

Henry Lake

Henry Lake is a 77-acre lake located within Hassan Township. Because the maximum depth of the lake is only 1.5 m (5 feet), the entire lake area is considered littoral zone (the 0-15 foot depth area of the lake dominated by aquatic vegetation). Additionally, because of the lake's shallowness it does not maintain a thermocline (a density gradient owed to changing water temperatures throughout the lake's water column).

This marks the second year that Henry Lake has been involved in CAMP (1995 being the other). Other than the 1995 and 2005 CAMP data, a search through the STORET nationwide water quality database yielded no additional information. On each sampling day the lake was monitored for TP, CLA, TKN, and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

The lake was monitored 11 times between early-May and mid-October, 2005. The lake's 2005 individual and overall grades are identical to those recorded in 1995.

2005 summer (May-September) data summary

<i>Parameter</i>	<i>Mean</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Grade</i>
TP (µg/l)	76.1	46.0	119.0	D
CLA (µg/l)	33.5	6.4	88.0	C
Secchi (m)	0.9	0.2	1.6	D
TKN (mg/l)	1.36	0.95	1.70	
			Overall Grade	D

Because so little water quality data is available for Henry Lake it is not possible to determine any long-term or short-term trends. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

Throughout the monitoring period, the volunteer(s) ranked their opinions of the lake's physical and recreational conditions on a 1-to-5 scale. The average user perception rankings were 3.9 for physical condition (between 3- "definite algae present" and 4- "high algal color"), and 4.6 for recreational suitability (between 4- "no swimming - boating ok" and 5- "no aesthetics possible").

