

# Delaware River Basin Commission

## FFMP Implementation Performance

Release Year 2019

June 1, 2019 – May 31, 2020

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June 2020



# NOTE

**All data used in the analysis are Provisional**

Final/approved data are available from:

NYC Department of Environmental Protection (NYCDEP)

Office of the Delaware River Master (ODRM)

United States Geological Survey (USGS)

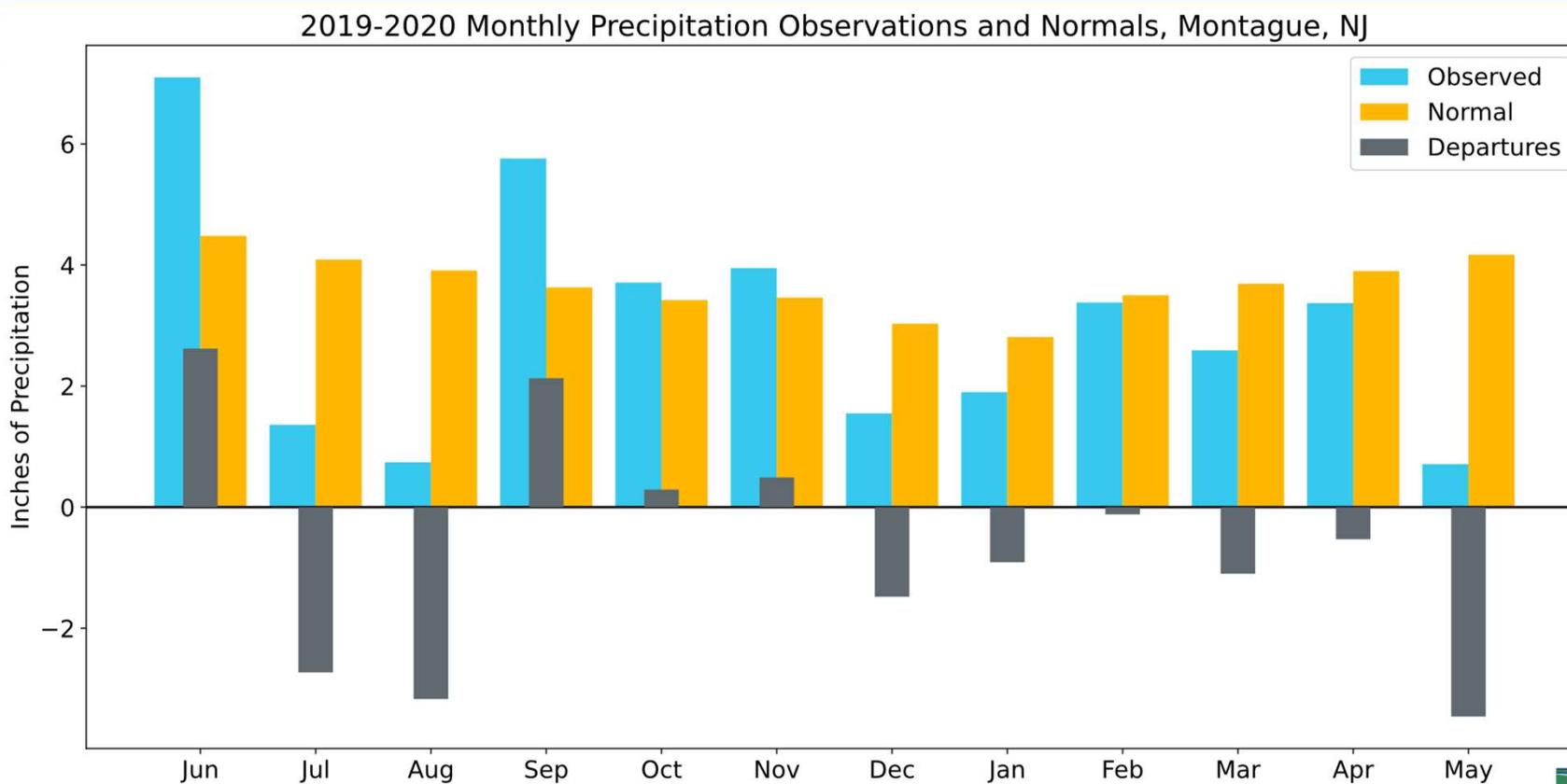
Methodology for calculations is included for reference on the last slide

For methodologies, refer to end slides.

# FFMP Performance Goals

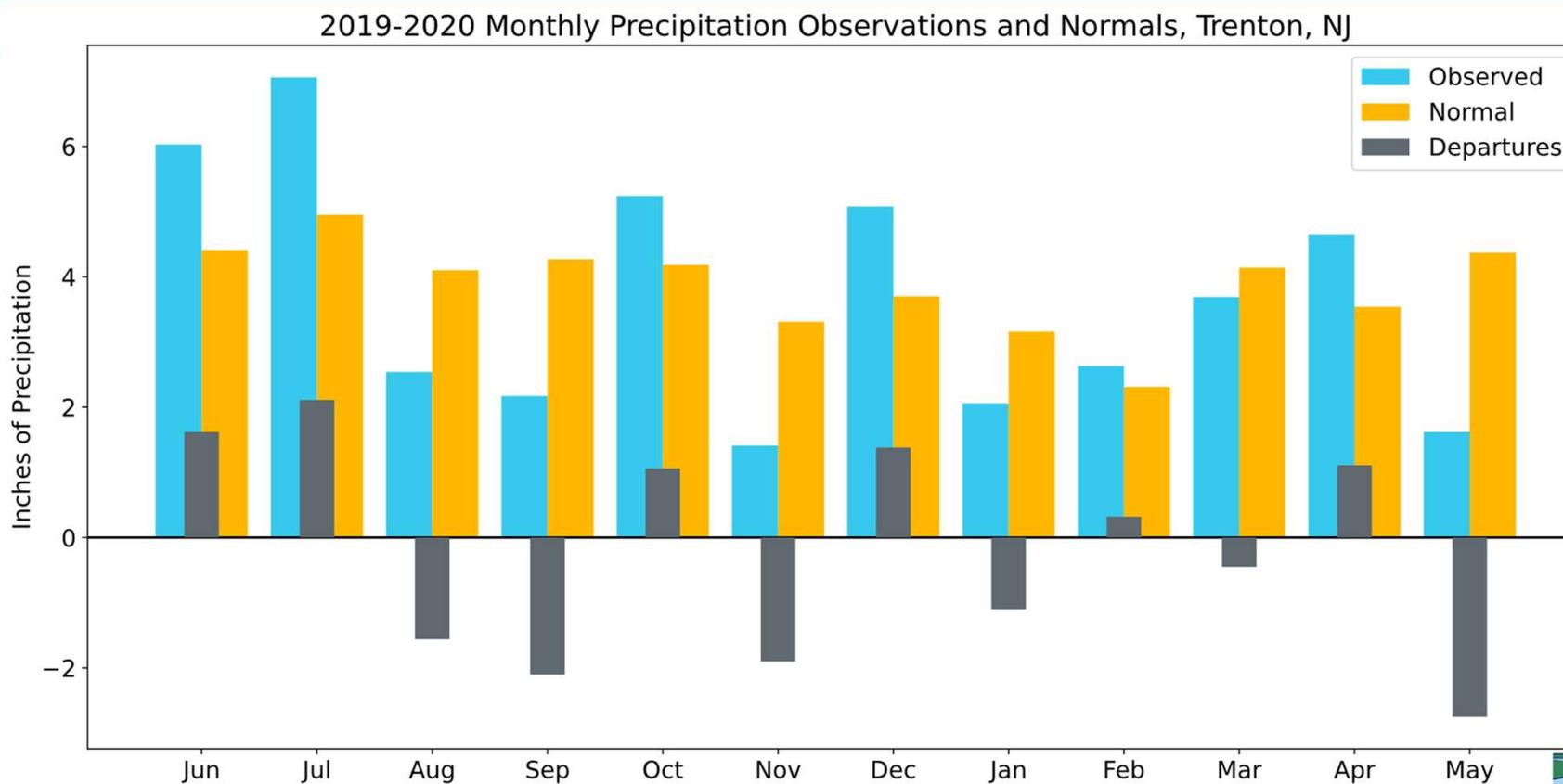
- \* Manage droughts
- \* Maintain flow objectives
- \* Provide enhanced conservation releases
- \* Maintain desirable tailwater temperatures
- \* Minimize spills using the Conditional Seasonal Storage Objective (CSSO)

