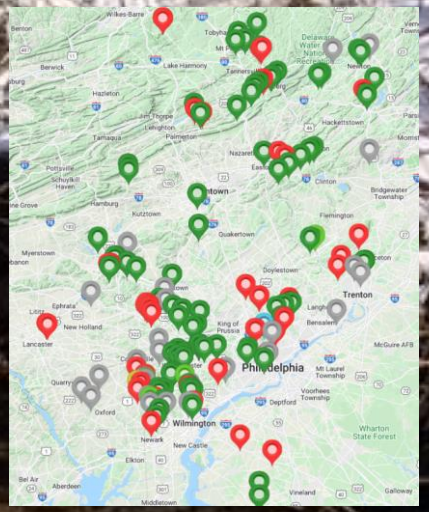
WELCOME!

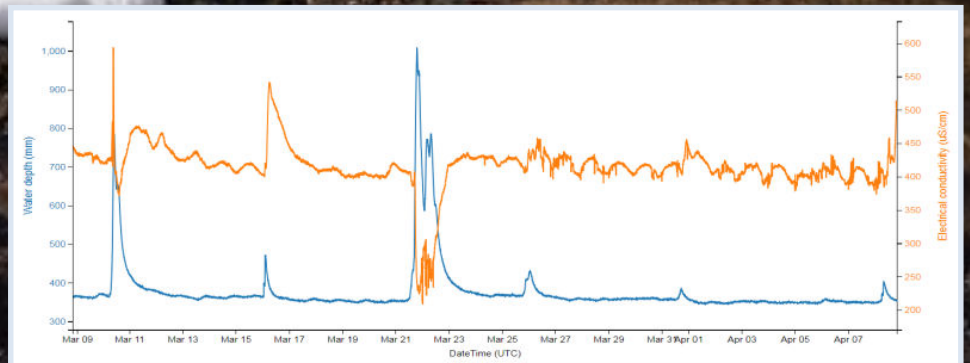
EnviroDIY and monitoring in the DRB monthly meeting

Online, Thursday December 14, 2023, 2:30-3:30p

EnviroDIY



Monitor My Watershed®



STROUD WATER RESEARCH CENTER

Today's Agenda

1. Introduction
2. Stroud Updates
3. Local Policy/Practice Workgroup Updates
4. Presentation – **2023 Year end review**
5. Discussion
6. Conclusion

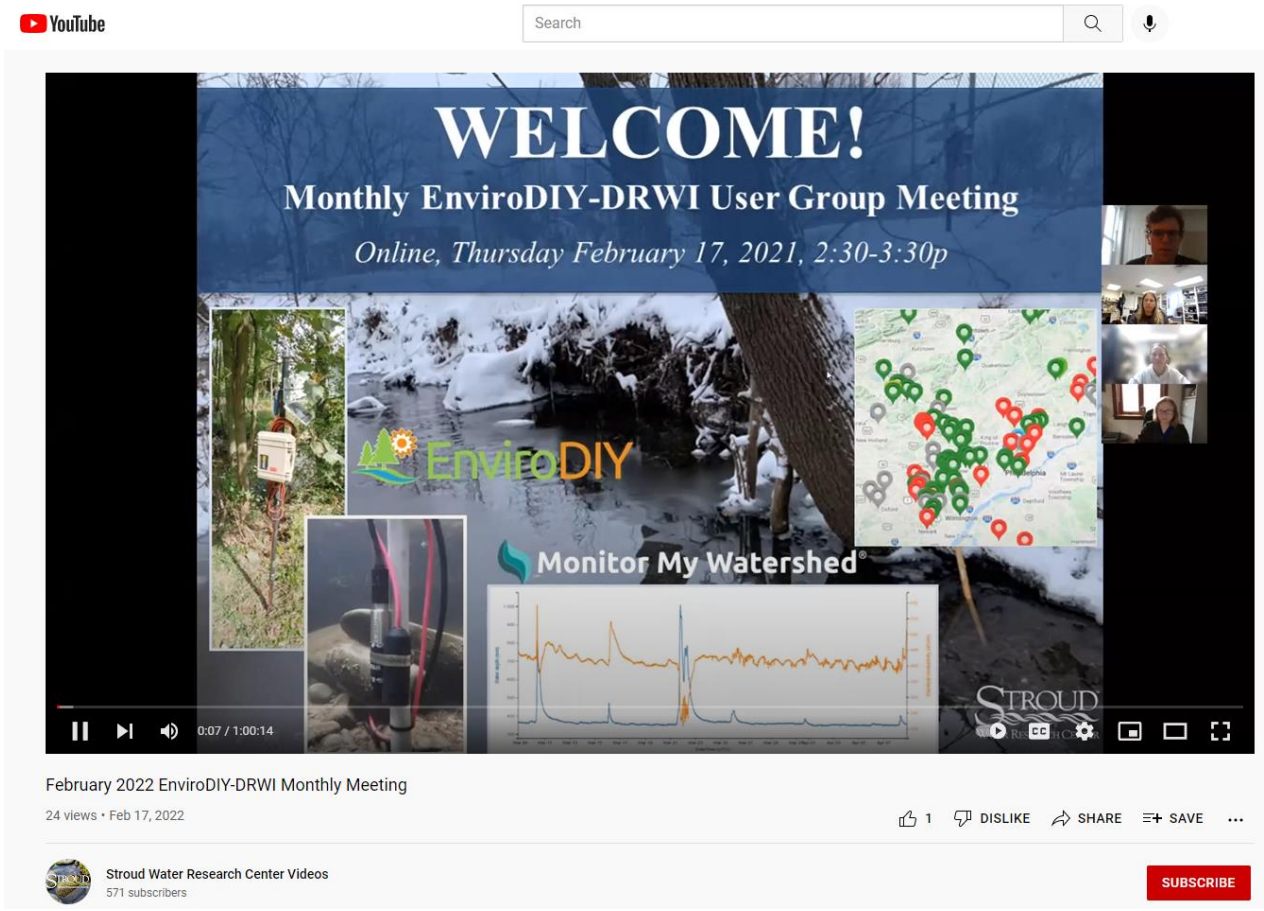
Zoom Orientation

***Meeting is being recorded**

***Please mute when not speaking to the group**

These Monthly Meetings

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



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**

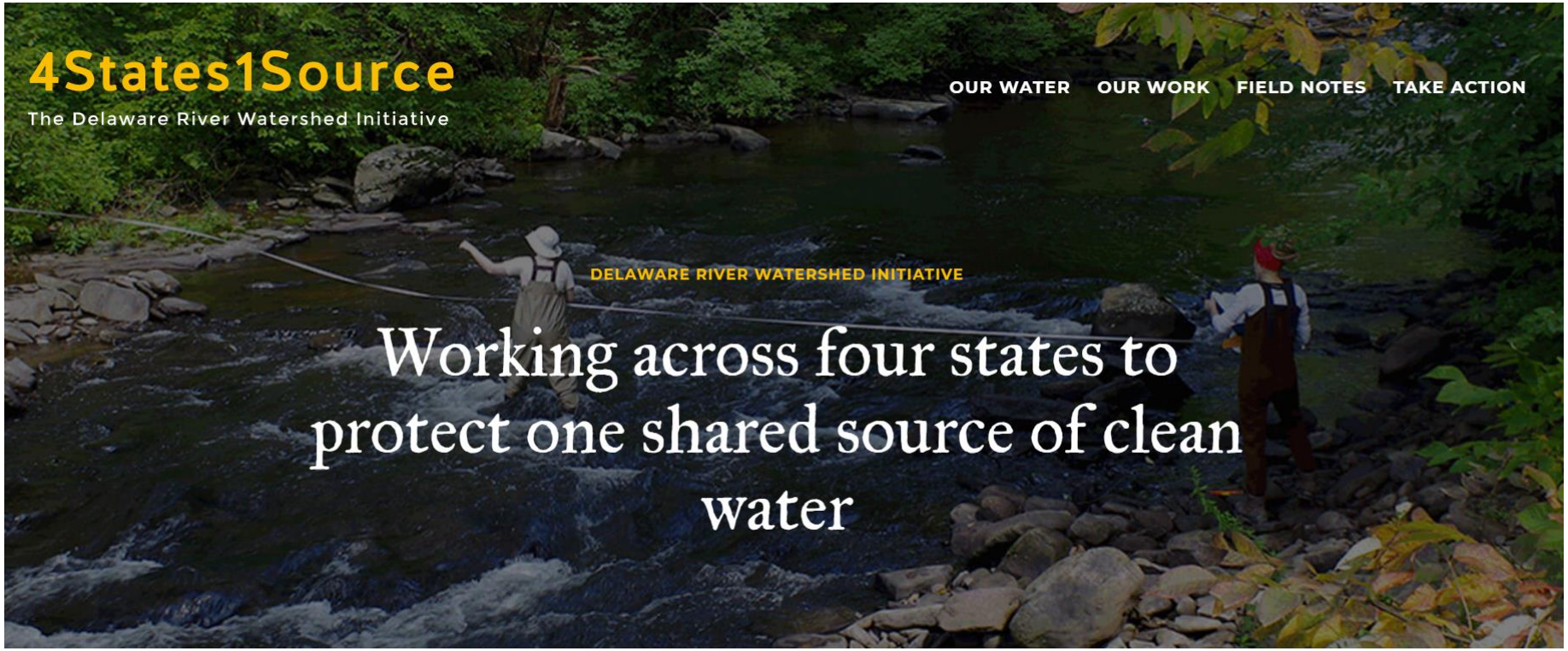
REMINDER

- 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

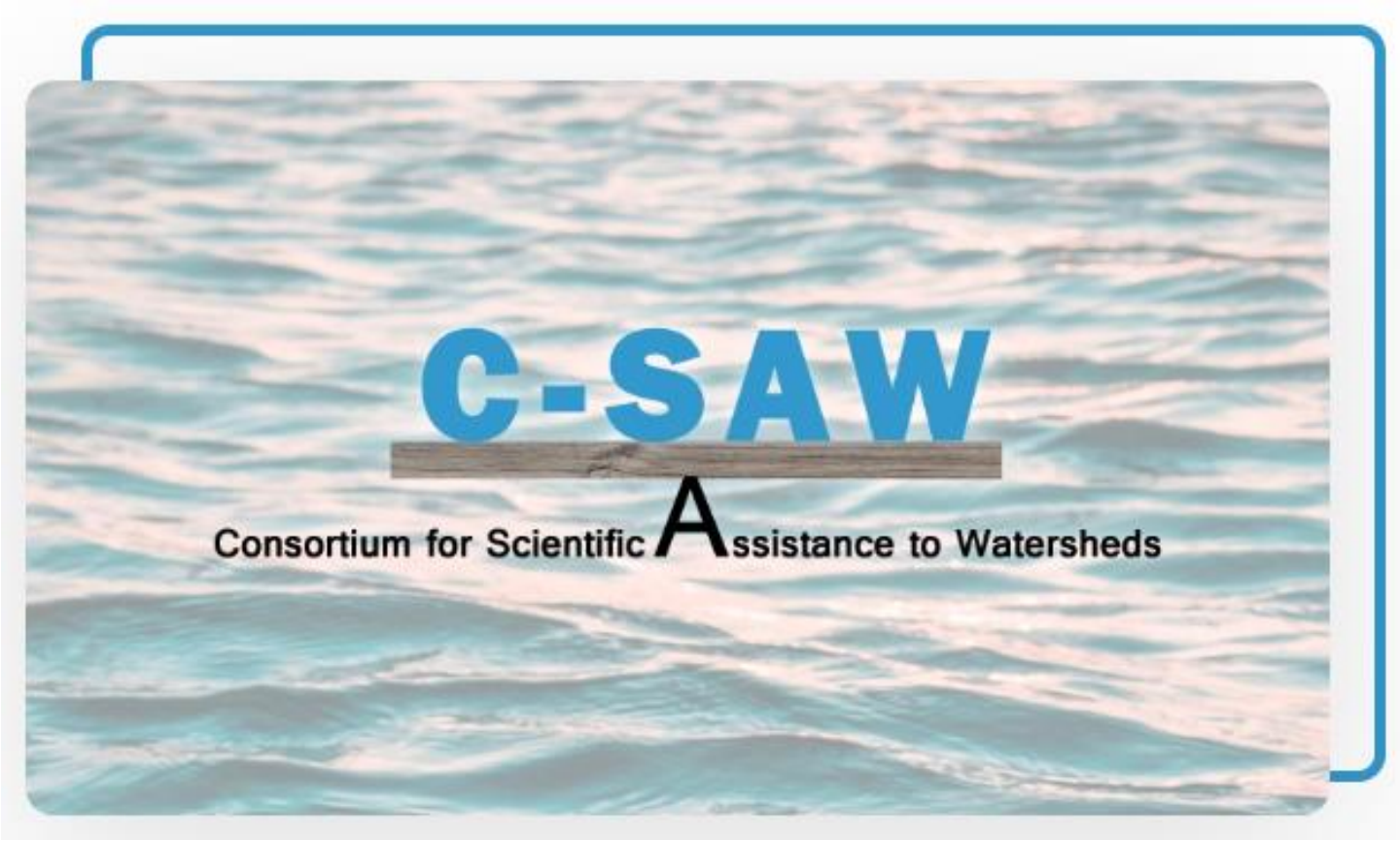
Delaware River Watershed Initiative (DRWI)

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**
  - **Science**
  - **Monitoring**
  - **Watershed management**

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

Stroud Center project personnel

Stroud Center team:

David Bressler

Community science facilitator

Christa Reeves

Northern DRB technician and collaborator

Shannon Hicks

Research Engineer, Mayfly and EnviroDIY Inventor/Designer

Stroud Center project personnel

Master Watershed Steward Facilitators:

Carol Armstrong

Joe Debes, George Seeds

Master Watershed Steward Program

PennState Extension

Stroud Center project personnel

Stroud Center DRWI Leads:

Dr. John Jackson

Senior Research Scientist

Matt Ehrhart

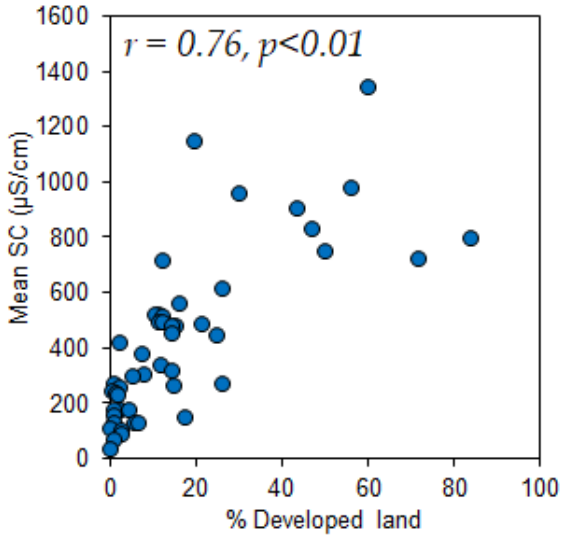
Director of Watershed Restoration

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



Updates

- Updates from the Stroud Center on EnviroDIY, science and monitoring, communications, etc.

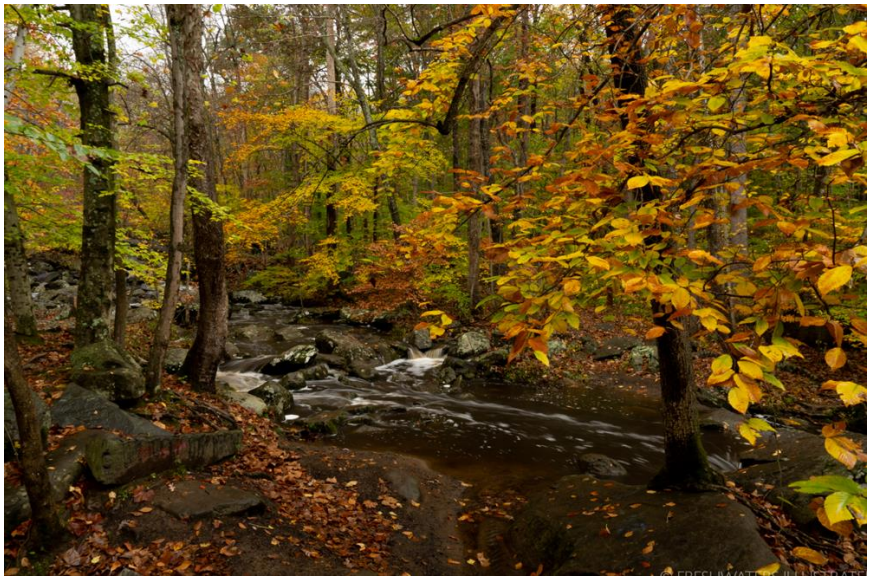
New publication

- Article to be published in Frontiers in Ecology and the Environment: **Advancing Freshwater Science with Sensor Data Collected by Community Scientists** by the Stroud Center (Oviedo, et al.)

