Delaware System Operations

October 11, 2022

NYC Environmental Protection

Agenda

Jennifer Garigliano

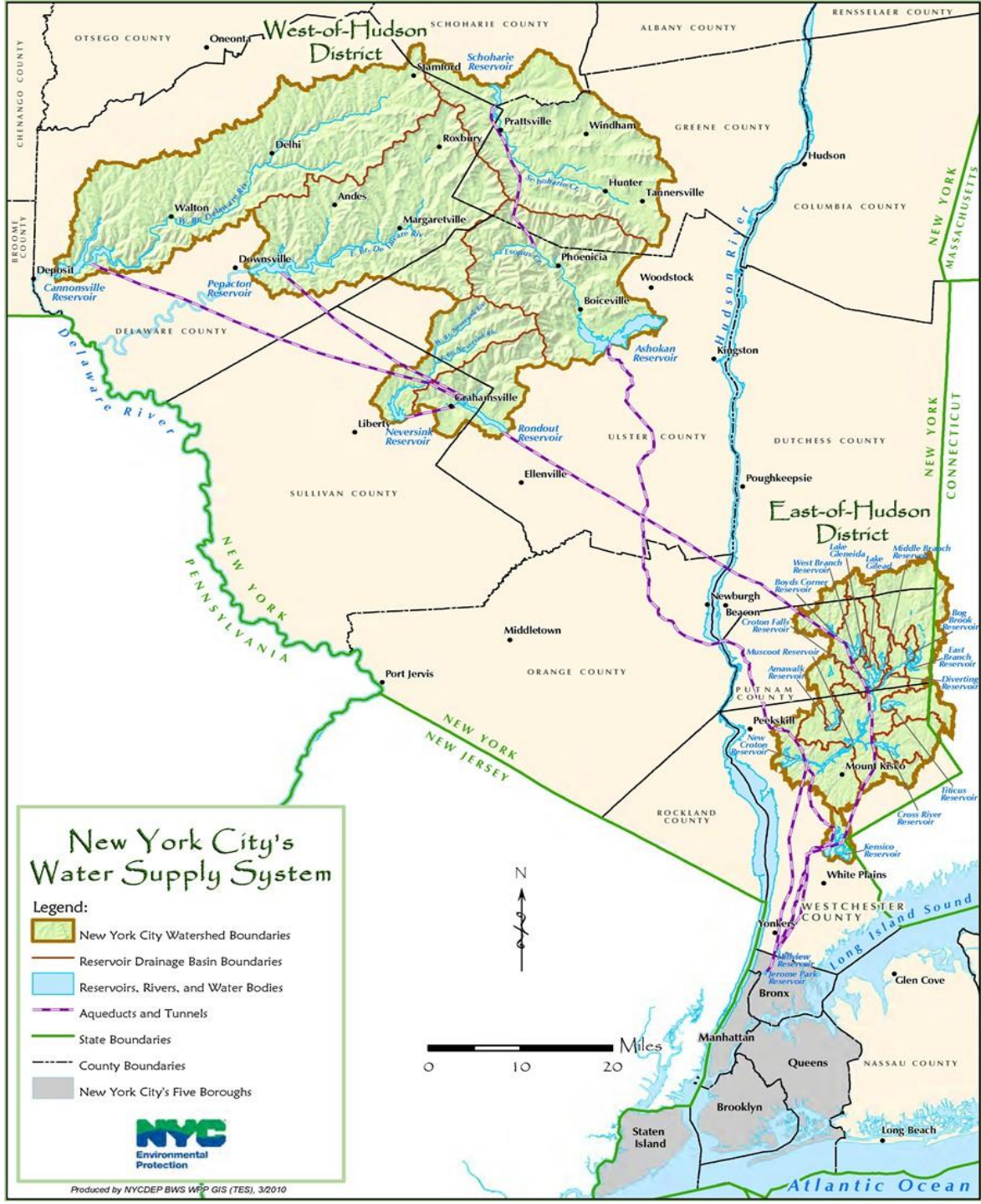
CHIEF OF STAFF
BUREAU OF WATER SUPPLY

NYC Environmental Protection

- System Overview
- Water Supply Operations
  - Goals/Objectives
  - Frameworks
  - Reservoir Operations
- Operational Tools
- Summary
- Questions

Water Supply Overview

- Surface water system
- 19 reservoirs + 3 lakes
- 570 billion gallon total reservoir storage capacity
- 9.8 million consumers (~1/2 New York State population)
- Delivers more than 1.1 billion gallons of water each day
- Watershed = 1,969 square miles (~1.2 million acres)
- Watershed covers parts of 8 upstate counties in NY plus a small portion of CT
- Nation's largest municipal water supply – 90% unfiltered



