



**Environmental
Protection**

The Operations Support Tool (OST): Forecast-informed Decision Making and the New York City Water Supply

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FIRO Workshop

University of Texas at Arlington

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Presentation Outline

- Water supply system overview
- Operations Support Tool (OST)
- OST Use Cases
- Summary



New York City Water Supply

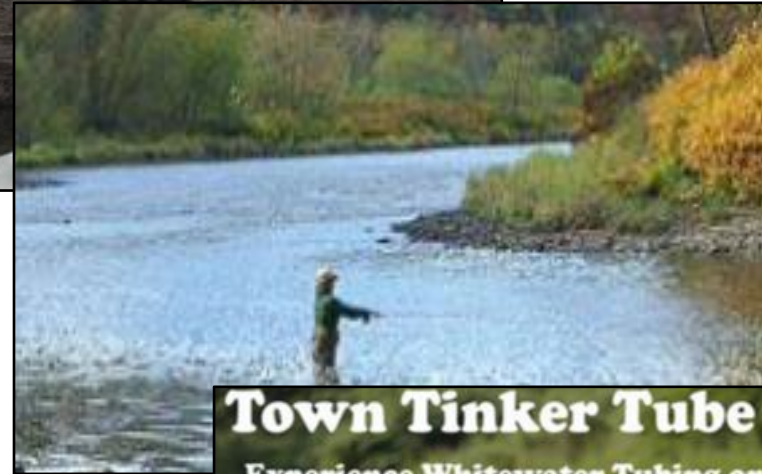
- Three systems
 - Croton
 - Catskill
 - Delaware
- 19 reservoirs & 3 lakes
- 2,000 square mile watershed
- 8 upstate counties
- Serves 9 million people
- Delivers 1.1 billion gal per day
- Unfiltered supply (Cat/Del)

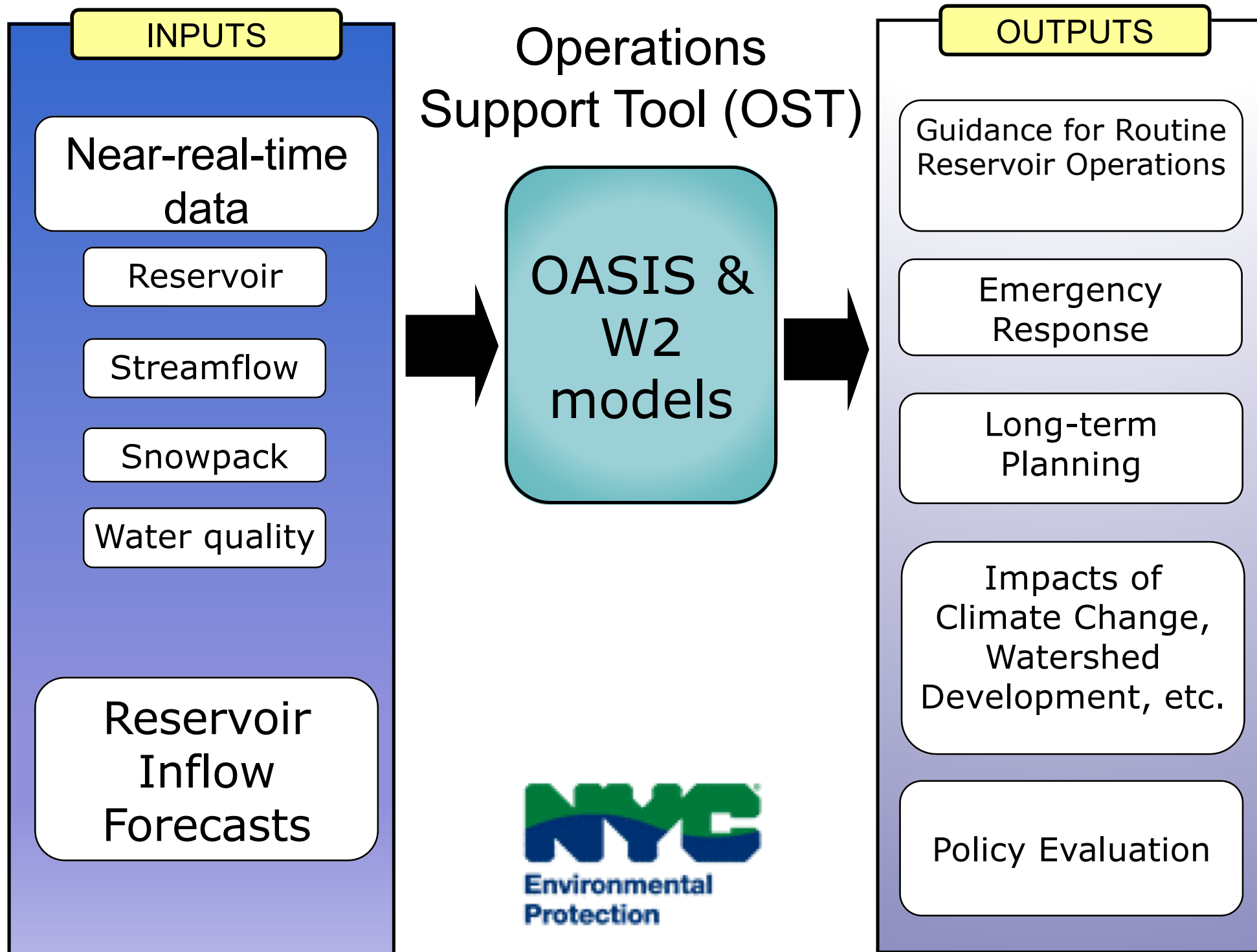




Multiple Objectives and Challenges

- Supply reliability
- Drinking water quality
- Tailwater fisheries
- Ecological flows
- Recreation
- Spill mitigation
- Operating costs
- Hydropower
- Long-term supply/demand
- Regulatory changes
- Stakeholders
- Climate change







NATIONAL WEATHER SERVICE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Hydrologic Ensemble Forecast Service (HEFS)



