

**Connecticut
Consolidated Assessment & Listing Methodology
for 305(b) and 303(d) Reporting
(CT CALM)**

2006



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Table of Acronyms used in the CT CALM 2006

303(d)	Section 303(d) of the Federal Clean Water Act, which requires States to employ corrective actions to address waters impaired by one or more pollutants (also referred to the 303(d) list)
305(b)	Section 305(b) of the Federal Clean Water Act, which requires States to assess and report on the status of their waters every two years
319(a)	Section 319(a) of the Federal Clean Water Act, which requires States to prepare a report that identifies waters impaired by nonpoint source pollution, its sources and programs to reduce such pollution
ALUS	Aquatic Life Use Support
AU	Assessment Unit; a section of a waterbody for which water quality is determined
CFU	Colony Forming Unit for bacteria enumeration
CSO	Combined Sewer Overflow
CT CALM	Connecticut Consolidated Assessment and Listing Methodology
CT DA-BA	Connecticut Department of Agriculture, Bureau of Aquaculture
CT DEP	Connecticut Department of Environmental Protection
CT DPH	Connecticut Department of Public Health
CT WQS	Connecticut Water Quality Standards
CWA	(Federal) Clean Water Act
NHD	National Hydrography Dataset
RBP	Rapid Bioassessment Protocols
RBV	Rapid Bioassessment for Volunteers
SDWA	(Federal) Safe Drinking Water Act
TMDL	Total Maximum Daily Load
US EPA	United States Environmental Protection Agency
USGS	United States Geological Survey

Introduction

The *Connecticut Consolidated Assessment and Listing Methodology* (CT CALM) documents the decision-making process for assessing and reporting on the quality of surface waters of the State, as required by Sections 305(b) and 303(d) of the Federal Clean Water Act (CWA). Section 305(b) requires biennial reporting of the quality of State waters relative to designated uses established in the State's *Water Quality Standards* (CT WQS, CT DEP 2002). Section 303(d) requires documentation and prioritization of waters impaired for one or more designated uses. States submit 305(b) and 303(d) reports every two years to the United States Environmental Protection Agency (US EPA). For waters impaired by one or more pollutants, Section 303(d) further requires that a total maximum daily load (TMDL) be established and allocated among pollutant and background sources.

For many years, Connecticut developed and submitted separate 305(b) and 303(d) Reports, as the statutory requirements for information gathering and public participation are slightly different for the two Sections of the CWA. In 2002 following a national effort for consolidation, Connecticut developed the first CT CALM and began to generate the 303(d) List as a subset of waters assessed for the 305(b) Report. For 2006, in accordance with US EPA guidance, Connecticut is submitting a fully integrated 305(b)/303(d) Report.

The assessment and listing process outlined here should be viewed in context of the Federal CWA and CT WQS (CT DEP 2002). The CWA is the primary federal law that protects our nation's surface waters, including lakes, rivers, wetlands, estuaries and ocean waters. In authorizing the Act, Congress declared as a national goal the attainment, wherever possible, of "water quality, which provides for the protection and propagation of fish, shellfish and wildlife and provides for recreation in and on the water". This goal is popularly referred to as the "fishable / swimmable" requirement of the CWA. In 1967, the State of Connecticut adopted Water Quality Standards as required under Section 22a – 426 of the Connecticut General Statutes to accomplish this and other water quality goals.

The CT WQS (CT DEP 2002) document contains policy statements addressing the protection of water quality and a classification of State waters (Appendix A). Described for each Class are: 1) allowable discharges; 2) numeric or narrative criteria for various parameters, such as dissolved oxygen and indicator bacteria, to maintain water quality; and 3) designated uses that should be supported. For example, the designated uses for Class A waters are: habitat for fish and other aquatic life and wildlife; potential drinking water supplies; recreational use; and water supply for industry and agriculture (Table 1). **The extent to which waterbodies support their designated uses is the basis for 305(b)/303(d) assessments.**

Designated Uses Assessed for 305(b) and 303(d) Reporting

Historically, there were some minor differences in the designated uses stated in the CT WQS document and those reported for 305(b)/303(d) assessments (Table 1). Starting with the 2006 reporting cycle, assessments are based solely on the designated uses specifically stated in the CT WQS (CT DEP 2002). This change mostly affects assessments of recreational use support, which was formerly assessed for both primary and secondary contact. Since CT WQS do not distinguish between waters that should provide primary or secondary contact recreation opportunities, all waters are now assessed simply for "recreation" (see section on recreation use support determination, page 13).

Table 1. Designated uses for surface waters as described in Connecticut Water Quality Standards (CT WQS, CT DEP 2002) and 305(b)/303(d) Reports.

Formerly reported 305(b)/303(d) Designated Use	CT WQS and present 305(b)/303(d) Designated Use	Applicable Class of Water	Functional Definition
Primary Contact Recreation	Recreation	AA, A, B, SA, SB	Swimming, water skiing, surfing or other full body contact activities (primary contact), as well as boating, canoeing, kayaking, fishing, aesthetic appreciation or other activities that do not require full body contact (secondary contact).
Secondary Contact Recreation			
Aquatic Life Support	Habitat for fish and other aquatic life and wildlife.	AA, A, B, SA, SB	Waters suitable for the protection, maintenance and propagation of a viable community of aquatic life and associated wildlife.
Fish Consumption	Not specified as a use, but implicit in “Habitat for fish and other...” ^a CT will continue to report on Fish Consumption for 305(b)/303(d)	AA, A, B, SA, SB	Waters supporting fish that do not contain concentrations of contaminants, which would limit consumption to protect human health.
Shellfishing	Shellfish harvesting for direct human consumption where authorized.	SA	Waters from which shellfish can be harvested and consumed directly without depuration or relay. Waters may be conditionally approved.
	Commercial shellfish harvesting where authorized.	SB	Waters supporting commercial shellfish harvesting for transfer to a depuration plant or relay (transplant) to approved areas for purification prior to human consumption (may be conditionally approved); also support seed oyster harvesting
Public Water Supply	Existing or proposed ^b drinking water supplies.	AA	Waters presently used for public drinking water supply or officially proposed for future public water supply.
	Potential drinking water supplies.	A	Waters that have not been identified, officially, but may be considered for public drinking water supply in the future.
Navigation	Navigation	SA, SB	Waters capable of being used for shipping, travel or other transportation by private, military or commercial vessels.
Industrial	Water Supply for Industry	AA, A, B, SA, SB	Waters suitable for industrial supply.
Agricultural	Agriculture	AA, A, B	Waters suitable for general agricultural purposes.

^a Also addressed in CT WQS policy statement #14: “Surface waters... shall be free of chemical constituents in concentrations or combinations which will... bioconcentrate or bioaccumulate in tissues of fish, shellfish and other aquatic organisms at levels which will impair the health of aquatic organisms or wildlife or result in unacceptable tastes, odors or health risks to human consumers...”.

^b Drinking water supplies identified in the Long Range Plan for Management of Water Resources prepared and adopted pursuant to Section 22a-352 Section 25-32d of the Connecticut General Statutes (Water Quality Standards, CT DEP 2002).

Levels of Use Support

In making water quality assessments, each designated use of a waterbody is assigned a level of support (*e.g.*, full support, not supporting), which characterizes the degree to which the water is suitable for that use. The level of use support attainment is in turn based on available data and other reliable information. The following use support categories are currently used for 305(b)/303(d) reporting. These are general definitions. Refer to the section in this report entitled *Assessment Methodology* (p. 10) for specific information regarding the criteria for determining levels of support for each designated use.

Full Support: Waterbody is suitable for the designated use.

Full Support – Threatened flag: Waterbody currently supports the designated use, but may not in the future due to degrading water quality or the existence of pollution threats that may impair water quality.

Not Supporting: Waterbody does not support the designated use some or all of the time.

Insufficient Information: Available information is not adequate to assess use support.

Not Assessed: No (credible) information is available to assess use support.

Information Used to Assess Use Support

Depending on the waterbody and data availability, any one or combination of several types of data may be used to assess water quality and use support: ambient physical and chemical, benthic invertebrate and fish community, indicator bacteria, aquatic toxicity, tissue contaminant, sediment chemistry/toxicity and effluent analysis. Following guidance from US EPA (2005), the following sources of data and information are considered in conducting water quality assessments:

- ◆ Results from recent ambient monitoring;
- ◆ Recent Section 305(b) reports, 303(d) lists, and 319(a) nonpoint assessments;
- ◆ Reports of water quality problems provided by local, state, territorial or federal agencies, volunteer monitoring networks, members of the public or academic institutions;
- ◆ Fish and shellfish advisories, restrictions on water sports or recreational contact;
- ◆ Reports of fish kills or abnormalities (deformities, lesions, tumors);
- ◆ Safe Drinking Water Act source water assessments;
- ◆ Superfund and Resource Conservation and Recovery Act reports
- ◆ Results from predictive modeling, dilution calculations or landscape analysis.