# Precipitation -- Montague



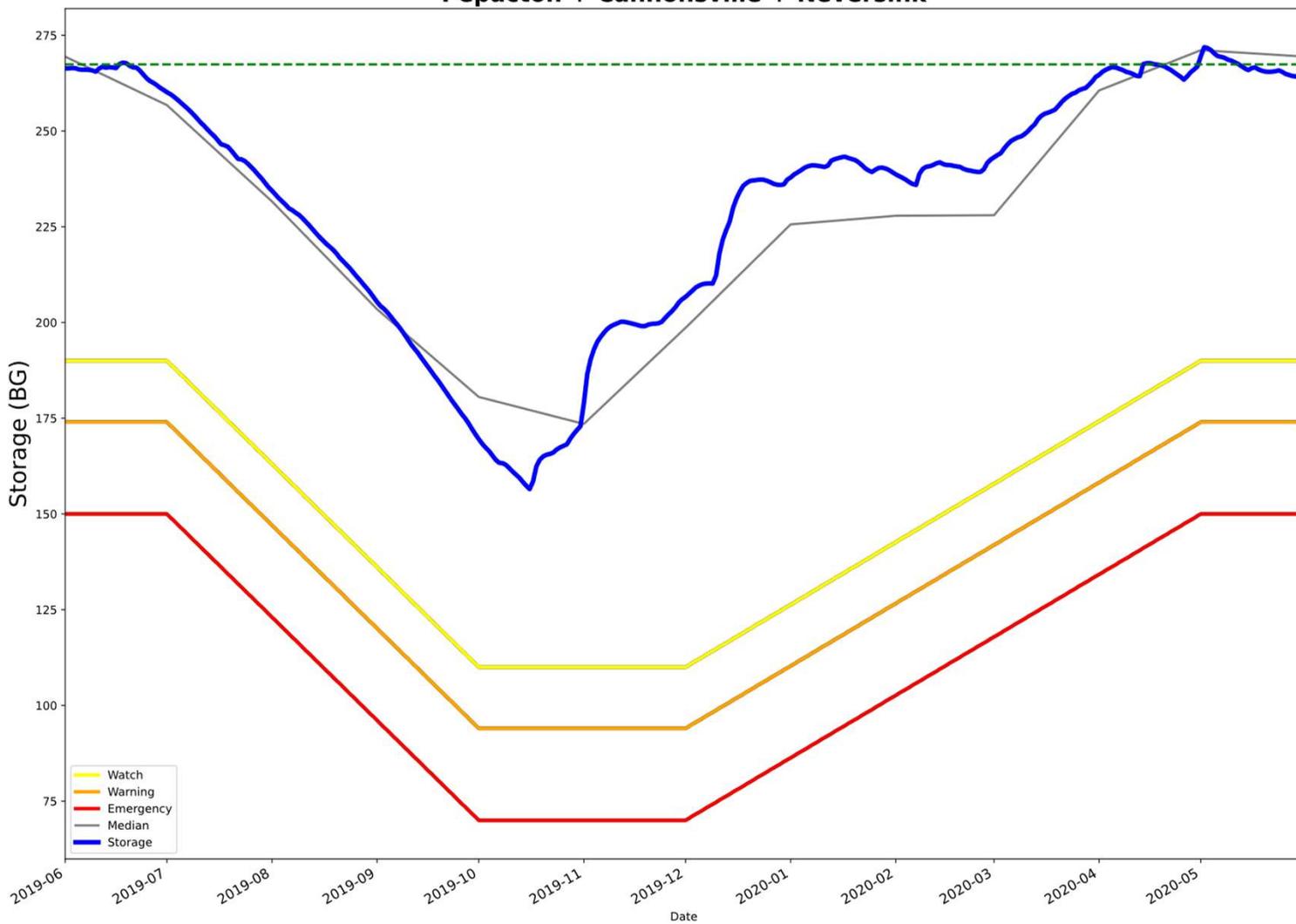
Data Source: Applied Climate Information System (ACIS), ODRM

# Precipitation – Trenton, NJ



Data Source: Applied Climate Information System (ACIS)

### Combined Storage Amount in the NYC Reservoirs Pepacton + Cannonsville + Neversink



Data Source: NYCDEP

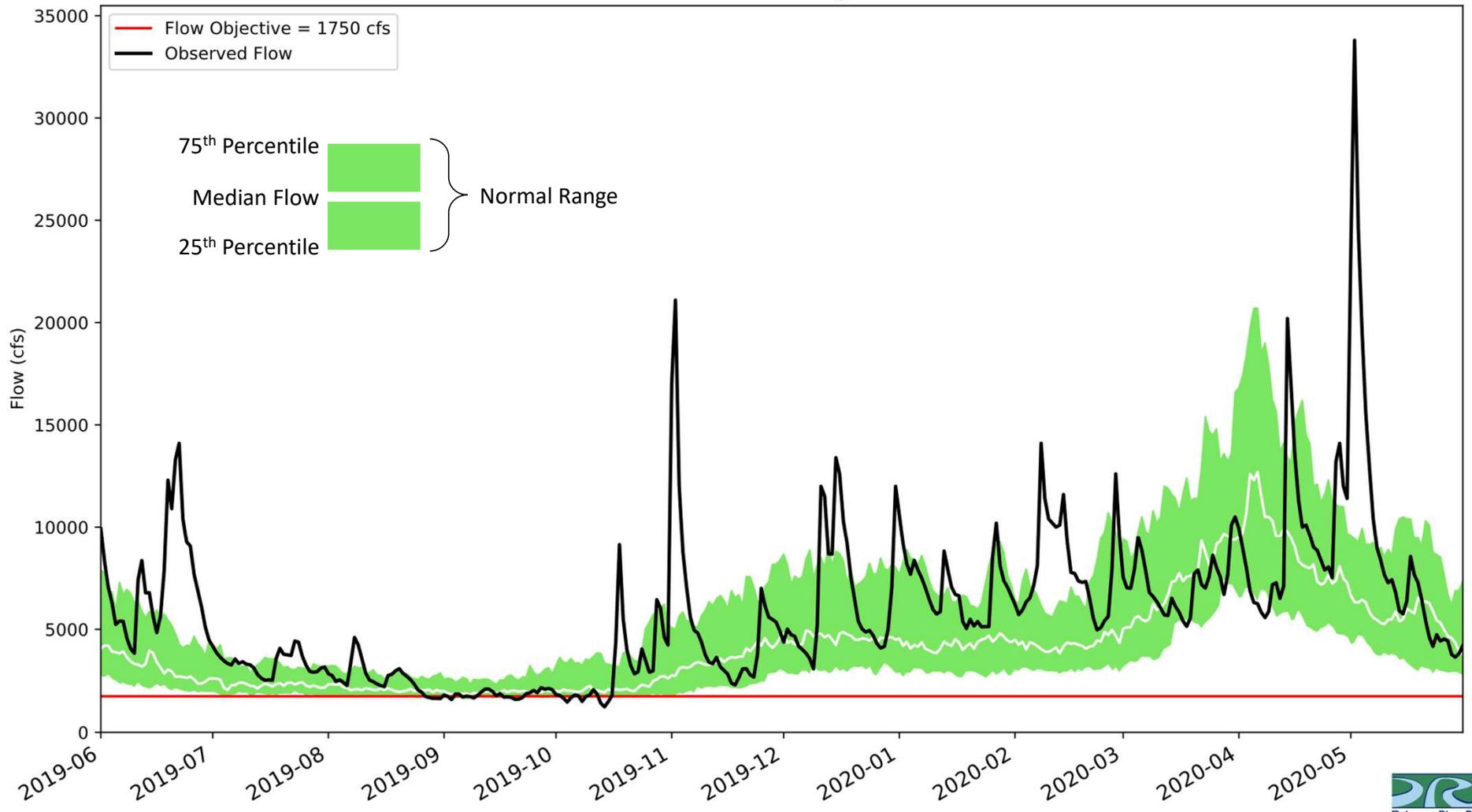
# Flow Objectives

<b>Water Released from NYC Reservoirs to Meet Flow Objectives (MG)</b>	
Montague	26,113*
Trenton	1,338
Total	27,451

<b>Water Released from Lower Basin Reservoirs to meet Trenton Flow Objective (MG)</b>	
Beltzville	148.7
Blue Marsh	0
Total	148.7

\*Includes the portion of the conservation releases needed to meet Montague, but not the amount of the conservation release that exceeds what is needed to meet Montague.

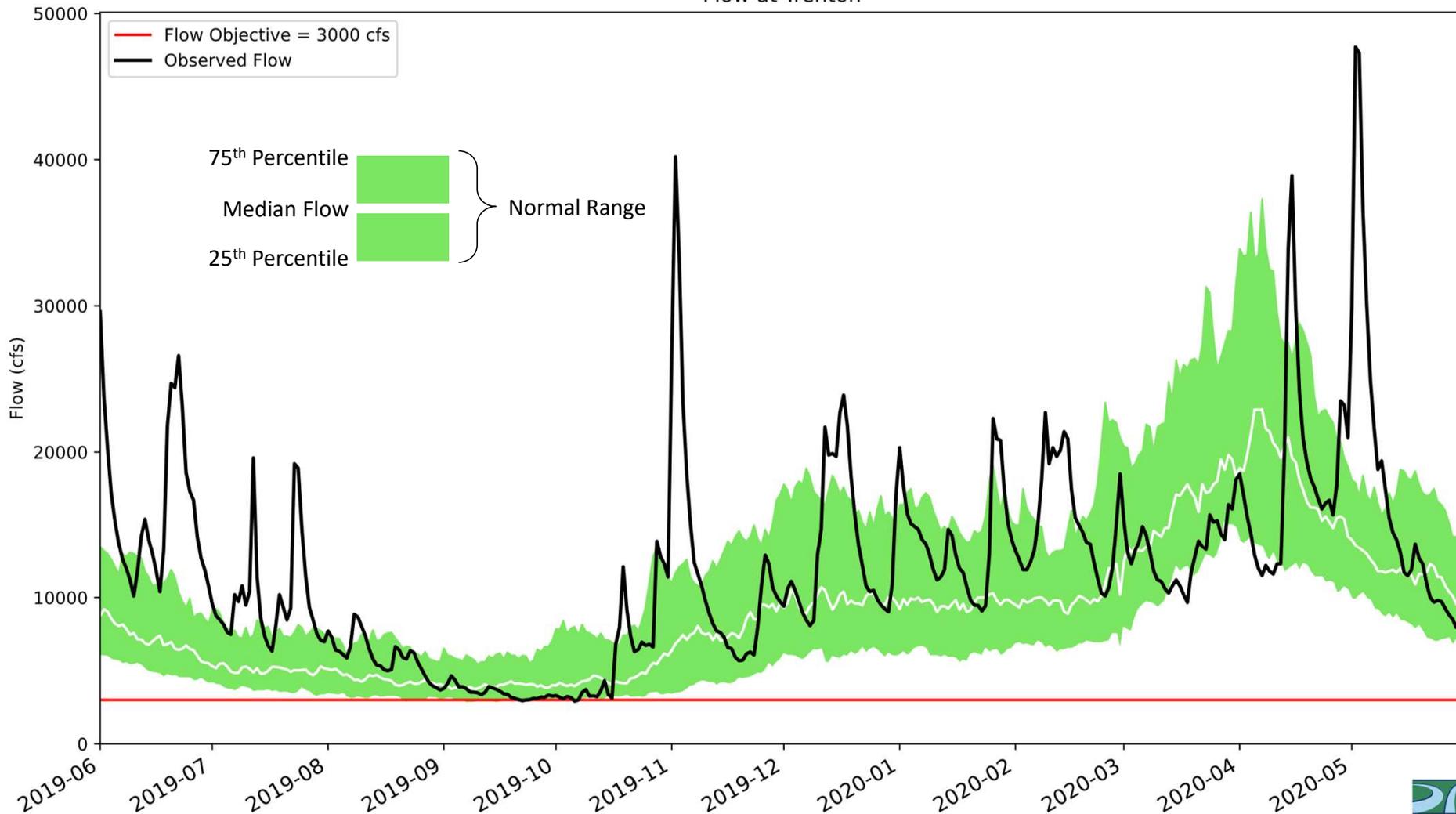
### Flow at Montague



Data Source: USGS



# Flow at Trenton



Data Source: USGS



# Diversions

Monthly Average Daily Diversion (June 1, 2019 – May 31, 2020)

