

**Preliminary – Do not distribute or cite**

# A few ideas for explaining water-quality trends

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Integrated Trends Analysis Meeting

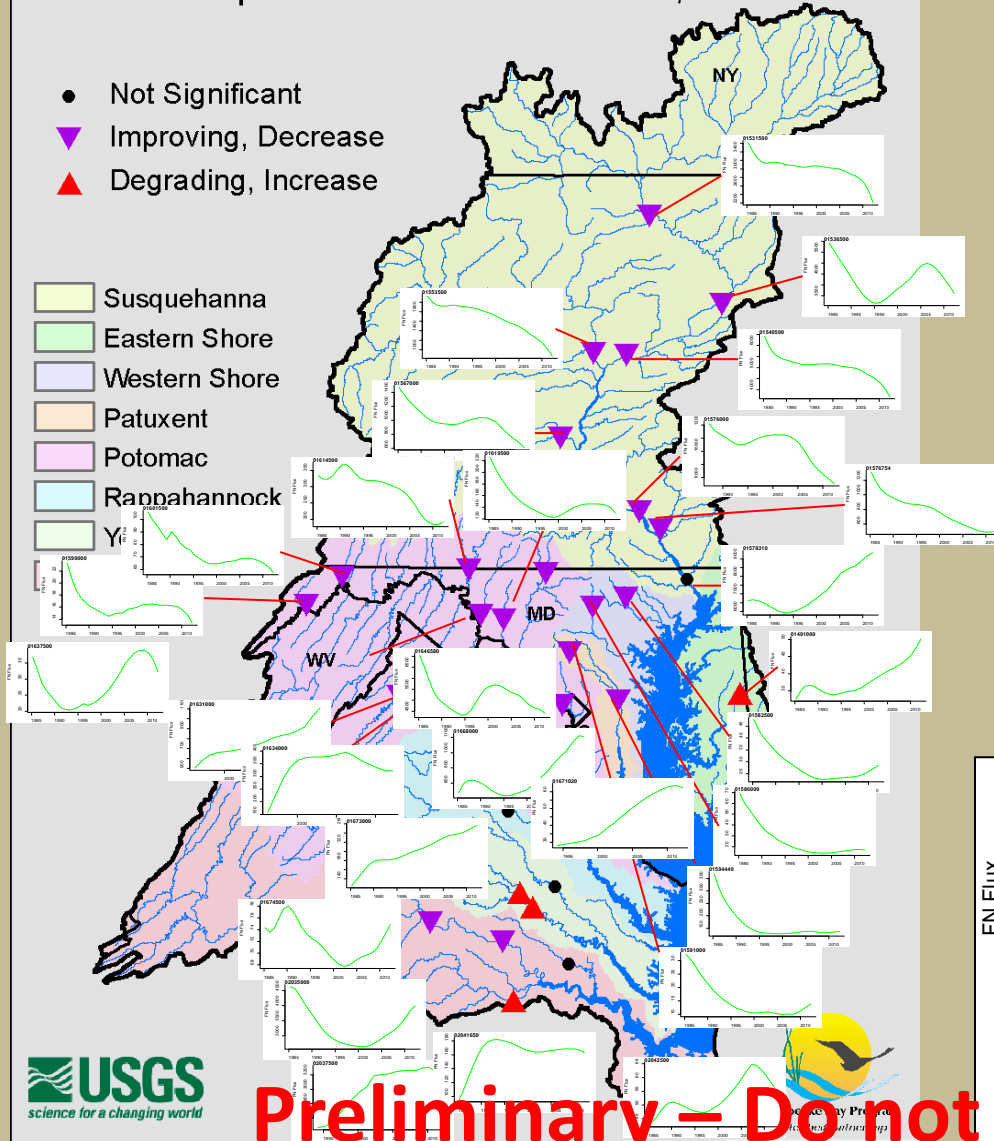
March 17, 2015

# 1. Spatially-referenced downstream routing of “change”.

## Long-Term Trend in Flow-Adjusted Total Phosphorus Concentration, 1985-2012

- Not Significant
- ▼ Improving, Decrease
- ▲ Degrading, Increase

Susquehanna  
Eastern Shore  
Western Shore  
Patuxent  
Potomac  
Rappahannock  
York

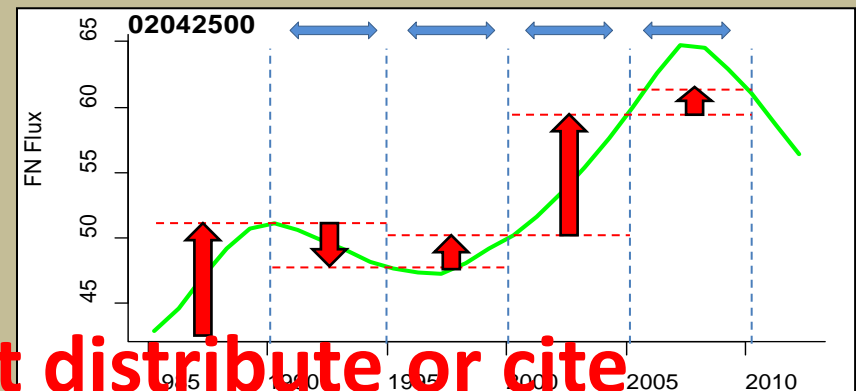


**Question:** “Can spatially-referenced measures of land-use change over time be empirically related to changes in flow-normalized loads over the same period?”

