Continuous Water Quality in the VA WSC

August 19, 2015

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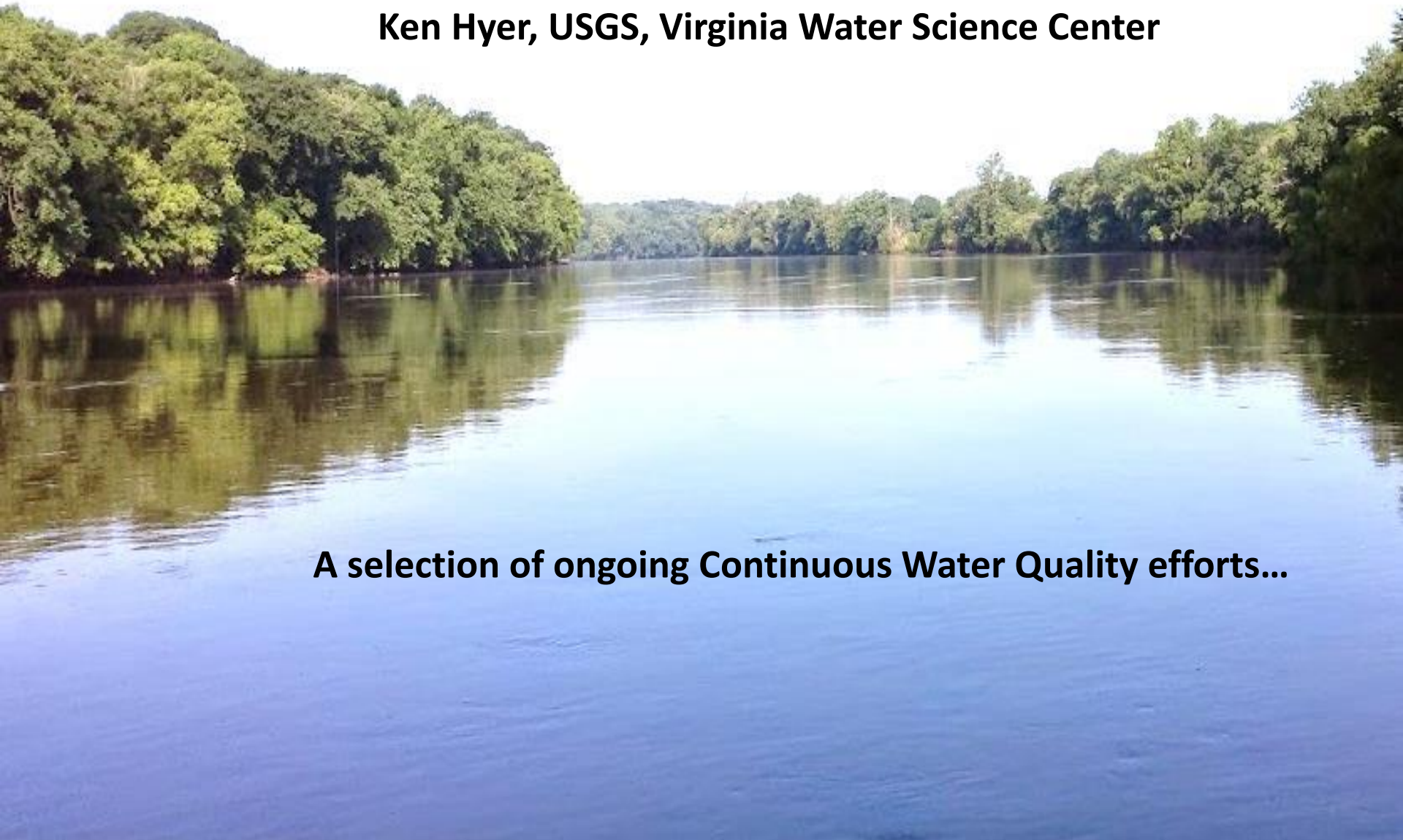


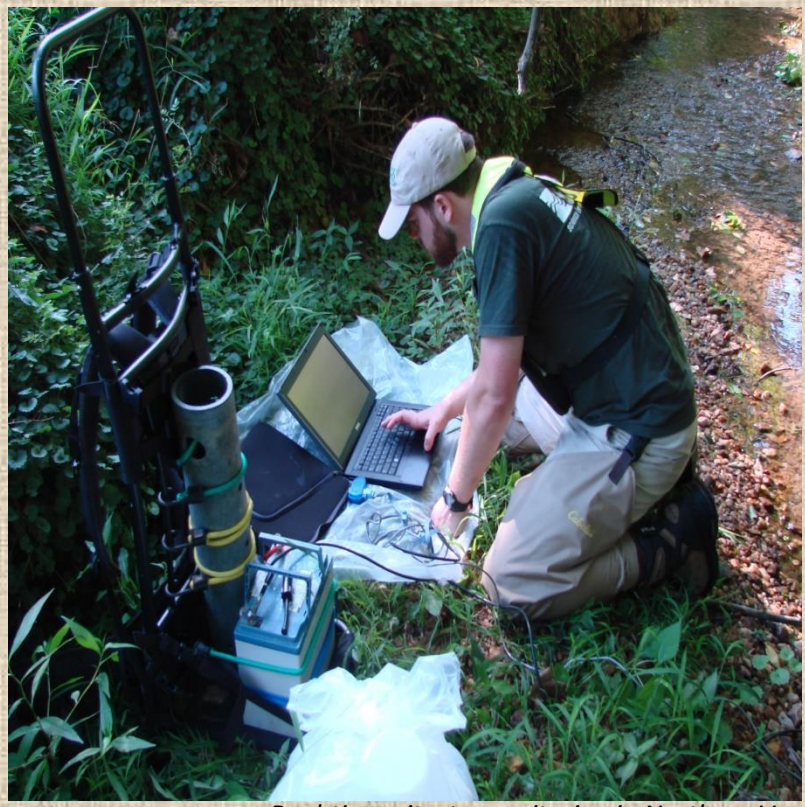
A selection of ongoing Continuous Water Quality efforts…

