

# **LITTLE PORTAGE LAKE**

## **DEXTER TOWNSHIP**

## **WASHTENAW COUNTY**

### **1997-2006 WATER QUALITY STUDIES**

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#### **LITTLE PORTAGE LAKE DATA**

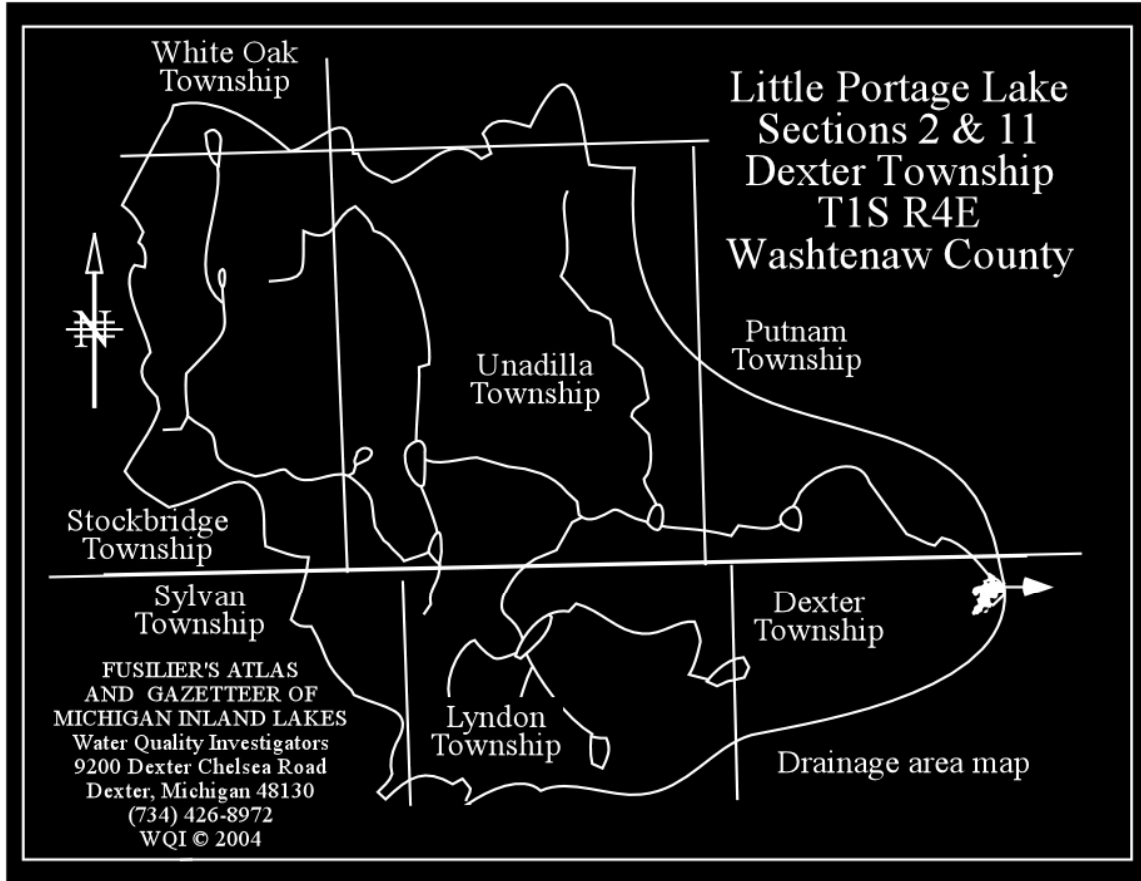
Little Portage Lake is a 112-acre natural hard water kettle lake located in Sections 2 and 11, Dexter Township (T1S R4E), Washtenaw County, Michigan. The lake has a maximum depth of 42 feet, a water volume of 1813 acre-feet, and a mean depth of 17.3 feet. The elevation of the lake is 850 feet above sea level. The lake consists of a single basin.

Defining the watershed of the lake is a bit difficult because of the John Flook dam on the Huron River just below the Big Portage Lake outlet. Although water from the Huron River probably does not contribute water to Little Portage Lake, the dam does influence the level of the lake, so in terms of maintaining or raising the level of the lake, the entire Huron River watershed above the dam could be considered part of the Little Portage Lake watershed.

The size of the upstream watershed, which is the land area that contributes water to the lake, but does not include the lake, is 54,672 acres. The drainage area, which includes the lake and the watershed, is 54,784 acres. The watershed to lake ratio is large, 488 to 1. Because of this the lake flushes rapidly, once every 0.04 years (or 15 days) on an average.

There are two inlets. A small unnamed inlet flows into the lake on the east side. The Portage River, which drains 51,136 acres, flows into the lake on the north end. The lake has 15099 feet of shoreline.

The outlet flows into Portage Lake on the northeast corner. The Portage River joins the Huron River on the east side of Portage Lake. The Huron River flows into Lake Erie at Monroe, Michigan.



The longitude and latitude of the 42-foot deep hole is 83° 55.795W and 42° 24.912N.

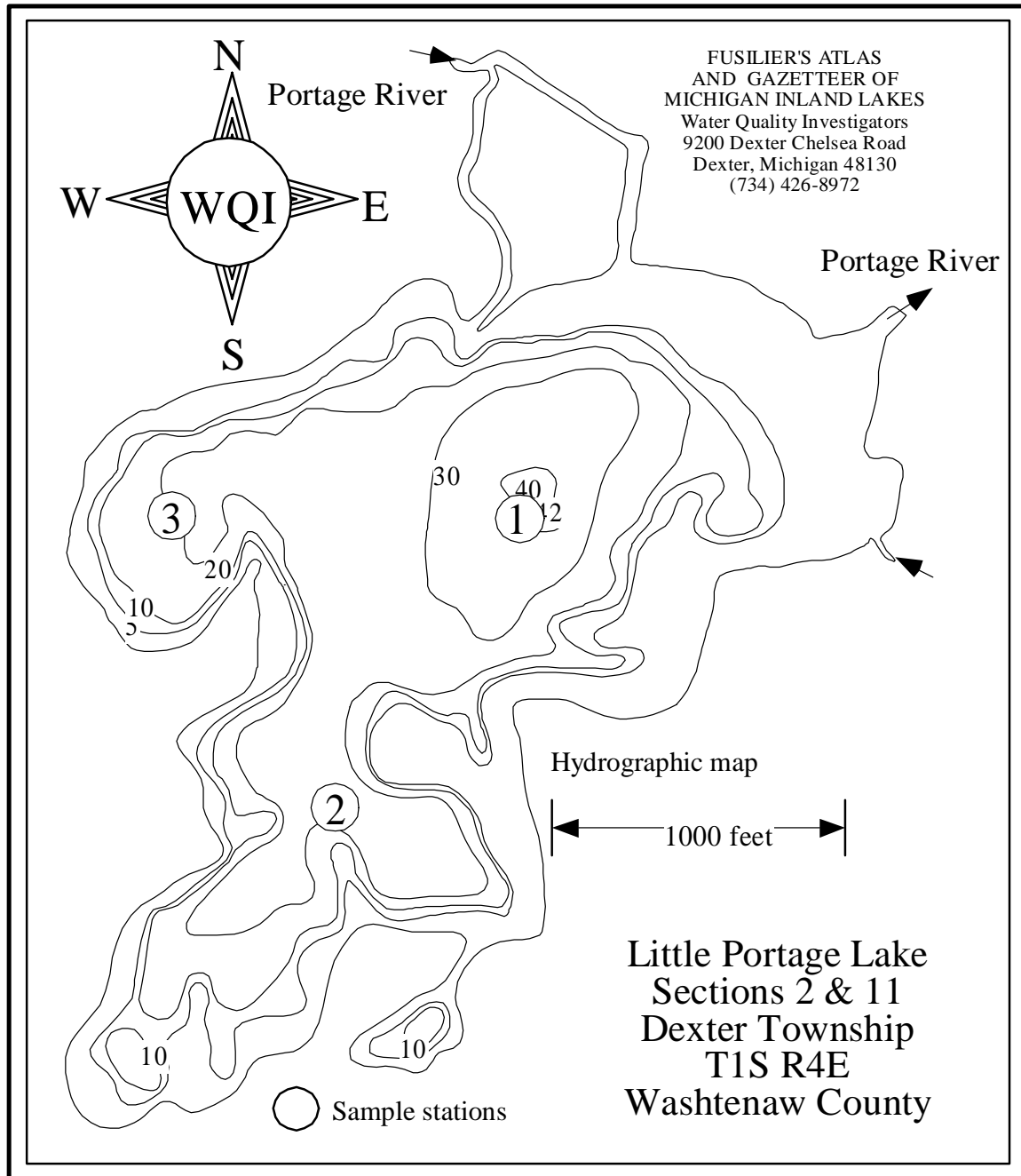
## THE ANALYSES

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 SAMPLE DATES

WQI limnologists took spring and summer surface samples at Stations 1, 2 and 3 May 12 and August 25, 1997, April 19 and August 10, 1998, April 25