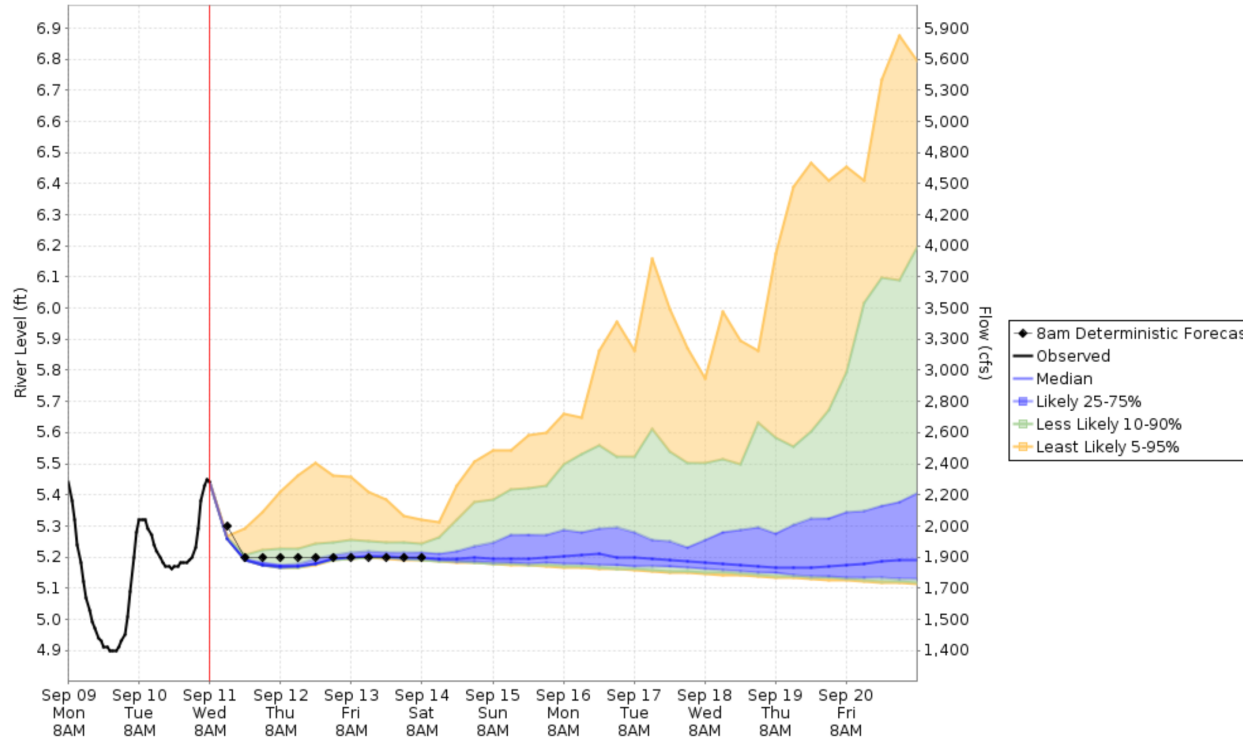
10-day Probability of Exceeding River Levels

Used to Estimate the Range of Possible River Levels
[without ENSPOST (Experimental)]

