

Stream Nutrient Aquatic Life Criteria
Technical Advisory Committee

Meeting Notes

Wednesday, April 7, 2010
Wallace Building, 3rd Floor Conference Room

Present: Mike Birmingham, Mike Burkart, Connie Dou, Greg Gelwicks, Chris Jones, Steve Kalkhoff, John Olson, Clay Pierce, Kurt Pontasch, Keith Schilling, Mary Skopec, Mark Tomer, Gary Welker, Tom Wilton

Not present: Ed Brown, Tom Isenhardt, Peter Jacobson, Donna Schulze-Lutz

The meeting began at 9:30 a.m. Tom Wilton presented several PowerPoint slides covering some background information about nutrients and describing the TAC mission and process.

1. Introductions and meeting objectives
 - a. Clarify mission and process
 - b. Establish work direction
2. Preliminary Questions
 - a. Why nutrient criteria?
 - i. Need to address serious water quality problems caused by nutrient enrichment.
 - ii. Federal and State requirements to establish nutrient standards
3. Why form a TAC?
 - a. Ensure sound science
 - b. State law requires
4. Need for nutrient criteria to protect aquatic life
 - a. Freshwater mussels – 55 species, 29 are Species of Greatest Conservation Need (SGCN); Fish – 153 species, 68 are SGCN.
 - b. Wildlife Diversity Plan: Flowing water habitat important for many SGCN
5. Nutrient enrichment problem
 - a. Typical focus is on N & P and the primary (increased photosynthesis production and aquatic plant biomass) and secondary responses (water quality problems and detrimental impacts to aquatic communities) that occur from increased nutrient inputs
 - b. Recently, more attention is being paid to heterotrophic production (e.g., bacteria, fungi) responses to nutrients
6. TAC mission & process
 - a. Mission: assist IDNR in developing nutrient criteria for the protection of stream aquatic life designated uses.
 - b. Objectives:
 - i. Advise IDNR and public on scientific aspects of stream nutrient and nutrient effects
 - ii. Develop criteria recommendations
 - iii. Identify and clarify future technical needs
7. TAC process characteristics:
 - a. Lead by IDNR.
 - b. Focus on objective and data driven approach
 - c. Consensus orientated, majority and minority views documented
 - d. Interface with IDNR standards development process

Wilton emphasized the process will include an interface between the TAC and the IDNR whereby the TAC will have the opportunity to meet with IDNR during the water quality standards

development process. He also indicated the IDNR is considering ways to inform stakeholders and seek their input.

Bill Ehm, IDNR Water Policy Coordinator, commented that IDNR does plan to have at least one opportunity for a wider (broader) group of stakeholders to get involved with the nutrient criteria process, although not necessarily to provide comments on the process. WQ Standards and rules are “a beast of their own,” but the process begins with the TAC.

8. TAC Process Steps:

- a. Become familiar with water quality standards and nutrient criteria guidance
- b. Review nutrient literature and available nutrient criteria benchmarks
- c. Inventory, summarize, and analyze Iowa-specific data
- d. Define data gaps and nutrient monitoring needs
- e. Construct and evaluate conceptual nutrient criteria scenarios
- f. Where feasible, quantifiably define nutrient and nutrient response criteria
- g. Document TAC proceedings and recommendations

9. Issues/questions

- a. How suitable is Iowa’s current life designated use framework for establishing nutrient criteria?
- b. What other stream classes or strata should be considered in developing nutrient criteria recommendations?
- c. To what extent are existing nutrient criteria benchmarks applicable to Iowa streams?
- d. To what extent can Iowa-specific data be used to craft nutrient criteria recommendations for all aquatic life uses or sub classifications?
- e. How should uncertainty/variability in nutrient-biological responses be dealt with?
- f. How sufficient is the cause and effect evidence linking nutrient levels with biological assemblage indicators?
- g. What is the best approach for dealing with downstream nutrient impacts?
- h. What were the pristine or pre-settlement nutrient levels in Iowa streams?
- i. What are realistically achievable nutrient levels?
- j. How might the Department address anthropogenic-related attainability issues in developing nutrient standards and policies?

Discussion - TAC mission and process:

Mike Burkart asked if the TAC will address toxicity concerns of nutrients (e.g., ammonia, nitrate). Wilton responded the TAC will primarily focus on sub-lethal effects of nutrients and will not directly address acute or chronic toxicity caused by some nutrient parameters. IDNR has been working on ammonia toxicity criteria for a long time and he doesn’t see the TAC re-examining that work. He expressed, however, the TAC should be mindful of emerging concerns over nitrate toxicity and ammonia toxicity to freshwater mussels as described in published research articles provided to the TAC by Burkart.

