

# Delaware River Basin Commission

Briefing for:

Delaware Valley  
University



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

Peter Eschbach, DRBC  
Feb. 26, 2020

# Today's Agenda

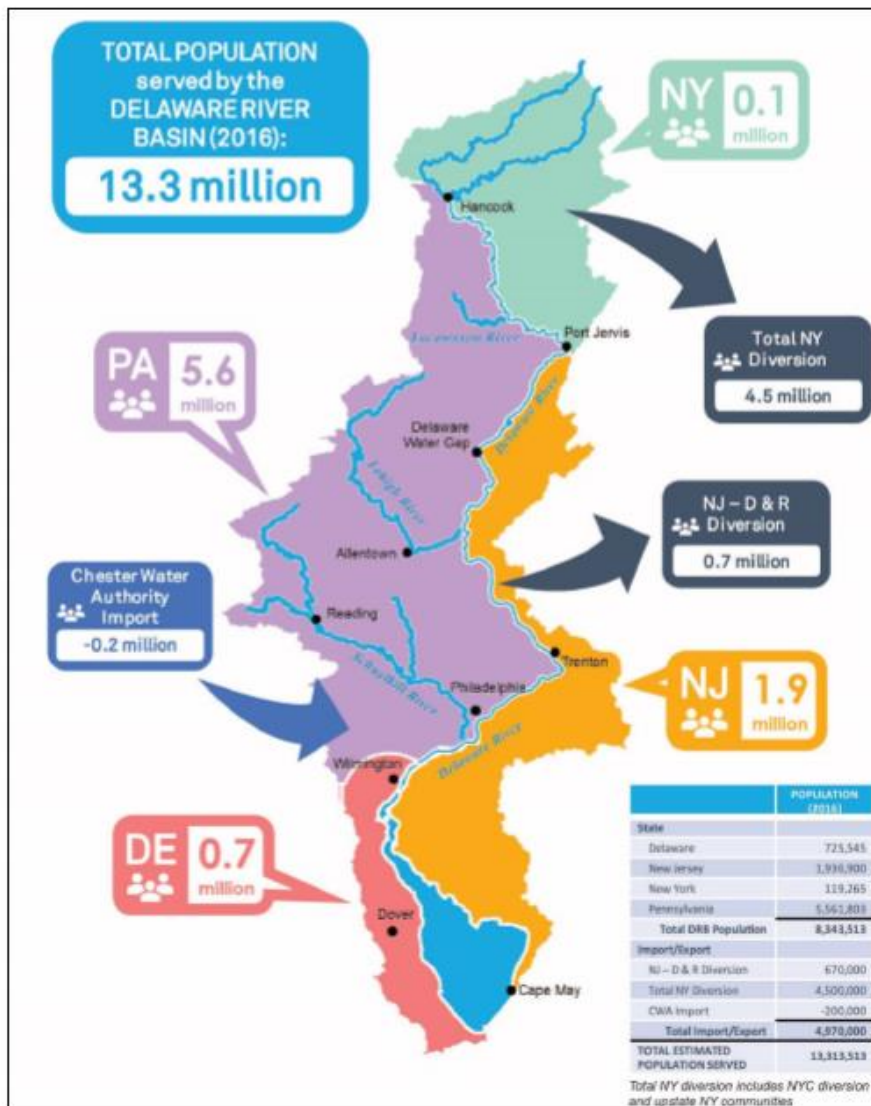
- Who we are  
(and who we “are not”).
- What we do.
- Why it matters.



*Tow path at Lumberville, PA by Keith Balderston*



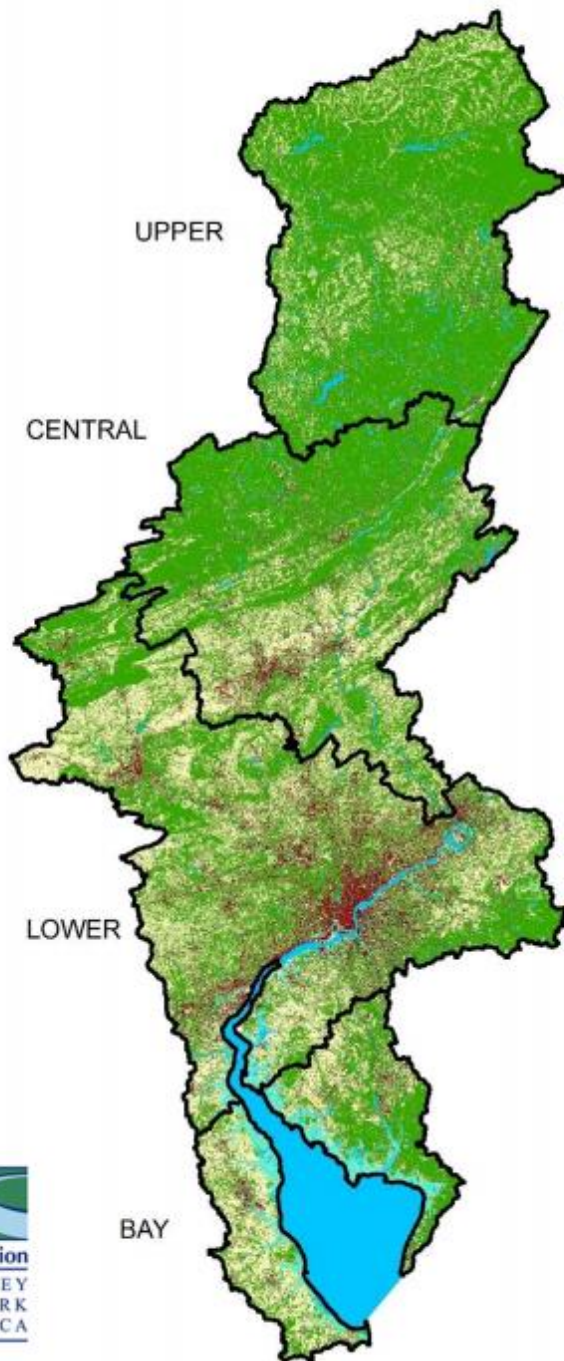
# The Delaware River Basin



- ~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- 6.4 billion gallons are withdrawn every day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

## Legend

- Background
- Water
- Emergent Wetlands
- Tree Canopy
- Scrub
- Low Vegetation
- Barren
- Structures
- Other Impervious Surfaces
- Roads
- Tree Canopy over Structures
- Tree Canopy over Other Imp Surface
- Tree Canopy over Roads



# Landcover

- Most up-to-date data published by Shippensburg University
  - 1-meter resolution, LiDAR-based, 12 land cover classes
  - Predominantly Forested – especially Upper Basin
  - More urbanized around Wilmington – Philadelphia - Trenton corridor
- Action: continue to update high-resolution landcover over time for trends
- Management of growth will help mitigate negative impacts to source waters, water quality and aquatic life







# The Delaware River “Today”

Photo: Nicholas A. Tonelli



Photo: Troy Bystrom



Photo: Aqua Vida



Photo: <https://camdenwd.weebly.com/>



# It Used to Look Like...



*Slaughterhouses discharging in 1928  
(PWD Historic Collection)*



*Bridgeport Canal up from Schuylkill River in 1928.  
(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)*



EDITORIAL PAGE  
**PHILADELPHIA RECORD**

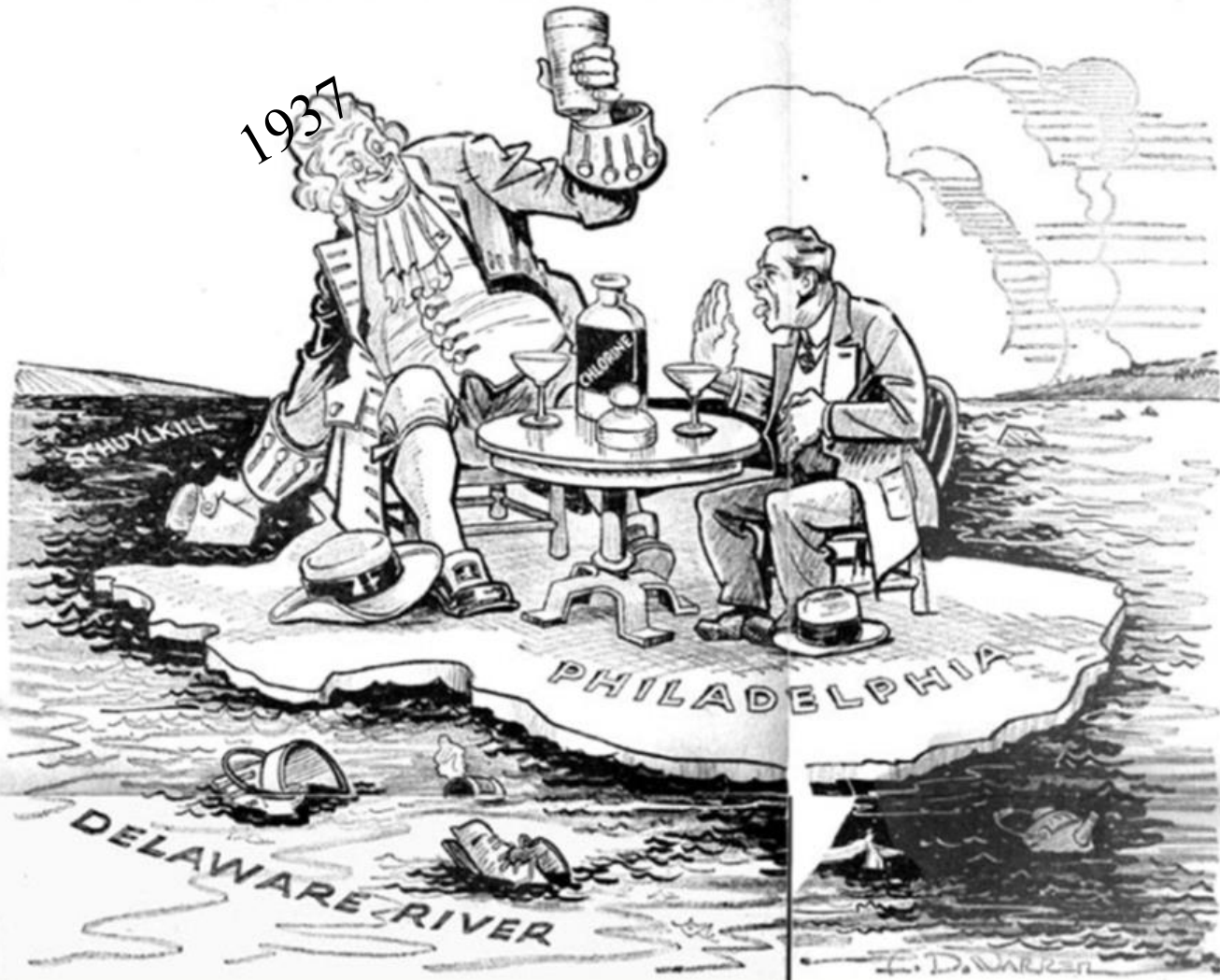
The War in Outline :: America Speaks :: Travel

