Solute transport into Shark River Slough

Troy D. Hill[1], Kevin Kotun[2]

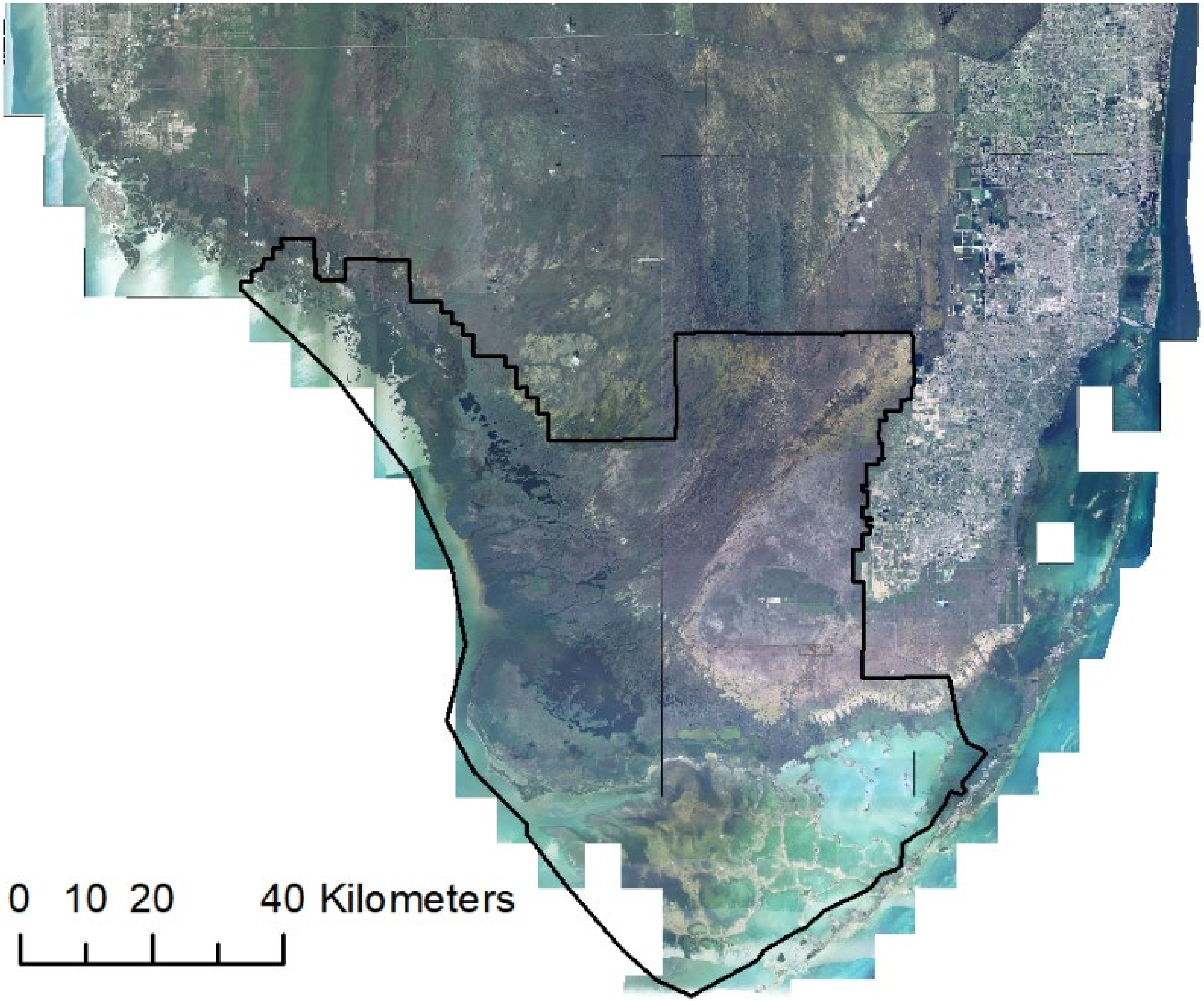
[1]National Park Service, Department of the Interior

