

Phase 5.3 Calibration

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Calibration Method

- Calibration method largely unchanged for several years
 - P5.1 – 8/2008 - first automated calibration
 - P5.2 – 6/2009 - better constraints on parameters and regional factors
 - P5.3 – 2/2010 - few small changes in reaction to new scenario builder data
- Reviews
 - WQSC
 - Modeling Subcommittee
 - STAC review

Watershed Model Inputs

- Phase 5.1
 - No Scenario Builder
- Phase 5.2
 - Half-Built Scenario Builder with known issues
- Phase 5.3
 - Final TMDL Scenario Builder

Fixed Issues with Scenario Builder for phase 5.3

- Realistic uptake values
- Realistic nutrient applications
- Low variability between states for uptake and application
- Manure spread logic improved
- Scenarios now possible within Scenario Builder

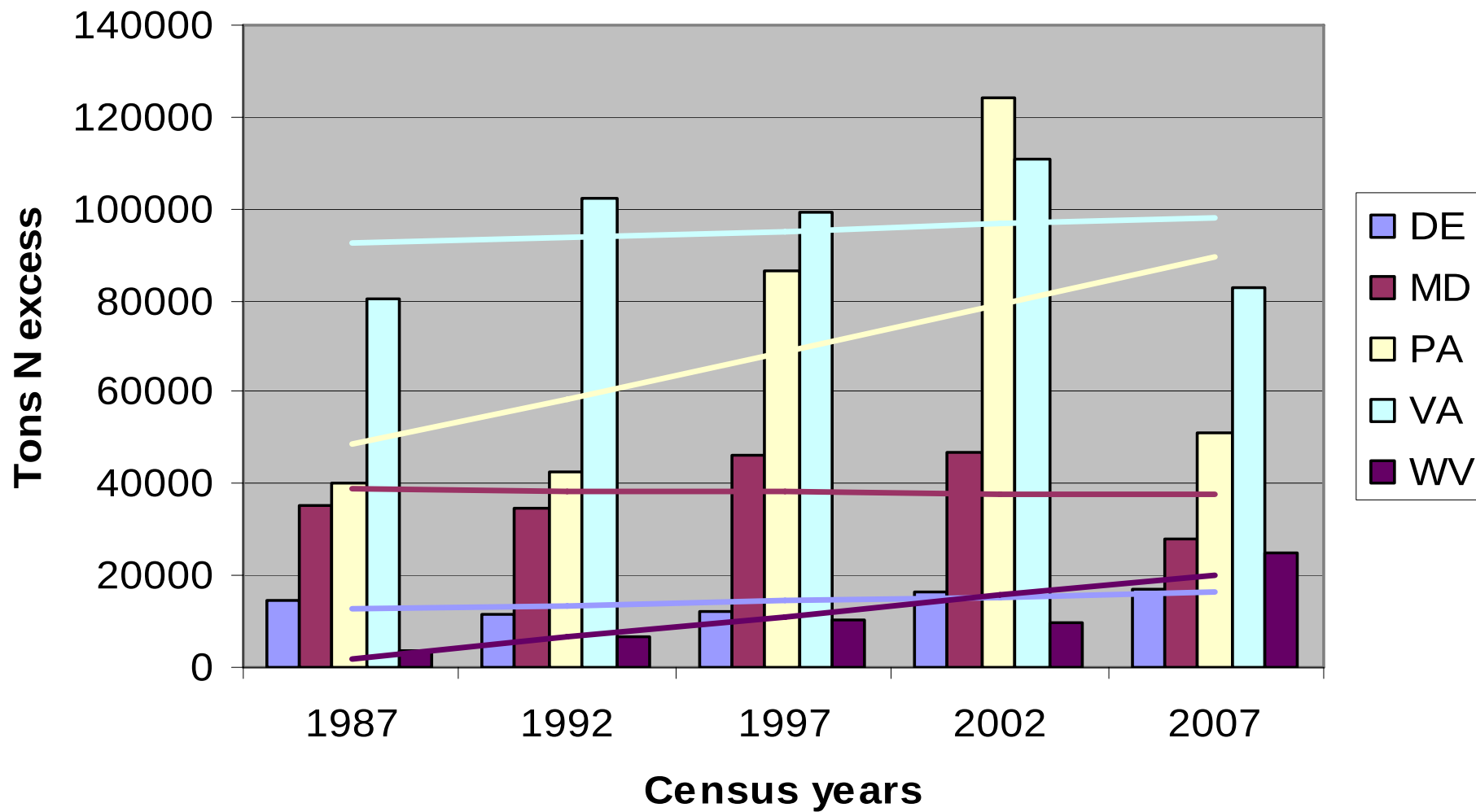
Scenario Builder Nutrient Allocation

- Land with and without NM plans have manure applied up to NM recommendations if manure is available.
- If there is remaining manure
 - First eligible manure is transported out of county.
 - Second it is applied to non-NM land in a sequence
 - Non-NM pasture
 - Degraded stream corridors
 - Hay receiving nutrients
 - Non-NM row crops
- Any land not receiving necessary nutrients up to NM plan rate are supplied fertilizer.
 - Non-NM land does not receive fertilizer in excess of NM plan rates (\$\$).
 - State supplied data for Non-NM nutrient rates were so variable among the 100+ crops, the model couldn't calibrate with them.
- Summary: County level nutrient application rates are the same for NM and non-NM lands if no excess manure.

Decision Making Process

- Nutrient Management source data came from the *states'* NM recommendations.
- Recommendations were discussed at Joint WTWG and AgNSRWG meetings held 12/11/2008 and 4/8/2009
- Minutes available:
http://www.chesapeakebay.net/committee_tribstratworkgroup_meetings.aspx?menuitem=16745

Nitrogen excess from Ag census years per state



Attainment of NM goals

- General increase in excess N from 1987 to 2002. Some decrease 2002-2007.
- The rate of increase is slowing, but other BMPs should be considered.
 - Enhanced Nutrient Management and Decision Ag promote more efficient nutrient use.

Other P5.3 changes

- Land Use –
 - Better characterization of ag land location
 - Better trend in urban land
- Point Source
 - Addition of “non-significant” sources
- Septic
 - Tied to land use modeling

