An analysis of six years of conductivity data in the Buffalo and Wheeling Creek watersheds

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WEST LIBERTY UNIVERSITY

Tennessee TECH

3RQ
THREE RIVERS QUEST

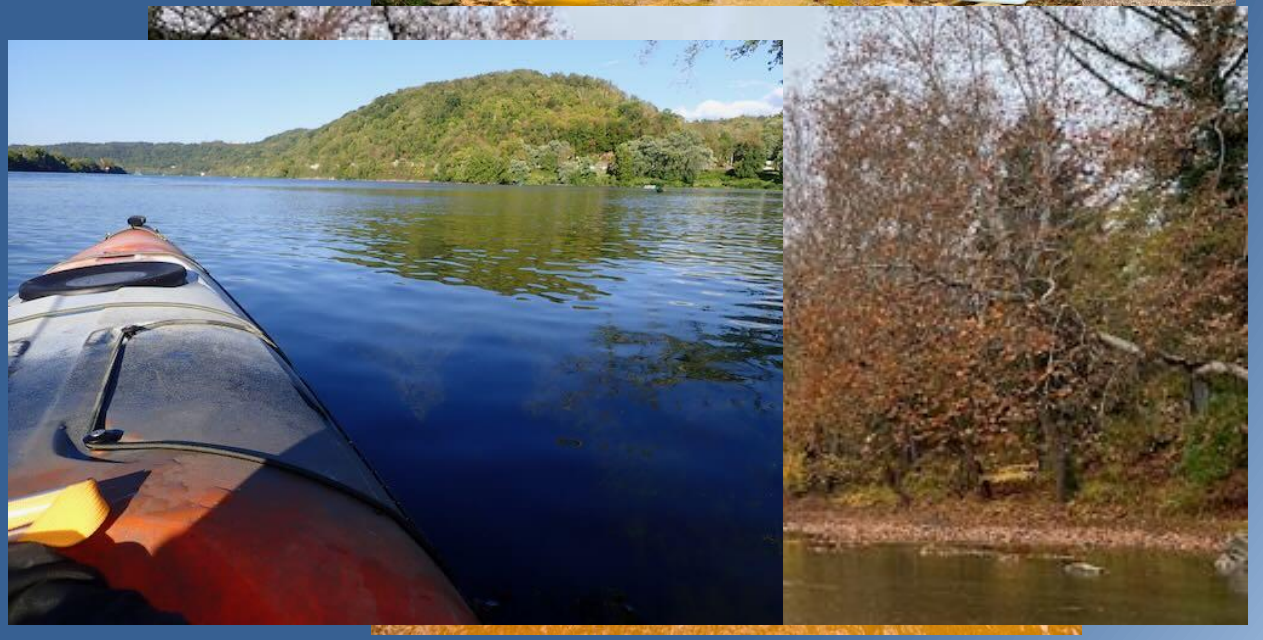
Water Quality Monitoring

Goal: better understand trends in local water quality

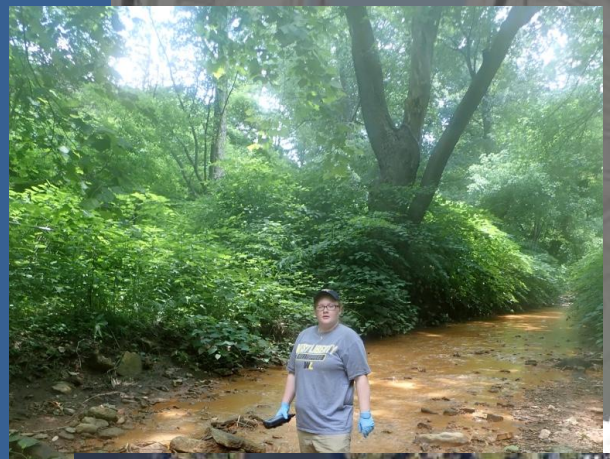
- 23 sites
  - Starting as far back as 2018
- Water Chemistry
  - SPC
  - Temp
  - pH
  - Cl
  - Turbidity
- *E. coli* (select sites)

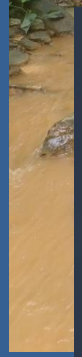
Focus on Conductivity

- Buffalo Creek (4th order)
  - Castlemans (3rd) - reference site for region
- Wheeling Creek (5th)
  - Little Wheeling Creek (4th)
  - Peters Run (3rd)
- Short Creek (3rd)
  - North Fork (2nd)
- Glenns Run (2nd)
  - AMD impacted
- Ohio River (8th)