[2]United States Geological Survey, Department of the Interior

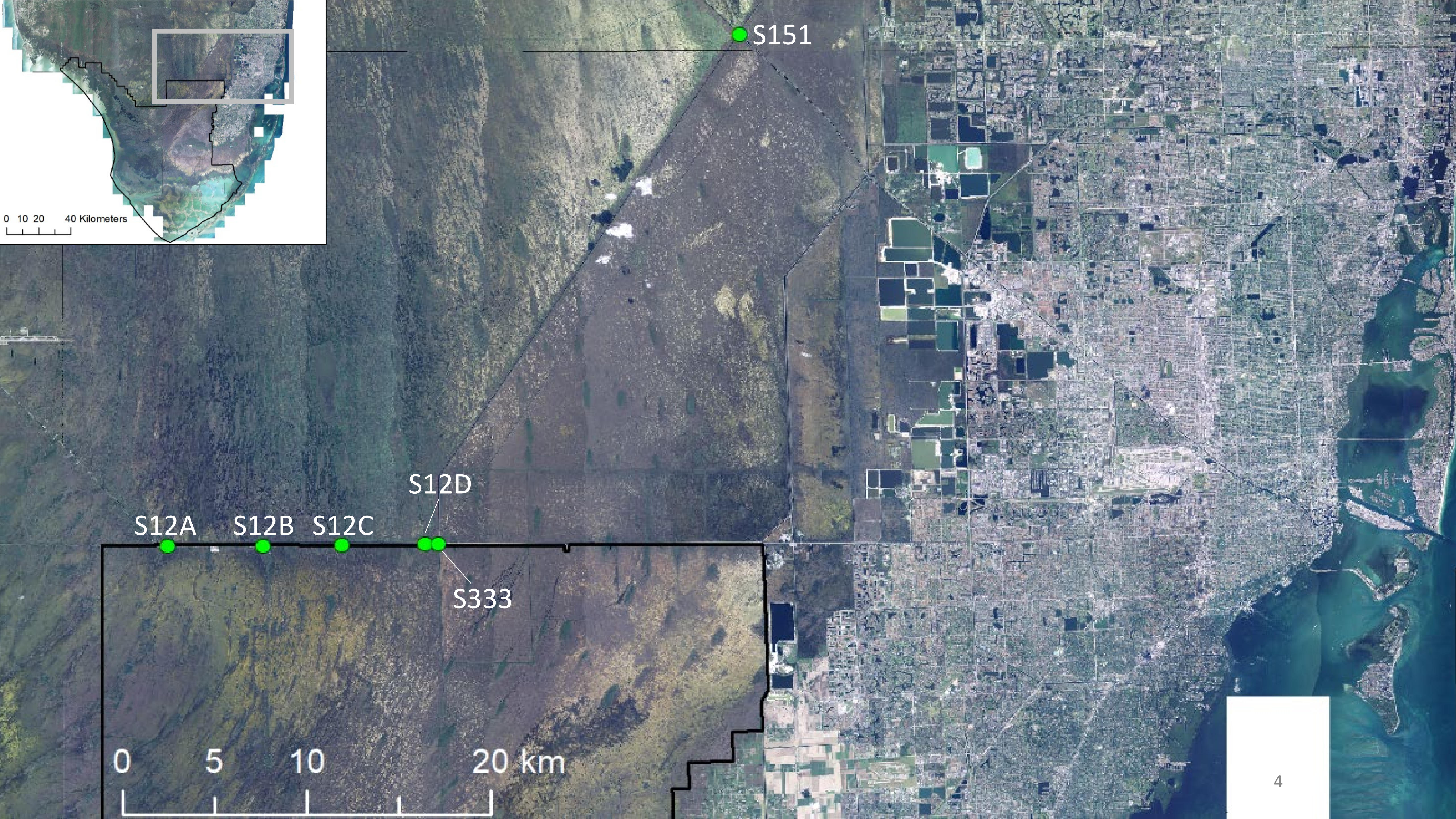
Outline

1. Application of WRTDS to stations at ENP northern boundary, 1992 - 2017

2. Trends in nutrients (TP, TKN) and geogenic solutes (Ca, Mg, Na)

