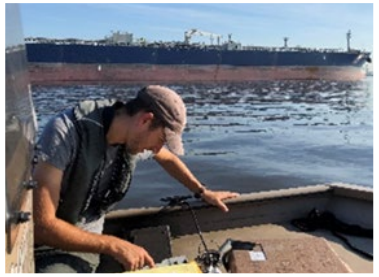

Monitoring and Managing Chloride in DRBC's Special Protection Waters (SPW)

Elaine Panuccio,
Senior Water Resource Scientist

May 20, 2025
SSWP Meeting

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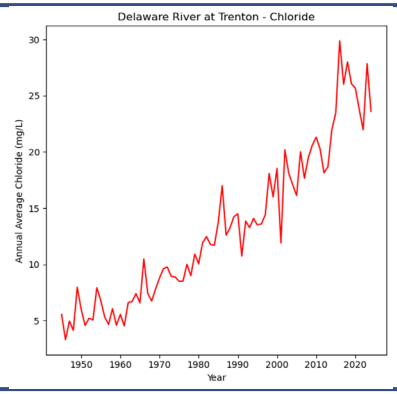
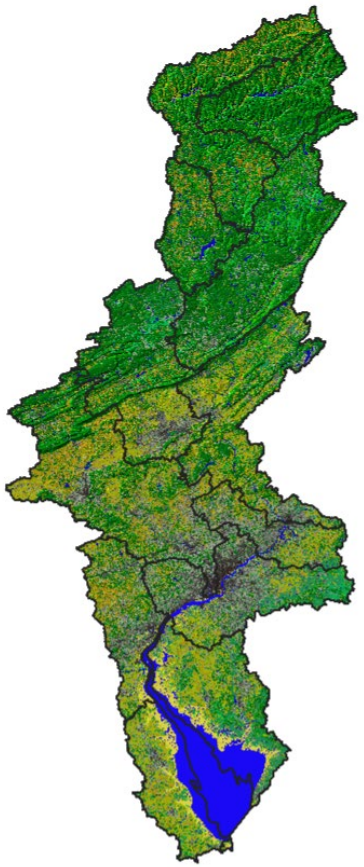
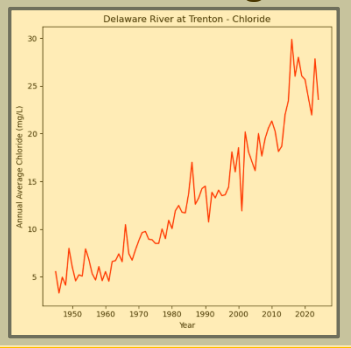
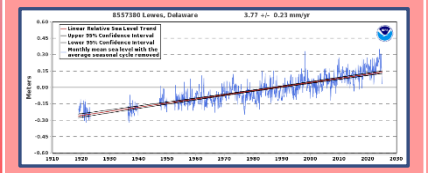
DRBC’s SPW program



Chloride trends in SPW

Next steps



Zone	Tidal Non-Tidal	Major Sources	Status & Trends	Management Thresholds		Drinking Water Use?
1A	Non-tidal	Road De-icing Point Sources	Surface & Ground Water Concentrations **Increasing** 	Existing Water Quality (**EWQ**) under Special Protection Waters (SPW): **NOT a Criteria**		
1B						
1C						
1D						
1E						
2	Tidal	Road De-icing Point Sources Upstream Flow		**Salt Front** Monitoring	**Chloride** Criteria*	
3					**Chloride & Sodium** Criteria* @ RM 98	
4					N/A	N/A
5						
6		Ocean Salt	 Sea Level **Rising**			

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Special Protection Waters (SPW)

Objective: maintain exceptional water quality

Monitoring: identified exceptional water quality, defined Existing Water Quality (EWQ), and continues to ensure the program is working

Coverage: the entire 197 miles of the non-tidal Delaware River

Implementation: no measurable change to EWQ

Limitation: primarily regulates new and expanding dischargers;
non-point sources unregulated

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Results from Measurable Change Assessment (2009–2011)

	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 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 cha						

