Delaware River Basin Commission

Managing the Water Quality of a Shared Resource, the Delaware River

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June 28, 2018

South-East PA - Regional Watershed Workshop

Photo: David B. Soete

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Managing the Water Quality of a Shared Resource, the Delaware River

Today's talk will cover…

- Overview of the DRBC and Water Quality Concerns
- DRBC Water Quality Management
  - Monitoring
  - Criteria Based Program – Delaware Estuary
  - Anti-Degradation Program – Special Protection Waters

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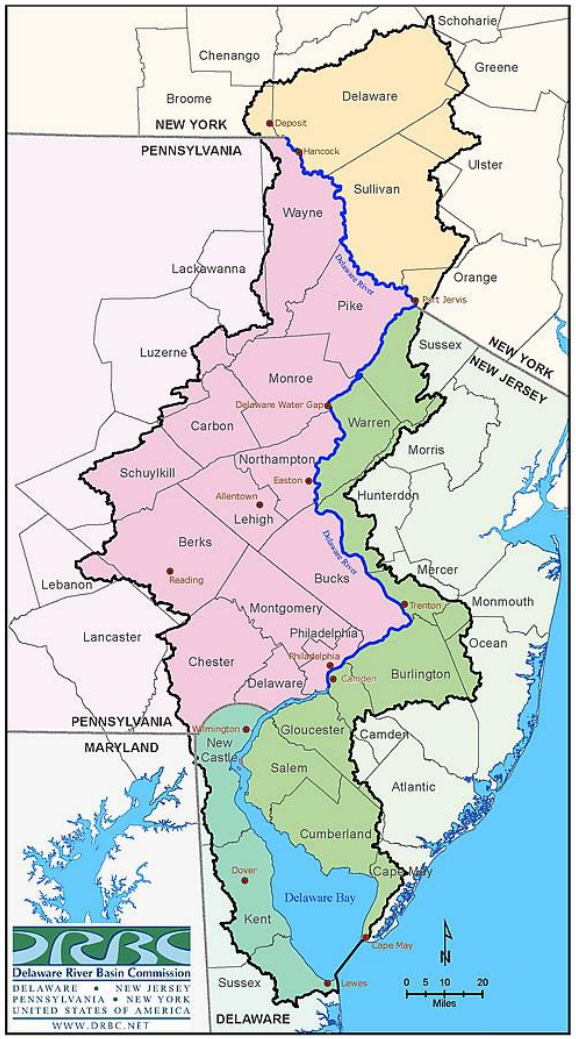
“A river is more than an amenity, it is a treasure”

-US Supreme Court Justice
Oliver Wendell Holmes



Fast Facts:

- Delaware River Main stem river is **330 miles long** – “shared” throughout its length
- **Drains 13,539 square miles** of watershed.
- **~15 million people** (about 5% of the U.S. population) rely on the waters of the Delaware River Basin
- Water **withdrawal** in the Basin = **6.4 billion gallons a day**
- **Contributes over $21B in economic value** to the Region.

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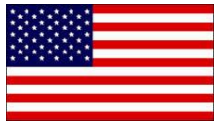
Delaware River Basin Commission
Founded by ***Compact*** in 1961

Five Equal Members:

- Delaware 
- New Jersey 
- Pennsylvania 
- New York 
- Federal Government  

Note: New York City and Philadelphia are "advisors" and not members

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Water Quality Definitions

* Water Quality – characteristics of the water body relative to some use(s); often associated with level of water pollution
* Nature's effects – natural processes that affect water quality
* Chemical, Physical & Biological factors – natural and man-made impacts to water quality
* Designated Uses – uses that are protected under regulation (e.g., agricultural, industrial, public supply, recreation, aquatic life, wildlife, etc.)

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Water Quality Definitions

* Criteria – regulated levels for specified water quality parameters
* Restoration – impaired waters restored to water quality criteria through pollution abatement
* Prevention – exceptional waters protected from degrading to criteria or below (anti-degradation, Special Protection Waters)

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Water Quality Parameters

* **Physical**
  * Temperature (air, water)
  * Discharge (Q)
  * Total suspended solids (TSS)
  * Total dissolved solids (TDS)
  * Turbidity
  * Color
  * Taste & odor
  * Specific conductance

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Water Quality Parameters

* **Chemical**
  * Dissolved oxygen (DO)
  * DO saturation
  * Biochemical oxygen demand (BOD)
  * Chemical oxygen demand (COD)
  * pH
  * Alkalinity
  * Hardness
  * Chloride

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Water Quality Parameters

* **Chemical – Nutrients**
  * Ammonia
  * Nitrate
  * Total nitrogen
  * Orthophosphate
  * Total phosphorous

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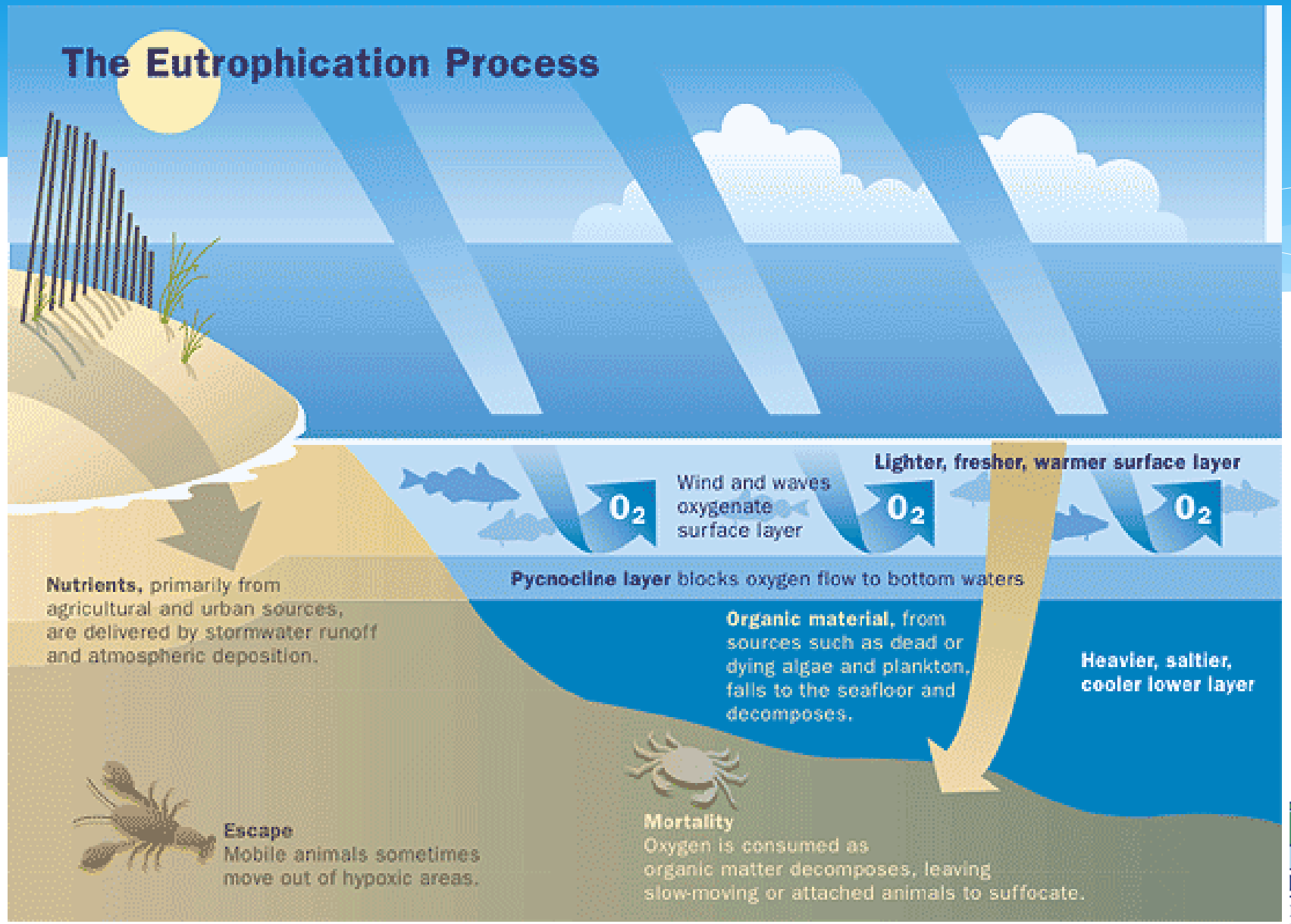
Water Quality Parameters

