Ohio EPA Nutrient TAG Meeting #6

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TIC Subgroup Report

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Preliminary Report

- Function of the TIC
- TIC vs. Box Model

TIC Scoring Subgroup

- Original objective: review TIC score calculations and scoring values matrix
- New objective: consider the Box Model as ***alternate***, or as ***addition***, to TIC

- Subgroup activities / discussion / review:
  - Function of TIC
  - Review of OEPA data used for TIC development
  - Discussion of TIC vs. Box Model

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

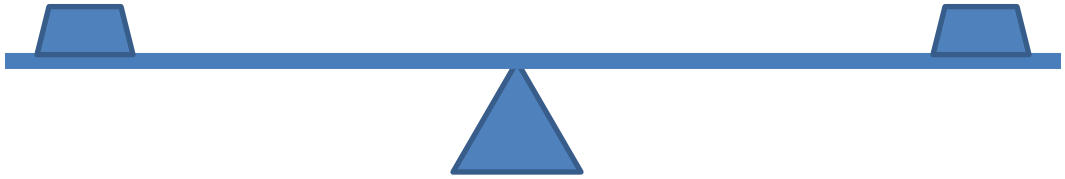
Biology	Response (D.O. and Chlorophyll)	Nutrients	Outcome	Notes
Passing	Normal	Low or Elevated	Attaining	
		High *Low probability event	Evaluate potential for downstream impact	Interpretation within broader context of survey may explain result
Passing	Elevated	Attenuated	Attaining	Attenuation documented 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 not a criterion
  - Concern about false positives or false negatives

- Box Model
  - Lack of quantitative scoring
  - Potentially more flexible
  - May more easily accommodate unique situations



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 (<__ mg/m^2)	Attaining use / not threatened
		High (>__ mg/m^2)	Attaining use, but may be threatened
	Wide swings (>6.5 mg/l)	Low (<__ mg/m^2)	
		Moderate to high (>__ mg/m^2)	
Non-attaining (one or more indices below non-significant departure)	Normal or low swings (<6.5 mg/l)	Low to moderate (<__ mg/m^2)	Impaired, but cause(s) other than nutrients
		High (>__ mg/m^2)	Impaired / likely enriched
	Wide swings (>6.5 mg/l)	Low (<__ mg/m^2)	
		Moderate to high (>__ mg/m^2)	Impaired / nutrient over-enriched

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

- Based upon Ohio EPA's development and survey data
  - In statistical comparison with DO and Chlorophyll, Nutrients provide 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

Issue: Selection of threshold values for response variables in box model

	A		B	
DO Swings	"normal variation"	<6 mg/l	"normal or low"	<6.5 mg/l
	"modest swings"	6 to 7 mg/l		
	"wide swings"	>7 mg/l	"wide swings"	>6.5 mg/l
Benthic Chlorophyll	"low level"	<107 mg/m^2	"low"	<125 mg/m^2
	"typical healthy stream"	107 to 183 mg/m^2	"moderate"	125 to 250 mg/m^2
	"enriched"	183 to 320 mg/m^2		
	"thick to nuisance levels"	183 to 320 mg/m^2	"high"	>250 mg/m^2

Implementation Issues

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2. Current Nutrient Limits

B7 - How will nutrient limits currently in place be addressed?

C6 - How will nutrient reduction activities already undertaken by point sources be accounted for?

B7 - How will nutrient limits currently in place be addressed?

- Current nutrient limits are generally result of
  - Lake Erie (P-only)
  - Existing TMDL
- Lake Erie – state is working on separate strategy
- Existing TMDL – three possibilities
  - A: No TIC evaluation (TICE)
    - TMDL implementation proceeds until TMDL achieved or shown to be flawed
    - Once TMDL achieved, trading program established to maintain TMDL
  - B: TIC evaluation (TICE) with existing nutrient TMDL
    - B1: TICE confirms impairment. Same options as A
    - B2: TICE indicates water body not enriched
      - State goes through de-listing process
      - Limits likely to remain in place unless science shows water body can accommodate more nutrient loads. State could provide additional permitting flexibility.

B7 - How will nutrient limits currently in place be addressed? (cont.)

- C: TIC evaluation (TICE) no TMDL
  - C1: TICE shows nutrient enrichment
    - TMDL conducted OR
    - Default permit limits established and TICE repeated after some period of time
  - C2: TICE is negative for nutrient enrichment
    - Nutrient limits not imposed

B7 - How will nutrient limits currently in place be addressed? (cont.)

