June 2025

WATER RESOURCES PROGRAM

FY 2026-2028

Report No. 2025-x

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

Water Resources Program FY 2026-2028

Prepared by staff at the Delaware River Basin Commission

Suggested Citation

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Authorization

The Delaware River Basin (DRB) Compact states:

The commission shall annually adopt a water resources program, based upon the comprehensive plan, consisting of the projects and facilities which the commission proposes to be undertaken by the commission and other authorized governmental and private agencies, organizations and persons during the ensuing six years or such other reasonably foreseeable period as the commission may determine. (§13.2 DRB Compact, 1961).

According to the Compact, "Project" shall mean any work, service or activity which is separately planned, financed, or identified by the Commission, or any separate facility undertaken or to be undertaken within a specified area, for the conservation, utilization, control, development or management of water resources which can be established and utilized independently or as an addition to an existing facility, and can be considered as a separate entity for purposes of evaluation (§1.2.(g)).

Scope and Organization

The Water Resources Program (WRP) covers fiscal years (FY) 2026 through 2028 (July 1, 2025, through June 30, 2028) and is an element of strategic planning for DRBC program direction over the next three years. The architecture is based on the requirements of the Delaware River Basin Compact (Compact) and the goals of the five Key Result Areas of the *Water Resources Plan for the Delaware River Basin* (Basin Plan, 2004).

The WRP is presented in two parts:

- **Part I: General Statement of Conditions in the Basin** summarizes water resource conditions in the Basin, including hydrologic conditions, water use and sufficiency, overall assessment of water quality, landscape conditions, and emergent issues that could affect long-range water resource planning and management in the Basin.
- **Part II: Work Resource Management** notes the key issues that focus the Commission's programs and summarizes by Key Result Area the work program initiatives the Commission plans to undertake over the next three years.

LIST OF ACRONYMNS/ABBREVIATIONS

7Q10	the lowest 7-day average flow that occurs (on average) once every 10 years
AA	Administrative Agreement
ACWA	Association of Clean Water Administrators
AEMR	Annual Effluent Monitoring Report
ANSDU	Academy of Natural Sciences of Drexel University
AWRA	American Water Resources Association
AWWA	American Water Works Association
BLM	Biotic Ligand Model
BG	billion gallons
C&D	Chesapeake and Delaware (Canal)
CA2	Critical Area 2
CaCO3	calcium carbonate
CBOD	carbonaceous biochemical oxygen demand
CCMP	Comprehensive Conservation and Management Plan
cfs	cubic feet per second
CRP	Climate Resilience Plan
CWMS	Corps Water Management System
CY	calendar year
CZM	Coastal Zone Management
D & R	Delaware and Raritan
DGS	Delaware Geological Survey
DNREC	Delaware Department of Natural Resources and Environmental Control
DO	dissolved oxygen
DOC	dissolved organic carbon
DRB	Delaware River Basin
DRB-PST	Delaware River Basin Planning Support Tool
DRBC	Delaware River Basin Commission
DRBRP	Delaware River Basin Restoration Program
DRWCC	Delaware River Watershed Conservation Collaborative

DWCF	Delaware Watershed Conservation Fund
EFDC	Environmental Fluid Dynamics Code
EIC	Estuary Implementation Committee
EPA	United States Environmental Protection Agency
EWQ	Existing Water Quality
EWS	Early Warning System
FAC	Flood Advisory Committee
FEMA	Federal Emergency Management Agency
FFMP	Flexible Flow Management Program
FUDR	Friends of the Upper Delaware River
FY	fiscal year
GIS	Geographic Information System
GWPA	Groundwater Protected Area
HEC-HMS	Hydrologic Engineering Center - Hydrologic Modeling System
HUC	Hydrologic Unit Code
IBI	Index of Biological Integrity
ICWP	Interstate Council of Water Policy
IIJA	Infrastructure Investment and Jobs Act
IWA	International Water Association
IWAAs	Integrated Water Availability Assessments
KRA	Key Result Area
LNG	liquefied natural gas
MACC	Monitoring Advisory and Coordination Committee
mg/L	milligrams per liter
MGD	million gallons per day
mi	mile
MLR	multiple linear regression
mm	millimeters
MM	million
MWh	megawatt hour
NBOD	nitrogenous biochemical oxygen demand

NFWF	National Fish and Wildlife Foundation
NGWMN	National Ground-Water Monitoring Network
NLCD	National Land Cover Database
NJDEP	New Jersey Department of Environmental Protection
NJWSP	New Jersey Water Supply Plan
NOAA	National Oceanic and Atmospheric Administration
NOAA-CSC	National Oceanic and Atmospheric Administration - Coastal Services Center
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRDA	Natural Resource Damage Assessment
NWS	National Weather Service
NYC	New York City
NYSDEC	New York State Department of Environmental Conservation
ODRM	Office of the Delaware River Master
PADEP	Pennsylvania Department of Environmental Protection
PAFBC	Pennsylvania Fish and Boat Commission
PAS	Planning Assistance to States
PBDE	polybrominated diphenyl ethers
PCB	polychlorinated biphenyls
PDE	Partnership for the Delaware Estuary
PEMA	Pennsylvania Emergency Management Agency
PFC	perfluorinated compound
PFAS	perfluoroalkyl and polyfluoroalkyl substances
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PMP	Pollution Minimization Plan
ppb	parts per billion
PPL	Pennsylvania Power and Light
PRM	Potomac-Raritan-Magothy (aquifer system)
PWS	Public Water Supply

RFAC	Regulated Flow Advisory Committee
REF-DSS	Riverine Environmental Flow - Decision Support System
RFP	Request for Proposal
RPP	Rules of Practice & Procedure
RSM	Regional Sediment Management
SAN	Schuylkill Action Network
SEF	Subcommittee on Ecological Flows
SEPA GWPA	Southeast Pennsylvania Groundwater Protected Area
SPW	Special Protection Waters
SRMP	Scenic Rivers Monitoring Program
STAC	Science and Technical Advisory Committee
TAC	Toxics Advisory Committee
TDS	total dissolved solids
TEFO	Trenton Equivalent Flow Objective
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TREB	Technical Report for the Delaware Estuary and Basin
TWh	terawatt hour
UDC	Upper Delaware Council
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UWFP	Urban Waters Federal Partnership
WAUSP	Water Availability and Use Science Program
WLA	waste load allocation
WMAC	Water Management Advisory Committee
WPF	William Penn Foundation
WQAC	Water Quality Advisory Committee
WQM	Water Quality Management
WQS	water quality standards
WQX	Water Quality Exchange

WRP	Water Resources Program
WRRDA	Water Resources Reform and Development Act
WSCC	Water Supply Coordinating Council
WSSF	Water Supply Storage Fund
WTP	water treatment plant

TABLE OF CONTENTS

1. GENERAL STATEMENT OF CONDITIONS IN THE BASIN

Part I of the Water Resources Program is presented in six sections:

- **Section 1.1: Hydrologic Conditions: Brief Summary** is a summary of the hydrologic conditions in the Basin from January 1, 2024, through December 31, 2024.
- **Section 1.2: Water Use and Sufficiency** is a summary of water and groundwater withdrawal trends as well as surface and groundwater conditions in the Basin.
- **Section 1.3: Surface Water Quality** summarizes the most recent assessments of surface water quality in the Basin.
- **Section 1.4: Population and Land Use** summarizes population and land use trends based upon recent data.
- **Section 1.5: Emergent Issues** briefly describes emerging issues of concern.
- **Section 1.6: Climate and Hydrology** summarizes trends and changes in air temperature, streamflow, precipitation, and sea level in the Basin.
- **Section 1.7: Inventory of Other Dockets** lists an inventory of projects approved pursuant to Section 3.8 of the Compact, but which are not included in the Comprehensive Plan or Water Resources Program.

1.1 HYDROLOGIC CONDITIONS

The hydrologic conditions in the Delaware River Basin for calendar year (CY) 2024 are summarized below. Conditions alternated between wet and dry periods, with significant dry conditions beginning in the fall. Minor to moderate flooding occurred in January and March due to high rainfall during those months. Due to the pending NYC Delaware aqueduct shutdown, reservoir storage was slightly below normal in the summer and fall months. Flows across the basin started at normal levels and ended the year below normal, while the salt front location saw upstream movement to RM 90 in the fall. Groundwater levels in wells across the Basin states varied between normal and drought watch. As a result of dry conditions, drought watch declarations were made in all four basin states. Conditions began to recover with more precipitation in December. More detailed daily, weekly, quarterly, and annual summaries of CY 2024 hydrologic conditions[1] in the Basin – including precipitation, streamflow, reservoir storage, groundwater levels, and the salt front (river mile location of the 7-day average 250 mg/l chloride concentration) – are provided on the DRBC website.

[1] https://www.nj.gov/drbc/programs/flow/hydrologic-reports.html

The total annual precipitation and the departures from normal precipitation for 2024 are shown in **Figure 1 and Figure 2**, respectively. Except for the upper basin, the rest of the basin received below normal precipitation for the year. In the upper basin, annual rainfall ranged from 55 to 65 inches, while in the lower basin, rainfall ranged between 35 to 45 inches. Slightly below average precipitation occurred in Schuylkill, Berks, Chester, and Delaware Counties in Pennsylvania and in Southern New Jersey, with rainfall ranging from 35 to 45 inches. In some locations, there was a deficit of at least 6 inches (**Figure 2**). In Delaware and New Jersey, a statewide drought was declared in October and continued through the end of year, and New Jersey was upgraded to a drought warning in November. Pennsylvania and New York declared drought watches for Delaware River Basin (DRB) counties in November. Snowfall followed a similar pattern with higher amounts in the upper basin and little snowfall in the lower basin (**Figure 3**). Streamflow generally mirrored precipitation patterns. In January and March, during high precipitation events, streams in Southeastern Pennsylvania and Southwestern New Jersey experienced minor to moderate flooding.

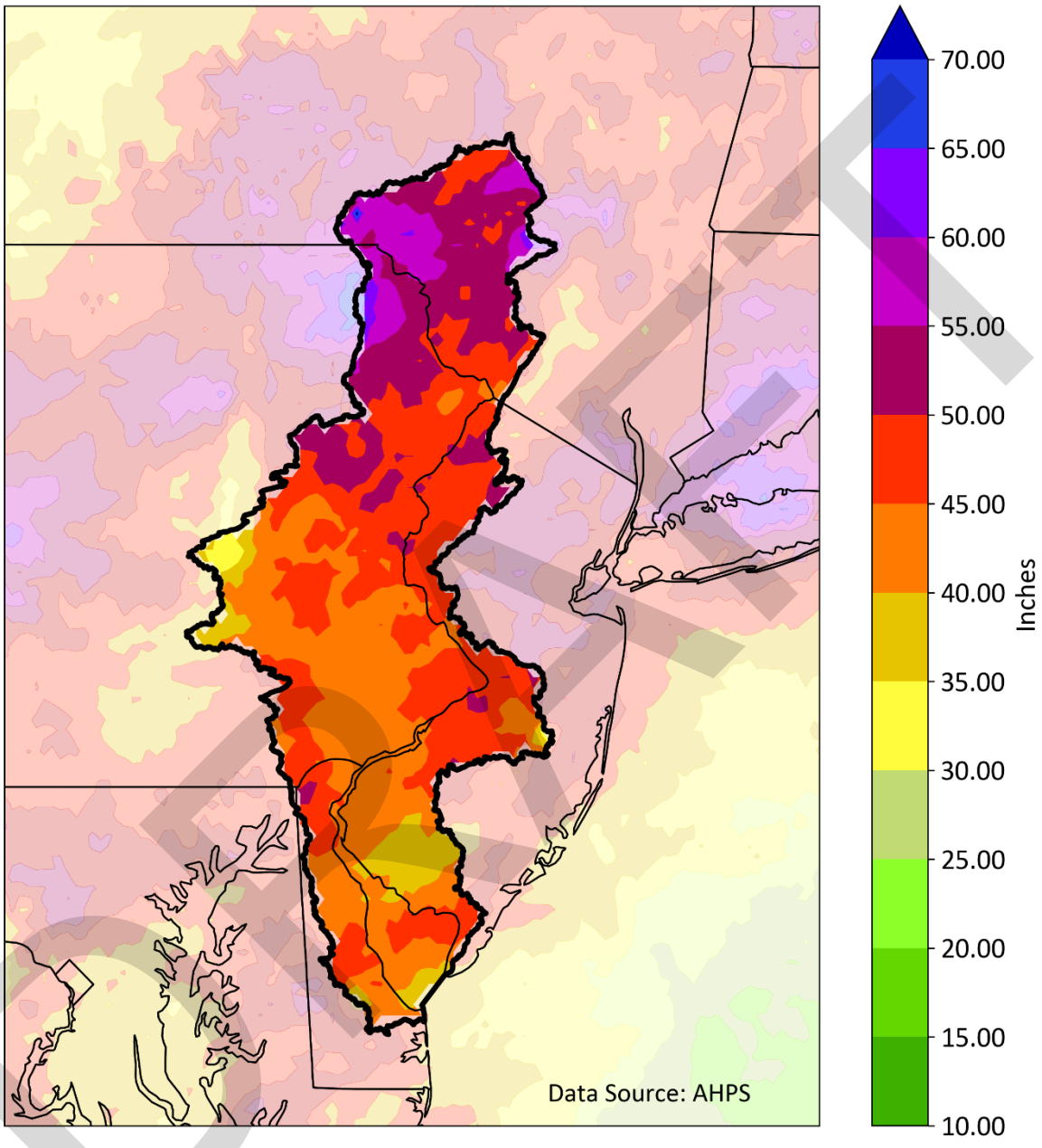


Figure 1. *Annual precipitation in 2024.*

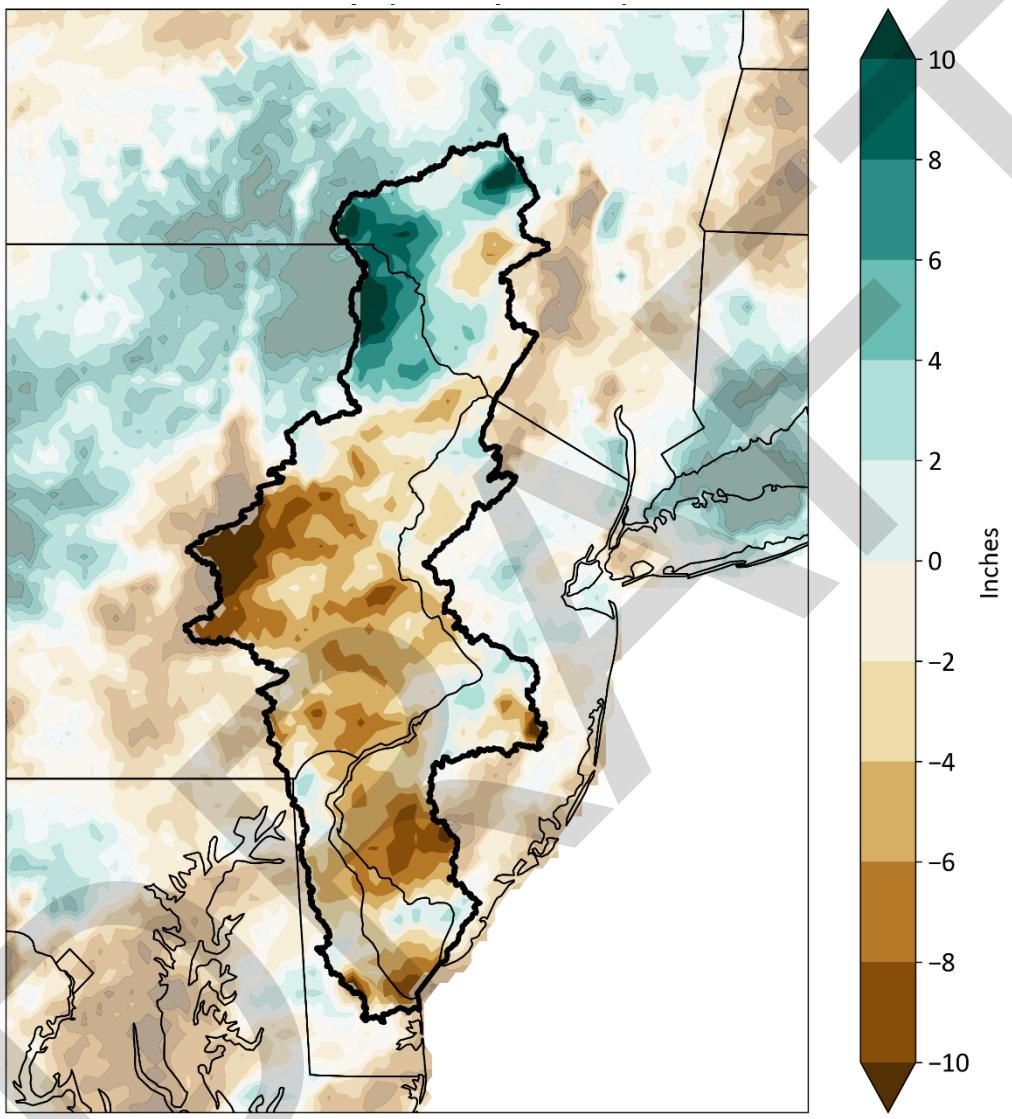


Figure 2. *Departure from normal precipitation in 2024.*

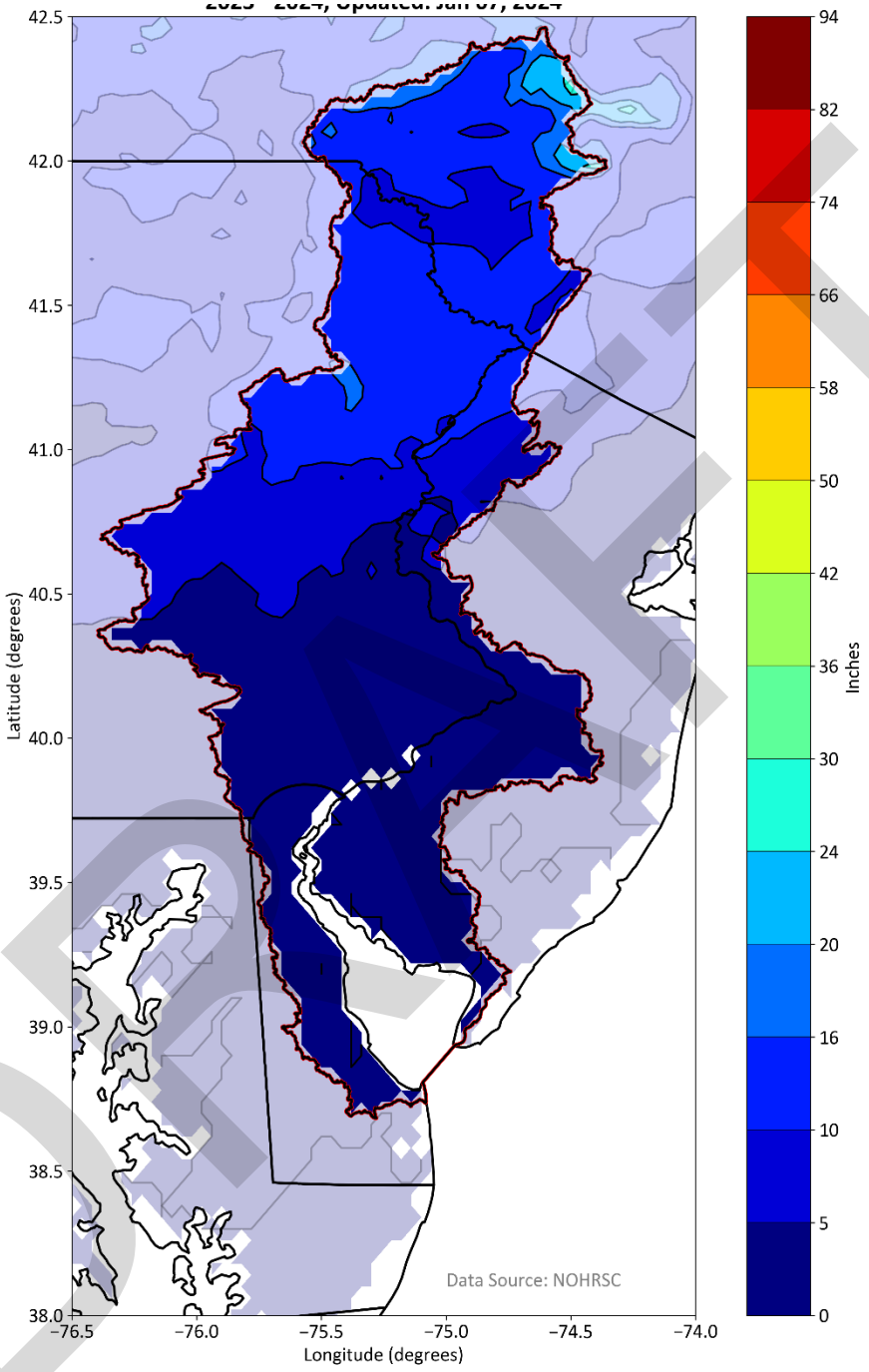


Figure 3. *Annual snowfall in 2024.*

Storage throughout the Basin remained normal for most of the year. The combined storage in the New York City reservoirs – Cannonsville, Pepaction, and Neversink Reservoirs – stayed at, or slightly below, the long-term median the whole year except for a dry period beginning in September and continuing until December (**Figure 4**). Lower basin storage stayed within normal levels, except beginning in August through December when there was a dry period with little precipitation. Thermal releases from the New York City reservoirs were made for seven days in June, seven days in July, and for two days in August to offset high water temperatures in downstream tailwaters during the summer. The amount of water used for thermal releases was 1.03 BG (1,590 cfs-days). Three rapid flow change mitigation releases were made between November 20 and 22, using 142 million gallons (219 cfs-days). Releases of 1.87 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).

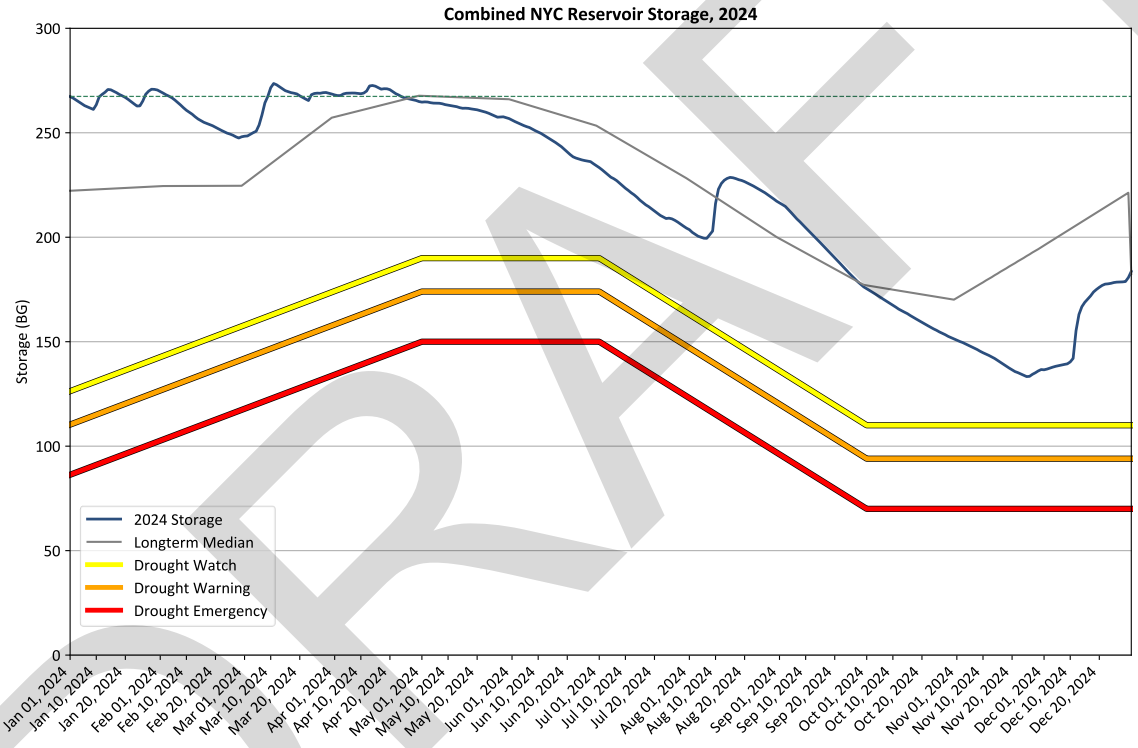


Figure 4. *Combined storage in the New York City Reservoirs during 2024.*

The location of the salt front remained in the normal range for much of the year, with dry conditions causing it to move below the normal range from mid-May to July (**Figure 5**). The most upstream location for the salt front in 2024 was RM 89.7 on November 21st.

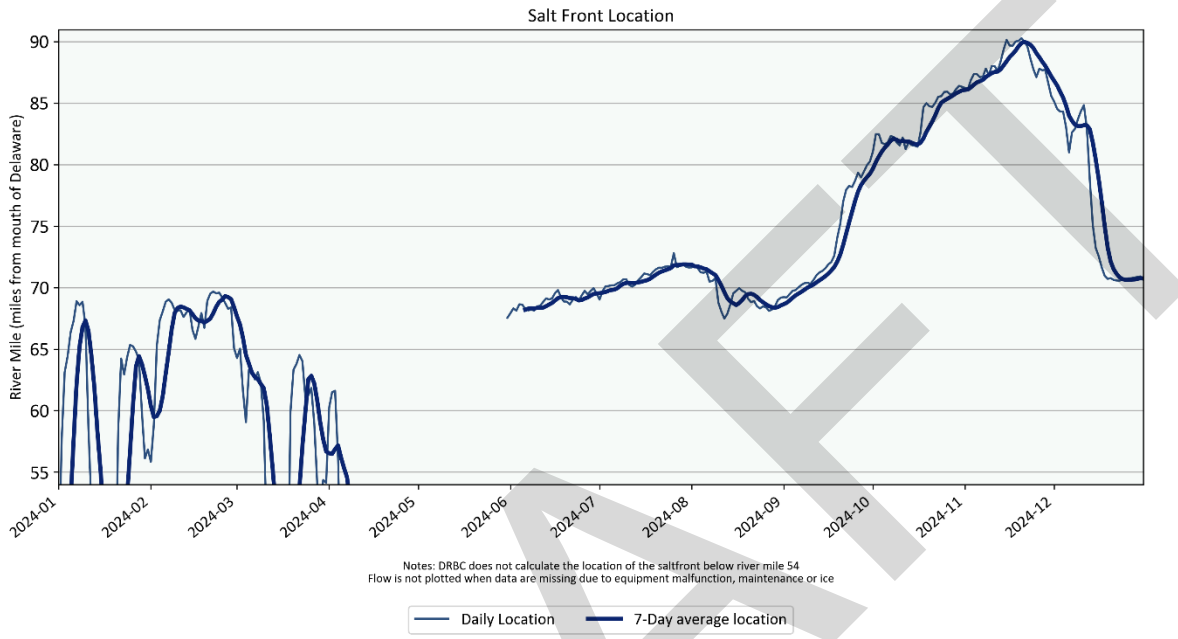


Figure 5. *Salt Front Location during 2024.*

Overall groundwater conditions were assessed based on the water levels in thirteen wells throughout the basin, including the U.S. Geological Survey (USGS) well in Woodbourne, New York; the USGS wells in Bucks, Carbon, Chester, Delaware, Lebanon, Lehigh, Monroe, Schuylkill and Wayne Counties, Pennsylvania; the USGS wells in Burlington and Cumberland Counties, New Jersey; and the Delaware Geological Survey (DGS) well in New Castle County, Delaware. Groundwater well levels were close to the normal range at the beginning of the year. Wells in New Jersey started the year in the normal range and remained normal until the fall when levels dropped due to dry conditions; the Cumberland County well was in drought at the end of the year. Beginning in May, some wells in Pennsylvania experienced a decrease in groundwater levels through August and were either normal or below normal for most of the year. By the end of the year, wells in New Jersey and Delaware (New Castle) were in the normal range. Several wells in Pennsylvania and the Woodbourne well in New York were below normal at the end of the year.

1.2 WATER USE AND SUFFICIENCY

1.2.1 Population Served

The Delaware River Basin (DRB) provides water to portions of the four states located in the Basin: New York, New Jersey, Pennsylvania, and Delaware. The total population served includes those within the Basin boundaries and populations of the Basin states located outside of the DRB that are served through exports, and excludes populations located inside the DRB that are served through imports (**Figure 6**). Estimates of population served through exports are based on daily use by "equivalent" populations outside the Basin. Although water from the Basin is mixed with other sources for New York City, the "equivalent" population served for New York City is estimated by multiplying the DRB portion of the water supply by the population.

In 2023 the DRBC estimated that the total equivalent population served by DRB water was 14.2 million (DRBC, 2023). This estimate was based upon 2020 U.S. Census Bureau data and information obtained from state and local water resource agencies. The population in the DRB was estimated to be 8.63 million, and the net population served by imports/exports was estimated to be 5.56 million. A summary of these data is presented graphically in **Figure 6** as detailed in **Appendix A**.

	POPULATION (2020)
State	
Delaware	0.774
New Jersey	1.989
New York	0.117
Pennsylvania	5.749
Total DRB Population	**8.629**
Import/Export	
NJ – D & R Diversion	1.087
Total NY Diversion	4.664
CWA Import	-0.187
Total Import/Export	**5.564**
TOTAL ESTIMATED POPULATION SERVED	**14.193**

Total NY diversion includes NYC diversion and upstate NY communities. All values are in million people.

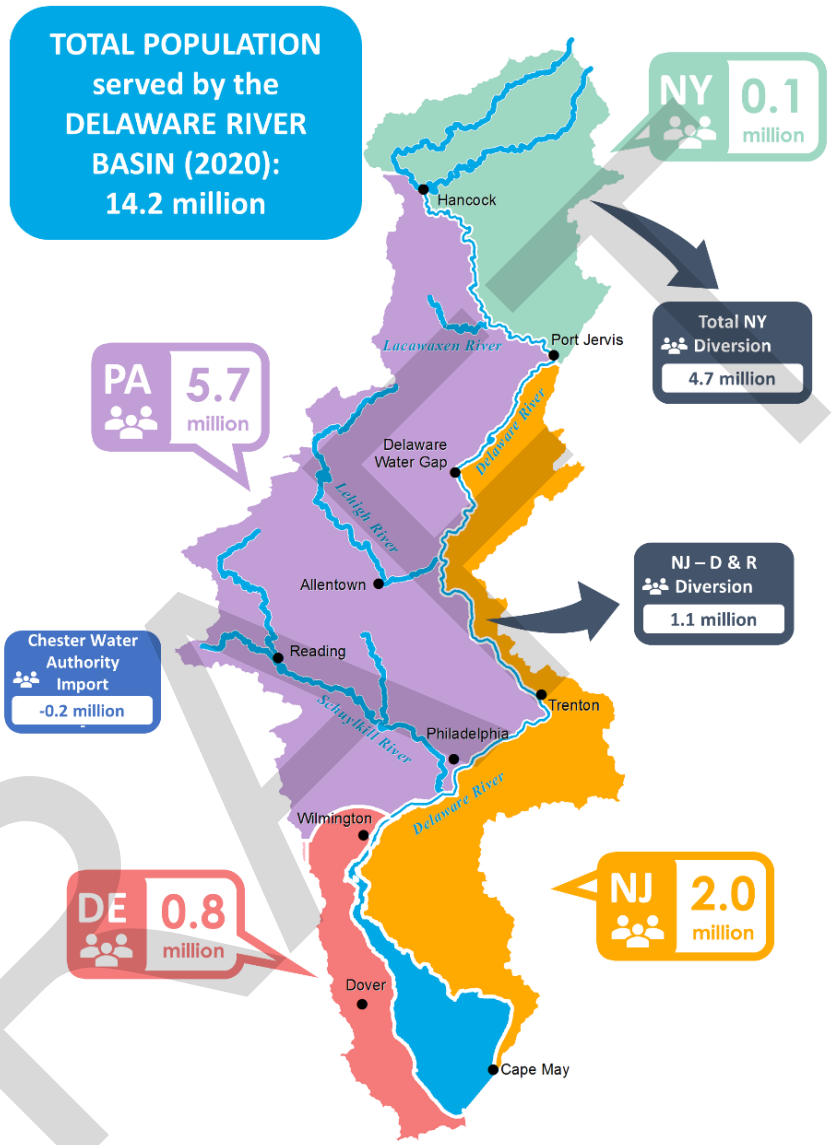


Figure 6. *Population served by DRB water based on population estimates for 2020 in the Delaware River Basin by state.*

1.2.2 Water Withdrawal Annual Summary

Understanding water withdrawals, water use, and supply is integral to the management of water resources. In recent years, our understanding of the ways in which water is withdrawn and used has improved greatly, as have the underlying systems in place to manage the data, allowing more timely and comprehensive assessments to be made. **Figure 7** shows the Basin-wide picture of water withdrawals, exports, and consumptive use, by sector, based on Calendar Year (CY) 2022 water use data; the data shown represent daily average withdrawals on an annual basis.

Key Delaware River Basin Water Use Facts:

- Based on 2020 data, an estimated 14.2 million people rely on water from the Basin for their daily water needs (see **Part I – Section 1.2.1**). Approximately 8.63 million people live in the Basin, and the volume of exports to New York City and northeastern New Jersey is sufficient to supply water to an additional 5.56 million people.
- Based on CY 2022 data, ground and surface water withdrawals from the Delaware River Basin are estimated to total 6,096 million gallons per day (MGD), out of basin diversions total 578 MGD, and consumptive use (including out of basin diversions) is 847 MGD.
- Approximately 92% of all water used in the Basin is obtained from surface waters.
- Four dominant use sectors account for over 90% of total water withdrawals. These sectors are thermoelectric power generation (57%); drinking water (24%) which includes public water supply, self-supplied domestic, and out of basin diversions; hydroelectric (9%); and industrial (7%).

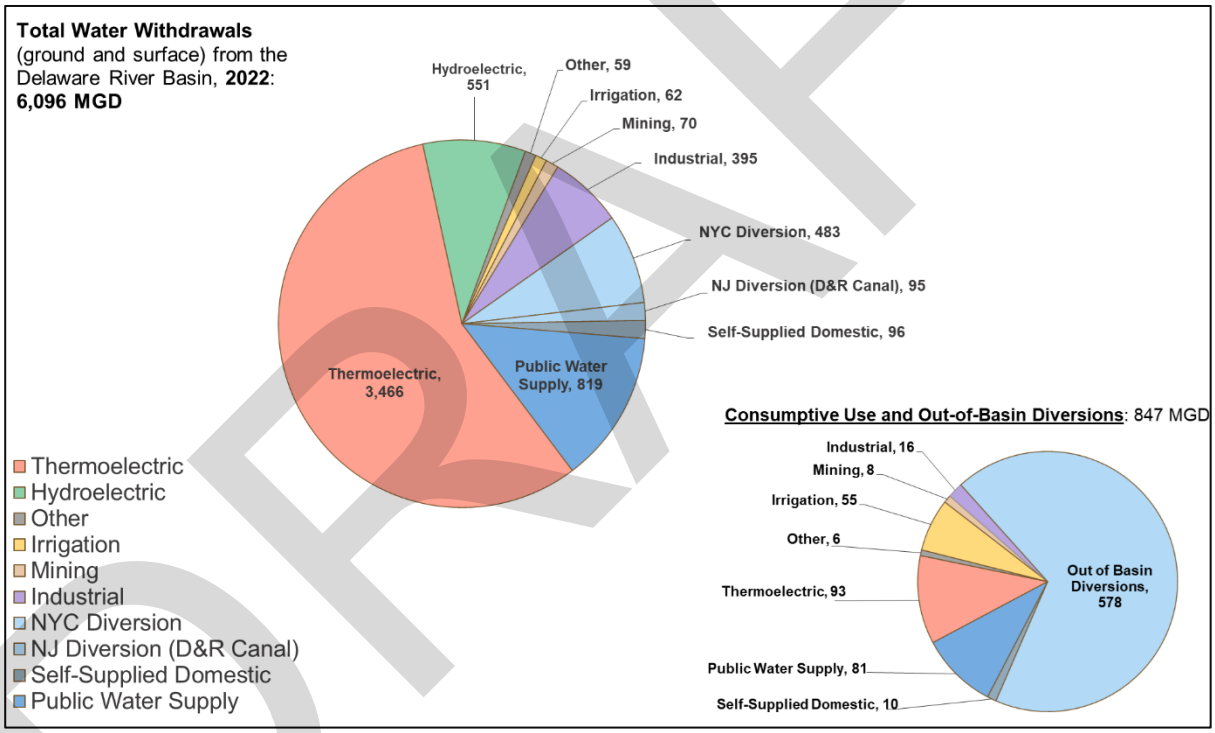


Figure 7. *Total water withdrawals and consumptive use / major exports from the Basin in CY 2022.*

1.2.3 Water Withdrawal Trends

In 2021 DRBC published a comprehensive report assessing historical water withdrawals and consumptive use in the Delaware River Basin from 1990-2017, with projections provided for eight major sectors through the year 2060 (Thompson & Pindar, 2021). The historical data and projections for water withdrawals and consumptive use are provided in **Figure 8** and **Figure 9**, respectively. The projections are based on data through 2017, while the plots have been updated to include water withdrawal data through 2022. The standard presentation of projection results in Thompson & Pindar, 2021 used a solid blue line to show the "projected value", surrounded by grey areas representing calculated "predictive intervals". The predictive intervals represent the likelihood of future data falling within each area around the expected value and are based largely on the distribution of residual errors of individual projection models (80% is dark grey; 95% is light gray). The projections and predictive intervals were calculated on a water supply system basis but can be aggregated to various scales such as the entire Basin (as shown in **Figure 8** and **Figure 9**) or individual water use sectors (as shown in **Figure 10** and **Figure 11**).