* **Chemical – Nutrients**
  * A close-up on eutrophication
  * A case for additional wastewater treatment



Credit: Pew Trusts via http://www.wri.org/our-work/project/eutrophication-and-hypoxia/about-eutrophication

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Eutrophication

Credit: http://www.education.txstate.edu/ci/faculty/dickinson/PBI/PBISpring05/Lake/Content/227.1994.jpeg

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Water Quality Parameters

* **Biological**
  * Fecal coliform
  * E. Coli
  * Enterococcus
  * Streptococcus
  * Total coliforms

Water Quality Parameters

* **Chemical – Toxics**
  * PCBs
  * Metals (Hg, Pb, Cu, etc.)
  * Pesticides (DDT, Chlordane, etc.)
  * Organics (TCE, TCA, VC, Benzene, etc.)
  * Semi-volatile organics (PAHs, phthalates, etc.)
  * Per- and polyfluoroalkyl substances (PFAS)
  * Prescription drugs

https://www.epa.gov/wqs-tech

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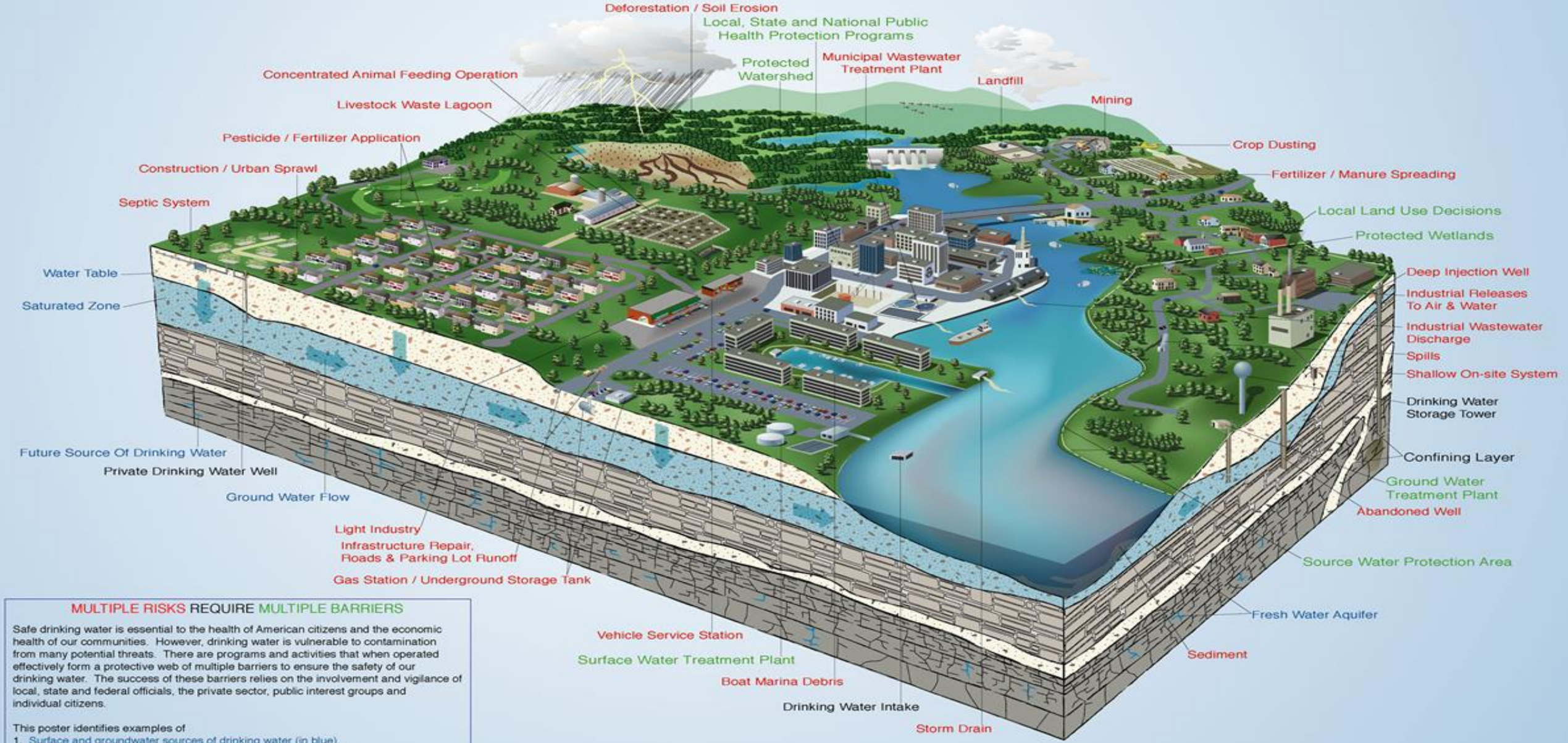
Safe Drinking Water Act - Protecting America's Public Health



MULTIPLE RISKS REQUIRE MULTIPLE BARRIERS

Safe drinking water is essential to the health of American citizens and the economic health of our communities. However, drinking water is vulnerable to contamination from many potential threats. There are programs and activities that when operated effectively form a protective web of multiple barriers to ensure the safety of our drinking water. The success of these barriers relies on the involvement and vigilance of local, state and federal officials, the private sector, public interest groups and individual citizens.

This poster identifies examples of

1. Surface and groundwater sources of drinking water (in blue),
2. Potential threats to those drinking water sources (in red), and
3. The multiple barriers that together protect our nation's public health (in green).
   - Risk Prevention Barrier
   - Risk Management Barrier
   - Risk Monitoring and Compliance Barrier
   - Individual Action Barrier

Safe Drinking Water Hotline – (800) 426-4791 Safewater Web Site – www.epa.gov/safewater

EPA
United States Environmental Protection Agency
EPA 816-H-02-003
January 2002

Water-Land Use Interactions

* Understanding of the interactions and management is essential to maintaining water quality
  * Stormwater runoff
  * Agricultural runoff
  * Management of runoff volume and flow
  * Other non-point source issues

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Stormwater Issues

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Water Quality Management in Delaware River Basin

- Water quality criteria
- High quality waters
  - High quality (HQ)/Exceptional Value (EV) – PA
  - C-1 Waters – NJ
  - Special Protection Waters – DRBC
- Water quality degradation
  - Total maximum daily loads (TMDLs)
  - Restoration

