

Water Quality Advisory Committee (WQAC) Chloride Trends

Delaware River Basin Commission

West Trenton, NJ
March 29, 2018



Delaware River Basin Commission

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UNITED STATES OF AMERICA

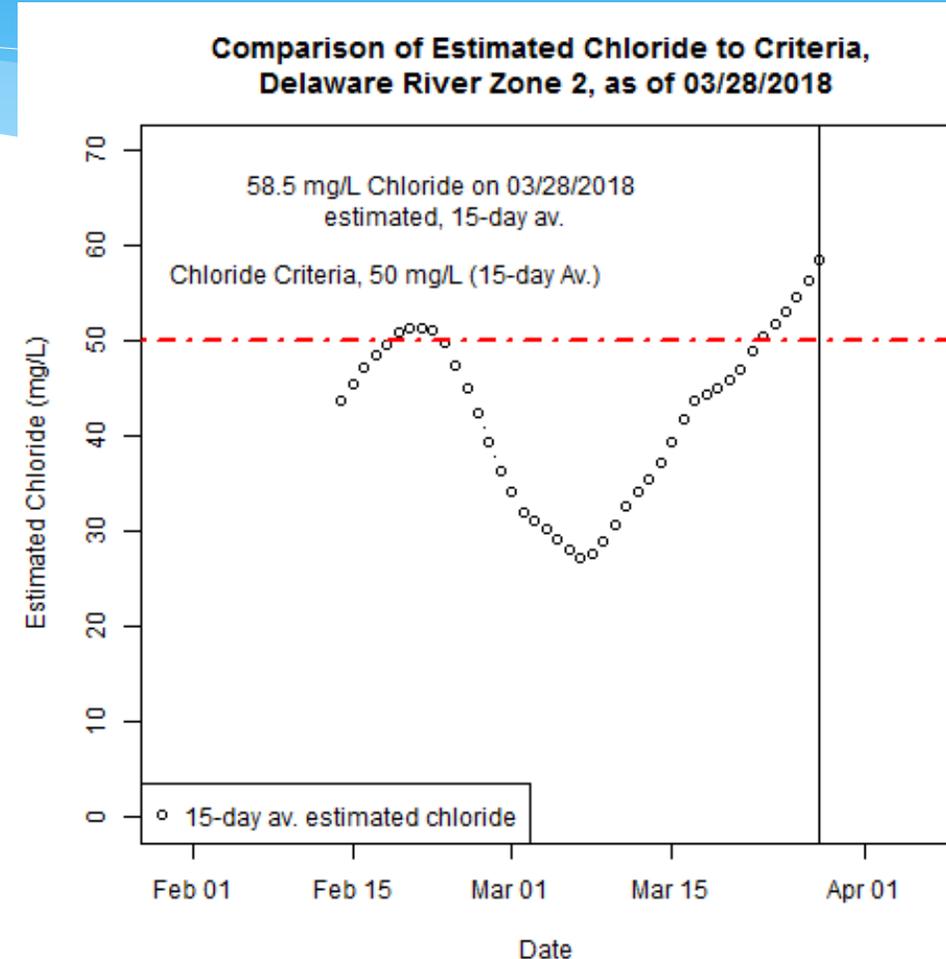


Criteria Exceedances

- * Recent criteria exceedances occurring in Zone 2;
- * Estimated chloride concentrations computed using regression-based calculation.



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Philadelphia Water Department 2007 Study

Philadelphia Water Supply Protection Plan - Delaware River

**Early Warning System
Steering Committee
April 27, 2007**

**Philadelphia Water Department
Office of Watersheds**



Key Findings – Sodium, Chloride, & Conductivity

Increasing since 1975 at:

Montague, NJ
Portland, PA
Lumberville, PA
Trenton, NJ

In <100 years, sodium will exceed 20 mg/L
at Trenton, NJ



Special Protection Waters Lower Delaware Measurable Change Assessment

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 Lambtrvle	Wickecheoke Creek, NJ	Locketong Creek, NJ	Delaware River at Bulls Island	Paunacussing Creek, PA	Tohickon Creek, PA	Tinicum Creek, PA	Nishisakawick Creek, NJ	Del. River at Milford	Cooks Creek, PA	Musconetcong River, NJ	Del. River at Rieglsvl	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																								
Conventional	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 change toward more degraded status											

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Special Protection Waters Lower Delaware Measurable Change Assessment

- * Existing Water Quality period (2000-2004) vs. Assessment Period (2009-2011);
 - * Non-tidal Delaware River;
 - * Evaluated data at 24 sites in the Lower Delaware River (Portland, PA to Trenton, NJ);
 - * At a majority of locations, specific conductance and chloride data has been determined to be significantly different between the Existing Water Quality period and Assessment Period (increasing concentrations);
 - * Unclear about the exact reasoning, but suspected to partially be a road salt issue.