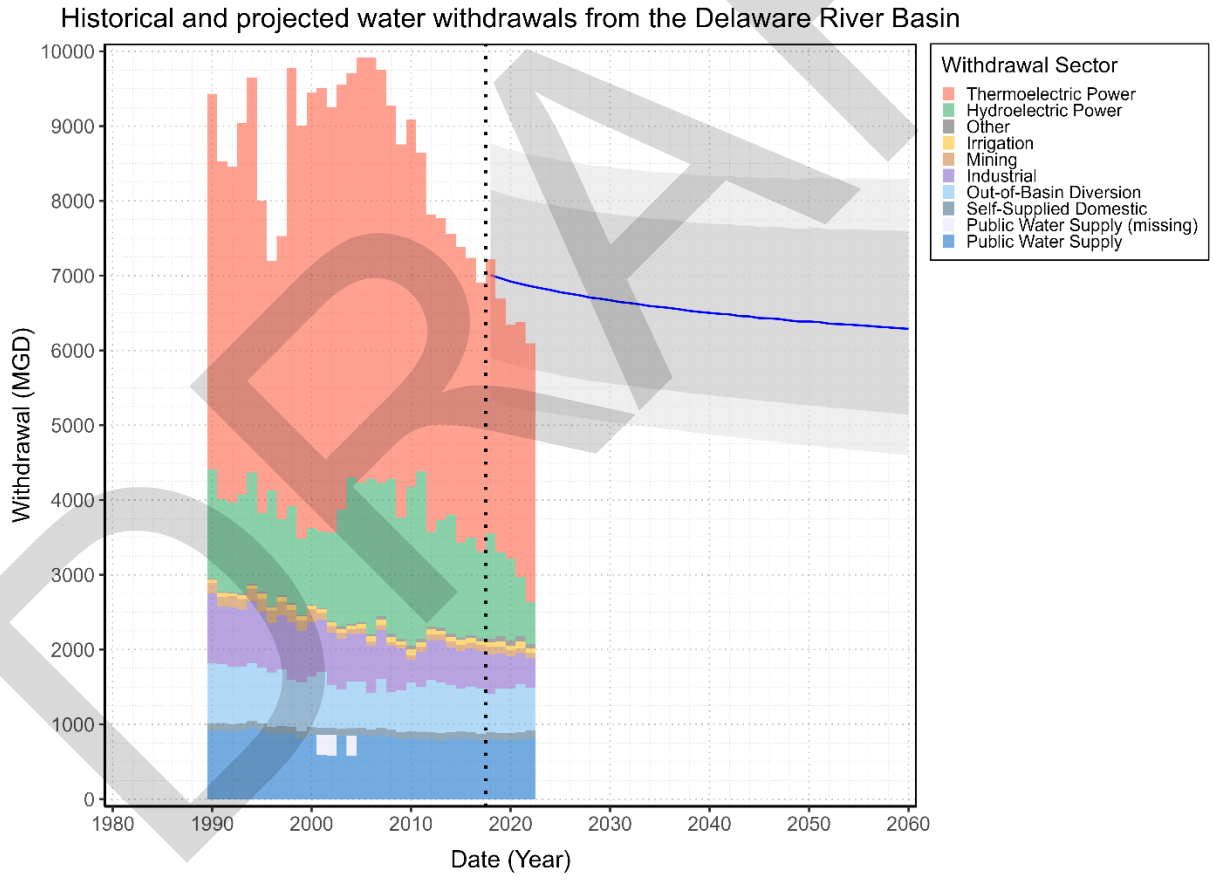


Figure 8. *Historical and projected water withdrawals from the Delaware River Basin, initially published in Thompson & Pindar, 2021 through 2017. The predictive interval shown represents the aggregated predictive intervals for all sectors. The figure has been amended with complete years of data through 2022.*

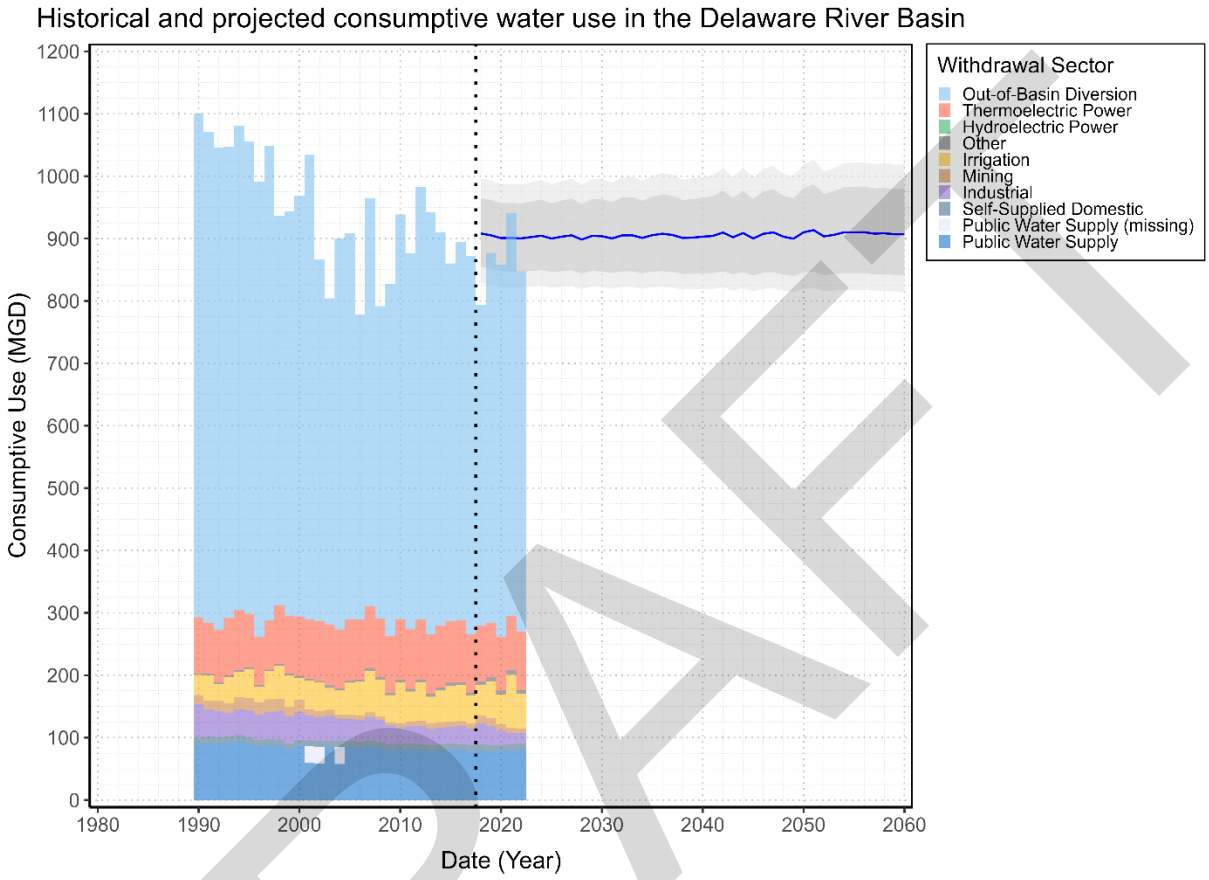


Figure 9. *Historical and projected consumptive use of water in the Delaware River Basin, initially published in Thompson & Pindar, 2021 through 2017. The predictive interval shown represents the aggregated predictive intervals for all sectors, excluding the out-of-Basin diversions which did not have a calculated predictive internal. The figure has been amended with complete years of data through 2022.*

Some key findings from these figures are that:

1. Peak water withdrawal from the Delaware River Basin has likely already occurred (in 2005 and 2006 it was estimated to be approximately 9.917 billion gallons per day). This conclusion remains unchanged based on recent data.
2. On average, historical water withdrawals from the Basin (1990-2017) have been comprised of about 5.4% groundwater and 94.6% surface water. In 2022 the ratio was approximately 8.1% groundwater and 91.9% surface water.
3. Reported withdrawals in 2022 were 6,096 MGD, 11.1% lower than the projected value of 6,859 MGD. Calculated consumptive use (excluding Out-of-Basin diversions) was 270 MGD, 4.3% lower than the projected value of 282 MGD.

Considering the data presented in **Figure 8** and **Figure 9**, it was determined that additional presentation of data from four of the withdrawal sectors would be helpful in describing the Basin-wide trends. These sectors include Thermoelectric, Industrial, Public Water Supply, and Irrigation. Individual sector plots showing historical data and projections from Thompson & Pindar, 2021 are provided for withdrawals (**Figure 10**) and consumptive use (**Figure 11**). From these graphics, it is possible to conclude that:

- The thermoelectric sector has displayed dramatic decreases in water withdrawals since about 2007 (almost -2,500 MGD), which has not translated into reduced consumptive use. The projection for withdrawals continues to decrease, whereas the projection for consumptive use is almost constant.
- The industrial sector has shown significant declines in both withdrawals and consumptive use, related to declines in production at specific facilities (*e.g.*, U.S. Steel Fairless Plant stopped iron and steel production in 1991, Bethlehem Steel ceased production in 1995, there was a temporary shutdown of Delaware City Refinery in 2010, and Philadelphia Energy Solutions closed in 2019). Despite these historical declines, the projections for self-supplied industrial withdrawal and consumptive use suggest a lower plateau and continuation at a relatively constant rate. Recent data suggests that reported withdrawals and consumptive use are near the lower predictive interval, and may reflect driving factors which were outside the scope of Thompson & Pindar, 2021 projection models.
- The public water supply sector historically has shown a decrease in withdrawals of about 100 MGD over three decades (1990-2020). The projection provides a slight overestimation but suggests that the decrease will continue despite growing in-Basin populations.
- The irrigation sector is comprised of multiple uses, of which the primary is agricultural irrigation. . Withdrawal reporting compliance and accuracy appears to be increasing. Withdrawals and consumptive use are projected to increase in the future.

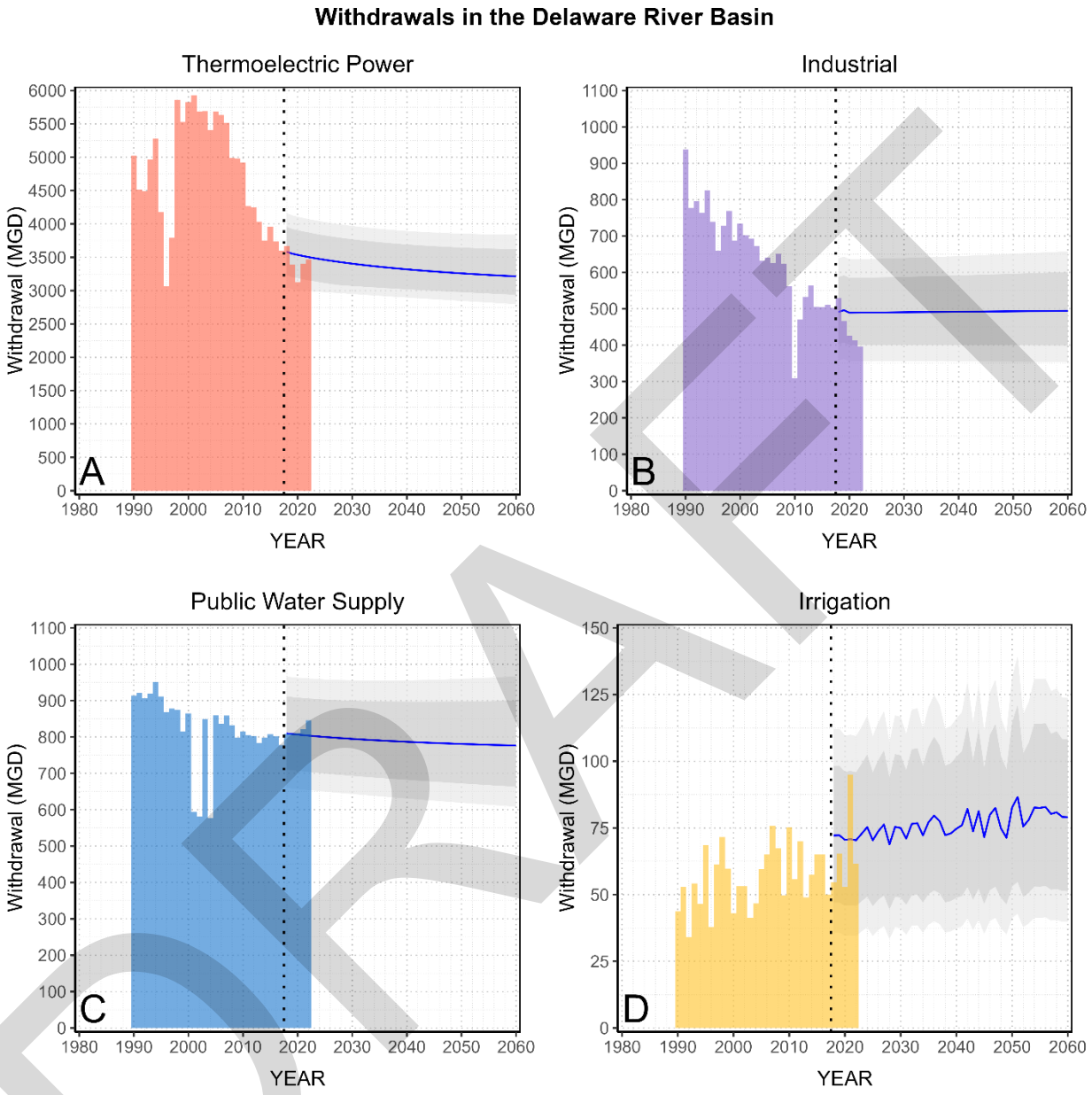


Figure 10. *Historical and projected water withdrawals for the major sectors within the Delaware River Basin. These data used to generate these figures have been adopted from Thompson & Pindar, 2021 through 2017; however, the historical data has been updated through 2022.*

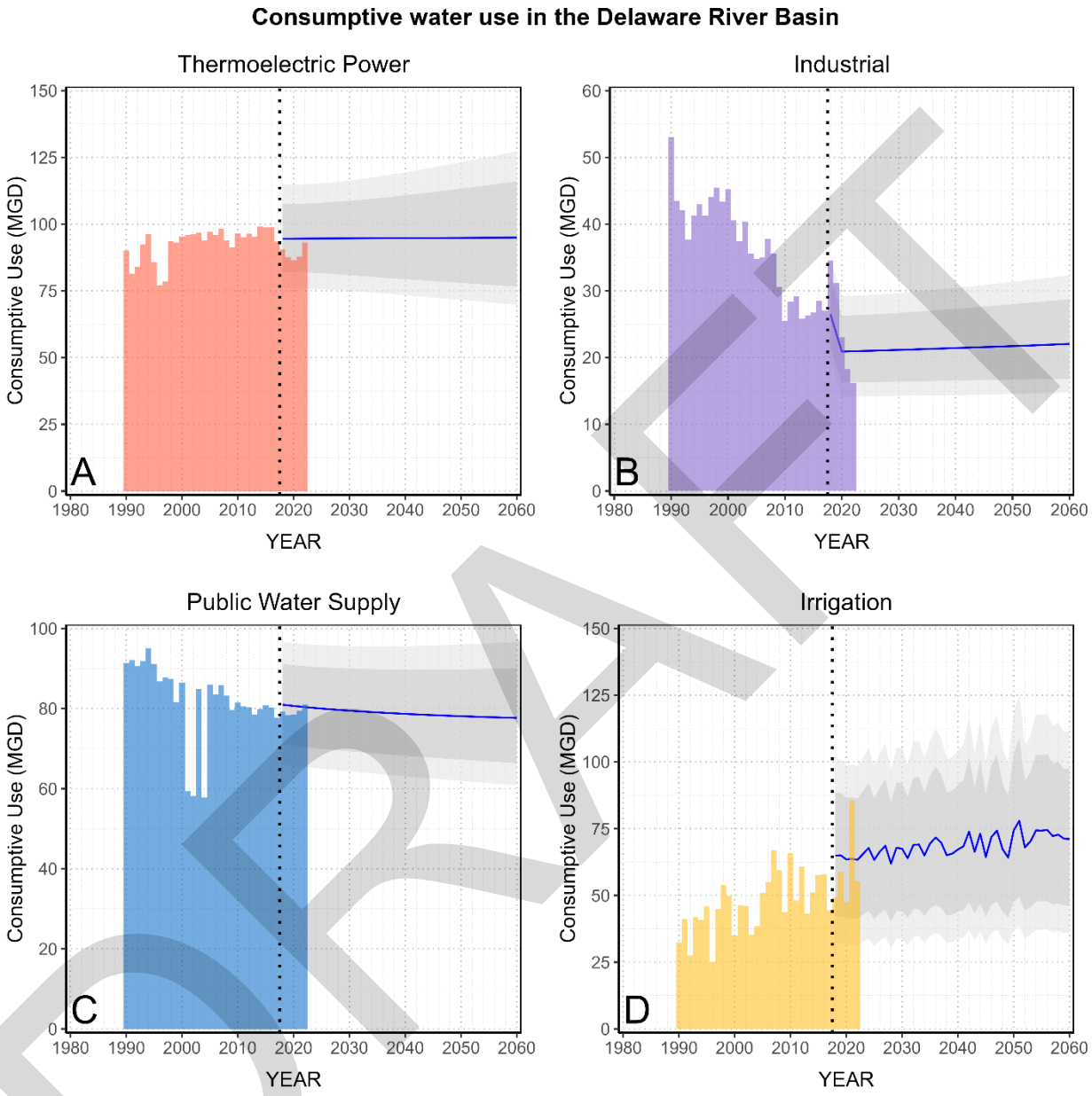
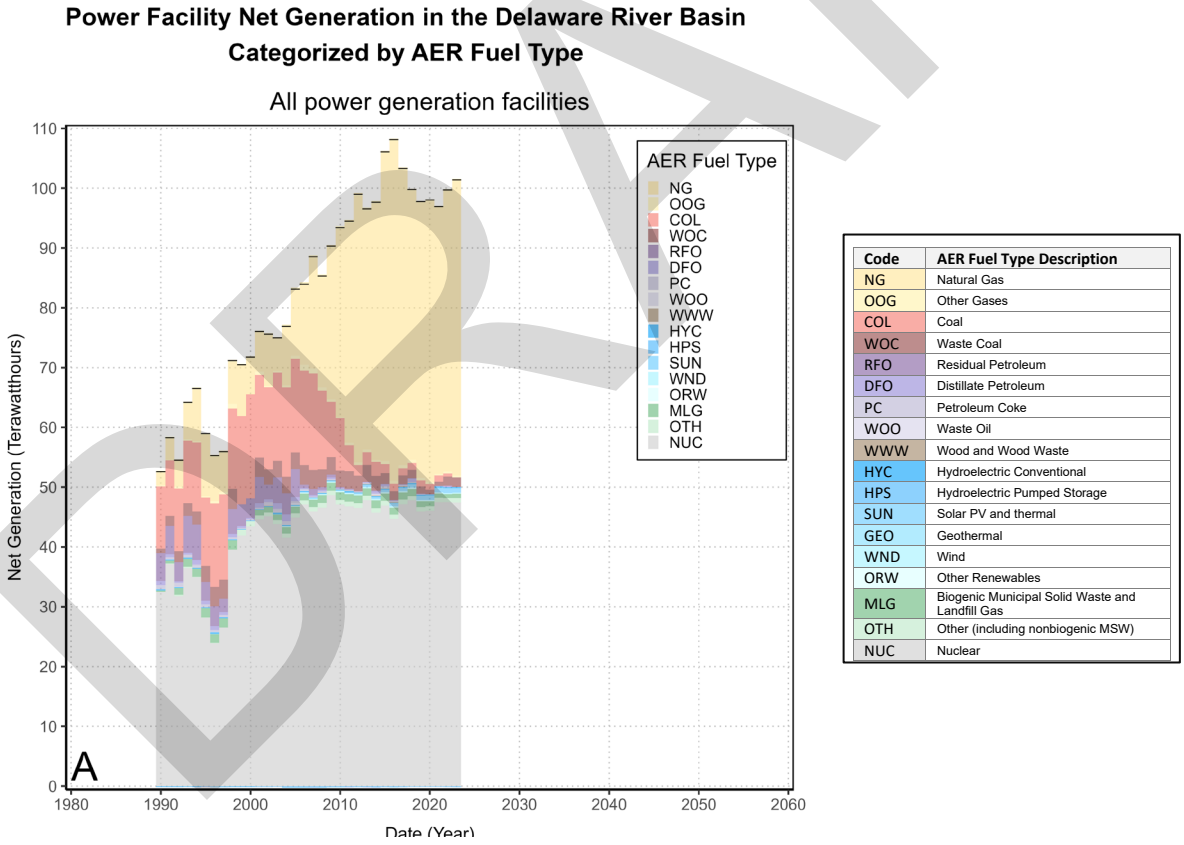


Figure 11. *Historical and projected consumptive use for the major sectors within the Delaware River Basin. These data used to generate these figures have been adopted from Thompson & Pindar, 2021 through 2017; however, the historical data has been updated through 2022.*

1.2.3.1 THERMOELECTRIC

An evaluation presented in Thompson & Pindar, 2021 compiled a historical timeseries of net energy generation by primary fuel type for the Delaware River Basin through 2017 and has been updated through 2023 (**Figure 12**). The study broadly showed that electrical energy production by facilities within the Delaware River Basin is nationally significant, with the Lower Delaware portion of the Basin ranking second in the country for total net generation in terawatt hours (TWh) in multiple years. The trends observed with the addition of more recent data are still largely reflected by the discussion provided in Thompson & Pindar, 2021.

Water withdrawals for thermoelectric power generation are primarily used for cooling purposes. The cooling process is typically achieved by either highly evaporative cooling towers or a once-through cooling (OTC) process that uses a condenser to absorb heat. The two types of cooling use water in different ways. Evaporative cooling towers require a smaller volume of withdrawal but consume most of the water (typically >90% consumptive use). Once-through cooling requires much greater volumes of water at the intake, but the rate of loss to evaporation is very small (typically <1%). An analysis presented in Thompson & Pindar, 2021 allowed withdrawal and consumptive use data by thermoelectric facilities to be classified by cooling technology.



Code	AER Fuel Type Description
NG	Natural Gas
OOG	Other Gases
COL	Coal
WOC	Waste Coal
RFO	Residual Petroleum
DFO	Distillate Petroleum
PC	Petroleum Coke
WOO	Waste Oil
WWW	Wood and Wood Waste
HYC	Hydroelectric Conventional
HPS	Hydroelectric Pumped Storage
SUN	Solar PV and thermal
GEO	Geothermal
WND	Wind
ORW	Other Renewables
MLG	Biogenic Municipal Solid Waste and Landfill Gas
OTH	Other (including nonbiogenic MSW)
NUC	Nuclear

Figure 12. *Historical net electrical energy generation by facilities within the Delaware River Basin.*

1.2.3.2 PUBLIC WATER SUPPLY

Historical data for public water supply (PWS) withdrawals largely show a decreasing trend (**Figure 13**) but with slight increases in recent years; DRBC will continue to monitor the data and possible changing trends. The long-term decreases are largely driven by water conservation measures in the form of changes in plumbing codes, enacted in the early 1990s, which require use of more efficient plumbing fixtures and fittings. In addition, education and awareness of water conservation practices have played a role in decreasing water use for this sector despite increases in population (shown by the red line in **Figure 13**). While decreasing in the aggregate, withdrawals have increased in several systems where there are population growth regions (*i.e.*, where water conservation practices cannot offset the more rapid increase in population). Over the past 30 years, DRBC has been a leader in enacting regulations to promote water conservation in the areas of source and service metering, leak detection and repair, plumbing fixtures and fittings, and water rate structures. The withdrawal trend shown in **Figure 13** indicates that these regulations have been successful and have contributed to the trend in PWS water withdrawals.

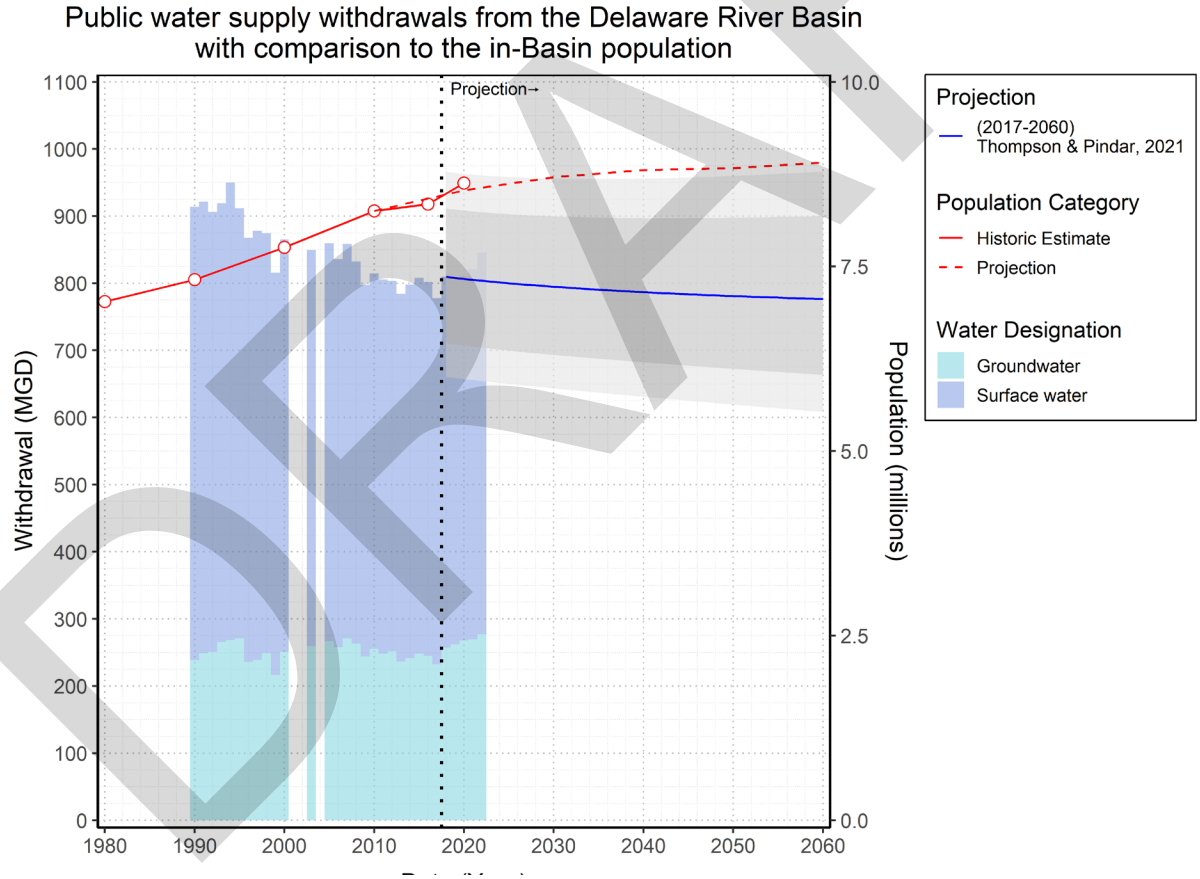


Figure 13. *Withdrawals by public water supply systems in the Delaware River Basin 1990-2022. There are known data gaps present for 2001, 2002 and 2004. The population values projected from 2010 through 2060 are based on data through 2017 and are reflective of the population residing within the Basin boundary. The historical estimates are from U.S. Census Bureau data from 1980 through 2020, as well as the 2016 estimate described in Section 1.2.1 based upon 2012-2016 ACS data.*

1.2.3.2.1 Population and Public Water Supply Withdrawals

In evaluating trends in PWS withdrawals, the population which resides within the Basin is of interest, as well as the percentage of that population which may live within public water supply service areas. Understanding these dynamics, especially in relation to water demands, can play a key role in sustainable water resource planning for the Delaware River Basin.

The Thompson & Pindar, 2021 study leveraged spatial population data available from the U.S. Environmental Protection Agency (EPA) and performed an analysis which allowed a dynamic estimate and projection of in-Basin population, including estimated percentages of the population residing within and outside of public water supply service areas. The estimated 2010 population is based on U.S. Census Bureau data adjusted to the Basin boundary, and was projected as described in Thompson & Pindar, 2021. The results from the 2021 study estimated a 2010 in-Basin population estimate for the Delaware River Basin of approximately 8.252 million (MM) people, of which approximately 86% reside within public water supply service areas (7.106 MM) and approximately 14% reside outside of public water supply service areas (1.146 MM), as shown in **Figure 14**. The total in-Basin population in the 2021 study was projected to increase to 8.907 million people by 2060, of which the percentage of people residing with public water supply service areas is projected to increase to 87.6% (~7.803 MM). The figure has been updated with an in-Basin population estimate based on 2020 U.S. Census Bureau information (8.629 MM), as presented in **Part I – Section 1.4.1**.

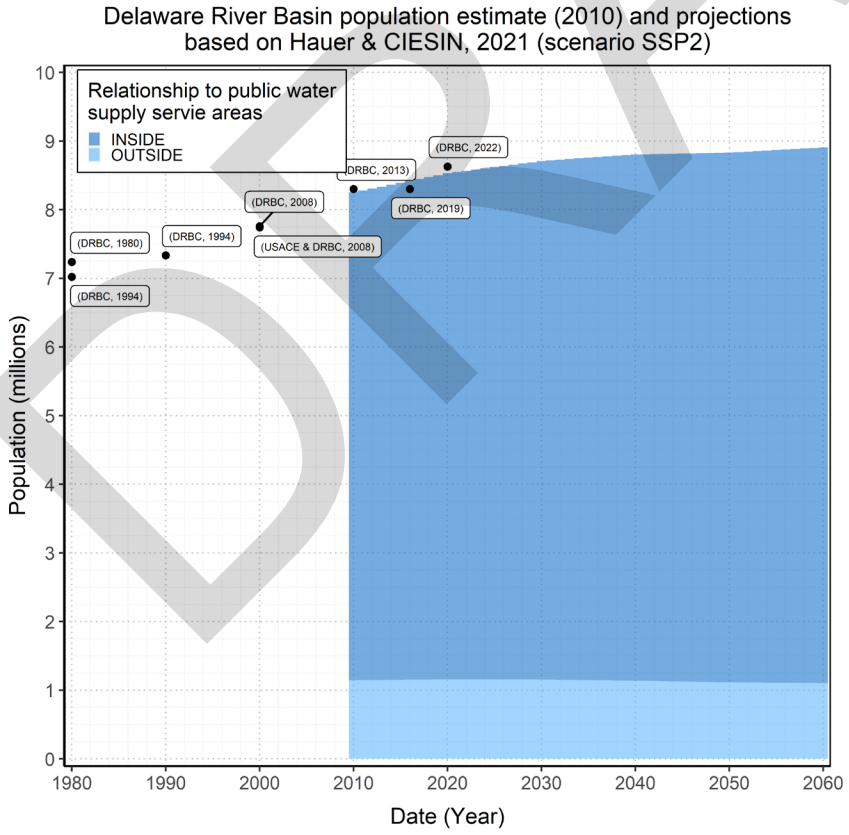


Figure 14. *In-Basin population estimates for the Delaware River Basin, categorized by relationship to public water supply service areas, projected under model scenario SSP-2 through 2060. Note that estimates indicated by points with reference information are population only, and do not contain information related to service areas.*

1.2.3.2.2 Public Water Supply Water Audit Data

In 2009, as part of DRBC's effort to ensure its regulations reflect the latest thinking in the field of water efficiency, the Commission amended its Comprehensive Plan and Water Code to implement an updated water audit approach to identify and manage water loss in the Basin, in partnership with Basin water purveyors. The approach is consistent with the International Water Association (IWA) and American Water Works Association (AWWA) Water Audit Methodology and is considered a best management practice in water loss control. The revised regulations require PWS systems to conduct an annual water audit to help identify water losses, particularly water lost due to leaky infrastructure. DRBC performed multiple outreach efforts, and the audit became a mandatory requirement in 2012.

In CY 2022, there were 277 water audits received by the Commission. Reports from 21 systems were not received, and therefore those data were backfilled with the most recent data available. A "water balance" for all systems subject to audit requirements is presented in **Figure 15**, indicating that approximately 805 MGD of water was put into distribution systems in the Delaware River Basin (termed *Water Supplied*). A key term used in the AWWA water audit methodology to quantify water losses and unbilled water consumption is *Non-revenue water*. Non-revenue water is that which has been treated, pressurized, and enters the distribution system but generates no revenue for the water purveyor (i.e., water losses or unbilled water). Water losses can be real losses (through leaks, also referred to as physical losses) or apparent losses (for example, through theft or metering inaccuracies). Based on the CY 2022 reported data, an estimated 176 MGD were reported as physically lost from distribution systems in the Basin along with an estimated 28 MGD reported as apparent losses and 25 MGD of unbilled authorized consumption for a total of 229 MGD of non-revenue water reported in CY 2022.

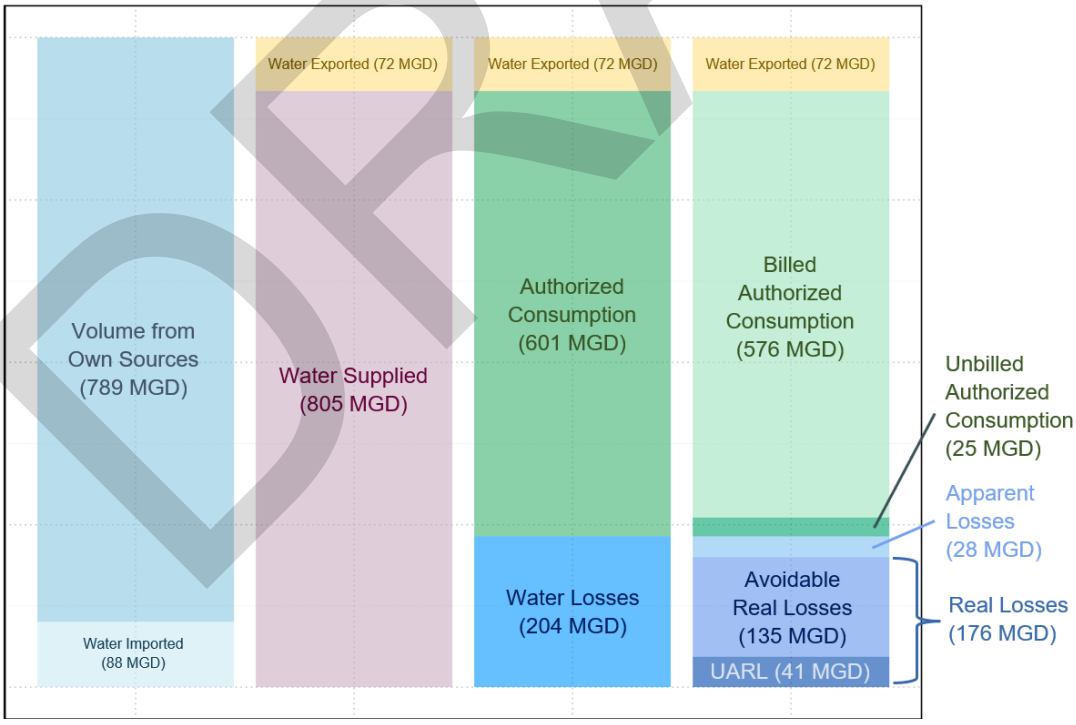


Figure 15. *Aggregate water balance for 300 systems reporting water audit data to DRBC for CY2022.*

DRBC recently published an analysis of the first ten years of data collected in through the water audit program, titled *A Comprehensive Assessment of the Delaware River Basin Commission's Water Audit Program (2012-2021)* (Thompson et. al, 2023). **Figure 15** has been adapted from that report and presents the term UARL (Unavoidable Annual Real Losses), which is calculated at the system level to determine the portion of all real losses that is likely to never be eliminated no matter how hard a purveyor tries. This is a deviation from the way AWWA presents the water balance but determined to be an important component to remind readers that not all leaks can be prevented. Consequently, it suggests that the other portion of real losses (135 MGD) might be termed something like Avoidable Real Losses. Within the Basin, it is possible to show how different levels of reduction in real losses compares to projections of water withdrawals by purveyors, and shown in **Figure 16** using CY 2022 data. The full report not only provides extensive analysis of the program (such as **Figure 16**), but provides recommendations to help shape the program moving forwards.

Data collection under the DRBC's water audit program marks a significant step in a long-term effort to improve water efficiency and promote best practices in water loss control for Basin water purveyors. As the program progresses, continued emphasis will be placed on ensuring that water purveyors build confidence in the data submitted in the water audit (for example, data validation). Developing and providing accurate data for the water audit process will result in a clearer understanding of the causes of water loss and is a vital first step in the process.

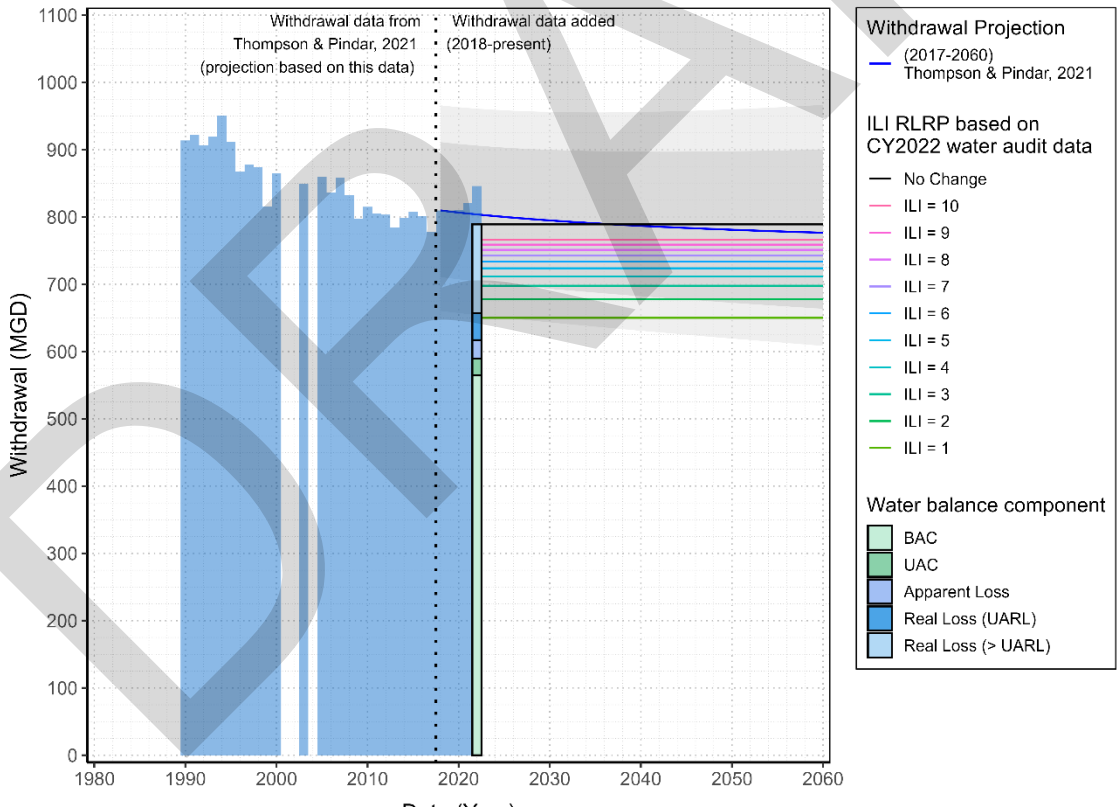


Figure 16. *A comparison of historical water withdrawals in the basin, projected withdrawals from Thompson & Pindar, 2021, and CY 2022 water audit data. Horizontal lines representing the different levels of possible real loss reduction have been calculated for each ILI (Infrastructure Leakage Index) based on applying the real loss reduction potential (RLRP) to the CY 2022 Volume from Own Sources.*

1.2.3.3 INDUSTRIAL

Historical data for industrial withdrawals show a decline from levels in the early 1990s (**Figure 10**). The closing of the Bethlehem Steel plant in Bethlehem, Pa., in 1995 contributed significantly to the overall decline in water use for this sector as it was the Basin's largest industrial water user. Over the past decade, industrial water use has declined slightly despite numerous facilities changing hands. Several large refineries in the Basin have experienced ownership turnover in recent years. Refineries that were idle are once again in production and have returned to more normal operations with water withdrawal data returning to previous levels. As an example, the large drop in water use observed near 2010 is primarily attributed to a period of temporary closure of a major refinery.

