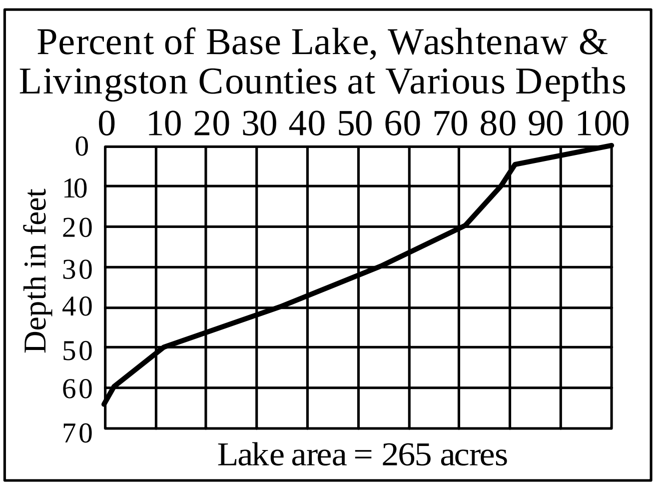
BASE LAKE
WEBSTER TOWNSHIP
WASHTENAW COUNTY
AND HAMBURG TOWNSHIP
LIVINGSTON COUNTY

1994 – 2006 WATER QUALITY STUDIES

BASE LAKE DATA

Base Lake, also called Baseline Lake, is a 265-acre natural hard-water kettle lake located in Section 31, Hamburg Township (T1N R5E) Livingston County, and Section 6, Webster Township (T1S R5E), Washtenaw County, Michigan. The lake consists of two basins. A small mid-lake island, plus two sunken islands rising within five feet or less of the surface, plus indentations in the north and south shorelines separates the lake into a 57-foot deep west basin and a 64-foot deep east basin. A second island is located on the northwest corner and was created when a dug canal isolated a parcel of land.

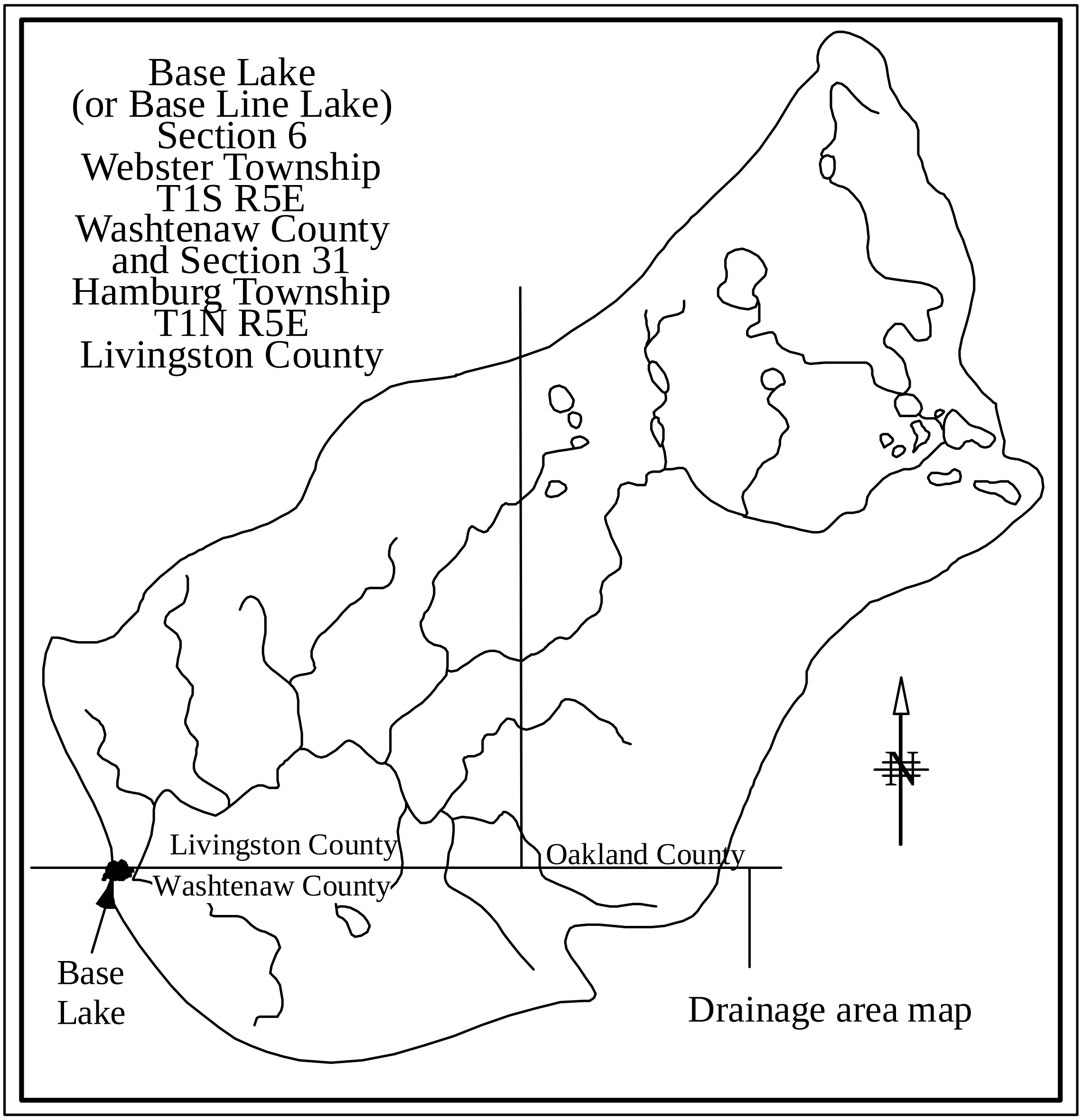


The hypsographic (depth-area) graph shows about 22 percent of the lake is ten feet deep or less.

The lake contains 7975 acre feet of water, and has a mean depth of 30.1 feet. The shoreline length is 17,790 feet.

The Huron River flows through the lake from east to west, so it is both an inlet and the outlet. The lake has no other inlets.

The entire Huron River upstream watershed is included in the Base Lake watershed. The Huron River watershed above Base Lake is 259,575 acres.

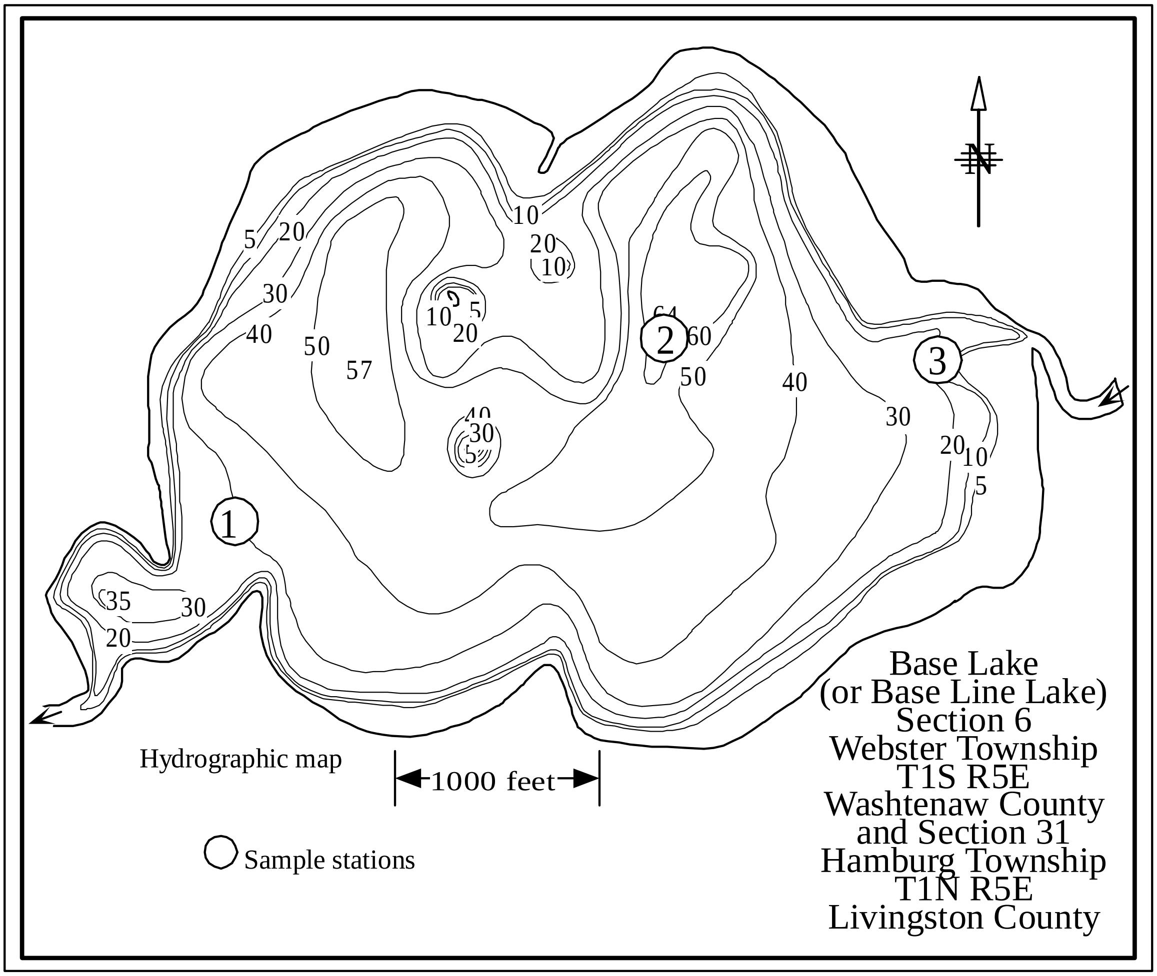


The drainage area, which includes the watershed plus the surface area of Base Lake, is 259,840 acres. The watershed to lake ratio is large, 980 to 1. Because of this large ratio the flushing rate of the lake is rapid, on the order of 0.038 years (or once every 14 days) on an average.

The longitude and latitude of the 64-foot deep hole is 83° 53.557W and 42° 25.590N. The elevation of the lake is 852 feet above sea level.

THE SAMPLE STATIONS

The locations of the three in-lake sample stations are shown as circles on the hydrographic map of the lake.



THE SAMPLE DATES

Base Lake residents took three spring surface samples for water quality testing at the sites shown on the map June 7, 1994 and June 19 and July 31, 1995. WQI limnologists took three spring surface samples plus surface temperatureS, dissolved oxygen concentrations and Secchi disk readings at the sites shown on the map June 9, 1996, May 12, 1997, April 19, 1998, April 25, 1999, April 15, 2000, May 13, 2001, April 15, 2002, April 28, 2003, April 16, 2004, April 18, 2005 and April 19, 2006.

WQI limnologists collected late summer surface samples at three stations August 1, 1994, August 14, 1995, August 7, 1996, August 25, 1997, August 10, 1998, August 27, 1999, August 4, 2000, August 1, 2001, August 2, 2002, August 1, 2003, August 2, 2004, August 3, 2005 and August 1, 2006. Temperature and dissolved oxygen profile data were collected when the lake was sampled in late summer at the 64-foot deep hole. Bottom sediment samples were collected on Base Lake in spring 2005. Davis Creek (at Merrill Road) and the Huron River (at M-36) were sampled 11 times beginning in June 2005 and continuing until April 2006.

THE ANALYSES

The tests performed on the samples included total phosphorus, total nitrate nitrogen, total alkalinity, pH, conductivity, chlorophyll a, Secchi disk depth, temperature, and dissolved oxygen.

Temperature, dissolved oxygen and Secchi disk depths were measured in the field. Chlorophyll a, phosphorus, nitrate nitrogen, alkalinity, pH and conductivity tests were performed at the Water Quality Investigators laboratory in Dexter, Michigan. All test procedures followed those outlined in APHA's *Standard Methods for the Examination of Water and Wastewater* (1985).

THE TEST RESULTS

The results of the tests are found in the text, in the tables at the end of this report and on the enclosed atlas pages.

