Delaware River Basin Commission

Briefing for Delegation Visits:

Nanjing Water Affairs Bureau – Oct. 23
&
Shaanxi Water Affairs Group – Oct. 31

Photo courtesy of the U.S. Army Corps of Engineers

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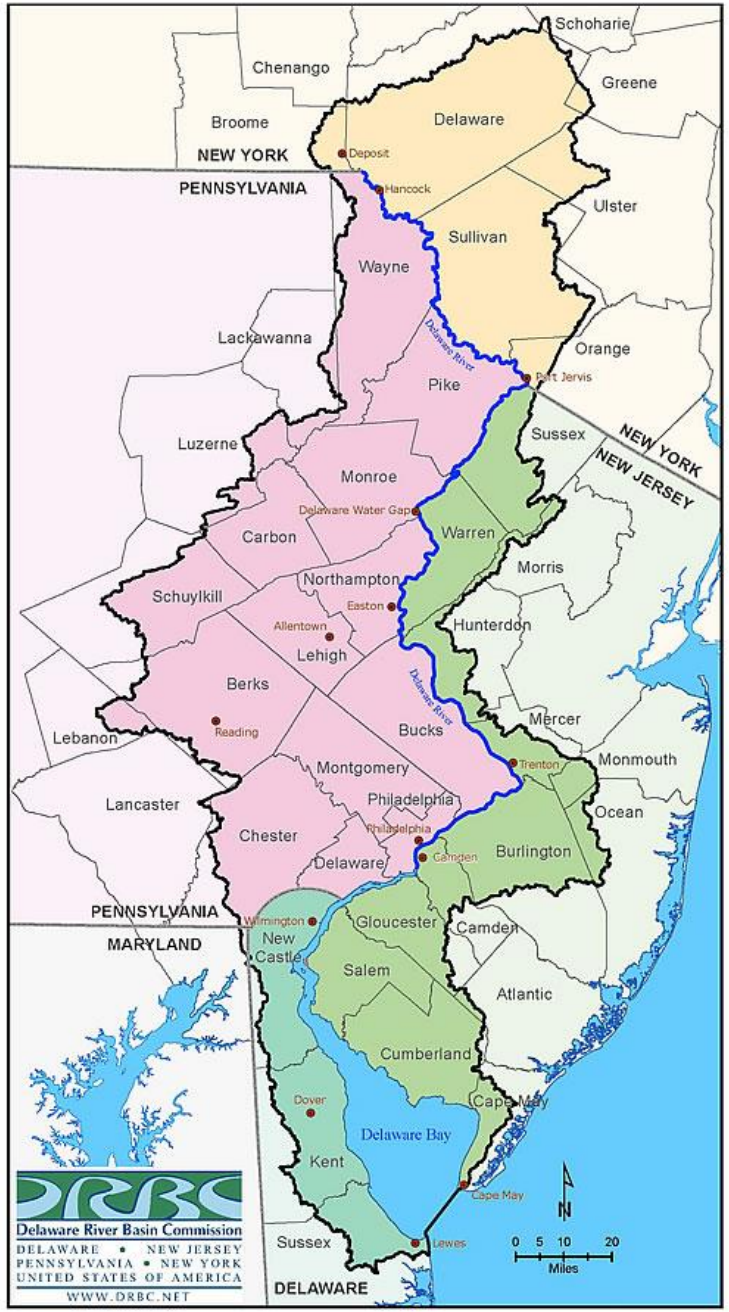

The Delaware River

- 330 miles long.
- Interstate boundary its entire length.
- Longest, un-dammed U.S. river east of the Mississippi (dams are located on tributaries, not the main stem Delaware).
- Tidal to Trenton, NJ.

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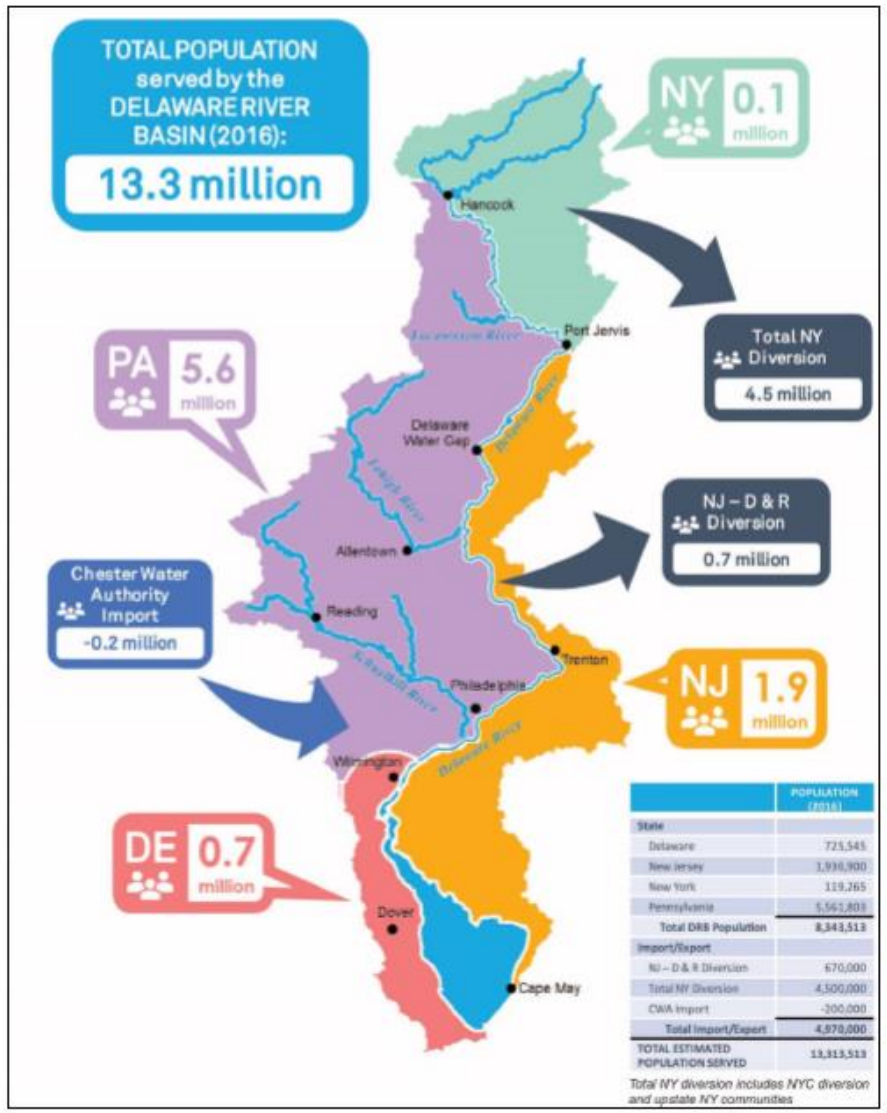
The Delaware River Basin



	POPULATION (2016)
State	
Delaware	725,545
New Jersey	1,930,900
New York	119,265
Pennsylvania	5,561,803
Total DRB Population	8,343,513
Import/Export	
NJ – D & R Diversion	670,000
Total NY Diversion	4,500,000
CWA Import	-200,000
Total Import/Export	4,970,000
TOTAL ESTIMATED POPULATION SERVED	13,313,513

- ~13 million people (about 5% of the U.S. population) rely on its waters
- Provides half the drinking water to NYC
- Drains 13,539 square miles of watershed in 4 states.
- 6.4 billion gallons are withdrawn every day
- Contributes over $21B in economic value

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The Delaware River "Today"

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Photo: Delaware River Sojourn


Photo: Nicholas A. Tonelli


Photo: Aqua Vida


Photo: Delaware River Sojourn

It Used to Look Like…

Slaughterhouses discharging in 1928
(courtesy PWD Historic Collection)

Bridgeport Canal up from Schuylkill River in 1928.
(courtesy PWD Historic Collection)

And Sometimes It Looked Like…

Easton-Phillipsburg free bridge in 1955
(lehighvalleylive.com file photo)

Delaware River at Trenton in 1965
(DRBC photo)

The Problems

- Water supply shortages and disputes over the apportionment of the basin's waters
- Severe pollution in the Delaware River and its major tributaries
- Serious flooding

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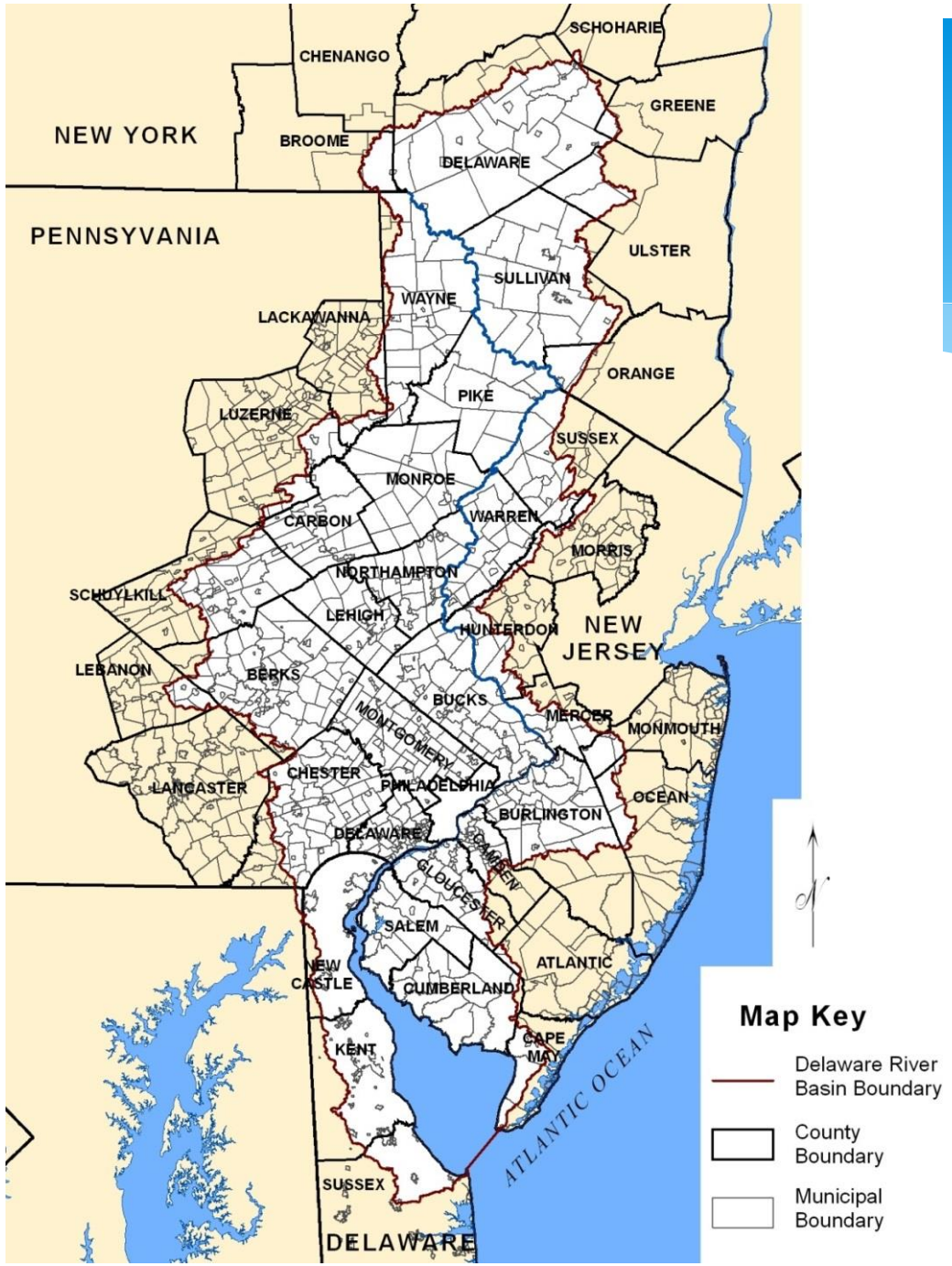

The Challenge

- 4 States
- 42 Counties
- 838 Municipalities
- NY City

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The Solution:
The Delaware River Basin Commission

- 1961 – President Kennedy and the four Basin State Governors sign the Delaware River Basin Compact, the federal/state law that formed the Delaware Basin Commission (DRBC)

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Delaware River Basin Compact

- Recognizes DRB as a regional asset with local, state and national interests
- Management and control of water resources under a **Comprehensive Plan** will bring benefits and is in the public welfare.
- The Commission shall develop and effectuate **plans, policies and projects** relating to the water resources of the Basin

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Delaware River Basin Commission

- Five Equal Members:
  - Delaware 
  - New Jersey  
  - Pennsylvania  
  - New York  
  - Federal Government   

- Four Governors **are** the Commissioners
- Commissioner may select alternates
- Federal Commissioner is Commanding General, USACE, NAD
- Majority rules in most voting
- Meets quarterly

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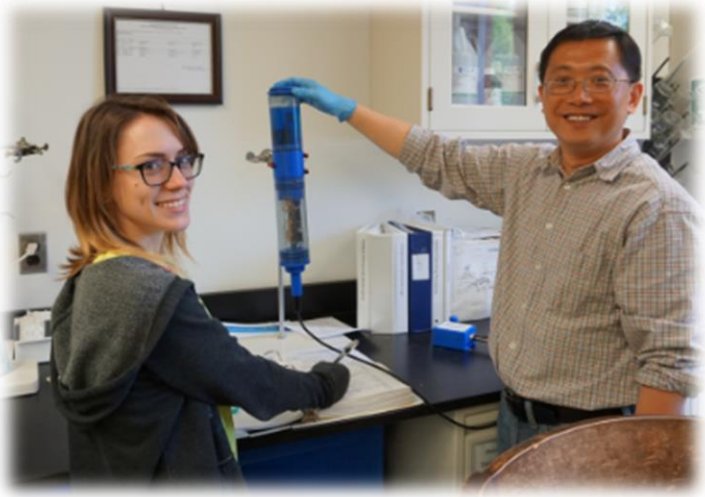
DRBC Staff and Budget

- Professional Planners, Engineers and Scientists
- 39 Budgeted Staff (12% Vacancy Rate)
- FY2019 Budget = $6.3 million
- Funding from “Signatory Members” = $1.7 M (27%)
- Located in West Trenton, NJ since 1974



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Compact Designated Responsibilities

Create a Comprehensive Plan

- Flood damage (and drought) reduction
- Ground and surface water supply development
- Propagation of fish and game
- Related watershed projects
- Recreational facilities
- protection to fisheries…;
- Hydroelectric power development
- Control of movement salt water;
- Abatement and control of surface water pollution;

and the regulations towards the attainment of these goals

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DRBC Core Responsibilities

- **FLOW** - An adequate and sustainable supply of water.
- **QUALITY** - Clean and heathy water resources.