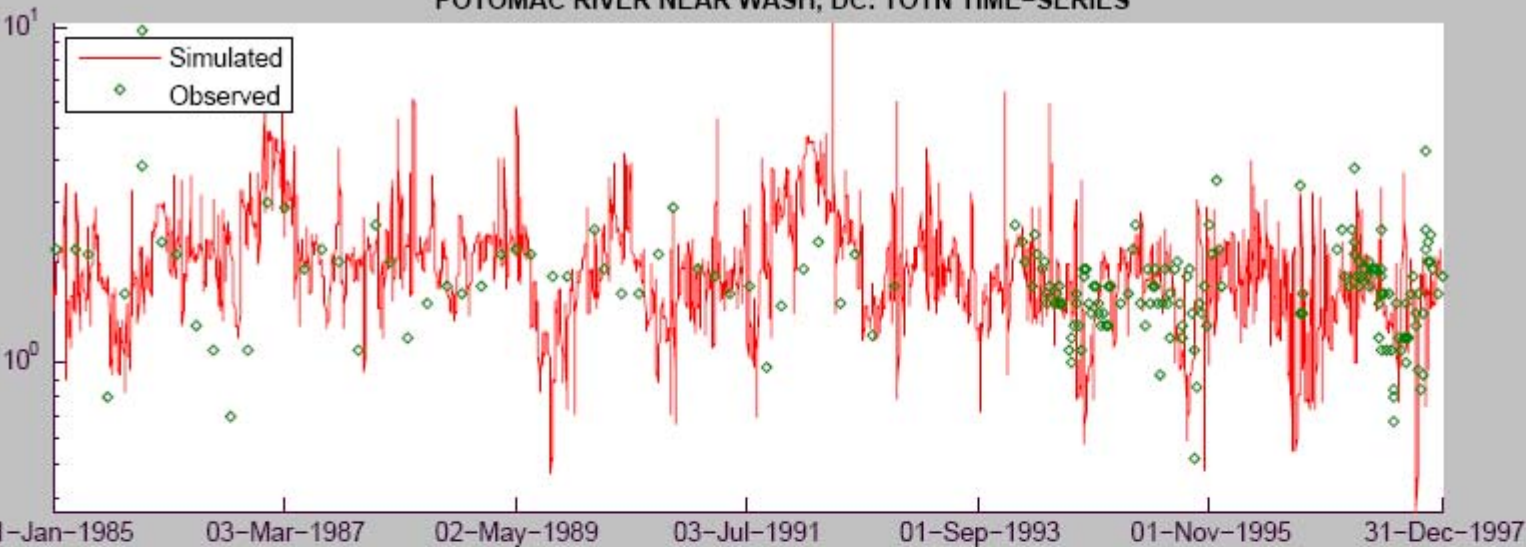
River Calibration Criteria

- CFD only
- Estimator Loads for Regional Factors
- STAC thought this was good calibration strategy but not a representative way to present the results
- Recommended that results communicated in the outputs of interest (loads)

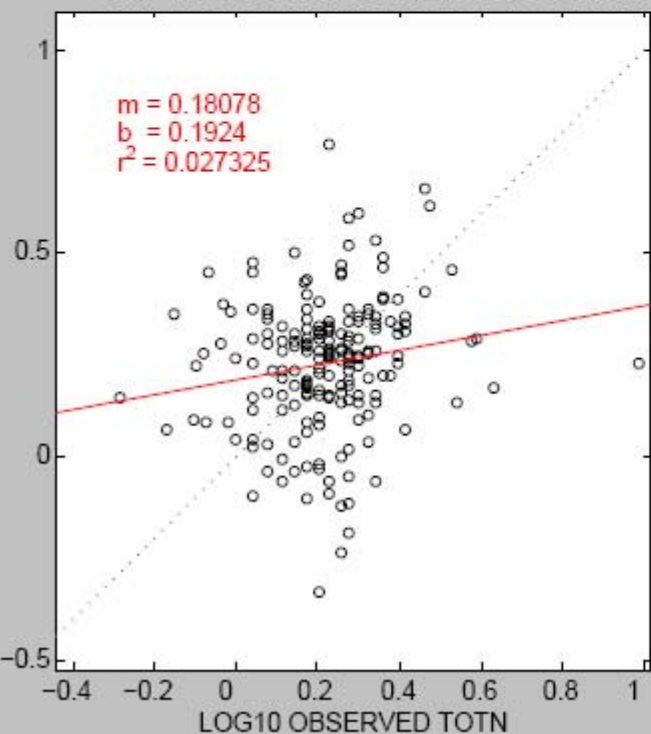
Comparisons

- Statistics
 - Phase 5 and Estimator
 - Total Loads over space
 - Loads at a point over time
 - **Phase 5 and USGS unbiased Samples**
 - Phase 5 and Validation
- Calibration Plots
 - Phase 4 and Phase 5
 - Phase 5 all station
- **Compare Loads to Previous Models**