Mary Skopec asked about the status of lake nutrient standards and whether the TAC should be concerned about the timing. For example, if stream criteria were to be passed before lake criteria would there be a risk of the stream criteria not being compatible with the lake criteria? Wilton responded the proposed lake recreational nutrient standards are being revisited at the moment, and he can’t predict when they are likely to become effective. He mentioned the TAC does need to consider downstream effects in establishing stream criteria; therefore consideration of potential lake nutrient criteria is relevant.

Greg Gelwicks asked about the status of stream nutrient criteria in surrounding states. Wilton responded he is aware of similar criteria development work underway in most of the states

surrounding Iowa; however he has not a chance yet to talk to each of the State nutrient contacts yet.

[The meeting was interrupted here for approximately 20 minutes due to a scheduled tornado warning & evacuation drill]

Connie Dou noted that water quality standards are developed to protect both recreational and aquatic life designated uses. She asked if the TAC will address only aquatic life uses or will recreational uses also be considered? Wilton responded that he has been operating under the assumption the TAC will address aquatic life uses only.

Wilton asked Gary Welker whether the Regional Technical Assistance Group (RTAG) had considered recreational uses when it developed the EPA Region 7 stream nutrient benchmarks. Welker responded the RTAG focused on aquatic life uses and assumed that aquatic life would be the most sensitive use; therefore, aquatic life criteria would also be protective of other uses (e.g., recreational uses).

Welker then provided a brief description of the RTAG's work. He indicated the RTAG began in about 1999 and included representatives from several universities, state environmental agencies (Region 7 states), and the USGS. The RTAG started with lakes and reservoirs and established the following benchmarks: TP, 35 ug/l; TN, 700 ug/l; and chlorophyll-a, 8 ug/l). The RTAG then worked on streams and established the following benchmarks: TP, 75 ug/l; TN, 900 ug/l; free-floating chlorophyll-a, 8 ug/l; and benthic chlorophyll-a, 40 mg/m²). Now, the RTAG is moving (slowly) toward developing nutrient recommendations for wetlands.

Welker mentioned the RTAG struggled a lot with the problem of how to classify lakes and streams/rivers when setting nutrient benchmarks; i.e., should all lakes and all rivers/streams receive the same respective recommendations? Welker noted that the RTAG went through several attempts at lake classification (e.g., shallow versus deep; artificial versus natural) but wound up lumping all these classes into one for purposes of establishing nutrient benchmarks.

Wilton asked Welker about the RTAG's investigation of relationships between stream nutrient levels and biological assemblages. Welker indicated the benthic macroinvertebrate data turned out to be more relevant than the fish data when looking at reference models. In the end, the RTAG used multiple lines of evidence to arrive at the stream nutrient benchmarks. Wilton remarked that it makes sense for the TAC to take a close look at the RTAG stream benchmarks to determine if they are appropriate for Iowa.

Kurt Pontasch asked whether anyone had looked at relative nutrient inputs from agriculture and wastewater treatment plants. Wilton responded that work on a nutrient budget for Iowa watersheds has been completed, and he thought that such questions were outside the scope of the TAC. Pontasch replied he had heard that about 75% of nutrient contributions are from agriculture, and wondered if we could ever meet a goal of something like 1 mg/l nitrate as indicated in a number of proposed benchmarks? [Note: Pontasch later clarified the study he referenced is from England and was published in the 1970s. Wilton also noted that the 2005 nutrient budget for Iowa completed by DNR found that 92% of stream N loads and 80% of stream P loads were from nonpoint sources <http://www.iowadnr.gov/water/nutrients/files/nbsum.pdf>.]

Mark Tomer noted that looking at what can lower nutrient levels is an entirely different question; Wilton agreed, and noted that for the purpose of nutrient criteria development, the TAC will be dealing mostly with nutrient concentrations and not with nutrient loads.

Greg Gelwicks asked for clarification about what nutrient criteria actually consist of and how they will be used. Wilton responded that states typically set [or have been strongly urged by EPA to set] nutrient criteria for two causal variables - TP & TN, and two primary response variables - chlorophyll-a and some measure of water clarity (e.g., Secchi depth). However, the guidance

does allow some flexibility in choosing nutrient criteria parameters, particularly among the response variables. Regarding nutrient criteria implications, Wilton deferred to Bill Ehm who noted that nutrient criteria will be used to set nutrient goals for WQ projects on impaired waters and that nutrient criteria could have impacts on agriculture (e.g., feedlot runoff) as well.

