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WATER RESOURCES PROGRAM FY 2025-2027

Report No. 2024-3

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



Water Resources Program FY 2025-2027

Prepared by staff at the Delaware River Basin Commission

Suggested Citation

DRBC (2024). *Water Resources Program FY 2025-2027*. (DRBC Report No: 2024-3). West Trenton, New Jersey. Delaware River Basin Commission.

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.\(g\)](#)).

Vision, Mission, and Values

The following vision, mission, and values of the Delaware River Basin Commission was unanimously approved by the commissioners in a Resolution for the Minutes dated March 9, 2022.

Vision

The Delaware River Basin Commission (DRBC or Commission) provides trusted, effective, and coordinated management of our Basin's shared water resources.

The vision of the Delaware River Basin Commission is built upon the Compact signed in 1961 by the states of Delaware, New Jersey, and New York, the Commonwealth of Pennsylvania, and the federal government. The vision as set forth in the Delaware River Basin Compact is for, "the conservation, utilization, development, management and control of water and related resources of the Delaware River Basin under a comprehensive multipurpose plan [to] bring the greatest benefits and produce the most efficient service in the public welfare."

Mission

Managing, protecting, and improving the water resources of the Delaware River Basin.

The DRBC will "develop and effectuate plans, policies and projects relating to the water resources of the Basin" through:

- Watershed-based planning and management
- Effective, efficient, and coordinated regulatory programs
- Policies and practices informed by science
- Collaboration with and among our state and federal signatory partners

- Adaptive and innovative water resource management
- Public education and outreach
- Public and stakeholder input
- Application of equitable practices and promotion of just outcomes
- Dedicated and engaged staff in a high performing workplace

To accomplish this mission, the Commission will continue to lead and collaborate with the signatory parties to protect and improve water quality; manage river flows to meet diverse and at times conflicting Basin needs; reduce damage caused by floods; provide for the reasonable and sustainable development and use of surface and ground water; and promote water conservation and efficiency.

Values

The DRBC will be guided in its mission by the following core values:

- Service: to the public, the regulated community and our DRBC colleagues.
- Respect: for each other, the public and the Basin’s water resources.
- Professionalism: defined by high ethical standards, integrity, continuous improvement, and accountability.
- Diversity and inclusion: promoted both as an employer and as a public agency.

Scope and Organization

The Water Resources Program (WRP) covers fiscal years (FY) 2024 through 2026 (July 1, 2023, through June 30, 2026) 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 ACRONYMS/ABBREVIATIONS

| | |
|-------------------|--|
| 7Q10 | the lowest 7-day average flow that occurs (on average) once every 10 years |
| AA | Administrative Agreement |
| ACCC | Advisory Committee on Climate Change |
| 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 |
| BRIC | Building Resilient Infrastructure and Communities |
| C&D | Chesapeake and Delaware (Canal) |
| CA2 | Critical Area 2 |
| CaCO ₃ | calcium carbonate |
| CBOD | carbonaceous biochemical oxygen demand |
| CCMP | Comprehensive Conservation and Management Plan |
| cfs | cubic feet per second |
| 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 |
| 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 |
| IPCC | Intergovernmental on Climate Change |
| 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 |
| 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 |
| 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 |
| 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

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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, 2023, through December 31, 2023.
- **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 Change** 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) 2023 are summarized below. Conditions alternated between wet and dry periods, with normal reservoir storage levels, typical flows, the salt front location in the normal range, and periods of low groundwater levels. Two notable exceptions were drought watch declarations in Pennsylvania and minor to moderate flooding events in December due to high rainfall in December. More detailed daily, weekly, quarterly, and annual summaries of [CY 2023 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.

The total annual precipitation and the departures from normal precipitation for 2023 are shown in **Figures 1 and 2**, respectively. In the upper basin, annual rainfall ranged from 45-65 inches, while in the lower basin, rainfall ranged between 35-65 inches. In the upper basin, portions received at least 6 inches more than the normal precipitation, while portions of the western part of the basin experienced more than 6 inches below the average precipitation for the year (**Figure 2**). In

¹ <https://www.nj.gov/drbc/programs/flow/hydrologic-reports.html>

Pennsylvania, a statewide drought was declared in June and lifted at different times as conditions improved. 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 December, during high precipitation events, streams in Southeastern Pennsylvania and Southwestern New Jersey experienced minor to moderate flooding.

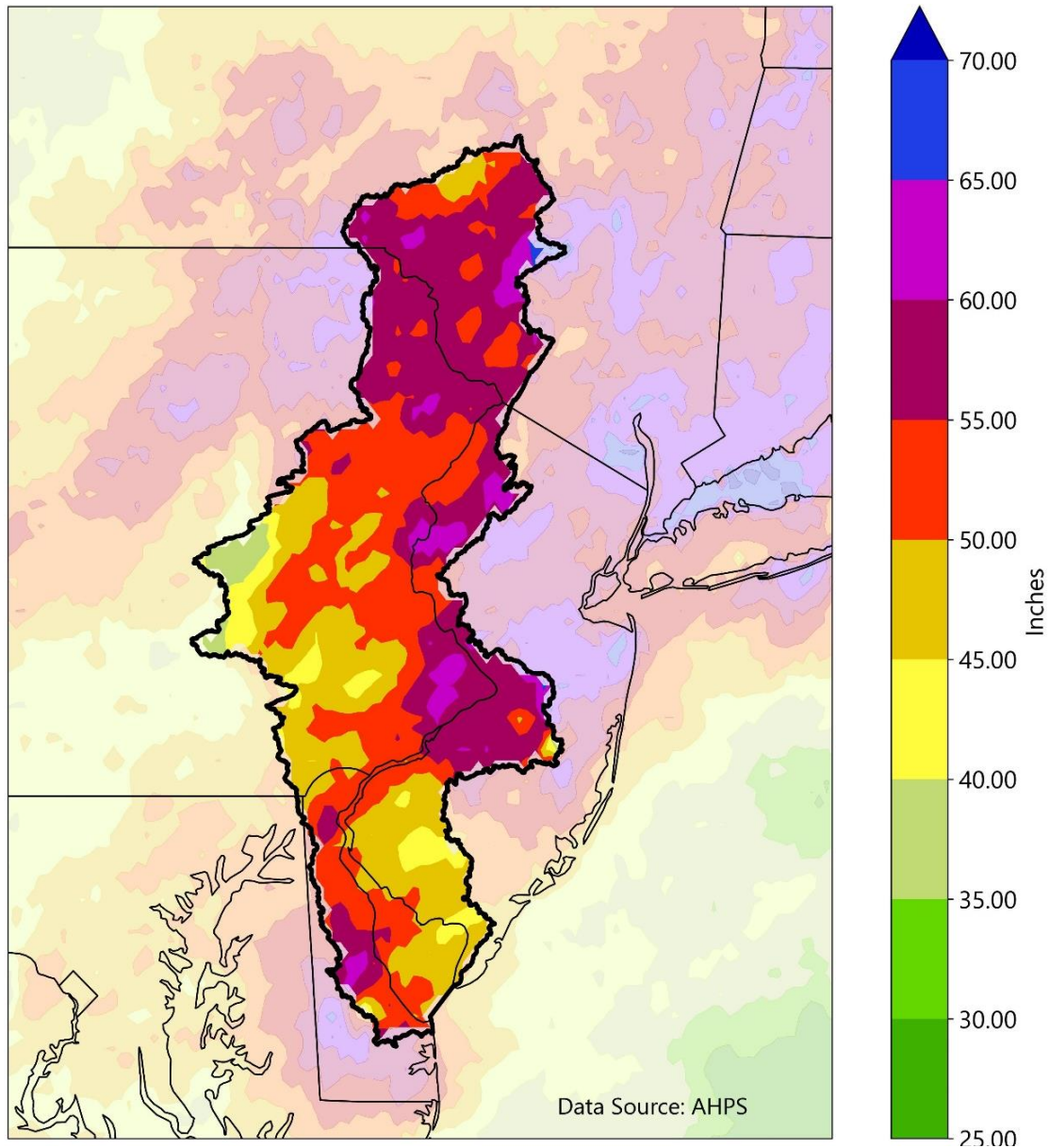


Figure 1. Annual precipitation in 2023.

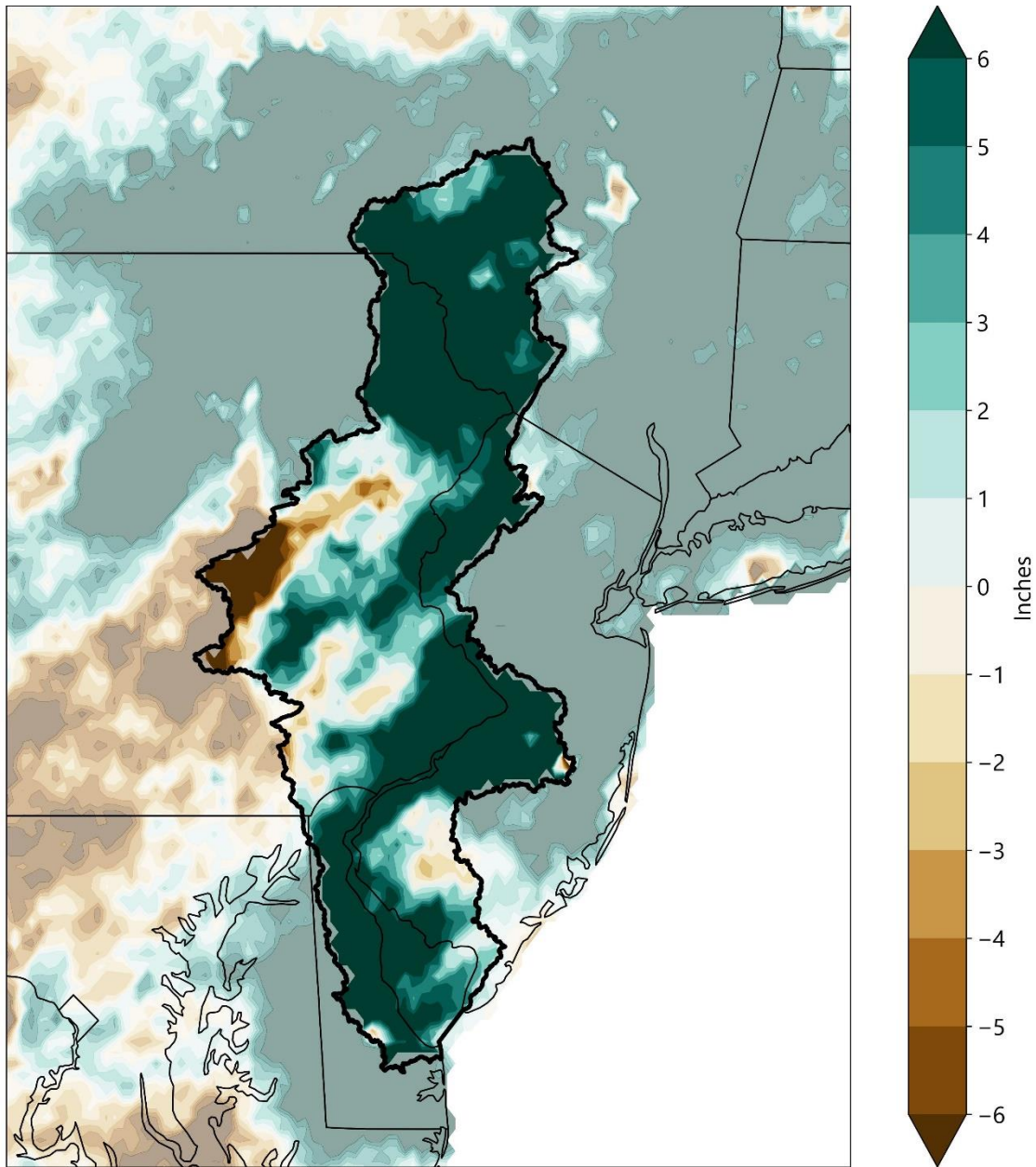


Figure 2. Departure from normal precipitation in 2023.

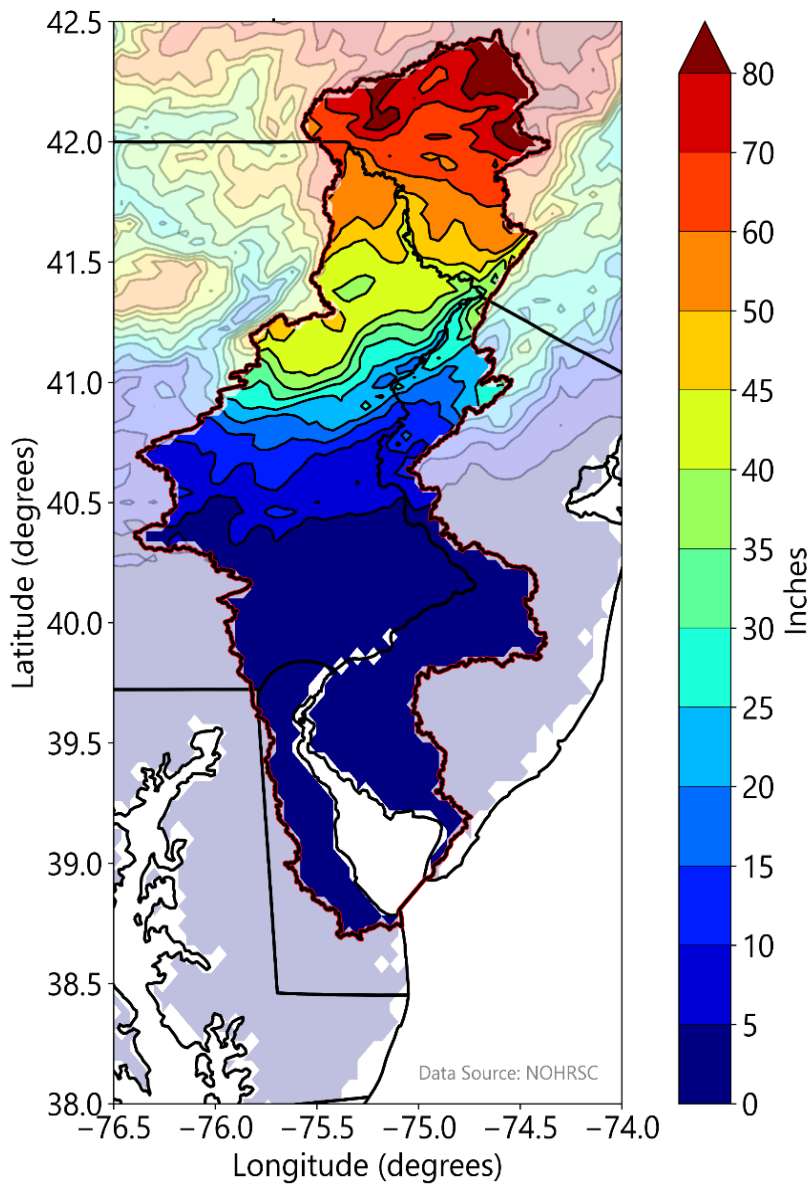


Figure 3. Seasonal snowfall for Winter 2022 – 2023.

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 above the long-term median the whole year except for a dry period from mid-May to the end of June and a few other dry days (**Figure 4**). Lower basin storage stayed within normal levels, except during high rainfall events in the spring and December. Thermal releases from the New York City reservoirs were made for three days in July and for two days in September to offset high water temperatures in downstream tailwaters during the summer. The amount of water used for thermal releases was 0.15 BG (234 cfs-days).

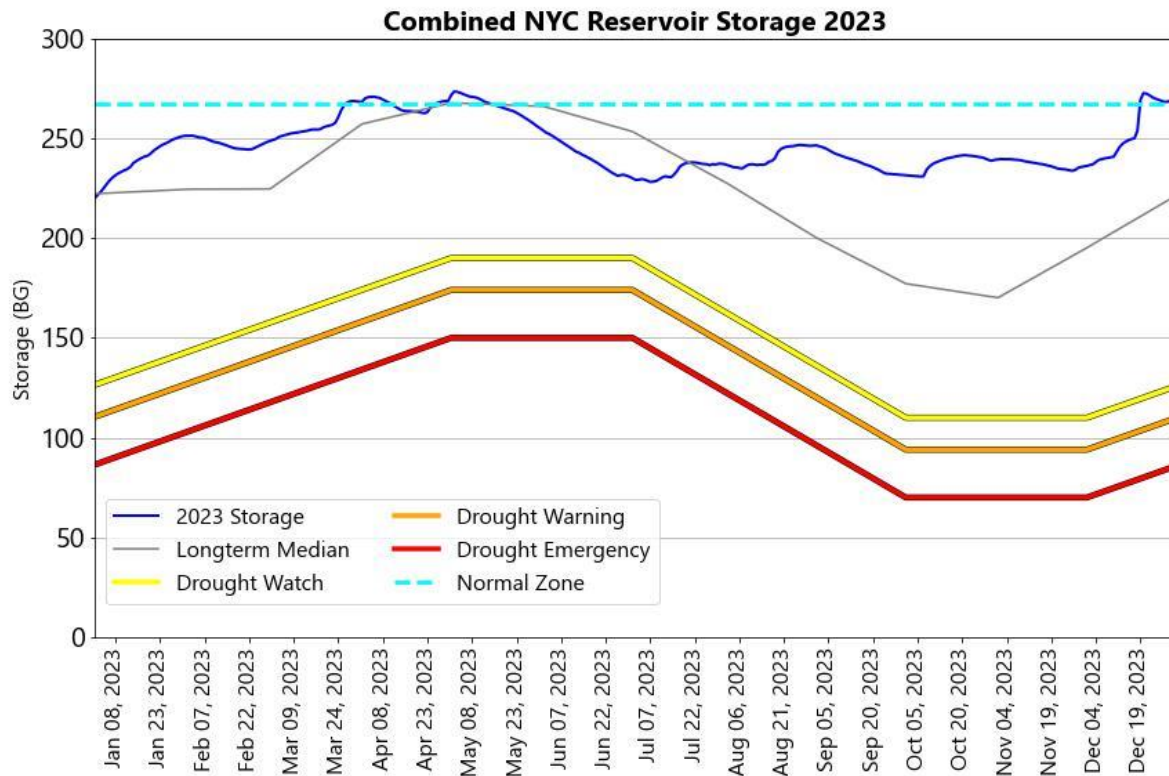
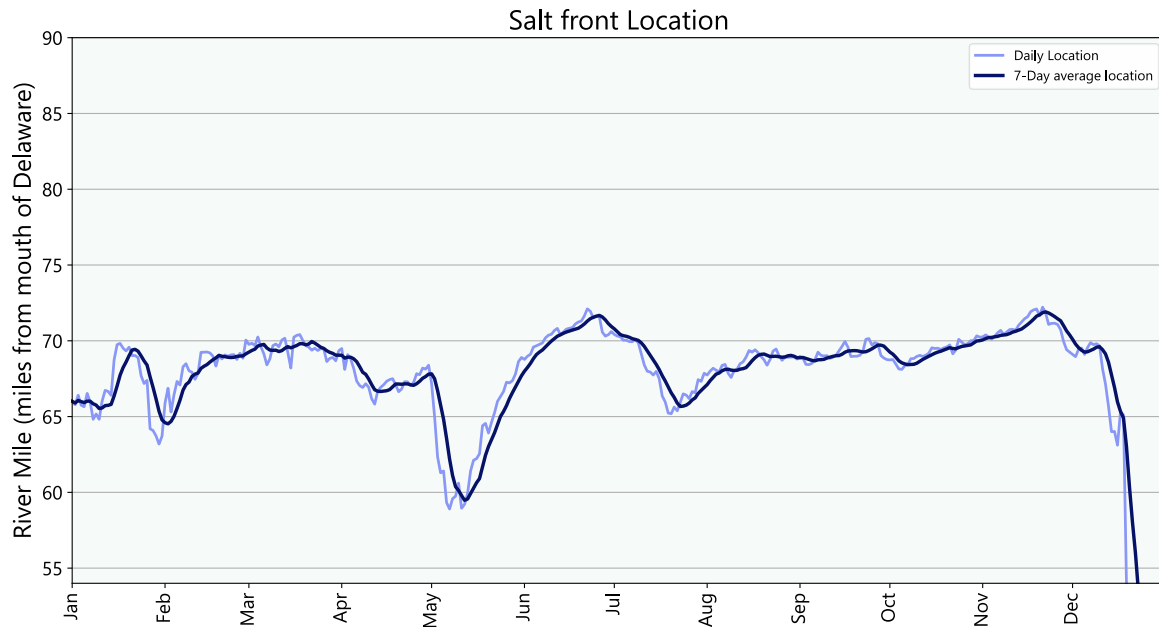


Figure 4. Combined storage in the New York City Reservoirs during 2023.

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 2023 was RM 71.8.



Note: DRBC does not calculate the location of the saltfront below river mile 54.

Figure 5. Salt Front Location during 2023

Groundwater level wells were close to the normal range at the beginning of the year. Wells in New Jersey started the year below normal and remained well below normal until December when groundwater levels began to rebound. Beginning in March, 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 Pennsylvania, New York, New Jersey, and Delaware were within the normal range.

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.