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Water Quality Zones

Source: DRBC 2002 305(b) Report

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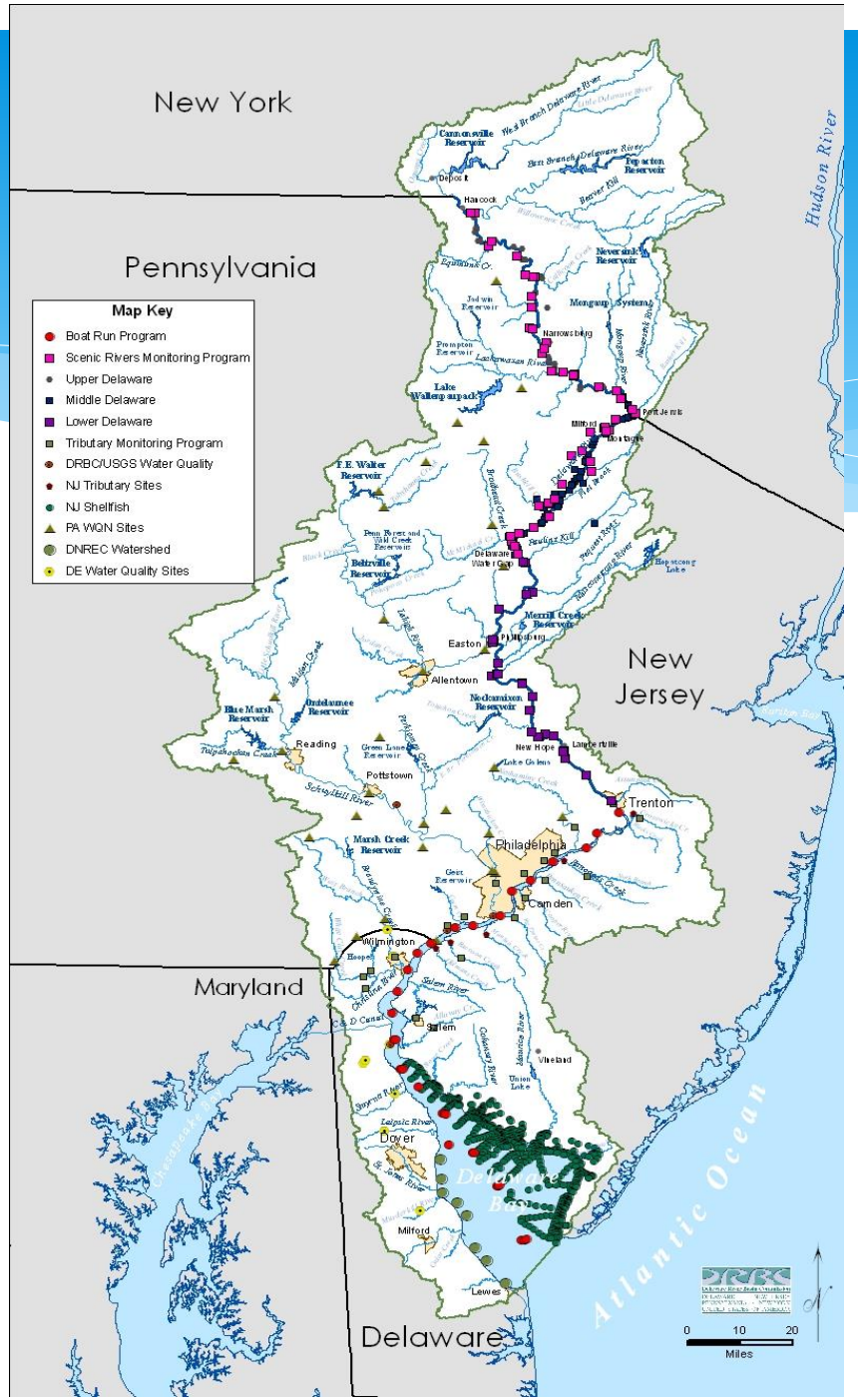
DRBC Monitoring Programs

- SPW Monitoring Program
- Estuary Boat Run Program
- Special Studies
  - Fish Tissue Monitoring
  - Whole Effluent Toxicity
  - TMDL Monitoring Programs
    - PCBs
    - VOCs
  - Emerging Contaminants
- USGS Flow and WQ Gages supported by DRBC



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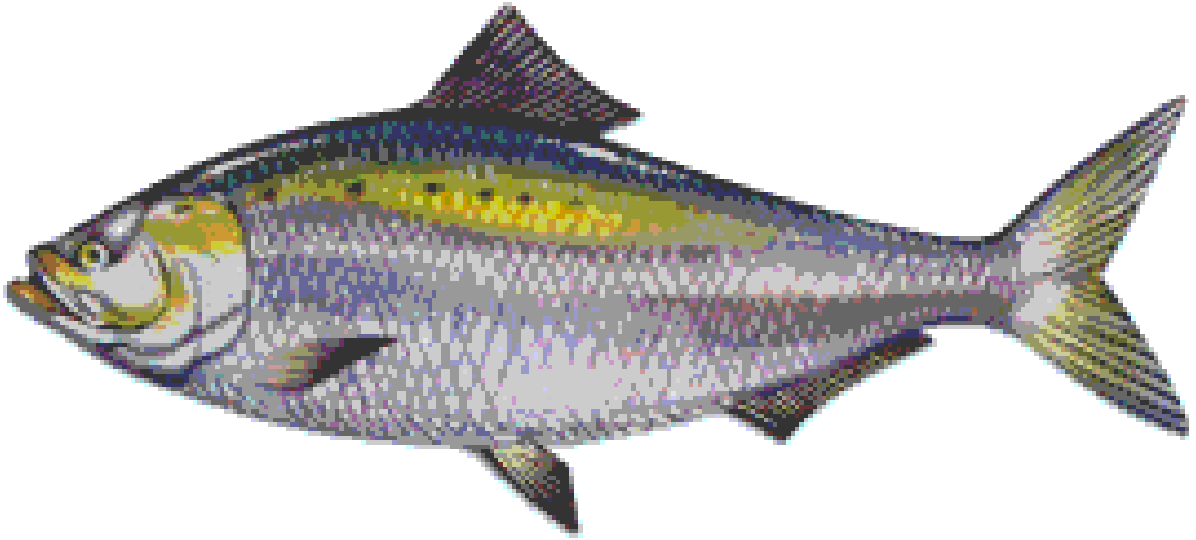
Water Quality Protection

The Quality of Basin Waters Shall Be Maintained For:

- Public drinking water (after reasonable treatment)
- Agriculture
- Industry
- Recreation
- Wildlife, fish and other aquatic life
- Regulated waste assimilation

American shad



anadromous fish live in the ocean mostly, and breed in fresh water

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American eel

Credit: NOAA Fisheries, Northeast Fisheries Science Center

catadromous fish live in fresh water, and breed in the ocean

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Criteria Based Program

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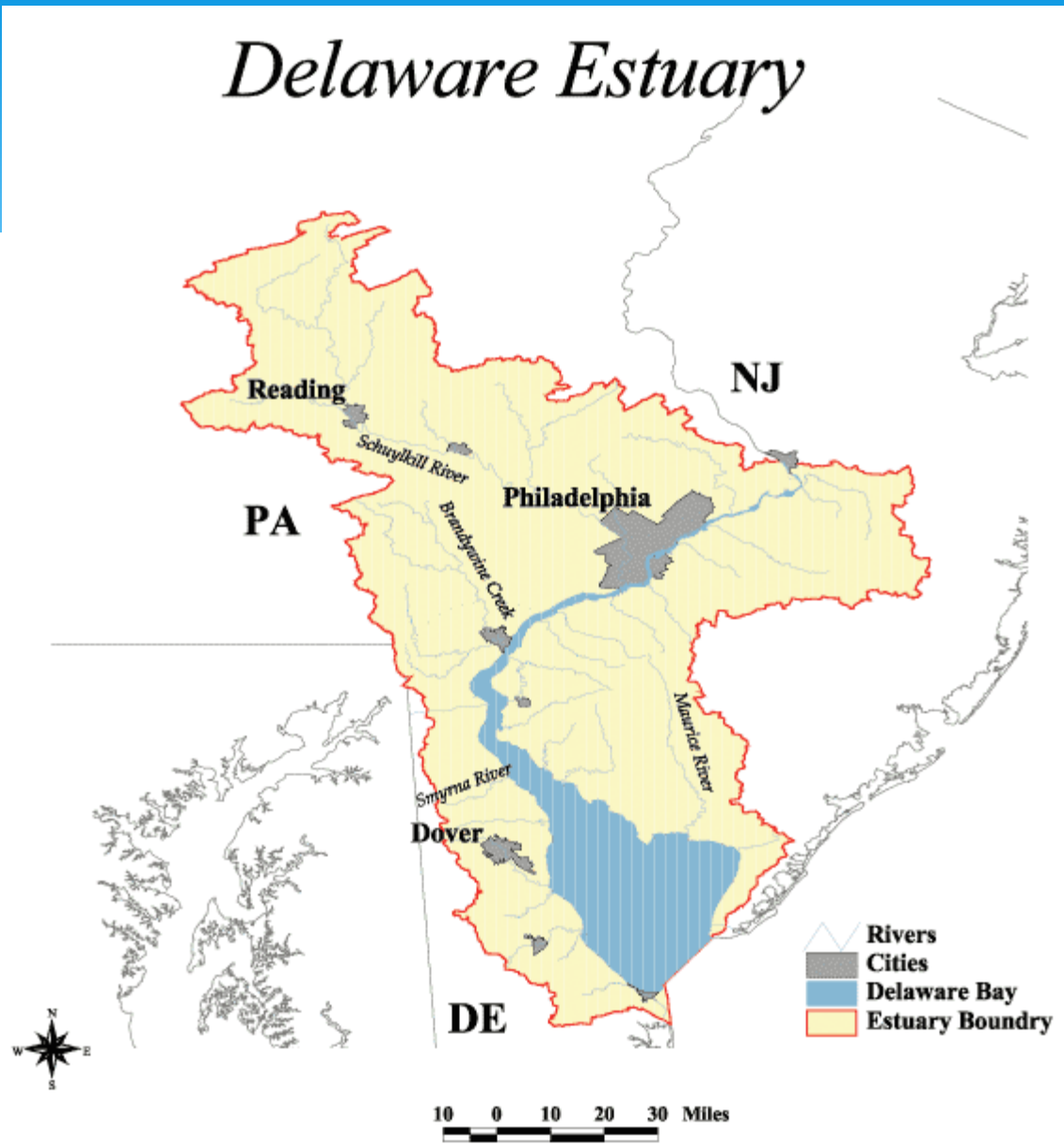