USGS Long-Term Water Quality Trend Study

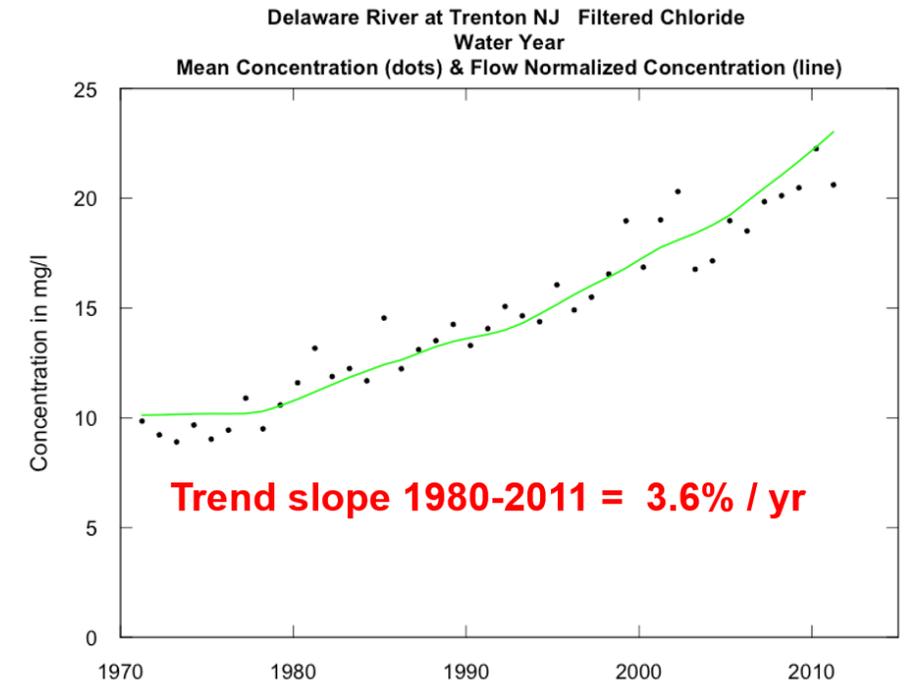


Trends in the quality of water in the streams in New Jersey over water years 1971-2011

In cooperation with the New Jersey Department of Environmental Protection (NJDEP) and the Delaware River Basin Commission (DRBC)

R.E. Hickman and R. M. Hirsch

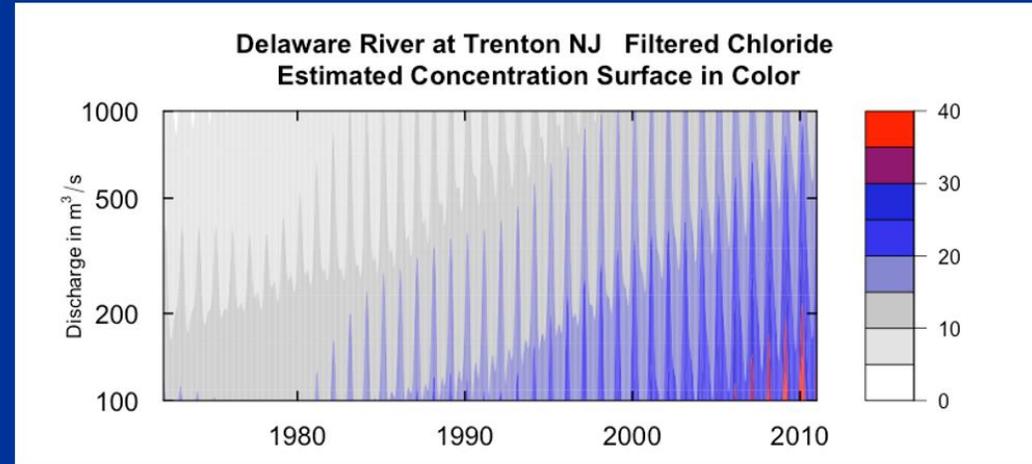
U.S. Department of the Interior
U.S. Geological Survey



USGS Long-Term Water Quality Trend Study

- * Long-term USGS NAWQA data indicates increasing concentrations of chloride at the Delaware River at Trenton, NJ;
- * Increases occur year-round.

