Connecticut Plan for Nutrient Criteria Development

Purpose and Intent

This document sets forth the Connecticut Department of Environmental Protection (CT DEP) plan to develop nutrient criteria for eventual adoption into the State's Water Quality Standards (WQS). In 2001, the United States Environmental Protection Agency (US EPA or EPA), under Section 304(a) of the Federal Clean Water Act (CWA), published recommended water quality criteria for nutrients as starting points for refinement by States (see Appendix). Each State must demonstrate substantial progress in nutrient criteria development by the end of 2004, or US EPA may promulgate its own criteria (Grubbs memo 11/01).

Existing Connecticut Water Quality Standards

Connecticut WQS presently contain narrative criteria for total phosphorus in certain waters and chemical constituents in all waters, but no specific numeric criteria for either causal (*e.g.*, phosphorus, nitrogen) or response (*e.g.*, chlorophyll *a*, Secchi depth transparency) nutrient variables. Ranges of total phosphorus, total nitrogen, chlorophyll *a* and Secchi depth transparency describe lake trophic categories. But, these ranges do not constitute criteria for lake water quality, *per se*. For the purpose of determining consistency with WQS (*i.e.*, water quality), a comparison of the natural trophic state, absent significant cultural impacts, to the existing trophic conditions of a lake must be performed.

For Class AA and A waters (designated and potential drinking water supplies, respectively), the narrative criterion for phosphorus is "none other than natural in origin" (see definition of "natural" below). For all waters, the general narrative criterion for chemical constituents is "none in concentrations or combinations which would be harmful to designated uses." The turbidity criterion for all freshwaters is that it "shall not exceed 5 NTU over ambient levels or levels necessary to protect and maintain all designated uses. All reasonable controls or Best Management Practices are to be used to control turbidity."

The term "natural" is addressed in Connecticut water quality standard number 8, which states: "The meaning of the word "natural" is not limited to only those conditions which would exist in

water draining from pristine land. Conditions, which exist in the surface water, in part due to normal uses of the land, may be considered natural, provided Best Management Practices are used. It shall not be considered normal use of the land if excursions from established Criteria adversely impact an existing or designated use."

Connecticut's anti-degradation policy (CT DEP2002a) requires that, where current nutrient loadings are less than the maximum possible to maintain the natural trophic category, these waters must be managed to prevent increases in loading and to allow for future growth. As a standard policy, Connecticut DEP advises communities to minimize nutrient loading regardless of the present level.

Connecticut Approach to Nutrient Criteria Development

General Approach

Connecticut will develop nutrient criteria appropriate to local conditions that protect designated uses of waters, specifically aquatic life support and recreation. Criteria will take into consideration the natural trophic state or tendency of a waterbody, absent of human influence (i.e., forested watershed), as determined from land use and empirical models. For both lakes/reservoirs and rivers/streams Connecticut will initially use a site-specific approach. Criteria development in these waters will focus on chlorophyll *a*, transparency and algal/plant communities as response (assessment) variables. Phosphorus, which has been identified as the limiting nutrient in Connecticut lakes (Norvell and Frink 1975), will be addressed as a causal (management) variable when waters are found to exceed established criteria for response variables. Numeric nitrogen criteria for freshwater will not be considered at this time as nitrogen is being managed throughout the state under the Long Island Sound Total Maximum Daily Load (TMDL, see Estuaries Approach below). Development of nitrogen criteria for fresh waters may be considered at a future date, should progress made during the implementation of the Long Island Sound TMDL prove to be non-protective of freshwater designated uses.

