A Nutrient Biotic Index (NBI) for Use with Benthic Macroinvertebrate Communities

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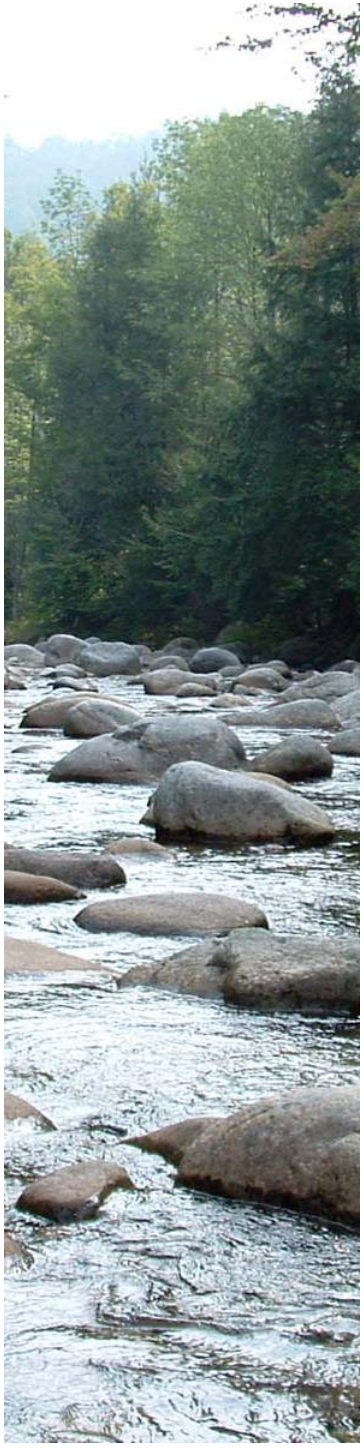
NYS DEC Stream Biomonitoring

Outline

- Development of the NBI
  - Deriving Nutrient Optima
  - Creating Scale of Eutrophication
  - Impairment Thresholds
  - Brief Comparison w/Diatoms

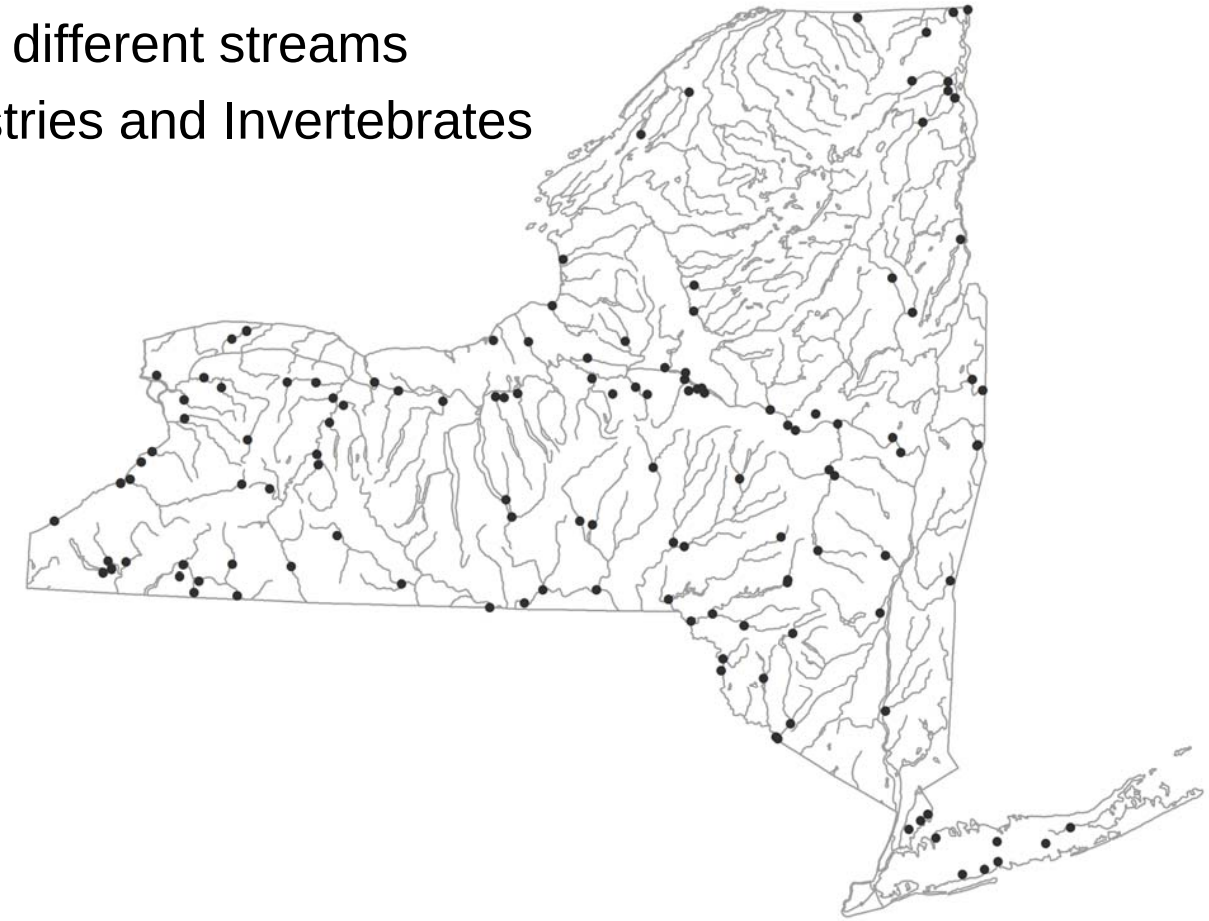
Nutrient Biotic Index

- Question
  - How can we estimate the degree of enrichment?
- Nutrient Biotic Index
  - Linear Scale of Eutrophication
    - Oligotrophic → Eutrophic
- Importance
  - Assist in reporting
  - Assist in site prioritizing
  - Nutrient criteria