SUNDAY, MARCH 14, 1937

Screen :: Stage :: Music :: Art :: Radio :: Puzzles

**WATER, WATER EVERYWHERE, BUT NOT A DROP FIT TO DRINK.**

1937

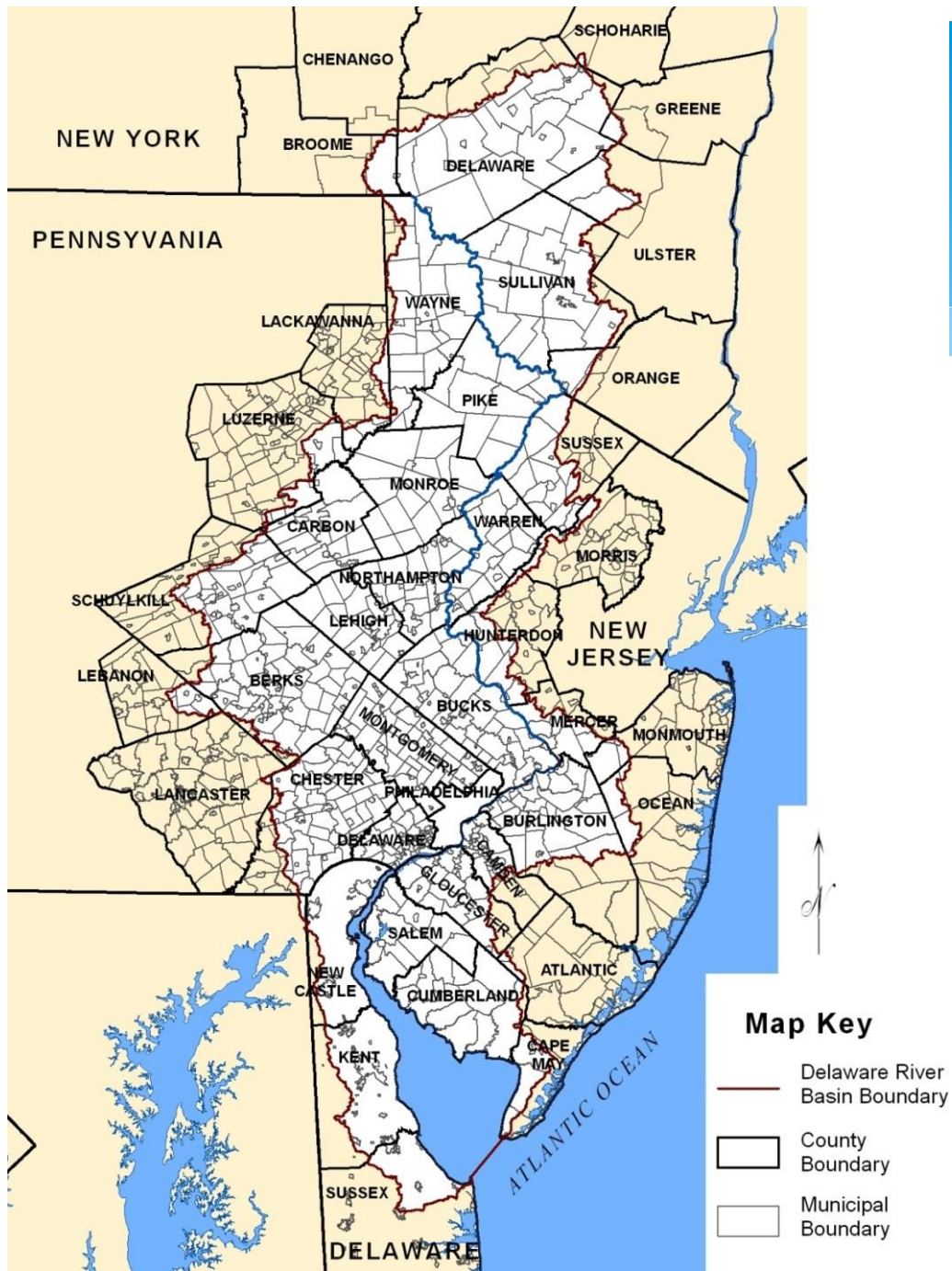


# The Problems

- 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

# The Challenge

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





# 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)



# 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





# Not Us



Delaware River  
Joint Toll Bridge  
Commission

DELAWARE  
**RIVER BASIN**  
SOURCE WATER COLLABORATIVE



**Delaware River and Bay Authority**

**Delaware Watershed  
Research Fund**



**DELAWARE RIVER  
PORT AUTHORITY**  
*of Pennsylvania & New Jersey*<sup>®</sup>



# 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

Note: New York City and Philadelphia are “advisors” and not members



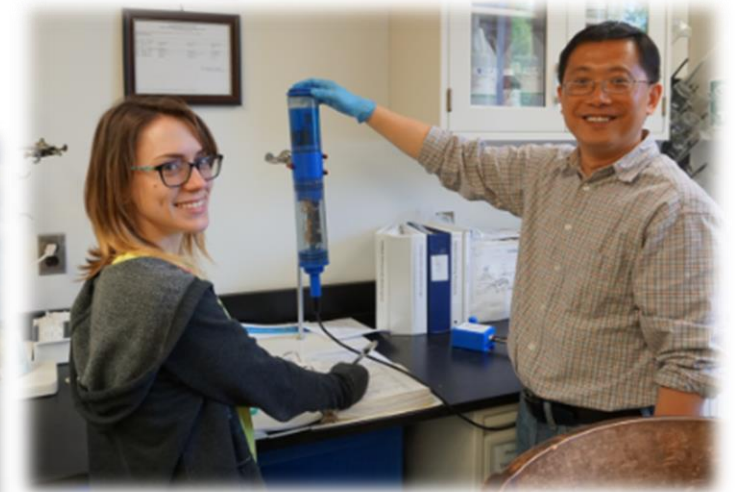
# DRB Compact Basic “Charges” From the Preamble

A Comprehensive Plan administered by a basin wide agency will provide:

- **flood damage** reduction;
- conservation and **development of ground and surface water supply...**;
- development of **recreational facilities**;
- **propagation of fish and game**;
- promotion of related...**watershed projects**;
- **protection to fisheries...**;
- development of **hydroelectric power**;
- **control of movement salt water**;
- **abatement and control of stream pollution**;
- **and regulation towards the attainment of these goals.**

