

Sediment and Nutrient Concentrations and Loads in Small Urban Streams in Fairfax County, Virginia

John Jastram

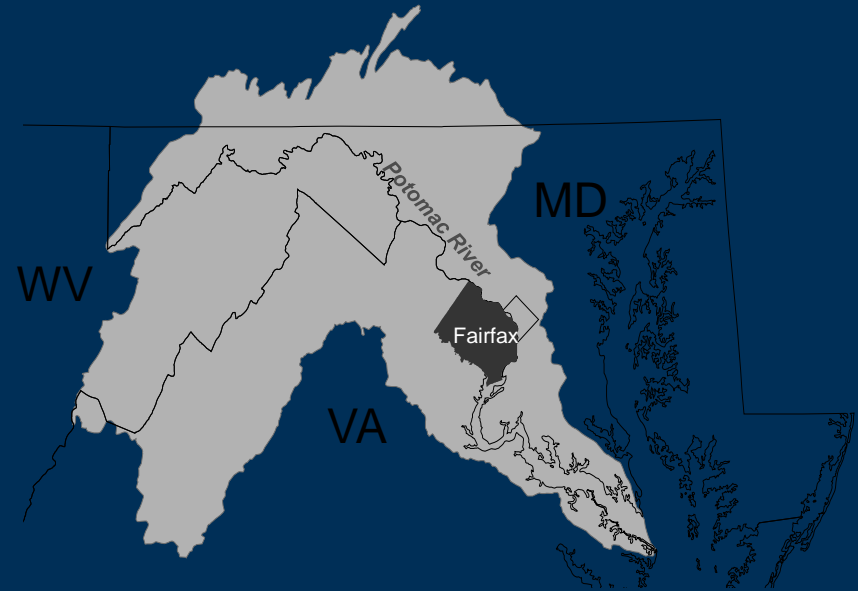
Virginia Water Science Center



Fairfax County, VA

- Washington, DC Suburbs
- Potomac River Watershed
- Piedmont and Coastal Plain
- Highly urbanized
 - Medium Density Residential
 - Population 1 million

- USGS / Fairfax County Cooperative Monitoring Program initiated in 2007



Study Objectives

■ Phase 1

- Ongoing since 2007

1. Generate long-term monitoring data to describe:
 - Current water-quality conditions,
 - Trends in water-quality, Nutrient and Sediment Loads and Yields.

■ Phase 2

- Future

2. Evaluate relations between observed conditions/trends and BMP implementation.
3. Transfer the understanding gained to other less-intensively monitored watersheds.

Approach: Intensive Monitoring

- Operate ~~four~~ ^{five} intensive monitoring stations
- 10+ years of data collection
 - Continuous-record stream gage
 - Continuous water-quality monitor (turbidity, pH, SC, water temp, DO)
 - Nutrients & Sediment Sampling
 - Automated sampler (storm samples)
 - Scheduled monthly sampling
 - Annual benthic macroinvertebrate monitoring



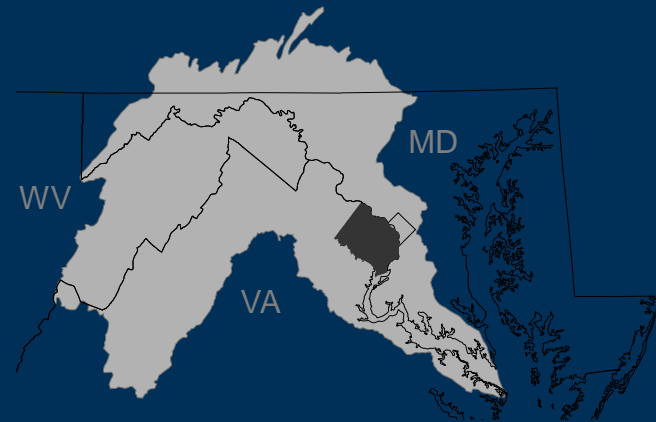
Approach: Knowledge Transfer



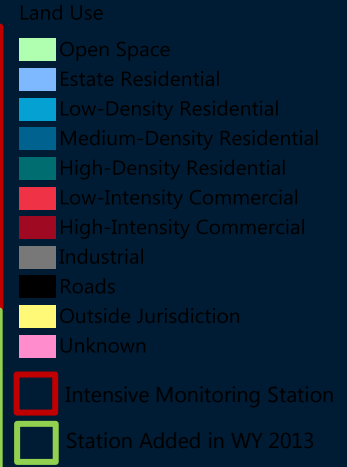
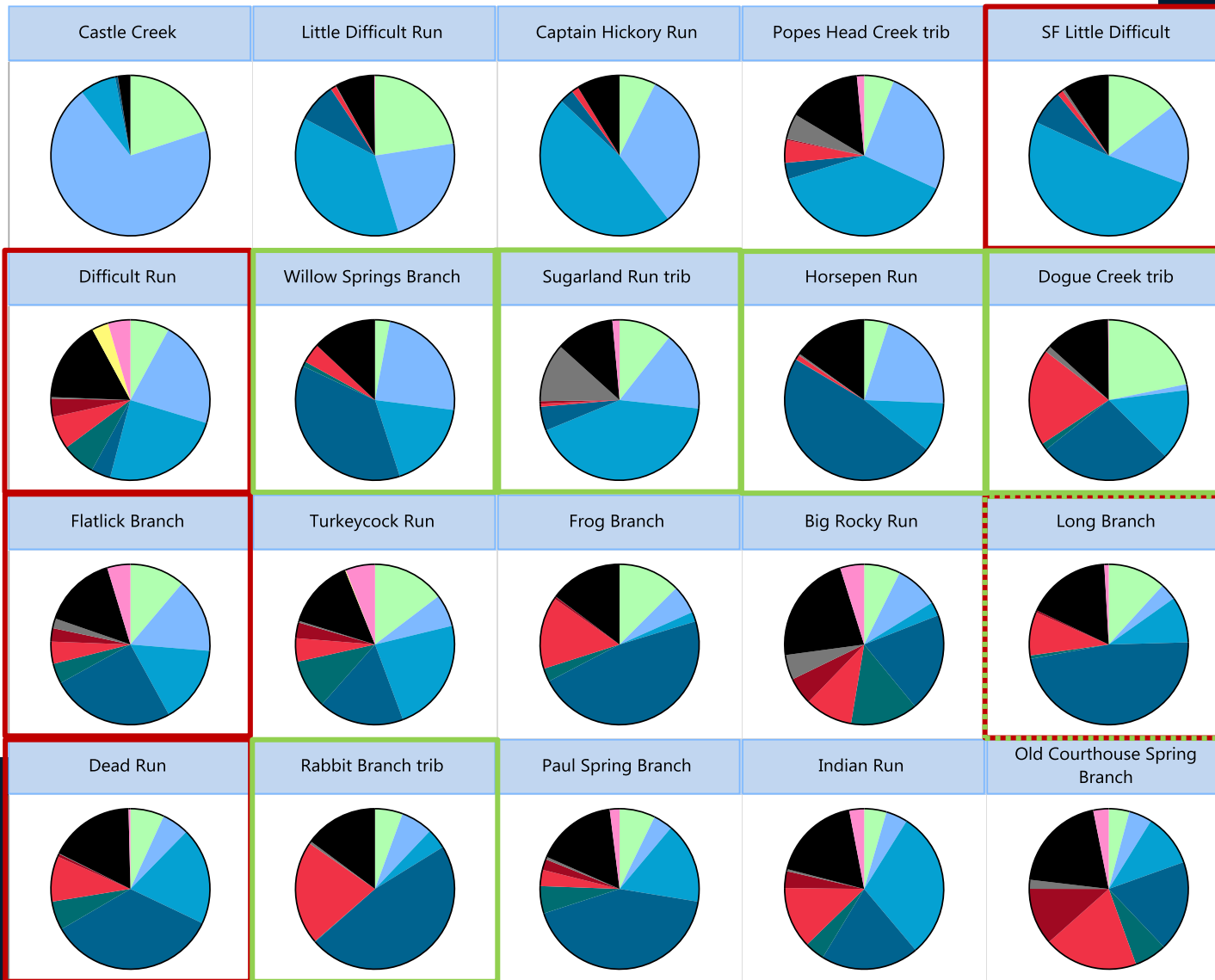
- Operate ~~10~~¹⁵ trend monitoring stations
 - Partial-record stream gage
 - Nutrient & sediment sampling
 - Scheduled monthly sampling
 - Annual benthic macroinvertebrate monitoring
- Evaluate relations between trend- and intensive monitoring sites

