# Delaware River Basin Commission

## FFMP Implementation Performance

Release Year 2019

June 1, 2019 – May 31, 2020


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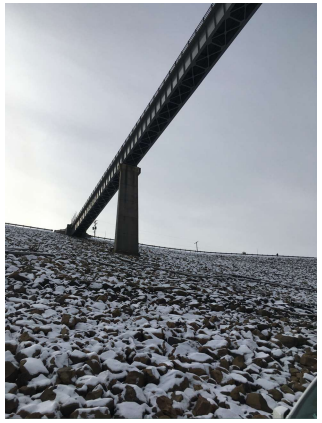
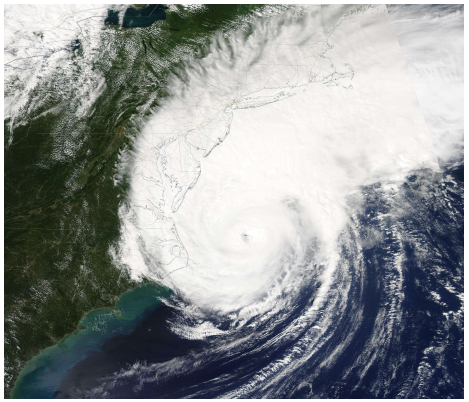
Manager, Water Resource Operations


**June 2020**





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# 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.

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# 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)

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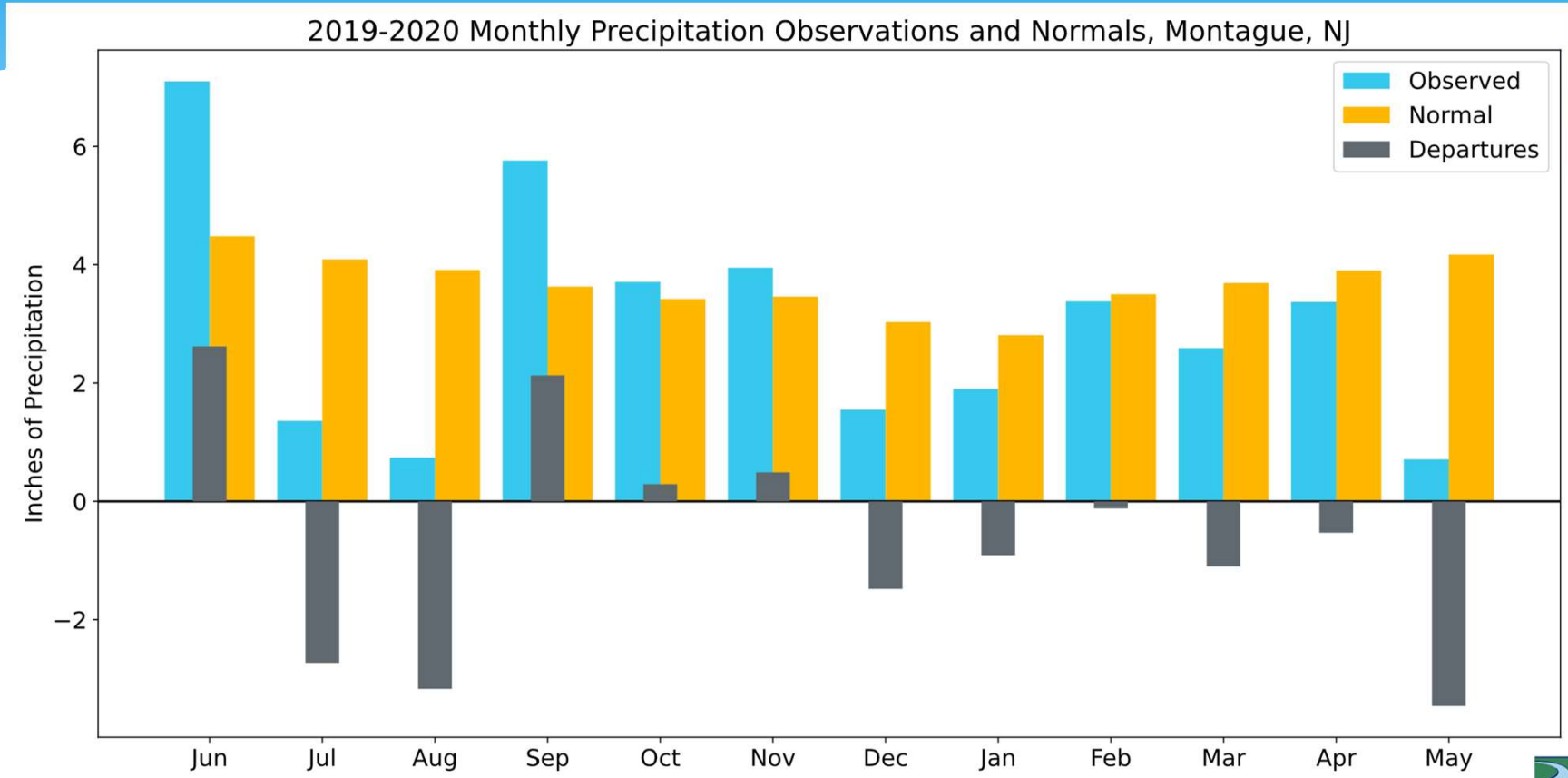
# Precipitation -- Montague




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

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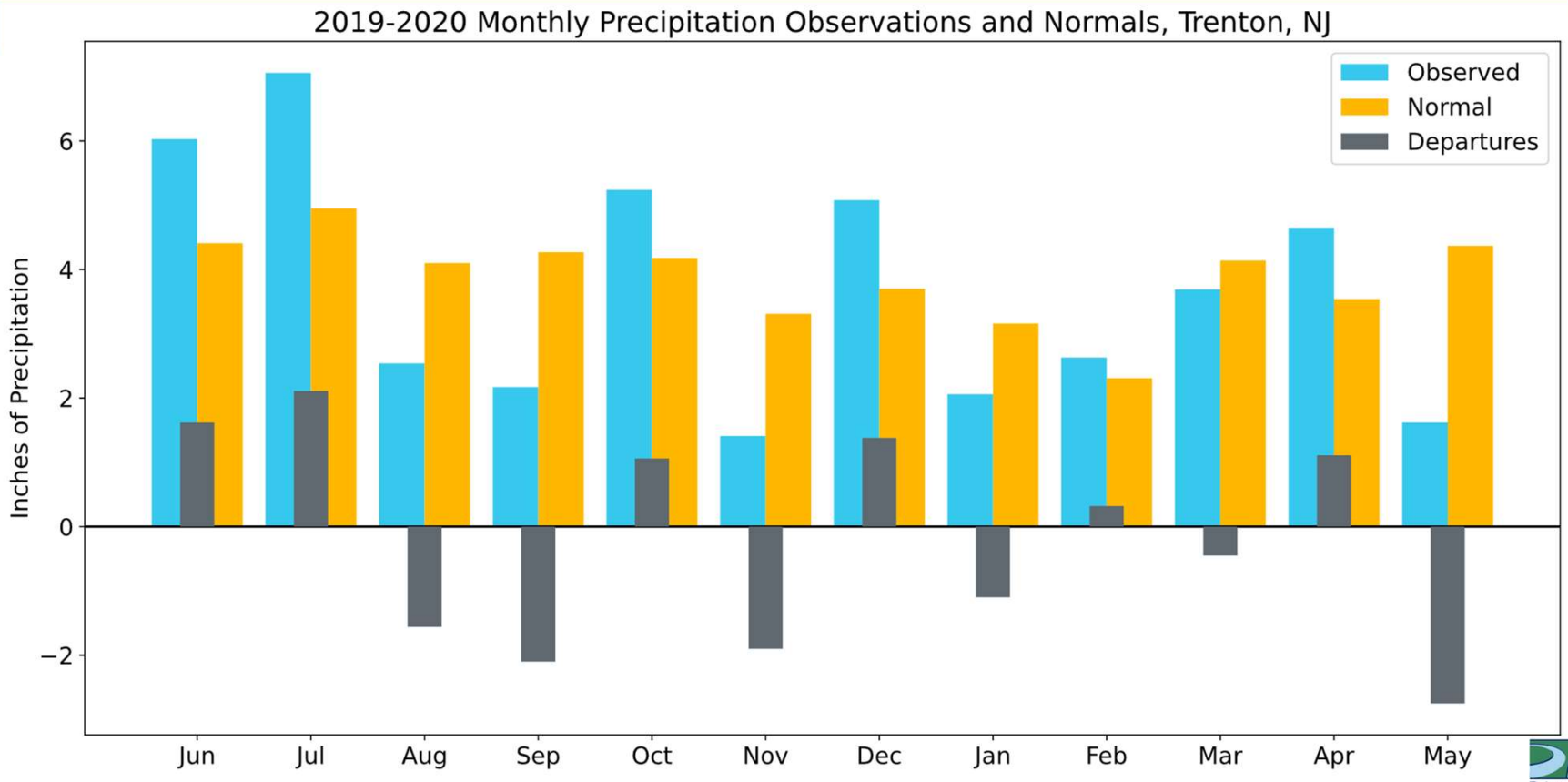
# Precipitation – Trenton, NJ




Data Source: Applied Climate Information System (ACIS)