The Delaware Estuary -- the tidal portion of the river including the Delaware Bay -- begins at Trenton and stretches approximately 130 miles to the ocean

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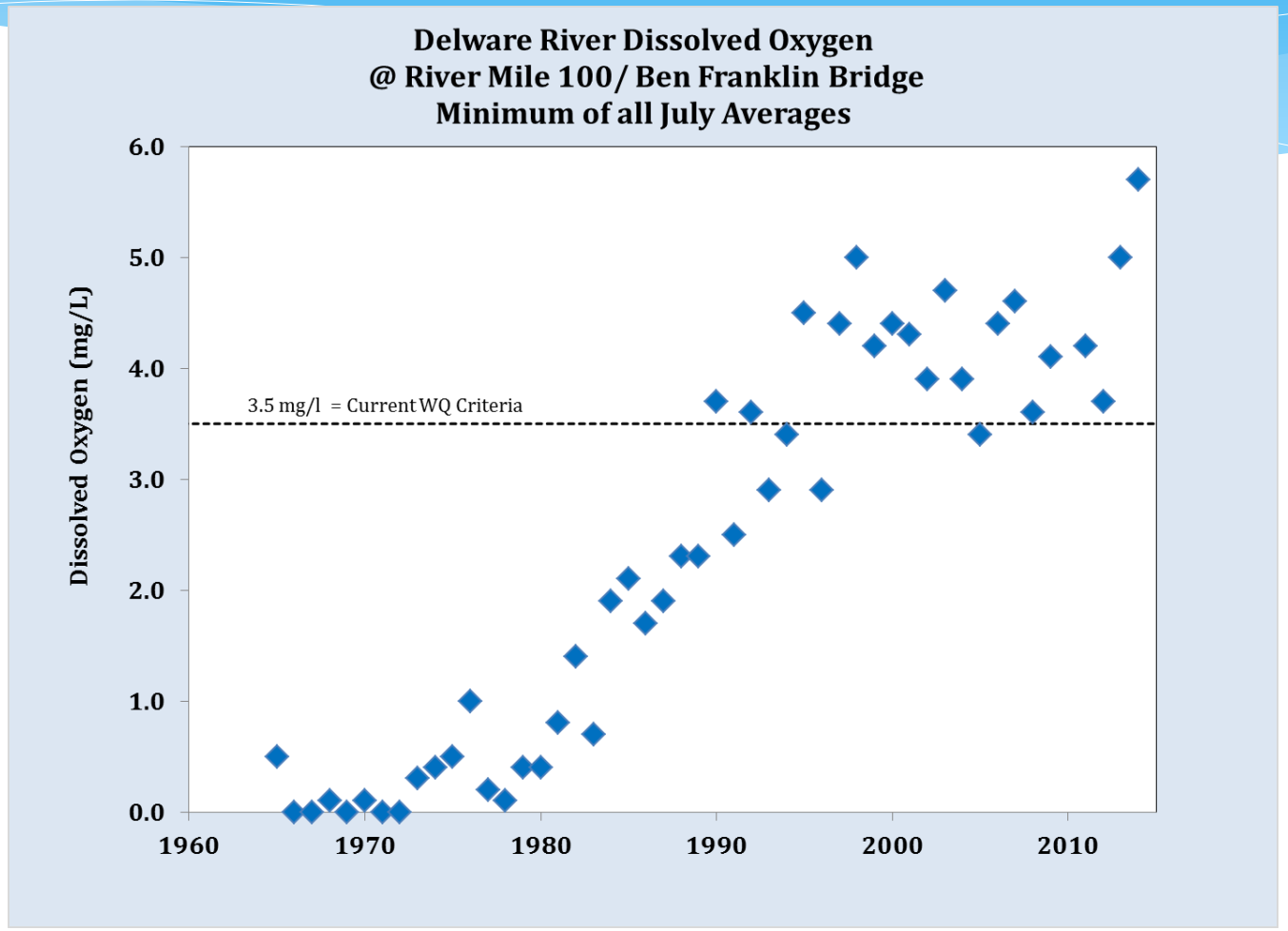
Water Quality

A "dead" river zone restored… and more

- **Dissolved Oxygen** – 30 mile "dead zone" near Philadelphia pre-DRBC
  - ✓ Pre Clean Water Act WQ Standards
  - ✓ CWA and Treatment @ POTWs
  - ✓ Delaware River designated uses and Criteria set in 1967 surpassed
  - ✓ American Shad returning
  - ✓ Atlantic Sturgeon spawning
  - ✓ Designated use in the Estuary being revisited



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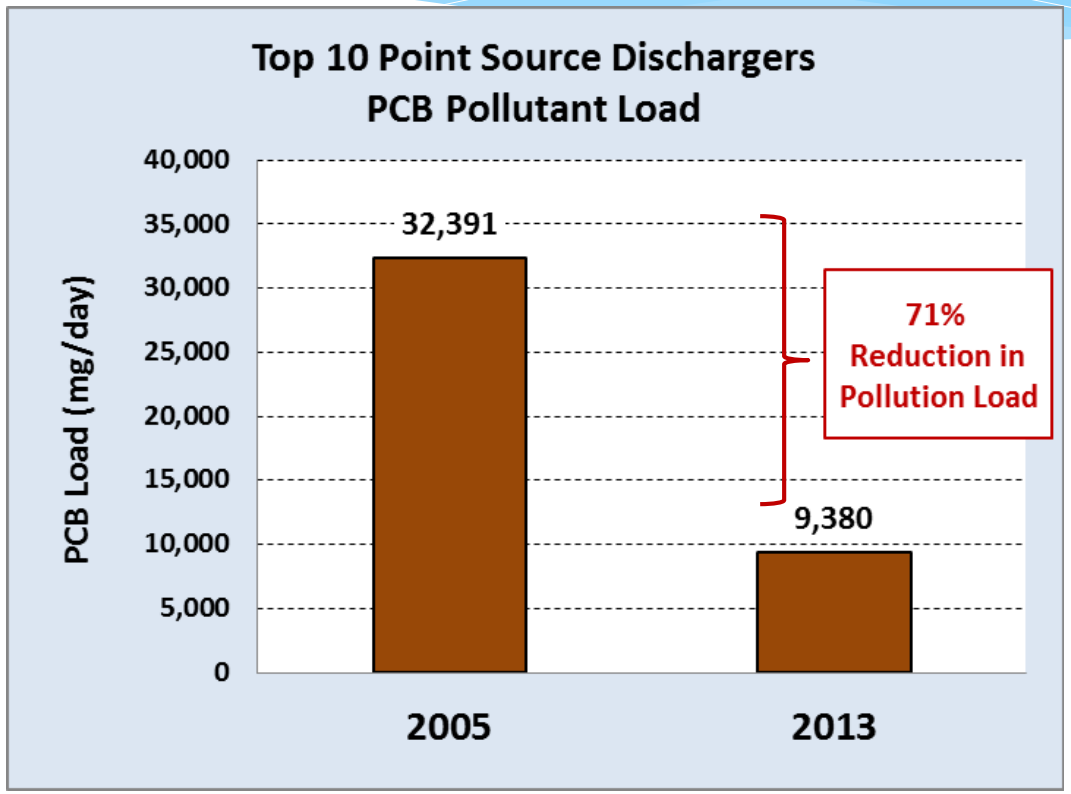
Water Quality

