June 2023

2022 Annual Hydrologic Conditions Report

Technical Report No. 2023-4

Managing, Protecting and Improving the Water Resources of the Delaware River Basin since 1961

Delaware River Basin Commission
DELAWARE • NEW JERSEY
PENNSYLVANIA • NEW YORK
UNITED STATES OF AMERICA

ACKNOWLEDGEMENTS

This report was prepared by the Delaware River Basin Commission staff: Anthony Preucil, Water Resource Scientist, and Amy Shallcross, P.E., Water Resource Operations Manager. Anthony Preucil was the principal author of the report. Amy Shallcross, P.E., managed development, provided guidance, and offered technical recommendations.

SUGGESTED CITATION

Delaware River Basin Commission (2023). *Annual Hydrologic Conditions Report for 2022*. (DRBC Report No. 2023-4.)

LIST OF ACRONYMS/ABBREVIATIONS

ACIS	Applied Climate Information System
AHPS	Advanced Hydrologic Prediction Service
DRB	Delaware River Basin
DRBC	Delaware River Basin Commission
NCEP	National Center for Environmental Prediction
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
USGS	United States Geological Survey

DEFINITIONS

Stage – The level of the water above an arbitrary point in the river (commonly measured in feet)

Crest – The level a river peaks at during a flood as it passes a particular point. Used synonymously with 'peak.'

Water Level – The surface level of a body of water

Liquid Water Equivalent - The amount of water that results from melting any form of frozen precipitation (e.g., snow, sleet, or ice), including any liquid precipitation.

Action Stage – the stage which, when reached by a rising stream, represents the level where the NWS or a partner/user prepares for possible significant hydrologic activity. The action taken varies for each gage location. Gage data should be closely monitored by any affected people if the stage is above action stage.

Minor Flood – minimal or no property damage, but possibly some public threat. Examples of conditions that would be considered minor flooding include: water over banks and in yards; no building flooded, but some water may be under buildings built on stilts (elevated); water overtopping roads, but not very deep or fast flowing; inconvenience or nuisance flooding. In remote areas with few specific impacts, floods with 5-10 year recurrence interval would be assumed to be causing minor flooding on streams in the area.

Moderate Flood – some inundation of structures, evacuations of people and/or require transfer of property to higher elevations (e.g., move cars, water rescues from flooded streets). During a moderate flood, water is deep enough over the road to make driving unsafe. In remote areas with few specific impacts, floods with 15-40 year recurrence interval would be assumed to be causing minor flooding on streams in the area.

Major Flood – Extensive inundation of strictures and roads occurs. Significant evacuation and/or transfer of property to higher elevations are necessary. Multiple Homes flooded, moved off foundations. Extreme erosion occurs. In remote areas with few specific impacts, floods with 50-100-year recurrence interval would be assumed to be causing major flooding on streams in the area.

Flood category definitions based on descriptions from the National Weather Service.

Reported flood locations: The flooding mentioned in this report is based on information provided by the Middle Atlantic River Forecast Center. The locations referenced are flood forecast and reporting locations used for the Advanced Hydrologic Prediction Service website. Flooding occurred at other locations in the basin. The impacts of flash flooding are not detailed herein.

TABLE OF CONTENTS

HYDROLOGIC CONDITIONS IN 2022

The components of the hydrologic cycle that are measured and monitored are summarized below and include: precipitation, streamflow, storage, groundwater, and the salt front. Notable events include a Nor'Easter storm in January which brought snow to the entire basin, a Nor'Easter storm in April which caused flooding in the lower basin, and the remnants of Hurricane Ian. Much below normal precipitation from June – September led to drought watch declaration in New York, Pennsylvania and New Jersey. Groundwater levels were mostly normal to below normal following seasonal patterns. The most upstream location of the salt front was river mile 79.5 on September 8.

PRECIPITATION

The precipitation in the Delaware River Basin (DRB) was characterized with information such as individual station reports, radar-based estimates, and satellites. **Figure 1** shows a spatial representation of the total precipitation based on data from the Advanced Hydrologic Prediction Service (AHPS).

The highest amounts of precipitation in 2022 were observed in the upper basin near the Catskill Mountains in New York, ranging from 64 to 68 inches (approximately ten inches above normal). Large amounts of precipitation, ranging from 60 to 64 inches (approximately ten inches above normal), occurred near Doylestown, Pennsylvania in the lower basin. Areas near the Delaware Estuary only received amounts between 36 and 40 inches which (approximately four inches below normal). Below average precipitation also occurred in areas near Schuylkill County in Pennsylvania, with amounts ranging from 32 to 36 inches (approximately eight inches below normal). Reported values include the liquid equivalent precipitation[i].

Table 1 presents the annual and normal precipitation, based on data from 1990 to 2019, for ten stations located within or close to the Delaware River Basin (DRB). The difference from normal and the rank for each station based on the number of years of data are also presented. The most amount of precipitation, 57.96 inches (7.74 inches above the normal) was reported at Mount Pocono, PA. Below-normal precipitation occurred at eight of the stations. The lowest amount of precipitation, 37.56 inches (5.81 inches below normal) occurred at Millville, NJ.

The monthly precipitation pattern at nine locations within the basin is presented in **Figure 2** and indicate the temporal variation in amounts throughout the year. The wettest months were April and October, influenced by a Nor'Easter storm in April and tropical remnants from Hurricane Ian in

October. The driest months were July, August, and September. Regional monthly and normal precipitation values are shown in **Appendix A.**

Table 1: Total Annual Precipitation at Select Weather Stations in the DRB

Station	Number of Years Reporting	2022 Precipitation Total (inches)	Normal (inches) Based on 1990 – 2019	Departure (inches)	Annual Rank (Lower = Wetter)
Callicoon, NY*	12	49.5	50.22	-0.72	7
Mount Pocono, PA*	22	57.96	50.22	7.74	7
Sussex, NJ	83	41.8	48.73	-6.93	59
Allentown, PA	83	46.47	47.36	-0.89	32
Pottsville, PA	1	50.7	-	-	-
Trenton, NJ	25	43.34	45.47	-2.23	15
Reading, PA	27	42.7	45.21	-2.51	13
Philadelphia, PA	83	42.51	44.11	-1.6	39
Millville, NJ	79	37.56	43.37	-5.81	58
Wilmington, DE	74	43.17	45.33	-2.16	40

*The occurrence of the same amount of precipitation and rank within the respective records at the Callicoon and Mount Pocono is coincidence and not an error.

January Nor'Easter

Between January 28 and January 30, a strong Nor'Easter storm system produced between 0.5 and 16 inches of snow across the basin. A Nor'Easter storm is characterized by strong winds blowing from the northeast and is usually accompanied by heavy precipitation, either rain or frozen or both. This storm was distinctive because, the entire basin was covered with snow when the system left the region (visible by satellite imagery shown in **Figure 3**). **Figure 4** depicts the total snowfall accumulation for this event, as reported by the National Operational Hydrologic Remote Sensing

Center (NOHRSC). The highest amounts occurred in the southern and eastern parts of the basin, ranging from 12 to 16 inches. In the northern part of the basin, 1 to 4 inches of total snow accumulation were observed.

Total Seasonal Snowfall 2021 – 2022

Winter precipitation stored in snowpack does not contribute to streamflow until it melts, in the spring. **Figure 5** shows snowfall in the DRB for the 2021-2022 winter season. The northern parts of the basin received between 24 and 66 inches of snow, with some areas in the mountainous terrain receiving approximately 82 to 94 inches. The majority of the southern half of the basin including the Lehigh basin received between 10 and 24 inches of snow.

April Nor'Easter

Between April 18 and April 19, a Nor'Easter storm produced heavy rain and quicky moved across the basin. **Figure 6** shows the total 24-hour precipitation accumulation ending on April 19 at 6:00 AM Eastern Daylight Time (EDT). Widespread precipitation amounts between 1.5 inches and 2.0 inches were observed. Minor flooding occurred at twelve National Weather Service Flood Forecast Gage locations, including the Neshaminy Creek and Perkiomen Creek in Pennsylvania, as well as the Brandywine Creek and Christina River in Delaware. In addition, coastal flooding occurred in the tidal areas of the Delaware River. Nine tidal locations reached action stage, including the Cooper River in New Jersey, the Schuylkill River and Chester Creek in Pennsylvania, and Red Clay Creek and Whiteclay Creek in Delaware. Further details on flooding with hydrographs and peak stage for each location are included in **Appendix B**.

Hurricane Ian

The remnants of Hurricane Ian stalled off the coast of New Jersey between September 30 and October 6. Despite no longer being classified as tropical, the remnants of hurricanes still generate large amounts of precipitation across widespread areas. A visible satellite image of the storm on October 5 is shown in **Figure 7**. Precipitation from the storm is presented in **Figure 8**. Southern Delaware's Sussex County received the most precipitation, between 8 to 9 inches. The lower basin, including the Lehigh Valley, received between 3.5 and 6 inches. No flooding was reported on AHPS, but the sustained winds caused minor coastal flooding at three locations in the tidal portion of the river.

STREAMFLOW

The daily time series and a comparison of the monthly average with normal flows are presented in **Figure 9** for four selected locations in the DRB, including the Lehigh River at Bethlehem, the Delaware River at Montague, the Schuylkill River at Philadelphia, and the Delaware River at Trenton. Low flows occurred in January because precipitation was stored in snowpack, and in the summer months due to below-average precipitation. The flow rates during July, August, and September were approximately 50 percent of normal at the four locations. Flows were also low in November as the result of below-normal precipitation.

Higher flows occurred in February, when snow began to melt and reach the river as runoff. April and May experienced high flows as a result of several storm systems including a Nor'Easter on April 18. Monthly flows were approximately 125 to 150 percent of normal during these two months. Flows were near normal levels during the remainder of the year, with the exception of the Schuylkill River at Philadelphia, where flows were 130 percent of normal flows during October as the result of precipitation from the remnants of Hurricane Ian.

RESERVOIR STORAGE AND RELEASES

Reservoir releases are used to augment river flows for multiple purposes. Releases from Beltzville and Blue Marsh in the lower basin are used to support the Trenton Flow Objective, which was established to maintain freshwater flows in the estuary. Releases from Cannonsville, Pepacton and Neversink in the upper basin are made to maintain the tailwater fishery and meet the Montague Flow Objective. Low flows during the summer contributed to the need for releases from both lower and upper basin reservoirs.

Lower Basin

The DRBC pays for water supply storage in Beltzville Reservoir (located on the Pohopoco Creek, a tributary of the Lehigh River) and Blue Marsh Reservoir (located on the Tulpehocken Creek, a tributary of the Schuylkill River) for use to augment flows in the Delaware River in support of the Trenton Equivalent Flow Objective (TEFO). Both reservoirs maintained their storage at their respective normal pools from January through July. Between August 15 and September 1, DRBC requested flow augmentation releases from its water supply storage in these reservoirs: 0.99 billion gallons (BG) from Beltzville and 0.55 BG from Blue Marsh Reservoirs. The reservoir storage levels are shown in **Figure 10** for Beltzville and **Figure 11** for Blue Marsh. The decrease in the storage while the flow augmentation releases were made is evident in August. Storage levels began to increase in September. Both had returned to their normal pools by the end of September.

Blue Marsh reservoir has a seasonal recreation pool. The reservoir storage is increased in mid-March to create the recreation pool and released in mid-October to bring the storage back to the normal winter pool, to create additional flood control space for spring runoff. The increase and decrease in storage for the recreation pool is apparent in **Figure 11**.

Merrill Creek Reservoir, located in Phillipsburg, N.J., was constructed by thermoelectric power utilities for the replacement of their consumptive use when the DRBC drought management plan is in effect. Releases from the Merrill Creek during drought conditions allow the power generators to continue producing power during drought conditions. The drought management plan was not in effect during 2022 and no releases were made for consumptive use replacement from Merrill Creek reservoir.

Upper Basin

Three of the four largest reservoirs in the basin, Cannonsville, Pepacton, and Neversink, were constructed by New York City's water supply system. The combined storage of New York City reservoirs is important because it is used to determine drought status in the basin as it relates to out-of-basin diversions and flow objectives (Delaware River Basin Water Code, 18 CFR Part 410). Combined storage in the three New York City (NYC) reservoirs is presented as a daily time series in **Figure 12**. At the beginning of the year, the combined storage was approximately 228.5 BG, or 85.4 percent. Reservoir levels were normal in January but began to decrease as precipitation (snow and ice) was stored as snowpack. Beginning in February, warmer temperatures began to melt the snow, increasing the storage in the reservoirs. Additional rain events occurred throughout the spring. The reservoirs were full on March 21 and remained so until the beginning of May. During this time, the reservoirs spilled a combined total of approximately 79.2 BG (**Figure 13**).

Reservoir levels began decreasing in May due to higher water demands and conservation releases along with lower precipitation. During the summer months, the combined storage decreased until September and remained steady until mid-November. The lowest combined storage of 161.8 BG (60.5 percent, 51.8 BG above the drought watch curve), occurred on November 11. The end-of-year combined storage was approximately 218.3 BG (81.6 percent).

Releases were made from the three NYC Delaware River Basin (DRB) reservoirs in accordance with the 2017 Flexible Flow Management Program (FFMP). The Delaware River Master directed releases to meet the Montague flow objective during the summer months. The total volume of water released for Montague was approximately 21.3 BG. Two releases were made at the end of January. Other releases were made between the end of July through the beginning of September and on five days in November. Thermal mitigation releases were made for 26 days in June, July, and August when water temperatures were in danger of exceeding 25 degrees Celsius at Lordville, N.Y. The amount of water used for thermal releases was 1.13 BG (1,754 cfs-days). One rapid flow change mitigation release was made on August 20, using 9 million gallons (14 cfs-days). Releases of 0.52 BG in total were also made from a bank of water reserved in the New York City reservoirs to support the Trenton Equivalent Flow Objective (TEFO bank).

GROUNDWATER

Groundwater conditions are characterized using thirteen representative wells in the basin states. The individual wells were selected based on their geographic locations and availability of data. The range of conditions (normal, drought watch, drought warning, drought) is defined by each well's respective period of record and represents a comparison to the value for the same day in past years. Groundwater levels wells were in the normal range at the beginning of the year. Most wells experienced a decrease in groundwater levels starting from May through August and were either normal or below normal for most of the year. By the end of the year, wells in Pennsylvania, New York, and Delaware were in the normal range. New Jersey wells were within the drought watch range. A detailed description of the groundwater conditions for each state is summarized below.

New York

The USGS groundwater well at Woodbourne, New York is used to represent the groundwater levels in the upper Basin (**Figure 14**). Groundwater levels increased to high end of the normal range in response to a storm at the end of January. The peak levels occurred in mid-April after another large storm event. During the summer, groundwater levels decreased and were below normal by August. Groundwater levels recovered over the fall, fluctuating between normal to above normal until the end of the year.

Pennsylvania

Water levels in Bucks, Carbon, Lebanon, Schuylkill, Monroe and Delaware counties were lower than normal for the first two months of the year as a result of below average precipitation during previous months and water stored in snowpack (**Figure 15**). The water levels for all wells increased and peaked with recharge from March through April from snowmelt and increased precipitation. Groundwater levels decreased from May through October, when conditions were dry but remained within the normal range except in the wells for Lebanon and Schuylkill counties. With the return to normal precipitation from October through November, the water levels increased and were near the high end of the normal range at the end of the year.

New Jersey

Two USGS county observation wells represent groundwater conditions in New Jersey: Burlington and Cumberland Counties, New Jersey. Water levels were normal for the first three months of the year, before steadily decreasing in the summer. Through the summer and into the fall months, both wells were in the Drought Watch range. At the end of the year, the water level in Cumberland County well was in Drought Watch and the Burlington County well was in Drought Warning (**Figure 16**).

Delaware

Groundwater levels in Delaware are determined with wells maintained by the Delaware Geological Survey (DGS) in New Castle County. Water levels were below normal for the year but followed a typical seasonal pattern (**Figure 17**). Higher levels occurred in the winter and spring and lower levels occurred in the summer and fall.

SALT FRONT

The salt front is defined as the seven-day average of the 250 parts-per-million isochlor. The salt front is used by DRBC as an indicator of salinity intrusion in the Delaware Estuary for reservoir operations. The location of the salt front moves downstream or upstream along the main stem Delaware River as streamflow increases or decreases, respectively. The long-term median monthly locations range from river mile 67 (RM 67) in April (two miles downstream of the Delaware Memorial Bridge) to RM 76 in September (two miles downstream of the Pennsylvania-Delaware State boundary).

In January of 2022, the salt front was at RM 69 (near the Delaware Memorial Bridge). It remained near the normal zone until mid-April, when runoff from the Nor'Easter pushed the salt front below RM 54[1]. The salt front moved upstream through the summer months, reaching its maximum location of RM 79.5 on September 8. Though the remainder of the year, the salt front moved downstream as a result of increased flow from precipitation (including the remnants of Hurricane Ian). At the end of the year, the salt front was near RM 65 (near Pennsville, NJ). The time series for the salt front location is shown in **Figure 18**.

[1] Data needed for calculation of the salt front location are not available.

DROUGHT

Dry conditions and decreasing groundwater levels during the summer resulted in drought watch declarations in DRB counties in three basin states (**Figure 19**, left panel). New Jersey declared a drought watch for all basin counties on August 10 as part of a statewide drought watch. On August 12, New York declared a drought watch for all basin counties as part of a drought watch in place for drought regions II and III. Pennsylvania declared drought watch for 36 counties including all basin counties except Chester and Lancaster Counties on August 31. The right panel of **Figure 19** shows the Drought Monitor (data courtesy of NOAA). The drought monitor is based on information about past precipitation, groundwater conditions, and other climatologic variables to define regions of drought. On August 30, the drought monitor indicated that most of the basin was experiencing abnormally dry conditions. Implementation of DRBC's drought management plan was not needed because the combine storage in the NYC reservoirs did not decrease to the drought watch level.

SUMMARY

The hydrologic conditions in the DRB for 2022 were characterized by two Nor'Easter storm systems that occurred in January and April, a dry summer period, and the remnants of Hurricane Ian which impacted the basin in October. Flooding occurred in lower basin tributaries as a result of runoff from precipitation after the April storm. Flows were below normal during the dry summer, and releases were made from upper and lower basin reservoirs to support flow objectives and thermal mitigation. Groundwater levels declined during the dry period and were in drought watch or warning levels by the end of August. New York, Pennsylvania and New Jersey declared drought watches during August for basin counties as a result of the dry conditions. The maximum location of the salt front was RM 79.5 on September 8. Conditions returned to normal by the end of the calendar year.

