

# WELCOME!

## Monthly EnviroDIY in the DRB User Group Meeting

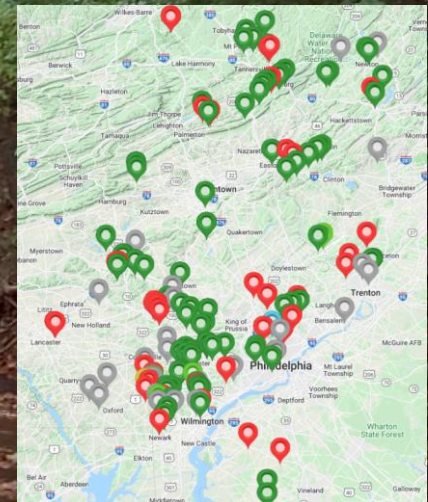
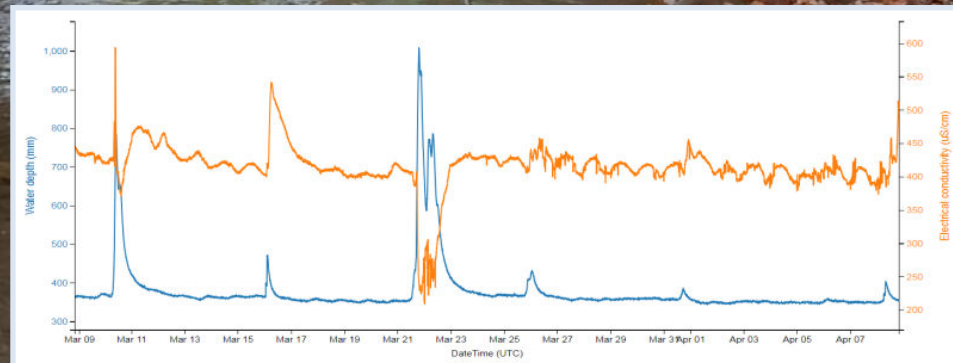
*Online, Thursday, October 20, 2022, 2:30-3:30p*



EnviroDIY



Monitor My Watershed®



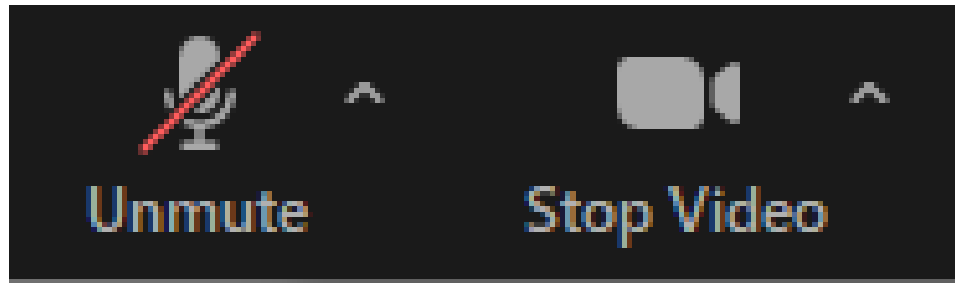
STROUD  
WATER RESEARCH CENTER



# Zoom Orientation



**\*Meeting is being recorded**



**\*Mute unless asking question**



# These Monthly Meetings

Recordings available at: <https://wikiwatershed.org/drwi/>

YouTube

Search

**WELCOME!**  
**Monthly EnviroDIY-DRWI User Group Meeting**  
*Online, Thursday February 17, 2021, 2:30-3:30p*

EnviroDIY

Monitor My Watershed®

STROUD

February 2022 EnviroDIY-DRWI Monthly Meeting

24 views • Feb 17, 2022

1 DISLIKE SHARE SAVE ...

Stroud Water Research Center Videos  
571 subscribers

SUBSCRIBE

# These Monthly Meetings

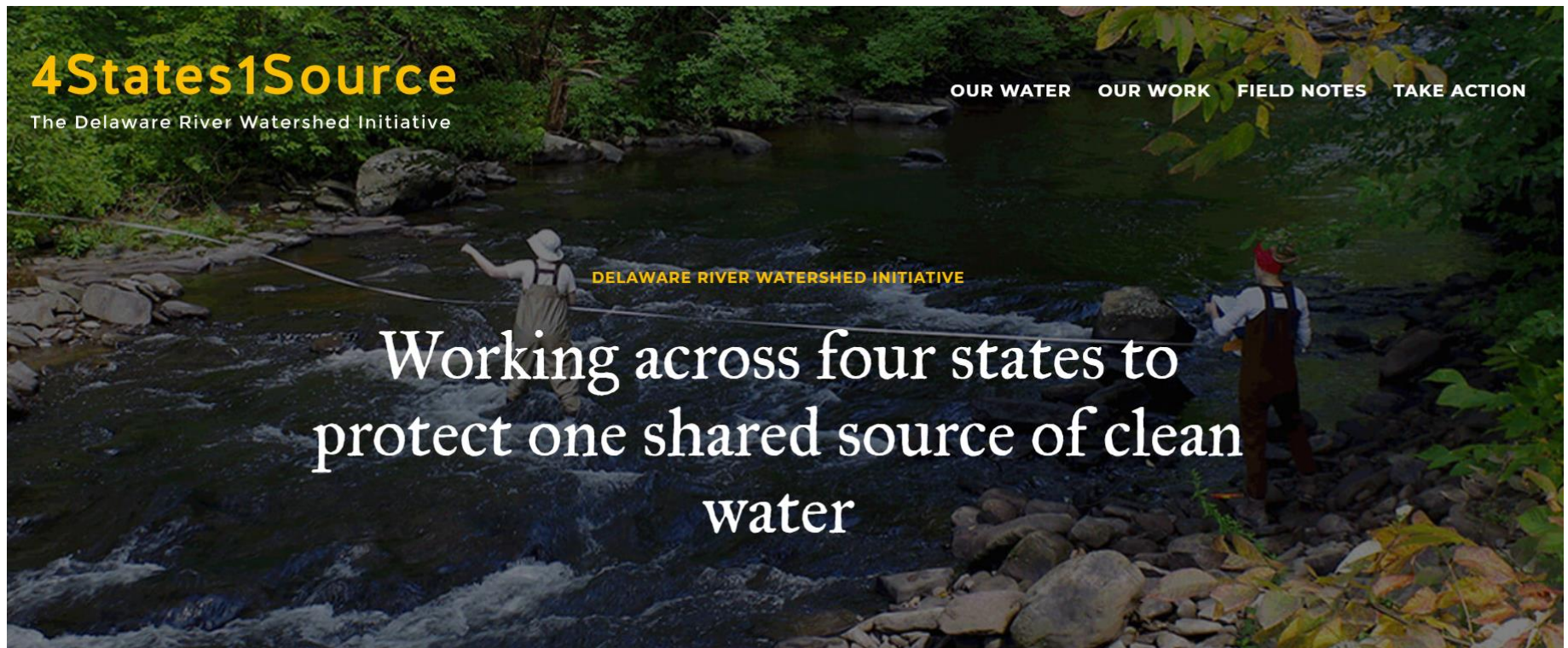
- Every third Thursday of the month
- 2:30-3:30p
- Zoom link will remain the same:  
<https://us02web.zoom.us/j/81881801310?pwd=eUFmbXZLbmRibVcxa1dtNVhzRmNvZz09>
- Reminder email one week prior to each month's meeting
  - All are welcome, please share
  - **And let us know if others should be added**

# REMINDER

- Attendees include:
  - Groups working in Delaware River Watershed Initiative (DRWI)
  - Groups working in Delaware River Basin (DRB) but not DRWI
  - Folks from outside the DRB
- Stroud Center support via DRWI and C-SAW

# Delaware River Watershed Initiative (DRWI)

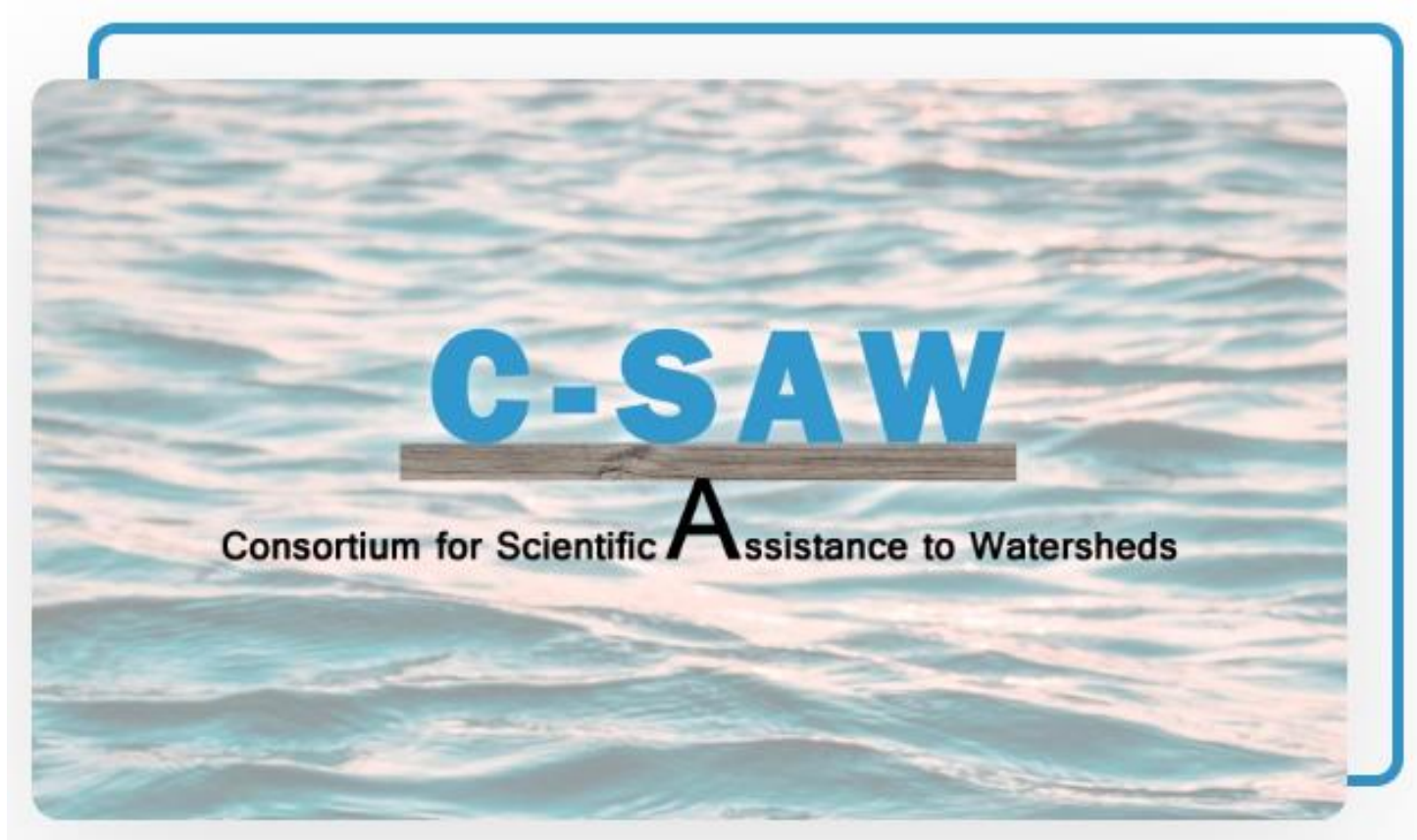
<https://4states1source.org/>





# C-SAW

<https://www.c-saw.info/>



# Goals for these monthly meetings

- Time to check-in, ask questions, report issues, network, etc.
- **Updates** from the Stroud Center
- **Presentations**
  - **Station Owner/Manager Presentations** – communicate about individual situations, local watershed work
  - **Focus Topic Presentations** – guest presenters talk about technical/ecological/other focus topics