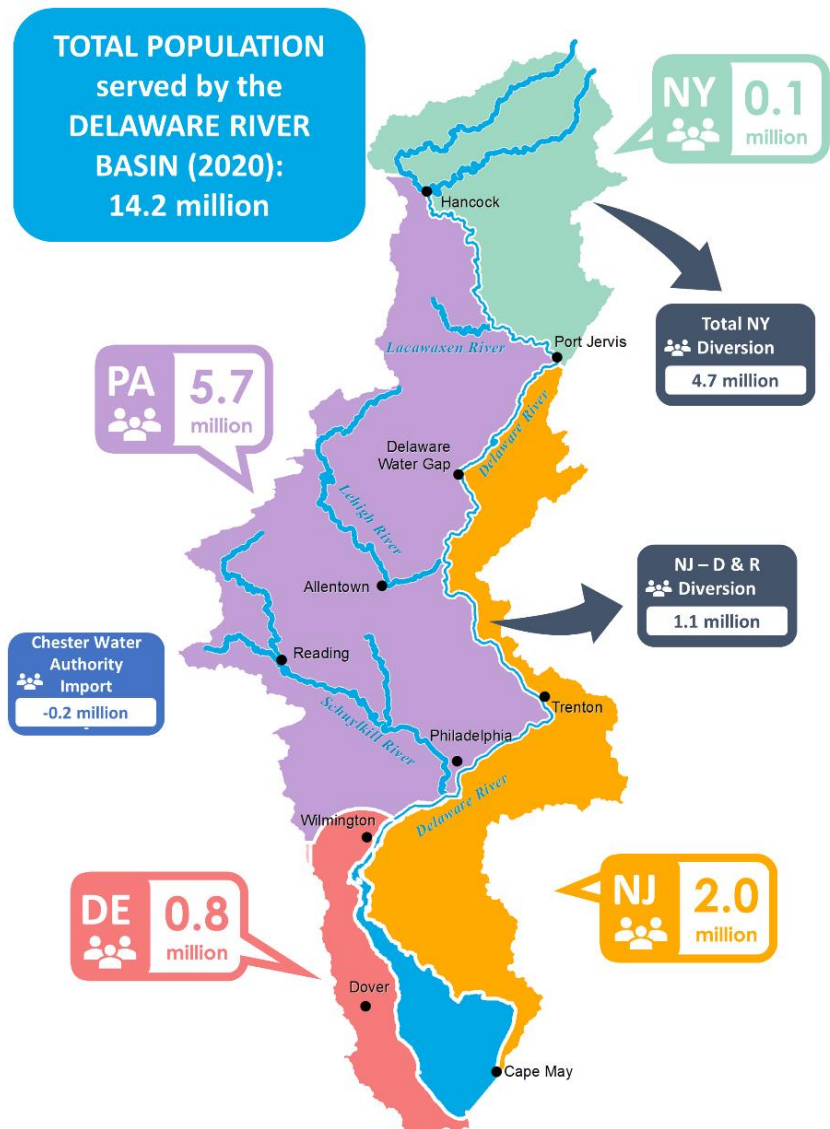


Figure 6. Population served by DRB water based on population estimates for 2020 in the Delaware River Basin by state.

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 2020 calendar year 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 2020 data, ground and surface water withdrawals from the Delaware River Basin are estimated to total 6,390 million gallons per day (MGD), out of basin diversions total 594 MGD, and consumptive use (including out of basin diversions) is 857 MGD.
- Approximately 95% of all water used in the Basin is obtained from surface waters.
- Three dominant use sectors account for over 68% of total water withdrawals; these sectors are thermoelectric power generation (49%), public water supply (12%), and industrial (7%).

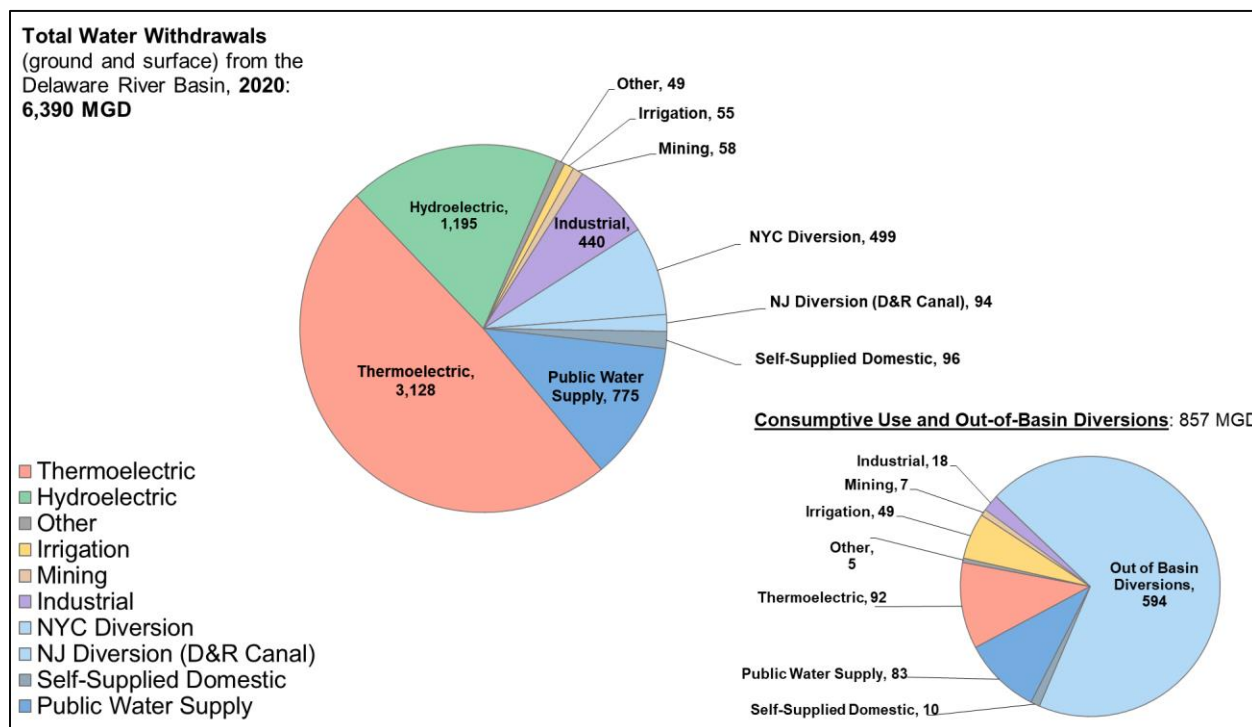


Figure 7. Total water withdrawals and consumptive use / major exports from the Basin in 2020.

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, and have been updated with data through 2020. The standard presentation of projection results in Thompson & Pindar, 2021 used a solid blue line to show the “projected value,” representing either a single projection (such as the result of an Ordinary Least Squares regression), or an aggregation of multiple projections (as shown in Figures 9 and 10). Additionally, each individual projection had two “predictive intervals” calculated, 80% (dark grey) and 95% (light grey), which are based largely on the distribution of residual errors from the individual projection. Similar to the blue line representing the projected value, the 80% and 95% predictive intervals might be aggregated for presentation (as shown in **Figures 10 and 11**).

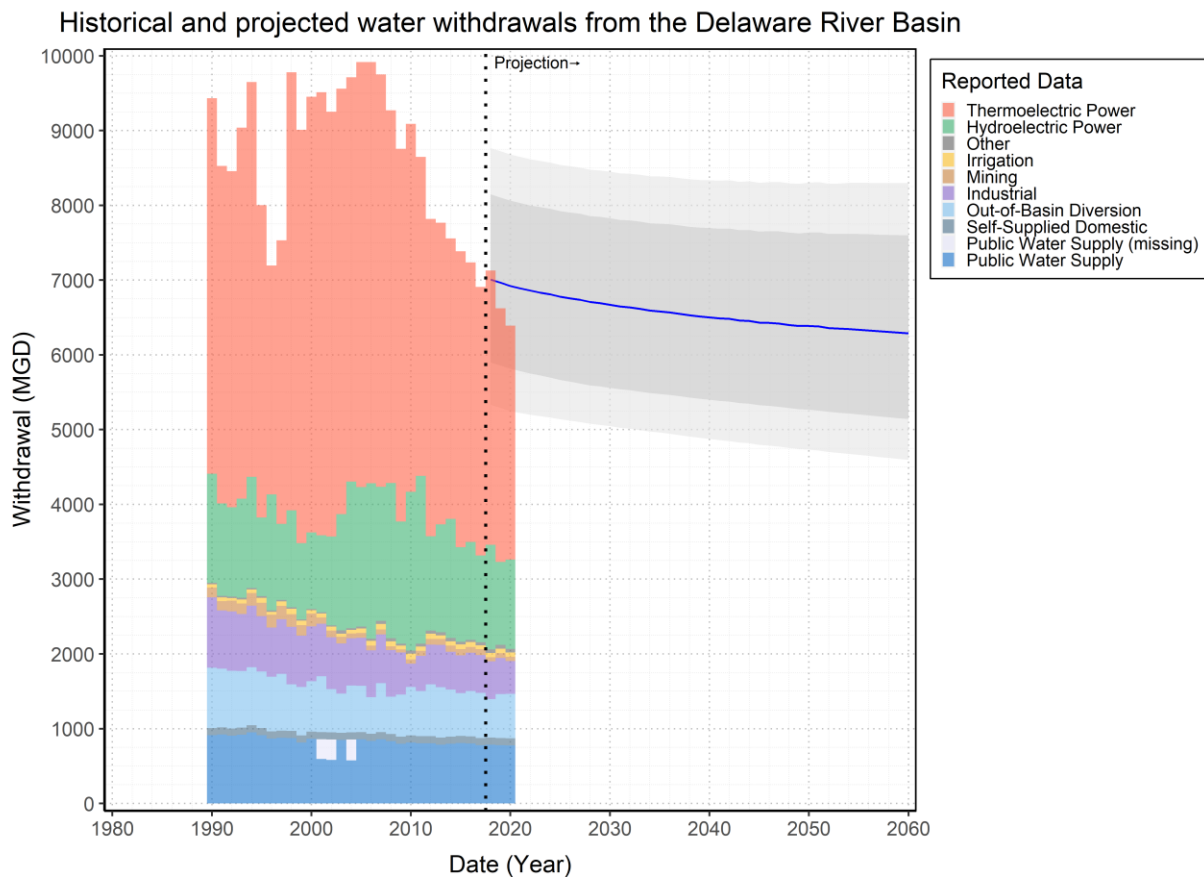


Figure 8. Historical and projected water withdrawals from the Delaware River Basin, initially published in Thompson & Pindar, 2021 through 2017. The predictive interval shown represents the aggregated predictive intervals for all sectors. The figure has been amended with complete years of data through 2020.

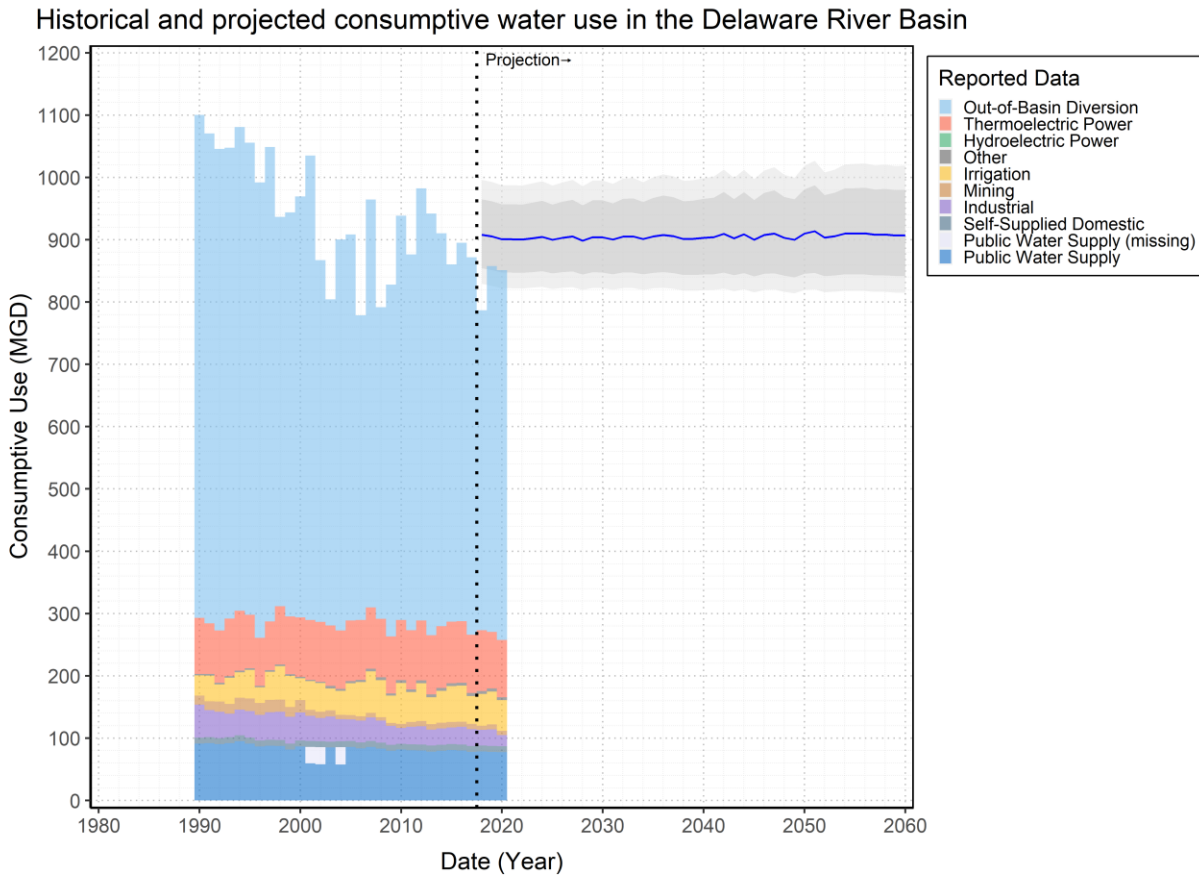


Figure 9. Historical and projected consumptive use of water in the Delaware River Basin, initially published in [Thompson & Pindar, 2021](#) through 2017. The predictive interval shown represents the aggregated predictive intervals for all sectors, excluding the out-of-Basin diversions which did not have a calculated predictive interval. The figure has been amended with complete years of data through 2020.

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 2020 the ratio was approximately 6.3% groundwater and 93.7% surface water.
3. Reported withdrawals in 2020 were 6,390 MGD, 7.7% lower than the projected value of 6,922 MGD. Calculated consumptive use (excluding Out-of-Basin diversions) was 263 MGD, 6.7% 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 eight 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.
- 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. These withdrawals were determined to be strongly correlated with climatic variables and were projected using Regional Climate Model data ([Thompson & Pindar, 2021](#)). Withdrawal reporting compliance and accuracy appears to be increasing. Withdrawals and consumptive use are projected to increase in the future.

Withdrawals in the Delaware River Basin

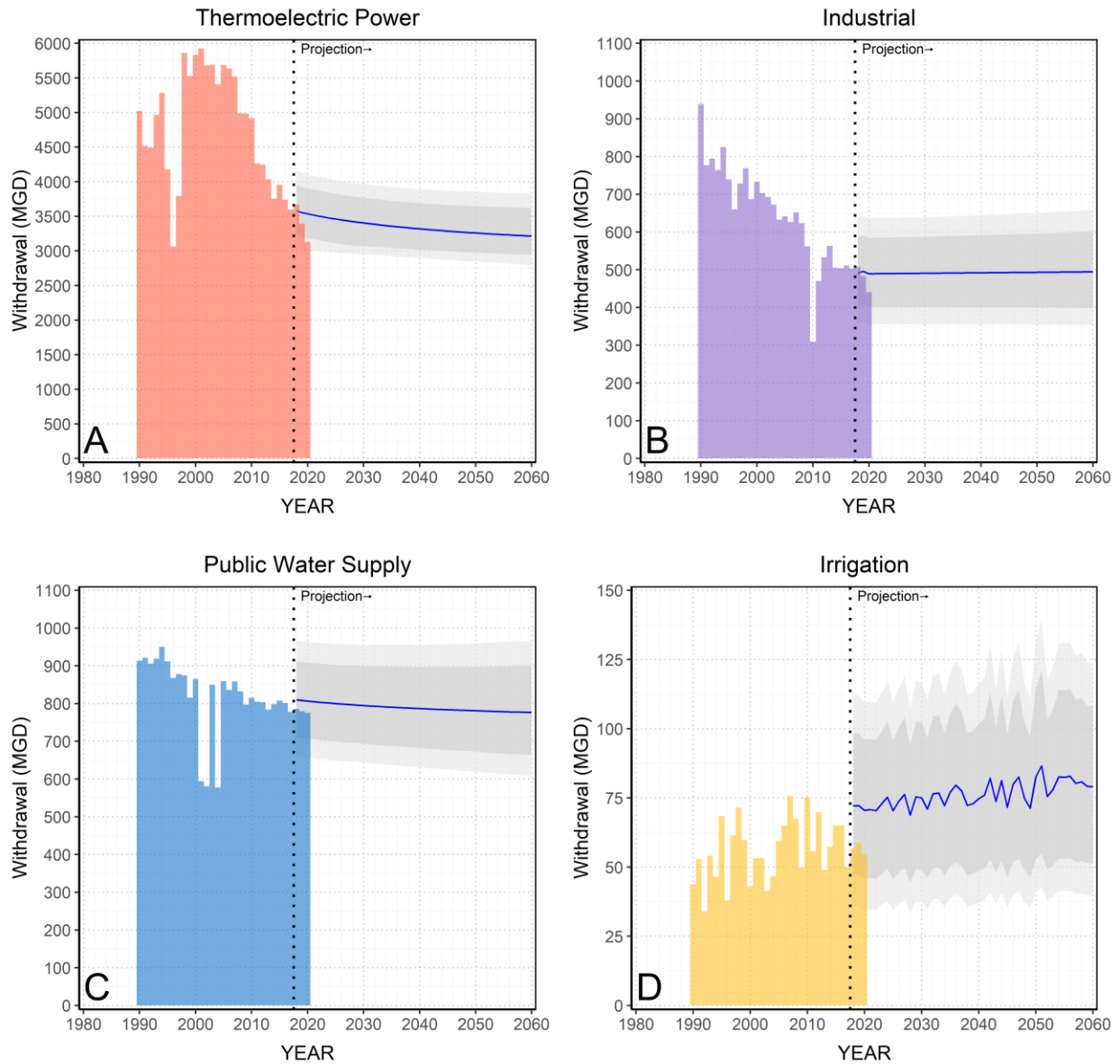


Figure 10. Historical and projected water withdrawals for the major sectors within the Delaware River Basin. These data used to generate these figures have been adopted from [Thompson & Pindar, 2021](#) through 2017; however, the historical data has been updated through 2020.

Consumptive use in the Delaware River Basin

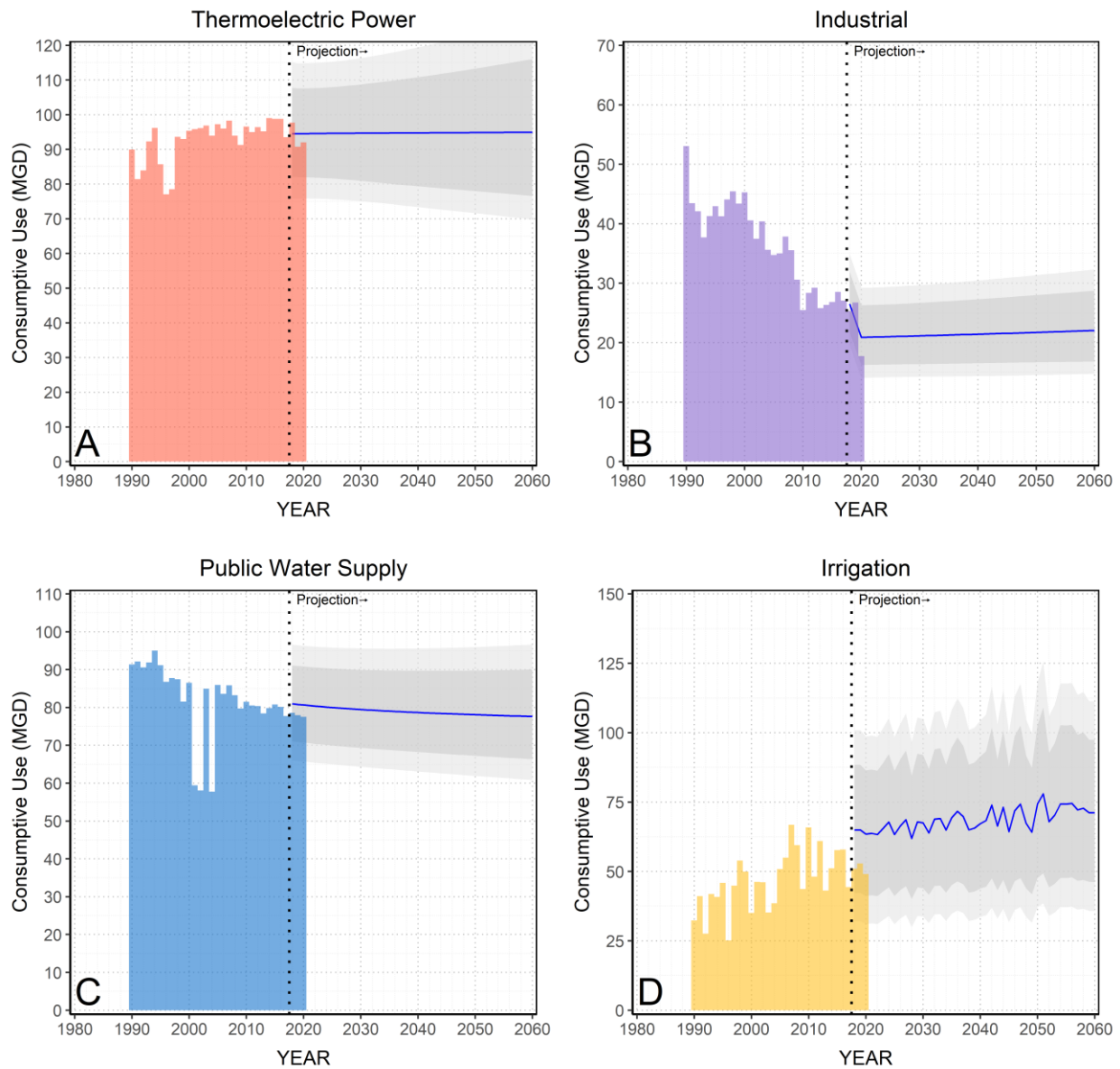


Figure 11. Historical and projected consumptive use for the major sectors within the Delaware River Basin. These data used to generate these figures have been adopted from [Thompson & Pindar, 2021](#) through 2017; however, the historical data has been updated through 2020.

