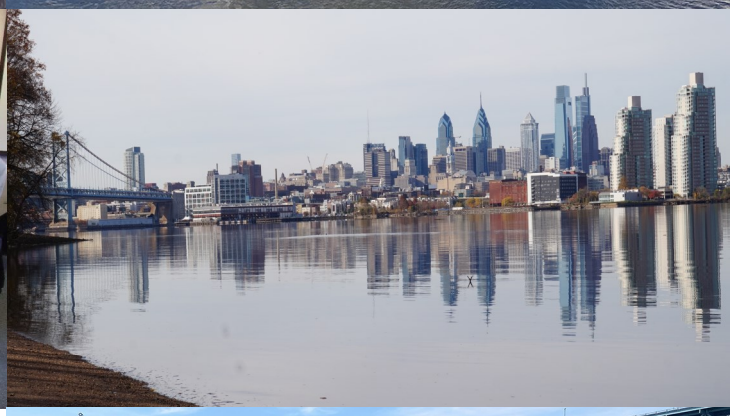







Delaware River Basin Commission

DELAWARE • NEW JERSEY
PENNSYLVANIA • NEW YORK
UNITED STATES OF AMERICA

A Primer on the Country's First Federal/Interstate Basin-Scale Water Resources Agency

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

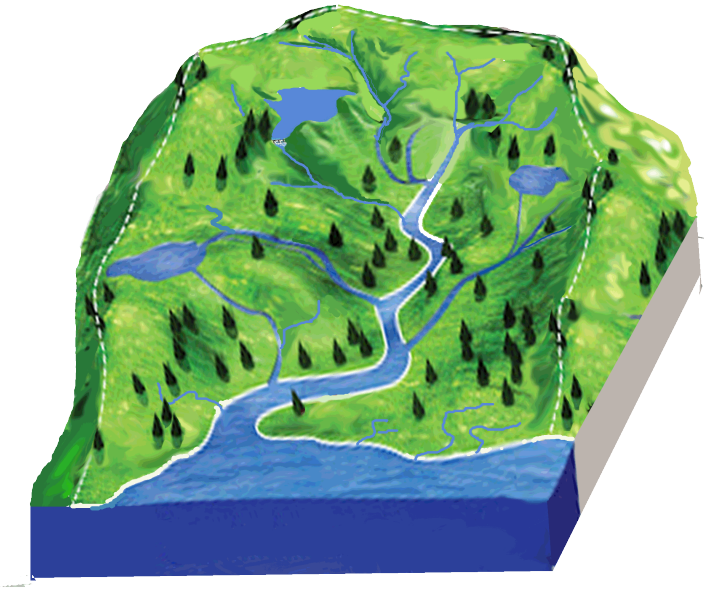
BASIN BASICS

Watershed or Basin?

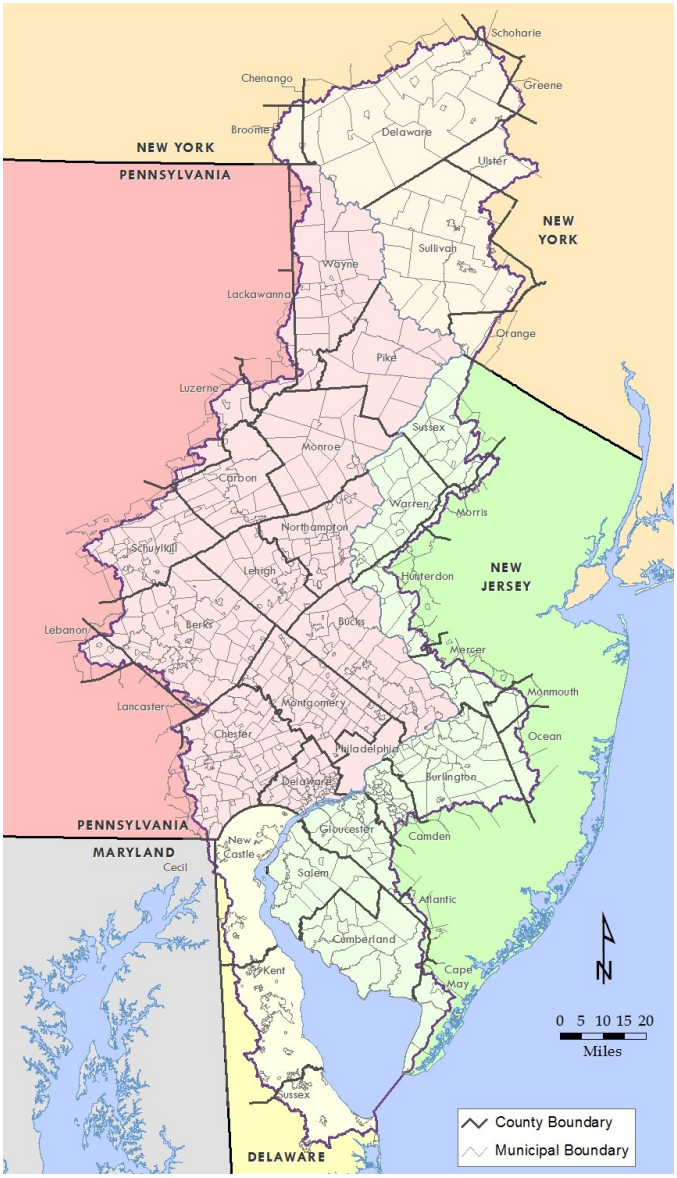
A **watershed** can be simply described as the area of land draining to a particular stream.

A **basin** is that land from which all the water flowing through watersheds end up in a particular river and ultimately into a larger body of water such as the Atlantic Ocean.

The **Delaware River Basin** is the area of drainage into the Delaware River and its tributaries, including Delaware Bay. The condition of the Basin is based upon its underlying geology, topography, microclimates and land uses of its various sub-watersheds.



The Delaware River Basin is equal to the sum of its parts, with regions and sub-regions defined by watershed boundaries rather than state or political boundaries.



Geographic, Physiographic & Political Boundaries

The Delaware River Basin's drainage area encompasses extensive landscapes in New York, New Jersey, Pennsylvania and Delaware.

The Basin lies in two significantly different hydrologic regions which correspond to the two major physiographic divisions in the northeastern US: 1) the Appalachian Highlands 2) the Atlantic Coastal Plain. The Appalachian Highlands includes four distinct provinces: the Appalachian Plateau, Ridge and Valley, New England and Piedmont.

The Basin is divided into four main regions (Upper, Central, Lower and Bay). These are created by grouping watersheds together based on the segment of the Delaware River to which they drain. These four regions are divided into ten sub-regions; examples include the Lackawaxen (in upper), Lehigh Valley (in central), the Schuylkill Valley (in lower) and the Delaware Bay watersheds (in bay).

All or part of 42 counties and 836 municipalities within the four Basin states contribute to and benefit from the resources of the Delaware River Basin (as shown in the map at left.)

County and municipal boundaries within the Delaware River Basin.

The Delaware River Basin

Lying in the densely populated corridor of the northeastern U.S., the **13,539 square-mile** Delaware River Basin stretches approximately **330 miles** from the river's headwaters in New York State to its confluence with the Atlantic Ocean. The Basin includes approximately 12,800 square-miles of land area, nearly 800 square-miles of the Delaware Bay and **nearly 2,000 named tributaries**, including many that are rivers in their own right.

There are several reservoirs in the Delaware River Basin, all located on tributaries. They have many purposes, including water supply, hydro power generation, recreation and flood control. The Basin's major reservoirs are indicated on this map.