TEMPERATURE AND DISSOLVED OXYGEN

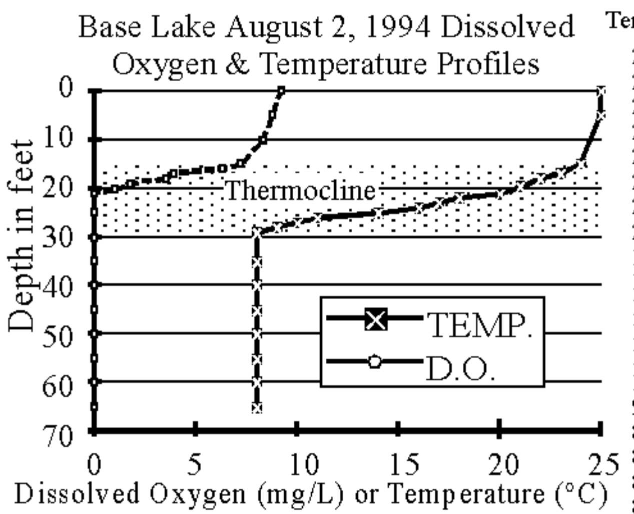
Temperature exerts a wide variety of influences on most lakes, such as the separation of layers of water (stratification), solubility of gasses and biological activity.

Dissolved oxygen is the test most often selected by lake scientists as being important. Besides providing oxygen for aquatic organisms, in natural lakes oxygen is involved the capture and release of various chemicals, such as iron and phosphorus.

In spring top to bottom temperature and dissolved oxygen concentrations were not measured but surface temperatures and oxygen concentrations were. On the other hand, dissolved oxygen and temperature profile data were collected each time the lake was sampled in late summer.

1994

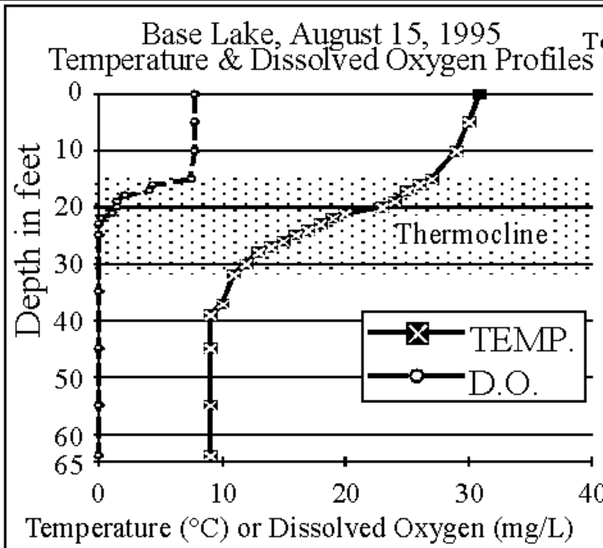
In late summer 1994, the lake formed a 15-foot-thick thermocline (defined as a layer of water in a lake where the temperature changes rapidly with depth and shown shaded on the graphs) from 15 to 30 feet. Dissolved oxygen was plentiful above the thermocline. In 1994, the lake ran out of dissolved oxygen at 21 feet. That condition remained to the bottom. The hypsographic (depth-area) graph shows about 68 percent of the lake is deeper than 21 feet.



Temp.	Depth	D.O.	Depth
25	0	9.2	0
25	5	8.8	5
24	15	8.3	10
23	17	7.2	15
22	18	6.3	16
21	19	3.9	17
21	20	3.5	18
20	21	1.8	19
18	22	1	20
17	23	0	21
16	24	0	25
14	25	0	30
11	26	0	35
10	27	0	40
9	28	0	45
8	29	0	50
8	40	0	55
8	50	0	60
8	65	0	65

1995

In late summer 1995, the lake formed a 16-foot-thick thermo-cline from 15 to 31 feet.



Temp.	Depth	D.O.	Depth
31	0	7.8	0
30	5	7.8	5
29	10	7.8	10
27	15	7.6	15
26	16	4.4	16
25	17	4.1	17
24	19	2.2	18
23	20	1.5	19
20	21	1.5	20
19	22	1.1	21
18	23	0.2	22
17	24	0.0	23
16	25	0.0	25
15	26	0.0	35
14	27	0.0	45
13	28	0.0	55
12	30	0.0	64
11	32		
10	37		
9	39		
9	45		
9	55		
9	64		

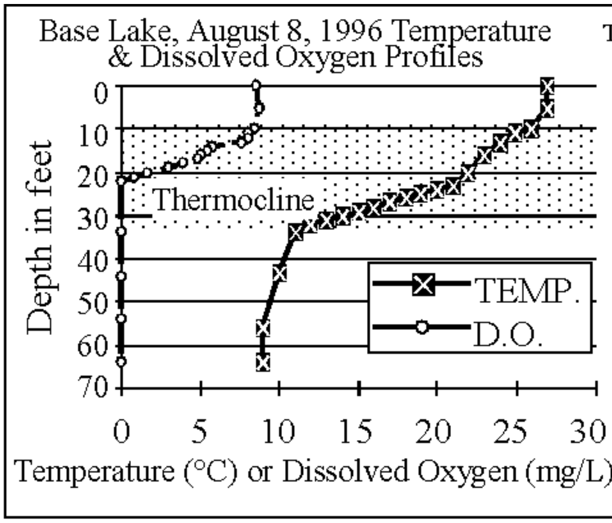
Dissolved oxygen was plentiful above the thermocline. This year the lake ran out of dissolved oxygen at 23 feet. That condition remained to the bottom. About 65 percent of the lake is deeper than 23 feet.

1996

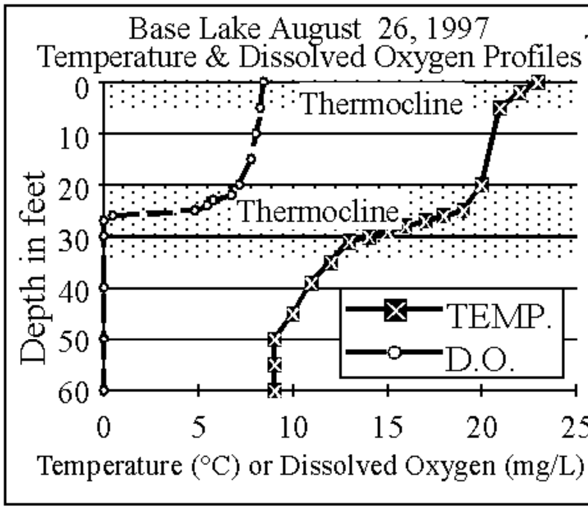
In late summer 1996, the lake formed a 22-foot-thick thermocline from 10 to 32 feet. Dissolved oxygen was again plentiful above the thermocline. This year the lake ran out of dissolved oxygen at 22 feet and that condition remained to the bottom.

1997

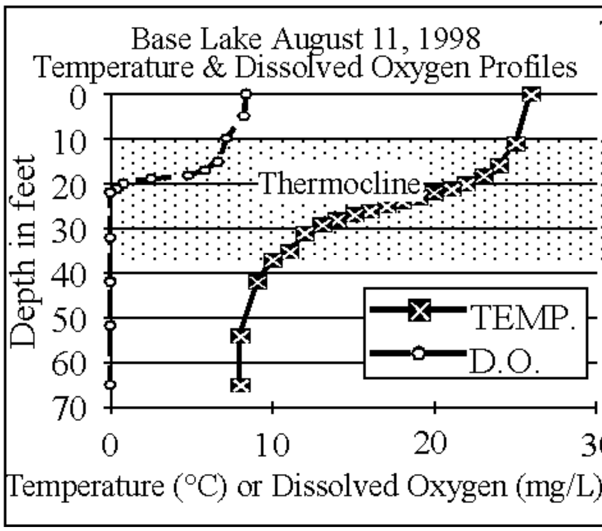
In late summer 1997, the lake formed two thermoclines. The first was five feet thick, from the surface to five feet. The second was 13 feet thick,



Temp.	Depth	D.O.	Depth
27	0	8.6	0
27	5	8.8	5
26	10	8.5	10
25	11	8.0	11
24	13	8.0	12
23	16	7.6	13
22	20	5.8	14
21	23	5.5	15
20	24	5.1	16
19	25	4.8	17
18	26	3.9	18
17	27	3.0	19
16	28	1.7	20
15	29	0.8	21
14	30	0.0	22
13	31	0.0	34
12	32	0.0	44
11	34	0.0	54
10	43	0.0	64
9	56		
9	64		



Temp.	Depth	D.O.	Depth
23	0	8.5	0
22	2	8.3	5
21	5	8.1	10
20	20	7.8	15
19	25	7.2	20
18	26	6.9	21
17	27	6.8	22
16	28	5.8	23
15	29	5.5	24
14	30	4.8	25
13	31	0.5	26
12	35	0.0	27
11	39	0.0	30
10	45	0.0	40
9	50	0.0	50
9	55	0.0	60
9	60		



Temp.	Depth	D.O.	Depth
26	0	8.4	0
25	11	8.3	5
24	16	7.2	10
23	18	6.6	15
22	20	5.9	17
21	21	4.8	18
20	22	2.5	19
19	23	0.8	20
18	24	0.4	21
17	25	0.0	22
16	26	0.0	32
15	27	0.0	42
14	28	0.0	52
13	29	0.0	65
12	31		
11	35		
10	37		
9	42		
8	54		
8	65		

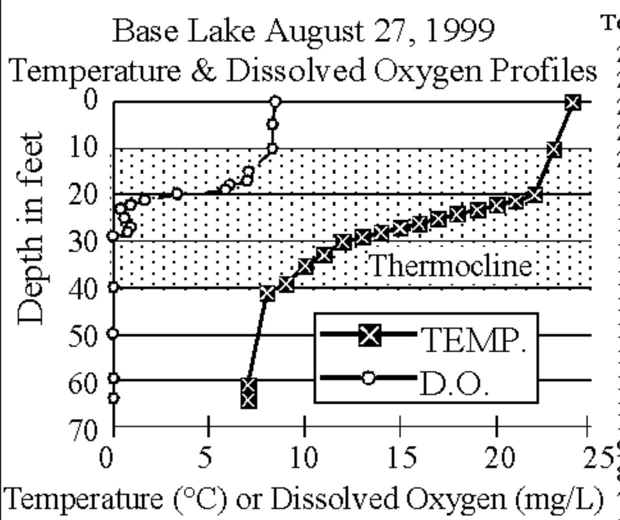
from 20 to 33 feet. Dissolved oxygen was plentiful above the deeper thermocline. In 1997, the lake ran out of dissolved oxygen at 27 feet. That condition remained to the bottom. The hypsographic (depth-area) graph shows about 60 percent of the lake is deeper than 27 feet.

1998

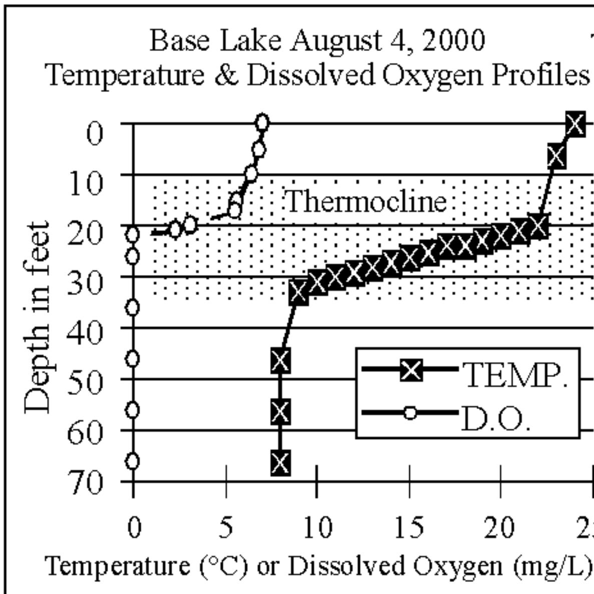
In late summer 1998, the lake formed a 28-foot-thick thermocline from 10 to 38 feet. Dissolved oxygen was plentiful above the thermocline. The lake ran out of dissolved oxygen at 22 feet and that condition remained to the bottom. About 68 percent of the lake is deeper than 22 feet.

1999

In late summer, 1999, the lake formed a 30-foot-thick thermocline from 10 to 40 feet. Dissolved oxygen was plentiful above the thermocline. The lake ran out of dissolved oxygen at 29 feet. That condition remained to the bottom. About 57 percent of the lake is deeper than 29 feet.