- Permitting flexibility
  - Discharger has invested in and optimized technology to remove nutrients to permitted levels (BNR namely)
  - State removes weekly or monthly average limits and replaces with annual (or seasonal) load limits
  - Nutrient trading program established with new permit conditions
    - Annual report from nutrient exchange

C6 - How will nutrient reduction activities already undertaken by point sources be accounted for?

- Option (TMDL scenario): Calculate existing percent removal from a baseline of secondary treatment.
  - Weigh this when establishing required reductions between point and nonpoint sources
  - Any implementation scenario must consider
    - Establishing attainable and affordable reduction goals
    - Cost-benefit

C6 - How will nutrient reduction activities already undertaken by point sources be accounted for?

- Option (TMDL absent scenario):
  - Evaluate current reductions for each water body segment using 2ndary treatment as baseline
  - First step is technology-based limits: DIN = 10 mg/l; TP = 1 mg/l
  - TICE evaluation
    - No impairment, no further reductions needed
    - Impairment, DIN = 10 mg/l; TP = 0.5 mg/l

Implementation Issues – Rule Language

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4. Rule Language

C16 - What content belongs in administrative rule language vs. operational guidelines?

C16 - What content belongs in administrative rule language vs. operational guidelines?

- Combine with #13? (adaptive management)
- Should be well written, specific, and flexible and include:
  - Overview of the TIC and what it means
  - Box Model
  - Flow chart and general language describing flow chart
  - Permit cycles
  - Implementation timeframes
  - Data gathering requirements
  - Financial hardship determinations
  - Off ramps

C16 - What content belongs in administrative rule language vs. operational guidelines?

- Should <u>not</u> include:
  - Numeric values
  - Language subject to different interpretations
- Rule could be accompanied by Operational Guidelines
  - Numerical values
  - Background on Box Model
  - Detailed discussion of flow chart
  - Near vs. far-field impacts
  - Off-ramps
  - Examples

Implementation Issues- 9
Minimum Data Requirements

Rob Reash

AEP – Environmental Services

What is the issue?

- The nutrient TAG wishes to work with Ohio EPA in the shared goal of obtaining ***high quality, defensible*** field-based data to ensure defensible TIC scores.

- The goal is to ***maximize*** precision and accuracy while ***minimizing*** error (all sources)…cradle to grave.

- High quality data will ***help*** ensure that uncertainty in the interpretation of TIC scores is minimized.

What These Recommendations *Will Not* Do

- Replace, take precedence over, or contradict with existing Ohio EPA standard operating procedures, quality assurance/control measures, personnel training requirements, etc.

- The recommendations are meant to ***supplement*** existing SOPs for the derivation, calculation, and interpretation of TIC scores.

- Starting place: “Ohio EPA Surface and Ground Water Monitoring Strategy, 2011 – 2015”. DSW/EAS/2011-4-1.

Standardization of Field Procedures

- Follows existing guidelines for basin surveys:

  → summer/fall sampling period
  → target low flow conditions. When analyzing TIC scores and input variables, conduct correlation analysis using flow as ind. vari.
  Q: is there a "don't sample" flow that OEPA uses?
  → watershed size 400 – 1,000 mi^2; 10 – 12 sentinel sites; continual DO and chl *a* within point-source discharge bracket.

Standardization (cont.)

- Fish/invertebrate sampling locations: six water/sediment sample events during low-flow index period:

  → This sampling is crucial for TIC calculation.
  → Increased sample size may be needed if flows are too high, preliminary results suggest > 1 outlier, sample location is considerable distance from fish/invertebrate sample spots.
  → QA: field blanks, field duplicates, field replicates.

Data Interpretation (means to minimize false positives and increase accuracy)

- Are results consistent with the nutrient framework?

- How strong is the signal that other pollutants may be causing metric score/chemical parameter shifts?

  The principal guideline in making accurate decisions on nutrient enrichment is to have high certainty in eliminating other potential stressors.

- The process of causal identification should be documented, transparent, and understandable.

Miscellaneous

- Explain reasons why hypothesis testing is or is not used.
- Evaluate results in light of historical data.
- Fish sampling only uses 2 sample events. Concern of low sample size. What happens if the two sampling events result in highly divergent results/use attainment status?

Implementation Issues – Seasonality of Limits

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M Brom

10. Seasonality of Limits

B6: Will seasonal/annual NPDES permit limits be used?
B13: How will permit limits be expressed (30-day avg, harmonic mean, seasonal, annual, etc)?