FIGURES

Figure 1: Annual Precipitation in 2022

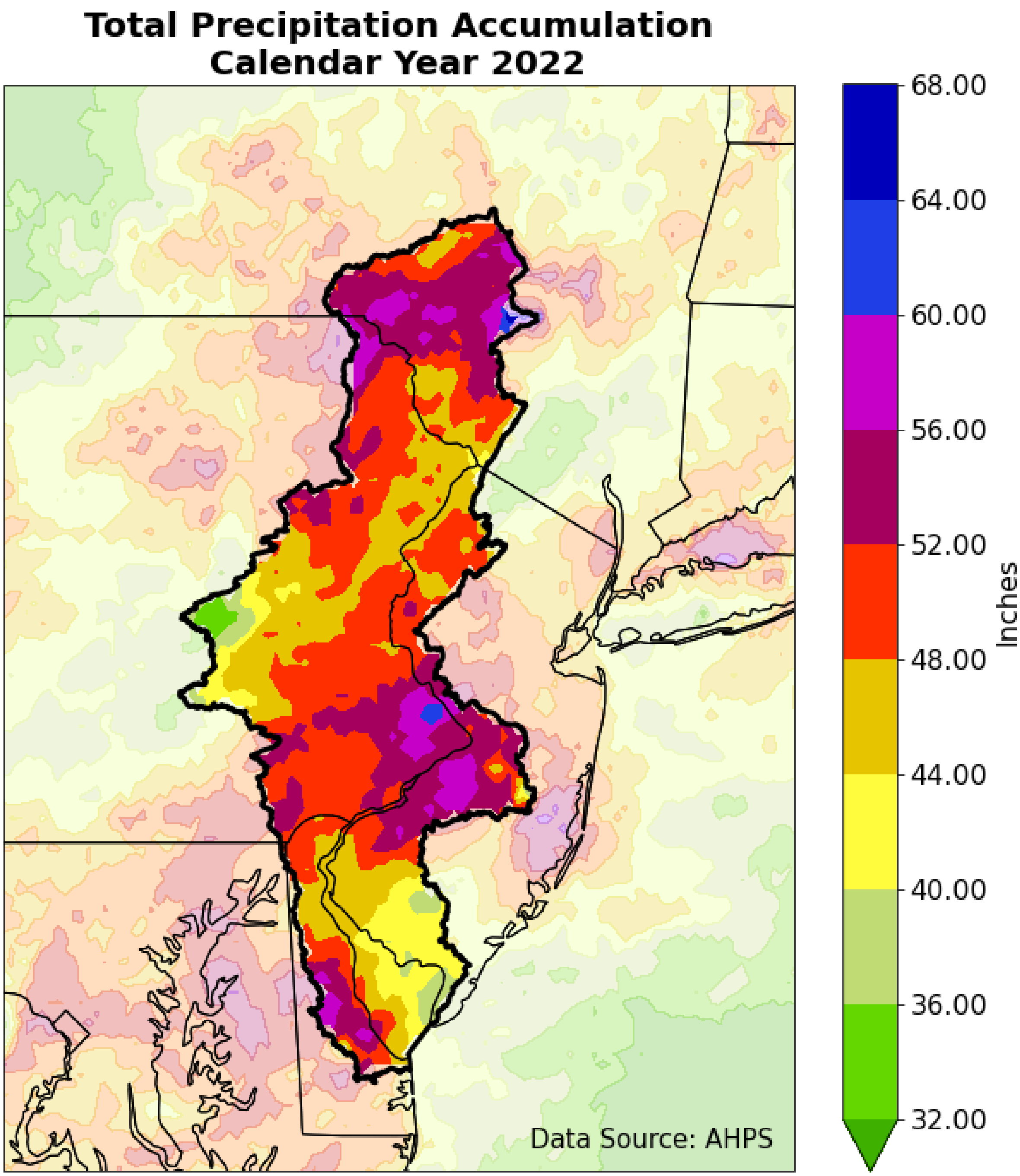


Figure 2: Monthly Precipitation at Nine Regional Weather Stations

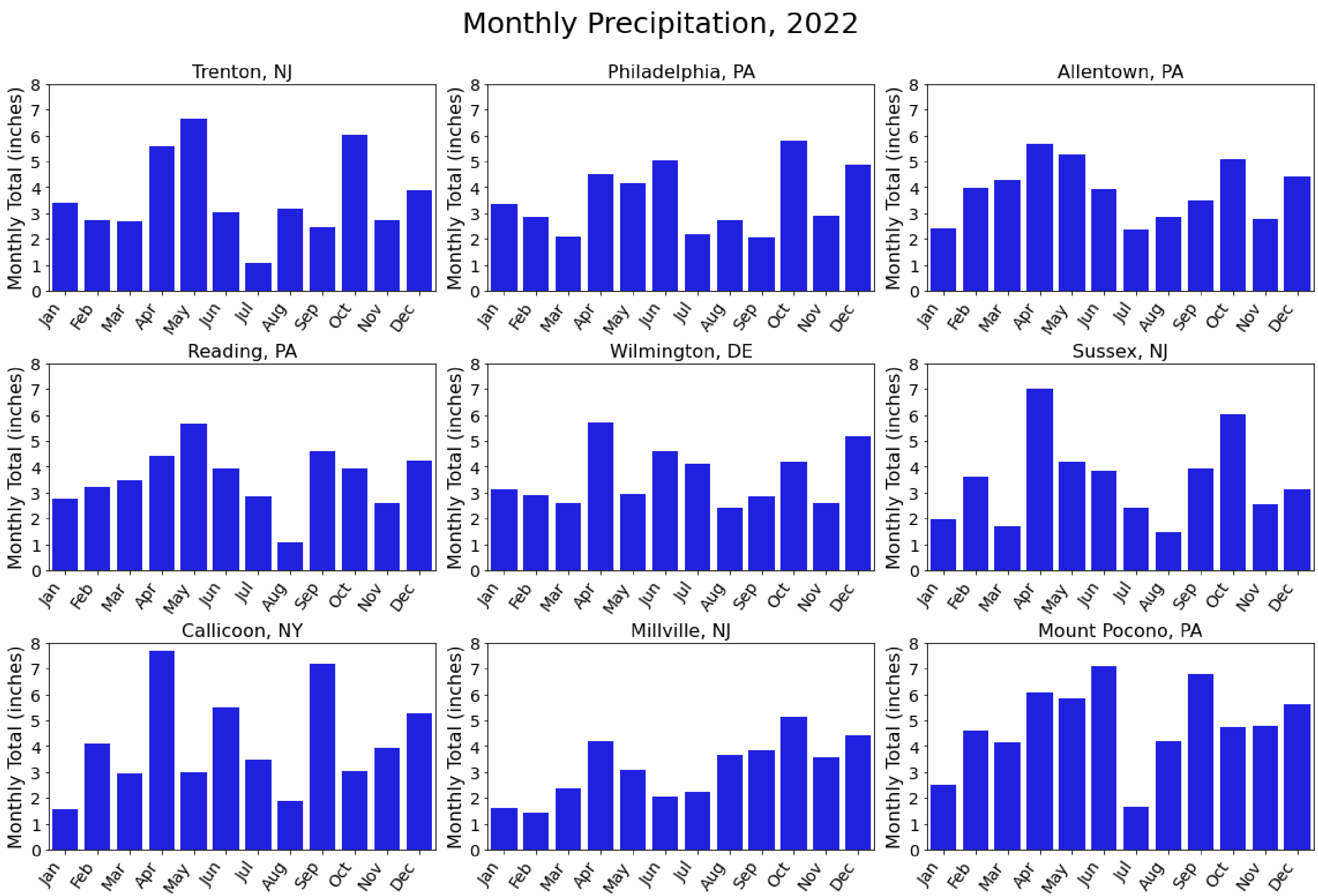


Figure 3: Basinwide Snow Cover after the January 30, 2022 Nor'Easter (Satellite imagery courtesy of NASA).

Figure 4: Accumulated Snowfall for the January 30, 2022 Nor'Easter

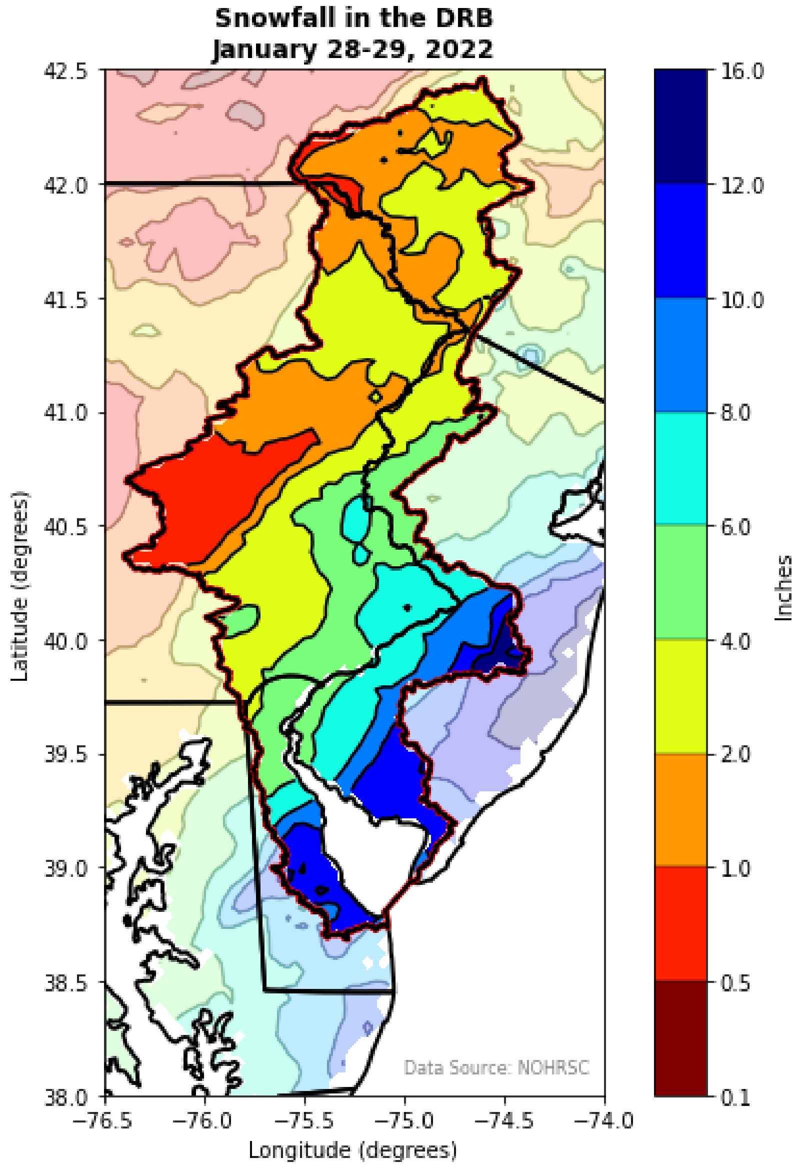


Figure 5: Total Snowfall for the 2021-2022 Winter

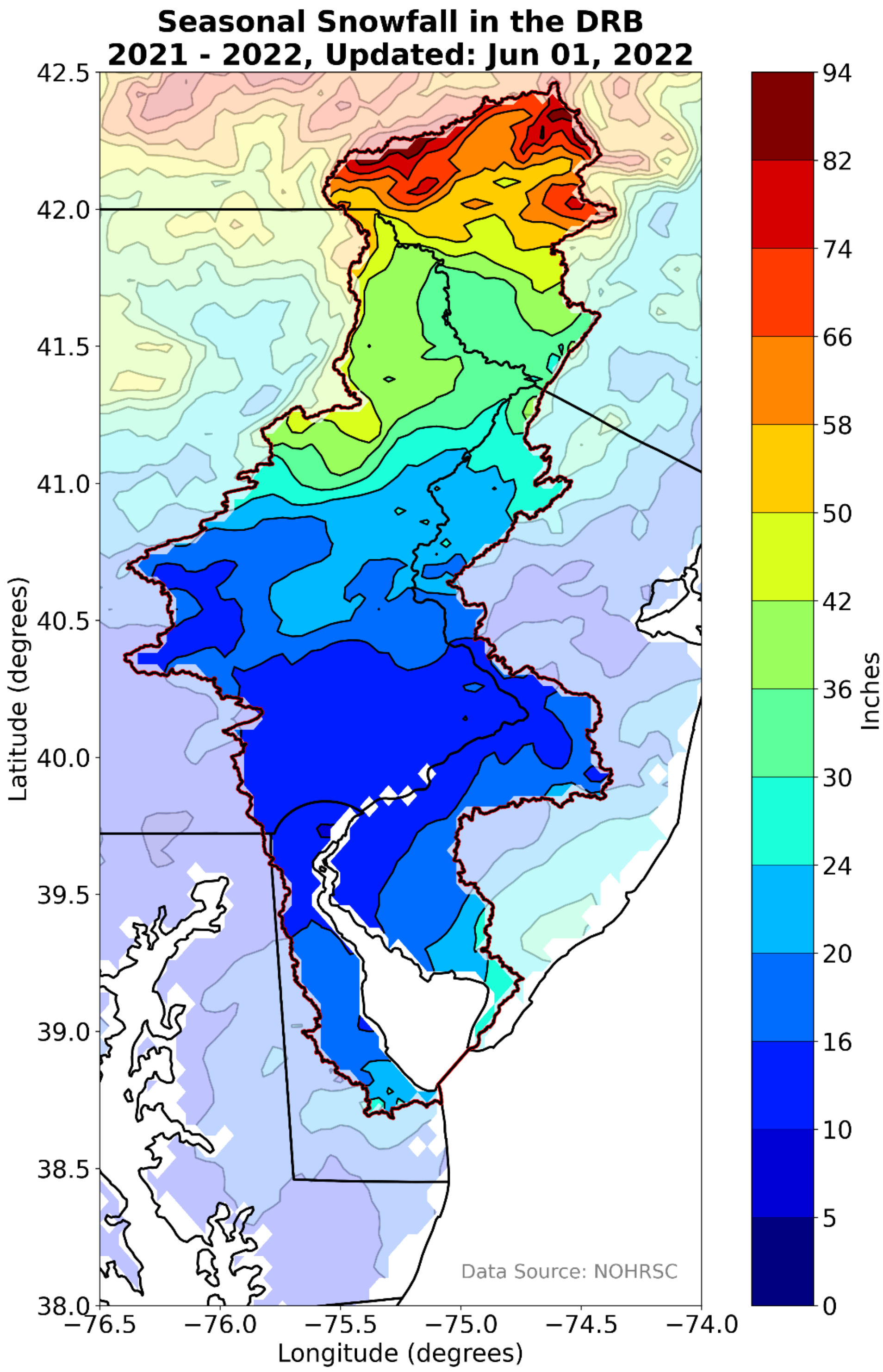


Figure 6: Total Precipitation from the April 18, 2022 Nor'Easter

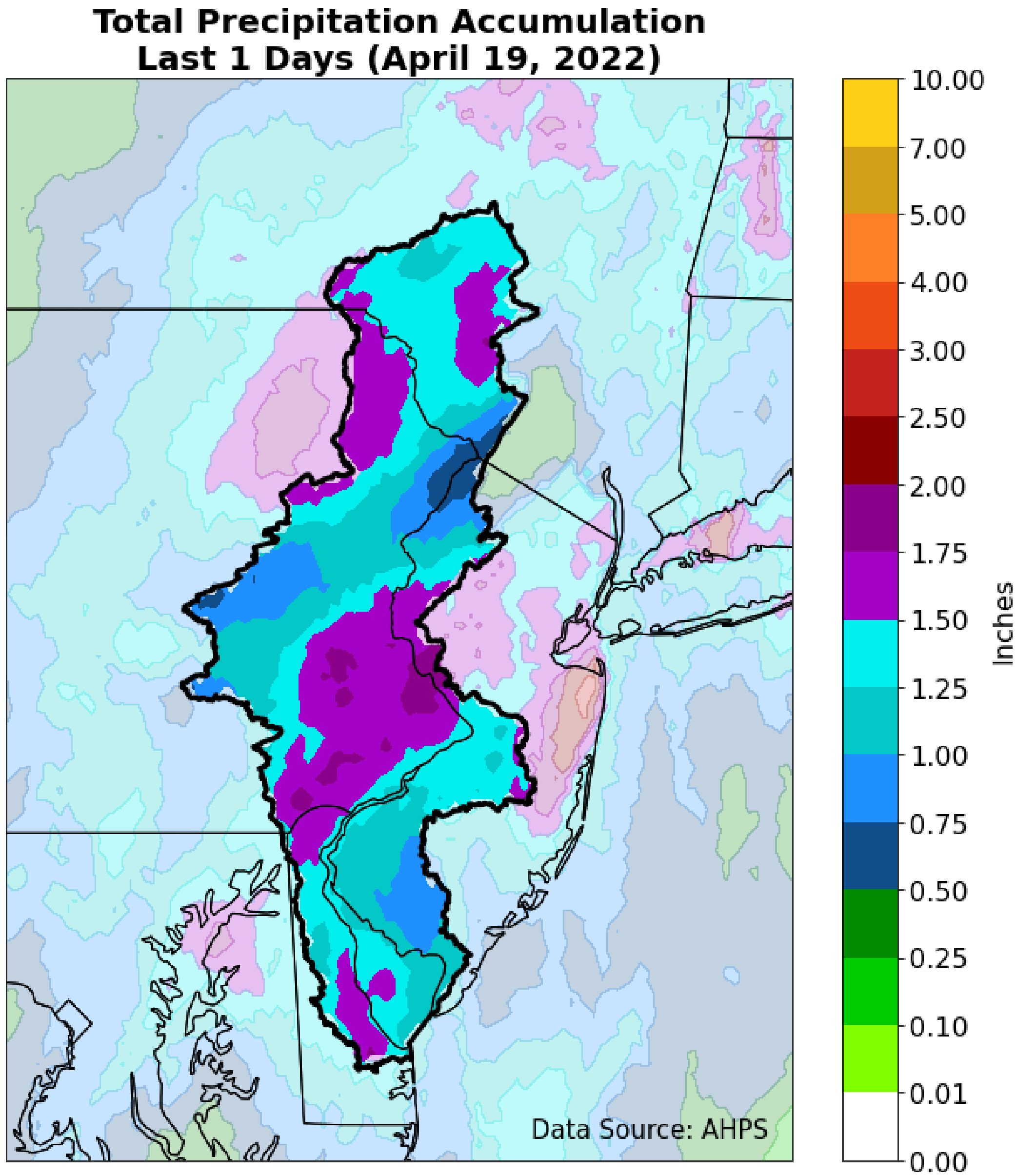


Figure 7: Remnants of Hurricane Ian East of the Basin on October 25, 2022 (Satellite Image: courtesy of NASA)

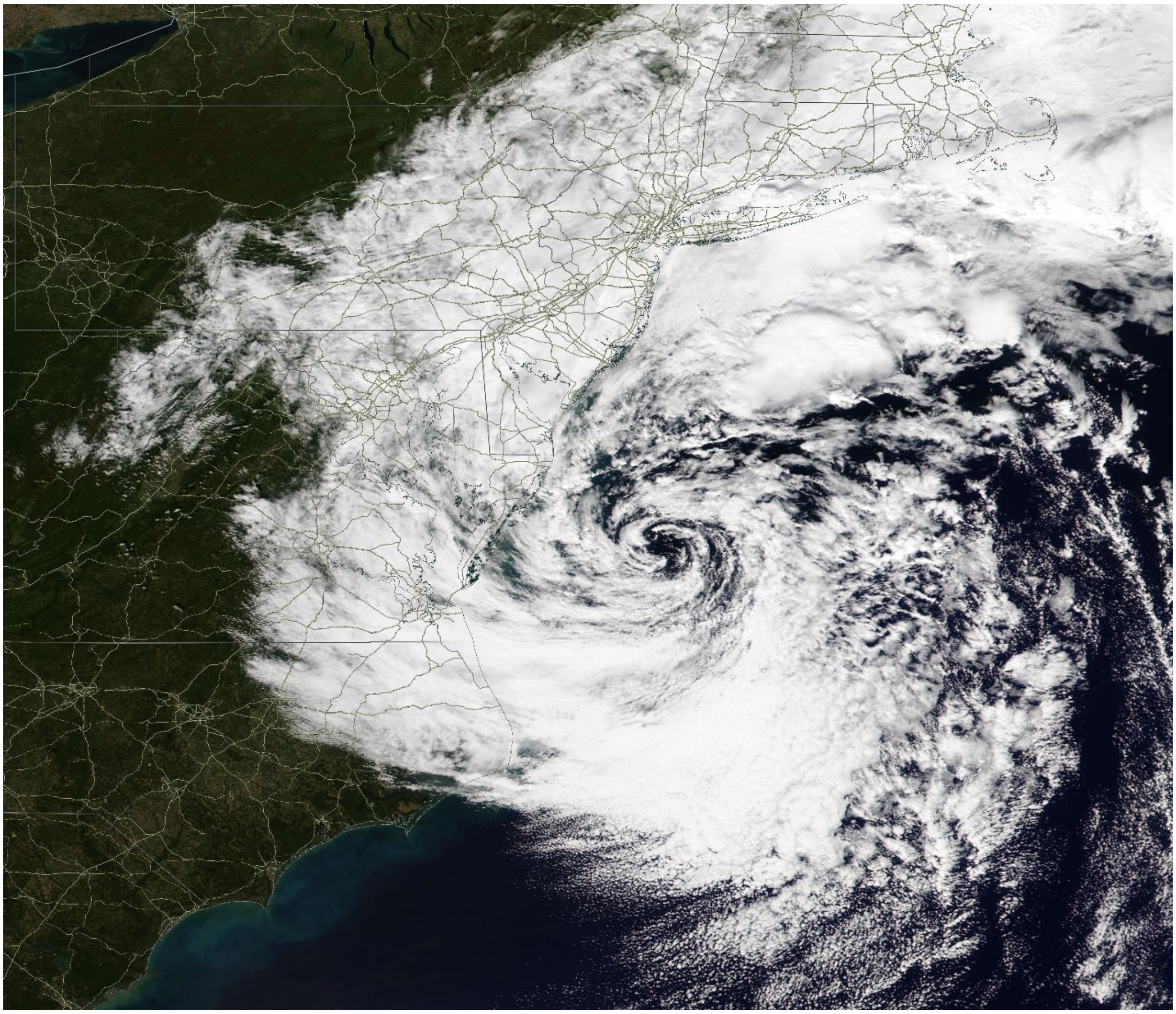


Figure 8: Total Precipitation from Hurricane Ian (September 30 and October 5, 2022)