Take Home Messages

- Continuous Water Quality is here and ready for prime time:
    1. Well developed for field parameters
    2. Exponential growth in continuous nitrate
    3. Developments in phosphate

- Applications are many
    1. Transport Processes
    2. Load and Yield
    3. Trends in water quality
    4. Assessment
    5. Modeling
    6. Stream Metabolism
    7. Reduced Sampling Frequency

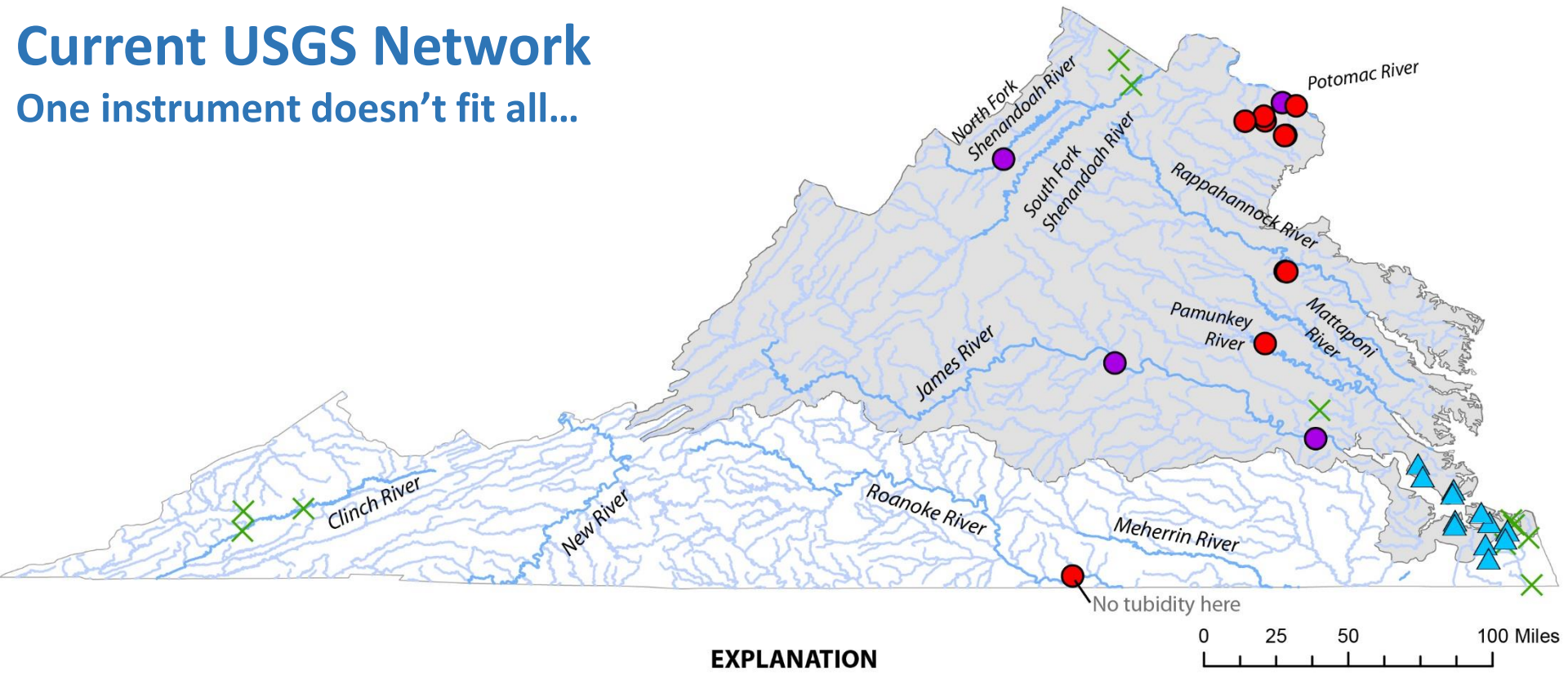
- Strategic Planning thoughts:
    1. One Size doesn't fit all
    2. Prioritize sites (factors include…)
    3. Can we reduce sampling frequency?
    4. Need improved sensors and anti-fouling



