

# MA Drought Management Plan

## MA Water Resources Commission

Linda M. Hutchins  
DCR Office of Water Resources  
Division of Water Supply Protection

October 11, 2012

**MASSACHUSETTS DROUGHT MANAGEMENT PLAN  
AUGUST 2010**



Massachusetts Emergency Management Agency  
400 Worcester Rd, Box 1496  
Framingham, MA 01701



Executive Office of Energy and Environmental Affairs  
100 Cambridge Street  
Boston, MA 02114

*Governor Deval Patrick, Secretary Ian Bowles, Secretary Mary Elizabeth Heffernan*

# 2010 Drought Management Plan

Developed after  
dry summer 1999

Revised 2012

# Drought Management Task Force Chaired by MEMA and EEA

DCR—Water Resources, Forest Fire Control

NWS— Service Hydrologist

DEP— Water Supply, Wetlands, Water Management

MA Water Works Association

MA Water Resources Authority

MA Department of Health

MA Department of Agricultural Resources

MA Department of Telecommunications and Energy

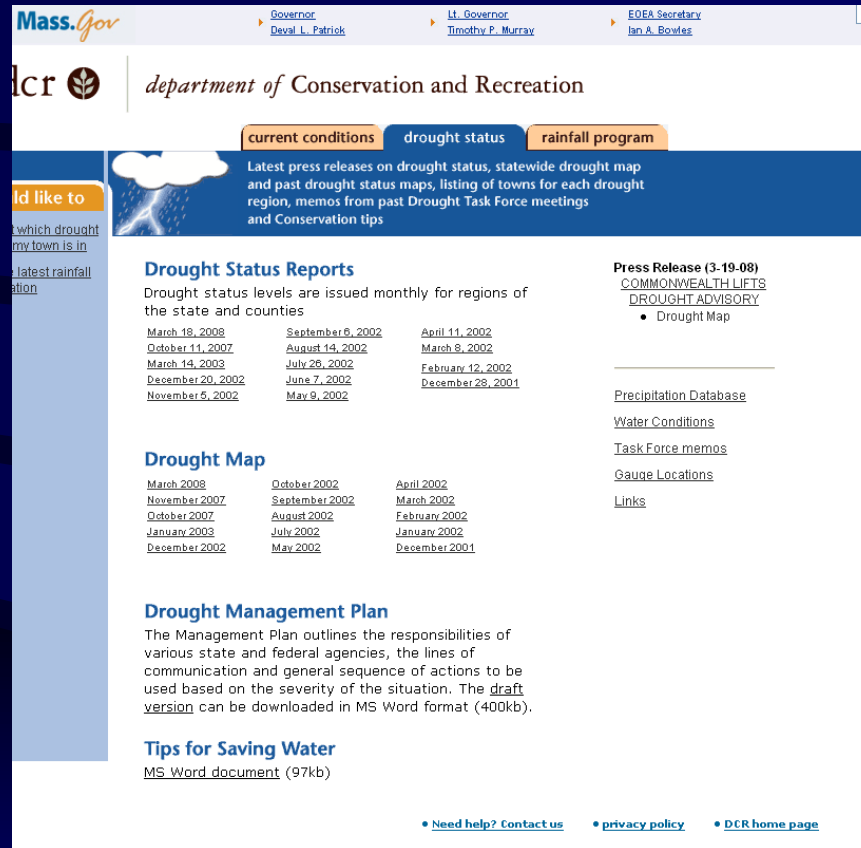
MA Department of Fish and Game

US Army Corps of Engineers

US Geological Survey

# DCR Rainfall Web Page

## Drought Status tab



The screenshot shows the DCR Rainfall Web Page with the Drought Status tab selected. The page features a navigation bar with tabs for 'current conditions', 'drought status', and 'rainfall program'. A blue banner at the top of the content area contains a cloud and lightning icon and text about press releases and drought status maps. The main content is organized into several sections: 'Drought Status Reports' with a grid of dates, 'Drought Map' with a grid of dates, 'Drought Management Plan' with a paragraph of text, and 'Tips for Saving Water' with a link to an MS Word document. A sidebar on the left contains a search box and a 'latest rainfall' link. A footer at the bottom contains links for 'Need help? Contact us', 'privacy policy', and 'DCR home page'.

Mass.gov  
Governor: Deval L. Patrick  
Lt. Governor: Timothy P. Murray  
EOEA Secretary: Jan. A. Bowles

dcr department of Conservation and Recreation

current conditions drought status rainfall program

Latest press releases on drought status, statewide drought map and past drought status maps, listing of towns for each drought region, memos from past Drought Task Force meetings and Conservation tips

Which drought my town is in  
latest rainfall situation

### Drought Status Reports

Drought status levels are issued monthly for regions of the state and counties

<a href="#">March 18, 2008</a>	<a href="#">September 6, 2002</a>	<a href="#">April 11, 2002</a>
<a href="#">October 11, 2007</a>	<a href="#">August 14, 2002</a>	<a href="#">March 8, 2002</a>
<a href="#">March 14, 2003</a>	<a href="#">July 26, 2002</a>	<a href="#">February 12, 2002</a>
<a href="#">December 20, 2002</a>	<a href="#">June 7, 2002</a>	<a href="#">December 28, 2001</a>
<a href="#">November 6, 2002</a>	<a href="#">May 9, 2002</a>	

### Drought Map

<a href="#">March 2008</a>	<a href="#">October 2002</a>	<a href="#">April 2002</a>
<a href="#">November 2007</a>	<a href="#">September 2002</a>	<a href="#">March 2002</a>
<a href="#">October 2007</a>	<a href="#">August 2002</a>	<a href="#">February 2002</a>
<a href="#">January 2003</a>	<a href="#">July 2002</a>	<a href="#">January 2002</a>
<a href="#">December 2002</a>	<a href="#">May 2002</a>	<a href="#">December 2001</a>

### Drought Management Plan

The Management Plan outlines the responsibilities of various state and federal agencies, the lines of communication and general sequence of actions to be used based on the severity of the situation. The [draft version](#) can be downloaded in MS Word format (400kb).

