



Georges-Pierre Seurat: *Sunday Afternoon at the Island of La Grande Jatte*, 1884-1886

Lake Monitoring Results for Gorman, Rice, Sabre, Shields, Lower Sakatah, Upper Sakatah, and Tetonka Lakes, Cannon River Watershed Partnership, 2007

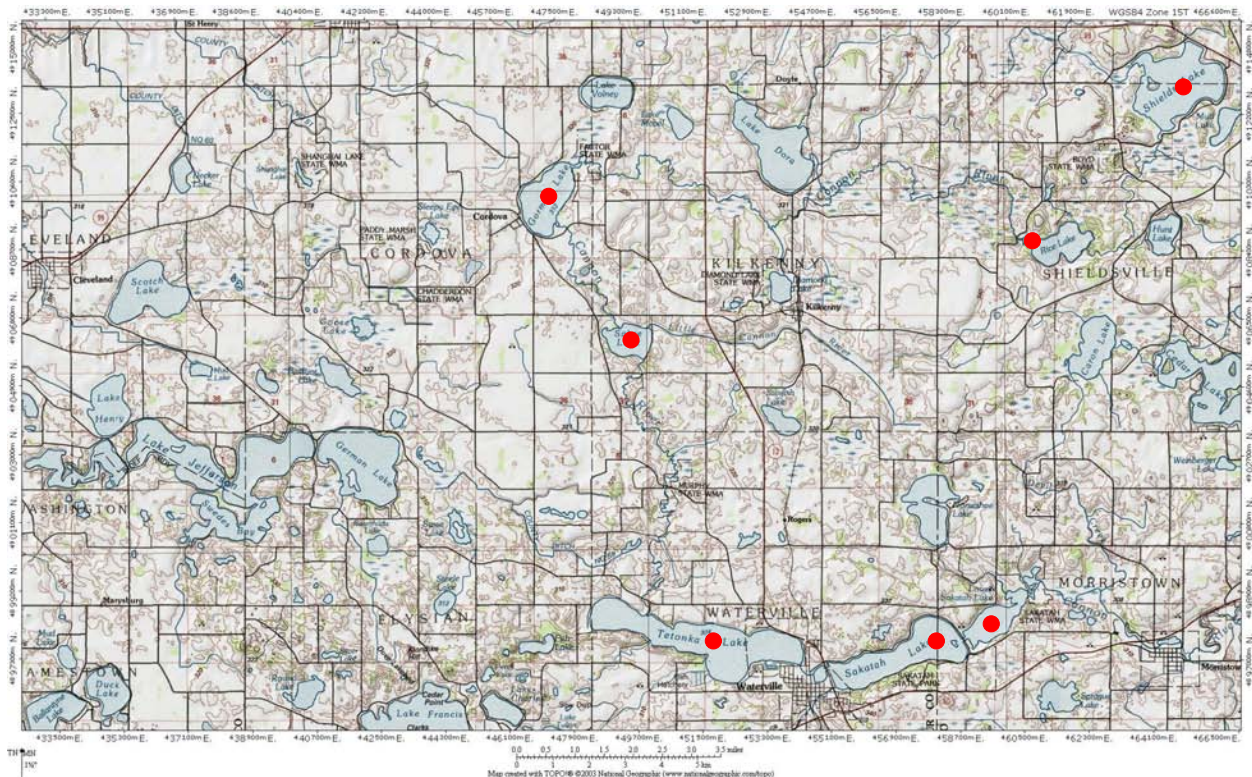
[Lake Sampling Conducted: May - September, 2007]

Prepared for:
LeSueur County

Prepared by:
Steve McComas
Blue Water Science
(651) 690.9602

Prepared February 2008

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Locations for lakes monitored twice a month from May through September in 2007 are shown above. Samples were collected by Steve McComas, Blue Water Science, St. Paul, Minnesota and analyzed by MVTI, Inc, New Ulm, Minnesota.

Water Quality Monitoring Results

Summary

Seven lakes in Cannon River Watershed Partnership were sampled for up to three water quality parameters twice per month from May through September, 2007. Results are shown in Table 1. Averages are from May through September.

Table 1. Summary of water quality data 2007 for Lakes Gorman, Rice, Sabre, Shields, Lower Sakatah, Upper Sakatah, and Tetonka (SD = Secchi disc, phos = total phosphorus and chl a = chlorophyll a).

Date (2007)	Gorman			Rice			Sabre			Shields			Lower Sakatah			Upper Sakatah			Tetonka		
	SD (ft)	Total Phos (µg/l)	Chl a (µg/l)	SD (ft)	Total Phos (µg/l)	Chl a (µg/l)	SD (ft)	Total Phos (µg/l)	Chl a (µg/l)	SD (ft)	Total Phos (µg/l)	Chl a (µg/l)	SD (ft)	Total Phos (µg/l)	Chl a (µg/l)	SD (ft)	Total Phos (µg/l)	Chl a (µg/l)	SD (ft)	Total Phos (µg/l)	Chl a (µg/l)
5.8	10.2	386	<1	5.0	137	2.4	11.6	317	1.8	17.2	111	1.2	6.9	110	<1	9.9	84	<1	17.8	197	1.2
5.21/22	5.3	590	4.4	4.3	248	1.6	5.4	499	2.5	10.9	130	2.8	5.1	152	8.3	4.6	189	1.7	11.4	182	1.1
6.6	2.7	820	20.3	3.6	200	1.9	4.1	790	1.7	2.6	220	8.3	4.6	180	24.8	5.8	162	22.6	14.2	169	3.4
6.19/20	3.6	1,040	68.8	3.0	326	1.7	2.3	892	56.4	7.1	303	10.3	3.5	418	37.1	2.4	307	36.4	7.6	193	9.9
7.10	2.1	1,390	37.2	3.3	674	7.4	2.2	1,400	22.5	2.8	369	31.3	1.8	512	28.7	3.0	647	88.4	3.6	220	46.6
7.20	5.3	1,310	9.2	4.0	757	5.0	4.0	1,280	8.7	3.3	341	20.1	1.0	659	148	1.7	646	36.0	2.3	288	49.7
8.15	2.1	1,660	61.4	4.0	624	1.2	2.4	1,650	50.4	1.7	440	117	1.2	604	55.2	3.6	954	6.9	5.3	410	31.2
8.28	4.0	1,450	13.1	2.0	385	4.2	4.3	1,510	11.2	3.1	356	31.0	4.0	850	93.2	4.0	769	53.4	3.0	497	107
9.12	2.3	1,170	42.3	2.3	288	4.8	2.8	1,510	59.0	1.7	436	149	1.8	711	131	2.0	594	101	4.1	595	49.7
9.23/27	1.7	1,070	11.1	2.6	414	2.5	3.0	1,590	4.9	3.0	360	43	1.0	571	68.3	3.0	459	68.0	5.0	597	33.2
Avg	4.0	1,089	26.9	3.3	405	3.3	4.3	1,144	21.9	5.3	307	41.2	3.0	477	59.6	4.0	481	41.5	7.3	335	33.3
Met Council Grade	C	F	C	D	F	A	C	F	C	C	F	C	D	F	D	D	F	C	B	F	C

