Gaining an Understanding of the Water Quality on Two Reaches of the Pickering Creek in CC

(Chester Springs and Phoenixville)

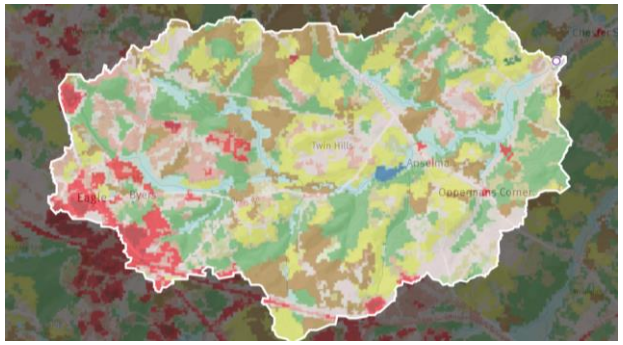
Goals

1. What is the variability of TSS and chloride in sediment loads for each site separately?

   - Donovan et al. (2015) cautions that sediment varies over short time scales and short reaches.

2. What is causing short term peaks in conductivity in the Chester Springs site?

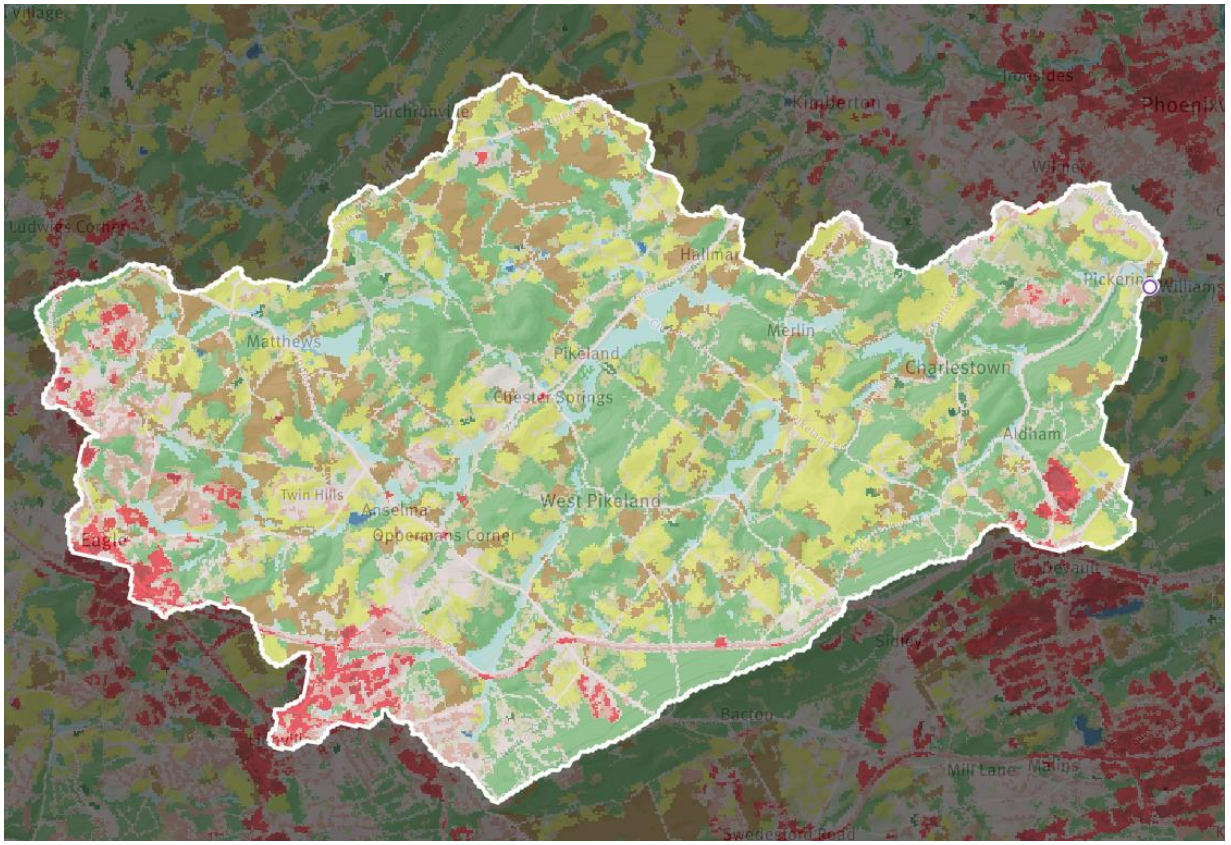
Land Use Type	Coverage (%)
Open Water	0.2
Perennial Ice/Snow	0
Developed, Open Space	19.5
Developed, Low Intensity	8.3
Developed, Medium Intensity	4
Developed, High Intensity	1.1
Barren Land (Rock/Sand/Clay)	0.2
Deciduous Forest	22.6
Evergreen Forest	0.1
Mixed Forest	0.4
Shrub/Scrub	7.2
Grassland/Herbaceous	0.3
Pasture/Hay	16.5
Cultivated Crops	14.3
Woody Wetlands	5.3
Emergent Herbaceous Wetlands	0