CT DEP, with the assistance of a reputable consultant, has recently developed TMDLs for nutrients in four eutrophied lakes. Work is also being conducted with USGS to identify timing and sources of nutrient loading in a major watershed for appropriate TMDL development. All of

these waters are considered impaired for either primary contact or aquatic life use or both due, at least in part, to excessive algal blooms. For the lake TMDLs, nutrient loads were calculated from several mass balance and land use models, which incorporate coefficients for nonpoint and point source contributions. Management strategies will require implementation of Best Management Practices (BMPs) and, where applicable, point source reductions. The ultimate objective is to restore natural trophic conditions to these waters. As this TMDL approach is further evaluated, Connecticut expects to identify the model(s) and relevant variables that provide(s) the most appropriate nutrient values for a natural trophic state or reference condition.

After careful evaluation, CT DEP has chosen not to implement the US EPA 304(a) recommended criteria, which were based on a simple percentile approach (see Appendix). EPA recommends a "reference" approach that uses the 75th percentile concentration (of a causal or response variable) for unimpaired lakes (or rivers) as a potential criterion. Alternatively, the lower 25th percentile concentration for all lakes within an ecoregion can be used as a surrogate to establish the numeric nutrient criteria. This method automatically establishes that 75% of an (eco)region's waters are impaired (*i.e.*, exceed nutrient criteria), and does not clearly link nutrient levels to protection of designated uses. Further, although the US EPA 304(a) criteria were developed at reasonable geographic scale (ecoregion III level, see Appendix), they do not account for many important waterbody characteristics and local conditions, such as lake origin, retention time, depth or watershed size, which may have equal or more bearing on trophic condition. Connecticut's approach to nutrient criteria development for major waterbody types (lakes, rivers, estuaries) is discussed below.

Recreational Lakes Approach

The most recent statewide trophic studies for lakes were conducted with funding from Section 314 of the federal CWA: in 1995 by USGS for twelve lakes (CT DEP 1998): in 1992-93 for 56 lakes (Canavan & Siver 1995): and in 1989-91 for 49 lakes (USGS 1995). Except for a limited number of targeted studies, usually done in cooperation with USGS, CT DEP has not conducted statewide ambient lake monitoring since 1994. DEP Lake Management Program staff has since relied heavily on information provided in diagnostic/feasibility (D/F) studies and other technical

reports from qualified professionals regarding trophic state, nutrient loading, sedimentation and macrophyte issues.

D/F studies are usually initiated in response to local community concerns. For instance, a lake association may request assistance in analyzing and managing excessive macrophyte growth, or a town may wish to restore an urban park pond that has silted in. State financial support is available, on a limited basis, to municipalities for study and restoration of lakes through the *Grants to Improve Water Quality of Lakes Used for Recreation* (Statute 22a-339, a-d). When monies are available in the fund, it provides up to 75% match for diagnostic and planning studies, and up to 50% match for restoration projects. The studies and subsequent restoration activities are reviewed and overseen by the CT DEP Lakes Management Program.

In large part, these studies and the evaluation of subsequent restoration activities provide CT DEP with information necessary to make use support assessments for Section 305(b) and 303(d) reporting, and may serve as the foundation for TMDLs or management plans. Generally D/F studies provide data regarding present nutrient loading, in-lake nutrient levels, an estimation of natural conditions for a lake absent of significant human influence, as well as expected conditions following implementation of management strategies.

As of December 2004, four nutrient TMDLs have been completed for eutrophied lakes in Connecticut. These TMDLs provide a template for criteria development. CT DEP will evaluate the land use and empirical models used in these TMDLs as well as other models, such as AVGWLF (Evans et al. 2002), to determine which are the best predictors of natural or reference conditions. In so doing CT DEP will develop and define "detailed mechanisms for translating narrative criteria into numeric values" (Grubbs 2001).

