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*New Hampshire Department of Environmental Services  
Plan for Adoption of Nutrient Water Quality Criteria*

### SUMMARY

This document is New Hampshire's plan for adoption of nutrient water quality criteria. The Environmental Protection Agency (EPA) requires states to develop and implement numeric nutrient criteria by the end of 2004. A memorandum dated 11/14/2001 from Geoffrey Grubbs, director of the Office of Science and Technology, requests states to prepare a nutrient criteria plan. New Hampshire's plan follows the example outline in Appendix A of the memo. EPA has recommended that nutrient criteria be established by "nutrient ecoregion" and waterbody type, using a statistical approach. In this approach numeric criteria are established for two "causal" parameters - nitrogen and phosphorus, and two "response" parameters - chlorophyll a and a measure of water clarity (secchi disk depth for lakes or turbidity for other waterbodies - and we would add PAR total light extinction for estuaries). A general population and a "reference" population of existing data for each parameter have been assembled by EPA for each ecoregion. These data are ranked and a threshold quantile (recommended as 75% for the reference population or 25% for the general population) is assigned as the criterion. A waterbody would be listed as impaired if measurement results were outside of the threshold quantile. States may develop their own "scientifically defensible" approach for developing numeric nutrient criteria if they choose not to use the statistical approach.

New Hampshire proposes to develop its own scientifically defensible approach. The primary reason for not using the statistical approach recommended by EPA is that statistically derived criteria do not (in our opinion) relate directly to use support, whereas the Clean Water Act water quality standards process explicitly provides for "setting criteria necessary to protect the uses" (40 CFR 131.2).

We do not have a large historical dataset for nutrient parameters in New Hampshire surface waters. However, based on 305(b) reports and professional experience, we believe that there are not many New Hampshire waterbodies for which water quality does not support designated or existing uses (primarily aquatic life and swimming) due to cultural nutrient enrichment. New Hampshire standards currently contain narrative criteria for aquatic life use support, numeric criteria for dissolved oxygen (DO), narrative criteria for nitrogen and phosphorus, and turbidity criteria based on threshold exceedance of "natural" turbidity. We are in the process of developing numeric biological criteria for aquatic life use support for wadeable streams.

Our approach will be to set "interim" criteria for chlorophyll a by waterbody type. Interim criteria will be based on literature values and our past experience in assessing waters for nutrient-related use impairment, making use of our limited dataset. We will then include chlorophyll a in our core parameters for waterbody assessment, and build our database for this parameter, as well as for nitrogen, phosphorus, and water clarity. We will continue to develop numeric biological criteria for aquatic life use support by waterbody type. When these are developed they will

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become our primary assessment tool for this designated use. We will also develop numeric criteria for nutrient response parameters (chlorophyll a and clarity) that are directly related to swimming use support. We will explore developing quantitative relationships between the response parameters, that actually result in impairment, and the input parameters of phosphorus and nitrogen that lead to changes in chlorophyll a and clarity, for each waterbody type. We propose to conduct surveys of recreational users specifically designed to assess the acceptability of waters of varying chlorophyll a concentrations and clarity for swimming. Nutrient criteria development will be a multi-year process, with interim criteria developed for lakes, rivers, and estuaries by the end of 2004. For the interim criteria, we expect to develop a "translator" or policy that translates the existing narrative nutrient criteria in the Surface Water Quality Regulations into quantitative limits for chlorophyll a by waterbody type. We have not yet begun to consider standards (either uses or the criteria necessary to protect them) for wetlands, and we have no timetable for this.

New Hampshire proposes to set numeric limits by waterbody type only for chlorophyll a because this is the parameter that (in almost all cases) actually results in non-attainment of a designated use due to cultural nutrient enrichment, either aquatic life use support or recreation. Clarity, although often strongly correlated with chlorophyll a, may result from mineral sources not related to excessive primary production. Nitrogen is not the limiting nutrient in most fresh waters, and so a numeric limit would not constrain primary production. For phosphorus, an analysis would need to be performed (as in a TMDL) to relate ambient chlorophyll a concentration to phosphorus concentration.

