



pennsylvania
DEPARTMENT OF ENVIRONMENTAL
PROTECTION



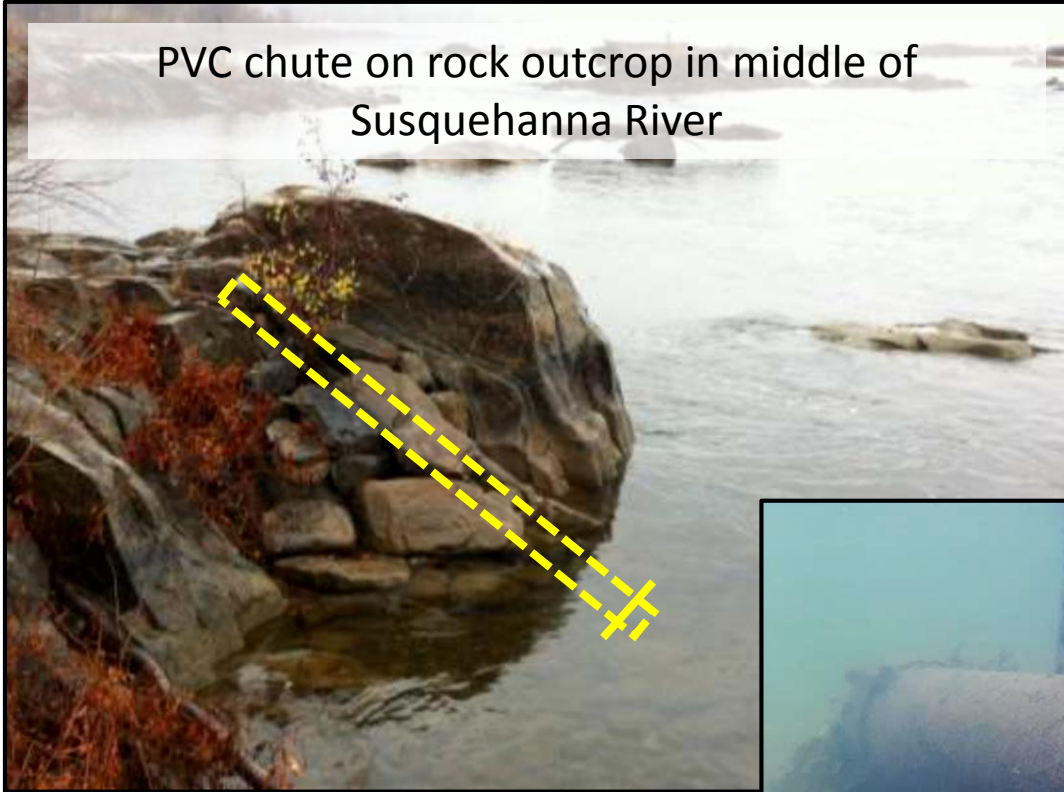
Bureau of Clean Water

Continuous Data and Assessments in Pennsylvania

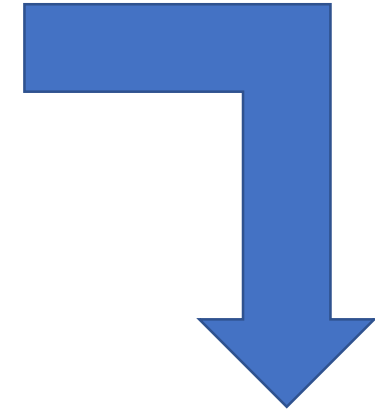
Mark Hoger
Pennsylvania DEP

Data Collection

PVC chute on rock outcrop in middle of
Susquehanna River



- Few long-term continuous sites
- No telemetry

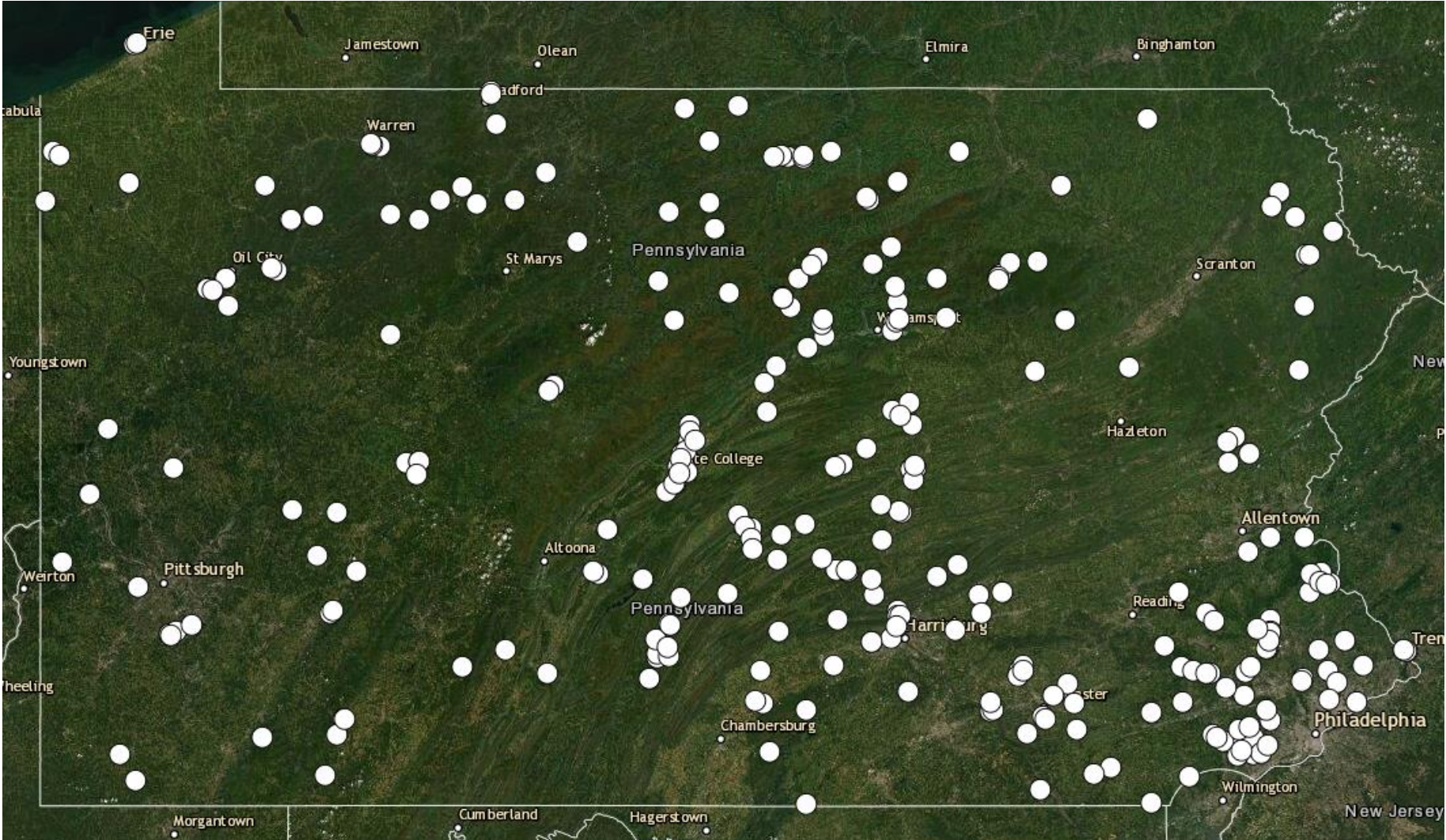


- Unique deployments
- Middle channel measurements

Suspended off bottom in high
deposition environment



Lots of Sites



QA/QC Requirements

- Regular fouling and calibration checks
- Discrete readings with independent meter
- Corrections and removal of “bad” data
- Cross-section transects to ensure data are representative.

Uses of Continuous Data

- Characterize background/historic conditions
- Cause and effect studies
- Assessments using established ALU and PWS criteria
- Cause determinations
 - Eutrophication
 - Temperature modification

Water Quality Standards

§93.7(a), Table 3

- pH: 6.0 - 9.0 units
- Dissolved Oxygen:
 - Instantaneous minimums (5.0 mg/L or higher)
 - 7-day average (5.5 mg/L or higher)