  - Summary
    - **Continuous data complemented data collected by USGS** because they were from smaller catchments with more diverse human land uses.
    - Some **data generated by this monitoring network were high-quality (temperature and conductivity),** data from optical sensors without wipers (i.e., turbidity) may need further quality control
    - We **suggest a comparative network approach with standardized metrics to help community scientists** incorporate high-frequency data into their watershed assessments and interpret the outcomes.

Fall EnviroDIY tech

- Leaves off trees now
  - Fall low battery should resolve in most cases
  - Cycle batteries if not resolved
    - Talk to Stroud if you need assistance on power supplies
    - Or if you think there's another issue



Freshwaters Illustrated

Support on Snapshots

- Stroud Center support on synoptic sampling events (aka snapshots and blitzes)
  - Salt (chloride and conductivity)
  - ~~Water temperature~~
- **Please be in touch if you would like support in doing this type of monitoring*

If you want, send your photos and stories

Email or Text to:

- **Diane Huskinson (dhuskinson@stroudcenter.org; 717-383-1179)**
- **Dave Bressler (dbressler@stroudcenter.org; 410-456-1071)**

Next month's presentation (Jan 18)

- Jan 18 – Review of EnviroDIY station technology, station management, troubleshooting ??

Local Policy/Practice Workgroup

- **Current leadership:**
  - Ian Brastow, Lopatcong Creek Initiative/New Jersey Highlands Coalition (NJ)
  - Dave Manning, PA Master Watershed Steward and Schuylkill Water Steward with Green Valleys Watershed Association (PA)
  - Steve Tricarico, Tulpehocken Creek Watershed Association, member Bern Township planning committee (PA)
  - Christa Reeves, Musconetcong Watershed Association (NJ)
  - Alex Jackson, Township Supervisor (PA)
  - Joe Debes, PA Master Watershed Steward and Stroud Center volunteer (PA)
  - Carol Armstrong, PA Master Watershed Steward (PA)
  - Tali MacArthur, PA Environmental Council (PEC)/PA Organization for Watersheds and Rivers (POWR)(PA)

- **Support:**
  - David Bressler, Stroud Water Research Center (PA)

- ***Meetings:*** **1st Thursdays, 11:00a – 12:30p (Zoom, https://zoom.us/j/5889670619)**

Local Policy/Practice Work Group

Short Term Charge:

To develop the most effective way of employing stream monitor data – conductivity, temperature, depth, and sometimes turbidity – and related measures to advise and otherwise influence municipal entities. The charge includes an emphasis on stream quality in relation to land use and development.

Updates from Local Policy/Practice Workgroup

Deliverable Updates

- Municipal Interactions
  - How to engage with municipal leaders (Ready for use)
- Temperature
  - Guidance Document – Putting Stream Temperature Data To Work (last stages of internal review)
  - One-pagers (some available, some in development)
- Conductivity
  - Guidance Document (outline ready)

Updates from Local Policy/Practice Workgroup

- Document: **Putting Stream Temperature Data to Work**
  - Final resource document under review
    - Internal review is coming to a conclusion
    - External reviewers have been identified
  - Discussion of supporting materials
    - 1-page summaries tailored per request to watershed groups (e.g., request from fishing association re temperature impacts on trout)
    - 1-page summaries, each dealing with a *single* concept as it pertains to stream temperature (e.g., groundwater, ambient temperature, solar radiation, stream mixing, impervious surface, deforestation, impoundments, etc.).
    - Powerpoint presentations that conform to middle- or high school curricular efforts aimed at watershed ecology.

Updates from Local Policy/Practice Workgroup

Document: **How to Engage with Municipal Leaders**

- To be distributed via the Stroud Center (https://wikiwatershed.org/drwi/ or possibly Manage My Watershed)
- Possibly a feedback survey which will document requested changes or suggestions
- The document will “live” in one place but be distributed via partners

Updates from Local Policy/Practice

https://weconservepa.org/eac/eac-network-conference-registration/

EAC Network Virtual Conference: Registration Open

The **EAC Network Virtual Conference** will be held **Saturday, February 24, starting at 9AM**. Join fellow Environmental Advisory Council (EAC) members, municipal staff, elected officials, and others interested in the work of EACs for a full day of training and networking, without the hassle of travel! Available sessions cover a wide range of topics, including healthy yards/healthy streams, urban agriculture & forestry, sustainable waste management options, light pollution, and deer management.

AGENDA **REGISTRATION**

NEW THIS YEAR:

EACs can submit group registrations for up to five members at one price!

Any questions before we move on?

Today's Presentation

2023 Year in review and plans for 2024

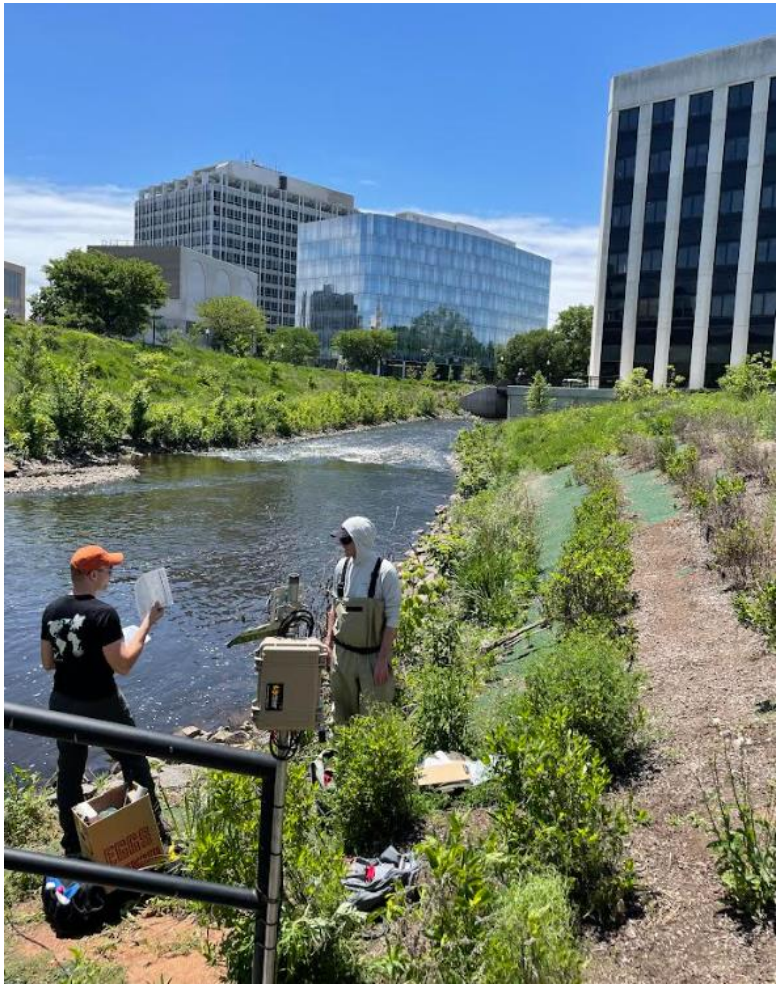
- Review of 2023 monthly meeting presentations
- Review of 2023 technology updates
- Review of EnviroDIY stations across the DRB
  - Stations deployed in 2023
  - Total number of active stations
- 2023 data
  - Example continuous data streams
  - Continuous data summaries
  - Salt and temperature snapshot summaries
- Plans for 2024 meetings

2023 monthly meeting presentation topics

- **Winter**
  - January
    - **Content for 2023 monthly meetings and organizing local policy/practice focus group**, David Bressler (Stroud)
  - February
    - **Salt pollution in the Valley Creek watershed**, Pete Goodman (Valley Forge TU)
  - March
    - **Forming a Watershed Council**, Alan Hunt (Musconetcong Watershed Association)

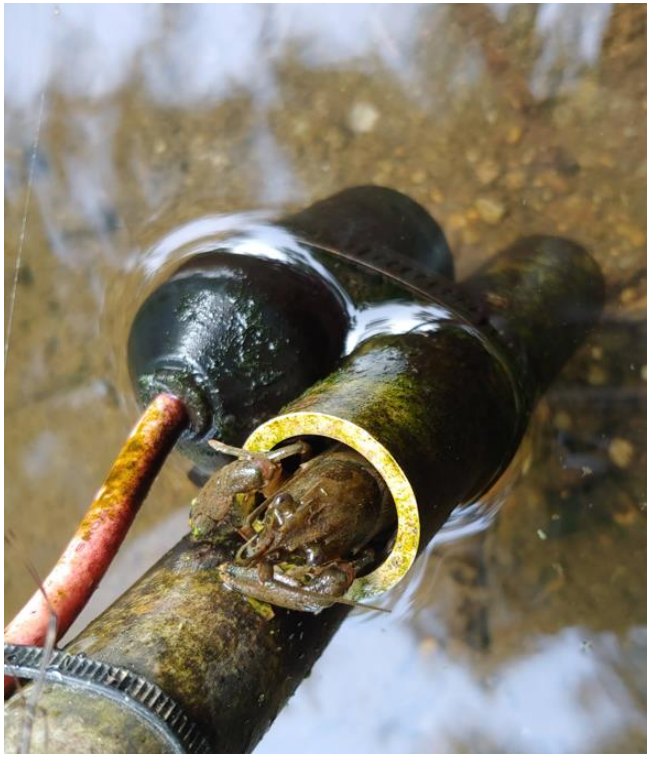
2023 monthly meeting presentation topics

- **Spring**
  - April
    - **Science of Stream Water Temperature and Recent Advances**, John Jackson (Stroud)
  - May
    - **Monitoring Stream Temperature and Data Usage**, David Bressler (Stroud)
  - June
    - **Flow Data Usage with USGS on the Musconetcong**, Christa Reeves (Musconetcong Watershed Association)



2023 monthly meeting presentation topics

- **Summer**
  - July
    - **Comprehensive Updates from the Local Policy/Practice Work Group**, Ian Brastow, Dave Manning, Steve Tricarico
  - August
    - **Urban Stream Syndrome in Southeast PA**, Megan Fork (West Chester University)
  - September
    - **Science of Salt Pollution and Recent Advances**, John Jackson (Stroud)



2023 monthly meeting presentation topics

- **Fall**
  - October
    - **Monitoring Salt Pollution and Data Usage**, David Bressler (Stroud)
  - November
    - **Student Presentations**, Toby Broun, Saranya Anantapantula, Elisabeth Ruschmann, Jay Byrd
  - December
    - **2023 End of Year Review**, David Bressler (Stroud)

2023 Technology Updates

- Mayfly upgrades from ver0.5b to ver1.0 or higher – >20? stations
  - Ver1.1 is current
  - View the details of changes between board versions here, https://www.envirodiy.org/mayfly/hardware/details-and-specs/
- Upgrade to EnviroDIY LTE bee cell board – >20? stations
- New Hydros 21 CTD sensor
  - Pressure transducer more protected
  - Temperature quicker response
  - Conductivity screw heads on underside of sensor (clean accordingly)
- Campbell Clarivue turbidity sensor testing – performs well so far
- All new stations Ver 1.1 Mayfly and EnviroDIY LTE bee cell board

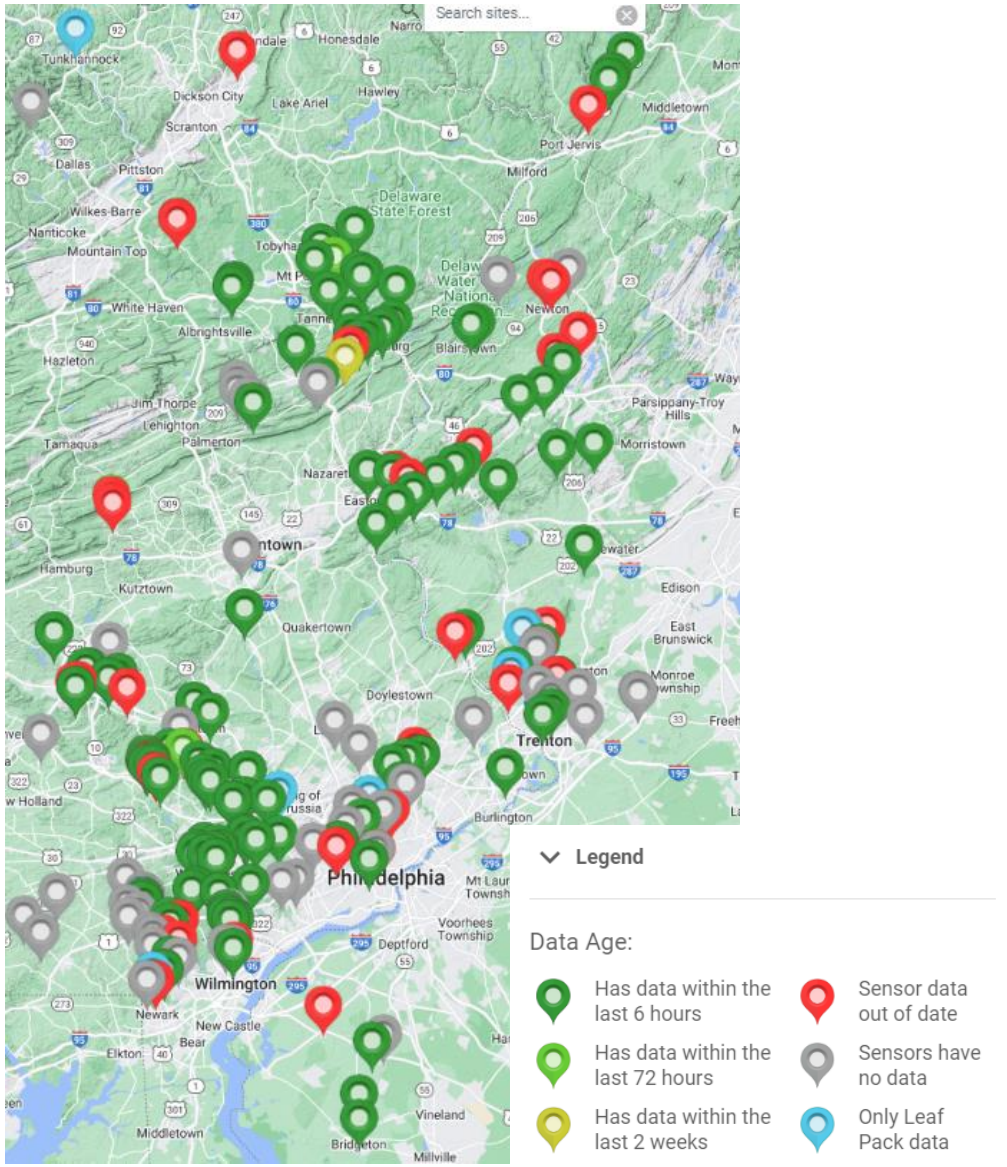
19 new stations in 2023

BWA6	Pocono Creek	Rail Gap Preserve	40.99118	-75.255695		2/7/2023
1-1-BL	Musconetcong River	Riegelsville Boat Launch	40.59263	-75.18779		2/10/2023
ULAQ2S	Aquashicola Creek	Aquashicola upstream BMR	40.84188	-74.82085		3/15/2023
GMI_CTD1	Marsh Creek	PaTpk Service Plaza below treatment planr	40.121083	-75.773594		3/15/23
30-8-A-BMD	Musconetcong River	Downstream of Beatty's Mill Dam	40.84188	-74.82085		3/21/2023
GMI_CTD3	Marsh Creek	N. Trib at culvert on rt 401	40.13027	-75.76231		4/4/2023
GMI_CTD2	Marsh Creek	Trib N. of Service plaza	40.12289	-75.77702		4/4/23
GMI_CTD4	Marsh Creek	From forested trib N. of Rt401	40.120694	-75.761167		4/5/2023
BWA8	Pocono Creek	Pocono Creek on Tannersville Woods	41.04027	-75.31025		6/28/2023
BWA9	McMichaels Creek	Upper McMichaels Creek	40.93578	-75.39235		6/28/2023
BWA10	Marshalls Creek	Marshalls Creek Falls	41.05237	-75.13727		6/28/2023
GMI_CTD5	Marsh Creek	North branch on Marsh Rd	40.13835	-75.77954		7/3/23
GMI_CTD8	Marsh Creek	Herman's Waterloo	40.125	-75.7653		7/4/2023
GMI_CTD6	Marsh Creek	Northwest branch on Marsh Rd	40.12909	-75.78066		7/4/2023
GMI_CTD9	Marsh Creek	Marsh Creek USGS station	40.0979	-75.74159		7/9/2023
VCRP1	Crabby Creek	Crabby Creek Park (Tredyffrin)	40.0524285	-75.4682784		7/25/2023
PKBK9S	Basha Kill	Downstream of New Century Films	41.39888	-74.6459		9/28/2023
PKBK10S	Basha Kill	Basha Kill OCLT-2	41.462472	-74.585417		10/24/2023
ULAQ4S	Aquashicola Creek	Aquashicola Creek at Eaton Rd	40.87494	-75.33174		11/30/2023