Mt Pleas
Twp
3D



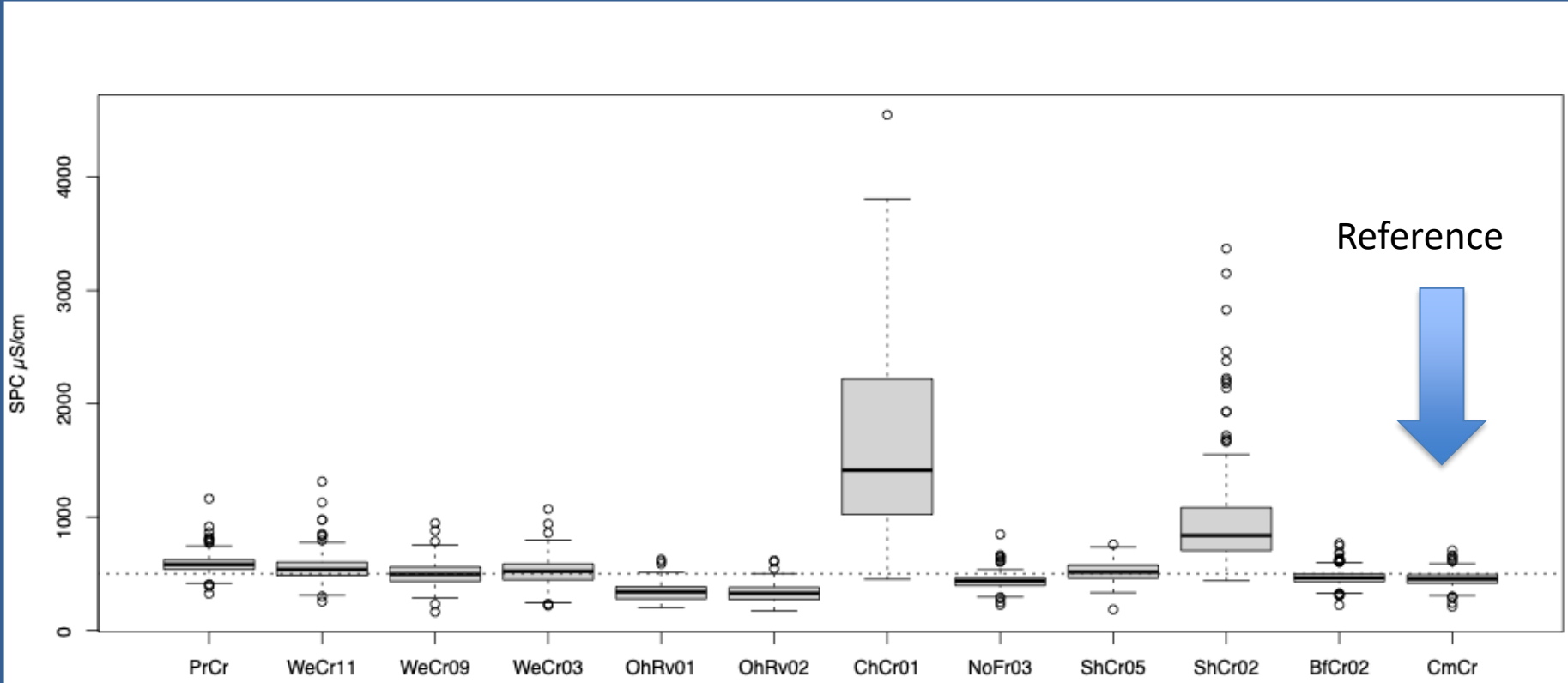


Clearview
Southell Run
Cherry Hill
Clearview Ave
1200 ft
4/2
3/1
3/2
4
Garden Park
Norfolk Southern
Richland
315 ft

Methods of Assessment

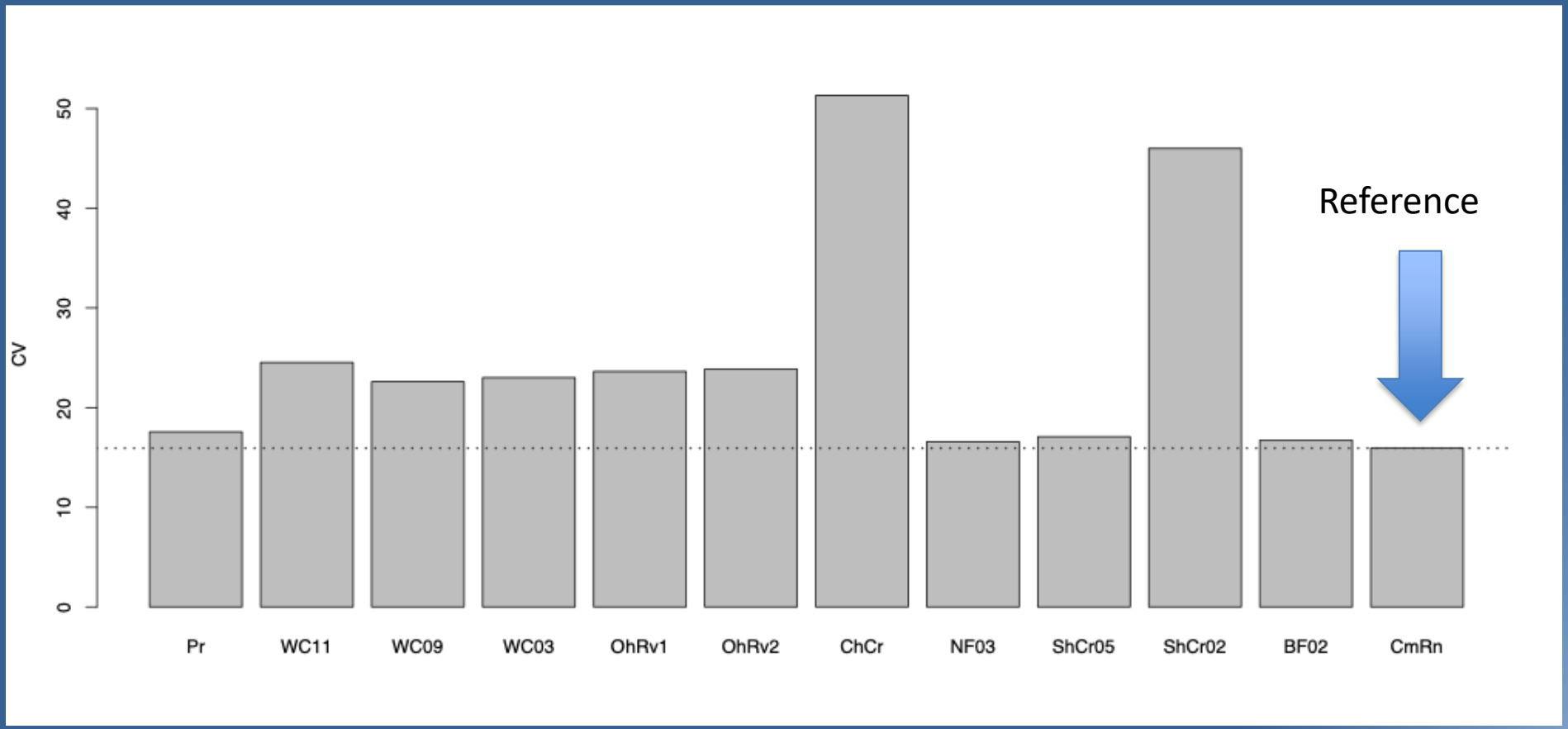
- Median and boxplots
- Coefficient of Variation
  - ratio of the standard deviation to the mean of a data set
    - CV=Mean (μ)Standard Deviation (SD)×100
  - Give insight to variability in SPC across multiple years
- Generalized Additive Model (GAM)
  - Best fit trend line over time