Model-derived parameters

- Examples: osmotic pressure (ALU), TDS (PWS)
- Account for uncertainty in model

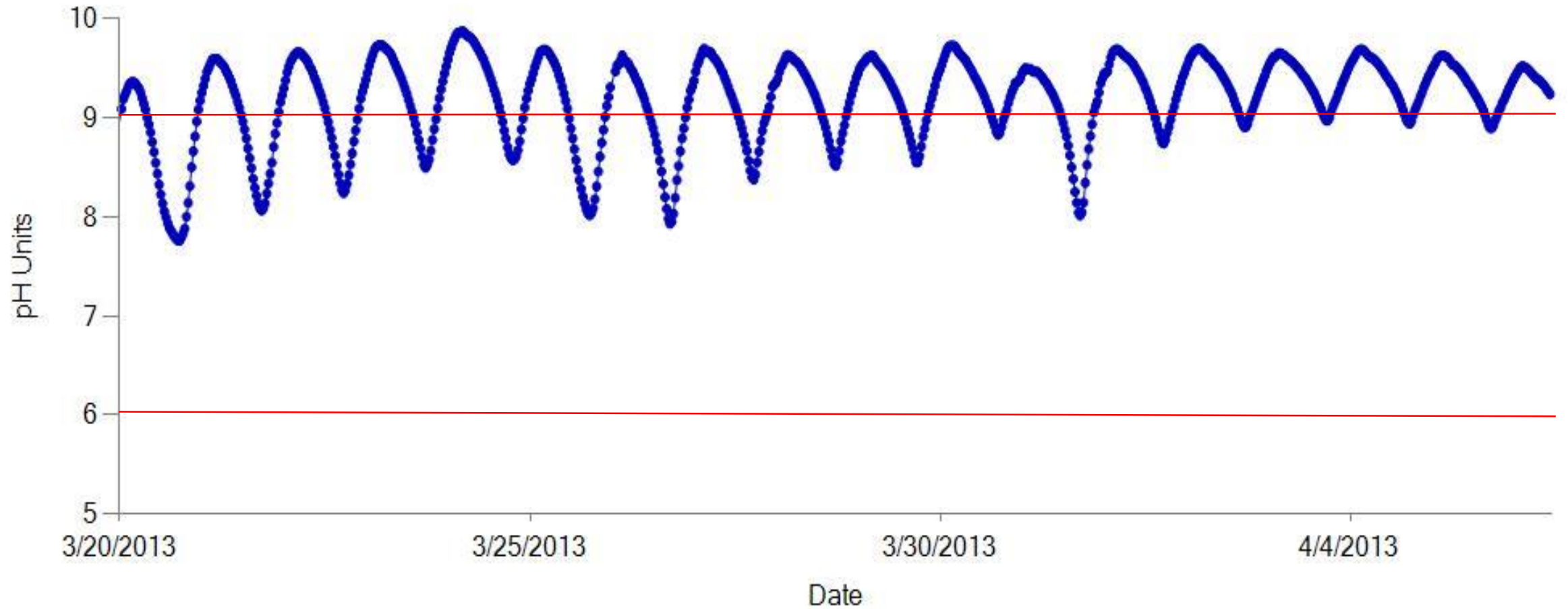
99% Rule

§96.3(c): “[criteria] shall be achieved in all surface waters at least 99% of the time”

Discrete samples

- Sample represents 1 day
- 4 samples = exceedance (4 days / 365 days = 1.1%)