Reducing PCB loadings through collaboration, not litigation

- **Legacy Pollutants – PCBs**
  - ✓ DRBC TMDL in 2003
  - ✓ Pollution minimization plans in 2005
  - ✓ Stakeholder process and stakeholder approval
  - ✓ 10 largest point sources reduced by over 70%
  - ✓ Nationally recognized program



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Anti-Degradation Program

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Wild and Scenic Reaches in the Delaware Basin

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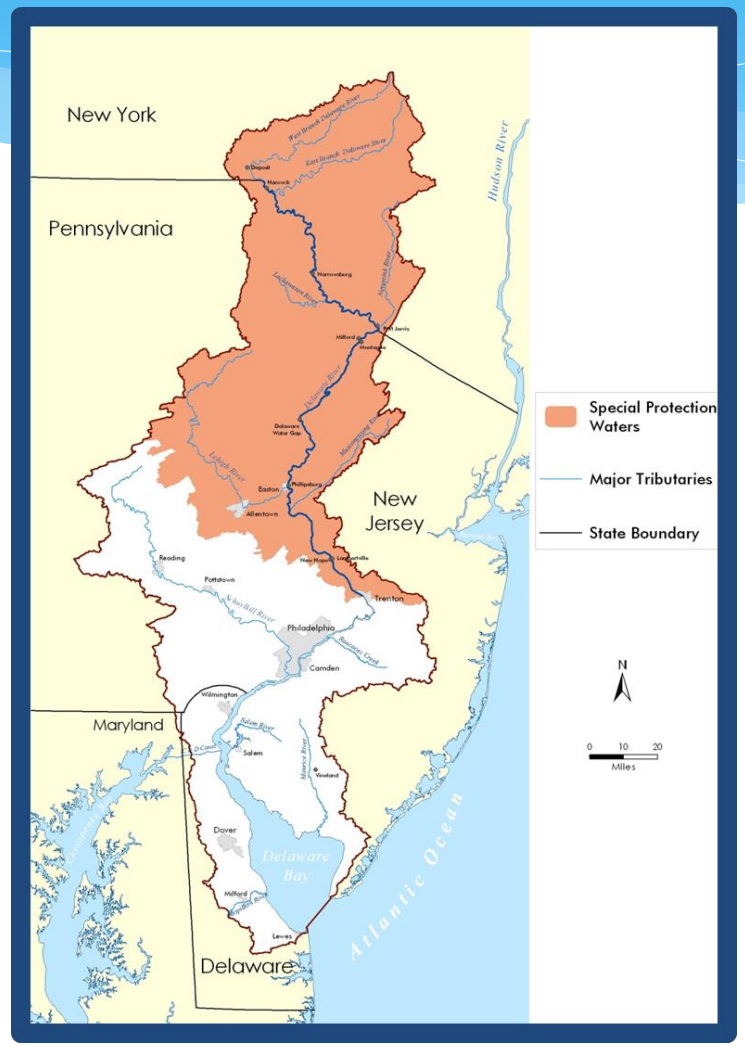
Water Quality

Keeping Clean Waters Clean

- **Special Protection Waters**
  - ✓ Entire basin upstream from Trenton – 197 river miles.
  - ✓ Believe to be the longest anti-degradation reach in the US
  - ✓ It's more beneficial to "keep the clean waters clean" than to allow them to become degraded and attempt to restore them later.



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Special Protection Waters

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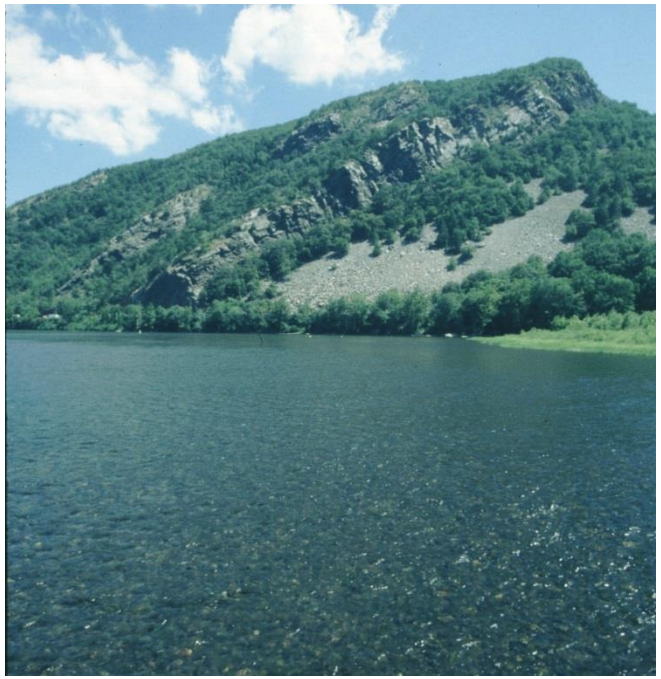
Delaware Water Gap



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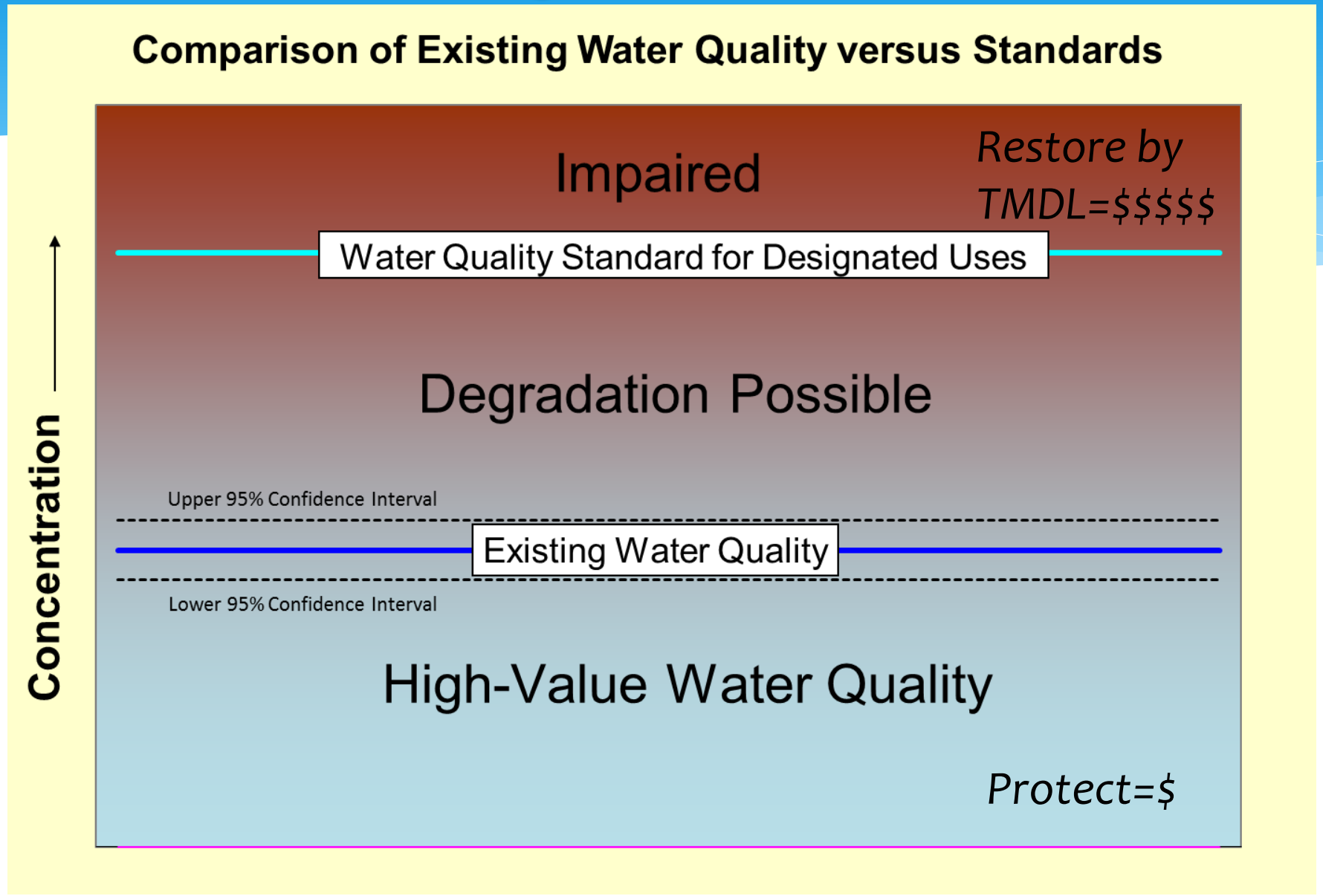
Special Protection Waters