Real-time nitrate monitoring in Northern Va

Current USGS Network

One instrument doesn't fit all…



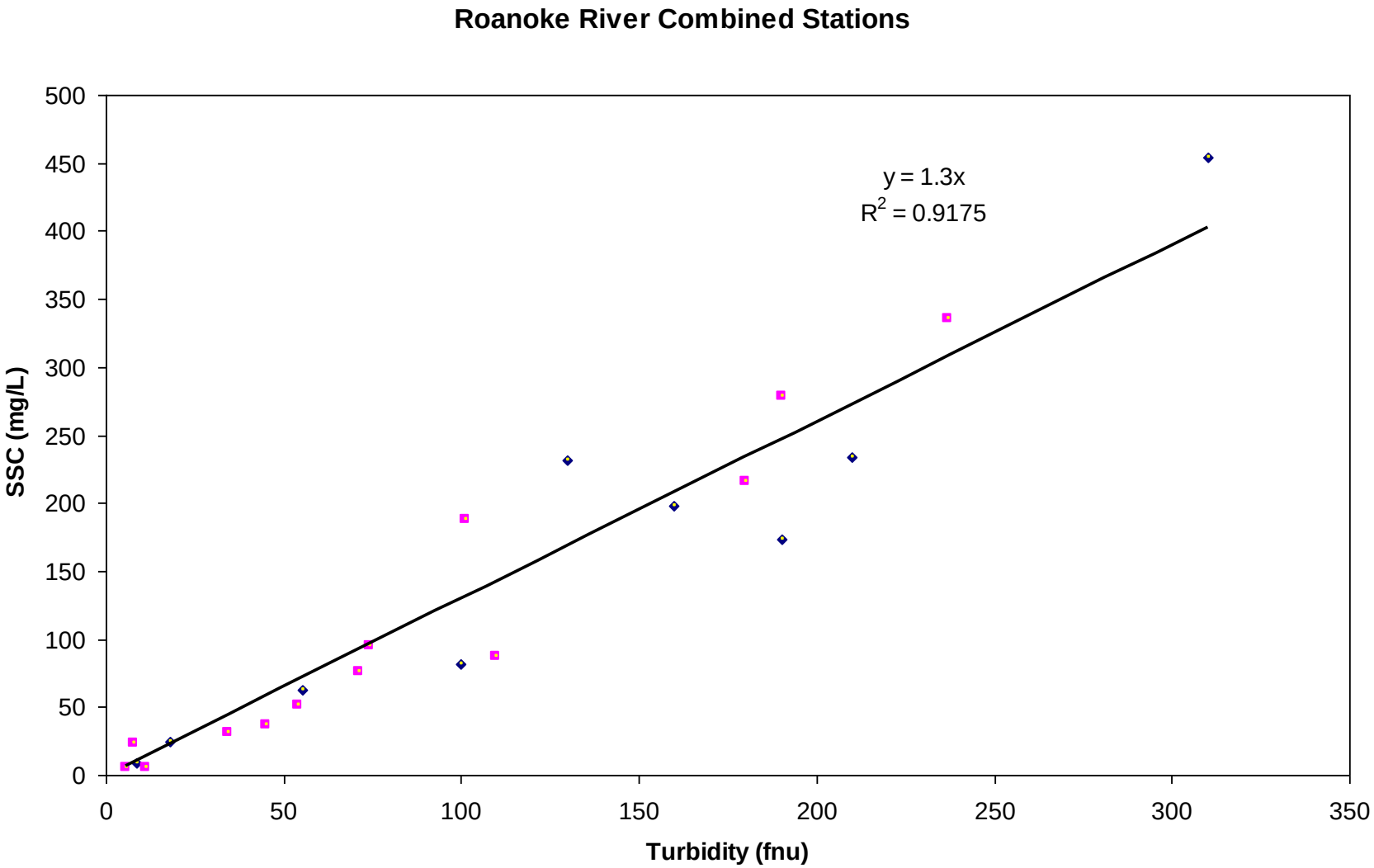
EXPLANATION

Chesapeake Bay Watershed Boundary

Parameters Measured	YSI 6920	YSI 6920 & SUNA	YSI 600 OMS	WT & SC probe
				
	Water Temp. Sp. Cond pH Dissolved Oxygen Turbidity	Nitrate (+ all parameters from 6920)	Water Temp. Sp. Cond Turbidity	Water Temp. Sp. Cond