### Tips for Saving Water

[MS Word document](#) (97kb)

Press Release (3-19-08)  
[COMMONWEALTH LIFTS DROUGHT ADVISORY](#)

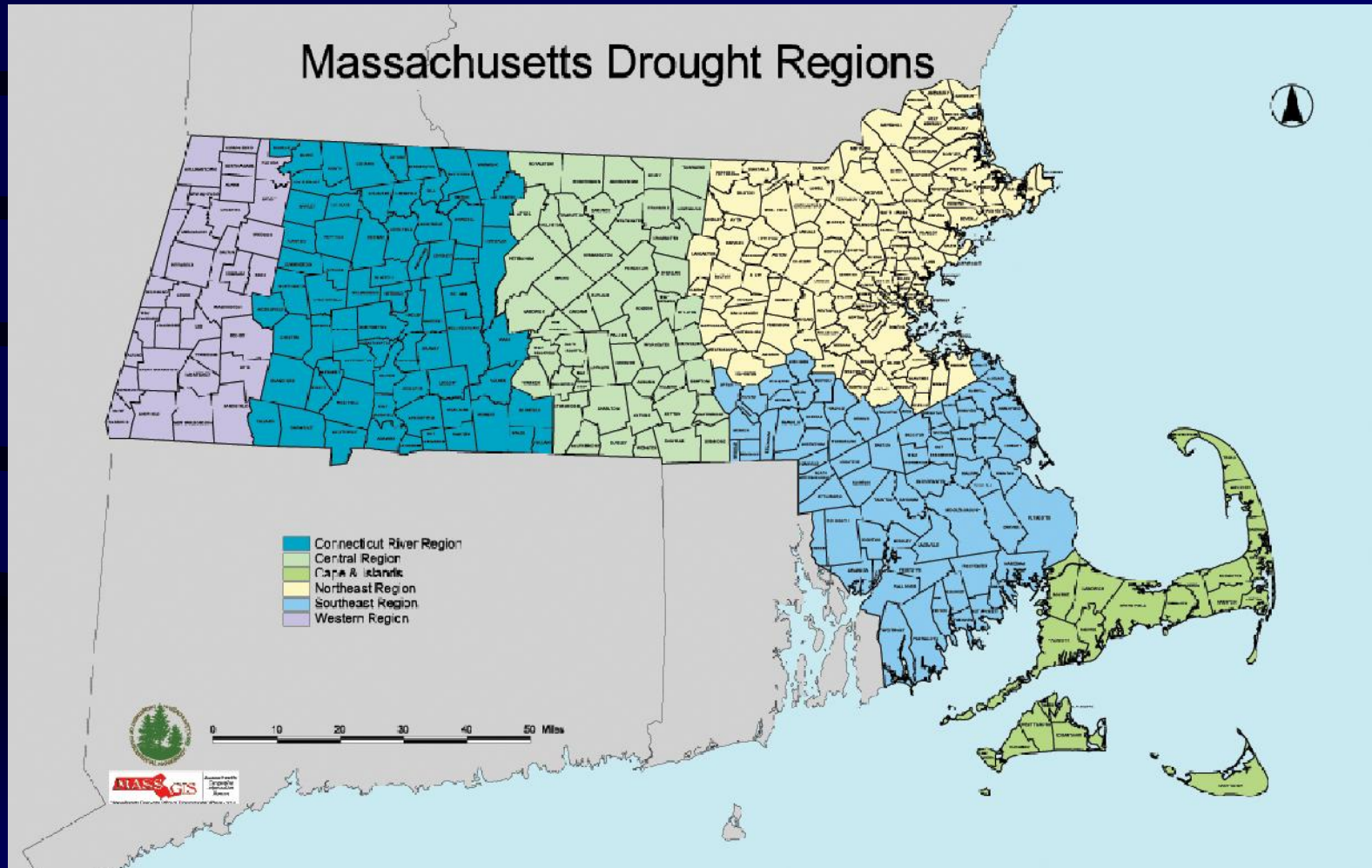
- Drought Map

[Precipitation Database](#)  
[Water Conditions](#)  
[Task Force memos](#)  
[Gauge Locations](#)  
[Links](#)

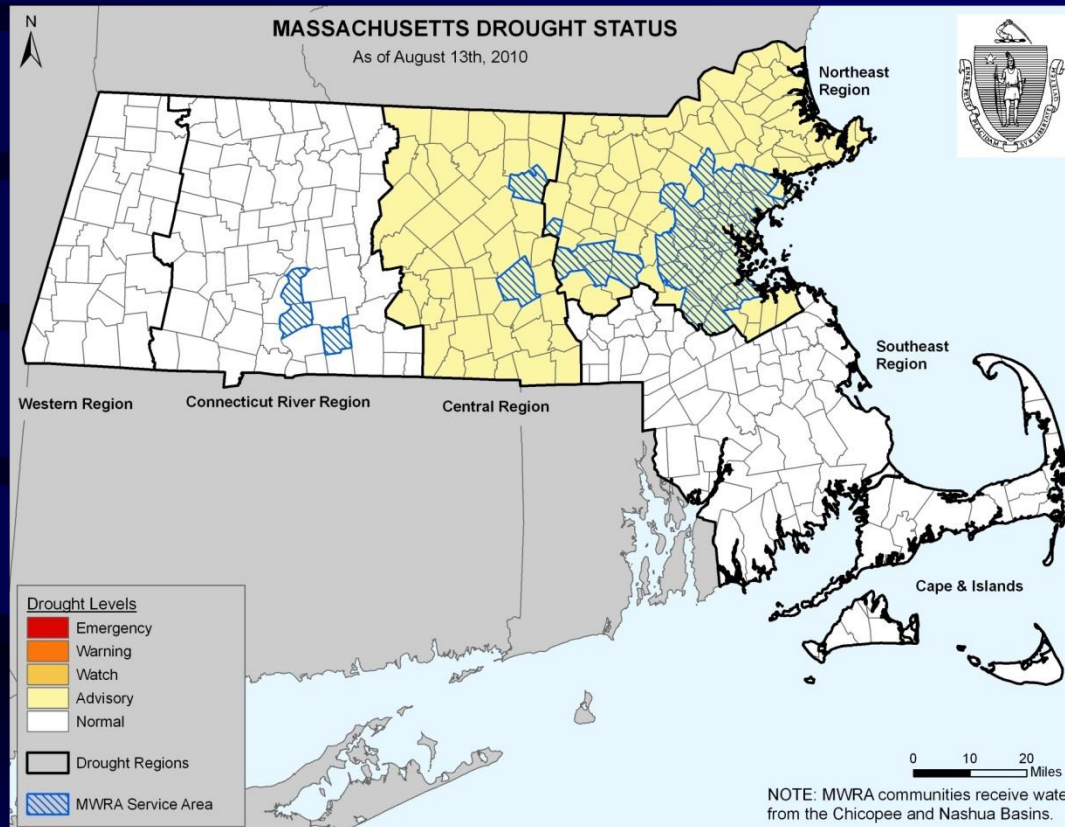
[Need help? Contact us](#) • [privacy policy](#) • [DCR home page](#)

