

Perspectives on Nutrient Criteria Development

*Freshwater Nutrient
Criteria Stakeholder's
Meeting*

June 12, 2008



About VAMWA

- 56 local governments & authorities that own and operate municipal wastewater treatment plants.
- Serves >95% of Virginia's sewer population
- Mission
 - *“...to protect public health and the environment successfully and cost-effectively.”*
 - *“...to ensure that Virginia water quality programs are based on sound science and good public policy...”*



Current perspectives

- Simple application of in-stream numeric nutrient targets/criteria (ala toxics) not recommended.
 - Unreliable indicators of attainment/non-attainment
- Still insufficient data on stream algal responses to make desired linkages.
- Tiered screening approach for assessment makes a lot of sense.
- May also require non-traditional permitting approaches.



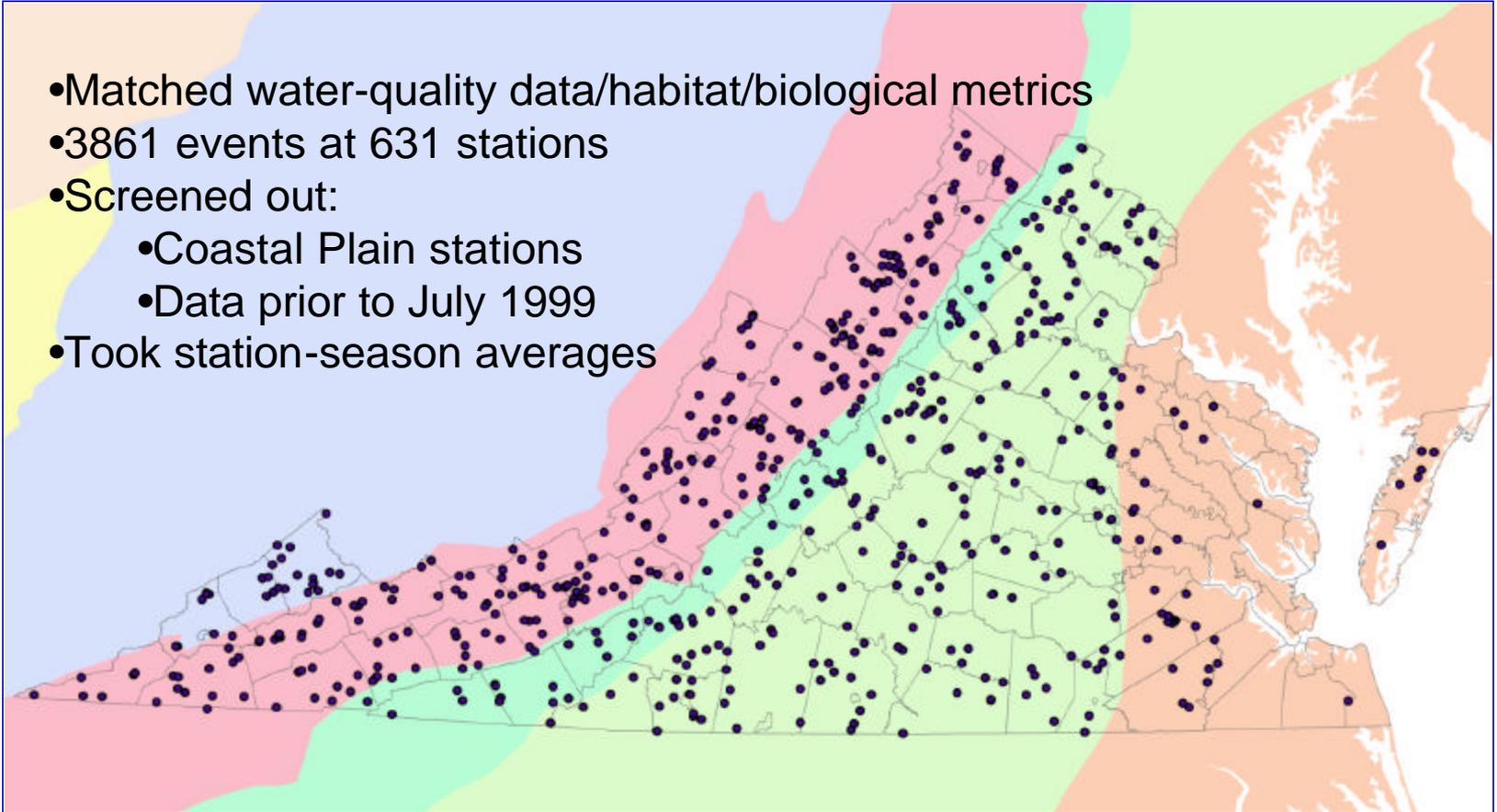