The northern-most tributaries to the Delaware River originate in the forested western slopes of the Catskill Mountains, which reach elevations of up to 4,000 feet. The East and West Branches meet at Hancock, N.Y., where the Delaware River descends about 800 feet on its journey to the Atlantic Ocean.

The river is tidal from the Delaware Bay to Trenton, N.J. Above Trenton to its headwaters, the river is non-tidal.

Land cover varies from mostly tree canopy in the northern portion of the Basin to more urbanized and farmland in the southern section. As expected, more impervious surface occurs in the more developed/urbanized sections of the Basin.

Over 14.2 Million people depend on the waters of the Basin for drinking water, agricultural and industrial use. This figure includes nearly 5 million people who live outside the Basin in New York City and northern N.J. New York City gets approximately half of its water from the Delaware River Basin.

The Delaware River is the **longest un-dammed river** in the U.S. east of the Mississippi River. If one stands on one side of the river, there is a different state on the other side. It is an interstate river its entire length.

WHY A DELAWARE RIVER BASIN COMMISSION?

The Situation Before the Creation of the DRBC

Who Was in Charge?

Prior to the creation of the DRBC, some 43 state agencies, 14 interstate agencies and 19 federal agencies exercised a multiplicity of splintered powers and duties within the Basin, which spans four states. There was a lack of coordination and cooperation among these many agencies, making it difficult to properly and effectively manage the Basin's water resources.

Water Quality

Pollution in the Delaware River, particularly in the tidal reaches of its urban centers, began to be a recognized problem by the early 1700s. Sewage was dumped right into the rivers and streams, which bred bacteria and consumed the oxygen in the water. This caused waterborne illnesses and also fish kills. The river was being used as a cesspool.

Pollution continued to be a serious issue over the next 200 years, mostly due to rapid population growth and increased human activity, for example, slaughterhouses, refineries and chemical companies.

By the height of World War II, the tidal Delaware River around Philadelphia was largely considered an open sewer for public and industrial waste. The river's water was so foul that it would turn the paint of ships brown as they traveled through or were docked for any period of time. People were sickened by simply the smell of the river. The river just wasn't a place people wanted to be.

Additionally, there were parts of the estuary that were considered dead zones, almost or completely devoid of oxygen needed for the survival of fish and other aquatic life. In addition to resident fish, the pollution also affected migratory fish, making it difficult for them to travel to/from spawning grounds.

Bridgeport Canal up from Schuylkill River in 1928.
(courtesy of the Phila. Water Dept.'s Historic Collection)

Slaughterhouses discharging in 1928.
(courtesy of the Phila. Water Dept.'s Historic Collection)

Water Supply/Quantity

Flooding

With no Basin-scale water resource management, the Delaware River, the largest undammed river east of the Mississippi River, was subject to flooding.

The Basin experienced devastating flooding in August 1955; in fact, to this day, that flood is the Basin's flood of record. The flood was the result of remnants of back-to-back hurricanes, Connie and Diane; Connie's rains saturated soils, so when Diane rolled through the region, there was nowhere for the excess water to go except for into already swollen rivers, creeks and streams.

Sadly, approximately 100 lives were lost in August 1955 due to floodwaters. About 1/3 of that number were people at a camp that was inundated by the Brodhead Creek, about five miles north of East Stroudsburg, Pa. Many bridges were destroyed or badly damaged, some never being rebuilt.

Easton-Phillipsburg Free Bridge in 1955.
(file photo courtesy of lehighvalleylive.com)

Droughts

Historically, the Delaware River Basin has also suffered through many droughts. Droughts impact the availability of water for drinking and other use by humans, as well as in-stream flow and habitat.

Research indicates the region experienced bad droughts as far back as 1635. In 1869, the area suffered such a severe drought that the Philadelphia Water Works built the East Fairmount Park Reservoir, which became operational in 1889.

The Delaware River Basin experienced its drought of record from 1962-1967. The DRBC was in its infancy, having just formed in 1961 (see next page). It declared a drought emergency in 1965, which lasted nearly two years.

The DRBC's role in Basin-wide drought operations was highlighted during the 1960s drought of record, and the Commission is still a leader in drought management to this day.

Delaware River at Trenton from Morrisville, Pa. in 1963.
(DRBC photo)

DELAWARE RIVER BASIN COMMISSION

Managing, Protecting and Improving the Basin's Water Resources Since 1961

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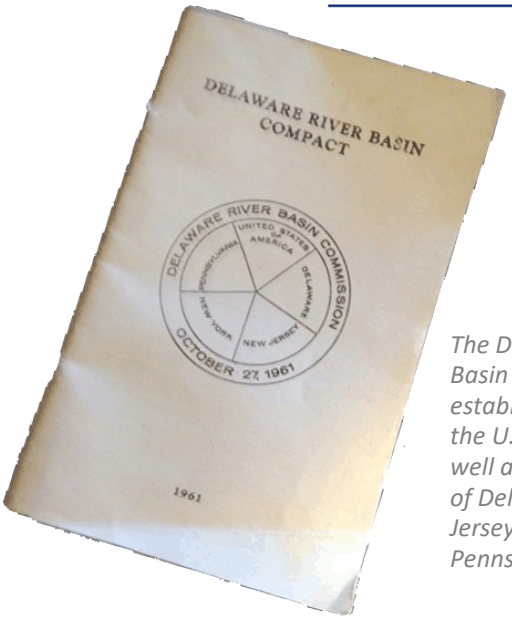
The Compact

A breakthrough in water resources management occurred in 1961 when President Kennedy and the governors of Pennsylvania, New Jersey, New York and Delaware for the first time signed concurrent compact legislation into law creating a regional body with the force of law to oversee a unified approach to managing a river system without regard to political boundaries.

The 1961 Compact establishing the Delaware River Basin Commission (DRBC) was the first federal-interstate agreement for Basin-scale water resources management. The Compact binds the signatory parties to the agreement for a period of 100 years, at which point it automatically renews unless there is a unanimous vote by the signatories to void the Compact.



The Delaware River Basin Compact was established as law by the U.S. Congress, as well as the legislatures of Delaware, New Jersey, New York and Pennsylvania.

White House ceremonial signing of the Delaware River Basin Compact, Nov. 2, 1961.

The Commission

The DRBC pre-dates the first Earth Day (April 22, 1970), the establishment of the Environmental Protection Agency (Dec. 2, 1970) and the passage of the Federal Water Pollution Control Act Amendments of 1972, typically referred to as the Clean Water Act (October 1972).

The members of this regional body -- the Delaware River Basin Commission (DRBC) -- include **the four Basin state governors** and the **Commander of the U.S. Army Corps of Engineers North Atlantic Division,** who serves as the federal representative. The federal representative just doesn't represent the USACE, it coordinates with and reflects the perspectives of all federal agencies on matters before the Commission.

Each of the five Commissioners formally appoint alternates, with the governors selecting high-ranking officials from their state environmental agencies. Each Commissioner has one vote of equal power, with a majority vote needed to decide most issues. Exceptions are votes to apportion among the signatory parties amounts required to support the current expense budget and votes to declare a state of emergency resulting from a drought or catastrophe, which require unanimity.

The Commission holds business meetings and public hearings on policy matters and water resource projects under regulatory review. These sessions, along with meetings of the Commission's advisory committees, are open to the public.

Working with the States

While the states retain autonomy, the Basin is unique in governance. It the only river basin with both an interstate-federal Commission (the DRBC) and a national estuary program in place. The national estuary program is administered by the Partnership for the Delaware Estuary (PDE); the DRBC Executive Director serves as a member of PDE's Steering Committee.