*\*All of this to support gathering good data and using it purposefully*



# Stroud Center project personnel

## Stroud Center Facilitators:

David Bressler



Project facilitator

Rachel Johnson



Research Engineer  
Technician

Christa Reeves



Northern DRB  
technician and  
organization  
collaborator

Shannon Hicks



Research Engineer,  
Mayfly and EnviroDIY  
Inventor/Designer



Elena Hadley  
Part-Time Environmental Educator  
Research Technician

# Stroud Center project personnel

## Master Watershed Steward Facilitators:

Carol Armstrong



George Seeds



Master Watershed  
Steward Program



PennState Extension

# Stroud Center project personnel

## Stroud Center DRWI Leads:

Dr. John Jackson



Senior Research Scientist

Matt Ehrhart



Director of Watershed Restoration

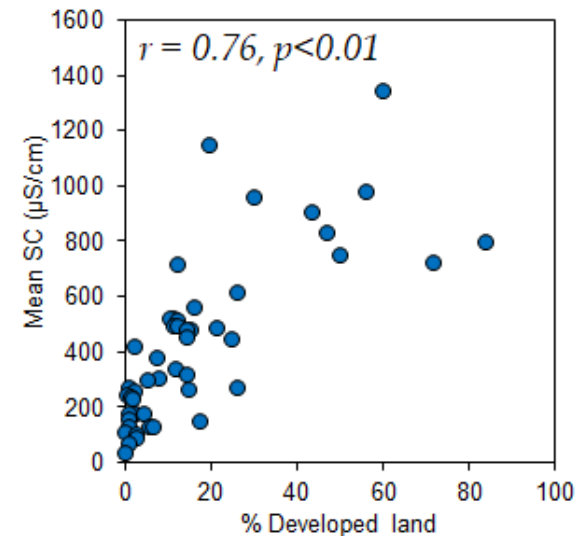
Dr. David Arscott



Executive Director, President  
Research Scientist

# Stroud Center Perspective – EnviroDIY in the DRB

- Primary Goal
  - Support Station owners, managers, and volunteers
  - Use stations for local purposes
- Secondary Goal
  - Analyze basin-wide data set
  - Develop tools to characterize and contextualize watersheds





# Today's Agenda

1. Introduction
2. Stroud Updates
3. Presentation: Winter Salt
4. Discussion: format and content of these meetings – feedback please
5. Conclusion

# Stroud Center Updates

- Fall weather means leaf fouling of turbidity sensors
  - Clean sensors more often, as needed
- Power issues due to lower light before leaves have fallen
  - Hang on until leaves fall
  - Cycle batteries in the meantime if necessary

# Stroud Center Updates

- Stroud Center (Rachel Johnson and Elena Hadley) collecting grab samples for lab analysis all new EnviroDIY sites deployed in 2022 in DRB
  - About 20 sites
  - If permission is needed we will be in touch, but feel free to reach out

# Stroud Center Updates

- A number of groups doing Salt Snapshots
  - Be in touch with the Stroud Center if you'd like assistance in doing this

## Watershed Salt Snapshot – Instructions

### Overview

The following is a method for documenting salt levels in streams and rivers across a watershed by measuring the concentration of chloride ( $\text{Cl}^-$ ) (milligrams/liter, mg/l) during baseflow conditions. Measuring electrical conductivity is also recommended as it can provide explanatory information and is directly related to chloride concentration.

The intent of this method is to 1) determine salt levels that aquatic life is exposed to the majority of the time (i.e., during baseflow conditions) in streams of a watershed(s) and 2) identify specific areas of the watershed(s) that may be contributing to or preventing salt contamination of nearby streams.

### The basic method:

Over a short period of time (less than a week, to ensure consistency in data) a group of people fans out across a watershed (or other area of interest) during baseflow conditions and collects water samples from pre-determined stream sites. Sites are strategically chosen to help identify specific areas of the landscape that may be contributing to or protecting nearby streams from salt contamination. The samples are returned to a central meeting location where they are measured for chloride (mg/l) and specific conductivity ( $\mu\text{S}/\text{cm}$ ). Because sampling is recommended to occur over a relatively short time period, it is important to consider the number of people available to conduct the work and the number of sites that can be visited in the allotted time. Judgment will be required to balance desired number of sites with personnel and time availability.

Baseflow: the resting state of a stream between precipitation events; a stream or river's normal flow state when not influenced by recent precipitation runoff, often composed primarily of groundwater; the flow that would exist in a stream without the contribution of direct overland runoff from rainfall or melting snow/ice.

### Equipment/Supplies

- Chloride Quantab® Test Strips, 30-600 mg/l, or other chloride measurement method



# Stroud Center Updates

- EnviroDIY in the DRB monthly meetings – discuss after presentation
  - Format?
  - Content?
  - Support via this meeting and others?
  - What are you needing?



Any questions before we move on?