The numeric expression of the narrative criterion would be the nutrient concentration consistent with achieving and maintaining a lake in its natural trophic condition (Figure 1). For example, if the forested watershed trophic category of a lake is determined by appropriate models to be early or oligo-mesotrophic (Frink and Norvell 1984), chlorophyll *a* concentrations during the critical summer months should be within the range of 2-5 *u*g/l, and transparency should be 4 – 6

meters. If the present lake condition falls within these ranges, the present trophic parameter values become the criteria. If the present condition exceeds the ranges for oligo-mesotrophic, then the lake is listed as impaired, and a target load (TMDL) for phosphorus will be established such that chlorophyll *a* and Secchi depth will to fall within the ranges for oligo-mesotrophic. Connecticut will evaluate use of the six trophic categories and respective parameter ranges from Frink and Norvell (1884) for this approach (Table 1).

Table 1. Total P, total N, chlorophyll a and Secchi depth criteria for six lake trophic categories.

Category*	Total P (ug/L)	Chlorophyll a (Summer)	Secchi Depth (Summer)
Oligotrophic	0-10	0-2	6+
Oligo-mesotrophic	10-15	2-5	4-6
Mesotrophic	15-25	5-10	3-4
Meso-eutrophic	25-30	10-15	2-3
Eutrophic	30-50	15-30	1-2
Highly Eutrophic	50+	30+	0-1

* Macrophyte information is reviewed in conjunction with water column data to classify shallow waters with significant macrophyte productivity. If macrophyte growth is 75-100% of the waterbody area and dense, the lake is classified as highly eutrophic regardless of water column data. If macrophyte growth is 30-75% of waterbody area and dense, the lake is classified as mesotrophic when water column data indicate oligortrophy and classified as eutrophic when water column data indicate a mesotrophic or eutrophic condition (CT DEP 1998).

The process will have the following components:

1. Determine the forested watershed trophic condition for the lake through land use and empirical models and/or sediment chrysophyte analysis – discussed below;
2. Determine the present trophic state of the lake based on chlorophyll *a*, transparency and macrophyte density;

If the present trophic condition is no greater than the forested watershed condition, then the present trophic parameter values will be established as the criteria for that lake. If the present trophic condition is more advanced than the forested watershed trophic condition, the lake will be listed as impaired, and additional modeling will be done to:

3. Determine the present phosphorus loadings to the lake;
4. Determine the phosphorus loadings and in-lake concentration that will be achievable following full implementation of all BMPs and point source reductions, if applicable.

The phosphorus loading and in-lake concentration following full implementation of BMPs and point source controls will be established in a TMDL as the numeric criteria. If, however, modeling results indicate that full implementation of BMPs cannot reasonably be expected to

restore the lake to forested watershed trophic conditions, the lake will be listed as impaired, and the post-BMP phosphorus load and in-lake concentration will be established as the numeric criteria through a Use Attainability Analysis (UAA).

Over time CT will establish natural trophic conditions for lakes of the State. The development of such meaningful site-specific water quality goals will help CT DEP direct attention to lakes that are truly impaired and in need of management. It is expected that after criteria have been established for a number of lakes on a site-specific basis, that patterns will emerge to allow logical groupings of waters with similar characteristics for assignment of criteria, and that experience with the appropriate models and datasets will facilitate the process.

To help facilitate data analysis, CT DEP will compile data contained in historic trophic surveys and numerous recent D/F studies into a relational database. This task will require a significant effort and will be performed as staff resources permit. CT DEP monitoring staff created and maintains an ambient water quality monitoring database for river and stream data, which houses data collected since 1996 by CT DEP, USGS and, to a large extent volunteers. A comparable data management system for lakes, either as a separate entity or a link to the stream monitoring database, would facilitate review and analysis of statewide data for nutrient analyses.

To supplement existing data, Connecticut is utilizing Section 319 funding to conduct statewide ambient lake monitoring using a probabilistic design. CT DEP will monitor 20 lakes per year for 3 years beginning in 2005. Physical and chemical sampling will be conducted once in spring following overturn and again in summer after stratification has been established. Chlorophyll *a* will also be analyzed for the summer sampling. Additionally sediment cores will be collected for chrysophyte analysis to determine present and historic trophic status (Siver 1999, Siver and Marsicano 1996). The sediment cores will be archived until funding for analysis is secured.