The DRBC works with member state environmental agencies in a cooperative and mutually supporting—*not duplicative*—manner. During a 2018 Audit by the Pa. Auditor General, the role the DRBC fulfills is stated as "complimentary and/or augmentative in nature."

DRBC Staff

The DRBC is made up of ~35 full-time employees, the bulk of which are engineers, scientists, hydrologists, geologists, modelers and planners, along with a support team of IT, service, administrative and communications professionals.

Like any organization, the DRBC is only as good as its employees or staff. In this category, the Commission benefits from a staff that is experienced, talented and diligent. Because of its small size, most staff members wear multiple 'hats' and often jump in to help in areas not part of their normal job descriptions. It is not unusual to find modelers on their knees on a shoreline helping with the Young of Year juvenile shad count, water resource engineers volunteering to hang over a bridge to collect water quality samples or a toxicologist helping teach about clean water at an outreach event.

Advisory Committees

The DRBC's advisory committees provide a forum for the exchange of information and viewpoints on a variety of issues, enhancing communication and coordination. The Commissioners recognize the importance of engaging qualified representatives from state/federal government agencies, industry, municipalities, academia, public health and environmental/watershed organizations to inform their policy decisions. Advisory committee and subcommittee meetings are open to the public and include:

- Flood Advisory Committee (FAC)
- Monitoring Advisory and Coordination Committee (MACC)
- Regulated Flow Advisory Committee (RFAC)
- Subcommittee on Ecological Flows (SEF) - RFAC Subcommittee
- Toxics Advisory Committee (TAC)
- Water Management Advisory Committee (WMAC)
- Subcommittee on Source Water Protection (SSWP) - WMAC Subcommittee
- Water Quality Advisory Committee (WQAC)

DRBC staff with several Commissioner alternates and interns take a break from a busy schedule and quarterly caucus meeting to pose in front of the Commission's West Trenton, N.J. building (2019).

Funding DRBC

The DRBC is funded by its signatory parties (the Commission members), project review fees, water use charges, compliance revenues and grants.

Signatory Funding

The founding Compact—both federal and state laws— states that the signatories will fund the operating costs of the Commission. In 1988, the signatories agreed on a formula to apportion their contributions as follows:

- Delaware 12.5% $447,000 From "Commission on Interstate Cooperation" in the Legislative budget
- New Jersey 25% $893,000 From "Independent Commissions" in the Governor's budget
- New York 17.5% $626,000 From "NYSDEC—Capital Projects" in the Legislative budget
- Pennsylvania 25% $893,000 From "Independent Commissions" in the Governor's budget
- Federal 20% $715,000 From the United States Army Corps of Engineers' budget

Despite the contributions being obligatory and agreed upon, state signatory funding has slowly eroded over the past decade. The notable exception is the "First State" of Delaware, which has consistently met its full fair share.

The largest, cumulative signatory funding shortfall comes from the federal government. From 1996 through 2024, the federal government has *only* provided funding to support its 20% "fair share" of the DRBC's annual current expense budget *during three federal fiscal years (federal FY 2009, federal FY 2023 and federal FY 2024). Since October 1996, the cumulative federal funding shortfall totals $17,144,250.*

DRBC Fiscal Year	Delaware	New Jersey	New York	Pennsylvania	Federal Gov't	Totals
2013	$447,000	$893,000	$246,000	$948,350	$0	2,534,350
2014	$447,000	$693,000	$246,000	$998,350	$0	2,384,350
2015	$447,000	$693,000	$359,500	$434,000	$0	1,933,500
2016	$447,000	$693,000	$359,500	$434,000	$0	1,933,500
2017	$447,000	$693,000	$359,500	$434,000	$0	1,933,500
2018	$447,000	$693,000	$359,500	$217,000	$0	1,716,500
2019	$447,000	$693,000	$359,500	$217,000	$0	1,716,500
2020	$447,000	$693,000	$359,500	$217,000	$0	1,594,755
2021	$447,000	$571,255	$359,500	$217,000	$0	1,716,500
2022	$447,000	$893,000	$359,500	$217,000	$0	1,916,500
2023	$447,000	$893,000	$359,500	$217,000	$715,000*	2,631,500
2024	$447,000	$893,000	$359,500	$217,000	$715,000*	2,631,500

**U.S. Congresswoman Bonnie Watson Coleman (NJ-12) secured community project funding for the DRBC in the amount of $715,000 for federal fiscal year 2023 (October 1, 2022—September 30, 2023) and the same for federal fiscal year 2024 (October 1, 2023—September 30, 2024.) This fulfills the federal signatory funding authorized in the DRBC's founding Compact.*

The Water Supply Storage Facilities Fund

The Water Supply Storage Facilities Fund (WSSF) was created to fund certain water supply storage facility projects in the Basin. The WSSF is used to repay the obligations the DRBC assumed to purchase storage capacity at the federal government's Beltzville and Blue Marsh reservoirs. The WSSF also supports the DRBC's pro rata share of the annual operations and maintenance costs of the two reservoirs, the water supply share of any future required improvements at these two facilities, a share of the DRBC operating costs to support a sustainable water supply within the Basin and any future required storage in the Basin. Revenues for the WSSF are generated from charges for applicable surface water withdrawals in the Basin.

DRBC Responsibilities

While Commission programs include water quality protection, water supply allocation, regulatory review, water conservation initiatives, watershed planning, drought management, flood loss reduction, education/outreach and recreation, they fall largely into two categories: flow and quality.

FLOW—An adequate and sustainable supply of water

QUALITY—Clean and healthy water resources

Bridge Between Two Seasons by Kevin Haines taken at the Mongaup River, N.Y.

Flow Management

"It has to be wet before it can be clean"
Steve Tambini, former DRBC Exec. Dir.

