A decorative graphic consisting of several thin, curved green lines that sweep from the top left towards the center. To the right of these lines is a large, light green, semi-circular shaded area. The year '2010' is printed in a large, bold, black font within this shaded area.

2010

**Chisago Lakes Chain of Lakes Watershed
Lake Monitoring**

Chisago Soil & Water Conservation District

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Definitions

Ammonia Nitrogen: An inorganic form of nitrogen contained in fertilizers, septic system effluent, and animal wastes. It is also a product of bacterial decomposition of organic matter. Ammonia nitrogen becomes a concern if high levels of the un-ionized form are present. In this form, it can be toxic to aquatic organisms. The presence of un-ionized ammonia is a function of the ammonia nitrogen concentration, pH, and temperature. Conversion of ammonia nitrogen to nitrite nitrogen by nitrification requires large quantities of oxygen which can kill aquatic organisms due to the lowered dissolved oxygen concentrations in water. The lowest reported limit is 0.05 mg/L. Any samples below 0.05 mg/L are reported as 0.05 mg/L or <0.05 mg/L.

Chlorophyll-A: Photosynthetic pigment found in all green plants and the main pigment in algae. The concentration of chlorophyll A is used to estimate the amount of algae in surface water (MPCA). The lower the reading, the clearer the water will be.

pH: A measure of acidity, with 7 being neutral. Numbers under 7 are acidic and numbers over 7 are alkaline.

Secchi Disk: A measure of water clarity taken with a black and white disk lowered into the water until it disappears, then raised until it barely appears and record a reading. The higher the reading, the clearer the water will be.

Temperature: A specific degree of hotness or coldness as indicated on or referred to a standard scale. Lakes in Chisago County meet the standard for temperature if the daily average temperature does not exceed 86.0 °F.

Total Phosphorus (TP): A nutrient essential to the growth of all organisms and commonly the limiting factor in the primary productivity of surface water bodies. Total phosphorus includes the amount of phosphorus in solution (reactive) and in particle form. Agricultural drainage, wastewater, and certain industrial discharges are typical source of phosphorus and can contribute to the eutrophication of surface water bodies (MPCA). The lower the reading, the clearer the water will be.

Total Suspended Solids (TSS): Very small particles remaining dispersed in water due to turbulent mixing that can create turbid or cloudy conditions. Total suspended solids cause interference with light penetration, buildup of sediment, and potential reduction in aquatic habitat. Solids also carry nutrients that cause algal blooms and other toxic pollutants that are harmful to fish.

Turbidity: An expression of the optical property that causes light to be scattered and absorbed rather than transmitted in straight lines through the sample. Turbidity in water is caused by suspended matter, such as clay, silt, finely divided organic and inorganic matter, soluble colored organic compounds, and plankton and other microscopic organisms. In lakes, a major cause of elevated turbidity is disturbed and eroding soils carried by storm run-off to streams. Once in the stream system, elevated turbidity reduces the depth of photosynthesis and the feeding ability of aquatic organisms.

Trophic Levels:

Trophic State Index: A formula used to determine the Trophic Level of a Lake. Total Phosphorus, Chlorophyll A and Secchi Transparency will each have an individual trophic level that allows the parameters to be compared to one another when the actual values cannot be compared.

Oligotrophic: Clear water, oxygen throughout the year the hypolimnion (area below the thermocline). Water may be suitable for an unfiltered water supply. Salmon can occupy these lakes.

Mesotrophic: Water is moderately clear, increasing probability of lack of oxygen in the hypolimnion during summer. Iron, manganese, taste, and odor problems worsen. Walleye population may be predominant.

Eutrophic: The hypolimnion is without oxygen the majority of the year. There may be problems with the macrophyte plant population. Blue-green algae blooms may occur. The water supply may have episodes of severe taste and odor. Only warm water fisheries are present. Nuisance macrophytes, algae blooms, and very low transparency may discourage swimming and boating.

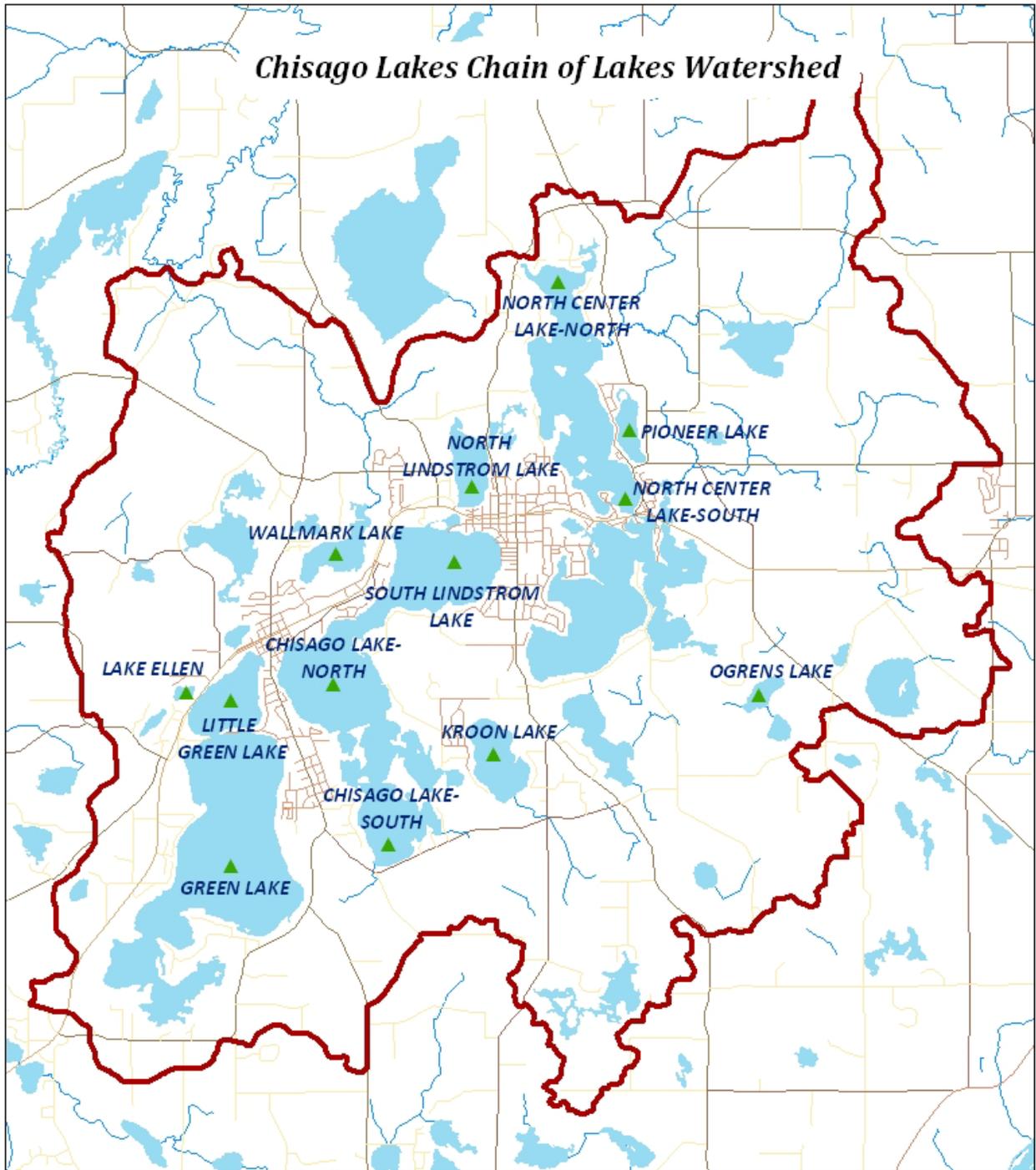
Hypereutrophic: Dense algae and macrophytes present. Rough fish dominate the fish population. The possibilities of summer fish kills exist.

Project Objective

The Chisago Lakes Lake Improvement District, the Chisago Soil & Water Conservation District and the Minnesota Pollution Control Agency partnered in 2009 and 2010 to collect water quality monitoring data in the Chisago Lakes Chain of Lakes Watershed. Gathering this data is necessary to determine the state of the Lakes in the Chisago Lakes area. Knowing where the lakes stand at this point will be beneficial as we start the Total Daily Maximum Load process to determine the amount of pollutants coming into the system, the amount leaving the system and the target goal for reducing pollutants and cleaning up our lakes.

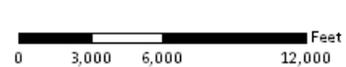
Eleven Lakes were fully or partially monitored through this program. Two of these lakes (Chisago and North Center) had 2 monitoring locations each. Other lakes within the Chain of Lakes were also monitored as a part a MPCA Surface Water Assessment Grant in earlier years – if the monitoring requirements were completely carried out through that program, they are not included in this report. If this data wasn't completed through the grant, it was finished with a few samples in the Chisago Lakes Chain of Lakes Monitoring Program. Two other lakes, South Center and Little Lakes, were monitored by the MPCA (not included in this report).

Monitoring Locations



2008-2010 Water Quality Monitoring Sites
Monitored by volunteers

- ▲ Lake Monitoring Sites
- 🔴 Lake
- 🌊 Stream



Explanation of Parameters

Parameter	Unit	MPCA Deep Lake Standard**	MPCA Shallow Lake Standard**	Expected Range Chisago County
Chlorophyll A	µg/L	14.0	20.0	5.0-22.0
Secchi Disk	Meters	>1.4	>1.0	1.5-3.2
Ammonia Nitrogen*	mg/L	No Standard	No Standard	None
*Minimum reporting level 0.05. Samples reported as 0.05 are actually 0.05 or less.				
pH		No Standard	No Standard	8.6-8.8
Total Phosphorus	µg/L	40.0	60.0	23.0-50.0
Total Suspended Solids	mg/L	No Standard	No Standard	2.0-6.0
Temperature	°F	Daily average should not exceed 86 °F	Daily average should not exceed 86 °F	None
Turbidity	NTU	No Standard	No Standard	1.0-2.0
A lake that fails to meet two of the three standards (Chlorophyll A, Secchi Disk, Total Phosphorus) is considered "impaired".				

Source: Heiskary, 1991

**Standards are based on June-September average. Shallow lakes have a maximum depth of 15 feet or less, or more than 80% of the lake is shallow enough to support emergent vegetation (littoral area). Deep lakes are generally more than 15 feet deep and have less than 80% littoral area.

Lake Classification

Parameter	Oligotrophic	Mesotrophic	Eutrophic	Hyper-Eutrophic
Total Phosphorus (µg/L)	<12	13-24	24-96	>96
Chlorophyll A (µg/L)	<3	3-7	7-56	>56
Secchi Transparency (m)	>4.0	2.0-4.0	2.0-0.5	<0.5

Source: Osgood, 1989b, Osgood, 1989c

Lake Water Quality Grades

Grade	Percentile	Total Phosphorus (µg/L)	Chlorophyll A (µg/L)	Secchi Transparency (m)
A	<10	<23	<10	>3.0
B	10-30	23-32	10-20	2.2-3.0
C	30-70	32-68	20-48	1.2-2.2
D	70-90	68-152	48-77	0.7-1.2
F	>90	>152	>77	<0.7

Source: Metropolitan Council-pg. 12,

<http://www.metrocouncil.org/environment/RiversLakes/Lakes/07IntPurAcknMethResAn.pdf>

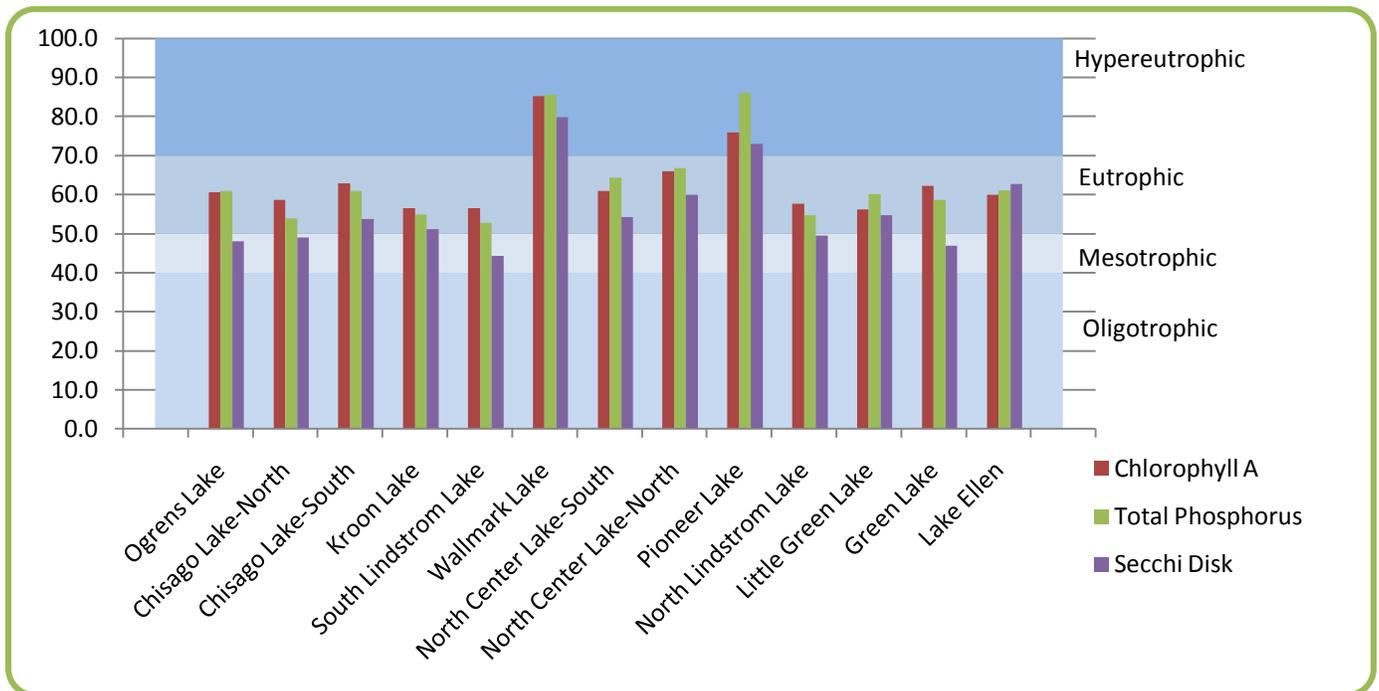
Grades are based on May-September average.

Rank of Lakes Monitored

Rank	Lake	Grade	Trophic State Index	Chlorophyll A (µg/L) (May-Sept)	Secchi Disk (meters) (May-Sept)	Total Phosphorus (µg/L) (May-Sept)	Classification	Shallow versus Deep	Meets MPCA Standard	2010 Impaired Waters List
1	South Lindstrom	B	51.2	14.1	3.0	29.0	Eutrophic	Deep	Yes	No
2	Chisago-North	B-	53.9	17.4	2.2	32.0	Eutrophic	Deep	Yes	No
3	North Lindstrom	C+	54.0	15.9	2.1	33.0	Eutrophic	Deep	Yes	No
4	Kroon	C+	54.1	14.0	1.9	34.0	Eutrophic	Deep	Yes	Yes
5	Green	C+	55.9	25.1	2.5	44.0	Eutrophic	Deep	No	No
6	Little Green	C+	56.9	13.6	1.5	49.0	Eutrophic	Deep	No	No
7	Ogren's	C+	56.45	21.1	2.3	50.0	Eutrophic	Shallow	Yes	No
8	Chisago-South	C	59.2	26.8	1.5	52.0	Eutrophic	Shallow	Yes	No
9	North Center-South	C	59.8	22.1	1.5	65.0	Eutrophic	Shallow	No	Yes
10	Ellen	C	61.27	19.9	0.8	52.0	Eutrophic	Shallow	No	No
11	North Center-North	D	64.2	36.6	1.0	77.0	Eutrophic	Shallow	No	Yes
12	Pioneer	F	78.25	100.8	0.4	291.2	Hypereutrophic	Shallow	No	No
13	Wallmark	F	83.5	262.0	0.3	281.0	Hypereutrophic	Shallow	No	Yes

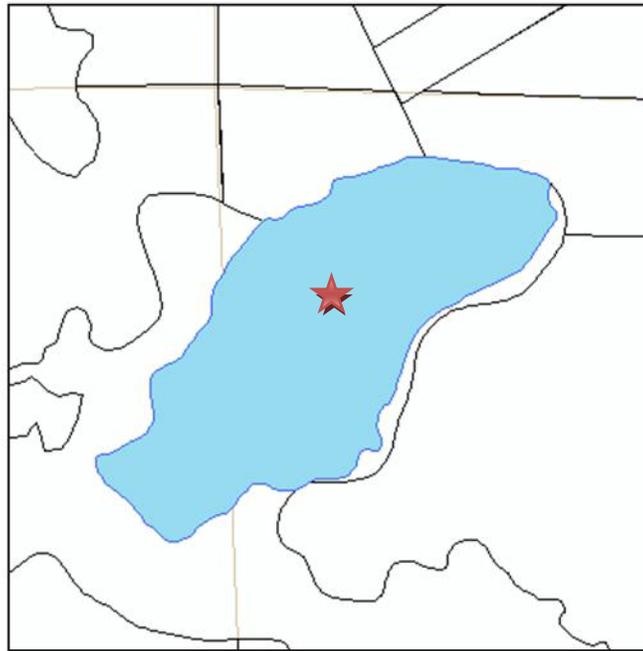
*Shaded cells do not meet Water Quality Standards

Lake Classification Charts





Ogren's Lake



Shallow Lake

Lake Classification: EUTROPHIC

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	60.52	47.98	60.85	56.45
Classification	Eutrophic	Mesotrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C+

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2009-2010 Average (May-Oct)	21.1 µg/L	2.3 meters	50.0 µg/L		
Grade	C	B	C	C+	7 th /13

MPCA Standards: Meets Standards

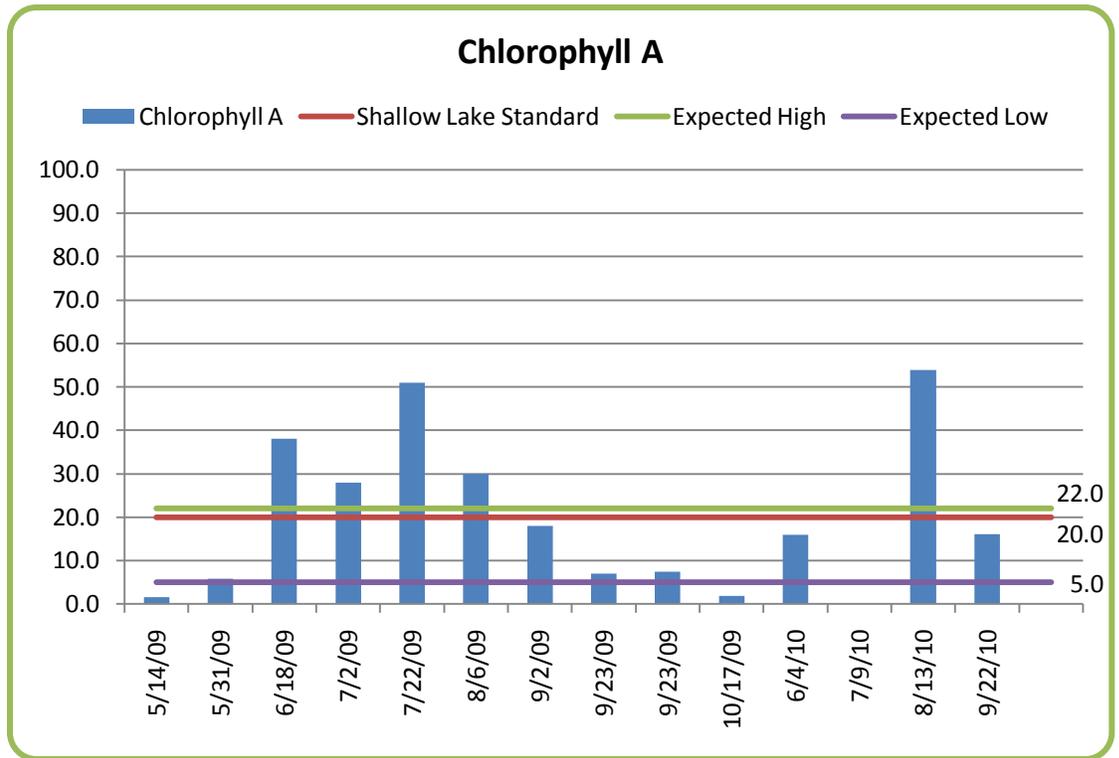
	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Shallow lake)	20.0 µg/L	>1.0 meters	60.0 µg/L	
2009-2010 Average (June-Sept)	26.5 µg/L	2.2 meters	54.0 µg/L	
Meets Standard	No	Yes	Yes	Yes

Chlorophyll A

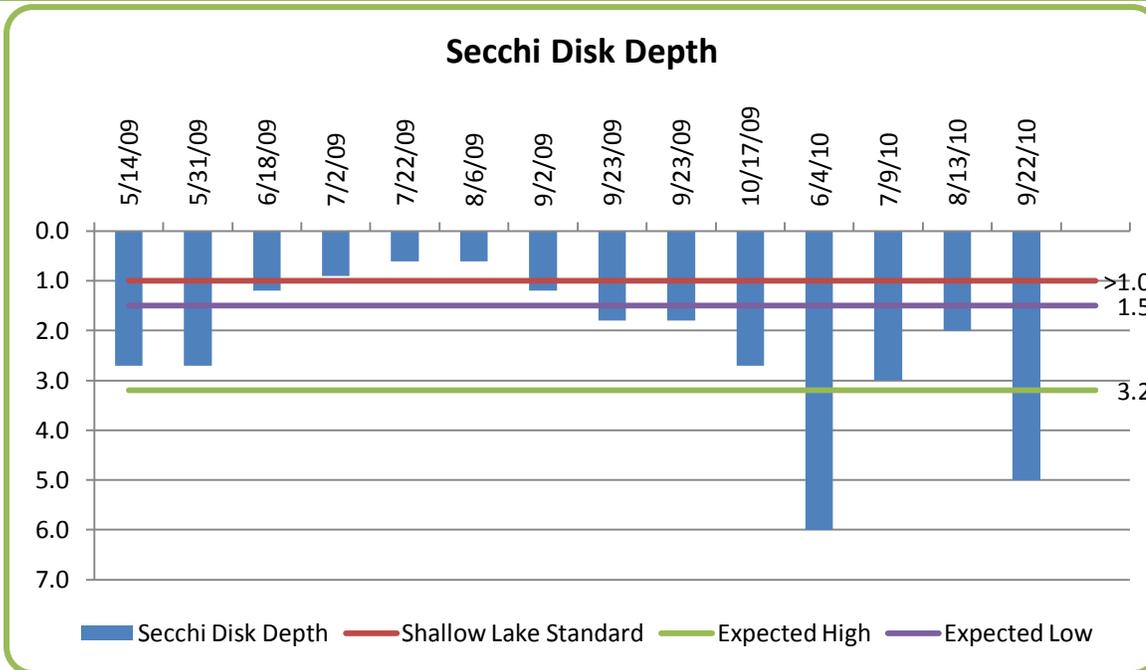
Expected Range:
5.0-22.0 µg/L

Shallow Lake
Standard: 20.0 µg/L

The averages for
2009, 2010, and the
combined 2009-
2010 average all
exceeded the
standard.



	2009	2010	2009-2010 Combined
Average (May-Oct)	18.9 µg/L	28.6 µg/L	21.1 µg/L
Grade	B	C	C
Average (June-Sept)	25.6 µg/L	28.6 µg/L	26.5 µg/L
Meets Standard (20.0 µg/L)	No	No	No



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Shallow Lake
Standard: >1.0
meters

Clarity in this lake
was good, especially
during 2010. The
averages meet the
standard.

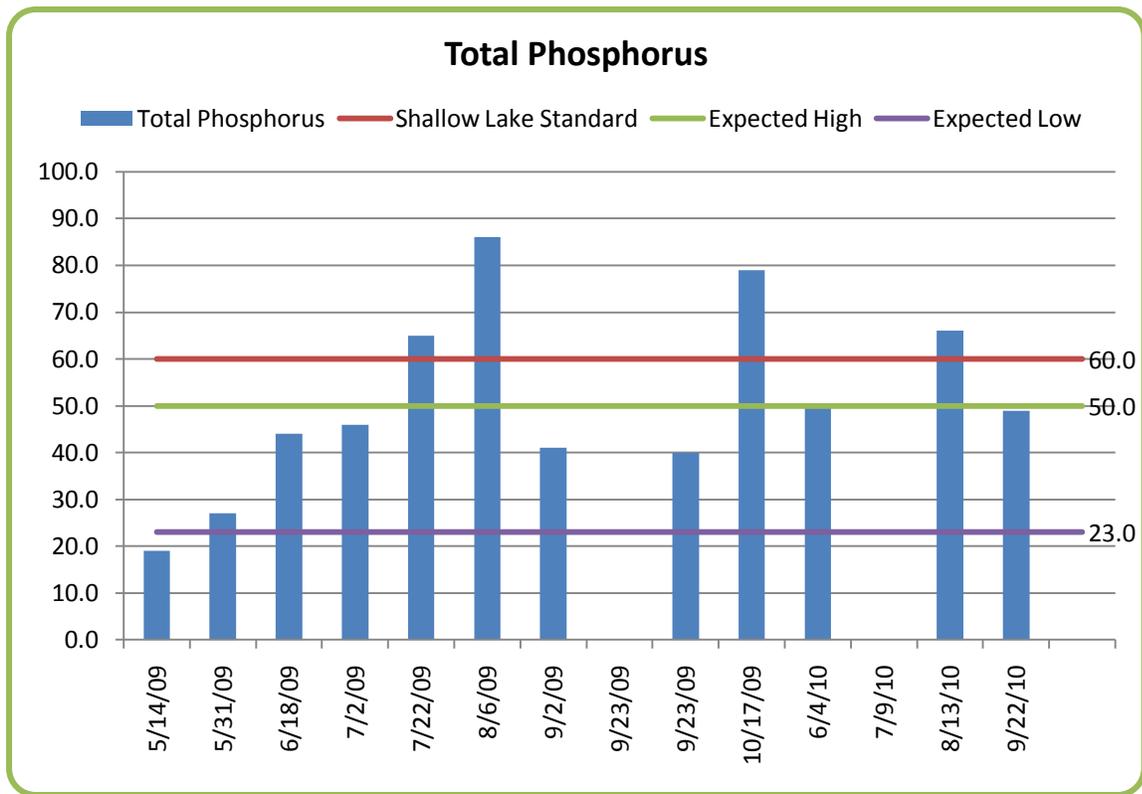
	2009	2010	2009-2010 Combined
Average (May-Oct)	1.6 meters	4.0 meters	2.3 meters
Grade	C	A	B
Average (June-Sept)	1.2 meters	4.0 meters	2.2 meters
Meets Standard (>1.0 m)	Yes	Yes	Yes

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

Shallow Lake
Standard: 60.0 µg/L

The averages meet the standard for this lake, although several samples exceed the expected range.



	2009	2010	2009-2010 Combined
Average (May-Oct)	50.0 µg/L	55.0 µg/L	51.0 µg/L
Grade	C	C	C
Average (June-Sept)	54.0 µg/L	55.0 µg/L	54.0 µg/L
Meets Standard (60.0 µg/L)	Yes	Yes	Yes

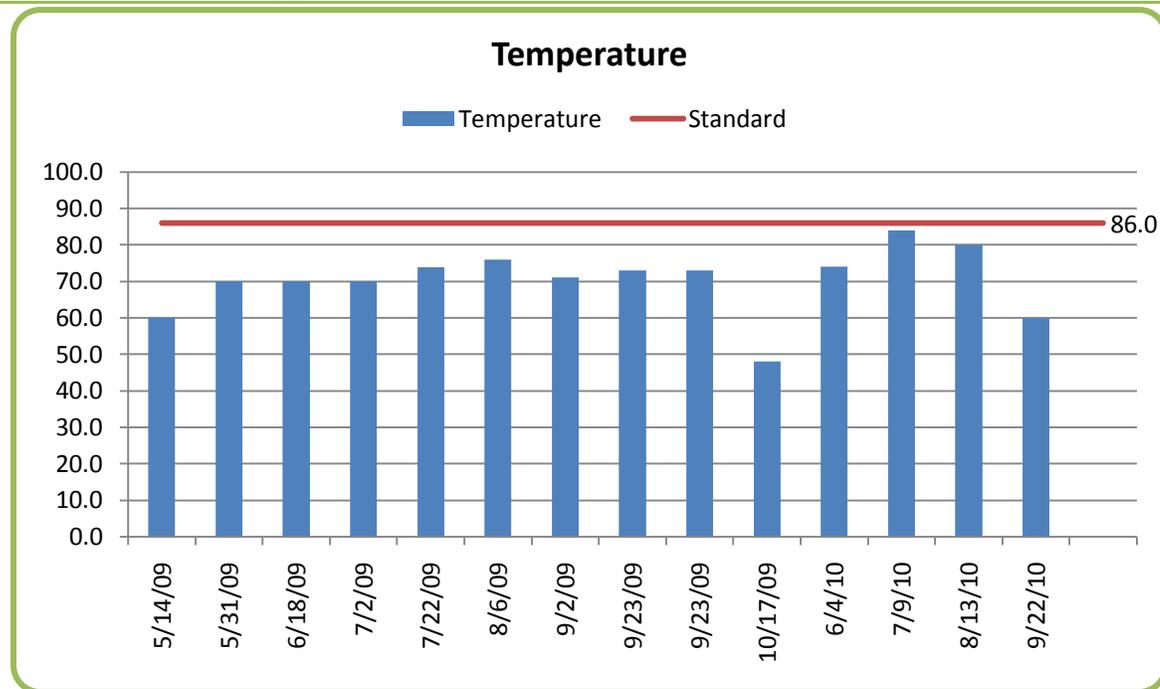
Temperature

Temperature

Expected Range:
None

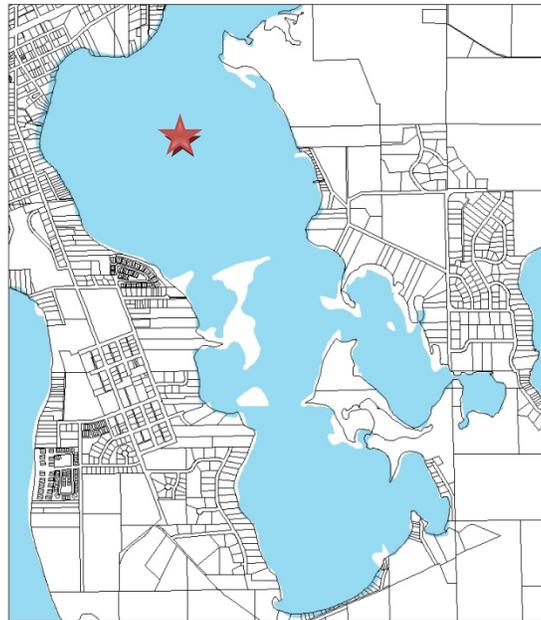
Shallow Lake
Standard: The daily
average shall not
exceed 86.0°F

Most temperatures
were between 60.0
and 85.0°F. One low
reading was
recorded.



