

# Freshwater Salinization: A Water Utility Perspective

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DRBC Subcommittee on Source Water Protection  
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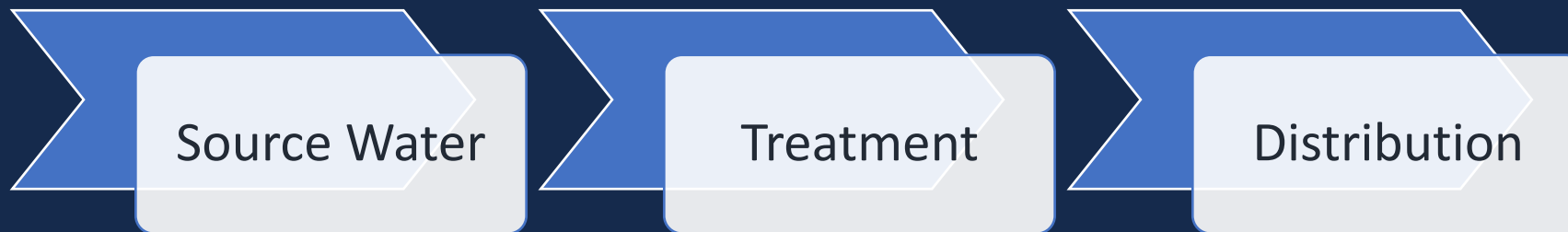
**PHILADELPHIA**  
**WATER**  
— DEPARTMENT —

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# Salt in the Water Supply

- What are we talking about?
  - Salinity, salt, chloride, sodium, TDS, freshwater salinization syndrome
- What are the challenges?
  - Source water (Clean Water Act)
  - Drinking water (Safe Drinking Water Act)
  - Infrastructure and distribution system impacts
- What are we *not* talking about (today)?
  - Ocean salt, the salt line, salinity intrusion, sea level rise



# PWD System Overview

## 3 drinking water treatment plants

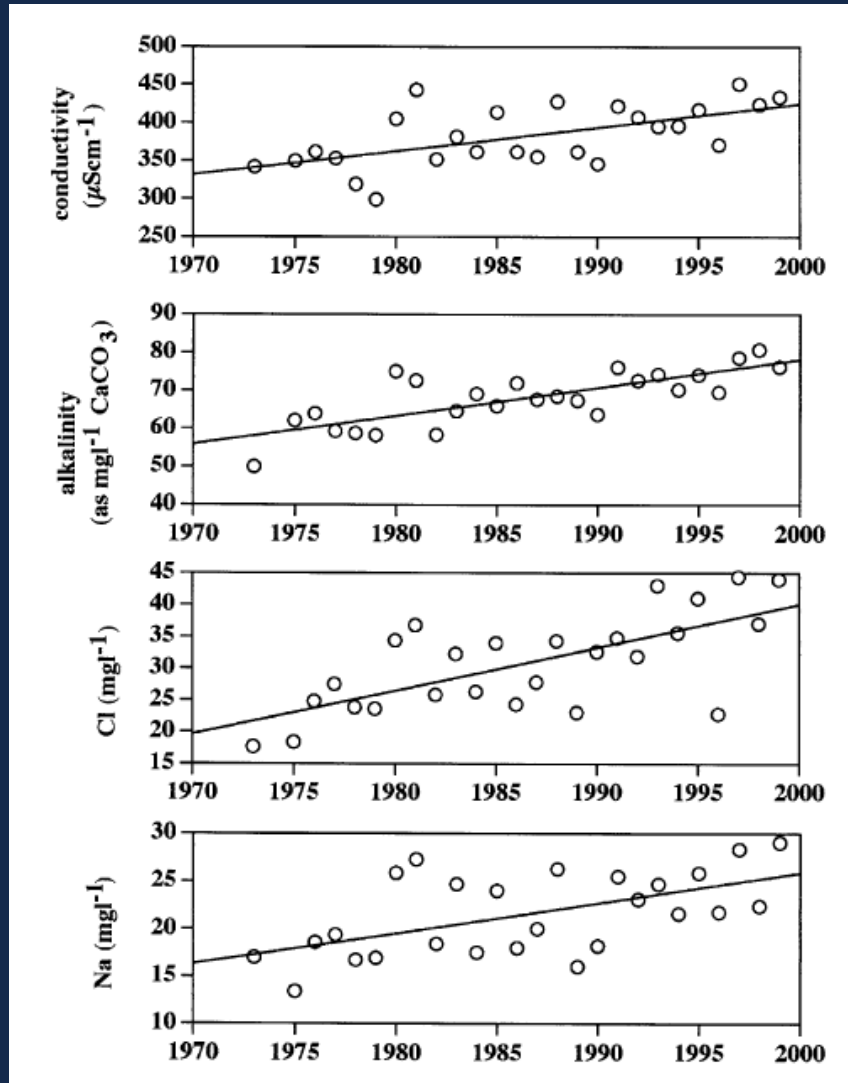
- Do not remove sodium, chloride, TDS
- One plant is tidally affected (Baxter)
- Downstream of many sources

