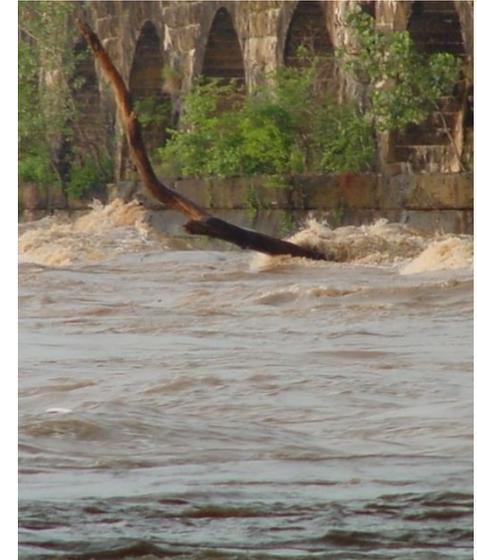


Delaware River Basin Commission

Flow Management

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Operations*

*PDE Science Summit
Monday, January 23, 2017*



Delaware River Basin Commission

DELAWARE • NEW JERSEY
PENNSYLVANIA • NEW YORK
UNITED STATES OF AMERICA

Commission

- * Established by Compact in 1961 to address:
 - * Water supply shortages – venue for cooperation
 - * Serious flooding
 - * Severe pollution in the main stem and major tributaries
- * Imposed conditions: obligations and release requirements **do not impair, diminish or adversely affect** the provisions of the 1954 Supreme Court Decree unless there is unanimous consent of the parties

Competing Objectives

- * Drinking Water
- * Aquatic Resources
- * Assimilative Capacity
- * Power generation
- * Recreation
- * Flood Mitigation



Flow Management:

What is it all about?

High (flood)



Low (Quality/Supply)



Trenton Flow Objective

GOALS

- * **Salinity “Repulsion”** – slow upstream movement
- * **Ensure Freshwater inflows to the Estuary**

Establishment:

- ✓ Response to 1960s drought
- ✓ Good Faith Agreement
- ✓ Incorporated into DRBC Water Code
- ✓ Reproduced in FFMP with minor modification (drought warning rule curve)

Concepts:

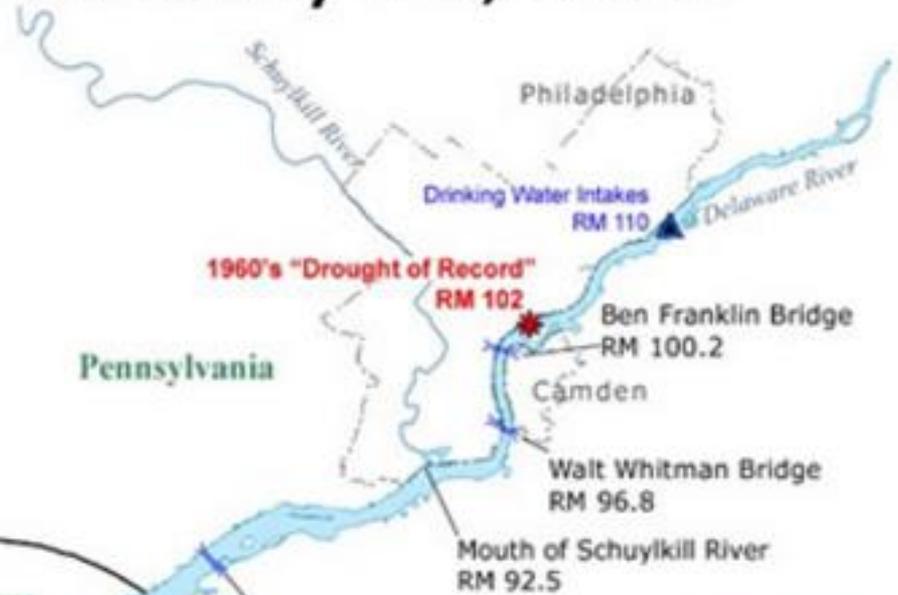
- ✓ Based on drought status
 - ✓ Basinwide – NYC Storage
 - ✓ Lower Basin – Beltzville and Blue Marsh Storage
- ✓ Varies Seasonally (normal, watch and warning)
- ✓ Varies with location of the “salt front” (drought emergency)

