Diatom-based Models and Indices for Monitoring Nutrient Enrichment in New Jersey Streams

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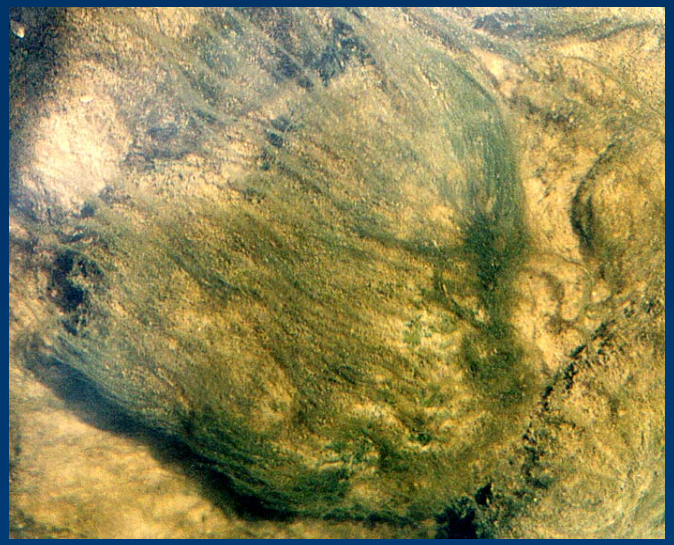
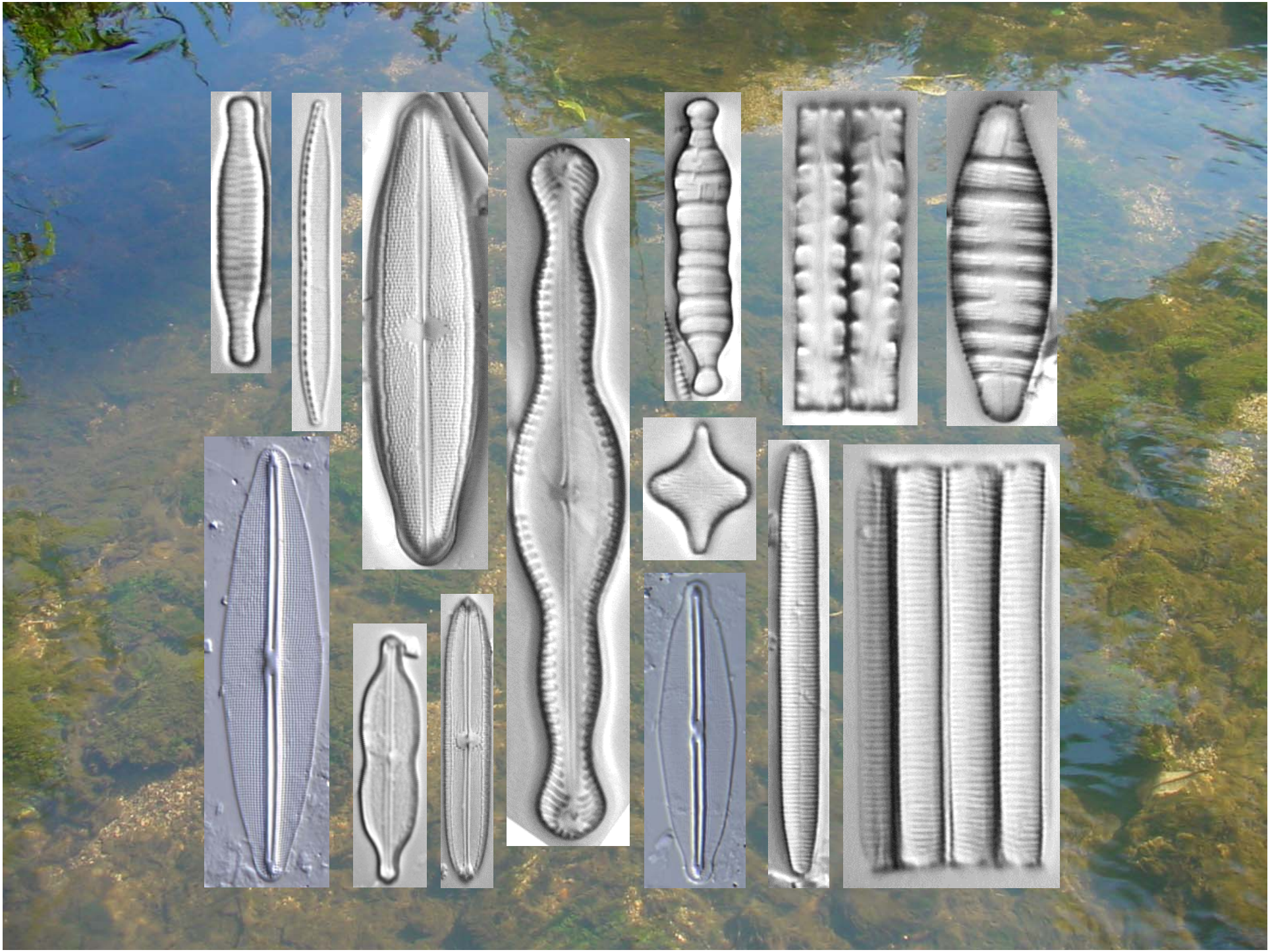
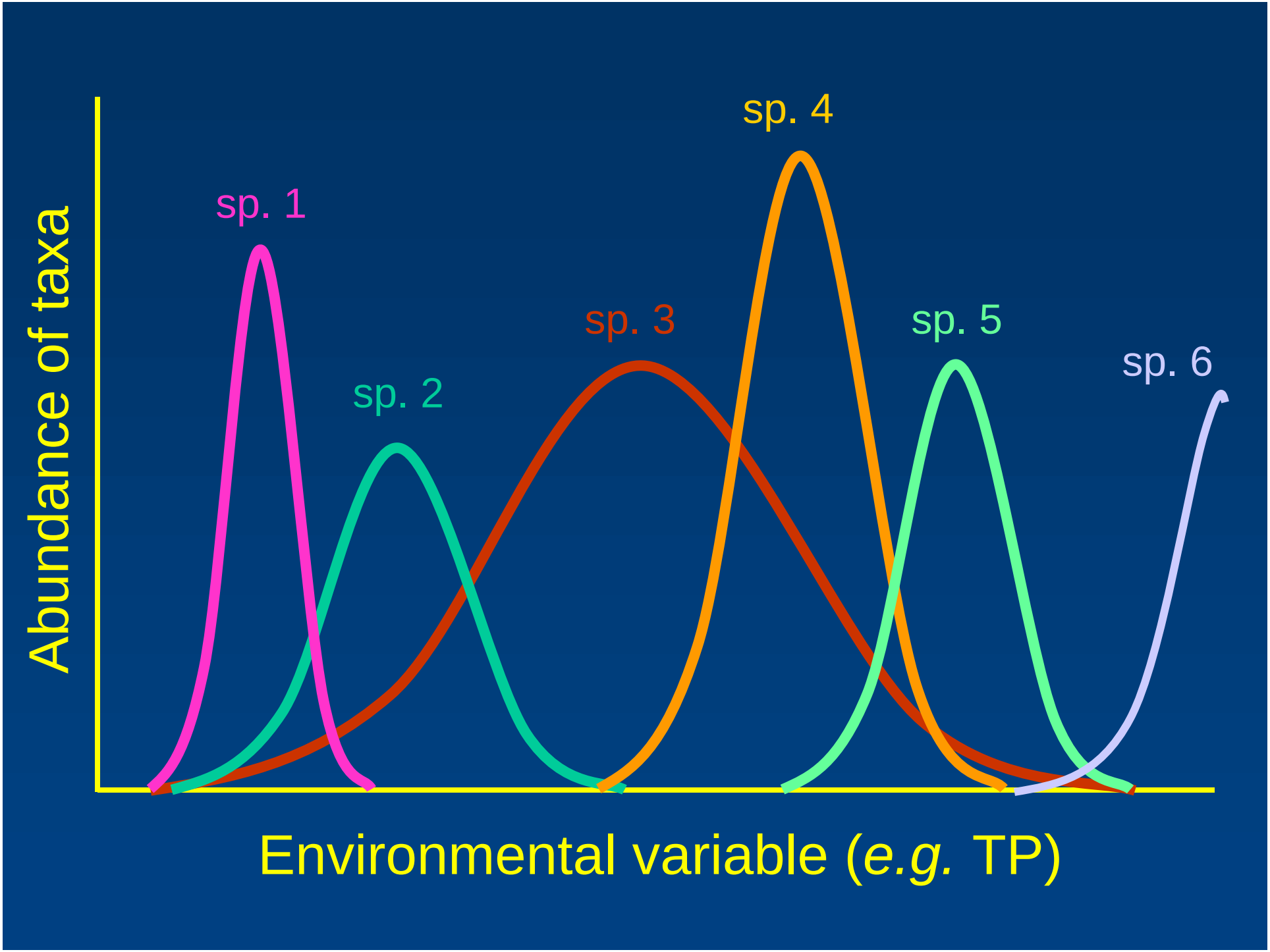
Algal indicators of nutrient conditions