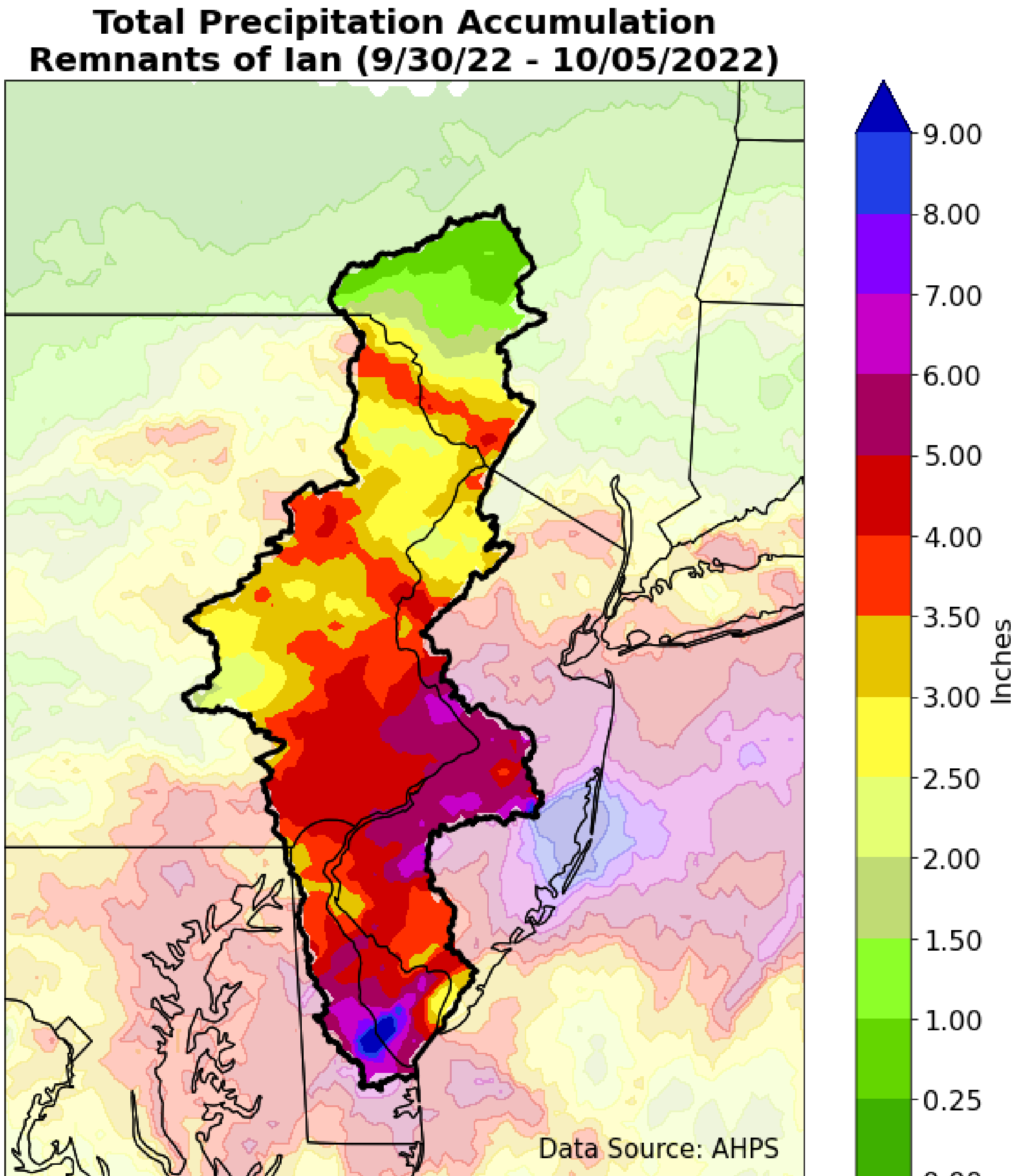


Figure 9: Streamflow and Percent of Normal Streamflow at Four Locations

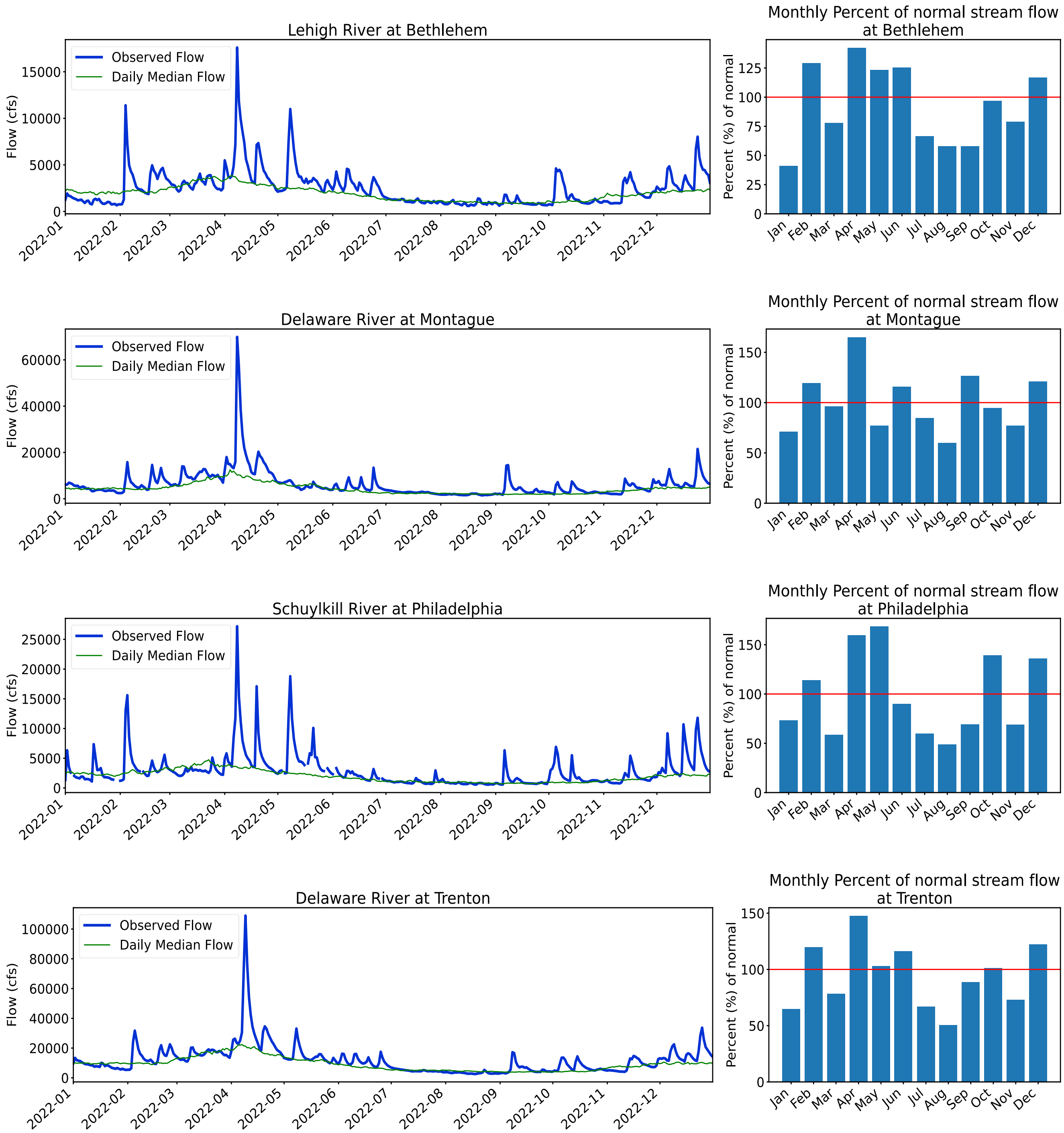


Figure 10: Beltzville Reservoir Storage

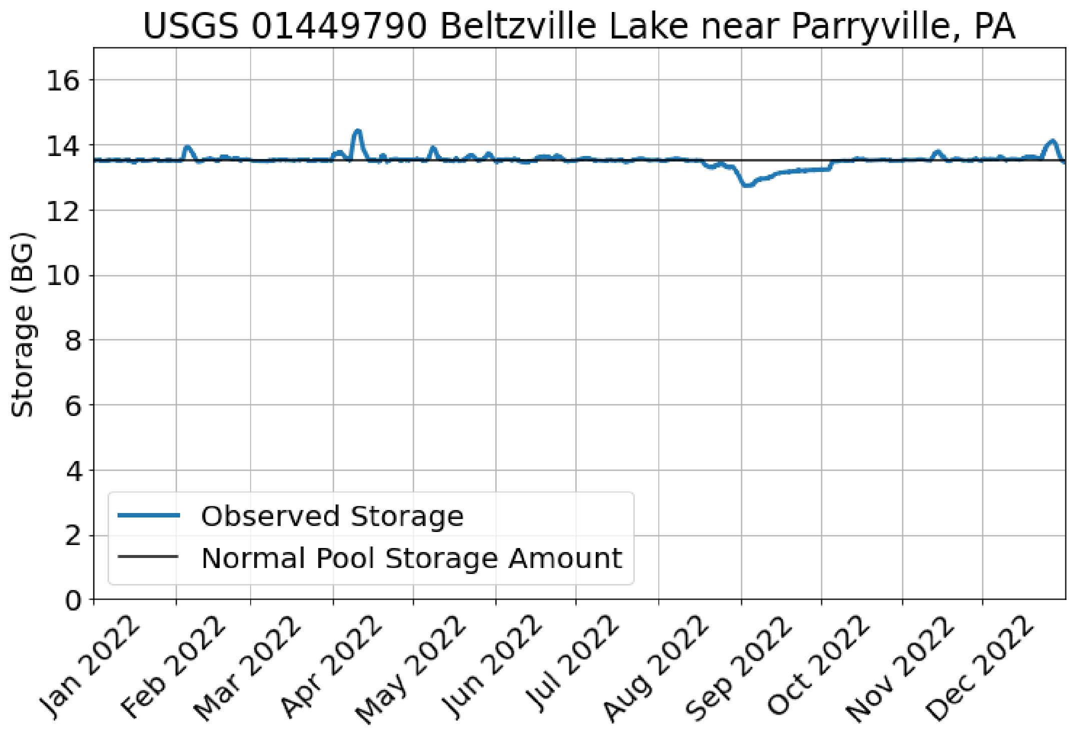


Figure 11: Blue Marsh Reservoir Storage.

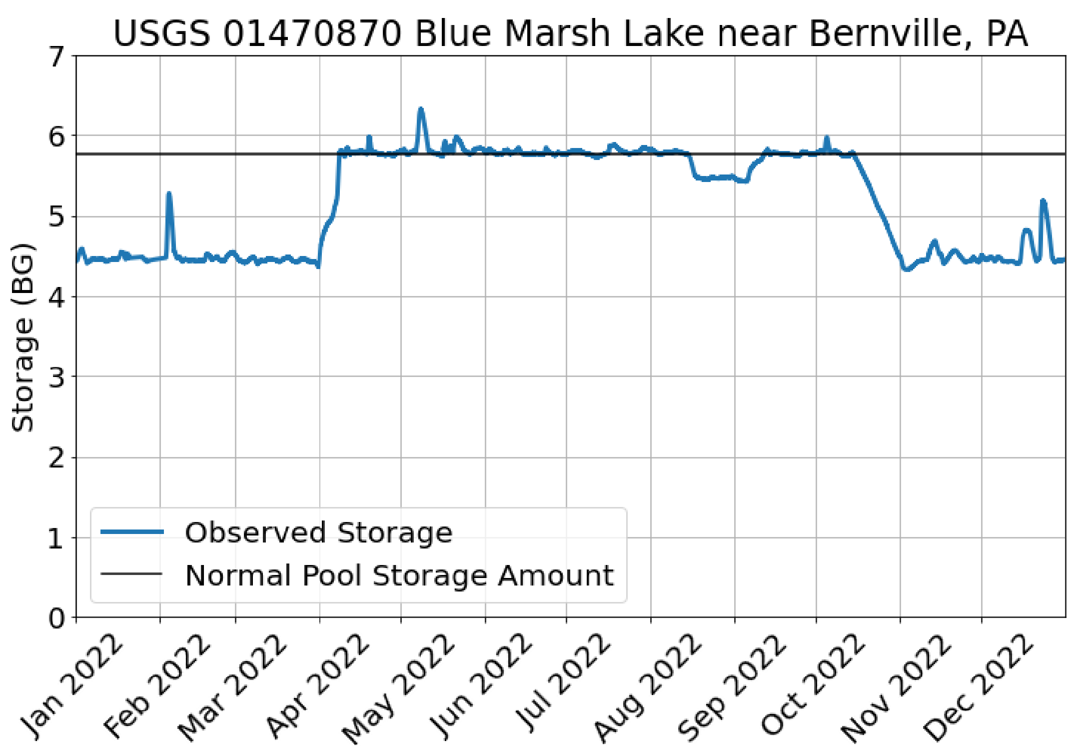


Figure 12: Combined Storage in the New York City Delaware River Basin Reservoirs (Cannonsville, Pepacton and Neversink).

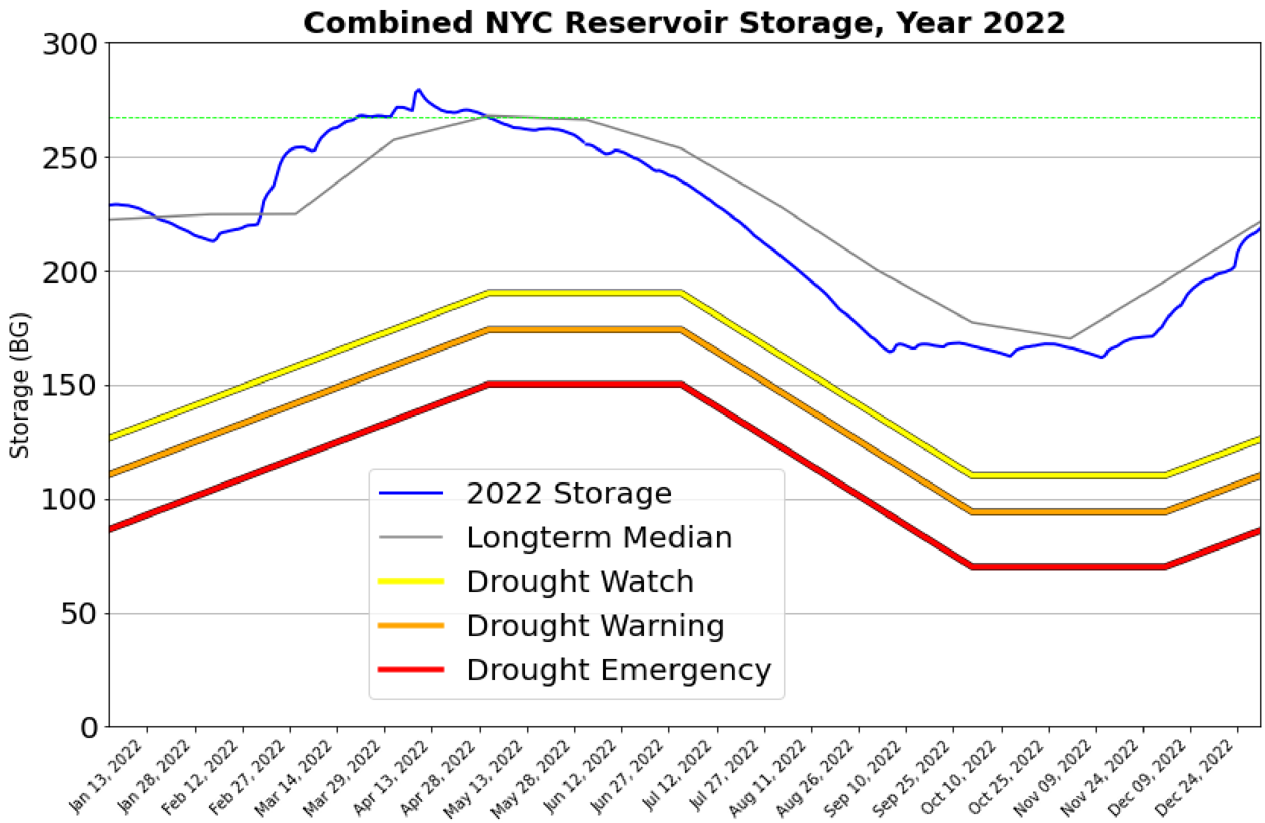
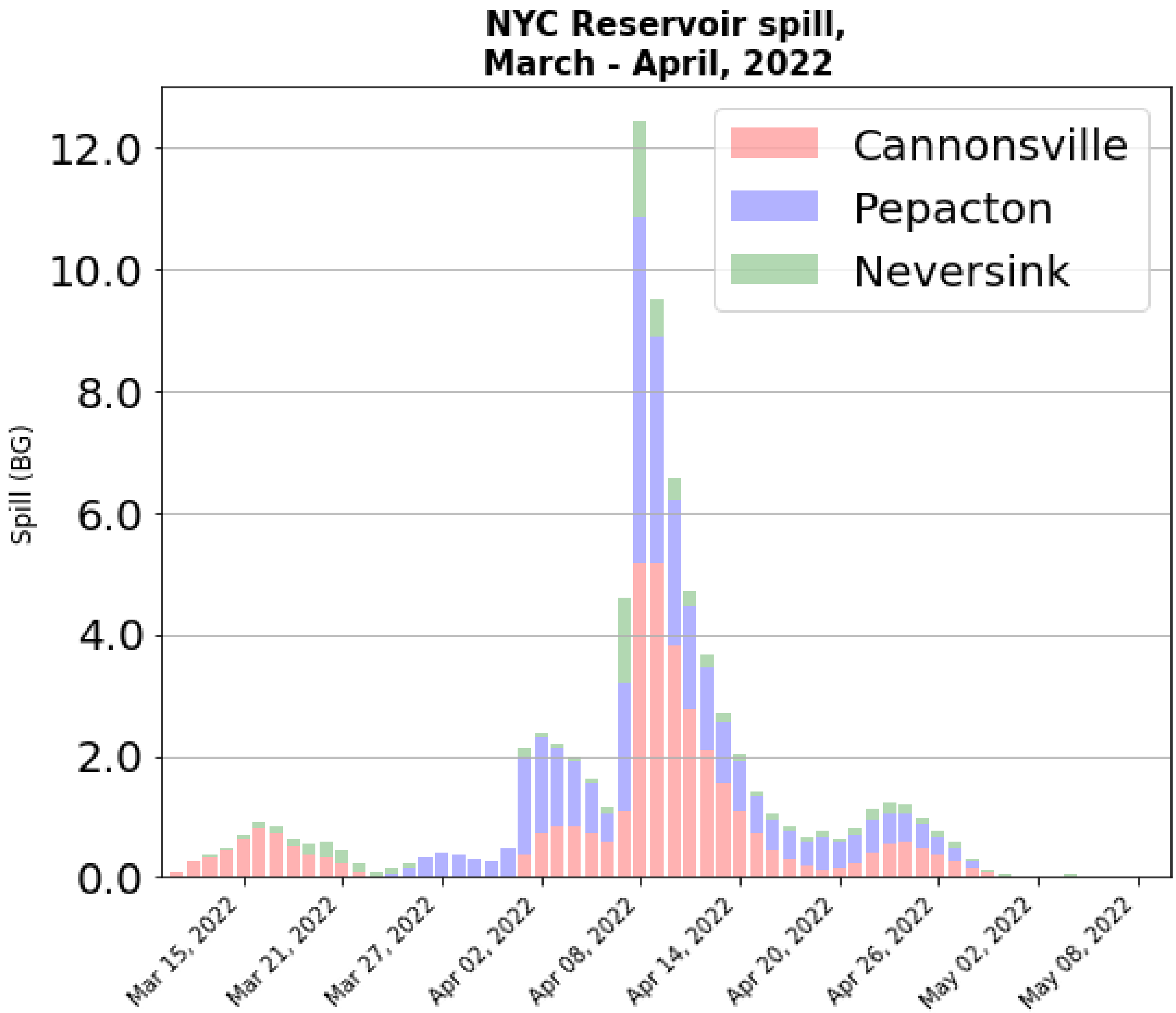


Figure 13: Spills during March and April from Cannonsville, Pepacton, and Neversink Reservoirs.



The total amount spilled over the period was approximately 79.2 BG.

