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Brown Todd** LLC
ATTORNEYS



The Future of Nutrient Regulation in Ohio

Stephen P. Samuels

Stephen N. Haughey

The Future of Nutrient Regulation in Ohio

“SNAP” is Coming.

What Is It?

What Impact will It have on Cities & Counties?

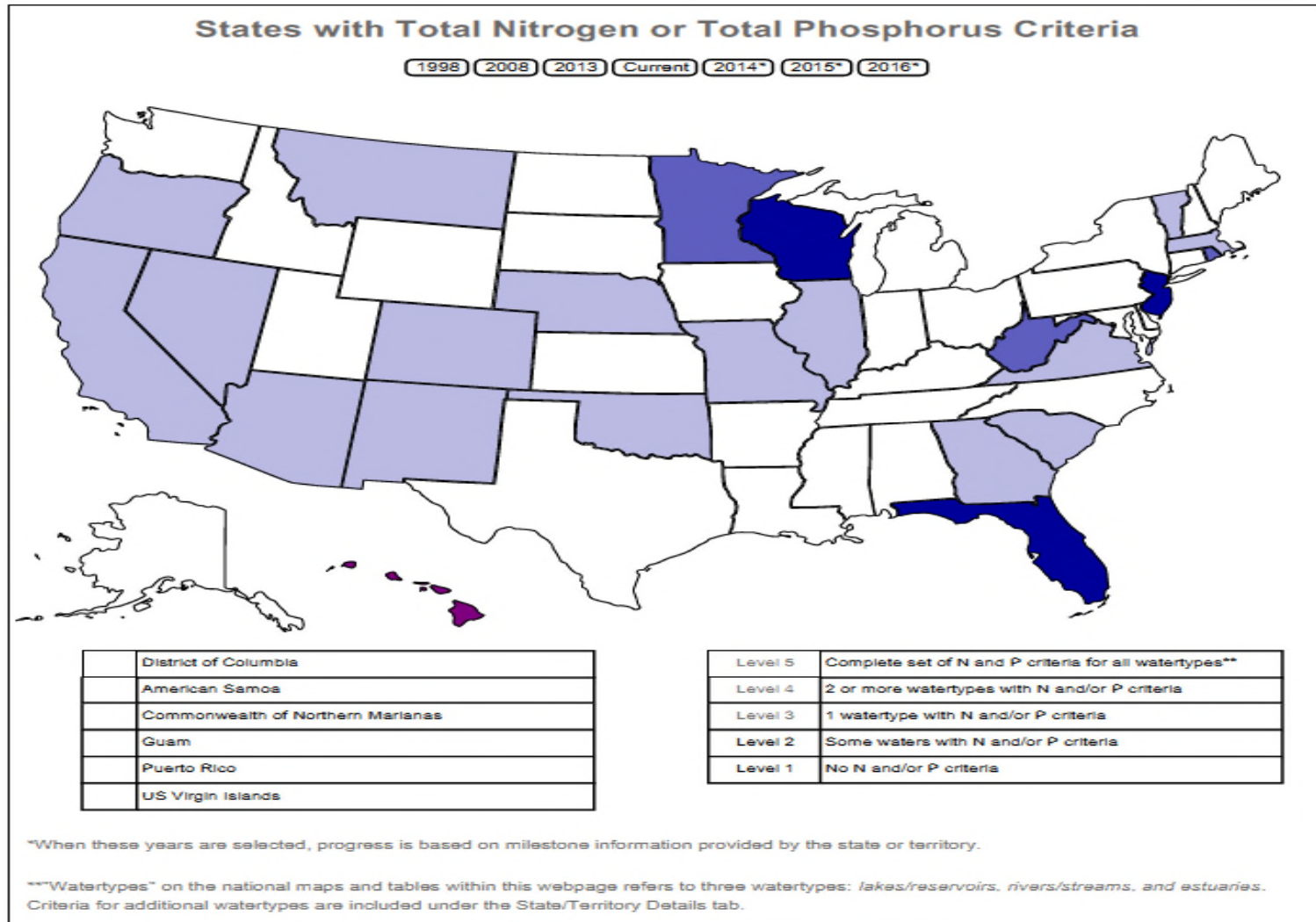
What is Nutrient Pollution? Why is it Important?