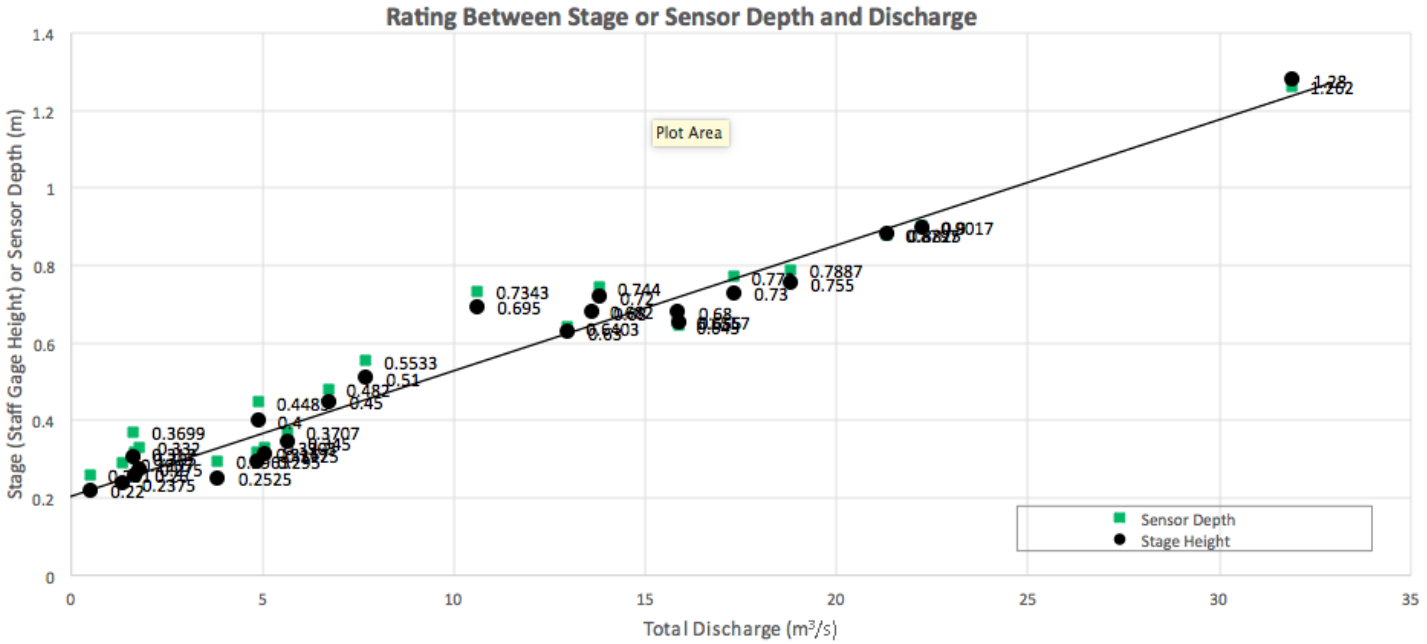
Montgomery School station watershed, Chester Springs

Land Use Type	Coverage (%)
Open Water	0.1
Perennial Ice/Snow	0
Developed, Open Space	15.8
Developed, Low Intensity	4.6
Developed, Medium Intensity	2.2
Developed, High Intensity	0.5
Barren Land (Rock/Sand/Clay)	0
Deciduous Forest	31.9
Evergreen Forest	0.2
Mixed Forest	0.8
Shrub/Scrub	8.8
Grassland/Herbaceous	0.3
Pasture/Hay	16.7
Cultivated Crops	12.6
Woody Wetlands	5.2
Emergent Herbaceous Wetlands	0.1