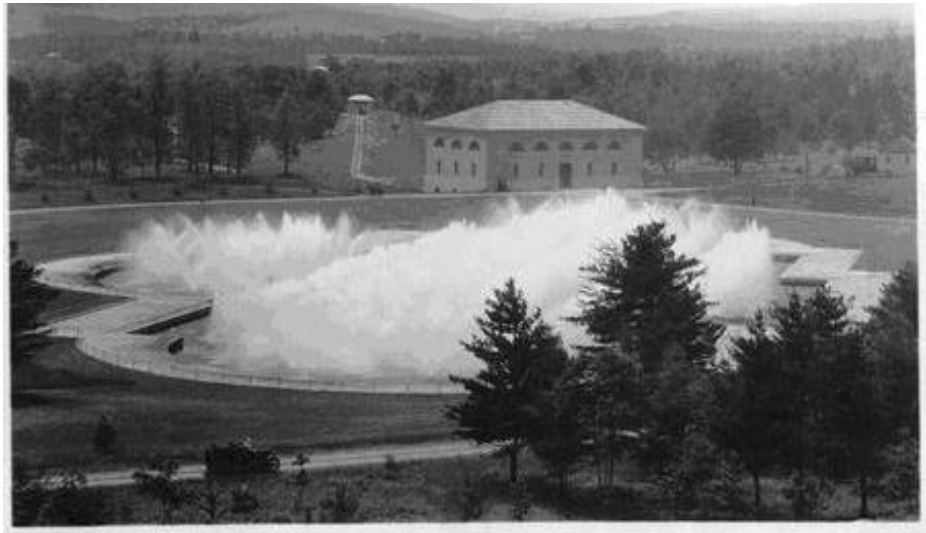
Water Supply Operations

- Essential Tasks
  - Meet the supply needs of New York City
  - Meet all reservoir release & diversion requirements
  - Maintain system to ensure a dependable supply

- Objectives
  - Divert the best quality water available
  - Maintain balanced system
  - Provide downstream habitat and flood mitigation benefits w/o water supply impact

Operational Framework

- 1954 Supreme Court Decree
- 1982 Good Faith Agreement
- NYS-DEC - 6 NYCRR Parts 670-672
- Flexible Flow Management Program (FFMP)
- Shandaken Tunnel SPDES Permit
- Catskill Alum SPDES Permit
- Ashokan Interim Operating Protocol
- Schoharie Snowpack Void Program



Reservoir Operations

All NYC systems are not created equal

Operational decisions are made based on:

- Water Quality
- Demand
- Modeling
- NWS Forecasting
- Maintenance
- Hydrological conditions

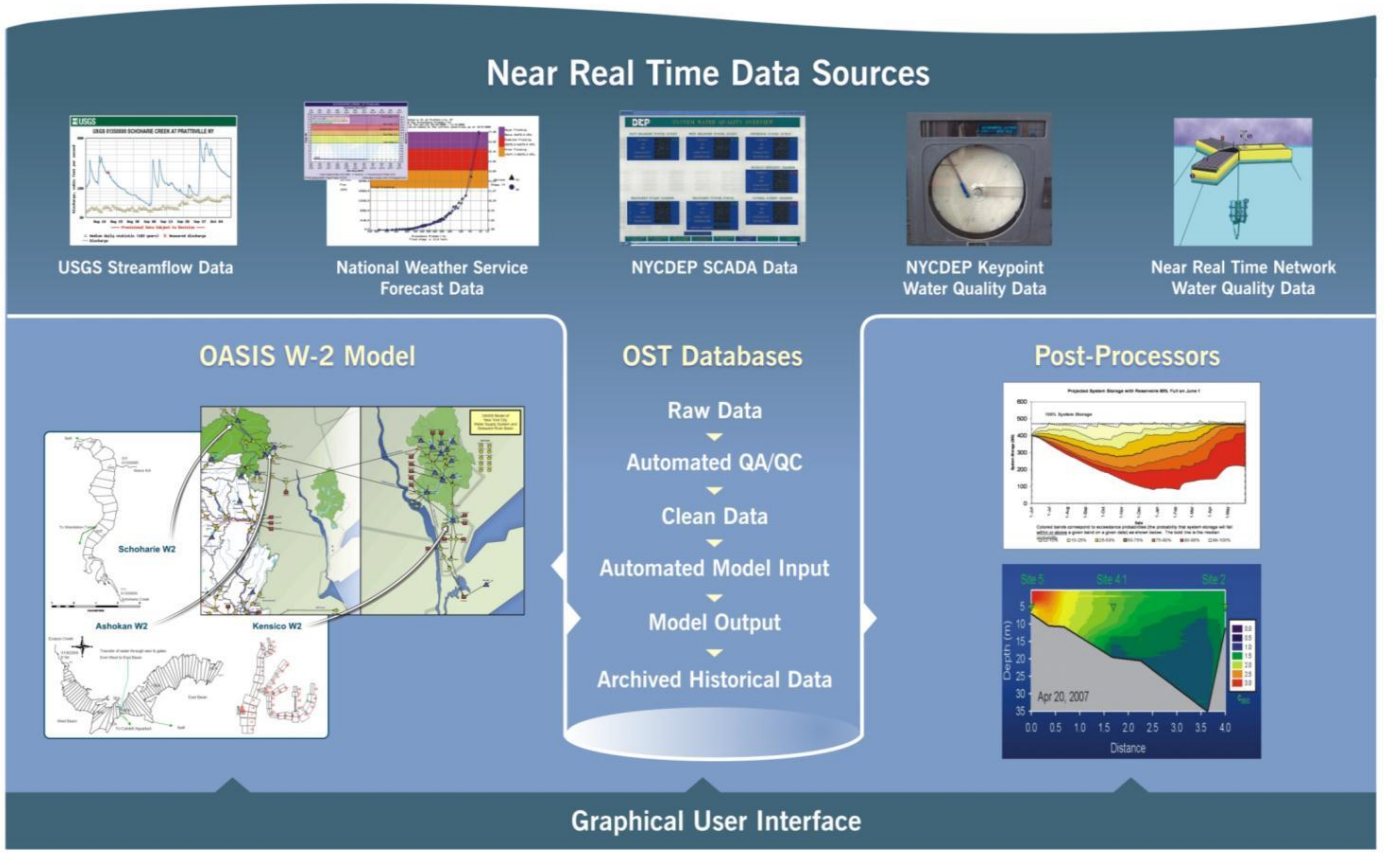
Croton

Ashokan

Rondout

Operations Support Tool

- Probabilistic foundation for water supply reliability
- Driven by more than 1,600 inputs
  - More accurate assessment of likely future inflows, release requirements, storage levels, drought warning triggers
- Better defines system capacity to meet objectives
- National Academies of Sciences, Engineering and Medicine review → most complex and advanced tools of its kind in the world



