

# CHISAGO LAKES CHAIN OF LAKES WATERSHED



## LAKE WATER QUALITY MONITORING



CHISAGO SOIL & WATER CONSERVATION DISTRICT

[www.chisagoswcd.org](http://www.chisagoswcd.org)

# STANDARDS AND EXPECTED RANGES FOR LAKES IN CHISAGO COUNTY

## Minnesota Pollution Control Agency Standards North Central Hardwood Forest

MPCA Standard	Total Phosphorus ( $\mu\text{g/L}$ )	Chlorophyll-A ( $\mu\text{g/L}$ )	Secchi Transparency (m)
Deep Lake	40	14	1.4
Shallow Lake	60	20	1.0

Summer (June-September) Mean - "Lakes where TP and at least one of the response variables (corrected chl-a or Secchi) exceed the standards are considered impaired in the integrated narrative report and are also included on the draft 303(d) list."

## Summer Average Water Quality Values of Ecoregion Lakes

Ecoregion	Percentile	Total Kjeldahl Nitrogen (mg/L)	Total Phosphorus ( $\mu\text{g/L}$ )	Chl-A ( $\mu\text{g/L}$ )	Secchi Trans. (m)
North Central Hardwood Forest	25—75	0.60-1.2	23—50	5—22	1.5—3.2

(Heiskary, 1991)

Some data was left out due to the uncertainty of laboratory values. These 'outliers' were not included in calculating Lake Grades and Summer Means.

A second year of monitoring is needed to properly determine if these lakes should be considered 'impaired'

### General Trophic Classification of Lakes

Grade	Percentile	Total Phosphorus (µg/L)	Chlorophyll-A (µg/L)	Secchi Transparency (m)
A	< 10	< 23	< 10	> 3.0
B	10—30	23—32	10—20	2.2—3.0
C	30—70	32—68	20—48	1.2—2.2
D	70—90	68—152	48—77	0.7—1.2
F	> 90	> 152	> 77	< 0.7

Metropolitan Council - pg. 12, <http://www.metrocouncil.org/environment/RiversLakes/Lakes/07IntPurAcknMethResAn.pdf> Grades are based on an May - September average.

Parameter	Oligotrophic	Mesotrophic	Eutrophic	Hypereutrophic
Total Phosphorus (µg/L)	< 12	13—24	24—96	> 96
Chlorophyll-A (µg/L)	< 3	3—7	7—56	> 56
Secchi Transparency (m)	< 4.0	2.0—4.0	2.0—0.5	< 0.5

(Osgood, 1989b, Osgood, 1989c).

**Oligotrophic:** Clear water, oxygen throughout the year the hypolimnion (area below the thermocline). Water may be suitable for an unfiltered water supply. Salmon can occupy these lakes.

**Mesotrophic:** Water is moderately clear, increasing probability of lack of oxygen in the hypolimnion during the summer. Iron, manganese, taste, and odor problems worsen. Walleye population may be predominant.

**Eutrophic:** The hypolimnion is without oxygen the majority of the year. There may be problems with the macrophyte plant population. Blue-green algae blooms may occur. The water supply may have episodes of severe taste and odor. Only warm water fisheries are present. Nuisance macrophytes, algae blooms, and very low transparency may discourage swimming and boating.

**Hypereutrophic:** Dense algae and macrophytes present. Rough fish dominate the fish population. The possibilities of summer fish kills exist.

## CHISAGO LAKE (NORTH)

	<b>Total Phosphorus</b>	<b>Chlorophyll-A</b>	<b>Secchi Transparency</b>	<b>Overall</b>
<b>Lake Grade</b>	B	B	B	<b>B</b>
<b>Summer Average</b>	28.0 µg/L	13.7 µg/L	2.2 m	
<b>Meets MPCA Standard</b>	yes	yes	yes	<b>YES</b>
<b>Carlson Trophic State Index</b>				<b>Eutrophic</b>

## CHISAGO LAKE (SOUTH) - SHALLOW

	<b>Total Phosphorus</b>	<b>Chlorophyll-A</b>	<b>Secchi Transparency</b>	<b>Overall</b>
<b>Lake Grade</b>	C	B	C	<b>C+</b>
<b>Summer Average</b>	41.6 µg/L	19.1 µg/L	1.7 m	
<b>Meets MPCA Standard</b>	yes	yes	yes	<b>YES</b>
<b>Carlson Trophic State Index</b>				<b>Eutrophic</b>