Nutrient Biotic Index

- 1993 - 2002
- 185 different sampling events
  - 129 different Locations
  - On 116 different streams
  - Chemistries and Invertebrates



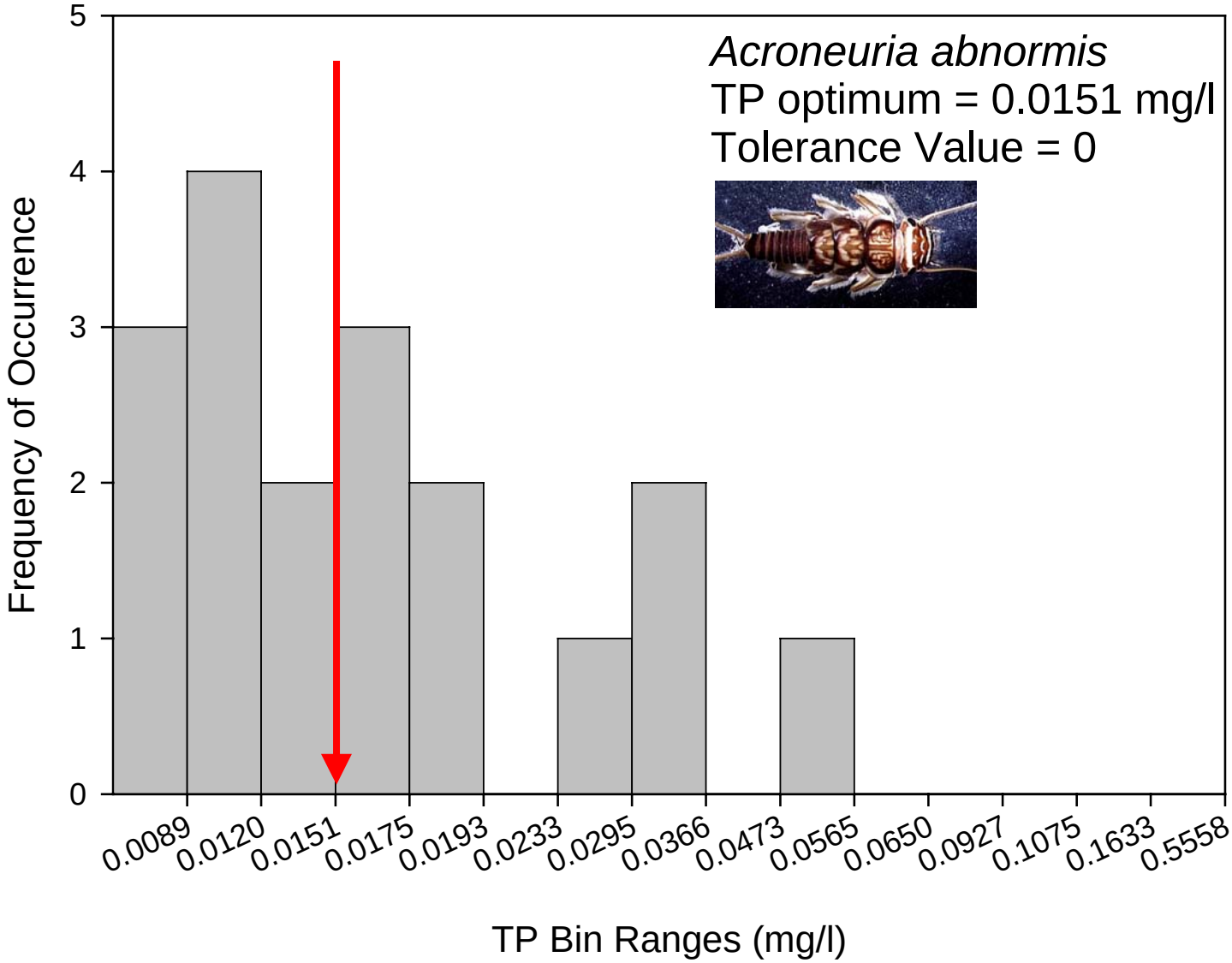
Nutrient Biotic Index

- Chemistries were averaged
  - Within 90 days prior to invertebrate sampling date
  - Split NO_3^- and TP values into Bins (ranges)
    - 15 bins
    - Between 11 and 14 sites in each