## ***APPLICABLE LAWS / REGULATIONS***

### **I. WATERBODY TYPES**

New Hampshire law generally identifies lakes, rivers and streams, tidal waters, and wetlands as different waterbody types. The Department of Environmental Services (DES) is in the process of concisely defining waterbody types and cataloging waterbodies using GIS. We may further refine waterbody types to include additional types such as impounded rivers, estuaries, open ocean waters, and multiple categories of wetlands. These would be consistent with the National Hydrography Dataset protocols, and with EPA guidance. We expect to have a preliminary GIS waterbody catalog by January, 2004.

### **I. DESIGNATED USES**

All New Hampshire waters are assigned to either "Class A" or "Class B" by the legislature under RSA 485-A:9 after recommendation by the Department of Environmental Services. The statute identifies "fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies" as uses for Class B, and implicitly for Class A as well. Growing or taking shellfish for human consumption is a statutory use for tidal waters. DES Surface Water Quality Regulations Chapter Env-Ws 1700 further define these uses.

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Recently, DES has conducted a review of New Hampshire designated uses, for development of a coordinated listing and assessment methodology for 305(b) reporting and 303(d) listing.

The table below shows designated uses found to be clearly identified in statute or rule.

Aquatic life	All surface waters
Cold Water Fishery	Waterbodies designated by NH Fish & Game
Primary Contact Recreation	All surface waters
Secondary Contact Recreation	All surface waters
Drinking Water after Adequate Treatment	All fresh surface waters
Fish Consumption	All surface waters
Shellfish Consumption	All tidal waters
Wildlife	All surface waters

## *PLAN*

### 1. Criteria Development Process

#### A. Conceptual Approach

- a. We will use a two-step empirical approach to develop numeric nutrient criteria. In the first step we would research literature values and our own history of assigning and reporting waterbody impairment due to nutrients. We expect to prepare and publish a policy that translates the existing narrative criteria into numeric limits by waterbody type for chlorophyll a, based on published studies. In the second step, we would build our dataset for nutrient water quality parameters through our annual sampling efforts and the efforts of cooperating organizations. We would also concurrently develop independent measures of aquatic life use support by waterbody type using biological indices. We would use a similar process for primary contact recreation, by means of specially designed user surveys, and possibly also for the drinking water use. Using standard statistical methods, we plan to develop relationships between the nutrient parameters and the independent measures of use support. We expect that chlorophyll a will be directly related to use support, and that phosphorus (and in rare cases nitrogen) will be related to chlorophyll a, clarity, and possibly other waterbody-specific measures. These relationships may be adopted as standards after peer review and public comment. Developing relationships between use support measurements and nutrient parameters is expected to take at least five years.

#### B. Relation to State/Tribal Use Classifications

Our nutrient criteria will be tailored to specific uses, by waterbody type. We anticipate developing separate standards for aquatic life use support, for recreation, and possibly for drinking water supply.

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### C. Relation to Physical Classification

In the first step of our two-step approach, we expect to adopt interim criteria for chlorophyll a by waterbody type. We do not propose to further stratify waterbodies into sub-types based on physical parameters, except for estuaries. Our two estuaries, Great Bay and Hampton Harbor, are physically very different and would require separate interim criteria.

In the second step, we would build a sufficient dataset to be able to evaluate whether stratification is needed to determine use support. For example, we expect that numeric biocriteria for larger rivers (4<sup>th</sup> order and above) will be different than for Wadeable streams, and we would develop separate relations between nutrient parameters and the biological criteria for large and small rivers. We will also explore stratification by ecoregion, although our limited experience to date with biological indices for streams suggests that for New Hampshire streams, stratification by ecoregion does not significantly reduce variability, and we would expect even less relationship for primary contact recreation. It is likely that other parameters related to waterbody type and characteristics will be needed, in addition to the four nutrient parameters, in order to evaluate use support. We will explore these related parameters and possible stratification within waterbody types.