Impacts of Salinity and Chloride on Purveyors

- * Corrosion
- * Requires additional treatment
- * Secondary drinking water standards
 - * Original based on old Department of Health Standard
 - * Chloride 250 mg/l
 - * Sodium restricted diets
 - * Dialysis
 - * Food and Beverage Manufacturers

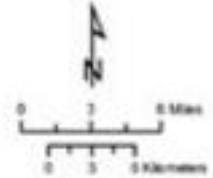
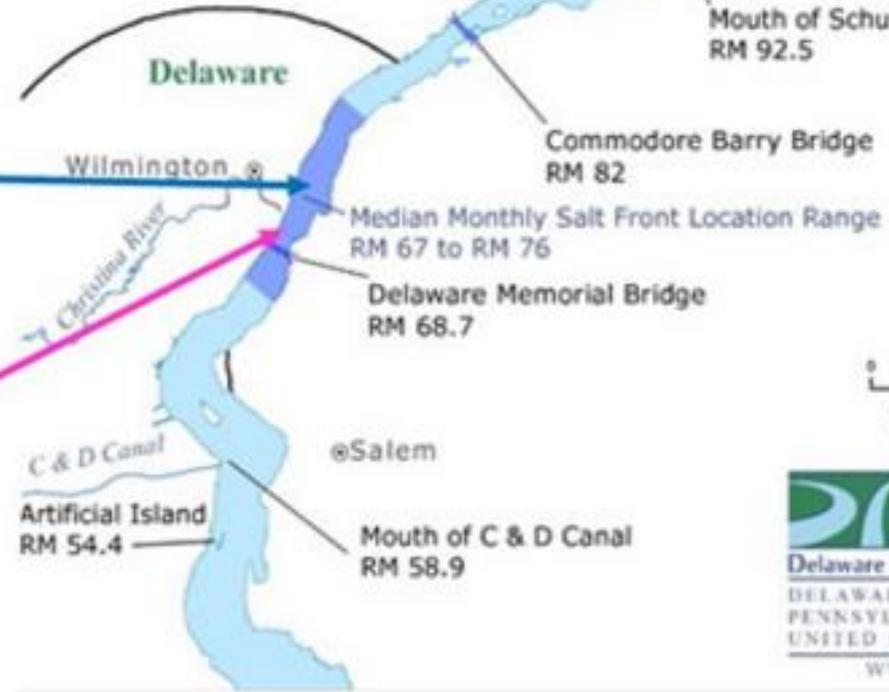
Salt Line Location: January 18, 2017

7-Day Average Salt Front Location	Emergency Flow Objective		
	DEC - APR	MAY-AUG	SEP-NOV
US RM 92.5	2,700	2,900	2,900
BTN 92.5 and 87	2,700	2,700	2,700
BTN 87 and 82.5	2,500	2,500	2,500
DS 82.5	2,500	2,500	2,500



