

# OPTIMIZING WINTER SALT MANAGEMENT

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Karl Berger, COG staff

CBPC Meeting  
Nov. 20, 2020



Metropolitan Washington  
Council of Governments

# What is Freshwater Salinization Syndrome

- Salinity -- the amount of salt in many rivers, streams, lakes and reservoirs – has been increasing for decades due to man-made impacts
- Increased use of road salt is the main culprit, but not the only cause
- Sodium and chloride are two of the major ions, but there are others (Mg, K, Ca)

NATIONAL GEOGRAPHIC



General view of the Flint River as it passes through downtown on March 17, 2016 in Flint, Michigan.  
PHOTOGRAPH BY BRETT CARLSEN, GETTY IMAGES

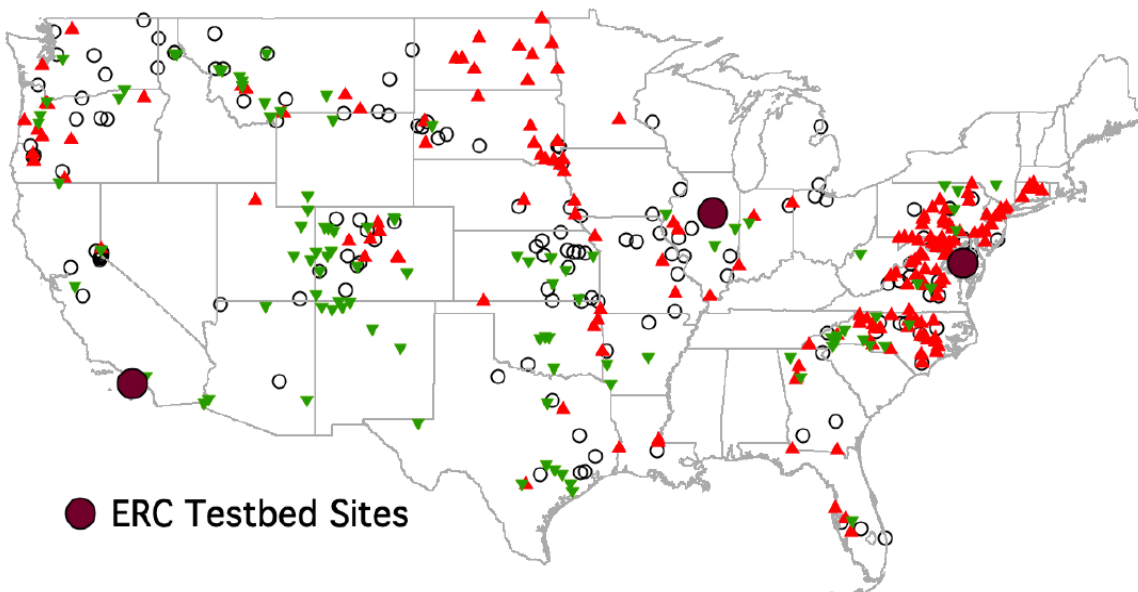
## North America's Waterways are Getting Saltier. That's a Big Problem.

A salty chemical cocktail could make rivers and streams more corrosive, leading to dangerous effects.

BY ELAINA ZACHOS



PUBLISHED JANUARY 9, 2018



● ERC Testbed Sites

Trends in Stream Specific Conductance:

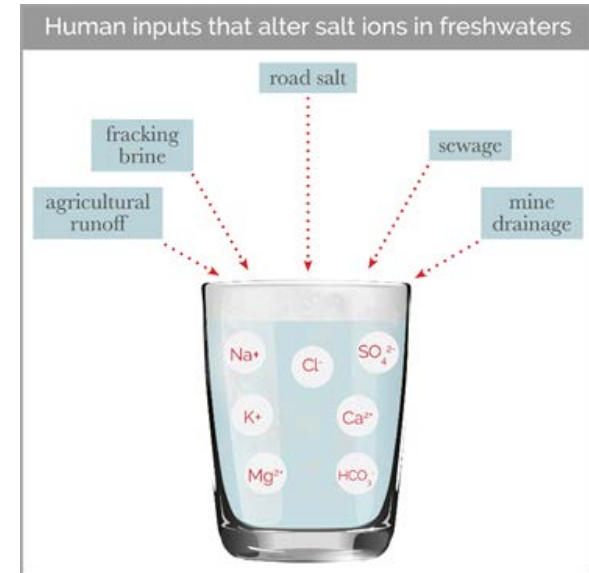
▲ Increasing ( $p < 0.1$ ) ▼ Decreasing ( $p < 0.1$ ) ○ No Trend