Temp.	Depth	D.O.	Depth
24	0	8.5	0
23	10	8.3	5
22	20	8.3	10
21	21	7.1	15
20	22	7.0	17
19	23	6.1	18
18	24	5.9	19
17	25	3.4	20
16	26	1.7	21
15	27	0.9	22
14	28	0.4	23
13	29	0.6	25
12	30	0.9	27
11	33	0.8	28
10	35	0.0	29
9	39	0.0	40
8	41	0.0	50
7	61	0.0	60
7	64	0.0	64



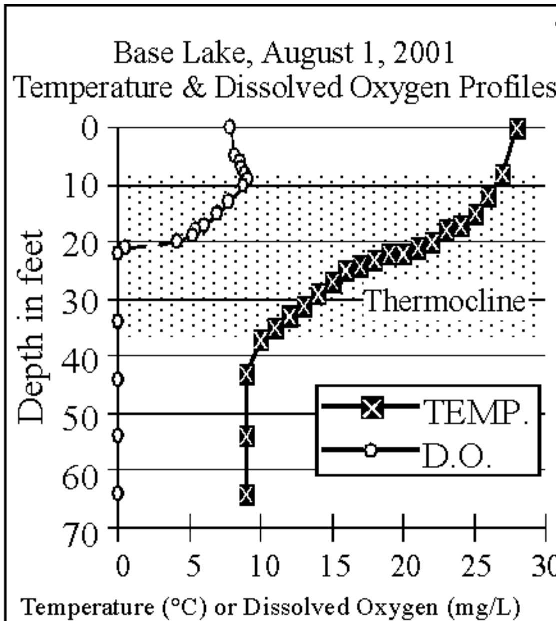
Temp.	Depth	D.O.	Depth
24	0	7.1	0
23	6	6.9	5
22	20	6.5	10
21	21	5.6	15
20	22	5.5	17
19	23	3.1	20
18	24	2.3	21
17	24	0.0	22
16	25	0.0	26
15	26	0.0	36
14	27	0.0	46
13	28	0.0	56
12	29	0.0	66
11	30		
10	31		
9	33		
8	46		
8	56		
8	66		

2000

In late summer 2000 the lake formed a 25-foot-thick thermocline from 10 to 35 feet. The lake ran out of dissolved oxygen in the middle of the thermocline at 22 feet, and that condition remained to the bottom. About 68 percent of the lake is deeper than 22 feet.

In this case, dissolved oxygen concentrations rather than temperature determined the top of the thermocline.

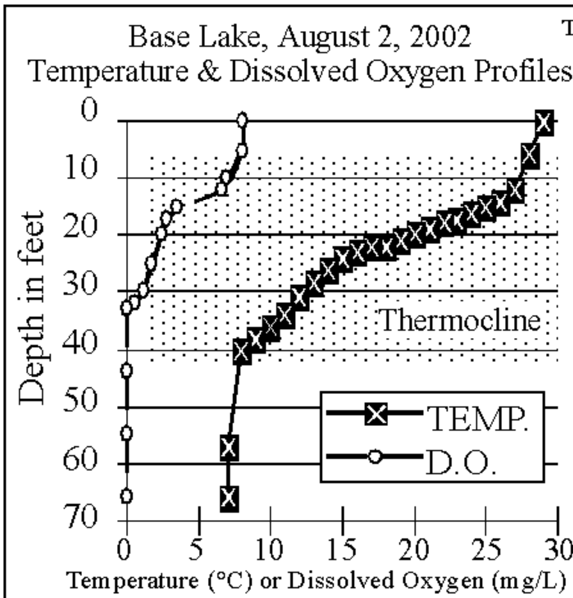
2001



Temp.	Depth	D.O.	Depth
28	0	7.9	0
27	8	8.2	5
26	12	8.6	6
25	15	8.7	7
24	17	8.9	8
23	18	9.1	9
22	20	8.8	10
21	21	7.8	13
20	22	7.0	15
19	22	6.1	17
18	23	5.5	18
17	24	5.3	19
16	25	4.1	20
15	27	0.5	21
14	29	0.0	22
13	31	0.0	34
12	33	0.0	44
11	35	0.0	54
10	37	0.0	64
9	43		
9	54		
9	64		

In late summer 2001 the lake formed a 30-foot-thick thermocline from 9 to 39 feet. Dissolved oxygen was plentiful above 12 feet. The lake ran out of dissolved oxygen in the middle of the thermocline at 22 feet, and that condition remained to the bottom. About 68 percent of the lake is deeper than 22 feet.

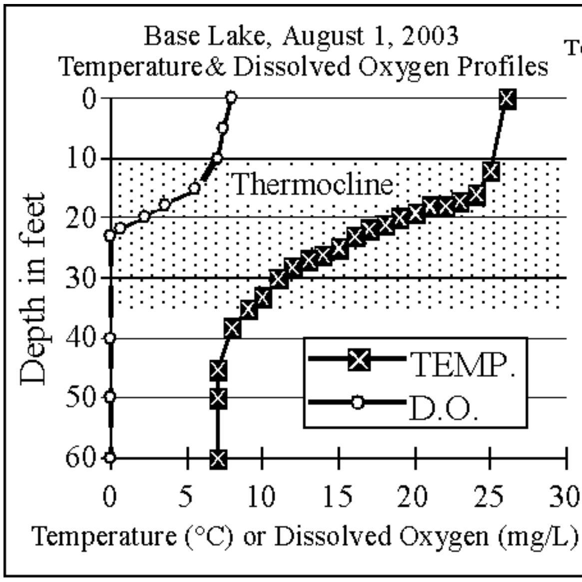
2002



Temp.	Depth	D.O.	Depth
29	0	8.1	0
28	6	8.1	5
27	12	6.9	10
26	14	6.6	12
25	15	3.4	15
24	16	2.7	17
23	17	2.5	20
22	18	1.8	25
21	19	1.2	30
20	20	0.6	32
19	21	0.0	33
18	22	0.0	44
17	22	0.0	55
16	23	0.0	66
15	24		
14	26		
13	28		
12	31		
11	34		
10	36		
9	38		
8	40		
7	57		
7	66		

In late summer 2002 the lake formed a 35-foot-thick thermocline from 6 to 41 feet. The lake ran out of dissolved oxygen near the bottom of the thermocline at 33 feet, and that condition remained to the bottom. About 48 percent of the lake is deeper than 33 feet.

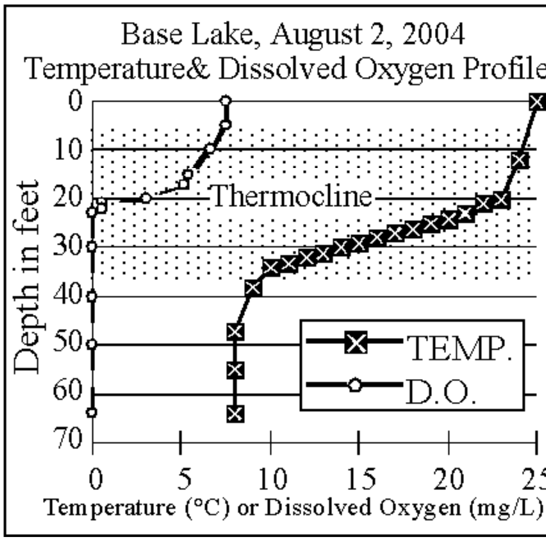
2003



Temp.	Depth	D.O.	Depth
26	0	8.0	0
25	12	7.4	5
24	16	7.1	10
23	17	5.6	15
22	18	3.6	18
21	18	2.2	20
20	19	0.7	22
19	20	0.0	23
18	21	0.0	40
17	22	0.0	50
16	23	0.0	60
15	25		
14	26		
13	27		
12	28		
11	30		
10	33		
9	35		
8	38		
7	45		
7	50		
7	60		

In late summer 2003 the lake formed a 25-foot-thick thermocline from 10 to 35 feet. The lake ran out of dissolved oxygen at 23 feet, and that condition remained to the bottom. About 66 percent of the lake is deeper than 23 feet.

2004

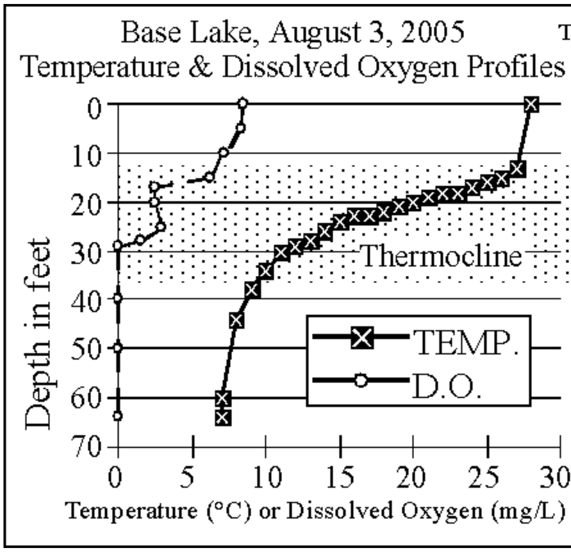


Temp.	Depth	D.O.	Depth
25	0	7.6	0
24	12	7.6	5
23	20	6.7	10
22	21	5.4	15
21	23	5.2	17
20	24	3.0	20
18	26	0.6	21
16	28	0.6	22
14	30	0.0	23
12	32	0.0	30
10	34	0.0	40
9	38	0.0	50
8	47	0.0	64
8	55		
8	64		

In late summer 2004 the lake formed a 30-foot-thick thermocline from 5 to 35 feet. Above five feet dissolved oxygen was plentiful and uniform. At five feet the dissolved oxygen concentration started to decrease. The lake ran out of dissolved oxygen at 23 feet, and that condition remained to the bottom.

2005

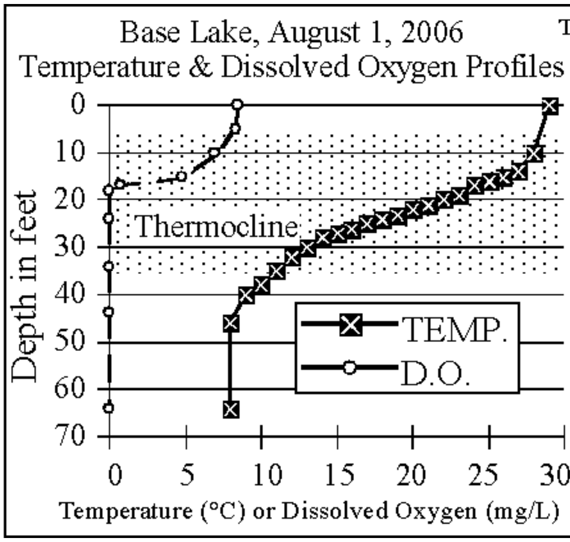
In late summer 2005 the lake formed a 20-foot-thick thermocline from 10 to 30 feet. Above five feet dissolved oxygen was plentiful. At five feet the dissolved oxygen concentration started to decrease. The lake ran out of



Temp.	Depth	D.O.	Depth
28	0	8.5	0
27	13	8.4	5
26	15	7.2	10
25	16	6.2	15
24	17	2.5	17
22	18	2.5	20
21	19	2.9	25
20	20	1.5	28
18	22	0.0	29
16	23	0.0	40
15	24	0.0	50
14	26	0.0	64
13	28		
11	30		
10	34		
9	38		
8	44		
7	60		
7	64		

dissolved oxygen at 29 feet, and that condition remained to the bottom. About 57 percent of the lake is deeper than 29 feet.

2006



Temp.	Depth	D.O.	Depth
29	0	8.5	0
28	10	8.3	5
27	14	6.9	10
26	15	4.8	15
25	16	0.7	17
24	17	0.0	18
23	19	0.0	24
22	20	0.0	34
21	21	0.0	44
20	22	0.0	64
19	23		
18	24		
17	25		
16	26		
15	27		
14	28		
13	30		
12	32		
11	35		
10	38		
9	40		
8	46		
8	64		

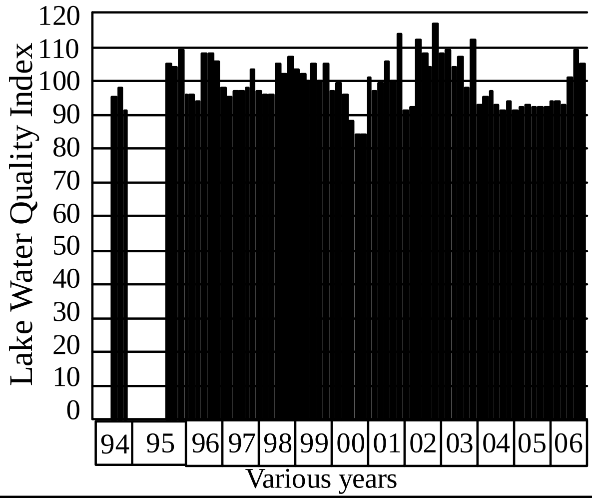
In late summer 2006 Base Lake formed a 30-foot thick thermocline from 5 to 35 feet. Dissolved oxygen supplies were plentiful above five feet, and adequate to 15 feet. The lake ran out of dissolved oxygen at 18 feet, and that condition remained to the bottom. About 72 percent of the lake is deeper than 18 feet.

DISSOLVED OXYGEN SATURATION

Since the amount of oxygen dissolved in the water is dependent on temperature, with cold water holding more oxygen dissolved in the water than warm water, dissolved oxygen saturation, with near 100% being ideal, is often a better way to determine if dissolved oxygen supplies are adequate.