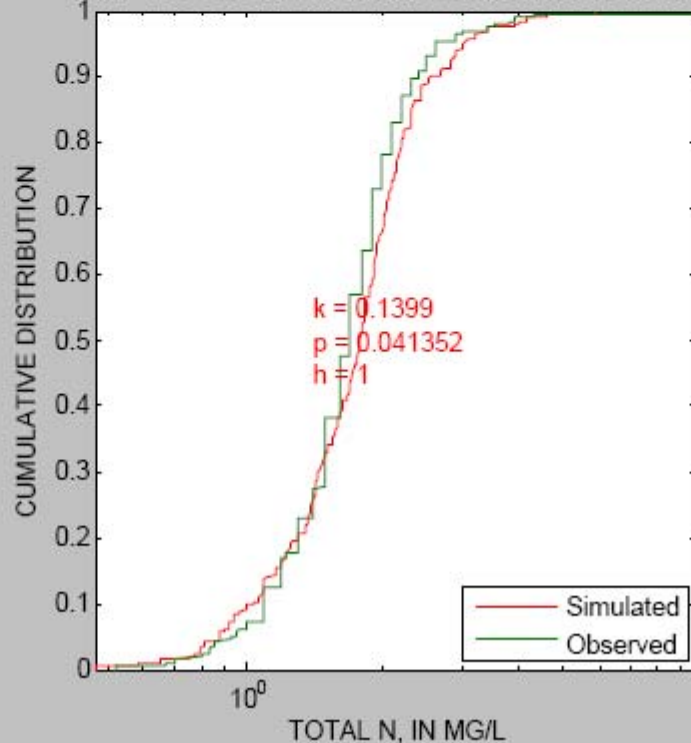
POTOMAC RIVER NEAR WASH, DC: TOTN TIME-SERIES



PM7-4820-0001: SIMULATED VS. OBSERVED

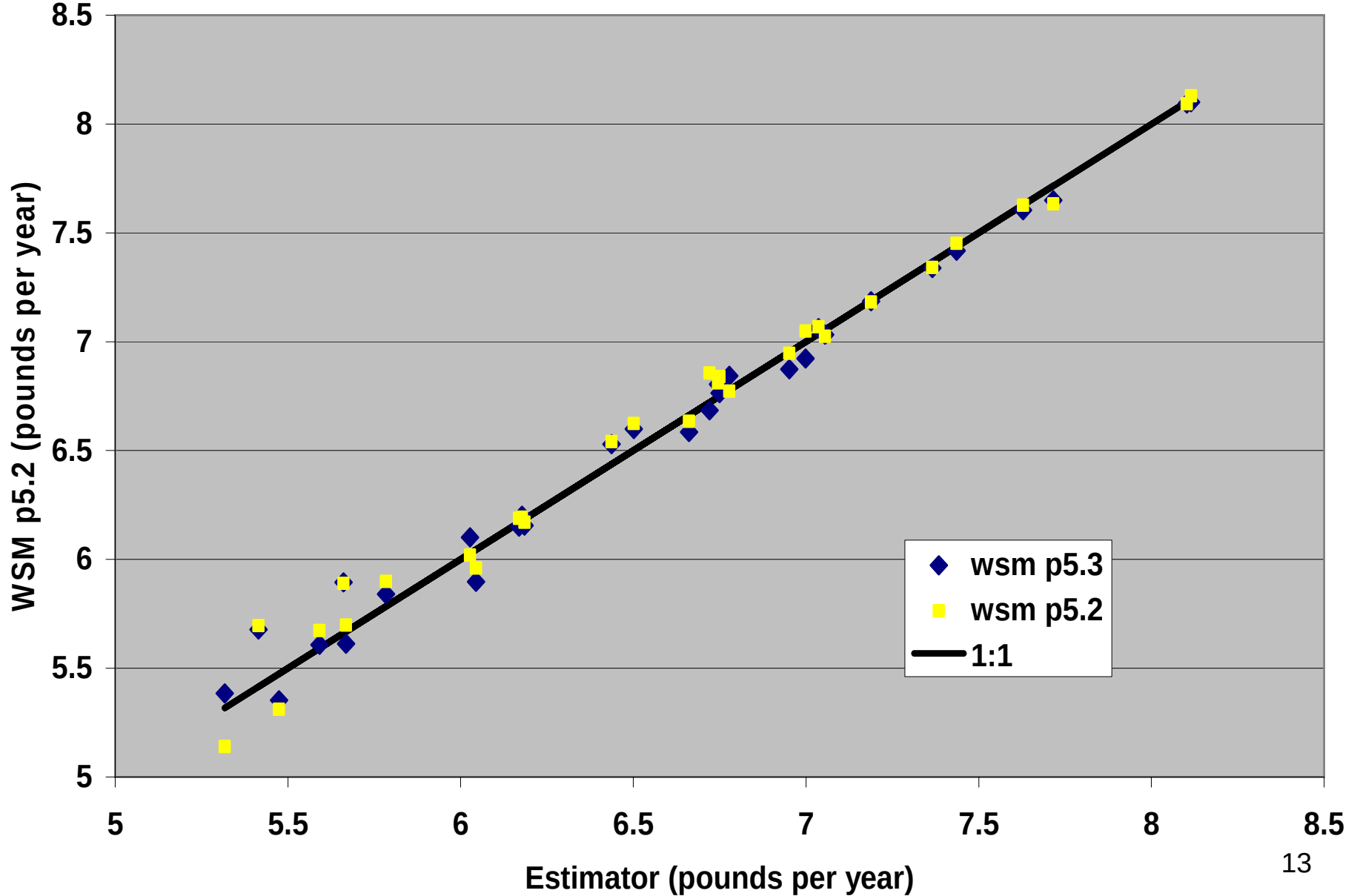


PM7-4820-0001: EMPIRICAL CUMULATIVE DISTRIBUTION

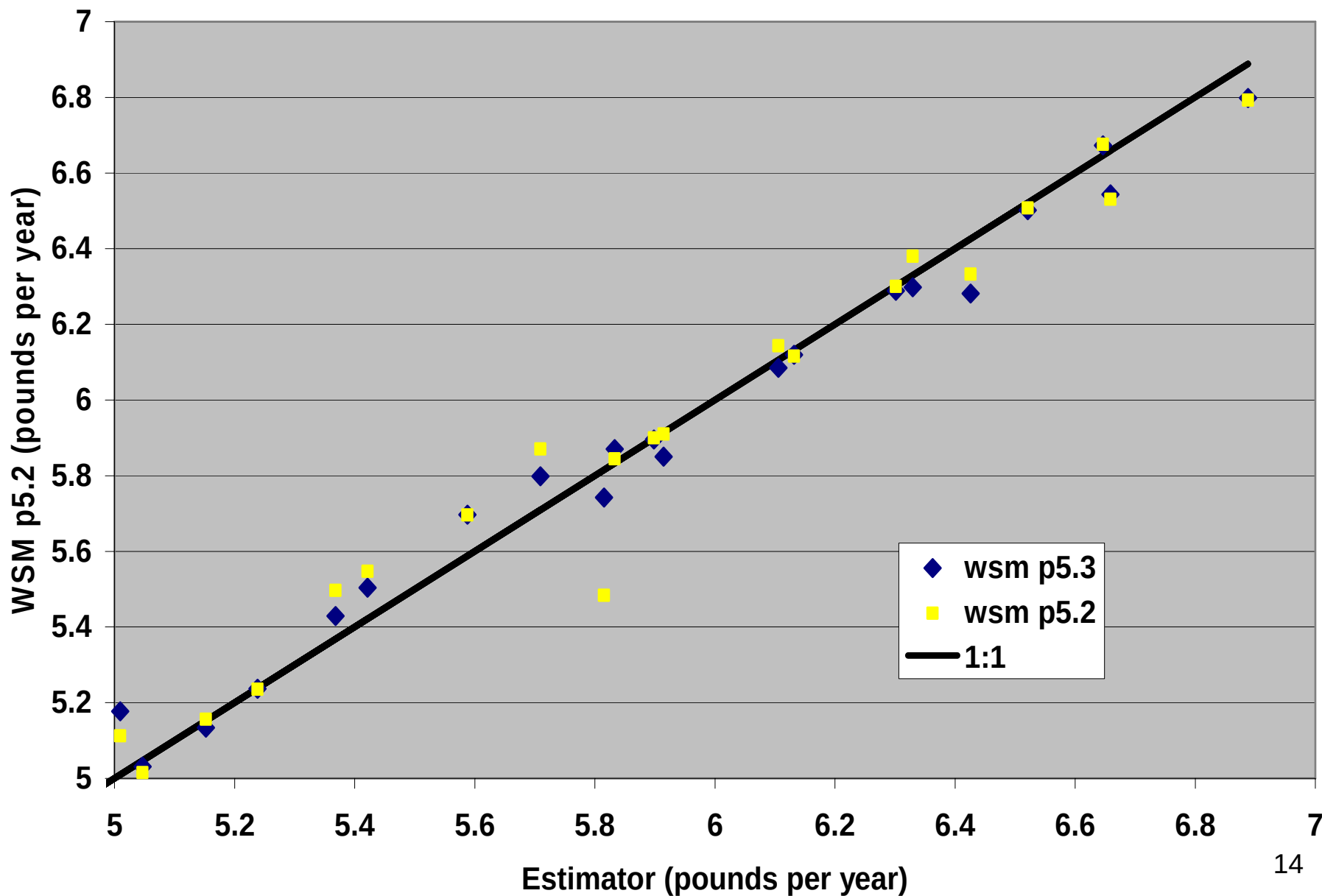


DATA SELECTION			
scenario		file name	
p53cal		phase4.calib	
plot data			
TOTN - total nitrogen			
Dates	1/1/1985	12/31/1997	
Drive	Directory	Observed Data	
y	modeling/	all data	
STATISTICS			
n	193	193	
	observed	simulated	
min	0.52	0.46814	
	-0.203997	-0.32962	
mean	1.77238	1.83009	
	0.220302	0.23223	
median	1.7	1.7861	
	0.230449	0.25190	
max	9.8	5.8862	
	0.991226	0.76993	
variance	0.655283	0.51058	
	0.0224817	0.026889	
JB test	☐ 0.001	☐ 0.001	
	☐ 0.001	☐ 0.0161752	
	PM	log10	
% rel. bias	3.25561	5.41472	
em. var.	1.01889	0.041386	
rel. std. err.	1.55408	1.04087	
mod. eff.	-0.554084	-0.04087	