New Jersey needs:

- Monitoring and regulatory tools
- Accurately characterize nutrient enrichment and biological response
  - determine impairment
  - diagnose cause of impairment
- Consistent with State nutrient criteria





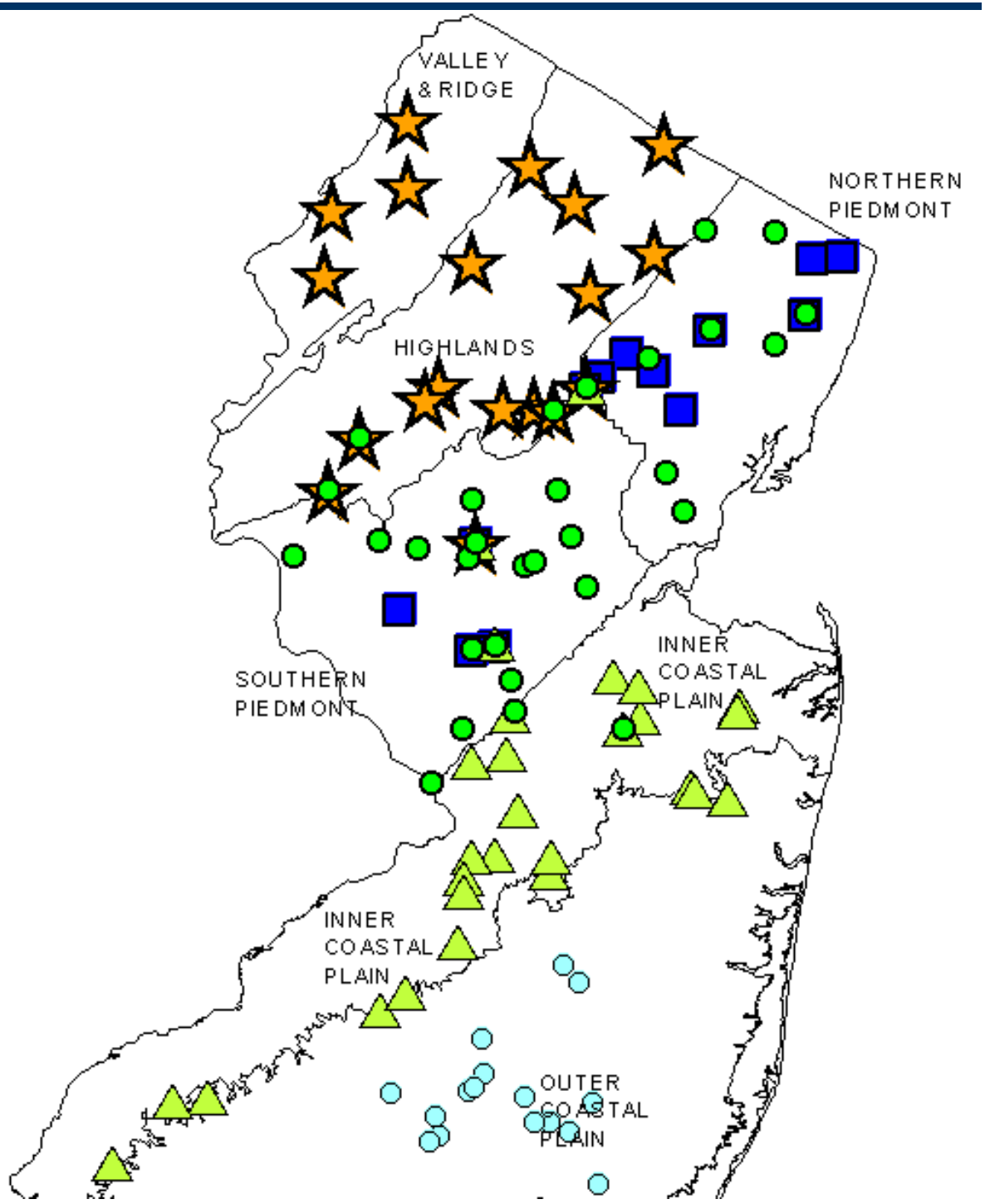

sp. 1
sp. 2
sp. 3
sp. 4
sp. 5
sp. 6
Abundance of taxa
Environmental variable (*e.g.* TP)

Study sites 2000 – 2004

Piedmont	28
Ridge & Val.	5
Highlands	12
Coastal Plain	34

total:
79 streams,

13 resampled



Study Design

- Sampling period - August - October
- Analyze diatoms, filamentous algae, biomass and water chemistry
- Quantify ecological characteristics of taxa
- Develop models and metrics
- Sample additional sites
- Test models and metrics

