SOUTH WASHINGTON WATERSHED DISTRICT

Markgrafs Lake

DNR ID #82-0089 Municipality: Woodbury
Surface Area: 46 Acres Watershed Area: 436 Acres
Mean Depth: 5 feet Maximum Depth: 8 feet
SWWD Maximum Allowable Phosphorus Load: 0.61 lbs/ac/yr
SWWD Trophic State Index (TSI) Goal: 66-70

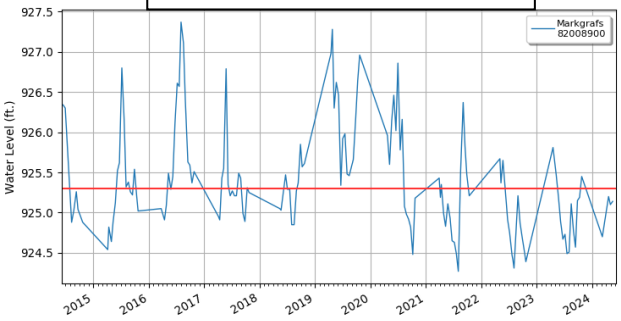
Map 1: Markgrafs Lake

Markgrafs Lake is approximately 46 acres in surface area and has a contributing watershed of 413 acres. Along with Armstrong Lake, Markgrafs makes up the headwaters of SWWD's Northern Watershed (NWS).

The Markgrafs Lake watershed is completely built out. The upper part of the watershed is dominated by commercial land use while the remainder is made of dense residential neighborhoods. Water from Markgrafs Lake drains to the south basin of Wilmes Lake via Woodbury's storm sewer network. Markgrafs Lake levels (Figure 1) are stable, with routine discharge to downstream Wilmes Lake following wet periods.

The State sets several in-lake water quality standards applicable to Markgrafs Lake; including a total phosphorus (TP) concentration of 0.060 mg/L and secchi transparency depth of 1.0 meter. TP concentrations higher than the state standard or secchi depths less than the state standard are generally indicative of increased rates of eutrophication or excess plant and algae growth. SWWD's interim goal for Markgrafs Lake (Trophic State Index = 66-70) corresponds to an in-lake total phosphorus (TP) concentration of 0.073-0.096 mg/L and an average watershed TP loading rate of 0.61 lbs/ac/yr. Water Quality as measured by all three eutrophication measures significantly ($p < 0.01$) exceeds SWWD and State goals. Recently, however, the lake has improved modestly, possibly due to increasing dominance of rooted vegetation. Increasing use of nutrients by rooted vegetation limits what is available for algae. Long term trends in Total Phosphorus, Chlorophyll a, and Secchi Transparency are shown in Figures 2-4, respectively. Markgrafs Lake is currently listed as impaired for excess nutrients. Historic lake grades which compare Markgrafs Lake to other Twin Cities metro lakes are shown in Table 1. All monitoring data is available through

Figure 1: Markgrafs Lake Levels



SWWD's web database at www.swwdmn.org.

As expected from the generally poor water quality, Markgrafs Lake exhibits near constant nuisance algal conditions throughout the summer. Those conditions severely impair both recreation opportunities and aesthetic value of the lake. Those conditions may be exacerbated by what seems to be an over-abundance of bullheads and sunfish which significantly disturb the lake bottom and increase internal nutrient loading. However, as already noted the lake has shifted to favor rooted vegetation which could indicate a decline in the bullhead and sunfish populations due to either winter kill or natural fluctuations.

A vegetation survey was completed in 2021. Depending on season, 73-94% of the lake is vegetated, dominated by coontail and Canadian waterweed. Curly leaf pondweed, an invasive, non-native species which can exacerbate late summer phosphorus impairments, is present at small amounts. SWWD and City of Woodbury began herbicide treatments in 2023 targeting curly leaf pondweed.

SWWD has completed a lake management study for Markgrafs Lake. Modeling completed for that study indicated that the watershed nutrient load would need to be nearly completely eliminated in order to restore the lake to state standards. SWWD is working with its partners to explore project options to reduce watershed loading. However, because of the degree of impairment displayed at Markgrafs Lake, it will be important to set reasonable public expectations for water quality.