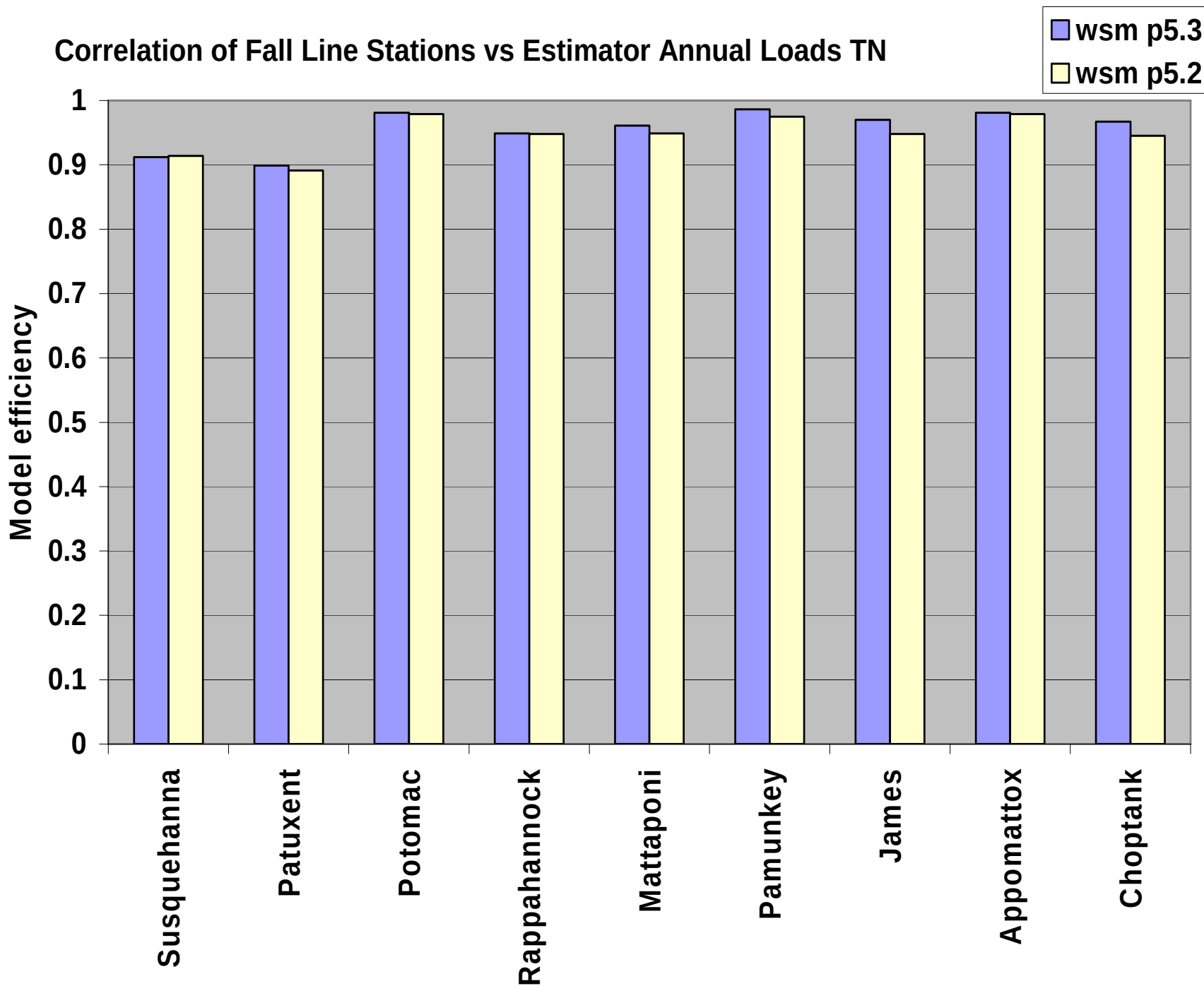
Log of WSM and Estimator TN Loads



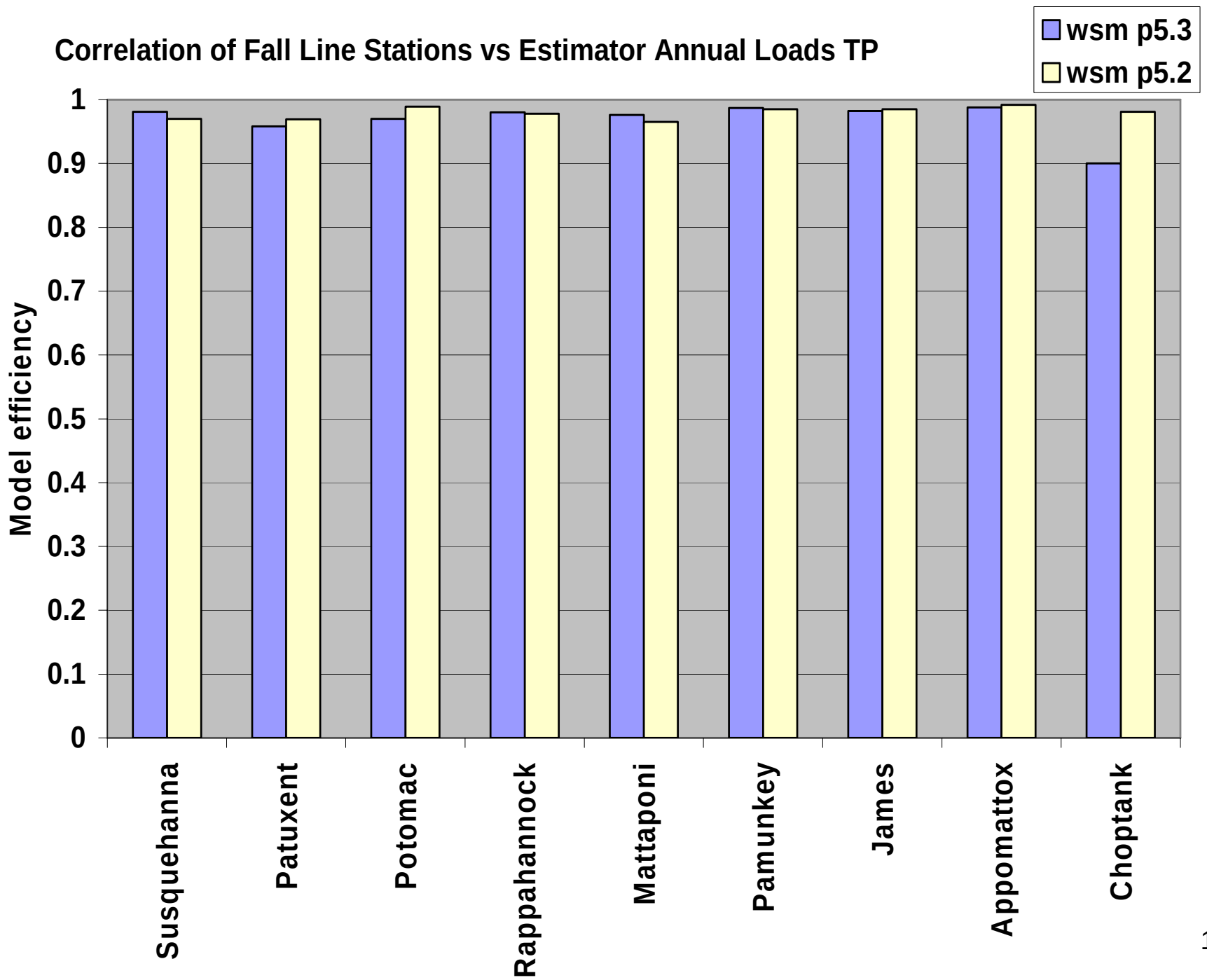
Log of WSM and Estimator TP Loads



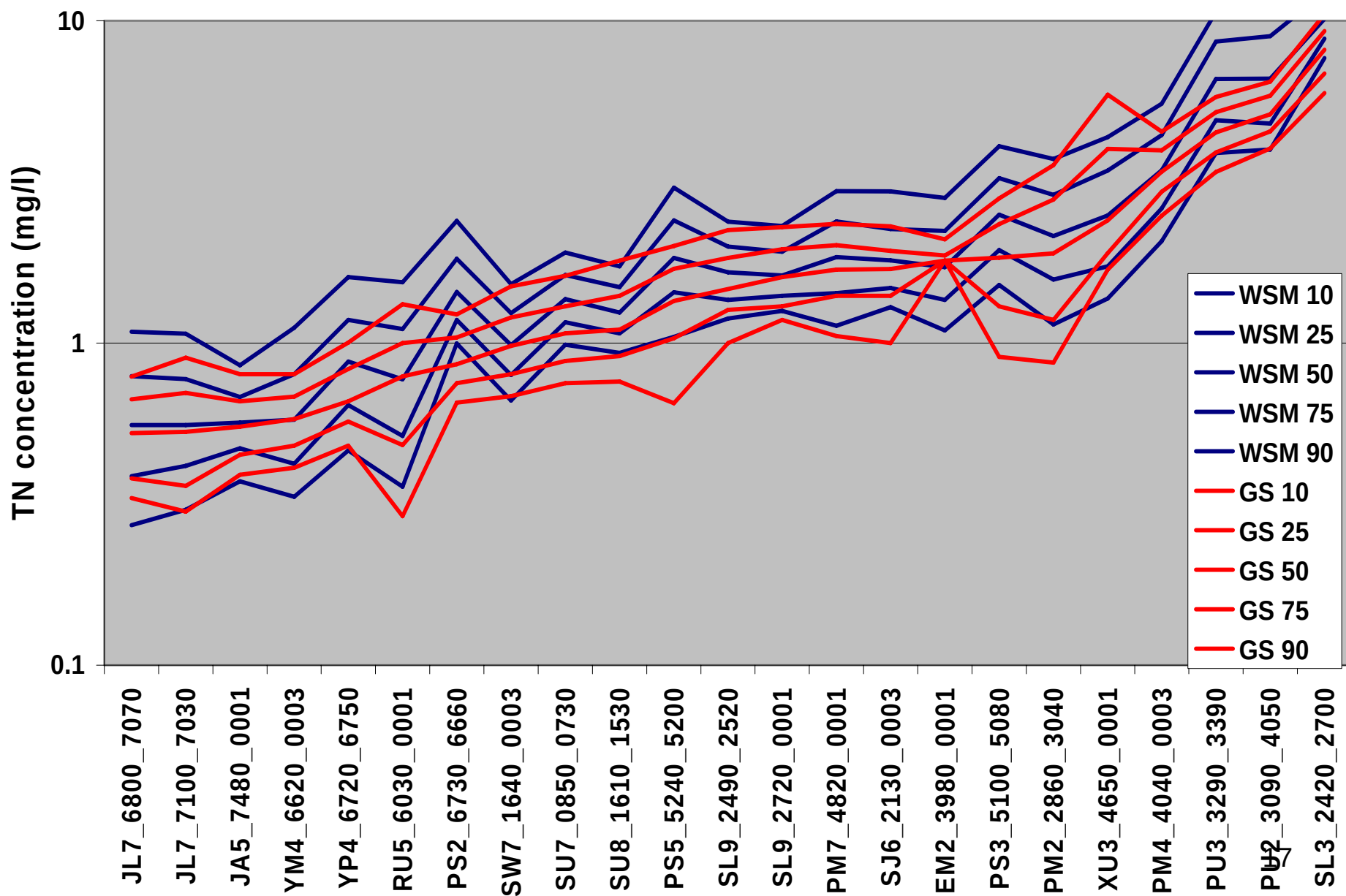
