Current Water Conditions in Massachusetts
November 10, 2011

- October precipitation above normal
- October streamflows were generally above normal
- October ground-water levels were generally above normal
- October reservoir levels were above normal

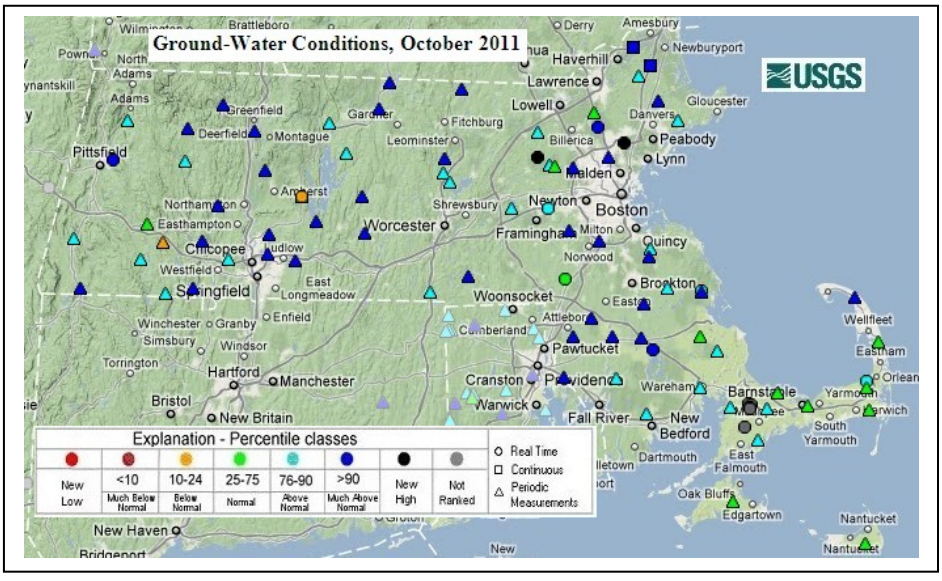
Precipitation Conditions

Estimated October state-wide average precipitation is 6.99 inches, which is 181 percent of the long-term average for the month. The regions of Massachusetts received between 225 (Northeast) and 110 percent (West) of average precipitation during October. Several moderate and large rain events were spread over the month of October. On the morning of October 4th intense persistent rainfall, totaling more than 5 inches in some north shore locations, caused street and urban flooding in the northeast part of the State. On October 28-29 an exceptionally early 'Nor'easter' deposited up to 30 inches of snow across a wide area of Massachusetts. The early snow on top of still leafed out trees caused severe limb and tree failure and resulted in wide spread and long lasting power outages across the Northeast, Central, and Connecticut Valley areas of the State. October 2011 was the 8th wettest October in the last 117 years in Massachusetts according to the National Climate Data Center. A table of October 2011 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 October rainfall in Massachusetts.
November precipitation to date across the State has been negligible.

Ground-Water Levels

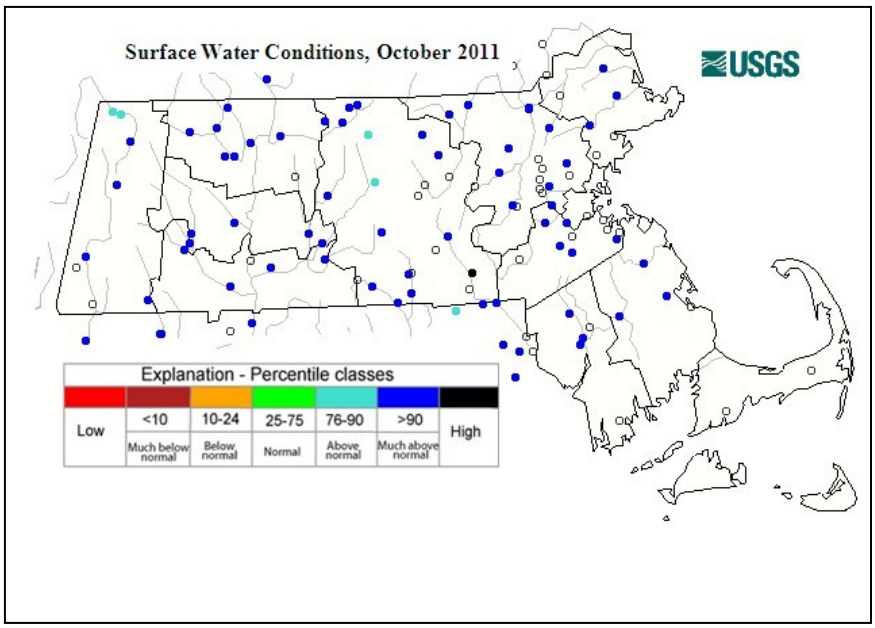
Ground-water levels reported by the United States Geological Survey (USGS) at the end of October were generally normal on the Cape and Islands and above to much above normal in the rest of the State. An assessment of ground-water conditions in the Massachusetts drought regions is shown in a table at the end of this report.