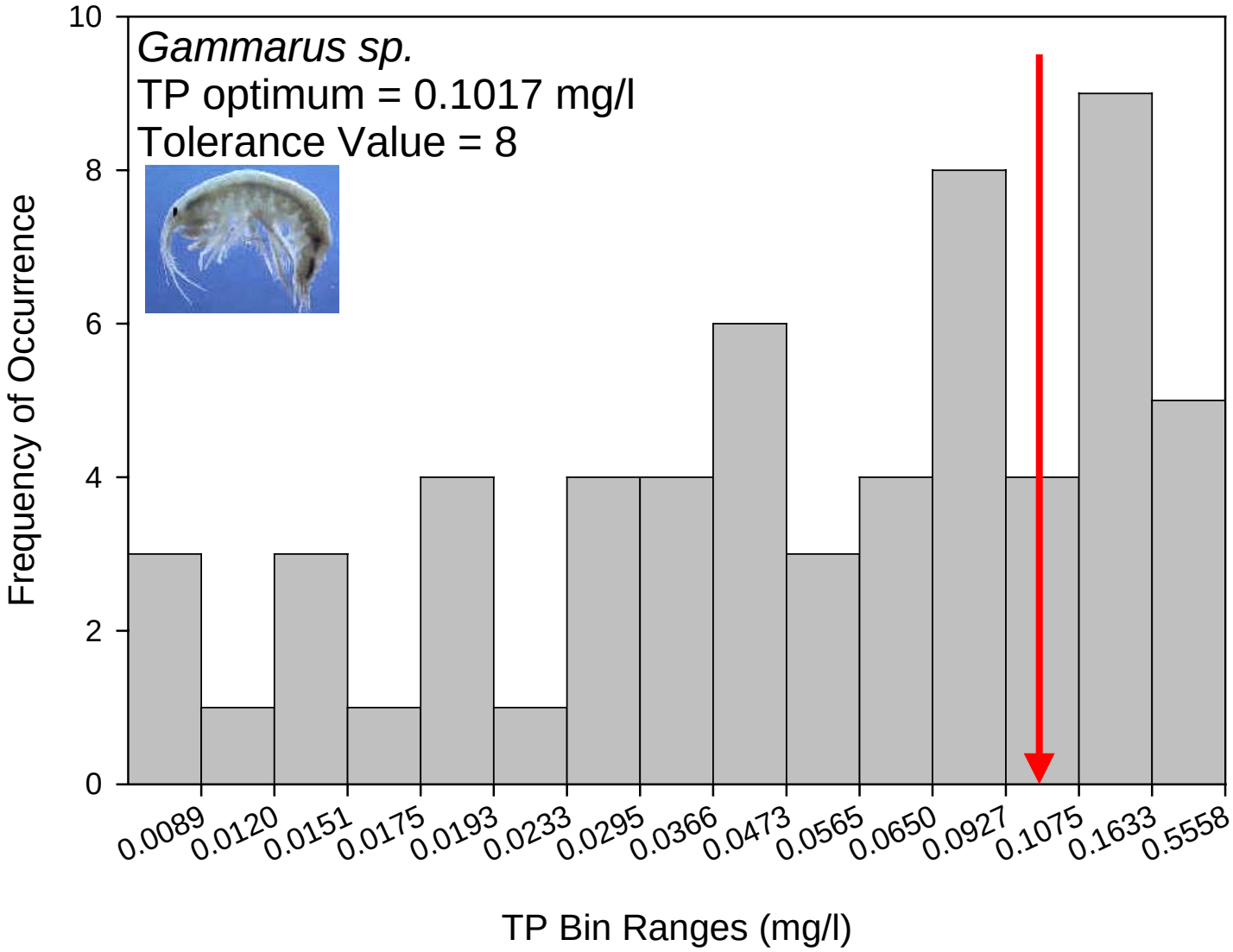
Nutrient Biotic Index

- Weighted Averaging used the proportion of times a taxon was present w/in bins
  - Established nutrient optima
    - Basis for tolerance values
- Site Index scores are calculated using tolerance values