View from Bowman Hill Tower by Linda Park

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Flow

“It has to be wet before it can be clean.”

Dawn at Ten Mile River by Martha Tully

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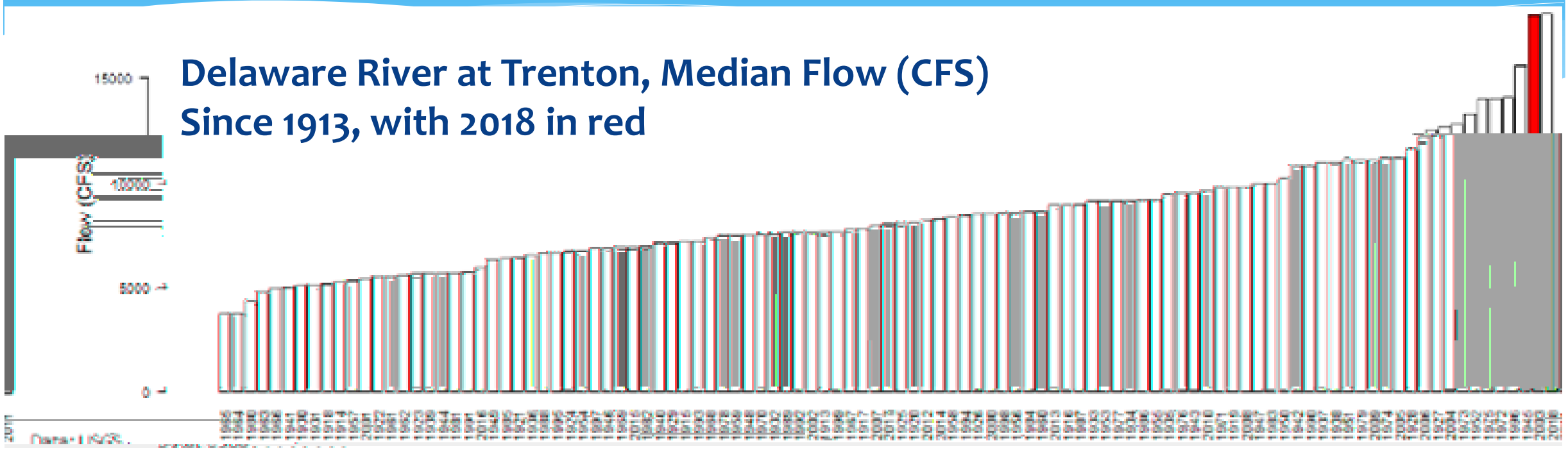
How Wet Has It Been?



NOTE: Highest year was 2011, which included flows resulting from Hurricane Irene and Tropical Storm Lee.

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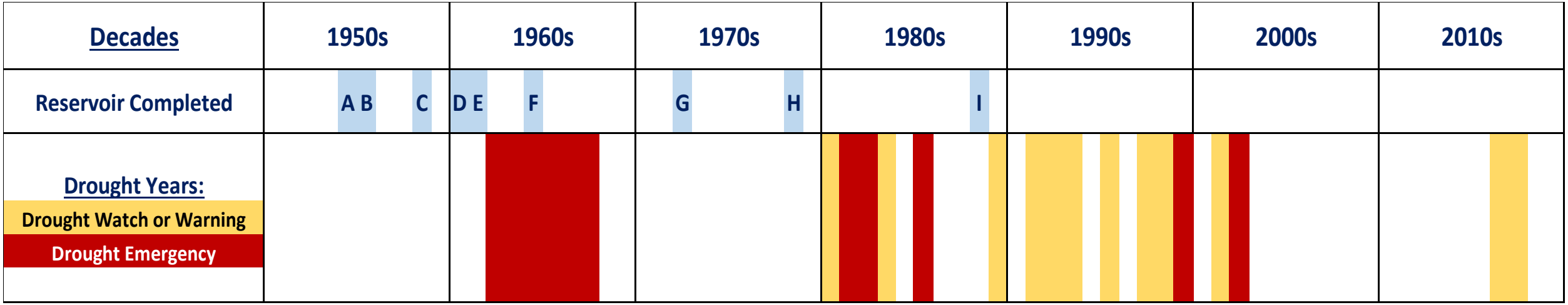
How Dry Has It Been?



A=Neversink, B=Pepacton, C=Nockamixon, D=Promtpon and Jadwin, E=FE Walter; F=Cannonsville, G=Belzville, H=Blue Marsh, I=Merrill Creek.
Lake Wallenpaupack and the Mongaup System were constructed in the 1920s]; Dates are approximate.

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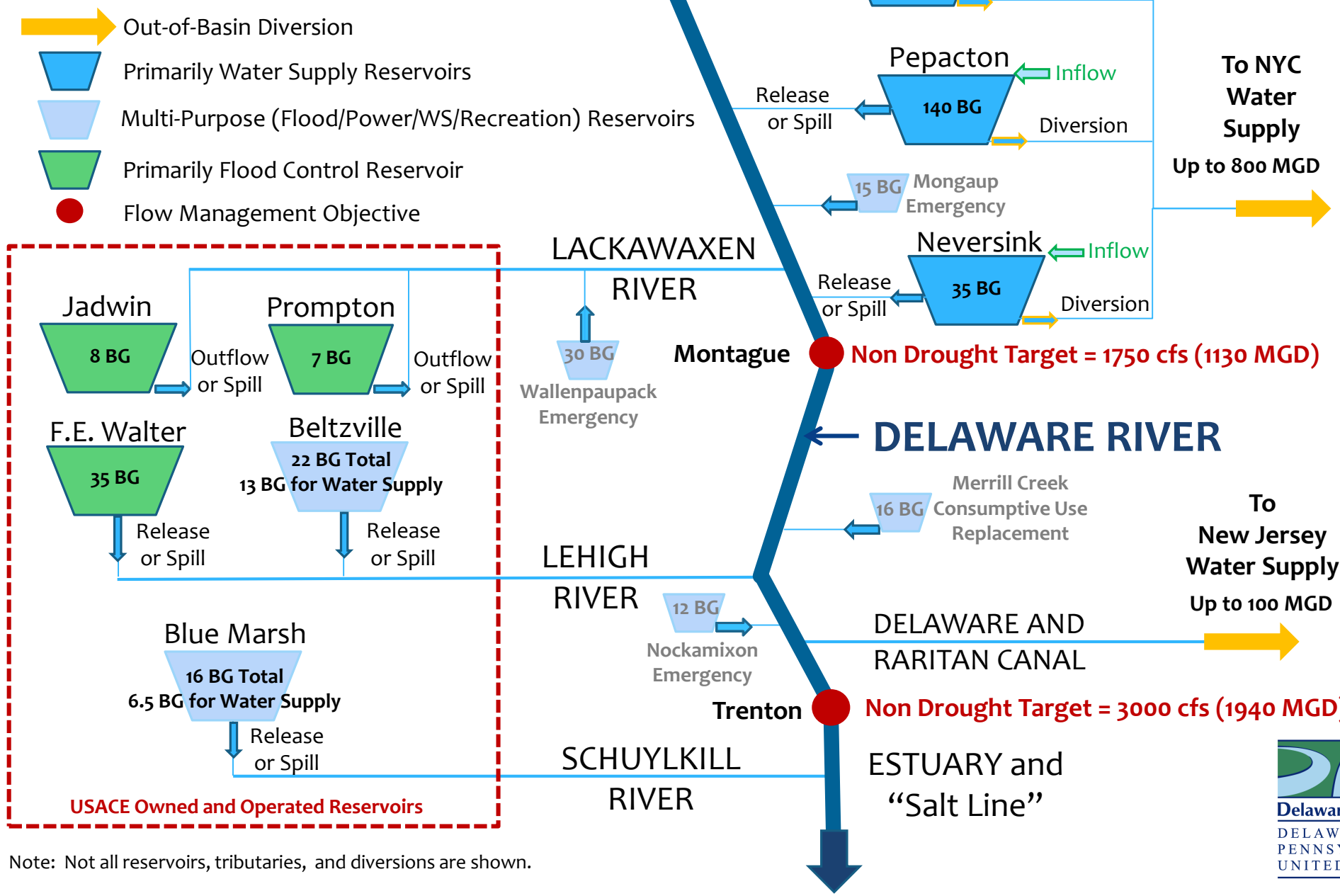
Water Management Schematic for the Delaware River Basin



Note: Not all reservoirs, tributaries, and diversions are shown.

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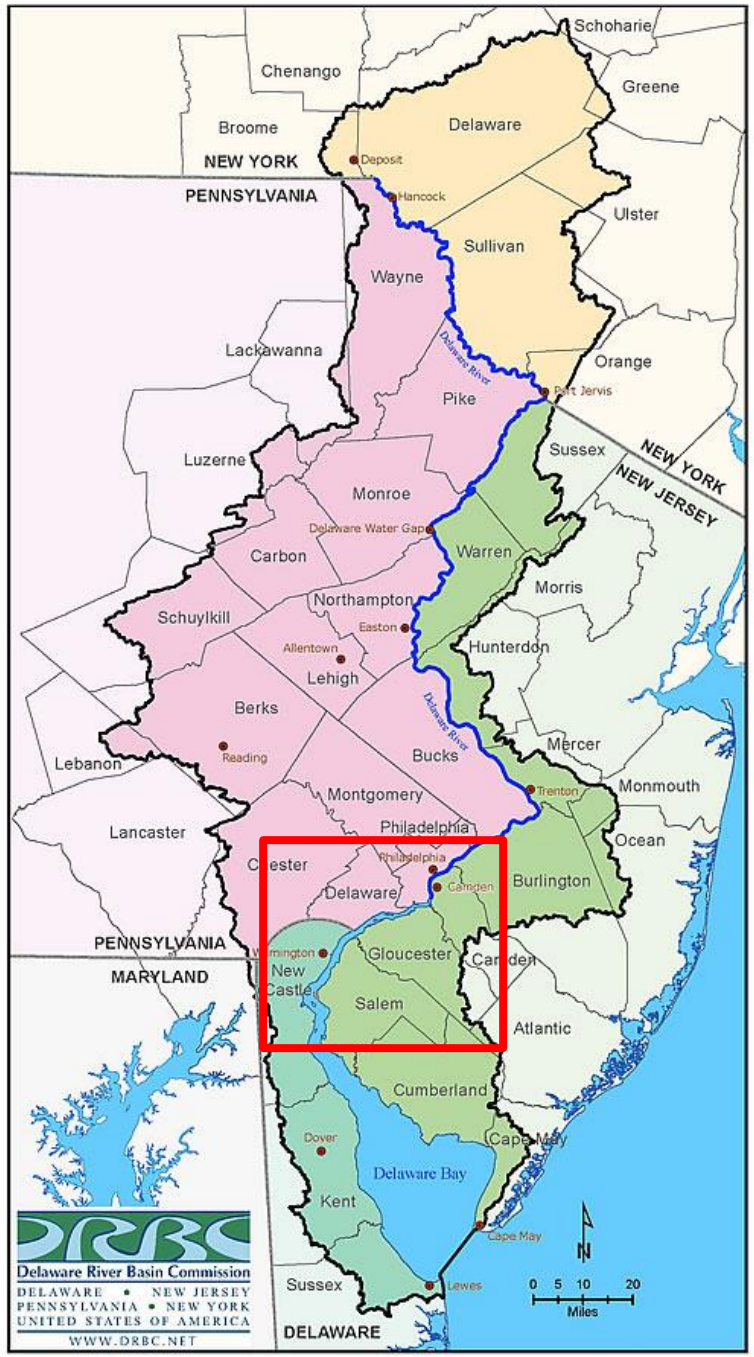
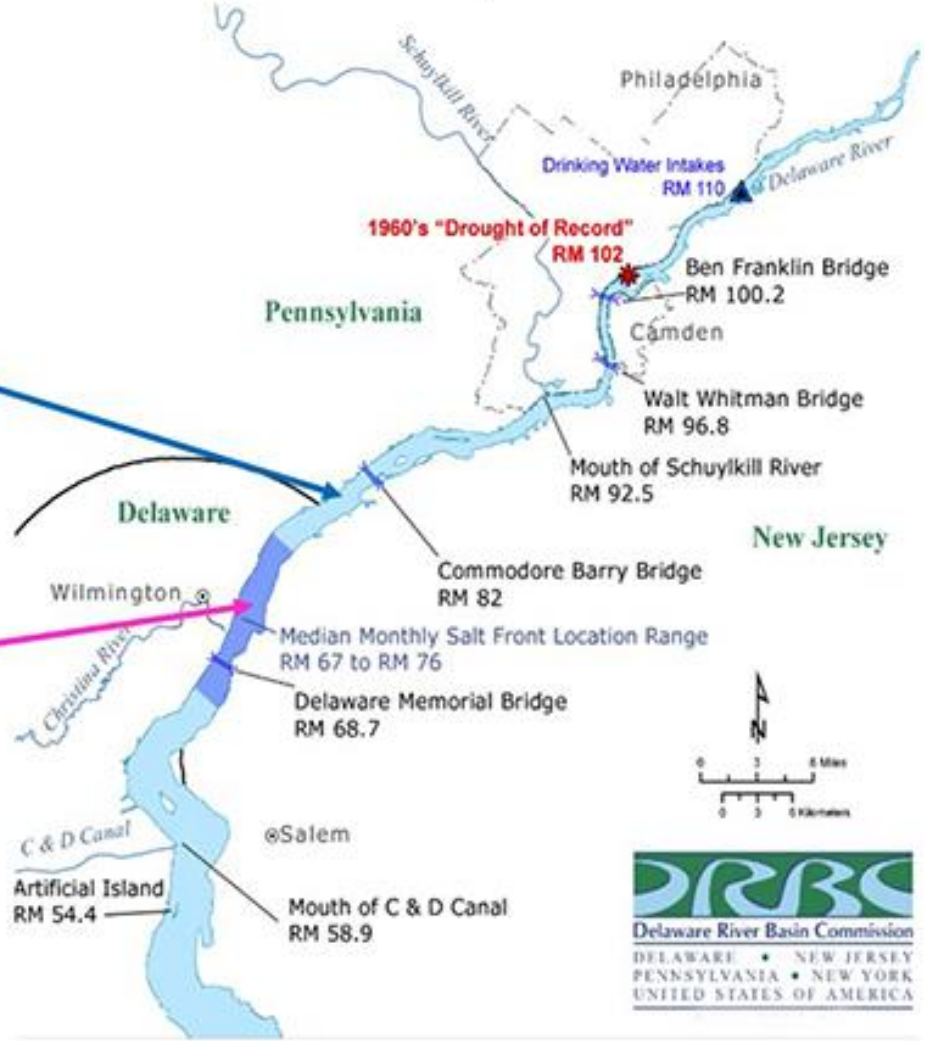


