

Comments on Empirical Approaches for Nutrient Criteria Derivation

presented by

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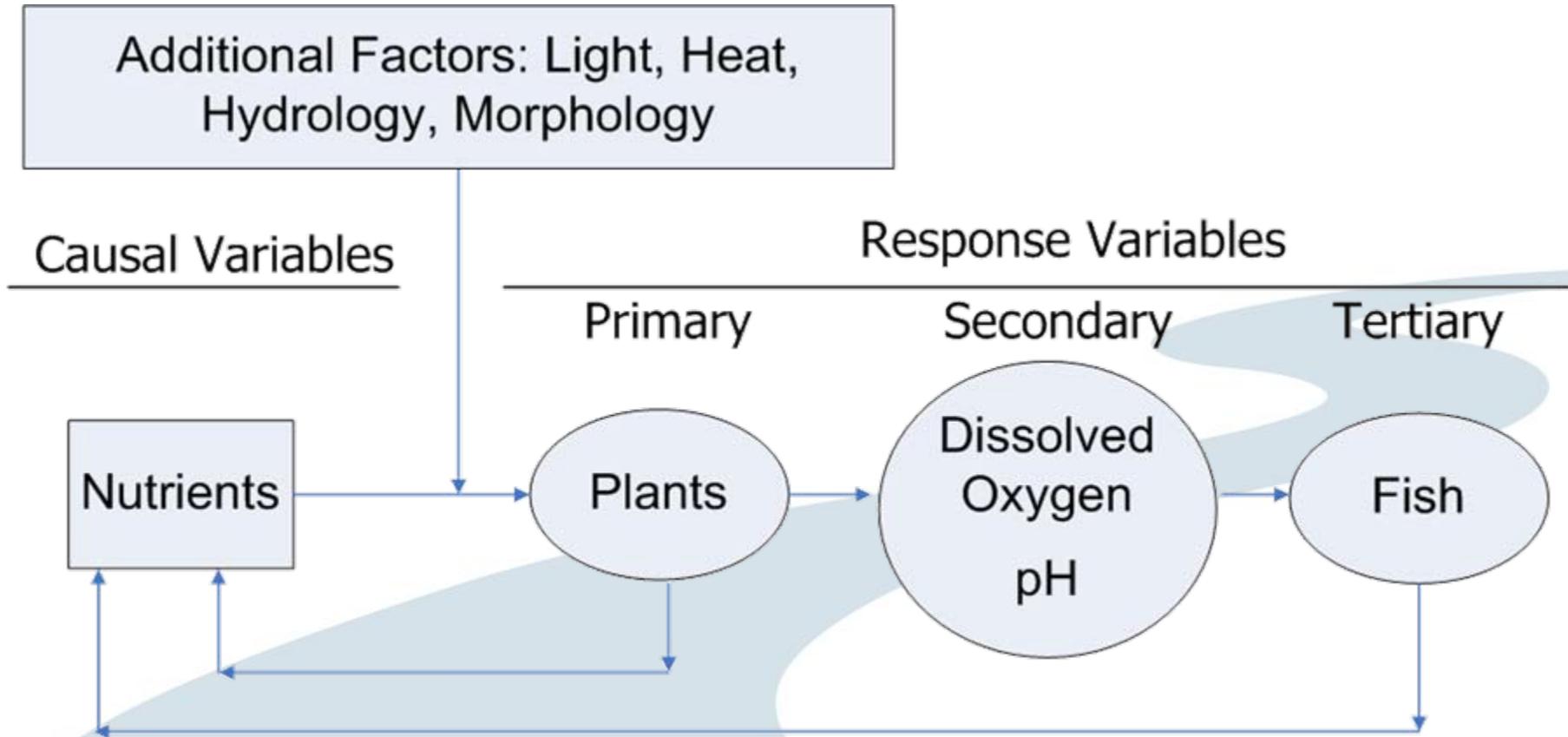
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Overview



- 💧 EPA document provides summary of useful statistical tools
 - 💧 data analysis
 - 💧 consideration of stressor - response variable relationships
- 💧 Eutrophication - a problem of causal variables and response variables
- 💧 Complexity
 - 💧 multiple causal variables
 - 💧 multiple response variables
 - 💧 feedback between causal and response variables.

