TIC Subgroup Report

Guy Jamesson
Larry Antosch
Michael Brom
Bill Hall
Dale Kocarek
Kristen Kubitza
Adrienne Nemura
Adam Sackenheim
Anthony Sasson

- TIC *vs.* Box Model
- Proposed Box Model
- Proposed Tables (decision flow charts)
  - for determination of threat status, nutrient and/or other causes

As proposed by Ohio EPA:

TIC (Trophic Index Criterion)

- Biocriteria score 0 to 12
- Dissolved oxygen score 0 to 12
- Benthic chlorophyll score 0 to 8
- Nutrients (TP, DIN) score 0 to 6

- TIC (sum of components) = 0 to 38

- TIC score used to determine trophic condition: “acceptable”, “threatened” or “impaired”

As presented by Ohio EPA:

The TIC Decomposed as a Box Model

Biology	Response (D.O. and Chlorophyll)	Nutrients	Outcome	Notes
Passing	Normal	Low or Elevated	Attaining	
		High *Low probability event	Evaluate potential for downstream impact	Interpretation within broader context of survey may explain result
Passing	Elevated	Attenuated	Attaining	Attenuation documented within survey
		Elevated or High	Evaluate potential for downstream impact; evaluate reasonable potential for projected increases in nutrient concentrations	Directs sampling priority if no data exist for downstream reaches
	High (D.O. range > 9 mg/l) *Low probability event	Low or High	Reasonable potential	Unique site-specific conditions or follow-up sampling may override RP
Marginal	Normal	Low or High	Other locally limiting factors, or evaluate for downstream impact	Directs sampling priority if no data for downstream reaches
	Elevated or High	Low or High	Threatened by over-enrichment	Reasonable potential exists
Failing	Normal	Low or High	Other limiting factors	Document cause of impairment
	Elevated	Low or High	Impaired by over-enrichment	Other limiting factors ruled out as proximate stressors, or not manageable
	High	Low or High	Impaired by over-enrichment	Unequivocal

TIC *vs.* Box Model

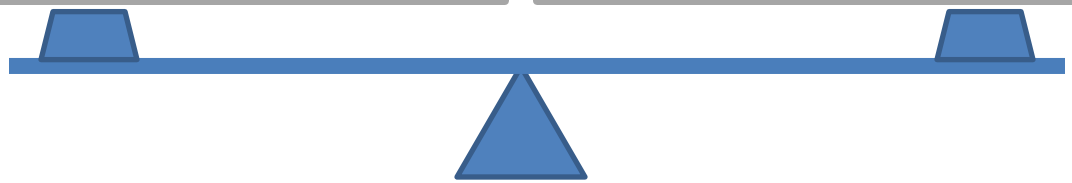
Either used to determine trophic condition status

TIC

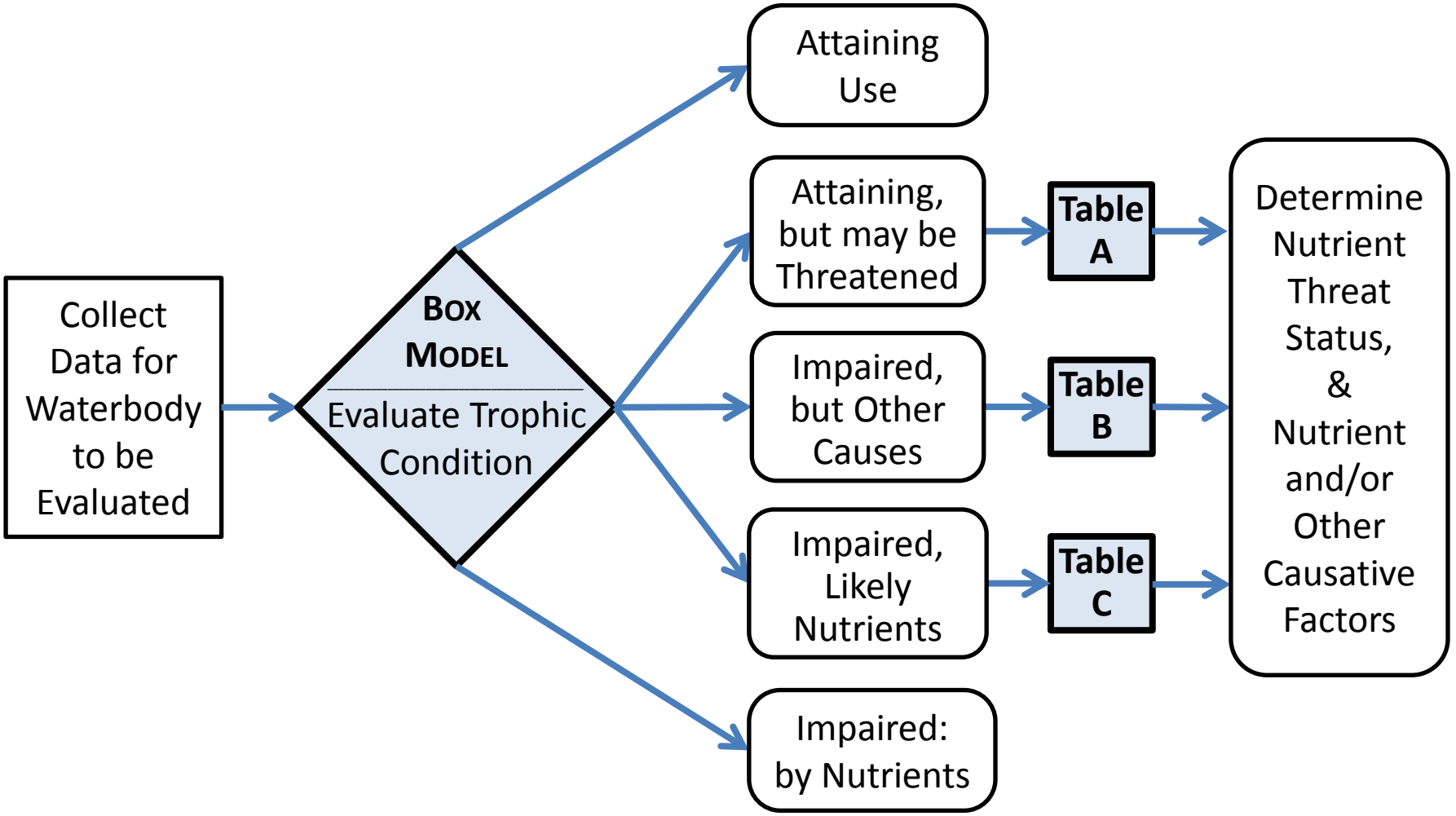
- 'Clear' scoring calculation
- May be too rigid
- Name confusion:
  TIC is <u>not</u> a criterion
- Concern about false positives or false negatives

