

## AGGREGATE ECOREGIONAL (AGG. ER) CRITERIA RECOMMENDATIONS FOR RIVERS AND STREAMS

Parameter	Agg. ER 1	Agg. ER IV	Agg. ER V	Agg. ER VIII	Agg. ER X
TP µg/L .....	47.00	23.00	67.00	10.00	*128
TN mg/L .....	0.31	0.56	0.88	0.38	0.76
Chl a µg/L .....	1.80	2.40	3.00	0.63	2.10(S)
Turb (FTU) .....	4.25	4.21	7.83	1.30	17.50

\* This number appears inordinately high and may either be a statistical anomaly or reflects a unique condition. In any case, further regional investigation strongly encouraged to determine the sources, i.e., measurement error, notational error, statistical anomaly, natural enriched conditions, or cultural impacts (impacts from human activities).

Turb = Turbidity, FTU are nephelometric turbidity units, calibrated with formazin suspension.

#### What were the Main Submissions of Significant Scientific Information Provided by the Public?

Many of the concerns raised by the public about EPA's approach for developing nutrient criteria were raised earlier during the development of EPA's Technical Guidance Manuals. At that time, questions were raised about EPA's use of a statistical derivation of a reference condition. EPA continues to believe these approaches are reasonable for the purpose of making today's criteria recommendations. The Science Advisory Board (SAB) endorsed the reference condition approach used by EPA. The SAB stated in its review of "Biological Criteria: Technical Guidance for Streams and Small Rivers" (EPA, 1993) that "the definition of reference condition using reference sites is appropriate when used in conjunction with historical data, empirical models, and expert opinion/consensus." EPA's Nutrient Criteria Program later adopted the reference condition approach and continues to recommend it in all of its nutrient criteria guidance manuals. Additionally, the statistical derivation approach to developing nutrient criteria was favorably reviewed by peer reviewers as well. Consequently, EPA did not change its fundamental approach to nutrient criteria development or change the documents significantly beyond responding to comments of peer reviewers. Following is a summary of the most significant scientific information submitted by the public. The issues are grouped by topic, and then followed by EPA's response:

#### Percentile Approach

(1) The criteria are based on a statistical analysis of current nutrient levels in the Nation's waters rather than on the latest scientific knowledge and therefore are inconsistent with section 304(a) of the Clean Water Act.

(2) The use of the 25th percentile of all data or the 75th percentile of all reference data as criteria by States is undocumented, not scientifically valid, and results in meaningless numerical criteria values.

(3) Many data gaps exist in the nutrient database (for example a lake with only one reading for a parameter in a given year). Some screening techniques should have been done so that only those waterbodies were included for which there are sufficient representative data.

(4) The statistical approach used to develop the nutrient criteria is statistically flawed because it ignores the relationship between nutrient levels and in-stream/in-lake effects. As a result, there is no way of knowing the environmental benefit or the level of protection of designated uses gained by attaining the nutrient criteria levels set forth in the documents. As a result, EPA's statistical derivation of numerical nutrient criteria are meaningless to real world situations and are not helpful in making watershed management decisions, TMDL allocations, or in developing Water Quality Standards for nutrients at the State level. Therefore, they should be withdrawn.

**EPA Response:** The mean, median and mode are measures of central tendency commonly used in science to represent the distribution of a population of observations. The frequency distribution approach is not used to establish criteria; rather it is used to determine one of the components of a criterion, the reference condition. This reference condition is one element of a criterion which should be considered along with historical background information, possible model extrapolations of data, and consideration of possible downstream impacts on those waters by a regional panel of experts (Regional Technical Assistance Group—RTAG).

Further, the scientific community uses frequency distributions as a common basic interpreter of data with the upper and lower quartiles as an admittedly subjective, but traditional, approach to viewing the extent of a distribution about a central tendency. It is not mandatory or expected that the reference condition so derived be translated directly into a criterion. The selection of an upper quartile (or lower

quartile with mixed water quality samples) is also consistent with the EPA policy to set levels protective of the majority of waters and has been peer reviewed both by EPA's SAB and external peer reviewers of our water body type technical guidance.

Finally, EPA's technical guidance manuals provide examples of alternate approaches to frequency distributions to assess reference conditions and determine relationships among causal response variables.

#### Model Based Approach

The percentile-based nutrient criteria proposed by EPA are acceptable only as a way to initiate a model-based, decision-theoretic approach to standard setting (as described in submission) to be undertaken by the effected States and Tribes with the assistance of EPA.

**EPA Response:** The presumption underlying EPA's use of a reference condition approach is that reference conditions reflect conditions conducive to the protection of most aquatic life in the given water body type and geographic region. The upper quartile of the reference data distribution is an accommodation to variability of the reference condition, and the lower quartile of a mixed sample is an effort to approach this reference condition when insufficient a priori sites exist. Therefore, the percentiles serve as recommended starting points to be further refined by in the absence of refinements that may be employed by the States, authorized Tribes and RTAGs.

#### Need for Site Specific Criteria

(1) Establishing a single nutrient criterion for all waters of a geographically diverse region based on inadequate data is not an appropriate approach. Numeric criteria should be developed at a site-specific level.

(2) Regarding the chlorophyll standard: annual cycle of circadian photo-periods vary significantly from southern Georgia to southern Maine. Hours of daylight affect the growth of the chlorophyll in a water body not only in photons activating chlorophyll but in