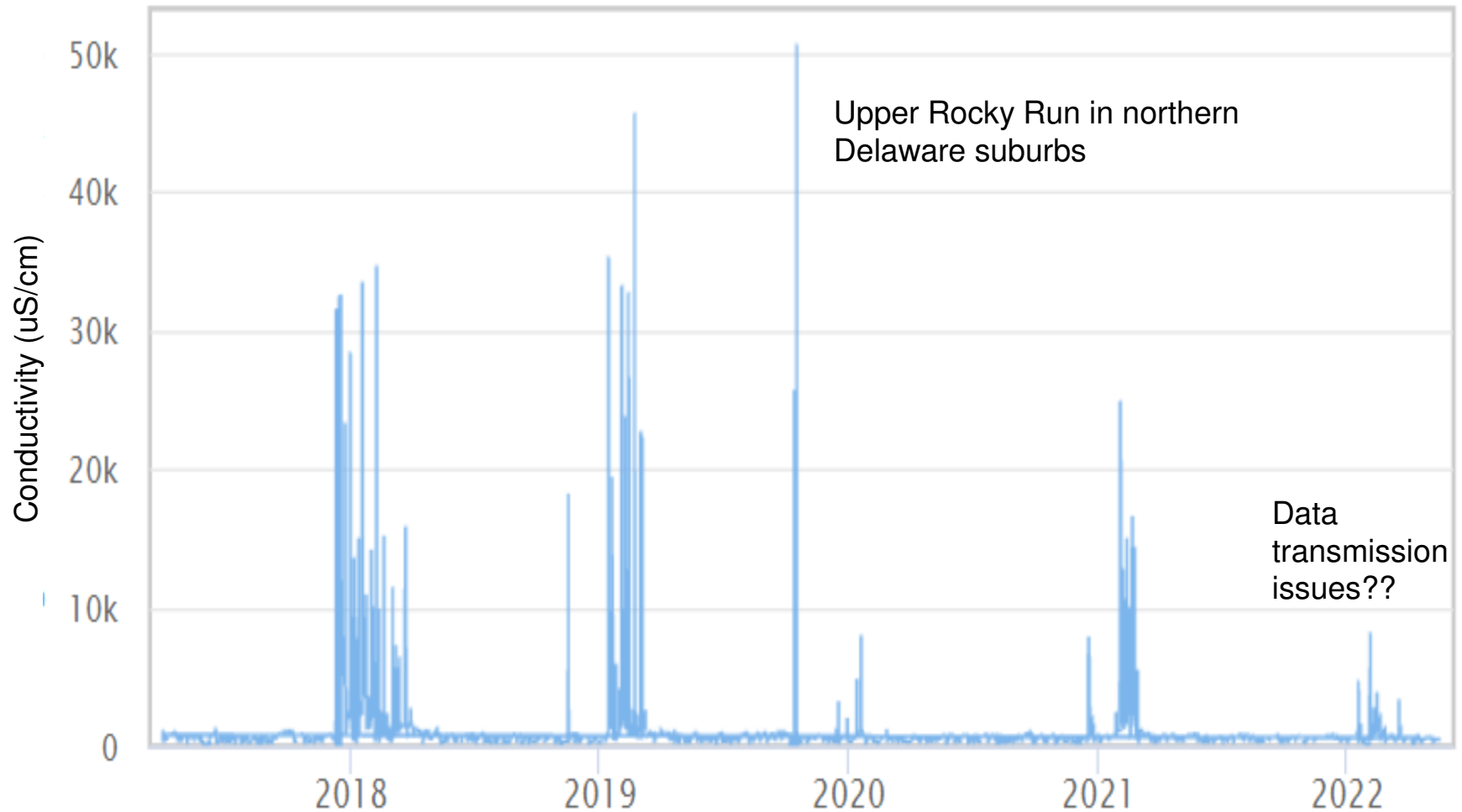




# Winter Salt

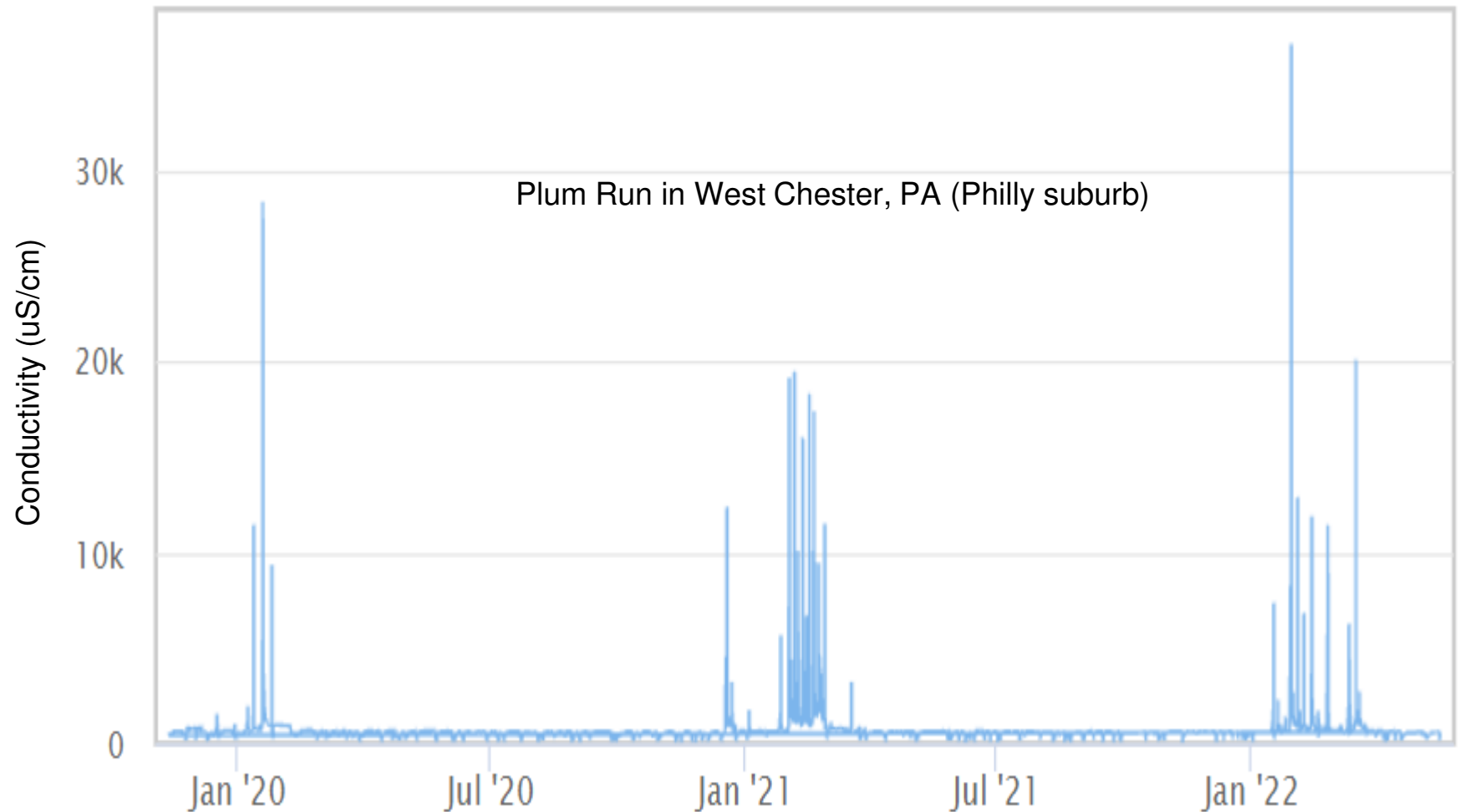
- Road salt is applied in the winter
  - Large flushes via runoff during snow/ice melt
  - Immediate acute toxicity to aquatic life
  - Large amounts in the winter lead to gradual contamination of groundwater – chronic toxicity

# Salt pollution via salt flushes in the winter

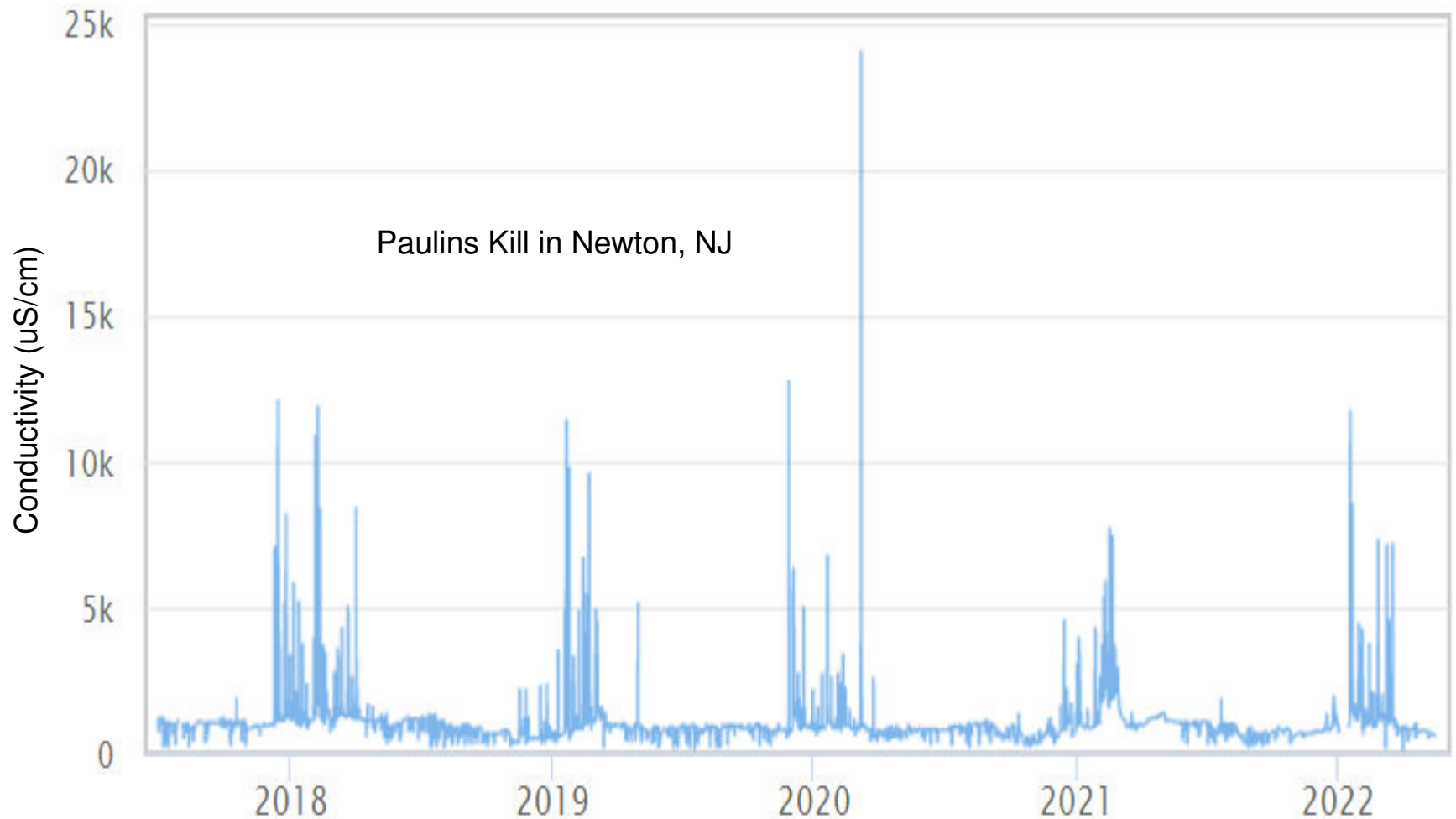




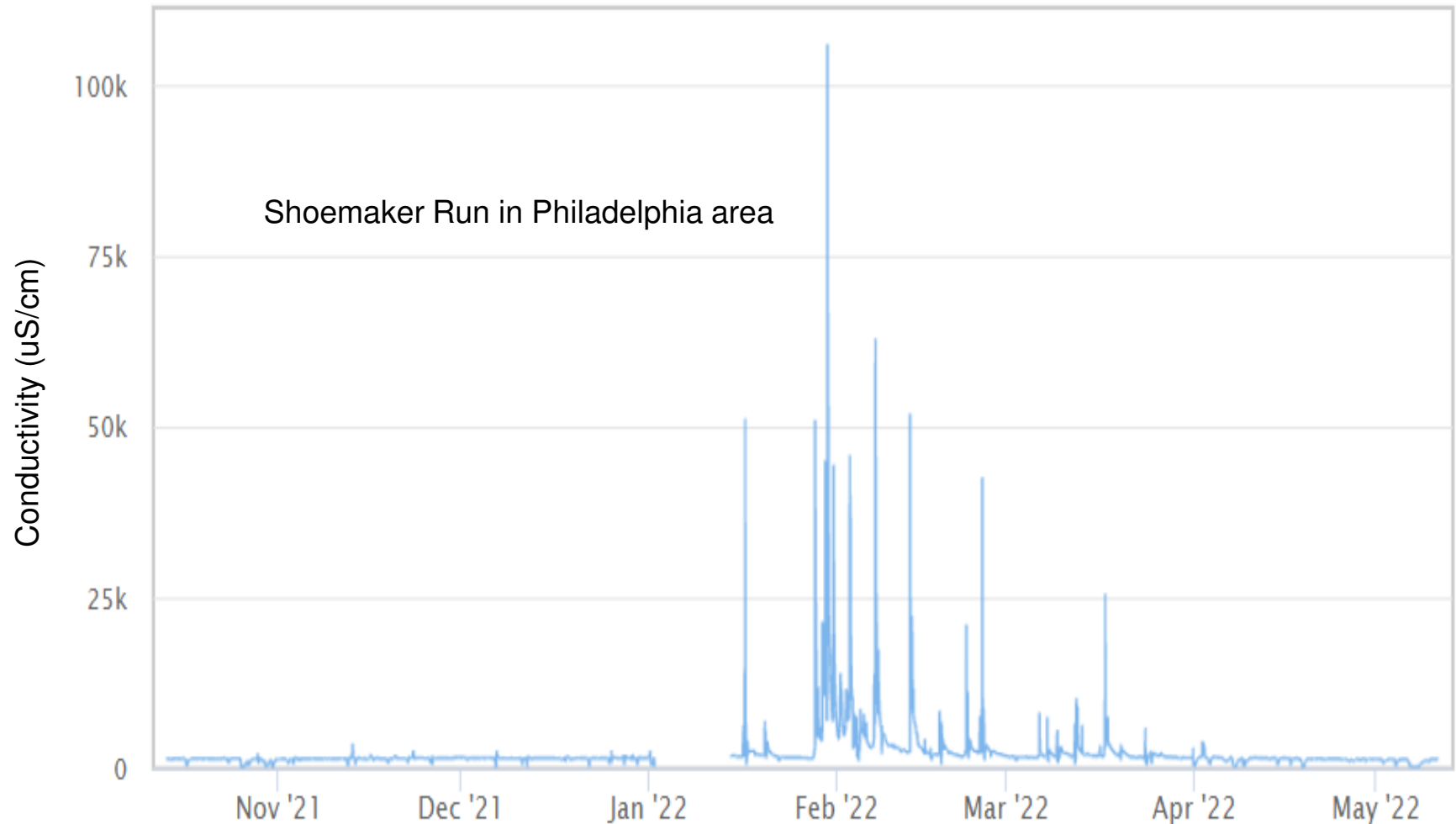
# Salt pollution via salt flushes in the winter