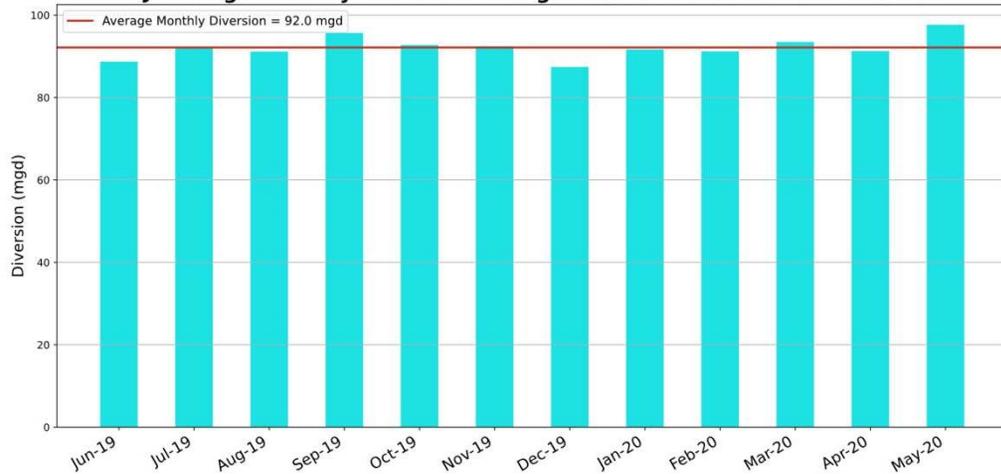
New Jersey

New York

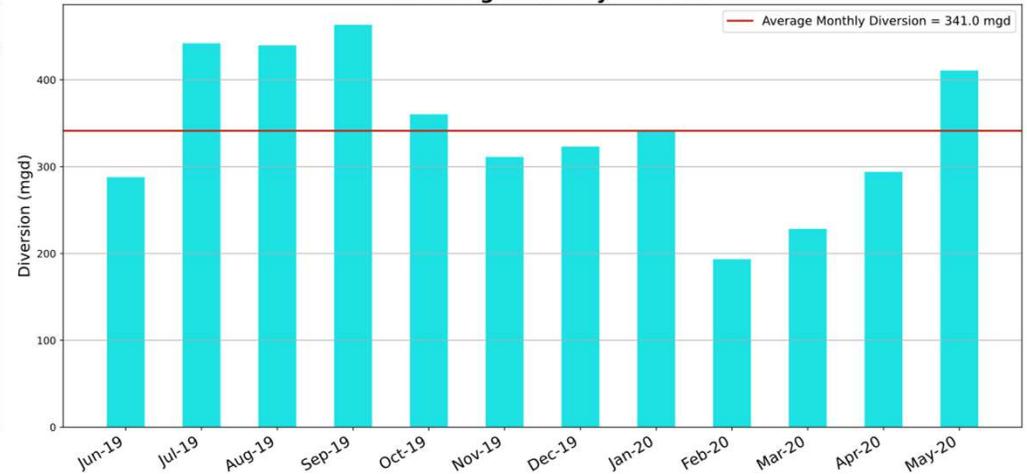
92 mgd

529 mgd

**NJ average monthly diversion through the Delaware and Raritan Canal**



**NYC average monthly diversion**



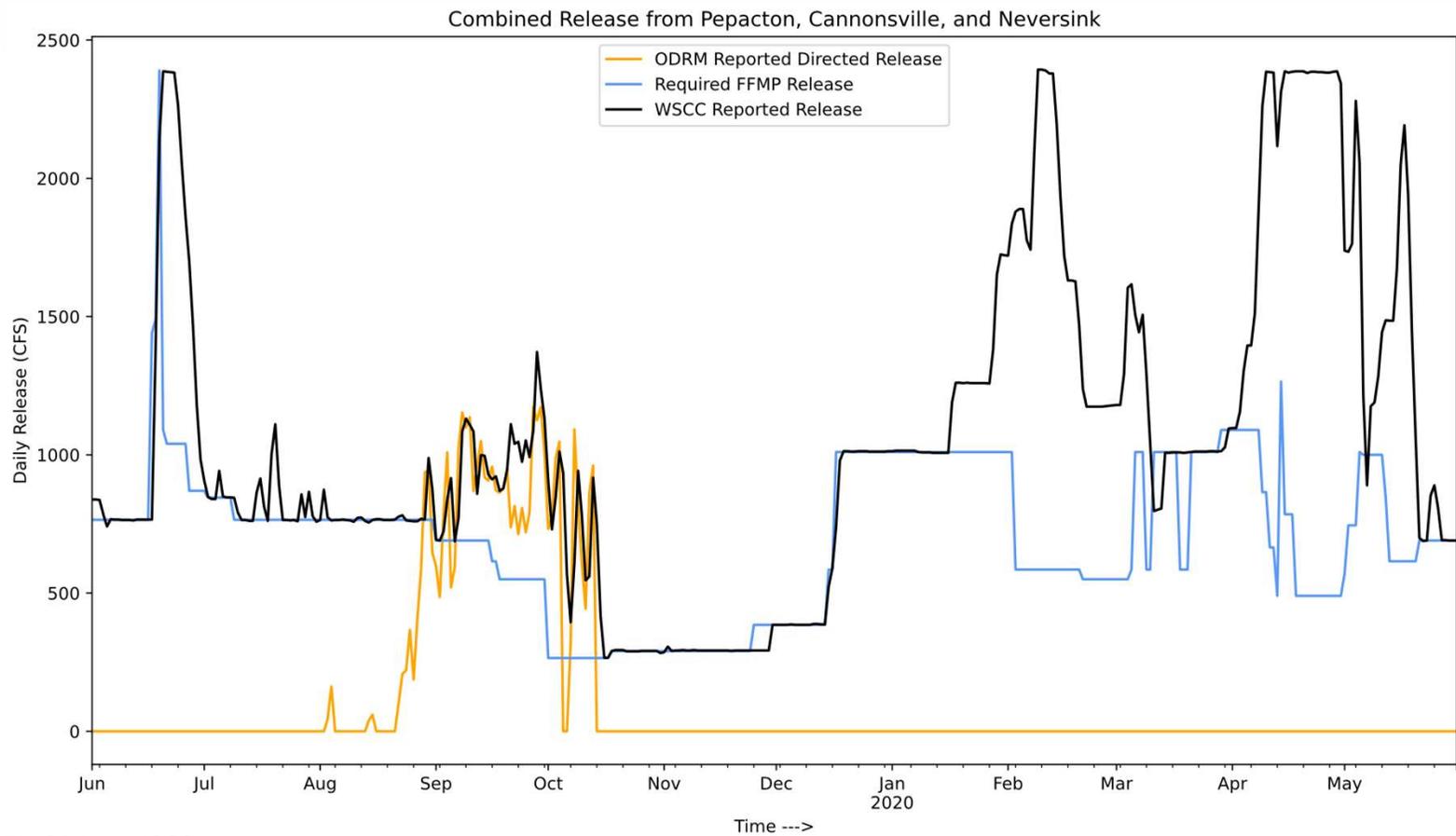
Data Sources: USGS, NYDEP

# Conservation Releases

<b>Volume of Conservation Releases (MG)</b>			
	<b>FFMP 2017 Tables</b> Based on Storage (6/1/19 - 5/31/20)	<b>REV1</b>	<b>Multiple of Revision 1</b>
<b>Cannonsville</b>	95,508	20,686	4.6
<b>Pepacton</b>	45,314	14,594	3.1
<b>Neversink</b>	24,645	8,680	2.8

