



Satellites, Weather and Climate Module 28:

2012 Drought: A case study



The
UNIVERSITY
of VERMONT



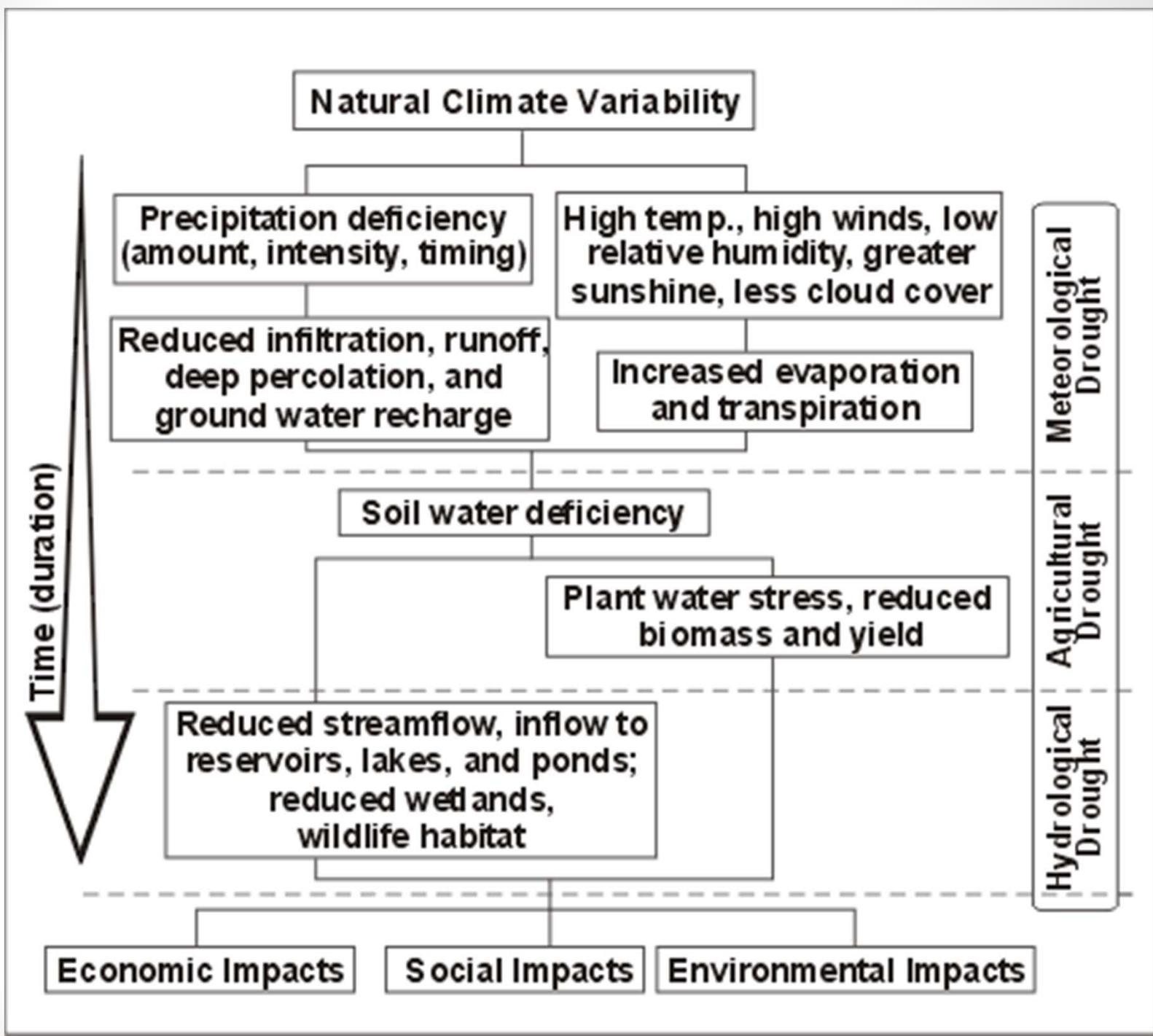
Drought in Oklahoma – April 2011



Photo credit: Gary McManus

Drought is ...

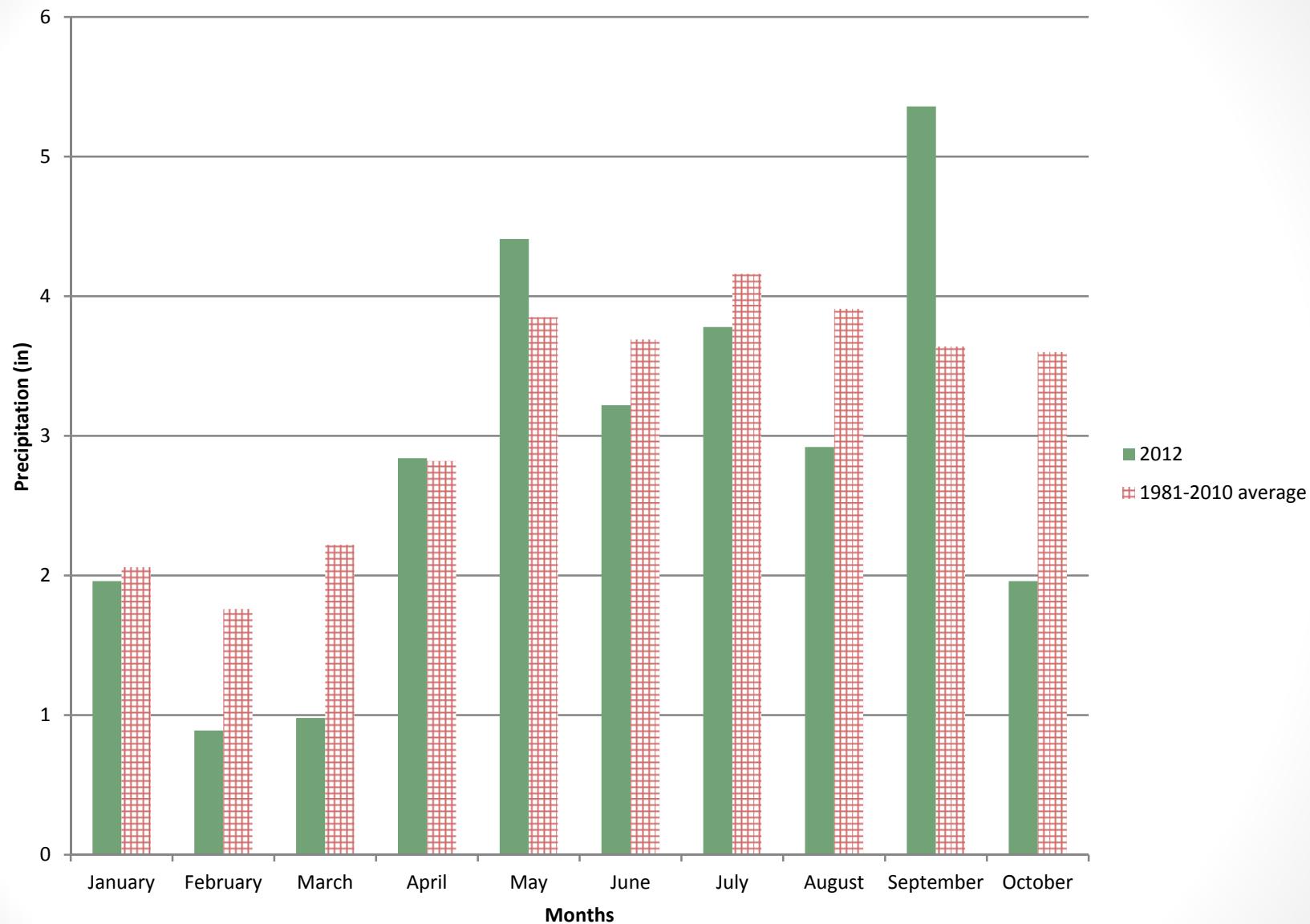
- = water shortage with reference to a specified need for water in a conceptual supply and demand relationship (Dracup et al., 1980)
- quantified
 - precipitation
 - soil moisture
 - evapotranspiration
 - runoff
 - mean temperature
 - climatic indices
 - vegetation stress