Returning to Tomer's remark distinguishing issues concerning nutrient loads versus nutrient concentrations, Wilton suggested that the TAC might be able to shed some light on the issue of what is attainable with respect to watershed nutrient load reductions, thus contributing to the science surrounding the implementation side of nutrient criteria. Although this is not the main focus of the TAC, it is an important issue that will have to be dealt with eventually.

Mary Skopec asked whether a fiscal impact statement will be needed for the proposed nutrient criteria. Wilton responded that a fiscal impact statement will be needed but that such a task is the responsibility of the IDNR water quality standards section, and not a TAC objective.

Connie Dou asked Gary Welker if the RTAG benchmarks incorporated seasonality considerations; he indicated the RTAG benchmarks do not account for seasonal nutrient variation. Connie also asked whether the RTAG benchmarks accounted for downstream impacts. Welker indicated that the benchmarks do not directly account for downstream impacts; however, he thought the RTAG's belief was that if the benchmarks were met, downstream impacts would not be a problem.

Keith Schilling asked Welker about the RTAG's comfort level in setting such low benchmarks for TN and TP. Welker responded that the RTAG used data from all four states and mentioned that Nebraska and Kansas were incorporating the RTAG nutrient benchmarks into their lake criteria. Schilling followed up with asking, again, how the RTAG arrived at such low benchmarks when the data used are from, more or less, nutrient-impacted sites. Welker explained that the RTAG used several approaches to develop potential benchmark values including using EPA's percentile approach, the tri-section method, and macroinvertebrate data to back-calculate to nutrient benchmarks. No one approach was weighted over the other; rather, all approaches (lines of evidence) pointed toward similar nutrient levels.

Steve Kalkhoff suggested that, if protecting against downstream impacts is an important issue, then loading might be more important than concentration. Wilton agreed and added that timing of nutrient delivery is also important, noting that a disproportionate amount of the load occurs during storm events or the "wet season" when stream nutrient problems are not usually manifested. Therefore, concentration-based nutrient criteria recommendations for low flow conditions may not be particularly useful for protecting downstream uses.

Mary Skopec recommended that the TAC evaluate the "data gaps" issue right away. If done soon, there might still be time to implement monitoring projects via UHL if necessary. Wilton indicated some preliminary discussions about special monitoring studies had already occurred. He noted that Tom Isenhardt, ISU-NREM, has a grant to study instream nutrient dynamics and this research might offer an opportunity for IDNR to collaborate for nutrient criteria monitoring objectives.

Kurt Pontasch asked that if EPA is requiring criteria for TP, TN, chlorophyll-a, and water clarity, how much data do we have for these parameters? Wilton responded there is a lot of data for some parameters and some types of streams/rivers; however, there are likely to be some data gaps. Pontasch remarked about the role of inorganic sedimentation as a major player in controlling species richness, and about Iowa's seemingly very broad classifications of aquatic life use designations.

Water Quality Standards / Designated Uses

Wilton provided a brief introduction to Iowa Water Quality Standards, mostly emphasizing aspects of the aquatic life use designations.

1. Iowa WQ standards
 - a. 3 Components: designated uses, criteria, anti-degradation policy
 - b. 3 types of designated uses: A – primary recreation; B – aquatic life; C – drinking
 - c. 5 aquatic life use classifications:
 - Cold water aquatic life—Type 1 (Class “B(CW1)”)
 - Cold water aquatic life—Type 2 (Class “B(CW2)”)
 - Warm water—Type 1 (Class “B(WW-1)”)
 - Warm water—Type 2 (Class “B(WW-2)”)
 - Warm water—Type 3 (Class “B(WW-3)”)
 - d. Class B – aquatic life designations are generally distinguished by the following characteristics:
 - thermal (warm water, cold water)
 - stream size/flow
 - variety of aquatic life & ability to support game fish

Much of the discussion centered on the lack of specificity in the definitions of aquatic life uses. Kurt Pontasch asked for clarification on the term, “resident aquatic community”. Mike Burkart asked for clarification on what defines “variety” with respect to aquatic life. He noted this term is used in many of the designations. Wilton agreed the definitions are vague with respect to aquatic life expectations, and he added that the stream biological assessment program uses the Index of Biotic Integrity (IBI) as more or less a quantitative translator of the aquatic life definitions. Iowa’s IBI’s quantify many different aspects of the benthic macroinvertebrate and fish assemblages, including species richness, tolerance, trophic (feeding) and habitat guilds.