# Freshwater Salinization Syndrome (FSS)

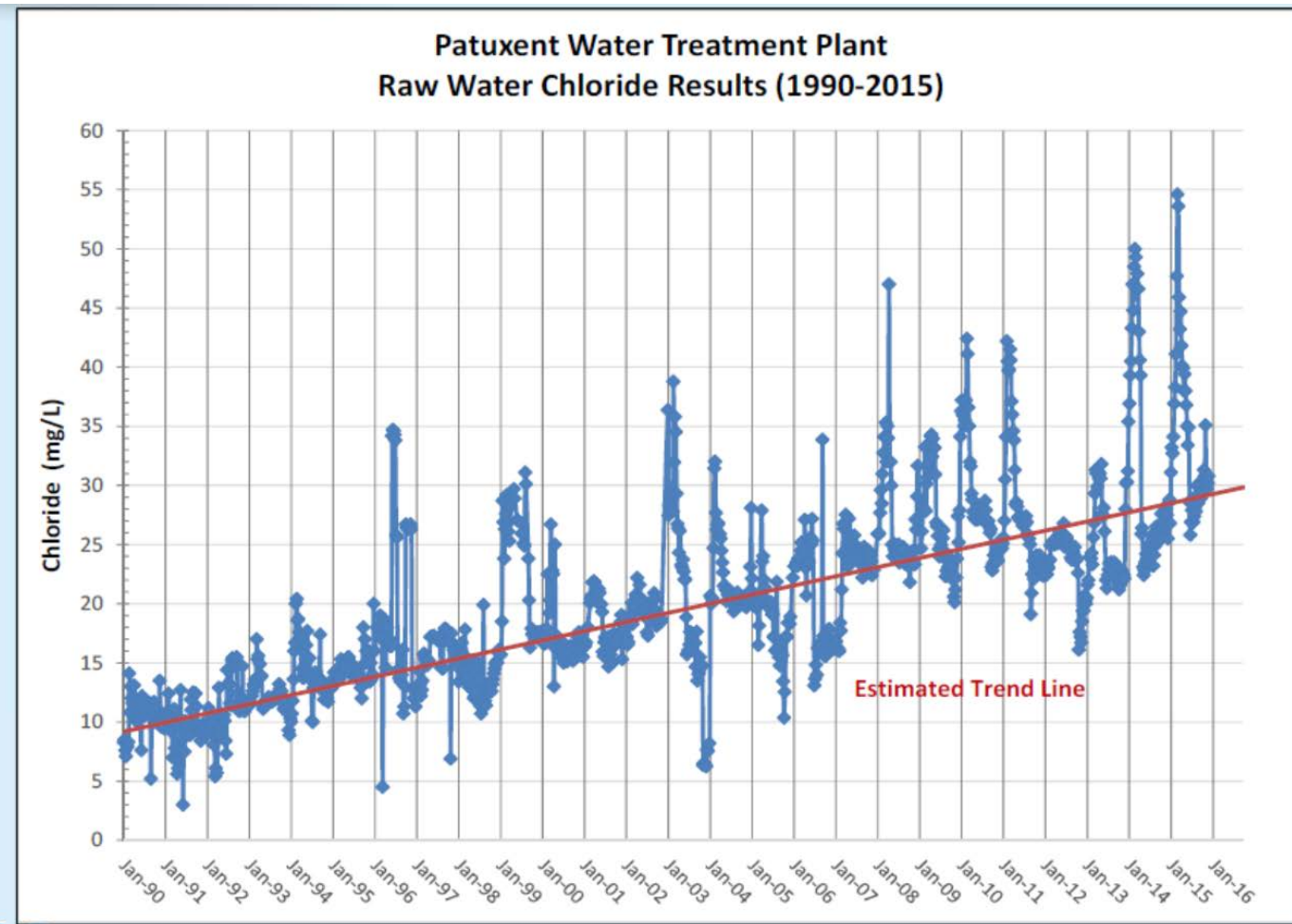
## Why Do We Care

- Drinking water/ human health concerns (both wells and reservoirs)
- Harm to aquatic ecosystems
- Damage to infrastructure
- Increased corrosivity in pipes and home appliances
- Impairs stormwater management functions
- Harms roadside vegetation
- Mobilizes heavy metals and radionuclides in surface and groundwater