1. Meteorologic drought

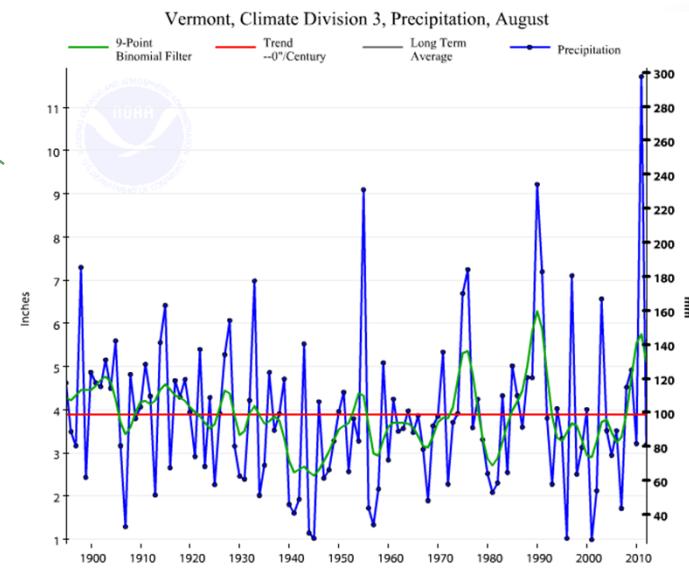
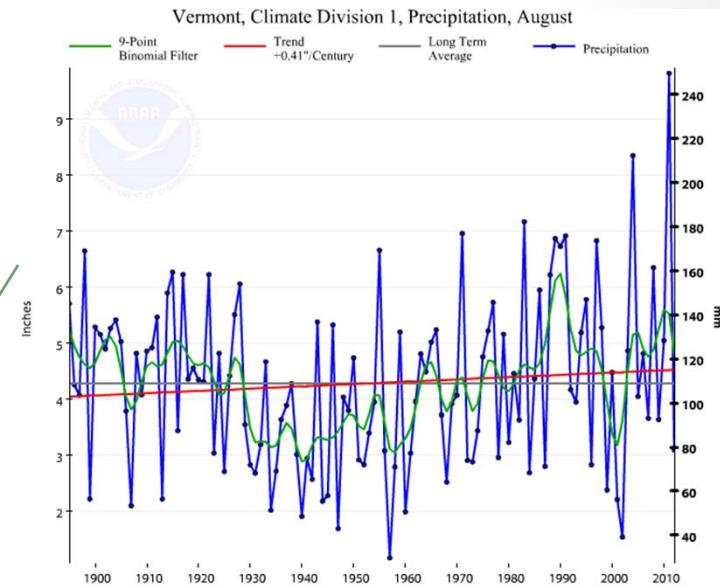
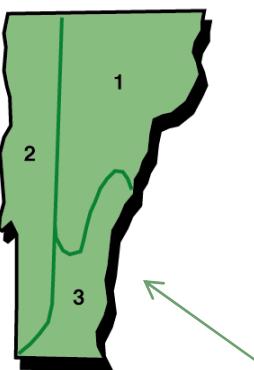
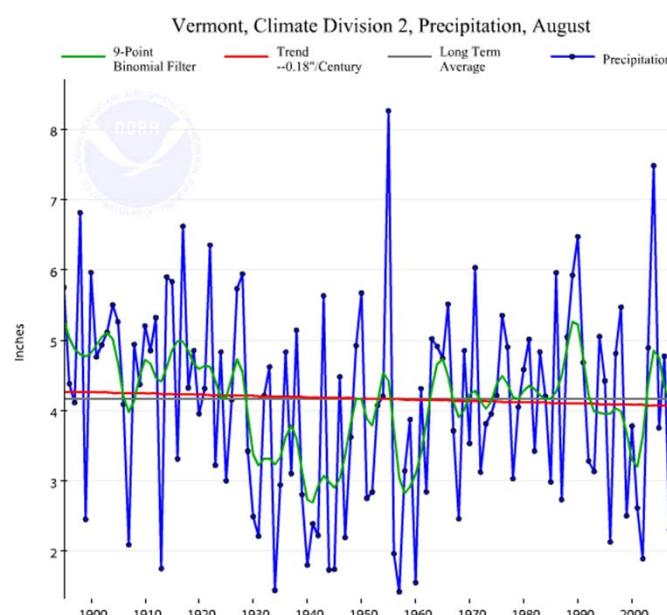
- reduction in rainfall of a specific amount
- 30 year normal
- humidity and temperature
- precipitation, wind and temperature in arid and semiarid regions