Correlation of Fall Line Stations vs Estimator Annual Loads TN



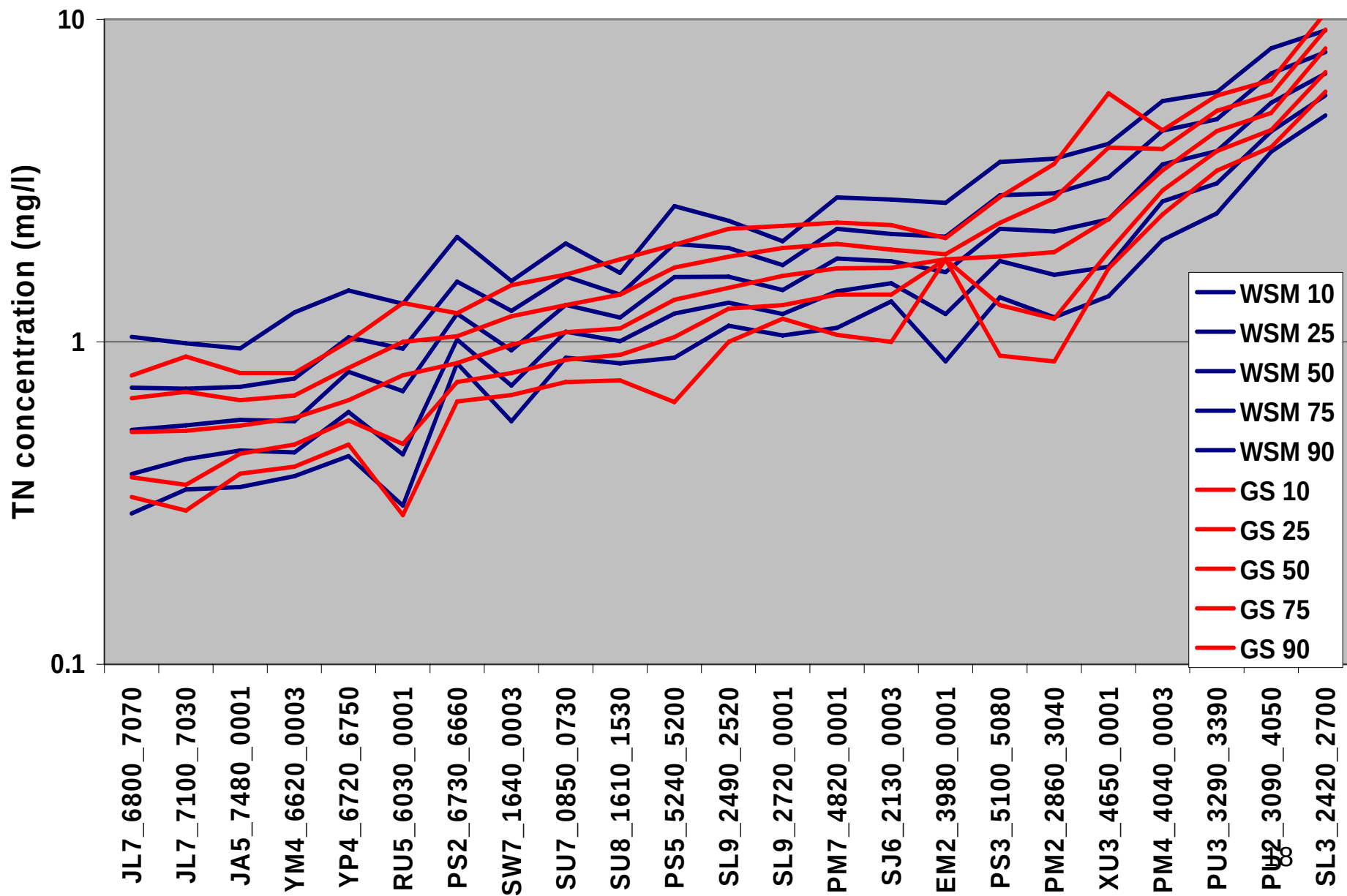
Correlation of Fall Line Stations vs Estimator Annual Loads TP