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 2020 (**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, as shown in **Figure 13**. Presenting data in this way highlights that although overall withdrawals have decreased, the resulting consistent trend in consumptive use can be attributed to increased proportions of withdrawals by facilities with recirculating evaporative cooling.

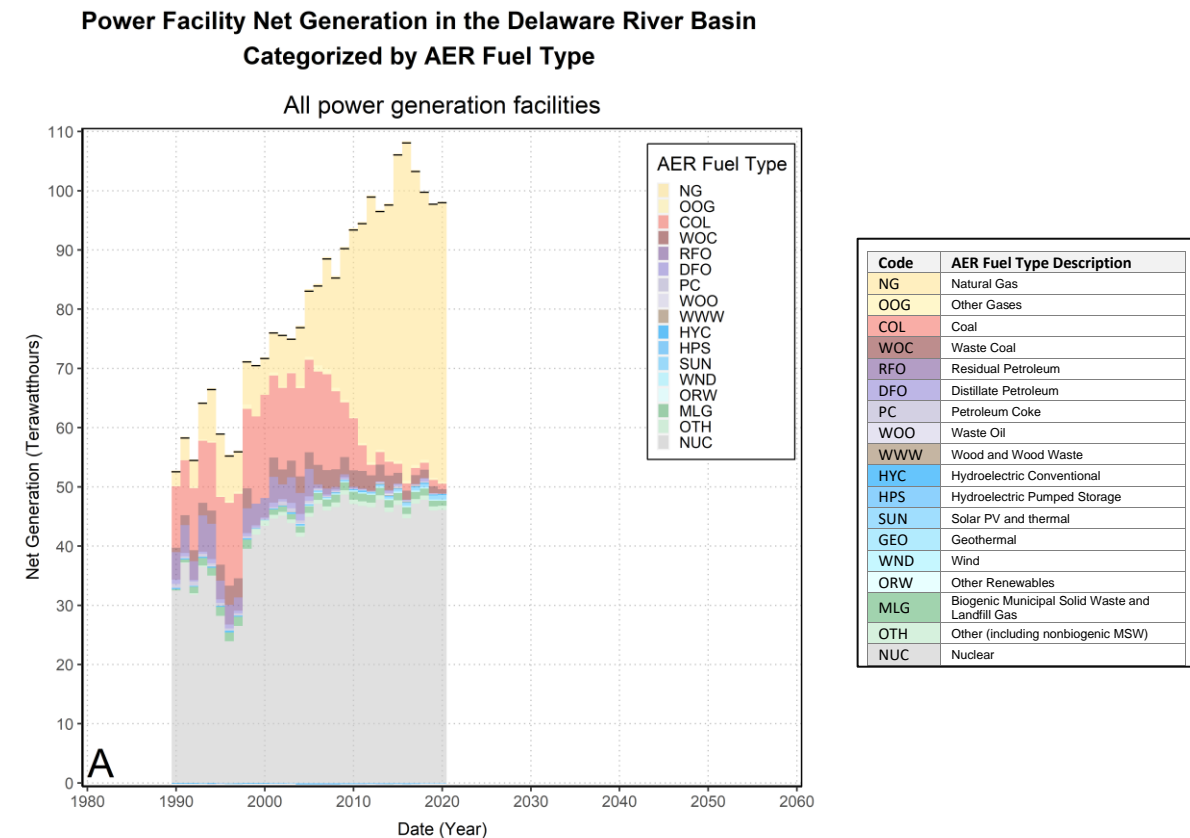


Figure 12. Historical net electrical energy generation by facilities within the Delaware River Basin.

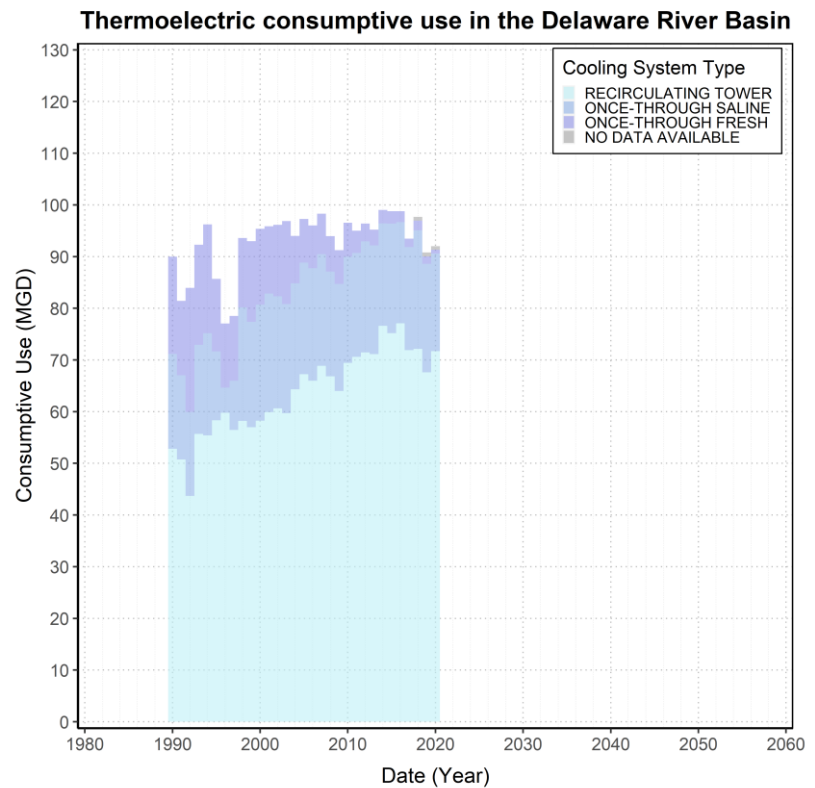
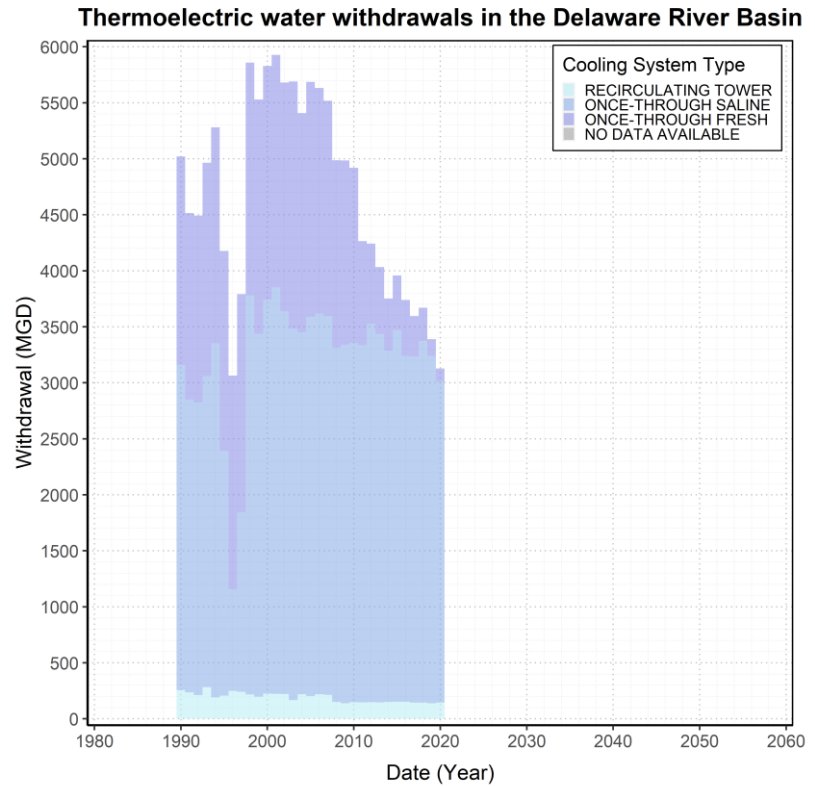


Figure 13. Water withdrawals and consumptive use by power generation facilities within the Delaware River Basin, categorized by the type of cooling system at the facility.

1.2.3.2 PUBLIC WATER SUPPLY

Historical data for public water supply (PWS) withdrawals show a decreasing trend (**Figure 14**) 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 14**). 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 14** indicates that these regulations have been successful and have contributed to the trend in PWS water withdrawals.

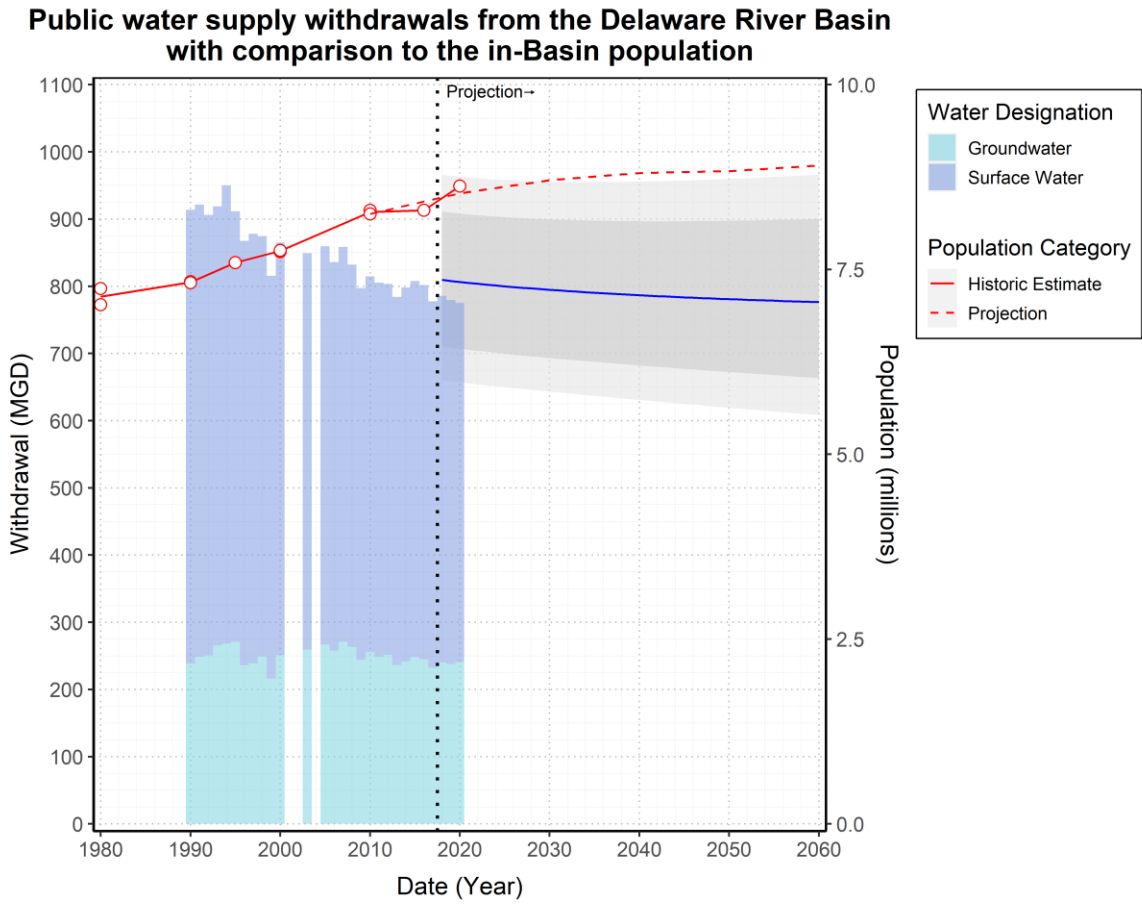


Figure 14. Withdrawals by public water supply systems in the Delaware River Basin 1990-2020. There are known data gaps present for 2001, 2002 and 2004. The population values projected from 2010 through 2060 are reflective of the population residing within the Basin boundary as presented in **Figure 17**. 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 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 through 2060 using a model scenario termed SSP-2 (Shared Socioeconomic Pathway), which represents a “middle of the road” scenario ([M. E. Hauer, 2019](#); [M. Hauer & CIESIN, 2021](#); [O’Neill et al., 2014](#)). 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 15**. 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**.

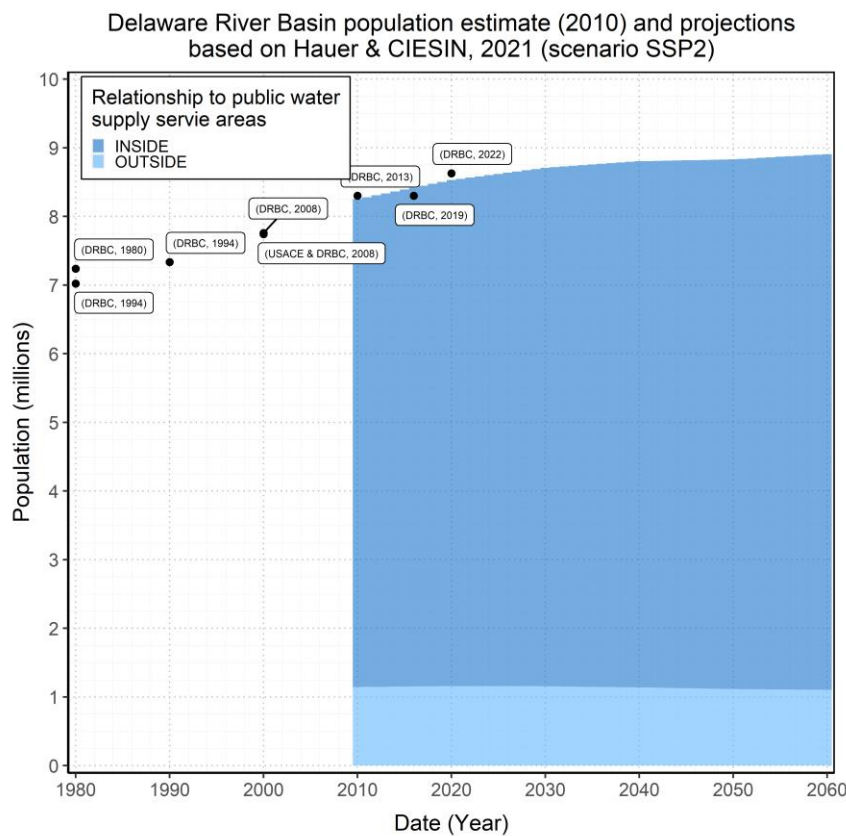


Figure 15. In-Basin population estimates for the Delaware River Basin, categorized by relationship to public water supply service areas, projected under model scenario SSP-2 through 2060. Note that estimates indicated by points with reference information are population only, and do not contain information 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 Calendar Year (CY) 2021, there were 282 water audits received by the Commission. Reports from 18 systems were not received, and therefore those data were back-filled with the most recent data available. A “water balance” for all 300 systems subject to audit requirements is presented in **Figure 16**, indicating that approximately 795 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 2021 reported data, an

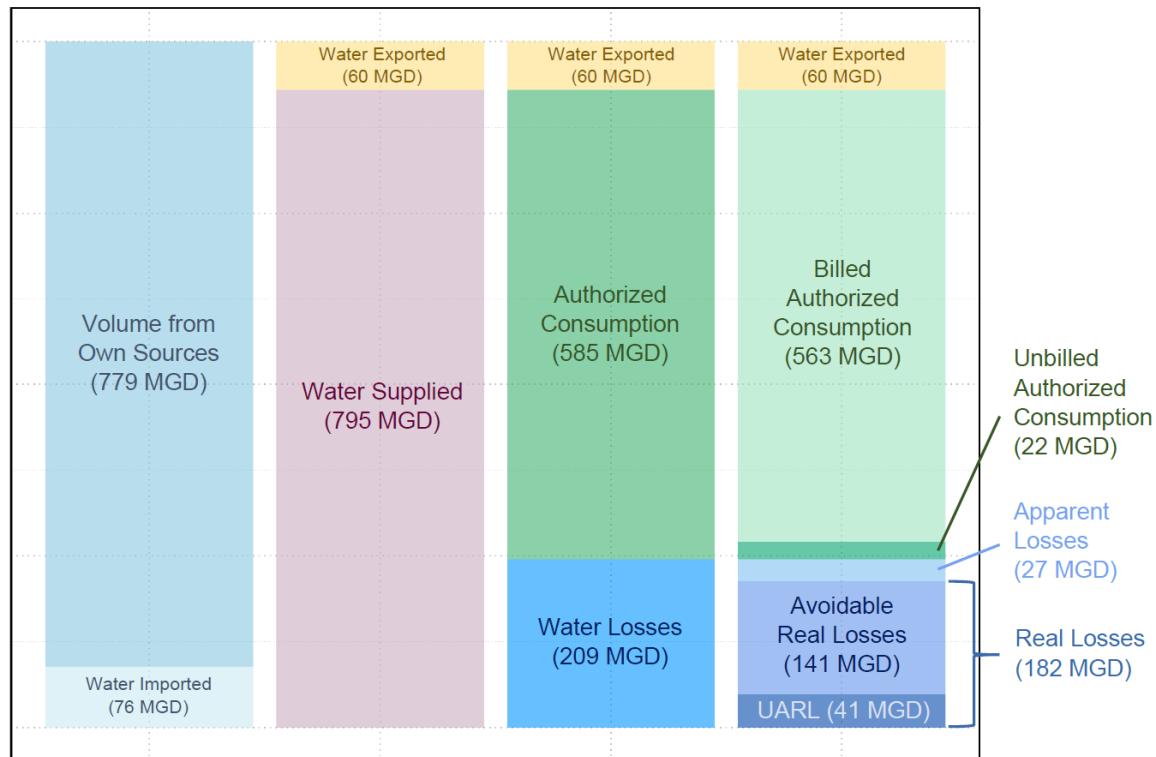


Figure 16. Aggregate water balance for 300 systems reporting water audit data to DRBC for CY2021. Note that the totals in the 3rd and 4th columns are 1 MGD less than the 1st and 2nd due to rounding when the data is disaggregated.

estimated 182 MGD were reported as physically lost from distribution systems in the Basin along with an estimated 27 MGD reported as apparent losses and 22 MGD of unbilled authorized consumption for a total of 231 MGD of non-revenue water reported in CY 2021.

Notably, data from CY 2021 marked the tenth year of mandatory reporting via the DRBC Water Audit Program. An analysis of the complete ten-year dataset was prepared and published in 2023, titled *A Comprehensive Assessment of the Delaware River Basin Commission’s Water Audit Program (2012-2021)* (Thompson et. al, 2023). **Figure 16** 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 (141 MGD) might be termed something like Avoidable Real Losses. Within the Basin, the recent report even shows how different levels of reduction in real losses compares to projections of water withdrawals by purveyors (**Figure 17**). The full report not only provides extensive analysis of the program (such as **Figure 17**), but provides recommendations to help shape the program moving forwards.

Public water supply withdrawals from the Delaware River Basin with comparison to the in-Basin population

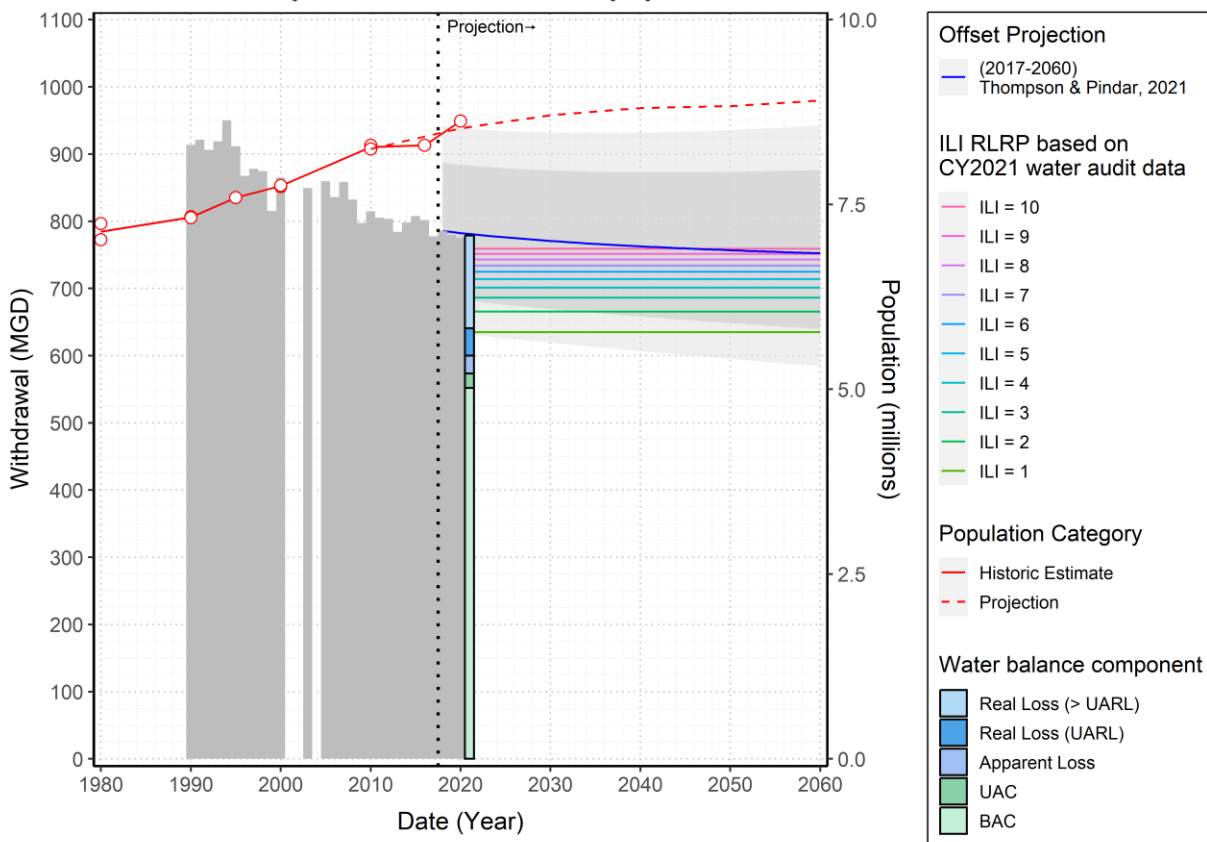


Figure 17. The projections from Thompson & Pindar, 2021 have been offset by about 33 MGD, equal to the error between the model and reported withdrawals in CY 2017. Horizontal lines representing the different levels of possible real loss reduction have been calculated for each ILI (Infrastructure Leakage Index) based on applying the real loss reduction potential (RLRP) to the CY 2021 Volume from Own Sources.