Vision for success

- Criteria/assessment approach
 - Effects-based
 - Emphasize response variables
 - Based on measurable effects to designated use attainment
 - Addresses uncertainty and environmental variability
- Permitting approach
 - Reasonable potential analysis
 - Based on response variables.
 - Considers characteristics of receiving water
 - Does not routinely result in unattainable permit limits.
 - Is not extremely burdensome to DEQ (or permittee)

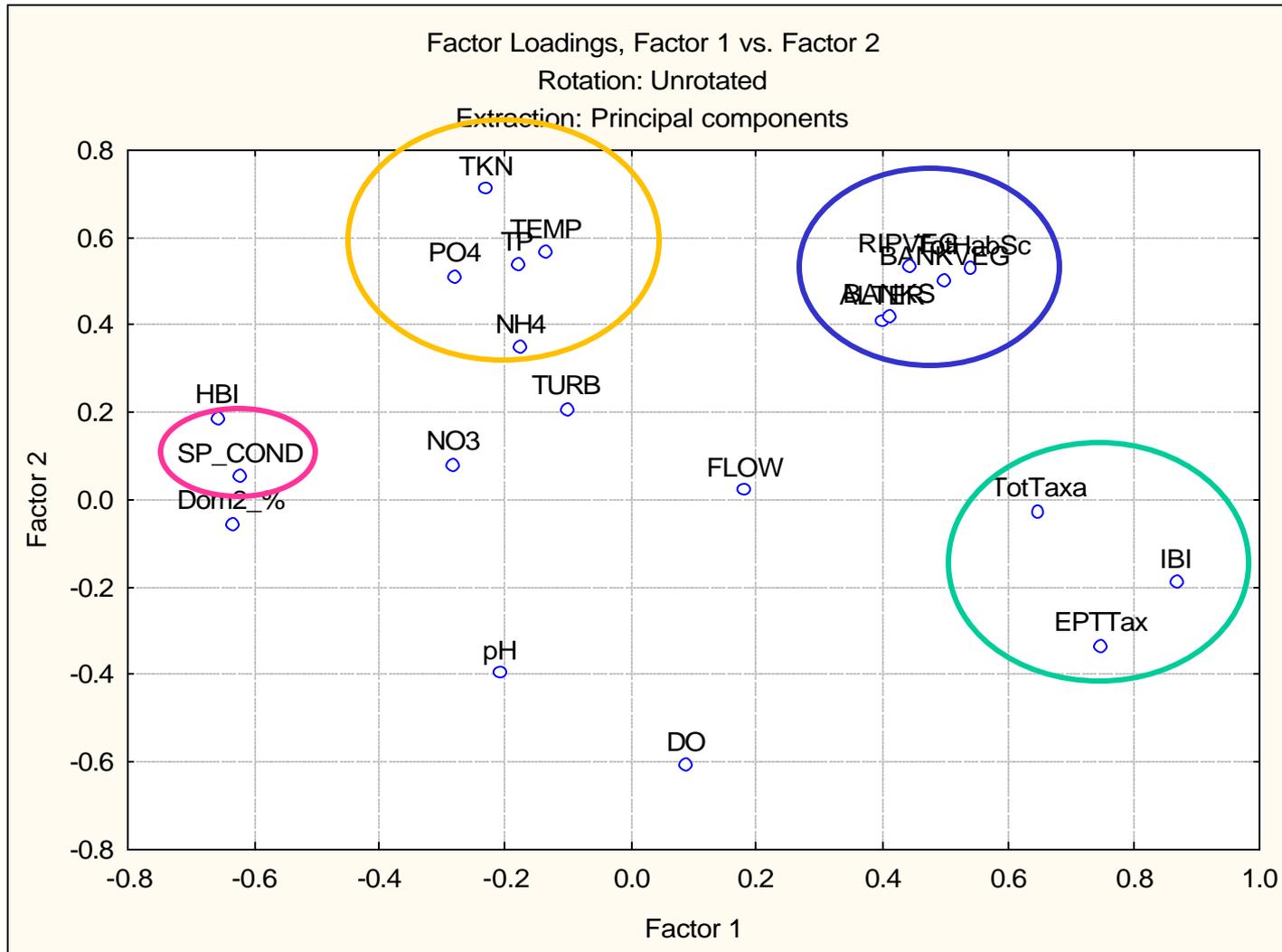


How important are nutrients relative to other stressors? : A look at DEQ/AAC streams database

- Matched water-quality data/habitat/biological metrics
- 3861 events at 631 stations
- Screened out:
 - Coastal Plain stations
 - Data prior to July 1999
- Took station-season averages



PCA: Biological metrics have strongest association with specific conductance and habitat scores.