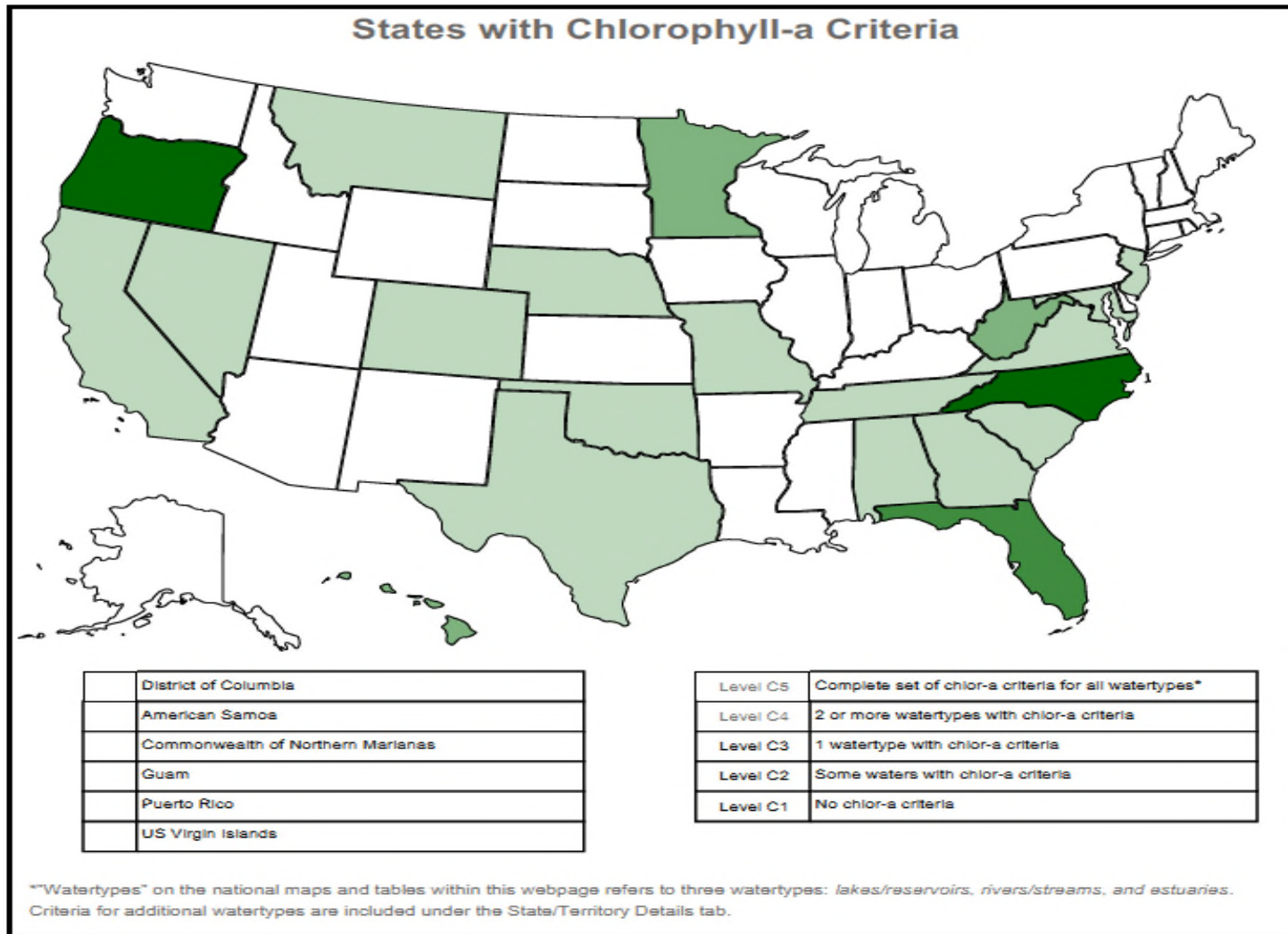
- **Excess phosphorus and/or nitrogen – “nutrients”**
- **Excess nutrients can deplete oxygen in the water, killing aquatic life.**
- **Excess nutrients promote growth of nuisance vegetation that impairs fishing and other recreational uses.**
- **Excess nutrients can lead to algal blooms that produce toxins and skin irritants.**

The Birth of Nutrient Reduction Plans

- Nutrient pollution is a major water quality problem.
- Current efforts rely primarily on use of imprecise narrative standards.
- USEPA “asked” states to develop state nutrient reduction plans, specifically numeric criteria.

How is State Planning Going?





The Florida Morass

- **Lawsuit filed by environmentalists (asserting narrative criteria were not protecting FL waters, and FL had not adopted numeric criteria).**
- **EPA and the environmental groups resolved lawsuit that required EPA to propose numeric criteria for Florida.**
- **USEPA was unable to develop stream criteria based on modeling and field studies and so adopted stream criteria using a reference stream approach.**

The Florida Morass (cont.)

- In 2011, Florida challenged the USEPA rule. Court invalidated majority of it: “Even if [USEPA’s] conclusion was that an increase in nutrients [above a certain] level ordinarily causes a harmful change in flora and fauna, USEPA did not cite a sound-science basis for the conclusion. Without a further explanation, the stream criteria were arbitrary or capricious.”

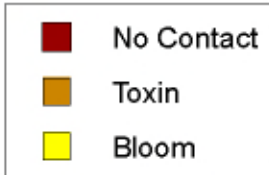
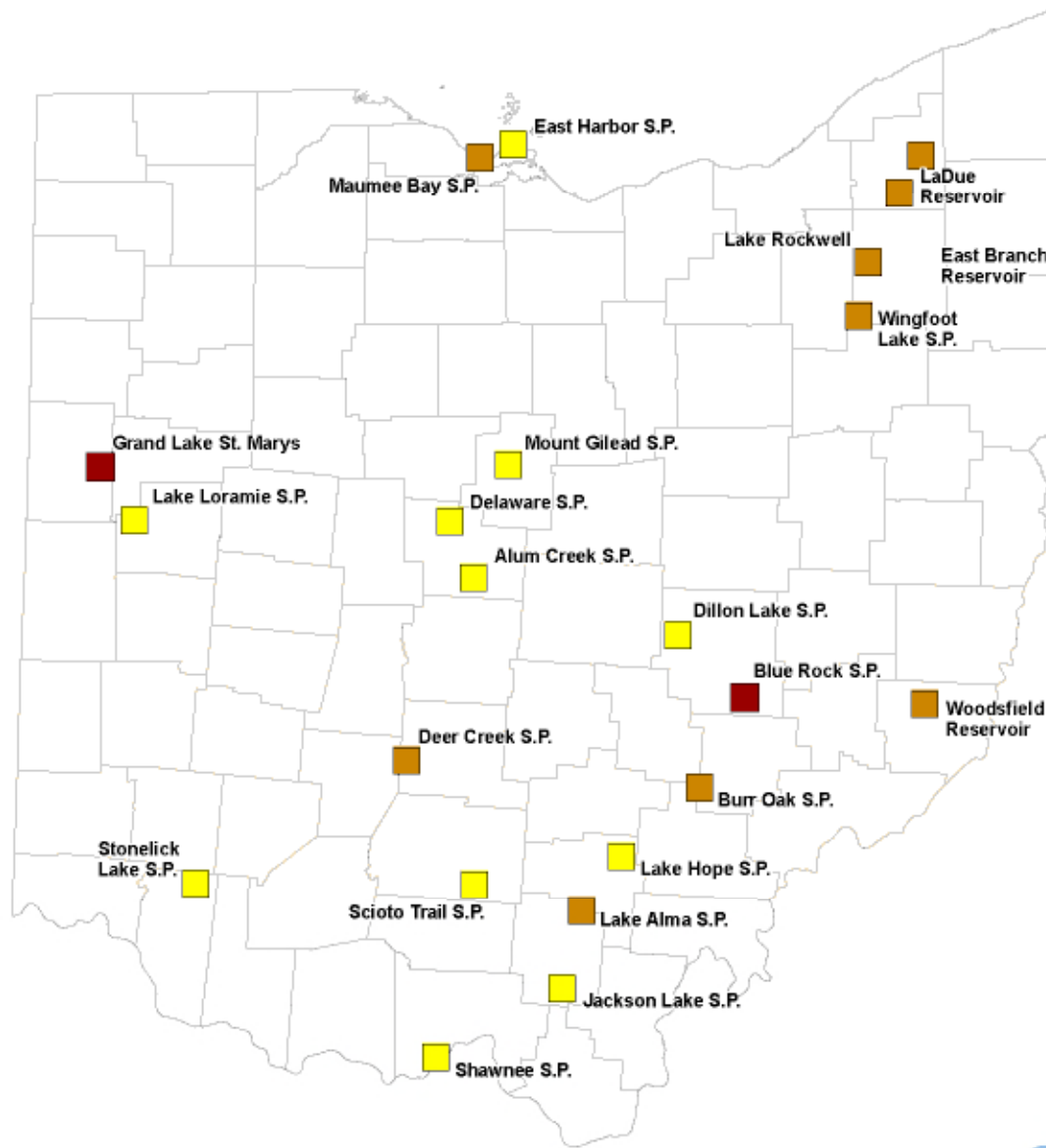
Nutrient Pollution in Ohio (Lakes)