Count Exceedances

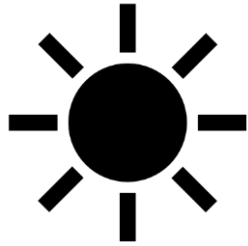


99% with CIM

$$\%Y=100 \left[\frac{n * i}{k} \right]$$

Interval	# Readings > 1% of Year
15 min	351
30 min	176
60 min	88

Critical Periods



- Open canopy vs closed
- Pre- vs post-leaf emergence



- Solubility of oxygen

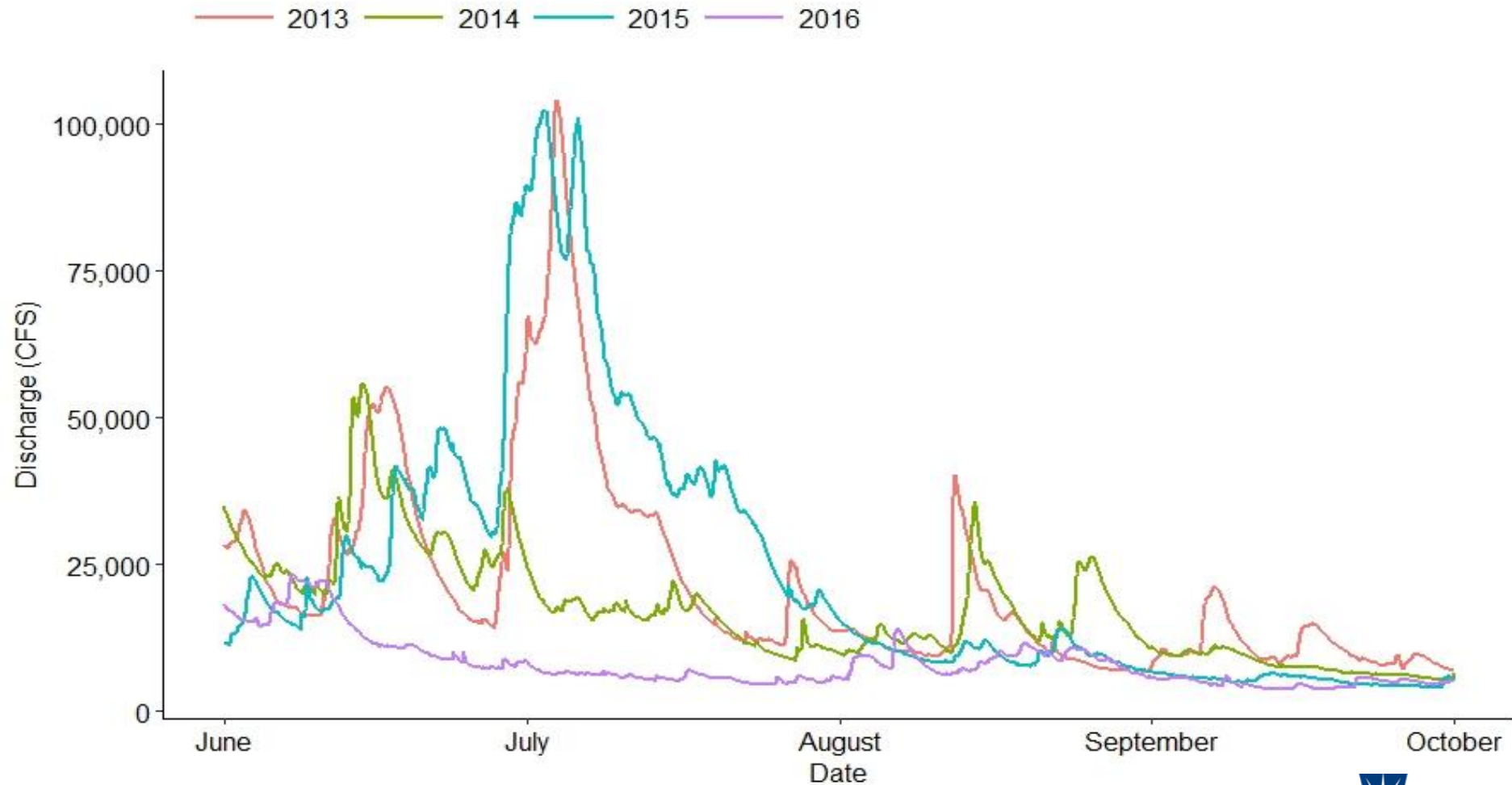


- Moderates conditions
- Scour of photosynthetic organisms

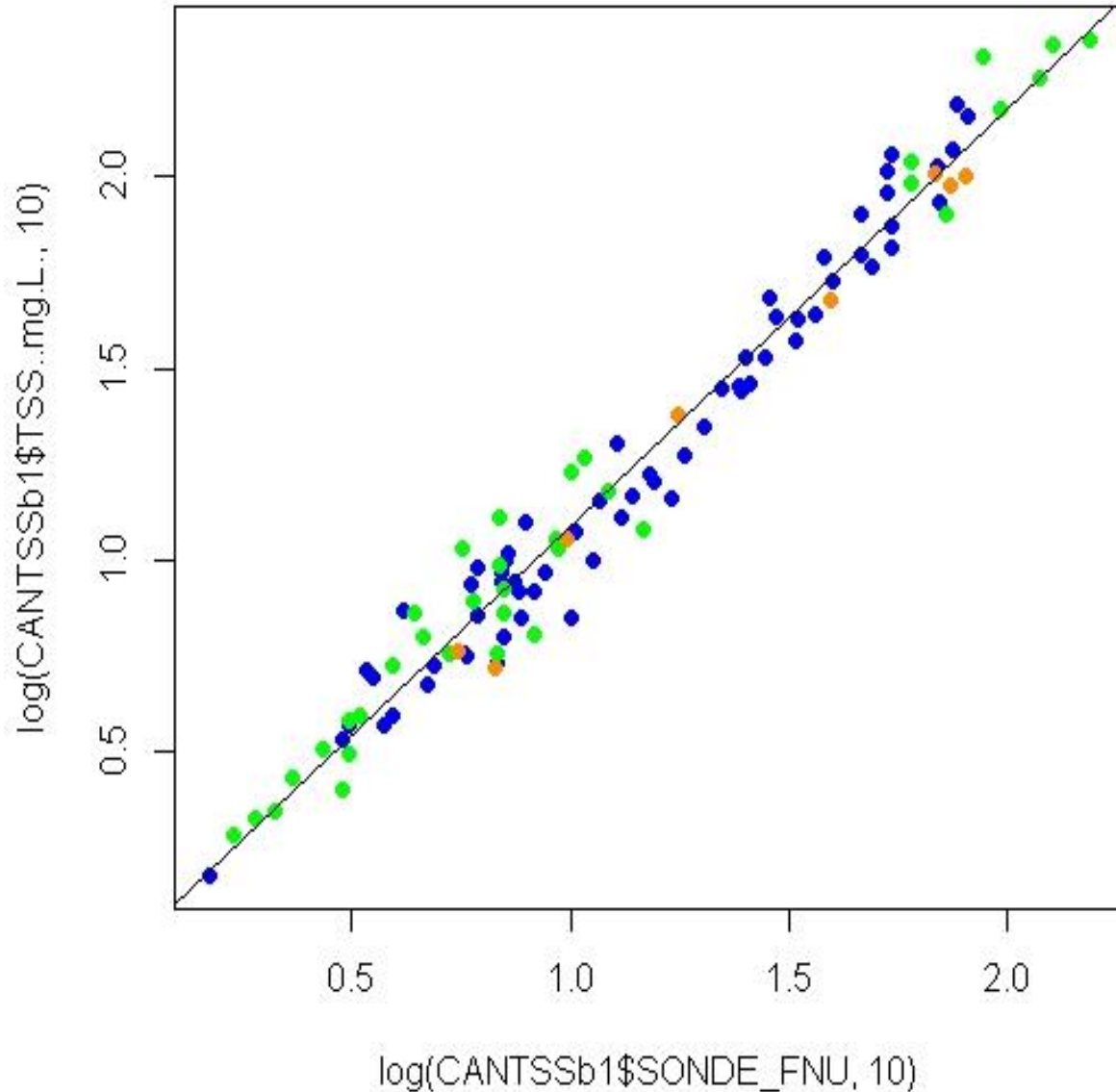
Annual Variation

Summer Discharge of Susquehanna River at Harrisburg 2013-16