Figure 14: Groundwater Levels, Woodbourne, New York

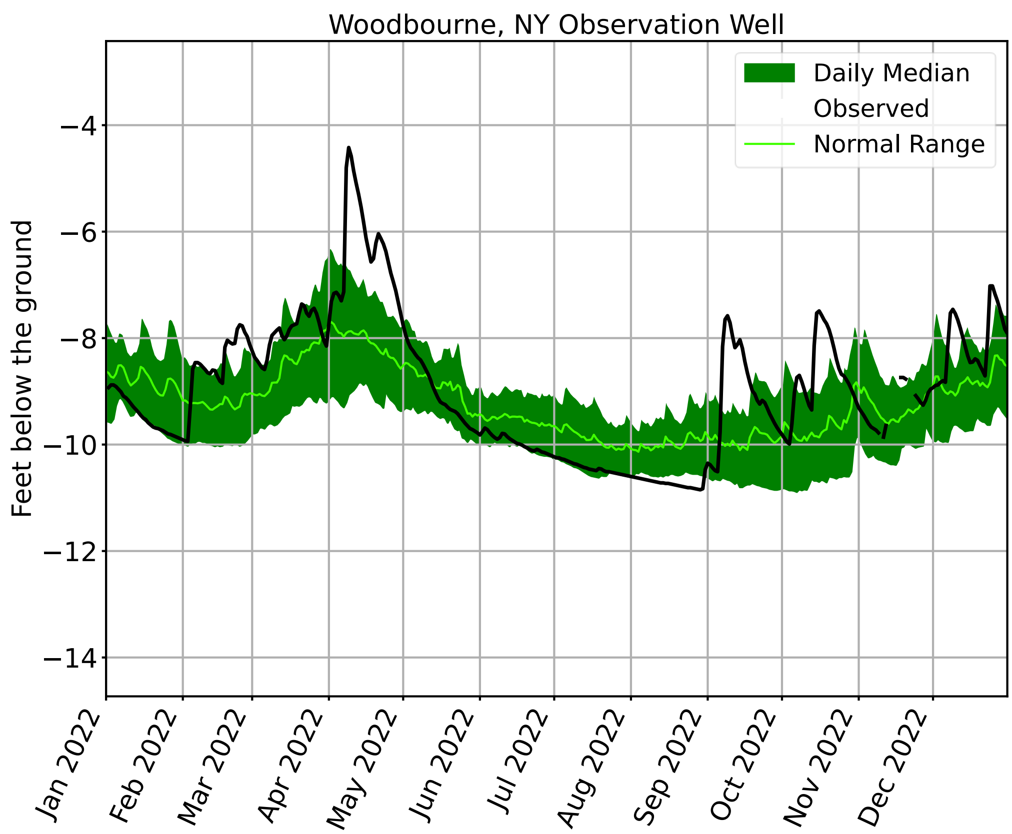


Figure 15: Groundwater Levels in Pennsylvania

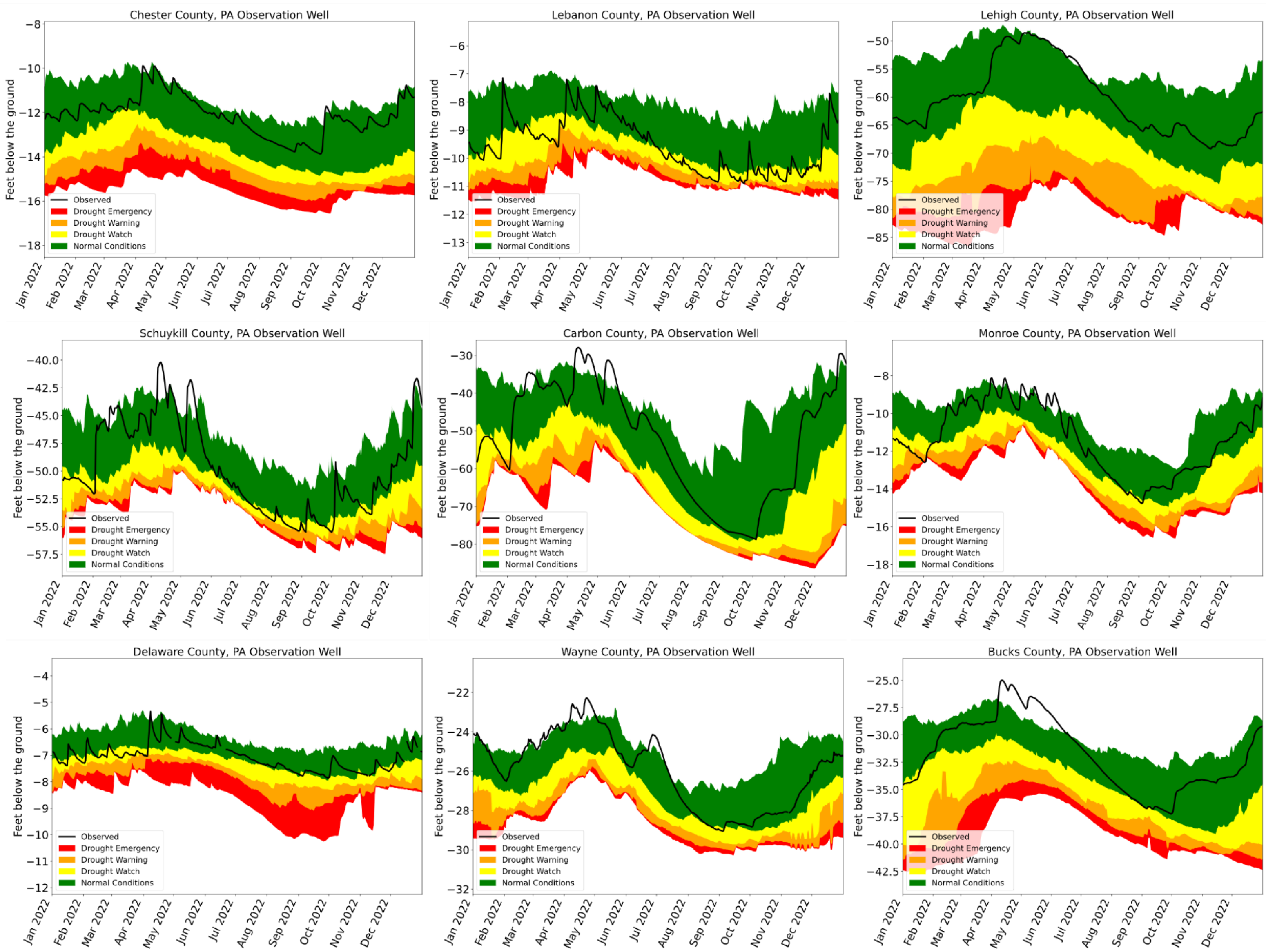


Figure 16: Groundwater Levels in New Jersey

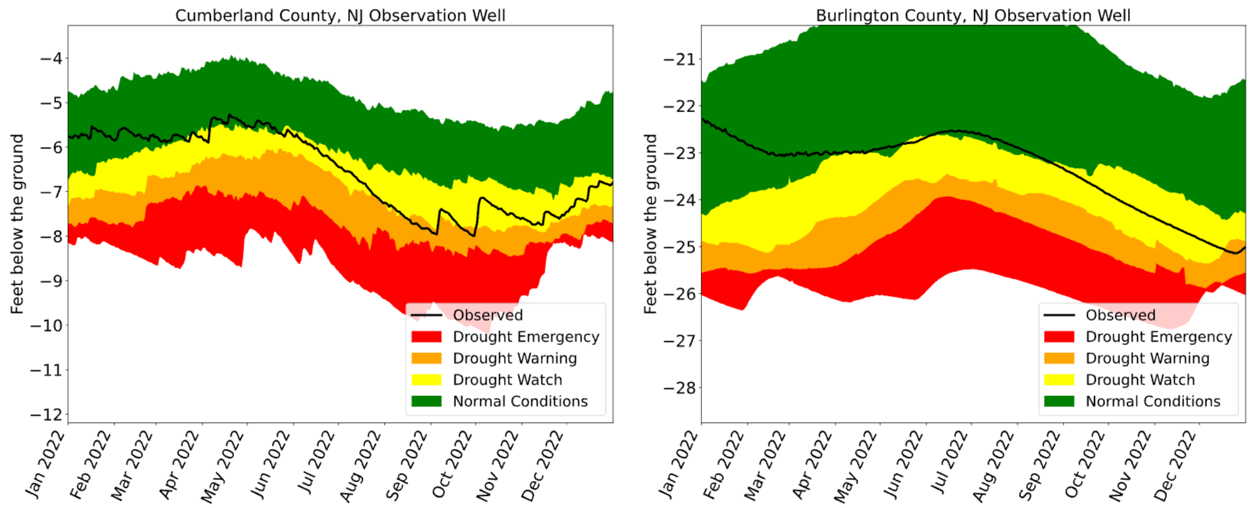


Figure 17: Groundwater Levels in New Castle County, Delaware

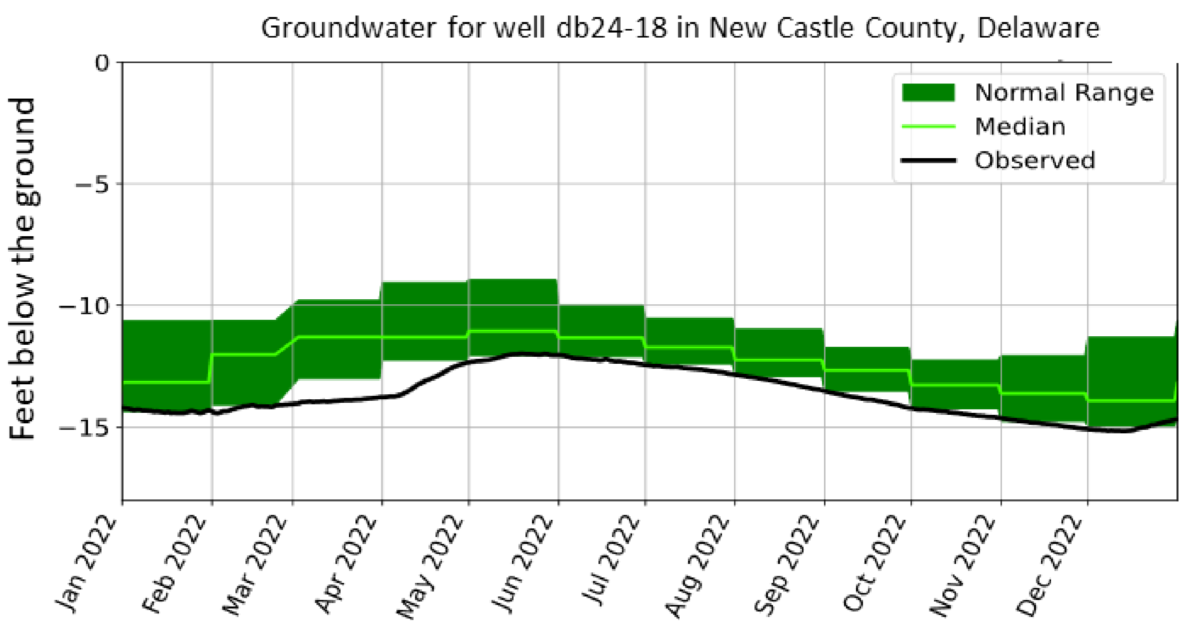


Figure 18: The Salt Front Location

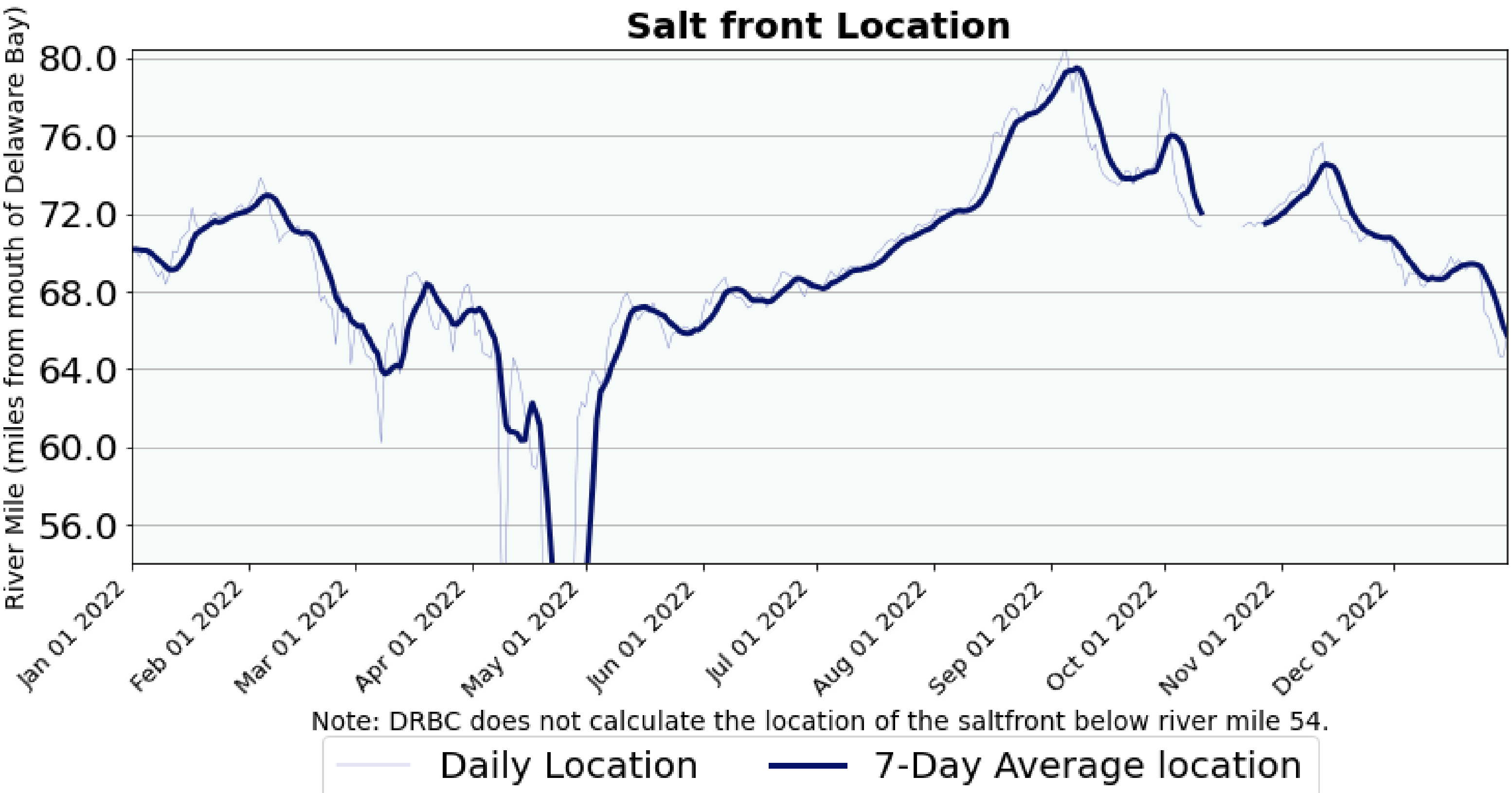
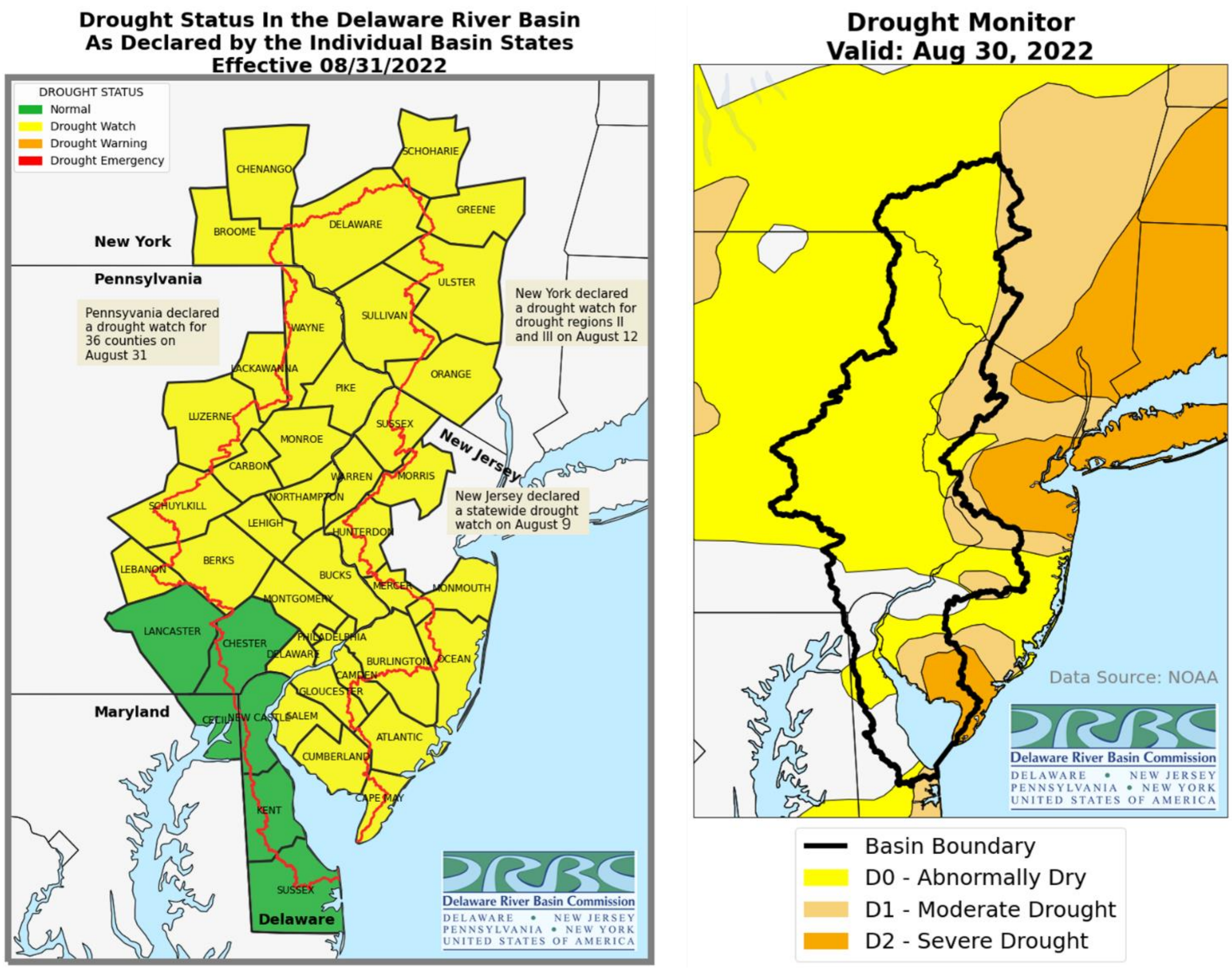


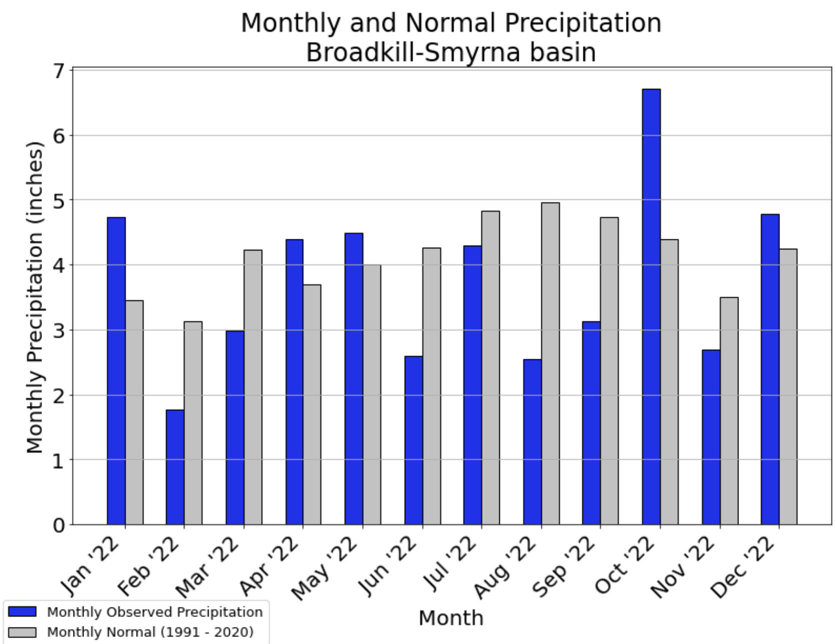
Figure 19: Drought Status in the Delaware River Basin.

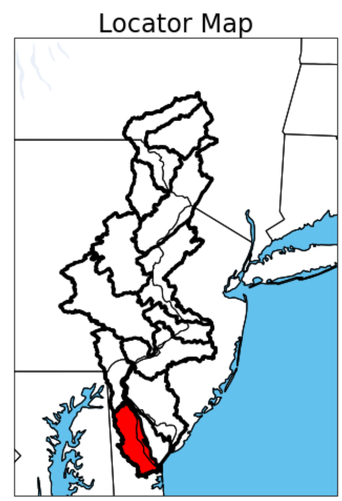


Left: Map of all counties partly or completely contained within the DRB, colored based on drought status as declared by individual basin states. On this map, the red line represents the boundary of the basin | Right: Drought monitor from August 30, 2022 shows that most of the basin was Abnormally Dry with some areas classified as in Moderate and Severe drought.

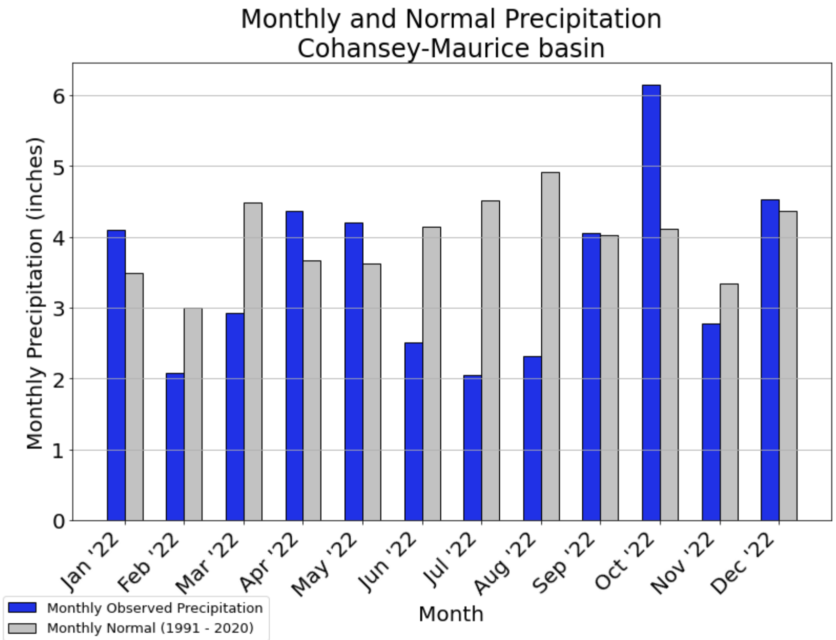
APPENDIX A: MONTHLY PRECIPITAITON COMPARED TO NORMAL

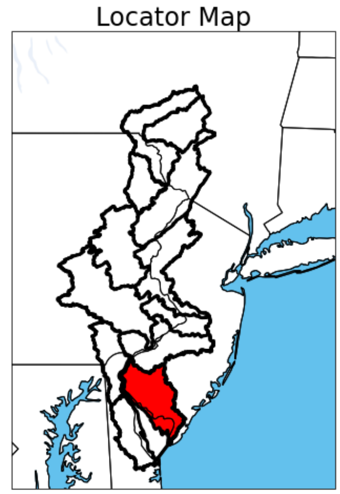
The following Figures present a comparison of observed monthly precipitation to normal monthly precipitation in twelve hydrologic regions across the DRB, as defined by the Hydrologic Unit Code system (HUC) at the eight-digit scale. The Applied Climate Information System (ACIS) is a service provided by the Northeast Regional Climate Center (NRCC), which compiles daily meteorological records from across the United States. The monthly total and normal are calculated using the daily average of precipitation stations within each HUC. In the Figures below, the observed precipitation for the year is depicted by dark blue bars, while the grey bars represent the normal precipitation using the 30-year period from 1991 to 2020, in accordance with NOAA's current definition of normal precipitation. a locator map accompanies each Figure.