Network

- Site selection optimized using statistical analyses and local knowledge
- All watersheds < 5 mi²

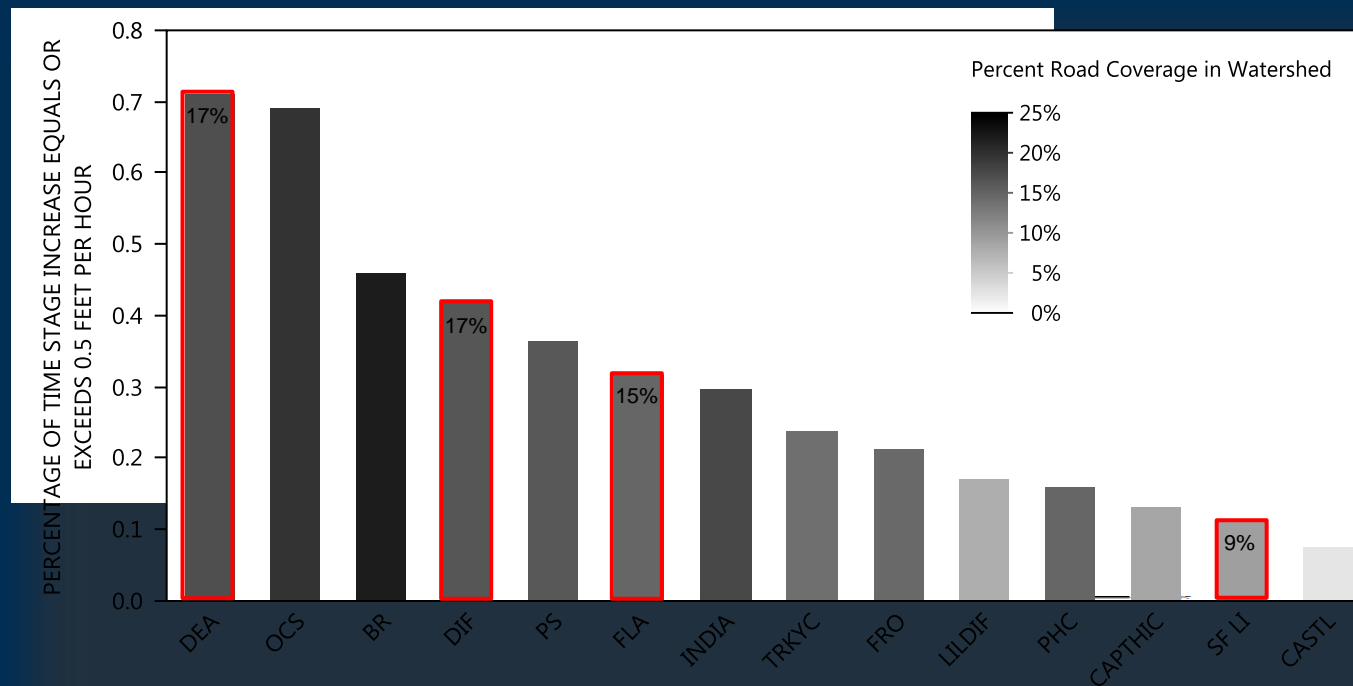


Land Use of Monitored Watersheds



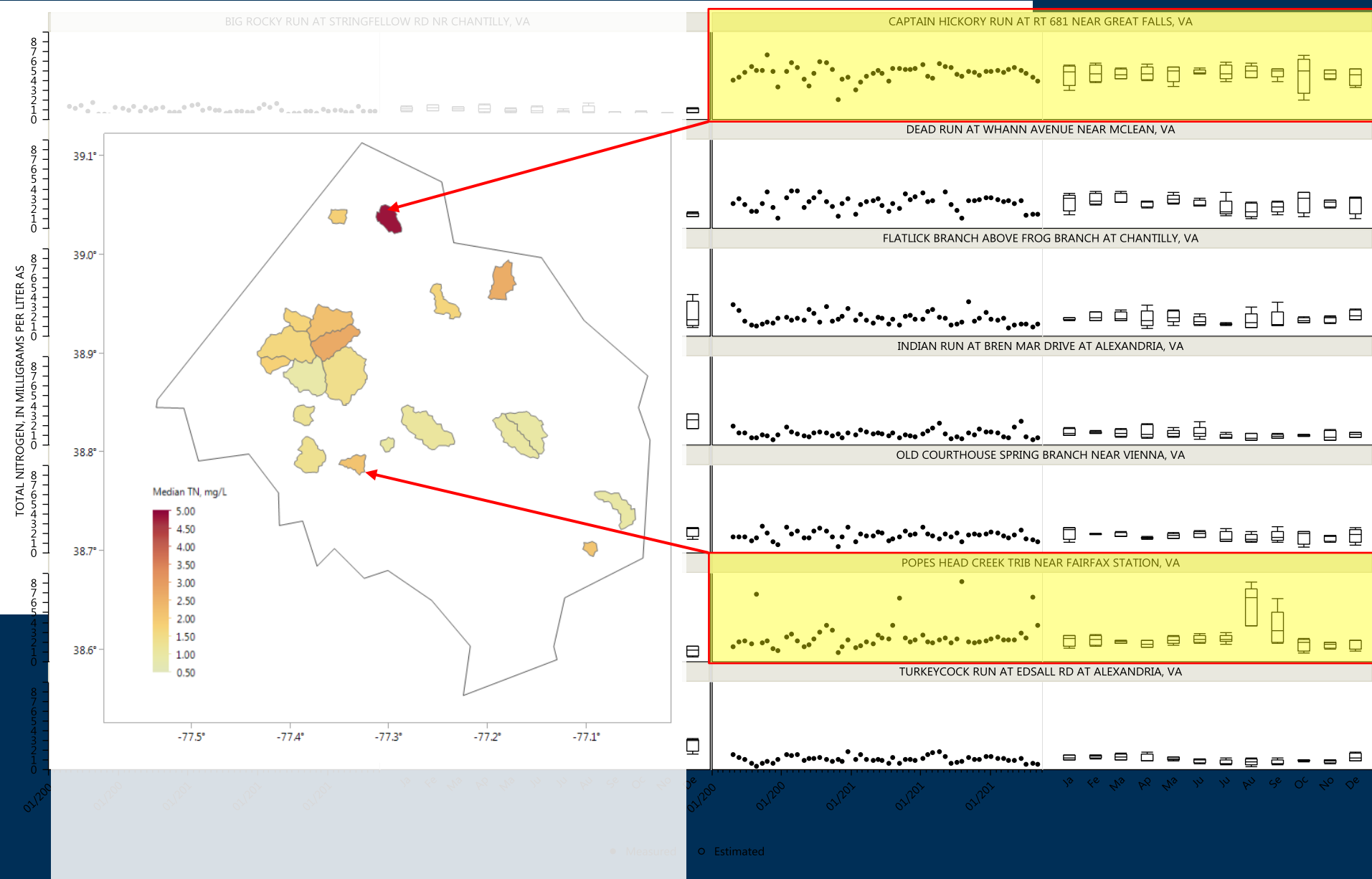
Provisional Data
Subject to Revision

Flashiness of monitored streams



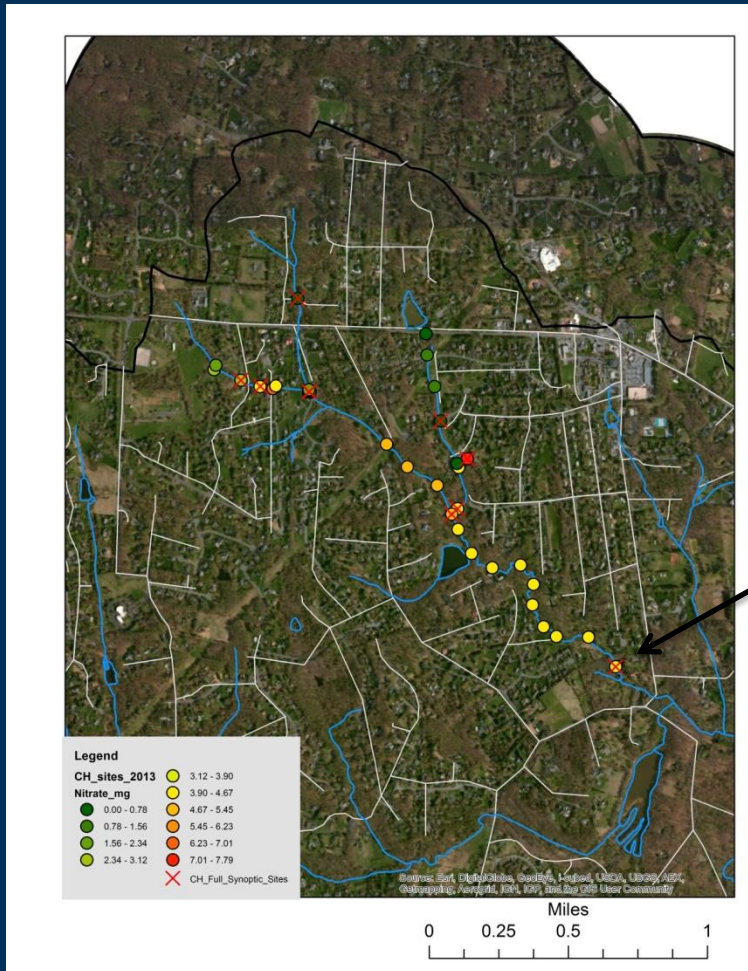
Flashiness computed as percentage of time stage increases exceed 0.5 feet/hour (McMahon and others, 2003)

