

DES-WMB Policy Number: 009		Date Printed: 4/18/2008
Program:	Water Quality Standards	Last Revised: 12/19/2003
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**New Hampshire Department of Environmental Services
Interim Chlorophyll-a Criteria for Estuaries**

Situation

1. Chlorophyll is a pigment in all plants. Measuring chlorophyll in estuarine water provides an estimate of the phytoplankton (floating algae) biomass in the estuary.
2. Excessive algal growth (high biomass and high chlorophyll values) can impair the aesthetic enjoyment (swimming use) of a lake.
3. New Hampshire's surface water quality regulations (Chapter 1700) currently have no chlorophyll criteria. DES does have a plan for adopting nutrient criteria by the end of 2004, which will include a chlorophyll criterion.
4. The purpose of this policy is to establish an interim chlorophyll criterion for estuaries that can be used in the 2004 assessments for 305(b) and 303(d) reporting purposes. It also provides a numerical chlorophyll translator for the narrative criteria of Env-Ws 1703.03(c)(1) (to paraphrase, surface waters shall be free from substances that interfere with recreational activities).

Policy

1. The chlorophyll criterion for estuaries shall be 20 mg/m³ (ppb, ug/L).
2. The magnitude of exceedance criterion shall be 40 mg/m³.
3. Assessment of use support (primary contact) shall be according to the current version of the NHDES CALM. Currently that means a minimum of 10 samples and no more than 2 out of 10 may exceed 20 mg/m³ and no more than 1 may exceed 40 mg/m³

Justification and Supporting Data for the Selected Criteria

The justification for this interim criteria is provided by the chlorophyll-a concentrations that we have traditionally observed in NH's estuaries and the chlorophyll-a criteria that have been used elsewhere.

Summary of Monitoring Results

Results from estuarine samples collected in NH waters between 1988 and 2003 show that central tendency concentrations have been between 3 and 4 ug/L. The National Coastal Assessment (NCA) dataset was collected in 2000 and 2001 following a probabilistic monitoring design which should be unbiased. The statistics from this program mirror the statistics from the full dataset.

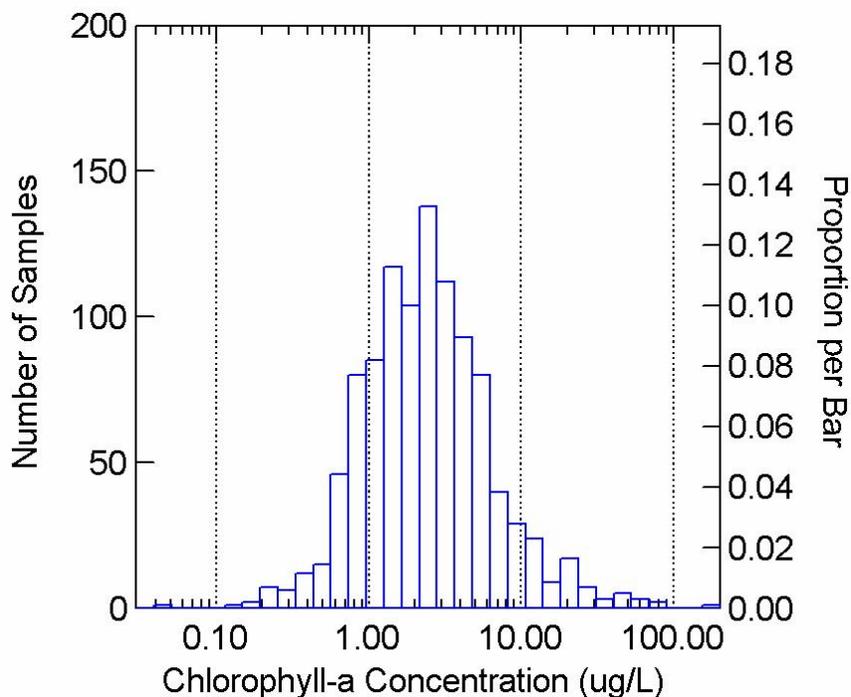
Dataset	N	Min	Mean	Median	Max	% of samples >15 ug/L	% of samples >20 ug/l
All Data (1988-2003)	1040	0.00	4.26	2.31	160.25	4%	3%
NCA Data (2000-2001)	76	0.71	4.49	3.22	20.12	3%	1%

Units: ug/L

The following figure shows that the chlorophyll-a concentrations appear to be lognormally

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distributed with the majority of samples falling below 10 ug/L.



From the NHEP Technical Characterization Report (Jones, 2000), the long term record of sampling at Adams Point (1973-1996) has shown average concentrations of 3.2 ug/L with peak values of 20 ug/L. However, tidal rivers such as the Squamscott typically have peak summer-fall concentrations equal to or greater than 30 ug/L.

Based on these data, NH's estuaries have average chlorophyll-a concentrations in the 3-4 ug/L range, but it is not unusual to have concentrations up to 20 ug/L. Higher concentrations (up to 30 ug/L) are most commonly found in the tidal rivers.

Criteria from Other States

Neither Maine nor Massachusetts have numeric criteria for chlorophyll-a in estuaries in their water quality standards.

EPA used 20 ug/L as their cut-off to designate tidal waters as being of "poor quality" for the latest National Coastal Condition report (EPA, in press). This criteria was specific to East Coast and Gulf Coast estuaries. EPA will likely use this threshold again for the baseline NCA analyses.

EPA decided not to publish numeric criteria for the Chesapeake Bay because the system is too variable (EPA, 2003). Instead, they published a narrative standard and asked the States to develop numeric standards.

The Buzzards Bay Program developed nutrient criteria for the tidal embayments on the south side

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of Cape Cod (Costa, 2000). The criteria were for mean summer concentrations to be below 5-9 ug/L. Since these criteria are for mean summer concentrations, they cannot be applied to single sample results. Moreover, the estuaries south of Cape Cod are distinctly different from the macrotidal estuaries that we have in NH.

Conclusion

NHDES will use 20 ug/L as the threshold chlorophyll-a in tidal waters for the 2004 305b assessments. This threshold value has the benefit of having passed peer-review at EPA and is somewhat specific to our ecoregion. If EPA continues to use 20 ug/L for the NCA reports, our 305b results will be consistent with EPA's reports.

Most of the samples from NH's estuaries that have greater than 20 ug/L chlorophyll-a are from the tidal rivers, particularly the Squamscott River. The Squamscott was listed as impaired from chlorophyll-a in the 2002 305b report. Therefore, using 20 ug/L as the threshold in 2004 will produce listings for chlorophyll-a that are consistent with those from 2002.

References

EPA (in press) National Coastal Condition Report II. EPA-620/R-03/002. U.S. Environmental Protection Agency, Office of Research and Development/Office of Water, Washington, DC. Expected publication date August 2004.

EPA (2003) Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity, and Chlorophyll-a for the Chesapeake Bay and its Tidal Tributaries. EPA 930-R-03-002. U.S. Environmental Protection Agency, Region III, Chesapeake Bay Program Office/Water Division. April 2003.

Jones SJ (2000) Technical Characterization Report. NH Estuaries Project, Portsmouth, NH. 2000.

Costa JE (2000) Managing anthropogenic nitrogen inputs to coastal embayments: Technical basis and evaluation of a management strategy adopted for Buzzards Bay. Supplementary information on water quality and habitat goals. Buzzards Bay Project Technical Report, January 14, 2000.

Approved:

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Date:
