8th Annual Delaware River Watershed Forum

September 14-17, 2020

#DelRivForum2020

A Fishable, Swimmable (and Drinkable) Delaware River Estuary

Steve Tambini
John Yagecic
Amy Shallcross

Photo: Paul Michael Bergeron

Photo: Delaware River Waterfront Corporation

Photo: Partnership for the Delaware Estuary

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- Attendees are muted by the host. To indicate that you would like to speak please use the raise hand button in the participants window or use the chat box.
- If you are having technical issues please message the host in the chat box.
- See the rest of the Forum schedule here: https://delawareriverwatershedforum.sched.com/

Coalition *for the* Delaware River Watershed

Meet Your Presenters

Amy Shallcross, P.E.
Manager of Water Resource Operations, Delaware River Basin Commission

Steve Tambini, P.E.
Executive Director
Delaware River Basin Commission

John Yagecic, P.E.
Manager of Water Quality Assessment Delaware River Basin Commission

Coalition *for the* Delaware River Watershed

Delaware River Basin Commission

A fishable, swimmable (and drinkable) Delaware River Estuary

Steve Tambini
John Yagecic
Amy Shallcross

Coalition for the Delaware River Watershed
September 17, 2020

Photo: Paul Michael Bergeron

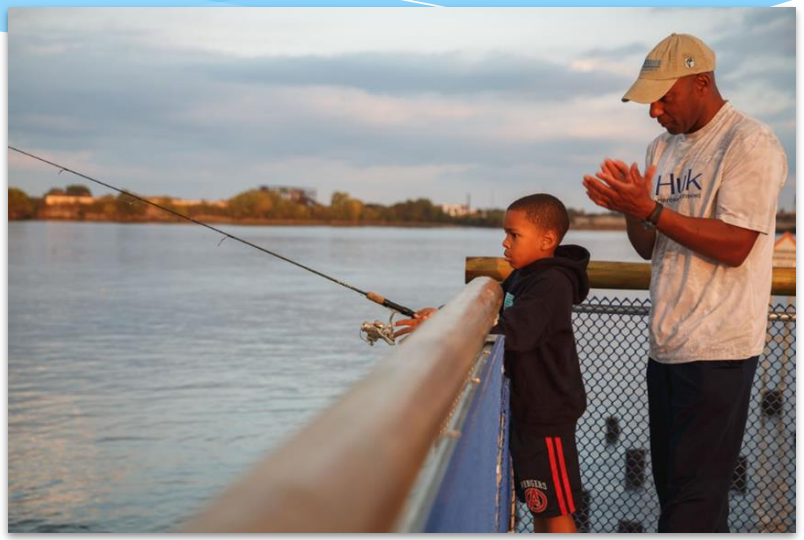

Photo: Delaware River Waterfront Corporation

Photo: Partnership for the Delaware Estuary

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Poll Question

Q1. What advice would you give your [spouse, partner, friend, child, etc.] if they wanted to go for a swim in Delaware River at a park in Philadelphia on a hot summer day and it rained the night before: (choose one)

1. Go for it … enjoy your swim!
2. Wade up to your knees or belt line and be careful.
3. Go for it…but try to keep your head above water.
4. Stay out of the water.

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Objectives

- Focus on the urban reaches of the Delaware River Estuary
- Identify fishable, swimmable, drinkable goals.
- A practical review of:
  - The problems impacting water quality.
  - The toolbox of potential solutions.

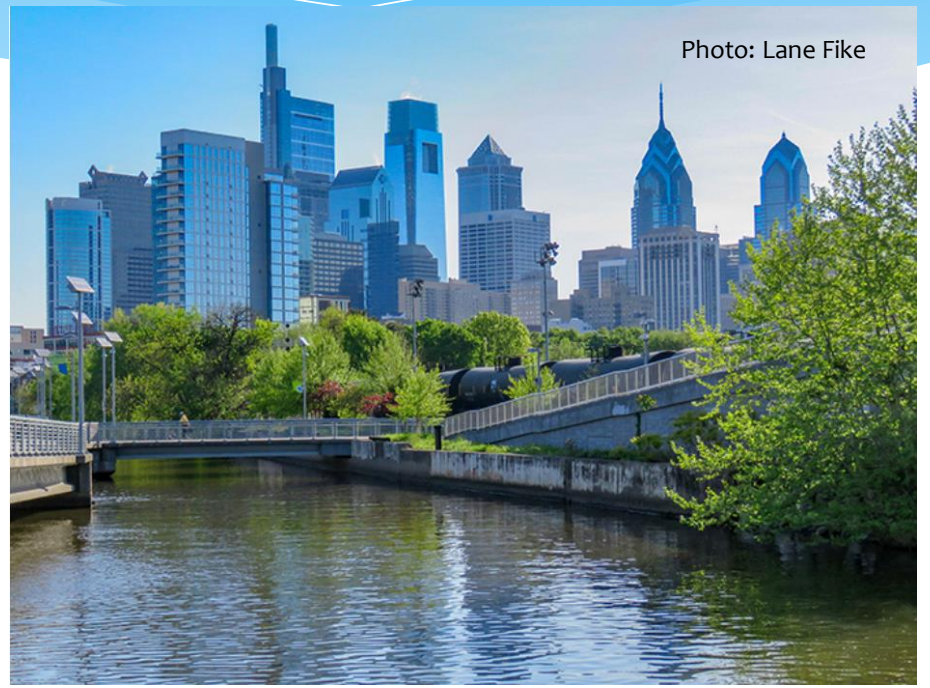
Photo: Lane Fike

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American Rivers
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AMERICA'S RIVERS THREATS & SOLUTIONS

River of the Year for 2020: The Delaware River

American Rivers announces 2020 River of the Year alongside Most Endangered Rivers of 2020 release.

Amy Souers Kober | April 14, 2020

https://www.americanrivers.org/2020/04/river-of-the-year-for-2020-the-delaware-river/

"The Delaware River is a national success story,"

said Bob Irvin, President and CEO of American Rivers

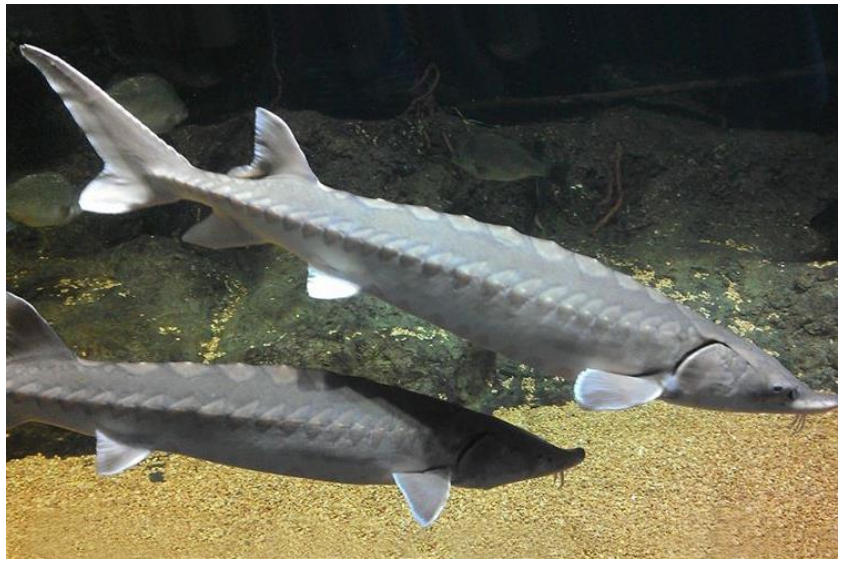
"Today, the Delaware River is on the mend and thriving… but, **important work remains to be done.** Continued action is critical to address ongoing challenges, such as **aging water infrastructure, urban development and climate change**. Severe storms, which occur with increasing frequency due to climate change, threaten drinking water intakes with **saltwater intrusion** and can cause **sewage overflows** at ill-prepared water treatment plants."

Goals
Clean Water Act (1972)

"…fishable, swimmable waters…"

"for the protection and propagation of fish, shellfish, and wildlife, and to provide for recreation in and on the water."

Photo: Aqua Vida



fisheries.noaa.gov

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Goals
DRBC Water Quality Regulations

Uses to be Protected:

1. agricultural, industrial, and **public water supplies after reasonable treatment, except where natural salinity precludes such uses;**

2. wildlife, **fish and other aquatic life**;

3. **recreation;**

4. navigation;

5. controlled and regulated waste assimilation to the extent that such use is compatible with other uses;

6. such other uses as may be provided by the Comprehensive Plan.

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Problems

Major Sources of water quality pollution in the urban Estuary:

- Domestic and industrial discharges: wastewater treatment plants

  Toxics/ carbon / **ammonia** ("us")
- Stormwater runoff: **bacteria,** nutrients, trash, oils, greases, chemicals
- Combined sewer overflows: **bacteria** and raw sewage
- Other sewage overflows: **bacteria**
- Toxic and legacy pollutants (like **PCBs**)
- **Salinity**: ocean salt (sea level rise) and road salts
- Contaminants of Emerging Concern (like **PFAS**).
- **Spills** (land based and shipping)

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Solutions

CLEAN WATER ACT (1972)

DELAWARE RIVER BASIN COMPACT (1961)

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Section 5.2: The commission may assume jurisdiction to control future pollution and abate existing pollution in the waters of the basin…

Complex and Integrated Solutions

REGULATION / POLICY / BMPs

Local, County, etc.

Complex and Integrated Solutions

REGULATION / POLICY / BMPs

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Local, County, etc.

DATA / SCIENCE / TECHNOLOGY

Localized monitoring and assessment

Forecasting and Notification Tools

City of Philadelphia | CSOcast Beta

Public Notification of **Combined Sewer Overflows**

Near real time monitoring

Complex and Integrated Solutions

REGULATION / POLICY / BMPs

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INVESTMENT / INFRASTRUCTURE

Green
Photo: PWD

Grey
Photo: PWD

Public Health

Complex and Integrated Solutions

REGULATION / POLICY / BMPs

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INVESTMENT / INFRASTRUCTURE

Green
Photo: PWD

Grey
Photo: PWD

Public Health

Agenda

Moderator: *Steve Tambini,* DRBC Executive Director

- **Fishable and swimmable waters:** *John Yagecic*, DRBC Manager of Water Quality Assessment
- **Drinkable waters:** *Amy Shallcross* , DRBC Manager of Water Resource Operations
- **Wrap-up Comments:** *Steve Tambini*
- **Questions:** Send them in via chat at any time