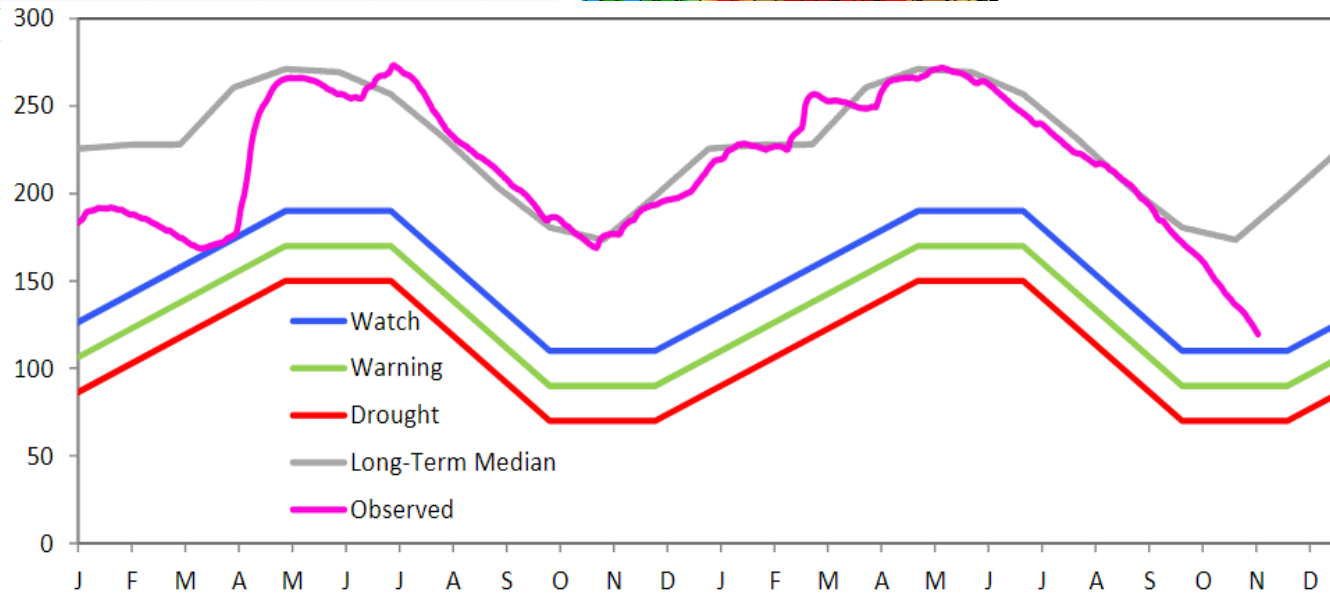
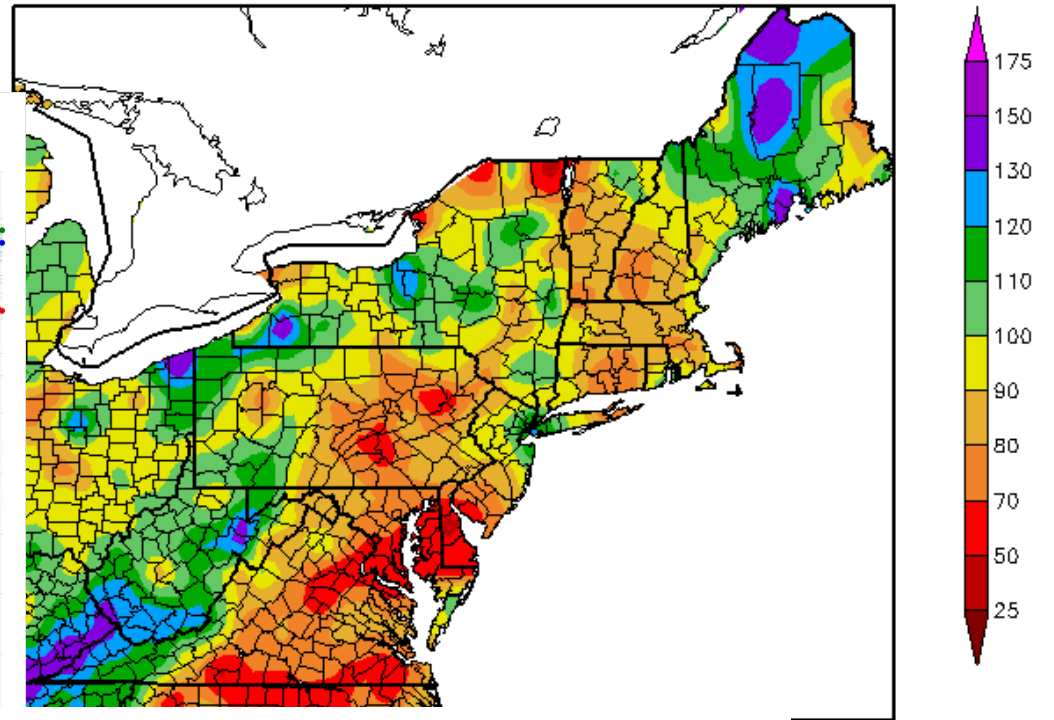
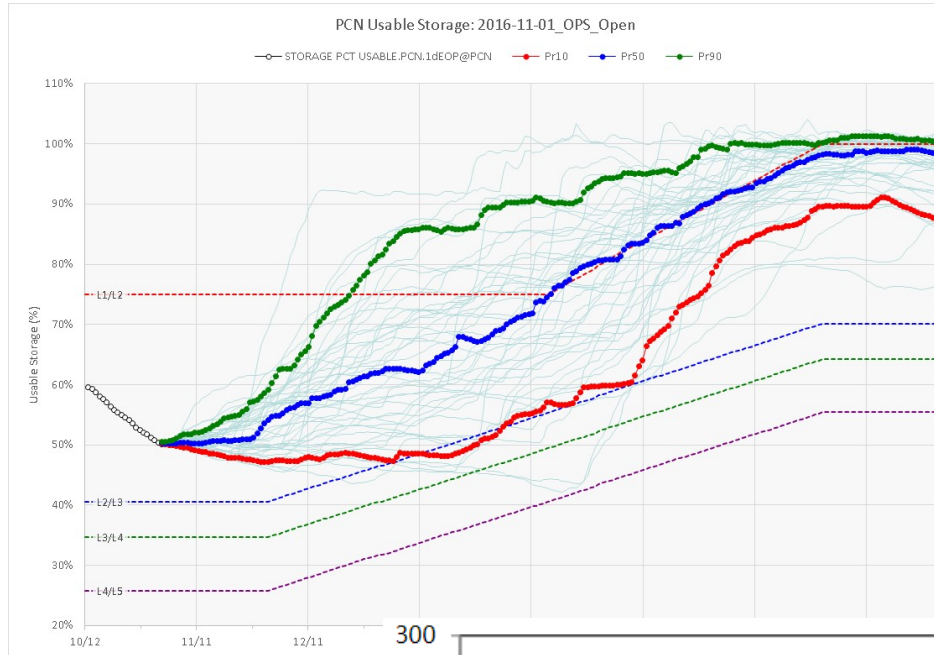
Caution: Official forecast may be updated after this graph is generated.
For the latest official forecast, go to <https://water.weather.gov/ahps>



Delaware River at Montague, NJ (MTGN4)