Patterns in Monthly Nitrogen Results

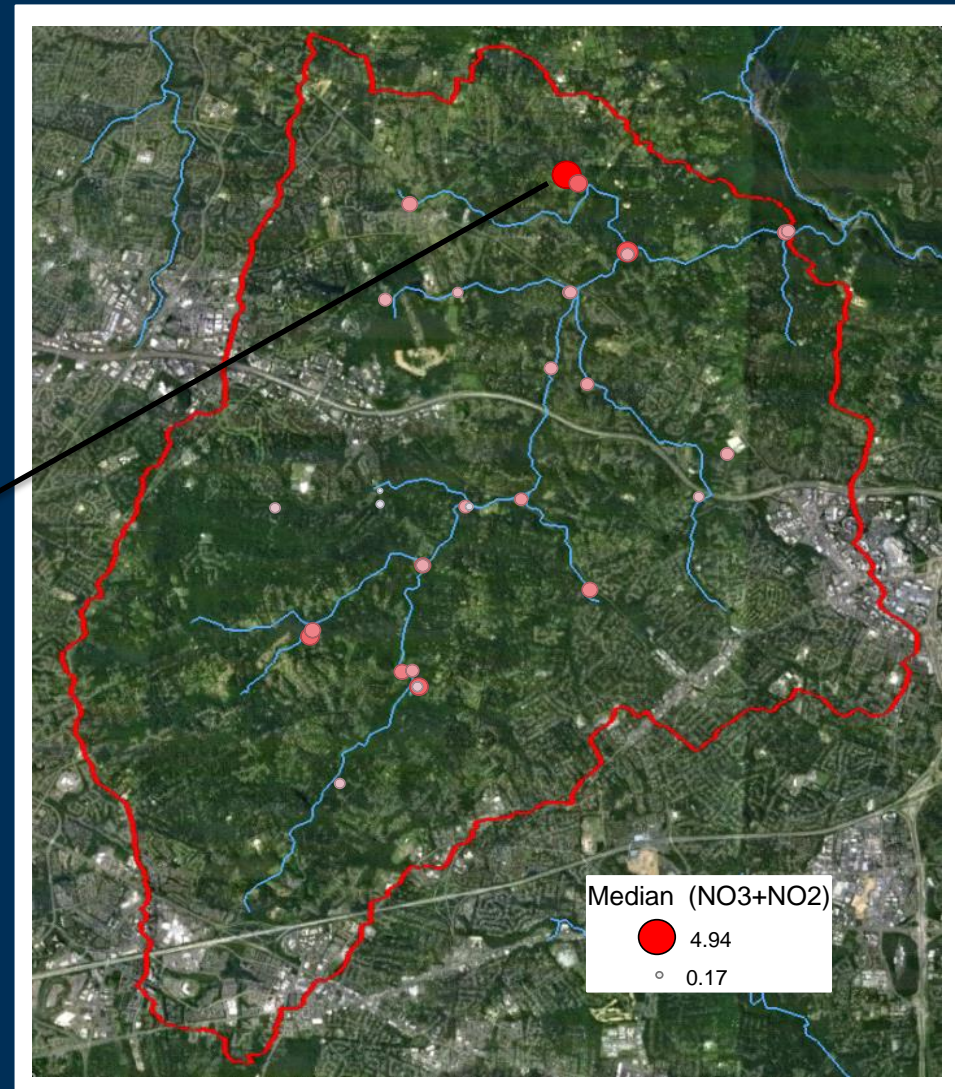


CB Small Watershed Studies (Ken Hyer)