From appropriate models, probabilistic lake monitoring, consultant reports, and historical trophic studies, CT DEP staff will identify factors for eventual grouping of lakes by type and natural trophic states. For example, an analysis conducted by CT DEP in the 1980s (CT DEP unpublished) indicated that artificially created (dammed) lakes tended to be eutrophic much

more frequently than natural lakes, and that the watershed-to-lake surface area ratio plotted against mean water depth showed promise as a predictor of natural trophic state.

Table 2 provides a list of the three possible outcomes when a lake is compared to its natural trophic condition under forested watershed conditions, and the resulting criteria. Figure 1 provides a generalized flow chart of Connecticut's proposed approach to developing nutrient criteria for lakes.

Table 2. Resulting criteria for three categories of lakes after comparison to forested watershed trophic conditons.

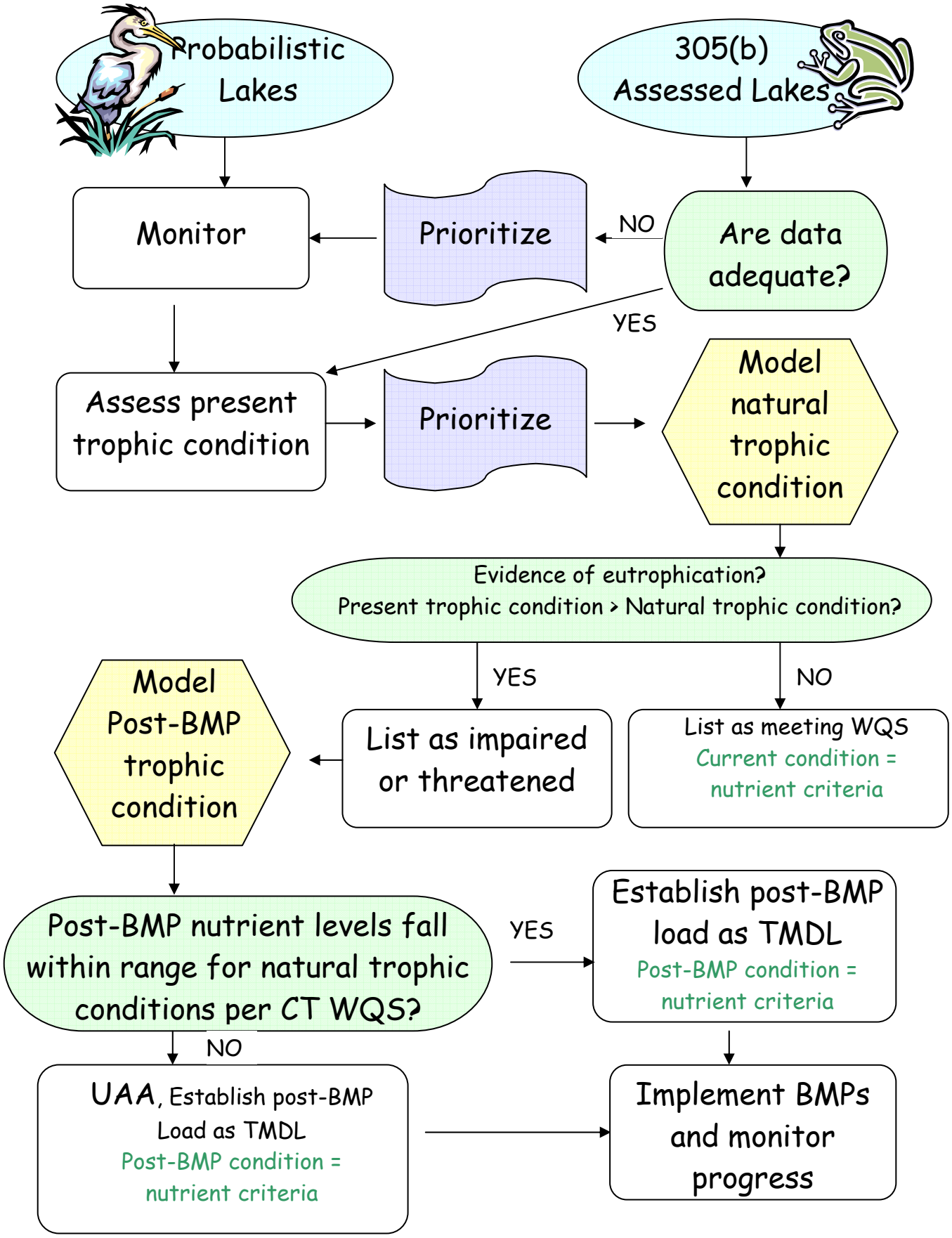
Category	**Condition**	**Criteria**
Anti-degradation Waters	Current trophic state ~ forested watershed	Existing Load and Concentration
TMDL Waters	Current trophic state > forested watershed ~ post BMP	Post BMP Load and Concentration
UAA Waters	Current trophic state > forested watershed trophic state < Post BMP	Post BMP Load and Concentration