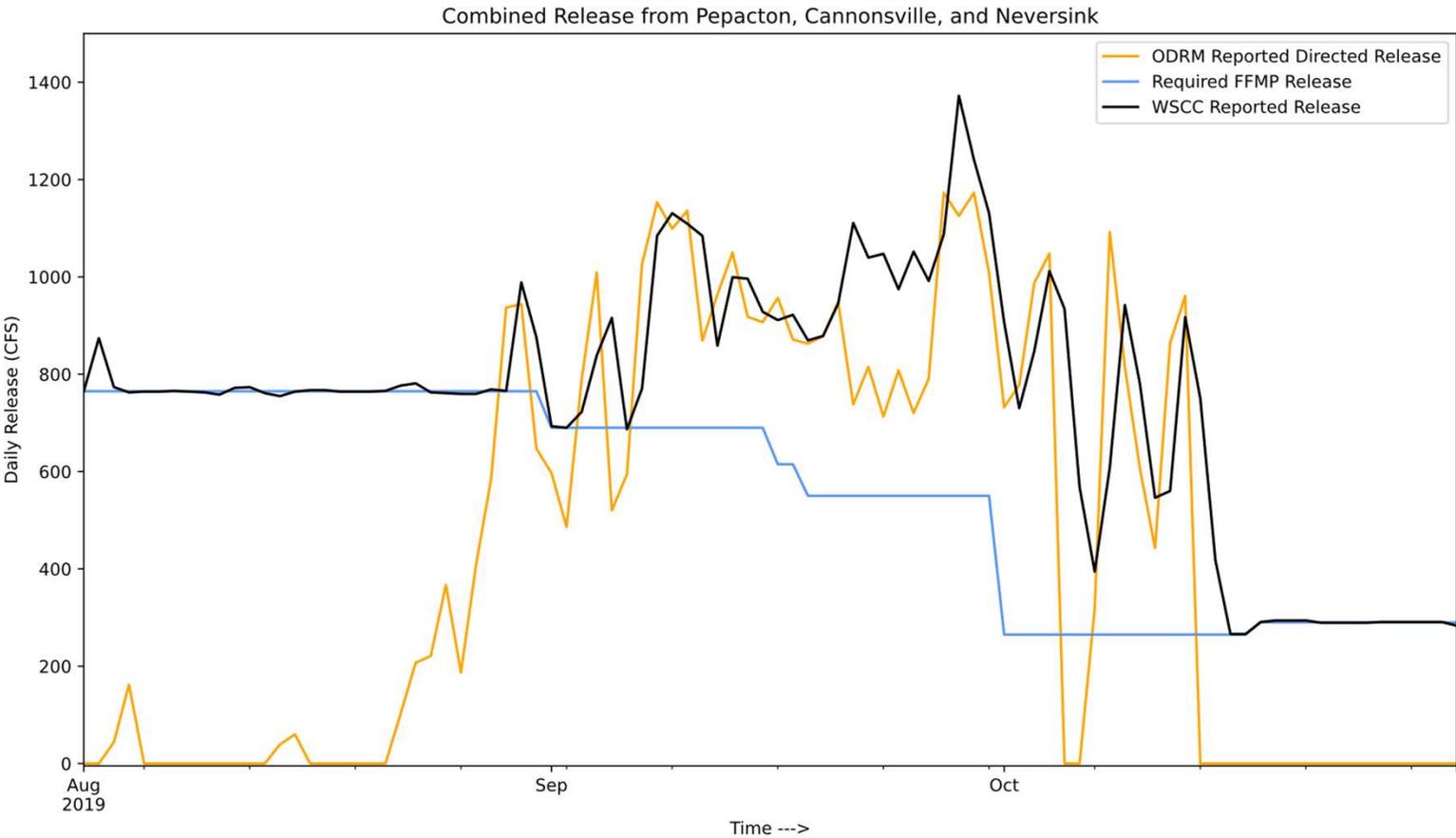
Values are the conservation releases required by the FFMP Tables Only. All or a portion of the release may have been used to meet the Montague Flow Objective. Additional release volume may have been required for bank use.