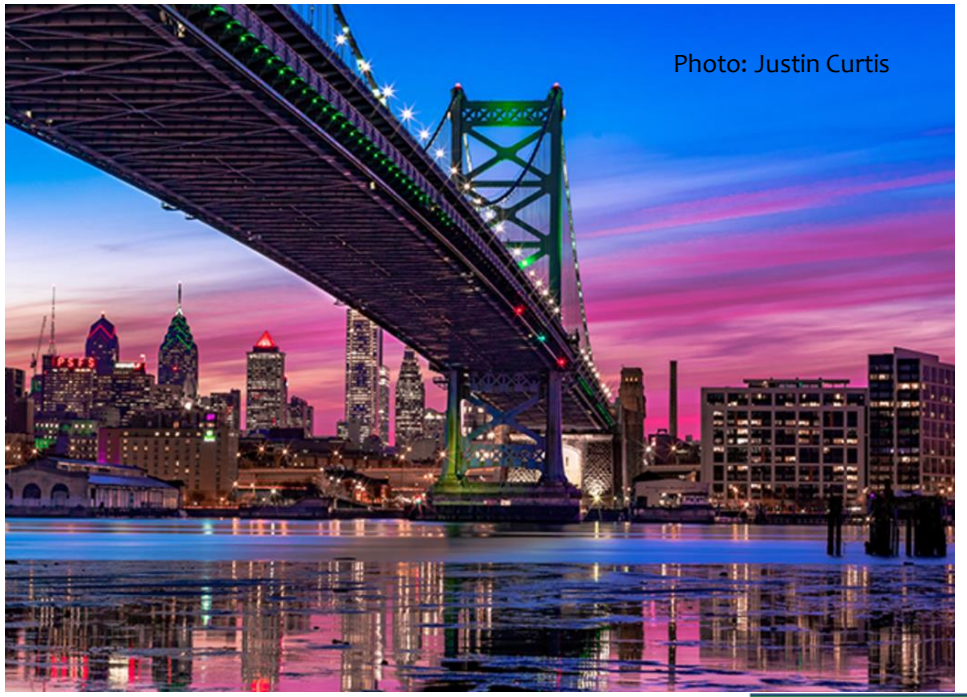

Photo: Justin Curtis

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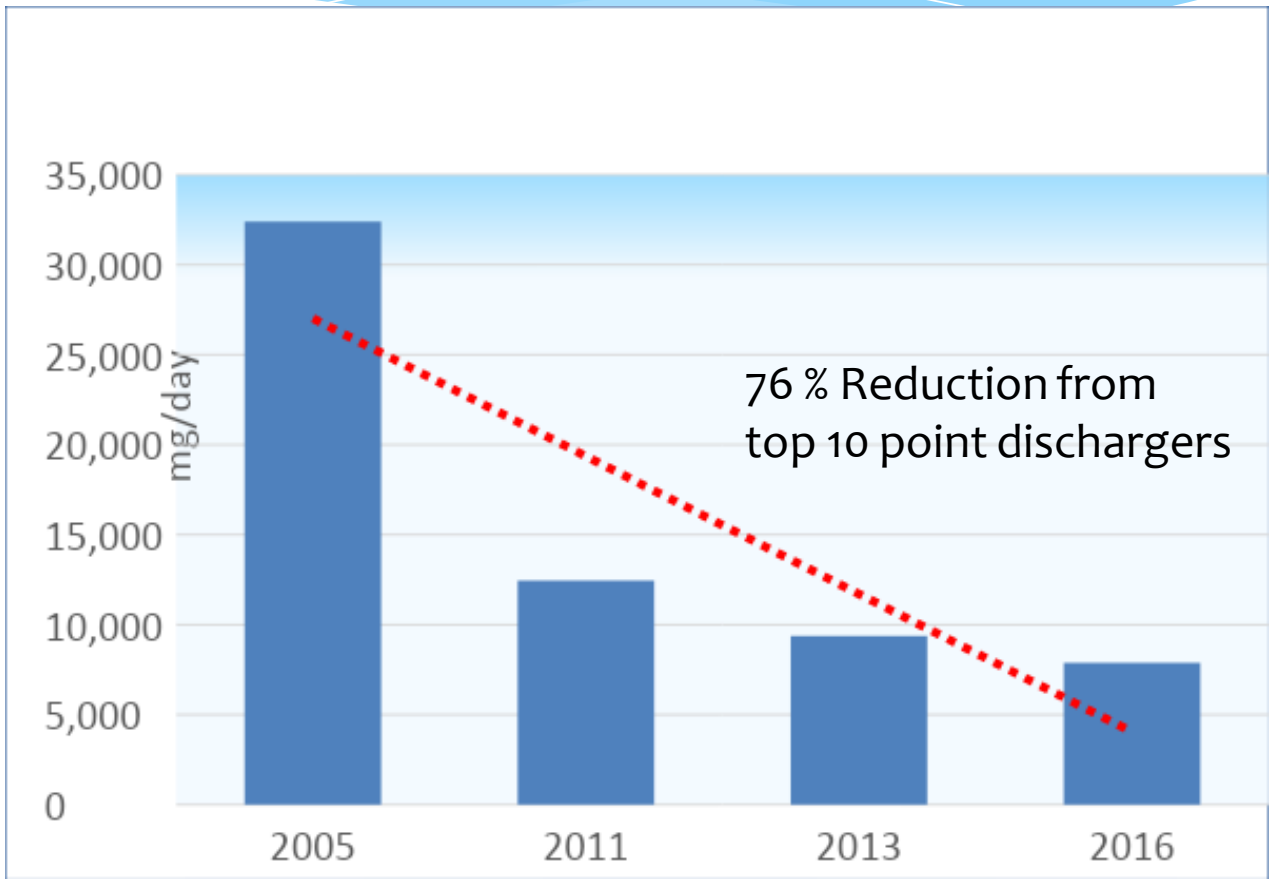
Meeting Fishable Goals for the Delaware River

PCBs

- 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
- Stage 2 TMDL refinement



Fish and Shellfish Program Newsletter (July 2018)

New Fish Consumption Advisories Reflect Continuing Improvements in Water Quality for Delaware Waterways

DNREC Secretary Shawn M. Garvin. “I anticipate that, with continued cleanup efforts and cooperation between DNREC, DHSS, and our regional partners who include New Jersey Department of Environmental Protection and the **Delaware River Basin Commission** that we will continue to see a trend of improvement into the future.”

EPA United States Environmental Protection Agency

Fish and Shellfish Program NEWSLETTER

July 2018
EPA 823-N-18-007

In This Issue

This newsletter provides information only. This newsletter does not impose legally binding requirements on the U.S. Environmental Protection Agency (EPA), states, tribes, other regulatory authorities, or the regulated community. The Office of Science and Technology, Office of Water, U.S. Environmental Protection Agency has approved this newsletter for publication. Mention of trade names, products, or services does not convey and should not be interpreted as conveying official EPA approval, endorsement, or recommendation for use.

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

Recent Advisory News

New Fish Consumption Advisories Reflect Continuing Improvements in Water Quality for Delaware Waterways

On February 20, 2018, new fish consumption advisories issued by the Delaware Department of Natural Resources and Environmental Control (DNREC) and the Delaware Department of Health and Social Services’ Division of Public Health (DHSS/DPH) showed that the concentration of chemical contaminants in fish caught from the state’s waterways continues to decline. The new advisories indicate that water quality is improving throughout the state and fish caught in many Delaware waters can be eaten today with lowered concerns about risks to public health.

Fish consumption advisories are recommendations by DNREC and DHSS to limit or avoid eating certain species of fish caught in local waters due to potential health risks from contaminants. The latest advisories convey that anglers and the public can eat more fish caught locally, while keeping health risks low and enjoying the dietary health benefits that fish provide. The agencies’ recommendations on the safe amount of fish that can be eaten are based on the testing of these fish by DNREC and an assessment of the health risks associated with their consumption.

The updated advisories show a continuing trend of the most significant declines in fish tissue contaminant concentrations since the state began assessing contaminants in fish in 1986.

“Seeing the positive results of regional efforts to restore water quality and the health of Delaware’s aquatic resources is very exciting and encouraging,” said DNREC Secretary Shawn M. Garvin. “I anticipate that, with continued cleanup efforts and cooperation between DNREC, DHSS, and our regional partners who include New Jersey Department of Environmental Protection and the Delaware River Basin Commission that we will continue to see a trend of improvement into the future.”

“The improved water quality allowing people to eat more fish caught in local waterways is good news across the board,” said DHSS Secretary Dr. Kara Odom Walker, a board-certified family physician. “Consuming fish is an essential part of a healthy diet because fish contain so many key nutrients, are low in saturated fat, and contain omega-3 fatty

This newsletter provides a monthly summary of news about fish and shellfish. 1

https://www.epa.gov/sites/production/files/2018-08/documents/fish-news-july2018.pdf

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After 10+ Years of Stage 1 PCB TMDLs

- Fish Consumption Advisory Changes for General Population

- New Jersey and Delaware have revised advisories in the Delaware Estuary from PA/DE Border to C&D Canal (River Mile 80-58)
  - All fin fish including; white perch and channel catfish
    - Before 2015 Do not eat
    - 2015-2017 One meal per year
    - 2018 Three meals per year

- PA revised advisories from Trenton, NJ to Morrisville PA bridge to PA/DE border
  - for carp
    - Before 2015 Do Not Eat
    - 2016 six meals per year

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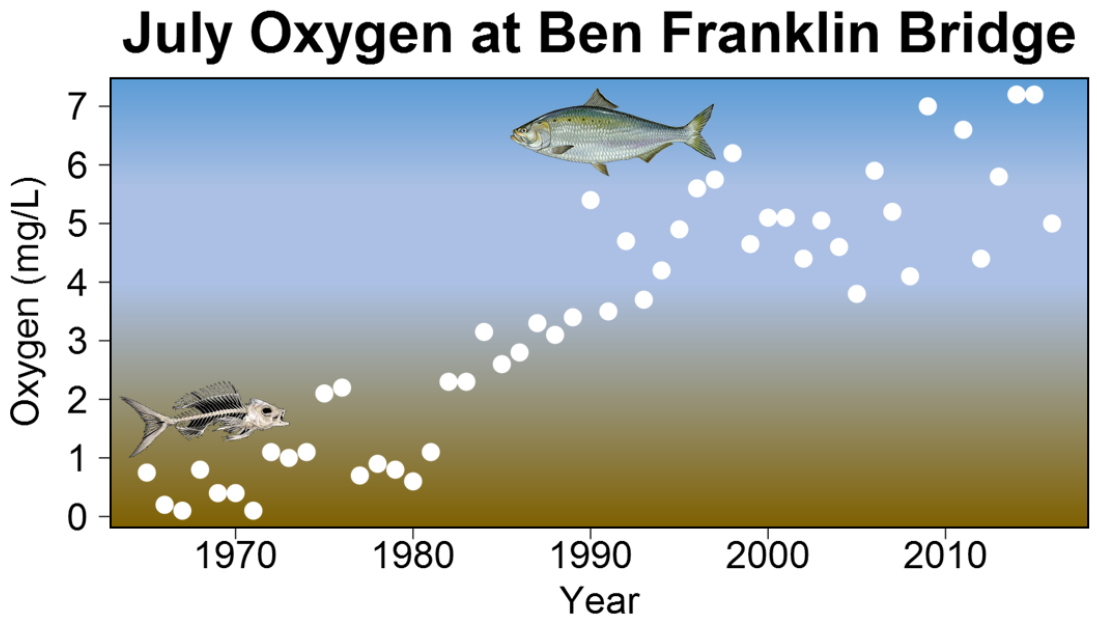
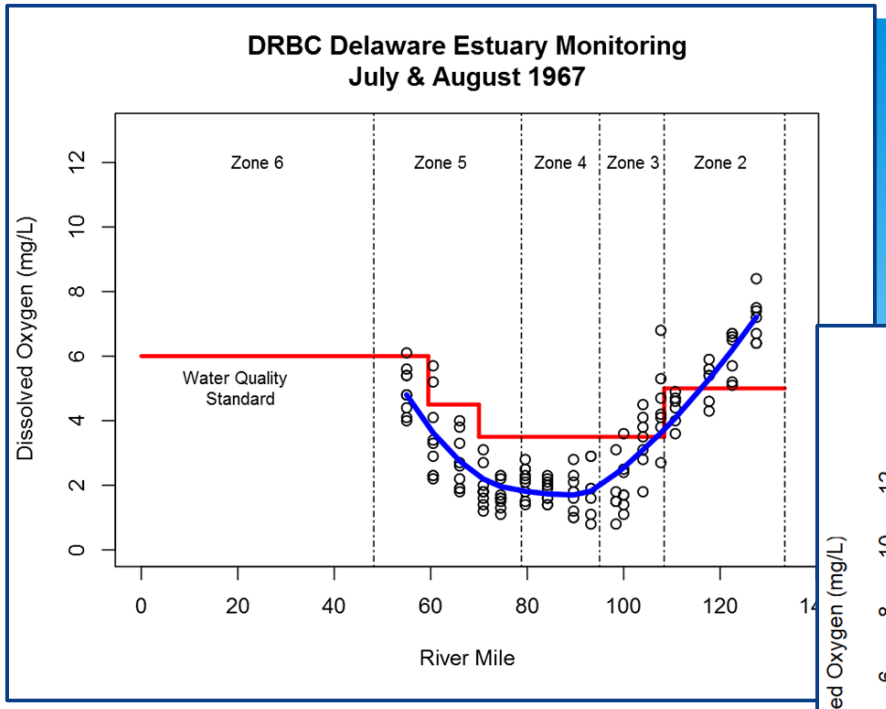
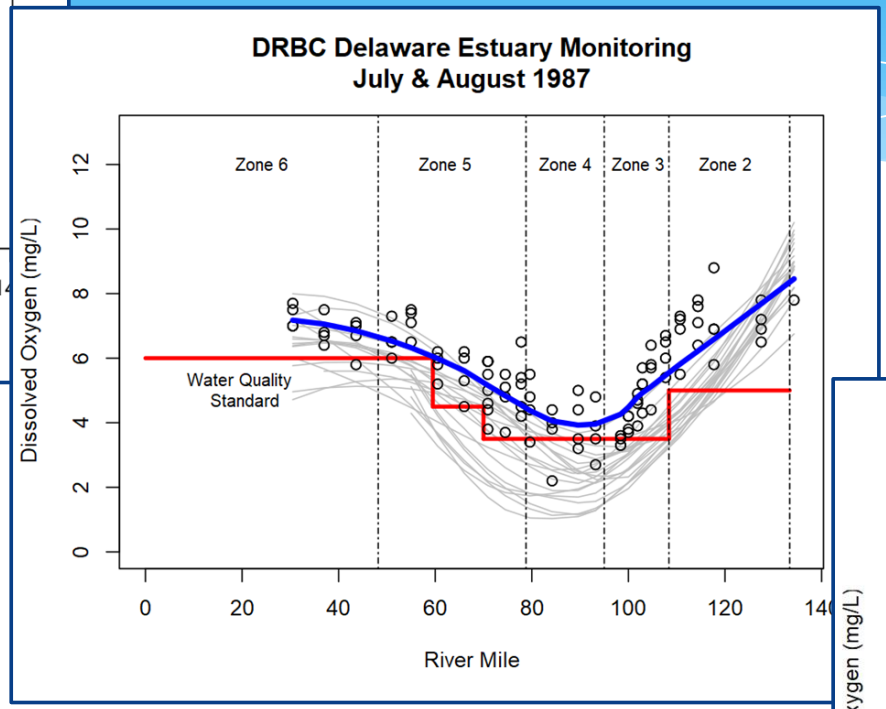
Dissolved Oxygen History