- Harmful Algal Blooms (HABs) and widespread nuisance growths of aquatic vegetation are increasing.
- Algal toxin warnings posted for Grand Lake St. Mary's (GLSM), Ohio's largest inland lake, each of the past four summers.
- Declining Fisheries
- Fewer dollars spent on water based recreation and tourism.
- June 2010, "No Contact Advisory" for GLSM cost more than \$77 million in lost tourism dollars.
 - <http://bit.ly/17KXfVx> (Dispatch article)

Nutrient Pollution in Ohio (Drinking Water)

- In September 2013, warnings posted for Lake Erie toxin-tainted water.
- WHO recommended standard for microcystin (blue-green algae liver toxin) in drinking water is 1 ppb.
- Raw intake water from Lake Erie tested at 17 ppb in Ottawa County water treatment plant. Treated water tested at 3.56 ppb.
- Increased water treatment costs.

Ohio Harmful Algal Bloom Advisories in 2010



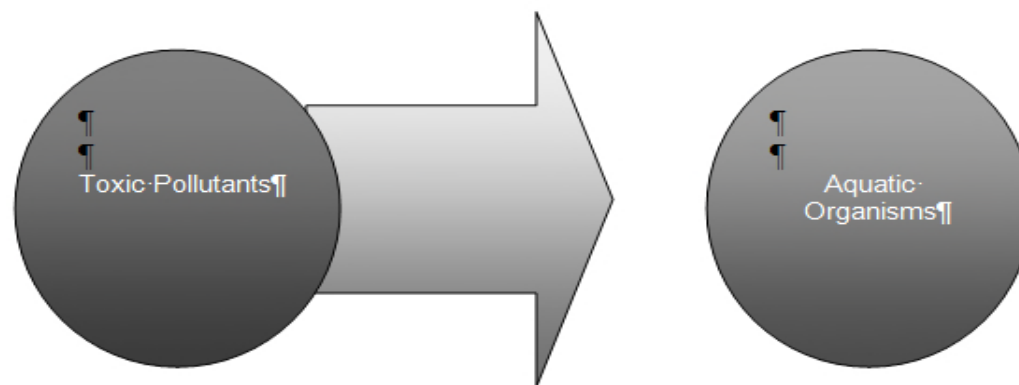
Nutrient Pollution in Ohio (Streams)

- **Almost 50% of Ohio's watersheds are degraded by nutrients.**
- **Poor/declining biological scores for fish and macroinvertebrates.**

Source – *“Ohio Nutrient Reduction Strategy,”* Ohio EPA, June, 2013.

Ohio's Nutrient Reduction Strategy

- Traditionally, numeric water quality criteria are developed using a direct dose-response relationship between pollutant and aquatic organisms:



Ohio's Nutrient Reduction Strategy

- **However, traditional dose-response relationship does not work with nutrients.**
- **Nutrients do not have direct toxic effects on aquatic organisms.**
- **Relationship between nutrients and aquatic life is indirect and complicated by other physical variables in ecosystem (e.g. substrate, canopy, temperature, flow).**

OHIO NUTRIENT REDUCTION STRATEGY

The road from “free froms” to SNAP

- **OAC 3745-1-04(E) – Ohio EPA’s narrative “free from” (1978)**
- **OAC 3745-1-07, Table 7-11 – 1.0 mg/l technology-based phosphorus limit for Lake Erie basin dischargers, as part of International Joint Commission (U.S. – Canada Agreement)**
- **The Associations Report – Ohio EPA’s reference stream approach (1999)**
- **TIC – Trophic Index Criterion – Ohio EPA’s first stressor response approach to nutrients (2013)**
- **SNAP – Stream Nutrient Assessment Procedure (2015)**

OHIO NUTRIENT REDUCTION STRATEGY: 1978-1999

Case-by-Case based on existing OEPA nutrient rules

- **OAC 3745-1-04(E) (First adopted 2/14/78):**
“To every extent practical and possible . . . all surface waters shall be free from nutrients entering the water as a result of human activity in concentrations that create nuisance growths of aquatic weeds and algae.”
- **3745-1-07 (Table 7-1): limited to lake Erie basin – as part of the U.S.- Canada Agreement**
“In areas where such nuisance growths exist, phosphorus discharges from point sources determined significant by the director shall not exceed a daily average of 1 mg/l, or such stricter requirements as may be imposed by the director . . .”