The primary sources of assessment information for rivers are ambient monitoring data collected by CT DEP monitoring staff, and physical, chemical and bacteria data collected at fixed sites by the United States Geological Survey (USGS). Lake assessments and trophic status are generally determined from studies conducted by CT DEP, the Connecticut Agricultural Experiment Station, USGS and Connecticut College since 1979 (Frink and Norvell 1984,

Canavan and Siver 1995, Healy and Kulp 1995, CT DEP 1998) as well as recent studies by professional contractors. For estuaries, use assessments are based primarily on physical, chemical and biological monitoring by the CT DEP for the Long Island Sound Study and National Coastal Assessment (Strobel 2000), bacterial monitoring for shellfish sanitation by the CT Department of Agriculture, Bureau of Aquaculture (CT DA-BA), and beach monitoring by state and local authorities.

Reasonable efforts are also made to incorporate data from other state and federal agencies, municipalities, utilities, consultants, academia, and volunteer monitoring groups. Volunteer groups and academics that receive funding through Section 319 of the CWA have data reporting requirements, which encourages the sharing of information for water quality assessments. The CT DEP also directs a monitoring program for volunteers from which usable assessment information is obtained. The details of this program, *A Tiered Approach to Citizen – Based Monitoring of Wadeable Streams and Rivers*, can be obtained from the CT DEP, Bureau of Water Protection and Land Reuse, Water Monitoring and Assessment Program or online at <http://www.dep.state.ct.us/wtr/volunmon/volmonindex.htm>.

Other types of information that may be used for assessments include water quality surveys conducted by municipalities and discharge monitoring data from municipal sewage treatment plants, industries and remediation projects. CT DEP staff may conduct effluent or ambient toxicity tests as follow-up to suspected problems. Knowledge of a condition known to cause water quality impairment is also considered valid information for determining use support. For example, the presence of a combined sewer overflow (CSO) in a stream segment automatically precludes recreational use support. Use restrictions, such as beach closures and shellfishing restrictions, are also taken into consideration.

Data Quality and Degree of Confidence

The manner in which assessments are characterized and reported is to a large degree determined by the US EPA and software provided by them. For a number of years, CT tracked waterbodies as either being “monitored” or “evaluated”. Monitored meant the assessment was based on sufficient and scientifically defensible data less than five years old. If the data were more than five years old, not considered high quality, reflected limited sampling events, or if the assessment was made using other types of information, such as knowledge of a pollution source, the waterbody was considered evaluated. As of 2006, the revised database provided by US EPA no longer supports this categorization. Rather, assessment types are given a confidence rating of low, fair, good and excellent. For each waterbody type the hierarchy is defined somewhat differently (Table 2).

The minimum requirement for data to be considered for a water quality assessment is that the data are “sufficient and credible,” meaning that the quantity and quality of information can support a scientifically defensible assessment by an experienced professional familiar with waters of similar characteristics.

Table 2. 2006 assessment confidence for data types for rivers, lakes and estuaries.

Assessment type	Confidence	Rivers/Streams	Lakes	Estuaries
Biological	Low	This level of confidence not applied to assessments	Algae/macrophyte data > 15 years old	National Coastal Assessment – limited scope
	Fair	For previously impaired waters, biological community data > 5 years old*. For waters fully supporting, biological community data > 3 but < 5 years old	Algae/macrophyte data 11-15 years old	Special studies > 5 years old
	Good	Fish community data < 3 years old	Algae/macrophyte data 5-10 years old	Fisheries trawl data; some special studies < 5 years old
	Excellent	Macroinvertebrate community and fish community data < 3 years old	Algae/macrophyte data < 5 years old	Intensive studies coupled with physical/chemical data < 5 years old
Physical/chemical	Low	This level of confidence not applied to assessments	Data > 15 years old	National Coastal Assessment – limited scope
	Fair	For impaired waters only, data >3 years old	Data 11-15 years old	Data > 5 years old
	Good	Infrequent sampling (< 8 times per year) and < 3 years old	Data 5-10 years old	Fixed station monitoring < 5 years old
	Excellent	Frequent (≥ 8 times per year) recent (< 3 years old) sampling data	Data < 5 years old	Intensive surveys and fixed station monitoring < 5 years old
Pathogen indicators	Low	For impaired rivers only, data > 3 years old	This level of confidence not applied to assessments	Limited or single event sampling > 5 years old
	Fair	Infrequent sampling (< 8 times per year); data < 3 years old.	This level of confidence not applied to assessments	Sampling data or evaluations > 5 years old
	Good	Weekly beach monitoring or other frequent monitoring; data < 3 years old.	Weekly beach monitoring or other frequent monitoring; data < 3 years old.	Survey data from Aquaculture or Beach Monitoring < 5 years old
	Excellent	Intensive seasonal sampling: data < 3 years old; Knowledge of human fecal source (e.g., CSO)	Intensive seasonal sampling; data < 3 years old; Knowledge of human fecal source (e.g., CSO)	Knowledge of human fecal source (e.g., CSO); intensive seasonal sampling < 5 years old

*Streams/rivers that were previously assessed as impaired remain impaired regardless of the age of the data (i.e., it will take new data to move these waters out of the impaired category). Streams/rivers previously assessed as fully supporting are moved to the not assessed category if the data are older than 5 years.

Geographic and Temporal Extent of Assessment Coverage

Assessment Units

Waterbodies, such as streams, lakes or estuaries are divided into water quality assessment units (AUs, formerly called waterbody segments). Each unit is considered to have homogenous water quality (i.e., use support is uniform throughout the unit). Generally, streams units are delimited by features that may cause a change in water quality, such as a confluence with a tributary, a point source discharge, an impoundment or a significant change in land use. Lakes are generally assessed as one segment. Long Island Sound, including its embayments and river-mouth estuaries, was divided into more than 120 AUs based primarily on shellfish bed and water quality classifications.

Time Frame

Data collected through April 1, 2005 were considered for assessments for this cycle, with the exception of reports of catastrophic events (fish kills, chemical spills), which were incorporated into assessments up until March 30, 2006. Some lake macrophyte and Long Island Sound survey data collected during the summer of 2005 were also evaluated.

Stream & Rivers: Probabilistic and Targeted Approaches

For the 2006 assessment cycle, the primary source of river/stream data was the probabilistic monitoring project conducted jointly with Region I US EPA between fall 2002 and spring 2004. To some extent, these data were already used in assessments for the 2004 305(b) report. However, at the time of the 2004 report submission, not all laboratory analyses had been completed from the probabilistic fieldwork. In particular, not all macroinvertebrate data were available for complete analyses. Therefore, some changes have been made to the aquatic life use assessments reported in 2004 that had been based on preliminary macroinvertebrate analyses.

The probabilistic project also included fish community surveys, periphyton surveys, and four quarterly monitoring events for physical parameters, chemistry and indicator bacteria at each site. The project design provided a statistically valid sample of Connecticut's wadeable streams from approximately 70 sites and, for the first time, the ability to make statistically valid statements regarding the condition of all wadeable streams of the State. Prior to this project, targeted stream sampling, including that conducted during a five-year rotating basin study (CT DEP 1999), achieved maximum coverage of approximately 20% of perennial stream miles and was generally biased toward waters with known impairments. The dataset from the probabilistic survey was evaluated two ways: 1) on a river AU-by-AU basis, and 2) as a representation of all wadeable streams for the state.

Assessments were also updated for river units based on other targeted monitoring conducted by CT DEP between 2002 and 2004. This included annual evaluations of benthic reference sites, focused monitoring for TMDL development or other management actions, and follow-up to reported problems. For this reporting cycle, any assessment based on data collected since the year 2000 was retained (Table 2) even if no new data were collected between 2002 and 2004. Assessments of impairment were retained regardless of the age of the data. Assessment units, which were fully supporting designated uses for the last reporting cycle but for which no data had been collected since 2000, were placed into the not assessed category for this reporting cycle.

Physical, chemical and bacteria data from the cooperative DEP/USGS long-term fixed-network were also reviewed for the time period 2002-2004. This network of approximately thirty sites provides data for up to eight sampling events at each site per year on several major rivers and streams throughout the State.

Lakes

Historically, Connecticut has assessed between 105 and 115 "significant public" lakes statewide for 305(b) reporting. Significance was based on a lake having state or federal public access, or providing unique or otherwise important habitats. In incorporating 303(d) listed waters into the 305(b) assessment process, a number of lakes and ponds which are not considered "significant", but believed to have impairments, were added to the lake assessment list.

Additionally, lakes and ponds with locally monitored bathing beaches have been added. For the 2006 reporting cycle, assessments were reviewed for 143 lakes throughout the State.

