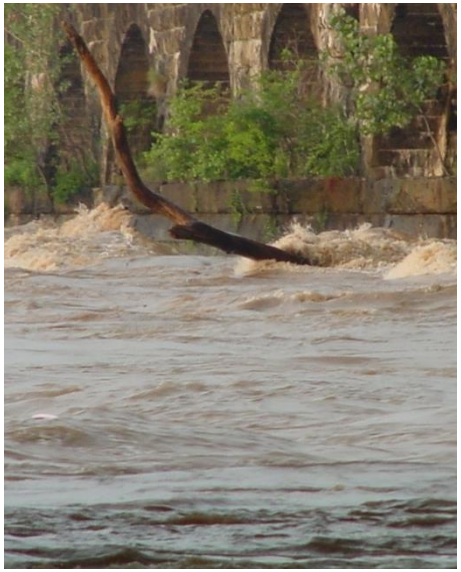
Delaware River Basin Commission

Drought Management and Hydrologic Conditions

Amy L. Shallcross, PE

Manager, Water Resource Operations

Public Hearing – November 9, 2016



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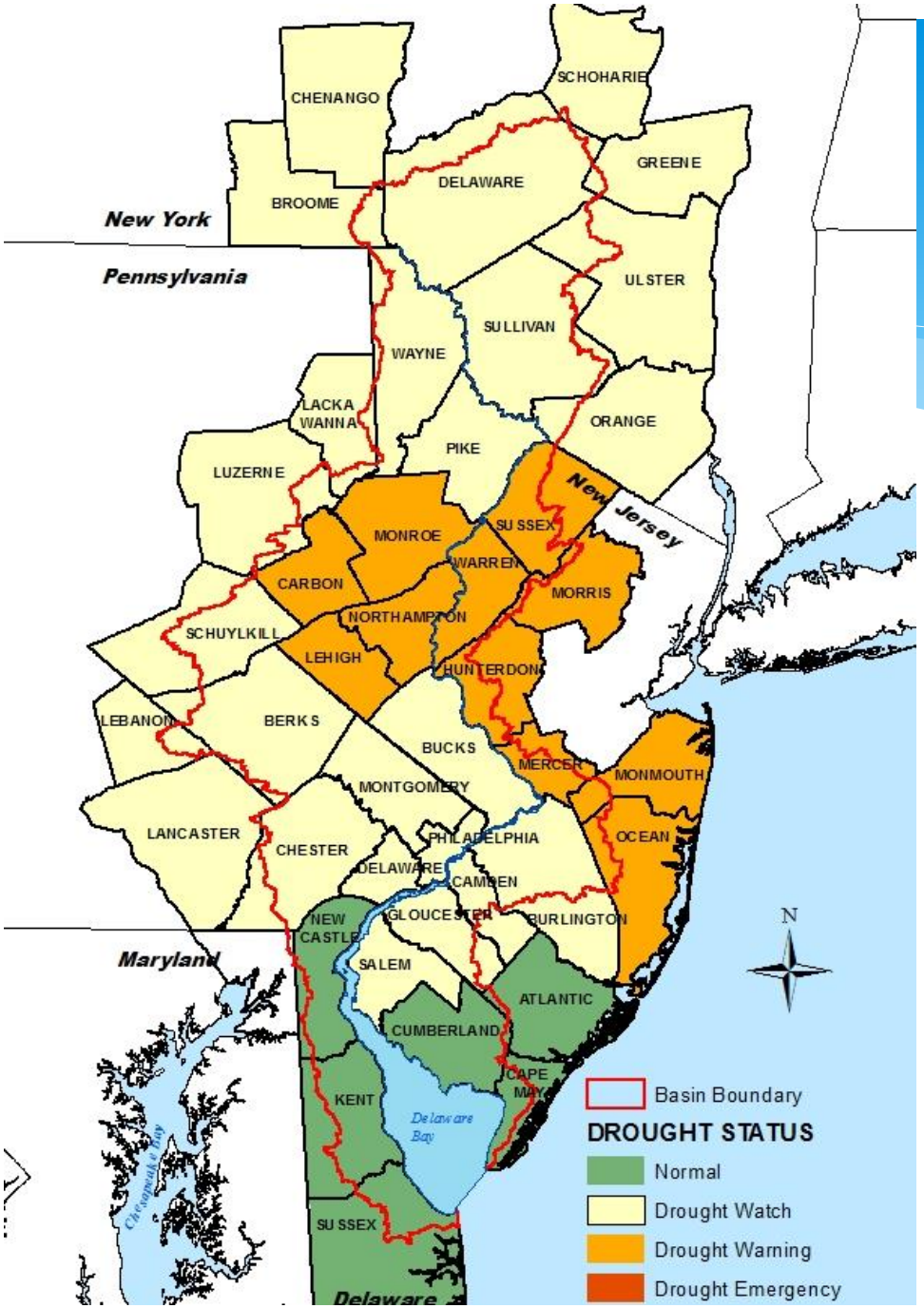
DRB Drought Conditions



STATE INDICATORS

- Groundwater levels
- Precipitation
- Streamflow trends
- Water supplies
- Palmer Index

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DRBC's Role in Drought Management

The Commission's drought **planning and response** actions:

- Complement the states' drought actions
- Address the **essential conservation of regional reservoir storage** for purposes of water supply and flow augmentation for the Delaware River
- Control salinity in the Delaware Estuary.

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Commission Authorities

* Emergency Declarations under Sections 3.3(a) and 10.4 of the Compact
* Drought Operations of Major Reservoirs
* Direction of Storage for Emergencies
* Consumptive Use Replacement
* Drought Management and Contingency Plans
* Voluntary Conservation
* Coordinated Actions with the Signatory States

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DRBC Actions

- Pre-emptive
  - Comprehensive Plan/Project Review
  - Water Conservation
  - Water Audits
  - SE PA Groundwater Protected Area
- Responsive
  - Drought Operating Plans
  - Consumptive Use Replacement
  - Low Flow Augmentation

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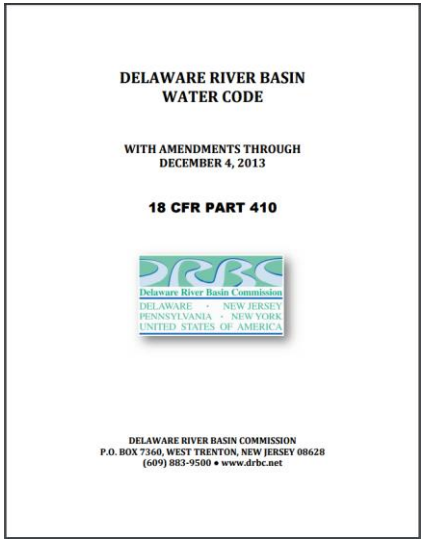
Drought Operating Plans and Actions

Water Code 18 CFR Part 410

* Basinwide
  * Reduced conservation releases
  * Reduced flow objectives
  * Reduced out-of-basin diversions
  * Consumptive Use Replacement
  * Use of additional reservoirs



DELAWARE RIVER BASIN
WATER CODE

WITH AMENDMENTS THROUGH
DECEMBER 4, 2013

18 CFR PART 410

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P.O. BOX 7360, WEST TRENTON, NEW JERSEY 08628
(609) 883-9500 • www.drbc.net

* Lower Basin (below intersection of PA, NJ and NY borders)
  * Similar to basinwide, except Montague, NYC Diversion and Releases
  * Reduced Trenton Flow Objective – based on salt front location
  * Choice of six operating plans