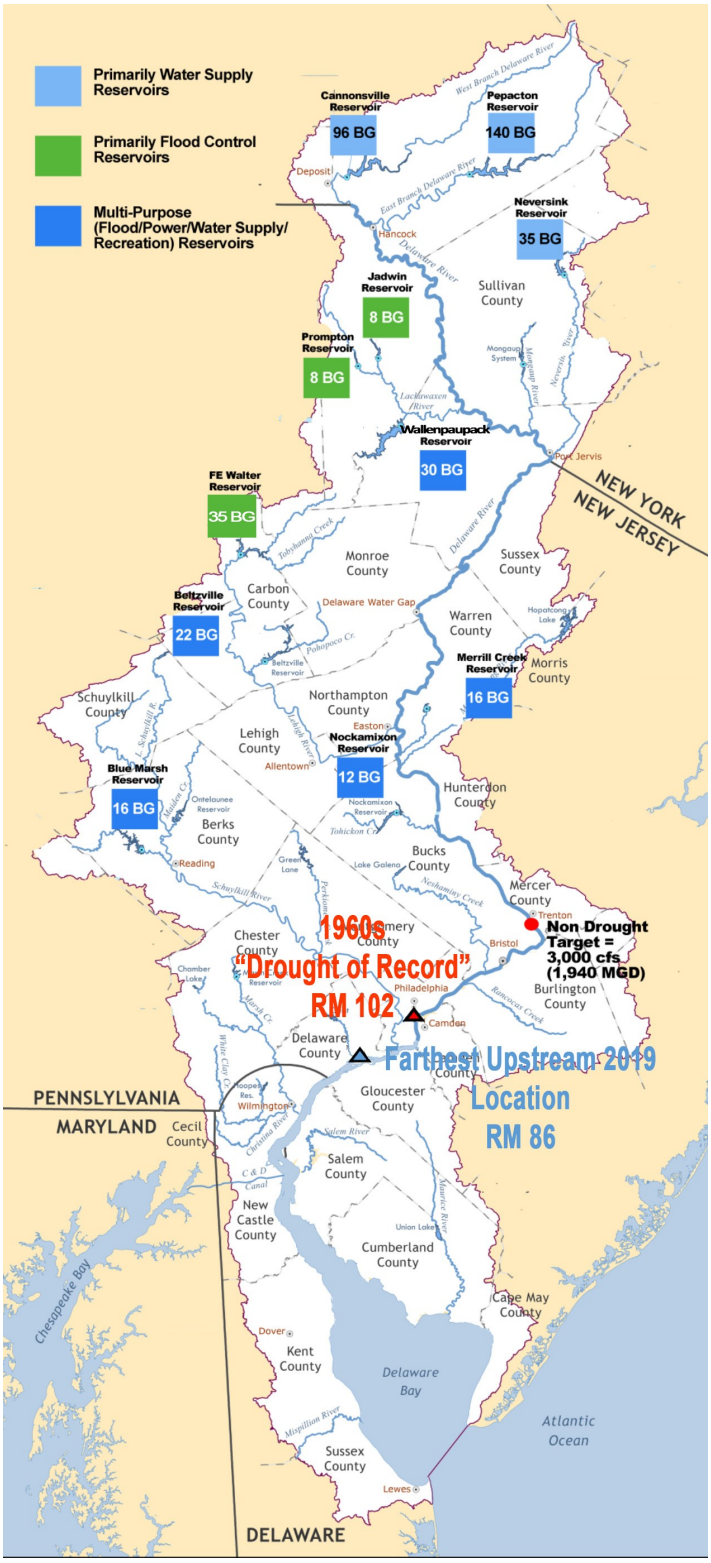
Left to nature alone, the amount of fresh water flowing through the Delaware River Basin's streams and rivers can be too much (resulting in flooding) or too little (resulting in drought). The DRBC's drought operating program regulates river flows and reservoir releases and complements state drought operating programs.

There are multiple reservoirs in the Delaware River Basin, all located on tributaries (see map at right). During a drought emergency, the DRBC can manage stream flow by controlling the timing and amount of water released into the Basin's major waterways from several of these reservoirs.

In late November 2016, following weeks of no precipitation, the DRBC issued a drought watch. However, if you were to look at the Delaware River at Trenton, N.J., the river's level and flow appeared normal, thanks to the DRBC's flow management efforts. Approximately 65% of the water in the river at that time was from reservoir releases.

Flow Augmentation Reservoirs

The DRBC owns billions of gallons of water in the Beltzville Reservoir, located on a tributary to the Lehigh River, and in the Blue Marsh Reservoir, located on a tributary to the Schuylkill River. Though both are owned and operated by the U.S. Army Corps of Engineers, these two reservoirs are the DRBC's primary sources for managing flow.

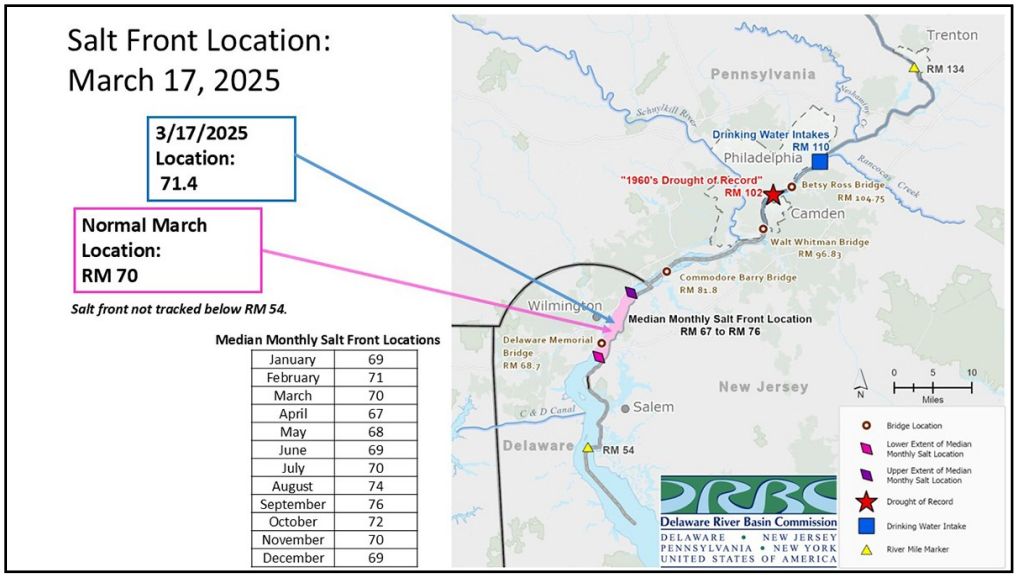


Reservoirs in the Basin have many purposes, including: water supply, hydropower generation, recreation and flood control. BG = Billion Gallons. MGD = Million Gallons/Day.

Why Manage Flow? To Protect Drinking Water From Salt Water Contamination

In managing flow in the Delaware River, the DRBC has a non-drought flow objective at Trenton (where the river ceases being tidally influenced) of 3,000 cubic feet per second (cfs). This is to control the movement of the "salt front" in the tidal Delaware River.

Adequate freshwater flowing downstream is needed to repel the upstream advancement of "salty" or "brackish" water from the Delaware Bay to protect drinking water intakes serving residents in Philadelphia and New Jersey and also industrial intakes along the river from corrosion.



For the DRBC, river mile (RM) zero is where the Delaware Bay meets the Atlantic Ocean and RM 330 marks the beginning of the river in New York State.

The salt front is defined as the 250 parts-per-million chloride concentration. The salt front's location fluctuates along the main stem Delaware River as freshwater from upstream rivers increases or decreases in response to rainfall, snowmelt or DRBC-managed releases from reservoirs.

Long-term median monthly locations range from river mile (RM) 67 in April (~two miles downstream of the Delaware Memorial Bridge) to RM 76 in September (~two miles downstream of the Pennsylvania-Delaware state line). *See map at top right.*

The farthest upstream location of the salt front during 2024 was about at RM 90 in mid-late November. By comparison, the farthest recorded upstream location of the salt front measured during the 1960's drought of record was RM 102. *See map on previous page.*

Pushing Back The Salt Front

- **Monitored Daily by the DRBC**
- **Goal: Salinity Repulsion to Protect Drinking & Industrial Intakes**
- **Location Varies**
- **Daily Updates at http://hydrosnap.drbc.net**

Fed by the Tulpehocken Creek and located northwest of the City of Reading, in western Berks County, Pa., the 16 billion gallon (BG) Blue Marsh Reservoir is owned and operated by the U.S. Army Corps of Engineers. The DRBC maintains 6.5 BG of the reservoir for use in augmenting stream flows downstream into the Delaware River.

Water Supply and Conservation

The DRBC's comprehensive water conservation program is an integral component of its broader strategy to manage water supplies throughout the Basin. A core principle of this program is that water efficiency should be practiced at all times, not just during drought. Reducing water use not only provides significant economic and environmental benefits, but can help avoid or delay the imposition of drought declarations.