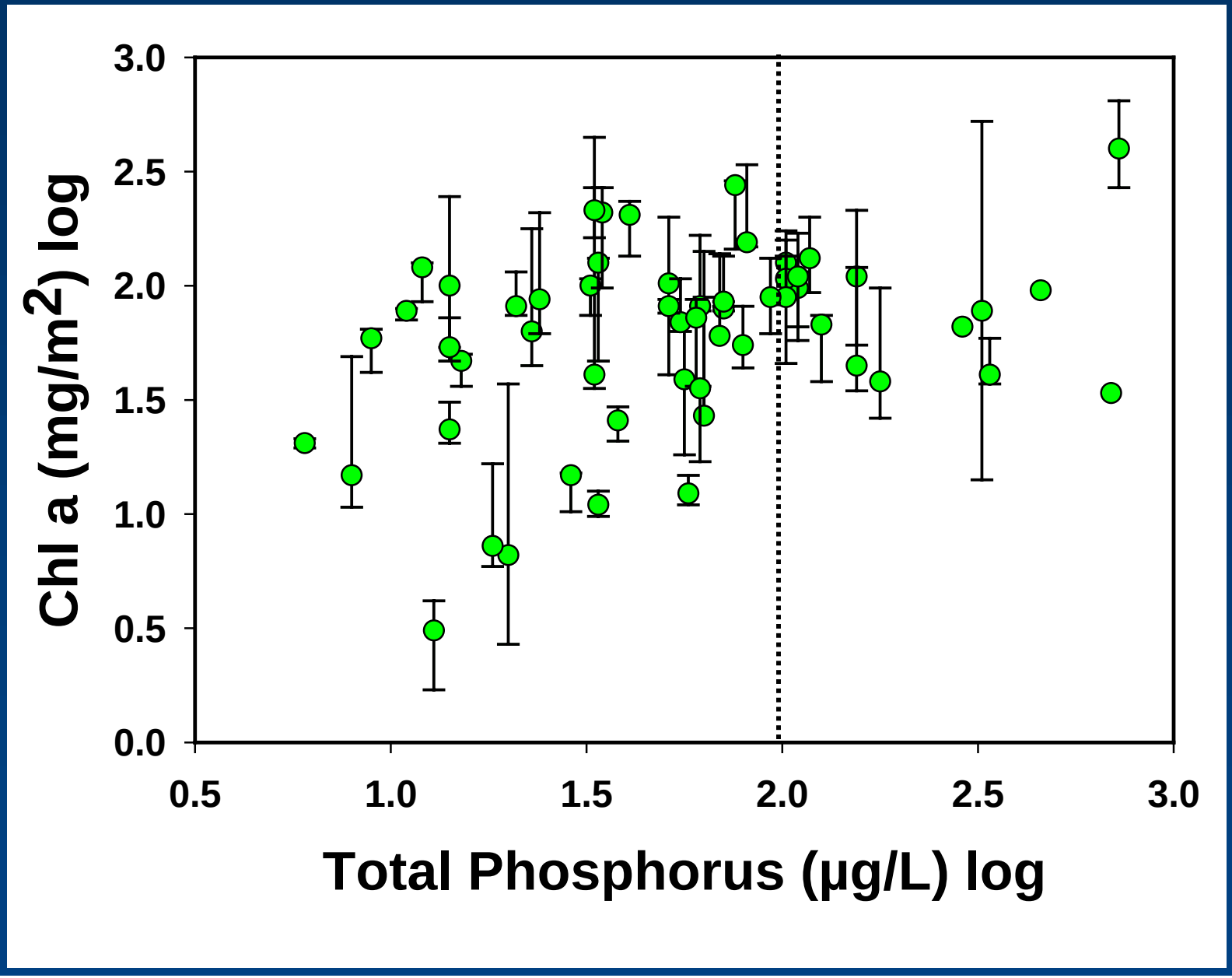
Field sampling

- Width, depth, velocity range
- Substrate, canopy cover
- Nutrients – several forms of N and P
- Composite algal sample for chl *a*, AFDM, and filamentous algae taxa
- Composite sample for diatom analysis
- Visual estimate of algal abundance along transects
- Sample 3 stream Sections first year