Salt Line Location: October 7, 2019

10/7/2019 Location: RM 80

Normal October Location: RM 72



Water Supply Planning Objectives

- Meet Compact planning requirements (Articles)
  - **Water Supply:** sustainable and resilient
    - During existing extremes - floods and droughts
    - Meeting water demands – consumptive and non-consumptive
    - Under future scenarios that include mega trends - water efficiency, energy needs, climate change, ecological flows
  - **Flow Management:** Support needs and targets – balance supply & flood loss reductions

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Current Tasks
Water Supply Planning

Water Supply Planning (DRBC)

- Water Use

Partner Led Efforts

- DE WSCC
- NJ WSAC
- PA State Water Plan

2060 Planning Elements

Water Demand Projections

- Public Water Supply
- Power
- Industrial / Commercial
- Agricultural
- Other

Whitepapers

- Blue Marsh Reservoir
- Beltzville Reservoir
- Brandywine System
- Power (policy)
- FE Walter Expansion

Water Availability Analyses

- Surface water
  - Non-tidal (SWEET)
  - Tidal (PST & Salinity models)
- Groundwater (USGS recurrence interval)

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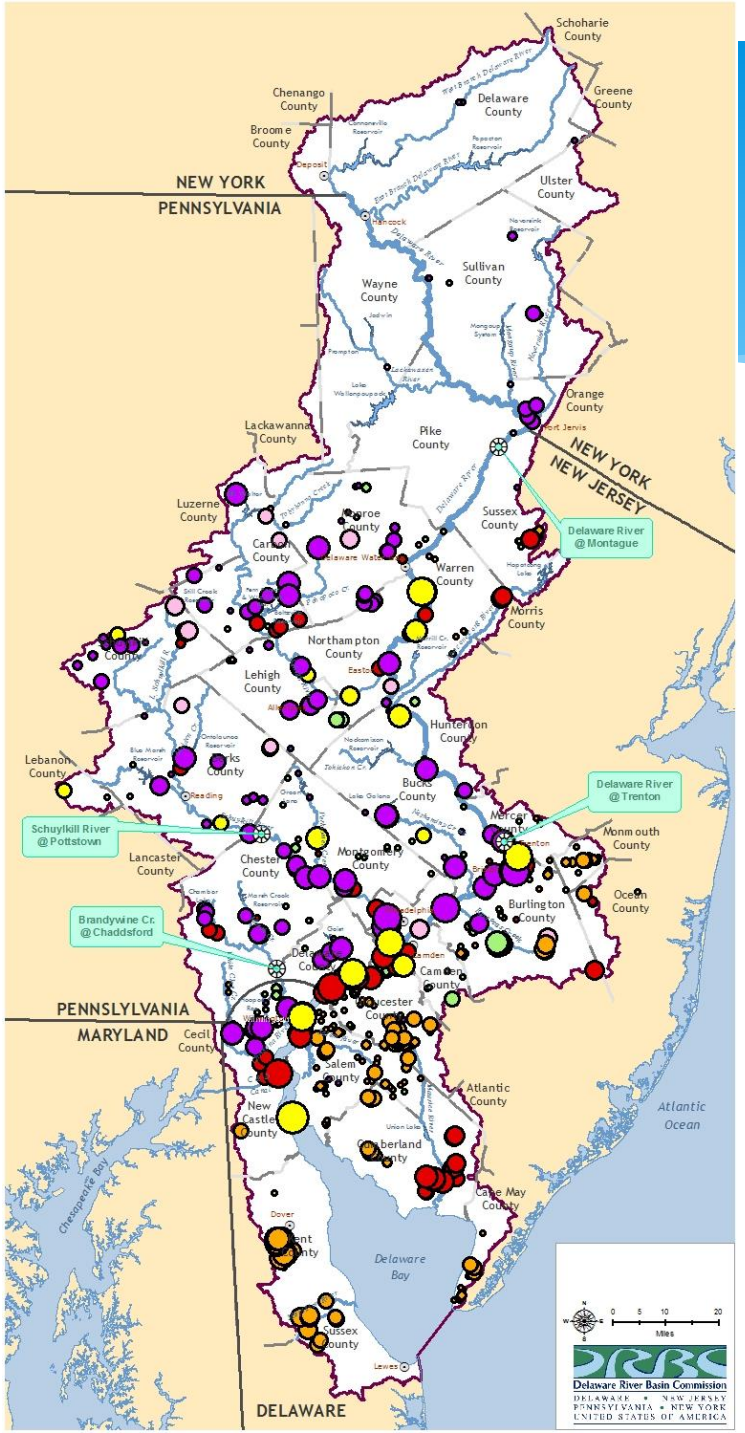
Surface Water Intake



Surface Water Withdrawals

Withdrawal Category

- Public Water Supply
- Agriculture
- Golf
- Industrial
- Thermoelectric
- Other

Volume in Million Gallons per Day

- 0 - 0.5 MGD
- 0.6 - 1.0 MGD
- 1.1 - 5.0 MGD
- 5.1 - 10 MGD
- 10 - 100 MGD
- 100 - 1,000 MGD
- Greater than 1,000 MGD

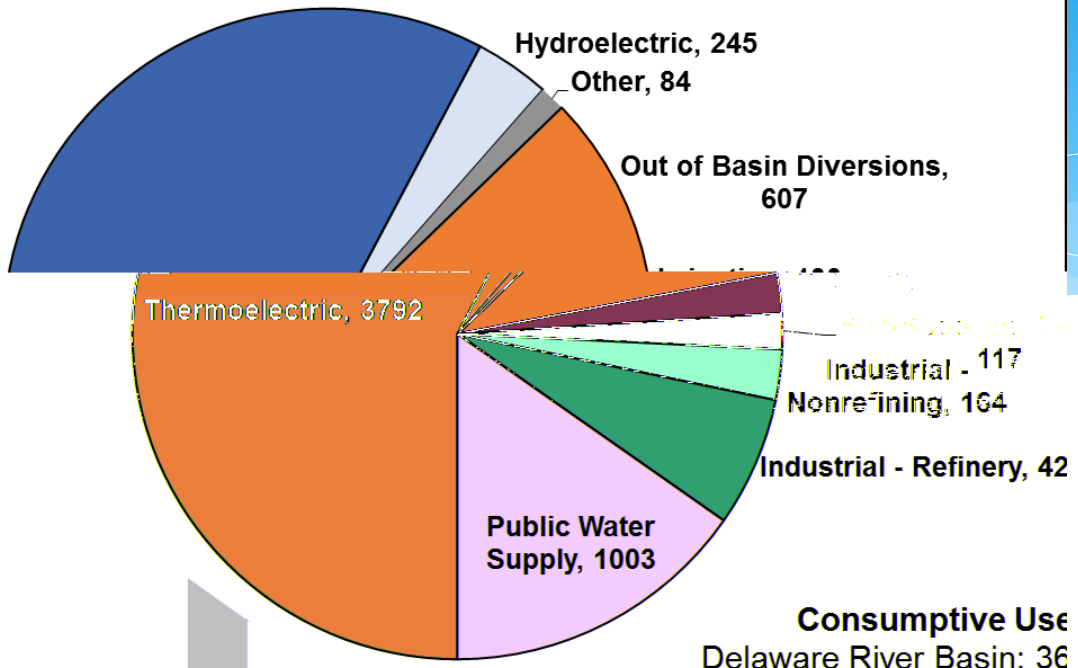
USGS Stream Gage Location

- >1,200 active docket approvals for water (groundwater & surface water).
- ~ 1,500 surface water withdrawals approved in ~375 dockets.
- ~5,600 groundwater withdrawals approved in ~850 dockets

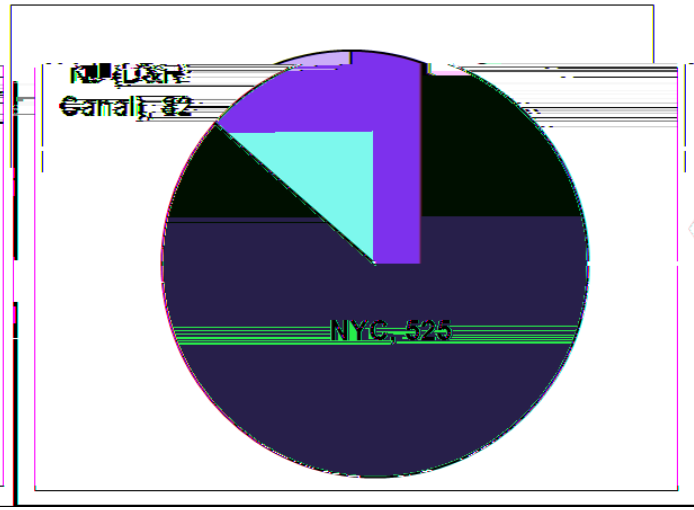
Delaware River Basin Water Use : CY2016

Total Water Withdrawals (ground and surface) from the Delaware River Basin: 6,565 mgd

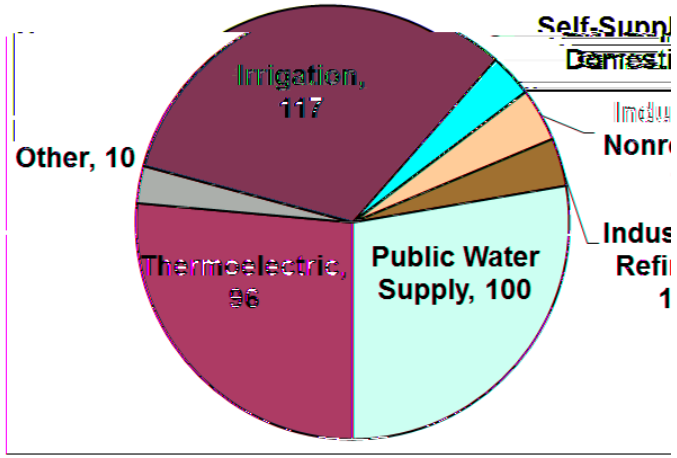
- Thermoelectric
- Hydroelectric
- Other
- Out of Basin Diversions
- Irrigation
- Self-Supplied Domestic
- Industrial - Nonrefining
- Industrial - Refinery
- Public Water Supply