Total active stations in the DRB

- Over 130 active stations in the Delaware River Basin

- Red stations offline >2 weeks
  - Station relocated
  - No cell transmission but collecting data
  - Not functional
  - Station removed

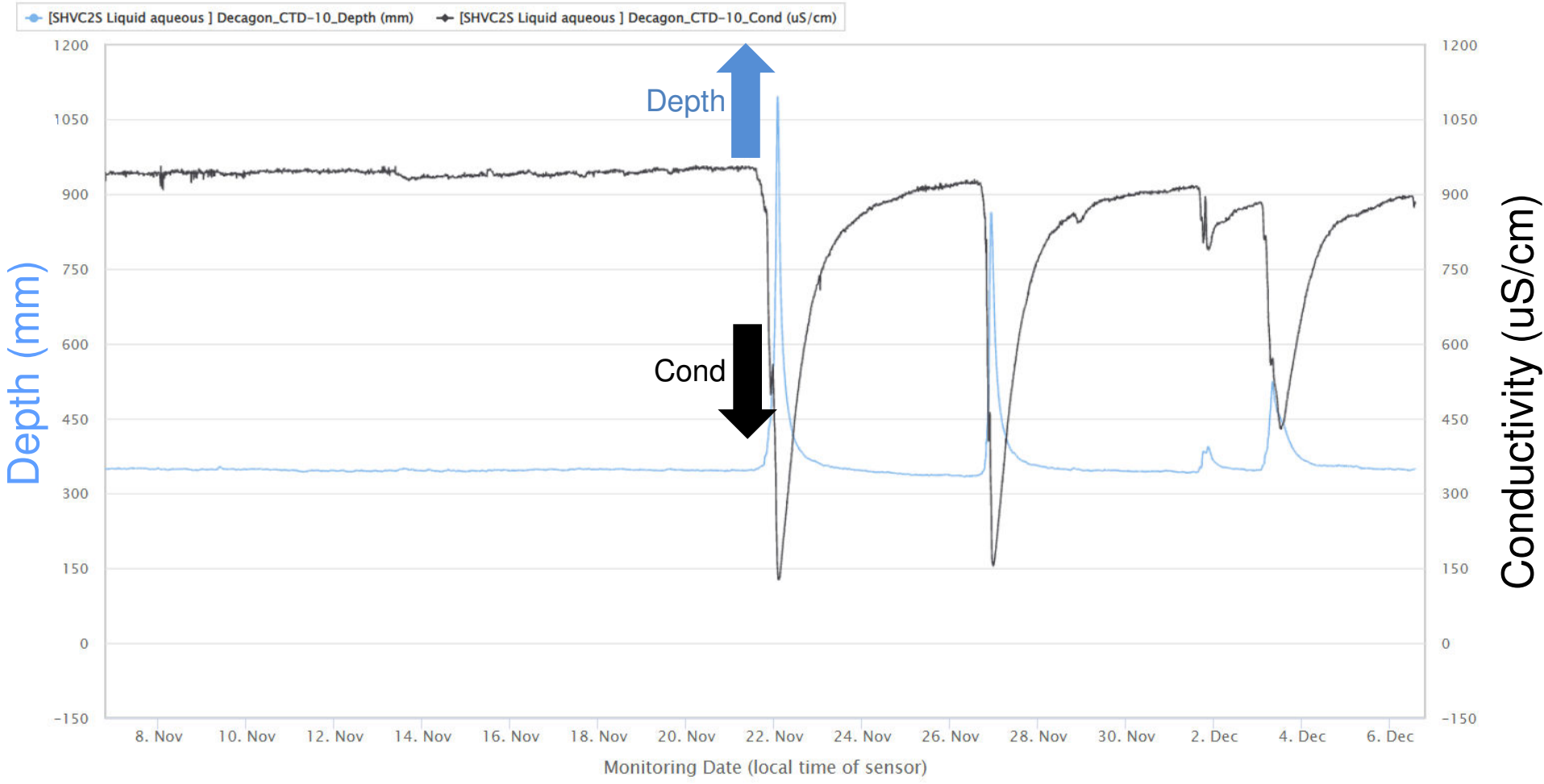


2023 continuous data patterns from across the DRB

- Example continuous data patterns that describe different occurrences/relationships
  - Brings up questions on real or error
  - Importance of quality control (QC) crosshecks
  - Importance of communication/dialogue

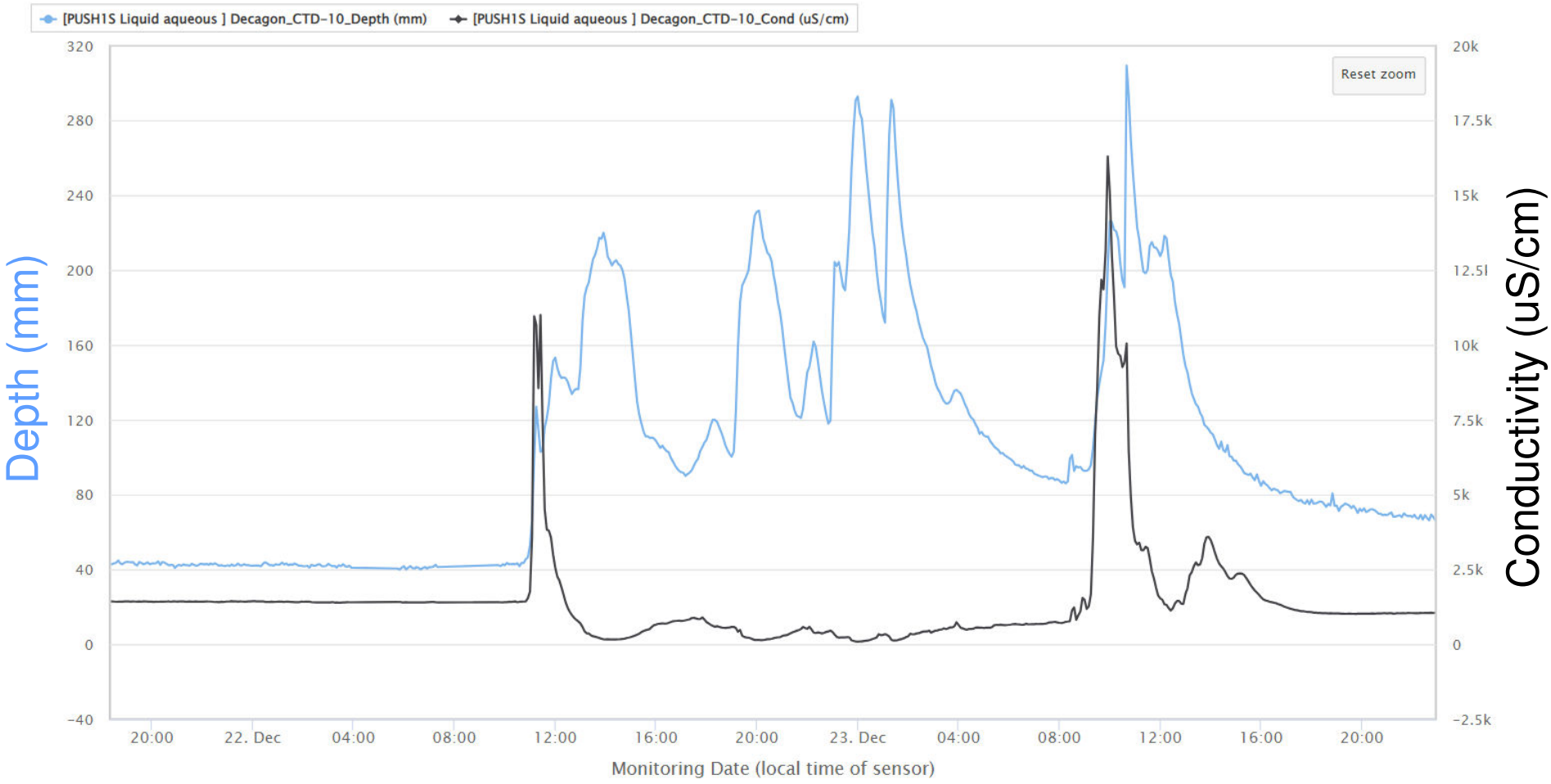
- Possibly expand on this in Feb 2024 meeting

Typical Depth/Cond response



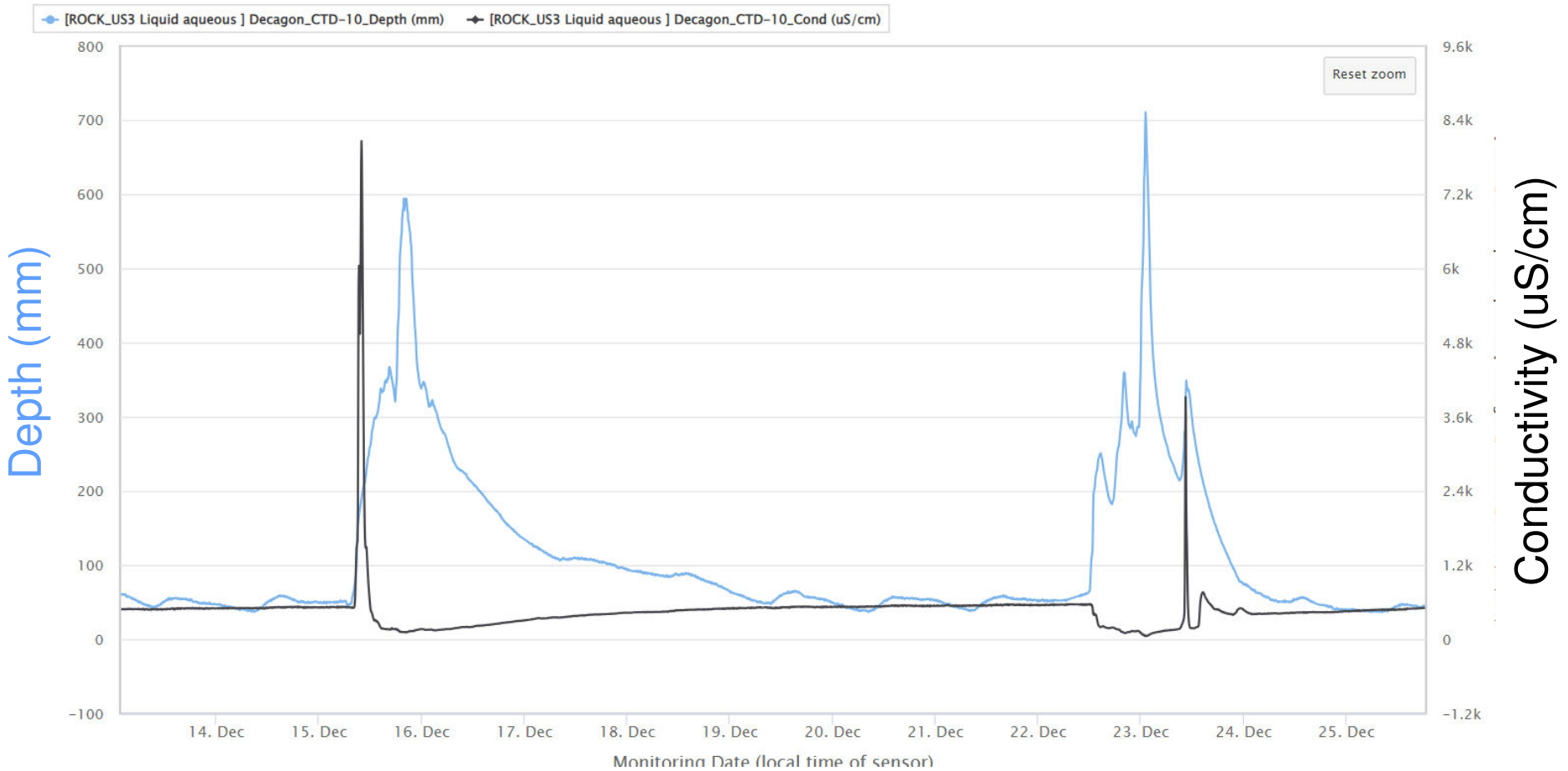
Valley Creek at Valley Creek Park – typical depth/conductivity storm dilution response

Winter salt flushes, depth, and dilution



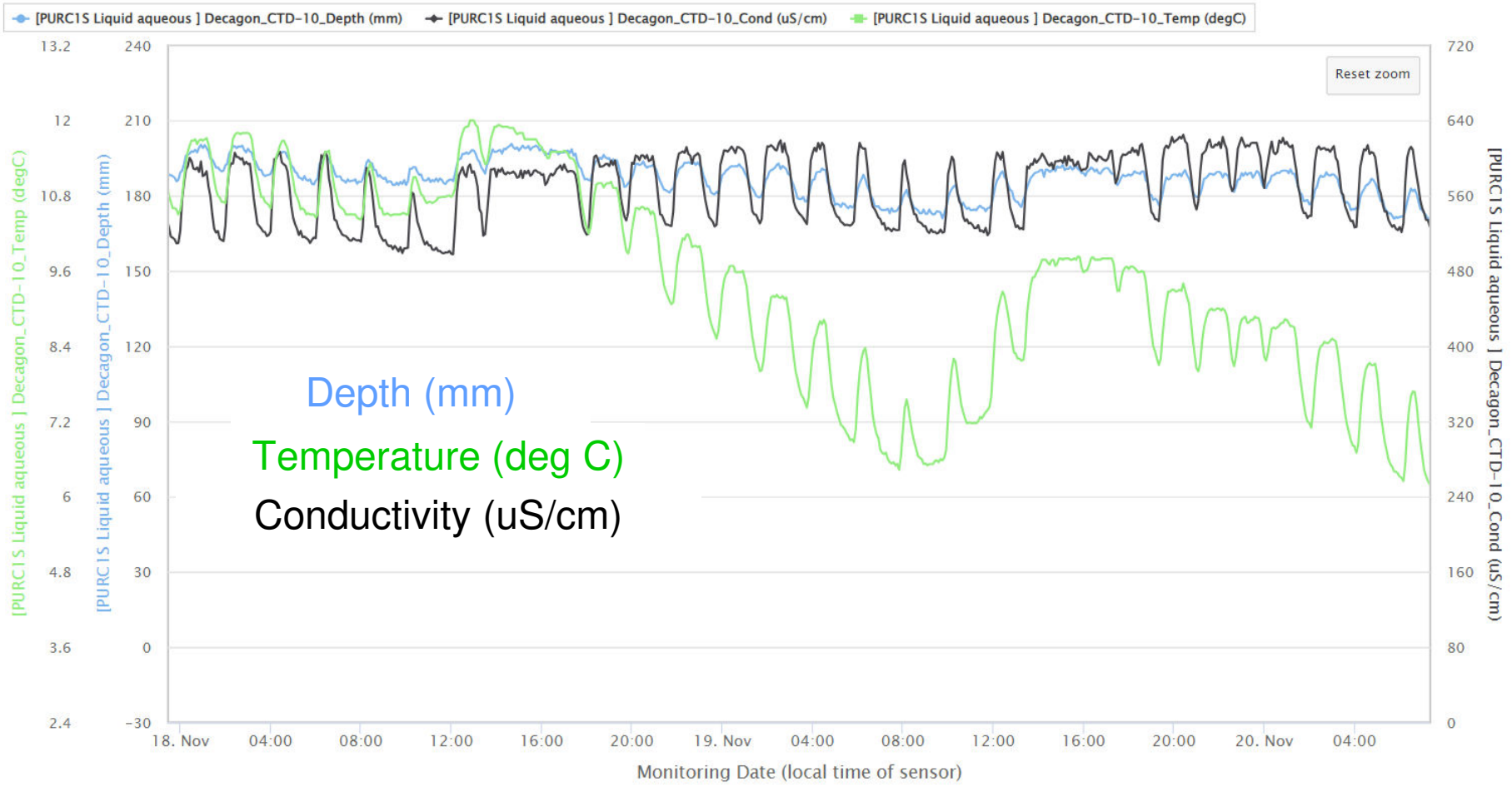
Shoemaker Run at Old York Rd – salt (conductivity) spike and follow-up dilution, variable timing/extent of responses