The graph shows most of the time dissolved oxygen saturation is between 90 and 110 percent, which is good. For some reason, spring and summer 2004 and 2005 and spring 2006 dissolved oxygen saturation values were lower than normal.

Base Lake 1994-2006 Surface Dissolved Oxygen Saturation



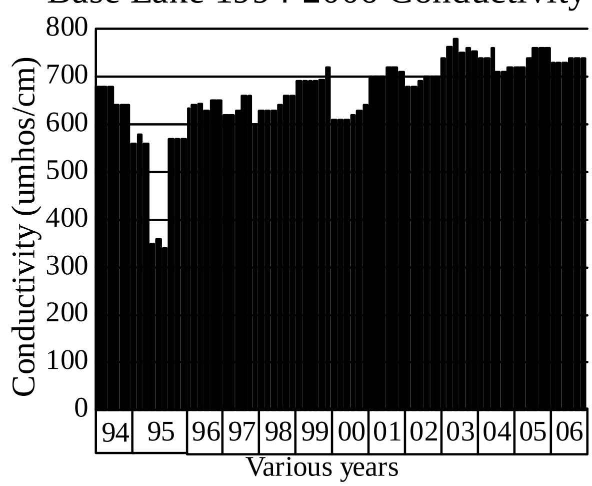
6/7/94	---	5/12/97	98	8/4/00	88	4/16/04	93
6/7/94	---	5/12/97	95	8/4/00	84	4/16/04	95
6/7/94	---	5/12/97	97	8/4/00	84	4/16/04	97
8/1/94	95	8/25/97	97	5/13/01	101	8/2/04	93
8/1/94	98	8/25/97	98	5/13/01	97	8/2/04	91
8/1/94	91	8/25/97	103	5/13/01	99	8/2/04	94
6/19/95	---	4/19/98	97	8/1/01	106	4/18/05	91
6/19/95	---	4/19/98	96	8/1/01	100	4/18/05	92
6/19/95	---	4/19/98	96	8/1/01	114	4/18/05	93
7/31/95	---	8/10/98	105	4/15/02	91	8/3/05	92
7/31/95	---	8/10/98	102	4/15/02	92	8/3/05	92
7/31/95	---	8/10/98	107	4/15/02	112	8/3/05	92
8/14/95	105	4/25/99	103	8/2/02	108	4/19/06	94
8/14/95	104	4/25/99	102	8/2/02	104	4/19/06	94
8/14/95	109	4/25/99	100	8//2/02	117	4/19/06	93
6/9/96	96	8/27/99	105	4/28/03	108	8/1/06	101
6/9/96	96	8/27/99	100	4/28/03	109	8/1/06	109
6/9/96	94	8/27/99	105	4/28/03	104	8/1/06	105
8/7/96	108	4/15/00	97	8/1/03	107		
8/7/96	108	4/15/00	99	8/1/03	98		
8/7/96	106	4/15/00	96	8/1/03	112		

CONDUCTIVITY

Conductivity, measured with a meter, detects the capacity of a water to conduct an electric current. More importantly however, it measures the amount of materials dissolved in the water (salts), since only dissolved materials will permit an electric current to flow. Theoretically, pure water will not conduct an electric current. It is the perception of the experts that poor quality water has more dissolved materials than good quality water. I agree. Lower is usually better.

Normal conductivities in Michigan inland lakes range from 75 to 450 micromhos per centimeter.

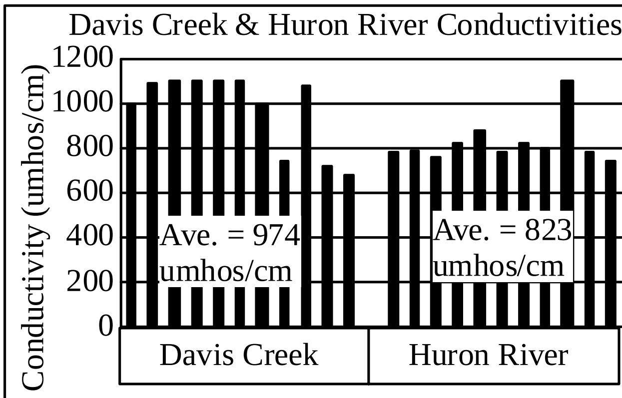
Base Lake 1994-2006 Conductivity



6/7/94	680	5/12/97	620	8/4/00	620	4/16/04	740
6/7/94	680	5/12/97	620	8/4/00	630	4/16/04	740
6/7/94	680	5/12/97	630	8/4/00	640	4/16/04	760
8/1/94	640	8/25/97	660	5/13/01	700	8/2/04	710
8/1/94	640	8/25/97	660	5/13/01	700	8/2/04	710
8/1/94	640	8/25/97	600	5/13/01	700	8/2/04	720
6/19/95	560	4/19/98	630	8/1/01	720	4/18/05	720
6/19/95	580	4/19/98	630	8/1/01	720	4/18/05	720
6/19/95	560	4/19/98	630	8/1/01	710	4/18/05	740
7/31/95	350	8/10/98	640	4/15/02	680	8/3/05	760
7/31/95	360	8/10/98	660	4/15/02	680	8/3/05	760
7/31/95	340	8/10/98	660	4/15/02	690	8/3/05	760
8/14/95	570	4/25/99	690	8/2/02	700	4/19/06	730
8/14/95	570	4/25/99	690	8/2/02	700	4/19/06	730
8/14/95	570	4/25/99	690	8//2/02	700	4/19/06	730
6/9/96	635	8/27/99	690	4/28/03	740	8/1/06	740
6/9/96	640	8/27/99	695	4/28/03	765	8/1/06	740
6/9/96	645	8/27/99	720	4/28/03	780	8/1/06	740
8/7/96	630	4/15/00	610	8/1/03	750		
8/7/96	650	4/15/00	610	8/1/03	760		
8/7/96	650	4/15/00	610	8/1/03	755		

The graph shows spring and summer conductivities ranged from 340 in spring 1995 to 780 micromhos per centimeter in spring 2003. These are high conductivities for a Michigan inland lake, and may indicate salt from the large upstream watershed is starting to affect the lake. And the current practices of dumping water softener brine into the lake will probably increase the conductivities even more, even with the high flushing rate.

The graph shows conductivities appear to be increasing, although there doesn't seem to be much of a change since 2003.



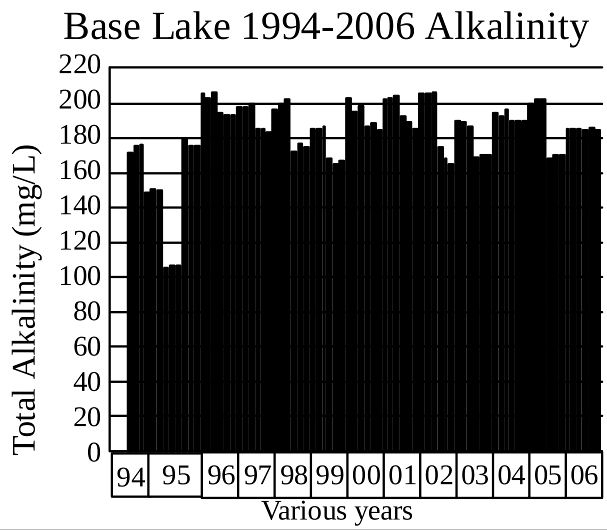
Davis Cr.		Huron R.	
6/30/05	1000	6/30/05	780
7/29/05	1090	7/29/05	790
8/29/05	1100	8/29/05	760
9/27/05	1100	9/27/05	820
10/24/05	1100	10/24/05	880
11/30/05	1100	11/30/05	780
12/27/05	1000	12/27/05	820
1/27/06.	740	1/27/06.	800
2/28/06.	1080	2/28/06.	1100
3/30/06.	720	3/30/06.	780
4/19/06.	680	4/19/06.	740

The graph of Davis Creek and Huron River conductivities shows Davis Creek has higher conductivities (and hence more salts) than the Huron River. Huron River conductivities mimic Base Lake conductivities for the most part.

TOTAL ALKALINITY

Alkalinity measures carbonates and bicarbonates in water. Soft water lakes have alkalinities below 75 milligrams per liter. Moderately hard water lakes have alkalinities between 75 and 150 milligrams per liter. Hard water lakes have alkalinities above 150 milligrams per liter.

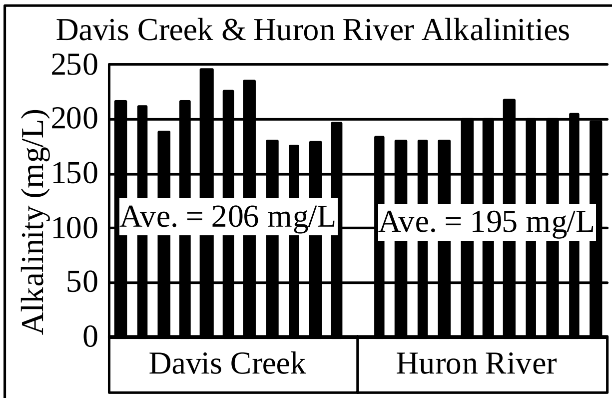
The spring and summer surface alkalinities of Base Lake are generally above 150 milligrams per liter, and are sometimes in the 200 milligrams per liter range or more. These data indicate the lake is a hard water lake. The high alkalinities are a result of the Huron River, which is (mostly fed by groundwater) flowing through the lake. The reason for the lower July 1995 alkalinities is unknown.



6/7/94	---	5/12/97	197	8/4/00	187	4/16/04	194
6/7/94	---	5/12/97	197	8/4/00	188	4/16/04	192
6/7/94	---	5/12/97	200	8/4/00	184	4/16/04	196
8/1/94	171	8/25/97	185	5/13/01	202	8/2/04	190
8/1/94	175	8/25/97	185	5/13/01	203	8/2/04	190
8/1/94	176	8/25/97	183	5/13/01	204	8/2/04	190
6/19/95	148	4/19/98	196	8/1/01	192	4/18/05	200
6/19/95	151	4/19/98	200	8/1/01	189	4/18/05	202
6/19/95	150	4/19/98	202	8/1/01	185	4/18/05	202
7/31/95	105	8/10/98	172	4/15/02	205	8/3/05	168
7/31/95	107	8/10/98	177	4/15/02	205	8/3/05	170
7/31/95	107	8/10/98	174	4/15/02	206	8/3/05	170
8/14/95	180	4/25/99	185	8/2/02	174	4/19/06	185
8/14/95	175	4/25/99	185	8/2/02	168	4/19/06	185
8/14/95	175	4/25/99	187	8//2/02	165	4/19/06	185
6/9/96	205	8/27/99	168	4/28/03	190	8/1/06	184
6/9/96	203	8/27/99	165	4/28/03	189	8/1/06	186
6/9/96	206	8/27/99	167	4/28/03	187	8/1/06	184
8/7/96	194	4/15/00	203	8/1/03	169		
8/7/96	193	4/15/00	195	8/1/03	170		
8/7/96	193	4/15/00	198	8/1/03	170		

The graph shows generally spring alkalinities are higher than summer alkalinities, which is normal. However, in 2006 spring and summer alkalinities were about the same. Other than that, it shows alkalinites do not appear to be changing as the years pass.

Hard water lakes are tougher than soft water lakes because they have the ability to precipitate some phosphorus to the bottom sediments as calcium phosphate where it is permanently tied up.



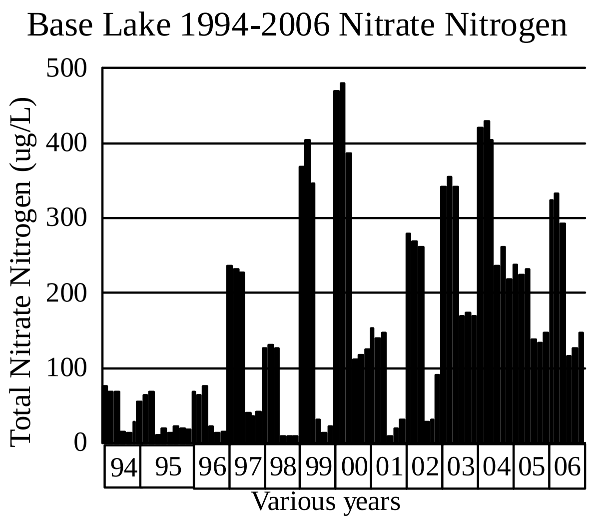
Davis Cr.		Huron R.	
6/30/05	217	6/30/05	184
7/29/05	212	7/29/05	180
8/29/05	188	8/29/05	180
9/27/05	217	9/27/05	180
10/24/05	245	10/24/05	200
11/30/05	225	11/30/05	200
12/27/05	235	12/27/05	218
1/27/06.	180	1/27/06.	200
2/28/06.	175	2/28/06.	200
3/30/06.	179	3/30/06.	205
4/19/06.	196	4/19/06.	198

The graph of Davis Creek and Huron River alkalinities shows similar concentrations in both streams, and also similar concentrations to Base Lake. This is normal and expected.

