

Delaware River Basin Commission

Delaware Aqueduct Shutdown Analysis

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Regulated Flow Advisory Committee
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Delaware River Basin Commission
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This presentation was given at the April 29, 2024, RFAC Meeting and pertains to the potential impacts of the project related to drought potential, conservation releases from the NYC reservoirs, and flooding. Slides 3 and 4 were not presented but are included for context. Detailed information about the Delaware Aqueduct Repair Project was presented by Jennifer Garigliano, located here:

https://www.nj.gov/drbc/library/documents/RFAC/042623/DelawareAqueductRepair_gariglianoNYCDEP.pdf

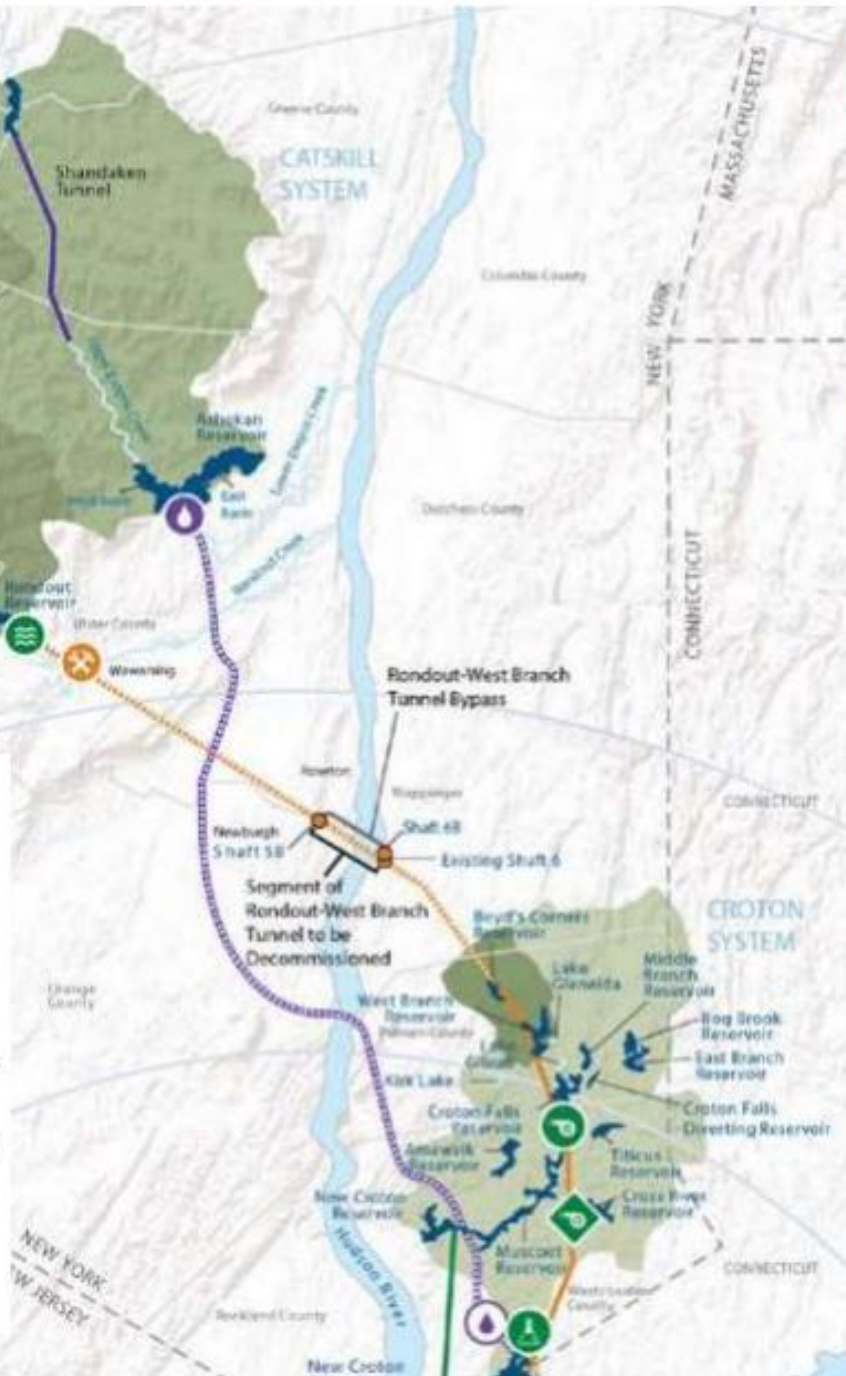
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Slide added for context.

Water for the Future

- Multiple infrastructure projects in preparation for the shutdown
- Concern for DRB –
 - Roundout West-Branch bypass
 - Possible Impacts
 - Water Supply “Emergency” - Drought declaration based on Combined storage
 - Conservation releases
 - FLOODING

- ◆ Cross River Pump Station
- ◆ Croton Falls Pump Station
- Delaware Aqueduct
- Catskill Aqueduct
- New Croton Aqueduct
- Water Tunnels
- Rondout-West Branch Tunnel Inspection and Repair
- Rondout-West Branch Tunnel Repairs
- Pleasantville Alum Plant
- Rondout Reservoir Siphons
- Chlorination Facility at Ashokan Screen Chamber
- Dechlorination Facility at Pleasantville Alum Plant
- Catskill Aqueduct Repair and Rehabilitation
- Water for the Future Shutdown System Operations Reservoirs

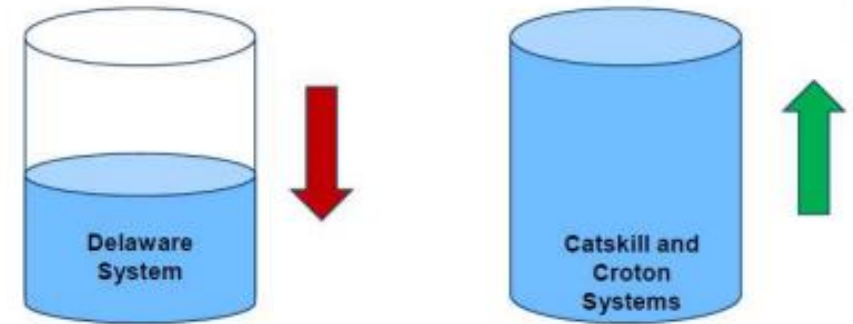


Map courtesy of NYCDEP

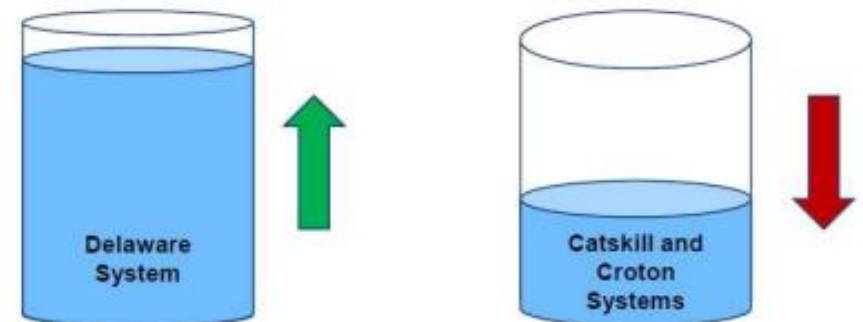
Delaware Aqueduct Shut Down Operations

- Intended operation to prepare for shutdown
 - June 1 through September 30
 - Follow the Flexible Flow Management Program (FFMP)
 - Maximize Diversion from the Delaware Basin (only FFMP restriction is must be less than 800 mgd)
 - Goal: Preserve storage in the **non**-Delaware System
- Shutdown
 - October through completion (6-8 months after shutdown)
 - Shutdown Operations will also be in accordance with FFMP (no modifications at this time)
- “Go/No-Go” decision has not been made