Mark Tomer asked about where drainage ditches fit into Iowa’s stream classification system. Wilton responded that prior to 2006, many drainage ditches would be classified either as “general use” streams or designated for Class B(LR) uses. After 2006, all perennial streams, including perennial ditches, are presumed to be capable of supporting Class A1 and Class B(WW1) uses until a use attainability analysis is conducted, which might change the designated uses.

Clay Pierce asked whether modification of the aquatic life use designations is part of the TAC process, or whether we need to accept these definitions and develop nutrient criteria to fit this current framework. Wilton responded that, yes, we need to fit the TAC’s nutrient criteria recommendations to the existing WQS framework; however, the TAC might find the current WQS framework may not be a good fit for nutrient criteria and may need to explore other ideas on subdividing/revising this framework.

Gary Welker asked about “native fish and invertebrate species.” Wilton responded that we use an index (the IBI) to characterize these aquatic communities and that the index is designed to correspond to IDNR’s current definitions of aquatic life uses. He assumes that the TAC’s nutrient criteria recommendations will be developed to protect the most sensitive aquatic group.

Mike Burkart suggested that we clarify the off-hand comments made thus far about aquatic life uses (e.g., clarify what is meant by “associated aquatic communities”). He sees these distinctions as important.

Greg Gelwicks stated that he sees the current definitions of designated uses as combining water quality and habitat, but nutrient criteria do not account for habitat. Habitat could be a confounding factor in many streams – if you lack habitat, many species will not be present.

Wilton remarked there are some differences in chemical criteria reflected in the use designations. Connie Dou confirmed there are human health (HH) criteria for toxic contaminants designed to protect people who catch and consume fish from streams designated B(WW1). She also noted that ammonia criteria are somewhat different between B(WW1) and B(WW2) aquatic life uses, but only in the fact that the early life stage for B(WW1) starts earlier in the year than the ELS for B(WW2) streams; other than that difference, the numeric criteria for ammonia are the same.

Chris Jones asked whether IDNR has a list of indicator species for each aquatic life subdivision. Wilton responded not really, but that IDNR does have indicator species listed in the cold water designated use protocol that are used to identify cold water streams. He explained that IDNR does not use an indicator species approach in biomonitoring. The IBI approach looks at various aspects of the aquatic community that are not species-specific. Wilton also remarked that he had recently seen an example where one state (New York) had developed a benthic macroinvertebrate nutrient index based on each species sensitivity to nutrient levels.

Gary Welker asked whether we have biological data for all stream sizes. Wilton responded that we do have some biological data for all stream/river sizes but most of the data are from wadeable streams. Biological data from the very small perennial streams and from large non-wadeable rivers are less extensive.

Chris Jones asked whether we would expect large variations in biological diversity or quality among large streams. Wilton responded that he plans to present some information about the range of biological conditions at the next meeting, but did remark that biological monitoring has found a substantial range in conditions among large streams; however, most of the sites monitored seem to be clumped in the fair-to-good range.

Mary Skopec mentioned the complicating factor of regional differences and asked whether Iowa's ecoregion framework might be used to develop nutrient criteria recommendations. Wilton agreed that it was probably something to consider.

John Olson commented on the difficulty in placing streams into the various aquatic life subclasses and that IDNR revisits the definitions of these subclasses from time to time; thus, the TAC should not feel that the current definitions are set in stone.

Kurt Pontasch suggested that the TAC should not waste much time on the issue of aquatic life subclasses given the time constraints and need to mesh the criteria with the existing use designations.

Nutrient criteria guidance

Wilton presented information about nutrient criteria development steps and approaches from EPA's (2000) river/stream nutrient criteria technical guidance manual.

Criteria Development Steps:

1. Identify water quality needs and goals with regard to managing nutrient enrichment problems.
2. Classify rivers and streams first by type, and then by trophic status.
3. Select variables for monitoring nutrients.
4. Design a sampling program for monitoring nutrients and algal biomass in rivers and streams.
5. Collect data and build database.
6. Analyze data.
7. Develop criteria based on reference conditions and data analyses.

Wilton remarked that ideally these steps would be done sequentially; however, the reality is that steps are not done in order, and we have to make the most of what is available. He added that

Iowa is in pretty good shape with many of the steps and is probably close to the point where data analysis can occur.