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.

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 **Figures 8** through **14** 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 18**).

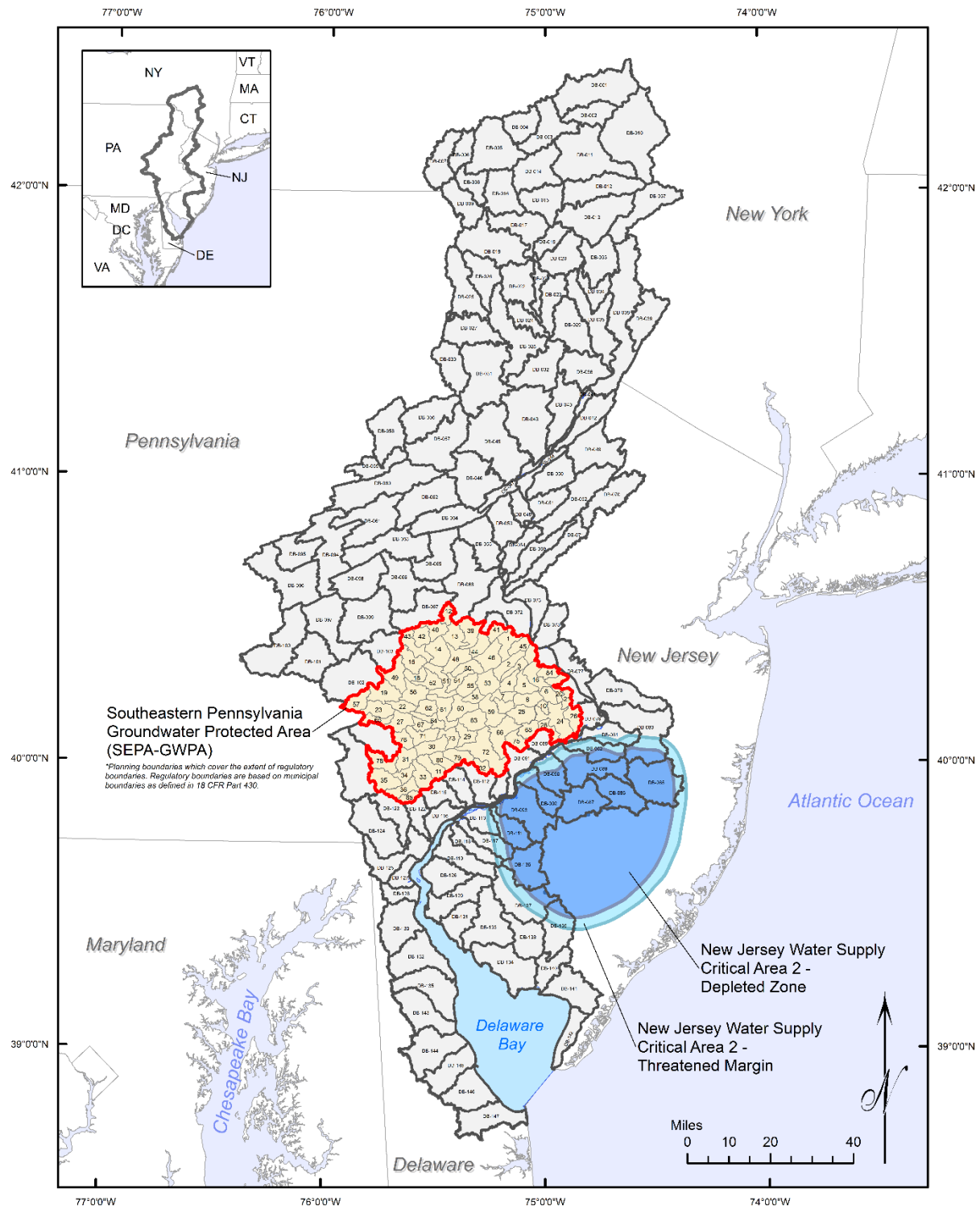


Figure 18. Groundwater Management Areas in the Delaware River Basin.

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 19** ([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 2020 (**Figure 19**). 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 two 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 2020, as presented in **Figure 20**.

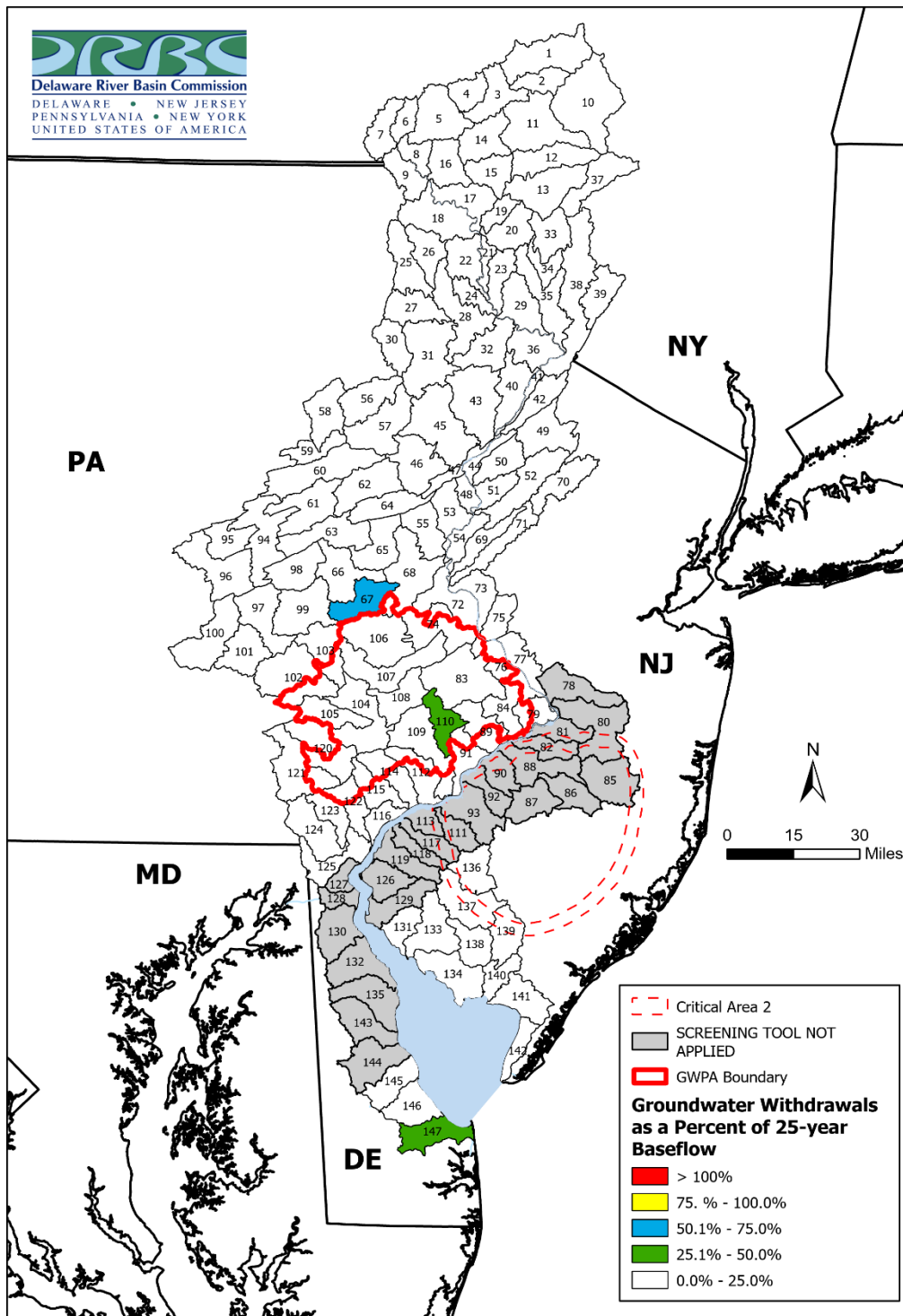


Figure 19. Net groundwater withdrawals basin wide for CY 2020. One (blue) basin is currently between 50.1% and 75% of its 25-year annual baseflow. Greyed out basins denote areas where the Commission’s screening tool was determined to not be a suitable method for analysis based upon geologic conditions.

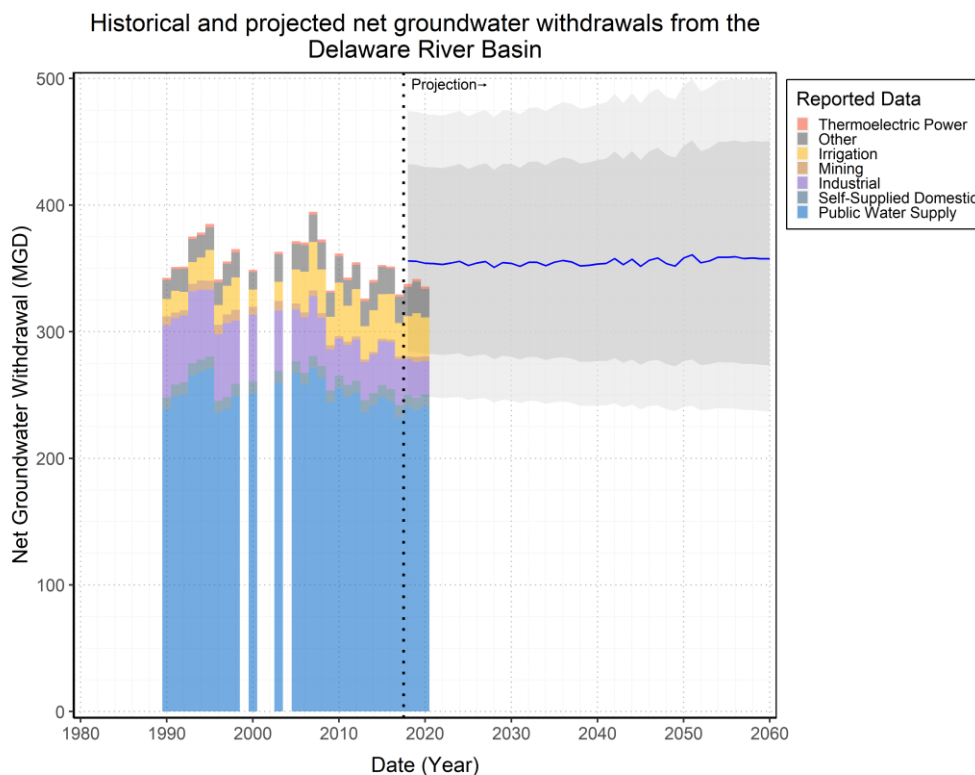


Figure 20. Net groundwater withdrawals from the Delaware River Basin, calculated from the data initially published in [Thompson & Pindar, 2021](#) through 2017. The figure has been amended with complete years of data through 2020.

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 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 21**, 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.

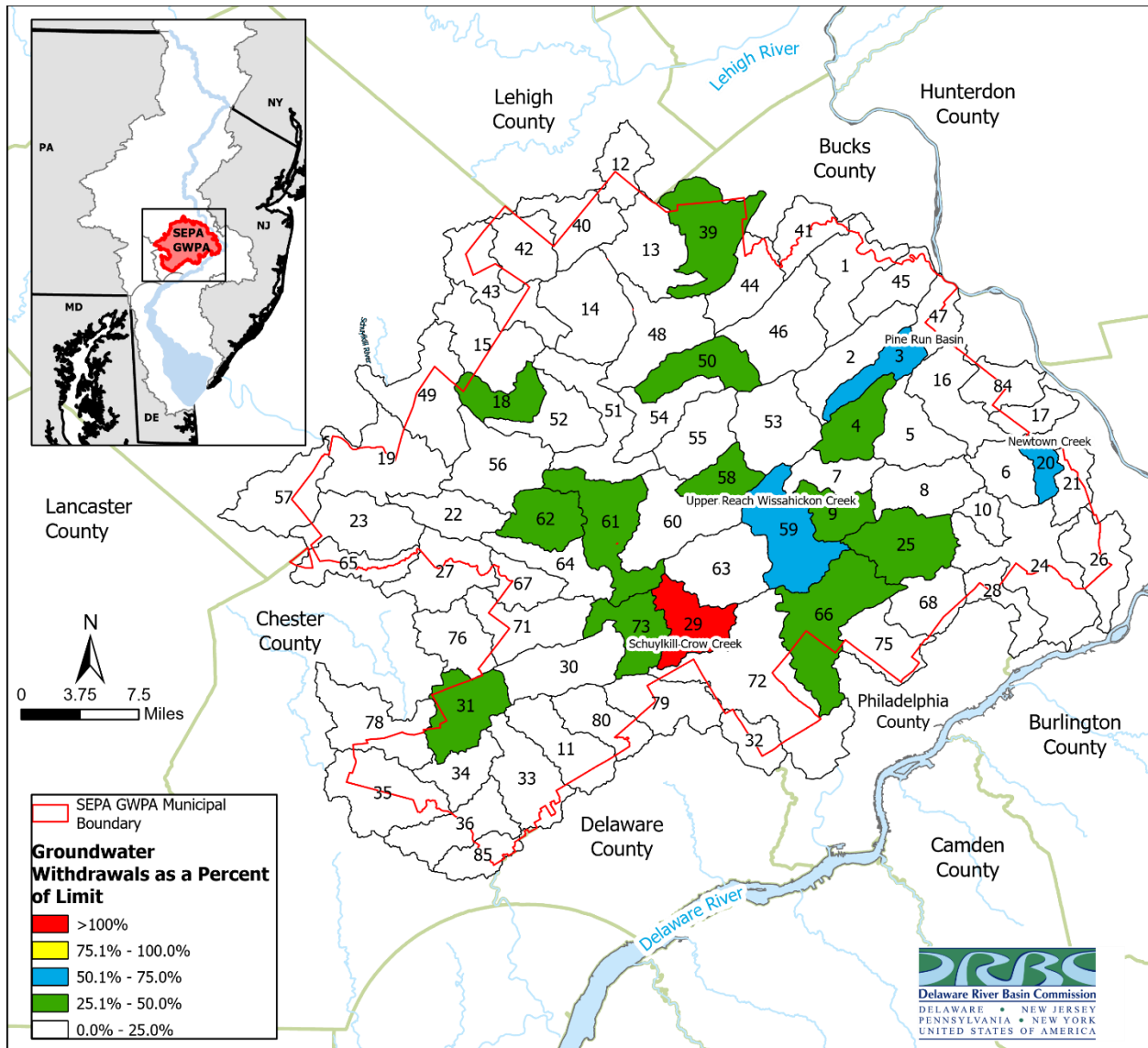


Figure 21. Net groundwater withdrawals in the Southeastern Pennsylvania Groundwater Protected Area for CY 2020. Three (blue) basins are currently between 50.1% and 75% of their annual withdrawal limits and one basin (red) is greater than 100.1% of its withdrawal limit.

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 2020, as presented in **Figure 22**. Over the period from 2000 to 2020, 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).

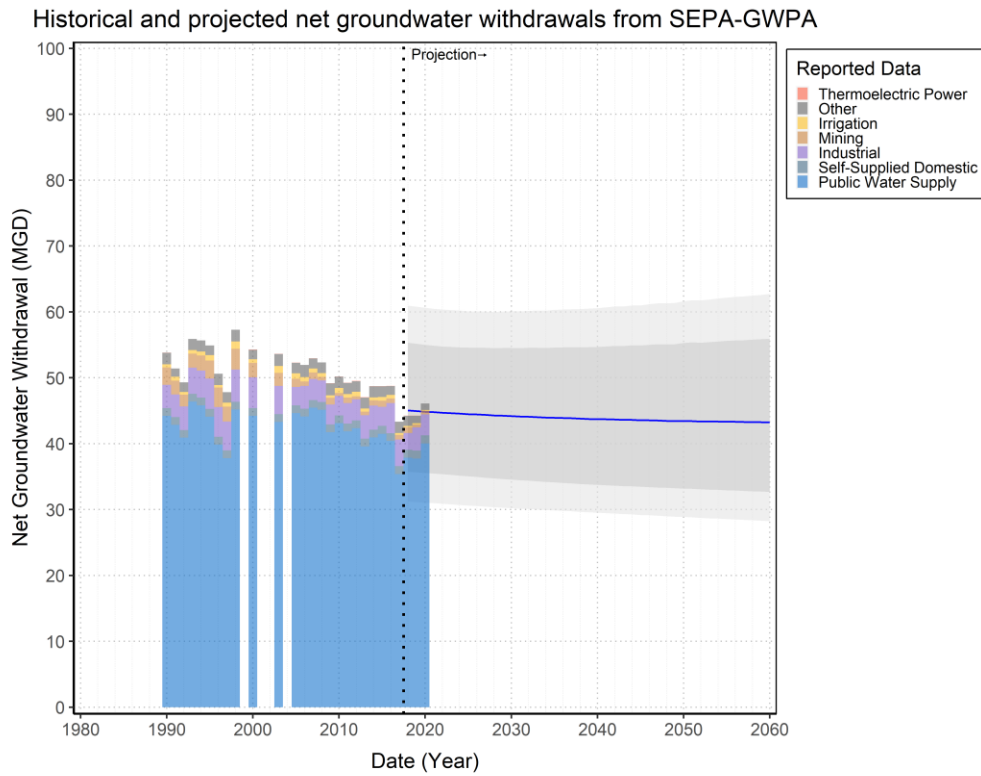


Figure 22. Net groundwater withdrawals from the Southeastern Groundwater Protected Area, calculated from the data initially published in [Thompson & Pindar, 2021](#) through 2017. The figure has been amended with complete years of data through 2020.