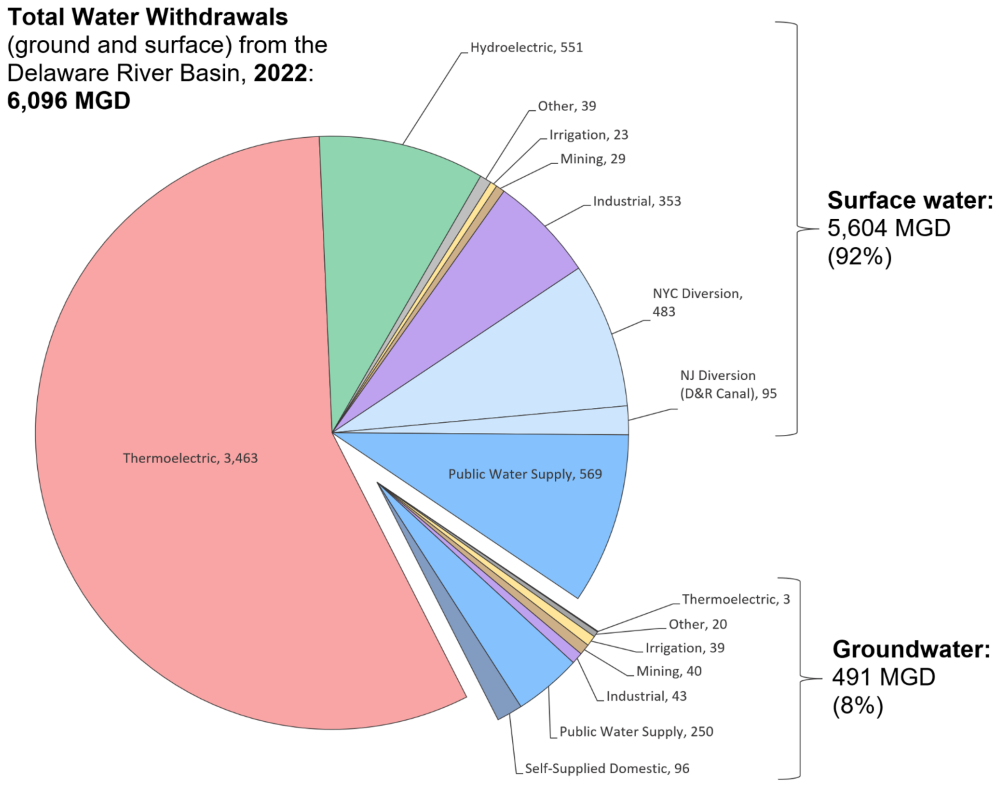
Key components of the DRBC's water conservation strategy include the following:

- Basin Water Use Analysis & Trends
- Water Conservation Initiatives
- Water Audit Program

Basin Water Use—Where Does the Water Go?

About 6.1 billion gallons are withdrawn from the Basin every day (2022 data). Approximately 92% of that water is surface water. Four sectors account for nearly all water withdrawals. These are: thermoelectric power generation (57%), public water supply, including major exports and self-supplied domestic withdrawals (24%), hydroelectric power generation (9%) and industry (6%). The DRBC tracks withdrawals in these key sectors closely. Long-term data extend through 2022 and show generally static trends in total water withdrawn; for PWS, water conservation practices have neutralized population increases, and for industry, the closing of some facilities have balanced new ones.

In 2021, the DRBC published a report that analyzes 30 years of historic withdrawal data and projects withdrawal demands to the year 2060. The report concludes that peak water withdrawal has likely occurred & consumptive use (see next page) has remained the same and is projected to remain constant.



What is Consumptive Use?

Consumptive use is the portion of water withdrawn from a watershed that is not immediately returned. In the Delaware River Basin, nearly 1 billion gallons of water leaves each day and is not directly returned. In addition to major exports of water leaving the Basin for water supply to NYC and northeastern N.J., the rest of this 1 BGD is from in-Basin consumptive use; for example, from irrigation, public water supply and thermoelectric power generation. An understanding of consumptive water use provides additional insight into water use patterns and is an important indicator the DRBC uses to manage water resources.

Martins Creek Power Plant, on the Delaware River, Bangor, Pa.

Out of Basin Diversions—NYC

Three Delaware River Basin reservoirs (Cannonsville, Pepacton and Neversink) are owned and operated by New York City. Though the city itself is not in the Delaware River Basin, about half of its water is provided by these three reservoirs. According to a U.S. Supreme Court Decree issued in 1954, NYC is authorized to take up to 800 MGD from the Basin for its water needs; to make up for this out-of-Basin diversion of water, releases are made from these reservoirs into Basin waters to meet a mandated flow target at Montague, N.J., near the PA/NY/NJ border. This is part of a current management plan known as the Flexible Flow Management Program (FFMP).

The combined storage in the three NYC reservoirs is managed by the parties to the 1954 Decree (PA, NJ, NY, DE and NYC) for the purposes of water supply, flow augmentation in the Delaware River and salinity control in the Delaware River Estuary when necessary. To ensure the conservation of regional reservoir storage in times of drought, phased reductions in out-of-Basin diversions, reservoir releases and flow objectives are part of the Commission's Drought Operating Program.

Out of Basin Diversions—N.J.

The 1954 U.S. Supreme Court Decree also provided New Jersey the right to withdrawal DRB water for its out-of-Basin needs through the Delaware and Raritan Canal. The water travels from Bulls Island, north of Stockton, N.J., for 22 miles along the river until it turns inland near Trenton, N.J., crossing into the Raritan Basin near Princeton, N.J. The water is managed by the New Jersey Water Supply Authority for multiple drinking water suppliers that serve the residents of north-central New Jersey. On average, about 100 MGD are exported through the Delaware and Raritan Canal.

The Delaware and Raritan Canal runs from Bulls Island on the Delaware River to New Brunswick, N.J.

Protecting Groundwater

While groundwater withdrawals only amount to about 8% of all water withdrawn from the DRB daily, it is still important to track, as the bulk of that water (71%) is for drinking water. There are two areas in the DRB that are showing signs of stress from over-pumping and are recognized as critical or protected areas: Critical Area #2 in south-central New Jersey (managed by N.J.) and the Southeastern Pennsylvania Groundwater Protected Area (GWPA).

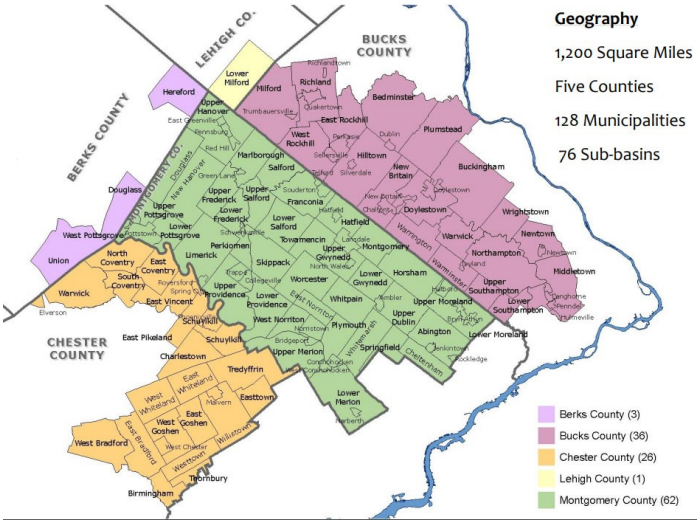
Southeastern Pa. Groundwater Protected Area (GWPA)

The GWPA, where more stringent regulations apply to ground water withdrawals than they do in the rest of the Delaware River Basin, was initially established in 1980 by the DRBC at the request of the Commonwealth of

Pennsylvania after it became evident that development was negatively impacting ground water levels in southeastern Pennsylvania.

