Benthic Macroinvertebrate and Periphyton Monitoring in the Suwannee River Basin in Florida 2: Relationships between Water Quality and Biology

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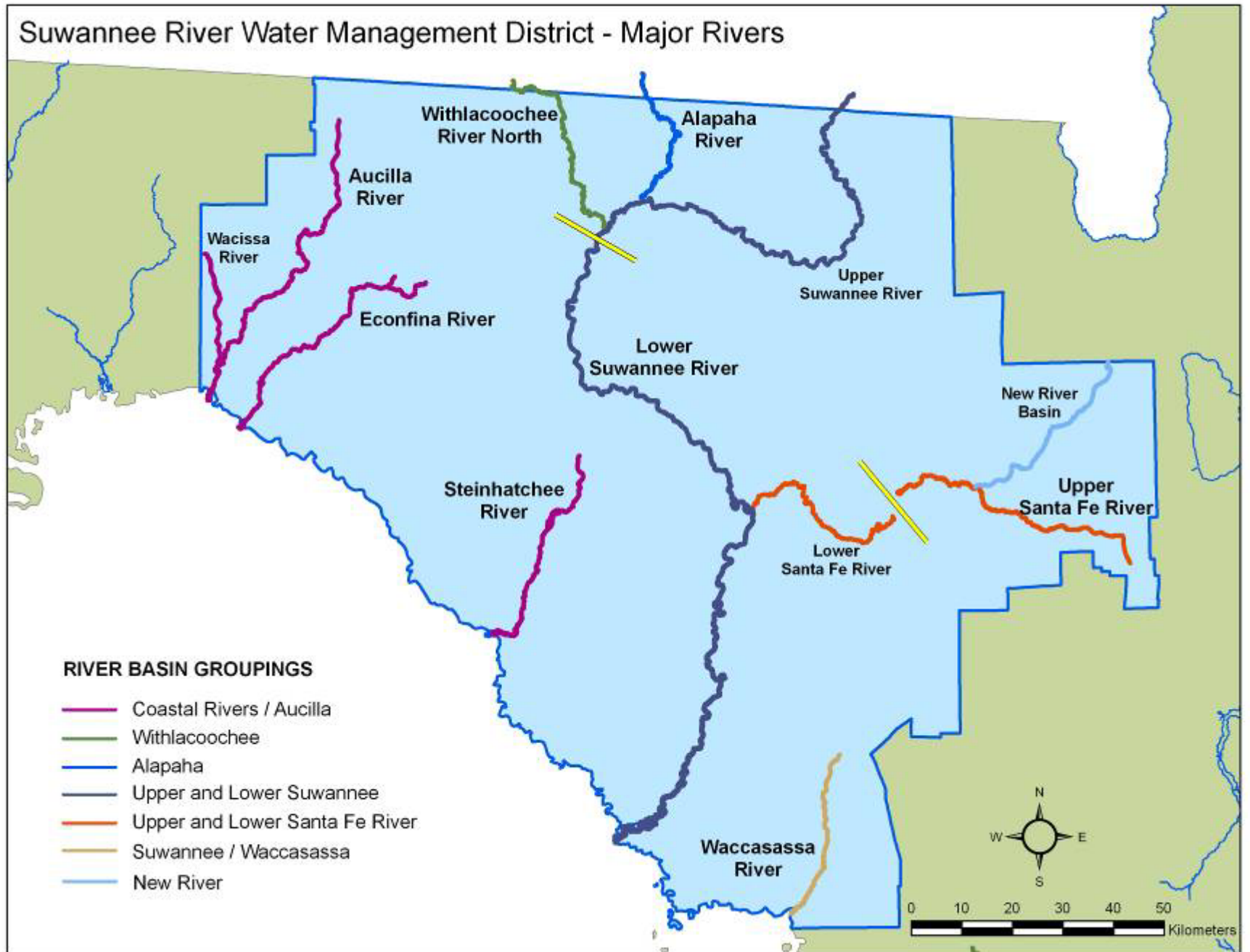SUWANNEE RIVER WATER MANAGEMENT DISTRICT

