State of the Delaware River Basin 2013

Is our water safe to drink?
Are fish plentiful and safe to eat?
What problems might we encounter in the future?
Will we have enough water to drink
and to grow our food?
What will be the water legacy for our children?

How are we doing?

In the Delaware River Basin, the news is mixed and hopeful. We have more than 15 million people—in and out of the Basin—depending on our water, and we are using it more efficiently than we used to. Water continues to be a crucial part of generating electrical power. As our demand for electricity increases, so will the need for water.

After decades of improvement, water quality seems to be holding steady, which is very good. Pollutants that are regulated are stable or decreasing. Attention is now focused on testing for and understanding the effects of a wide array of emerging chemicals of concern.

Striped bass are thriving and horseshoe crabs may be on the rebound. News for oysters and shad is mixed, however, and all but the most common mussels are hard to find in freshwater streams. The Atlantic sturgeon was recently listed as "endangered," its habitat and survival at risk from both natural conditions and human activity in the River.

Landscape changes are perhaps the most difficult to see in a few years, but we removed forest at the surprising rate of 45 football-fields per week over the past decade. Natural changes happen

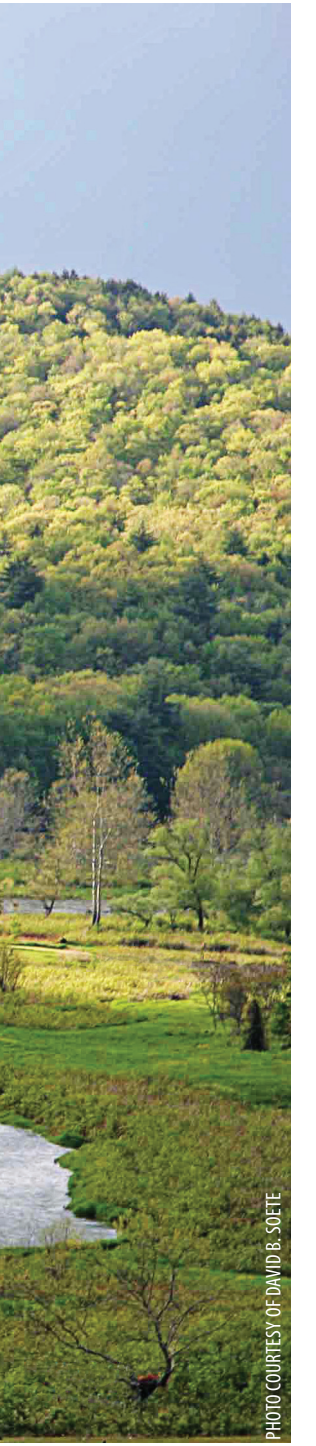


PHOTO COURTESY OF DAVID B. SOETE

more slowly; our bayshore marshes are being eroded or inundated by rising sea levels at a rate of about 4 football-fields a week. Freshwater wetlands and stream corridors are in better condition, especially in the upper basin where more than 70% retain their natural forest cover and function. These natural landscapes are important for water supply and habitat.

We continue to be rich in natural resources that provide benefits to us: water to drink and grow food, streams to canoe and fish, forests to provide clean water and trails to walk. This is our legacy to safeguard for coming generations.

What's in a name?

The Delaware River Basin includes nearly 13,000 square miles of land in New York, New Jersey, Pennsylvania and Delaware. Rain that falls on this land flows into streams and rivers that empty into the Delaware River or Delaware Bay. This defines a watershed. A large watershed with many rivers is also called a basin.

The Delaware River Basin Commission (DRBC) is a government agency started in 1961 to safeguard the water resources within the Delaware River Basin. Representatives of each of the four states and the federal government meet regularly to ensure that water resources are fairly managed for current and future generations.

Want more information?

Explore the links ✱ provided to learn more about any item. The 2013 brochure you are reading represents the most recent look at conditions in the Delaware River Basin based on information on more than 50 topics gathered by experts at DRBC, government agencies, universities and other groups. More details can be found in

- ✱ *Technical Report for the Estuary and Basin* (TREB): http://www.state.nj.us/drbc/about/public/publications/pde_treb2012.html.
- ✱ *State of the Basin 2008*: http://www.state.nj.us/drbc/programs/basinwide/report/index.html.

We'll be back with a new summary of conditions in 2018.