# Actual Releases



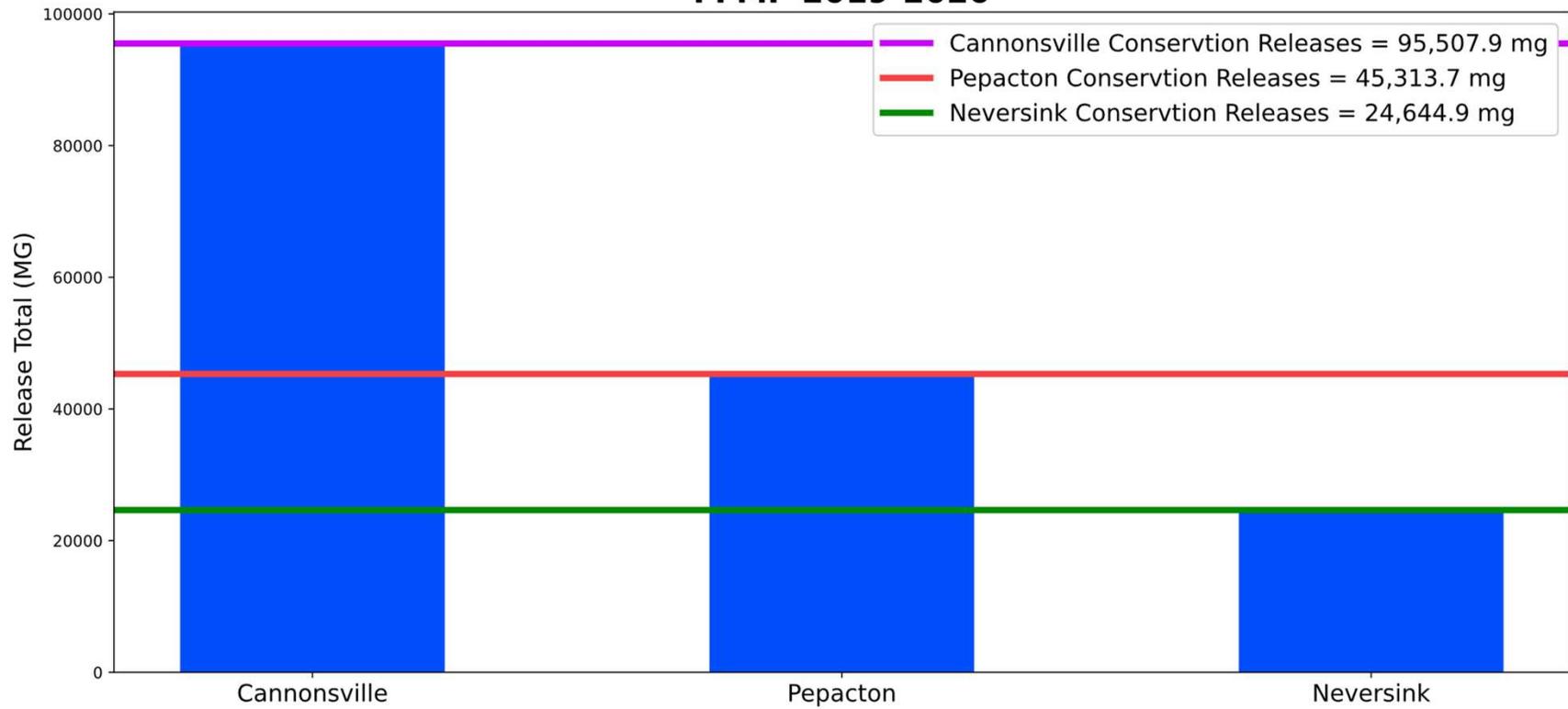
Data Sources: NYDEP, ODRM, USGS

# Actual Releases



Data Sources: NYDEP, ODRM, USGS

## Conservation Releases from NYC Delaware River Basin Reservoirs FFMP 2019-2020

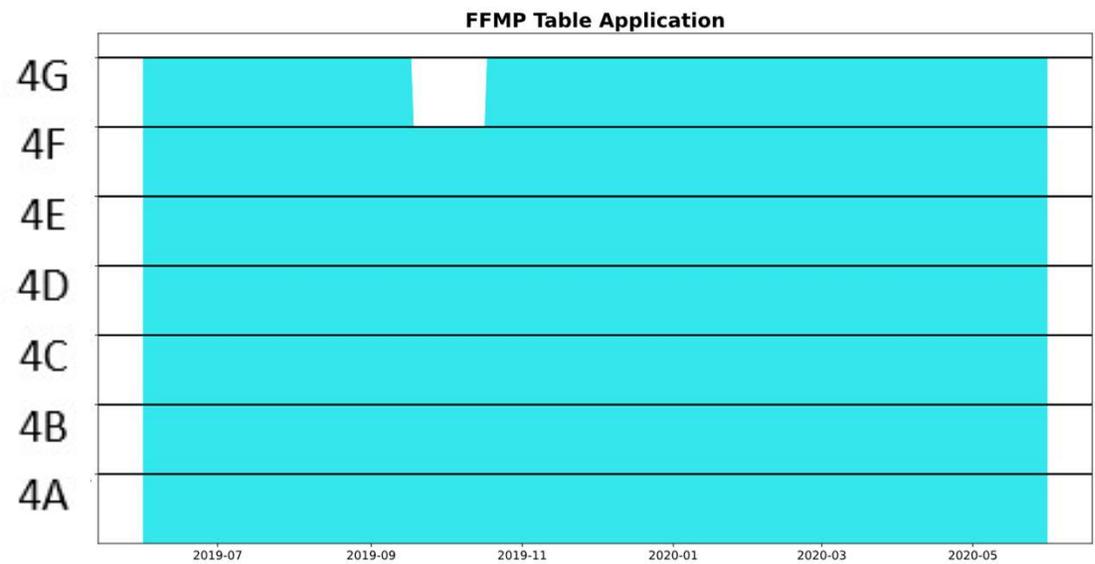


Data Source: NYDEP

# Time in FFMP Release Tables

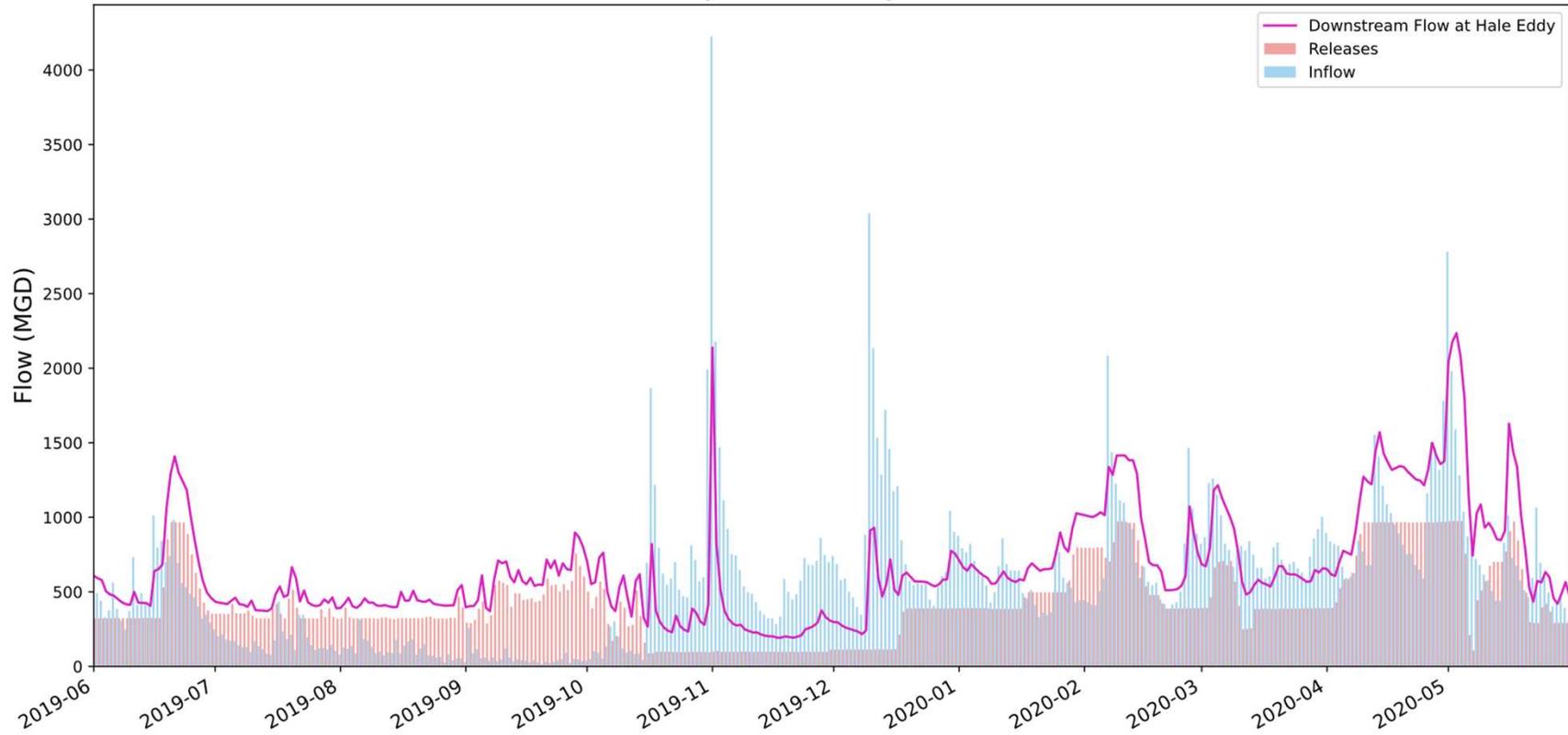
## Release Tables

FFMP TABLE	Number of Days	Percent
4G	336	92
4F	30	8
4E	0	0
4D	0	0
4C	0	0
4B	0	0
4A	0	0



Data Source: NYDEP

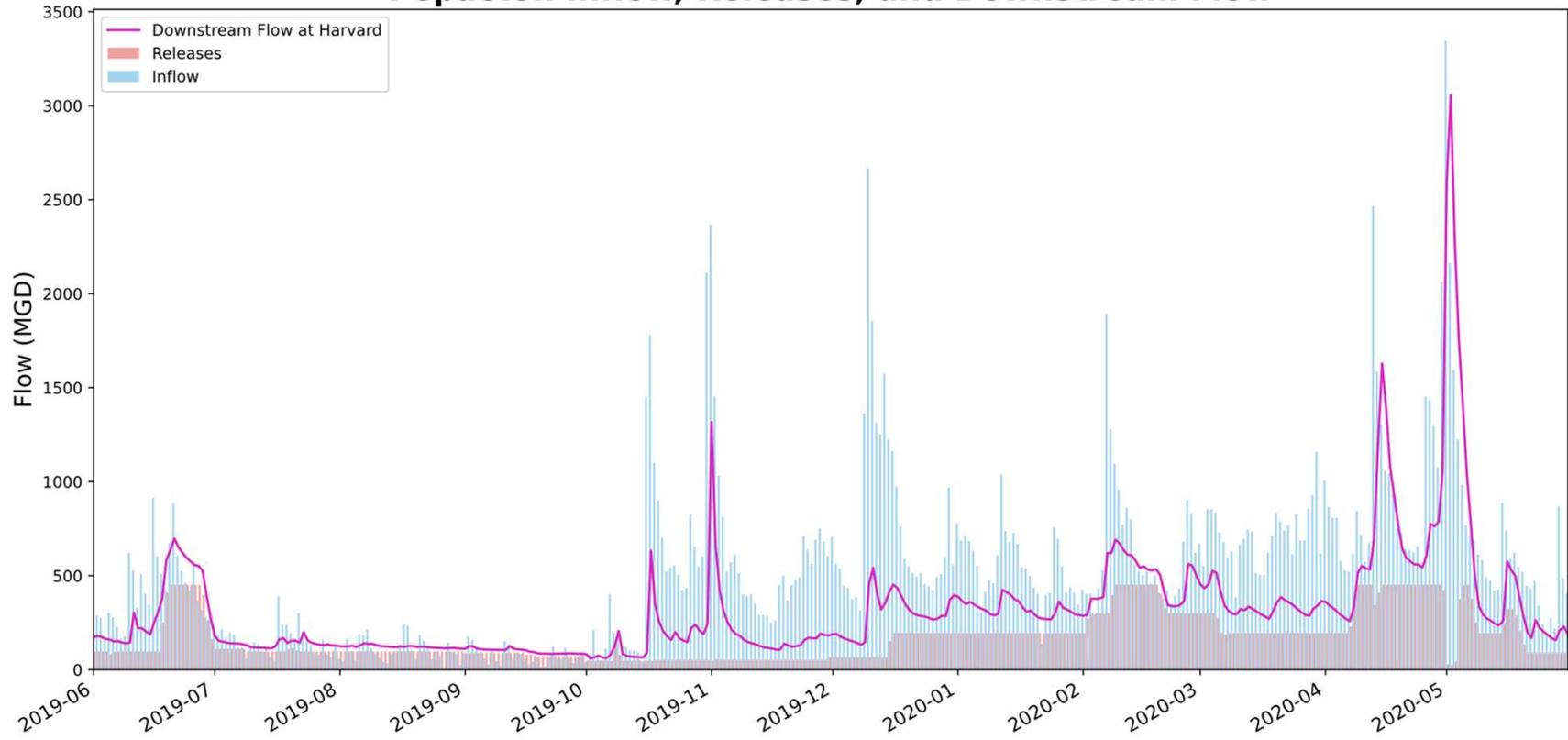
## Cannonsville Inflow, Releases, and Downstream Flow