	2009	2010	2009-2010 Combined
Average	69.3 °F	74.5 °F	70.2 °F
Meets Standard (Not to exceed 86.0°F)	Yes	Yes	Yes

Chisago Lake



Deep Lake

Lake Classification: EUTROPHIC

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	58.6	49.0	54.0	53.9
Classification	Eutrophic	Mesotrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: B-

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2009-2010 Average (May-Sept)	17.4 µg/L	2.2 meters	32.0 µg/L		
Grade	B	C	B-C	B-	2 nd /13

MPCA Standards: Meets Standards

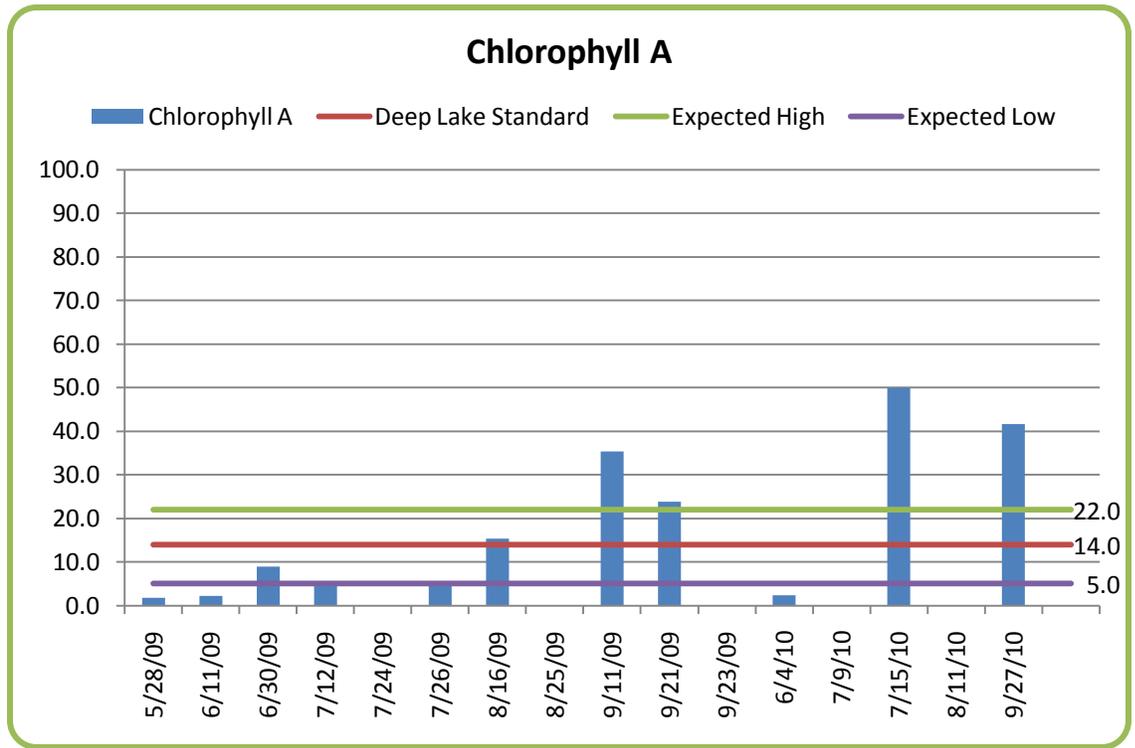
	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Deep lake)	14.0 µg/L	>1.4 meters	40.0 µg/L	
2009-2010 Average (June-Sept)	19.0 µg/L	2.0 meters	32.0 µg/L	
Meets Standard	No	Yes	Yes	Yes

Chlorophyll A

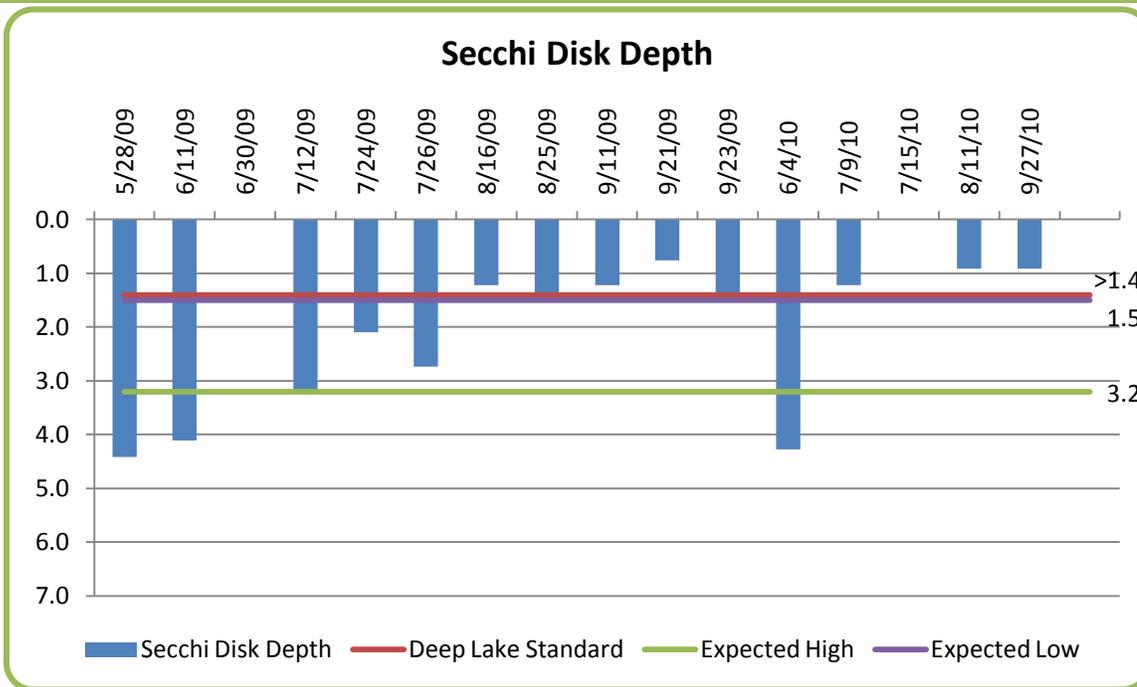
Expected Range:
5.0-22.0 µg/L

Deep Lake Standard:
14.0 µg/L

Early season samples are below or within the expected range, but by late summer, samples exceed both the standard and the expected high.



	2009	2010	2009-2010 Combined
Average (May-Sept)	12.2 µg/L	31.3 µg/L	17.4 µg/L
Grade	B	C	B
Average (June-Sept)	13.7 µg/L	31.3 µg/L	19.0 µg/L
Meets Standard (14.0 µg/L)	Yes	No	No



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Deep Lake Standard:
>1.4 meters

This part of the lake meets the standard. Readings are below the expected range during August and September, indicating poorer water clarity during late summer.

	2009	2010	2009-2010 Combined
Average (May-Sept)	2.3 meters	1.8 meters	2.2 meters
Grade	B	C	C
Average (June-Sept)	2.0 meters	1.8 meters	2.0 meters
Meets Standard (>1.4 m)	Yes	Yes	Yes

Total Phosphorus

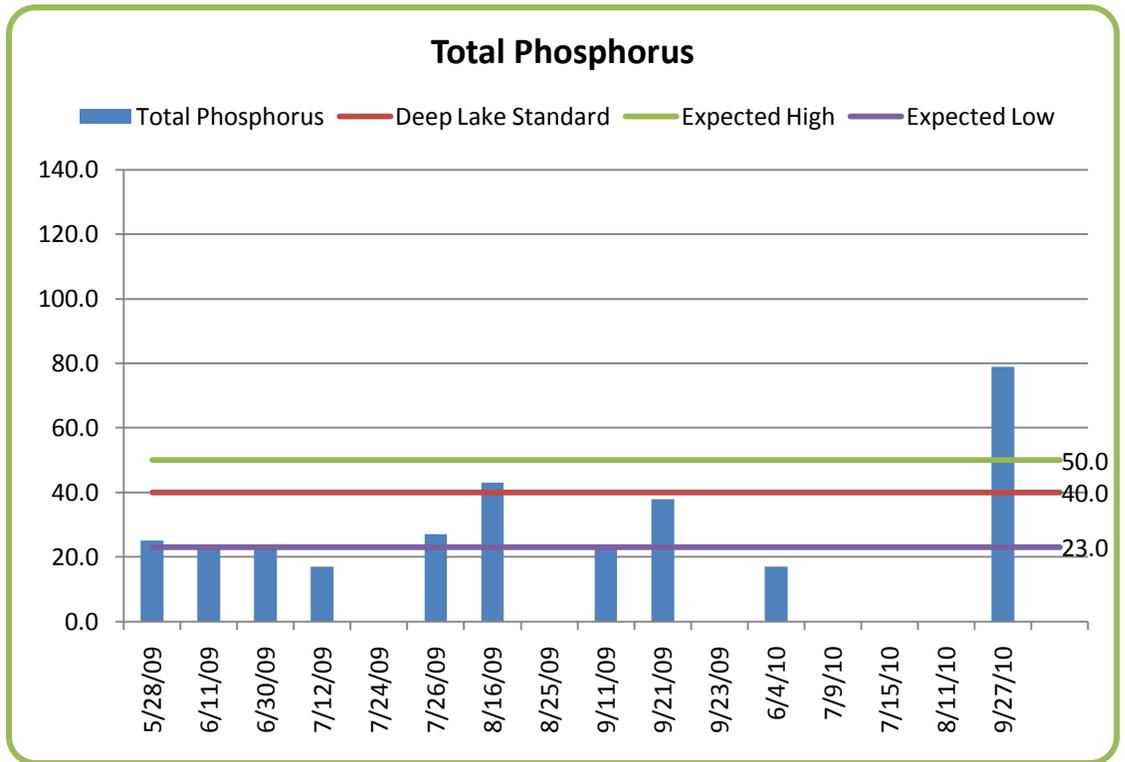
Expected Range:

23.0-50.0 µg/L

Deep Lake Standard:

40.0 µg/L

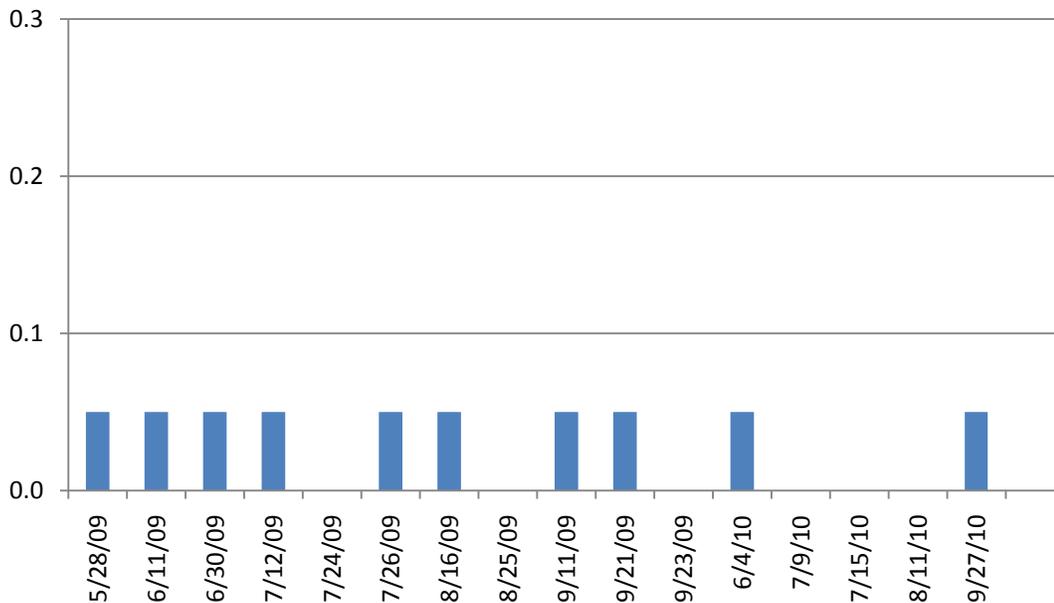
Only two samples were taken in 2010, one of which was very high and pushed the average for that year so that it did not meet the standard. The standard was met in 2009.



	2009	2010	2009-2010 Combined
Average (May-Sept)	28.0 µg/L	48.0 µg/L	32.0 µg/L
Grade	B	C	B-C
Average (June-Sept)	28.0 µg/L	48.0 µg/L	32.0 µg/L
Meets Standard (40.0 µg/L)	Yes	No	Yes

Ammonia Nitrogen

Ammonia Nitrogen



Ammonia Nitrogen

Expected Range: None

Deep Lake Standard: None

There is no standard, but the ammonia nitrogen levels were very low.

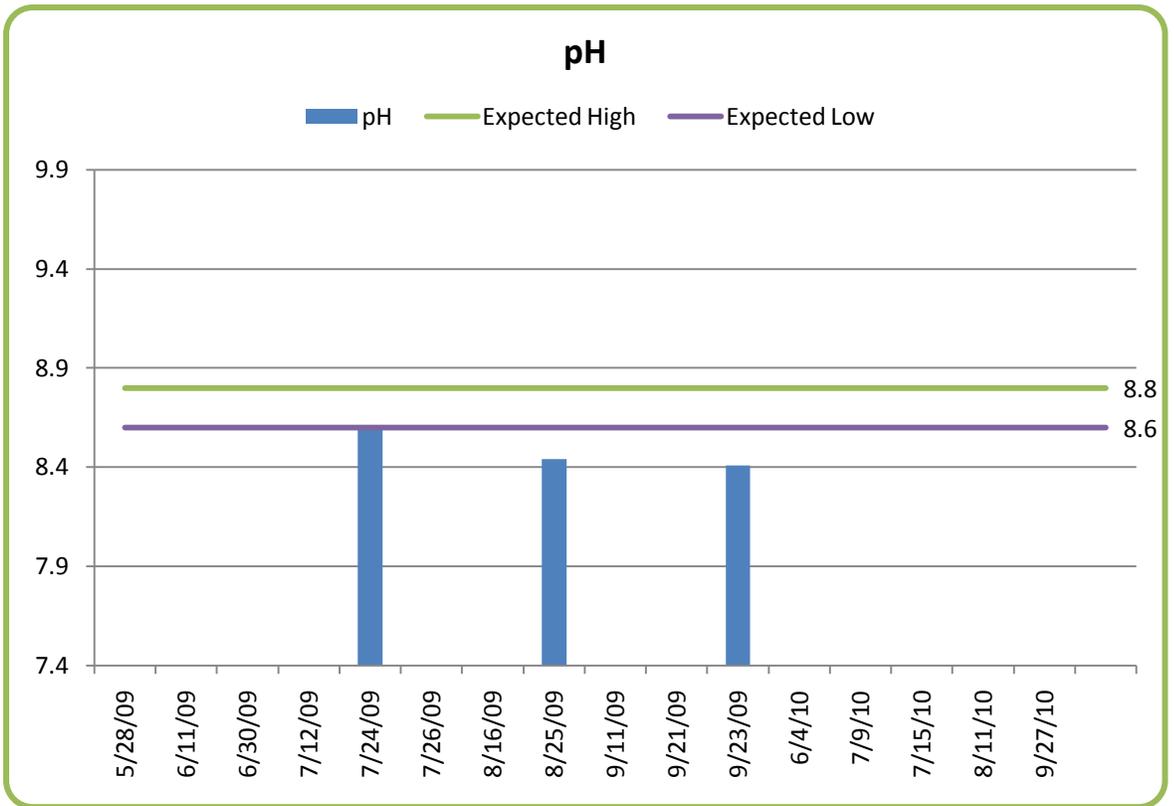
	2009	2010	2009-2010 Combined
Average	<0.05	<0.05	<0.05

pH

Expected Range:
8.6-8.8

Deep Lake Standard:
None

The pH levels were lower than the expected range on all three occasions that samples were taken.



	2009	2010	2009-2010 Combined
Average	8.5	NO DATA	8.5
Within Expected Range	No		No

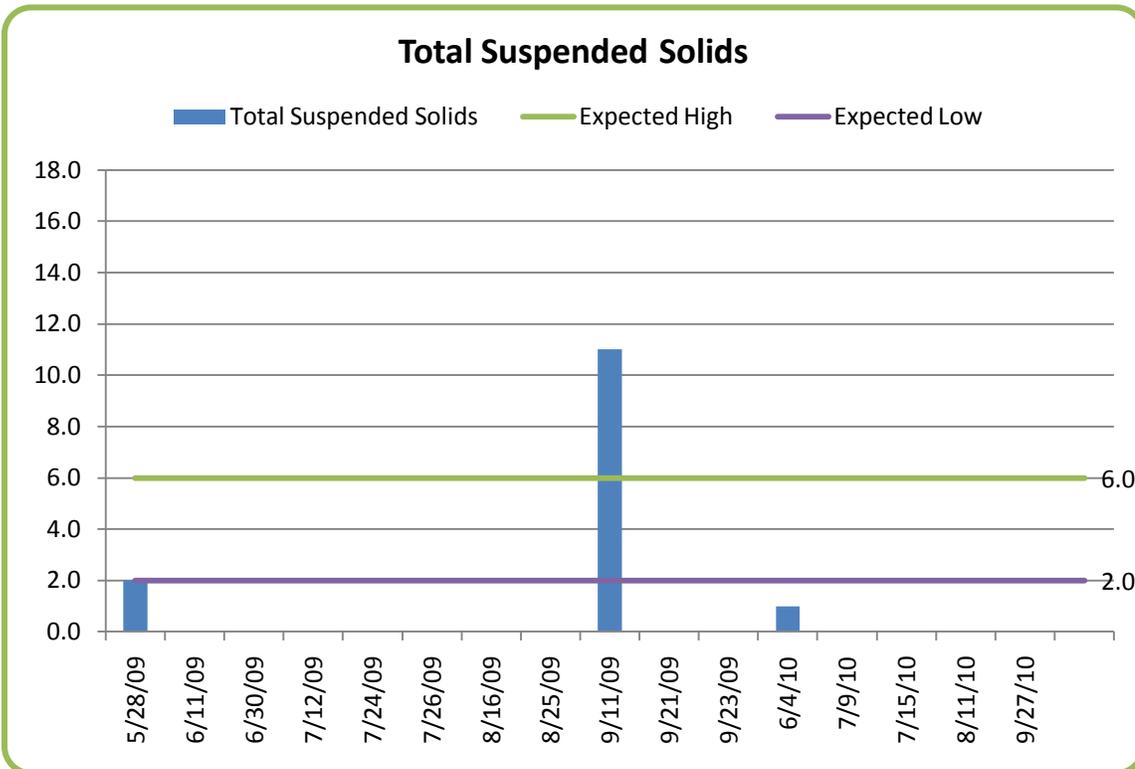
Total Suspended Solids

Total Suspended Solids

Expected Range: 2.0-6.0 mg/L

Deep Lake Standard: None

The early 2009 sample was just below the expected range, while the late sample was well above it. The 2010 sample was below the range. The average was within the expected range.



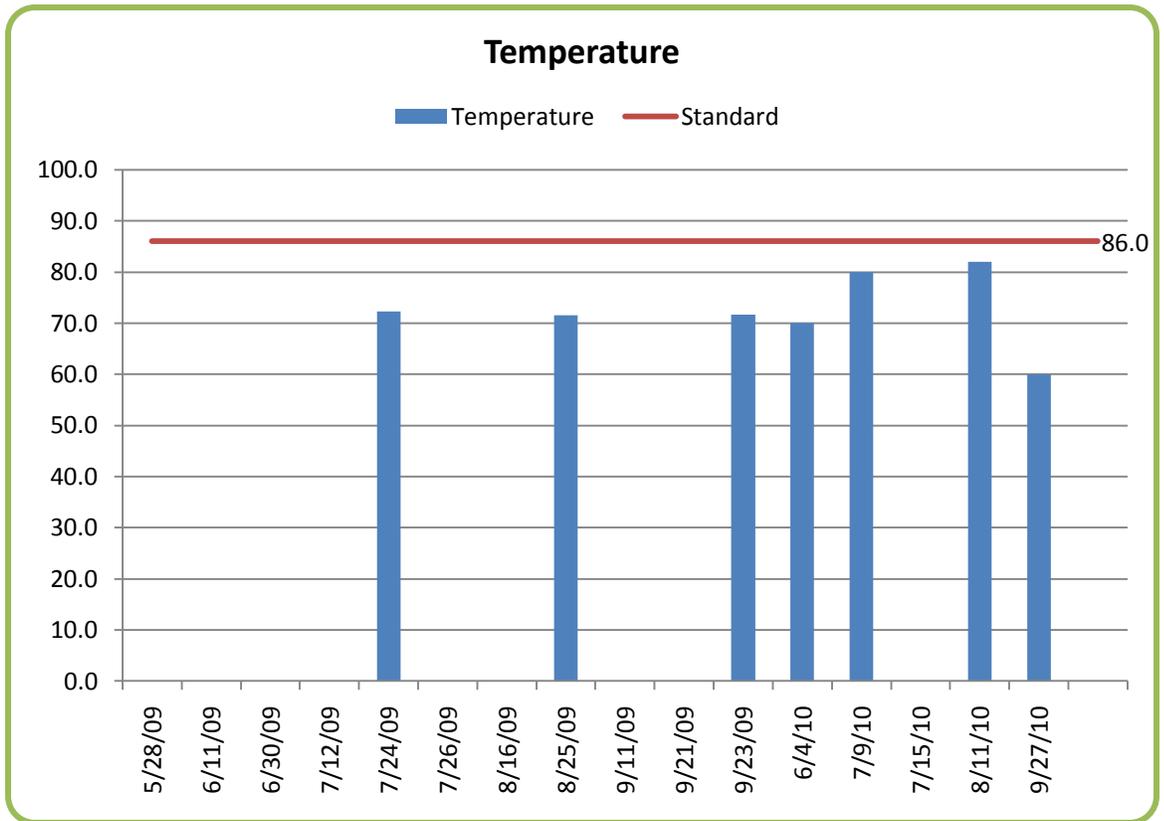
	2009	2010	2009-2010 Combined
Average	6.5 mg/L	1.0 mg/L	4.7 mg/L
Within Expected Range	No	Lower Than (More Clear)	Yes

Temperature

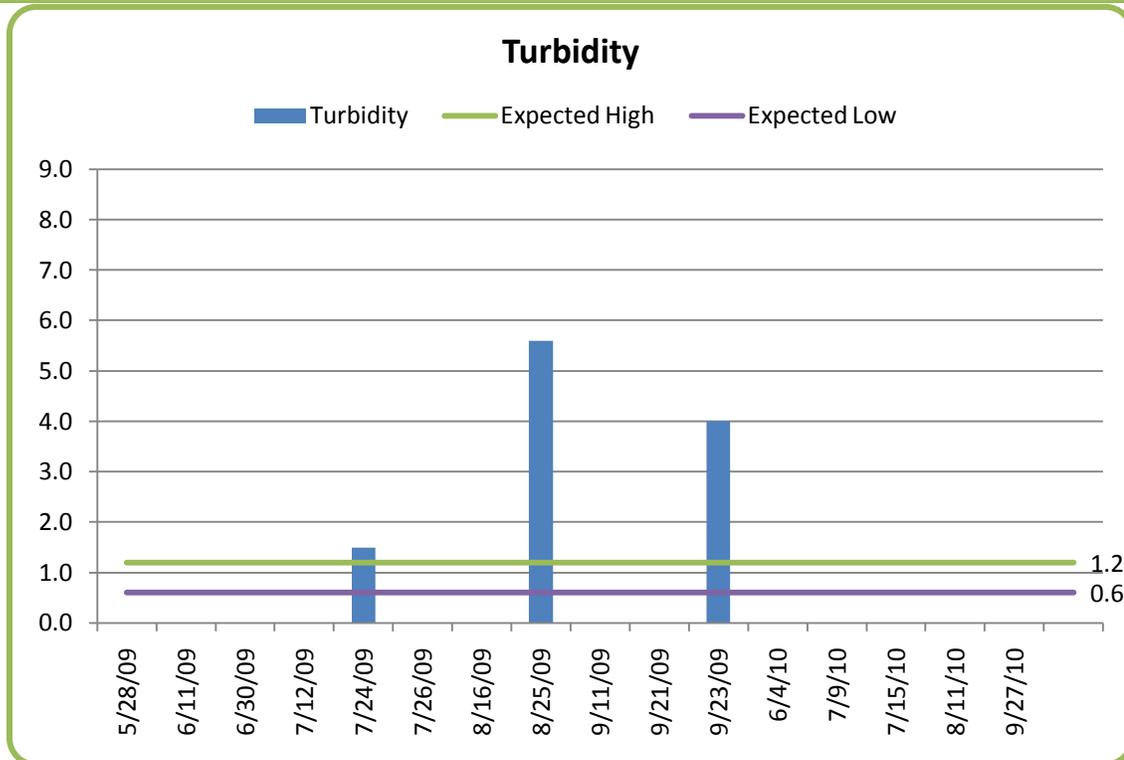
Expected Range:
None

Deep Lake Standard:
The daily average
shall not exceed
86.0°F

Temperatures were
between 60.0 and
85.0°F for all
samples.



	2009	2010	2009-2010 Combined
Average	71.8 °F	73.0 °F	72.5 °F
Meets Standard (Not to exceed 86.0°F)	Yes	Yes	Yes



Turbidity

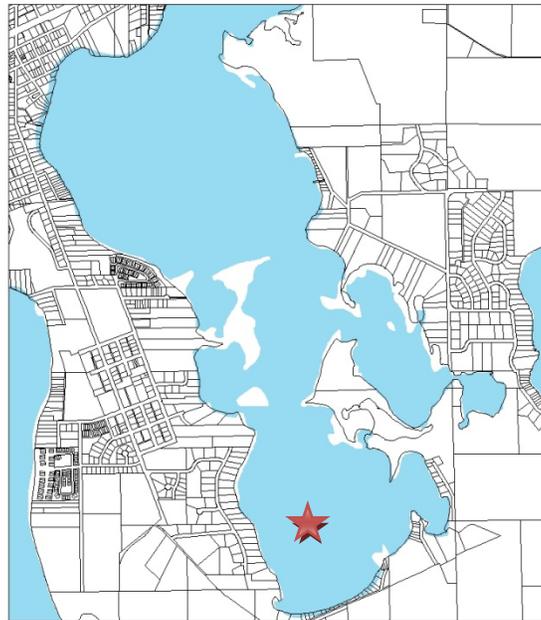
Expected Range: 1.0-
2.0 NTU

Deep Lake Standard:
None

All three samples
exceeded the
expected range. The
average also exceeded
the expected range.