## GREEN LAKE

	<b>Total Phosphorus</b>	<b>Chlorophyll-A</b>	<b>Secchi Transparency</b>	<b>Overall</b>
<b>Lake Grade</b>	C	B	B	<b>B-</b>
<b>Summer Average</b>	48.4 µg/L	23.4 µg/L	2.2 m	
<b>Meets MPCA Standard</b>	no	no	yes	<b>NO</b>
<b>Carlson Trophic State Index</b>				<b>Eutrophic</b>

## LITTLE GREEN LAKE

	<b>Total Phosphorus</b>	<b>Chlorophyll-A</b>	<b>Secchi Transparency</b>	<b>Overall</b>
<b>Lake Grade</b>	C	B	C	<b>C+</b>
<b>Summer Average</b>	41.6 µg/L	19.1 µg/L	1.7 m	
<b>Meets MPCA Standard</b>	no	no	yes	<b>NO</b>
<b>Carlson Trophic State Index</b>				<b>Eutrophic</b>

## KROON LAKE

	<b>Total Phosphorus</b>	<b>Chlorophyll-A</b>	<b>Secchi Transparency</b>	<b>Overall</b>
<b>Lake Grade</b>	C	B	C	<b>C+</b>
<b>Summer Average</b>	37.2 µg/L	13.6 µg/L	1.4 m	
<b>Meets MPCA Standard</b>	yes	yes	yes	<b>IMPAIRED</b>
<b>Carlson Trophic State Index</b>				<b>Eutrophic</b>

## LITTLE LAKE

	<b>Total Phosphorus</b>	<b>Chlorophyll-A</b>	<b>Secchi Transparency</b>	<b>Overall</b>
<b>Lake Grade</b>	D	A	D	<b>C</b>
<b>Summer Average</b>	153.8 µg/L	7.4 µg/L	0.7 m	
<b>Meets MPCA Standard</b>	no	yes	no	<b>IMPAIRED</b>
<b>Carlson Trophic State Index</b>				<b>Eutrophic</b>

## NORTH CENTER LAKE (NORTH) - SHALLOW

	Total Phosphorus	Chlorophyll-A	Secchi Transparency	Overall
<b>Lake Grade</b>	D	C	D	<b>D+</b>
<b>Summer Average</b>	79.9 µg/L	40.9 µg/L	0.9 m	
<b>Meets MPCA Standard</b>	no	no	no	<b>IMPAIRED</b>
<b>Carlson Trophic State Index</b>				<b>Eutrophic</b>

## NORTH CENTER LAKE (SOUTH) - SHALLOW

	Total Phosphorus	Chlorophyll-A	Secchi Transparency	Overall
<b>Lake Grade</b>	D	C	C	<b>C-</b>
<b>Summer Average</b>	70.3 µg/L	24.9 µg/L	1.5 m	
<b>Meets MPCA Standard</b>	no	no	yes	<b>IMPAIRED</b>
<b>Carlson Trophic State Index</b>				<b>Eutrophic</b>

## NORTH LINDSTROM LAKE

	<b>Total Phosphorus</b>	<b>Chlorophyll-A</b>	<b>Secchi Transparency</b>	<b>Overall</b>
<b>Lake Grade</b>	C	B	C	<b>C+</b>
<b>Summer Average</b>	33.3 µg/L	14.0 µg/L	1.9 m	
<b>Meets MPCA Standard</b>	yes	no	yes	<b>YES</b>

**Carlson Trophic State Index**

**Eutrophic**

## SOUTH LINDSTROM LAKE

	<b>Total Phosphorus</b>	<b>Chlorophyll-A</b>	<b>Secchi Transparency</b>	<b>Overall</b>
<b>Lake Grade</b>	B	B	A	<b>B+</b>
<b>Summer Average</b>	26.0 µg/L	11.8 µg/L	3.0 m	
<b>Meets MPCA Standard</b>	yes	yes	yes	<b>YES</b>

**Carlson Trophic State Index**

**Eutrophic**



## WALLMARK LAKE

	<b>Total Phosphorus</b>	<b>Chlorophyll-A</b>	<b>Secchi Transparency</b>	<b>Overall</b>
<b>Lake Grade</b>	F	F	F	<b>F</b>
<b>Summer Average</b>	281.1 µg/L	262.0 µg/L	0.3 m	
<b>Meets MPCA Standard</b>	no	no	no	<b>IMPAIRED</b>
<b>Carlson Trophic State Index</b>				<b>Hyper-eutrophic</b>

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