Area affected by Lower Basin Drought Management Plan

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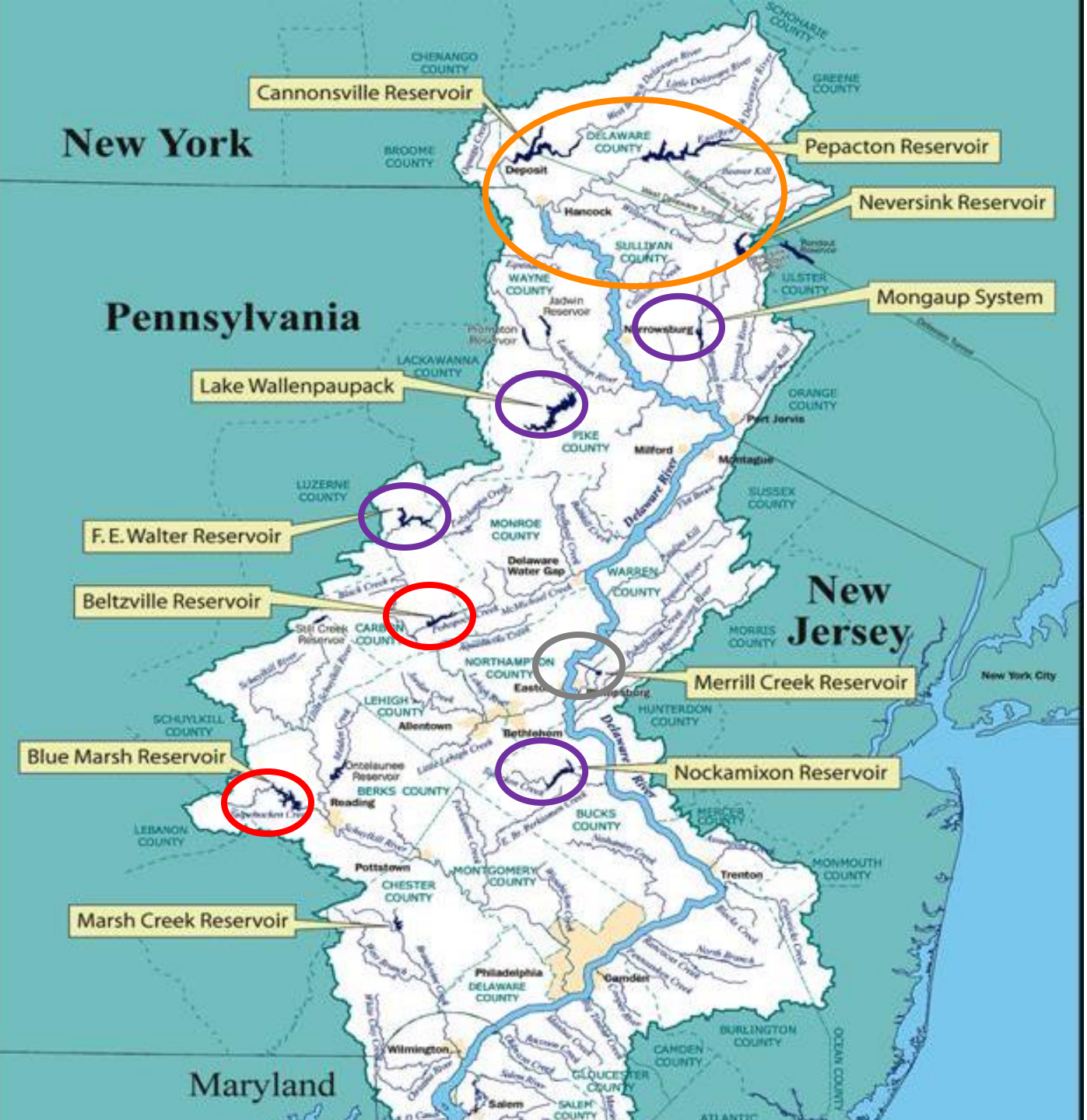

Sources of Water

* ERQ (bank est. by Decree)
* DRBC Storage in USACE Reservoirs
* Emergency
* Consumptive Use Make –Up

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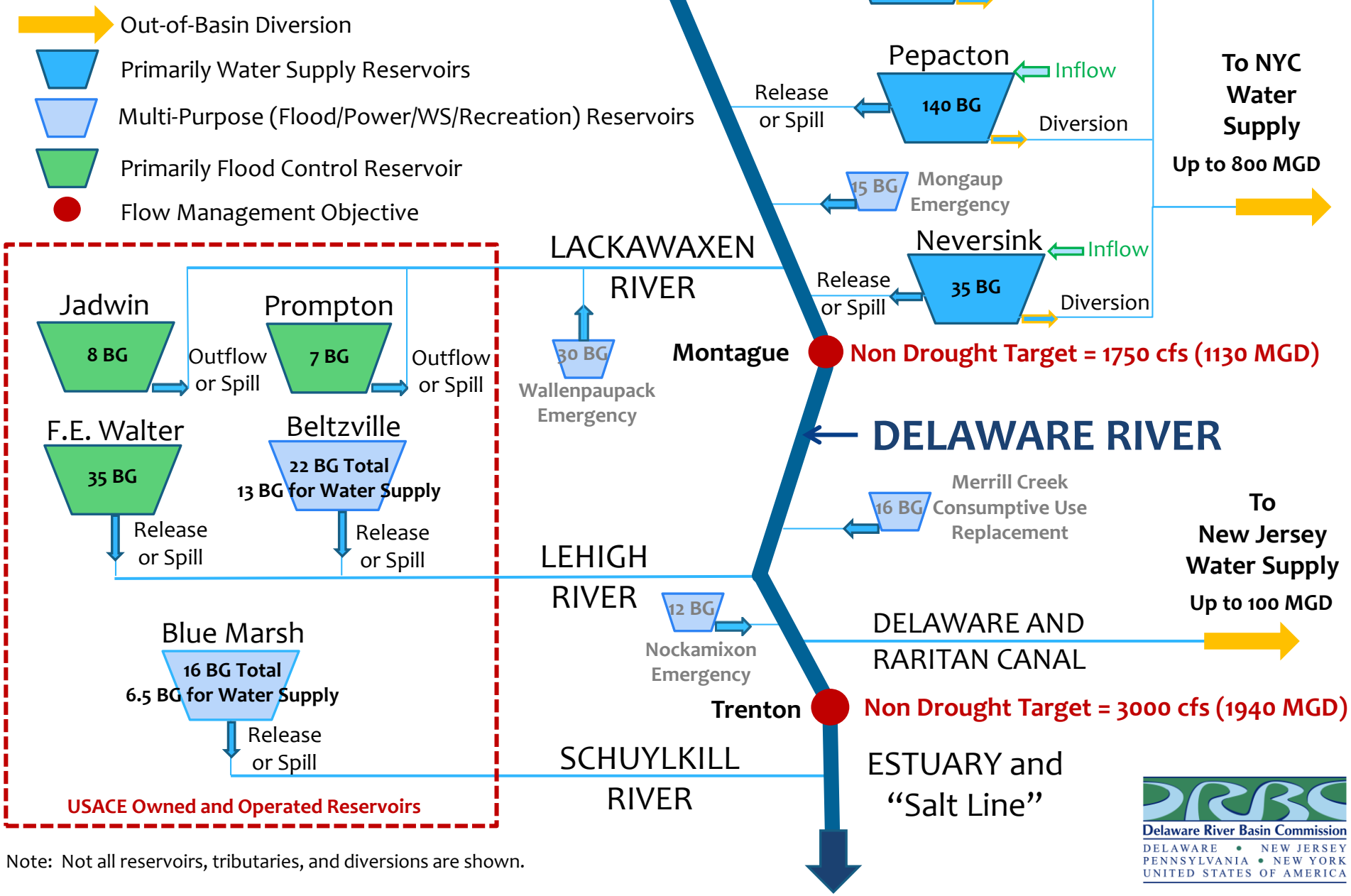
Water Management Schematic for the Delaware River Basin



Note: Not all reservoirs, tributaries, and diversions are shown.

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Precipitation

	2014	2015	January-November 6, 2016
Above Montague	42.40” (-2.89”)	43.34” (-1.95”)	32.63” (-6.27”)
Above Trenton	43.20” (-4.79”)	44.06” (-3.93”)	33.70” (-7.44”)
Wilmington	50.91” (+7.83”)	48.74” (+5.66”)	36.41” (-0.71”)