L. Quillen (2018) FSS Press Release

# FSS: A Local Example

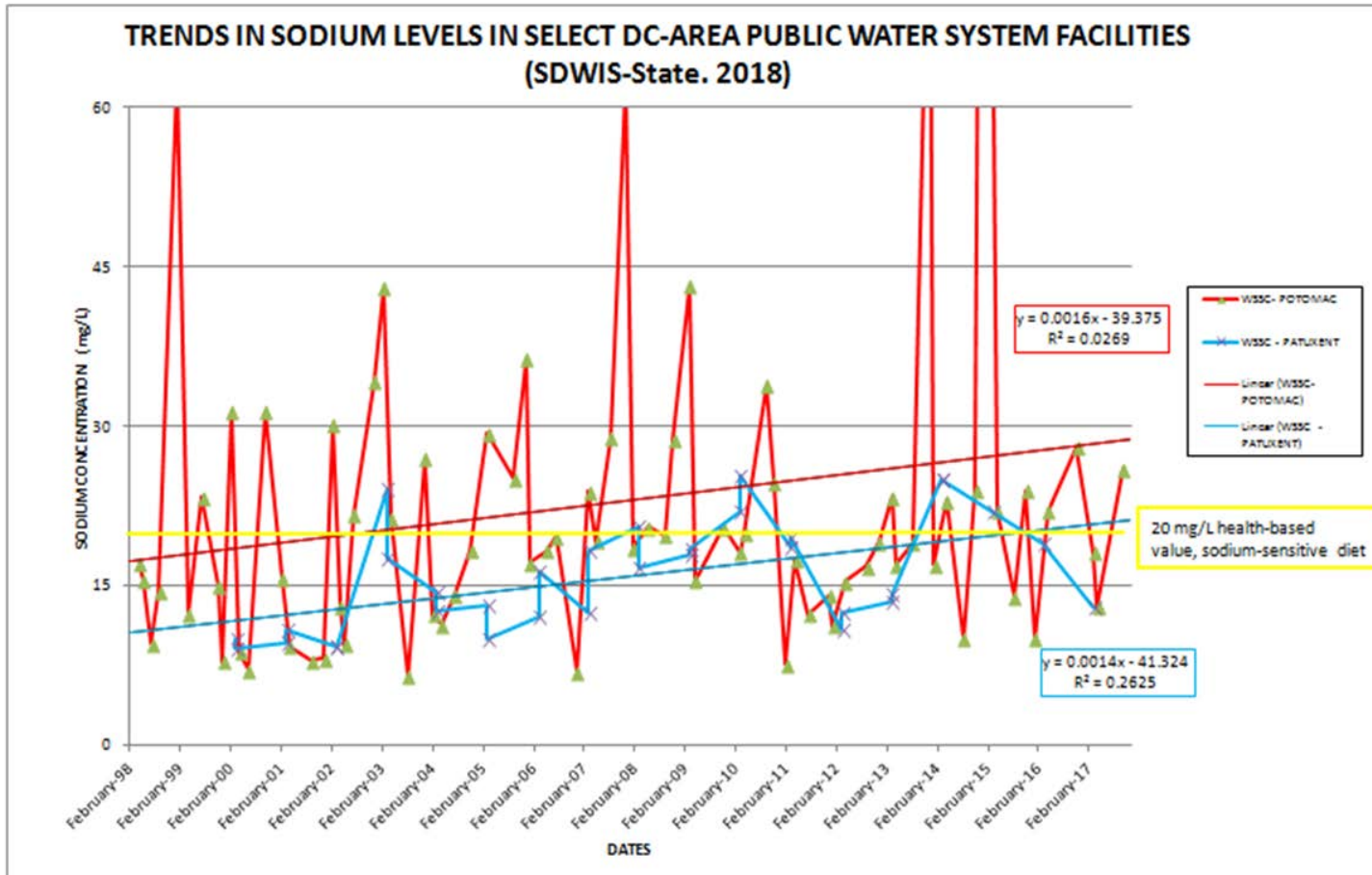


## Chloride in the Patuxent Reservoir

From Jin Shen,  
WSSC,  
presentation at  
Salt  
Management in  
the Washington  
Region, June  
27, 2016



# FSS: Another Local Example



Sodium in the Potomac River and Patuxent Reservoir

Slide courtesy of MDE



# COG Technical Work Priority

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- Salinization new focus of COG's monitoring program
  - Previous COG monitoring focused on nutrients and sediment in the Potomac
  - In 2019, COG's Water Resources Technical Committee chose salinization as the new monitoring focus over two other pressing issues (nitrogen fate and transport, bacteria source tracking)
- In 2020, COG initiated new project to address issue with 3 partners
  - Va Tech's Occoquan Watershed Monitoring Laboratory
  - U. S. Geological Survey
  - University of Maryland's Earth System Science Interdisciplinary Center