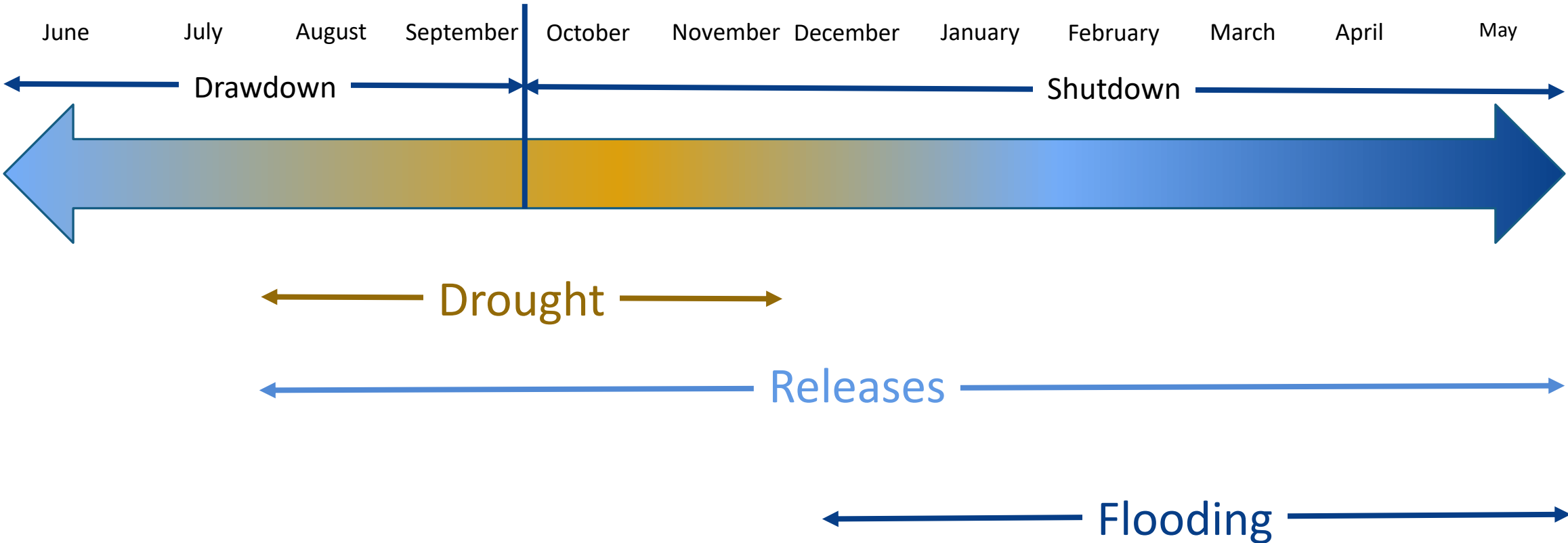
Before the aqueduct shutdown



During the aqueduct shutdown



Potential Impacts of the Shutdown



Periods during the shutdown when impacts may potentially occur.

Preliminary Findings

- * FFMP 2017 has enough flexibility to address potential impacts
- * Drought “caused” by shutdown (unlikely)
- * Conservation Releases (likely to be normal – or better)
- * Flooding (small increase in the risk of minor flooding)

DRBC Analysis

- * **Ensemble Simulations** – estimate probability of an outcome/risk
- * FFMP 2017 with 90 years of streamflow, including
 - * Six of the “wettest” or flood years (1955, 2003, 2004, 2005, 2006, 2011)
 - * Three of the driest periods (1930s, 1960s, early 2000s)

- * **Except**, diversions were:

- * maximum amount diverted – dry year (800 mgd)
- * amount slightly greater than a typical summer – likely (680 mgd)
- * too much rain – wet year/late season hurricanes (500 mgd)

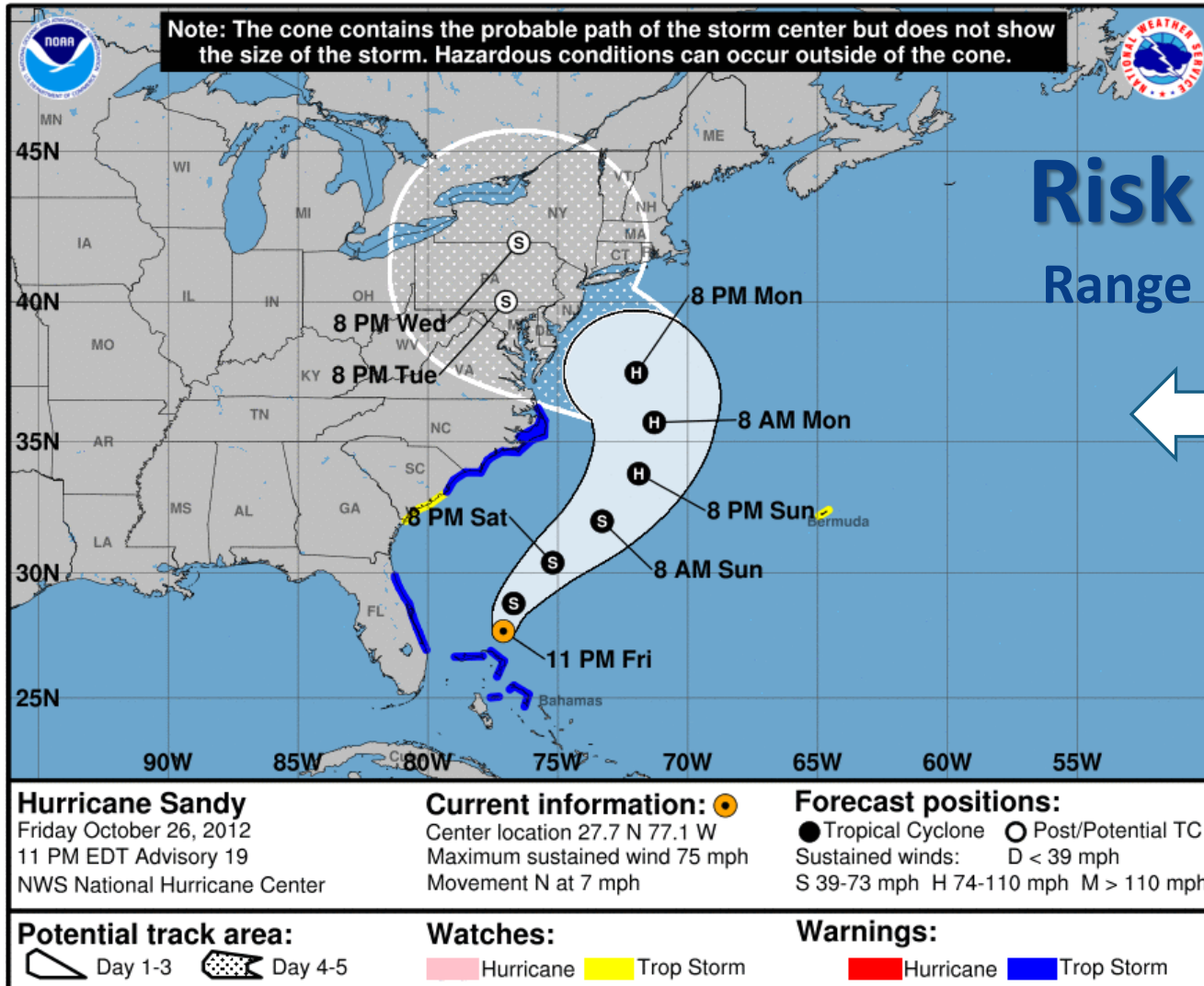
Vulnerability

Drought (800 mgd)
Releases (680 mgd)
Flood (500 mgd)