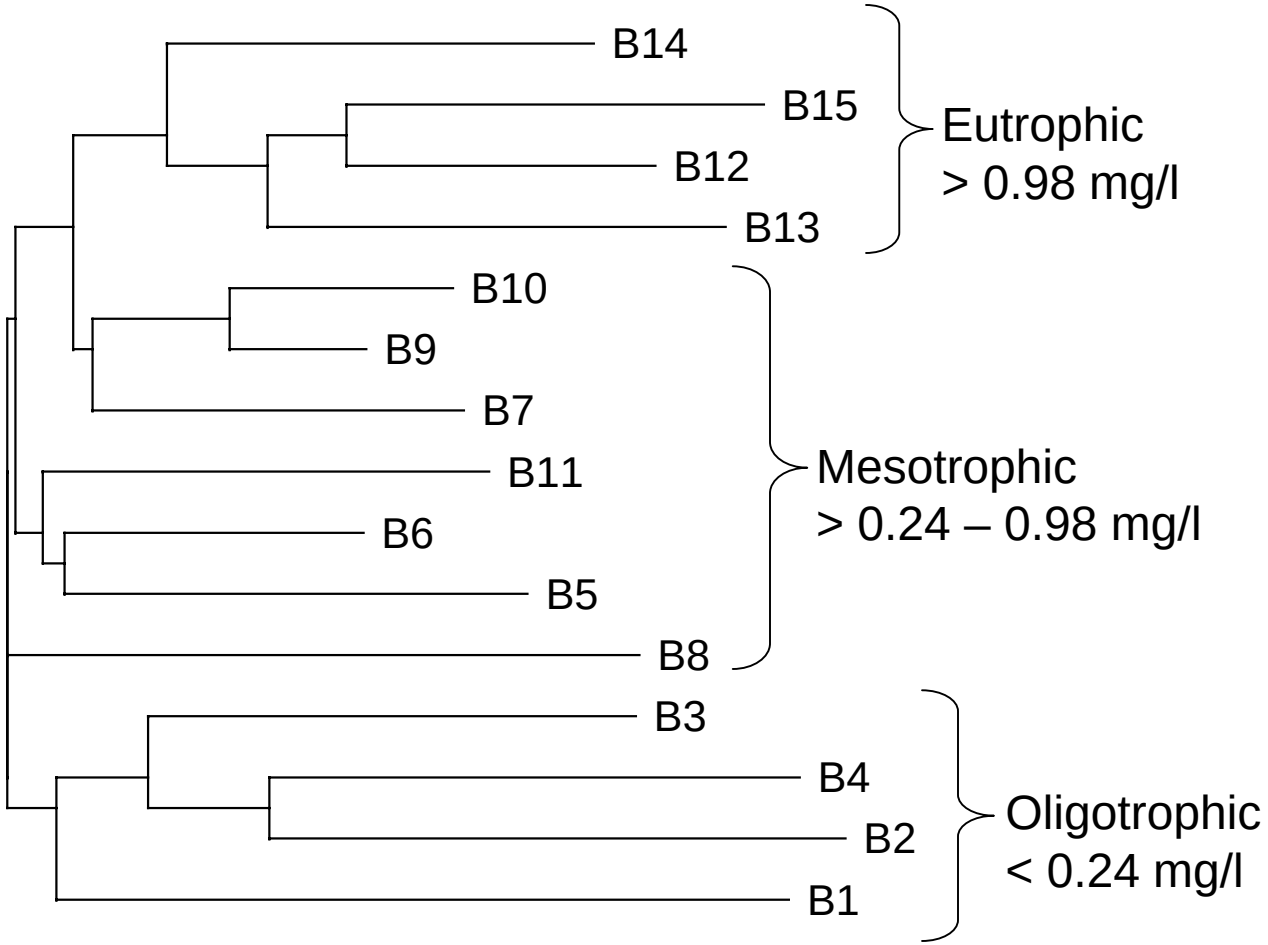
Nutrient Biotic Index



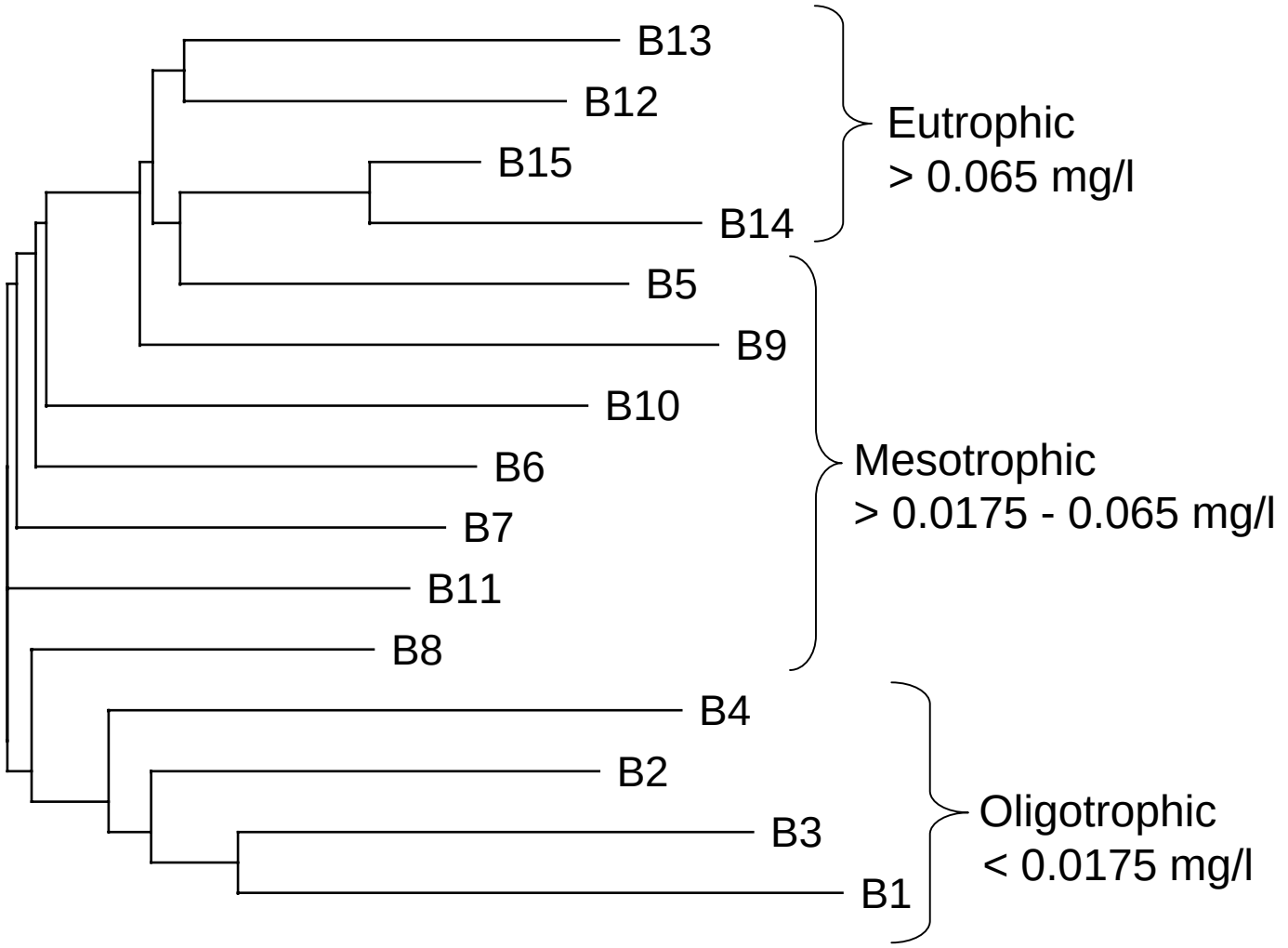
Nutrient Biotic Index