THE DELAWARE RIVER BASIN LANDSCAPE

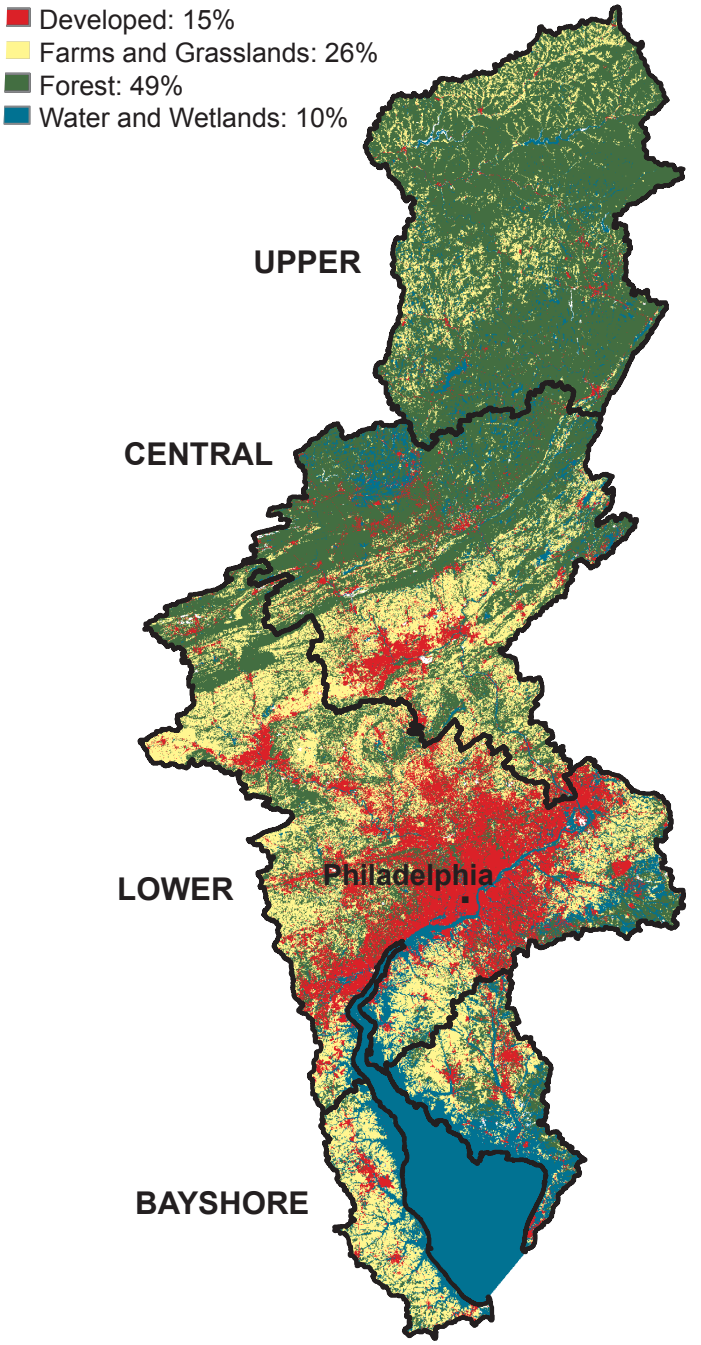
Fast Facts

- Basin size: 13,500 sq mi
- Population: 8.3 million (2010)
- Nearly 500,000 new people since 2000
- Projected: 9 million by 2030
- Every 1 million people adds ~100 million gallons daily to public water supply & wastewater treatment needs
- Development & people are concentrated in the Lower Basin Region (red on map)
- Forest (green) is important for water supply and quality and is still dominant in Upper basin and most headwaters
- Freshwater and tidal wetlands (aqua) provide specialized habitat and flood protection.

✱ Landscape and population: http://www.state.nj.us/drbc/library/documents/TREB-PDE2012/Ch1-watersheds-landscapes.pdf

✱ Watershed habitat and wetlands: http://www.state.nj.us/drbc/library/documents/TREB-PDE2012/Ch5-aquatic-habitats.pdf

Forested land is being converted to other uses at a rate of 3,147 acres – or 2,400 football fields – each year.



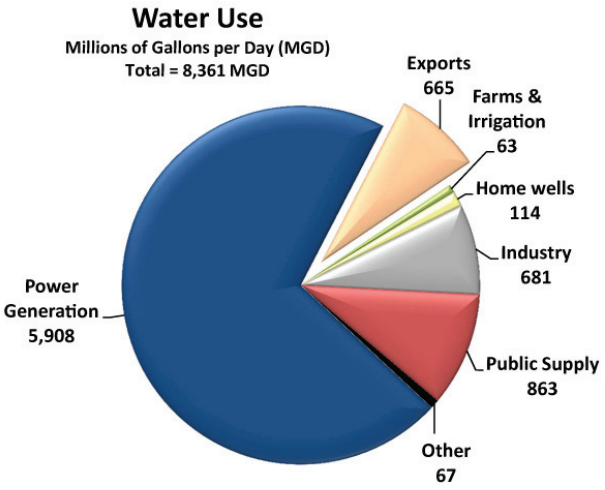
WATER QUANTITY: HOW WE USE AND PROTECT WATER SUPPLY

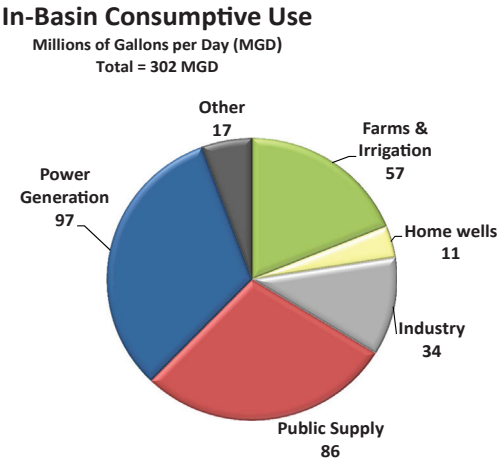
Water Supply Indicator	2013 Status	Present Condition	Trend
Salt Line Location	○	Protective of public supply	↔
Water Use Efficiency	○	Per capita use improving (decreasing)	↑
Water Use	○	Human needs being met; Instream needs being evaluated	↔
Consumptive Use: Public	○	Has decreased, although population has increased	↑
Consumptive Use : Power Generation	◑	Has increased over past	↓
Areas of Groundwater Stress	◑	No additional management areas identified	↔