1.2.4 Seasonal Variation in Withdrawals and Consumptive Use

The data shown in **Figure 8** through **Figure 13** are annual average rates of withdrawal and consumptive use; however, most sectors experience seasonal and even daily fluctuations. Thermoelectric power generation experiences peaks in the summer months as a consequence of increased power demand for residential and commercial cooling. Simultaneously, public water suppliers experience peak demands in the summer months when lawn-watering and other outside uses are greatest. Compared to an average annual withdrawal rate, irrigation withdrawals during the growing season have some of the highest median peaking factors. This highlights the need for including accurate seasonal (peak) considerations—including ecological (instream) needs—in long-range supply sufficiency assessments.

1.2.5 Groundwater Availability

Two areas of the Basin are included in special management programs to mitigate historical groundwater supply issues and prevent future stress. The Commission manages the Southeast Pennsylvania Groundwater Protected Area (SEPA GWPA) on behalf of the Commonwealth of Pennsylvania, and New Jersey manages Critical Area 2 in the Potomac-Raritan-Magothy (PRM) aquifer system in southwestern New Jersey (**Figure 17**).

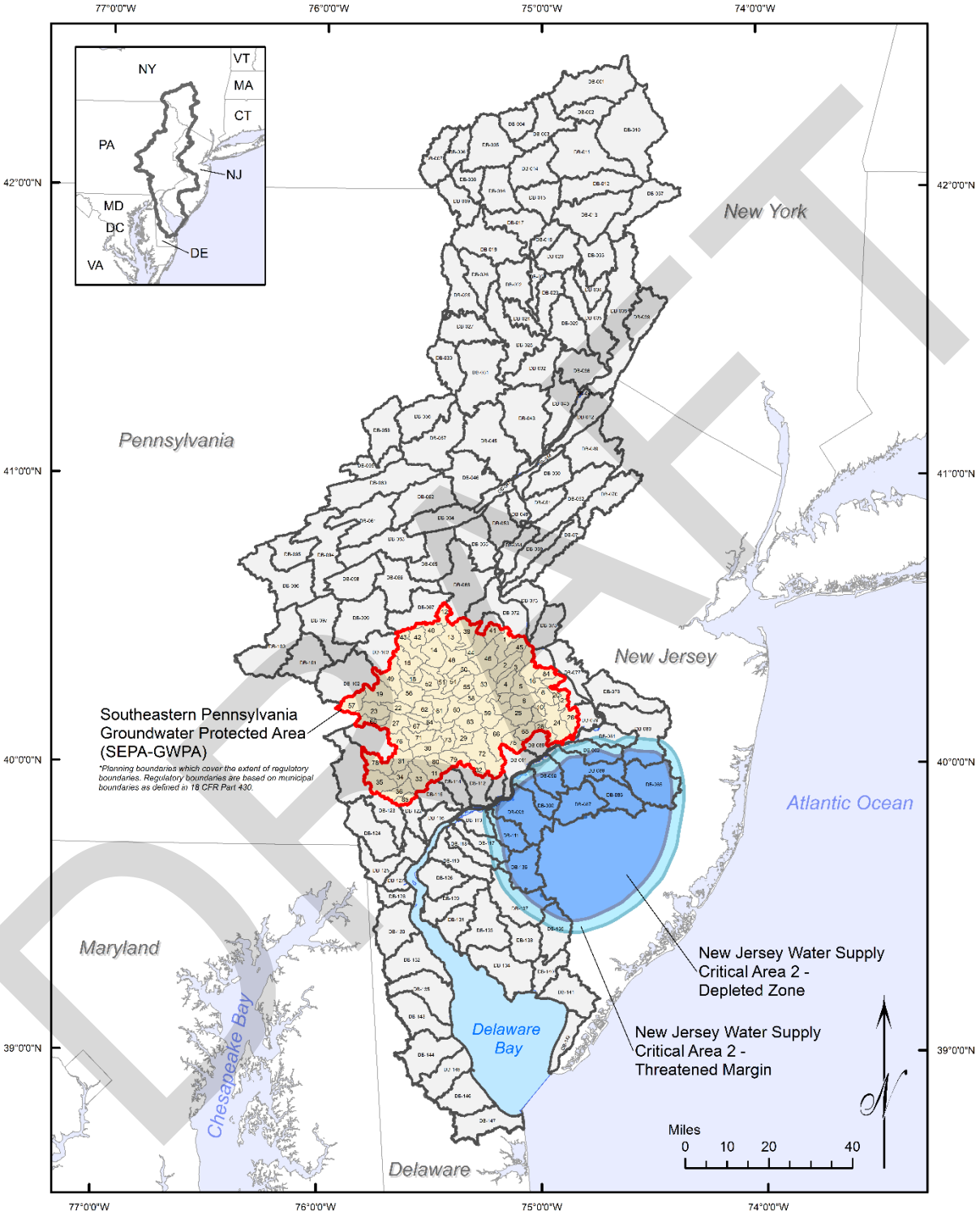


Figure 17. *Groundwater Management Areas in the Delaware River Basin.*

1.2.5.1 BASIN-WIDE

A study in partnership with USGS was commissioned in 2006 to assess baseflows in 147 subbasins of the DRB (Sloto & Buxton, 2006). Groundwater availability was determined using two separate but similar methods appropriate for (1) subbasins underlain by fractured rocks and (2) subbasins with unconsolidated sediments in the Coastal Plain. At a high level, the methods compare net groundwater withdrawals from each subbasin against the available natural resources (groundwater baseflows calculated for each subbasin based on geology). One particularly important limitation of this method is that groundwater withdrawals from confined aquifers in the Coastal Plain subbasins are not evaluated, as withdrawals from confined aquifer networks may have regional influences which extend beyond subbasin boundaries. DRBC investigated this concept further while assessing groundwater withdrawal data and concluded that the method is not suited for the 26 subbasins which are greyed out on **Figure 18** (Thompson et. al, 2022).

DRBC has used the Sloto & Buxton, 2006 methodology in the remaining 121 subbasins to calculate groundwater availability in the Delaware River Basin based on withdrawal data from 2022 (**Figure 18**). Withdrawal data was adjusted to represent "net" groundwater withdrawals, which is assumed to be the difference between the total groundwater withdrawal from a subbasin and water recharge occurring within the same subbasin. Examples of groundwater recharge include water returned to the subsurface from septic fields or infiltration during irrigation. An example of surface water recharge is mine dewatering below a water table which pumps to a stream. The results indicate that one subbasin is currently between 50.1% and 75% of its 25-year annual baseflow, and five subbasins are between 25.1% and 50% of their 25-year annual baseflow. A historical timeseries of net groundwater withdrawals can be compiled from the work performed by Thompson & Pindar, 2021 through 2017, and updated through the year 2022, as presented in **Figure 19**.

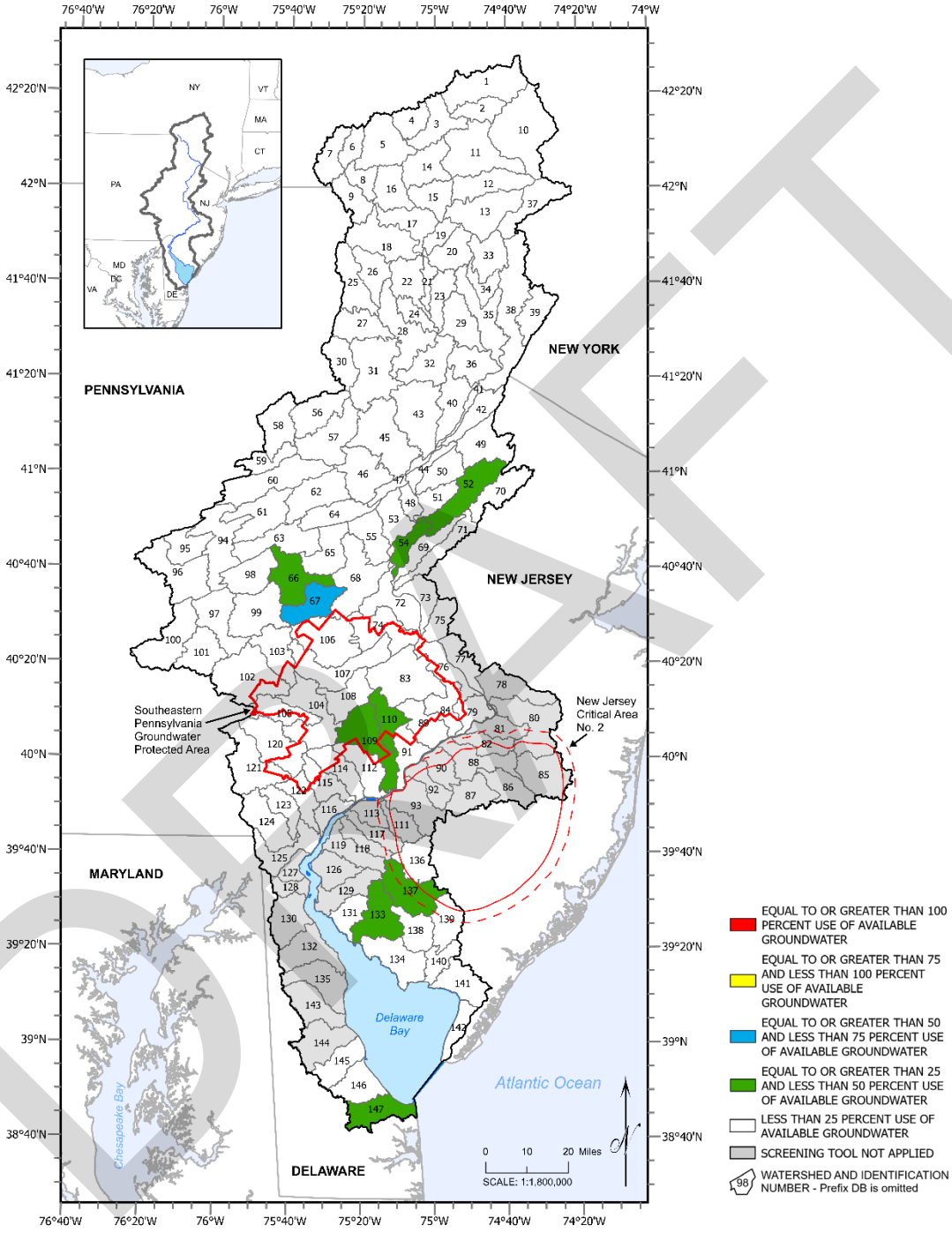


Figure 18. *Net groundwater withdrawals basin wide for CY 2022. One (blue) basin is currently between 50.1% and 75% of its 25-year annual baseflow. Greyed out basins denote areas where the Commission's screening tool was determined to not be a suitable method for analysis based upon geologic conditions.*

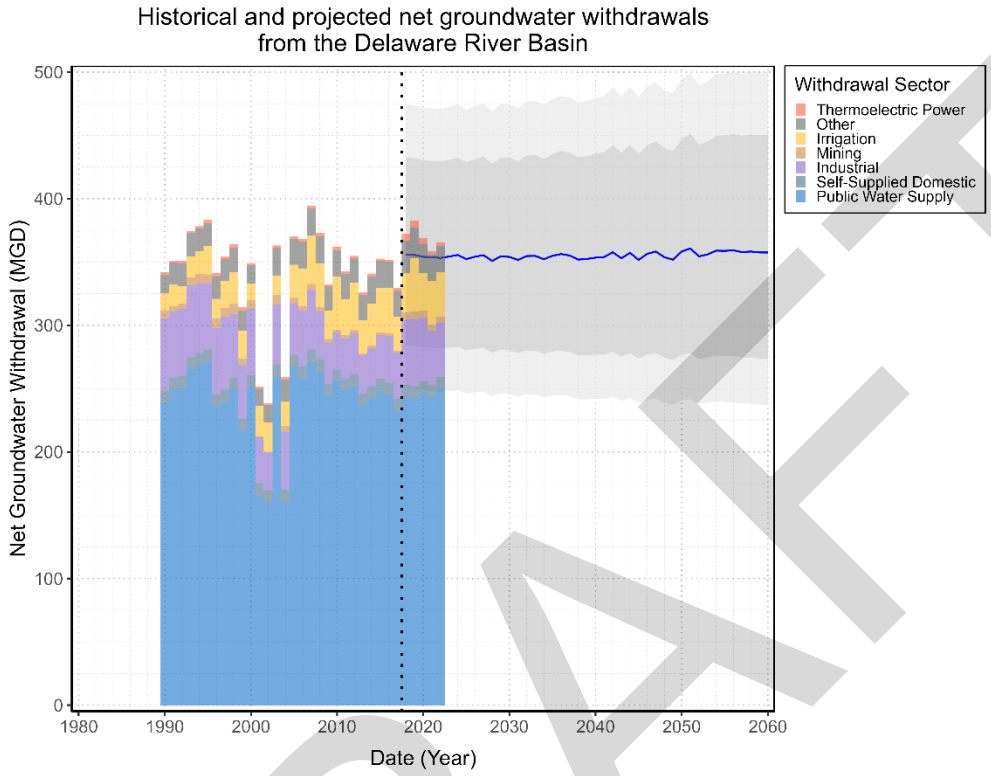


Figure 19. *Net groundwater withdrawals from the Delaware River Basin, calculated from the data initially published in Thompson & Pindar, 2021 through 2017. The figure has been amended with complete years of data through 2022.*

1.2.5.2 SOUTHEAST PENNSYLVANIA GROUNDWATER PROTECTED AREA

The SEPA GWPA is an area of 1,200 square miles that includes 76 basins closely managed by DRBC regarding groundwater withdrawals, well interferences, and municipal water supply planning. Withdrawal limits have been established for each of the basins. The following summary of conditions is based on an analysis by DRBC using groundwater withdrawal data reported to the Pennsylvania Department of Environmental Protection (PADEP), adjusted to represent net groundwater withdrawals.

The Commission will continue to update basin usage with current PADEP water withdrawal data. As highlighted in **Figure 20**, the net groundwater withdrawal in three basins is currently between 50.1% and 75% of their subbasin withdrawal limits. One basin is above its withdrawal limit, that is greater than 100.1%. This basin, Basin 29 (Schuylkill-Crow Creek), has historically been above its withdrawal limit because a major withdrawal from a quarry reservoir is counted as a groundwater withdrawal by PADEP as are all quarries as a matter of PADEP policy.

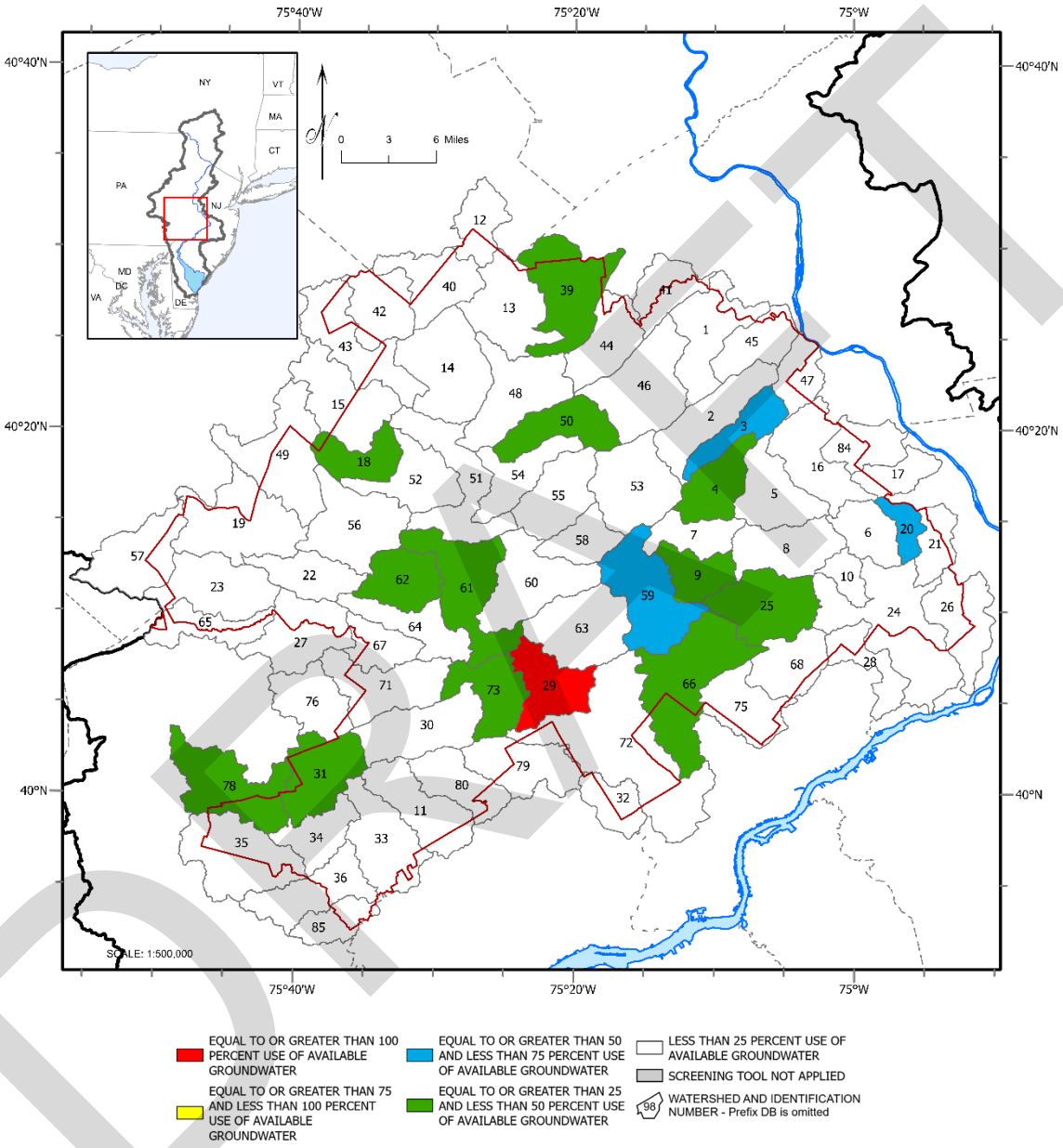


Figure 20. *Net groundwater withdrawals in the Southeastern Pennsylvania Groundwater Protected Area for CY 2022. Three (blue) basins are currently between 50.1% and 75% of their annual withdrawal limits and one basin (red) is greater than 100.1% of its withdrawal limit.*

A historical timeseries of net groundwater withdrawals from SEPA GWPA was compiled from the work performed by Thompson & Pindar, 2021 and updated through the year 2022, as presented in **Figure 21**. Over the period from 2000 to 2022, cumulative net groundwater withdrawal in the SEPA GWPA has decreased. This is likely partially attributable to improved water conservation, as noted above, and due to infrastructure changes (such as the diversion of surface water from the Delaware River near Point Pleasant, Pa., which helps to offset groundwater use by communities in Bucks and Montgomery counties).

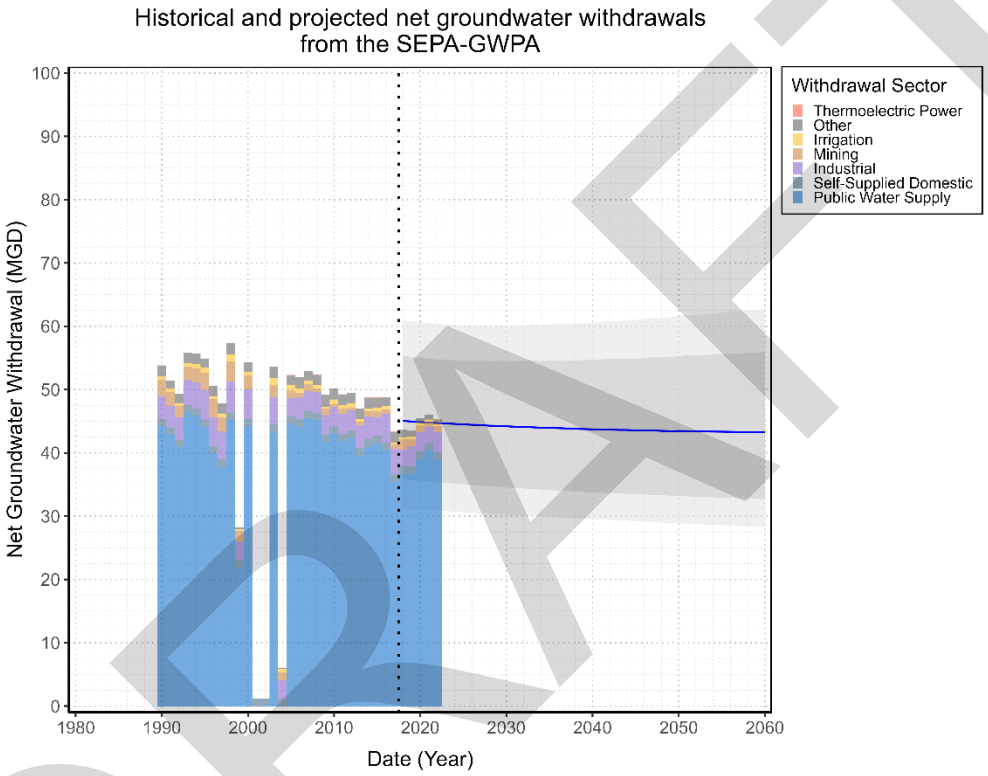


Figure 21. *Net groundwater withdrawals from the Southeastern Groundwater Protected Area, calculated from the data initially published in Thompson & Pindar, 2021 through 2017. The figure has been amended with complete years of data through 2022.*

DRBC has an automated dashboard of groundwater surface elevations in the SEPA GWPA[2] which is available on the DRBC website.

[2] https://www.drbc.net/Sky/sepagwpa.htm

1.2.5.3 NEW JERSEY CRITICAL AREA 2

The New Jersey Department of Environmental Protection (NJDEP) and USGS regularly monitor groundwater levels in the affected aquifers of Critical Area 2 (CA2) in southern New Jersey, and assessments indicate that withdrawals have significantly decreased beginning with the program's inception in 1996 (**Figure 22A**), resulting in concurrent rebounding of groundwater levels in most monitoring wells (**Figure 22B**).[3] The surface water diversion/treatment facility on the Delaware River in Delran, Burlington County, N.J., owned and operated by the New Jersey American Water Company, was chosen as the regional water supply alternative for Critical Area 2. The Tri-County Water Supply Project remains the primary water source to meet growing water demands in the region. The downward trend that is visible in **Figure 22A** is primarily the result of major infrastructure improvements to allow areas that were previously solely reliable on local Potomac-Raritan-Magothy (PRM) withdrawals to tap into the regional solution of the Delaware River Tri-County project, which is primarily a surface water withdrawal. In addition, water conservation and indoor plumbing efficiencies, as well as economic and business trends, add to the overall downward trend in water withdrawals.

DRBC has an automated dashboard of groundwater surface elevations in Critical Area 2[4] which is available on the DRBC website.

[3] Critical Area 2 was designated on July 20, 1993, by administrative order (NJAC 7:19-8.5).

[4] https://www.drbc.net/Sky/nj2.htm

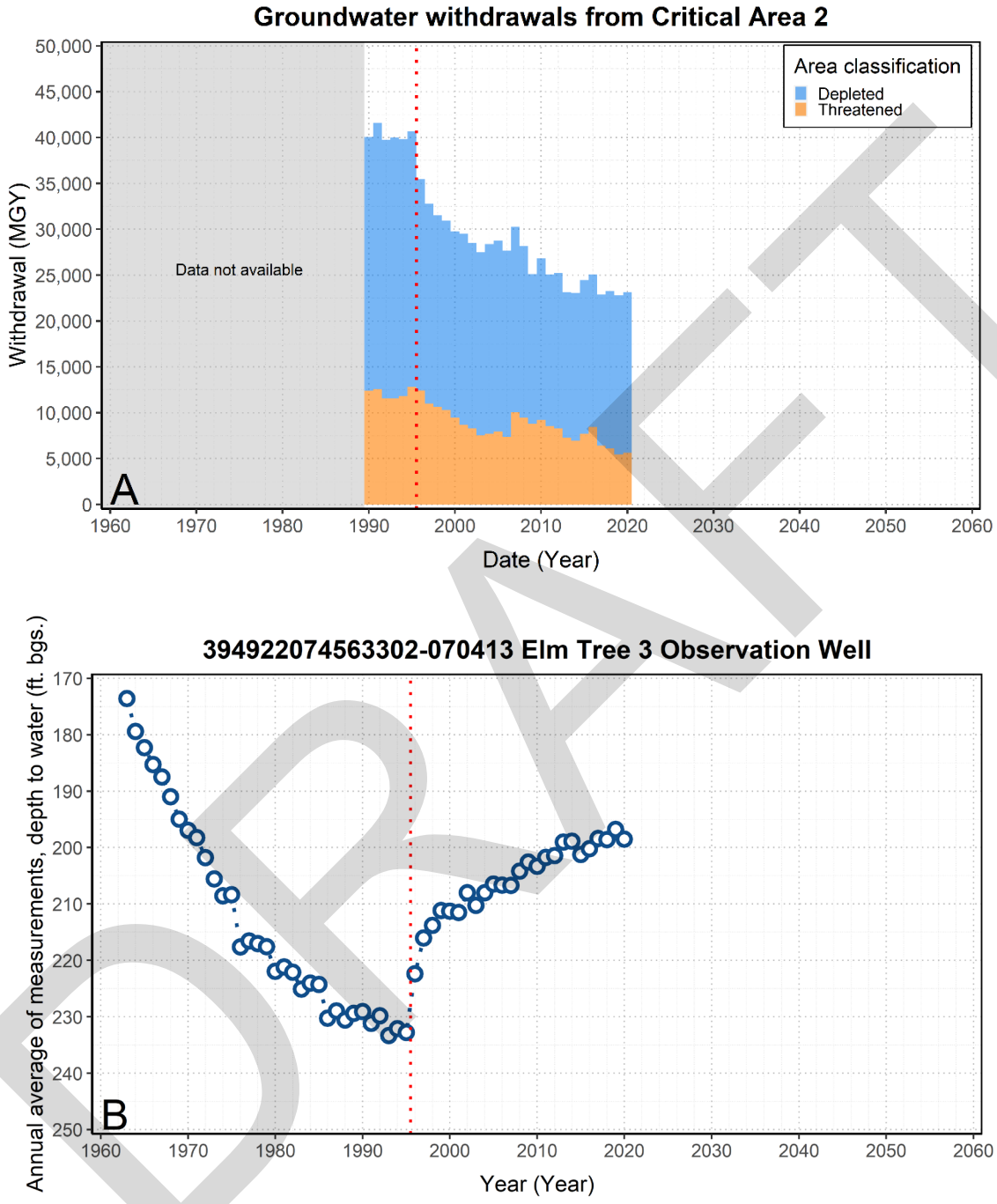


Figure 22 (A). *Withdrawals from the PRM from 1990-2020 show significant reductions since the inception of Critical Area 2 management in 1996. Source: I. Snook, NJDEP, February 2023.* ***(B)*** *Example of rebounding groundwater levels in the upper PRM of NJ Critical Area 2 since program inception in 1996. Elm Tree 3 observation well Burlington Co., NJ. Period of record shown (02/22/1963 – 12/31/2020), data presented as an annual average of measurements. Source: USGS, February 2023. (https://groundwaterwatch.usgs.gov/awlSites.asp?S=394922074563302)*

1.2.6 Areas of Concern: PRM and Bayshore Watersheds

A 2007 report of a multi-year investigation by the U.S. Army Corps of Engineers (USACE or Corps) concluded that groundwater withdrawals in northern New Castle County, Del., were reducing local stream base flows and forming cones of depression. According to this report, pumping in Delaware is increasing groundwater flow from Maryland and decreasing flow into New Jersey by about 10% each, and regional pumping has created overlapping cones of depression across the study area of the three states (USACE, 2007).

1.2.6.1 DELAWARE

Critical water resource issues in Delaware have driven funding for multi-year programs as it relates to monitoring infrastructure and saltwater intrusion. Current ongoing efforts include:

- The Delaware Geological Survey (DGS) began a multi-year project in fall 2023 to install new groundwater monitoring infrastructure and collect baseline data in Sussex County, Delaware. This project is a continuation of a larger effort to construct a statewide groundwater monitoring network and collect hydrologic, water quality, and hydraulic information that addresses near-term (10-year) critical water resource management issues. This project continues the efforts of those done in Kent County (2017-2021) and New Castle County (2013-2014) and is expected to add 12 new monitoring sites that will host well nests across Sussex County.

- The Delaware Department of Natural Resources and Environment (DNREC), in collaboration with the University of Delaware and the DGS are working to establish a long-term saltwater intrusion (SWI) monitoring network to safeguard Delaware's groundwater resources from these threats, including an assessment of vulnerability and monitoring network gaps that will be used for developing a detailed monitoring plan. DNREC has expanded SWI monitoring in recent years by adding new wells and sampling sites, including a network of five wells installed in the Bowers Beach community in 2020, as well as the installation of three wells in the community of Slaughter Beach in 2023. Additionally, DNREC continues to support the Potomac Aquifer Saltwater Monitoring Network Project, initiated in the late 1970s, and conducts biannual sampling at 18 wells along the Delaware River.

- The DGS completed a field study to monitor water levels and salinity in target areas that were previously identified as being high risk for salinization, primarily in the area east of Dover (**Figure 23**). Groundwater flow and salinity distribution in east Dover are controlled, in part, by discontinuous confining layers in the shallow subsurface that divide the Columbia aquifer into shallow unconfined and deeper semiconfined portions. While saltwater intrusion in deeper parts of the Columbia aquifer was not observed during this study, several events were observed that lead to salinization in shallow parts of the aquifer. A freshwater-saltwater interface likely exists in the deeper portion of the Columbia aquifer, under the marshes or even the Delaware Bay. Data collected during this study can be used in future efforts to delineate the freshwater-saltwater interface. Results of this study will inform stakeholders of the potential salinization risks in coastal Delaware with respect to sea level rise.

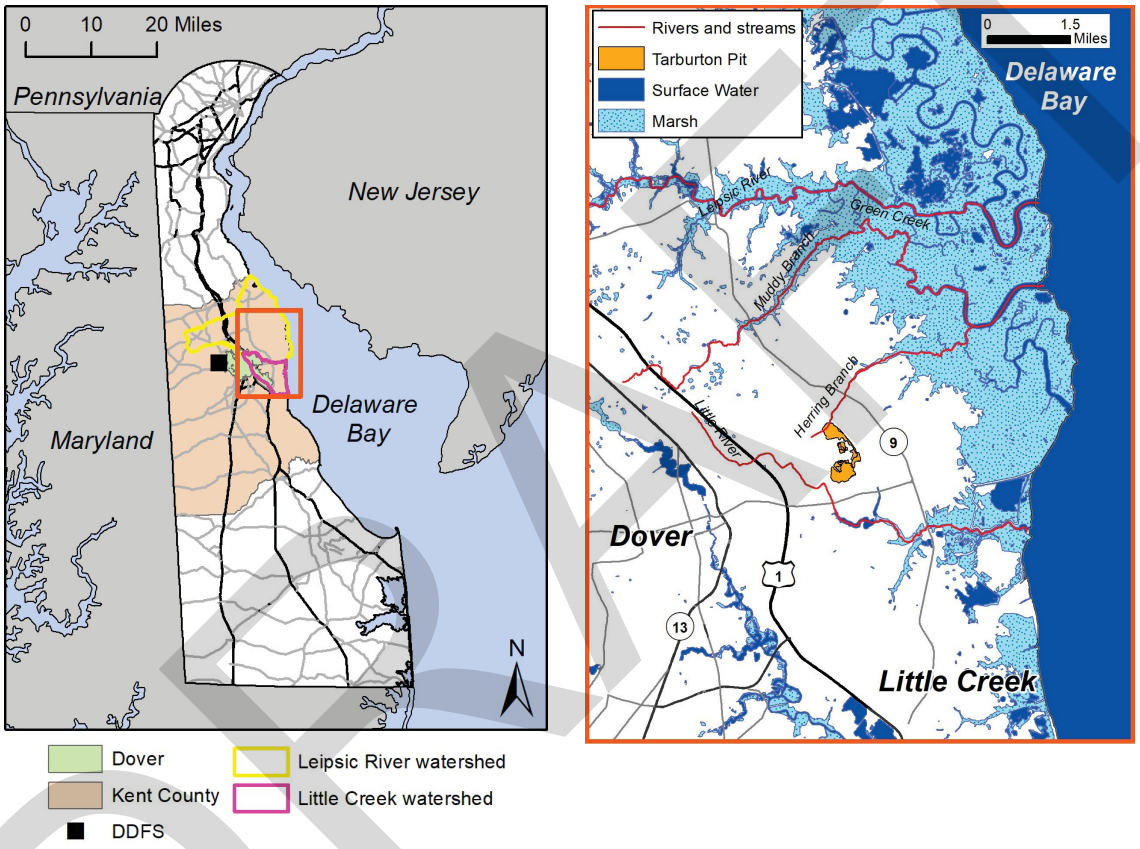


Figure 23. *Site plan showing project area, surface water features, and Delaware Environmental Observing System (DEOS) Dover monitoring station (DDFS). The inset box and figure on the right show the area where the majority of monitoring locations are located. The yellow polygon borders the Leipsic River watershed, and the magenta polygon borders the Little Creek watershed.*

1.2.6.2 NEW JERSEY

NJDEP released the New Jersey Statewide Water Supply Plan (NJSWSP) 2024 in September 2024, which improves the management and protection of the state's water supplies (NJDEP, 2024). The plan is the fourth major water plan since the Water Supply Management Act was enacted in 1982. New Jersey concludes that the state (once thought to be sufficiently water rich) can satisfy current demand, but future security will be heavily reliant on the consistent conservation of all water supplies. The 2022 and 2024 droughts brought issues of water supply to light, while the increase of emerging contaminants in water like PFAS and 1,4 dioxane raised the issue of water quality. These state-wide concerns are addressed in the seven-part NJSWSP.

NJDEP signed a 10-year Flexible Flow Management Program in October 2017 which allows New Jersey to maintain and allocate a Delaware and Raritan Canal diversion of 80 mgd during declared drought emergency. This diversion plays a critical role in meeting New Jersey's current and future water supply needs.

NJDEP reports that saltwater intrusion is currently being observed in several observation wells located along the Delaware Bay in the Cohansey and Estuarine Sand Aquifers in Lower and Middle Townships in Cape May County. In response to increasing chloride concentrations in a public supply well located approximately 2 miles to the east of the Delaware Bay (installed in the Cohansey Aquifer), NJDEP reduced allowable withdrawal rates from the well and initiated an investigation into the saltwater intrusion in the area. The well is located within Water Management Area (WMA) 17 which has a combined net water demand exceeding the natural available resources by nearly 58 mgd in 2020. Reducing permissible withdrawal rates from a well in this area notably further stresses regional water availability issues by reducing the natural available resources and further exaggerating the water deficit. Recent hydrogeologic and water quality data suggest eastward migration of brackish water from the Delaware Bay towards pumping centers, thus threatening the ability of those wells to meet demands. Without appropriate treatment technology for increasingly saline groundwater withdrawn from the Cohansey aquifer, groundwater availability will further decrease and increased reliance on surface water sources will be needed to meet demand. As WMA-17 and WMA-16 (Cape May) sit along the Delaware Bay, fresh surface water is not directly available from the Delaware River as they are south of the typical location of the salt front,. A slight increase in chloride concentrations over time was noticed in two other production wells located in the vicinity of the above-mentioned production well. The New Jersey Geologic and Water Survey (NJGWS), in cooperation with local water purveyors, has collected hydrogeologic and water quality data to help clarify the saltwater intrusion issue in the area. Although the zone of saltwater contamination in the Cohansey and Estuarine sand aquifers is delineated along the Delaware Bay, it is difficult to trace the movement of saltwater inland at this time, and more studies are needed. Local water purveyors have been collecting monthly groundwater elevations and quarterly water-quality data (sodium and chloride concentrations) in the established network of observation and production wells for the past five years. These data have been used as part of NJDEP's efforts to effectively manage the water supplies of Cape May County.

A limited number of water supply alternatives are available for this area. Non-critical, confined aquifers are one option, but these may be limited depending on the magnitude of the diversion or by water quality problems. New Jersey American Water's tri-county pipeline, originally developed as an alternative source of water for the stressed municipalities in Critical Area 2, has now been extended through much of Gloucester County, including Logan, Harrison, East Greenwich,

Woolwich, Pitman, and Elk Townships. There are no imminent plans to extend this pipeline into Cape May county.

1.2.7 National Groundwater Monitoring Network

The National Ground-Water Monitoring Network (NGWMN) is a consortium of state and local agencies and the USGS that was established to create a single point of access for scientists, engineers, policy makers, and the public to view and acquire important physical and chemical data on the nation's groundwater resources. NJDEP has contributed data to the NGWMN since 2011. Its network consists of 150 shallow wells designed to provide information on three land uses (urban, agricultural, and undeveloped) and are monitored for 177 analytes on a three-year cycle. DGS became a data provider in early 2016. The network will ultimately allow users to view groundwater data across state lines to observe trends in groundwater quality and availability in a local, regional or national context. NGWMN[5] resources are managed by the USGS Center for Integrated Data Analytics and can be accessed online.

1.2.8 General Statement of Basin Supply Sufficiency

Under normal hydrologic conditions, and in accordance with current DRBC drought management plans and docket requirements (conservation releases, pass-by flows, consumptive use replacement, etc.), an adequate supply of water is available to meet flow objectives, in-Basin water withdrawal demands, and out-of-Basin diversions. Under below normal hydrologic conditions and corresponding low stream flows (*e.g.*, 7-day average, one-in-ten-years (7Q10)), in-Basin water withdrawal demands, flow objectives, and out-of-Basin demands can most likely be met. Under a repeat of the drought of record, analyses indicate that current streamflow objectives at Montague and Trenton, N.J., and current out-of-Basin diversions under the DRBC drought management plans, can most likely be met under existing flow management plans, water demands, and other conditions. DRBC is nearing completion of a study to evaluate whether the Trenton Flow Objective remains adequate with sea level rise and changes in Estuary bathymetry since the 1960s. Potential changes to in-Basin withdrawal demands, consumptive uses, flow objectives, hydrology, and sea level rise are currently being evaluated to assess future water availability and resilience.

Groundwater in both New Jersey Critical Area 2 and the SEPA Groundwater Protected Area are managed under special programs, and conjunctive use of surface water is both recommended and, in some locations, necessary.