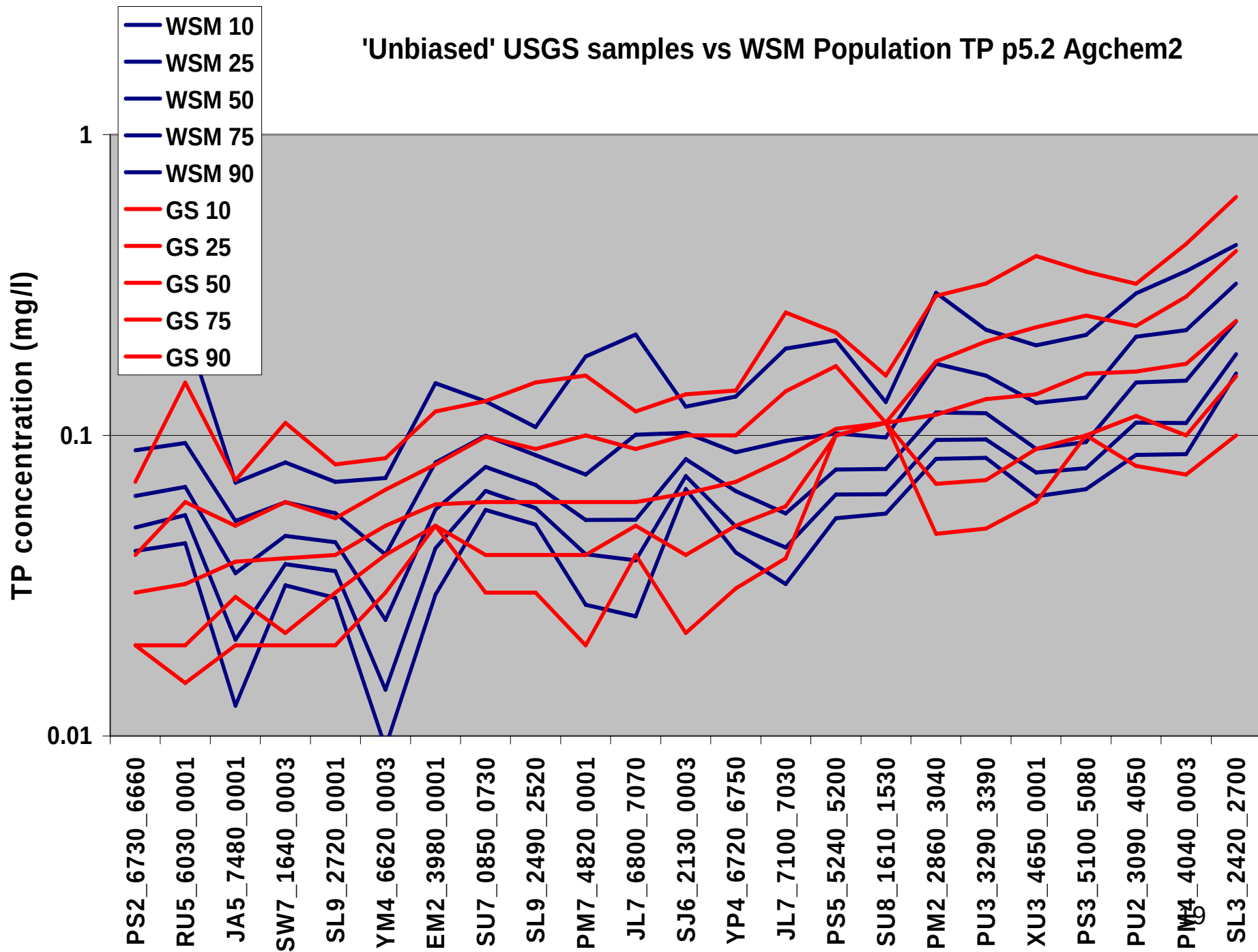
'Unbiased' USGS samples vs WSM Population TN p5.2 AGCHEM



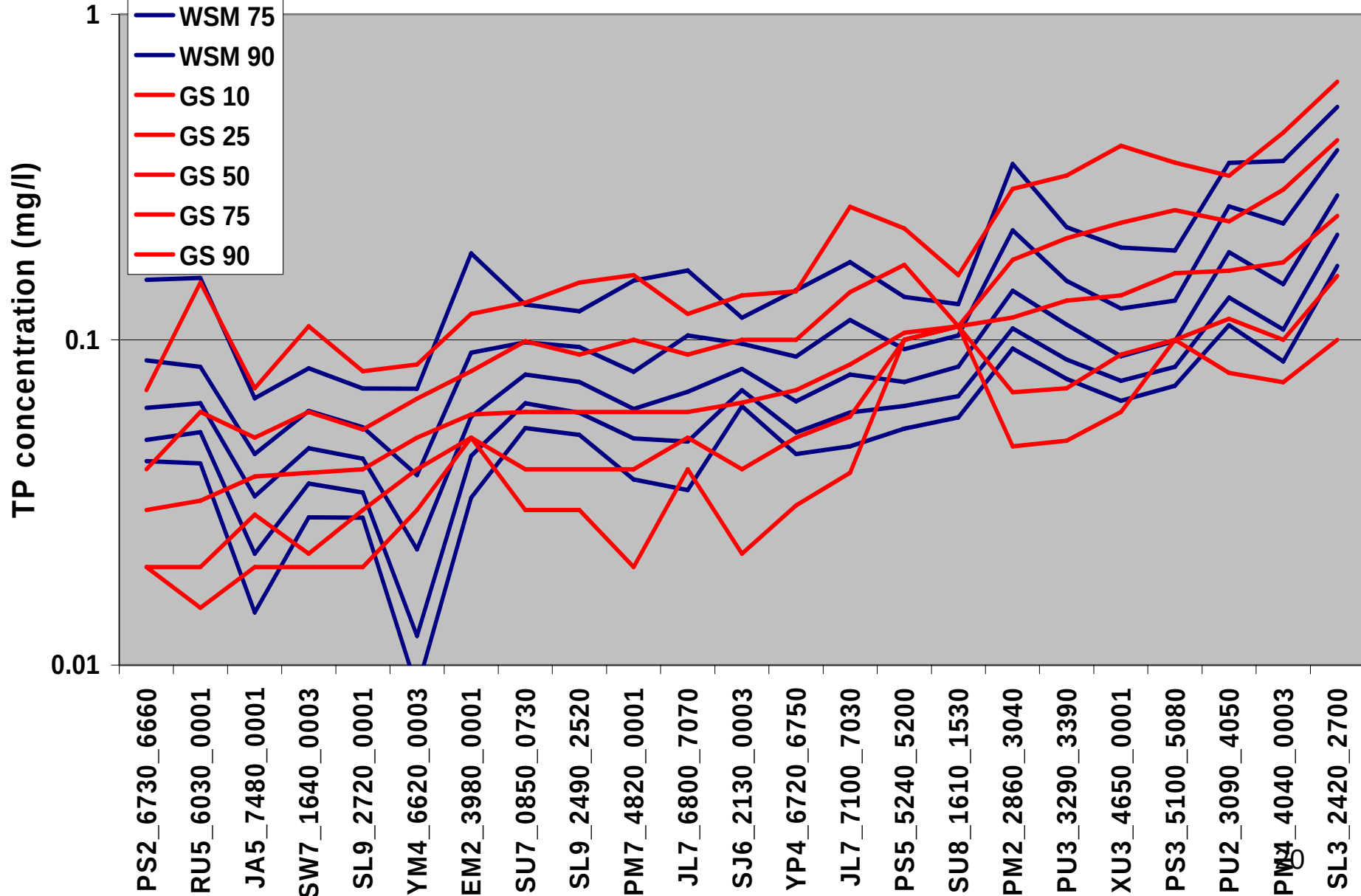
'Unbiased' USGS samples vs WSM Population TN p5.3



