Communication strategy for the new trend in load analysis and results

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Points of Discussion

- WRTDS and ESTIMATOR Comparison Report – Status
- Plans for a Communication Fact Sheet
- Taking our message on the road
- Next Steps

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Current Study: Moyer, Hirsch, & Hyer

OBJECTIVE:

Evaluate the performance of ESTIMATOR and WRTDS in reproducing nutrient and sediment concentrations and loads and determine which model ultimately ensures the highest level of accuracy in annual load estimates provided to the Chesapeake Bay Program.

QUESTIONS:

1. What are the differences in functional form and model construction?
2. Which model reproduces discrete observations with the greatest accuracy and least bias?
3. How different would the historical estimates of load been had WRTDS been used instead of ESTIMATOR?
4. What are the trends in annual nutrient and sediment loads and how do they compare to ESTIMATOR concentration trends?

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Chesapeake Bay: River Input Monitoring Stations

Stations:

- Susquehanna
- Potomac
- James
- Rappahannock
- Appomattox
- Pamunkey
- Mattaponi
- Patuxent
- Choptank

Why these stations:

- Greater than 75% of the land area
- Vast majority of the total discharge from the nontidal areas passes these stations
- Robust datasets: nearly 30 years of monitoring with total observations ranging from 600 to 1,400

Constituents:

- Total Nitrogen
- Nitrate
- Total Phosphorus
- Orthophosphorus
- Suspended Sediment

Therefore 9RIM * 5 Constituents = 45 possible analytical combinations

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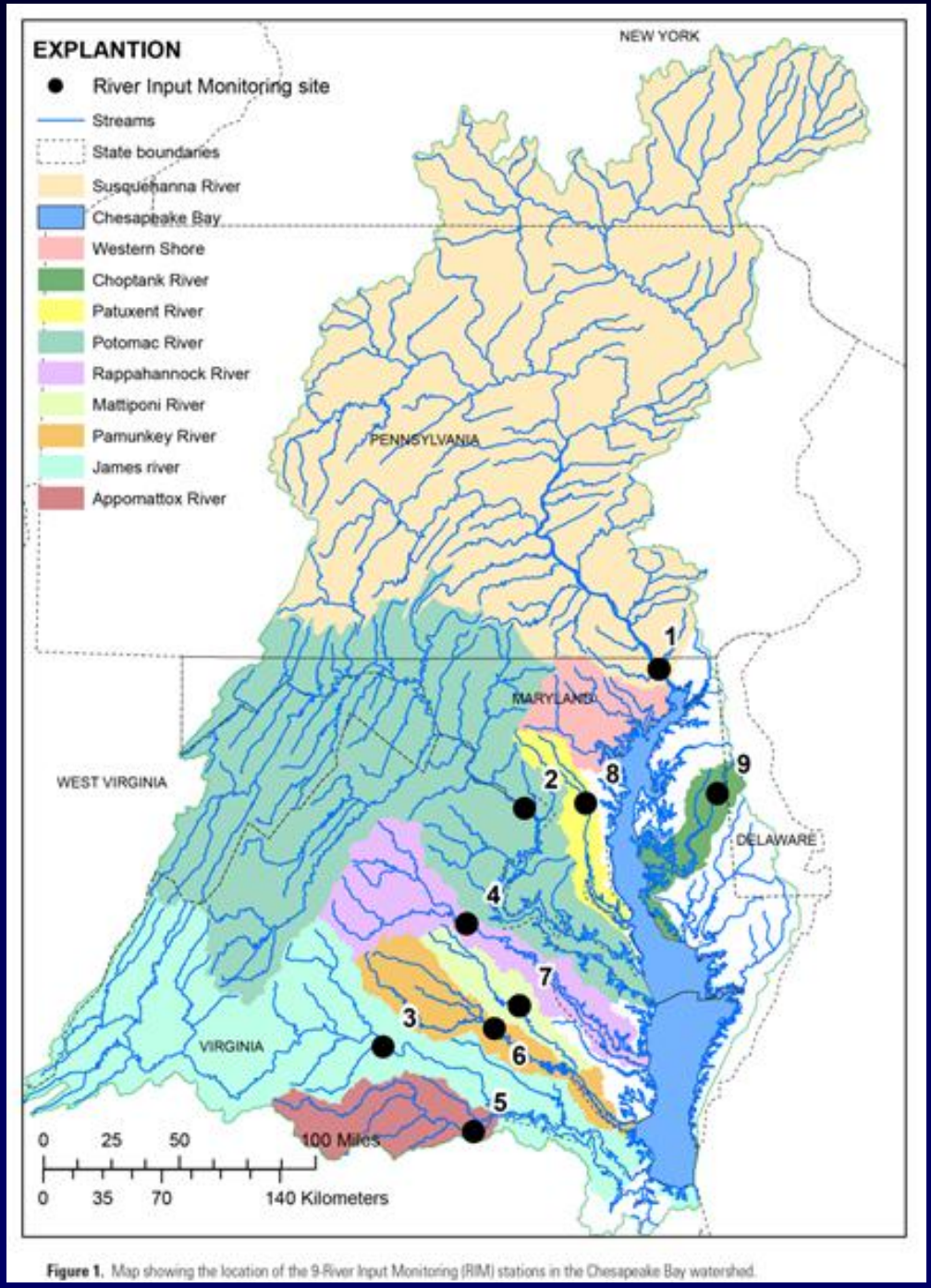