OHIO NUTRIENT REDUCTION STRATEGY: 1999 - ? The Associations Report (January 7, 1999)

- **Study of Unimpacted Smaller Streams found that TP concentrations were typically < 0.1 mg/l.**
- **Application of Associations Report to TMDLs: *de facto* TP Water Quality Standard of 0.11 mg/l.**
- **Based on U.S. EPA's initial recommendation that states develop numeric standards using the reference stream approach.**
- **Reference stream approach criticized by U.S. EPA Science Advisory Board and ultimately rejected by the federal courts in Florida.**

OHIO NUTRIENT REDUCTION STRATEGY: 2013

TIC: Trophic Index Criterion

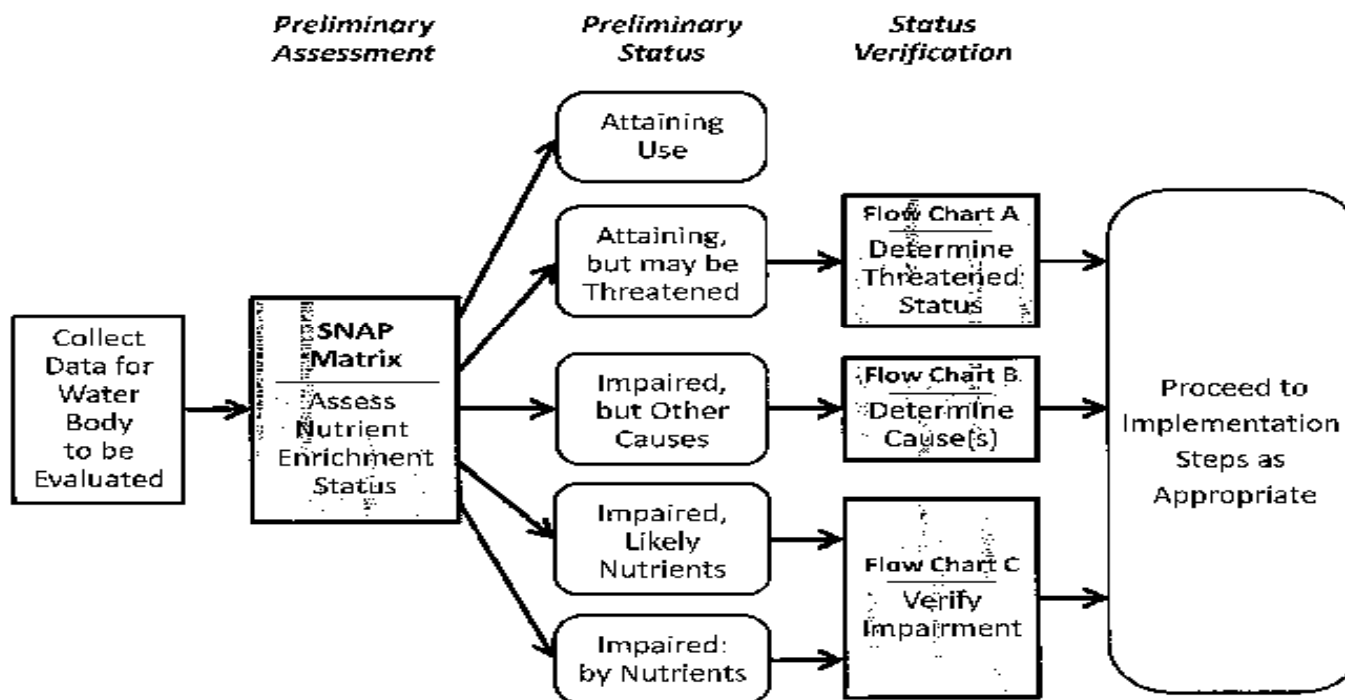
- To better reflect the nutrient-aquatic life relationship and develop a defensible cause-effect connection, OEPA proposed the TIC.
- TIC determined trophic condition of a stream - acceptable, threatened, or impaired - based on weighing of four indicators of water quality: biocriteria, DO, Chl-a, and nutrients (TP, DIN).

FROM TIC to TAG to SNAP

- TIC put out for Early Stakeholder Outreach (ESO) in Spring, 2013.
- At a high level, the Comments were generally favorable and endorsed the multi-metric biologically-based approach to establishing nutrient WQS.
- At ground level, a substantial number of questions and concerns about the TIC were raised.
- So, OEPA created a stakeholder-based technical advisory group (“TAG”).
- In coordination with OEPA, the Technical Subgroup of the TAG modified and relabeled the TIC, which is now known as the Stream Nutrient Assessment Procedure (“SNAP”).

SNAP IN A NUTSHELL

Stream Nutrient Assessment Procedure (SNAP)



Proposed Stream Nutrient Assessment Procedure (SNAP)

| 1 | 2 | 3 | 4 | |
|--|-------------------------------------|---|--|------------------------|
| Biological Criteria | DO Swing ² | Benthic Chlorophyll ³ | Preliminary Assessment: Trophic Condition Status of Evaluated Reach or Waterbody | |
| All indices attaining or in non-significant departure ¹ | 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 Flow Chart 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 | |
| | | High (>320 mg/m ²) | Impaired; likely nutrients over-enrichment | See Flow Chart C |
| | Wide swings (>6.5 mg/l) | Low (≤182 mg/m ²) | | |
| | | Moderate to high (>182 mg/m ²) | Impaired; Nutrients over-enrichment | |

Notes:

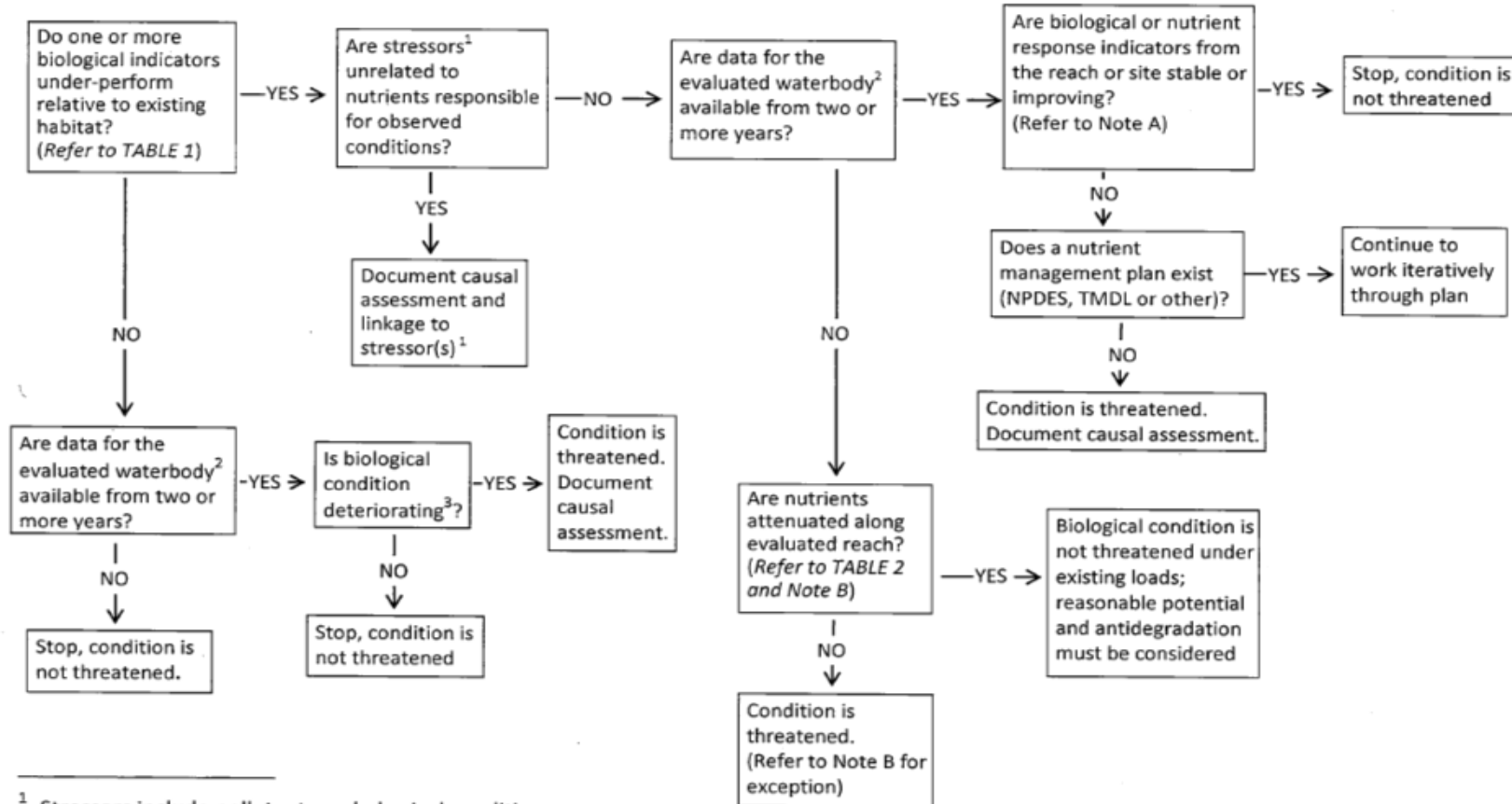
¹ Non-significant departure from biocriteria values accounts for background variability in measurements for biological indices. In accordance with "Biological Criteria for the Protection of Aquatic Life: Volume II: Users Manual for Biological Field Assessment of Ohio Surface Waters", Ohio EPA (1987, updated 1988, 1989, 2006), non-significant departure is 4 points for IBI and ICI, and 0.5 point for MIwb.

² Threshold value for 24-hour DO swing based upon a change point of 6.5 mg/l between DO swing and minimum DO. "Low to normal" DO swing is ≤ 6.5 mg/l. "Wide" DO swing is > 6.5 mg/l. Data used for analysis from *Technical Support Document for Nutrient Water Quality Standards for Ohio Rivers and Streams*, Ohio EPA (2011).

³ Threshold values for benthic chlorophyll *a* are based upon change points between benthic chlorophyll *a* and DO swings or Invertebrate Community Index (ICI). "Low" chlorophyll *a* is ≤ 182 mg/m². "Moderate" chlorophyll *a* is > 182 and ≤ 320 mg/m². "High" chlorophyll *a* is > 320 mg/m². Data used for analysis from *Technical Support Document for Nutrient Water Quality Standards for Ohio Rivers and Streams*, Ohio EPA (2011).

FLOW CHART A. – DECISION TREE FOR DETERMINING WHEN BIOLOGICALLY ATTAINING CONDITION STATUS IS THREATENED

For application when biological criteria are attaining, but one or both nutrient response indicators (DO swing or benthic chlorophyll) are elevated.



¹ Stressors include pollutants and physical conditions.

² The geographic scope or length of evaluated reaches or waterbodies are defined in approved study plans.

³ For a given site, a decrease of 5 or more IBI or ICI points, or 0.6 or more MIWb points between sampling years can represent a significant change. Trends for waterbodies are formally evaluated in Biological and Water Quality Technical Support Documents.

Flow Chart A (continued) – Additional Notes:

Note A. The top row provides for a conditional evaluation for a subset of cases where existing nutrient management plans exist, either via NPDES permits or a TMDL. To enter this row, the determination has already been made that nutrient response indicators are elevated, and biological indicators are under-performing relative to habitat. This evaluation identifies cases where biology may be under-performing, but is on an improving trajectory due to management. An existing management plan implies historic data exist, and that the reach was likely flagged as impaired; therefore, in most cases, to get to the right hand side of this row presupposes that the biological condition has already improved.

Note B. Attenuation of nutrients in an evaluated reach is demonstrated by nutrient concentrations measured at two or more successive sites downstream from a defined source decreasing through uptake, sequestration or dilution such that concentrations fall to either background levels or levels where risk of eutrophication to downstream waters is minimal (see Table 2). Where there are no historic data on which to base trends, attenuation of nutrients within the reach implies assimilation within what the waterbody can handle under existing conditions, and that stress from the nutrient load is spatially transient (i.e., localized to the immediate reach).

If attenuation appears ambiguous or cannot be determined because of an insufficient number of downstream sampling points between the source in question and the next downstream receiving water or the next major source contributor, additional sampling is needed to determine condition status.

TABLE 1 – Equations used as guidance to help determine whether biological indicators are underperforming relative to existing habitat.

