

Guidance on Developing Nutrient Standards for Protecting Designated Uses of Water Bodies

entities decide to pursue a more subjective approach that would rely on non-effects-based data, there is a risk that it may lead to the development of less-scientifically defensible nutrient criteria. This is an important consideration in determining the type of approach to pursue.

Table 6. Most Sensitive Lake Uses by Ecoregion and Corresponding Phosphorus Criteria for Minnesota (Heiskary and Walker 1988).

Ecoregion	Most Sensitive Uses	P Criteria (µg/L)
Northern Lakes and Forests	Drinking water supply	<15
	Cold water fishery	<15
	Primary contact recreation and aesthetics	<30
North Central Hardwood Forests	Drinking water supply	<30
	Primary contact recreation and aesthetics	<40
Western Corn Belt Plains	Drinking water supply	<40
	Primary contact recreation and aesthetics	<40
	• (full support) • (partial support)	<90
Northern Glaciated Plains	Recreation and aesthetics • (partial support)	<90

Table 7. Aesthetic or Use Impairment Classification Systems Based on Chl *a* or Transparency (Heiskary and Walker 1988).

Author/Location	Chl <i>a</i> (µg/L)	Rating
Walmsley (1984) South African Reservoir	0-10	No Problems
	10-20	Scums Evident
	20-30	Nuisance
	>30	Severe Nuisance
Barica (1975) Canadian Prairie Ponds	0-25	Clear, No Blooms
	25-100	Moderate Blooms
	100-200	Dense Colonies and Scums
McGhee (1983) North Carolina	>15	Unsuitable for Trout
	>40	Severe Nuisance
Lillie and Mason (1983) Wisconsin	<1	Excellent
	1-5	Very Good
	5-10	Good
	10-15	Fair
	15-30	Poor
	>30	Very Poor

Table 8. Potential Lake Uses Identified by Chlorophyll Levels for Lakes in Southern Ontario (Dillon and Rigler 1975).

Chl <i>a</i> (µg/L)	Use Category
2	Body contact recreation and cold water fishery.
5	Water recreation where a cold water fishery is not imperative.
10	Body contact recreation of little importance, emphasis is on warm water fish.
25	Suitable for warm water fishery.

6.11 Step 11: Evaluate Potential Unacceptable Downstream and Upstream Effects of Trial Criteria Effects

Nutrient criteria should be developed with a full understanding of potential impacts to downstream and upstream water quality. In some watersheds, it is possible that nutrient concentrations resulting in acceptable levels of algal biomass in rivers or streams may cause unacceptable levels of algal biomass in downstream lakes, reservoirs, and estuaries. For example, in water bodies that undergo thermal stratification, hypolimnetic oxygen depletion may occur, with adverse effects to benthic and pelagic communities. In addition, discharges of low DO hypolimnetic waters from reservoirs may adversely impact aquatic life in downstream waters. In such cases, if nutrient loads from upstream sources cause unacceptable effects to one or more designated uses in downstream water bodies, then more stringent nutrient criteria may be required in the upstream water bodies. It is also possible that restrictive downstream criteria may limit upstream recreational opportunities by reducing overall fish production. Evaluation of potential downstream and upstream impacts of trial criteria will require a loading analysis, such as is done in a Total Maximum Daily Load (TMDL) analysis. If the trial criteria are predicted to prevent attainment or development of upstream or downstream criteria, then the trial criteria may have to be revised to preclude those impacts.

6.12 Step 12: Begin Criteria Adoption Process

If the proposed criteria are acceptable to the regulatory and regulated entities involved in developing the criteria, they could be submitted to the State water quality management agency and implemented as water quality standards. Implementation would occur through the State rulemaking process for updating water quality standards, which is required of each State by the Clean Water Act every three years (the "triennial review").

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APPENDIX 1

Example State Nutrient Criteria Development Plan: Virginia

APPENDIX 2

**Report Of The Academic Advisory Committee To The
Virginia Department of Environmental Quality
– Freshwater Nutrient Criteria**

APPENDIX 3

**Developing Uses and Nutrient Criteria
For Reservoirs In The Trinity River Basin**

APPENDIX 4

**Water Quality Assessments of Selected Lakes
Within Washington State**