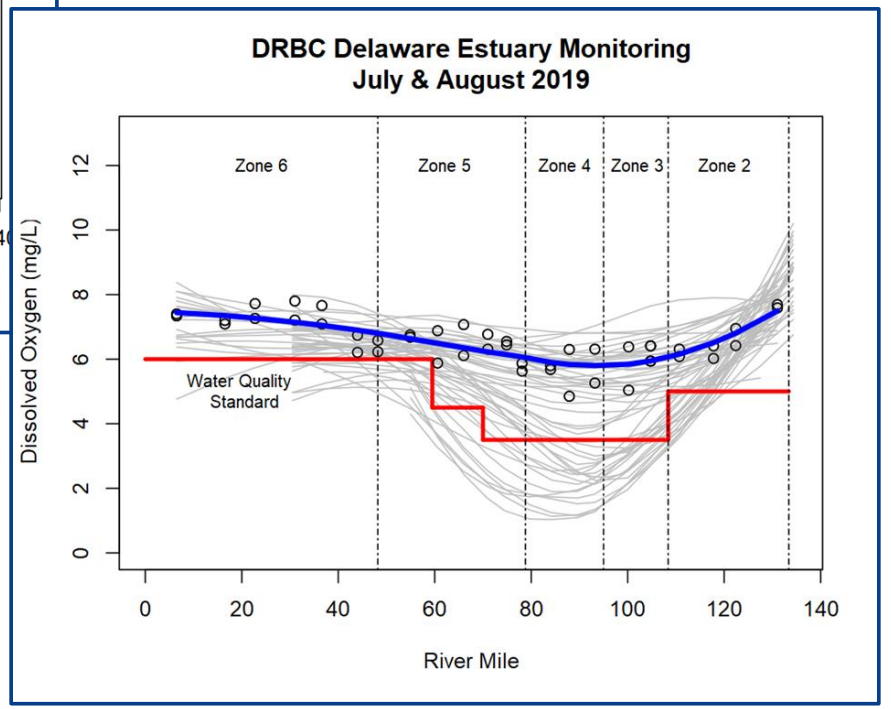


- Historically, summer DO in estuary near Philadelphia & Camden was too low for migratory fish to reach upstream to spawn
- Pollution source? Carbon from wastewater treatment (CBOD).
- DRBC adopted water quality standards (1967) & wasteload allocation (1968)
- Secondary treatment added at wastewater treatment plants 70's & 80's – funding CWA

Dissolved Oxygen Improvement

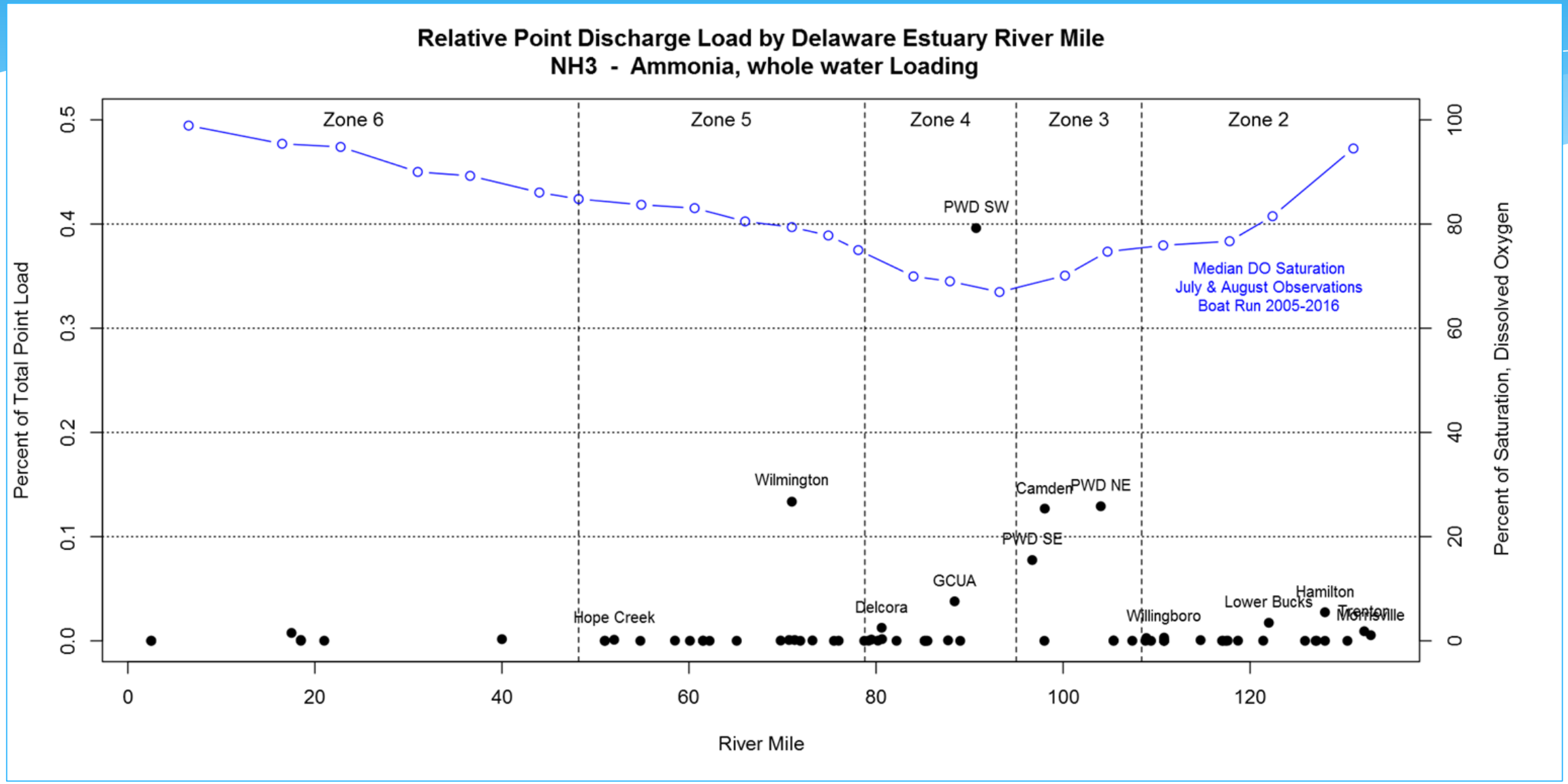






- 3.5 mg/L criteria near Philadelphia, Camden, & Wilmington protect fish migration (not propagation)
- By 2000's that criteria is nearly always met

Next Phase for Dissolved Oxygen



DRBC Resolution 2017-04
Studies Required Before Rulemaking

Fish/DO Studies

- 6(a). Input on the **dissolved oxygen requirements of aquatic species**
- 6(b). Field studies of the occurrence, spatial and temporal distribution of the life stages of Estuary fish species
- 6(c). Input from consultations pursuant to the **Endangered Species Act** ("ESA")

Modeling Studies

- 6(d). Development and calibration of a **eutrophication model** for the Delaware River Estuary and Bay;
- 6(e). Determination of the nutrient **loadings from point and non-point sources** necessary to support key aquatic species;

Cost/Feasibility Studies

- 6(f). Evaluation of the **capital and operating costs for treatment** capable of achieving higher levels of dissolved oxygen;
- 6(g). Evaluation of the physical, chemical, biological, **social and economic factors affecting the attainment of uses**,

6. "Analysis of Attainability"

6(h). Preparation of a **draft report and final report** containing findings and conclusions.

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Eutrophication Modeling

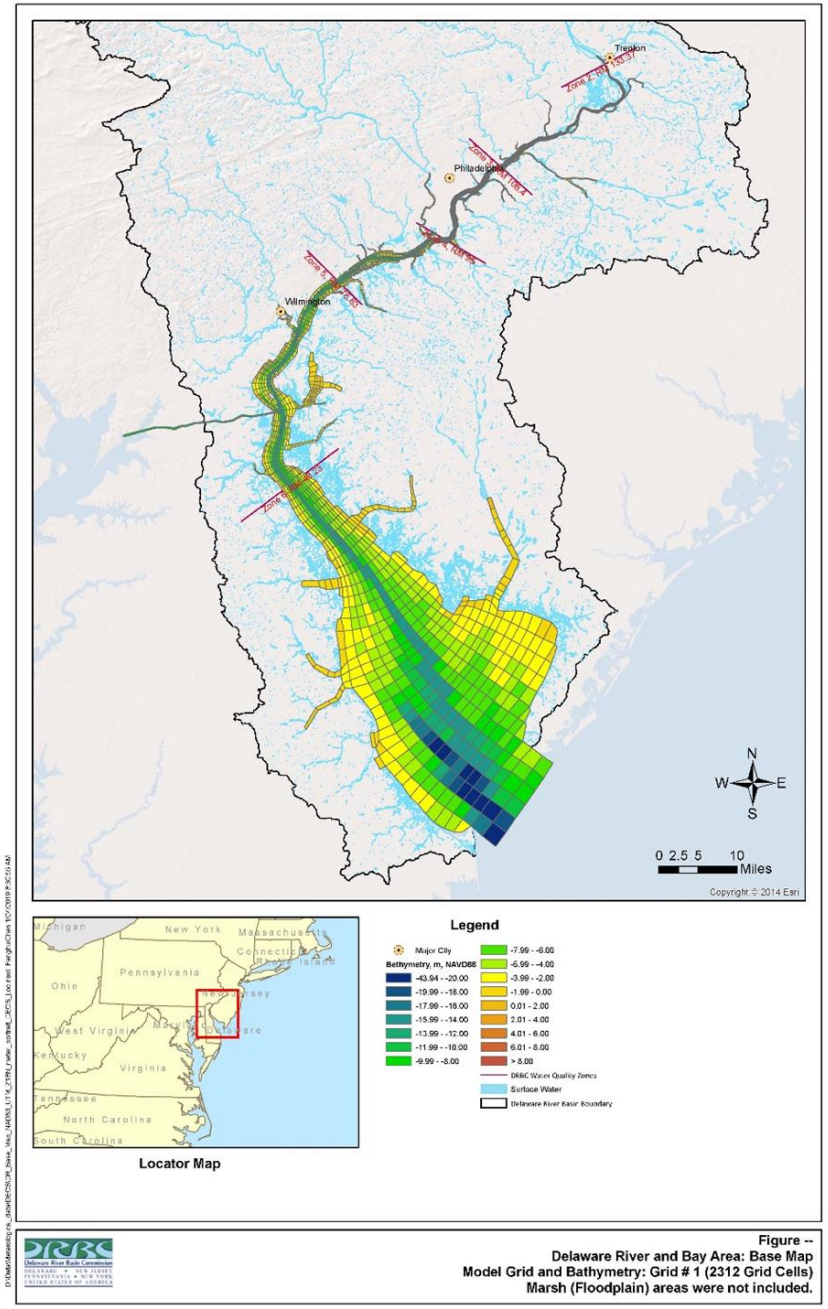

Figure --
Delaware River and Bay Area: Base Map
Model Grid and Bathymetry: Grid # 1 (2312 Grid Cells)
Marsh (Floodplain) areas were not included.