The Metropolitan Council, a governmental unit that plans for metropolitan growth, has set-up grading criteria for metropolitan lakes. The grading criteria are based a range of data collected from metropolitan lakes. Three parameters are graded and include: total phosphorus and chlorophyll a concentrations, and secchi disc transparencies.

Metropolitan Council Guidelines.

Grade	Total Phosphorus (µg/l)	Chlorophyll <u>a</u> (µg/l)	Secchi Disc (ft)
A	<23	<10	>10.0
B	23-32	10-20	7.25-10.0
C	32-68	20-48	4.0-7.25
D	68-152	48-77	2.3-4.0
F	>152	>77	<2.3

Water Quality Review

Secchi Disc Transparency (feet)

Date (2007)	Gorman	Rice	Sabre	Shields	Lower Sakatah	Upper Sakatah	Tetonka
5.8	10.2	5.0	11.6	17.2	6.9	9.9	17.8
5.21/22	5.3		5.4	10.9	5.1	4.6	11.4
6.6	2.7	3.6	4.1	2.6	4.6	5.8	14.2
6.19/20	3.6		2.3	7.1	3.5	2.4	7.6
7.10	2.1		2.2	2.8	1.8	3.0	3.6
7.20	5.3	4.0	4.0	3.3	1.0	1.7	2.3
8.15	2.1	4.0	2.4	1.7	1.2	3.6	5.3
8.28	4.0	2.0	4.3	3.1	4.0	4.0	3.0
9.12	2.3	2.3	2.8	1.7	1.8	2.0	4.1
9.23/27	1.7	2.6	3.0	3.0	1.0	3.0	5.0
Avg	4.0	3.3	4.3	5.3	3.0	4.0	7.3

Secchi disc transparency was poor to good for the seven lakes. All of the lakes had periodic algae blooms. Tetonka had the highest summer average clarity.

Total Phosphorus (µg/l)

Date (2007)	Gorman	Rice	Sabre	Shields	Lower Sakatah	Upper Sakatah	Tetonka
5.8	386	137	317	111	110	84	197
5.21/22	590	248	499	130	152	189	182
6.6	820	200	790	220	180	162	169
6.19/20	1,040	326	892	303	418	307	193
7.10	1,390	674	1,400	369	512	647	220
7.20	1,310	757	1,280	341	659	646	288
8.15	1,660	624	1,650	440	604	954	410
8.28	1,450	385	1,510	356	850	769	497
9.12	1,170	288	1,510	436	711	594	595
9.23/27	1,070	414	1,590	360	571	459	597
Avg	1,089	405	1,144	307	477	481	335

Phosphorus concentrations in the seven lakes were high. Shields had the lowest summer average and Sabre the highest.

Chlorophyll a (µg/l)

Date (2007)	Gorman	Rice	Sabre	Shields	Lower Sakatah	Upper Sakatah	Tetonka
5.8	<1	2.4	1.8	1.2	<1	<1	1.2
5.21/22	4.4	1.6	2.5	2.8	8.3	1.7	1.1
6.6	20.3	1.9	1.7	8.3	24.8	22.6	3.4
6.19/20	68.8	1.7	56.4	10.3	37.1	36.4	9.9
7.10	37.2	7.4	22.5	31.3	28.7	88.4	46.6
7.20	9.2	5.0	8.7	20.1	148	36.0	49.7
8.15	61.4	1.2	50.4	117	55.2	6.9	31.2
8.28	13.1	4.2	11.2	31.0	93.2	53.4	107
9.12	42.3	4.8	59.0	149	131	101	49.7
9.23/27	11.1	2.5	4.9	43	68.3	68.0	33.2
Avg	26.9	3.3	21.9	41.2	59.6	41.5	33.3

Chlorophyll concentrations in early summer were low to moderate in the lakes. Lower Satatah had the highest summer average.

Gorman Lake (40-00) LeSueur County

Gorman Lake was monitored 10 times between May through September, 2007. The water quality data and related graphs are presented on the information sheet on the following page.

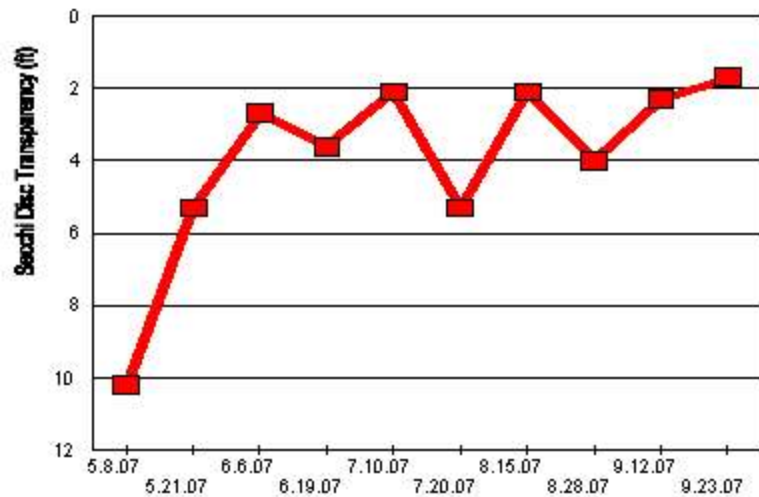
The summertime (May-September) mean total phosphorus concentration of 1,089 $\mu\text{g/l}$ (minimum of 386 $\mu\text{g/l}$ and maximum of 1,660 $\mu\text{g/l}$) corresponded to a lake water quality grade of a F. The lake's 2007 Secchi disc transparency mean of 4.0 ft (minimum of 2.1 feet and maximum of 10.2 feet) was equal to a grade of C. The chlorophyll a mean of 26.9 ppb (minimum of <1 $\mu\text{g/l}$ and maximum of 68.8 $\mu\text{g/l}$) fell within the C grade range. The overall lake quality grade for Gorman Lake, determined from the three individual grades, was D+.