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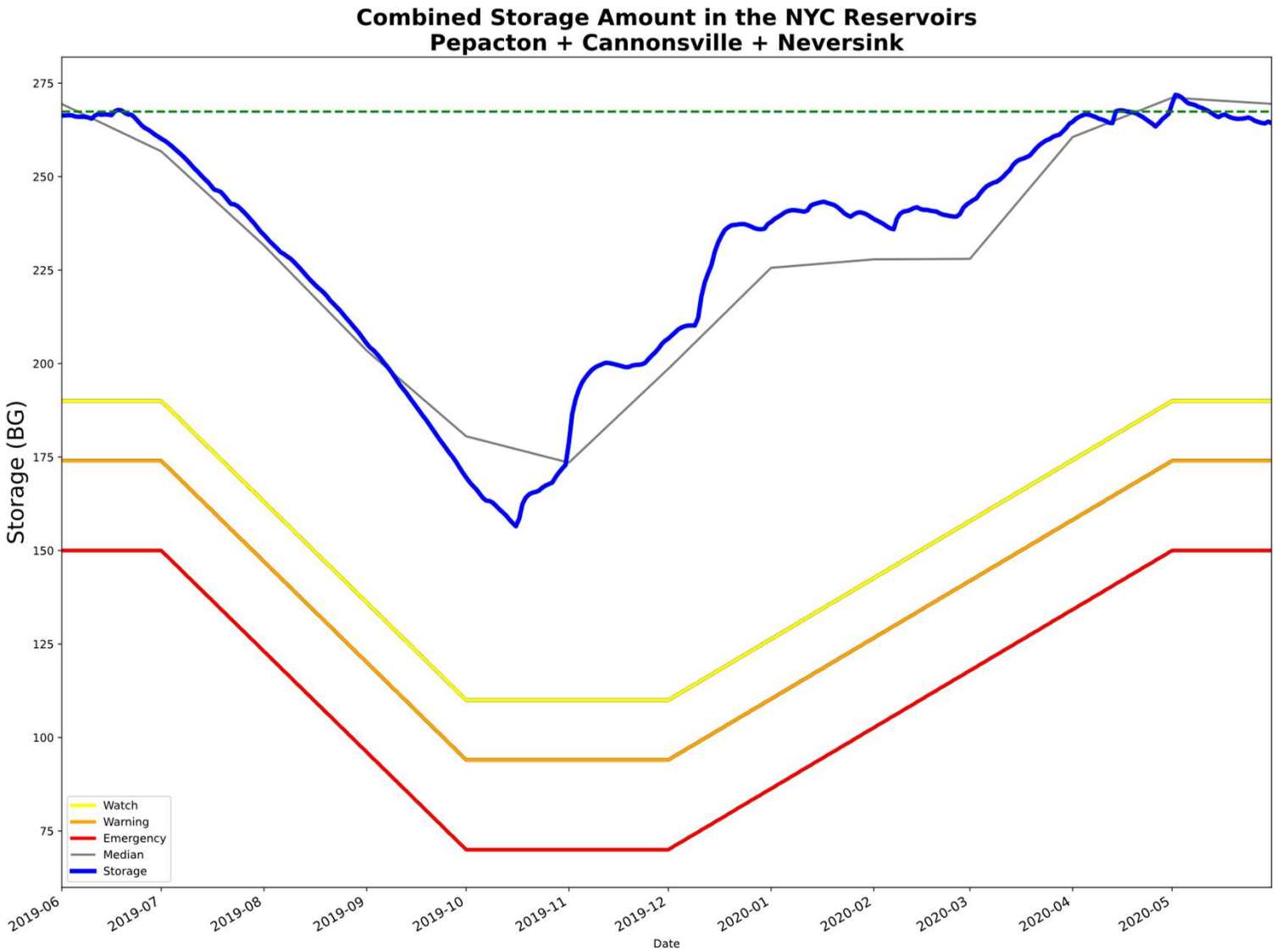


Data Source: NYCDEP

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# Flow Objectives

| Water Released from NYC Reservoirs to Meet Flow Objectives (MG) | |
|---|---|
| Montague | 26,113* |
| Trenton | 1,338 |
| Total | 27,451 |

| Water Released from Lower Basin Reservoirs to meet Trenton Flow Objective (MG) | |
|---|---|
| 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.

Data Source: NYDEP, ODRM

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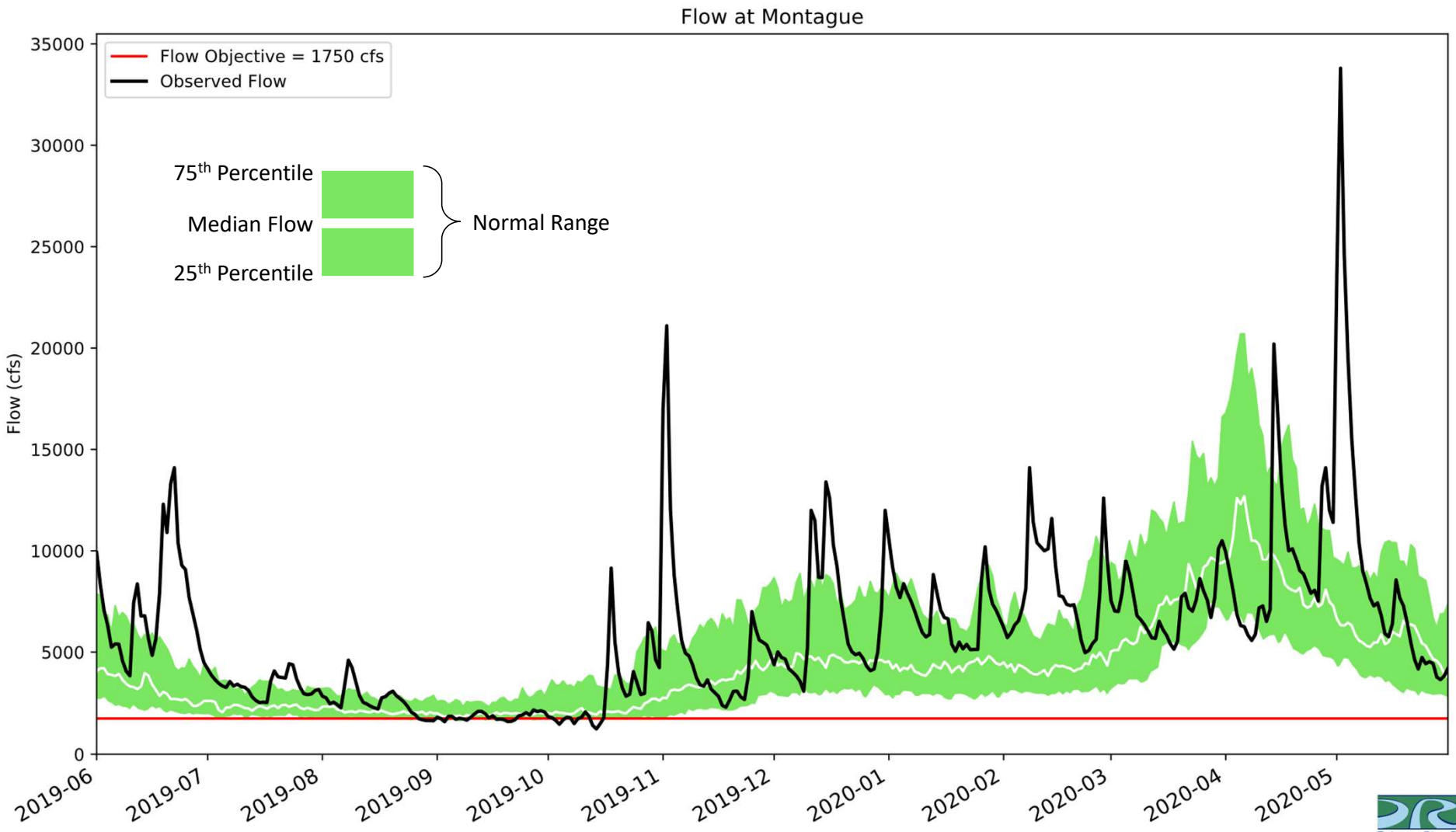