<http://www.mass.gov/dcr/waterSupply/rainfall/drought.htm>

# 6 Precipitation / Drought Regions



# Drought Maps Issued as Needed by Drought Management Task Force



<http://www.mass.gov/dcr/waterSupply/rainfall/drought.htm>

# DCR Monthly Water Conditions Reports

### Current Water Conditions in Massachusetts July 8, 2010

- June precipitation was below normal
- June streamflows were normal to below normal
- June ground-water levels were above normal to below normal
- June reservoir levels were near normal

#### Precipitation Conditions

June state-wide average precipitation was about 3.08 inches, which is about 83 percent of the long-term average for the month. The regions of Massachusetts received between 102 (Cape Cod and islands) and 60 percent (Northeast) of average precipitation during June. Statewide, the June rainfall occurred in 5 to 10, mostly small, convective events, during the 1<sup>st</sup> two-thirds of the month. Rainfall during the end of June and early July has been very low with almost no rain for the last 14 days. Massachusetts experienced a heat wave during the last week with three consecutive days with temperatures above 90 degrees. The fire danger index across the State has increased during this period especially in the NE and SE parts of the State. A table of June 2010 estimated precipitation statistics, based on precipitation data from the Department of Conservation and Recreation and National Weather Service precipitation monitoring networks, is attached. A map at the back of this report shows the distribution of June total rainfall in Massachusetts and adjacent areas of New England.

#### Ground-Water Levels

Ground-water levels reported by the United States Geological Survey (USGS) at the end of June were generally normal across most of the southern part of the State including Cape Cod and the Islands. With some exceptions, generally below and much below normal ground-water levels were recorded in the northern tier of the State. The USGS assessment of ground-water levels is based on 89 wells in Massachusetts with 10 or more years of record. Ground-water conditions in Massachusetts drought regions range from above normal to below normal (Central Region) and are shown in a table at the end of this report.

The USGS Groundwater Conditions Statement for the end of June 2010 can be viewed at the web site: [http://usa.water.usgs.gov/water/water\\_g\\_h.html](http://usa.water.usgs.gov/water/water_g_h.html)

#### Water Supply Reservoir Levels

Surface water reservoir percent-full values for water supply sources provided by water suppliers are listed below. The reservoir percent-full values listed are for the end of June. Reservoirs in the Northeast and Central Regions are slightly below normal for this time of year. As of June 10<sup>th</sup> 2010 water suppliers had initiated water use restrictions in Massachusetts (see enclosed map).

Reservoir City or Town	Percent Full	Reservoir City or Town	Percent Full
Quabbin	97	Barnett/Salem	92.2
Warenesse	90.7	Lynn	74.3
Cobble Mt./Springfield	78	Taunton New Bedford/Acushnet	97

Note: N/A indicates data not available for this report.

#### Drought Indices/Forecasts

##### U.S. Drought Monitor

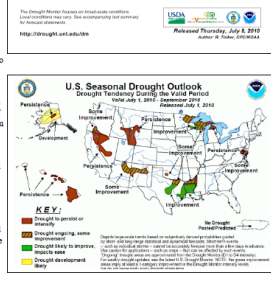
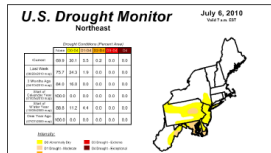
The National Drought Mitigation Center's (NDMC) July 6, 2010, Drought Monitor Map for the northeast shown at right indicates no drought conditions in Massachusetts or New England.

##### Standardized Precipitation Index

The Western Regional Climate Center's (Desert Research Institute, University and Community College System of Nevada) 1-, 3-, 6-, and 12-Month Standardized Precipitation Index across Massachusetts at the end of June were near normal, moderately dry (east/northwest), moderately wet/wet/wet, and very wet/wet/wet (extremely wet/wet and central).

##### NWS/NOAA's Climate Prediction Center

The U.S. Seasonal Drought Outlook dated July 1, 2010, predicts no tendency for drought conditions to develop in Massachusetts through September 2010.

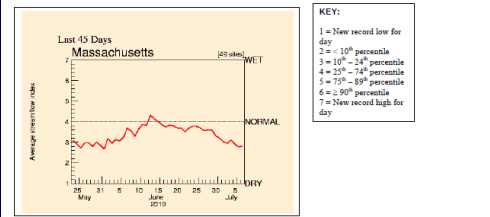


#### Streamflow

During June 2010, streamflows that are monitored by the Commonwealth of Massachusetts and United States Geological Survey (USGS) cooperative stream gaging program ranged from normal to below normal. The Concord, Nashua River, and Housatonic River basins had below normal streamflows in June. Streamflows in the rest of the State were generally normal. As shown in a table at the end of this report, the USGS has listed the drought regions of Massachusetts as having normal and below normal (Northeast and West Regions) surface-water conditions for June.

The graph below depicts a composite daily streamflow relative to normal streamflow for Massachusetts for the period of May 23 to July 6, 2010. During June generally moderately below-normal flows at the beginning of the month rose to just above normal at mid-month and then declined to moderately below normal flows at the end of June. The graph is a composite of 49 end-time pages across the state with a long period of record.