- Development and calibration of a eutrophication model for the Delaware River Estuary and Bay
- Determination of the nutrient loadings from point and non-point sources necessary to support key aquatic species

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Engineering evaluation & cost estimate

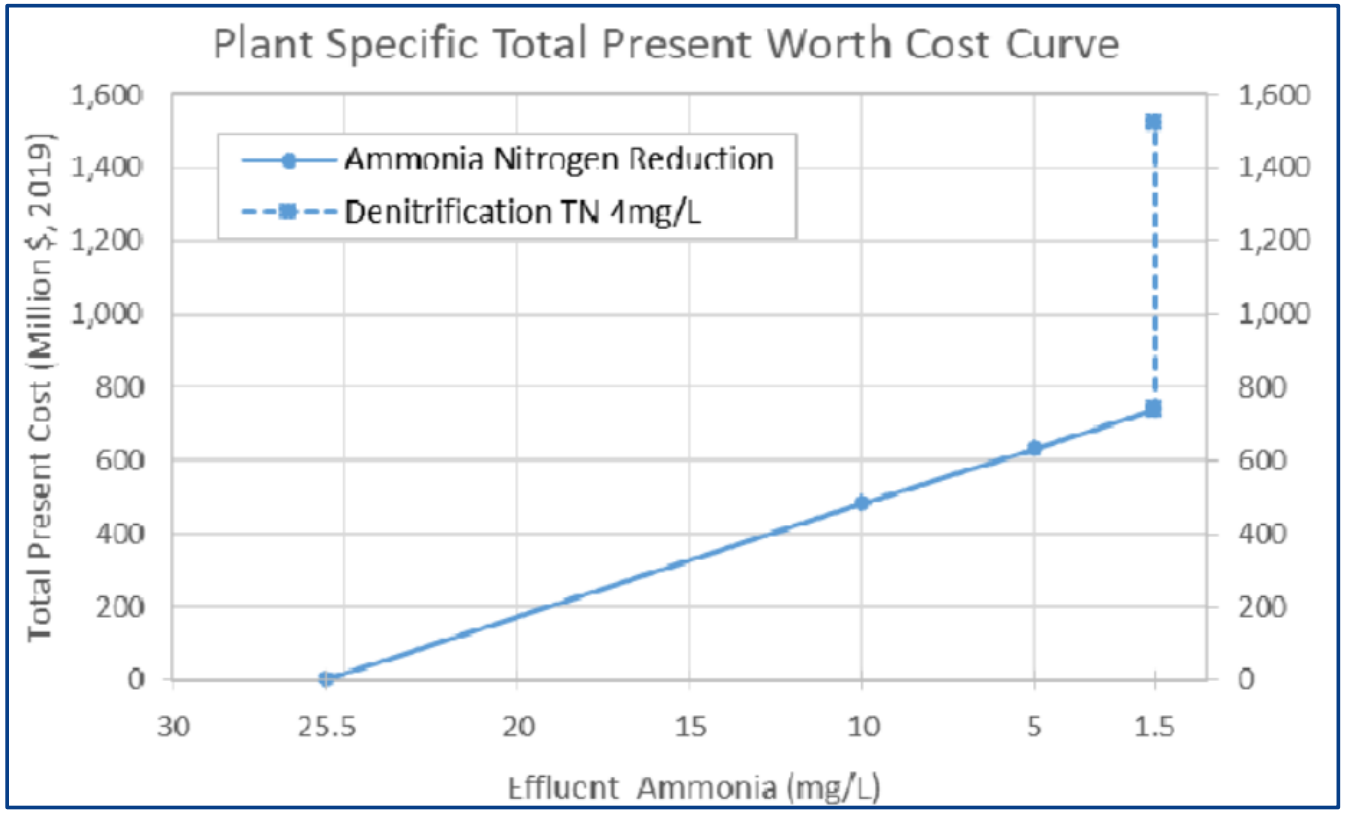
- Contracted with Kleinfelder
- Planning level cost estimate for top 12 loading facilities to achieve new ammonia effluent levels
- Coordination with facilities
- Initiated summer 2018
- 2-year contract

Preliminary Technology and Effluent Level Recommendations

Effluent Level	Conventional Activated Sludge	Pure Oxygen Activated Sludge	Fixed Film (RBC and TF)
NH_3-N – 10 mg/L	Conversion to IFAS with low level of media addition to aeration tanks	Add downstream BAF sized for approximately 50% of plant flow	Add downstream BAF sized for approximately 50% of plant flow
NH_3-N – 5 mg/L	Conversion to IFAS with medium level of media addition to aeration tanks	Add downstream BAF sized for approximately 75% of plant flow	Add downstream BAF sized for approximately 75% of plant flow
NH_3-N – 1 mg/L	Conversion to IFAS with high level of media addition to aeration tanks	Add downstream BAF sized for 100% of plant flow	Add downstream BAF sized for 100% of plant flow
TN – 3 mg/L	Conversion to IFAS with high level of media addition plus downstream DF	Add downstream BAF sized for 100% of plant flow plus DF	Add downstream BAF sized for 100% of plant flow plus DF

What's the Cost?

If each of the top 12 ammonia loading facilities upgraded to achieve 1.5 mg/L ammonia, the Total Present Worth Cost would be **$2.7 Billion**



Meeting Swimmable Goals for the Delaware River

DRBC Water Quality Regulations
Section 1.20.6

http://www.nj.gov/drbc/library/documents/WQregs.pdf

F. "Recreation" includes all water-contact sports.

G. "Recreation - secondary contact" restricts activities to where the probability of significant contact or water ingestion is minimal, encompassing but not limited to:

1. boating,

2. fishing,

3. those other activities involving limited contact with surface waters incident to shoreline recreation.

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Current Recreational Uses / Criteria in Delaware Estuary (DRBC WQ Regs)

http://www.nj.gov/drbc/library/documents/WQregs.pdf

Zone	Use	Fecal Coliform	Enterococcus
		Geometric mean colonies per 100 mL	
2	Recreation	**200**	**33**
3	Recreation – Secondary Contact	**770**	**88**
Upper 4			
Lower 4	Recreation	**200**	**33**
5			**35**
6			

EPA Office of Water 820-F-12-058

Table 1. Recommended 2012 RWQC.

Criteria Elements	Estimated Illness Rate (NGI): 36 per 1,000 primary contact recreators			Estimated Illness Rate (NGI): 32 per 1,000 primary contact recreators	
	Magnitude			Magnitude	
Indicator	GM (cfu/100 mL)[a]	STV (cfu/100 mL)[a]	OR	GM (cfu/100 mL)[a]	STV (cfu/100 mL)[a]
Enterococci – marine and fresh	35	130		30	110
OR					
E. coli – fresh	126	410		100	320
Duration and Frequency: The waterbody GM should not be greater than the selected GM magnitude in any 30-day interval. There should not be greater than a ten percent excursion frequency of the selected STV magnitude in the same 30-day interval.					

[a] EPA recommends using EPA Method 1600 (U.S. EPA, 2002a) to measure culturable enterococci, or another equivalent method that measures culturable enterococci and using EPA Method 1603 (U.S. EPA, 2002b) to measure culturable *E. coli*, or any other equivalent method that measures culturable *E. coli*.

https://www.epa.gov/sites/production/files/2015-10/documents/rwqc2012.pdf

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Possible Sources of Bacteria?

- Combined Sewer Overflows
  - Sanitary sewage and storm water in same pipes
  - Legacy systems (100+ years) in our oldest, largest communities
- Other Urban Runoff (MS4s)
- Urban Animal Life
  - *Sources are local*

http://archive.phillywatersheds.org/watershed_issues/stormwater_management/combined_sewer_system

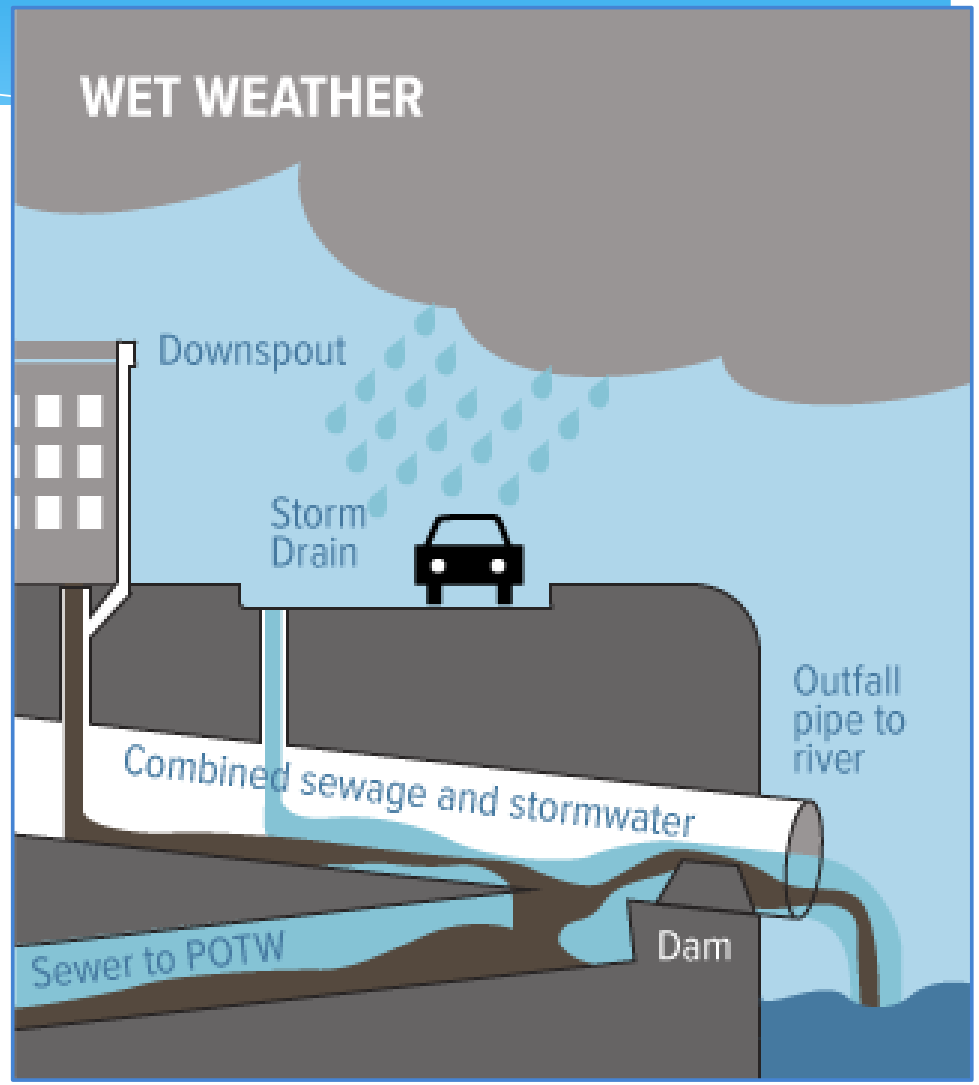

Image credit: Jersey Water Works

Monitoring
Summer 2019 & 2020

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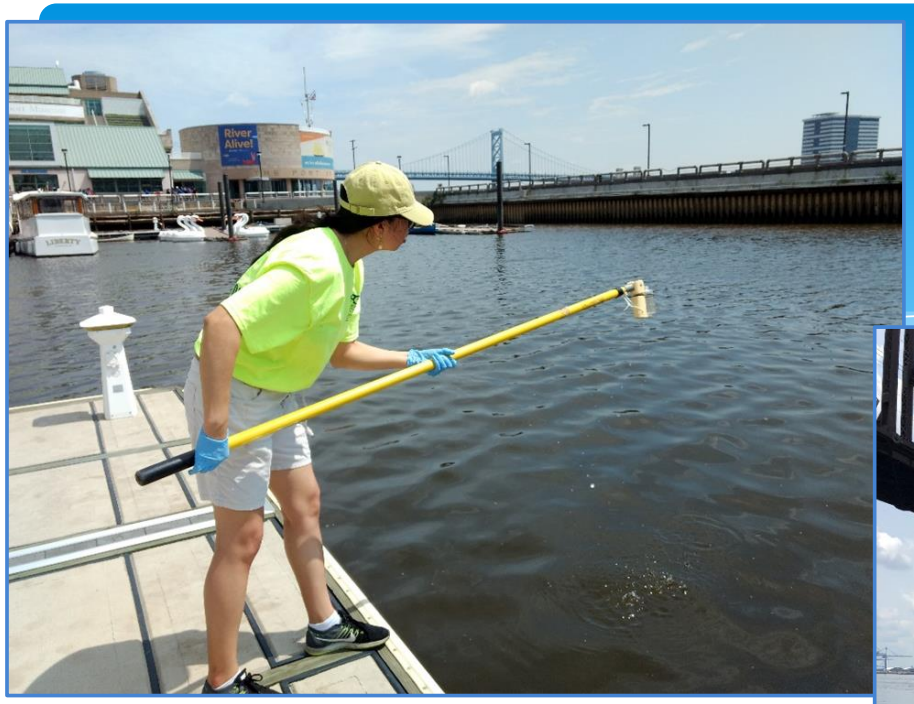

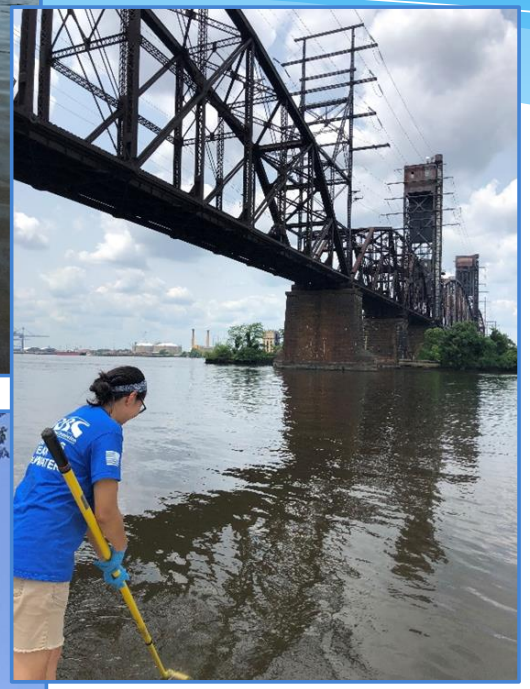

Shore-based, where recreation more likely
~ 5x per month, May - September
Fecal coliform, enterococcus, E. coli

- Riverton Yacht Club
- Palmyra Cove Nature Center
- Pennsauken Access
- Pyne Poynt Park
- National Park