Data Source: USGS

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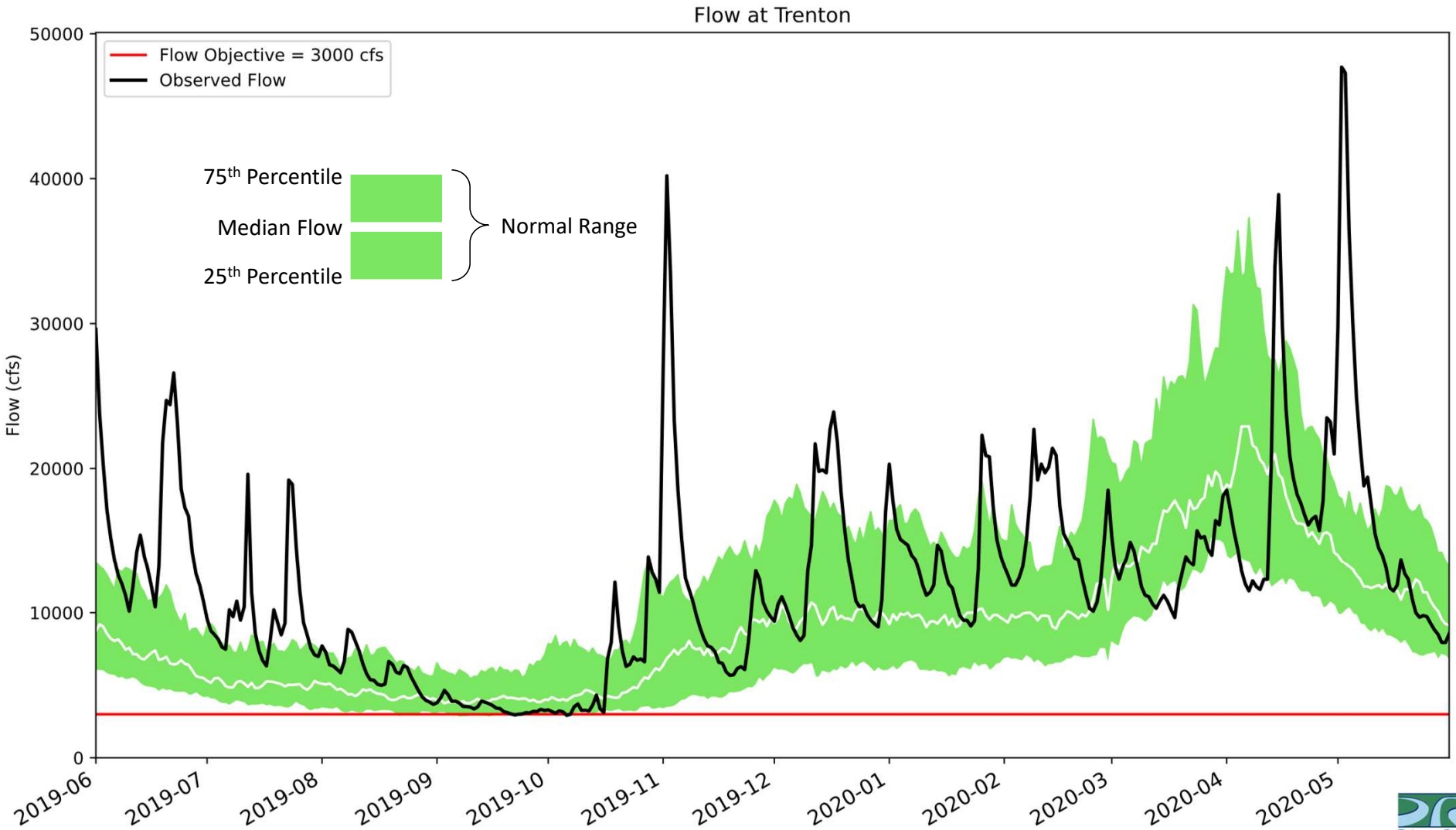


Data Source: USGS

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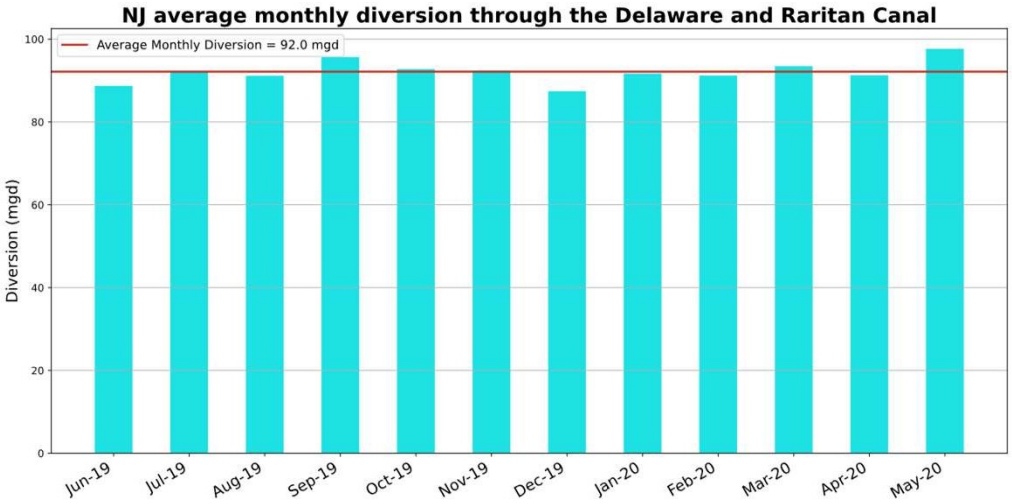
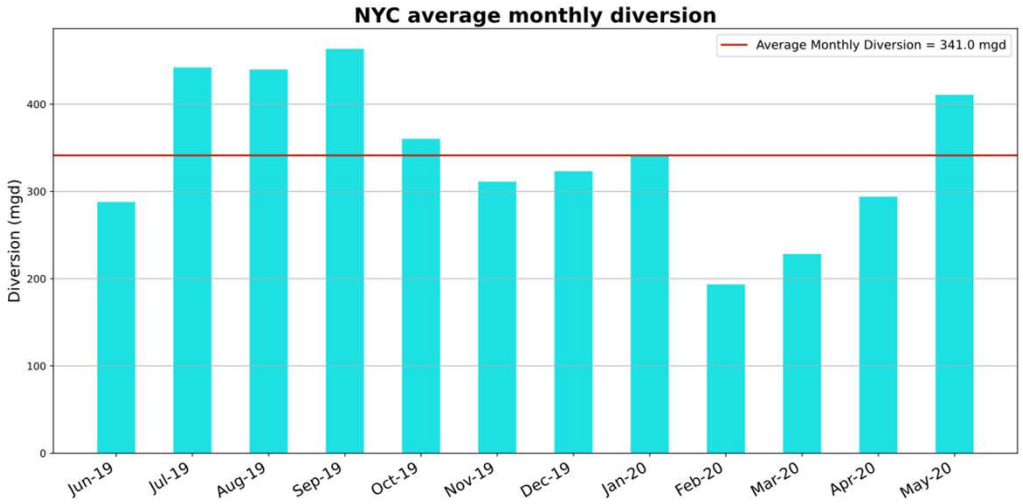
# Diversions

| Monthly Average Daily Diversion (June 1, 2019 – May 31, 2020) | |
|---|---|
| New Jersey | New York |
| 92 mgd | 529 mgd |




Data Sources: USGS, NYDEP

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# Conservation Releases

| Volume of Conservation Releases (MG) | | | |
|---|---|---|---|
| | FFMP 2017 Tables Based on Storage (6/1/19 – 5/31/20) | REV1 | Multiple of Revision 1 |
| Cannonsville | 95,508 | 20,676 | 4.6 |
| Pepacton | 45,314 | 16,551 | 2.7 |
| Neversink | 24,645 | 10,640 | 2.3 |
| 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. | | | |