OST Use Cases



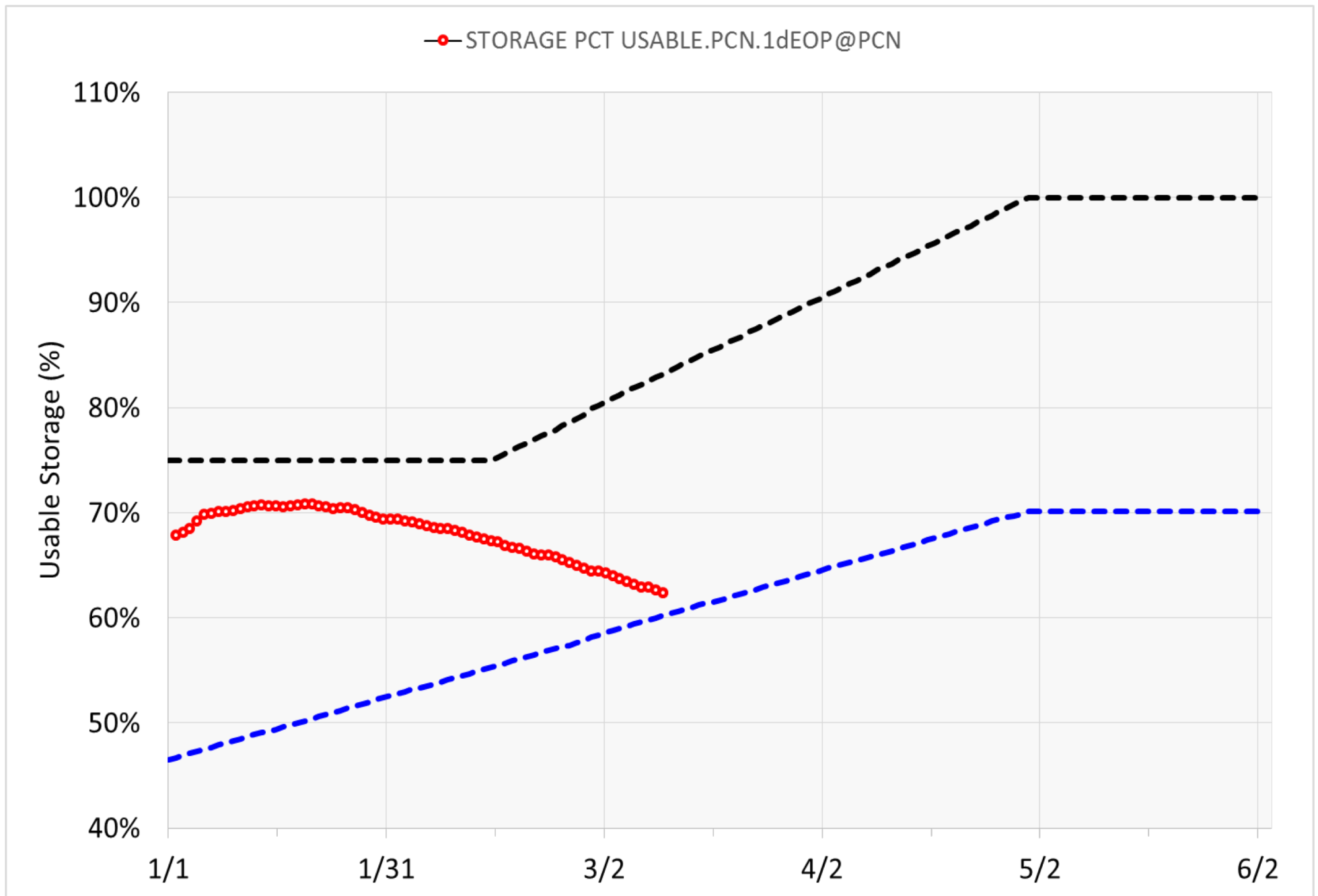
Regional Climate Centers

2015-16

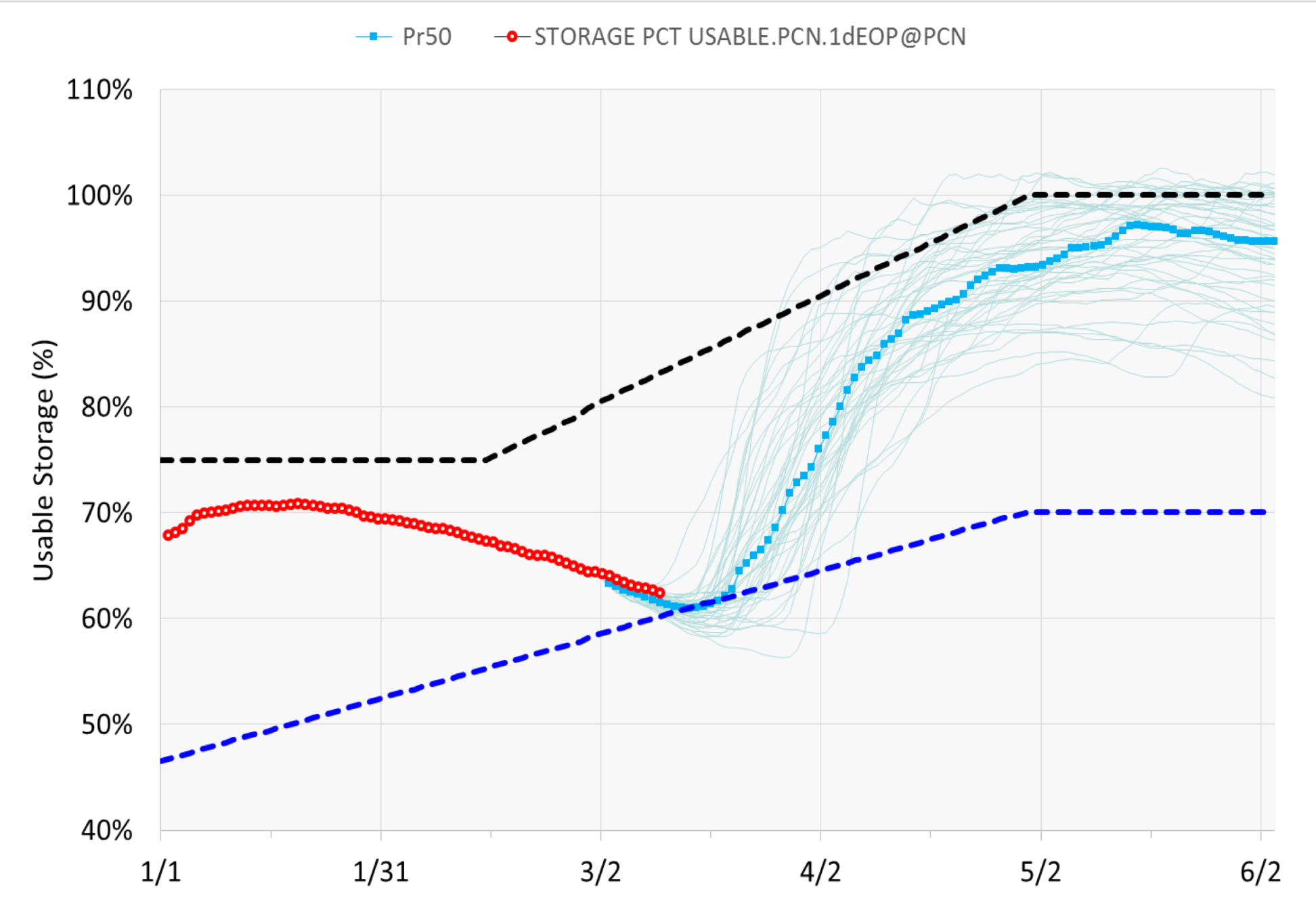
OST Use Case #1

2015 Delaware Basin

2015 Delaware Basin Storage Observations

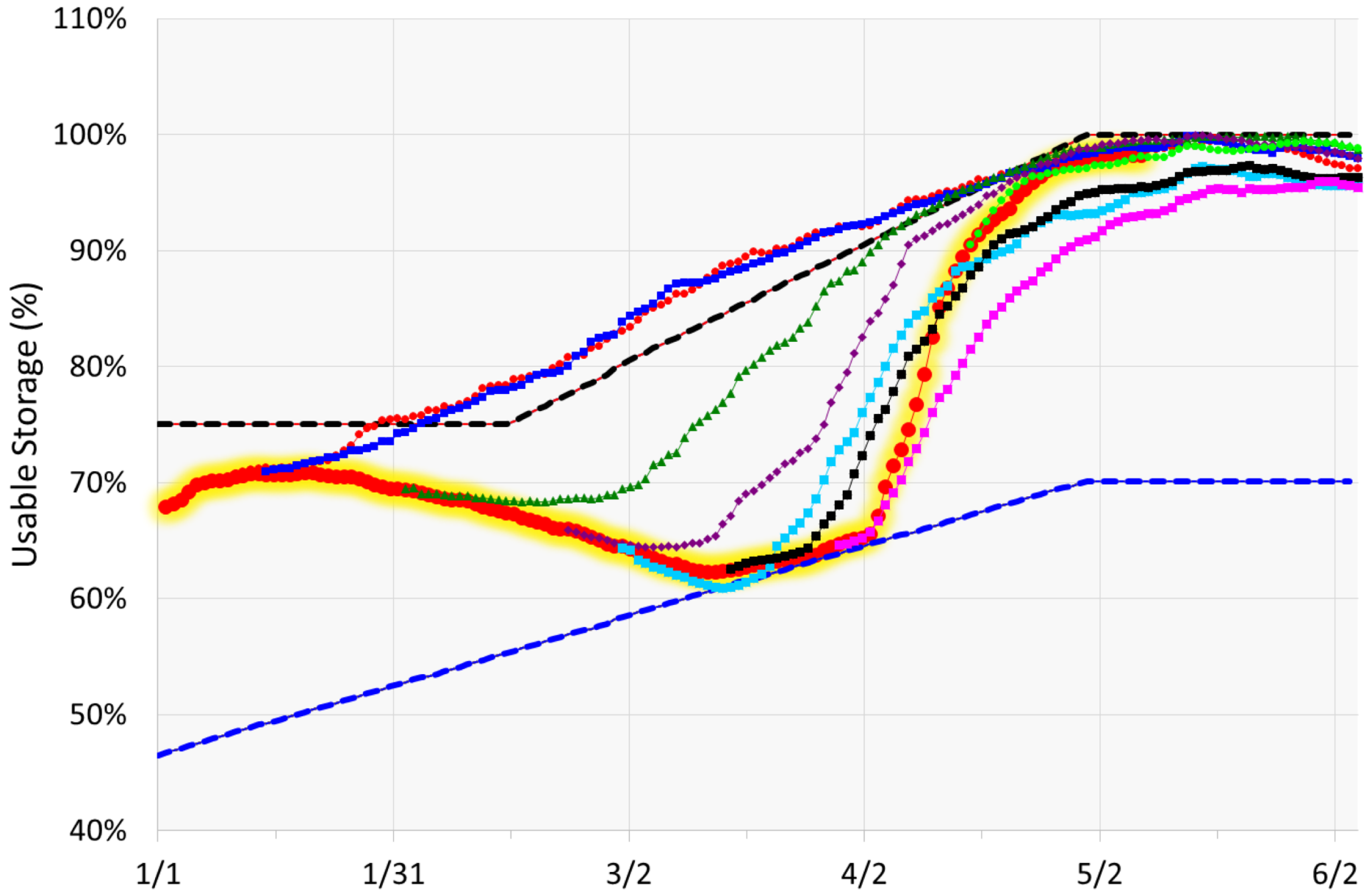


2015 Delaware Basin Storage Forecast