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Randy Anhorn of the Metropolitan Council at randy.anhorn@metc.state.mn.us or (651) 602-8743.



Fish Lake

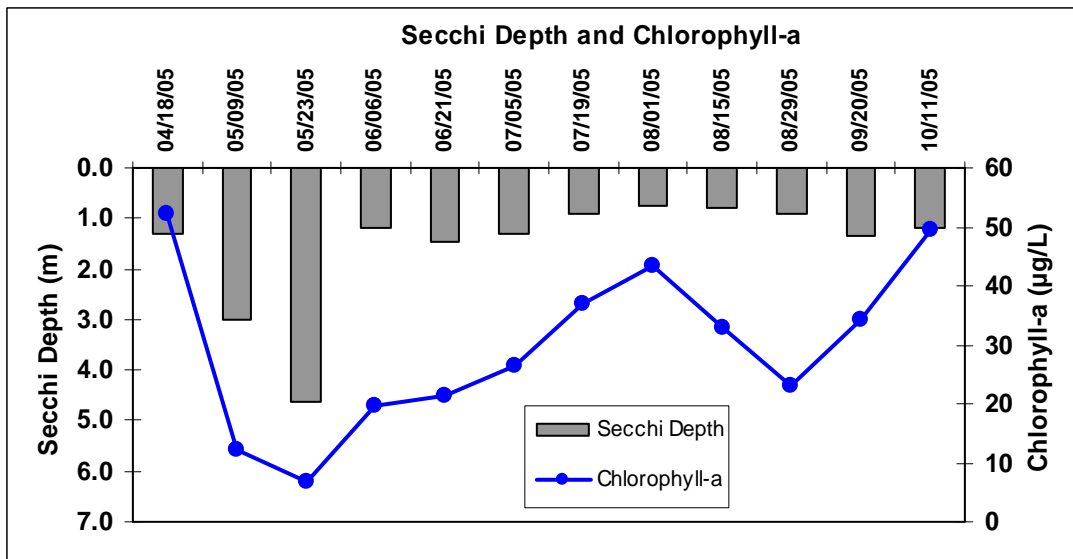
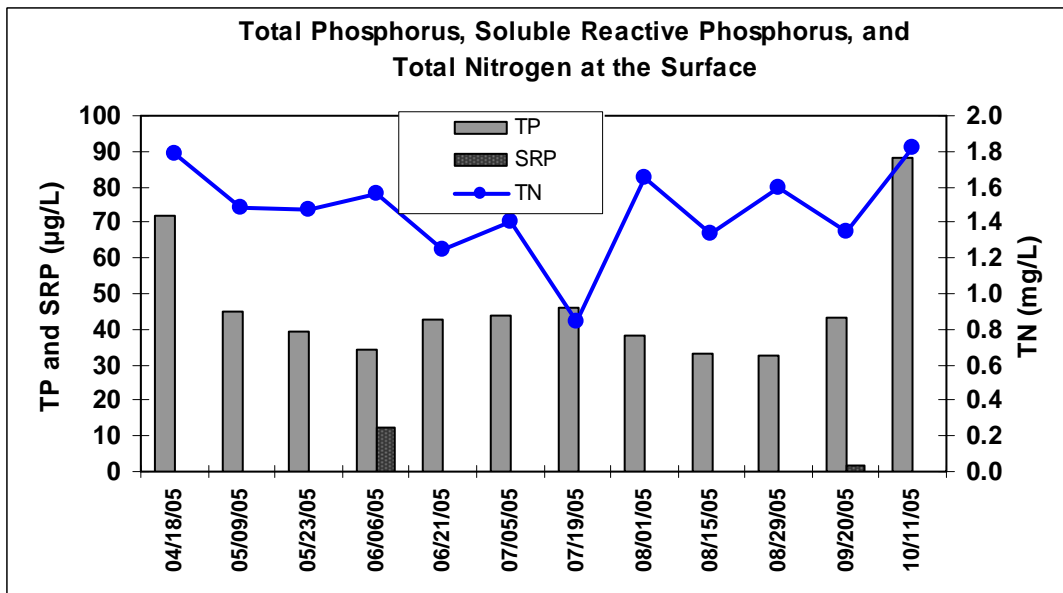
The Three Rivers Park District in-lake phosphorus concentration goal to support direct contact recreational use for Fish Lake is 36 $\mu\text{g/L}$. The average phosphorus concentration for Fish Lake in 2005 was 39 $\mu\text{g/L}$, which was slightly less than the Minnesota Pollution Control Agency impaired water criteria of 40 $\mu\text{g/L}$. The highest phosphorus concentrations in 2005 coincided with the time period of lake turn-over in the spring and fall. The process of lake turn-over re-suspended nutrients throughout the water column and contributed to high total phosphorus concentrations in April (72 $\mu\text{g/L}$) and October (88 $\mu\text{g/L}$). Despite the elevated concentrations in the spring and fall, the total phosphorus was relatively low throughout the remaining portion of the year ranging between 33 and 43 $\mu\text{g/L}$. Although these phosphorus concentrations can potentially inhibit recreational use, the phosphorus concentrations have gradually decreased from 2003 to 2005. The variations in phosphorus concentrations were partially due to the amount of precipitation that contributed to changes in watershed loading.