Salt spikes variable timing



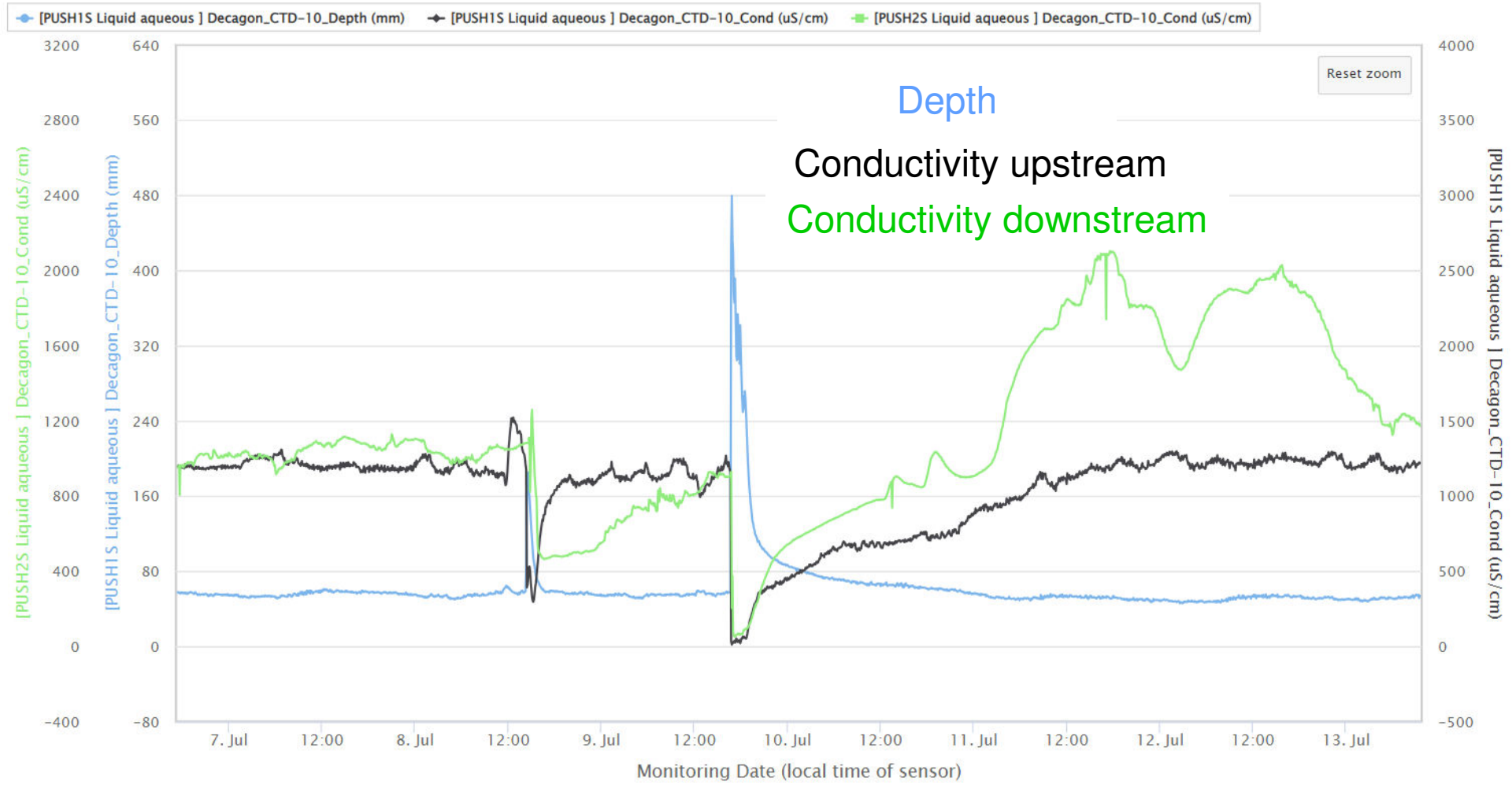
Rocky Run at Marriot – salt spikes, variable timing – not always at the beginning of runoff events

Data fluctuation in response to human inputs



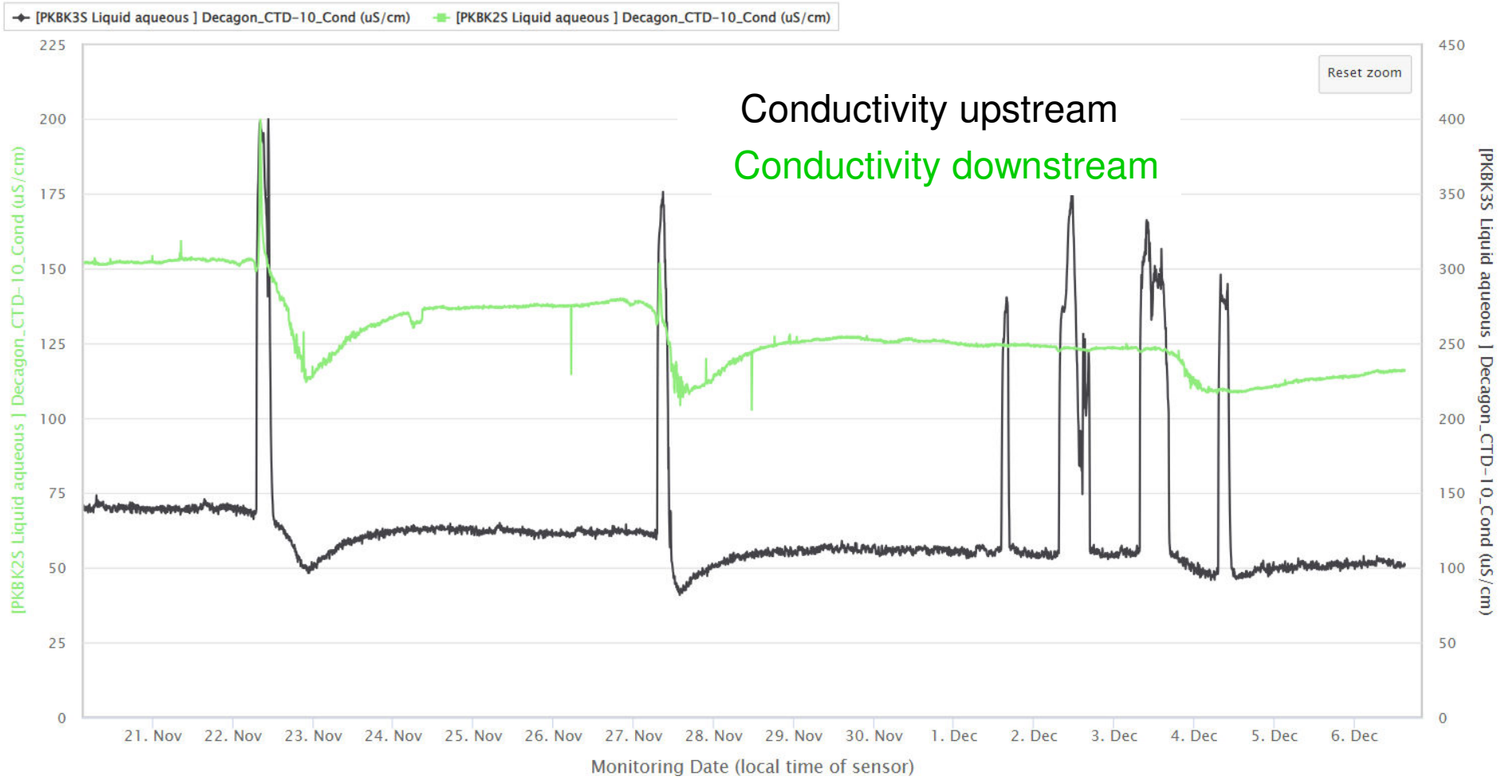
Ridley Creek Upstream of Ashbridge Lake – just downstream of a waste water treatment facility, variability in relation to effluent entry into receiving stream

Variability between two stations (pollutant entry?)



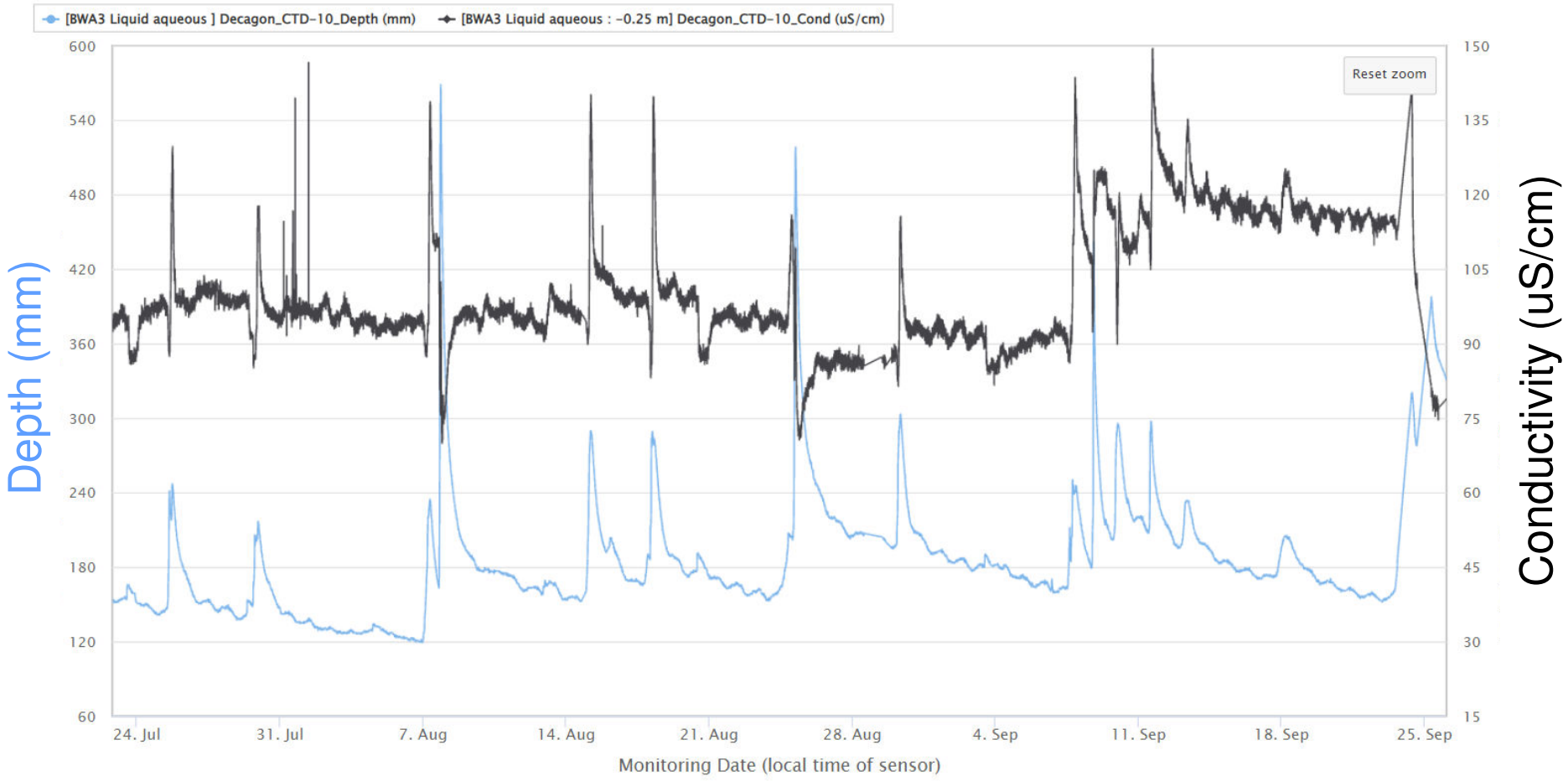
Shoemaker Run upstream (**black**) and downstream (**green**) – upstream/downstream, pollutant appears to enter between stations

Variability between two stations (pollutant entry?)



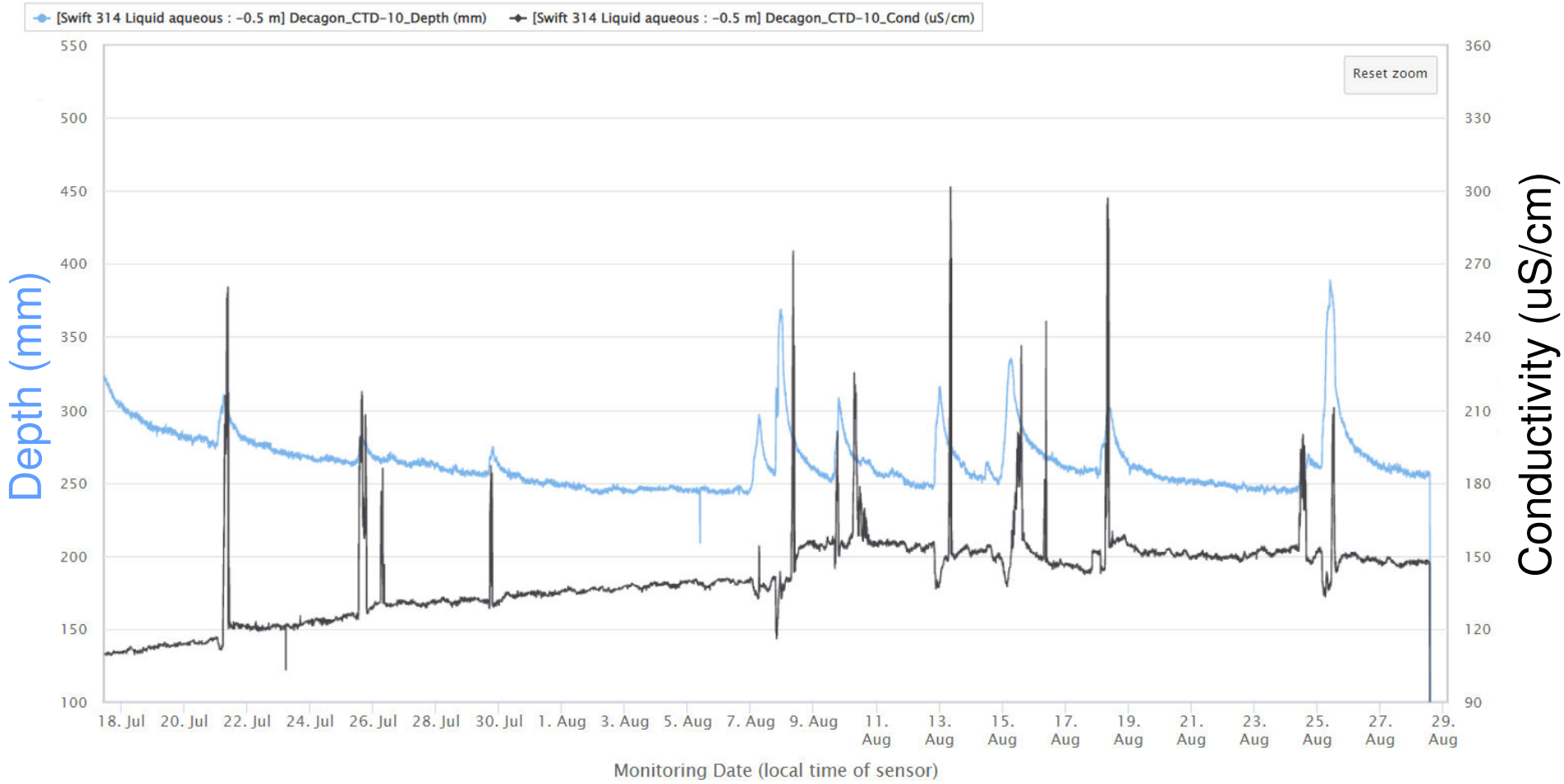
Basha Kill upstream (**green**) and downstream (**black**) – pollutant appears to enter between stations

