

# Delaware River Basin Commission

## 2022-2023 Monitoring Updates

Autumn MACC Meeting

November 2, 2022

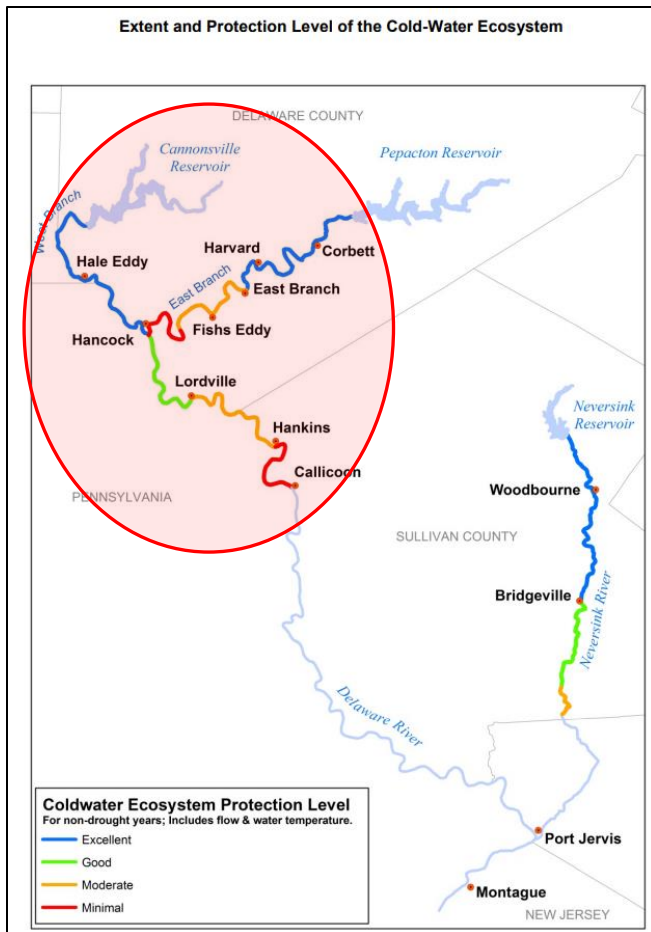
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Management, DRBC

Presented to an advisory committee of the DRBC on November 2, 2022. Contents should not be published or re-posted in whole or in part without permission of DRBC.