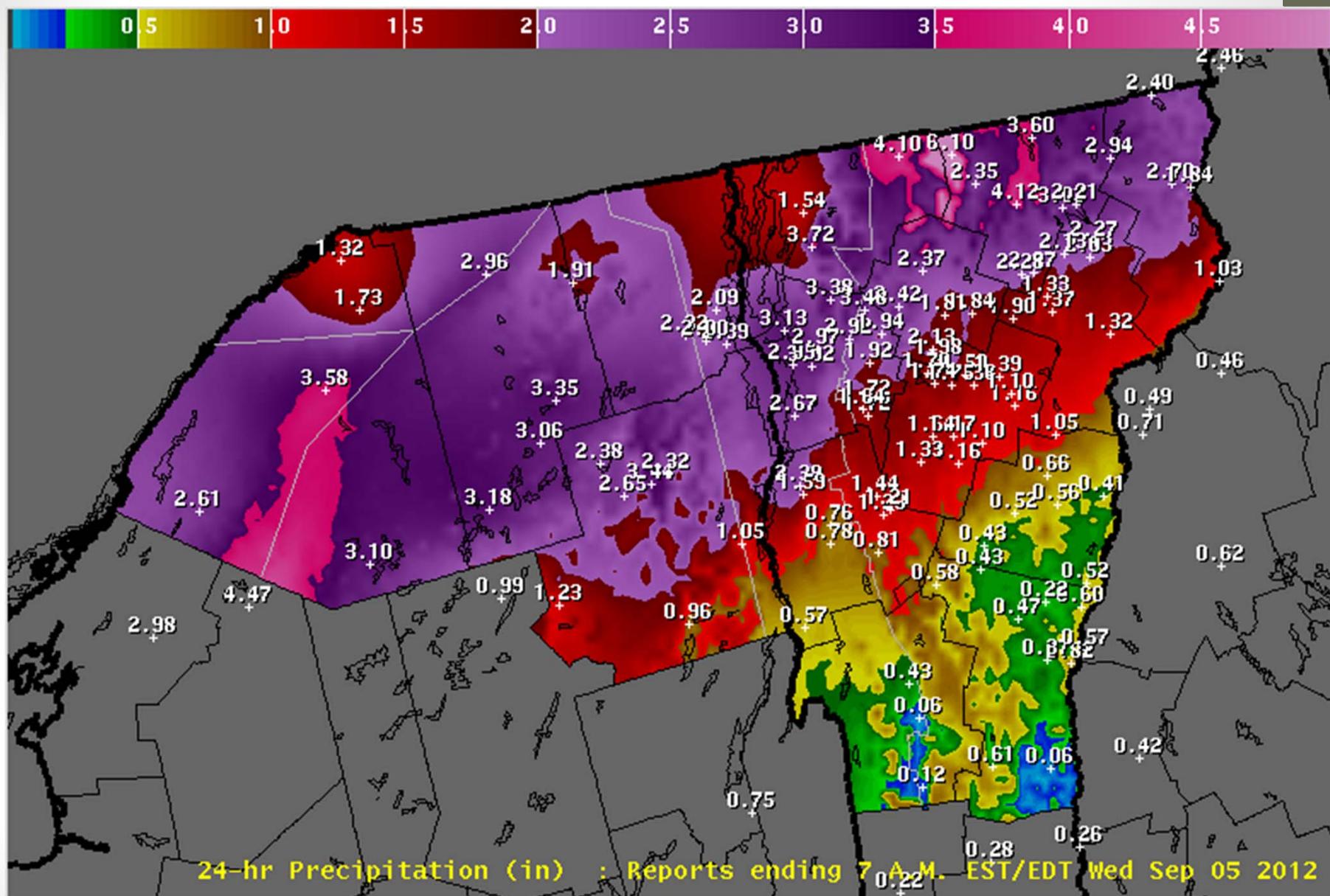
2012 vs. 1981-2010 average - Burlington area



Data: NWS

August 2012 rainfall around Vermont





NOAA / National Weather Service Burlington, Vermont

Graphic created: Wed Sep 05 2012 10:23 AM EDT

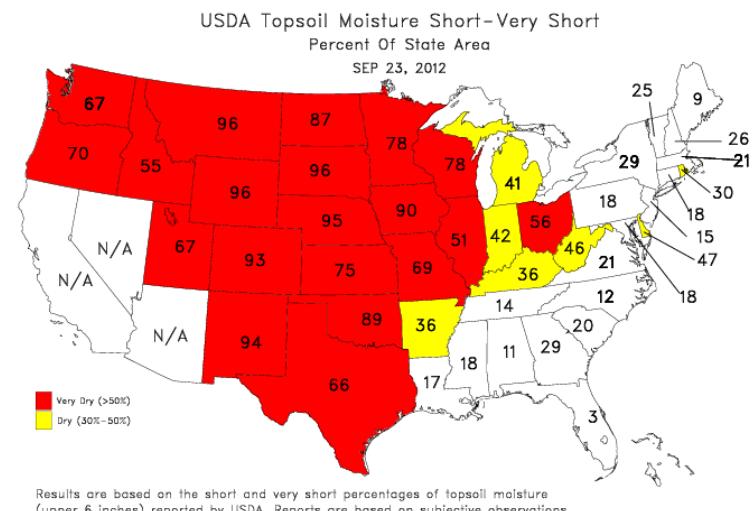
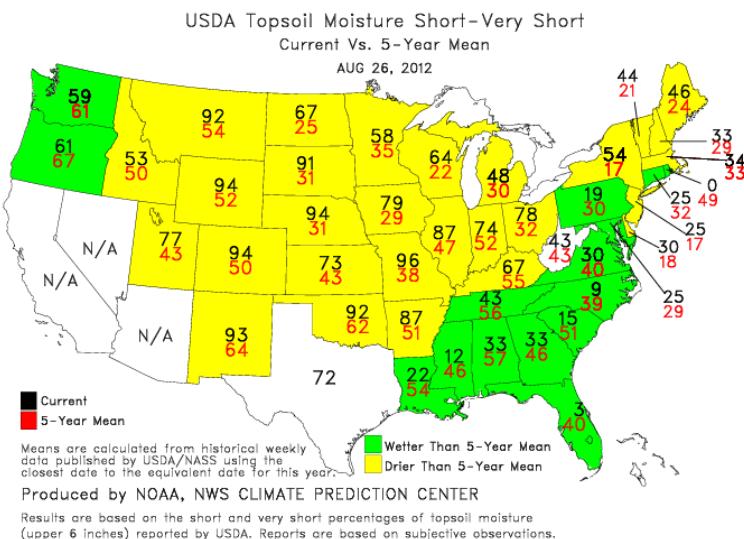