Major Exports from the Delaware River Basin: 607 mgd



Consumptive Use Delaware River Basin: 36



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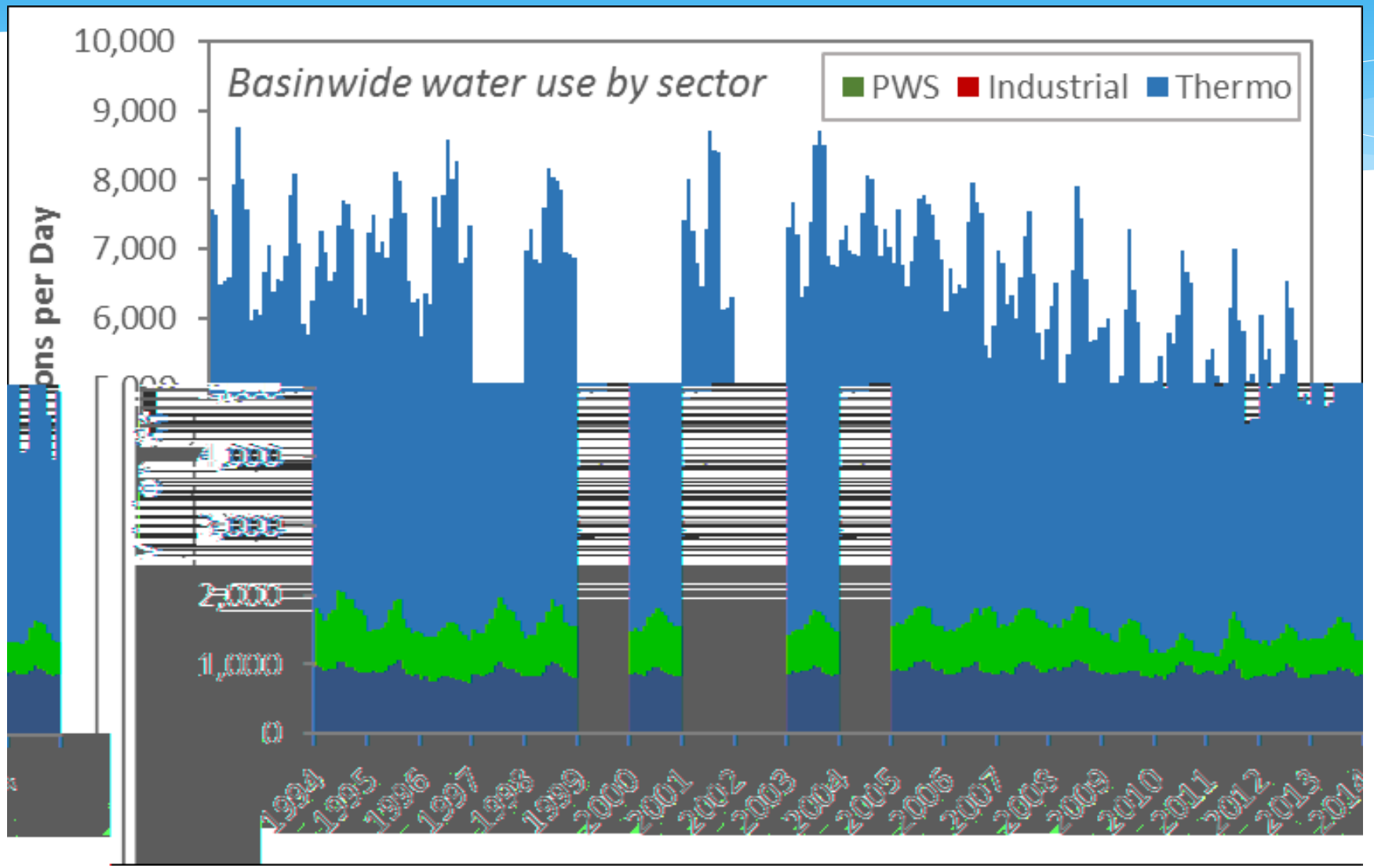
Monthly Total Water Withdrawals for Three Key Sectors in the Delaware River Basin



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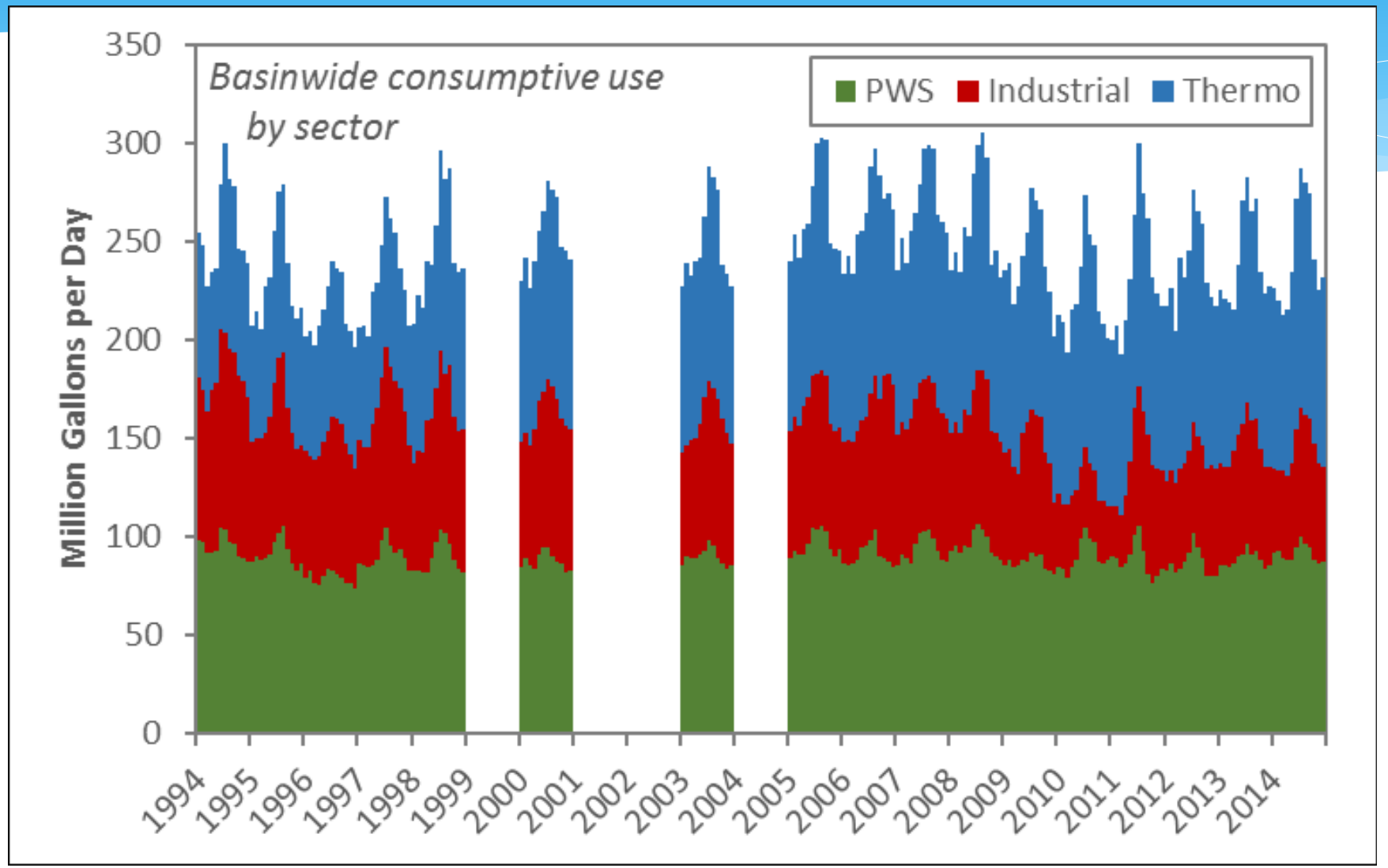
Monthly Consumptive Water Use for Three Key Sectors in the Delaware River Basin



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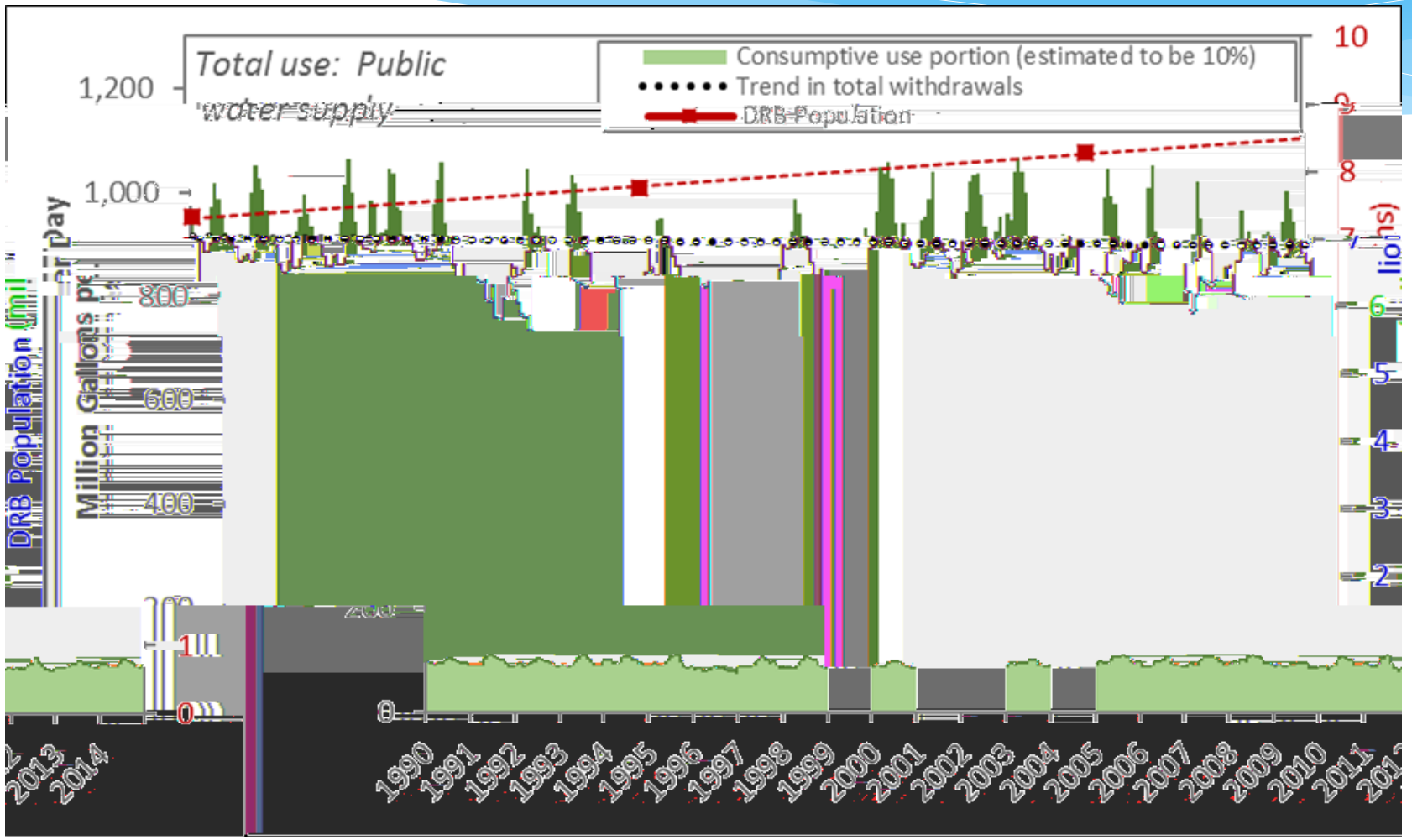
Public Water Supply Demand--DRB



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Southeastern Pennsylvania Groundwater Protected Area