Data Source: USGS

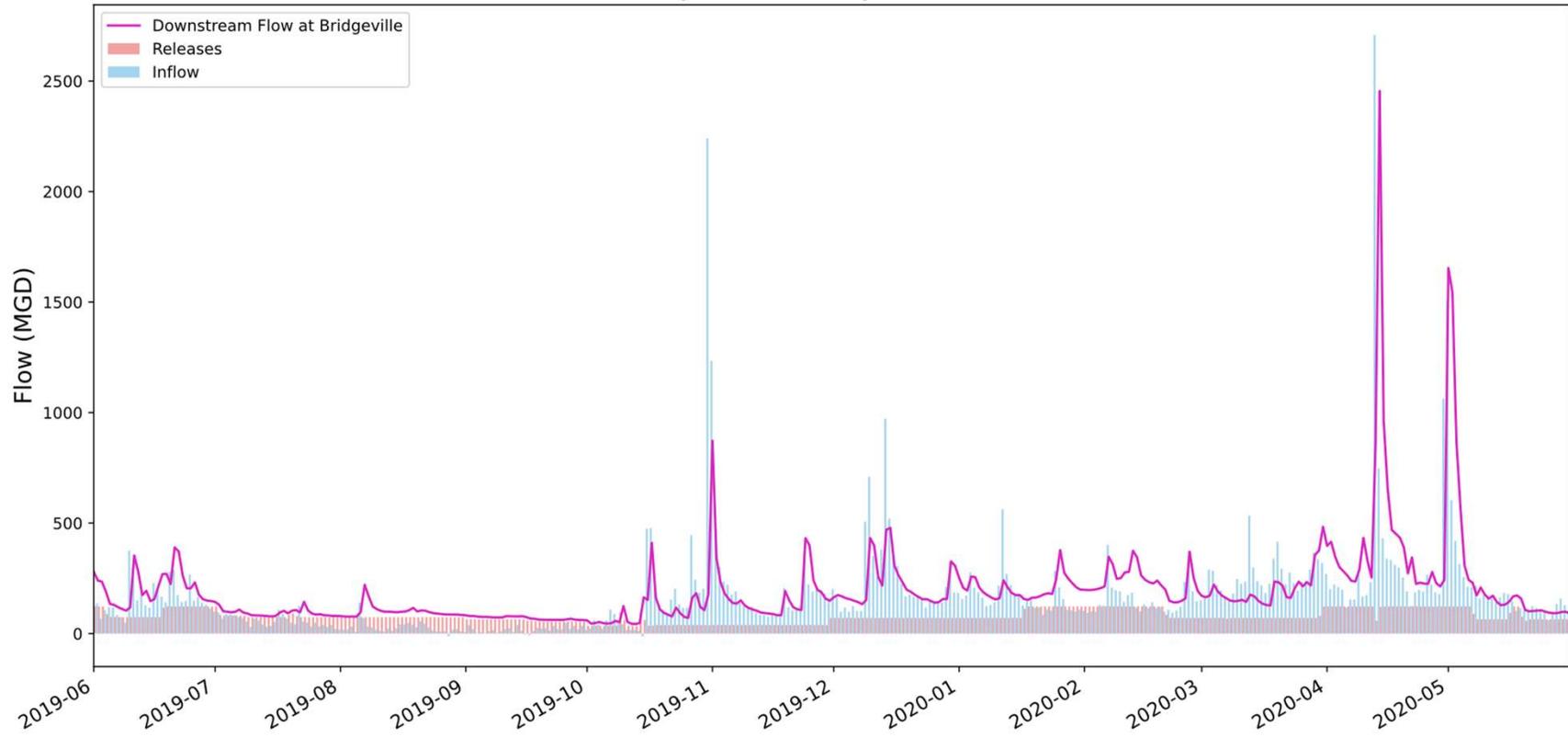


## Pepacton Inflow, Releases, and Downstream Flow



Data Source: USGS

## Neversink Inflow, Releases, and Downstream Flow



Data Source: USGS

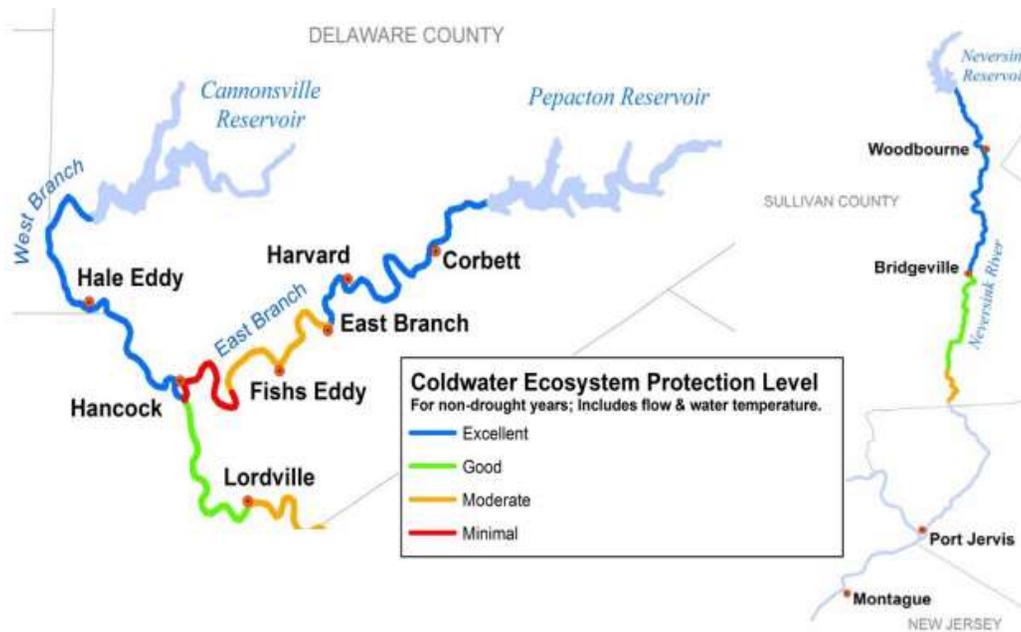
# Bank Use

FFMP 2017 Bank	Used	Size
NJ Diversion Amelioration Bank	0	of 2,545 cfs-days
Rapid Flow Change Mitigation Bank	739	of 1,000 cfs-days
Thermal Mitigation Bank	1539	of 2,500 cfs-days
Trenton Equivalent Flow Objective Bank	2070	of 9,423 cfs-days
NJ Diversion Offset Bank	0	of 2,300 cfs-days

Thermal releases were made on 17 days for 6 events in July and early August. Two RFC events were mitigated in October. Releases were made from the TEFO bank for 9 days (9/23-10/1).

# Habitat Protection

(Temperature)



## Goals for Excellent Habitat:

- \* Summer Temperature typical less than 20°C
- \* Rare Exceedances of > 24°C

# Temperature

## Goals for Excellent Habitat:

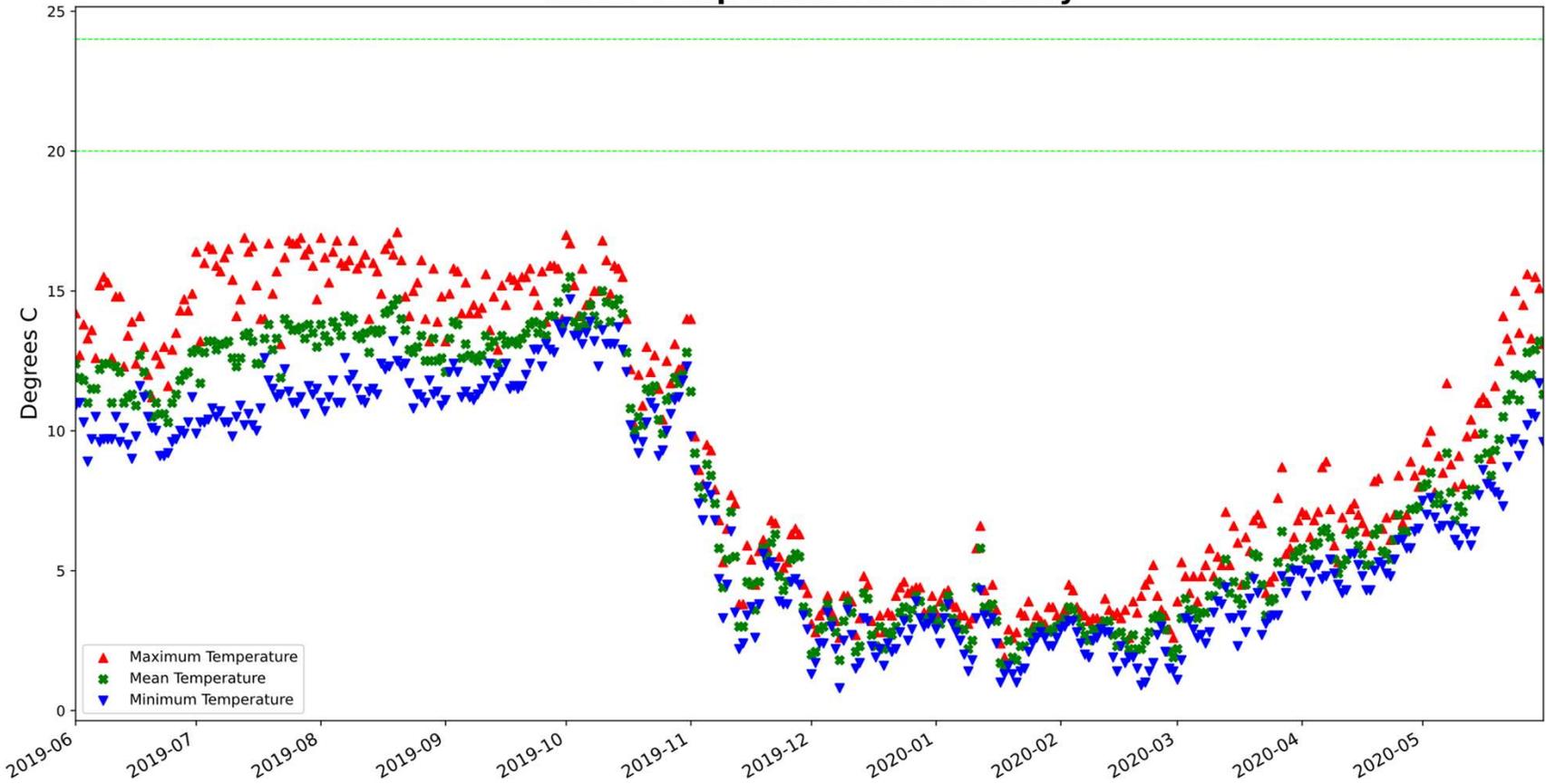
- \* Summer Temperature typical less than 20°C
- \* Rare Exceedances of > 24°C

Location	Exceedances of 24°C		Exceedances of 20°C	
	Days the Maximum Temperature was above 24°C	Days the Average Temperature was above 24°C	Days the Maximum Temperature was above 20°C	Days the Average Temperature was above 20°C
Hale Eddy	0	0	0	0
Harvard	0	0	10	0
Hancock	0	0	0	0
Lordville	0	0	53	43
Bridgeville	0	0	40	1

Thermal Mitigation releases were made on 17 days and a total of approximately 1 BG was used from the bank

