CORDLEY LAKE

HAMBURG TOWNSHIP

LIVINGSTON COUNTY

1993-2009

WATER QUALITY STUDIES

CORDLEY LAKE DATA

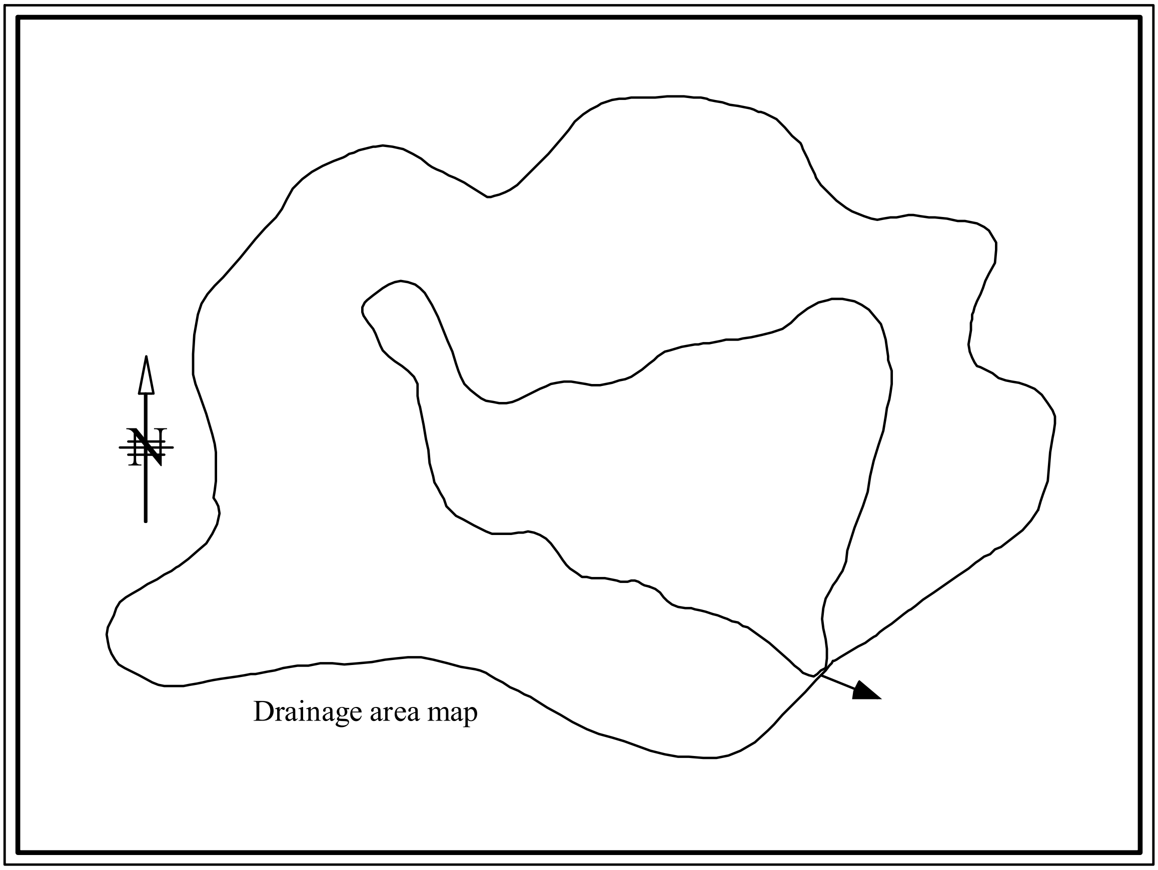
Cordley Lake is a 43-acre natural moderately hard water kettle lake located in Section 29, Hamburg Township (T1N R5E), Livingston County, Michigan. The lake has a maximum depth of 32 feet, a water volume of 563 acre-feet, and a mean depth of 13.1 feet. It has 6700 feet of shoreline. The elevation of the lake is 854 feet above sea level. There are no islands in the lake.

The lake has no visible inlets. The outlet is located on the south side of the lake. Water from Cordley Lake flows into Gallagher Lake, one of the chain of lakes along the Huron River. The Huron River flows into Lake Erie at Monroe, Michigan.

The lake was formed when a block of ice broke off the retreating glacier. Then as the glacier melted, materials from the glacier surrounded the ice block. Finally the ice block melted, forming the present lake basin. Lakes formed in this manner are called kettle lakes.

The size of the watershed, which is the land area that contributes water to the lake, but does not include the lake, is 125 acres. The drainage area, which includes the lake and the watershed, is 168 acres. See map below. The watershed to lake ratio is 2.93 to 1, which is on the low side of normal for a Michigan inland lake. Because of this low ratio, the lake flushes slowly, about once every 4.3 years, on an average.

The longitude and latitude of the 32-foot deep hole is 83° 52.398W and 42° 26.914N.



THE SAMPLE DATES

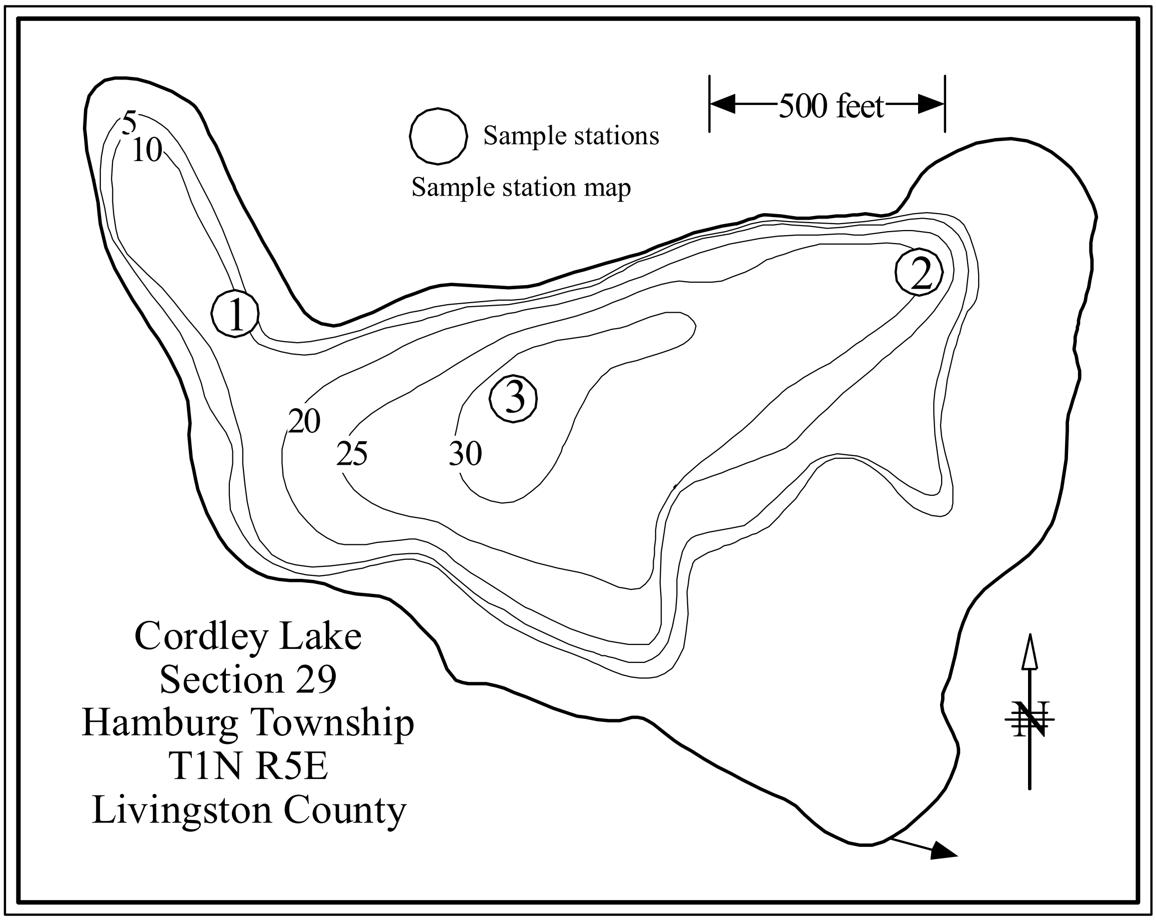
In spring Greg Morris sampled the lake every year since 1994 for water quality testing at the three surface stations shown on the map below.

In summer, WQI limnologists visited the lake every year since 1993 and sampled the same three surface stations for water quality testing. Each year, temperature and dissolved oxygen profile data were collected from the 32-foot deep hole in summer. Bottom sediment samples were collected at the three sites in summer 2000. In 2004 and 2008 additional samples for water quality testing were collected at 10, 20 and 30 feet at Station 3, the deep hole in the lake.

Greg Morris took Secchi disk readings on the lake on a regular basis 1994 through 1998. Betty Tilley collected Secchi disk readings in 2000, 2001, 2002, 2003, 2004, 2005 and 2006. Russ Hanshue took the readings in 2007 and 2008. We did not receive Secchi disk data for 2009.

THE SAMPLE STATIONS

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



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

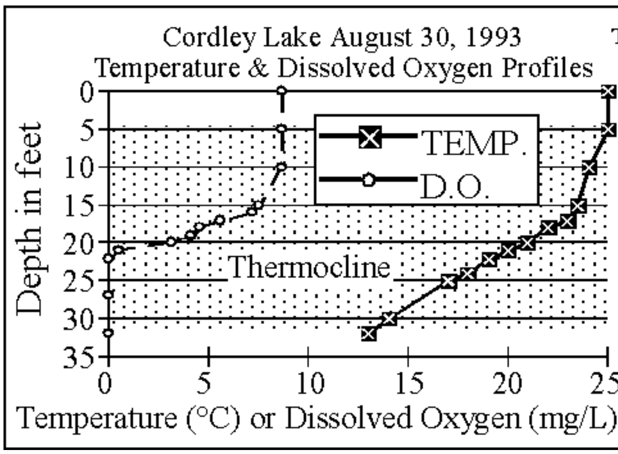
The results of the tests are found in the text, in the table at the end of this report, and on the enclosed atlas pages.

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 its importance in providing oxygen for aquatic organisms, in natural lakes, oxygen is involved the capture and release of various chemicals, such as iron and phosphorus.