The excess in-lake phosphorus was conducive for the development of algae blooms. In 2005, the Fish Lake average chlorophyll-a concentration was 26 $\mu\text{g/L}$, which is significantly higher than the water quality goal of 12 $\mu\text{g/L}$. Despite the high chlorophyll-a concentrations, the water clarity was not as significantly impaired. The average secchi depth transparency of 1.7 m in 2005 achieved the water clarity goal of 1.2 m for recreational use. The secchi depth transparency achieved the water clarity goal because of a clear water phase that occurred in May and contributed to secchi depth measurements of 3.2 m and 4.6 m. The clear water phase is due to an abundance of zooplankton that reduced the amount of phytoplankton within Fish Lake. The water clarity in Fish Lake did not begin to degrade until June when conditions were more conducive for algae growth. Consequently, the warmer weather conditions resulted in higher chlorophyll-a concentrations that persisted throughout the summer. The secchi depth transparency ranged between 0.75 and 0.9 m during this time period.

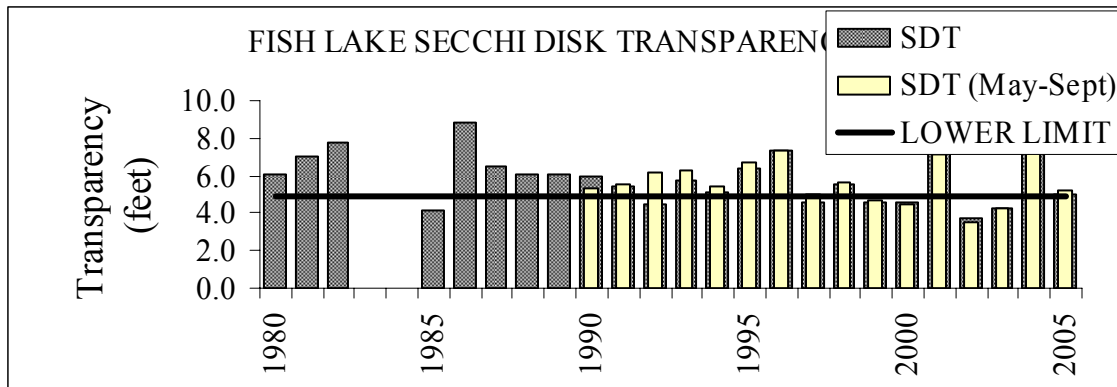
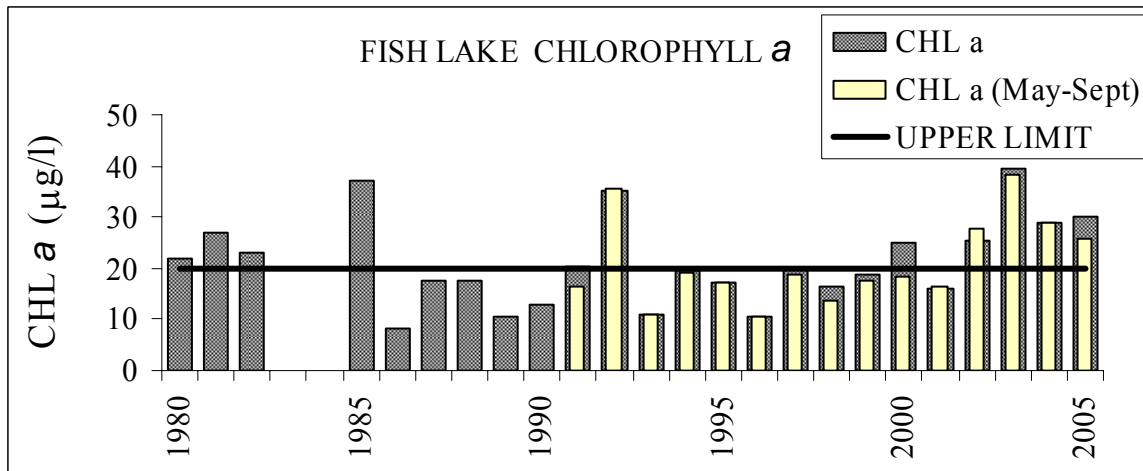
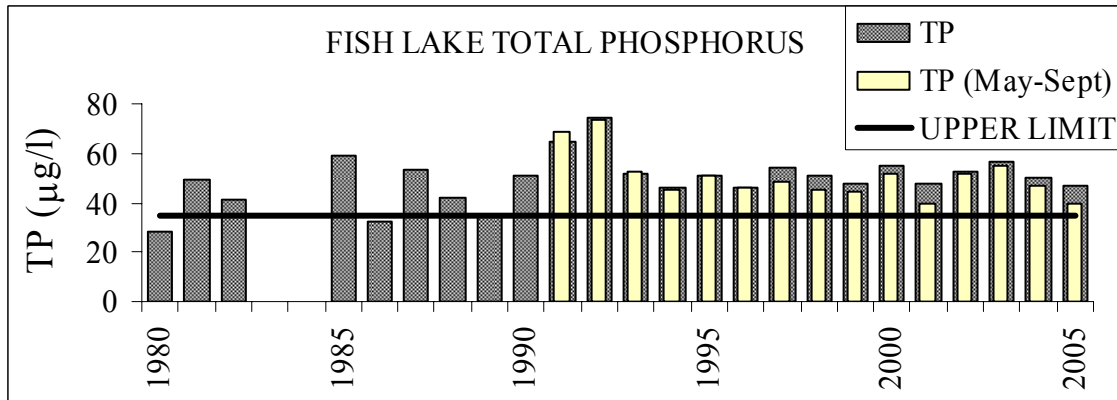


Water Quality Data.

Fish Lake, 2005



Historical Water Quality Data.



Weaver Lake

The Weaver Lake water quality in 2005 achieved the in-lake goals to support full contact recreational use. In 2005, the Weaver Lake average phosphorus concentration was 23 $\mu\text{g}/\text{L}$ with values ranging between 17 and 38 $\mu\text{g}/\text{L}$ from May through September. The concentrations were significantly below the water quality goal of 40 $\mu\text{g}/\text{L}$. The low phosphorus concentrations resulted in significantly less algae production in 2005. The average chlorophyll-a concentration was 4 $\mu\text{g}/\text{L}$, which is below the laboratory detection limit. Consequently, Weaver Lake had excellent water clarity conditions in 2005. The average secchi depth transparency for Weaver Lake was 5 m. This high value was partially caused by a clear water phase that developed in May with water clarity conditions of 10.2 and 8.1 m. Throughout the remainder of the season, secchi depth measurement exceeded water quality goals, which ranged between 2.6 to 6.7 m.