and August 27, 1999, April 15 and August 4, 2000, May 13 and August 1, 2001, April 15 and August 2, 2002, April 28 and August 1, 2003, April 16 and August 2, 2004, April 18 and August 3, 2005 and April 18 and August 1, 2006. Temperature and dissolved oxygen profile data were collected each time the lake was sampled in late summer at the deepest part of the lake. Three bottom sediment samples were collected in spring 2005.



## THE BOTTOM CONTOURS AND SAMPLE STATIONS

The hydrographic map shows the bottom contours, the locations of the inlets and the outlet, and the locations of the in-lake sample stations.

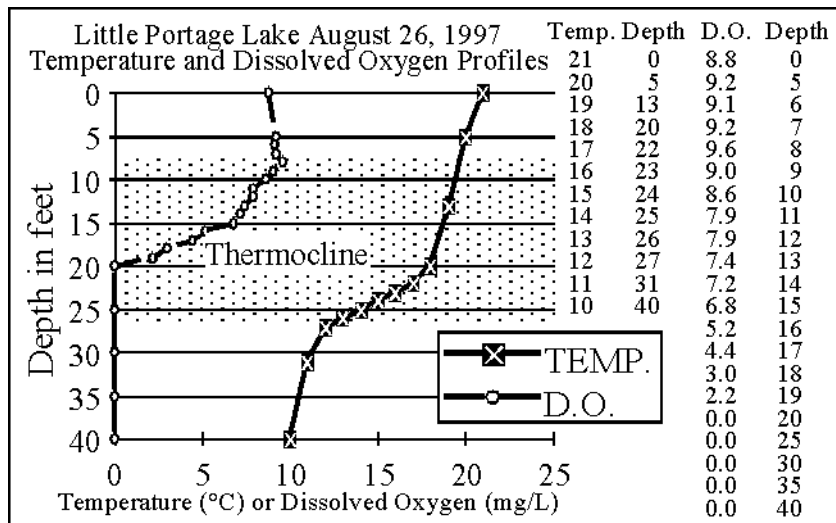
## THE DATA

The data discussed below can be 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 gases, and biological activity.

Dissolved oxygen is the parameter most often selected by lake water quality scientists as being important. Besides providing oxygen for aquatic organisms, in natural lakes, dissolved oxygen is involved in phenomena such as phosphorus precipitation and release from the lake bottom sediments and decomposition of organic material in the lake.

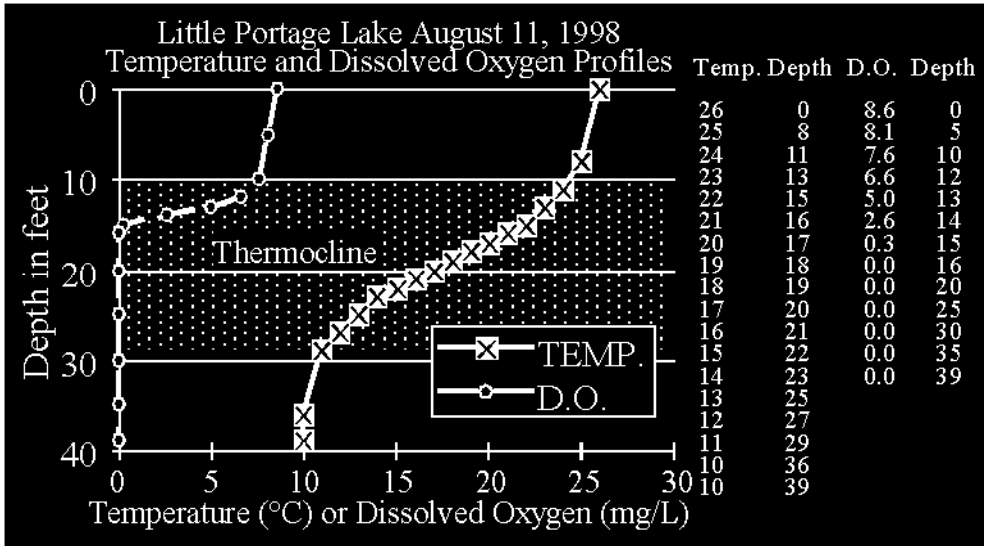


**1997**

On August 26, 1997 (late summer), Little Portage Lake formed an 18-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 8 to 26 feet. Dissolved oxygen was plentiful above the thermocline. The lake ran out of dissolved oxygen at 20 feet and that condition remained to the bottom. The hypsographic (depth-area) graph shows about 35 percent of the lake is deeper than 20 feet.

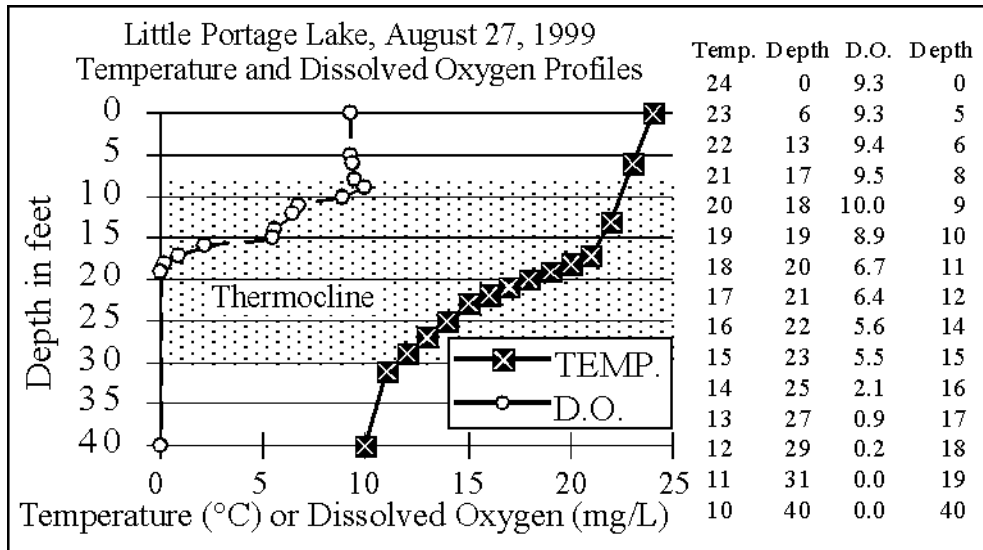
1998



On August 11, 1998, Little Portage Lake formed a 19-foot-thick thermocline from 10 to 29

feet. Dissolved oxygen was plentiful above the thermocline. The lake ran out of dissolved oxygen at 16 feet and that condition remained to the bottom. About 44 percent of the lake is deeper than 16 feet.