Data Source: USGS

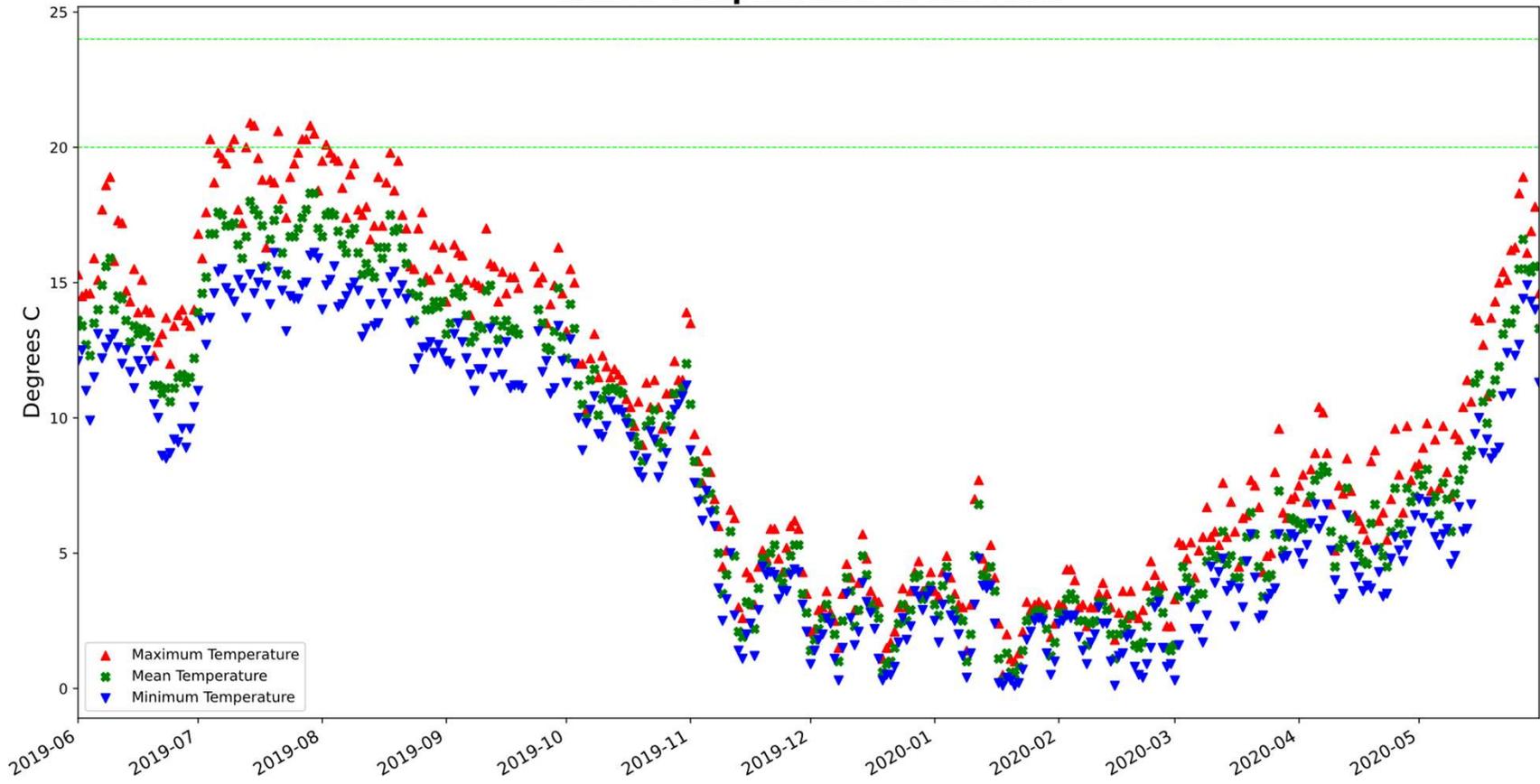
# Water Temperature at Hale Eddy



Data Source: USGS



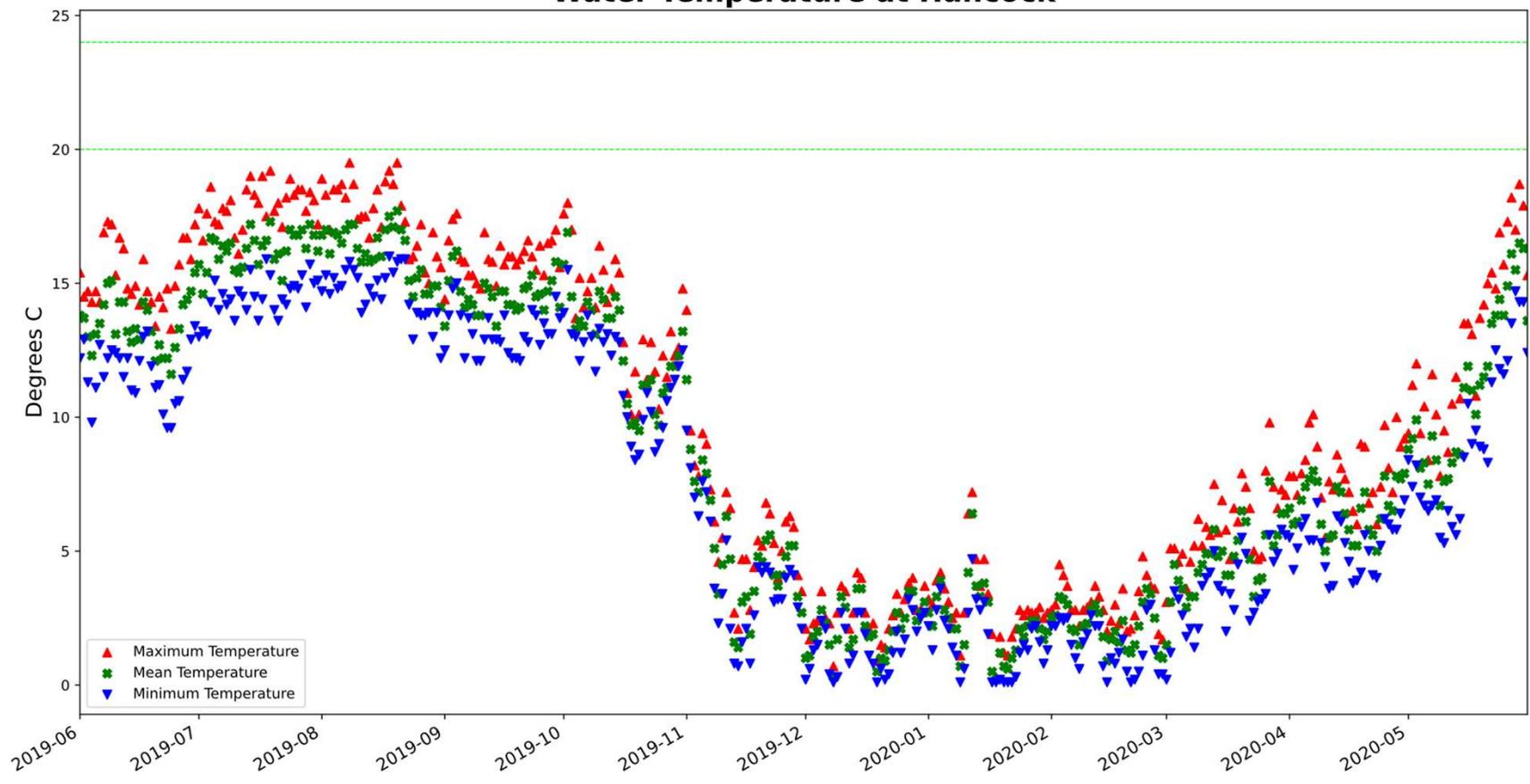
# Water Temperature at Harvard



Data Source: USGS



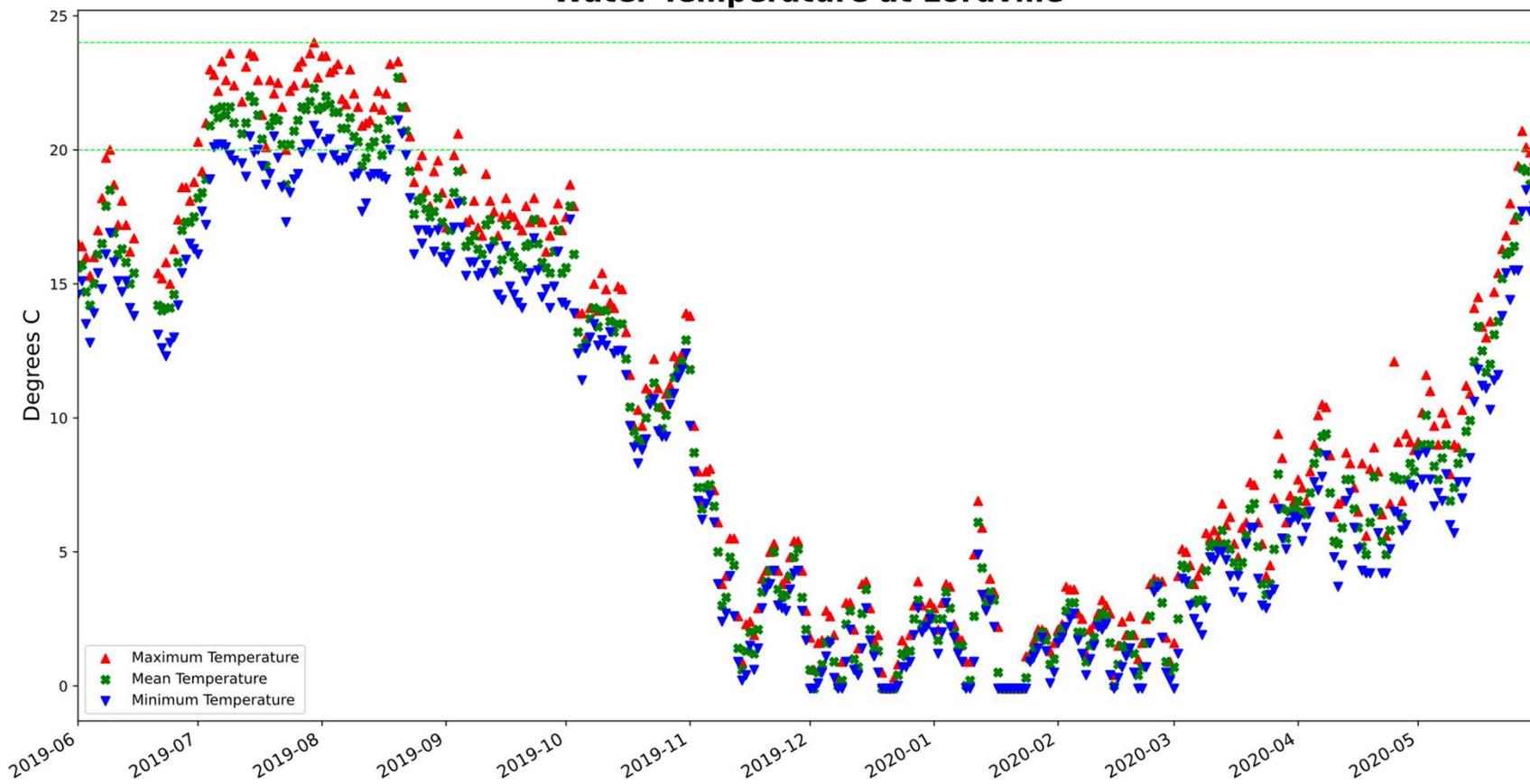
### Water Temperature at Hancock



Data Source: USGS



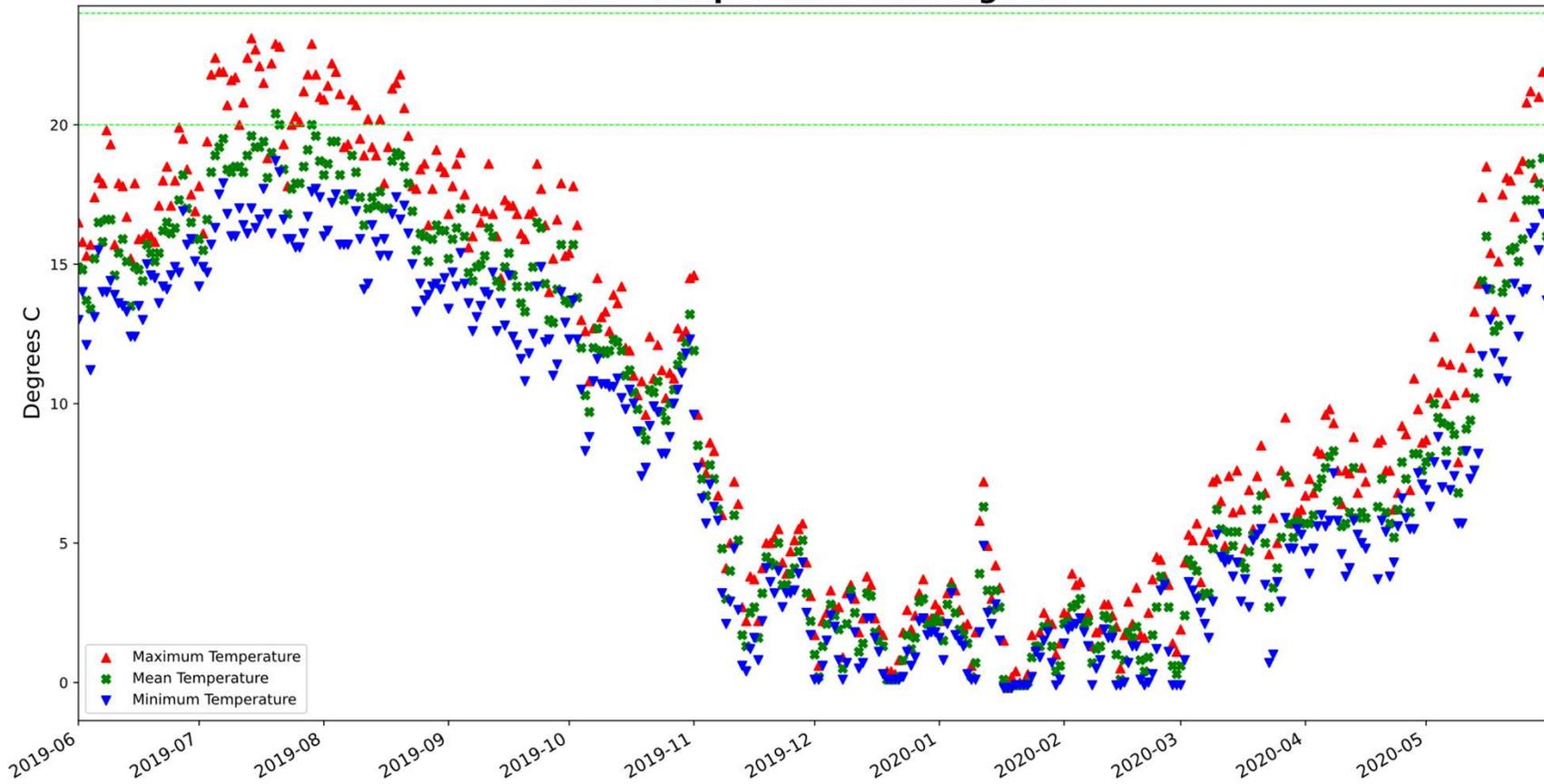
### Water Temperature at Lordville



Data Source: USGS



### Water Temperature at Bridgeville



Data Source: USGS



# Temperature Rankings

May-August

May-Aug 2019 4-Month	64.3°F (17.9°C)	64.1°F (17.8°C)	0.2°F (0.1°C)	47th Coolest	Coolest since: 2017	1958
				22nd Warmest	Warmest since: 2018	1975
May-Aug 2019 4-Month	72.0°F (22.2°C)	69.2°F (20.7°C)	2.8°F (1.5°C)	96th Coolest	Coolest since: 2017	1927
				2nd Warmest	Warmest since: 2018	2018
<i>Ties: 2010, 2012</i>						
Apr-Aug 2019 5-Month	68.8°F (20.4°C)	65.4°F (18.6°C)	3.4°F (1.8°C)	97th Coolest	Coolest since: 2018	1927
				1st Warmest	Warmest to Date	2019
May-Aug 2019 4-Month	74.8°F (23.8°C)	72.8°F (22.7°C)	2.0°F (1.1°C)	67th Coolest	Coolest since: 2018	1967, 1992
				6th Warmest	Warmest since: 2015	2010

New York, NY

Allentown, PA

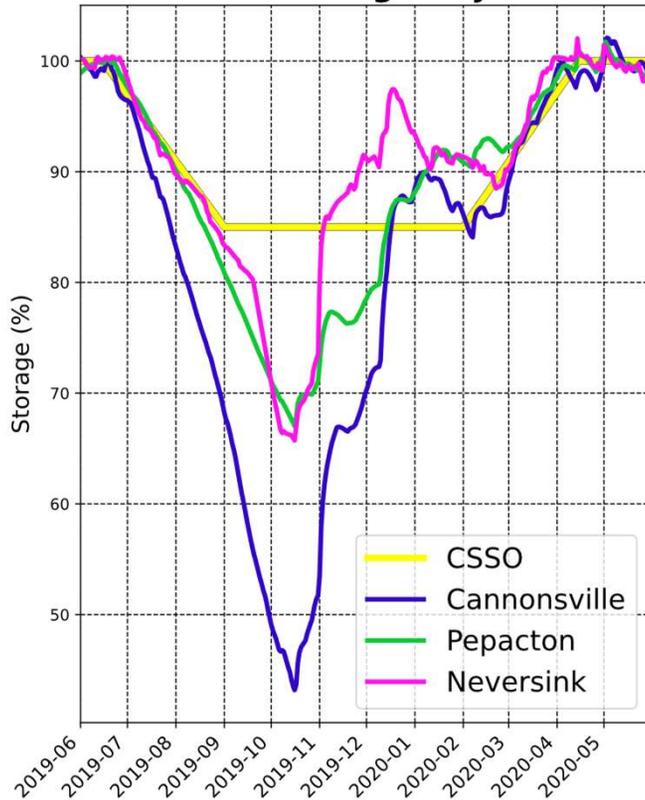
Philadelphia, PA



Data Source: National Climactic Data Center, National Centers for Environmental Information

# Discharge/Spill Mitigation

**Usable Storage and Conditional Season Storage Objective**



	Spill Volume (MG)	Days
Cannonsville	4,544	17
Pepacton	11,356	28
Neversink	9,263	51

	All L1 Discharge Mitigation Releases	Number of Days Above CSSO (L1-a, L1-b)
Cannonsville	86,758	90
Pepacton	41,205	139
Neversink	16,288	151
<b>All Discharge Mitigation Releases L1 (L1-a, L1-b, L1-c)</b>		

Data Source: NYCDEP

# Summary

- \* Dry conditions during August – Early October required releases of approximately 27.5 BG to meet the Montague Flow Objective.
- \* Little water was required to meet the Trenton Effective Flow Objective.
- \* The conservation releases were based on Table 4G for 92% of the year.
- \* The maximum water temperature did not exceed 24°C at any of the Upper Delaware gages
- \* The maximum temperature exceeded 20°C at Harvard (10 days), Lordville (53 days), and Bridgeville (40 days)