Additional information on streamflow is available from the USGS web page: <http://usa.water.usgs.gov/water/water.htm>



## GENERAL WATER CONDITIONS IN MASSACHUSETTS - JUNE 2010

EOEEA and MEMA DROUGHT MANAGEMENT PLAN REGIONS

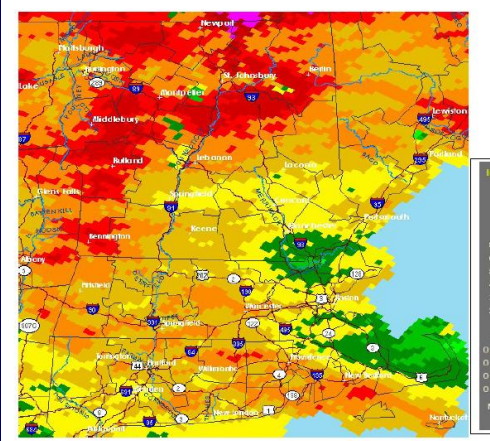
Massachusetts Regions	Surface-Water Conditions	Ground-Water Conditions
Cape and Islands	Normal	Above Normal
Southeast	Normal	Normal
Northeast	Below Normal	Normal
Central	Normal	Below Normal
Connecticut River	Normal	Normal
Western	Below Normal	Normal

Note: Surface- and ground-water conditions for individual streamflow-gaging stations and wells may differ from general conditions.

### Department of Conservation and Recreation Water Resources Data Collection and Analysis Program June 2010 Massachusetts Monthly Precipitation Composite Estimate

June 10	Normal		Percent Excess/Deficit		Excess or Deficit Since Last											
	Normal	Actual	10/1/2009	2 Months	% Norm	3 Months	% Norm	6 Months	% Norm	12 Months	% Norm	12 Months	% Norm	12 Months	% Norm	
State	3.72	3.08	83	-0.64	6.54	-1.39	81	-3.72	67	3.08	117	10.78	124			
Cape Cod and Islands	3.13	3.18	102	0.05	5.52	-0.36	95	-2.84	74	1.09	105	10.85	124			
Central	3.04	3.53	90	-0.41	6.69	-0.54	88	-3.49	70	5.47	124	8.74	119			
Connecticut River	4.00	3.48	87	-0.52	-0.67	-2.35	71	-5.13	57	-1.80	93	-3.86	106			
Northeast	3.51	2.69	60	-1.42	12.62	-1.83	74	-3.57	67	9.08	142	16.40	157			
Southeast	3.55	2.64	74	-0.91	12.17	-1.22	83	-3.46	69	7.15	131	18.69	141			
Western	4.12	4.11	100	-0.01	-1.20	-0.89	89	-3.01	74	-2.52	88	4.05	109			

Note: Precipitation values are total rainfall and melted snow in inches.  
Values are estimated pending receipt of additional data and final calculations.