# Salt pollution via salt flushes in the winter

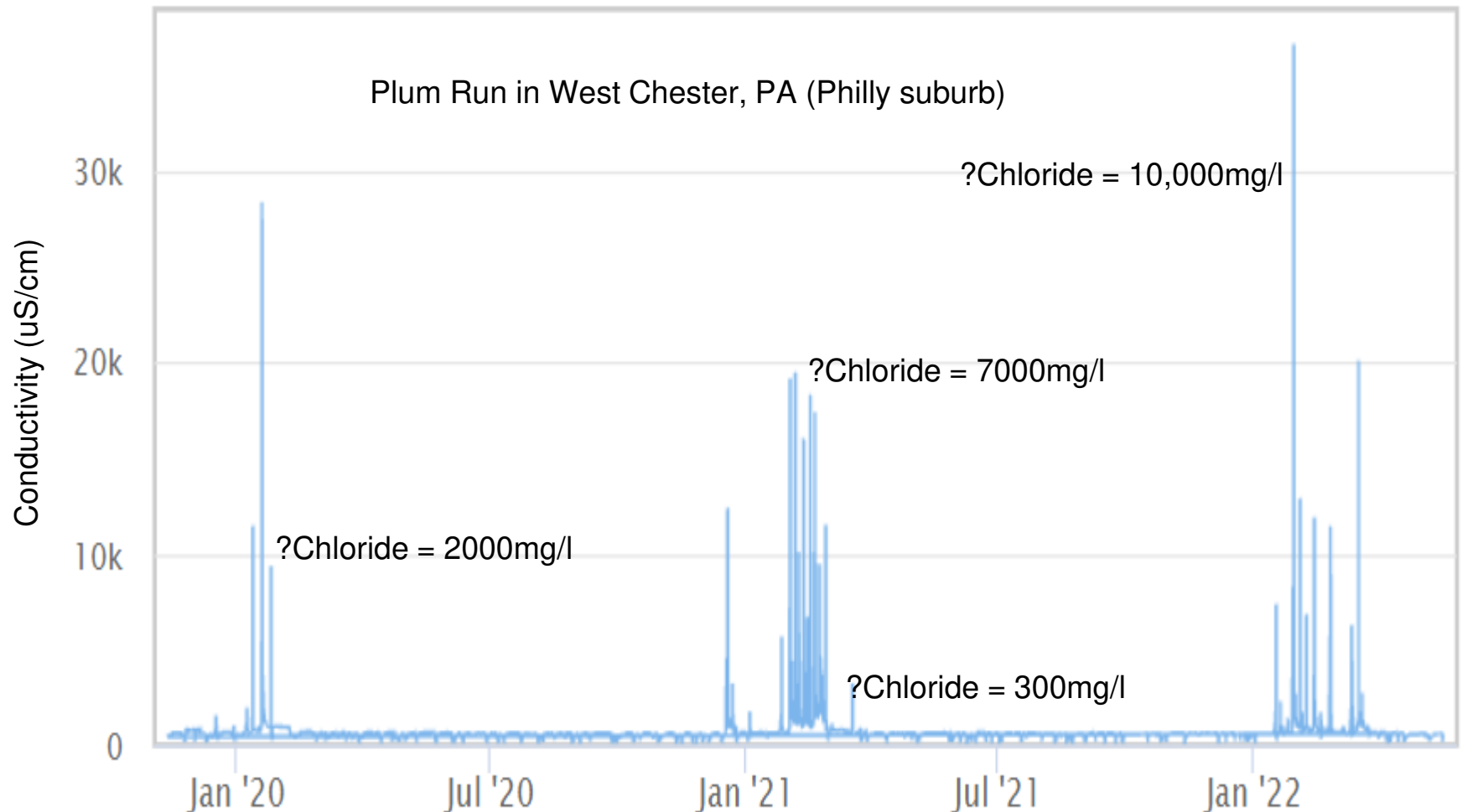


# Salt pollution via salt flushes in the winter



# Salt pollution via salt flushes in the winter

- To understand what conductivity really means in terms of salt, measure chloride across the range of observed conductivity





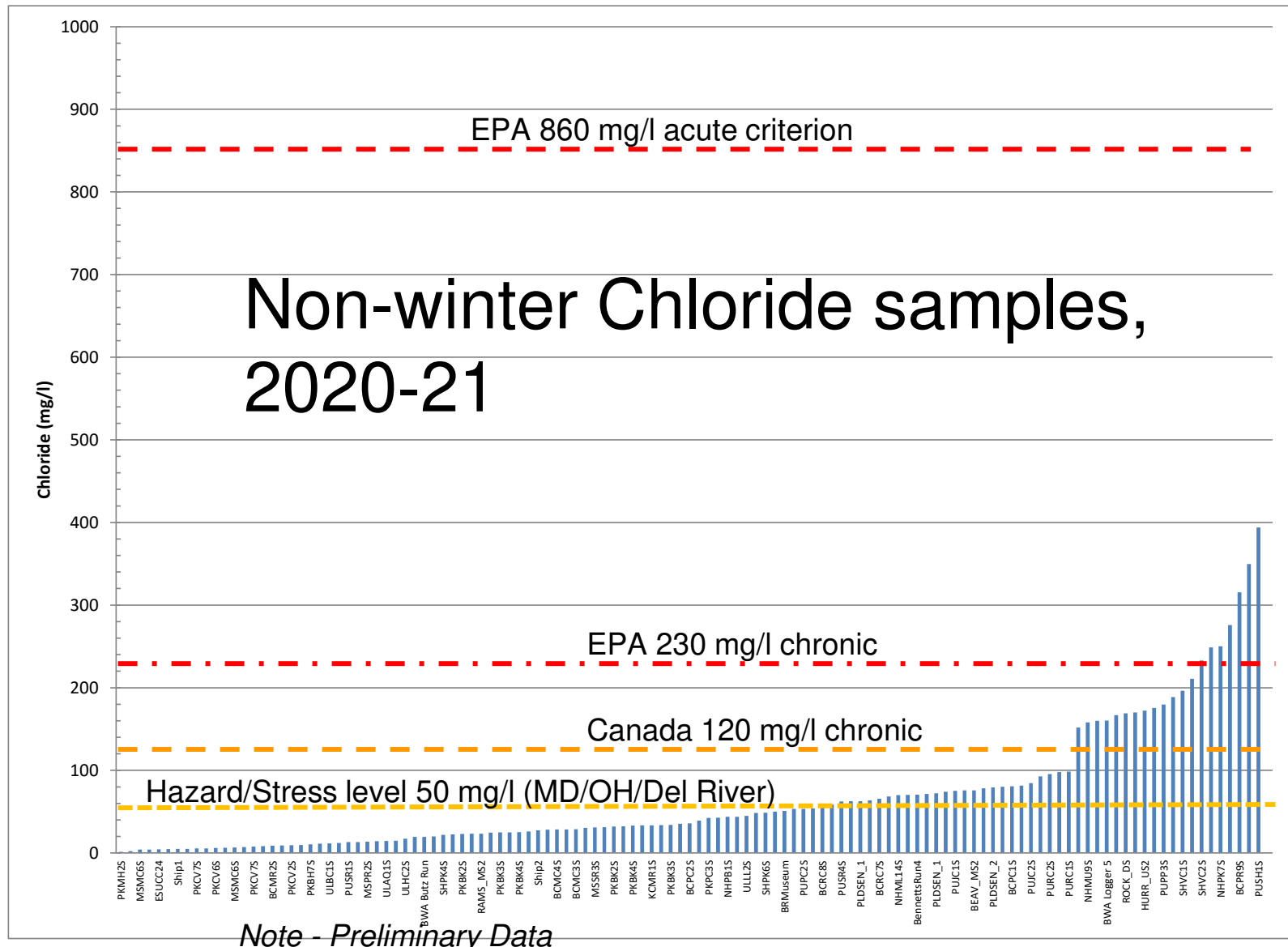
# Winter chloride samples including salt flush events, 2020-22