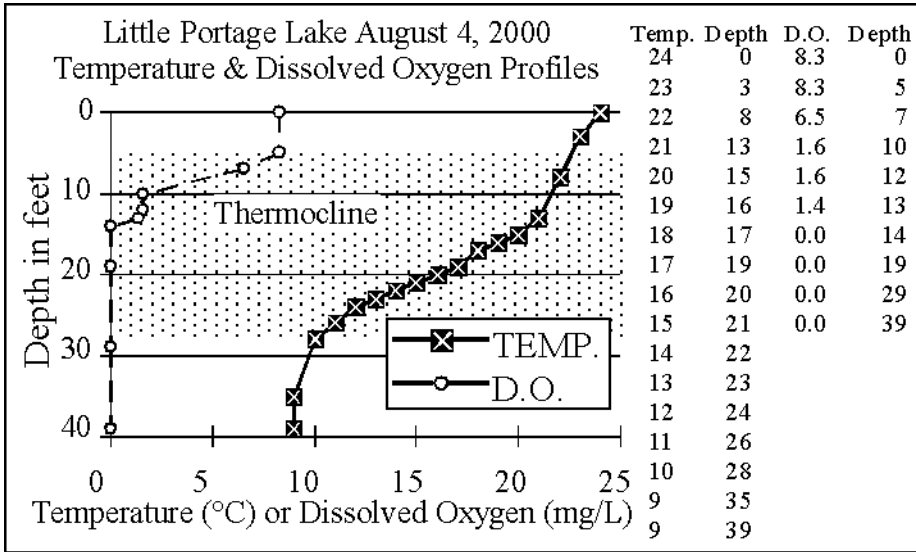
1999



On August 27, 1999, Little Portage Lake formed a 22-foot-thick thermocline

from 8 to 30 feet. The lake ran out of dissolved oxygen at 19 feet and that condition remained to the bottom. About 38 percent of the lake is deeper than 19 feet.

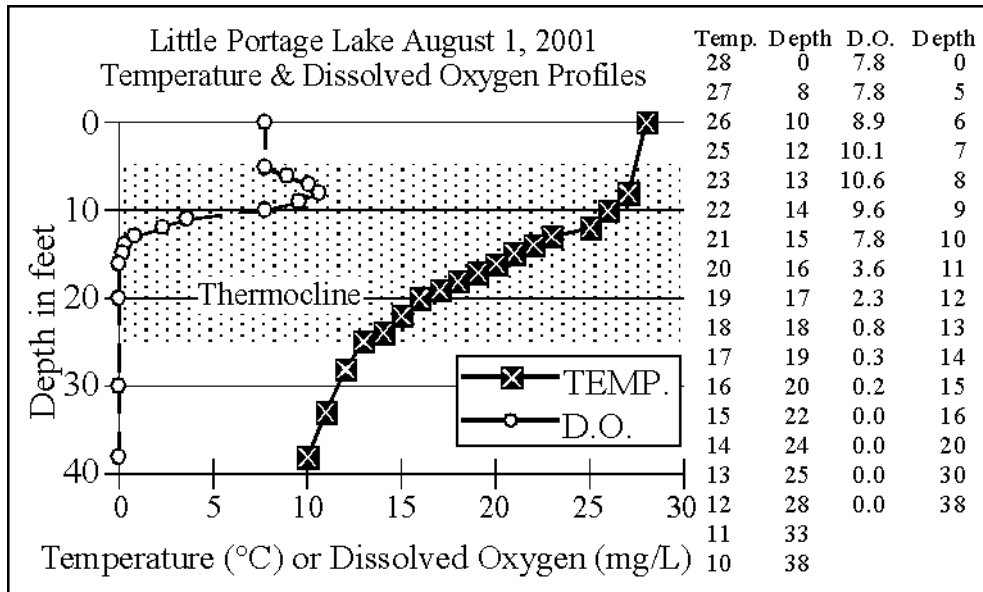
**2000**



On August 4, 2000 Little Portage Lake formed a 23-foot-thick thermocline from 5 to 28 feet. Dissolved oxygen was plentiful in the first five

feet. The lake ran out of dissolved oxygen at 14 feet and that condition remained to the bottom. About 46 percent of the lake is deeper than 14 feet.

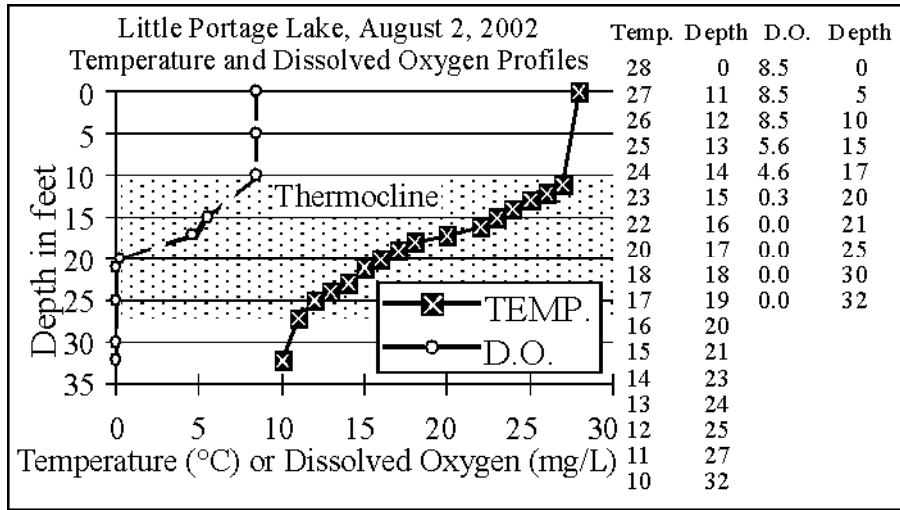
**2001**



On August 1, 2001 Little Portage Lake formed a 20-foot-thick thermocline from 5

to 25 feet. Dissolved oxygen was plentiful above the thermocline, and reached a maximum of 10.6 milligrams per liter in the thermocline, probably the result of an algal bloom which settled there. The lake ran out of dissolved oxygen at 16 feet and that condition remained to the bottom. About 44 percent of the lake is deeper than 16 feet.

**2002**

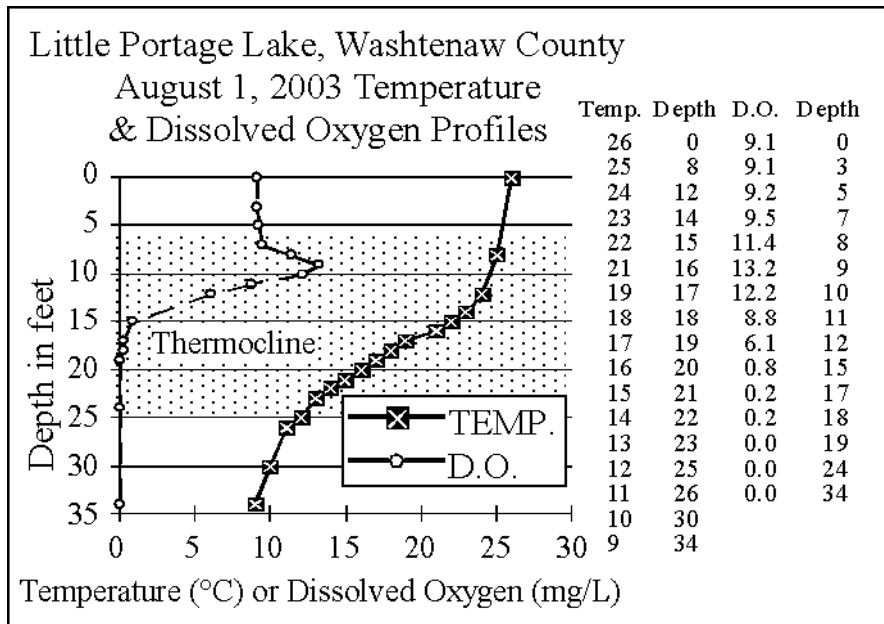


On August 2, 2002, the lake formed a 17-foot-thick thermocline from 10 to 27 feet. Dissolved oxygen was plentiful above the thermocline.

The lake ran out of dissolved oxygen at 21 feet and that condition remained to the bottom. About 32 percent of the lake is deeper than 21 feet.