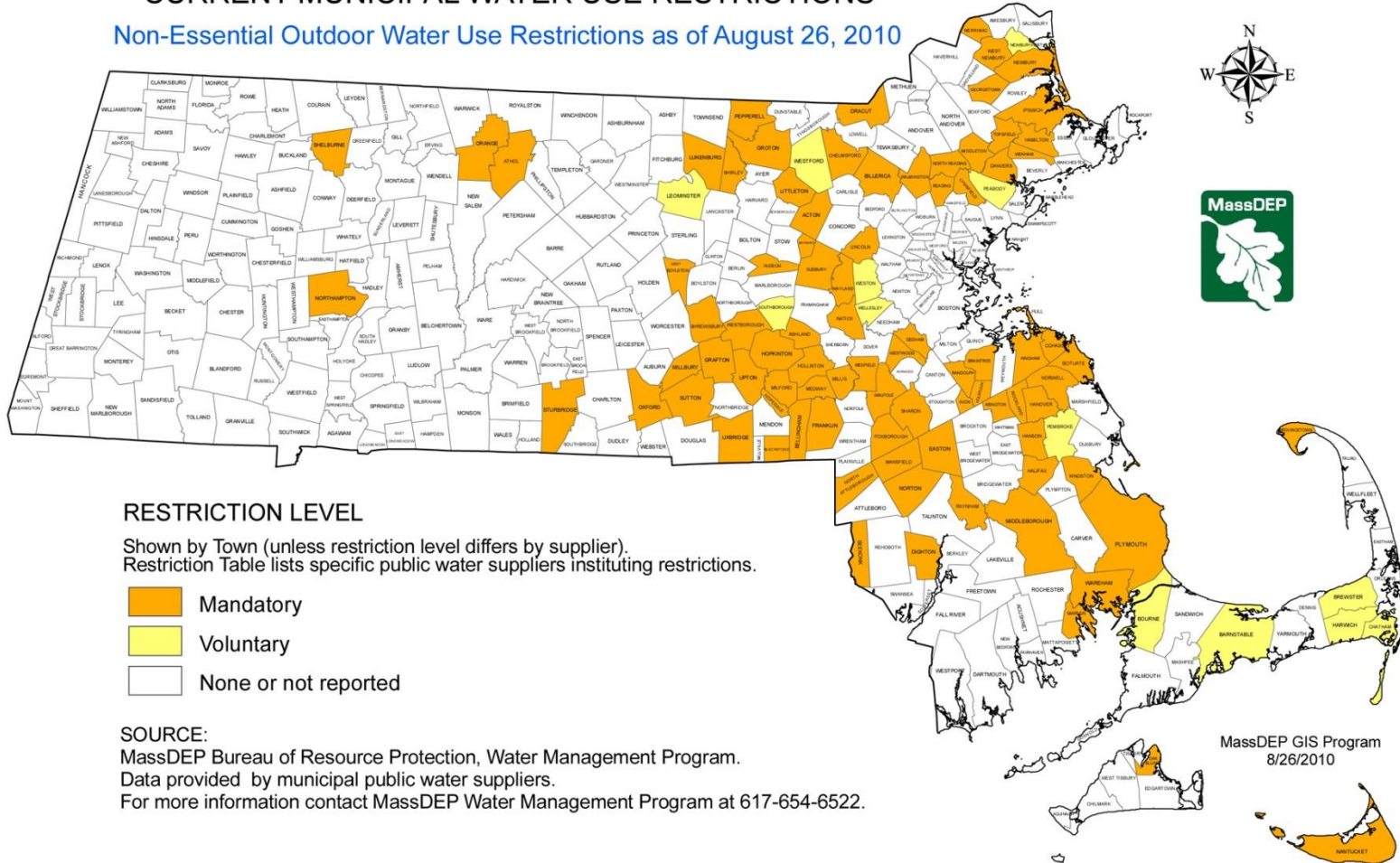
TOTAL RAINFALL  
JUNE 2010



# Water Supply Restrictions

## CURRENT MUNICIPAL WATER USE RESTRICTIONS

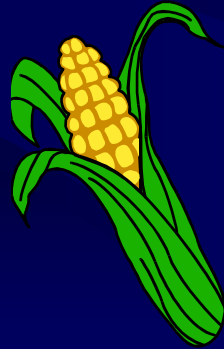
Non-Essential Outdoor Water Use Restrictions as of August 26, 2010







***Drought is not measured  
by precipitation alone!!***



# MA Drought Levels and Thresholds

## 6 Drought Indices

### 5 Drought Levels

Drought Level	MA SPI	CMI*	KBDI	Precipitation	Groundwater	Streamflow	Reservoir
Normal	3-month > -1.5 or 6-month > -1.0 or 12-month > -1.0	0.0 to -1.0 slightly dry	< 200	1 month below normal	2 consecutive months below normal**	1 month below normal**	Reservoir levels at or near normal for the time of year
Advisory	3-month -1.5 to -2.0 or 6-month -1.0 to -1.5 or 12-month -1.0 to -1.5	-1.0 to -1.9 abnormally dry	200 to 400	2 month cumulative below 65% of normal	3 consecutive months below normal**	At least 2 out of 3 consecutive months below normal**	Small index Reservoirs below normal
Watch	3-month < -2.0 or 6-month -1.5 to -3.0 or 12-month -1.5 to -2.0	-2.0 to -2.9 excessively dry	400 to 600	1 of the following criteria met: 3 month cum. < 65% or 6 month cum. < 70% or 12 month cum. < 70%	4-5 consecutive months below normal**	At least 4 out of 5 consecutive months below normal**	Medium index Reservoirs below normal
Warning	6-month < -3.0  or  12-month -2.0 to -2.5	< -2.9 severely dry	600 to 800	1 of the following criteria met: 3 month cum. < 65% and 6 month cum. < 65% or 6 month cum. < 65% and 12 month cum. < 65% or 3 month cum. < 65% and 12 month cum. < 65%	6-7 consecutive months below normal**	At least 6 out of 7 consecutive months below normal**	Large index reservoirs below normal
Emergency	12-month < -2.5	< -2.9 severely dry	600 to 800	Same criteria as Warning <b>And</b> Previous month was Warning or Emergency	>8 months below normal**	>7 months below normal**	Continuation of previous month's conditions

# Summary of Monthly Drought Indices

## DROUGHT INDICES SUMMARY 9/16/2010

### Cape Cod and Islands Normal

Level	SPI	CMI	Fire	Precip	Ground Water	Streamflow	Reservoir
Normal							
Advisory							
Watch							
Warning							
Emergency							

### Northeast Normal (But GW still Below Normal)

Level	SPI	CMI	Fire	Precip	Ground Water	Streamflow	Reservoir
Normal							
Advisory							
Watch							
Warning							
Emergency							

### Central Advisory

Level	SPI	CMI	Fire	Precip	Ground Water	Streamflow	Reservoir
Normal							
Advisory							
Watch							
Warning							
Emergency							

### Connecticut Normal

Level	SPI	CMI	Fire	Precip	Ground Water	Streamflow	Reservoir
Normal							
Advisory							
Watch							
Warning							
Emergency							

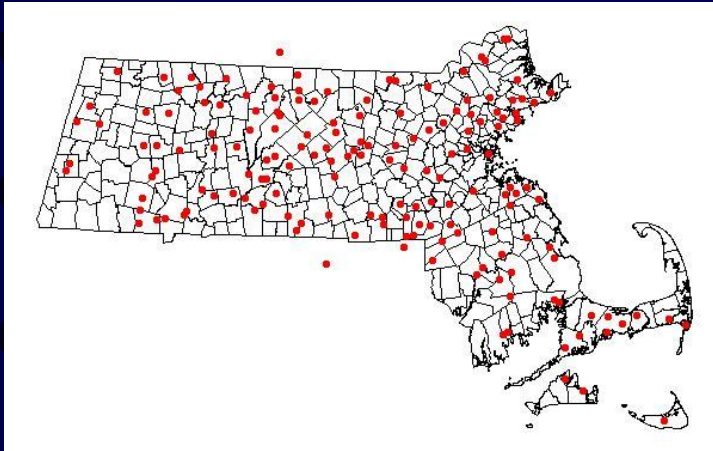
### Southeast Normal

Level	SPI	CMI	Fire	Precip	Ground Water	Streamflow	Reservoir
Normal							
Advisory							
Watch							
Warning							
Emergency							

### Western Normal

Level	SPI	CMI	Fire	Precip	Ground Water	Streamflow	Reservoir
Normal							
Advisory							
Watch							
Warning							
Emergency							

# MA Precipitation Monitoring Network



BEL 736  
MONTHLY PRECIPITATION REPORT

Massachusetts Executive Office of Environmental Affairs  
Department of Conservation and Recreation  
Office of Water Resources  
251 Causeway Street, Boston, Mass. 02114-0104 • 617 626-1250

Station: Bellingham, Station No. 756, Month: Jan, 2007

Observer: \_\_\_\_\_ River Basin: \_\_\_\_\_

Date	Day	24 Hour PRECIPITATION OBSERVATIONS †												Rain & Sleet Snow	Snowfall (Inches)	Snow on Ground	REMARKS	
		1	2	3	4	5	6	7	8	9	10	11	12					
1	Mon														1.73			
2	Tue																	
3	Wed																	
4	Thu																	
5	Fri																	
6	Sat																	
7	Sun														1.78			
8	Mon																	
9	Tue																	
10	Wed																	
11	Thu																	
12	Fri																	
13	Sat																	
14	Sun																	
15	Mon														0.2			
16	Tue														0.5			
17	Wed																	
18	Thu														0.2			
19	Fri														0.2			
20	Sat																	
21	Sun																	
22	Mon																	
23	Tue																	
24	Wed																	
25	Thu																	
26	Fri																	
27	Sat																	
28	Sun																	
29	Mon																	
30	Tue																	
31	Wed																	