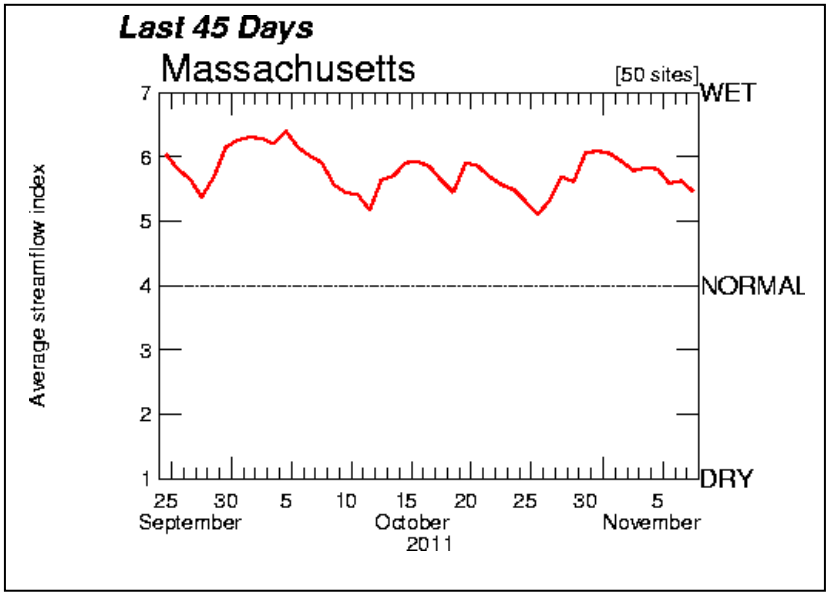
The USGS Groundwater Conditions for the end of October 2011 can be viewed at the web site: http://groundwaterwatch.usgs.gov/StateMapsNet.asp?ncd=crn&sc=25



Streamflow

Average October 2011 streamflows that are monitored by the Commonwealth of Massachusetts and United States Geological Survey (USGS) cooperative stream gaging program were generally much above normal throughout the State. As shown in a table at the end of this report MA DCR has listed the drought regions of Massachusetts as having above normal, and no data (Cape Cod and Islands) surface-water conditions for October. The graph below depicts a composite daily streamflow relative to normal streamflow for Massachusetts for the period of September 24 to November 7, 2011. Well above normal flows with some increases and decreases corresponding to precipitation events were present throughout the month and into early November. These above normal streamflows are the result of moderate to large precipitation events in August through October. The graph is a composite of 50 real-time gages across the state with a long period of record.





KEY:

1 = New record low for day
2 = < 10th percentile
3 = 10th – 24th percentile
4 = 25th – 74th percentile
5 = 75th – 89th percentile
6 = ≥ 90th percentile
7 = New record high for day

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 October. Reservoirs are generally above normal for this time of year.

October / November 2011 Massachusetts Reservoir Status

Reservoir/City or Town	Percent Full	Reservoir/City or Town	Percent Full
Quabbin	98	Beverly/Salem	87.1
Worcester	101	Lynn	82
Cobble Mt./ Springfield	93.2	Taunton/New Bedford/Assawompsett	100

Note: NA Indicates data not available for this report

Drought Indices/Forecasts

US Drought Monitor

The National Drought Mitigation Center's (NDMC's) November 8, 2011 Drought Monitor Map for the United States shown at right indicates no drought conditions in Massachusetts.