# 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





# DRBC Core Responsibilities

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



*View from Bowman Hill Tower by Linda Park*

# Flow

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

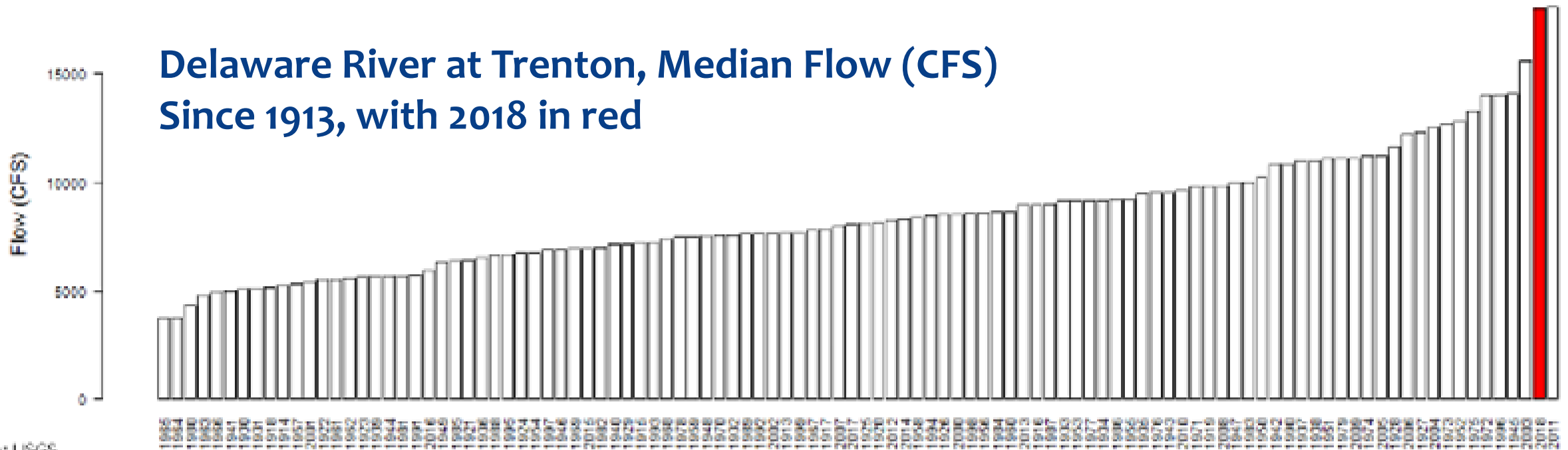


*Dawn at Ten Mile River by Martha Tully*



# How Wet Has It Been?

**Delaware River at Trenton, Median Flow (CFS)  
Since 1913, with 2018 in red**



Data: USGS

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

# How Dry Has It Been?

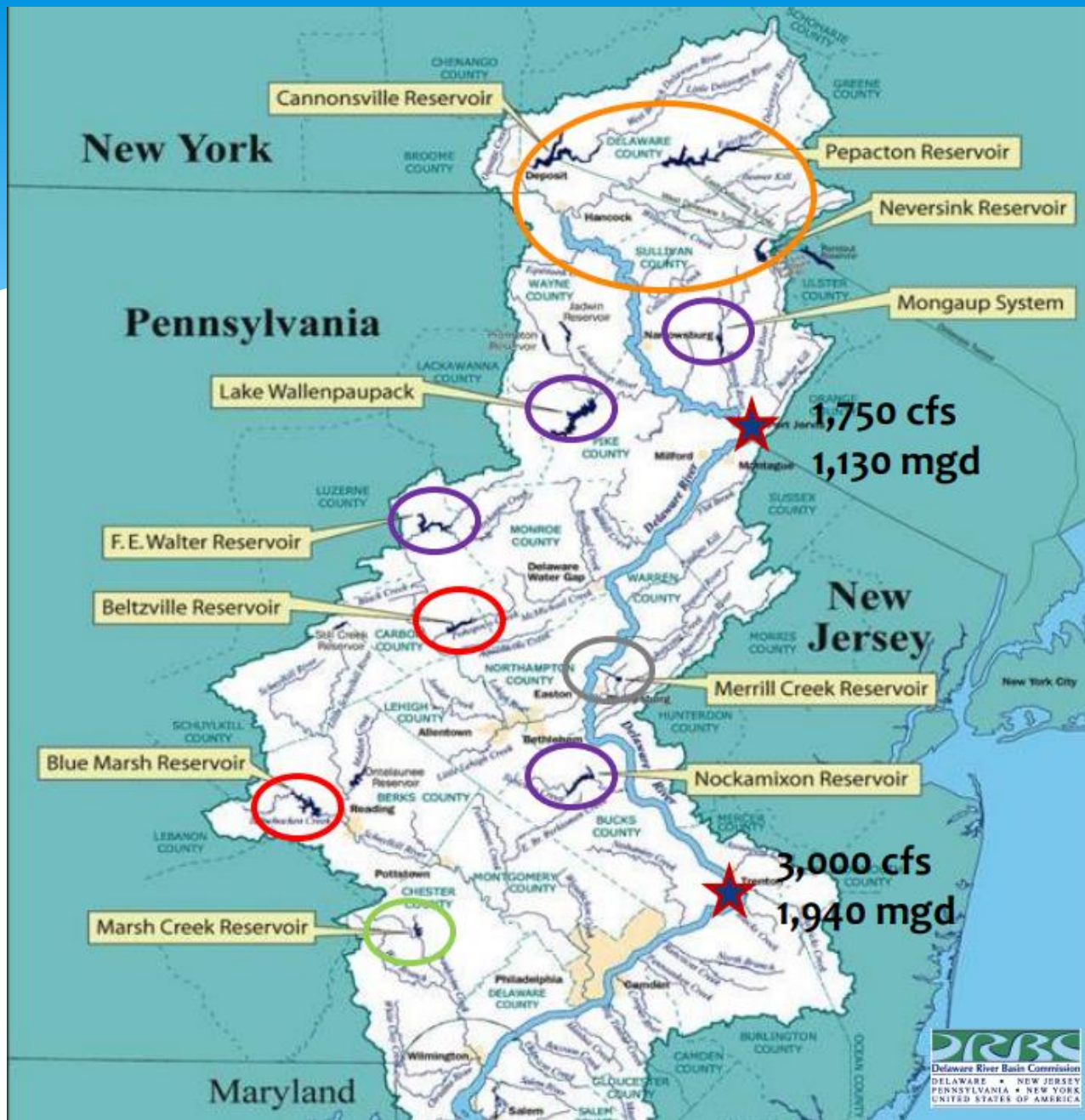
| <u>Decades</u>                  | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | 2010s |
|---------------------------------|-------|-------|-------|-------|-------|-------|-------|
| <b>Reservoir Completed</b>      | A B C | D E F | G H   | I     |       |       |       |
| <b><u>Drought Years:</u></b>    |       |       |       |       |       |       |       |
| <b>Drought Watch or Warning</b> |       |       |       |       |       |       |       |
| <b>Drought Emergency</b>        |       |       |       |       |       |       |       |

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.








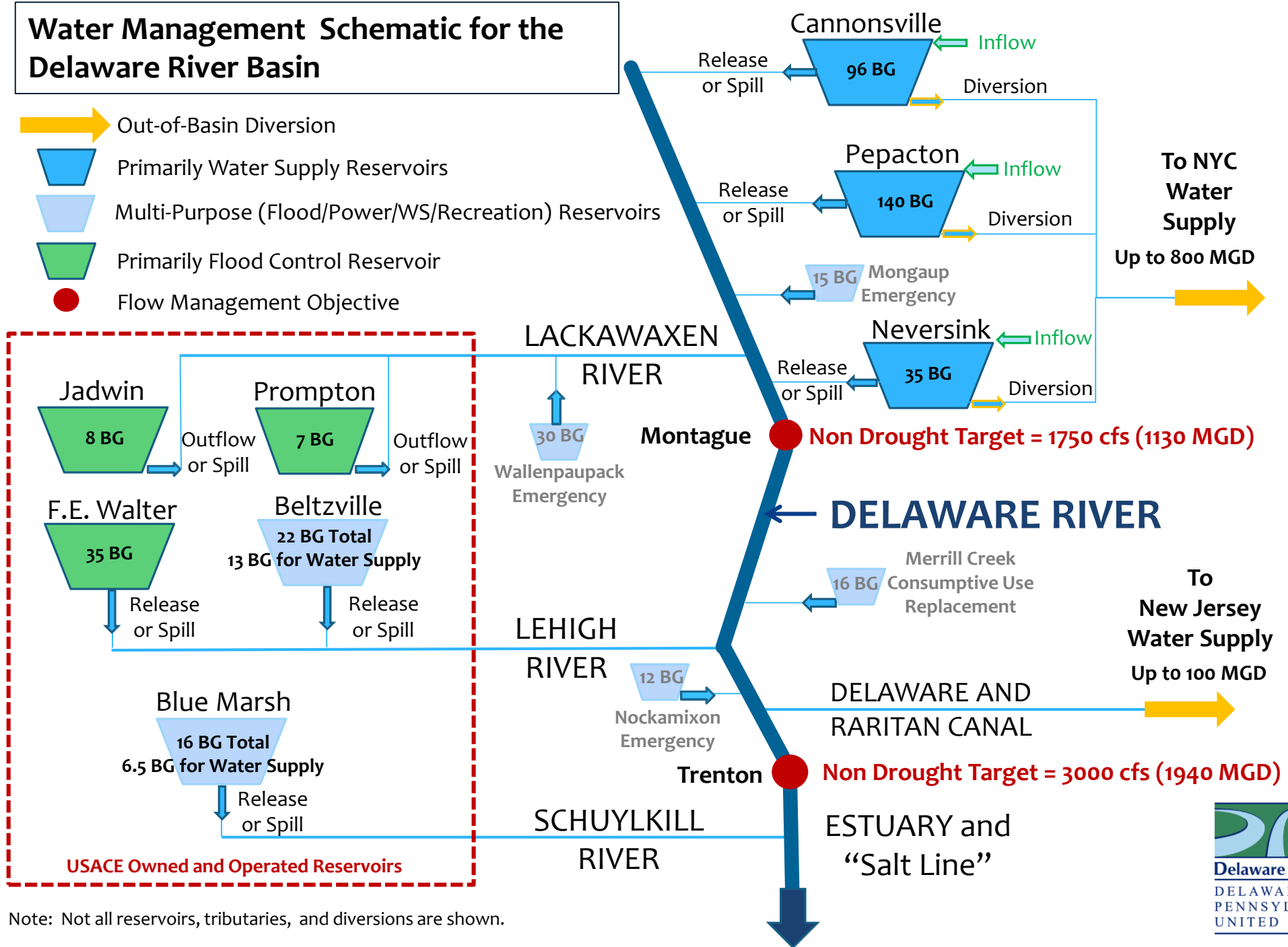
# Sources of Water



- NYC Reservoirs - instream flow support - Montague)
- USACE Reservoirs (Flood and Recreation; DRBC - instream flow support – Trenton)
- Emergency (Private, PA)
- Consumptive Use Replacement (Thermoelectric)
- Dockets
- Others not shown