Phoenixville YMCA station watershed

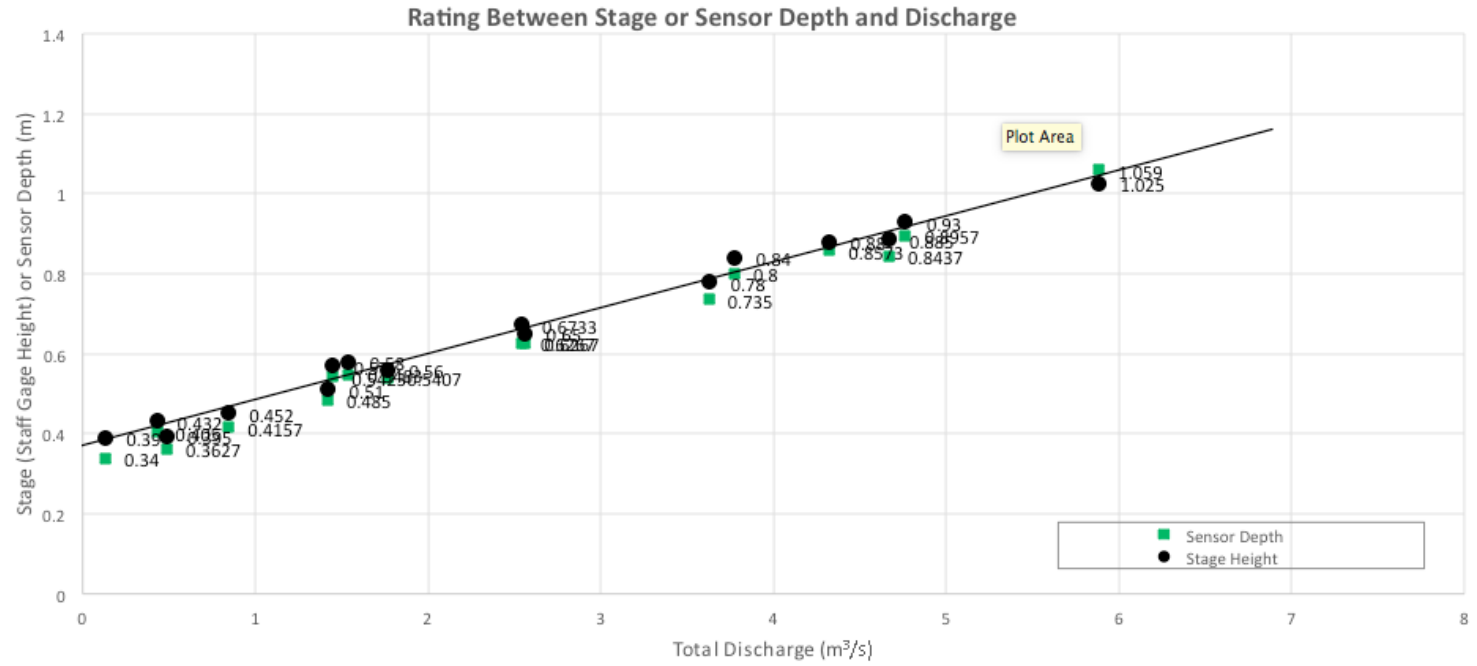


1. What is the variability of TSS and chloride in sediment loads for each site separately?



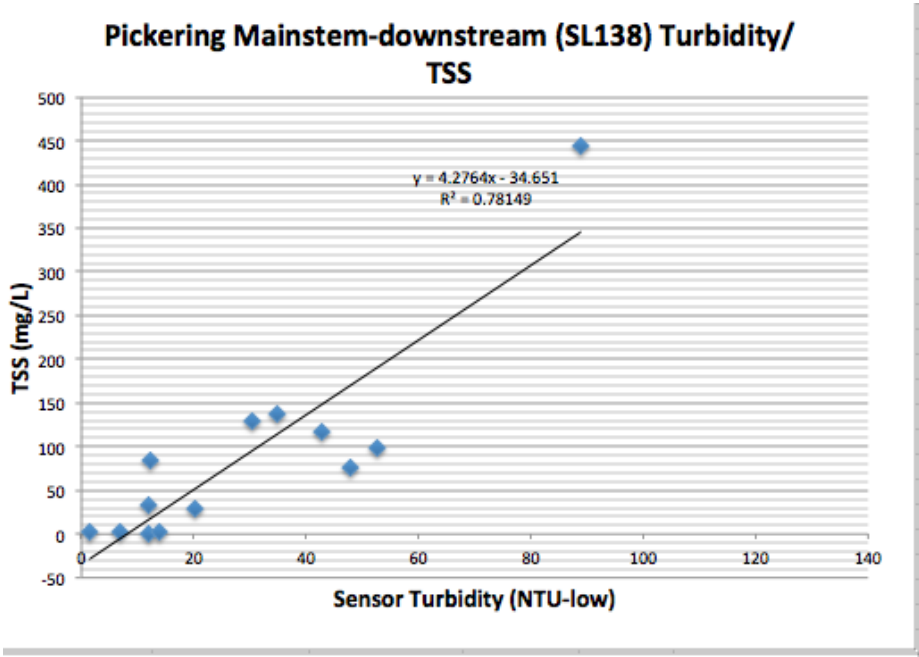
Pickering, SL138, n=23 events.

