

7.031(4) Specific Criteria

(N) Nutrients and chlorophyll

1. Definitions

A. For the purposes of this rule, all lakes and reservoirs shall be referred to as “lakes”.

B. Lake Ecoregions – Due to differences in topography, soils and geology, nutrient criteria for lakes and reservoirs will be determined by the use of four major ecoregions. These regions were delineated by grouping the ecological subsections described in Nigh and Schroeder, 2002, Atlas of Missouri Ecoregions, Missouri Dept of Conservation as follows:

- I. Plains: TP2 – Deep Loess Hills; TP3 – Loess Hills; TP4 – Grand River Hills; TP5 – Chariton River Hills; TP6 – Claypan Till Plains; TP7 – Wyaconda River Dissected Till Plains; TP8 – Mississippi River Hills;**
- II. Ozark Border: MB2a – Crowley’s Ridge Loess Woodland/Forest Hills; OZ11 – Prairie Ozark Border; OZ12 – Outer Ozark Border; OZ13 – Inner Ozark Border;**
- III. Ozark Highland: OZ1 – Springfield Plain; OZ2 – Springfield Plateau; OZ3 – Elk River Hills; OZ4 – White River Hills; OZ5 – Central Plateau; OZ6 – Osage River Hills; OZ7 – Gasconade River Hills; OZ8 – Meramec River Hills; OZ9 – Current River Hills; OZ10 – St Francois Knobs and Basins; OZ14 – Black River Ozark Border;**
- IV. Big River Floodplain: MB1 – Black River Alluvial Plain; MB2b – Crowley’s Ridge Footslopes and Alluvial Plains; MB3 – St. Francis River Alluvial Plain; MB4, OZ16, TP9 – Mississippi River Alluvial Plain; OZ15, TP1 – Missouri River Alluvial Plain.**

C. Criteria Values

- I. Prediction Value – A total phosphorus (TP), in $\mu\text{g/L}$, that is derived from the characteristics of a lake or reservoir, including dam height in feet, hydraulic residence time in years, and percentage of the watershed that was historically covered by prairie grasses. Prediction values for total phosphorus are calculated directly from these factors.**
- II. Reference Value – A limit for TP, in $\mu\text{g/L}$, that is representative of lakes and reservoirs within the lake ecoregion with the following characteristics:**
 - (a) less than 20 percent of the watershed is in crop land and urban land combined,**
 - (b) there are no point source wastewater discharges and no concentrated animal feeding operations within the watershed,**

- (c) in the Plains region, more than 50 percent of the watershed is in grass land,
 - (d) in the Ozark Highlands region, more than 50 percent of the watershed is in woodland.
- III. **Site Specific Value** – A limit for TP, in µg/L, for a lake or reservoir that has been identified as having trophic characteristics for which the reference of the ecoregion (and the prediction values) for that water body are not adequate to prevent deterioration of water quality. Site specific criteria are applicable to lakes with geomean TP concentrations at or below the 10th percentile of the range of geomean TP concentrations measured in reference lakes within a lake ecoregion. Site specific criteria are also applicable to lakes with actual TP geomean concentrations that are at or below the reference value where the prediction value is at or below the 10th percentile for TP concentrations within a lake ecoregion. The 10th percentile values for each ecoregion are listed in Table L and lakes with site specific criteria are listed in Table M.
- 2. This rule applies to all lakes and reservoirs listed in Table G that are outside the Big River Floodplain ecoregion and have an area of at least ten (10) acres during normal pool.
- 3. Nutrient criteria for lakes and reservoirs with site specific criteria are listed in Table M. Nutrient criteria for other lakes are as follows:
 - a) **Total Phosphorus (TP):**
 - i) For lakes in which the TP prediction value or the actual TP concentration does not exceed the reference value listed in Table L, TP concentration shall be limited to the reference value, except as described below.
 - ii) For lakes in which the TP prediction value does not exceed the reference value, and the actual TP value does not exceed the prediction value, TP concentration shall be limited to the prediction value.
 - iii) For lakes in which the TP prediction value and the actual TP concentration exceeds the reference value listed in Table L, TP concentrations shall be limited to the prediction value.
 - b) **Total Nitrogen (TN):**
 - i) For lakes in which the TP prediction value does not exceed the reference value listed in Table L, TN concentration shall be limited to twenty (20) times the TP reference value.
 - ii) For lakes in which the TP prediction value does not exceed the reference value, and the actual TP value does not exceed the prediction value, TN concentration shall be limited to twenty (20) times the TP prediction value.
 - iii) For lakes in which the TP prediction value exceeds the TP reference value listed in Table L, TN concentration shall be limited to twenty (20) times the TP prediction value.
 - iv) This portion of the rule does not apply to lakes that are held to site specific criteria for TP, TN, and Chl, as listed in Table M.

c) Chlorophyll (Chl) – The ratio of Chl concentration to the TP criteria shall be limited to the following in lakes within each ecoregion:

- i) Plains – 0.44,
- ii) Ozark Border and Ozark Highlands – 0.42,
- iii) This portion of the rule does not apply to lakes that are held to site specific criteria for TP, TN, and Chl, as listed in Table M.

4. All TP, TN, and chlorophyll concentrations must be calculated as the geometric mean of data representing at least a four year period from a minimum of sixteen samples. At least four of the samples must have been taken during each year. All samples must be from the surface and near the outflow end of the lake and collected during a period starting May 1 and ending August 31.

Table L: Total Phosphorus (TP) Criteria for classified lakes and reservoirs

Lake Ecoregion	TP Reference Value (µg/L)	TP Prediction Value (µg/L) (1)	TP 10 th percentile reference value for site specific criteria (µg/L)
Plains	58	$a/4 + 16/b + 570/c$	20
Ozark Border	41	$15 + 740/c$	16
Ozark Highland	26	$5 + 740/c$	9

(1) Coefficients: a = portion of watershed originally in prairie as percentage (0 to 100); b = hydraulic residence time in years; c = dam height in feet

Table M: Lakes with site specific criteria

Lake Ecoregion	Lake	County	Site specific criteria (µg/L)		
			TP	TN	Chl
Plains	Bowling Green Lake	Pike	21	502	6.5
	Bowling Green Lake (old)	Pike	31	506	5.0
	Forest Lake	Adair	21	412	4.3
	Fox Valley Lake	Clark	17	581	6.3
	Hazel Creek Lake	Adair	27	616	6.9
	Lincoln Lake – Cuivre River State Park	Lincoln	16	413	4.3
	Marie, Lake	Mercer	14	444	3.6
	Nehai Tonkaia Lake	Chariton	15	418	2.7
	Viking, Lake	Daviess	25	509	7.8
	Waukomis Lake	Platte	25	553	11.0
Ozark Border	Weatherby Lake	Platte	16	363	5.1
	Goose Creek Lake	St Francois	12	383	3.2
Ozark Highlands	Wauwanoka, Lake	Jefferson	12	384	6.1
	Clearwater Lake	Wayne-Reynolds	13	220	2.6
	Council Bluff Lake	Iron	7	229	2.1
	Crane Lake	Iron	9	240	2.6

Fourche Lake	Ripley	9	236	2.1
Loggers Lake	Shannon	9	200	2.6
Lower Taum Sauk Lake	Reynolds	9	203	2.6
Noblett Lake	Douglas	9	211	2.0
St. Joe State Park Lakes	St Francois	9	253	2.0
Sunnen Lake	Washington	9	274	2.6
Table Rock Lake	Stone	9	253	2.6
Terre du Lac Lakes	St Francois	9	284	1.7
Timberline Lakes	St Francois	8	276	1.5