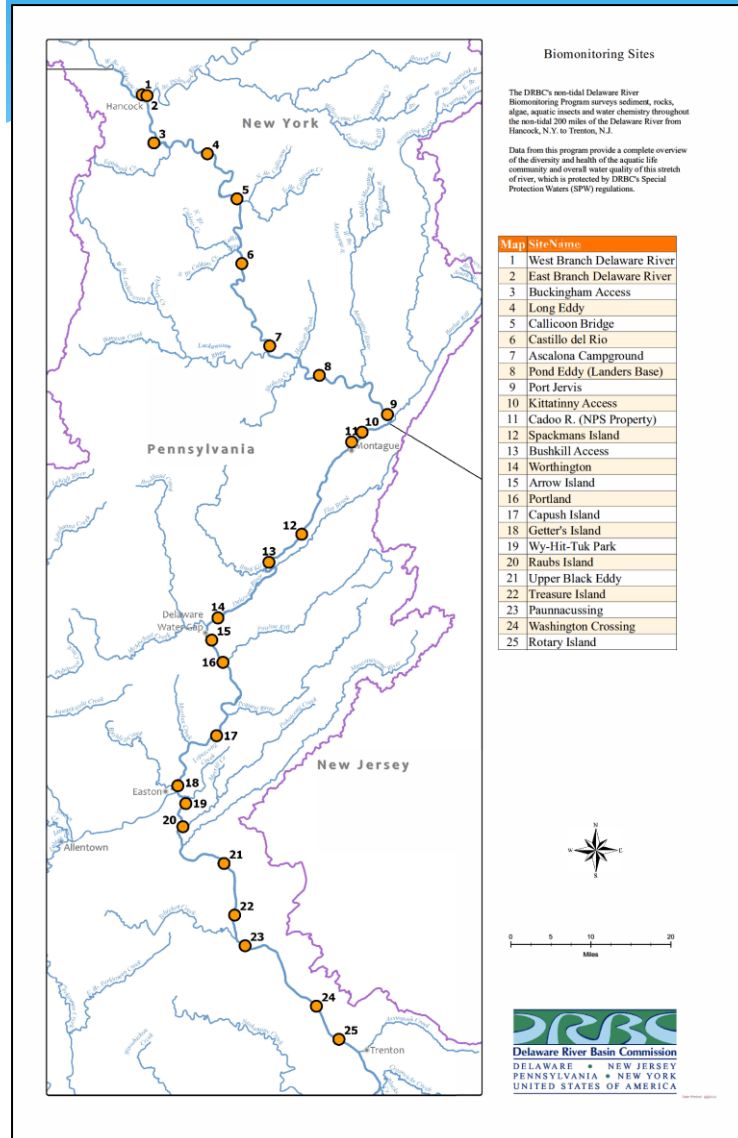


# Thermal Shading Study



- Estimate canopy cover using a hemispherical camera in areas that support cold water fisheries
- Areas lacking canopy cover could be targeted for tree planting efforts

# Non-tidal Biological Monitoring



- 25 Stations from Trenton to Hancock
- August and September Index Period
- Collected macroinvertebrates, algae, water quality, and physical habitat data
- Sampling split between '21/'22
- Samples will be analyzed in '23



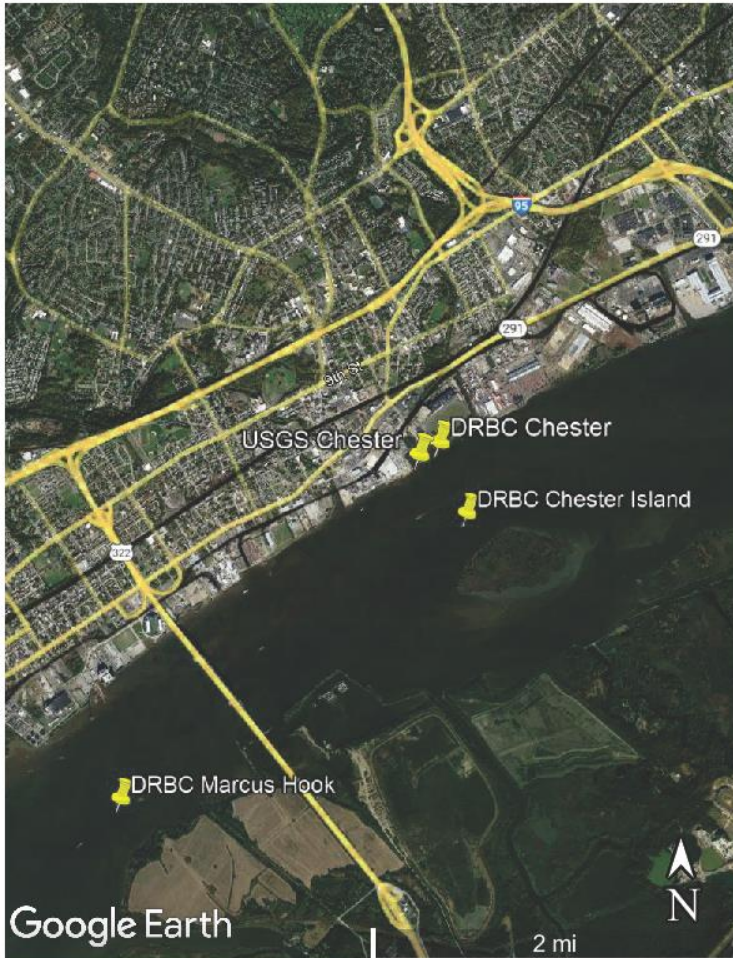


# Delaware River PFAS Monitoring



- Biological samples were collected throughout the Delaware River in 2022 for tissue analysis of PFAS
- Smallmouth bass and white sucker in non-tidal river
- Channel catfish and white perch in tidal river
- Blue crab in zone 5
- Water and sediment samples collected at all locations
- Additional sampling planned for '23

# DO Monitoring Sturgeon Habitat



- Current USGS logger at Chester is several miles upstream of important sturgeon nursery grounds
- Collect enhanced spatial resolution DO data in portion of the estuary important to young-of-year Atlantic sturgeon
- Deploy several top/bottom DO loggers at multiple locations
- Target low DO time of year (July-September)
- 2022 was proof of concept year. Plan to redeploy in 2023.