To assist in determining whether measured biological indicator values at the site being assessed underperform relative to the existing habitat, the measured value(s) are compared with the 25th and 15th percentile values of all data classified as unimpaired in the Ohio EPA assessment database and stratified by the designated classification (EWH, WWH or MWH) within the specific ecoregion for the site. The 25th and 15th percentiles represent levels that most sites equal or exceed. If the respective measured biological indicator value is less than the 15th percentile value then the site is likely underperforming relative to what could be expected given the local habitat quality (QHEI). If the indicator value is between the 15th and 25th percentile values, additional information or observations should be used to determine whether or not the site is underperforming with respect to its habitat. If the indicator value is above the 25th percentile value, the site would be considered performing within the range expected for the existing habitat.

The following equations calculate the 25th and 15th percentile values as determined by regression analysis for the respective biological indicators for a given QHEI score, or a combination of QHEI score and drainage area. For small and headwater streams where insufficient stream flow prevents collection of a quantitative sample, thereby precluding calculation of an ICI score, the number of EPT taxa is used as the macroinvertebrate indicator. Such small streams are typically less than 20 square miles in drainage area, or larger if stream velocity is insufficient to collect a quantitative sample.

| Class / Ecoregion | | Percentile | IBI (fish) | MIWb (fish) | EPT Taxa (macroinvertebrates) | ICI (macroinvertebrates) |
|----------------------|-----------|------------------|-----------------------------------|---|--|---|
| EWH / All Ecoregions | | 25 th | $40.67 + 0.118 \cdot \text{QHEI}$ | $8.21 + 0.006 \cdot \text{QHEI} + 0.385 \cdot \text{Log}_{10}(\text{DA})$ | $4.65 + 0.123 \cdot \text{QHEI} + 1.182 \cdot \text{Log}_{10}(\text{DA})$ | = 46 |
| | | 15 th | $39.60 + 0.113 \cdot \text{QHEI}$ | NA | $1.47 + 0.151 \cdot \text{QHEI} + 1.084 \cdot \text{Log}_{10}(\text{DA})$ | NA |
| WWH & MWH | HELP | 25 th | $23.65 + 0.150 \cdot \text{QHEI}$ | $5.64 + 0.959 \cdot \text{Log}_{10}(\text{DA})$ | $4.26 + 2.585 \cdot \text{Log}_{10}(\text{DA})$ | All Ecoregions: 25 th percentile: $19.32 + 0.213 \cdot \text{QHEI}$ 15 th percentile: $25.60 + 0.160 \cdot \text{QHEI}$ |
| | | 15 th | $22.00 + 0.121 \cdot \text{QHEI}$ | NA | $2.54 + 2.659 \cdot \text{Log}_{10}(\text{DA})$ | |
| | EOLP | 25 th | $22.00 + 0.316 \cdot \text{QHEI}$ | $4.76 + 0.043 \cdot \text{QHEI} + 0.491 \cdot \text{Log}_{10}(\text{DA})$ | NA | |
| | | 15 th | $18.24 + 0.336 \cdot \text{QHEI}$ | $4.55 + 0.045 \cdot \text{QHEI} + 0.397 \cdot \text{Log}_{10}(\text{DA})$ | = 9 taxa | |
| | WAP | 25 th | $27.78 + 0.225 \cdot \text{QHEI}$ | $7.58 + 0.543 \cdot \text{Log}_{10}(\text{DA})$ | $3.94 + 0.114 \cdot \text{QHEI}$ | |
| | | 15 th | $31.30 + 0.200 \cdot \text{QHEI}$ | $7.94 + 0.537 \cdot \text{Log}_{10}(\text{DA})$ | $2.14 + 0.113 \cdot \text{QHEI}$ | |
| | ECBP & IP | 25 th | $29.47 + 0.133 \cdot \text{QHEI}$ | $4.96 + 0.034 \cdot \text{QHEI} + 0.362 \cdot \text{Log}_{10}(\text{DA})$ | $-0.95 + 0.147 \cdot \text{QHEI} + 0.927 \cdot \text{Log}_{10}(\text{DA})$ | |
| | | 15 th | $29.96 + 0.157 \cdot \text{QHEI}$ | $4.94 + 0.036 \cdot \text{QHEI} + 0.388 \cdot \text{Log}_{10}(\text{DA})$ | $-2.19 + 0.138 \cdot \text{QHEI} + 1.010 \cdot \text{Log}_{10}(\text{DA})$ | |

NA = Not Available. Could not be determined because of limited data or data distribution.
DA = Drainage Area (in square miles)

Table 1

TABLE 2 – Concentrations of total phosphorus (TP) and dissolved inorganic nitrogen (DIN) arrayed by narrative levels of ecological risk.