NJ

- Washington Ave. Green
- Penns Landing Lagoon
- Frankford Arsenal Boat Ramp
- Penn Treaty Park (2020)

PA

Site Specific Comparison to EPA E. Coli Criteria (126 cfu/100mL GM)

Date	NPK	WAG	PLL	PPP	PSA	FAA	PCN	RYC
6/10/2019	132.7	212.9	174.4	759.6	223.3	889.9	300.5	168.5
6/19/2019	104.7	212.9	123.1	809.6	177.2	737.5	309.5	142.6
6/25/2019	185.5	429	177.4	786.8	240.5	105.2	309.5	182
7/1/2019	332.2	737.8	326.8	140.6	194.9	50	301.1	173.8
7/9/2019	316.4	599.5	312.5	168.2	182.3	87.4	381.6	144.5
7/22/2019	414.3	356.6	352.8	92.5	139.1	111.9	359.4	118.2
7/30/2019	182.2	182.3	233.6	138	130.1	283.9	400.3	84.9
8/6/2019	28.6	265.2	292.3	1162.8	95.8	109.6	131.4	38.7
8/12/2019	40.2	172.7	342.8	1716.9	72.2	83.3	47.4	61.7
8/19/2019	57.9	124.5	257.9	1817.9	75.6	137.1	57.1	58.1
8/28/2019	35.2	146.7	296.5	2059.7	76.8	111.8	48.4	55.3
9/4/2019	72.2	200.9	588	1771.8	104.4	186	50.8	76.8
9/9/2019	491.2	134.1	505.8	1279.5	121	285.7	115.8	158.4
9/16/2019	416.1	145.6	516.7	968.6	220.4	388.6	157.3	115.2
9/24/2019	216.4	231.3	892.6	203.9	235.2	362.9	147.2	139.6

NPK	National Park
WAG	Washington Ave. Green
PLL	Penns Landing Lagoon
PTP	Penn Treaty Park
PPP	Pyne Poynt Park
PSA	Pennsauken Access
FAA	Frankford Arsenal Access
PCN	Palmyra Cove
RYC	Riverton Yacht Club

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Monitoring Results So Far

- Assessment by geometric mean, system-wide: Unfavorable
- Assessment by geometric mean, site-by-site: Mixed
- Assessment by STV, site-by-site: More favorable

- May predict conditions based on: Location, Cumulative rainfall
  - Need a larger, more robust data set than this one

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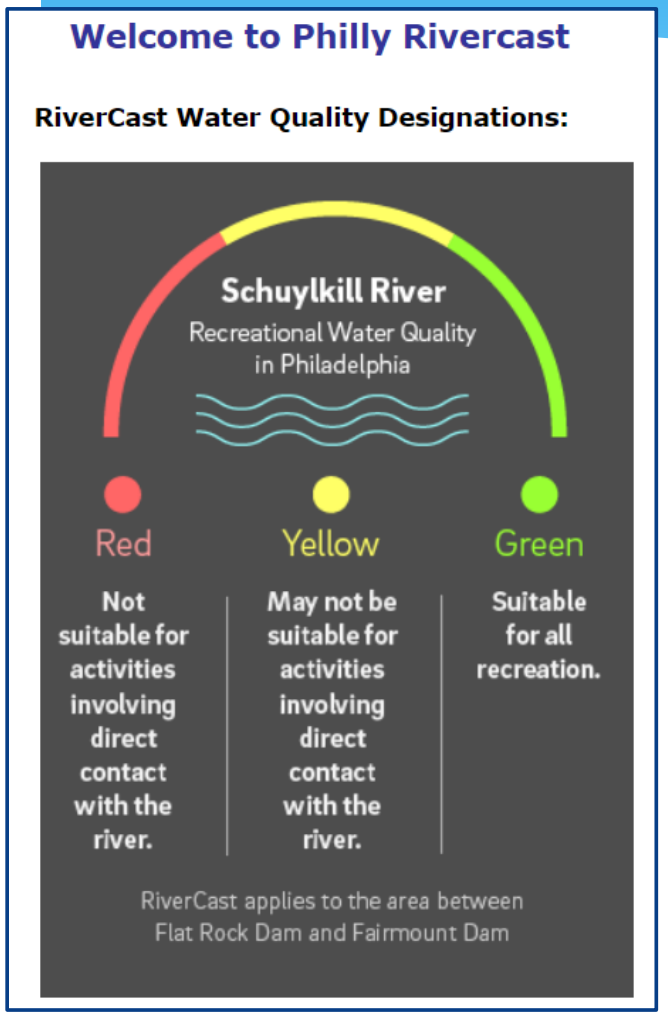
Data & Technology *may* help us expand recreational opportunities



- ***Question: Is it safe to swim?***
- Statistical Models
  - Use things we can measure in real time like rain & turbidity
  - Is today a red day or a green day?
- Near real-time monitoring systems
  - Fluidion Alert
  - In-situ, 6-hours from sample to report
- Some locations are much better than others

http://www.phillyrivercast.org/

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Reducing Bacterial Loads?

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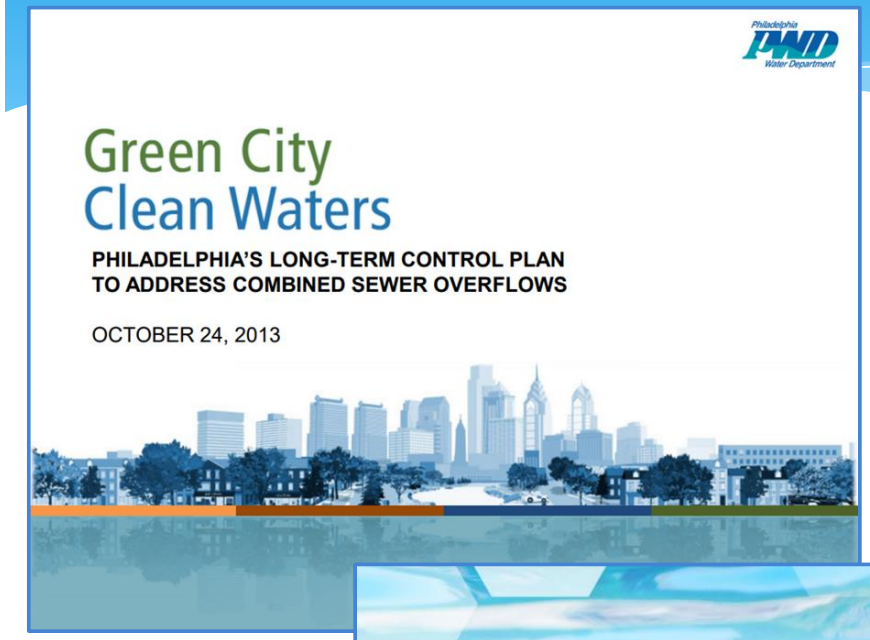
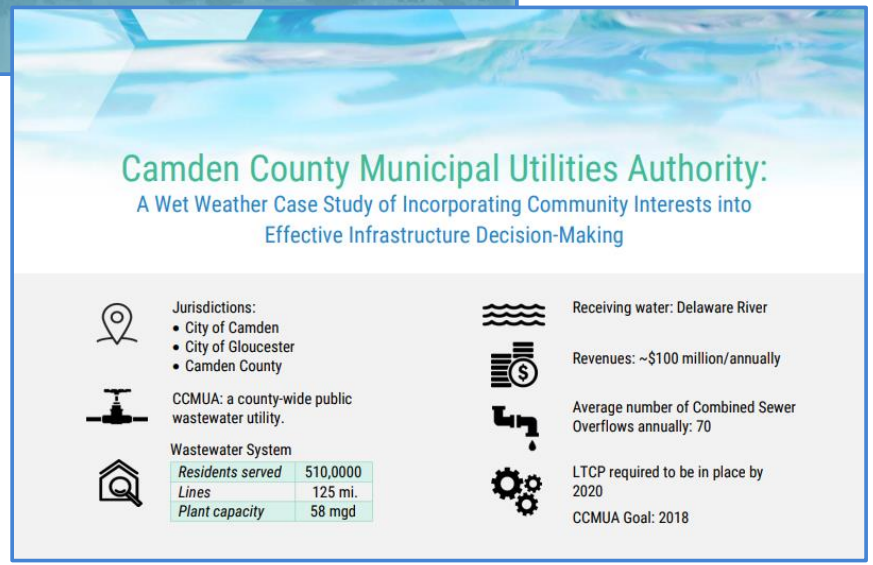
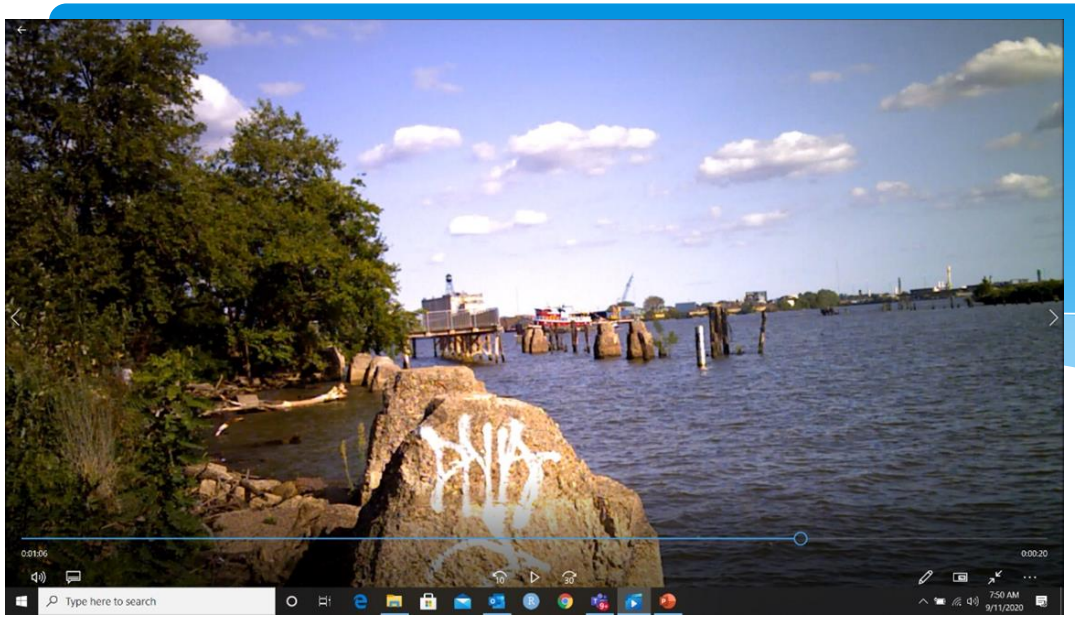




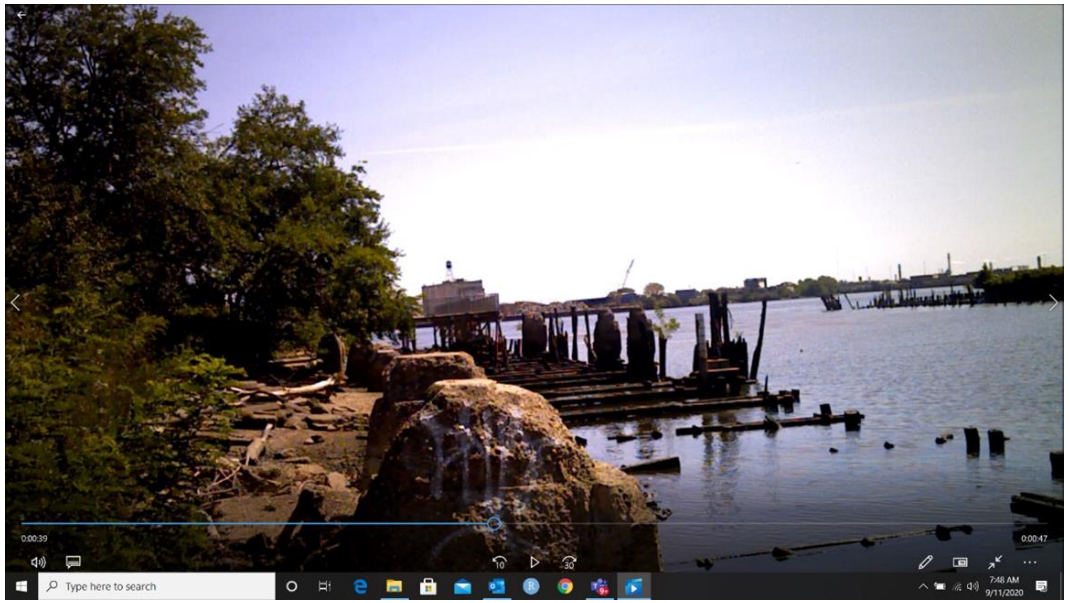
- CSO Long Term Control Plans
- MS4 Permitting
- Stormwater management
- Capture & disinfect more combined sewage