OST-FFMP Summary Page

OST-2017 FFMP Release Summary
Decision Day: 9/29/2022

General Release Mass Balance

Combined Pepacton, Cannonsville, and Neversink (PCN) Storage:	167,660	MG
+ PCN Inflow Forecast Accumulated to Jun 1:	343,229	MG
- Expected PCN Diverson Accumulated to Jun 1:	147,312	MG
-Jun 1 Storage Target:	267,460	MG
= Available Release Quantity Accumulated to Jun 1:	96,118	MG

Available Release Quantity Evenly Distributed to June 1

Available Release Quantity Accumulated to Jun 1:	96,118	MG
/ Number of Days to Distribute Release Quantity:	245	days
Current PCN Release Target:	392	mgd
Current PCN Release Target:	607	cfs

Current Storage Zone for Schedule Selection

	Usable Storage	Usable Storage + Snow Storage	Zone
PCN	62.7%	*	L2
Pepacton	72.5%	*	L2
Cannonsville	44.3%	*	L2
Neversink	72.7%	*	L2

*Not applicable (snow storage is included in the forecast)

Use Release Target and Storage Zone to Select Release Schedule

	Storage Zone, Fall (cfs)			
	Pepacton L2	Cannonsville L2	Neversink L2	PCN L2
Table-4a	60	85	50	195
Table-4b	70	140	55	265
Table-4c	80	190	65	335
Table-4d	95	245	70	410
Table-4e	105	295	75	475
Table-4f	115	350	85	550
Table-4g	125	400	90	615

Selected Schedule:Table(s) 4f

OST-2017 FFMP Release Summary
Decision Day: 9/29/2022

General Release Mass Balance		
Combined Pepacton, Cannonsville, and Neversink (PCN) Storage:	167,660	MG
+ PCN Inflow Forecast Accumulated to Jun 1:	343,229	MG
- Expected PCN Diverson Accumulated to Jun 1:	147,312	MG
-Jun 1 Storage Target:	267,460	MG
= Available Release Quantity Accumulated to Jun 1:	96,118	MG

Available Release Quantity Evenly Distributed to June 1		
Available Release Quantity Accumulated to Jun 1:	96,118	MG
/ Number of Days to Distribute Release Quantity:	245	days
Current PCN Release Target:	392	mgd
Current PCN Release Target:	607	cfs

Observed Storage on Decision Day

Forecasted inflow based on recent and forecasted hydrology

What NYC anticipates demand to be

Storage at 100%

Available Release Quantity Evenly Distributed to June 1

Available Release Quantity Accumulated to Jun 1:	96,118	MG
/ Number of Days to Distribute Release Quantity:	245	days
Current PCN Release Target:	392	mgd
Current PCN Release Target:	607	cfs

Current Storage Zone for Schedule Selection

	Usable Storage	Usable Storage + Snow Storage	Zone
PCN	62.7%	*	L2
Pepacton	72.5%	*	L2
Cannonsville	44.3%	*	L2
Neversink	72.7%	*	L2

*Not applicable (snow storage is included in the forecast)