Data Sources: NYDEP

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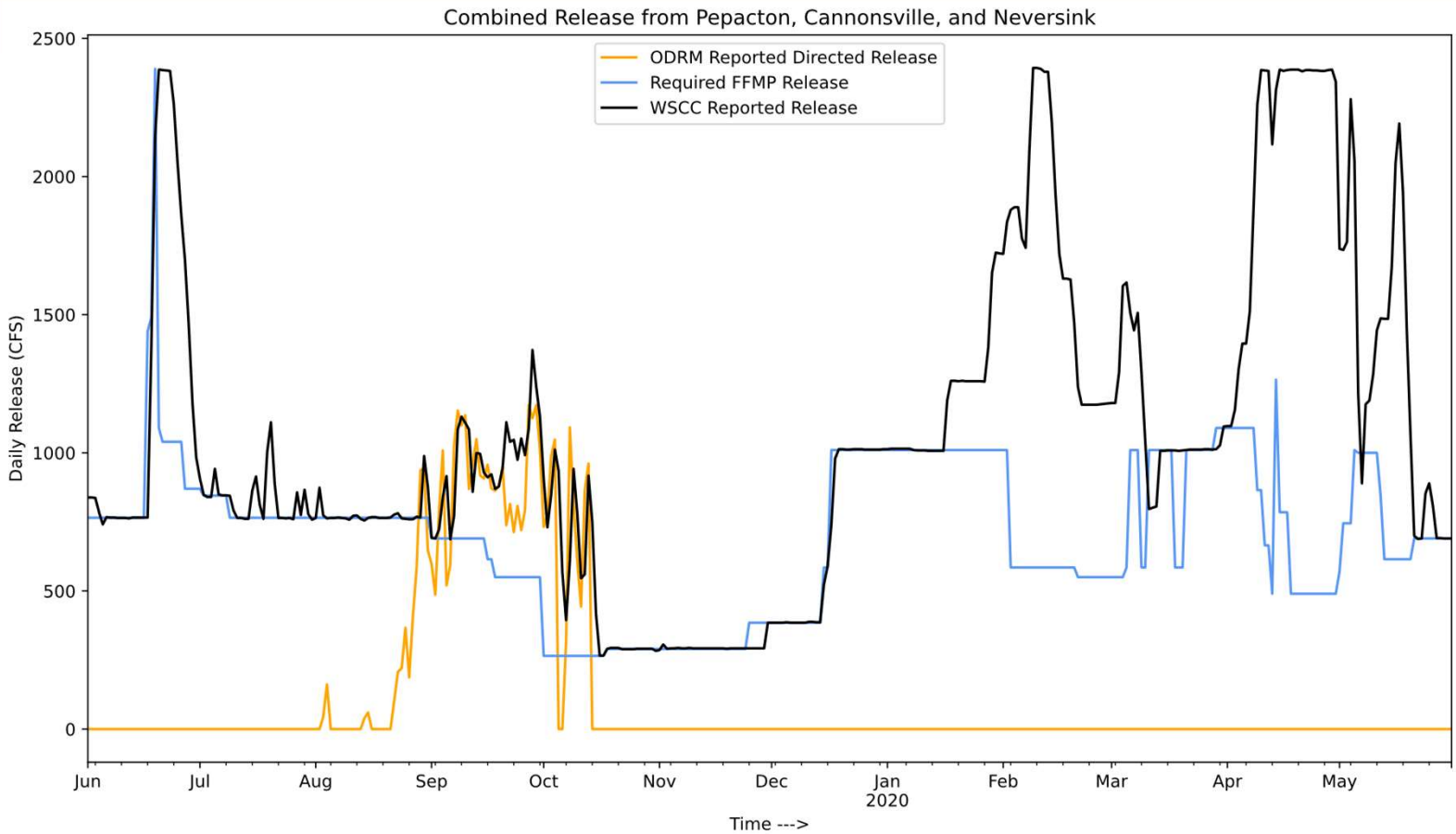
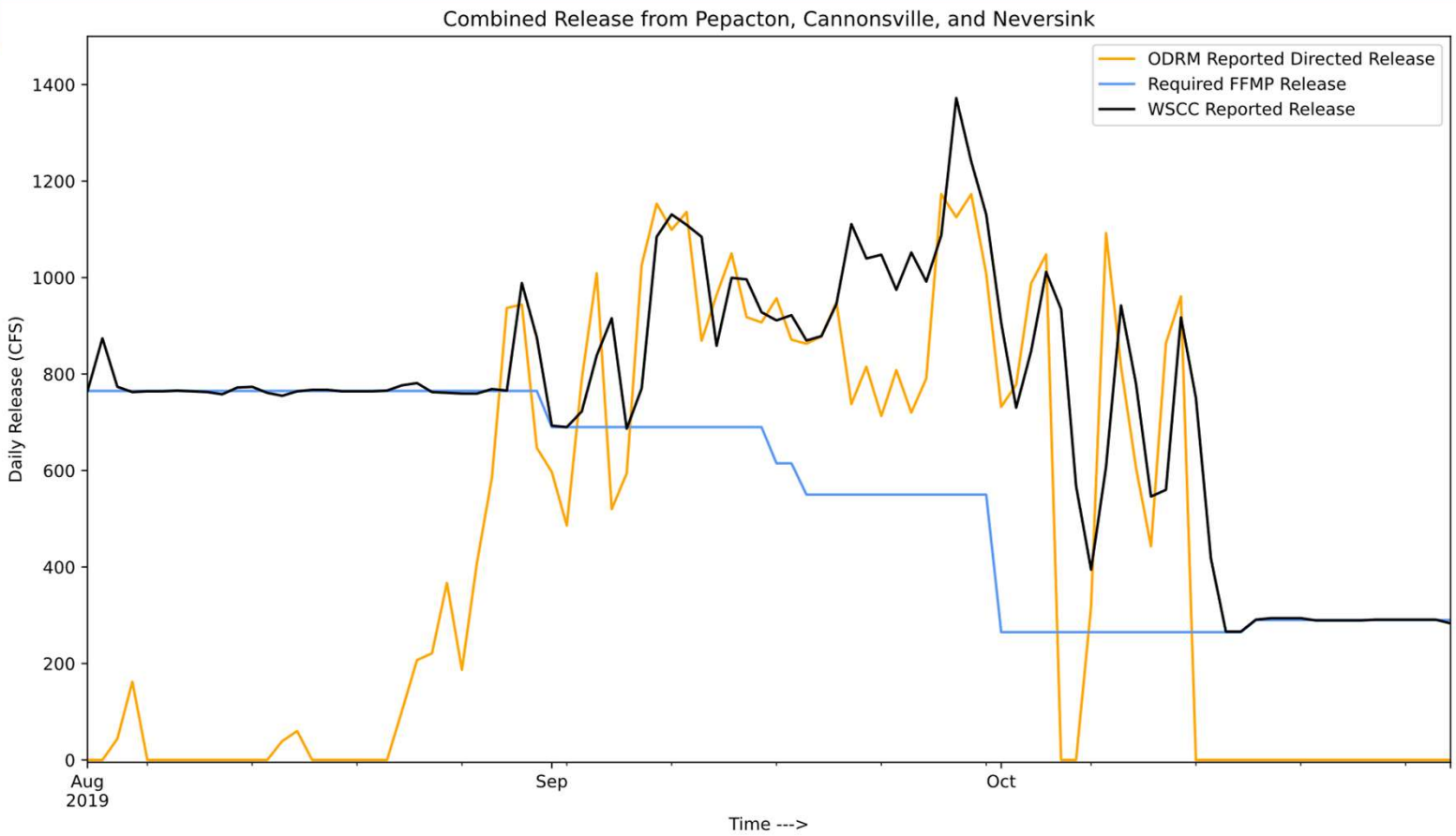
# Actual Releases