# Non-tidal Delaware River Mussel Survey

## Freshwater Mussel Community Composition and Relative Abundance in the Lower Delaware River



Report prepared by:  
*Erik Silldorff<sup>1</sup> and Amanda Schwartz<sup>1</sup>*

29-Dec-2014 (*final revision*)

In cooperation with:  
*Carrie Blakeslee<sup>2</sup> and Heather Galbraith<sup>2</sup>*

Data collected by:  
*Carrie Blakeslee<sup>2</sup>, Heather Galbraith<sup>2</sup>, Robert Limbeck<sup>1</sup>, Greg Mayer<sup>1</sup>,  
Amanda Schwartz<sup>1</sup>, Erik Silldorff<sup>1</sup>, Micah Swann<sup>1</sup>, and Eric Wentz<sup>1</sup>*

<sup>1</sup>Delaware River Basin Commission (West Trenton, NJ)  
<sup>2</sup>USGS Northern Appalachian Research Branch (Wellsboro, PA)

- Study last performed in 2013
- Semi-quantitative survey from Portland, PA down to Trenton, NJ
- Previous survey found a decrease in mussel abundance below Lehigh
- Goal is to repeat the survey and look for any changes in mussel abundance / community composition

# Estuary Bacteria Monitoring

- 9 sites within Zones 3 and upper 4
- Completed 3 wet weather events over the summer
- Mostly dry weather events
- In 2023, plans to collect samples consecutive days to capture storm events (pre-storm through post-storm)



# Microbial Source Tracking Monitoring

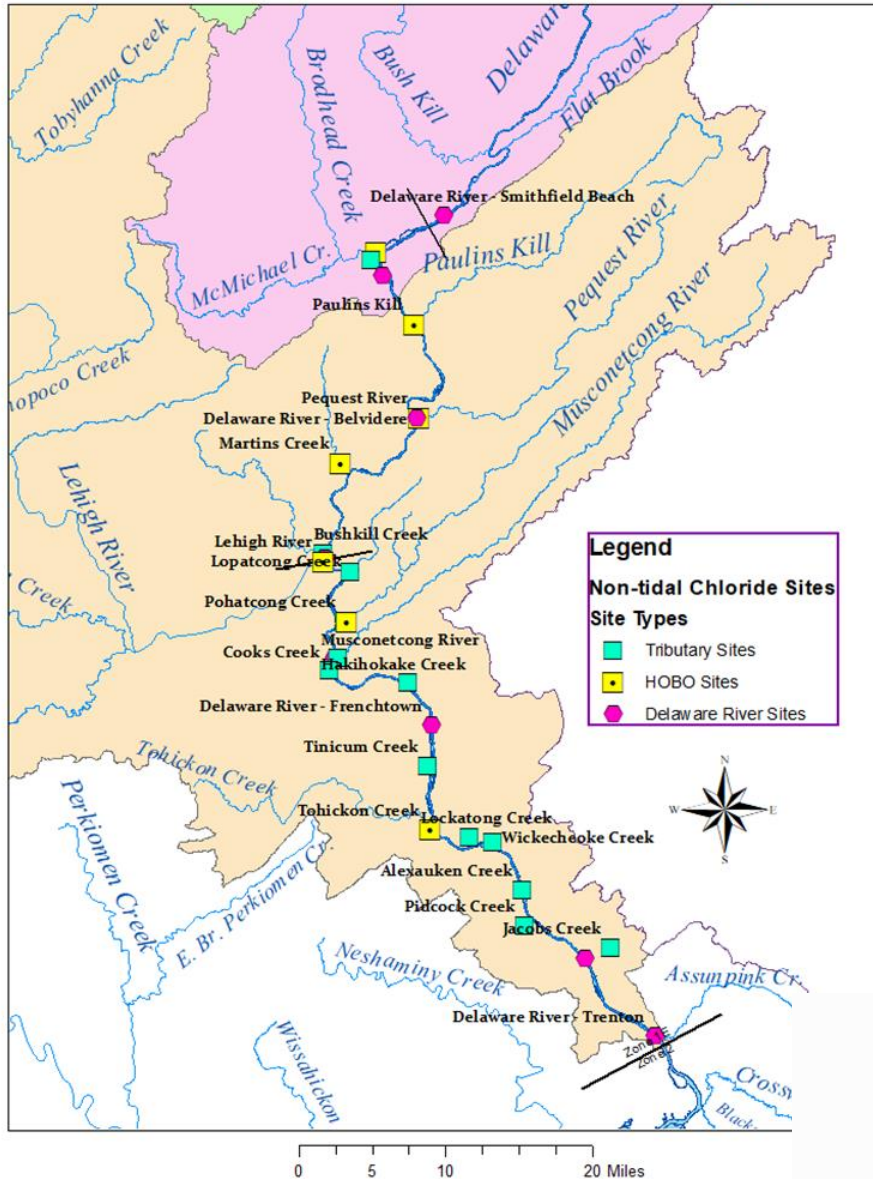
- Microbial source tracking to differentiate bacteria derived from humans, cows, horses, Canada geese, deer, and dogs
- 3 wet weather & 3 dry weather events - **COMPLETE**
- 9 sites
- NJ Center for Water Science & Technology, Montclair State University
- Started in May 2022 and ended in early October 2022
  - Most events were concurrent with the shore-based bacteria monitoring, but not all