Causal & Response Variables



Cause - Response Interactions



- 💧 Multiple levels of response variables
 - 💧 Higher level response due to lower level response
 - 💧 Lower level response variables become causal variables for higher level response variables
 - 💧 Causal variables exhibit characteristics of response variables
 - 💧 e.g., nutrient concentrations affected by “response” variables
- 💧 No pure casual variable or pure response variable

Consequences



- 💧 Effect on a “response” variable not likely to be satisfactorily described by changes in a single “causal” variable
- 💧 Poor correlations
 - 💧 R^2 as low as 0.05 in document illustrations
- 💧 Sometimes they work; sometimes they don't
 - 💧 Useful for site specific criteria?
- 💧 Too many variables and confounding factors

Previous Position Papers



💧 Position Papers - 1994 and 2005

- 💧 Prepared in connection with proposed amendments to NJ SWQS
- 💧 A consequence of decades of practice in applying SWQS to NPDES effluent limitations
- 💧 Reviewed scientific basis for numeric criteria
- 💧 Surveyed States' SWQS

💧 Conclusion - no basis for uniform criteria

- 💧 Scientific literature and EPA guidance documents do not support uniform criteria
- 💧 States do not adopt uniform criteria

Nutrients in SWQS



- 💧 Objective of SWQS for nutrients - *reduce the possibility that adverse changes in response variables will occur*
- 💧 For control of eutrophication - *nutrients should not be present in quantities that cause excessive plant growth*
- 💧 What is Excessive?
 - 💧 Render waterway unsuitable for its designated uses
 - 💧 Cause violations of other parameters (e.g. dissolved oxygen)
 - 💧 Result in significant adverse changes in higher level aquatic organism populations (e.g., fish)

Statewide Criteria in SWQS



- 💧 Statewide criteria and policies that prescribe how site-specific criteria can be established
- 💧 *Arkansas in 1994*
 - 💧 *Nutrients shall not be present in concentrations sufficient to cause nuisance aquatic vegetation.*
 - 💧 *Guideline - total phosphorus shall not exceed 100 ug/l in streams or 50 ug/l in lakes and reservoirs*
 - 💧 *Alternative nutrient limitations in water quality management plans*
- 💧 **An objective**
- 💧 **A numeric guideline**
- 💧 **Provide for site specific criteria**

Alternative Program



- 💧 We recommended that NJ delete its numeric criteria for phosphorus
 - 💧 Replace with a nutrient policy
 - 💧 Focus on impact to, and attainability of, use
 - 💧 Abandon emphasis on phosphorus concentration
- 💧 Numeric criteria, if any, for response variables, not causal variables
- 💧 Include narrative criteria and numeric guidelines for nutrients
 - 💧 Guidelines to suggest whether further study may be warranted

Nutrient Guidelines



Nutrient Numeric Guidelines for Control of Excessive Plant Growth* March 1 - October 31

	TOTAL DISSOLVED ORTHOPHOSPHATE PHOSPHORUS (mg/l)	TOTAL DISSOLVED INORGANIC NITROGEN (mg/l)
STREAMS	< 0.1	< 1.0
IMPOUNDMENTS	< 0.05	< 0.5

* Above values presented for discussion only. Further research recommended.

Alternative Program (cont'd)



- 💧 Use biologically available forms of nutrients
- 💧 Applicable during growing season only
- 💧 If numeric guidelines are being met, then narrative criteria assumed to be met
- 💧 Periodic need to determine if narrative criteria and numeric guidelines are being met