Gorman Lake.

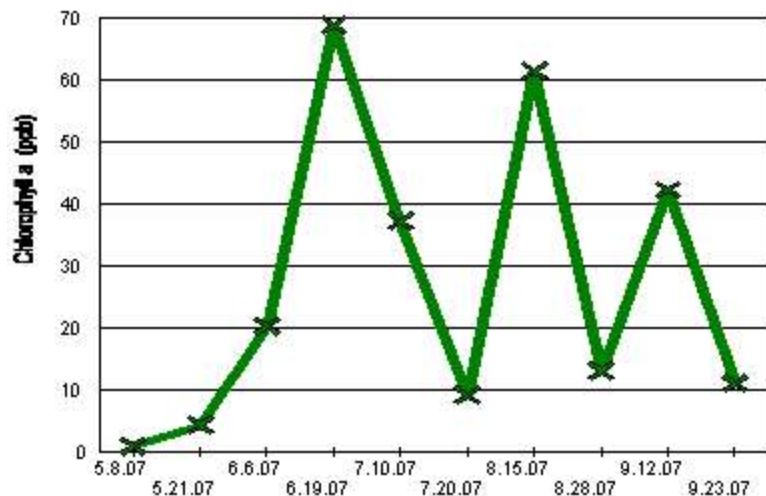
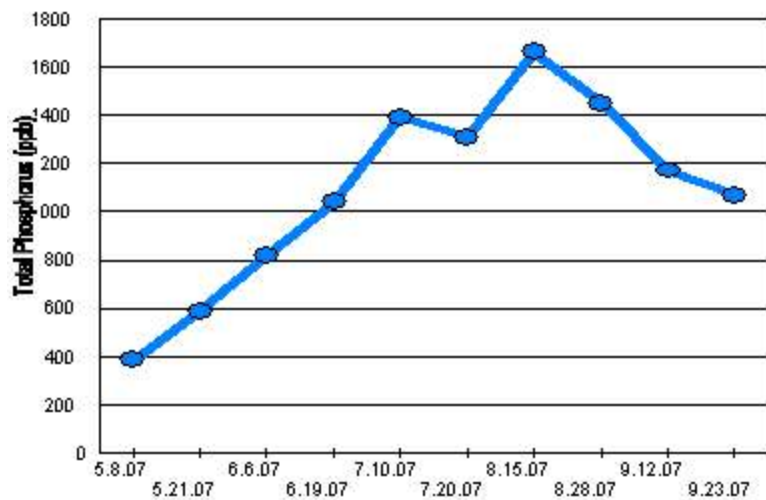
Gorman Lake

Lake surface area: acres



2007 Data

Date (2007)	SD (ft)	Gorman Total Phos (µg/l)	Chl a (µg/l)
5.8	10.2	386	<1
5.21/22	5.3	590	4.4
6.6	2.7	820	20.3
6.19/20	3.6	1,040	68.8
7.10	2.1	1,390	37.2
7.20	5.3	1,310	9.2
8.15	2.1	1,660	61.4
8.28	4.0	1,450	13.1
9.12	2.3	1,170	42.3
9.23/27	1.7	1,070	11.1
Avg	4.0	1,089	26.9



Lake Water Quality Grades Based on Summertime Averages (Met Council criteria)

	2007
Secchi disc	C
Total phosphorus	F
Chlorophyll a	C
Overall	D+

Rice Lake (40-00) LeSueur County

Rice Lake was monitored 10 times between May through September, 2007. The data and related graphs are presented on the information sheet on the following page.

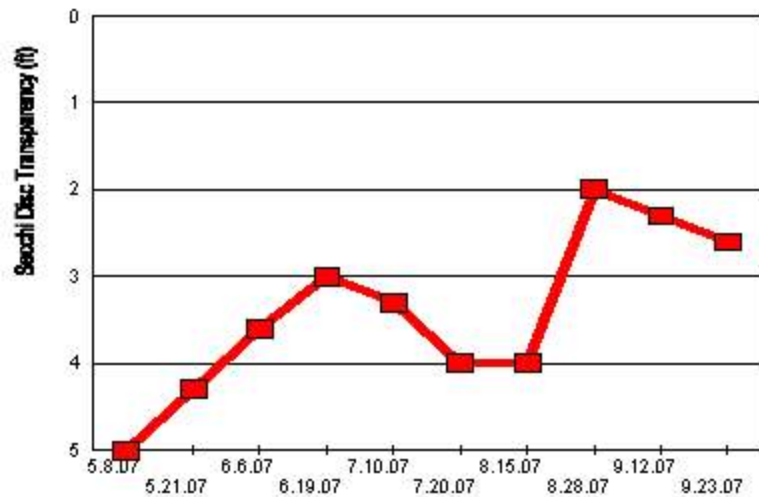
The summertime (May-September) mean total phosphorus concentration of 405 $\mu\text{g/l}$ (minimum of 137 $\mu\text{g/l}$ and maximum of 757 $\mu\text{g/l}$) corresponded to a lake water quality grade of a F. The lake's 2007 Secchi disc transparency mean of 3.4 ft (minimum of 2.0 feet and maximum of 5.0 feet) was equal to a grade of D. The chlorophyll a mean of 3.3 $\mu\text{g/l}$ (minimum of 1.2 $\mu\text{g/l}$ and maximum of 5.0 $\mu\text{g/l}$) was within the A grade range. The overall lake quality grade for Rice Lake, determined from the three individual grades, was D+.