○ **Good** ◑ **Fair** ● **Poor** ↑ **Improving** ↓ **Worsening** ↔ **No Trend or Stable**

Fast Facts

- A million gallons (MG) of water will fill up 20,000 bath tubs
- A billion gallons (BG) of water = 1,000 million gallons
- 8.4 billion gallons of water are pumped daily from Basin reservoirs, streams and wells
- Over 15 million people rely on Basin water, about 1 in every 20 Americans
- 92% of all water withdrawn is used in the Basin (7.7 billion gallons per day or BGD)
- 8% is exported (665 MGD)
- 77% of in-basin water is used to generate power (5,908 MGD)
- 11% of in-basin use is for public water supply (863 MGD)
- 82% of people are on public water supply; 18% have their own well
- One gallon of water weighs more than 8 pounds.





Water Used Is Not the Same as Water "Consumed"

Water geeks speak a different language. Consumptive use or loss of water means that the water is not deliberately returned to the watershed. Most of the water taken from wells or streams is used, treated, and put back into streams and rivers. Overall—after exports—about 4% doesn't get returned and is identified as "consumptive use".

- Water supply & conservation: http://www.state.nj.us/drbc/programs/supply/
- Consumptive use: http://www.state.nj.us/drbc/library/documents/TREB-PDE2012/Ch2-water-quantity.pdf

Greater Efficiency

All of us use water. Most of us (82%) use water delivered as public supply; a few of us (18%) have our own well. We measure water use in gallons per person (capita) per day (gpcd), and compare this number over time. Based on recent (2007) reported water use, the basin-wide average is 116 gallons per person per day. In 2003, the average was 133 gpcd. The good news is that—even with more people—per capita use and total water use has declined. We are using water more efficiently. This is a very positive trend driven by improvements in water conservation—like low flow toilets and showers—and greater public awareness.

- Per capita water use: http://www.state.nj.us/drbc/library/documents/TREB-PDE2012/Ch2-water-quantity.pdf

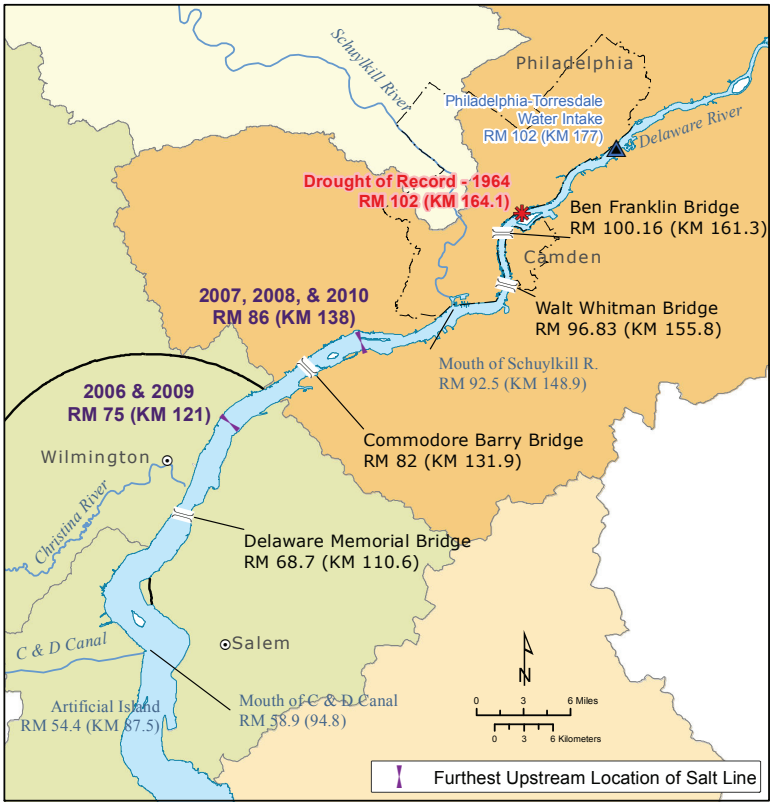
Power from Water

While water and electricity are usually not a good mix, making electricity traditionally requires a lot of water—77% of all water use in the Basin is involved in power generation. As our need for electricity has increased in the last twenty years, so has our use of water to generate it. How much is actually "consumed" (see above) depends on the type of cooling system used. *Once-through* systems use a heat absorber, use more water, but have a lower consumptive use (<1%). Systems that use tall *evaporative cooling towers* need less water, but have a high consumptive use (>90% is evaporated). The amount of water used to create electricity now accounts for one third of all the water used consumptively. Recently, rules were changed to require recirculating systems at new power generating plants. While requiring less water to run, such plants will have a higher percentage of consumptive use. This is a mixed result, since more water can remain in the rivers, but less will be immediately returned to be used again.