More in-depth analysis and investigation are needed to provide a detailed forecast of supply adequacy during a repeat of the drought of record, under modified operating restrictions, or under different climatic conditions. The Commission proposes over the next three years to complete a supply assessment under various scenarios and make recommendations for a Sustainable Water Future through 2060.

During low flow and drought conditions, releases from numerous reservoirs may be used to meet the Trenton Equivalent Flow Objective (TEFO), as specified in the Commission's Water Code.

[5] http://cida.usgs.gov/ngwmn/

Maintaining sufficient drought storage is critical for water supply sufficiency. USACE is currently working on a re-evaluation study of F.E. Walter Reservoir, with New York City and the DRBC as non-federal sponsors. The study will evaluate whether the reservoir can be operated in accordance with the drought management plans in the Water Code due to structural concerns. The Commission completed a storage study in early CY 2023 to explore the feasibility of additional freshwater storage if the DRBC determines that additional storage is needed in the future. Commission staff will work with the Commissioners to begin a second phase of the 2023 storage study to further evaluate three quarries.

1.3 SURFACE WATER QUALITY

1.3.1 Dissolved Oxygen and Aquatic Life Designated Uses

Based on significant improvements in dissolved oxygen (DO) levels in the Delaware Estuary (Estuary)[6], as well as observation of propagation of sensitive fish species[7] within the 38-mile urban portion of the estuary currently designated for maintenance (as opposed to maintenance and propagation), the DRBC began re-evaluating the designated aquatic life uses and supporting DO criteria in the Estuary in 2017.

Prior to determining the attainable aquatic life designated uses and DO criteria to support those uses in Zones 3, 4, and the upper portion of Zone 5, DRBC staff performed multiple scientific studies as outlined in Resolution 2017-4[8] and Resolution for the Minutes dated September 10, 2020[9]. Final reports for key scientific studies performed pursuant to these resolutions are accessible from the DRBC website.

On December 1, 2022, the EPA issued an Administrator's Determination that declared "the CWA Section 101(a)(2) use of 'propagation' is attainable" throughout the Delaware River Estuary based on the DRBC studies listed above and USGS ambient data, and that 40 CFR 131.20 therefore requires that the applicable aquatic life designated uses and corresponding dissolved oxygen criteria in Zones 3, 4, and the upper portion of Zone 5 of the Delaware River Estuary be revised to reflect and protect the propagation of resident and migratory fish species. Pursuant to CWA Section 303(c)(4)(B), EPA determined that revised water quality standards (WQS) to protect aquatic life in zones 3, 4, and upper 5 of the Delaware River Estuary are necessary to satisfy the requirements of the CWA. Accordingly, DRBC worked closely with EPA and the estuary States, and contributed significantly towards an effort to revise the WQS during the first half of 2023. Nonetheless, EPA also initiated WQS development in 2023, resulting in the potential for dual rulemaking processes. To support regulatory efficiency, intergovernmental coordination, and clarity to the public in revising the aquatic life designated uses to provide for fish propagation and corresponding water quality criteria for dissolved oxygen in the Delaware River Estuary, DRBC suspended its own actions to develop regulations for public comment to upgrade the designated aquatic life use for Water Quality Zones 3 and 4 and the upper portion of Zone 5 to include

[6] https://www.nj.gov/drbc/programs/quality/history-DO-estuary.html

[7] https://www.nj.gov/drbc/library/documents/ExistingUseRpt_zones3-5_sept2015.pdf

[8] https://www.nj.gov/drbc/library/documents/Res2017-04_EstuaryExistingUse.pdf

[9] https://www.nj.gov/drbc/library/documents/ResForMinutes091020_EstuaryDesignatedUse.pdf

propagation, as indicated in the Resolution for the Minutes dated September 7, 2023. This Resolution for the Minutes further directed DRBC staff to:

- continue to coordinate and collaborate with state and federal co-regulators during EPA's rulemaking process;
- update its Comprehensive Plan and Water Quality Regulations for the Delaware River Basin to include designated uses and criteria after EPA's rulemaking process is complete; and
- develop plans, analyses, and, if appropriate, related regulations for the implementation of new aquatic life uses and criteria in the Delaware River Estuary.

On December 13, 2023, the EPA Administrator Michael S. Regan signed a proposed rule[10] to revise the aquatic life designated use and dissolved oxygen water quality criteria applicable to Zone 3, Zone 4, and the upper portion of Zone 5 of the Delaware River (in total, river miles 108.4 to 70.0; approximately from Philadelphia, Pa., to Wilmington, Del.). DRBC will continue to provide scientific, technical, and engineering assistance to support EPA's rulemaking process. DRBC will also support the estuary States in development of an implementation plan, consistent with a schedule to be determined after EPA's rulemaking process is complete, and will initiate rulemaking as appropriate.

DRBC reviewed the EPA's proposed rule and provided testimony and technical comments in February 2024. As of March 1, 2025, EPA's proposed rule has not been finalized.

Three-dimensional hydrodynamic and water quality model calibration reports were finalized and published in 2024. Commission staff applied the aforementioned models to a study of the factors that influence the remaining DO sag in the urbanized portion of the Estuary and the scale of DO improvement that can be expected after implementation of feasible wastewater controls. The study (A Pathway for Continued Restoration), which was finalized and published in 2024, demonstrated that reducing summer ammonia loads from a relatively small number of domestic wastewater treatment discharges in the Estuary would significantly improve dissolved oxygen levels in the Estuary. The costs, benefits and affordability considerations associated with advanced treatment upgrades at these critical facilities were explored in the report.

- Modeling Eutrophication Processes in the Delaware River Estuary: Three-Dimensional Hydrodynamic Model
- Modeling Eutrophication Processes in the Delaware River Estuary: Three-Dimensional Water Quality Model
- A Pathway for Continued Restoration: Improving Dissolved Oxygen in the Delaware River Estuary

[10] https://www.federalregister.gov/documents/2023/12/21/2023-27758/water-quality-standards-to-protect-aquatic-life-in-the-delaware-river

1.3.2 Surface Water Quality Assessment

Two major water quality assessments describe the water quality of the Delaware River Basin: the 2025 State of the Basin and the 2024 Delaware River and Bay Water Quality Assessment Report (Water Quality Assessment). These two reports complement each other by utilizing different approaches to assess water quality (see **Table 1**). Additionally, the Commission authored Chapter 4 – Water Quality of the 2022 Technical Report for the Delaware Estuary and Basin (TREB)[11].

Table 1. Comparison of Water Quality Assessment Reports

Comparison	2025 State of the Basin	2024 Delaware River and Bay Water Quality Assessment
Evaluation Method	Use of Indicators	Compare observations to DRBC Stream Quality Objectives (or Criteria)
Assessment	Current status, long term trends, future predictions	Supporting or not supporting designated uses
Term	Expanded data window for current status, full period of record for long term trends	5-Year data window
Extent	Entire basin	Mainstem Delaware River only

1.3.3 State of the Basin 2025: Water Quality

The Water Quality chapter of the State of the Basin 2025 report provides an assessment of water quality indicators for the entire Basin, with special emphasis on the estuary (DRBC, 2025). The State of the Basin differs from, and complements, the 2024 Water Quality Assessment, in that it focuses on metrics for which no criteria have been developed and evaluates long term trends. The State of the Basin report is published approximately every five years, and the next update will be performed in CY 2030.

1.3.4 2024 Delaware River and Bay Water Quality Assessment

The biennial Water Quality Assessment performed by DRBC focuses on the mainstem Delaware River, comparing observations to water quality criteria to determine whether water quality is

[11] https://delawareestuary.org/data-and-reports/state-of-the-estuary-report-2/

sufficient to support designated uses as described in the Water Code. Designated uses for the Delaware River include Aquatic life, Public Water Supply, Recreation, Fish Consumption, and Shellfish Consumption, although not all uses are designated in all water quality zones (see **Figure 24**). Assessments to determine support of the designated uses of the Delaware River are reported in the 2024 Water Quality Assessment[12] (DRBC, 2024). The water quality conditions presented below are based upon the results of the 2024 Water Quality Assessment. The Water Quality Assessment report is published every two years, and the next update will be performed in CY 2026 for publishing in FY 2027.

[12] https://www.nj.gov/drbc/library/documents/WQAssessmentReport2024.pdf

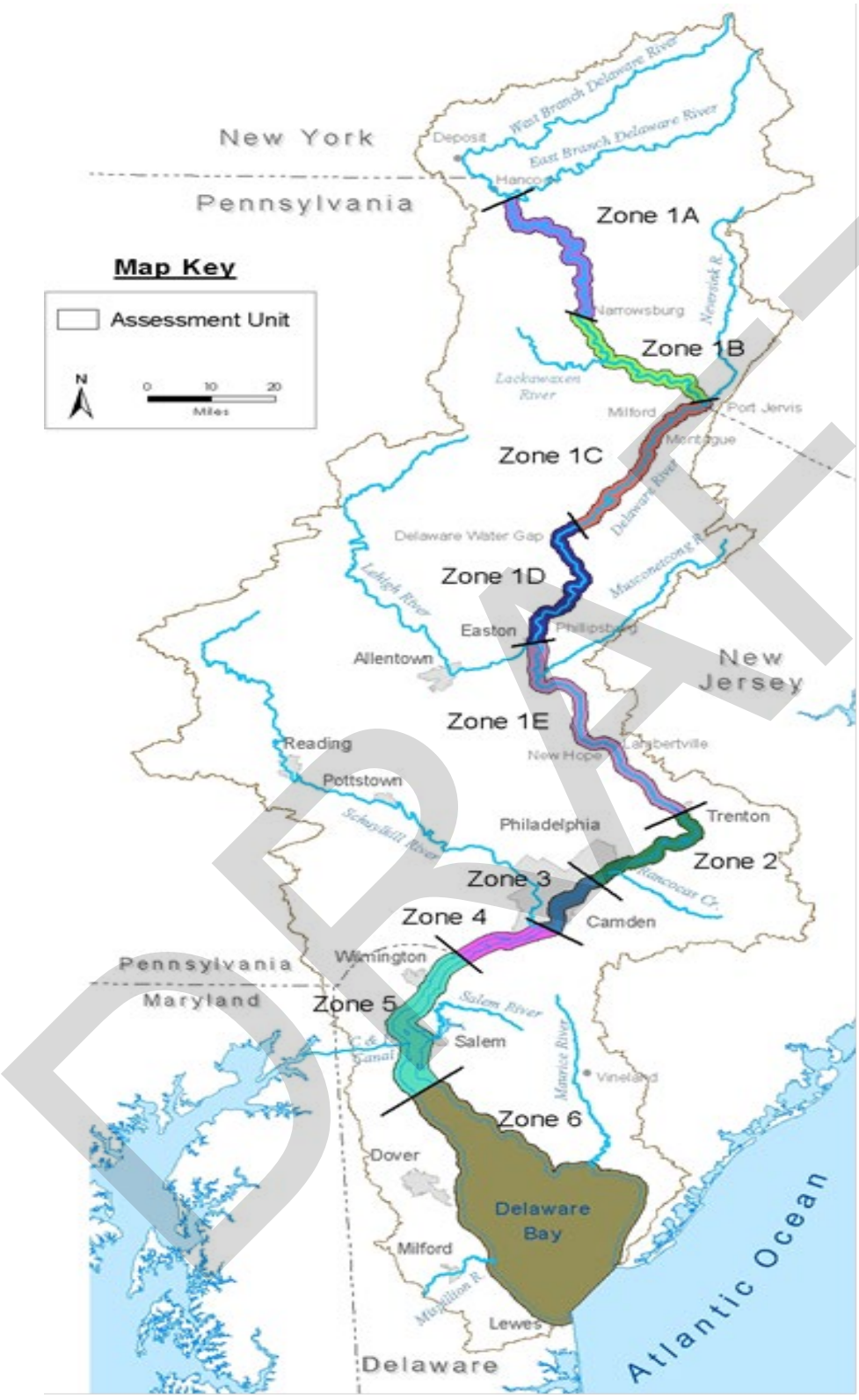


Figure 24. *DRBC Water Quality Zones for the Delaware River mainstem.*

1.3.4.1 GENERAL STATEMENT OF INTERSTATE WATER QUALITY

Overall, the majority of observations met water quality criteria in the Delaware River and Bay.

1.3.4.2 AQUATIC LIFE

Support of the aquatic life designated use is assessed by evaluation of dissolved oxygen, pH, turbidity, temperature, total dissolved solids (TDS), alkalinity, toxic pollutants, and biological indicators. The majority of observations met water quality standards. Additional details on select portions of the assessment in support of Aquatic Life are provided below.

1.3.4.2.1 Conventional Pollutants

- **Dissolved Oxygen.** The vast majority of the measurements met the criteria. Criteria were met in all zones except Zones 5 and 6. Both zones failed to meet the daily mean criteria.
- **pH.** The majority of discrete pH observations were within the criteria range and therefore met criteria. However, values exceeding the maximum criterion of 8.5 were not uncommon and constituted most criteria violations when they occurred, largely in Zone 1.
- **Turbidity.** Observations met criteria for turbidity in all zones.
- **Temperature**. There are no ambient temperature criteria in Zones 1A through 1E; therefore, we assessed temperature data against applicable New Jersey criteria in Zone 1. Water temperature data consistently met New Jersey's instantaneous freshwater non-trout criteria throughout Zone 1 but failed to meet the 7-day average criteria. In Zones 2 through 5, assessment results failed to meet criteria for temperature. Atmospheric temperatures and meteorological conditions are strong drivers of water temperature.

1.3.4.2.2 Toxic Pollutants

- **Copper.** Data showed a small number of exceedances for copper in the lower portion of Zone 5 and in Zone 6. Coordination among Basin states and agencies should continue to ensure the use of the most appropriate methods and procedures for conducting monitoring studies for copper in the Basin and the harmonization of water quality criteria and assessment methodologies in all zones**.**
- **Aluminum.** Data showed numerous exceedances of aluminum acute and chronic freshwater objectives for the support of aquatic life in Zones 2, 3 4, and 5. Coordination among Basin states and agencies should continue to ensure the use of the most appropriate methods and procedures for conducting monitoring studies in the Basin and the harmonization of water quality criteria and assessment methodologies for aluminum.

1.3.4.3 PUBLIC WATER SUPPLY

Support of the Public Water Supply designated use is assessed by evaluating TDS, Hardness, Chlorides, Odor, Phenols, Sodium, Turbidity, Systemic Toxicants, Carcinogens, and Drinking Water Closures. The majority of observations met water quality standards.

1.3.4.4 RECREATION

Section 101(a)(2) of the Clean Water Act sets as a national goal, "wherever attainable[,]… water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water." For interstate waters in the Delaware River Basin, the regulations that the states use to implement the Clean Water Act defer or refer to DRBC water quality standards. In the Delaware River, primary contact recreation is a designated use for all zones except within a 27-mile-long segment that comprises Zone 3 and the portion of Zone 4 above River Mile 81.8 ("upper Zone 4"). Designated recreational uses in the latter reaches include only recreation—secondary contact (see definition in DRBC Water Quality Regulations § 1.20.6 F & G, (DRBC, 2013b)). The 2024 Water Quality Assessment indicates that primary contact recreation is supported in Zones 1A, 1B, 1E, lower Zone 4, Zone 5, and Zone 6, but is not supported in Zone 2. Secondary contact recreation is supported in Zone 3 and upper Zone 4. Insufficient data were available in Zones 1C and 1D. DRBC Enhanced Bacteria Monitoring data (discussed below) were included in the 2024 Water Quality Assessment. Assessments prior to 2020 relied solely on DRBC Boat Run data collected in the center river channel. DRBC Enhanced Bacteria Monitoring data, which are collected near-shore, show higher levels of *Enterococcus* than the center channel data. DRBC will continue field studies and analysis to better understand the issue.

DRBC conducted a special monitoring study from 2019 through 2021 to assess water quality in areas that are currently designated for secondary contact recreation. DRBC collected near-shore samples for bacteria (*E. Coli*, fecal coliform, and *Enterococci*) from locations in Zone 3 and the upper portion of Zone 4 during the summers of 2019 through 2021, at several locations where primary or secondary contact recreation was observed or anticipated and where access was readily available. In addition, DRBC performed boat-based transect sampling to assess differences in center channel and near-shore concentrations. All locations sampled are within the portion of the river designated for recreation—secondary contact, where primary contact recreation is not supported by the data and is not recommended for health and safety reasons. A presentation[13] of the results of the first two years of this special monitoring study was made to the Water Quality Advisory Committee and is available on the DRBC website.

Results of the monitoring were compared to existing DRBC criteria, which include geometric mean values for *Enterococci* and fecal coliform corresponding to secondary contact recreation. Results of the monitoring were also compared to EPA nationally recommended criteria, which include geometric mean values and statistical threshold values (STV) for *Enterococci* and *E. coli* corresponding to primary contact recreation. Results were highly variable site-to-site and day-to-day.

DRBC convened a recreational use co-regulator workgroup, which developed a strategy for addressing enhanced recreational designated uses in Zones 3 and upper 4 as summarized in **Part II - Section 2.2.2.2.1**. This strategy will be implemented in coordination with the co-regulator workgroup, Water Quality Advisory Committee, and other stakeholders.

[13] https://www.nj.gov/drbc/library/documents/WQAC/120320/Yagecic_Review2020BacteriaData.pdf

1.3.4.5 FISH CONSUMPTION

While working to reduce toxic pollutants that bioaccumulate, "advisories" containing meal advice for consumers of recreationally caught fish and shellfish are issued to minimize the risk to human health. While the DRBC does not issue fish consumption advisories, DRBC staff work with Basin states to provide data to use in developing state-issued advisories. The following resources provide detailed information on state-issued fish consumption advisories in the Basin states:

- NJDEP New Jersey Department of Environmental Protection[14]
- Fish Health Advisories - NYS Dept. of Environmental Conservation[15]
- Fish Consumption Advisories (pa.gov)[16]
- Fish Consumption Advisories - DNREC Alpha (delaware.gov)[17]

The fish consumption designated use applies to all DRBC Water Quality Management (WQM) Zones. The assessment criterion is based primarily on the presence of the Basin states' fish consumption advisories in the mainstem Delaware River and Bay for the assessment period. The presence of fish consumption advisories results in an assessment of "not supporting the designated use." Advisories were issued for each assessment unit, so the use is not supported in any zone.

Improvements in the advisories include New Jersey and Delaware revised advisories in the Delaware Estuary from the Pennsylvania/Delaware border (RM 78.8) to the C&D Canal (RM 58) to allow three meals per year for all fin fish, including white perch and channel catfish. Before 2015, no consumption was advised. Similarly, Pennsylvania revised its advisories from "Do not eat" to "six meals per year" for sections from the Trenton/Morrisville bridge (RM 133) to the Pennsylvania/Delaware border (RM 78.8) for carp in 2016. Those less stringent fish consumption advisories are due to declining levels of contaminants in fish tissue and are current state advisories.

Declining levels of PCBs reflect the efforts of the DRBC and the states to reduce PCB loadings through the implementation of Total Maximum Daily Loads (TMDLs) developed by DRBC and established by the EPA in 2003 and 2006, as well as attenuation through removal, sequestration, and degradation of contaminated sediments. Polychlorinated biphenyls (PCBs or total PCBs) are a class of human-made compounds that were manufactured and used extensively in electrical equipment such as transformers and capacitors, paints, printing inks, pesticides, hydraulic fluids and lubricants. PCBs are considered legacy pollutants, since their manufacture and use have generally been banned by federal regulation since 1978. However, mobilization and recycling of legacy PCBs results in ongoing sources of PCBs to the Delaware River Estuary and Bay including: industrial and municipal wastewater treatment plants, combined sewer overflows (CSOs) and

[14] https://njdep.maps.arcgis.com/apps/MapJournal/index.html?appid=922dff1885394cf19ccf1d9c8d52b4f0&webmap=3bac9ba1ee0a49b6b3e4a11a78fd2fb6#map

[15] https://www.dec.ny.gov/outdoor/7736.html

[16] https://www.dep.pa.gov/Business/Water/CleanWater/WaterQuality/FishConsumptionAdvisory/Pages/default.aspx

[17] https://dnrec.alpha.delaware.gov/fish-wildlife/fishing/consumption-advisories/

municipal separate storm sewer systems (MS4s); contaminated sites; tributaries and boundaries such as the ocean and the C&D Canal; nonpoint source runoff directly to the estuary; atmospheric deposition and exchange of PCBs between estuary waters and the atmosphere; and sediments contaminated by PCBs. In addition, PCBs may also be incidentally created as a byproduct from certain manufacturing processes, such as dye and pigment production.

On behalf of Delaware, New Jersey, and Pennsylvania, DRBC developed total maximum daily loads (TMDLs) for polychlorinated biphenyls (PCBs or total PCBs) for the tidal Delaware River mainstem (Zones 2-5) and Delaware Bay (Zone 6) in 2003 and 2006, respectively. These TMDLs, established by EPA Regions II and III, were designed to achieve and maintain the applicable water quality criteria for PCBs to protect human health from the carcinogenic effects of eating contaminated fish caught in these waters. As a result of these Stage 1 PCB TMDLs, 113 National Pollutant Discharge Elimination System (NPDES) permittees are each required to develop and implement a PCB Pollutant Minimization Plan (PMP) to reduce PCB loadings to the estuary. DRBC works directly with the co-regulating states to review and improve the minimization efforts, and DRBC manages the PCB effluent database for all dischargers within the tidal drainage portion of the Basin. Between 2005 and 2016, implementation of the Stage 1 PCB TMDLs, through monitoring and pollutant minimization, resulted in a cumulative PCB load reduction of 64% to the estuary from permittees regulated through the Stage 1 PCB TMDLs. DRBC, in close coordination with the co-regulating states in the estuary (Del., Pa., and N.J.) as well as EPA Regions II and III, has developed Stage 2 PCB TMDLs that incorporate enhanced loading data and implementation requirements as well as revised criteria. These Stage 2 TMDLs are expected to be established by EPA, after which they will be implemented by DRBC and the co-regulating States. DRBC will continue to manage PCB data for discharges within the tidal drainage portion of the Basin, provide technical support to the minimization program, and work with co-regulating states to extend TMDL implementation to all sources of PCB loads to the estuary.

A contaminant of emerging concern for fish consumption advisories is PFOS (perfluorooctane sulfonate) a member of a larger group of chemicals known as PFAS (per- and polyfluoroalkyl substances). PFOS has been used in a variety of consumer products and industrial applications including water/stain resistant clothing, and aqueous film-forming foams employed in firefighting primarily at military bases and civilian airports. PFOS that is released into the environment can contaminate surface water as well as groundwater. PFOS that enters surface waters can accumulate in fish. Consumption of fish from contaminated waters can lead to exposure to PFOS at levels that may cause health concerns. Studies in human populations exposed to PFOS have identified a number of health effects that are associated with PFOS. The most sensitive of these effects involve effects on the immune system, including decreased vaccine response and increased incidence of childhood infections that are associated with maternal exposure during pregnancy. The DRBC and Basin states include PFOS and other PFAS in analyses of collected fish. PFAS has been detected at levels that have triggered fish consumption advisories in Pennsylvania, New Jersey, and New York.

1.3.4.6 SHELLFISH CONSUMPTION

Shellfish consumption, as a DRBC designated use, only applies to DRBC Zone 6. For the 2024 Water Quality Assessment, approved harvesting areas were considered to be supporting the use. Prohibited waters were considered to be not supporting the use. Assessment units classified as Special Restricted and Seasonally Restricted are considered to be supported but with special

conditions. In total for the 2024 assessment, 626 mi^2 are in full support (91% of Zone 6) and 64 miles have harvest either prohibited, restricted, or suspended (9%).

1.3.4.7 DRBC SPECIAL PROTECTION WATERS

Being interstate waters, Special Protection Waters (SPW) are also antidegradation waters per the Commission's Water Quality Regulations for the Delaware River and Basin, Section 3.10.3.A. (18 CFR Part 410). The maintenance of exceptional water quality under this program, adopted in 1992 and expanded upon in 1994 and 2008, requires a multi-faceted approach to be effective. The following steps have been accomplished to both maintain exceptional water quality and measurably track changes over time: 1) stricter requirements for point-discharge facilities within SPW, 2) definition of the "existing water quality" (baseline) in which to compare future water quality measurements, and 3) water quality monitoring and assessments (baseline water quality vs. assessment period) to ensure no measurables changes are occurring toward degradation. These steps ensure that SPW water quality is effectively managed and tracked over time. Where water quality is not maintained, these methods allow DRBC to identify and track trends to investigate and employ management solutions to address, or prevent further, degradation. The first measurable change assessment since site-specific existing water quality (EWQ) targets were established in DRBC rules was completed in 2016 for the Lower Delaware segment of SPW. This assessment was detailed in the Lower Delaware Measurable Change Assessment 2009 – 2011 (DRBC, 2016a) report. Methods for determining measurable change were successfully applied, showing that water quality has not degraded and, in many cases, has improved for most parameters, particularly nitrogen and phosphorus. Notable water quality improvements were observed in the Delaware, Lehigh, and Musconetcong Rivers, where nutrient concentrations declined. The publication is also available as an online story map[18].

Only chlorides and specific conductance exceeded water quality targets at almost all sites, in addition to *E. Coli* at less than half of the sites, but all are still far better than water quality standards. The causes for the increase in chlorides and specific conductance are believed to be winter road salting and other non-point sources. *E. Coli* monitoring presents challenges, as natural areas tend to be populated by wildlife whose excrement contains *E. Coli* also detected in water quality samples. The data are highly variable between sampling events and are largely dependent upon the amount of wildlife, particularly waterfowl, that inhabit or frequent the monitoring locations.

To address the increasing chloride and specific conductance trends, DRBC initiated a chloride monitoring project from 2021 – 2023, a decade after the prior assessment period for the Lower Delaware was completed, within the Lower Delaware reach to investigate areas where these exceedances occurred and to track current trends. DRBC is in a reporting phase to 1) summarize the findings, 2) identify variables contributing to the increasing trends, and 3) suggest actionable steps to address the increasing trends.

Site-specific EWQ targets have been developed for all Upper, Middle, and Lower Delaware River sites. There are currently 85 Delaware River and tributary sites. EWQ targets are documented in the Existing Water Quality Atlas of the Delaware River Special Protection Waters (DRBC, 2016b). Data were compiled from the following: DRBC/National Park Service (NPS) Special Protection

[18] http://drbc.maps.arcgis.com/apps/MapSeries/index.html?appid=e63f5f1320794666a7def165ff9ae0e4

Waters (SPW) monitoring results; three USGS water quality investigations (Hickman and Fischer, 2008; Siemion and Murdoch, 2010; and Senior (in press)); and state monitoring results from PADEP, NJDEP, and the New York State Department of Environmental Conservation (NYSDEC).

Since 2013, water quality models have been developed, calibrated, and are utilized for watershed-wide cumulative evaluations of wastewater projects for four regions: the Lower Delaware, the Lehigh River watershed, the Brodhead Creek watershed, and the Neversink River watershed. These models are regularly updated and used for No Measurable Change (NMC) evaluations of new or expanding wastewater facilities in DRBC's permitting process.

The site-specific definition of EWQ targets allows for assessments of individual sites opposed to reach-wide only, which is how water quality targets were defined prior to the EWQ Atlas definitions in 2016. Starting in 2023, DRBC staff decided that monitoring sites on a rotating basis allows for more spatial coverage across the Basin and less time constraints on monitoring staff to accomplish monitoring at a large number of sites, which was a multi-day effort during for the 2009 – 2011 Lower Delaware monitoring period. For the 2023 – 2025 monitoring period, DRBC and NPS staff are collecting water quality data for 17 sites within the Upper, Middle, and Lower Delaware segments. The goal is to perform a measurable change assessment similar to that published in 2016 for the 2009 – 2011 assessment period. For sites included in that prior assessment, recent data will be compared against that data as well as the EWQ targets for a multi-period trend analysis and assessment (2000 – 2004 vs. 2009 – 2011 vs. 2023 – 2025). As the 2009 – 2011 assessment was completed for the Lower Delaware sites only, the Upper and Middle Delaware 2023 – 2025 data will be compared against the EWQ targets. For the next assessment period starting in 2026 or 2027, a new suite of sites will be selected for another 3- to 5-year monitoring cycle.

1.4 POPULATION AND LANDSCAPE

1.4.1 Population

The following statistics are based on the U.S. Census Bureau, 2010 and 2020 Census data. The county population figures for 2010 and 2020, discussed below, are adjusted to the Basin boundary according to the proportion of area within the Basin. The estimated total 2020 population in the Basin is 8.63 million people. **Table 2** compares the 2010 and 2020 Basin population by state. **Figure 25** shows the portion of the Basin population by state in 2020.

Table 2. Basin Population by State in 2010 and 2020

Based on U.S. Census Data and Adjusted to DRB Boundary

State	2010	2020	Change	% Change
PA	5,487,968	5,749,089	+261,121	+4.8%
NJ	1,940,165	1,988,600	+48,435	+2.5%
DE	699,592	774,047	+74,455	+10.6%
NY	122,309	117,158	-5,151	-4.2%
Total	8,250,034	8,628,894	+378,860	+4.6%

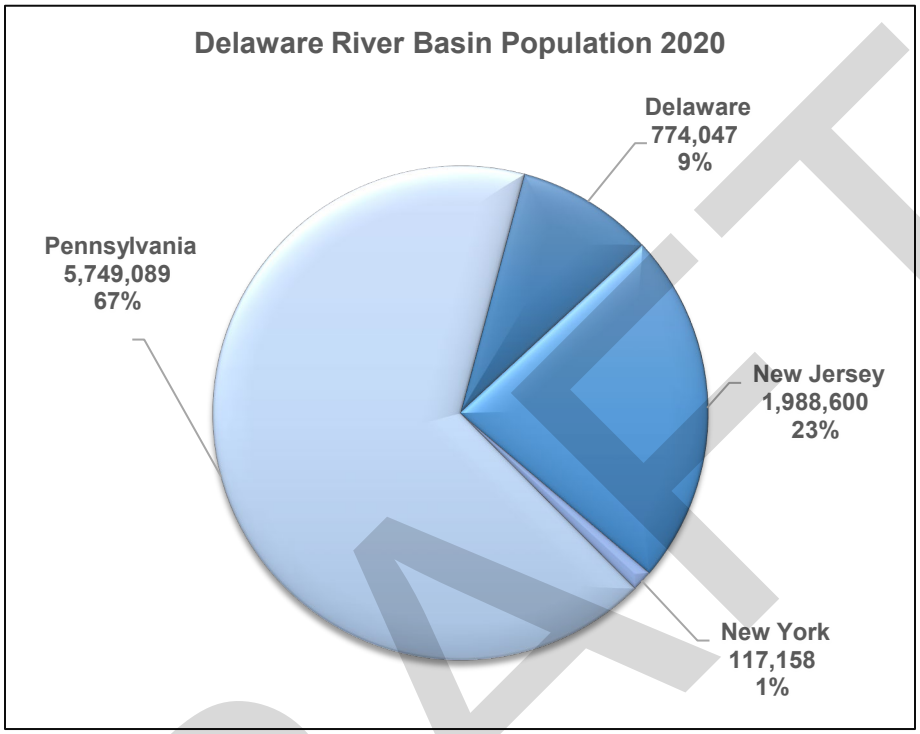


Figure 25. *Basin Population 2020. Pennsylvania accounts for approximately two-thirds of the basin's population. (Note: Based on the 2016 analysis described in Section 1.2.1, an additional 5 million people outside of the basin who rely on basin water supplies are not included on this chart).*

Between 2010 and 2020, the population in 14 Basin counties in the DRB increased by 10,000 or more (**Table 3**). Growth in both Kent County and Sussex County, Delaware, is entirely dependent on groundwater, whereas the other growing counties have greater availability of water supply infrastructure and conjunctive use of source supplies.

Table 3. Portions of DRB Counties with the Largest Population Growth

State	County	2010	2020	Change	% Change
DE	Sussex	44,714	55,655	10,941	24.5%
DE	Kent	145,230	164,673	19,443	13.4%
PA	Chester	452,523	486,097	33,574	7.4%
PA	Lehigh	349,497	374,557	25,060	7.2%
PA	Montgomery	799,874	856,553	56,679	7.1%
DE	New Castle	523,239	553,719	30,481	5.8%
NJ	Gloucester	257,410	271,632	14,221	5.5%
PA	Philadelphia	1,526,006	1,603,797	77,791	5.1%
PA	Northampton	297,735	312,951	15,216	5.1%
NJ	Mercer	271,474	284,889	13,415	4.9%
PA	Berks	397,233	414,214	16,981	4.3%
PA	Bucks	625,249	646,538	21,289	3.4%
PA	Delaware	558,979	576,830	17,851	3.2%
NJ	Burlington	437,883	451,349	13,465	3.1%

Similarly, between 2010 and 2020, seven Basin counties decreased in population by more than 1,000 people: three in New Jersey, three in Pennsylvania, and one in New York (**Table 4**).

Table 4. Portions of DRB Counties with the Largest Population Loss

State	County	2010	2020	Change	% Change
NY	Delaware	32,713	29,707	-3,006	-9.2%
NJ	Sussex	77,004	74,887	-2,117	-2.8%
PA	Wayne	50,809	49,618	-1,191	-2.3%
NJ	Salem	66,083	64,837	-1,246	-1.9%
NJ	Cumberland	156,754	154,102	-2,652	-1.7%
PA	Schuylkill	86,133	84,817	-1,316	-1.5%
PA	Monroe	169,842	168,327	-1,515	-0.9%

Key Population Data Comparisons:

- The population of the Basin increased by just over 375,000 people, from 8.25 million in 2010 to nearly 8.63 million in 2020 (an increase of 4.6%).
- Continued population growth at the rate of change between 2010 and 2020 (4.6% per decade) will mean an increase of 19.7% to 10.3 million people by 2060. In comparison, the projected Basin population according to Thompson & Pindar, 2021 in **Part I – Section 1.2.3.2.1** is 8.907 million.
- The greatest concentration of developed land (and population density) continues to be in the Lower Region of the Basin, the greater Trenton-Philadelphia-Camden-Wilmington area.

1.4.2 Landscape

Landscape change occurs gradually across the Basin but is nonetheless worth tracking since landscape conditions can affect water resources. In the years between 1996 and 2010, the landscape changed, although not dramatically in the aggregate. Net changes between 1996 and 2020 are summarized below, and regional shifts in land cover are illustrated in **Figure 26** based upon land cover data from the National Oceanic and Atmospheric Administration – Coastal Services Center (NOAA-CSC).

Developed land in 2010 covered nearly 2,100 square miles – more than 16% of the Basin.

- Natural landscapes (*e.g.*, forests and wetlands) covered slightly less than 60% of the landscape in 2010.
- Forested land, once a dominant feature, accounted for less than half of the Basin land cover in 2010 and decreased by more than 100 square miles (approx. 68,460 acres) between 1996 and 2010. Continued loss of forest, crucial to sustaining water quality and availability, could have a negative impact on the long-term condition of the Basin's water resources.
- Changes in wetlands between 1996 and 2020 appeared to be less dramatic, since no-net-loss policies minimized losses from development activity. However, coastal wetlands face the threat of erosion and inundation from rising sea levels, effects exacerbated by their inability to migrate inland when trapped by existing developed land.
- Cultivated land (agricultural and transitional scrub shrub landscapes) experienced a net decrease during the period of 1996 to 2020 in all but the Upper region of the Basin.

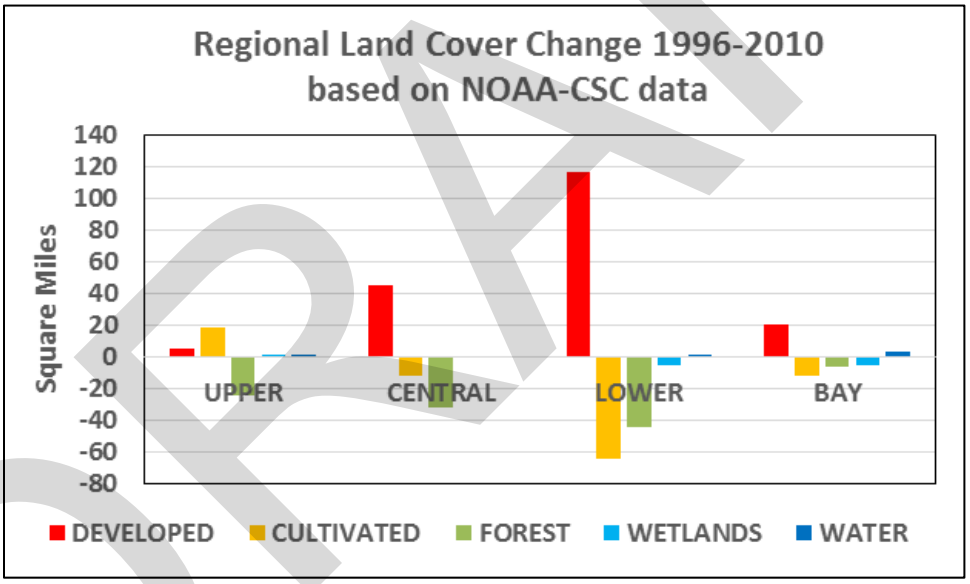


Figure 26. *Regional Net Change in Land Cover 1996-2010 illustrates the magnitude of change and the net gains/ losses in land cover in the four basin regions. Forest loss was experienced across the basin. Based on analysis of satellite imagery from NOAA Coastal Services Center.*

Figure 27 is a regional summary of land cover data for 2021 in the upper, central, lower, and bay regions of the Basin from the USGS National Land Cover Database (NLCD).

- Developed land covers 2,854 square miles – more than 20% of the Basin – with the majority occurring in the lower Basin.
- Natural landscapes (*e.g.*, forest and water/wetland) cover more than 60% of the landscape (8,187 square miles).
- Forested land, once a dominant feature, now accounts for only half (50%) of the upland (non-Bay) Basin land cover. The upper Basin has the largest percentage of forest cover (77%).
- Agricultural land covers 2,538 square miles, or 19% of the landscape.