The main goal of the GWPA is to prevent the depletion of ground water, and data show it's working. In December 2022, the DRBC published a report "Estimated Groundwater Availability in the Delaware River Basin 2020-2060." The report's key takeaway is that groundwater resources are being used at sustainable rates in the Delaware River Basin.

Both the GWPA & Critical Area #2 in N.J. have been successful in protecting groundwater through stricter control and regulation of withdrawals, as well as water conservation programs and an overall increase in surface water diversions to supplement or reduce groundwater withdrawals.



Map of the Southeastern Pennsylvania GWPA.

Water Conservation Initiatives

In order to meet the needs of present and future populations and ensure that ecosystems are protected, the DRBC works to ensure that water resources are properly managed, efficiently utilized and responsibly conserved.

Through regulation, the DRBC has helped conserve Basin water resources from the source to the tap. Its water conservation initiatives have resulted in significant cost savings, enhanced environmental protection and improved drought preparedness.

For example, large water withdrawals are required to submit water conservation plans with their applications. Water suppliers are required to audit their systems for leaks (more in next section) and meter to track water usage. Knowing how much water is being used and also potentially lost is critical to water supply management. And, the DRBC has established water conservation performance standards for plumbing fixtures/fittings (toilets, lavatory faucets and shower heads) for new construction and major renovations.

These regulations, plus multiple education initiatives about the importance (and cost savings) of conserving water, have helped the Basin be more resilient during times of drought.

Water Audit Program

Nationwide, an estimated six billion gallons of water is taken from water resources every day and never reaches the customer; this water is lost due to infrastructure leaks (see photo below), metering inaccuracies or improper billing practices.

In 2009, as part of the DRBC's effort to ensure its regulations reflect the latest thinking in the field of water efficiency, the Commission approved a requirement mandating public water suppliers use an updated water audit approach to identify and manage water loss in the Basin. The approach, which was officially implemented in 2012, 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 DRB water purveyors who have been issued approvals by the Commission to withdraw more than 100,000 gallons per day of water during any 30-day period to conduct an annual water audit to help identify water losses.

In 2022, roughly three hundred water audits were available for analysis and showed that approximately 176 million gallons of water per day were lost in the DRB due to leaking pipes, inaccurate meters or improper billing. Some loss is unavoidable.

In December 2023, the DRBC published "A Comprehensive Assessment of the Delaware River Basin Commission's Water Audit Program (2012-2021)." The report provides a detailed look at ten years of data, which show that water losses have remained relatively constant and that there is broad compliance with the program.

As demand for water increases, it is essential to ensure that water supplies and the infrastructure delivering water are dependable and efficiently move water from source to customer. Data from the DRBC's water audit program help improve water efficiency and promote best practices in water loss control for Basin water purveyors, saving both water resources and money.

DRBC Project Review

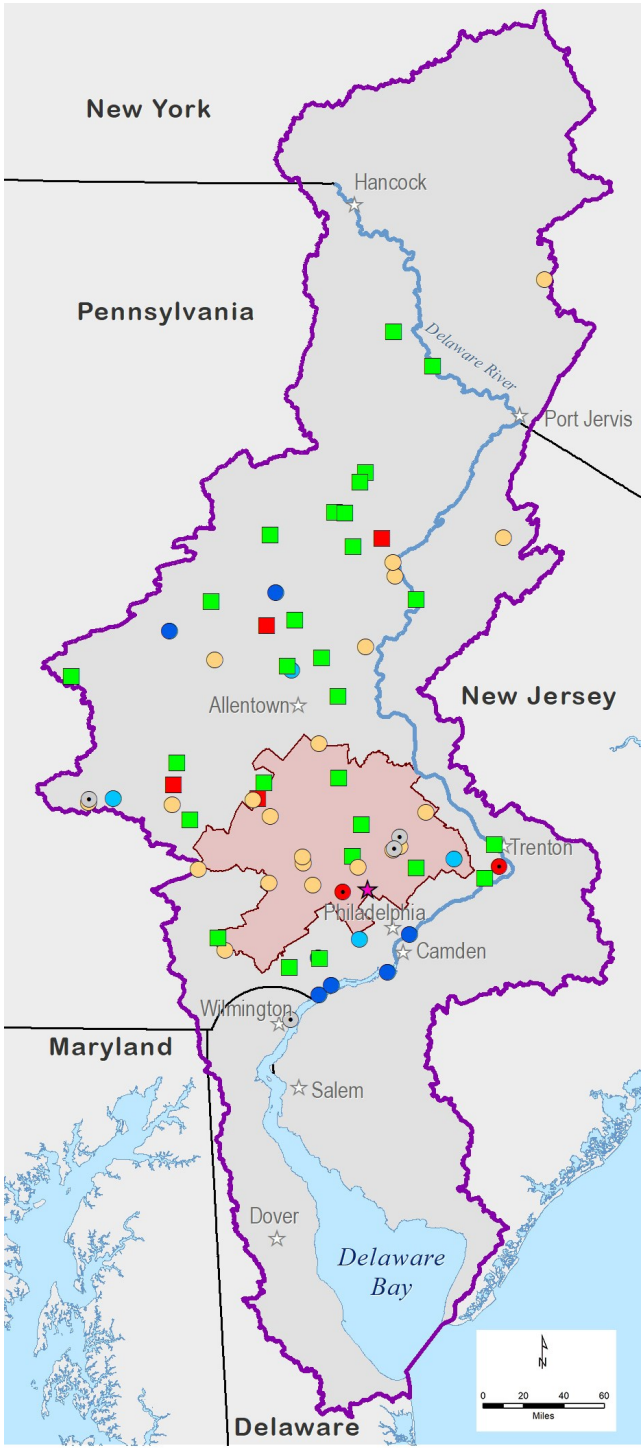
The Delaware River Basin Compact provides that no project having a substantial effect on the water resources of the Delaware River Basin shall be undertaken unless it has been first submitted to and approved by the Commission. The DRBC's regulations detail the procedure of submission, review and consideration of projects and for its determinations pursuant to the Compact.

The majority of the projects subject to Commission review under the Compact are large water withdrawal and wastewater discharge projects.

Other projects in the Basin that may also be subject to Commission review include bridges, water impoundments, natural gas and liquid petroleum transmission pipelines and electric transmission and bulk power lines.

The Commission is required to approve a project whenever it finds and determines that the project would not substantially impair or conflict with its Comprehensive Plan.

The DRB Commissioners decide on whether to approve projects at regularly scheduled public business meetings after a public hearing has occurred.



Map Key

Discharge Dockets
- Industrial WTP
- Wastewater WTP

Withdrawal Dockets
- Groundwater
- Ground and Surface Water
- Surface Water

Other Dockets
- Other
- Power
- Recreation
- DRB Boundary
- SE PA GWPA

Dockets Approved by the DRBC in 2022.

Water Quality

The Delaware River Basin Compact, federal law and law in each of the four Basin states, provides the DRBC with the jurisdiction and responsibility for the quality of the Basin waters. Specifically, it directs the DRBC to maintain water quality for public drinking water (after reasonable treatment), recreation, aquatic life and fish/ shellfish consumption.

The Commission uses a multi-faceted strategy to water quality regulation that provides a rational approach to protecting and restoring water quality in the Basin. To evaluate how water quality criteria are being met and whether the designated uses are being protected, you must monitor and assess the collected data. The foundation of the DRBC's water quality monitoring programs is the tenet *you can't manage what you don't measure*.