Rice Lake.

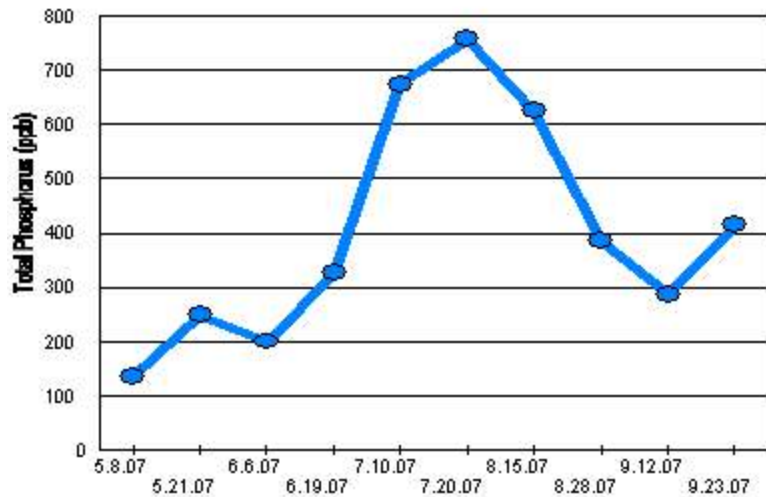
Rice Lake

Lake surface area: acres



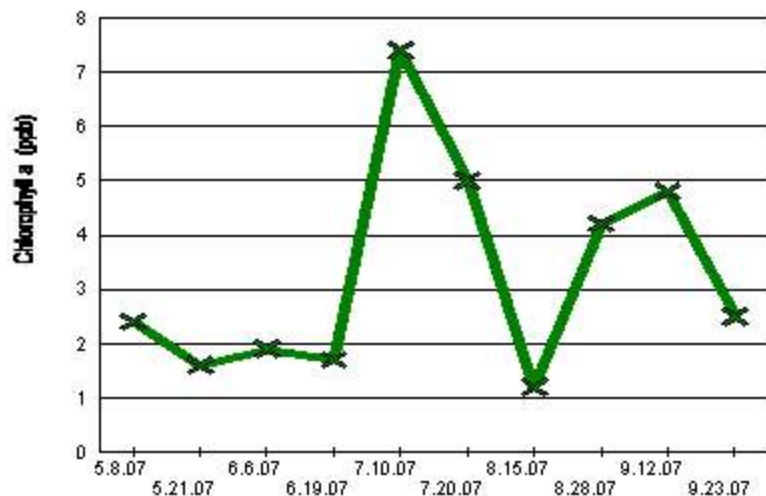
2007 Data

Date (2007)	SD (ft)	Rice Total Phos (µg/l)	Chl a (µg/l)
5.8	5.0	137	2.4
5.21/22	4.3	248	1.6
6.6	3.6	200	1.9
6.19/20	3.0	326	1.7
7.10	3.3	674	7.4
7.20	4.0	757	5.0
8.15	4.0	624	1.2
8.28	2.0	385	4.2
9.12	2.3	288	4.8
9.23/27	2.6	414	2.5
Avg	3.4	405	3.3



Lake Water Quality Grades Based on Summertime Averages (Met Council criteria)

	2007
Secchi disc	D
Total phosphorus	F
Chlorophyll a	A
Overall	D+



Sabre Lake (40-00) LeSueur County

Sabre Lake was monitored 10 times between May through September, 2007. The data and related graphs are presented on the information sheet on the following page.

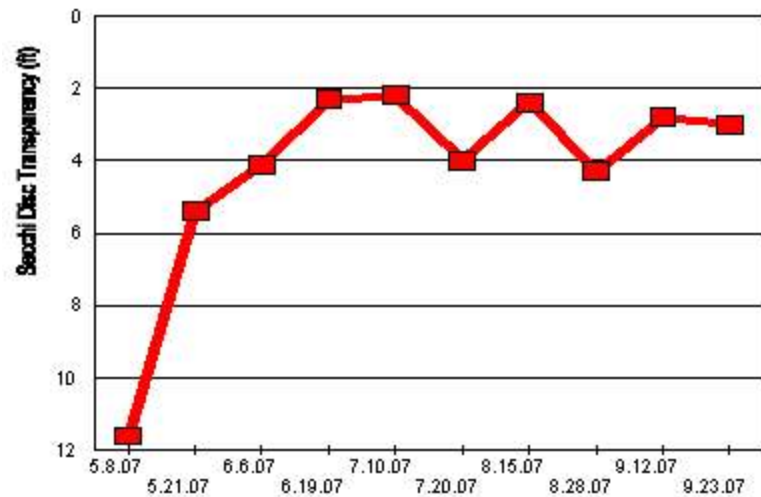
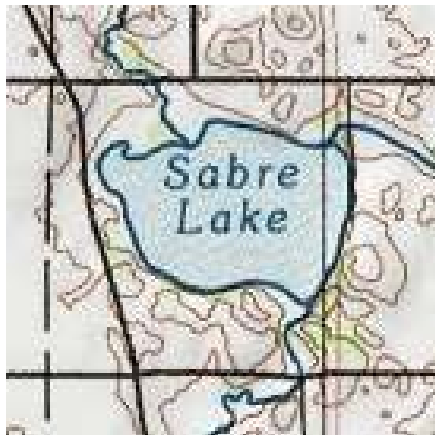
The summertime (May-September) mean total phosphorus concentration of 1,144 $\mu\text{g/l}$ (minimum of 317 $\mu\text{g/l}$ and maximum of 1,650 $\mu\text{g/l}$) corresponded to a lake water quality grade of F. The Secchi disc transparency with a mean of 4.3 ft (minimum of 2.2 feet and maximum of 11.6 feet) had a grade equal to a C. The chlorophyll a mean of 21.9 ppb (minimum of 1.7 $\mu\text{g/l}$ and maximum of 59.0 $\mu\text{g/l}$) fell within the C grade range. The overall lake quality grade for Sabre Lake, determined from the three individual grades, was D+.