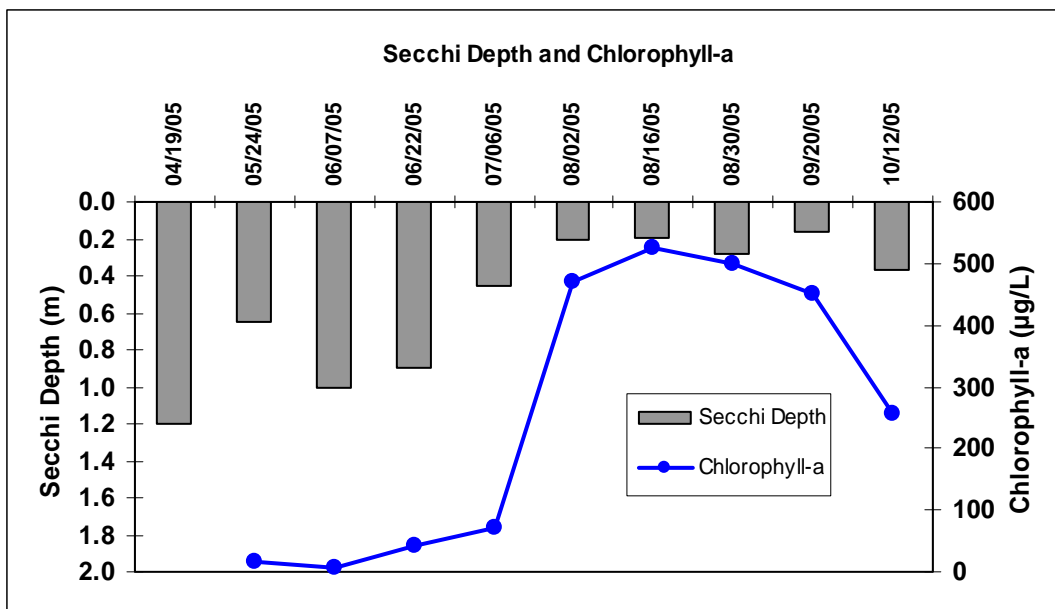
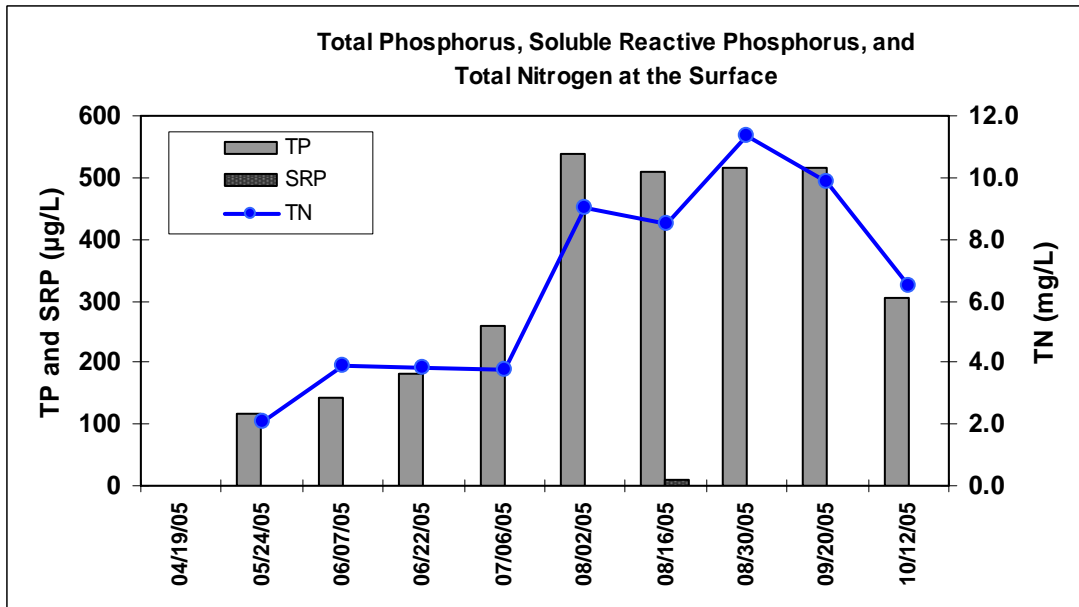
The Weaver Lake water quality conditions in 2005 significantly improved relative to the declining water quality trend that has occurred the past ten years. Several factors may have contributed to the significant improvement in water quality conditions. Weaver Lake water quality conditions are significantly influenced by the amount watershed nutrient loading that the lake receives. The variation in watershed nutrient loading is mainly due to changes in the annual precipitation. However, the amount of precipitation in 2005 was above average. In 2004, a legislative law was implemented to limit the use of phosphorus fertilizer throughout the seven county metropolitan area to reduce potential watershed phosphorus loading. Weaver Lake may have received less phosphorus loading from the watershed as a consequence of the ban on phosphorus fertilizer.