Maintain Quality Upstream, Improve Quality Downstream

The Commission sets, maintains and enforces water quality standards for the Basin's waters. While the water quality issues in the tidal portion of the lower Basin, particularly the industrialized urban stretch near Philadelphia and Camden, require special attention, the water quality of the non-tidal river upstream of Trenton, N.J. is better than established standards. As a result, the DRBC has two basic strategies when it comes to the Basin's water quality:

- Improve the quality of the water in the Basin below Trenton.
- Maintain the quality of the water in the Basin above Trenton. The area in the grey portion of the map at right drains to the section of the river that is designated ***Special Protection Waters (SPW).***

Drainage area to DRBC's Special Protection Waters.

Special Protection Waters: Keeping the Clean Water Clean

The DRBC first established the SPW Program in 1992; it was expanded in 1994 and 2008. It is designed to prevent degradation in streams and rivers where existing water quality is better than the established water quality standards through stricter control of wastewater discharges and reporting requirements. Currently, the entire 197-mile non-tidal Delaware River from Hancock, N.Y. to Trenton, N.J. is considered Special Protection Waters.

The program states that there will be no measurable change in existing water quality of SPW except towards natural conditions. It allows new or expanded pollutant loadings as long as they do not measurably change the existing water quality and considers the cumulative impacts of these loadings, rather than just looking at them individually. It is believed that these regulations establish an anti-degradation policy on the longest stretch of any river in the nation.

The SPW regulations require monitoring to determine if measurable change is occurring at designated interstate and boundary control points where existing water quality has been defined. In 2016, the DRBC published an assessment of water quality in the Lower Delaware River SPW, a 76-mile stretch of river from Portland, Pa. to Trenton, N.J. The assessment looked at whether changes to existing water quality in this section of river have occurred by comparing baseline data collected from 2000-2004 to data collected from 2009-2011. For most water quality parameters at most locations, there were no measurable changes to existing water quality, demonstrating that the SPW program is working and plays an important role in managing water quality in the Delaware River Basin. One parameter that is increasing is chlorides; while levels are below criteria for drinking water and aquatic life, the DRBC is studying this trend closely. A full SPW reassessment is currently underway (2023-2025).

Good "Bugs" Mean Good Water

The DRBC monitors water quality in SPW through a variety of programs. One is the SPW Monitoring Program, which is conducted through an informal partnership between the National Park Service (NPS) and the DRBC. NPS staff leads the monitoring programs in the Upper Delaware and Delaware Water Gap, while Commission staff is in charge of the Lower Delaware program. The goals are to assess compliance with existing water quality criteria to ensure the goals of the SPW Program are being met.

The other is the DRBC's Biomonitoring Program, which samples sediment, rocks, algae, aquatic insects and water chemistry to provide a complete overview of the diversity and health of the aquatic life community and overall water quality of the 197-mile non-tidal river. Every few years, staff collects samples at 25 river sites. One parameter monitored is macroinvertebrates, or aquatic insects. Looking under rocks and in the river's silt (photo, top), staff collect these bugs for analysis (like the mayfly larvae in the photo, right). Since different species have different tolerance levels for pollutants, the presence of pollution-sensitive "bugs" are a good indicator of the river's water quality.

Monitoring the River's Health

Since the 1960s, the DRBC has maintained a comprehensive water quality monitoring program in the Delaware River Estuary (the tidal portion of the river, south of Trenton, N.J.). This program, known as the Delaware Estuary Water Quality Monitoring Program (aka the "Boat Run"), *is one of the longest running monitoring programs in the world.* Working with our partners at the Delaware Dept. of Natural Resources and Environmental Control, water samples are taken at 22 sites once a month, usually from March to October. Analysis is done on a variety of parameters, for example, bacteria, nutrients, dissolved oxygen, heavy metals, chlorophyll-a, dissolved silica and volatile organics.

Other DRBC water quality monitoring efforts include:

- **Ambient Toxicity:** Surface water sampling in the Delaware Estuary—tidal river & tributaries.
- **Sediment Monitoring:** For PCBs, PAHs, pesticides and other contaminants.
- **Monitoring for Metals:** The DRBC monitors metals, such as copper, zinc, nickel and mercury, in ambient water, sediment and tissues of aquatic life of the Delaware Estuary to ensure compliance with water quality criteria.
- **Fish Tissue Monitoring:** A total of nine sites are sampled in both the tidal and non-tidal river. Data are used for Basin state fish consumption advisories.

DRBC scientists collect a water sample (top) and a sediment sample (bottom).

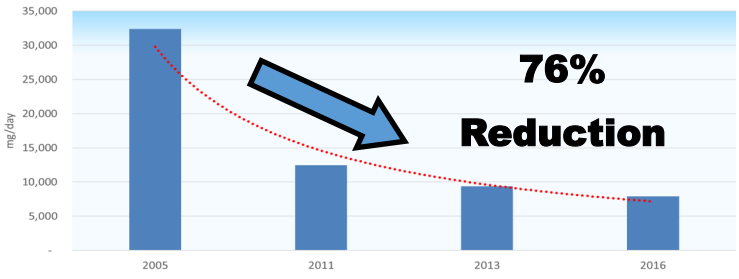
DRBC Actions Help Reduce PCBs in the Delaware Estuary

Polychlorinated biphenyls (PCBs) are man-made chemicals that were used in industrial and commercial applications such as electrical insulation and hydraulic fluid. Even though production was banned in 1979, as they were identified as a probable human carcinogen, PCBs are still in use and are the main cause of fish consumption advisories in the Delaware River Estuary.

The DRBC has been working hard to eliminate PCB contamination in the Delaware River Basin. It developed the technical basis for the Delaware Estuary PCB TMDL established by the U.S. EPA. The Commission supports the implementation of the TMDL by monitoring ambient waters, sediment and fish tissue to provide data on PCB concentrations in the Delaware Estuary.

Additionally, the DRBC requires dischargers complete Pollutant Minimization Plans to track down and reduce point source and non-point source PCB loadings from their facility sites. This collaborative effort has proven quite successful. By engaging over ninety dischargers, the DRBC and estuary states have reduced PCBs by 76% since 2005 from the top ten dischargers (see chart below).

The success of these efforts is also evident by the easing of some fish consumption advisories by the estuary states of New Jersey and Delaware in 2018. Allowing more local fish to be eaten is an indication that water quality is improving and there is less concern with risks to public health from consuming certain fish species from estuary waters. The DRBC will continue to work with its partners to further reduce contaminant levels and continue this trend of improvement into the future.

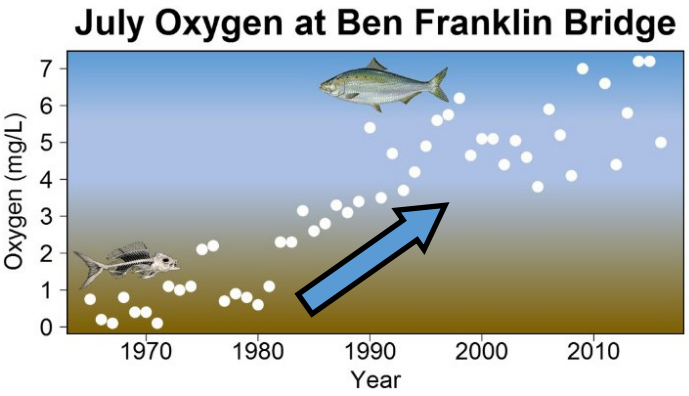


DRBC Working to Further Improve the River for Fish and to Help People Reconnect

Like people, fish require oxygen to breathe. However, by the 1960s, oxygen (dissolved oxygen, or DO) in the Delaware River at the Ben Franklin Bridge (connecting Philadelphia & Camden) was non-existent in the summer. Among other reasons, the major culprit was the discharge of partially treated human wastes, which consumed oxygen from the river. This severe water quality problem was part of the reason the DRBC was created.