Target	Primers/Probes	Sequence	Amplicon	Reference
Universal	AllBacF	GAGAGGAAGGTCCCCAC	106	Layton et al. 2006
	AllBacR	CGCTACTTGGCTGGTTCAG		
	AllBacP	[6-FAM]- CCATTGACCAATATTCCTCACTGCTG CCT-[BHQ]		
Human	HF183	ATCATGAGTTCACATGTCCG	126	USEPA Method 1696
	BacR287	CTTCCTCTCAGAACCCCTATCC		
	BacP234MGB	[6-FAM]- CTAATGGAACGCATCCC – [MGB]		
Cow	CF128F	CCAACYTCCCGWTACTC	177	Kildare et al. 2007
	BacCow-305R	GGACCGTGTCTCAGTTCAGTG		
	BacCow-257P	[6-FAM]- TAGGGGTTCTGAGAGGAAGGTCCC CC-[BHQ]		
Horse	Hof597F	CCAGCCGTAATAATAGTCGG	129	Dick et al. 2005
	Bac708R	CAATCGGAGTTCCTCGTG		
Canada goose	CanadaGooseFor	CTAACATCCAAATCCCTCGACCCA	77	Caldwell and Levine, 2009
	CanadaGooseRev	TCCTATTCAGCTCCTAGTGCTCT		
	CanadaGoosePro	[6-FAM]- TACTCACCGCCATAGCCCTAGCCT- [BHQ]		
Deer	Deer Forward	TAACCCGATTCTTCGCCTTCCTC	122	Caldwell and Levine, 2009
	Deer Reverse	GTCTGCGTCTGATGGAATTCCTGAT		
	DeerProbe	[6-FAM]- CCTCCCATTTATCATCGCAGCACTTG CT-[BHQ]		
Dog	BacCanF	GGAGCGCAGACGGGTTTT	145	Kildare et al. 2007
	BacUni690R	CAATCGGAGTTCCTCGTGATATCTA		
	BacUni656P	[6-FAM]-TGGTGTAGCGGTGAAA- [BHQ]		