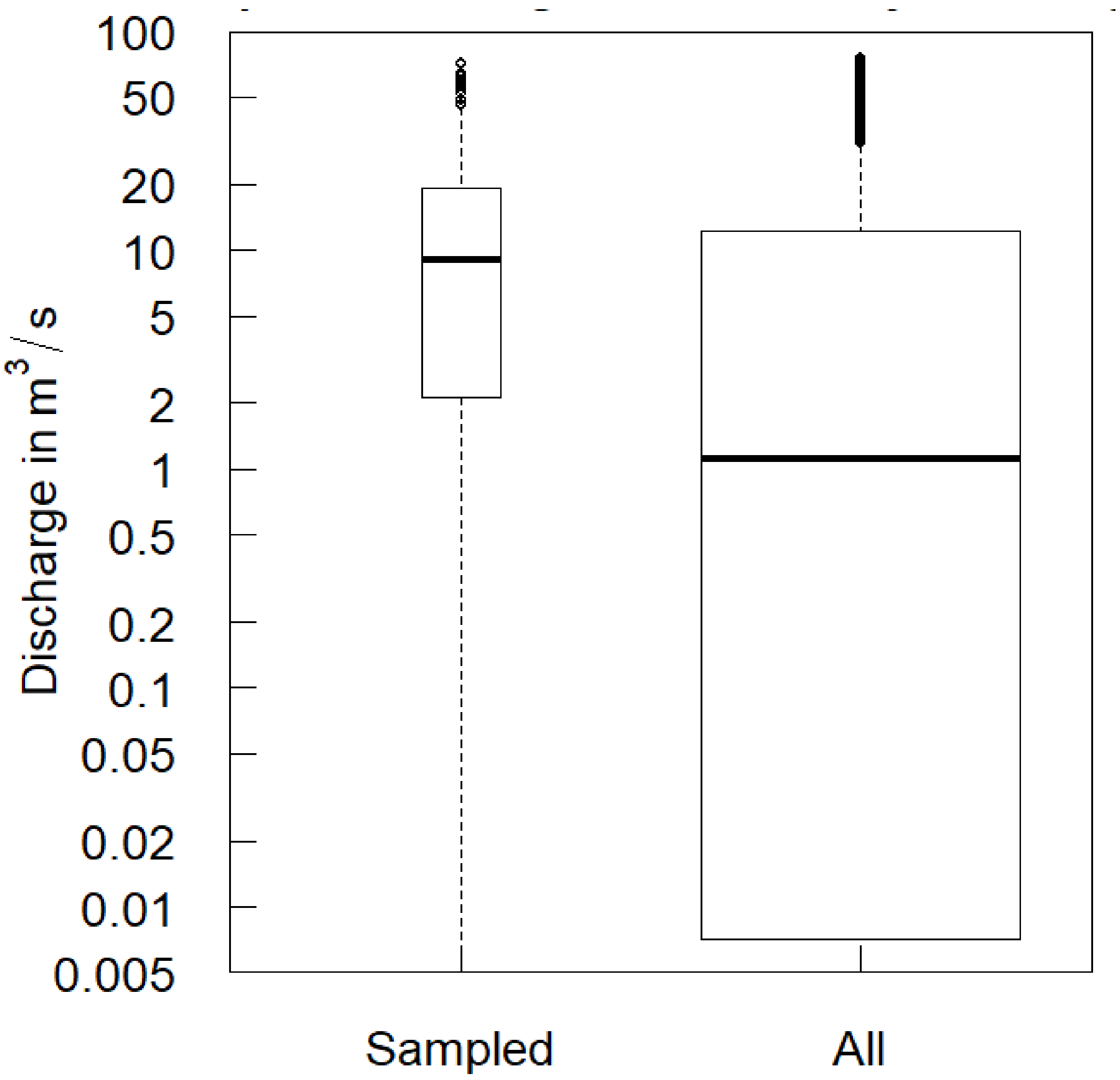


> 5000 sampling locations



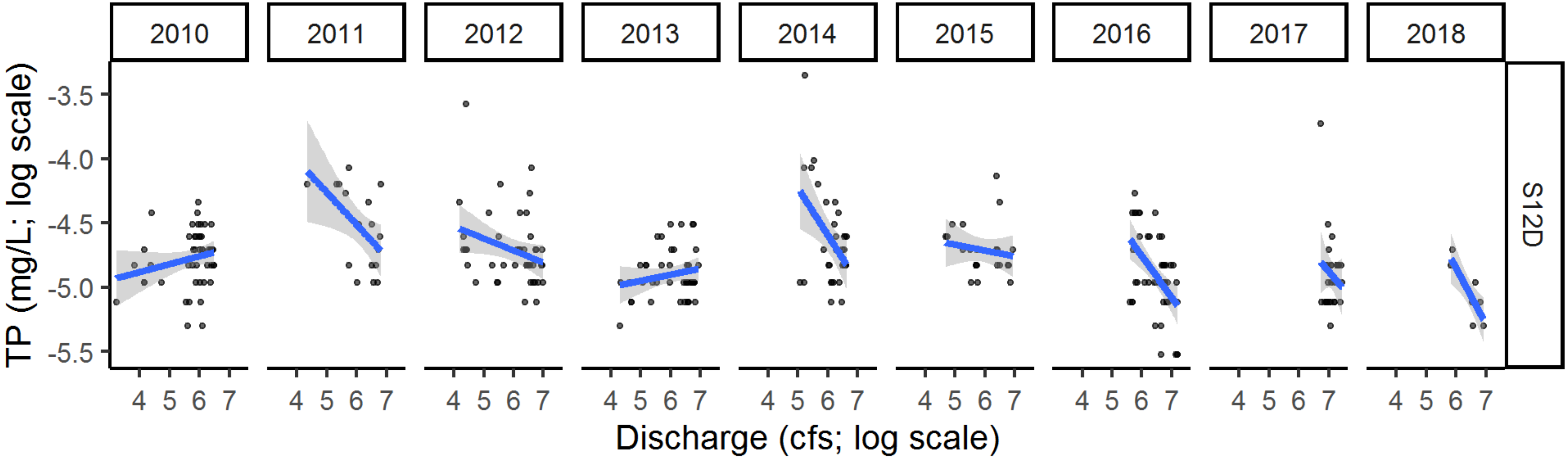
S151
S12A
S12B
S12C
S12D
S333
0 5 10 20 km
0 10 20 40 Kilometers

Why model concentrations?