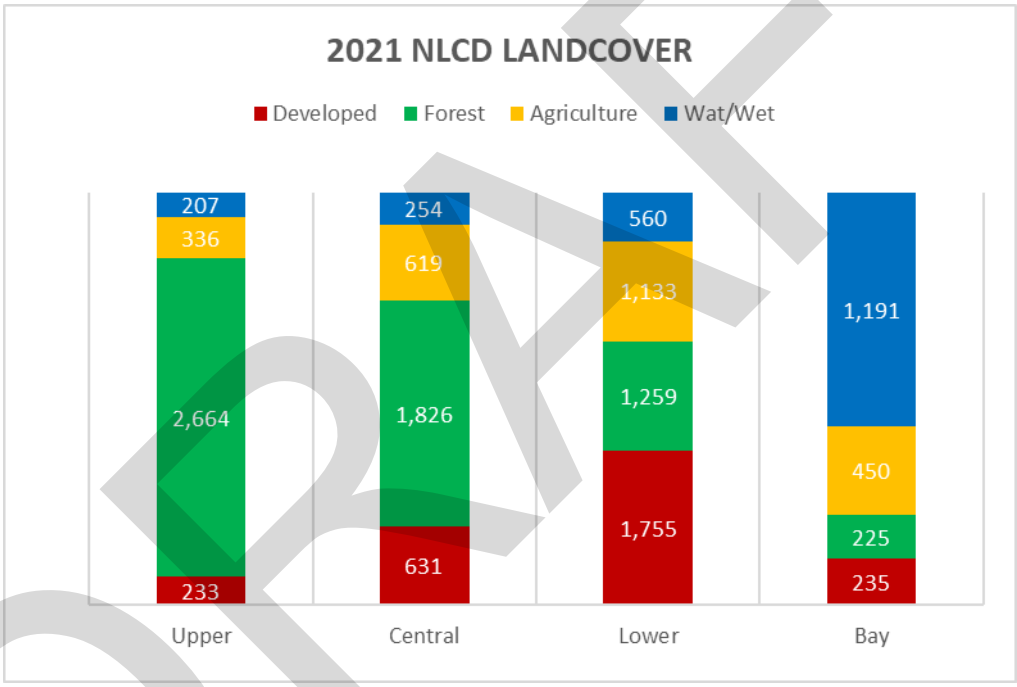


Figure 27. *Regional summary of land cover areas (in square miles) based on analysis of satellite imagery from USGS NLCD. Total Basin area is 13,579 square miles.*

Changes in species composition can be expected with changes in climatic conditions, including the transitioning of coastal freshwater wetlands to salt marsh and the loss of once-dominant forest species—such as hemlock and oak—from infestation and disease supported by warmer temperatures. The overall effects of these changes on water resources remain to be examined.

1.5 EMERGENT ISSUES

1.5.1 Pipelines, Electric Transmission Lines, Electric Generation and Cogeneration

The development of natural gas outside of the Delaware River Basin has resulted in the modification and/or expansion of existing natural gas pipelines in the Basin and the construction of new natural gas transmission pipelines and supporting infrastructure (*e.g.*, compressor stations) across the Basin. The Commission has received, reviewed, and approved several applications for transmission pipelines in recent years.

In addition to the natural gas transmission pipelines, the Basin has experienced the reconstruction and or expansion of electric transmission lines. The replacement of the existing infrastructure is due to such factors as its age, the need to improve delivery system reliability and redundancy, and the need for increased capacity to meet growing demand in the northeastern U.S. Existing coal and oil burning electric generating and cogenerating facilities have closed or converted to natural gas as a fuel. New natural gas power plants are being proposed and constructed throughout the northeastern U.S. to take advantage of cheaper, regional sources of natural gas. Electric generating facilities have transitioned from once-through to evaporative cooling as capacity has been added, a shift that is expected to increase the consumptive use of water. At the same time, the emergence of dry cooling as a technology for power generation could reduce water use overall and thereby consumptive use as well. Finally, projects that would convert natural gas from regional or other locations into a liquid form (liquid natural gas or LNG) for local use, and/or for export to other areas of the country or overseas, have also been proposed. The Commission periodically receives project review applications for electric transmission lines and associated facilities.

1.5.2 Port Development / Dredging

The Delaware River and Estuary supports the largest freshwater port in the world, and the Delaware River port complex comprises numerous facilities in Delaware, Pennsylvania, and New Jersey. The DRBC periodically receives project review applications for port development and dredging projects and is aware of several large projects being planned.

1.5.3 Perfluoroalkyl and polyfluoroalkyl substances (PFAS)

Perfluoroalkyl and polyfluoroalkyl substances (PFAS) are a diverse group of ~15,000 compounds that have varying degrees of persistence, toxicity, and bioaccumulation in the environment. They are found in a variety of industrial and household products, such as stain and water-repellant textiles, fire-fighting foams, paper coatings, and food packaging. They have unique properties to repel both water and oil. While there is still much to be learned about the effects of PFAS on human and ecological health, exposure from drinking water and fish consumption are a concern. These substances have been detected in surface water, sediment and fish tissues of the Basin states. Health advisories and standards have been developed by federal and Basin state agencies for some PFAS. In April 2024, the EPA finalized National Primary Drinking Water Regulations for six PFAS compounds. This rule sets maximum containment levels (MCLs), which

require public water systems to monitor these compounds, notify the public of their concentrations, and reduce levels that exceed the proposed standards. Three of the four basin states, New Jersey, Pennsylvania, and New York, have PFAS drinking water standards for two to three compounds but are all two to three times higher than the EPA MCL values. The fourth basin state, Delaware, was developing PFAS drinking water standards but paused those efforts when the EPA proposed drinking water regulations.

In December 2024, the USEPA released draft Human Health Criteria for perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS) and perfluorobutane sulfonic acid (PFBS) in surface waters. If finalized, the criteria represent threshold concentrations that values below are expected to protect against adverse effects to human health.

The four states within the Delaware River drainage basin have initiatives to manage PFAS exposure. Available data for surface water show that PFAS levels are highly variable, but all samples with detections of PFOS and PFOA exceed EPA draft surface water criteria for human health. Additionally, a large percentage of samples also exceed the recently enacted drinking water MCL values for PFOA and PFOS.

PFAS levels in fish are also highly variable, with less data compared to water, indicating that further evaluation of risk to human health and wildlife is warranted in the Delaware River. However, one specific PFAS compound, perfluorooctane sulfonic acid (PFOS), has also been detected in fish tissue at levels triggering fish consumption advisories in some locations (see **Part I – Section 1.3.4.5**). DRBC staff and its Toxics Advisory Committee (TAC) continue to review and assess PFAS in the Delaware River. For additional information, see Contaminants of Emerging Concern[19] on the DRBC website.

1.5.4 Atlantic Sturgeon (Acipenser oxyrinchus)

Effective in April 2012, four geographically distinct populations of Atlantic sturgeon—including those of the New York Bight, which includes the Delaware River—were listed as endangered. Mature Atlantic sturgeon migrate from the sea to fresh water in advance of spawning, and juveniles remain in the Delaware River Estuary for several years. The Endangered Species Act requires species listed as endangered to receive protection under the Act to prevent extinction, including a prohibition against "take," which includes harassing, harming, pursuing, wounding, killing, trapping, capturing, or collecting. In August 2017, critical habitat for Atlantic sturgeon in the Delaware River was designated as the entire tidal river from the head of the tide at Trenton, N.J., to the head of Delaware Bay. In 2022 a five-year review of this listing was completed, and the endangered status of the New York Bight distinct population segment was upheld. Atlantic sturgeon is one of the key fish species being considered in the aquatic life designated use studies (see **Part II – Section 2.2.1.4.2**).

[19] http://www.nj.gov/drbc/programs/quality/cecs.html

1.5.5 Increasing Chloride Trends

Freshwater instream monitoring has shown an upward trend in chloride concentrations of the non-tidal Delaware River (see **Figure 28**). This is a trend common to areas of the U.S. with significant roadway deicing, agricultural, mining, and other activities (Kaushal et al, 2018). While concentrations are still below EPA-recommended surface water criteria for drinking water (250 mg/L) and aquatic life (860 mg/L acute and 230 mg/L chronic) uses, there is evidence that sensitive aquatic organisms may be intolerant of ionic changes below these criteria (Arnott et al, 2020). Additionally, these increasing trends occur in DRBC's Special Protection Waters (SPW) area, which is protected under the SPW antidegradation program that states no measurable changes in existing water quality shall occur. While most water quality monitoring parameters have been maintained through stricter requirements of point source discharges, chloride and specific conductance continue to increase (DRBC, 2016a). Furthermore, residential wells in the Delaware River Basin (Knowlton Township in Warren County, N.J.) were identified by NJDEP as sites of sodium and chloride contamination due to roadway deicing salts (Lubenow et al, 2022).

DRBC recently completed a two-year data collection effort (2021 – 2023) to study chlorides, TDS, and other major ion concentrations in the lower non-tidal Delaware River watershed. Using Classification and Regression Tree Analysis (CART), chloride concentrations were predicted for the recent period based on 2000 – 2018 data, and those predictions were compared against the true concentrations of samples collected between 2021 – 2023. Sites with higher observed concentrations than predicted were flagged as potential hot spots due to increasing concentrations. DRBC is in the second phase of this project which includes track-down and outreach efforts to address areas of concern, as well as collaboration with partner agencies and relevant stakeholders to formulate actionable mitigation measures. A report is underway to highlight these areas of concern and will be available to the public once completed by the end of CY 2025. Since the last Water Resources Program (WRP) for FY 2025-2027 was approved in June 2024, DRBC formed a regional workgroup, Salinity Impacts Freshwater Toxicity (SIFT), to collaborate on the issues of increasing chloride and salinization. Optimizing the application of winter deicing salts is an overarching goal of SIFT participants and is a likely target for mitigation measures.

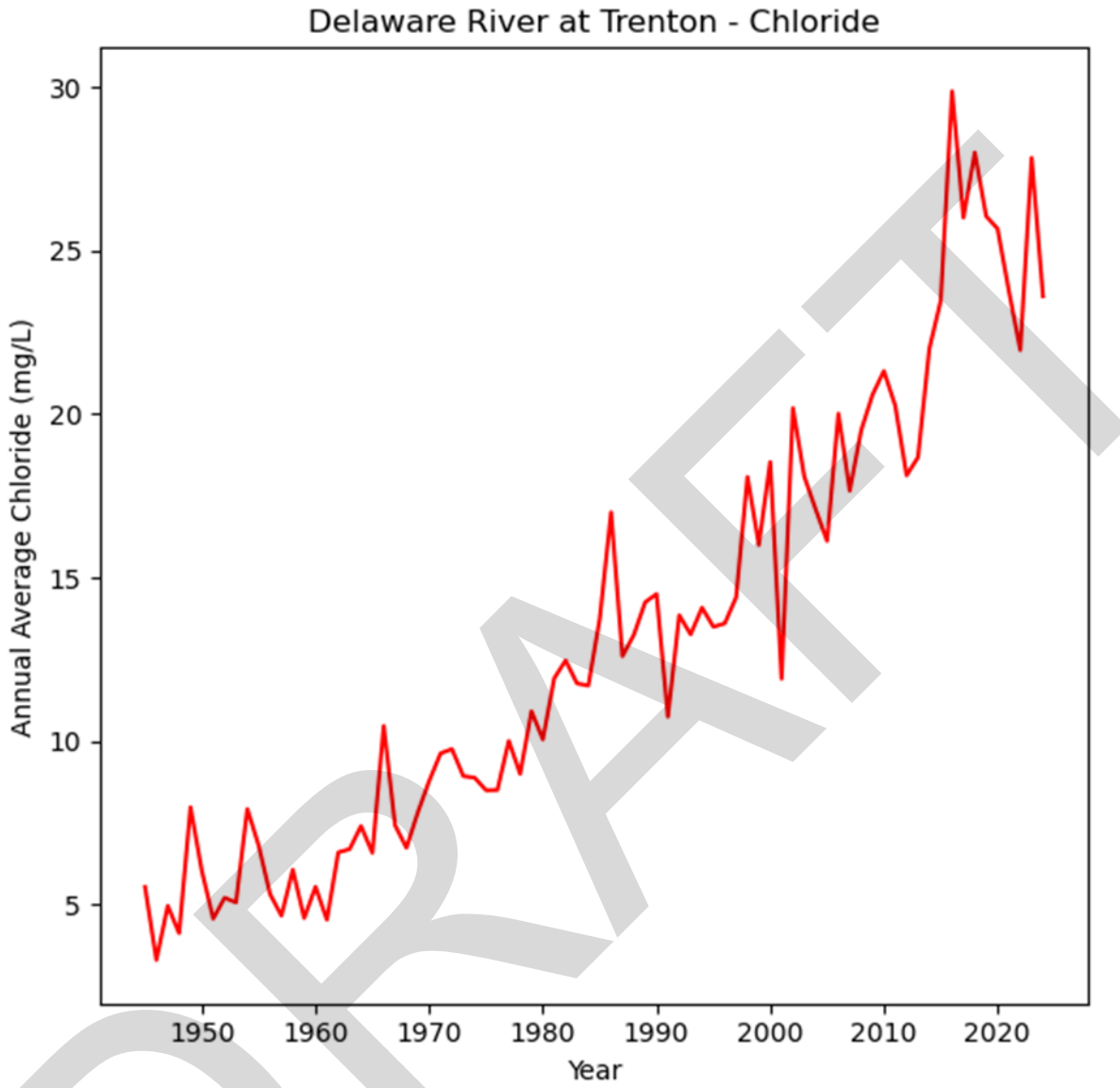


***Figure 28**. Long-term annual average chloride concentrations (mg/L) at the Delaware River in Trenton, N.J.. This location is monitored by many agencies and is the downstream catchment of the non-tidal drainage area. Data were obtained from the EPA's Water Quality Data Portal.*

1.5.6 Microplastics

Plastic is perhaps the most prevalent type of debris found in our oceans and large lakes. Plastic debris is highly variable in size, shape and polymer type, but those that are less than five millimeters in length (or no bigger than the size of a sesame seed) are "microplastics."

In 2018, DRBC received a grant from the Delaware Watershed Conservation Fund to monitor microplastics and model loadings of microplastics in the upper Delaware River Estuary. This project provided greater detail into how microplastics are distributed in this section of the Basin

and which source tributaries are introducing the most microplastics. DRBC collected samples from four sites in the upper Delaware River Estuary and 10 tributary sites. As the non-tidal Delaware River is the largest loading into the estuary, samples were also collected at the head of tide in Trenton, N.J. Samples were collected from 2019 – 2021 and were analyzed by Temple University for microplastic concentrations. Data collected during microplastic monitoring efforts were used to model microplastic dynamics in the estuary. Plastic cleanup efforts were completed at two locations within the Delaware River Estuary. A report summarizing the results and findings of this study was published in CY 2022 (DRBC, 2022a). In 2024, in conjunction with Temple University, a paper on the study was published in the *Journal of Environmental Engineering and Science* (Akbari et al., 2024).

1.5.7 Cyanobacteria

During summer 2019, cyanobacteria blooms were noted in several impoundments draining to tributaries of, and ultimately, the Delaware River. Fate and degradation of cyanotoxins are not well understood. DRBC will continue to coordinate with advisory committees and other stakeholders to determine what, if any, strategies or follow-up steps are warranted. Pennsylvania has formed an interagency task force to coordinate state agency activities regarding cyanobacteria blooms; for more information, see the Pennsylvania Harmful Algae Bloom (HAB) Task Force website[20], hosted by PADEP. The NJDEP also has extensive guidance[21] on this topic at their website along with an expert team to identify, monitor, and manage HABs in New Jersey, largely on lakes.

As a Monitoring Initiative under its Water Pollution Control (Clean Water Act Section 106) grant, DRBC conducted a cyanotoxins study in both 2022 and 2023 on the mainstem Delaware River to screen for several cyanotoxins (microcystins, cylindrospermopsin, and anatoxin-a) emitted by cyanobacteria species. The monitoring employs a passive sampling technique known as Solid Phase Adsorption Toxins Tracking (SPATT[22]), involving the deployment of resin-filled mesh bags for a specified duration to capture toxins present in the water. This technique allows for the collection of time-integrated samples that are more likely to capture episodic events that grab samples tend to miss. Following deployment, the SPATT bags were extracted and analyzed by the Delaware Department of Natural Resources and Environmental Control (DNREC) to quantify the toxins adsorbed.

In 2024, DRBC deployed SPATT bag samplers during the autumn and winter periods to obtain cyanotoxins data outside of the typical high growth period (July through September). These samples were extracted and analyzed by DNREC to quantify the toxins adsorbed. Plans to deploy samplers downstream of known HABs, when possible, and around drinking water intakes will be continued in the upcoming years. Grab samples will be collected concomitantly during deployment and retrieval, and also throughout the deployment period, at a select number of sites to estimate

[20] www.dep.pa.gov/HABs

[21] https://www.state.nj.us/dep/hab/

[22] Standard Operating Procedure for Solid Phase Adsorption Toxins Tracking (SPATT) Assemblage and Extraction of HAB Toxins http://oceandatacenter.ucsc.edu/home/Misc/SPATT%20SOP%20All%20Toxins.pdf

water column concentrations of microcystins and cylindropermopsin, for which there are Drinking Water Health Advisories[23]

The DRBC SPATT screening study provided insights into using SPATT for cyanotoxin monitoring, allowing relative site comparisons during the same deployment period. However, SPATT does not quantify cyanotoxin concentrations for comparison with EPA drinking water health advisories. To address this, DRBC plans to use paired grab samples during deployment periods in the coming years.

Lastly, DNREC has preserved all extracted SPATT samples from 2022 to 2024 for potential future analysis of microcystin congeners, allowing identification of specific forms present in each sample. Certain congeners, such as MC-LR, MC-LA, and MC-LW, are more likely to have toxic effects on humans, making it important to understand the composition of toxins within the microcystins class.

1.5.8 Data Centers

The growing importance of data centers and their potential impacts on water resources within the Basin are important to understand. Data centers consume large volumes of potable water for various purposes, primarily for cooling systems and humidity control, and the Commission has received inquiries for construction of data centers in recent years. DRBC will research and develop a briefing document on the potential impacts that data centers may have on water resources in the Basin.

1.6 CLIMATE AND HYDROLOGY

Defined as the average of global or of a locale's weather patterns over an extended period, climate is different from normal variations in weather, which can change on a regional scale, hour to hour, day to day, season to season. Changes in atmospheric temperature, precipitation, and sea level, and their associated impacts to water availability, may create new challenges to meet water supply and management goals for the water resources in the Delaware River Basin.

Water resource plans and programs are typically developed using probability-based estimates, such as the 100-year flood, or the most critical (*i.e.*, "worst") observed condition, such as the drought of record. In the Delaware River Basin, both the flood of record and the drought of record occurred more than 50 years ago, in 1955 and 1962 – 1967, respectively. For planning purposes, it is important to understand what factors contribute to these events, such as temperature and precipitation, how they have changed, and estimate how they may change water availability in the future.

Observed historical data were used to evaluate trends and changes in air temperature, streamflow, precipitation, and sea level in the Basin. The average annual temperature and precipitation are increasing. Average annual streamflows are also increasing, but when compared seasonally, the trend is predominantly inconclusive or weak. Historical sea levels have risen over time and are predicted to continue rising into the future. However, the predicted rate of change is

[23] https://www.epa.gov/habs/epa-drinking-water-health-advisories-cyanotoxins

likely to shift as more information about contributing factors, such as the melting of polar ice sheets and glaciers, evolves.

1.6.1 Atmospheric Temperature

Changes in atmospheric temperatures affect sea level, precipitation patterns, moisture availability, and extreme meteorological events (*i.e.*, droughts, floods, and severe storms).

Average annual air temperature data from 1960 through 2019 at five weather stations inside the Basin and two nearby locations outside of the Basin (used due to lack of data within the upper Basin) suggest an increasing trend in temperature. **Figure 29** presents the computed five-year moving average and linear trend for each station. The five-year average is used so the general trend is not obscured by the year-to-year variability in temperature resulting from shorter-term weather patterns. Temperatures in the upper Basin (Poughkeepsie, N.Y., and Binghamton, N.Y.) and lower Basin (Wilmington, Del., and Philadelphia, Pa.) have increased by more than 2°F. Temperatures mid-basin (Trenton, N.J.; Reading, Pa.; Allentown, Pa.) have increased by approximately 1°F.

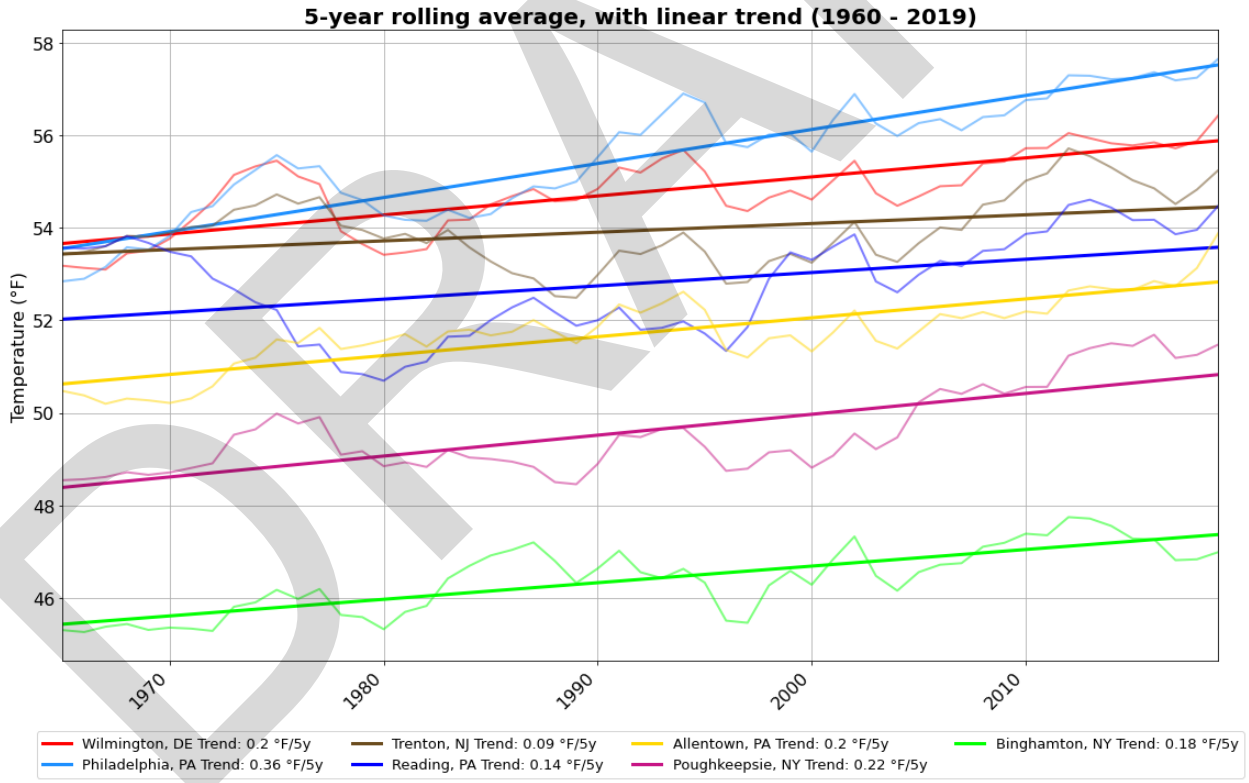


Figure 29. *Five-year moving average of annual temperature at seven weather stations in or near the Delaware River Basin. A five-year moving average is used to show the trend in temperature by "dampening" the interannual variability of weather patterns.*

Air temperatures were also compared for two 35-year year periods (1950-1984 and 1985-2019) by region (**Figure 30**). Regions are defined by the drainage areas of rivers, and/or combinations of rivers and streams, and referenced by a Hydrologic Unit Code (HUC), a number that represents the relative size of the drainage area. **Figure 30** presents the change in the average daily minimum (left panel), daily average (center panel), and average daily maximum (right panel) temperatures in the HUC8 regions between the two 35-year periods. The average daily minimum and daily average temperatures increased for all regions except one located in the mid-Basin. The largest increases were in the western and southwestern regions of the Basin. The average daily maximum temperature stayed approximately the same in much of the upper basin and the state of Delaware, while increasing elsewhere.

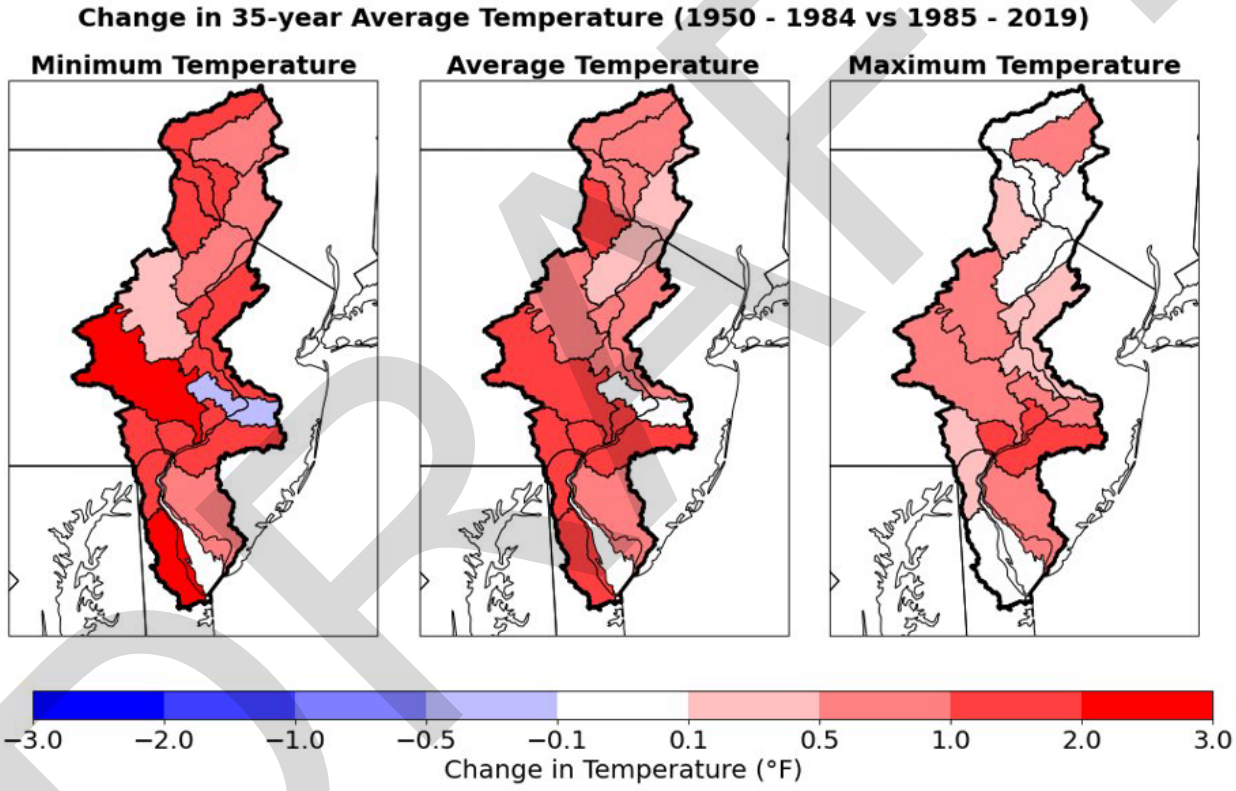


Figure 30. *Average Change in Minimum, Average and Maximum Daily Temperatures between 1950-1984 versus 1985–2019. Observed data from 360 weather stations were used to generate a complete time-series and then spatially distributed for the analysis. Regions are based on watershed delineations of a river, or combined river and stream system, and named based on a Hydrologic Unit Code (HUC) and stream classification. The basins shown are HUC8s.*

1.6.2 Precipitation

Based on information from 360 weather stations in the Basin, precipitation amounts were compared for the same two periods as temperature: 1950-1984 and 1985-2019. **Figure 31** presents the change in average annual and annual seasonal precipitation. On an average annual basis, the precipitation in the Basin has increased in almost all areas. However, an evaluation of

seasonal precipitation indicates that most increases in precipitation primarily occurred in the summer (June, July, and August) and fall (September, October, and November). Winter precipitation (December, January, and February) showed a slight decrease in many areas of the upper Basin and a slight increase in most areas of the lower Basin. Spring precipitation (March, April, and May) has decreased slightly in the middle Basin and mostly increased in the lower Basin.

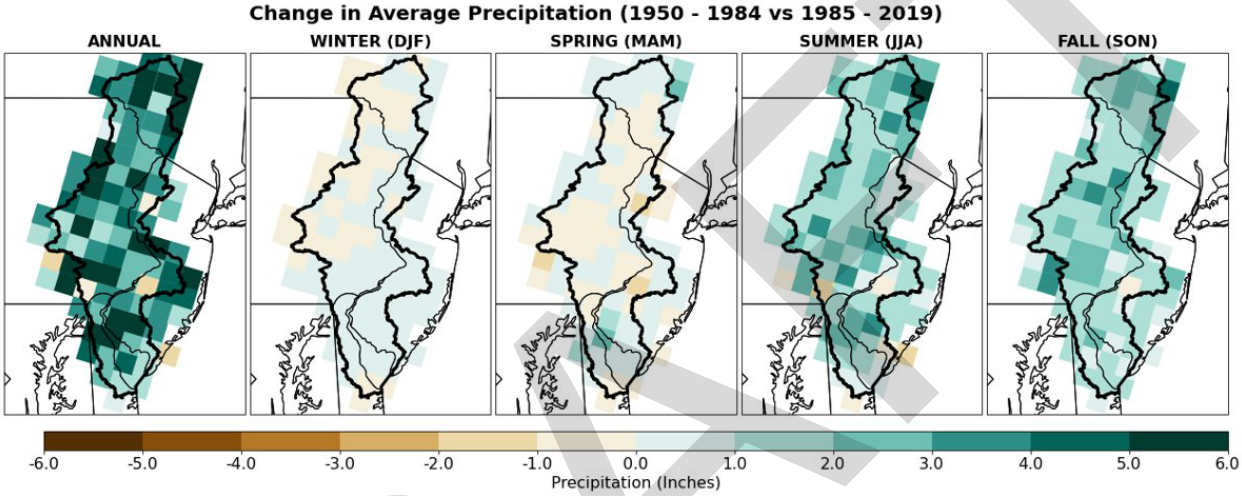


Figure 31. *Change in Average Annual Precipitation between 1950-1984 vs. 1985 – 2019. Observed data from 360 weather stations were used to develop a continuous spatially distributed precipitation record for comparison. The average annual precipitation has increased from 1950-1984 to 1985-2019. However, the difference is not evenly distributed among the seasons.*

1.6.3 Streamflow

Streamflow is affected by many factors. In addition to temperature, precipitation, and evapotranspiration, land use can also alter the volume and timing of flow. A trend analysis was performed with streamflow data from 20 representative USGS monitoring stations considered to have minimum impacts from reservoir operations and flow management programs. The locations were chosen to reflect the change in flow due to climate rather than other factors such as reservoir releases, water use, and landcover changes. The average annual flow and annual seasonal flow from periods of record ranging from 30 to 40 years were used. The relative trends in the total annual and total seasonal flow are presented in **Figure 32**. The trends in flow were predominantly increasing in the fall and on an annual basis except for inconclusive trends at five and four locations, respectively, along the eastern edge of the basin. The trend analysis was inconclusive for most locations in the spring, except increasing trends were shown for two locations in the middle basin, and decreasing trends were determined for two locations in the eastern portion of the upper middle basin. In the winter and summer, approximately half of the locations exhibited increasing trends with the remainder exhibiting no trend, but not at the same locations. No attempt was made to correlate the trend in flow to changes in temperature, precipitation, and/or land uses.

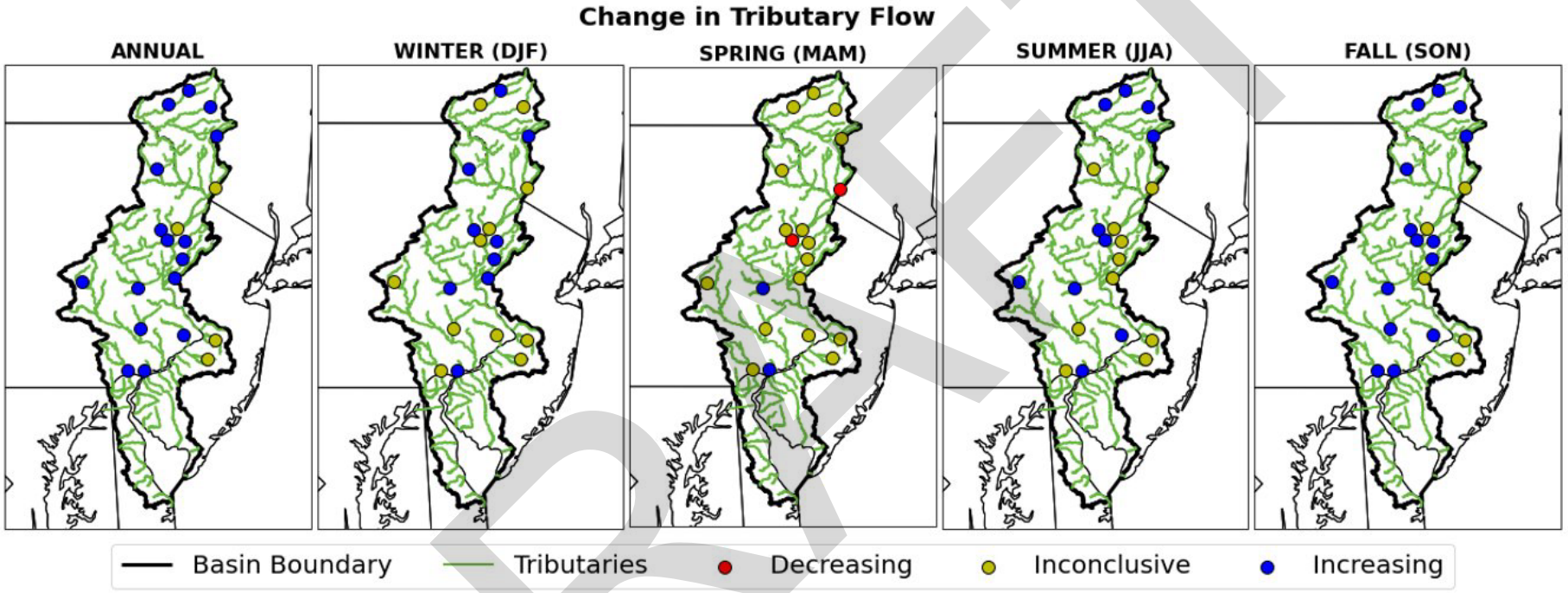


Figure 32. *Trends in average total flow and average seasonal flow. Blue dots indicate a gage location with an increasing trend in flow. Yellow dots indicate an inconclusive trend. Red dots indicate a decreasing trend. In general, the increasing and decreasing trends were weak. DJF is December, January, February; MAM is March, April, May; JJA is June, July, August; and SON is September, October, November.*

1.6.4 Sea Level Rise

The Basin has also been impacted by sea level rise (SLR), not only from storm and tidal flooding, but also from salinity intrusion. **Figure 33** presents time-series of measured sea level at Lewes, Del., and Philadelphia, Pa., which show rates of SLR of 3.71 mm/yr and 3.11 mm/year, respectively. Since 1960, the sea level has risen by 8.7 inches at Lewes and 7.3 inches at Philadelphia. In addition to the impacts of storm surge and high tide flooding, the upstream migration of saltwater into the Delaware Estuary as the result of sea level rise is also of concern to human and aquatic life.

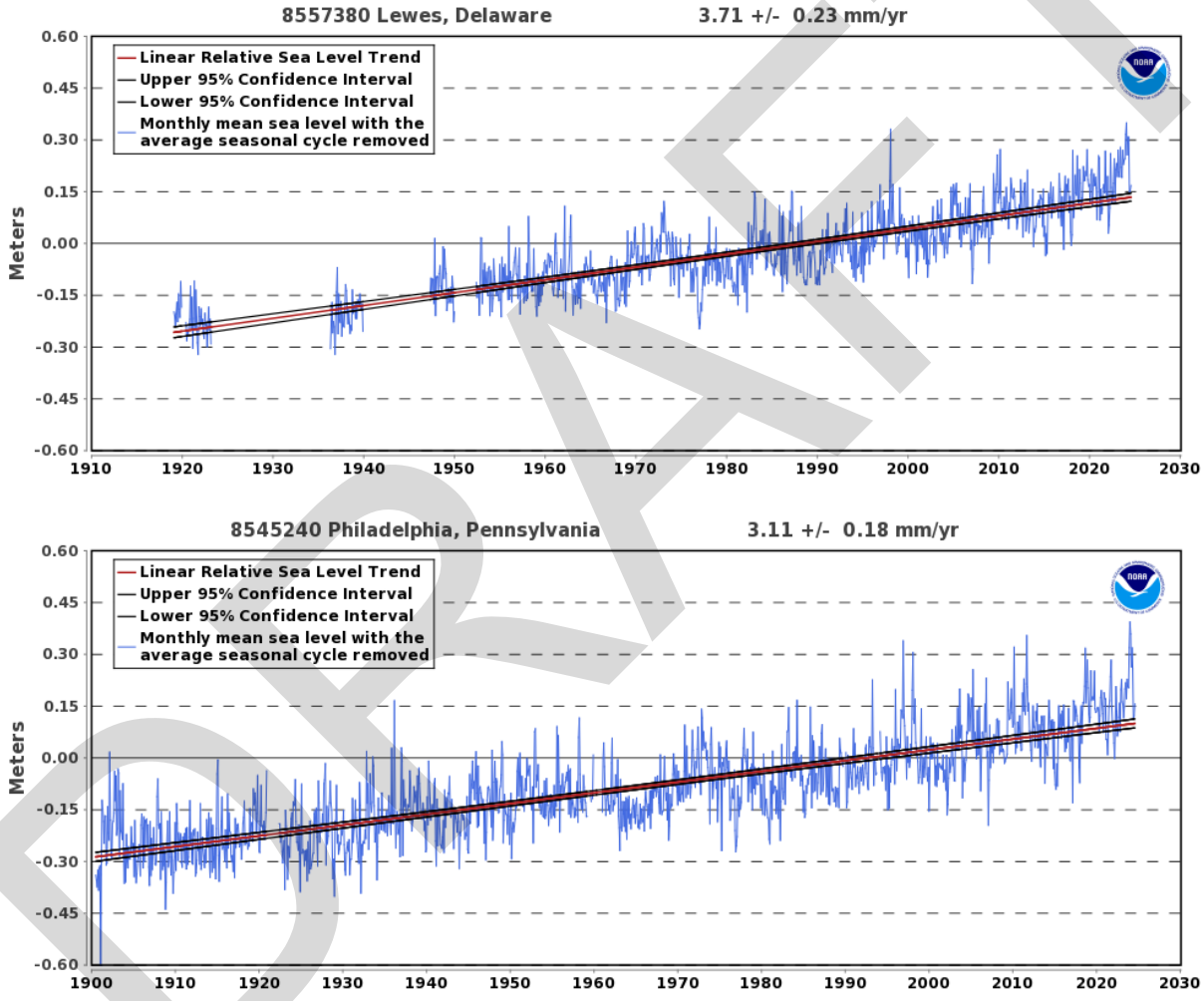


Figure 33. *Rates in Sea Level Rise at Lewes, DE and Philadelphia, PA. Source: NOAA*

During periods of low upstream freshwater flows, releases are made from reservoirs to meet the Trenton Equivalent Flow Objective (TEFO), which was established in the Commission's Water Code to ensure sufficient freshwater inflow for salinity management. With higher sea level, the forces moving saltwater upstream into the estuary will be increasing in comparison to the freshwater inflows pushing it downstream. New sources of freshwater may be needed to provide sufficient water for salinity management. An increased frequency of salinity intrusion farther upstream may eventually result in unsuitable quality water for conventional treatment for many estuarine water users south of Philadelphia. In addition, the drinking water intakes for the water supplies of Philadelphia and portions of central New Jersey may ultimately be in jeopardy. If estuary water becomes too saline, conventional water treatment will not be adequate, and the intakes may need to be relocated or alternative treatment technologies, such as desalinization, may need to be considered. Changes in estuary salinity will also affect habitat for fish and shellfish, as well as impact wetlands and marshes.