Operations during the shutdown will be in accordance with FFMP 2017
DRB-PST: Delaware River Basin **P**lanning **S**upport **T**ool for water resource system analysis

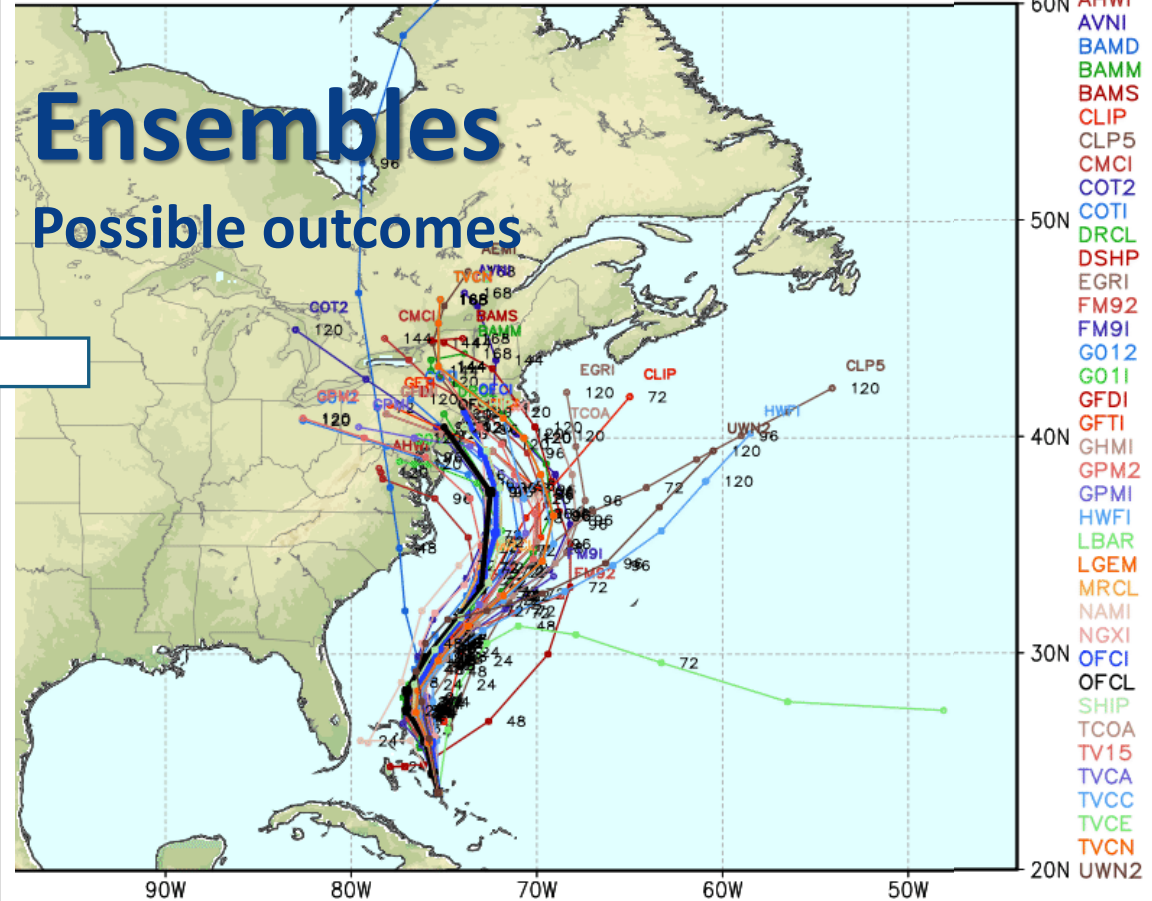
Ensemble Simulations - Risk

similar to the method for defining hurricane tracks



SANDY Guidance valid: 2012102518

Track Models



ce only -- expert interpretation required. Check NHC Official Forecasts
r. Ryan Maue, WeatherBELL Analytics.

Refresh Image every 30 recent data

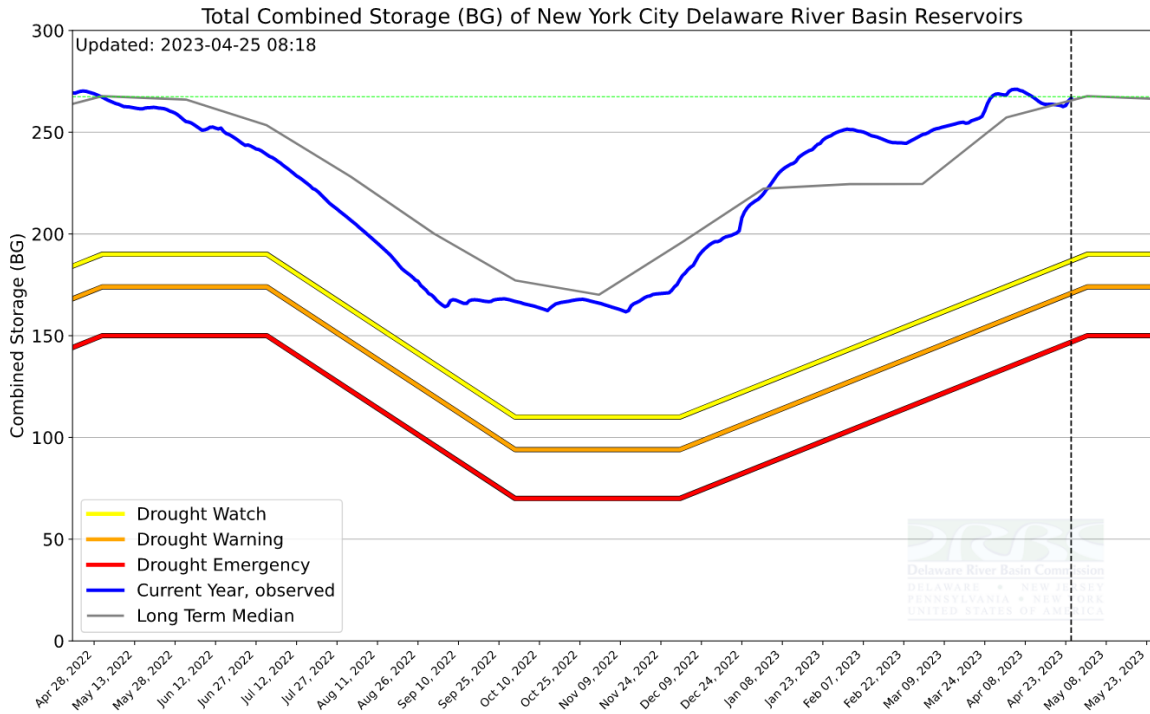
Drought

- * Large summer drawdown - offset by no diversions during shutdown
- * Go/No-Go decision based on predicted precipitation
- * Flexibility in the plan
- * Drought Management Plan (incorporated into FFMP 2017)
 - * Based on combined storage
 - * designed for 1960s drought