Sampling events may not be representative

C-Q relationships are not uniform



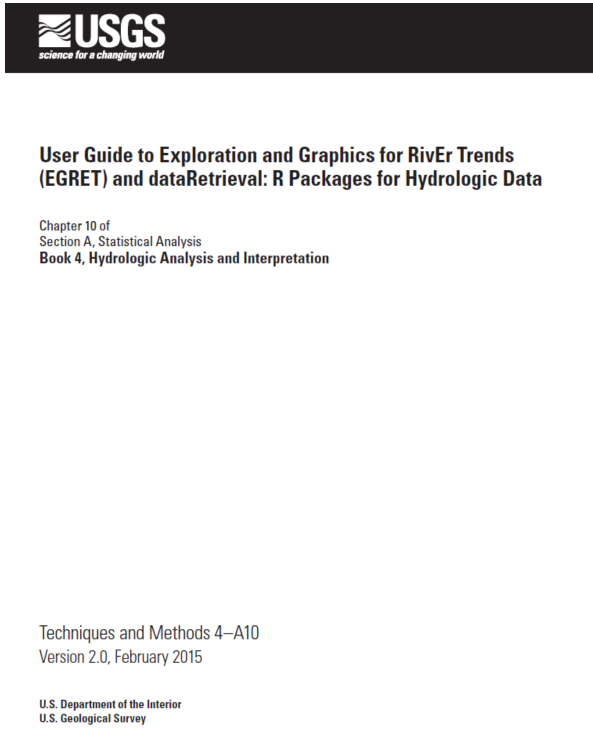
WRTDS – WTF?

- Weighted Regression on Time, Discharge, and Season (EGRET)

$$\ln(c) = \beta_0 + \beta_1 t + \beta_2 \ln(Q) + \beta_3 \sin(2\pi t) + \beta_4 \cos(2\pi t) + \varepsilon$$

- Allows time and discharge relationships to vary
- Estimates raw and flow-normalized concentrations

- What are the trends? How confident are we?
- Do trends differ by season? By discharge magnitude?


USGS
science for a changing world

User Guide to Exploration and Graphics for RivEr Trends (EGRET) and dataRetrieval: R Packages for Hydrologic Data

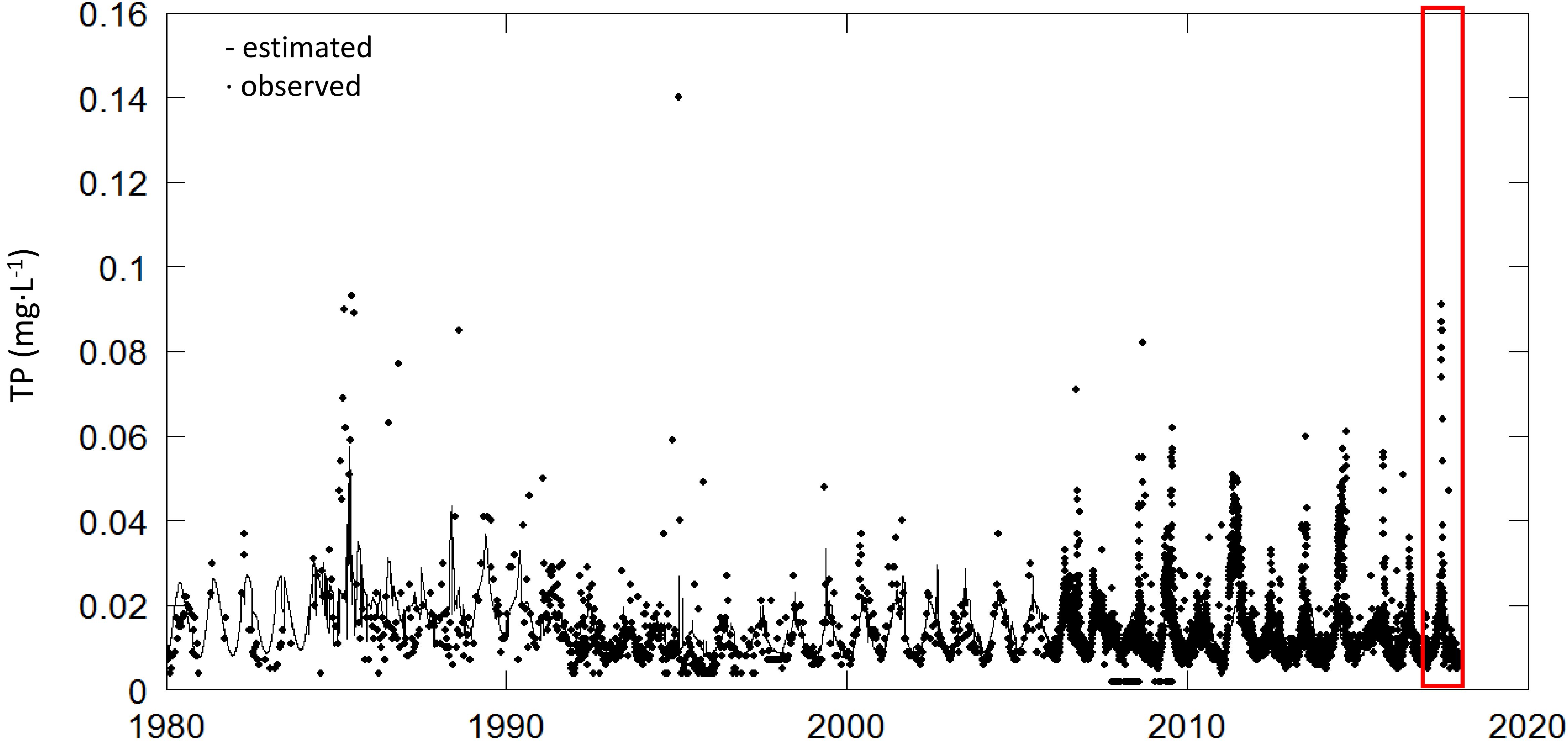
Chapter 10 of
Section A, Statistical Analysis
Book 4, Hydrologic Analysis and Interpretation