## 3 wastewater treatment plants

- Receivers and dischargers of sodium, chloride, TDS



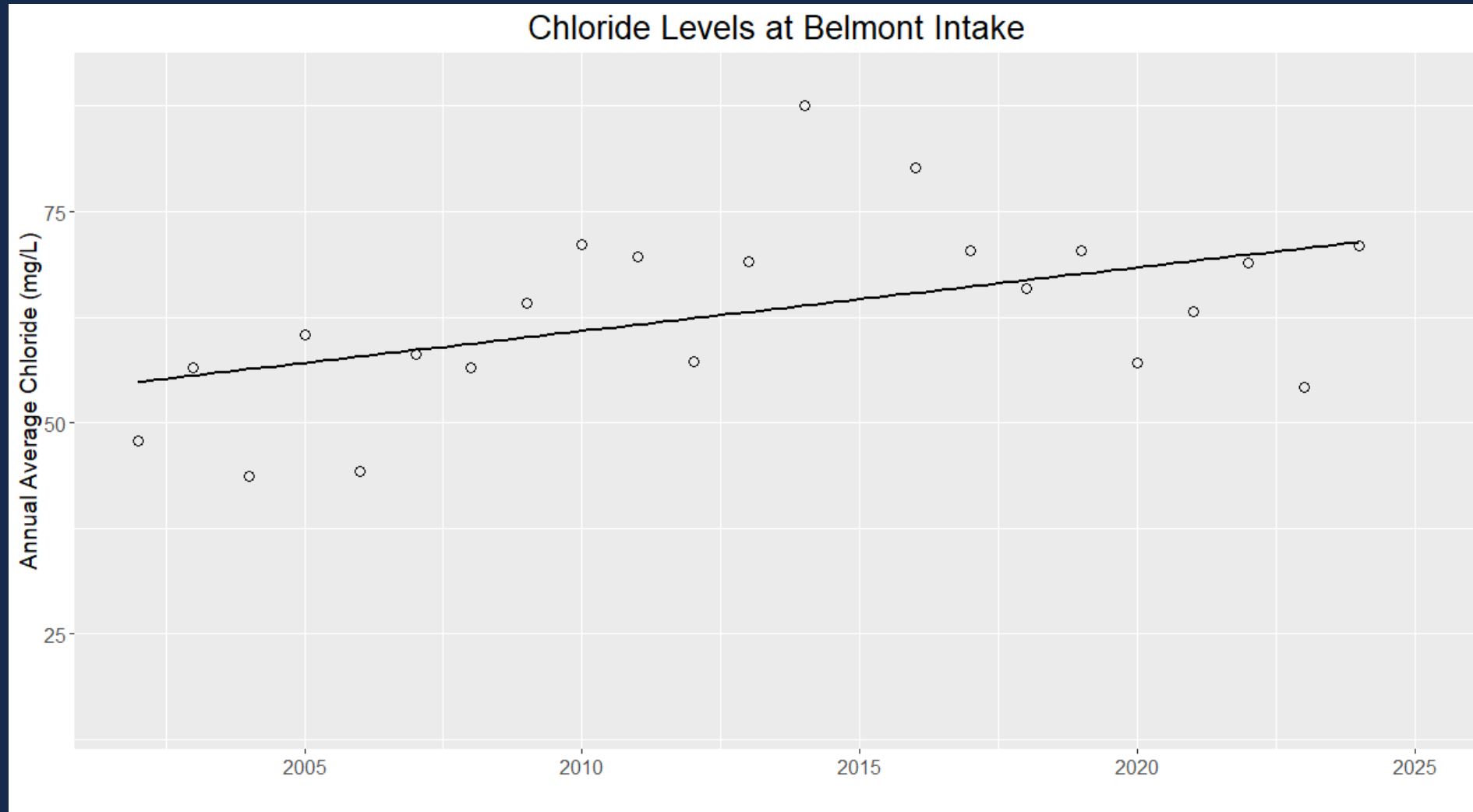
# Decades of data and trends



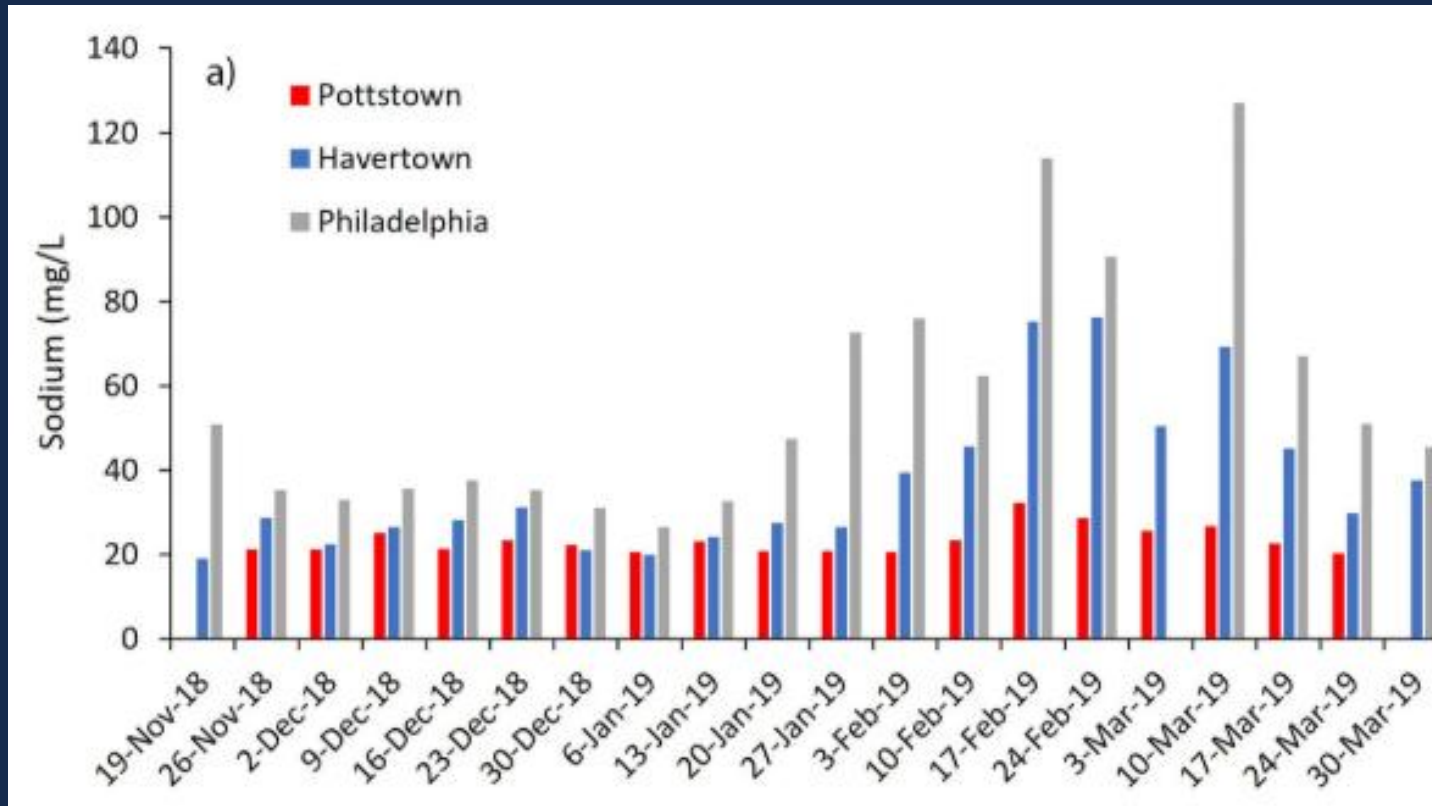
Interlandi and Crockett, 2002