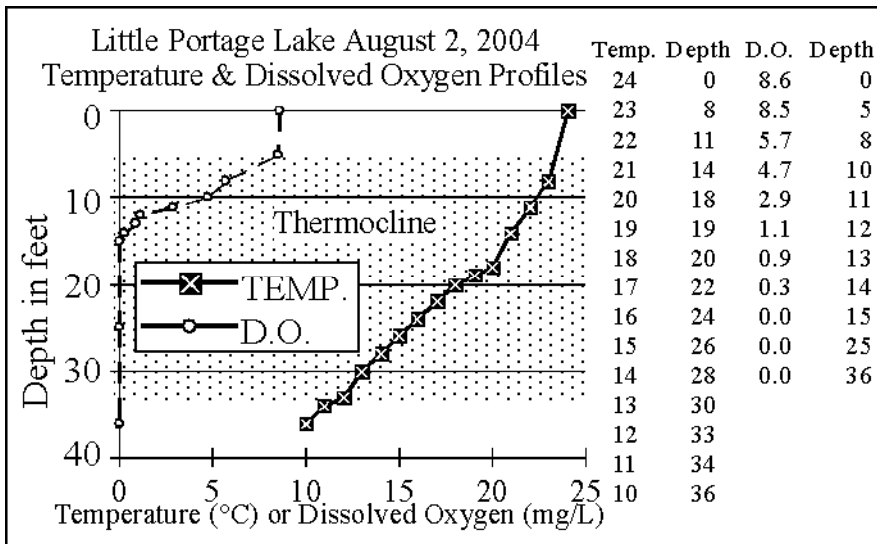
**2003**

On August 1, 2003, the lake formed a 21-foot-thick thermocline from 5 to 26 feet. Dissolved oxygen was plentiful above the thermocline. A dissolved oxygen maximum again occurred in the thermocline, a result of an algal bloom which settled there.



The lake ran out of dissolved oxygen at 19 feet and that condition remained to the bottom.

About 39 percent of the lake is deeper than 19 feet.

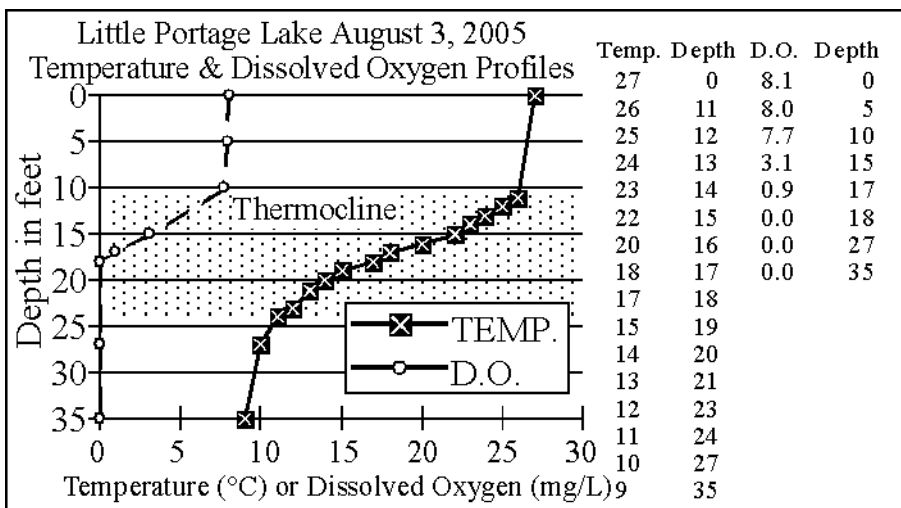


**2004**

On August 2, 2004, the lake formed a 30-foot-thick thermocline from 5 to 35 feet. Dissolved oxygen was plentiful above the thermocline.

The lake started to lose its dissolved oxygen below 5 feet. The lake ran out of dissolved oxygen at 15 feet and that condition remained to the bottom.

About 45 percent of the lake is deeper than 15 feet.



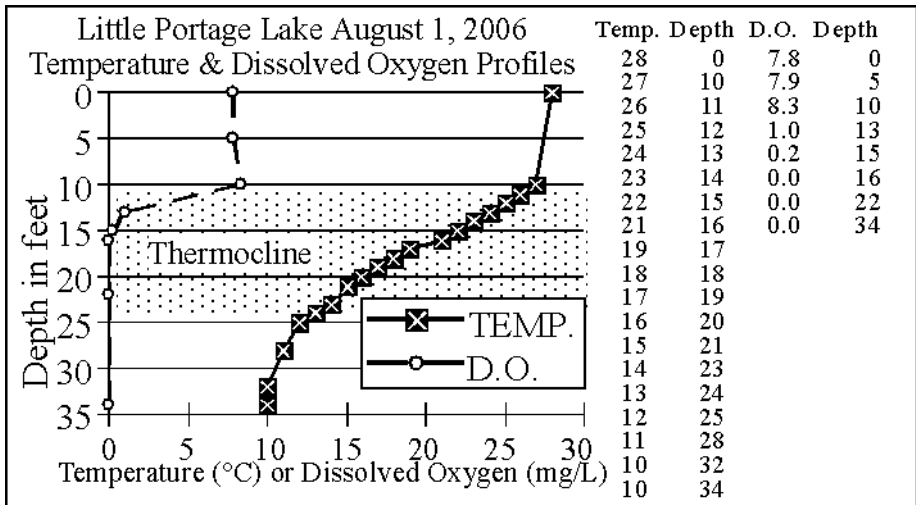
**2005**

In late summer 2005 Little Portage Lake formed a 15-foot-thick thermocline from 10 to 25 feet. Dissolved oxygen was

plentiful above ten feet, and started to decrease below that depth. It was zero at 18 feet, and that condition remained to the bottom. About 40 percent is deeper than 18 feet.

**2006**

In late summer 2006 Little Portage Lake formed a 13-foot-thick thermocline from 10 to 23 feet. Dissolved oxygen was plentiful above ten feet, and

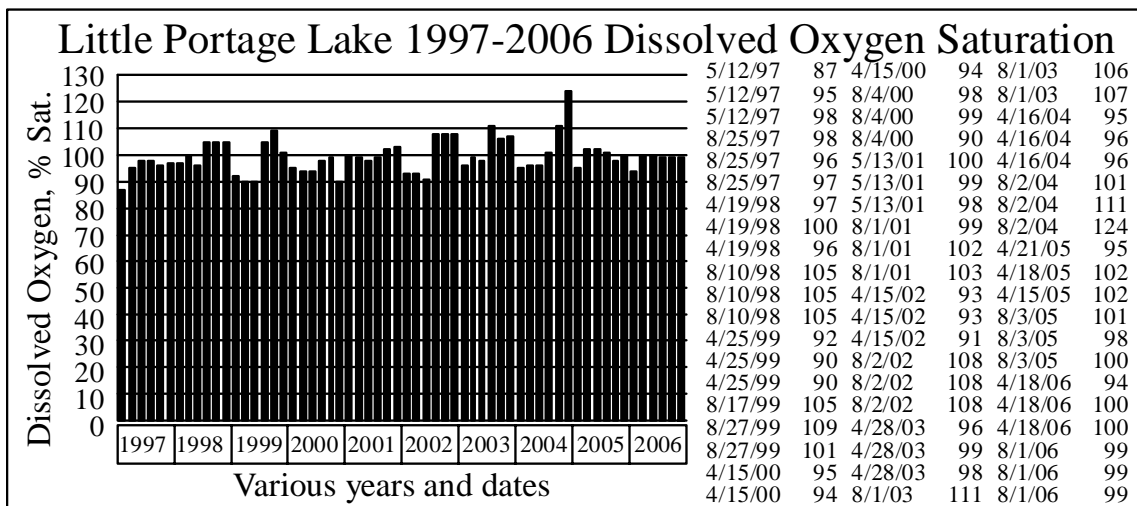


started to decrease below that depth. It was zero at 16 feet, and that condition remained to the bottom. About 42 percent is

deeper than 16 feet.