2015 Delaware Basin Storage Observations

● STORAGE PCT USABLE.PCN.1dEOP@PCN

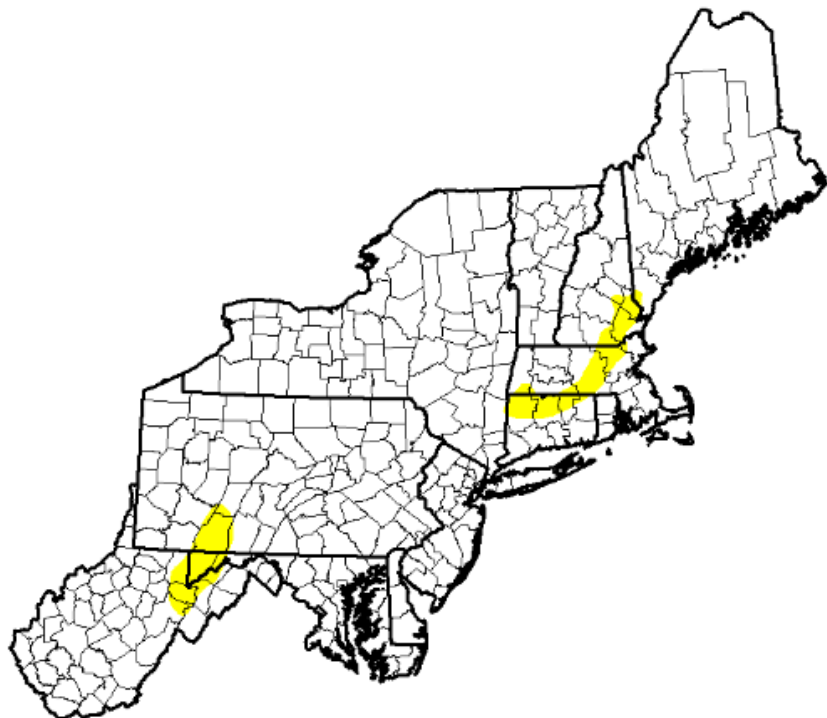


OST Use Case #2

2016-17 Delaware Basin

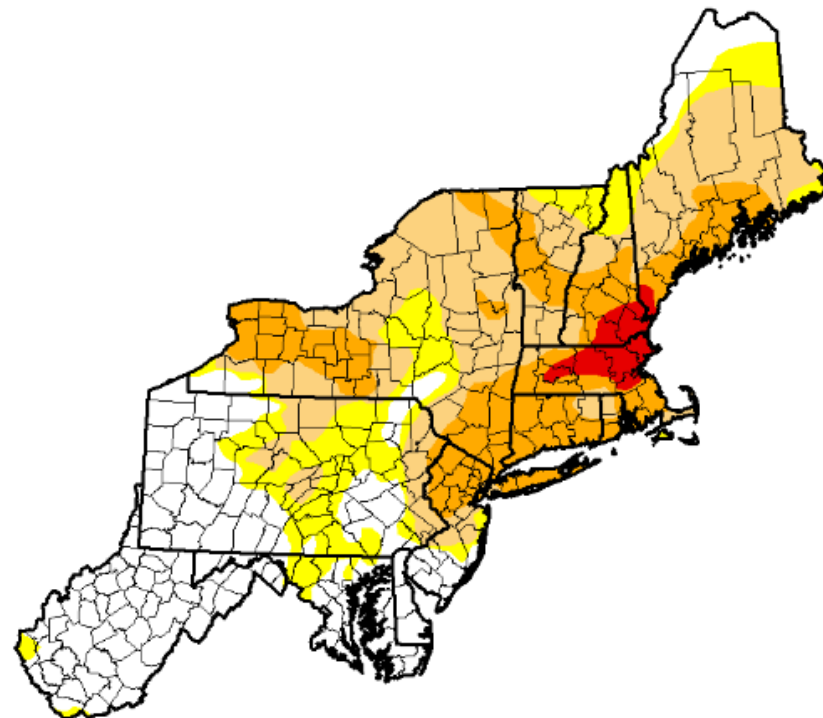
Development Timeline

22 Mar 2016



◀ March 22, 2016 ▶

25 Oct 2016

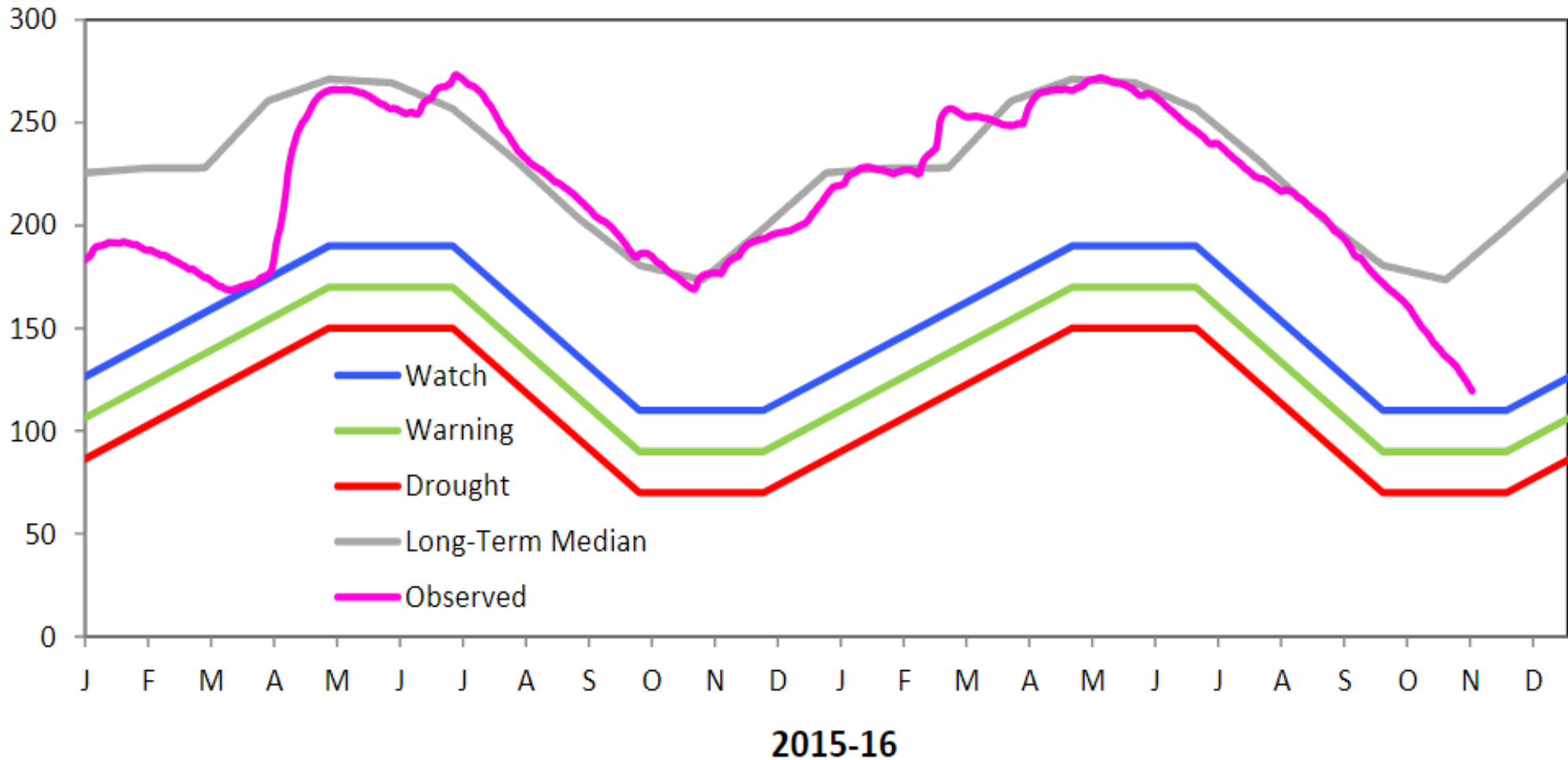