Figure 1. Map showing the location of the 9 River Input Monitoring (RIM) stations in the Chesapeake Bay watershed.

Major Comparison Conclusions

We have shown:

- For the majority of the combinations, ESTIMATOR and WRTDS produce nutrient and sediment loads that are comparable in accuracy and bias.
- However, WRTDS produces nutrient and sediment loads that are considerably more accurate and less biased for 15 of the 45 combinations with complex concentration-discharge relations.
- Out of 85 possible combinations for trend, there are 10 where the percent change in concentration is in the opposite direction of the percent change in load

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Publication

Draft report has been completed and has gone through technical and editorial review.

The report should be approved and ready for release near the end of the calendar year.

The report is fairly technical which will impede consumption of the new trends in load results, so…..

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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

U.S. Department of the Interior
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- Primary focus will be to communicate the trends in load for TN, TP, SSC from the 9-RIM stations
- The target audience will be water-resource managers and general public
- To be released at the same time as the full report

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Fact Sheet - Content

- Introduction – We have a new tool and this is a very good thing!!
- Present trends in load (%)
- Present trends in flow-adjusted concentration (%)
- What can we learn from these two trend types – why are they sometimes different?
  - Concentration vs. Load

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Trends in Annual Load (Yield)

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

Example: Nitrate

Determine trend in flow-normalized load for:
1985 to 2010
2001 to 2010

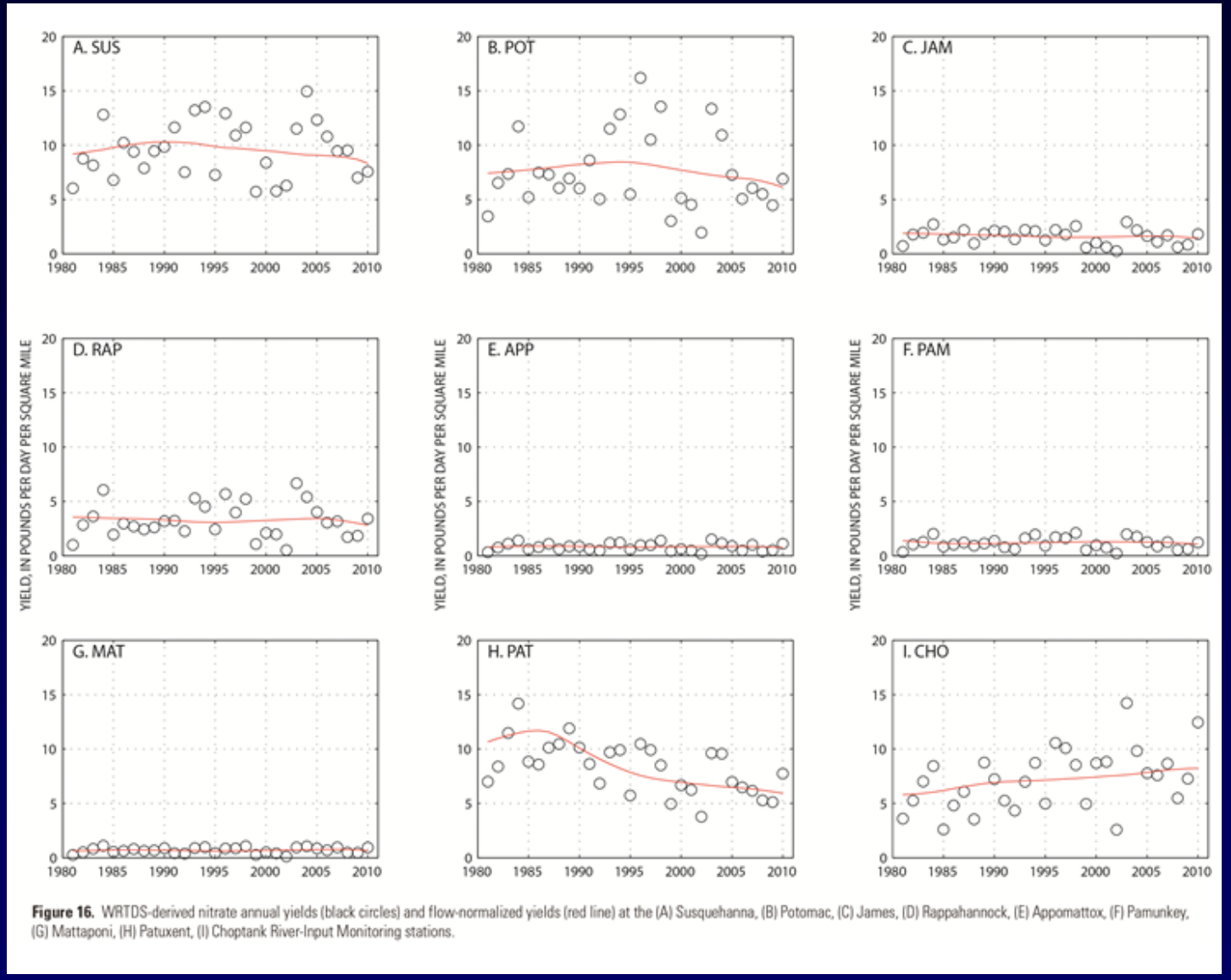

Figure 16. WRTDS-derived nitrate annual yields (black circles) and flow-normalized yields (red line) at the (A) Susquehanna, (B) Potomac, (C) James, (D) Rappahannock, (E) Appomattox, (F) Pamunkey, (G) Mattaponi, (H) Patuxent, (I) Choptank River-Input Monitoring stations.