Sabre Lake.

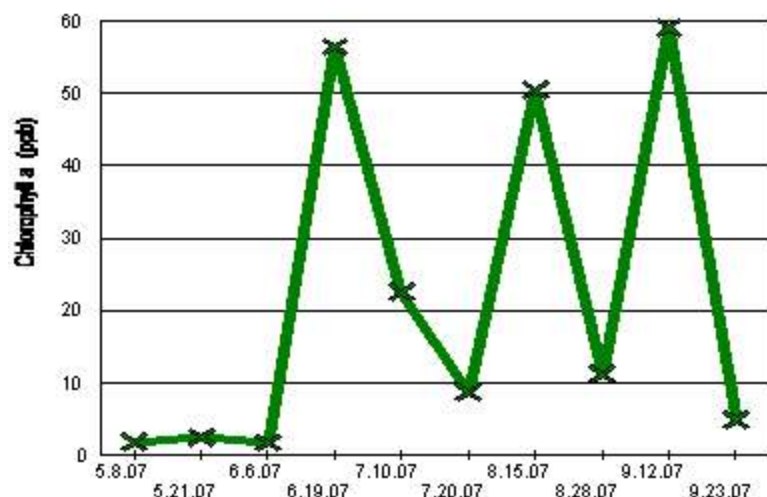
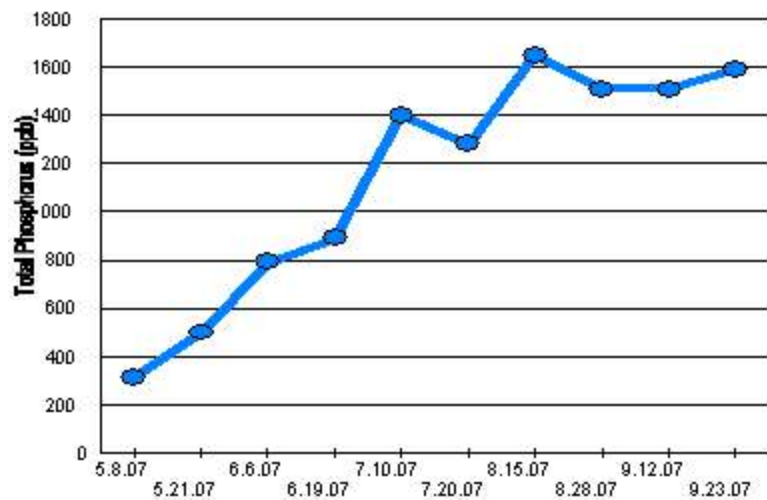
Sabre Lake

Lake surface area: acres



2007 Data

Date (2007)	SD (ft)	Sabre Total Phos (µg/l)	Chl a (µg/l)
5.8	11.6	317	1.8
5.21/22	5.4	499	2.5
6.6	4.1	790	1.7
6.19/20	2.3	892	56.4
7.10	2.2	1,400	22.5
7.20	4.0	1,280	8.7
8.15	2.4	1,650	50.4
8.28	4.3	1,510	11.2
9.12	2.8	1,510	59.0
9.23/27	3.0	1,590	4.9
Avg	4.3	1,144	21.9



Lake Water Quality Grades Based on Summertime Averages (Met Council criteria)

	2007
Secchi disc	C
Total phosphorus	F
Chlorophyll a	C
Overall	D+

Shields Lake (40-00) LeSueur County

Shields Lake was monitored 10 times between May through September, 2007. The data and related graphs are presented on the information sheet on the following page.

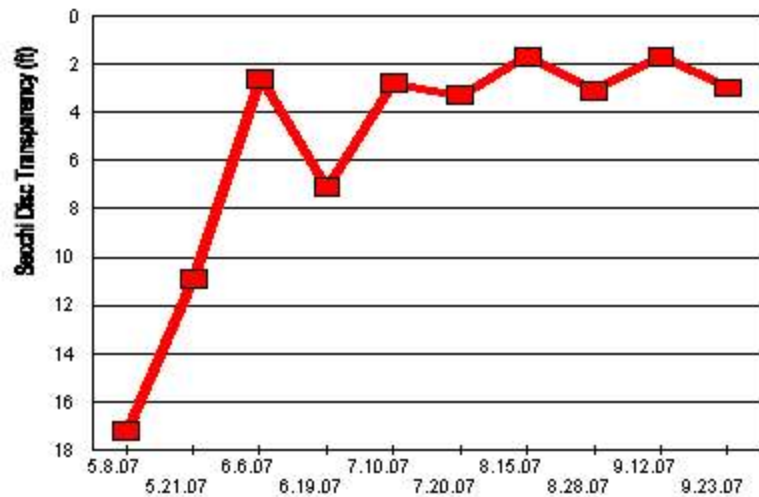
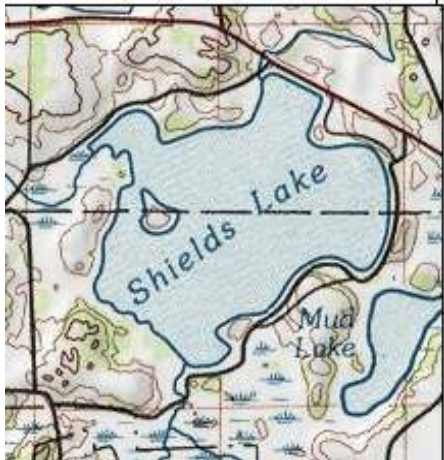
The summertime (May-September) mean total phosphorus concentration of 307 $\mu\text{g/l}$ (minimum of 111 $\mu\text{g/l}$ and maximum of 440 $\mu\text{g/l}$) corresponded to a lake water quality grade of F. The Secchi disc transparency with a mean of 5.3 ft (minimum of 1.7 feet and maximum of 17.2 feet) had a grade equal to a C. The chlorophyll a mean of 41.2 ppb (minimum of 1.2 $\mu\text{g/l}$ and maximum of 149 $\mu\text{g/l}$) fell within the C grade range. The overall lake quality grade for Shields Lake, determined from the three individual grades, was D+.