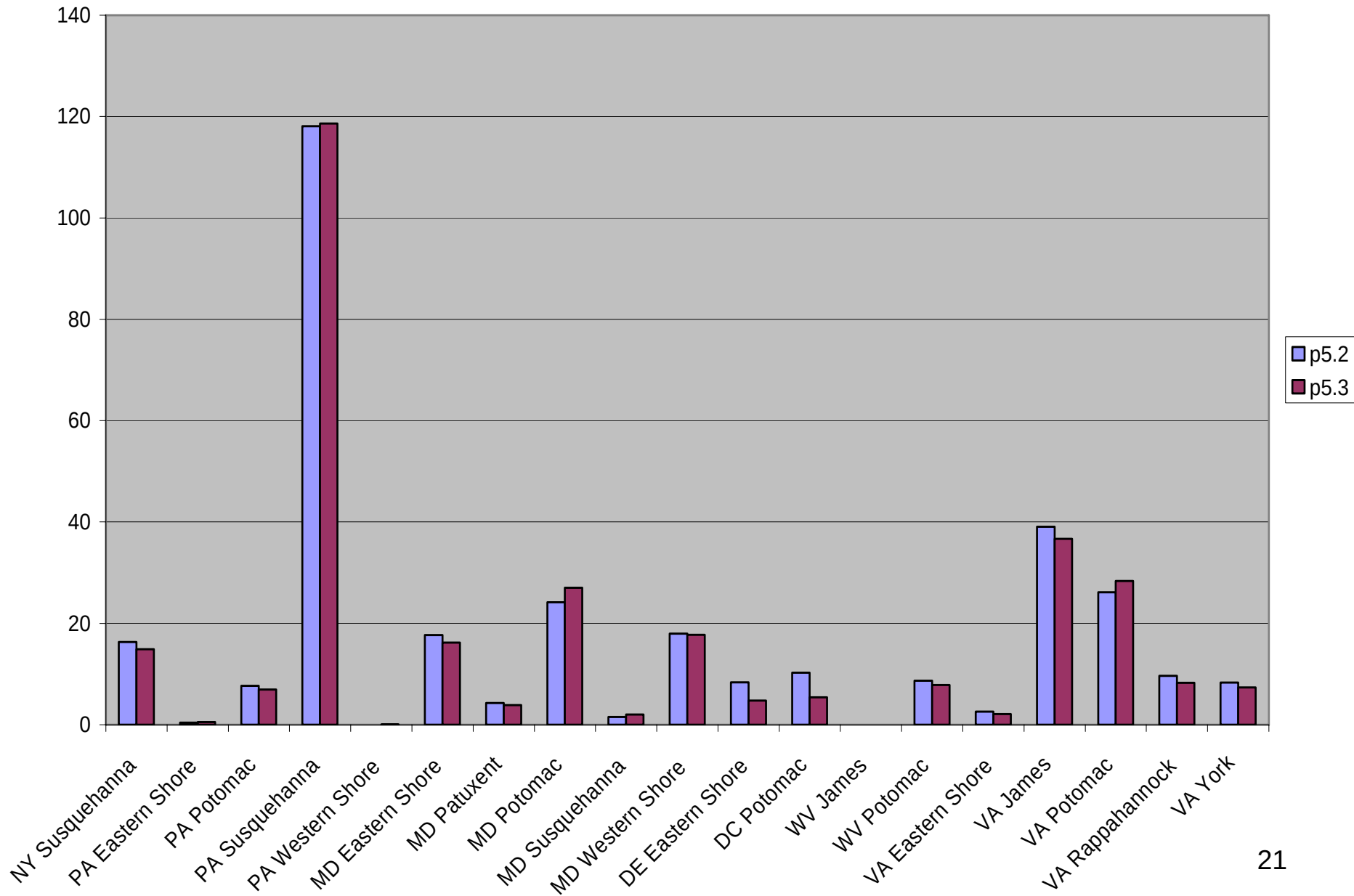
'Unbiased' USGS samples vs WSM Population TP p5.2 Agchem2



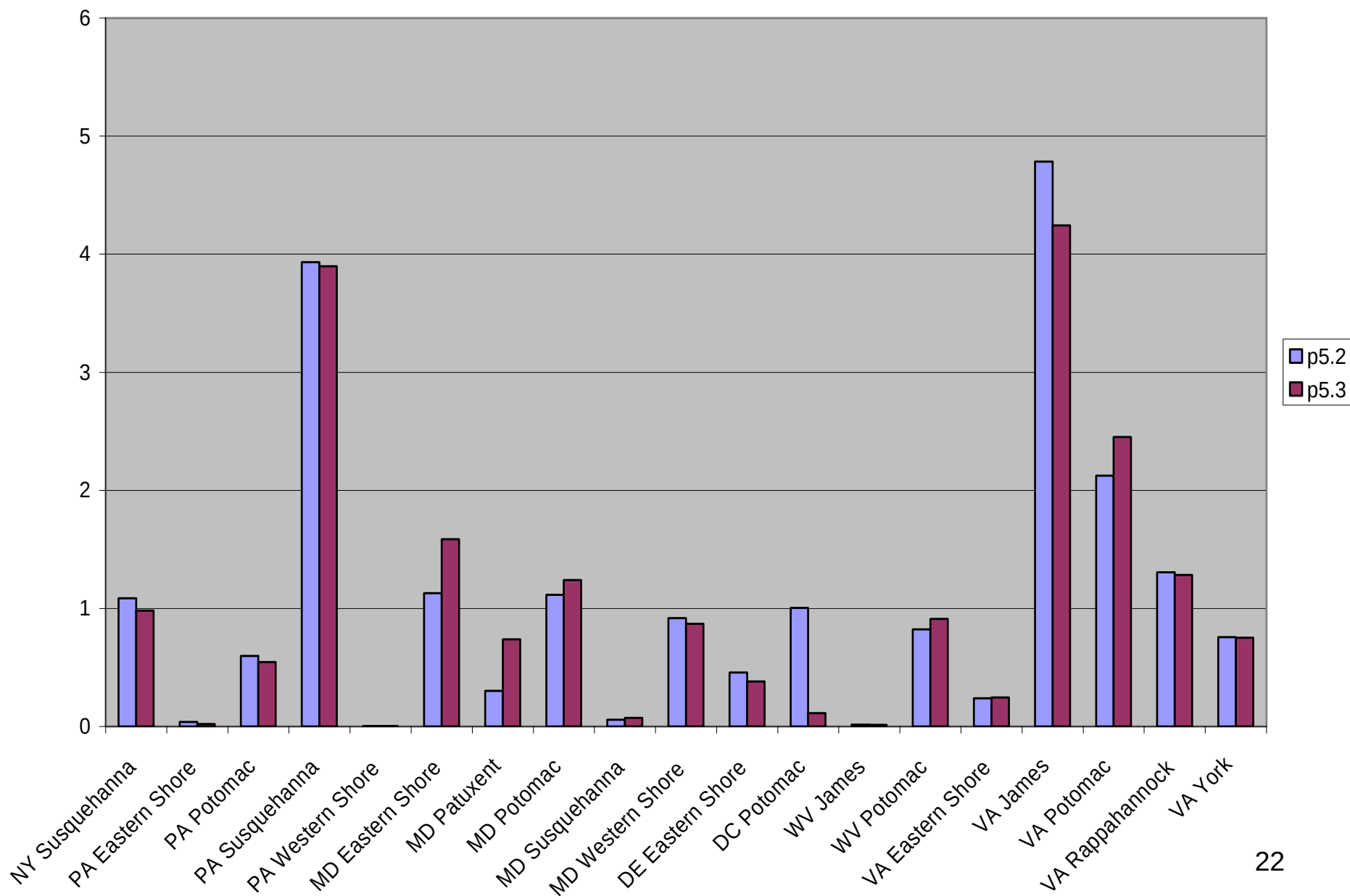
'Unbiased' USGS samples vs WSM Population TP p5.3