Median SPC

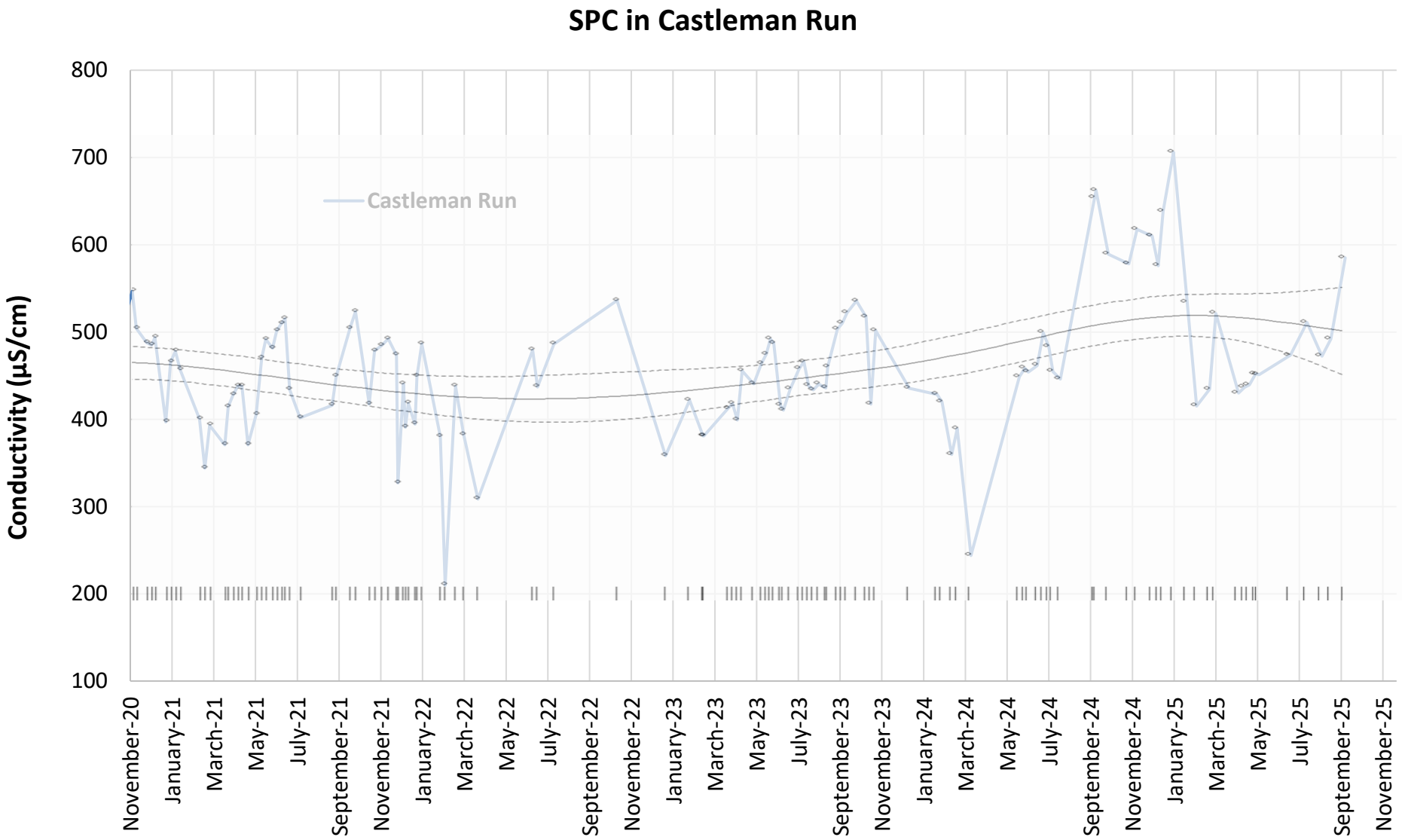


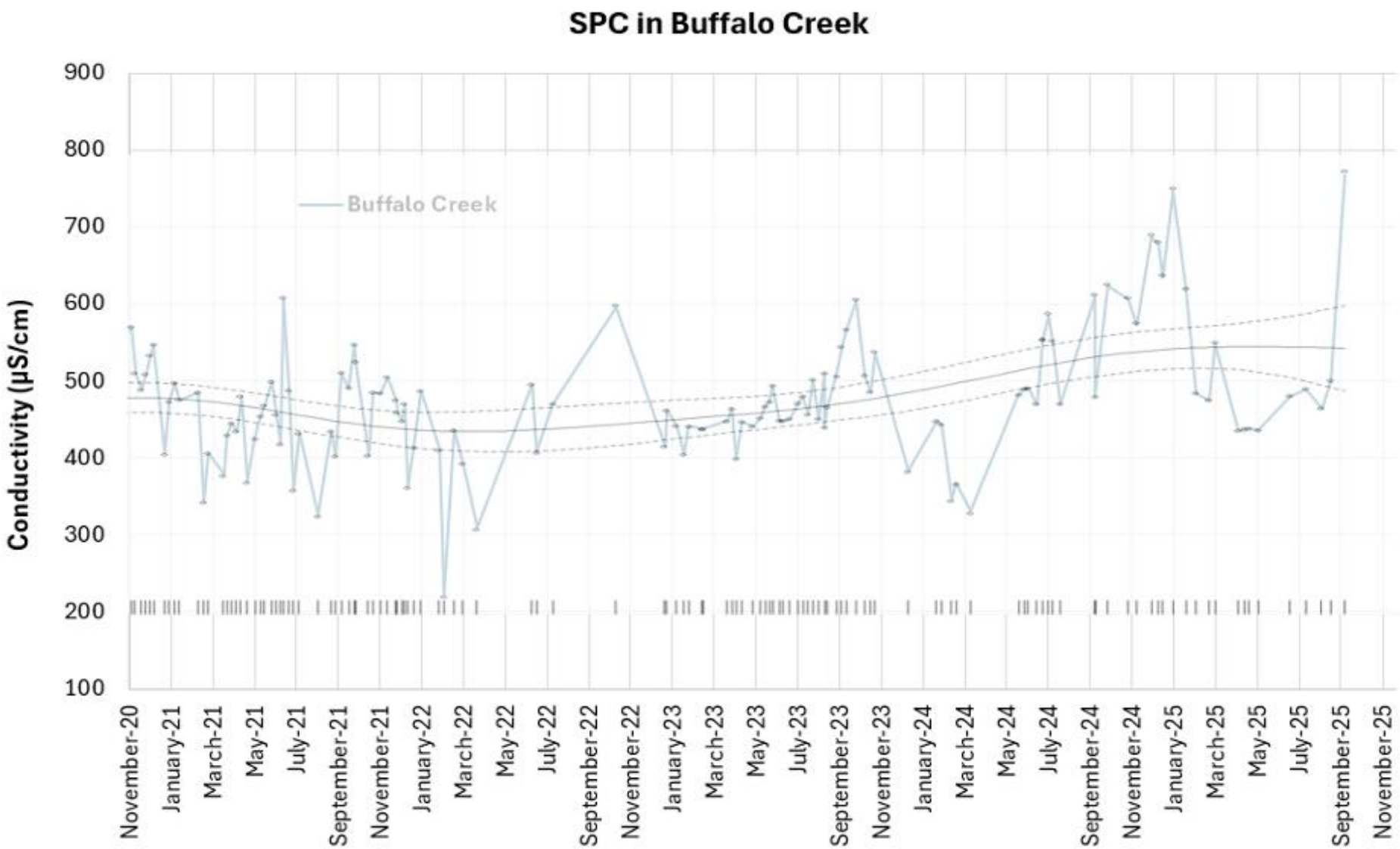
Dotted line = 500µs/cm

Coefficient of Variation



Dotted line = CV of reference site (CmRn)