Non-winter conductivity spikes



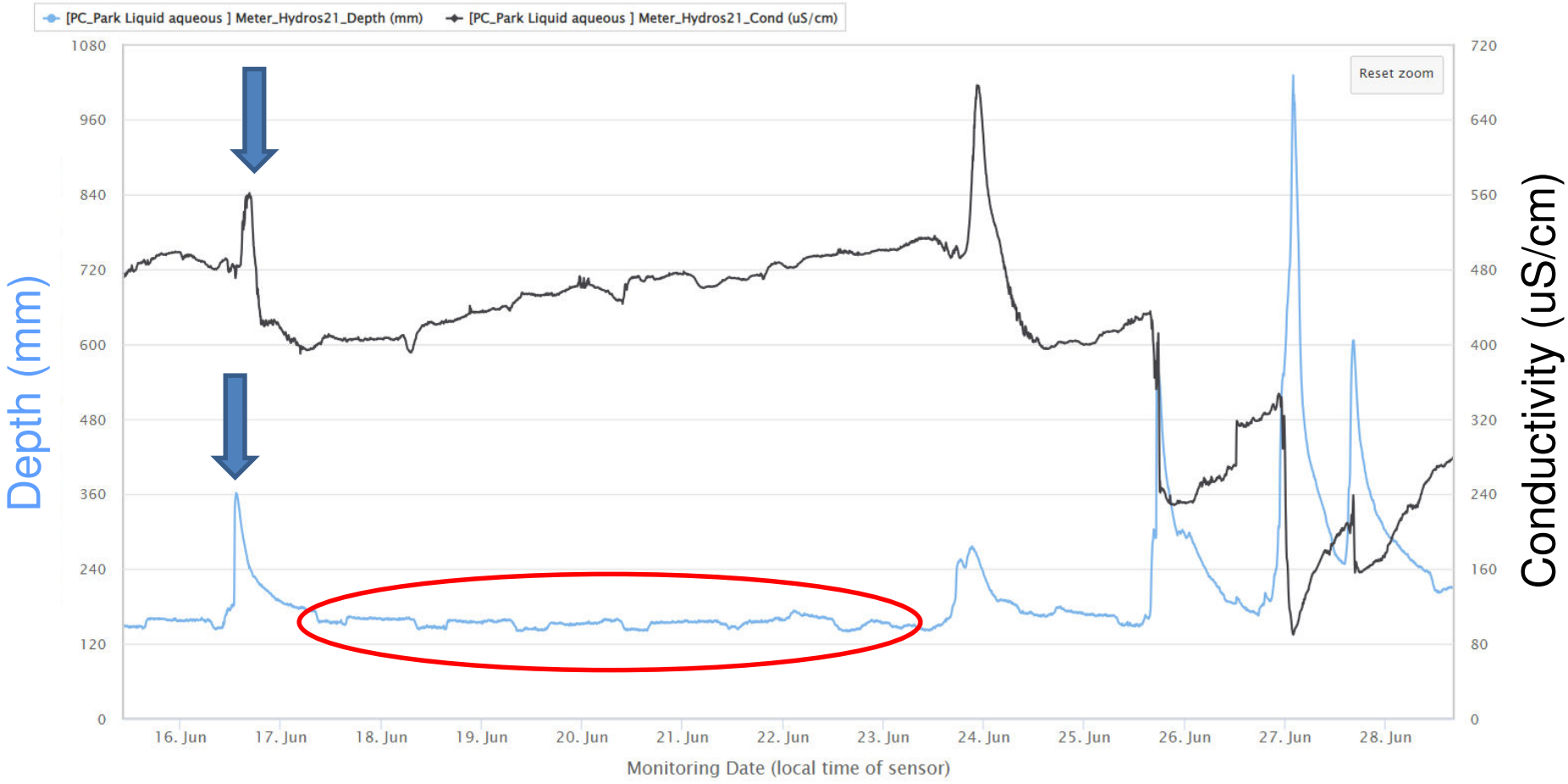
Lower Mill Creek (Brodhead watershed) – consistent non-winter conductivity spikes associated with depth increases – upstream commercial/residential (***but need to confirm data accuracy with QC crosschecks***)

Non-winter conductivity spikes



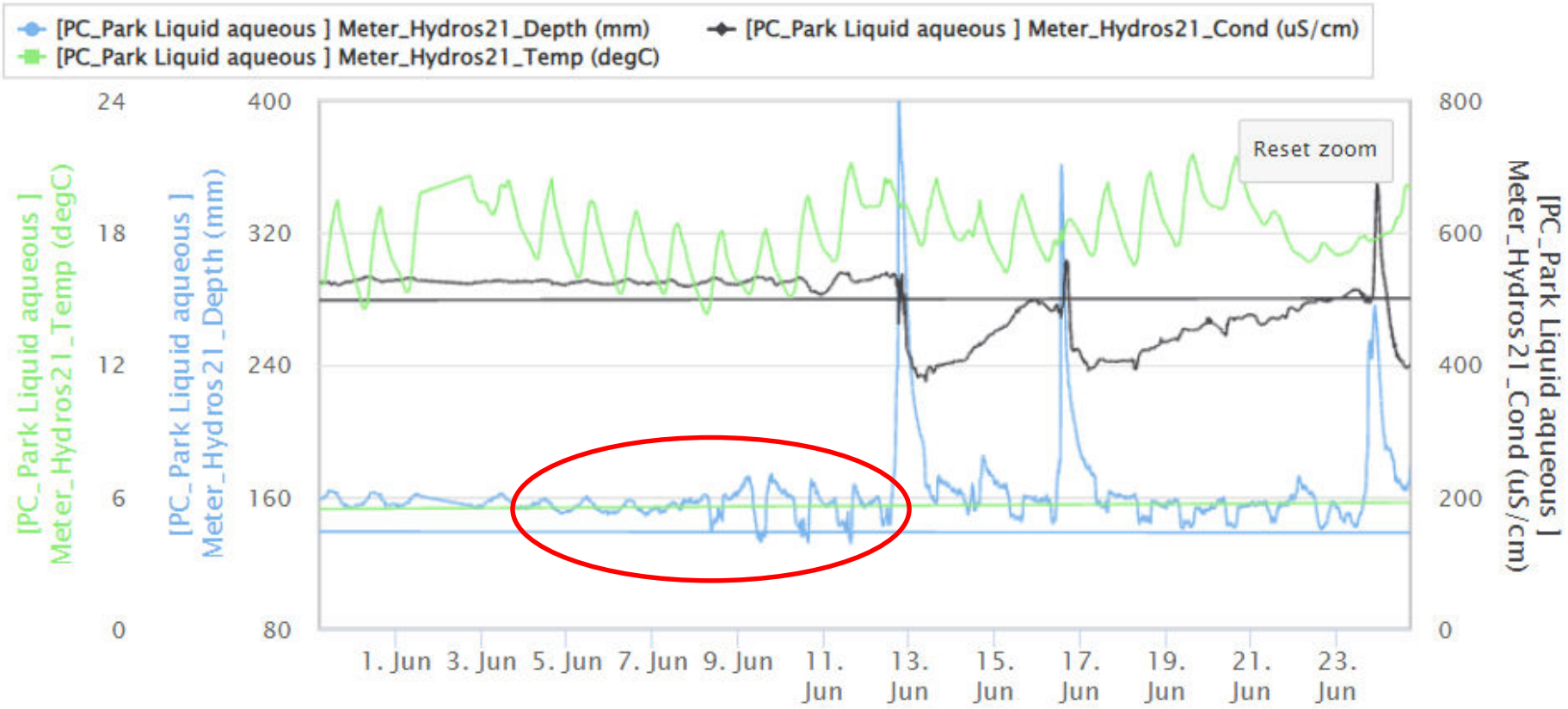
Swiftwater Creek between Rt. 314 and confluence – consistent conductivity spikes associated with depth increases – headwaters in urban area and golf course (***but good to confirm data accuracy with QC crosschecks***)

Abrupt patterns



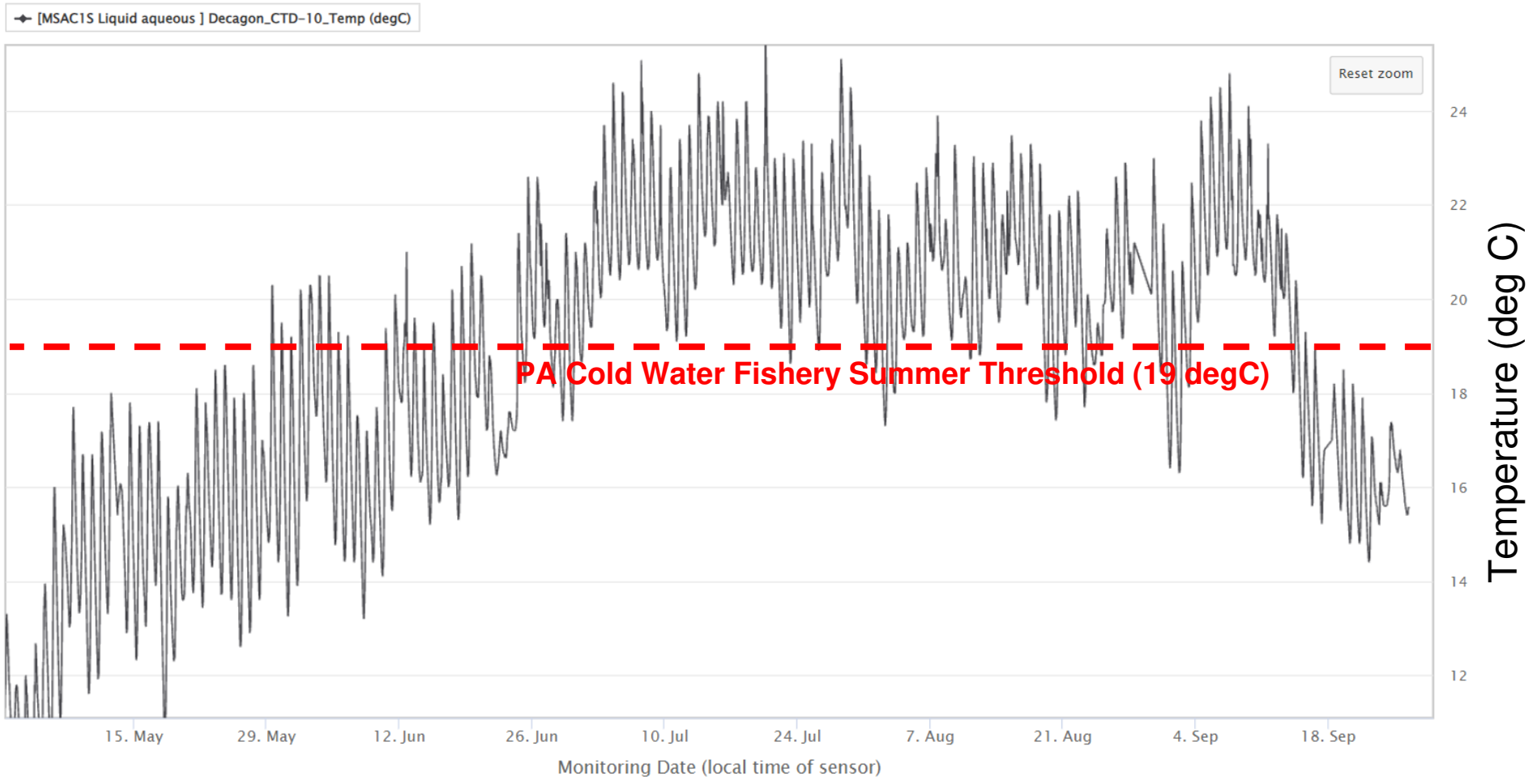
Pine Creek at Pine Creek Park – non-winter storm associated conductivity spikes and abrupt (but subtle) water depth changes at baseflow (Upstream influence? Sensor function/issue?) – *QC crosshchecks, sensor performance*

Abrupt patterns



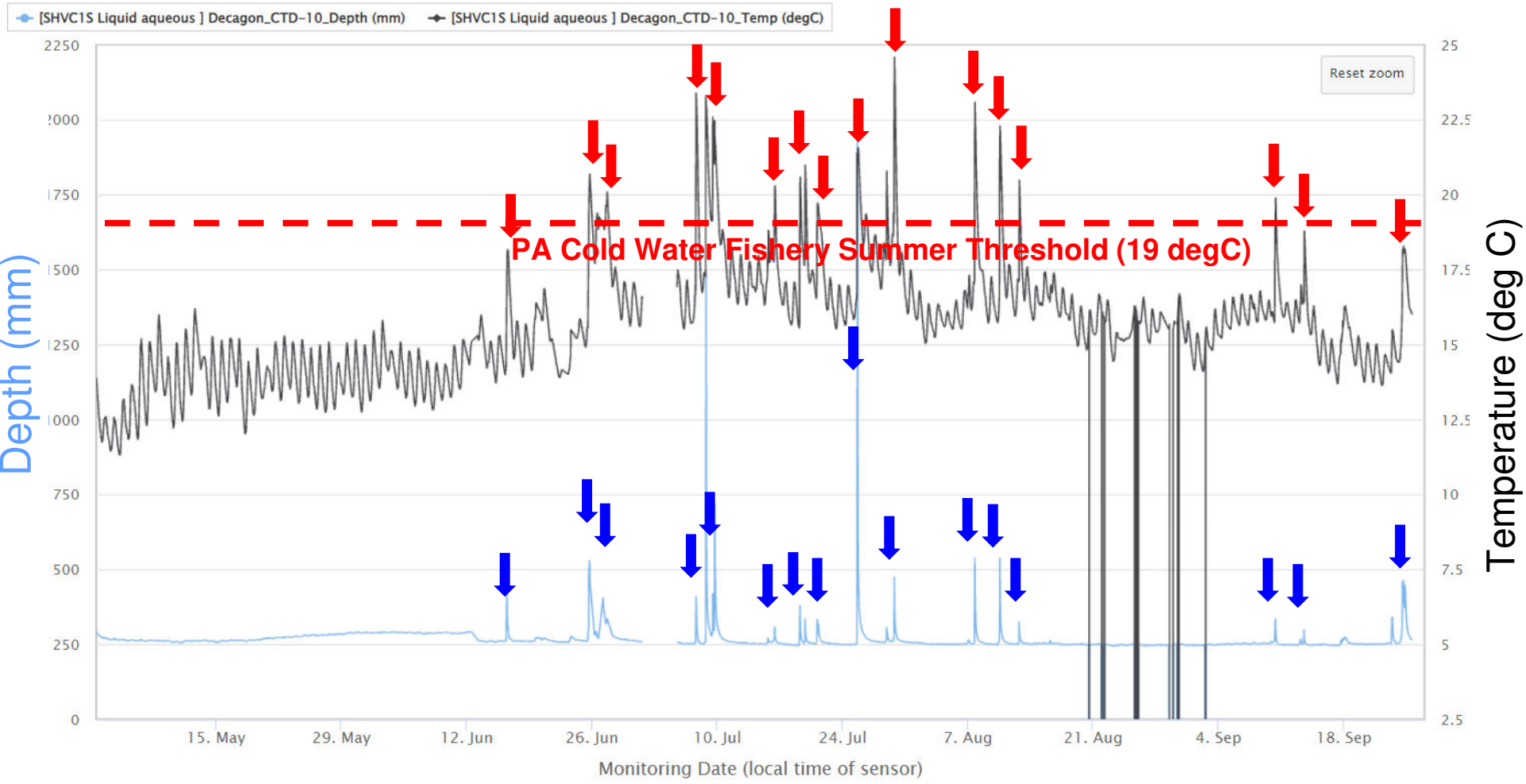
Pine Creek at Pine Creek Park – Sensor function/issue? Temperature can have effects on sensor output