# Water Management Schematic for the Delaware River Basin

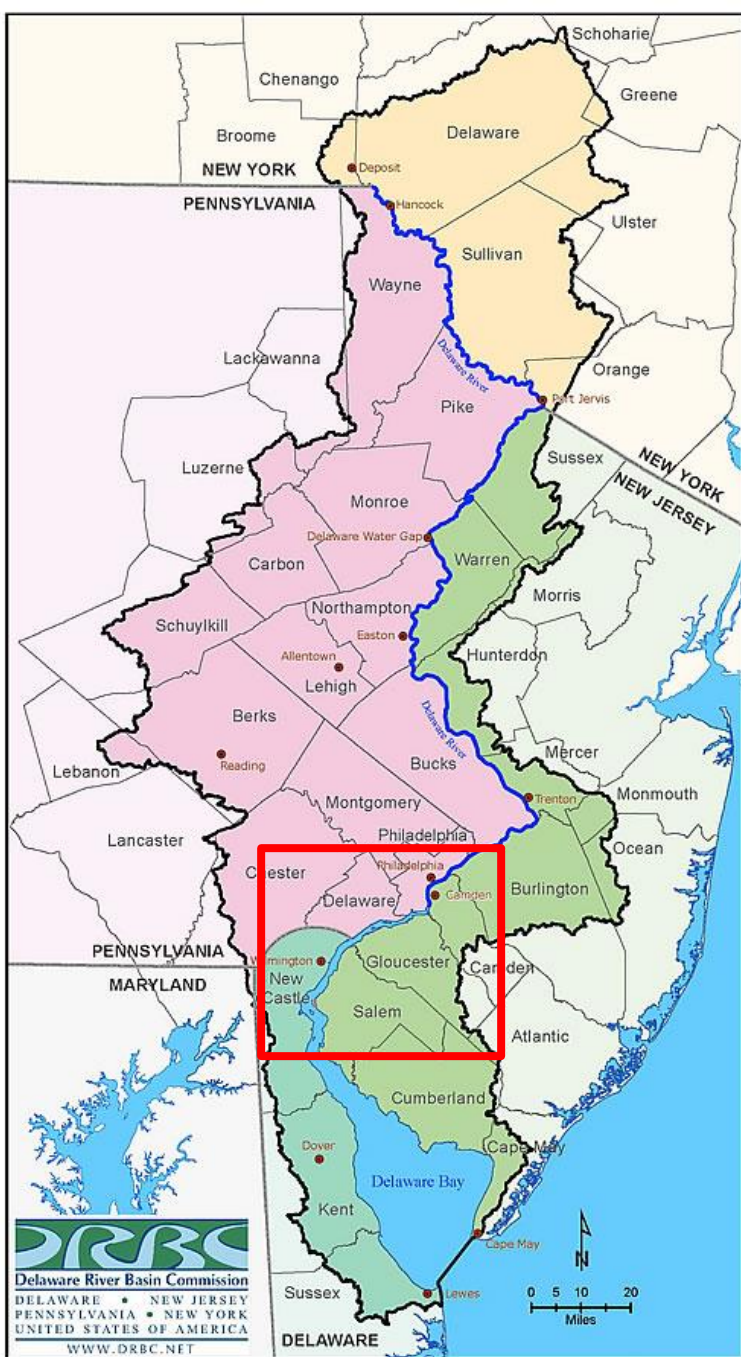
-  Out-of-Basin Diversion
-  Primarily Water Supply Reservoirs
-  Multi-Purpose (Flood/Power/WS/Recreation) Reservoirs
-  Primarily Flood Control Reservoir
-  Flow Management Objective