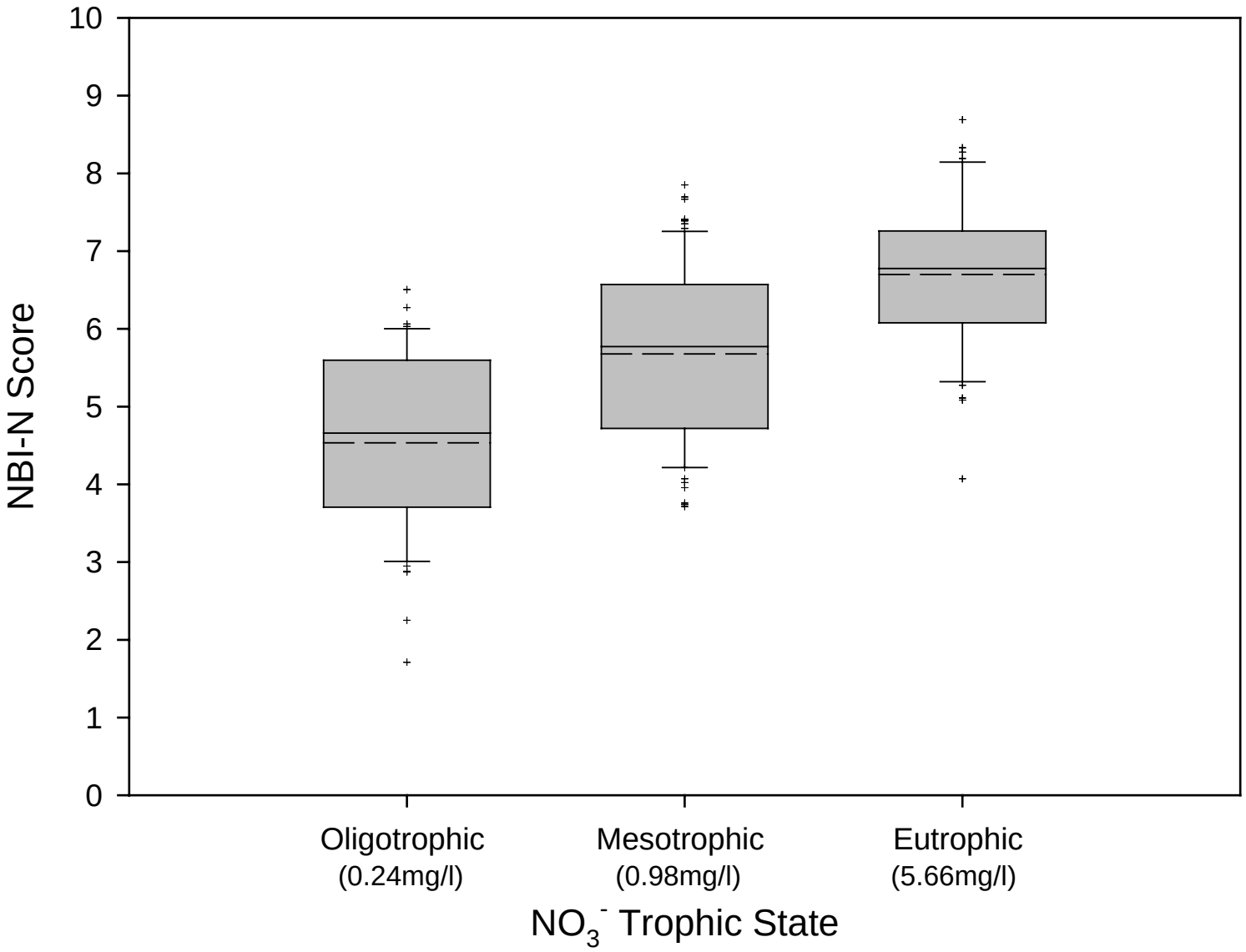
Additive tree cluster of Nitrate bins based on mean pair-wise Bray-Curtis similarity