Surrogate-Regression Models

Turbidity to predict Suspended Sediment Concentration



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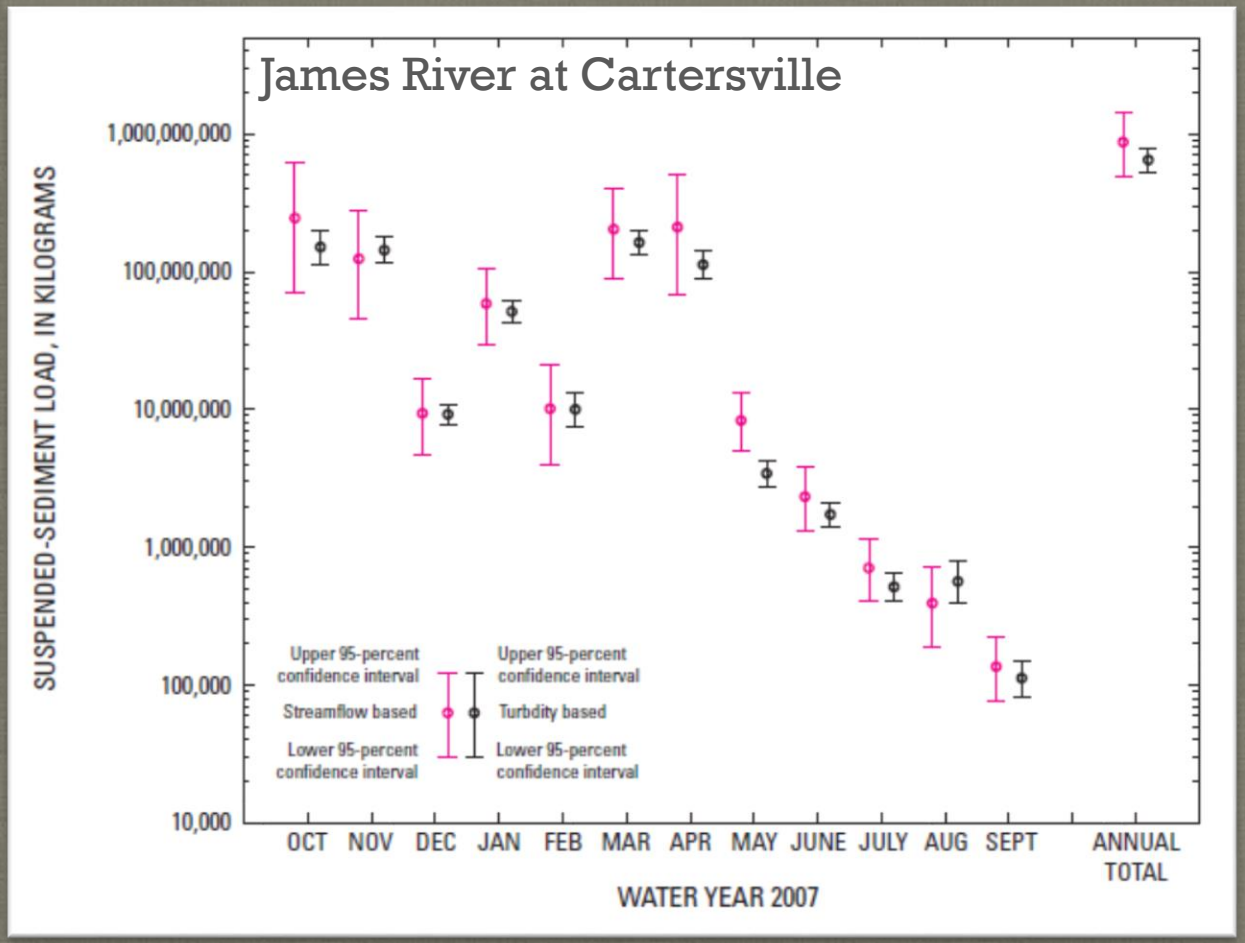
**Note: All results are provisional and are subject to review. Do not cite or release.

Effect on Summed Loads



- Loads generated using LN transformed models in LOADEST
- Greatly reduced width of 95% confidence intervals.
- Critical improvement to enable change detection.

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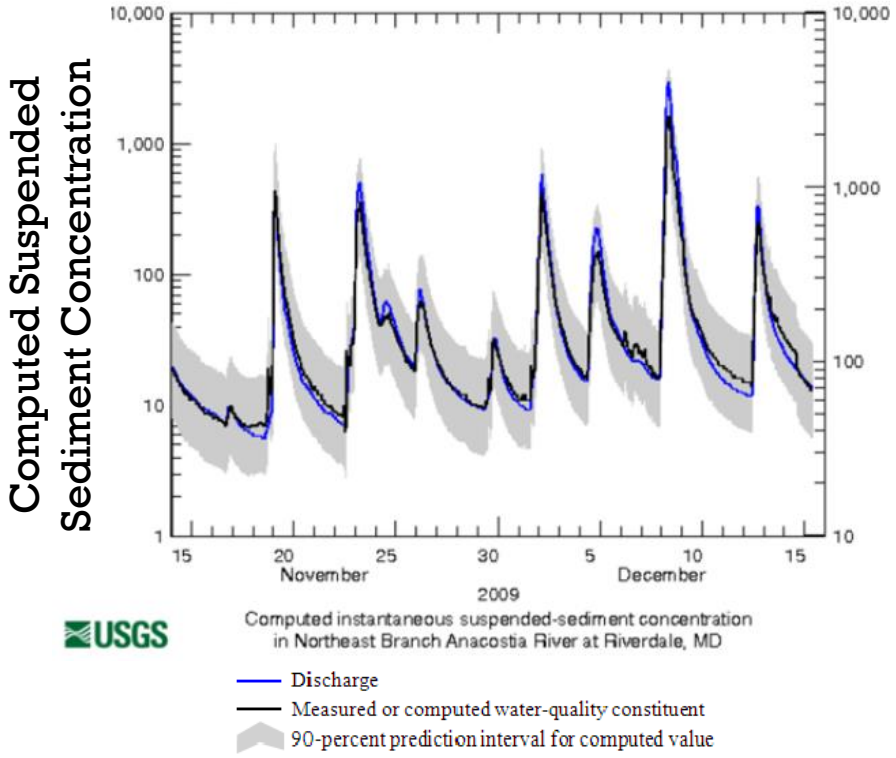
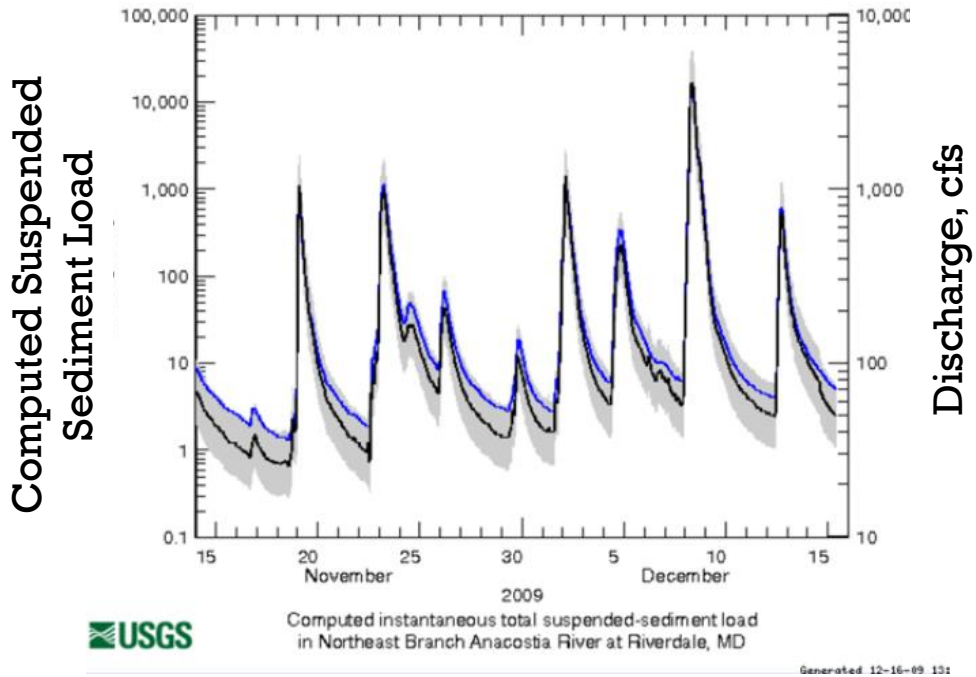
Further Potential