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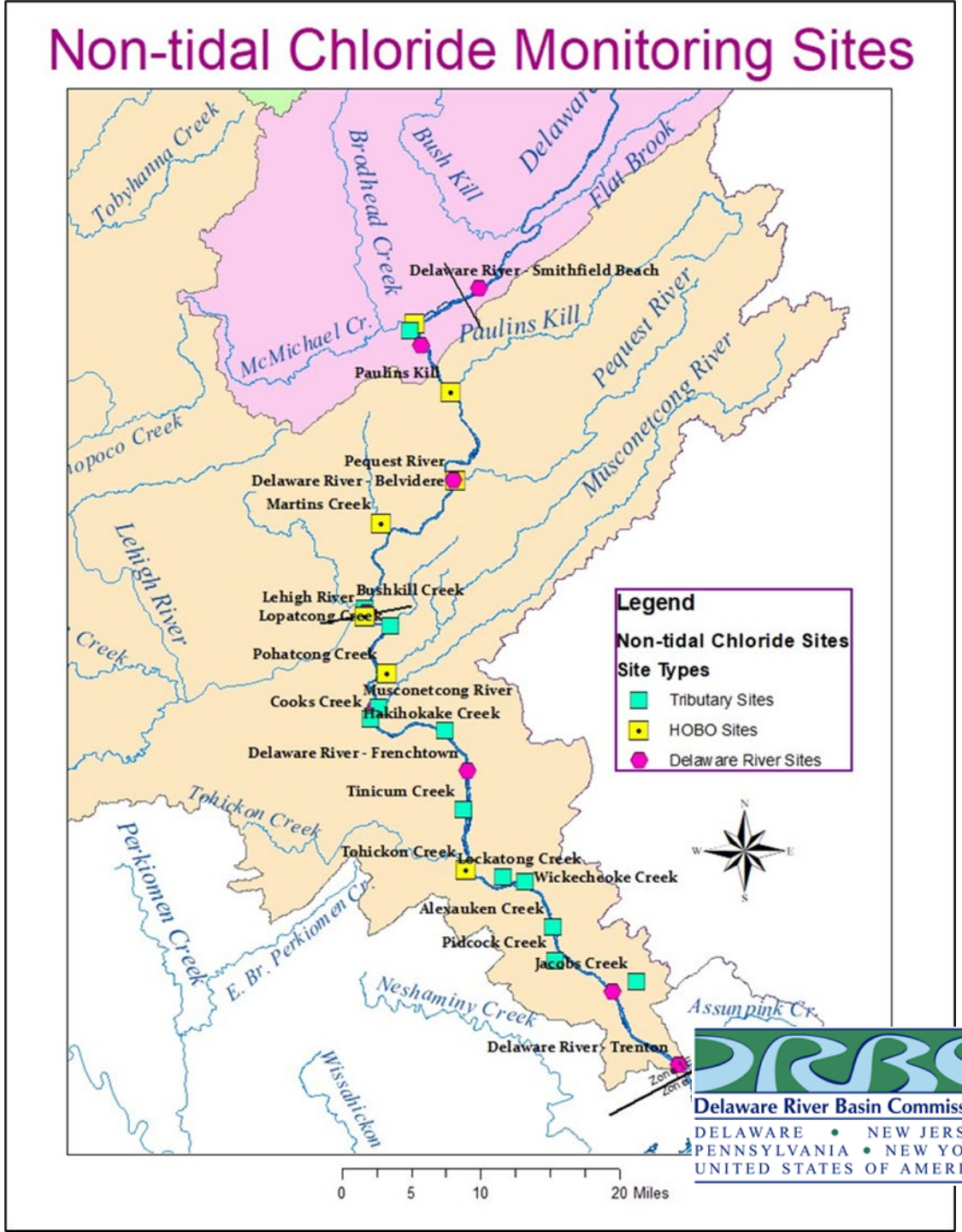
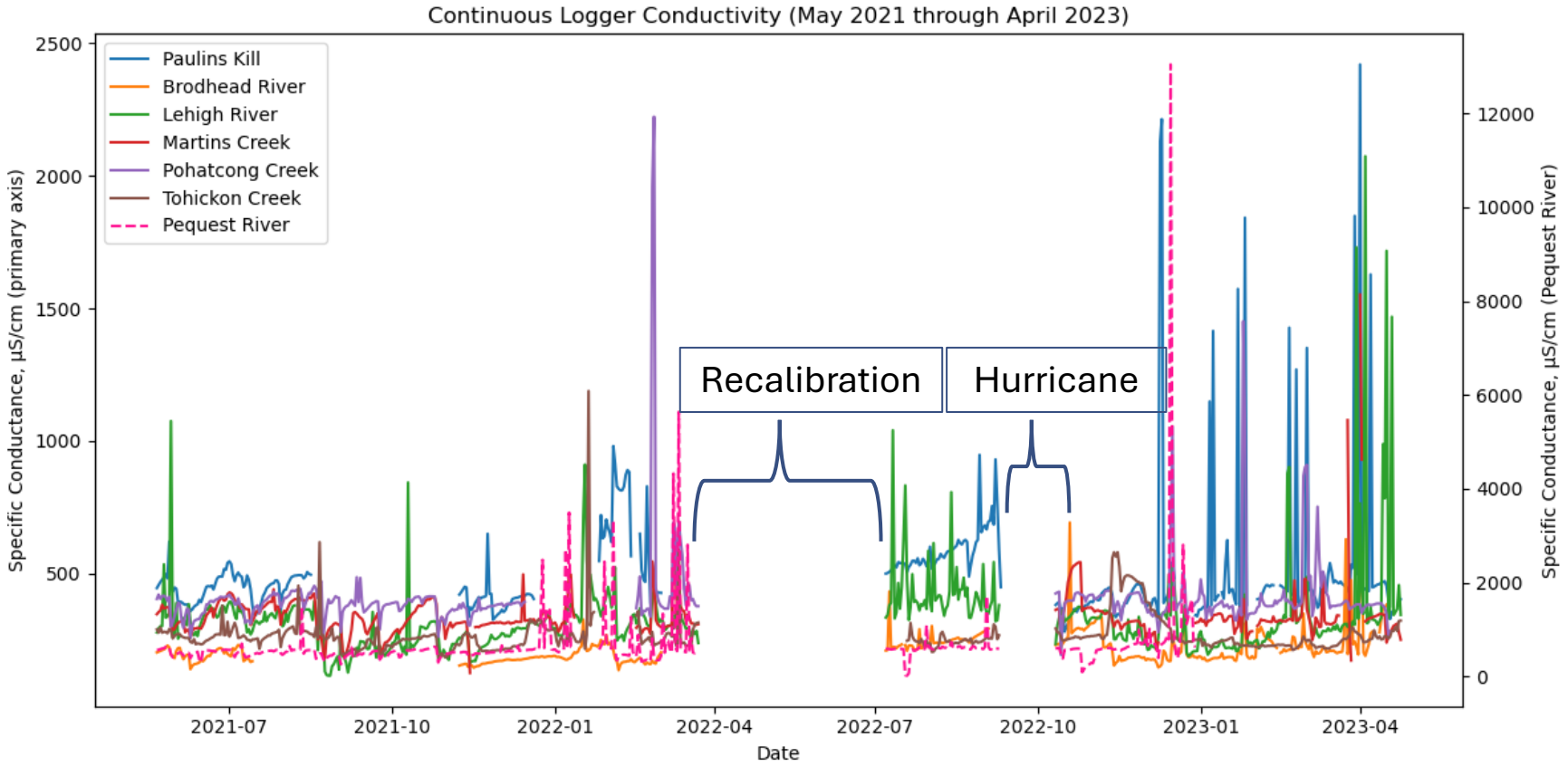
2009–2011 Assessment Results Prompted Targeted Monitoring

- May 2021 – April 2023
- 27 locations
  - 19 tributaries
  - 8 mainstem sites
- Year-round monitoring
  - SPW Monitoring routinely occurs from May through September
- Deployed and maintained continuous conductivity and temperature loggers in 7 tributaries



Continuous Conductivity Meter Capture Episodic Events

Continuous conductivity (HOBO® U24) deployment (left), and logger maintenance and data offload (right).



