Propose Changes to River Calibration Methods

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Interstate Commission on the Potomac Rive Basin

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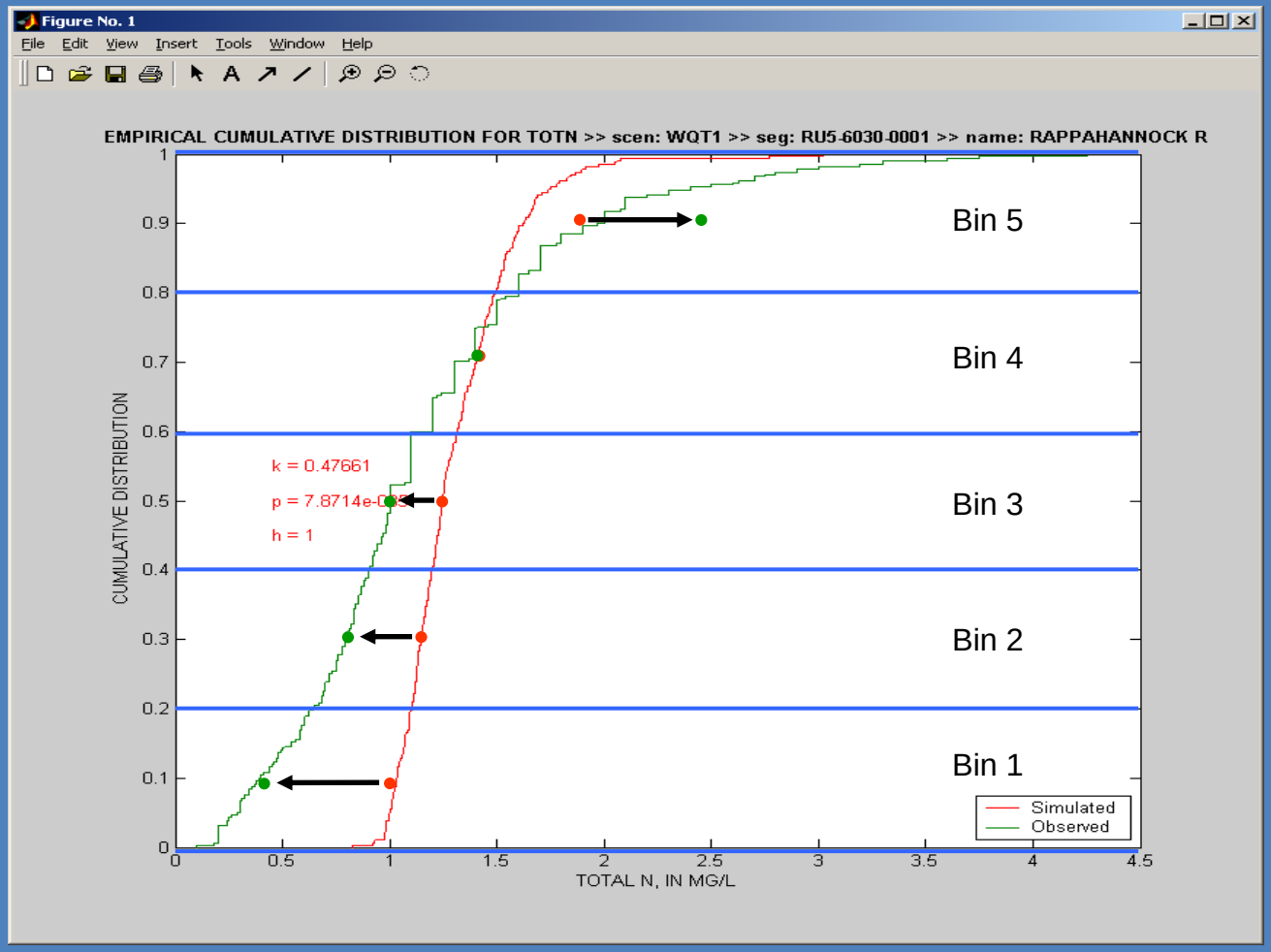
Overivew