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



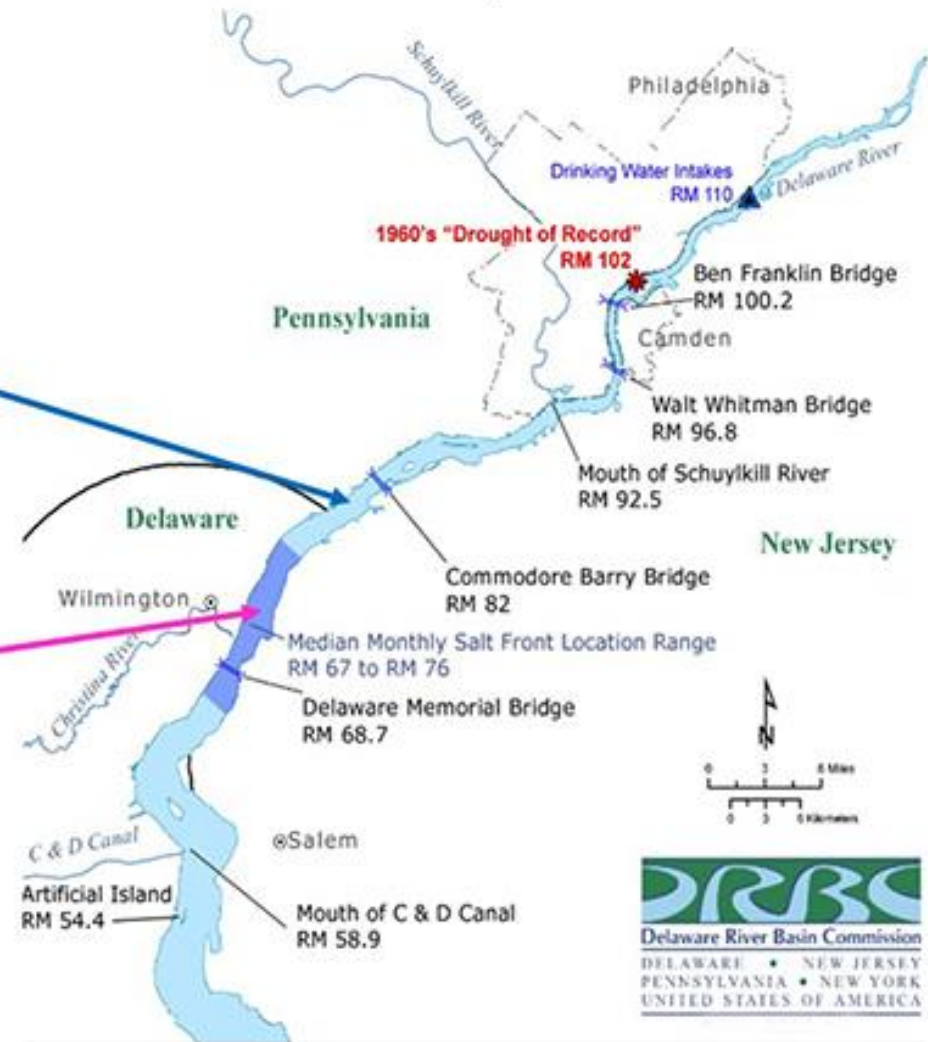




# Salt Line Location: October 7, 2019

**10/7/2019  
 Location:  
 RM 80**

**Normal October  
 Location:  
 RM 72**







# Water Quality



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



*Plastic Pollution*



# 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



Photo: David B. Soete

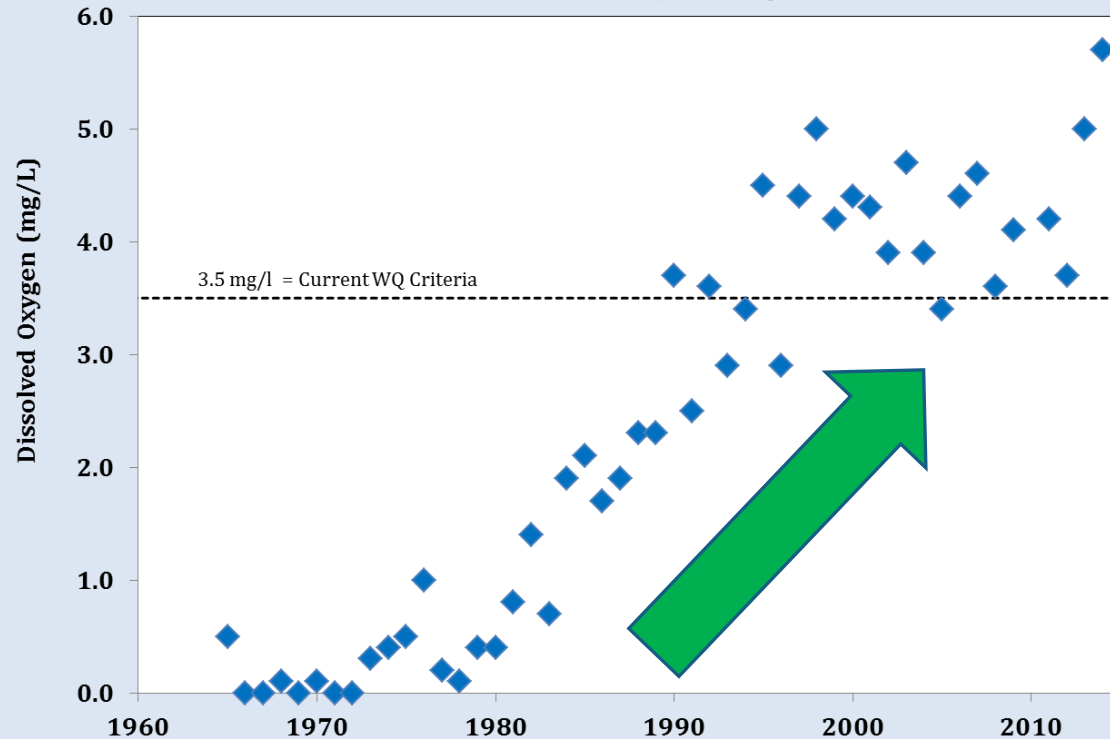




Fisheries.noaa.gov

# DRBC Collaborative Results Aquatic Life Benefits

**Delaware River Dissolved Oxygen  
@ River Mile 100/ Ben Franklin Bridge  
Minimum of all July Averages**



- **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

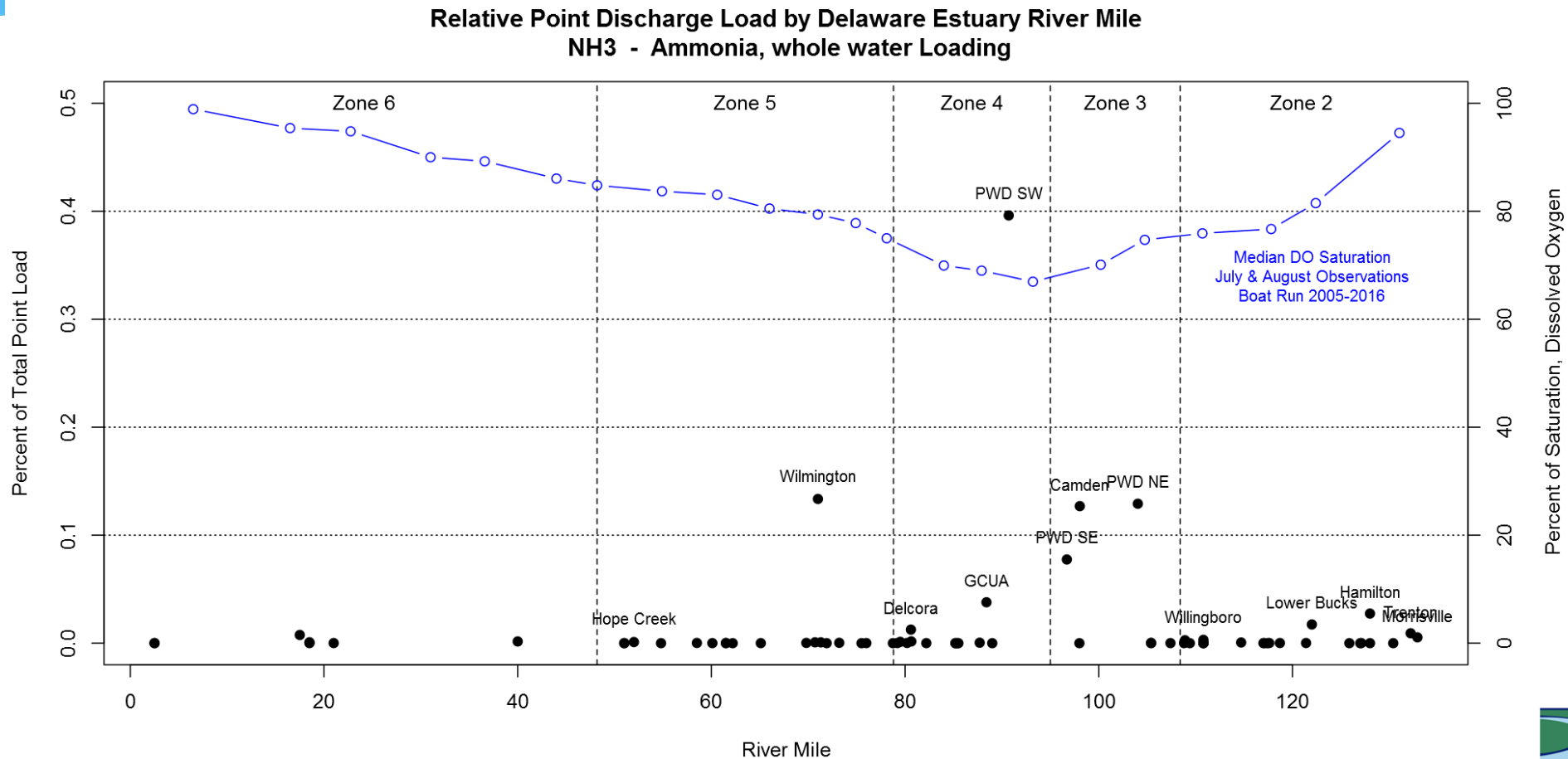
[https://www.pressofatlanticcity.com/news/shad-make-a-big-comeback-in-delaware-river/article\\_bd20f7b6-9888-54ec-8930-8c476eec7013.html](https://www.pressofatlanticcity.com/news/shad-make-a-big-comeback-in-delaware-river/article_bd20f7b6-9888-54ec-8930-8c476eec7013.html)

**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](https://www.nj.com/news/2017/10/atlantic_sturgeon_still_depleted_but_slowly_recove.html)

# Delaware Estuary DO "Sag"



**The Dissolved Oxygen "sag" in the Estuary is primary influenced by point source discharges**





# Other Challenges

## What's in our waters?

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

## Climate

- Precipitation
- Temperature
- Sea Level Rise

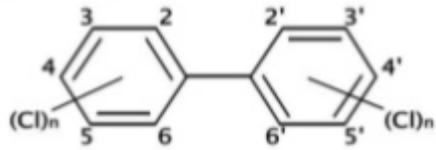
## Can we Swim in it?



*Frozen Stemware on the Flat Brook by Evan Kwityn*



# Polychlorinated Biphenyls (PCBs)

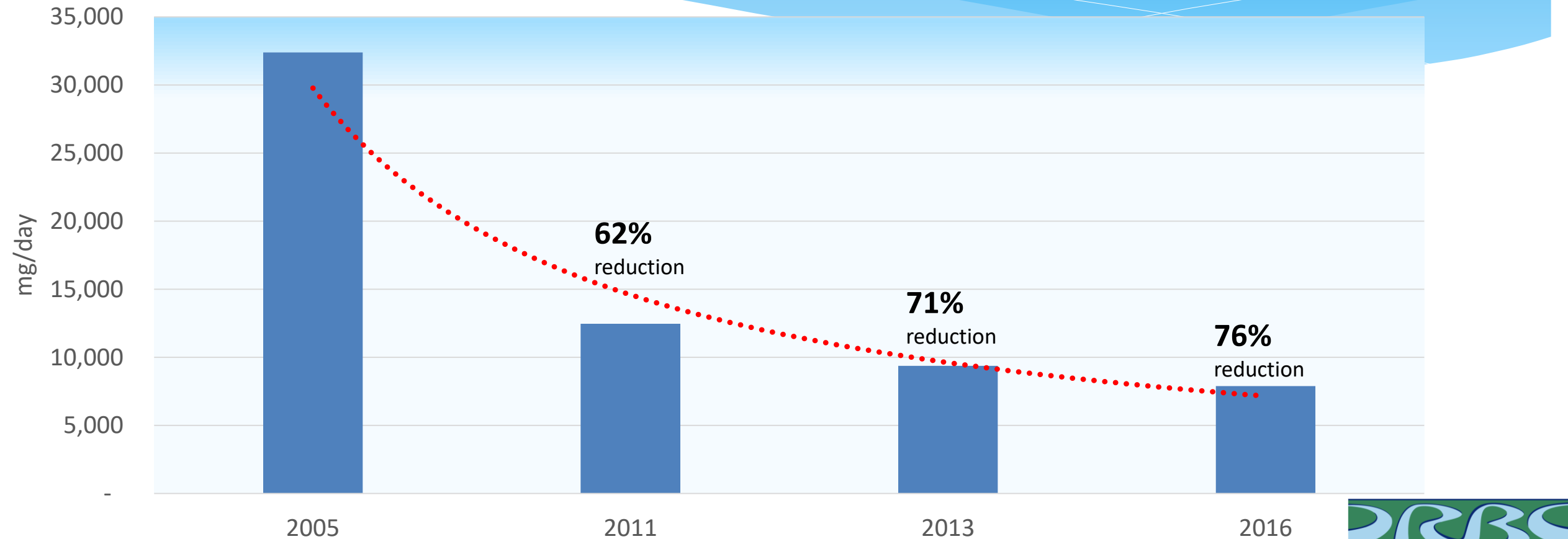


- Man-made organic chemicals
- Industrial and commercial applications
  - Electrical insulating
  - Flame retardant
- Banned in 1979
- Possible human carcinogen
- Not water soluble



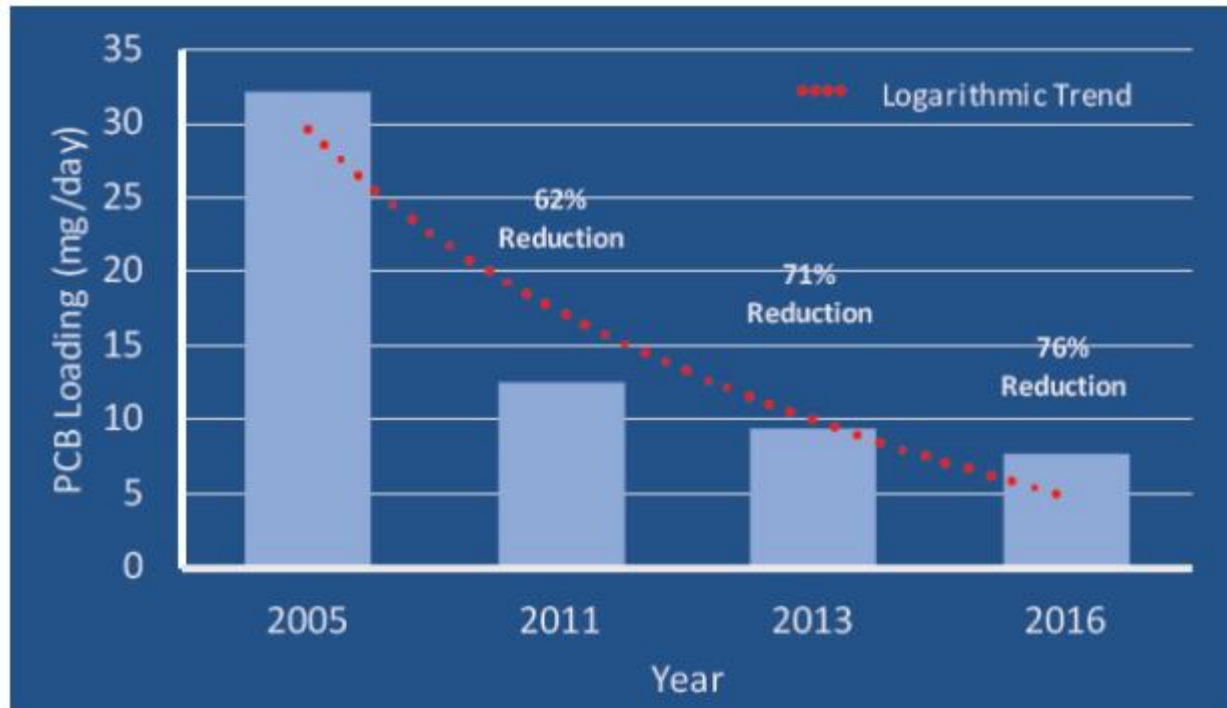
# PCB Loadings

## Top Ten Point Source Dischargers mg/day





# Toxics: PCB Trends in Effluent



- PCBs are probable human carcinogen
- Human exposure from fish & water consumption
- Delaware Estuary 100 to 1000X higher than criteria
- DRBC developed TMDLs 2003 & 2006
- 90+ Point dischargers perform pollutant minimization plans – DRBC reviews
- DRBC manages all the data from PMPs
- Decades long commitment
- Top 10 dischargers reduced their contributions by 76% between 2005 and 2016