- Tracking supply and demand: http://www.state.nj.us/drbc/library/documents/TREB-PDE2012/Ch2-water-quantity.pdf

Protecting Drinking Water

The amount of water passing by at Trenton—the location of the most upstream point of the River that is influenced by the tides—is automatically monitored every fifteen minutes. This information is important. Low flow conditions could be a problem for water supplies taken from the River south of Trenton. When flow is very low, salty water from the Bay moves upstream and can cause trouble for drinking and for industrial use. Monitoring the flow gives managers time to order releases from reservoirs far up stream.



The additional water protects drinking water supplies by keeping the "salt line" a safe distance downstream of water intakes. With good management, the safe distance has been successfully maintained for decades. While we have good flow information, we need better tools for predicting conditions in advance to make sure there will be enough water where and when we need it in the future.

✱ Where is the salt line today? http://www.state.nj.us/drbc/hydrological/river/salt/index.html

Water Quality Alert!

DRBC has developed a real-time flow and transport model to protect drinking water intakes from spills and other mishaps. The model was used in November 2012 to assess potential vulnerability from a railroad accident and vinyl chloride spill in Mantua Creek (NJ).

✱ DRBC transport model: http://www.nj.gov/drbc/library/documents/mac_drbc-monitor-model-vinyl-cl-spill010913.pdf

✱ Watch the model in action: http://www.youtube.com/watch?v=gAYjWld4cn0

Groundwater Stress

Two areas of groundwater stress are under special management; no new areas have been identified for special management in the Basin at this time.

SEPA-GWPA

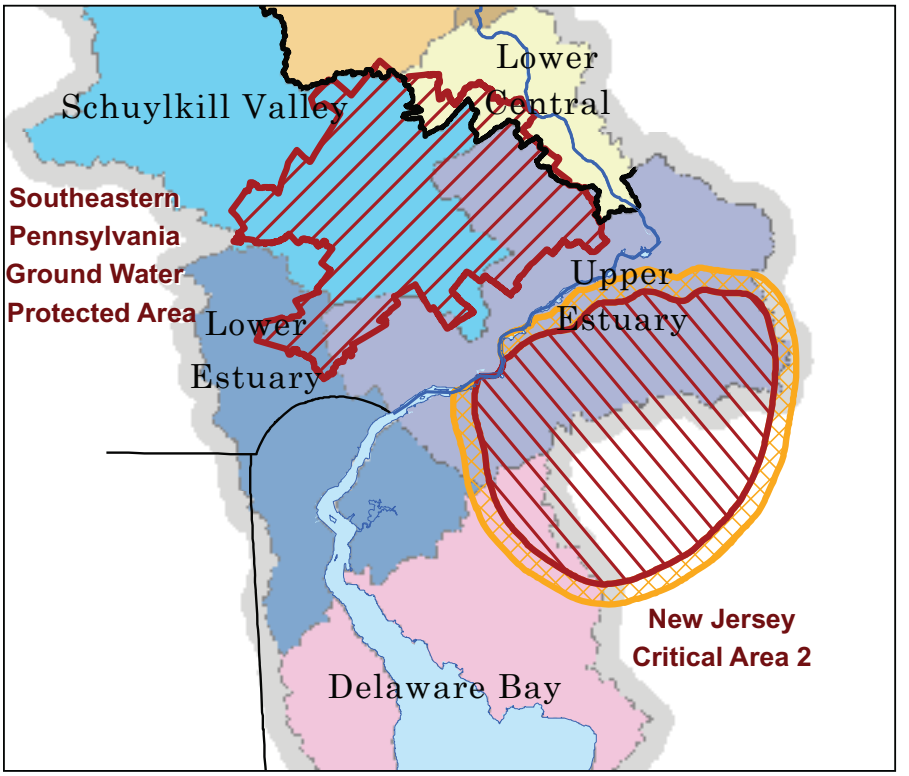
DRBC manages the Southeastern Pennsylvania Groundwater Protected Area (SEPA-GWPA), where 12 of 78 watersheds are within or beyond 50% of their recommended allocation limit. Recent use data indicate a slight decrease in groundwater use in the SEPA-GWPA, and no additional management efforts are necessary at this time.

✱ SEPA Groundwater Protected Area: http://www.state.nj.us/drbc/programs/project/southeast/

New Jersey Critical Area 2

In southwest New Jersey, NJDEP limits the allocation of groundwater in Critical Area 2 and, with USGS, regularly checks groundwater levels, which are generally improving.

✱ TREB, Ch 2, page 58: http://www.state.nj.us/drbc/library/documents/TREB-PDE2012/Ch2-water-quantity.pdf



WATER QUALITY: HOW CLEAN IS THE WATER?