Objectives:

1. Determine which water quality variables are most strongly correlated with biology

2. Determine probability of occurrence of species as a response to water quality

SRWMD Data:

- Most frequently occurring benthic invertebrate and periphyton species

- 16 water quality parameters:

  alkalinity, chl a, color, conductivity, DO, NO2+NO3, NH3,TKN, total N, total P, OPO4 ,PH, temperature, TOC, TSS, turbidity

Suwannee River Water Management District - Major Rivers

Withlacoochee River North

Alapaha River

Aucilla River

Wacissa River

Econfina River

Upper Suwannee River

Lower Suwannee River

New River Basin

Steinhatchee River

Upper Santa Fe River

Lower Santa Fe River

Waccasassa River

RIVER BASIN GROUPINGS

- Coastal Rivers / Aucilla
- Withlacoochee
- Alapaha
- Upper and Lower Suwannee
- Upper and Lower Santa Fe River
- Suwannee / Waccasassa
- New River

0 10 20 30 40 50
Kilometers

N
W E
S

Spearman Correlation

- non-parametric

- tests statistical significance of bivariate relationship

- provides measure of association (positive, negative, strong, weak)
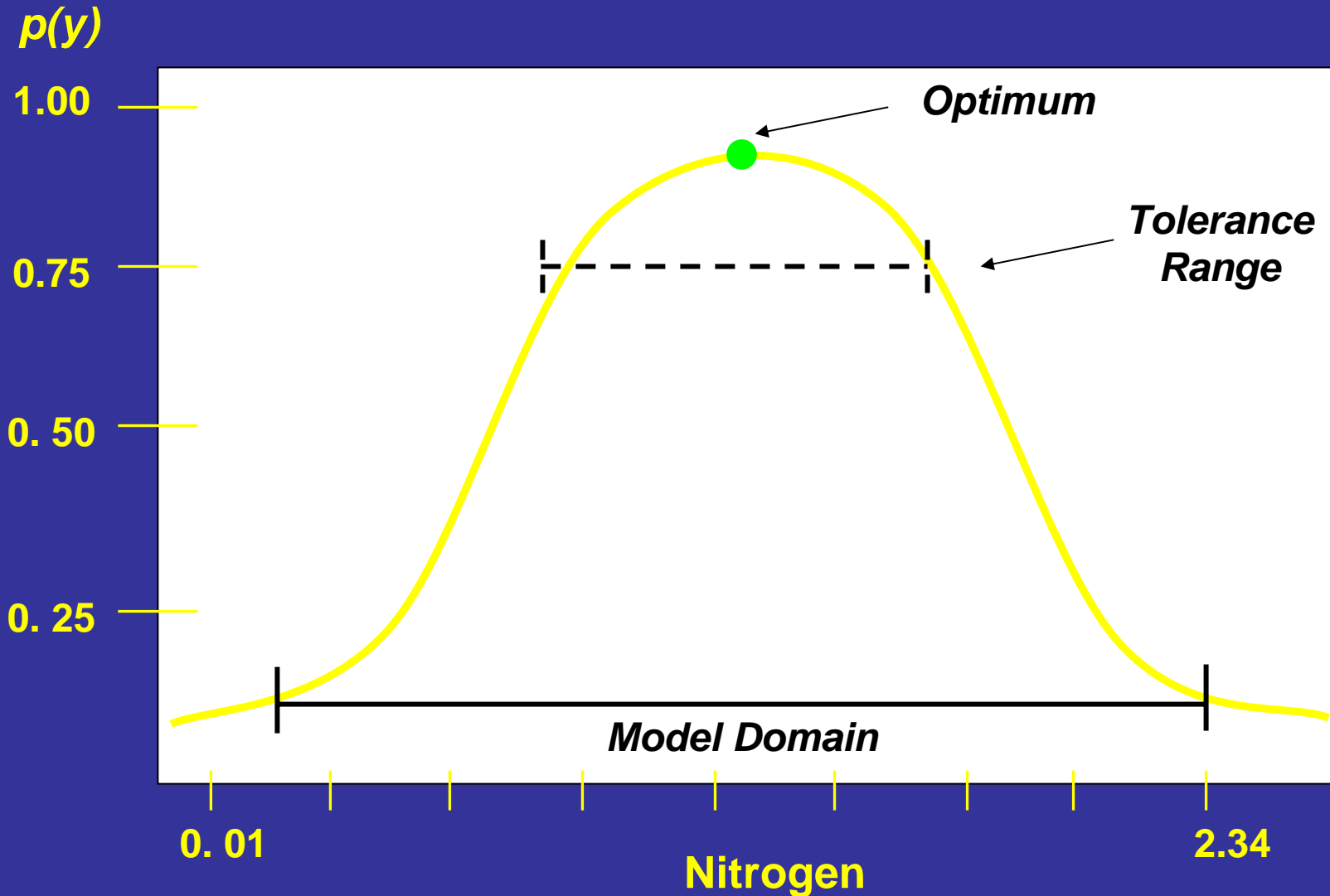
Logistic Regression