Captain Hickory Run



Difficult Run

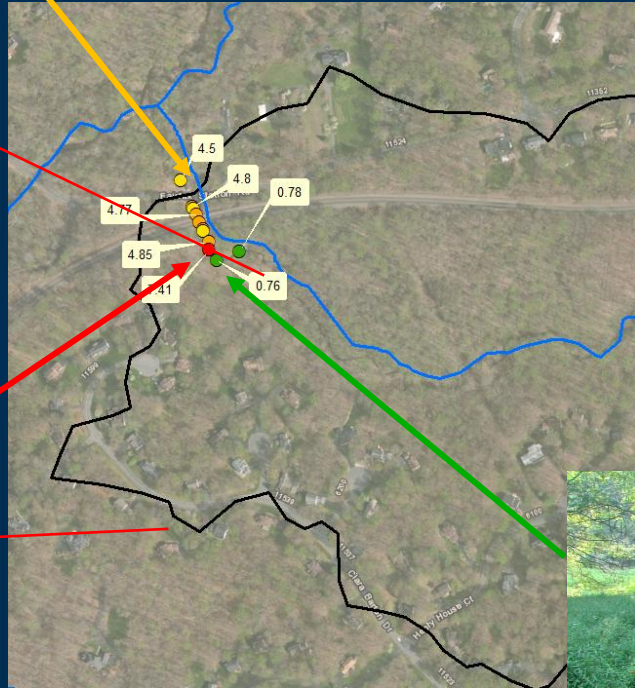


Popes Head Creek Tributary – NO3

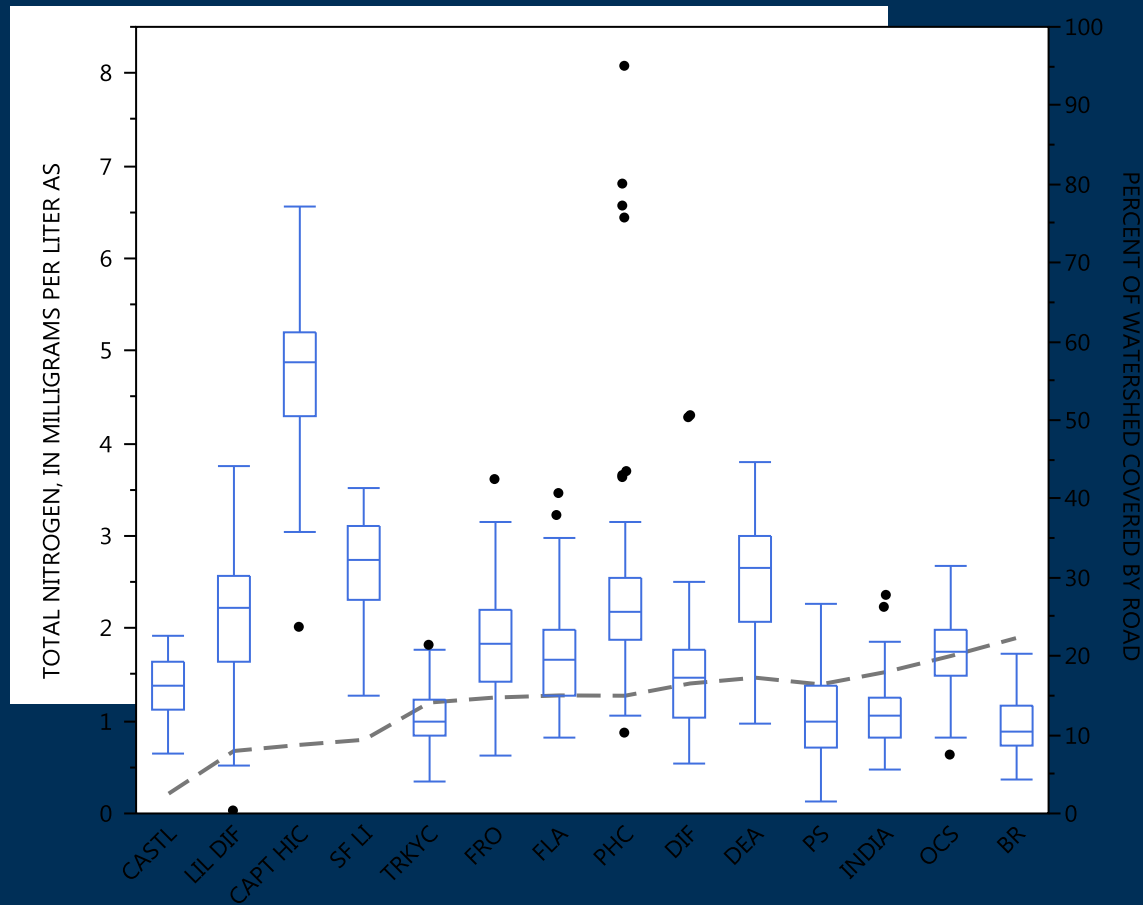


September 10, 2013

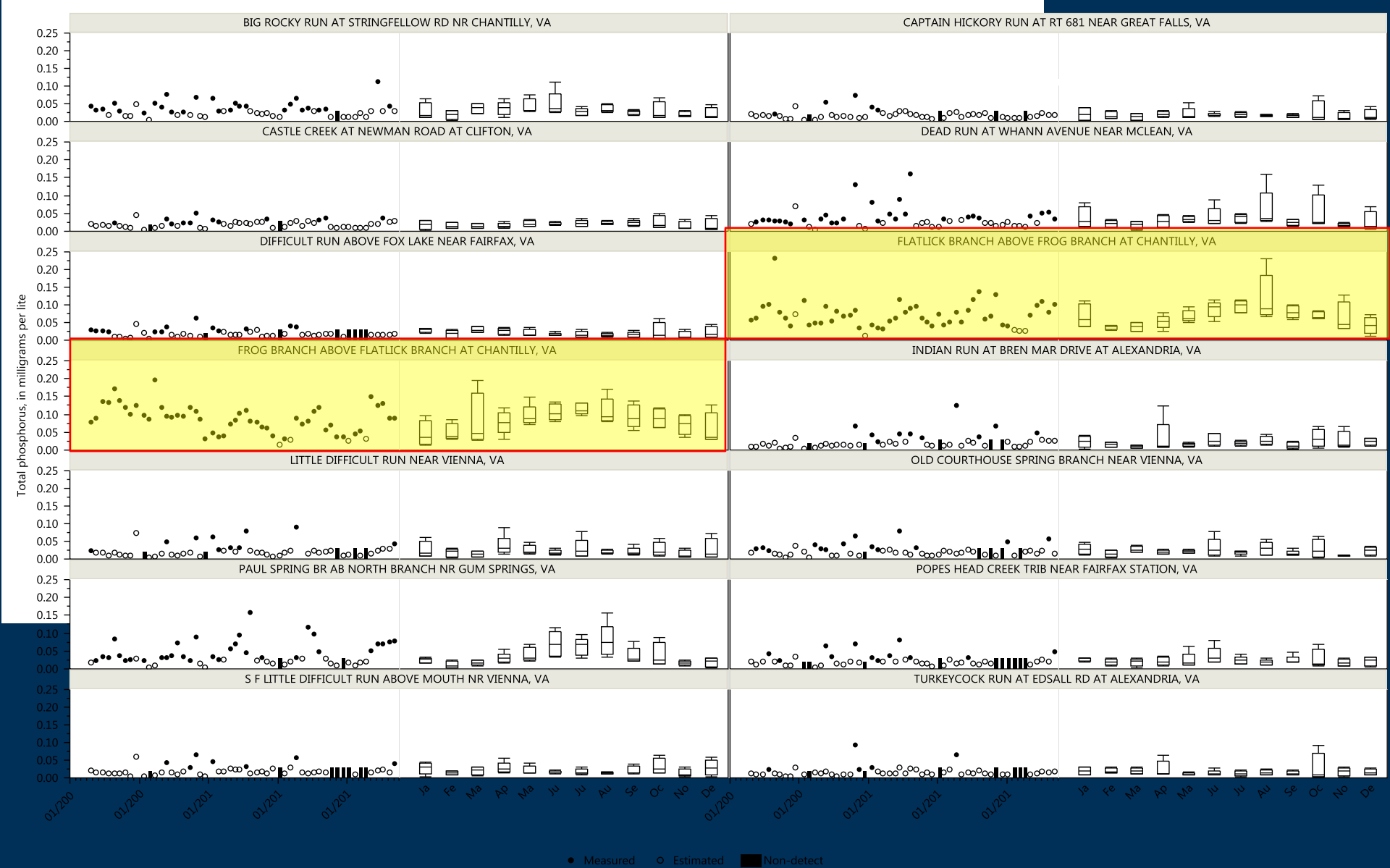
August 28, 2013



Patterns in Monthly Nitrogen Results

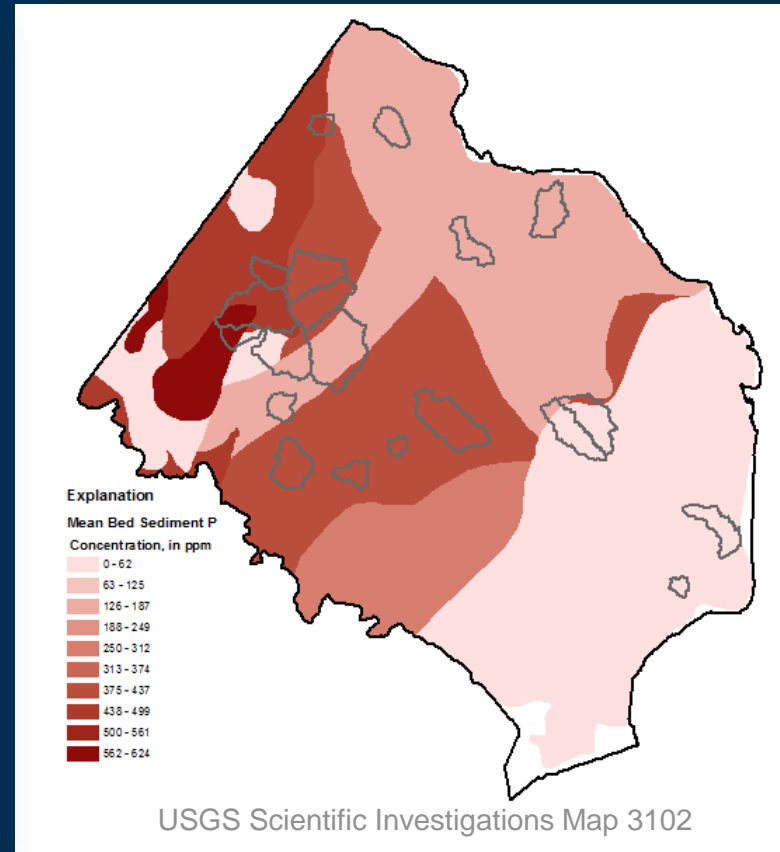
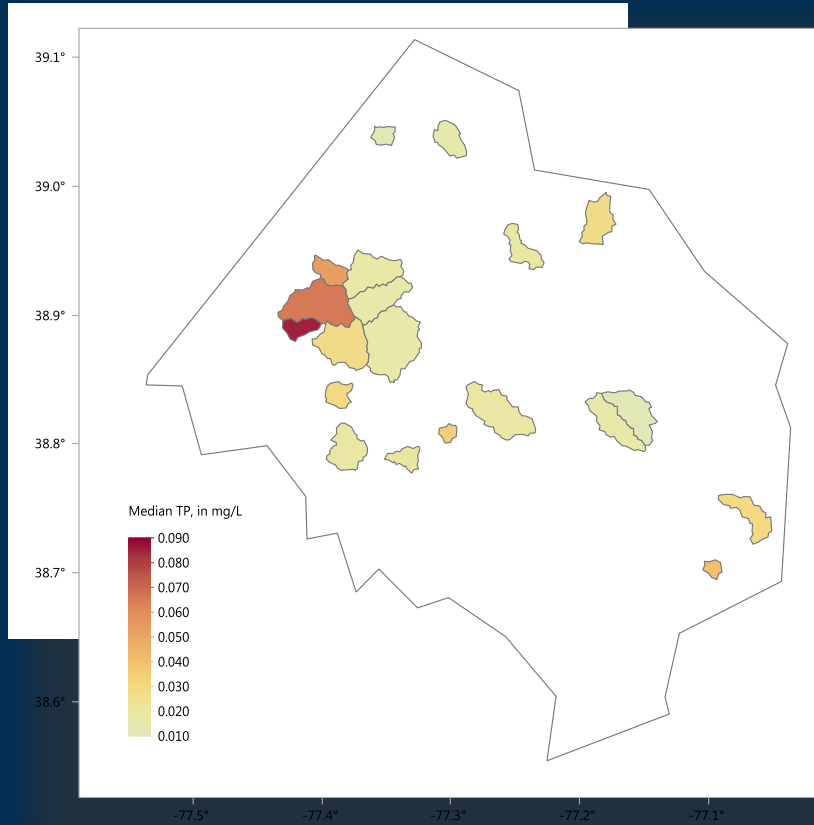