NITRATE NITROGEN

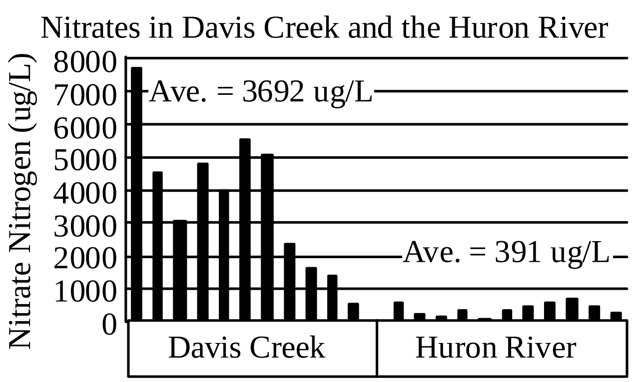
Most Michigan inland lakes have spring nitrate nitrogen concentrations around 200 micrograms per liter (or parts per billion). Summer nitrate nitrogen concentrations are generally much lower, in the 10 to 40 micrograms per liter range.

The graph shows spring nitrate nitrogen concentrations range from a low of 56 micrograms per liter in 1995 to a high of 479 micrograms per liter in 2000. For the most part, summer values are lower, ranging from 9 to 262 micrograms per liter.



6/7/94	76	5/12/97	236	8/4/00	111	4/16/04	419
6/7/94	70	5/12/97	231	8/4/00	118	4/16/04	429
6/7/94	70	5/12/97	226	8/4/00	124	4/16/04	404
8/1/94	15	8/25/97	39	5/13/01	153	8/2/04	236
8/1/94	13	8/25/97	36	5/13/01	139	8/2/04	262
8/1/94	28	8/25/97	43	5/13/01	147	8/2/04	218
6/19/95	56	4/19/98	127	8/1/01	8	4/18/05	238
6/19/95	65	4/19/98	132	8/1/01	21	4/18/05	224
6/19/95	69	4/19/98	127	8/1/01	32	4/18/05	231
7/31/95	11	8/10/98	10	4/15/02	280	8/3/05	137
7/31/95	20	8/10/98	9	4/15/02	270	8/3/05	133
7/31/95	14	8/10/98	9	4/15/02	263	8/3/05	146
8/14/95	23	4/25/99	368	8/2/02	30	4/19/06	324
8/14/95	21	4/25/99	405	8/2/02	32	4/19/06	333
8/14/95	17	4/25/99	347	8//2/02	92	4/19/06	293
6/9/96	69	8/27/99	32	4/28/03	343	8/1/06	116
6/9/96	64	8/27/99	14	4/28/03	355	8/1/06	126
6/9/96	75	8/27/99	23	4/28/03	343	8/1/06	147
8/7/96	23	4/15/00	469	8/1/03	168		
8/7/96	13	4/15/00	479	8/1/03	173		
8/7/96	15	4/15/00	386	8/1/03	168		

Summer 2003, 2004, 2005 and 2006 nitrates were higher than normal. The latest data indicate Base Lake is probably phosphorus limited in both spring and summer. It also means no fertilizers containing either nitrogen or phosphorus should be used on near-lake areas.



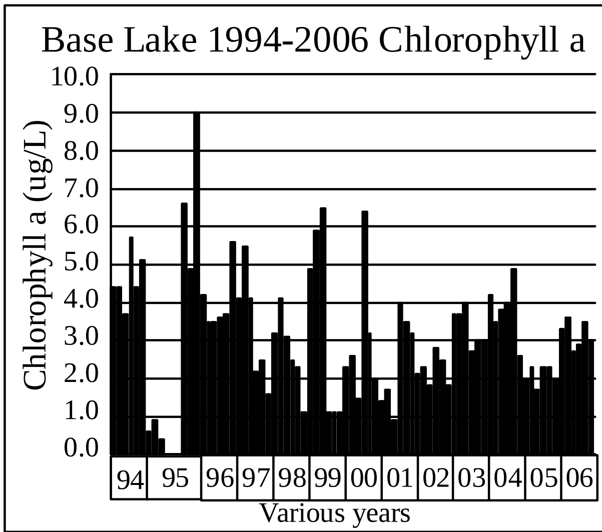
Davis Cr.		Huron R.	
6/30/05	7700	6/30/05	581
7/29/05	4532	7/29/05	256
8/29/05	3060	8/29/05	160
9/27/05	4800	9/27/05	344
10/24/05	4007	10/24/05	55
11/30/05	5527	11/30/05	352
12/27/05	5061	12/27/05	470
1/27/06.	2368	1/27/06.	611
2/28/06.	1632	2/28/06.	726
3/30/06.	1376	3/30/06.	458
4/19/06.	549	4/19/06.	288

The graph of Davis Creek and Huron River nitrate nitrogen concentrations shows a much higher concentration of nitrates in Davis Creek (almost ten times higher) compared to the Huron River. My guess is the high nitrates are probably coming from the Northfield Township sewage treatment plant.

The DNR/DEQ suggests only limiting the amount of phosphorus going into a lake, but I feel both nitrogen and phosphorus should be limited. The reason is although algae may capture phosphorus from the water column, rooted aquatic plants can get phosphorus from the bottom sediments, so limiting phosphorus inputs won’t affect the aquatic plant community. Thus limiting nitrogen inputs is extremely important if controlling aquatic plant communities is a goal. It is a real plus that the Portage, Base and Whitewood Association Board passed a resolution recommending no fertilizer use (nitrogen or phosphorus) within 400 feet of the lakes or from streams feeding the lakes. This is the first lake association I am aware of to do this. Hopefully others will follow.

CHLOROPHYLL A

Chlorophyll a, reported in micrograms per liter (or parts per billion) generally gives an estimate of algal densities. Best is below 1 microgram per liter.



6/7/94	4.4	5/12/97	4.1	8/4/00	6.4	4/16/04	4.2
6/7/94	4.4	5/12/97	5.5	8/4/00	3.2	4/16/04	3.5
6/7/94	3.7	5/12/97	4.1	8/4/00	2.0	4/16/04	3.8
8/1/94	5.7	8/25/97	2.2	5/13/01	1.4	8/2/04	4.0
8/1/94	4.4	8/25/97	2.5	5/13/01	1.7	8/2/04	4.9
8/1/94	5.1	8/25/97	1.6	5/13/01	0.9	8/2/04	2.6
6/19/95	0.6	4/19/98	3.2	8/1/01	4.0	4/18/05	2.0
6/19/95	0.9	4/19/98	4.1	8/1/01	3.5	4/18/05	2.3
6/19/95	0.4	4/19/98	3.1	8/1/01	3.2	4/18/05	1.7
7/31/95	---	8/10/98	2.5	4/15/02	2.1	8/3/05	2.3
7/31/95	---	8/10/98	2.3	4/15/02	2.3	8/3/05	2.3
7/31/95	---	8/10/98	1.1	4/15/02	1.8	8/3/05	2.0
8/14/95	6.6	4/25/99	4.9	8/2/02	2.8	4/19/06	3.3
8/14/95	4.9	4/25/99	5.9	8/2/02	2.5	4/19/06	3.6
8/14/95	9.0	4/25/99	6.5	8//2/02	1.8	4/19/06	2.7
6/9/96	4.2	8/27/99	1.1	4/28/03	3.7	8/1/06	2.9
6/9/96	3.5	8/27/99	1.1	4/28/03	3.7	8/1/06	3.5
6/9/96	3.5	8/27/99	1.1	4/28/03	4.0	8/1/06	3.0
8/7/96	3.6	4/15/00	2.3	8/1/03	2.7		
8/7/96	3.7	4/15/00	2.6	8/1/03	3.0		
8/7/96	5.6	4/15/00	1.5	8/1/03	3.0		

The graph of chlorophyll a data shows Base Lake has had significant algal blooms since 1994. Since 1999, the amount of variation decreased, but the data still show algal blooms in both spring and summer although 2005 chlorophylls were among the lowest in the past few years. 2006 chlorophylls were a bit higher.

pH (Hydrogen ion concentration)

1994 through 2006 spring and summer surface pH values ranged from 7.6 to 8.6. These are normal pH values for a Michigan inland lake with a river flowing through it.

Lakes with extensive plant communities often have high summer pH values (greater than 9) because the plants use the carbonates in the water as a carbon source. This causes a decrease in the buffering capacity of the water, and allows the pH to rise.

TOTAL PHOSPHORUS

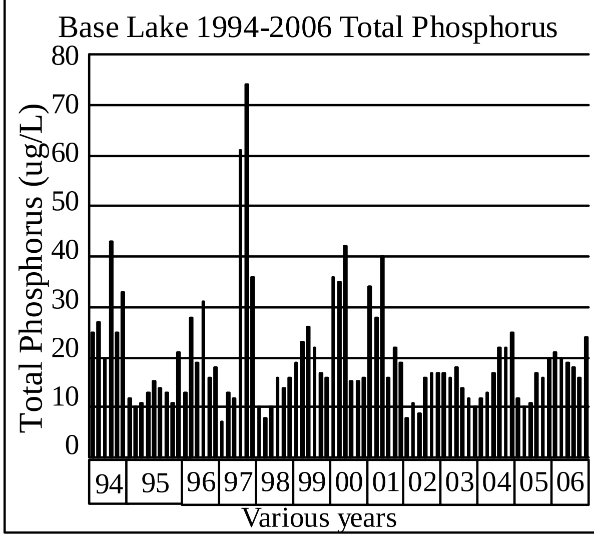
Although there are several forms of phosphorus found in lakes, the experts selected total phosphorus as being most important. This is probably because all forms of phosphorus can be converted to the other forms. Currently, most lake scientists feel phosphorus, which is measured in parts per billion or micrograms per liter (ug/L), is the one nutrient which might be controlled. If its addition to lake water could be limited, the lake might not become covered with the algal communities so often found in eutrophic lakes.

However, based on our studies of many Michigan inland lakes, we've found many lakes were phosphorus limited in spring (so don't add phosphorus) and nitrate limited in summer (so don't add nitrogen).

10 parts per billion is considered a low concentration of phosphorus in a lake and 50 parts per billion is considered high by many limnologists.

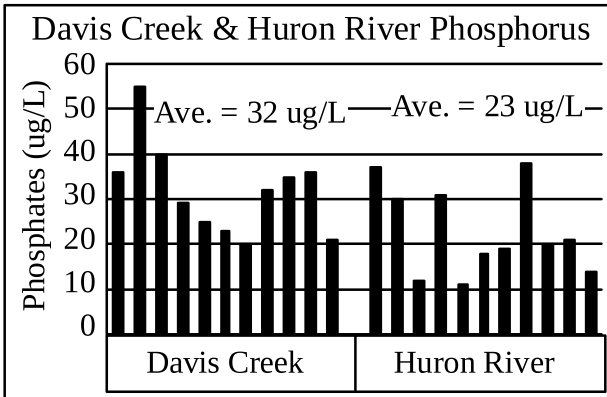
The 1994-2006 total phosphorus graph shows Base Lake had phosphorus concentrations ranging from 7 to 74 micrograms per liter. However most of the time the graph shows phosphorus concentrations are in the 10 to 25 microgram per liter range.

The graph shows some variation, but no trend in the phosphorus concentration over the years although the 2002, 2003 and 2005 phosphorus concentrations were all at or below 20 micrograms per liter, which is better than in past years. 2006 phosphorus concentrations ranged from 16 to 24 ug/L.