◀ October 25, 2016 ▶

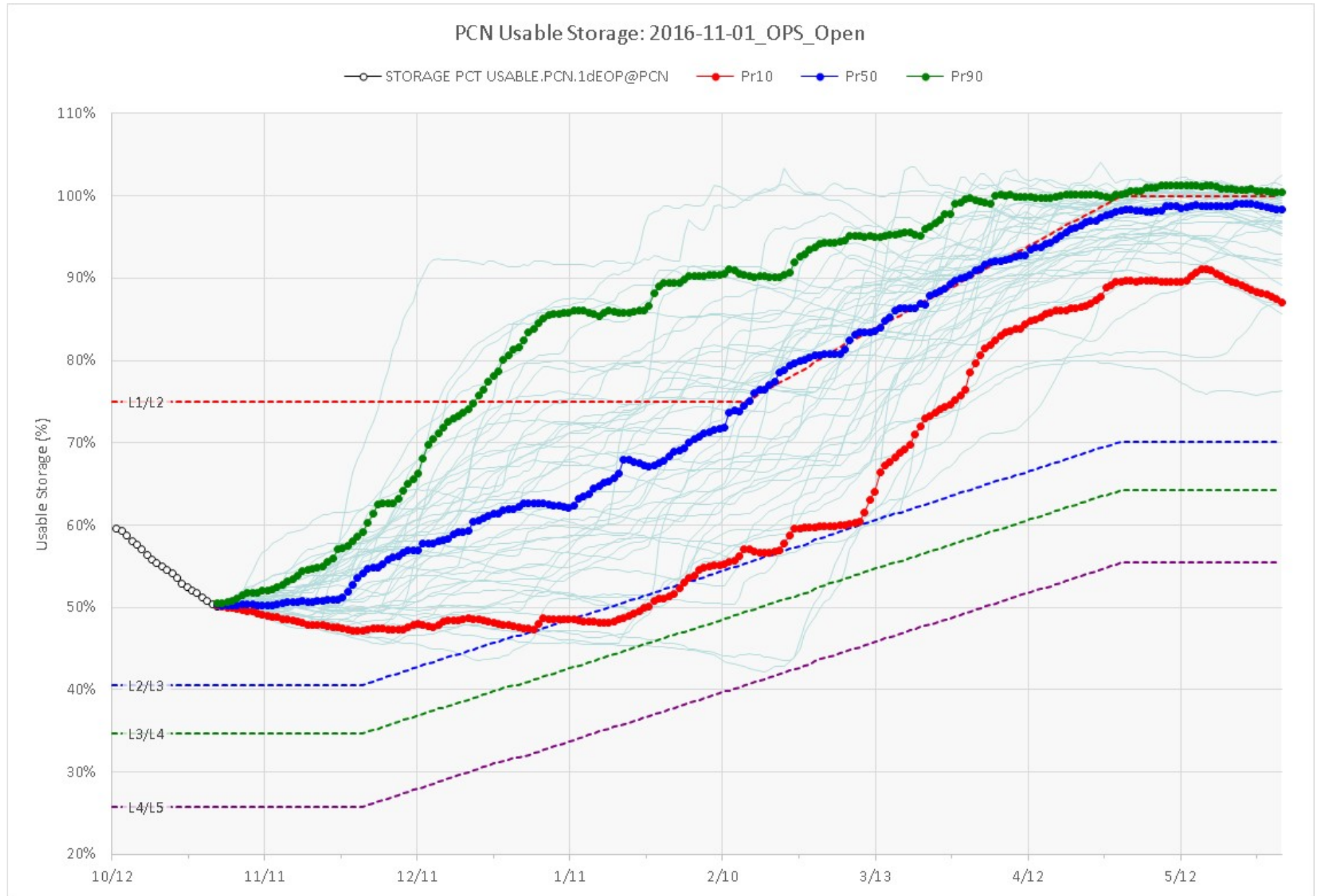
Statistics Comparison

Week	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
2016-03-22	96.00	4.00	0.00	0.00	0.00	0.00
2016-10-25	32.69	67.31	51.68	22.84	2.59	0.00

2016 Delaware Basin Storage Observations