Special Events \_\_\_\_\_ TOTAL 9.65 ✓

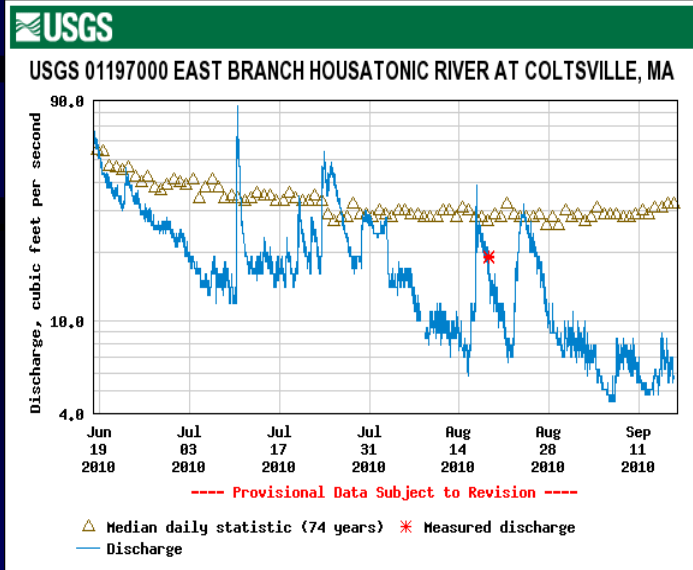
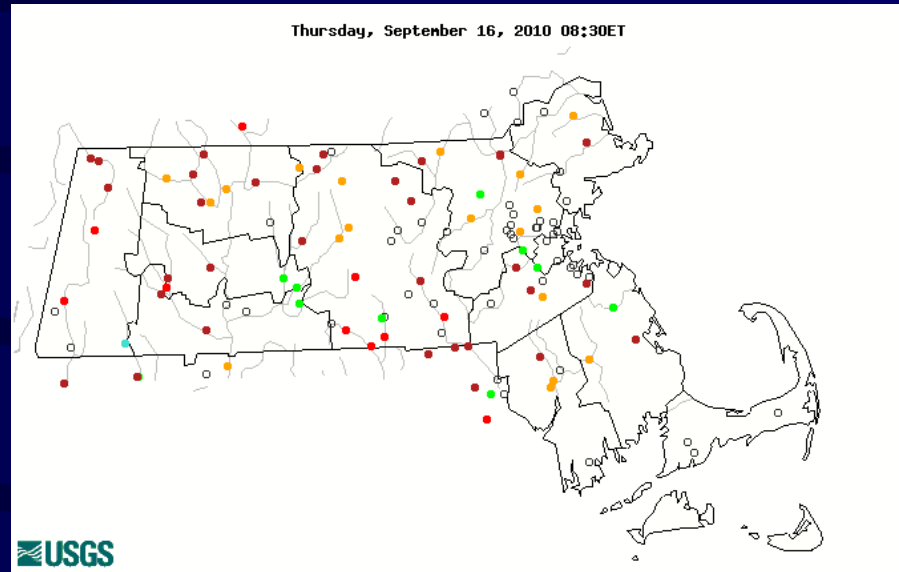
SEND WHITE SHEET TO THE OFFICE THE FIRST OF EACH MONTH

† Data straight (—) line through hours precipitation actually observed  
Dashed wavy (-----) line through hours precipitation probably occurred unobserved

Jan Berard  
Observer Signature



# USGS/MA Cooperative Stream Gage Network

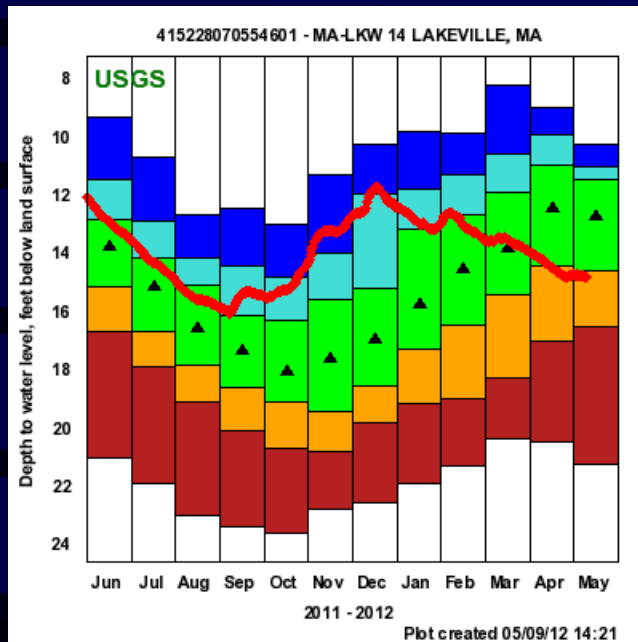


Explanation - Percentile classes

Low	<10 Much below normal	10-24 Below normal	25-75 Normal	76-90 Above normal	>90 Much above normal	High Not-ranked