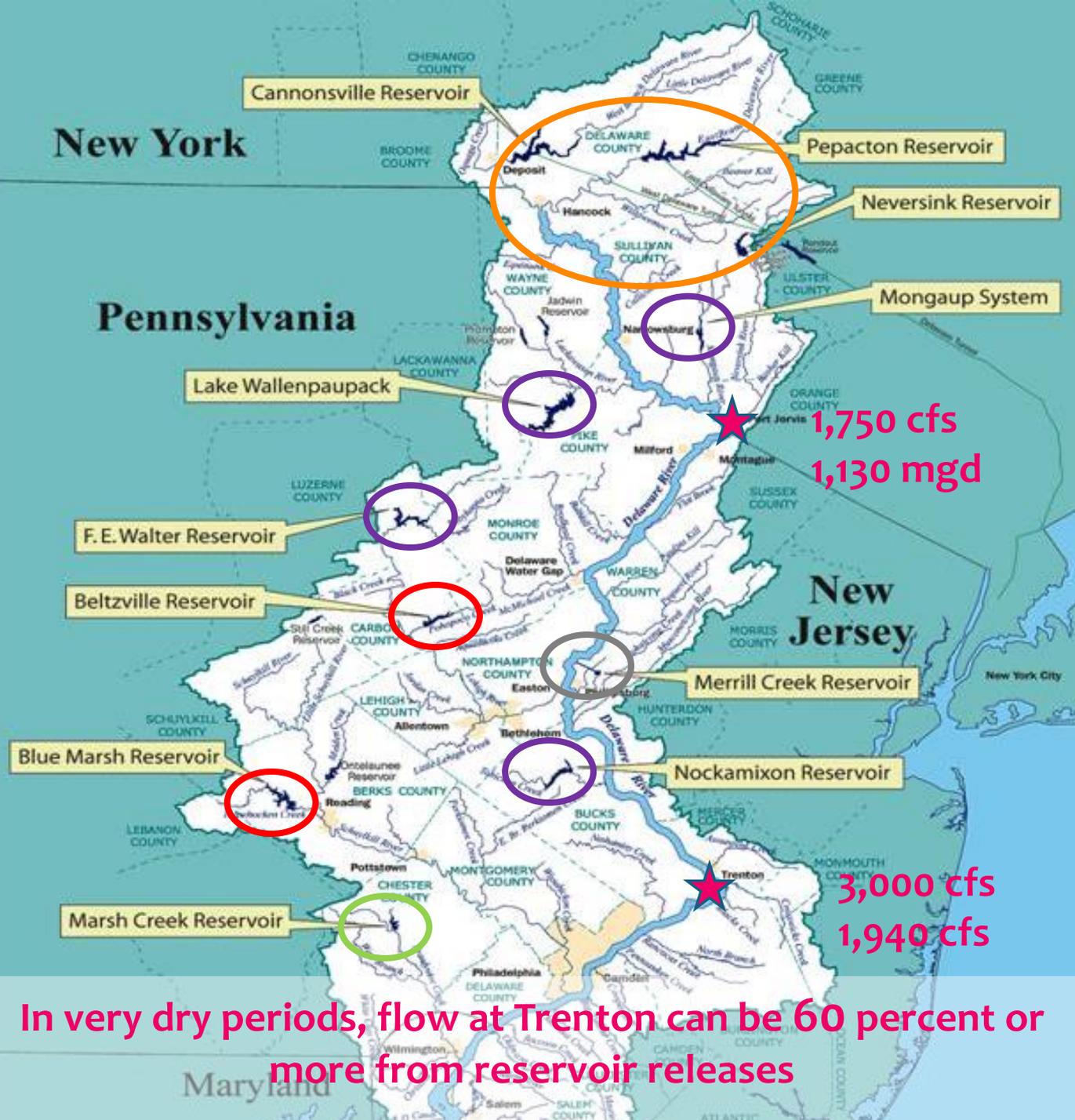
1/18/2017 Location: RM 72

Normal Jan. Location: RM 69



Sources of Water

- * ERQ (Decree)
- * DRBC Storage in USACE Reservoirs
- * Emergency
- * Consumptive Use Make-Up
- * Below Trenton

