



Chloride Trends in the Delaware River's Special Protection Waters (SPW)



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	Zone	Tidal Non-Tidal	Major Sources	Status & Trends	Manag Thres	Drinking Water Use?		
	1A			Surface & Ground Water				
	1B			Concentrations Increasing			+	
	1C	Non-tidal	Road De-icing Point Sources	Delaware River at Trenton - Chloride	under Special Pi (SPW/)· NC	rotection Waters		
	1D			Bu 200- proto Disas- proto Disas- proto Disas- proto Disas- proto Disas- proto Disas- proto Disas- proto Disas- proto Disas- proto Disas- proto Disas- Disas	(31 77). 198		•	
2 - Al	1E			5				
	2		Road De-icing Point Sources			Chloride Criteria*	-	
	3	Tidal	Upstream Flow		Salt Front	Chloride & Sodium Criteria* @ RM 98		
Delaware River Basin Commission Delaware • NEW JERSEY PENNSYLVANIA • NEW YORK UNITED STATES OF AMERICA	4	паа		4.0 E537281 Leves, Fadorare 3.77 -6 5.23 mayer 4.0 Extended and the formation of the format	Monitoring			
	5					N/A	N/A	
	6		Ocean Salt	Sea Level Rising				



Salt pollution is rising in freshwater systems



SPW program and goals



Chloride trends in SPW



Addressing the problem

Freshwater is getting saltier nationwide



https://cleanwater.org/2021/09/29/how-salt-gets-environment

Image credit: Ryan Utz, Chatham University. Source: University of Maryland.

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Chloride pollution is rising in freshwater systems



SPW program and goals



Chloride trends in SPW



Addressing the problem

Special Protection Waters Program

- Special Protection Waters (SPW)
 Objective: <u>Antidegradation</u> of Existing Water Quality (EWQ)
- SPW rules cover ~6,780 of the 13,800 mi² DRB watershed (197mile stretch)
- Monitored by DRBC and NPS





Results from Lower Delaware 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 Bo	P)					
	Parameter Site	Del. River at Trenton	Del. River at Washngtn Crossing	Pidcock Creek, PA	Delaware River at Lambrtvile	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 Riegisvil	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
	Dissolved Oxygen (DO) mg/l											2													
ple	Dissolved Oxygen Saturation %											\$													
Fie	pH, units																								
	Water Temperature, degrees C																								
	Ammonia Nitrogen as N, Total mg/l																								
ts	Nitrate + Nitrite as N, Total mg/l																**								
ien	Nitrogen as N, Total (TN) mg/l																**								
lutr	Nitrogen, Kjeldahl, Total (TKN) mg/l																								
Z	Orthophosphate as P, Total mg/l																								
	Phosphorus as P, Total (TP) mg/l																								
eria	Enterococcus colonies/100 ml	~			~																				
acte	Escherichia coli colonies/100 ml	**	**	**	**	**	**			**	**	**													
В	Fecal coliform colonies/100 ml																								
	Alkalinity as CaCO3, Total mg/l																								
als	Hardness as CaCO3, Total mg/l			_					_			~	_	_		_		_	_		_	_			_
ion	hloride, Total mg/l			**		**	**	**	**	**		**	**	**	**	**	**	**	~	**	**	**	**		**
ent	pecific Conductance µmho/cm			**		**	**	~	**	**	**	**	**	**	**	~	**	**	~	~	~	**	~		
NUC	Total Dissolved Solids (TDS) mg/l																								
ŏ	Total Suspended Solids (TSS) mg/l																								
	Turbidity NTU																						$\mathbf{\mathcal{C}}$	^	
	KEY		= No indication o	* No indication of measurable change to EWQ = Indication of measurable water quality change toward more degraded status = We										= Weak indic	ation of mea	asurable wate	er quality cha	Delawa	re River I	Basin Cor	nmission				
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Chloride pollution is rising in

freshwater systems



SPW program and goals



Chloride trends in SPW



Addressing the problem

Non-tidal Drainage Area & SPW (Non-tidal)

Drainage Area to DRBC's Special Protection Waters



Increasing longterm trend of chloride at Trenton



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



Chloride at SPW Delaware River Tributaries (1960 to Current)

Ordered by descending River Mile

Data obtained from the Water Quality Portal



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 to September
- Deployed and maintained continuous conductivity and temperature loggers in 7 tributaries

Non-tidal Chloride Monitoring Sites



Continuous Conductivity Meter Capture Episodic Events





2021 – 2023 results suggest further chloride increases





Chloride pollution is rising in freshwater systems



Special Protection Waters chloride



Chloride trends in SPW



Addressing the problem

The Basin is located within the "Salt Belt"



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



Annual U.S. Highway Deicing Salt Use and Average Annual Chloride Delaware River at Trenton



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

Oversalting and Mismanagement

Over-salting





Sidewalk pile

pile covered Poorly





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



SIFT Workgroup lessons learned

- Salt reduction programs mostly
 voluntary
- Challenging to get DOTs and other winter salt applicators engaged
- Need to balance public safety and water quality management



Next Steps

- Implementation of a pilot study with salt applicators to reduce loadings
- Currently in SPW Monitoring Assessment Period (2023 – 2025)
 - All monitoring parameters will be assessed for measurable changes
- More targeted salt monitoring in nontidal



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Questions?

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