber;
- for the maintenance of livestock;
- to meet the core functions of a business (for example, irrigation by plant nurseries as necessary to maintain stock).

2. If your water supplier has stricter restrictions in place, abide by those.