TN Loads



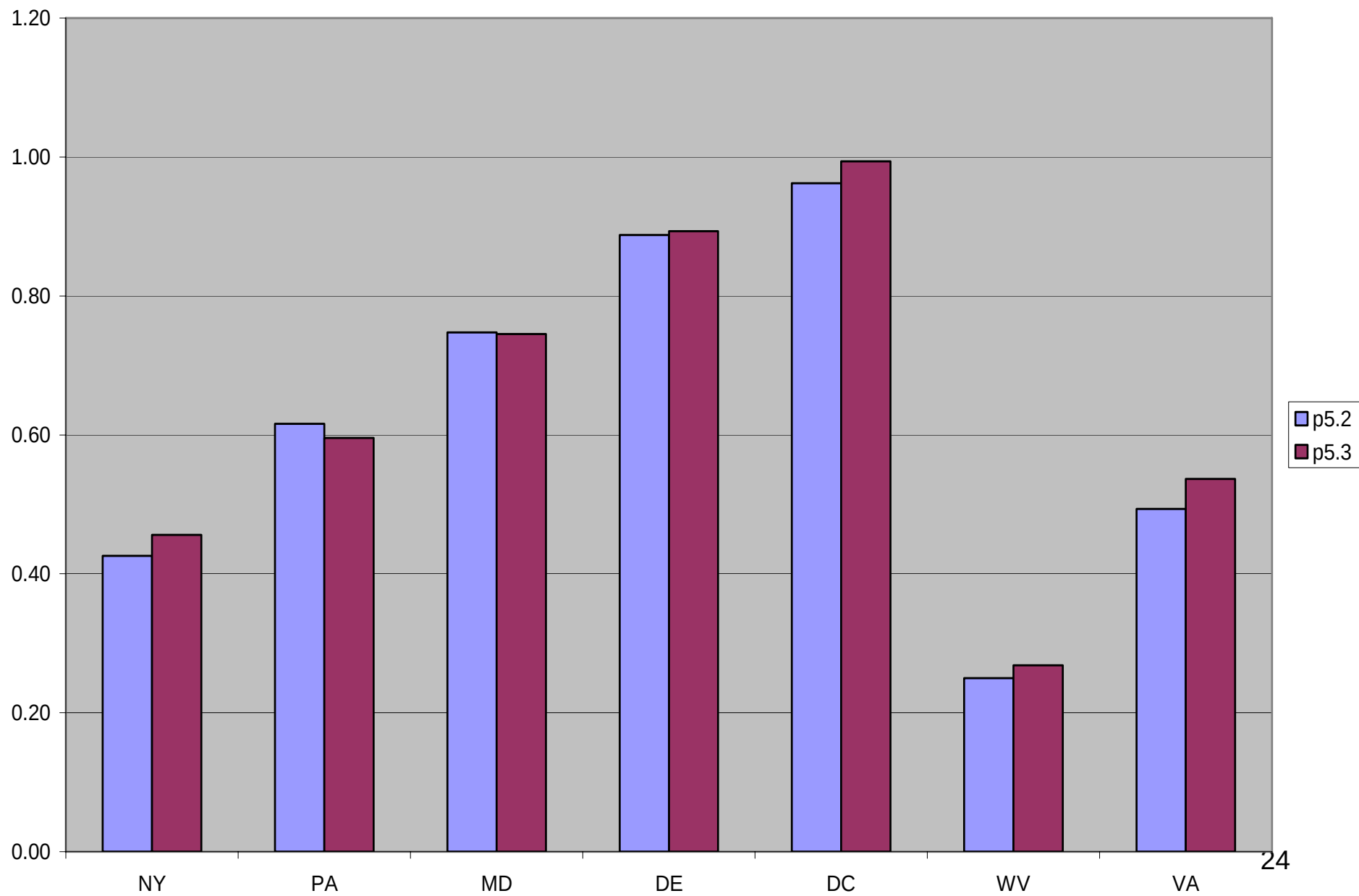
TP Loads



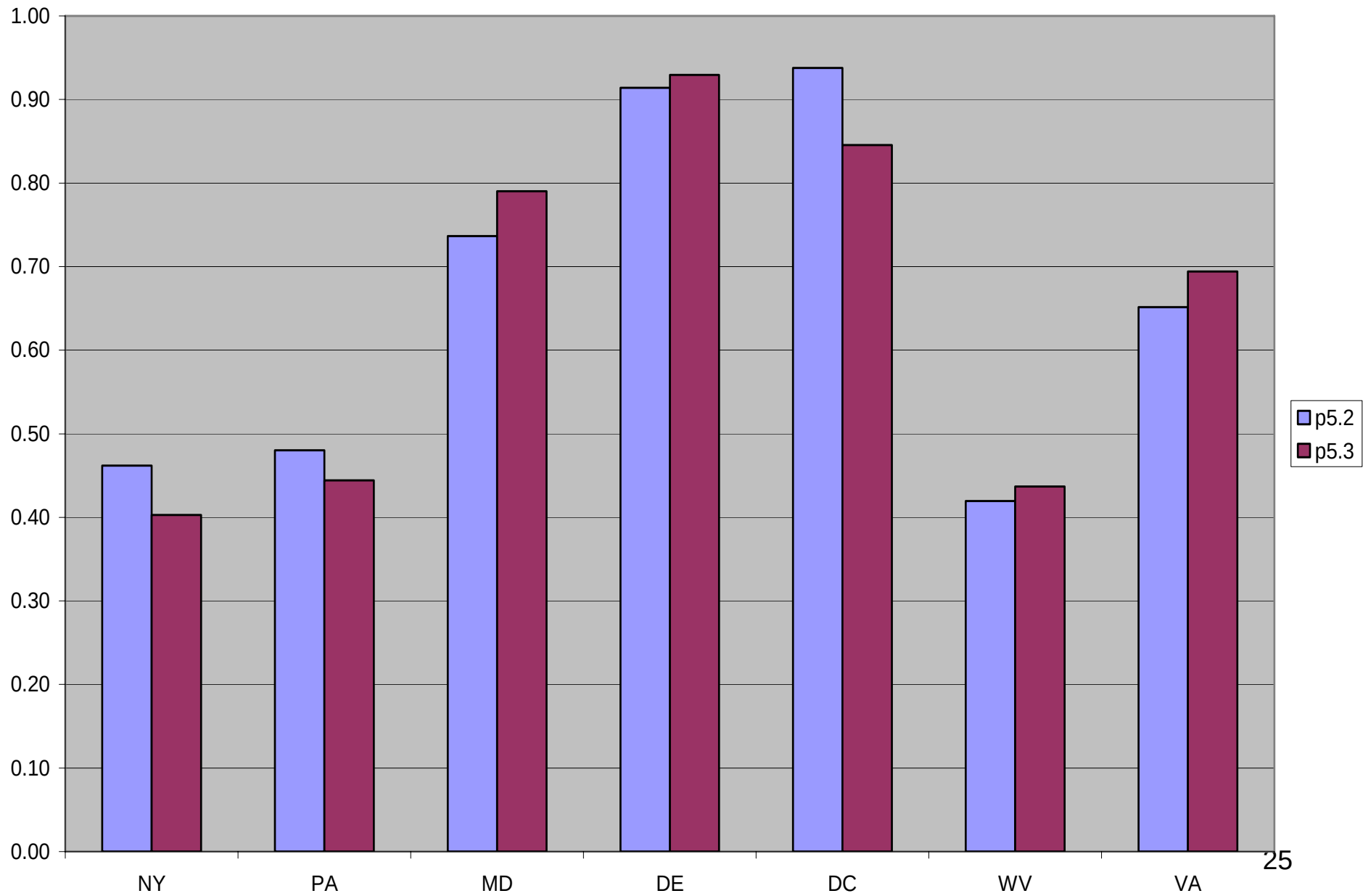
TMDL Allocations Based on

- No Action
- E3
- Riverine Delivery Factors
- Estuarine Delivery Factors

TN Delivery



TP Delivery



Summary

- Calibration method has been stable for years.
- Scenario Builder is now producing reasonable input data
- Phase 5.3 calibration similar to phase 5.2
 - Point source based changes in Potomac and Patuxent
 - Coastal Plain changes in unmonitored area
- Delivery Factors similar