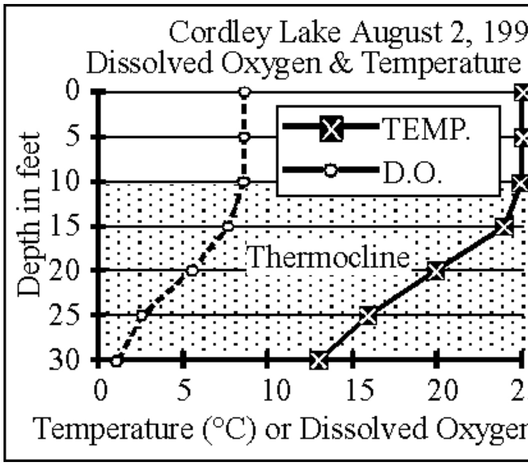
1993



Temp.	Depth	D.O.	Depth
25	0	8.7	0
25	5	8.7	5
24	10	8.7	10
23.5	15	7.5	15
23	17	7.2	16
22	18	5.6	17
21	20	4.6	18
20	21	4.1	19
19	22	3.2	20
18	24	0.5	21
17	25	0.0	22
14	30	0.0	27
13	32	0.0	32

In late summer 1993 Cordley Lake formed a 22-foot thick thermocline (defined as a layer of water in a lake where the temperature changes more than one degree C per meter of depth and shown shaded on the graphs) from 10 to 32 feet. Dissolved oxygen was plentiful above the thermocline. The lake started to lose its dissolved oxygen below ten feet. Dissolved oxygen was zero at 22 feet. That condition remained to the bottom. The hypsographic (depth-area) graph shows about 31 percent of the lake is deeper than 22 feet.

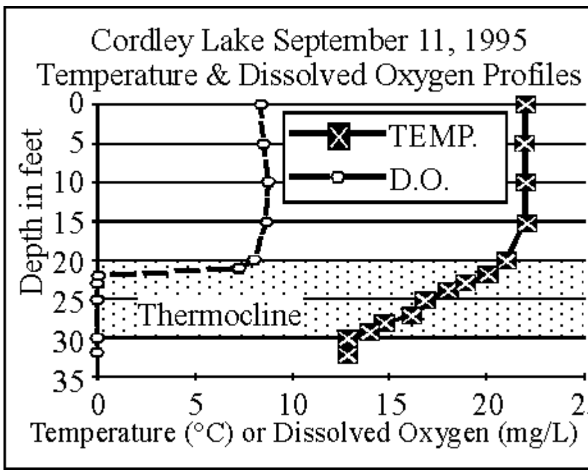
1994



Temp.	Depth	D.O.	Depth
25	0	8.6	0
25	5	8.6	5
25	10	8.6	10
24	15	7.7	15
20	20	5.5	20
16	25	2.6	25
13	30	1.2	30

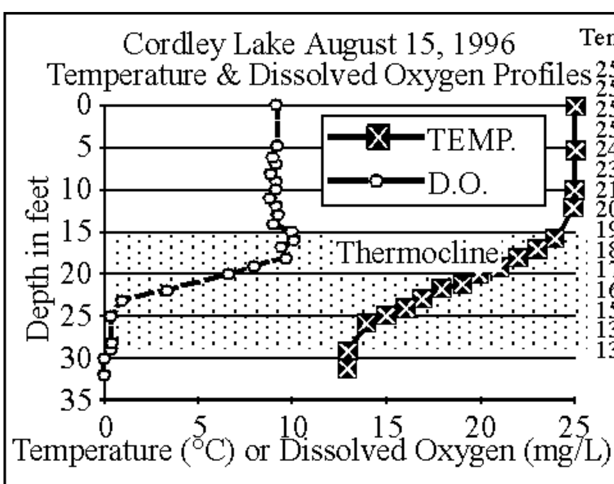
In late summer 1994 the lake formed a twenty-two-foot-thick thermocline from 10 to 32 feet (the bottom). The lake did not run out of dissolved oxygen at any depth, which is good.

1995



Temp.	Depth	D.O.	Depth
22	0	8.4	0
22	5	8.5	5
22	10	8.8	10
22	15	8.7	15
21	20	8.1	20
20	22	7.3	21
19	23	0.1	22
18	24	0.0	23
17	25	0.0	25
16	27	0.0	30
15	28	0.0	32
14	29		
13	30		
13	32		

In late summer 1995 the lake formed a 10-foot thick thermocline from 20 to 30 feet. This year the lake ran out of dissolved oxygen at 23 feet and that condition remained to the bottom. The graph shows about 26 percent of the lake is deeper than 23 feet.



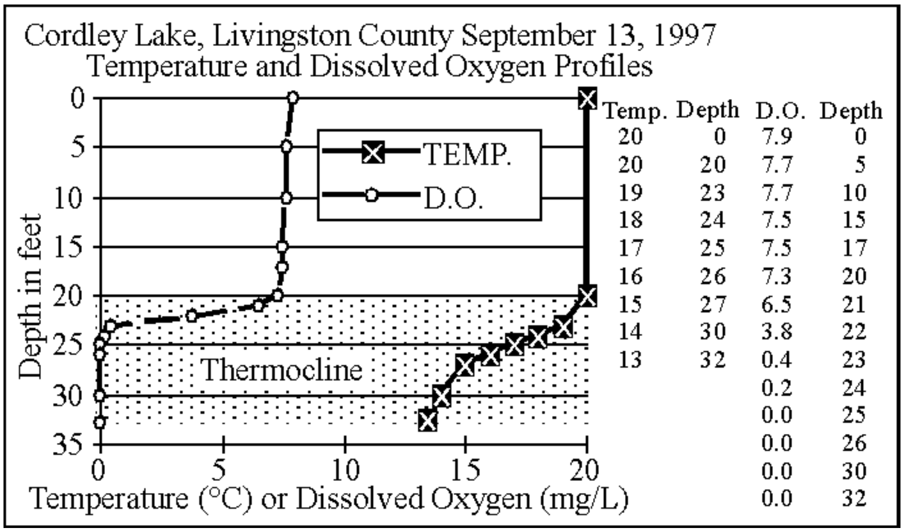
Temp.	Depth	D.O.	Depth
25	0	9.2	0
25	5	9.2	5
25	10	8.9	6
25	12	9.1	7
24	16	8.9	8
23	17	9.1	9
21	19	8.8	11
20	20	9.2	12
19	21	9.3	13
18	22	9.0	14
17	23	10.0	15
16	24	10.1	16
15	25	9.5	17
13	29	8.0	19
13	31	6.6	20
		3.3	22
		1.0	23
		0.4	28
		0.3	29
		0.0	30
		0.0	32

1996

In late summer 1996 the lake formed a 14-

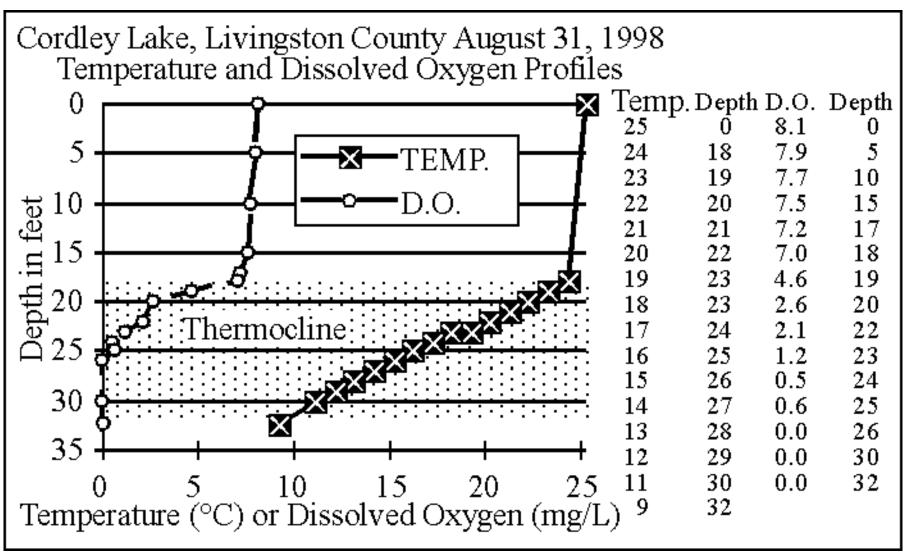
foot thick thermocline from 15 to 29 feet. Dissolved oxygen concentrations peaked at 10.1 mg/L at 16 feet. This was probably due to an algal bloom that settled there. This year the lake ran out of dissolved oxygen at 30 feet. About 4 percent of the lake is deeper than 30 feet.

1997



In late summer 1997, the lake formed a 12-foot-thick thermocline from 20 to 32 feet. The lake ran out of dissolved oxygen at 25 feet, and that condition remained to the bottom. About 22 percent of the lake is deeper than 25 feet.

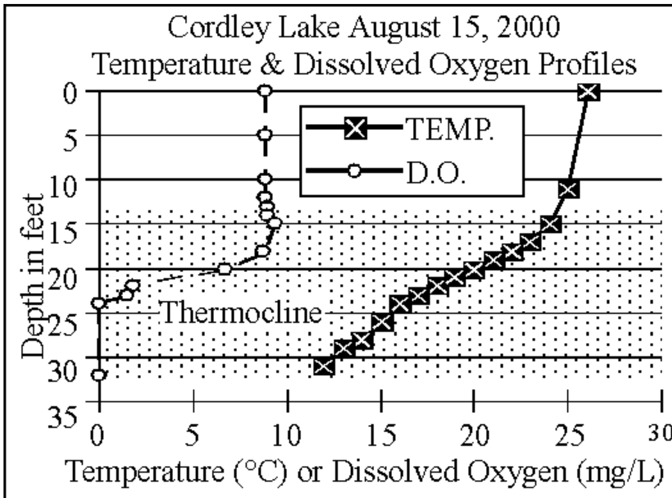
1998



In late summer 1998 the lake formed a 14-foot-thick thermocline from 18 to 32 feet. The lake ran out of dissolved oxygen at 26 feet and that condition again remained to the bottom. About 18 percent of the lake is deeper than 26 feet.

2000

In late summer 2000 the lake formed an 18-foot-thick thermocline from 14 to 32 feet. The lake ran out of dissolved oxygen at 24 feet and that condition again remained to the bottom. About 27 percent of the lake is deeper than 24 feet.