- Realtime instantaneous concentration and load estimates.



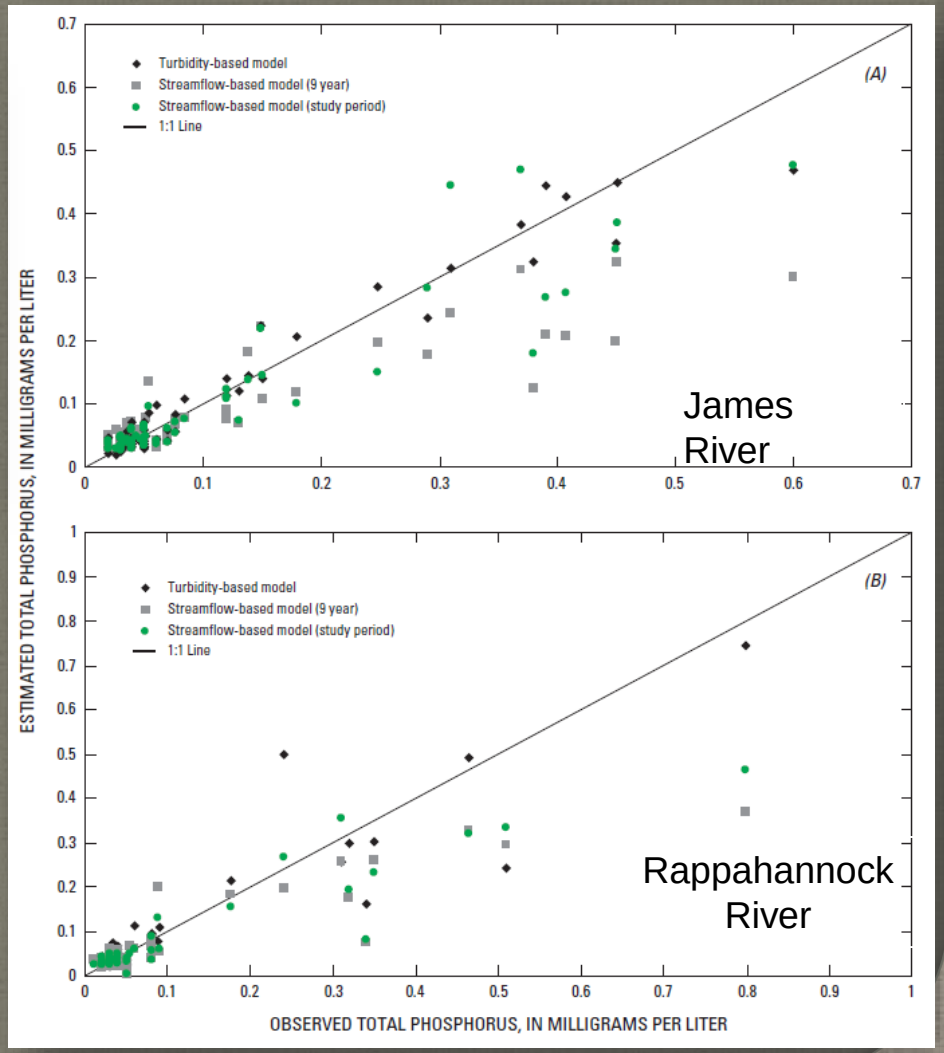


http://nrtwq.usgs.gov

Transfer to Nutrient Estimations - TP

	Turbidity-based error statistics	Streamflow-based error statistics (using 9-year dataset)	Streamflow-based error statistics (using study-period dataset)
James River at Cartersville (n = 61)			
SSE	0.055 (626.3)	0.370 (4,568.6)	0.164 (1,868.7)
MSE	0.001 (10.3)	0.006 (74.9)	0.003 (30.6)
MAE	0.019 (1.2)	0.044 (3.6)	0.030 (2.4)
Rappahannock River near Fredericksburg (n = 42)			
SSE	0.191 (124.4)	0.376 (1,135.7)	0.276 (718.7)
MSE	0.005 (3.0)	0.009 (27.0)	0.007 (17.1)
MAE	0.035 (0.6)	0.046 (1.3)	0.039 (1.1)