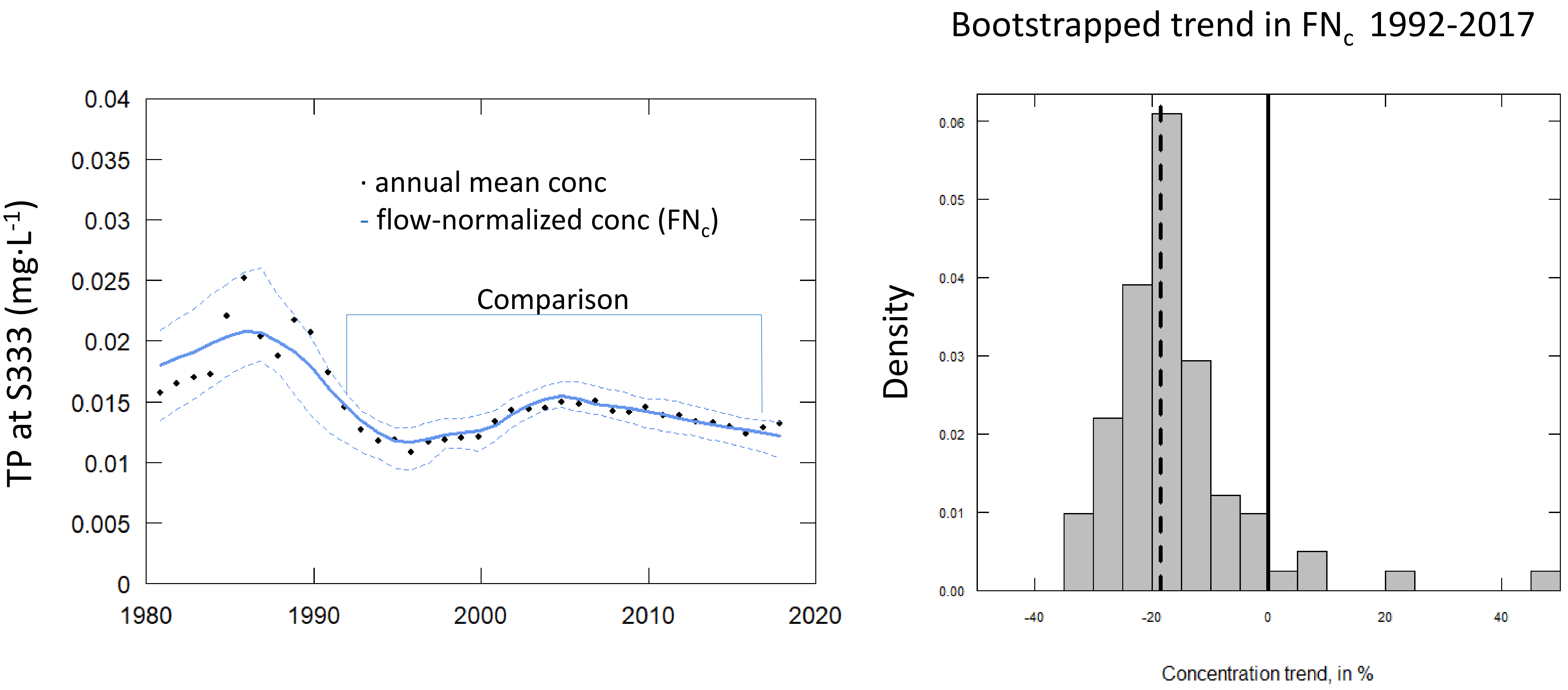
Techniques and Methods 4–A10
Version 2.0, February 2015