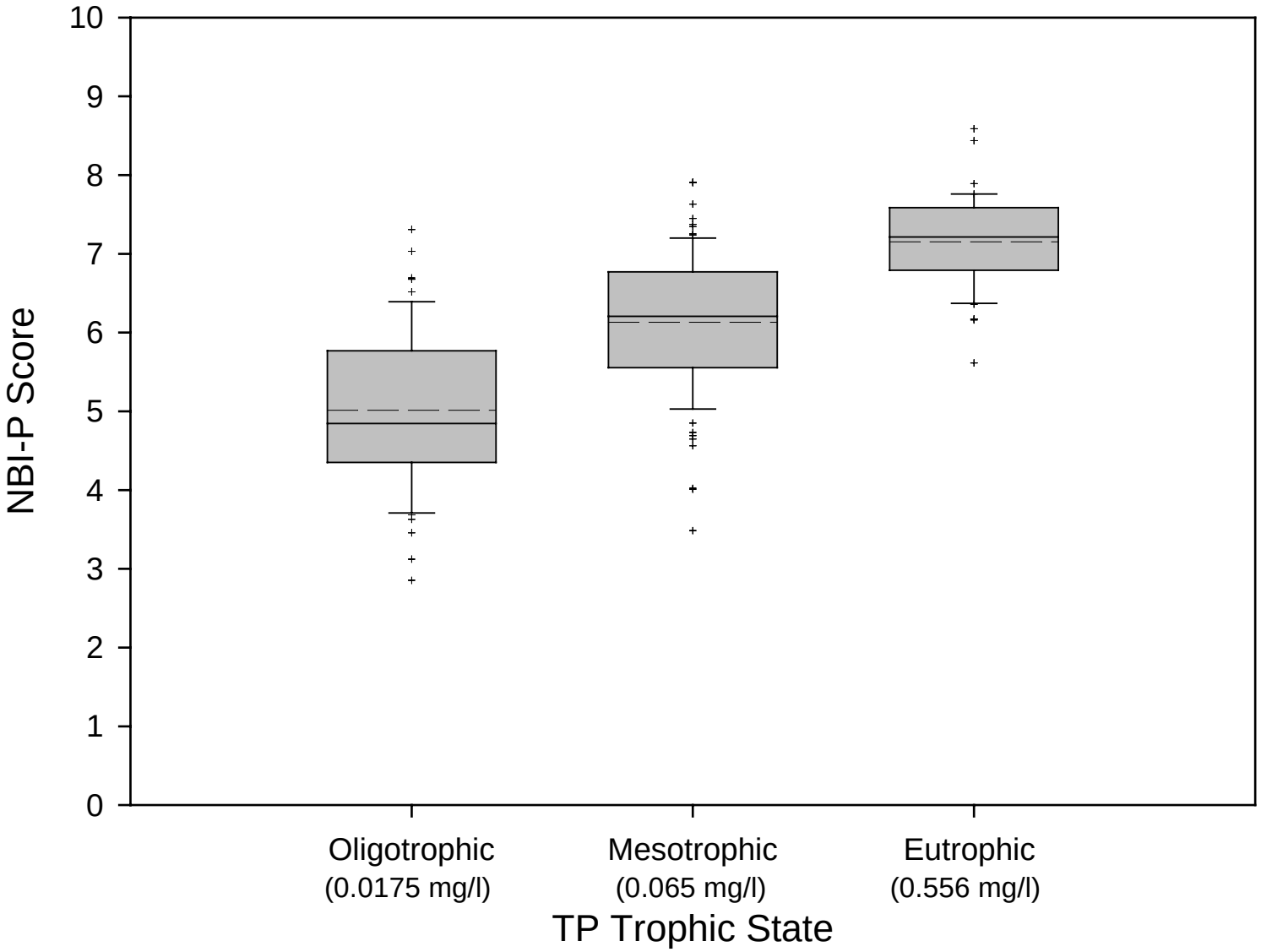
Additive tree cluster of Total P bins based on mean pair-wise Bray-Curtis similarity