Delaware Basin Storage Forecast



Early Drought Declaration

NEWS RELEASE

DELAWARE RIVER BASIN COMMISSION

**P.O. Box 7360, 25 State Police Drive
West Trenton, NJ 08628**

FOR IMMEDIATE RELEASE

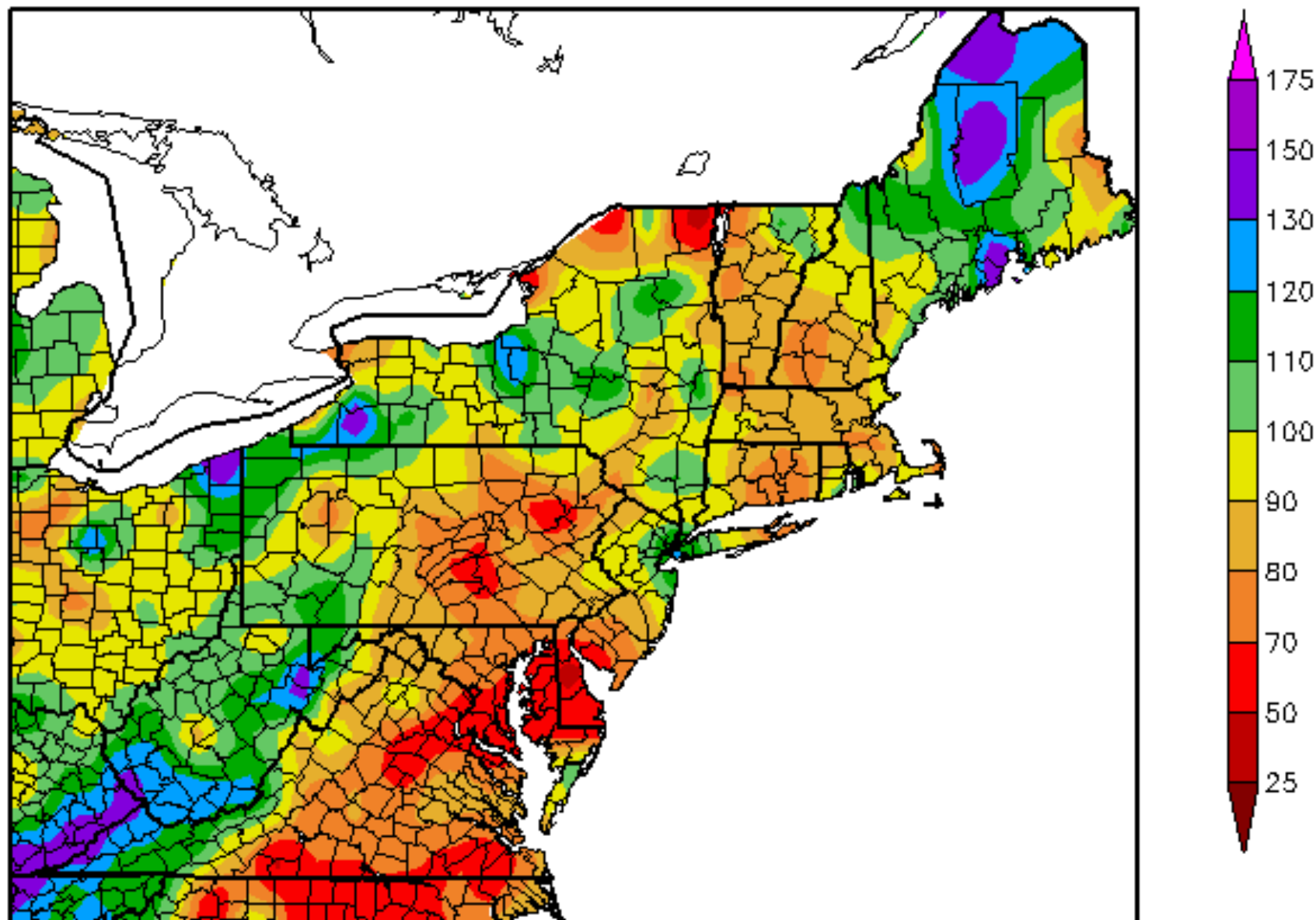
**CONTACTS: Clarke Rupert
(609) 883-9500 x260
Kate Schmidt
(609) 883-9500 x205**