CT DEP lakes management staff reviewed recent data from limited CT DEP surveys, as well as studies provided through the CT DEP-administered Lakes Management Grant Program. The grant program funds intensive surveys and diagnostic studies in lakes identified as having special problems or special concerns to communities. Also considered for this report were available macrophyte data from the Connecticut Agricultural Experiment Station and CT DEP Natural History Survey staff. Beach closure data, where available, from 2003 and 2004 were evaluated to determine recreation use support. For a number of previously assessed lakes, no new information has been collected in many years.

In 2005, CT DEP contracted with Connecticut College to begin a statewide probabilistic lake-monitoring program of 60 lakes. Twenty lakes, chosen by a weighted random design, will be monitored each year for a three-year period (2005-2007). Water column measures (nutrients, transparency, chlorophyll *a*) as well as sediment chrysophyte data from this project will be used to determine trophic conditions and trends, and will be incorporated into lake assessments for 305(b)/303(d) reporting beginning with the 2008 cycle.

Estuaries

Long Island Sound is monitored year-round on a monthly schedule for dissolved oxygen and nutrients at 17 fixed stations; 25 - 30 stations are added during summer months for dissolved oxygen monitoring as part of the ongoing Long Island Sound Study (<http://www.longislandsoundstudy.net/>). Concurrent with this effort, CT DEP collects water quality, sediment, biological community and tissue data at as many as 40 offshore and harbor sites for a US EPA probabilistic monitoring program, the National Coastal Assessment (Strobel 2000). For the national assessment, representative stations in coastal harbors and offshore waters are chosen randomly to represent conditions of the entire Sound. This information provides the basis for aquatic life use assessments. Annual shellfish bed monitoring and sanitary surveys conducted by the CT Department of Agriculture – Bureau of Aquaculture (CT DA-BA) provide assessment information for shellfish use support. Beach closure information as well as known sources of pollution, such as CSOs, is used to determine recreation use support. All estuarine waters were re-assessed for the 2006 cycle using the most recent available information.

Management of Assessment information

Assessment data (*e.g.*, AU descriptions, assessment methods, use-support, causes and sources of impairment) are stored electronically in an Assessment Database (ADB) provided by the US EPA. During 2005 CT DEP transferred assessment information to the upgraded ADB Version 2, which allows for categorization of waters for the consolidated 305(b)/303(d) report and tracks some TMDL information. Data from the ADB are submitted to US EPA annually in electronic format in addition to the written biennial report.

Connecticut is part of a national effort to index assessed surface waters to the National Hydrography Dataset (NHD). In 2004, CT obtained the NHD at 1:24,000 scale and began the indexing process. For the 2006 reporting cycle, all assessed river AUs are indexed to the NHD. Estuary and lake AUs (polygons) will be geographically represented and indexed to the existing

CT DEP hydrography layer. CT DEP is in the process of developing a geodatabase for permanent estuary segments that will be rolled out in the 2008 reporting cycle.

Raw monitoring data are stored and managed in a Microsoft Access database developed by CT DEP Water Monitoring and Assessment staff. This database contains sampling results and meta-data collected by the Monitoring and Assessment Section since 1997. While CT DEP uses this in-house database for normal monitoring and assessment purposes, EPA's STORET national water quality database will be the ultimate repository for all monitoring results. Migration of CT DEP monitoring data to STORET began in 2003 with all beach data. Monitoring station information was added 2004, to be followed by chemical, physical, bacterial data, and biological community information.

CT DEP TMDL staff maintains a separate Microsoft Access database to document progress of TMDL development and implementation. This database stores pertinent information regarding impaired waters including the status of the development and implementation of TMDLs or other management activities, and contact information for stakeholders/participants from CT DEP and other agencies for each project.

Assessment Methodology

Assessment procedures generally follow guidance provided by US EPA (1997) using a variety of information and data types. The CT DEP applies a "weight of evidence" approach when using multiple types of data. A waterbody is generally considered impaired when one or more sources of data or information indicate a water quality standard is not attained, providing that information is considered sufficient and credible (see Data Quality section, p. 7). In resolving discrepancies in conflicting information, consideration is given to data quality, age, frequency and site-specific environmental factors. If reconciliation of conflicting data is not possible or the data are deemed insufficient, the assessment unit is flagged for further monitoring.

Aquatic Life Use - River and Streams

Because the biological community of a stream integrates the effects of pollutants and other conditions over time, biological community assessment is the best and most direct measure of aquatic life use support (ALUS), or as stated in the CT WQS "Habitat for fish and other aquatic life and wildlife" (hereafter ALUS). CT DEP has used benthic macroinvertebrate community structure as the primary indicator of biological integrity since the mid-1970s. These data provide a relatively direct characterization of impairment and use support through comparison of sample communities to reference communities (Table 3). Occasionally, where habitat conditions are not optimal, a non-quantitative assessment may be used to infer aquatic life use support. It is important to note that while CT DEP employs the methods described in US EPA's Rapid Bioassessment Protocols (RBP, Plafkin *et al.* 1989, CT DEP 1996), the actual criteria for benthic invertebrates in the CT WQS (CT DEP 2002) are narrative community descriptions, rather than numeric values. Data from the CT DEP-sponsored Rapid Bioassessment for Volunteers was incorporated into assessments if the presence of four or more "most wanted" invertebrates was reported (see <http://www.dep.state.ct.us/wtr/volunmon/rbvpt1.pdf>).

Beginning in 1999, fish community sampling has been conducted at wadeable sites through a cooperative project with the DEP Fisheries Division (CT DEP 2001). CT DEP is presently developing a tiered aquatic life use index for assessing biological condition based on fish and macroinvertebrate communities. For this reporting cycle, fisheries data were evaluated in light of the best professional judgment of fisheries and water quality monitoring staff biologists. In general, fish populations from sampled streams are compared to what would be expected in an unimpaired or minimally impaired stream of similar size. Fisheries assessments are used to support benthic information and in some cases provide the primary method to assess ALUS. Methods for both benthic invertebrate and fish monitoring are described in CT DEP (1996, 2001), Plafkin *et al.* (1989) and Barbour *et al.* (1999).

Periphyton information (chlorophyll a and preliminary diatom community data) was also incorporated into assessments. For AUs assessed as impaired by other biological community data, nutrient enrichment was added as potential cause if periphyton data showed elevated chlorophyll (>50 mg/m²), and dominance by diatom species reported to prefer elevated nutrient conditions (Van Dam *et al.* 1994). Siltation was added as a potential cause if more than 30% of the diatom community comprised motile diatoms in the genera *Nitzschia*, *Navicula* and *Surirella* (Bahls *et al.* 1992). Data from the CT DEP-sponsored Rapid Bioassessment for Volunteers was incorporated into assessments if the presence of four or more “most wanted” invertebrates was reported (see <http://www.dep.state.ct.us/wtr/volunmon/rbvpt1.pdf>).

Indirect measurements of ALUS such as ambient physical/chemical data, discharge monitoring reports, aquatic toxicity monitoring reports, and sediment chemistry data are also evaluated against water quality criteria established in CT WQS (CT DEP 2002). Decision criteria used in making ALUS assessments are provided in Table 3.

Table 3. Aquatic life use support categories and contributing decision criteria for wadeable streams.

Aquatic Life Use	Criteria / Indicators
Fully Supporting	<ul style="list-style-type: none"> • Benthic community: bioassessment indicates community is non-impaired or slightly impaired^a, and meets narrative criteria in CT WQS; RBP III Community Score (Plafkin <i>et al.</i> 1989) > 54 % of Reference Condition. • RBV data submitted to CT DEP listed 4 or more “Most Wanted” invertebrates (see http://www.dep.state.ct.us/wtr/volunmon/rbvpt1.pdf) • Fish community: species composition, trophic structure, and age class distribution as expected for an unimpaired stream of similar size. • Conventional physical/chemical criteria are not exceeded. • Measured toxicants do not exceed chronic toxicity criteria. • No record of catastrophic events (<i>e.g.</i>, chemical spills, fish kills) • No evidence of flow diversion
Full Support – Threatened Flag	<ul style="list-style-type: none"> • Benthic community as above, but documented trend is downward or conditions exist that may impact the community in the future. • RPB III Community Score (Plafkin <i>et al.</i> 1989) at or near 54%, but habitat rather than water quality conditions may account for a reduced Community Score. • Fish community as above, but documented trend is downward or conditions exist that may impact the community in the future. • Slight exceedences of either conventional or toxicant criteria in < 10% of samples; exceedences difficult to discern from expected analytical variability or error. • Treated wastewater effluent constitutes >20% of stream flow. • Land use conditions exist that threaten aquatic life.