Goal: Protect existing high quality waters with exceptionally high scenic, recreational, ecological or water supply values through the "**no measurable change**" policy

EWQ Targets are not Criteria



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Lower Delaware Management Program

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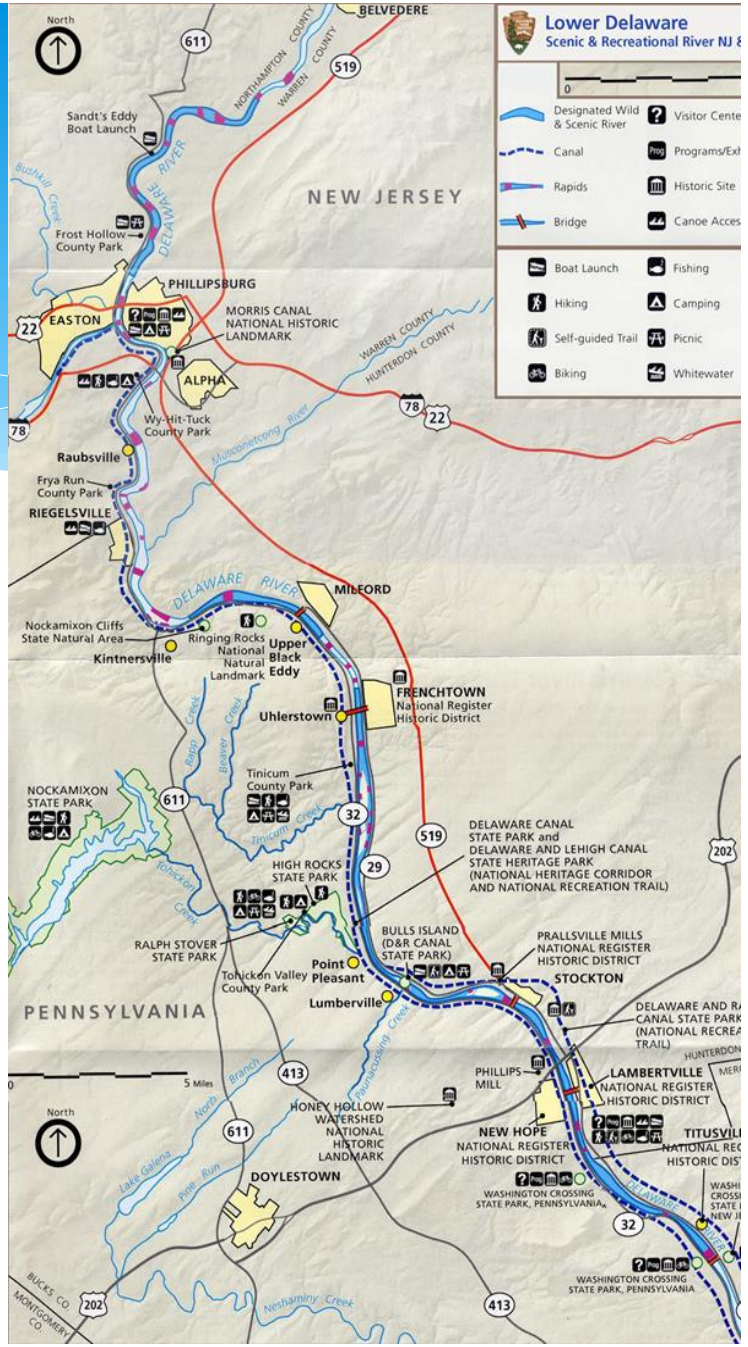
Lower Delaware Wild & Scenic River

* Designated in 2000 as a Partnership River
* 67.3 miles of scenic & recreational designation
* Scenic = 25.4 miles; Recreational = 41.9 miles
* Portions of four tributaries also designated:
  - Tinicum Creek
  - Tohickon Creek
  - Paunacussing Creek
  - Musconetcong River (2006)



** These 4 slides from Lower Delaware Management Council*

Lower Delaware Wild & Scenic River
Management Plan

Key Goals:

* Maintain/improve water quality
* Preserve and protect natural resources
* Preserve and protect historic & cultural resources
* Encourage recreational use of the river corridor
* Encourage economic development
* Preserve open space
* Educate and inform citizens and landowners

Lower Delaware Wild & Scenic River
Management Council

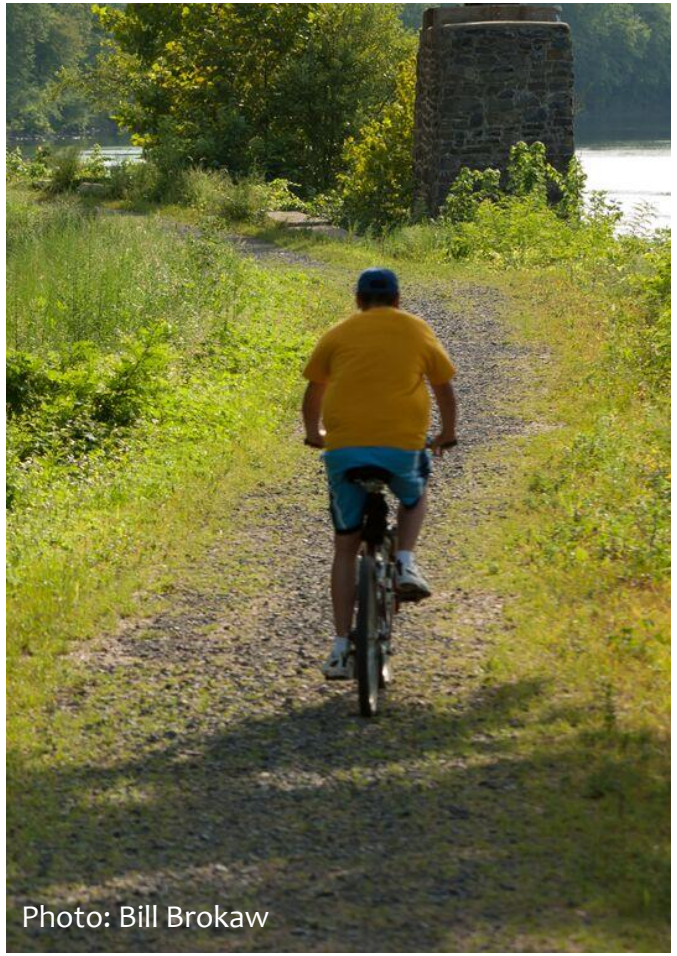


Photo: Bill Brokaw

Important Functions:

Provides forum for river-related issues

Monitors watershed activities and proposals

Promotes enhancement/restoration of the watershed

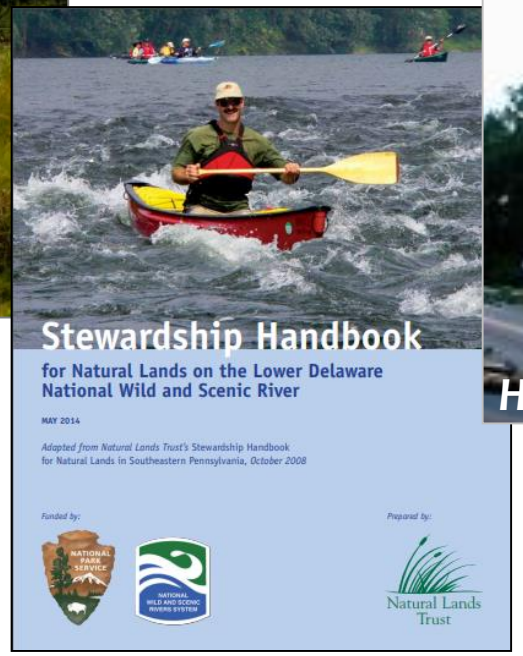
Performs watershed stewardship education and outreach

