Trends in Nutrient and Sediment Loads at the 9 Chesapeake Bay River Input Monitoring Stations

Douglas L. Moyer, Robert M. Hirsch, and Kenneth E. Hyer

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Conclusions

- The USGS has a new method for quantifying trends in nutrient and sediment loads.
- The new trend in load information:
  - Improves the relevancy of the information we provide to our local, state, and federal partners
  - Enhances the existing information for trend in concentration
- Trend in load and trend in concentration together provide a more complete understanding of how changes in watershed characteristics (e.g. land use) and the implementation of BMPs influence resulting water-quality conditions.

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Trend in Concentration vs. Trend in Load

- Trend in concentration provides information on how BMPs have influenced in-stream concentrations at a given point.
  - Great information for local water quality condition
  - Determined based on patterns in the majority of observed water-quality data (often low to intermediate Q); most influenced by baseflow, groundwater, point-source inputs
- Trend in load *(concentration x discharge)* provides information on how BMPs have influenced the downstream transport of nutrients and sediment.
  - Relevant for managers trying to reduce the mass delivered to the tidal portions of the Bay (TMDL)
  - Determined based on patterns in the highest load samples (~10 percent of the observations); most influenced by wet-weather inputs (nonpoint sources)

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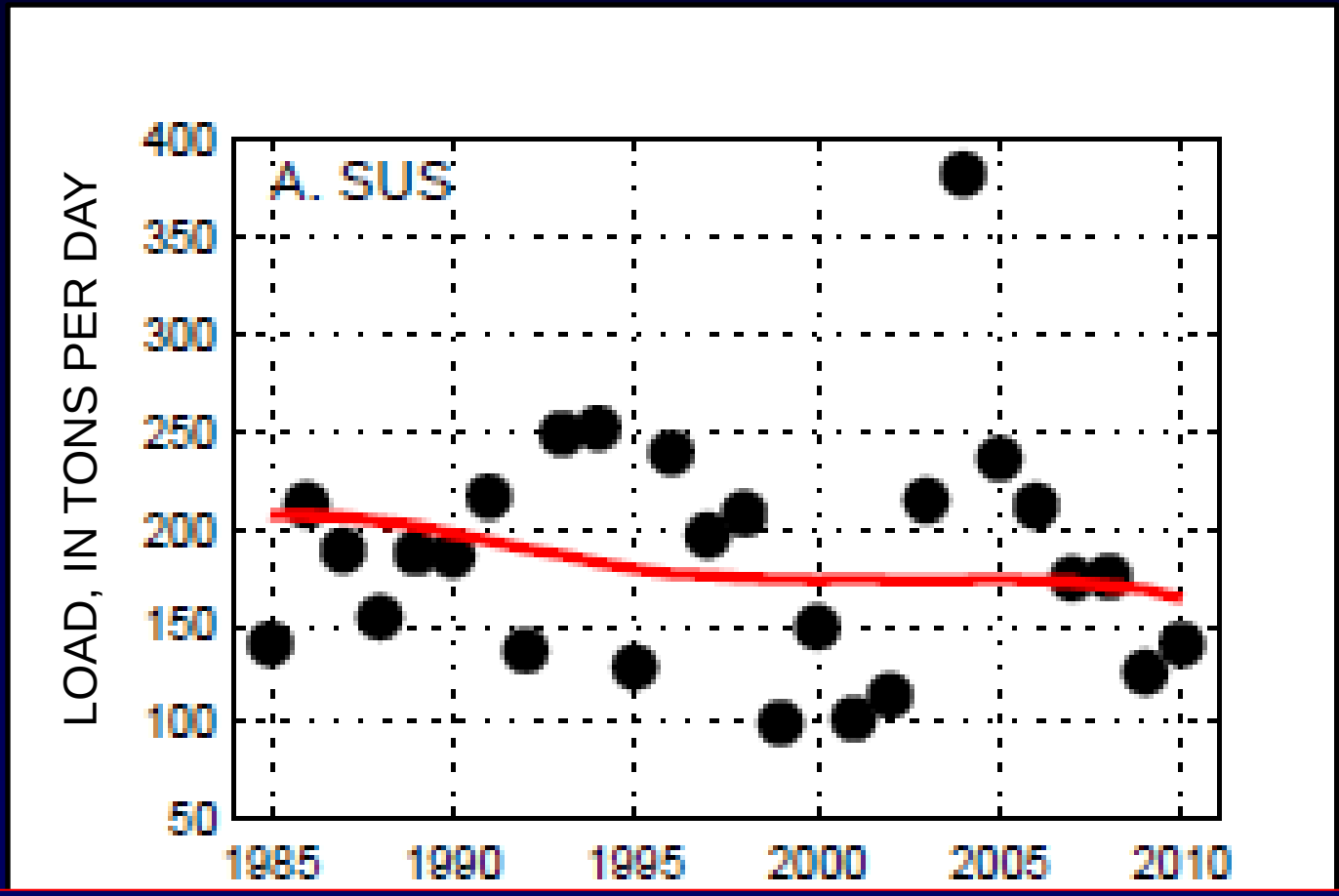
Trends in Total Nitrogen Annual Load