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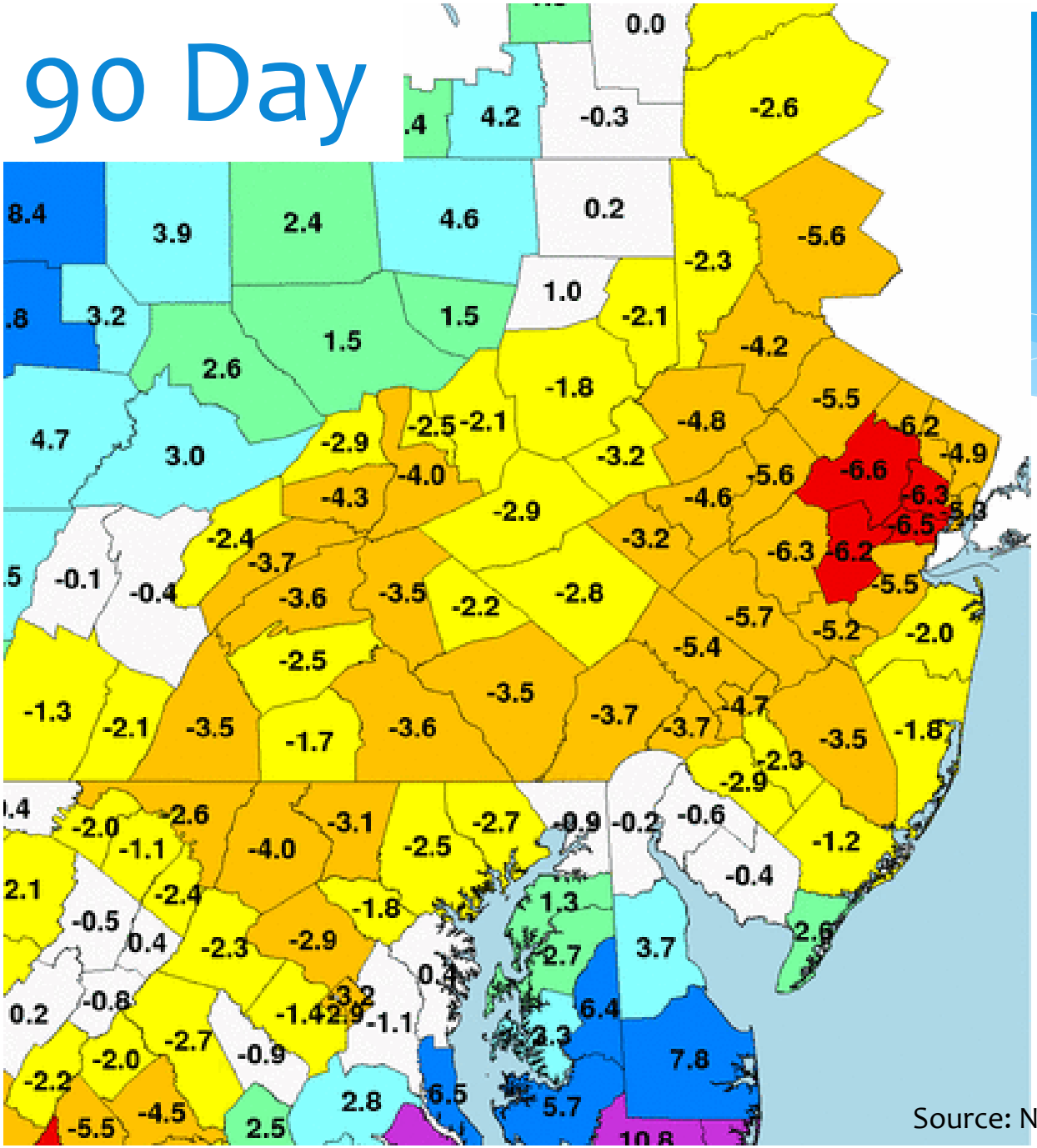
90 Day

Precipitation Departures

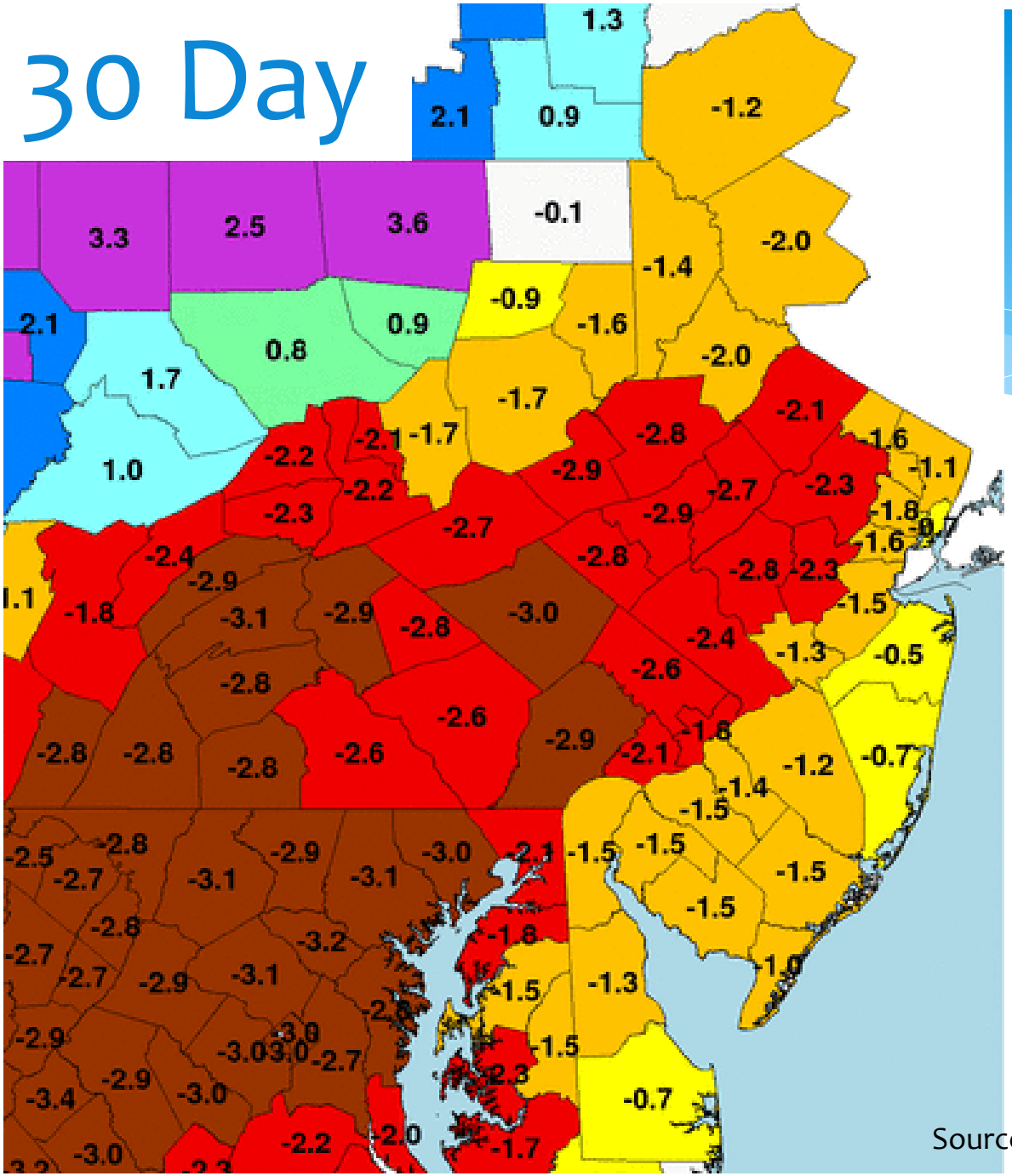


Departures from Average
Amounts in Inches
Greater than 75% Below
51% to 75% Below
26% to 50% Below
11% to 25% Below
10% Below to 10% Above
11% to 25% Above
26% to 50% Above
51% to 75% Above
Greater than 75% Above

Source: NWS Mid-Atlantic River Forecast Center

30 Day

Precipitation Departures



Departures from Average
Amounts in Inches
Greater than 75% Below
51% to 75% Below
26% to 50% Below
11% to 25% Below
10% Below to 10% Above
11% to 25% Above
26% to 50% Above
51% to 75% Above
Greater than 75% Above

Source: NWS Mid-Atlantic River Forecast Center

Groundwater

COUNTY	STATE	AGENCY DATA	WELL ID	YEAR RECORD BEGINS	INDICATOR STATUS AS OF OCTOBER 6, 2016	CURRENT STATUS
Sullivan	NY	USGS	SV 535	2001	Below Normal (10-24 percentile)	Below Normal (10-24 percentile)
Wayne	PA	USGS	WN 64	1967	Normal	Drought Watch
Monroe	PA	USGS	MO 190	1967	Drought Watch	Drought Warning
Carbon	PA	USGS	CB 104	1969	Drought Watch	Drought Emergency
Schuylkill	PA	USGS	SC 296	1975	Normal	Drought Warning
Lehigh	PA	USGS	LE 644	1971	Drought Warning	Drought Warning
Berks	PA	USGS	BE 623	1975	Drought Emergency	Below Drought Emergency
Lebanon	PA	USGS	LB 372	1973	Drought Watch	Drought Warning
Bucks	PA	USGS	BK 1020	1975	Normal	Drought Watch
Chester	PA	USGS	CH 10	1966	Drought Watch	Drought Watch
Delaware	PA	USGS	DE 723	1983	Drought Watch	Drought Watch
Burlington	NJ	USGS	050689	1955	Below Normal (<10th percentile)	Below Normal (<10th percentile)
Cumberland	NJ	USGS	110042	1972	Normal	Normal
New Castle	DE	Delaware GS	Db24-18	1993	Normal	Normal