Standardized Precipitation Index (SPI)

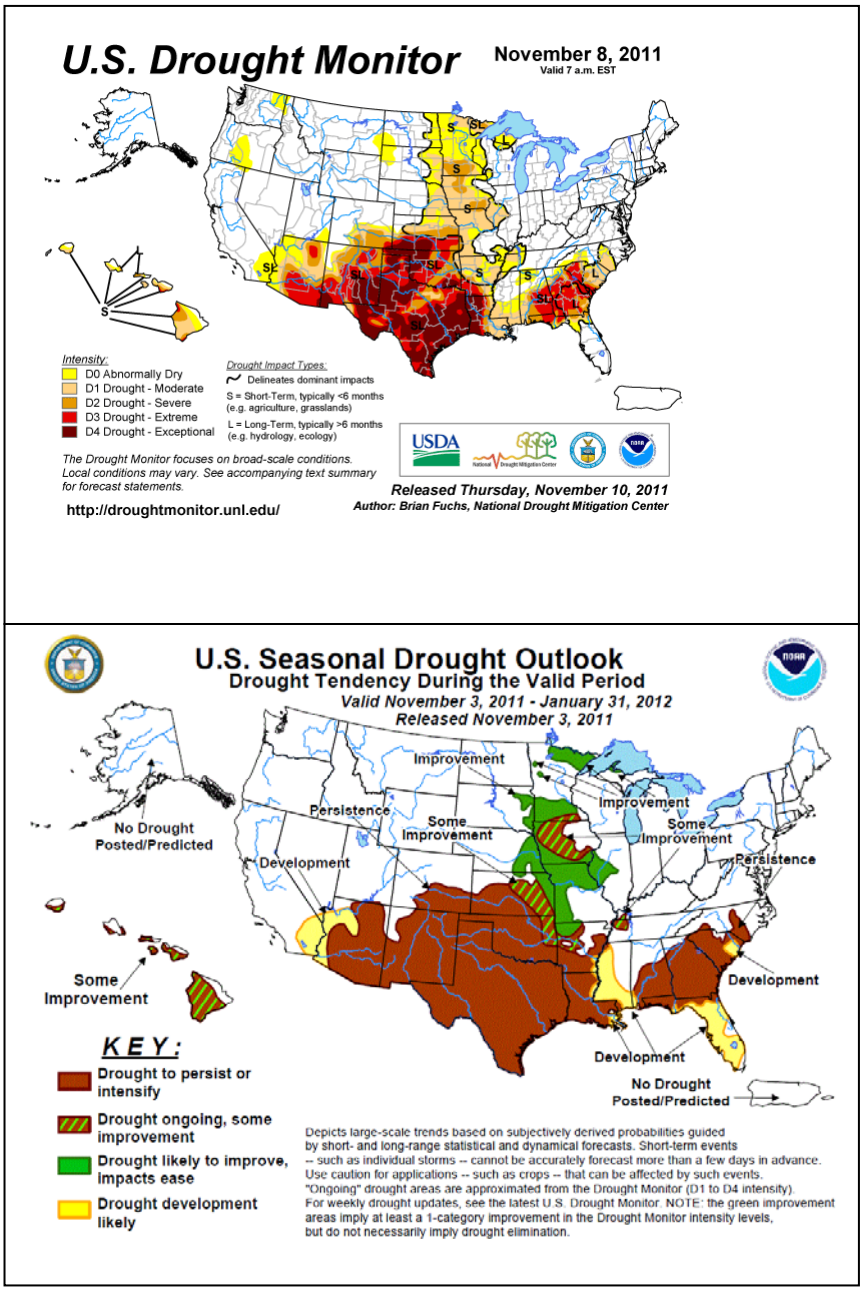
The Western Regional Climate Center's (Desert Research Institute, University and Community College System of Nevada) 1-, 3-, 6-, and 12-Month Standardized Precipitation Index values at the end of October for the 3 Massachusetts climate regions ranged from very wet to exceptionally wet. Massachusetts SPI 1-, 3-, 6-, and 12-month values for all the drought regions are all above normal with several new maximum values.