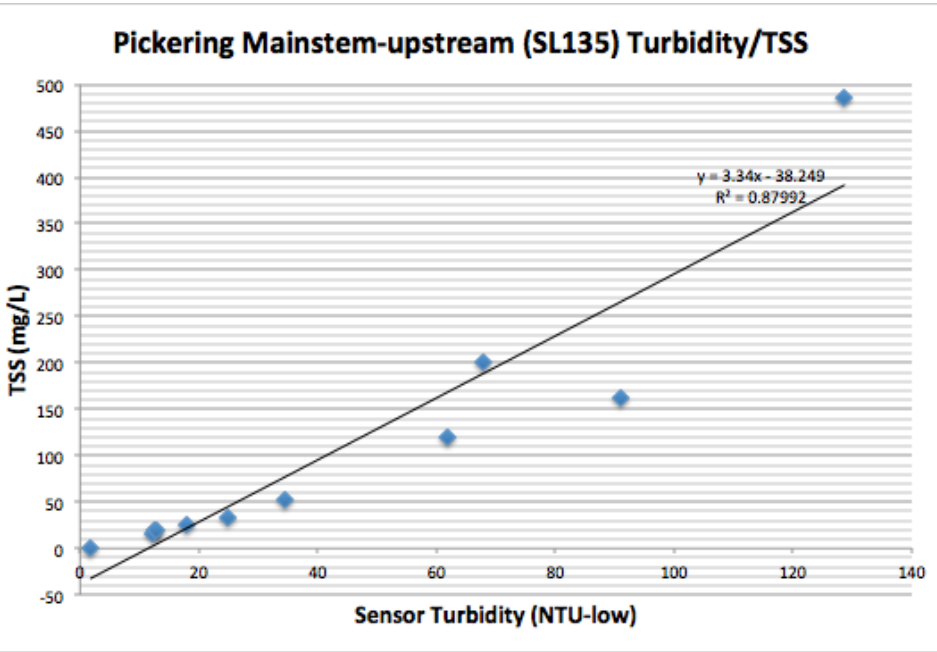
Total discharge (m^3/sec) with offset)= -3.143