U.S. Department of the Interior
U.S. Geological Survey

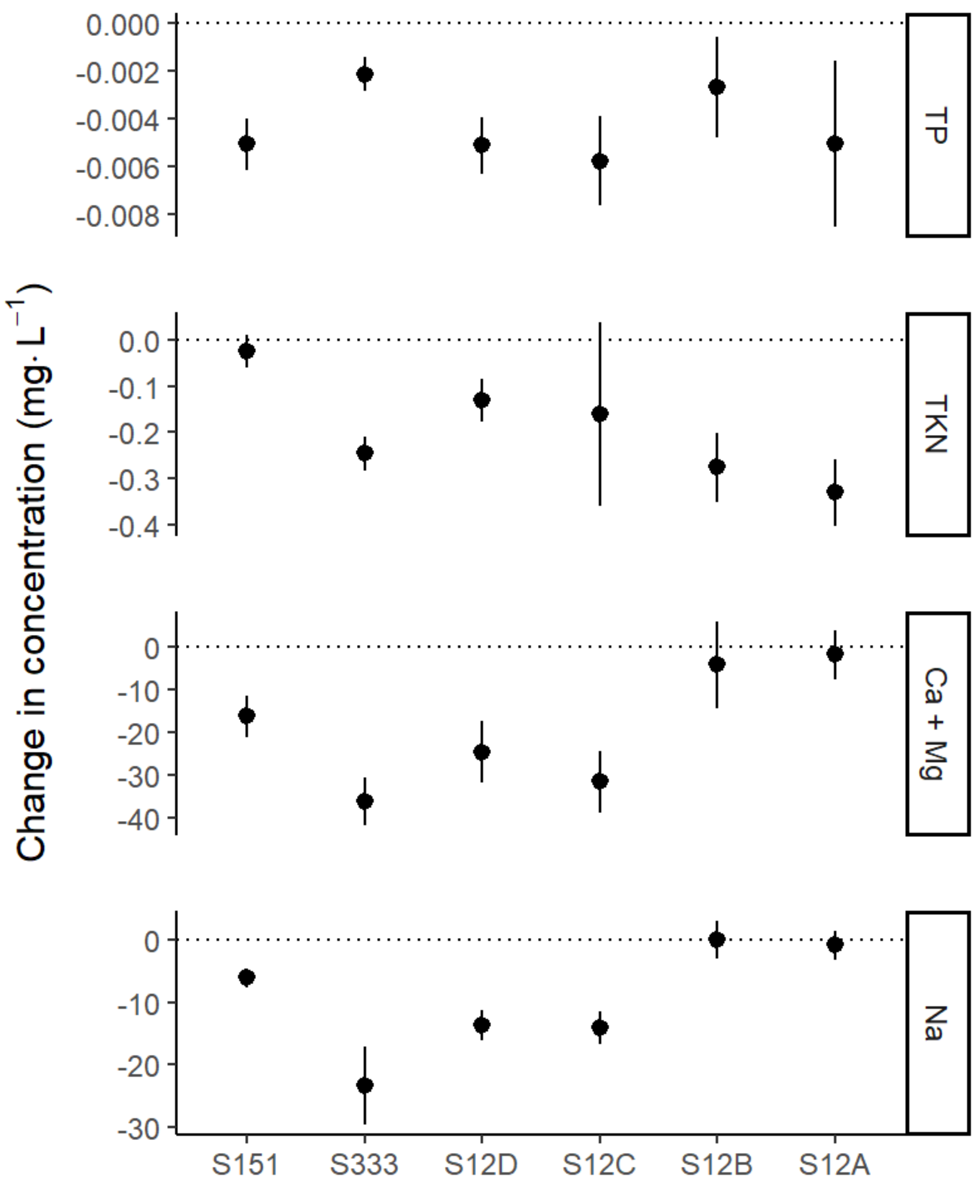
Hirsch et al. 2010; Hirsch et al. 2015

TP time series for S333

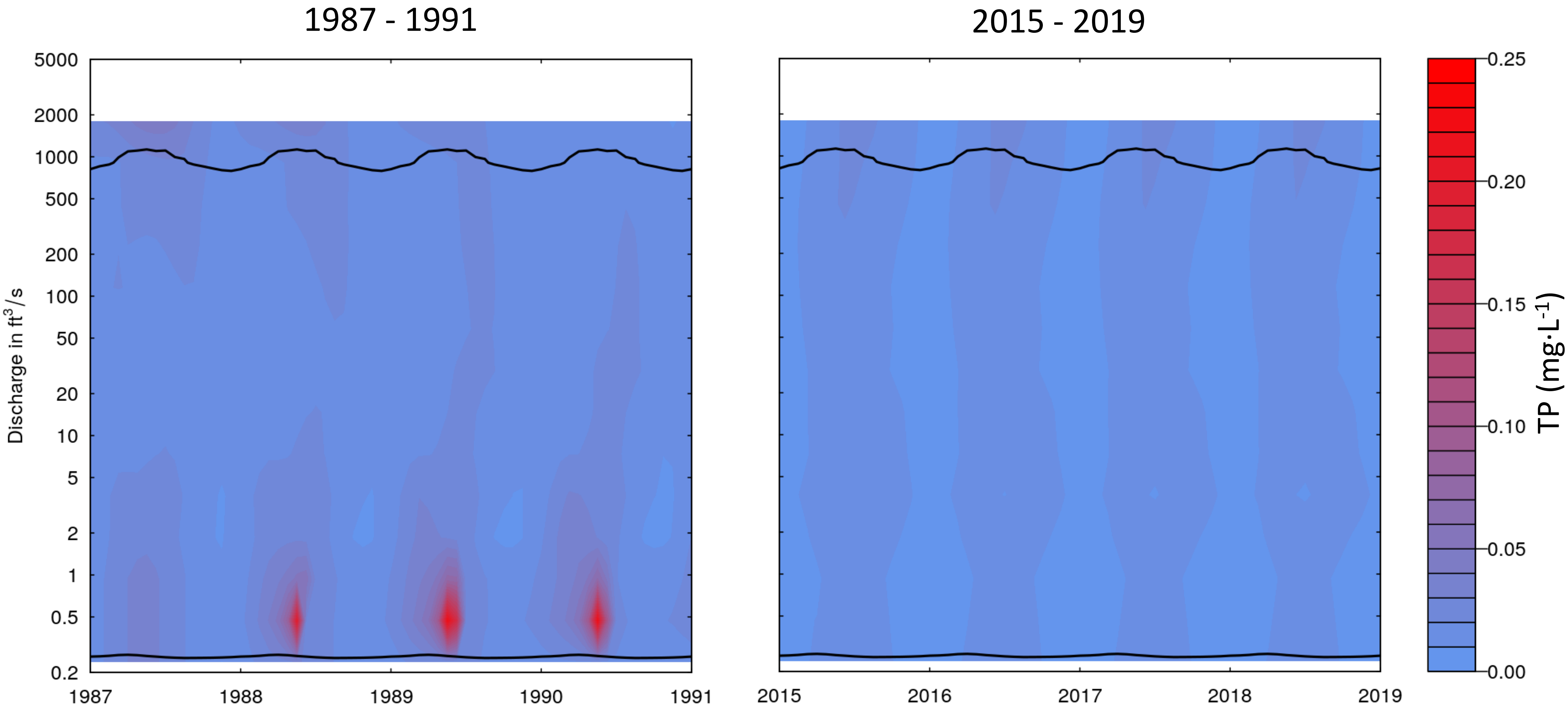



Bootstrapped trend in FNc 1992-2017
TP at S333 (mg·L-1)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1980