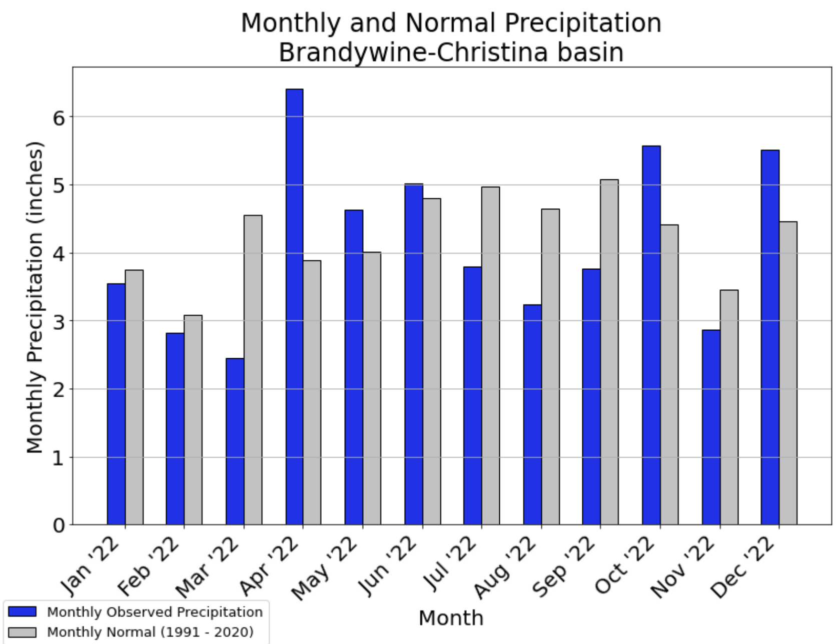


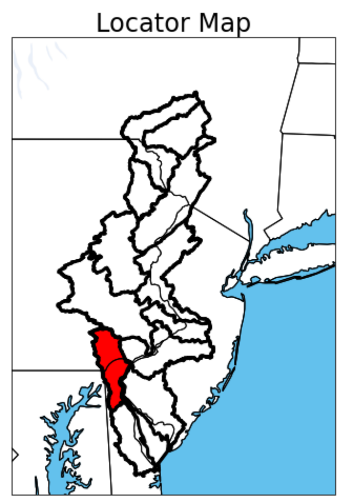
Source: ACIS, USGS HUC: 02040207
Monthly Normal is based of 2 stations in the Broadkill-Smyrna basin



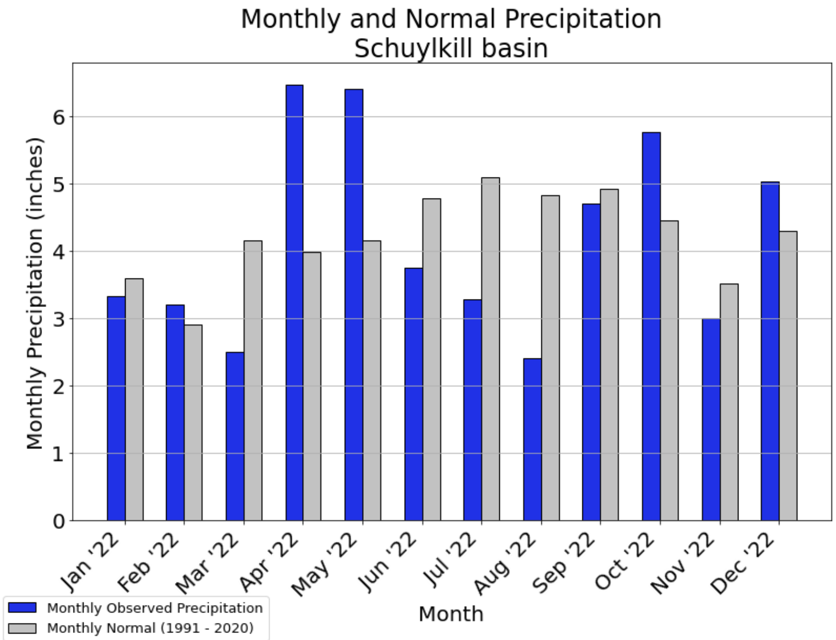


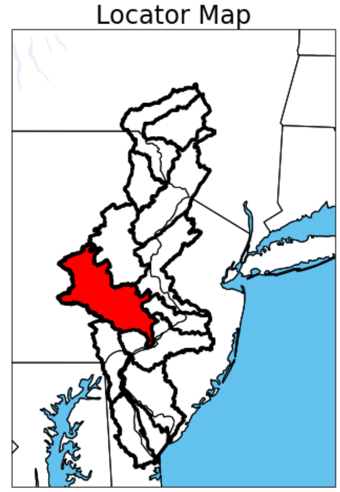
Source: ACIS, USGS HUC: 02040206
Monthly Normal is based of 3 stations in the Cohansey-Maurice basin



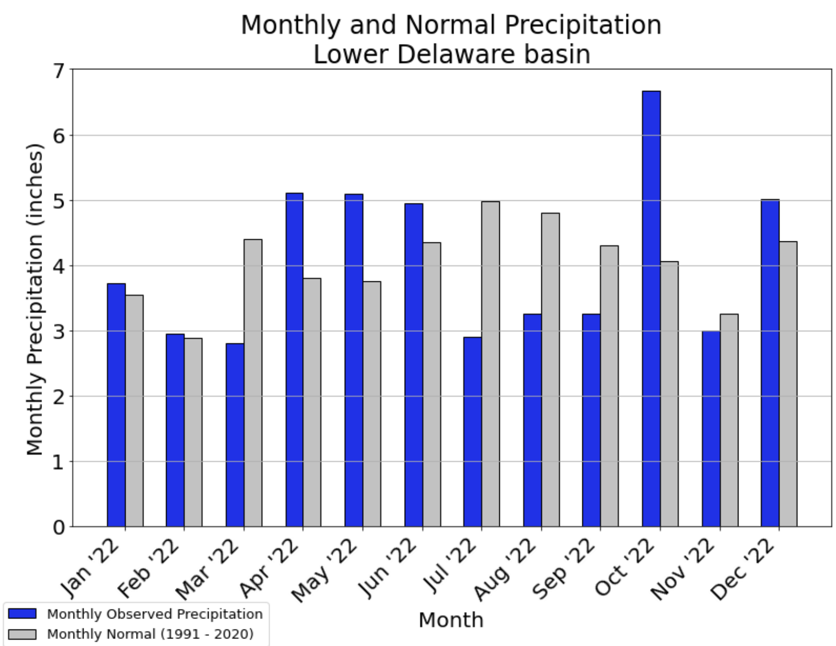


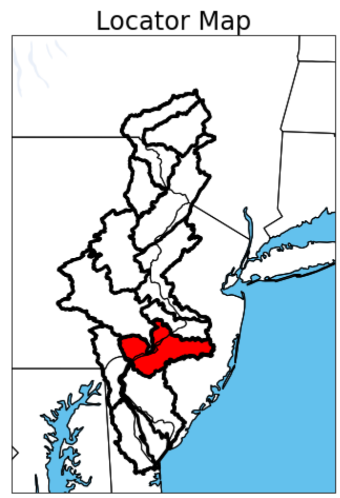
Source: ACIS, USGS HUC: 02040205
Monthly Normal is based of 6 stations in the Brandywine-Christina basin



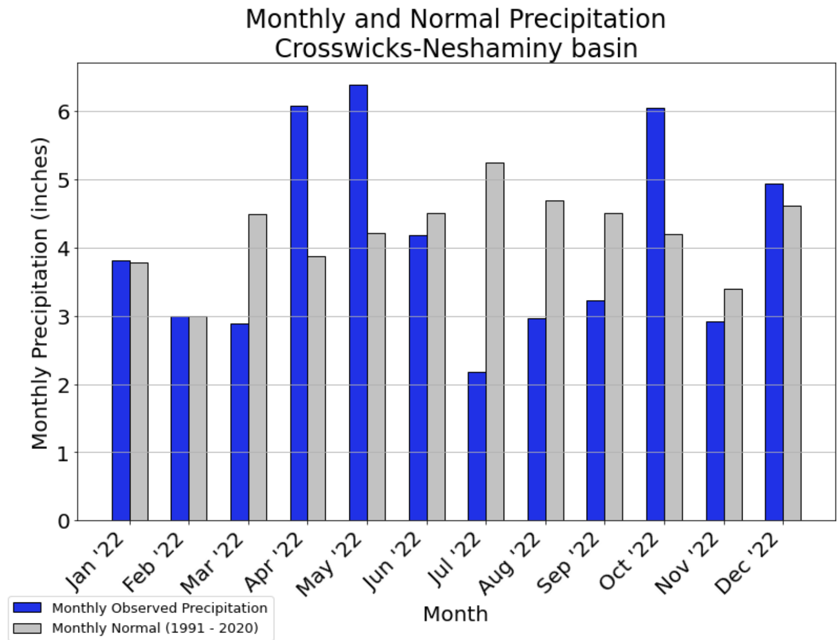


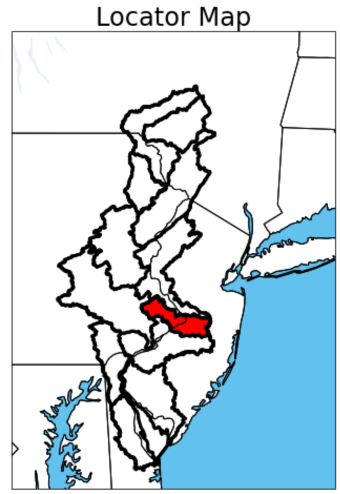
Source: ACIS, USGS HUC: 02040203
Monthly Normal is based of 19 stations in the Schuylkill basin



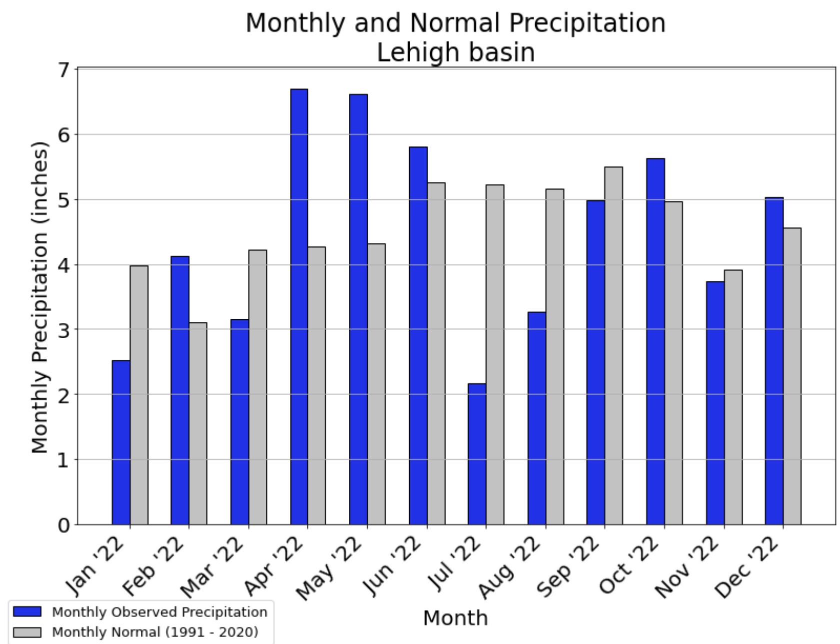


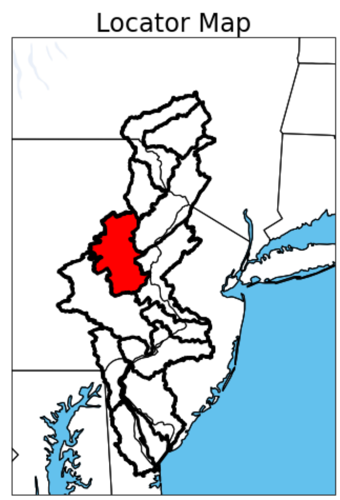
Source: ACIS, USGS HUC: 02040202
Monthly Normal is based of 8 stations in the Lower Delaware basin



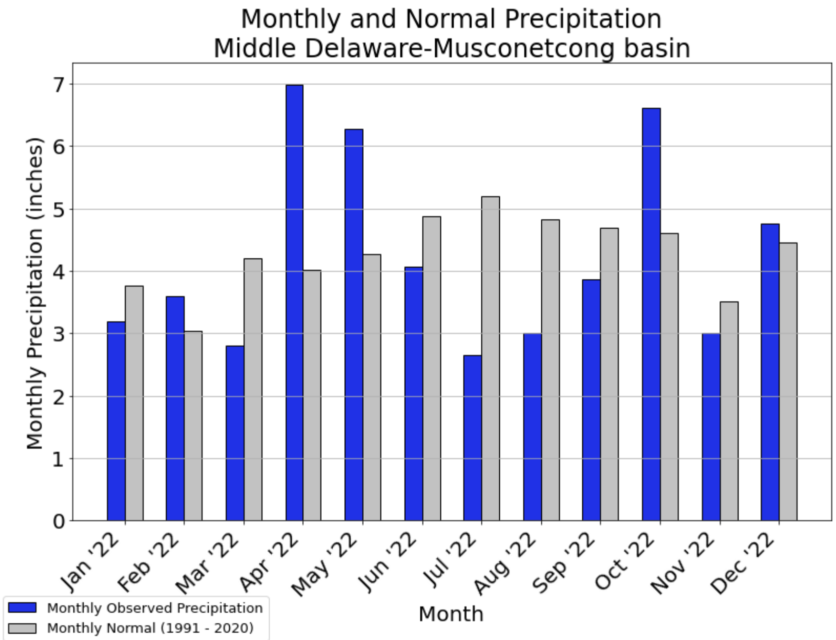


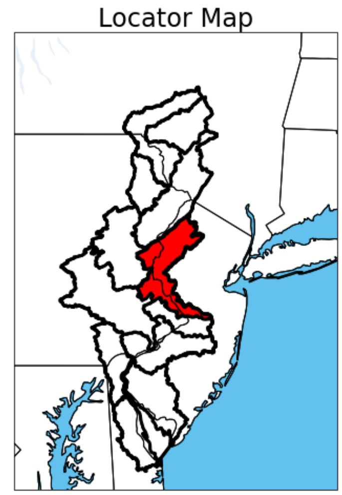
Source: ACIS, USGS HUC: 02040201
Monthly Normal is based of 5 stations in the Crosswicks-Neshaminy basin



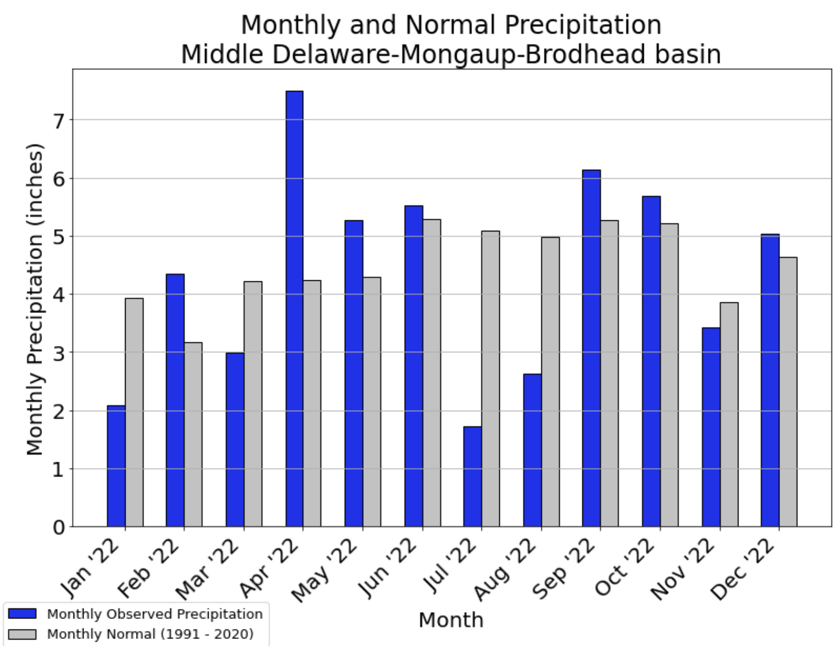


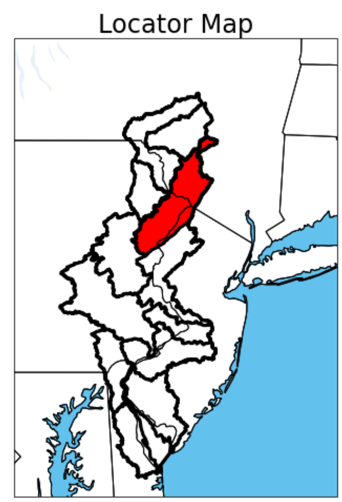
Source: ACIS, USGS HUC: 02040106
Monthly Normal is based of 7 stations in the Lehigh basin



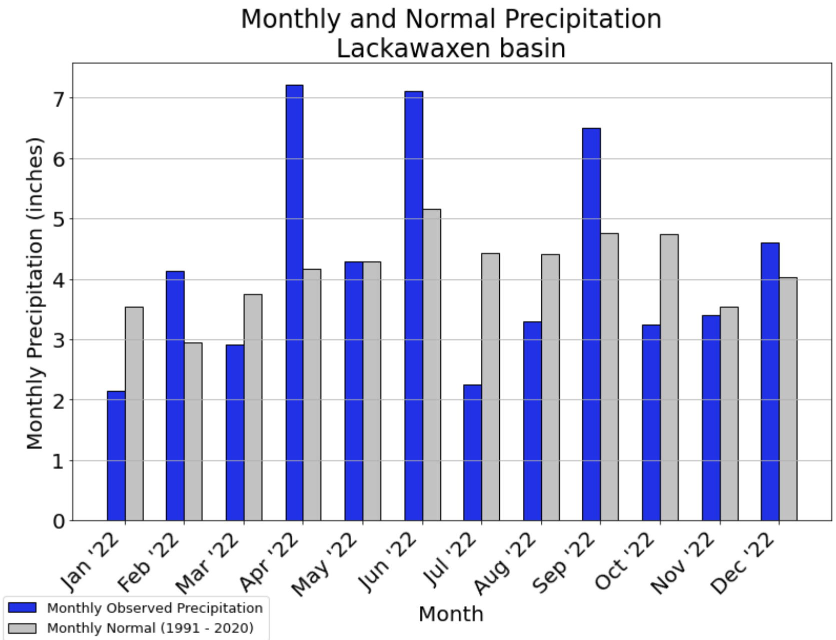


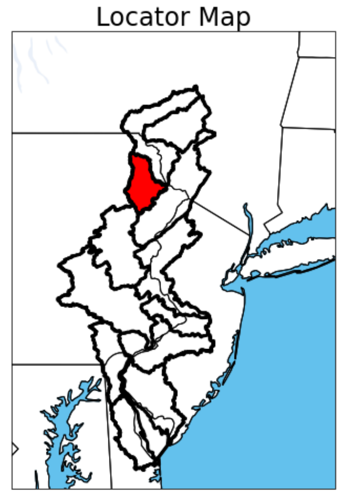
Source: ACIS, USGS HUC: 02040105
Monthly Normal is based of 8 stations in the Middle Delaware-Musconetcong basin



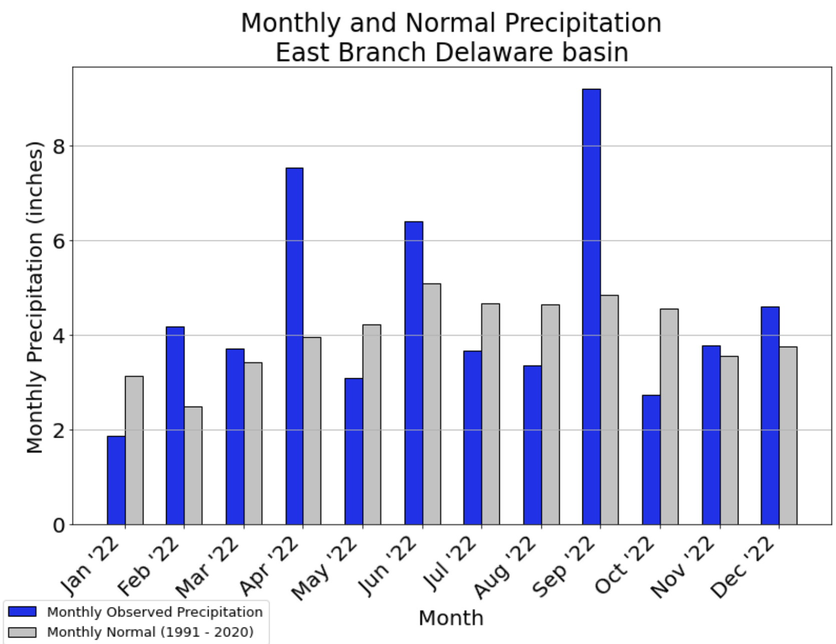


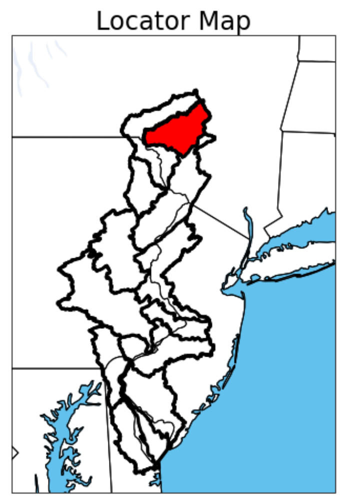
Source: ACIS, USGS HUC: 02040104
Monthly Normal is based of 6 stations in the Middle Delaware-Mongaup-Brodhead basin



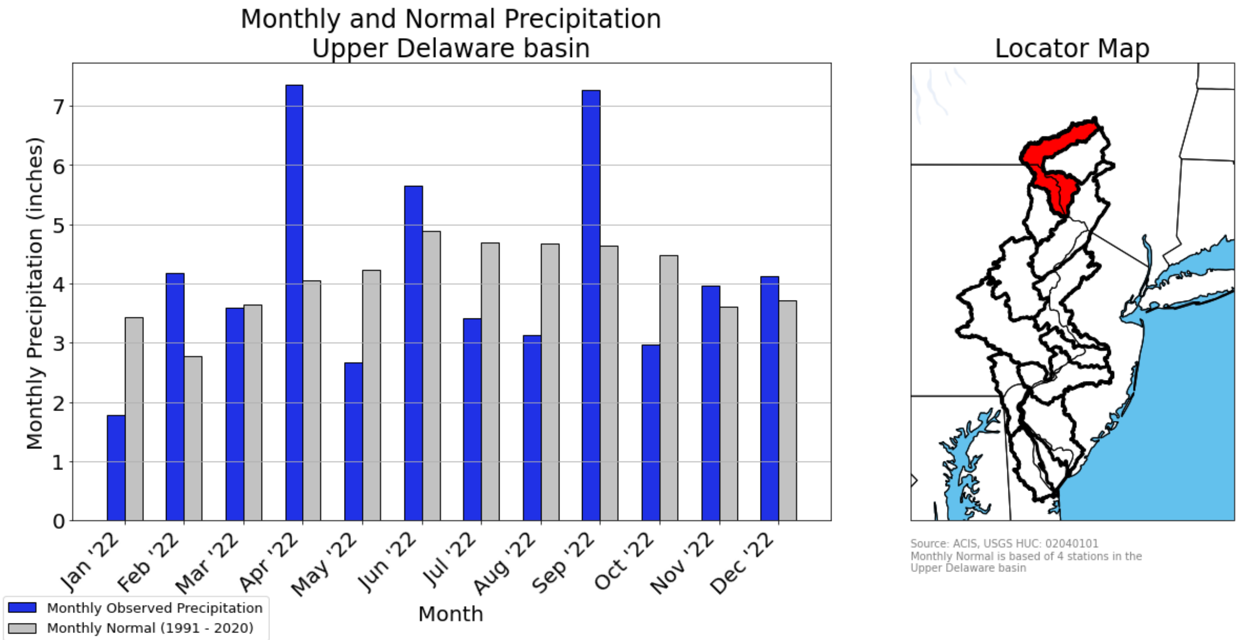


Source: ACIS, USGS HUC: 02040103
Monthly Normal is based of 2 stations in the
Lackawaxen basin