Temp.	Depth	D.O.	Depth
26	0	8.9	0
25	11	8.9	5
24	15	8.9	10
23	17	8.9	12
22	18	9.0	13
21	19	9.0	14
20	20	9.4	15
19	21	8.8	18
18	22	6.7	20
17	23	1.8	22
16	24	1.5	23
15	26	0.0	24
14	28	0.0	32
13	29		
12	31		

2001

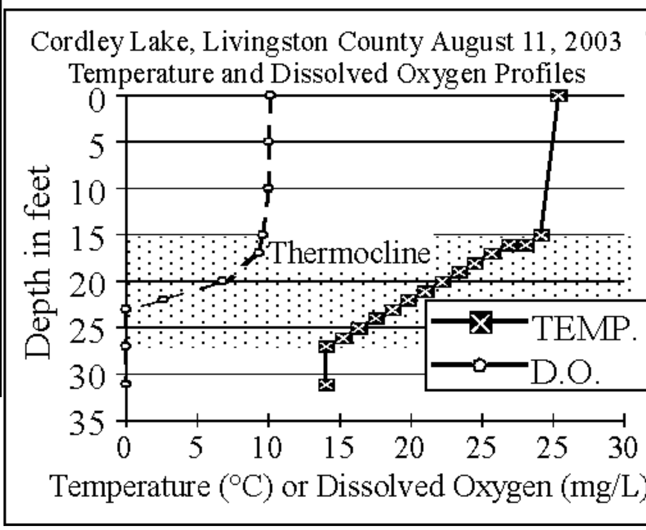
In late summer 2001 the lake formed a 17-foot-thick thermocline from 15 to 32 feet. The lake ran out of dissolved oxygen at 23 feet and that condition again remained to the bottom. About 28 percent of the lake is deeper than 23 feet.

h	D.O.	Depth
	8.9	0
	8.8	5
	8.7	10
	8.4	15
	6.1	18
	3.0	20
	1.5	21
	0.1	22
	0.0	23
	0.0	27
	0.0	32

2002

In late summer 2002, Cordley Lake formed a 17-foot thick thermocline from 15 feet to the bottom at 32 feet. In this case, dissolved oxygen concentration was a better delimiter of the top of the thermocline than temperature. This year the lake ran out of dissolved oxygen at 26 feet and that condition remained to the bottom.

epth	D.O.	Depth
0	8.5	0
10	8.5	5
19	8.5	10
20	8.3	15
21	4.7	20
22	0.6	23
23	0.4	25
24	0.0	26
25	0.0	31
26		
27		
28		
29		
30		
31		

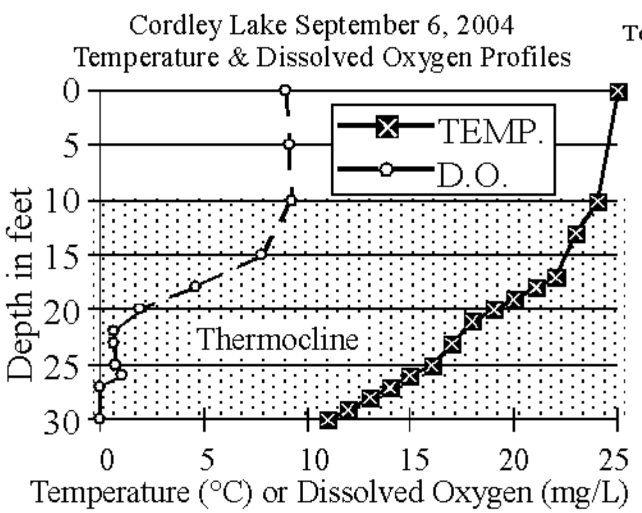


Temp.	Depth	D.O.	Depth
26	0	8.7	0
25	15	8.6	5
24	16	8.6	10
23	16	8.2	15
22	17	8.0	17
21	18	5.8	20
20	19	2.3	22
19	20	0.0	23
18	21	0.0	27
17	22	0.0	31
16	23		
15	24		
14	25		
13	26		
12	27		
12	31		

2003

In late summer 2003, Cordley Lake formed a 12-foot thick thermocline from 15 feet to 27 feet. Dissolved oxygen was plentiful in the surface water. This year the lake ran out of dissolved oxygen at 23 feet and that condition remained to the bottom.

2004



Temp.	Depth	D.O.	Depth
25	0	9.0	0
24	10	9.2	5
23	13	9.3	10
22	17	7.8	15
21	18	4.6	18
20	19	1.9	20
19	20	0.7	22
18	21	0.7	23
17	23	0.8	25
16	25	1.1	26
15	26	0.0	27
14	27	0.0	30
13	28		
12	29		
11	30		

In late summer 2004, Cordley Lake formed a 22-foot thick thermocline from 10 to 32 feet. This year the lake ran out of dissolved oxygen at 27 feet and that condition remained to the bottom.

2005

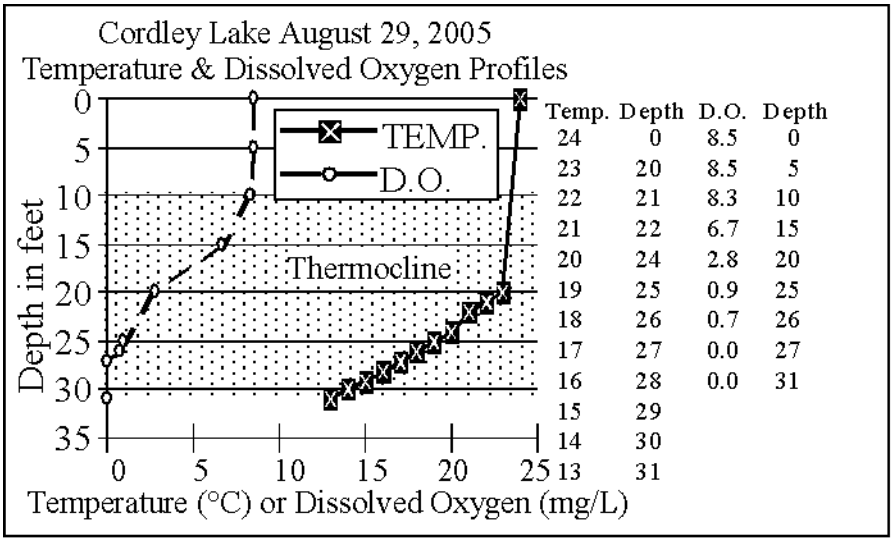
In late summer 2005 the lake again formed a 22-foot thick thermocline from 10 feet to the bottom. Dissolved oxygen was plentiful above the thermocline. The lake ran out of dissolved oxygen at 27 feet and that condition remained to the bottom.

2006

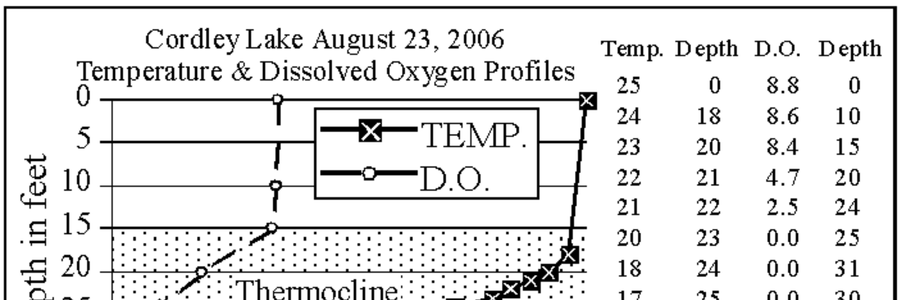
In late summer 2006 Cordley Lake formed a 15-foot thick thermocline from 15 to 30 feet. Dissolved oxygen concentrations were plentiful above the thermocline. At 15 feet, the top of the thermocline, the dissolved oxygen concentration started to decrease. It was zero at 25 feet and that condition remained to the bottom.

2007

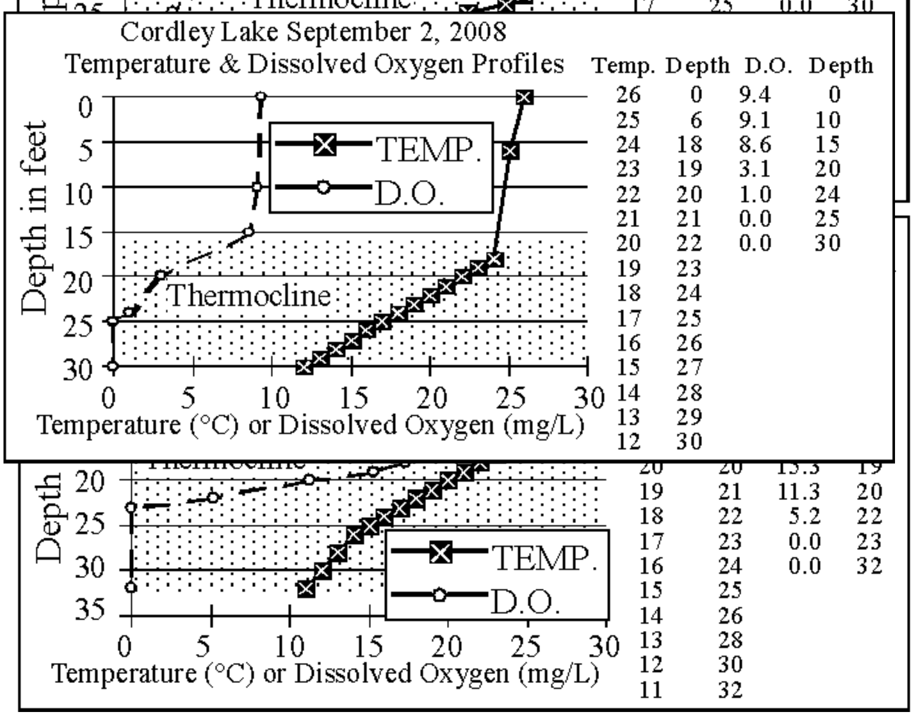
In late summer 2007 Cordley Lake formed a 22 foot thick thermocline from 10 to 32 feet. Dissolved oxygen was plentiful above 22 feet, partly because a dissolved oxygen maximum occurred in the thermocline at 17 feet,



Temp.	Depth	D.O.	Depth
24	0	8.5	0
23	20	8.5	5
22	21	8.3	10
21	22	6.7	15
20	24	2.8	20
19	25	0.9	25
18	26	0.7	26
17	27	0.0	27
16	28	0.0	31
15	29		
14	30		
13	31		



Temp.	Depth	D.O.	Depth
25	0	8.8	0
24	18	8.6	10
23	20	8.4	15
22	21	4.7	20
21	22	2.5	24
20	23	0.0	25
18	24	0.0	31
17	25	0.0	30
[illegible]	[illegible]	[illegible]	[illegible]
19	21	11.3	20
18	22	5.2	22
17	23	0.0	23
16	24	0.0	32
15	25		
14	26		
13	28		
12	30		
11	32		



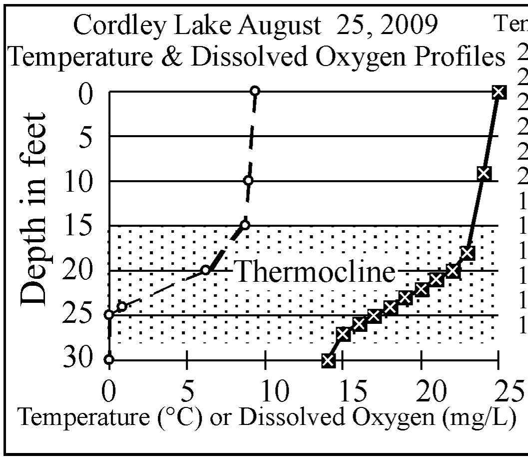
Temp.	Depth	D.O.	Depth
26	0	9.4	0
25	6	9.1	10
24	18	8.6	15
23	19	3.1	20
22	20	1.0	24
21	21	0.0	25
20	22	0.0	30
19	23		
18	24		
17	25		
16	26		
15	27		
14	28		
13	29		
12	30		

probably the result of an algal bloom which settled there. Below 17 feet, dissolved oxygen concentrations declined and were zero at 23 feet. That condition remained to the bottom.