Patterns in Monthly Phosphorus Results

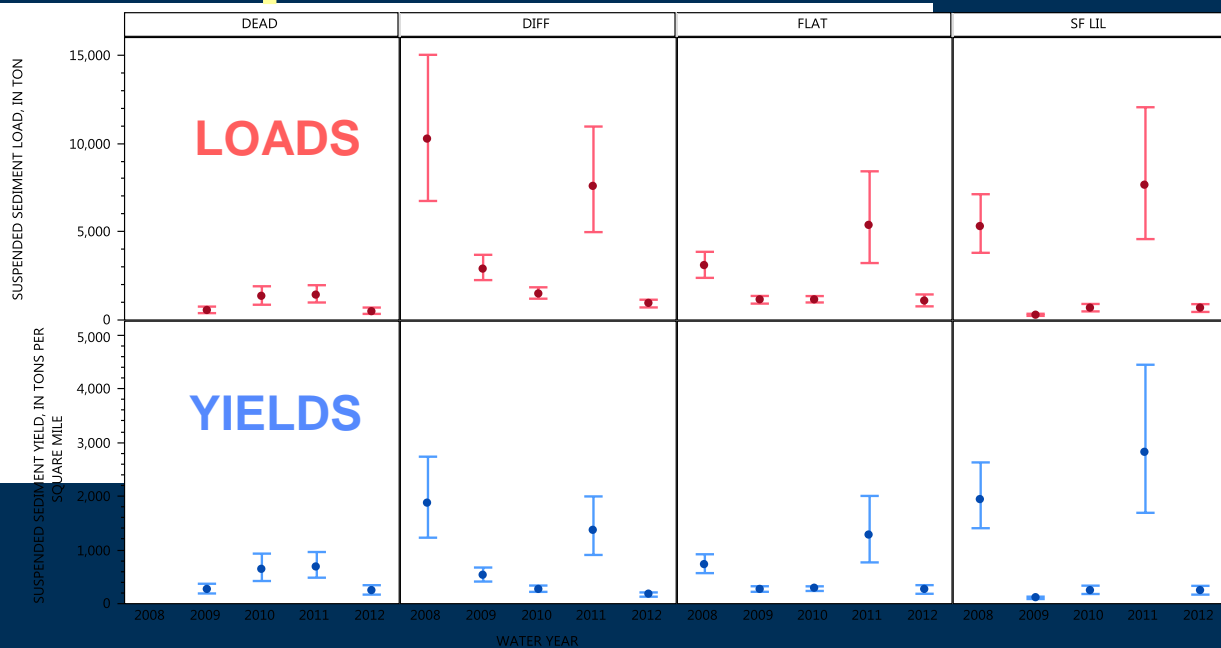


● Measured ○ Estimated ■ Non-detect

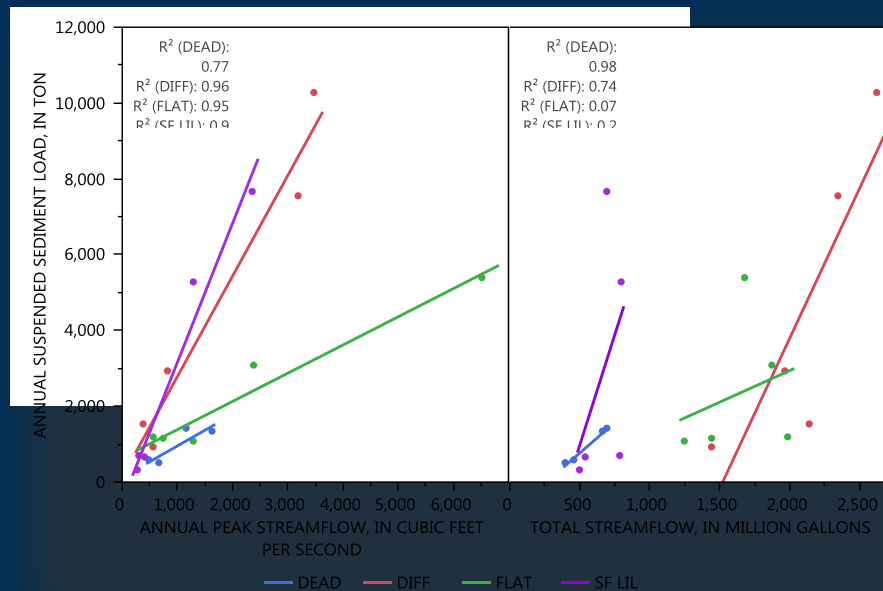
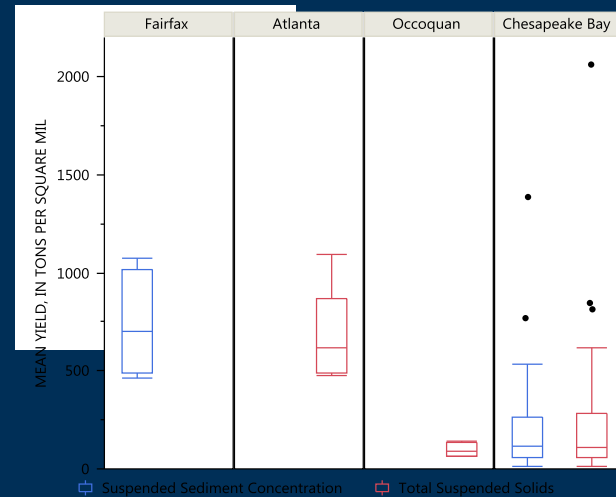
Spatial Patterns in Phosphorus