To combat this, the DRBC in 1967 established designated aquatic life uses for the estuary and associated numerical water quality criteria necessary to protect those uses. The DRBC established a DO level (3.5 mg/l) that was necessary to support migratory fish like the American shad and Atlantic sturgeon on their annual spawning/returning runs and to support the survival of resident fish. Commission regulations put dischargers on a "pollution diet" based on their contribution to the problem.

Collectively, these DRBC requirements, and investment in improved wastewater treatment, have resulted in greatly improved DO levels, which are now routinely well above the minimum level of 3.5 mg/l (see chart, below).



(Right, top) The American shad and (right, below) the Atlantic sturgeon. Sturgeon pic courtesy of NOAA Fisheries.

Today, improvements in Delaware Estuary water quality have allowed for the return of migratory fish, improved populations of resident fish and the propagation of various fish species, including the aforementioned Atlantic sturgeon, which is listed as an endangered species. However, its reproduction and the survival of juveniles is still limited.

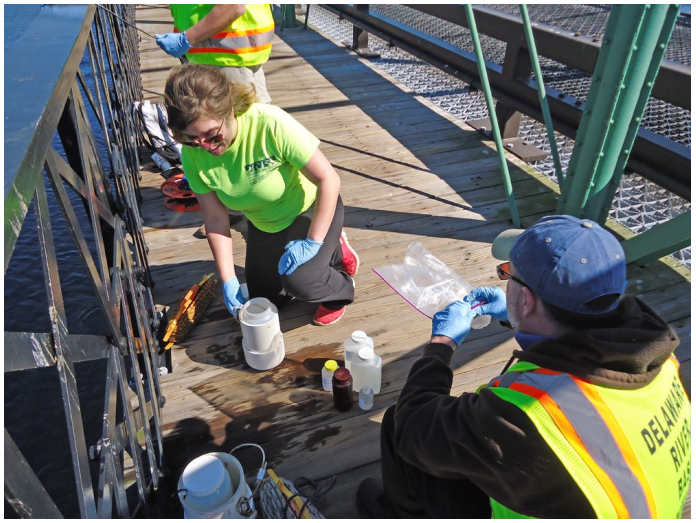
The DRBC completed a multi-year effort to examine whether dissolved oxygen levels can be further improved in these waters to better support all life stages of fish populations. The DRBC led this groundbreaking work, which focused on improving wastewater discharges, through a collaborative process informed by expert scientists and engineers and in close consultation with its Water Quality Advisory Committee.

The study included intensive monitoring, additional research and the development of a technically sound hydrodynamic eutrophication model for the Delaware Estuary and Bay. The model enhances our understanding of the impact of nitrogenous and carbonaceous oxygen-demanding loads and other factors on DO levels in the estuary. The EPA is currently developing rules, which the DRBC will help implement once final.

Another result of improved water quality is now that the Delaware River is cleaner, urban waterfronts are thriving. People want to be near the water and reconnect. Companies are moving to the riverfront. Parks and trails are filled with joggers, bikers and families. Even more recreational activities like kayaking (below) and fishing are taking place on the river. The change is remarkable.

DRBC will continue to monitor the river and work with its co-regulators, partners & dischargers to maintain and/or further improve DO levels and reduce other pollutant loadings—e.g., bacteria—to the river.

Kayaks along the Delaware River.

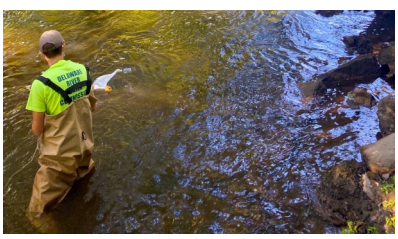


DRBC scientists collect nutrient samples for development of the eutrophication model.

Emerging Challenges to Water Quality

In addition to dealing with legacy pollutants in the Basin's waters, the DRBC is also working on emerging issues. These include:

- **Per– and Polyfluoroalkyl Substances (PFAS):** Man-made chemicals that have been manufactured since the 1940s. The DRBC has an ongoing monitoring program for PFAS in DRB waters, examining surface water, fish tissue and sediment.
- **Microplastics:** Plastic pieces less than 5 mm long; can be harmful to aquatic life. A recent DRBC grant-funded study found microplastics in every sample at all 15 site locations in the upper Delaware River Estuary (mainstem and tributaries) , laying the groundwork for future microplastics monitoring and cleanup efforts in the Basin.
- **6-PPDq:** This chemical sheds off car tires & enters waterways via stormwater runoff. Studies have shown it is sub-lethally toxic to several salmonid species found in the DRB, incl. brook, rainbow & brown trout. DRBC is undertaking a first-of-its-kind study in the DRB to collect baseline data on its presence in DRB waterways.



A DRBC scientist collects a water sample from N.J.'s Assunpink Creek to monitor for microplastics.

Planning for Sustainable and Resilient Water Resources

In the Delaware River Basin, DRBC staff works to ensure clean and sustainable water supplies now and in the future. Here's a shortlist of a few water resilience activities and planning efforts that are underway:

- DRBC is developing adaptation strategies to ensure future water availability.
- DRBC tracks and projects water use and is studying the need for increased freshwater storage in the Basin to protect drinking water supplies and other water uses.
- Modeling and other analyses are underway to determine whether current flow management regimes are sufficient to meet future water demands.
- DRBC helped develop technical tools to support Basin water resilience, including one to better understand habitat suitability and one for projecting extreme precipitation patterns.

The DRBC will continue to work with its partners and Basin community stakeholder groups to share information and facilitate collaboration.

Connecting with Peers and the Public through Education, Outreach & Service

DRBC staff exhibit at the 2019 Frenchtown River Fest.

The DRBC recognizes the value of working with its partners in government, as well as with Basin stakeholders and the general public. Its advisory committees provide a forum for the exchange of information and viewpoints on a variety of issues, enhancing communication and coordination. Staff is often asked to speak on water resource management and related technical issues at conferences, workshops and seminars. And, at times, staff is invited to provide testimony before state and federal legislative branches about issues on which they have expertise.

Connecting with the public at outreach events and engaging with our community partners helps share information about the Delaware River and how we are working to manage, protect and improve its waters. These efforts, which fall under the umbrella of DRBC's *Our Shared Waters* program, help foster stewardship for our shared water resources.

Another effort that is important to the DRBC staff is helping out in our Basin communities. Staff has volunteered time for a variety of public service projects over the years, from river and park cleanups to work at a local food bank.

DRBC staff pose with their "bounty" after a successful volunteer cleanup day at Palmyra Cove Nature Center, N.J.

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Front Page Photo Credits:

(*Top left*) Sr. Environmental Toxicologist Dr. Ron MacGillivray (retired), Water Resource Scientist Elaine Panuccio & former Water Quality Intern Scott Jedrusiak in the DRBC lab; (*top right*) Bald eagle by DRBC staff; (*middle left*) Water Resource Scientist Elaine Panuccio; (*middle right*) the Delaware River at the Calhoun Street Bridge (connecting Trenton, N.J. & Morrisville, Pa.) by DRBC staff; (*bottom left*) DRBC staff review a project map with a docket-holder; (*2nd from bottom right*) the Delaware River & Philadelphia, Pa. by DRBC staff; and (*bottom right*) the Delaware River Estuary by DRBC staff.

Delaware River Basin Commission

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