1.6.5 Resilience and Adaptation

Future changes to climate and hydrology in the Delaware River Basin are anticipated to include increased atmospheric temperature, changes in precipitation patterns and intensity, and continued sea level rise, all of which will affect water supply and water quality – critical components of water security in the DRB. As will be detailed in **Part II – Section 2.1.3**, the Commission has numerous planning, modeling, and data analysis efforts underway and proposed to provide scientifically-based information to the Commissioners and Basin stakeholders to support development and implementation of water resource management strategies in the Basin that increase the resiliency of our water resources to anticipated changes in climate and rising sea levels, as well as support improved adaptation planning.

1.7 INVENTORY OF OTHER DOCKETS

In accordance with [18 C.F.R. § 401.26 of] the Commission's Rules of Practice and Procedure, an inventory of projects[24] approved pursuant to Section 3.8 of the Compact between January 1, 2024, and December 31, 2024, but which are not included in the Comprehensive Plan or Water Resources Program is available on the DRBC website.

[24] https://drbc.maps.arcgis.com/apps/instant/minimalist/index.html?appid=8ffff72639f44c699318b3f34454a5d5

2. WATER RESOURCE MANAGEMENT

Part II of the Water Resources Program is presented in two sections:

- **Section 2.1: Goals and Priorities** summarizes the primary water resource goals of the DRBC and FY 2026-2028 Commission focus areas.
- **Section 2.2: Water Resource Management Work Program** summarizes the activities and programs constituting the Commission's work plan for FY 2026-2028, organized by the five Key Result Areas of the Basin Plan 2004[25].

These five Key Results Areas (KRAs) are:

1. Ensuring the Sustainable Supply of Suitable Quality Water
2. Waterway Corridor Management
3. Linking Land and Water Resource Management
4. Institutional Coordination and Cooperation
5. Education and Outreach for Stewardship

See also **Supplemental Table B-1** in **Appendix B** for a summary of prospective changes to the DRBC Comprehensive Plan, regulations and/or programs.

2.1 GOALS AND PRIORITIES

The primary water resource goals of the DRBC are:

- An adequate and sustainable supply of water for the Basin.
- Clean and healthy water resources throughout the Basin.
- Reduction of losses and impacts in areas prone to flooding within the Basin.

2.1.1 Commission Focus Areas

The Commission Focus Areas for FY 2026-2028 are as follows:

1. Water Quantity
   - Analyze surface and seasonal groundwater availability for the Basin using demand projections out to 2060.
   - Work with Commissioners to advance the Phase II Storage Study, which evaluates three quarries for potential storage opportunities. Also work with New York City

[25] https://www.nj.gov/drbc/library/documents/BasinPlan_Sept04.pdf

Department on facilitating the further evaluation of the expansion of Cannonsville Reservoir. This work builds upon the 2023 Storage Study.

- Provide technical support (modeling, research, assessments, documentation) to the states and New York City (Decree Parties) for the studies specified in FFMP2017.
- Continue the re-evaluation study of additional storage and/or optimizing operations at F.E. Walter Reservoir with the USACE.
- Evaluate the impact of changes to climate and hydrology on macro-scale water resource management and define avenues of investigation for resilience planning.
- Manage DRBC's water storage to support the Trenton Equivalent Flow Objective for salinity management.
- Monitor hydrologic conditions that may require Commission action.
- Coordinate drought management actions with states, reservoir operators, and facilities with consumptive use replacement requirements.
- Use the 3D hydrodynamic salinity model (SM3D) to evaluate effectiveness of various flow management alternatives to meet salinity repulsion goals under future sea level rise predictions.

2. Water Quality

- Coordinate and collaborate with state and federal co-regulators in the development of an implementation strategy (high level) and implementation plan, including individual wasteload allocations for point sources and load allocations for non-point sources as needed, to meet final DO criteria expected to be promulgated by EPA for Zone 3, Zone 4 and upper portion of Zone 5.
- Support implementation, consistent with a schedule to be determined after EPA's aquatic life use and DO criteria rulemaking process is complete, and update DRBC's Comprehensive Plan and Water Quality Regulations for the Delaware River Basin to include designated uses and criteria as appropriate.
- Implement water quality programs (monitoring, assessment, and modeling), supported in part by an EPA Section 106 grant, in Special Protection Waters (SPW) and the Delaware Estuary.
- Coordinate with basin states as needed to share monitoring, assessment, and other scientific studies to support the states' development of their integrated water quality monitoring and assessment reports.
- Perform enhancements to 3D eutrophication model to support ongoing water quality studies and anticipated DO criteria implementation plan. Enhancements include more accurate characterization of external loads of particulate organic matter and simulation of internal phytoplankton production, as well as dynamic representation of sediment loads and sinks.
- Initiate discussion on alternative no measurable change (NMC) allocation methods for watersheds draining into Special Protection Waters with the goal of satisfying regulatory objectives while balancing competing water resource needs.

- Collaborate with EPA and the Basin states to implement Stage 1 PCB TMDLs throughout the tidal system; support establishment of Stage 2 PCB TMDLs and develop revised implementation requirements.
- Coordinate with advisory committees to recommend updates to DRBC water quality regulations for the mainstem for key parameters, such as ammonia.
- Coordinate and implement the co-regulator strategy for addressing enhanced recreational designated uses in Zones 3 and upper 4.
- Coordinate, develop, and implement chloride load reduction strategy with the co-regulators and key stakeholders.

3. Regulatory Review
   - Review applications and issue approvals for projects as required.
   - Develop, update, and implement the One Process / One Permit Program and associated administrative agreements (AAs) for collaborative permitting and technical coordination of state permits and DRBC approvals.
   - Enforce conditions of approvals through compliance program.
4. Strategic Planning
   - Develop a Climate Resilience Plan for improving resilience and adaptation of the Basin's water resources.
   - Develop a plan and priorities for updating the Commission's Comprehensive Plan.
5. Partnership and Public Engagement
   - Collaborate with watershed partners in nonprofit, industry, and government sectors through existing committees/councils, one-on-one relationships, and events.
   - Provide meaningful opportunities for public input from interested or affected parties.
   - Develop and implement a Community Engagement Plan to guide outreach and engagement efforts.
   - Engage and solicit input from elected officials on matters related to Basin water resources.
   - Provide timely and relevant information to guide the public's understanding of water resource issues impacting the Basin.
   - Present the findings of the recently-published 2025 State of the Basin report.
6. Agency Fiscal Management
   - Water Withdrawal and Discharge Project Fees: Continue to evaluate and implement the annual monitoring and coordination fee program. Annually adjust fees for review of project applications and coordination with state permitting programs based upon the Consumer Price Index (CPI).
   - Signatory Party Contributions: Re-establish and/or maintain state and federal contributions.

- Pursuant to the Water Resources Development Act of 2022, work with USACE to amend DRBC water supply contracts for Blue Marsh and Beltzville Reservoirs to provide DRBC with the option to finance projects constituting repair, rehabilitation or replacement.

2.1.2 Climate Resilience Planning

Changes to basin climate and hydrology are anticipated to present challenges for the management, protection, and improvement of water resources in the Basin. Changes observed to-date are summarized in **Part I – Section 1.6**. Potential impacts expected in the Basin in the future include greater extremes in precipitation, higher temperatures, continued sea level rise, and increased riverine and tidal flooding, among others. Much research and analysis have been performed by others concerning the vulnerability of locations in the estuary to increased storm surge and tidal flooding and the associated risks. The initial focus of the Commission's efforts has been and will continue to be on the impacts of sea level rise and changes to atmospheric temperature, precipitation, and hydrology on water security and the resiliency of our water resources.

Over the period covered by this FY 2026-2028 Water Resources Program (WRP), the focus areas of DRBC's climate resilience planning will include continuing or initiating the following work:

- Researching and analyzing the potential impacts of sea level rise on water resources;
- Evaluating alternative flow management programs and outcomes considering changes to hydrology and sea level rise;
- Evaluating groundwater and surface water availability considering the effects of changes to climate and hydrology;
- Identifying additional freshwater storage and other adaptation measures to meet future water availability, drought management, and flow management needs;
- Developing tools to evaluate the effects of changes in climate and hydrology and sea level rise on aquatic habitat in tidal and non-tidal portions of the Delaware River;
- Developing a framework for evaluating the impacts of changes in climate and hydrology on water quality and emerging contaminants;
- Researching and assessing flood impacts;
- Sharing the results of DRBC technical studies on climate resilience planning via conferences and presentations; and
- Developing a Climate Resilience Plan.

As directed by Commission Resolution 2024-04, approved in June 2024, DRBC staff are developing a Climate Resilience Plan (CRP), consisting of a plan of prioritized DRBC actions for improving the resilience of the Basin's water resources. The CRP will focus on areas within the authority, jurisdiction, and expertise of the Commission. These may include, but are not limited to flow and drought management, flood loss, water quality, water use, and water conservation. The CRP is being developed in three phases as follows:

Phase I: The first phase of the CRP is the scoping phase, in which the framework for subsequent phases will be presented. Phase I will also include the vision and goals of the CRP and the development of metrics for use in evaluating impacts and the performance of resilience and adaptation measures.

Phase II: The second phase of the CRP is the vulnerability assessment and gap analysis, which will be used as the basis for developing a prioritized plan of actions for DRBC to implement, as resources allow, to increase the resiliency of the Basin's water resources.

Phase III: The third phase of the CRP is the ongoing process of reviewing and revising the plan and evaluating and reporting on progress.

The CRP may include recommendations that the Commission consider new or revised regulations or policies to address risks and vulnerabilities. Implementation of such recommendations will require Commission action.

During the development of each phase of the CRP, input will be sought from the public, stakeholders, and the ACCC.

2.1.3 Comprehensive Plan Update

In accordance with Sections 3.2(a) and 13.1 of the Delaware River Basin Compact (Compact[26]), the Commission has developed and adopted, and periodically reviews and revises, a Comprehensive Plan that includes all public and private projects and facilities that are required, in the judgment of the Commission, for the optimum planning, development, conservation, utilization, management and control of the water resources of the Basin to meet present and future needs. The Comprehensive Plan also incorporates policies and regulations adopted by the Commission for the effectuation and enforcement of the Compact. Although the Commission makes regular updates to the Comprehensive Plan at quarterly Business Meetings (by the addition or subtraction of projects via docket / permit actions), the last printable version is the 2001 Comprehensive Plan[27]. Thus, an update and compilation of all elements is planned, including but not necessarily limited to a robust geographic information system (GIS) platform for all of the Commission's approved projects.

2.2 WATER RESOURCES MANAGEMENT WORK PROGRAM

2.2.1 Ensuring the Sustainable Supply of Suitable Quality Water (Key Result Area #1)

1.1 Water Supply Strategy: Forecasting and Planning

1.2 Multi-objective Flow Management

1.3 Water Supply Management: Conservation, Special Area Management and Permitting

[26] https://www.nj.gov/drbc/library/documents/compact.pdf

[27] https://www.nj.gov/drbc/library/documents/comprehensive_plan.pdf

1.4 Determining Water Quality and Meeting Standards: Criteria-Based Programs, Anti-Degradation and Water Quality Administration

2.2.1.1 WATER SUPPLY STRATEGY: FORECASTING AND PLANNING

2.2.1.1.1 Water Supply Planning for a Sustainable Water Future 2060

Building on the water use and demand evaluation work in past reporting efforts, the Commission will integrate efforts to prepare a detailed and comprehensive analysis of water demand, availability, and sufficiency through 2060. Assessment of surface flows, aquifer conditions, anthropogenic supply needs, permitted allocations, and ecological needs will be compiled to identify long-term sustainability concerns and suggest appropriate action. The work plan includes:

- Assessment of water availability during a repeat of the drought of the 1960s, the Basin's drought planning benchmark.
    - Groundwater availability analyses (seasonal) using current and projected water demand out to 2060.
    - Surface water availability in non-tidal watersheds using current and projected water demand out to 2060.
- Assessment of water availability with predicted future trends and sea level rise.
- Assessment of the efficacy of the Trenton Equivalent Flow Objective for salinity management for different sea level rise scenarios.
- Identification of additional information and tools necessary to develop future condition scenarios.
- Review of the adequacy of supply storage facilities to meet future water use and in-stream needs.
- DRBC will work to develop a briefing document on the potential impacts that data centers may have on water resources.

While most tasks are included in this **Part II - Section 2.2.1.1** of the work program, others (*e.g.*, those related to modeling or agency coordination), are described in other sections of the document as appropriate.

2.2.1.1.2 Supporting and Coordinating with State Water Supply Planning and Allocation

DRBC works closely with the states through the DRBC Water Management Advisory Committee (WMAC) and by serving on committees organized by the states for water supply planning and management. Basin states continue to improve their data collection efforts, which are critical for well-informed planning and management.

As reflected in the updated administrative agreements between the Commission and the states of New Jersey (2024) and New York (2016), the Commission is cooperating with the state permitting/allocation programs for the groundwater and surface water withdrawals in those states.

DRBC administers a special program for the Southeastern Pennsylvania Groundwater Protected Area (SEPA GWPA, see **Part II – Section 2.2.1.3.3**) on behalf of the Commonwealth of Pennsylvania. New York's water supply law (see primarily NY Environmental Conservation Law, Article 15, Titles 15, 16 and 33) was amended on August 16, 2011 (Laws of New York, Chapter 401), with most of the statutory amendments effective as of February 15, 2012. The amendments expand the permit program to include withdrawals for purposes beyond public water supply, such as those for commercial, manufacturing, industrial, and other purposes, and limit the permit program to only include systems with capacity to withdraw 100,000 gallons per day or more. Previously, permits were required for any volume of withdrawals for public supply. The revised rule indicates that since the NYSDEC, as a voting member of the DRBC, is integrally involved with the DRBC's water withdrawal approval processes, that if a water withdrawal occurs in the jurisdiction of the DRBC and the water withdrawal is approved by DRBC, as applicable, then the water withdrawal is exempt from the permit requirements of the rule.

2.2.1.1.3 Surface Water Charging Program

DRBC administers a Surface Water Charging Program for water withdrawals which includes on-line registration, reporting and invoicing. Revenue from the program is added to the Water Supply Storage Facilities Fund (WSSFF). The WSSFF is used to fund the cost-share debt service and joint use operations and maintenance of Blue Marsh and Beltzville Reservoirs, facilities where DRBC holds water supply storage. This storage is used to ensure freshwater flows into the estuary during periods of low flow. The WSSFF is also used to provide the local cost-sharing support for approximately a dozen USGS streamflow and water quality gages that are used for flow management, water quality assessments, and flood forecasting by the National Weather Service (NWS).

2.2.1.1.4 Facility Planning

The Commission has considerable powers of oversight relating to major facilities and projects affecting water resources in the Basin, and "*…for the determination of project priorities, pursuant to the requirements of the comprehensive plan and [the] water resources program.*"

The Commission will focus on several aspects of facility planning in the next three years:

- Execute a contract and begin work with an engineering consultant on the Phase II Storage Study. The Phase II Storage Study will evaluate three quarries for additional storage potential. This work builds on the Phase I Storage Study published in 2023.
- Potentially facilitate a contract between the engineering consultant for the Phase II Storage Study and NYCDEP to evaluate the conceptual expansion of Cannonsville Reservoir, as described in the Phase I Storage Study.
- F.E. Walter Re-evaluation Study: The Commission is a non-federal sponsor of the USACE study, along with NYCDEP, to evaluate F.E. Walter Reservoir for additional purposes (drought management, water supply, and additional recreation). DRBC's in-kind services include developing and modeling alternatives to evaluate the benefits of drought storage in the reservoir.
- Development and refinement of models and assumptions for future planning exercises and studies.

2.2.1.1.4.1 Beltzville and Blue Marsh Reservoirs

The Commission owns water supply storage in two federal reservoirs – Beltzville (Lehigh River Watershed) and Blue Marsh (Schuylkill River Watershed) – and is responsible for annual debt service and a portion of operation and maintenance costs at each of these facilities. The Commission directs releases from the two reservoirs to augment low flows in the main stem Delaware River to control salinity intrusion and thereby protect water supply intakes serving Philadelphia, southern New Jersey, and surrounding areas, and to prevent damage to industrial intakes. A portion of the Commission's storage in Blue Marsh is allocated to the Western Berks Water Authority (WBWA) in accordance with contracts executed prior to construction of this facility.

Conservation releases from Beltzville and Blue Marsh Reservoirs are made by the USACE from their respective water supply pools. At Blue Marsh, releases of 9 cfs from the Commission's water supply pool are made in addition to the conservation releases from the USACE water supply pool to support a downstream contract water user. If additional water is needed to satisfy the Trenton Equivalent Flow Objective, the Commission will request additional releases from one or both of its water supply pools (DRBC storage) in the reservoirs.

The Commission's costs other than debt service at the two reservoirs have risen substantially in recent years. Fortunately, the Water Resources Development Act ("WRDA") of 2022 provided that expenses comprising "repair, rehabilitation, or replacement" are eligible for financing and that "[a]t the request of the State or local interest, the Secretary of the Army shall amend a repayment contract" to incorporate this financing option. Since April 2024 the DRBC has pursued, and will continue to pursue, amendments to its water supply contracts at both Blue Marsh and Beltzville Reservoirs for consideration by the Corps and the Secretary of the Army. Importantly, the DRBC will not assume any new debt obligation without the Commissioners' express approval.

2.2.1.1.4.2 Storage Study

Evaluating future storage needs in relationship to future water demands (both consumptive and non-consumptive uses), changes to hydrology (from changes in precipitation and temperature), and sea level rise are part of the Water Supply Planning for a Sustainable Water Future in **Part II – Section 2.2.1.1.1**. DRBC recently completed a related study to explore the feasibility of additional freshwater storage to meet future water availability, adaptation, drought management and flow management needs in the Delaware River Basin. The study, titled "Evaluation of Additional Storage in the Delaware River Basin[28]," was published in April 2023. The study objectives were to identify, inventory, and evaluate the feasibility of new and existing options that could provide additional usable storage. Although the DRBC has not determined the need for additional storage within the Basin, the study is a planning level inventory of potential options that would be available if the DRBC determines that additional storage is needed in the future. On September 5, 2024, the Commission approved a Resolution for the Minutes authorizing the Executive Director to enter into a contract for engineering services to evaluate additional selected storage options. This study is referred to as the Phase II Storage Study. Staff will work to finalize

[28] https://www.nj.gov/drbc/library/documents/EvaluationAdditionalStorageDRB_april2023.pdf

a contract with the engineering consultant and begin a more detailed evaluation of several potential options identified in the 2023 study.

DRBC WATER RESOURCES PROGRAM
2.2.1.1 Water Supply Strategy

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Sustainable Water Future	Seasonal groundwater availability	2026-2027	General Fund, DWCF 2022
	Surface water availability analyses	2026-2028	
	Strategies for supply sufficiency through 2060	2026-2028	
Support of State Programs	Coordination and support of Basin state water supply programs	On-going	General Fund
Surface Water Charging Program	Program administration, on-line registration and reporting, invoicing	On-going	WSSFF
Facility Planning	F.E. Walter Re-evaluation Study	2026-2027	General Fund
	Phase II Storage Study contract and report.	2026-2027	WSSFF

2.2.1.2 MULTI-OBJECTIVE FLOW MANAGEMENT

The mainstem of the Delaware River is the longest undammed river east of the Mississippi, 152 miles of which are designated under the Wild and Scenic Rivers Act. However, dams on several large tributaries, which store water in reservoirs, have a significant effect on river flows. Together these facilities serve multiple purposes, providing for conservation releases, flood mitigation, water supply, recreational opportunities, hydropower, consumptive use make-up, and instream flow augmentation. In addition to precipitation, snowmelt, and groundwater seeps and springs, activities that affect instream flows include releases and diversions from water supply and multipurpose reservoirs on tributaries; inter-basin water transfers from tributaries and the river; and water withdrawals from surface waters and interconnected groundwater sources. Low flows may impact habitat and wildlife and reduce the assimilative capacity of the river for wastewater discharges. High flows may cause loss of life and property, but they are also a part of the natural hydrologic cycle. High flows and flooding events move sediment, provide inputs of coarse particulate organic matter that feed organisms at the base of the food chain, and periodically alter the river morphology and riparian corridor, which contribute to habitat and species diversity. Seasonal high flows also provide environmental cues that trigger spawning and

lifecycle events for myriad species dependent on this river (*e.g.*, American shad, oysters, mussels, and Atlantic sturgeon).

2.2.1.2.1 Reservoir Operations

DRBC staff work with and use forecasts from the National Weather Service (Philadelphia and Binghamton, Weather Forecast Offices; Mid-Atlantic River Forecast Center) to determine the amounts of water needed (i.e., low flow augmentation releases) to meet the Trenton Equivalent Flow Objective during low flow conditions. Regular coordination occurs between the DRBC and USACE staff and between DRBC and the USGS Office of the Delaware River Master (ODRM). DRBC uses its storage in both Blue Marsh and Beltzville Reservoirs and may also use up to 6.09 BG reserved from the Excess Release Quantity from the New York City Reservoirs, for the Trenton Equivalent Flow Objective.

2.2.1.2.1.1 Flow Management

The Commission's flow and drought management plans (18 CFR Part 410, Sections 2.5.3 through 2.5.6) were developed to ensure flow in the main stem for water supply, water quality, habitat, and recreation. During normal conditions, main stem flow management actions are related to conservation releases, flow objectives at Montague and Trenton, N.J., and limits on out-of-basin diversions by New York City and New Jersey. The 1954 Supreme Court Decree, the parties to which are New York, Pennsylvania, New Jersey, Delaware, and New York City (the "Decree Parties"), established the Montague Flow Objective and maximum out-of-basin diversions. Minimum conservation releases for the three New York City reservoirs in the Delaware River Basin (Pepacton, Cannonsville, and Neversink) were established by DRBC Docket D77-20-CP (and subsequent revisions and programs). In 1983, the Trenton Flow Objective was established with adoption of the normal and drought management plan in the Delaware River Basin Water Code (18 CFR Part 410, Sections 2.5.3 through 2.5.6). The Decree Parties unanimously consented to actions in the plan that modified relevant provisions of the Decree during drought conditions.

The drought management plan requirements for the main stem are intended to augment low flows in the non-tidal river and ensure freshwater inflow into the Delaware Estuary to repel the upstream movement of salt water while preserving regional storage without increasing the risks to the Basin's water supplies. Provisions of the drought management plan related to the main stem and reservoir operations include phased reductions in flow objectives at Montague and Trenton, N.J., conservation releases, and out-of-basin diversions. The phases are defined by the combined storage in the three New York City reservoirs. Occasionally, the lower basin below Montague, N.J., may experience drought conditions while the upper basin is classified as normal. Lower basin drought management actions are determined by the storage in Beltzville and Blue Marsh Reservoirs in the Lehigh and Schuylkill River Basins, respectively.

Since 2007, the Decree Parties have operated in accordance with the Flexible Flow Management Program (FFMP). The FFMP incorporates the relevant provisions of DRBC's basinwide drought management plan but also specifies additional operations for habitat protection and assistance in flood mitigation. The intent of the FFMP is to adaptively manage the three New York City reservoirs with consideration of current hydrologic conditions to meet water supply needs while also supporting the tailwater fisheries and mitigating flooding below the reservoirs. The current program, adopted in 2017 (FFMP2017) is described in a two-part, 10-year unanimous agreement

of the Decree Parties. The agreement called for three major studies and includes the relevant provisions of the normal and basinwide drought operations plans. On May 8, 2023, the Decree Parties unanimously agreed to continue the program with modifications to the studies that were outlined in the original agreement. The associated operating plan was not modified. The DRBC will provide technical analyses and support for the FFMP studies.

In 2025 New York City plans to continue its Delaware Aqueduct Repair Project, depending on hydrologic conditions and construction-related factors. From June through September 2025, New York City will maximize its diversions from the Delaware River Basin to preserve water in other parts of their water supply system. From October 2025 until the repair is finished (estimated by June 2026), the Aqueduct will be shut down and no water will be diverted from the basin. For the duration of the project, NYC will operate its Delaware Basin Reservoirs in accordance with the Water Code and Flexible Flow Management Program. The DRBC will implement a communication and outreach plan to keep Basin residents and stakeholders informed about important project updates and progress.

DRBC's Regulated Flow Advisory Committee (RFAC) serves as a venue for public input and dialogue with the Decree Parties regarding the FFMP, upper basin fisheries, and progress on the FFMP studies. RFAC's subcommittee, the Subcommittee on Ecological Flows, may be re-established to engage in the evaluation of the habitat protection program aspects of the FFMP. (See **Part II – Section 2.2.4.4.2**).

The Commission continues to evaluate salinity management and proposed alternative operating plans to determine how the Commission's water supply storage in Beltzville and Blue Marsh Reservoirs may be affected. Results from the analyses will provide valuable information for use by the Decree Parties in considering new operating plans. DRBC staff will utilize its existing and developing models for the evaluations (see **Part II - Section 2.2.1.2.3**).

2.2.1.2.1.2 Commission Storage (Blue Marsh and Beltzville)

Commission staff may review the purpose, use, and inclusion of Blue Marsh and Beltzville Reservoirs in the Comprehensive Plan. In addition, other related Commission actions, such as dockets and resolutions, may be compiled and reviewed so that their intended use and status can be evaluated. The findings will be prepared for Commissioner review.

2.2.1.2.1.3 Mandated Storage

Commission staff will conduct reviews of all approvals where the Commission has required releases from storage. The reviews will focus on the projects' relationship to the Comprehensive Plan. Other related Commission actions, such as dockets and resolutions, will be reviewed and compiled so that their intended use and their status can be evaluated. The findings will be prepared for Commissioner review.

2.2.1.2.1.4 Consumptive Use Policy for Electric Generating and Cogenerating Facilities

During FY 2018 Commission staff developed, and the Commission approved, a consumptive use policy (Resolution 2018-5)[29] that formalized the Commission's previously existing policy as it related to the consumptive use make-up requirements of electrical generating or cogenerating facilities who consumptively use more than 100,000 gallons per day during critical hydrologic conditions. The Commission will continue to implement the policy for new electrical generating and cogenerating facility dockets and for existing dockets as they are renewed. Consumptive use replacement releases are made from Merrill Creek Reservoir, the Mongaup reservoir system, and imports from the Susquehanna River Basin.

2.2.1.2.2 Ecological Flows

Several initiatives are underway to better identify the ecological flow needs of the Basin.

2.2.1.2.2.1 Non-tidal Mainstem and Tributaries

In 2022, DRBC completed a web-based habitat model for the Upper Delaware River with partial funding from the DWCF. This project built upon existing models (including REF-DSS) that measure habitat changes resulting from regulated flow and temperature mitigation efforts in the upper Delaware River Basin. Additional model features and improvements may be made in the future, as needed. The updated habitat models resulting from this effort allow DRBC and other resource stakeholders to evaluate how reservoir releases and flow management protocols affect available habitat. The new models are expandable, accommodating new research and additional species, and can be used for other parts of the Delaware River. DRBC has also explored the use of a HEC-RAS flow model of the non-tidal, mainstem Delaware River to evaluate available habitat under different flow regimes. The HEC-RAS model may be further developed in the future for habitat, spill response, or contaminant modeling.

2.2.1.2.2.2 Estuary

Freshwater inflow requirements for estuary populations, such as oysters and Atlantic sturgeon spawning, are a part of ongoing research by DRBC partners. For both instream and estuary flow needs, the seasonal components affecting salinity and temperature are currently the principal elements of concern. DRBC has and will continue to evaluate the effects of sea level rise and changes in hydrology on Estuary water quality.

2.2.1.2.3 Flow Management Modeling

An understanding of water supply, storage, and flow regimes is essential for managing the water resources of the Basin. DRBC continues to develop and use modeling tools to evaluate water resources management and associated risks in the Basin. The models are used to assess reservoir operations for water supply, flood mitigation, power generation and recreation, the

[29] https://www.nj.gov/drbc/library/documents/Res2018-05_ConsumptiveUse_ReplacementPolicy.pdf

impacts of such operations on Basin resources, the ability of reservoirs to meet intended and multiple-objective uses, and the effectiveness of conservation releases. DRBC's Planning Support Tool (DRB-PST) is a daily flow model used to evaluate flow management alternatives in the Basin. DRBC updates DRB-PST as needed to improve the simulation of existing reservoir operations or add proposed operations to evaluate new flow management programs.

DRBC is using data analysis tools, and hydrologic models such as HEC-HMS to evaluate hydrologic changes in the Basin resulting from future conditions. The simulated future flows will be used in DRB-PST for evaluating the effectiveness of the drought management program and the performance of future flow management programs.

See also **Supplemental Table C-1** in **Appendix C** for a summary of all proposed modeling activities.

2.2.1.2.3.1 Hydrologic Reports

A summary of hydrologic conditions in the Basin including precipitation, streamflow, reservoir storage, groundwater levels, and the salt front (river mile location of the 7-day average 250 mg/l chloride concentration) are prepared daily, weekly, monthly, quarterly, and annually. The reports are posted on the DRBC website. Graphics and information about the salt front, flow, Basin storage (at Blue Marsh, Beltzville, F.E. Walter, Cannonsville, Pepacton, and Neversink Reservoirs) and combined storage of the New York City reservoirs (foundation of the drought management program) are updated and posted daily on the DRBC hydrologic conditions website[30]. During wet hydrologic conditions, staff provide Basin-specific situational awareness briefings to Commissioners, signatory staff, and other partners.

[30] hydrosnap.drbc.net

DRBC WATER RESOURCES PROGRAM
2.2.1.2 Multi-Objective Flow Management

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Flow Management	Study of flow management alternatives under different scenarios (and their impacts on salinity management and lower Basin storage	On-going	General Fund, DWCF 2022
DRB-PST	On-going improvements and modifications to DRB-PST in support of comprehensive studies (FE Walter Re-evaluation, FFMP2017 Studies, and others)	On-going	General Fund
Salinity Model (SM3D)	Use and refinement of SM3D model for estuary analyses	On-going	General Fund, DWCF 2022
Hydrologic Reports, Event Summaries	Reports; website; situational awareness briefings	On-going	General Fund
Reservoir Operations	Explore options for optimizing existing storage for the FFMP2017 studies	2025-2026	General Fund
	Directed releases for Trenton as needed	On-going	General Fund
	F.E. Walter Re-evaluation Study	On-going	General Fund
Consumptive Use Replacement	Implementation of the Consumptive Use Policy for electric generating and cogenerating facilities	On-going	General Fund

2.2.1.3 WATER SUPPLY MANAGEMENT: CONSERVATION, SPECIAL AREA MANAGEMENT, AND PERMITTING

2.2.1.3.1 Water Conservation and Loss Accounting

DRBC's water conservation program incorporates a wide range of elements, including but not limited to requirements for metering, leak detection and repair programs, water conservation plans, water conservation performance standards for plumbing fixtures, and a water audit requirement to deliver staged improvements in accounting for water loss in distribution systems based on the methodology proposed by the American Water Works Association (AWWA). The rule requires water suppliers to submit water audits annually. This information is used to inform water use analyses and improve water supply planning. Analysis of the results of this program are being used in the development of performance metrics. A comprehensive assessment of the first ten-years of the water audit program was completed in 2023 (Thompson et. al, 2023), which outlined numerous recommendations for the program moving forward. Staff will work with the Commissioners to develop "next steps" to advance the report recommendations, with initial consideration to be given to developing a pilot program to provide water audit training and "water audit validation" services.

2.2.1.3.2 Water Efficiency Standards

Staff will consider reviewing the potential implementation of updated water efficiency standards for inclusion in the DRBC Water Conservation Program. Over the next few years staff will review the potential water and cost savings from potential water efficiency improvements as well as the Basin-wide benefits of water use reduction to the public water sector.

2.2.1.3.3 Groundwater Management and Special Management Areas

The Commission will focus efforts on the subbasins of the SEPA GWPA where use assessments indicate subbasins are potentially stressed or near their withdrawal limit. The Commission will continue to monitor conditions and work with docket holders and permittees to find realistic supply solutions and to ensure that approved allocations are sustainable in the GWPA. The Commission also plans to enhance its tracking of groundwater level conditions and to increase its use of annual hydrogeologic reports submitted by docket/permit holders. This information and a program status report will be used to provide a more comprehensive analysis of groundwater levels across the GWPA.

2.2.1.3.4 Project Review

DRBC's regulatory activities remain important for water supply management and planning. To eliminate unnecessary redundancy and to streamline project reviews, updated administrative agreements between the Commission and the states of New Jersey and Delaware were executed in December 2009 (N.J.) and July 2010 (Del.), with minor amendments made to both in May 2013. On March 11, 2015, the Commission adopted Resolution No 2015-4 directing the Executive Director to initiate rulemaking to amend the Commission's Rules of Practice and Procedure to establish the One Permit Program (Rule). The Commission published a draft rule in May 2015 and held a public hearing in June 2015. The Commission approved the Rule in December 2015.

The Resolution also authorized the Executive Director to enter into an administrative agreement with the NJDEP. In March 2015, an Administrative Agreement (AA) between DRBC and NJDEP was executed. Upon approval of the Rule, the One Process and One Permit Program portion of the AA was activated. In March 2016, an AA between DRBC and NYSDEC was also executed. The AA between DRBC and NJDEP was revised in January 2024 to: (1) include within the categories of projects managed under the Commission's One Permit Program, underground storage caverns as contemplated by NJDEP's regulations codified at Title 7, Chapter 1F of the New Jersey Administrative Code; (2) remove provisions that are no longer necessary or applicable concerning the transition to the One Permit Program; and (3) update certain citations, language and procedures to align with recent regulatory changes and with current terminology and practice, and to eliminate redundancy.

Discussions have occurred between the Commission and PADEP regarding updating its existing AA (executed in 1976). Additional coordination is anticipated during the FY 2026-2028 period covered by this WRP. DRBC will continue to support state partners in their permitting programs through data collection, assessment, and planning, and will issue water supply approvals in accordance with Administrative Agreements and special area management programs. The DRBC Relational Database will be updated to incorporate covered state permit decisions.

2.2.1.3.5 Compliance

Staff will continue annual reviews of DRBC-required data submissions, such as the Water Audit Reports. Pre-emptive correspondence and notification systems will continue for approval expiration dates and data/report submittal date reminders.

DRBC WATER RESOURCES PROGRAM
2.2.1.3 Water Supply Management

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Water Conservation and Loss Accounting	Assess data inputs from Water Audit submissions	Ongoing	General Fund
	Develop next steps to advance recommendations included in the Comprehensive Assessment report of the Water Audit Program report, including considering a water audit training and validation pilot program	2026-2028	General Fund
	Consider evaluating and developing updated water efficiency standards	2026-2028	General Fund
Southeastern PA Groundwater Protected Area	Evaluate water use in subbasins of SEPA GWPA against allocation and supply limits	Ongoing	PA SEPA GWPA

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Water Supply Approvals	Review and process water supply approvals in accordance with AAs	Ongoing	Project Review Fees
	Update DRBC database to incorporate state allocation permit conditions	Ongoing	General Fund
Compliance	Track construction start/completion forms, monitoring requirements, approval expirations	Ongoing	General Fund

2.2.1.4 DETERMINING WATER QUALITY AND MEETING STANDARDS: CRITERIA-BASED PROGRAMS, ANTI-DEGRADATION, AND WATER QUALITY ADMINISTRATION

Note: Details on Aquatic Life, including ecosystem needs and restoration, are in **Part II – Section 2.2.2.3**.

2.2.1.4.1 Special Protection Waters

The Delaware River Basin is unique in having many miles of high-quality waterways in the midst of the densely populated Mid-Atlantic metropolitan area. The river provides multiple benefits to the residents and workers of the Basin. However, it is a water resource management challenge to maintain existing high-water quality in a region that continues to grow. The Commission will continue to work with the states and federal agencies, including the National Park Service (NPS), in the implementation of the Special Protection Waters (SPW) program, to maintain no measurable change to existing water quality (EWQ) in the non-tidal river. Program implementation includes management through DRBC approvals and state NPDES permits (including coordination of programs) and monitoring programs to obtain data to assess changes to EWQ parameters.

Over the next three years, the following tasks are planned to capitalize upon the achievements described above:

- Continue to investigate increasing chloride concentrations in SPW watersheds and identify causes and provide potential remedies.
- Initiate discussion on alternative NMC allocation methods for watersheds draining into Special Protection Waters.
- Propose updates of water quality regulations as needed.
- Continue development and publication of SPW outreach and educational materials.

- Initiate a monitoring period for a subset of EWQ sites spanning the Lower, Middle, and Upper non-tidal Delaware reaches to conduct a current assessment of measurable changes to water quality.
- Create a plan to rotate monitoring sites every 3 years for recurring measurable change assessments.
- Define EWQ for additional sites.

The original SPW program (DRBC Water Quality Regulations, Section 3.10.3.A.2[31]) contemplated that DRBC would prioritize watersheds having a substantial potential to pollute SPW waters and encourage the development of watershed non-point source management plans in these watersheds. However, new circumstances arose – among them, the development and implementation of NPDES municipal stormwater management requirements – that led DRBC to invest instead in developing and implementing powerful monitoring and assessment programs and other tools that support SPW protections (2000 – present). Documents describing these efforts are posted on the DRBC website[32].

2.2.1.4.2 Criteria Based Program

DRBC's criteria-based program will continue to focus efforts on the assessment of water quality and technical support of project review. The DRBC is also partnering with NJDEP for collection of nutrient data from tidal tributaries. Details on the Commission's bacteria monitoring programs and efforts are included in **Part II - Section 2.2.2.2.1**, Recreational Designated Uses.

2.2.1.4.2.1 Monitoring Programs to Assess Criteria

Long Term Delaware Estuary Water Quality Monitoring

The long-term Delaware Estuary Water Quality monitoring program conducted by the Commission (formerly known as the Boat Run) occurs monthly from March through October. This program provides data to evaluate water quality trends and to assess compliance with Commission water quality criteria. Within available resources, DRBC monitors multiple analytical parameters each year in all zones of the estuary for a periodic, rotating assessment of criteria.

Dissolved Oxygen and Aquatic Life Uses in the Delaware River Estuary

DRBC's role in the upgrade of aquatic life uses in the estuary and the enhancement of dissolved oxygen conditions to support those uses has significantly changed due to actions by EPA and DRBC as described previously in **Section 1.3.1**.

- On December 1, 2022, the EPA issued an Administrator's Determination that: 1) propagation is an attainable use throughout the estuary; and consequently 2) water quality standards in Zones 3, 4, and upper 5 must be revised to reflect the designated use of fish propagation.