Pontasch noted the EPA steps overlap with the steps in the TAC mission and process document. He suggested following the EPA steps because they seem to make sense. Wilton indicated he would revisit the mission and process document and could modify the process steps to better reflect EPA's steps.

With respect to criteria setting or derivation - three approaches are advocated:

1. Identification of *reference reaches* for each stream class based on best professional judgment (BPJ) or percentile selections of data plotted as frequency distributions;
2. Use of *predictive relationships* (e.g., trophic state classifications, models, biocriteria);
3. Application and/or modification of *established nutrient/algal thresholds* (e.g., nutrient concentration thresholds or algal limits from published literature).

Wilton noted that EPA guidance favors using a weight-of-evidence approach to setting criteria based on more than one derivation approach. He suggested that all three approaches could probably be used in Iowa.

Mike Burkart asked how the seven steps on the previous slide related to derivation approaches "B" and "C"? Wilton responded that "B" applies to step 6 "data analysis" and that he would prefer using Iowa data for this type of analysis. Kurt Pontasch stated he thought that all three derivation approaches would give approximately the same answer. He further asked what data the TAC has to evaluate the various approaches to criteria derivation. Wilton remarked that a lot of data had been collected since 2000 when the EPA National guidance criteria were released. He said that he would like to attempt derivation approach "A" (reference reach; e.g., use the 25th percentile approach) and showed an example using REMAP random stream survey data.

Mark Tomer suggested that we might want to tailor any future monitoring to the particular derivation approach used.

Mike Burkart recommended not beginning any data analysis until clear objectives had been identified.

Moving forward

Short term (1-2 months):

- Monitoring needs
- Data inventory/literature review
- Data analysis strategy

TAC utilization

- Communication/meetings
- Data analysis and interpretation
- Process documentation
- Products

Wilton outlined his views on short-term work plans and utilizing the TAC. He briefly described the ongoing efforts to find and review nutrient literature resources. His approach is to evaluate relevancy to Iowa and to glean any quantitative benchmarks that are documented in the literature. He suggested it might be helpful to develop a ranking process to help identify the most useful literature sources.

Wilton also indicated the inventory of Iowa-specific data would continue and invited TAC members to help identify and describe data sources they are familiar with. WQ data collected

more frequently than monthly would be very useful since the State monitoring programs usually don't collect "temporally dense" data.

With respect to data analysis strategy, Clay Pierce noted that the timing of when data has been collected is critical in relation to the "loading versus concentration" issue. He views seasonality and flow as important variables, and conceivably these variables might be used to define target conditions for establishing load-based and concentration-based nutrient criteria recommendations.

Kurt Pontasch offered that nutrient criteria recommendations based on concentration should be sufficient to address loading issues. He would like to see the TAC focus on protecting Iowa's aquatic life versus a focus on downstream impacts.

TAC utilization:

Wilton estimates that the TAC will meet from four to six times over the next year with meeting scheduled more on a "need to discuss" basis than on a fixed-interval. Wilton suggested that holding the next meeting sometime in June might make sense. Wilton briefly discussed data sharing and communication options for the TAC, and what types of products could be expected. At a minimum, a final report of the TAC's findings and criteria recommendations will be prepared.

Mike Burkart expressed that he would like to see a set of key issues identified that the TAC can address one-by-one. Wilton agreed this would be helpful as a way of avoiding circular discussions. Burkart further suggested answering "basic questions" first and remarked that the TAC had not reached a decision on nutrient criteria goals. Kurt Pontasch agreed and suggested the TAC follow a step-by-step process like the EPA guidance. Wilton indicated he would attempt to outline key issues and distribute them to the TAC for consideration. One idea that was mentioned was using something like "Doodle Survey" as a means of documenting member opinions on various issues.

Regarding nutrient monitoring needs, Keith Schilling suggested focusing on temporal/seasonal aspects. Wilton remarked there doesn't seem to be much temporal sampling data on stream benthic chlorophyll. Also, we have relatively little nutrient sampling data from biological reference stream sites; therefore, collecting more detailed nutrient related data from these and other high-quality systems might be important.

Kurt Pontasch mentioned he thought he might have some repeat sampling data for benthic chlorophyll but it probably won't have corresponding data for TN or TP. Wilton responded that even without supporting data for nutrient, such data could still be useful.

The meeting adjourned at approximately 12:15 p.m.