Reviews and selects incentive grants

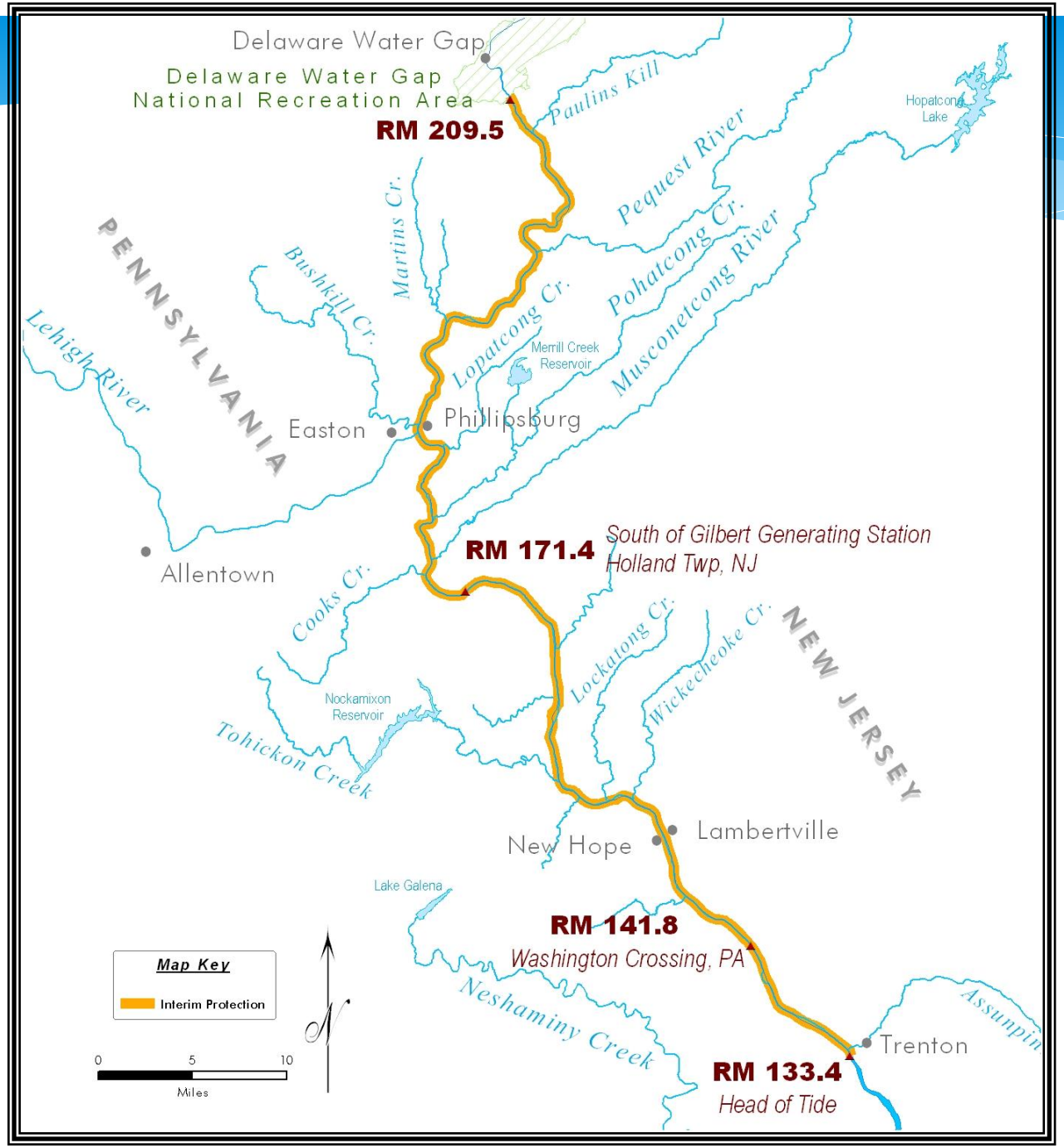
Advises NPS on its budget allocations

Lower Delaware Wild & Scenic River

Between 2000 and 2014, the NPS provided more than $1.1 million for more than 60 projects throughout the LDWS corridor:



Images courtesy of the NPS Lower Delaware Management Council



Lower Delaware SPW

Designated in 2008

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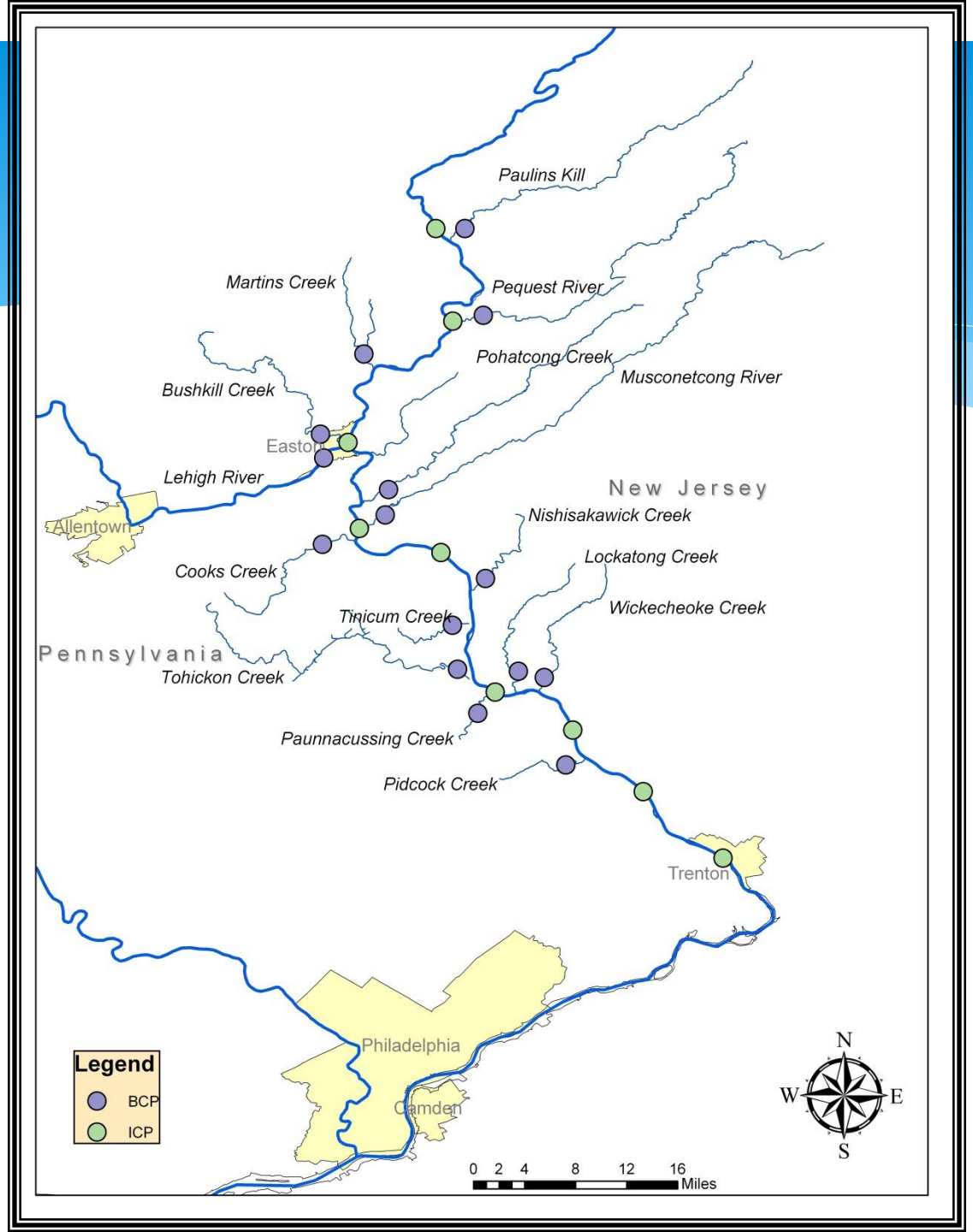
Lower Delaware Monitoring Program