As of November 3, 2016

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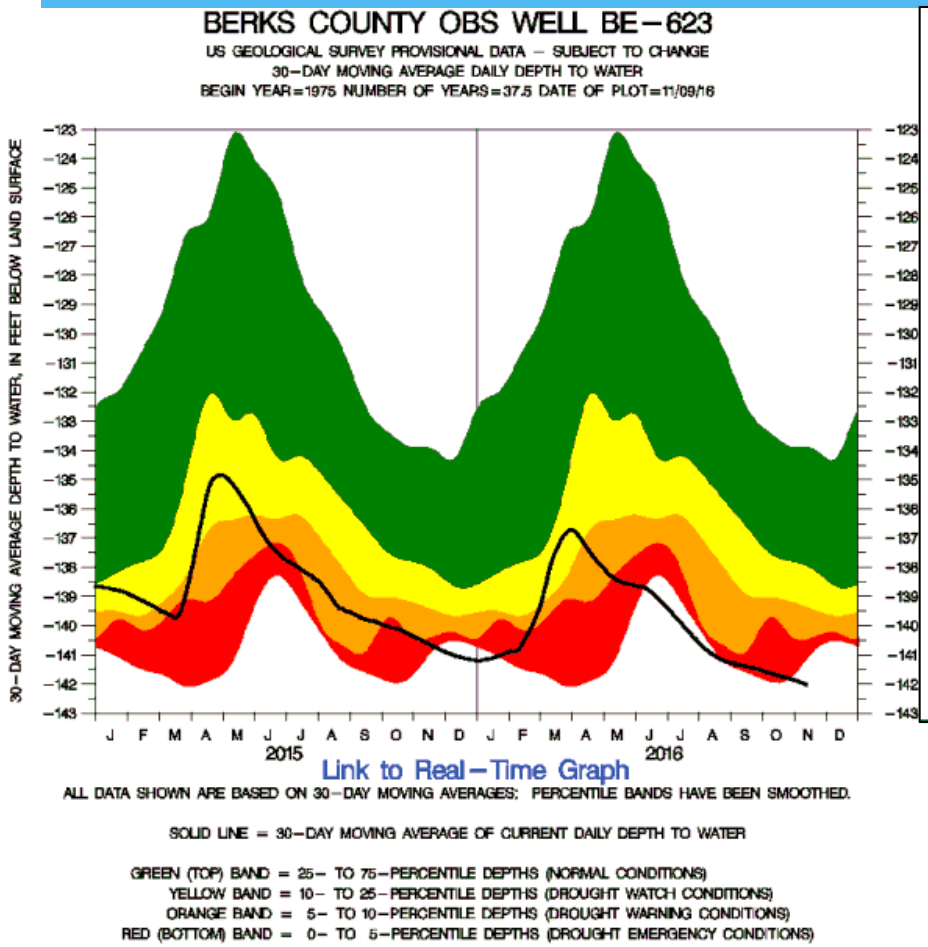
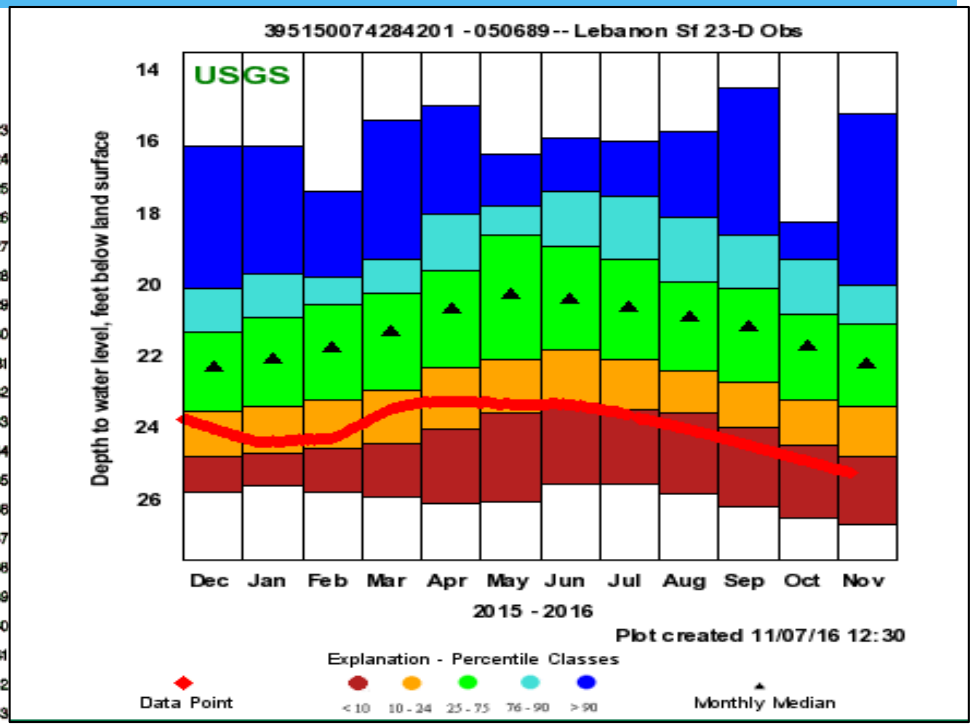
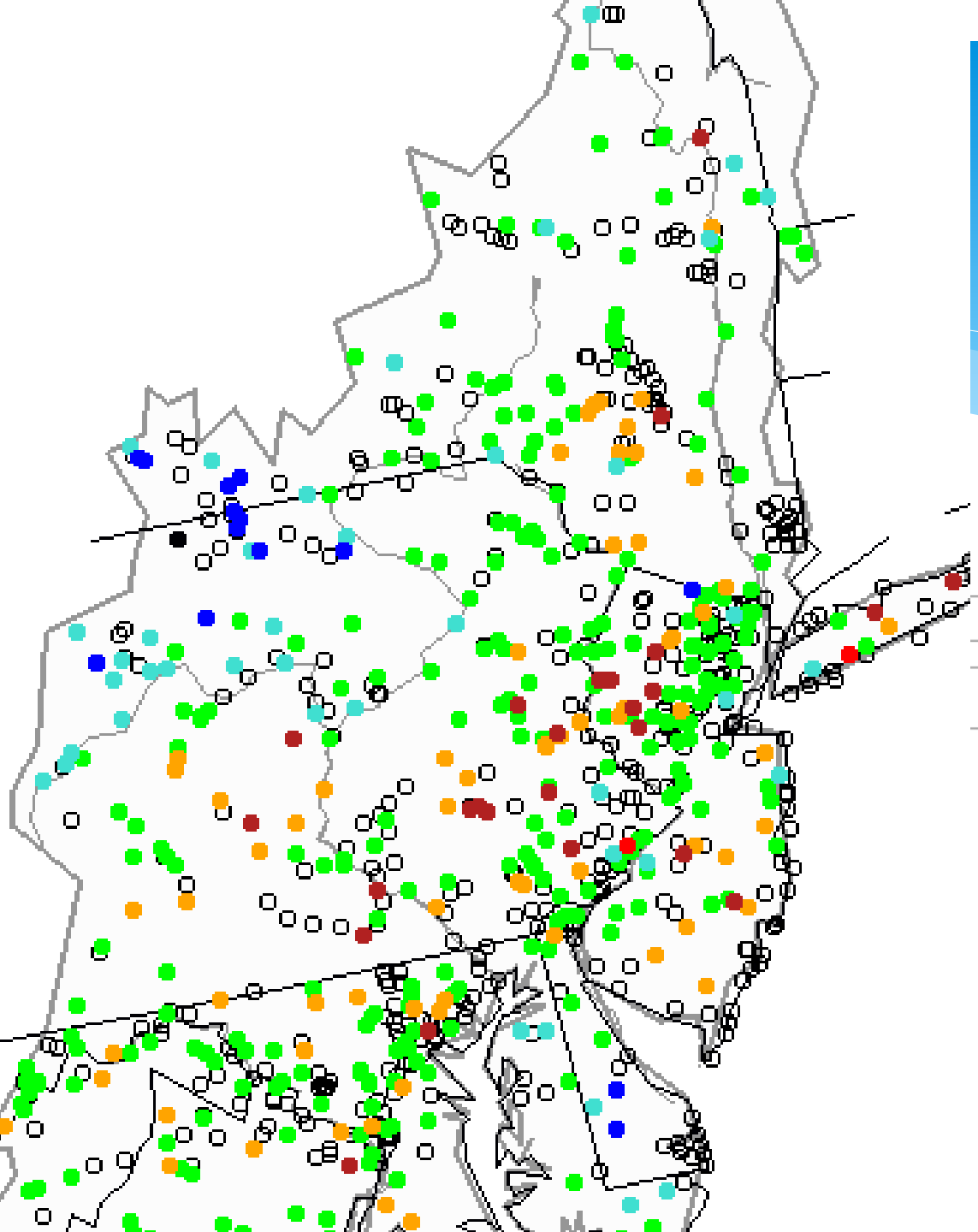
Groundwater Levels