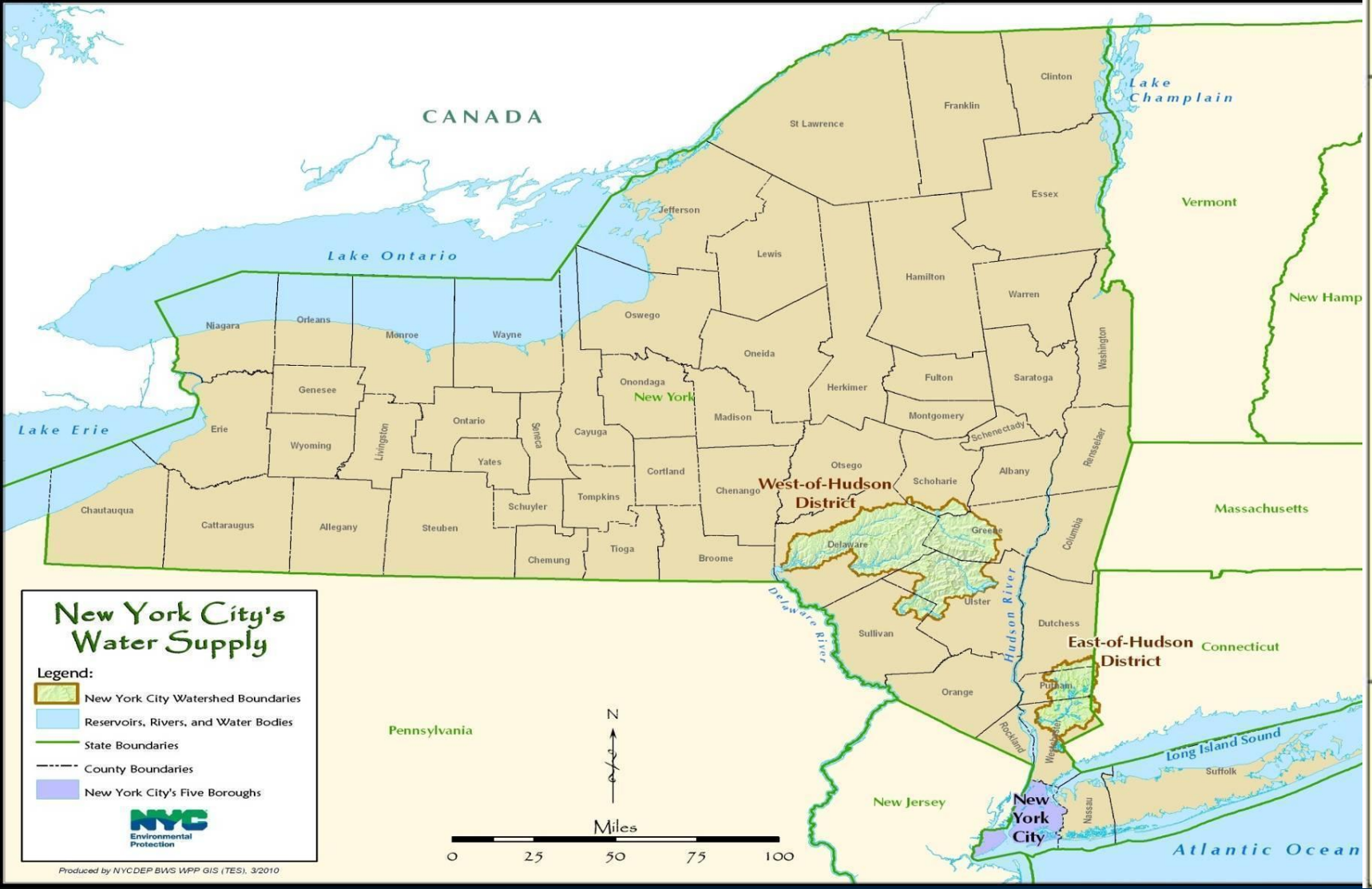
Shows current storage zones

Use Release Target and Storage Zone to Select Release Schedule

	Storage Zone, Fall (cfs)			
	Pepacton	Cannonsville	Neversink	PCN
	L2	L2	L2	L2
Table-4a	60	85	50	195
Table-4b	70	140	55	265
Table-4c	80	190	65	335
Table-4d	95	245	70	410
Table-4e	105	295	75	475
Table-4f	115	350	85	550
Table-4g	125	400	90	615