Figure 2: In-lake Total Phosphorus Concentration at Markgrafs Lake

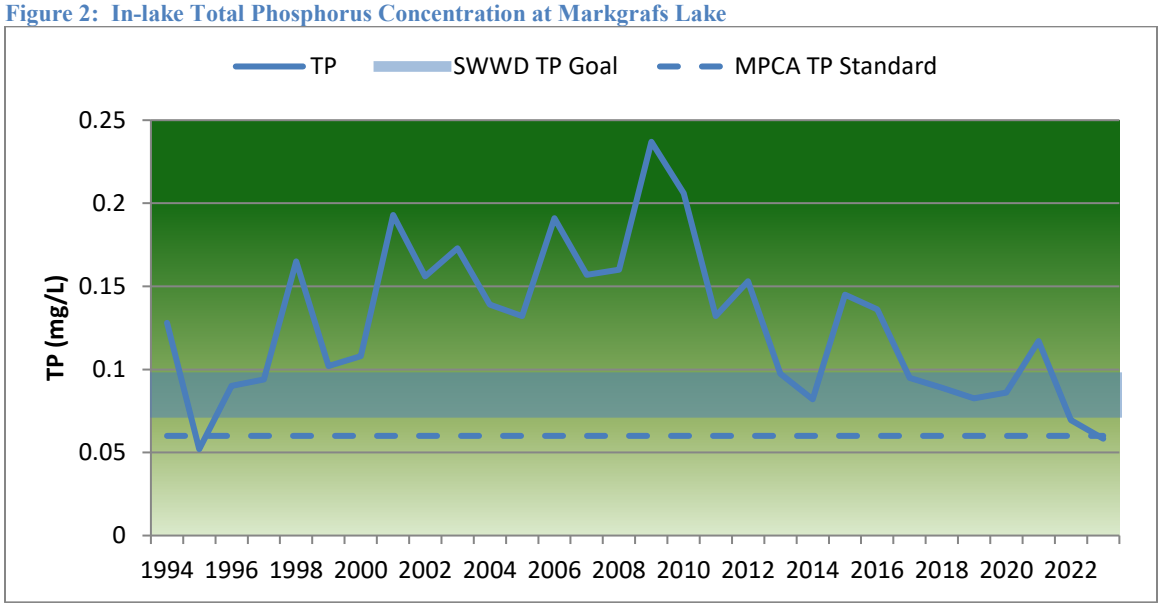


Figure 3: In-lake Chlorophyll a Concentration at Markgrafs Lake

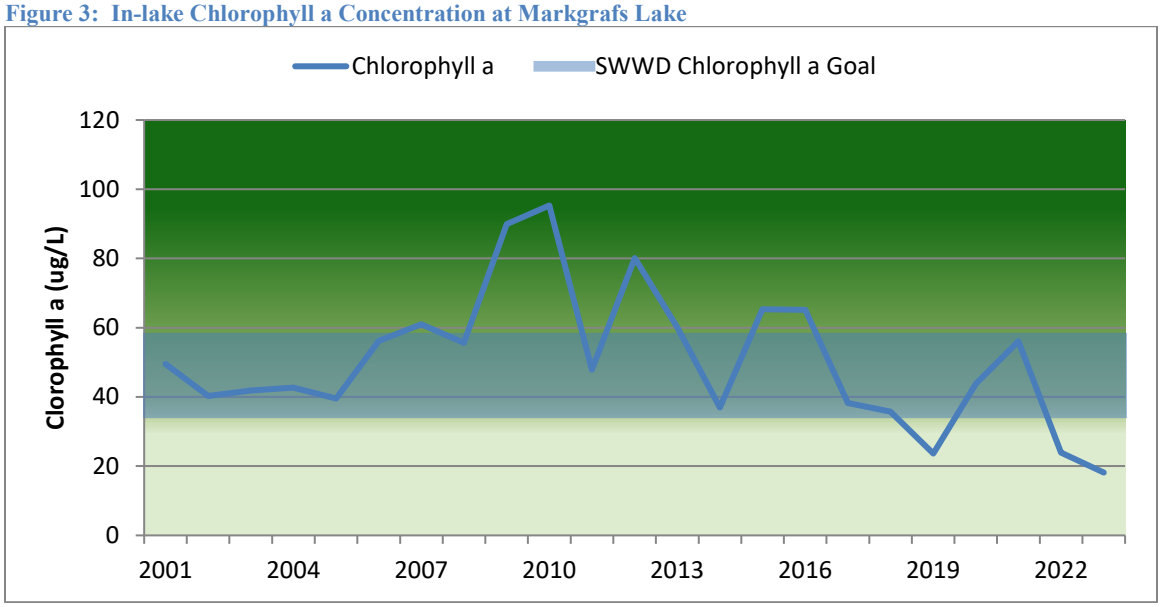


Figure 4: In-lake Secchi Transparency at Markgrafs Lake

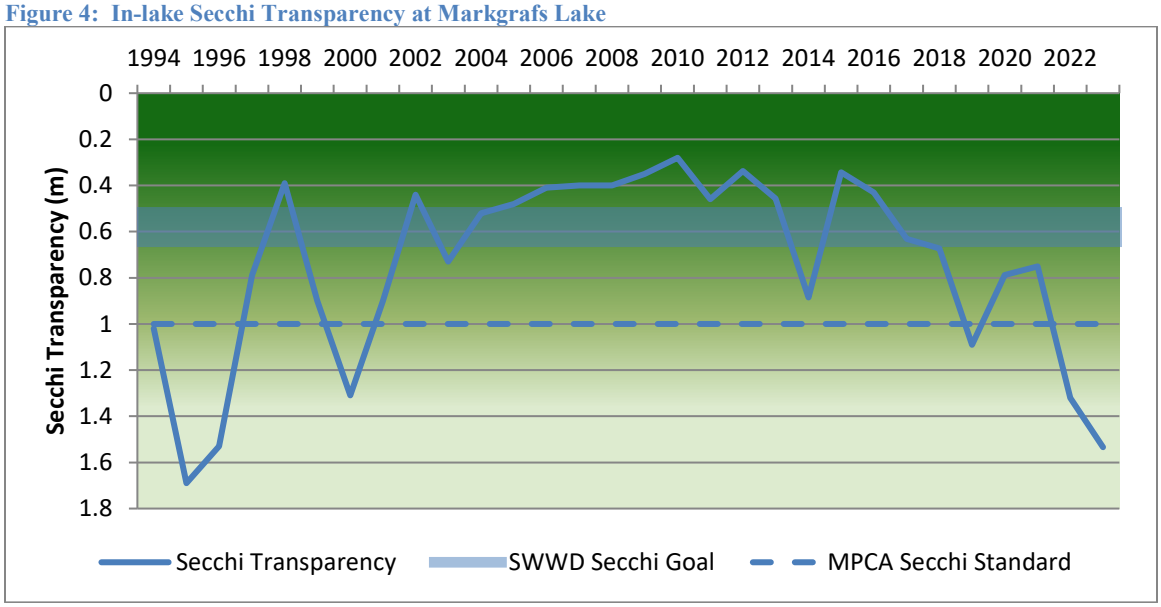


Table 1: Historic Lake Grades for Markgrafs Lake

Parameter	Trophic Status	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Total Phosphorus	63; eutrophic	D	F	F	D	D	D	F	D	D	F	F	D	F	D	D	D	D	D	D	D	D	D	C	C
Chlorophyll	59; eutrophic	C	C	C	C	D	C	D	D	D	F	F	C	F	D	C	D	D	C	C	C	C	D	C	B
Secchi Transparency	54; eutrophic	C	D	F	D	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	D	F	F	D	C
Overall	eutrophic	C	D	D	D	D	D	F	D	D	F	F	D	F	D	D	D	D	D	D	D	D	D	C	C

Note: Lake Grades are based on comparison with other lakes in the Minneapolis-St. Paul metropolitan area. Criteria for assigning lake grades are established by the Metropolitan Council.