Source: U.S. Geological Survey

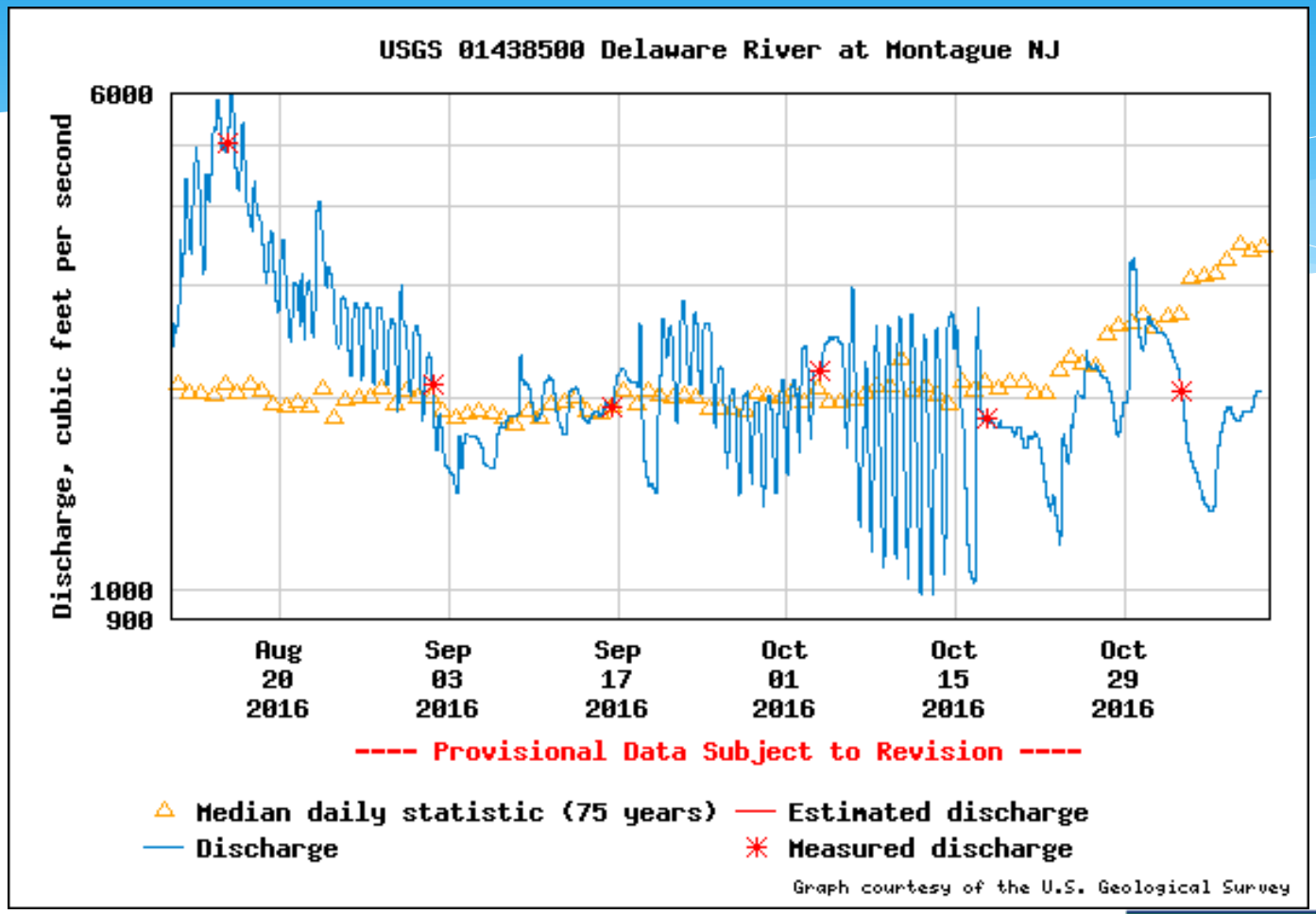
Streamflow



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		

Source: U.S. Geological Survey

Montague



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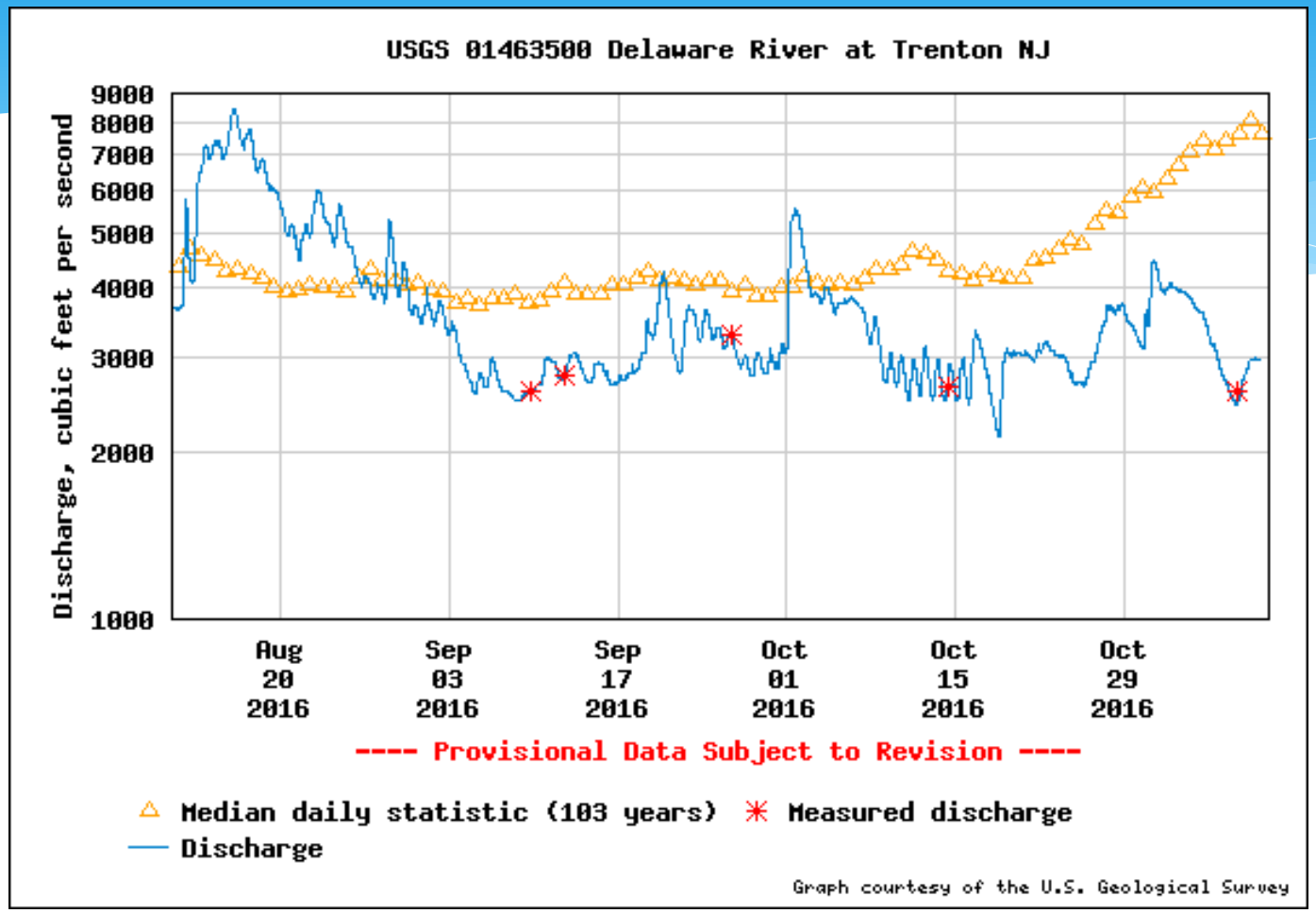
Trenton