Drinking Water Reservoirs and Artificial Impoundments of Large Rivers

Drinking water reservoirs will be treated as lakes in so far as the natural (reference) trophic condition of the reservoir can be established. Some drinking water reservoirs are completely unnatural waterbodies, as are impoundments of large rivers, and will require a different approach to establishing reference conditions. Analysis will focus on determining the cause of nuisance algal conditions in order to establish appropriate concentrations and loadings of nutrients to bring the waterbody in to compliance with WQS.

Criteria may incorporate seasonal and stratification considerations. For example, the phosphorous management program for Housatonic River impoundments has shown that summertime phosphorous levels in epilimnetic waters are most directly related to algal production. In the Quinebaug River system, West Thompson Reservoir sediments may be a sink for phosphorus in the winter, and a source in the summer, a process currently under investigation by USGS and CT DEP.

Figure 1. Proposed Strategy for Establishing Lake Nutrient Criteria



Rivers and Streams Approach

CT DEP, with its USGS partner, has a long history of stream water quality monitoring, assessment and management. Connecticut will utilize information from these assessments, modeling efforts and TMDL analyses to develop and refine nutrient criteria with a focus on protecting designated uses.

A preliminary look at available data does not reveal a direct relationship between high nutrient concentrations and biological impairment. In the 2002 305(b) report (CT DEP 2002b), approximately 340 of 1,460 assessed stream miles were considered impaired for aquatic life use support, primarily by benthic invertebrate community analysis (Plafkin *et al*. 1989) supplemented by fisheries information where it existed. Nutrients were identified as one of several potential or threatening causes in approximately 48 percent of the impaired waters. Based on best professional judgment, CT DEP monitoring staff identified 62 miles where nutrients were a *potential* cause for the biological impairment, and an additional 103 miles where nutrients were considered a threat. The use of the word "*potential*" indicates that there is not a clear linkage between a potential stressor and impairment. Rather, elevated nutrients levels had been observed with other potential stressors. Positive identification of causes/stressors for biological community impairment generally requires further intensive investigations.

A different comparison of stream miles with known biological impairments to stream miles in exceedence of the EPA recommended phosphorus criterion showed that application of the criterion would result in twice as many impaired stream miles. Based strictly on monitoring conducted by CTDEP staff during the five-year rotating-basin assessment (excluding data from USGS, volunteers and other sources), approximately 1,000 miles had data for both nutrients and benthic invertebrate community analysis. Application of the EPA 304(a) total phosphorus criterion of 31 *u*g/l for Ecoregion XIV (the ecoregion that encompasses most of Connecticut), would result in 368 of the 1,000 assessed stream miles exceeding criteria. Of those 368 stream miles exceeding this value, 183 miles (about half) were fully supporting for aquatic use as determined by benthic invertebrate community analysis (CT DEP, 2002b).