### D. Prioritization of Waters

We propose to develop nutrient criteria first for lakes and ponds, then for rivers and streams, and finally for estuaries. Development of nutrient criteria for wetlands would be lowest priority, after development is complete for other waterbody types. This prioritization order is consistent with EPA order, and with our judgment of the relative threat and magnitude of nutrient enrichment issues in New Hampshire. Lakes, ponds and river impoundments are most vulnerable, with phosphorus the primary concern. They are also of great importance to New Hampshire's tourist economy. Rivers and streams are second both in vulnerability and in importance. And we have considerable data on our estuarine waters to indicate that estuarine nutrient enrichment, while important, is not a critical issue for New Hampshire estuaries.

### E. Inventory of Existing Data (Input from RTAG)

1. **National Nutrient Data Base** We will use selected data from the National Nutrient Database.
2. **Other Data** We will use data from our own databases, and from those maintained at the University of New Hampshire.

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3. Identification of Data Distribution and Gaps We have not yet developed a statement of work for data needs to accomplish the second step of our proposed empirical approach. We have developed a Coordinated Listing and Assessment Methodology for the October 305(b)/303(d) reports. DES and others will use this to prepare a monitoring plan for sampling efforts in 2003 and beyond. Data needs for nutrient criteria development will be incorporated into the monitoring plan.

4. Identification of Data Base Management Needs We are in the process of developing a comprehensive, statewide water quality database, based on the STORET data model. Version 1 of this database is expected to be operational by June, 2003. Data useful for development of nutrient criteria from multiple sources would be available in this database for analyses to develop nutrient criteria.

Continued and increased support for STORET at the regional and national level is needed, as well as increased technical support at the regional level. Region 1 needs to put substantially more effort into STORET and the development of regional capability for data management using STORET and the STORET data model. To build statistical relationships between nutrient input and response parameters, efficient regional data sharing is important.

5. Representativeness of Data As with all data used for 305(b) waterbody assessment, data collection will be designed to be representative of the waterbody being sampled.

#### F. Requirements for New Data Collection

1. Physical, Chemical, and Biological Measurement Variables The four nutrient parameters (N,P, a measure of clarity appropriate to the waterbody type, Chlorophyll a will be included as core parameters in our water quality data collection for assessment. We will routinely collect N, P, and clarity data at stations where chlorophyll a data are collected. We will also ask volunteer monitoring organizations for both rivers and lakes to include these parameters in their sampling efforts. New data collection needs will be derived from the assessment methodology and the supporting monitoring plan.

2. Sampling and Analysis Plan A sampling and analysis plan (also called a monitoring plan) will be prepared.

3. Data Quality Objectives Data Quality Objectives will be developed in the process of preparing the monitoring plan.

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## 2. Schedule for Development and Adoption

<b>November 2003</b>	<b>Publish Draft Nutrient Criteria Plan</b>
<b>September 2004</b>	<b>Publish draft "interim" nutrient criteria for comment by EPA and Water Quality Standards Advisory Committee</b>
<b>September 2004</b>	<b>Revise Nutrient Criteria Plan to include schedule for development of final nutrient criteria</b>
<b>January 2005</b>	<b>Publish interim nutrient criteria "translator" policy</b>
<b>January 2005</b>	<b>Publish schedule and work plan for tasks leading to final nutrient criteria, including biological indices, user surveys, and analysis of quantitative relationships between nutrient parameters and use support.</b>
<b>April 2005</b>	<b>Publish Sampling and Analysis Plan for nutrient data collection</b>

### A. Items to Consider

#### 1. Administrative Procedures and Process

Interim nutrient criteria will be implemented via a "translator" policy that applies quantitative meaning to our existing narrative criteria in administrative rules. Final criteria will be incorporated into administrative rule, or if needed, into law by legislative action.

#### 2. Stakeholder Input and Public Participation

New Hampshire has a standing Water Quality Standards Technical Advisory Committee, with representation from diverse interest groups. Interim criteria will be presented to the Committee, and, if recommended by the Committee, a public information session will be held. Final criteria will be incorporated into administrative rule via the fully public rulemaking process of RSA 541-A, involving an agency public hearing and written comment response, followed by two legislative committee hearings with written comment and response. If legislation is needed, a bill will be introduced for hearing and vote by the General Court.

#### 3. RTAG Coordination

New Hampshire will continue to participate in the RTAG process.

#### 4. Scientific Review

Scientific review will be solicited through the Water Quality Standards Technical Advisory Committee, as well as through RTAG.