**Approach:** Time-derivative of SPARROW mass-balance equation, with changes in sources, transport terms, and flux quantified in discrete (e.g., 1-year, 5-year) increments.

**Pilot constituent:** Total phosphorus

**Data time series:** NLCD land use, point sources, livestock counts, crop data, fertilizer & manure application, etc.



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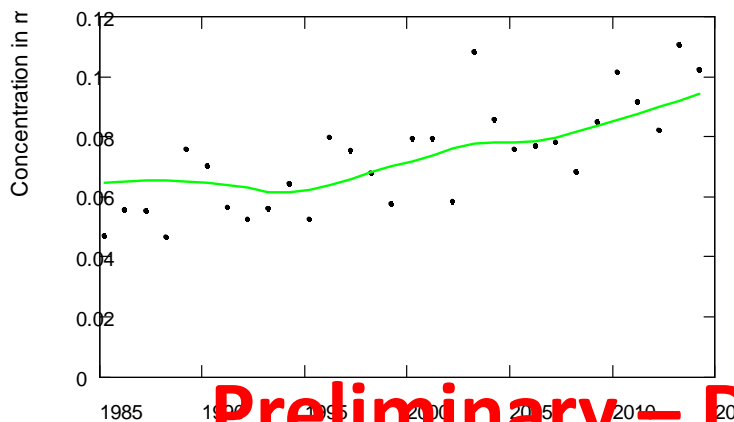
## 2. Interpreting trends in nutrient speciation.

**Question:** “Can patterns in relations between constituents over time hint at land-use/BMP effects that might not be evident from examining individual time series?”

**Approach:** Graphical analysis, coupled with weight-of-evidence association with documented changes in land use / BMP implementation.

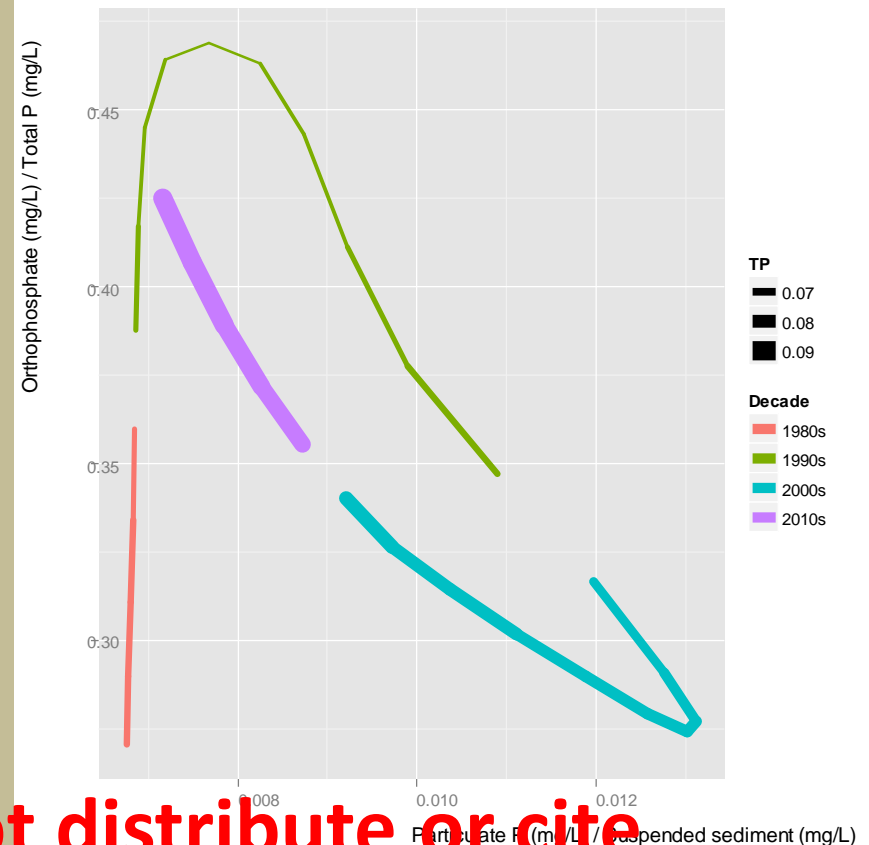
**Pilot constituent:** Total phosphorus

Time series of concentration of total phosphorus, Choptank River, 1985-2012



*Currently exploring collaboration opportunities with Bill Ball's research group, Johns Hopkins DOGEE*

Evolution of phosphorus speciation, Choptank River, 1985-2012



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