- P532 River Calibration Methodology:
  - Goal: Match simulated and observed concentration Cumulative Frequency Distributions (CFDs)
  - Adjust river parameters based on CFD quintiles
  - Regional Factors calculated to match ESTIMATOR loads or concentrations at key stations
- Proposed Phase 6 Methodology
  - Additional Goal: Improve (qualitatively) match in concentration rating curves
  - Adjust river parameters based on flow-sensitive statistics
  - Does not address Regional Factor calculations

Current River Calibration Methodology



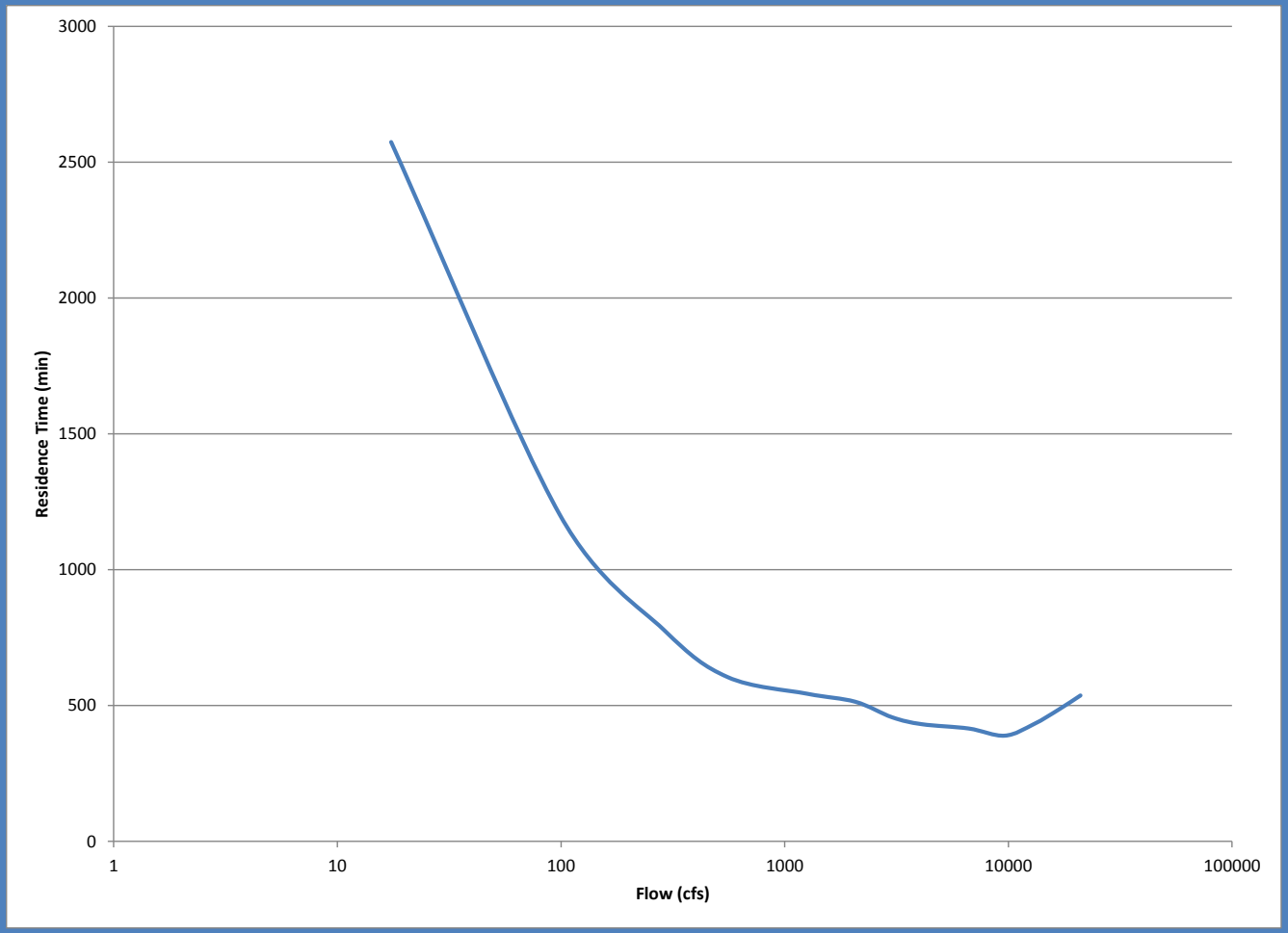
Current River Calibration Methodology

Constituent	Parameter	Description	Quintiles
DO	REAK+	Reparation coefficient	1-5
	BENOD	Benthic oxygen demand (SOD)	1-2
	SUPSAT	Maximum supersaturation concentration	4-5