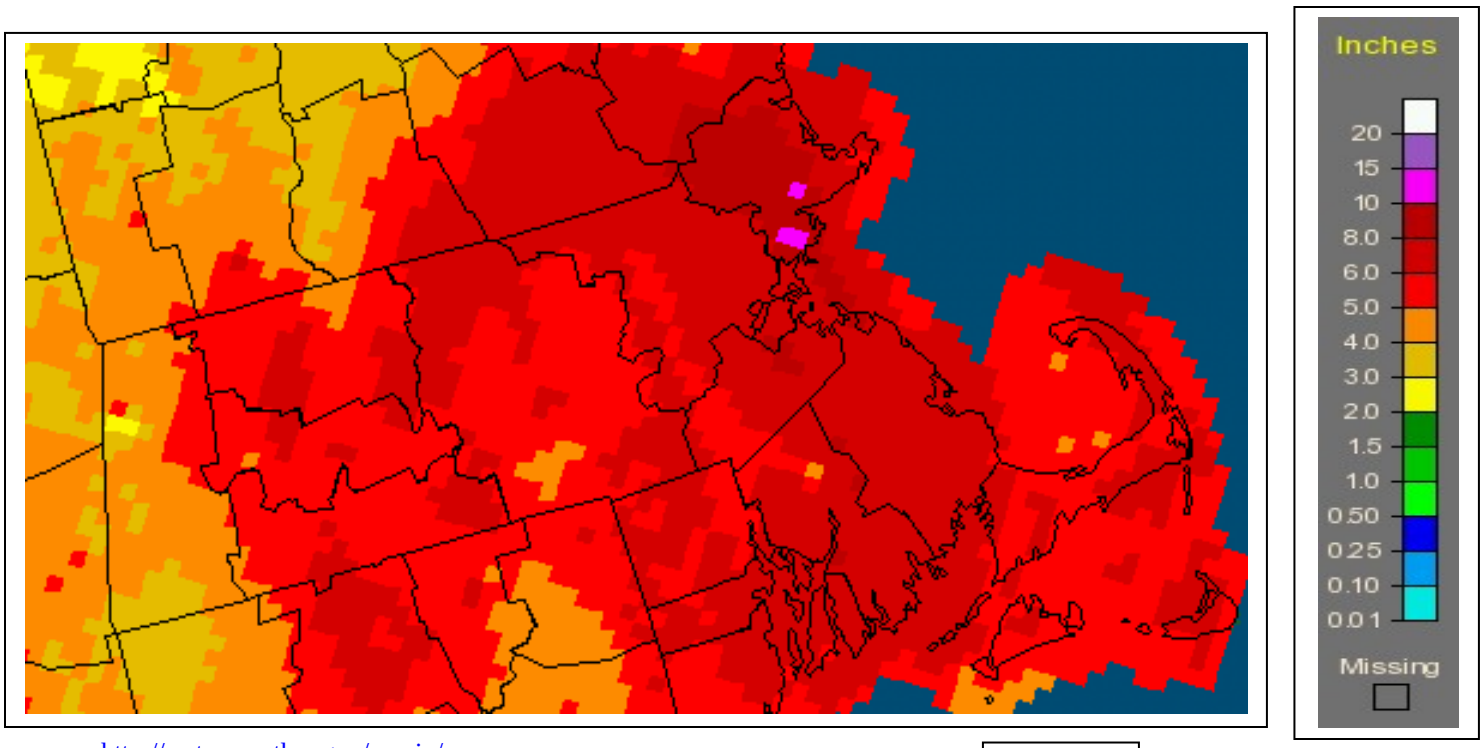
NWS/NOAA's Climate Prediction Center

The U.S. Seasonal Drought Outlook dated November 6, 2011, predicts no tendency for drought conditions to develop in Massachusetts through January 2012.