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Basin Storage

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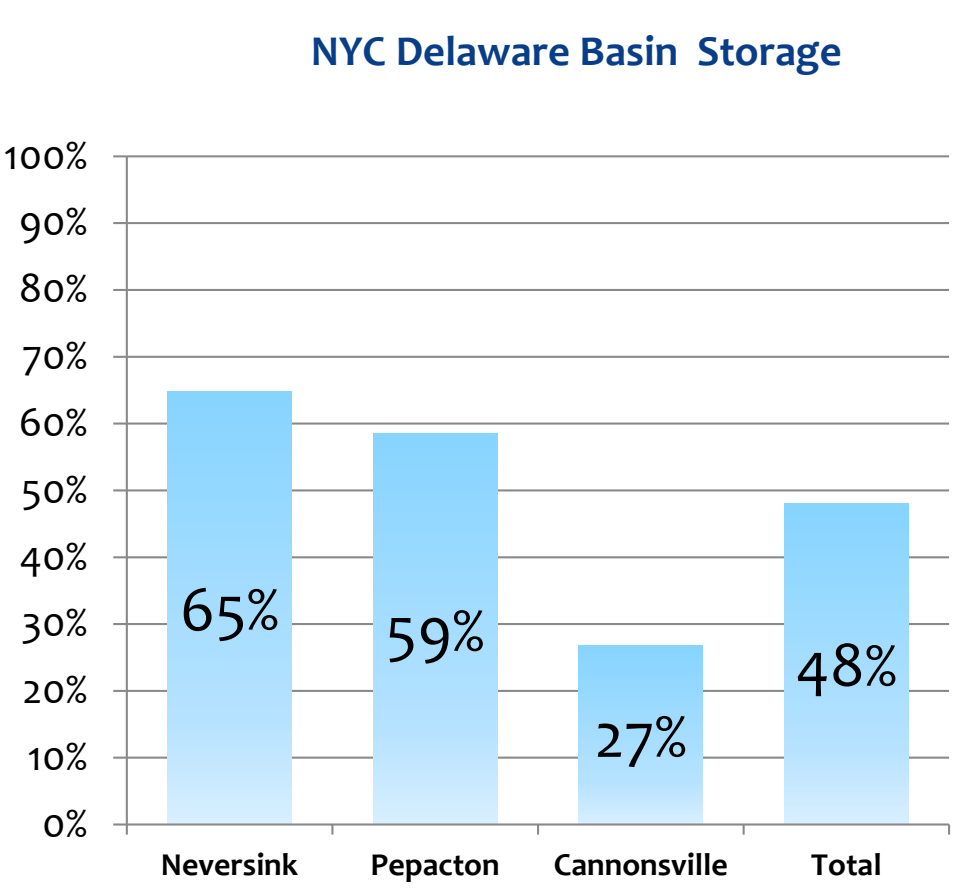

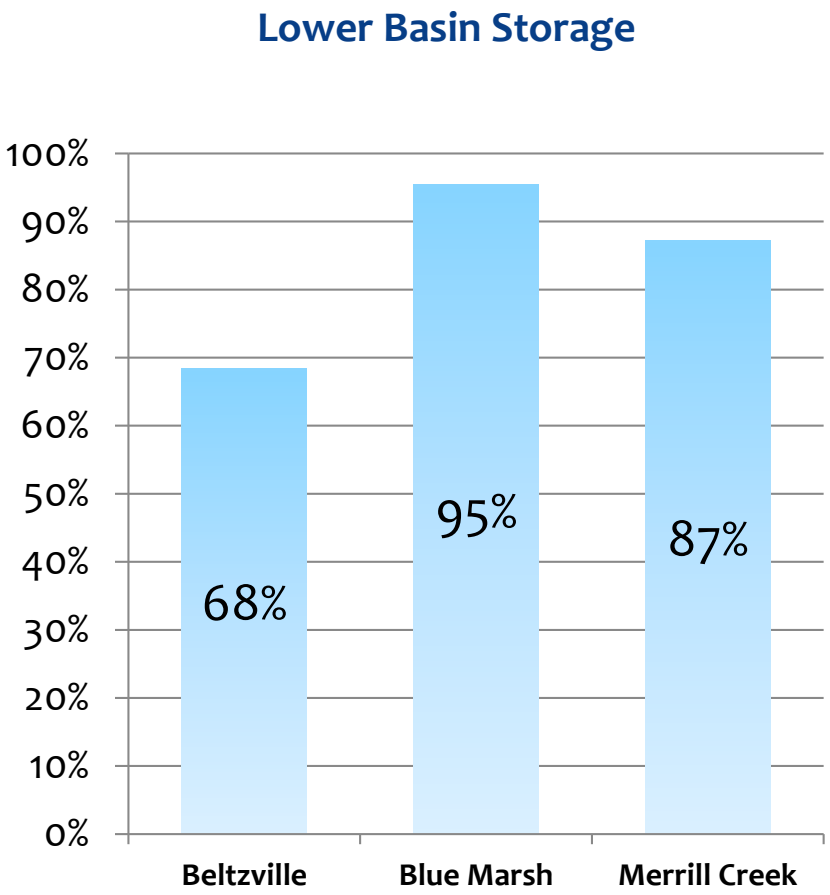

Lower Basin Storage

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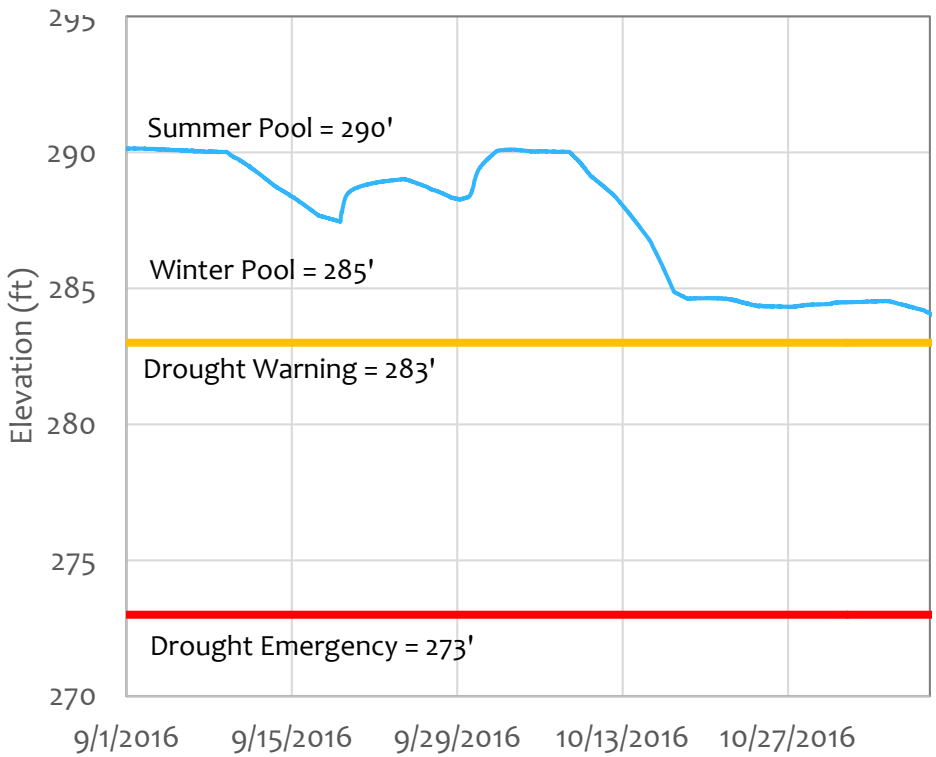
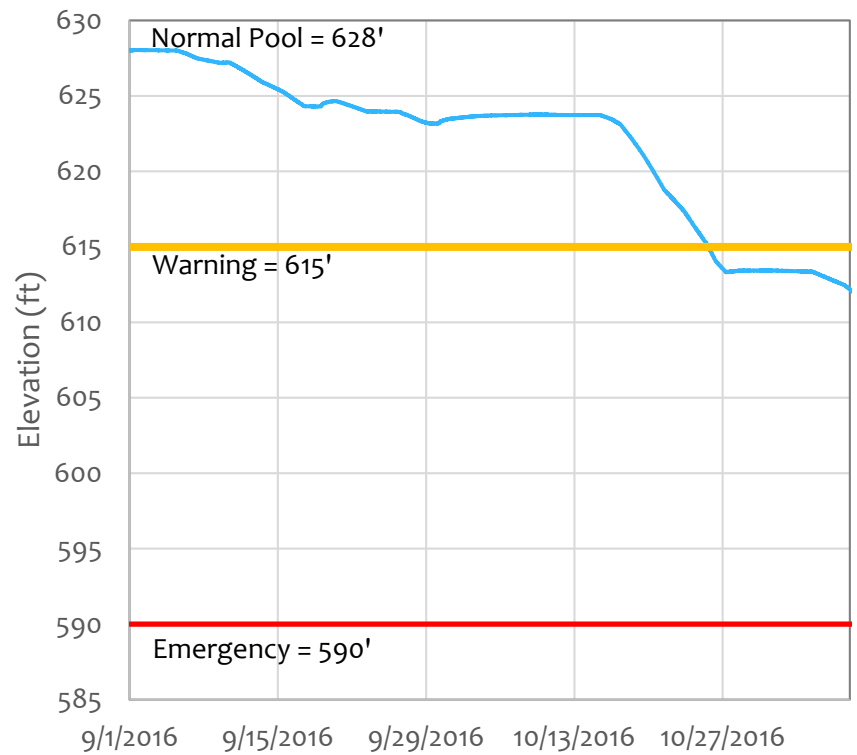
Blue Marsh