	<ul style="list-style-type: none"> Stream flow reductions due to diversions have been observed.
Not Supporting	<ul style="list-style-type: none"> Benthic community: bioassessment indicates community is moderately impaired, RBP III Community Score 21- 50% of Reference Condition^b; or community is severely impaired, RBP III Community Score < 17% of Reference Condition (Plafkin <i>et al.</i> 1989). Fish community: species composition, trophic structure and age class distribution significantly less than expected for a non-impacted stream of similar size; diversity and abundance of intolerant species reduced or eliminated; top carnivores rare or absent; trophic structure skewed toward omnivory. Physical/chemical or toxicant criteria exceeded in $\geq 10\%$ of samples. Stream is known to dry completely or flow is severely reduced during drought conditions. Stream completely enclosed in conduit or cleared concrete trough. Documented catastrophic event (<i>e.g.</i>, chemical spill, fish kill) from anthropogenic cause.
Insufficient information	<ul style="list-style-type: none"> Some community data exist, but sampling was very limited and/or the results are ambiguous or conflicting, requiring follow-up monitoring.

a. "Slightly impaired" refers to a bioassessment category (Plafkin *et al.* 1989) represented by a benthic macroinvertebrate community that may show some loss of pollution-intolerant forms. In Connecticut, a slightly impaired assessment may still meet water quality standards given habitat restrictions.

b. When a bioassessment falls on the border between two use support categories, use support is determined by staff biologists giving consideration to site conditions and other available data.

Aquatic Life Use - Lakes

Levels of support for aquatic life use are based on the best professional judgment of CT DEP lake management staff after reviewing the most recent available information from government agencies and/or reliable contractors and lake associations. Factors taken into consideration are known problems, such as chronic algal blooms, the extent of coverage by exotic invasive plants, severe sedimentation, and surveys by fisheries biologists.

Lake trophic classifications, as listed in the CT WQS (CT DEP 2002, Appendix A) are based on ambient measurements of four parameters: total phosphorus, total nitrogen, chlorophyll a, and secchi disc transparency in specified seasons. Lakes are classified as either oligotrophic, mesotrophic, eutrophic, or highly eutrophic based on the range of values for these four parameters. Macrophyte coverage and density is used to adjust the trophic classification based on water column data described above. While trophic status is not a direct measure of aquatic community health, highly eutrophic conditions, beyond what is naturally expected (given the relative size of the lake/pond and watershed, the origin of the lake/pond, and other physiographic parameters), or a documented trend toward increased eutrophy may indicate impairment or a threat to aquatic life. A naturally eutrophic lake, having nutrient concentrations that support high levels of biological activity without any significant anthropogenic source, would not be considered impaired.

Aquatic Life Use - Estuaries

Aquatic life use assessments for estuaries are based primarily on oxygen and nutrient data (eutrophication assessments) collected by CT DEP's Long Island Sound monitoring staff as part of the EPA Long Island Sound Study. Evaluations are supplemented by special studies, intensive surveys, fish trawl surveys and National Coastal Assessment samples, when available. In cases where State water quality criteria are violated for a specific parameter as defined in the CT WQS (CT DEP 2002), the waterbody is identified as impaired. Low dissolved oxygen, or hypoxia, in offshore waters and some embayments is the most frequently cited impairment of

aquatic life (Table 4). CT DEP revised its dissolved oxygen criteria in 2001 (Appendix C) for offshore bottom waters, based on risk assessment criteria published by EPA (U.S. EPA 2000). Benthic community analyses conducted as part of the National Coastal Assessment (Strobel 2000) are being used to support other findings on ALUS, but the coverage of LIS is not yet spatially or temporally adequate to support assessments on its own. CT DEP Marine Fisheries trawl data are also used to support low dissolved oxygen findings with respect to ALUS. Other information sources include tissue analyses, sediment analyses, irregular sampling (*e.g.*, for spills, site assessments or research projects), and professional judgment evaluations of pollutant sources and water quality conditions.

Table 4. Aquatic life use support in estuaries as determined by dissolved oxygen levels.

Aquatic Life Use Assessment	Dissolved Oxygen Criteria
Fully Supporting	Waters not affected by hypoxic events. No supporting evidence that the benthic or fish communities are impacted. No violations of state water quality criteria or excessive levels of sediment contamination.
Not Supporting	Waters affected by hypoxia for some period during the year. Trawl survey data and benthic community assessments through the National Coastal Assessment are used to support these findings. State water quality criteria may be exceeded or high levels of contaminants in sediments observed.

Fish Consumption

Fish consumption use support is determined by consumption advisories issued by the Connecticut Department of Public Health (CT DPH, CT DEP 2006). Consumption advisories are in turn based on risk assessments conducted by CT DPH using fish tissue contaminant data. A statewide fish consumption advisory was issued for all species except trout < 15 inches in the mid-1990s due to mercury contamination. This advisory was based on statewide surveys of mercury contamination in fish from lakes (Neumann 1996), and rivers (CT DEP unpublished). Therefore, in addition to fish consumption use support as determined by the criteria below (Table 5), all freshwaters of the State are considered impaired for fish consumption due to mercury contamination. Likewise, all estuarine waters are considered impaired for fish consumption due to a statewide advisory for PCB contamination in migratory striped bass and bluefish.

Table 5. Fish consumption use support and criteria.

Fish Consumption Assessment	Criteria
Fully Supporting	No consumption advisory for any fish species or any consumer group, other than the statewide advisory for Mercury in freshwater fish or PCBs in migratory saltwater fish.
Fully Supporting – Threatened Flag	As above, but sediments contain detectable levels of contaminants known to bioaccumulate in fish.
Not Supporting	A consumption advisory exists for all or some fish species or for all or certain consumer groups, in addition to the statewide advisory for Mercury in freshwater fish or PCBs in migratory saltwater fish.

Shellfishing (in Estuaries)

Starting with the 2006 reporting cycle, shellfishing has been divided into two designated uses as specified in the CT WQS (2002): shellfishing for direct human consumption (SA waters), and shellfishing for commercial operations (SB waters). The Department of Agriculture, Bureau of Aquaculture (CT DA-BA) is responsible for regulating shellfish harvest, based on fecal coliform data (see Appendix B and CT WQS 2002). Shellfish beds are classified with respect to the restrictions on harvest. There are four general classifications: 1) Approved for direct human

consumption; 2) Conditionally approved for human consumption based upon rainfall, sewage treatment plant operations, season or other conditions, 3) Restricted-relay or restricted-relay/depuration operations (may also be conditional), and 4) Prohibited (may be used for oyster seed harvest). Shellfish growing water classifications are based on seawater sampling and analyses, shoreline surveys and pollution source evaluations conducted by CT DA-BA, in conformance with the Interstate Shellfish Sanitation Conference Model Ordinance. CT DEP applies these classifications to SA and SB waters to assess shellfishing use support (Table 6).

Table 6. Shellfishing use support as determined by shellfish bed classifications.

Class SA waters: Shellfish harvesting for direct human consumption where authorized.	Criteria
Fully Supporting	Waters approved for direct harvest.
Not Supporting	Waters prohibited to shellfishing operations of any kind; or approved only for relay operations or approved conditionally for direct harvest.
Class SB waters: Commercial shellfish harvesting where authorized.	Criteria
Fully Supporting	Waters approved for direct harvest, conditional direct harvest, restricted-relay or restricted-relay/depuration, or other aquaculture operations.
Not Supporting	Waters prohibited to shellfishing operations of any kind.

In a number of towns, the CT DA-BA has placed restrictions on direct harvest of shellfish from the shoreline out to the mid-Sound state boundary. However, beyond a depth of 50 feet, there is essentially no shellfishing conducted at this time, and these waters are not regularly monitored. Therefore, for 305(b)/303(d) purposes, shellfishing is not evaluated as a use in waters between the 50-foot depth contour and the state line. The lack of monitoring should not be construed to mean these deeper offshore waters do not achieve applicable water quality criteria for indicator bacteria.

Recreation

As noted earlier, recreation has historically been assessed for primary contact (full body contact activities such as swimming and water-skiing) and secondary contact (boating, fishing, etc.). Because the CT WQS (2002) do not distinguish waters that should support primary or secondary contact, all waters are assessed for “recreation”, inclusive of both levels of contact. Assessment is based on sanitary/safety considerations and aesthetic/practical usability. Sanitary condition is determined from indicator bacteria data provided by CT DEP, USGS, volunteer, or municipal monitoring, along with sanitary surveys where appropriate. Aesthetic and practical usability is based on algae and/or macrophyte surveys, mostly for lakes (Table 7).