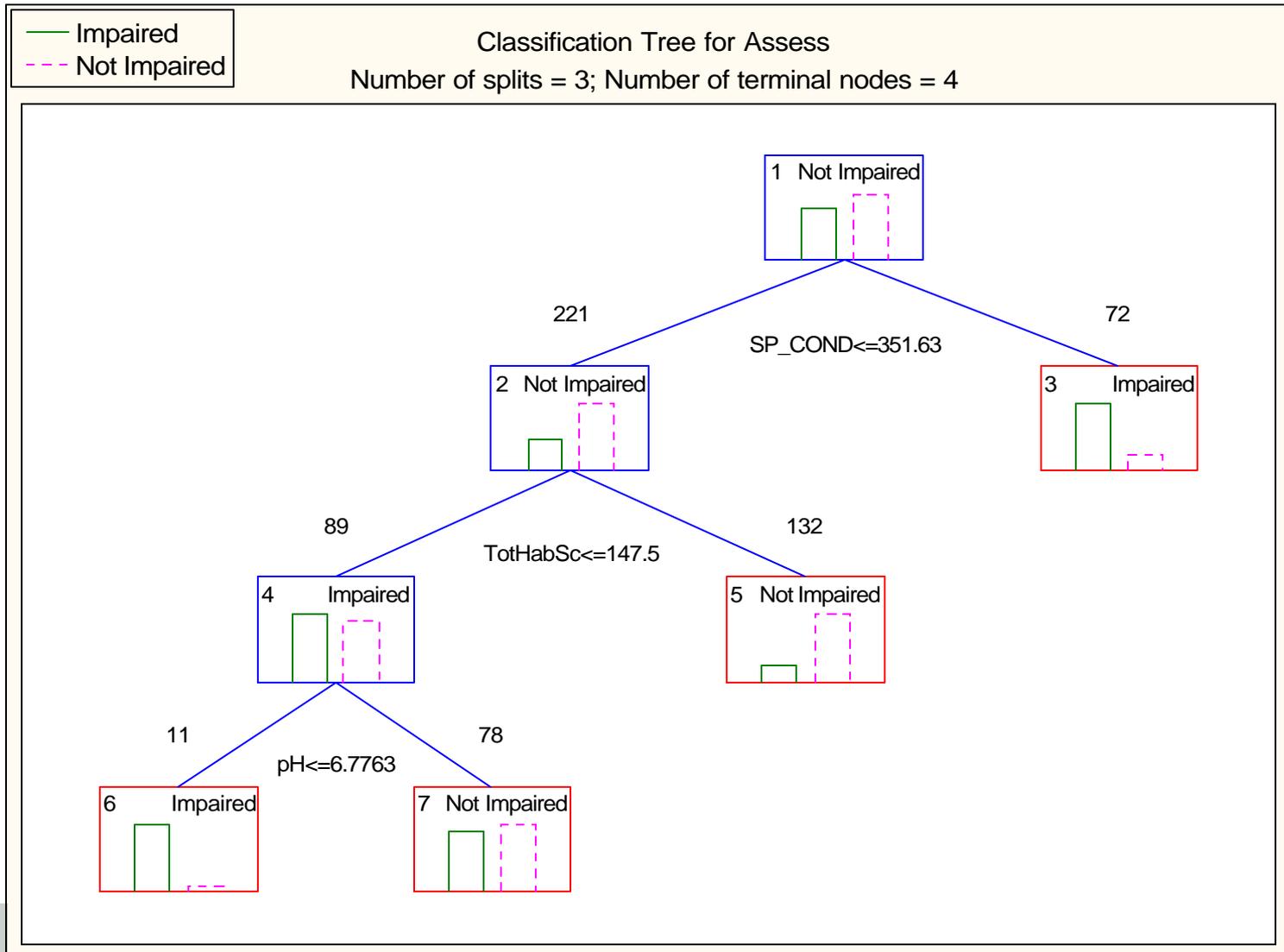


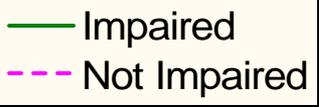
Non-parametric correlations strongest between IBI and TDS, habitat metrics