CHLA	PYSET	Phytoplankton settling rate	1-3
	MAGR	Maximum phytoplankton growth rate	4-5
TN, TP *	REFSET	Organic matter settling rate	3-5
NO3	KNO320	Denitrification rate	1-3
NH4	KTAM20	Nitrification rate	1-5
TN	BPNH4	Sediment ammonia concentration (rivers only)	4-5
TP	BDPO4	Sediment phosphate concentration (rivers only)	4-5
PO4	ADSPO4	Adsorption coefficient for PO4	4-5

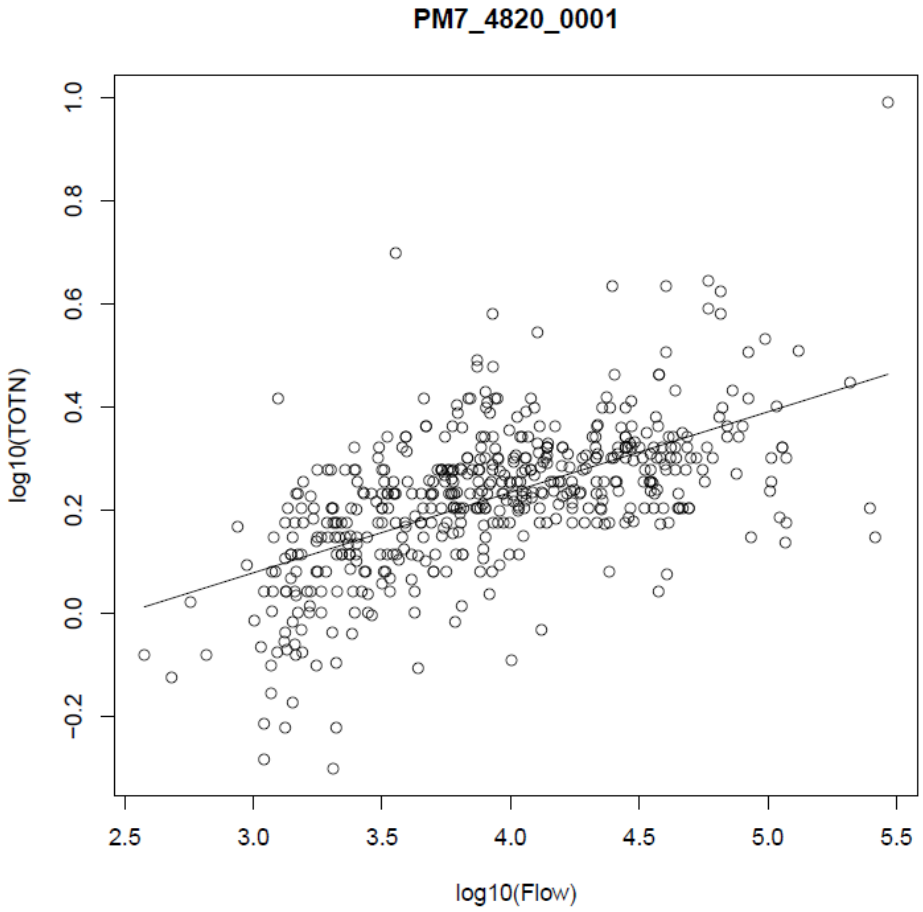
Flow Regime and Parameter Effectiveness

- Baseflow has long residence time than stormflow: first order decay more effective in baseflow
- Stormflow has higher concentrations of particulate material than baseflow: parameters linked to particulate matter more effective in stormflow

Residence Time—Monocacy River at Bridgeport (from FTABLE)