----- EPA 860 mg/l acute criterion

— · — · — Canada 640 mg/l acute criterion

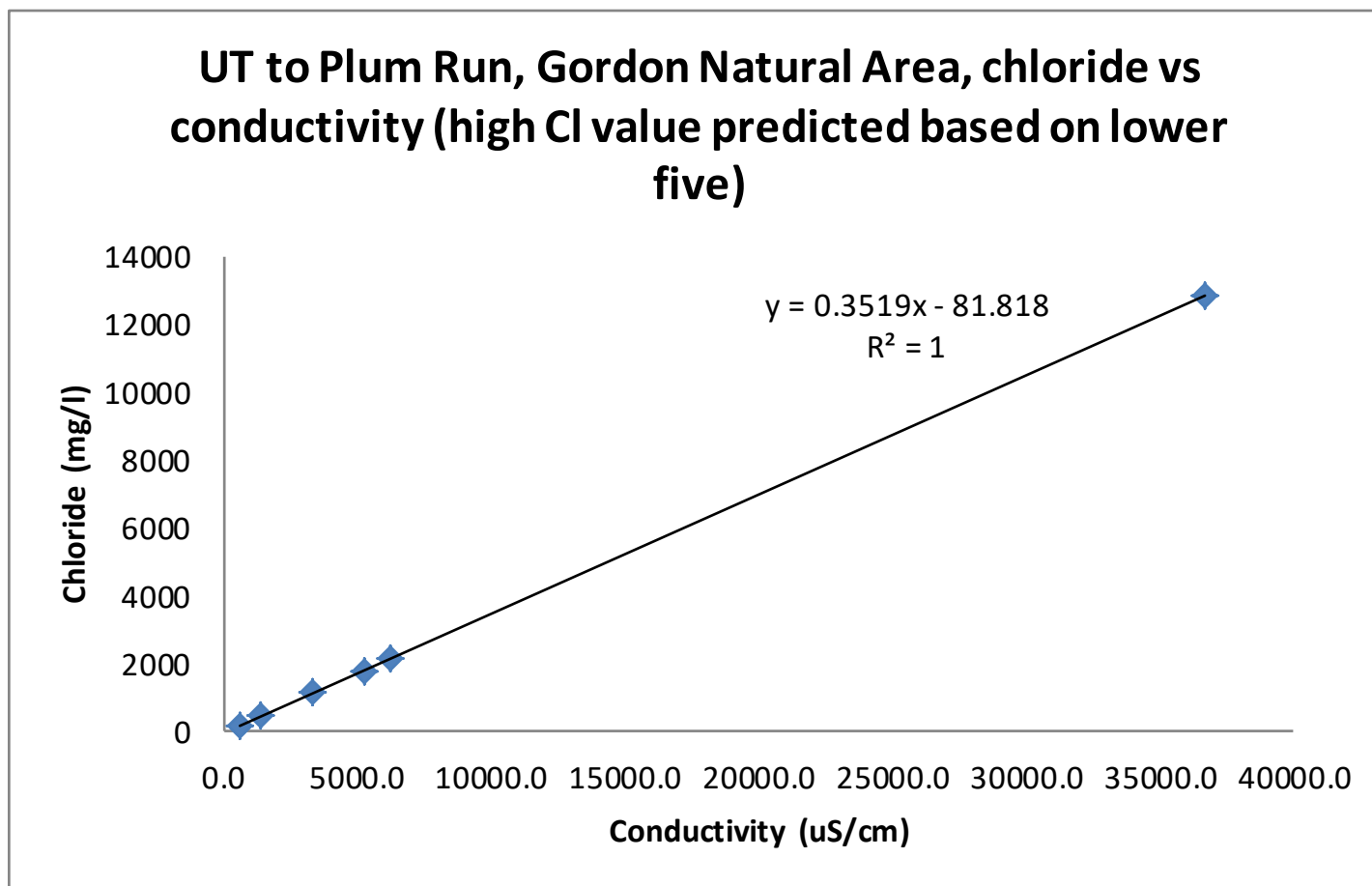


# Winter data highlights pollution issues



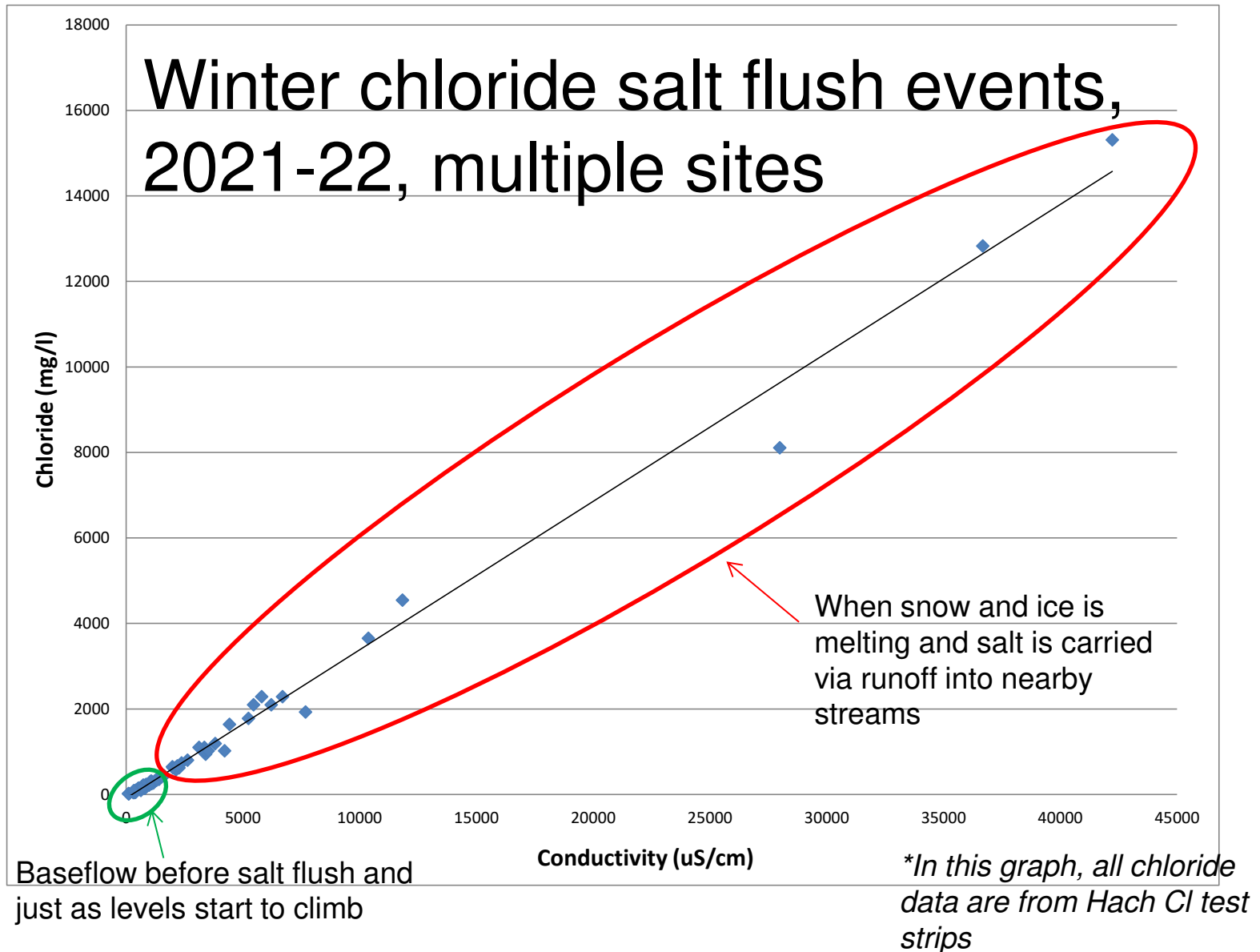
## Non-winter samples

# “Rating Curves” to see how conductivity relates to chloride

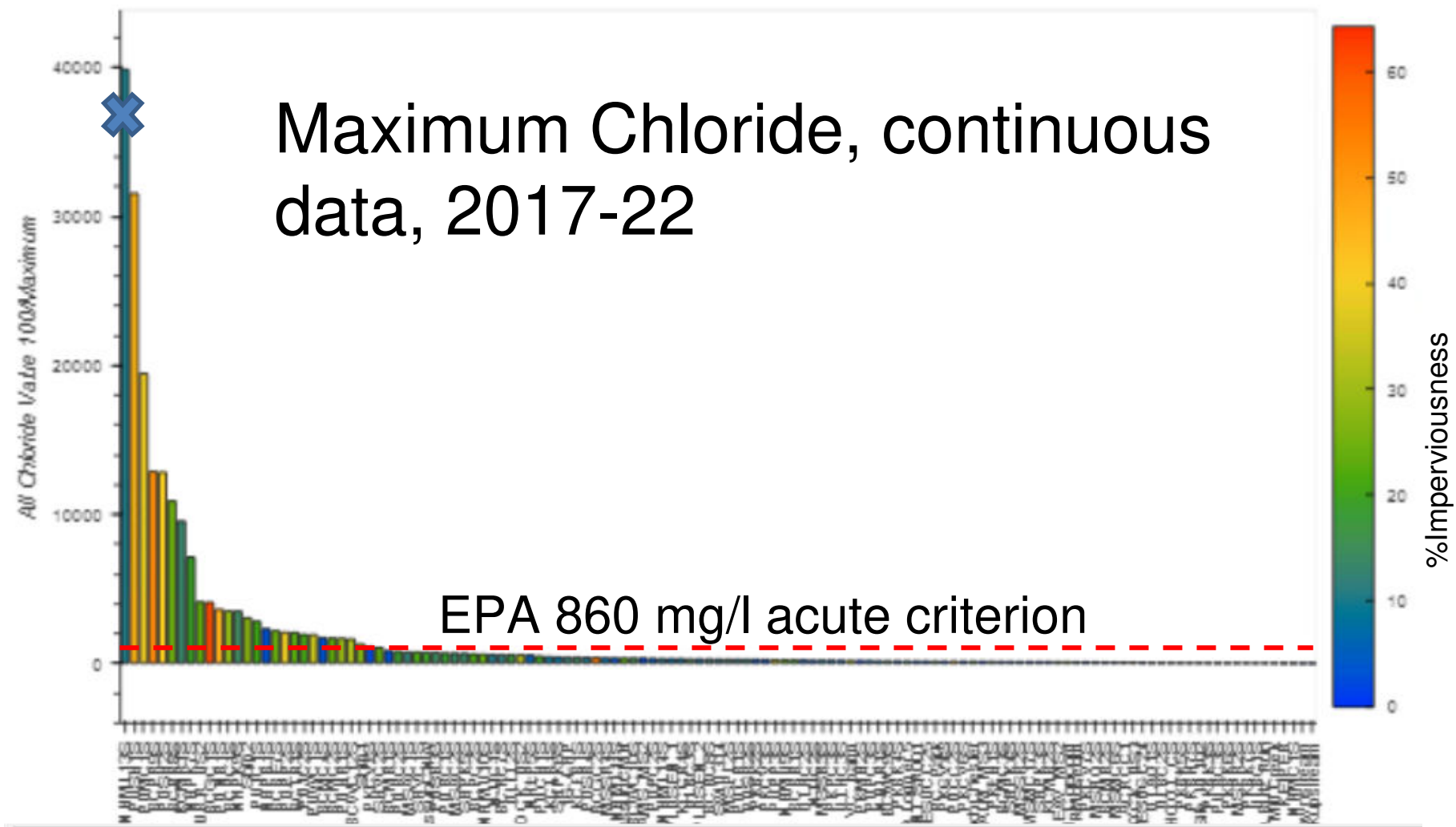




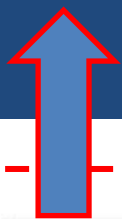
# “Rating Curves” to see how conductivity relates to chloride