Water Quality Indicator	2013 Status	Present Condition	Trend
DO - Upper & Central Region	○	Good water quality	↔
DO - Tidal River & Bay	◑	Some areas with low oxygen	↔
Nutrients – Upper Region	○	Cold, low nutrient waters	↔
Nutrients - Central Region to Lehigh River	○	Warm, low nutrient-waters	↔
Nutrients - Central Region below Lehigh River	◑	Warm, elevated-nutrient waters	↔
Nutrients – Tidal River & Bay	◑	Elevated nutrients might be linked to signs of problems	↔
Metals – Tidal River & Bay	◑	Copper being investigated; no problems with other metals	↔
Toxics: PCBs – Tidal River & Bay	●	PCBs persist, but reductions evident	↑
Pharmaceuticals & Personal Care Products (PPCPs) – Tidal River	◑	Priority PPCPs identified; codeine & metformin found in higher than expected amounts	↔
Toxics in Fish Tissue	●	6 chemicals exceeded screening values in some fish from the Delaware River	↔
Fish Consumption Advisories	●	Advisories exist for mercury & PCBs in many water bodies	↔

○ **Good** ◑ **Fair** ● **Poor** ↑ **Improving** ↓ **Worsening** ↔ **No Trend or Stable**

Fast Facts

- In 1950, the urban Delaware River was one of the most polluted stretches of river in the nation
- In 1967, dissolved oxygen was too low (<1 mg/L) to support fish survival and DRBC started a program to improve water quality
- By 1990, with $1.5 billion invested in wastewater treatment, DO improved to meet or exceed the goal of 3.5 mg/L
- A 197 mile segment of the River above Trenton is part of DRBC's Special Protection Waters program—possibly the longest stretch of river in the nation under an anti-degradation policy
- Over 85,000 chemicals are commercially available in the U.S.; most remain unstudied and unregulated

What Do We Mean by "Clean"?

Governments set standards for basic uses and for the acceptable amount of substances of concern that are found in our waters. These safeguards protect human health and the overall well-being of our streams, rivers, lakes and bays. Maintaining good quality water is not

The presence of a substance is measured as the amount per unit of volume of water. For example, DO is measured as the number of milligrams in a liter of water (mg/L).

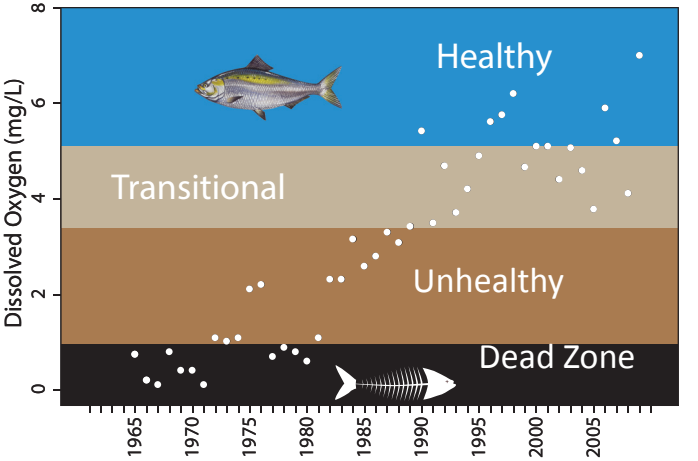
1 mg = 1/1000 (one thousandth) of a gram

always easy. Temperature, salt content, and other natural conditions—even the kind of bedrock and soils—are specific to each stream or river, affect water chemistry and also our ability to assess and manage conditions. Generally, when we say "clean" we want to know if the water is fishable and swimmable, that is, is it healthy for us and for the plants and animals that live in the water. Dissolved oxygen is one very crucial measurement of healthy streams.

Fish Need Oxygen, Too

Dissolved oxygen (DO) refers to the amount of oxygen gas in water. DO is essential for the breathing, growth and reproduction of fish and shellfish. The amount of oxygen in water can typically range from 0 to 12 mg/L (saturation). Cold-water fish (like trout) require at least 6 mg/L to be healthy. At 4 to 5 mg/L, warm-water fish become stressed. Fish eggs and young fish need more oxygen than adults. A drop in DO to below 1 to 2 mg/L will result in a fish kill, where large amounts of fish die and float to the surface.

Ben Franklin Bridge - July Data



What Changes DO?

Warmer water generally contains less oxygen than colder water, so the amount of DO naturally changes seasonally and daily as water and air temperatures change. Salinity affects DO; saltier water carries less oxygen than fresh water. Wastewater discharges, decaying leaves and seaweed, some chemical compounds and too many nutrients can also decrease the amount of dissolved oxygen in water.

✱ Watch how DO can change with tide and time: http://www.youtube.com/watch?v=JgP_TtZ4Zx8

DO Where Fresh Water Meets Salty

The history of DO recovery in the tidal Delaware River and Bay (aka the Estuary) is well known since automatic monitors track DO levels at 4 locations. Recent studies reveal an intriguing oxygen story for the estuary that is still unfolding. Increases in temperature and salinity—expected with sea level rise and global climate change—could lower the oxygen carrying capacity for portions of the River and Bay. It may be necessary to seek water quality improvements just to maintain the current, yet still highly changeable, levels of DO. Furthermore, current requirements may need revision to be protective of fish reproduction.