	2009	2010	2009-2010 Combined
Average	3.7 NTU	NO DATA	3.7 NTU
Within Expected Range	No		No

Chisago Lake



Shallow Lake

Lake Classification: EUTROPHIC

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	62.9	53.8	61.0	59.2
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2009-2010 Average (May-Sept)	26.8 µg/L	1.5 meters	52.0 µg/L		
Grade	C	C	C	C	8 th /13

MPCA Standards: Meets Standards

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Shallow lake)	20.0 µg/L	>1.0 meters	60.0 µg/L	
2009-2010 Average (June-Sept)	34.0 µg/L	1.4 meters	58.0 µg/L	
Meets Standard	No	Yes	Yes	Yes

Chlorophyll A

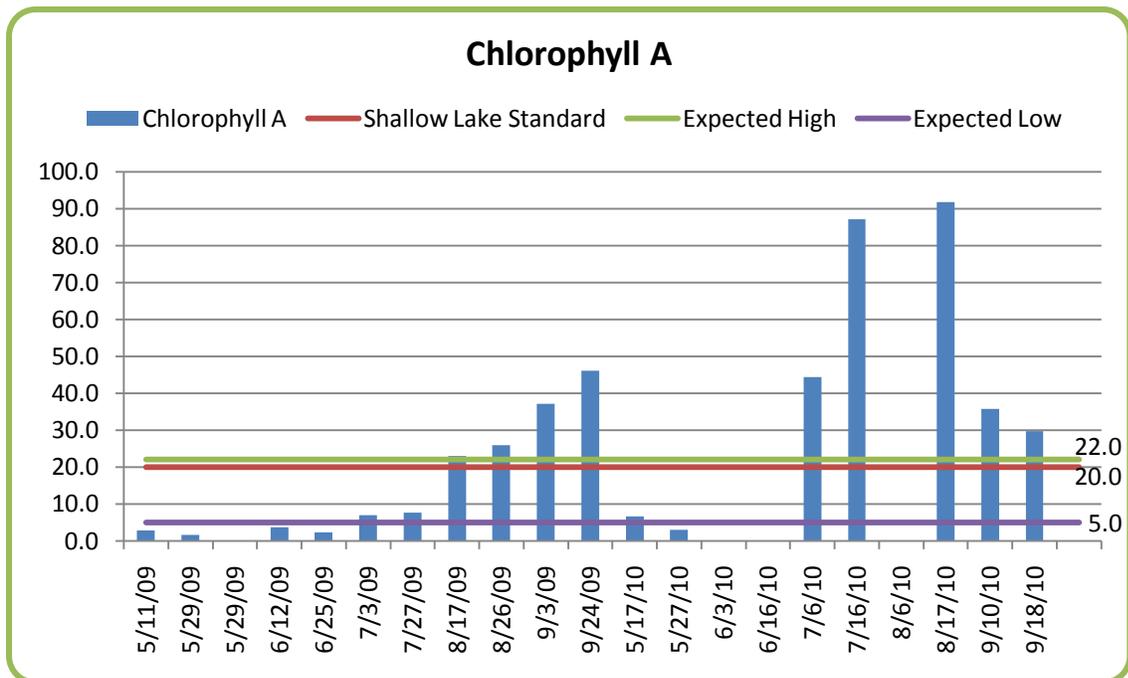
Expected Range:

5.0-22.0 µg/L

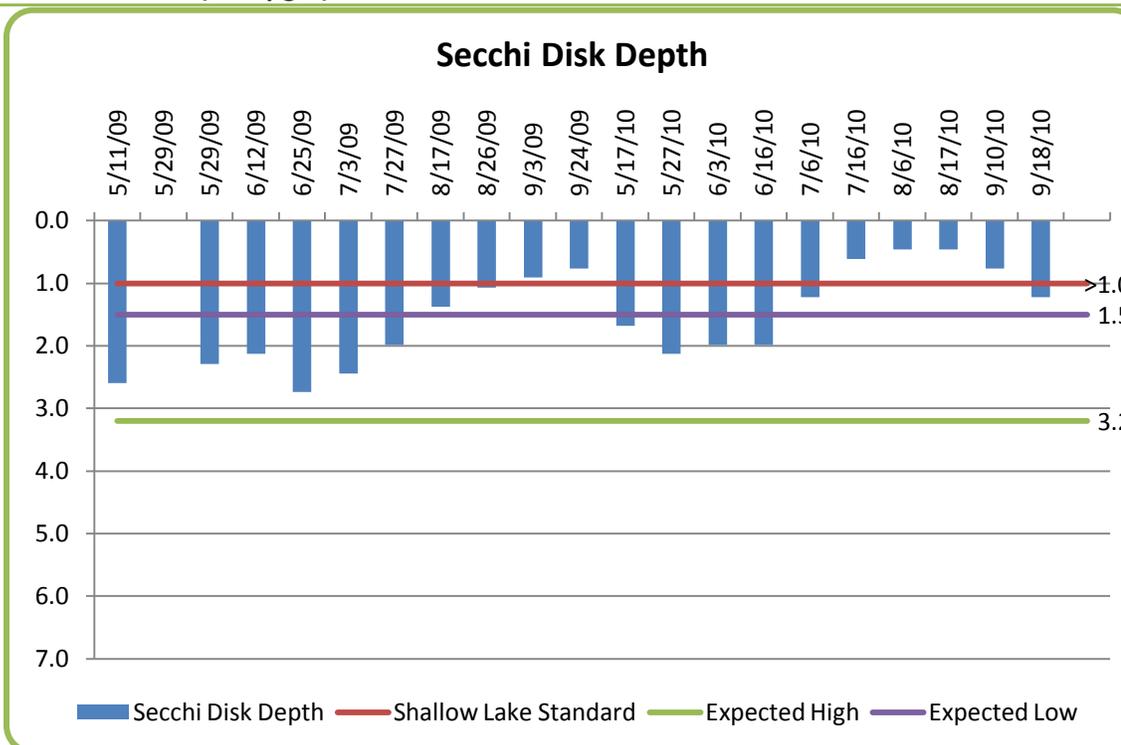
Shallow Lake

Standard: 20.0 µg/L

August and September samples were very high. The 2009 average met the standard, but 2010 did not. The average of all readings did not meet the standard.



	2009	2010	2009-2010 Combined
Average (May-Sept)	15.8 µg/L	42.6 µg/L	26.8 µg/L
Grade	B	C	C
Average (June-Sept)	19.1 µg/L	57.7 µg/L	34.0 µg/L
Meets Standard (20.0 µg/L)	Yes	No	No



Secchi Disk Depth

Expected Range:

1.5-3.2 meters

Shallow Lake

Standard: >1.0

meters

This part of the lake meets the standard. These numbers were often artificially low due to aquatic vegetation.

	2009	2010	2009-2010 Combined
Average (May-Sept)	1.8 meters	1.3 meters	1.5 meters
Grade	C	C	C
Average (June-Sept)	1.7 meters	1.1 meters	1.4 meters
Meets Standard (>1.0 m)	Yes	Yes	Yes

Total Phosphorus

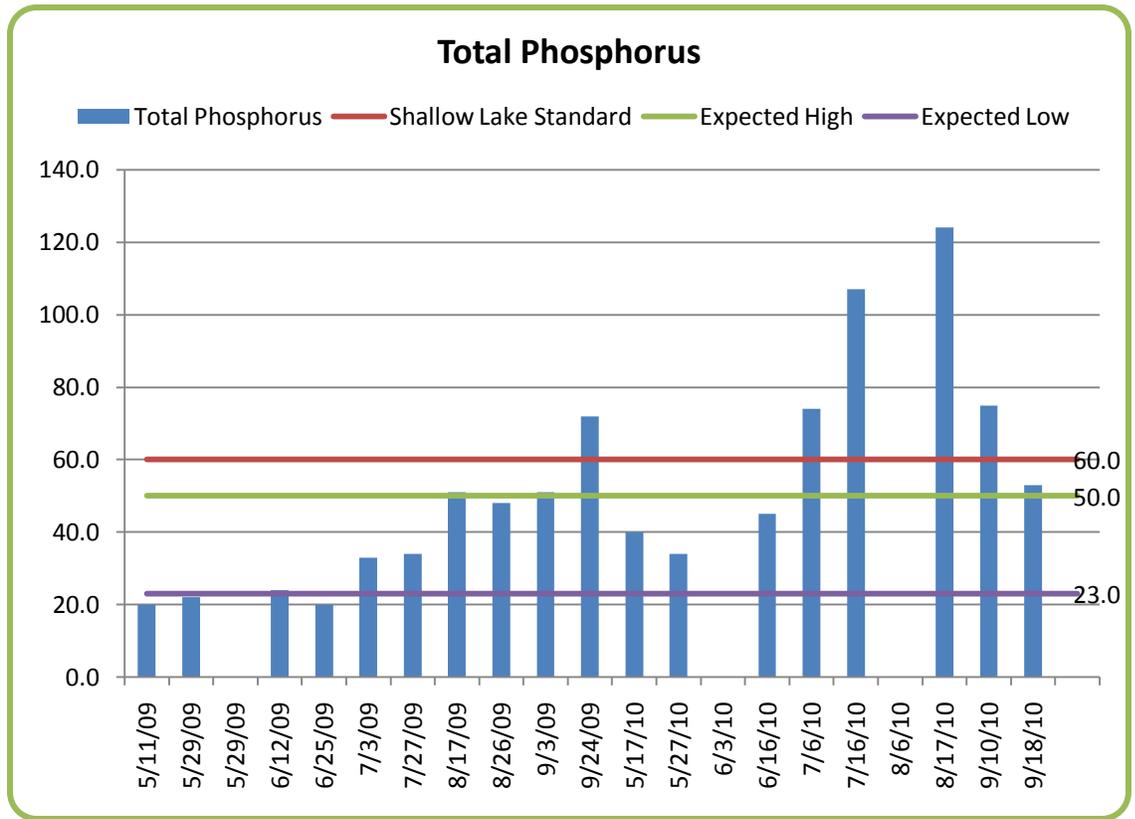
Expected Range:

23.0-50.0 µg/L

Shallow Lake

Standard: 60.0 µg/L

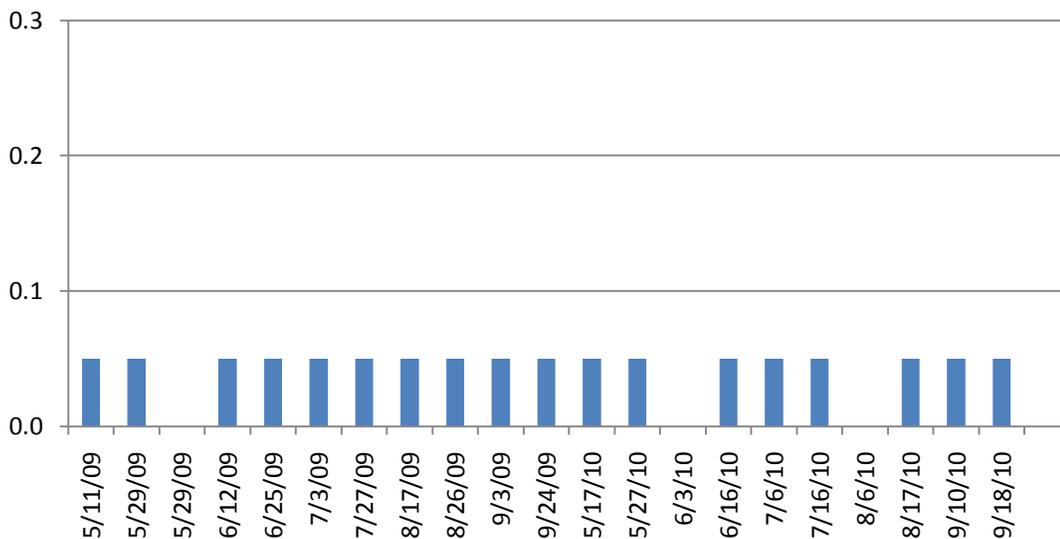
Although several samples were well above the expected high and the standard, the yearly and overall averages did meet the standard.



	2009	2010	2009-2010 Combined
Average (May-Sept)	38.0 µg/L	69.0 µg/L	52.0 µg/L
Grade	C	D	C
Average (June-Sept)	42.0 µg/L	80.0 µg/L	58.0 µg/L
Meets Standard (60.0 µg/L)	Yes	No	Yes

Ammonia Nitrogen

■ Ammonia Nitrogen



Ammonia Nitrogen

Expected Range: None

Shallow Lake Standard: None

There is no standard, but the ammonia nitrogen levels were very low.

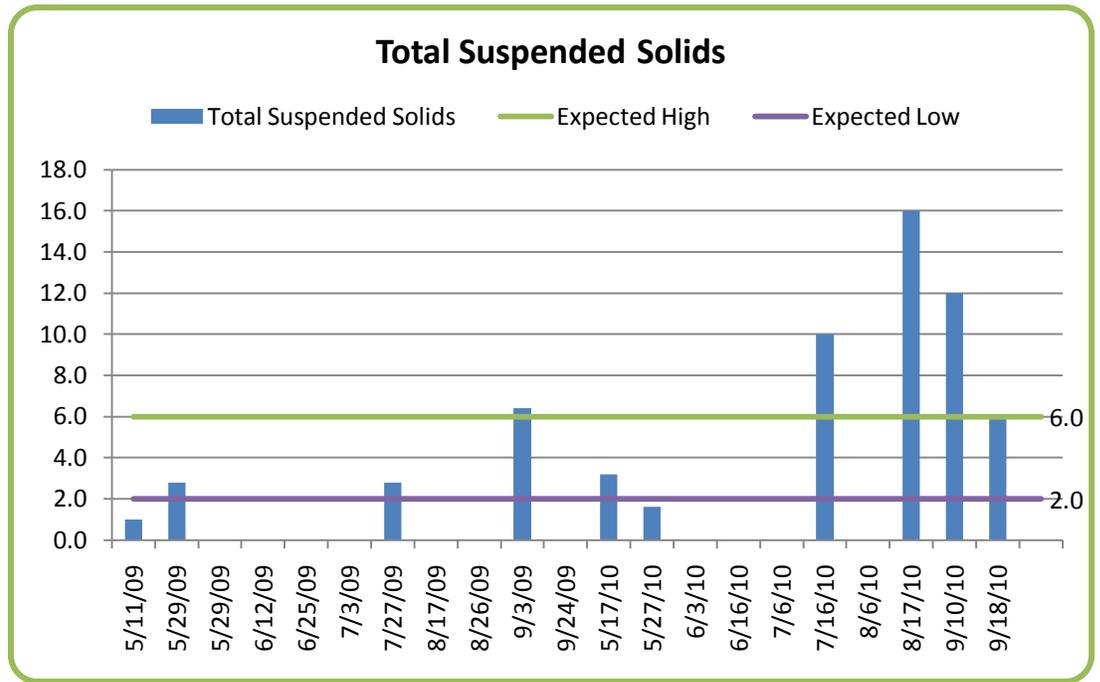
	2009	2010	2009-2010 Combined
Average	<0.05	<0.05	<0.05

Total Suspended Solids

Expected Range:
2.0-6.0 mg/L

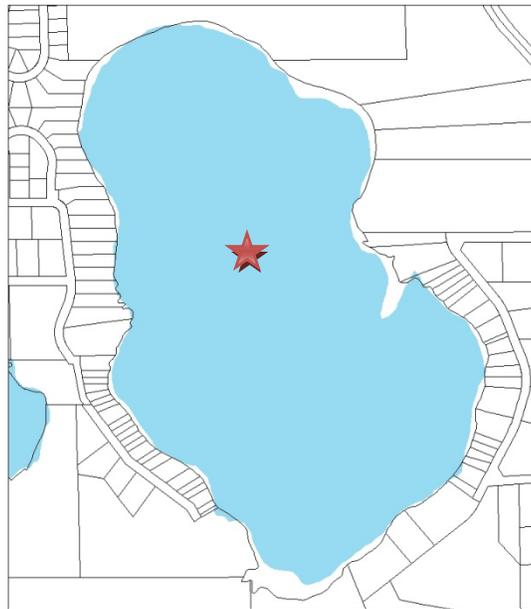
Shallow Lake
Standard: None

The 2009 average fell within the expected range, but the 2010 and the overall averages did not.



	2009	2010	2009-2010 Combined
Average	3.3 mg/L	8.1 mg/L	6.2 mg/L
Within Expected Range	Yes	No	No

Kroon Lake



Deep Lake

Lake Classification: EUTROPHIC

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	56.5	51.1	54.9	54.1
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C+

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2009-2010 Average (May-Sept)	14.0 µg/L	1.9 meters	34.0 µg/L		
Grade	B	C	C	C+	4 th /13

MPCA Standards: Meets Standards

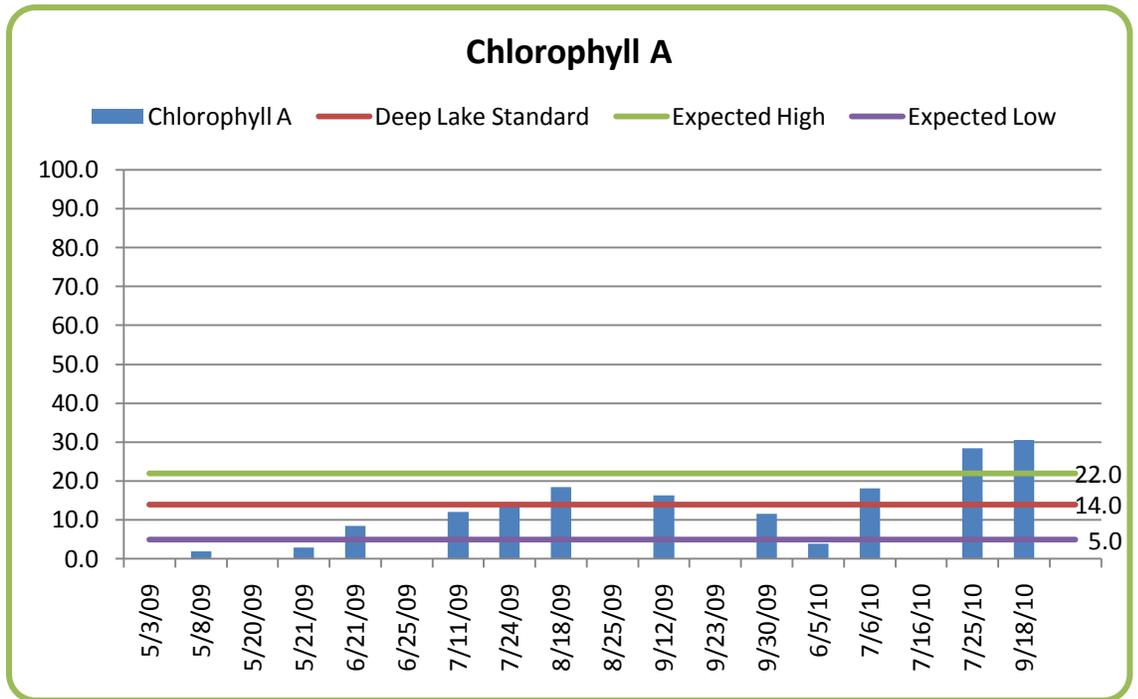
	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Deep lake)	14.0 µg/L	>1.4 meters	40.0 µg/L	
2009-2010 Average (June-Sept)	16.2 µg/L	1.4 meters	35.0 µg/L	
Meets Standard	No	Yes	Yes	Yes

Chlorophyll A

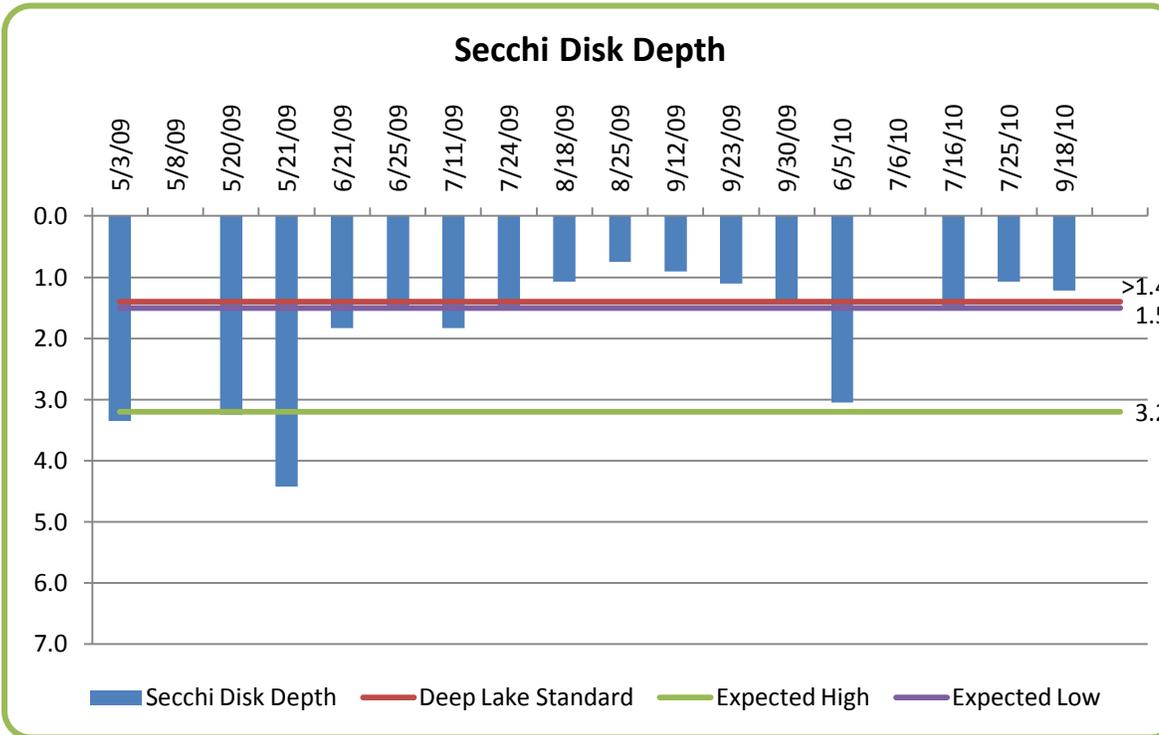
Expected Range:
5.0-22.0 µg/L

Deep Lake Standard:
14.0 µg/L

The combined 2009-2010 average (June-Sept) did not meet the standard.



	2009	2010	2009-2010 Combined
Average (May-Sept)	10.8 µg/L	20.3 µg/L	14.0 µg/L
Grade	B	C	B
Average (June-Sept)	13.6 µg/L	20.3 µg/L	16.2 µg/L
Meets Standard (14.0 µg/L)	Yes	No	No



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Deep Lake Standard:
>1.4 meters

This lake just barely meets the standard. Readings are below the expected range during August and September, indicating poorer water clarity during late summer.

	2009	2010	2009-2010 Combined
Average (May-Sept)	1.9 meters	1.7 meters	1.9 meters
Grade	C	C	C
Average (June-Sept)	1.3 meters	1.7 meters	1.4 meters
Meets Standard (>1.4 m)	No	Yes	Yes

Total Phosphorus

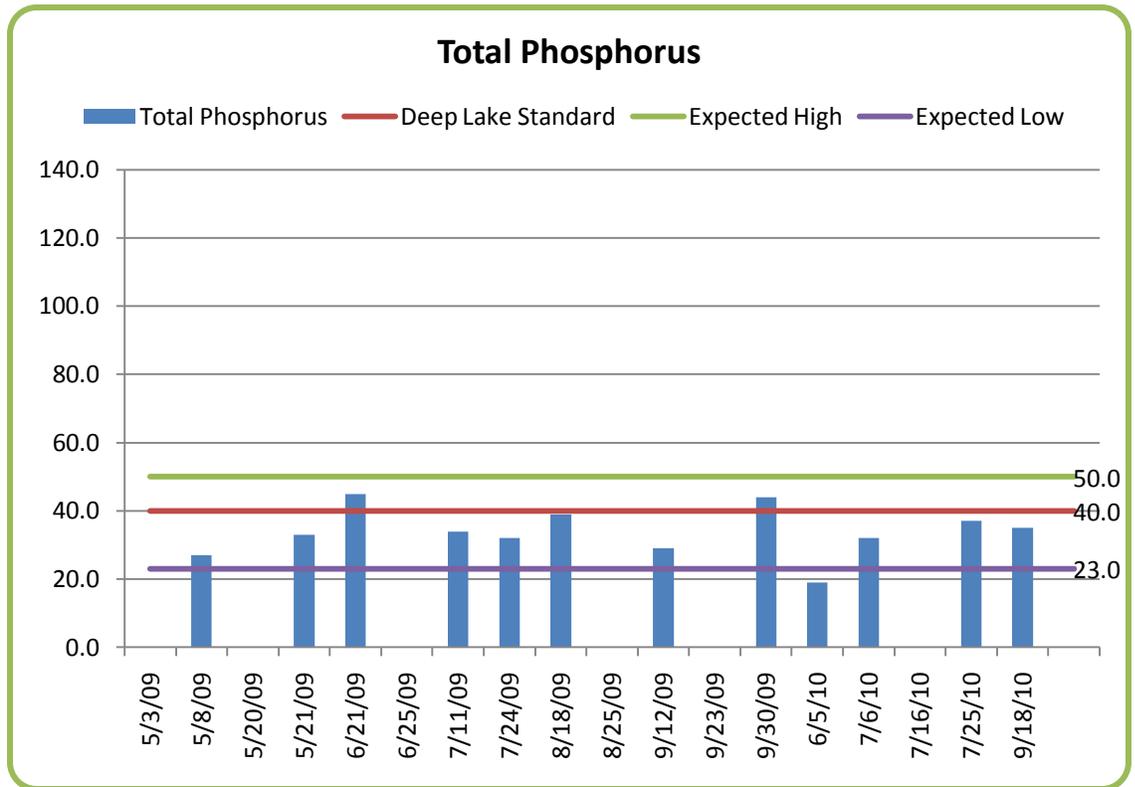
Expected Range:

23.0-50.0 µg/L

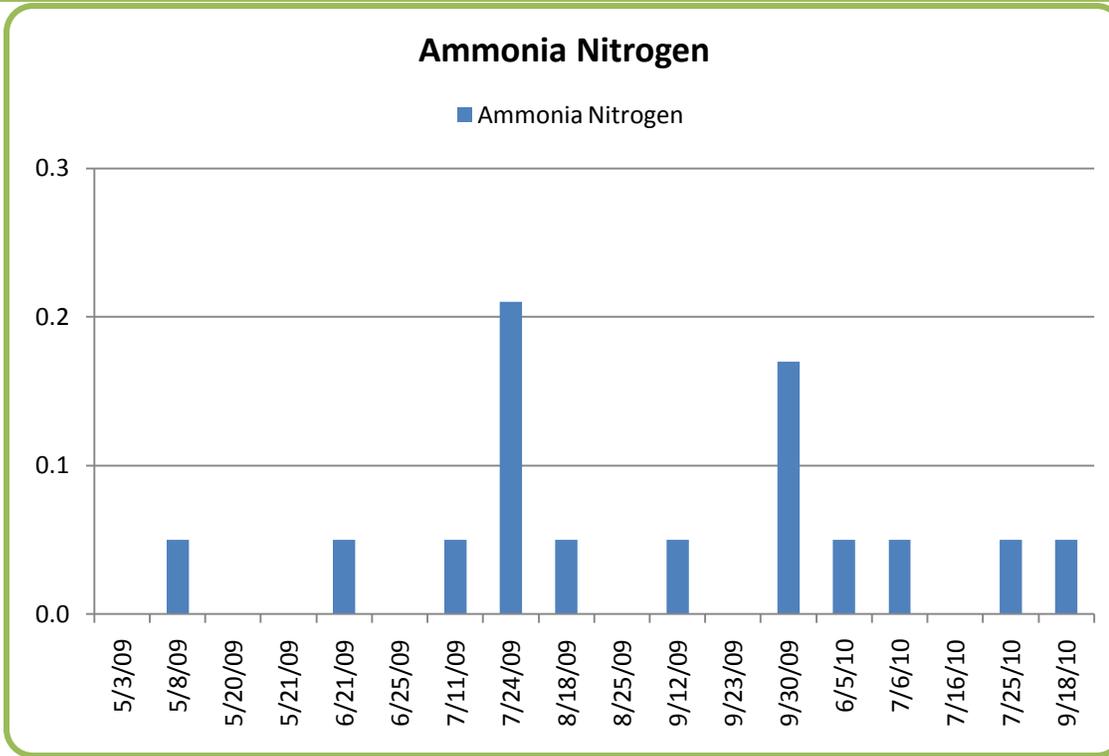
Deep Lake Standard:

40.0 µg/L

The lake meets the standard for total phosphorus.



	2009	2010	2009-2010 Combined
Average (May-Sept)	35.0 µg/L	31.0 µg/L	34.0 µg/L
Grade	C	B	C
Average (June-Sept)	37.0 µg/L	31.0 µg/L	35.0 µg/L
Meets Standard (40.0 µg/L)	Yes	Yes	Yes



Ammonia Nitrogen

Expected Range: None

Deep Lake Standard: None

Most samples were very low. Two had elevated readings.

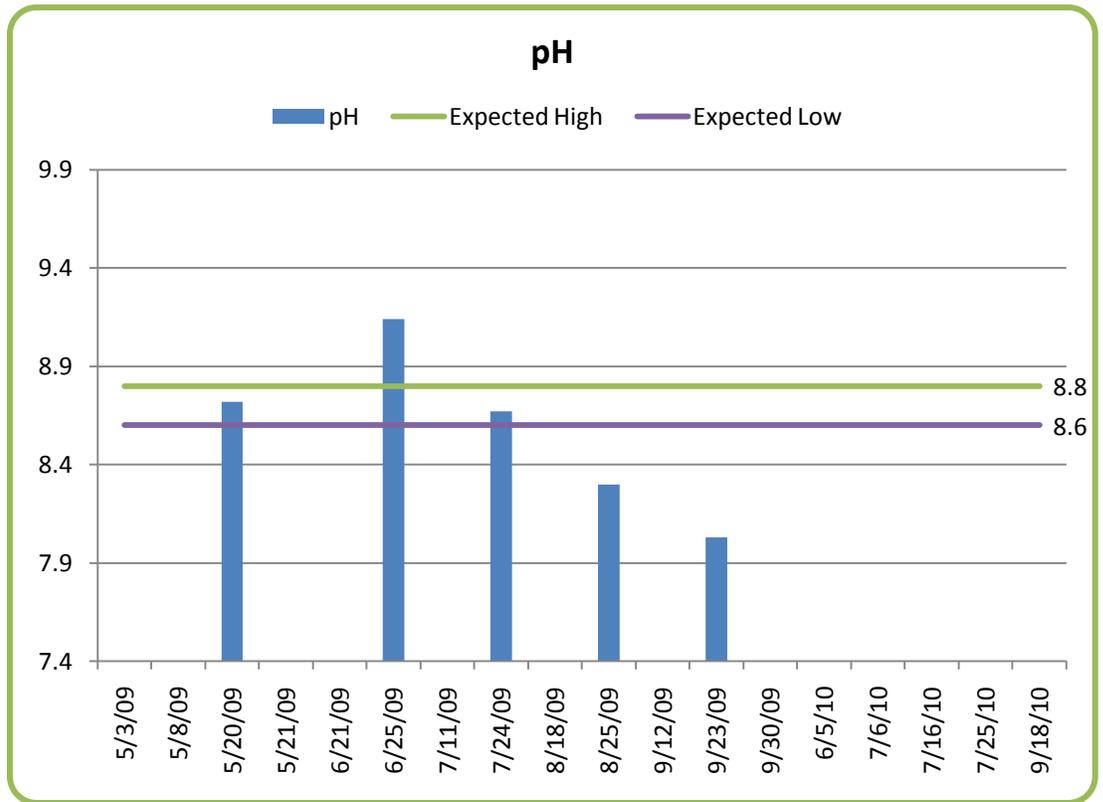
	2009	2010	2009-2010 Combined
Average	0.09	<0.05	0.06

pH

Expected Range:
8.6-8.8

Deep Lake Standard:
None

The pH average was below the expected range, although there was a wide range of sample results.