# Winter data highlights salt pollution issues



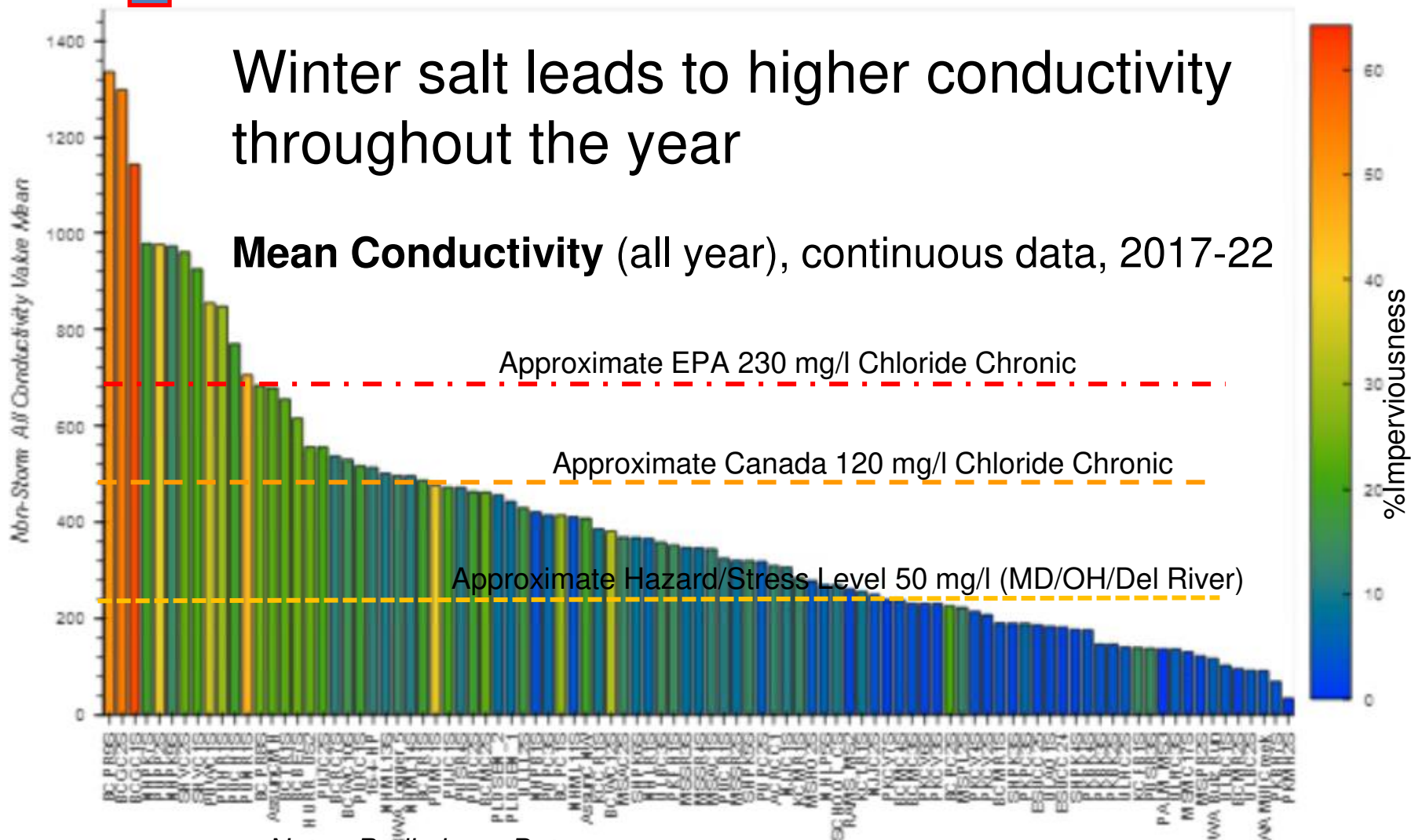
*Note - Preliminary Data*



EPA 860 mg/l Chloride acute criterion

# Winter salt leads to higher conductivity throughout the year

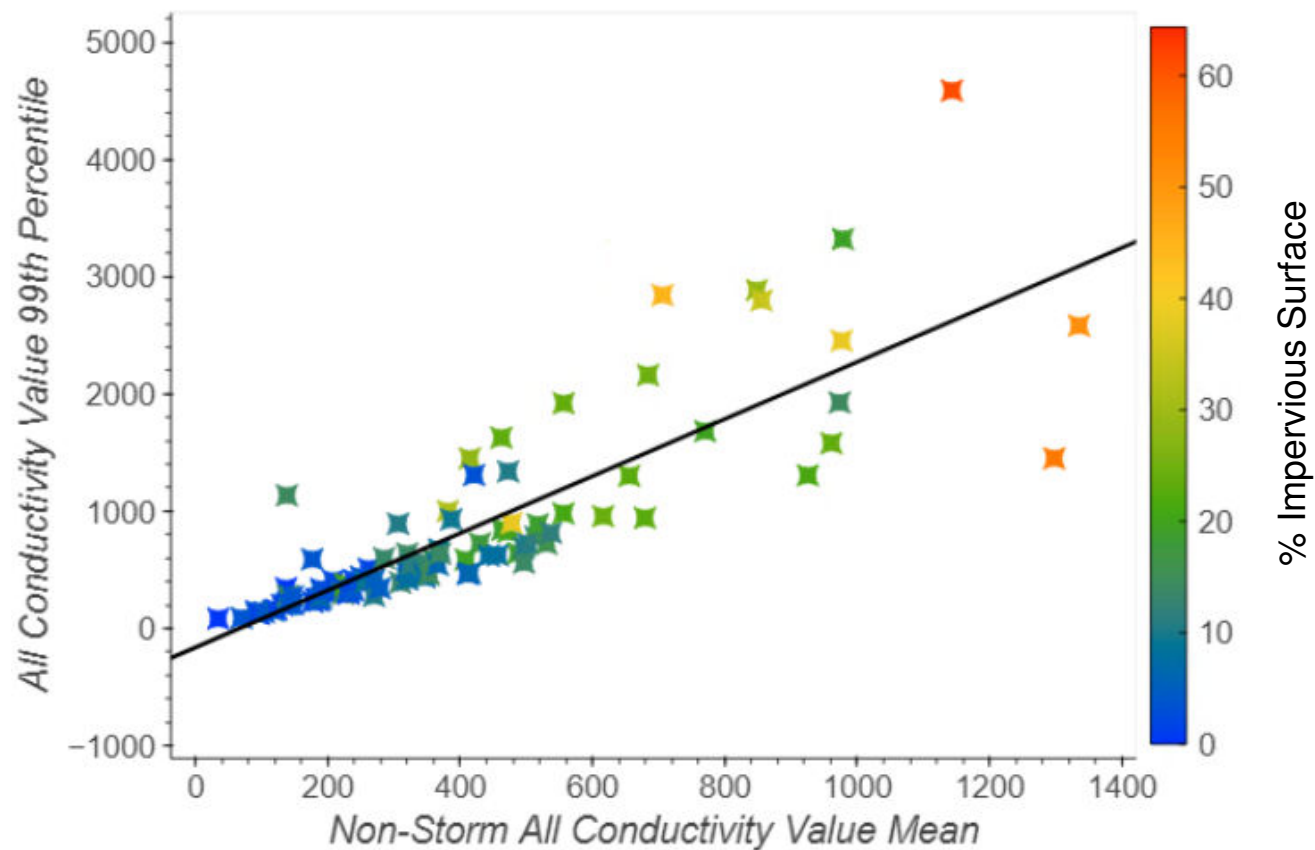
## Mean Conductivity (all year), continuous data, 2017-22



Note - Preliminary Data

# Winter chloride

- The greater the salt flushes (99<sup>th</sup> percentile of continuous conductivity data) the greater the groundwater contamination

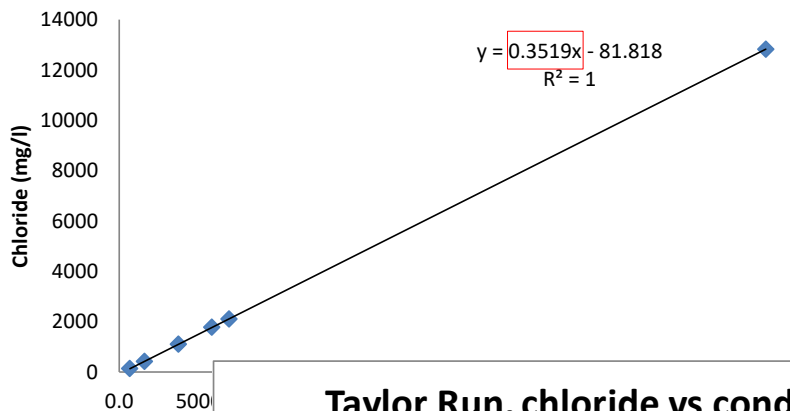




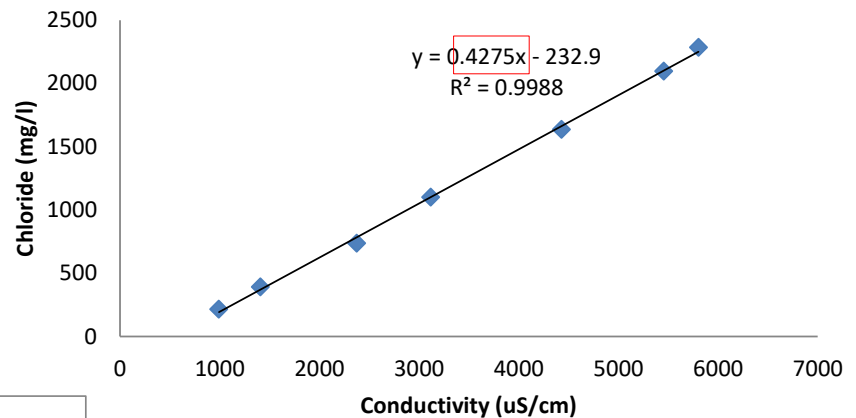
# Watershed specific rating curves

- Stream-specific curve may be better than general multi-site curve (if you have enough data) - *Rating curve slopes vary stream to stream (red)*

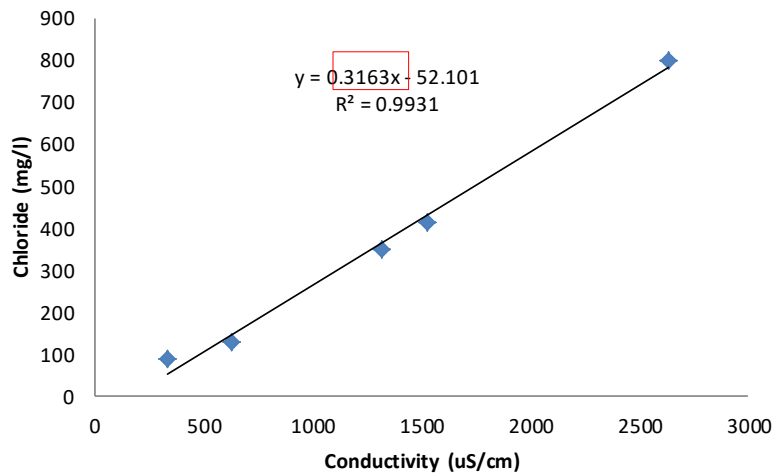
UT to Plum Run, Gordon Natural Area, chloride vs conductivity