Water temperature in relation to trout habitat



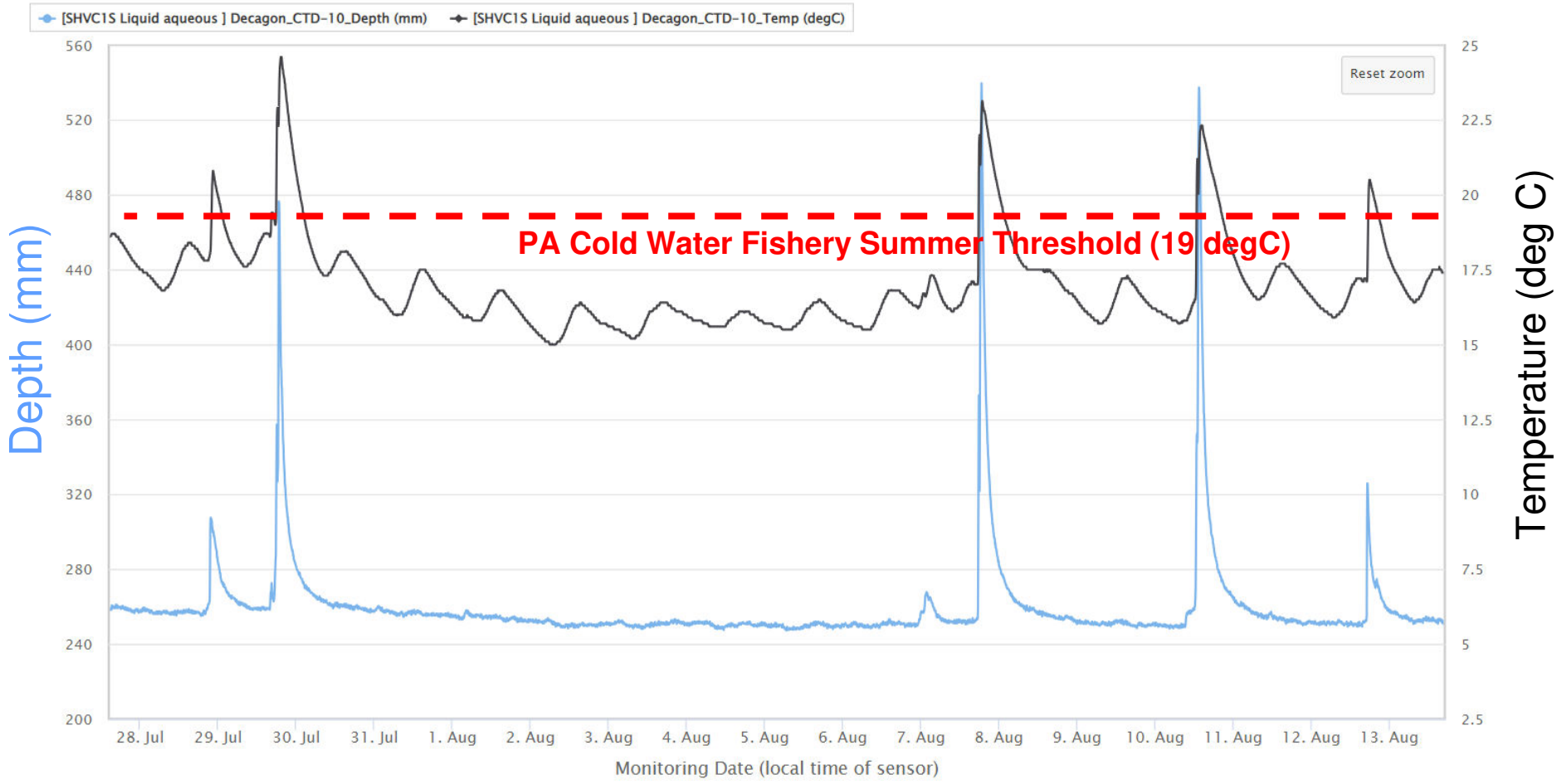
Angelica Creek at St. Bernardine St – trout stream that with summer warming

Thermal surges from warm stormwater runoff



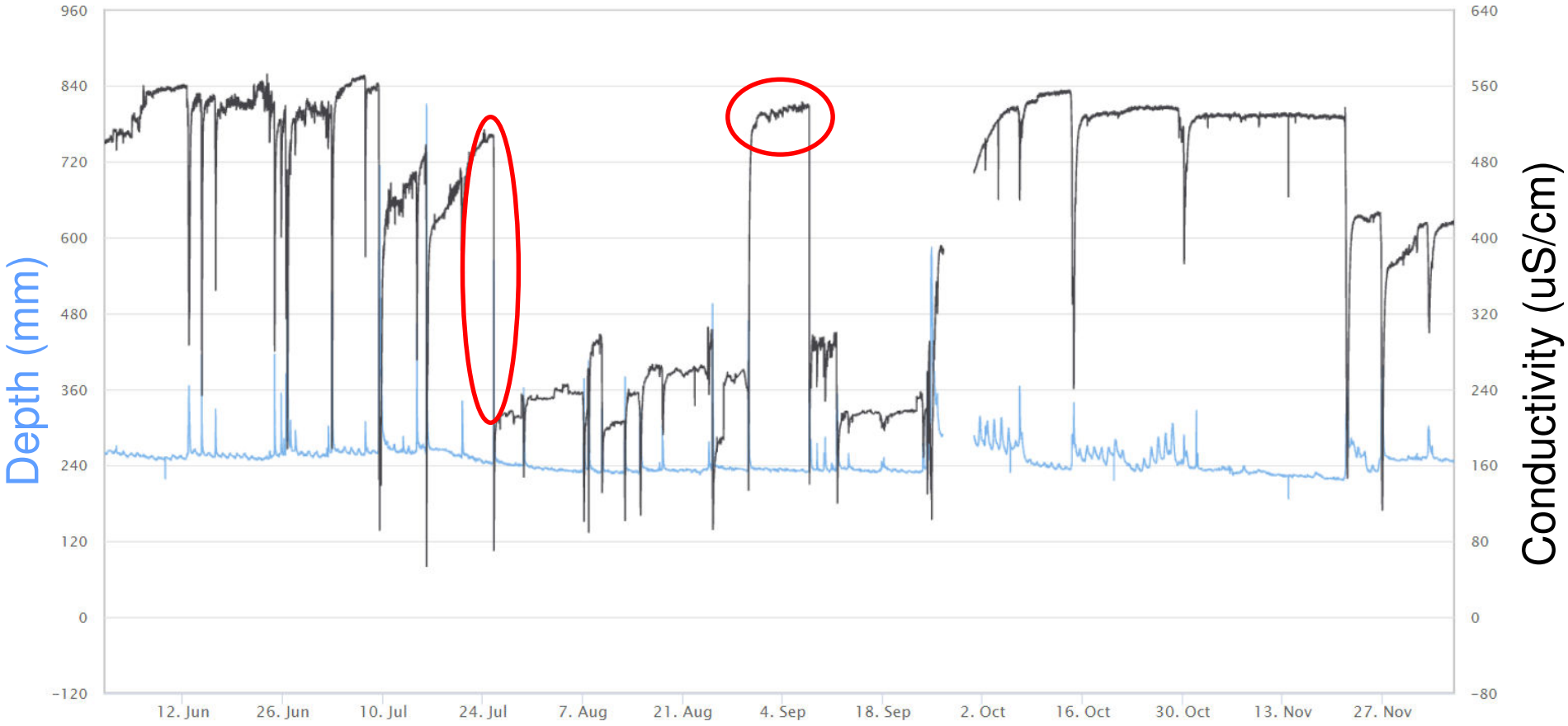
Valley Creek at Ecology Park – trout stream with cool limestone springs with urban summer thermal storm pollution (i.e., stormwater warmed from impervious surfaces and stormwater ponds flushes into the stream)

Thermal surges from warm stormwater runoff



Valley Creek at Ecology Park – trout stream with cool limestone spring-fed with urban thermal storm pollution

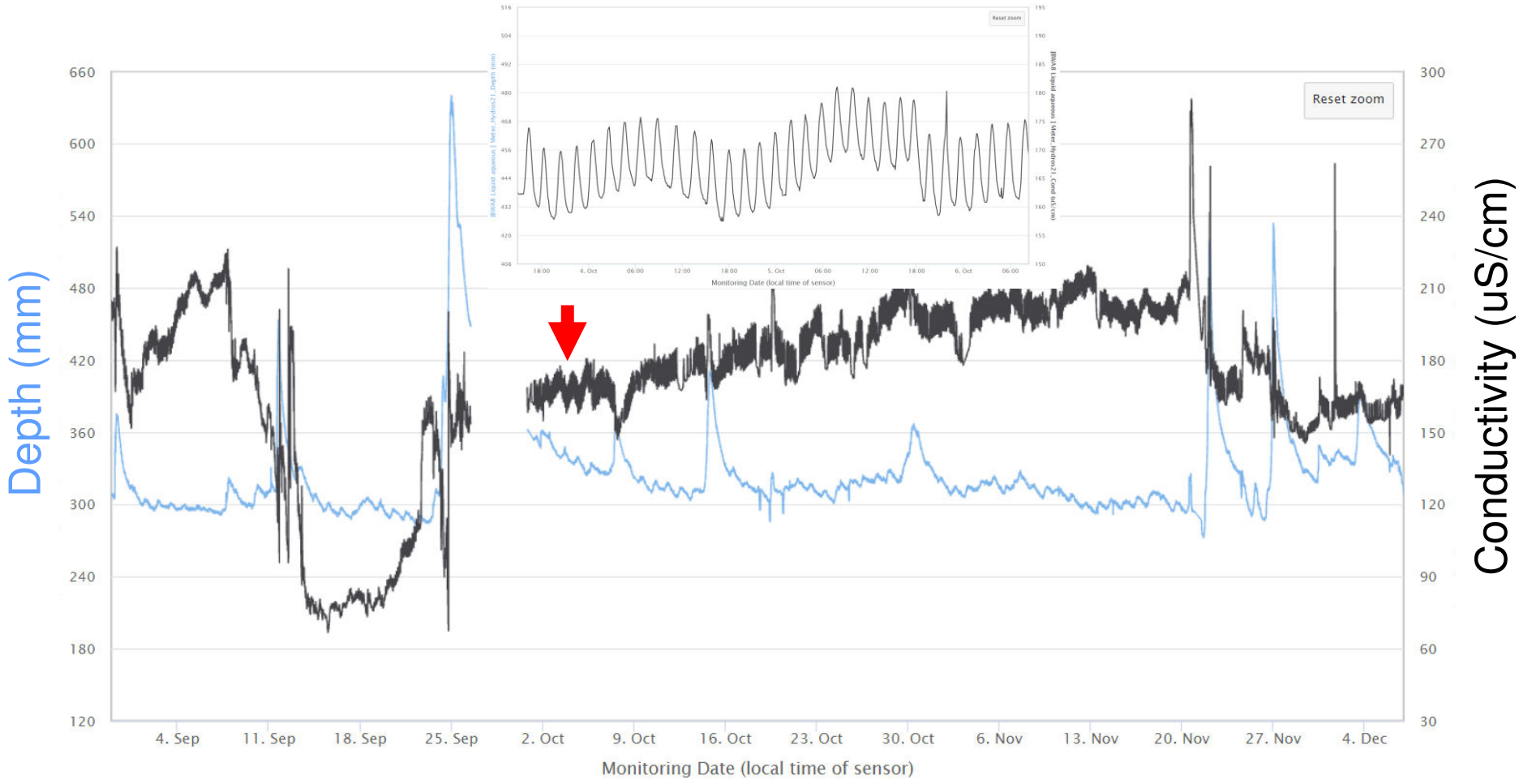
Notes on importance of QC cross checks and watching the data



Is the decrease in conductivity on July 24 real? Is the increase/plateau/decrease around Sept 4 real?

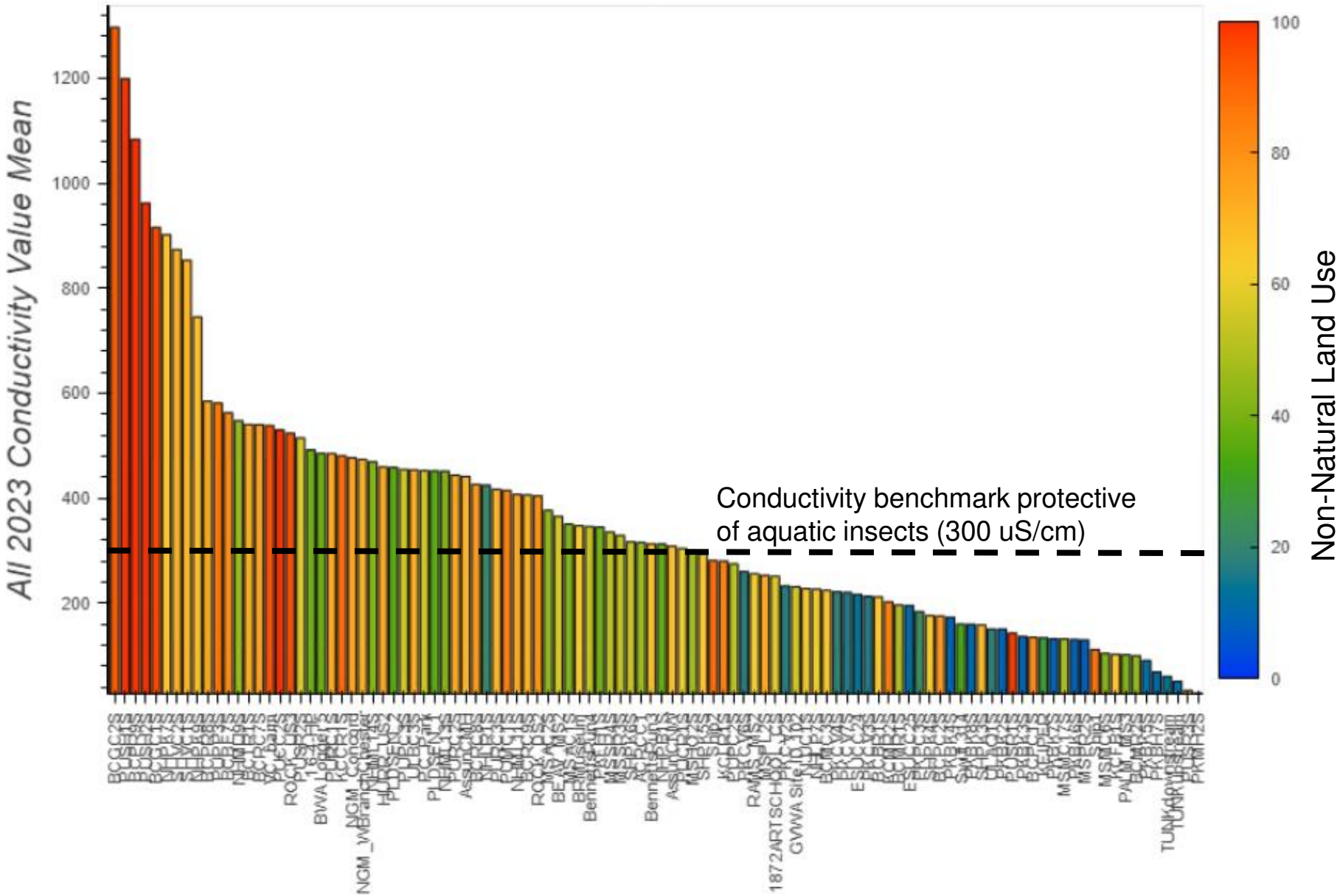
Ideally QC CROSS CHECKS are done to confirm accuracy when dramatic data changes happen – OTHERWISE you don't know for sure