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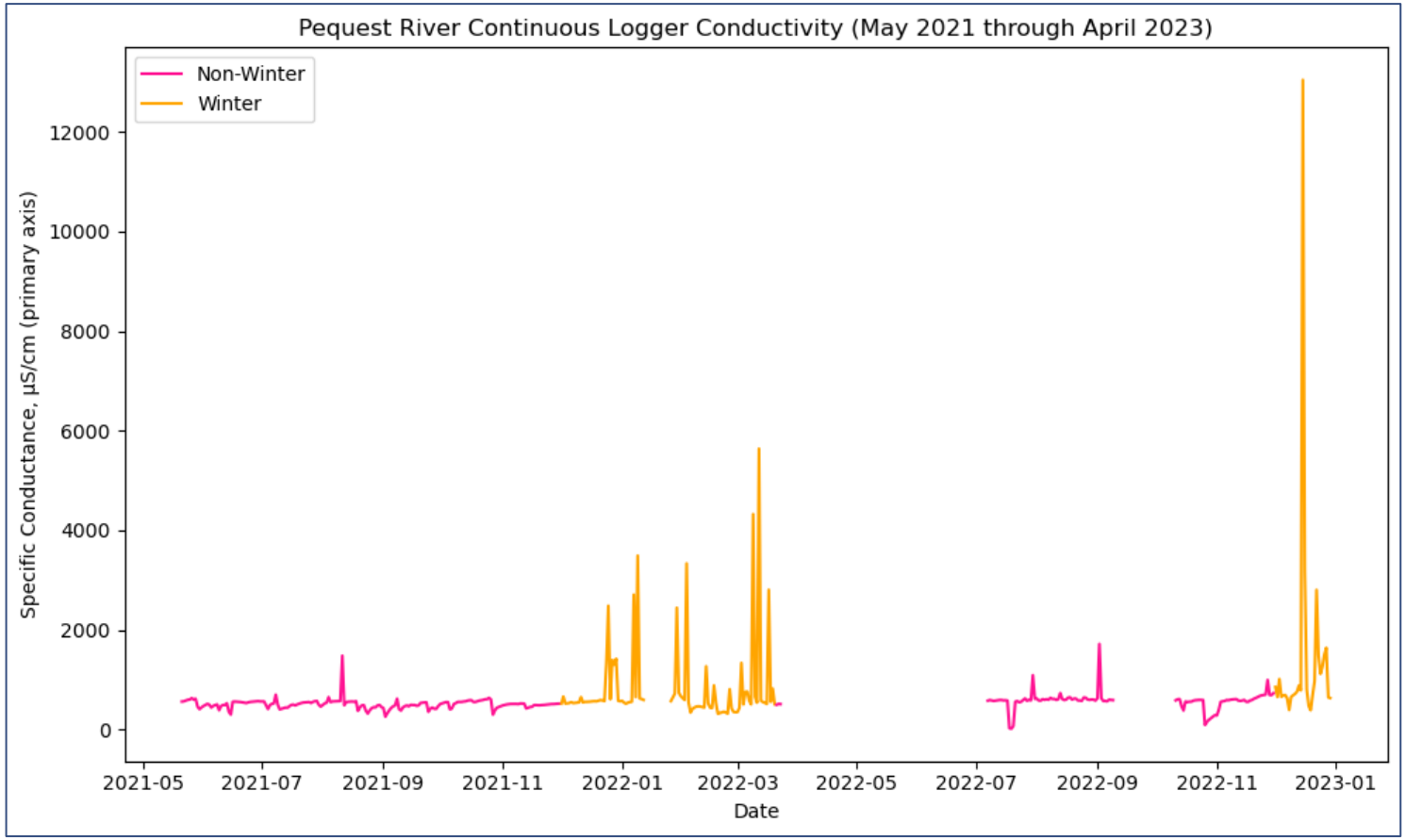
Elevated conductivity during winter



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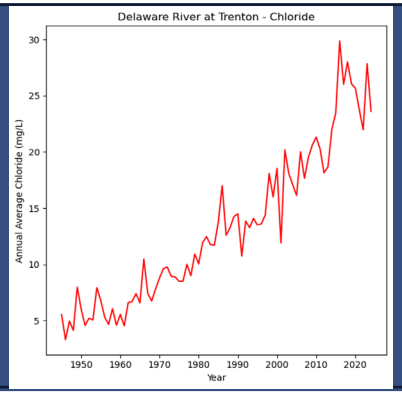
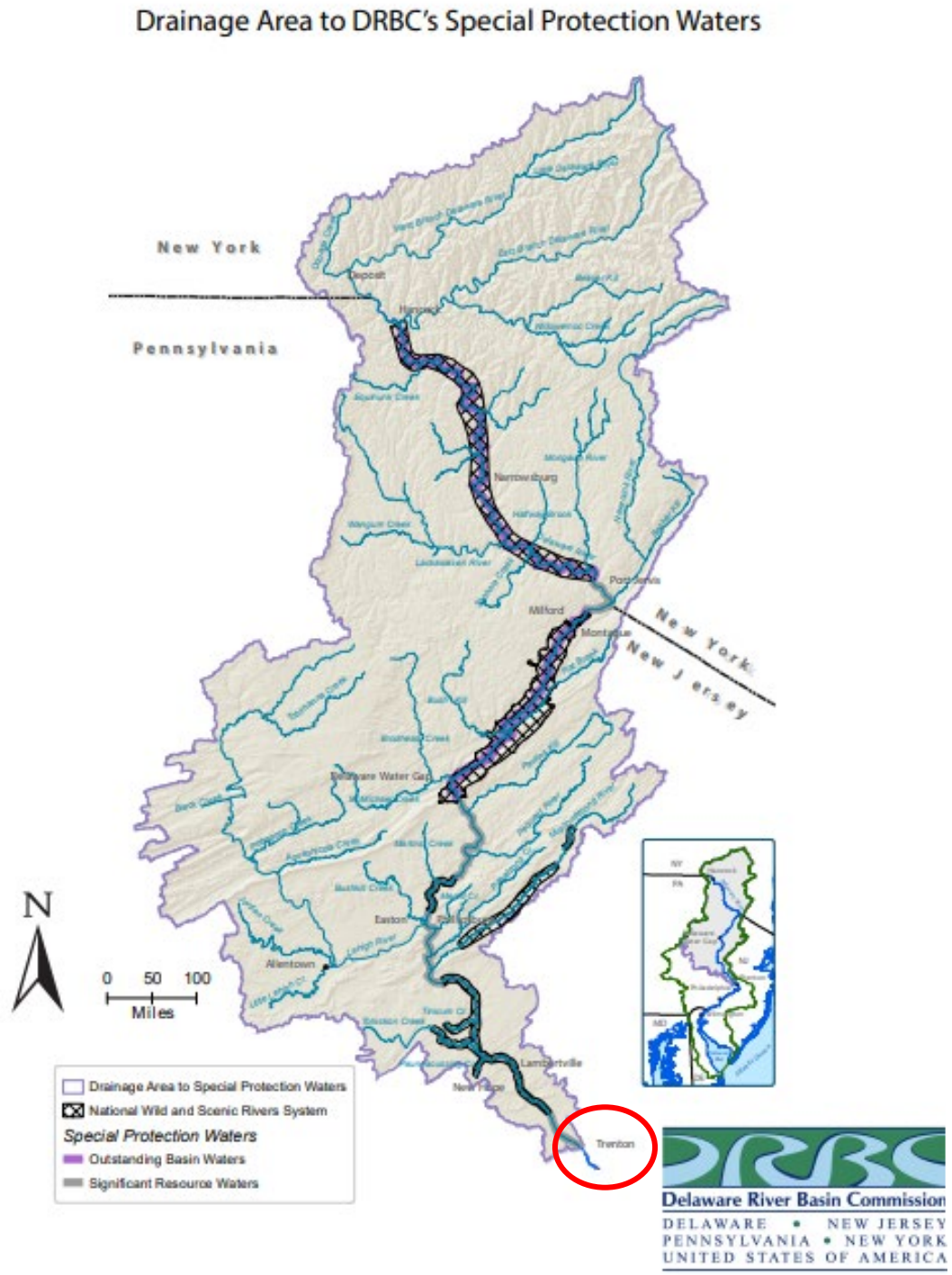
DRBC’s SPW program