Parameter	Spearman Rank Correlation with IBI
TDS	-0.48
COVER	0.46
TotHabSc	0.44
SP_COND	-0.42
EMBED	0.42
SUBSTRATE	0.41
CL	-0.39
TKN	-0.39
TS	-0.38
TOC	-0.37
TVS	-0.37
TFS	-0.36
SC	-0.33
NH4	-0.32
SEDIMENT	0.31
TP	-0.30

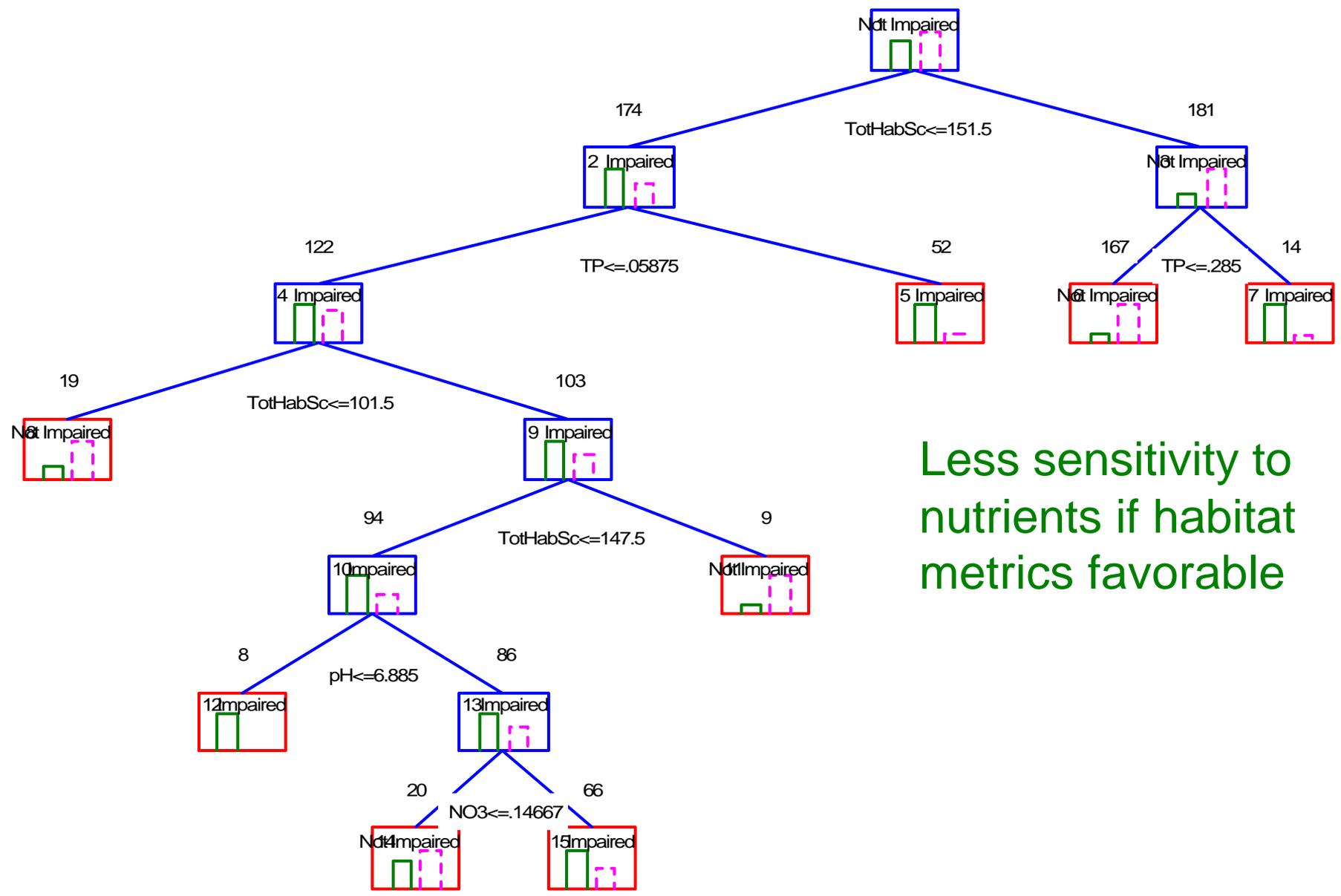


CART Analysis: Specific conductance and habitat metrics are best discriminators of impairment