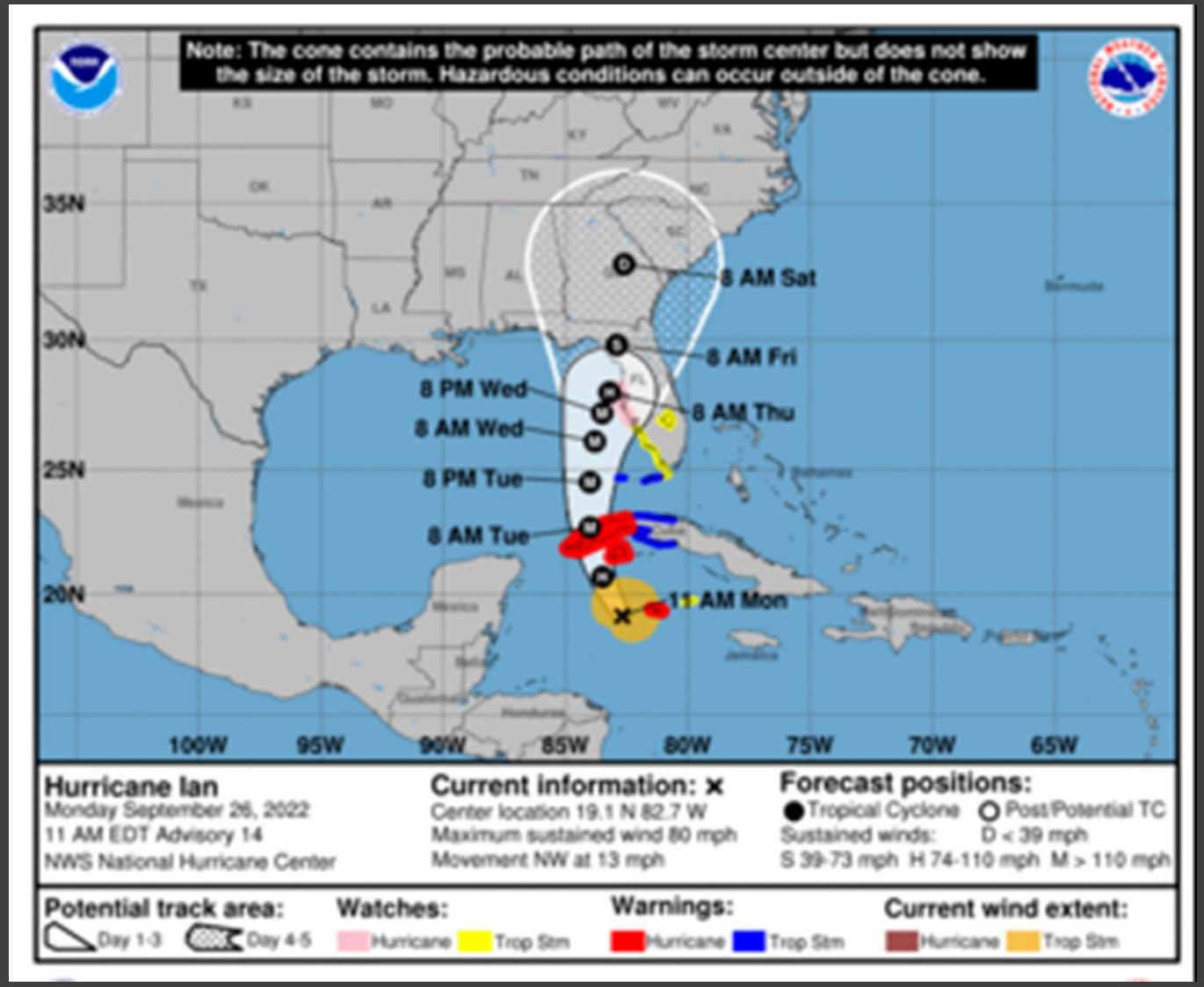
Selected Schedule:Table(s) 4f

NYC Environmental Protection

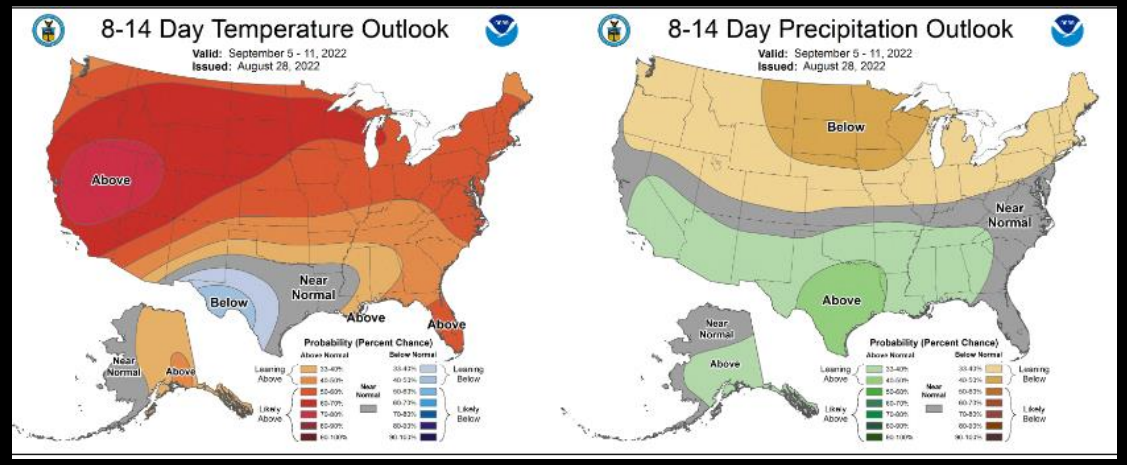

New York City's Water Supply
Legend:
New York City Watershed Boundaries
Reservoirs, Rivers, and Water Bodies
State Boundaries
County Boundaries
New York City's Five Boroughs
NYC Environmental Protection
Produced by NYCDEP BWS WPP GIS (TES), 3/2010
CANADA
Lake Ontario
Lake Erie
Lake Champlain
Vermont
New Hamp
Massachusetts
Connecticut
Pennsylvania
New Jersey
New York
West-of-Hudson District
East-of-Hudson District
Delaware River
Hudson River
Long Island Sound
Atlantic Ocean
New York City
Clinton
Franklin
St Lawrence
Essex
Jefferson
Lewis
Hamilton
Warren
Washington
Oswego
Oneida
Herkimer
Fulton
Saratoga
Niagara
Orleans
Monroe
Wayne
Genesee
Onondaga
Madison
Montgomery
Schenectady
Albany
Rensselaer
Erie
Wyoming
Livingston
Ontario
Seneca
Cayuga
Yates
Otsego
Schoharie
Cortland
Chenango
Schuyler
Tompkins
Chautauqua
Cattaraugus
Allegany
Steuben
Chemung
Tioga
Broome
Delaware
Greene
Columbia
Ulster
Dutchess
Sullivan
Orange
Putnam
Rockland
Westchester
Nassau
Suffolk
N
Miles
0
25
50
75
100

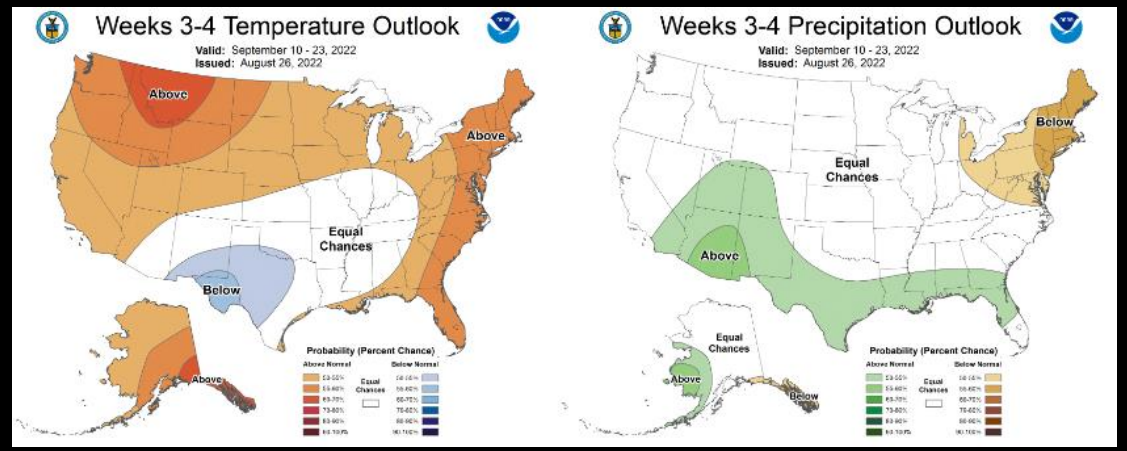

PENNSYLVANIA
NEW JERSEY
MARYLAND
Raritan Bay
Trenton
Philadelphia
Camden
Wilmington
Dover
Delaware Bay
ATLANTIC OCEAN
0
10
20
MILES
N