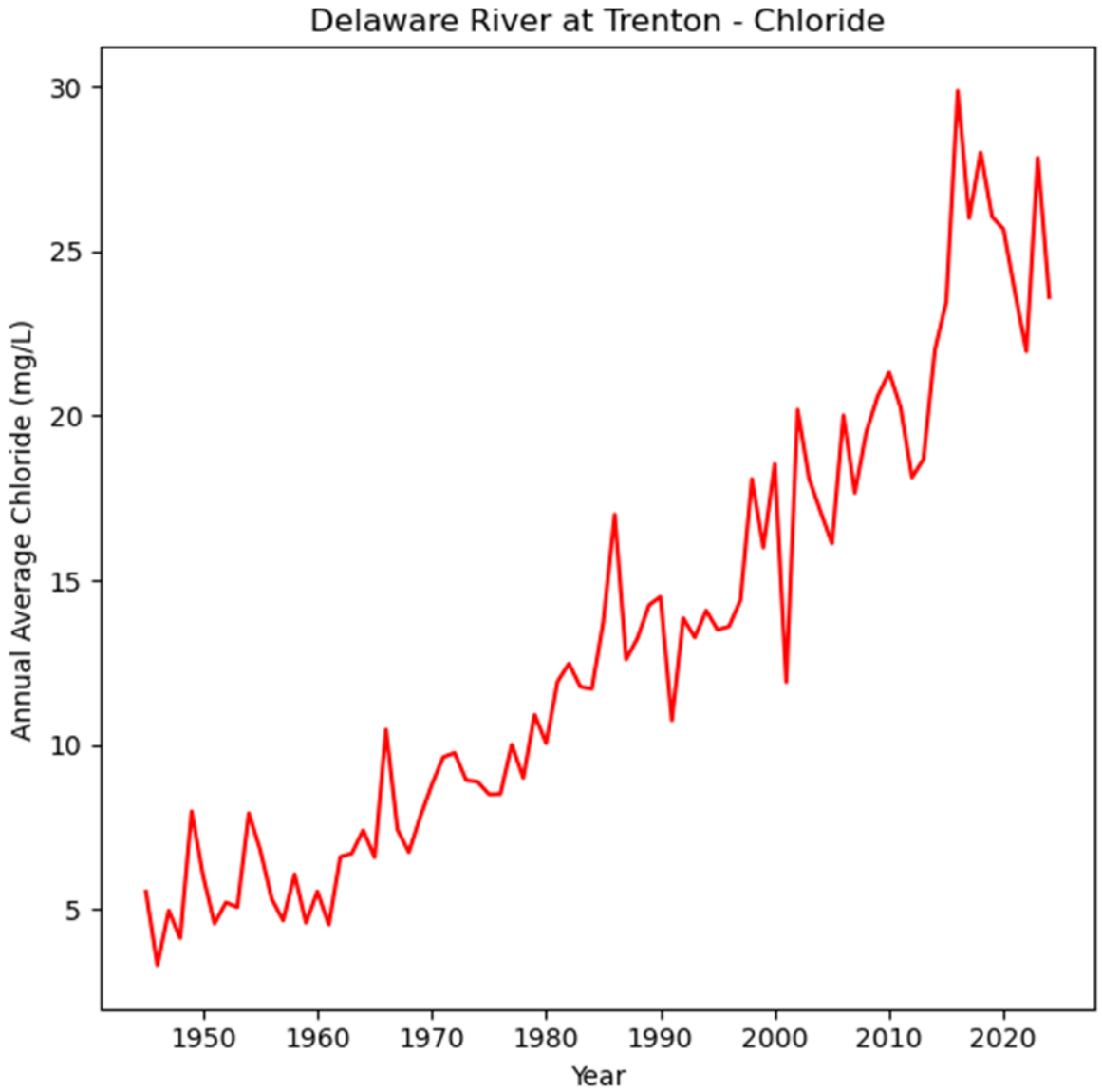
Chloride trends in SPW

Next steps

Downstream Catchment of SPW: Trenton, NJ



Increasing Long-Term Chloride Trend



Data obtained from the Water Quality Portal

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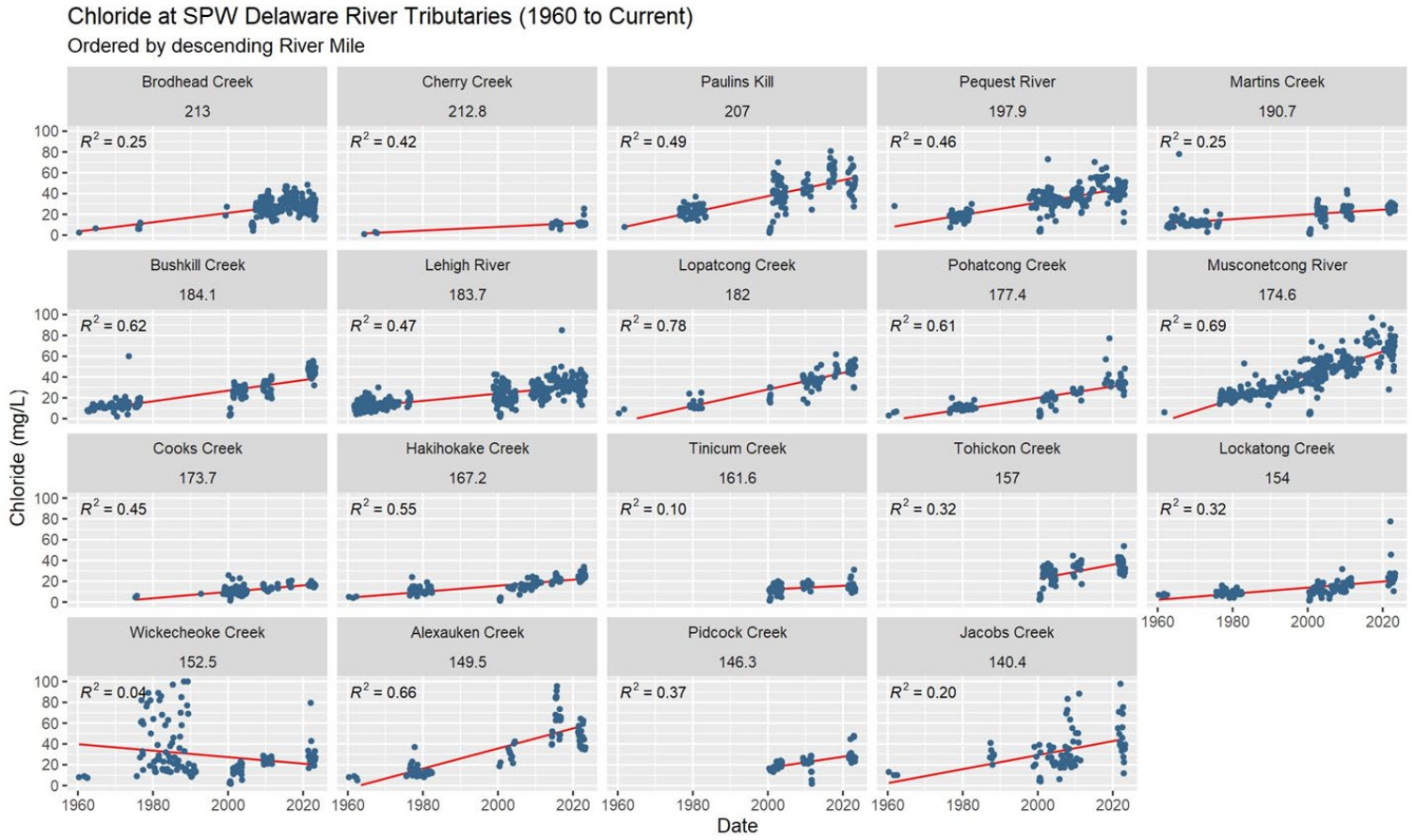