Black Circles = Annual Yield Red Line = Flow Normalized Load

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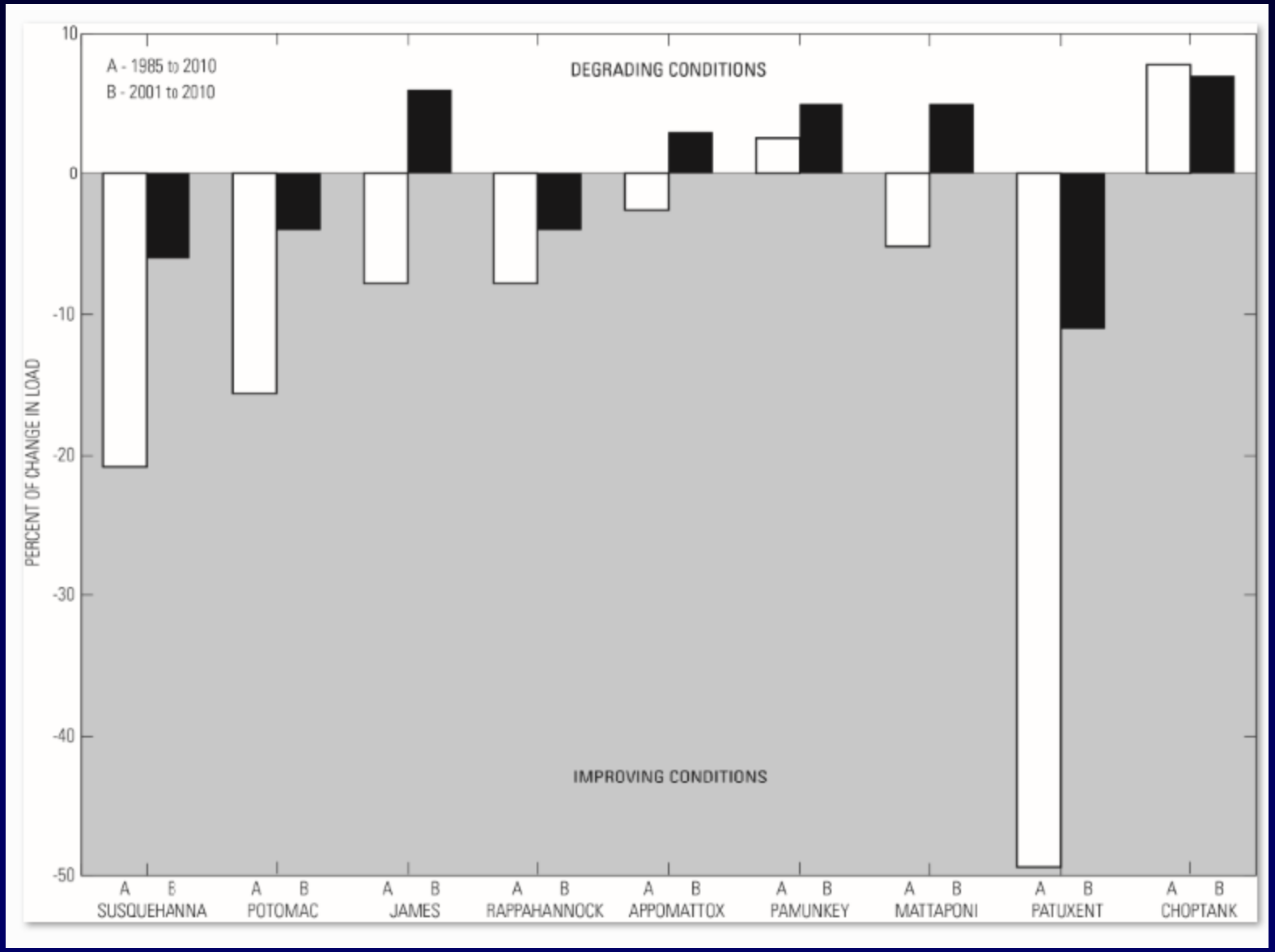
Trends in Annual Loads

Two Time periods:

1985 to 2010 (white bars)

2001 to 2010 (black bars)



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Trend in Concentration vs. Trend in Load

- Now, a challenge for the NTN is to communicate two different types of trend results
- Our goal is to explain how these trends should be interpreted and why trends in concentration may differ in direction compared to trends in load

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Trend in Concentration vs. Trend in Load

- Trend in concentration (flow-adjusted) provides information on how BMPs have influenced instream concentrations at a given point.
  - Great information for local water-quality and standards attainment
  - Determined based on patterns in the majority of observed water-quality data (often low to intermediate Q)

- Trend in load (flow-normalized) provides information on how BMPs have influenced the downstream transport of mass.
  - Great information for managers trying to reduce the mass delivered to the tidal portions of the Bay.
  - Determined based on patterns in the highest load samples (~10 percent of the observations)