2. Agricultural drought

- deficient moisture conditions that cause a lasting effect on plants (economic importance)
- defined for crops and not natural vegetation

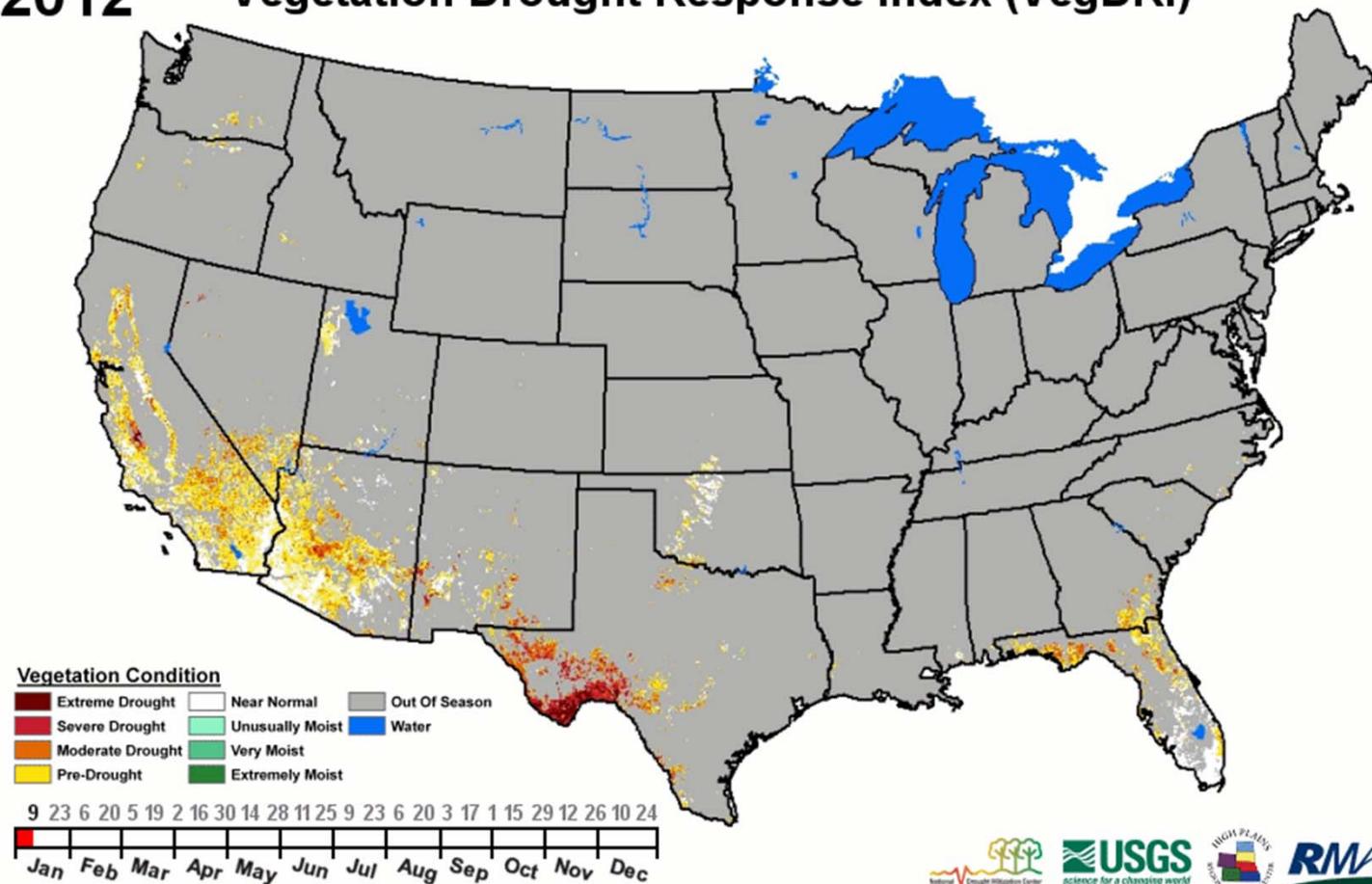


Dry soil (upper-most layers)



Time series loop

2012 Vegetation Drought Response Index (VegDRI)



3. Hydrologic drought

- effects of precipitation on surface or subsurface water supply
- lagged behind meteorological and agricultural drought
- affected
 - deforestation
 - land degradation
 - dam construction
- last to return to normal when meteorological conditions return