2008

In late summer 2008 the lake formed a 15-foot thick thermocline from fifteen feet to the bottom. Dissolved oxygen concentrations were adequate above 15 feet and started to decrease below that depth. It was zero at 25 feet, and that condition remained to the bottom. About 22 percent of the lake is deeper than 25 feet.

2009



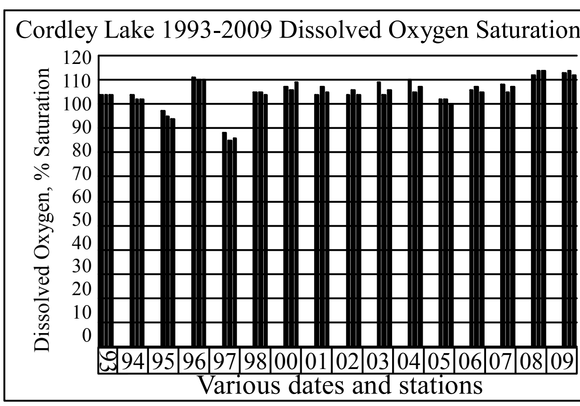
Temp.	Depth	D.O.	Depth
25	0	9.4	0
24	9	9.0	10
23	18	8.8	15
22	20	6.2	20
21	21	0.8	24
20	22	0.0	25
19	23	0.0	30
18	24		
17	25		
16	26		
15	27		
14	30		

In late summer 2009 the lake formed a 15-foot thick thermocline from 15 feet to the bottom. Dissolved oxygen concentrations were adequate above 15 feet and started to decrease below that depth. It was zero at 25 feet, and that condition remained to the bottom.

The temperature and dissolved oxygen data shows in summer the lake generally forms a 10 to 20-foot-thick thermocline starting 10 to 20 feet. When the lake runs out of dissolved oxygen in the bottom water in late summer, it generally runs out low in the thermocline at about 25 feet. Most of the time in late summer, about 25 percent of the deep area of the lake has no dissolved oxygen in the water at the bottom.

DISSOLVED OXYGEN, PERCENT SATURATION

Since the amount of dissolved oxygen a water can hold is temperature dependent, with cold water holding more dissolved oxygen than warm water, the percent saturation of dissolved oxygen is often a better way to determine if dissolved oxygen supplies are adequate. Best is between 90 and 110 percent saturation.



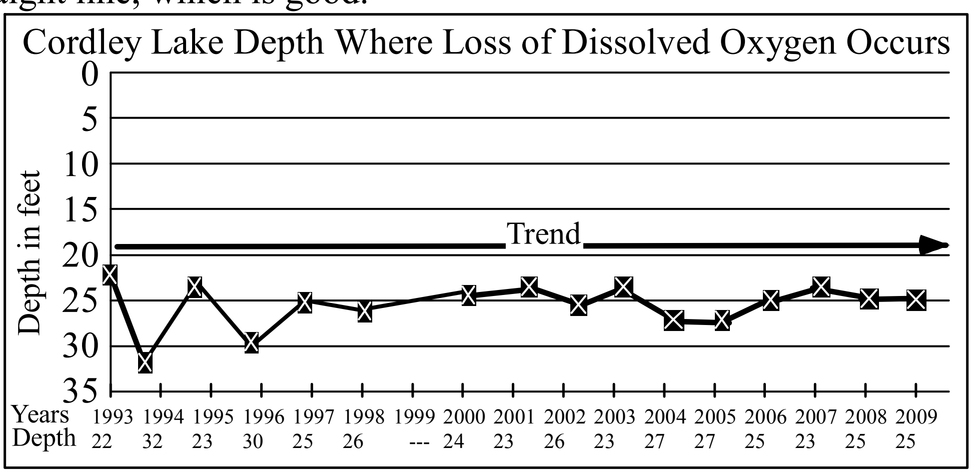
8/29/93	104	8/14/96	110	5/1/01	---	9/6/04	110	8/16/07	107
8/29/93	104	4/14/97	---	5/1/01	---	9/6/04	105	5/5/08	---
8/29/93	104	4/14/97	---	8/27/01	104	9/6/04	107	5/5/08	---
4/24/94	---	4/14/97	---	8/27/01	107	4/19/05	---	5/5/08	---
4/24/94	---	9/12/97	88	8/27/01	105	4/19/05	---	9/2/08	112
4/24/94	---	9/12/97	85	4/16/02	---	4/19/05	---	9/2/08	114
8/1/94	104	9/12/97	86	4/16/02	---	8/29/05	102	9/2/08	114
8/1/94	102	4/5/98	---	4/16/02	---	8/29/05	102	4/17/09	---
8/1/94	102	4/5/98	---	8/27/02	104	8/29/05	100	4/17/09	---
4/24/95	---	4/5/98	---	8/27/02	106	4/19/06	---	4/17/09	---
4/24/95	---	8/30/98	105	8/27/02	104	4/19/06	---	8/25/09	113
4/24/95	---	8/30/98	105	4/16/03	---	4/19/06	---	8/25/09	114
9/10/95	97	8/30/98	104	4/16/03	---	8/23/06	106	8/25/09	112
9/10/95	95	4/24/00	---	4/16/03	---	8/23/06	107		
9/10/95	94	4/24/00	---	8/11/03	109	8/23/06	105		
5/6/96	---	4/24/00	---	8/11/03	104	4/22/07	---		
5/6/96	---	8/15/00	107	8/11/03	106	4/22/07	---		
5/6/96	---	8/15/00	106	4/18/04	---	4/22/07	---		
8/14/96	111	8/15/00	109	4/18/04	---	8/16/07	108		
8/14/96	110	5/1/01	---	4/18/04	---	8/16/07	105		

The dissolved oxygen saturation graph shows summer dissolved oxygen saturations range from 85 to 114 percent, but most of the time they are between 90 and 110 percent, which is good. (Spring dissolved oxygen concentrations and temperatures were not measured.) The cause of the low saturation values in summer 1997 is unknown. And for some reason, saturation values were higher than normal in both 2008 and 2009.

DEPTHS AT WHICH THE LAKE RUNS OUT OF DISSOLVED OXYGEN

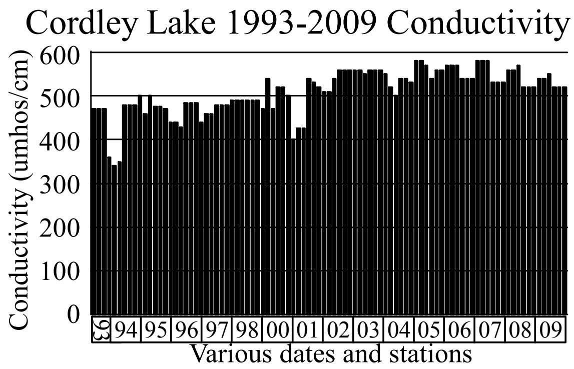
One of the measures of how a lake is doing is the depth it runs out of dissolved oxygen in late summer. Generally the higher in the water column this occurs the worse it is.

The graph shows the depth Cordley Lake runs out of dissolved oxygen each year in late summer. The graph shows since 1997, this is essentially a straight line, which is good.



CONDUCTIVITY

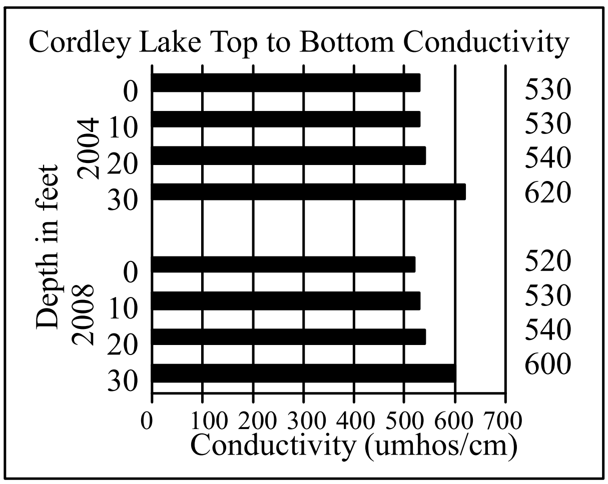
Conductivity, measured with a meter, detects the capacity of a water to conduct an electric current. More importantly however, it measures the amount of materials dissolved in the water (salts), since only dissolved materials will permit an electric current to flow. Theoretically, pure water will not 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.



8/29/93	470	8/14/96	485	5/1/01	425	9/6/04	540	8/16/07	530
8/29/93	470	4/14/97	440	5/1/01	425	9/6/04	540	5/5/08	560
8/29/93	470	4/14/97	460	8/27/01	540	9/6/04	530	5/5/08	560
4/24/94	360	4/14/97	460	8/27/01	530	4/19/05	580	5/5/08	570
4/24/94	340	9/12/97	480	8/27/01	520	4/19/05	580	9/2/08	520
4/24/94	350	9/12/97	480	4/16/02	510	4/19/05	570	9/2/08	520
8/1/94	480	9/12/97	480	4/16/02	510	8/29/05	540	9/2/08	520
8/1/94	480	4/5/98	490	4/16/02	540	8/29/05	560	4/17/09	540
8/1/94	480	4/5/98	490	8/27/02	560	8/29/05	560	4/17/09	540
4/24/95	500	4/5/98	490	8/27/02	560	4/19/06	570	4/17/09	550
4/24/95	460	8/30/98	490	8/27/02	560	4/19/06	570	8/25/09	520
4/24/95	500	8/30/98	490	4/16/03	560	4/19/06	570	8/25/09	520
9/10/95	475	8/30/98	490	4/16/03	560	8/23/06	540	8/25/09	520
9/10/95	475	4/24/00	470	4/16/03	550	8/23/06	540		
9/10/95	470	4/24/00	540	8/11/03	560	8/23/06	540		
5/6/96	440	4/24/00	470	8/11/03	560	4/22/07	580		
5/6/96	440	8/15/00	520	8/11/03	560	4/22/07	580		
5/6/96	430	8/15/00	520	4/18/04	550	4/22/07	580		
8/14/96	485	8/15/00	500	4/18/04	520	8/16/07	530		
8/14/96	485	5/1/01	400	4/18/04	500	8/16/07	530		

The graph shows the surface conductivity of Cordley Lake ranges from 340 to 580 micromhos per centimeter. The conductivity values over 500 are in the high normal range for a Michigan inland lake. The graph appears to show conductivites were increasing through 2006. Since then they appear to be decreasing. If this is really the case, it's a plus.