	2009	2010	2009-2010 Combined
Average	8.6	NO DATA	8.6
Within Expected Range	Yes		Yes

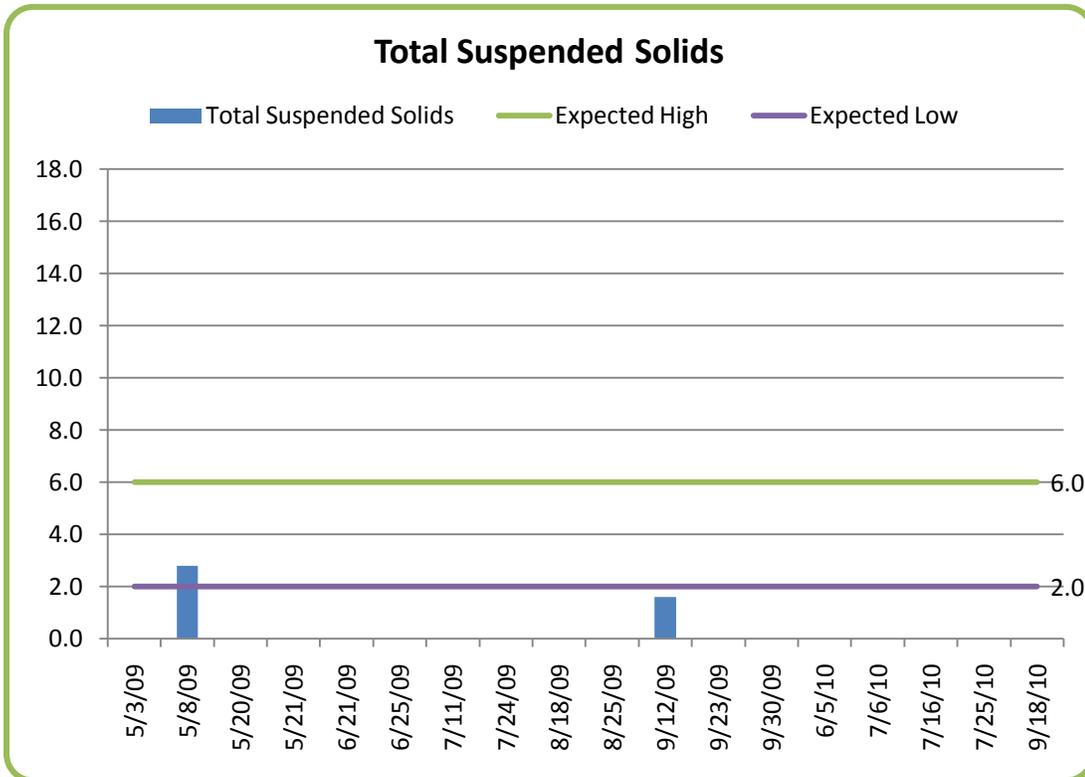
Total Suspended Solids

Total Suspended Solids

Expected Range: 2.0-6.0 mg/L

Deep Lake Standard:
None

Only two samples were taken. One was within the expected range and the other just below it. The average was within the expected range.



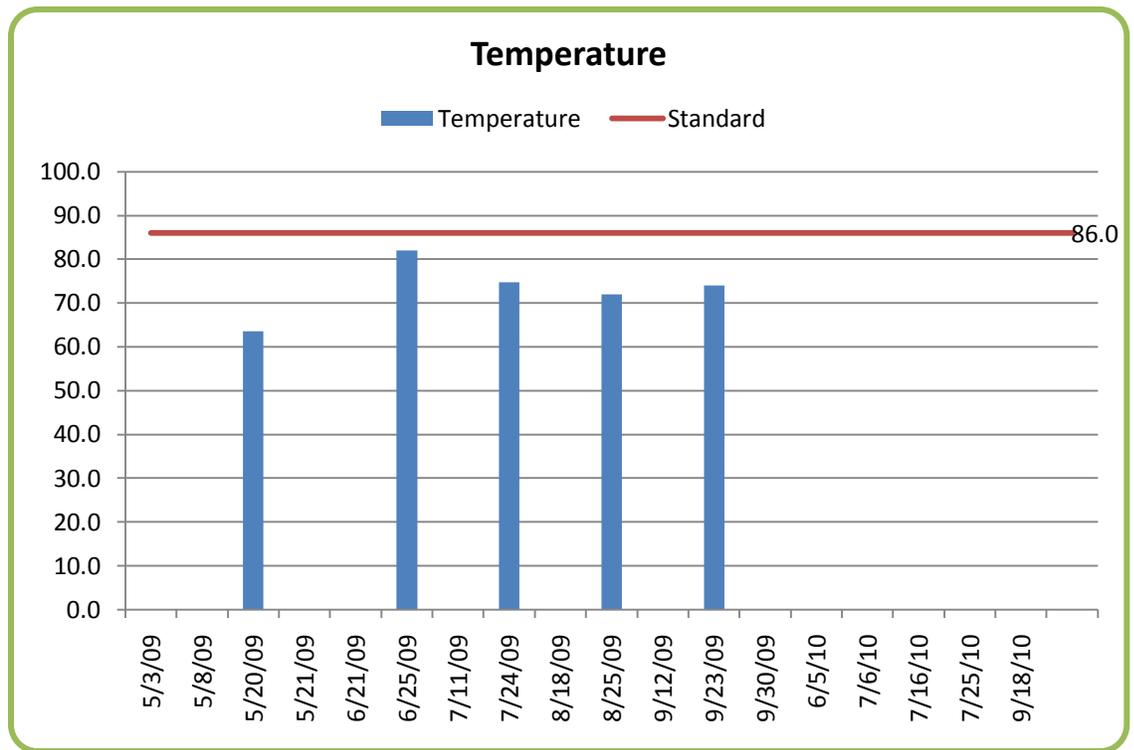
	2009	2010	2009-2010 Combined
Average	2.2 mg/L	NO DATA	2.2 mg/L
Within Expected Range	Yes		Yes

Temperature

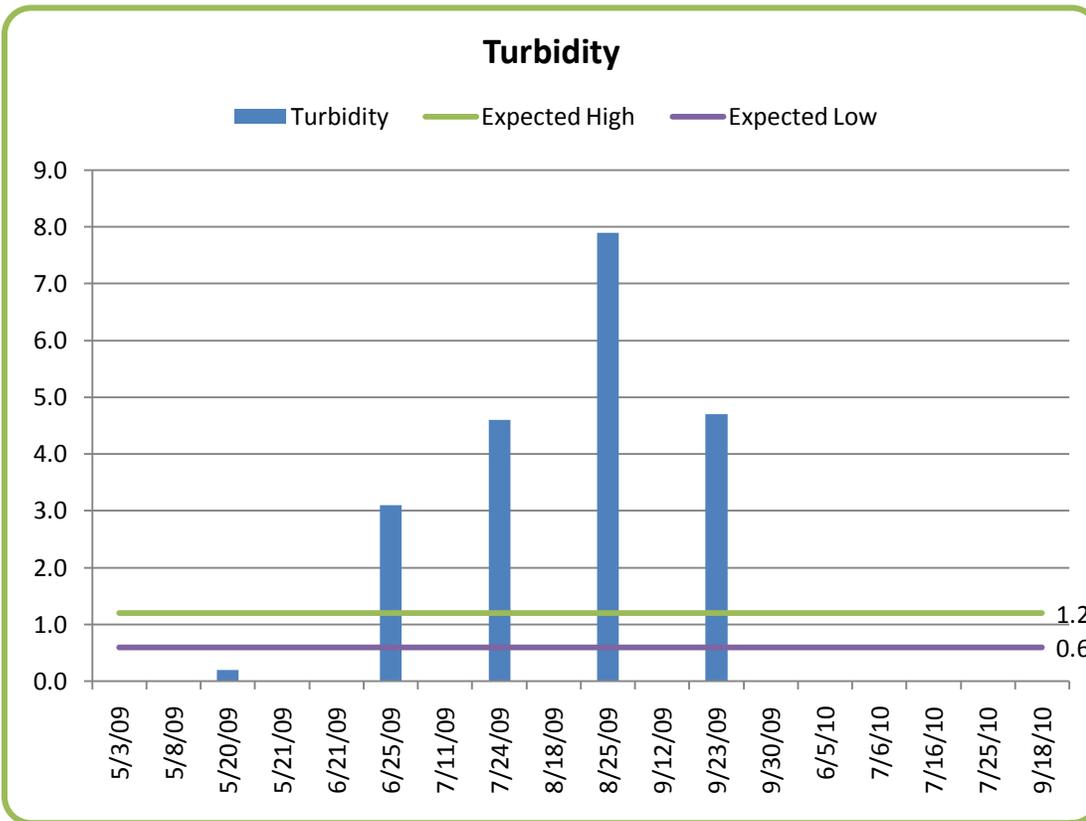
Expected Range:
None

Deep Lake Standard:
The daily average
shall not exceed
86.0°F

Temperatures were
between 60.0 and
85.0°F for all
samples.



	2009	2010	2009-2010 Combined
Average	73.3 °F	NO DATA	73.3 °F
Meets Standard (Not to exceed 86.0°F)	Yes		Yes



Turbidity

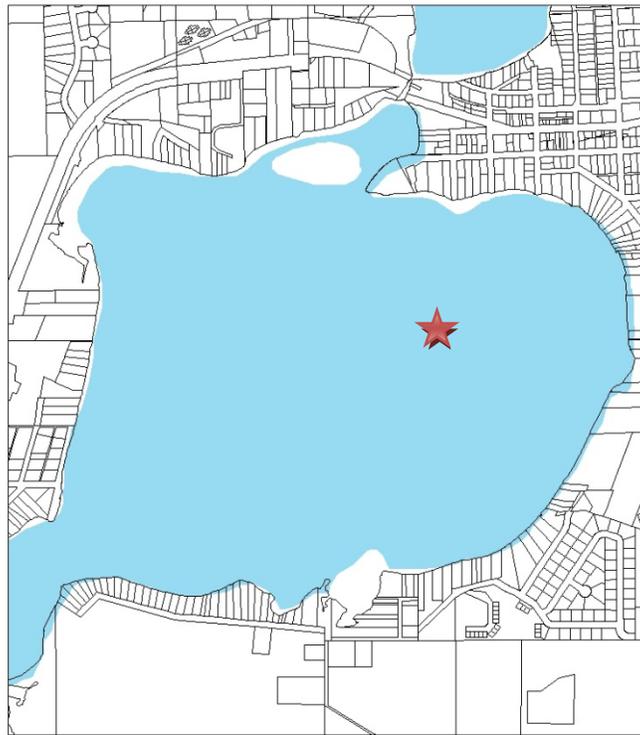
Expected Range: 1.0-
2.0 NTU

Deep Lake Standard:
None

Four of five samples
exceeded the
expected range. The
average also
exceeded the
expected range.

	2009	2010	2009-2010 Combined
Average	4.1 NTU	NO DATA	4.1 NTU
Within Expected Range	No		No

South Lindstrom Lake



Deep Lake

Lake Classification: EUTROPHIC

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	56.5	44.3	52.8	51.2
Classification	Eutrophic	Mesotrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: B

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2009-2010 Average (May-Sept)	14.1 µg/L	3.0 meters	29.0 µg/L		
Grade	B	B	B	B	1 st /13

MPCA Standards: Meets Standards

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Deep lake)	14.0 µg/L	>1.4 meters	40.0 µg/L	
2009-2010 Average (June-Sept)	15.3 µg/L	2.6 meters	30.0 µg/L	
Meets Standard	No	Yes	Yes	Yes

Chlorophyll A

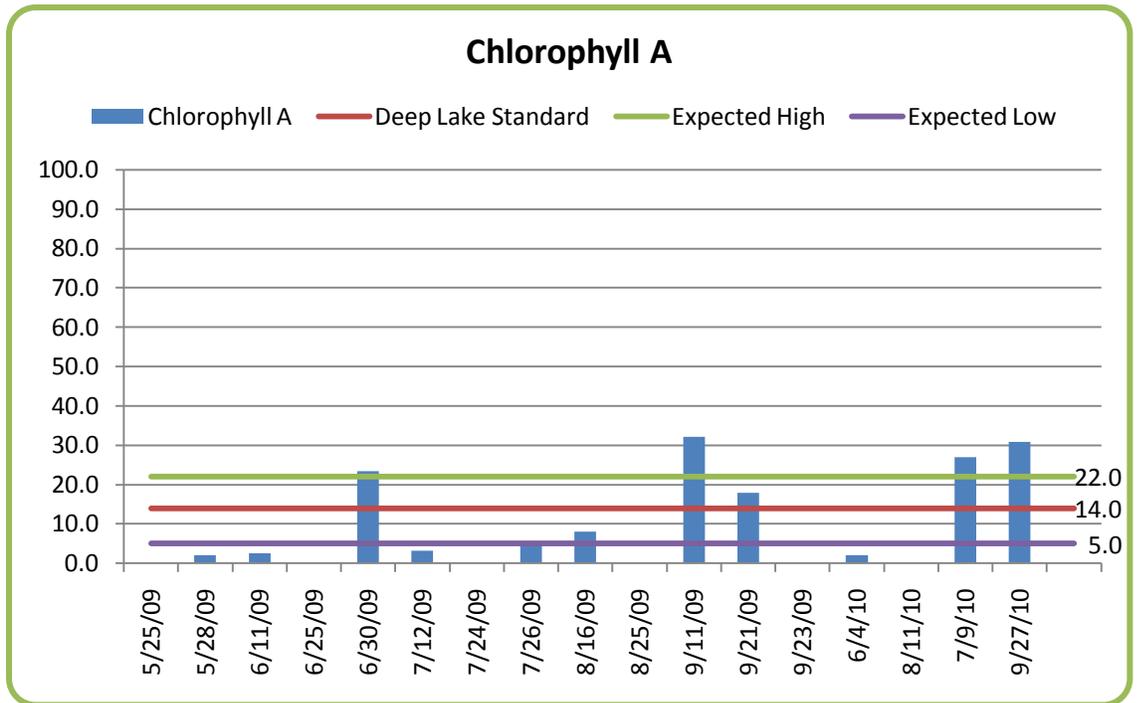
Expected Range:

5.0-22.0 µg/L

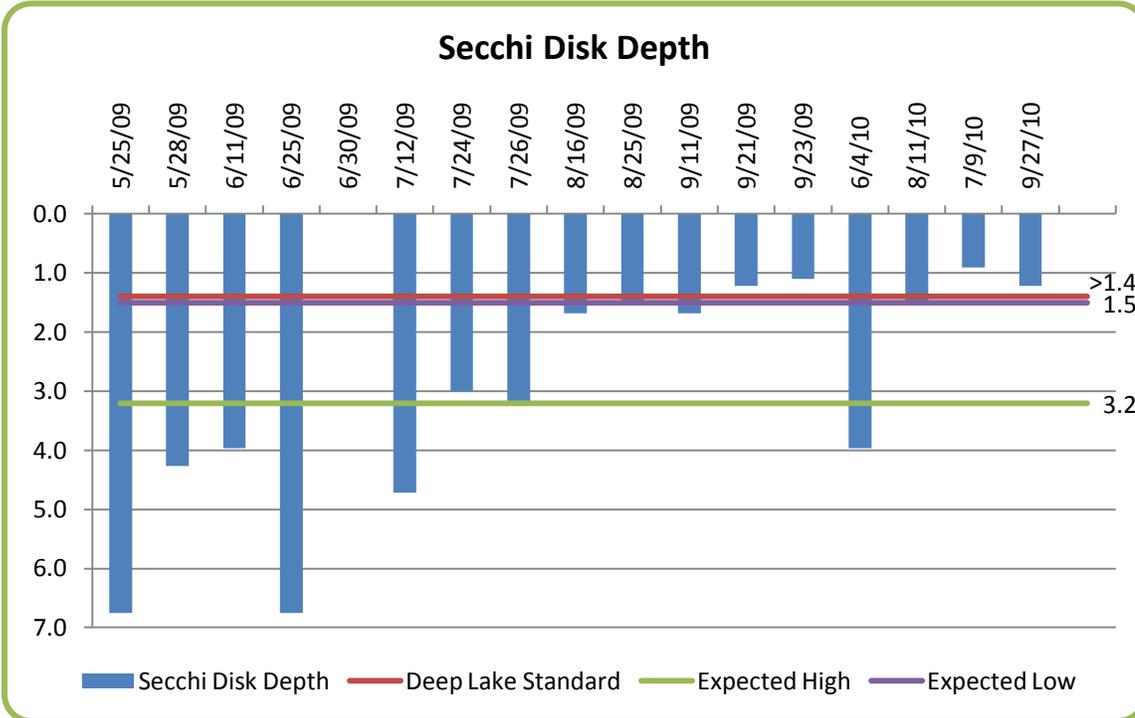
Deep Lake Standard:

14.0 µg/L

Two of three 2010 samples were above the expected range, which inflated the overall 2009-2010 average so that it is just above the standard.



	2009	2010	2009-2010 Combined
Average (May-Sept)	11.8 µg/L	20.0 µg/L	14.1 µg/L
Grade	B	B	B
Average (June-Sept)	13.2 µg/L	20.0 µg/L	15.3 µg/L
Meets Standard (14.0 µg/L)	Yes	No	No



Secchi Disk Depth

Expected Range:

1.5-3.2 meters

Deep Lake Standard:

>1.4 meters

Most of the year, excluding the late summer months, the water clarity in this lake is very good. The averages meet the standard.

	2009	2010	2009-2010 Combined
Average (May-Sept)	3.3 meters	1.9 meters	3.0 meters
Grade	A	C	B
Average (June-Sept)	2.9 meters	1.9 meters	2.6 meters
Meets Standard (>1.4 m)	Yes	Yes	Yes

Total Phosphorus

Expected Range:

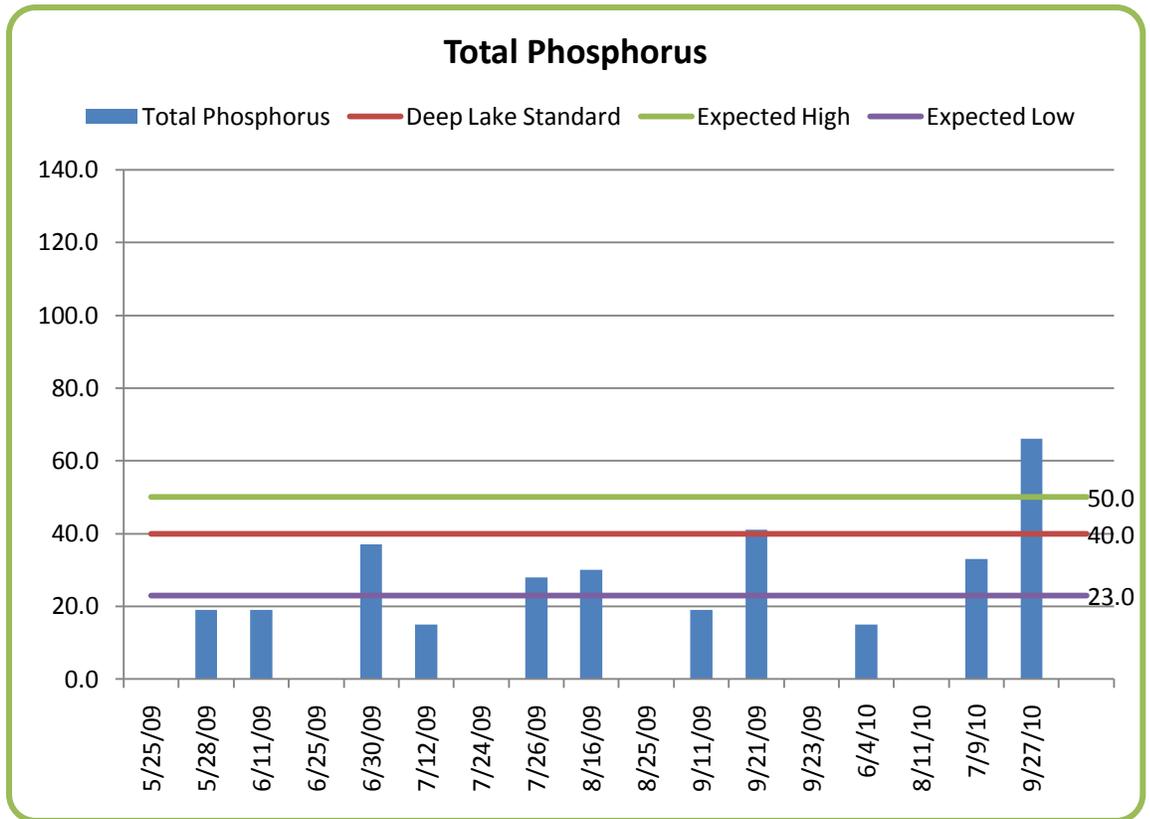
23.0-50.0 µg/L

Deep Lake Standard:

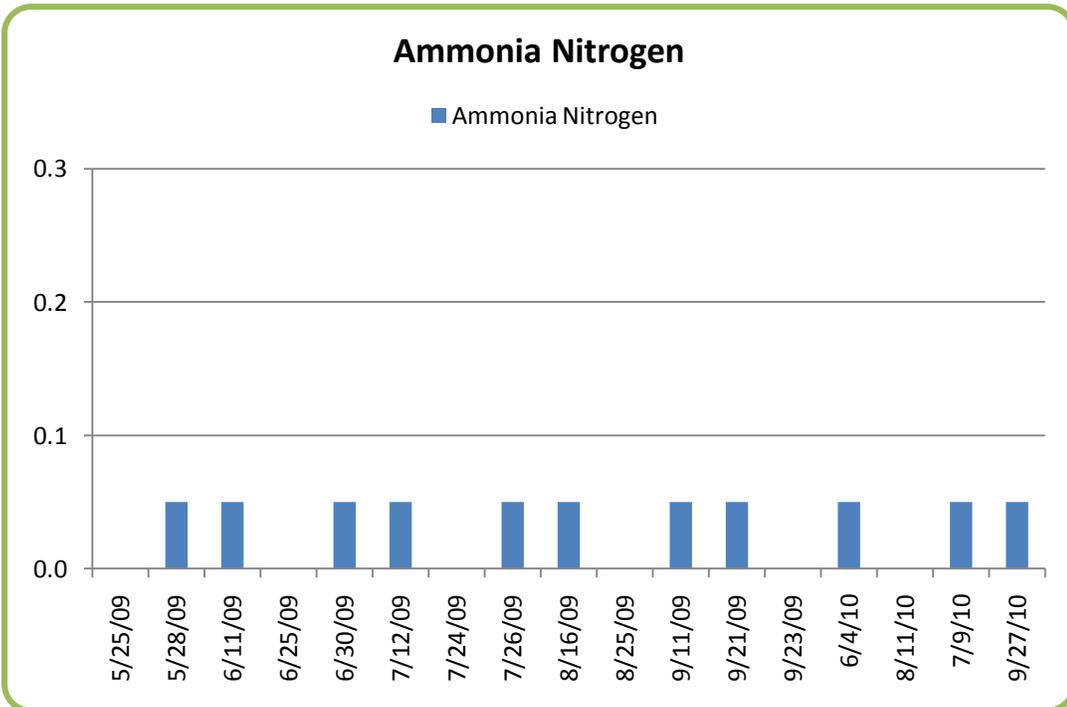
40.0 µg/L

Most samples are within or below the expected range.

The averages for this lake meet the standard.



	2009	2010	2009-2010 Combined
Average (May-Sept)	26.0 µg/L	38.0 µg/L	29.0 µg/L
Grade	B	C	B
Average (June-Sept)	27.0 µg/L	38.0 µg/L	30.0 µg/L
Meets Standard (40.0 µg/L)	Yes	Yes	Yes



Ammonia Nitrogen

Expected Range: None

Deep Lake Standard: None

All samples were very low.

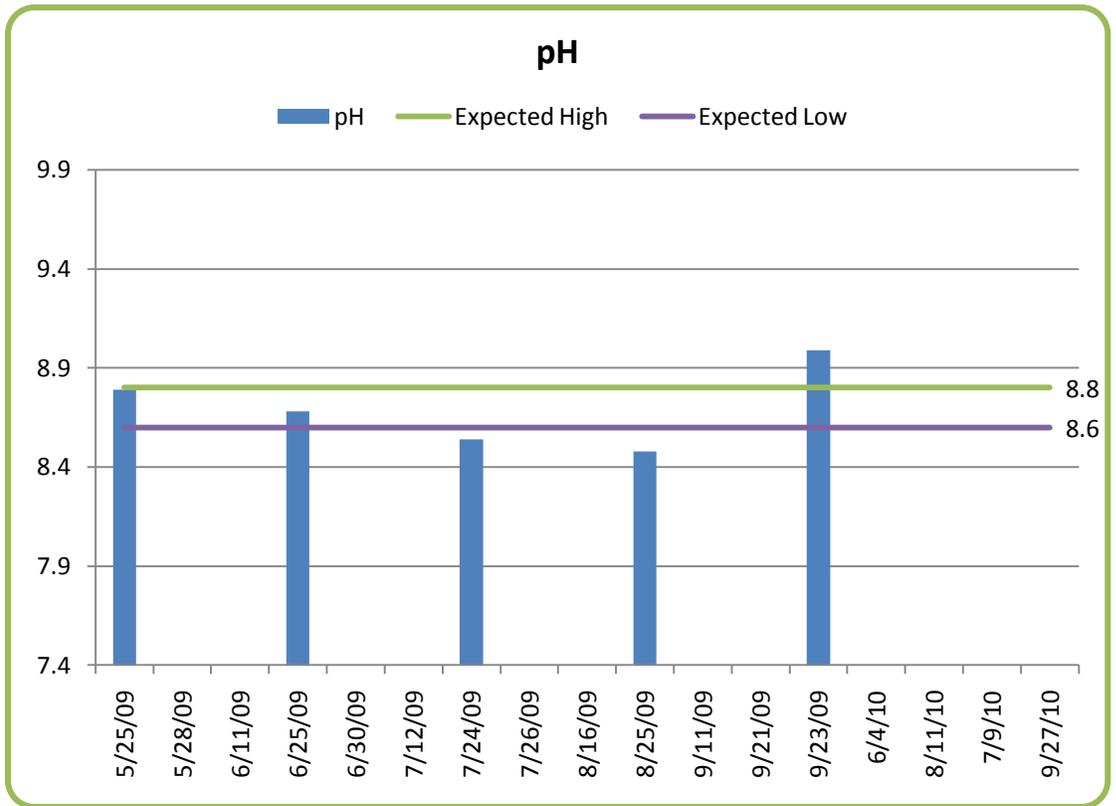
	2009	2010	2009-2010 Combined
Average	<0.05	<0.05	<0.05

pH

Expected Range:
8.6-8.8

Deep Lake Standard:
None

Although there were samples both above and below the expected range, the average does meet the standard.



	2009	2010	2009-2010 Combined
Average	8.7	NO DATA	8.7
Within Expected Range	Yes		Yes

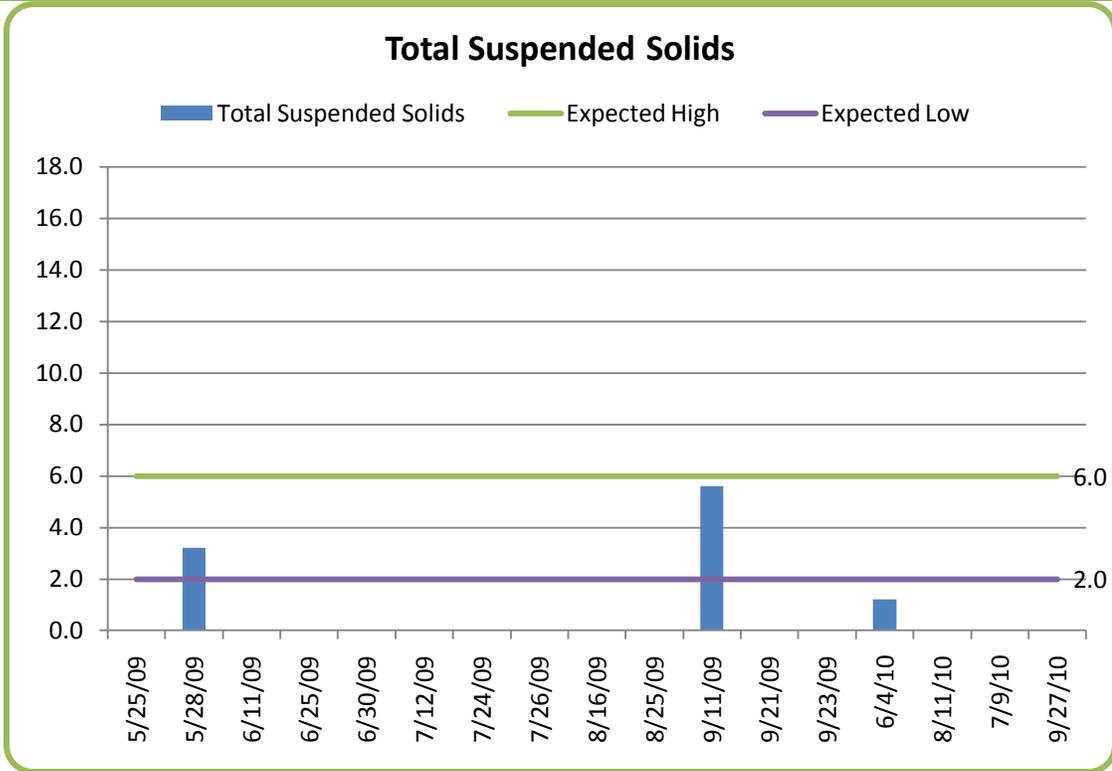
Total Suspended Solids

Total Suspended Solids

Expected Range:
2.0-6.0 mg/L

Deep Lake Standard:
None

Two of three samples were within the expected range. The third was below the expected range.