- Happening now
- Long Term Proposition
- More reduction requires more $$$

Other Hazards & Challenges



- Beaches have an elaborate protocol for monitoring, beach closures, re-opening



- Busy shipping ports
- Hazardous currents
- Debris, pilings, junk

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DRBC Next Steps

- Continued Monitoring in 2020 and beyond
- Expanded analytical approaches?
  - How much is human derived
  - How much is animal derived
- Coordination with our Water Quality Advisory Committee (WQAC)
  - Help in setting priorities for DRBC's Water Resources Program

Drinkable
(and Usable)

agricultural, industrial, and public water supplies after reasonable treatment,

except where natural salinity precludes such uses

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Water Users

Phila.gov

N. Suk

http://wikimapia.org/21274124/Kimberly-Clark-Inc-Chester-Papermill#/photo/1905408

Photo: Peretz Partensky, https://www.flickr.com/photos/ifl/7238282472/in/album-72157629823114004/; unedited

- Drinking Water Providers
- Manufacturing
- Refining
- Energy Production

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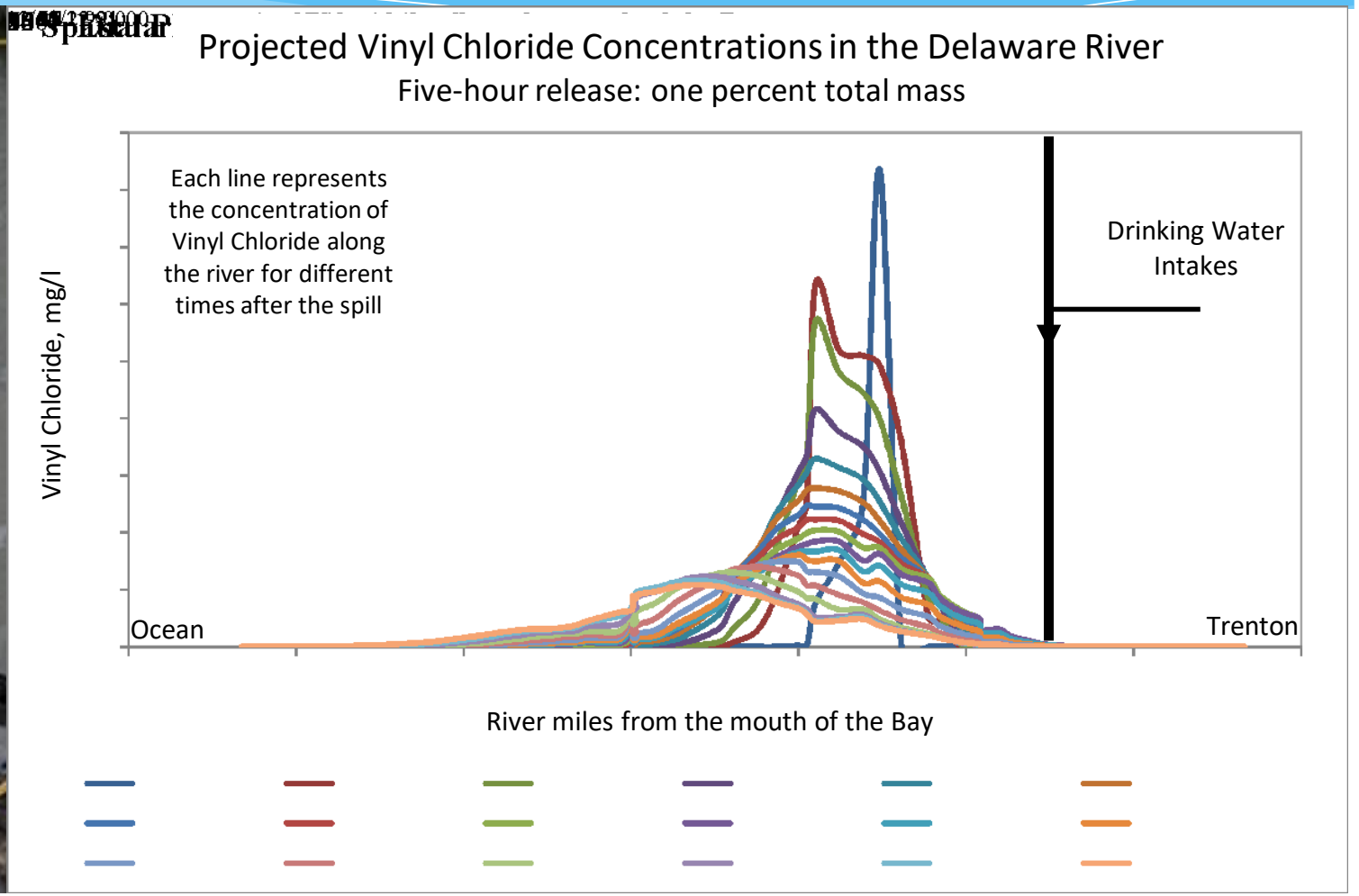
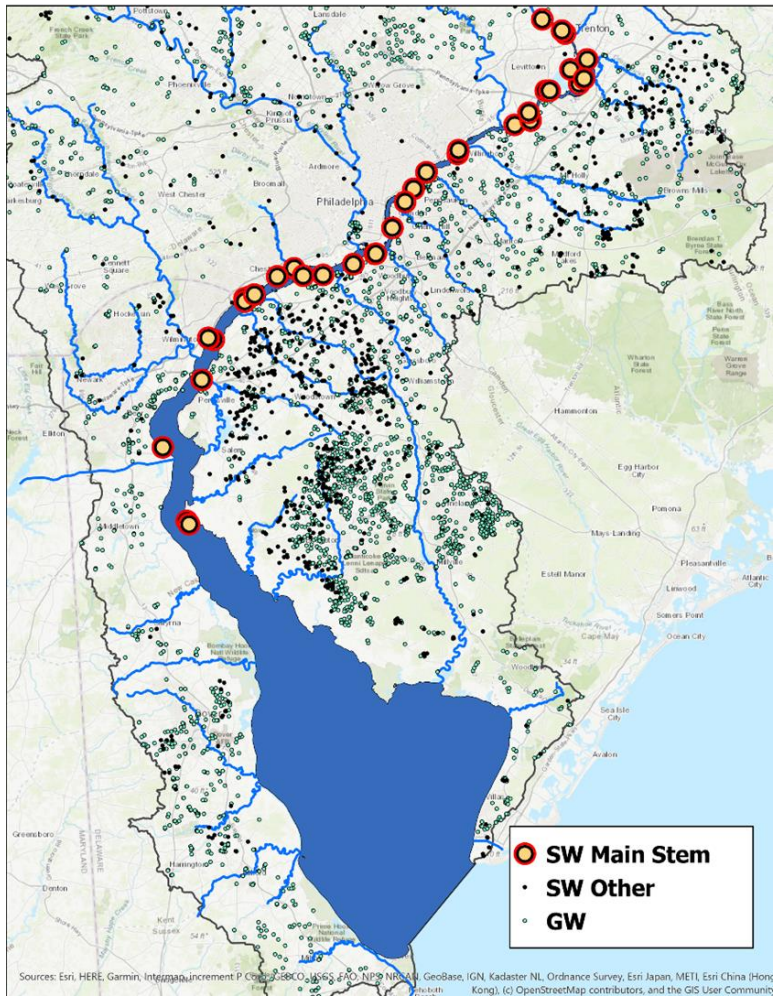
Risks to Drinkable Water



NOAA Office of Response and Restoration

DRBC Spill Model Analysis

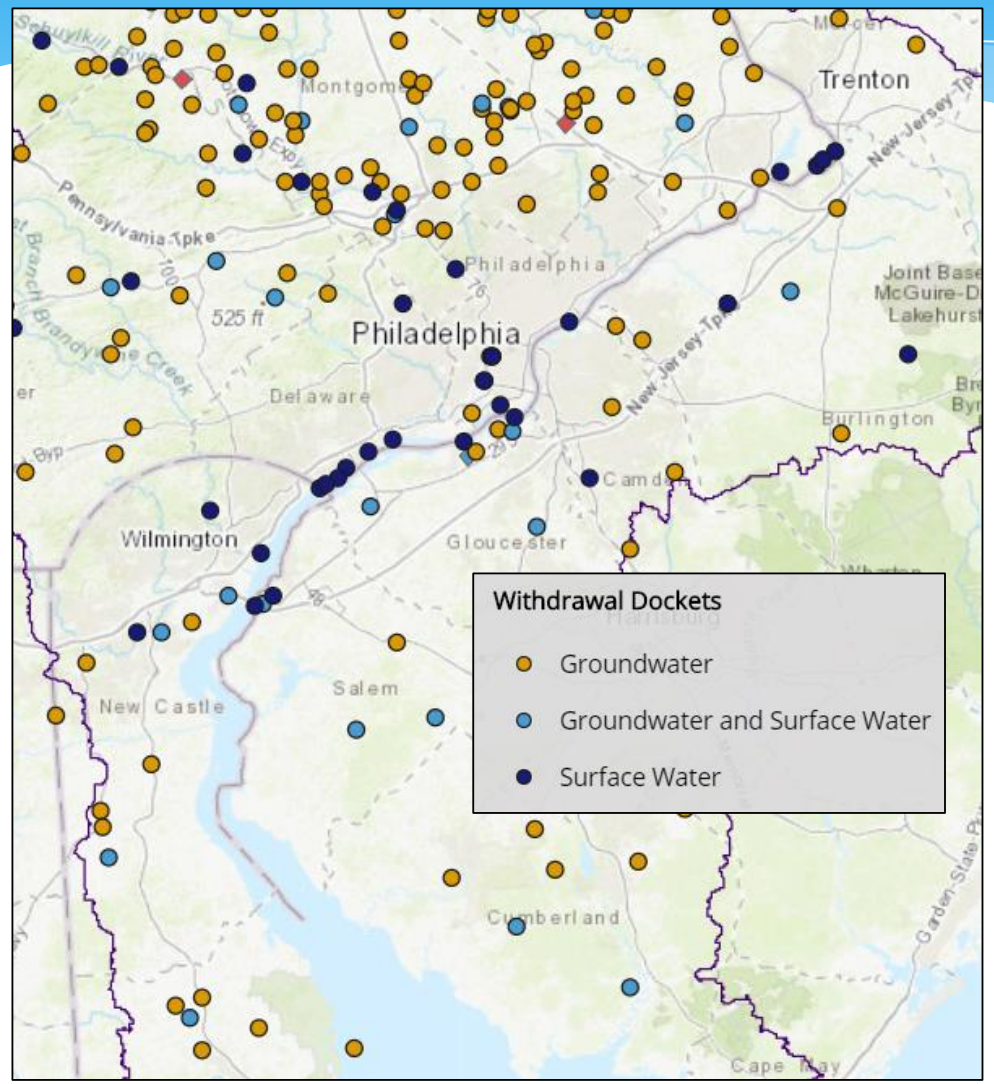
Water Users, Risks and Salinity



Risks to Availability and Usability

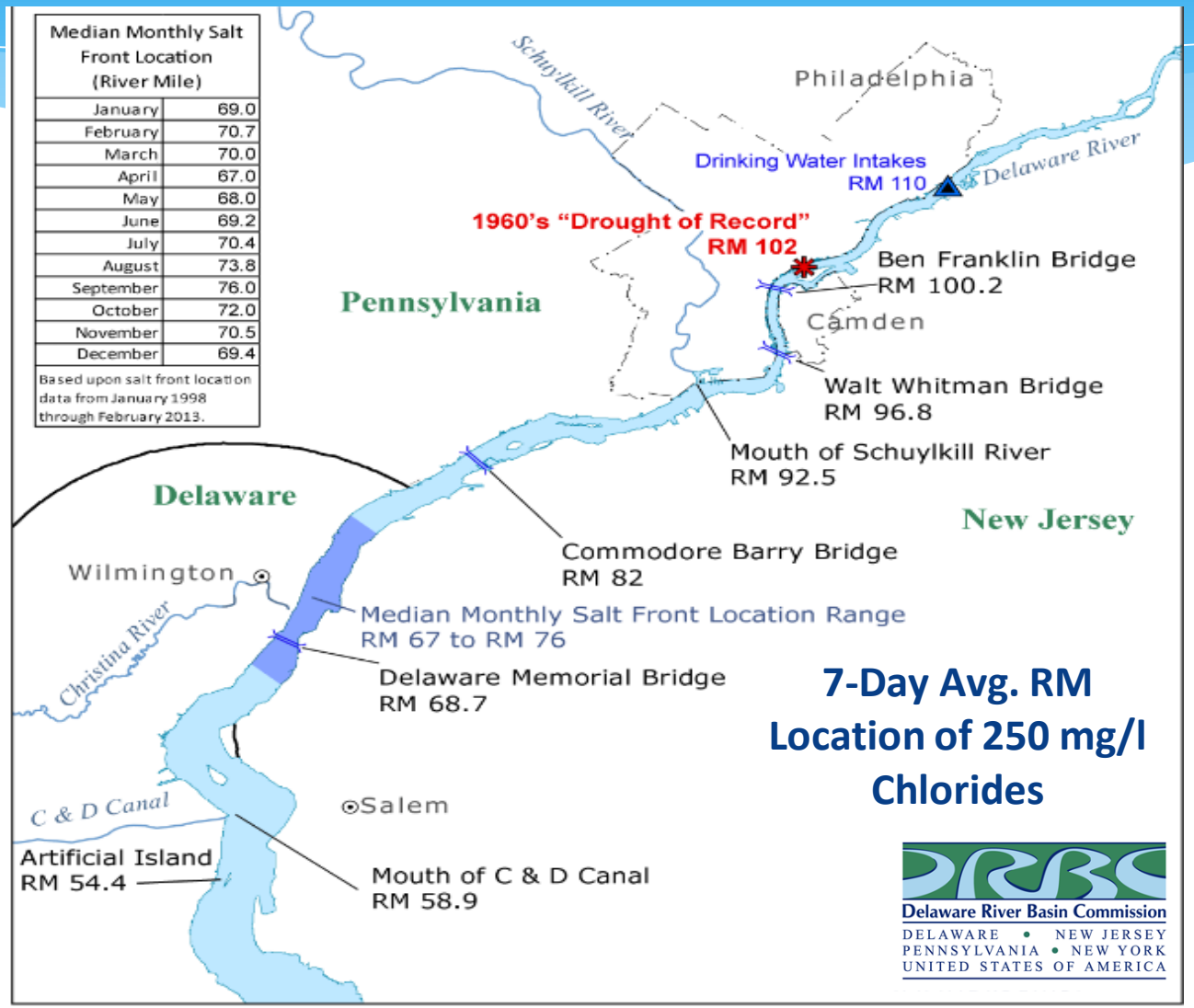
Droughts, Spills, Contaminants of Emerging Concern, Salt (deicing, ocean), Sea Level Rise