Total Nitrogen Load: Susquehanna (RIM)

- Influence of year-to-year variation in flow

With WRTDS, we now can communicate how annual loads have changed once the year-to-year variation in Q has been removed



Trend in load for:
1985 to 2010 = Total reduction of 21% at a rate of -0.8% per year
2001 to 2010 = Total reduction of 6% at a rate of -0.6% per year

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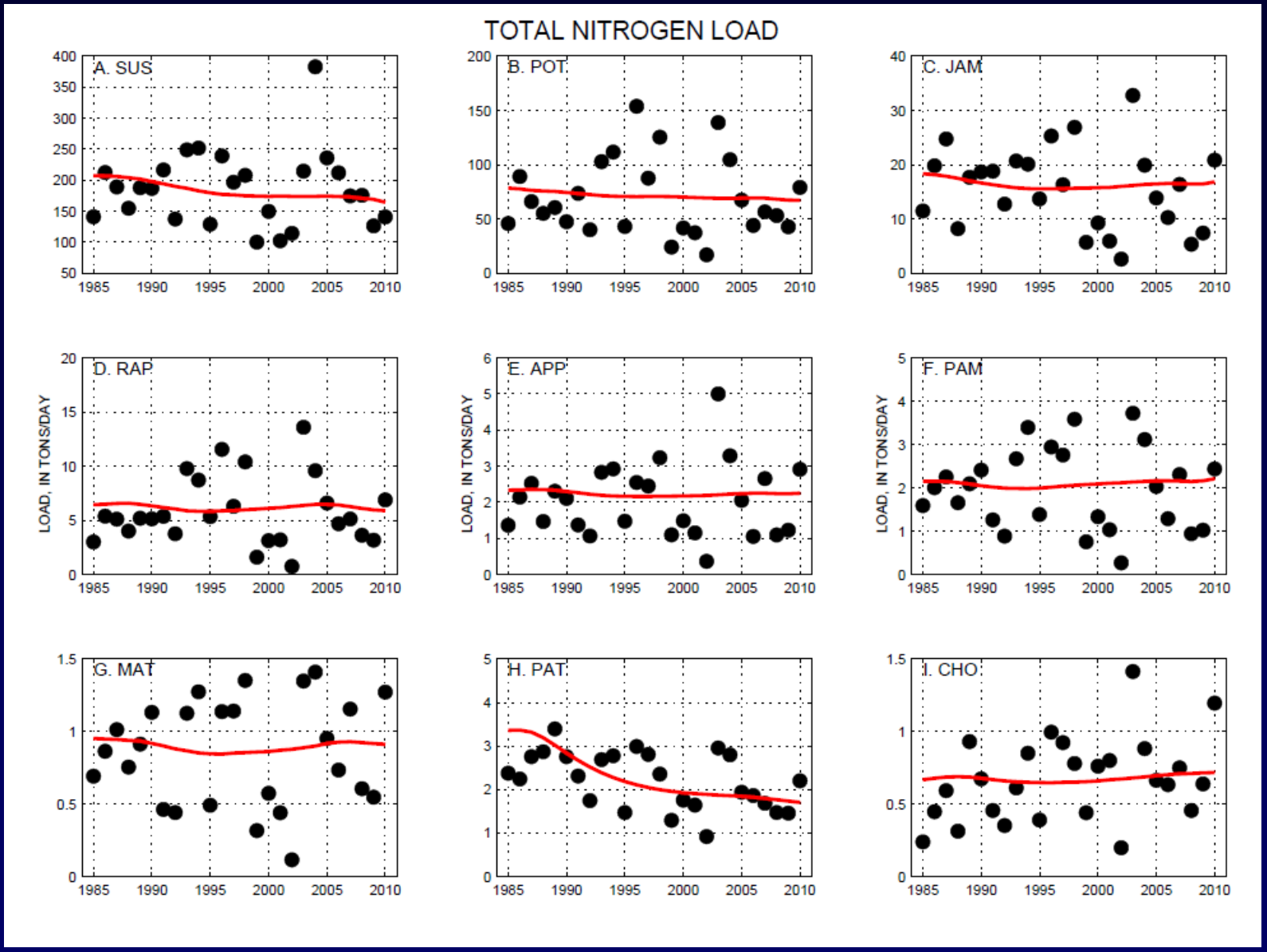
Black Dots = Annual Load Red Line = Flow Normalized Load