### DISSOLVED OXYGEN SATURATION VALUES

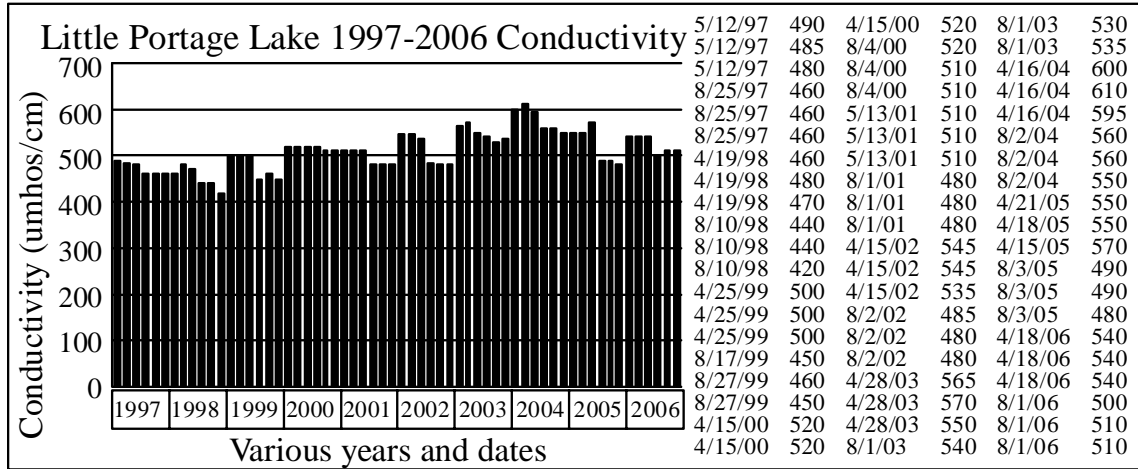
Since the amount of oxygen a water will hold is dependent on temperature, with cold water holding more dissolved oxygen than warm water, dissolved oxygen saturation is often a better way to determine if oxygen supplies are adequate.



The graph shows surface dissolved oxygen saturation values ranged from 87 to 124 percent. This is somewhat variable, but satisfactory for a southeast Michigan lake, except for the 124 percent value at Station 3 in late summer 2004. Best is near 100 percent. 2005 and 2006 dissolved oxygen saturation values were ideal.

## CONDUCTIVITY

Conductivity generally measures salts, and lower is usually better.



The graph shows the conductivity of Little Portage Lake ranges from a low of 420 micromhos per centimeter to a high of 610 micromhos per centimeter. These are high normal conductivities for a Michigan hard water inland lake.

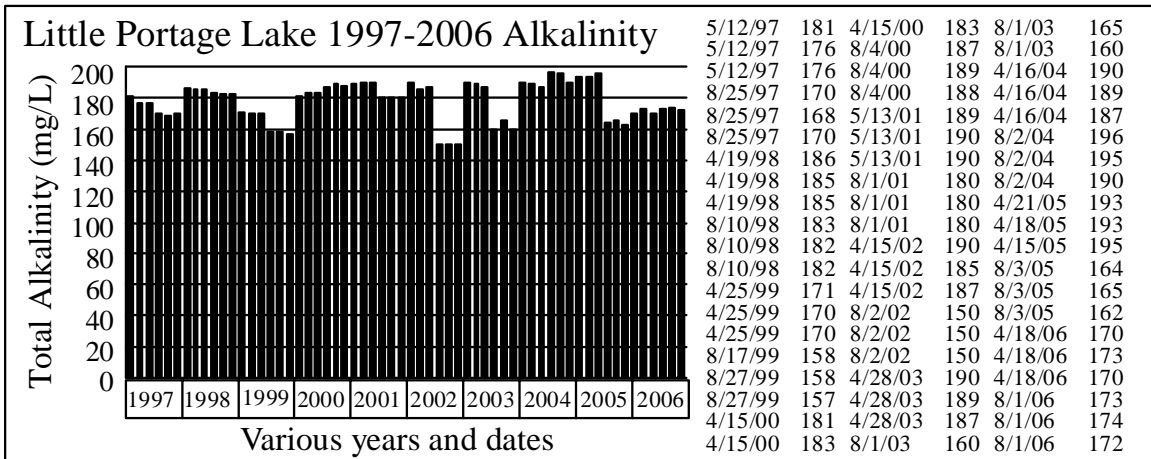
The data show salts may be entering the lake from various activities in the watershed, including the Peach Mountain groundwater discharge sewage treatment plant, although 2005 and 2006 conductivities were lower. (Conductivities in the 600+ range generally indicate the presence of salts in the lake from other than natural sources.) The graph seems to show increasing conductivities until 2005.

## 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 graph shows the alkalinity of Little Portage Lake ranges from 150 to 196 milligrams per liter. Summer 2002 had the lowest alkalinites since we started sampling the lake, 150 milligrams per liter while summer 2004 and spring 2005 had the highest, 190-196 mg/L. These data indicate Little Portage Lake is a hard water lake. Alkalinity varies more in Little Portage

Lake than in most natural lakes, but that is probably a result of the streams feeding the lake. Streams generally have higher alkalinities than lakes.



The graph shows spring alkalinities are generally higher than summer alkalinities although that was not the case in 2004 or 2006. Higher spring alkalinities are normal because the carbonates and bicarbonates (which is what the alkalinity test measures) precipitate to the bottom sediments as the water warms in summer.

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.

The graph seems to show alkalinities in Little Portage Lake are not changing.

## NITRATE NITROGEN

Nitrate, also measured in the parts per billion range, has traditionally been considered by lake scientists to also be a limiting nutrient. The experts felt any concentration below 200 parts per billion was excellent in terms of lake water quality. The highest value found by this author was 48,000 parts per billion in a river which flowed into an Ottawa County lake.

On the other hand, we've studied hundreds of Michigan inland lakes, and many times we find them nitrate limited (very low nitrate nitrogen concentrations), especially in summer.



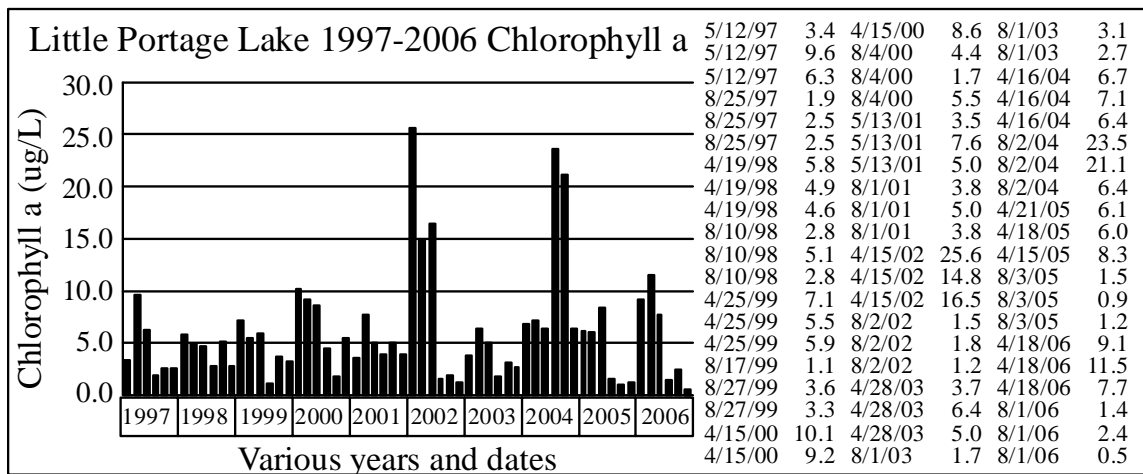
probably upstream. In summer, except for 2003, nitrate nitrogen concentrations were low every time the lake was sampled. They ranged from 3 to 70 micrograms per liter.

The spring and summer 2003 nitrate nitrogen concentrations were essentially the same. This is unusual, and unexpected. However it's not a problem.

These data indicate Little Portage Lake is probably phosphorus limited in spring and nitrate limited in summer. It also means no fertilizers containing either nitrogen or phosphorus should be used on near lake areas.