# Water Quality



|                         |  |  |  |
|-------------------------|--|--|--|
| Dissolved Oxygen        |  | <i>Good</i><br>From the mid-1990s onward, criteria has mostly been met, although DO concentrations exhibit high variability from year to year. | <ul style="list-style-type: none"> <li>• Examine whether DO criteria needs revision</li> <li>• Measure sources of nutrient and oxygen-depleting materials</li> <li>• Build water quality model</li> </ul>                                      |
| Nutrients               |  | <i>Very Good</i><br>Total nitrogen and phosphorus concentrations were highest towards the Upper Delaware River.                                | <ul style="list-style-type: none"> <li>• Continue developing and monitoring nutrient criteria</li> <li>• Develop eutrophication model</li> </ul>   |
| pH                      |  | <i>No Rating</i><br>All pH values from each monitoring station are within DRBC's criteria.   | <ul style="list-style-type: none"> <li>• Develop a better understanding of the Estuary carbon cycle and its impact on pH</li> </ul>  |
| Salinity                |  | <i>Good</i><br>It is estimated that the range of the salt front will be pushed upstream along with its maximum extent of upstream intrusions.  | <ul style="list-style-type: none"> <li>• Create better models to establish relationship between sea level rise and salinity</li> <li>• Evaluate different adaptation options</li> <li>• Research increasing trends in chlorides</li> </ul>     |
| Temperature             |  | <i>Good</i><br>Temperature at Trenton is expected to remain stable for the foreseeable future.   | <ul style="list-style-type: none"> <li>• Continue developing temperature criteria in non-tidal portion of Delaware River</li> <li>• Create stronger linkages between meteorological drivers and resultant water temperatures</li> </ul>        |
| Contaminants            |  | <i>Fair</i><br>It is likely that levels will remain relatively the same at their current levels.   | <ul style="list-style-type: none"> <li>• Continue evaluating and monitoring effects of contaminants on water quality</li> <li>• Continue implementing PCB PMPs</li> <li>• Provide technical reviews and support to the community</li> </ul>    |
| Fish Contaminants       |  | <i>Good</i><br>There is a trend of increasing concentration moving from non-tidal to tidal regions.  | <ul style="list-style-type: none"> <li>• Partake in pollution minimization efforts</li> <li>• Cooperate between state and federal agencies to reduce bioaccumulation contaminants and expand to address persistent toxic pollutants</li> </ul> |
| Emerging Contaminants   |  | <i>Fair</i><br>PFOA and PFOS levels are below current EPA and basin state human health advisory levels in parts of the Delaware River.         | <ul style="list-style-type: none"> <li>• Continue monitoring PFAS in drinking water and the environment</li> <li>• Track and evaluate other emerging contaminants of concern</li> </ul>  |
| Whole Effluent Toxicity |  | <i>Fair</i><br>Recent data do not predict exceedances of stream quality objectives for chronic toxicity by individual discharges.              | <ul style="list-style-type: none"> <li>• Continue coordinating between the basin states, DRBC, and USEPA to generate consistent WET testing</li> <li>• Monitor both effluent from discharges as well as ambient environment</li> </ul>         |

# Microplastics

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

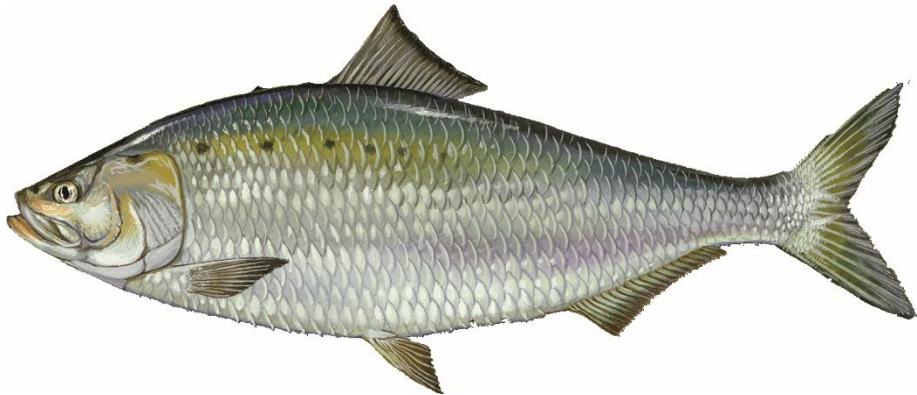
- Primary microplastics include microbeads which were commonly found in health care products like face washes and toothpastes.
- Secondary microplastics occur when larger pieces of plastic like bottles and fishing line break down through photodegradation.



*University of Delaware*



# Aquatic Life

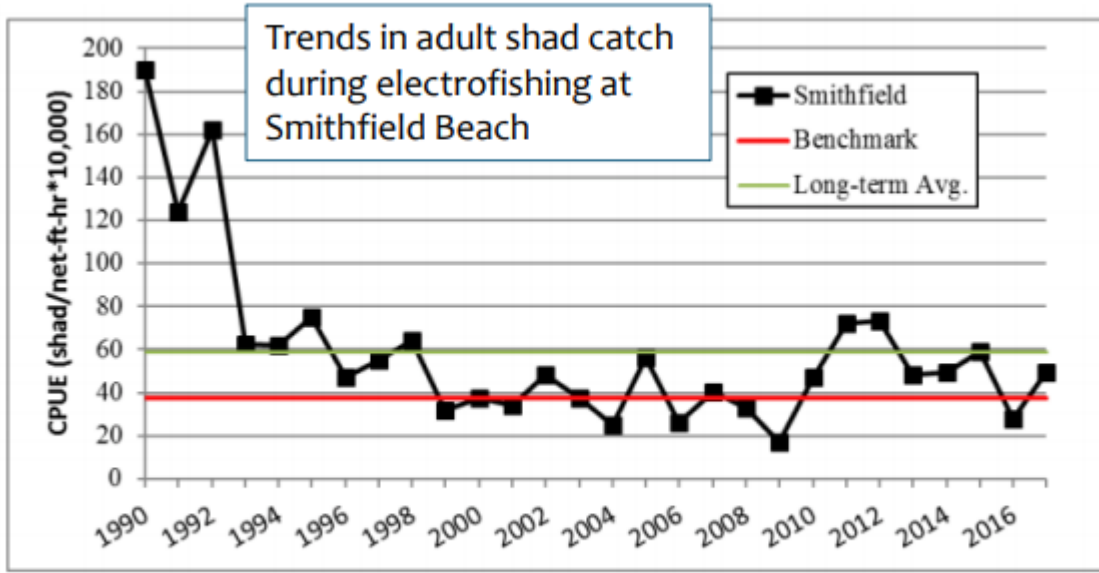


# Shad Young of Year Seining

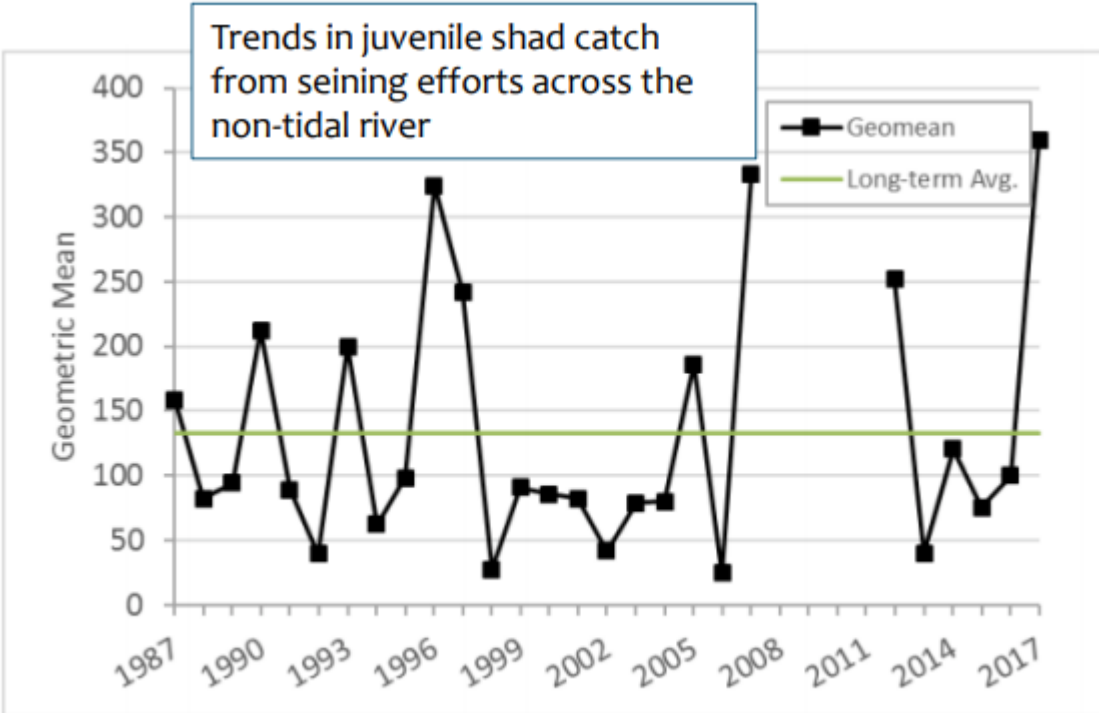




# American Shad



Credit PFBC.