Increasing long-term trend of chloride at tributaries upstream of Trenton



Data obtained from the Water Quality Portal

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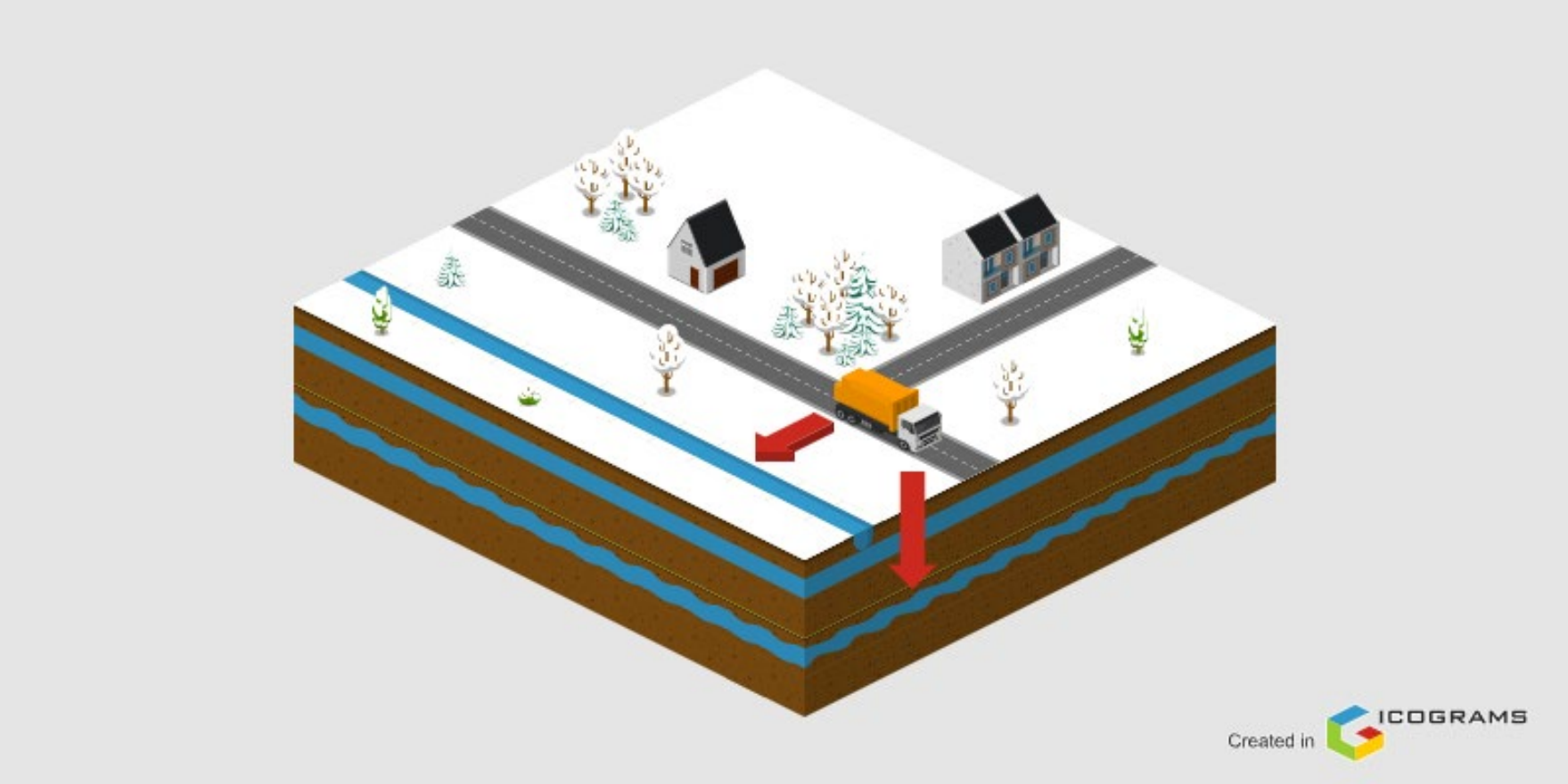
Salt in Groundwater