Drought Management and the Salt Front

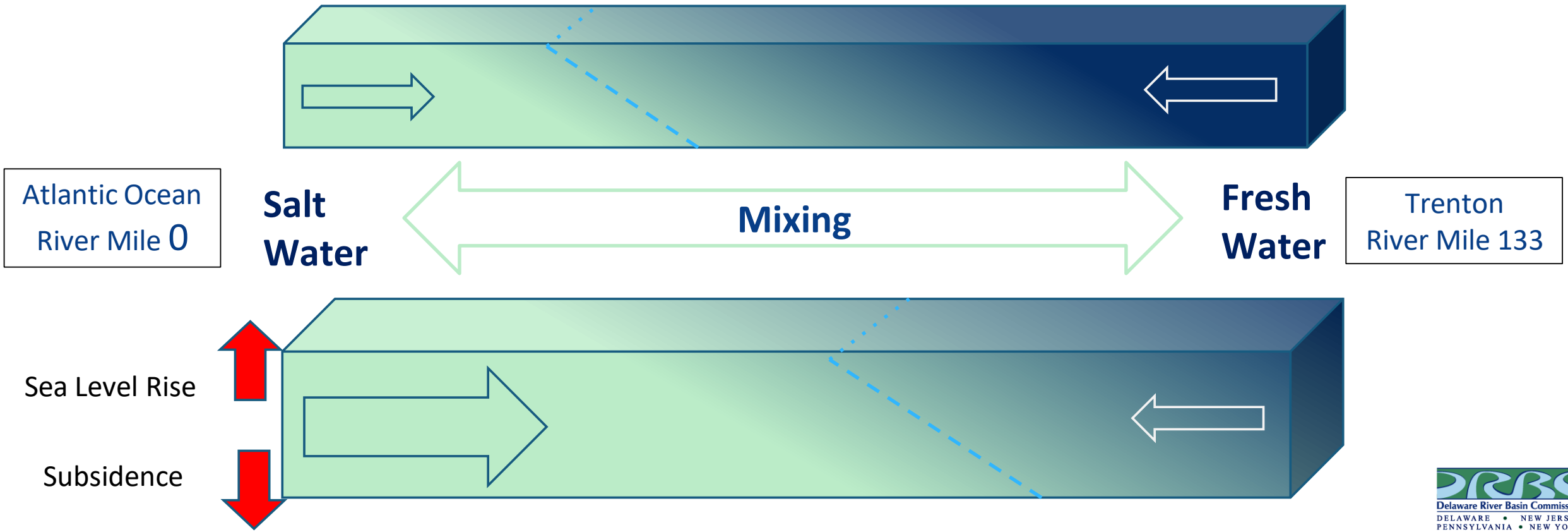


Median Monthly Salt Front Location (River Mile)	
January	69.0
February	70.7
March	70.0
April	67.0
May	68.0
June	69.2
July	70.4
August	73.8
September	76.0
October	72.0
November	70.5
December	69.4

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



Sea Level Rise and Salinity



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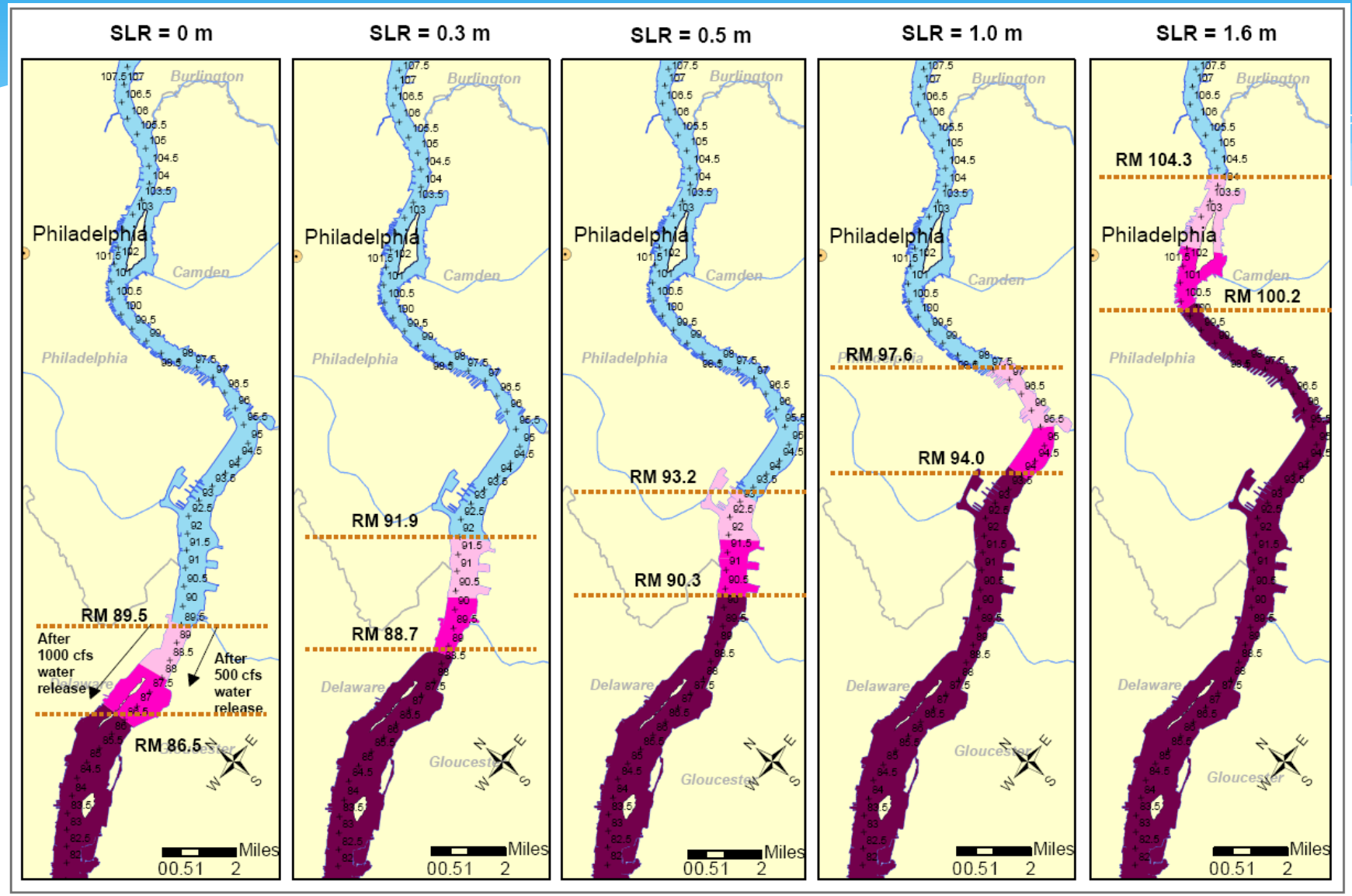
Range of Salt Front Movement

with dry conditions and different flow augmentation



Legend

Simulated SF Range (SLR = 1.6 m)

- No additional flow added
- 500 cfs for 2 months
- 1,000 cfs added for 2 months

Simulations of July-October 2002 conditions with additional water released in August and September. A significant amount of water may be needed to keep the salt front below RM 92.5.

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What are the options to reduce the risk?


Phila.gov

Relocation


Rijkswaterstaat

Estuary Barrier

Reservoir Releases


USACE

Desalinization


https://www.environmentalleader.com/wp-content/uploads/2016/07/desalination-plant.jpg

DRBC Next Steps

* Investigate how climate change will affect hydrology
* Inventory new storage opportunities (new infrastructure, under-utilized, revised operations)
* Use existing models to quantify risk and examine mitigation options
* Develop or modify strategies to manage issue

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Summary

- Focus
- Funding
- Equity
- Priorities

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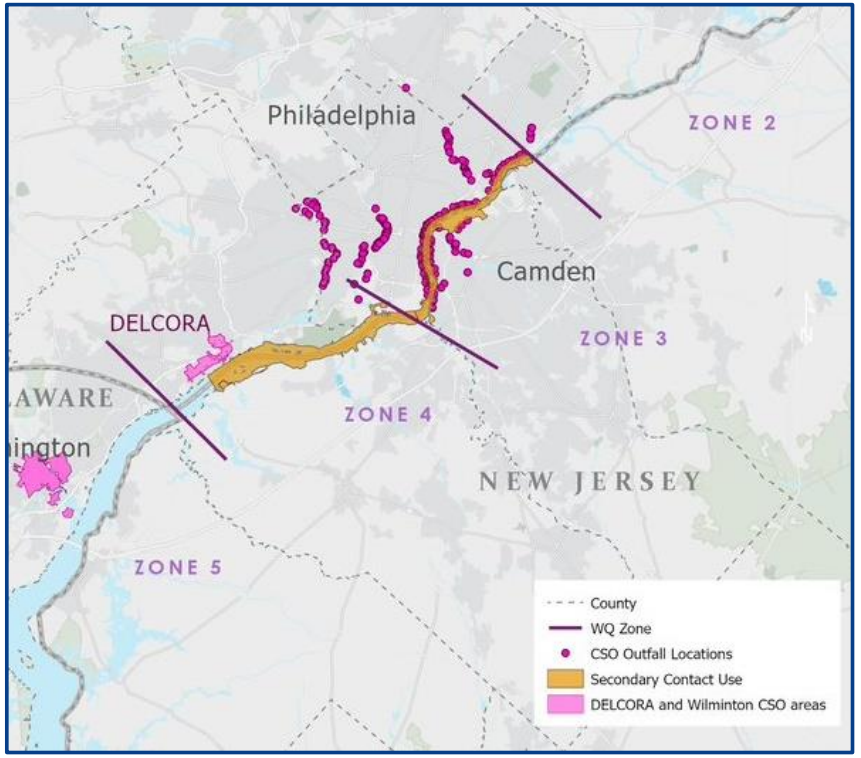
Focus

Measurable improvement in WQ in the urban Estuary, requires solutions focused on the urban Estuary

Ammonia Discharges

CSO Outfalls



Who Pays?

- Dischargers? - Local taxpayers and rate payers
- Water users?
- Federal Government?
- Those who benefit most?
- Philanthropic organizations?