### CHLOROPHYLL A

Chlorophyll a generally gives an estimate of algal densities. Best is below 1 microgram per liter.



The graph shows Little Portage Lake had algal blooms each time it was sampled. The data also shows the lake generally has smaller algal blooms in summer. 2002 spring and summer 2004 chlorophylls were high. Summer 2005 and 2006 chlorophylls were among the best so far.

### TOTAL PHOSPHORUS

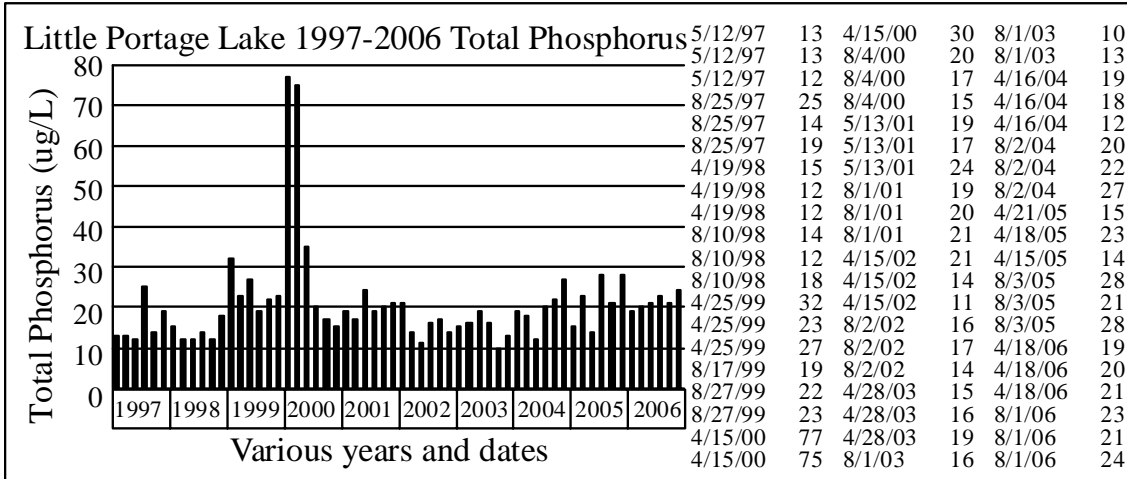
Although there are several forms of phosphorus found in lakes, the experts selected total phosphorus as being most important. This is probably because all forms of phosphorus can be converted to the other forms. Currently, most lake scientists feel phosphorus, which is measured in parts per billion (1 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 blooms 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 graph shows the 1997 through 2006 phosphorus data. It shows Little Portage Lake generally has relatively low phosphorus concentrations.



Phosphorus concentrations range from a low of 10 micrograms per liter (which is good) to a high of 77 micrograms (which is not good at all).

The spring 2000 phosphorus concentrations were high (30-77 micrograms per liter). The source of these high phosphorus concentrations is unknown.

The graph shows 1997, 1998, 2002 and 2003 spring and summer phosphorus concentrations were better than most years, ranging from 10 to 21 ug/L. 2004 phosphorus concentrations ranged from 12 to 27 ug/L while in 2005, they ranged from 14 to 28 ug/L. Summer 2005 phosphorus concentrations were generally higher than normal. In 2006 both spring and summer phosphorus concentrations were higher than in the past, ranging from 19 to 24 ug/L.

## **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.

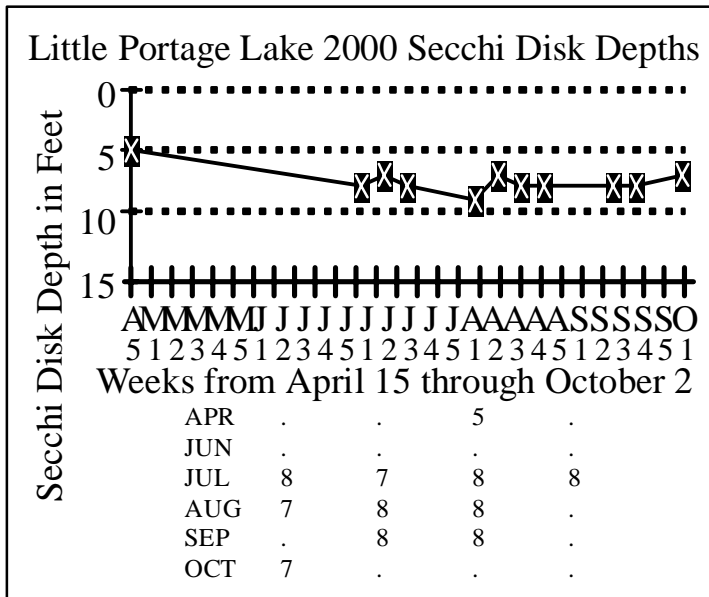
Most limnology texts recommend the following: to take a Secchi disk transparency reading, lower the disk into the water on the shaded side of an anchored boat to a point where it disappears. Then raise it to a point where it's visible. The average of these two readings is the Secchi disk transparency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

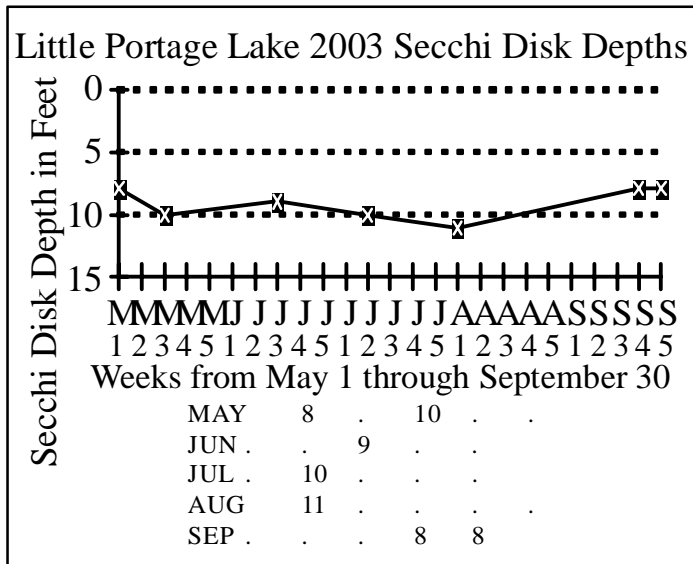
If there are sample sites where the lake is too shallow and the disk is visible when resting on the bottom, the reading should be taken at a nearby deeper site. Since the sampling procedure is designed to obtain "representative samples" moving the boat to an area where a Secchi disk transparency reading 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.

**SECCHI DISK DATA**



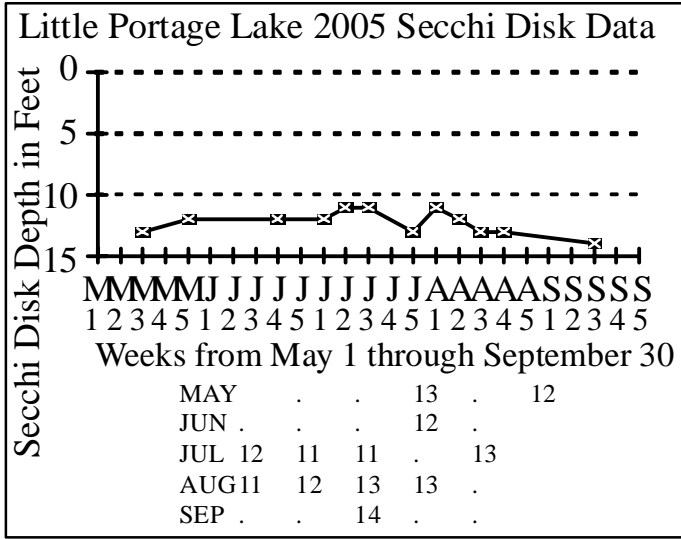
**2000**

Dan Doran collected Secchi disk data on Little Portage Lake in 2000. The graph shows his data. It shows Little Portage Lake got clearer as the water warmed from spring to summer, but not a lot clearer. The chlorophyll a data shows why. Algal blooms.