Transport of applied salts

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Impacts to Groundwater

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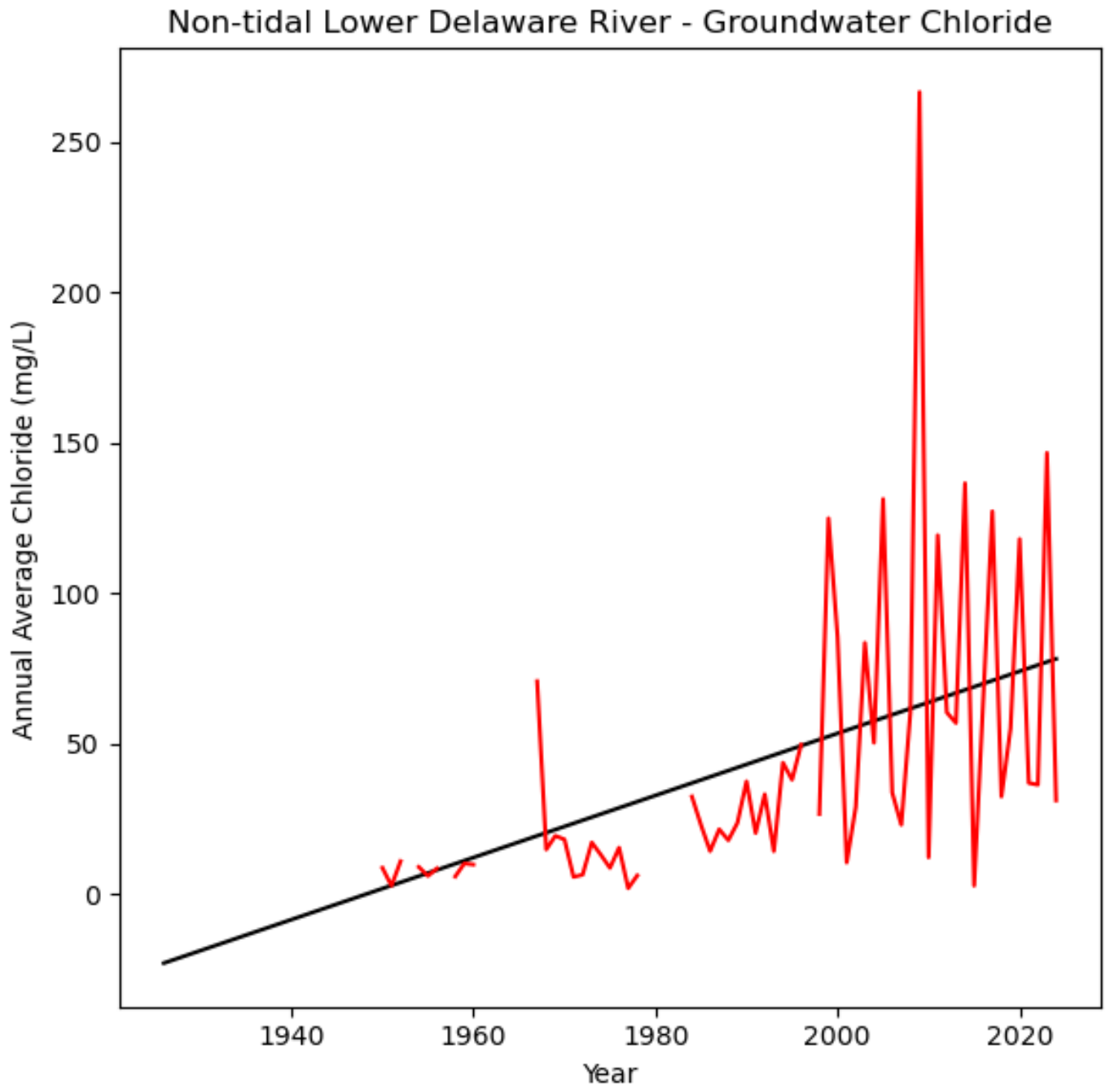
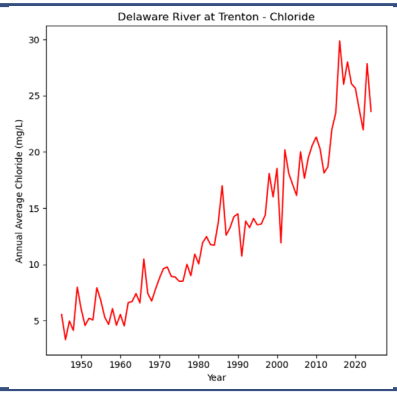