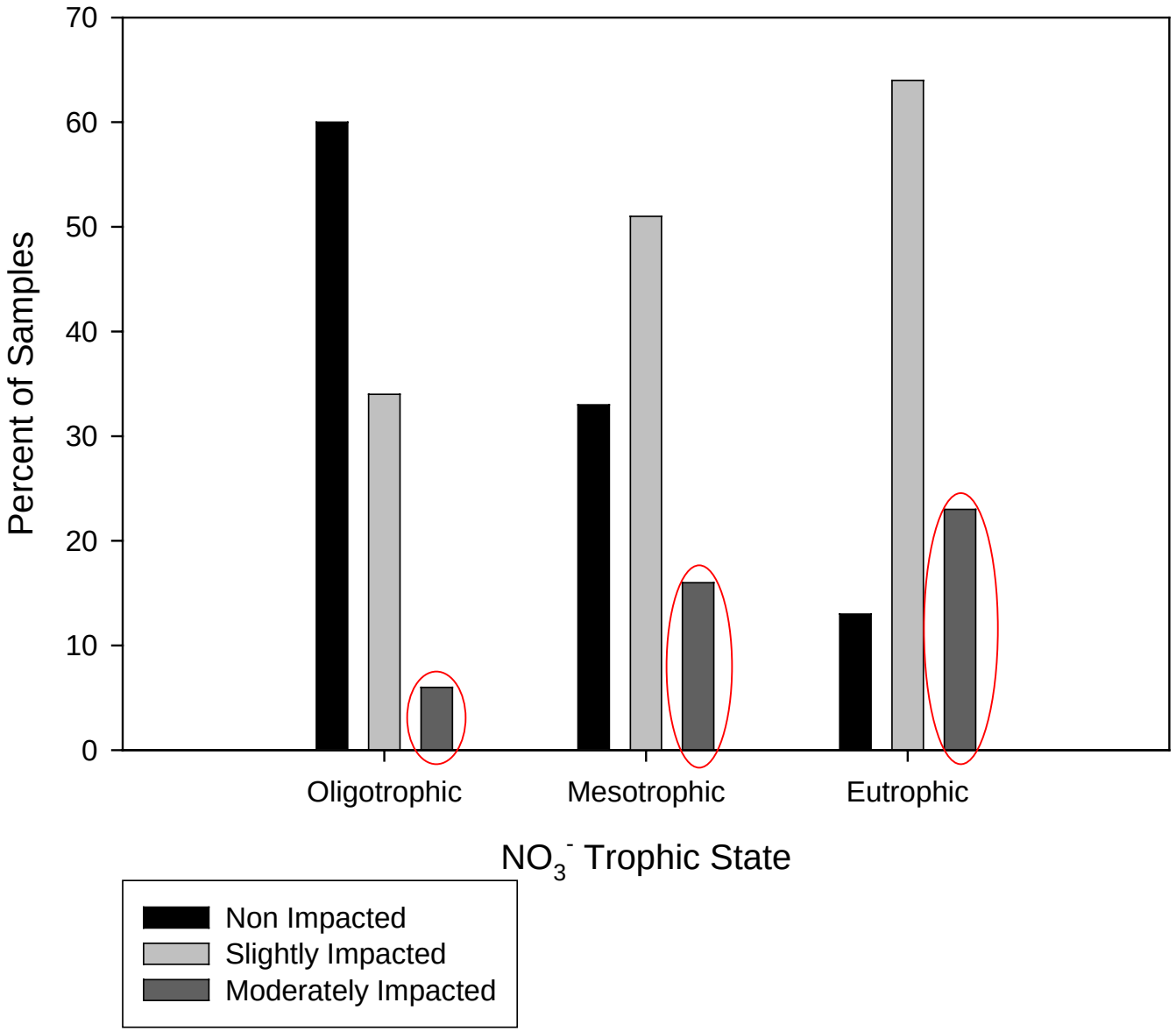
NBI-N and Nitrate



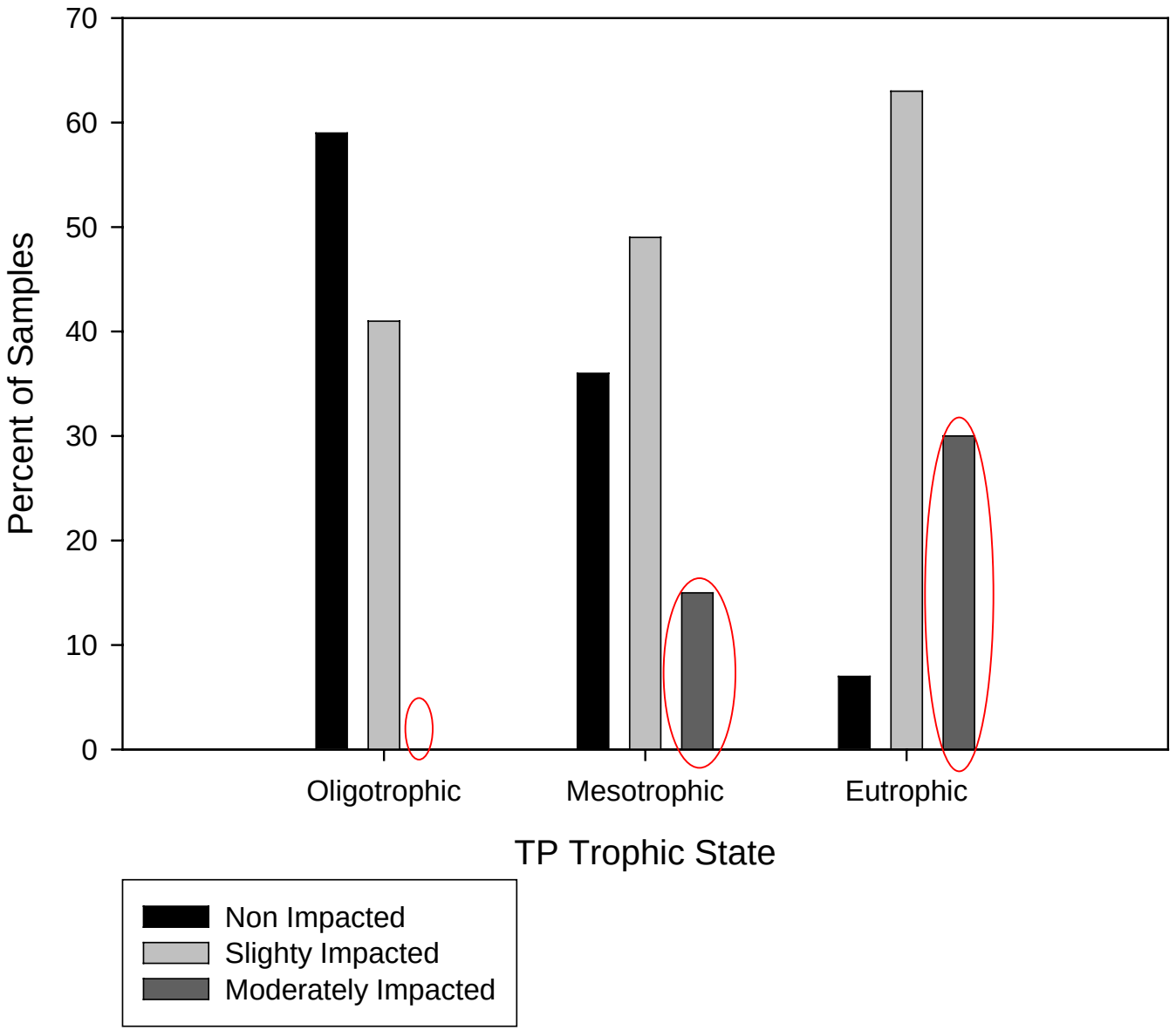
NBI-P and TP


NBI-P Score
10
9
8
7
6
5
4
3
2
1
0
Oligotrophic
(0.0175 mg/l)
Mesotrophic
(0.065 mg/l)
Eutrophic
(0.556 mg/l)
TP Trophic State