✱ About dissolved oxygen: http://www.state.nj.us/drbc/quality/conventional/dissolved/

DO in Fresh Water

DO in the fresh water of the River above Trenton and in most tributaries appears to be generally good and reasonably stable. Adding more automatic monitors is recommended to improve our ability to measure and report on conditions. Many of the Basin's best quality streams are located in the watersheds above Trenton, and the DRBC has a Special Protection Waters program in effect there to "keep the clean water clean".

- ✱ Special Protection: http://www.state.nj.us/drbc/programs/quality/spw.html

Too Much of a Good Thing

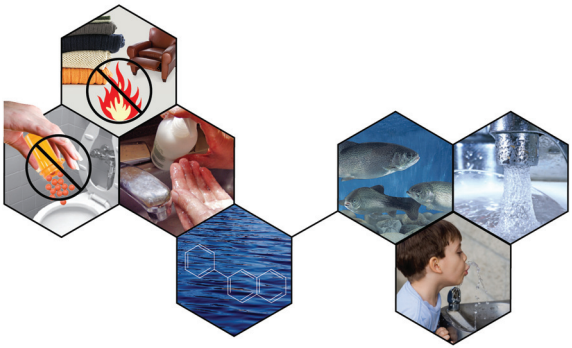
Nutrients promote growth in most plants. Forms of nitrogen (N) and phosphorus (P) are the most commonly measured and reported nutrients related to water quality. High levels of nutrients are not good, because they may reduce DO and can result in poor—or *eutrophic*—conditions in streams. Nitrogen and phosphorus pollution comes from fertilizers, animal waste, septic systems, storm runoff, and sewage treatment plants. Nitrogen and phosphorus pollution is reported to be a problem in more than half of the water bodies in the nation.

- ✱ Nutrients nationally: http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/problems.cfm

The Delaware Estuary is high in the amount of nutrients relative to other estuaries. There are signs of problems—including an area of persistent low DO in the urban river corridor—where nutrients have been identified as a potential cause. DRBC is working to identify appropriate levels of nutrients and sensible measures to take, especially in relation to DO.

- ✱ Estuary water quality history: http://www.state.nj.us/drbc/library/documents/diss-oxygen-estuary_120810pres.pdf
- ✱ Nutrient monitoring: http://www.state.nj.us/drbc/quality/conventional/nutrients/#2

We Are What We Eat…and It Shows Up in Water



What we drink and take for aches and pains also gets into our streams. Caffeine, aspirin, hormones and antibiotics are just a few of hundreds of pharmaceuticals (medicines) and personal care products (PPCPs) that are used daily and flushed from homes, hospitals and other facilities. Water treatment plants don't completely remove them, so they end up in streams and rivers. Water quality studies of Contaminants of Emerging Concern (CECs) conducted by DRBC over a three year period identified priority PPCPs. Most were found in amounts similar to other urban areas; however codeine and metformin—an oral anti-diabetic

drug—were found in higher than expected amounts. The potential effects of these compounds is a concern; DRBC and Temple University will be doing more studies in 2013.

✱ Emerging contaminants: http://www.state.nj.us/drbc/quality/reports/emerging/

Are the Fish Safe to Eat?

Certain chemicals tend to concentrate—or *bioaccumulate*—in fish in amounts thousands of times greater than the amount in the water itself. Eating these fish exposes the consumers—fish, birds, animals and humans—to chemicals that may, over time, cause cancer or other harmful effects. Mercury and PCBs are the most frequent reasons for state advisories to limit or avoid consumption of fish. Advisories exist on many streams, rivers and lakes in the Basin. Always check your state advisories before eating fish that you catch.

✱ Fish advisories: http://www.state.nj.us/drbc/quality/fish/

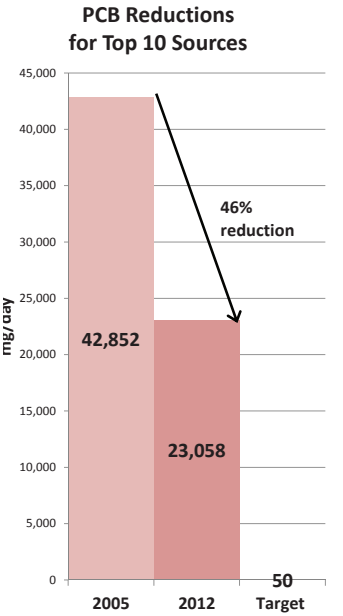
Fish tissue samples from the Delaware River were checked for an additional 16 cancer-causing chemicals and 21 other chemicals. Six of the cancer-causing substances were found to exceed screening values in some fish, indicating that additional work needs to be done to manage these chemicals. None of the toxic chemicals were found to exceed screening values.