Lake Champlain Extremes and Level

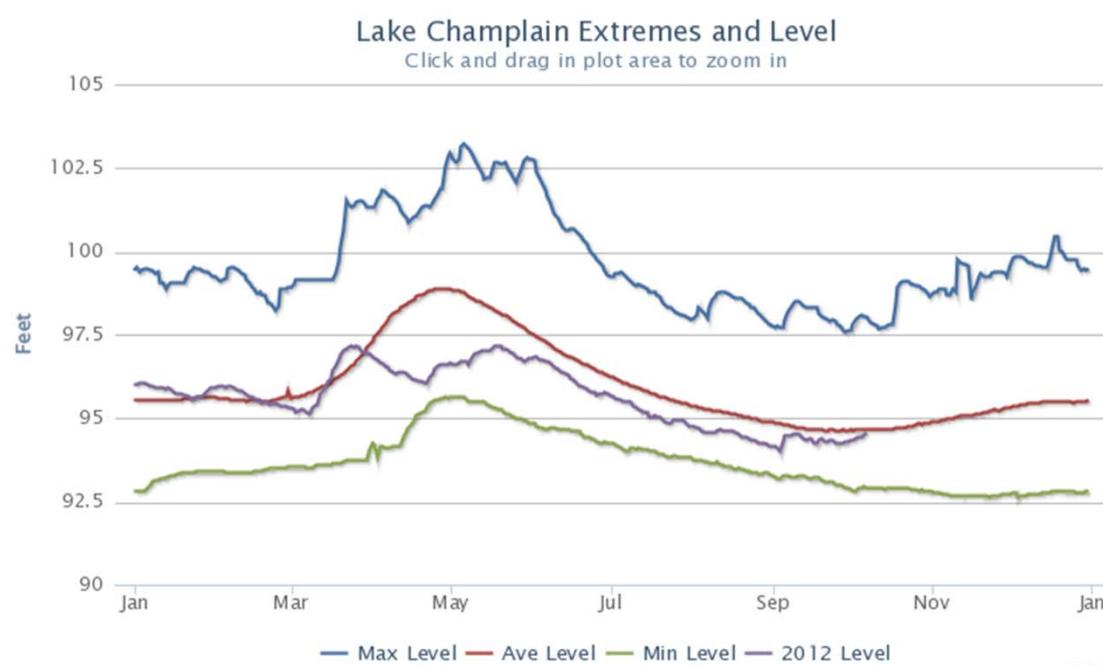
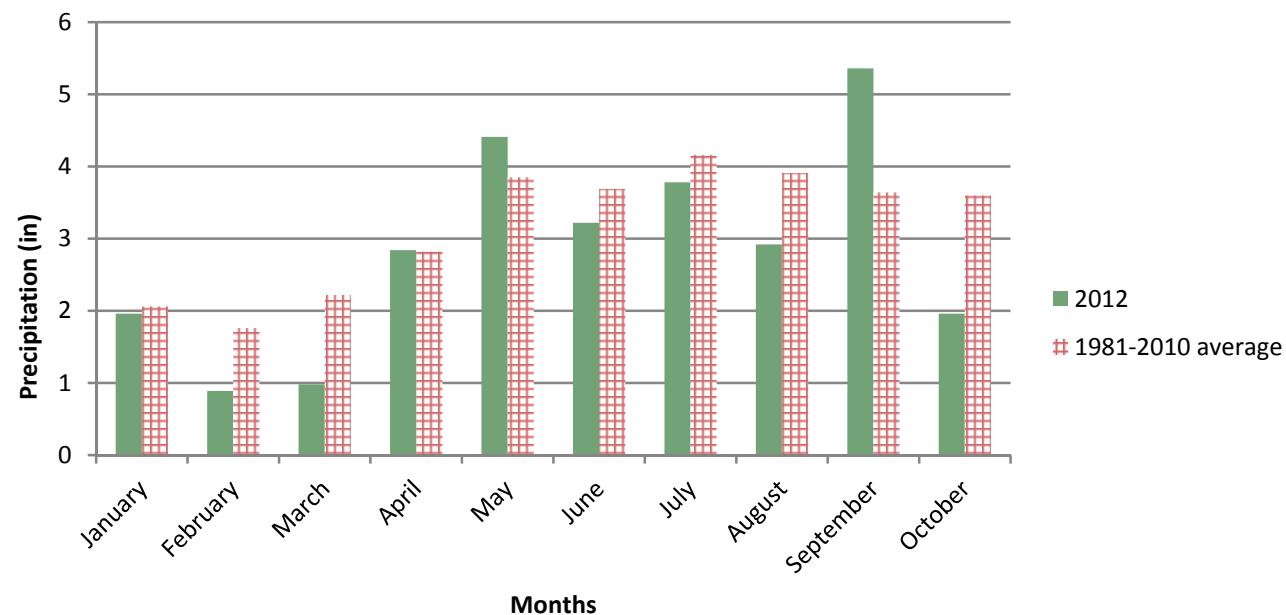
Click and drag in plot area to zoom in