Classification Tree for Assess
 Number of splits = 7; Number of terminal nodes = 8



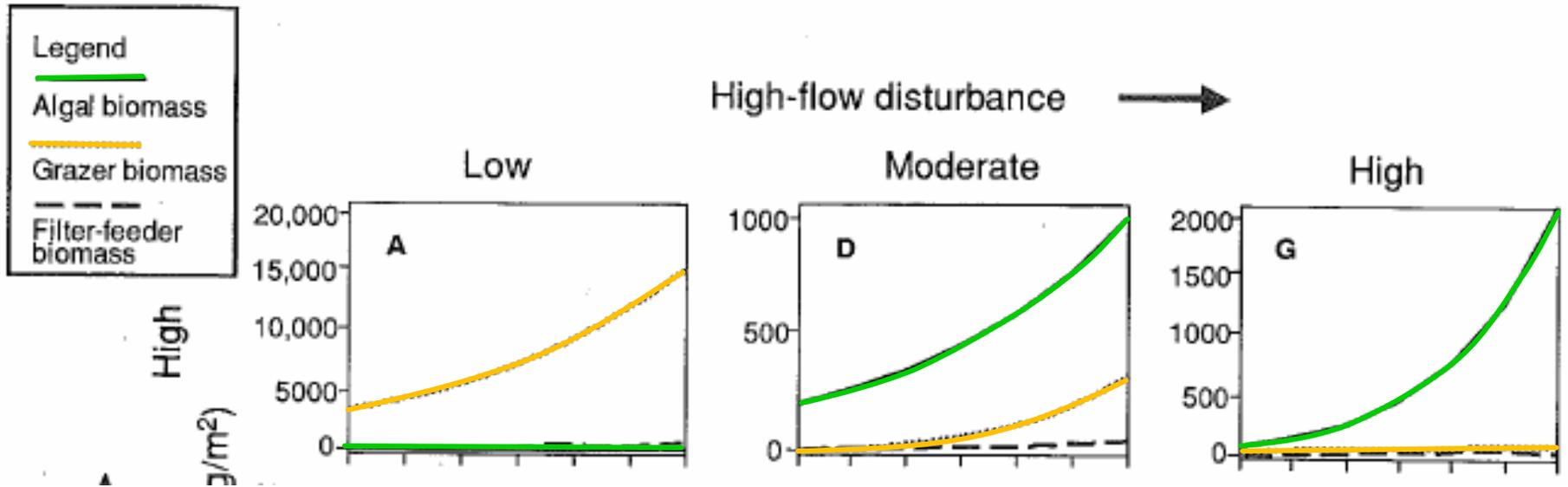
Less sensitivity to nutrients if habitat metrics favorable

Conclusions of analysis

- Confirmed correlations between nutrient concentrations and biological impairments.
 - Statistically significant
 - Weak
- Habitat scores and measures of dissolved solids are better indicators of impairment.
- Evidence for nutrients as secondary stressors, esp. in combination with habitat impacts.



Notes from the literature: Frequency of scour controls grazers and algal biomass



From Resing and others, 2004

Implication:

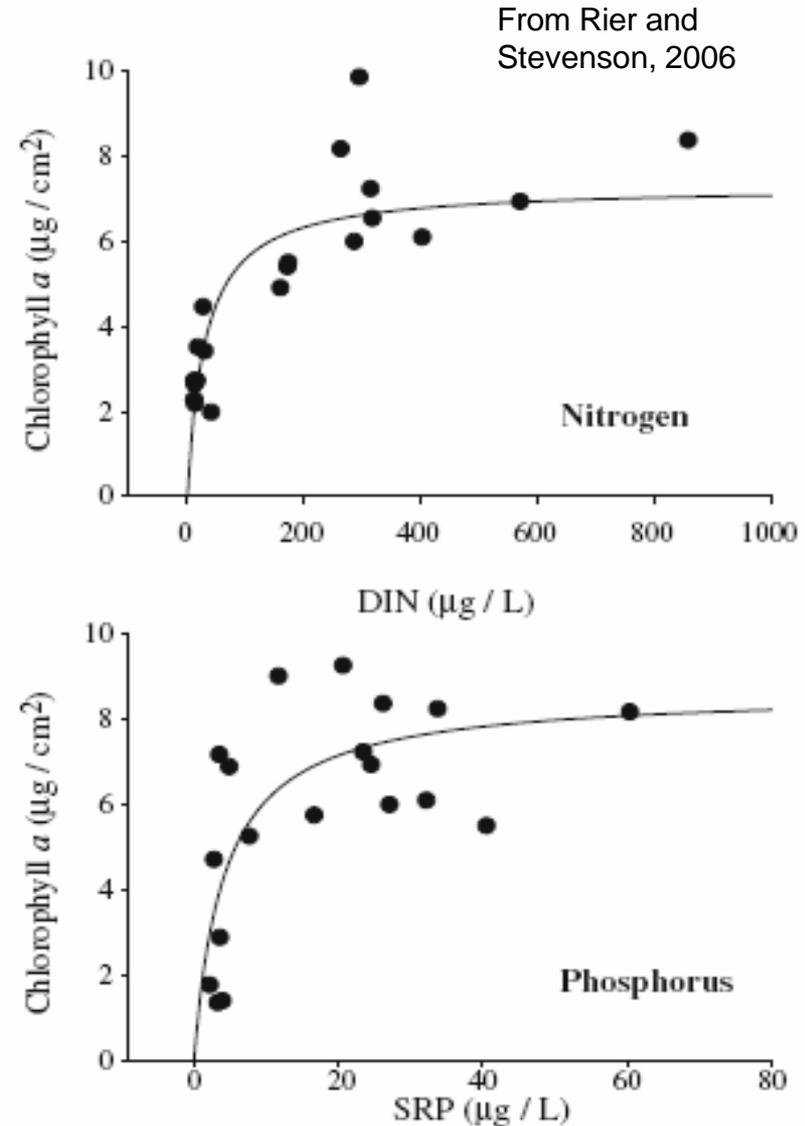
- Stable streams can assimilate more nutrients than flashy or hydrologically disturbed streams

Notes from the literature: Stream algal growth/biomass limitations

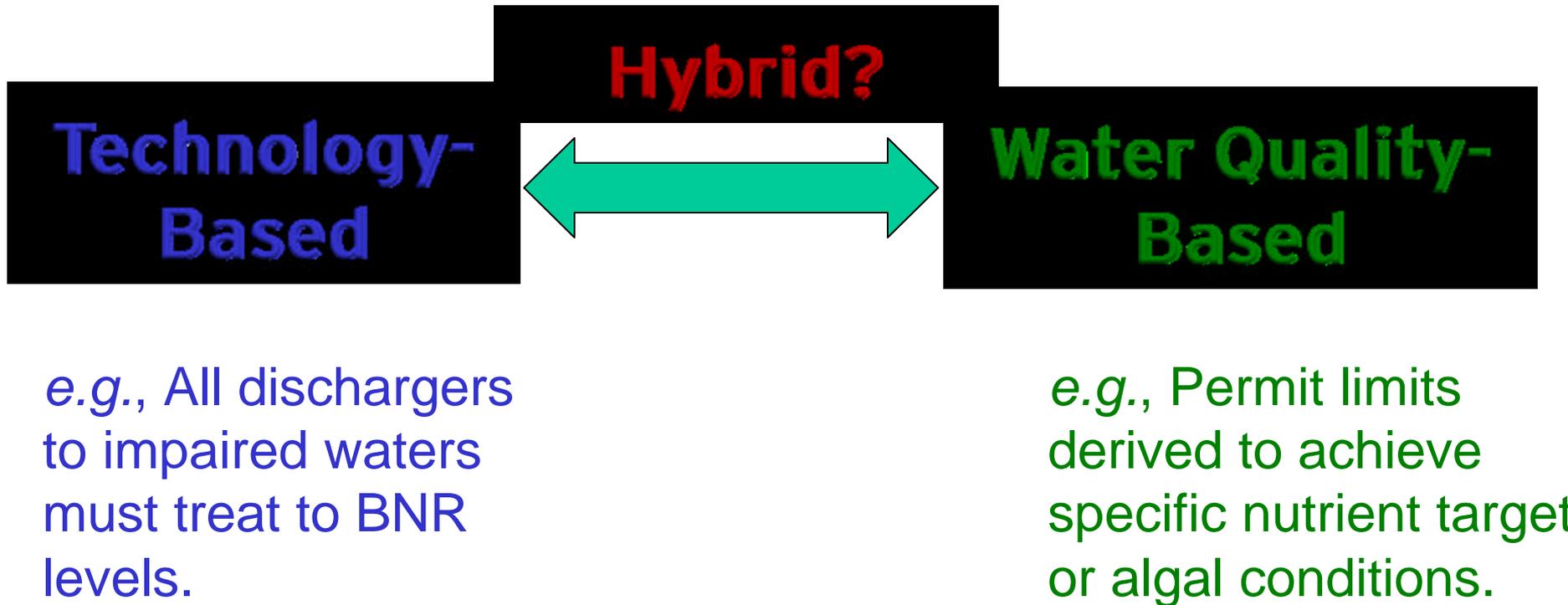
- Algal growth rates max out at very low nutrient concentrations (<10 SRP).
- Maximum biomass accruals occur at higher concentrations.
- But curves “flat” at top.