Northern NJ
Sample substrate : rocks
Karin
Ponader

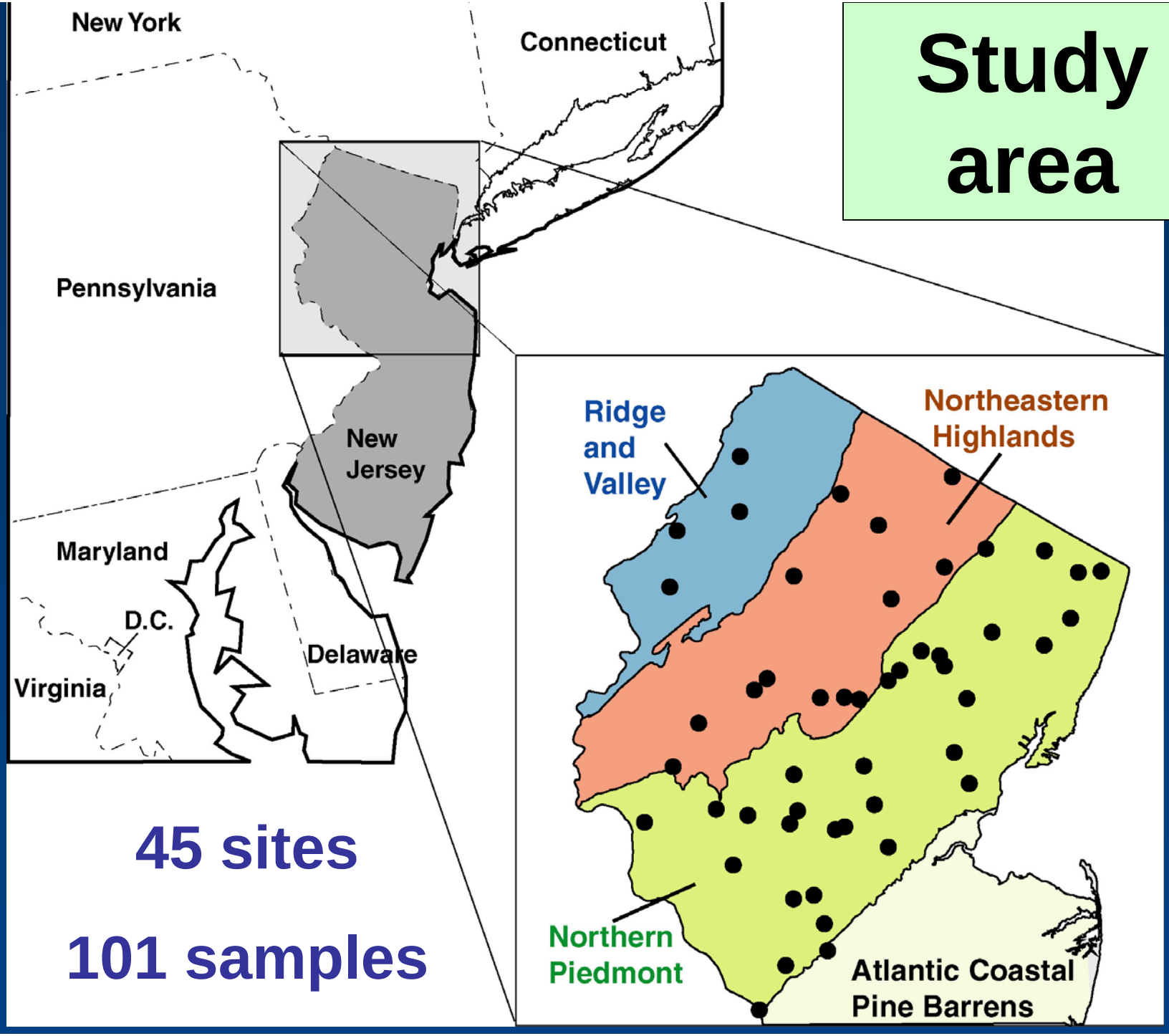
Southern New Jersey
Sampling Substrate:
Diatometer and
Sand / silt