Highcharts.com

Data: NWS

2012 vs. 1981-2010 average - Burlington area



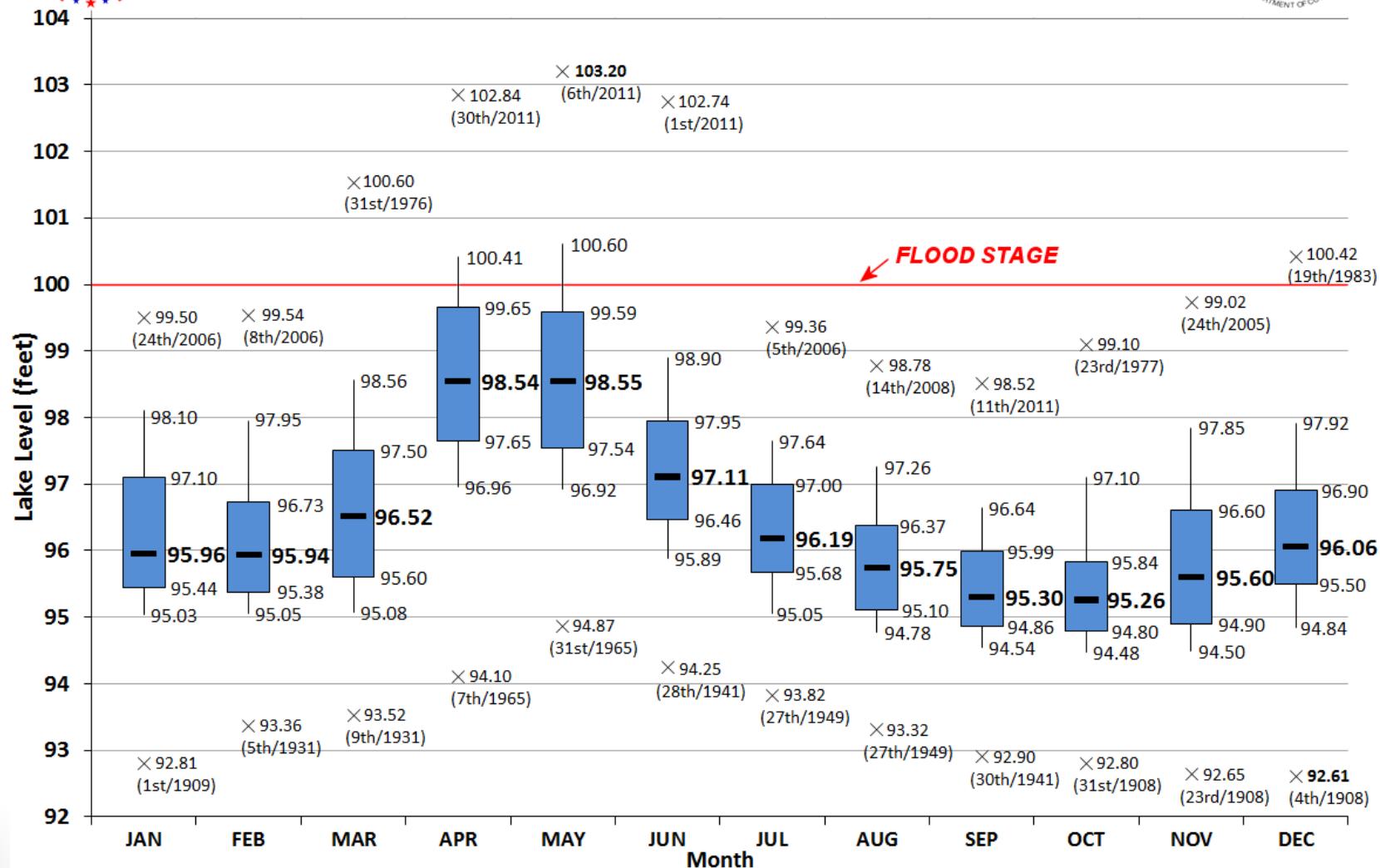
Highcharts.com

Data: NWS



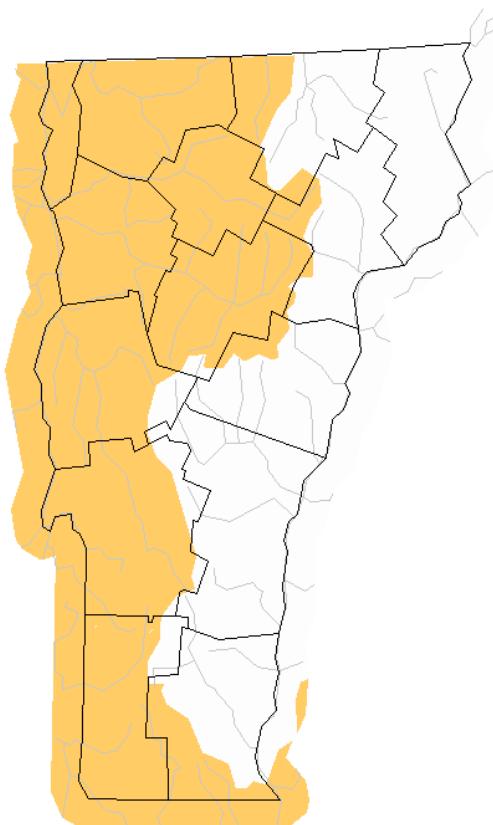
Lake Champlain Lake Level - King St. Ferry Dock (1970-2011)

Solid Bar - Median Monthly Value; Boxes 25th-75th Percentile; Whiskers 10th/90th Percentile
(x - monthly record values since 1908)



Hydrologic drought – 2 September, 2012

Sunday, September 02, 2012

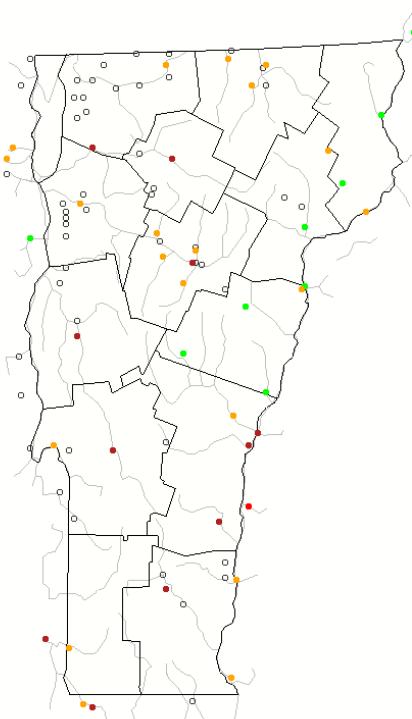


Explanation - Percentile classes				
Low	≤5	6-9	10-24	N/A
Extreme hydrologic drought	Severe hydrologic drought	Moderate hydrologic drought	Below normal	Insufficient data for a hydrologic region

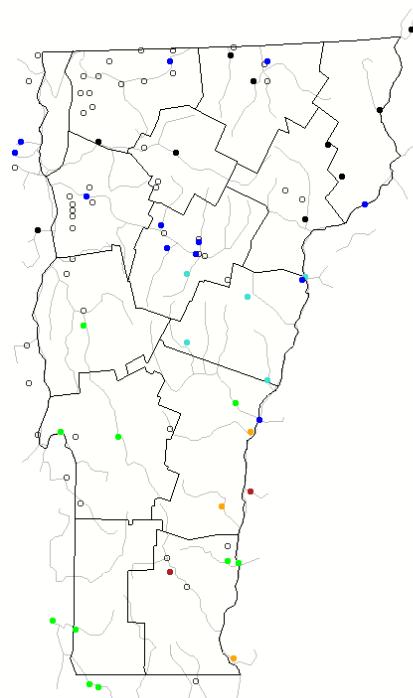
USGS gauges

3, 5, 27 September, 2012

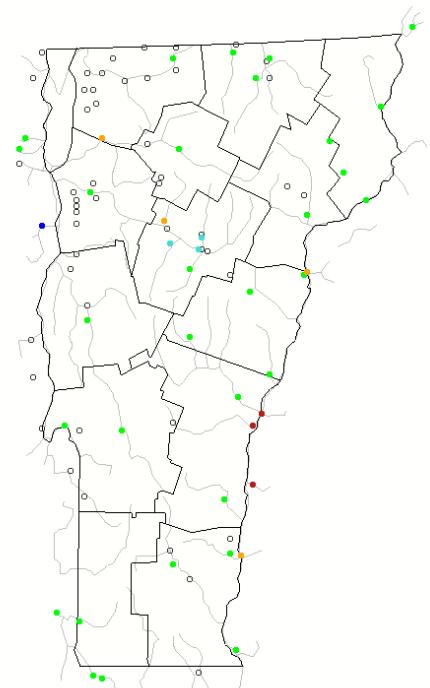
Monday, September 03, 2012 21:30ET



Wednesday, September 05, 2012 21:30ET



Thursday, September 27, 2012 11:30ET



USGS

Explanation - Percentile classes							
●	●	●	●	●	●	●	○
Low	≤10	10-24	25-75	76-90	>90	High	Not-ranked
Much below normal	Below normal	Normal	Above normal	Much above normal			

4. Socioeconomic drought

- demand for economic good > supply due to weather-related drought
- goods - water, HEP, food grains
- compounded
 - population increase
 - per capita consumption increase