✱ Fish contaminant levels: http://www.nj.gov/drbc/library/documents/TREB-PDE2012/Ch3-water-quality.pdf

New Success with an Old Problem

DRBC has been focusing on polychlorinated biphenyls (PCBs) for over ten years. PCBs are a class of non-flammable and very stable compounds once used in a wide variety of ways—from transformers to house paint. The manufacture and use of PCBs was banned in 1976, but its stability means it has stuck around and is found nearly everywhere in soils and water. Efforts have been underway since 2000 to clean it up. It is a slow process, but necessary because PCBs can cause cancer and very serious health effects. In addition to checking water, soil and fish for PCBs, DRBC requires Pollution Minimization Plans to reduce or eliminate PCBs where they are known to exist. Recent reports show that the plans required by DRBC are working. The top ten dischargers responsible for 90% of the point-source PCB loading have reduced their contributions by 46% since 2005. This improvement hopefully will show up as reduced amounts of PCBs in fish tissue in future years.

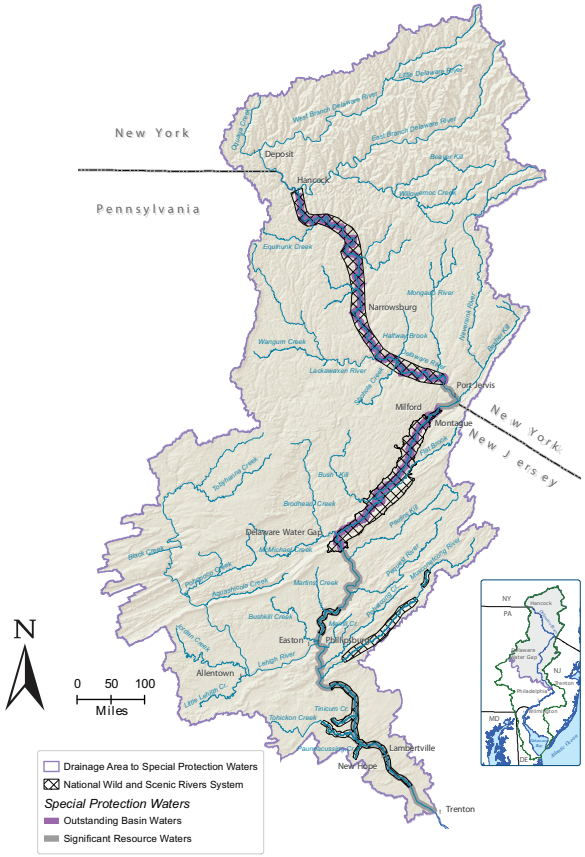
✱ PCBs: http://www.state.nj.us/drbc/quality/toxics/pcbs/



Special Protection Waters

High Water Quality

The main stem of the Delaware River begins near Hancock, NY, and the cool, clean water flows 197 miles downstream to Trenton, NJ. This non-tidal[1] portion drains a landscape of nearly 6,800 square miles in three states, creating the political boundary between them. It is also the primary water supply for cities along its banks—most notably Easton, PA, Trenton and Philadelphia. Water diverted through the Delaware and Raritan Canal regularly supplies water to 2.1 million people in northeastern New Jersey—an additional 1.2 million in an emergency. Existing water quality in this stretch of river exceeds most state and federal standards, and to protect it, DRBC created the Special Protection Waters (SPW) program to "keep the clean water clean."



No Measurable Change

The objective of the SPW program is to ensure that the existing high quality waters are not measurably changed as a result of pollution inputs to the tributaries and the River. In partnership with the National Park Service, DRBC routinely collects data on water quality, plant and macro-invertebrate conditions at 78 monitoring points. A new assessment of SPW water quality is in progress. The data are also used in computer models developed for priority tributaries—that is, those that have a high number of existing discharges, or are expected to have new growth and associated wastewater discharge needs. The models are used to predict possible changes to water quality, and to establish discharge limits to prevent a measurable change.

Exceptional

The SPW designation is believed to establish the longest stretch of river in the nation under an anti-degradation policy. It also is a crucial function of the DRBC, a single agency established to cooperatively protect the water quality of a river shared by multiple states.

✱ Special Protection: http://www.state.nj.us/drbc/programs/quality/spw.html

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[1] South of the geologic fall-line at Trenton, the river is subject to tidal influence.

LIVING RESOURCES

Living Resource Indicator	2013 Status	Present Condition	Trend
Benthic Macroinvertebrates	Mixed	Conditions & trends vary by location; No clear trend in Delaware River	↔
Fresh Water Mussels	●	Very poor in streams, better in main stem Delaware River	↓
Eastern Oyster	◑	Sustained with active management	↔
Horseshoe Crabs	◑	Improving with management. Egg densities affect shore-birds	↑
Striped Bass	○	Water quality improvements helped restore numbers; currently good adult stock numbers	Variable
Weakfish	◑	Delaware's state fish is experiencing high natural mortality	↔
Atlantic Sturgeon	●	Endangered; sitings are uncommon	↓
America Shad	◑	Some improvement; still low compared to historic numbers	↔
American Eel	◑	Moderate numbers currently	Cyclical
○ **Good** ◑ **Fair** ● **Poor** ↑ **Improving** ↓ **Worsening** ↔ **No Trend or Stable**			

The Basin is blessed with a wide variety of native plants and animals that depend on the condition of our streams, rivers, wetlands and forests. We are only reporting on a few that live in water. Many species are doing well, but some are feeling the bad effects of water quality problems, less space to live in, competition from non-native species, or combinations of factors that make it tough to survive and impossible to be healthy.