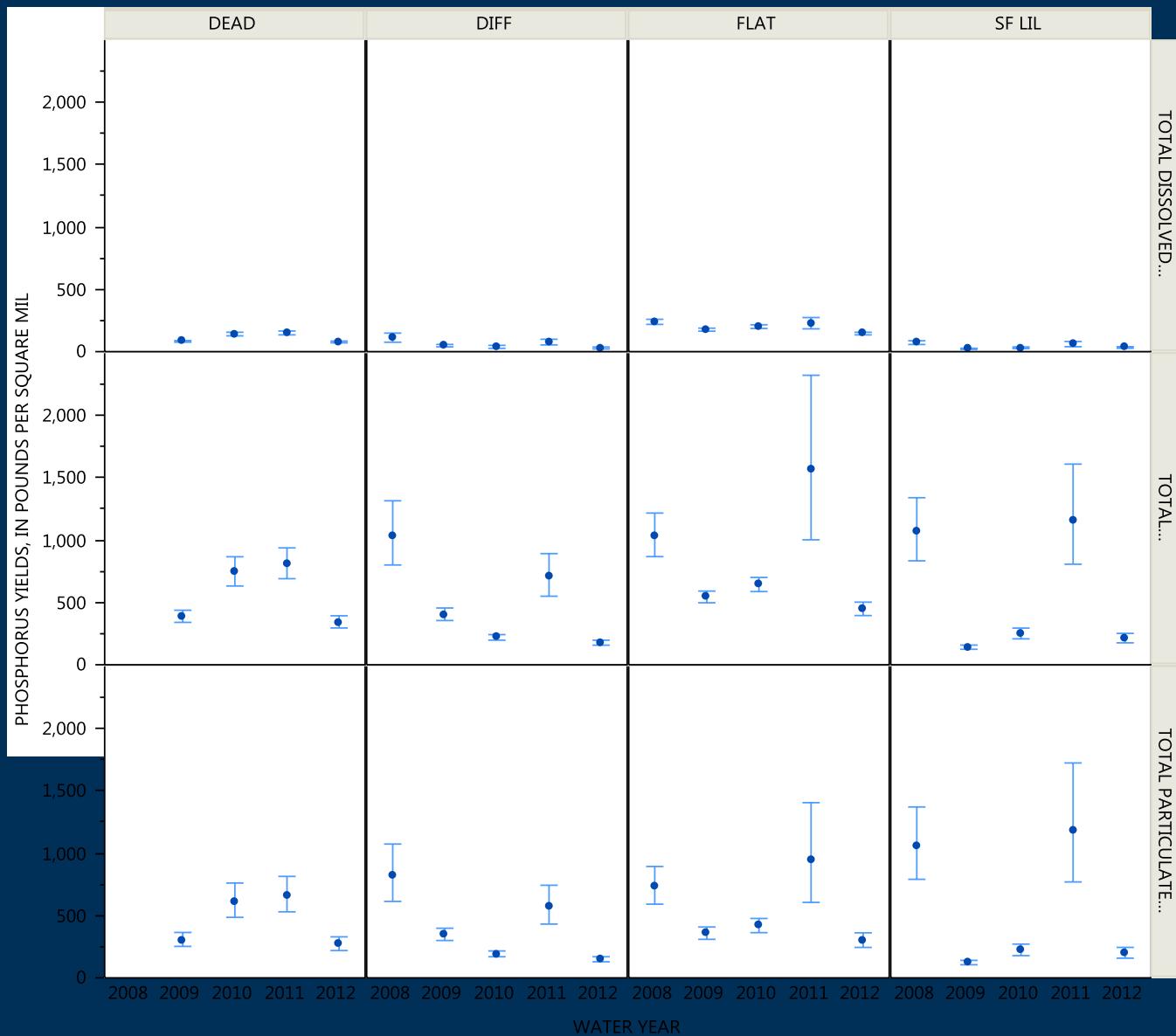
Suspended Sediment Loads & Yields



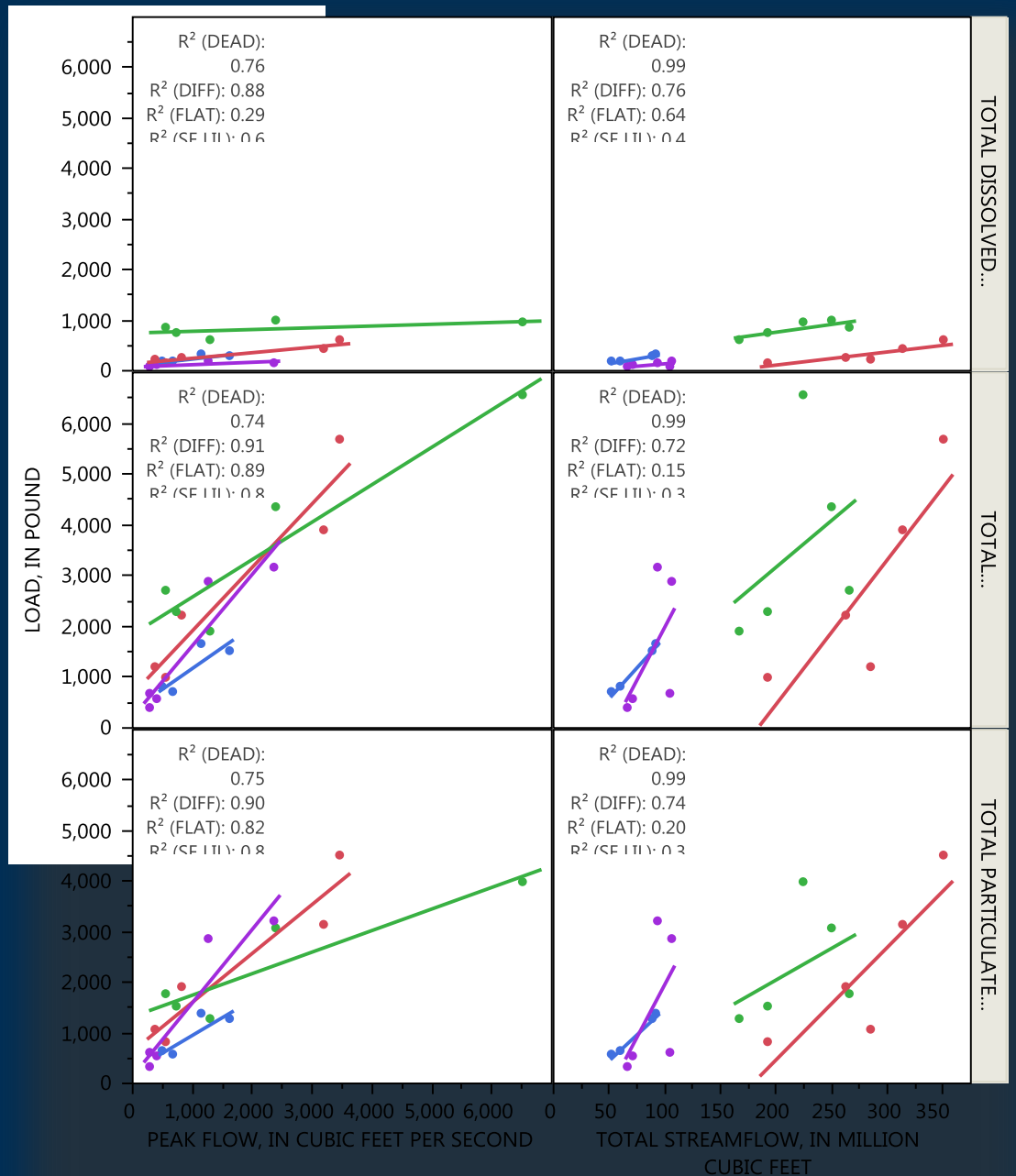
I 95% Confidence Interval
 • Load
 I 95% Confidence Interval
 • Yield