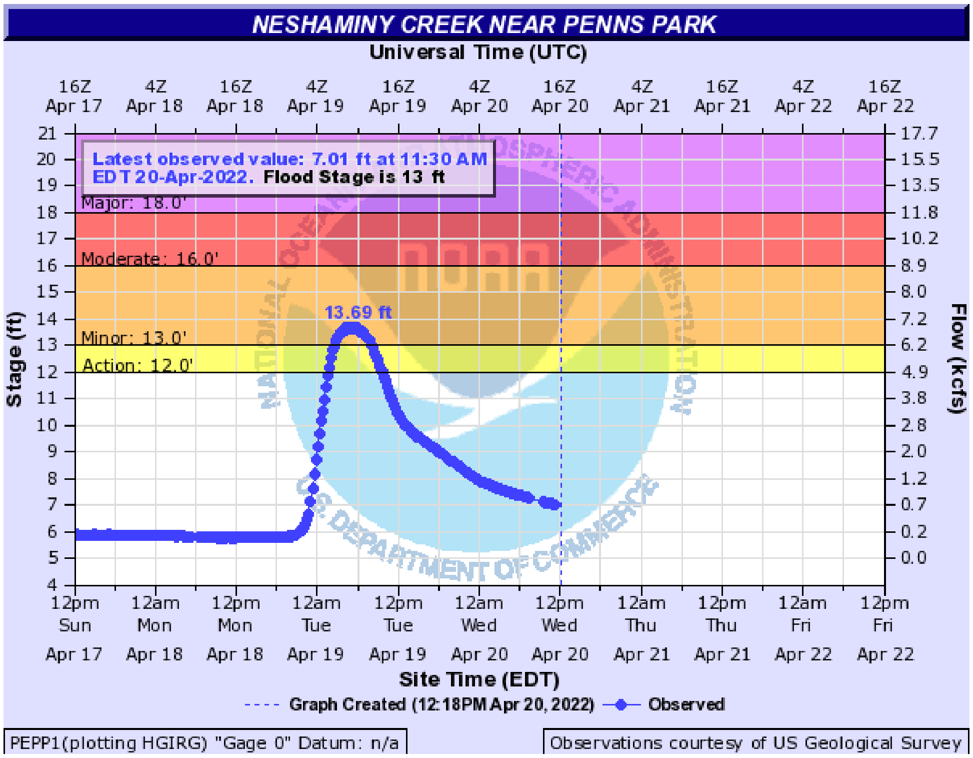
Source: ACIS, USGS HUC: 02040102
Monthly Normal is based of 1 stations in the
East Branch Delaware basin

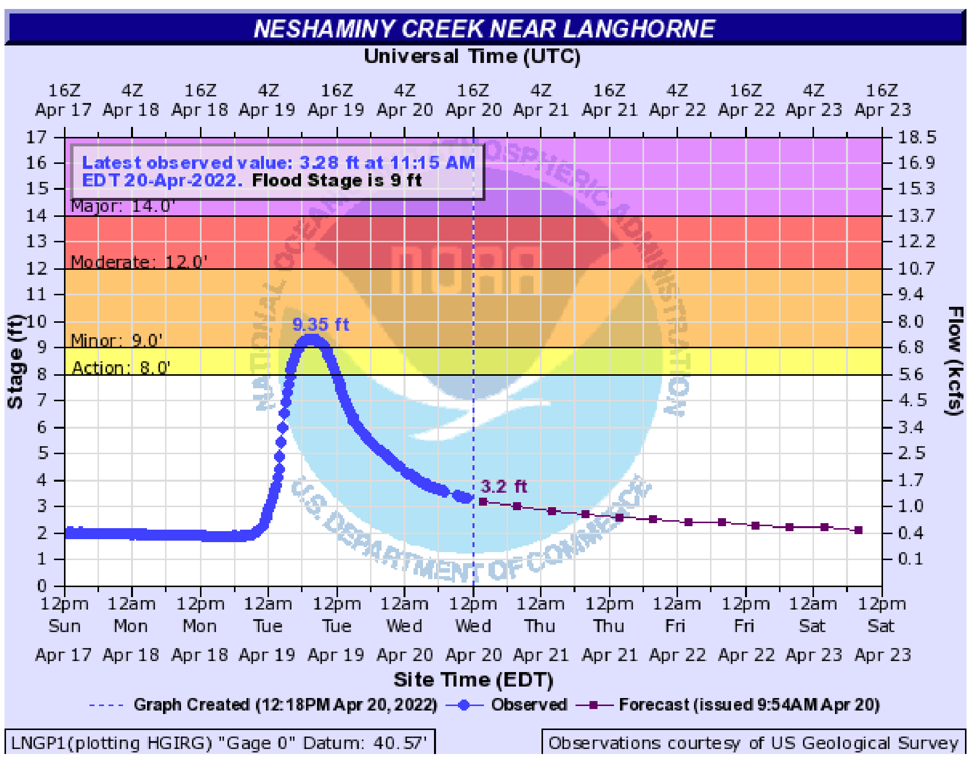

Monthly and Normal Precipitation
Upper Delaware basin
Monthly Precipitation (inches)
Month
Jan '22
Feb '22
Mar '22
Apr '22
May '22
Jun '22
Jul '22
Aug '22
Sep '22
Oct '22
Nov '22
Dec '22
Monthly Observed Precipitation
Monthly Normal (1991 - 2020)
Locator Map
Source: ACIS, USGS HUC: 02040101
Monthly Normal is based of 4 stations in the
Upper Delaware basin

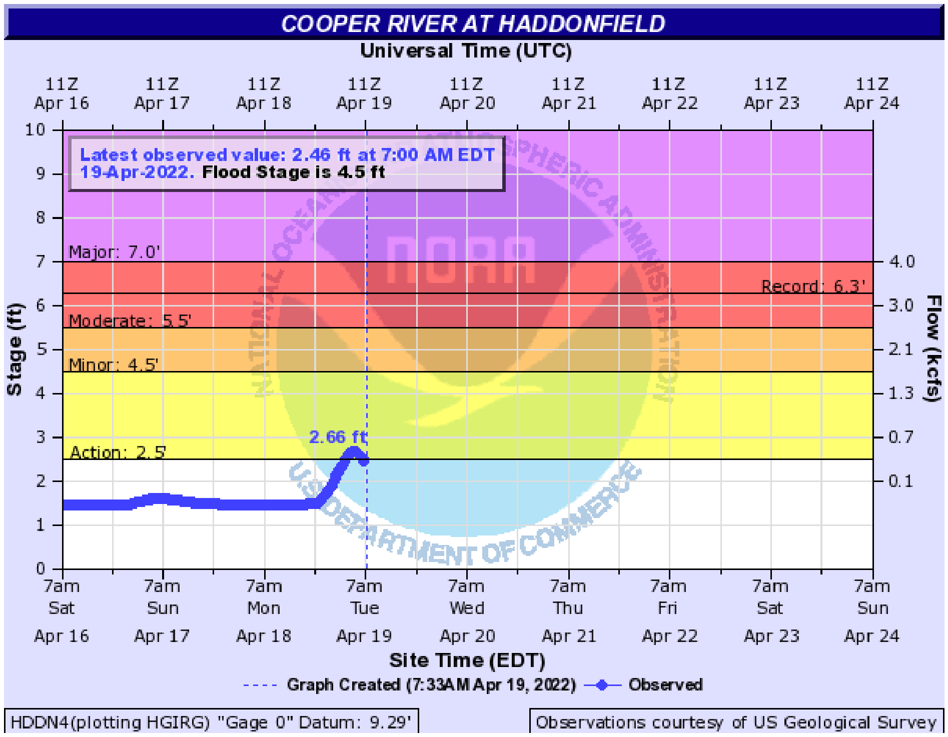
APPENDIX B: HYDROGRAHPS FOR THE APRIL 18-19 NOR'EASTER

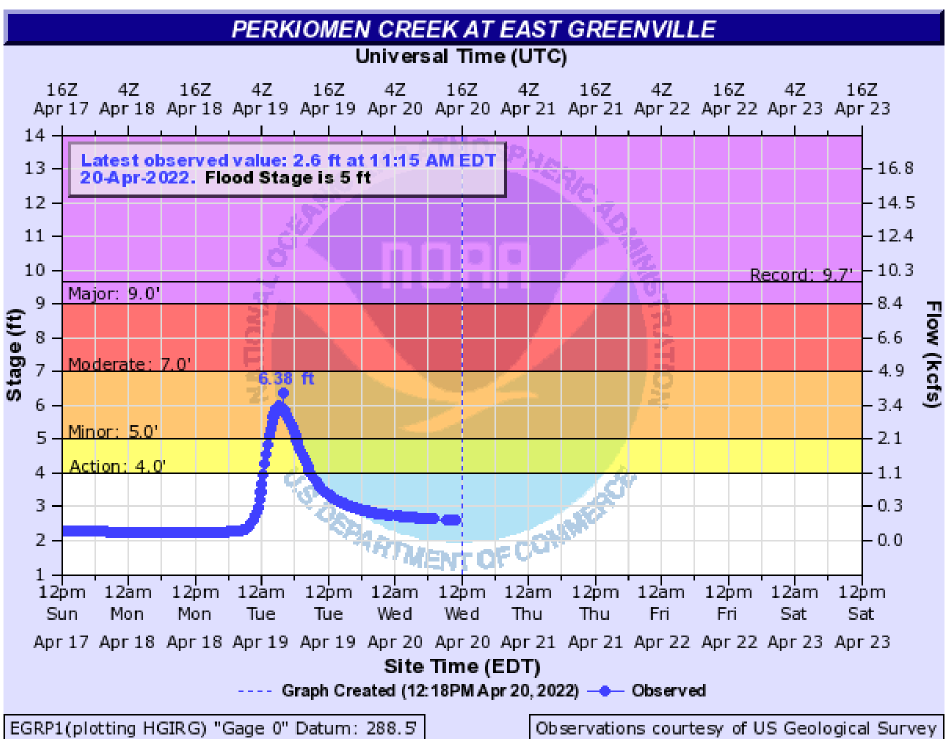
Table B1: NWS Forecast Locations with Levels at Action or Minor Flood Stage

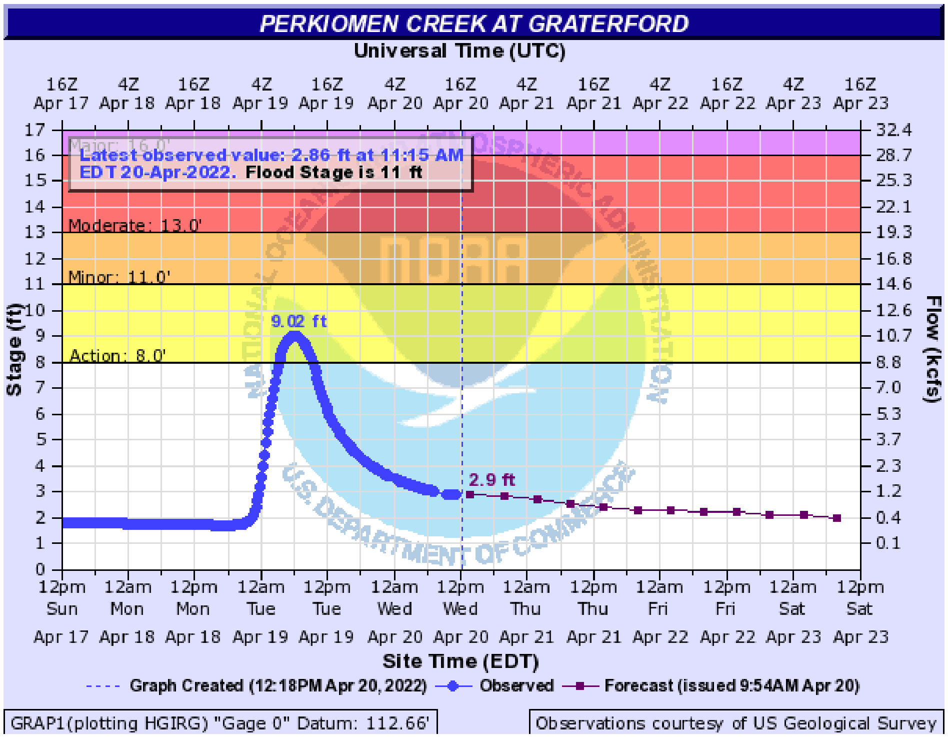
NWS Flood Forecast Location	Type	Peak	Stage
Neshaminy Creek near Penns Park	Stream	13.69 ft	Minor
Neshaminy Creek at Langhorne	Stream	9.35 ft	Minor
Cooper River at Haddonfield	Stream	2.66 ft	Action
Perkiomen Creek at East Greensville	Stream	6.1 ft *	Minor
Perkiomen Creek at Graterford	Stream	9.02 ft	Action
Schuylkill River at Norristown	Stream	12.2 ft	Action
Chester Creek near Chester	Stream	7.86 ft	Action
East Branch Brandywine Creek Below Downingtown	Stream	8.45 ft	Minor
Brandywine Creek at Chadds Ford	Stream	8.64 ft	Action
Brandywine Creek at Wilmington	Stream	15.05 ft	Action
Red Clay Creek at Wooddale	Stream	6.35 ft	Action
White Clay Creek near Newark	Stream	11.44 ft	Action
Christina River at Coochs Bridge	Stream	11.14 ft	Minor
Delaware River at Newbold Island	Tidal	10.59 ft	Minor
Delaware River at Burlington	Tidal	9.95 ft	Minor
Delaware River at Bridesburg	Tidal	8.83 ft	Minor
Delaware River at USCG Station Washington Street	Tidal	8.52 ft	Minor
Delaware River at Marcus Hook	Tidal	7.83 ft	Minor
Delaware River at Delaware City	Tidal	7.6 ft	Minor
Schuylkill River near Philadelphia near 30th street	Tidal	5.54 ft	Action
Christina River at Newport	Tidal	7.69 ft	Minor
Christina River at Wilmington	Tidal	7.56 ft	Minor

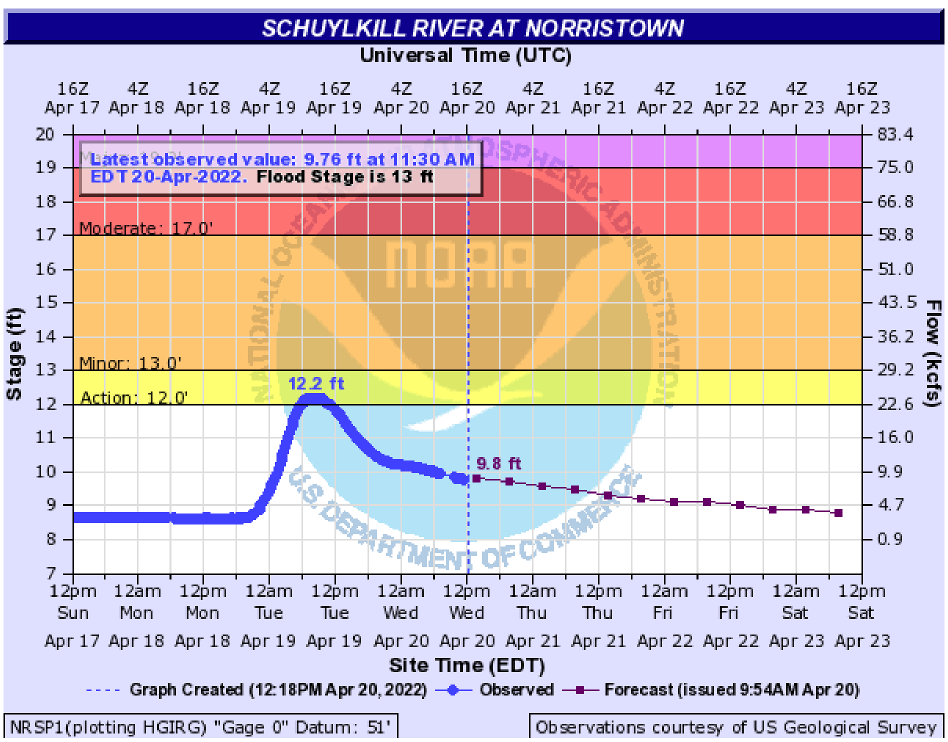

NESHAMINY CREEK NEAR PENNS PARK
Universal Time (UTC)
Latest observed value: 7.01 ft at 11:30 AM EDT 20-Apr-2022. Flood Stage is 13 ft
Major: 18.0'
Moderate: 16.0'
Minor: 13.0'
Action: 12.0'
13.69 ft
Stage (ft)
Flow (kcfs)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
PEPP1(plotting HGIRG) "Gage 0" Datum: n/a
Observations courtesy of US Geological Survey

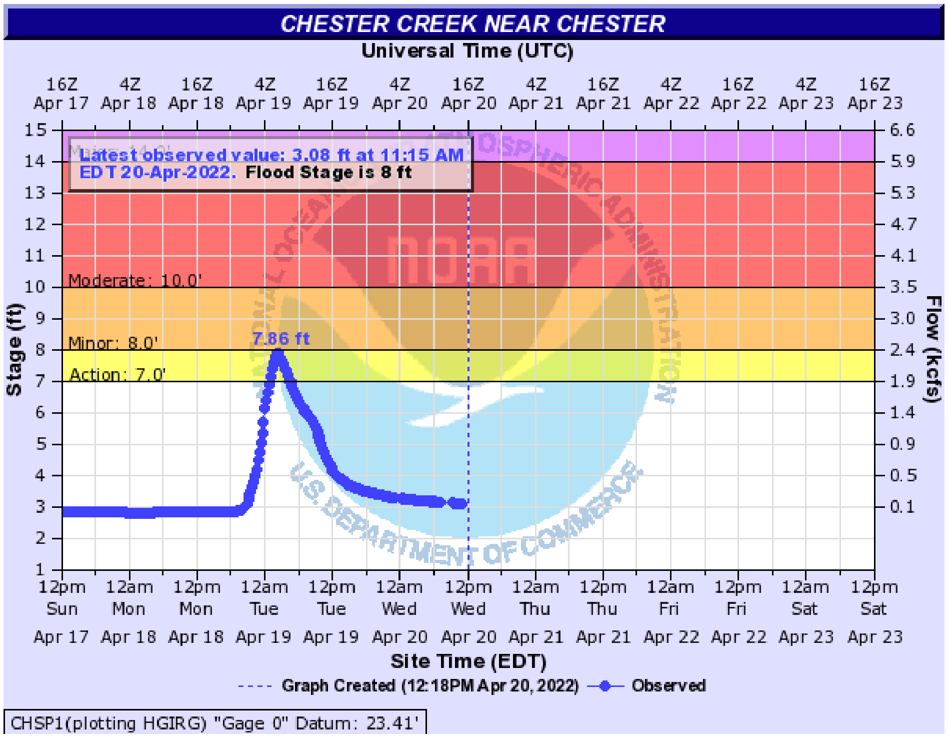

NESHAMINY CREEK NEAR LANGHORNE
Universal Time (UTC)
Latest observed value: 3.28 ft at 11:15 AM EDT 20-Apr-2022. Flood Stage is 9 ft
Major: 14.0'
Moderate: 12.0'
Minor: 9.0'
Action: 8.0'
9.35 ft
3.2 ft
Stage (ft)
Flow (kcfs)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
Forecast (issued 9:54AM Apr 20)
LNGP1(plotting HGIRG) "Gage 0" Datum: 40.57'
Observations courtesy of US Geological Survey