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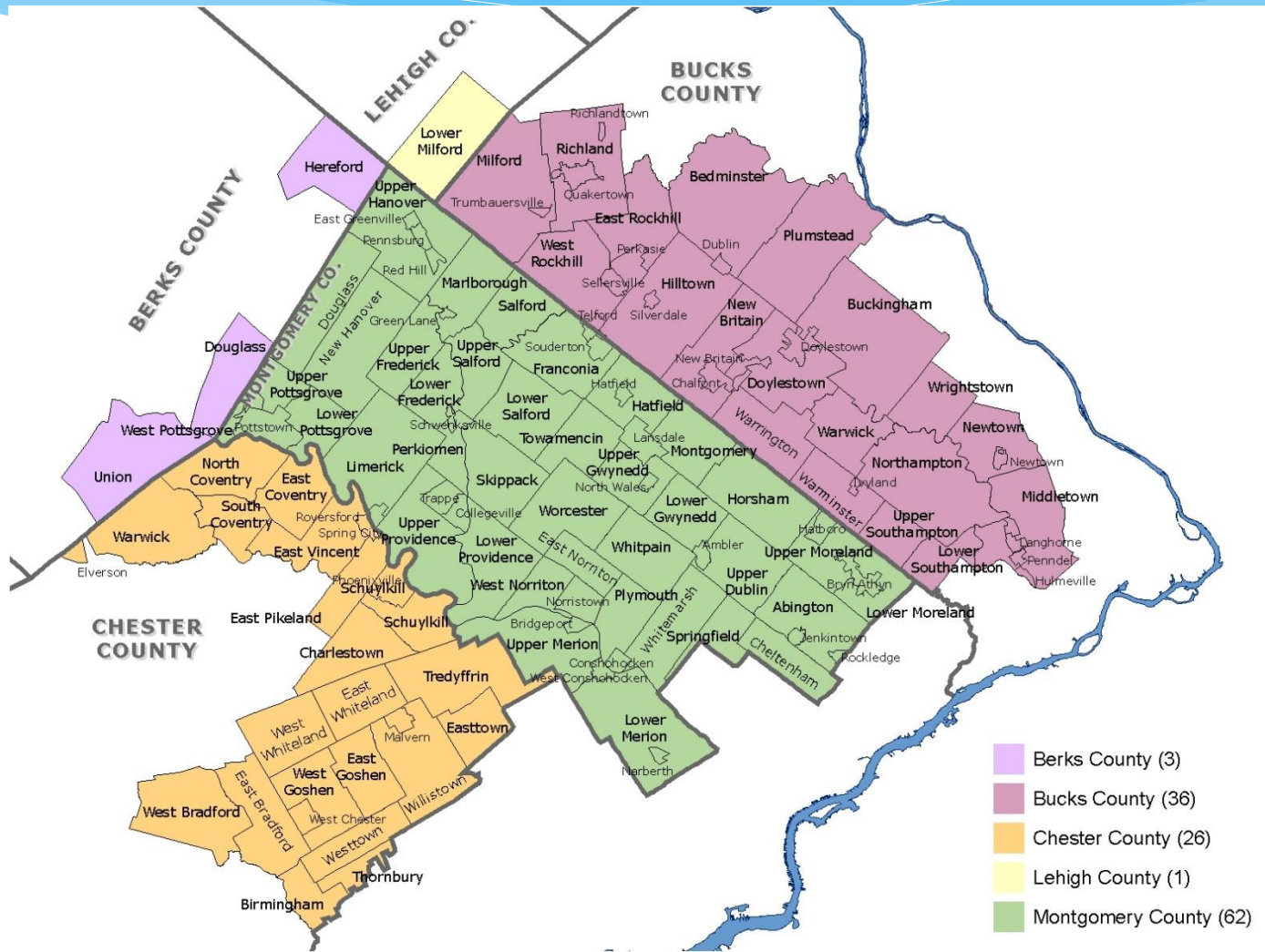
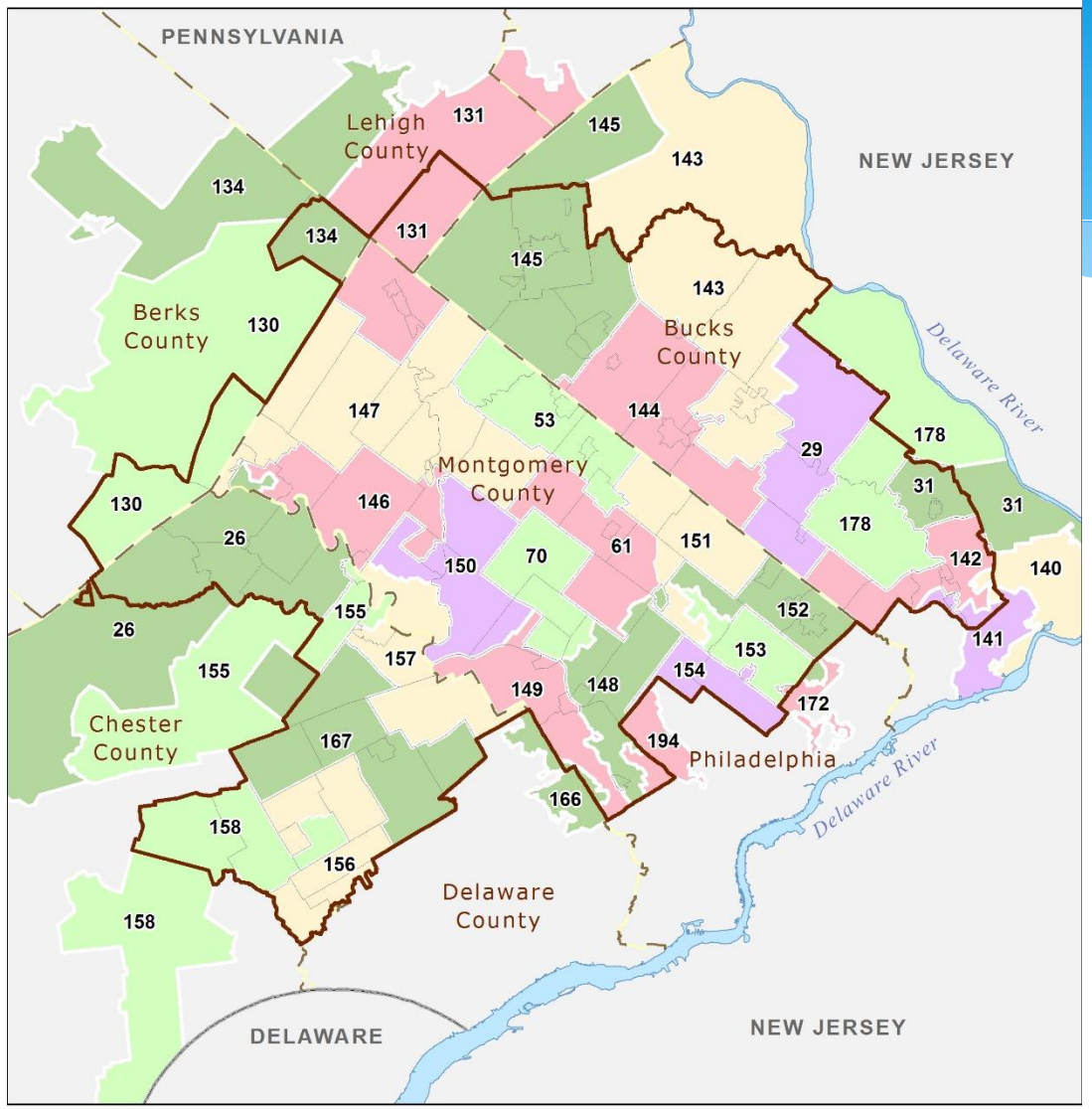
- Established in 1980 **at the request of the Commonwealth of Pennsylvania. Why?:**
- Groundwater interference and conflicts
- Projected water use expected to exceed the safe yield of GW resources
- Loss of water in public and private wells during dry periods.
- Sub-basin groundwater withdrawal limited were modeled, set and implemented by DRBC.



Southeastern Pennsylvania Groundwater Protected Area



Southeastern Pennsylvania GW Protected Area

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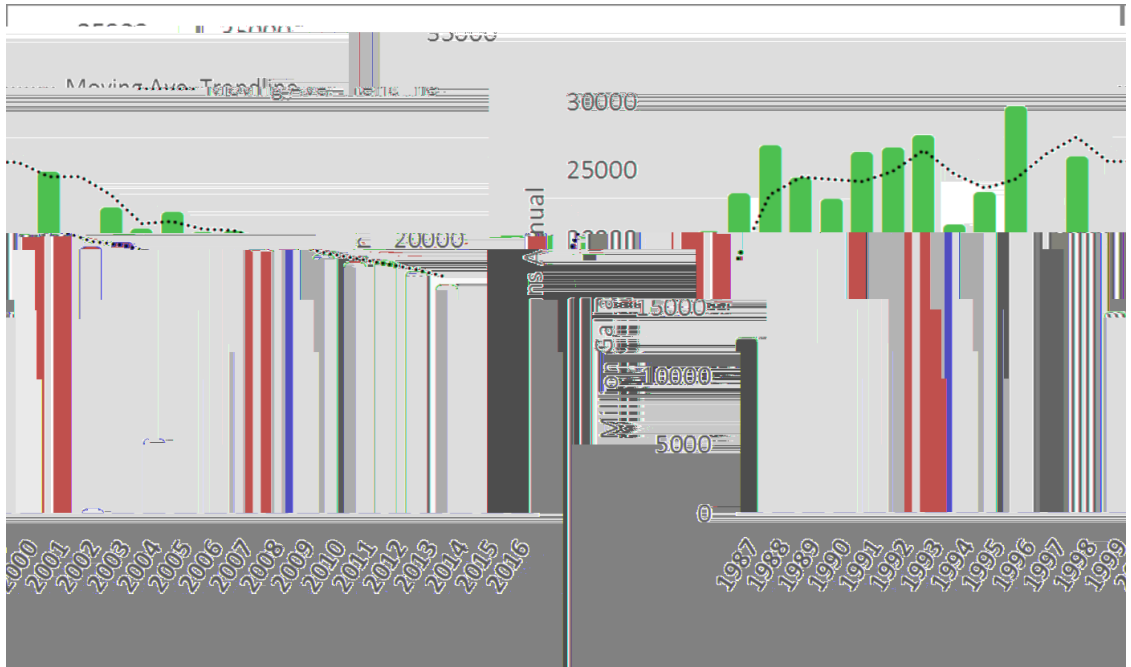
- Between 1990-2013 total withdrawals were reduced by approximately 8.5 billion gallons or 23.4 million gallons a day.
- More use of surface water sources including the Delaware River.



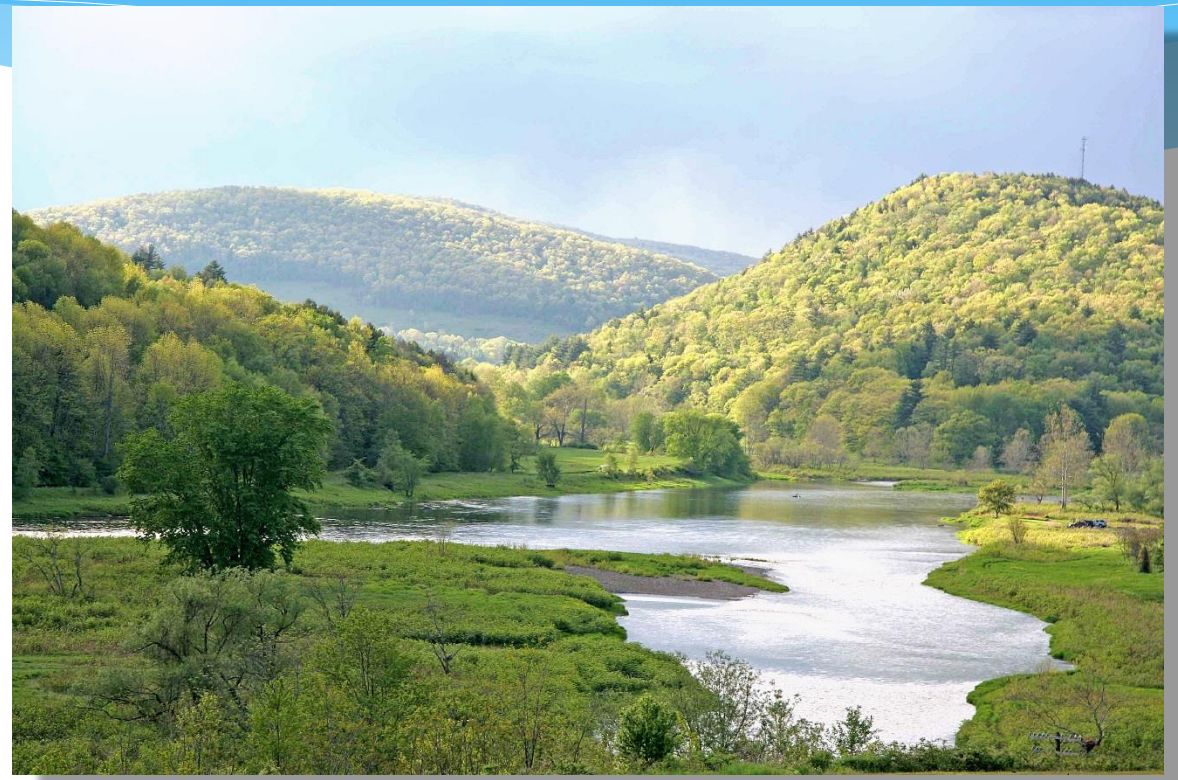
Water Quality

Fish kill on the Delaware from oil spill in 1929 (courtesy Temple Archives)

Plastic Pollution along waterways

The Quality of Basin Waters Shall Be Maintained For:

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



Point Mountain by David B. Soete

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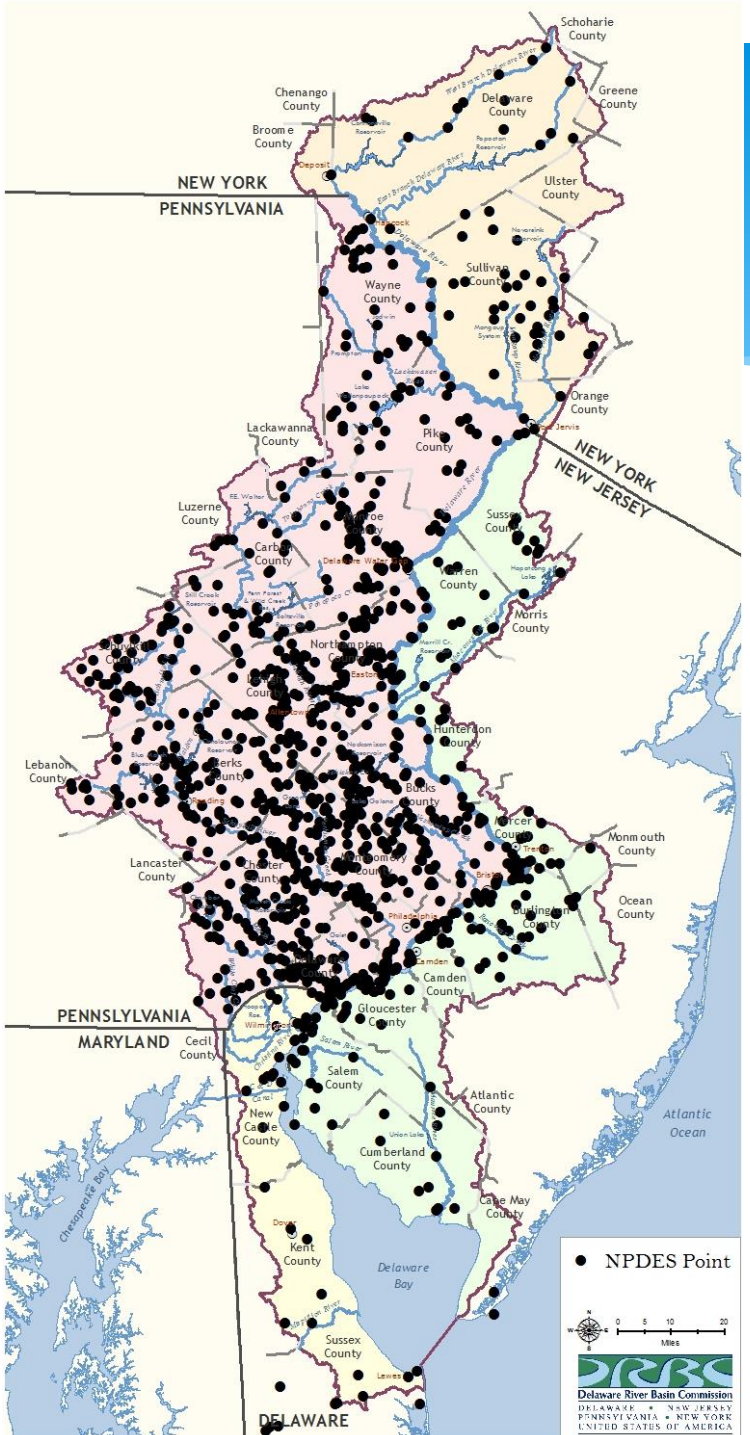
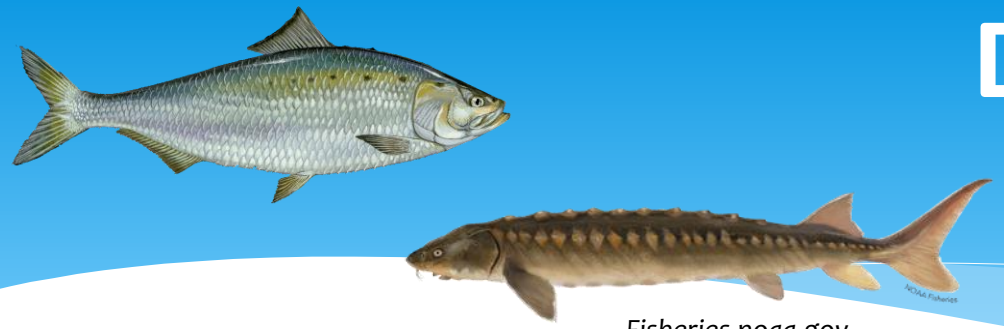