# USGS/MA Cooperative Ground Water Observation Network



169 observation wells

22 Real-Time

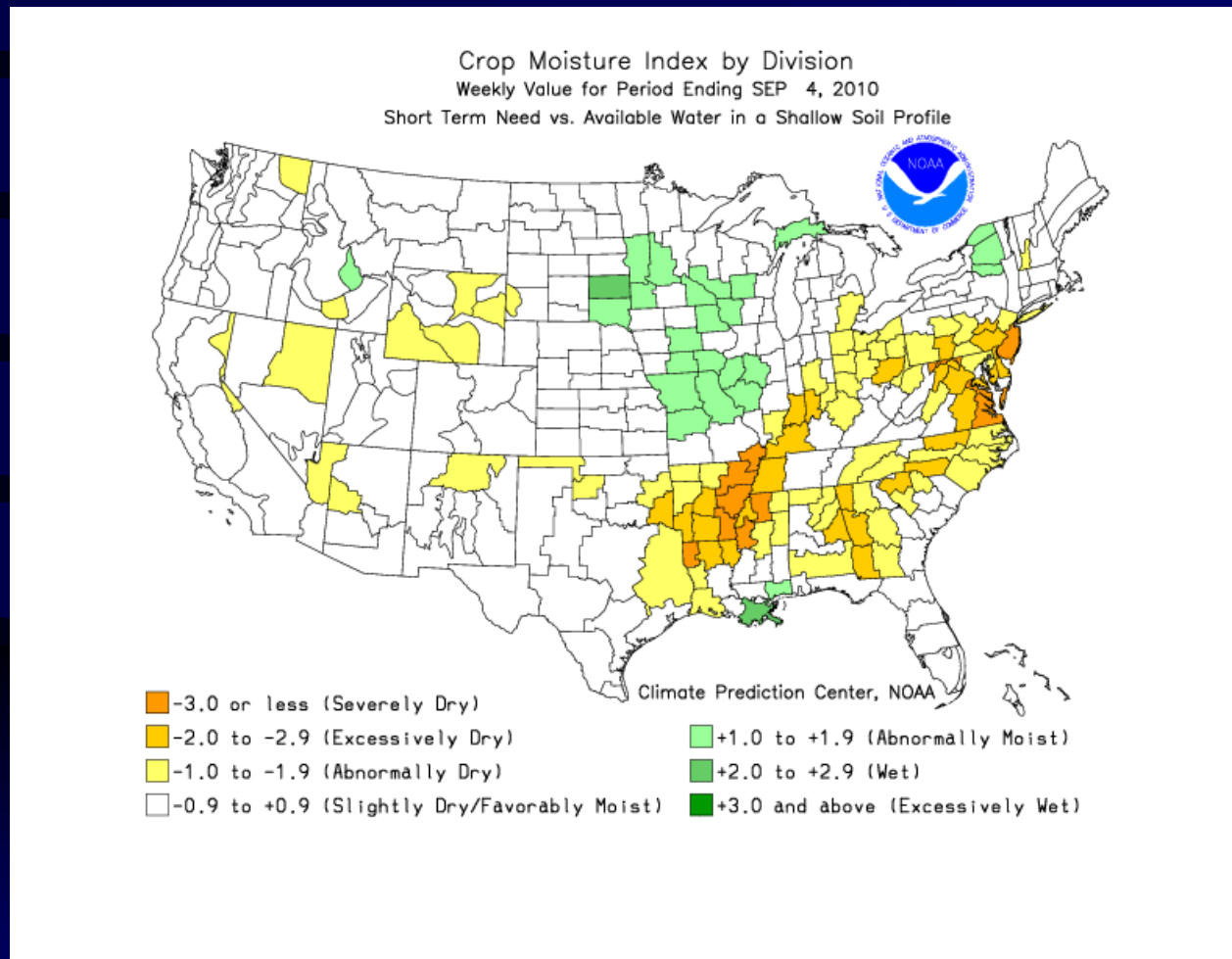
Explanation - Percentile classes (symbol color based on most recent measurement)

●	●	●	●	●	●	●	○
Low	<10	10-24	25-75	76-90	>90	High	□
	Much Below Normal	Below Normal	Normal	Above Normal	Much Above Normal		△
							Real Time
							Continuous
							Periodic Measurements