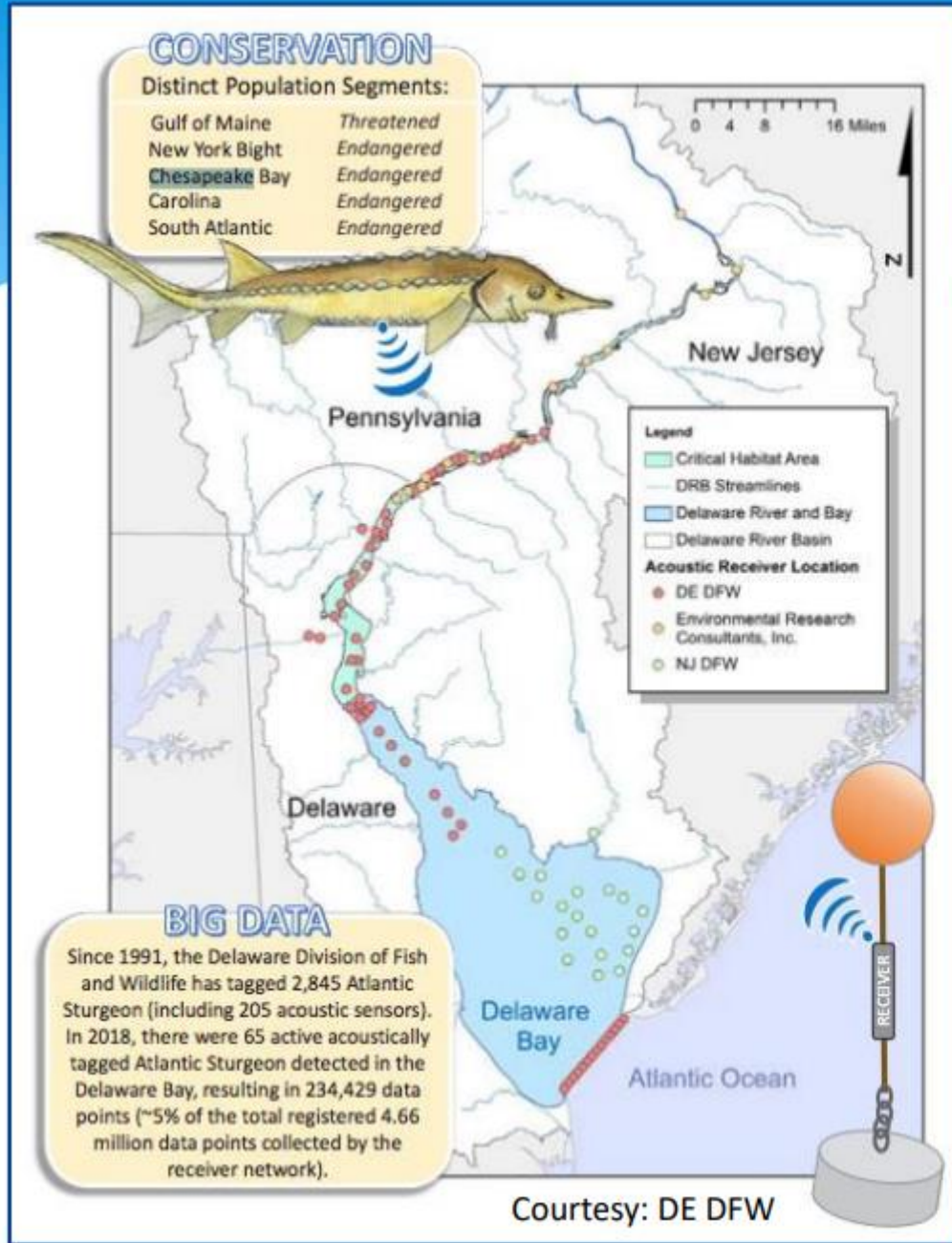


Credit PFBC.

- American shad populations in the Delaware River have rebounded from historical lows in the mid 20<sup>th</sup> century
- Today, the river supports a fishable American shad population
- Monitoring results generally meet long-term goals and recent juvenile shad surveys have returned promising results



# Atlantic Sturgeon



- The Delaware River once supported the largest Atlantic sturgeon population in the US
- Commercial fishing, degraded water quality, and ship strikes contributed to a declining population
- Listed as an Endangered Species in 2012
- Delaware Division of Fish and Wildlife (DE DFW) monitors juvenile sturgeon gill net surveys, tagging and acoustic tracking
- A tag-recapture study in 2014 estimated 3,656 juvenile Atlantic sturgeon (but wide confidence intervals)







NOAA Fisheries; [fisheries.noaa.gov](http://fisheries.noaa.gov)

# Atlantic Sturgeon

## TRENDS

- DE DFW has documented successful sturgeon reproduction in recent years.
- Uncertainty about adult spawning population in the Delaware River
- There has been a recent increase of reported sturgeon carcasses attributed to vessel strikes; however, it is unclear if this is a result of increased reporting awareness, or increased mortality rates.

## ACTIONS/NEEDS

- Continue monitoring, telemetry studies - behavior & habitat
- Expand research into causes of mortality and survival
- Expanded study of ship strikes in collaboration with shipping to minimize population impacts





(Note: The sturgeon captured during this activity were not harmed and were quickly returned to the Delaware Bay after scientific evaluation and tagging were performed. This activity was conducted under a NOAA National Marine Fisheries Service PERMIT TO TAKE PROTECTED SPECIES FOR SCIENTIFIC PURPOSES (Permit No. 20548) issued to Dewayne Fox, Ph. D., Delaware State University, Dover, DE. Research fishing was performed in August 2019 in the Delaware Bay on board the Dana Christine II – Captain Kevin Wark.)



# Climate Change

# 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

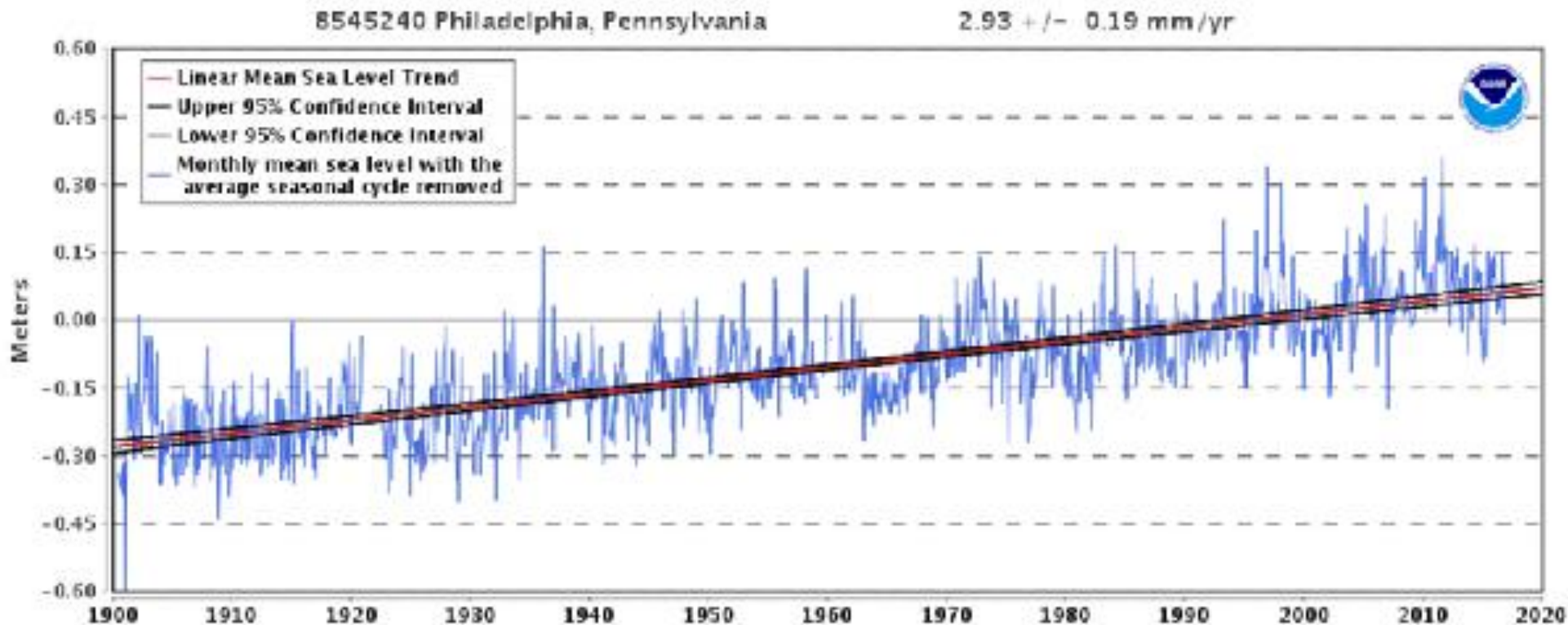
*From RCI Co-Director **Tony Broccoli** featured at September 27, 2017 statewide conference *Climate Change Policy in New Jersey: Advancing Opportunities to make New Jersey Safer, Greener, Healthier and More Prosperous* , sponsored by the *New Jersey Climate Adaptation Alliance*.*