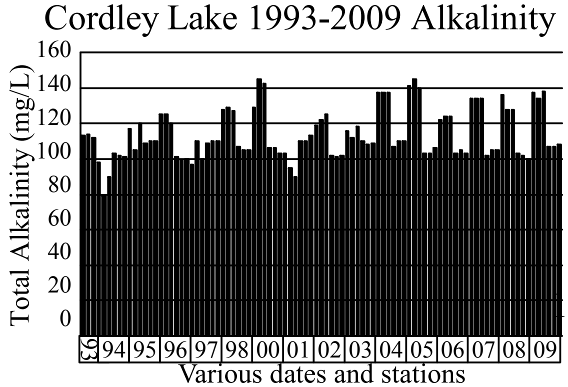
TOP TO BOTTOM CONDUCTIVITIES



The graph of late summer top to bottom conductivities shows salt concentrations are higher near the bottom. This is what we normally find and is probably the result of increased solubility with depth.

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.



8/29/93	113	8/14/96	100	5/1/01	95	9/6/04	107	8/16/07	105
8/29/93	114	4/14/97	97	5/1/01	90	9/6/04	110	5/5/08	136
8/29/93	112	4/14/97	110	8/27/01	110	9/6/04	110	5/5/08	128
4/24/94	98	4/14/97	100	8/27/01	110	4/19/05	141	5/5/08	128
4/24/94	79	9/12/97	109	8/27/01	113	4/19/05	145	9/2/08	103
4/24/94	90	9/12/97	110	4/16/02	119	4/19/05	140	9/2/08	102
8/1/94	103	9/12/97	110	4/16/02	122	8/29/05	103	9/2/08	100
8/1/94	102	4/5/98	128	4/16/02	125	8/29/05	103	4/17/09	137
8/1/94	101	4/5/98	129	8/27/02	102	8/29/05	106	4/17/09	134
4/24/95	117	4/5/98	127	8/27/02	101	4/19/06	122	4/17/09	138
4/24/95	105	8/30/98	107	8/27/02	102	4/19/06	124	8/25/09	107
4/24/95	120	8/30/98	105	4/16/03	116	4/19/06	124	8/25/09	107
9/10/95	109	8/30/98	105	4/16/03	112	8/23/06	103	8/25/09	108
9/10/95	110	4/24/00	129	4/16/03	118	8/23/06	105		
9/10/95	110	4/24/00	145	8/11/03	110	8/23/06	103		
5/6/96	125	4/24/00	142	8/11/03	108	4/22/07	134		
5/6/96	125	8/15/00	106	8/11/03	109	4/22/07	134		
5/6/96	120	8/15/00	106	4/18/04	137	4/22/07	134		
8/14/96	101	8/15/00	103	4/18/04	137	8/16/07	102		
8/14/96	99	5/1/01	103	4/18/04	137	8/16/07	105		

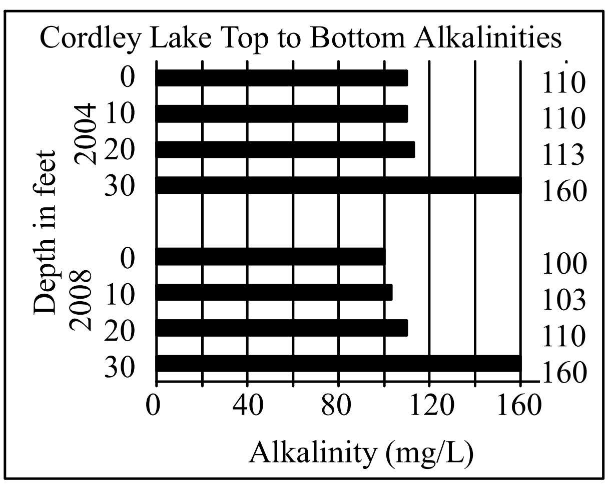
The graph of 1993 through 2009 Cordley Lake surface alkalinity concentrations shows three things.

First, in later years summer alkalinities are generally lower than spring alkalinities. That's normal because surface layer carbonates and bicarbonates precipitate to the bottom sediments as the water warms in summer.

Second, the alkalinity in Cordley Lake ranges from about 79 to 145 milligrams per liter in spring, and from 100 to 114 milligrams per liter in summer. These data indicate Cordley Lake is a moderately hard water lake.

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. When this occurs, that phosphorus is pretty well tied up in the sediments.

And third, the graph shows spring alkalinities are a lot more variable than summer alkalinities. The graph does not show alkalinities are changing as years pass.

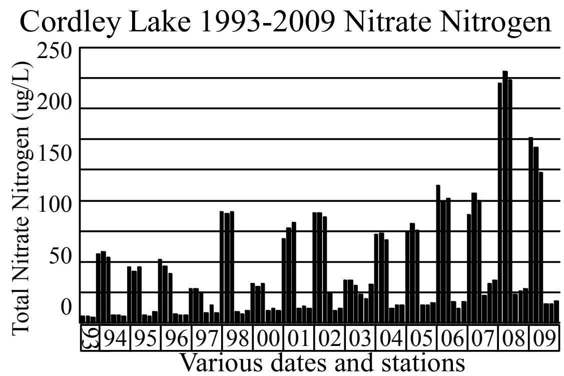


TOP TO BOTTOM ALKALINITIES

The graph shows both the 2004 and 2009 late summer data. It shows alkalinity increases near the bottom both years. This is normal, and is indicates carbonates and bicarbonates are precipitating to the bottom sediments during the warm months.

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.

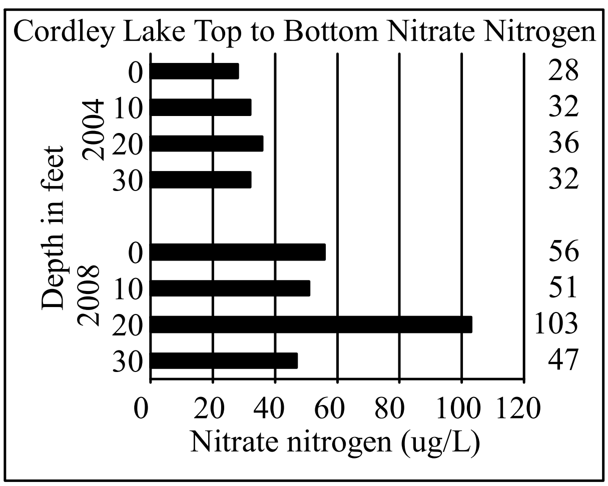


8/29/93	11	8/14/96	12	5/1/01	155	9/6/04	24	8/16/07	70
8/29/93	10	4/14/97	55	5/1/01	163	9/6/04	28	5/5/08	391
8/29/93	9	4/14/97	55	8/27/01	23	9/6/04	28	5/5/08	411
4/24/94	112	4/14/97	49	8/27/01	27	4/19/05	147	5/5/08	396
4/24/94	115	9/12/97	16	8/27/01	23	4/19/05	162	9/2/08	47
4/24/94	107	9/12/97	28	4/16/02	179	4/19/05	151	9/2/08	51
8/1/94	12	9/12/97	16	4/16/02	179	8/29/05	28	9/2/08	56
8/1/94	12	4/5/98	182	4/16/02	172	8/29/05	28	4/17/09	303
8/1/94	11	4/5/98	177	8/27/02	48	8/29/05	32	4/17/09	287
4/24/95	91	4/5/98	182	8/27/02	20	4/19/06	225	4/17/09	245
4/24/95	84	8/30/98	18	8/27/02	24	4/19/06	198	8/25/09	30
4/24/95	91	8/30/98	14	4/16/03	69	4/19/06	203	8/25/09	30
9/10/95	13	8/30/98	19	4/16/03	69	8/23/06	34	8/25/09	36
9/10/95	11	4/24/00	64	4/16/03	60	8/23/06	24		
9/10/95	17	4/24/00	59	8/11/03	46	8/23/06	34		
5/6/96	104	4/24/00	64	8/11/03	40	4/22/07	176		
5/6/96	93	8/15/00	19	8/11/03	63	4/22/07	211		
5/6/96	80	8/15/00	23	4/18/04	144	4/22/07	200		
8/14/96	14	8/15/00	19	4/18/04	145	8/16/07	45		
8/14/96	13	5/1/01	137	4/18/04	136	8/16/07	64		

The graph shows the 1993 through 2009 nitrate nitrogen data. Spring nitrate nitrogen concentrations were within normal ranges (49-225 micrograms per liter) for a Michigan inland lake.

Summer nitrate nitrogen concentrations were low (range = 9-70 micrograms per liter) but normal almost every year the lake was tested.

LATE SUMMER TOP TO BOTTOM NITRATES



In 2004 the data shows late summer top to bottom nitrate concentrations were the same as the surface concentrations. In 2008 the data shows an increase in nitrates at 20 feet. Both the 2004 and 2008 data are normal although they show more dissolved oxygen was available in 2008 at 20 feet than in 2004. The reason is the higher level of nitrates in 2008, which indicates dissolved oxygen concentrations were adequate for bacterial decomposition processes at 20 feet so the bacteria did not need to break down the nitrates to get additional oxygen.

The lake appears to be nitrogen limited in summer, so any nitrogen added to the lake during the year is not recommended. Fertilizers containing either nitrogen or phosphorus should not be used on lawns near (within 400 feet of) the lake.

pH (Hydrogen ion concentration) (No graph)

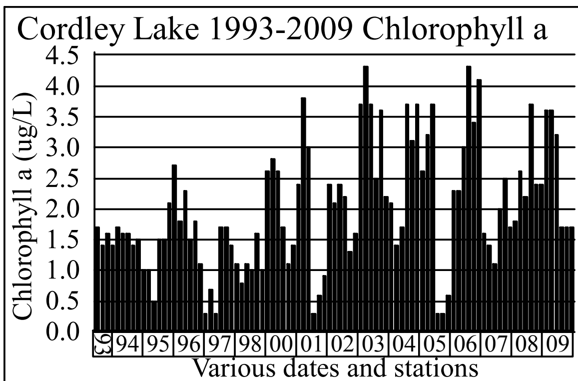
pH has traditionally been a measure of water quality. Today it is an excellent indicator of the effects of acid rain on lakes. About 99% of the rain events in southeastern Michigan are below a pH of 5.6 and are thus considered acid. However, there seems to be no lakes in southern Michigan which are being affected by acid rain. Most lakes have pH values between 7.5 and 9.0.

Cordley Lake pH values ranged between 7.5 and 8.7. These are normal values for a good quality southeast Michigan inland lake.

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.

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.