DRBC’s SPW program

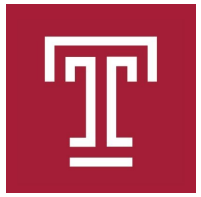


Chloride trends in SPW

Next steps

SIFT (Salinity Impacts Freshwater Toxicity) Workgroup

- Regional workgroup formed through the WQAC by DRBC in late 2022
- Collaboratively *sift* through the escalating issue of freshwater salinization and increasing chlorides in rivers and streams
- Discussions focus on strategies for potential regulatory approaches to address salt pollution



The Basin is located within the “Salt Belt”

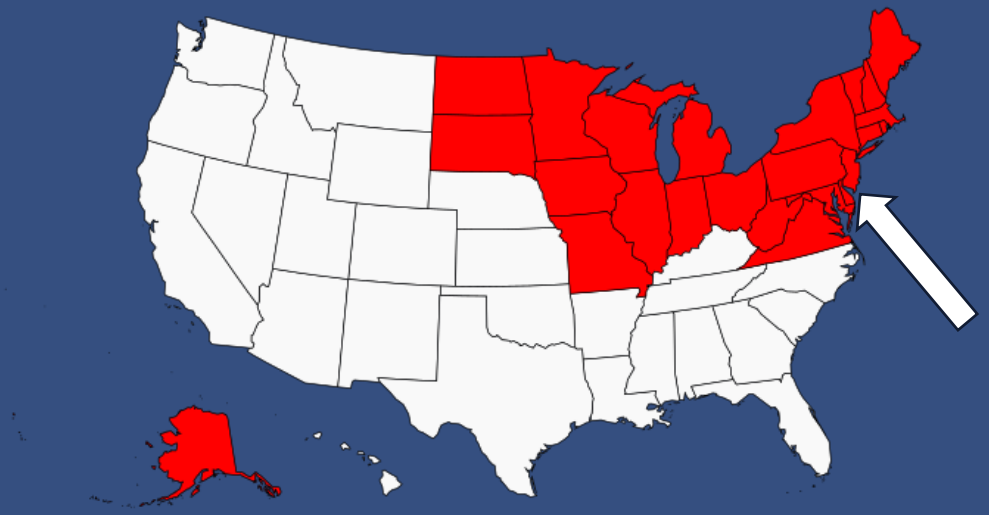


Image: by Randommapmaker, Wikimedia Commons, CC BY-SA 4.0

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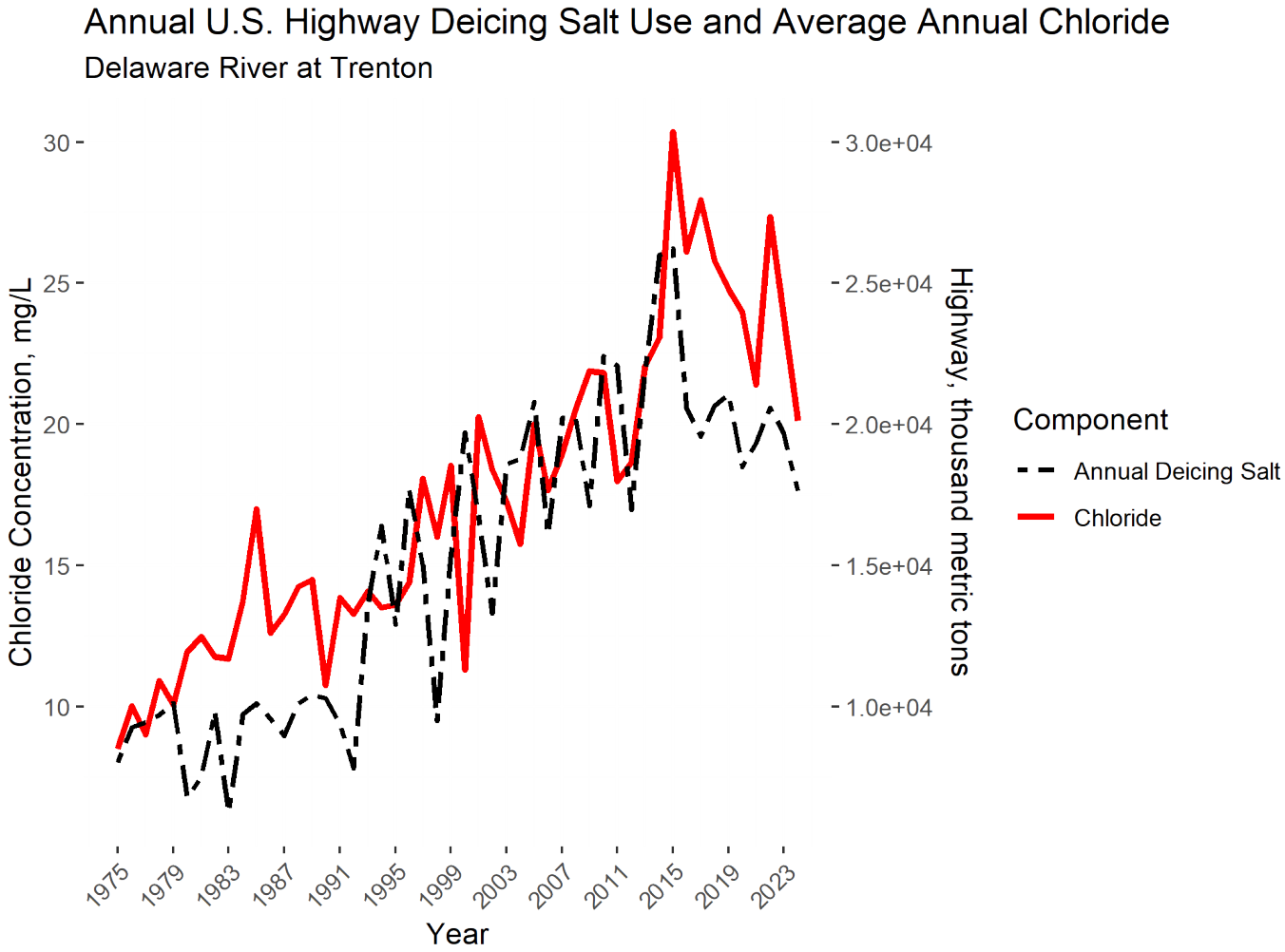