- What is the tipping point?
- *When* is the tipping point?
- Long-term infrastructure planning in a short-term world

# Source Water Quality



# Finished Water Quality

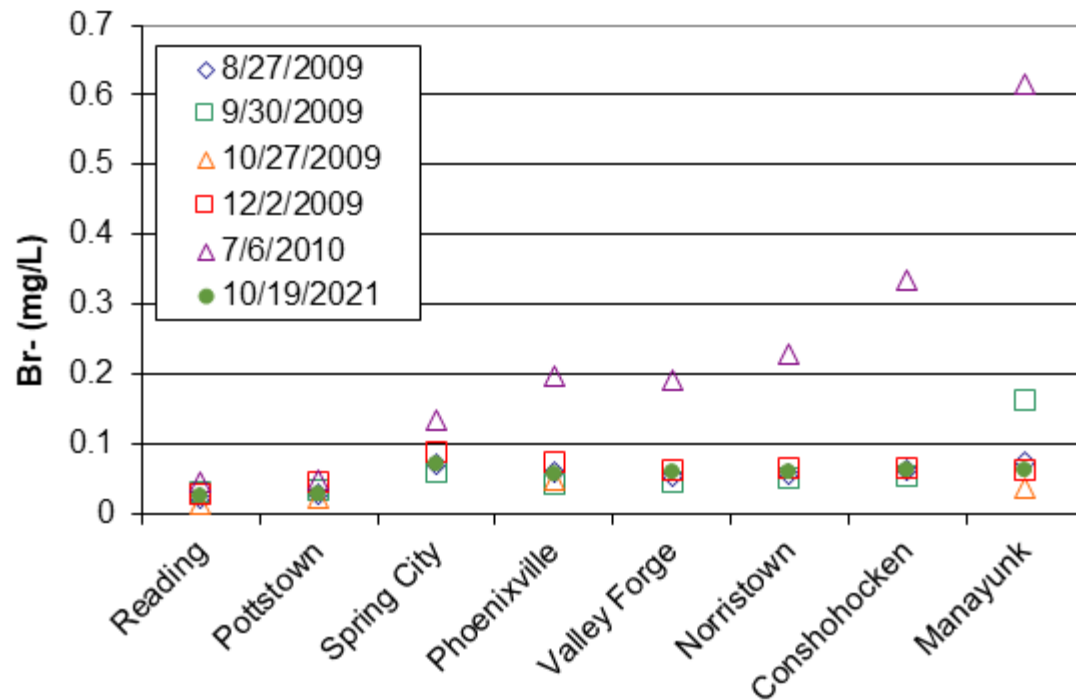


Cruz, Rossi, Goldsmith (2022)

- Samples from customer taps
- Three different water utilities
  - 2 surface water (Schuylkill)
  - 1 surface water (Schuylkill) and groundwater mix
- Winter road salt spikes
- Well above EPA recommendations for sodium in drinking water