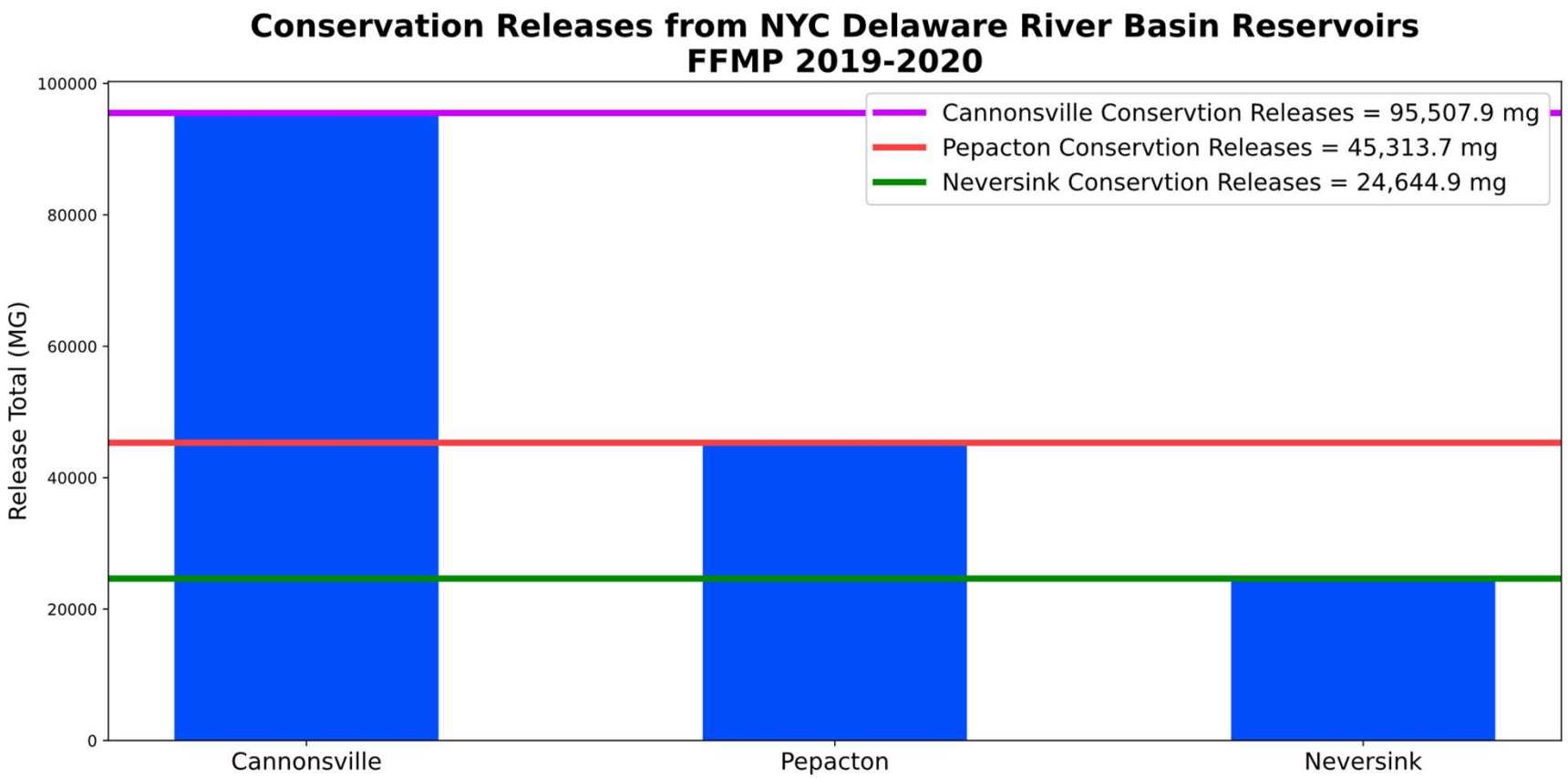



Data Sources: NYDEP, ODRM, USGS

# Actual Releases




Data Sources: NYDEP, ODRM, USGS




Data Source: NYDEP

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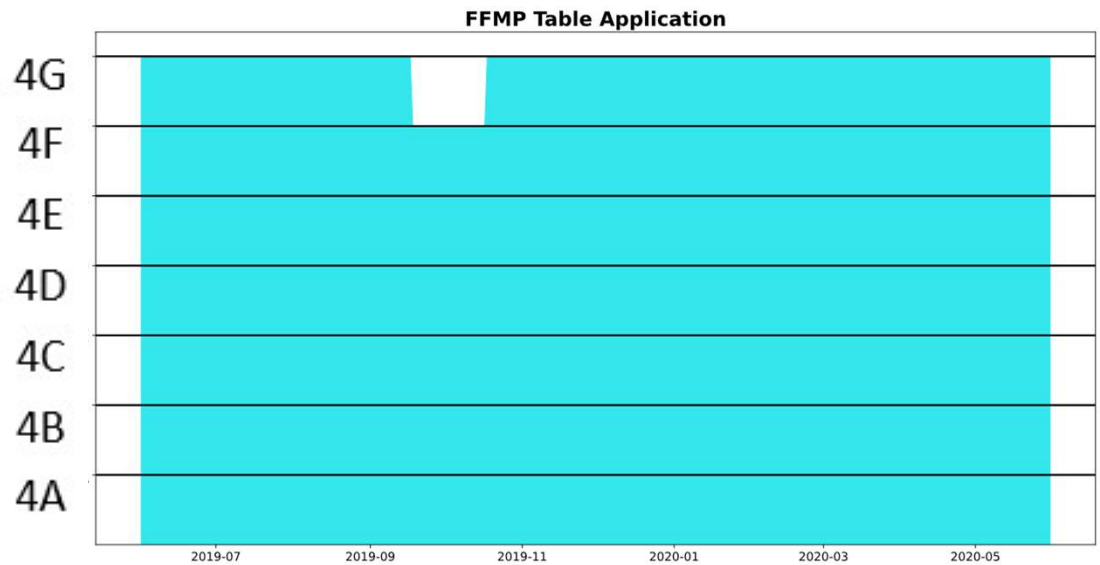
# Time in FFMP Release Tables

**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

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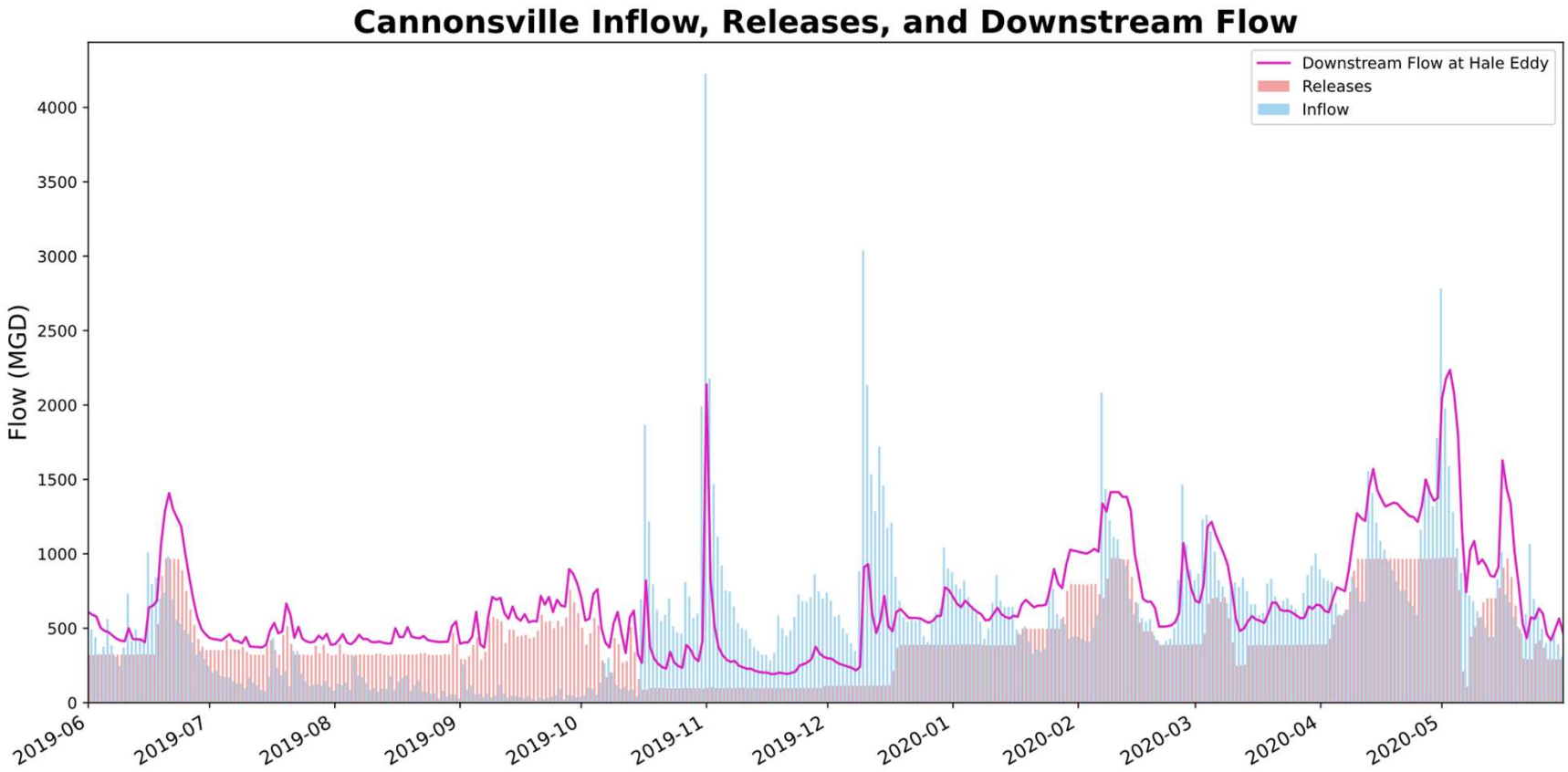


Data Source: USGS

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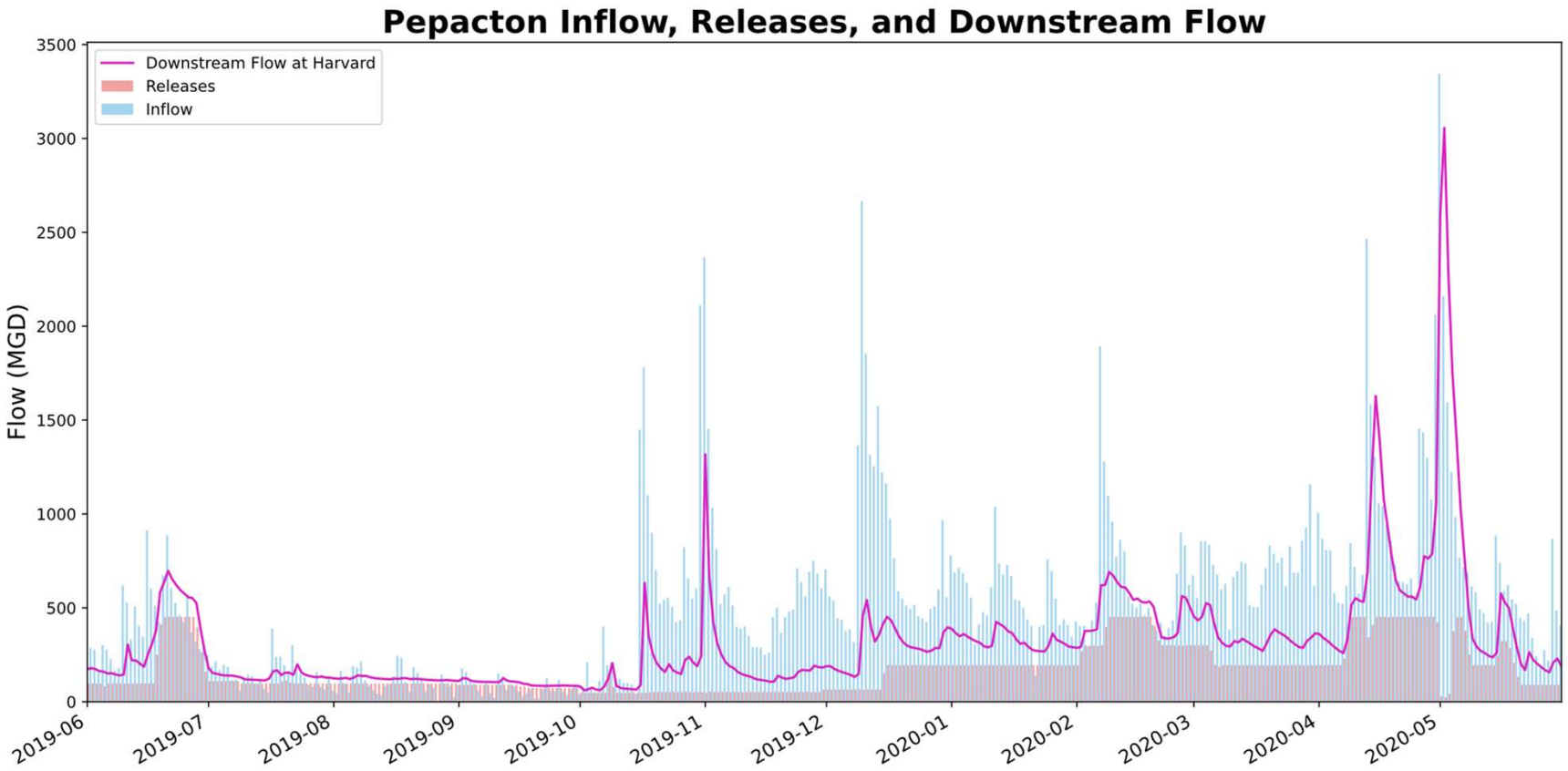