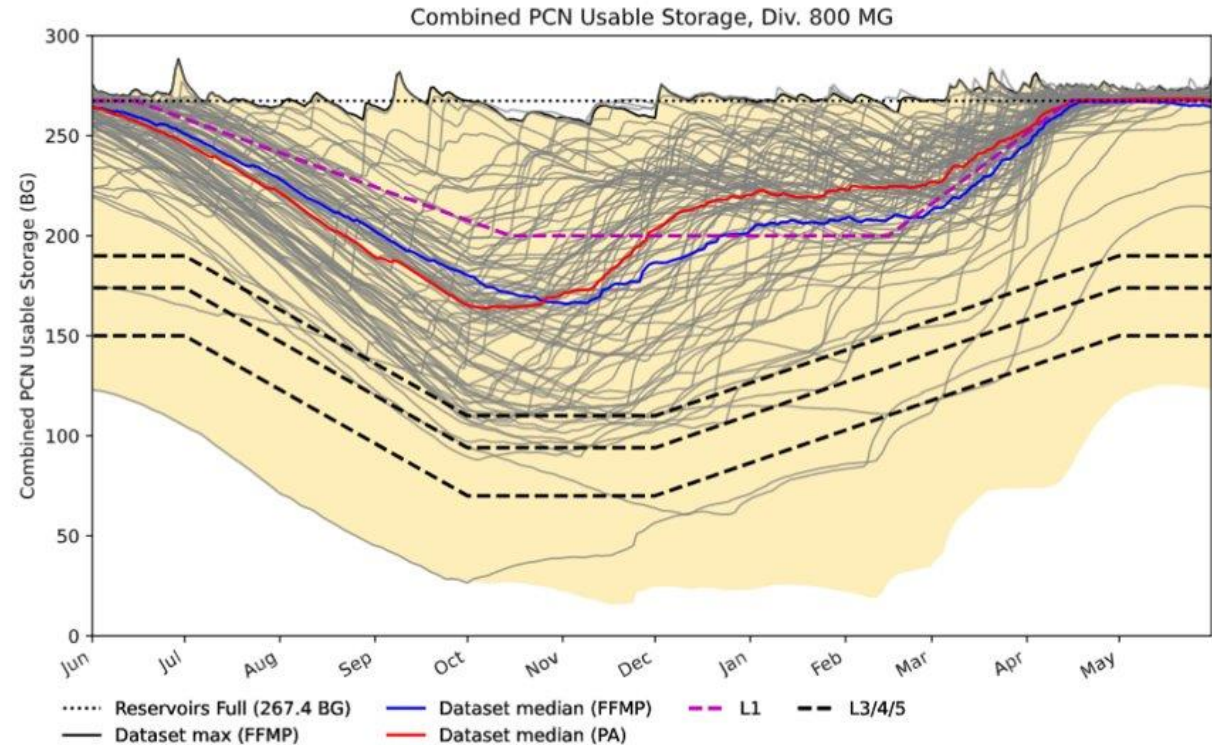


Drought Conditions Unlikely

Simulated 90 years, diversions 800 mgd (June-Sept), no diversions (Oct-May)



Usable Storage BG %	Cannonsville	Pepacton	Neversink	Total	BG above drought watch = 79.8	BG above median = 1.0
	93.5	138.5	34.6	266.6	BG above drought warning = 95.8	BG below one year ago = 3.1
	100.1	99.4	99.6	99.7	BG above drought = 119.8	



Simulated NYC Combined Usable Storage

Position Analysis Run ID: PA_202205-06_Div300, PA_202205-04_Div500, PA_202205-07_Div800
 Set NYC diversion as a constant value during June 1 through Sep 30 period, then followed by a 12-month shut-down period.
 Position analysis results were from 86 traces: start year of the trace is from 1929 through 2014.

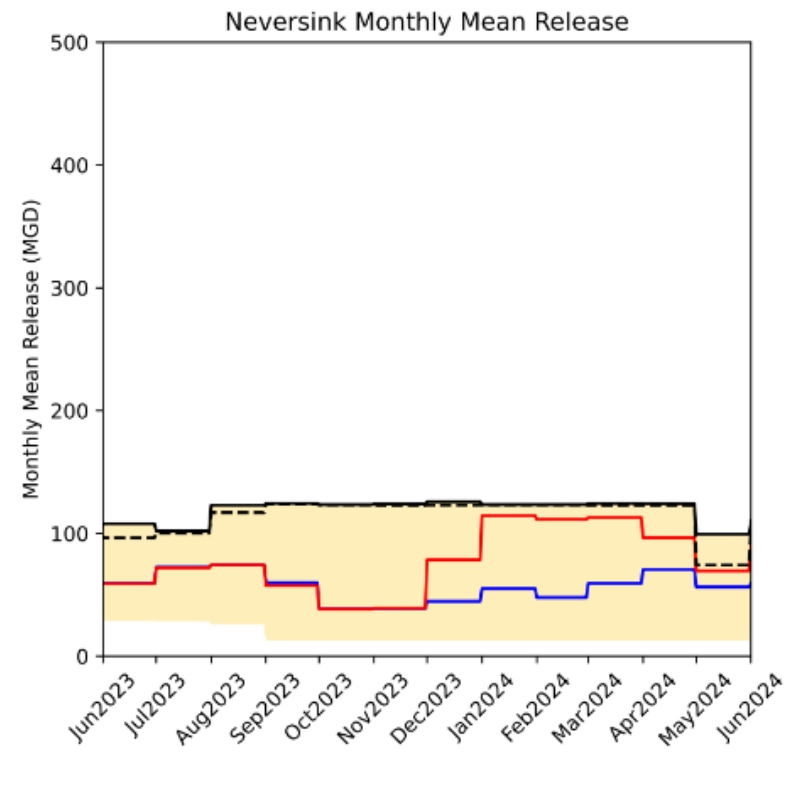
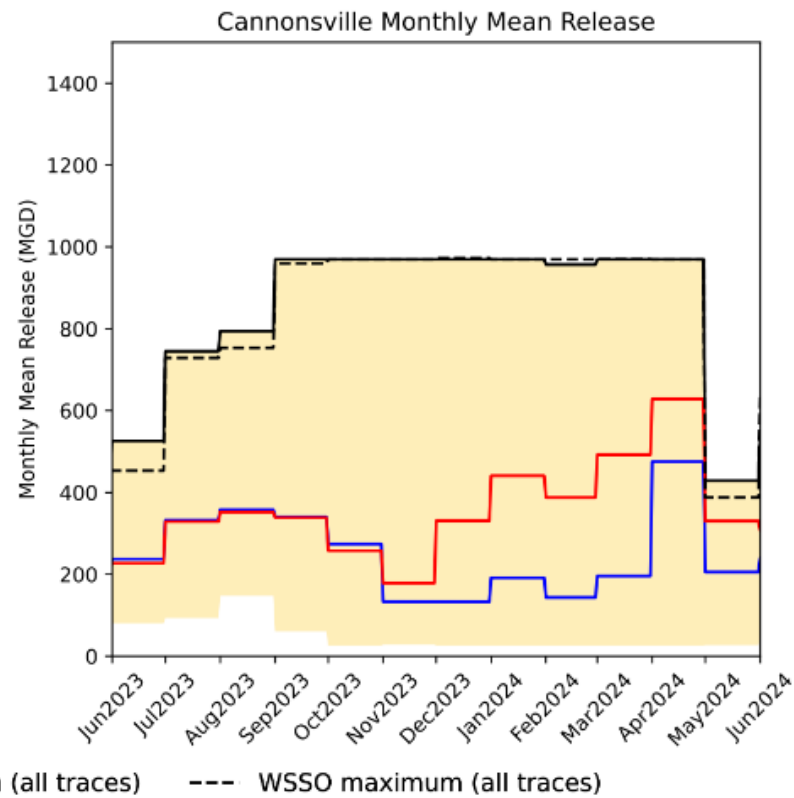
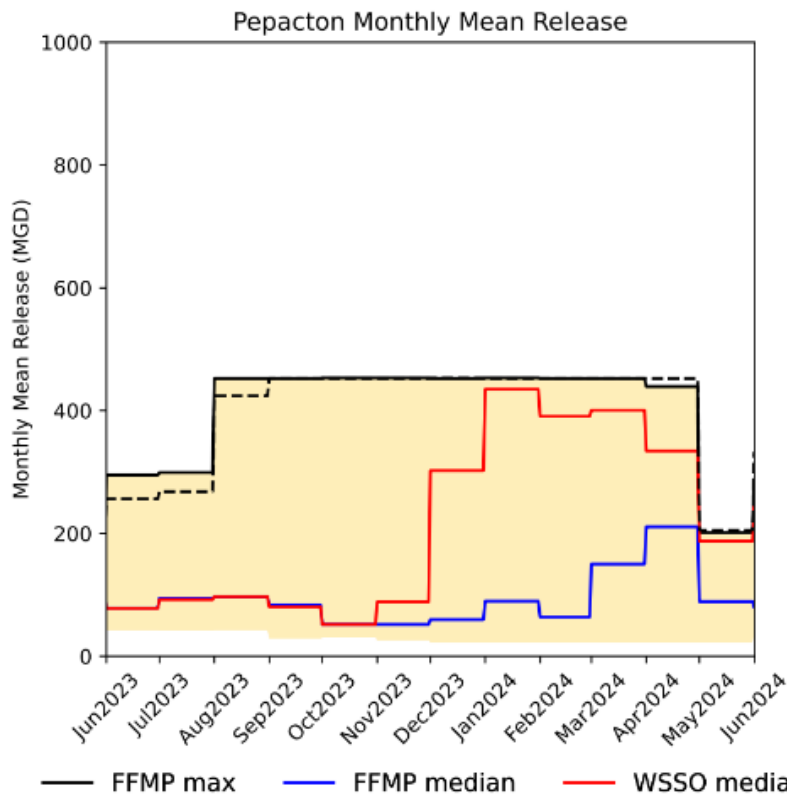
Conservation Releases