8/29/93	1.7	8/14/96	1.1	5/1/01	3.8	9/6/04	3.7	8/16/07	1.7
8/29/93	1.4	4/14/97	0.3	5/1/01	3.0	9/6/04	3.1	5/5/08	1.8
8/29/93	1.6	4/14/97	0.7	8/27/01	0.3	9/6/04	3.7	5/5/08	2.6
4/24/94	1.4	4/14/97	0.3	8/27/01	0.6	4/19/05	2.6	5/5/08	2.2
4/24/94	1.7	9/12/97	1.7	8/27/01	0.9	4/19/05	3.2	9/2/08	3.7
4/24/94	1.6	9/12/97	1.7	4/16/02	2.4	4/19/05	3.7	9/2/08	2.4
8/1/94	1.6	9/12/97	1.4	4/16/02	2.1	8/29/05	0.3	9/2/08	2.4
8/1/94	1.4	4/5/98	1.1	4/16/02	2.4	8/29/05	0.3	4/17/09	3.6
8/1/94	1.5	4/5/98	0.8	8/27/02	2.2	8/29/05	0.6	4/17/09	3.6
4/24/95	1.0	4/5/98	1.1	8/27/02	1.3	4/19/06	2.3	4/17/09	3.2
4/24/95	1.0	8/30/98	1.0	8/27/02	1.6	4/19/06	2.3	8/25/09	1.7
4/24/95	0.5	8/30/98	1.6	4/16/03	3.7	4/19/06	3.0	8/25/09	1.7
9/10/95	1.5	8/30/98	1.0	4/16/03	4.3	8/23/06	4.3	8/25/09	1.7
9/10/95	1.5	4/24/00	2.6	4/16/03	3.7	8/23/06	3.4		
9/10/95	2.1	4/24/00	2.8	8/11/03	2.5	8/23/06	4.1		
5/6/96	2.7	4/24/00	2.6	8/11/03	3.6	4/22/07	1.6		
5/6/96	1.8	8/15/00	1.7	8/11/03	2.2	4/22/07	1.4		
5/6/96	2.3	8/15/00	1.1	4/18/04	2.1	4/22/07	1.1		
8/14/96	1.5	8/15/00	1.4	4/18/04	1.4	8/16/07	2.0		
8/14/96	1.8	5/1/01	2.4	4/18/04	1.7	8/16/07	2.5		

The graph shows in earlier years, Cordley Lake chlorophyll a concentrations were low in both spring and summer. The graph shows in later years, chlorophylls increased. Spring values started increasing earlier than summer values. Now they are about the same.

In 2005 spring chlorophylls were high but summer chlorophylls were low.

In 2006 spring chlorophylls ranged from 2.3 to 3.0 ug/L while in summer they ranged from 3.1 to 4.3 ug/L.

In 2007 spring chlorophylls ranged from 1.1 to 1.6 ug/L while summer values were a bit higher, ranging from 1.7 to 2.5 ug/L.

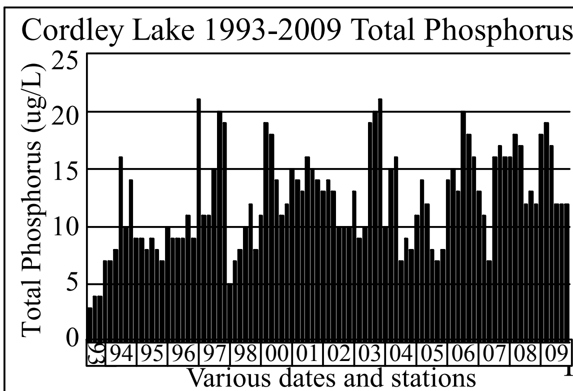
In 2008 spring values ranged from 1.8 to 2.6 ug/L while summer values were higher, ranging from 2.4 to 3.7 ug/L.

In 2009 spring values were 3.2or 3.6 ug/L while summer values were lower by about half, 1.7 ug/L at all three stations.
The graph shows chlorophyll a in Cordley Lake is generally increasing. This is not a plus. Residents need to quit using lawn fertilizers.

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 (1 part per billion is one second in 31 years) 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 often 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 a high value in a lake by many limnologists.

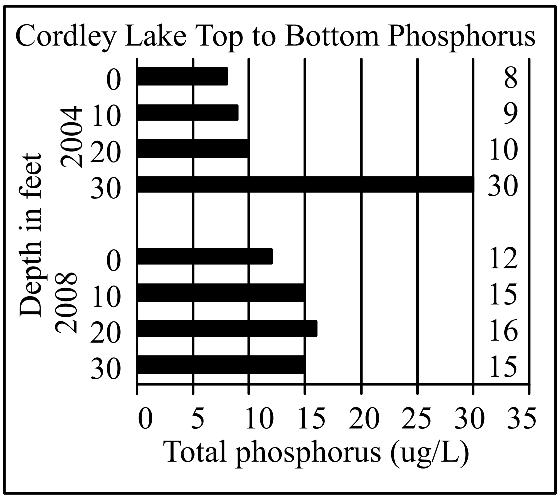


8/29/93	3	8/14/96	9	5/1/01	14	9/6/04	7	8/16/07	16
8/29/93	4	4/14/97	21	5/1/01	13	9/6/04	9	5/5/08	16
8/29/93	4	4/14/97	11	8/27/01	16	9/6/04	8	5/5/08	18
4/24/94	7	4/14/97	11	8/27/01	15	4/19/05	11	5/5/08	17
4/24/94	7	9/12/97	15	8/27/01	14	4/19/05	14	9/2/08	12
4/24/94	8	9/12/97	20	4/16/02	13	4/19/05	12	9/2/08	13
8/1/94	16	9/12/97	19	4/16/02	14	8/29/05	8	9/2/08	12
8/1/94	10	4/5/98	5	4/16/02	13	8/29/05	7	4/17/09	18
8/1/94	14	4/5/98	7	8/27/02	10	8/29/05	8	4/17/09	19
4/24/95	9	4/5/98	8	8/27/02	10	4/19/06	14	4/17/09	17
4/24/95	9	8/30/98	10	8/27/02	10	4/19/06	15	8/25/09	12
4/24/95	8	8/30/98	12	4/16/03	13	4/19/06	13	8/25/09	12
9/10/95	9	8/30/98	8	4/16/03	9	8/23/06	20	8/25/09	12
9/10/95	8	4/24/00	11	4/16/03	10	8/23/06	18		
9/10/95	7	4/24/00	19	8/11/03	19	8/23/06	16		
5/6/96	10	4/24/00	18	8/11/03	20	4/22/07	13		
5/6/96	9	8/15/00	14	8/11/03	21	4/22/07	11		
5/6/96	9	8/15/00	11	4/18/04	10	4/22/07	7		
8/14/96	9	8/15/00	12	4/18/04	15	8/16/07	16		
8/14/96	11	5/1/01	15	4/18/04	16	8/16/07	17		

The graph shows Cordley Lake in the past had phosphorus concentrations in the 10 micrograms per liter range (or less). Best is below 10 micrograms per liter. The graph seems to show phosphorus concentrations are increasing in spring. 2009 spring phosphorus concentrations ranged from 17 to 19 ug/L while summer values were lower, 12 ug/L at all three stations.

1993-2009 spring phosphorus concentrations average 12 ug/L while summer values average 13 ug/L.

TOP TO BOTTOM PHOSPHORUS



The top to bottom graph show higher phosphorus concentrations near the bottom in 2004. This is normal, and is the result of phosphorus being released from the bottom sediments during anoxic periods. The amount being released is not great.

In 2008 the graph does not show that phosphorus was released from the bottom sediments in late summer.

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.

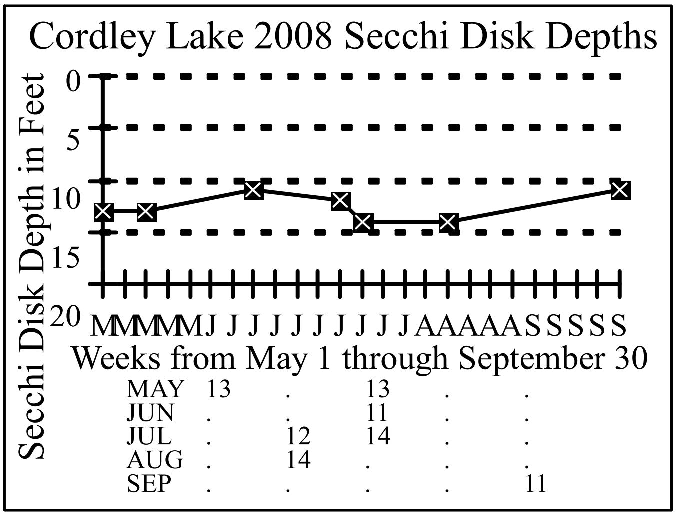
We do it slightly differently. We lower the disk on the shaded side of an anchored boat until the disk disappears, and note the depth, then report the depth to the next deepest foot. For example if the disk disappears at six and a half feet, we report the Secchi disk depth as 7 feet. The reason we do 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.

2008 CORDLEY LAKE SECCHI DISK DATA

We received Secchi disk data for Cordley Lake every year since 1994. Data from earlier years are shown on the attached atlas pages.



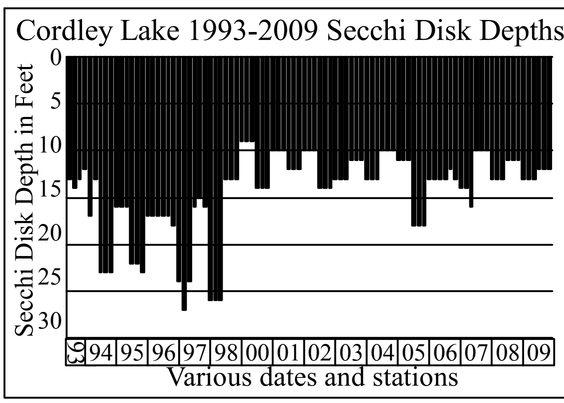
In 2008 Russ Hanshue did a good job taking Secchi disk readings through the warm months.

The graph shows the 2008 Secchi Disk data. Generally the 2008 Secchi disk data show the clarity of the lake was in the range of 11 to 14 feet all summer long, indicating the clarity of the lake didn't change much as the lake warmed from spring to summer.

We did not receive Secchi disk data for Cordley Lake in 2009.

Secchi disk readings should continue being taken regularly on a weekly basis through the warm months to follow what is happening in the lake.