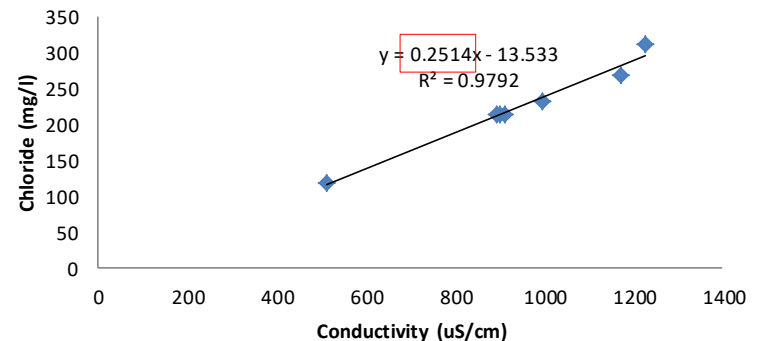
Goose Ck, chloride vs conductivity



Taylor Run, chloride vs conductivity

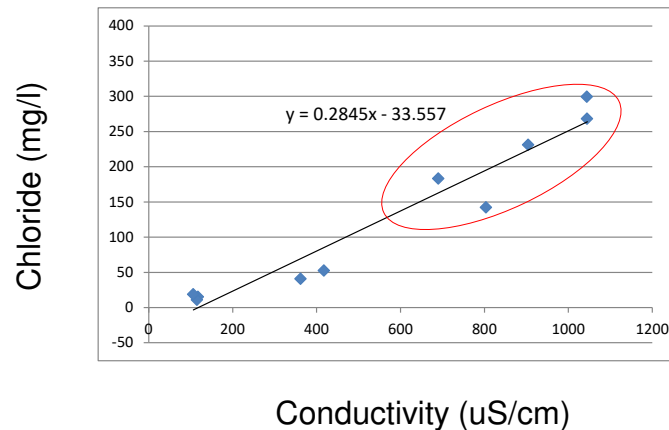


Paulins Kill at Sussex CCC, chloride vs conductivity



# Watershed specific rating curves

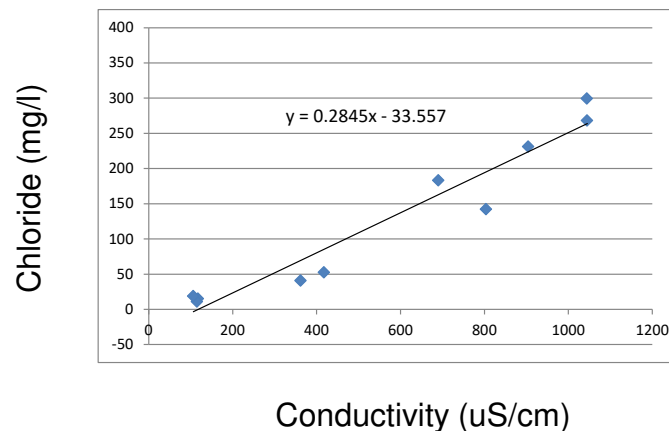
- Watershed specific rating curve allows you to know the full range of salt per your continuous conductivity data



			$y = 0.2845x - 33.557$		
		Max Conductivity Spike (uS/cm)	Max Chloride Spike (Winter)(mg/l)	Chloride Ecological acute impact threshold, low (Canada)(mg/l)	Chloride Ecological acute impact threshold, high (USA)(mg/l)
MSAC1S	Angelica Ck at St. Bernardine Rd	1980	530	640	860
MSAC2S	Angelica Ck at The Nature Place	2412	653	640	860
MSPR2S	Punches Run at Nolde St Forest	325	59	640	860

# Watershed specific rating curves

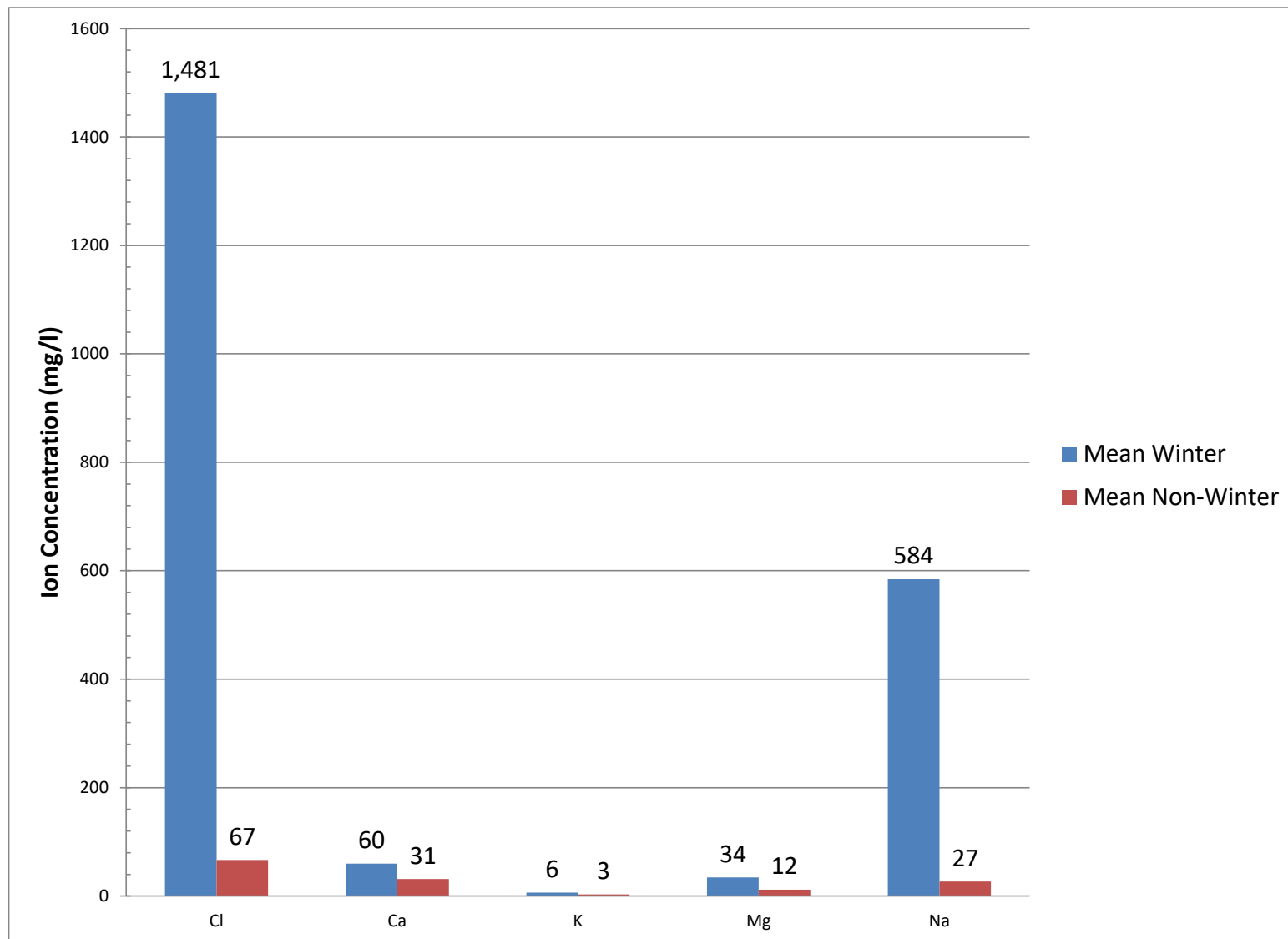
- As we saw in earlier graph winter salt influences year round conditions



	$y = 0.2845x - 33.557$ (for msac1s and 2s)				
	Average Summer (July/Aug) Conductivity (uS/cm)	Average Summer (July/Aug) Chloride (mg/l)	Chloride Ecological chronic impact threshold, low (OH/MD)(mg/l)	Chloride Ecological chronic impact threshold, medium (Canada)(mg/l)	Chloride Ecological chronic impact threshold, high (USA)(mg/l)
Angelica Ck at St. Bernardine Rd	372	72	50	120	230
Angelica Ck at The Nature Place	384	76	50	120	230
Punches Run at Nolde St Forest	140	16	50	120	230
	$y = 0.0002x^2 + 0.0556x + 3.8303$ (for mspr2s)				

Natural level

# Cations associated with Cl, winter and non-winter samples

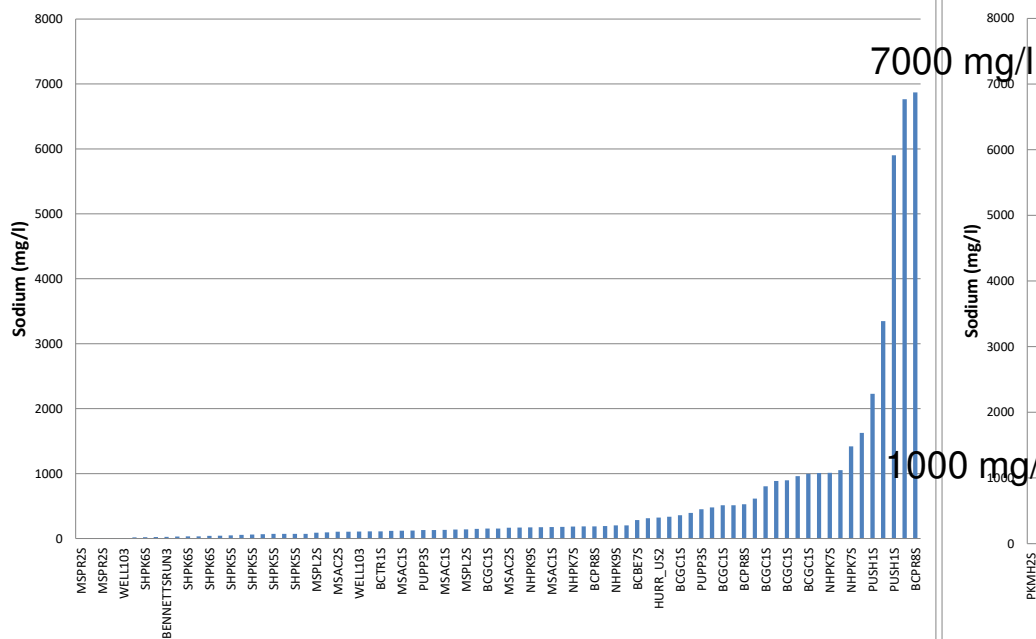




# Cations

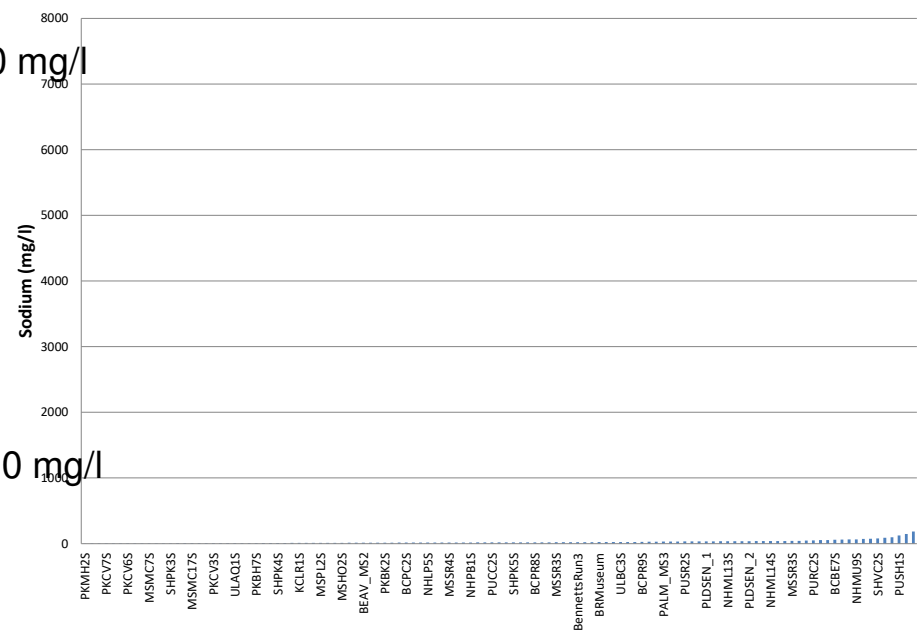
- Sodium (Na) follows the same pattern as Chloride
  - NaCl = majority of road salt