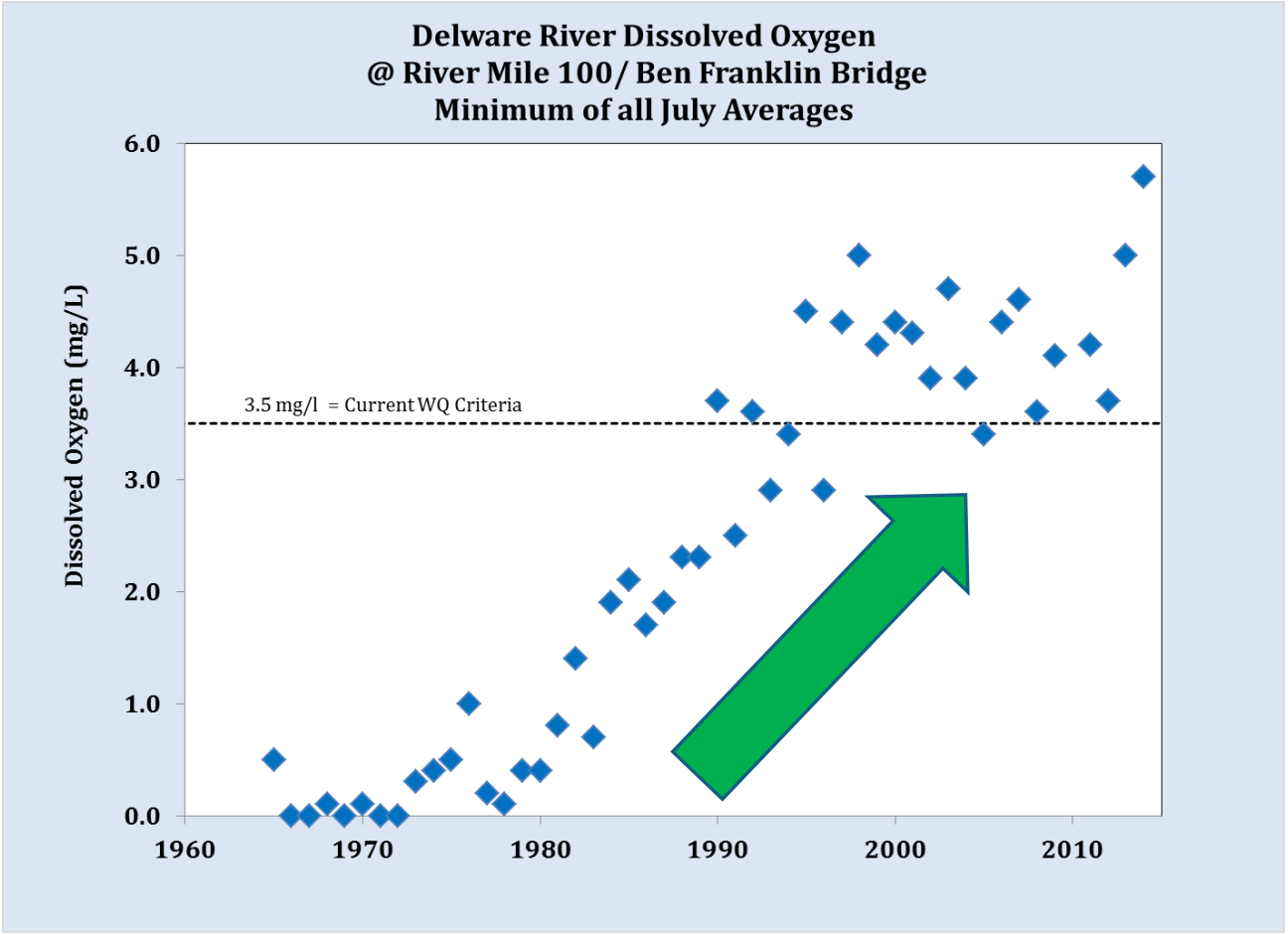
NPDES Dischargers in DRB

- NPDES = National Pollutant Discharge Elimination System: Requires Permit to discharge
- Set effluent limits and monitoring requirements in the permit
- 1,164 active discharge permits in Delaware River Basin

DRBC Collaborative Results
Aquatic Life Benefits



Fisheries.noaa.gov



- **A dead zone in the Estuary restored.**
- Significant improvement in dissolved oxygen.

News / Local News / Easton Area

Shad making a big comeback in Delaware River https://www.pressofatlanticcity.com/news/shad-make-a-big-comeback-in-delaware-river/article_bd20f7b6-9888-54ec-8930-8c476eec7013.html

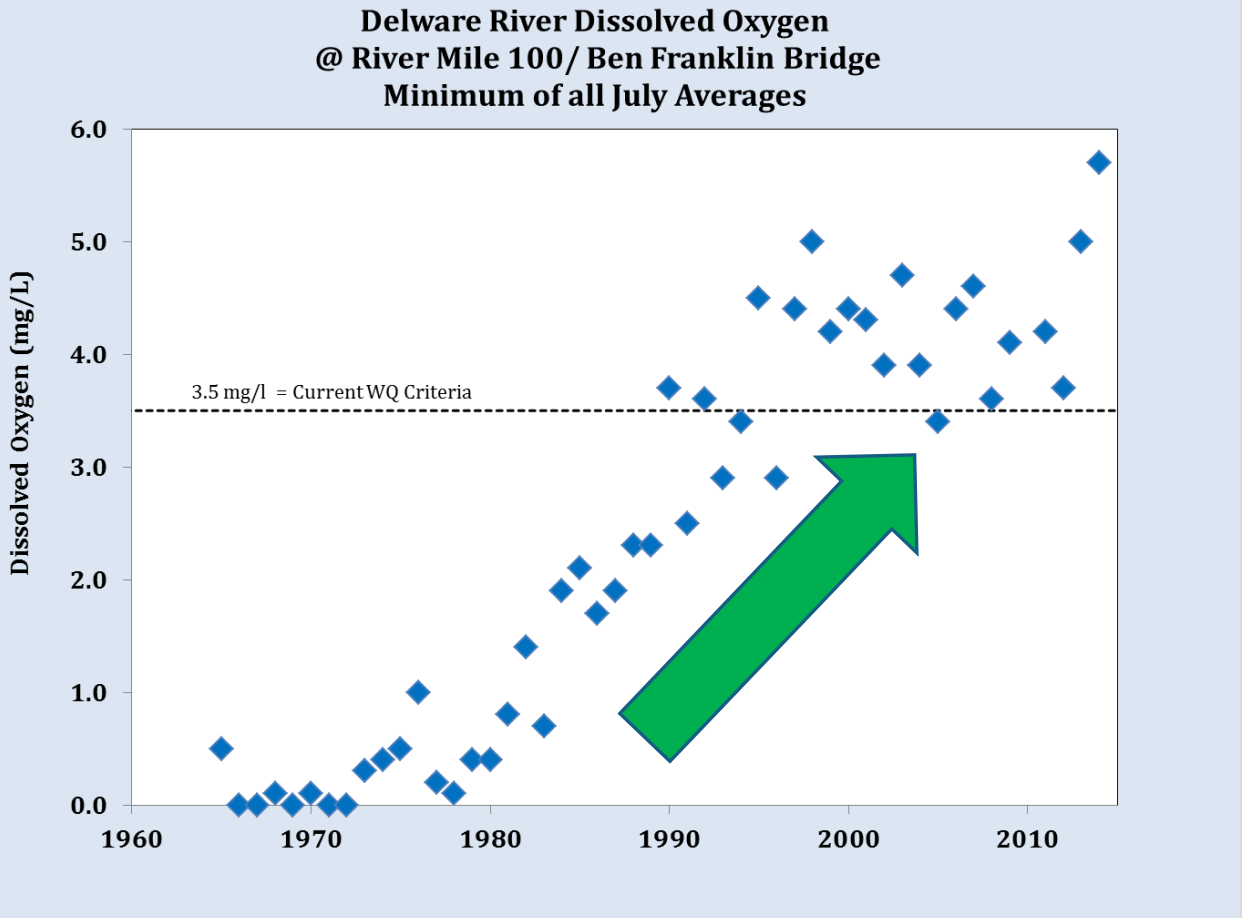
There's good news for one of N.J.'s most endangered fish

Updated Oct 28, 2017; Posted Oct 28, 2017

https://www.nj.com/news/2017/10/atlantic_sturgeon_still_depleted_but_slowly_recove.html

Photo: https://urbanland.uli.org/development-business/camdens-comeback/; Volley for Robert A. M. Stern Architects

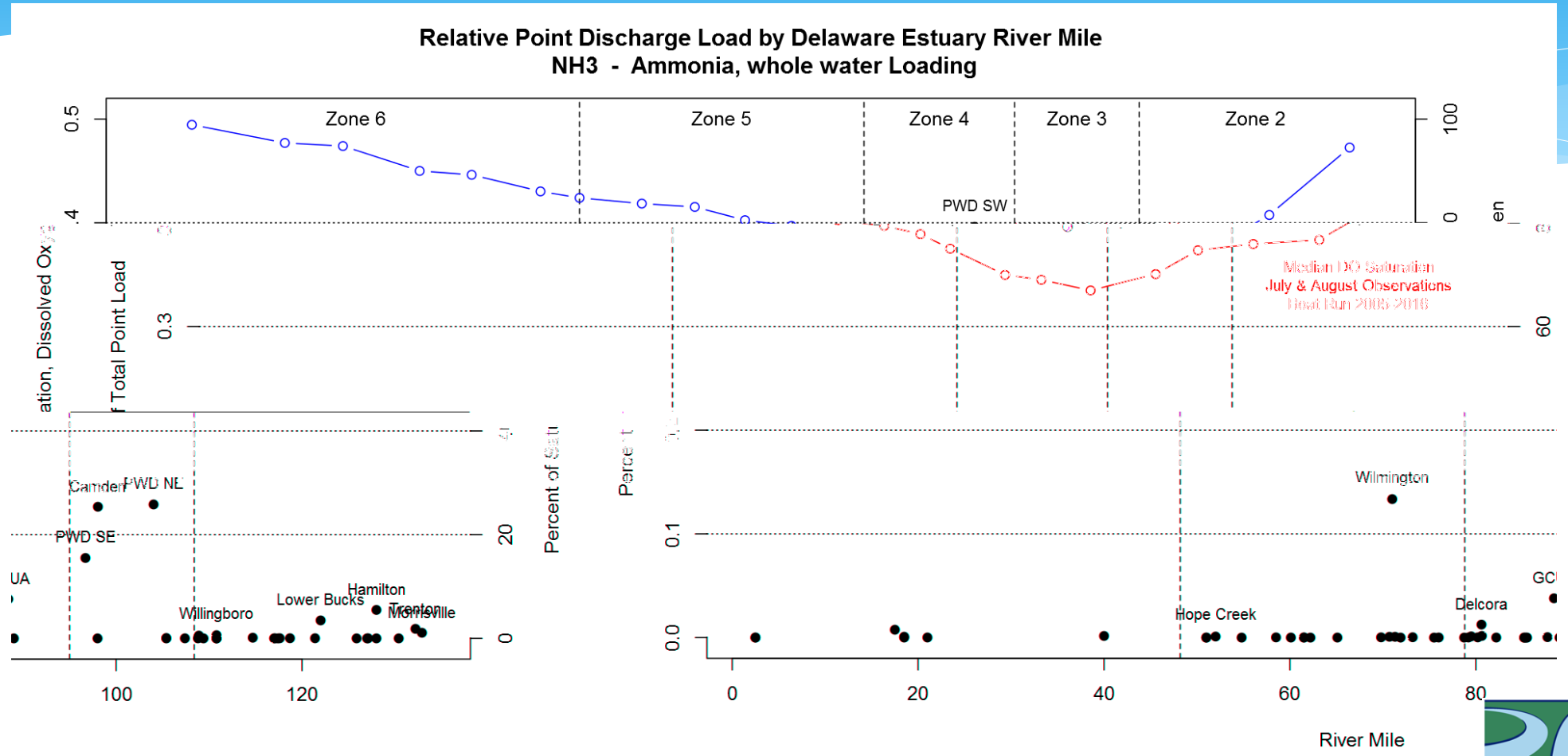
DRBC Collaborative Results
Local Economic Benefits