# 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

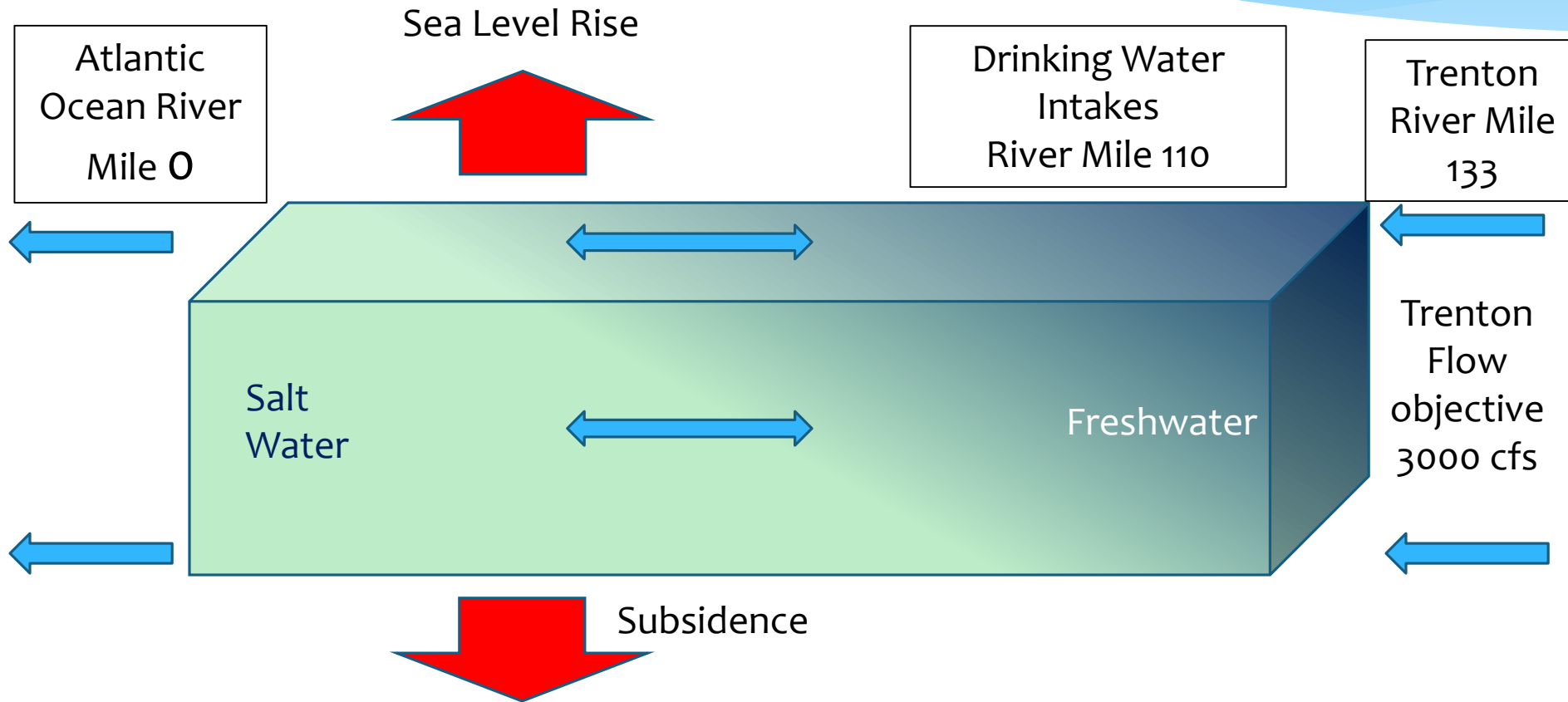


## NOAA: Mean Sea Level Trend, Philadelphia:

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

# Sea Level Rise and Salinity

? Future Ocean and River Salinities ?

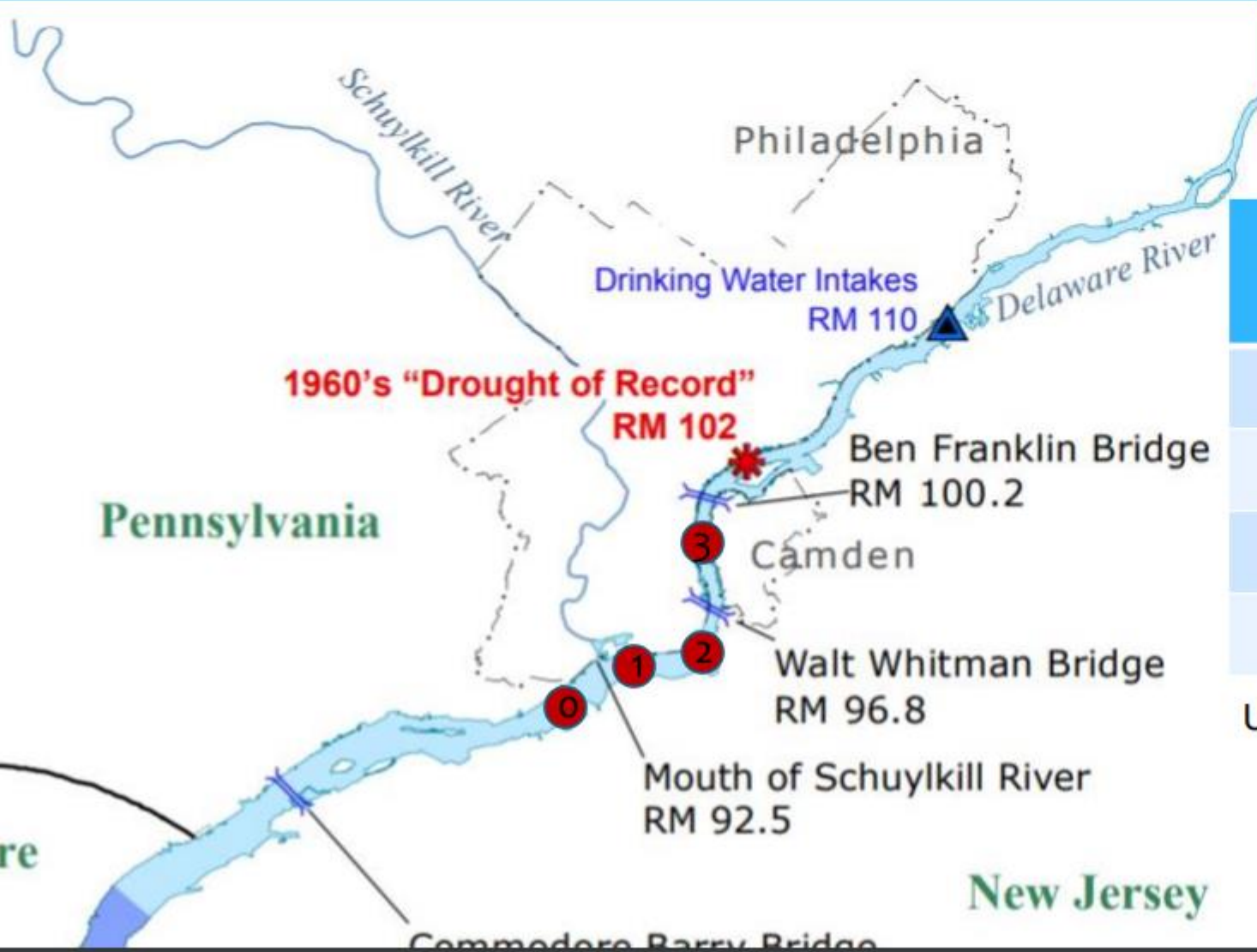




# Possible Sea Level Rise Impacts on Salt Front

| Median Monthly Salt Front Location (River Mile) |      |
|---|------|
| January   | 69.0 |
| February  | 70.7 |
| March   | 70.0 |
| April   | 67.0 |
| May   | 68.0 |
| June  | 69.2 |
| July  | 70.4 |
| August  | 73.8 |
| September                                       | 76.0 |
| October   | 72.0 |
| November  | 70.5 |
| December  | 69.4 |

Based upon salt front location data from January 1998 through February 2013.











| Sea Level Rise (ft) | River Mile |
|---------------------|------------|
| 0                   | 90         |
| 1                   | 93         |
| 2                   | 95         |
| 3                   | 98         |

USACE Model Results 2010

# Summary - Hydrology

- Basin is vulnerable to floods and droughts
- Reservoirs were constructed on tributaries for flood damage reduction
- Extensive studies and analyses were conducted after the drought of record to build resiliency (salinity repulsion)
- DRBC implements both basinwide and lower basin drought management plans (as well as water conservation, allocations, water audits, etc.)
- Uncertainty about climate change related factors warrants a new assessment of basin resources and flow/drought management

# Living Resources Summary

| Living Resources  |   |  |   |
|-------------------|---|--|---|
| Atlantic Sturgeon |    | <i>Poor</i><br>Commercial demand for their meat and degraded water quality contributed to their declining population.                  | <ul style="list-style-type: none"> <li>• Continue monitoring abundance</li> <li>• Continue telemetry studies to better understand behavior</li> <li>• Expand study of ship strikes</li> <li>• Collaborate with shipping industry</li> </ul>                   |
| White Perch       |    | <i>Very Good</i><br>The species' tolerance and wide range of habitat will help it continue to support healthy fisheries.               | <ul style="list-style-type: none"> <li>• Protect upper reaches of tidal tributary areas under developmental pressure</li> <li>• Establish an 8-inch minimum size for white perch to ensure they have a chance to spawn</li> </ul>                             |
| Striped Bass      |    | <i>Very Good</i><br>The overall status of the Delaware River spawning stock is positive.   | <ul style="list-style-type: none"> <li>• Continue monitoring long-term trends in biomass and recruitment</li> </ul>   |
| Weakfish          |    | <i>Poor</i><br>Coastwide, weakfish population is considered depleted.  | <ul style="list-style-type: none"> <li>• Investigate factors contributing to recent weakfish decline</li> <li>• Recreational and commercial fishing sectors should practice catch and release</li> <li>• Continue artificial reef use and creation</li> </ul> |
| American Eel      |    | <i>Good</i><br>Coast-wide populations have declined in recent years, but there is no apparent bases for future predictions.            | <ul style="list-style-type: none"> <li>• Improve monitoring of species abundance in non-tidal reaches</li> <li>• Continue monitoring in the Estuary</li> <li>• Improve fish passage at dams</li> </ul>  |
| American Shad     |  | <i>Good</i><br>2017 and 2018 data show abundance well above the recent average.  | <ul style="list-style-type: none"> <li>• Continue restoring blocked habitat</li> <li>• Maintain and monitor habitat conditions in spawning reaches</li> <li>• Establish sustainable harvest limitations after restoration</li> </ul>                          |
| Brook Trout       |  | <i>Fair</i><br>There have been widespread reductions in populations due to many factors. Efforts to reverse this trend have increased. | <ul style="list-style-type: none"> <li>• Continue conservation/management efforts</li> <li>• Determine if special designation or current status reclassification is needed</li> <li>• Continue researching and monitoring population</li> </ul>               |
| Blue Crab         |  | <i>Good</i><br>They are at healthy levels of abundance and safe levels of fishing mortality.   | <ul style="list-style-type: none"> <li>• Continue long-term ad fishery-independent management surveys</li> <li>• Report fishery landings accurately</li> <li>• Preserve and restore habitat needed for critical life stages</li> </ul>                        |



# Peter Eschbach

*Peter.Eschbach@drbc.gov*

*www.drbc.gov*



## **Delaware River Basin Commission**

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

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*Managing, Improving and  
Protecting Our Shared Water  
Resources since 1961*