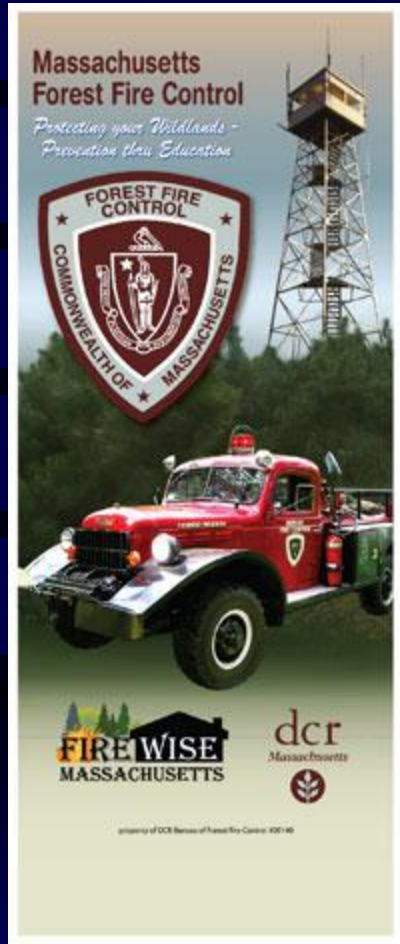


<http://ma.water.usgs.gov/>

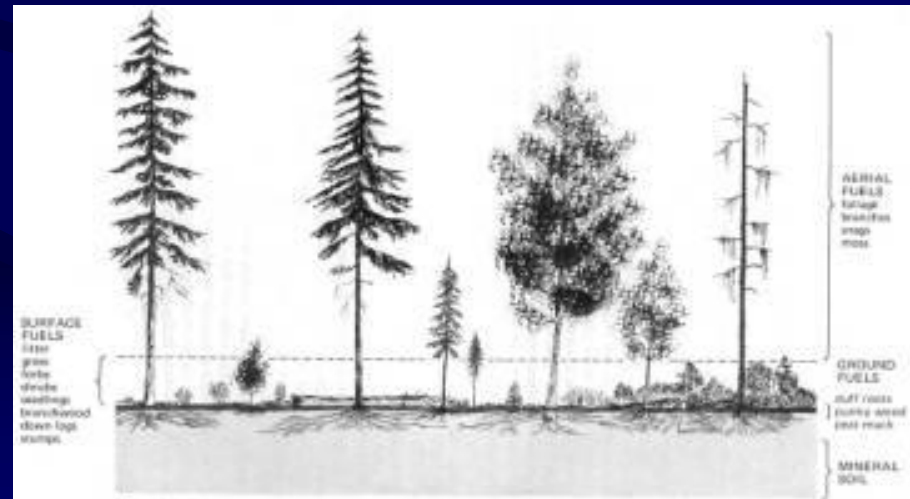
# Weekly Crop Moisture Index



# Keetch-Byram Drought Index



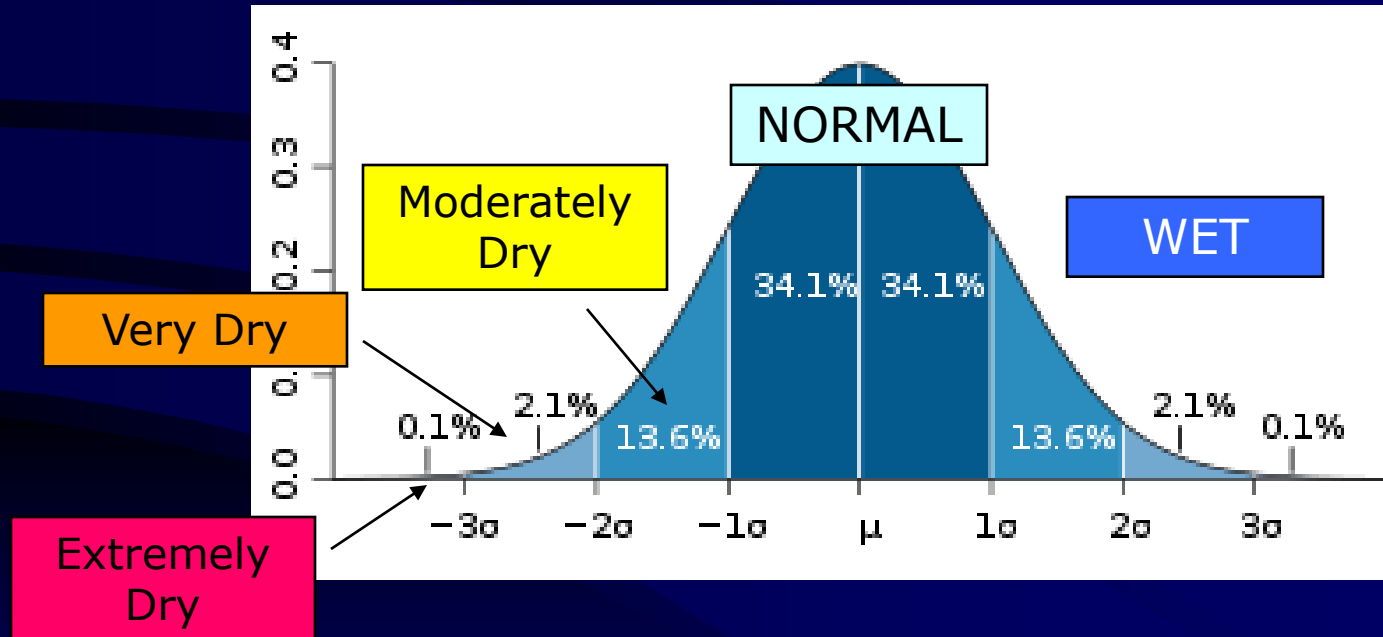
- Long-term indicator of fuel moisture
- Calculated daily for MA Fire Districts
- Values indicate amount of rain needed to return soil to saturated condition





# Standardized Precipitation Index MA SPI

Uses Normal Distribution,  
Standard Deviations of Historic MA Precip Data



Historic frequency and severity indicator

# Drought Plan Reservoir Monitoring

Region	Water System	Size Class
West	Lenox	Small
West	Pittsfield	Medium
CT River	Springfield	Medium
CT River	MWRA Quabbin	Large
Central	A-1 DCR reservoir	Small
Central	Rutland Muschopauge	Small
Central	Southbridge	Medium
Central	Worcester	Medium

# Reservoir Monitoring (cont'd)

Region	Water System	Size class
Northeast	Breakheart/Pierce DCR	Small
Northeast	Rockport	Small
Northeast	Hudson	Medium
Northeast	North Andover	Medium
Northeast	Gloucester	Medium
Northeast	Salem-Beverly	Medium
Northeast	Lynn	Medium
Northeast	Cambridge	Medium
Southeast	Watson Pond DCR	Small
Southeast	Cohasset	Small
Southeast	Milford	Medium
Southeast	Assawompsett Taunton	Medium

# Drought Statements Issued by EEA



Don R. Boyce  
DIRECTOR

THE COMMONWEALTH OF MASSACHUSETTS  
MASSACHUSETTS EMERGENCY MANAGEMENT AGENCY  
MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL  
AFFAIRS

Deval L. Patrick  
GOVERNOR  
Timothy P. Murray  
LIEUTENANT GOVERNOR



Ian A. Bowles  
SECRETARY

For Immediate Release  
October 11, 2007

Peter Judge, MEMA (508) 820-2002  
Robert Keough, EOEEA (617) 626-1109  
Lisa Capone, EOEEA (617) 626-1119

### Commonwealth Issues Drought Advisory

#### *Stepped-Up Monitoring of Water Resources Covers Four Regions of the Bay State*

BOSTON, MA – Following two months of unusually dry weather in most of the state, the Massachusetts Drought Management Task Force has issued a Drought Advisory in four of the Commonwealth's six water resources management regions. The Advisory covers all of Massachusetts except for Cape Cod and the Islands and Berkshire County, and calls on state, regional and local water officials to be vigilant, especially concerning fire danger and water supply for firefighting.

Issuance of the Drought Advisory came at the Wednesday, October 10<sup>th</sup> meeting of the Task Force at the Massachusetts Emergency Management Agency (MEMA) headquarters in Framingham. The second of five levels of drought conditions outlined in the Massachusetts Drought Management Plan (Normal, Advisory, Watch, Warning and Emergency), an Advisory indicates a level of dry conditions that warrants closer tracking by agencies at all levels of government. Of particular concern is fire danger in the coming weeks, when fallen leaves will provide abundant fuel and dry soil conditions can allow fire to burn deep and spread rapidly to large areas.

<http://www.mass.gov/dcr/waterSupply/rainfall/drought.htm>