- Predict the ***probability of occurrence***, p(y), of a species as a function of environmental variables

- Concept: an organism has ***tolerance limits*** for a given environmental variable (bounded by a minimum and maximum value)

- Single logistic regression describes ***optimum habitat requirements***

- Multiple logistic regressions provide information on relative ***importance of each environmental variable***

Nitrate + Nitrite

- Statistically significant correlations for 16 of the 20 frequently occurring periphyton species
  - 11 were highly significant (<0.001)
- Correlations varied in strength, ranging from 0.62-0.20
  - most positively correlated
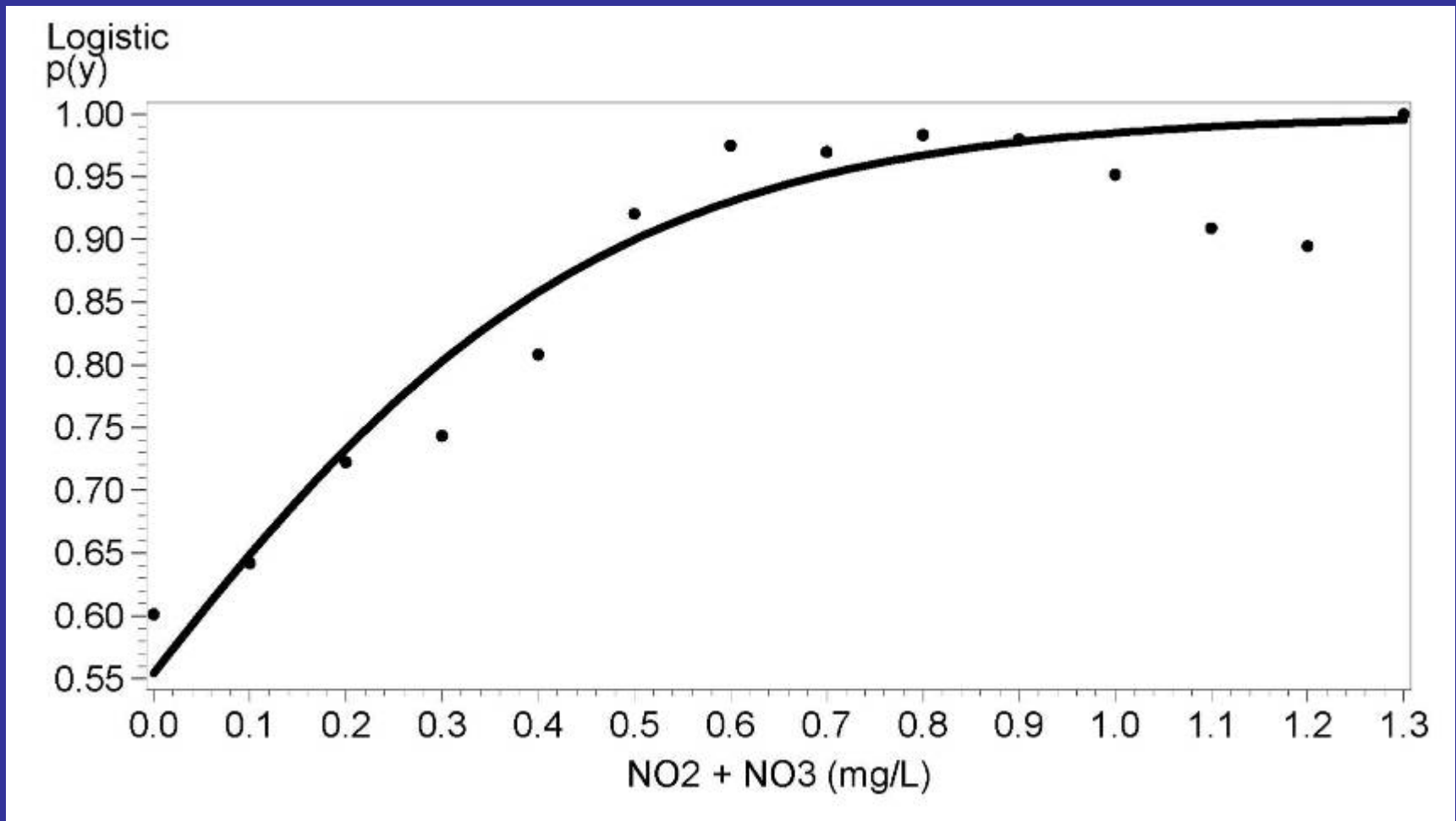- Example species:
  - *Cocconeis placentula*
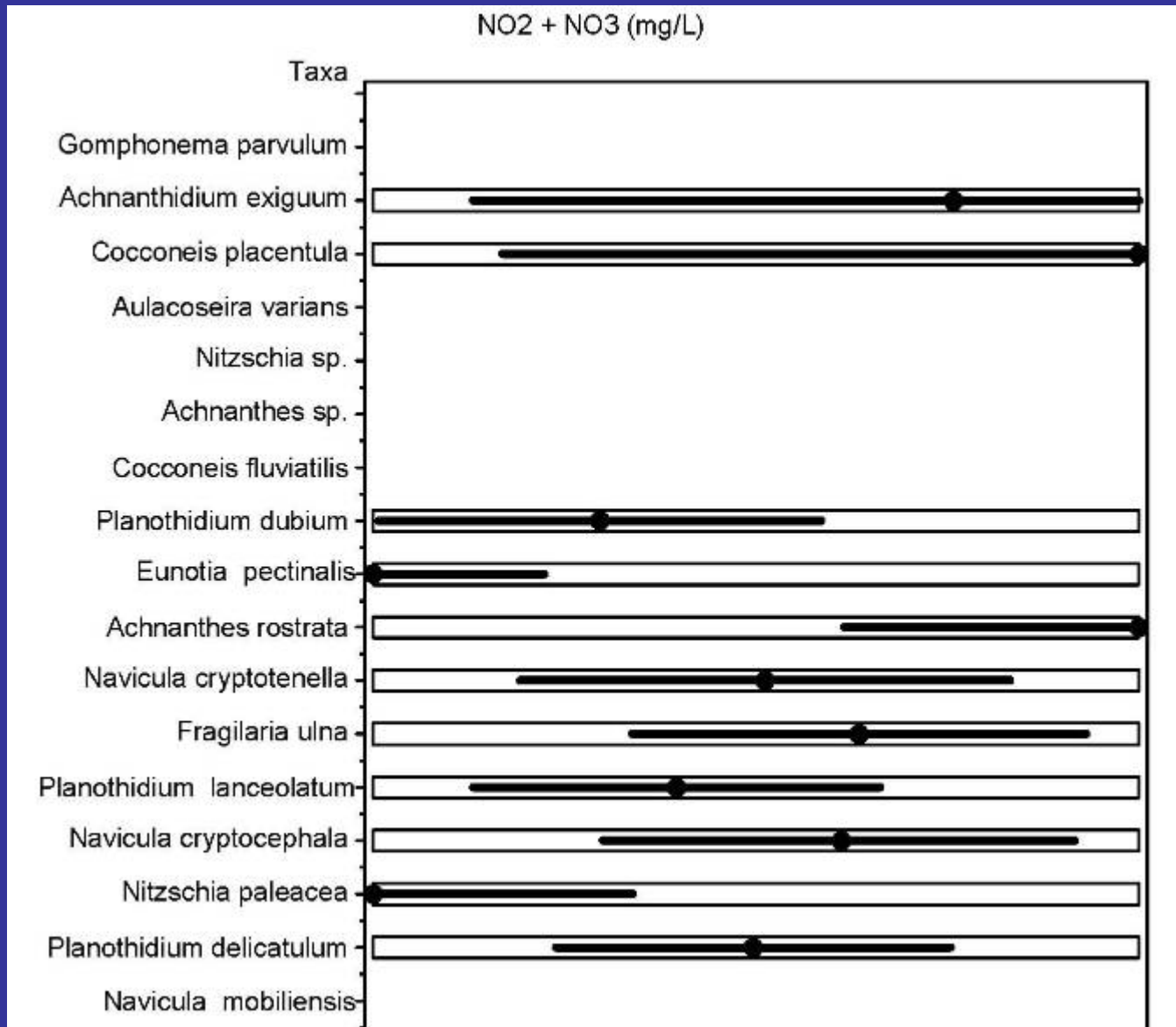 - R=0.62, p<0.001
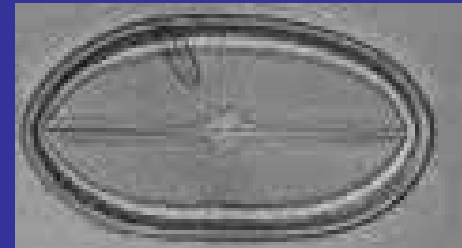
Logistic Output