Enterococci group bacteria are used as the primary sanitary indicator organism in salt (estuarine) water, and *Escherichia coli* in fresh water (see CT WQS 2002 and Appendix B of this document). For salt water, 104 Colony Forming Units (CFU)/100 ml of enterococci is the single sample criterion for designated bathing areas, 500 CFU/100 ml for other recreational uses, and 35 CFU/100 ml is the geometric mean criterion for any recreational use. In fresh water, 235 Colony Forming Units or CFU/100 ml of *Escherichia coli* is the single sample criterion for designated bathing areas, 410 CFU/100 ml for non-designated swimming areas, 576 CFU/100 ml for other recreational uses, and 126 CFU/100 ml is the geometric mean criterion for any recreational use. Fecal coliform data, where it exists, may be used to confirm use support determinations.

For AUs with designated bathing areas, beach closure information rather than actual indicator bacteria data is generally used to determine use support. Closures of public bathing areas are, for the most part, based on the results of weekly sampling for indicator bacteria during the swimming season. A complete discussion of Connecticut's practices related to beach monitoring and closure may be found in "Guidelines for Monitoring Bathing Waters and Closure Protocol" developed jointly by the Connecticut Department of Health, the DEP, the Connecticut Environmental Health Association, the Connecticut Association of Directors of Health (CT DPH and CT DEP 2003). Some local health departments implement administrative beach closures, which take effect after rainfall events of some pre-determined magnitude. In these cases, precipitation during the swimming season is also considered in evaluating beach closure information.

Additionally, beach personnel conduct daily inspections of shoreline bathing areas for evidence of contamination. State and local officials also utilize sanitary surveys of shorelines and watersheds as a primary tool to determine sanitary quality. Evidence of waste materials indicative of untreated sewage or human fecal contamination can be sufficient justification to support a beach closure decision by local or state authorities. Small quantities of temporary and/or transient sources of human fecal contamination transported to a site (*e.g.*, diapers, tampons, medical waste) would likely result in a beach closure. Whereas, as "significant" sources of contamination from a fixed location within the AU, such as a CSO or failing septic system, would automatically result in an assessment of impairment.

In some lakes, recreation may also be impaired by excessive growth of aquatic invasive plants or algae, which hampers use by physical means (*e.g.*, dense weeds prevent boat mobility) or creates aesthetically offensive conditions. Lakes for which no bacteria data exist may be considered fully supporting of recreation if the lake is situated completely within an undeveloped area or if there have been no complaints of illness or excessive aquatic plant growth, or, as in the case of some urban ponds, swimming is not allowed but other recreation activities are supported.

Table 7. Decision criteria for various categories of recreational use support.

Recreation Assessment	Criteria / Indicators for designated public bathing areas
Fully Supporting	<ul style="list-style-type: none"> • Designated bathing area closed 5% of swimming season or less, and • Sanitary survey indicates no significant source ^a of human fecal contamination. • Recreational use is not hindered by weed or algal growth.
Fully Supporting – Threatened Flag	<ul style="list-style-type: none"> • Designated bathing area closed between 6% and 10% of swimming season, and • Sanitary survey indicates no significant source of human fecal contamination. • Land use or environmental conditions exist that threaten use • Increased growth of exotic aquatic weeds or algae noted, but recreation still supported.
Not Supporting	<ul style="list-style-type: none"> • Designated bathing area closed more than 10% of swimming season, or • Sanitary survey indicates potential for significant source of human fecal contamination. • Algal or exotic weed growth precludes normal recreational use.
	Criteria / Indicators for areas not designated as public bathing areas
Fully Supporting	<ul style="list-style-type: none"> • Sanitary survey indicates no significant source of human fecal contamination, and • Reliable ambient monitoring data show no exceedences of indicator bacteria. • Recreational use is not hindered by restricted flow conditions or excessive weed /algal growth.
Fully Supporting – Threatened Flag	<ul style="list-style-type: none"> • Sanitary survey indicates no significant source of human fecal contamination, and • Limited monitoring data show a single sample exceedence of indicator bacteria.

	<ul style="list-style-type: none"> • Land use or environmental conditions exist that threaten use. • Increased growth of exotic aquatic weeds or algae noted, but recreation still supported. • Water diversion results in restricted flow during some periods, but recreation is still supported. • Stream flow comprises >20% treated sewage effluent.
Not Supporting	<ul style="list-style-type: none"> • Sanitary survey indicates potential for significant source of human fecal contamination; or • (Rivers only) There are a minimum of 8 samples for the assessment period, and there is one or more exceedences of the single sample criteria for <i>Escherichia coli</i> (410 CFU^b/100 ml for non-designated swimming areas, 576 CFU/100 ml for all other areas), or there is an exceedence of the geometric mean criteria (126 CFU/100 ml), or • There are 2 - 7 samples for the assessment period, and there are two single sample exceedences over 1000 CFU/100 ml, or • There are 5 - 7 samples for the assessment period and there is an exceedence of a geometric mean of 250 CFU/100 ml. • Water diversion results in flow conditions that prevent normal recreational use. • Recreation not possible; river enclosed in conduit. • Algal or exotic weed growth precludes normal recreational use.
Insufficient information	<ul style="list-style-type: none"> • Less than 5 samples in the assessment period, and less than two samples that exceed 1000 CFU/100 ml.

^a a significant source of human fecal contamination is one that originates from a fixed location and is transported to or within the water body (*e.g.*, an untreated sewage discharge or a community with failing septic systems).

^b CFU refers to colony-forming-unit, which is a the unit of measure for indicator bacteria. It is the general equivalent of one bacterium (one bacterium will grow into one colony when incubated on a plate of growth medium.)

Drinking Water Supply

The CT DPH, in cooperation with the CT DEP, implements the federal Safe Drinking Water Act (SDWA) in Connecticut. The DPH tracks and reports on the water quality of public drinking water supplies within the context of the SDWA. Because CT DEP does not have direct access to ambient water quality information for these waterbodies, they are not tracked as waterbodies in the ADB for 305(b) assessments. However, CT DEP periodically surveys water utilities for information concerning closures, trophic status, and potential causes and sources of pollution. Trophic status is reported in a separate table in the 305(b) Report.

A number of Class AA tributaries to drinking water reservoirs are tracked and assessed in the ADB for 305(b) reporting. Assessment of these streams is based on standard measures of water quality (physical/chemical parameters, macroinvertebrate community, fish community, *etc.* where available), plus consideration of the potential causes and sources of pollution noted on water utility surveys.

Aesthetics

“Aesthetics” is not a designated use of waters in the CT WQS (2002); rather it is a narrative criterion (Appendix A). Aesthetics is taken into consideration in recreational use assessments based on best professional judgment of CT DEP staff and complaints received from the public. Complaints are usually due to excessive growth of aquatic plants or chronic algal blooms in lakes.

Navigation

Navigation is assumed to be fully supported for all AA, A, B, SA and SB waters.

Agriculture, Industry

Agricultural uses are assumed to be fully supported for all AA, A, and B waters. Industrial use is assumed to be fully supported for all AA, A, B, SA and SB waters.

Listing of Unimpaired and Impaired Waters

Based on the above assessment methodology, all waters of the State may be placed in one or more of five categories described in the US EPA guidance (US EPA 2005) and based on assessed support of designated uses. The five EPA categories and the subsequent monitoring recommended to support water quality management are described below:

1. Fully supporting of all uses (may be flagged as “threatened” for some uses). Reliable data and information support a determination that the water quality standards are attained for the Class designation. For lakes restoration projects, reliable information includes a review of the site and post-dredging plan if applicable, as well as restored recreational use. These waters will be monitored in the future, in accordance with the ambient monitoring strategy adopted by the CT DEP. Waters with uses flagged as threatened may be prioritized for future monitoring.
2. Fully supporting of one or more designated uses (may be flagged as “threatened” for some uses); other uses may be unassessed or impaired. Reliable data and information exist to support a determination that some uses are attained. These waters will be monitored in the future, in accordance with the ambient monitoring strategy adopted by the CT DEP. Waters with uses flagged as “threatened” may be prioritized for future monitoring. DEP flags waters as “threatened” when water quality standards are presently met, but conditions exist that may impair these waters in the future. This does not refer to the “threatened category” defined by US EPA.
3. Not assessed, insufficient or no information exists to determine if any designated use is attained; other uses may be fully supported or impaired. These waters may be prioritized for monitoring as considered appropriate by CT DEP staff, or may be monitored in accordance with the ambient monitoring strategy adopted by the CT DEP. Following a probabilistic approach, these waters may be assessed through statistical representation.
4. Impaired for one or more designated uses. TMDL development not required for one of the following reasons. Other uses may be unassessed, fully supported or require a TMDL.
 - a. TMDLs have been completed for all pollutants causing non-attainment of uses. Waters for which TMDL(s) have been developed and approved by EPA that, when implemented, are expected to result in full attainment of the standard. Follow-up monitoring will be scheduled as specified in the approved TMDL implementation and monitoring plan, to verify that the water quality standard is met after implementation.
 - b. Other (non-TMDL related) pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near

future. These are waters where other pollution controls required by local, state, or federal authority are stringent enough to attain any water quality standard applicable to such waters. The pollution controls required are specifically applicable to the particular water quality problem. These waterbodies will remain in Category 4b until the CT DEP determines that WQS have been met.