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 23A**), resulting in concurrent rebounding of groundwater levels in most monitoring wells (**Figure 23B**).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 23A** 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>

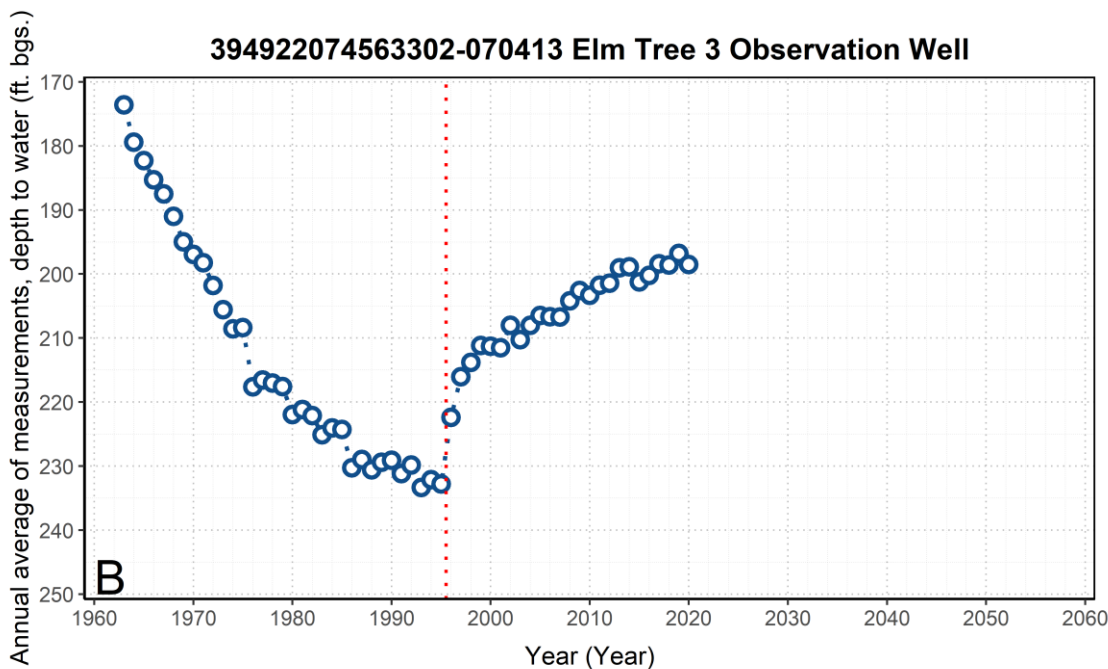
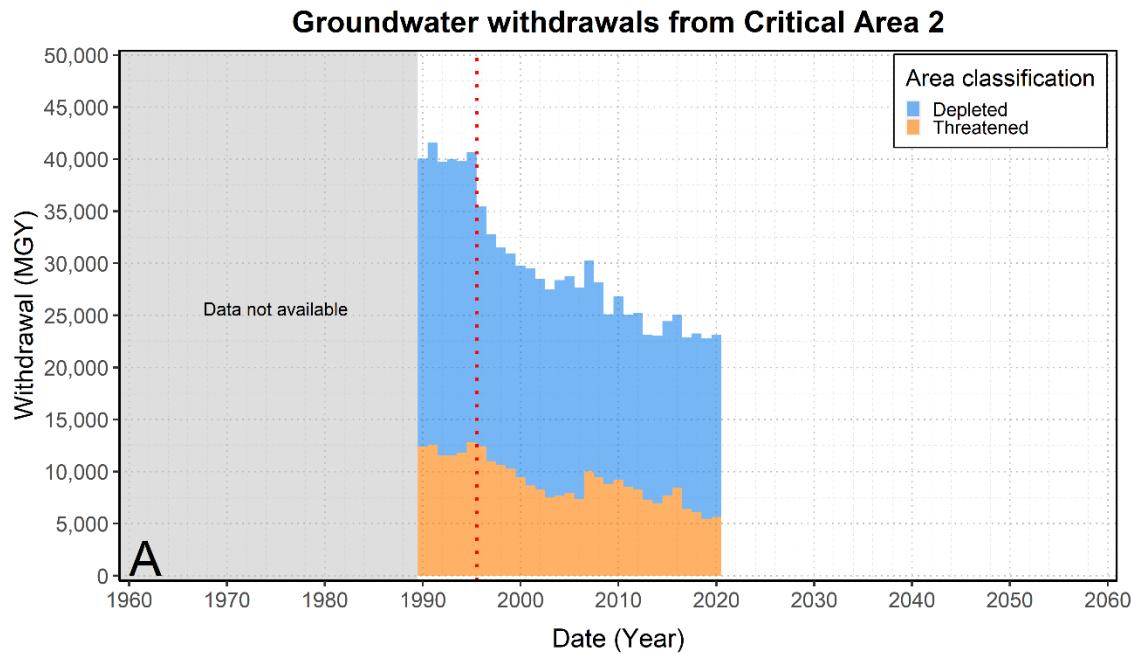


Figure 23 (A). Withdrawals from the PRM from 1990-2020 show significant reductions since the inception of Critical Area 2 management in 1996. Source: I. Snook, NJDEP, February 2023. **(B)** Example of rebounding groundwater levels in the upper PRM of NJ Critical Area 2 since program inception in 1996. 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/aw/Sites.asp?S=394922074563302>)

1.2.6 Areas of Concern: PRM and Bayshore Watersheds

The 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. 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 the Rancocas, Piney Point, Cheswold, Federalsburg, Frederica, and Columbia aquifers of Kent County, Del., have driven state capital funding for a multi-year program in Delaware. The program's goal is to improve groundwater monitoring and includes the collection of detailed, baseline hydrologic information to inform near-term (e.g., 10 year) management options (see **Figure 24**). Monitoring wells were installed and equipped with water level sensors in multiple aquifers at 10 sites, and two rounds of groundwater quality sampling of these wells have been completed. Two USGS stream gaging stations have been re-activated. In 2019 initial results of this effort were published by the Delaware Geological Survey ([DGS, 2019](#)). A focused monitoring effort is underway to study the Columbia aquifer in the east Dover area where increased pumping for irrigation and the City of Dover are causing concerns for increased drawdown and saltwater intrusion. In this area, salinity sensors were installed in 14 wells, five streams, and two groundwater fed irrigation ponds and are providing information on the duration, intensity, and frequency of saline water incursion. The project is a collaborative effort of the DGS, Delaware Department of Natural Resources and Environmental Control (DNREC), the Governor's Water Supply Coordinating Council (WSCC), and the USGS. It provides critical information on salt-water intrusion and groundwater quality conditions, yields, and pumping interactions to improve planning and provide options for managing growing water demand and sea-level rise in this region.

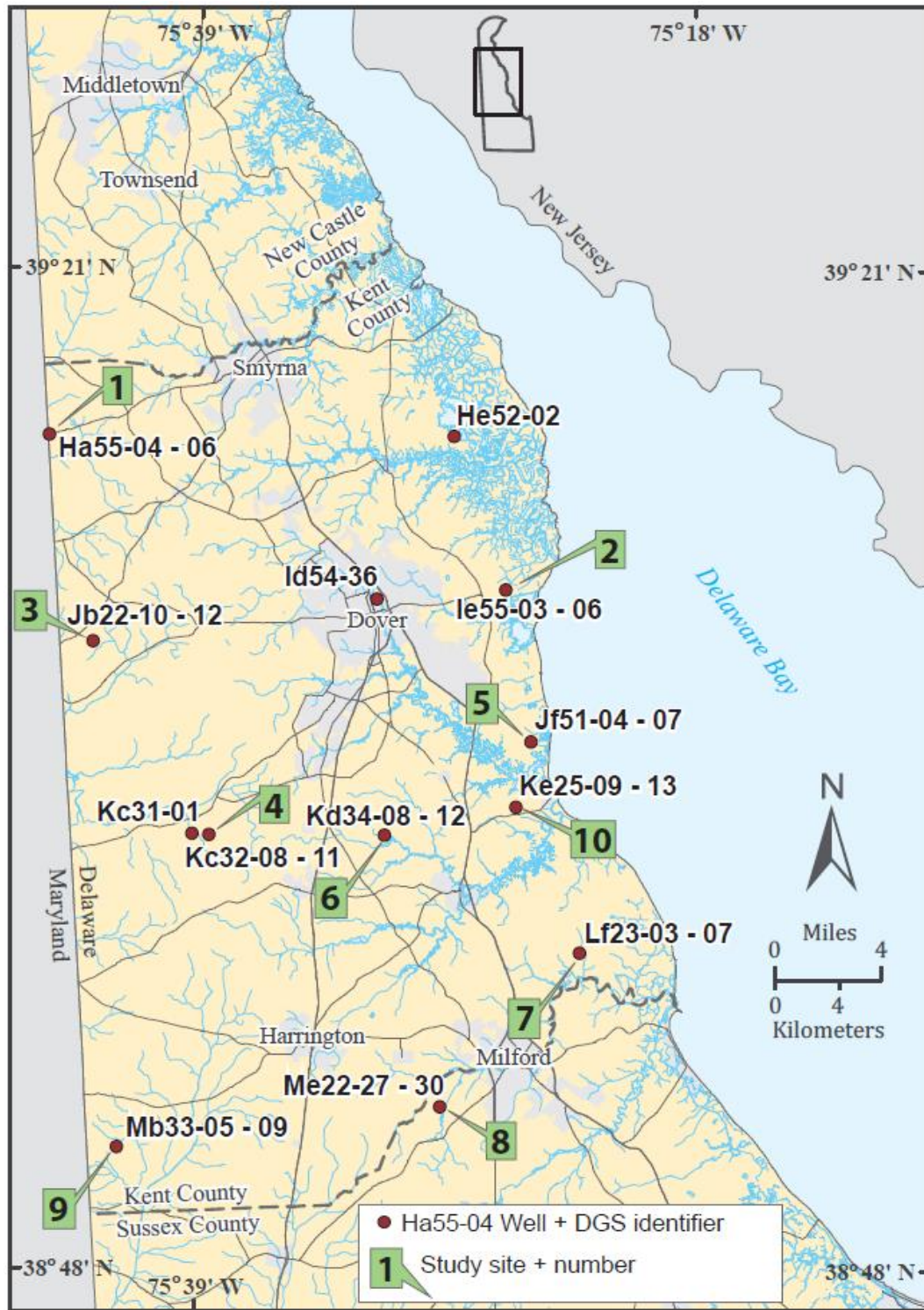


Figure 24. Monitoring sites for Groundwater and Saline Water Intrusion Monitoring Network Infrastructure Improvements: Kent County, Delaware. Source: S. Andres, DGS, Nov. 2019.

1.2.6.2 NEW JERSEY

NJDEP released the New Jersey Water Supply Plan (NJWSP) 2017-2022 in October 2017, which improves the management and protection of the state's water supplies ([NJDEP, 2017](#)). The plan is a critical document which emphasizes the need to balance traditional water use with water resource protection, while outlining a range of policy options to achieve that balance amid an array of competing interests and issues. The 2017-2022 NJWSP differs from preceding plans as it is designed to allow for continuous technical and policy updates, as ongoing water resource evaluations, water use data, and more refined water demand projections become available. Using the NJWaTr Database, which is used to determine water budgets for the 151 HUC11 watersheds existing throughout New Jersey and to evaluate confined aquifer and surface water reservoir diversion rates, the state's future water supply planning efforts will be streamlined. In coordination with the extensive surface water, groundwater and drought monitoring systems and assessment tools, water supply planning at this scale represents significant advancements from those provided in previous frameworks. 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. Additionally, the agreement called for a study to be conducted to evaluate the further increase in the diversion during drought. This diversion plays a critical role in meeting New Jersey's current and future water supply needs, while enhancing water system resiliency in the Central, Coastal North, and Northeast drought regions of New Jersey. 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 and completed in the Cohansey Aquifer, NJDEP reduced allowable withdrawal rates in the well and initiated an investigation into the saltwater intrusion in the area. Recent hydrogeologic and water quality data suggest eastward migration of salty water from the Delaware Bay towards pumping centers, thus threatening the ability of those wells to meet demands. A slight increase in chloride concentrations over time was noticed in two other production wells located in the vicinity of the abovementioned 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 (e.g., Piney Point, Mt. Laurel-Wenonah) or by water quality problems (e.g., salt water in the Mt. Laurel-Wenonah). 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.

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 also 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. Potential changes in in-Basin withdrawal demands, consumptive uses, flow objectives, climate change hydrology, and sea level rise are currently being evaluated to assess future water availability and resiliency.

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 is 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, the Commission's Water Code relies upon storage in numerous reservoirs to meet the Trenton Equivalent Flow Objective. 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

⁵ <http://cida.usgs.gov/ngwmn/>

storage if the DRBC determines that additional storage is needed in the future. Commission staff will work with the Commissioners to determine appropriate next steps related to that study.

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 the following studies as outlined in [Resolution 2017-4](#)⁸ and [Resolution for the Minutes dated September 10, 2020](#)⁹.

- Fish studies to determine the DO requirements of aquatic species as well as the spatial and temporal distribution of fish communities.
- Development and calibration of a 3D eutrophication model of the tidal river and estuary in close coordination with a panel of nationally recognized experts.
- Application of the eutrophication model to relate nutrient loads to DO targets, and to prepare scenarios to evaluate the attainability of various DO conditions and aquatic life uses.
- Application of the eutrophication model to determine load and waste load allocations necessary to achieve attainable aquatic life uses.
- Evaluation of costs to achieve various levels of nutrient reductions through enhanced wastewater treatment.
- Technical and socioeconomic evaluations of upgrading designated aquatic life uses in the portion of the estuary currently designated for fish maintenance only.

These studies involved extensive monitoring and modeling efforts conducted over a six-year period with the technical direction of a Model Expert Panel composed of internationally renowned engineers and scientists. The following [draft reports](#)¹⁰ document the results of the studies performed pursuant to Resolution 2017-4.

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

¹⁰ https://www.nj.gov/drbc/about/advisory/WQAC_index.html#AA

- [*Analysis of Attainability: Improving Dissolved Oxygen and Aquatic Life Uses in the Delaware River Estuary*](#) (DRAFT; September 2022; pdf)
- [*Modeling Eutrophication Processes in the Delaware Estuary: Three-Dimensional Water Quality Model*](#) (DRAFT; September 2022; pdf) & [*Appendices A-H*](#) (DRAFT; September 2022; zip)
- [*Modeling Eutrophication Processes in the Delaware River Estuary: Three-Dimensional Hydrodynamics Model*](#) (DRAFT; December 2021) & [*Appendices A-N*](#) (DRAFT; December 2021; zip)
- [*Social and Economic Factors Affecting the Attainment of Aquatic Life Uses in the Delaware River Estuary*](#) (DRAFT; September 2022; pdf)
- [*Linking Aquatic Life Uses with Dissolved Oxygen Conditions in the Delaware River Estuary*](#) (DRAFT; November 2022; pdf)
- [*Nitrogen Reduction Cost Estimation Study: Final Summary Report*](#) (submitted to the DRBC by Kleinfelder, Inc.; January 2021; pdf)

The results of these studies demonstrate that support for fish propagation is an attainable goal throughout the Estuary.

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, in 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 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](#)¹¹ 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 initiate rulemaking as appropriate.

1.3.2 Surface Water Quality Assessment

Two major water quality assessments describe the water quality of the Delaware River Basin: the [2019 State of the Basin](#) and the [2022 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 \(TREB\)](#)¹².

Table 1. Comparison of Water Quality Assessment Reports

| Comparison | 2019 State of the Basin | 2022 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 |

¹¹ <https://www.federalregister.gov/documents/2023/12/21/2023-27758/water-quality-standards-to-protect-aquatic-life-in-the-delaware-river>

¹² <https://delawareestuary.org/data-and-reports/state-of-the-estuary-report-2/>

1.3.3 State of the Basin 2019: Water Quality

The Water Quality chapter of the State of the Basin 2019 report provides an assessment of water quality indicators for the entire Basin, with special emphasis on the estuary. The State of the Basin differs from, and complements, the 2022 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 2019](#)¹³ is available on the DRBC website ([DRBC, 2019b](#)). The State of the Basin report is published approximately every five years, and the next update will be performed in CY 2024.

1.3.4 2022 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 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 25**). Assessments to determine support of the designated uses of the Delaware River are reported in the [2022 Delaware River and Bay Water Quality Assessment](#)¹⁴ ([DRBC, 2022b](#)). The water quality conditions presented below are based upon the results of the 2022 Water Quality Assessment. The Water Quality Assessment report is published every two years, and the next update will be performed in CY 2024 for publishing in FY 2025.

¹³ https://www.nj.gov/drbc/library/documents/SOTBreport_july2019.pdf

¹⁴ <https://www.nj.gov/drbc/library/documents/WQAssessmentReport2022.pdf>

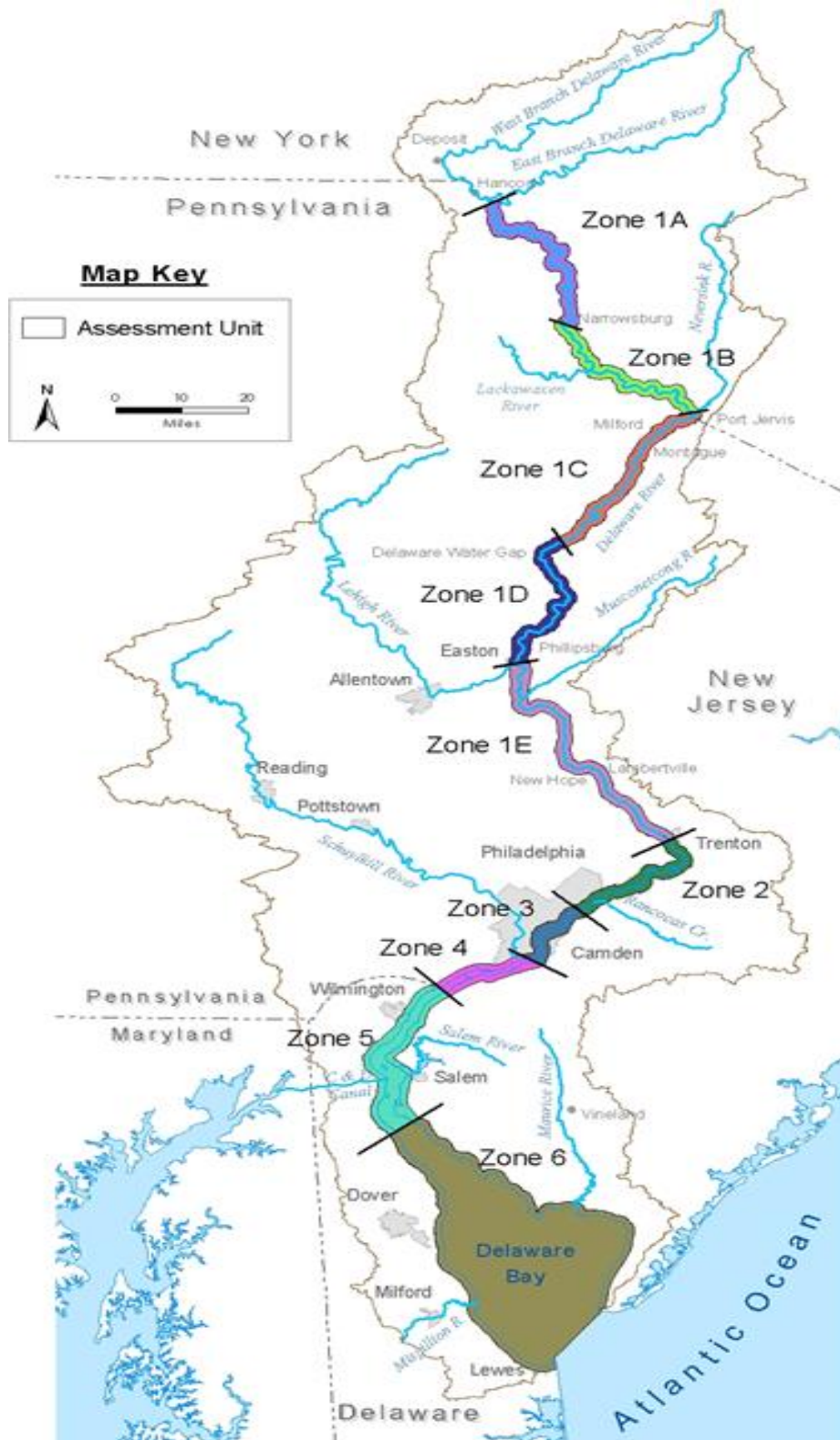


Figure 25. DRBC Water Quality Zones for the Delaware River mainstem.

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.
- **Turbidity.** The majority of observations met criteria for turbidity in all Zones except Zone 6, which fell just below the 99% threshold for meeting criteria.
- **Temperature.** There are no ambient temperature criteria in Zones 1A through 1E; therefore, we assessed temperature data against applicable Pa. and N.J. criteria in Zone 1. Water temperature data consistently met New Jersey's freshwater non-trout criteria throughout Zone 1. When assessed using Pennsylvania's warmwater fishery criteria, water temperature data met criteria between 91-97% of the time depending on the assessment zone. Excursion frequency increased in downstream zones. 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.** Exceedances of freshwater chronic objectives were observed for copper in Zone 1. Assessment is complicated by factors such as: field sampling and analytical issues with contamination, a need to assess revisions to current criteria, and the influence of other water quality attributes that influence the partitioning and toxicity of copper. 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 over multiple years. With enhanced monitoring in 2017, the chronic criterion was exceeded in Zones 2, 3 4, and 5, and the acute criterion was exceeded in Zones 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 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 Water Quality Assessment. More specifically, DRBC Enhanced Bacteria Monitoring data were included in the 2022 Assessment. 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.

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](#)¹⁵ 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. Overall, both existing DRBC secondary contact and

¹⁵ https://www.nj.gov/drbc/library/documents/WQAC/120320/Yagecic_Review2020BacteriaData.pdf

EPA nationally recommended primary contact criteria were not met in Zones 3 and upper Zone 4. However, 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.

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](#)¹⁶
- [Fish Health Advisories - NYS Dept. of Environmental Conservation](#)¹⁷
- [Fish Consumption Advisories \(pa.gov\)](#)¹⁸
- [Fish Consumption Advisories - DNREC Alpha \(delaware.gov\)](#)¹⁹

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 developed by DRBC and established by the EPA in 2003 and 2006, as well as attenuation through removal, sequestration, and

¹⁶ <https://njdep.maps.arcgis.com/apps/MapJournal/index.html?appid=922dff1885394cf19ccf1d9c8d52b4f0&webmap=3bac9ba1ee0a49b6b3e4a11a78fd2fb6#map>

¹⁷ <https://www.dec.ny.gov/outdoor/7736.html>

¹⁸ <https://www.dep.pa.gov/Business/Water/CleanWater/WaterQuality/FishConsumptionAdvisory/Pages/default.aspx>

¹⁹ <https://dnrec.alpha.delaware.gov/fish-wildlife/fishing/consumption-advisories/>

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 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 2022 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 2022 assessment, 617 mi² are in full support (89% of Zone 6), 11 mi² are supporting with special conditions (2%), and 61mi² are not supporting the shellfish consumption use (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). Three major advancements have been achieved in the Special Protection Waters program:

- The Lower Delaware Measurable Change Assessment 2009-2011 ([DRBC, 2016a](#)) was completed. This was DRBC's first assessment of measurable change since site-specific existing water quality (EWQ) targets were established in DRBC rules. Methods for determination of measurable change were successfully applied, showing that water quality has not degraded and, in many cases, has improved. 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 cause for the increase in chlorides and specific conductance is believed to be winter road salting. DRBC initiated a chloride monitoring project between 2021-2023 within the Lower Delaware reach to investigate areas where these exceedances occurred and identify factors that may lead to potential degradation as well as factors that may lead to improvements. 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](#)²⁰.
- 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 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

²⁰ <http://drbc.maps.arcgis.com/apps/MapSeries/index.html?appid=e63f5f1320794666a7def165ff9ae0e4>

Change (NMC) evaluations of new or expanding wastewater facilities in DRBC's permitting process.