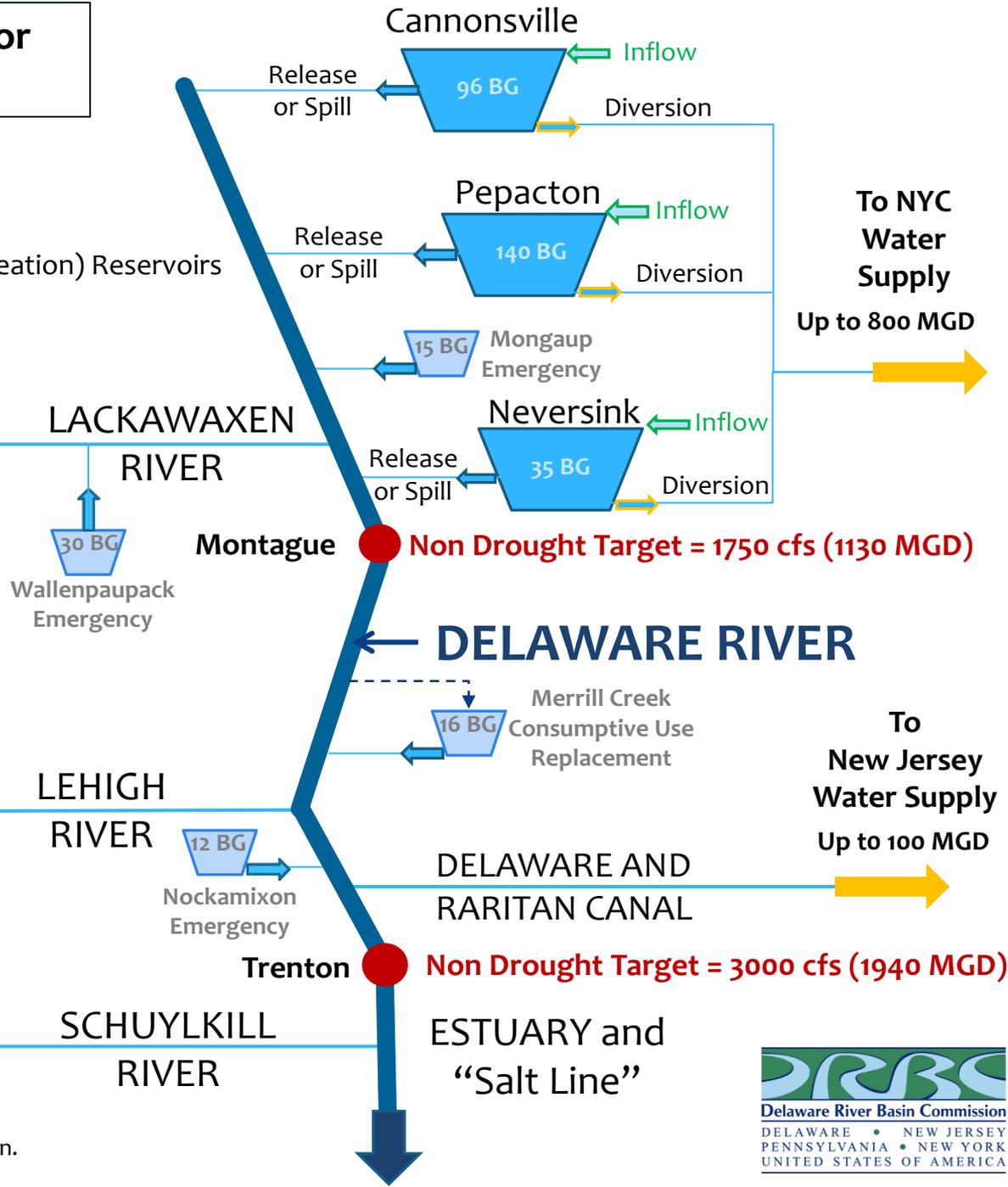
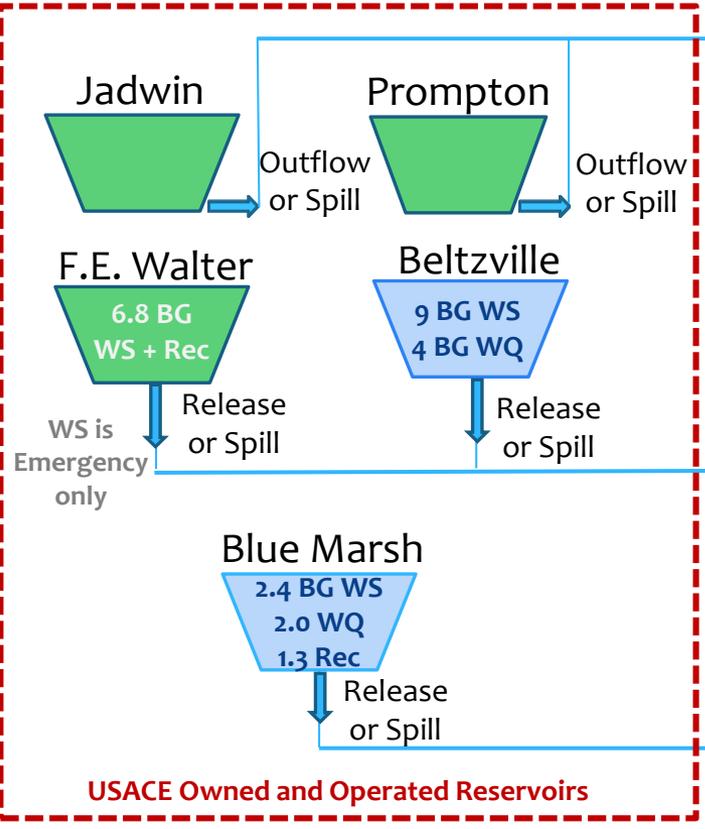