Weaver Lake water quality may have also been influenced by the senescence of curlyleaf pondweed. Weaver Lake has a substantial amount of curlyleaf pondweed that inhibits potential recreational use. Consequently, a substantial amount of internal loading is due to the plant senescence. The released nutrients from the senescence of curlyleaf pondweed often resulted in an algae bloom that persists throughout the summer. In 2005, a whole lake Fluoridone herbicide treatment was completed in Weaver Lake in an attempt to control curlyleaf pondweed. There was significantly less curlyleaf pondweed in Weaver Lake due to the herbicide treatment. An increase in phosphorus concentration from 20 $\mu\text{g}/\text{L}$ at the end of June to 38 $\mu\text{g}/\text{L}$ in early July suggests that there was some curlyleaf pondweed remaining within the lake. However, it appears that the senescence of curlyleaf pondweed did not further influence the water quality conditions for the remaining portion of the year. A significant decrease in the amount of curlyleaf pondweed in Weaver Lake would reduce the amount of internal nutrient loading, and subsequently improve water quality conditions.



Water Quality Data

French Lake, 2005



These two factors may have significantly influenced the water quality conditions in Weaver Lake for 2005. Unfortunately, it is difficult to determine the influence that each potential factor may have had on improving water quality conditions. Additional monitoring efforts would be necessary to determine the influence each potential factor may have had on the water quality conditions. Consequently, it becomes critical to further monitor Weaver Lake to determine potential changes in water quality conditions.

French Lake

French Lake has impaired water quality conditions that inhibit recreational use. Unfortunately, the lake does not have any long term monitoring data to determine whether there are any water quality trends.

Despite the absence of long term water quality data, it is apparent from the data collected in 2005 that the lake has had a history of severe eutrophic conditions. The average phosphorus concentration in 2005 was 347 $\mu\text{g}/\text{L}$ with values ranging between 116 and 539 $\mu\text{g}/\text{L}$. The excessive amount of phosphorus in the lake causes severe algae blooms.

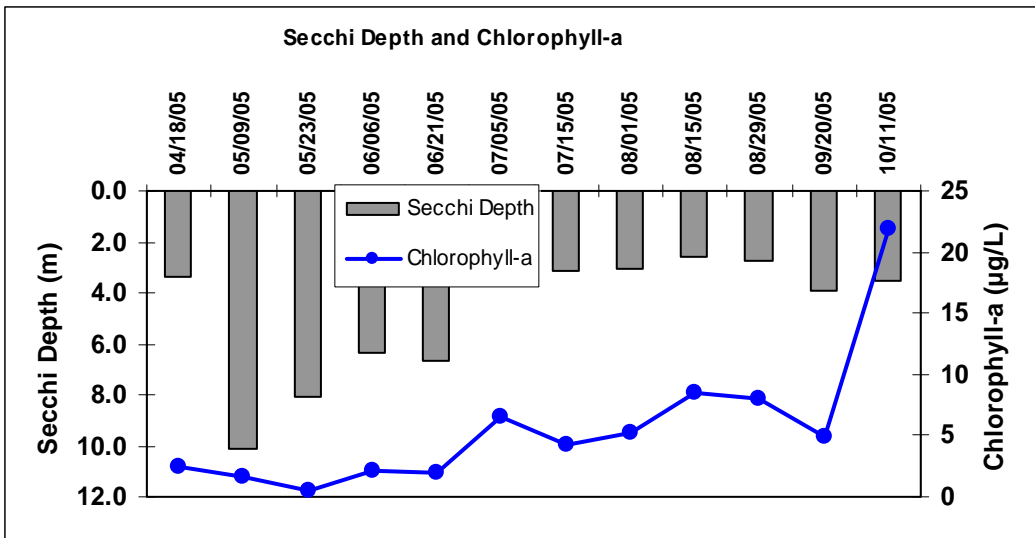
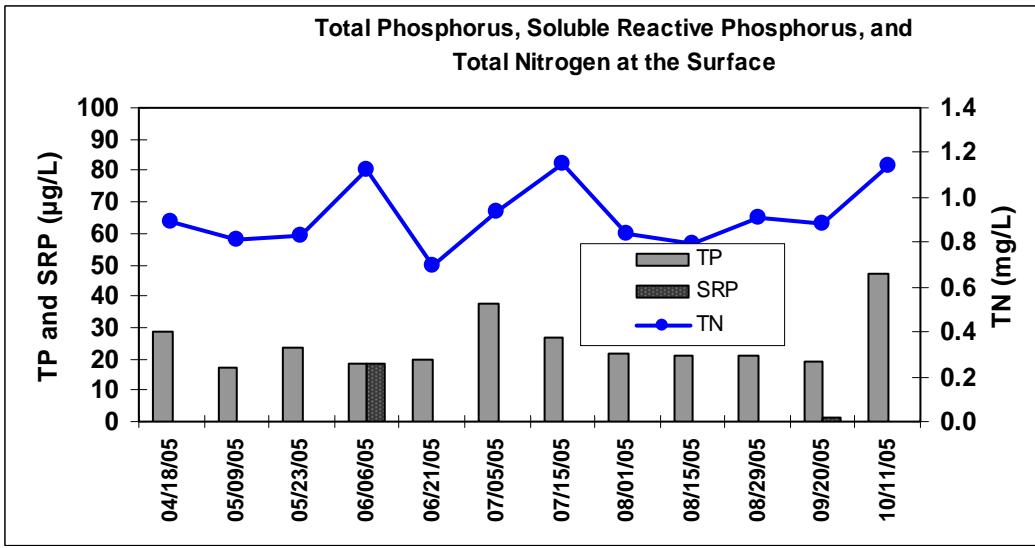
The average chlorophyll-a concentration was 260 $\mu\text{g}/\text{L}$ in 2005. Seasonal variation in chlorophyll-a concentrations ranged between 6 $\mu\text{g}/\text{L}$ in the early spring to 525 $\mu\text{g}/\text{L}$ in the summer. Consequently, water clarity conditions were extremely poor in which secchi depth measurements ranged between 0.16 m to 1.2 m. The severe algae blooms provided a shading effect that inhibited the development of a diverse aquatic plant community.