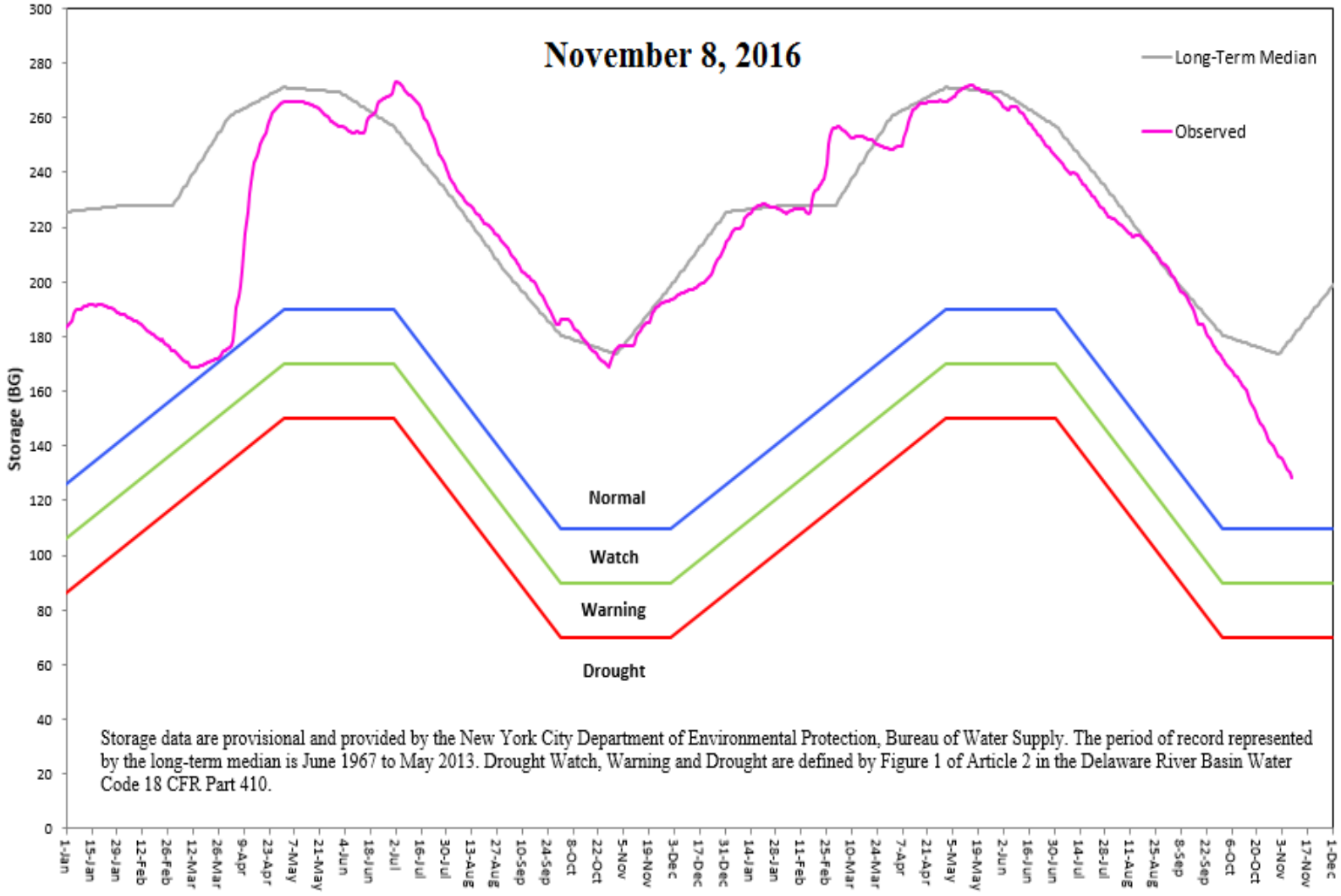
Beltzville



Schuylkill

Lehigh

New York City Delaware River Basin Storage



Storage data are provisional and provided by the New York City Department of Environmental Protection, Bureau of Water Supply. The period of record represented by the long-term median is June 1967 to May 2013. Drought Watch, Warning and Drought are defined by Figure 1 of Article 2 in the Delaware River Basin Water Code 18 CFR Part 410.

Useable Storage	Cannonsville	Pepacton	Neversink	Total
BG	25.0	81.2	22.5	128.7
%	26.1%	57.9%	64.5%	47.5%

2015-16

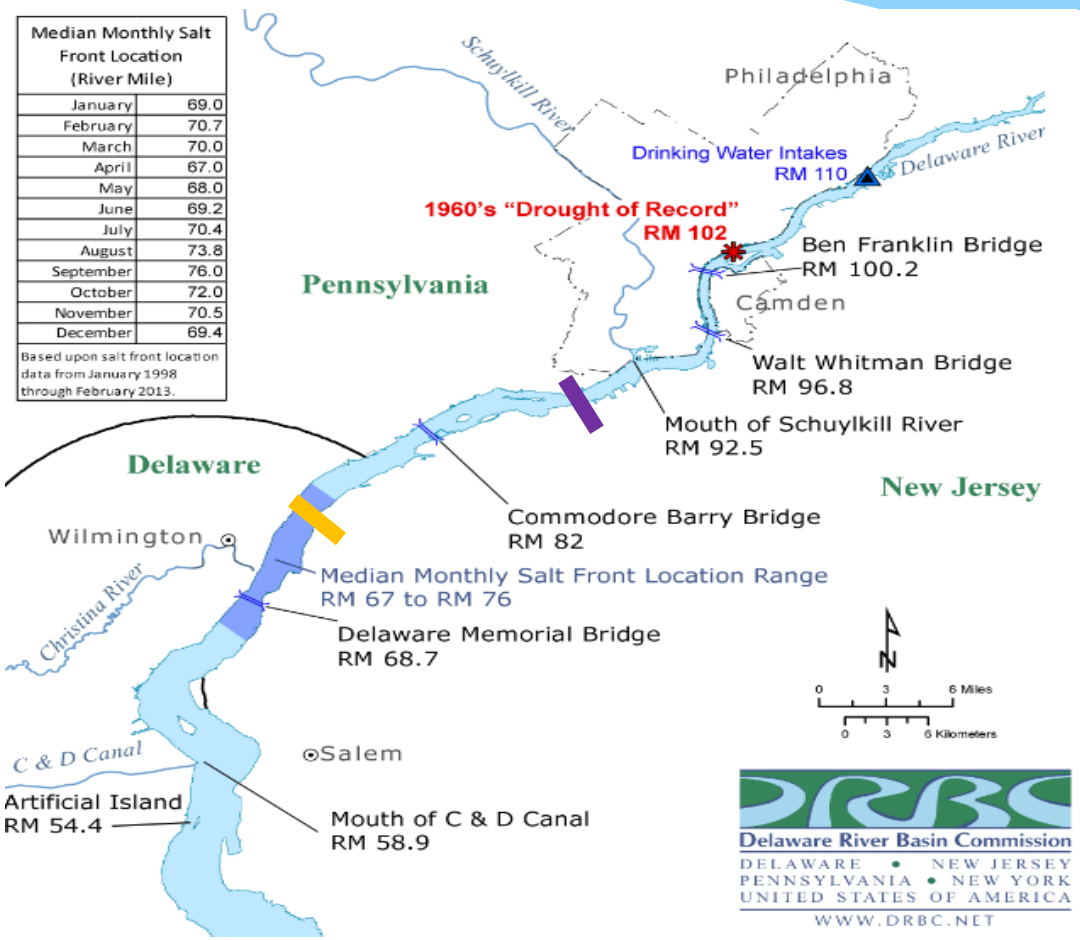
BG Above Drought Watch =	19
BG Above Drought Warning =	39
BG Above Drought =	59

BG Below Daily Storage Median =	51
BG Below One Year Ago =	48

Salt Front

Median Monthly Salt Front Location (River Mile)	
January	69.0
February	70.7
March	70.0
April	67.0
May	68.0
June	69.2
July	70.4
August	73.8
September	76.0
October	72.0
November	70.5
December	69.4

Based upon salt front location data from January 1998 through February 2013.