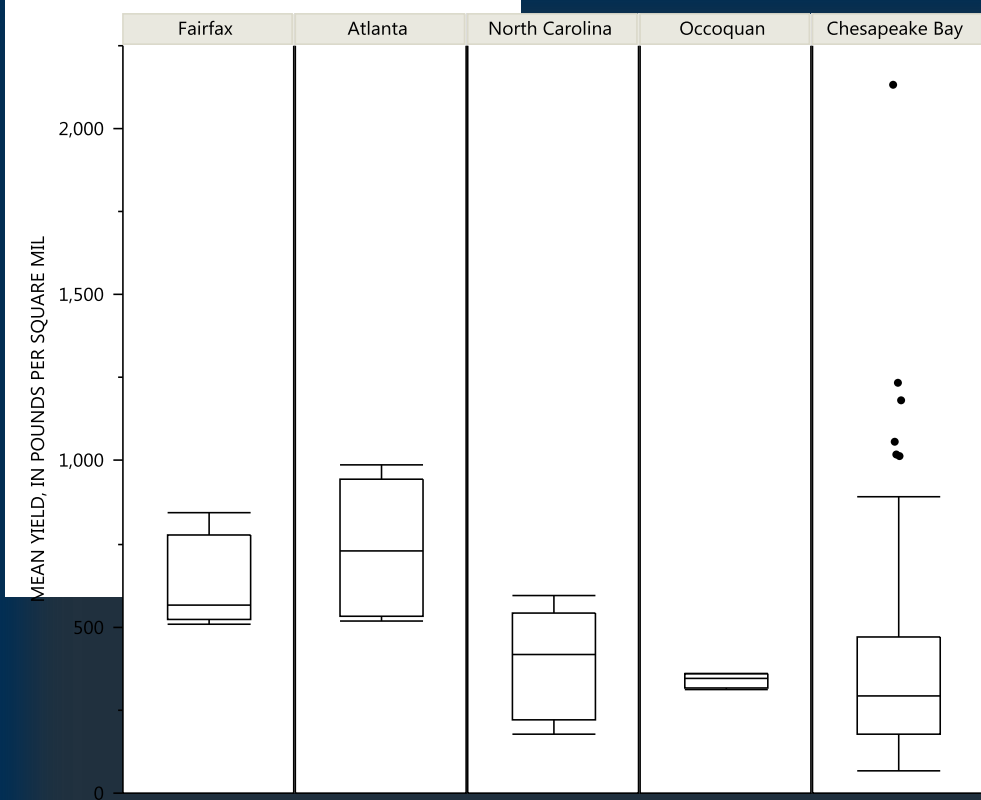
Phosphorus Yields



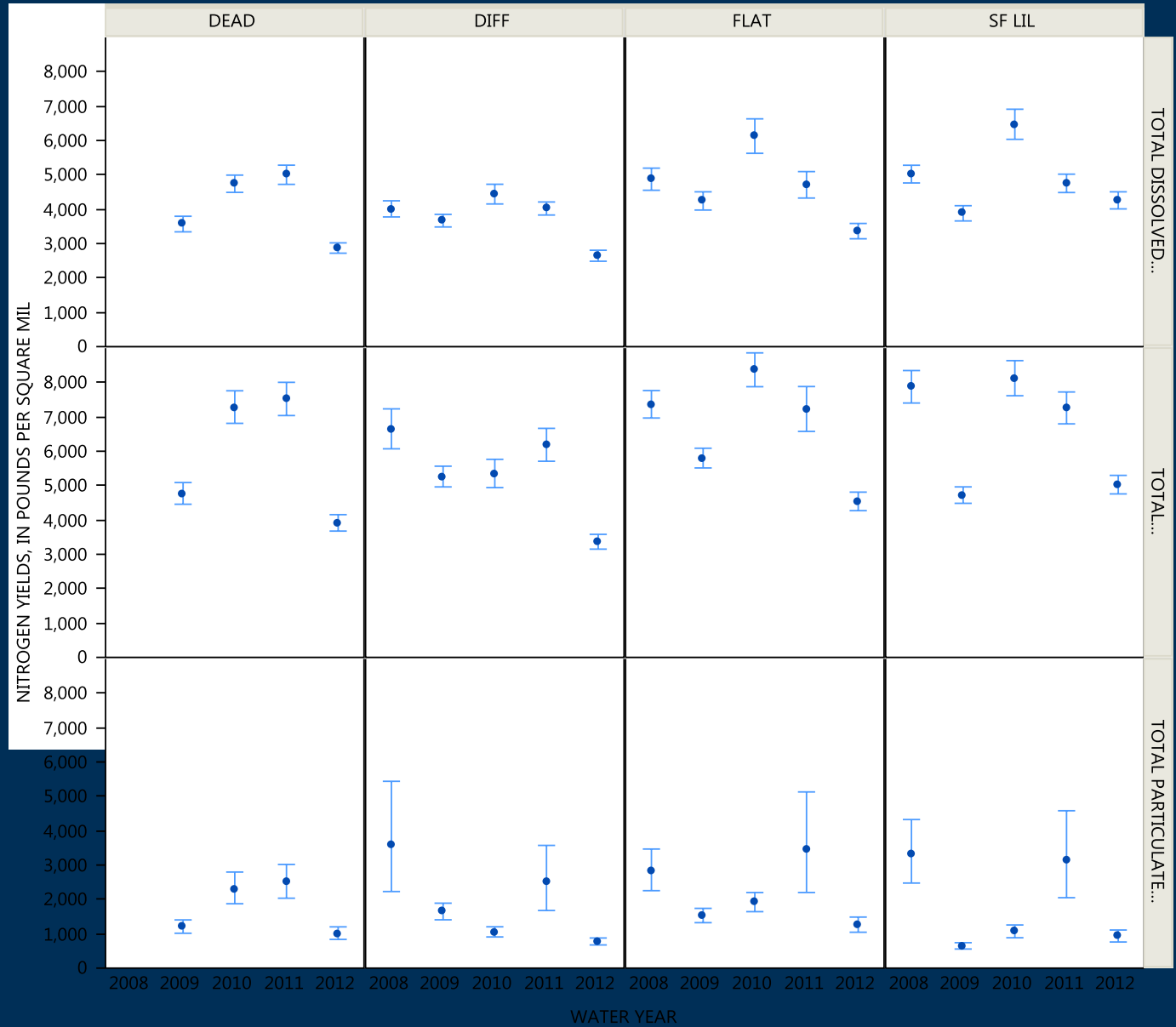
Relations between Streamflow and Phosphorus Loads



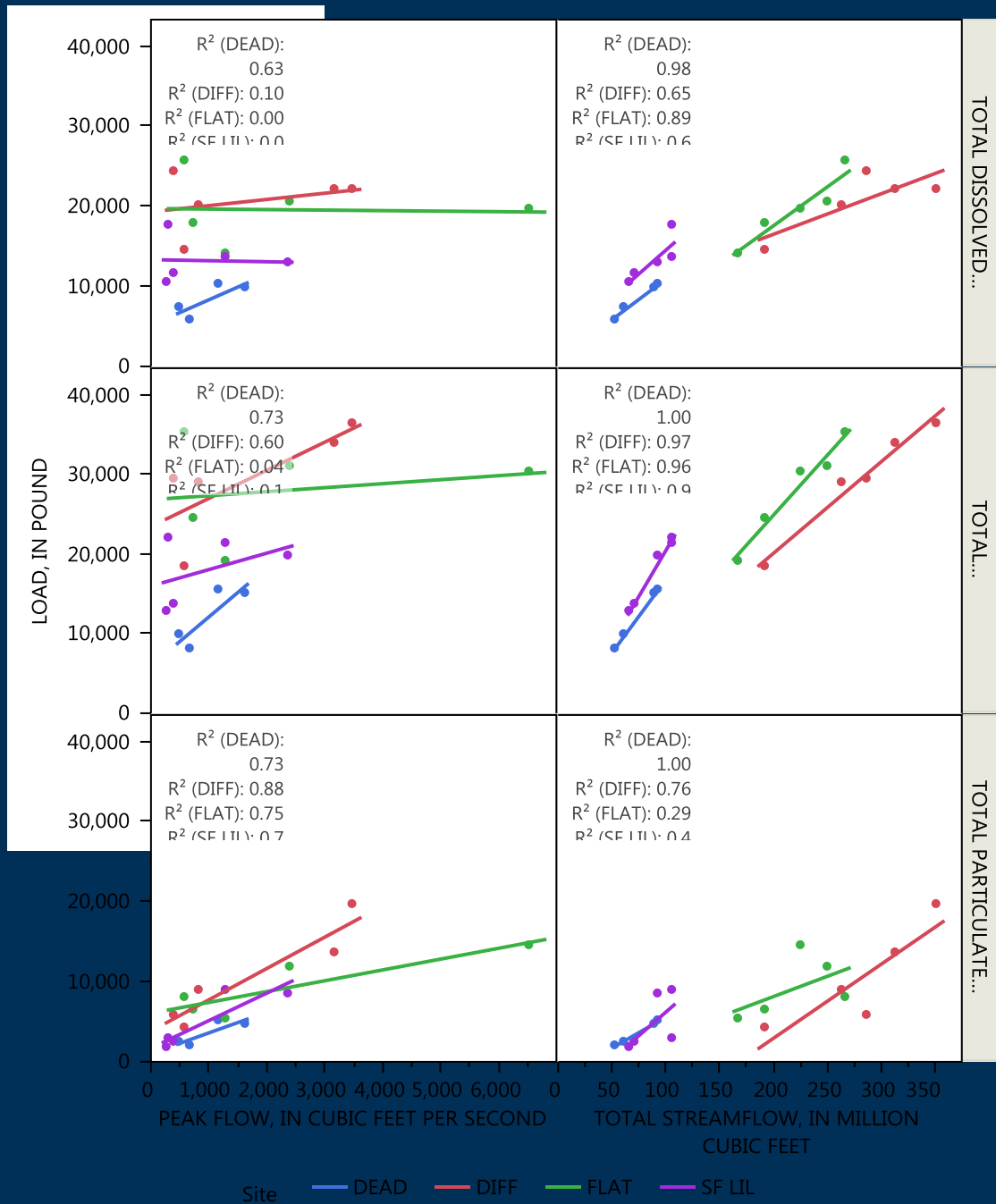
Comparison of TP Yields with Other Networks