Box Model

- Lack of quantitative scoring
- Potentially more flexible
- More easily accommodates unique situations
- Decision tables provide greater transparency



NUTRIENTS BOX MODEL:
Trophic Condition Evaluation Process



Alternate Proposed Box Model for Trophic Condition

1	2	3	4	
Biological Criteria	**DO Swing**	**Benthic Chlorophyll**	**Trophic Condition Status**	
All indices attaining or non-significant departure	Normal or low swings (≤6.5 mg/l)	Low to moderate (≤320 mg/m^2)	Attaining use / not threatened	
		High (>320 mg/m^2)	Attaining use, but may be threatened	*See Table A*
	Wide swings (>6.5 mg/l)	Low (≤182 mg/m^2)		
		Moderate to high (>182 mg/m^2)		
Non-attaining (one or more indices below non-significant departure)	Normal or low swings (≤6.5 mg/l)	Low to moderate (≤320 mg/m^2)	Impaired, but cause(s) other than nutrients	*See Table B*
		High (>320 mg/m^2)	Impaired / likely nutrient enriched	*See Table C*
	Wide swings (>6.5 mg/l)	Low (≤182 mg/m^2)		
		Moderate to high (>182 mg/m^2)	Impaired / Nutrient enriched	

Table A.
Decision matrix for determining when biologically attaining condition status is threatened by nutrients

Key Questions:

→ Are adjacent sites impaired?

→ Do one or more biological indicators under-perform relative to available habitat?

↘ Are stressors unrelated to nutrients elevated and responsible for observed conditions?

↘ Is the reach or site improving due to nutrient management?

↘ Are nutrients from a defined source attenuated along elevated reach?

→ Is biological condition deteriorating?

Table B.
Decision matrix for determining when biological impairment is caused by stressors other than nutrients

Key Questions:

→ Are stressors unrelated to nutrients elevated?

→ Are adjacent sites impaired?

↘ Are stressors at adjacent sites unrelated to nutrients elevated?

↘ Do natural conditions dictate status (e.g., wetland, coldwater)

→ Do natural conditions dictate status (e.g., wetland, coldwater)?

Table C.
Decision matrix for determining when biological impairment is caused by nutrients

Key Questions:

→ Are stressors unrelated to nutrients elevated?

↘ Would abatement alone of stressors unrelated to nutrients restore biological condition?

↘ Would additional abatement of nutrient stressors restore biological condition?

→ Would abatement of nutrient stressors restore biological condition?

Issue: Why no "nutrients" in proposed box model?

- Based upon Ohio EPA's development and survey data
  - In statistical comparison with DO and chlorophyll, nutrient concentration provides lowest value as a predictor
  - Too many instances of confounding nutrient concentrations in actual data:
    - Full attainment with high nutrient concentrations, *OR*
    - Impaired with low nutrient concentrations
  - Other eutrophication factors interact with nutrients as causative factors:
    - Canopy cover
    - Stream morphology
    - Riparian buffer
- ***BUT***... The entire Box Model with decision Tables evaluates nutrient trophic condition, threatened status & nutrients *vs*. other stressors