1990
2000
2010
2020
· annual mean conc
- flow-normalized conc (FNc)
Comparison
Density
0.06
0.05
0.04
0.03
0.02
0.01
0.00
-40
-20
0
20
40
Concentration trend, in %

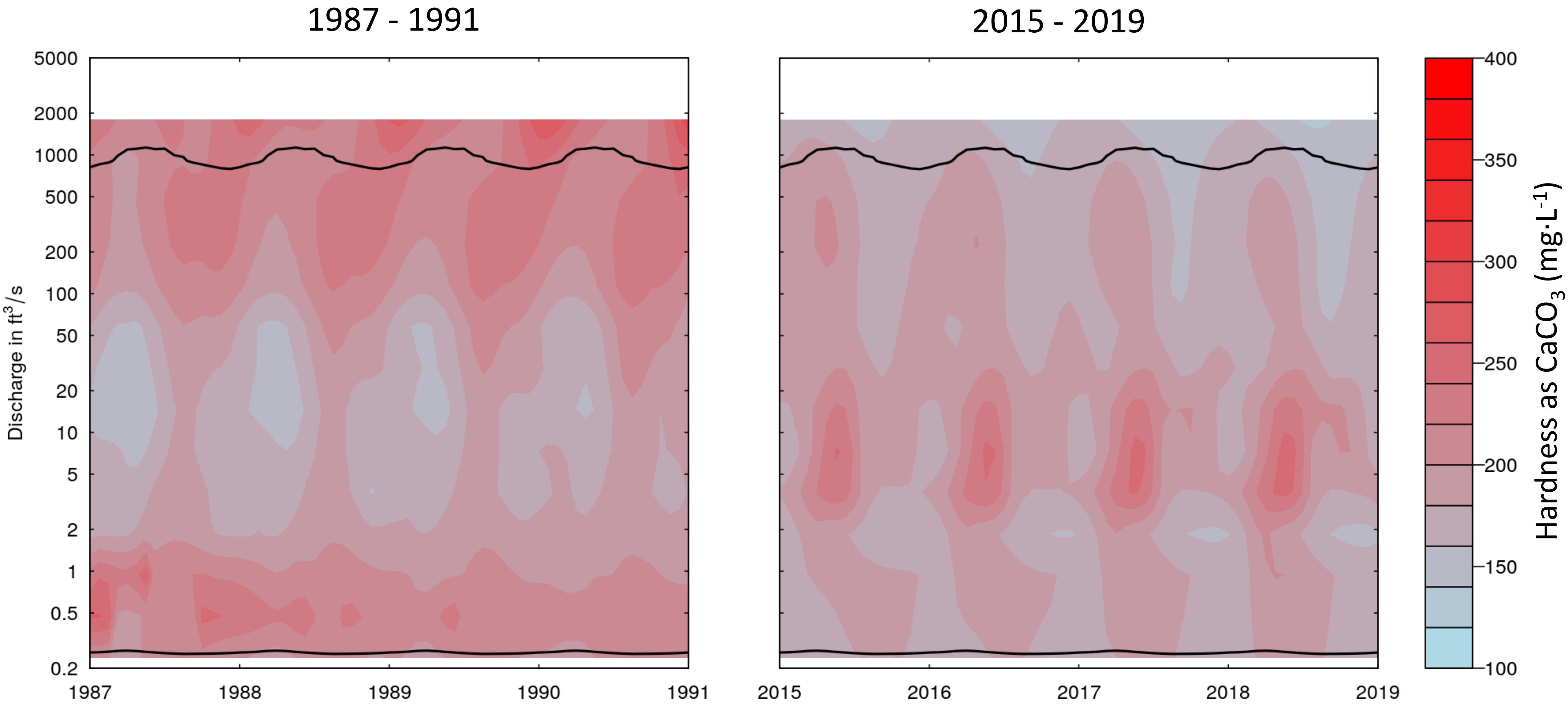
Water quality trends: 1992-2017



TP at different flows (S333)