Photo: gifttothecity.com

Federal Funding

- “New” federal funding is not aimed at the urban Estuary.
- More funds aimed at urban waters fishable/swimmable needs and solutions (CSOs, etc.).
- More funds to support urban recreational access.
- Increase share for the Delaware River.
- Increase share for clean water for disadvantaged communities.
- Clean water Infrastructure as economic stimulus.
- America’s Water Infrastructure Act.
- Fund the DRBC

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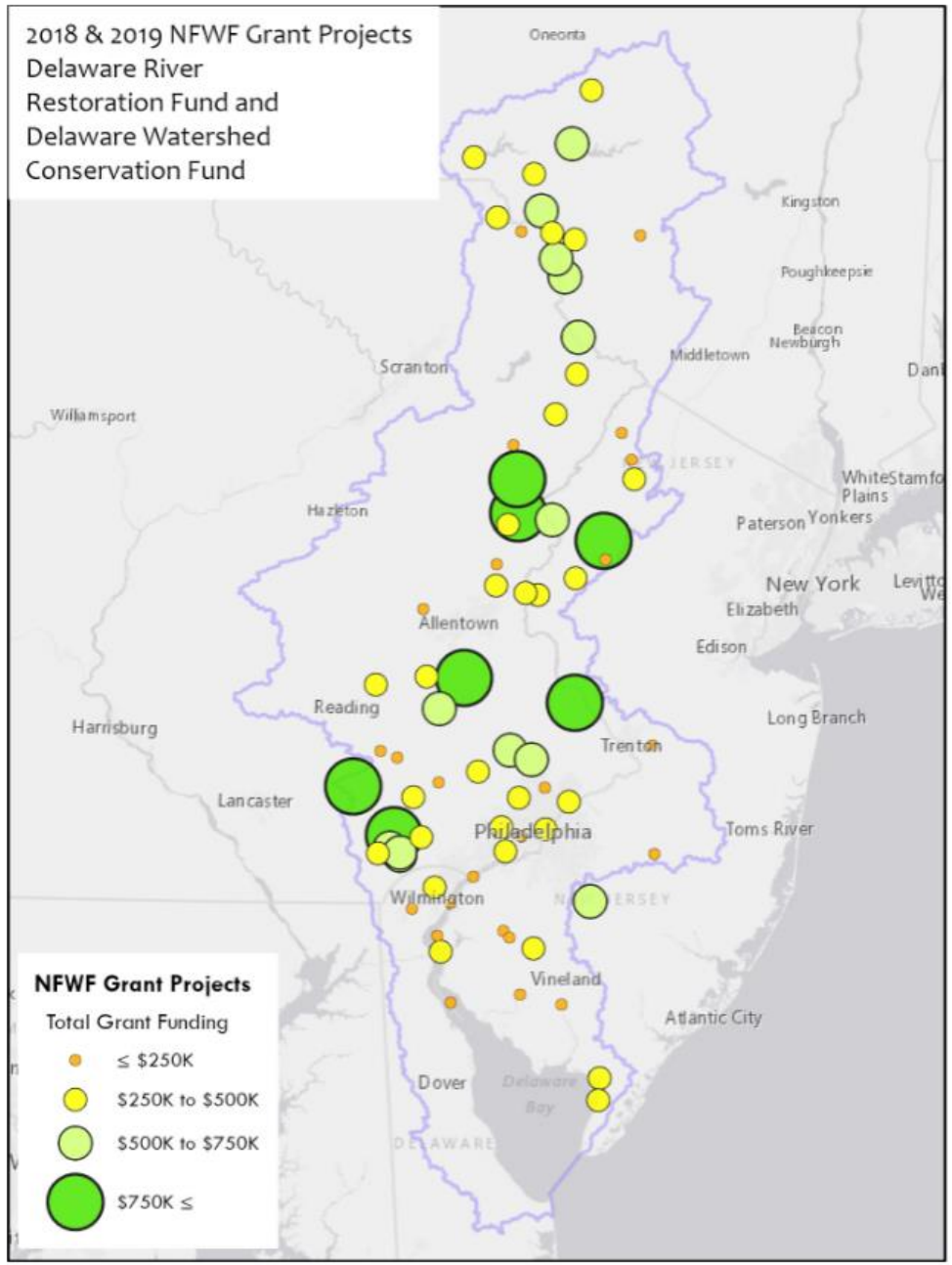
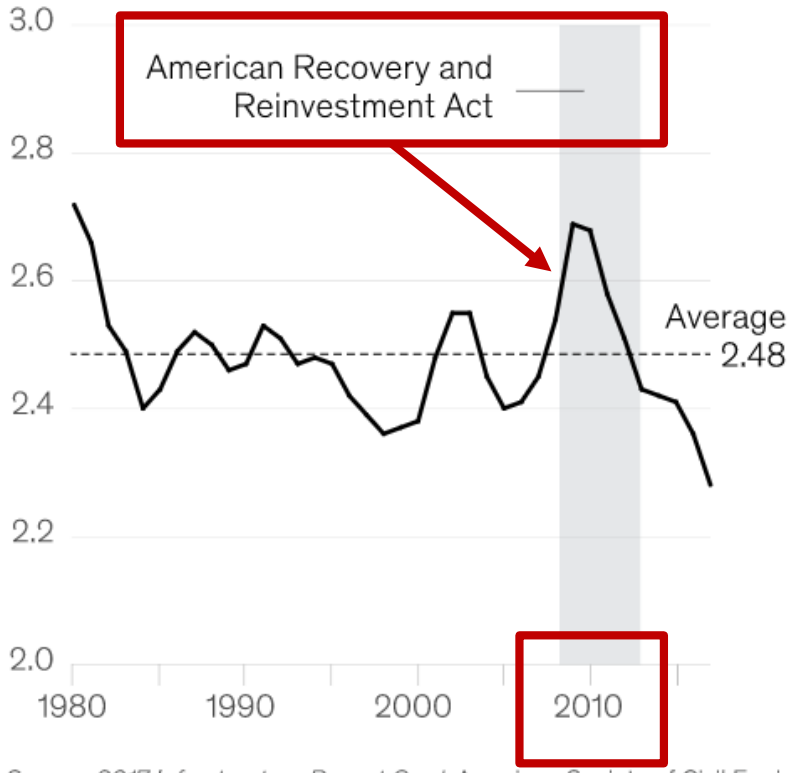


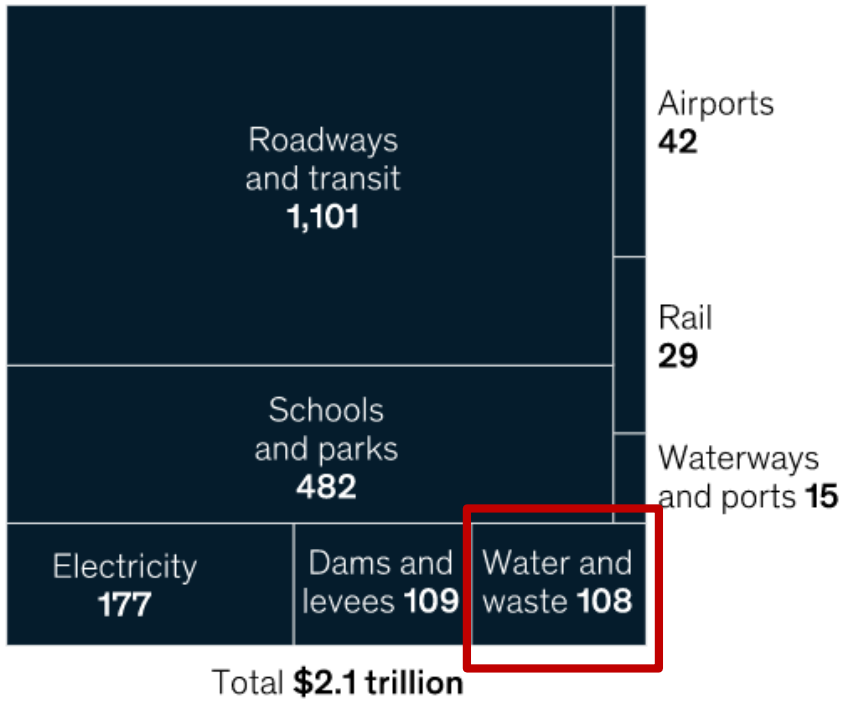
Public Infrastructure Spending as a % of GDP

Public-infrastructure spending has fallen, and there is a backlog of more than $2 trillion.

Public spending on water and transportation infrastructure, 1980–2017, % of GDP



Estimated 10-year infrastructure-funding gap by asset type, 2016–25, $ billion



Source: *2017 Infrastructure Report Card*, American Society of Civil Engineers, March 2017, infrastructurereportcard.org; *Public spending on transportation and water infrastructure*, 1956-2017, US Congressional Budget Office, October 2018, cbo.gov

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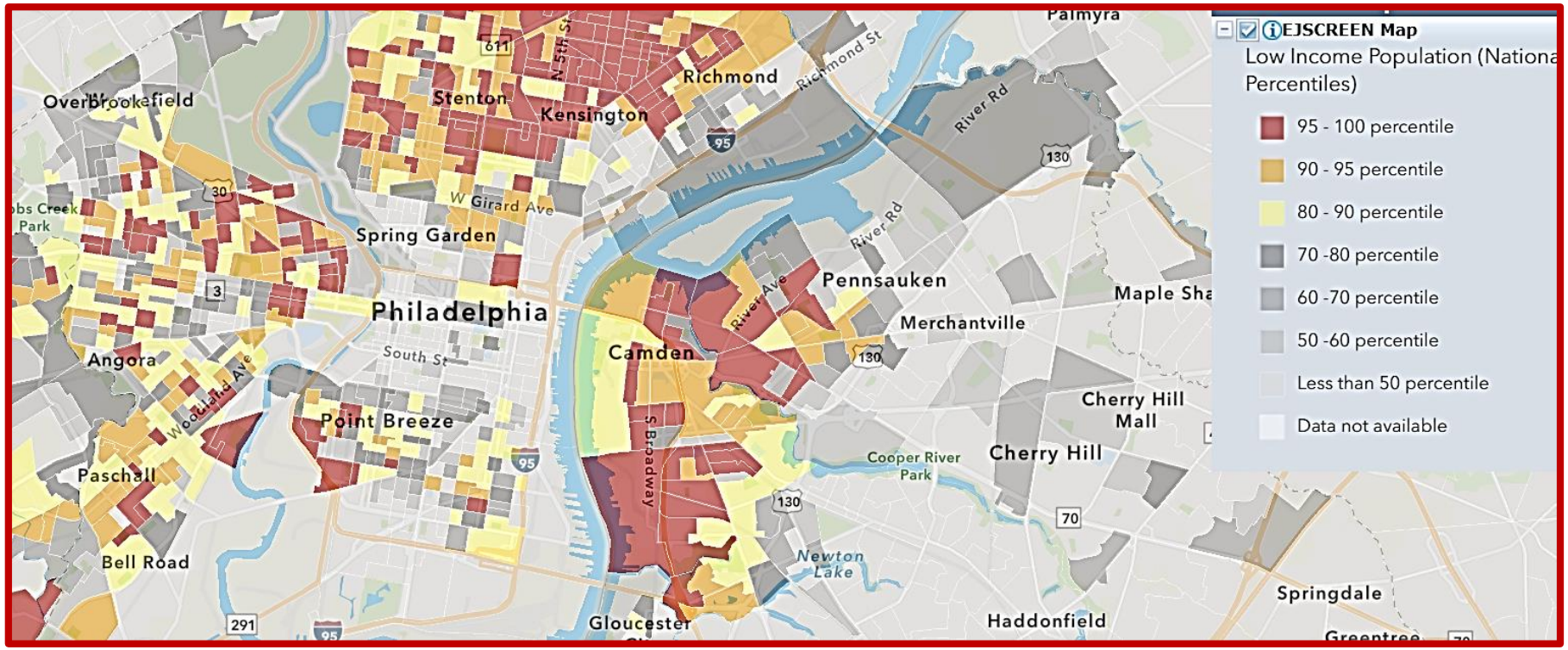
Equity

Photo: Urban Promise

Access to fishable, swimmable, drinkable waters.



**From EPA EJSCREEN: Environmental Justice Screening and Mapping Tool*

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Equity
Who pays for what?


Photo: Upstream Alliance


Photo: Aqua Vida

Photo: Paul Michael Bergeron

Priorities

We will reach our economic endpoint long before we reach our environmental endpoint.

Howard Neukrug - Water Center at UPenn

Clean Water Act / DRBC

- Drinkable? Swimmable? Fishable?

Photo: Philadelphia Water Department

Community / Society (Water Only)

- Climate change threats
- Safe and reliable drinking water
- Neighborhood flooding
- Trash
- Water main breaks
- Water efficiency
- Lead water service line replacements
- Recreation in the Delaware River
- Wastewater Treatment Updates
- Affordability

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From “One Water” Policy Framework

- A focus on achieving multiple benefits, meaning that our **water-related investments should provide economic, environmental, and societal returns**.
- Utilizing **watershed-scale thinking** and action, that respects and responds to the natural ecosystem, geology, and hydrology of an area.
- **Relying on partnerships and inclusion**, recognizing that real progress will only be made when all stakeholders have a seat at the table.

From “One Water for America Policy Framework”, Executive Summary, US Water Alliance, 2017

US Water Alliance

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AMERICA'S RIVERS THREATS & SOLUTIONS

River of the Year for 2020: The Delaware River

American Rivers announces 2020 River of the Year alongside Most Endangered Rivers of 2020 release.

Amy Souers Kober | April 14, 2020

https://www.americanrivers.org/2020/04/river-of-the-year-for-2020-the-delaware-river/

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"The Delaware River is a national success story," *said Bob Irvin, President and CEO of American Rivers*

Steve Tambini, Executive Director

Steve.Tambini@drbc.gov

www.drbc.gov

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