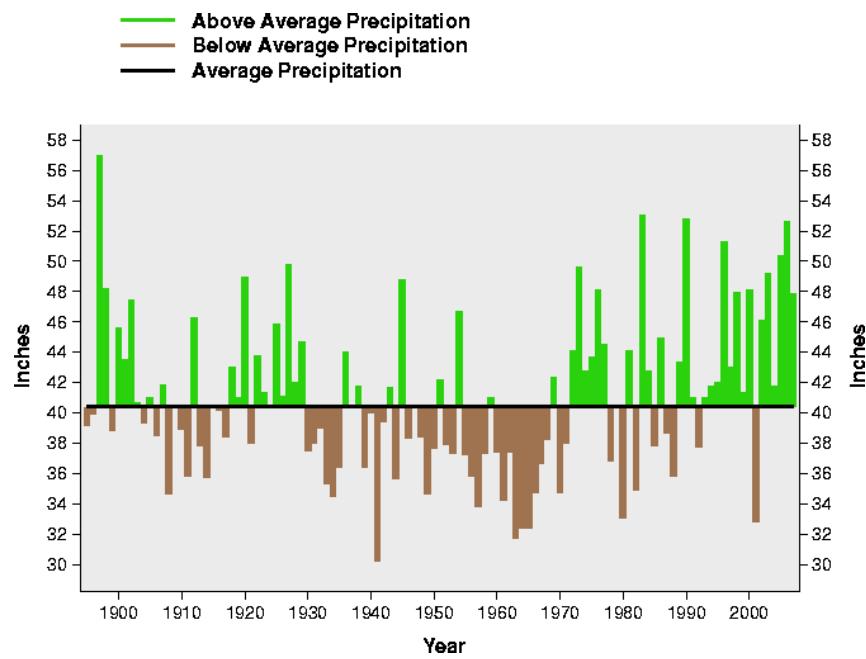
The face of drought in Vermont

Mt. Ascutney & Springfield, VT – 3 October 2010



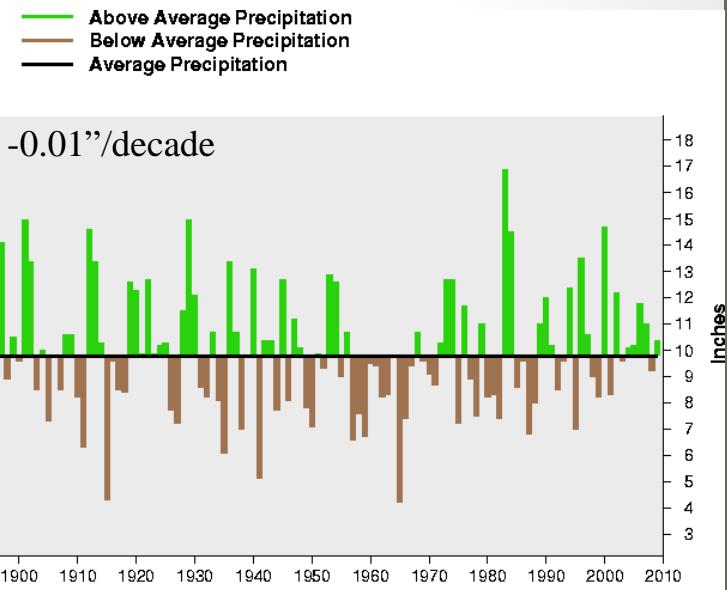
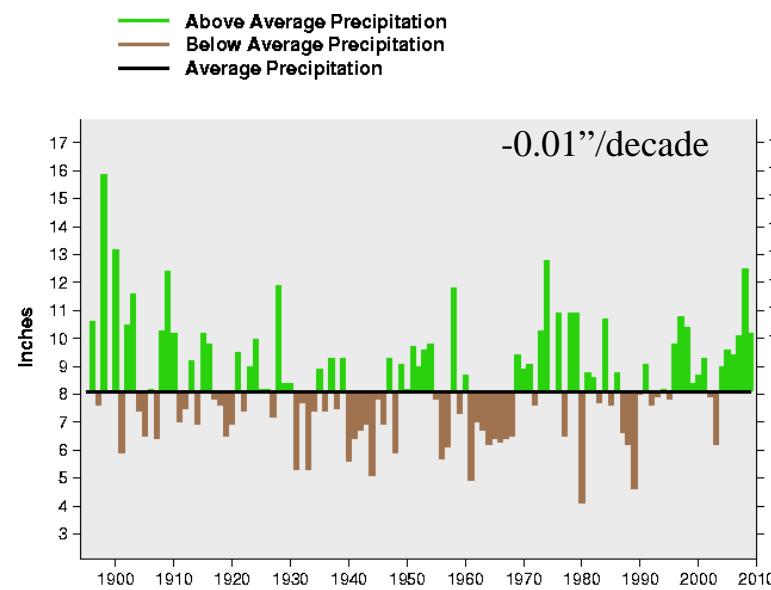
Photo credit: Marita Johnshon, Springfield, VT

1. Timing



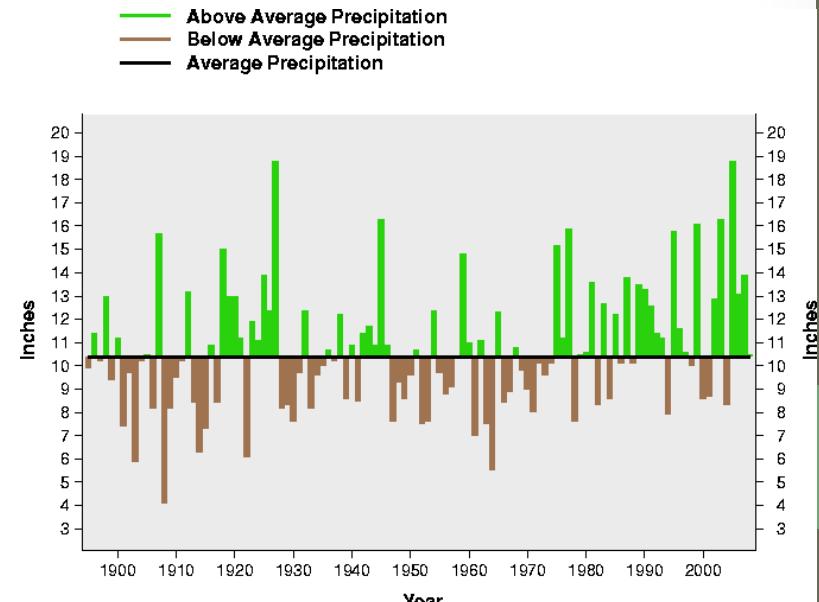
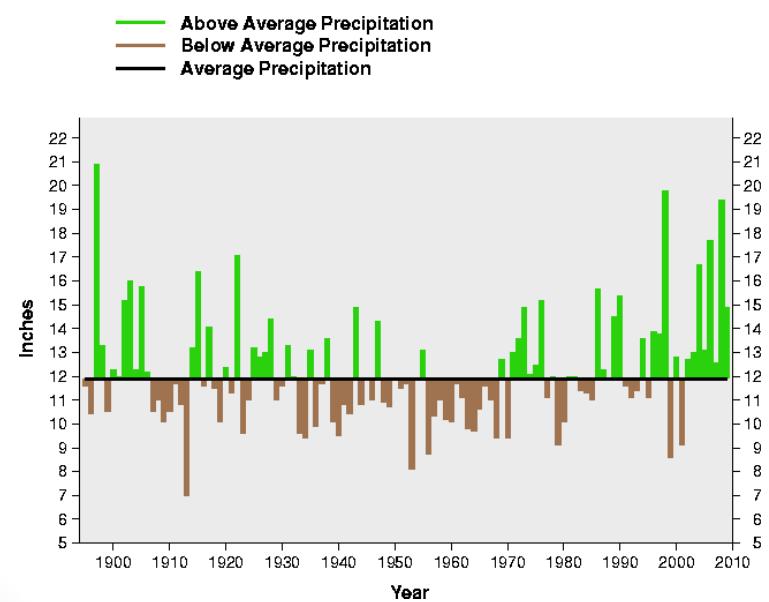
- severe droughts
 - rare
 - statewide
 - multiyear
- less severe droughts
 - more frequent
 - localized
- tendency for drought & floods to occur in the same year