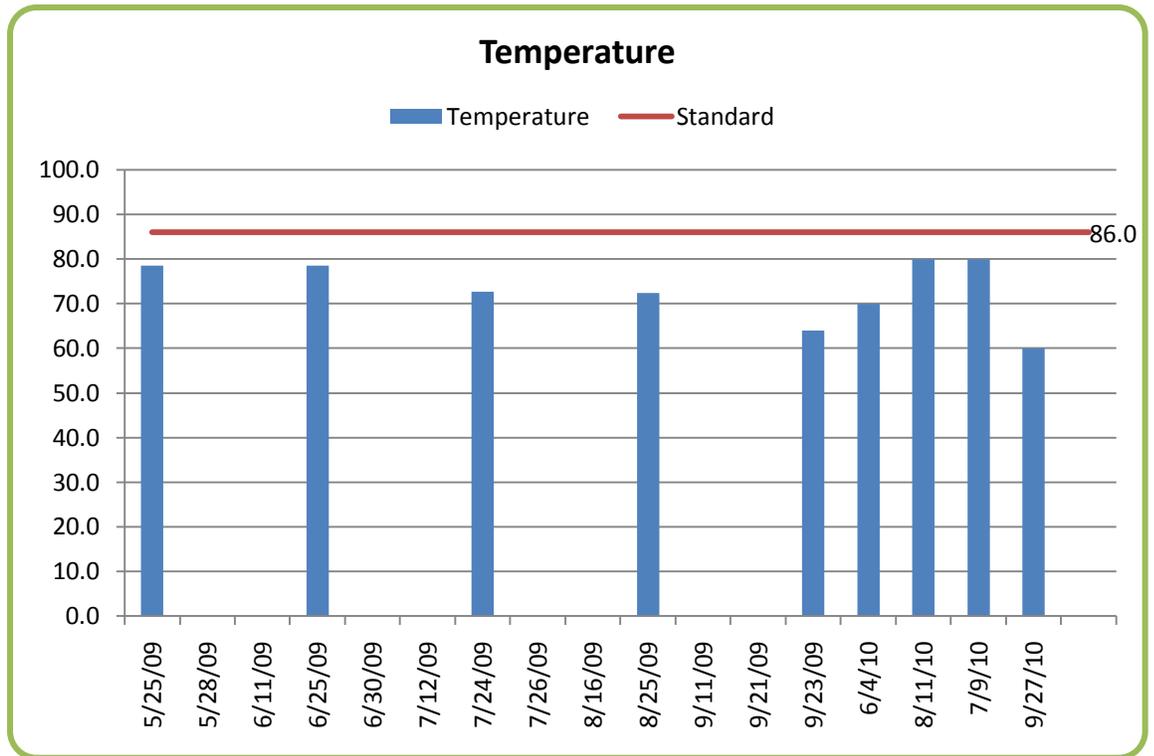
	2009	2010	2009-2010 Combined
Average	4.4 mg/L	1.2 mg/L	3.3 mg/L
Within Expected Range	Yes	No - Below	Yes

Temperature

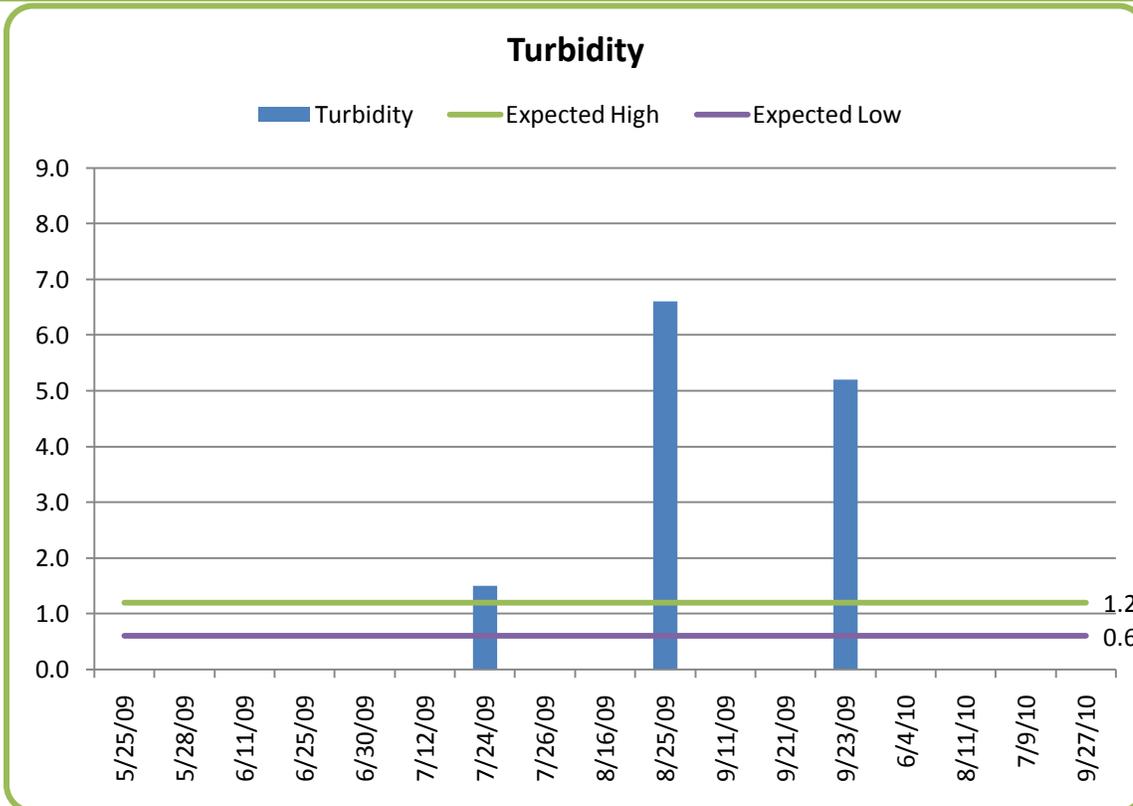
Expected Range:
None

Deep Lake Standard:
The daily average
shall not exceed
86.0°F

Temperatures were
between 60.0 and
85.0°F for all
samples.



	2009	2010	2009-2010 Combined
Average	73.2 °F	72.5 °F	72.9 °F
Meets Standard (Not to exceed 86.0°F)	Yes	Yes	Yes



Turbidity

Expected Range:
1.0-2.0 NTU

Deep Lake Standard:
None

All three samples, as
well as the average,
exceeded the
expected range.

	2009	2010	2009-2010 Combined
Average	2.7 NTU	NO DATA	2.7 NTU
Within Expected Range	No	-	No

Wallmark Lake



Shallow Lake

Lake Classification: HYPEREUTROPHIC

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	85.2	79.8	85.5	83.5
Classification	Hypereutrophic	Hypereutrophic	Hypereutrophic	Hypereutrophic

Overall Lake Quality Grade: F

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2009 Average (May-Sept)	262.0 µg/L	0.3 meters	281.0 µg/L		
Grade	F	F	F	F	13 th /13

MPCA Standards: Impaired

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Shallow lake)	20.0 µg/L	>1.0 meters	60.0 µg/L	
2009-2010 Average (June-Sept)	269.4 µg/L	0.2 meters	271.0 µg/L	
Meets Standard	No	No	No	No

Data is only available from 2009.

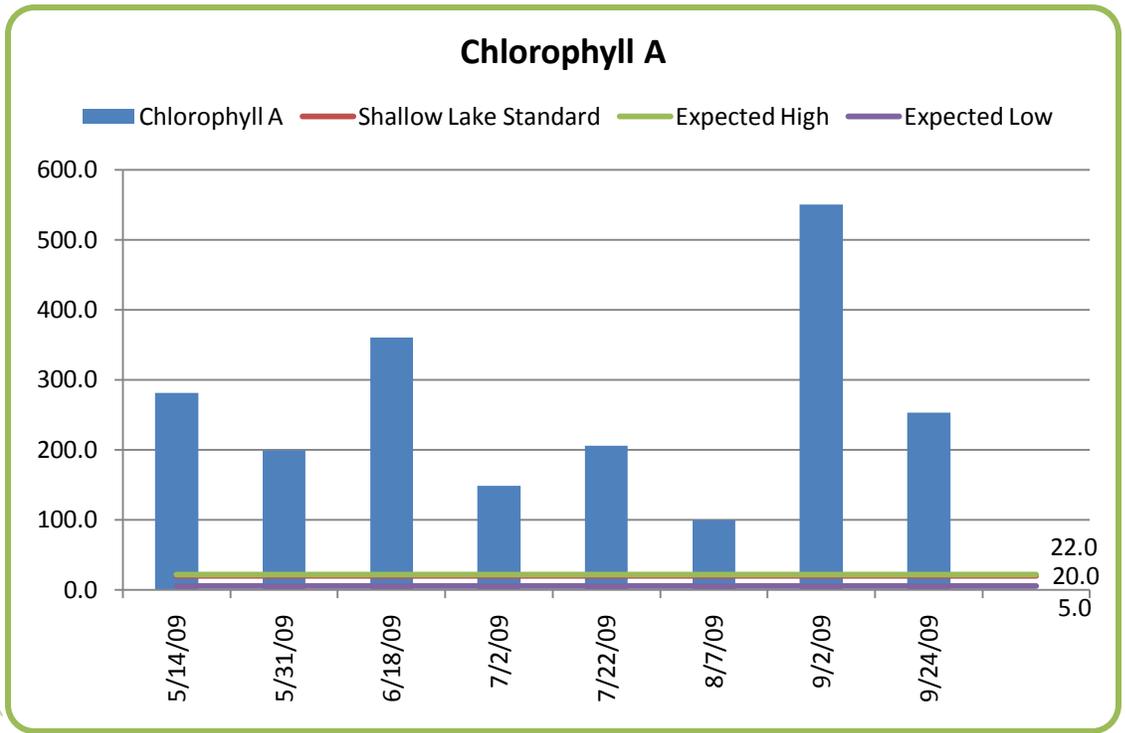
Chlorophyll A

Expected Range: 5.0-22.0 µg/L

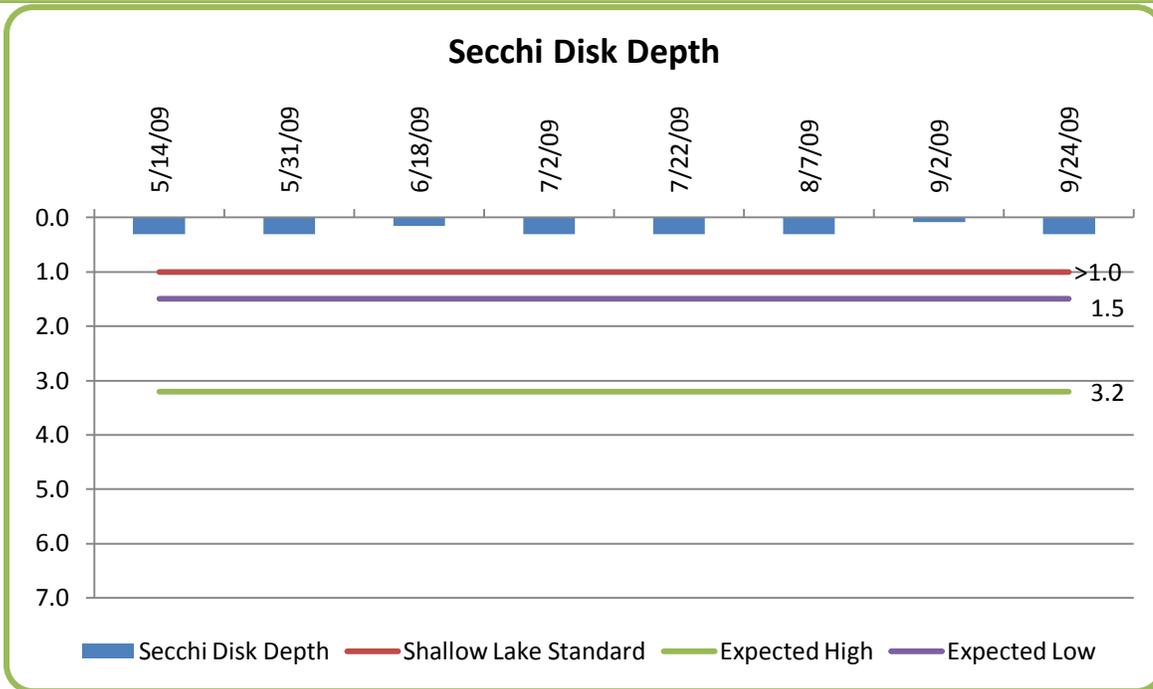
Shallow Lake Standard: 20.0 µg/L

The amount of chlorophyll A in this lake is incredibly high.

This chart cannot be directly compared to others in this report due to a change in scale.



	2009	2010	2009-2010 Combined
Average (May-Sept)	262.0 µg/L	NO DATA	262.0 µg/L
Grade	F		F
Average (June-Sept)	269.4 µg/L	NO DATA	269.4 µg/L
Meets Standard (20.0 µg/L)	No		No



Secchi Disk Depth

Expected Range: 1.5-3.2 meters

Shallow Lake Standard: >1.0 meters

The clarity is far below the expected range and does not meet the standard.

	2009	2010	2009-2010 Combined
Average (May-Sept)	0.3 meters	NO DATA	0.3 meters
Grade	F		F
Average (June-Sept)	0.2 meters	NO DATA	0.2 meters
Meets Standard (>1.0 m)	No		No

Total Phosphorus

Expected Range:

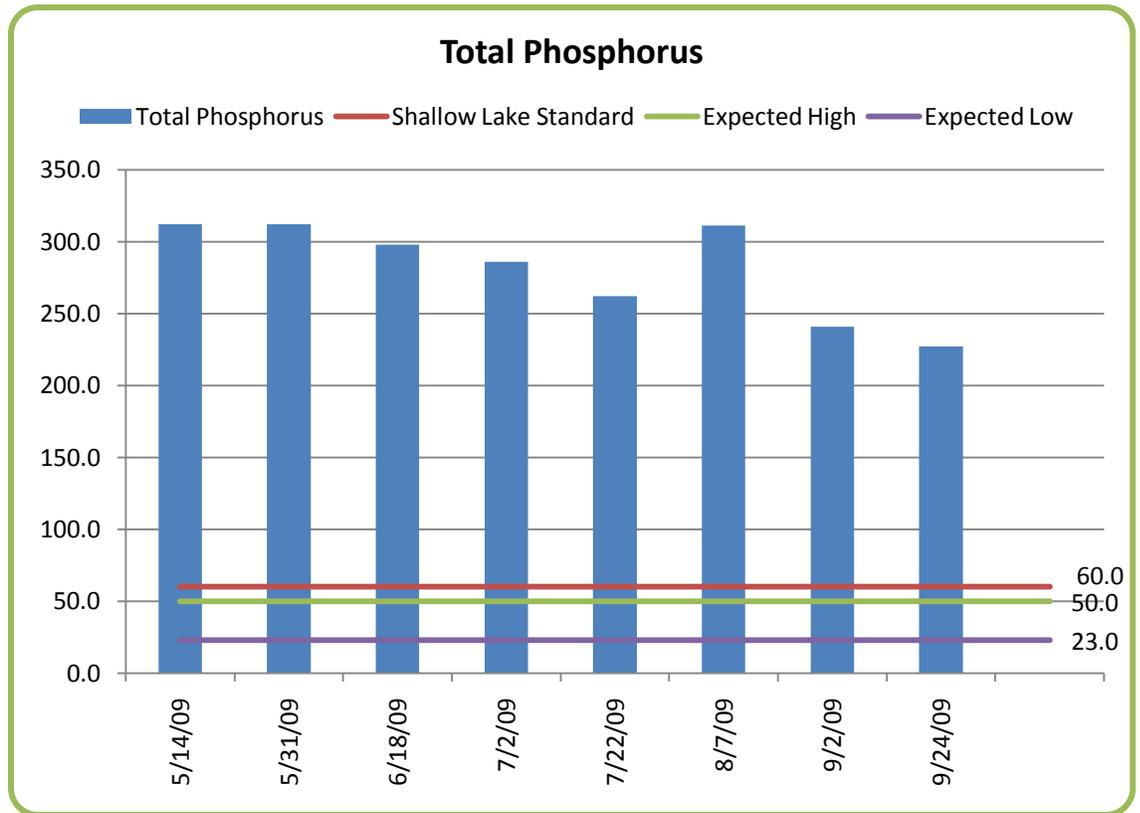
23.0-50.0 µg/L

Shallow Lake

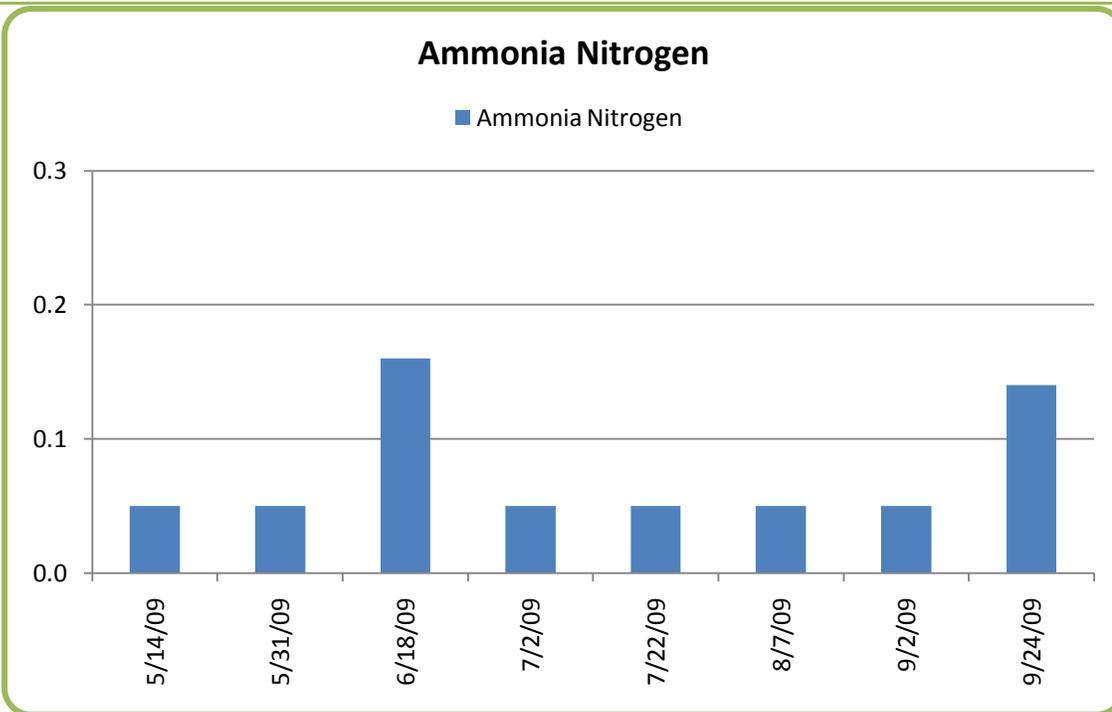
Standard: 60.0 µg/L

All samples were far above the expected range and do not meet the standard.

This chart cannot be directly compared to other total phosphorus charts in this report due to a scale change.



	2009	2010	2009-2010 Combined
Average (May-Sept)	281.0 µg/L	NO DATA	281.0 µg/L
Grade	F		F
Average (June-Sept)	271.0 µg/L	NO DATA	271.0 µg/L
Meets Standard (60.0 µg/L)	No		No



Ammonia Nitrogen

Expected Range: None

Shallow Lake Standard: None

Two samples were elevated. The average was higher than in most surrounding lakes.

	2009	2010	2009-2010 Combined
Average	0.09	NO DATA	0.09

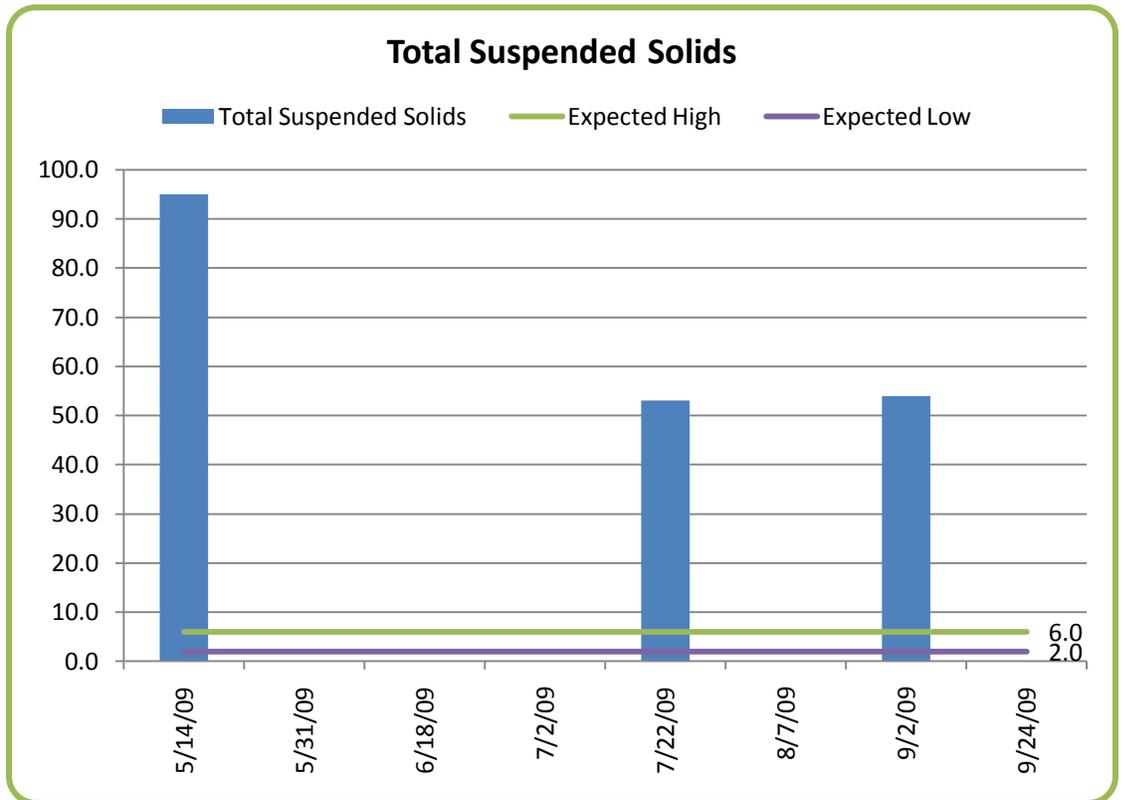
Total Suspended Solids

Expected Range:
2.0-6.0 mg/L

Shallow Lake
Standard: None

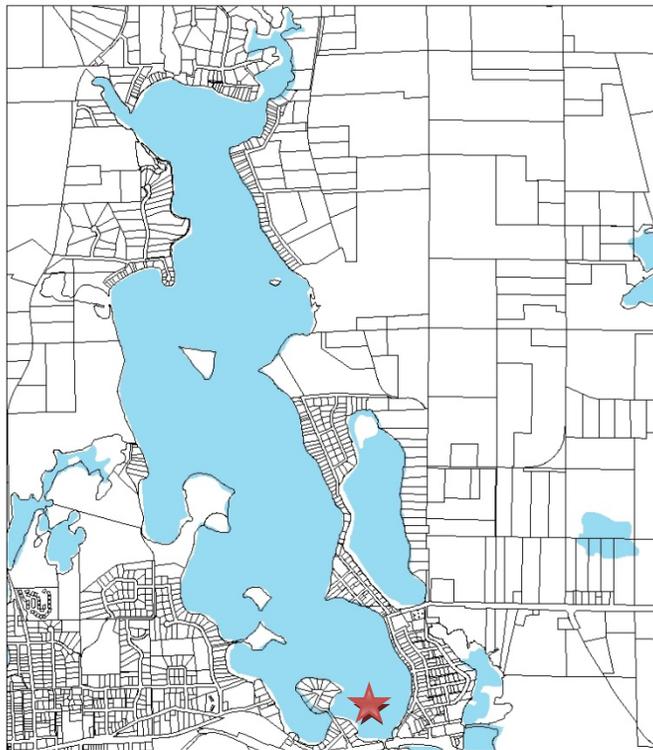
All samples were far above the expected range.

This chart cannot be directly compared to other total suspended solids charts in this report due to a scale change.



	2009	2010	2009-2010 Combined
Average	67.0 mg/L	NO DATA	67.0 mg/L
Within Expected Range	No		No

North Center Lake



Shallow Lake

Lake Classification: EUTROPHIC

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	60.9	54.3	64.3	59.8
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2009-2010 Average (May-Sept)	22.1 µg/L	1.5 meters	65.0 µg/L		
Grade	C	C	C	C	9 th /13

MPCA Standards: Impaired

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Shallow lake)	20.0 µg/L	>1.0 meters	60.0 µg/L	
2009-2010 Average (June-Sept)	26.1 µg/L	1.3 meters	71.0 µg/L	
Meets Standard	No	Yes	No	No

Chlorophyll A

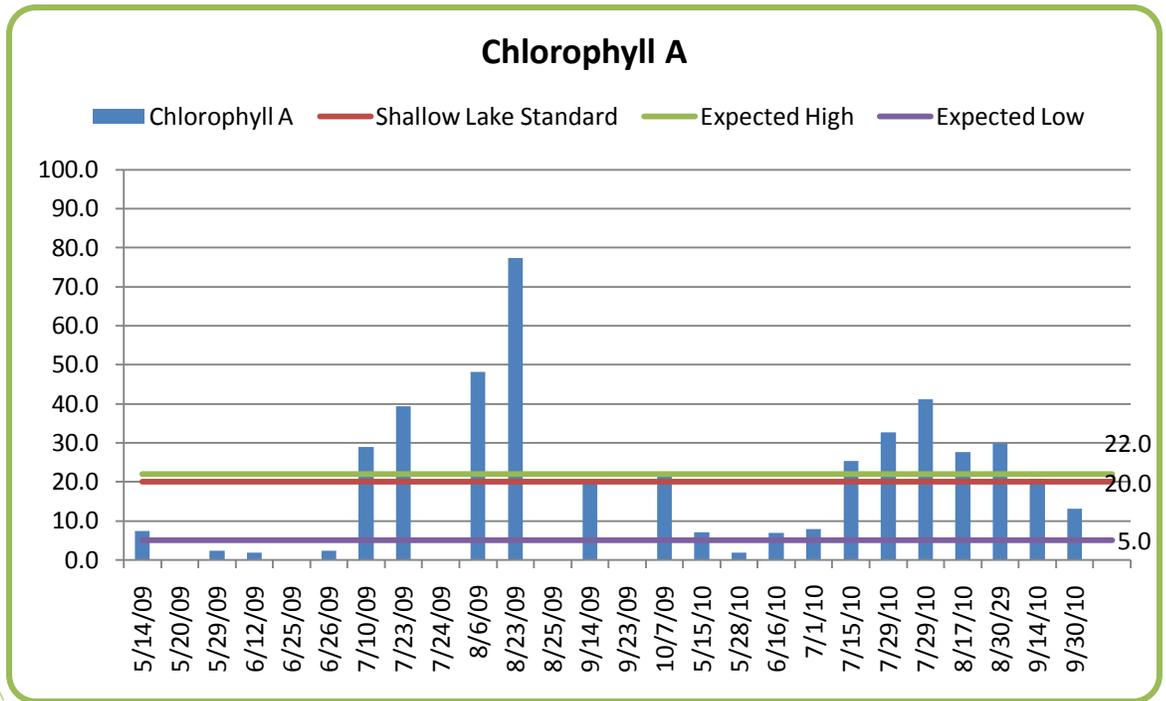
Expected Range:

5.0-22.0 µg/L

Shallow Lake

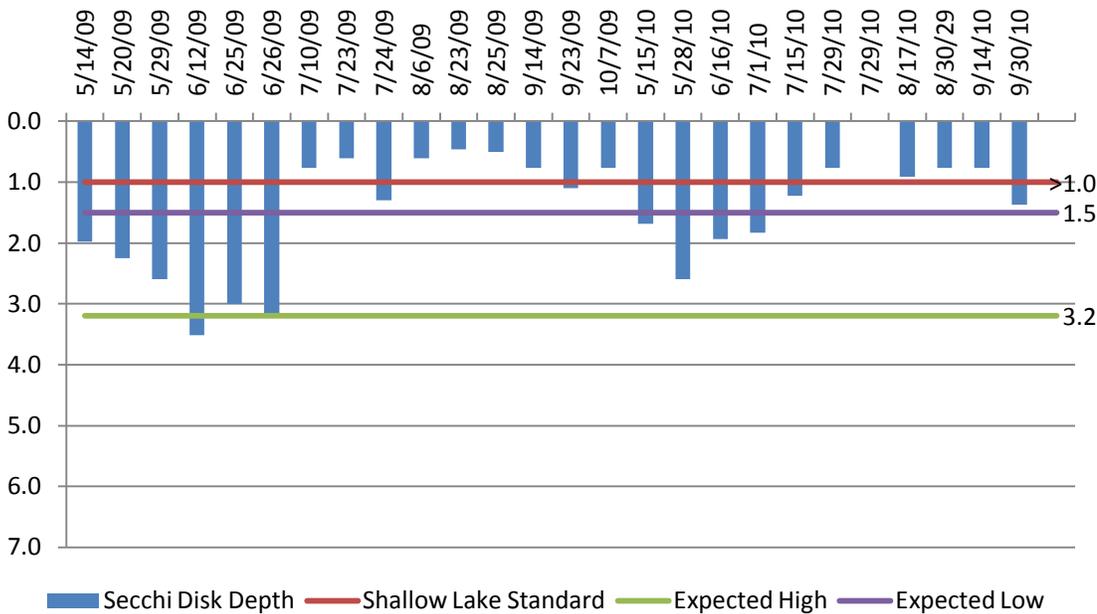
Standard: 20.0 µg/L

None of the averages meet the standard for this lake.



	2009	2010	2009-2010 Combined
Average (May-Sept)	24.9 µg/L	19.5 µg/L	22.1 µg/L
Grade	C	B	C
Average (June-Sept)	29.9 µg/L	22.8 µg/L	26.1 µg/L
Meets Standard (20.0 µg/L)	No	No	No

Secchi Disk Depth



Secchi Disk Depth

Expected Range:

1.5-3.2 meters

Shallow Lake

Standard: >1.0 meters

The average depths for 2009, 2010, and the two years combined meet the standard.