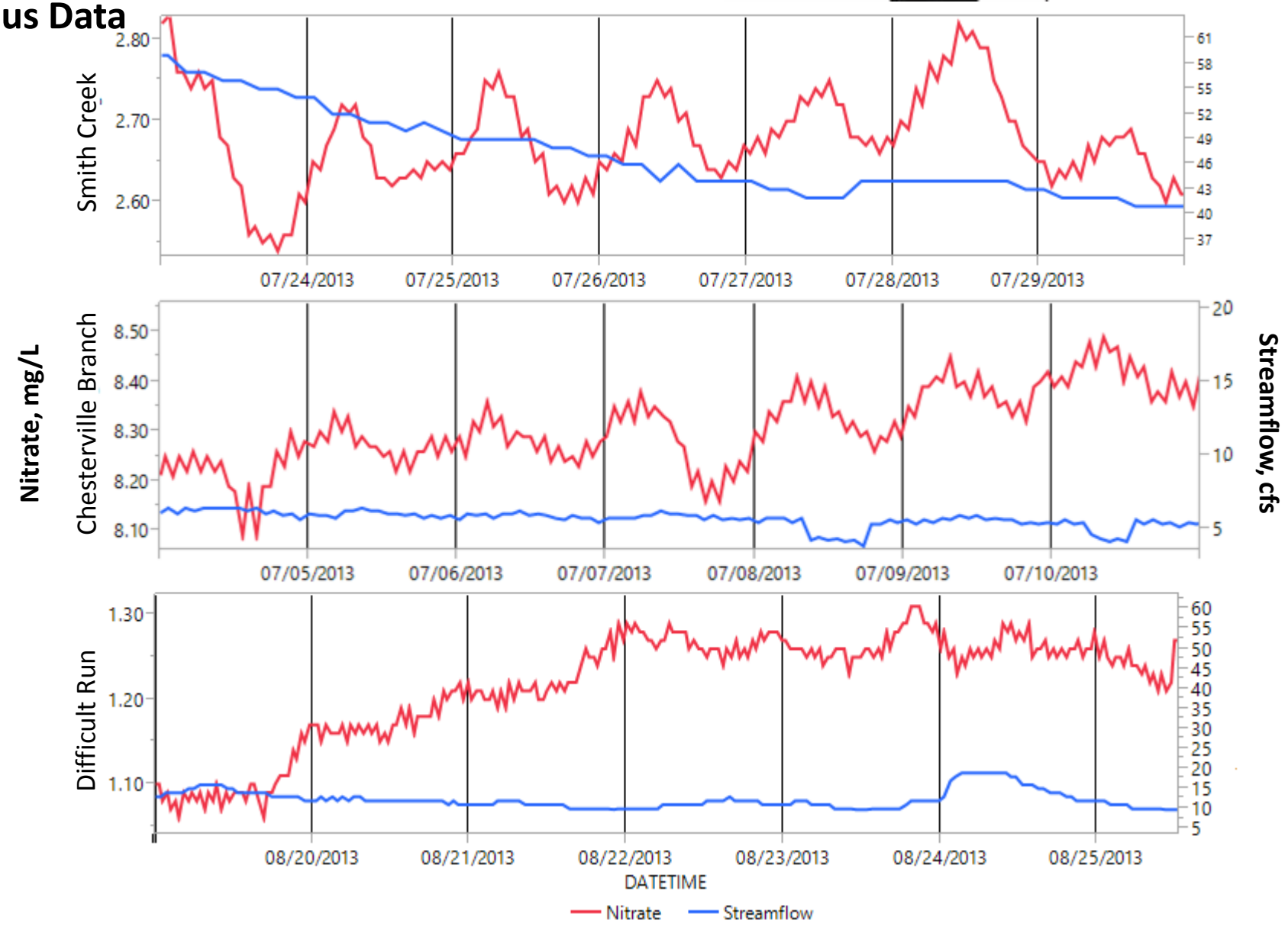
	Streamflow-based p-values (using 9-year dataset)	Streamflow-based p-values (using study-period dataset)
James River at Cartersville		
Estimates	<0.01	<0.01
Residuals	<0.01	0.119
Rappahannock River near Fredericksburg		
Estimates	0.02	<0.01
Residuals	<0.01	<0.01