- * Conservation Releases (likely to be normal – or better)
- * Forecast Available Water = water not diverted (June-Oct) = more for releases
- * OST provides guidance; operators make the decisions
- * Fishing should be great!



Conservation Releases

(likely better – Forecast Available Water and Flexibility)



Simulated Monthly Mean Release

Precipitation Outlook

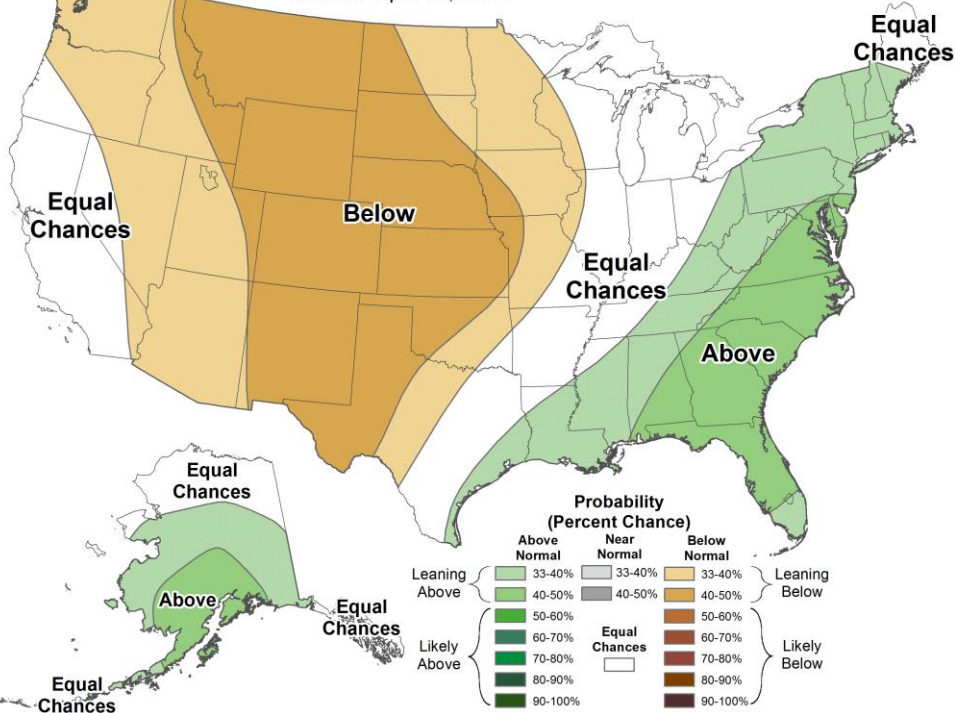
(July – August –September)



Seasonal Precipitation Outlook



Valid: Jul-Aug-Sep 2024
 Issued: April 18, 2024



ATLANTIC HURRICANE SEASON FORECAST

2024

Exclusive AccuWeather Forecast

	Named Storms	Hurricanes	Major Hurricanes	Accumulated Cyclone Energy (ACE)	Direct U.S. Impacts
Forecast 2024	20-25	8-12	4-7	175-225	4-6
Previous Year 2023	19	7	3	145.6	4
30-Year Historical Average 1990-2020	14	7	3	123	4

AccuWeather

Flooding

- * Small increase in the risk of minor flooding
- * Storm: track, intensity and amount of precipitation, prior rainfall
- * Location and river geomorphology (shape)
- * Mainstem flooding is possible even if the reservoirs do not spill
 - * Flood analysis model
 - * Only 14 percent of the drainage area above Trenton is controlled by the NYC Reservoirs



Flooding

(probability of river rising to flood levels during shutdown)