SECCHI DISK DATA COLLECTED WITH WATER SAMPLES

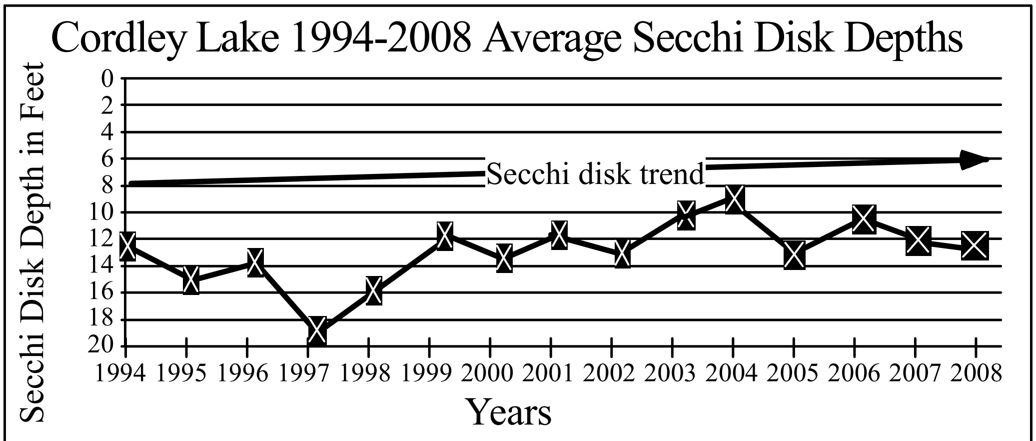


8/29/93	13	8/14/96	18	5/1/01	10	9/6/04	10	8/16/07	10
8/29/93	14	4/14/97	24	5/1/01	10	9/6/04	10	5/5/08	13
8/29/93	13	4/14/97	27	8/27/01	12	9/6/04	10	5/5/08	13
4/24/94	12	4/14/97	24	8/27/01	12	4/19/05	11	5/5/08	13
4/24/94	17	9/12/97	16	8/27/01	12	4/19/05	11	9/2/08	11
4/24/94	13	9/12/97	15	4/16/02	10	4/19/05	11	9/2/08	11
8/1/94	23	9/12/97	16	4/16/02	10	8/29/05	18	9/2/08	11
8/1/94	23	4/5/98	26	4/16/02	10	8/29/05	18	4/17/09	13
8/1/94	23	4/5/98	26	8/27/02	14	8/29/05	18	4/17/09	13
4/24/95	16	4/5/98	26	8/27/02	14	4/19/06	13	4/17/09	13
4/24/95	16	8/30/98	13	8/27/02	14	4/19/06	13	8/25/09	12
4/24/95	16	8/30/98	13	4/16/03	13	4/19/06	13	8/25/09	12
9/10/95	22	8/30/98	13	4/16/03	13	8/23/06	13	8/25/09	12
9/10/95	22	4/24/00	9	4/16/03	13	8/23/06	12		
9/10/95	23	4/24/00	9	8/11/03	11	8/23/06	13		
5/6/96	17	4/24/00	9	8/11/03	11	4/22/07	14		
5/6/96	17	8/15/00	14	8/11/03	11	4/22/07	14		
5/6/96	17	8/15/00	14	4/18/04	13	4/22/07	16		
8/14/96	17	8/15/00	14	4/18/04	13	8/16/07	10		
8/14/96	17	5/1/01	10	4/18/04	13	8/16/07	10		

The graph shows spring and summer Secchi disk data which were collected with the water samples.

The graph shows spring readings were getting better through 1998. Since then they have decreased to about half the earlier values. The graph pretty much shows a decrease in the readings. That is not a plus.

AVERAGE SECCHI DISK TREND DATA



Data:

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
12.7	15.0	13.8	19.0	15.2	11.9	13.4	11.9	12.9	9.9	8.8	13.2	10.7	12.0	12.4

The graph shows the average Secchi disk data collected with the samples from 1994 through 2009. It shows average Secchi disk readings are relatively deep. The trend seems to show the same thing the earlier graph shows, the water was getting less clear although 2005, 2007 and 2008 were slightly better.

THE LAKE WATER QUALITY INDEX

The Lake Water Quality Index used in this study to define the water quality of Cordley 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 involved 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	Total alkalinity
Chlorophyll a	Temperature
Secchi disk depth	Conductivity
Total nitrate nitrogen	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).

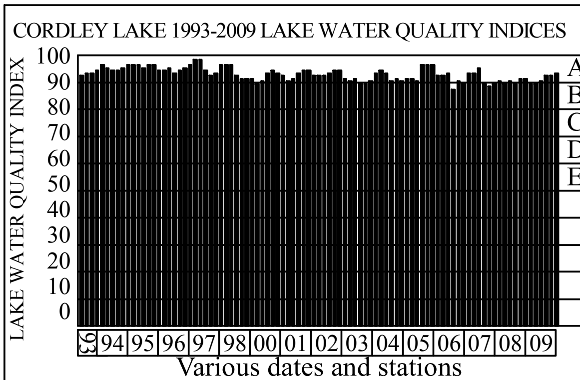
The calculation sheet permits calculation of the Lake Water Quality Index, using the results of all nine lake water quality tests.

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 1993-2009 LAKE WATER QUALITY INDICES FOR CORDLEY LAKE



`8/29/93	92	8/14/96	95	5/1/01	90	9/6/04	90	8/16/07	89
8/29/93	93	4/14/97	96	5/1/01	91	9/6/04	91	5/5/08	90
8/29/93	93	4/14/97	98	8/27/01	93	9/6/04	90	5/5/08	89
4/24/94	94	4/14/97	98	8/27/01	94	4/19/05	91	5/5/08	90
4/24/94	96	9/12/97	94	8/27/01	94	4/19/05	91	9/2/08	89
4/24/94	95	9/12/97	92	4/16/02	92	4/19/05	90	9/2/08	91
8/1/94	94	9/12/97	93	4/16/02	92	8/29/05	96	9/2/08	91
8/1/94	94	4/5/98	96	4/16/02	92	8/29/05	96	4/17/09	89
8/1/94	95	4/5/98	96	8/27/02	93	8/29/05	96	4/17/09	89
4/24/95	96	4/5/98	96	8/27/02	94	4/19/06	92	4/17/09	90
4/24/95	96	8/30/98	92	8/27/02	94	4/19/06	92	8/25/09	92
4/24/95	96	8/30/98	91	4/16/03	91	4/19/06	93	8/25/09	92
9/10/95	95	8/30/98	91	4/16/03	90	8/23/06	87	8/25/09	93
9/10/95	96	4/24/00	91	4/16/03	91	8/23/06	90		
9/10/95	96	4/24/00	89	8/11/03	89	8/23/06	89		
5/6/96	94	4/24/00	90	8/11/03	89	4/22/07	93		
5/6/96	94	8/15/00	93	8/11/03	90	4/22/07	93		
5/6/96	95	8/15/00	94	4/18/04	93	4/22/07	95		
8/14/96	93	8/15/00	93	4/18/04	94	8/16/07	89		
8/14/96	94	5/1/01	92	4/18/04	93	8/16/07	88		

The graph shows the water quality of Cordley Lake in the past was above 90 or in the A range. However, in later years some of the LWQIs are 88 or 89 (B), which indicates the water quality is not quite as good as it was in earlier years. The graph seems to show the water quality of Cordley Lake is decreasing. In 2009 spring values were 89 or 90 (B to A) and summer values were 92 or 93 (A).

THE LAKE WATER QUALITY INDEX CALCULATION SHEETS

Because the spring and summer Lake Water Quality Indices in 2009 were about the same (89, 89, 90 and 92, 92, 93) two Lake Water Quality Index calculation sheets are included in this report, one for the three spring 2009 surface samples, using averaged data, and another for the three summer 2009 surface samples, using averaged data.

In the report marked MASTER, all 6 of the 2009 LWQI calculation sheets are included. That is the only difference between the MASTER and the other 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, 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 and bicarbonates. 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.

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

CORDLEY LAKE BOTTOM SEDIMENTS

Three bottom sediment samples were collected at the sample stations shown on the map in 2000. The graph shows the data.

The sample from Station 1 collected in 13 feet of water was black when recovered, turned gray after air-drying and remained gray after burning at 550 degrees C. It shrank 88 percent and was 72 percent mineral.

The sample from Station 2 collected in 25 feet of water was black when recovered, turned gray after air-drying and remained gray after burning at 550 degrees C. It shrank 84 percent and was 78 percent mineral.

The sample from Station 3 collected in 31 feet of water was black when recovered, turned gray after air-drying and remained gray after burning at 550 degrees C. It shrank 82 percent and was 78 percent mineral.

The graph shows the amount of shrinkage in Cordley Lake bottom sediments ranged from 82 to 88 percent. This amount of shrinkage is more than most bottom sediments, but not excessive. These data indicate they are not well compacted, and can be mixed into the water column by vigorous wind and wave action. The color of the sediments was black when recovered from the bottom but turned gray after air-drying.

The mineral content of the bottom sediments ranged from 72 to 78 percent (average = 76 percent) after burning at 550°C. These data indicate Cordley Lake is starting to accumulate organic material in the bottom sediments.

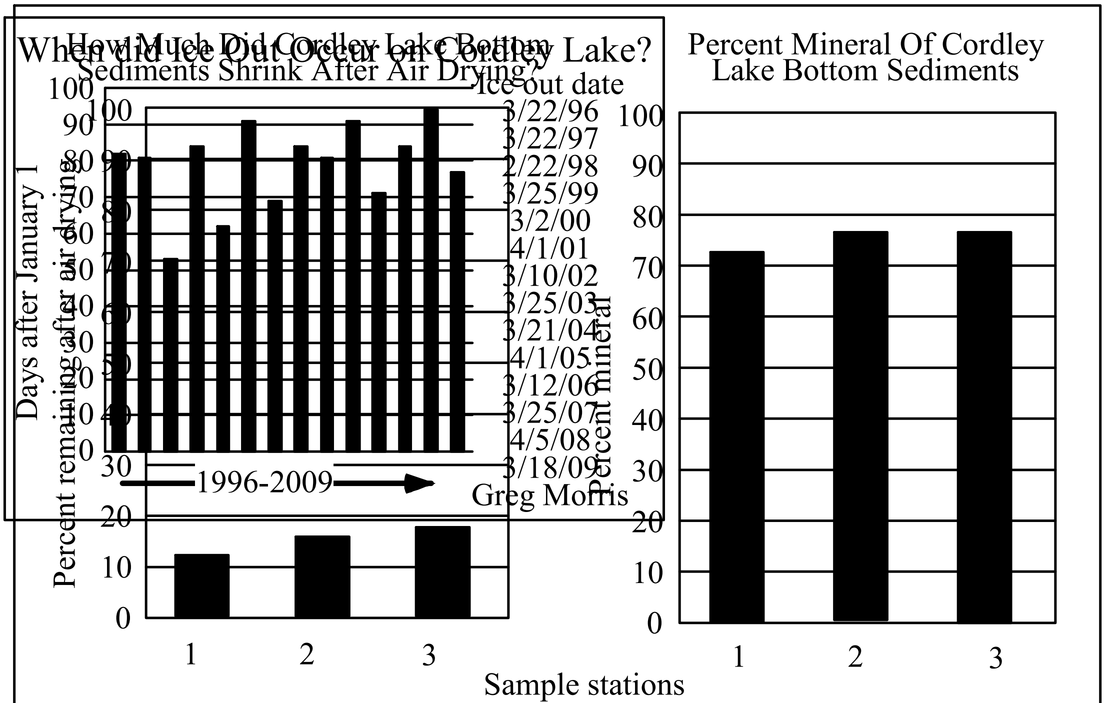
Every effort should be made to prevent this. Limiting nutrient inputs is paramount.