Water-Quality at the Gage

Continuous Data

Nitrate, mg/L



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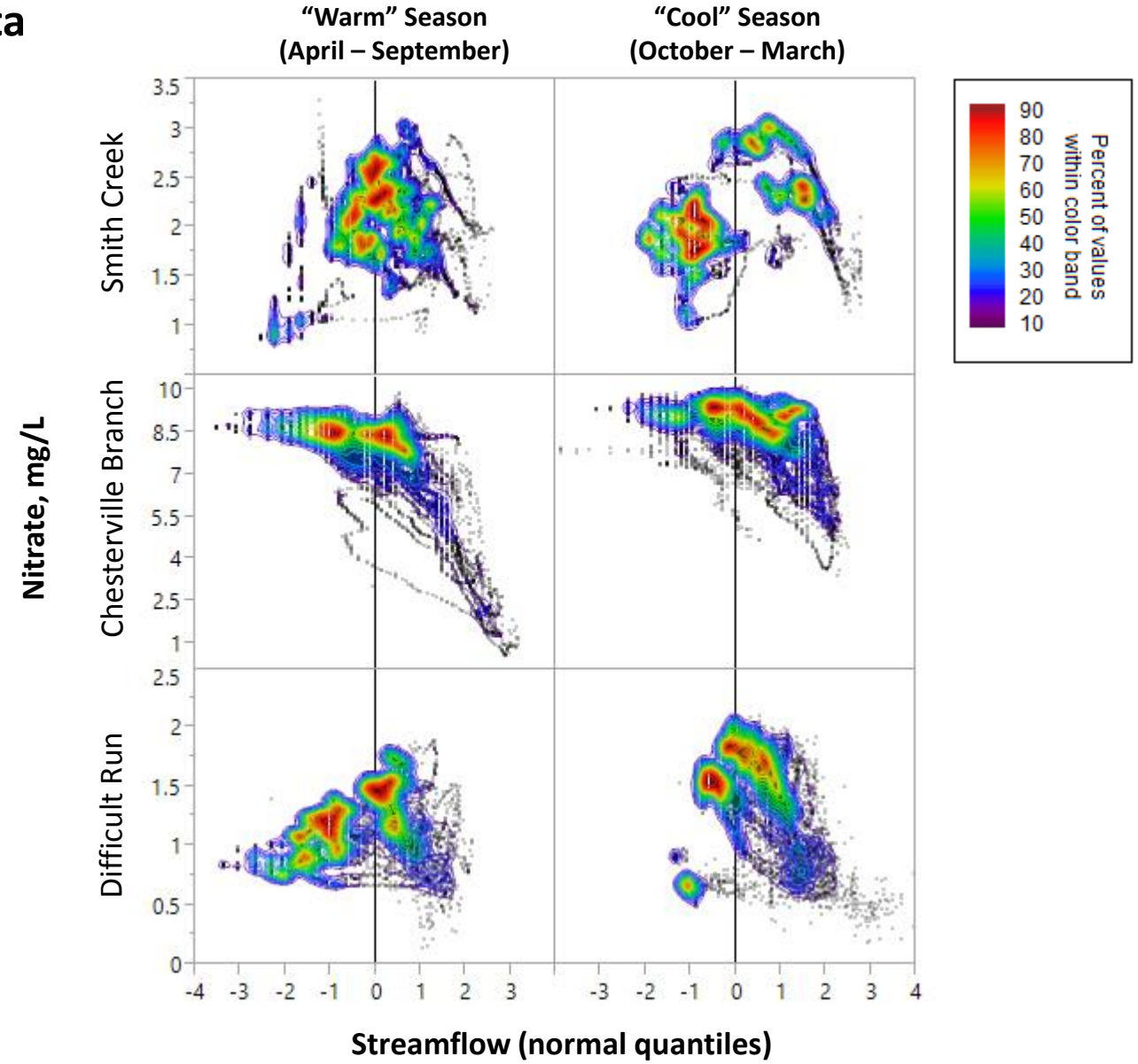
Water-Quality at the Gage

Continuous Data



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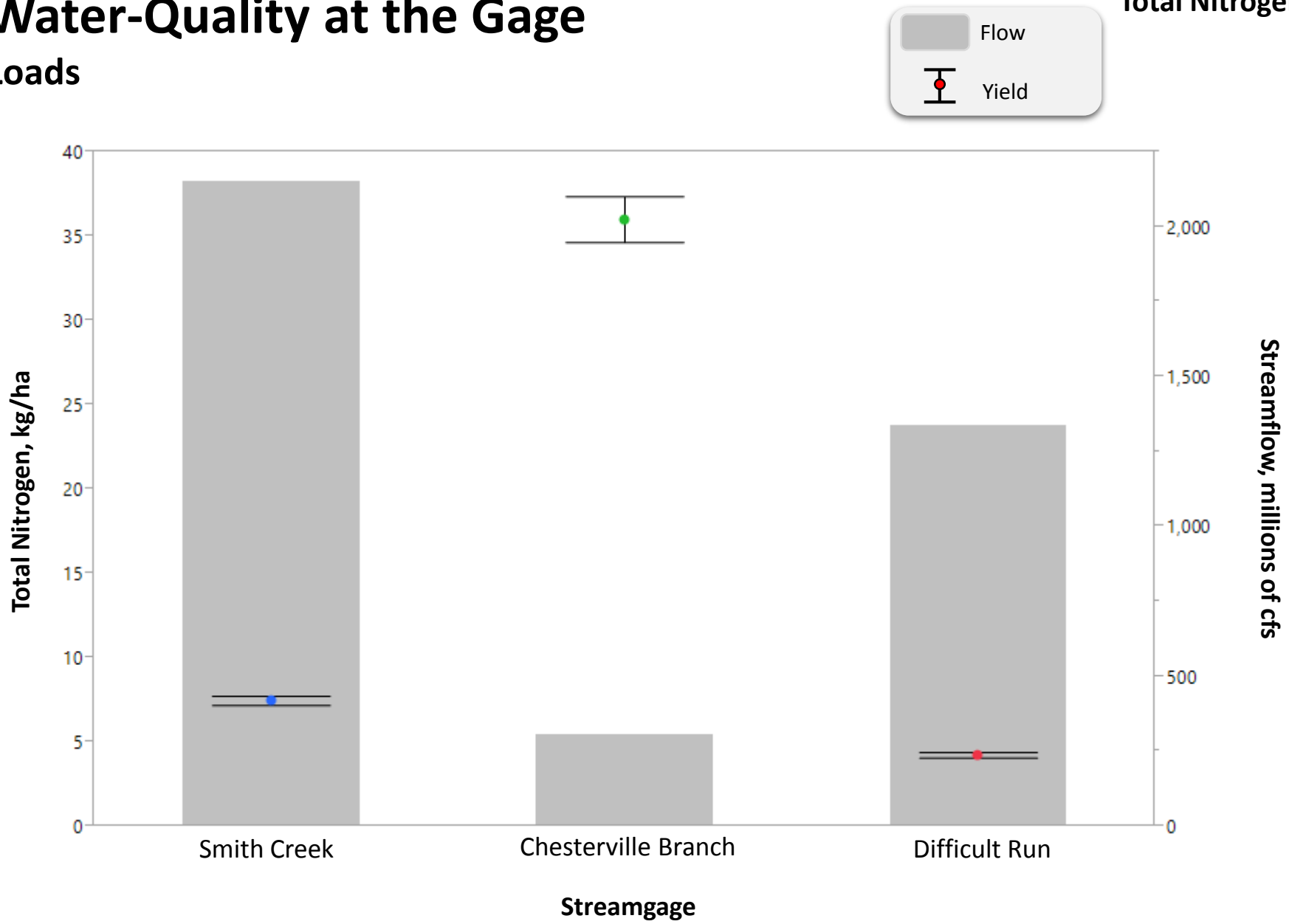
Water-Quality at the Gage