Other Tools



NOAA Topical Forecast





NOAA Short-term forecasts

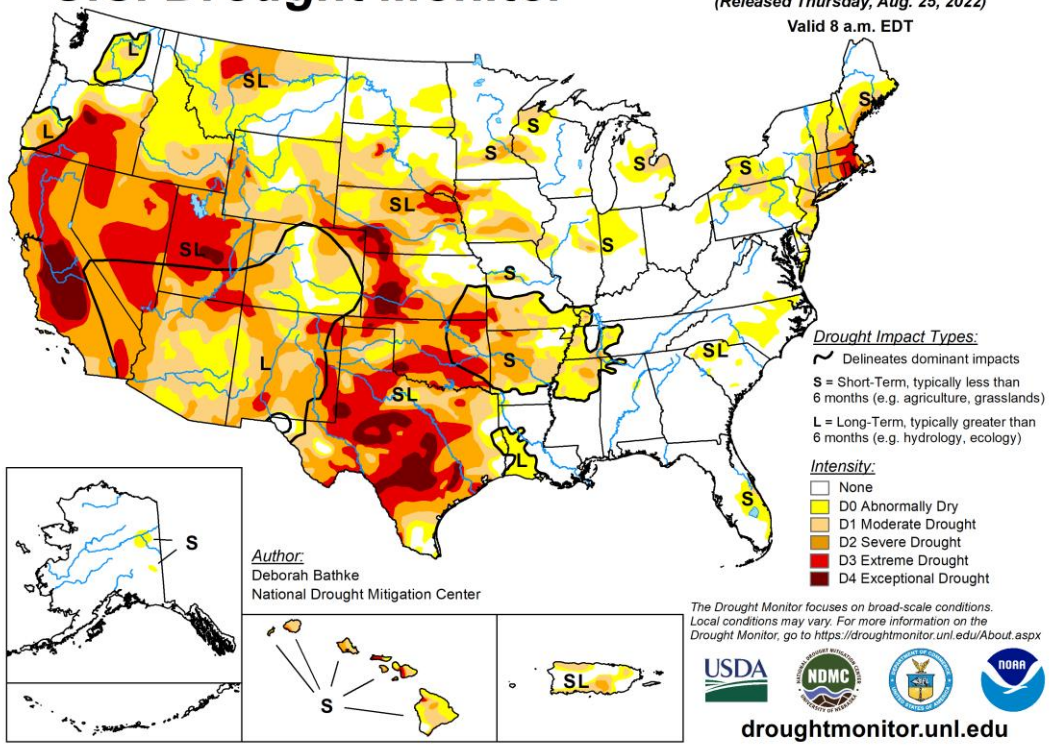
- 6-10 Days
- 8-14 Days
- 3-4 Weeks
- Monthly
- Seasonally

U.S. Drought Monitor

August 23, 2022

(Released Thursday, Aug. 25, 2022)

Valid 8 a.m. EDT



Drought Impact Types:

~ Delineates dominant impacts

S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

Author:
Deborah Bathke
National Drought Mitigation Center

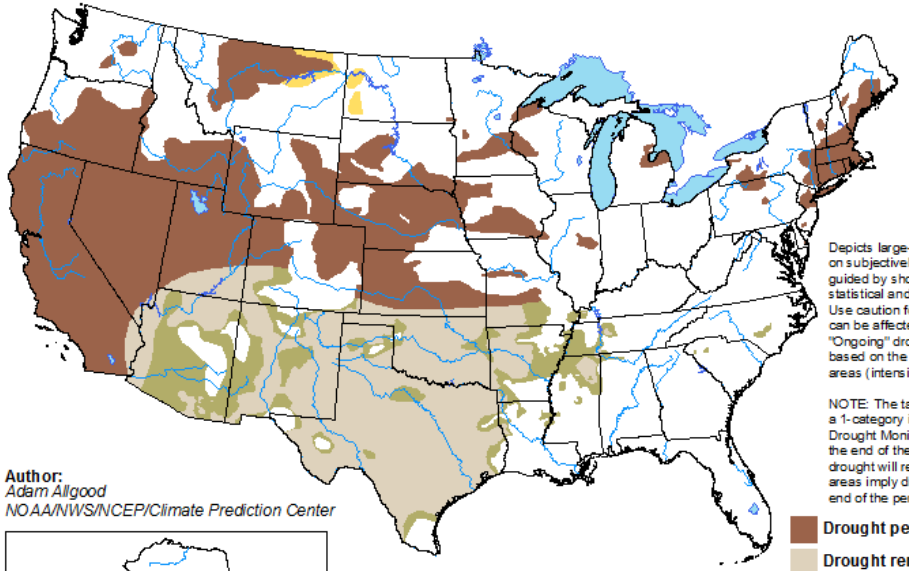
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

droughtmonitor.unl.edu

U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid for August 18 - November 30, 2022
Released August 18



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).