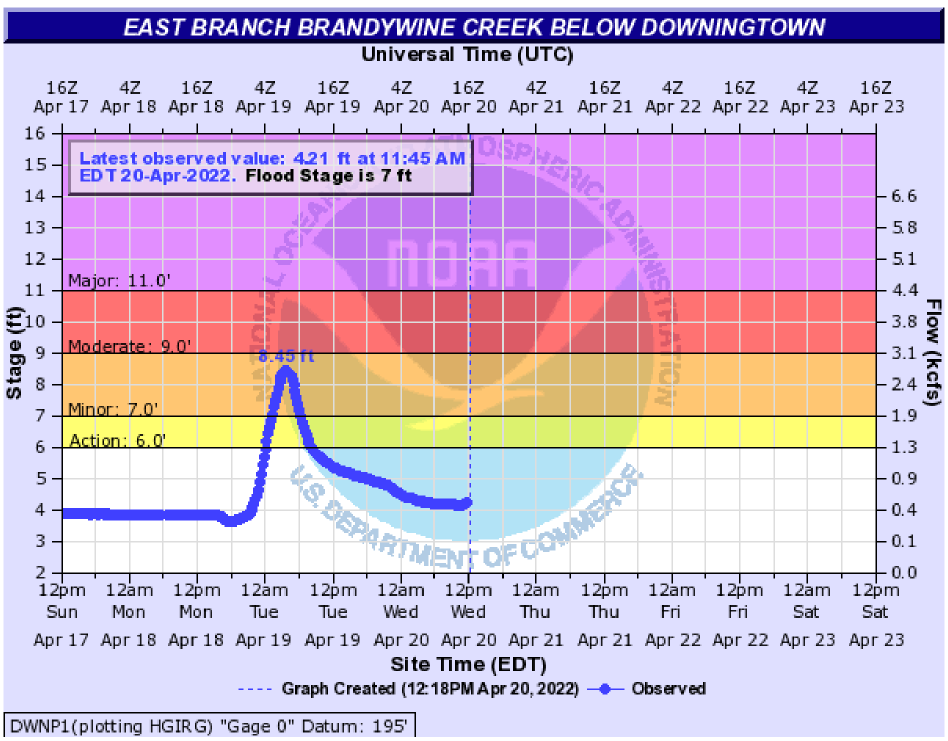

COOPER RIVER AT HADDONFIELD
Universal Time (UTC)
11Z Apr 16
11Z Apr 17
11Z Apr 18
11Z Apr 19
11Z Apr 20
11Z Apr 21
11Z Apr 22
11Z Apr 23
11Z Apr 24
Latest observed value: 2.46 ft at 7:00 AM EDT 19-Apr-2022. Flood Stage is 4.5 ft
Major: 7.0'
Record: 6.3'
Moderate: 5.5'
Minor: 4.5'
Action: 2.5'
2.66 ft
Stage (ft)
Flow (kcfs)
7am Sat Apr 16
7am Sun Apr 17
7am Mon Apr 18
7am Tue Apr 19
7am Wed Apr 20
7am Thu Apr 21
7am Fri Apr 22
7am Sat Apr 23
7am Sun Apr 24
Site Time (EDT)
Graph Created (7:33AM Apr 19, 2022)
Observed
HDDN4(plotting HGIRG) "Gage 0" Datum: 9.29'
Observations courtesy of US Geological Survey

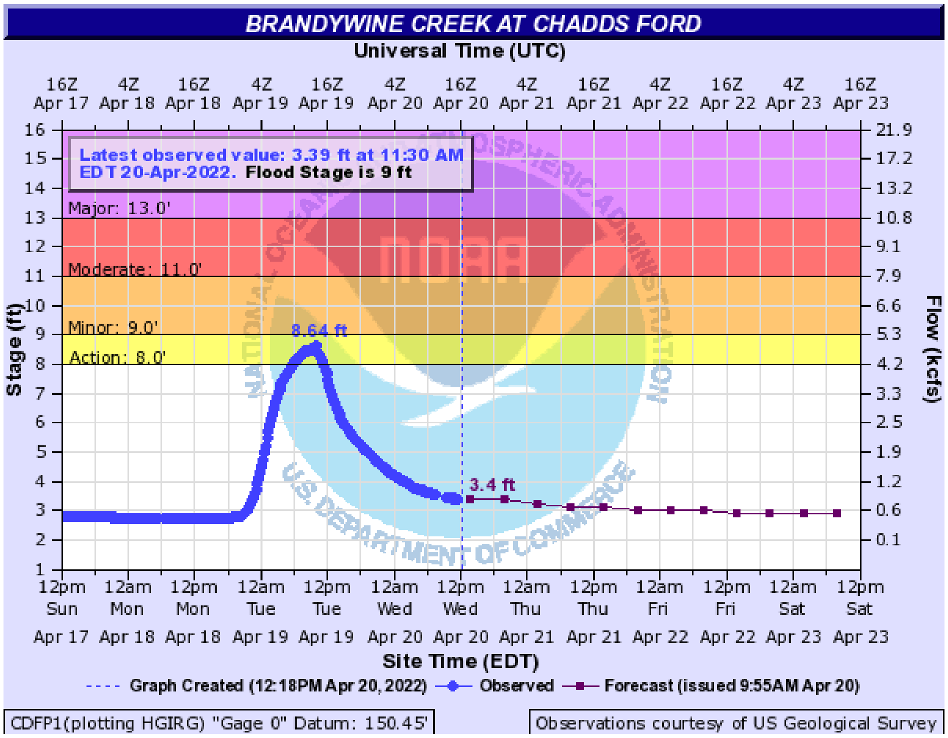

PERKIOMEN CREEK AT EAST GREENVILLE
Universal Time (UTC)
16Z Apr 17
4Z Apr 18
16Z Apr 18
4Z Apr 19
16Z Apr 19
4Z Apr 20
16Z Apr 20
4Z Apr 21
16Z Apr 21
4Z Apr 22
16Z Apr 22
4Z Apr 23
16Z Apr 23
Latest observed value: 2.6 ft at 11:15 AM EDT 20-Apr-2022. Flood Stage is 5 ft
Record: 9.7'
Major: 9.0'
Moderate: 7.0'
6.38 ft
Minor: 5.0'
Action: 4.0'
Stage (ft)
Flow (kcfs)
12pm Sun Apr 17
12am Mon Apr 18
12pm Mon Apr 18
12am Tue Apr 19
12pm Tue Apr 19
12am Wed Apr 20
12pm Wed Apr 20
12am Thu Apr 21
12pm Thu Apr 21
12am Fri Apr 22
12pm Fri Apr 22
12am Sat Apr 23
12pm Sat Apr 23
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
EGRP1(plotting HGIRG) "Gage 0" Datum: 288.5'
Observations courtesy of US Geological Survey

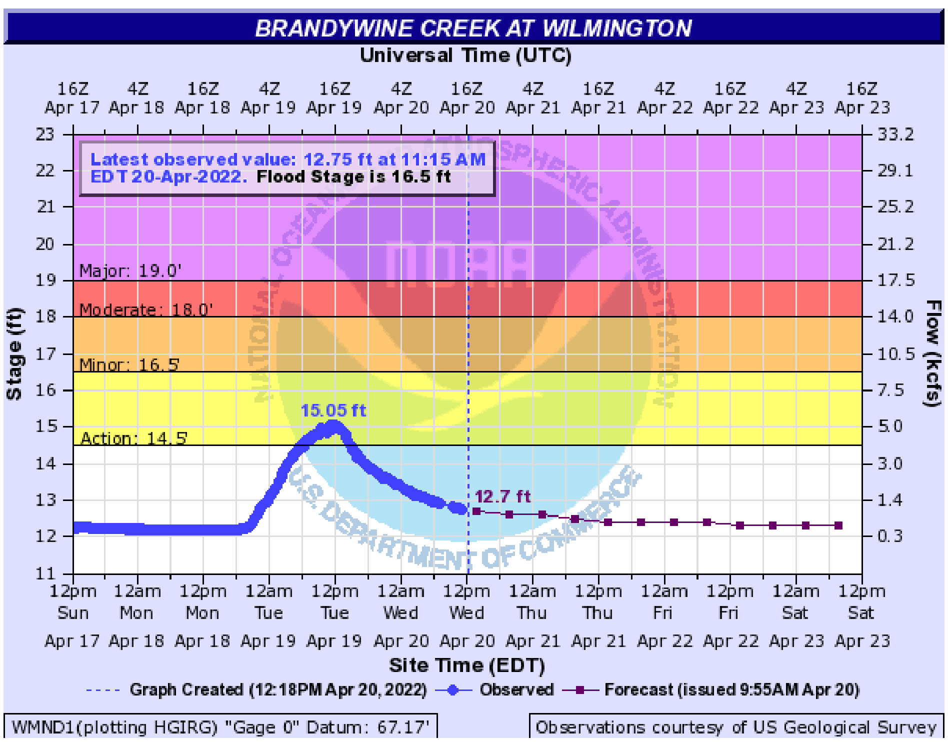

PERKIOMEN CREEK AT GRATERFORD
Universal Time (UTC)
Latest observed value: 2.86 ft at 11:15 AM EDT 20-Apr-2022. Flood Stage is 11 ft
Moderate: 13.0'
Minor: 11.0'
Action: 8.0'
9.02 ft
2.9 ft
Stage (ft)
Flow (kcfs)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
Forecast (issued 9:54AM Apr 20)
GRAP1(plotting HGIRG) "Gage 0" Datum: 112.66'
Observations courtesy of US Geological Survey

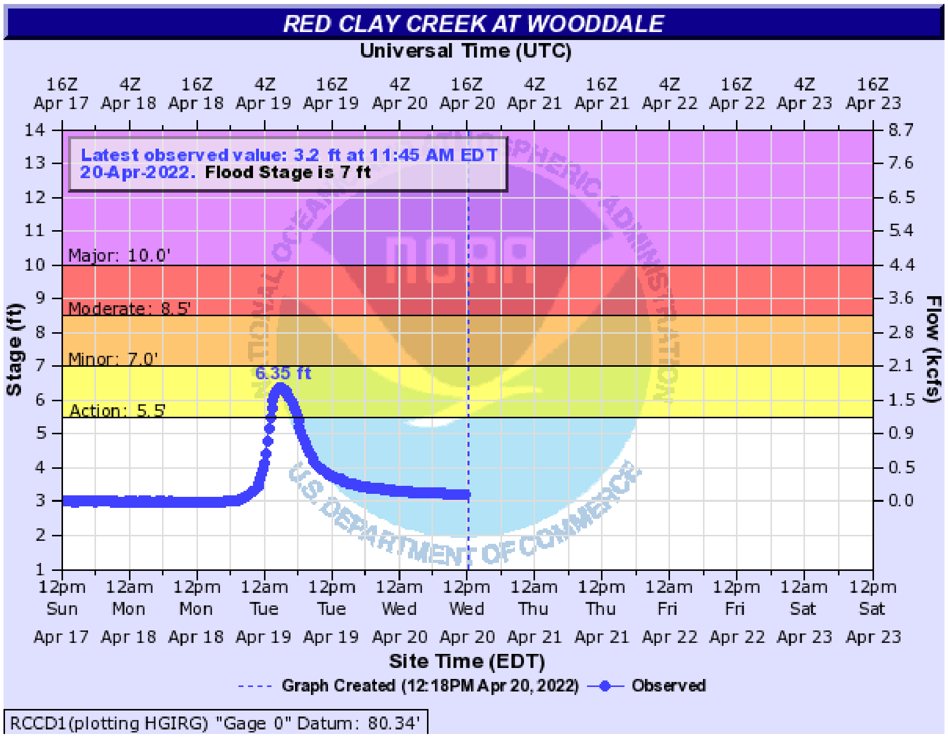

SCHUYLKILL RIVER AT NORRISTOWN
Universal Time (UTC)
Latest observed value: 9.76 ft at 11:30 AM EDT 20-Apr-2022. Flood Stage is 13 ft
Moderate: 17.0'
Minor: 13.0'
Action: 12.0'
12.2 ft
9.8 ft
Stage (ft)
Flow (kcfs)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
Forecast (issued 9:54AM Apr 20)
NRSP1(plotting HGIRG) "Gage 0" Datum: 51'
Observations courtesy of US Geological Survey

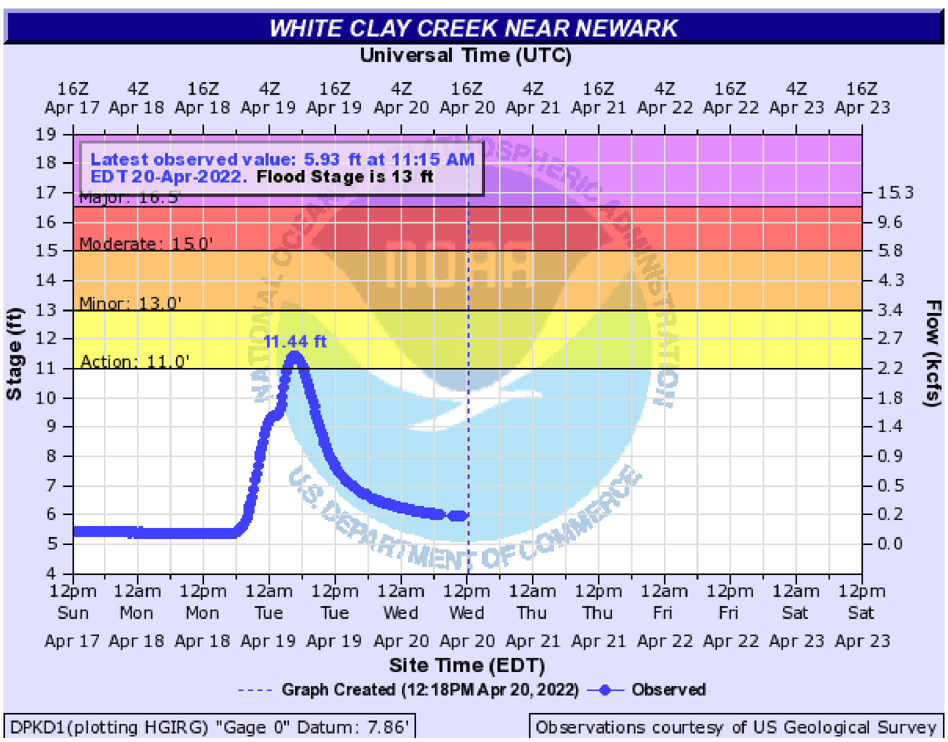

CHESTER CREEK NEAR CHESTER
Universal Time (UTC)
Latest observed value: 3.08 ft at 11:15 AM EDT 20-Apr-2022. Flood Stage is 8 ft
Moderate: 10.0'
Minor: 8.0'
Action: 7.0'
7.86 ft
Stage (ft)
Flow (kcfs)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
CHSP1(plotting HGIRG) "Gage 0" Datum: 23.41'

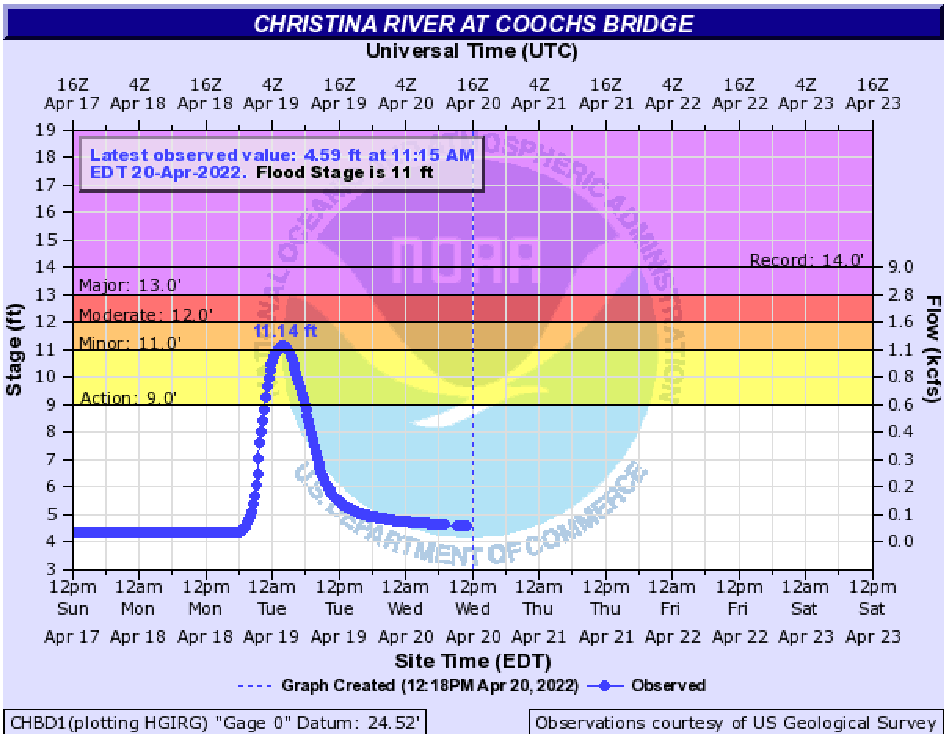

EAST BRANCH BRANDYWINE CREEK BELOW DOWNINGTOWN
Universal Time (UTC)
Latest observed value: 4.21 ft at 11:45 AM EDT 20-Apr-2022. Flood Stage is 7 ft
Major: 11.0'
Moderate: 9.0'
Minor: 7.0'
Action: 6.0'
8.45 ft
Stage (ft)
Flow (kcfs)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
DWNP1(plotting HGIRG) "Gage 0" Datum: 195'

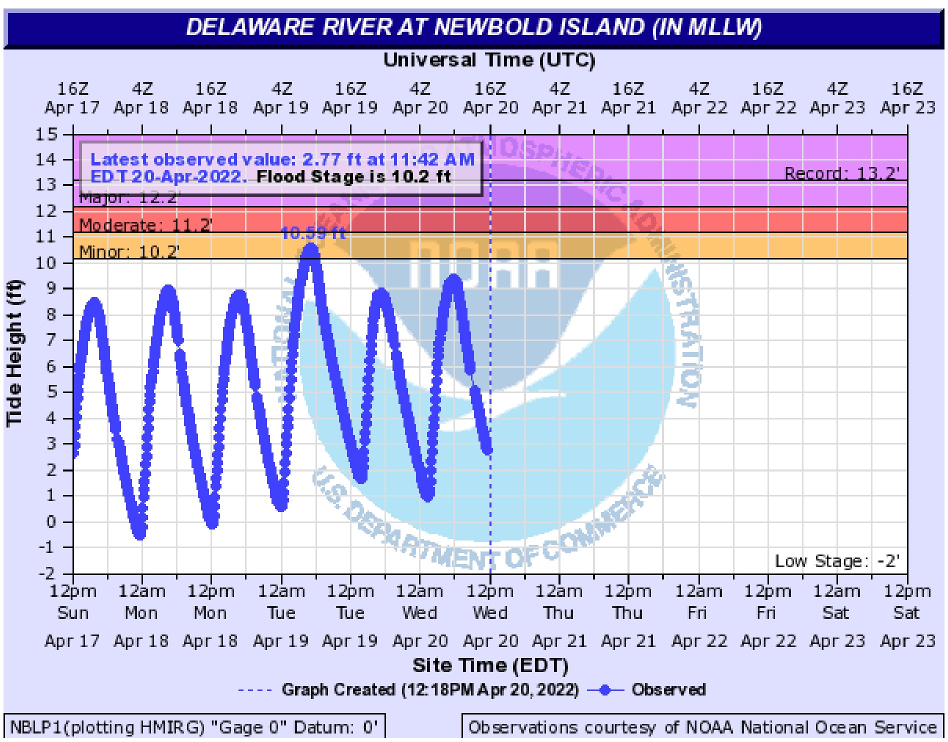

BRANDYWINE CREEK AT CHADDS FORD
Universal Time (UTC)
Latest observed value: 3.39 ft at 11:30 AM EDT 20-Apr-2022. Flood Stage is 9 ft
Major: 13.0'
Moderate: 11.0'
Minor: 9.0'
Action: 8.0'
8.64 ft
3.4 ft
Stage (ft)
Flow (kcfs)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
Forecast (issued 9:55AM Apr 20)
CDFP1(plotting HGIRG) "Gage 0" Datum: 150.45'
Observations courtesy of US Geological Survey

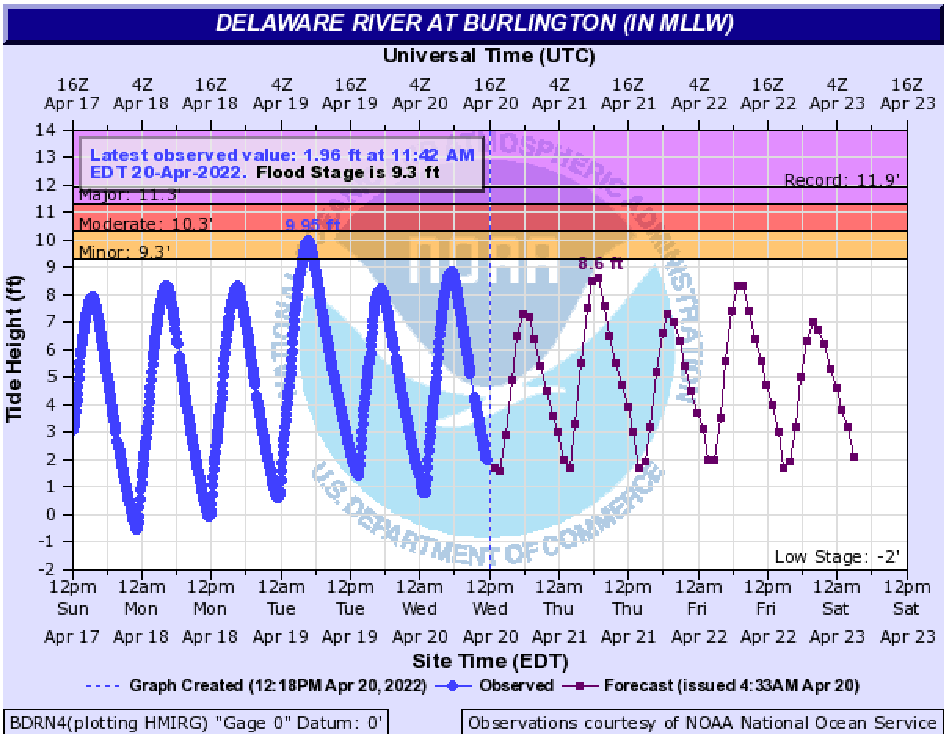

BRANDYWINE CREEK AT WILMINGTON
Universal Time (UTC)
Latest observed value: 12.75 ft at 11:15 AM EDT 20-Apr-2022. Flood Stage is 16.5 ft
Major: 19.0'
Moderate: 18.0'
Minor: 16.5'
Action: 14.5'
15.05 ft
12.7 ft
Stage (ft)
Flow (kcfs)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
Forecast (issued 9:55AM Apr 20)
WMND1(plotting HGIRG) "Gage 0" Datum: 67.17'
Observations courtesy of US Geological Survey