Trends in Total Nitrogen Load



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Trends in Nitrogen Loads

Station	Long-Term Trend (1985-2010)		Short-Term Trend (2001-2010)	
	Nitrate	Total Nitrogen	Nitrate	Total Nitrogen
Susquehanna	Improving	Improving	Improving	Minimal
Potomac	Improving	Improving	Improving	Minimal
James	Improving	Minimal	Minimal	Minimal
Rappahannock	Improving	Minimal	Improving	Minimal
Appomattox	Improving	Minimal	Minimal	Minimal
Pamunkey	Minimal	Minimal	Improving	Minimal
Mattaponi	Minimal	Minimal	Minimal	Minimal
Patuxent	Improving	Improving	Improving	Improving
Choptank	Degrading	Minimal	Degrading	Minimal

Minimal Trend = total change less than or equal to |10%|

Improving Trend = total load reduction greater than 10%

Degrading Trend = total load increase greater than 10%

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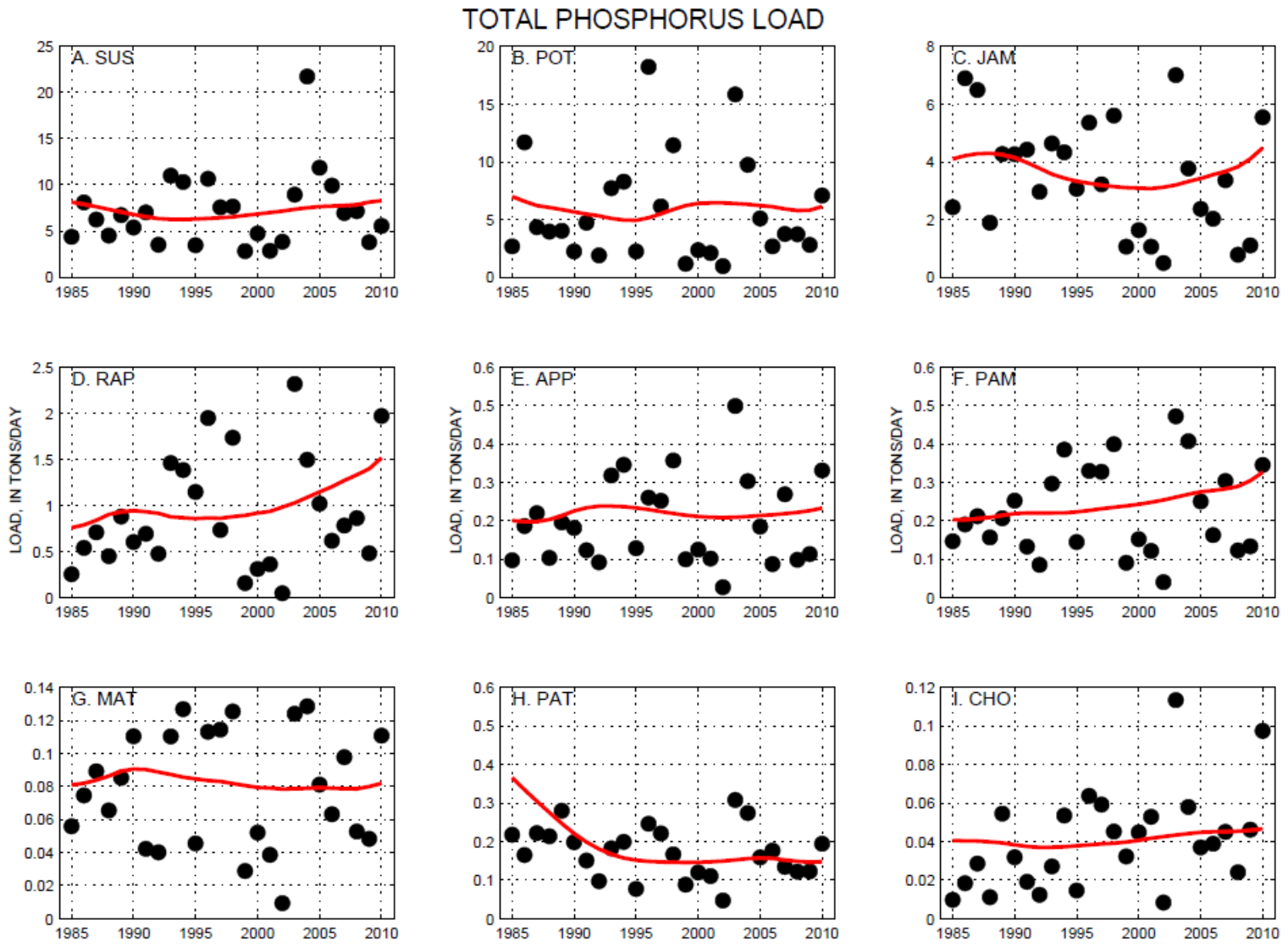
Trends in Total Phosphorus Load