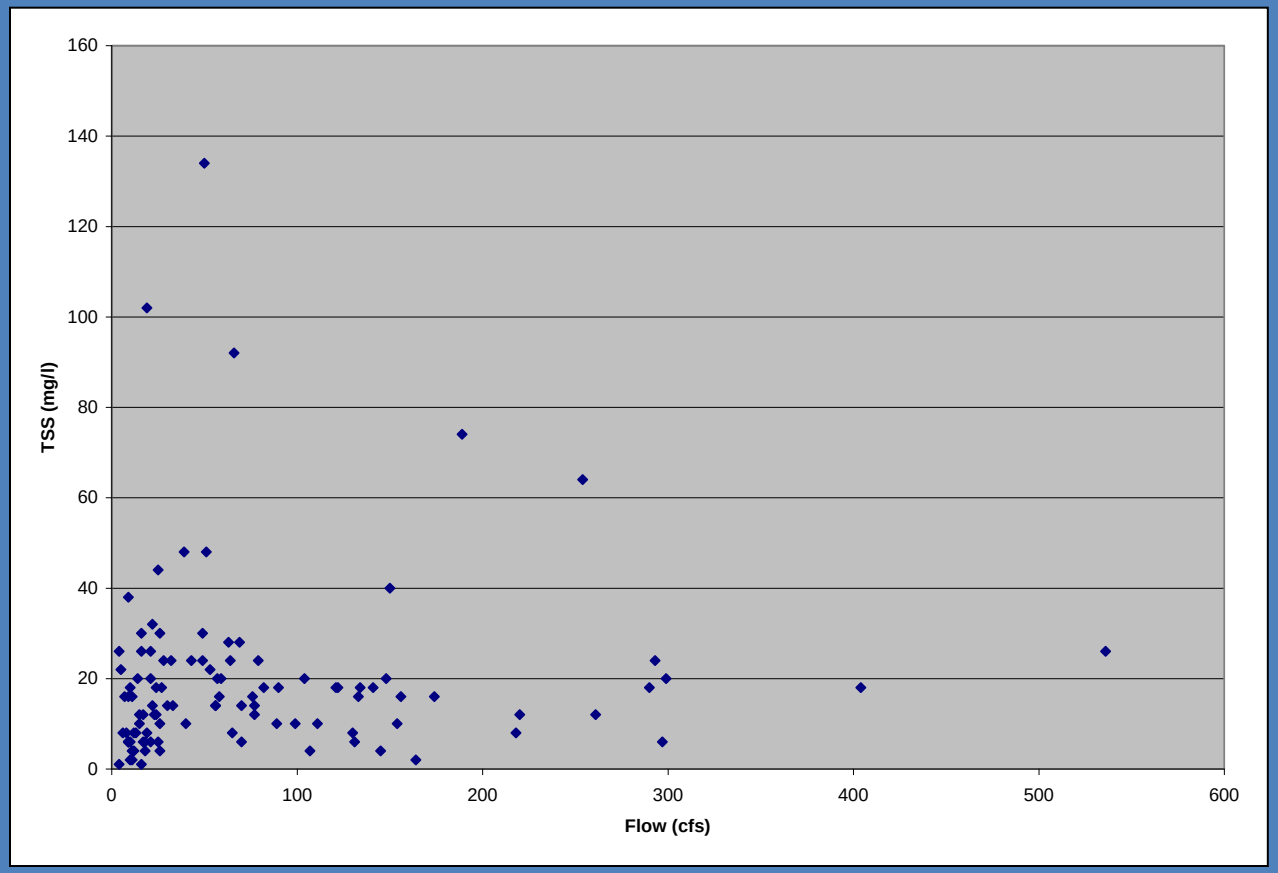
TN (mg/l) Potomac River Chain Bridge



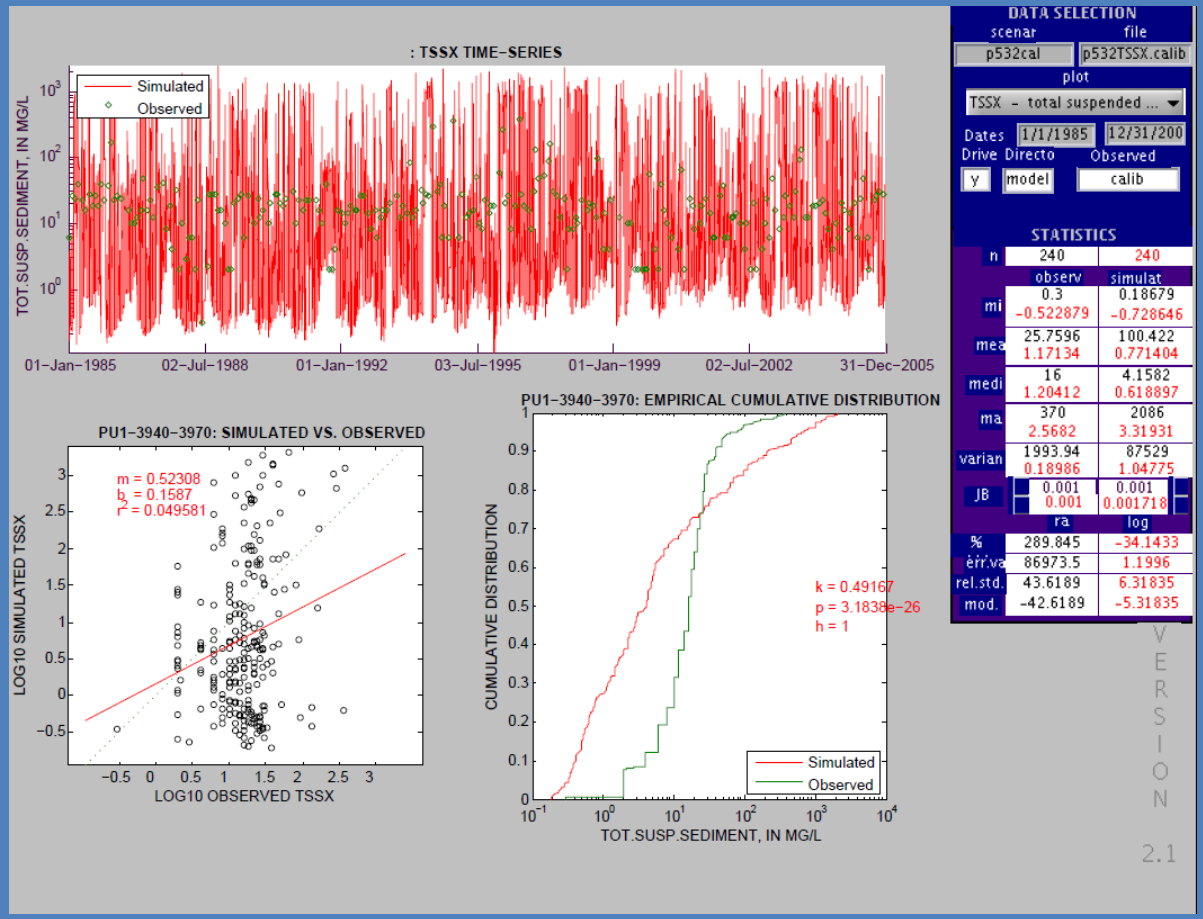
Potential Problems with Current Methods

- Quintiles may not always capture where parameters are most effective
- Even if there is agreement in CFD, if there is not agreement in flow-concentration relation, then loads may be overestimated/underestimated