SPC in Castleman Run
Conductivity (µS/cm)
800
700
600
500
400
300
200
100
Castleman Run
November-20
January-21
March-21
May-21
July-21
September-21
November-21
January-22
March-22
May-22
July-22
September-22
November-22
January-23
March-23
May-23
July-23
September-23
November-23
January-24
March-24
May-24
July-24
September-24
November-24
January-25
March-25
May-25
July-25
September-25
November-25


SPC in Buffalo Creek
Buffalo Creek
Conductivity (µS/cm)
900
800
700
600
500
400
300
200
100
November-20
January-21
March-21
May-21
July-21
September-21
November-21
January-22
March-22
May-22
July-22
September-22
November-22
January-23
March-23
May-23
July-23
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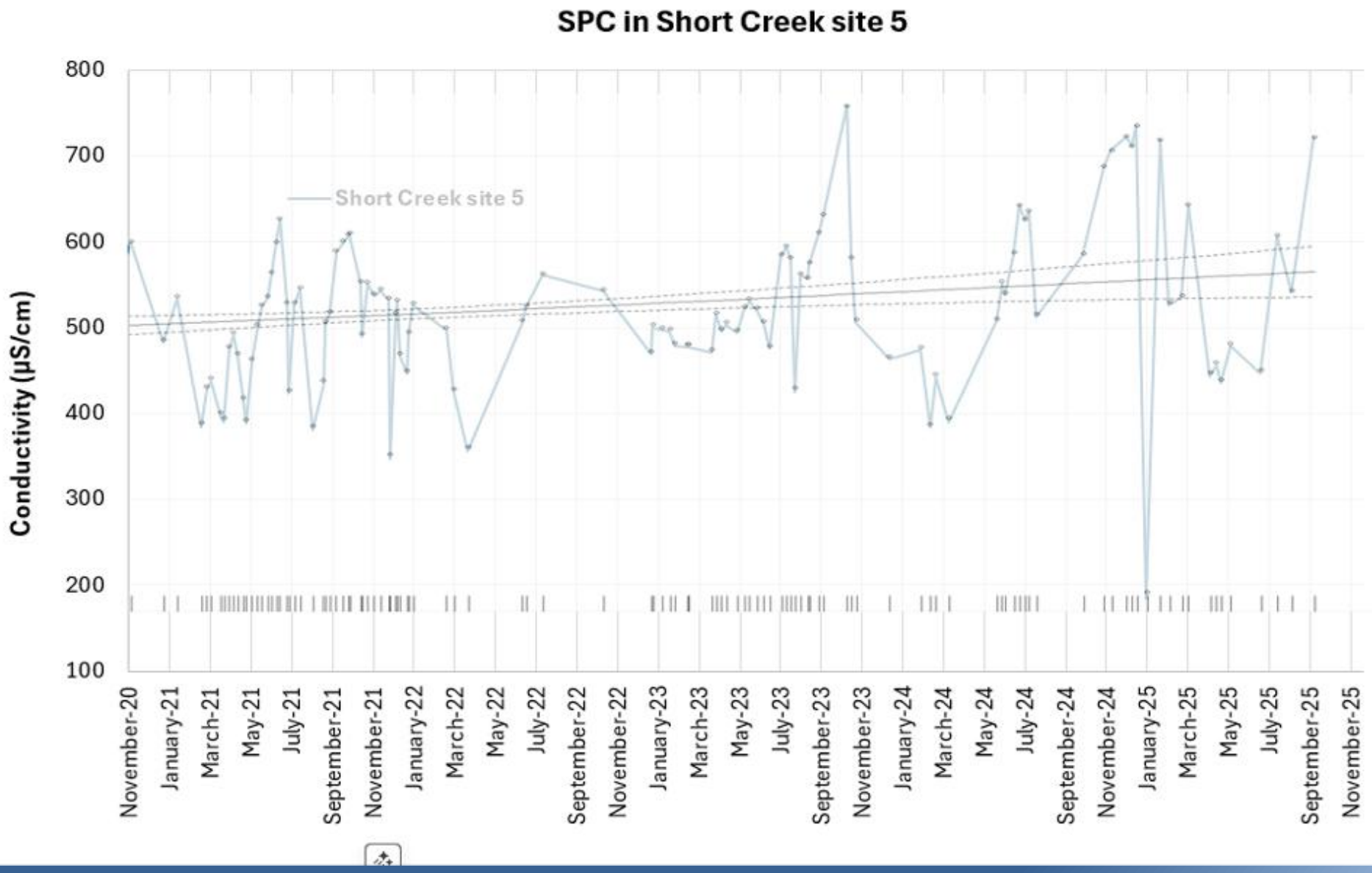
May-25
July-25
September-25
November-25


SPC in Short Creek site 5
Short Creek site 5
Conductivity (µS/cm)
800
700
600
500
400
300
200
100
November-20
January-21
March-21
May-21
July-21
September-21
November-21
January-22
March-22
May-22
July-22
September-22
November-22
January-23
March-23
May-23
July-23
September-23
November-23
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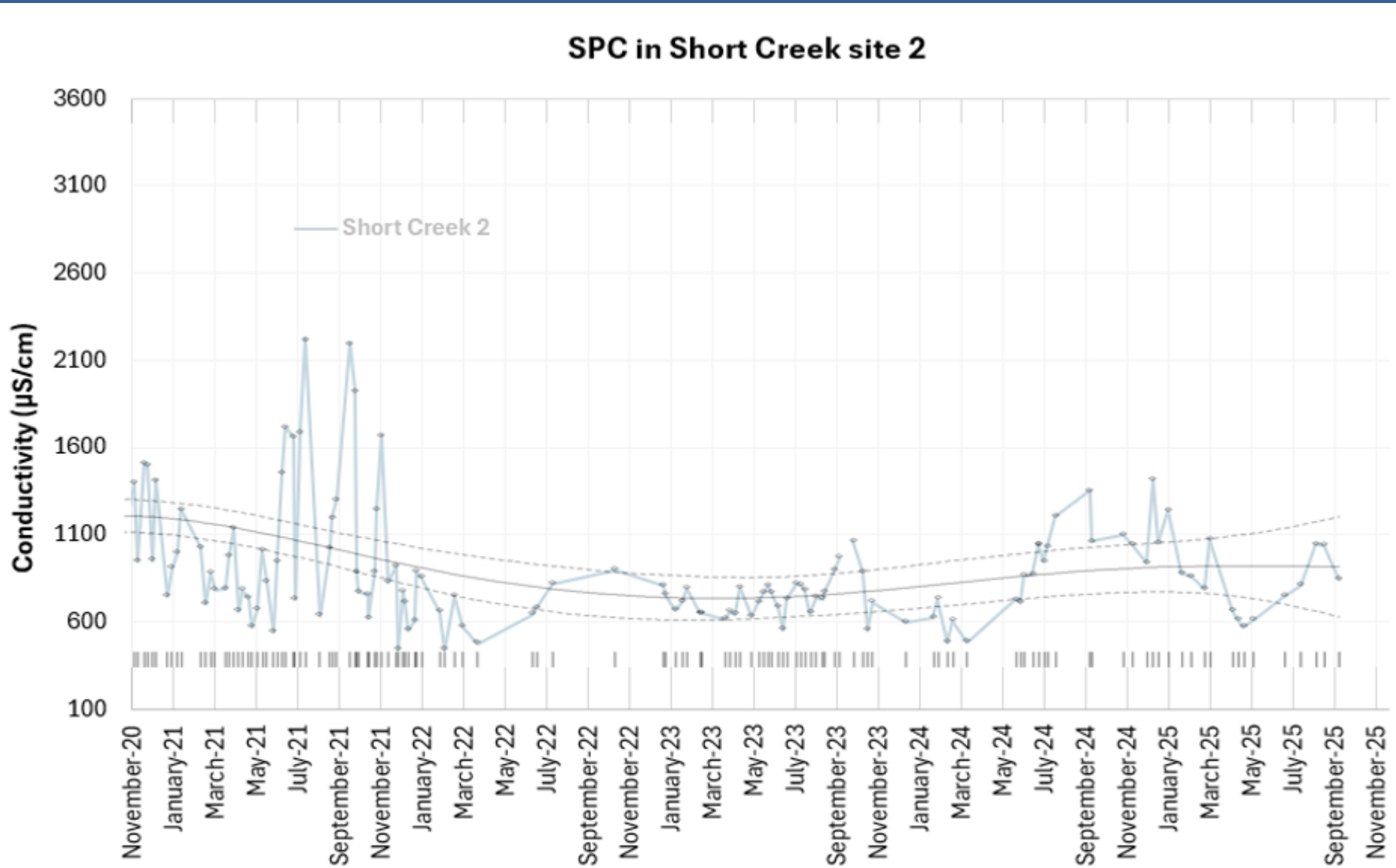
May-25
July-25
September-25
November-25