Monitored Interstate Control Points (ICP) and Boundary Control Points (BCP)

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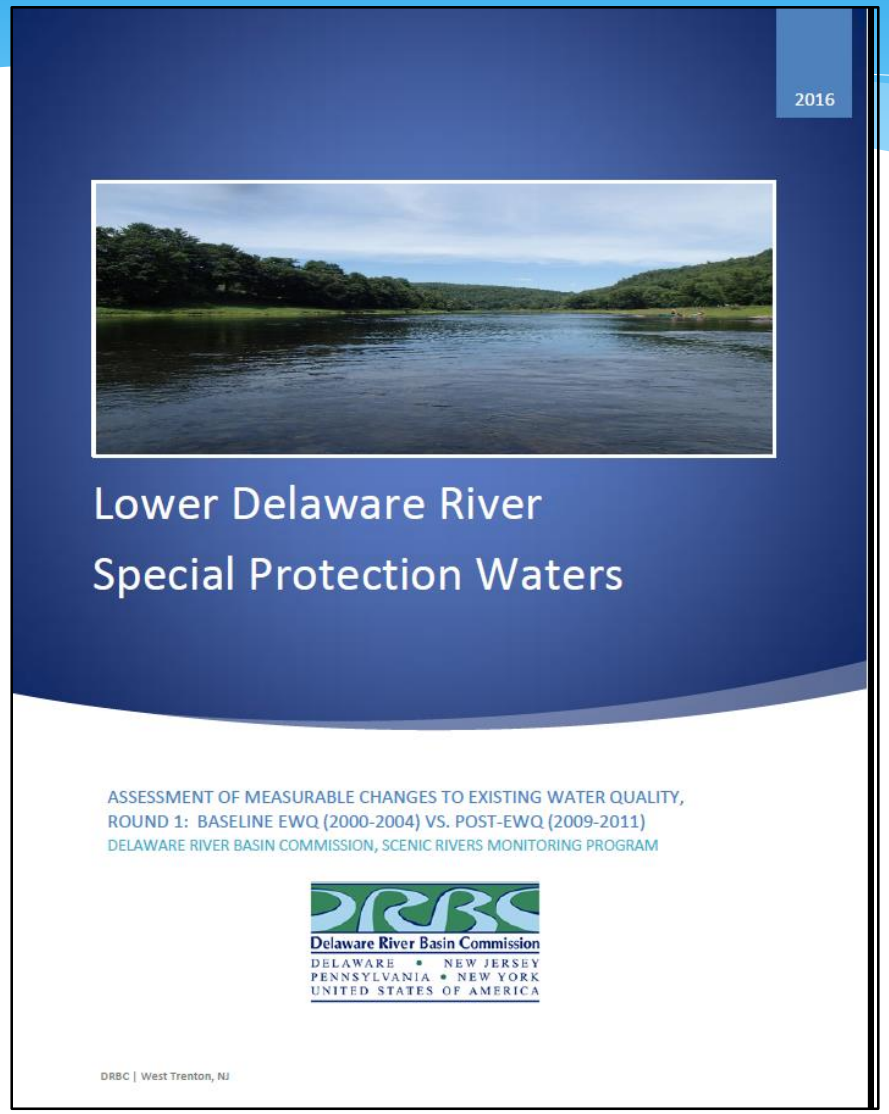
Lower Delaware Measurable Change Assessment 2009-2011



DRBC Publication - 2016

Executive Summary,
24 Chapters (one per site),
3 Appendices:

- New ICP/BCP sites
- Statistical Guide
- Flow Estimation Methods

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Summary Matrix of Measurable Changes: 440 Within-Site Comparisons at a Glance

Mostly **Good News:**
88% of water quality tests showed no degradation

Site Color Key: Dark Blue =Interstate Control Point (ICP); Dark Red =Pennsylvania Tributary Boundary Control Point (BCP); Dark Green =New Jersey Tributary Boundary Control Point (BCP)

	Parameter / Site--->	Del. River at Trenton	Del. River at Washngtn Crossing	Pidcock Creek, PA	Delaware River at Lambrtvlle	Wicke-cheoke Creek, NJ	Lockatong Creek, NJ	Delaware River at Bulls Island	Pauna-cussing Creek, PA	Tohickon Creek, PA	Tinicum Creek, PA	Nishi-sakawick Creek, NJ	Del. River at Milford	Cooks Creek, PA	Musco-netcong River, NJ	Del. River at Rieglsvll	Pohat-cong Creek, NJ	Lehigh River, PA	Del. River at Easton	Bushkill Creek, PA	Martins Creek, PA	Pequest River, NJ	Del. River at Belvidere	Paulins Kill River, NJ	Del. River at Portland
	Site Number--->	1343 ICP	1418 ICP	1463 BCP	1487 ICP	1525 BCP	1540 BCP	1554 ICP	1556 BCP	1570 BCP	1616 BCP	1641 BCP	1677 ICP	1737 BCP	1746 BCP	1748 ICP	1774 BCP	1837 BCP	1838 ICP	1841 BCP	1907 BCP	1978 BCP	1978 ICP	2070 BCP	2074 ICP
Field	Dissolved Oxygen (DO) mg/l											~													
	Dissolved Oxygen Saturation %											~													
	pH, units																								
	Water Temperature, degrees C																								
Nutrients	Ammonia Nitrogen as N, Total mg/l																								
	Nitrate + Nitrite as N, Total mg/l																**								
	Nitrogen as N, Total (TN) mg/l																**								
	Nitrogen, Kjeldahl, Total (TKN) mg/l																								
	Orthophosphate as P, Total mg/l																								
	Phosphorus as P, Total (TP) mg/l																								
Bacteria	Enterococcus colonies/100 ml	~			~																				
	Escherichia coli colonies/100 ml	**	**	**	**	**	**			**	**	**													
	Fecal coliform colonies/100 ml																								
Conventionals	Alkalinity as CaCO3, Total mg/l																								
	Hardness as CaCO3, Total mg/l											~													
	Chloride, Total mg/l			**		**	**	**	**	**		**	**	**	**	**	**	**	~	**	**	**	**		**
	Specific Conductance µmho/cm			**		**	**	~	**	**	**	**	**	**	**	~	**	**	~	~	~	**	~		
	Total Dissolved Solids (TDS) mg/l																								
	Total Suspended Solids (TSS) mg/l																								
	Turbidity NTU																								

KEY: = No indication of measurable change to EWQ; ** = Indication of measurable water quality change toward more degraded status; ~ = Weak indication of measurable water quality change toward more degraded status

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Lower Delaware Assessment Findings: Measurable Changes 2000-2011

88% of tests revealed no evidence of water quality degradation; many revealed water quality improvement.

Chlorides and Specific Conductance increased at almost all locations (winter road salting is most likely cause). Both parameters are unregulated, as are DOT practices. Further continuous monitoring planned; we want to work with co-regulators on issue.

E. Coli concentrations increased from Nishisakawick Creek (Frenchtown) southward.

Nutrients improved at most sites since 2000. Only Pohatcong Creek increased.

What are the current water quality conditions in the Delaware River?

- **Overall**: water quality in the Delaware River and Bay is good, with the majority of observations meeting criteria
- **Estuary**:
  - DO: Average summer DO concentrations in the Estuary indicate that present-day oxygen levels are at or near WQ standards, with improvements near Philadelphia continuing. Further improvements in the urban region might be realized if water quality standards are raised in the future.
  - Bacteria in the mainstem at acceptable levels but tributaries exceed primary contact standards.
  - Toxics: Elevated levels of contaminants exist in fish tissues.
- **SPW**:
  - Program successful at maintaining existing high water quality
  - Implementation challenges remain for new/expanding discharges

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Managing Our Shared Water Resources since 1961