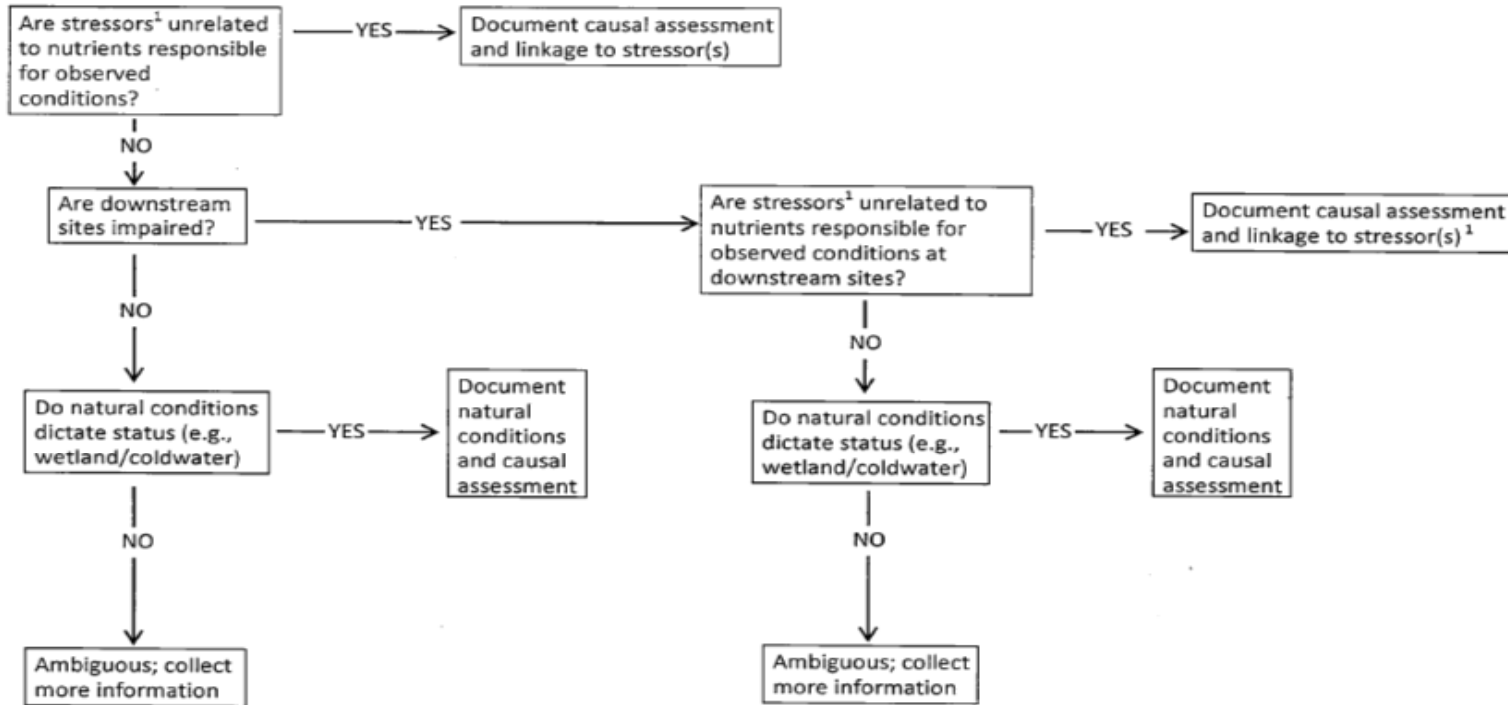
Table 2 presents narrative descriptions of various levels of ecological condition and potential risk, arrayed with ranges of nutrient concentrations commonly observed at the respective ecological condition levels. This information may be useful reference for nutrient assessment using Charts A or C. **Chart A:** Attenuation from a defined source may be inferred by nutrient concentrations measured at successive stations within an evaluated reach decreasing from a higher risk level to a lower risk level. **Chart C:** Table 2 may be used as a general reference in assessing impairment risk. Actual risks and the potential benefits of abatement are site-specific determinations.

| | | ← DECREASING RISK | | | | |
|-------------------|-----------------|--|---|--|--|---|
| | | DIN Concentration (mg/l) | | | | |
| | | <0.44 | 0.44 < 1.10 | 1.10 < 3.60 | 3.60 < 6.70 | ≥6.70 |
| DECREASING RISK → | TP Conc. (mg/l) | | | | | |
| | <0.040 | background levels typical of least disturbed conditions | levels typical of developed lands; little or no risk to beneficial uses | levels typical of modestly enriched condition in phosphorus limited systems; low risk to beneficial use if allied responses are within normal ranges | levels typical of enriched condition in phosphorus limited systems; moderate risk to beneficial use if allied responses are elevated | characteristic of tile-drained lands; otherwise atypical condition with moderate risk to beneficial use if allied responses are elevated (1.1% of observations) |
| | 0.040- <0.080 | levels typical of developed lands; little or no risk to beneficial uses | levels typical of developed lands; little or no risk to beneficial uses | levels typical of working landscapes; low risk to beneficial use if allied responses are within normal ranges | levels typical of enriched condition in phosphorus limited systems; moderate risk to beneficial use if allied responses are elevated | characteristic of tile-drained lands; moderate risk to beneficial use if allied responses are elevated (1.1% of observations) |
| | 0.080- <0.131 | levels typical of modestly enriched condition in nitrogen limited systems; low risk to beneficial use if allied responses are within normal ranges | levels typical of working landscapes; low risk to beneficial use if allied responses are within normal ranges | levels typical of working landscapes; low risk to beneficial use if allied responses are within normal ranges | characteristic of tile-drained lands; moderate risk to beneficial use if allied responses are elevated; increased risk with poor habitat | characteristic of tile-drained lands; moderate risk to beneficial use if allied responses are elevated (1.0% of observations) |
| | 0.131- <0.400 | levels typical of modestly enriched condition in nitrogen limited systems; low risk to beneficial use if allied responses are within normal ranges | levels typical of enriched condition; low risk to beneficial use if allied responses are within normal ranges | levels typical of enriched condition; low risk to beneficial use if allied responses are within normal ranges; increased risk with poor habitat | enriched condition; generally high risk to beneficial uses; often co-occurring with multiple stressors; increased risk with poor habitat | enriched condition; generally high risk to beneficial uses; often co-occurring with multiple stressors |
| | ≥0.400 | atypical condition (1.3% of observations) | atypical condition (1% of observations); | enriched condition; generally high risk to beneficial uses; often co-occurring with multiple stressors; increased risk with poor habitat | enriched condition; generally high risk to beneficial uses; often co-occurring with multiple stressors; increased risk with poor habitat | enriched condition; generally high risk to beneficial uses; often co-occurring with multiple stressors |

"allied responses" = allied response indicators (DO swing, benthic chlorophyll)