[31] https://www.nj.gov/drbc/library/documents/WQregs.pdf

[32] http://www.nj.gov/drbc/programs/quality/spw.html#4

- On September 7, 2023, DRBC adopted a Resolution for the Minutes[33] in which, in order to support regulatory efficiency, intergovernmental coordination, and clarity to the public, DRBC suspended its own actions to develop revised water quality standards.
- On December 13, 2023, the EPA proposed[34] to revise the aquatic life designated use and dissolved oxygen water quality criteria applicable to Zone 3, Zone 4, and the upper portion of Zone 5 of the Delaware River (in total, river miles 108.4 to 70.0; approximately from Philadelphia, Pa., to Wilmington, Del.).

DRBC will continue to provide scientific, technical, and engineering assistance to support EPA's rulemaking process and the co-regulating estuary States in implementation. As noted in the Resolution for the Minutes adopted on September 7, 2023, DRBC staff will commit to continue to coordinate and collaborate with state and federal co-regulators during EPA's rulemaking process; to update its Comprehensive Plan and Water Quality Regulations for the Delaware River Basin to include designated uses and criteria after EPA's rulemaking process is complete; and to develop plans, analyses, and, if appropriate, related regulations for the implementation of new aquatic life uses and criteria in the Delaware River Estuary. To that end, DRBC will support development of an implementation plan, consistent with a schedule to be determined after EPA's rulemaking process is complete, and initiate rulemaking as appropriate.

Polychlorinated Biphenyls (PCBs)

Since the establishment of the Stage 1 PCB TMDLs, the water quality criteria for PCBs have been revised to 16 pg/L for Zones 2 – 6, water quality information has been gathered and assessed, and there has been significant progress in the reduction of PCB levels in the Delaware River as described in **Part I – Section 1.3.4.5**. At the request of the three estuary states and EPA, DRBC developed the technical basis for draft Stage 2 PCB TMDLs. DRBC staff worked closely with federal and state co-regulators, the Commission's Toxics Advisory Committee (TAC), and an expert panel of scientists on these efforts. The draft Stage 2 PCB TMDLs also incorporate a more equitable allocation approach than that taken in the Stage 1 PCB TMDLs and include a revised implementation plan for traditional NPDES permittees in the appendix of the document. A draft report for the Stage 2 PCB TMDLs for the Delaware River Estuary and Bay has been developed and shared with estuary states. Although there is no legal deadline, DRBC is working closely with EPA and the Basin states on the establishment of the Stage 2 PCB TMDLs.

For FY 2026-2028 the Commission will continue to provide technical support to the estuary states to implement PCB pollutant minimization plans (PMPs) and to manage the effluent PCB database under the Stage 1 PCB TMDLs. DRBC will work closely with EPA and the Basin states to establish the Stage 2 PCB TMDLs. Once the Stage 2 PCB TMDLs are established, these will supersede the Stage 1 PCB TMDLs established in 2003 and 2006. DRBC will provide technical assistance to the states to implement the Action Level requirement of the Stage 2 PCB TMDLs while providing continued support for PMP reviews and effluent database management.

As resources permit, ambient water samples will be collected in Zones 2 – 6 for analyses of PCBs, dioxin/furans, pesticides, and per- and polyfluoroalkyl substances (PFAS). Collected information

[33] https://www.nj.gov/drbc/library/documents/ResForMinutes090723_EstuaryALDU.pdf

[34] https://www.federalregister.gov/documents/2023/12/21/2023-27758/water-quality-standards-to-protect-aquatic-life-in-the-delaware-river

will be assessed and compared with previously collected data to identify trends and to assess the effect of PCB reductions already achieved.

Chloride Assessment in Zone 2

Over time, chloride has measurably increased at most monitoring locations in the Lower Delaware stretch of the non-tidal Delaware River (see the Special Protection Waters and Increasing Chloride Trends sections of the DRBC website). While DRBC does not have chloride criteria in the non-tidal Zone 1, there are chloride criteria for Zones 2 and 3. DRBC's assessment of chloride measurements against criteria will focus on Zone 2 (15-day average of 50 mg/L), a freshwater tidal section spanning River Miles 133.4 to 108.4. Trends in this stretch are influenced by upstream non-tidal and localized inputs rather than ocean-based salts, making it an ideal location to evaluate chloride trends identified in the non-tidal region. Additionally, freshwater inflows from the non-tidal Delaware River help manage the salt front and are crucial for protecting downstream drinking water intakes especially under low flow conditions, emphasizing the importance of limiting upstream chloride concentrations.

DRBC has a Water Quality dashboard[i] page that displays daily automated plots of various water quality parameters. Included on this web page are comparisons of real-time chloride estimates to DRBC chloride criteria. The estimates are derived from USGS continuous specific conductance gage data, modeled using a linear equation developed from paired chloride and specific conductance observations collected under the long-term Delaware Estuary Water Quality Monitoring (formerly Boat Run Survey) project. Apparent exceedances of DRBC's 15-day average of 50 mg/L chloride criterion in Zone 2 tend to occur during both winter low-flow and after winter storm events. DRBC staff will coordinate with co-regulators in FY 2026-2028 to develop approaches to collaboratively address this issue.

2.2.1.4.2.2 Contaminants of Emerging Concern (CECs)

The DRBC continues to cooperate with Basin states, EPA, and academics on a prioritized list of contaminants of emerging concern for further evaluation of sources, fate, and effects in water column, sediments, and biota. Two recent publications describing DRBC's cooperative work evaluating contaminants of emerging concern are MacGillivray, 2021 and Vilimanovic, et al, 2020.

In FY 2026-2028, DRBC will complete a series of studies assessing PFAS occurrence data along 231 miles of the mainstem Delaware River, between Narrowsburg, N.Y., and Salem River, N.J., and multiple tributaries (in ambient water concentrations as well as from sediments and fish tissue samples) to inform fish consumption advisories as well as future PFAS efforts. The data DRBC collects will be synthesized with other publicly available data on PFAS in the Delaware Basin to assess trends over the last 20 years and locate hot spots that require additional attention. Through these efforts DRBC hopes to identify PFAS sources, both point and non-point, and then work to reduce PFAS loading into Delaware River Basin surface waters. Input on this research will be sought via presentations to external experts and stakeholders through DRBC advisory committees.

In FY 2026-2028, DRBC in collaboration with Delaware DNREC and the Academy of Natural Sciences-Drexel University plans to perform analyses of microplastics and PFAS in historical sediment cores collected in 2007-2012 and in newly collected sediment cores which were (and will be) collected from marshes fringing the Delaware River Estuary and Bay. The integration of

historical and fresh datasets will provide a comprehensive assessment of contamination trends in the Delaware River and Bay, supporting future monitoring efforts and management strategies for mitigating the impacts of these emerging contaminants.

In summer 2022, DRBC initiated a pilot monitoring program for algal toxins in the mainstem Delaware to identify the presence or absence of microcystins, anatoxin-a, and cylindrospermopsin. Typically monitored in lentic systems and impounded areas where Harmful Algal Blooms (HABs) occur, there is a data gap for algal toxins in the flowing mainstem Delaware River. Despite understanding that algal toxins associated with HABs are transported via water and air, knowledge about the origin and transport of algal toxins is not yet well-understood (Schmale III et al. 2019). As drinking water intakes are situated along the Delaware River, it is important to understand if, and where, algal toxins are detected from a human health standpoint. To monitor for the presence of algal toxins, DRBC created and deployed Solid Phase Adsorption Toxin Tracking (SPATT) bags, mesh bags filled with resin, to passively adsorb dissolved algal toxins in the river. SPATT bags were deployed at 11 mainstem Delaware River locations at fishing piers and boat docks for three 8-day periods during late August through September 2022. The spatial extent covered Delaware River sites on both the Pennsylvania and New Jersey sides of the river between Washington Crossing, Pa., and Marcus Hook, Pa. Bags were sent to DNREC's Environmental Laboratory for analysis via the Enzyme-Linked Immunoassay (ELISA) method, and results were reported as µg/g of resin/day, thus providing an estimated rate, and not a concentration. Results indicate presence of microcystins, anatoxin-a, and cylindrospermopsin across all Delaware River sites. In 2023, SPATT bags were deployed in the non-tidal Delaware River for similar assessment. Moving forward, DRBC plans to work with partners to better predict algal toxins' origin and transport throughout the system.

A recently discovered contaminant of emerging concern (CEC), 6-PPDq (N-(1,3-Dimethylbutyl)-N′-phenyl-p-phenylenediamine-quinone), causes acute mortality to Coho Salmon. It is also toxic to other salmonid fish, including rainbow and brook trout (Brinkmann et al. 2022). Salmonid fish are exposed to this chemical when tiny bits of tire rubber, known as tire wear particles (TWPs), that accumulate on driving surfaces interact with water. The water causes a chemical that is added to tires during manufacturing, 6-PPD, to transform to 6-PPDq. On average, every person in the United States generates 3.2 to 5.4 kg (7-12 lbs) of TWPs annually (Moran and Askevold 2022). In fact, TWPs were found to be the most numerous form of microplastic entering San Francisco Bay (Sutton et al. 2019), which may also be true of most surface water systems near developed areas. DRBC received a DWCF 2023 grant from the National Fish and Wildlife Foundation that included work to quantify baseline concentrations of 6-PPDq in the Delaware River and its tributaries. It is believed that this is a first of its kind study in the Basin.

2.2.1.4.3 Water Quality Modeling

2.2.1.4.3.1 Water Quality Modeling for SPW Program

In the non-tidal river, QUAL2K model enhancement will continue as needed for the Lower Delaware River, Lehigh River, Neversink River, Brodhead Creek and smaller tributaries throughout FY 2026-2028. All models will be continually refined, recalibrated, or validated as more effluent or ambient data and resources are available. Utilization of updated models in no measurable change (NMC) evaluations of new or expanding discharges will reduce uncertainties for maintaining water quality in Special Protection Waters (SPW) from the cumulative impacts from multiple dischargers in a specific watershed. As noted in **Part II – Section 2.2.1.4.1**, during

the FY 2026-2028 period covered by this WRP, the Commission will also initiate discussion on alternative NMC allocation methods for watersheds draining into Special Protection Waters.

2.2.1.4.3.2 Dissolved Oxygen Modeling of Delaware River Estuary

The DRBC developed a three-dimensional dynamic model of the physical, chemical, and biological processes that impact (and are impacted by) nutrients and dissolved oxygen (i.e., "eutrophication model") throughout the Delaware River Estuary. The purpose of the eutrophication model was to estimate the ambient dissolved oxygen (DO) levels that can be expected for various pollutant reduction scenarios using a dynamic (time-varying), long-term simulation of diurnal DO patterns. The model was specifically calibrated and endorsed by DRBC's Model Expert Panel for this intended use. By providing a quantitative means of evaluating management options for improving DO, the eutrophication model provides the scientific and engineering basis for the DRBC to determine the pollutant loads that can be expected to result in specific DO conditions in the estuary. This was reflected in the Pathway for Continued Restoration report published in September 2024, which described design conditions, evaluation metrics, and various loading scenarios.

The EPA official versions of Environmental Fluid Dynamics Code (EFDC) and Water Quality Simulation Program (WASP8) were selected as the base codes for the hydrodynamic and water quality models. A statistical sub-model based on a regional analysis of shared features was developed to estimate hydrologic and water quality inputs from unmonitored tributaries and watersheds. The water quality model incorporates significant improvements by DRBC staff to the formulations for light extinction and reaeration processes. Draft hydrodynamic and water quality calibration reports were released in December 2021 and September 2022, respectively. DRBC received detailed comments from its Model Expert Panel and members of the Water Quality Advisory Committee that resulted in improvements to both the models and the reports. Final versions of the hydrodynamic and water quality model calibration reports were published in September 2024.

While the current eutrophication model is suitable for its purpose of determining the DO levels that would be expected based on specific load reductions, opportunities exist to improve the model representation of sediment processes that impact the water column, such as sediment oxygen demand (SOD) and nutrient fluxes. Current modeling efforts suggest that sediments play an important role in the urban estuary in terms of dissolved oxygen dynamics. While the existing model leverages an extensive dataset to prescribe SOD and sediment flux rates, this methodology does not facilitate the simulation of future changes to sediment dynamics that may result from external loading reductions, for example. Modeling sediment diagenesis explicitly will expand our understanding of the additional nutrient sources that support SOD and the prospect for its reduction over time. It is likely that this study will lead to model enhancements to internal carbon production (i.e., phytoplankton) as well as better characterization of external carbon loads. In addition to enhancement of the eutrophication model to better simulate sediments, DRBC is analyzing algae composition in the urban estuary based on data collected in 2024. DRBC is leveraging funding through the Partnership for the Delaware Estuary (PDE) to partially fund both the monitoring and modeling components of the eutrophication model enhancements that are currently under development. DRBC expects to complete this work in CY 2025 and present its findings to the Model Expert Panel.

See **Supplemental Table C-1** in **Appendix C** for a summary of ongoing and proposed modeling activities.

2.2.1.4.3.3 Mixing Zone Modeling

Near field modeling efforts to support permitting actions (DRBC approvals and/or NPDES permits) for acute mixing zones, heat dissipation areas, and/or TDS mixing zones will continue as needed in FY 2026-2028.

2.2.1.4.3.4 Spill Modeling

While rare, accidental pollution releases occur within the Delaware River basin, a river that supplies drinking water to over 14.2 million people. The DRBC has therefore developed spill models for both the non-tidal riverine system and the Delaware River Estuary that are designed to quickly provide estimates of potential impacts to drinking water intakes within the basin. DRBC's work in this area is intended to supplement and expand on capabilities that already exist within other agencies such as the Philadelphia Water Department and the United States Coast Guard. DRBC's spill models are applied to spill events on an as-needed basis.

DRBC developed and maintains a dilution estimation model for rapid assessment of spills and water quality events in the non-tidal Basin. This model delineates the spill path from the point of release to the top of the Delaware estuary, computes the dilution within each HUC12 sub-watershed in the spill path using real-time hydrology data, and identifies intakes in the spill path and the estimated concentration at the intake. For the non-tidal Delaware River mainstem, DRBC will investigate the level of effort and potential benefits of developing a channel-specific spill model using HEC-RAS that leverages detailed bathymetric data.

In the Delaware River Estuary, where spills are more common and where tidal forces impact spill propagation, DRBC has developed codes that fully automate data retrieval, processing, and simulation for both one-dimensional and three-dimensional hydrodynamic models. These hydrodynamic files are generated nightly, incorporating the latest tidal and flow data, ensuring immediate availability for chemical tracer simulations in the event of a spill. Significant updates from the previous spill model are ongoing and will be completed in CY 2025, including the integration of a three-dimensional simulation model, expanded process automation, and the migration of scripts to Python for enhanced performance. Ongoing developments include staff training, improving automation, conducting quarterly drills, and increasing model parameterization to bolster response readiness.

2.2.1.4.4 Project Review

DRBC's regulatory activities remain important for water quality management. To eliminate unnecessary redundancy and to streamline project reviews, updated administrative agreements between the Commission and the states of New Jersey and Delaware were executed in December 2009 (N.J.) and July 2010 (Del.), with minor amendments made to both in May 2013. On March 11, 2015, the Commission adopted Resolution No 2015-4 directing the Executive Director to initiate rulemaking to amend the Commission's Rules of Practice and Procedure to establish the One Permit Program (Rule). The Commission published a draft rule in May 2015 and held a public hearing in June 2015. The Commission approved the Rule in December 2015. Upon approval of the Rule, the One Process and One Permit Program portion of the AA was activated. In March 2016, an AA between DRBC and NYDEC was also executed. The AA between DRBC and NJDEP was revised in January 2024 to: (1) include within the categories of projects managed under the Commission's One Permit Program, underground storage caverns as

contemplated by NJDEP's regulations codified at Title 7, Chapter 1F of the New Jersey Administrative Code; (2) remove provisions that are no longer necessary or applicable concerning the transition to the One Permit Program; and (3) update certain citations, language and procedures to align with recent regulatory changes and with current terminology and practice, and to eliminate redundancy.

Discussions have occurred between the Commission and PADEP regarding updating its existing AA (executed in 1976). Additional coordination is anticipated during the FY 2026-2028 period covered by this WRP. DRBC will continue to support state partners in their permitting programs through data collection, assessment, mixing zone analyses, no measurable change (NMC) evaluations, and other modeling and will issue approvals in accordance with Administrative Agreements and special area management programs, with continued emphasis on cooperative efforts to implement DRBC standards in shared waters. The DRBC Relational Database will be updated to incorporate covered state permit decisions.

2.2.1.4.5 Water Quality Assessment Report

DRBC biennially reports on the conditions of mainstem Delaware river water quality relative to criteria in accordance with EPA guidelines for 305 (b) reporting. The finalized 2024 Water Quality Assessment[35] report was published in December 2024. Results are described in **Part I – Section 1.3.4**. Commission staff will work on the 2026 report for publication in FY 2027.

2.2.1.4.6 Compliance

Staff will continue annual reviews of DRBC-required data submissions, such as the annual effluent monitoring reports (AEMRs). Pre-emptive correspondence and notification systems will be continued for approval expiration dates and data/report submittal date reminders.

DRBC WATER RESOURCES PROGRAM
2.2.1.4 Determining Water Quality and Meeting Standards: Criteria-based Programs, Anti-degradation, Water Quality Administration

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Water Quality Standards	Support DO criteria implementation and initiate rulemaking as appropriate	2026-2028 (date to be determined after EPA's rulemaking is complete)	General Fund, EPA §106

[35] https://www.nj.gov/drbc/library/documents/WQAssessmentReport2024.pdf

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Special Protection Waters	Monitoring and modeling to support program implementation as needed	2026-2028	General Fund
Delaware Estuary Water Quality Monitoring (formerly Boat Run Survey)	Perform rotating monitoring plan to ensure periodic assessment of all parameters (criteria)	Ongoing	EPA §106
	Data in WQX	Ongoing	EPA §106
	Perform 305(b) Water Quality Assessment	Ongoing every even numbered year (next CY 2026)	EPA §106
PCBs	Evaluate PMPs and point source monitoring data under PCB TMDLs	Ongoing	EPA §106
	Support EPA in establishing Stage 2 TMDLs	Dependent upon EPA	EPA §106
	Continue implementation of PCB TMDLs	Ongoing	General Fund, EPA §106
	PCB monitoring in ambient waters in estuary	2026-2028	EPA §106
Toxics (Ammonia, metals and emerging contaminants)	Coordination with TAC; update water quality criteria	2026-2028	General Fund, EPA §106
	Synthesize existing data on PFAS in the Basin to identify sources	2026	EPA §106

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Water Quality Approvals	Changes to Water Quality regulation and Rules of Practice and Procedure, as required	2026-2028	General Fund
	Review and processing of water quality approvals per AAs	Ongoing	Project Review Fees
Water Quality Assessment Report	Prepare assessment for EPA and states	2026-2027	General Fund, EPA § 106
Compliance	Construction start/completion forms, monitoring requirements, annual effluent monitoring reports, docket expirations	Ongoing	General Fund
Eutrophication Model for Delaware Estuary	Enhancement of 3D eutrophication model to dynamically simulate sediment diagenesis processes	Ongoing	General Fund, IIJA
	Model application for ammonia-nitrogen allocation and/or potential CBOD reallocation	2026-2028 (date to be determined after EPA's rulemaking is complete)	General Fund, EPA §106

2.2.2 Waterway Corridor Management (Key Result Area #2)

2.2.2.1 FLOOD WARNING AND LOSS REDUCTION

Flood loss reduction is a shared responsibility among federal, state, and local agencies and organizations in the Delaware River Basin. DRBC's activities involve coordination, education, planning and permitting. DRBC's Flood Advisory Committee (FAC), although currently inactive, has historically brought together government and non-governmental stakeholders across jurisdictional boundaries and facilitated coordination among agencies to improve the Basin's flood warning system and mitigate flood losses. The Commission will explore the need and opportunities to reestablish this committee.

2.2.2.1.1 Flood Warning and Preparedness

DRBC serves on the Mid-Atlantic River Forecast Center Customer Advisory Board, working to improve NWS products related to flood forecasting and warnings in the DRB and nationwide. As a continuation of previous education and outreach efforts, DRBC will periodically evaluate whether updates are needed to its flood resources portal, which makes NWS flood forecasting and warning information more accessible and focuses on flood warning products, preparedness, and DRB flood issues.

2.2.2.1.2 Flood Mitigation

DRBC will be actively engaged with federal entities to monitor the development of robust scientific information to support flood mitigation for the Basin. Up-to-date and regionally relevant information on changes in expected precipitation patterns and land use patterns, for example, may have a significant impact on how to prepare for storm events and manage floodplains.

The DRBC will continue to assist the Pennsylvania Emergency Management Agency (PEMA) in the completion of an outreach and capacity building program in the middle Delaware, with a primary focus on the counties of Carbon, Northampton, Lehigh, Bucks, and Luzerne. The purpose of the program is to increase the number of viable flood mitigation projects developed in these counties for future grant applications. Contingent on available funding and resources, the DRBC will continue to seek opportunities to partner with Basin state emergency management agencies to support flood mitigation efforts.

The DRBC will pursue with USACE the development of a Comprehensive Flood Mitigation Study of the Delaware River Basin. The proposed study would further the work of Basin stakeholders in the development and implementation of flood mitigation strategies and result in an Integrated Water Resource Management Program for the Basin that addresses the multiple goals and objectives for the use of water and water resource infrastructure within the Basin, including drought management, habitat protection and flood mitigation.

The DRBC staff will continue to convene, attend and/or participate in regional, state, and national opportunities to learn and share technical information with communities and stakeholders on this topic.

DRBC WATER RESOURCES PROGRAM
2.2.2.1 Flood Warning and Loss Reduction

Program/Projects	Products/Outputs	Fiscal Year	Funding Sources
Flood Mitigation	Assist PEMA with outreach and capacity building program in middle Delaware counties to support grant applications	2026	FEMA grant
Flood plain dockets	Review and processing of flood plain dockets	Ongoing	Project Review Fees
Flood Outreach and Education	Convene, attend, and/or participate in events, conferences, and other opportunities to educate communities and stakeholders	Ongoing	General Fund

2.2.2.2 ENHANCED RECREATION

2.2.2.2.1 Recreational Designated Uses

The DRBC supports the Clean Water Act goals, including the goal to achieve "swimmable" waters throughout the Basin. Currently primary contact recreation on the mainstem Delaware River is the designated use for all zones except for a 27-mile-long segment that comprises Zone 3 and the upper portion of Zone 4. Zone 3 and the upper portion of Zone 4, above River Mile 81.8, are designated as recreation – secondary contact (restricts activities to those in which the probability of significant contact or water ingestion is minimal), while the lower portion of Zone 4, below River Mile 81.8, is designated for primary contact recreation.

The DRBC assessment criteria for primary contact recreation waters are based on two bacterial parameters, Fecal Coliform and *Enterococcus*, that are more stringent than in waters designated for recreation – secondary contact (DRBC, 2013b). The 2022 Water Quality Assessment indicates that primary contact recreation is supported in Zones 1A, 1B, 1E, lower Zone 4, Zone 5, and Zone 6, but is not supported in Zone 2. Secondary contact recreation is supported in Zone 3 and upper Zone 4. This assessment differs, in part, from previous water quality assessments due to changes in locations and amounts of data collection as explained in detail in the 2022 and 2024 Water Quality Assessments. More specifically, DRBC Enhanced Bacteria Monitoring data were

included in the 2022 and 2024 Assessments. Previous assessments relied solely on DRBC Boat Run data collected in the center river channel. DRBC Enhanced Bacteria Monitoring data, which are collected near-shore, show higher levels of *Enterococcus* than the center channel data. DRBC will continue field studies and analysis to better understand the issue. Data were insufficient to assess water quality for recreational uses in Zones 1C and 1D.

The DRBC conducted a three-year, special bacteria monitoring study to assess the likelihood of achieving water quality criteria that would support primary contact recreation in Zones 3 and upper Zone 4. DRBC collected shore-based samples and boat-based transect samples for *E. Coli*, fecal coliform, and *Enterococci* from locations in Zones 3 and upper Zone 4 in summer 2019 through 2021, at locations where some level of primary contact (not recommended for health and safety reasons) or secondary contact recreation was noted. A presentation[36] of the first two years of the monitoring results was made to the Water Quality Advisory Committee (WQAC) and is available on the DRBC website. The study results indicated that the water quality criteria for primary contact recreation were not attained. However, some sites could be closer to achieving criteria than others. In CY 2025, DRBC will perform expanded bacterial monitoring in partnership with PADEP.

In 2024, DRBC performed expanded bacteria monitoring in Zones 1E, 2, 3, 4, and the upper section of Zone 5, funded by Pennsylvania and New Jersey. Samples were collected over six sampling events at 125 sites within a 30-day window in June and July 2024. All samples were analyzed for fecal coliform, *E. Coli*, and *Enterococcus*. A subset of samples were also analyzed for human, swine, dog, avian, and bovine DNA markers using Quantitative Polymerase Chain Reaction (qPCR) analytical techniques. DRBC developed a draft report summarizing results from that monitoring effort. At the time of the development of this Water Resources Program, the draft report is being coordinated with Pennsylvania.

The causes of elevated bacteria in Zones 3 and the upper portion of Zone 4 may include: 1) discharges of raw sewage from combined sewer overflows (CSOs) following certain wet weather events from: the City of Philadelphia, Pa.; the City of Camden, N.J., the City of Gloucester, N.J.; the DELCORA wastewater system in Delaware County, Pa.; and the City of Wilmington, Del.; 2) localized urban runoff during wet weather events (including bacteria from animal sources); 3) episodic overflows of existing sanitary sewer systems; 4) runoff from upstream sources during extreme wet weather events, and 5) unspecified dry weather sources including localized in-situ animal sources. In terms of addressing discharges from CSOs, the states have worked with their regulated communities to develop and implement CSO Long-Term Control Plans (LTCPs). These plans include significant capital investments over multiple decades to achieve the targeted bacteria load reductions from reductions in CSOs and other infrastructure or operational improvements.

Despite the long-term nature of the infrastructure investment needed to achieve “swimmable” waters by significantly reducing bacteria loadings in the entire area designated for secondary contact recreation, the DRBC, along with other stakeholders, have an aligned interest in making continued improvements in water quality in the urban estuary and providing additional opportunities for safe and equitable recreational uses. Requests to potentially change water quality standards (designated uses and water quality criteria) for recreational uses had been

[36] https://www.nj.gov/drbc/library/documents/WQAC/120320/Yagecic_Review2020BacteriaData.pdf

referred to the DRBC's WQAC for input from diverse stakeholders and for a recommendation to the Commissioners.

In 2021, DRBC convened a recreational uses co-regulator work group to examine the issue and develop a strategy for addressing enhanced recreational uses in Zones 3 and upper 4. The strategy includes near term activities (5 years) and long-term activities.

The co-regulators share a combined long-term goal of designating primary contact recreation as the applicable recreation use for Zones 3 and upper Zone 4 of the Delaware Estuary.

The co-regulators met throughout 2021 to develop the following near- and long-term activities for implementation that support the goal of designating primary contact recreation as the applicable recreation use for Zones 3 and upper Zone 4 of the Delaware Estuary. As of the writing of this Water Resources Program, good progress has been made on the Near Term Activities. DRBC anticipates that all proposed Near Term Activities will be completed at the end of the 5-year window, which ends in December 2026.

Near Term Activities (5 years)

- Assess whether existing criteria are protective of primary contact recreation in Zone 2 and lower Zone 4- Zone 6. If necessary, establish new criteria that are protective of the primary contact designated use.
- Assess guidance on primary and secondary contact recreation according to activity and location as it would apply to Zones 3 and upper 4 of the Delaware Estuary.
- Continue data collection to define which areas are more or less likely to support primary contact recreation.
- Continue data collection to differentiate proportions of human-derived versus animal-derived bacteria especially during dry weather.
- Evaluate the duration of bacteria exceedances and relationship to wet weather.
- Develop bacteria models that simulate current and projected bacteria loads.
- Evaluate hazard report developed by PWD and other stakeholders.
- Explore and evaluate hazard mitigation and risk reduction recommendations for recreational use in this area.
- Review and consider results of the University of Pennsylvania Water Center Study.
- Evaluate performance of the Fluidion® (near real-time) bacterial monitors deployed by USGS at sites in the Delaware Estuary.
- Assess whether existing criteria are protective of secondary contact recreation in Zones 3 and upper Zone 4. If necessary, establish new criteria that are protective of the secondary contact designated use.
- Continue and/or enhance CSO permit oversight, enforcement and compliance assistance
  a. Use existing regulatory and enforcement tools to ensure implementation of LTCPs.
  b. Forecast post-LTCP water quality conditions.
  c. Identify funding opportunities for CSO infrastructure upgrades.

Long Term Activities (+ 5 years)

- Upon completion of the above Near-Term Activities and where the data and evaluation support it, the DRBC would recommend site-specific locations and conditions for rulemaking to revise the designated use to primary recreation.
- As appropriate, evaluate the positive impacts of green and gray infrastructure on bacterial water quality given the ongoing execution of CSO Long Term Control Plans (LTCPs) and wet weather flow treatment enhancements.
- As major CSO controls are implemented and at conclusion of CSO LTCP implementation, assess CSO permittee sampling plans and results of CSO Post Construction Compliance Monitoring to verify compliance with water quality standards and protection of designated uses as well as to ascertain the effectiveness of CSO controls.

2.2.2.2.2 Delaware River Recreation Maps

The Delaware River Recreation Maps[37] are a 10-section, waterproofed map set that covers the river's east and west branches prior to their confluence at Hancock, N.Y., the entire 200 mile, non-tidal reach of the river from Hancock to Trenton, N.J., and an additional 25 miles of the tidal river from Trenton to just south of the Betsy Ross Bridge, Pa. The maps depict river channel locations and depths, access areas, places of interest, stream miles, and reference points.

DRBC is working to digitize the maps and extend the map coverage farther downstream as part of an existing project being funded in part by the DWCF. The Commission will explore the possibility of obtaining and/or processing more detailed LIDAR bathymetry data of the river, collected by the USGS from Delaware Water Gap to Trenton, N.J., in order to update the recreation maps. The processed Lidar data, if available, may also be valuable for use by the DRBC in HEC-RAS modeling of the non-tidal river (see **Section 2.2.1.2.2.1**), as well as by the DRBC and other stakeholders in the basin on related issues as well as flood loss reduction.

2.2.2.2.3 Recreation at Reservoirs

DRBC will review plans for enhanced fisheries protection at Beltzville Reservoir when a proposal is developed by the Pennsylvania Fish and Boat Commission (PAFBC). Additional opportunities for recreation in the Lehigh River Valley will be considered as part of the F.E. Walter Reservoir Re-evaluation Study (see **Part II - Section 2.2.1.1.4**). DRBC will continue to work with the USACE in scoping, coordinating, and evaluating the impacts of new recreation opportunities on existing and proposed uses of water from the reservoir.

2.2.2.3 AQUATIC LIFE AND WILDLIFE HABITAT IMPROVEMENT

2.2.2.3.1 Ecosystem Needs

DRBC intends to remain involved in the development and expansion of creative funding opportunities, such as the Delaware River Basin Conservation Act, which was authorized by Congress in 2016 and supports the Delaware Watershed Conservation Fund (DWCF) grant program that is managed by the U.S. Fish and Wildlife Service (USFWS) as part of the Delaware

[37] https://www.nj.gov/drbc/basin/recreation/river-maps.html

River Basin Restoration Program (DRBRP). DRBC will continue to increase the understanding of ecosystem needs and habitat conditions in the Basin through ambient water quality monitoring and macroinvertebrate and periphyton surveys conducted in partnership with federal and state agencies. Commission staff continues to monitor macroinvertebrates, algae, and habitat of the non-tidal Delaware River, working to improve DRBC's existing macroinvertebrate Index of Biological Integrity (IBI) for assessing the aquatic life use of the Delaware River. See also **Part II – Section 2.2.1.2.2** for Ecological Flows.

2.2.2.3.2 Ecosystem Restoration

The Commission has agreed to function as the recipient and distributor of certain funds required to be expended as a result of the damages resulting from the 2005 Ash Slurry Spill from the PPL Martins Creek facility, located in Lower Mount Bethel Township, Northampton County, Pennsylvania. The Natural Resource Damage Assessment (NRDA) was developed for the spill by PADEP in consultation with the NJDEP, Pennsylvania Fish and Boat Commission, and DRBC. With the settlement agreement ratified in 2016, the Commission is managing the funds for restoration projects located entirely within Pennsylvania and those defined as "mussel restoration projects," which may be located in Pennsylvania and/or New Jersey. The Pennsylvania restoration projects currently consist of dam removals on Bushkill Creek. The Commission has an agreement with a local watershed organization, The Wildlands Conservancy, who has taken the lead role in removal of the identified dams located within Pennsylvania. Wildlands is responsible for all design, permitting, administrative and construction costs. DRBC staff is overseeing performance under the Settlement Agreement to ensure that the deliverables are carried out in a timely manner and are consistent with the settlement terms. The Wildlands Conservancy secured additional grant funding for the dam removals in Fall 2022. Two of the three targeted dams on the Bushkill Creek were removed in summer 2023. The third and final dam included in the NRDA scope was removed in summer 2024. DRBC entered into a contract with the Partnership for the Delaware Estuary (PDE) for freshwater mussel restoration services in December 2023. The first of two freshwater mussel restocking efforts occurred in summer 2024, and a second effort is targeted for summer 2025. The NRDA team will review options for additional projects in order to expend all remaining funds.

DRBC WATER RESOURCES PROGRAM
2.2.2.3 Aquatic Life and Wildlife Habitat Improvement

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Ecosystem Needs	Review data and continue to use Index of Biological Integrity	2026-2027	General Fund
Ecosystem Restoration	Manage distribution of funds for PPL Martins Creek NRDA projects	2026-2027	PPL NRDA settlement via PADEP

2.2.3 Linking Land and Water Resource Management (Key Result Area #3)

3.1 Integrated Resource Management and Watershed Partnerships

3.2 High Value Water Resource Landscapes

2.2.3.1 INTEGRATED RESOURCE MANAGEMENT AND WATERSHED PARTNERSHIPS

2.2.3.1.1 Watershed Management Partnerships

DRBC is involved in watershed management efforts that include watersheds overlapping two or more states as well as projects within a single Basin state, typically as pilot programs for larger multi-jurisdictional management efforts or when those projects have an effect on the Basin. Staff is involved with collaborative partnerships in these watersheds:

- **Christina Watershed.** DRBC is a founding member of the Christina Basin Clean Water Partnership, which was established in the 1990s to improve source water quality in the 300 mi^2, interstate watershed. DRBC participates in activities and provides support as the Partnership continues implementation of its long-term clean water strategy.
- **Coalition for the Delaware River Watershed.** CDRW is a coalition of non-governmental organizations created to achieve greater national recognition and funding for the Basin. DRBC's involvement is limited to general assistance and participation in the annual Forum.
- **Schuylkill River Watershed.** DRBC is a founding member of the Schuylkill Action Network (SAN), a collaboration among federal, state, and regional agencies for local implementation of source water protection projects. DRBC serves on the Executive Steering and Planning Committees to oversee Work Groups that prepare and execute projects to improve the management of stormwater, agricultural activities, wastewater discharges, and mining reclamation. In addition, a portion of the Schuylkill River Restoration Fund (SRRF, see below) is directed to projects identified through SAN as priority source water protection projects.
- **Neversink Watershed Management Plan.** The DRBC contributed to the development of a watershed management plan, led by Friends of the Upper Delaware River (FUDR), Sullivan County, Trout Unlimited, and additional partners. The written plan was completed in late 2024 and profiles the Neversink watershed, outlines management goals and recommendations, and identifies pilot sites for project implementation. Staff from DRBC will continue to coordinate ad hoc as the plan is implemented.

  Upper Delaware River Network. Staff support the Upper Delaware River Network, a New York State Department of Environmental Conservation-funded collaborative effort, administered by FUDR, bringing together stakeholders with a shared goal to "protect and restore the UDR Watershed." DRBC staff participate in the technical and science advisory committees.

2.2.3.1.2 Watershed Restoration

The Schuylkill River Restoration Fund, a unique public/private partnership, provides grants to local governments and non-profit organizations for projects that improve the quality of water in the Schuylkill watershed. The grants focus on three major sources of pollution: stormwater run-off, agricultural pollution, and abandoned mine drainage. DRBC participates in the steering committee that reviews proposals, selects projects for funding, and oversees program direction and expansion. The DRBC Executive Director is responsible for approving the distribution of Constellation Energy LLC's (formerly Exelon) contributions to the SRRF.

2.2.3.1.3 Delaware Valley Early Warning System

The Delaware Valley Early Warning System (EWS) is an integrated monitoring, communication, and notification system used to provide advanced warning of water quality events to water suppliers and industrial intake operators in the Schuylkill and Delaware River watersheds. The EWS was initially deployed in 2004 and by 2008 had grown to include over 250 users in 47 different organizations within the EWS coverage area. The Commission is one of many EWS partners, including 23 water treatment plants (WTPs) from 12 utilities in Pennsylvania and five WTPs from five utilities in New Jersey, along with PADEP, NJDEP, EPA, USGS, US Coast Guard, County Health Departments, and over 25 industries. The EWS provides advanced warning of water quality events, web-based tools for determining proper event response, and a strong partnership between water users and emergency responders in the Schuylkill and Delaware River watersheds. The Commission currently serves as the "banker" for handling the annual administrative/user fees.

2.2.3.2 HIGH VALUE WATER RESOURCE LANDSCAPES

DRBC promotes sound practices of watershed management in the Basin (Compact §7.1). The Basin Plan goals regarding watershed management include:

- Preserving and restoring natural hydrologic cycles through improved stormwater management
- Maintaining and restoring the function of High Value Water Resource Landscapes
- The integration of water resource considerations into land use planning and growth management

The protection of water resources is incorporated into all DRBC programs, regulations, and permit conditions.

DRBC WATER RESOURCES PROGRAM
2.2.3 Linking Land and Water Resource Management

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Christina Clean Water Partnership	Continued participation to meet long term goal of restoring the water quality of all watershed streams to designated uses	Ongoing	General Fund
Coalition for the Delaware River Watershed	General assistance and participation in the annual Forum	Ongoing	General Fund
Schuylkill Action Network	Participation in the facilitation and oversight of watershed improvement projects for source water protection	Ongoing	General Fund
Watershed Restoration: Schuylkill River Restoration Fund	Annual review and recommendations of projects for funding	Ongoing	General Fund
Neversink Watershed Management Plan	Written plan including recommendations for funding and projects	Ongoing	General Fund
Upper Delaware River Network	Plans and annual conference. Meetings as scheduled	Ongoing	General Fund

2.2.4 Institutional Coordination and Cooperation (Key Result Area #4)

4.1 Intergovernmental Coordination

4.2 Data Sharing and Management

4.3 Agency Funding

4.4 Associations and Internal Advisory Committees

4.5 Utilizing Planning and Regulatory Authority

2.2.4.1 INTERGOVERNMENTAL COORDINATION

2.2.4.1.1 Federal and Interagency Collaborative Partnerships

It is important that the activities and authorities of the Commission and of the multiple federal, state, and local governmental agency efforts to manage the water resources of the Basin are conducted in a coordinated and supportive fashion. Collaboration among state and interstate agencies across Basin boundaries encourages the exchange of information, ideas, and experience and supports initiatives of benefit to member agencies and to water resources management generally. The Commission is involved in several federal/state initiatives that not only stimulate positive environmental outcomes in the Basin but also help shape water policy on regional and national scales. Other activities are focused on improving coordination and collaboration generally among federal and state agencies with authorities within the Basin, as well as with regional entities. This includes many ongoing as well as special initiatives.