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 26** 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% |

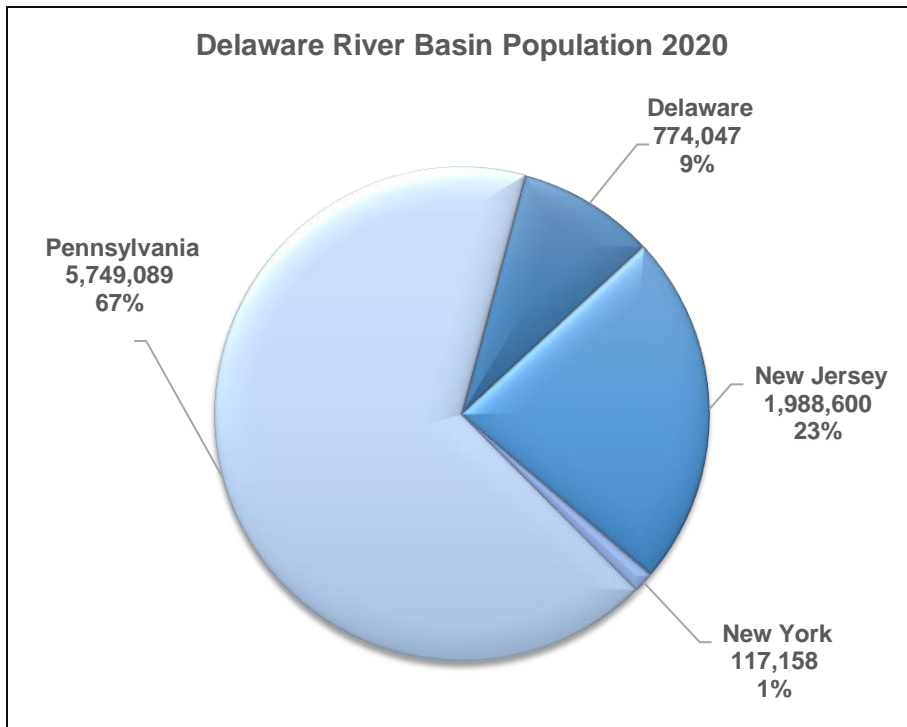


Figure 26. Basin Population 2020. Pennsylvania accounts for approximately two-thirds of the basin's population. (Note: Based on the 2016 analysis described in Section 1.2.1, an additional 5 million people outside of the basin who rely on basin water supplies are not included on this chart.)

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 from 2010 to 2020 Based on U.S. Census Data

| 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 from 2010 to 2020 Based on U.S. Census Data

| 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 27** 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.

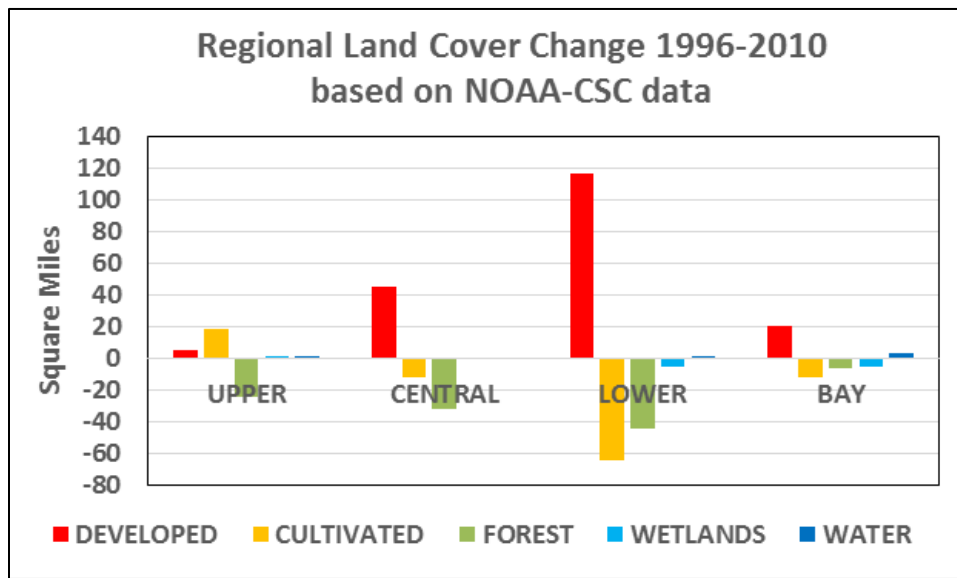


Figure 27. Regional Net Change in Land Cover 1996-2010 illustrates the magnitude of change and the net gains/ losses in land cover in the four basin regions. Forest loss was experienced across the basin. Based on analysis of satellite imagery from NOAA Coastal Services Center.

Figure 28 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.

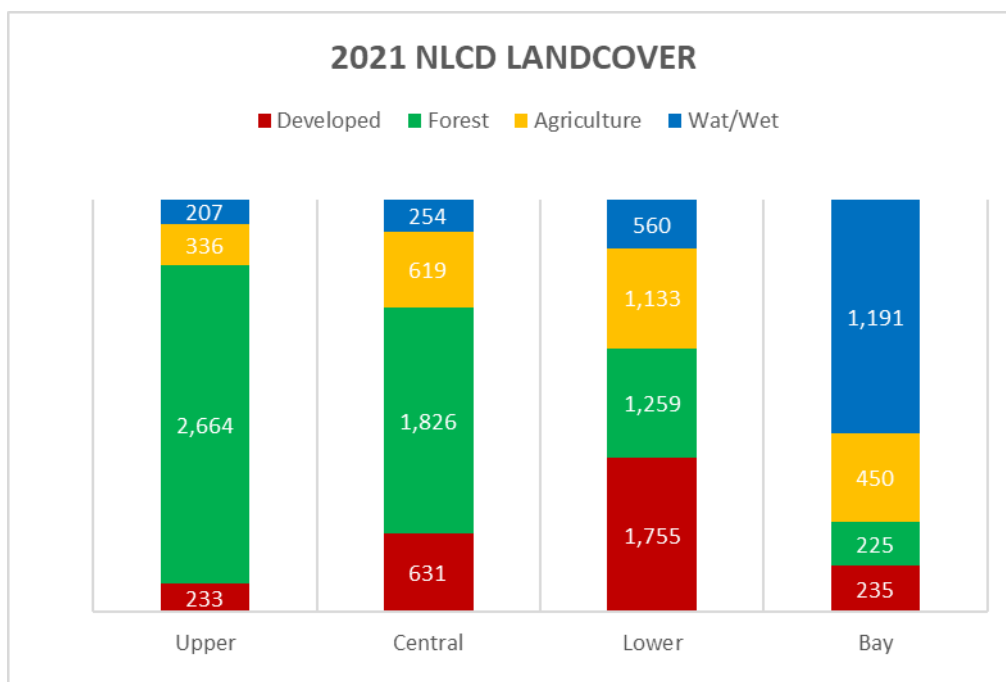


Figure 28. Regional summary of land cover areas (in square miles) based on analysis of satellite imagery from USGS NLCD. Total Basin area is 13,579 square miles.

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 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 repellent 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 drinking water wells in 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 proposed EPA limits. The fourth basin state, Delaware, was developing PFAS drinking water standards but paused those efforts when the EPA proposed drinking water regulations.

The four states within the Delaware River drainage basin have initiatives to manage PFAS exposure. Available data for surface water show PFAS levels are below current EPA and Basin state human health advisory levels in segments of the Delaware River designated as drinking water sources. However, PFAS levels observed in fish indicate that further evaluation of risk to human health and wildlife is warranted in the Delaware River. One specific PFAS compound, Perfluorooctane sulfonic acid (PFOS), has also been detected in fish tissue at levels that triggered 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](#)²¹ 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**).

1.5.5 Increasing Chloride Trends

Freshwater instream monitoring has shown an upward trend in chloride concentrations of the non-tidal Delaware River. This is a trend common to areas of the U.S. with significant roadway de-icing activity. While concentrations are still below criteria for drinking water and aquatic life use, the trend is of concern. [Studies](#)²² in New York, Maryland, and Vermont indicated that chloride concentrations in winter could increase as much as a hundred-fold over summertime levels in unimpacted forest streams; and mean annual levels increase as a function of impervious surface, sometimes exceeding tolerance for freshwater life in suburban and urban streams ([Kaushal, 2005](#)). Additional monitoring and investigation into sources, mitigation measures, and de-icing alternatives to salt and brine are needed. DRBC completed a two-year data collection effort to study chlorides, TDS, and other major ion concentrations in the lower non-tidal Delaware

²¹ <http://www.nj.gov/drbc/programs/quality/cecs.html>

²² <http://www.pnas.org/content/102/38/13517.long>

River watershed. Using Classification and Regression Tree Analysis (CART), chloride concentrations will be estimated for the current period based on 2000-2018 data and will be compared against observed data collected between 2021-2023. The second phase of this project includes a track-down and outreach portion to highlight areas of concern, troubleshoot probable causes of degradation, educate the public about the issue, and collaborate with partner agencies and relevant stakeholders to formulate actionable mitigation measures. A comprehensive report summarizing the 2021-2023 data is currently in progress and will serve as the foundation for the second phase of the project. This report will provide comparisons of current (2021-2023) chloride and conductivity to baseline levels, ranking of tributary locations to identify potential hot spots for further investigation, and a detailed list of actionable recommendations aimed at addressing the observed increasing chloride trends.

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 was 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](#)).

1.5.7 Cyanobacteria

During summer 2019, cyanobacteria blooms were noted in several impoundments draining to tributaries, 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](#)²³, hosted by PADEP. The NJDEP also has extensive [guidance](#)²⁴ on this topic at their website. Under its Water Pollution Control (Clean Water Act Section 106) grant, DRBC conducted cyanotoxins monitoring in both 2022 and 2023 on the mainstem Delaware River to screen for a number of cyanotoxins (microcystin, cylindrospermopsin, and anatoxin-a). The monitoring employs a passive sampling technique known as Solid Phase Adsorption Toxins Tracking (SPATT),

²³ www.dep.pa.gov/HABs

²⁴ <https://www.state.nj.us/dep/hab/>

involving the deployment of resin-filled mesh bags for a specified duration to capture toxins present in the water. Following deployment, the SPATT bags were extracted and analyzed by Delaware Department of Natural Resources and Environmental Control (DNREC) to quantify the toxins adsorbed. In 2024, DRBC plans to deploy SPATT bag samplers downstream of known HABs, when possible, and to collect concurrent water grab samples to analyze microcystins congeners, as they differ in levels of toxicity.

1.5.8 Tracking 1,4-Dioxane

1,4-Dioxane is a synthetic industrial chemical. It is one of the most mobile organic contaminants because of its low absorption potential and miscibility. It was classified as a likely human carcinogen in 2017. 1,4-Dioxane is a likely contaminant at many sites contaminated with certain chlorinated solvents (particularly 1,1,1-trichloroethane [TCA]) because of its widespread use as a stabilizer for chlorinated solvents. 1,4-Dioxane is released into the environment from wastewater discharges, unintended spills, leaks, historical disposal practices of solvents, and unregulated manufacturing waste streams. (EPA and Interstate Technology & Regulatory Council [ITRC]).

NJDEP convened a multi-organization 1,4-dioxane working group with several sub-groups including a monitoring and track down group. DRBC contributed to and participated in this group, including the Monitoring and Trackdown sub-group, which suspended operation in 2023 as a result of no new quantifiable concentrations of 1,4-dioxane in the Delaware Estuary.

Recent monitoring performed by DRBC identified a wastewater treatment facility as a source of 1,4-dioxane to the Lehigh River. DRBC and PADEP coordinated with the wastewater treatment facility which discontinued acceptance of the industrial waste contributing to the elevated 1,4-dioxane levels. Confirmatory DRBC monitoring in the Lehigh and Delaware Rivers and Delaware Estuary suggests current concentrations are very low to non-detect. In 2023, DRBC monitored 1,4-dioxane during six (6) Delaware Estuary Water Quality Monitoring events at 22 stations. All results were non-detect.

1.6 CHANGING CLIMATE

Climate change refers to fluctuations in the Earth's climate over a long time. 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 meeting 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 how factors contributing to these events, such as temperature and precipitation, have changed and to estimate how they may change water availability in the future.

Observed historic data were used to evaluate trends and changes in air temperature, streamflow, precipitation, and sea level in the Basin. 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 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

Atmospheric temperature is a critical climate change indicator. It affects 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.

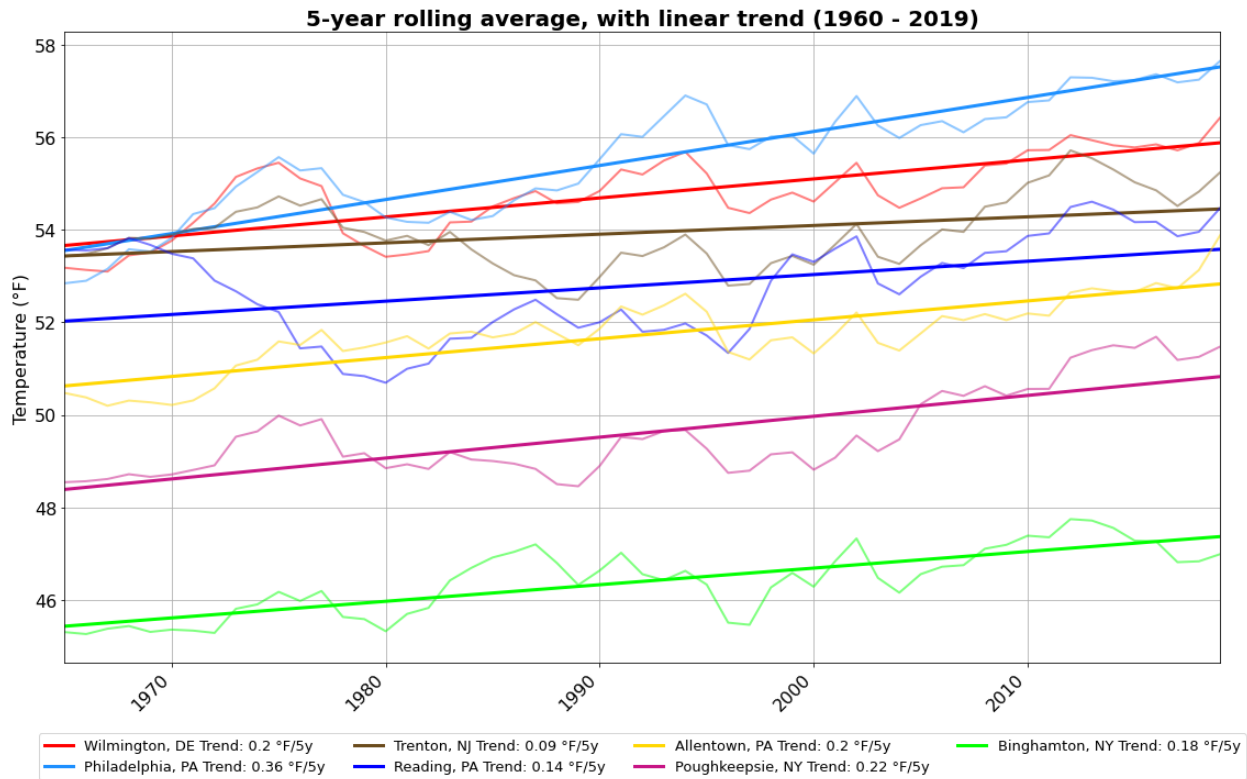


Figure 29. Five-Year moving average of annual temperature at seven weather stations in or near the Delaware River Basin. A five-year moving average is used to show the trend in climate by “dampening” the interannual variability of weather patterns.

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. Error! Reference source not found. **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 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.

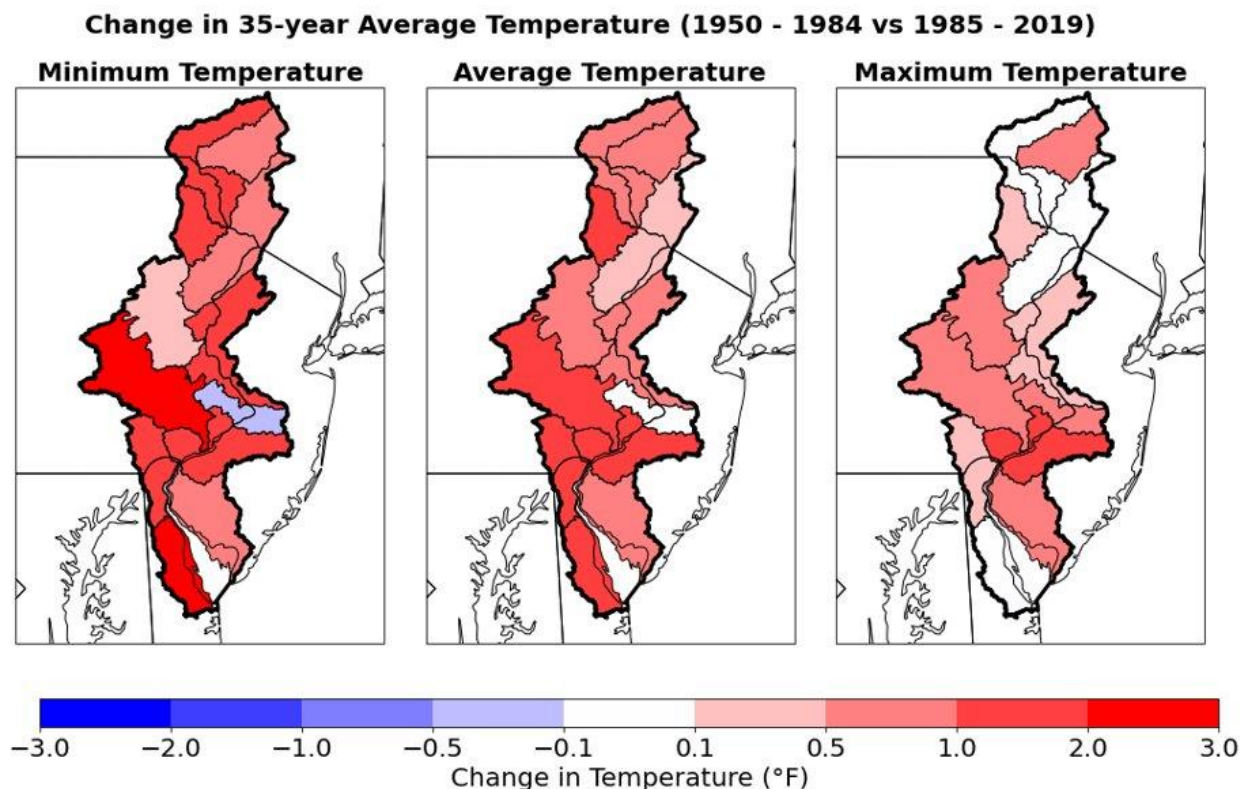


Figure 30. Average Change in Minimum, Average and Maximum Daily Temperatures between 1950-1984 versus 1985-2019. Observed data from 360 weather stations were used to generate a complete time-series and then spatially distributed for the analysis. Regions are based on watershed delineations of a river, 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 the majority of 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, May) has decreased slightly in the middle Basin and mostly increased in the lower Basin.

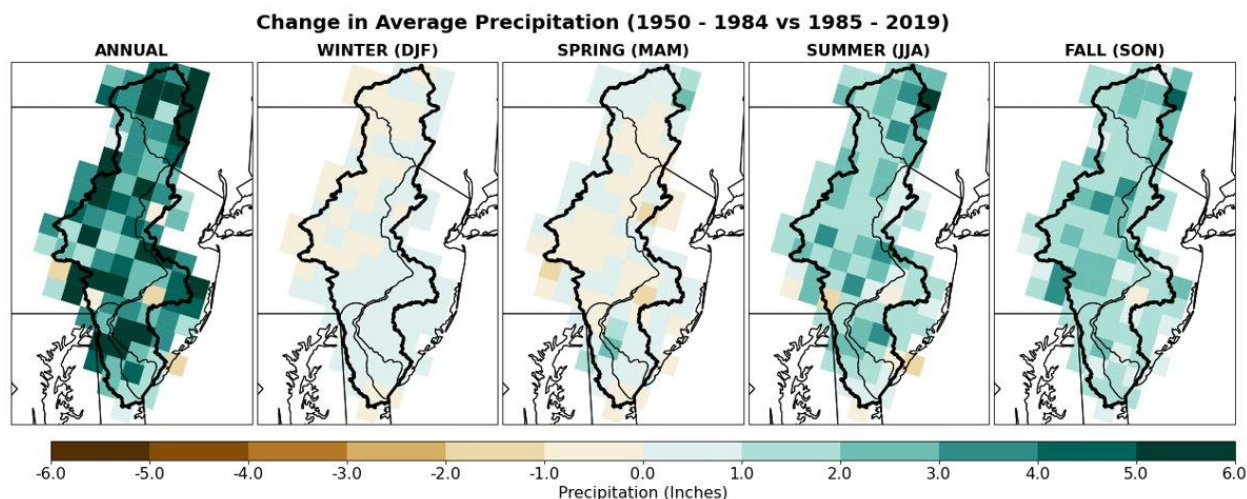


Figure 31. Change in Average Annual Precipitation between 1950-1984 v 1985 – 2019. Observed data from 360 weather stations were used to develop a continuous spatially distributed precipitation record for comparison. The average annual precipitation has increased from 1950-1984 to 1985-2019. However,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

1.6.3 Streamflow

Streamflows are 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.