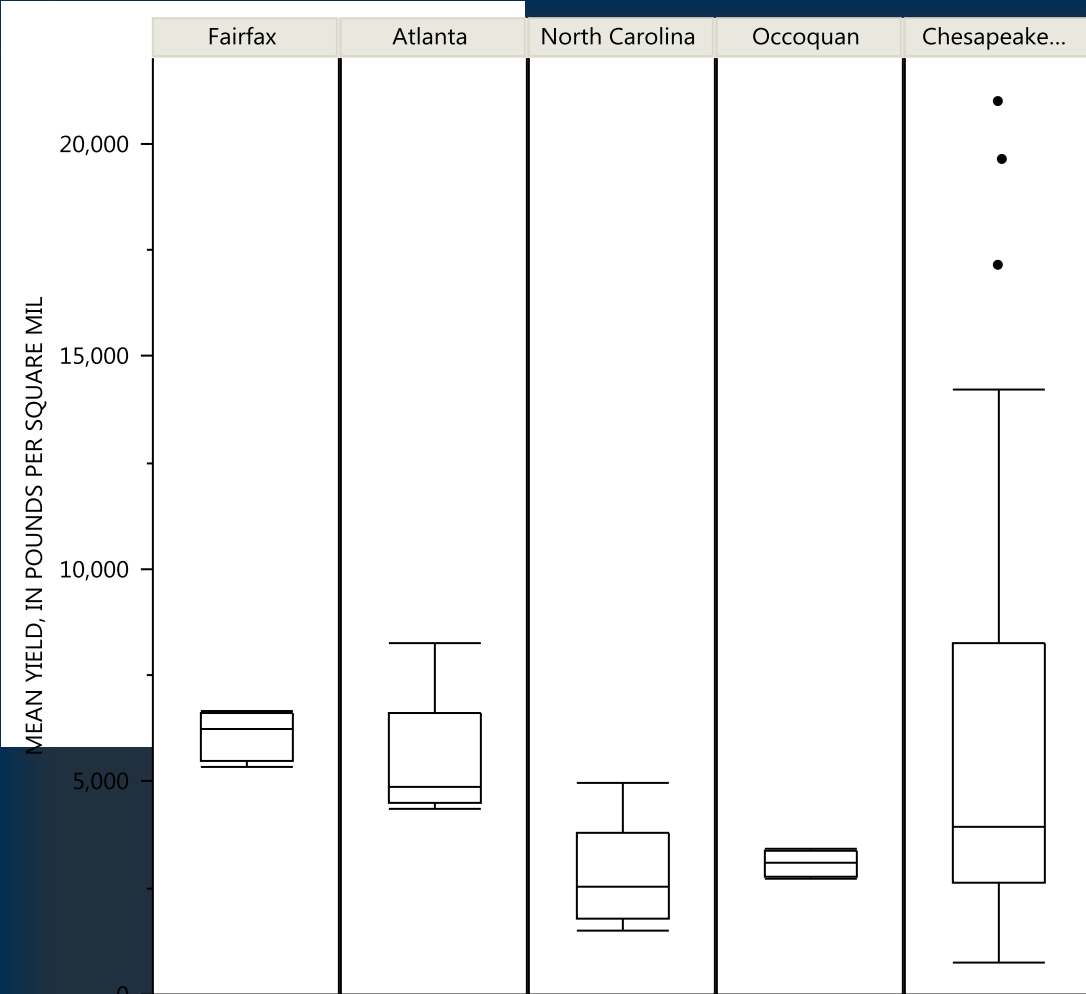
Nitrogen Yields



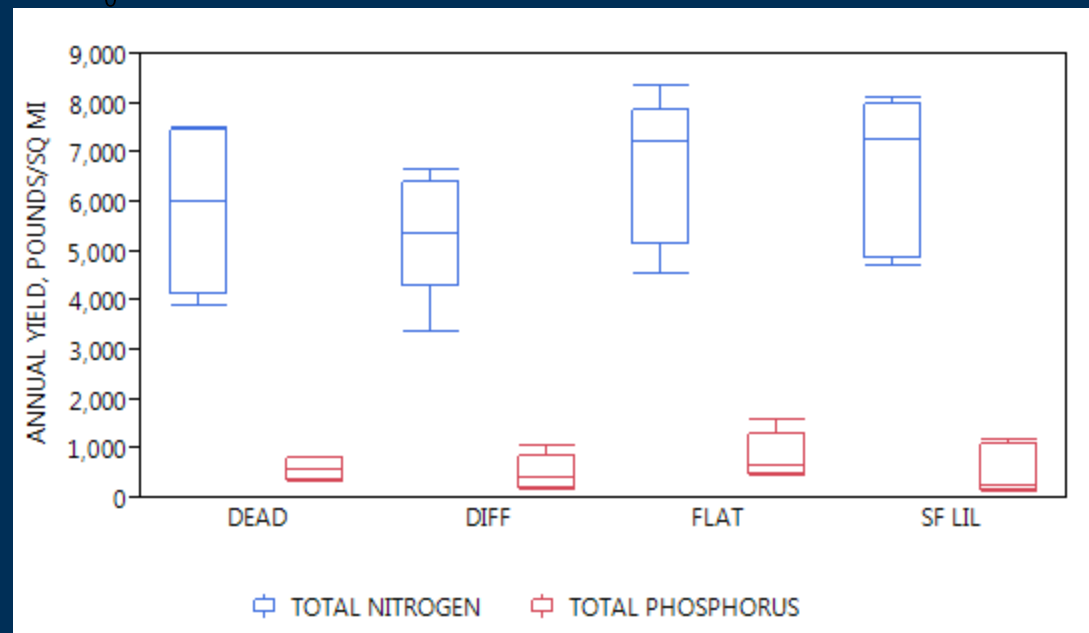
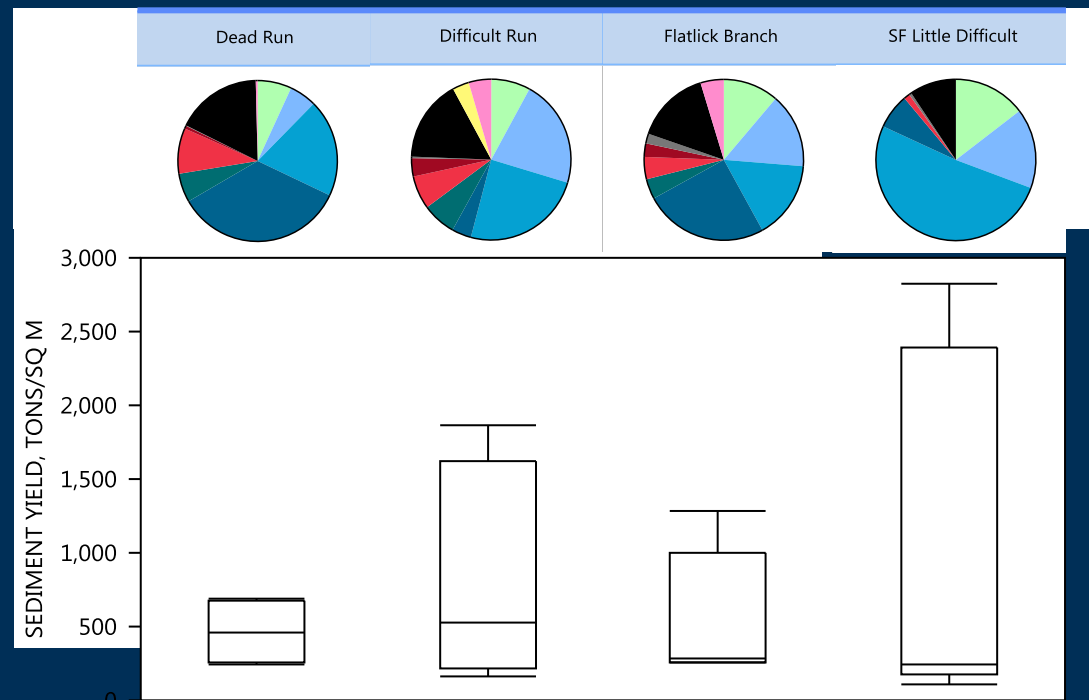
Relations between Streamflow and Nitrogen Loads



Comparison of TN Yields with Other Networks

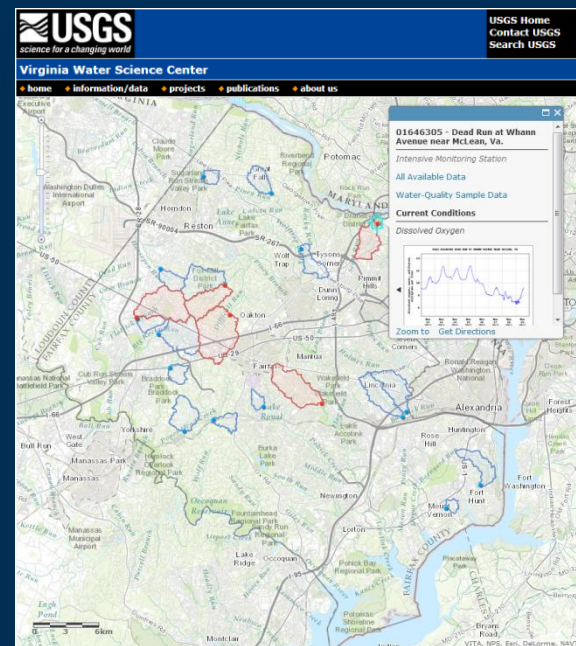


Summary of Yields



Looking forward...

- Report to be released imminently
- Enhanced web tools
 - Realtime sediment and nutrient concentration and load estimates (<http://nrtwq.usgs.gov>)
 - Improved online station map with data access
- Increased BMP Implementation
 - Cooperation with engineering firms
 - Data sharing
 - Minimization of monitoring downtime
- BMP Data Compilation





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