Comments / Thoughts

- As the goal of the TIC/TAG committee is aquatic life and not downstream sources/Gulf of Mexico hypoxic zone issues, and because aquatic life is dormant in the winter, seasonal limits should apply. (J Meyer)
- For example, we have a NPDES Permit in South Dakota with the following 30 Day Average/Daily Maximum limits for ammonia-nitrogen (as N) in pounds/day (J. Meyer):
  - Winter (November through March): 163/285
  - Spring (April through May): 70/123
  - Summer (June through August): 58/102
  - Fall (September through October): 75/131

Examples to consider

- Seasonal limits seem to make sense. Ohio EPA has issued permits with seasonal nutrient limits. For example, see NPDES permit for Lower Little Miami WWTP (Warren County), which only has "summer" Phosphorus limits.
- 1.0 mg/l monthly; 1.5 mg/l weekly (and loading limits) – SUMMER only

http://wwwapp.epa.ohio.gov/dsw/permits/doc/1PK00018.pdf

Examples to consider

- Montgomery County's Eastern Regional WRF has summer-only limits (weekly and monthly concentration limits; and weekly and monthly loading limits), as well as an "annual" seasonal average load limit that is the most stringent.
- 1.0 mg/l monthly; 1.5 mg/l weekly (and loading limits) – SUMMER only
- Seasonal load limit based on 0.5 mg/l discharge level at rated capacity (13 MGD)
- Is this overly stringent???
- http://wwwapp.epa.ohio.gov/dsw/permits/doc/1PL00001.pdf

Thoughts / Comments

- If the TIC is designed to evaluate and ultimately improve WQ (via TMDL protocol) during low flow / summer flow conditions, then seasonal nutrient limits could often be appropriate. Seasonal limits for Phosphorus could result in substantial cost savings for POTW's utilizing chemical feed systems for Phosphorus control, but likely little financial benefit for POTW's utilizing BNR. (A. Sackenheim)

Thoughts / Comments

- Regardless of seasonality concerns, Butler County believes that P concentration limits should be monthly only, and P loading limit should be an "annual" limit. This setup would allow a POTW to potentially avoid the occasional (short term) violation by factoring in its long-term performance record, and still be protective of the surface water as nutrient enrichment is a long-term / cumulative phenomenon. (A. Sackenheim)

Implementation Issues – Adaptive Management

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13. Adaptive Management

Ohio Nutrient TAG Implementation Issues

13. Adaptive Management

C3 – What does Ohio EPA mean by adaptive management in the context of imposing nutrient limits on POTWs?

C4 – How will adaptive management be incorporated into the nutrient program?

C7 – How will the amount of time it takes for the effects of nutrient reduction measures to occur be accounted for?

C8 – What if two permit cycles show clear water quality improvement trend but the stream has not achieved full attainment of the aquatic life use?

C9 – How will the associated (to nutrient reduction) water quality improvements be tracked?

C11 - How will downward trends in nutrient levels (and/or upward trends in biocritieria scores) that have not yet met the goals be addressed?

C5 - How will water quality trading be used in the nutrient program?

C10 - How will the rules accommodate the implementation of effective alternatives to nutrient permit limits?

General Observations

- Address in rule including in definitions
- Implementation of flow chart could take decades
- Financial burden off-ramp will get used
- Integrated planning for stormwater (SW) and wastewater (WW) should be considered
- Mutual interests of drinking water supplies and other surface water uses needs to be considered

Implementation Issues
Financial Issues

John Meyer
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John Lyons

14. Financial Issues

C12 – How will the financial implications of meeting nutrient targets be addressed/accounted for?

C12 – How will the financial implications of meeting nutrient targets be addressed/accounted for?

- Ohio EPA needs to be a partner in implementation (particularly if majority of load is from nonpoint sources)
- Point source costs will be significant if
  - Effluent limits for TP < 0.3 mg/l
  - Biological process is different from activated sludge
  - Process cannot be expanded or there are physical space constraints
  - No trading options are available
  - Other compliance costs (e.g., wet weather) already cause a financial burden

C12 – How will the financial implications of meeting nutrient targets be addressed/accounted for?

- Science-based mass balance needed for rationale, scientific, and fair solutions
  - Who contributes the load and in what amounts?
  - What are the options available?
  - Will implementation of control measures remove the stream segment from the 303 d list?
  - Are options feasible, fair, implementable, realistic, and affordable?
  - Will primary responsibility be allocated fairly and equitably to those that contribute to the problem?
  - Will there be a disproportionate impact on POTWs given that the Clean Water Act does not give EPA or OEPA the authority to directly address many non-point source pollution loads other than those from MS4s, CAFOs, CSOs, or POTWs?