Logistic Regression Approach
Diatom, *Cocconeis placentula*

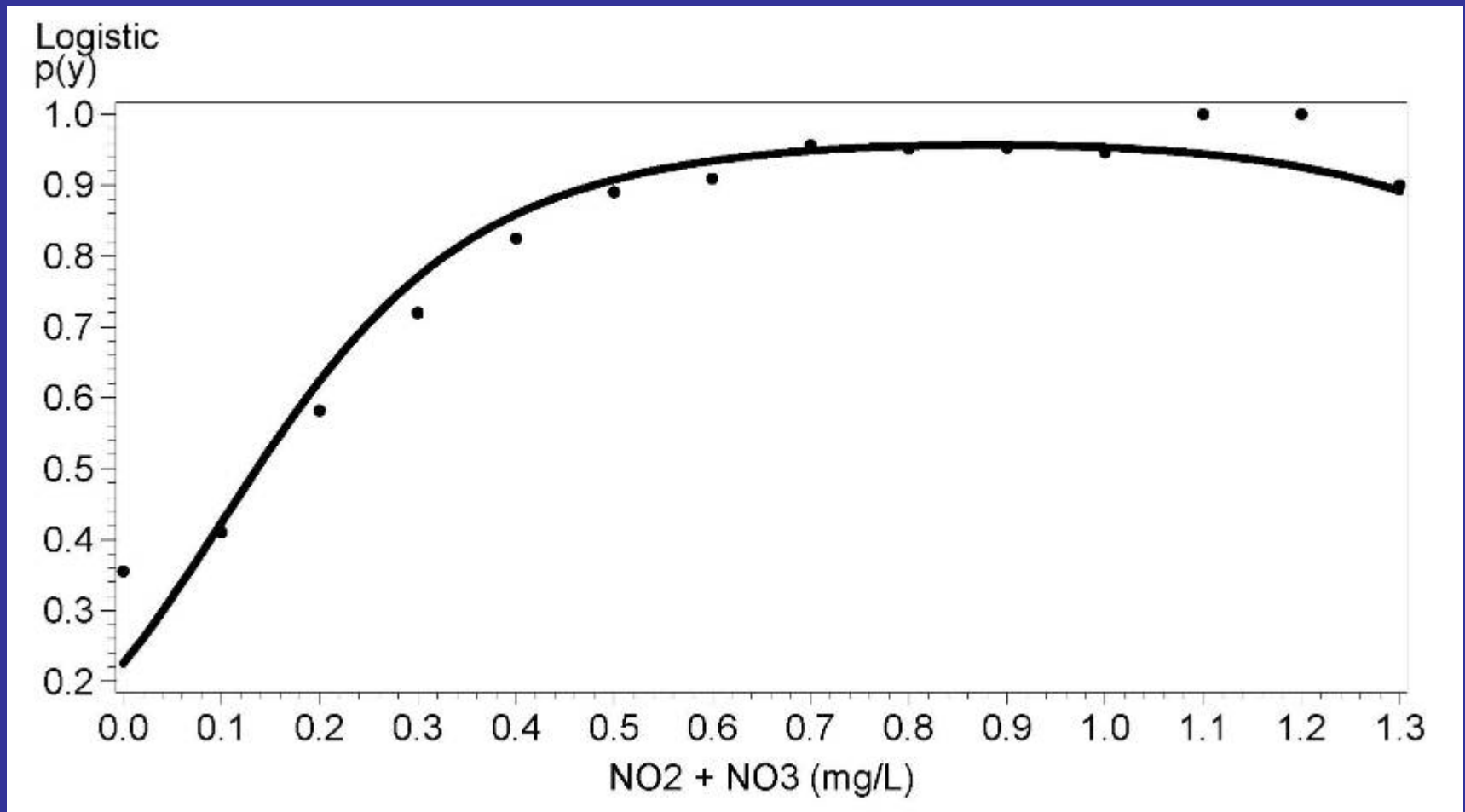# *Periphyton Species Summary*

NO2 + NO3 (mg/L)