Ca+Mg at different flows (S333)



Conclusions

- WRTDS is a promising tool
- Water quality gains more dramatic for nutrient concentrations vs. fluxes
- Concentrations of geogenic solutes are also declining – less groundwater
- Nutrient reductions more dramatic at low flows

Troy_Hill@nps.gov

DataForEver data requests: EVER_Data_Request@nps.gov

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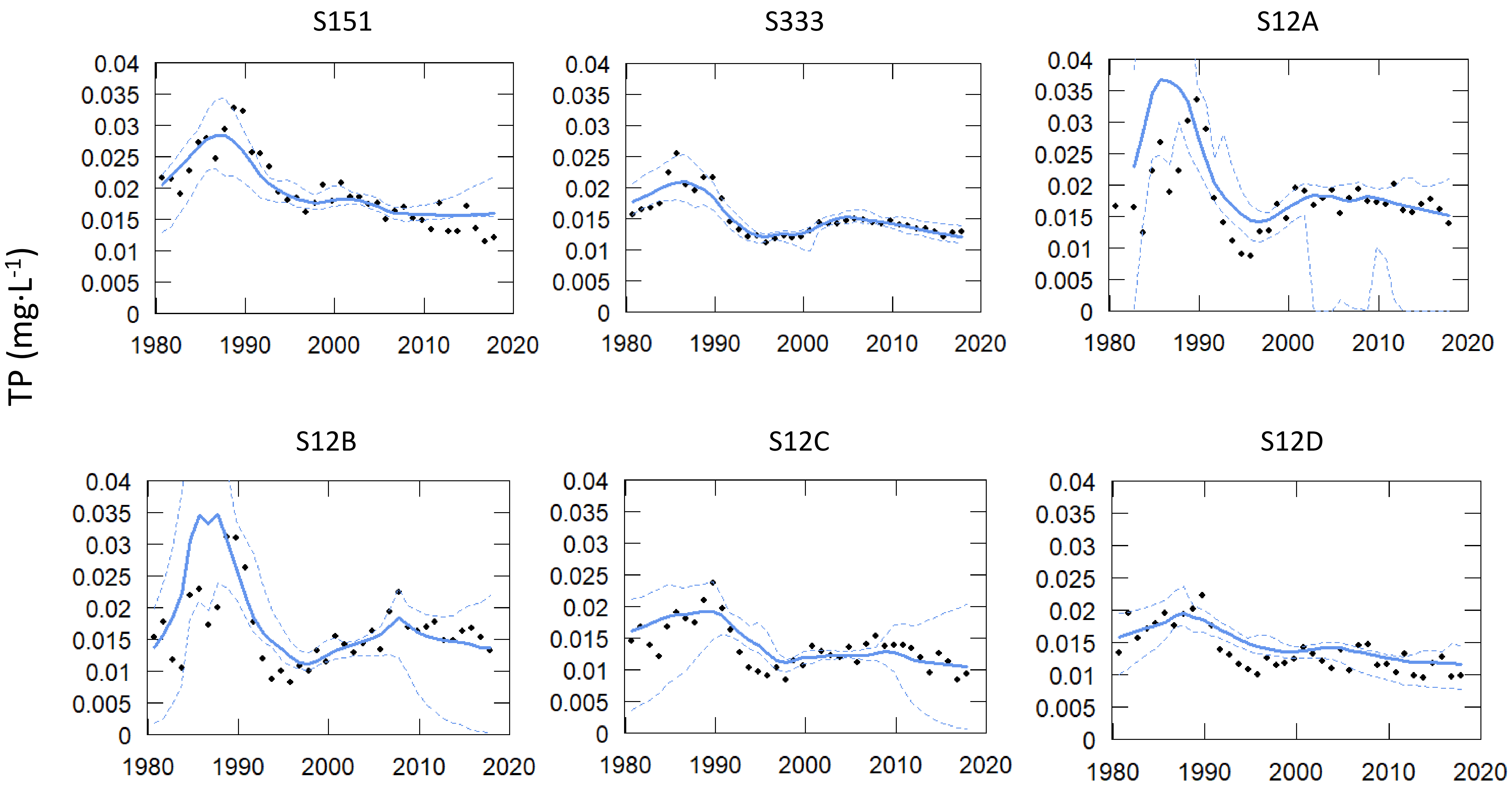

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