The sediments appear to be made up primarily of carbonates and bicarbonates, since they remained gray after burning. There was no trace of red in the burned sediments so clay does not appear to be entering the lake from home and/or road building activities around the lake at this time.

CORDLEY LAKE ICE OUT DATA

Greg Morris has been collecting Cordley Lake ice out data since 1996.

The purpose of collecting ice out data was to see if global warming was occurring. If it were, the bars on the graph would get shorter as time passed. The bars on the graph represent the number of days after January 1 ice out occurred on Cordley Lake.



Characteristics of Cordley Lake Bottom Sediments (2000)

Sample I.D.	Percent Shrinkage	Percent Mineral	Dried at 100°C Color & Description	Color after burning at 550°C	Depth of water (feet)
1	88	72	Gray	Gray	13
2	84	78	Gray	Gray	25
3	82	78	Gray	Gray	31

76 percent = average mineral content of bottom sediments

As you can see, they don’t get shorter. In fact the graph seems to show them getting longer, so it not only doesn’t show global warming, it more likely shows global cooling.

This is not the only lake that shows this trend. In fact none of the more than 60 lakes ice out data have been collected on show global warming.

Wallace E. Fusilier, Ph.D.
Consulting Limnologist

Water Quality Investigators
Dexter, Michigan
April 2010

Cordley 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
8/29/93	1	25	8.7	104	1.7	13	11	113	8.4	470	3	92	A
8/29/93	2	25	8.7	104	1.4	14	10	114	8.4	470	4	93	A
8/29/93	3	25	8.7	104	1.6	13	9	112	8.5	470	4	93	A
4/24/94	1	---	---	---	1.4	12	112	98	8.0	360	7	94	A
4/24/94	2	---	---	---	1.7	17	115	79	7.9	340	7	96	A
4/24/94	3	---	---	---	1.6	13	107	90	8.0	350	8	95	A
8/1/94	1	25	8.7	104	1.6	23	12	103	8.3	480	26	94	A
8/1/94	2	25	8.6	102	1.4	23	12	102	8.2	480	30	94	A
8/1/94	3	25	8.6	102	1.5	23	11	101	8.3	480	14	95	A
4/24/95	1	---	---	---	1.0	16	91	117	8.0	500	9	96	A
4/24/95	2	---	---	---	1.0	16	84	105	7.8	460	9	96	A
4/24/95	3	---	---	---	0.5	16	91	120	8.1	500	8	96	A
9/10/95	1	22	8.5	97	1.5	22	13	109	8.4	475	9	95	A
9/10/95	2	22	8.4	95	1.5	22	11	110	8.3	475	8	96	A
9/10/95	3	22	8.3	94	2.1	23	17	110	8.2	470	7	96	A
5/6/96	1	---	---	---	2.7	17	104	125	8.1	440	10	94	A
5/6/96	2	---	---	---	1.8	17	93	125	8.3	440	9	94	A
5/6/96	3	---	---	---	2.3	17	80	120	8.1	430	9	95	A
8/14/96	1	25	9.3	111	1.5	17	14	101	8.5	485	9	93	A
8/14/96	2	25	9.2	110	1.8	17	13	99	8.4	485	11	94	A
8/14/96	3	25	9.2	110	1.1	18	12	100	8.4	485	9	95	A
4/14/97	1	---	---	---	0.3	24	55	97	7.9	440	21	96	A
4/14/97	2	---	---	---	0.7	27	55	110	7.7	460	11	98	A
4/14/97	3	---	---	---	0.3	24	49	100	7.6	460	11	98	A
9/12/97	1	20	8.1	88	1.7	16	16	109	8.1	480	15	94	A
9/12/97	2	20	7.8	85	1.7	15	28	110	8.2	480	20	92	A
9/12/97	3	20	7.9	86	1.4	16	16	110	8.2	480	19	93	A
4/5/98	1	---	---	---	1.1	26	182	128	8.3	490	5	96	A
4/5/98	2	---	---	---	0.8	26	177	129	8.3	490	7	96	A
4/5/98	3	---	---	---	1.1	26	182	127	8.3	490	8	96	A
8/30/98	1	25	8.8	105	1.0	13	18	107	8.6	490	10	92	A
8/30/98	2	25	8.8	105	1.6	13	14	105	8.6	490	12	91	A
8/30/98	3	25	8.1	104	1.0	13	19	105	8.7	490	8	91	A
4/24/00	1	---	---	---	2.6	9	64	129	8.5	470	11	91	A
4/24/00	2	---	---	---	2.8	9	59	145	8.5	540	19	89	B
4/24/00	3	---	---	---	2.6	9	64	142	8.5	470	18	90	A
8/15/00	1	26	8.8	107	1.7	14	19	106	8.6	520	14	93	A
8/15/00	2	26	8.7	106	1.1	14	23	106	8.6	520	11	94	A
8/15/00	3	26	8.9	109	1.4	14	19	103	8.6	500	12	93	A
5/1/01	1	---	---	---	2.4	10	137	103	7.8	400	15	92	A
5/1/01	2	---	---	---	3.8	10	155	95	7.5	425	14	90	A
5/1/01	3	---	---	---	3.0	10	163	90	7.6	425	13	91	A
8/27/01	1	25	8.7	104	0.3	12	23	110	8.5	540	16	93	A
8/27/01	2	24	9.1	107	0.6	12	27	110	8.5	530	15	94	A
8/27/01	3	24	8.9	105	0.9	12	23	113	8.4	520	14	94	A
4/16/02	1	---	---	---	2.4	10	179	119	7.8	510	13	92	A
4/16/02	2	---	---	---	2.1	10	179	122	7.8	510	14	92	A
4/16/02	3	---	---	---	2.4	10	172	125	7.8	540	13	92	A
8/27/02	1	26	8.5	104	2.2	14	48	102	8.0	560	10	93	A
8/27/02	2	26	8.7	106	1.3	14	20	101	7.9	560	10	94	A
8/27/02	3	26	8.5	104	1.6	14	24	102	7.9	560	10	94	A
4/16/03	1	---	---	---	3.7	13	69	116	8.1	560	13	91	A
4/16/03	2	---	---	---	4.3	13	69	112	8.2	560	9	90	A
4/16/03	3	---	---	---	3.7	13	60	118	8.1	550	10	91	A
8/11/03	1	26	8.9	109	2.5	11	46	110	8.7	560	19	89	B
8/11/03	2	26	8.5	104	3.6	11	40	108	8.6	560	20	89	B
8/11/03	3	26	8.7	106	2.2	11	63	109	8.6	560	21	90	A
4/18/04	1	---	---	---	2.1	13	144	137	7.6	550	10	93	A
4/18/04	2	---	---	---	1.4	13	145	137	7.6	520	15	94	A
4/18/04	3	---	---	---	1.7	13	136	137	7.5	500	16	93	A
9/6/04	1	25	9.2	110	3.7	10	24	107	8.5	540	7	90	A
9/6/04	2	25	8.8	105	3.1	10	28	110	8.5	540	9	91	A
9/6/04	3-0	25	9	107	3.7	10	28	110	8.5	530	8	90	A
9/6/04	3-10	24	9.3	110	---	---	32	110	8.5	530	9	---	---
9/6/04	3-20	19	1.9	20	---	---	36	113	8.4	540	10	---	---
9/6/04	3-30	11	0	0	---	---	32	160	7.5	620	30	---	---

Cordley Lake Water Quality Data

Date	Sample Station Number	Temperature °C	Dissolved Oxygen		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
			(mg/L)	Percent Saturation									
4/19/05	1	---	---	---	2.6	11	147	141	8.4	580	11	91	A
4/19/05	2	---	---	---	3.2	11	162	145	8.3	580	14	91	A
4/19/05	3	---	---	---	3.7	11	151	140	8.4	570	12	90	A
8/29/05	1	25	8.6	102	0.3	18	28	103	8.4	540	8	96	A
8/29/05	2	25	8.6	102	0.3	18	28	103	8.4	560	7	96	A
8/29/05	3	24	8.5	100	0.6	18	32	106	8.3	560	8	96	A
4/19/06	1	---	---	---	2.3	13	225	122	8.4	570	14	92	A
4/19/06	2	---	---	---	2.3	13	198	124	8.4	570	15	92	A
4/19/06	3	---	---	---	3.0	13	203	124	8.3	570	13	93	A
8/23/06	1	25	8.9	106	4.3	13	34	103	8.7	540	20	87	B
8/23/06	2	25	9.0	107	3.4	12	24	105	8.6	540	18	90	A
8/23/06	3	25	8.8	105	4.1	13	34	103	8.6	540	16	89	B
4/22/07	1	---	---	---	1.6	14	176	134	8.3	580	13	93	A
4/22/07	2	---	---	---	1.4	14	211	134	8.3	580	11	93	A
4/22/07	3	---	---	---	1.1	16	200	134	8.3	580	7	95	A
8/16/07	1	26	8.8	108	2.0	10	45	102	8.6	530	16	89	B
8/16/07	2	27	8.7	105	2.5	10	64	105	8.7	530	17	88	B
8/16/07	3	27	8.5	107	1.7	10	70	105	8.6	530	16	89	B
5/5/08	1	---	---	---	1.8	13	391	136	8.1	560	16	90	A
5/5/08	2	---	---	---	2.6	13	411	128	8.1	560	18	89	B
5/5/08	3	---	---	---	2.2	13	396	128	8.1	570	17	90	A
9/2/08	1	26	9.2	112	3.7	11	47	103	8.6	520	12	89	B
9/2/08	2	26	9.4	114	2.4	11	51	102	8.5	520	13	91	A
9/2/08	3	26	9.4	114	2.4	11	56	100	8.5	520	12	91	A
9/2/08	3-10	25	9.1	108	---	---	51	103	8.5	530	15	---	---
9/2/08	3-20	22	3.1	35	---	---	103	110	8.3	540	16	---	---
9/2/08	3-30	12	0	0	---	---	47	160	7.6	600	15	---	---
4/17/09	1	---	---	---	3.6	13	303	137	8.2	540	18	89	B
4/17/09	2	---	---	---	3.6	13	287	134	8.1	540	19	89	B
4/17/09	3	---	---	---	3.2	13	245	138	8.1	550	17	90	A
8/25/09	1	25	9.5	113	1.7	12	30	107	8.5	520	12	92	A
8/25/09	2	25	10.2	114	1.7	12	30	107	8.5	520	12	92	A
8/25/09	3	25	9.4	112	1.7	12	36	108	8.4	520	12	93	A