SPC in Short Creek site 2
Conductivity (µS/cm)
3600
3100
2600
2100
1600
1100
600
100
Short Creek 2
November-20
January-21
March-21
May-21
July-21
September-21
November-21
January-22
March-22
May-22
July-22
September-22
November-22
January-23
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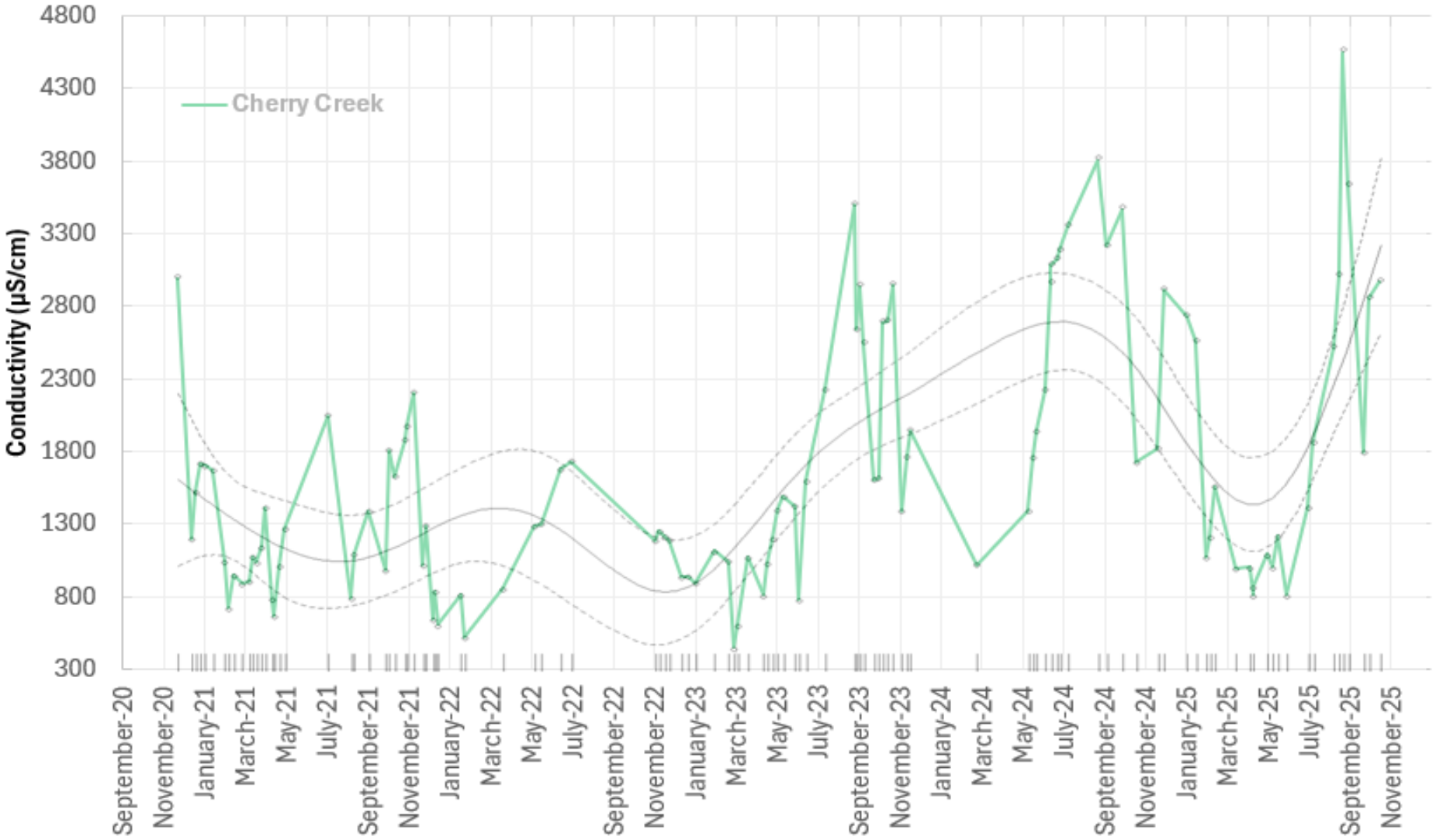
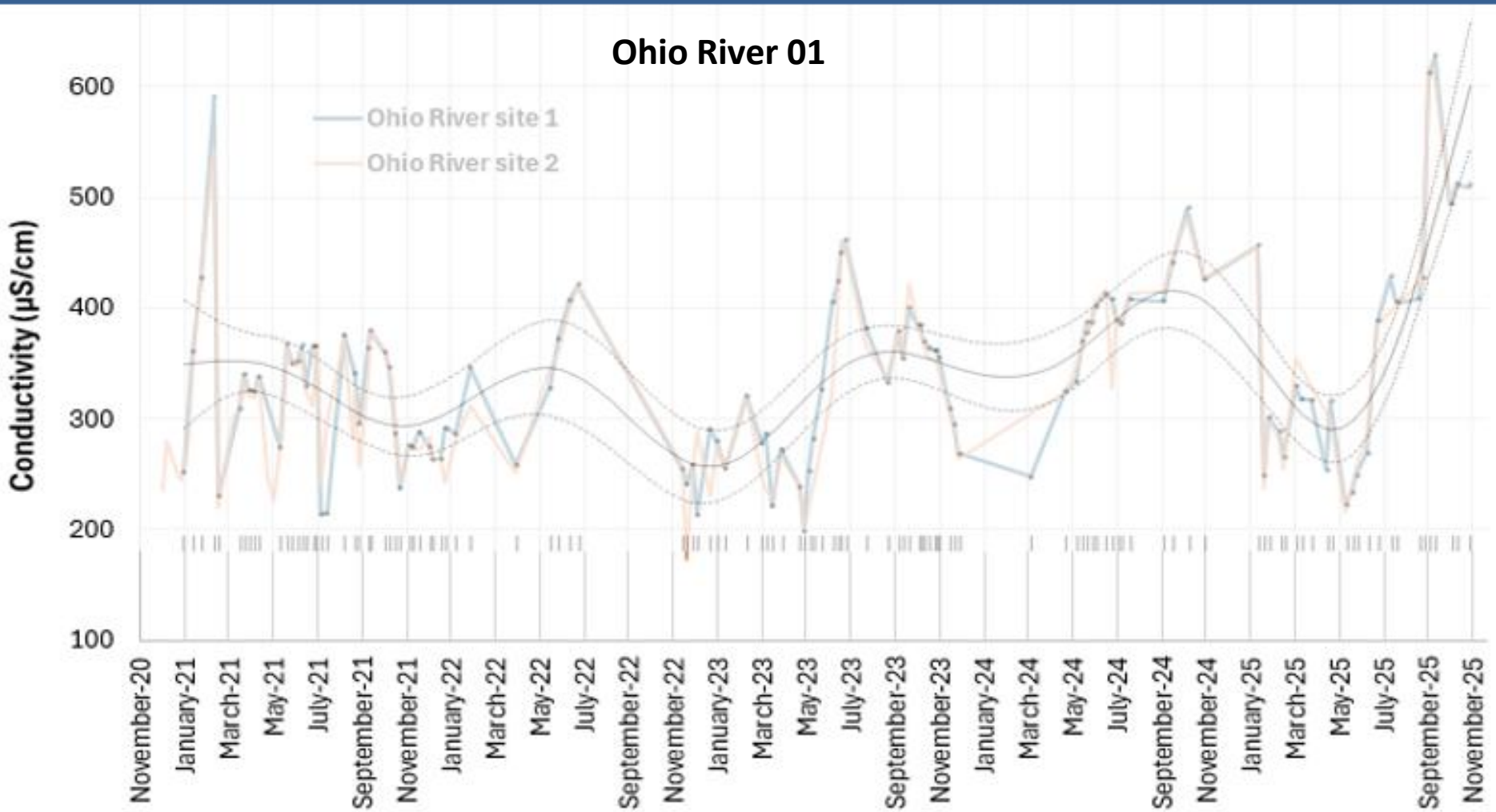
July-25
September-25
November-25