Shields Lake.

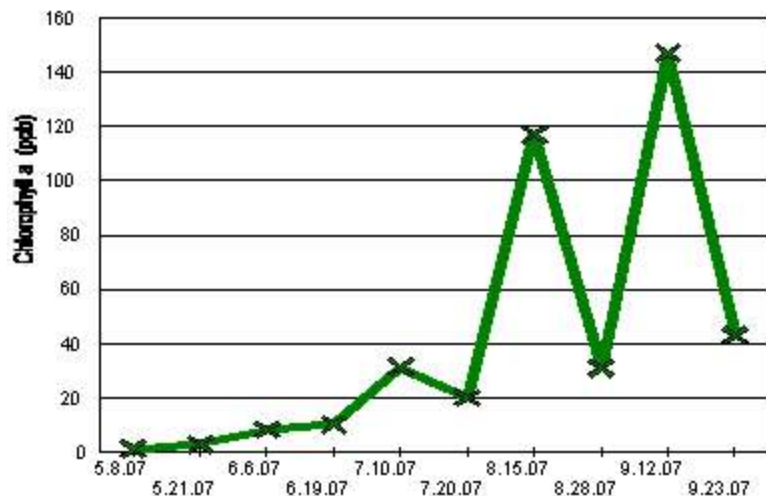
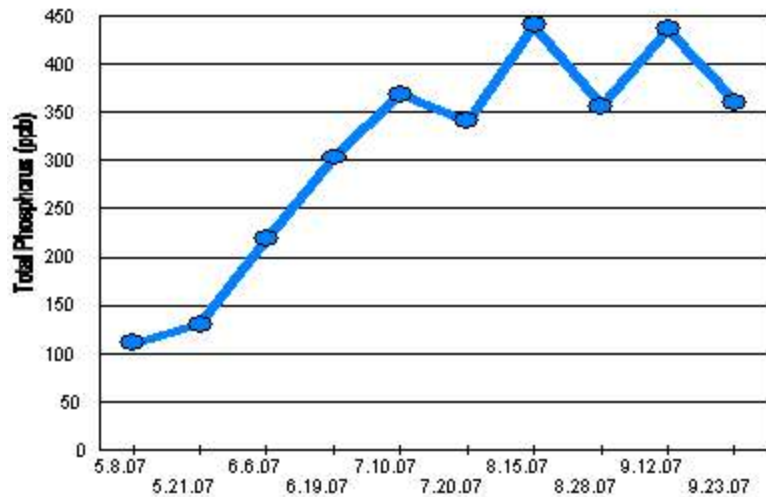
Shields Lake

Lake surface area: ac



2007Data

Date (2007)	SD (ft)	Shields Total Phos (µg/l)	Chl a (µg/l)
5.8	17.2	111	1.2
5.21/22	10.9	130	2.8
6.6	2.6	220	8.3
6.19/20	7.1	303	10.3
7.10	2.8	369	31.3
7.20	3.3	341	20.1
8.15	1.7	440	117
8.28	3.1	356	31.0
9.12	1.7	436	149
9.23/27	3.0	360	43
Avg	5.3	307	41.2



Lake Water Quality Grades Based on Summertime Averages (Met Council criteria)

	2007
Secchi disc	C
Total phosphorus	F
Chlorophyll a	C
Overall	D+

Lower Sakatah Lake (40-00) LeSueur County

Lower Sakatah Lake was monitored 10 times between May through September, 2007. The data and related graphs are presented on the information sheet on the following page.

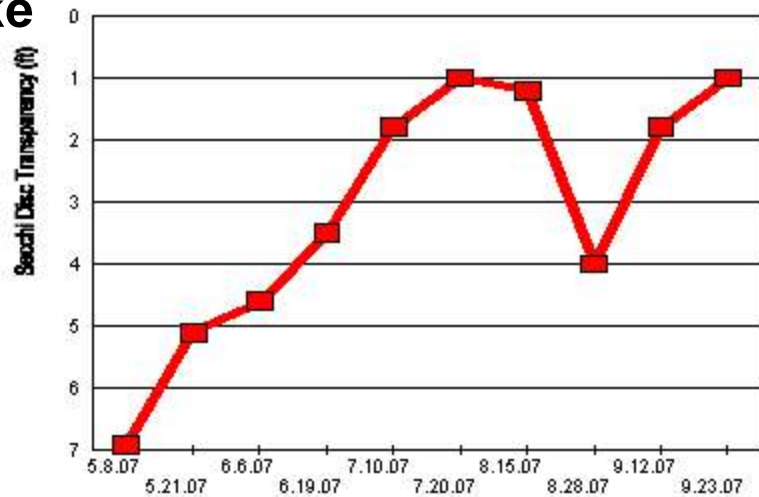
The summertime (May-September) mean total phosphorus concentration of 477 $\mu\text{g/l}$ (minimum of 110 $\mu\text{g/l}$ and maximum of 850 $\mu\text{g/l}$) corresponded to a lake water quality grade of F. The Secchi disc transparency with a mean of 3.0 ft (minimum of 1.0 feet and maximum of 6.9 feet) had a grade equal to a D. The chlorophyll *a* mean of 59.6 ppb (minimum of <1 $\mu\text{g/l}$ and maximum of 148 $\mu\text{g/l}$) fell within the D grade range. The overall lake quality grade for Lower Sakatah Lake, determined from the three individual grades, was D-.



Lower Sakatah Lake.