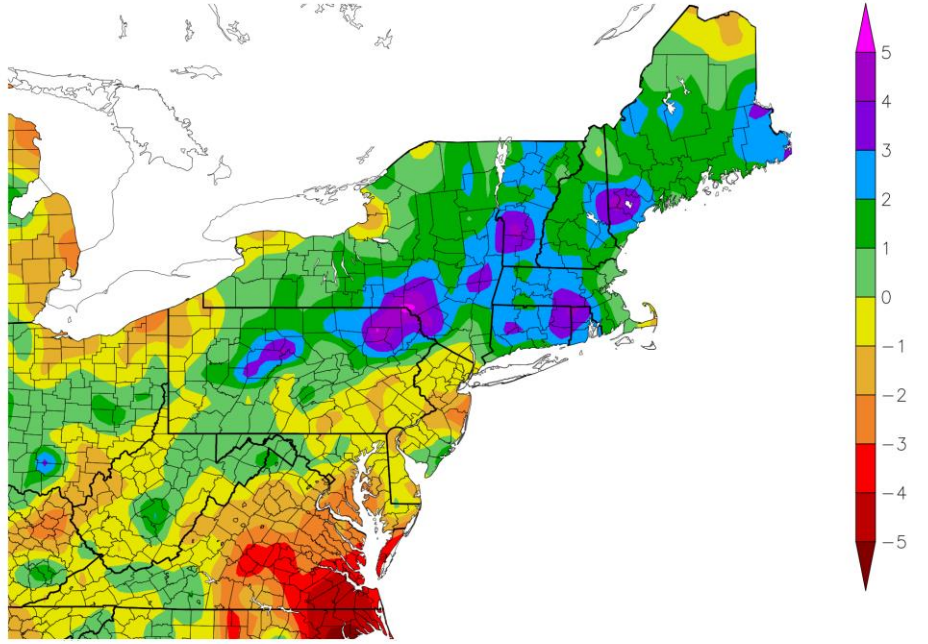
NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

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

Author:
Adam Allgood
NOAA/NWS/NCEP/Climate Prediction Center

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

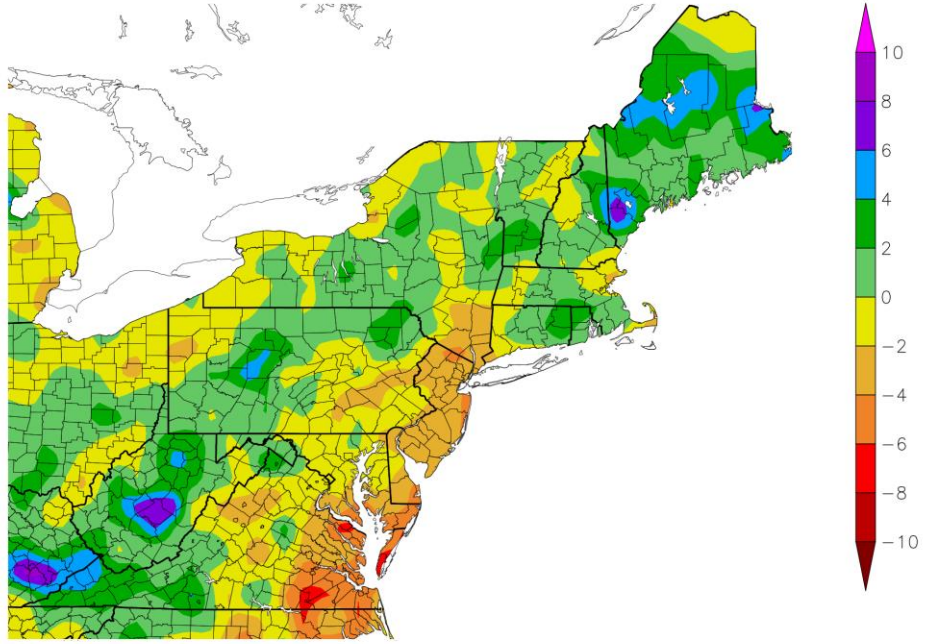
Departure from Normal Precipitation (in)
8/27/2022 – 9/25/2022



Generated 9/26/2022 at HPRCC using provisional data.