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Trends Agree

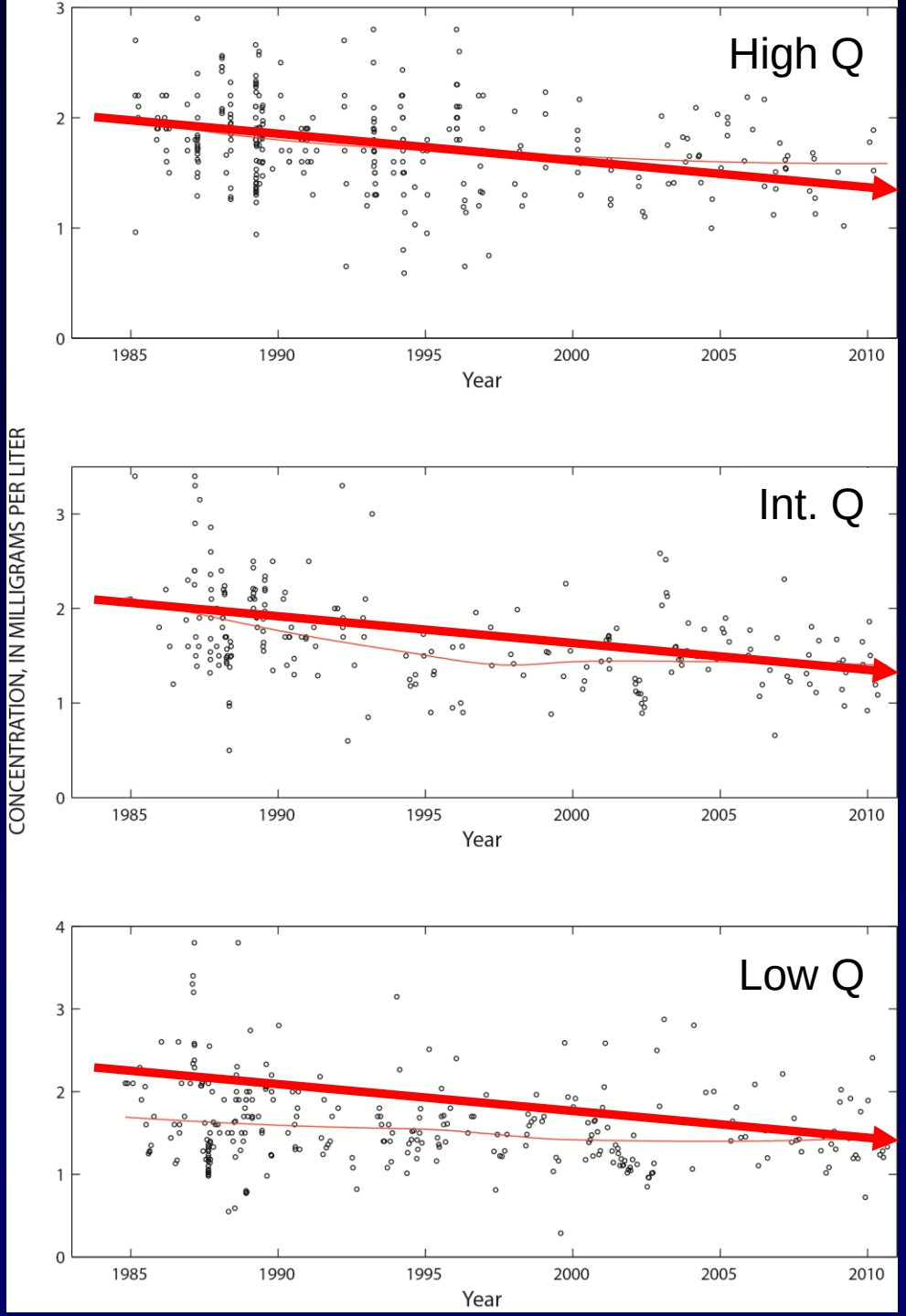
Example where trend in concentration and trend in load are in the same direction

Categorize water-quality observations based on 3 discharge conditions:

- High
- Intermediate
- Low

ESTIMATOR trend in concentration indicates improving conditions

WRTDS trend in load indicates improving conditions

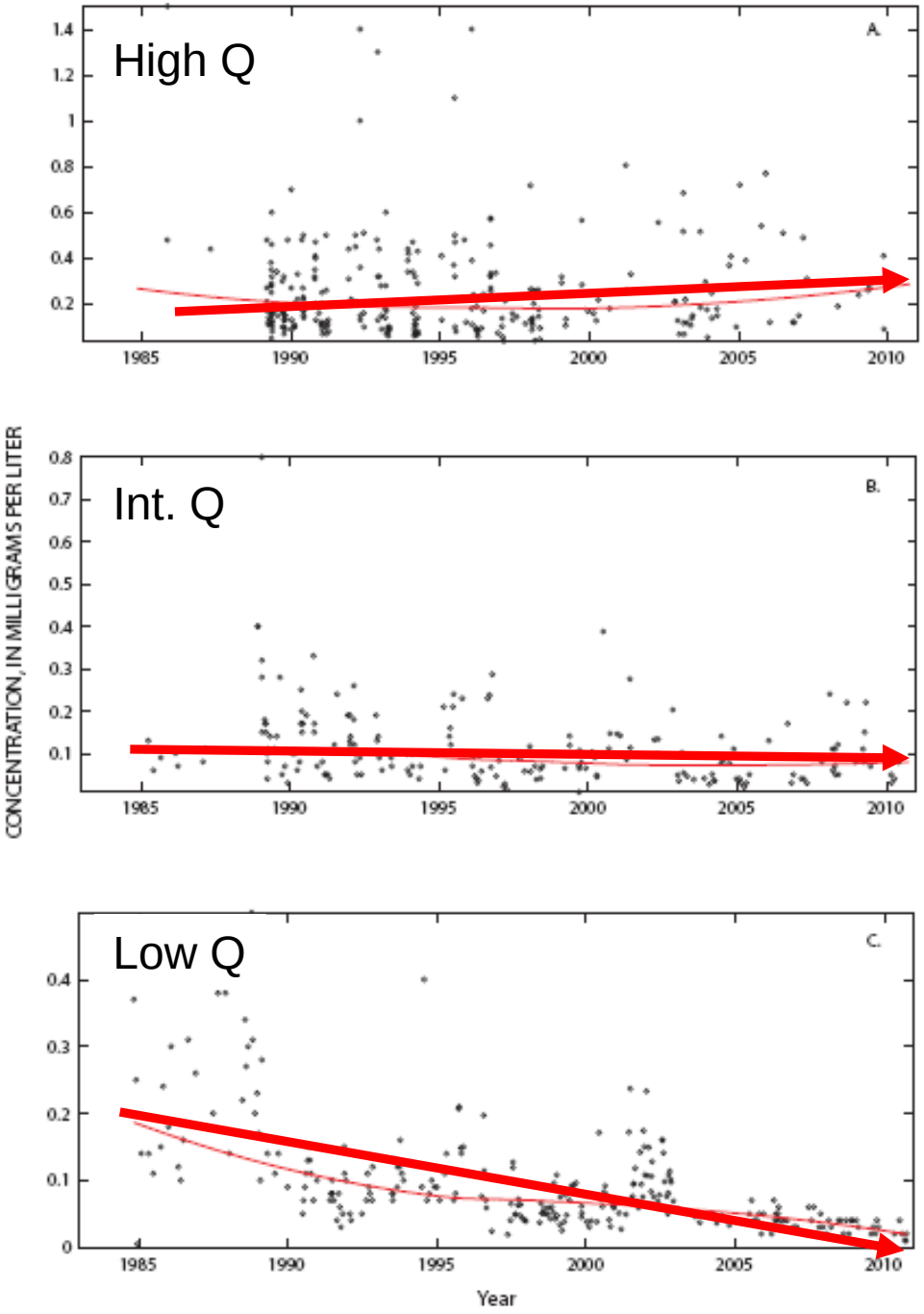


Trends Disagree

Example where trend in concentration and trend in load are in opposite direction

ESTIMATOR trend in concentration indicates improving conditions

WRTDS trend in load indicates degrading conditions



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Taking Our Message on the Road

- Present WRTDS results to cooperators and concerned partners (VADEQ, MDDNR, NRCS)
- Water-Quality Goal Implementation Team
  - October 9 – General overview of WRTDS
  - November 13 or mid-December – Present trends in loads

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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)
- Continue effort to develop method for quantifying uncertainty associated with WRTDS estimates (2013)
- Work with CBP TMAW to better integrate nontidal nutrient and sediment load and trend results into the current tidal-waters assessment methodology
- Determine how WRTDS and ESTIMATOR results are integrated at the 9-RIM stations
- Develop a strategy for utlizing our data-analysis tools at the rest of the NTN stations

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