- \* The three NYC reservoirs were below the CSSO most of the time during 2019, and followed or were above the CSSO through May 2020.

# Methodology

- \* Slide 7: Amount of water released for flow objectives is calculated by summing the NYC WSCC spreadsheet directed release column for each reservoir. Since directed releases include thermal releases (which is water not released for meeting Montague specifically), this amount of water is removed from the releases for Montague.
- \* Slide 10: Diversions
  - \* NJ Diversion is calculated using the daily discharge observations from the USGS Port Mercer gage, 01460440. The averages are of the daily discharge for each month and the average of the daily discharge for the entire year (release year 6/1-5/31).
  - \* NYC diversion is determined from the WSCC data spreadsheet (column E, daily total). The averages are of the daily discharge for each month and the average of the daily discharge for the entire year (release year 6/1-5/31).
- \* Slide 11: Conservation release volume: the sum of the conservation released based on the zone (L1, L1-a, L1-b, L1-c, L2) and FFMP Table (4F, 4G). It should be noted that more water may have been released for Montague. For example, if no releases were required for Montague, this is the amount of water that would have been released with minor differences related to transitions among tables and zones.
- \* Slide 14: Conservation releases, same as slide 11 but displayed as a graph.
- \* Slide 15: Plot and table of the number of days in each FFMP table from the NYC WSCC end-of-month reports, column AA.
- \* Slide 19: Bank Use: was obtained from the accumulated Daily River Master Data, dated June 1, 2020.
- \* Slide 28: CSSO: Discharge Mitigation Releases – volume of water released when a reservoir is in L1. Number of days above CSSO: days when reservoir is in L1-a or L1-b.

Sources: NYC Water Supply Control Center End-of-Month reports, ODRM Daily Data, and USGS provisional data.

# Presentation Available On DRBC's Website

[https://www.nj.gov/drbc/hydrological/drought/FFMP\\_PerformanceRpts.html](https://www.nj.gov/drbc/hydrological/drought/FFMP_PerformanceRpts.html)