Nitrate + Nitrite

- Statistically significant correlations for 15 of the 20 frequently occurring invertebrate species
  - 11 were highly significant (<0.001)
- Correlations varied in strength, ranging from 0.59-0.17
  - most positively correlated, a few negatively
- Example species:
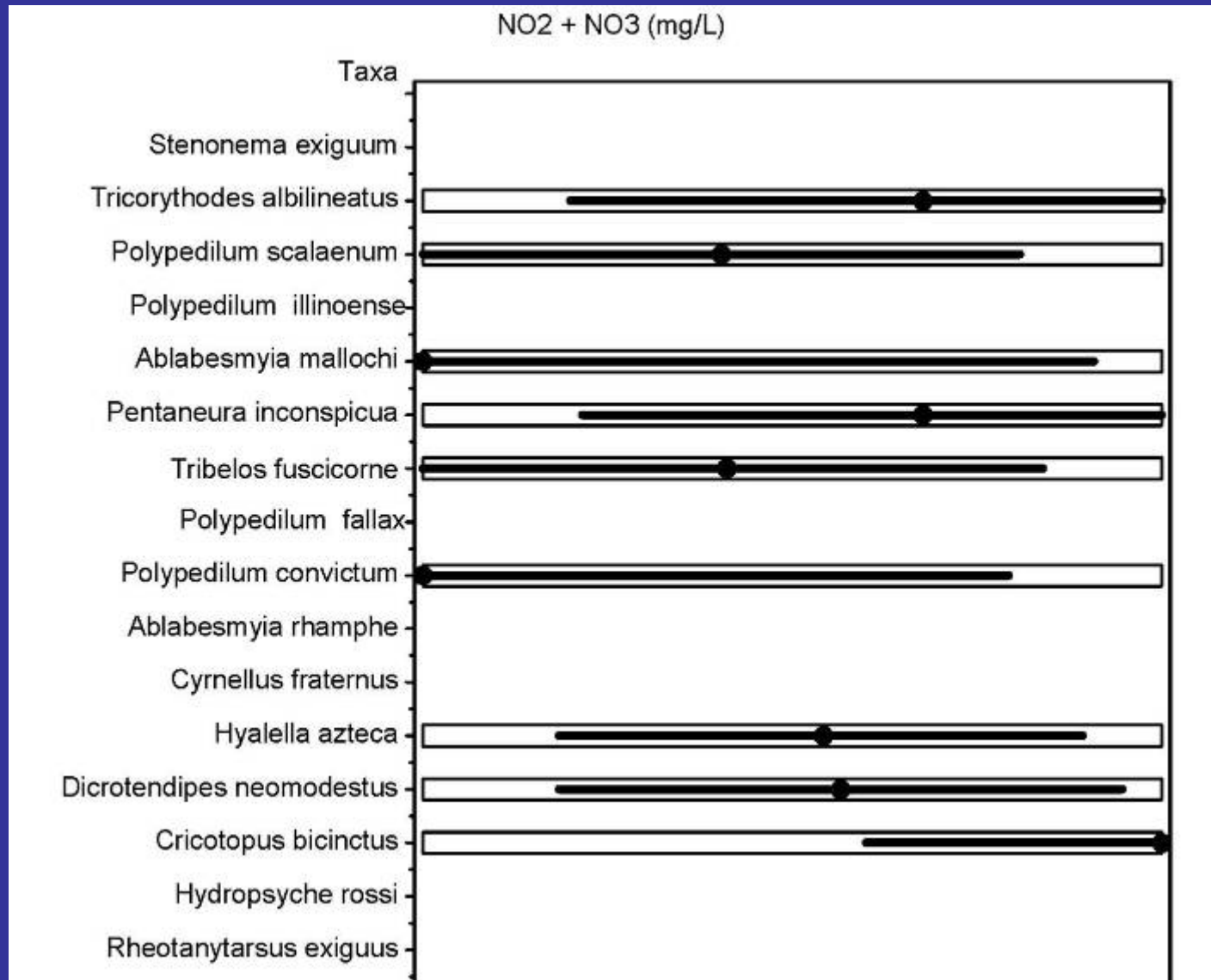 - *Tricorythodes albilineatus*
  - R=0.59, <0.001

# *Logistic Regression Approach*
Mayfly, *Tricorythodes albilineatus*

Invertebrate Species Summary

NO2 + NO3 (mg/L)

Taxa

- Stenonema exiguum
- Tricorythodes albilineatus
- Polypedilum scalaenum
- Polypedilum illinoense
- Ablabesmyia mallochi
- Pentaneura inconspicua
- Tribelos fuscicorne
- Polypedilum fallax
- Polypedilum convictum
- Ablabesmyia rhamphe
- Cyrnellus fraternus
- Hyalella azteca
- Dicrotendipes neomodestus
- Cricotopus bicinctus
- Hydropsyche rossi
- Rheotanytarsus exiguus

Alkalinity

- Statistically significant correlations for 13 of the 20 frequently occurring periphyton species
  - 10 were highly significant (<0.001)
- Correlations varied in strength, ranging from 0.61-0.18
  - most positively correlated
- Example species:
  - *Cocconeis placentula*
  - R=0.61, <0.001
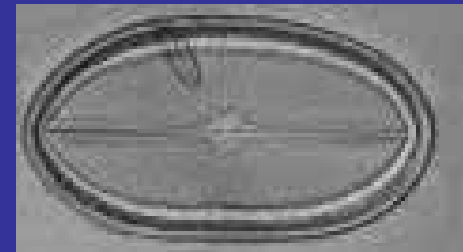
Alkalinity

- Statistically significant correlations for 17 of the 20 frequently occurring invertebrate species
  - 11 were highly significant (<0.001)
- Correlations varied in strength, ranging from 0.62-0.15
  - most positively correlated, a few negatively
- Example species:
  - *Tricorythodes albilineatus*
  - R=0.62, <0.001

Answer Questions:

- What are the most sensitive biological indicators for selected environmental variables?

- Is there a set of physical/chemical conditions that will result in an expected biological condition?