- c. Impairment is not caused by a pollutant, but by a stressor not directly related to water quality (*e.g.*, habitat modification, hydraulic modification). These waters will be monitored in the future, in accordance with the ambient monitoring strategy adopted by the CT DEP.
5. Impaired for one or more designated uses and TMDL development required; other uses may be fully supported, unassessed or impaired but not requiring a TMDL as above. This category constitutes the subset of impaired waters for which one or more TMDLs are needed (*i.e.*, the 303(d) List). Waters in this category will be prioritized for TMDL development based on threats to human health, the potential for a TMDL analysis to result in improved water quality and comments received during the public review of the proposed 303(d) list. A schedule will be developed for the establishment of TMDLs, which will reflect the priority ranking of the listed waters. Waters in this category are inclusive of the two following subcategories:
- a. It has been determined through methodology described below, that the impairment is caused by a pollutant stressor (*e.g.*, chemical, clean sediment, temperature), a surrogate indicator (*e.g.*, indicator bacteria), or can be attributed to a source that contributes multiple pollutants to a waterbody such that implementing a TMDL for one or more pollutants can reasonably be expected to result in attainment of uses. Where more than one pollutant is associated with the impairment, the assessment unit will remain in this category until TMDLs for all pollutants have been completed and approved by EPA. Further investigative monitoring, if necessary, will be scheduled to confirm causes. Follow-up monitoring will be scheduled to determine if standards are attained following TMDL implementation.
 - b. The assessment unit does not support a use based on biological or other information, and the cause is unknown. It is uncertain whether a pollutant causes the impairment. Additional monitoring will be scheduled to identify the cause of impairment. If the additional monitoring determines the cause of the impairment to be a pollutant(s), and other pollution control requirements can not reasonably be expected to result in attainment of standards in the near future, the State will complete a TMDL(s) for the pollutant(s). If the additional monitoring determines the impairment is not caused by a pollutant, the waterbody or assessment unit will be moved Category 4c.

Determining Causes and Sources of Impairment

The primary focus of the CT DEP Monitoring and Assessment Program is to evaluate existing data and information to make use support assessments. In some cases, ambient biological community data indicate impairment, but the cause(s) and source(s) are unknown or, more often, multiple potential causes/sources exist but a direct link to impairment is lacking. Therefore, for most river segments listed as impaired for aquatic life use, the causes and sources indicated are based on the best judgment of DEP monitoring staff using a weight of evidence approach. Once a waterbody or segment is designated for TMDL development, a more thorough investigative study is conducted to identify causes and sources of impairment. These investigations may include more intensive ambient water quality sampling, aquatic toxicity studies, sediment or fish tissue analysis and/or dilution calculations of known discharges.

Delisting of Impaired (303(d)) Waters

The assessment of surface waters for 305(b) reporting is an on-going process that will result in the removal of some waterbodies from the 303(d) portion of the impaired waters list (IWL), and the addition of others. A waterbody is removed from the 303(d) List when an assessment of relevant data confirms attainment of water quality standards. Additionally, waterbodies may be delisted when:

- 1) An error was made in the initial listing causing an erroneous listing. Erroneous listings include those based on anecdotal information (information, often transmitted orally and undocumented, that can not be confirmed through direct observation or measurement using generally accepted, reproducible analytical methods). In these circumstances, the waterbody usually was moved into EPA category 2 (supporting for some uses, other uses not assessed) or more often category 3 (no or insufficient data available to make any assessment).
- 2) Quality controlled data, which are acceptable to CT DEP, demonstrate that designated uses are being met for the waterbody (with or without implementation of a TMDL).
- 3) Revisions in Water Quality Standards and Criteria result in a change in assessment from non-attainment to attainment.
- 4) The waterbody or assessment unit meets conditions described in 4a - 4c in the listing methodology above. These AUs will continue to be listed as impaired until water quality standards are met, although the regulatory requirement to adopt a TMDL will no longer apply.

Public Participation

As described previously, the CT DEP solicits data and information from a variety of sources, including volunteer groups, other federal and State agencies, municipalities, utilities, and academia to incorporate into the assessment process. Additionally, there is a public review process for the 303(d) List and listing methodology. Public comments are particularly relevant to the process of establishing priorities for the development of TMDLs and other management plans for impaired waters included in Categories 4 and 5.

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Appendix A: Applicable Water Quality Standards and Criteria for Assessed Waters

The information provided in this appendix has been excerpted from the Connecticut Water Quality Standards (2002) to provide reference material for the Consolidated Assessment & Listing Methodology (2006). Refer to the full text of the Connecticut Water Quality Standards (<http://www.dep.state.ct.us/wtr/wq/wqs.pdf>) for further information and policy statements.

Allowable Discharges to Surface Waters:

- (A) Class AA, A and SA surface waters: discharges may be permitted by the Commissioner from public or private drinking water treatment systems, dredging activity and dredge material dewatering operations, including the discharge of dredged or fill material and clean water discharges. In Class AA surface waters such discharges shall be subject to the approval of the Commissioner of Health Services. The Commissioner may authorize other discharges to surface waters with a Classification of SA, A or AA provided the Commissioner finds such discharge will be of short duration and is necessary to remediate surface water or ground water pollution. Any such discharge shall be treated or controlled to a level, which in the judgment of the Commissioner protects aquatic life and public health.
- (B) Class B and SB surface waters: discharges may be permitted for all those allowed in Class AA, A and SA surface waters, cooling water discharges, discharges from municipal and industrial wastewater treatment systems and other discharges subject to the provisions of Section 22a-430 of the Connecticut General Statutes.

INLAND SURFACE WATERS CLASSES AND CRITERIA

CLASS AA

Designated Uses- These surface waters are designated for: existing or proposed drinking water supplies; habitat for fish and other aquatic life and wildlife; recreation; and water supply for industry and agriculture.

<u>Parameter</u>	<u>Criteria</u>
1. Aesthetics	Uniformly excellent.
2. Dissolved oxygen	Not less than 5 mg/l at any time.
3. Sludge deposits-solid refuse- floating solids-oils and grease-scum	None other than of natural origin.
4. Color	None other than of natural origin.

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| 5. | Suspended and settleable solids | None in concentrations or combinations which would impair designated uses; none aesthetically objectionable; none which would significantly alter the physical or chemical composition of the bottom; none which would adversely impact aquatic organisms living in or on the bottom substrate. |
| 6. | Silt or sand deposits | None other than of natural origin except as may result from normal agricultural, road maintenance, construction activity or dredging activity or discharge of dredged or fill materials provided all reasonable controls or Best Management Practices are used in such activities and all designated uses are protected and maintained. |
| 7. | Turbidity | Shall not exceed 5 NTU over ambient levels and none exceeding levels necessary to protect and maintain all designated uses. All reasonable controls or Best Management Practices are to be used to control turbidity. |
| 8. | Indicator bacteria | See Appendix B. |
| 9. | Taste and odor | None other than of natural origin. |
| 10. | pH | As naturally occurs. |
| 11. | Allowable temperature increase | There shall be no changes from natural conditions that would impair any existing or designated uses assigned to this Class and, in no case exceed 85 degrees F, or in any case raise the temperature of surface water more than 4 degrees F. |
| 12. | Chemical constituents | None in concentrations or combinations which would be harmful to designated uses. Refer to Water Quality Standards (2002) numbers 10, 12, 13, and 19. |
| | (a) Phosphorus | None other than of natural origin |
| | (b) Sodium | Not to exceed 20 mg/l |
| 13. | Benthic invertebrates which inhabit lotic waters | A wide variety of macroinvertebrate taxa should normally be present and all functional feeding groups should normally be well represented. Presence and |

productivity of aquatic species is not limited except by natural conditions, permitted flow regulation or irreversible cultural impacts. Water quality shall be sufficient to sustain a diverse macroinvertebrate community of indigenous species. Taxa within the Orders Plecoptera (stoneflies), Ephemeroptera (mayflies), Coleoptera (beetles) and Trichoptera (caddisflies) should be well represented.

CLASS A

Designated Uses - These surface waters are designated for: habitat for fish and other aquatic life and wildlife; potential drinking water supplies; recreation; and water supply for industry and agriculture.