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Trends in Phosphorus Loads

Station	Long-Term Trend (1985-2010)		Short-Term Trend (2001-2010)	
	Ortho-phosphorus	Total Phosphorus	Ortho-phosphorus	Total Phosphorus
Susquehanna	Improving	Minimal	Minimal	Degrading
Potomac	Improving	Improving	Improving	Minimal
James	Improving	Degrading	Improving	Degrading
Rappahannock	Improving	Degrading	Minimal	Degrading
Appomattox	Improving	Degrading	Improving	Degrading
Pamunkey	Improving	Degrading	Improving	Degrading
Mattaponi	Improving	Minimal	Improving	Minimal
Patuxent	Improving	Improving	Improving	Minimal
Choptank	Degrading	Degrading	Degrading	Degrading

Minimal Trend = total change less than or equal to |10%|

Improving Trend = total load reduction greater than 10%

Degrading Trend = total load increase greater than 10%

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Trends in Suspended Sediment Load

Station	Long-Term Trend (1985-2010)	Short-Term Trend (2001-2010)
Susquehanna	Degrading	Degrading
Potomac	Degrading	Degrading
James	Not Available	Degrading
Rappahannock	Not Available	Minimal
Appomattox	Not Available	Minimal
Pamunkey	Not Available	Degrading
Mattaponi	Not Available	Improving
Patuxent	Improving	Degrading
Choptank	Improving	Degrading

Minimal Trend = total change less than or equal to |10%|
Improving Trend = total load reduction greater than 10%
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Publication

Draft report has been reviewed, approved, and is currently being prepared for printing and dissemination.

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science for a changing world

Comparison of two Regression Based Approaches for Determining Nutrient and Sediment Fluxes and Trends in the Chesapeake Bay Watershed.

By Douglas L. Moyer, Robert M. Hirsch, and Kenneth E. Hyer

Report Series XXXX–XXXX

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Communication

- Present trend in load results to cooperators and concerned partners (VA, MD, NY, PA, WV, COG, EPA, NRCS)
- Report release first week in January
- USGS Science Summary of trend results
- Other Ideas?