Winter Sodium measurements



Winter samples

Non-winter Sodium measurements

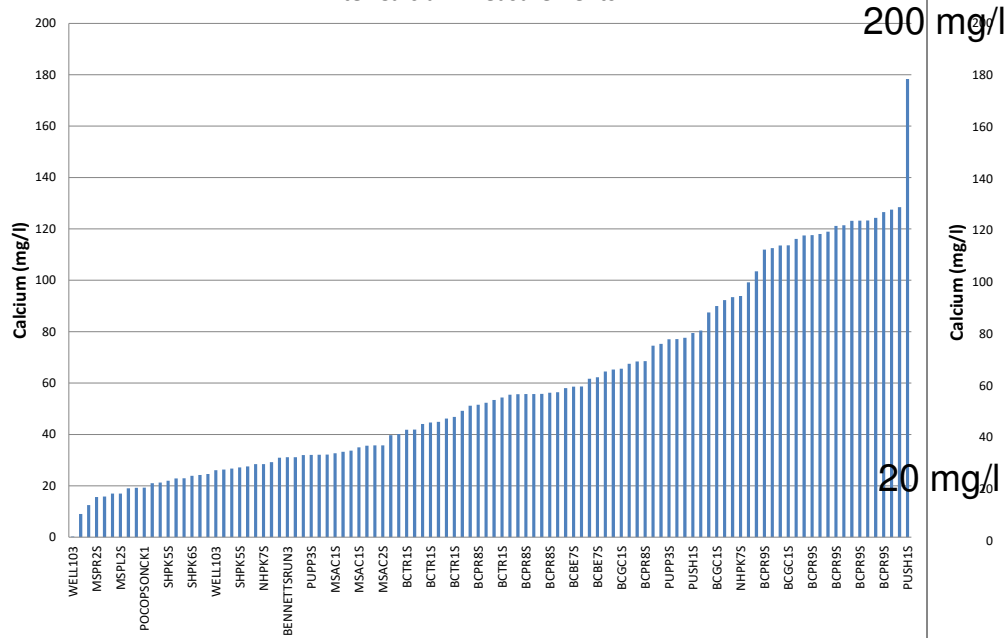


Non-winter samples

# Cations

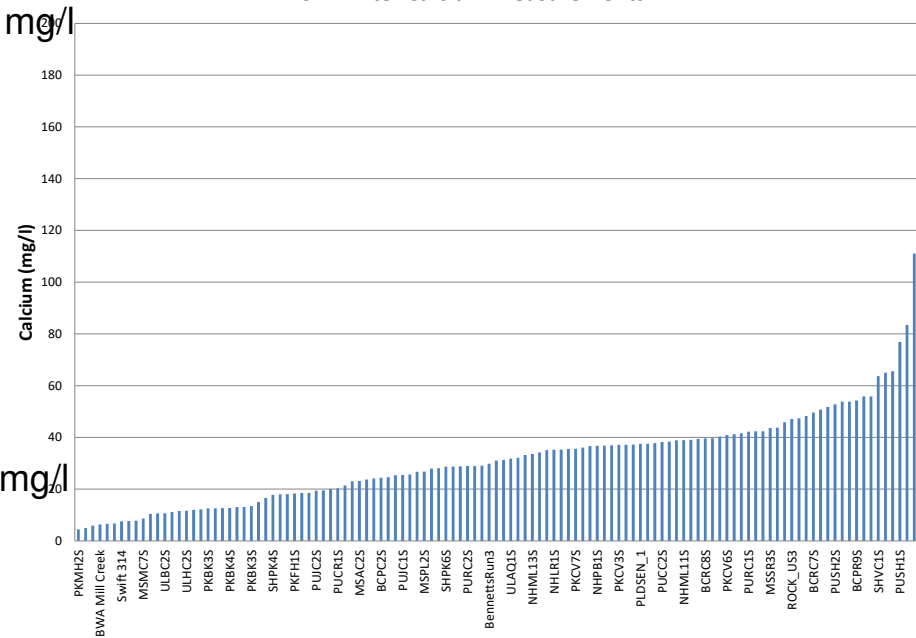
- Calcium is higher in winter but not as dramatic as Na and Cl – suggests salt pollution is indeed mostly NaCl

Winter Calcium measurements



Winter samples

Non-winter Calcium measurements



Non-winter samples

# Final Thoughts

- Request: please be in touch if you plan to do winter Chloride and Conductivity measurements (or snapshots),  
[dbressler@stroudcenter.org](mailto:dbressler@stroudcenter.org)
- Stroud Center can supply:
  - General support
  - Cl strips
  - Field sheets/tables for recording multiple measurements (printable and electronic)

# Monthly meeting format/content???

- EnviroDIY in the DRB monthly meetings – discuss after presentation
  - Format?
  - Content?
  - Support via this meeting and others?
  - What are you needing?

# Mentors currently available

- Carol Armstrong (MWS), [mnem.np@gmail.com](mailto:mnem.np@gmail.com), 610-659-7477
- George Seeds (MWS), [geoseeds@verizon.net](mailto:geoseeds@verizon.net), 484-886-9586
- Rachel Johnson (Stroud Center), [rjohnson@stroudcenter.org](mailto:rjohnson@stroudcenter.org), 973-557-8995
- Christa Reeves (Stroud Center)(in the north, situational), [christa@musconetcong.org](mailto:christa@musconetcong.org), 727-520-5849

***\*Anyone else interested? If so get in touch with Stroud Center or Carol or George***



# Conclusion

Next month's meeting will be on:

**Thursday November 17, 2022**  
**2:30-3:30p**



# Onward!

## Stroud Water Research Center, EnviroDIY-DRWI contacts:

- David Bressler, [dbressler@stroudcenter.org](mailto:dbressler@stroudcenter.org), 410-456-1071
- Shannon Hicks, [shicks@stroudcenter.org](mailto:shicks@stroudcenter.org), 610-268-2153 x267
- Rachel Johnson, [rjohnson@stroudcenter.org](mailto:rjohnson@stroudcenter.org), 973-557-8995
- Christa Reeves, [christa@musconetcong.org](mailto:christa@musconetcong.org), 908-537-7060

## Master Watershed Stewards, EnviroDIY-DRWI contacts:

- Carol Armstrong, [mnem.np@gmail.com](mailto:mnem.np@gmail.com), 610-659-7477
- George Seeds, [geoseeds@verizon.net](mailto:geoseeds@verizon.net), 484-886-9586



Organization	Chronic/Long-Term Chloride Threshold (mg/l)	Acute/Short-Term Chloride Threshold (mg/l)	Links
New York Department of Environmental Conservation	250	--	<a href="https://www.epa.gov/sites/default/files/2014-12/documents/nywqs-section2.pdf#page=24">https://www.epa.gov/sites/default/files/2014-12/documents/nywqs-section2.pdf#page=24</a>
New Jersey Department of Environmental Protection	230	860	<a href="https://www.nj.gov/dep/standards/njac7_9b.pdf">https://www.nj.gov/dep/standards/njac7_9b.pdf</a>
U.S. Environmental Protection Agency (Aquatic Life)	230	860	<a href="https://www.epa.gov/sites/default/files/2018-08/documents/chloride-aquatic-life-criteria-1988.pdf">https://www.epa.gov/sites/default/files/2018-08/documents/chloride-aquatic-life-criteria-1988.pdf</a>
Germany Environment Agency, Umweltbundesamt	50-200		<a href="https://www.umweltbundesamt.de/en/topics/water/rivers/assessment-of-watercourses/chemical-quality-standards-assessment#chemical-water-quality-classification">https://www.umweltbundesamt.de/en/topics/water/rivers/assessment-of-watercourses/chemical-quality-standards-assessment#chemical-water-quality-classification</a>
Delaware River Basin Commission, Delaware River Zone 3	180	--	<a href="https://www.epa.gov/sites/default/files/2016-10/documents/dewqs-drbc.pdf#page=109">https://www.epa.gov/sites/default/files/2016-10/documents/dewqs-drbc.pdf#page=109</a>
Michigan Department of Environment	150	640	<a href="https://www.michigan.gov/-/media/Project/Websites/egle/Documents/Programs/WRD/NPDES/chloride-sulfate-implementation-plan.pdf?rev=07c3a64eed2849a6aae7130eda1fe384">https://www.michigan.gov/-/media/Project/Websites/egle/Documents/Programs/WRD/NPDES/chloride-sulfate-implementation-plan.pdf?rev=07c3a64eed2849a6aae7130eda1fe384</a>
Canadian Council of Ministers of the Environment	120	640	<a href="https://sustainabletechnologies.ca/app/uploads/2014/05/CWQG_chlorides.pdf">https://sustainabletechnologies.ca/app/uploads/2014/05/CWQG_chlorides.pdf</a>
Ohio EPA Recommended Hazard Concentration for Aquatic Biota	52	--	Hazard concentration: <a href="https://www.researchgate.net/publication/352922966_Assessing_the_Impacts_of_Chloride_and_Sulfate_Ions_on_Macroinvertebrate_Communities_in_Ohio_Streams">https://www.researchgate.net/publication/352922966_Assessing_the_Impacts_of_Chloride_and_Sulfate_Ions_on_Macroinvertebrate_Communities_in_Ohio_Streams</a>
Delaware River Basin Commission, Delaware River Zone 2	50	--	<a href="https://www.epa.gov/sites/default/files/2016-10/documents/dewqs-drbc.pdf#page=96">https://www.epa.gov/sites/default/files/2016-10/documents/dewqs-drbc.pdf#page=96</a>
Maryland Department of Environment, MD Bio Stressor ID Process)	50	--	Threshold concentration: <a href="https://mde.maryland.gov/programs/Water/TMDL/Approved_FinalTMDLs/Documents/BSID_Methodology_Final_2009.pdf">https://mde.maryland.gov/programs/Water/TMDL/Approved_FinalTMDLs/Documents/BSID_Methodology_Final_2009.pdf</a> (p19-20)

Figure 4. Example chloride criteria and thresholds. To view Chloride criteria across the country:  
<https://www.epa.gov/wqs-tech/state-specific-water-quality-standards-effective-under-clean-water-act-cwa#tb3>