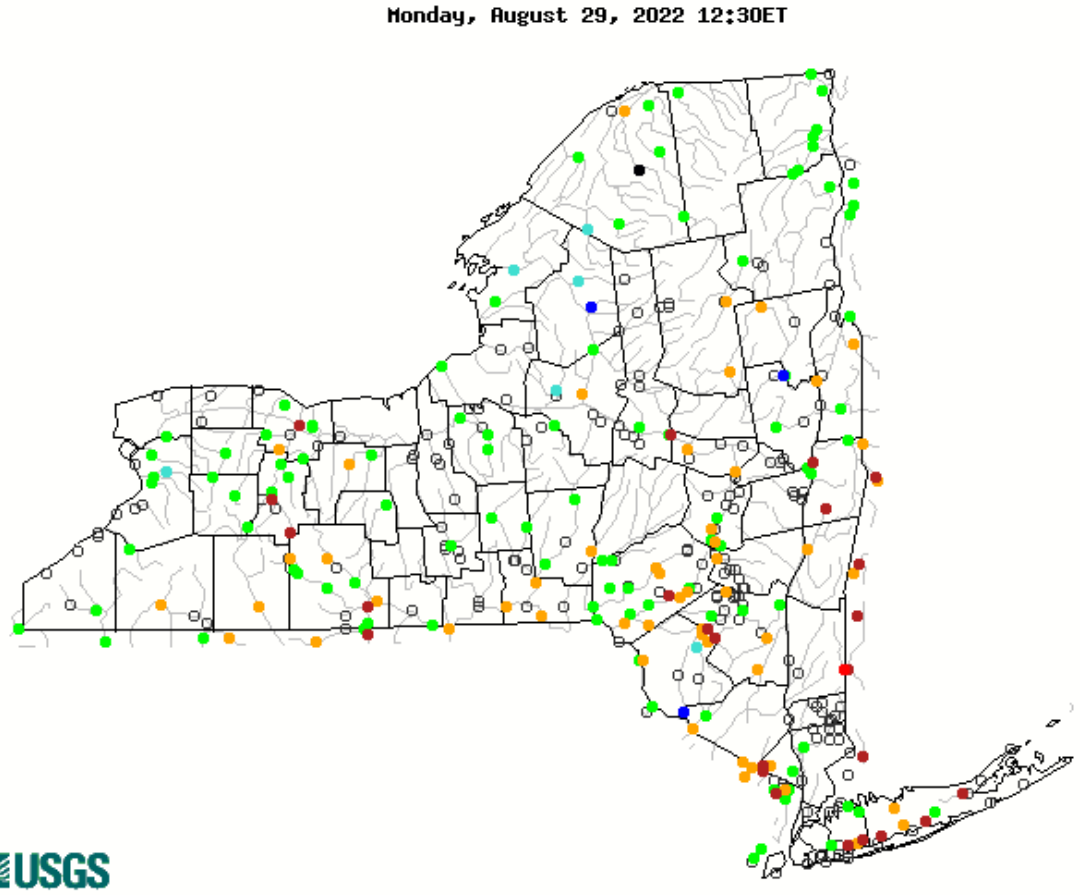
NOAA Regional Climate Centers

Departure from Normal Precipitation (in)
7/28/2022 – 9/25/2022



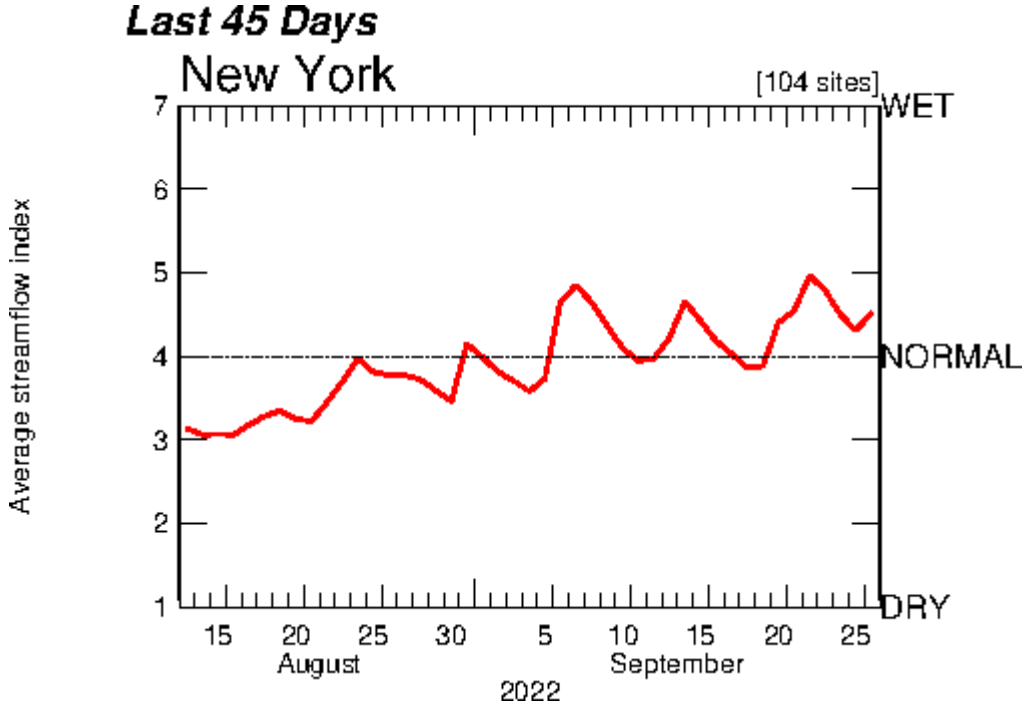
Generated 9/26/2022 at HPRCC using provisional data.

NOAA Regional Climate Centers



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

Time series plot of real-time streamflow compared to historical streamflow for the day of the year.



NYC Environmental Protection

Coordination

ODRM and DRBC
- Daily design process

National Weather Service (Binghamton, Albany, NYC)
- Meteorologist in Charge
- Service Hydrologists

Climate Prediction Center
- Short range products
- Seasonal Outlooks

National Drought Mitigation Center
- U.S. Drought Monitor
- Seasonal Drought Outlook

Middle Atlantic & Northeast River Forecast Centers
- MARFC Drought Advisory meeting

The same tools and coordination would also be happening if conditions were really wet

NYC Environmental Protection

Summary

- NYC operates under a series of regulatory frameworks
- There’s a lot of communication and coordination between agencies at a variety of levels
- Use of multiple, validated tools to make decisions
- NYCDEP and ODRM websites provide a lot of information on current operations

NYC Environmental Protection

Questions

NYC Environmental Protection