# Disinfectant Byproducts (DBPs)

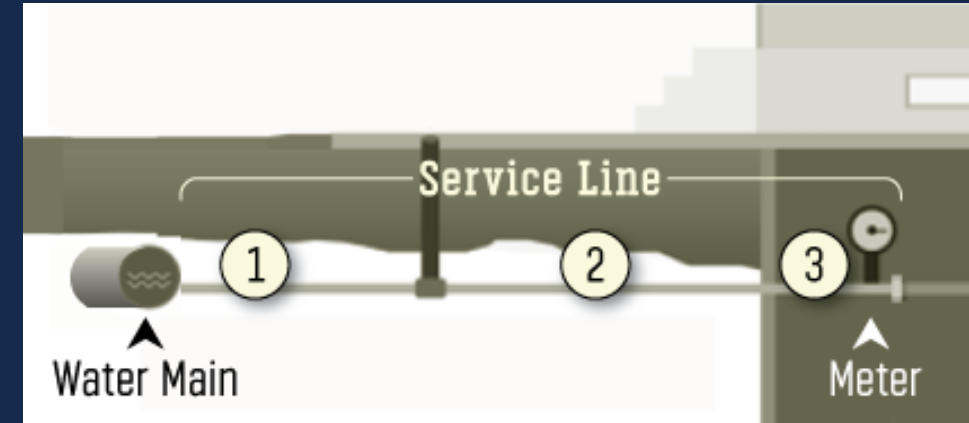
Fig. 1. Schuylkill River Bromide in 2009, 2010, 2021



- Disinfectants used to treat drinking water react with organic matter to form DBPs
  - Regulated by EPA
  - Linked to cancer in laboratory animals
- Preferred strategy is to remove or limit DBP precursors
  - TOC/NOM measured via UV254
  - Bromide
- Bromide is more of a concern for PWD than chloride
  - The priority source of concern for this is ocean salt

# Corrosion and Pipe Scale

- CSMR: Chloride to sulfate mass ratio
  - Useful in predicting corrosion and leaching in lead pipes
  - PWD's CSMR is high due to ferric chloride use as a coagulant
  - However, lead levels remain low – most service lines are copper or plastic
- Pitting and pinhole leaks with copper pipe is possible
- Galvanized steel service lines






# PWD Actions

- Monitor trends and correlations
  - Conductance/Chloride relationships
  - Winter surface water quality monitoring to capture road salt events
- Public messaging
  - In-city residential and commercial guidelines for deicing
  - Web and social media content for Philadelphia residents about responsible deicing

Site Description	Survey Date	Conductivity (µS/cm)
Belmont Intake	1/17/2025	629
Queen Lane Intake	1/17/2025	665
	1/27/2025	790
Wiss-Schuylkill confluence (Canoe Club)	1/17/2025	638
	1/27/2025	780
Manayunk Canal-Schuylkill confluence	1/17/2025	1062
	1/27/2025	1435
Flat Rock Dam Park	1/17/2025	261
	1/27/2025	843
Wissahickon at Fort Washington State Park	1/17/2025	1215
	1/27/2025	1409



# Upstream Collaboration




**Salt is a problem in the Tookany-Tacony/Frankford watershed**

- Most TTF streams are contaminated with salt
- Salt levels in local streams are 10-30 times higher than natural levels, even in the summer. During winter storms, levels rise to 50-100 times higher than natural (TTF and USGS)

**SAVE OUR STREAMS FROM ROAD SALT**

 Tookany-Tacony-Frankford Watershed Partnership, Inc.  STROUD WATER RESEARCH CENTER

 The amount of salt in TTF streams is shocking

**11,000+ TONS**  
of salt applied by humans  
flow through the watershed every year

=

**30+ TONS PER DAY**

- Support upstream partners
  - Address salt like other nonpoint issues e.g., *cryptosporidium*
  - Leverage existing partnerships e.g., Schuylkill Action Network
- Explore nontraditional BMPs for salt management
  - Land-based practices
  - Streets Dept./DOT