DJF



MAM

JJA



SON

1. Timing



- tends to be a summer occurrence, but can occur at any time
- timing influences who is affected
 - farmers
 - water management
- varies by climatic division
- southeast VT most affected & strong coupling between atmosphere and hydrology

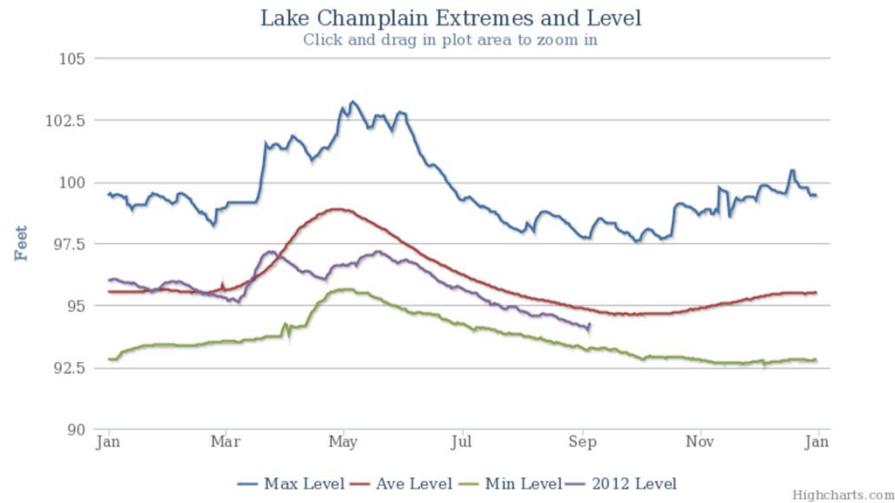
2. Who is affected by drought?



- Agriculture
 - dairy farming & other animal husbandry
 - forage crops
 - corn

- Tourism
 - fall foliage
 - ski industry

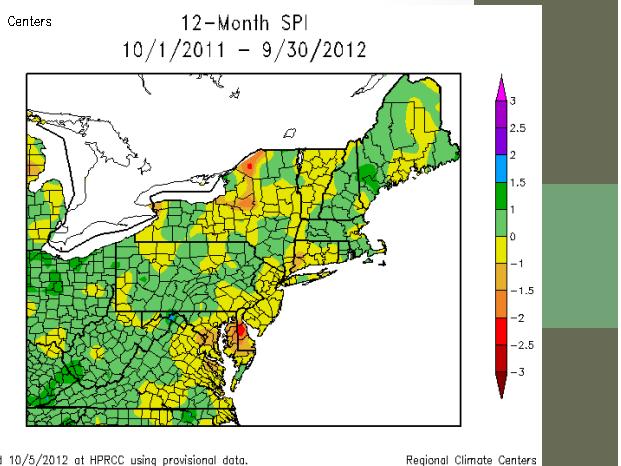
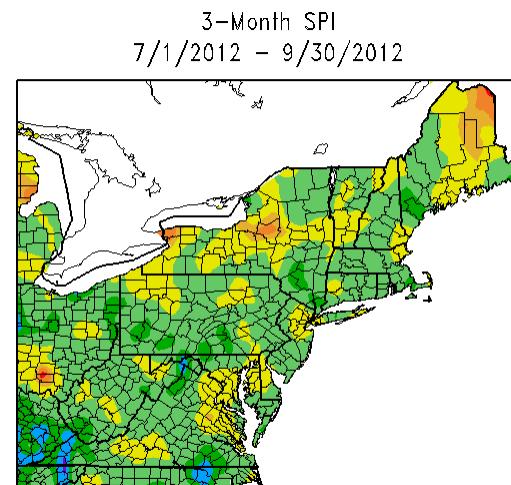
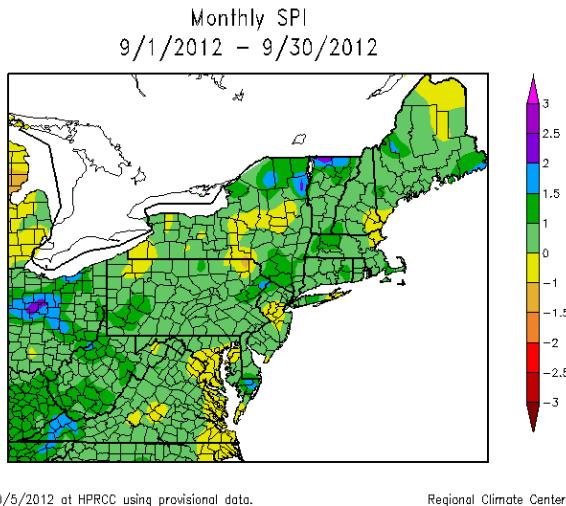
Who is affected by drought?



- Water resources
 - snowpack
 - lake levels
 - river discharge
 - groundwater

- Forestry
 - wildfires
 - health

3. Drought depends upon the timeframe



4. Trees can experience concurrent stressors

Photos: L-A.
Dupigny-
Giroux



2004 – Tent caterpillar & white pine damage



2006 -
Tar spot,
leaf curl,
fungus