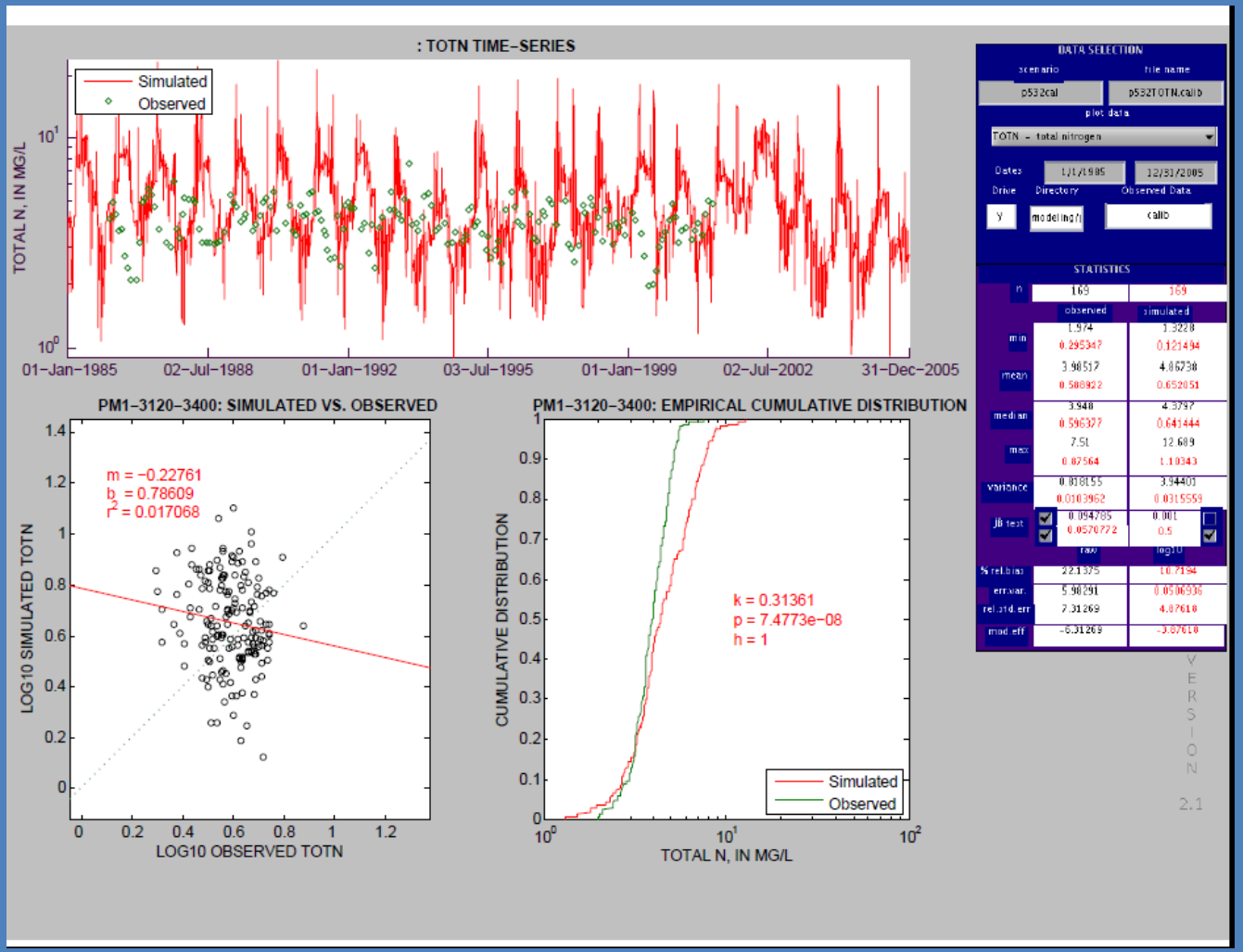
Georges Creek



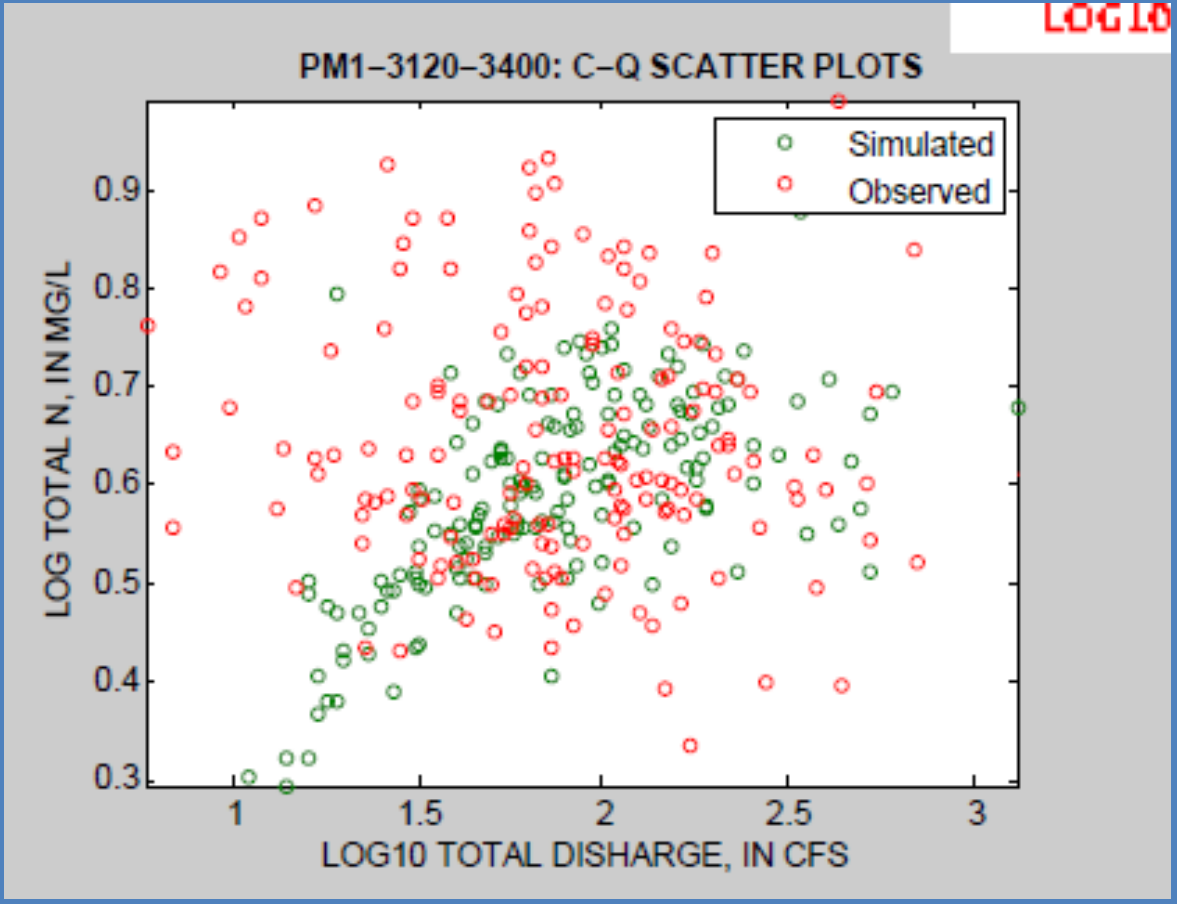
Georges Creek



Big Pipe Creek



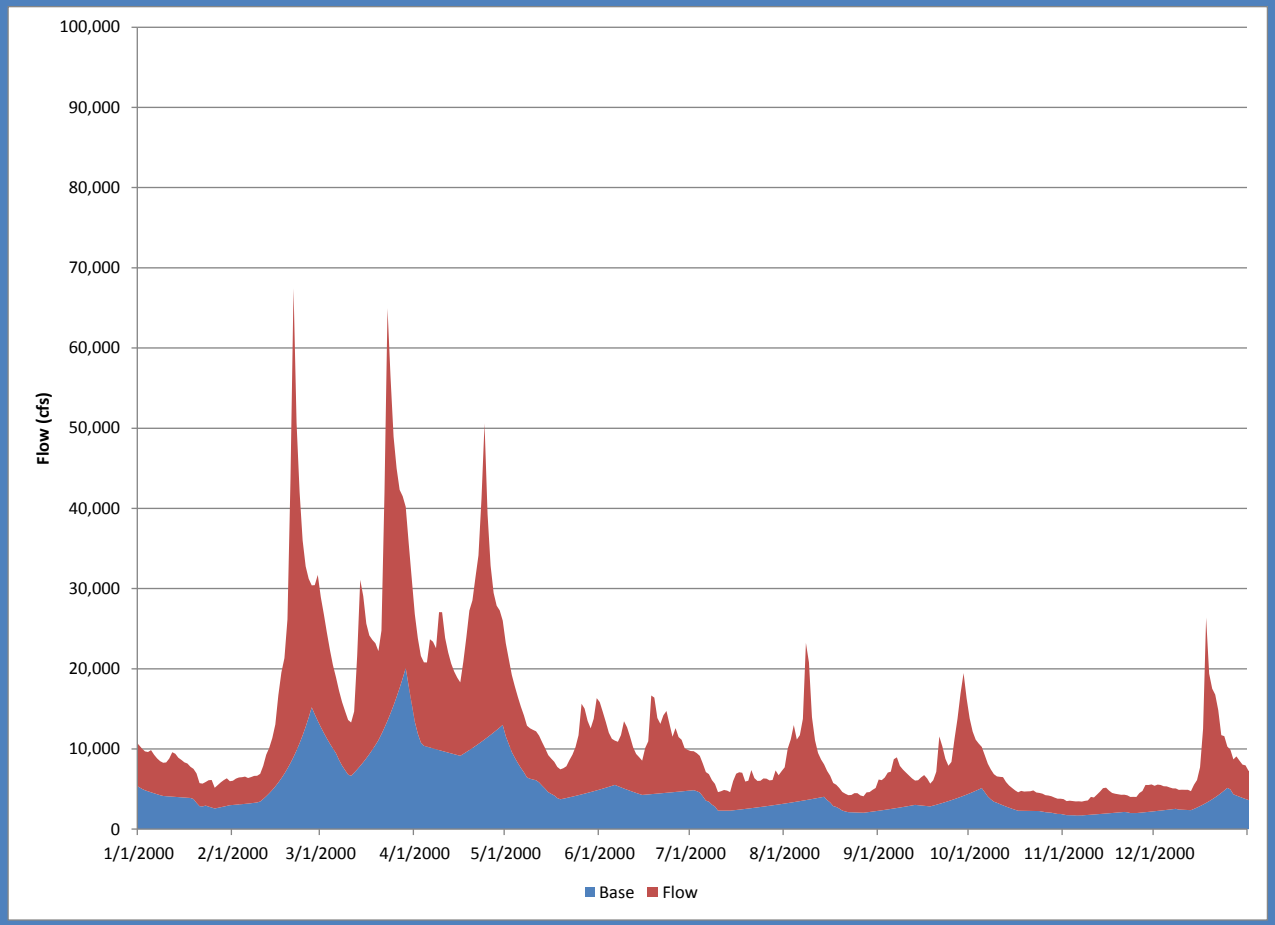
Big Pipe Creek



Proposed Revision in River Calibration Methodology

- Link parameter changes to explicitly bias in flow-based concentration statistics:
  - Concentrations by flow percentile bins
  - Concentrations by fraction stormflow/baseflow (as determined by PART)
- Benefits:
  - Better alignment of parameters with calibration data
  - Synchronization of river calibration by flow regime

PART Baseflow/Stormflow Separation Potomac River Chain Bridge



Revised Calibration Method