Notes on importance of QC cross checks and watching the data



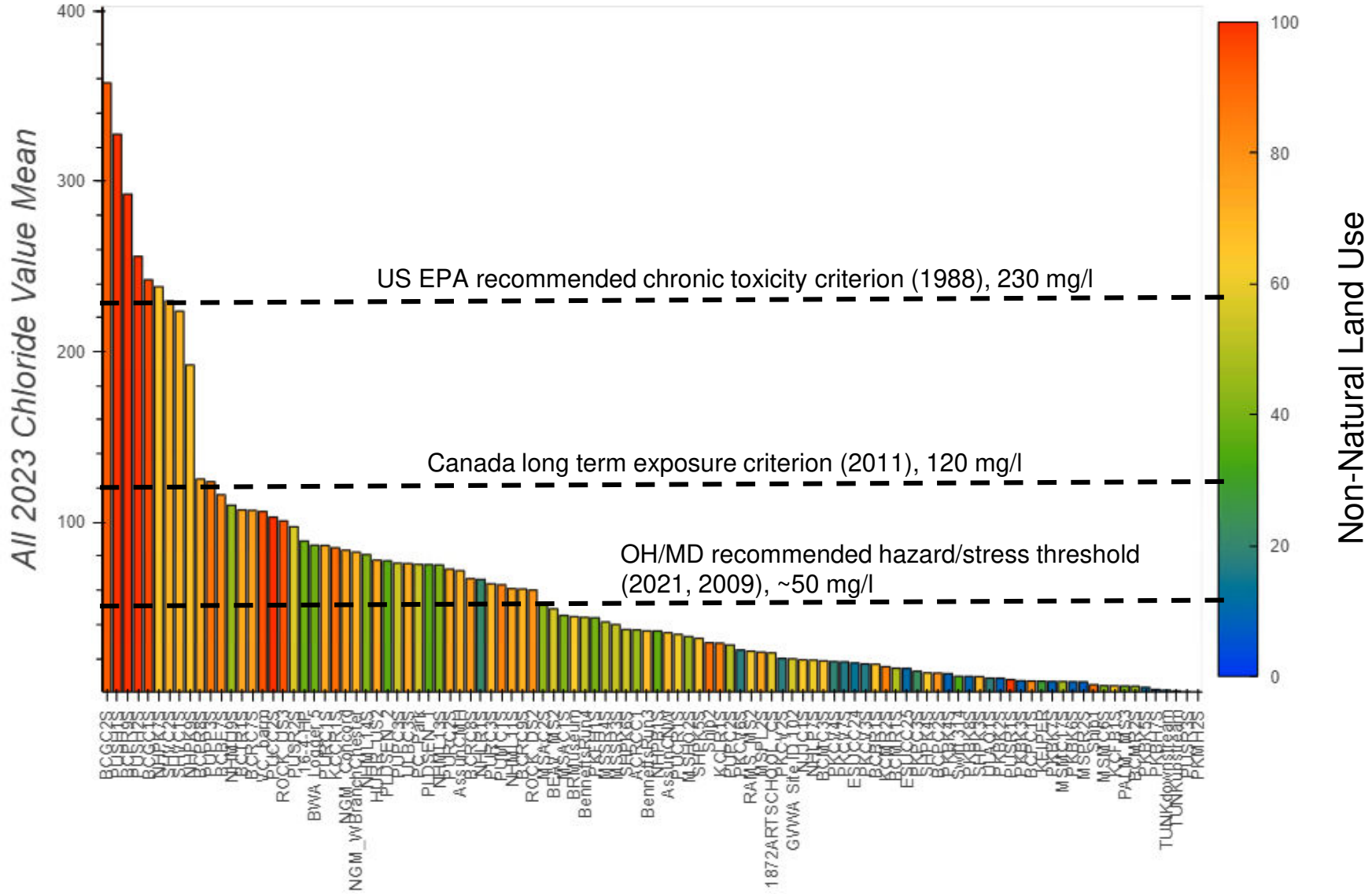
Are the fluctuations in conductivity and depth real? Sensor performance/issue? Upstream ski resort, water park, outlet malls

2023 site averages of continuous conductivity data



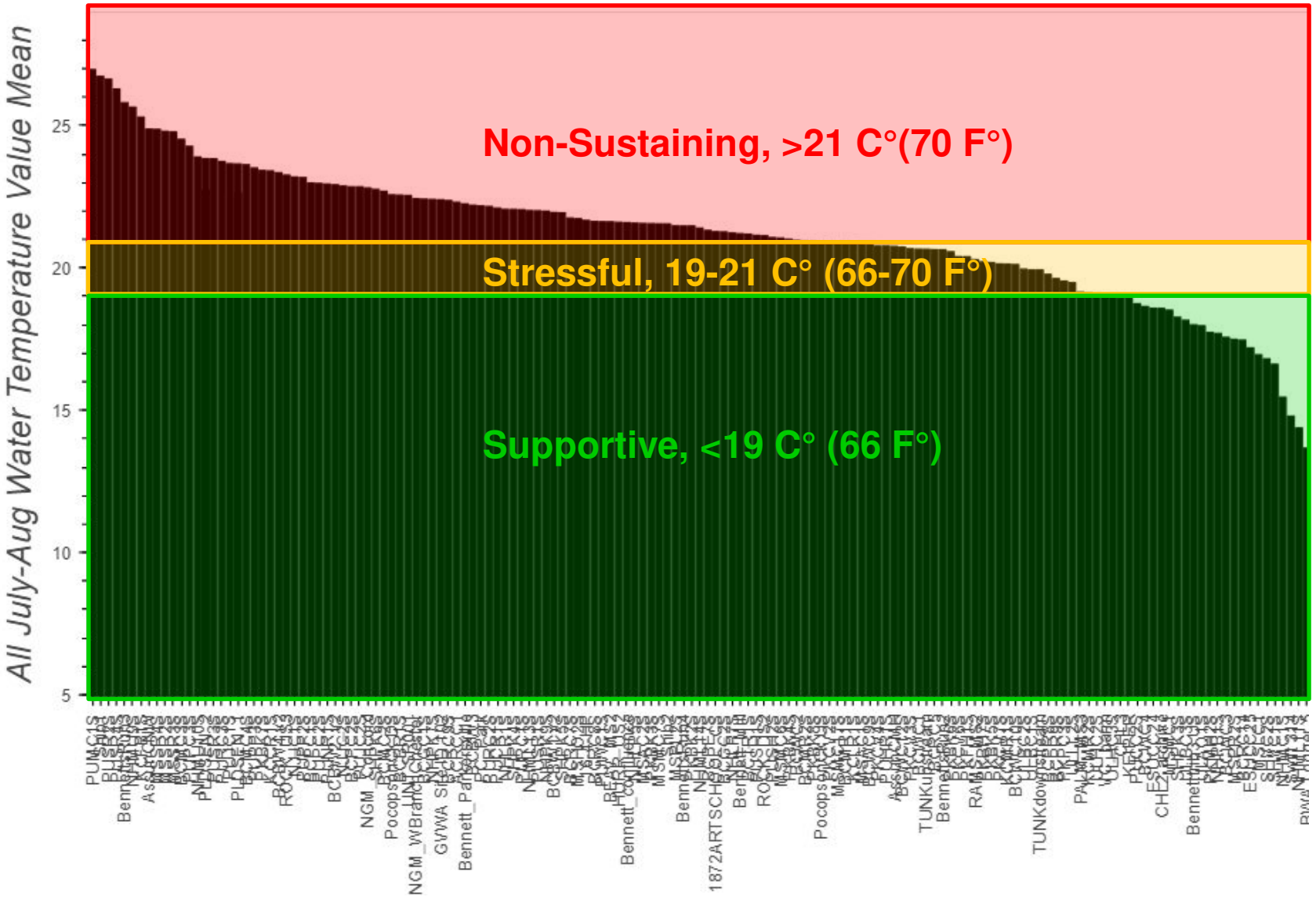
Clements and Kotalik, 2016 (300 uS/cm benchmark is protective of aquatic insect communities in naturally low-conductivity streams)

2023 site averages of continuous chloride data (converted from conductivity)



US EPA 1988; Canada Council of Ministers of the Environment 2011; Miltner 2021; MD Dept of Env 2009

All years site averages for July-Aug water temperature – trout habitat context

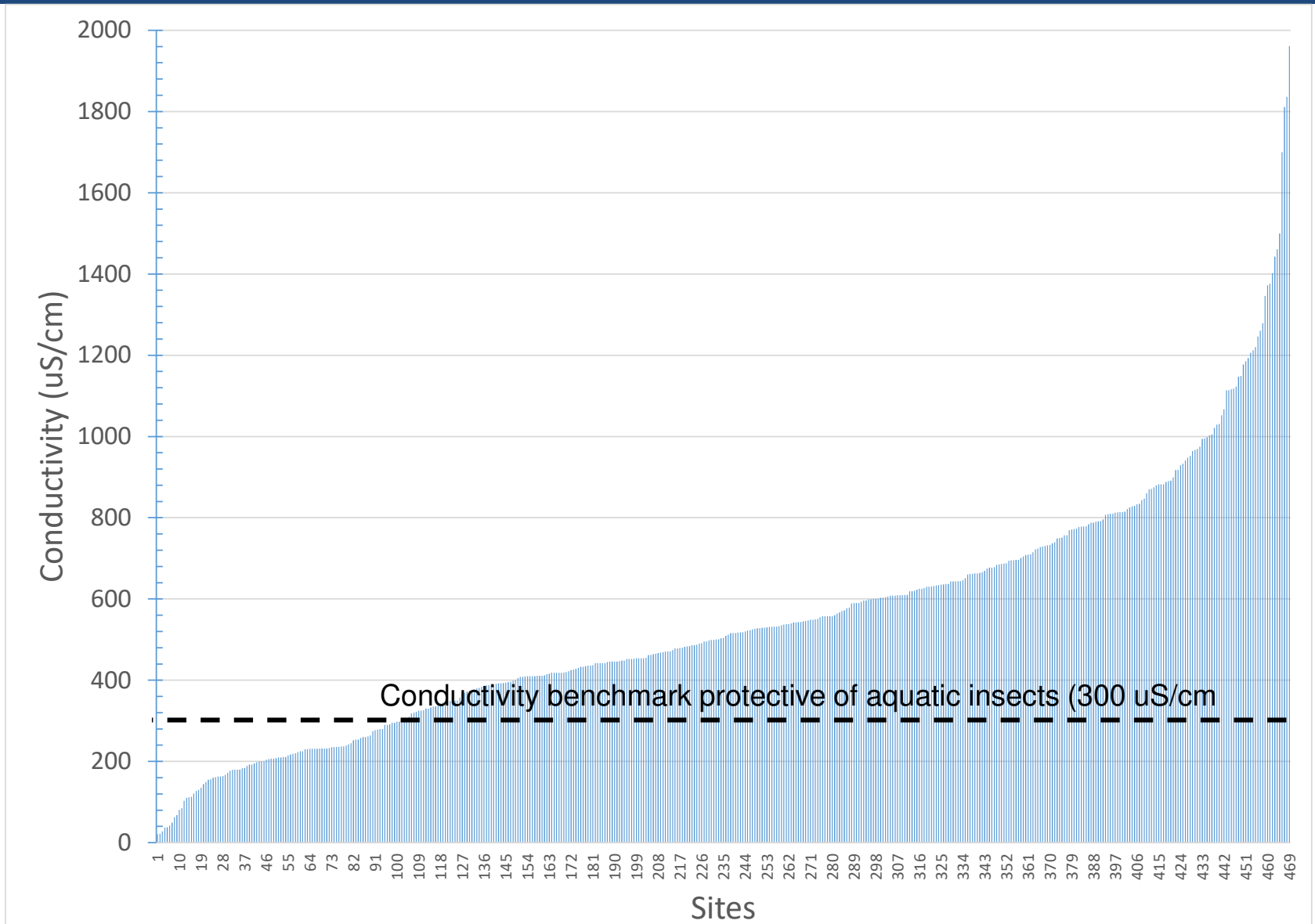


USGS SHEDS Brook trout model, NV DEP 2017, Chadwick et al. 2015, Kratzer 2013, Wehrly et al 2007; personal communication Keith Fritschie (VT DEC); PA DEP Ch 93 Water Quality Standards

2023 (and 2022) Salt Snapshots

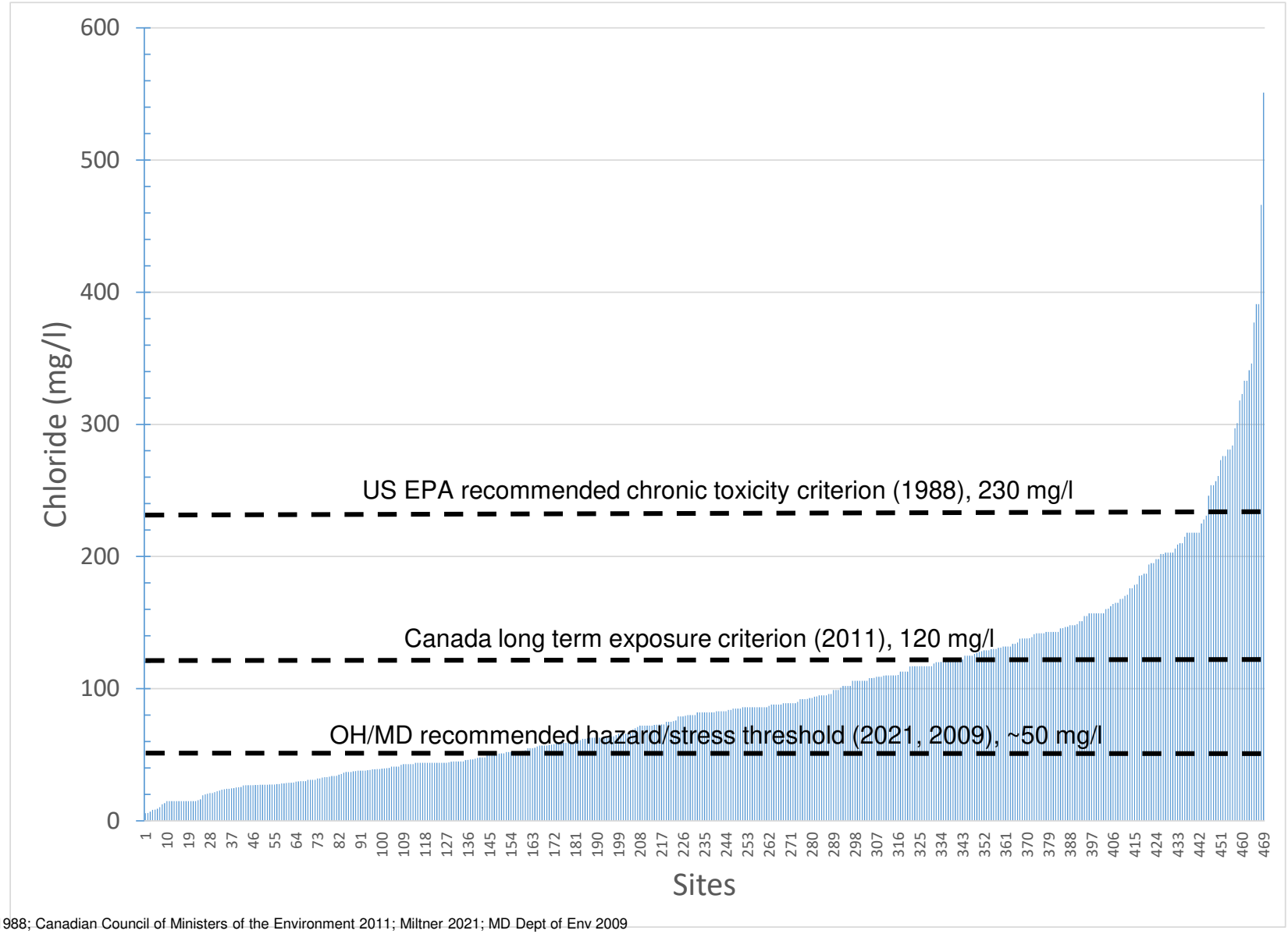
- Brodhead Watershed Association
- Angelica Creek Watershed Association
- Valley Forge Trout Unlimited
- Tookany-Tacony/Frankford Watershed Partnership
- Little Lehigh Watershed Stewards
- Bucks County Master Watershed Stewards/Neshaminy Watershed Association
- Willistown Conservation Trust/Darby Creek Valley Association
- Musconetcong Watershed Association
- The Nature Conservancy, Delaware
- West Chester University/Chester-Delaware Master Watershed Stewards/Stroud Center
- Others outside DRB – support in association with Izaac Walton League

