N-STEMS and T-REQS: Online support for nutrient criteria development

Mike Paul and Kristen Pavlik, Tetra Tech, Inc

EPA National Nutrient Team
Objective

- Provide regions, states, and tribes with support related to nutrient criteria development
- Provide access to expert assistance with issues related to nutrient criteria development and implementation
- Improve communication nationwide
Basic tools

- Nutrient Scientific Technical Exchange Partnership and Support (N-STEPS) Website
  - [http://n-steps.tetratech-ffx.com](http://n-steps.tetratech-ffx.com)
  - Username & Password: nutrient

- Technical REQuest System (T-REQS)
  - [http://t-reqs.tetratech-ffx.com](http://t-reqs.tetratech-ffx.com)
  - Or access via N-STEPS
  - Request username & password
N-STEMS - Website nutrient criteria support

- Multiple pages
  - Headquarters Nutrient Criteria News
  - Regional Nutrient Criteria News Support documents
  - Statistical Tools
  - Support Literature and Presentations
  - Upcoming Events
  - Links
  - Discussion Board (planned) and Webcasts (planned)
  - Glossary
  - Questions and answers and T-REQS
Nutrient Scientific Technical Exchange Partnership and Support

N-STEPS: Providing support to EPA Regional Nutrient Coordinators, States and Authorized Tribes

Nutrients, nitrogen and phosphorus, have consistently ranked as one of the top three causes of eutrophication in US waters for more than a decade. Excess nutrients lead to significant water quality problems including harmful algal blooms, hypoxia, declines in wildlife and wildlife habitat, and have been linked to increases in human pathogens. This website is designed to assist managers and other water quality personnel in developing and implementing nutrient criteria. It addresses technical issues related to the assessment and management of nitrogen and phosphorus, and their effects on aquatic biological communities. The focus of the N-STEPS is to provide timely and helpful input on topics such as cause-response relationships, sampling design, data collection, data evaluation, statistical analysis, classification of ecosystems, and implementation of numerical nutrient criteria.

The types of assistance available from the N-STEPS include:

- Reviewing and/or recommending sampling design of nitrogen and phosphorus and algal response in rivers and streams;
- Reviewing and/or recommending sampling design of nitrogen and phosphorus other biological responses in rivers and streams;
- Providing assistance with the implementation of methods from EPA's technical guidance manuals;
- Reviewing, recommending or performing statistical analyses on data to determine relationships between nutrient data and biological response, nutrient data analysis along gradients, non-parametric statistics, and power analysis;
- Recommendations for index periods for sampling in different geographic locations;
- Recommendations for the use of regional classification of ecosystems beyond the ecoregional approach;
- Recommendations and/or review of implementation procedures such as: the frequency and duration for exceedance in different geographical locations; translation of biological response data into NPDES permit limits; trading point and non-point sources to meet a standard; and;
- Development of narrative translation mechanisms for incorporation into a standard.

Resources on this website include:

- Technical REQUEST System: online question submission area;
- Regional Nutrient Criteria Activity: updates and highlights on nutrient criteria programs;
- Questions and Answers: expert answers to common technical questions;
- Support Documents: publication about nutrient criteria;
- Links: find pages with useful information for nutrient criteria development;
- Discussion Board: venue for online discussion with experts;
- Glossary: definitions of technical terms.
Website – Headquarters Nutrient News

U.S. Environmental Protection Agency

Nutrient Scientific Technical Exchange Partnership and Support

Criteria Development Approaches Recommended in Nutrient Criteria Guidance Manuals

Reference-Based Approach: Utilizes reference (relatively pristine) waterbodies to develop nutrient criteria. Three recommended approaches to nutrient criteria development that identify reference conditions are described in EPA's technical guidance:

1. Determine the nutrient gradient (e.g., lakes, rivers, streams) that is least impacted within each class of waterbody (e.g., lakes, rivers, streams). Identify the highest nutrient concentration associated with least impacted conditions. This concentration becomes the reference condition for the waterbody, upon which nutrient nutrient criteria are set.

2. Determine the 75th percentile (or acceptable upper percentile - 75th to 95th percentile) of the reference waterbody population from a frequency distribution and use this value to compare waterbody nutrient conditions for developing numeric nutrient criteria.

3. Determine the 25th percentile (or acceptable lower percentile - 25th to 30th percentile) of the total waterbody population from a frequency distribution and use this value to compare waterbody conditions for developing numeric nutrient criteria. It is also acceptable to utilize known reference conditions from another state or region to develop numeric nutrient criteria in the absence of true reference systems in a state or region.

Predictive Relationships: Determining nutrient concentrations that result in appropriate levels of response variables (e.g., algal biomass, stable submerged aquatic vegetation (SAV) coverage, etc.). This can be accomplished using empirical or mechanistic models, or other tools, such as, statistical analyses of bioassessment data.

Peer-Reviewed Published Literature: Determine appropriate in-waterbody concentrations of nutrients (thresholds of system changes) to maintain system integrity and protect water quality.