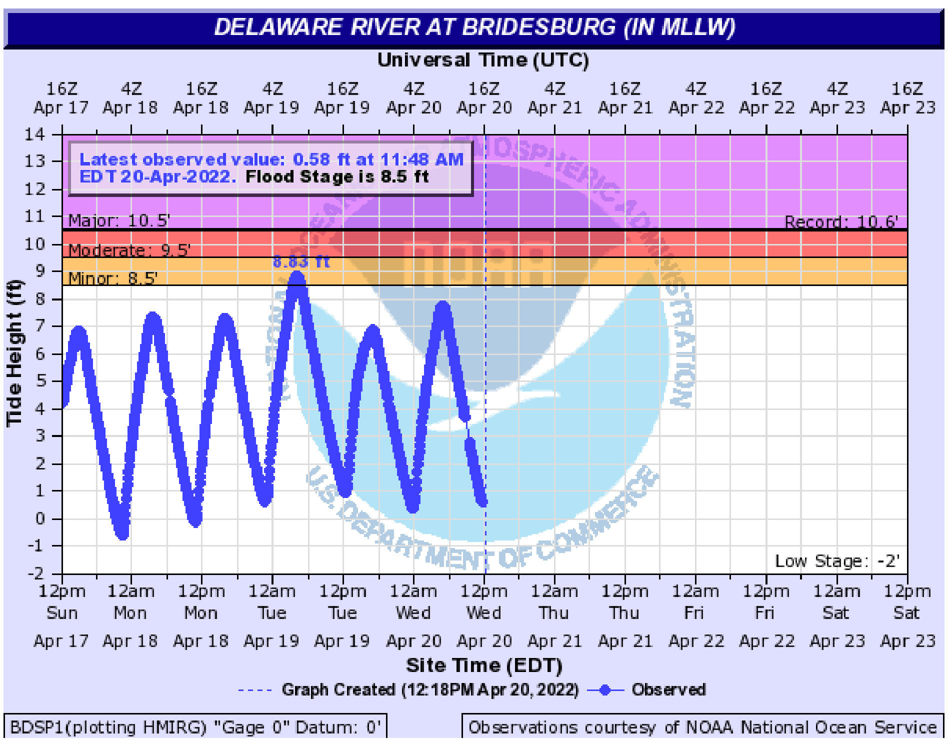

RED CLAY CREEK AT WOODDALE
Universal Time (UTC)
Latest observed value: 3.2 ft at 11:45 AM EDT 20-Apr-2022. Flood Stage is 7 ft
Major: 10.0'
Moderate: 8.5'
Minor: 7.0'
Action: 5.5'
6.35 ft
Stage (ft)
Flow (kcfs)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
RCCD1(plotting HGIRG) "Gage 0" Datum: 80.34'

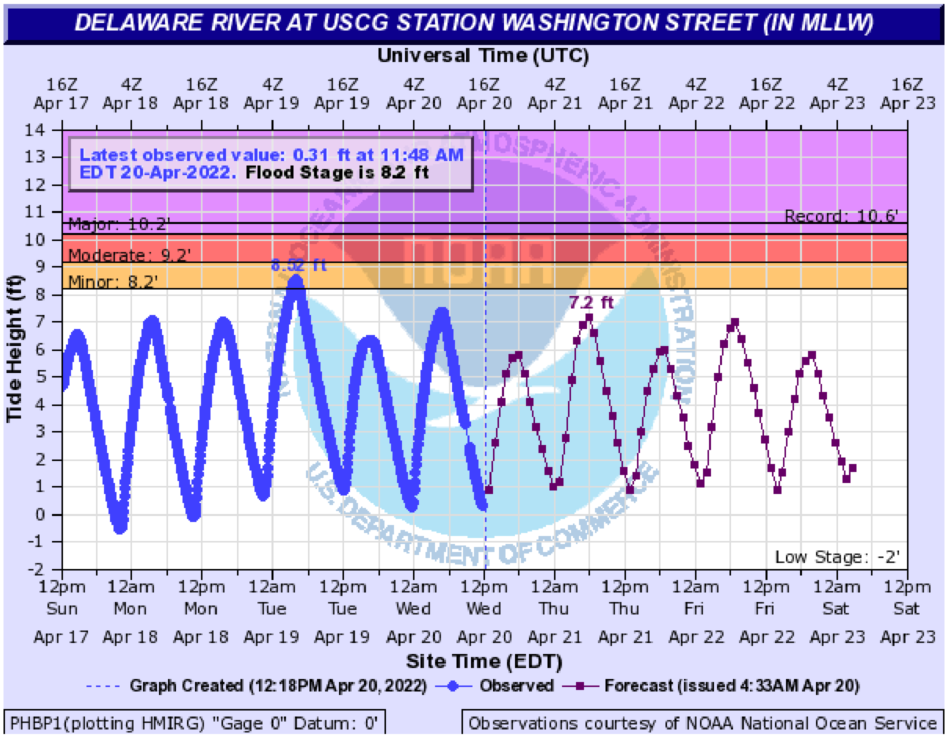

WHITE CLAY CREEK NEAR NEWARK
Universal Time (UTC)
Latest observed value: 5.93 ft at 11:15 AM EDT 20-Apr-2022. Flood Stage is 13 ft
Major: 16.5'
Moderate: 15.0'
Minor: 13.0'
Action: 11.0'
11.44 ft
Stage (ft)
Flow (kcfs)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
DPKD1(plotting HGIRG) "Gage 0" Datum: 7.86'
Observations courtesy of US Geological Survey

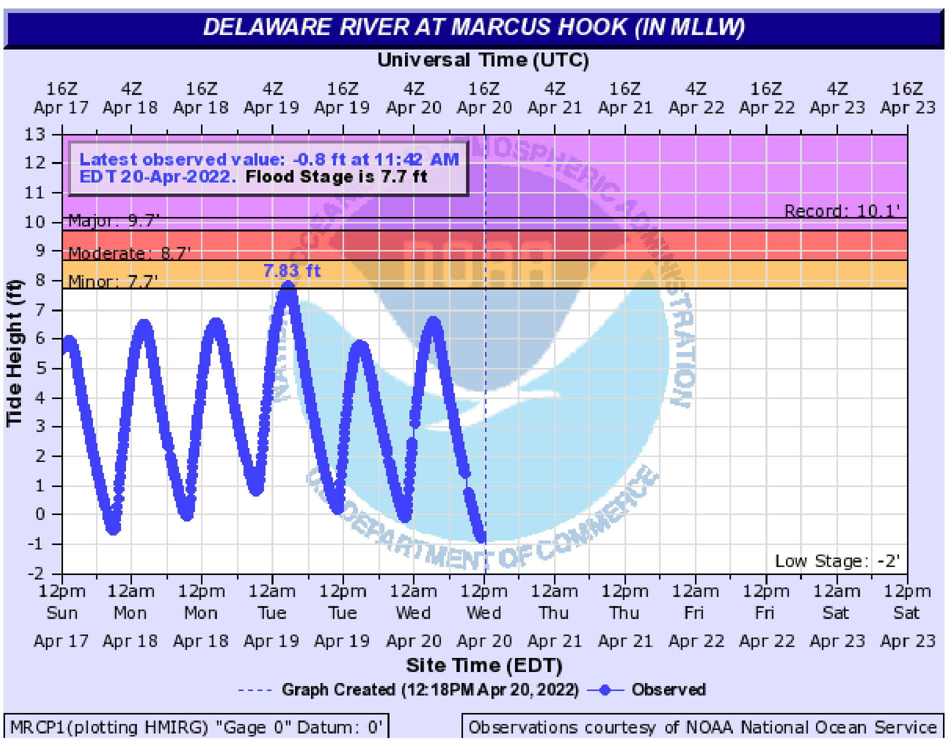

CHRISTINA RIVER AT COOCHS BRIDGE
Universal Time (UTC)
Latest observed value: 4.59 ft at 11:15 AM EDT 20-Apr-2022. Flood Stage is 11 ft
Record: 14.0'
Major: 13.0'
Moderate: 12.0'
Minor: 11.0'
Action: 9.0'
11.14 ft
Stage (ft)
Flow (kcfs)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
CHBD1(plotting HGIRG) "Gage 0" Datum: 24.52'
Observations courtesy of US Geological Survey

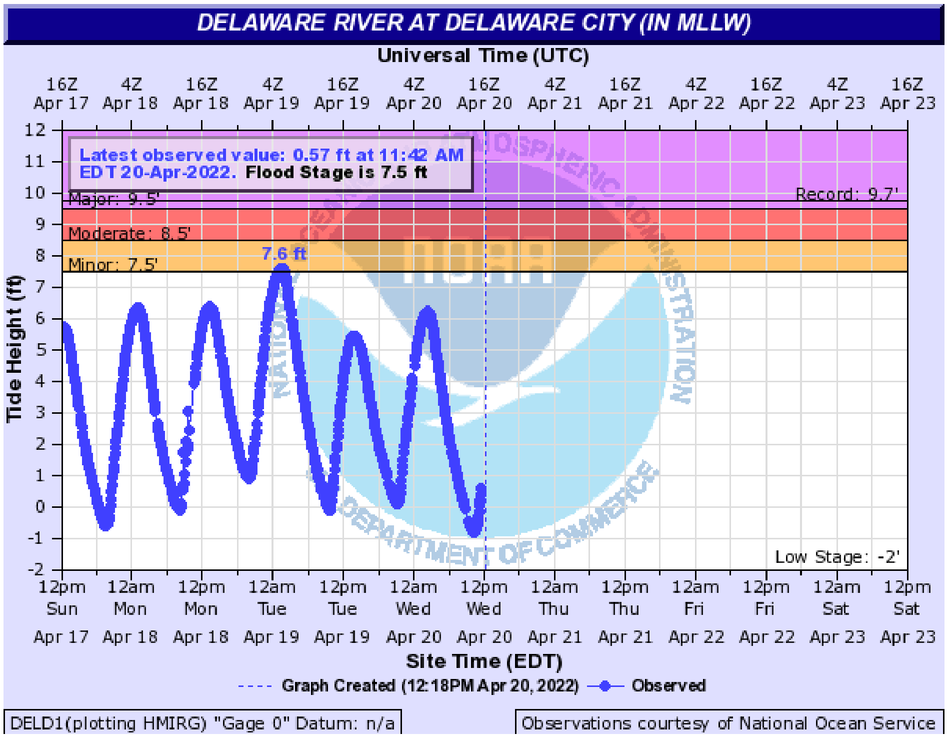

DELAWARE RIVER AT NEWBOLD ISLAND (IN MLLW)
Universal Time (UTC)
Latest observed value: 2.77 ft at 11:42 AM EDT 20-Apr-2022. Flood Stage is 10.2 ft
Record: 13.2'
Major: 12.2'
Moderate: 11.2'
Minor: 10.2'
10.59 ft
Low Stage: -2'
Tide Height (ft)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
NBLP1(plotting HMIRG) "Gage 0" Datum: 0'
Observations courtesy of NOAA National Ocean Service

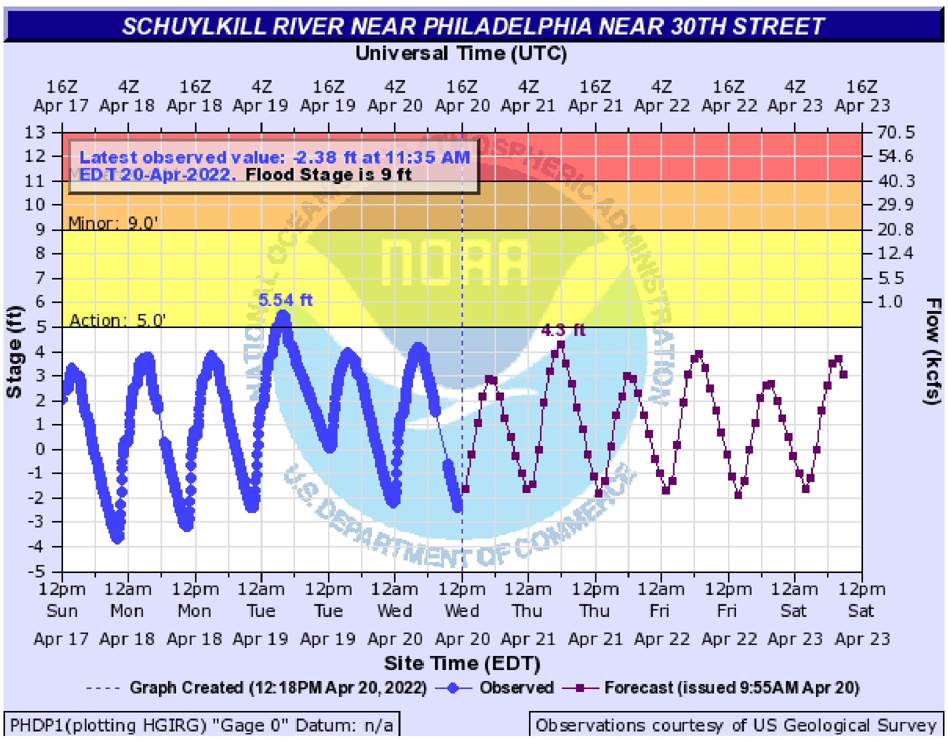

DELAWARE RIVER AT BURLINGTON (IN MLLW)
Universal Time (UTC)
Latest observed value: 1.96 ft at 11:42 AM EDT 20-Apr-2022. Flood Stage is 9.3 ft
Major: 11.3'
Moderate: 10.3'
Minor: 9.3'
Record: 11.9'
9.95 ft
8.6 ft
Low Stage: -2'
Tide Height (ft)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
Forecast (issued 4:33AM Apr 20)
BDRN4(plotting HMIRG) "Gage 0" Datum: 0'
Observations courtesy of NOAA National Ocean Service

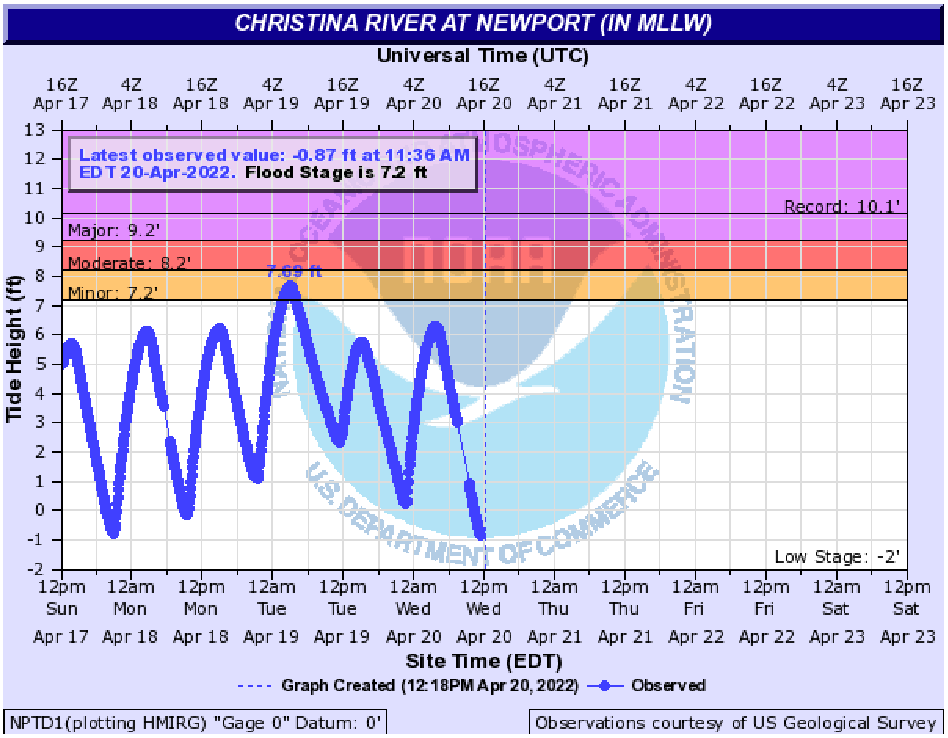

DELAWARE RIVER AT BRIDESBURG (IN MLLW)
Universal Time (UTC)
Latest observed value: 0.58 ft at 11:48 AM EDT 20-Apr-2022. Flood Stage is 8.5 ft
Major: 10.5'
Moderate: 9.5'
Minor: 8.5'
Record: 10.6'
8.83 ft
Low Stage: -2'
Tide Height (ft)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
BDSP1(plotting HMIRG) "Gage 0" Datum: 0'
Observations courtesy of NOAA National Ocean Service

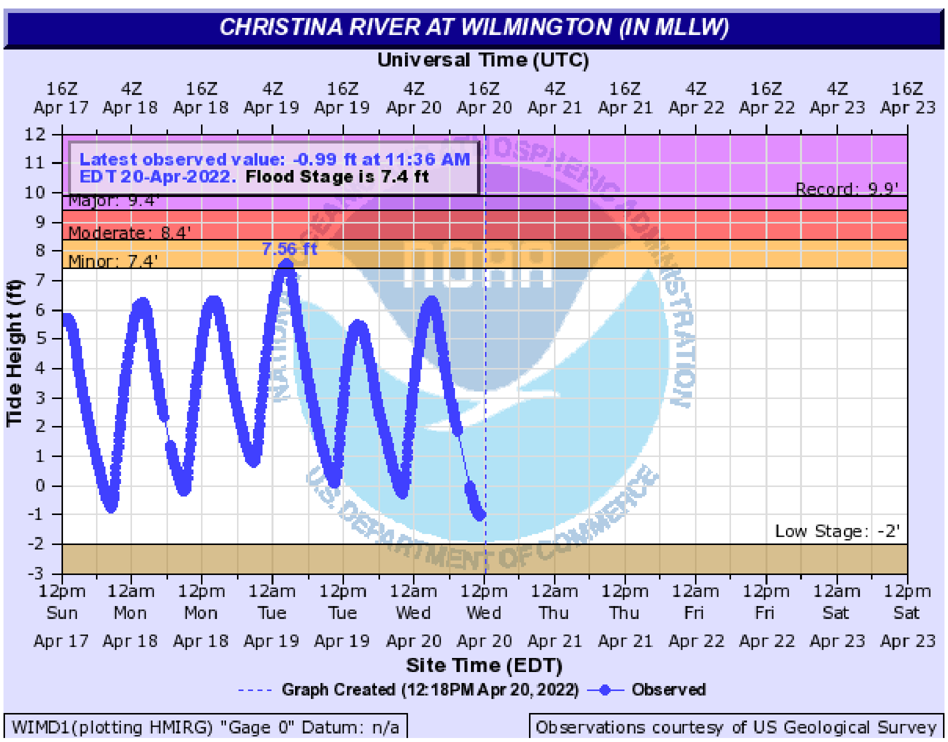

DELAWARE RIVER AT USCG STATION WASHINGTON STREET (IN MLLW)
Universal Time (UTC)
Latest observed value: 0.31 ft at 11:48 AM EDT 20-Apr-2022. Flood Stage is 8.2 ft
Major: 10.2'
Moderate: 9.2'
Minor: 8.2'
Record: 10.6'
8.52 ft
7.2 ft
Low Stage: -2'
Tide Height (ft)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
Forecast (issued 4:33AM Apr 20)
PHBP1(plotting HMIRG) "Gage 0" Datum: 0'
Observations courtesy of NOAA National Ocean Service


DELAWARE RIVER AT MARCUS HOOK (IN MLLW)
Universal Time (UTC)
Latest observed value: -0.8 ft at 11:42 AM EDT 20-Apr-2022. Flood Stage is 7.7 ft
Major: 9.7'
Moderate: 8.7'
Minor: 7.7'
Record: 10.1'
7.83 ft
Low Stage: -2'
Tide Height (ft)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
MRCP1(plotting HMIRG) "Gage 0" Datum: 0'
Observations courtesy of NOAA National Ocean Service


DELAWARE RIVER AT DELAWARE CITY (IN MLLW)
Universal Time (UTC)
Latest observed value: 0.57 ft at 11:42 AM EDT 20-Apr-2022. Flood Stage is 7.5 ft
Major: 9.5'
Record: 9.7'
Moderate: 8.5'
Minor: 7.5'
7.6 ft
Low Stage: -2'
Tide Height (ft)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
DELD1(plotting HMIRG) "Gage 0" Datum: n/a
Observations courtesy of National Ocean Service


SCHUYLKILL RIVER NEAR PHILADELPHIA NEAR 30TH STREET
Universal Time (UTC)
Latest observed value: -2.38 ft at 11:35 AM EDT 20-Apr-2022. Flood Stage is 9 ft
Minor: 9.0'
Action: 5.0'
5.54 ft
4.3 ft
Stage (ft)
Flow (kcfs)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
Forecast (issued 9:55AM Apr 20)
PHDP1(plotting HGIRG) "Gage 0" Datum: n/a
Observations courtesy of US Geological Survey


CHRISTINA RIVER AT NEWPORT (IN MLLW)
Universal Time (UTC)
Latest observed value: -0.87 ft at 11:36 AM EDT 20-Apr-2022. Flood Stage is 7.2 ft
Record: 10.1'
Major: 9.2'
Moderate: 8.2'
Minor: 7.2'
7.69 ft
Low Stage: -2'
Tide Height (ft)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
NPTD1(plotting HMIRG) "Gage 0" Datum: 0'
Observations courtesy of US Geological Survey


CHRISTINA RIVER AT WILMINGTON (IN MLLW)
Universal Time (UTC)
Latest observed value: -0.99 ft at 11:36 AM EDT 20-Apr-2022. Flood Stage is 7.4 ft
Record: 9.9'
Major: 9.4'
Moderate: 8.4'
Minor: 7.4'
7.56 ft
Low Stage: -2'
Tide Height (ft)
Site Time (EDT)
Graph Created (12:18PM Apr 20, 2022)
Observed
WIMD1(plotting HMIRG) "Gage 0" Datum: n/a
Observations courtesy of US Geological Survey

[i] https://forecast.weather.gov/glossary.php?word=water%20equivalent