TP versus Chl *a* – North. NJ



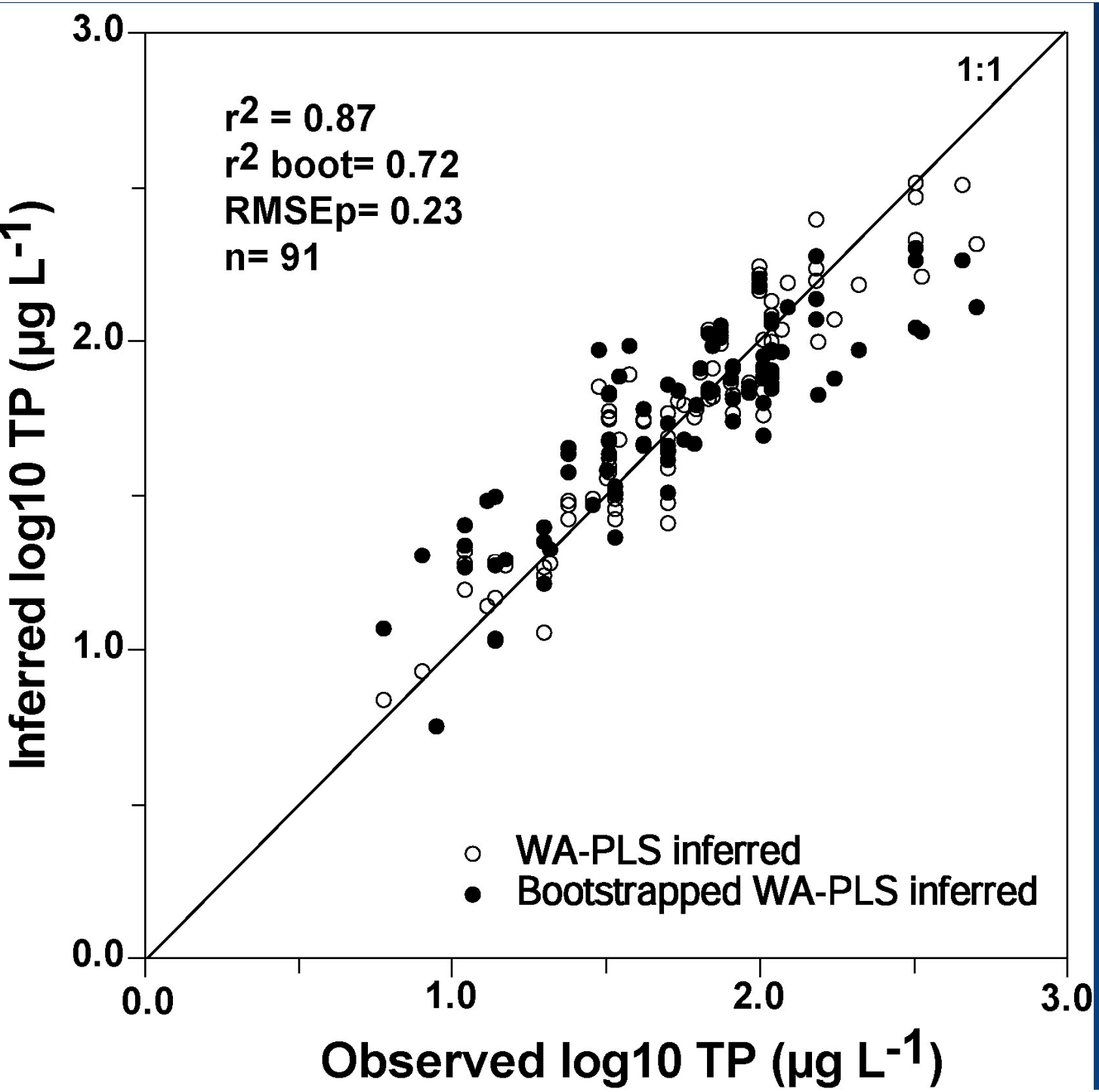
EPA Rapid Bioassessment
Visual Assessment of algal biomas
- Thickness
- Percent cover
- Length of filaments