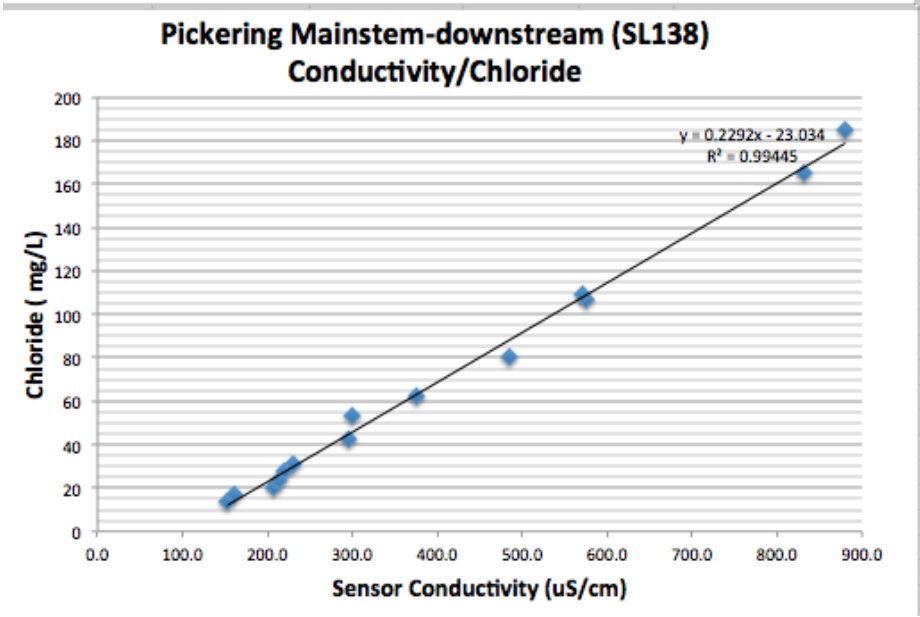


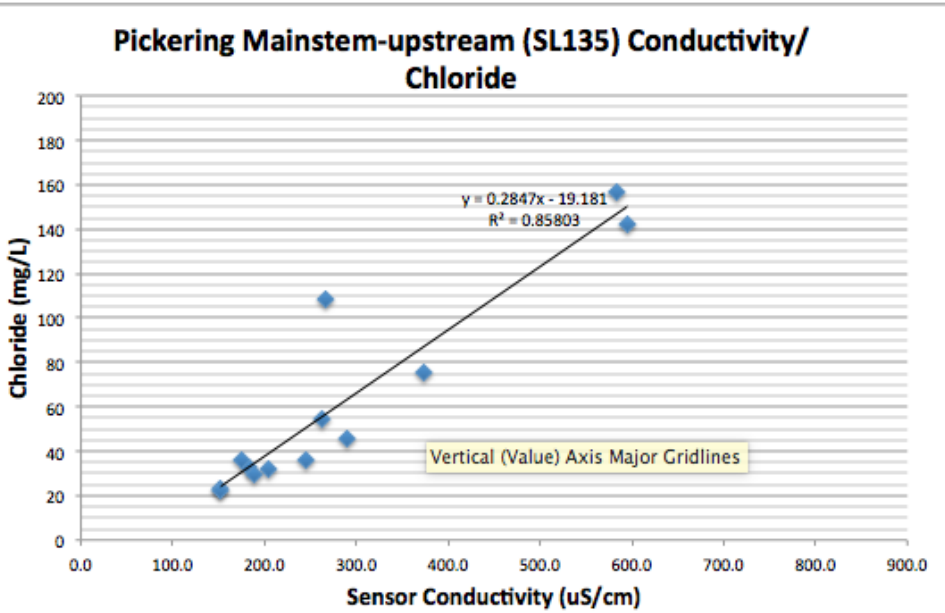
Pickering, SL135 n=16 events.

Total discharge (m3/sec) with offset= -5.702


Pickering Mainstem-downstream (SL138) Turbidity/ TSS
y = 4.2764x - 34.651
R² = 0.78149
TSS (mg/L)
Sensor Turbidity (NTU-low)


Pickering Mainstem-upstream (SL135) Turbidity/TSS
y = 3.34x - 38.249
R² = 0.87992
TSS (mg/L)
Sensor Turbidity (NTU-low)


Pickering Mainstem-downstream (SL138) Conductivity/Chloride
y = 0.2292x - 23.034
R² = 0.99445
Chloride (mg/L)
Sensor Conductivity (uS/cm)


Pickering Mainstem-upstream (SL135) Conductivity/ Chloride
y = 0.2847x - 19.181
R² = 0.85803
Vertical (Value) Axis Major Gridlines
Chloride (mg/L)
Sensor Conductivity (uS/cm)