Source: USGS Station 01570500



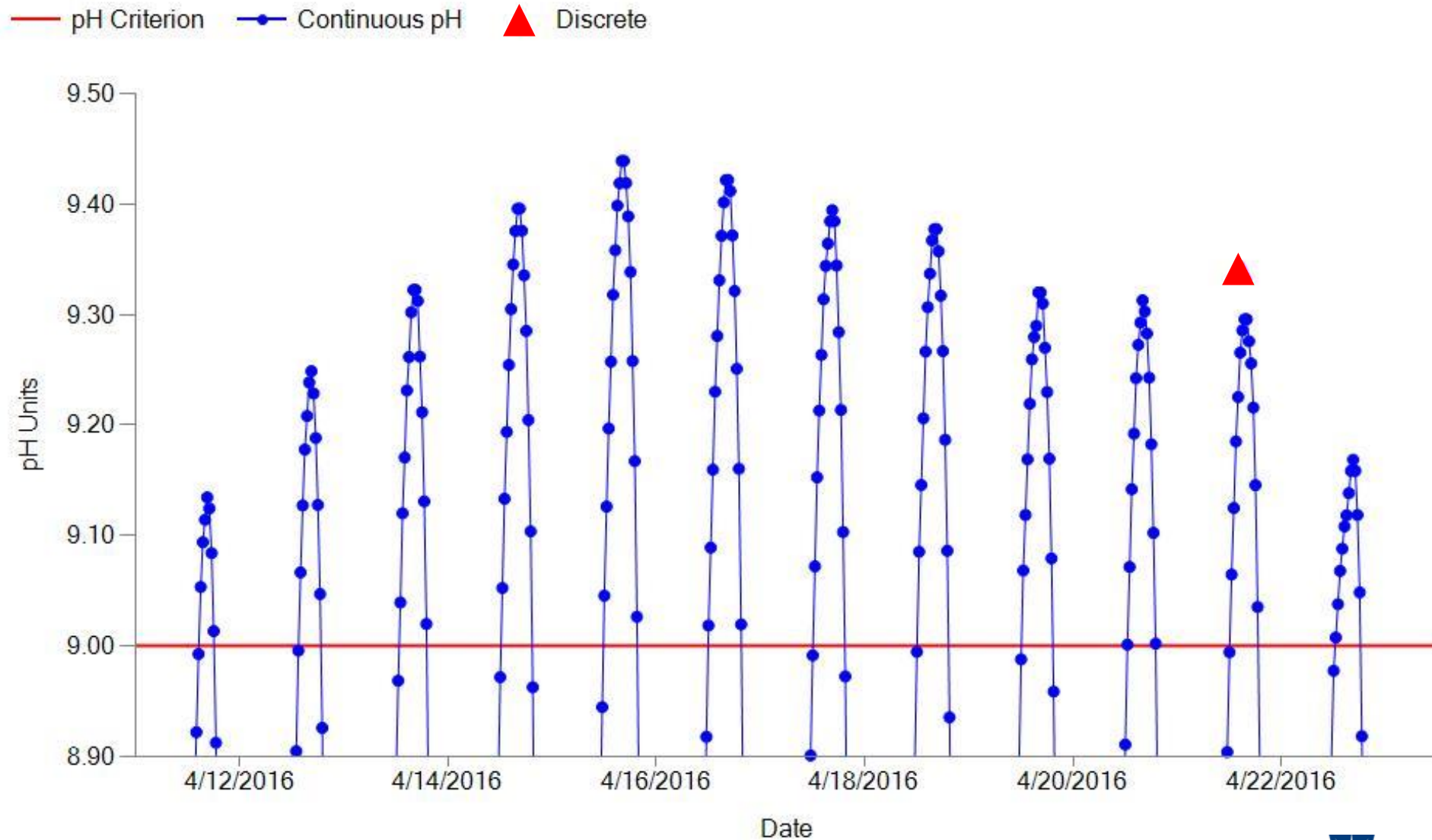
Model-Derived Parameters



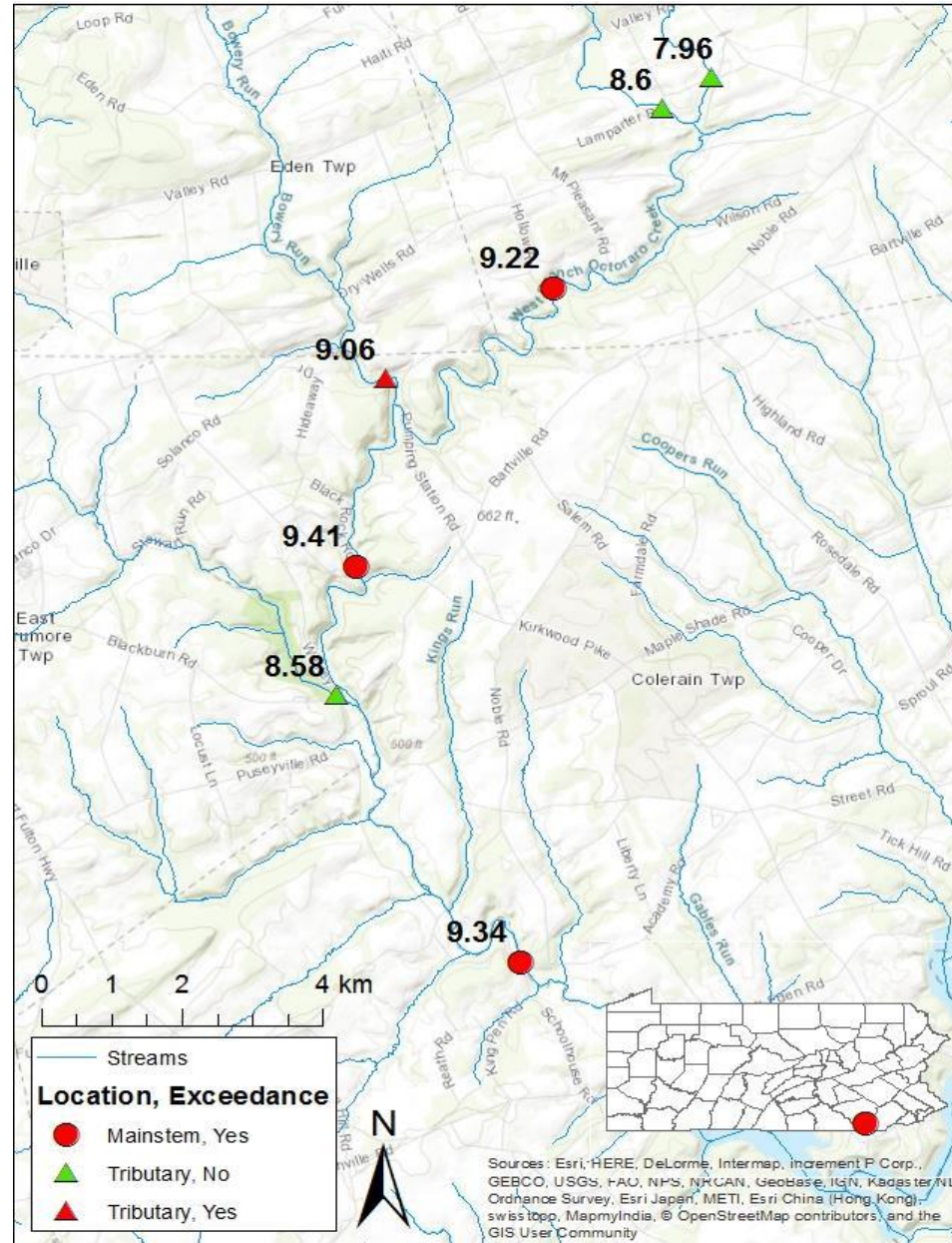
- USGS guidelines
- Discrete samples
 - Over-top of sonde
 - Cover range of values
- Site specific