	2009	2010	2009-2010 Combined
Average (May-Sept)	1.6 meters	1.4 meters	1.5 meters
Grade	C	C	C
Average (June-Sept)	1.4 meters	1.2 meters	1.3 meters
Meets Standard (>1.0 m)	Yes	Yes	Yes

Total Phosphorus

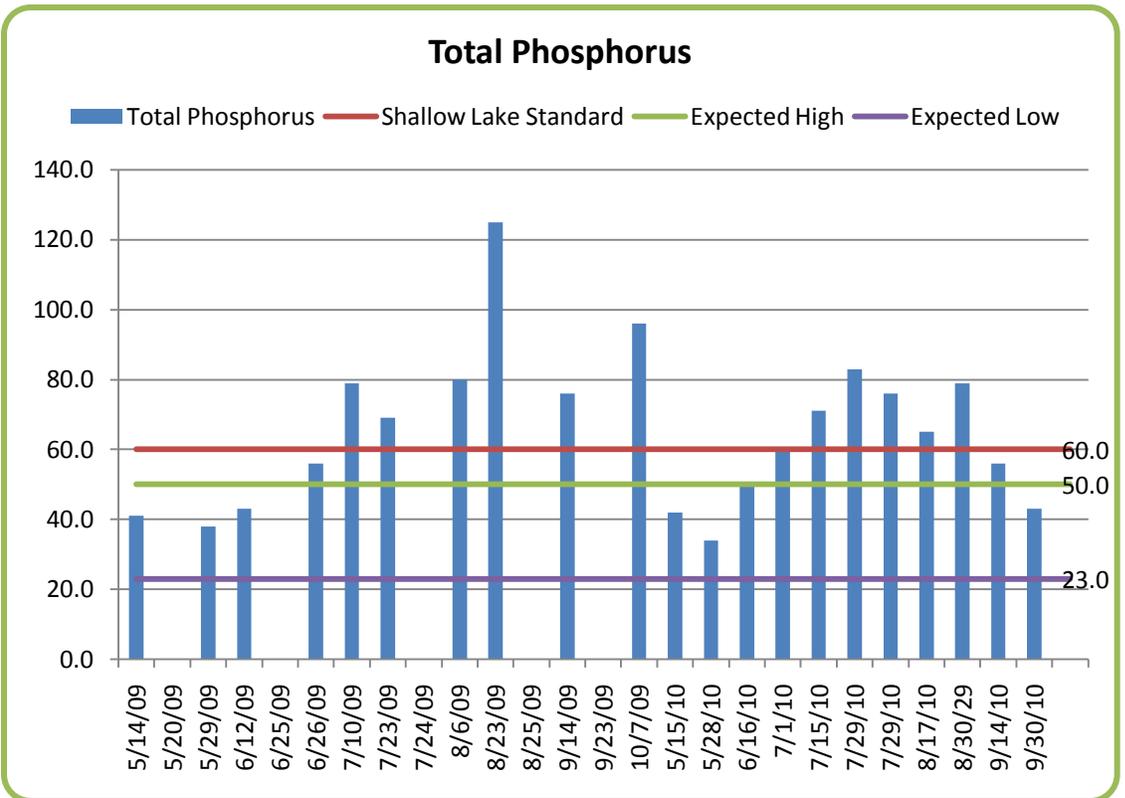
Expected Range:

23.0-50.0 µg/L

Shallow Lake

Standard: 60.0 µg/L

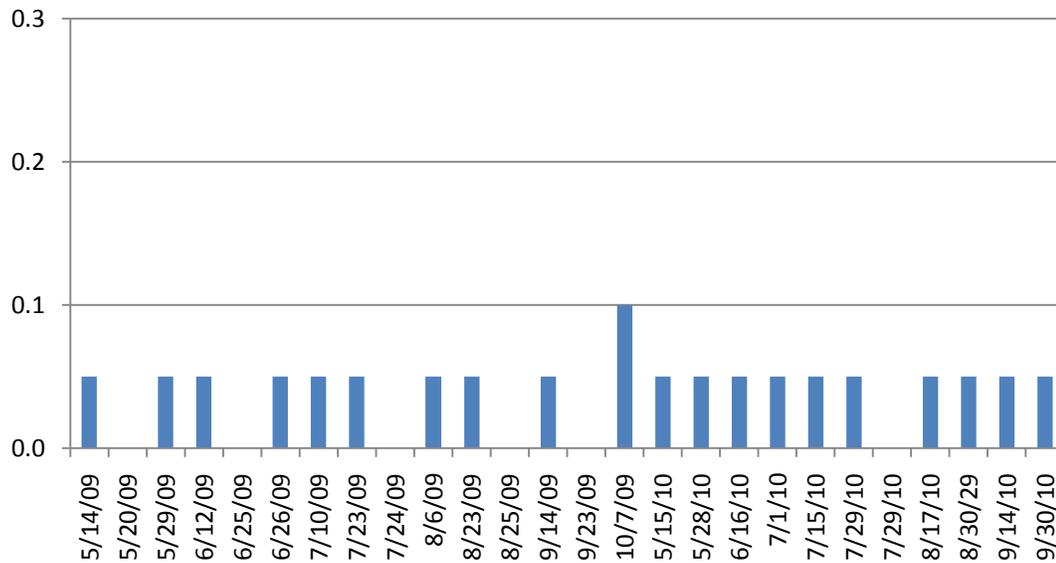
All averages did not meet the standard.



	2009	2010	2009-2010 Combined
Average (May-Sept)	70.0 µg/L	60.0 µg/L	65.0 µg/L
Grade	D	C	C
Average (June-Sept)	78.0 µg/L	65.0 µg/L	71.0 µg/L
Meets Standard (60.0 µg/L)	No	No	No

Ammonia Nitrogen

Ammonia Nitrogen



Ammonia Nitrogen

Expected Range: None

Shallow Lake Standard: None

Only one sample was above 0.05 mg/L.

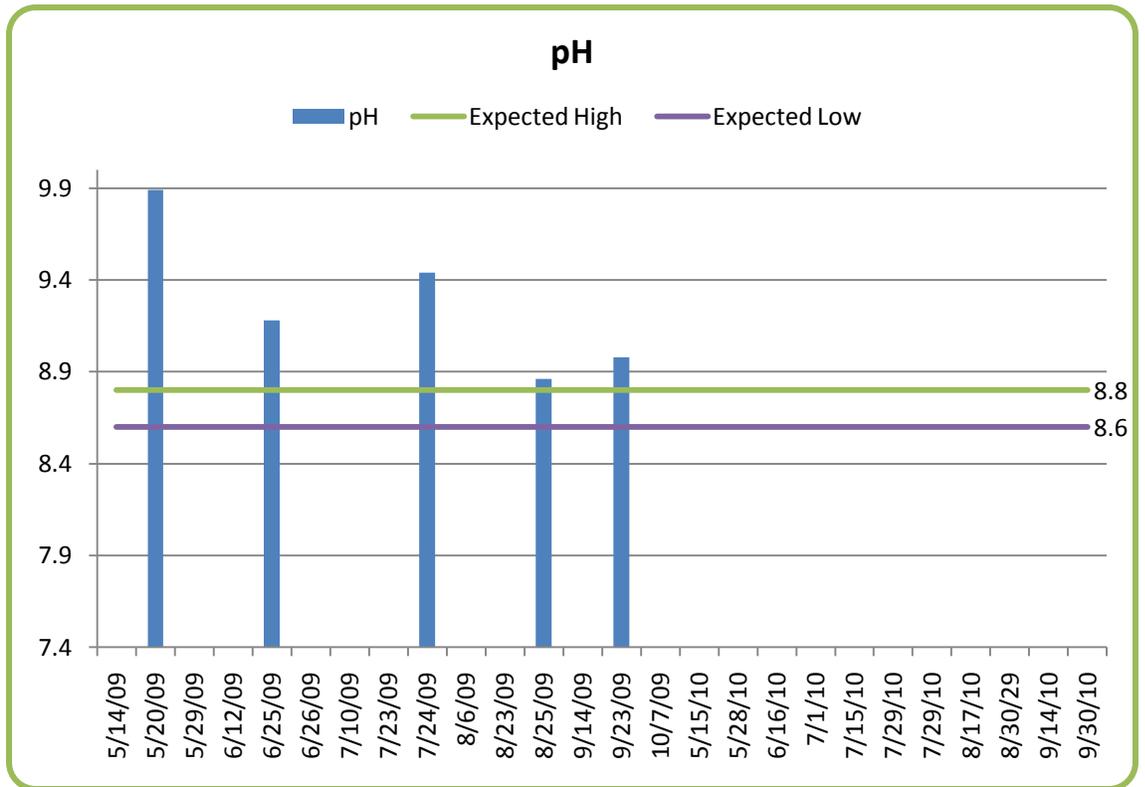
	2009	2010	2009-2010 Combined
Average	<0.05 mg/L	<0.05 mg/L	<0.05 mg/L

pH

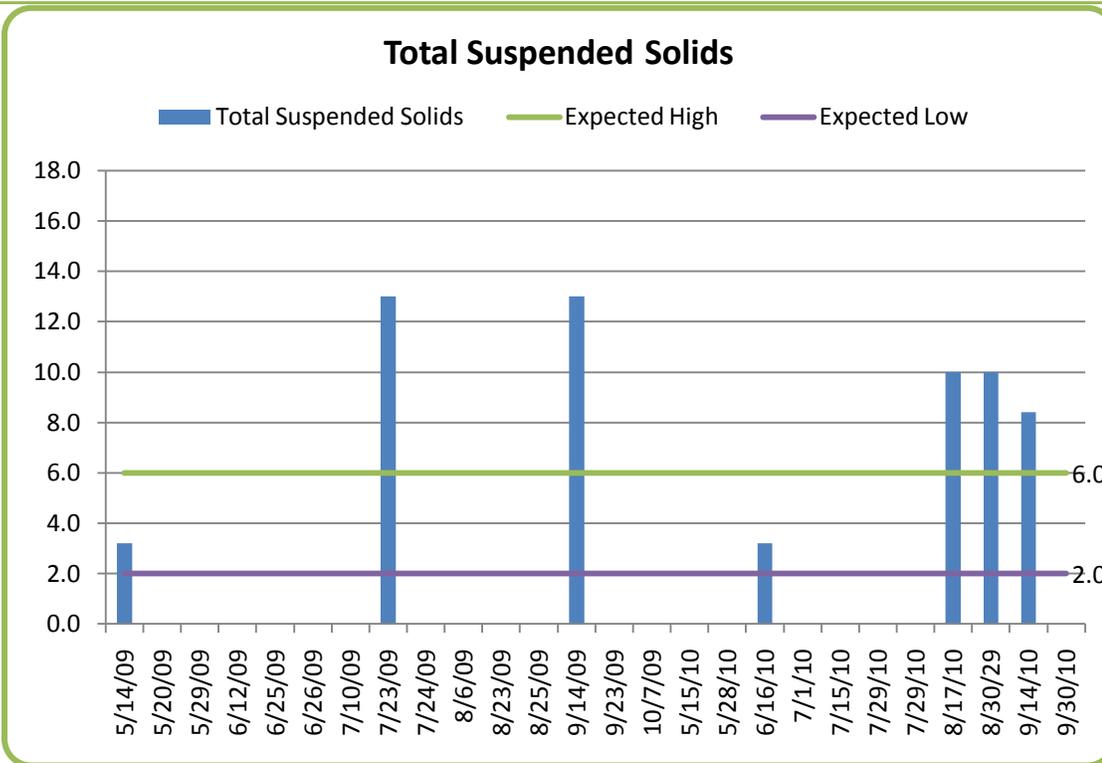
Expected Range:
8.6-8.8

Shallow Lake
Standard: None

All samples were
above the expected
range. The average
was also above the
expected range.



	2009	2010	2009-2010 Combined
Average	9.3	NO DATA	9.3
Within Expected Range	No		No



Total Suspended Solids

Expected Range: 2.0-
6.0 mg/L

Shallow Lake Standard:
None

The averages were all
above the expected
range.

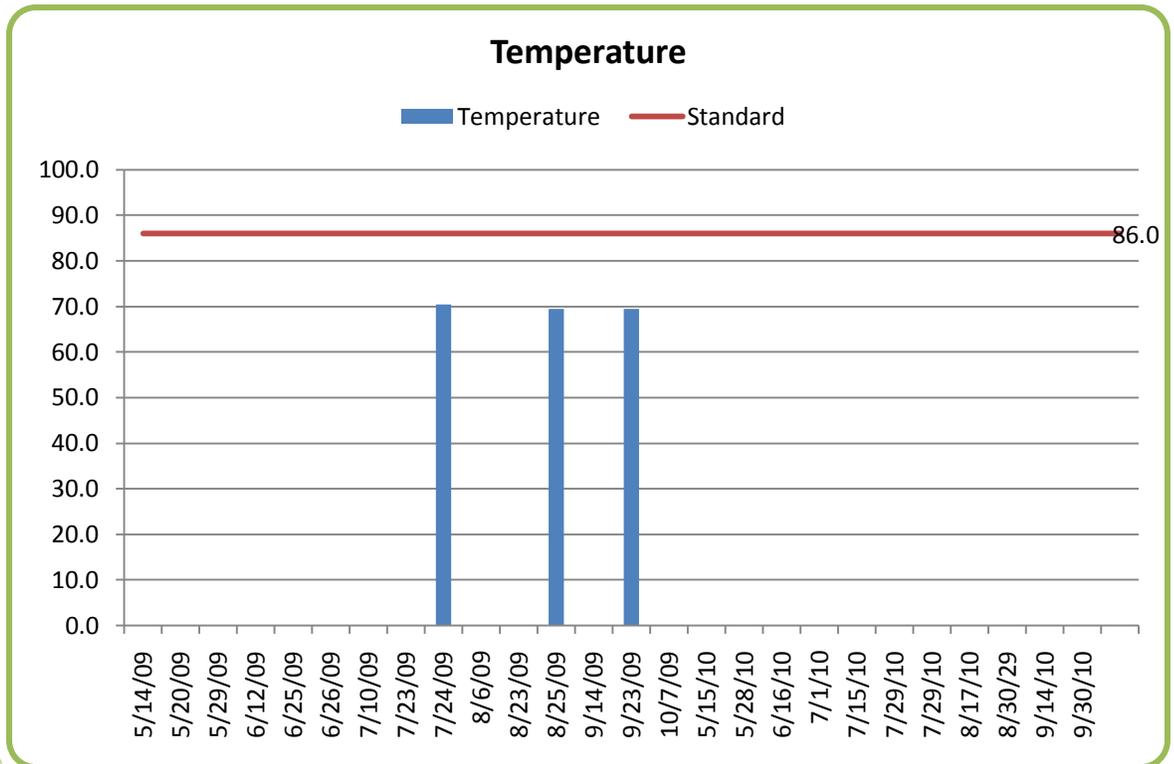
	2009	2010	2009-2010 Combined
Average	13.0 mg/L	7.9 mg/L	8.7 mg/L
Within Expected Range	No	No	No

Temperature

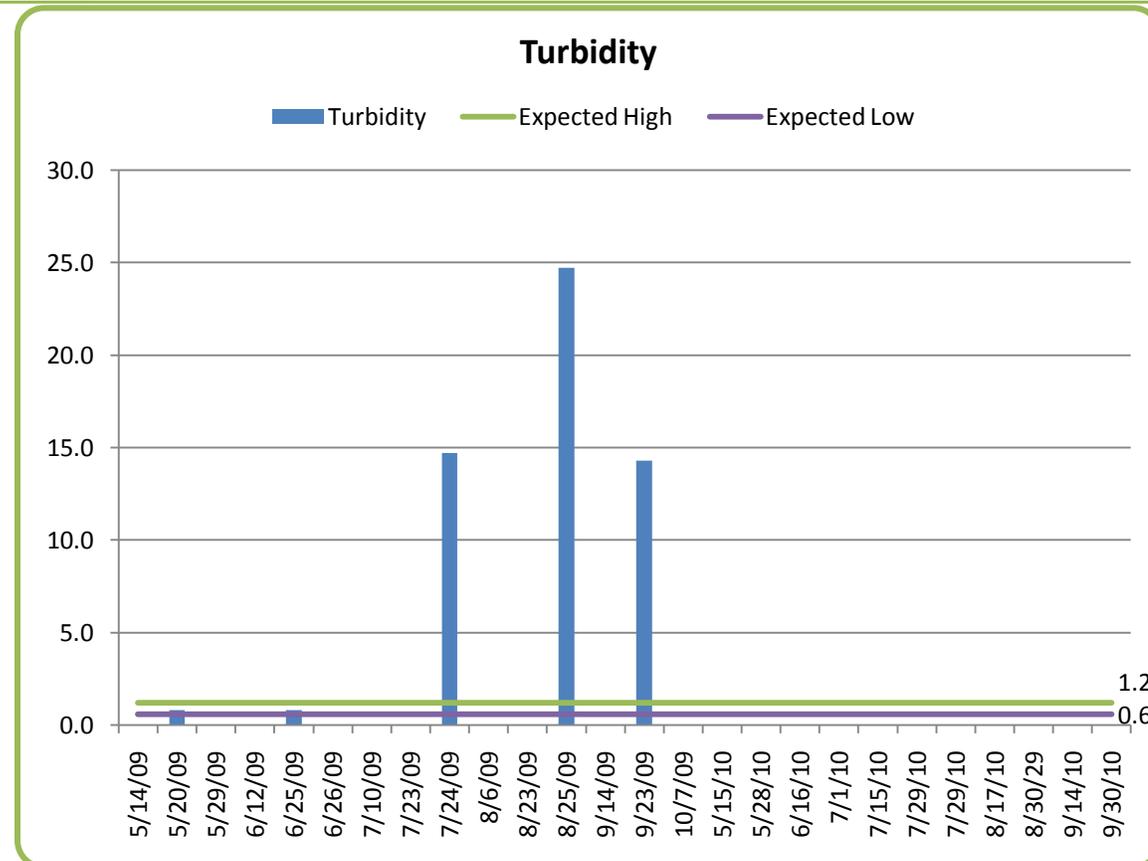
Expected Range:
None

Shallow Lake
Standard: The daily
average shall not
exceed 86.0°F

The three
temperatures were
very similar, all right
around 70.0°F.



	2009	2010	2009-2010 Combined
Average	69.8 °F	NO DATA	69.8 °F



Turbidity

Expected Range:
1.0-2.0 NTU

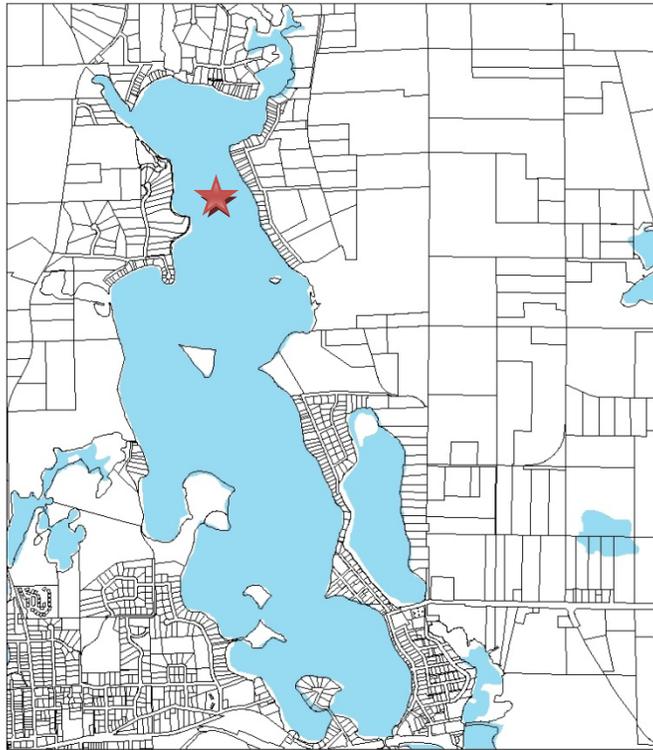
Shallow Lake
Standard: None

Three of five
samples, as well as
the average,
exceeded the
expected range.

This chart cannot be
directly compared
to other turbidity
charts in this report
due to a change in
the scale.

	2009	2010	2009-2010 Combined
Average	3.7 NTU	NO DATA	3.7 NTU
Within Expected Range	No	NO DATA	No

North Center Lake



Shallow Lake

Lake Classification: EUTROPHIC

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	65.9	60.0	66.8	64.2
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: D

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2009-2010 Average (May-Sept)	36.6 µg/L	1.0 meter	77.0 µg/L		
Grade	C	D	D	D	11 th /13

MPCA Standards: Impaired

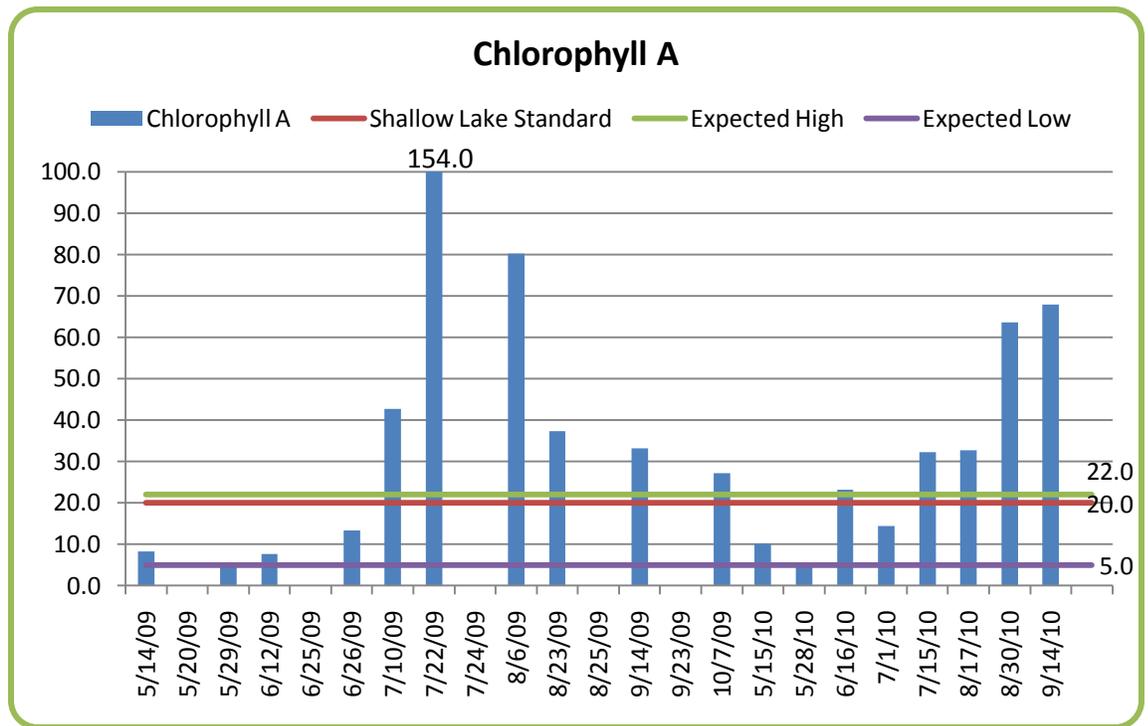
	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Shallow lake)	20.0 µg/L	>1.0 meters	60.0 µg/L	
2009-2010 Average (June-Sept)	45.0 µg/L	0.8 meters	85.0 µg/L	
Meets Standard	No	No	No	No

Chlorophyll A

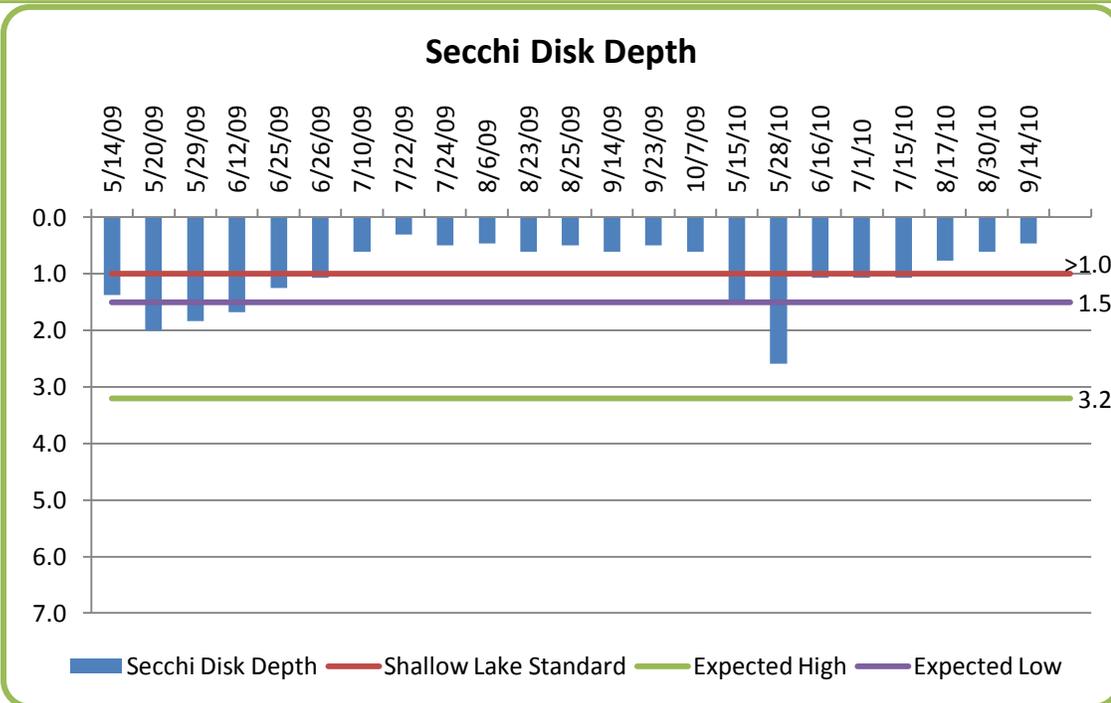
Expected Range:
5.0-22.0 µg/L

Shallow Lake
Standard: 20.0 µg/L

The averages are
nearly double the
standard.



	2009	2010	2009-2010 Combined
Average (May-Sept)	40.9 µg/L	31.2 µg/L	36.6 µg/L
Grade	C	C	C
Average (June-Sept)	49.5 µg/L	39.0 µg/L	45.0 µg/L
Meets Standard (20.0 µg/L)	No	No	No



Secchi Disk Depth

Expected Range: 1.5-
3.2 meters

Shallow Lake
Standard: >1.0 meters

This lake does not
meet the standard.

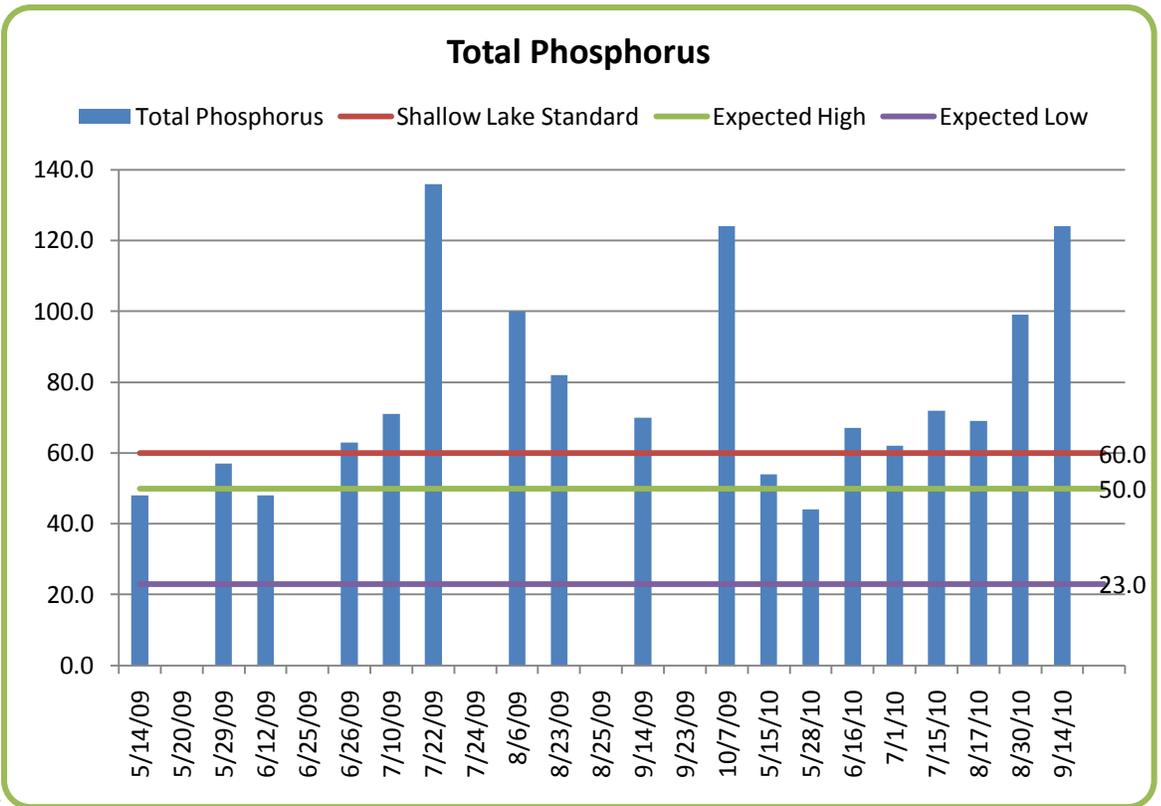
	2009	2010	2009-2010 Combined
Average (May-Sept)	0.9 meters	1.1 meters	1.0 meters
Grade	D	D	D
Average (June-Sept)	0.7 meters	0.8 meters	0.8 meters
Meets Standard (>1.0 m)	No	No	No

Total Phosphorus

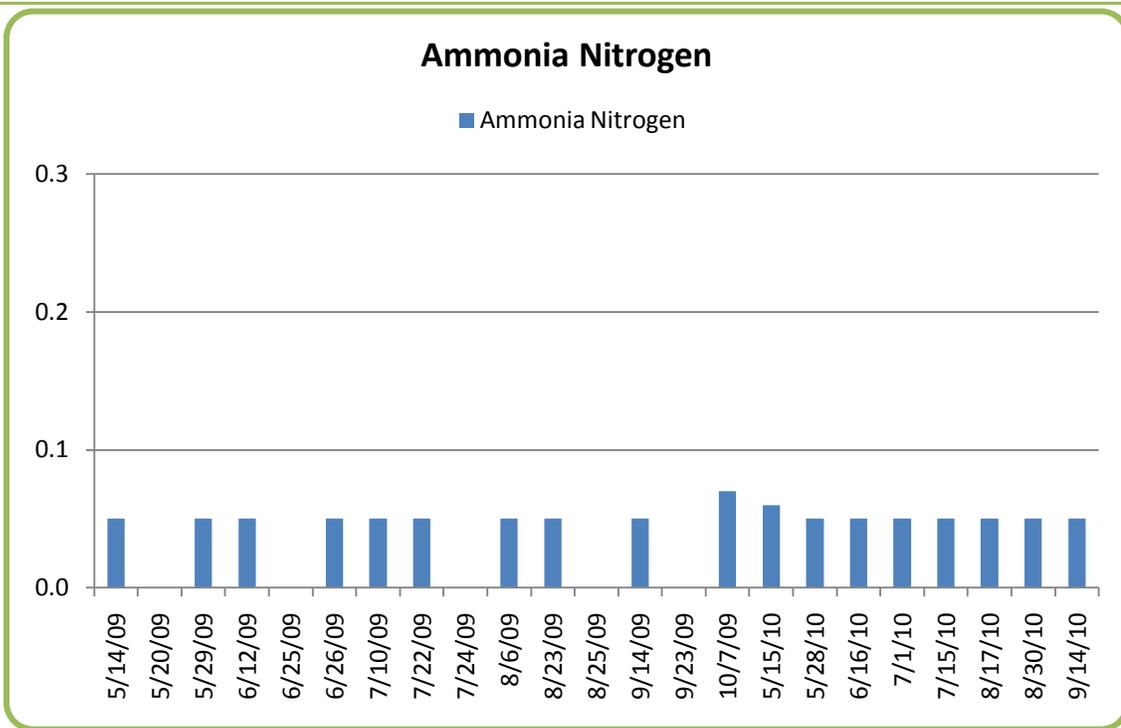
Expected Range:
23.0-50.0 µg/L

Shallow Lake
Standard: 60.0 µg/L

Most samples are well above the expected range. This lake does not meet the standard.