Action

Action: high water levels, call to action

Minor

Minor: Water begins to cause issues – over banks, road closures, inconvenience

Moderate

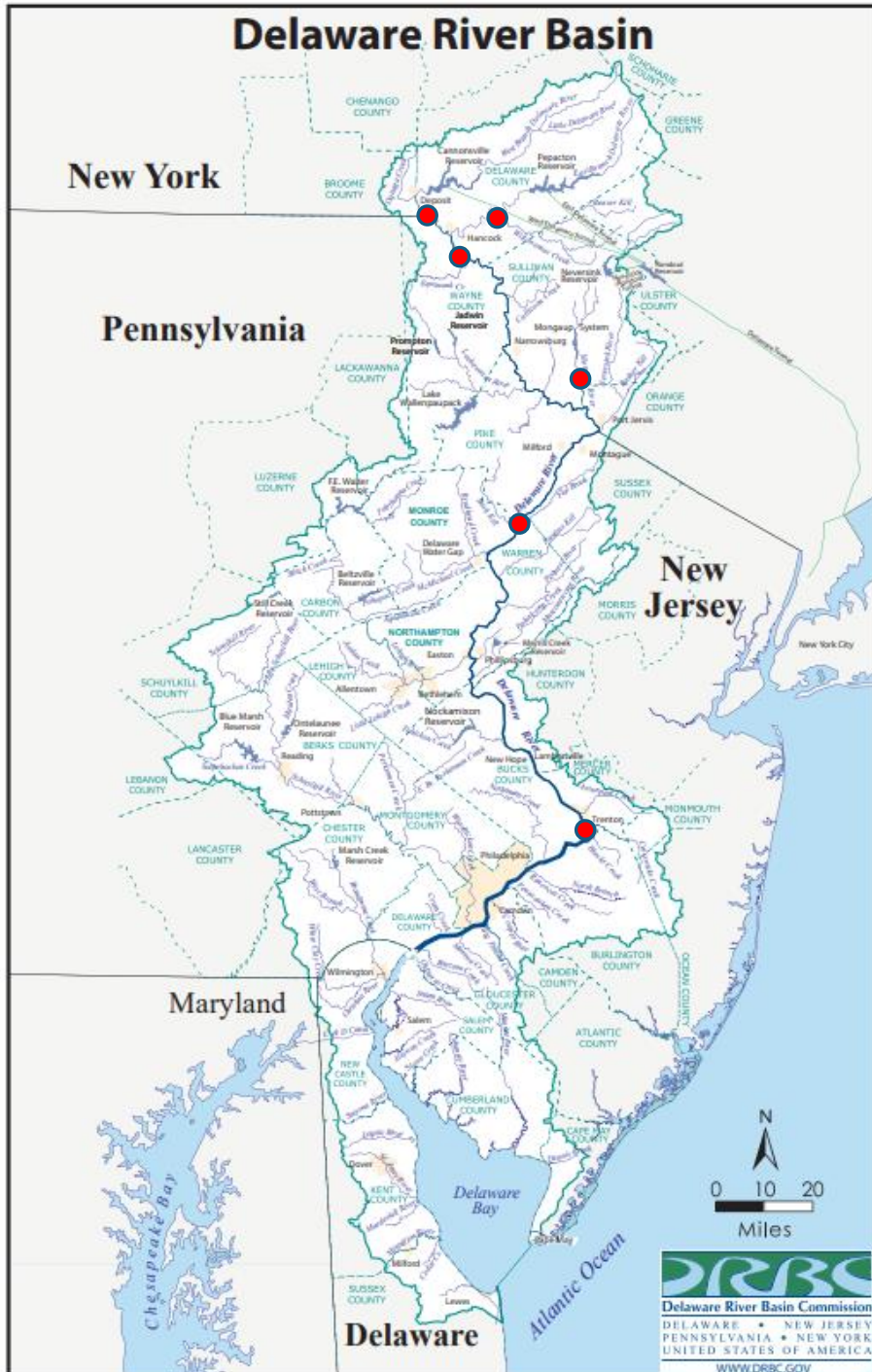
Moderate: Buildings, unsafe driving, evacuation of critical areas and populations

Major

Major: Many buildings, no transportation, debris floating downstream; high damage estimates

[High Water Level Terminology \(weather.gov\)](https://www.weather.gov/highwater)