Multi-Metric Indices of Biotic Data: Determine aquatic life responses to nutrient enrichment and derive nutrient criteria that protect aquatic life use and water quality of a waterbody or class of waterbodies.

Designated Uses: A comparison between reference conditions for specific waterbodies or waterbody segments. The most common tool for designating uses as a method of criteria development is to designate the use based on the aquatic life use.
Website – Statistical Tools

U.S. Environmental Protection Agency

Nutrient Scientific Technical Exchange Partnership and Support

Statistical Resources & Calculators

- Rice University Virtual Statistics Lab:
  Stats tools and case studies, demonstrations & books for background information and resources

- Statistical Analysis Tools:
  Analysis programs, power analysis, stats tables (t distribution, chi square, normal distribution, etc.), describes univariate data, curve fitting distribution free tests

- Statistical Resources:
  Compiled by Stephen Golds for the Center for Research, Evaluation, and Program Development Boston Graduate School of Psych... miscellaneous collection of statistics resources, elementary to advanced software, FAQs, papers, books, etc.

- Statistical Calculators Only
  - University of Minnesota - Arc Software:
    A package for regression analysis designed as a companion to the book Applied Regression Including Regression and Graphics by R. D. Cook and S. Weisberg
  - UCLA statistics calculators:
    This site provides numerous calculators for statistical analysis (e.g., correlation and regression calculator, power calculator, two sample test calculator...and many more)

- List of Web Pages That Perform Statistical Calculations
  Exhausitive list of statistical tools

- Vassar College "VassarStats" page:
  Calculates statistical functions

- GraphPad GraphCalc
Website – Support Literature

U.S. Environmental Protection Agency

Nutrient Scientific Technical Exchange Partnership and Support

Support Literature

U.S. Environmental Protection Agency

Support Literature

Nutrient Scientific Technical Exchange Partnership and Support

Home
Technical REQuest System (T-REQUS)
Headquarters Nutrient Criteria News
Regional Nutrient Criteria News
Questions and Answers
Statistical Tools
Nutrient Criteria Information
  - Support Literature
  - Presentations
Upcoming Events
Links
Interactive Tools
  - Discussion Board
  - Webcasts
Glossary
Submit Question
Logout

Support Literature by Topic
Support Literature by Water Body Type
Support Literature by State

Stream and Rivers:

Nutrient Criteria Technical Guidance: Rivers and Streams

Rivers & Streams: Presents an overview of nutrient enrichment problems in rivers and streams. Explains stream system classification, how to select variables, sampling design strategies for new monitoring programs, how to build a database of nutrients and algae-related water quality information and analyze any of that data, as well as the different management programs created to deal with excessive nutrients in streams.

Click here to View/Download

Lakes:

Nutrient Criteria Technical Guidance: Lakes and Reservoirs

This document explains the US EPA National Nutrient Strategy, as it relates to Lakes and Reservoirs. There is also information on the preliminary steps for criteria development, establishing an appropriate database, reference conditions, candidate variables for setting criteria, as well as modeling tools.

Click here to View/Download
Website - Presentations

Nutrient Scientific Technical Exchange Partnership and Support

All-States Meeting, Dallas, TX - February 2006:

Presentations from the 2006 All-States Nutrient Criteria Meeting can be found here.

Click here and send us your comments or suggestions, subject line "feedback".
Upcoming Events

**Fifth National Monitoring Conference: Monitoring Networks: Connecting for Clean Water**

San José, California, May 7–11, 2006

The National Water Quality Monitoring Council (NWQMC) will present its 5th National Monitoring Conference, Monitoring Networks: Connecting for Clean Water, in May 2006. The conference will highlight various networks, including monitoring designs, information exchanges, and the Internet, among others, and will work to form a single, coordinated, and coordinated framework for monitoring. These efforts will be supported by dedicated, coordinated, and coordinated coordination to support the elements of the Council's Framework for Monitoring. If you have questions about the conference, please contact the 2006 Monitoring Conference Coordinator at NWQMC@nws.gov.

**54th Annual North American Benthological Society (NABS) Meeting**

Anchorage, Alaska, June 4–9, 2006

The overall theme of the Conference is Communicating Our Science for Decision Makers. The theme of the Plenary Session is Ecosystems, Science, and Policy - Global Issues. We are interested in how our science has been used, or is being considered for making informed decisions regarding the environment. NABS takes pride in the unique blend of researchers and practitioners of the science from the various continents of the world, and the ability and interest of its members in collaboration across jurisdictional boundaries.

**The International Conference on Challenges in Coastal Hydrology and Water**

Baton Rouge, Louisiana, May 21–24, 2006

This conference aims to provide an international forum for the dissemination and exchange of current data, science, and technology on coastal hydrology, water quality, and their relationships to environmental problems, which is especially of national importance as we continue discussing how to rebuild a better, stronger Gulf Coast region. For more information: Y. Jun Xu, Ph.D. Phone: 225-578-8087 or 225-578-4168 Email: yjxu@lsu.edu
Website – Links

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Links Text</td>
<td>Links Text</td>
</tr>
<tr>
<td>EPA Program</td>
<td>Date</td>
</tr>
</tbody>
</table>

Information on how nutrients interact with the following EPA programs can be found in the links below:

- Nutrient Criteria
- CADDAS
- DRASTIC
- LCI
- TALY
- Large Rivers
- Gulf Hypoxia

Click here to view all your comments or organizations, useful links to State nutrient criteria programs can be found here.