Data Source: USGS

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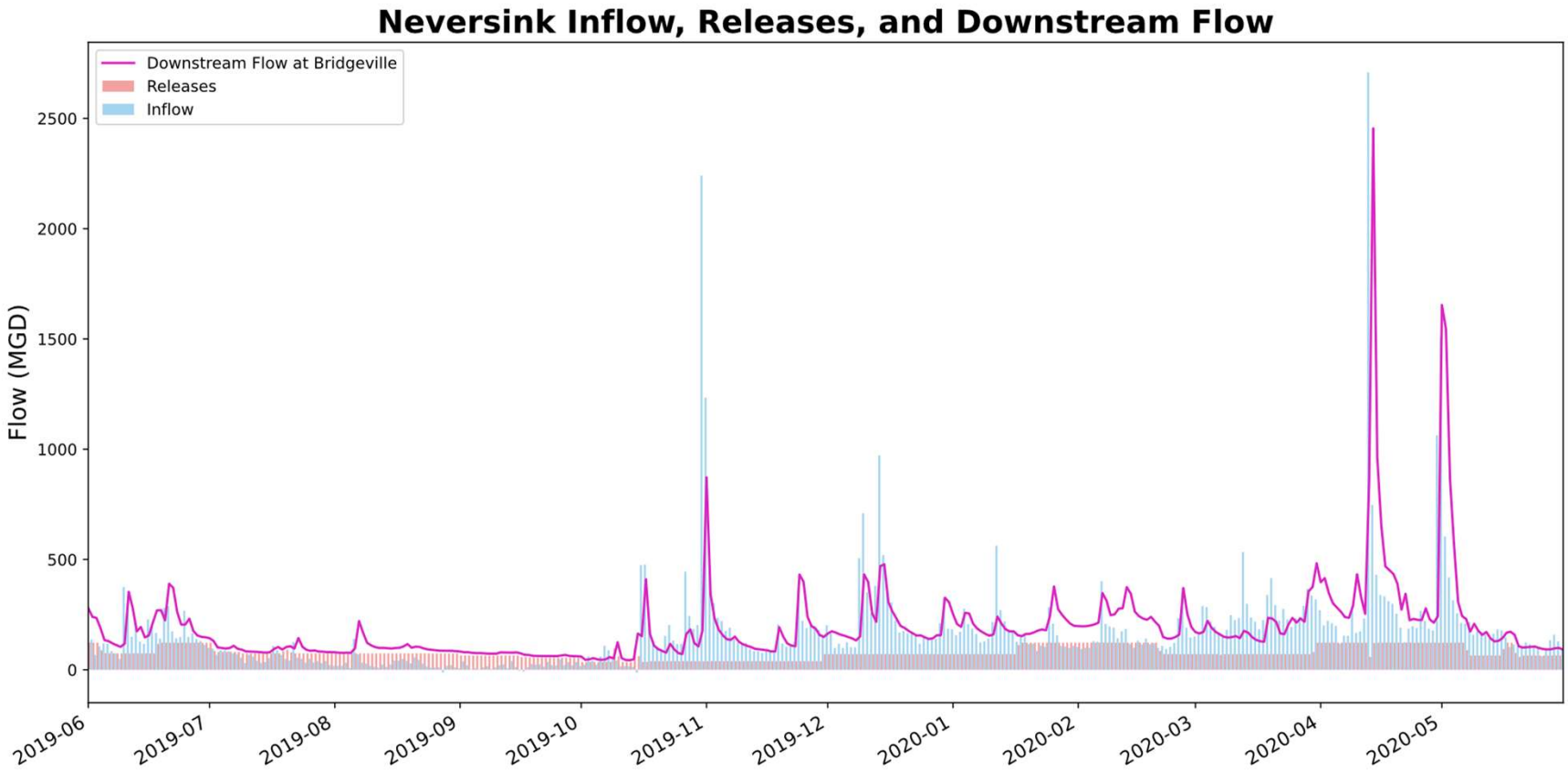


Data Source: USGS

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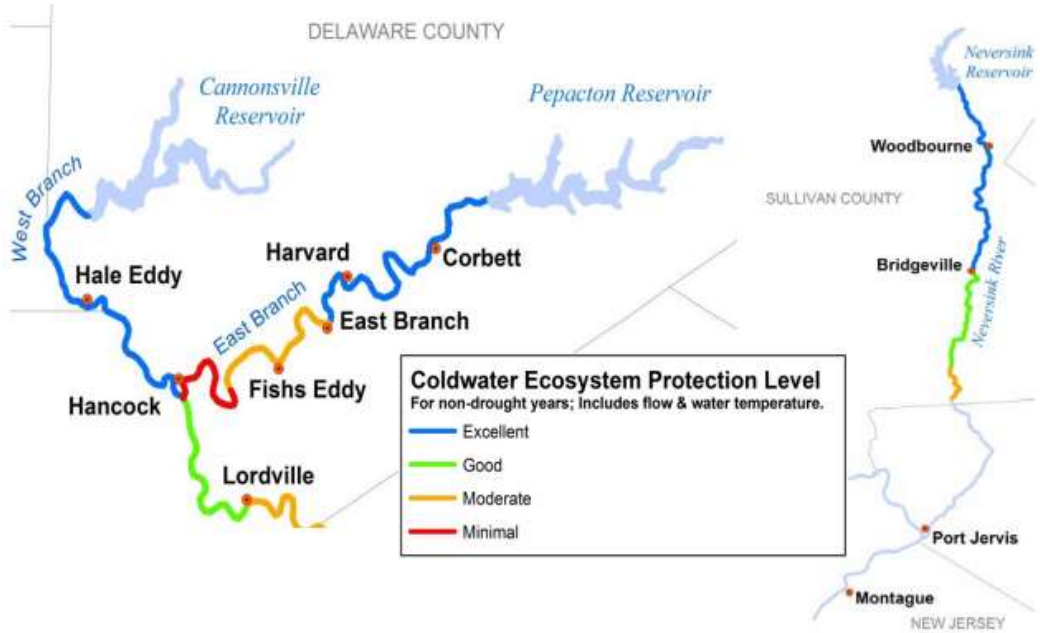
# Bank Use

| 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

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# 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

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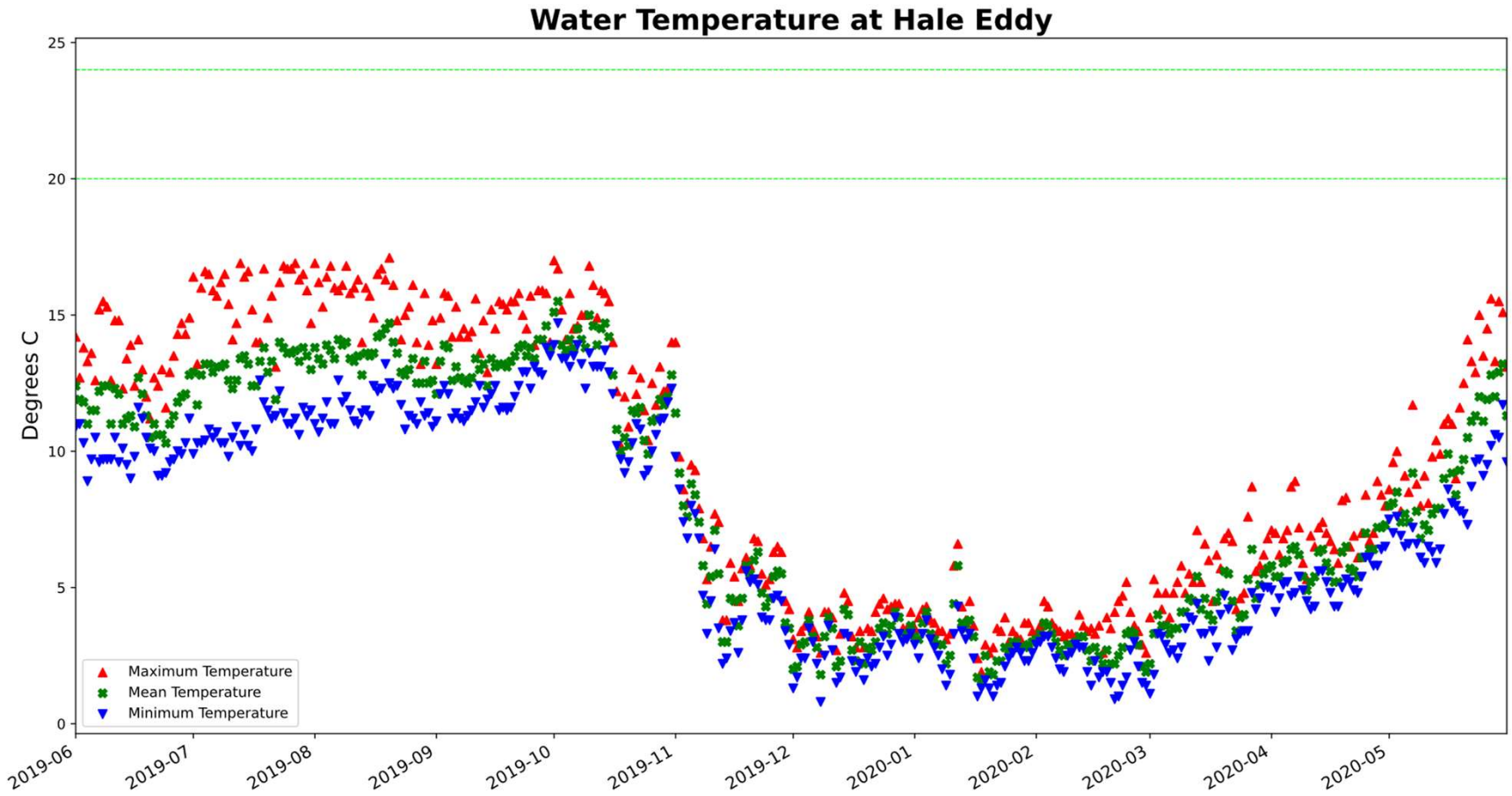