# COG Salinization Monitoring Project

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- Joint Effort of OWML, USGS and U MD begun in 2020
- Long-term Project (envision 10 -15 years)
  - Conducted in phases
  - Overseen by Technical Advisory Committee
- Goals
  - Measure Long-term Trends
    - Are mitigation efforts working?
    - How much of impact due to road salt, how much to other sources?
  - Collaborate with other initiatives
    - MDE, DEQ mitigation efforts
    - OWML's National Science Foundation grant

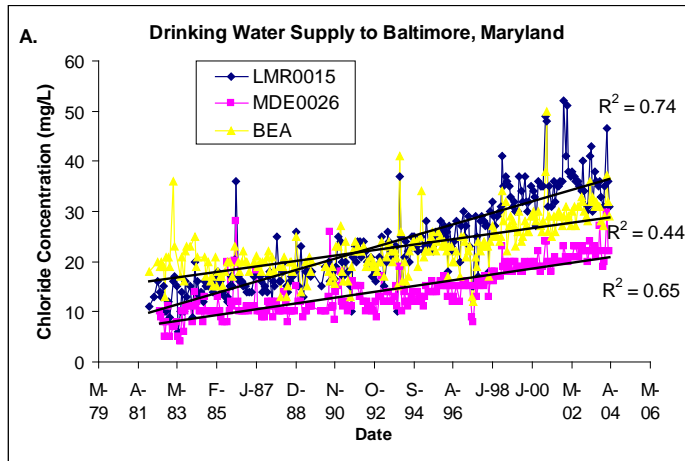
# OWML Salinization Monitoring Project

- OWML received a NSF grant for \$3.6 million over 5 years, starting in fall 2020
  - One of NSF's "Ten Big Ideas"
  - Virginia Tech, University of Maryland, North Carolina State University, Vanderbilt University
- Focus on salt management in the Occoquan Watershed
  - Phase I: Contribution of UOSA to Occoquan Reservoir salt budget
  - Phase II: Contribution of watershed to Occoquan Reservoir salt budget
- Also seeking another NSF Engineering Research Center grant of \$50M over 10 years