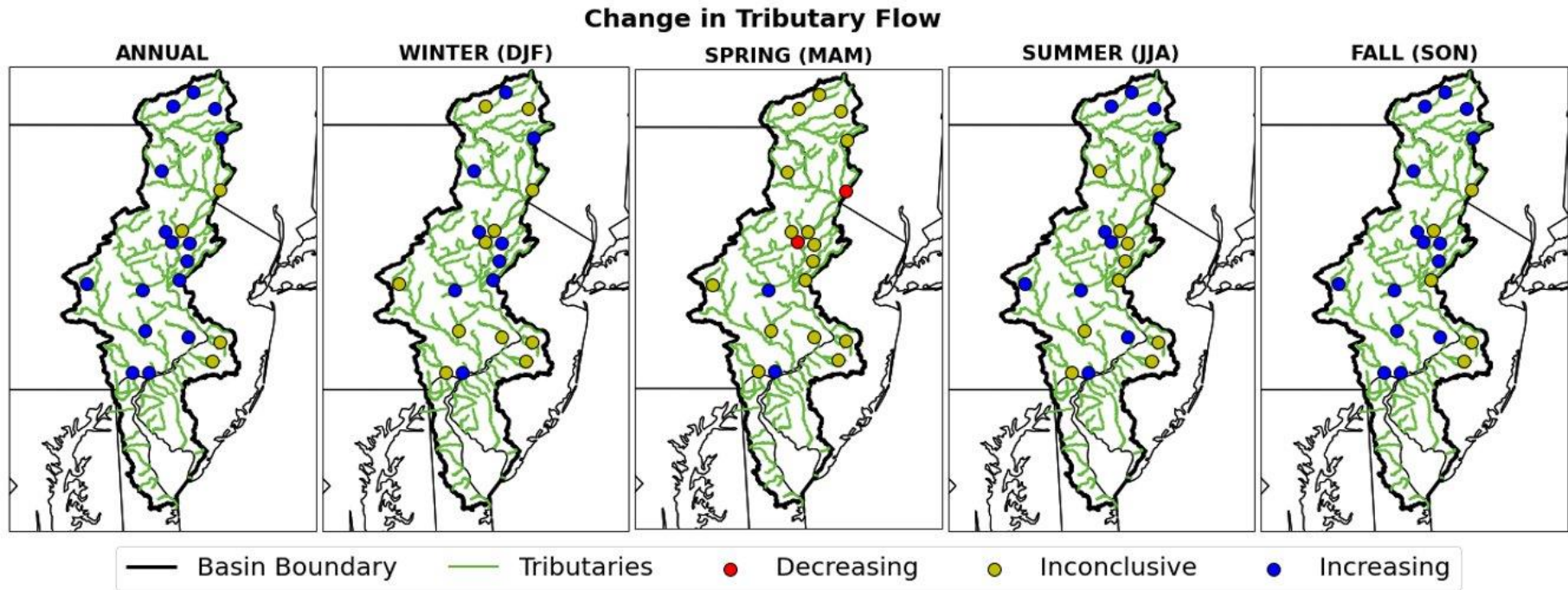


Figure 32. Trends in average total flow and average seasonal flow. Blue dots indicate a gage location with an increasing trend in flow. Yellow dots indicate an inconclusive trend. Red dots indicate a decreasing trend. In general, the increasing and decreasing trends were weak. DJF is December, January,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

1.6.4 Sea Level Rise

Along with changes in climate, 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 a time-series of measured sea level at Lewes, Del., and Philadelphia, Pa., which show rates of SLR of 3.61 mm/yr and 3.06 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.

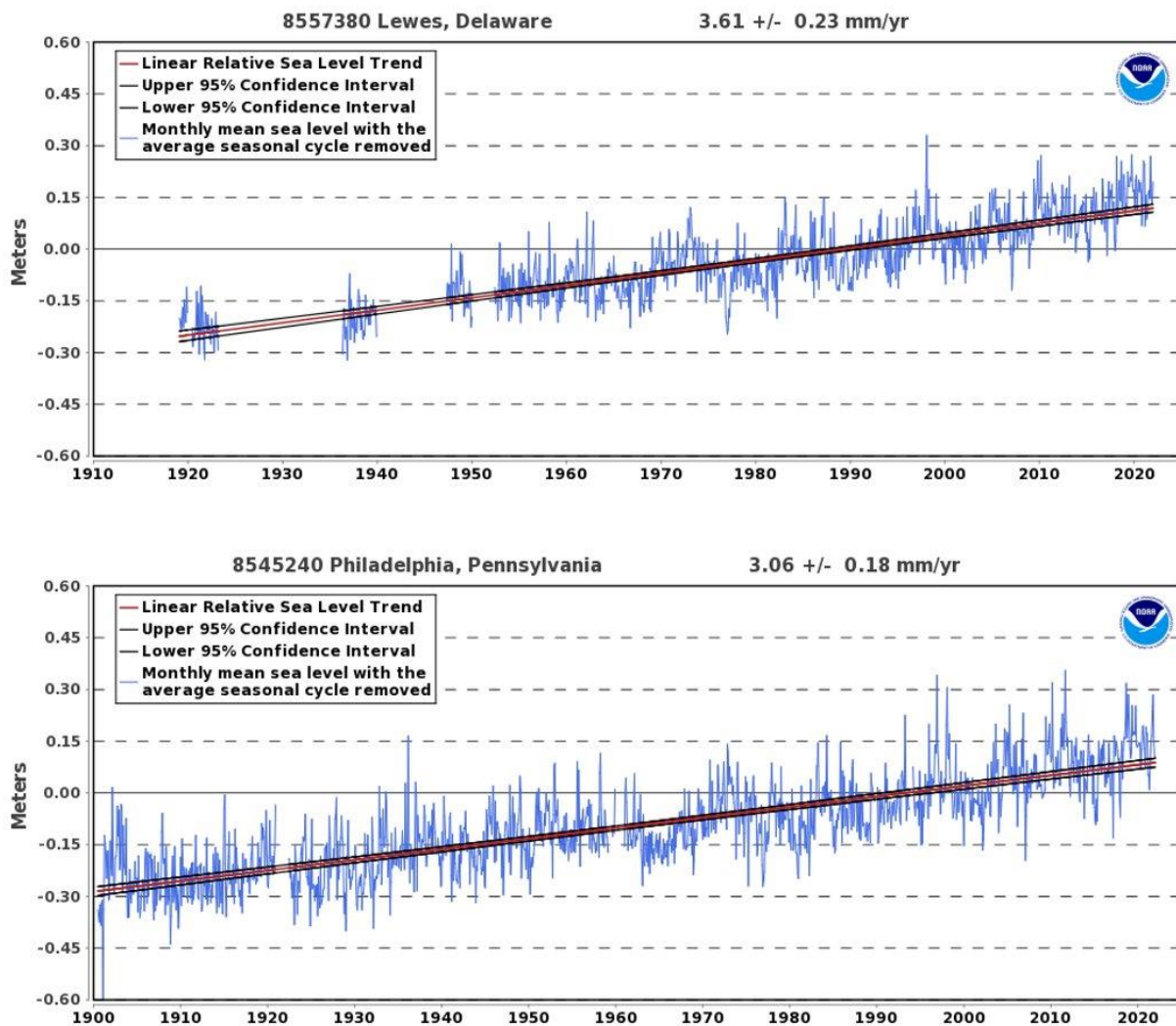


Figure 33. Rates in Sea Level Rise at Lewes, DE and Philadelphia, PA. Source: NOAA

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 a 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 water for conventional treatment for many 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 Resiliency and Adaptation

Predicted future climate change impacts for the Delaware River Basin, as being studied by the Commission in the context of water resource management, are anticipated to include increased temperature, changes in precipitation, 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](#)²⁵ approved pursuant to Section 3.8 of the Compact between January 1, 2023, and December 31, 2023, but which are not included in the Comprehensive Plan or Water Resources Program is available on the DRBC website.

²⁵ <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 2025-2027 Commission focus areas.
- **Section 2.2: Water Resource Management Work Program** summarizes the activities and programs constituting the Commission’s work plan for FY 2025-2027, organized by the five Key Result Areas of the [Basin Plan 2004](#)²⁶.

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 2025-2027 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 develop recommended “next steps” to the 2023 Storage Study.

²⁶ https://www.nj.gov/drbc/library/documents/BasinPlan_Sept04.pdf

- 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 climate change on macro-scale water resource management and define avenues of investigation for adaptation 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 during EPA's aquatic life use and DO criteria rulemaking process 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 program (monitoring, assessment, and modeling), supported in part by EPA Section 106 grant, in the Special Protection Waters (SPW) and 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.
- Update and/or extend existing HEC-RAS and REF-DSS models for use in water quality and habitat assessments of the non-tidal Delaware River and selected tributaries.
- Perform enhancements to 3D eutrophication model for ongoing water quality studies.
- Initiate discussion on alternative no measurable change (NMC) allocation methods for watersheds draining into Special Protection Waters.
- 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.

- Monitor and report on the location of the salt front.
3. Regulatory Review
 - Review applications and issue dockets/permits for projects under DRBC lead.
 - Develop/update and implement the One Process / One Permit Program and associated administrative agreements (AAs) for collaborative permitting and technical coordination of state NPDES permits and water withdrawals.
 - Enforce conditions of dockets/permits through compliance program.
 4. Continue to implement the Diversity, Equity, Inclusion, Justice, and Belonging strategic plan.
 5. Develop a plan of prioritized DRBC actions – a Climate Action Plan – for evaluating the impacts of climate change on water resources of the Basin.
 6. Develop a plan and priorities for updating the Commission’s Comprehensive Plan.
 7. Perform five-year update of the State of the Basin report.
 8. 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 and equitable opportunities for public input from interested or affected parties, including underserved communities.
 - Develop a written 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.
 9. 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.

2.1.2 Diversity, Equity, Inclusion, Justice and Belonging

While the DRBC is charged with managing, protecting, and improving the water resources of the Delaware River Basin, the Commission has always been steadfast in its commitment to the following core values:

- Service: to the public, the regulated community and our DRBC colleagues.

- Respect: for each other, the public and the Basin’s water resources.
- Professionalism: defined by high ethical standards, integrity, continuous improvement, and accountability.
- Diversity and inclusion: promoted both as an employer and as a public agency (added FY 2022).

The DRBC is committed to applying these core values to meet the vital goals of Diversity, Equity, Inclusion, Justice and Belonging (DEIJB) and to ensure that DEIJB best practices are fully incorporated into the work of all five of its functional branches: Directorate, Finance and Administration, External Affairs and Communications, Water Resource Management, and Science and Water Quality Management. The DRBC’s commitment to DEIJB is essential to its mission, and the Commission strives to ensure that our Basin community is one of respect, inclusion, and equality.

In 2023, DRBC completed its first [DEIJB Strategic Plan](#)²⁷. The Commission sought to identify policy and practices which support DEIJB goals, as well as processes and an organizational culture effectively incorporating DEIJB principles. The plan lays out four strategic goals, and with each goal, key strategic objectives and recommended actions, which DRBC will work to begin implementing:

- Our Water Resources: All communities share in the benefits and stewardship of the Basin’s water resources.
 - Provide and support access to clean water resources for all communities.
 - Provide and support resiliency in response to floods, drought, and water-related climate risks for all communities.
- Our Regulated Community: Equitable and just regulatory policies, processes and programs.
 - Promote and support environmental justice through fair treatment and meaningful involvement by all communities in rulemaking and project review processes.
- Our Publics and Stakeholders: All communities have meaningful opportunities to engage with the DRBC in its mission of managing, protecting, and improving the Basin’s water resources.
 - Enhance participation from diverse stakeholders and underserved communities in plans and programs related to the Basin’s water resources.
 - Strengthen opportunities for diverse stakeholders and underserved communities to participate in DRBC public processes meaningfully.
 - Provide timely and relevant water resource program information through user-friendly and accessible outreach.

²⁷ https://www.nj.gov/drbc/library/documents/DRBC_DEIJB_StrategicPlan.pdf

- Our Employees and Our Workplace: A safe, respectful, inclusive workplace culture supporting a diverse workforce.
 - Utilize inclusive outreach and recruiting processes to identify and provide opportunities for all qualified candidates.
 - Promote staff learning and leadership development designed to increase competencies and skills to promote equitable inclusion and cultivate a workplace culture of belonging.
 - Establish policies to prohibit discrimination and harassment and procedures for reporting and addressing violations.
 - Provide career development opportunities that enable and motivate all employees to apply their unique talents, skills and perspectives to the work of the Commission.
 - Develop a supplier diversity policy or practice.

The DEIJB workgroup developed the plan with input and feedback from internal staff and external stakeholders such as co-regulators, non-governmental organizations, vendors, and legislators and presented the plan to Commissioners in 2023.

In 2023 training, learning and outreach opportunities for staff were implemented including all-staff courses provided by an outside consultant, as well as listening circles convened to hear from several identity groups within DRBC, and individual learning opportunities through LinkedIn and other virtual providers. Additionally, DRBC staff take part in the Coalition for the Delaware River Watershed's (CDRW) workgroup on DEIJ.

More information on the Commission's DEIJB actions can be found on our [website](#)²⁸.

2.1.3 Climate Change

The impacts of climate change are anticipated to present challenges for the management, protection, and improvement of water resources in the Basin. Potential impacts expected in the Basin are 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 and will continue to be on the impacts of sea level rise and climate-induced changes to atmospheric temperature, precipitation, and hydrology on water security, and the resiliency of our water resources for the future to ensure an adequate and equitable supply of suitable quality water for Basin water users and the environment.

Over the period covered by this FY 2025-2027 WRP, DRBC will continue or initiate work on a range of modeling, research, and analytical studies of the impacts of climate change and sea level rise on the Basins' water resources. The goal of this work is to provide scientifically based information to support the Commission's planning and potentially support future policy. Although

²⁸ <https://www.nj.gov/drbc/about/staff/DEIJ.html>

detailed elsewhere in this work plan under their associated KRAs, these tasks are also summarized here:

- Establish assumptions and scenarios to define a range of potential impacts due to sea level rise;
- Incorporate methods to evaluate sea level rise into screening-level flow management models;
- Evaluate historical trends for precipitation, temperature and flow and other water resource indicators from climate change;
- Obtain and analyze downscaled global circulation model output for use in trend analysis and hydrologic models;
- Use hydrologic models to develop flows for a range of scenarios to evaluate the basin's vulnerability to future hydrologic conditions including drought;
- Evaluate alternative flow management programs and outcomes;
- Evaluate groundwater and surface water availability considering the effects of climate change;
- Identify additional freshwater storage and other adaptation measures to meet future water availability, climate adaptation, drought management, and flow management needs;
- Develop tools to evaluate the effects of climate change and sea level rise on aquatic habitat in tidal and non-tidal portions of the Delaware River;
- Develop a framework for evaluating the impacts of climate change on water quality and emerging contaminants;
- Provide technical analysis for Commission planning endeavors;
- Perform a literature review and other assessments related to flooding to incorporate into a comprehensive climate change and sea level rise impact assessment; and
- Share climate science focused on the Delaware River Basin with partners and stakeholders via periodic technical conferences and presentations.

The information being developed by others for use by the Commission in evaluating the impacts of climate change and sea level rise – such as the Intergovernmental Panel on Climate Change (IPCC) scenarios and sea level rise projections – are regularly updated, and more data become available each year from research in the basin. Thus, it is anticipated that the Commission's work and approach on climate change will continue to evolve over time as new information and understanding arise.

In addition to the modeling, research, and analytical studies outline above, the Commission will also work to develop a plan of prioritized DRBC actions – a Climate Action Plan – for evaluating the impacts of climate change on water resources of the Basin and formulating management approaches, including recommended policies and rules, for improving resilience and adaptation to a changing climate. The Climate Action Plan will focus on areas within the jurisdiction of the DRBC and that support the Commission's roles in managing the water resources of the Basin, consistent with its authority under the Compact.

2.1.4 Comprehensive Plan Update

In accordance with Sections 3.2(a) and 13.1 of the Delaware River Basin Compact ([Compact](#)²⁹), 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](#)³⁰. 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 (KRA #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
- 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.

²⁹ <https://www.nj.gov/drbc/library/documents/compact.pdf>

³⁰ https://www.nj.gov/drbc/library/documents/comprehensive_plan.pdf

- 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 climate 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 (demand, supply, climate) scenarios.
- Review of the adequacy of supply storage facilities to meet future water use and in-stream needs.

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 Fund (WSSF). The WSSF 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 WSSF 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:

- Work with the Commissioners to develop “next steps” as a follow-up to the 2023 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 their annual debt service and a portion of their operation and maintenance costs. The Commission uses water from these reservoirs for water supply needs, including support of the Trenton Equivalent Flow Objective and to support Western Berks Water Authority (WBWA) in accordance with contracts established prior to construction of Blue Marsh Reservoir.

Conservation releases from Beltzville and Blue Marsh Reservoirs are made by the USACE from their water supply pool. At Blue Marsh Reservoir, 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.

2.2.1.1.4.2 Storage Study

Evaluating future storage needs in relationship to future water demands (both consumptive and non-consumptive uses), climate change (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, climate adaptation, drought management and

flow management needs in the Delaware River Basin. The study, titled “[Evaluation of Additional Storage in the Delaware River Basin](#)”³¹ 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. Staff will work with the Commissioners to develop “next steps” related to the study, which may include 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 | 2025-2026 | General Fund, DWCF 2021, DWCF 2022 |
| | Surface water availability analyses | 2025-2026 | |
| | Strategies for supply sufficiency through 2060 | 2025-2027 | |
| 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 | WSSF |
| Facility Planning | F.E. Walter Re-evaluation Study | 2025-2027 | General Fund |
| | Recommend to the Commissioners a “next steps” plan to follow up the recently completed storage study | 2025 | WSSF |

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

³¹ https://www.nj.gov/drbc/library/documents/EvaluationAdditionalStorageDRB_april2023.pdf

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 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 as described in the Flexible Flow Management Program (FFMP) as modified over time. 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, but also support the tailwater fisheries and mitigate 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 2024 New York City plans to shut down its Delaware Aqueduct for repairs, depending on hydrologic conditions and construction-related factors. During the shutdown, New York City will operate in accordance with the FFMP2017. From June through September, NYC will maximize its diversions from the Delaware River Basin to preserve water in other parts of their water supply system. From October until the repair is finished (estimated by June 2025), no water will be diverted from the basin. 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, will be engaged 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 the 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 Docket Mandated Storage

Commission staff will conduct reviews for projects 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 the 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](#))³² 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 2019, DRBC received a grant from the Delaware Watershed Conservation Fund (DWCF) to create a web-based habitat model for the Upper Delaware River. 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. The project was completed in March 2022, and additional model features and improvements may be made in the future, as needed. The updated habitat models resulting from this effort are available for use by DRBC’s Subcommittee on Ecological Flows (SEF) 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. In addition, DRBC will continue working on a project that would extend the evaluation of available habitat under different flow regimes using a flow model of the non-tidal Mainstem Delaware River.

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 sought, and will continue to seek, grant support to study salinity and temperature impacts on aquatic life in the Delaware Estuary, including the effects of climate change and SLR.

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

³² https://www.nj.gov/drbc/library/documents/Res2018-05_ConsumptiveUse_ReplacementPolicy.pdf

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 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 HEC-HMS, a hydrologic model, with precipitation and temperature, adjusted for climate change, to generate climate-impacted flows. The simulated future hydrology 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](#)³³. During wet hydrologic conditions, staff provide Basin-specific situational awareness briefings to Commissioners, signatory staff, and other partners.

³³ 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 (e.g., SLR and climate change) and their impacts on salinity management and lower Basin storage | On-going | General Fund, DWCF 2022 |
| | HEC-RAS modeling to evaluate how reservoir releases and flow management protocols affect available habitat | On-going | General Fund |
| 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 sea level rise 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 developed by EPA WaterSense standards and Energy Star for inclusion in the DRBC Water Conservation Program. WaterSense is a voluntary partnership program sponsored by the EPA, which provides a label for water-efficient products and a resource for helping you save water. According to EPA, “*the WaterSense label makes it simple to find water-efficient products, new homes, and programs that meet EPA’s criteria for efficiency and performance. WaterSense-labeled products and services are certified to use at least 20 percent less water, save energy, and perform as well as or better than regular models. WaterSense partners with manufacturers, retailers and distributors, homebuilders, irrigation professionals, and utilities to bring WaterSense to your community. Our partnerships encourage innovation in manufacturing and support sustainable jobs for American workers.*” Over the next few years staff will review the potential water and cost savings from the WaterSense program 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 Dockets and Permitting

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 2025-2027 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 dockets in accordance with Administrative Agreements and special area management programs. The DRBC database will be updated to incorporate docket-related state permit decisions.

2.2.1.3.5 Compliance

Staff will continue annual reviews of DRBC-required data submission, such as the Water Audit Reports. Pre-emptive correspondence and notification systems will continue for docket 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 | 2025-2027 | General Fund |

| Program/Project | Products/Outputs | Fiscal Year | Funding Sources |
|--|---|-------------|---------------------|
| | the Water Audit Program report, including considering a water audit training and validation pilot program | | |
| | Consider evaluating and developing updated water efficiency standards using EPA WaterSense standards and/or Energy Star Certification | 2025-2027 | General Fund |
| Southeastern PA Groundwater Protected Area | Evaluate water use in subbasins of SEPA GWPA against allocation and supply limits | Ongoing | PA SEPA GWPA |
| Water Supply Dockets | Review and process water supply dockets 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, docket 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 the DRBC dockets 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](#)³⁴) 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](#)³⁵.

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

³⁴ <https://www.nj.gov/drbc/library/documents/WQregs.pdf>

³⁵ <http://www.nj.gov/drbc/programs/quality/spw.html#4>

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.
- On September 7, 2023, DRBC adopted a [Resolution for the Minutes](#)³⁶ 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](#)³⁷ 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

³⁶ https://www.nj.gov/drbc/library/documents/ResForMinutes090723_EstuaryALDU.pdf

³⁷ <https://www.federalregister.gov/documents/2023/12/21/2023-27758/water-quality-standards-to-protect-aquatic-life-in-the-delaware-river>

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 2025-2027 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 will be assessed and compared with previously collected data to identify trends and to assess the effect of PCB reductions already achieved.