**2003**

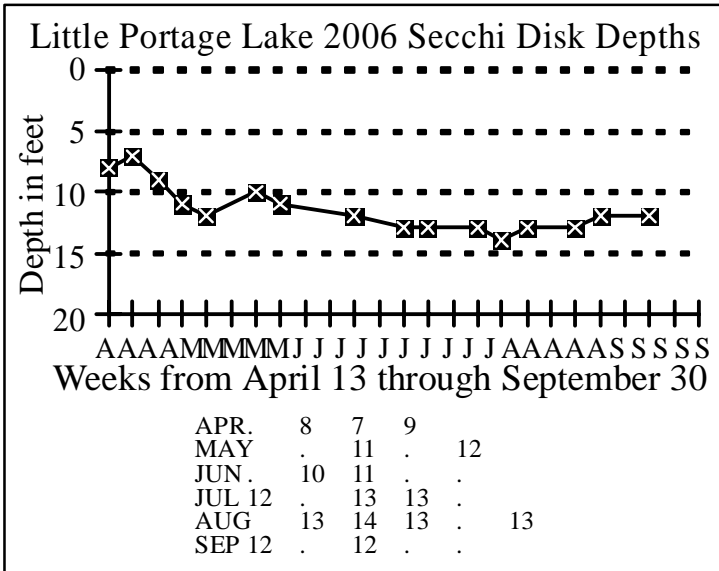
WQI limnologists collected monthly Secchi disk data in 2003. The graph shows the data. The graph shows the clarity of the water in Little Portage Lake didn't change much as the water warmed from spring to summer. This indicates nutrient additions are fairly uniform throughout the warm months.



**2005**

Steve Morehouse did a good job collecting Secchi disk data on Little Portage Lake in 2005. The graph shows his data which ranged from 11 to 14 feet.

These data indicate the clarity of the lake did not change much as the water warmed from spring to summer in 2005. Usually this indicates a fairly uniform delivery of nutrients to the lake.



**2006**

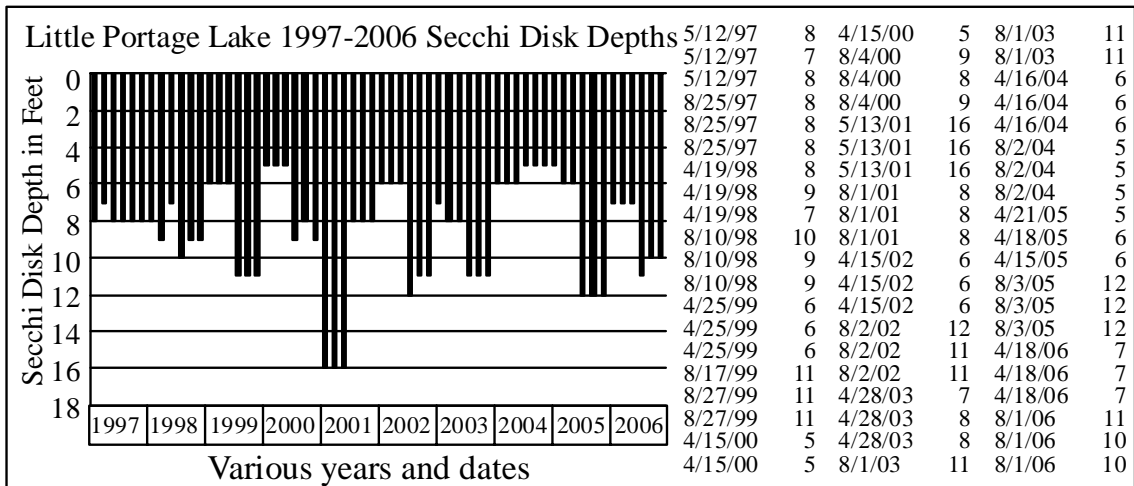
Steve Morehouse did a good job collecting Secchi disk data on Little Portage Lake in 2006. The graph shows his data which ranged from 7 to 14 feet.

These data indicate the clarity of the lake was worse in early spring (7-9 feet). After the middle of May the clarity gradually improved (11-14 feet).

**SECCHI DISK DATA COLLECTED WITH THE SAMPLES**

The graph below shows the Secchi disk readings collected at the same time as the spring and summer samples.

It shows summer Secchi disk readings are generally deeper than spring readings, although this trend was reversed in 2001 and 2004. The graph does not appear to show any specific trend.



## THE LAKE WATER QUALITY INDEX

The Lake Water Quality Index used in this study to define the water quality of Little Portage 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 LWQI seen by this author was 16 in 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



## **THE LAKE WATER QUALITY INDEX CALCULATION SHEETS**

Because the spring Lake Water Quality Indices in 2006 were similar (72 71 71) and the summer Lake Water Quality Indices in 2006 were also similar (90 89 90) 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 2006 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.

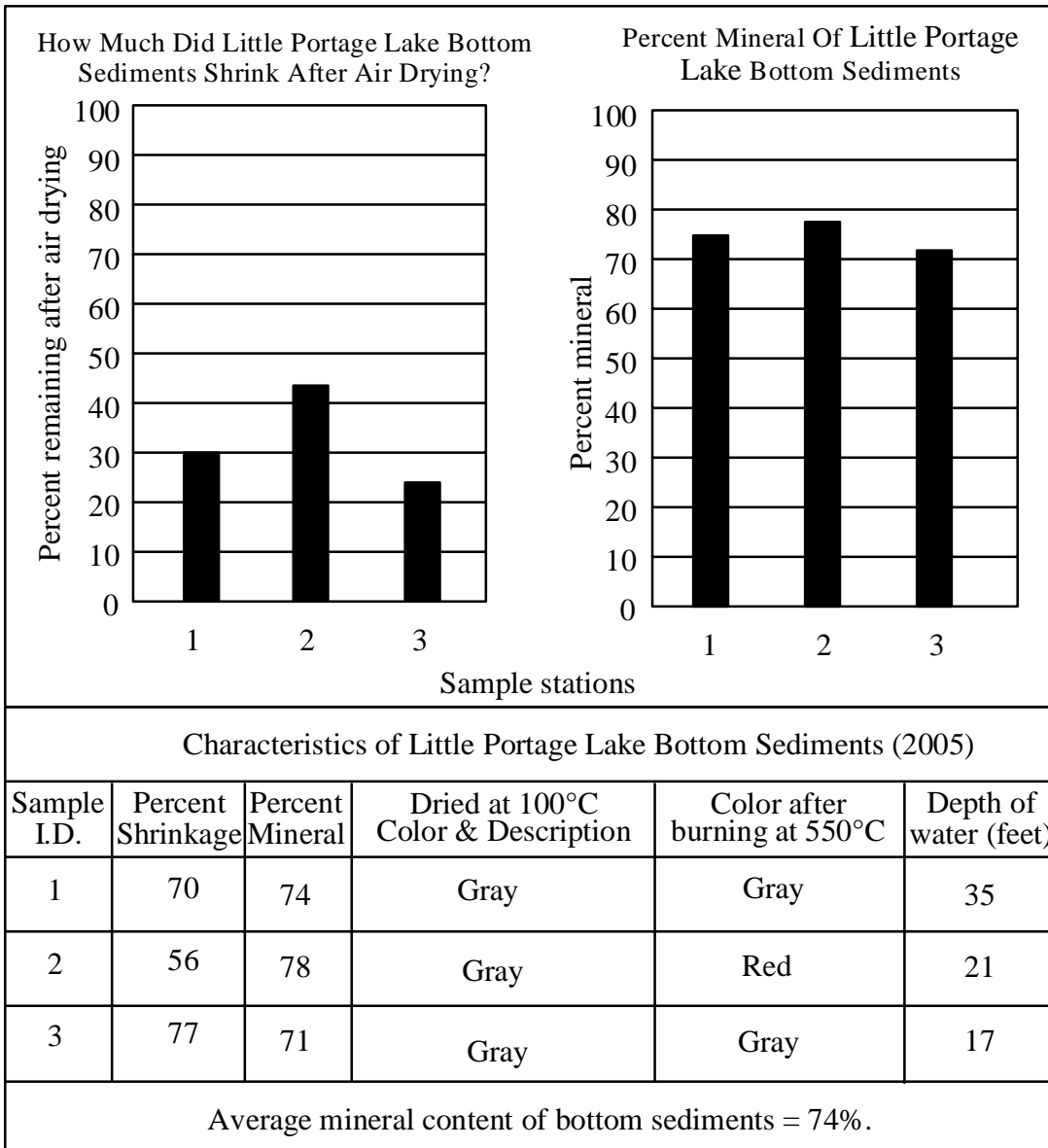
If the tan bottom sediments turn red after burning, it means the lake is filling with clay. Clay enters the lake from near-lake activities such as road building, home building or farming. Usually clay is not a material that makes up the bottom sediments of most inland lakes.