6/7/94	25	5/12/97	7	8/4/00	15	4/16/04	12
6/7/94	27	5/12/97	13	8/4/00	15	4/16/04	13
6/7/94	20	5/12/97	12	8/4/00	16	4/16/04	17
8/1/94	43	8/25/97	61	5/13/01	34	8/2/04	22
8/1/94	25	8/25/97	74	5/13/01	28	8/2/04	22
8/1/94	33	8/25/97	36	5/13/01	40	8/2/04	25
6/19/95	12	4/19/98	10	8/1/01	16	4/18/05	12
6/19/95	10	4/19/98	8	8/1/01	22	4/18/05	10
6/19/95	11	4/19/98	10	8/1/01	19	4/18/05	11
7/31/95	13	8/10/98	16	4/15/02	8	8/3/05	17
7/31/95	15	8/10/98	14	4/15/02	11	8/3/05	16
7/31/95	14	8/10/98	16	4/15/02	9	8/3/05	20
8/14/95	13	4/25/99	19	8/2/02	16	4/19/06	21
8/14/95	11	4/25/99	23	8/2/02	17	4/19/06	20
8/14/95	21	4/25/99	26	8//2/02	17	4/19/06	19
6/9/96	13	8/27/99	22	4/28/03	17	8/1/06	18
6/9/96	28	8/27/99	17	4/28/03	16	8/1/06	16
6/9/96	19	8/27/99	16	4/28/03	18	8/1/06	24
8/7/96	31	4/15/00	36	8/1/03	14		
8/7/96	16	4/15/00	35	8/1/03	12		
8/7/96	18	4/15/00	42	8/1/03	10		

The graph of Davis Creek and Huron River phosphorus concentrations shows Davis creek has phosphorus concentrations almost fifty percent higher than the Huron River (32 ug/L average vs 23 ug/L average).



Davis Cr.		Huron R.	
6/30/05	36	6/30/05	37
7/29/05	55	7/29/05	30
8/29/05	40	8/29/05	12
9/27/05	29	9/27/05	31
10/24/05	25	10/24/05	11
11/30/05	23	11/30/05	18
12/27/05	20	12/27/05	19
1/27/06.	32	1/27/06.	38
2/28/06.	35	2/28/06.	20
3/30/06.	36	3/30/06.	21
4/19/06.	21	4/19/06.	14

SECCHI DISK TRANSPARENCY (originally Secchi's disk)

In 1865, Angelo Secchi, the Pope's astronomer in Rome, Italy devised a 20 centimeter (8 inch) white disk for studying the transparency of the water in the Mediterranean Sea. Later an American limnologist (lake scientist) named Whipple divided the disk into black and white quadrants which many are familiar with today.

The Secchi disk transparency is a lake test widely used and accepted by limnologists. The experts generally felt the greater the Secchi disk depth, the better quality the water. However, one Canadian scientist pointed out acid lakes have very deep Secchi disk readings. Most lakes in southeast Michigan have Secchi disk transparencies of less than ten feet. On the other hand, Elizabeth Lake in Oakland County had 34 foot Secchi disk readings in summer 1996, evidently caused by a zebra mussel invasion a couple of years earlier.

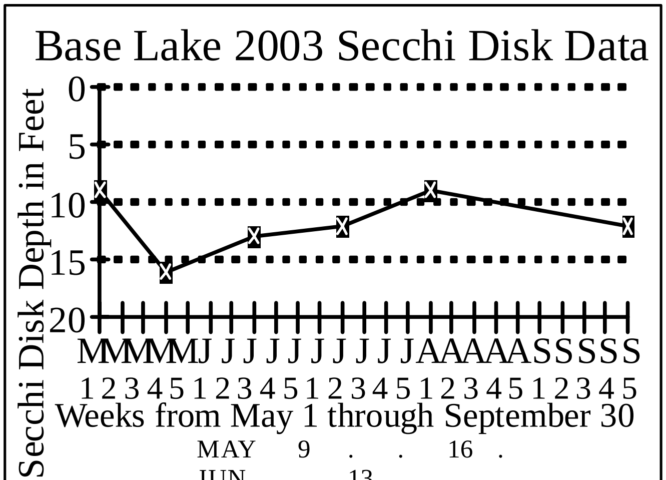
Most limnology texts recommend the following: to take a Secchi disk transparency reading, lower the disk into the water on the shaded side of an anchored boat to a point where it disappears. Then raise it to a point where it's visible. The average of these two readings is the Secchi disk transparency depth.

We do it slightly differently. We lower the disk on the shaded side of an anchored boat until the disk disappears, and note the depth, then report the depth to the next deepest foot. For example if the disk disappears at six and a half feet, we report the Secchi disk depth as 7 feet. The reason we do this is that some suggest using a water telescope (a device that works like an underwater mask and eliminates water roughness) to view the disk as it disappears. Since we don't use this device, we compensate for it by noting the slightly deeper depth.

We feel it is only necessary to report Secchi disk measurements to the closest foot. Secchi disk measurements should be taken between 10 AM and 4 PM. Rough water will give slightly shallower readings than smooth water. Sunny days will give slightly deeper readings than cloudy days. However, roughness influences the visibility of the disk more than sunny or cloudy days. Furthermore, it's been reported that most adults can see the Secchi disk disappear at about the same depth, but grand-children see it disappear 3-4 feet deeper than grand-parents.

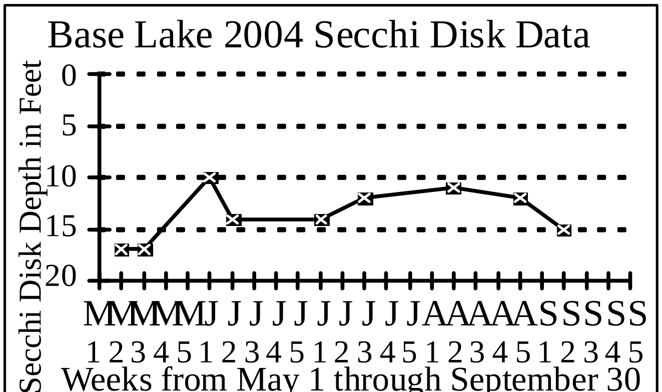
If there are sample sites where the lake is too shallow and the disk is visible when resting on the bottom, the reading should be taken at a nearby deeper site. Since the sampling procedure is designed to obtain "representative samples" moving the boat to an area where a Secchi disk transparency reading can be properly taken is appropriate. In the case of Secchi disk readings, this procedure is more valid than reporting the disk is visible on the lake bottom.

2003 BASE LAKE SECCHI DISK DATA



MAY	9	.	.	16	.
JUN.	.	13	.	.	
JUL .	12	.	.	.	
AUG	9	.	.	.	.
SEP .	.	.	.	12	

WQI limnologists collected Secchi disk data in 2003. The graph shows the data. It shows deeper (15 foot) readings in May, then shallower readings as the water warms. The shallower summer readings are probably the result of an algal bloom. The graph shows there is not a lot of difference in the water clarity between spring, summer and fall, probably due to the high flushing rate.



MAY	.	17	17	.	.
JUN	10	14	.	.	.
JUL	14	.	12	.	.
AUG	.	11	.	.	12
SEP	.	15	.	.	.

Jim Meyer collected Secchi disk data in Base Lake in 2004, 2005 and 2006.

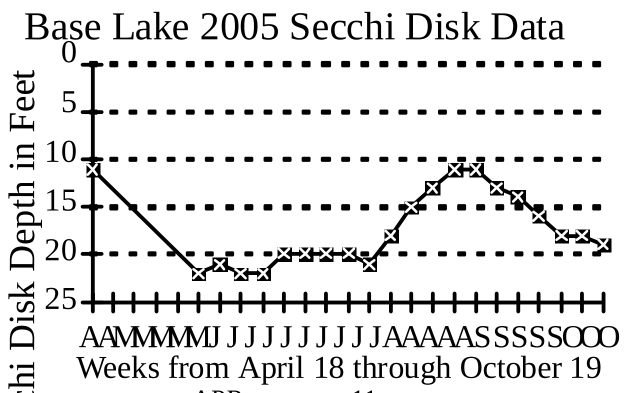
2004

Meyer's 2004 data indicated deeper Secchi disk readings in early spring (17 feet), then slightly shallower readings (10-15 feet) as the water warmed in summer.

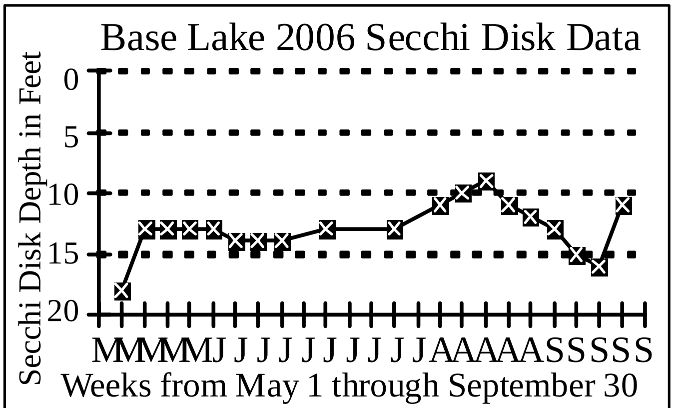
Other than the deeper spring readings, the data indicated little change through the warm months.

2005

Meyer's 2005 data were among the best so far, with the Secchi disk readings being 20 feet or deeper from the end of May to the end of July. (The 11-foot April Secchi disk reading was when WQI collected spring samples.)



APR	.	.	11	.	.
JUN	22	21	22	22	20
JUL	20	20	20	21	18
AUG	15	13	11	11	.
SEP	13	14	16	.	.
OCT	18	18	19		



MAY		.	18	13	13	13
JUN	13	14	14	14	.	
JUL	13	.	.	13	.	
AUG		11	10	9	11	12
SEP	13	15	16	11	.	

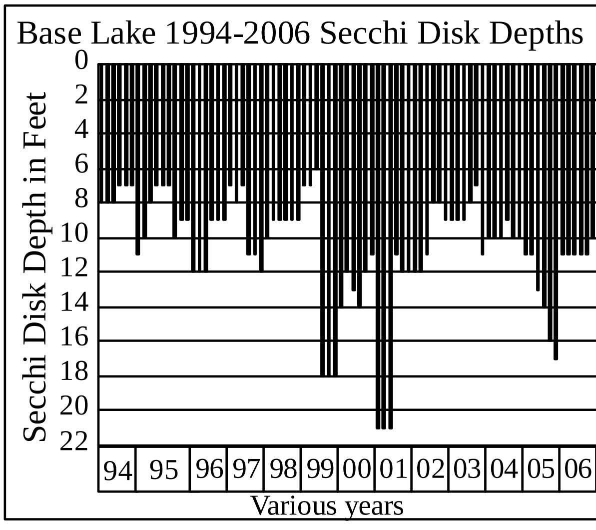
They decreased in August to 11 feet, before increasing to 18-19 feet in October.

2006

Meyer collected Secchi disk readings again in 2006. The graph of his data shows the deepest reading were in spring when WQI took the samples, 18 feet. After that water clarity readings were in the 11 to 14 foot range until mid August, when they dropped to a low of 9 feet. They then increased steadily to 16 feet in mid-September.

1994-2006 BASE LAKE SECCHI DISK READINGS COLLECTED WITH THE SAMPLES

We have Secchi disk data collected with the samples from 1994 through 2006. The

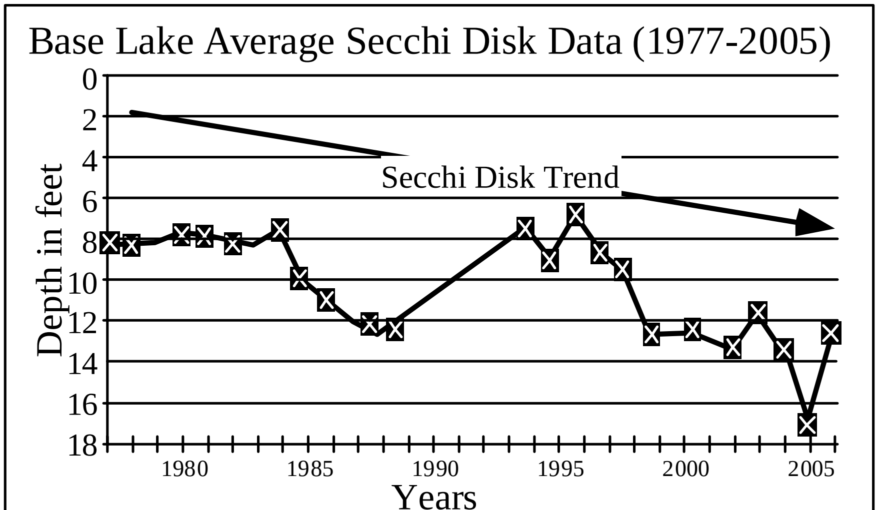


6/7/94	8	5/12/97	7	8/4/00	14	4/16/04	10
6/7/94	8	5/12/97	8	8/4/00	12	4/16/04	10
6/7/94	8	5/12/97	7	8/4/00	11	4/16/04	10
8/1/94	7	8/25/97	11	5/13/01	21	8/2/04	9
8/1/94	7	8/25/97	11	5/13/01	21	8/2/04	10
8/1/94	7	8/25/97	12	5/13/01	21	8/2/04	10
6/19/95	11	4/19/98	10	8/1/01	11	4/18/05	11
6/19/95	10	4/19/98	9	8/1/01	12	4/18/05	11
6/19/95	8	4/19/98	9	8/1/01	12	4/18/05	13
7/31/95	7	8/10/98	9	4/15/02	12	8/3/05	14
7/31/95	7	8/10/98	9	4/15/02	12	8/3/05	16
7/31/95	7	8/10/98	9	4/15/02	11	8/3/05	17
8/14/95	10	4/25/99	7	8/2/02	8	4/19/06	11
8/14/95	9	4/25/99	7	8/2/02	8	4/19/06	11
8/14/95	9	4/25/99	6	8//2/02	9	4/19/06	11
6/9/96	12	8/27/99	18	4/28/03	9	8/1/06	11
6/9/96	12	8/27/99	18	4/28/03	9	8/1/06	11
6/9/96	12	8/27/99	18	4/28/03	9	8/1/06	10
8/7/96	9	4/15/00	14	8/1/03	8		
8/7/96	9	4/15/00	12	8/1/03	7		
8/7/96	9	4/15/00	13	8/1/03	11		

graph shows those data.