Winter Chloride Assessment in Zone 2

The Zone 2 Winter Chloride Monitoring project aims to document increasing chloride concentrations in the non-tidal Delaware River and the freshwater tidal portion of the Delaware Estuary, crucial for safeguarding drinking water and aquatic life. Recognizing that conventional monitoring practices often miss opportunities to capture exceedances of the 15-day 50 mg/L average criterion set by DRBC due to sporadic sampling, the project will comprise dedicated monitoring with consecutive 15-day sampling periods to enhance the likelihood of capturing such exceedances, providing crucial data to effectively address escalating chloride levels. By providing measured data in Zone 2, a 303(d) listing under the Clean Water Act may be potentially triggered, enabling regulatory measures to address chloride impairment. Notably, while the DRBC's Special Protection Waters (SPW) program Existing Water Quality (EWQ) Atlas provides benchmarks for mainstem and tributary sites in the non-tidal portion above Zone 2, the absence of chloride criteria in the non-tidal SPW area limits regulatory action based solely on observed increases. Additionally, chloride concentrations are often estimated based on continuous specific conductance, which alone cannot trigger regulatory action; however, measured chloride data collected through this project can provide the necessary evidence for potential regulatory intervention.

Chronic Toxicity

Chronic toxicity is caused by repeated or long-term exposure to low doses of a toxic substance. Most effluent dischargers to the Delaware River are currently monitoring for chronic whole effluent toxicity (WET). Limiting chronic toxicity in effluents decreases the impact of point source discharges on water quality in the Delaware River. WET monitoring in the Delaware River should be coordinated among the Basin states, DRBC, and EPA to generate consistent WET testing and reporting with full compliance by dischargers. Continued efforts should be made to monitor not only effluent from discharges but also the ambient environment to ensure that aquatic life in the Delaware River is protected from toxicity ([MacGillivray, et al, 2011](#)).

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 2024-2026, 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 hotspots 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 the DRBC's Water Quality, Toxics, Monitoring and Coordination, and Climate Change advisory committees. The work is being supported in part with funding from DWCF 2021 and 2022 Grants, Pennsylvania Coastal Zone Management grants, and the Bipartisan Infrastructure Law.

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 test for 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 ug/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 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 surface 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 U.S. 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 would be 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, model development will continue with the ongoing calibration and validation of QUAL2K models for the Lower Delaware River, Lehigh River, Neversink River, Brodhead Creek and smaller tributaries throughout FY 2025-2027. 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 2025-2027 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 draft analysis of attainability completed in September 2022, which described design conditions, evaluation metrics, and various loading scenarios.

The EPA official version 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 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 will be published in CY 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 oxygen demand (SOD). Current modeling efforts suggest that sediments play an important role in the urban estuary in terms of dissolved oxygen dynamics.

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 will perform additional monitoring of algae composition in the urban estuary from April to October of 2024. DRBC is leveraging Bipartisan Infrastructure Law (BIL) funding through the Partnership for the Delaware Estuary (PDE) to partially fund both the monitoring and modeling components of the eutrophication model enhancements under development.

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 for Permit and Docket

Near field modeling efforts to support permitting actions (DRBC docket and/or NPDES permits) for acute mixing zones, heat dissipation areas, and/or TDS mixing zones will continue as needed in FY 2025-2027.

2.2.1.4.3.4 Rapid Assessment Dilution Model

DRBC developed 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. This dilution estimation model would be applied on an as needed basis.

2.2.1.4.4 Water Quality Dockets and Permitting

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 2025-2027 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 evaluations, and other modeling and will issue water quality dockets 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 database will be updated to incorporate docket-related 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 [2022 Water Quality Assessment](#)³⁸ report was posted on the Commission website during CY 2023. Results are described in **Part I – Section 1.3.4**. Commission staff will work on the 2024 report for publication in FY 2025.

2.2.1.4.6 Compliance

Staff will continue annual reviews of DRBC-required data submission, such as the annual effluent monitoring reports (AEMRs). Pre-emptive correspondence and notification systems will be continued for docket 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 | 2025-2027 (date to be determined after EPA’s rulemaking is complete) | General Fund, EPA §106 |
| Special Protection Waters | Monitoring and modeling to support program implementation | 2025-2027 | General Fund |

³⁸ <https://www.nj.gov/drbc/library/documents/WQAssessmentReport2022.pdf>



| Program/Project | Products/Outputs | Fiscal Year | Funding Sources |
|--|---|---|-------------------------------|
| 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 2024) | EPA §106 |
| | Perform technical assessments in support of State of the Basin Report | Ongoing every 5 years | General Fund |
| PCBs | Evaluate PMPs and point source monitoring data under Stage 1 PCB TMDLs | Ongoing | EPA §106 |
| | Support EPA in establishing Stage 2 TMDLs | Dependent upon EPA | EPA §106 |
| | Continue implementation of Stage 2 TMDLs | After Stage 2 PCB TMDLs are established | General Fund, EPA §106 |
| | PCB monitoring in ambient waters in estuary | 2024 | EPA §106, BIL Fund |
| Toxics (Ammonia, metals and emerging contaminants) | Coordination with TAC; recommended criteria revisions | 2025-2027 | General Fund, PACZM, EPA §106 |
| | Complete PFAS study of water, sediment, and fish tissue samples | 2025 | DWCF 2021 |

| Program/Project | Products/Outputs | Fiscal Year | Funding Sources |
|---|--|--|-------------------------|
| Water Quality Dockets | Changes to Water Quality regulation and Rules of Practice and Procedure, as required | 2025-2027 | General Fund |
| | Review and processing of water quality dockets per AAs | Ongoing | Project Review Fees |
| Water Quality Assessment Report | Prepare assessment for EPA and states | 2025 | 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 a 3-D eutrophication model evaluating sediment diagenesis process | 2025-2026 | General Fund, BIL |
| | Model application for ammonia-nitrogen allocation and/or potential CBOD reallocation | 2025-2027 (date to be determined after EPA's rulemaking is complete) | General Fund, EPA §106 |

2.2.2 Waterway Corridor Management (KRA #2)

- 2.2.2.1 Flood Warning and Loss Reduction
- 2.2.2.2 Enhanced Recreation
- 2.2.2.3 Aquatic Life and Wildlife Habitat Improvement

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 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.

2.2.2.1.1 Flood Mitigation Task Force Recommendations

The DRBC convened a Delaware River Basin Interstate Flood Mitigation Task Force (Task Force) in 2006 to develop a set of recommended measures for mitigating and alleviating flooding impacts along the Delaware River and its tributaries. In July 2007, the Task Force issued a final report with 45 consensus recommendations addressing six management areas: flood warning, reservoir operations, floodplain regulation, floodplain mapping, structural and non-structural mitigation, and stormwater management. In 2009 the Task Force met to discuss implementation progress on several recommendations highlighted in their final report. The Commission will consider organizing another forum to assess implementation progress since 2007.

In August 2017, DRBC submitted a proposal under Section 7001 of the Water Resources Reform and Development Act (WRRDA) to the USACE for 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.

2.2.2.1.2 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.

2.2.2.1.3 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, climate, and land use patterns, for example, may have a significant impact on how to prepare for storm events and manage floodplains.

During FY 2025-2026, DRBC will assist the Pennsylvania Emergency Management Agency (PEMA) in developing and delivering 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. This project is being funded by the Federal Emergency Management Agency (FEMA) 2021 Building Resilient Infrastructure and Communities (BRIC) grant program. DRBC will continue to seek opportunities to partner with Basin state emergency management agencies to support flood mitigation efforts.

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 | 2025-2026 | FEMA 2021 BRIC grant |
| Flood plain dockets | Review and processing of flood plain dockets | Ongoing | Project Review Fees |

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 the 2022 Water Quality Assessment. More specifically, DRBC Enhanced Bacteria Monitoring data were included in the 2022 Assessment. 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](#)³⁹ 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 2024, DRBC will perform expanded bacterial monitoring in partnership with PADEP.

The causes of elevated bacteria in Zones 3 and the upper portion of Zone 4 are generally understood to 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) overflows of existing sanitary sewer systems during extreme wet weather events; 4) runoff from upstream sources during extreme wet weather events, and 5) unspecified dry weather sources including localized in-situ animal sources such as Canada geese. 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 referred to the DRBC’s WQAC for input from diverse stakeholders and for a recommendation to the Commissioners.

³⁹ https://www.nj.gov/drbc/library/documents/WQAC/120320/Yagecic_Review2020BacteriaData.pdf

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.

They 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.

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.

As noted in **Part II – Section 2.1.2** of this Water Resources Program, the Commission has developed a Diversity Equity Inclusion Justice and Belonging (DEIJB) strategic plan. That plan and DEIJB principles provide additional guidance for development and implementation of both short term and longer-term activities related to improved water quality, additional recreational use opportunities, and consideration of affordability.

2.2.2.2.2 Delaware River Recreation Maps

The [Delaware River Recreation Maps](#)⁴⁰ 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 work with the USGS to obtain and/or process more detailed LIDAR bathymetry data of the river, collected by the USGS from Delaware Water Gap to Trenton, N.J., that can be used by the DRBC to update the recreation maps. The processed Lidar data will also be valuable for use by the DRBC in ongoing habitat assessment modeling and analyses 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 from 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 USFWS as part of the Delaware River Basin Restoration Program (DRBRP). DRBC will continue to increase the understanding of ecosystem needs and habitat

⁴⁰ <https://www.nj.gov/drbc/basin/recreation/river-maps.html>

conditions in the Basin through ambient water quality monitoring, fluvial geomorphologic assessments, 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 entered into an agreement with a local watershed organization, The Wildlands Conservancy, who is taking 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 is scheduled for removal 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 freshwater mussel restocking efforts are targeted for implementation in summer 2024 and summer 2025.

2.2.2.3.3 Delaware River Water Quality & Habitat Assessment

The Commission has identified the need to develop a modeling tool that can be used to evaluate temperature, water quality, and habitat availability along the entire length of the non-tidal, mainstem Delaware River and selected tributaries resulting from changes in flow rates and source water quality. Once fully developed, this model may also be used in conjunction with existing DRBPST, QUAL2K, and EFDC models to support more comprehensive basin-wide planning and water quality evaluations. The Commission identified the USACE HEC-RAS model as a potential tool for this evaluation. HEC-RAS is designed to perform one and two-dimensional hydraulic calculations for both natural and constructed channels. Of interest to the DRBC are the HEC-RAS river analysis components for: (1) steady flow water surface profile computations; (2) one- and two-dimensional unsteady flow simulations; and (3) temperature and water quality analysis. The DRBC currently has an existing HEC-RAS model for a limited portion of the Upper Delaware River only, upstream of the Delaware Water Gap. The existing model is being extended to include the entire length of the mainstem Delaware River, from Hancock, N.Y., to Trenton, N.J., and including selected tributaries. The model is also being updated with available water quality data and, if determined to be suitable, can be used to evaluate water quality and habitat under varying flow management scenarios. Initial model development is being funded, in part, by PADEP.

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 create an Index of Biological Integrity | 2025-2027 | General Fund |
| Ecosystem Restoration | Manage distribution of funds for PPL Martins Creek NRDA projects | 2025-2026 | PPL NRDA settlement via PADEP |
| Water Quality & Habitat Assessment | Water quality & habitat assessment modeling tool for non-tidal river | 2025-2026 | General Fund, PADEP |

2.2.3 Linking Land and Water Resource Management (KRA #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 mi², 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.

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 runoff, 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 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, which include 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 |
| Delaware River Watershed Initiative | Participation in steering committees and workgroups as needed | 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 |

2.2.4 Institutional Coordination and Cooperation (KRA #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 for the Lower Delaware Wild and Scenic Management Plan. DRBC has a collaborative relationship with NPS. DRBC conducts water quality monitoring and assessment in support of the Lower Delaware.
- **Office of the Delaware River Master.** DRBC coordinates with the 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 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 Management Plan.
- **USFWS Delaware River Basin Restoration Program.** The Delaware River Basin Conservation Act, signed into law in December 2016, emphasized the need for federal, state, and local governments and regional organizations to come together to identify, prioritize and implement restoration activities within the Basin. The Act 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.

- **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 aims to restore and reconnect overburdened and/or economically distressed urban communities in Chester, Philadelphia, Wilmington, and Camden to their waterways by improving coordination among federal, state, and local agencies with community partners.

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 2025-2027 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.

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 Integrated 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's library and central files contain hard copies of the Commission's dockets and applicant information, vital to day-to-day operations, and serves as the mechanism 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](#)⁴¹, on the DRBC website, and via presentations.

During FY 2024 DRBC initiated a Request for Proposals (RFP) for professional services for an upgrade of its relational database system. It is anticipated that the project will commence in CY 2024.

2.2.4.3 AGENCY FUNDING

The 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 of Water Policy (ICWP), and the American Water Resources Association (AWRA). As water resource management faces the growing challenges associated with a changing climate, a

⁴¹ <https://www.epa.gov/waterdata/water-quality-data-download>

challenging fiscal future, infrastructure needs, and shifting political environments, involvement with these partners will be of increasing benefit to DRBC.

2.2.4.4.2 DRBC Internal Advisory Committees

Continuing a long-standing practice, advisory committees aid the Commission in policy and standards development. Eight advisory committees meet on a regular basis. Details and contact information for each DRBC advisory committee are provided on the DRBC [website](#)⁴². All administrative needs are met by DRBC staff, including the development of agendas, arrangement of venues, communicating with members, and processing formal meeting minutes. Staff also coordinates internally on issues that cut across the interests or expertise of more than one committee. Major focus issues for the advisory committees and subcommittees include:

- **Advisory Committee on Climate Change.** The ACCC is the newest advisory committee and held its inaugural meeting in August 2020. It 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. It hosted a Climate Change Forum in March 2021 and January 2023, both as part of the biennial PDE Science Summit. The ACCC will continue to hold a biannual Forum, with a special Seminar/Webinar in the intervening years in addition to its regular committee meetings.
- **Flood Advisory Committee.** DRBC's Flood Advisory Committee (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.** In 2020, the SEF 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 near future, SEF will be charged with additional tasks to assess habitat issues which may include those of the dwarf wedgemussel (*Alasmidonta heterodon*).
- **Toxics Advisory Committee.** The TAC will be focusing on the review of new and existing toxics criteria including ammonia and emerging contaminants.

⁴² 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 supply sufficiency. The Commission is considering a recommendation to create a new WMAC Subcommittee on Source Water Protection (SSWP) focused on source water protection issues in the lower Delaware River.
- **Water Quality Advisory Committee.** The WQAC is focused on a review of aquatic life designated uses and associated criteria for Zones 3 – 5, as well as development of strategies to reduce bacteria levels in Zone 3 and 4.

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 milestones to be achieved for a three-fiscal year time horizon. 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 |

| Program/Project | Products/Outputs | Fiscal Year | Funding Sources |
|--|--|-------------|-----------------|
| Lower Delaware Wild and Scenic Steering Committee | Voting member, monthly conference call, 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 | 2025-2026 | General Fund |
| Pennsylvania Drought Task Force | Meetings scheduled as needed | 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 |

| Program/Project | Products/Outputs | Fiscal Year | Funding Sources |
|--|---|-------------|-----------------|
| 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 | 2025-2027 | General Fund |
| 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 (KRA #5)

- 5.1 Reporting
- 5.2 Public Information and Communications
- 5.3 Technical Outreach
- 5.4 Public Outreach and Stewardship
- 5.5 Government Outreach

As staff implement the DEIJB Strategic Plan (see **Part II – Section 2.1.2**) and updated Vision, Mission and Values (page i), 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, protection, 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 July 2019 (early FY 2020). Work on the next State of the Basin Report, targeted for publication in FY 2025, will occur in CY 2024.
- **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 [2022 Annual Report](#) (DRBC, 2023). DRBC [annual reports](#)⁴³ 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.

⁴³ <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/](https://www.flickr.com/photos/drbc1961/collections/)
- LinkedIn: [linkedin.com/company/delaware-river-basin-commission/](https://www.linkedin.com/company/delaware-river-basin-commission/)
- YouTube: [youtube.com/user/delrivbasincomm/](https://www.youtube.com/user/delrivbasincomm/)
- Instagram: [instagram.com/drbc1961/](https://www.instagram.com/drbc1961/)
- Facebook: [facebook.com/oursharedwaters](https://www.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 occasionally hosts visits by international delegations who wish to learn from Commission staff about water resource management at the Basin scale.

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 that may not be reflected in existing decision-

making structures. 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.

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 |
| State of the Basin Report | Report – post on web; limited paper copies | FY 2025 | General Fund |

| Program/Project | Products/Outputs | Fiscal Year | Funding Sources |
|--|--|-------------|----------------------------------|
| 2.2.5.2 Public Information & Communications | | | |
| Provide timely information to the Public | Clear, consistent message on water resource issues and DRBC activities; produce various handouts | Ongoing | General Fund |
| Media/External Relations | Clear, consistent message on water resource issues and DRBC activities; timely responses | 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 |
| Host foreign delegation visits | Information exchange | Ongoing | General Fund |
| 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 |

| Program/Project | Products/Outputs | Fiscal Year | Funding Sources |
|------------------------------------|--|-------------|-------------------------------|
| Partner Events | Educating partners and decisionmakers through experiential learning and more in the watershed | Ongoing | General Fund, DWCF 2022, 2023 |
| Social media | Information exchange | Ongoing | General Fund, DWCF 2022, 2023 |
| 2.2.5.5 Government Outreach | | | |
| Legislative meetings | Educating state and federal decisionmakers about DRBC's mission | Ongoing | General Fund |
| Educational events | Educating state and federal decisionmakers through experiential learning and more in the watershed | Ongoing | General Fund |

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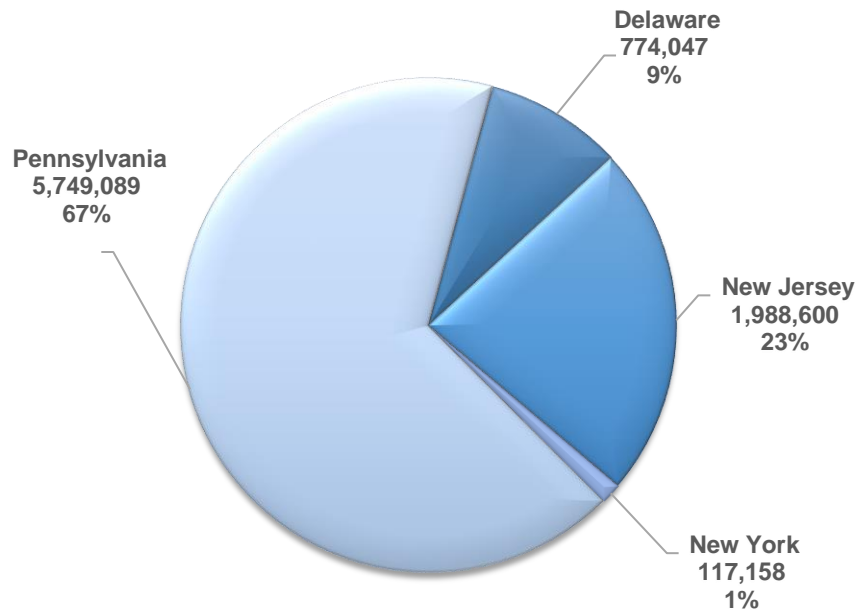
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APPENDIX A

Delaware River Basin Population 2020



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 Population⁴⁴ | |
| a. Population residing within the DRB boundary .. | 8.629 MM |
| 2. NYC Population⁴⁵ | |
| 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 Diversion⁴⁶ | |
| a. Equivalent NJ population served | 1.087 MM |
| 5. Chester Water Authority Import⁴⁷ | |
| 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 |

⁴⁴ 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.

⁴⁵ Correspondence with NYC Department of Environmental Protection on 8/15/2022.

⁴⁶ Correspondence with NJ Department of Environmental Protection on 11/7/2022.

⁴⁷ 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 2025 | FY 2026 | FY 2027 |
|-------------------------------|---|--|---|---------|---------|
| 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 2025 | FY 2026 | FY 2027 |
|---|-----------------------------------|--|--|---------|---|
| Water Quality Program (cont) | Estuary Toxics Management Program | Stage 2 PCB TMDLs | Support EPA in establishing TMDLs | | 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 | | |
| Ecological Flow Requirements | Comprehensive Plan and Water Code | Update Water Code to include pass-by flows, conservation releases, and consumptive use mitigation trigger policies | Technical review and analysis to support future policy options, recommendations, and rule development and proposal, as appropriate (beginning FY 2027) | | |
| 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 and SM3D to support the evaluation of water supply management options, salinity intrusion, and FFMP2017 studies | On-going | General Fund, DWCF 2022 |
| | HEC-RAS based model for assessing flow management impacts on water quality, temperature, and habitat | 2025-2026 | General Fund, PADEP |
| Water Supply Planning | Assess future water availability against withdrawal projections and drought of record | On-going | General Fund, DWCF 2021, DWCF 2022 |
| Emergency Response | Real time, one-dimensional flow and transport model | Daily | General Fund |
| | Real time, multi-dimensional flow and transport model | Daily | |
| | 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 |

| Program/Project | Products/Outputs | Fiscal Year | Funding Sources |
|---|---|-------------|------------------------------|
| Brodhead Model | Model refinement and validation | As needed | General Fund |
| Neversink Model | Model refinement and validation | As needed | General Fund |
| 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, BIL |
| | Model application for CBOD, ammonia-nitrogen allocations, and other nutrient requirements | 2025-2027 | General Fund, EPA §106 |
| CORMIX mixing zone models | Project Review and NPDES permit support | As needed | General Fund |