- **A dead river zone in the Estuary restored.**
- Significant improvement in Dissolved Oxygen.

https://philly.curbed.com/maps/delaware-river-philadelphia-development-projects

Delaware Estuary DO “Sag”



The Dissolved Oxygen “sag” in the Estuary is primary influenced by point source discharges

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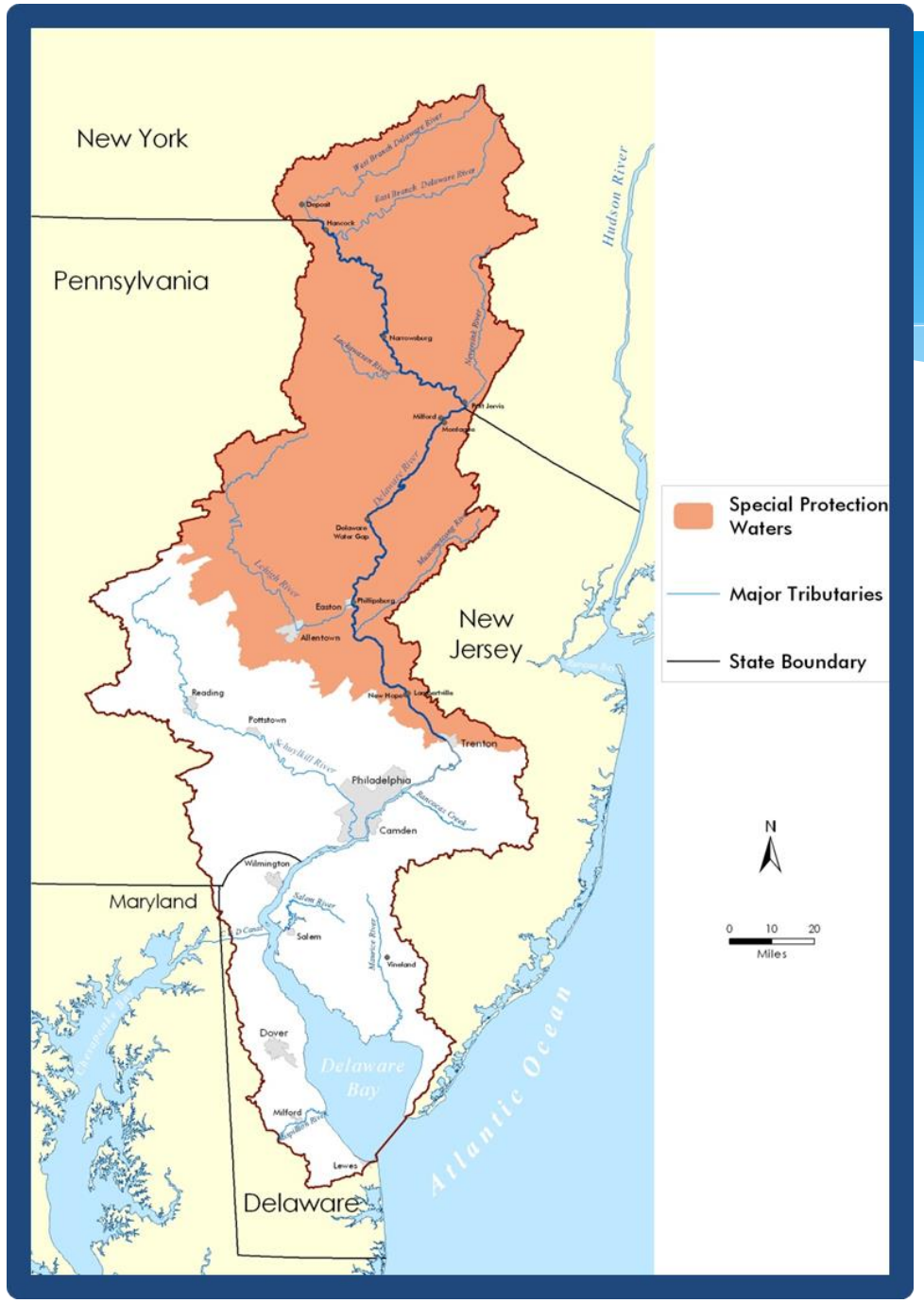

Special Protection Waters

Keeping Clean Waters Clean

- Entire basin upstream from Trenton
- Believed 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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Other Challenges

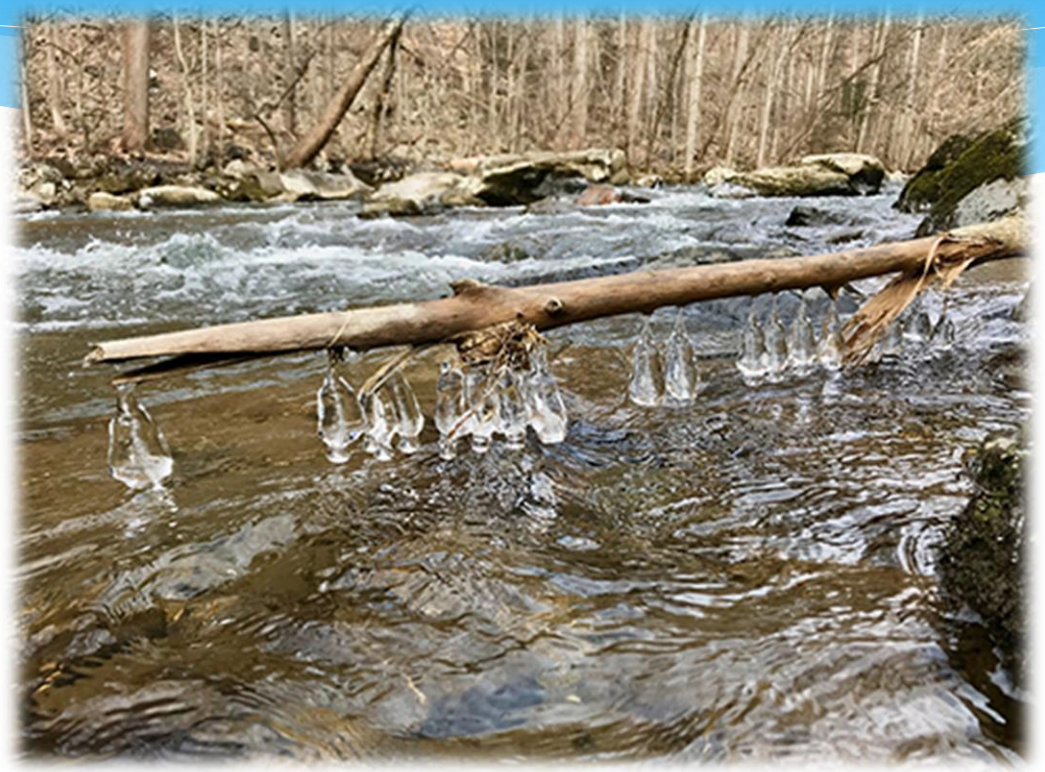
What's in our waters?

- PFAS
- Microplastics
- PCBs
- Other Contaminants of Emerging Concern

Climate

- Precipitation
- Temperature
- Sea Level Rise

Can we swim in it?



Frozen Stemware on the Flat Brook by Evan Kwityn

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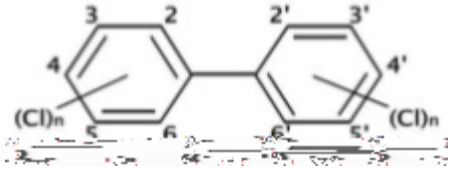
Polychlorinated Biphenyls (PCBs)



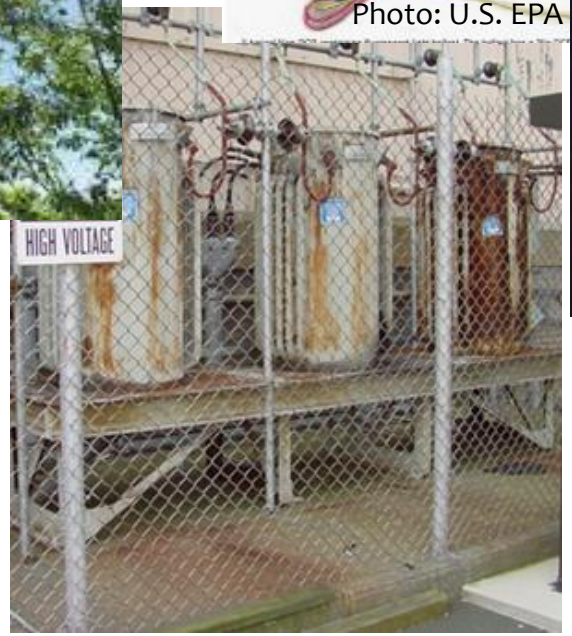
- Man-made organic chemicals
- Industrial and commercial applications
  - Electrical insulating
  - Flame retardant
- Banned in 1979
- Possible human carcinogen
- Not water soluble


Photo: Wikipedia

Photo: U.S. EPA


Photo: Wikipedia

Photo: U.S. EPA



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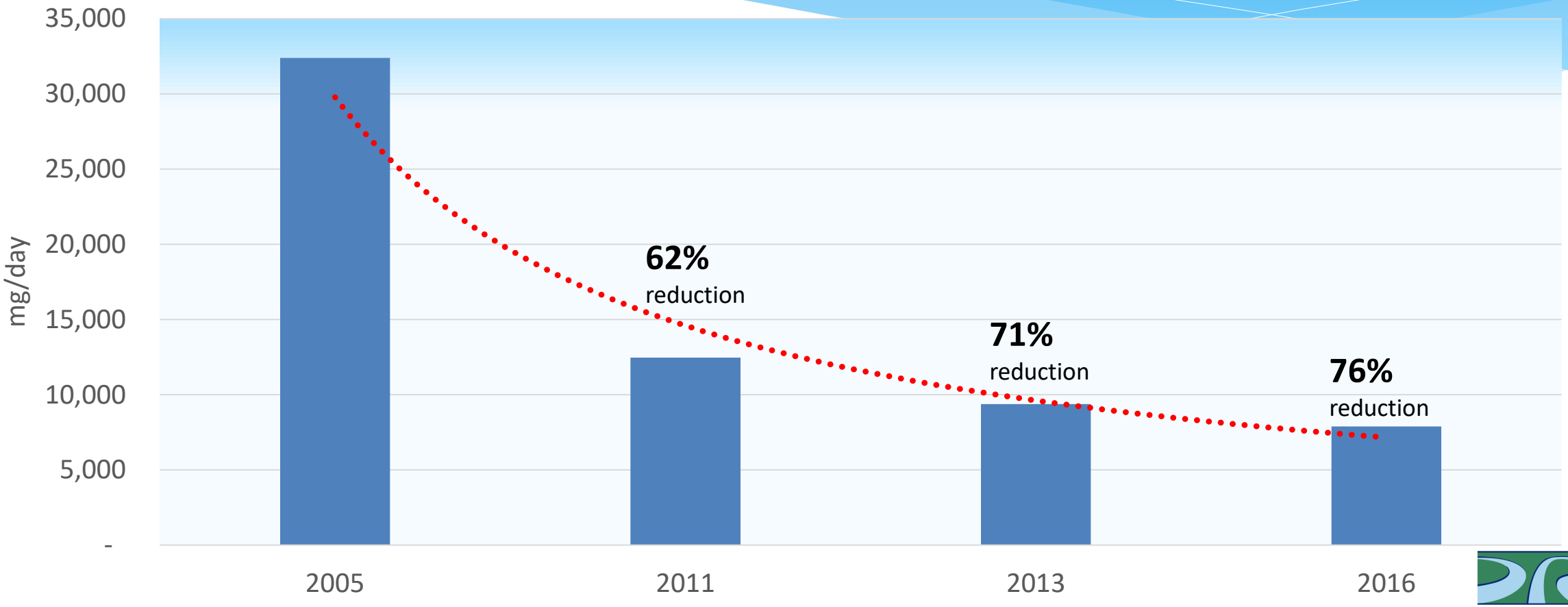
PCB Loadings