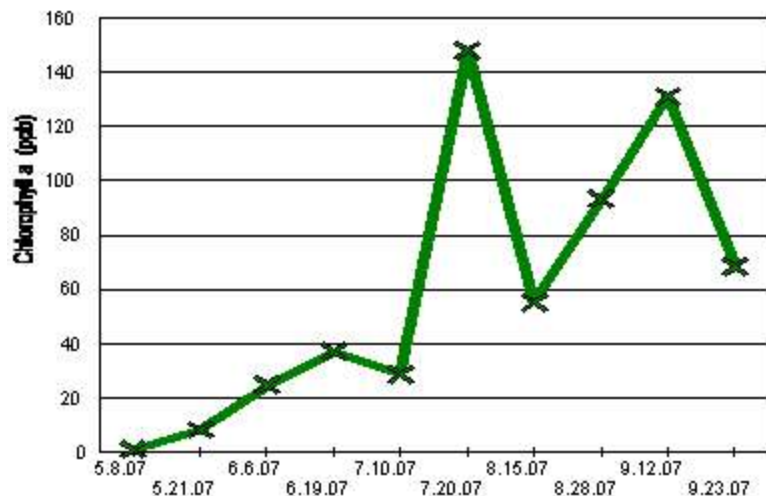
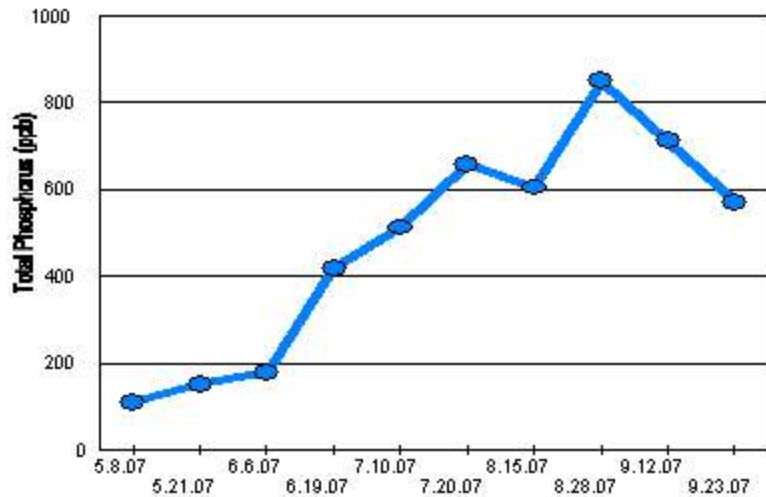
Lower Sakatah Lake

Lake surface area: acres



2007 Data

Date (2007)	Lower Sakatah		
	SD (ft)	Total Phos (µg/l)	Chl a (µg/l)
5.8	6.9	110	<1
5.21/22	5.1	152	8.3
6.6	4.6	180	24.8
6.19/20	3.5	418	37.1
7.10	1.8	512	28.7
7.20	1.0	659	148
8.15	1.2	604	55.2
8.28	4.0	850	93.2
9.12	1.8	711	131
9.23/27	1.0	571	68.3
Avg	3.0	477	59.6



Lake Water Quality Grades Based on Summertime Averages (Met Council criteria)

	2007
Secchi disc	D
Total phosphorus	F
Chlorophyll a	D
Overall	D-

Upper Sakatah Lake (40-00) LeSueur County

Upper Sakatah Lake was monitored 10 times between May through September, 2007. The data and related graphs are presented on the information sheet on the following page.

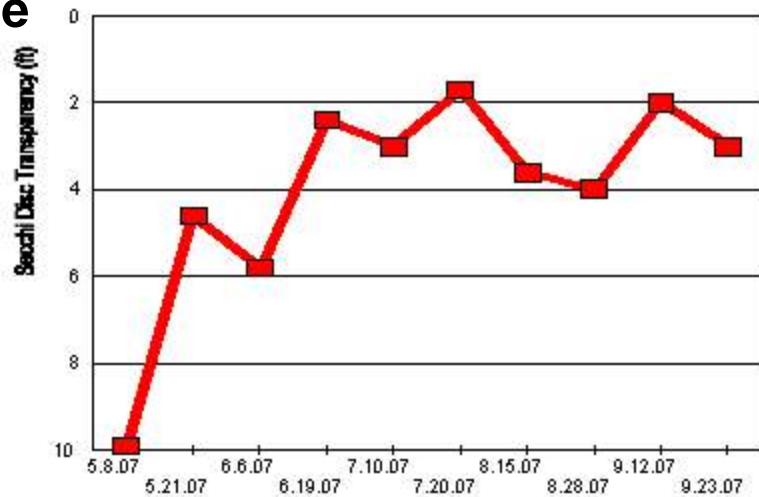
The summertime (May-September) mean total phosphorus concentration of 481 $\mu\text{g/l}$ (minimum of 84 $\mu\text{g/l}$ and maximum of 954 $\mu\text{g/l}$) corresponded to a lake water quality grade of F. The Secchi disc transparency with a mean of 4.0 ft (minimum of 1.7 feet and maximum of 9.9 feet) had a grade equal to a D. The chlorophyll *a* mean of 41.5 ppb (minimum of <1 $\mu\text{g/l}$ and maximum of 101 $\mu\text{g/l}$) fell within the C grade range. The overall lake quality grade for Upper Sakatah Lake, determined from the three individual grades, was D.



Upper Sakatah Lake.

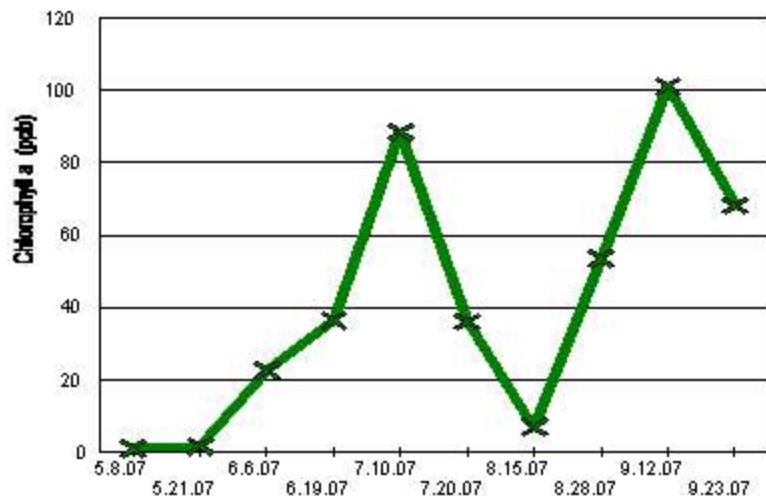
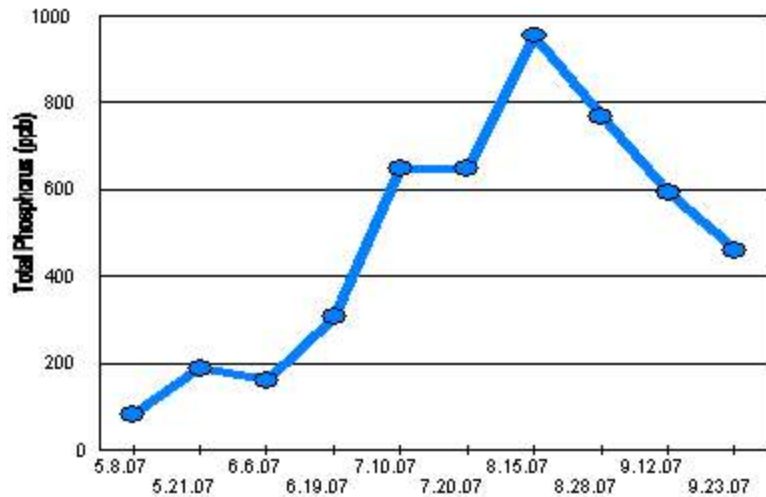
Upper Sakatah Lake