An example of a WRTDS model



Note: it isn't just increasing in the winter

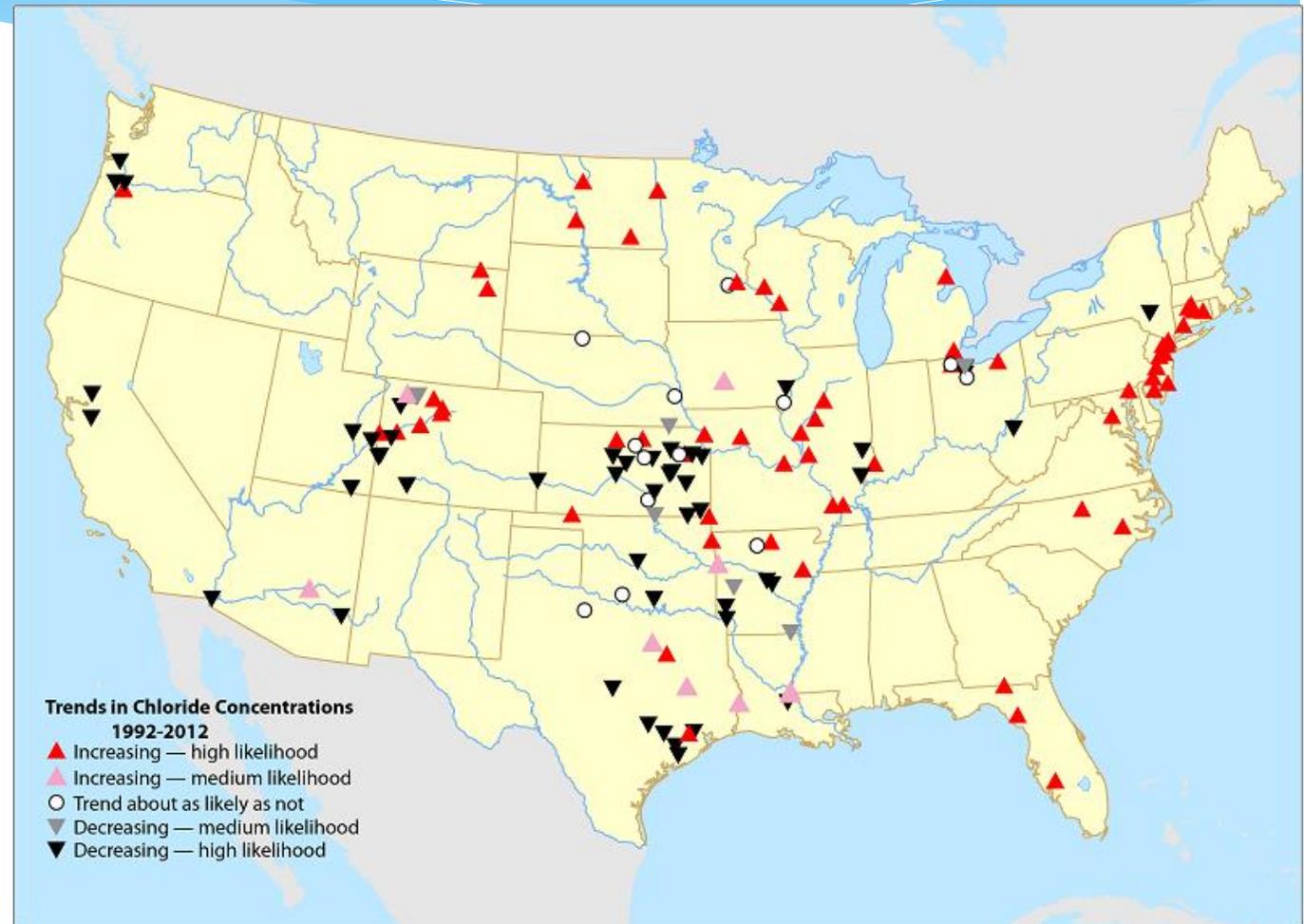


USGS National Water Quality Assessment (NAWQA) Project

- * Increasing salinity contributes to corrosion in water distribution systems;
- * Most notable in snow-affected urban areas in the northern U.S., but the study also reported increasing trends in urban areas with little snowfall;
 - * May be linked to wastewater discharge or septic systems.
- * DRBC water quality criteria of 50 mg/L (maximum 15-day average) for chloride in Zone 2;
- * DRBC water quality criteria of 180 mg/L (maximum 30-day average) for chloride and 100 mg/L (maximum 30-day average) for sodium in Zone 3 at river mile 98.



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https://water.usgs.gov/nawqa/home_maps/chloride_rivers.html

Next Steps

- * Increases in chloride concentration and specific conductance is not just a Delaware River Basin problem, but a national issue;
 - * Likely associated with road-salt application, but other sources/reasons should be assessed;
- * What can be done about it?
 - * A subcommittee could be formed to address the complex issues related to increasing chloride concentrations;
 - * Address data gaps;
 - * Generate discussion among groups and agencies;
 - * Inspire research on the topic.