Delaware River Basin

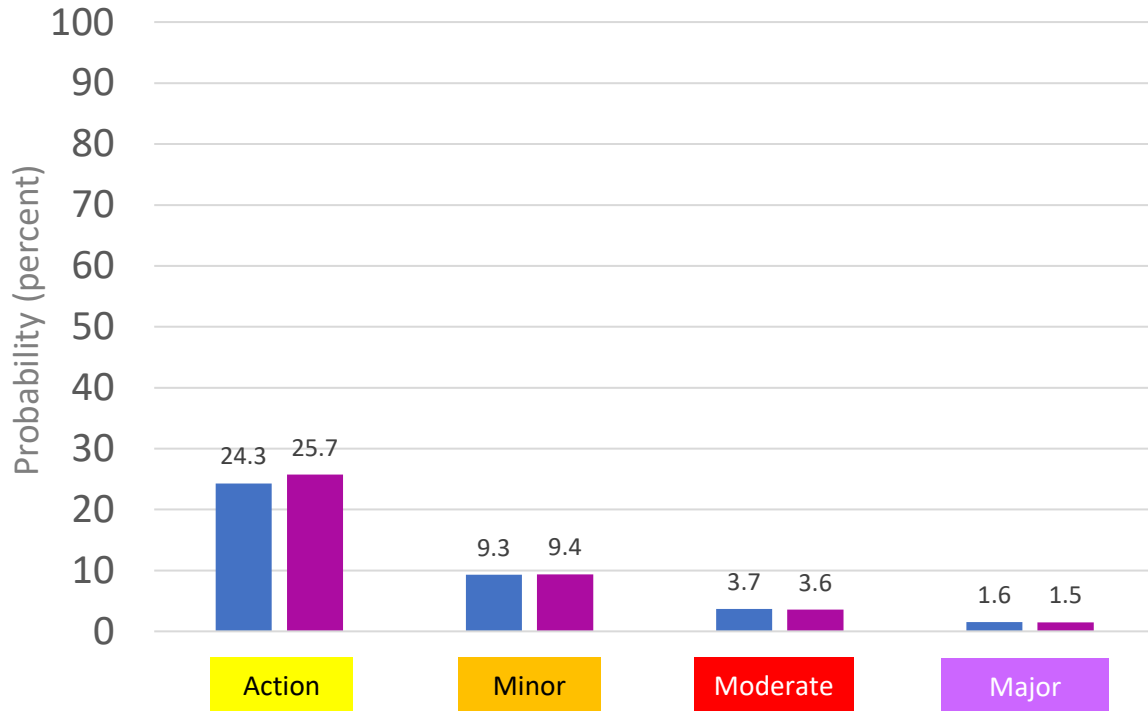


Locations

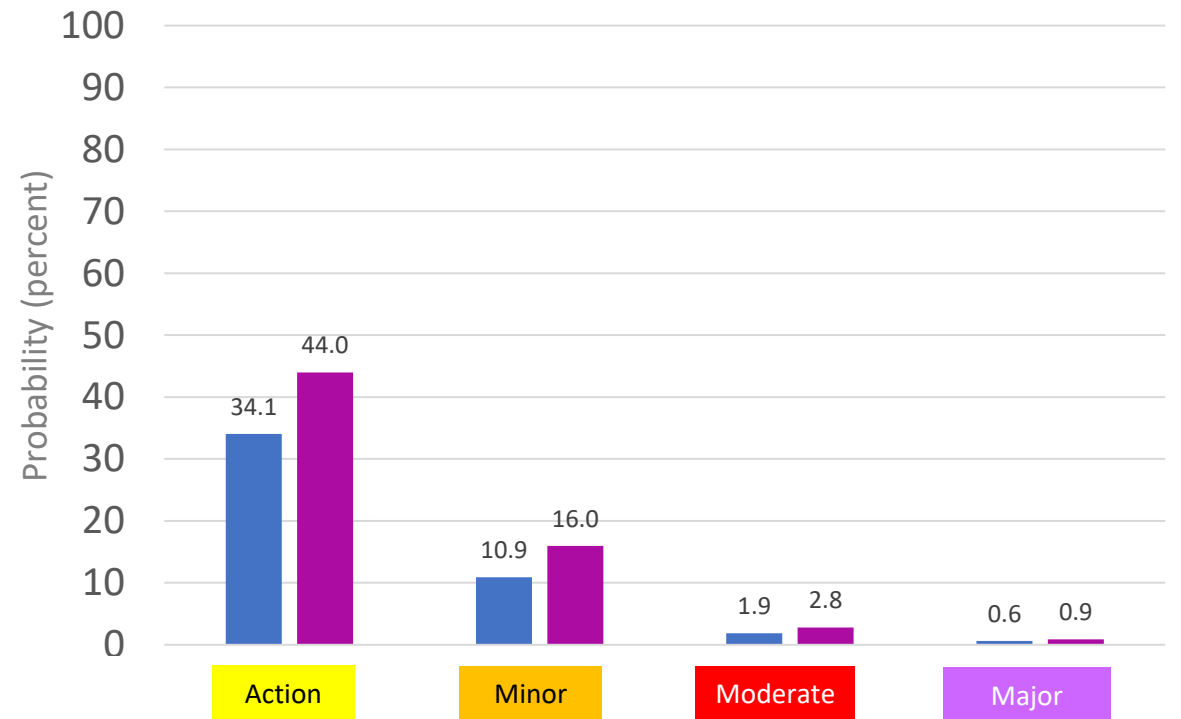
- * Hale Eddy – below Cannonville
- * Fishs Eddy – below Pepacton
- * Callicoon – below confluence of the East and West Branches of the Delaware River
- * Bridgeville – below Neversink
- * Belvidere
- * Trenton