FLOW CHART B – DECISION TREE FOR DETERMINING BIOLOGICAL IMPAIRMENT CAUSED BY STRESSORS OTHER THAN NUTRIENTS

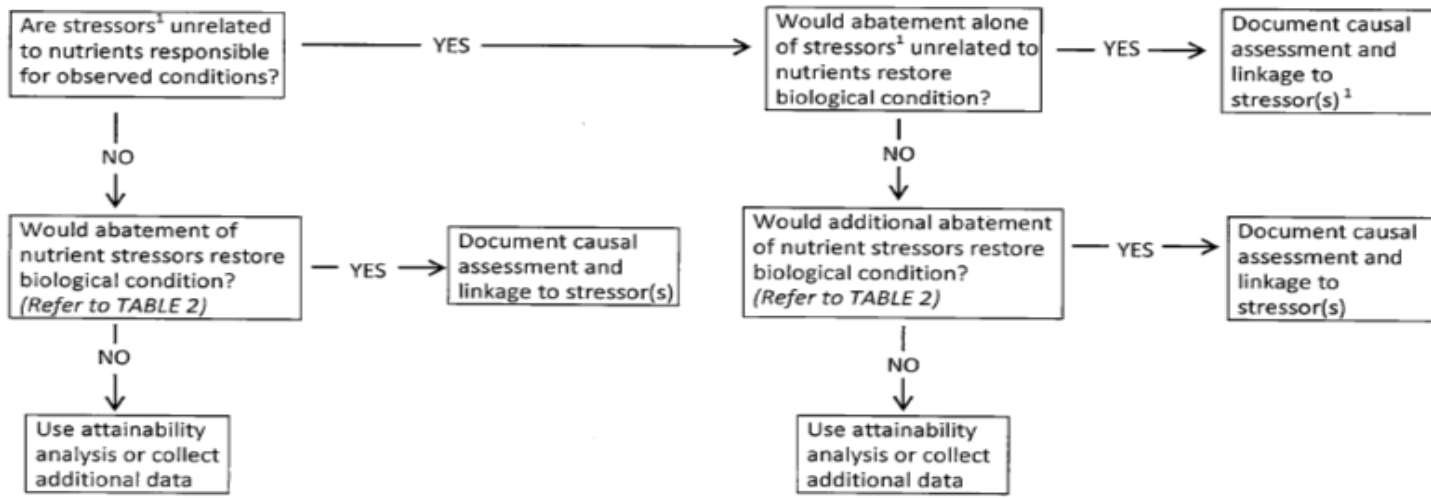
For application when one or more biological criteria are non-attaining, but no nutrient response indicators (DO swing or benthic chlorophyll) are elevated.



¹ Stressors include pollutants and physical conditions.

FLOW CHART C – DECISION TREE FOR CONFIRMING BIOLOGICAL IMPAIRMENT CAUSED BY NUTRIENTS

For application when one or more biological criteria are non-attaining, and either nutrient response indicator (DO swing or benthic chlorophyll) is elevated.



¹ Stressors include pollutants and physical conditions.

SNAP Implementation

Many Questions yet to be resolved, including:

- Will permit limits be imposed in advance of SNAP? If so, how will they be derived?
- Will SNAP be performed in any context other than TMDLs? If so, will SNAP results be subject to review, comment, legal challenge by third parties? When? How?
- Will SNAP be performed on basin, sub-basin, stream, or stream segment basis?
- Data Requirements
 - What if there is insufficient data (chemical or biological) for one of the SNAP factors?
 - What constitutes sufficient data?

SNAP Implementation

Many Questions yet to be resolved, including: (cont.)

- **What water bodies does SNAP apply to?**
 - a. Channelized watercourses? County ditches? Other?
 - b. Stream size?
 - c. Ponds, lakes, wetlands?
- **What happens if SNAP determines nutrients are not (or may not) be a problem when an existing TMDL or permit has recommended P limits?**

SNAP Implementation

Many Questions yet to be resolved, including: (cont.)

- **If SNAP determines nutrients are not the principal source of impairment, will any action be taken regarding point source TP and DIN discharges?**
- **Should implementation strategy be different if stream is threatened, but not impaired?**
- **Should implementation strategy be different if a nutrient management plan (NPDES or TMDL) has been approved?**

SNAP Implementation

Many Questions yet to be resolved, including: (cont.)

- **What should be the metric(s) for determining whether nutrient reductions by point sources should be required (and when):**
 - a. Stream is impaired?**
 - b. Stream is threatened, but not impaired?**
 - c. Nutrient reductions from PSs will materially improve (near-field) biology?**
 - d. Nutrient reductions from PSs will restore designated use?**
 - e. Non-nutrient stressors prevent substantial improvement (and such stressors are unlikely [or unknown] to be abated in the foreseeable future)?**
 - f. Are far field impacts relevant?**
 - g. Non-point sources or other unregulated sources are unlikely to be abated in the foreseeable future?**

SNAP Implementation

Many Questions yet to be resolved, including: (cont.)

- Will limitations of nutrient discharges be required for non-point sources?
- What will be the criteria for allocating nutrient reductions among contributing sources?
 - Will PS be treated differently than NPS?
 - Will all PS be treated identically?

SNAP Implementation

Many Questions yet to be resolved, including: (cont.)

- Effluent Trading Issues
- Will PSs that have already reduced nutrients be given “credit” for having done so?

SNAP Implementation

Many Questions yet to be resolved, including: (cont.)

- **Cost-benefit/Technical Feasibility/Economic Reasonableness**
 - Should there be “off ramps” for technical or economic factors?
 - How will affordability be determined?
 - Should integrated planning be incorporated into the rule?
 - If unaffordable, what is the relief?
- **Permit Limits**
 - Compliance schedule
 - Interim limits
 - Seasonal limits

SNAP Implementation

Many Questions yet to be resolved, including: (cont.)

- How will reasonable potential and antidegradation be determined ?
- Will SNAP be incorporated into regulatory decisions other than NPDES permits, e.g., storm water?

SNAP Implementation

Many Questions yet to be resolved, including: (cont.)

- **Adaptive management**
 - a. **Will AM be incorporated into nutrient reduction rule?**
 - b. **What does AM mean?**
 - c. **How will the amount of time it takes for nutrient reduction measures to be manifested be accounted for?**
- **Drinking water issues: nitrate, cyanobacteria, other?**
- **Margin of safety?**
- **Margin for growth?**

Steps to consider to reduce risk of stringent nutrient limits in the future

- Riparian habitat improvements
- Data collection
- Trading

Stephen P. Samuels, Esq.
FROST BROWN TODD LLC
One Columbus, Suite 2300
10 W. Broad Street
Columbus, OH 43215
(614) 559-7259
ssamuels@fbtlaw.com

Stephen N. Haughey, Esq.
FROST BROWN TODD LLC
3300 Great American Tower
301 E. Fourth Street
Cincinnati, OH 45202
(513) 651-6127
shaughey@fbtlaw.com