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.

## **LITTLE PORTAGE LAKE BOTTOM SEDIMENTS**

Bottom sediment samples were collected from Little Portage Lake in spring 2005.



The sample from Station 1 collected in 35 feet of water was gray when air dried, shrunk 70 percent, was 74 percent mineral and gray in color after burning at 550 degrees C.

The sample from Station 2 collected in 21 feet of water was gray when air dried, shrunk 56 percent, was 78 percent mineral and red in color after burning at 550 degrees C.

The sample from Station 3 collected in 17 feet of water was gray when air dried, shrunk 77 percent, was 71 percent mineral and gray in color after burning at 550 degrees C.

None of the samples shrunk excessively (excessive is greater than 95%). This means the sediments are fairly well consolidated and not easily mixed into the water column when the lake mixes in spring or fall. Two samples turned gray after air-drying and remained gray after burning. A third turned red after burning at 550 degrees C.

The average mineral content of the sediments was 74 percent indicating the lake is starting to build up organic material at a faster than normal rate.

The gray color after air drying and after burning at 550 degrees C indicate the deep water samples were essentially calcium and magnesium carbonate and bicarbonate, which is what we often see filling Michigan's inland lakes.

The sediment sample that turned red after burning at 550 degrees C indicated the presence of clay in the sediments, which is not a normal constituent to Michigan inland lake bottom sediments. Clay is usually washed into lakes from road or home building activities, or farming operations.

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		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
			(m g/L)	Percent Saturation									
5/12/97	1	12	9.7	87	3.4	8	594	181	8.2	490	13	82	B
5/12/97	2	12	10.3	95	9.6	7	623	176	8.2	485	13	76	C
5/12/97	3	12	10.4	98	6.3	8	604	176	8.3	480	12	79	C
8/25/97	1	21	8.8	98	1.9	8	17	170	8.4	460	25	88	B
8/25/97	2	21	8.6	96	2.5	8	17	168	8.4	460	14	89	B
8/25/97	3	21	8.7	97	2.5	8	35	170	8.3	460	19	89	B
4/19/98	1	13	10.3	97	5.8	8	578	186	8.3	460	15	80	B
4/19/98	2	13	10.6	100	4.9	9	594	185	8.2	480	12	81	B
4/19/98	3	13	10.2	96	4.6	7	572	185	8.3	470	12	80	B
8/10/98	1	26	8.6	105	2.8	10	7	183	8.6	440	14	88	B
8/10/98	2	26	8.6	105	5.1	9	9	182	8.5	440	12	85	B
8/10/98	3	26	8.6	105	2.8	9	5	182	8.6	420	18	87	B
4/25/99	1	13	9.8	92	7.1	6	495	171	8.1	500	32	78	C
4/25/99	2	13	9.5	90	5.5	6	523	170	8.2	500	23	79	C
4/25/99	3	13	9.5	90	5.9	6	544	170	8.1	500	27	78	C
8/27/99	3	24	8.9	105	1.1	11	9	158	8.3	450	19	93	A
8/27/99	1	24	9.3	109	3.6	11	14	158	8.3	460	22	90	A
8/27/99	2	23	8.8	101	3.3	11	7	157	8.3	450	23	90	A
4/15/00	1	12	10.3	95	10.1	5	112	181	8.4	520	80	70	C
4/15/00	2	10	10.6	94	9.2	5	132	183	8.4	520	95	71	C
4/15/00	3	10	10.6	94	8.6	5	117	183	8.4	520	91	78	C
8/4/00	1	24	8.3	98	4.4	9	66	187	8.3	520	20	87	B
8/4/00	2	23	8.6	99	1.7	8	46	189	8.4	510	17	91	A
8/4/00	3	23	7.8	90	5.5	9	46	188	8.3	510	15	87	B
5/13/01	1	19	9.4	100	3.5	16	423	189	8.4	510	19	89	B
5/13/01	2	19	9.3	99	7.6	16	398	190	8.4	510	17	85	B
5/13/01	3	19	9.2	98	5.0	16	398	190	8.3	510	24	85	B
8/1/01	1	28	7.8	99	3.8	8	8	180	8.0	480	19	86	B
8/1/01	2	27	8.2	102	5.0	8	5	180	8.0	480	20	85	B
8/1/01	3	28	8.1	103	3.8	8	3	180	8.0	480	21	86	B
4/15/02	1	10	10.5	93	25.6	6	419	190	8.5	545	21	74	C
4/15/02	2	10	10.5	93	14.8	6	439	185	8.4	545	14	77	C
4/15/02	3	9	10.6	91	16.5	6	410	187	8.4	535	11	77	C
8/2/02	1	28	8.5	108	1.5	12	32	150	7.5	485	16	91	A
8/2/02	2	28	8.5	108	1.8	11	22	150	7.6	480	17	91	A
8/2/02	3	28	8.5	108	1.2	11	18	150	7.6	480	14	92	A
4/28/03	1	14	9.9	96	3.7	7	192	190	8.2	565	15	87	B
4/28/03	2	14	10.2	99	6.4	8	185	189	8.2	570	16	85	B
4/28/03	3	14	10.1	98	5.0	8	173	187	8.2	550	19	86	B
8/1/03	1	26	9.1	111	1.7	11	173	160	8.5	540	16	92	A
8/1/03	2	25	8.9	106	3.1	11	173	165	8.6	530	10	90	A
8/1/03	3	25	9.0	107	2.7	11	173	160	8.6	535	13	91	A
4/16/04	1	11	10.6	95	6.7	6	741	190	8.2	600	19	75	C
4/16/04	2	11	10.7	96	7.1	6	697	189	8.2	610	18	75	C
4/16/04	3	11	10.7	96	6.4	6	643	187	8.3	595	12	77	C
8/2/04	1	24	8.6	101	23.5	5	70	196	8.3	560	20	76	C
8/2/04	2	24	9.4	111	21.1	5	61	195	8.4	560	22	76	C
8/2/04	3	24	10.5	124	6.4	5	44	190	8.4	550	27	79	C
4/18/05	1	16	9.5	95	6.1	5	422	193	8.2	550	15	80	B
4/18/05	2	16	10.2	102	6.0	6	438	193	8.3	550	23	80	B
4/18/05	3	16	10.2	102	8.3	6	444	195	8.3	570	14	79	C
8/3/05	1	27	8.1	101	1.5	12	18	164	8.2	490	28	90	A
8/3/05	2	27	7.8	98	0.9	12	18	165	8.1	490	21	92	A
8/3/05	3	27	8.0	100	1.2	12	22	162	8.2	480	28	91	A
4/18/06	1	14	9.8	94	9.1	7	842	170	8.2	540	19	72	C
4/18/06	2	14	10.4	100	11.5	7	828	173	8.3	540	20	71	C
4/18/06	3	14	10.4	100	7.7	7	864	170	8.2	540	21	71	C
8/1/06	1	28	7.8	99	1.4	11	42	173	8.4	500	23	90	A
8/1/06	2	28	7.8	99	2.4	10	42	174	8.4	510	21	89	A
8/1/06	3	28	7.8	99	0.5	10	42	172	8.4	510	24	90	C