Implication:

- Attainable nutrient reductions will often achieve only 70-90% of maximum peak biomass.



Potential NPDES Permitting Approaches



Technology-Based Permitting

- Advantages
 - Straightforward, requires no modeling
 - Does not result in unattainable limits
 - Bay-related precedents
- Disadvantages
 - No understanding of environmental benefits
 - No reasonable potential analysis: Are permit limits needed?
 - Can't identify where different levels of treatment would be needed.



Water-Quality Based Permitting Approaches (In-Stream Nutrient Targets Only)

- Advantages
 - Straightforward, consistent with toxics permitting
- Disadvantages
 - Limited understanding of stream response/use attainment.
 - Can result in unattainable permit limits.



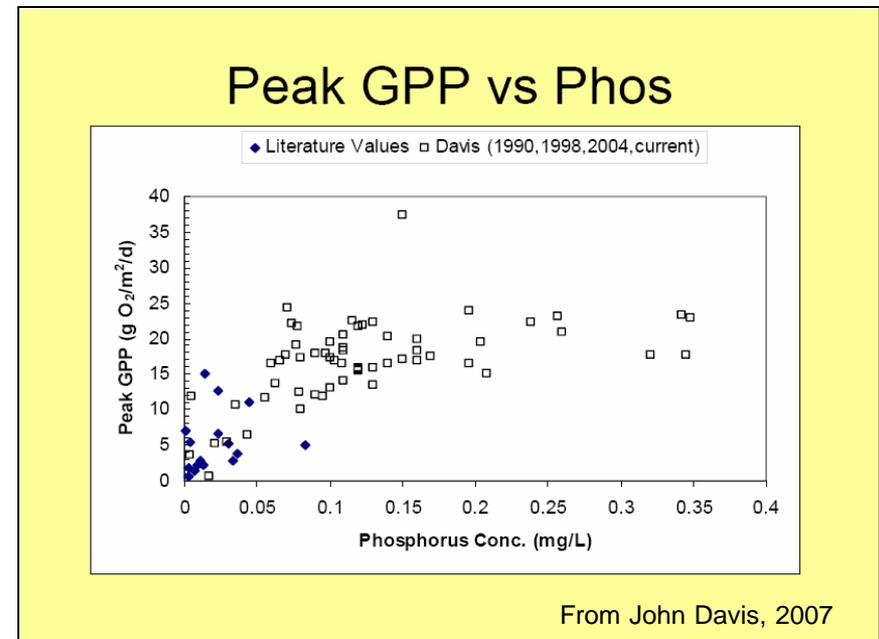
Water-Quality Based Permitting Approaches (Response Variables)

- Advantages
 - Allows reasonable potential analysis
 - Allows evaluation of environmental benefits.
 - Can evaluate different levels of treatment
- Disadvantages
 - Resource intensive to develop calibrated models of in-stream algal responses.



Potential Hybrid Approaches

- Simplified reasonable potential evaluation approaches
 - Screening-level modeling tools
 - Generalized model application
 - AQUATOX, WASP, QUAL2K
- Apply technology-based limits only where needed.
- Select from different tiers of technology-based limits.
- Water quality-based limits with technology-based “floors”.



Conclusions

- VAMWA continues to support DEQ/AAC's exploration of the weight-of-evidence assessment approach.
- Encourage early consideration of permitting approaches.
- Recommend additional investigation into simplified reasonable potential analysis methods.
- Ready to contribute technical resources to assist.