Extended Forecasts

Moisture from Tropical Storm Sean will interact with a cold front approaching the region to give us showers and possibly locally heavy rain today into early Friday. After the cold front passage, Friday's weather will give way to clear seasonably cool breezy weather continuing into Saturday. Clear warming weather is forecast to continue into mid week. The National Weather Service Climate Prediction Center's extended 6 to 10 day and 8 to 14 day forecasts are for above normal precipitation and temperatures. The 1-month forecast is for normal precipitation and temperatures. The NWS Climate Prediction Center Information can be found at: http://www.cpc.noaa.gov/index.php





http://water.weather.gov/precip/

TOTAL RAINFALL
OCTOBER 2011

GENERAL WATER CONDITIONS IN MASSACHUSETTS - OCTOBER 2011
EOEEA and MEMA DROUGHT MANAGEMENT PLAN REGIONS

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

Note: Surface- and ground-water conditions for individual streamflow-gaging stations and wells may differ from general conditions. ND, no data

Weather Ramblings --- Catching a Wave, and Measuring It

By QUENTIN HARDY

SUNNYVALE, Calif. — James Gosling wants to network the world's oceans. Mr. Gosling is transforming a fleet of robots that move out in the ocean to measure everything from weather to oil slicks, sharply reducing many of the costs of ocean-related businesses. If his plans sound rather extreme, consider this: Mr. Gosling designed of one of the most influential and widely used computer languages, Java. The Silicon Valley company he joined, Liquid Robotics, has raised serious money to accomplish the mission — $40 million, including $22 million in June from VantagePoint Capital Partners and Schlumberger, the oilfield services company.

Liquid Robotics' product, a Wave Glider, is about the size of a surfboard. Using a wave-based propulsion system and two solar panels to fuel its computers, the robots travel slowly over the ocean, recording data. The sensor data is crunched onboard by low-power cellphone chips, and then shipped by satellite or cellphone to big onshore computers that do complex analysis. "Getting a computer out into the middle of the ocean is a pretty big challenge, but that is the attractive thing," said Mr. Gosling, chief software architect at Liquid Robotics. "Three-quarters of the planet is ocean, and it's still dark to us." Liquid Robotics is working toward networking tens of thousands of the craft, adding sensors and onboard computing capability so the robots can manage themselves during oceangoing projects lasting years. Right now, the robots work solo. "This is a bit like 1960 in the Space Age, when they had launched just a few satellites," said Edward Lu, a former astronaut who is in charge of "innovative applications" at the company. "Space is now a normal part of life, used for television transmission, credit card transactions and driving directions. We can do the same thing with the sea." Liquid Robotics has sold Wave Gliders to the federal National Oceanic and Atmospheric Administration for $100,000 and up, depending on what kind of sensors are needed. The company has built about 70 Wave Gliders since 2009, largely for use by the petroleum industry and marine scientists. The company builds another 40 of the devices every three months. It also has a service for sending data to companies, for $1,000 to $3,000 a day. "We replace ships that cost $50,000 to $100,000 a day to operate," said Bill Vass, Liquid Robotics' chief executive. "Our last sortie covered 8,600 miles of the Gulf of Mexico for BP. By ship that would have cost them $10.5 million. We did it for $1.5 million." Other firms, like iRobot, also make seagoing robots with sensors, but these tend to be used for underwater work and aren't designed to be networked. When the Wave Gliders talk with each other, Mr. Gosling said, they can be used to signal other robots to join them on missions like measuring the size of an oil slick or an algae bloom, or determining patterns of midocean currents, alerting ships to avoid or seek them, saving on fuel costs. He also needs to figure out ways the robots can navigate on their own. Currently onshore pilots manage 10 to 15 gliders at a time, a technique Mr. Gosling finds primitive. "They have tools that remind me of banging two rocks together," Mr. Gosling said. "If a robot detects a ship, it should just get out of the way." There are other hazards. One craft was bitten by a shark. It lost a sensor, but still managed to make it to a rescue craft. In November the company is starting a yearlong awareness-building campaign by launching four craft on a trip across the Pacific. Two robots will aim for Tokyo, two for Sydney. Liquid Robotics will post sensor data online for the taking, awarding a prize to whomever comes up with the most innovative use for the information.

The robots move at about one and a half knots, powered by underwater wings connected to the surface vessel by a 22-foot strap. Looking something like window blinds, the wings tilt up when the craft is lifted by a wave, rising through the water and pulling it forward. On a down wave, the wings sink and tilt downward, pulling the craft forward. If a wave is very large, the glider is pulled under water and moves through it, the way a surfer dives under a wave to avoid its full force. As further proof of concept, the company hopes to pilot a Wave Glider through a hurricane.