Although a direct link between elevated nutrients and biological impairment is not obvious from initial comparisons as above, CT DEP will further investigate nutrients as a stressor in streams having benthic biological community impairment to discern a possible cause and effect relationship. This will involve further statistical correlation analyses between nutrients and impairment, as well as exploration of potential links between impairment and nutrient-related impairing causes such as low dissolved oxygen or excessive algal growth.

In 2002 and 2003, CT DEP conducted periphyton surveys in streams as part of a statewide probabilistic monitoring program. Additional sites were sampled in 2004, with emphasis on established reference and known enriched sites. Analyses of periphyton data will include determination of biomass and application of a variety of metrics based on community composition. Comparison of periphyton analyses to fish community, macroinvertebrate community and physical/chemical analyses will help CT DEP determine if and where the periphyton community is a useful water quality (nutrient) indicator, and which metrics to use to make that determination.

The USGS Sparrow (USGS 2204) and AVGWLF (Evans et al. 2002) models will also be explored as a possible tool for establishing reference conditions and/or nutrient loading to streams.

Downstream Effects

The effects of nutrient enrichment in rivers and streams are more likely to manifest and negatively impact designated uses in impoundments than flowing sections. The CT DEP is working with USGS on an intensive study and development of a nutrient TMDL for the Quinebaug River watershed, long plagued by algal blooms. In the Quinebaug and possibly in other rivers, nutrient criteria development will initially focus on remediation of river impoundments, where most eutrophic impairments occur. Such efforts are underway for West Thompson Reservoir, an impoundment of the Quinebaug River, and Lake Lillinonah, an impoundment of the Housatonic River. Achieving criteria in the impounded areas will likely mitigate any nutrient-related impairments of the free-flowing sections. This approach would

emphasize management of "downstream effects" verses immediate instream effects, much as nitrogen management in watersheds benefits LIS.

Estuaries Approach

The primary cause of hypoxia in offshore portions of Long Island Sound is excess nitrogen loading, which is currently being addressed through a TMDL (CT DEP and NYS DEC 2000). The TMDL established a 58.5% reduction target for nitrogen loading to the Sound from Connecticut and New York by 2014, through management of point and nonpoint sources. Given our productive study and management of nitrogen in the Sound, Connecticut has not identified a need for additional nutrient criteria development for offshore estuarine waters at this time. However, Connecticut is presently reviewing nitrogen reduction targets in terms of protection of nearshore harbors and embayments for submerged aquatic vegetation, eelgrass in particular. Recent studies at the University of Connecticut in eastern Long Island Sound suggest that eelgrass demise may be related to nitrogen overenrichment. Additional studies with funding from the Long Island Sound Study are targeting this area to monitor and determine levels of nitrogen enrichment and their effect on eelgrass. It is anticipated that these studies will help develop nearshore nitrogen loading criteria and may indicate that further reductions beyond the offshore target are necessary to protect and restore these nearshore resources.

Wetlands

Development of nutrient criteria for wetlands will be considered after methodologies for lakes and rivers have been established and successfully employed. CT DEP will review and consider approaches provided in US EPA guidance when they become available.

Coordination with the Regional Technical Assistance Group (RTAG)

The DEP has participated in New England RTAG meetings since 1998 and will do so as such meetings are convened. Staff representing the Long Island Sound program, lakes management program, the ambient monitoring and assessment program, and the TMDL program will participate as needed.

Relationship of Nutrient Criteria to Use Classifications

The two designated uses most impacted by nutrient enrichment in Connecticut are "recreation" and "aquatic life support". Recreational uses for lakes in particular must be considered in context of a lake's natural trophic tendency and the water quality expectations of recreational users. For example, a naturally eutrophic lake having a healthy warm water fishery may offer substantial recreational opportunities for fishermen, but the same physical characteristics may not make it desirable for swimming. A viable approach must recognize these different acceptable definitions of "designated" recreational uses and consider the public's water quality expectations. In the future, Connecticut may evaluate the appropriateness of assigning particular recreational uses to each waterbody or waterbody segment in the State based on natural trophic tendency and other relevant considerations.