2023 (and 2022) salt snapshot data from across the DRB



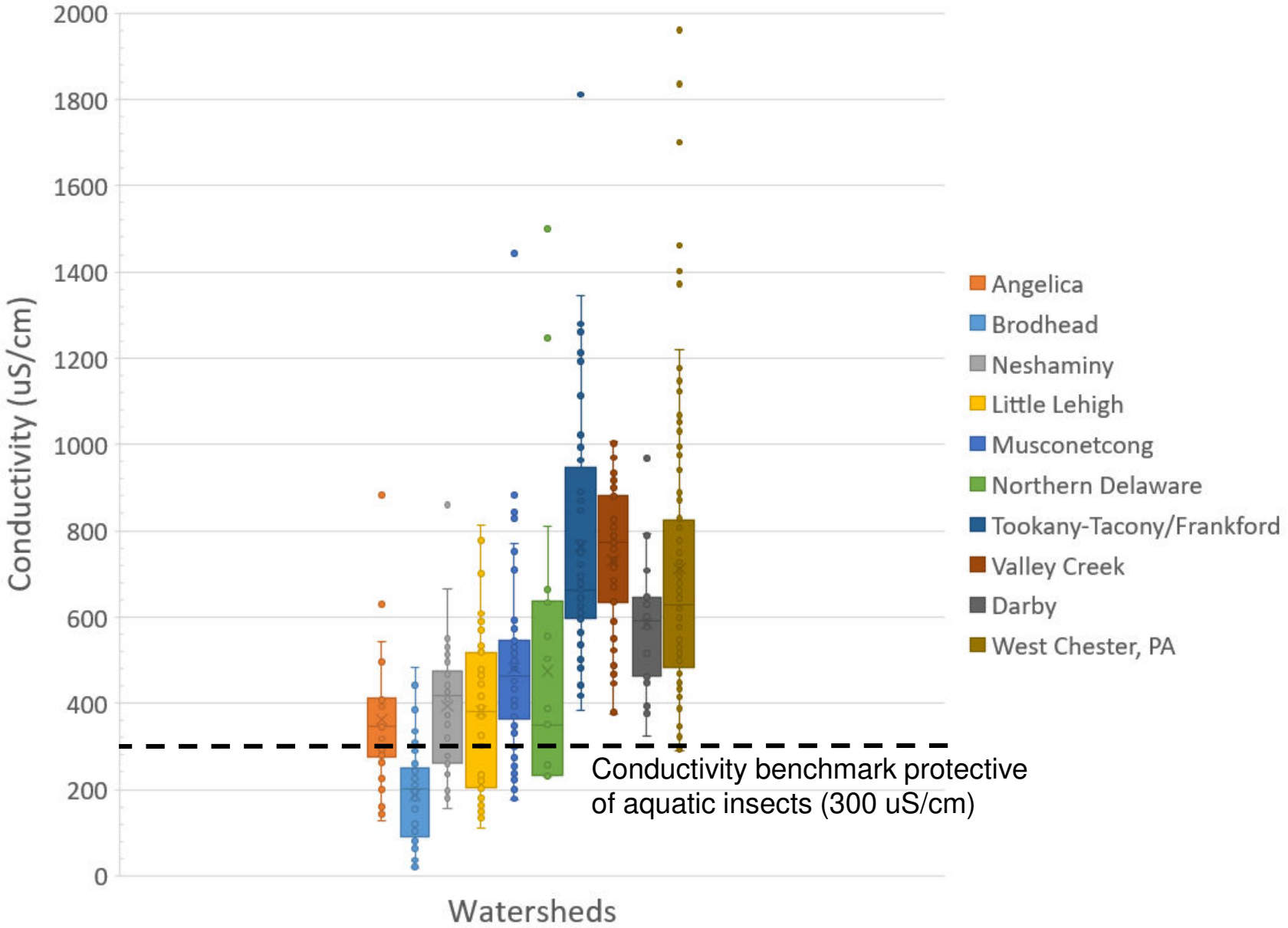
Clements and Kotalik, 2016 (300 uS/cm benchmark is protective of aquatic insect communities in naturally low-conductivity streams)

2023 (and 2022) salt snapshot data from across the DRB



US EPA 1988; Canadian Council of Ministers of the Environment 2011; Miltner 2021; MD Dept of Env 2009

2023 (and 2022) salt snapshot data by watershed



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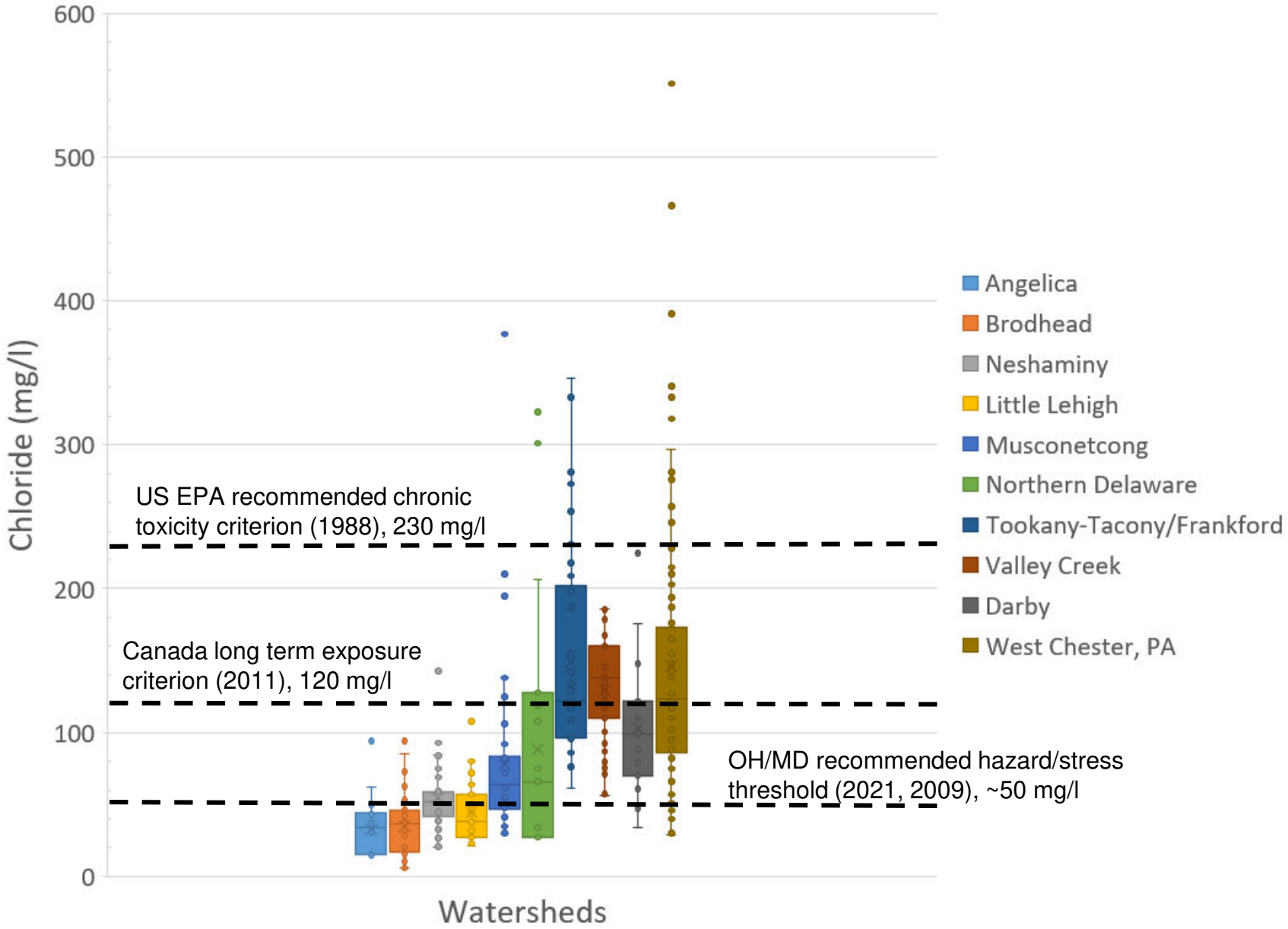
2023 (and 2022) salt snapshot data by watershed

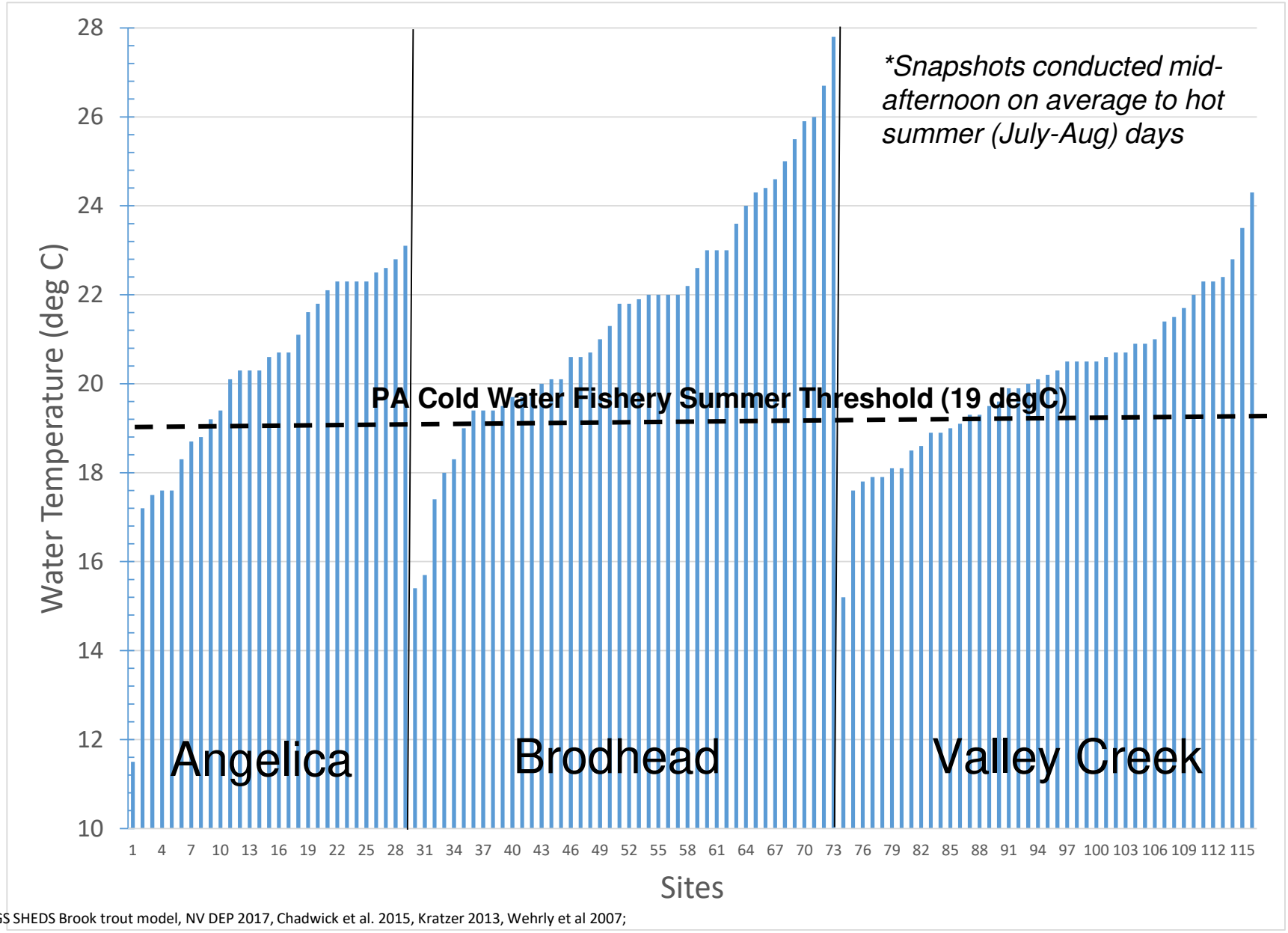


US EPA 1988; Canadian Council of Ministers of the Environment 2011; Miltner 2021; MD Dept of Env 2009

2023 Temperature Snapshots

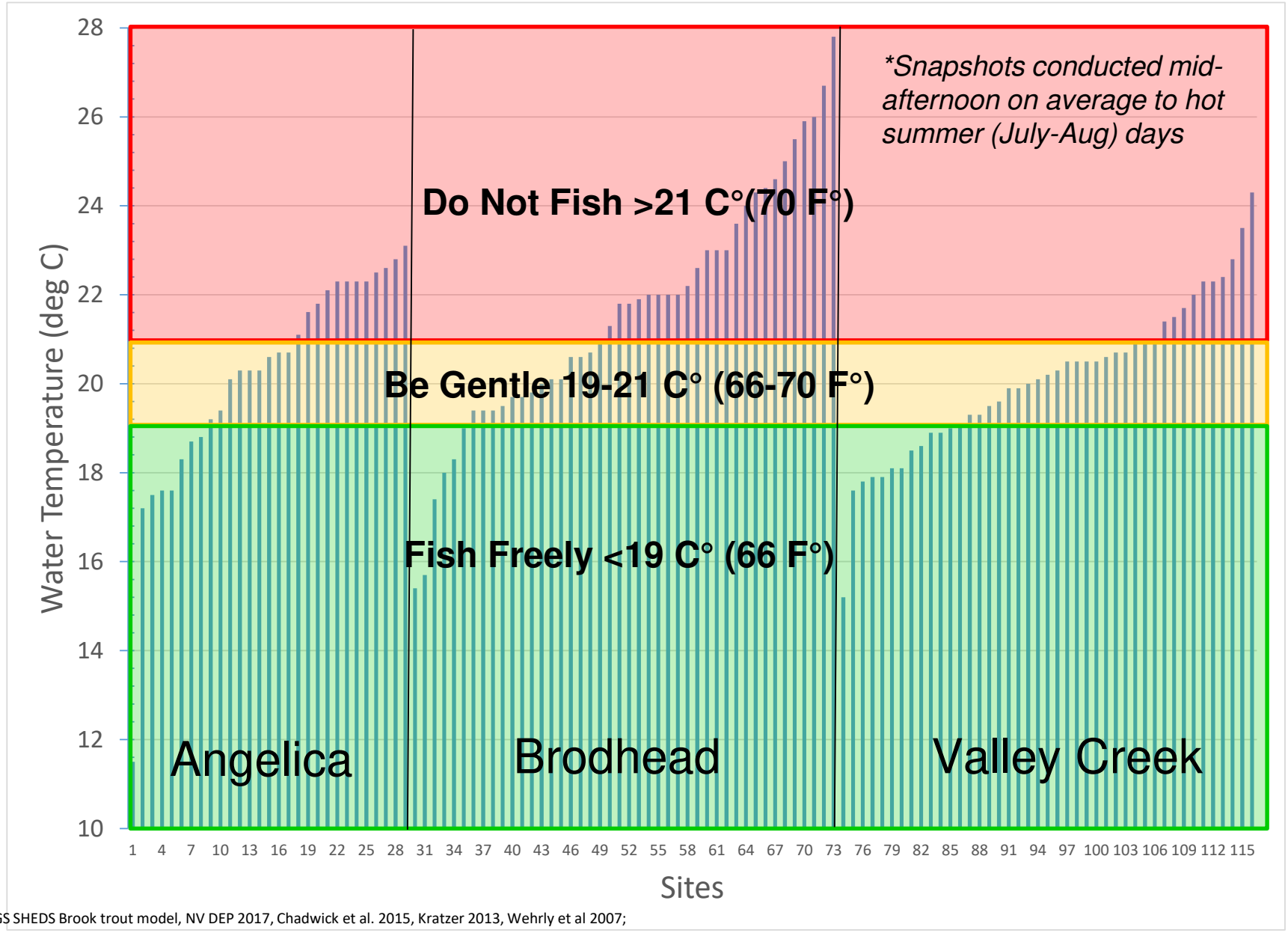
- Water Temperature Snapshots
  - Valley Forge Trout Unlimited
  - Brodhead Watershed Association
  - Angelica Creek Watershed Association

2023 temperature snapshot data



USGS SHEDS Brook trout model, NV DEP 2017, Chadwick et al. 2015, Kratzer 2013, Wehrly et al 2007; personal communication Keith Fritschie (VA DEC); PA DEP Ch 93 Water Quality Standards

2023 temperature snapshot data – trout fishing context



USGS SHEDS Brook trout model, NV DEP 2017, Chadwick et al. 2015, Kratzer 2013, Wehrly et al 2007; personal communication Keith Fritschie (VA DEC); PA DEP Ch 93 Water Quality Standards

2024 presentation topics – for discussion

- Jan - envirodiy station technology (including life span/replacement planning), station management/maintenance, troubleshooting??
- Feb - review of envirodiy station data - monitoring data, data trends/patterns?
- Mar - EPA habitat assessment methods and usage for watershed work? - Christa
- April – water temperature science, monitoring, and data usage?
- May - synoptic (snapshots) temperature and salt? And other parameters
- June – comprehensive update from local policy/practice workgroup
- July - fluvial geomorphology (tie in with depth)?
- August - Model My Watershed? volunteer? Stroud? Watershed group case study?
- Sept - salt? Carol/Christa work with DRBC to possibly present their current perspective on salt/chloride
- Oct - salt monitoring? volunteer?
- Nov - student presentations again
- Dec - end of year summary

- **OTHER POSSIBLE TOPICS – MODELMW USAGE, MANAGEMW USAGE (WORKGROUP APPLICABLE), OTHER – SUGGESTIONS???**

Mentors currently available

- Carol Armstrong (MWS), mnem.np@gmail.com, 610-659-7477
- Joe Debes (MWS), j_debes@msn.com,
- Christa Reeves (Musconetcong Watershed Association/Stroud Center), christa@musconetcong.org, 727-520-5849

Conclusion

Next month's meeting will be on:

Thursday January 18, 2023
2:30-3:30p

Onward!

Stroud Water Research Center contacts:

- David Bressler, dbressler@stroudcenter.org, 410-456-1071
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- George Seeds, geoseeds@verizon.net, 484-886-9586