The graph shows water clarity was increasing through 2001. The clarity decreased in 2002, 2003 and 2004. In 2005 it was much better. In 2006 spring and summer readings were about the same, 10 and 11 feet and not as good as 2005.

THE SECCHI DISK TREND GRAPH



Data:

1977	1979	1980	1981	1983	1984	1985	1987	1988	1994	
8.4	8.3	7.8	7.9	8.4	7.6	10.1	12.1	12.7	7.5	
1995	1996	1997	1998	1999	2001	2002	2003	2004	2005	2006
9.0	7.0	8.4	9.1	12.6	12.3	13.7	11.8	13.7	17.7	12.7

Because Base Lake residents have been taking Secchi disk readings on a regular basis since 1977 we were able to construct a Secchi disk trend graph.

The Secchi disk trend graph shows Base lake is getting clearer as the years pass, with 2005 dramatically so. 2006 average readings were not quite as good as the 2005 data, but they were still better than most years.

THE LAKE WATER QUALITY INDEX

The Lake Water Quality Index used in this study to define the water quality of Base Lake was developed for two reasons. First, there was no agreement among lake scientists regarding which tests should be used to define the water quality of lakes, and second, there was no agreement among lake scientists regarding what the results of various tests meant in terms of lake water quality.

Development of the index invoked the use of two questionnaires sent to a panel of 555 lake scientists who were members of the American Society of

Limnology and Oceanography. The panel was specifically selected because they were chemists and biologists with advanced degrees who studied lake water quality.

The first questionnaire asked the scientists to select tests which they felt should be used to define lake water quality. The tests most often selected by the panel became the index parameters (or tests). They were:

Dissolved oxygen (percent saturation)
Total phosphorus
Chlorophyll a
Secchi disk depth
Total nitrate nitrogen
Total alkalinity
Temperature
Conductivity
pH

The second questionnaire, sent out after the first was returned, asked the scientists what the results of the tests they selected as good indicators of lake water quality meant.

After the responses to the second questionnaire were returned and tabulated, the nine parameters and the accompanying rating curves were combined into a Lake Water Quality Index.

The index ranges from 1 to 100 and rates lakes about the same way professors rate students: 90-100=A, 80-90=B, 70-80=C, 60-70=D, and below 60 = E. The lake with the highest LWQI was Long Lake in Grand Traverse County, with a spring LQWI of 100. The lowest was 16 at an Ottawa County lake.

THE LAKE WATER QUALITY INDEX CALCULATION SHEETS

The Lake Water Quality Index calculation sheets which follow were developed to show graphically what the results of the nine different lake water quality tests mean in terms of lake water quality.

HOW TO READ THE LAKE WATER QUALITY INDEX CALCULATION SHEETS.

Listed across the top of the calculation sheets are the tests selected by the panel of experts as being good indicators of lake water quality. The results of the tests are entered into the square boxes immediately under the names of the tests.

The figures which look like thermometers are actually graphs which convert the test results (the numbers found outside the thermometer) to a uniform 1-100 lake water quality rating (found inside the thermometer).

The calculation sheet permits calculation of the Lake Water Quality Index, using the results of all nine lake water quality tests.

The position of the red lines across the thermometer indicates how the results of each test compare in terms of lake water quality. Test results indicating excellent water quality are indicated by red lines near the top of the thermometer. Test results indicating poor water quality are indicated by red lines lower on the thermometer. And the lower the red line on the thermometer, the greater the water quality problem. A glance at the top of the calculation sheet indicates the test and the actual test results.

The thermometer rating scales also allow you to determine what test results would be considered excellent in terms of lake water quality. They are the numbers found outside the thermometer near the top.

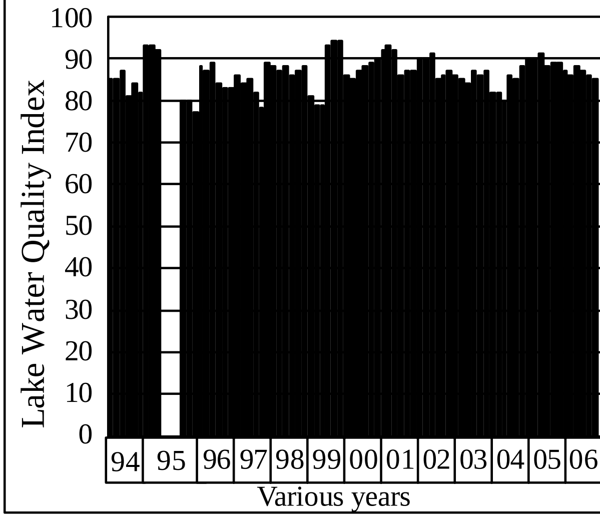
The index is shown three different ways, as a number between 1 and 100 in the circle marked LWQI, and by a color and position on the sheet edge scale. The purpose of the sheet edge scale is to review quickly large numbers of lakes or test sites within a lake, and determine how the water quality of the various lakes, or test sites within a lake compare.

THE 1994-2006 BASE LAKE WATER QUALITY INDICES

The graph shows the Lake Water Quality Indices for Base Lake ranges from a low of 77 in summer 1995 to a high of 94 in summer 1999. The graph shows the water quality varies somewhat but is generally in the 80s (B range).

There is no clear trend other than the fact that summer 1999 LWQIs (93 94 94) were the highest so far, with spring 2001 LWQIs not far behind. In 2006 spring and summer LWQIs were almost the same, ranging from 85 to 88.

Base Lake 1994-2006 Lake Water Quality Indices



6/7/94	85	5/12/97	86	8/4/00	88	4/16/04	82
6/7/94	85	5/12/97	84	8/4/00	89	4/16/04	82
6/7/94	87	5/12/97	85	8/4/00	90	4/16/04	80
8/1/94	81	8/25/97	82	5/13/01	92	8/2/04	86
8/1/94	84	8/25/97	78	5/13/01	93	8/2/04	85
8/1/94	82	8/25/97	89	5/13/01	92	8/2/04	88
6/19/95	93	4/19/98	88	8/1/01	86	4/18/05	90
6/19/95	93	4/19/98	87	8/1/01	87	4/18/05	90
6/19/95	92	4/19/98	88	8/1/01	87	4/18/05	91
7/31/95	---	8/10/98	86	4/15/02	90	8/3/05	88
7/31/95	---	8/10/98	87	4/15/02	90	8/3/05	89
7/31/95	---	8/10/98	88	4/15/02	91	8/3/05	89
8/14/95	80	4/25/99	81	8/2/02	85	4/19/06	87
8/14/95	80	4/25/99	79	8/2/02	86	4/19/06	86
8/14/95	77	4/25/99	79	8//2/02	87	4/19/06	88
6/9/96	88	8/27/99	93	4/28/03	86	8/1/06	87
6/9/96	87	8/27/99	94	4/28/03	85	8/1/06	86
6/9/96	89	8/27/99	94	4/28/03	84	8/1/06	85
8/7/96	84	4/15/00	86	8/1/03	87		
8/7/96	83	4/15/00	85	8/1/03	86		
8/7/96	83	4/15/00	87	8/1/03	87		

THE LAKE WATER QUALITY INDEX CALCULATION SHEETS

Because the 2006 Lake Water Quality Indices were relatively uniform in spring and in summer, only two Lake Water Quality Index calculation sheets are included in this report, one for the three spring 2006 surface samples, using averaged data, and a second for the three summer 2006 surface samples, using averaged data.

In the report marked MASTER, all 6 of the LWQI calculation sheets are included. That is the only difference between the MASTER and the rest of the reports.

BOTTOM SEDIMENTS

Many times bottom sediments tell us more about what is happening in a lake than the water quality tests do. That's because bottom sediments provide sort of a history of what's been happening in a lake, while water testing just provides a snapshot.

Bottom sediments are collected with a Pederson dredge, transferred to pint freezer containers and allowed to air dry. Once they are dry, the (usually) shrunken block of material is measured to determine volume, then ground, placed in porcelain dishes, dried at 100 degrees C, weighed, burned at 550 degrees C, and weighed again. Color after air-drying and after burning is also noted.

Bottom sediments almost always come up from the lake bottom black, and many people consider these black sediments “muck”. However that’s not usually the case.

The bottom sediments are black because no oxygen penetrates them, so the decomposition processes which occur use sulfur rather than oxygen, and in this process, they produce iron sulfides, which are black. However once the sediments are exposed to air, they usually turn some other color.

If the sediments remain black after air drying it usually means they are less than about 65 percent mineral (or more than 35% organic material). Sediments also remain black if they are from soft water lakes, but there’s a reason for that.

If the sediments turn gray after air drying it usually means they are made up primarily of carbonates. This is what we usually see in moderately hard water and hard water lakes.

If the sediments turn tan, it usually means they are made up primarily of clays. Further evidence of this occurs when we burn the sediments at 550 degrees C.

We determine how much bottom sediments shrink when they air dry because this information is useful when considering dredging a lake. Normal shrinkage after air-drying is in the range of 50 to 80 percent. However sands and gravels don’t shrink at all. Excessive shrinkage is more than 95 percent. In other words, there is only five percent or less of the material remaining after air-drying.

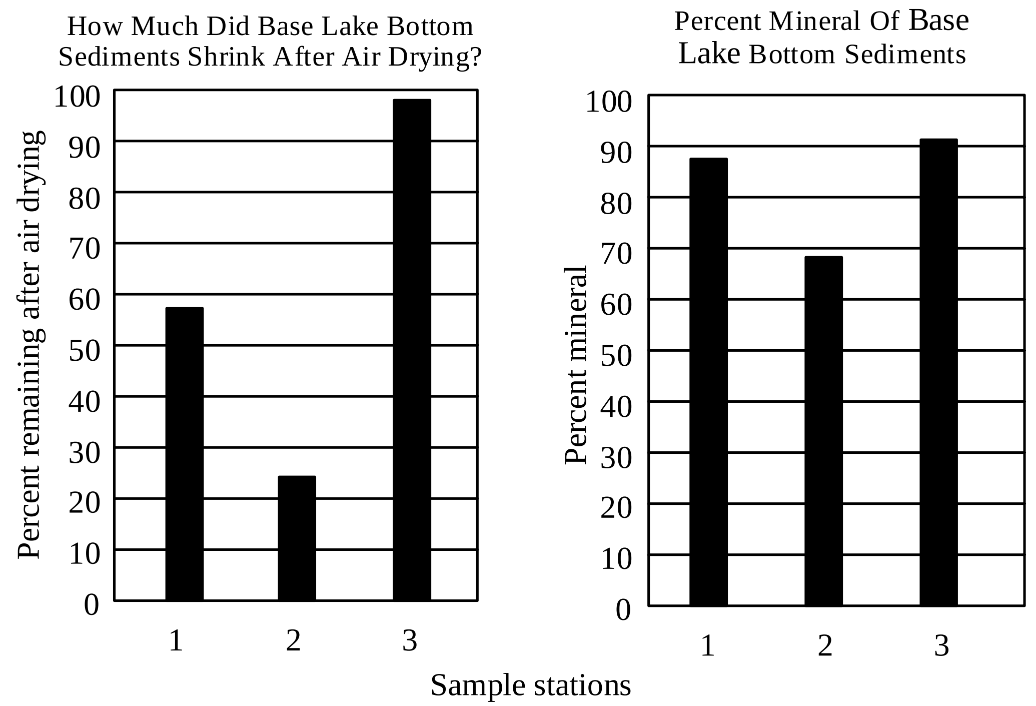
If the gray bottom sediments remain gray after burning they are considered carbonates, and the loss of material during this process is considered organic material. The results are expressed in the percentage of minerals in the bottom sediments.