Grouping State Waters

For programmatic and management purposes at CT DEP, waterbodies are presently grouped by type (*e.g.*, rivers/stream, lakes/reservoirs, and estuaries). Analyses of TMDLs, models and available data described above may indicate the value of further sub-dividing these groups. For example, it may be reasonable to group rivers and streams by stream order. Impoundments and reservoirs may need to be treated separately from natural lakes. Ultimately lakes will be grouped by their natural trophic category, as noted earlier and below.

Prioritization of Criteria Development

Those waters that are listed on the State's 303(d) List of Impaired Waters due to nutrient enrichment will be given highest priority for criteria development. Surface waters identified as threatened by nutrient enrichment in the most recent 305(b) report will also be given initial consideration. However, as efficiency is gained with the land use/empirical models to establish natural background conditions, it is expected that criteria can be established for number of lakes rapidly. Criteria can be established for all lakes with adequate data once the models have been selected and DEP staff become competent in their use.

Administrative Procedures

As part of the TMDL adoption process, a numeric expression of the State's current narrative nutrient criteria will be established on a site-specific basis. (Note: The numeric criteria to be established as a TMDL end-point must be a translation of an adopted narrative criteria. Otherwise, the numeric nutrient criteria established for a waterbody would need to be formally adopted into the State's WQS prior to EPA approval of a TMDL). As research and analysis allow development of the detailed mechanism for establishing numeric nutrient criteria, such criteria will be incorporated into CT Water Quality Standards, probably during the next two triennial revision processes. In some cases, estuaries for example, it will be expedient to develop criteria as a loading rate rather than an ambient concentration.

Water Quality Standards revisions will follow procedures outlined in Section 22a-426 of the Connecticut General Statutes, including required public notice and hearings. Finally, the CT DEP Commissioner will establish modifications to the State's WQS, and the US EPA will approve such changes before they are effective for purposes of implementing federal CWA requirements.

Decision Making Process

Development of nutrient criteria has and will continue to involve input and communication from staff of various DEP programs including: ambient stream monitoring, Water Quality Standards, lake management, Long Island Sound monitoring and TMDL.

Public Participation and Stakeholder Involvement

The development of the Nutrient Criteria Plan will proceed with stakeholder involvement. Stakeholders include but are not necessarily limited to statewide organizations for municipalities, lake and river non-profit groups, environmental organizations, and agricultural interests.

Integration of Plans with Adjacent States

As with 305(b) and 303(d) listings, CT DEP will communicate plans, findings and recommendations to respective agencies in adjacent States with regard to nutrient criteria development in shared waterbodies. Such communication is critical especially with respect to

remediation of impaired waters. CT DEP staff will also continue to participate in the Regional Technical Assistance Group, and bring forth plans and intentions.

Timeline for Establishment and Adoption of Nutrient Criteria

To date, February 2005, CT DEP has established numeric nutrient criteria for four lakes through the TMDL process. The method used was that described in this document, although actually performed by ENSR International under contract to the CT DEP. In the following months, CT DEP staff will begin processing data for additional lakes through the same models used by ENSR, resulting in numeric criteria establishment for a number of additional lakes. See "Proposed Timeline (Milestones)" below for details regarding the process of nutrient criteria establishment. CT DEP plans to incorporate numeric nutrient criteria that have been established for individual water bodies into the Water Quality Standards document as part of the regular triennial review and re-adoption process. It is Connecticut's goal to establish numeric criteria for lakes by 2008 and for rivers and streams by 2011.