Lake surface area: acres



2007 Data

Date (2007)	Upper Sakatah		
	SD (ft)	Total Phos (µg/l)	Chl a (µg/l)
5.8	9.9	84	<1
5.21/22	4.6	189	1.7
6.6	5.8	162	22.6
6.19/20	2.4	307	36.4
7.10	3.0	647	88.4
7.20	1.7	646	36.0
8.15	3.6	954	6.9
8.28	4.0	769	53.4
9.12	2.0	594	101
9.23/27	3.0	459	68.0
Avg	4.0	481	41.5



Lake Water Quality Grades Based on Summertime Averages (Met Council criteria)

	2007
Secchi disc	D
Total phosphorus	F
Chlorophyll a	C
Overall	D

Lake Tetonka (40-00) LeSueur County

Lake Tetonka was monitored 10 times from May through September, 2007. The data and related graphs are presented on the information sheet on the following page.

The summertime (May-September) mean total phosphorus concentrations of 335 $\mu\text{g/l}$ (minimum of 197 $\mu\text{g/l}$ and maximum of 597 $\mu\text{g/l}$) corresponded to a lake water quality grade of F. The Secchi disc transparency mean of 7.3 ft (minimum of 2.3 feet and maximum of 17.8 feet) also graded as an B. The chlorophyll a mean of 33.3 ppb (minimum of 1.1 $\mu\text{g/l}$ and maximum of 107 $\mu\text{g/l}$) fell within the C grade range. The overall lake quality grade for Lake Tetonka, determined from the three individual grades, was C-.



Lake Tetonka.

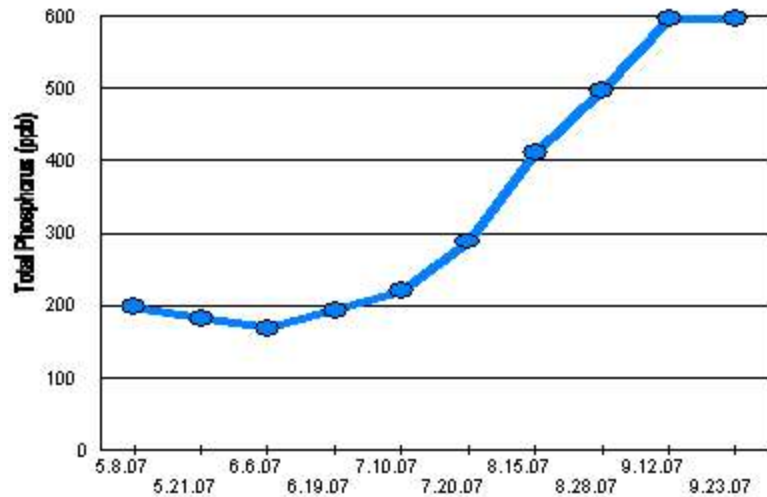
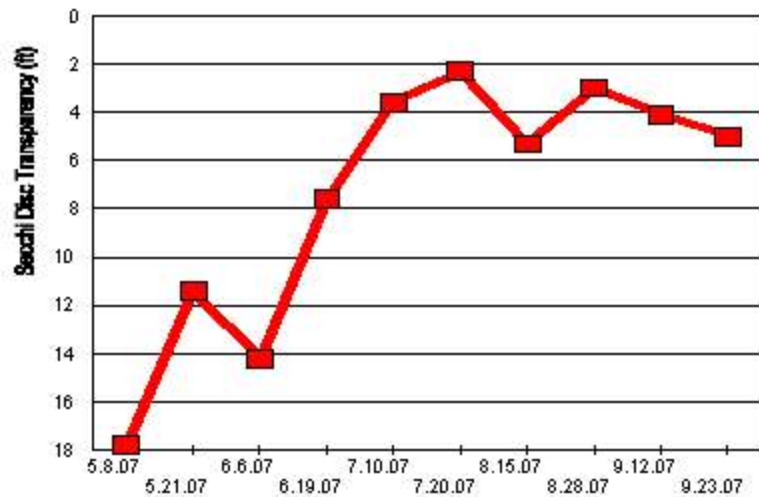
Lake Tetonka

Lake surface area: acres



2007 Data

Date (2007)	Tetonka		
	SD (ft)	Total Phos (µg/l)	Chl a (µg/l)
5.8	17.8	197	1.2
5.21/22	11.4	182	1.1
6.6	14.2	169	3.4
6.19/20	7.6	193	9.9
7.10	3.6	220	46.6
7.20	2.3	288	49.7
8.15	5.3	410	31.2
8.28	3.0	497	107
9.12	4.1	595	49.7
9.23/27	5.0	597	33.2
Avg	7.3	335	33.3



Lake Water Quality Grades Based on Summertime Averages (Met Council criteria)

	2007
Secchi disc	B
Total phosphorus	F
Chlorophyll a	C
Overall	C-