<u>Parameter</u>	<u>Criteria</u>
1. Aesthetics	Uniformly excellent.
2. Dissolved oxygen	Not less than 5 mg/l at any time.
3. Sludge deposits solid refuse – floating solids –oils and grease-scum.	None other than of natural origin.
4. Color	None other than of natural origin
5. Suspended and settleable solids	None in concentrations or combinations which would impair designated uses; none aesthetically objectionable; none which would significantly alter the physical or chemical composition of the bottom; none which would adversely impact aquatic organisms living in or on the bottom substrate.
6. Silt or sand deposits	None other than of natural origin except as may result from normal agricultural, road maintenance, construction activity, dredging activity or the discharge of dredged or fill materials provided all reasonable controls or best management practices are used in such activities and all designated uses are protected and maintained.
7. Turbidity	Shall not exceed 5 NTU over ambient levels and none exceeding levels necessary to protect and maintain all designated uses. All

reasonable controls or Best Management Practices are to be used to control turbidity.

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| 8. | Indicator Bacteria | See Appendix B. |
| 9. | Taste and odor | None other than of natural origin. |
| 10. | pH | As naturally occurs. |
| 11. | Allowable temperature increase | There shall be no changes from natural conditions that would impair any existing or designated uses assigned to this Class and, in no case exceed 85 degrees F, or in any case raise the temperature of surface water more than 4 degrees F. |
| 12. | Chemical constituents | None in concentrations or combinations which would be harmful to designated uses. Refer to Water Quality Standards (2002) numbers 10, 12, 13, and 19. |
| | (a) Phosphorus | None other than of natural origin. |
| | (b) Sodium | None other than of natural origin. |
| 13. | Benthic invertebrates which inhabit lotic waters. | A wide variety of macroinvertebrate taxa should normally be present and all functional feeding groups should normally be well represented. Presence and productivity of aquatic species is not limited except by natural conditions, permitted flow regulation or irreversible cultural impacts. Water quality shall be sufficient to sustain a diverse macroinvertebrate community of indigenous species. Taxa within the Orders Plecoptera (stoneflies), Ephemeroptera (mayflies), Coleoptera (beetles) and Trichoptera (caddisflies) should be well represented. |

CLASS B

Designated Uses - These surface waters are designated for: habitat for fish and other aquatic life and wildlife; recreation; and industrial and agricultural water supply.

Parameter	Criteria
1. Aesthetics	Good to excellent
2. Dissolved oxygen	Not less than 5 mg/l at any time.
3. Sludge deposits - solid refuse -	None except for small amounts that may result from the discharge from a permitted waste treatment facility and none

	floating solids - oil and grease – scum	exceeding levels necessary to protect and maintain all designated uses.
4.	Color	None which causes visible discoloration of the surface water outside of any designated zone of influence.
5.	Suspended and settleable solids	None in concentrations or combinations which would impair the most sensitive designated use; none aesthetically objectionable; none which would significantly alter the physical or chemical composition of the bottom; and none which would adversely impact aquatic organisms living in or on the bottom sediments; shall not exceed 10 mg/l over ambient concentrations.
6.	Silt or sand deposits	None other than of natural origin except as may result from normal agricultural, road maintenance, construction activity, dredging activity or discharge of dredged or fill materials provided all reasonable controls or Best Management Practices are used in such activities and all designated uses are protected and maintained.
7.	Turbidity	Shall not exceed 5 NTU over ambient levels and none exceeding levels necessary to protect and maintain all designated uses. All reasonable controls or Best Management Practices are to be used to control turbidity.
8.	Indicator bacteria	See Appendix B.
9.	Taste and odor	None that would impair any uses specifically assigned to this Class.
10.	pH	6.5 - 8.0
11.	Allowable temperature increase	There shall be no changes from natural conditions that would impair any existing or designated uses assigned to this Class and, in no case exceed 85 degrees F, or in any case raise the temperature of the receiving water more than 4 degrees F.
12.	Chemical constituents	None in concentrations or combinations which would be harmful to designated uses. Refer to Water Quality Standards (2002) numbers 10, 11, 12, 13, 17, and 19.
13.	Benthic invertebrates which inhabit lotic waters	Water quality shall be sufficient to sustain a diverse macroinvertebrate community of indigenous species. All functional feeding groups and a wide variety of macroinvertebrate taxa shall be present, however one or more

may be disproportionate in abundance. Waters which currently support a high quality aquatic community shall be maintained at that high quality. Presence and productivity of taxa within the Orders Plecoptera (stoneflies), Ephemeroptera (mayflies); and pollution intolerant Coleoptera (beetles) and Trichoptera (caddis- flies) may be limited due to cultural activities. Macroinvertebrate communities in waters impaired by cultural activities shall be restored to the extent practical through implementation of the department's procedures for control of pollutant discharges to surface waters and through Best Management Practices for non-point sources of pollution.

LAKE TROPHIC CATEGORIES

Criteria for Total Phosphorus, Total Nitrogen, Chlorophyll-a, and Secchi Disk Transparency appearing in the table below represent acceptable ranges for these parameters within which recreational uses will be fully supported and maintained for lakes in each trophic category. For the purpose of determining consistency with the water quality standards for lakes classified AA, A or B, an assessment of the natural trophic category of the lake, absent significant cultural impacts, must be performed to determine which criteria apply.

OLIGOTROPHIC

May be Class AA, Class A, or Class B water. Low in plant nutrients. Low biological productivity characterized by the absence of macrophyte beds. High potential for water contact recreation.

<u>Parameters</u>	<u>Criteria</u>
1. Total Phosphorus	0-10 ug/l spring and summer
2. Total Nitrogen	0-200 ug/l spring and summer
3. Chlorophyll-a	0-2 ug/l mid-summer
4. Secchi Disk Transparency	6 + meters mid-summer

MESOTROPHIC

May be Class AA, Class A, or Class B water. Moderately enriched with plant nutrients. Moderate biological productivity characterized by intermittent blooms of algae and/or small areas of macrophyte beds. Good potential for water contact recreation.

<u>Parameters</u>	<u>Criteria</u>
1. Total Phosphorus	10-30 ug/l spring and summer
2. Total Nitrogen	200-600 ug/l spring and summer
3. Chlorophyll-a	2-15 ug/l mid-summer
4. Secchi Disk Transparency	2-6 meters mid-summer

EUTROPHIC

May be Class AA, Class A, or Class B water. Highly enriched with plant nutrients. High biological productivity characterized by frequent blooms of algae and/or extensive areas of dense macrophyte beds. Water contact recreation opportunities may be limited.

<u>Parameters</u>	<u>Criteria</u>
1. Total Phosphorus	30-50 ug/l spring and summer
2. Total Nitrogen	600-1000 ug/l spring and summer
3. Chlorophyll-a	15-30- ug/l mid-summer
4. Secchi Disk Transparency	1-2 meters mid-summer

HIGHLY EUTROPHIC

May be Class AA, Class A, or Class B water. Excessive enrichment with plant nutrients. High biological productivity, characterized by severe blooms of algae and/or extensive areas of dense macrophyte beds. Water contact recreation may be extremely limited.

<u>Parameters</u>	<u>Criteria</u>
1. Total Phosphorus	50 + ug/l spring and summer
2. Total Nitrogen	1000 + ug/l spring and summer
3. Chlorophyll-a	0-1 meters mid-summer

COASTAL WATERS, CLASSES & CRITERIA.

CLASS SA -

Designated Uses - These surface waters are designated for: habitat for marine fish, other aquatic life and wildlife; shellfish harvesting for direct human consumption where authorized; recreation; industrial water supply; and navigation.

<u>Parameter</u>	<u>Criteria</u>
1. Aesthetics	Uniformly excellent.
2. Dissolved Oxygen	Not less than 6.0 mg/l at any time in the nearshore waters of Long Island Sound, including harbors, embayments and estuarine tributaries.

Not less than 6.0 mg/l at any time in the offshore waters of Long Island Sound, above the seasonal pycnocline and throughout the Sound when no pycnocline is established.

Not less than 3.5 mg/l for offshore waters within and below the seasonal pycnocline. Cumulative periods of dissolved oxygen in the 3.5 - 4.8 mg/l range shall not exceed exposure parameters detailed in the *Dissolved Oxygen (DO) Criteria for Offshore Coastal Waters* at the end of this appendix.

3. Sludge Deposits-
solid-refuse, floating-
solids, oils and grease
scum None other than of natural origin.
4. Color None other than of natural origin.
5. Suspended and
settleable solids None, other than of natural origin.
6. Silt or sand deposits None other than of natural origin except as may result from normal agricultural. Road maintenance, construction activity, dredging activity or discharge of dredged or fill materials provided all reasonable controls or Best Management Practices are used in such activities and all designated uses are protected and maintained.
7. Turbidity None other than of natural origin except as may result from normal agricultural, road maintenance, or construction activity, dredging activity or discharge of dredged or fill materials provided all reasonable controls and Best Management Practices are used to control turbidity and none exceeding levels necessary to protect and maintain all designated uses.
8. Indicator bacteria See Appendix B.
9. Taste and odor As naturally occurs.
10. pH 6.8 - 8.5
11. Allowable
temperature
increase There shall be no changes from natural conditions that would impair any existing or designated uses assigned to this Class and in no case exceed 83 degrees F, or in any case raise the temperature of the receiving water more than 4 degrees F. During the period including July, August, and September, the temperature of the receiving water shall not be raised more than 1.5 degrees F unless it can be shown that spawning and growth of

indigenous organisms will not be significantly affected.