PROPOSED TIMELINE (MILESTONES)

SPRING 2004

Lakes:

- TMDL completed and numeric criteria defined for Lake Kenosia
- Batterson Park Pond TMDL in review
- Continue development of Linsley and Cedar Ponds TMDLs
- Obtain initial lake list (probabilistic draw) for monitoring 2005-2007
- Refine criteria for lake choice (*e.g.*, greater than 20 acres, less than 1,000 acres, no hydropower impoundments) and begin desktop analysis of lake candidates

Rivers:

- Continue periphyton data analysis from 2002 data, and literature review
- Consult with EPA and other states doing similar analyses
- Receive and validate/verify 2003 periphyton laboratory data
- Select potential periphyton sampling sites for potential reference conditions, additional duplicates testing and re-sampling of 2002-2003 sites

General:

- Review models used in TMDL analyses (Vollenweider and others)
- Review other lake models (Norvell *et al*. 1979, Field *et al*. 1996)
- Review other stream/watershed models (USGS 2004, Evans et al. 2002)
- Review pertinent literature

SUMMER 2004

Lakes:

- TMDL completed and numeric criteria defined for Batterson Park Pond
- Final development and initial review of Linsley and Cedar Ponds TMDLs
- Begin QAPP for probabilistic lake monitoring
- Start field screening of probabilistic lake candidates

Rivers:

- Periphyton sampling at selected sites for reference conditions, additional duplicates and repeats of previously sampled sites
- Continue eutrophication studies (USGS) in Quinebaug River watershed

General: Continue review of models and pertinent literature

FALL 2004/WINTER 2004-2005

Lakes:

- Finalize TMDLs and define nutrient criteria for Cedar and Linsley Ponds
- Develop lake database structure and begin entering lake data into database
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- Complete QAPP for probabilistic lake monitoring
- Select promising empirical and/or land use models for determination of natural trophic conditions
- Learn to run models
- Select pilot lakes with adequate data; begin to run those lakes through models

Rivers:

- Determine which periphyton measures provide the most meaningful information with regard to nutrient impairment, and define stream conditions where periphyton can be used as and indicator
- Verify reference periphyton conditions and develop initial thresholds for periphyton indicating nutrient impairment
- Explore relationship between biologically impaired streams (as measured through macroinvertebrate and fish communities) and nutrients
- Select river impoundments with noted eutrophication problems and review available nutrient data for the impoundments and contributing streams/rivers
- Review available Quinnebaug watershed data and findings; begin to discern river-borne nutrient vs. in-lake cycling effects on West Thompson Reservoir

Estuaries:

- Initiate nearshore nitrogen loading evaluations funded by the Long Island Sound Study and form study group for criteria development

General:

- Continue review of models and pertinent literature

SPRING 2005

Lakes:

- Begin probabilistic sampling of 20 lakes

- Process additional lakes through selected models; identify data gaps

Rivers:

- Begin analysis of periphyton data: biomass vs. nutrients, community metrics
- Select 2005 periphyton sites
- Identify data gaps in existing monitoring, and evaluate selected eutrophied stream/river impoundments and tributaries for possible sampling

SUMMER 2005

Lakes:

- Summer sampling of 20 probabilistic lakes (if funding available, obtain benthic chrysophyte samples for correlation to current and historic trophic conditions)
- Determine natural trophic conditions with chosen models for additional lakes with adequate data

Rivers:

- Periphyton sampling
- Possible impoundment/tributary sampling

FALL 2005/ WINTER 2005-2006

Lakes:

- Continue to determine natural trophic conditions through modeling
- Verify trophic determinations and begin to define nutrient criteria for “modeled” lakes
- Begin to examine lakes for similarities in natural trophic tendency and explore possibilities of grouping similar waters

Rivers:

- Further periphyton analysis; define thresholds indicating nutrient impairment
- Begin to define nutrient conditions which cause eutrophication impairment of instream impoundments and set preliminary thresholds

Estuaries:

- Review status of nearshore studies and work group and report to Long Island Sound study on progress towards criteria development

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