Data Source: USGS

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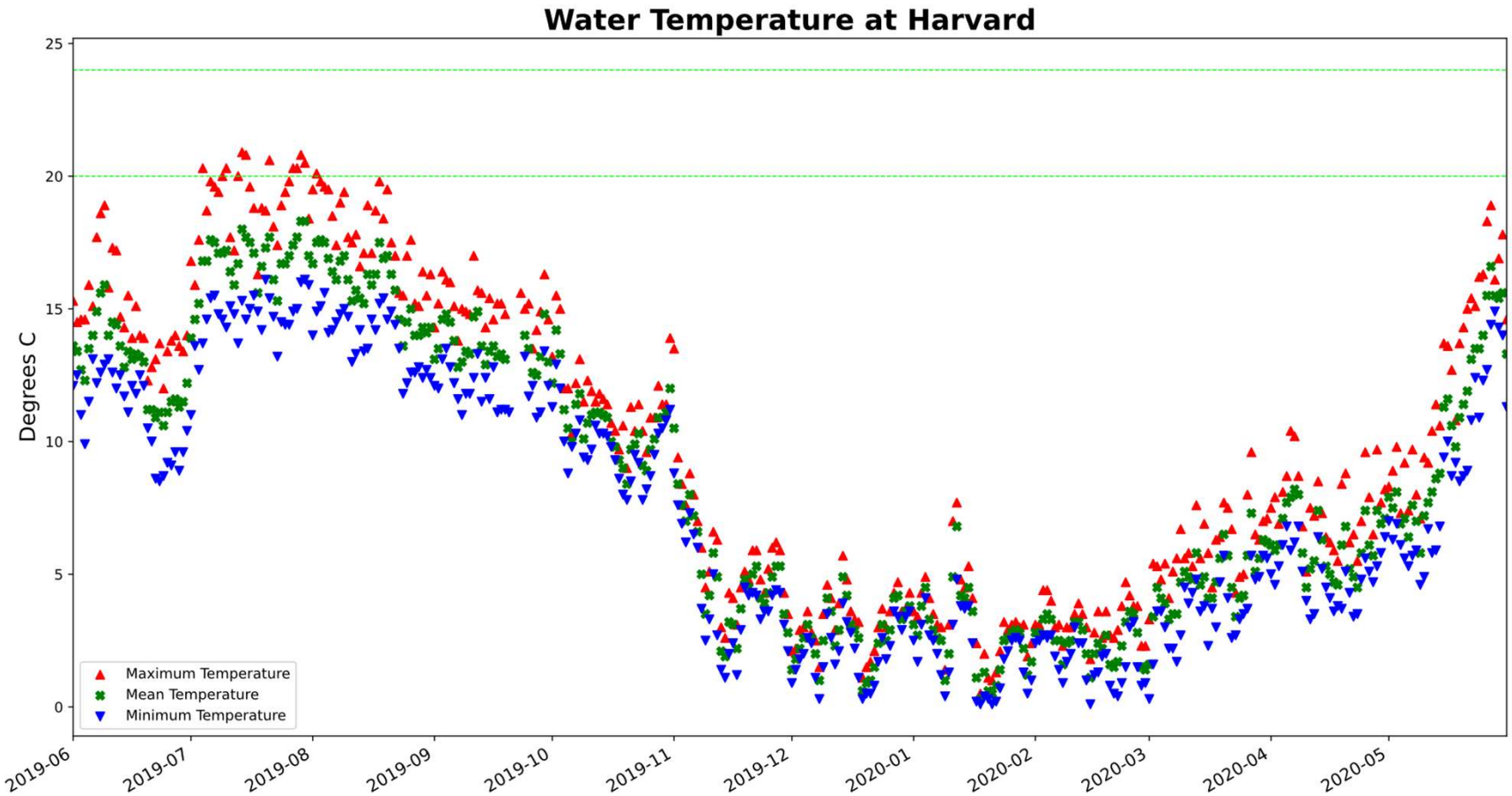


Data Source: USGS

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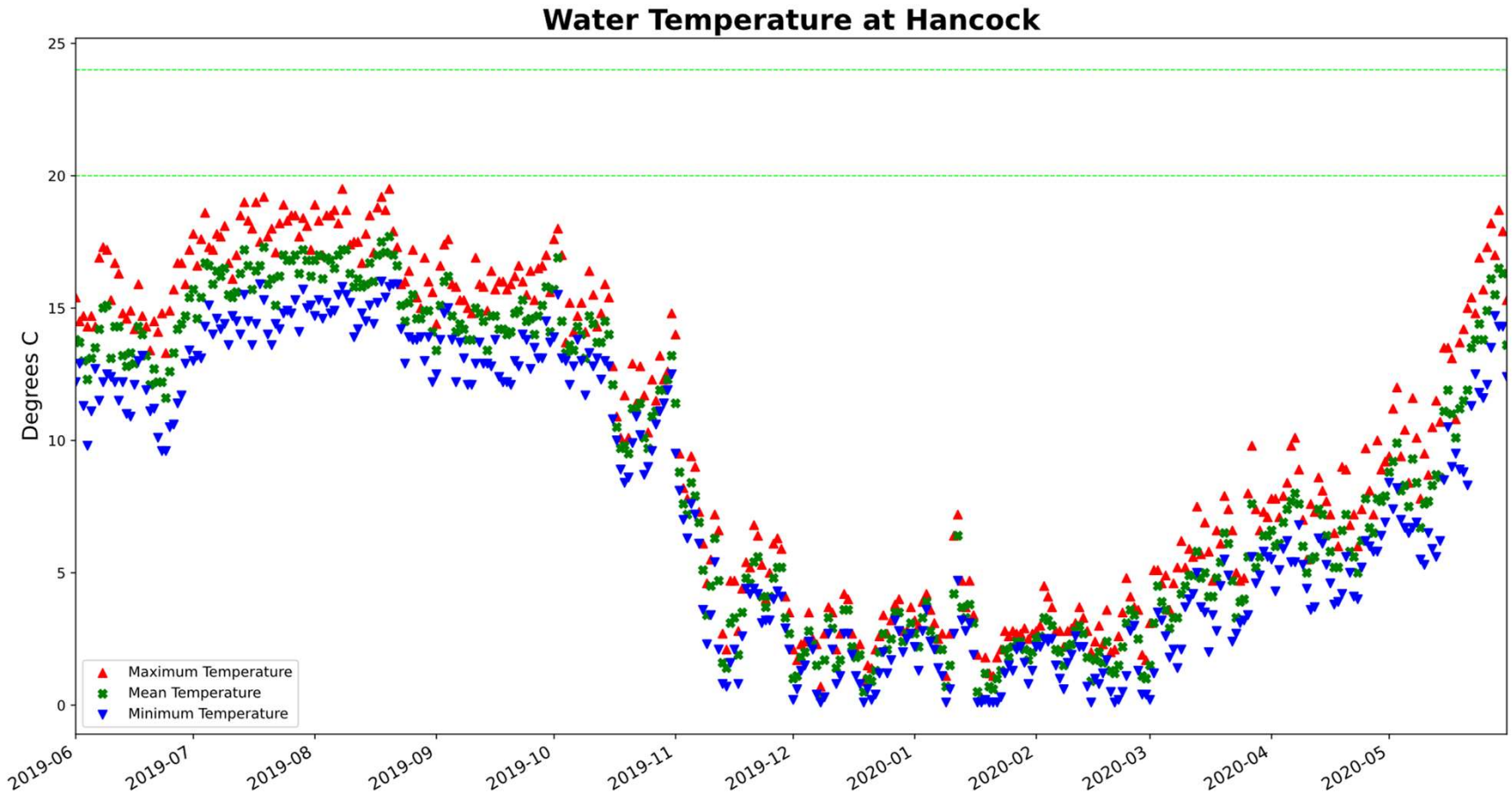