Water Quality - Nitrate



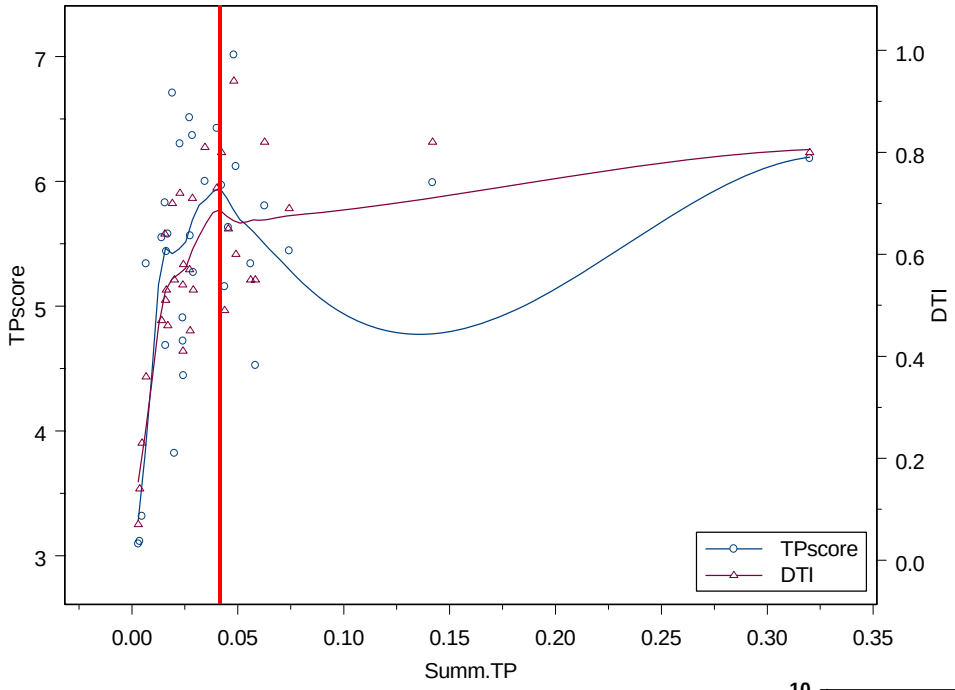
Water Quality - TP

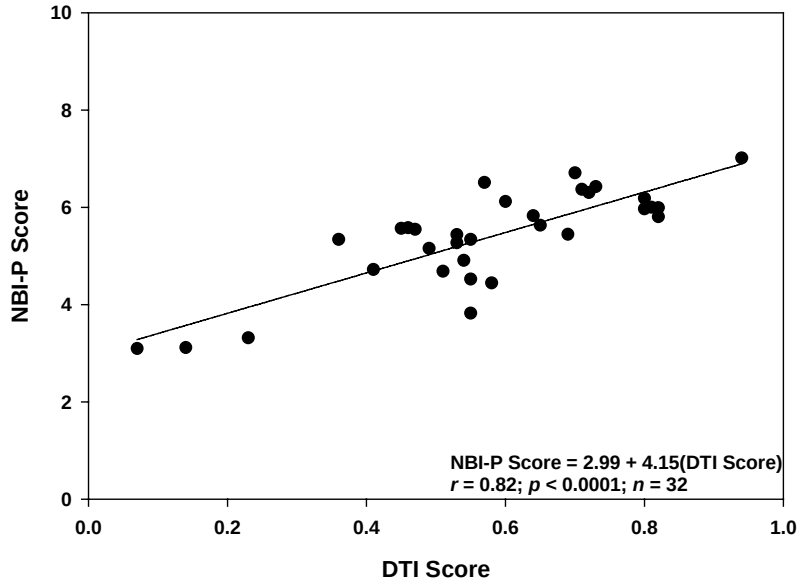


Impairment Thresholds

- Meso/Eutrophic boundaries
  - Nitrate
    - > 0.98 mg/l
    - NBI-N Score > 6.0
  - Total Phosphorus
    - > 0.065 mg/l
    - NBI-P Score > 6.1

NBI-P and DTI


TPscore
DTI
Summ.TP
7
6
5
4
3
1.0
0.8
0.6
0.4
0.2
0.0
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
TPscore
DTI


NBI-P Score
DTI Score
10
8
6
4
2
0
0.0
0.2
0.4
0.6
0.8
1.0
NBI-P Score = 2.99 + 4.15(DTI Score)
r = 0.82; p < 0.0001; n = 32

Conclusions

- NBIs provide a meaningful measure of enrichment
- Trophic state boundaries have direct relationship with biota
- Together they provide monitoring and enforcement mechanisms for nutrient criteria
- Similarity to diatom indices shows promise

Acknowledgements

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