



2011 Monitoring Report; 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.

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 Armstrong 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 has significantly ($p < 0.01$) declined since monitoring began and the Lake has long exceeded both State and SWWD standards. Long term trends in Total Phosphorus, Chlorophyll a, and Secchi Transparency are shown in Figures 1-3, 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.

As expected from the 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 are exacerbated by what seems to be an over-abundance of bullheads and sunfish which significantly disturb the lake bottom and increase internal nutrient loading.

Markgrafs Lake and the surrounding watershed will be further assessed in 2012 as SWWD works to complete a management plan for its entire NWS. The purpose of the management plan

will be to provide direction for efforts to restore the impaired lakes in the NWS. However, given the degree of impairment at Markgrafs Lake, it may not be feasible or possible to fully restore water quality to meet State Standards. Because of that, it will be important to set reasonable expectations for the lake.

Figure 1: In-lake Total Phosphorus Concentration at Markgrafs Lake

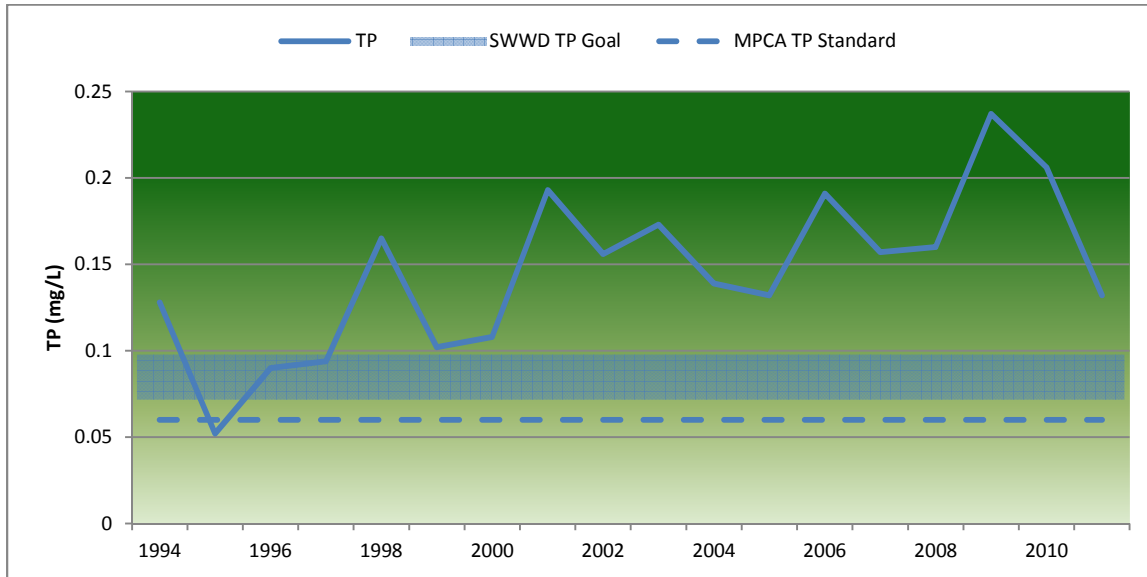


Figure 2: In-lake Chlorophyll a Concentration at Markgrafs Lake

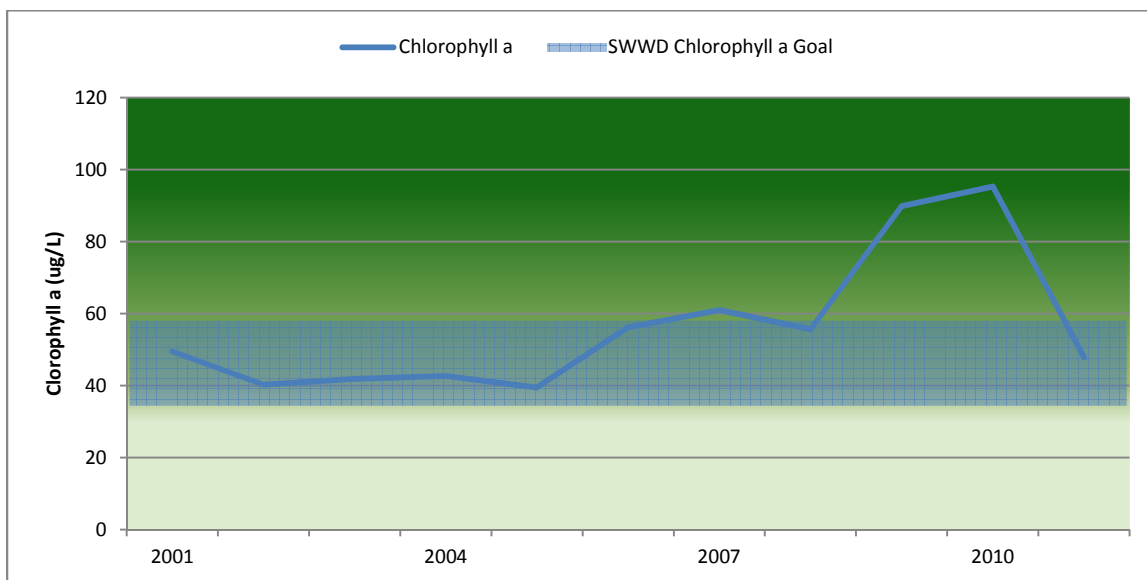


Figure 3: In-lake Secchi Transparency at Markgrafs Lake

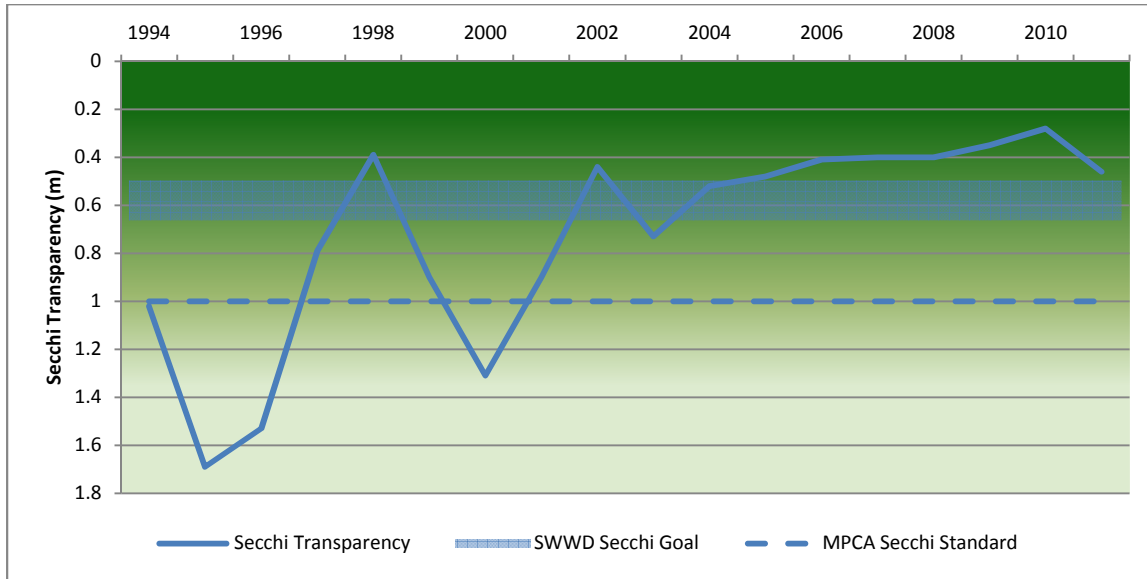


Table 3: Historic Lake Grades for Markgrafs Lake

Parameter	Trophic Status	Lake Grade																	
		94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11
Total Phosphorus	75; hyper-eutrophic	D	C	D	D	F	D	D	F	F	D	D	D	F	D	D	F	F	D
Chlorophyll	69; eutrophic	C	B	B	C	F	C	C	C	C	C	D	C	D	D	D	F	F	C
Secchi Transparency	71; hyper-eutrophic	D	C	C	D	F	D	C	D	F	D	F	F	F	F	F	F	F	F
Overall	Hyper-eutrophic	D	C	C	D	F	D	C	D	D	D	D	D	F	D	D	F	F	D

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.