- **Delaware Estuary Program.** Participation in multiple DELEP committees (Steering Committee, Estuary Implementation (EIC), Science and Technical Advisory Committee (STAC)), as well as special projects (State of the Estuary) and events (biennial Science Summit conference). DRBC assisted with the update of the Comprehensive Conservation Management Plan (CCMP) for the Delaware Estuary, which was completed in FY 2019. DRBC will continue to submit annual updates to the CCMP goal/strategy progress tracking tool and contributed to the 2022 update of the Technical Report for the Delaware Estuary and Basin (TREB).
- **Fish and Wildlife Management Cooperative – Delaware River Basin**. DRBC participates as a non-voting liaison to this Cooperative, which deals primarily with fishery management issues. DRBC also assists the Cooperative with field work as well as giving guidance on Basin issues and initiatives.
- **Lower Delaware Wild and Scenic Partnership River.** DRBC is a management committee member for implementation of the Lower Delaware Wild and Scenic Management Plan. DRBC has a collaborative relationship with the NPS. DRBC conducts water quality monitoring and assessment in support of the Lower Delaware.
- **Office of the Delaware River Master.** DRBC coordinates with the USGS Office of the Delaware River Master (ODRM) on flow related issues and negotiations regarding the Decree Parties.
- **Special Protection Waters (SPW) Monitoring Program.** This long-standing comprehensive water quality monitoring program (formerly referred to as Scenic Rivers Monitoring Program) is a collaborative partnership between the DRBC and the National Park Service (NPS) on the Upper and Middle Delaware designations.
- **Upper Delaware Council.** DRBC is a non-voting member of the UDC, which encourages collaboration among municipalities in the Upper Delaware Scenic and Recreational River corridor and reviews actions for conformity with the area-wide River Management Plan.
- **USFWS Delaware River Basin Restoration Program.** The Delaware River Basin Conservation Act, signed into law in December 2016, established the Delaware River Basin Restoration Program (DRBRP), which is managed by USFWS and of which DRBC is a partner. DRBC serves as a standing member of the steering committee, the Delaware

River Watershed Conservation Collaborative (DRWCC). DRBC is an active participant in the implementation of appropriated funds including review and approval of grant applications to the Delaware Watershed Conservation Fund (DWCF), which is administered by the National Fish and Wildlife Foundation (NFWF). DRBC will also explore ways to work towards complementary purposes with the DRBRP via increased coordination, collaboration, and integration. The Commission supports efforts to reauthorize the Delaware River Basin Conservation Act in the 119th Congress.

- **U.S. Coast Guard Local Area Committee.** Staff routinely participate in meetings of the U.S. Coast Guard Local Area Committee. This group exchanges information and updates the action plan for responding to spills of oil and other hazardous chemicals known as the *Local Area Contingency Plan*. Staff have provided technical support, modeling, and monitoring in support of the Coast Guard and state first responders.
- **Urban Waters Federal Partnership (UWFP).** The DRBC is a member of the Greater Philadelphia Area / Delaware River Watershed chapter of the UWFP, which includes the communities of Chester, Philadelphia, Wilmington, and Camden.
- **New Jersey Silver Jackets.** The DRBC is a coordinator and participant of the New Jersey Silver Jackets, an initiative of the Army Corps of Engineers in each state consisting of interagency teams that facilitate collaborative solutions to state flood risk priorities.

2.2.4.1.2 State-DRBC Coordination

Actions and activities to improve coordination with agencies of the Basin states include:

- **Update DRBC-State Administrative Agreements.** On March 11, 2015, the Commission adopted Resolution No 2015-4 directing the Executive Director to initiate rulemaking to amend the Commission's Rules of Practice and Procedure to establish the One Process / One Permit Program (Rule). The Commission published a draft Rule in May 2015 and held a public hearing in June 2015. The Commission approved the Rule in December 2015. Since passing the Rule, DRBC has executed Administrative Agreements (AAs) with New Jersey and New York. The AA between DRBC and NJDEP was revised in January 2024 to: (1) include within the categories of projects managed under the Commission's One Permit Program, underground storage caverns as contemplated by NJDEP's regulations codified at Title 7, Chapter 1F of the New Jersey Administrative Code; (2) remove provisions that are no longer necessary or applicable concerning the transition to the One Permit Program; and (3) update certain citations, language and procedures to align with recent regulatory changes and with current terminology and practice, and to eliminate redundancy. Discussions have occurred between the Commission and PADEP regarding updating its existing AA (executed in 1976). Additional coordination is anticipated to continue during the FY 2026-2028 period covered by this WRP.
- **State Advisory Committees.** DRBC participates in the New Jersey Water Supply Advisory Council, NJDEP Water Monitoring Council, and serves as a legislated member of the New Jersey Clean Water Council. DRBC also serves on the Drought Management Task Force for Pennsylvania and participates in Pennsylvania's State Water Planning committees when active. DRBC is also a member of Delaware's Water Supply Coordinating Council (WSCC) and their New Castle County Subcommittee.

2.2.4.2 DATA SHARING AND MANAGEMENT

Maintaining a Geographic Information System (GIS), along with gathering, processing, and mapping new data, is crucial for water resource management programs and projects within and external to DRBC. Staff will continue to provide interactive maps on the DRBC web site to allow for continued public access to information and water resources data. Maintaining the Commission's Relational Database, which includes water charging, water use, communications, and project review information, is also vital to implementing core Commission programs. Staff will continue efforts to assimilate data from the four Basin states and maintain datasets to support analysis at the Basin scale. The Commission maintains copies of dockets and applicant information, vital to day-to-day operations, which serve as the mechanisms to capture and log official Commission actions. Water quality data collected by the DRBC will continue to be shared with the public via the EPA's Water Quality Data Portal[38], on the DRBC website, and via presentations.

During FY 2024 DRBC initiated a Request for Proposals (RFP) for professional services for an upgrade of DRBC's Relational Database system. A third-party contractor was selected, and an agreement was executed in the beginning of FY 2025. Current expectations are that the updated database application will be completed and operational in FY 2026.

2.2.4.3 AGENCY FUNDING

The 2004 Basin Plan acknowledges the necessity of securing adequate resources to support water resource management, as well as the challenge of doing so. DRBC management works to secure funding for ongoing agency support as well as for special projects. Staff efforts will focus on the following:

- **Project/user Fees:** Continue to evaluate and implement the annual monitoring and coordination fee program. Update and maintain fee structures for the regulatory program, including annually adjusting fees for review of project applications and coordinating with state permitting programs based upon the CPI.
- **Signatory Party Contributions:** Re-establish and/or maintain state and federal signatory party contributions.

2.2.4.4 ASSOCIATIONS AND INTERNAL ADVISORY COMMITTEES

This category includes both voluntary partnerships with national and international organizations and committees assembled by DRBC for expert advice and support for the development and implementation of DRBC programs.

2.2.4.4.1 Associations

DRBC remains a partner in the Association of Clean Water Administrators (ACWA), the Interstate Council on Water Policy (ICWP), and the American Water Resources Association (AWRA).

[38] https://www.epa.gov/waterdata/water-quality-data-download

2.2.4.4.2 DRBC Internal Advisory Committees

Continuing a long-standing practice, advisory committees aid the Commission in proving input and recommendations on policies and standards development. Nine advisory committees meet on a regular basis. Details and contact information for each DRBC advisory committee are provided on the DRBC website[39]. All administrative needs are met by DRBC staff, including the development of agendas, arrangement of venues, communicating with members, and processing meeting minutes. Staff also coordinates internally on issues that cut across the interests or expertise of more than one committee. The current advisory committees and subcommittees include:

- **ACCC**. The ACCC provides the Commission and the Delaware River Basin community with vital expertise, information, and advice as the DRBC endeavors to maintain and improve streamflows, water quality, habitat, wetlands, and watersheds in the face of changing hydrologic conditions and sea level rise.
- **Flood Advisory Committee.** DRBC's FAC, although recently inactive, has historically brought together government and non-governmental stakeholders across jurisdictional boundaries and facilitated coordination among agencies to improve the Basin's flood warning system and mitigate flood losses. The Commission will explore the need and opportunities to reestablish the committee.
- **Monitoring Advisory and Coordination Committee**. The MACC will review and offer recommendations for the improvement of Basin monitoring activities and will seek to enhance coordination among the parties with respect to monitoring programs and data sharing.
- **Regulated Flows Advisory Committee**. The RFAC serves as a vehicle for public input into the Flexible Flow Management Program and will continue to focus on reservoir operations, instream flow needs, and flooding. RFAC will be used to work with the public on, and convey information about, the FFMP2017 studies.
- **Subcommittee on Ecological Flows**. From 2020 through 2023, SEF existed as a subcommittee of RFAC and completed review of the Thermal Mitigation and Rapid Flow Change Guidelines for the banks provided by FFMP2017. Minor alterations were made to the guidelines as a result. In the future, consideration will be given to re-establishing SEF with a charge to assess additional habitat issues, potentially including those of the dwarf wedgemussel (*Alasmidonta heterodon*).
- **Subcommittee on Source Water Protection**. Established in June 2024 as a subcommittee of WMAC, the SSWP will help define, elevate awareness of, and develop strategies to address source water protection concerns for drinking water supplies in the Delaware River Basin.
- **Toxics Advisory Committee**. The TAC will be focusing on the review of new and existing toxics criteria including ammonia and emerging contaminants.

[39] https://www.nj.gov/drbc/about/advisory/ACCC_committee.html

- **Water Management Advisory Committee**. The WMAC will continue to focus on the results of the groundwater and surface water availability studies, water loss accounting program, groundwater management, and water supply sufficiency.
- **Water Quality Advisory Committee.** The WQAC develops recommendations for consideration by the Commission with respect to policy and technical matters of water quality and pollution prevention, control, and abatement within the Basin.

2.2.4.5 UTILIZING PLANNING AND REGULATORY AUTHORITY

The Commission's planning and regulatory authority is used to facilitate, coordinate, and effect cooperation among water resource efforts across the Basin. Staff efforts to improve and direct the efficiency of DRBC programs include preparation of tools to guide resource allocation in accordance with Commissioner priorities. Based upon the mandate of the Compact and the goals of the Basin Plan, the Water Resources Program (WRP) notes the current conditions and needs of the Basin, the scope of DRBC programs, and the expected work and projects to be performed over the ensuing three fiscal years. The DRBC Budget details the receipt and distribution of financial resources to carry out the associated fiscal year activities.

- **Water Resources Program**. A prospective, multi-year program prepared annually to provide a general statement of conditions in the Basin and describe the proposed projects and activities the DRBC will undertake during the indicated period.
- **DRBC Budget.** Prepared annually.

DRBC WATER RESOURCES PROGRAM
2.2.4 Institutional Coordination and Cooperation

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
2.2.4.1 Intergovernmental Coordination			
Delaware Estuary Program (DELEP)	Participate in multiple committees (Steering, EIC, STAC), updates to the TREB, and implementation of the revised CCMP	Ongoing	General Fund
Fish and Wildlife Management Cooperative	Coordination, management plans	Ongoing	General Fund
Lower Delaware Wild and Scenic Steering Committee	Voting member, monthly calls, quarterly management council meetings	Ongoing	General Fund
Upper Delaware Council	Ex-Officio, non-voting member	Ongoing	General Fund
USFWS Delaware River Basin Restoration Program	Standing member of steering committee; Partner participant in the implementation of appropriated funds	Ongoing	General Fund
U.S. Coast Guard Local Area Committee	Routine participation in meetings	Ongoing	General Fund
Revise/Update DRBC-State Administrative Agreements	Update and maintain DRBC-state Administrative Agreements	2026-2028	General Fund
Pennsylvania Drought Task Force	Meetings scheduled as needed	On-going	General Fund
Pennsylvania State Water Plan	Participate in state-wide efforts as well as the Delaware River regional effort	On-going	General Fund

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Delaware Water Supply Coordinating Council	Routine participation in meetings. Voting member.	On-going	General Fund
NJ Clean Water Council	Permanent, legislated member; Monthly meetings, periodic chairmanship, annual public hearing	Ongoing	General Fund
NJ Water Supply Advisory Council	Meetings as scheduled, typically monthly	Ongoing	General Fund
NJ Water Monitoring Coordinating Council	Meetings as scheduled	Ongoing	General Fund
Urban Waters Federal Partnership	Meetings as scheduled	Ongoing	General Fund
New Jersey Silver Jackets	Meetings as scheduled	Ongoing	General Fund
2.2.4.2 Data Sharing and Management			
Data Sharing and Management	IT systems update and maintenance, GIS data assembly, processing and distribution	Ongoing	General Fund
	Update relational database	2026-2027	General Fund

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
2.2.4.3 Agency Funding			
Securing Funding	Meetings with federal and state legislators, state agency managers. Outreach to Basin community.	Ongoing	General Fund
2.2.4.4 Associations and Internal Advisory Committees			
ACWA	Contribute to discourse on national water policy, federal legislation and support for gaging infrastructure, and the development of federal decision support tools for water resource decisions	Ongoing	General Fund
AWRA			
ICWP			
DRBC Advisory Committees	Meetings as scheduled and/or necessary	Ongoing	General Fund
2.2.4.5 Utilizing Planning and Regulatory Authority			
Water Resources Program	Prepared annually	Ongoing	General Fund
DRBC Budget	Prepared annually	Ongoing	General Fund

2.2.5 Education and Outreach for Stewardship (Key Result Area #5)

5.1 Reporting

5.2 Public Information and Communications

5.3 Technical Outreach

5.4 Public Outreach and Stewardship

5.5 Government Outreach

DRBC may tailor its approach to the following work program tasks to meet the strategic goal of providing all communities with meaningful opportunities to engage with the DRBC in its mission of managing, protecting, and improving the Basin's water resources.

2.2.5.1 REPORTING

Many DRBC projects and programs have individual reporting elements for which outreach, collateral, and/or media relations are provided. These are included as products and outputs for the fiscal year of their scheduled delivery. There are also routine reporting activities that require more significant resources for coordination, integration, and production. Among these are:

- **State of the Basin Report.** By resolution, DRBC is required to compile an "indicators" report every five years to review current trends and conditions in the Delaware River Basin. The most recent report was published in February 2025, and the next publication will be in CY 2030.
- **DRBC Annual Report.** Required by the Compact, this report reviews programs, activities, products, and milestones achieved during a calendar year. The most recent report published is the 2023 Annual Report (DRBC, 2024). DRBC annual reports[40] from 1969 onward are available on the DRBC website.

2.2.5.2 PUBLIC INFORMATION AND COMMUNICATIONS

The DRBC provides proactive and clear communication, responds in a timely manner to inquiries, and requests and produces publications and materials about the Basin and water resource management issues.

The DRBC continues to reach new audiences through varied, appropriate, and accessible outreach and communications approaches, increasing input and engagement from communities and organizations throughout the Basin.

[40] https://www.state.nj.us/drbc/public/annual-reports/index.html

The DRBC's website provides accurate and up-to-date information from the Commissions and links to content from external government and other partners where additional information is available. The website is also used for submitting online project review applications and for reporting.

The DRBC uses several social media channels to share news on Commission activities and related information, and since 2019 has enhanced information sharing about Commission and Basin activities through the *Our Shared Waters* website, Facebook page, and blog. These may be accessed at:

- Web: www.drbc.gov; www.oursharedwaters.org
- X: twitter.com/DRBC1961/
- Flickr: flickr.com/photos/drbc1961/collections/
- LinkedIn: linkedin.com/company/delaware-river-basin-commission/
- YouTube: youtube.com/user/delrivbasincomm/
- Instagram: instagram.com/drbc1961/
- Facebook: facebook.com/oursharedwaters

Email lists (listservs) and informal newsletters allow DRBC to provide subject-specific information to subscribers and stakeholders. DRBC uses a combination of the DRBC and *Our Shared Waters* website and social media, as well as blog posts and email, to reach its audiences.

2.2.5.3 TECHNICAL OUTREACH

To keep current on technical issues and to share information with peers and various stakeholders, the DRBC staff attend and/or participate in regional, state, and national conferences and workshops throughout the year hosted by other government agencies, professional groups, or other organizations. The DRBC periodically hosts workshops on timely issues.

The DRBC and *Our Shared Waters* website and social media sites are used to supplement this information exchange.

2.2.5.4 PUBLIC OUTREACH AND STEWARDSHIP

The DRBC staff strives to *intake* diverse public and stakeholder input on water resource management issues and *outreach* to support DRBC's mission and the needs of interested user groups through two-way, proactive communications and engagement.

Staff communicates about the Basin and the Commission through in-person and virtual convenings and events throughout the Basin.

The DRBC has expanded its efforts to gather input from communities throughout the Basin about its work – including management, rulemaking, and dockets – using events, workshops, and meetings throughout the Basin and in communities potentially affected by DRBC actions and programs. Since 2019, the DRBC has managed *Our Shared Waters,* a program designed to increase awareness of the DRB and the critical role it plays in water resources. Through the

program, stakeholders are convened across sectors, increasing participation in basin decision-making.

The DRBC continues to play an active role in the Delaware River Sojourn, and the *Our Shared Waters* program has also provided opportunities for Basin residents to experience the Delaware River Basin through the Schuylkill and Delaware River Sojourns.

Commission staff contribute volunteer hours throughout the year supporting our Basin communities. These include trash and litter cleanups, educational and outreach events, assistance with research projects, and assisting at Mercer Street Friends, a local food bank.

2.2.5.5 GOVERNMENT OUTREACH

DRBC undertakes systematic, proactive outreach to state and federal elected officials representing districts within the DRB. This work supports our strategic goal of engaging and soliciting input from elected officials on matters related to Basin water resources. In-person and virtual meetings and briefings with officials and legislative staff ensure a collective and individual understanding and value of both the Basin's water resources and the Commission itself.

Experiential events held in conjunction with *Our Shared Waters* partners also boost awareness and understanding of DRBC's mission. These have included sails aboard the AJ Meerwald and Kalmar Nykel tall ships; kayaking and birding walks throughout the Basin; and behind-the-scenes tours of significant water resources sites such as Blue Marsh Reservoir and Limerick Nuclear Generating Station incorporating presentations and roundtables focused on discussing areas of shared efforts.

The DRBC and *Our Shared Waters* websites and social media are used to supplement this information exchange.

DRBC WATER RESOURCES PROGRAM
2.2.5 Education and Outreach for stewardship

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
2.2.5.1 Reporting			
DRBC Annual Report	Report – post on web; limited paper copies	Ongoing	General Fund
2.2.5.2 Public Information & Communications			
Provide timely information to the Public	Clear, consistent messaging/materials on water resource issues and DRBC activities	Ongoing	General Fund

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Media/External Relations	Clear, consistent messaging on water resource issues and DRBC activities	Ongoing	General Fund DWCF 2022, 2023
Website	New features, improvements, updated information	Ongoing	General Fund DWCF 2022, 2023
Social media	Information exchange	Ongoing	General Fund DWCF 2022, 2023
2.2.5.3 Technical Outreach			
Conference attendance and presentations	Information exchange	Ongoing	General Fund DWCF 2022, 2023
2.2.5.4 Public Outreach and Stewardship			
Community events	Tabling, displays and demonstrations at community events throughout the Basin	Ongoing	General Fund, DWCF 2022, 2023
Community engagement	Information exchange	Ongoing	General Fund, DWCF 2022, 2023
Partner Events	Educating partners and decision makers through experiential learning in the watershed	Ongoing	General Fund, DWCF 2022, 2023
Social media	Information exchange	Ongoing	General Fund, DWCF 2022, 2023

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
2.2.5.5 Government Outreach			
Legislative meetings	Educating state and federal decision makers about DRBC's mission	Ongoing	General Fund
Educational events	Educating state and federal decisionmakers through experiential learning in the watershed	Ongoing	General Fund

REFERENCES

Akbari, E., Powers, L., Shah, T., Suri, R., Jedrusiak, S., Bransky, J., Chen, F., & Andaluri, G., 2024, Microplastics in the Delaware River Estuary: Mapping the distribution and modeling hydrodynamic transport, *Environmental Engineering Science*, *41*(12), 552-562. https://doi.org/10.1089/ees.2024.0041

Arnott, S.E., Celis-Salgado, M.P., Valleau, R.E. et al, 2020, *Road Salt Impacts Zooplankton at Concentrations below Current Water Quality Guidelines*, Environmental Science & Technology. Vol 54(15), 9398 – 9407. https://pubs.acs.org/doi/10.1021/acs.est.0c02396 Accessed 2/25/2025.

Delaware Geological Survey, 2019, *Open File Report No. 53 Kent County Groundwater Monitoring Project: Results of Subsurface Exploration*. Authored by A. Scott Andres, R. W. McQuiggan, and C. He, University of Delaware and Delaware Geological Survey, State of Delaware. https://www.dgs.udel.edu/sites/default/files/publications/OPEN%20FILE%20REPORT%20No.%2053_V12.pdf

Delaware River Basin Commission, 1961, *Delaware River Basin Compact*. https://www.state.nj.us/drbc/library/documents/compact.pdf

Delaware River Basin Commission, 2004, *Water Resources Plan for the Delaware River Basin*. Report dated September 2004. https://www.nj.gov/drbc/library/documents/BasinPlan_Sept04.pdf

Delaware River Basin Commission, 2013a, *Ecosystem Flow Recommendations for the Delaware River Basin*. Prepared by The Nature Conservancy on behalf of the Delaware River Basin Commission. Authored by M. DePhilip and T. Moberg of The Nature Conservancy. https://www.nj.gov/drbc/library/documents/TNC_DRBFlowRpt_dec2013.pdf

Delaware River Basin Commission, 2013b, *Administrative Manual – Part III, Water Quality Regulations With Amendments Through December 4, 2013*, incorporated by reference into 18 CFR PART 410. https://www.nj.gov/drbc/library/documents/WQregs.pdf

Delaware River Basin Commission, 2015, *Existing Use Evaluation for Zones 3, 4, & 5 of the Delaware Estuary Based on Spawning and Rearing of Resident and Anadromous Fishes*. Report dated September 30, 2015. https://www.state.nj.us/drbc/library/documents/ExistingUseRpt_zones3-5_sept2015.pdf

Delaware River Basin Commission, 2016a, *Lower Delaware River Special Protection Waters Assessment of Measurable Changes to Existing Water Quality, Round 1: Baseline EWQ (2000-2004) vs. Post-EWQ (2009-2011)*. Delaware River Basin Commission, DRBC/NPS Scenic Rivers Monitoring Program, West Trenton, NJ. Authored by R. Limbeck, E. Wentz, E. Silldorff, J. Yagecic, T. Fikslin, and N. Suk. http://www.nj.gov/drbc/library/documents/LowerDel_EWQrpt_2016/LDel_EWQrpt_2016_entire.pdf

Delaware River Basin Commission, 2016b, *Existing Water Quality Atlas of the Delaware River Special Protection Waters*. Delaware River Basin Commission, Scenic Rivers Monitoring Program, West Trenton, NJ. Authored by R. Limbeck, E. Wentz, and K. Reavy. http://www.nj.gov/drbc/programs/quality/spw_ewq-atlas.html

Delaware River Basin Commission, 2018, *A Review of Dissolved Oxygen Requirements for Key Sensitive Species in the Delaware Estuary*. Prepared by the Academy of Natural Science of Drexel University on behalf of the Delaware River Basin Commission. Report dated November 2018. https://www.nj.gov/drbc/library/documents/Review_DOreq_KeySensSpecies_DelEstuary_ANStoDRBCnov2018.pdf

Delaware River Basin Commission, 2019a, *Water Resources Program FY 2019-2021*. Approved March 13, 2019.

Delaware River Basin Commission, 2020b, *2020 Delaware River and Bay Water Quality Assessment Report*. Authored by J. Bransky, E. Panuccio, and A. Ronald MacGillivray. https://www.nj.gov/drbc/library/documents/WQAssessmentReport2020.pdf

Delaware River Basin Commission, 2021, *2021 Annual Report.* https://www.nj.gov/drbc/library/documents/2021AR.pdf

Delaware River Basin Commission, 2022a, *Reducing Microplastics in the Delaware Estuary.* Authored by J. Bransky and F. Chen. Report in process and anticipated for publication in 2022. https://www.nj.gov/drbc/programs/quality/microplastics.html

Delaware River Basin Commission, 2023, *WATER RESOURCES PROGRAM FY 2024-2026. https://www.nj.gov/drbc/library/documents/WRPFY24-26.pdf*

Delaware River Basin Commission, 2024, *2024 Delaware River and Bay Water Quality Assessment Report*. DRBC Report No. 2024-7 https://www.nj.gov/drbc/library/documents/WQAssessmentReport2024.pdf

Delaware River Basin Commission, 2025, *State of the Basin 2025*. Thompson, M.Y. (Ed.)

Hauer, M., & CIESIN. 2021, *Georeferenced U.S. County-Level Population Projections, Total and by Sex, Race and Age, Based on the SSPs, 2020-2100.* Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). https://doi.org/10.7927/DV72-S254 https://doi.org/10.7927/DV72-S254

Hauer, M. E. 2019, *Population projections for U.S. Counties by age, sex, and race controlled to shared socioeconomic pathway*. Scientific Data, 6, 190005. https://doi.org/10.1038/sdata.2019.5

Hickman R.E., and Fischer J.M., 2008, *Water Quality of Streams In and Near the Delaware Water Gap National Recreation Area, Pennsylvania and New Jersey, 2002-04: U.S. Geological Survey Scientific Investigations Report 2007-5290*, 65p. https://pubs.usgs.gov/sir/2007/5290/pdf/sir2007-5290.pdf

Kaushal, S.S., Likens, G.E., Pace, M.L., and Grese, M. 2018, *Freshwater salinization syndrome on a continental scale,* Proceedings of the National Academy of Sciences of the US (PNAS). 115(4), E574 – E583. https://www.pnas.org/doi/full/10.1073/pnas.1711234115 Accessed 2/25/2025.

MacGillivray, AR, DE Russell, SS Brown, TJ Fikslin, R Greene, RA Hoke, C Nally and L O'Donnell. 2011. Monitoring the Tidal Delaware River for Ambient Toxicity. Integr. Environ. Assess. Manag.: 7 (3) 466-477. https://setac.onlinelibrary.wiley.com/doi/abs/10.1002/ieam.144

MacGillivray, A.R. (2021) Temporal trends of PFAS in Delaware River Fish, USA. Integrated Environmental Assessment and Management. 17(2) 411-421. https://setac.onlinelibrary.wiley.com/doi/abs/10.1002/ieam.4342

New Jersey Department of Environmental Protection, 2024, *New Jersey Statewide Water Supply Plan 2024*: 245p. https://dep.nj.gov/wp-content/uploads/water-supply-plan/2024-njswsp.pdf

Lubenow, B., Gagliano, M., Spencer, M., Bousenberry, R., and Spayd, S. (2022). *Investigation of Elevated Sodium and Chloride in Well Water, Village of Columbia, Knowlton Township, Warren County, New Jersey* (Technical Memorandum 21-1). New Jersey Department of Environmental Protection, New Jersey Geological & Water Survey. https://www.nj.gov/dep/njgs/pricelst/tmemo/tm21-1.pdf

Schmale III, D.G., Ault, A.P., Saad, W., Scott, D.T., & Westrick, J.A., 2019, *Perspectives on Harmful Algal Blooms (HABs) and the Cyberbiosecurity of Freshwater Systems*, Frontiers in Bioengineering and Biotechnology, Section Biosafety and Biosecurity, Vol. 7 – 2019, June 4, 2019. https://doi.org/10.3389/fbioe.2019.00128 Accessed 03/08/2023.

Siemion, J., and Murdoch, P.S., 2010, *Water quality of the Upper Delaware Scenic and Recreational River and tributary streams, New York and Pennsylvania: U.S. Geological Survey Scientific Investigations Report 2010–5009*, 43 p. https://pubs.usgs.gov/sir/2010/5009/pdf/sir2010-5009_508.pdf

Sloto, R. A., & Buxton, D. E. (2006). Estimated Ground-Water Availability in the Delaware River Basin, 1997-2000. Scientific Investigations Report 2006-5125--Version 1.1. Reston, Virginia. U.S. Geological Survey. https://pubs.usgs.gov/sir/2006/5125/pdf/sir2006-5125_ver1.1.pdf

Thompson, M. Y., & Pindar, C. E. (2021). *Water Withdrawal and Consumptive Use Estimates for the Delaware River Basin (1990-2017) With Projections Through 2060: DRBC Report No: 2021-4.* West Trenton, New Jersey. Delaware River Basin Commission. https://www.nj.gov/drbc/library/documents/water-use/DRBC_2021-4_Water2060_Final_101421.pdf

Thompson, M.Y., Sayed, S.C., Beganskas, S. & Pindar, C.E. (2022). *Estimated Groundwater Availability in the Delaware River Basin 2020–2060: DRBC Report No. 2022-5.* West Trenton, New Jersey. Delaware River Basin Commission. https://www.nj.gov/drbc/library/documents/DRB_Rpt_GW_Availability_dec2022.pdf

Thompson, M.Y., Sayed, S.C., & Pindar, C.E. (2023). *A Comprehensive Assessment of the Delaware River Basin Commission's Water Audit Program (2012-2021): DRBC Report No. 2023-7.* West Trenton, New Jersey. Delaware River Basin Commission. https://www.nj.gov/drbc/library/documents/wateraudits/Assessment_WaterAuditProgram2012-2021_dec2023.pdf

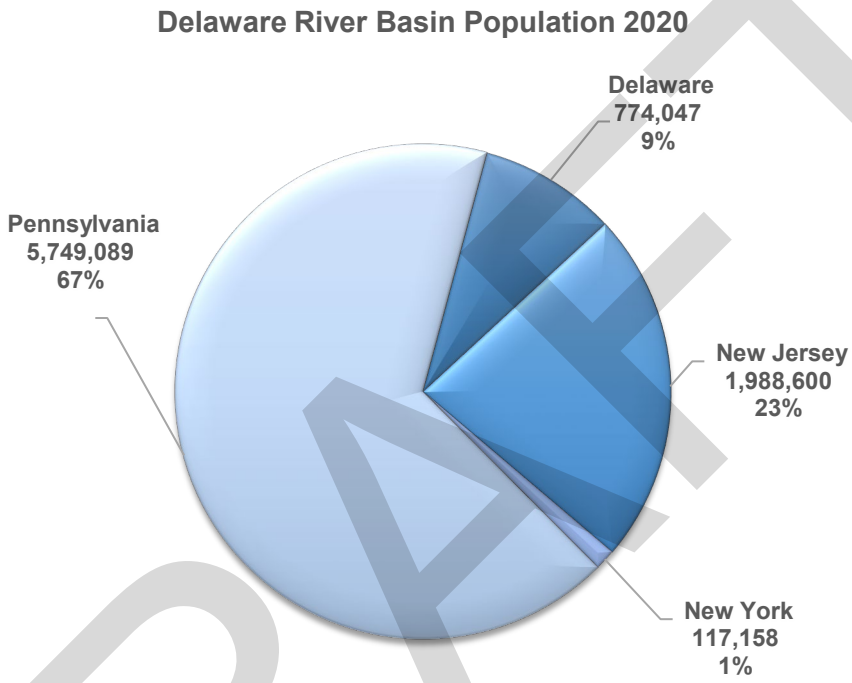
United States Army Corps of Engineers, 2007, *Updated Draft Groundwater Model Production Run Report, Upper New Castle County Delaware*. Prepared for the State of Delaware, Delaware Natural Resources and Environmental Control (DNREC) by United States Army Corps of Engineers Philadelphia District.

United States Army Corps of Engineers, 2013, *Delaware Estuary Regional Sediment Management Plan Final.* Prepared by the Delaware Estuary Regional Sediment Management Plan Workgroup. Report dated August 8, 2013. https://www.nap.usace.army.mil/Missions/Civil-

Works/Regional-Sediment-Management/Delaware-Estuary-Regional-Sediment-Management/Delaware-Estuary-RSM-Plan/

Vilimanovic D, Andaluri G, Hannah R, Suri R, MacGillivray A R. 2020. *Occurrence and aquatic toxicity of contaminants of emerging concern (CECs) in tributaries of an urbanized section of the Delaware River Watershed.* AIMS Environ Sci 7:302–319. https://www.aimspress.com/article/doi/10.3934/environsci.2020019

APPENDIX A



Basin Population 2020. Pennsylvania accounts for approximately two-thirds of the basin's population. (Note: An additional 5.564 million people outside of the basin who rely on basin water supplies are not included in this figure).

The following is an estimate by the DRBC of the population served in 2020 by DRB water, 14.2 million (MM), and includes supporting references (**Table A-1**). The previous estimate of the population served, first included in the Water Resource Program FY 2019-2021 (DRBC, 2019a), was 13.3 MM. The total population served includes those within the Basin boundaries (see chart above) as well as populations of the basin states located outside of the DRB that are served through exports. Estimates of population served through exports are based on daily use by "equivalent" populations outside the basin. Estimates for these populations come from water resource agency sources in those states and utilize per capita multipliers against supply or a measure of populations with direct access to the exports.

Table A-1: Estimation of Population Served by Delaware River Basin Water (2020 Data)

1. **Basin Population**[41]
   a. Population residing within the DRB boundary .. .. 8.629 MM
2. **NYC Population**[42]
   a. Estimated 2020 NYC population ..... 8.804 MM
   b. DRB fraction of NYC supply 48%
   c. Equivalent NYC population served .... 4.226 MM
3. **Outside NYC Served**
   a. Communities along aqueduct .... 0.438 MM
4. **NJ Served from Diversion**[43]
   a. Equivalent NJ population served .... 1.087 MM
5. **Chester Water Authority Import**[44]
   a. CWA's Delaware County service area (PA) ..... 0.112 MM
   b. CWA's Chester County service area (PA) ..... 0.034 MM
   c. CWA bulk sales
      i. Veolia (DE) ..... 0.001 MM
      ii. Suez (DE) ..... 0.009 MM
      iii. Artesian (DE) ..... 0.031 MM
   d. Total DRB population served by CWA .... -0.187 MM

Grand Total Estimated Population Served .... 14.193 MM

[41] Data Source: U.S. Census Bureau, 2020 American Community Survey, DP-5 ACS DEMOGRAPHIC AND HOUSING ESTIMATES Note: 2020 population by census tracts were adjusted to basin boundary.

[42] Correspondence with NYC Department of Environmental Protection on 8/15/2022.

[43] Correspondence with NJ Department of Environmental Protection on 11/7/2022.

[44] Correspondence with Chester Water Authority on 8/24/2022.

APPENDIX B

SUPPLEMENTAL TABLE B-1: Summary of Prospective Changes to DRBC Comprehensive Plan, Regulations and/or Programs

Management Topic	Affected Program and/or Rule	Products/Outputs	FY 2026	FY 2027	FY 2028
Administrative and Procedural	RPP (18 CFR Part 401)	Update fees as provided for in existing regulations	Annually		
		Amend any additional provisions as necessary or appropriate	Evaluation and rulemaking as directed		
	Water Code, Water Quality Regulations (18 CFR Part 410)	Replace Incorporation by Reference in the Code of Federal Regulations (CFR) by codifying all sections in the CFR		Evaluation and rulemaking as directed	
Water Quality Program	Designated Uses and Stream Quality Objectives	Revised Estuary Aquatic Life Designated Use and Criteria (WQAC Coordination)	Support implementation consistent with a schedule to be determined after EPA's rulemaking process is complete, and initiate rulemaking as appropriate		
	Stream Quality Objectives	Revised Estuary Ammonia Toxicity Criteria (TAC Coordination)	TAC recommendations; rulemaking process and adoption beyond FY 2026 as appropriate		

Management Topic	Affected Program and/or Rule	Products/Outputs	FY 2026	FY 2027	FY 2028
Water Quality Program (cont.)	Estuary Toxics Management Program	Stage 2 PCB TMDLs	Support EPA in establishing TMDLs (pending EPA's schedule)		Assist with implementation and management
	Recreation Designated Use	Recreation Designated Use Strategy	Conduct monitoring and, in coordination with co-regulators, implement strategy to address enhanced recreational designated uses in Zones 3 and upper 4		
	Special Protection Waters	Revised Load Allocation Methods for SPW watersheds as appropriate	Initiate discussion on alternative No Measurable Change (NMC) allocation methods for watersheds draining into Special Protection Waters; develop policy options and possible rule revisions as appropriate		
Water Use	Comprehensive Plan and Water Code	Updated Water Code or DRBC policy regarding pass-by flows, conservation releases, and consumptive use	Technical review and analysis to support future policy options, recommendations, and rule development; proposed rules or guidance, s as appropriate		
Interagency Project Review Coordination	Administrative Agreements	Alignment with partner agencies	Update and implement Pennsylvania Administrative Agreement (AA)		
Comprehensive Plan	Comprehensive Plan	Updated Comprehensive Plan	An update and compilation of all elements is planned, including but not necessarily limited to a robust geographic information system (GIS) platform for all of the Commission's approved projects		

APPENDIX C

SUPPLEMENTAL TABLE C-1: Summary of Modeling Projects

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Flow Management	Continued use and maintenance of DRB-PST, SM3D and hydrologic models to support the evaluation of flow management, salinity intrusion, and FFMP2017 studies	On-going	General Fund, DWCF 2022
Water Supply Planning	Assess future water availability against withdrawal projections and drought of record	On-going	General Fund, DWCF 2022
Emergency Response	Real time, one-dimensional flow and transport model	Ongoing	General Fund
	Real time, multi-dimensional flow and transport model	Ongoing	
	Water quality model	As needed	
	Rapid Dilution Assessment Tool	As needed	
Lower Delaware River and Tributaries Model	Model refinement and validation	As needed	General Fund
Brodhead Model	Model refinement and validation	As needed	General Fund
Neversink Model	Model refinement and validation	As needed	General Fund

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Lehigh River Model	Model refinement and validation	As needed	General Fund
Eutrophication Model for Delaware Estuary	Three-dimensional model for general water quality evaluations of the Estuary	Ongoing	General Fund, DWCF 2022
	Model application for CBOD, and ammonia-nitrogen allocations, and other nutrient requirements pending EPA's rulemaking schedule	2026-2028	General Fund, EPA §106
CORMIX mixing zone models	Project Review and NPDES permit support	As needed	General Fund

[ii] https://drbc.net/Sky/waterq.htm