✱ More about individual species: http://www.delawareestuary.org/pdf/TREB/Chap6.pdf

Healthy Streams

Scientists check on the health of streams and rivers in many ways. One test is to check the bottom of streams to see how many and what kind of insects are living there (benthic macroinvertebrate scores). You may not have heard about them, but just ask a trout fisherman about mayflies!

Many of these critters are very sensitive to changes in water quality and we use them as an early warning that there could be a problem. In addition to water quality, floods and droughts can also affect their condition. Measuring these little guys is both easy and hard. Easy, because you can wade into a stream to collect and count them. Hard, because aquatic insects form groups specific to each of the many types of streams in the Basin, and because each state has a unique way to evaluate them. Reports range from excellent

Mayfly nymph. Mayflies are very important food for fish and are very sensitive to pollution. (Donald S. Chandler/www.discoverlife.org)

to poor. Not surprisingly, conditions in streams in the less-developed portions of the Basin (green) are better for these important critters than in the more-developed (red) areas shown on the landscape map.

- ✱ See how the River and the streams in your state measure up: http://www.state.nj.us/drbc/library/documents/TREB-PDE2012/Ch6-living-resources.pdf

Setting a Baseline

DRBC is focusing on streams in the upper Basin to record current conditions as a baseline in advance of potential natural gas development. Conditions are being recorded for at least 5 sites in each of 28 target watersheds, and water quality conditions are also being checked at 150 sites.

- ✱ Status of pre-gas monitoring: http://www.state.nj.us/drbc/library/documents/mac_drbc-monitoring-nat-gas010913.pdf

Between Two Shells

Freshwater mussels and oysters are a class of larger benthic macroinvertebrates called bivalves (two shells). Since they eat by filtering their food out of the water, they help to make the water cleaner, but may also collect pollutants. Freshwater mussels are very important for water quality on streams, but are vulnerable to droughts, floods, and harvesting for use as bait and for their shells. Freshwater mussels are the most imperiled of all plants and animals in North America.

- ✱ http://www.state.nj.us/drbc/library/documents/TREB-PDE2012/Ch6-living-resources.pdf

Our *Founding Fish*

The silvery green American shad is a river herring that was important to Native Americans and European colonists, and remains so to anglers and riverfront communities. The fish are celebrated in festivals held to celebrate their arrival each spring. Shad spend most of their life at sea, returning to lay eggs—*spawn*—in the river where they were born. Over 300 miles of the Delaware River are open for migrating shad. The Schuylkill and Lehigh Rivers and many streams now have special fish passages to allow fish to swim upstream past the dams that had blocked their way. More dissolved oxygen in the Delaware River, plus these passages, have increased the number of shad successfully returning to spawn, although their numbers remain at low levels. Shad are also food for other fish, especially striped bass. When striped bass are abundant, shad numbers are reduced, and vice-versa.

- ✱ Author John McPhee tells of the shad's importance in American history in *The Founding Fish*.
- ✱ Shad: http://www.state.nj.us/drbc/edweb/special/shad/
- ✱ Fish passage: http://www.state.nj.us/drbc/library/documents/TREB-PDE2012/Ch5-aquatic-habitats.pdf

Aliens!

Didymo or "Rock Snot" (*Didymosphenia geminate*) is an invasive, single-celled type of algae that can form extensive mats in freshwater streams, rivers, and lakes. Its blooms have mostly been a problem in cold, nutrient-poor water—like trout streams—where it can the cover the streambed, rock surfaces, and aquatic plants and decrease food supply for fish. But, to the surprise of many scientists, this species may be expanding its range into warmer environments and into higher-nutrient waters. In fact, it is now believed to occur in many spots—and in two different shapes—along the 200 miles of the non-tidal Delaware River. DRBC will be investigating the many forms and odd living conditions of this alien species during the summer of 2013.

Didymo covers rocks, crowding out other plants and decreasing food supplies for fish.

- Didymo alert: http://www.state.nj.us/drbc/home/newsroom/news/approved/20120424_didymo.html
- Didymo update: http://www.state.nj.us/drbc/library/documents/silldorff_didymo-update051012.pdf

Endangered

Effective in April 2012, the Atlantic sturgeon was listed as *Endangered*, making it illegal to fish for, catch or keep them commercially or recreationally. In the Delaware River before 1890, there were an estimated 180,000 adult females spawning, and now spawning adults in the River are believed to number fewer than 300.

- Endangered Atlantic sturgeon: http://www.nero.noaa.gov/prot_res/atlsturgeon/
- Atlantic sturgeon recovery program: http://www.nmfs.noaa.gov/stories/2012/01/31_atlantic_sturgeon.html

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