Data Source: USGS

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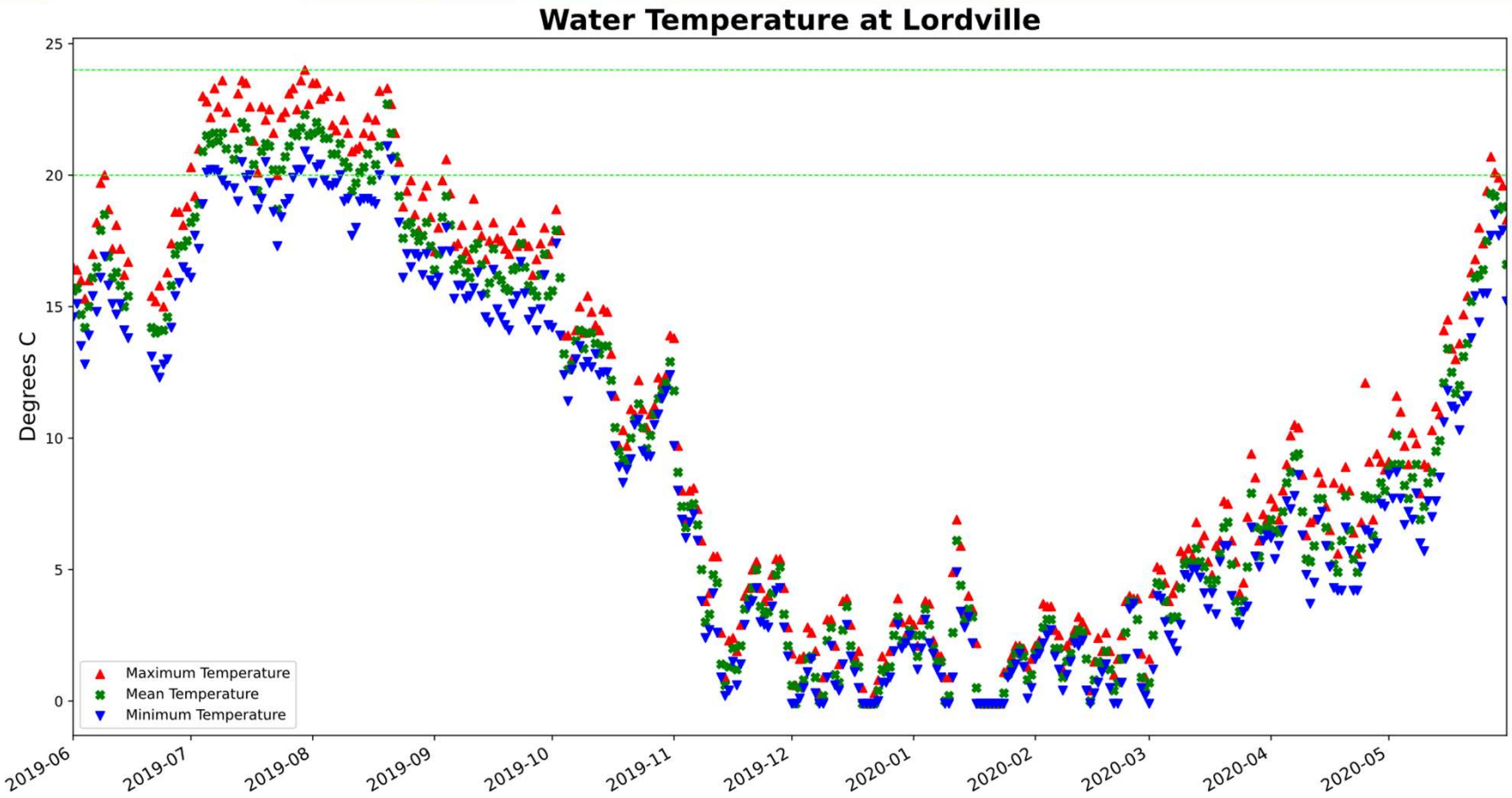


Data Source: USGS

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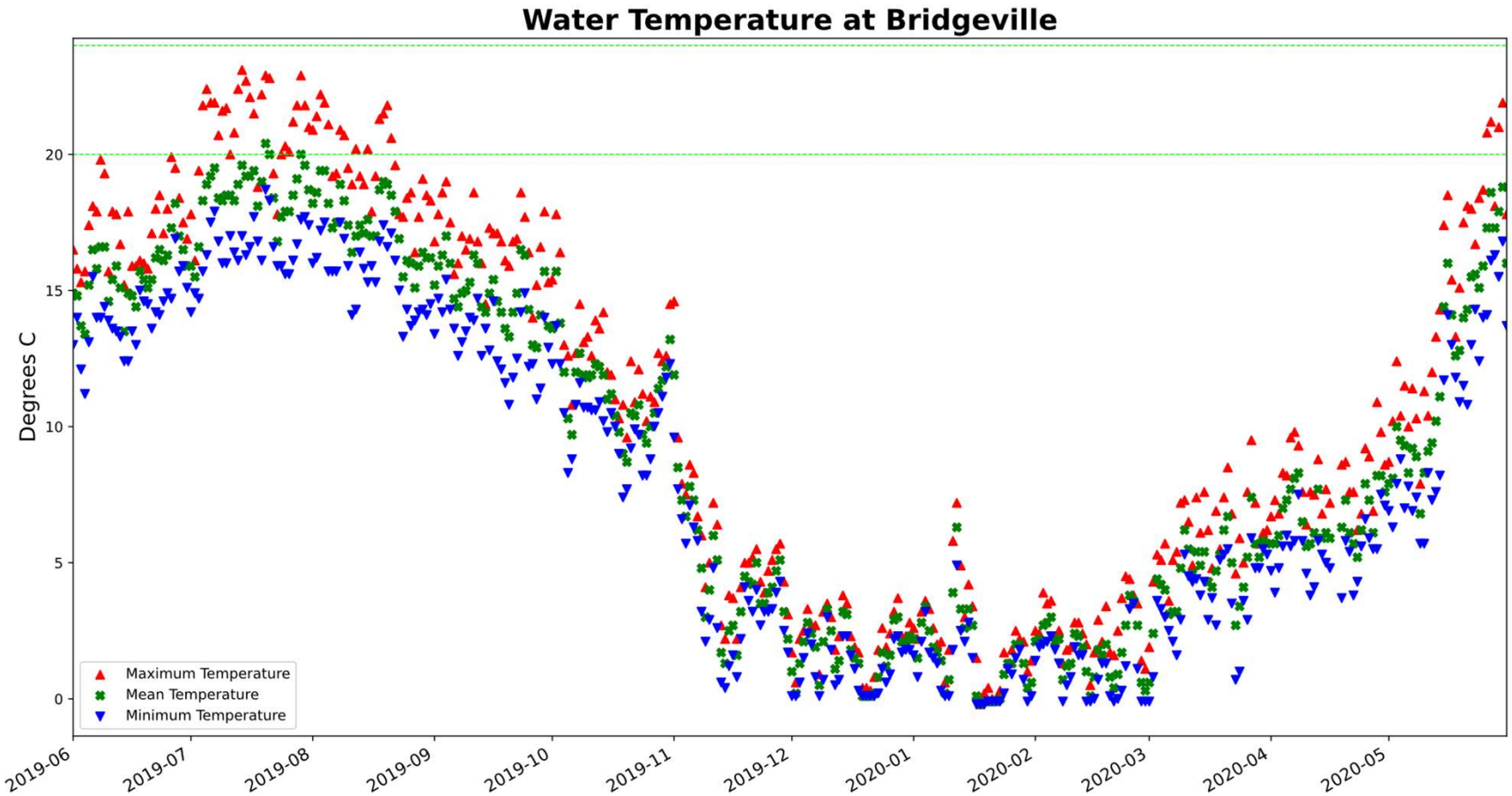


Data Source: USGS

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# 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 |

New York, NY

| | | | | | | |
|---|---|---|---|---|---|---|
| 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 |
| | *Ties: 2010, 2012* | | | | | |
| 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 |

Allentown, PA

| | | | | | | |
|---|---|---|---|---|---|---|
| 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 |

Philadelphia, PA

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

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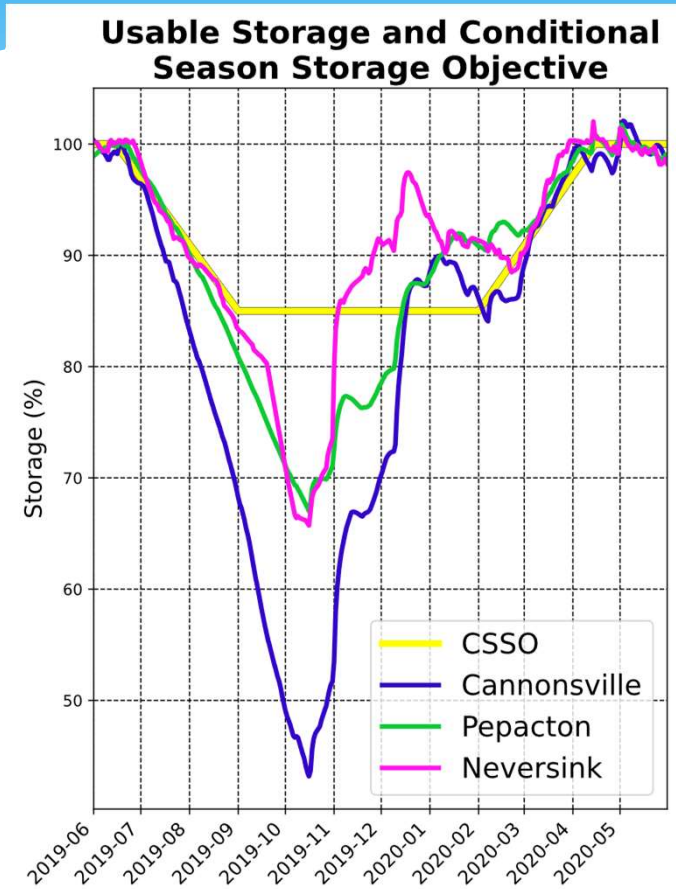
# Discharge/Spill Mitigation




| | 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 |
| **All Discharge Mitigation Releases L1 (L1-a, L1-b, L1-c)** | | |

Data Source: NYCDEP

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# 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.

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# 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