Glenn's Run – Aka Cherry Hill Creek

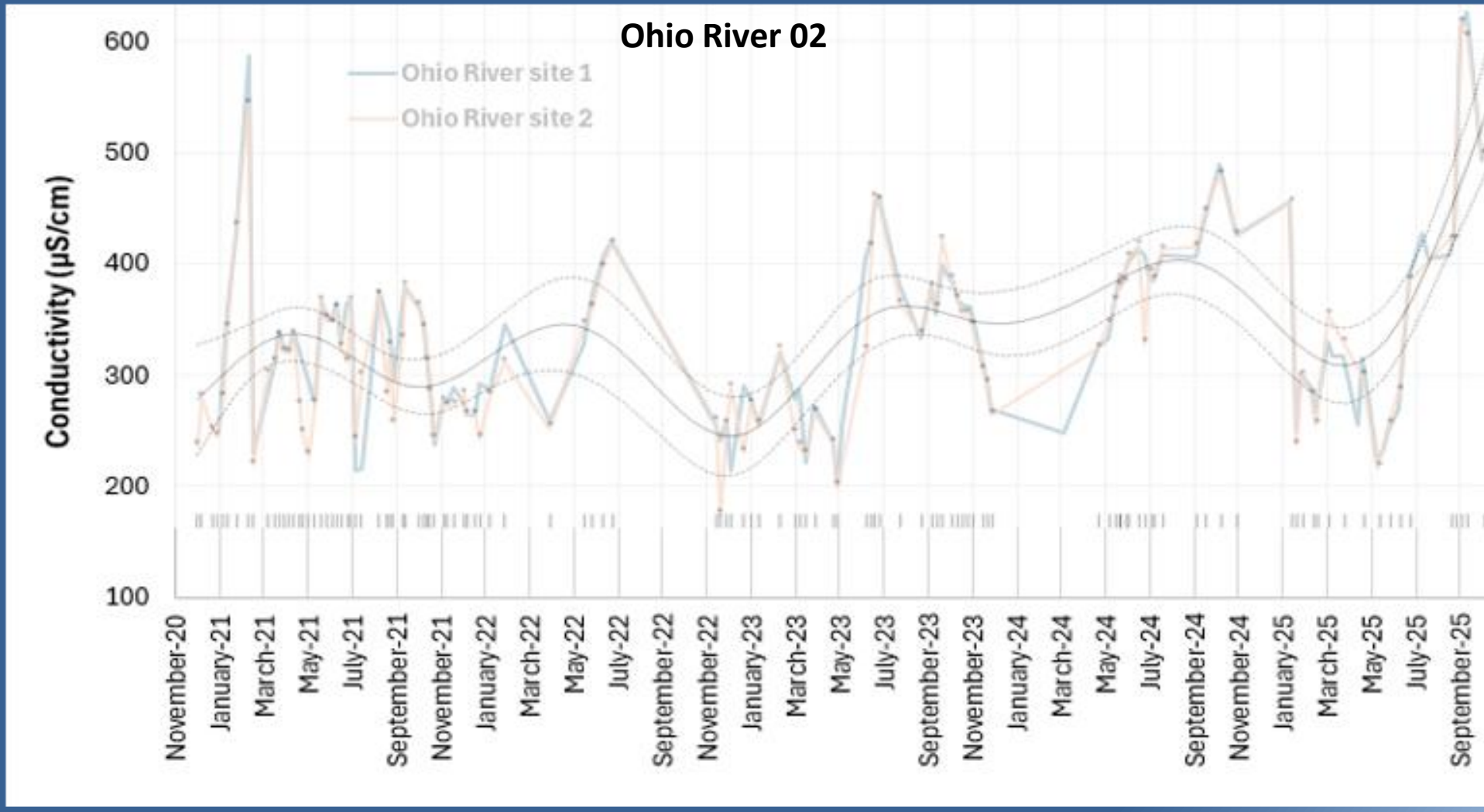


Severe AMD impacts

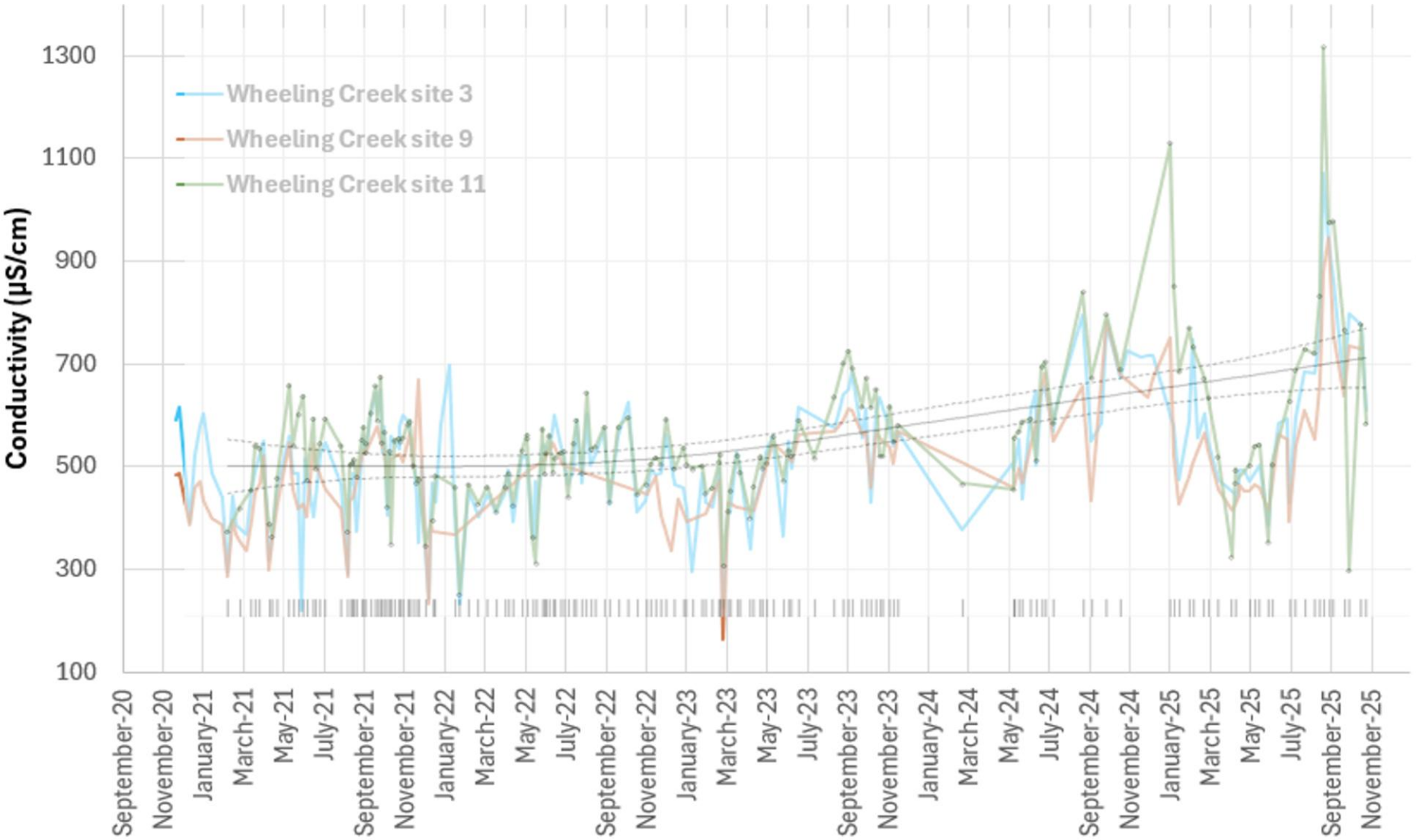
Ohio River 01

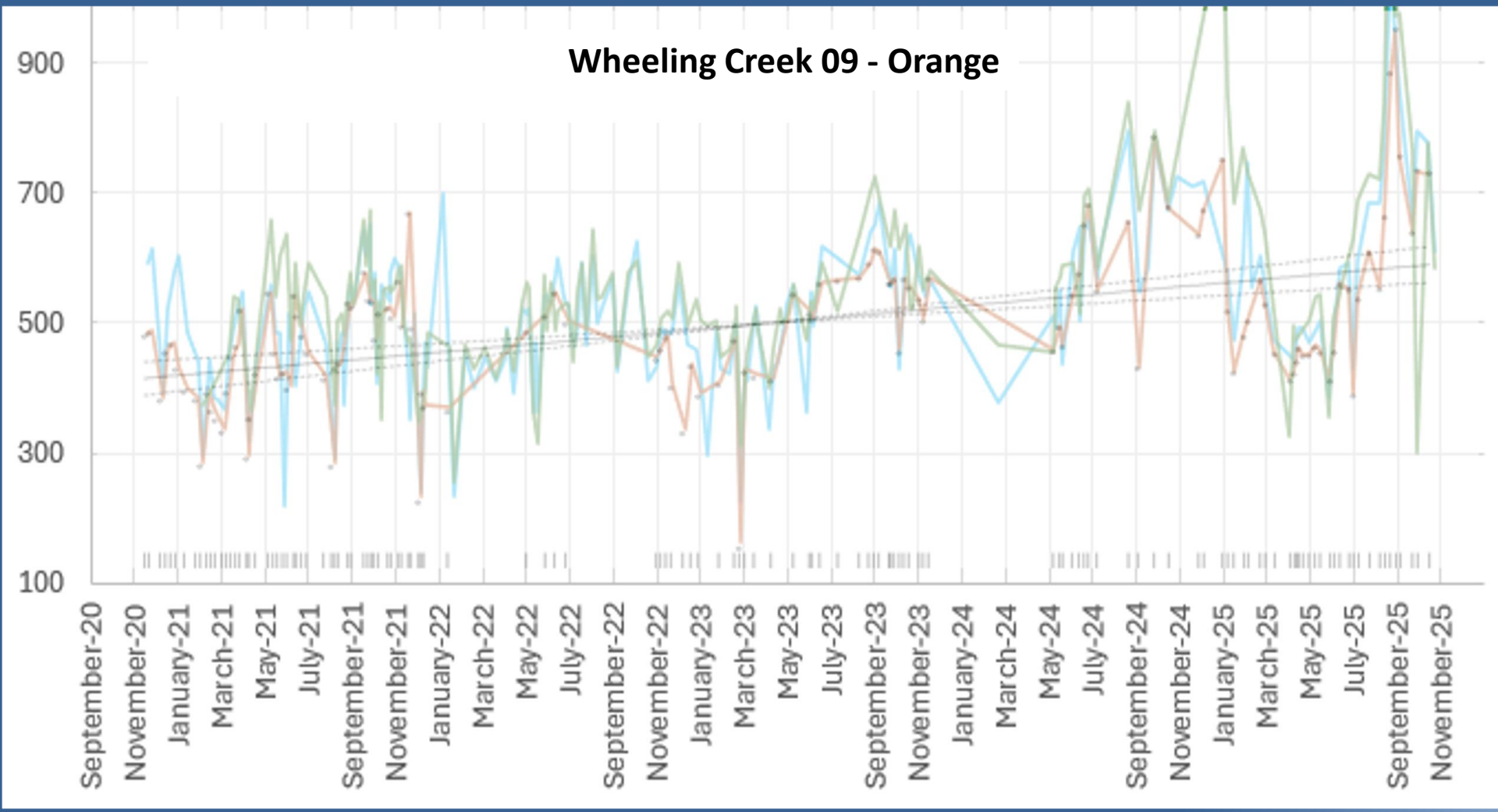


Ohio River 02



Little Wheeling Creek 11 – Green




Wheeling Creek 09 - Orange
900
700
500
300
100
September-20
November-20
January-21
March-21
May-21
July-21
September-21
November-21
January-22
March-22
May-22
July-22
September-22
November-22
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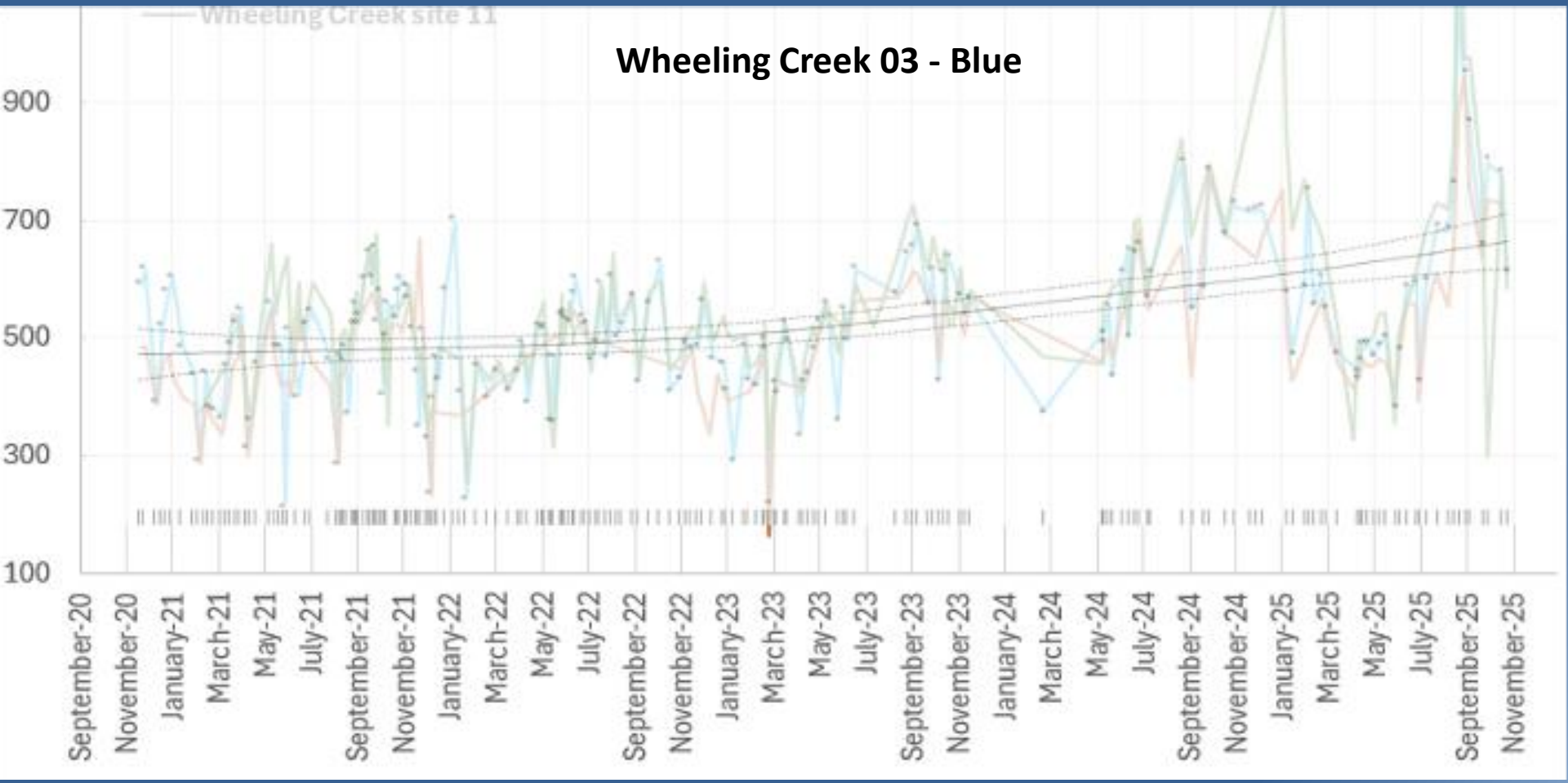
September-25
November-25


Wheeling Creek site 11
Wheeling Creek 03 - Blue
900
700
500
300
100
September-20
November-20
January-21
March-21
May-21
July-21
September-21
November-21
January-22
March-22
May-22
July-22
September-22
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July-25
September-25
November-25

Conclusions

- Many sites have high SPC over 500 µS/cm
- Some sites have more relative variation in SPC than other
  - ”better” sites have less variation than more impaired sites
  - variation in SPC in Ohio River more than expected
- SPC appears to increasing over time in most of the sites
  - Most notable in the last 2 years
- Increase may be related to dry summer(s)
  - increased reliance on groundwater
  - impacted by road salting
  - fracking?

Support

- Thank you all those who have helped collect this data
  - Emily Huff
  - David Greabe
  - Marissa Tordello
  - Emma McClelland
  - Jaclyn Wolff
  - Mycah Richie-Yoho
  - Reagan Bally
- 3RQ
- Wheeling Water Pollution Control Department

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