	2009	2010	2009-2010 Combined
Average (May-Sept)	80.0 µg/L	74.0 µg/L	77.0 µg/L
Grade	D	D	D
Average (June-Sept)	87.0 µg/L	82.0 µg/L	85.0 µg/L
Meets Standard (60.0 µg/L)	No	No	No



Ammonia Nitrogen

Expected Range: None
Shallow Lake Standard: None

Two samples were slightly higher, but in general the ammonia nitrogen levels were low.

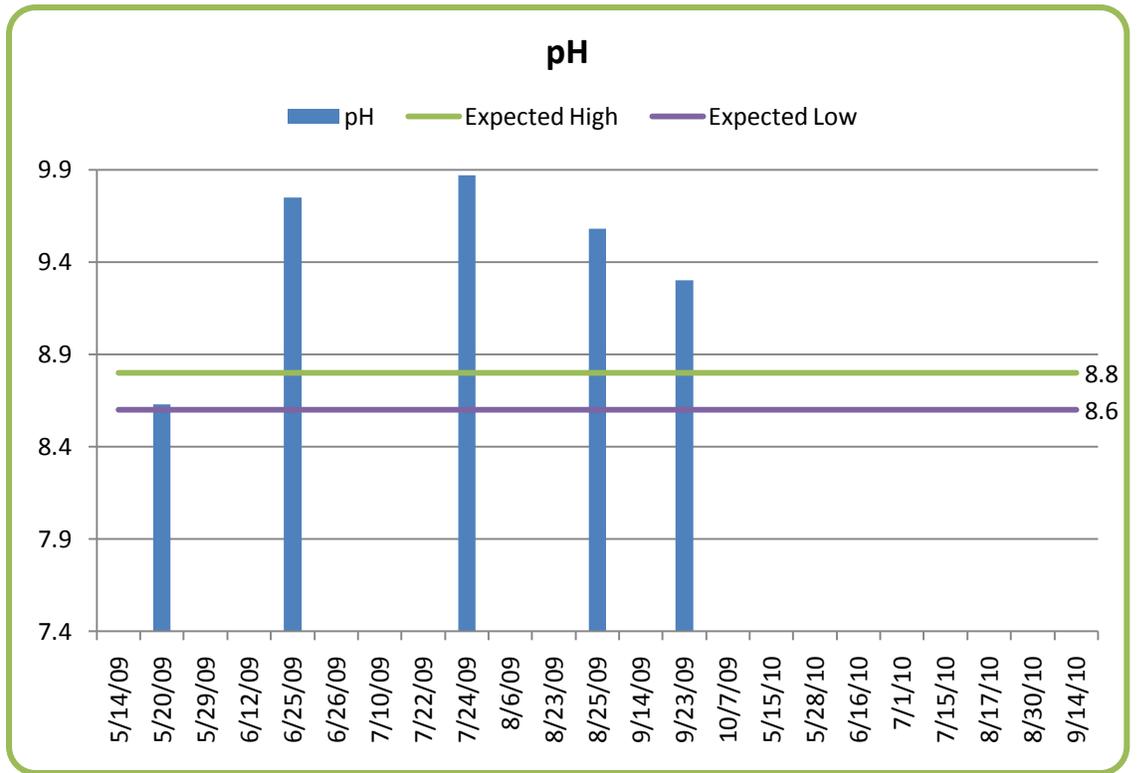
	2009	2010	2009-2010 Combined
Average	<0.05 mg/L	<0.05 mg/L	<0.05 mg/L

pH

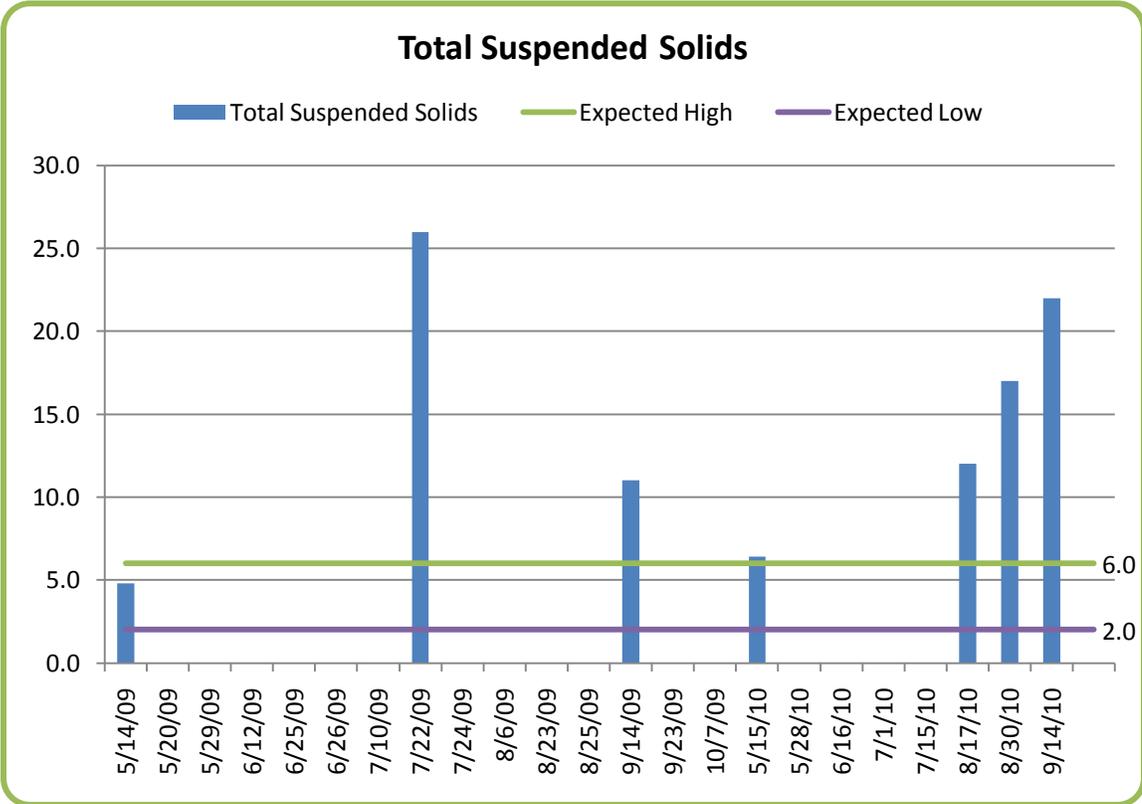
Expected Range:
8.6-8.8

Shallow Lake
Standard: None

The samples recorded some of the highest pH values of any area lake. The averages are above the expected range.



	2009	2010	2009-2010 Combined
Average	9.4	NO DATA	9.4
Within Expected Range	No		No



Total Suspended Solids

Expected Range:
2.0-6.0 mg/L

Shallow Lake
Standard: None

The averages were all well above the expected range.

This chart cannot be directly compared to other Total Suspended Solid charts in this report due to a scale change.

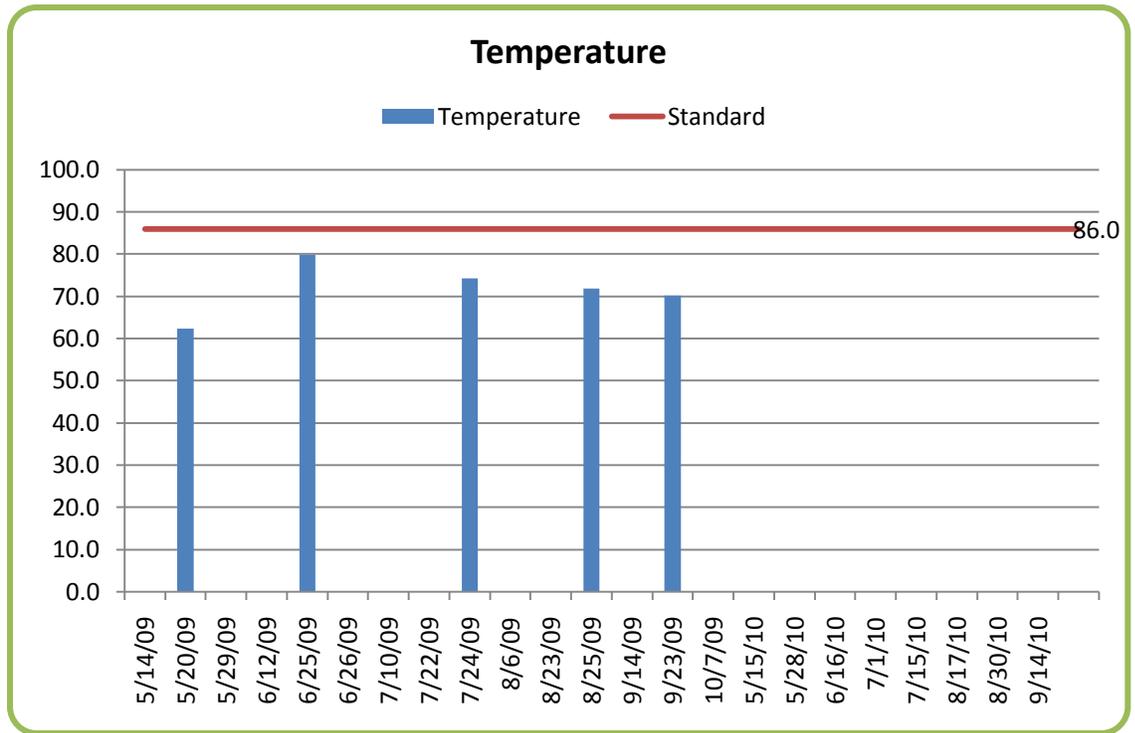
	2009	2010	2009-2010 Combined
Average	18.5 mg/L	14.4 mg/L	14.2 mg/L
Within Expected Range	No	No	No

Temperature

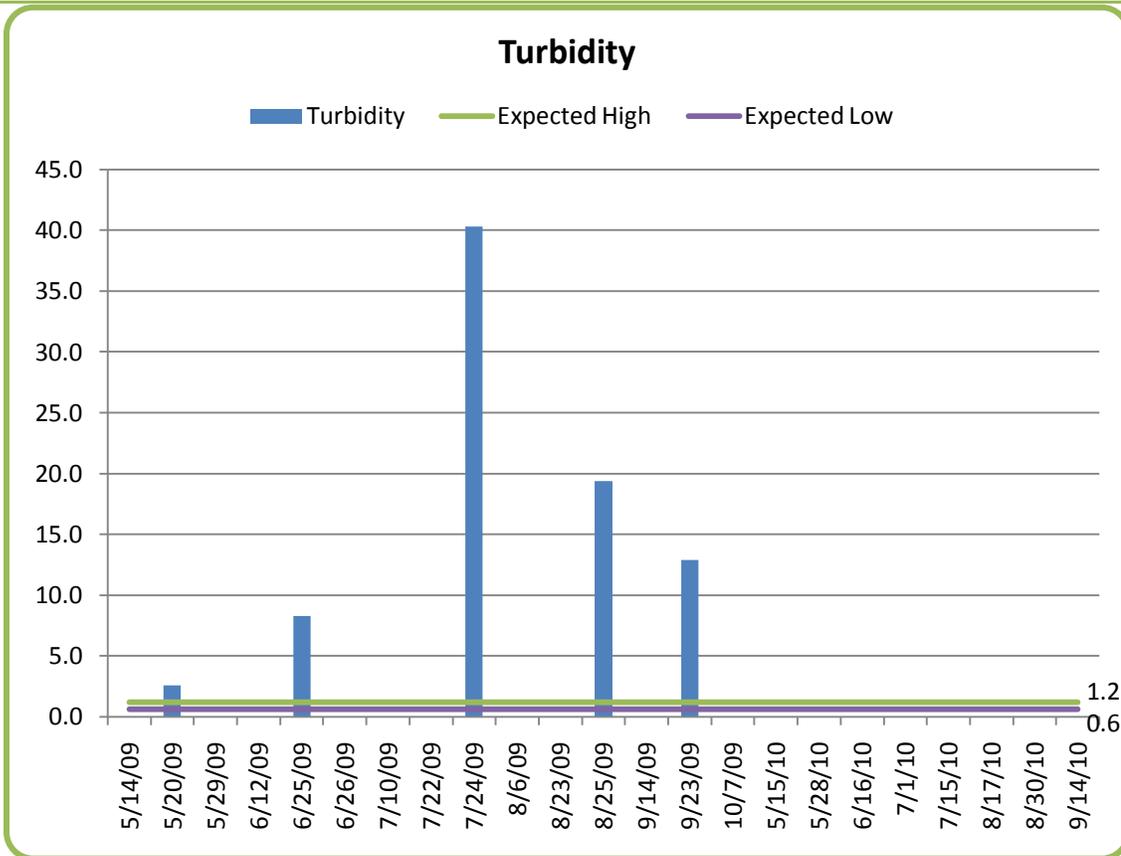
Expected Range:
None

Shallow Lake
Standard: The daily
average shall not
exceed 86.0°F

The temperatures
were between 60
and 85°F.



	2009	2010	2009-2010 Combined
Average	71.7 °F	NO DATA	71.72°F
Meets Standard (Not to exceed 86.0°F)	Yes		Yes



Turbidity

Expected Range: 1.0-
2.0 NTU

Shallow Lake
Standard: None

All samples exceeded
the expected range,
with several samples
extremely high.

This chart cannot be
directly compared
with other Turbidity
charts in this report
due to a change in
scale.

	2009	2010	2009-2010 Combined
Average	16.7 NTU	NO DATA	16.7 NTU
Within Expected Range	No		No

Lake 13-0034
Pioneer Lake

Pioneer Lake



Shallow Lake

Lake Classification: **HYPEREUTROPHIC**

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	75.85	72.93	85.97	78.25
Classification	Hypereutrophic	Hypereutrophic	Hypereutrophic	Hypereutrophic

Overall Lake Quality Grade: **F**

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2009-2010 Average (May-Sept)	100.8 µg/L	0.4 meters	291.2 µg/L		
Grades	F	F	F	F	12 th /13

MPCA Standards: Impaired

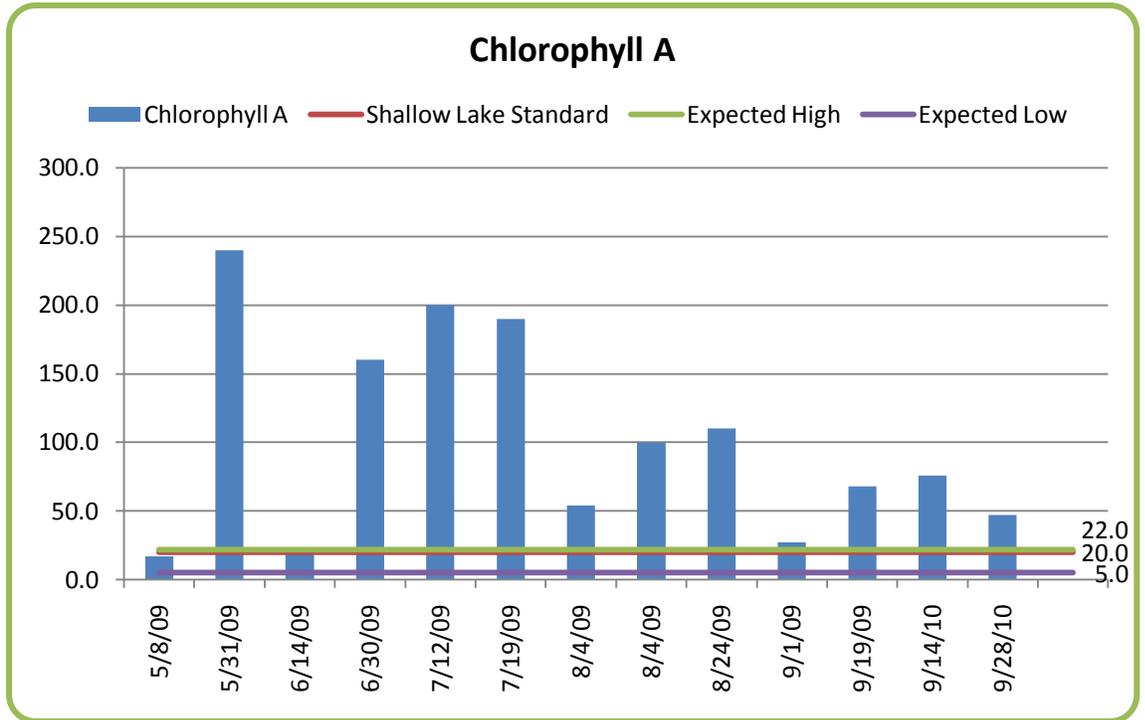
	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Shallow lake)	20.0 µg/L	>1.0 meters	60.0 µg/L	
2009-2010 Average (June-Sept)	95.7 µg/L	0.4 meters	315.5 µg/L	
Meets Standard	No	No	No	No

Chlorophyll A

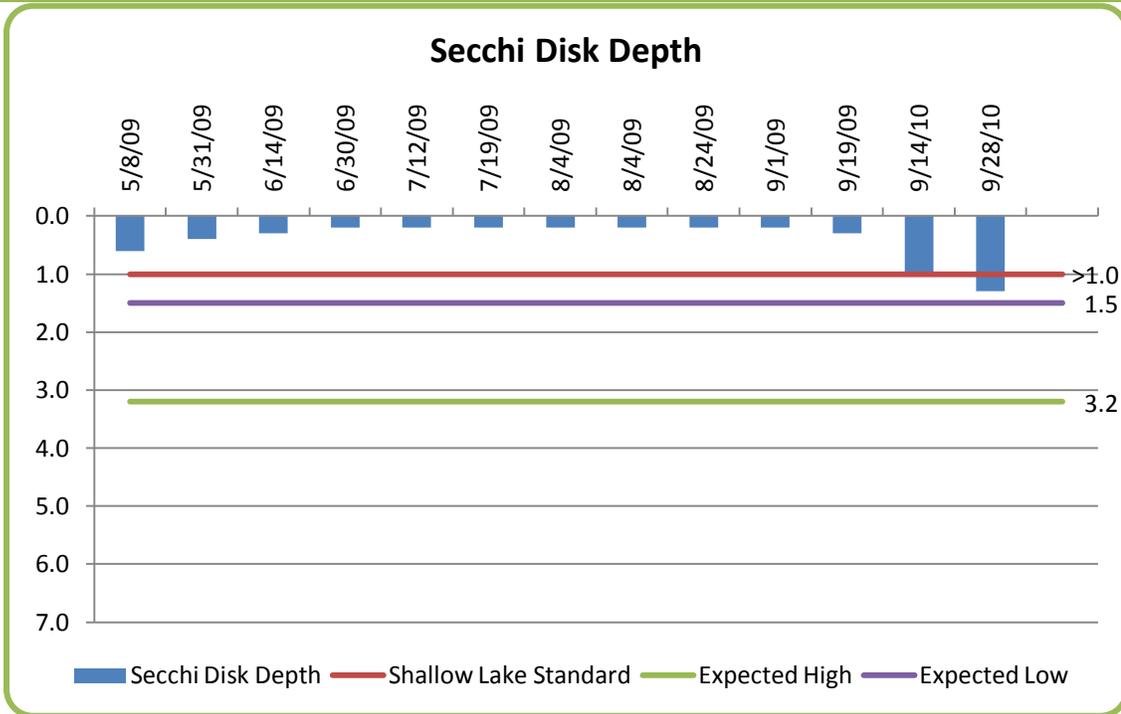
Expected Range:
5.0-22.0 µg/L

Shallow Lake
Standard: 20.0 µg/L

The readings are extremely high and do not meet the standard. This chart cannot be directly compared with other Chlorophyll A charts in this report due to a change in scale.



	2009	2010	2009-2010 Combined
Average (May-Sept)	107.9 µg/L	61.5 µg/L	100.8 µg/L
Grade	F	D	F
Average (June-Sept)	103.3 µg/L	61.5 µg/L	95.7 µg/L
Meets Standard (20.0 µg/L)	No	No	No



Secchi Disk Depth

Expected Range: 1.5-3.2 meters

Shallow Lake
Standard: >1.0 meters

The clarity is very poor. This lake does not meet the standard.

	2009	2010	2009-2010 Combined
Average (May-Sept)	0.3 meters	1.2 meters	0.4 meters
Grade	F	C-D	F
Average (June-Sept)	0.2 meters	1.2 meters	0.4 meters
Meets Standard (>1.0 m)	No	No	No

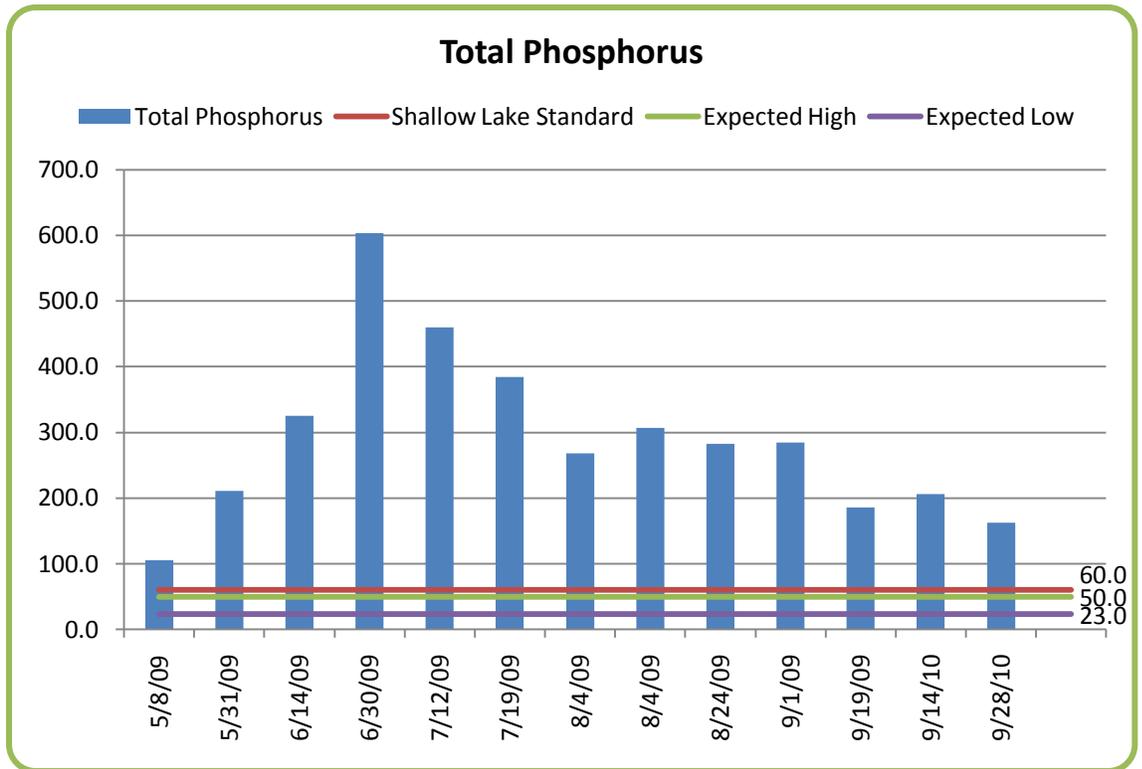
Total Phosphorus

Expected Range:
23.0-50.0 µg/L

Shallow Lake
Standard: 60.0 µg/L

The readings are extremely high. This lake does not meet the standard.

This chart cannot be directly compared with others in this report due to a change in scale.



	2009	2010	2009-2010 Combined
Average (May-Sept)	310.6 µg/L	184.5 µg/L	291.2 µg/L
Grade	F	F	F
Average (June-Sept)	344.6 µg/L	184.5 µg/L	315.5 µg/L
Meets Standard (60.0 µg/L)	No	No	No

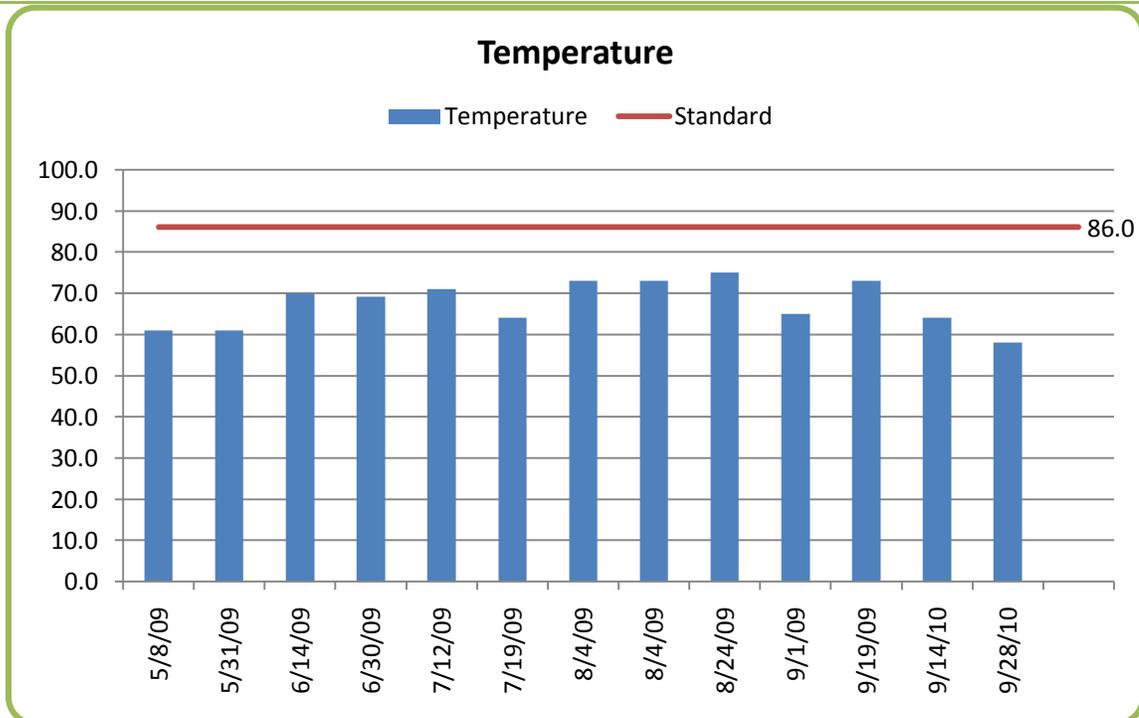
Temperature

Temperature

Expected Range:
None

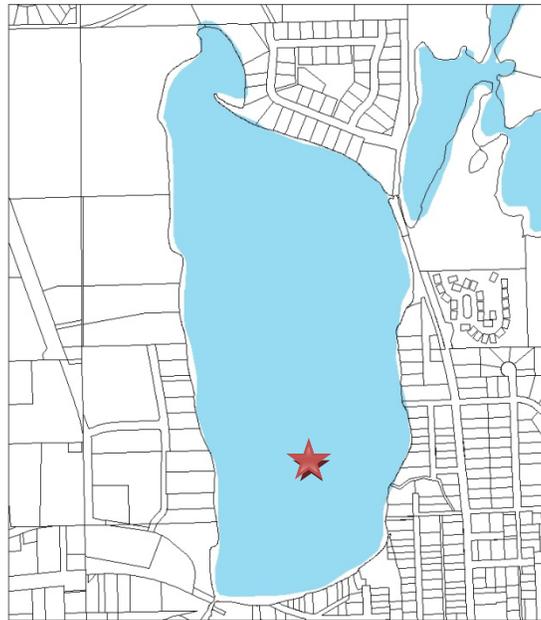
Deep Lake Standard:
The daily average shall not exceed 86.0°F

The temperatures were between 60 and 85°F.