Top Ten Point Source Dischargers mg/day



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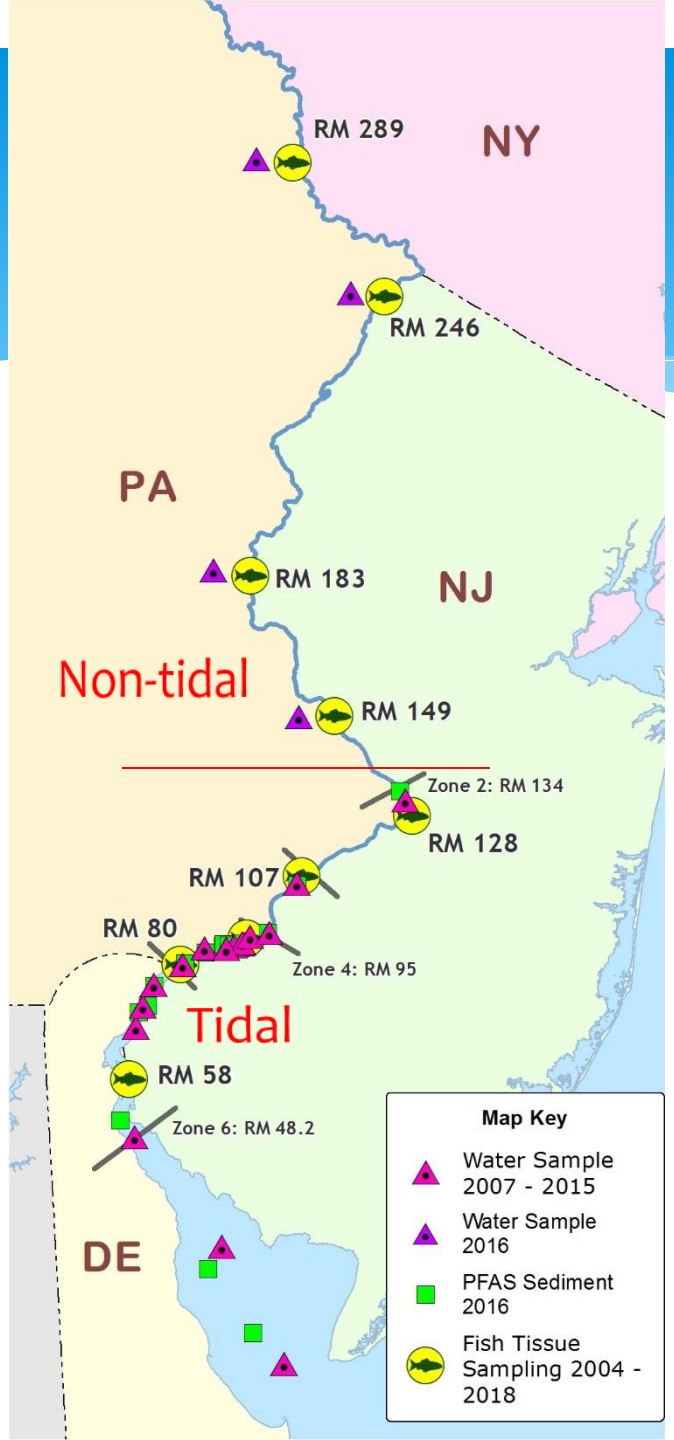
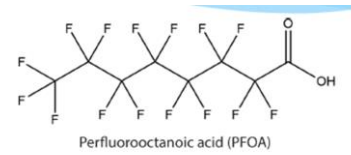
PFAS Sample Sites
Main Stem Delaware River



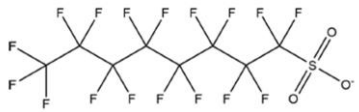
Surface water:

- Six tidal sites in 2007, 2008, 2009
- Fifteen tidal sites in 2015
- Four non-tidal sites in 2016

- **Fish:**
  - Four non-tidal and five tidal sites in 2004, 2005, 2006, 2007, 2010, 2012, 2015 and 2018
- **Sediment:**
  - Fifteen tidal sites in 2016



Perfluorooctanoic acid (PFOA)


Perfluorooctane sulfonate (PFOS)

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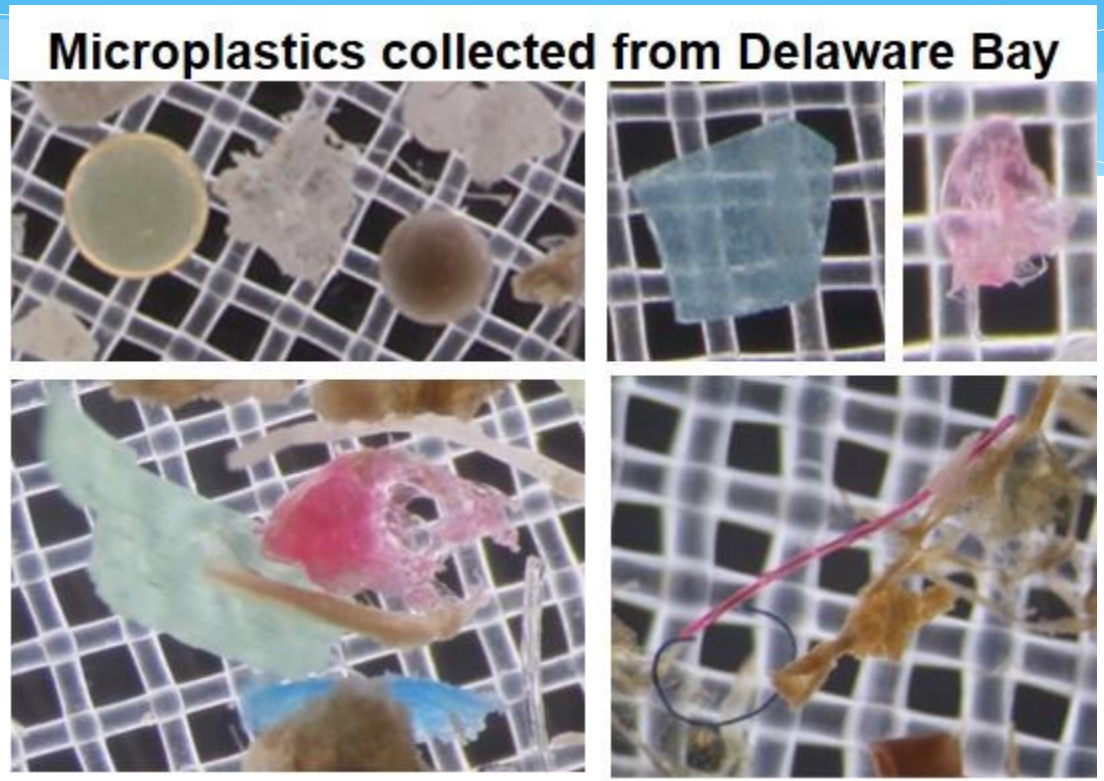
Microplastics

Small plastic pieces less than five millimeters long which can be harmful to our ocean and aquatic life.

- Primary microplastics include microbeads which were commonly found in health care products like face washes and toothpastes.
- Secondary microplastics occur when larger pieces of plastic like bottles and fishing line break down through photodegradation.



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Climate Change

- More warm extremes and fewer cold extremes
- Heavy rains become more intense
- More frequent dry spells
- Rising sea level with increased frequency and intensity of coastal flooding

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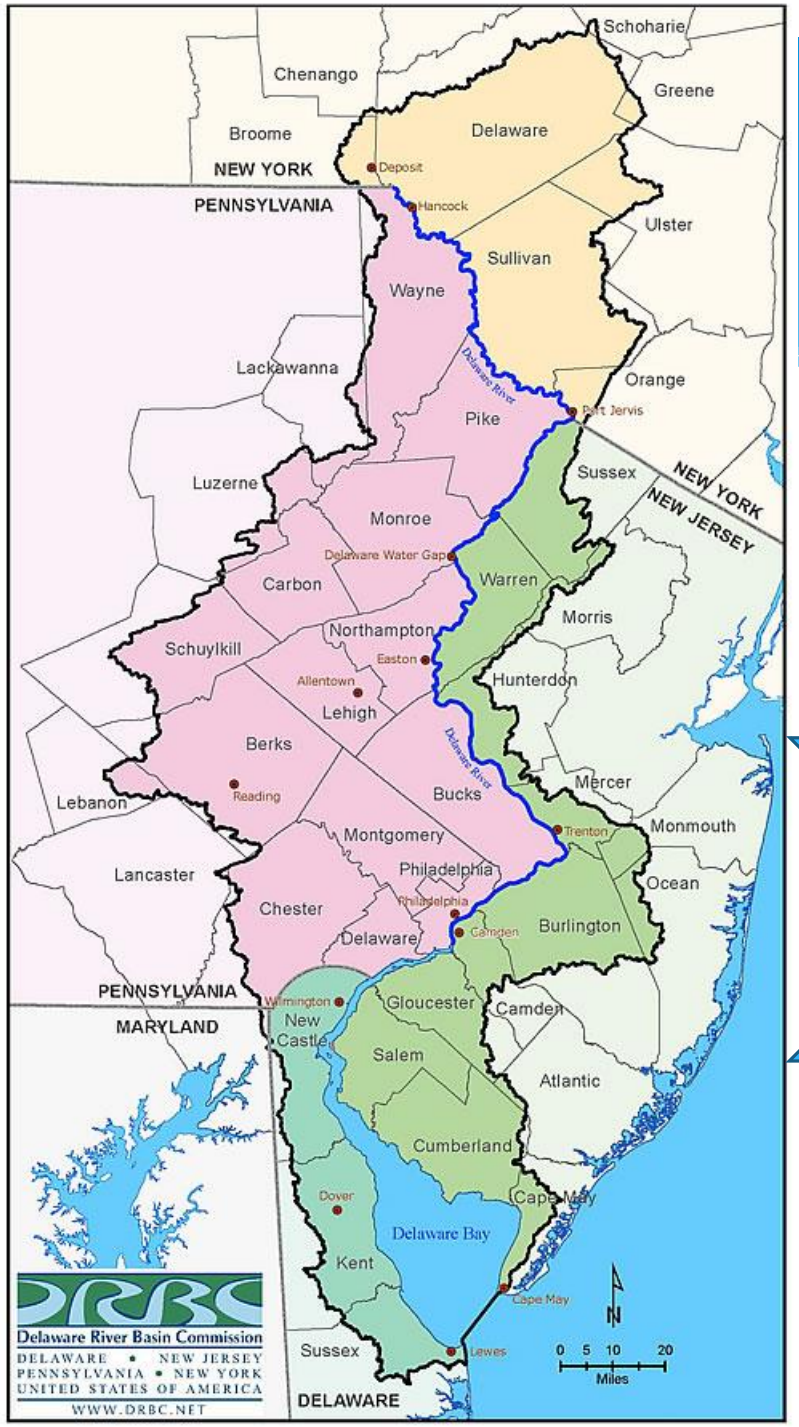

Complex Considerations

Freshwater Hydrologic Climate Considerations:

- Precipitation
  - Flow
- Temperature
  - Evapotranspiration
  - Snowpack

Salt Water Climate Considerations:

- Sea Level Rise

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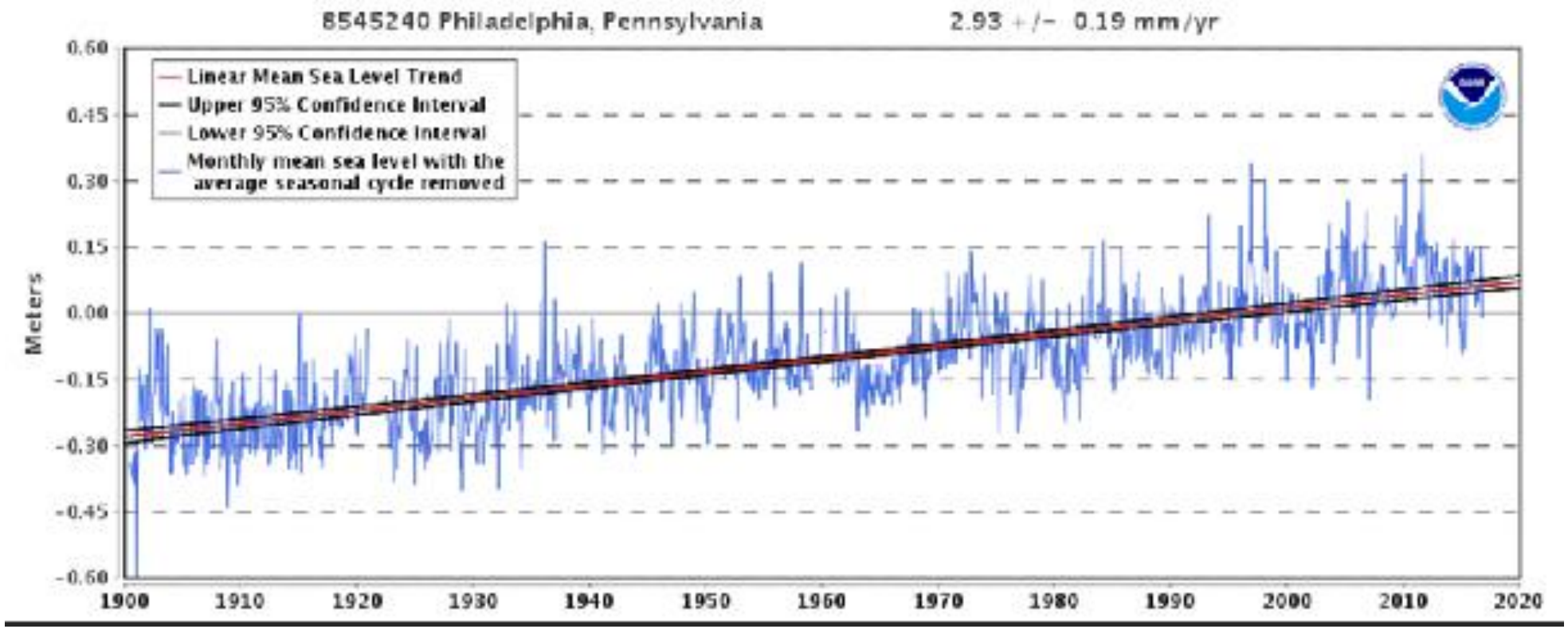
Sea Level Rise

"**Regional Sea Level Change Projections:** It is very likely that in the 21st century and beyond, **sea level change will have a strong regional pattern**, with some places experiencing significant deviations of local and regional sea level change from the global mean change." -IPCC 2013



Mean Sea Level Trend, Philadelphia:

- 2.93 mm/year (1/10 inch/year)
- 11.5 inches/century

Data: NOAA

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