The nutrient criteria documents, guidelines, and tools can be downloaded through:


The CADDAS database contains valuable information on nutrient concentration and criteria:


The DRASTIC model provides data and analysis for nutrient loading studies and criteria:


The LCI database contains valuable information on nutrient concentration and criteria:


The Large Rivers database contains valuable information on nutrient concentration and criteria:


The Gulf Hypoxia database contains valuable information on nutrient concentration and criteria:

Website – Discussion Board/Webcasts

Nutrient Scientific Technical Exchange Partnership and Support

Discussion Board

Discussion Board: The Discussion Board will be a venue for on-line discussion with experts on various topic areas. Please stay tuned for chat board discussions. To be placed on a mailing list for discussions, please send an email to Nutrient.Criteria@netrutech.com with “discussion room” in the subject line.

Click here and send us your comments or suggestions, subject line "feedback".
Website – Glossary

Nutrient Scientific Technical Exchange Partnership and Support

Glossary

AF G M N R S Z

Acclimation - response by an animal that enables it to tolerate a change in a single factor, e.g. temperature, in its environment.

Adaptation - adjustments made by animals in respect of their environments. The adaptations may occur by natural selection, as individuals with favorable genetically acquired traits breed more prolifically than those lacking these traits (genotypic adaptation), or they may involve non-genetic changes in individuals, such as physiological modification (e.g. acclimatization) or behavioral changes (phenotypic adaptation).

Algal biomass - the weight of living algal material in a unit area at a given time (Wetzel 1993).

Allochthonous - an organism or substance foreign to a given ecosystem (Aites and Bartha 1993); describes organic matter reaching an aquatic community from the outside in the form of organic detritus or organic matter adsorbed to sediment (Wetzel 1993).

Anion - a negative ion, i.e., an atom, or complex of atoms, that has gained one or more electrons and thereby carries a negative electric charge (e.g. Cl-, OH-, and $SO_4^{2-}$). It is so called because when an electric current is passed through a conducting solution the negative ions present in the solution are attracted to the anode (the positive electrode).

Aquatic Assemblage - an organism group of interacting populations in a given waterbody, for example, fish assemblage or an algal assemblage.

Aquatic Biota - collective term describing the organisms living in or depending on the aquatic environment.

Aquatic Community - association of interacting assemblages in a given waterbody, the biotic component of an ecosystem (see also aquatic assemblage).

Aquatic Life Use - a beneficial use designation in which the waterbody provides suitable habitat for survival and reproduction of desirable fish, shellfish, and other aquatic organisms.

Ash-Free Dry Weight - an algal biomass measurement that measures the standing crop of algae to estimate net production (APHA 2000).

Attribute - a measurable component of a biological system.

Autotrophs - organisms that establish, via photosynthesis, the energy to sustain their life processes. The term photosynthesis is used to mean the process by which autotrophic, green plants manufacture their food (sugars) from carbon dioxide in the atmosphere and water. The process requires the advent of blue light and its electrons, which are extracted from water, and the energy of sunlight. During this process, oxygen is a by-product of this process, which is essential to the oxygen exchange of the biosphere. The chemical fuel produced in photosynthesis is glucose, a carbohydrate that can be converted directly to other plant tissues and used to build cells, provide ATP for growth and repair, and support enzymes and other proteins.
Website – Questions and Answers

Nutrient Scientific Technical Exchange Partnership and Support

Questions and Answers

1. What are reference conditions and how are they used to develop nutrient criteria recommendations?
2. Why did EPA select a reference condition approach?
3. How can a state or authorized tribe account for variability within an ecosystem when developing nutrient criteria?
4. What is a Regional Technical Assistance Group (RTAG) and what is their role in the development of nutrient criteria recommendations?
5. What is the best sampling design strategy for characterizing nutrient concentrations, chlorophyll a, turbidity, and Secchi depth in streams/lakes for nutrient criteria development assessment?
6. Are nutrient loadings under different flow conditions equally important? Do storm loadings have the same impact as continuous point source loadings?
7. Does monitoring require baseflow conditions? How can “normal” flow for the sampling period and flow related to a recent storm event be distinguished?

WOUHTV
T-REQS – Technical REQuest System

- Expert answers for questions related to:
  - Study Design
  - Classification
  - Data Analysis
  - Indicators
  - Method
  - Implementation
T-REQS – New Question
T-REQS – View Questions

EPA
New
Closed
Expert
T-REQS

- Questions and responses sent to user and posted to website
- Building a set of useful answers to important questions
- Use statistics will help guide better future support too
Come visit us!

- During the poster session: Monday - Wednesday
- Sign up for T-REQS username and password
- Get a T-REQS User’s Guide