Chlorides
7-Day Avg. RM Location of 250 mg/l

Current R.M. 88

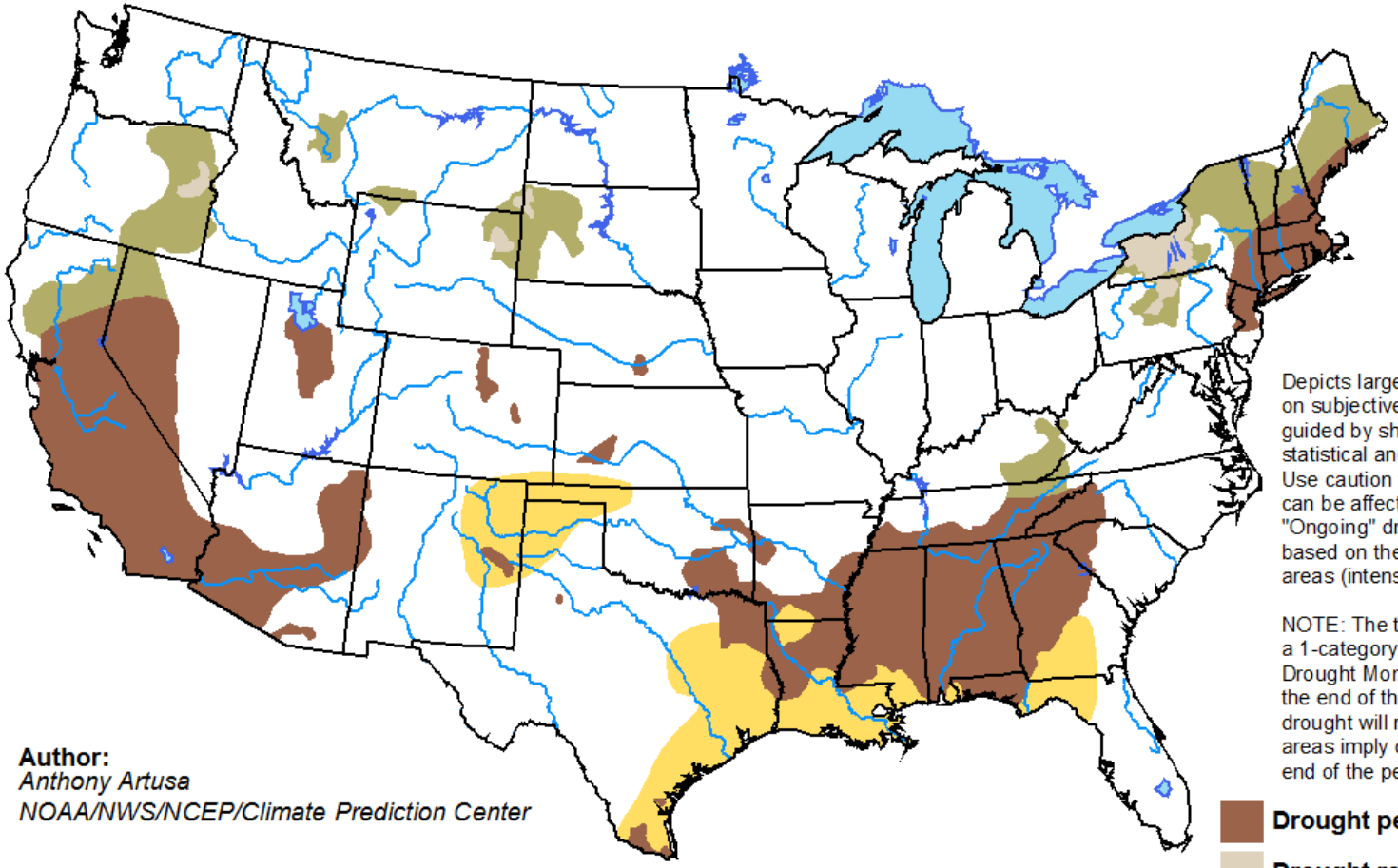
Normal R.M. 70

The Flow Objective at Trenton was designed to repel salinity for the protection of drinking water treatment facilities and industrial intakes.

U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid for October 20 - January 31, 2017
Released October 20, 2016

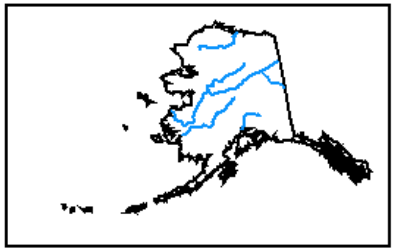


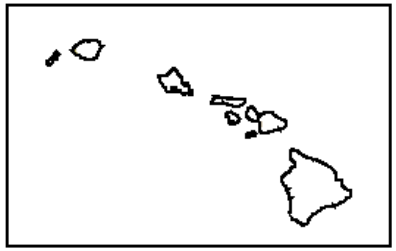
Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

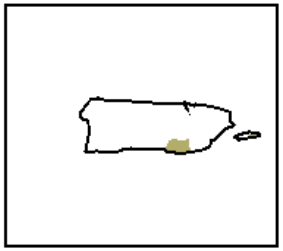
NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

- **Drought persists**
- **Drought remains but improves**
- **Drought removal likely**
- **Drought development likely**

Author:
Anthony Artusa
NOAA/NWS/NCEP/Climate Prediction Center



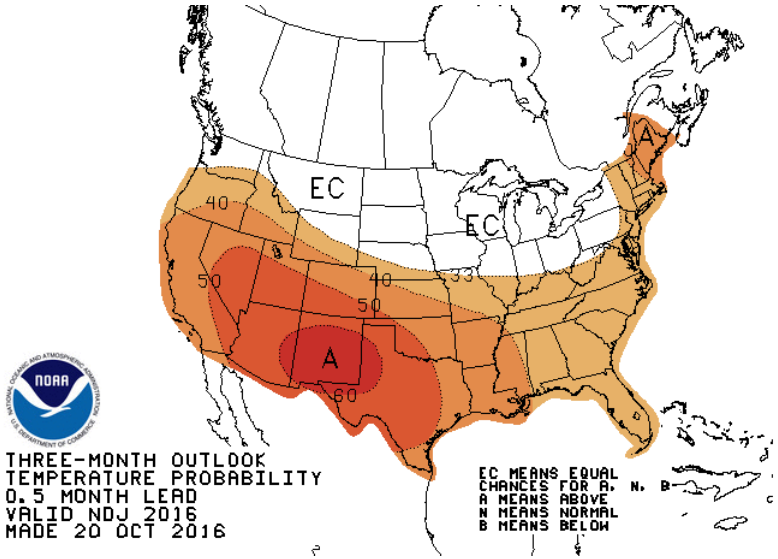




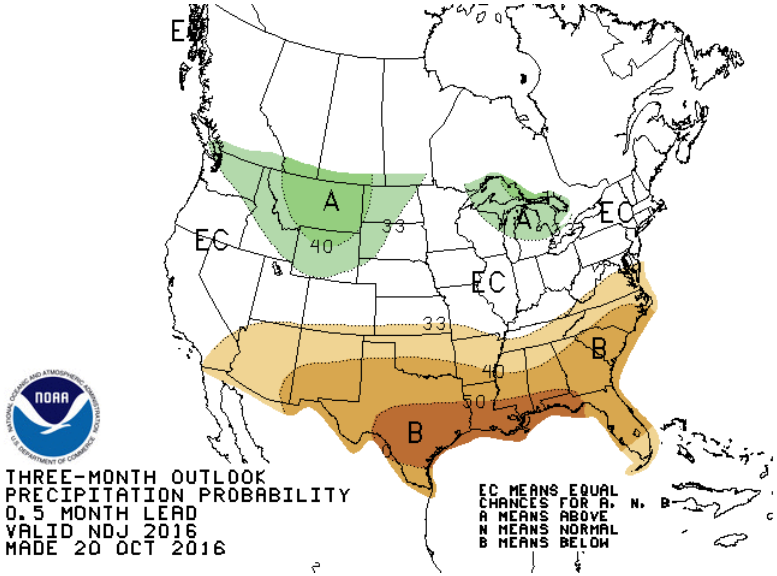
http://go.usa.gov/3eZ73

NOAA 3-Month Outlook

Temperature



Precipitation



Next Steps

- Initiation of drought operating plans:
  - Lower basin drought warning (a few days away)
  - Basinwide drought watch (a few weeks away)
- Notification of entities as to actions required under a lower basin drought warning
- Monthly meetings of Commission representatives and Decree Parties (includes all basin States, DRBC and NYC)
- Input from this hearing used for emergency declaration decision (under the Compact this may occur at any time regardless of reservoir levels)
- Coordination with the Basin states to encourage:
  - water use reductions
  - water conservation and
  - water efficiency

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Summary

* Complementary to the actions of the states
* Conservation of regional reservoir storage for purposes of flow augmentation and salinity control in the Delaware Estuary
* Operating Plans - phased reductions in flow objectives, out-of-basin diversions and conservation releases (prescribed by regulation)
* Additional storage for Commission use in meeting Trenton flow objective
* Consumptive use replacement

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Amy Shallcross

Amy.Shallcross@drbc.nj.gov

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