***Probability of
Digression*** \geq ***90%***

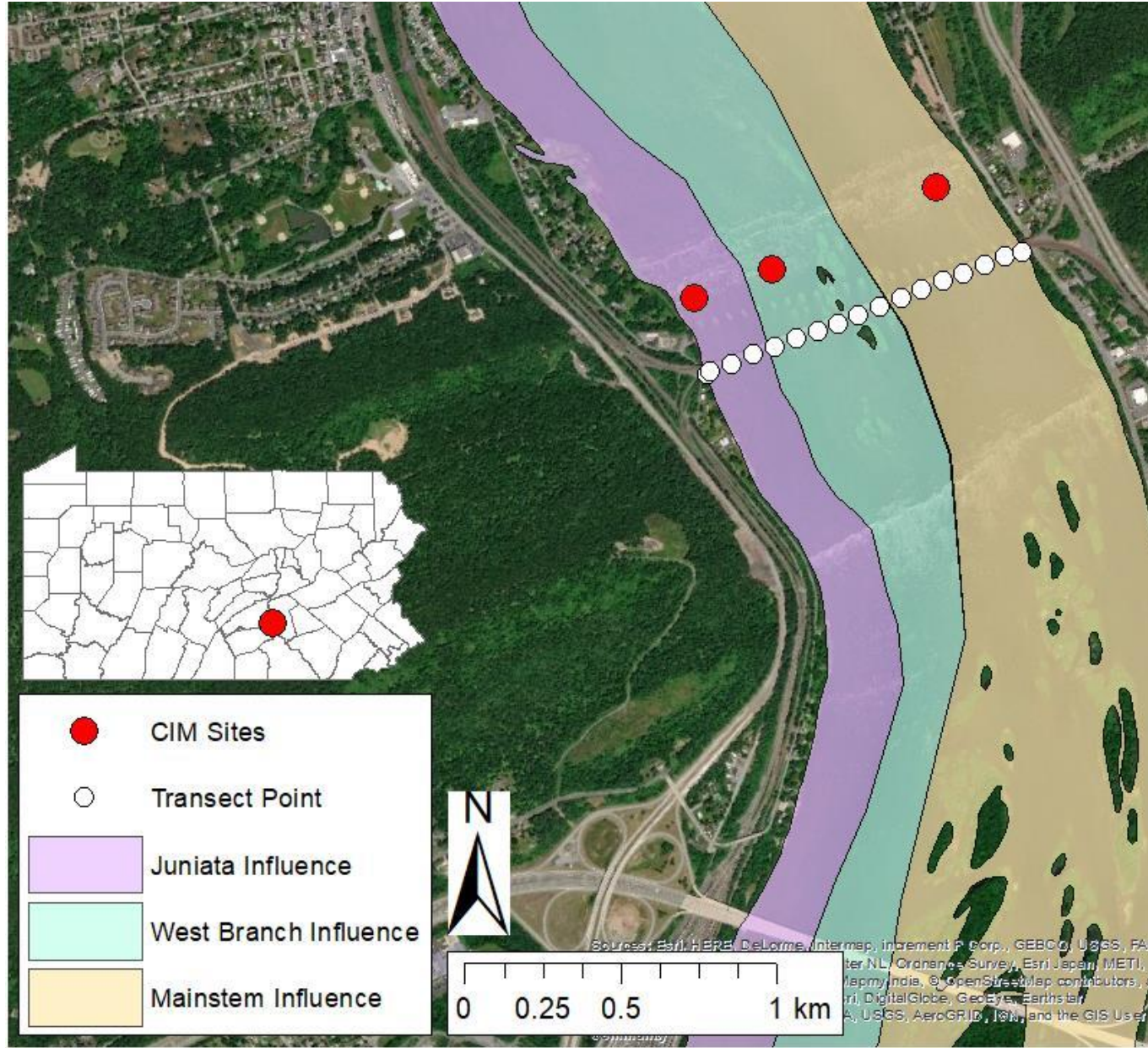
Delineating Spatial Extent



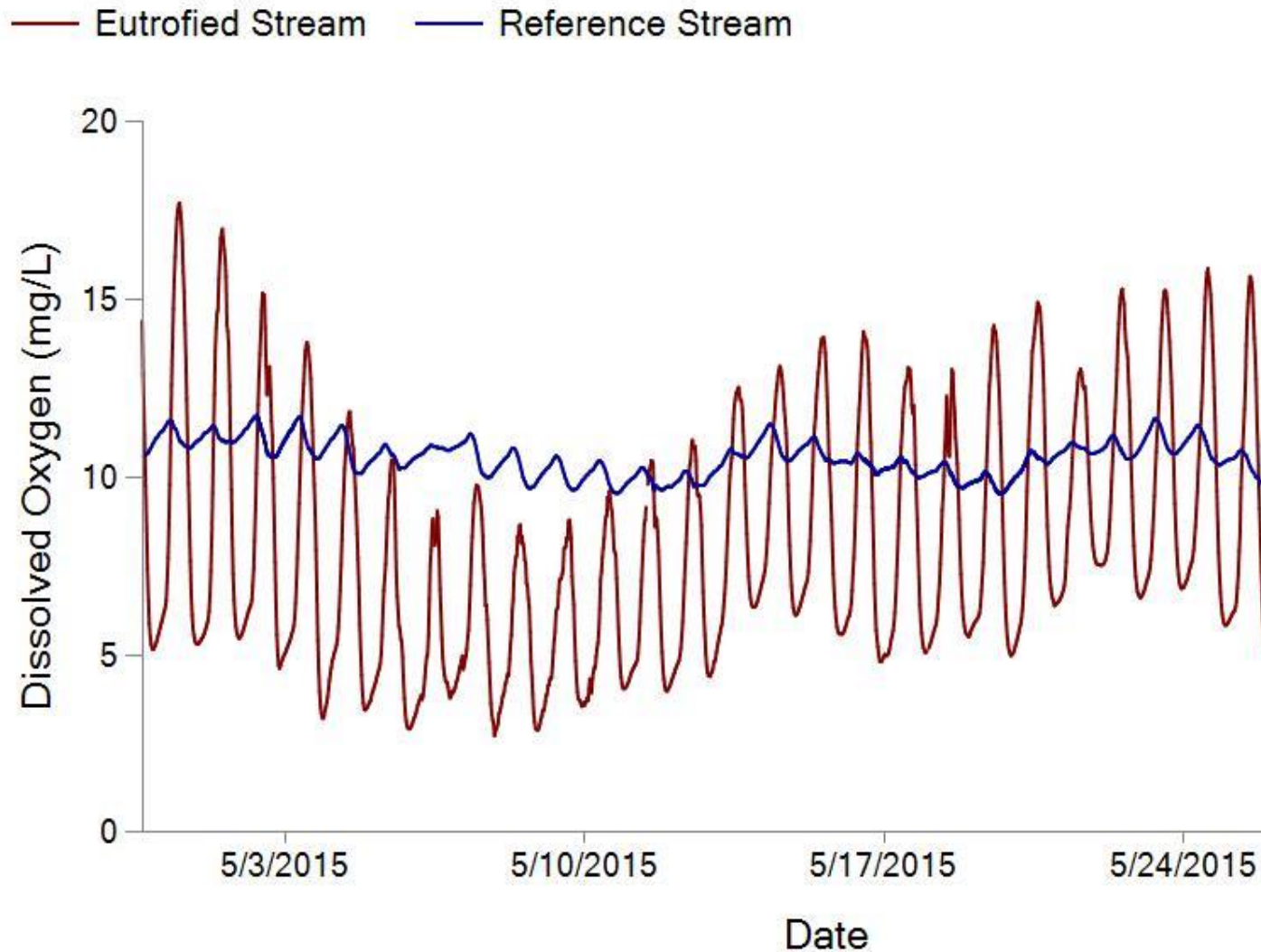
Delimiting Spatial Extent



Delimiting Spatial Extent – Non-Mixed Rivers



Eutrophication Cause Determination



- Diel DO Swings
- Region- and season-specific benchmarks
- Currently for small streams only (50 mi²) but future expansion up to 500 mi²
- Spatial delineation supported by discrete DO readings and N/P grabs

Temperature Modification Cause Determination

- Determination centered around fish community data
- Thermal Fish Index (TFI) assessment
 - Thermal preference of fish species
 - Response to habitat degradation and water quality in addition to temperature modification
- Continuous temperature, discrete water chemistry, and habitat evaluations all collected to determine cause of changes to TFI scores

Questions or Comments



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Finalized continuous data available at:

<https://padep.aquaticinformatics.net/AQWebPortal>

Protocols and methods can be found in Pennsylvania's Monitoring and Assessment books at:

<https://www.dep.pa.gov/Business/Water/CleanWater/WaterQuality/>