The poor water quality conditions are partially due to large amounts of watershed nutrient loading from surrounding agricultural areas. In addition, the shallow morphology of the lake with the absence of a diverse aquatic plant community is conducive for internal loading of nutrients that are re-suspended from the sediments. The lake is frequently vulnerable to winter and summer fish kills due to the extreme eutrophic conditions.

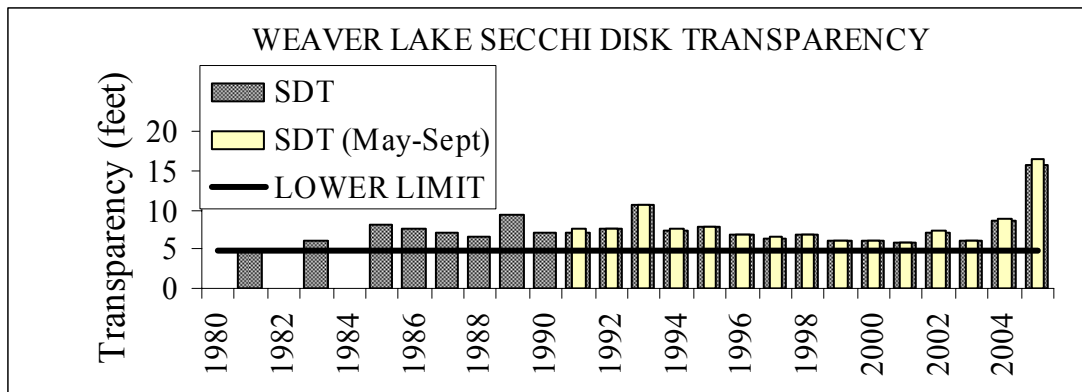
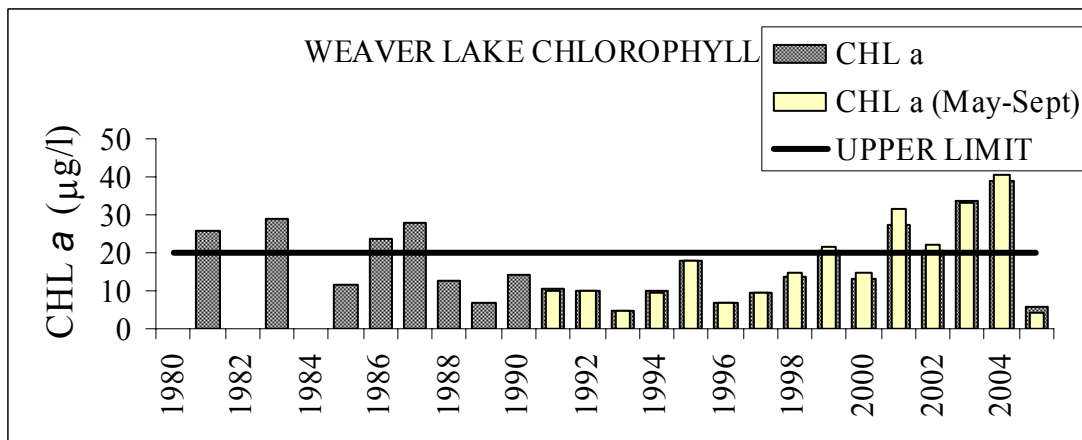
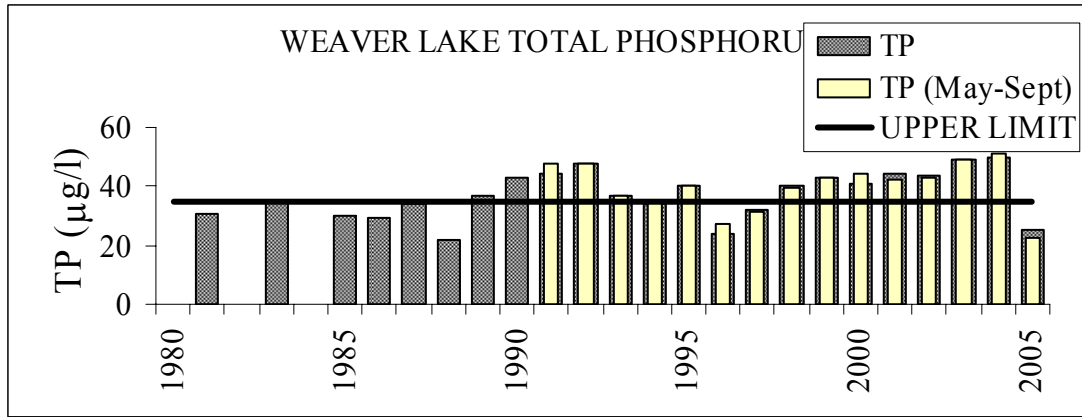