U.S. Highway Deicing Salt Data Source: USGS Mineral Commodity Summaries (1975 – 2024)

Oversalting and Mismanagement

Over-salting

Open salt-pile

Sidewalk pile

Poorly covered pile

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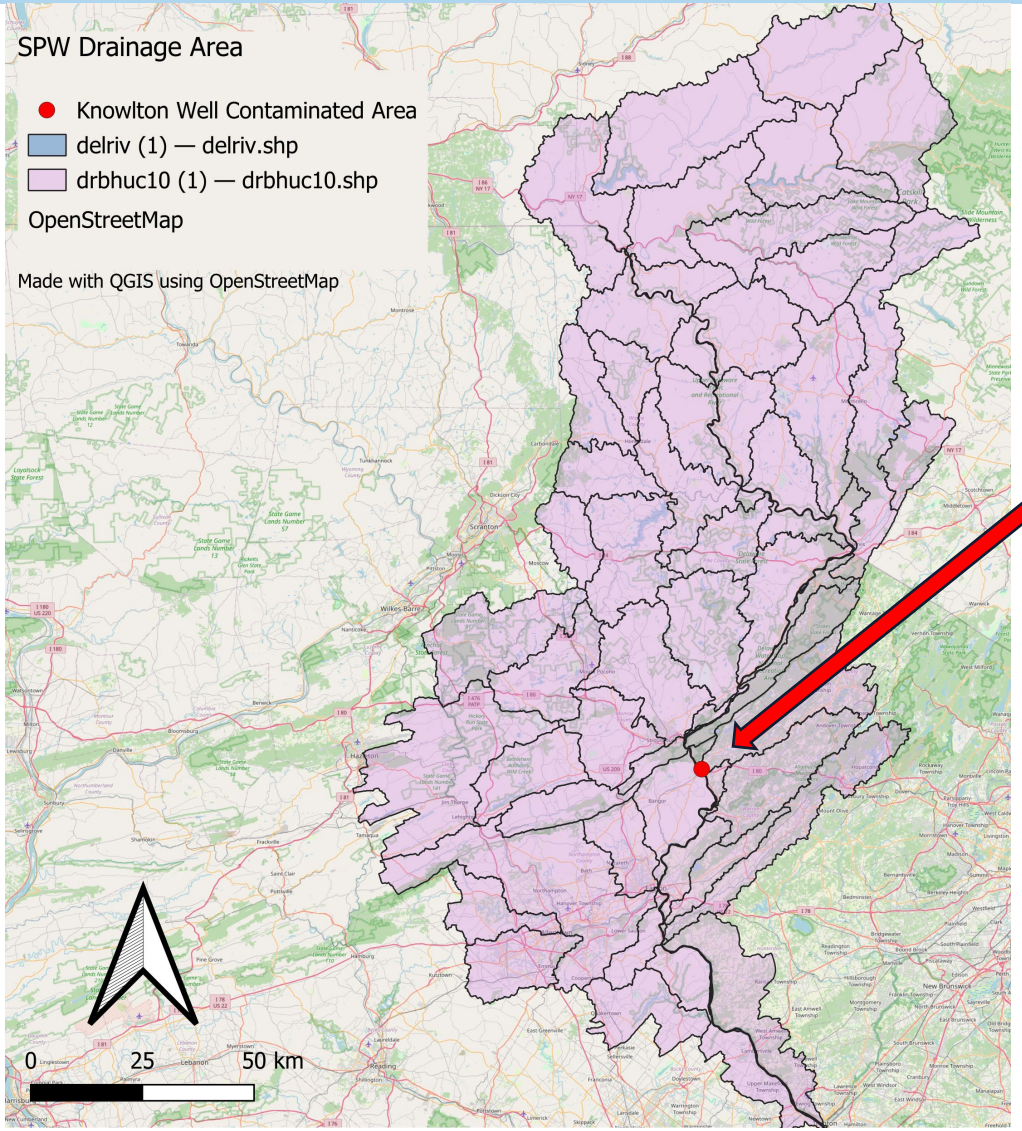
Salt Contamination in SPW



WARREN COUNTY

A town found the source of its contaminated wells: road salt. What's being done about it?

Updated: Feb. 27, 2019, 1:00 p.m. | Published: Feb. 27, 2019, 7:00 a.m.

ENVIRONMENT

Knowlton and Warren County to fund water filtration for Columbia residents

Bruce A Scruton
New Jersey Herald

Published 9:43 a.m. ET Jan. 27, 2023

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SIFT Workgroup lessons learned

- Salt reduction programs are mostly voluntary
- Challenging to get DOTs and other winter salt applicators engaged
- Need to balance public safety and water quality management
  - Other pollutants with societal benefits have been phased out, restricted/banned, or regulated

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DRBC Management Goals

- Reverse increasing trends
  - Act now to prevent the further build-up of chlorides and salts in the environment over time
- Identify and address sources of salt pollution
  - Current target: over-application of winter deicing salts
  - Evaluation of other sources (wastewater discharges, agriculture, food industry)

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How do we start to make headway on this problem?

Pilot study to implement salt reduction measures

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Chloride in the Non-Tidal Delaware: Summary and Next Steps

If your municipality is interested in participating in the pilot study, please reach out!

1) SPW policy is largely effective
   a. Most parameters maintained
   b. Chloride is an exception with a steady upward trend
   c. Subsurface storage likely contributing
2) Trend has implications for drinking water
   a. Elevated chloride in groundwater
   b. Long-term impacts on source water and assimilative capacity
3) Exploring strategies beyond current policy
   a. SIFT workgroup collaboration
   b. Winter salt reduction pilot study under development

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Questions?

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