Study area



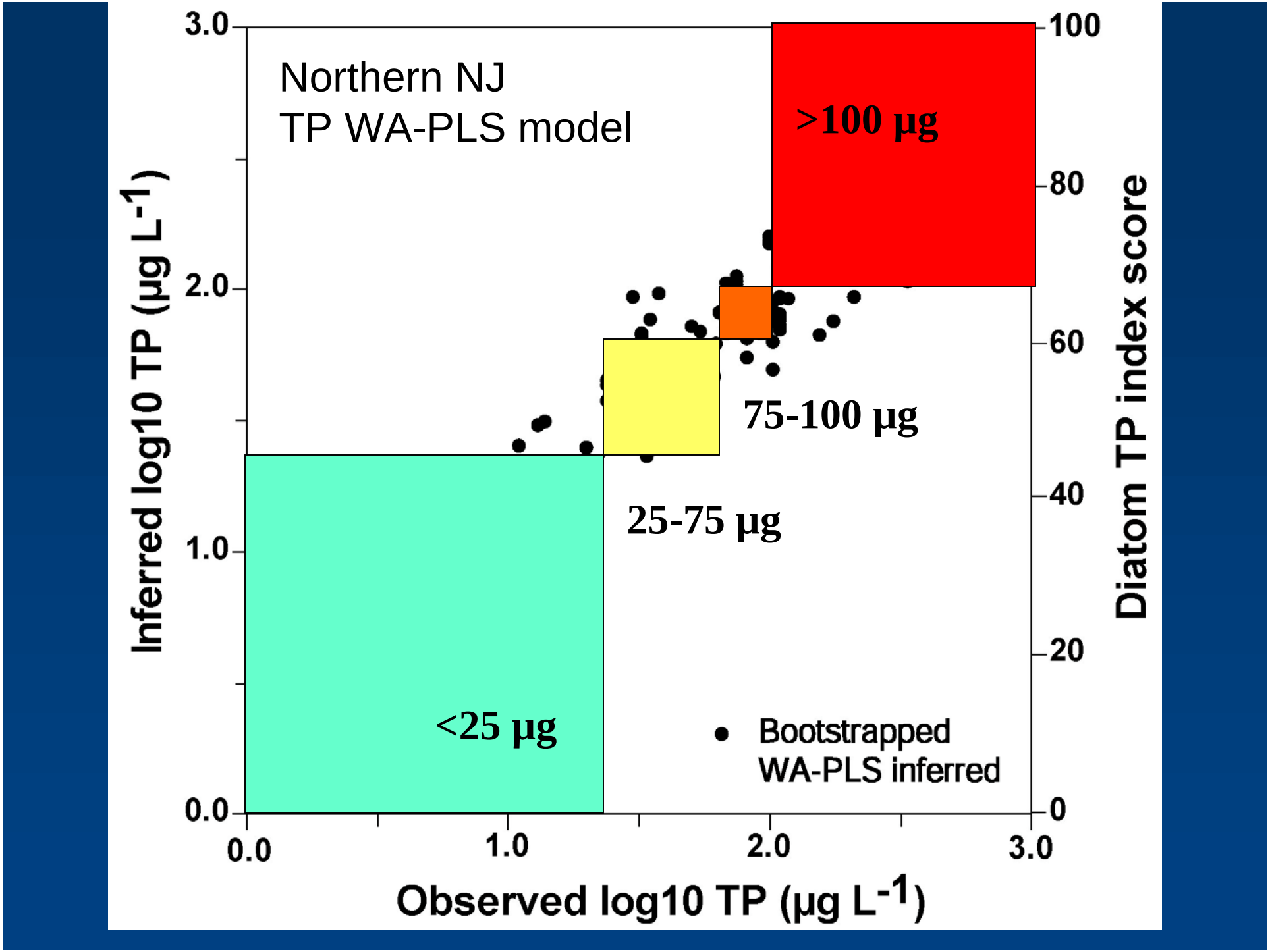
45 sites

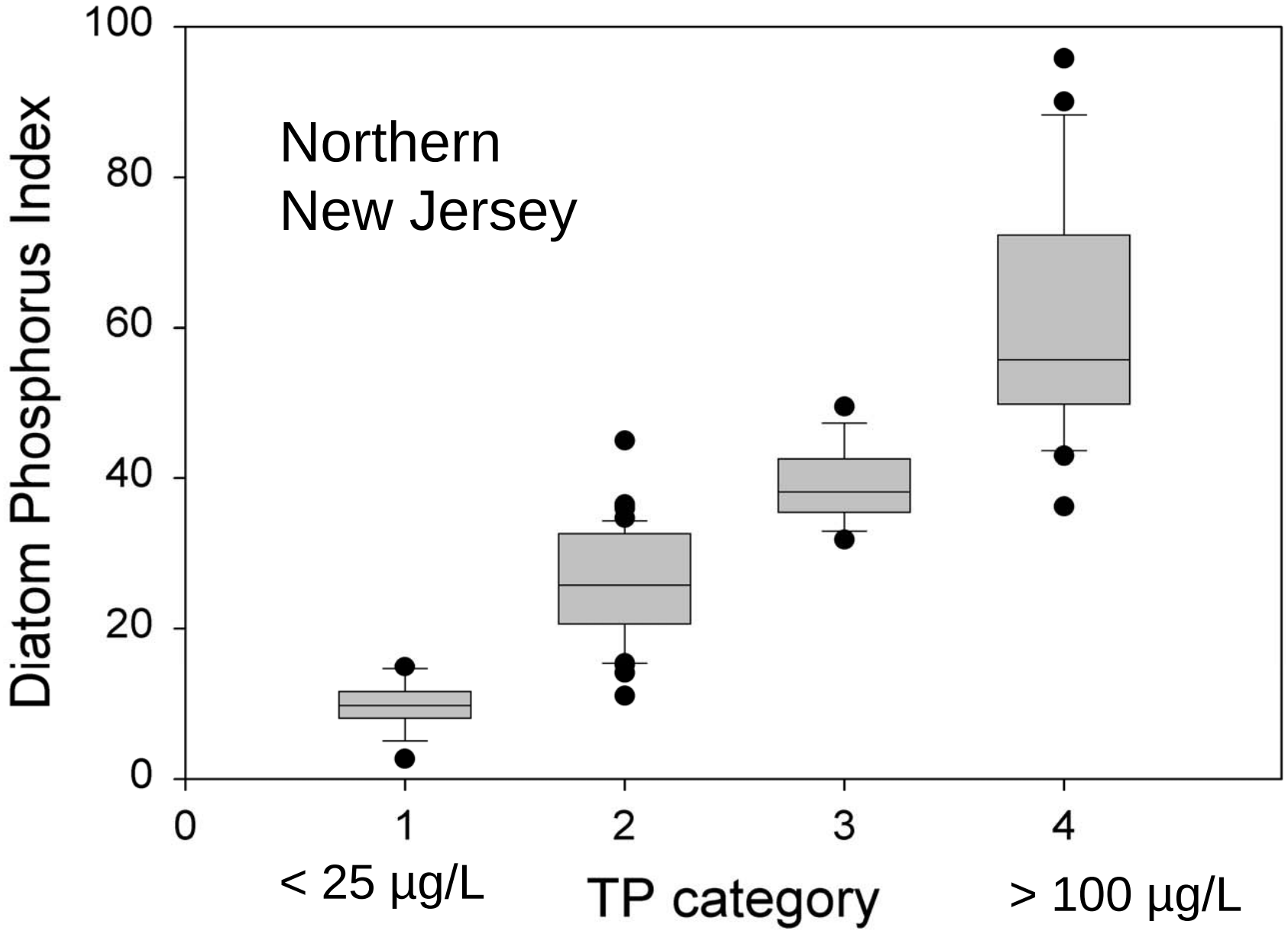
101 samples

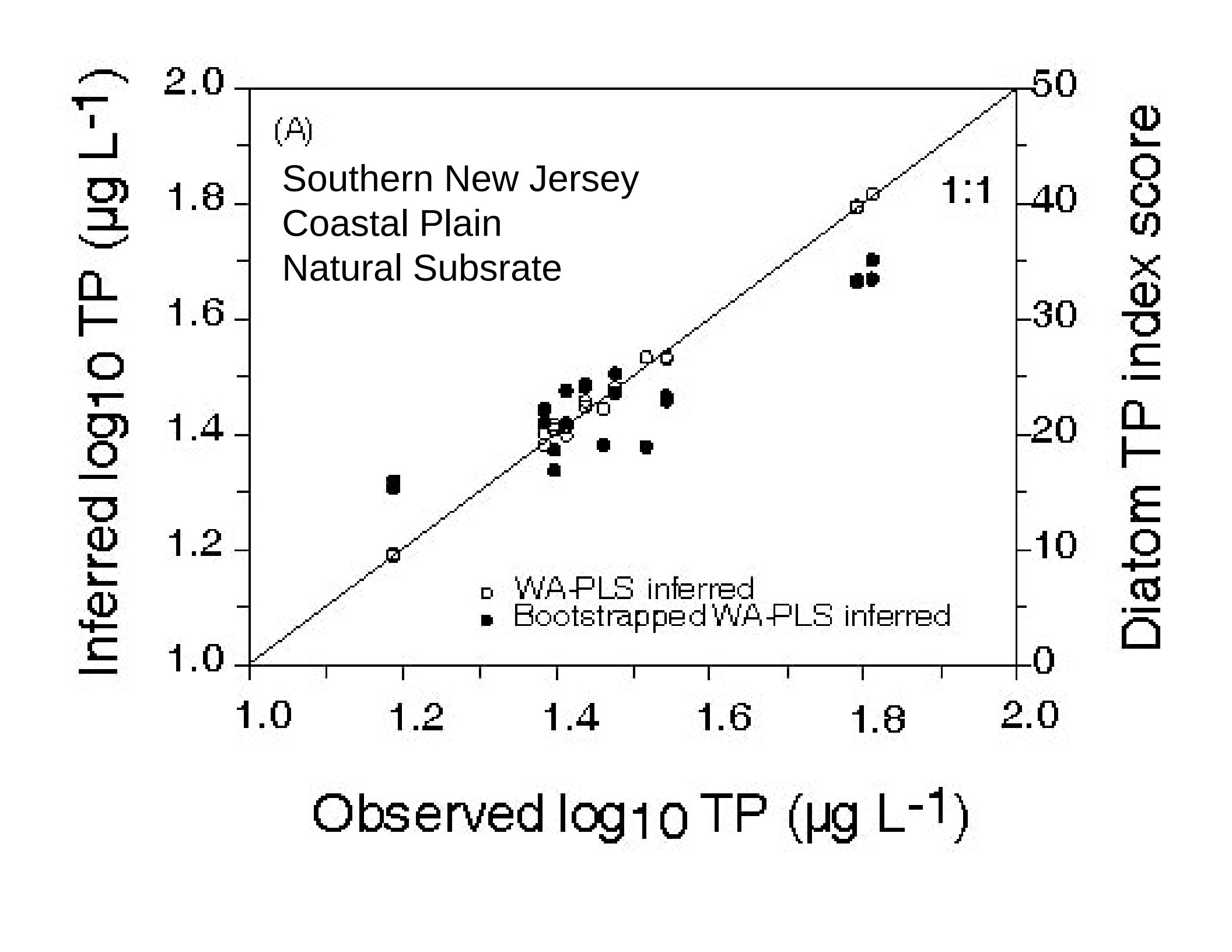


New Jersey Diatom TP Inference model

Weighted Average-Partial Least Squares WA-PLS


Northern NJ
TP WA-PLS model
>100 µg
75-100 µg
25-75 µg
<25 µg
Bootstrapped
WA-PLS inferred
Inferred log10 TP (µg L-1)
Observed log10 TP (µg L-1)
Diatom TP index score
3.0
2.0
1.0
0.0
100
80
60
40
20
0
0.0
1.0
2.0
3.0


Northern
New Jersey
Diatom Phosphorus Index
100
80
60
40
20
0
0
1
2
3
4
< 25 µg/L
TP category
> 100 µg/L


(A)
Southern New Jersey
Coastal Plain
Natural Subsrate
1:1
WA-PLS inferred
Bootstrapped WA-PLS inferred
Inferred log10 TP (µg L-1)
Observed log10 TP (µg L-1)
Diatom TP index score
2.0
1.8
1.6
1.4
1.2
1.0
50
40
30
20
10
0
1.0
1.2
1.4
1.6
1.8
2.0

Conclusions

- Diatom nutrient indicators of are ready to use in NJ monitoring and regulatory programs
- Available for all ecoregions
- Protocol manual and diatom taxonomic guide prepared
- Indicators and applications will be improved and refined with use

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