Constituent	Parameter	Description	Regime
TN, TP *	REFSET	Organic matter settling rate	Storm
NO3	KNO320	Denitrification rate	Base
NH4	KTAM20	Nitrification rate	Base
TN	BPNH4	Sediment ammonia concentration	Storm
TP	BDPO4	Sediment phosphate concentration	Storm
PO4	ADSPO4	Adsorption coefficient for PO4	Storm

Test Implementation Based on PART

Average baseflow and stormflow concentration: concentrations weighted by percent stormflow or percent baseflow (for example, for baseflow)

$$\frac{\sum_{i=1}^{n} c_i * \frac{b_i}{(b_i + q_i)}}{\sum_{i=1}^{n} \frac{b_i}{(b_i + q_i)}}$$

where

- c_i : ith (observed or simulated) concentration
- b_i: baseflow on day of ith concentration
- q_i: stormflow on day of ith concentration
- n: number of observations

Additional Comments

- Expect only modest improvements (mostly where calibration data doesn't fit quintile model)
- Can still use CFD as a independent measure of quality of calibration (like efficiency)
  - consistent with STAC recommendations

Current Status and Next Steps

- Current Status:
  - Code operational on ICPRB computer
  - Installing operation version at CPBO
  - Baseflow parameter adjustment method implemented with PART statistics
- Next Steps:
  - Test current version
  - Explore alternative statistics for parameter adjustment

Contact Information

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