Water Quality Data

Weaver Lake, 2005



Historical Water Quality Data



2005 Lake Water Quality Summary

Sample Id	Sample Date	Secchi m	Temp °C	DO mg/L	DO %	Sp. Cond µS/cm	pH	TP µg/L	SRP µg/L	TN mg/L	Chl-a µg/L
FISH	18-Apr-05	1.30	13.4	7.4	71	0.39	6.84	72		1.79	52.3
FISH	9-May-05	3.02	14.2	10.8	105	0.40	7.28	45		1.48	12.3
FISH	23-May-05	4.61	15.7	9.5	96	0.40	7.76	39		1.47	6.8
FISH	6-Jun-05	1.20	21.5	10.3	116	0.38	7.86	35	12.6	1.56	19.5
FISH	21-Jun-05	1.48	25.9	10.1	125	0.38	7.80	43		1.25	21.5
FISH	5-Jul-05	1.30	23.8	9.1	108	0.39	7.94	44		1.40	26.5
FISH	19-Jul-05	0.90	26.9	8.7	109	0.38	8.02	46		0.84	37.0
FISH	1-Aug-05	0.75	27.9	10.6	135	0.38	8.35	38		1.65	43.4
FISH	15-Aug-05	0.78	24.7	9.9	120	0.41	7.90	33		1.34	32.9
FISH	29-Aug-05	0.90	23.9	9.7	115	0.41	8.07	33		1.60	23.1
FISH	20-Sep-05	1.34	21.4	11.1	125	0.41	7.92	43	1.8	1.35	34.4
FISH	11-Oct-05	1.17	15.6	11.8	118	0.41	7.59	88		1.82	49.3
Mean		1.56	21.22	9.9	112	0.395	7.78	47	7.2	1.46	29.9
Std.Dev.		1.13	5.18	1.16	16.5	0.014	0.39	16.7	7.7	0.26	14.2
Summer Mean (May-Sept)		1.63	22.6	10.0	115	0.39	7.89	39.8	7.2	1.39	25.8
Sample Id	Sample Date	Secchi m	Temp °C	DO mg/L	DO %	Sp. Cond µS/cm	pH	TP µg/L	SRP µg/L	TN mg/L	Chl-a µg/L
WEAVER	18-Apr-05	3.40	14.2	10.7	104	0.34	7.53	28.8		0.89	2.4
WEAVER	9-May-05	10.15	14.6	11.6	114	0.35	7.38	17.3		0.81	1.6
WEAVER	23-May-05	8.08	15.9	9.8	100	0.35	7.84	23.7		0.83	0.5
WEAVER	6-Jun-05	6.35	21.9	8.8	100	0.35	7.78	18.7	18.7	1.12	2.2
WEAVER	21-Jun-05	6.70	25.9	8.7	107	0.36	8.17	19.7		0.70	1.9
WEAVER	5-Jul-05	3.45	24.0	9.4	111	0.36	8.14	37.7		0.94	6.5
WEAVER	15-Jul-05	3.10	29.3	10.4	136	0.36	8.68	26.5		1.15	4.3
WEAVER	1-Aug-05	3.03	27.3	14.7	185	0.29	8.89	21.9		0.84	5.2
WEAVER	15-Aug-05	2.62	24.6	10.4	125	0.39	8.14	21.3		0.79	8.4
WEAVER	29-Aug-05	2.71	23.4	9.9	117	0.39	8.09	21.0		0.91	8.1
WEAVER	20-Sep-05	3.93	21.6	10.6	120	0.38	7.94	19.4	1.2	0.88	5.0
WEAVER	11-Oct-05	3.52	14.9	11.2	111	0.39	7.84	47.4		1.14	22.0
Mean		4.75	21.47	10.5	119	0.36	8.04	25.3	9.9	0.92	5.7
Std.Dev.		2.46	5.30	1.6	23	0.03	0.43	8.9	12.4	0.15	5.7
Summer Mean (May-Sept)		5.01	22.85	10.4	121	0.36	8.11	22.7	9.9	0.90	4.4
Secchi =	Secchi Disc Transparency			TP =	Total Phosphorus			TN =	Total Nitrogen		
Sp. Cond =	Specific Conductivity			SRP =	Soluble Reactive Phosphorus			Chl-a =	Chlorophyll a		
Note: Temperature, DO, DO%, Specific Conductivity and Ph are measured at the surface.											