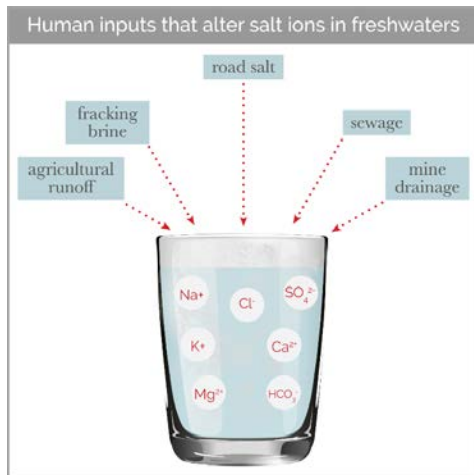
NATIONAL SCIENCE FOUNDATION	
Award Notice	
Award Number (FAIN): 2021015	Amendment Number: 000
Managing Division Abbreviation: OIA	
AWARDEE INFORMATION	
Award Recipient: Virginia Polytechnic Institute and State University	
Awardee Address: Sponsored Programs 0170 300 Turner Street NW, Suite 4200 Blacksburg, VA 240610001	
Official Awardee Email Address: nsfawards@vt.edu	
Unique Entity Identifier (DUNS ID): 003137015	



# Extra Slides



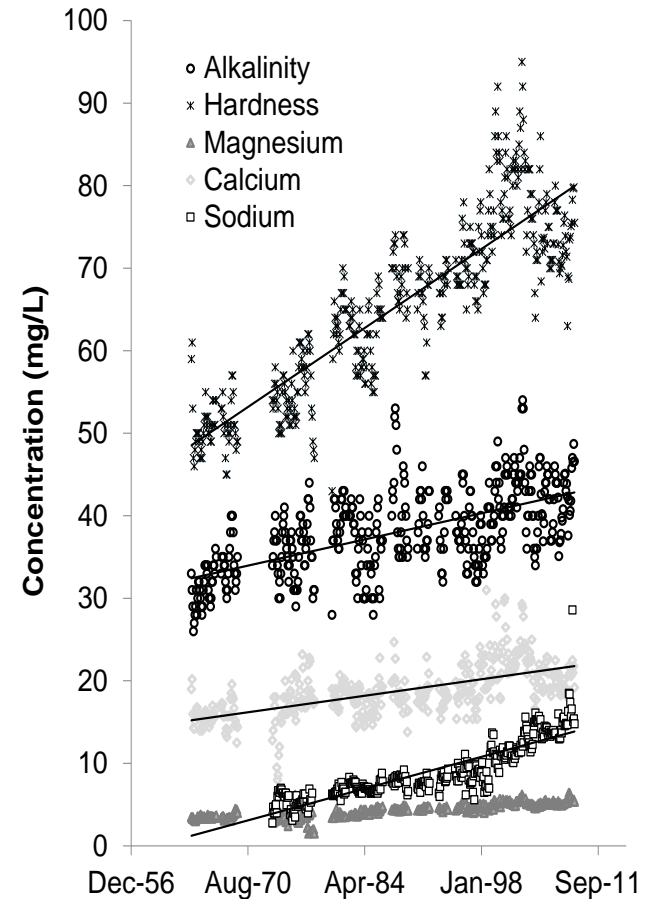
Kaushal et al. (2005) *PNAS*



L. Quillen (2018) FSS Press Release

# 1. Freshwater Salinization – Why Care?

*Drinking Water, Infrastructure, Aquatic Life, etc.*



Kaushal et al. (2017) *Appl. Geochem*

# Karl's Big-Picture Research Questions

- If nothing is done, in ten years from now what does the FSS look like across the region?
- We're right at the beginning of mitigation efforts for salt, can we discern their impact over time?
- If we get a handle on road salts, how much of the FSS is a road salt issue as opposed to other sources (wastewater plants, erosion of the built environment, septic systems...)?

# National trends in [Cl<sup>-</sup>] in groundwater