What we want to know: Variability in sediment loads at an individual site

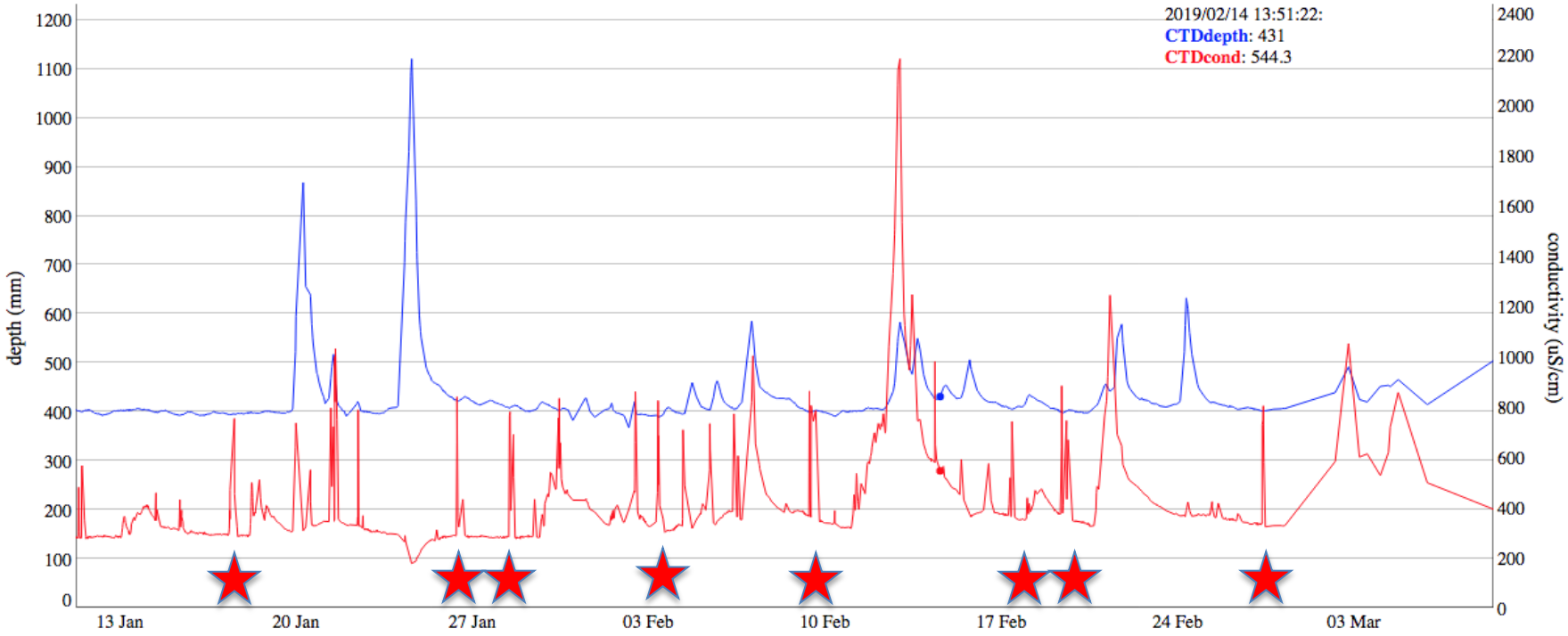
- Sediment varies throughout watersheds and over short time scales due to land use differences. Sediment estimations are subject to high spatial & temporal variability (Donovan et al., 2015).
- We will calculate the TSS and chloride loads for x storm events during 2018 and 2019 for each site separately. If possible, compare to data in Sloto paper.
- We are interested in how much variability there is in these loads at a single stream reach.
- Should we select storm events based on specific depth increase (i.e., define the storms as increase in depth over a specified mm or % increase), which accounts for changes in baseline depth in 2018 and 2019, and might be a better test of the variability of the sediment load by holding constant the change in depth during a storm? Or should we select storms over a specific precip amount regardless of stream depth increase?
- What else do we want to know?

2. What is causing short term peaks in conductivity at baseflow depth in the Chester Springs site?

SL135 - Water Conductivity

Water Depth and Conductivity(in uS/cm)

Highlight to zoom in, double-click to zoom out.
Note: you can highlight either vertically or horizontally to zoom the x or y axis
Hold Shift while dragging to pan left and right



Questions and Problems

- Cellular transmission has declined greatly, and we need to take a computer to the site to identify when a peak is occurring.
- Conductivity peaks occur during the week and on weekends, based on sd card data.
- Examination of 10 days of data from 3/22/19-4/1/19 showed it occurred multiple times daily, and most occurred in the morning. No discernable temporal pattern.
- Sometimes peaks will change rapidly (334-729 uS/cm) in five minutes; peak duration appears 10-30 minutes period.

Our Plan

- When we arrived we saw on the data card on a lap top that conductivity was at 629 uS/cm and 501 uS/cm, and we assumed we could measure a peak, even if declining. The mean for the past 10 days was 312 uS/cm, and the mode was 291 uS/cm. This peak reached the mean again within 25 minutes.
- We used a Hanna conductivity/temperature meter to measure each bank beginning at the sensor station, then going upstream at about 40-80 feet increments. This took about three hours.

Early Observations

- We found consistent measurements for both banks all the way up the stream, apparently because that peak ended in 20 minutes and another peak occurred when we were upstream from the instream sensor.
- It appears there is a point source that is between the sensors and where we were measuring upstream, because we did not see the second peak in our measurements.
- Because the Hanna measurements were consistent, and because we did not measure the second peak, there may be a point source not too far above the sensors. There are two outfalls from a housing development across the street that we will investigate.

Suggestions?