12. Chemical constituents None in concentrations or combinations which would be harmful to designated uses. Refer to Water Quality Standards (2002) numbers 10, 12, 13, and 19.

CLASS SB

Designated Uses - These waters are designated for: habitat for marine fish, other aquatic life and wildlife; commercial shellfish harvesting where authorized; recreation; industrial water supply; and navigation.

Parameter	Criteria
1. Aesthetics	Good to excellent.
2. Dissolved Oxygen	Not less than 5.0 mg/l at any time in the near shore water of Long Island Sound, including harbors, embayments and estuarine tributaries. Not less than 5.0 mg/l at any time in the offshore waters of Long Island Sound above the seasonal pycnocline and throughout the Sound when no pycnocline is established. Not less than 3.5 mg/l for offshore waters within and below the seasonal pycnocline. Cumulative periods of dissolved oxygen exposure in the 3.5 – 4.8 mg/l range shall not exceed parameters detailed in Appendix C.
3. Sludge deposits solid refuse – floating solids – oils and grease-scum	None except for small amounts that may result from the discharge from a grease waste treatment facility providing appropriate treatment and none exceeding levels necessary to protect and maintain all designated uses.
4. Color	None resulting in obvious discoloration of the surface water outside of any designated zone of influence.
5. Suspended and settleable solids	None in concentrations or combinations which would impair the designated uses; none aesthetically objectionable; none which would significantly alter the physical or chemical composition of bottom sediments; none which would adversely impact organisms living in or on the bottom sediment.

- | | | |
|-----|--------------------------------|--|
| 6. | Silt or sand deposits | None other than of natural origin except as may result from normal agricultural, road maintenance, construction activity, dredging activity or discharge of dredged or fill materials provided all reasonable controls or Best Management Practices are used in such activities and all designated uses are protected and maintained. |
| 7. | Turbidity | None other than of natural origin except as may result from normal agricultural, road maintenance, or construction activity, or discharge from a waste treatment facility providing appropriate treatment, dredging activity or discharge of dredged or fill materials provided all reasonable controls and Best Management Practices are used to control turbidity and none exceeding levels necessary to protect and maintain all designated uses. |
| 8. | Indicator bacteria | See Appendix B. |
| 9. | Taste and odor | As naturally occurs. None that would impair any uses specifically assigned to this Class. |
| 10. | pH | 6.8 - 8.5 |
| 11. | Allowable temperature increase | There shall be no changes from natural conditions that would impair any existing or designated uses assigned to this Class and, in no case exceed 83 degrees F, or in any case raise the temperature of the receiving water more than 4 degrees F. During the period including July, August, and September, the temperature of the receiving water shall not be raised more than 1.5 degrees F unless it can be shown that spawning and growth of indigenous organisms will not be significantly affected. |
| 12. | Chemical constituents | None in concentrations or combinations which would be harmful to the designated uses. Refer to Water Quality Standards (2002) numbers 10, 12, 13, and 19. |

Appendix B: Water Quality Criteria for Bacterial Indicators of Sanitary Quality
SEE ALSO STANDARDS # 23 AND 25

DESIGNATED USE	CLASS	INDICATOR	CRITERIA
<u>Freshwater</u>			
Drinking Water Supply (1)			
Existing / Proposed	AA	Total Coliform	Monthly Moving Average less than 100/100 ml Single Sample Maximum 500/100ml
Potential	A	----	-----
Recreation (2)(3)			
Designated Swimming (4)	AA, A, B	<i>Escherichia coli</i>	Geometric Mean less than 126/100ml Single Sample Maximum 235/100ml
Non-designated Swimming (5)	AA, A, B	<i>Escherichia coli</i>	Geometric Mean less than 126/100ml Single Sample Maximum 406/100ml
All Other Recreational Uses	AA, A, B	<i>Escherichia coli</i>	Geometric Mean less than 126/100ml Single Sample Maximum 576/100ml
<u>Saltwater</u>			
Shellfishing			
Direct Consumption	SA	Fecal Coliform	Geometric Mean less than 14/100ml 90% of Samples less than 43/100ml
Commercial Harvesting	SB	Fecal Coliform	Geometric Mean less than 88/100ml 90% of Samples less than 260/100ml
Recreation			
Designated Swimming (4)	SA, SB	Enterococci	Geometric Mean less than 35/100ml Single Sample Maximum 104/100ml
All Other Recreational Uses	SA, SB	Enterococci	Geometric Mean less than 35/100ml Single Sample Maximum 500/100ml

- Table Notes:**
- (1) Criteria applies only at the drinking water supply intake structure.
 - (2) Criteria for the protection of recreational uses in Class B waters do not apply when disinfection of sewage treatment plant effluents is not required consistent with Standard 23.
 - (3) See Standard # 25.
 - (4) Procedures for monitoring and closure of bathing areas by State and Local Health Authorities are specified in: Guidelines for Monitoring Bathing Waters and Closure Protocol, adopted jointly by the Department of Environmental Protection and the Department of Public Health, May 1989, revised June 1992.
 - (5) Includes areas otherwise suitable for swimming but which have not been designated by State or Local authorities as bathing areas, waters which support tubing, water skiing, or other recreational activities where full body contact is likely.

Guidelines for Use of Indicator Bacteria Criteria

Water Quality Classifications are reviewed approximately every three years at which time all available water quality monitoring data is considered along with other relevant information. Relevant information includes but is not limited to federal guidance concerning the scientific basis for deriving the criteria and the potential health risks associated with excursions above the criteria, recommended implementation procedures, and the results of sanitary surveys or other investigations into sources of indicator bacteria in the watershed. Public input is also solicited and considered in determining the existing water quality conditions and water quality goals. Nevertheless, the Water Quality Classification may not be an accurate representation of current water quality conditions at any particular site. For this reason, the Water Quality Classification should not be considered as a certification of quality by the State or an approval to engage in certain activities such as swimming or shellfish harvest

Appendix C: Dissolved Oxygen (DO) Criteria for Offshore Coastal Waters

Background: Offshore Coastal DO criteria are based on the Environmental Protection Agency's *Ambient Water Quality Criteria for Dissolved Oxygen (Saltwater): Cape Cod to Cape Hatteras*, noticed November 30, 2000 in the Federal Register (65(231):71317-71321).

Area Affected: DO criteria different from the 6.0 mg/l and 5.0 mg/l minimums for Class SA and SB offshore waters apply only in and below the pycnocline of Long Island Sound (LIS) where stratification occurs during warm, summer conditions. Offshore waters are defined as areas of LIS greater than 5m in depth at mean low water. Offshore waters above the pycnocline generally have ample DO from photosynthesis and wave-driven diffusion.

Cumulative DO exposure parameters: DO conditions in the area affected do not readily lend themselves to a single numeric criterion as is often done with toxic contaminants. Aquatic organisms are harmed based on a combination of minimum oxygen concentration and duration of the low DO excursion. A DO concentration of 4.8 mg/l would meet the chronic criteria for growth and protect estuarine organisms resident in LIS regardless of duration. If oxygen fell within a 0.5 mg/l incremental range below 4.8 mg/l (*i.e.*, between 4.3 and 4.8 mg/l), a duration of 21 days or less would meet resource protection goals. Based upon the EPA research and data, similar exposure allowances were used by the Connecticut DEP for each 0.5 mg/l increment (see Table 1). The minimum DO level that can be associated with the draft EPA DO criteria document (*i.e.* the level below which there would be no exposure period consistent with resource protection) is 2.3 mg/l. Given the environmental variability, DEP has used more protective minimum DO criteria of 3.5-3.8 mg/l with no more than 5 days exposure.

Because estuarine systems are variable, DO levels are unlikely to remain within one of the three incremental ranges presented in Table 1. Typically, DO conditions would fall through a range to a minimum and then begin to rebound depending on weather and stratification conditions. To account for this, the number of days within each incremental DO range is pro-rated, as follows. A decimal fraction is calculated for each range, *e.g.*, 10.5 days in the 4.3-4.8 mg/l range would produce a decimal fraction of 0.50 (10.5 days/21 days). As long as the sum of those fractions calculated for each range is less than 1.0, resource protection goals are maintained for larval recruitment.

Table 1. DO incremental ranges and duration (exposure) data to be applied to LIS in the area affected to ensure protection of larval recruitment.		
DO Range (mg/l)		No. of Days Allowed
Maximum	Minimum	
4.8	4.3	21
4.3	3.8	11
3.8	3.5	5