If the tan bottom sediments turn red after burning, it means the lake is filling with clay. Clay enters the lake from near-lake activities such as road building, home building or farming. Usually clay is not a material that makes up the bottom sediments of most inland lakes.

Highly organic sediments that remained black after air drying usually turn tan after burning, but the mineral content is usually quite low.

I consider high quality bottom sediments from natural lakes to be above 85 percent mineral. And I consider bottom sediments less than 50 percent mineral to be muck.

BASE LAKE BOTTOM SEDIMENTS



Characteristics of Base Lake Bottom Sediments (2005)					
Sample I.D.	Percent Shrinkage	Percent Mineral	Dried at 100°C Color & Description	Color after burning at 550°C	Depth of water (feet)
1	42	88	Gray	Gray	25
2	77	69	Gray	Red	60
3	2	91	Gray	Gray	17
Average mineral content of bottom sediments = 83%.					

Bottom sediments were collected from Base Lake in spring 2005. The graph shows the data.

The sample from Station 1, collected in 25 feet of water, was black when recovered, turned gray and shrunk 42 percent after air-drying, and remained gray after burning at 550 degrees C. It was 88 percent mineral.

The sample from Station 2, collected in 60 feet of water, was black when recovered, turned gray and shrunk 77 percent after air-drying, and turned red after burning at 550 degrees C. It was 69 percent mineral.

The red color after burning indicates the presence of clay in the sediments. Clay is not a normal constituent of inland lake bottom sediments. It usually enters the lake from home or road building activities, or farming.

The sample from Station 3, collected in 17 feet of water, was black when recovered, turned gray and shrunk 2 percent after air-drying, and remained gray after burning at 550 degrees C. It was 91 percent mineral.

The mineral content of the two shallow-water sediments (88 and 91 percent) shows the effectiveness of these sediments being exposed to oxygen for much longer periods than the sediments from Station 2 in 60 feet of water. The data from Station 2 indicates, at least in the deeper water, that Base Lake is starting to accumulate organic material in the sediments at a faster than normal rate.

Wallace E. Fusilier, Ph.D.
Consulting Limnologist
Water Quality Investigators
Dexter, Michigan
May 2007

Surface Lake Water Quality Data

Date	Sample Station Number	Temperature °C	Dissolved Oxygen (mg/L)	Dissolved Oxygen Percent Saturation	Chlorophyll a ug/L	Secchi Disk Depth (feet)	Total Nitrate Nitrogen ug/L	Alkalinity mg/L	pH	Conductivity umhos per cm at 25°C	Total Phosphorus ug/L	Lake Water Quality Index	Grade
6/7/94	1	---	---	---	4.4	8	76	---	8.1	680	25	85	B
6/7/94	2	---	---	---	4.4	8	70	---	8.0	680	27	85	B
6/7/94	3	---	---	---	3.7	8	70	---	8.0	680	20	87	B
8/1/94	1	25	8.8	95	5.7	7	15	171	8.2	640	43	81	B
8/1/94	2	25	8.6	98	4.4	7	13	175	8.3	640	25	84	B
8/1/94	3	25	9.2	91	5.1	7	28	176	8.3	640	33	82	B
6/19/95	1	---	---	---	0.6	11	56	148	7.6	560	12	93	A
6/19/95	2	---	---	---	0.9	10	65	151	7.7	580	10	93	A
6/19/95	3	---	---	---	0.4	8	69	150	7.6	560	11	92	A
7/31/95	1	---	---	---	---	7	11	105	7.6	350	13	---	---
7/31/95	2	---	---	---	---	7	20	107	7.6	360	15	---	---
7/31/95	3	---	---	---	---	7	14	107	7.8	340	14	---	---
8/14/95	1	31	7.9	105	6.6	10	23	180	8.6	570	13	80	B
8/14/95	2	31	7.8	104	4.9	9	21	175	8.6	570	11	80	B
8/14/95	3	31	8.2	109	9.0	9	17	175	8.5	570	21	77	C
6/9/96	1	21	8.6	96	4.2	12	69	205	8.3	635	13	88	B
6/9/96	2	21	8.6	96	3.5	12	64	203	8.3	640	28	87	B
6/9/96	3	21	8.5	94	3.5	12	75	206	8.2	645	19	89	B
8/7/96	1	27	8.6	108	3.6	9	23	194	8.3	630	31	84	B
8/7/96	2	27	8.6	108	3.7	9	13	193	8.3	650	16	83	B
8/7/96	3	27	8.5	106	5.6	9	15	193	8.3	650	18	83	B
5/12/97	1	13	10.4	98	4.1	7	236	197	8.3	620	7	86	B
5/12/97	2	12	10.3	95	5.5	8	231	197	8.3	620	13	84	B
5/12/97	3	13	10.3	97	4.1	7	226	200	8.3	630	12	85	B
8/25/97	1	21	8.7	97	2.2	11	39	185	8.4	660	61	82	B
8/25/97	2	23	8.5	98	2.5	11	36	185	8.4	660	74	78	C
8/25/97	3	22	9.1	103	1.6	12	43	183	8.3	600	36	89	B
4/19/98	1	13	10.3	97	3.2	10	127	196	8.4	630	10	88	B
4/19/98	2	13	10.2	96	4.1	9	132	200	8.2	630	8	87	B
4/19/98	3	13	10.2	96	3.1	9	127	202	8.2	630	10	88	B
8/10/98	1	26	8.6	105	2.5	9	10	172	8.6	640	16	86	B
8/10/98	2	26	8.4	102	2.3	9	9	177	8.6	660	14	87	B
8/10/98	3	26	8.8	107	1.1	9	9	174	8.6	660	16	88	B
4/25/99	1	14	10.7	103	4.9	7	368	185	8.3	690	19	81	B
4/25/99	2	13	10.8	102	5.9	7	405	185	8.4	690	23	79	C
4/25/99	3	12	10.8	100	6.5	6	347	187	8.3	690	26	79	C
8/27/99	1	25	8.8	105	1.1	18	32	168	8.2	690	22	93	A
8/27/99	2	24	8.5	100	1.1	18	14	165	8.2	695	17	94	A
8/27/99	3	24	8.8	105	1.1	18	23	167	8.0	720	16	94	A
4/15/00	1	10	11.0	97	2.3	14	469	203	8.3	610	36	86	B
4/15/00	2	10	11.0	99	2.6	12	479	195	8.4	610	35	85	B
4/15/00	3	11	10.7	96	1.5	13	386	198	8.3	610	42	87	B
8/4/00	1	25	7.4	88	6.4	14	111	187	8.3	620	15	88	B
8/4/00	2	24	7.1	84	3.2	12	118	188	8.2	630	15	89	B
8/4/00	3	24	7.1	84	2.0	11	124	184	8.2	640	16	90	A
5/13/01	1	19	9.5	101	1.4	21	153	202	8.3	700	34	92	A
5/13/01	2	19	9.1	97	1.7	21	139	203	8.4	700	28	93	A
5/13/01	3	19	9.3	99	0.9	21	147	204	8.3	700	40	92	A
8/1/01	1	28	8.4	106	4.0	11	8	192	8.2	720	16	86	B
8/1/01	2	28	7.9	100	3.5	12	21	189	8.0	720	22	87	B
8/1/01	3	28	9.0	114	3.2	12	32	185	8.0	710	19	87	B
4/15/02	1	8	10.8	91	2.1	12	280	205	8.3	680	8	90	A
4/15/02	2	8	10.9	92	2.3	12	270	205	8.3	680	11	90	A
4/15/02	3	13	11.9	112	1.8	11	263	206	8.3	690	9	91	A
8/2/02	1	29	8.4	108	2.8	8	30	174	7.7	700	16	85	B
8/2/02	2	29	8.1	104	2.5	8	32	168	7.6	700	17	86	B
8/2/02	3	29	9.1	117	1.8	9	92	165	7.6	700	17	87	B
4/28/03	1	14	11.2	108	3.7	9	343	190	8.4	740	17	86	B
4/28/03	2	14	11.3	109	3.7	9	355	189	8.3	765	16	85	B
4/28/03	3	14	10.8	104	4.0	9	343	187	8.3	780	18	84	B
8/1/03	1	26	8.8	107	2.7	8	168	169	8.6	750	14	87	B
8/1/03	2	26	8.0	98	3.0	7	173	170	8.6	760	12	86	B
8/1/03	3	27	9.0	112	3.0	11	168	170	8.6	755	10	87	B
4/16/04	1	10	10.5	93	4.2	10	419	194	8.3	740	12	82	B
4/16/04	2	10	10.7	95	3.5	10	429	192	8.2	740	13	82	B
4/16/04	3	10	10.9	97	3.8	10	404	196	8.2	760	17	80	B
8/2/04	1	25	7.8	93	4.0	9	236	190	8.2	710	22	86	B
8/2/04	2	25	7.6	91	4.9	10	262	190	8.2	710	22	85	B
8/2/04	3	24	8.0	94	2.6	10	218	190	8.2	720	25	88	B

Surface Lake Water Quality Data

Date	Sample Station Number	Temper-ature °C	Dissolved Oxygen (mg/L)	Dissolved Oxygen Percent Satu-ration	Chloro-phyll a ug/L	Secchi Disk Depth (feet)	Total Nitrate Nitrogen ug/L	Alka-linity mg/L	pH	Conduc-tivity umhos per cm at 25°C	Total Phos-phorus ug/L	Lake Water Quality Index	Grade
4/18/05	1	15	9.3	91	2.0	11	238	200	8.2	720	12	90	A
4/18/05	2	15	9.4	92	2.3	11	224	202	8.2	720	10	90	A
4/18/05	3	15	9.5	93	1.7	13	231	202	8.2	740	11	91	A
8/3/05	1	28	8.5	92	2.3	14	137	168	8.2	760	17	88	B
8/3/05	2	28	8.5	92	2.3	16	133	170	8.2	760	16	89	B
8/3/05	3	28	8.5	92	2.0	17	146	170	8.2	760	20	89	B
4/19/06	1	13	10.0	94	3.3	11	324	185	8.1	730	21	87	B
4/19/06	2	13	10.0	94	3.6	11	333	185	8.1	730	20	86	B
4/19/06	3	13	9.9	93	2.7	11	293	185	8.1	730	19	88	B
8/1/06	1	28	8.0	101	2.9	11	116	184	8.4	740	18	87	B
8/1/06	2	29	8.5	109	3.5	11	126	186	8.5	740	16	86	B
8/1/06	3	29	8.2	105	3.0	10	147	184	8.4	740	24	85	B
6/30/05	Davis Cr.	---	---	---	---	---	7700	217	7.9	1000	36	---	---
7/29/05	Davis Cr.	---	---	---	---	---	4532	212	7.8	1090	55	---	---
8/29/05	Davis Cr.	---	---	---	---	---	3060	188	7.9	1100	40	---	---
9/27/05	Davis Cr.	---	---	---	---	---	4800	217	7.8	1100	29	---	---
10/24/05	Davis Cr.	---	---	---	---	---	4007	245	7.8	1100	25	---	---
11/30/05	Davis Cr.	---	---	---	---	---	5527	225	7.9	1100	23	---	---
12/27/05	Davis Cr.	---	---	---	---	---	5061	235	7.8	1000	20	---	---
1/27/06	Davis Cr.	---	---	---	---	---	2368	180	7.7	740	32	---	---
2/28/06	Davis Cr.	---	---	---	---	---	1632	175	7.8	1080	35	---	---
3/30/06	Davis Cr.	---	---	---	---	---	1376	179	7.8	720	36	---	---
4/19/06	Davis Cr.	---	---	---	---	---	549	196	7.9	680	21	---	---
6/30/05	Huron R.	---	---	---	---	---	581	184	8.1	780	37	---	---
7/29/05	Huron R.	---	---	---	---	---	256	180	7.9	790	30	---	---
8/29/05	Huron R.	---	---	---	---	---	160	180	8.2	760	12	---	---
9/27/05	Huron R.	---	---	---	---	---	344	180	8.0	820	31	---	---
10/24/05	Huron R.	---	---	---	---	---	55	200	8.1	880	11	---	---
11/30/05	Huron R.	---	---	---	---	---	352	200	8.1	780	18	---	---
12/27/05	Huron R.	---	---	---	---	---	470	218	8.1	820	19	---	---
1/27/06	Huron R.	---	---	---	---	---	611	200	8.0	800	38	---	---
2/28/06	Huron R.	---	---	---	---	---	726	200	8.0	1100	20	---	---
3/30/06	Huron R.	---	---	---	---	---	458	205	8.1	780	21	---	---
4/19/06	Huron R.	---	---	---	---	---	288	198	8.1	740	14	---	---