Probability of River Level Exceeding Flood Stage during Shutdown Project

Hale Eddy - Below Cannonsville



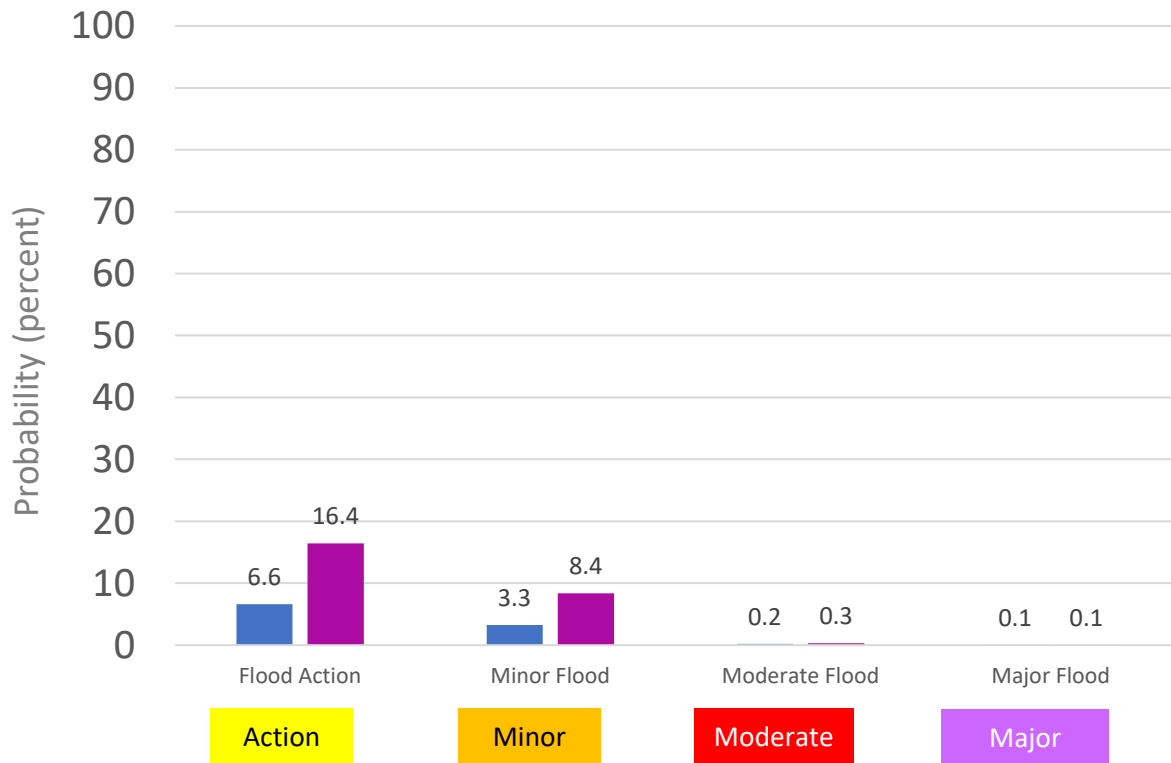
Fishs Eddy - Below Pepacton



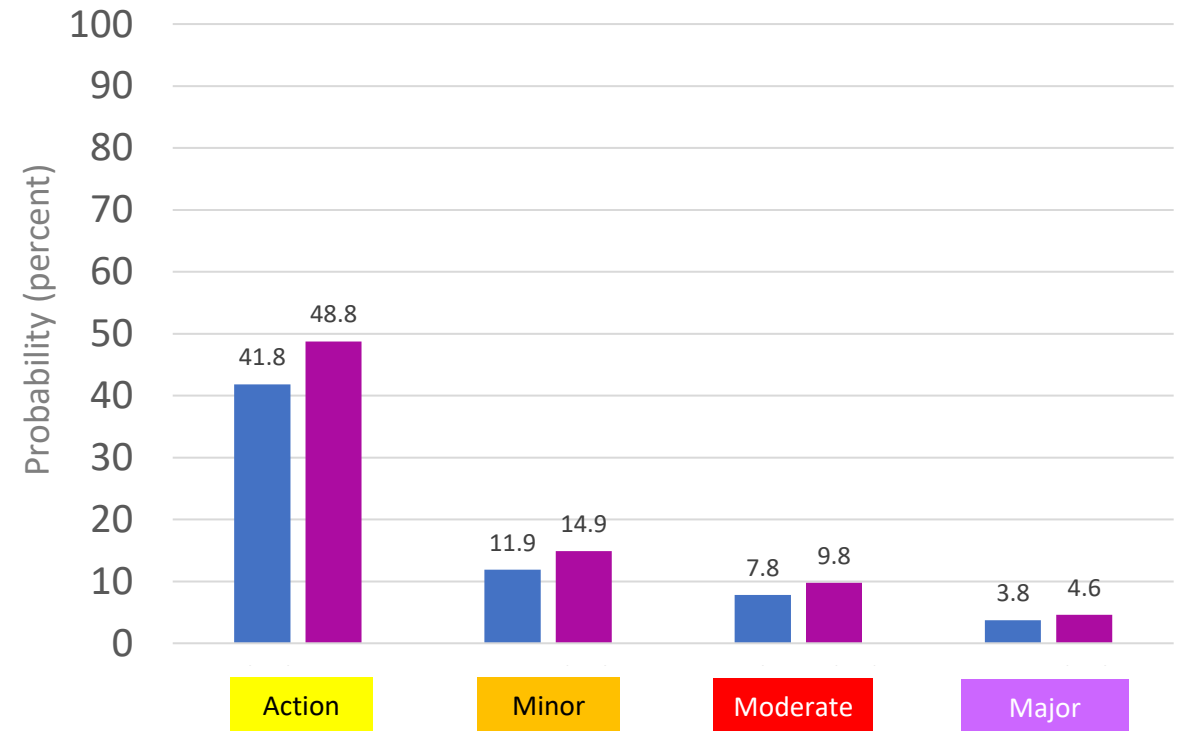
■ Typical ■ Shutdown

Probability of River Level Exceeding Flood Stage during Shutdown Project

Bridgeville - Below Neversink

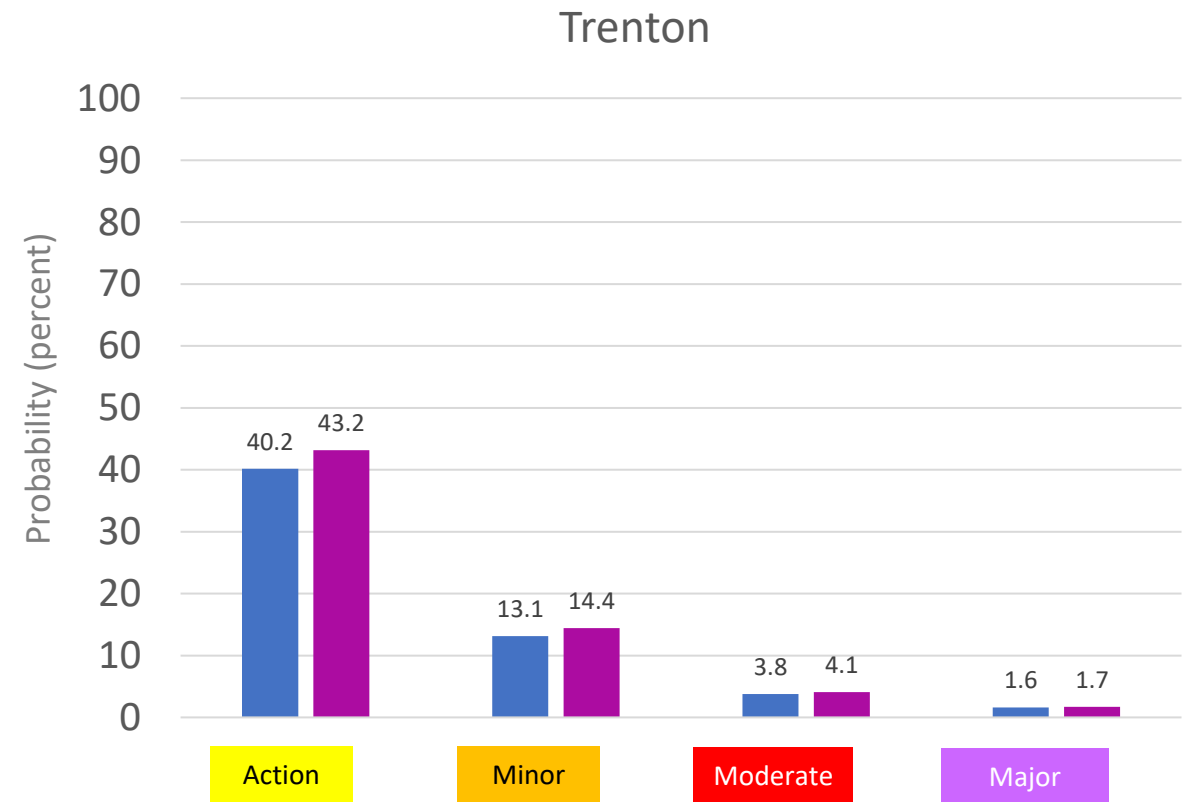
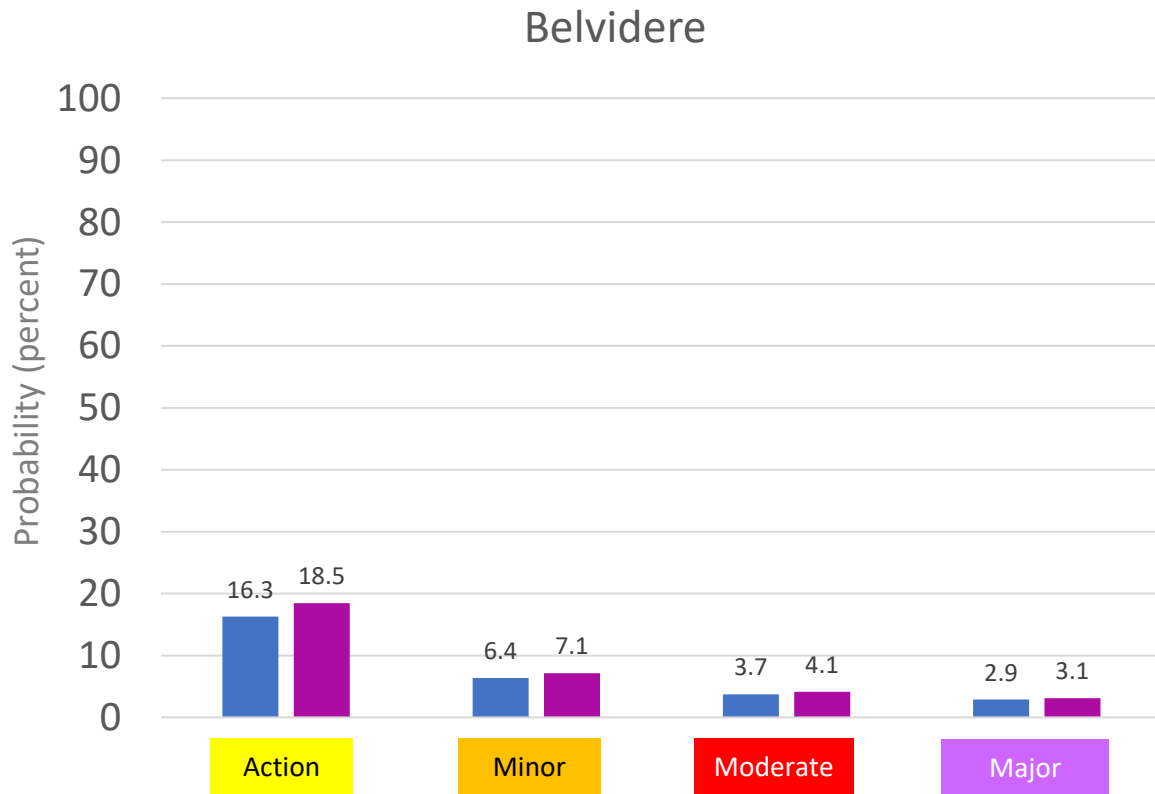


Callicoon



■ Typical ■ Shutdown

Probability of River Level Exceeding Flood Stage during Shutdown Project



■ Typical ■ Shutdown

Summary

- * Shutdown operations are in accordance with the FFMP 2017
- * OST and Forecast Available Water – flexibility to minimize/avoid impacts
- * Outlook is for a slightly greater chance of below normal summer precipitation and normal thereafter.
- * Drought risk is nominal, given lack of diversions after September
- * Conservation releases will be minimally affected and likely at the higher rates
- * Increased risk of flooding is primarily in the action and minor categories

Links to useful information will be posted on DRBC/RFAC Aqueduct Shutdown Update Page, beginning May 15 (Scroll down):

<https://www.nj.gov/drbc/programs/flow/nyc-aqueduct-shutdown.html>