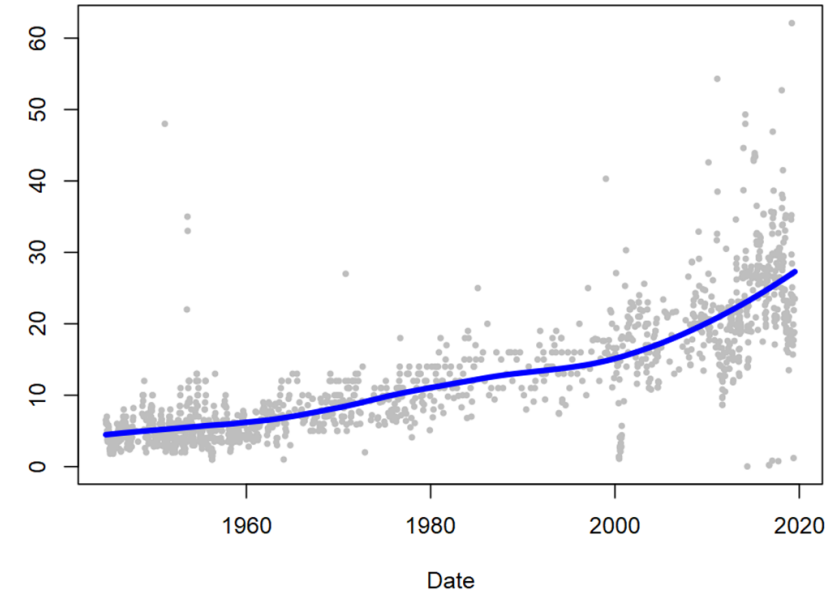
## Non-tidal Chloride Monitoring Sites



# Non-tidal Chloride Monitoring Program 2021-2023

- 27 sites (19 tributaries & 8 mainstem Delaware River)
- Once per month monitoring
- Twice per month continuous conductivity logger maintenance
- Chloride used as a tracer in environment
- Added sodium, potassium, magnesium, calcium, total alkalinity, sulfate, total P, nitrate, and silica in 2022

Chloride Time Series, Delaware River at Trenton



- Chlorides & Freshwater Salinization Monitoring Workgroup met in October 2022

Open Access | Published: 12 April 2021

Freshwater salinization syndrome: from emerging global problem to managing risks

Sujay S. Kaushal, Gene E. Likens, Seyram A. Wogolo + Show authors

Biogeochemistry 154, 255–292 (2021) | Cite this article

# Cyanotoxins Monitoring Pilot Study

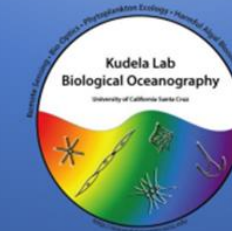


- Anatoxin
- Microcystins
- Cylindrospermopsin
  
- Extraction followed by immunoassay
- DNREC lab
  
- 15 deployment sites in flowing mainstem Delaware River
  - In 2022, samples were retrieved from 11 sites between Washington Crossing and National Park, NJ
- 3 rounds
- Early planning stages – will know more for 2023 deployments



STANDARD OPERATING PROCEDURE FOR SOLID PHASE ADSORPTION TOXIN TESTING (SPATT) ASSEMBLAGE AND EXTRACTION OF HAB TOXINS

August 2018





# Special Protection Waters (SPW) Monitoring Program

- SPW program designed to prevent degradation
  - The program states no measurable change in Existing Water Quality (EWQ) shall occur
    - EWQ defined for 85 locations within SPW
  - Accomplished through stricter regulations of wastewater dischargers with consideration of cumulative loadings
  - Monitoring goals: determine that EWQ is being maintained
- Monitoring to resume in 2023 with NPS as partners for Middle and Upper Delaware locations
- Next round of assessment (2023-2026?)
  - Previous Lower Delaware Measurable Change Assessment covered 2009-2011
  - Plans to conduct a new Measurable Change Assessment monitoring period starting in May 2023
  - Sites TBD



# SPW Lower Delaware Measurable Change Assessment Grid Results (2000-2004 vs 2009-2011)

Summary Matrix of Water Quality Changes at Lower Delaware Control Points: 2000-2004 Baseline vs. 2009-2011 Assessment Round 1

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 Lambrtville	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 Millford	Cooks Creek, PA	Musco-netcong River, NJ	Del. River at Rieglsvil	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 EIQ										** = Indication of measurable water quality change toward more degraded status					~ = Weak indication of measurable water quality change toward more degraded status								