2005 Lake Water Quality Summary

Sample Id	Sample Date	Secchi m	Temp °C	DO mg/L	DO %	Sp. Cond µS/cm	pH	TP µg/L	SRP µg/L	TN mg/L	Chl-a µg/L
FRENCH	19-Apr-05	1.20									
FRENCH	24-May-05	0.65	19.0	8.3	90	0.26	8.05	116.0		2.07	16.4
FRENCH	7-Jun-05	1.00	24.2	6.3	76	0.29	7.69	141.3		3.91	6.0
FRENCH	22-Jun-05	0.90	26.8	9.4	118	0.27	7.78	182.4		3.81	43.0
FRENCH	6-Jul-05	0.45	24.0	17.8	211	0.28	8.87	261.0		3.77	71.5
FRENCH	2-Aug-05	0.21	27.3	10.1	128	0.21	9.73	539.2		9.03	471.7
FRENCH	16-Aug-05	0.19	23.1	18.5	216	0.28	9.98	508.3	8.5	8.51	525.1
FRENCH	30-Aug-05	0.28	22.9	8.7	102	0.25	8.09	514.8		11.35	500.5
FRENCH	20-Sep-05	0.16	19.2	7.3	79	0.26	8.23	514.7		9.83	449.3
FRENCH	12-Oct-05	0.37	12.1	11.0	103	0.26	7.42	304.5		6.48	256.0
Mean		0.54	22.07	10.8	124	0.26	8.43	342		6.53	259.9
Std.Dev.		0.38	4.71	4.37	53.2	0.02	0.91	177.1		3.28	227.8
Summer Mean (May-Sept)		0.48	23.33	10.8	127.2	0.26	8.55	347.2		6.54	260.4

Secchi = Secchi Disc Transparency

TP = Total Phosphorus

TN = Total Nitrogen

Sp. Cond = Specific Conductivity

SRP = Soluble Reactive Phosphorus

Chl-a = Chlorophyll *a*

Note: Temperature, DO, DO%, Specific Conductivity and Ph are measured at the surface.



Lake Sampling History

	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	1990	1989	1988	1987	1986	
Cook					x									x		x		x			x
Diamond		x						x				C		x			x				x
Dubay																	x				x
Fish	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
French	x	C		C	C											x					
Henry	C										C										
Jubert						C									x		x			x	
Mill Pond				x			x								x			x			
Mud																					x
Sylvan									x												
Weaver	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

x = monitored by Three Rivers Park District/Hennepin Parks
 C = monitored through the CAMP program