Loads

Total Nitrogen Load



*Water Year 2013

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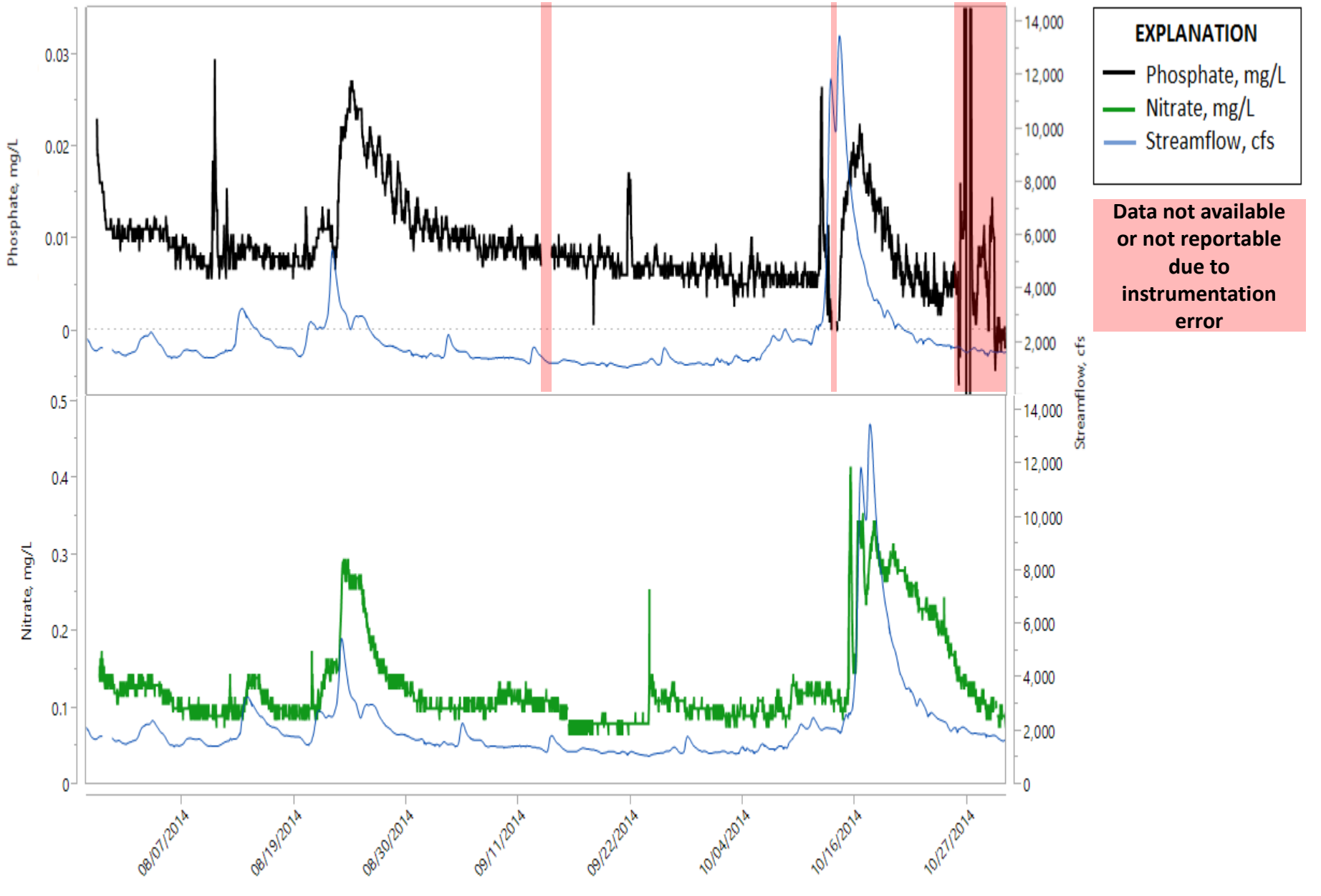
Continuous Phosphate Monitoring

James River at Cartersville VA – Aug-Oct 2014 – provisional data



Closing Thoughts

- An idea whose time has come…
- Applications are many
  1. Transport Processes
  2. Load and Yield
  3. Trends in water quality
  4. Assessment
  5. Modeling
  6. Stream Metabolism
  7. Reduced Sampling Frequency
- Publication of many of these studies is still needed...
- As this discussion moves forward, we are happy to contribute to the development of a strategic continuous monitoring plan.
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