DRBC APPROVES DROUGHT MANAGEMENT SPECIAL PERMIT
Basin Placed in “Drought Watch” Stage Effective Immediately

WEST TRENTON, N.J. (Nov. 23) – The Delaware River Basin Commission (DRBC) at a special meeting today issued a special permit for coordinated operation of regional reservoirs, out-of-basin diversions, and Delaware River flow objectives in response to persistent dry conditions.

“The special permit unanimously approved today provides for enhanced coordination of operations of regional reservoirs, diversions, and flow objectives during the ongoing, extended period of below-normal precipitation,” said DRBC Executive Director Steve Tambini. “Today’s action also makes clear that the entire basin is currently deemed to be in a ‘drought watch’ stage.”

% of Normal Precip 01 Nov 2016 – 31 Jan 2017



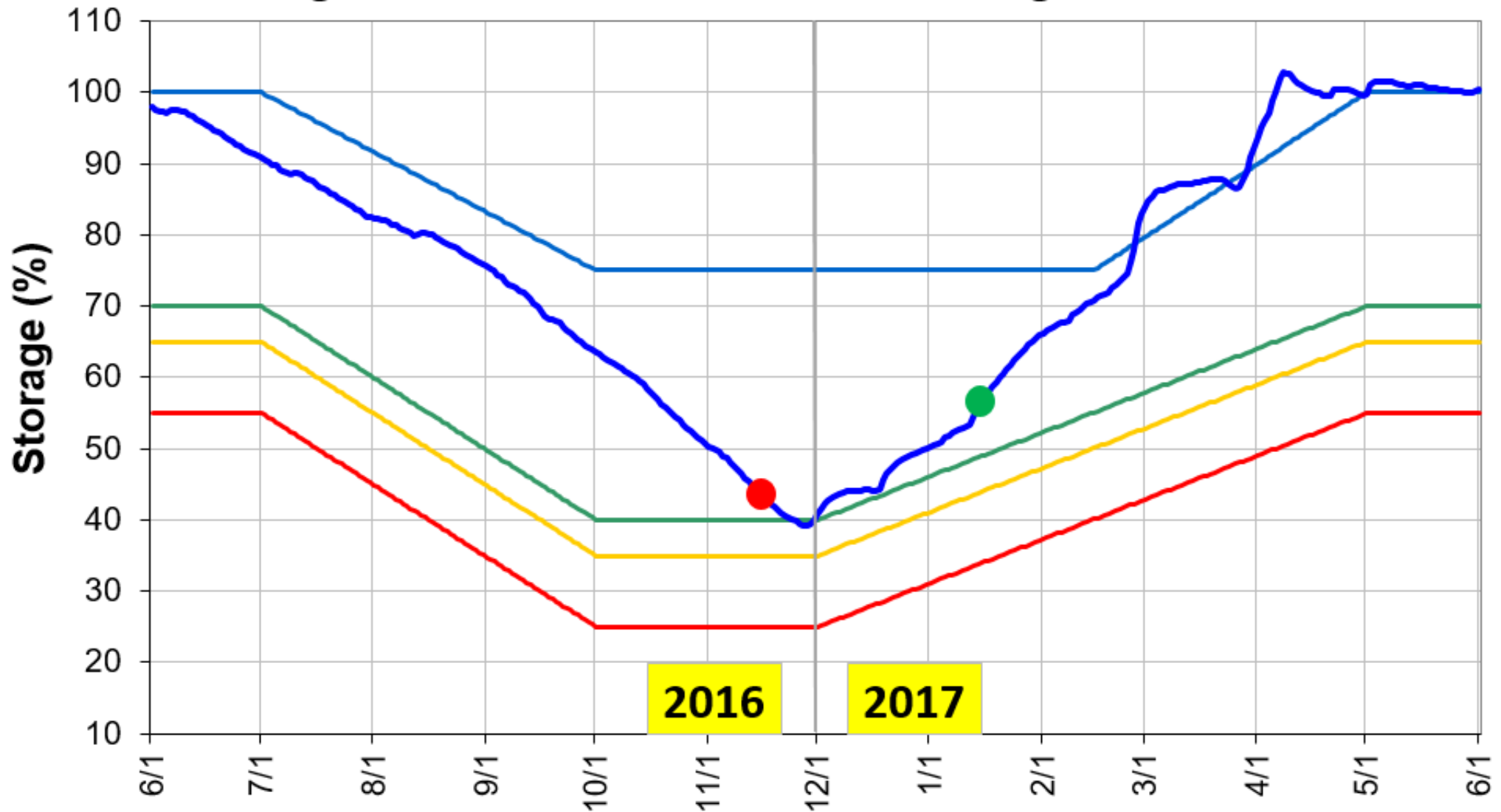
Generated 2/11/2017 at HPRCC using provisional data.

Regional Climate Centers

Storage Observations and Drought Status

Drought Watch Declared ●

Drought Watch Exit ●



- Forecasts provide invaluable decision-support
 - BUT uncertainty information is essential
- Ensembles are a paradigm shift
 - No longer focus on single trace or “right” forecast
 - Provide greater context for evaluation and decision-making
 - Allow us to see the forest, not just the trees
- Hydrologic system type/season matters
 - Snowpack-dominated: less uncertainty
 - Value of observations increases
 - Rainfall-dominated: greater uncertainty
 - QPF, QPF, QPF

Thank You



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