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Next Steps

- Compare WRTDS load and flow normalized results from the 9 RIM stations to CB Watershed Model results. Link WRTDS results to CBP nutrient and sediment goals (2012-2013)
- Apply WRTDS methodology to other long-term stations in the watershed (e.g. Potomac and Susquehanna)
- Work with CBP to better integrate nontidal nutrient and sediment load and trend results into the current tidal-waters assessment methodology

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Questions and Discussion

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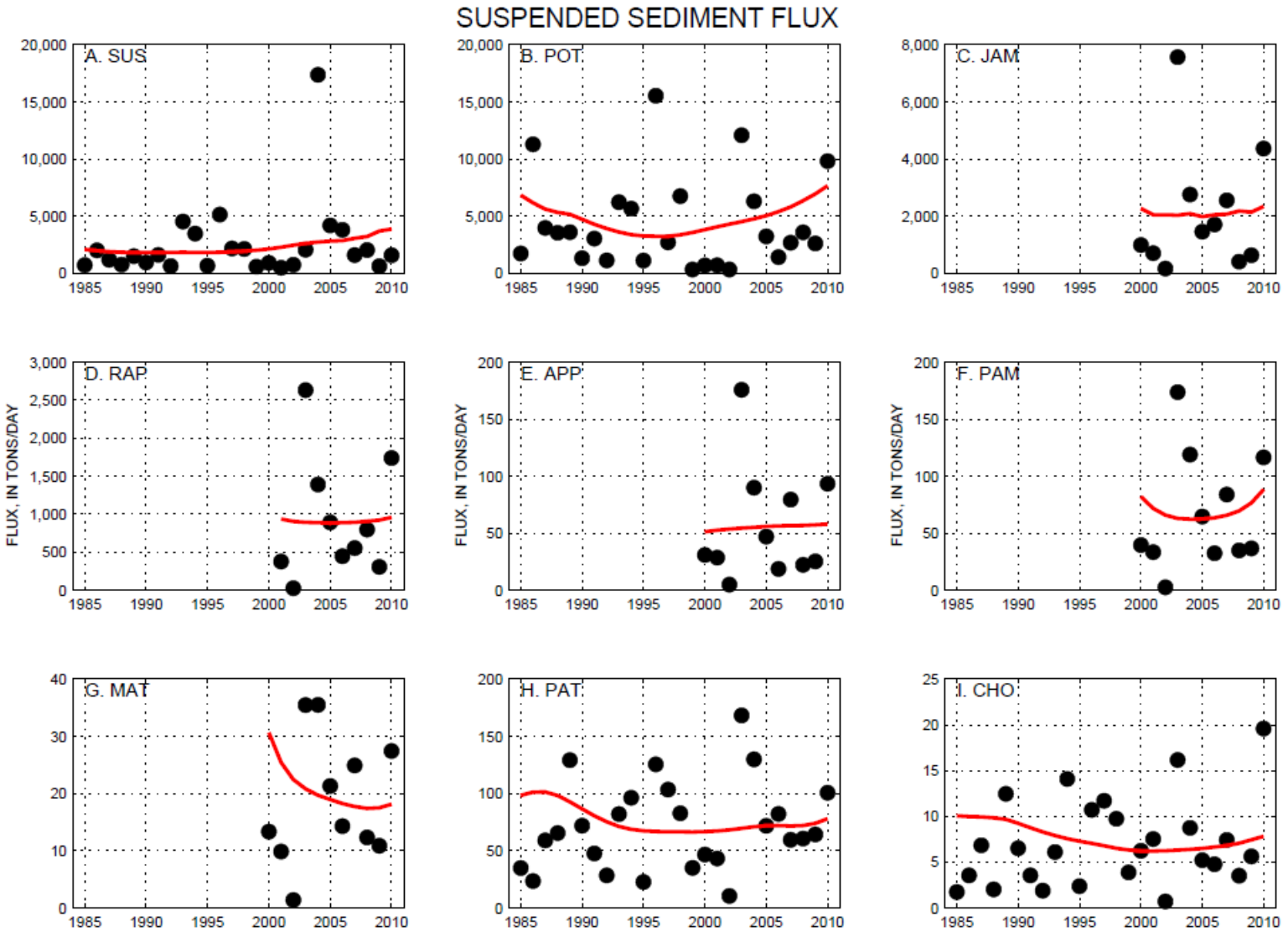
Trends in Suspended Sediment Load



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