In very dry periods, flow at Trenton can be 60 percent or more from reservoir releases



Water Management Schematic for the Delaware River Basin

-  Out-of-Basin Diversion
-  Primarily Water Supply Reservoirs
-  Multi-Purpose (Flood/Power/WS/Recreation) Reservoirs
-  Primarily Flood Control Reservoirs
-  Flow Management Objective



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

Cannonsville Reservoir - NY



From full to nearly empty in 6 months

Beltzville (2014)



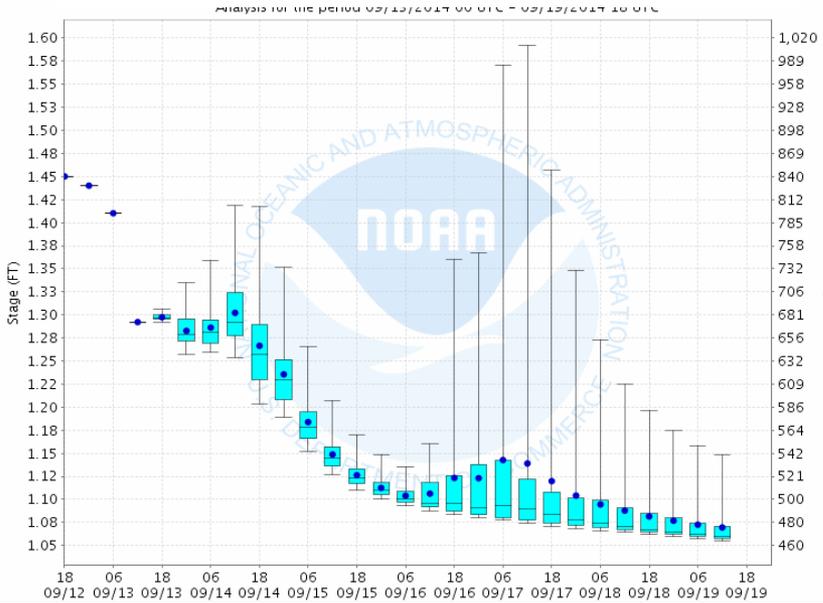
Photo: US Army Corps of Engineers



Designing Reservoir Releases

- * USGS Gages
- * River Master's Office (Montague)
 - * Balancing Adjustment (over/under adjustments)
 - * Post-Release Montague Prediction
 - * Hydropower changes to schedule
- * Quantitative Precipitation Forecasts (Day 1, Day 2, Day 3, Days 1-2, Days 1-3, Days 4-5, Days 6-7 and 5- and 7-day totals)
- * Observed Precipitation
- * Meteorologic Model Ensemble River Forecasts (MMEFS)
 - * Flow
 - * Precipitation

How quickly will baseflow drop?

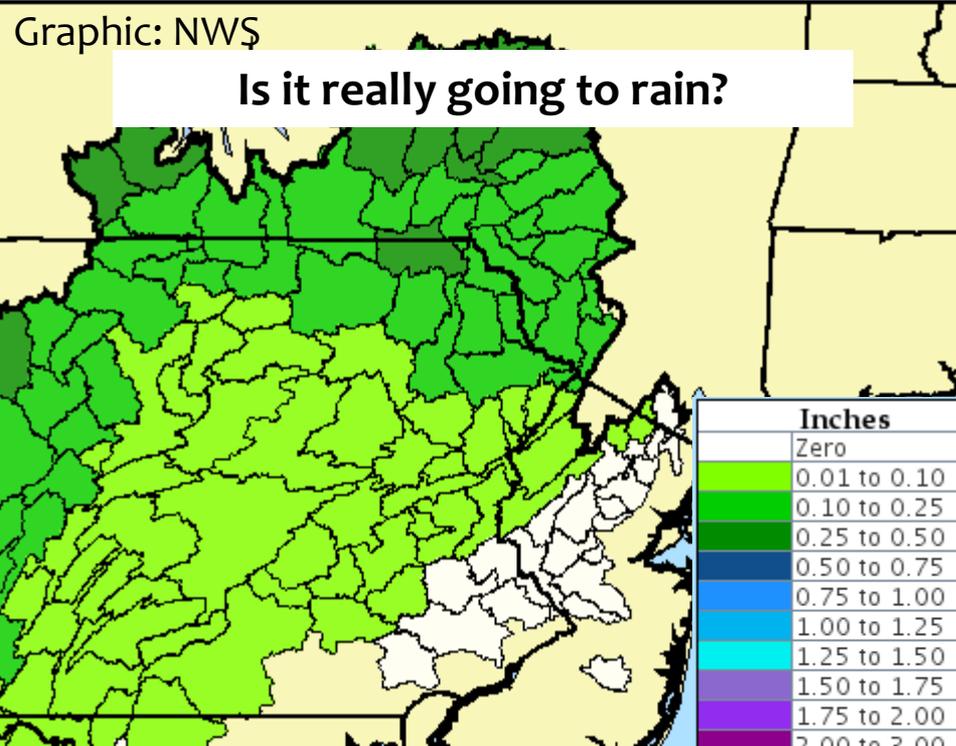


Will it get there on time?

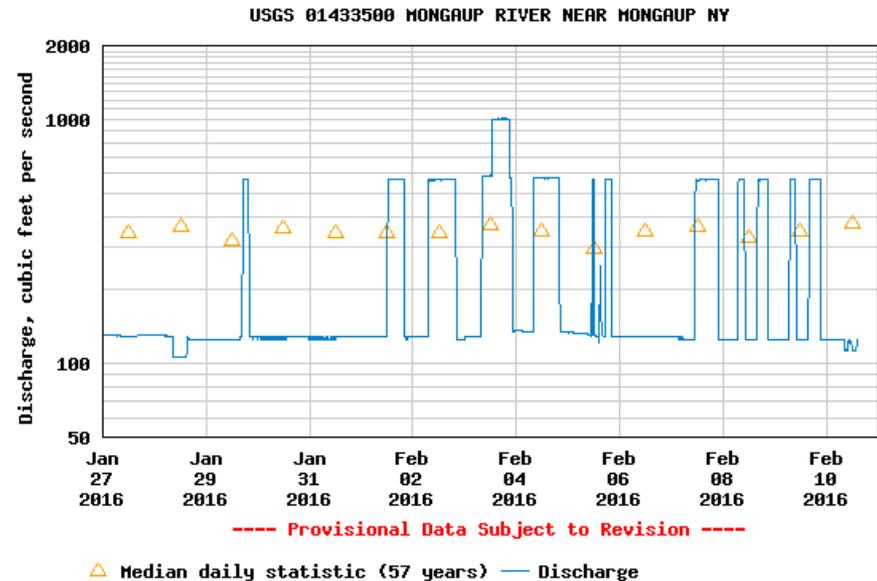
Approximate Travel Times During Low Flow Conditions				
	Hours		Days	
	Montague	Trenton	Montague	Trenton
Cannonsville	48	96	2	4
Pepacton	60	108	2.5	4.5
Neversink	33	84	1.4	3.5
Wallenpaupack	16	64	0.7	2
Rio	8	56	0.3	2
Merrill Creek		24		1
FE Walter	44	60		2.5
Beltville		32		2
Nockamixon		12		0.5
	Philadelphia			
Blue Marsh		38		

Graphic: NWS

Is it really going to rain?



Will scheduled hydropower release occur?



Flow Management

- * Finite resources (water and storage)
- * Competing Objectives – not all can be fully met
- * Operations can be designed to:
 - * Use the resource when available
 - * Conserve the water when becoming scarce
 - * Be more drought resilient
- * Uncertainties in real-time management
- * Future uncertainties: *today could be the first day of the next drought of record*

Questions

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