	2009	2010	2009-2010 Combined
Average	68.7 °F	61.0 °F	67.5 °F
Meets Standard (Not to exceed 86.0°F)	Yes	Yes	Yes

North Lindstrom Lake



Deep Lake

Lake Classification: EUTROPHIC

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	57.6	49.5	54.7	54.0
Classification	Eutrophic	Mesotrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C+

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2009-2010 Average (May-Sept)	15.9 µg/L	2.1 meters	33.0 µg/L		
Grades	B	C	C	C+	3 rd /13

MPCA Standards: Meets standards

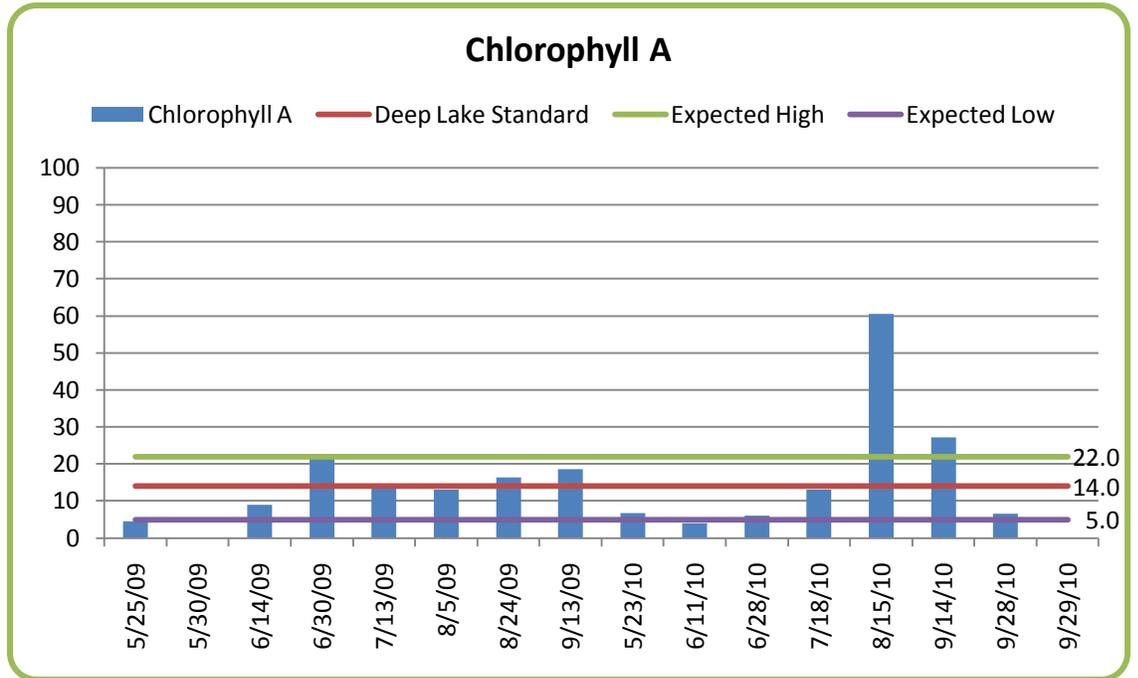
	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Deep lake)	14.0 µg/L	>1.4 meters	40.0 µg/L	
2009-2010 Average (June-Sept)	17.6 µg/L	1.8 meters	33.0 µg/L	
Meets Standard	No	Yes	Yes	Yes

Chlorophyll A

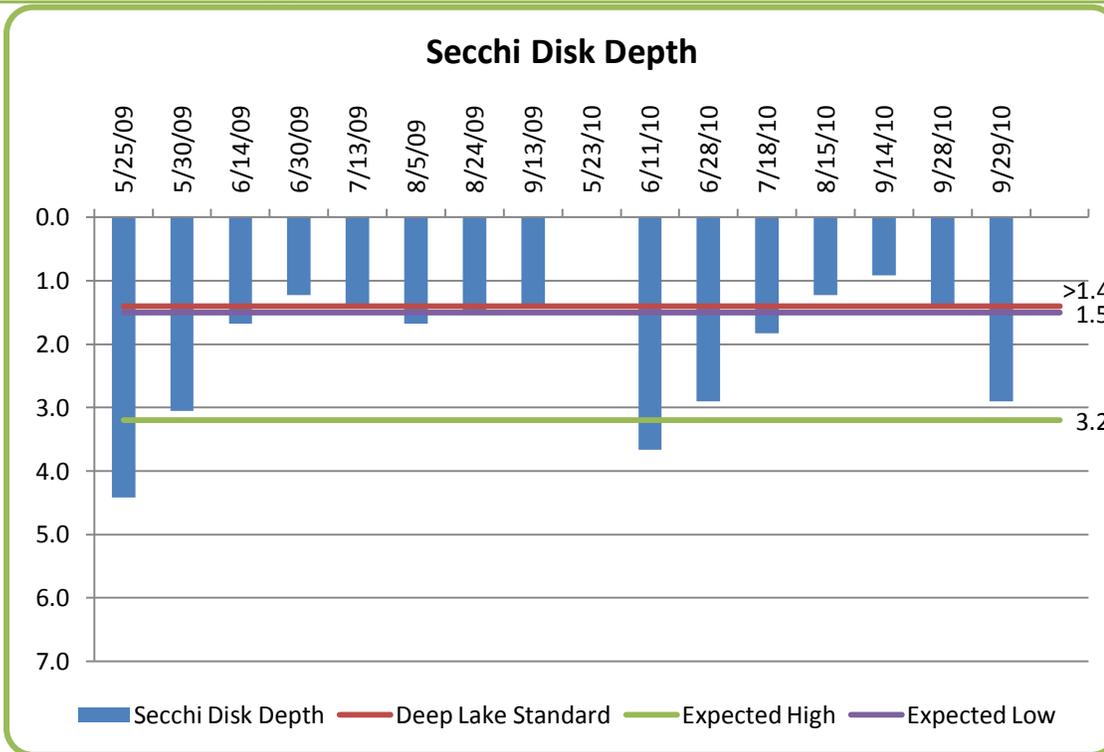
Expected Range:
5.0-22.0 µg/L

Deep Lake Standard:
14.0 µg/L

Most readings are within the expected range. However, the averages do not meet the standard.



	2009	2010	2009-2010 Combined
Average (May-Sept)	14.0 µg/L	17.7 µg/L	15.9 µg/L
Grade	B	B	B
Average (June-Sept)	15.6 µg/L	19.6 µg/L	17.6 µg/L
Meets Standard (14.0 µg/L)	No	No	No



Secchi Disk Depth

Expected Range: 1.5-3.2 meters

Deep Lake Standard:
>1.4 meters

All the averages meet the standard.

	2009	2010	2009-2010 Combined
Average (May-Sept)	2.0 meters	2.1 meters	2.1 meters
Grade	C	C	C
Average (June-Sept)	1.5 meters	2.1 meters	1.8 meters
Meets Standard (>1.4 m)	Yes	Yes	Yes

Total Phosphorus

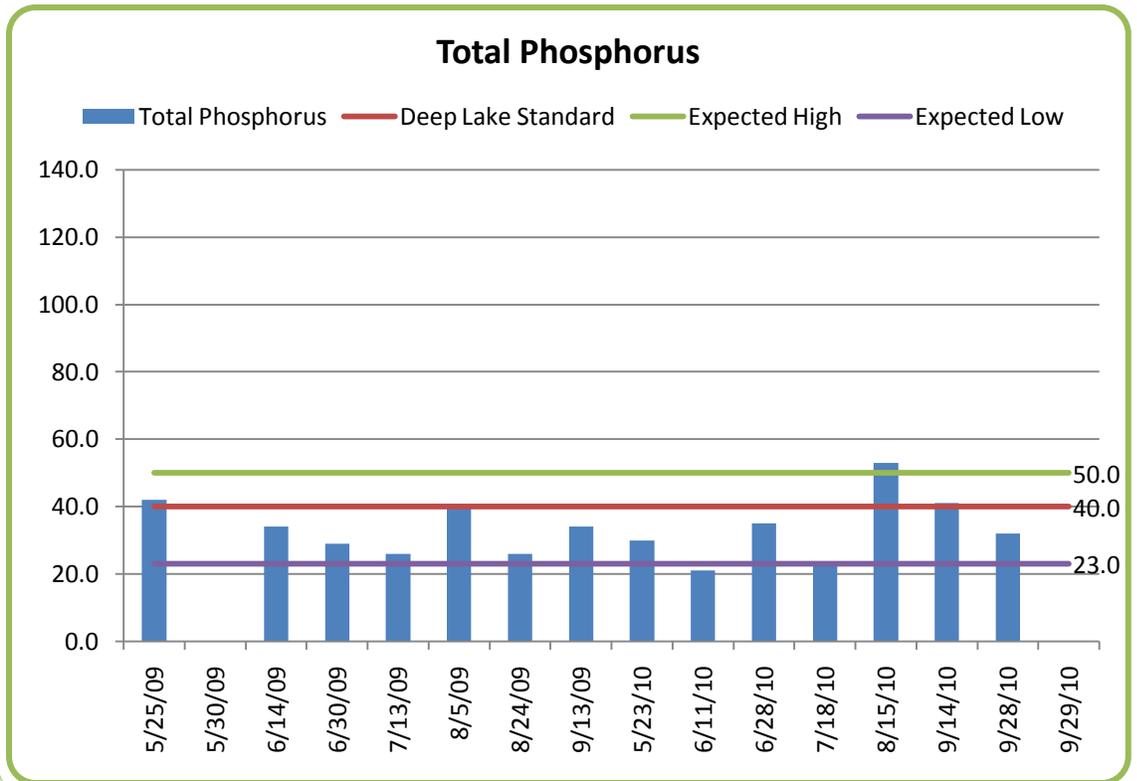
Expected Range:

23.0-50.0 µg/L

Deep Lake Standard:

40.0 µg/L

Most samples fall within the expected range. The averages meet the standard.



	2009	2010	2009-2010 Combined
Average (May-Sept)	33.0 µg/L	34.0 µg/L	33.0 µg/L
Grade	C	C	C
Average (June-Sept)	32.0 µg/L	33.0 µg/L	33.0 µg/L
Meets Standard (40.0 µg/L)	Yes	Yes	Yes

Ammonia Nitrogen

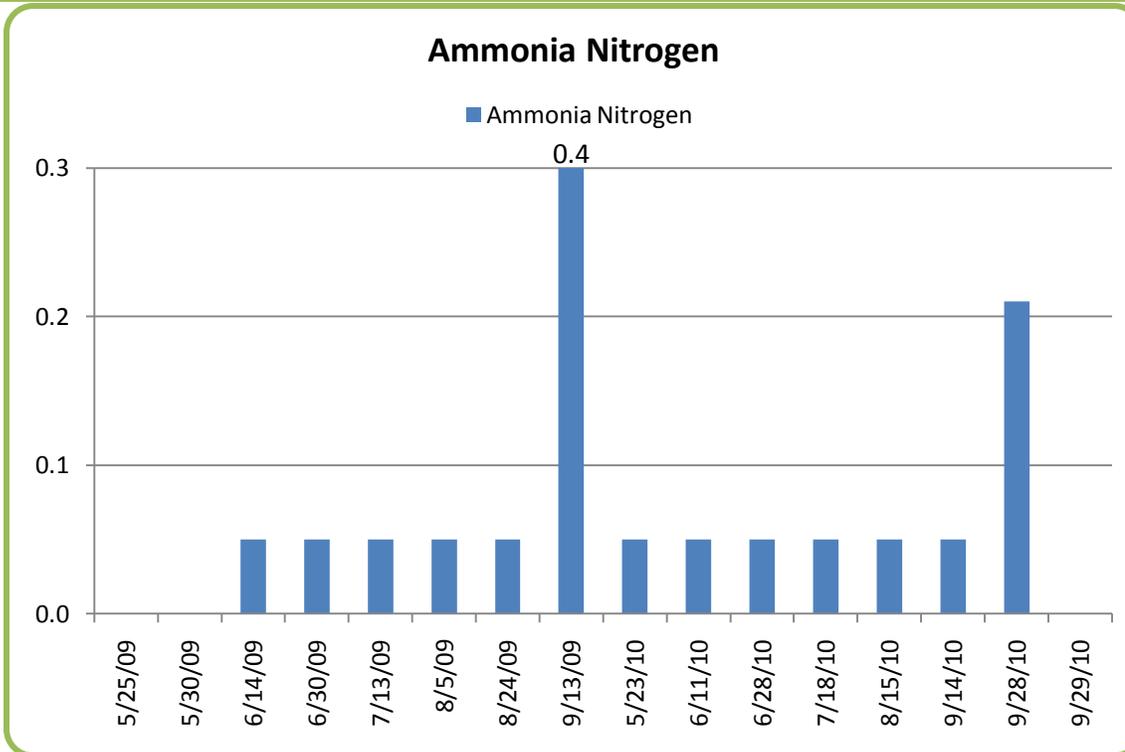
Ammonia Nitrogen

Expected Range: None

Deep Lake Standard:

None

Two samples were higher, but in general the ammonia nitrogen levels were low. The scale on this chart is different than other ammonia nitrogen charts in this report.



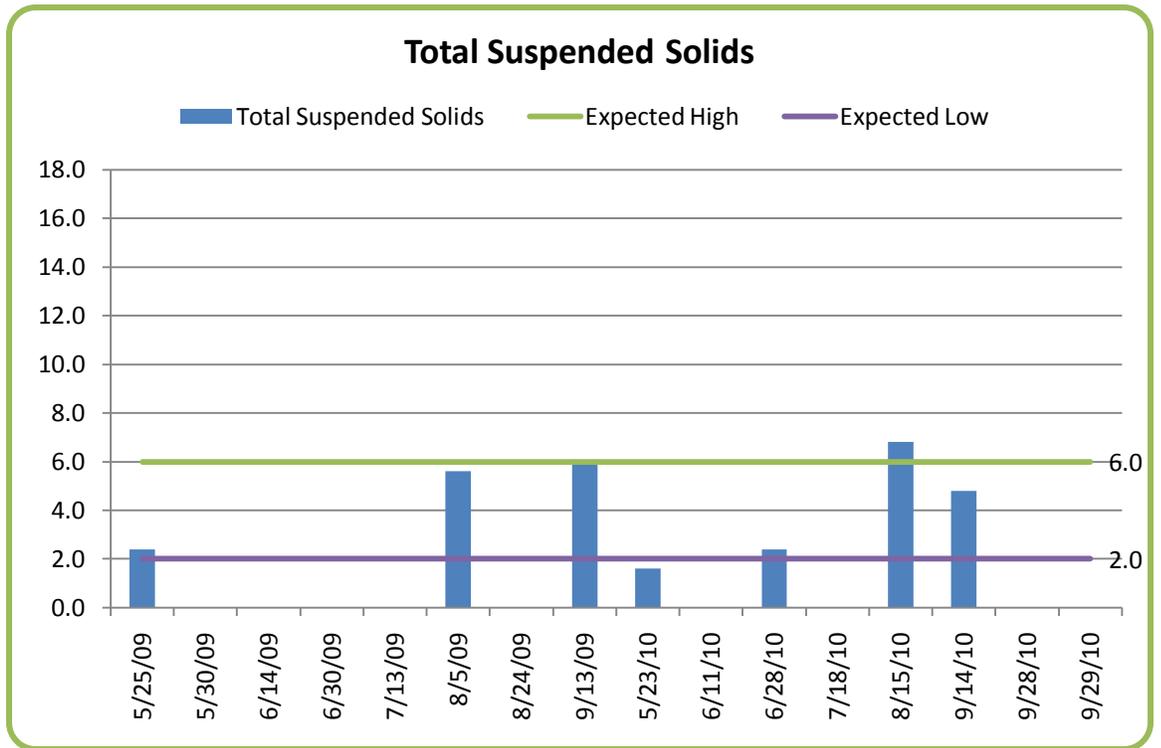
	2009	2010	2009-2010 Combined
Average	0.1 mg/L	0.1 mg/L	0.1 mg/L

Total Suspended Solids

Expected Range:
2.0-6.0 mg/L

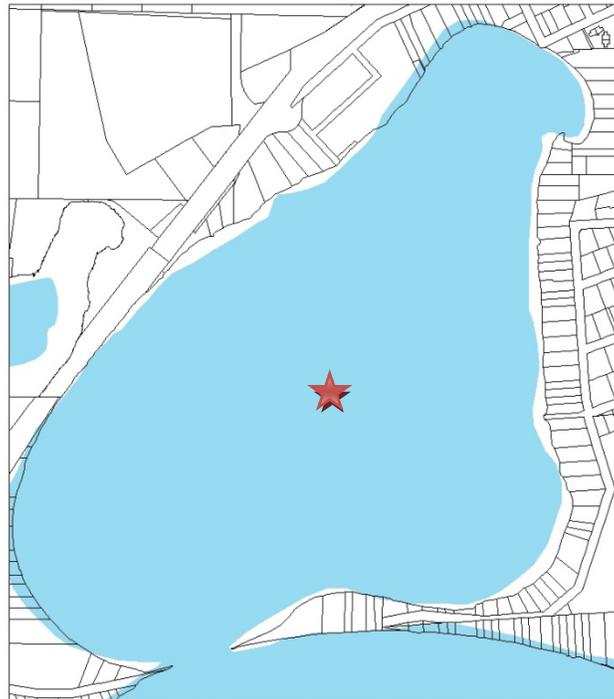
Deep Lake Standard:
None

The averages were
all within the
expected range.



	2009	2010	2009-2010 Combined
Average	4.7 mg/L	3.9 mg/L	4.2 mg/L
Within Expected Range	Yes	Yes	Yes

Little Green Lake



Deep Lake

Lake Classification: **EUTROPHIC**

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	56.2	54.3	60.2	56.9
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: **C+**

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2009-2010 Average (May-Sept)	13.6 µg/L	1.5 meters	49.0 µg/L		
Grade	B	C	C	C+	6 th /13

MPCA Standards: Impaired

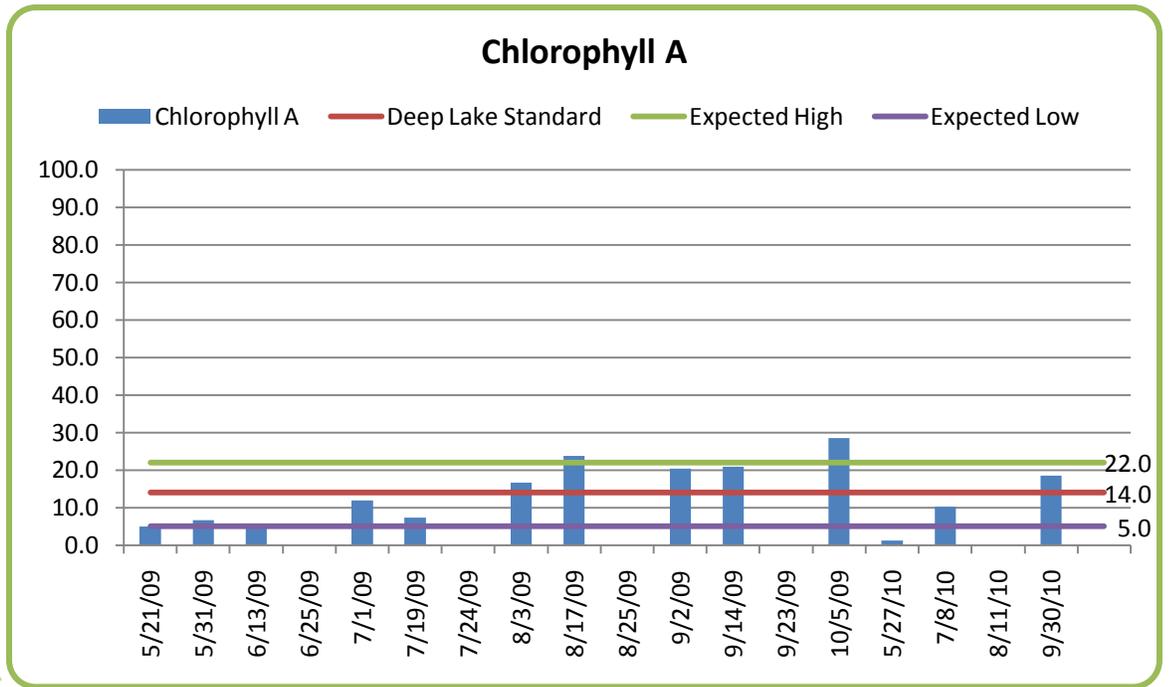
	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Deep lake)	14.0 µg/L	>1.4 meters	40.0 µg/L	
2009-2010 Average (June-Sept)	16.3 µg/L	1.2 meters	55.0 µg/L	
Meets Standard	No	No	No	No

Chlorophyll A

Expected Range:
5.0-22.0 µg/L

Deep Lake Standard:
14.0 µg/L

Most readings are within the expected range. However, the averages do not meet the standard.



	2009	2010	2009-2010 Combined
Average (May-Sept)	14.6 µg/L	10.0 µg/L	13.6 µg/L
Grade	B	B	B
Average (June-Sept)	16.8 µg/L	14.4 µg/L	16.3 µg/L
Meets Standard (14.0 µg/L)	No	No	No

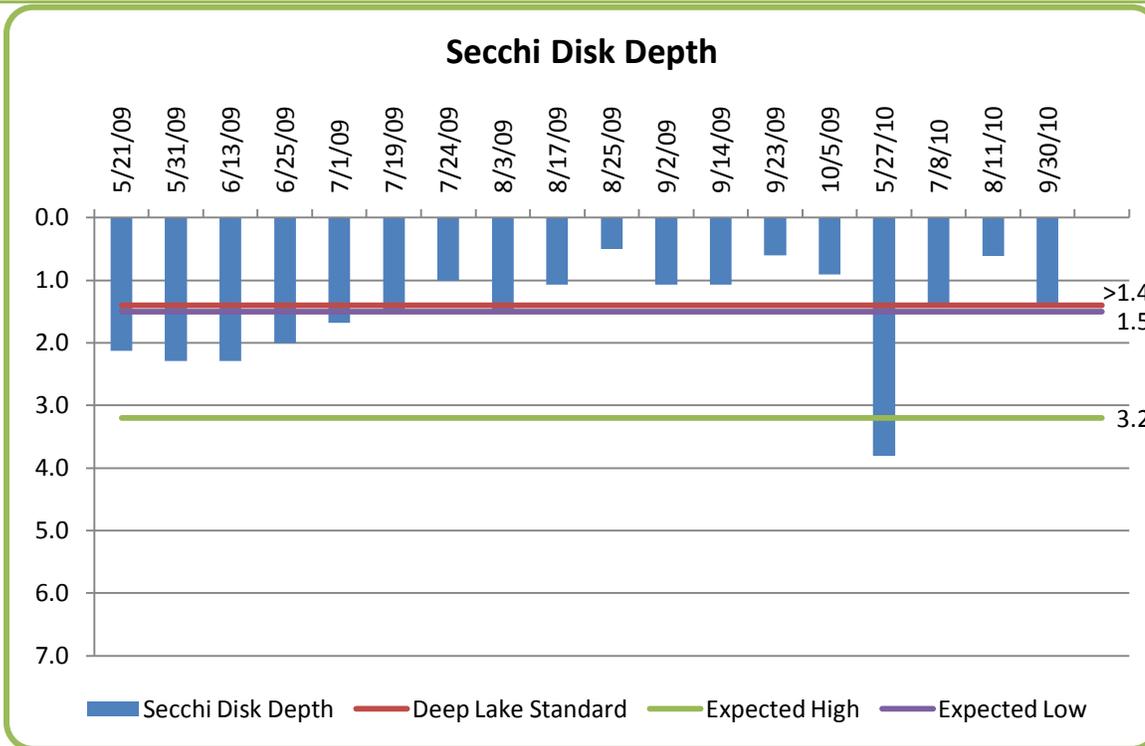
Secchi Disk Depth

Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Deep Lake Standard:
>1.4 meters

The averages are near, but do not meet the standard.



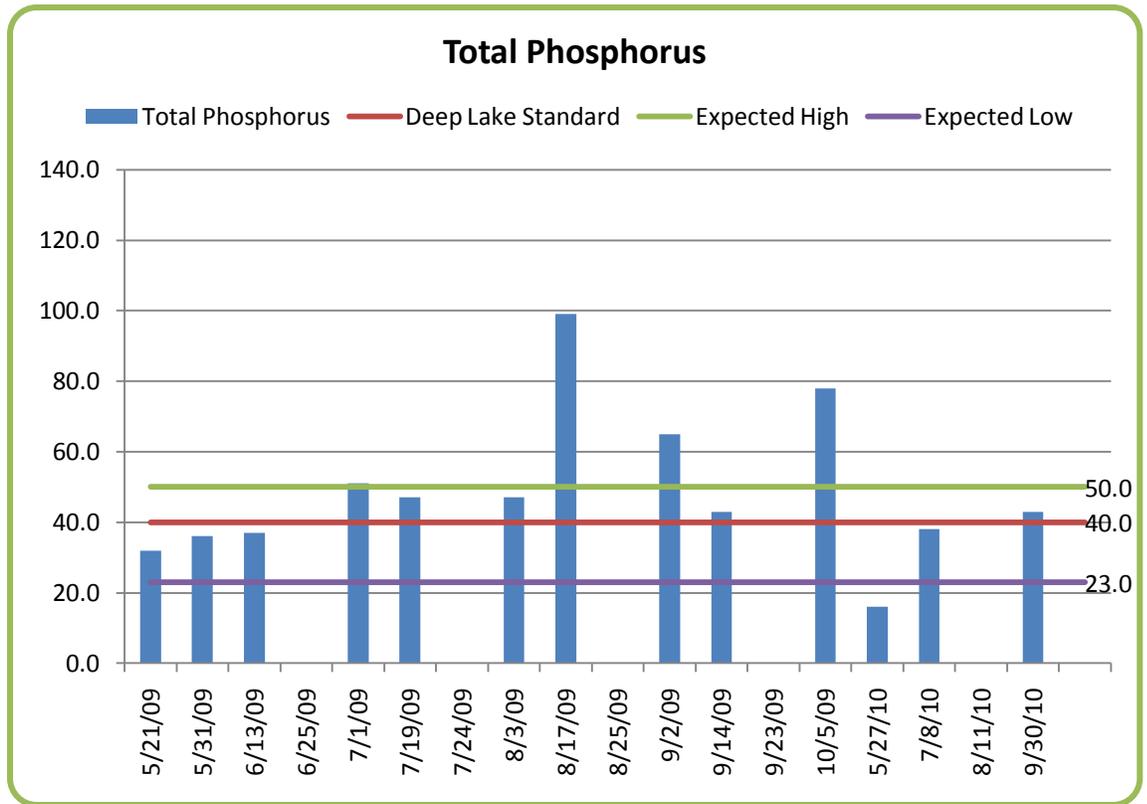
	2009	2010	2009-2010 Combined
Average (May-Sept)	1.4 meters	1.8 meters	1.5 meters
Grade	C	C	C
Average (June-Sept)	1.3 meters	1.1 meters	1.2 meters
Meets Standard (>1.4 m)	No	No	No

Total Phosphorus

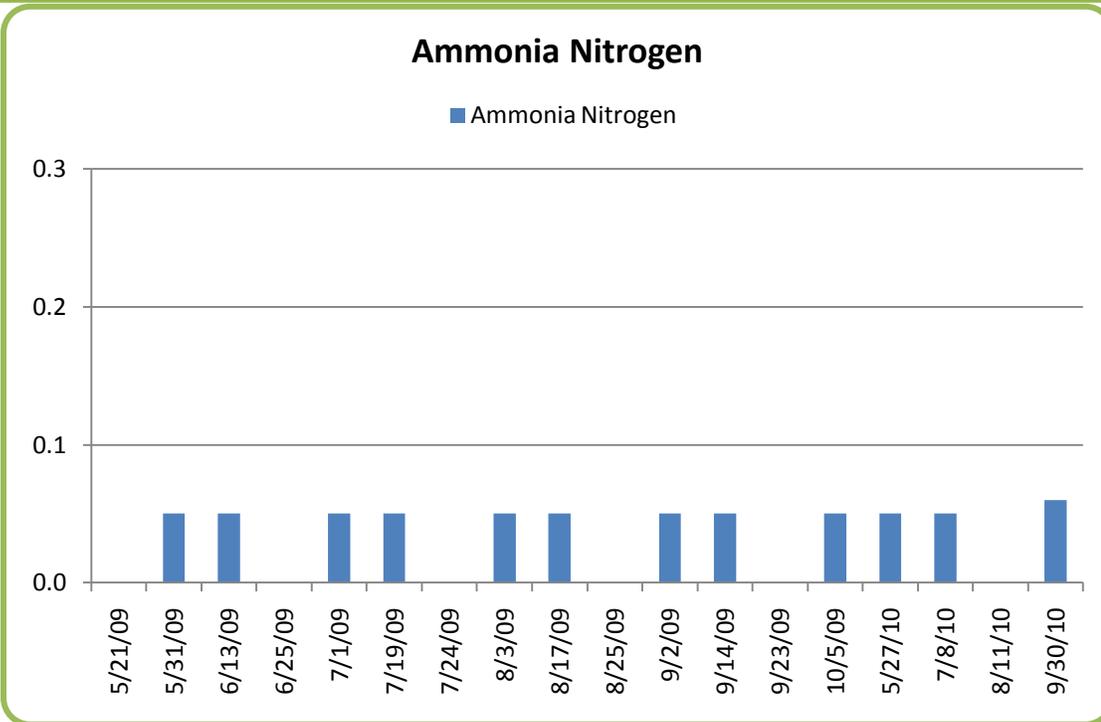
Expected Range:
23.0-50.0 µg/L

Deep Lake Standard:
40.0 µg/L

The overall 2009-2010 average did not meet the standard.



	2009	2010	2009-2010 Combined
Average (May-Sept)	54.0 µg/L	32.0 µg/L	49.0 µg/L
Grade	C	B-C	C
Average (June-Sept)	58.0 µg/L	41.0 µg/L	55.0 µg/L
Meets Standard (40.0 µg/L)	No	No	No



Ammonia Nitrogen

Expected Range: None

Deep Lake Standard:
None

All samples were very low.

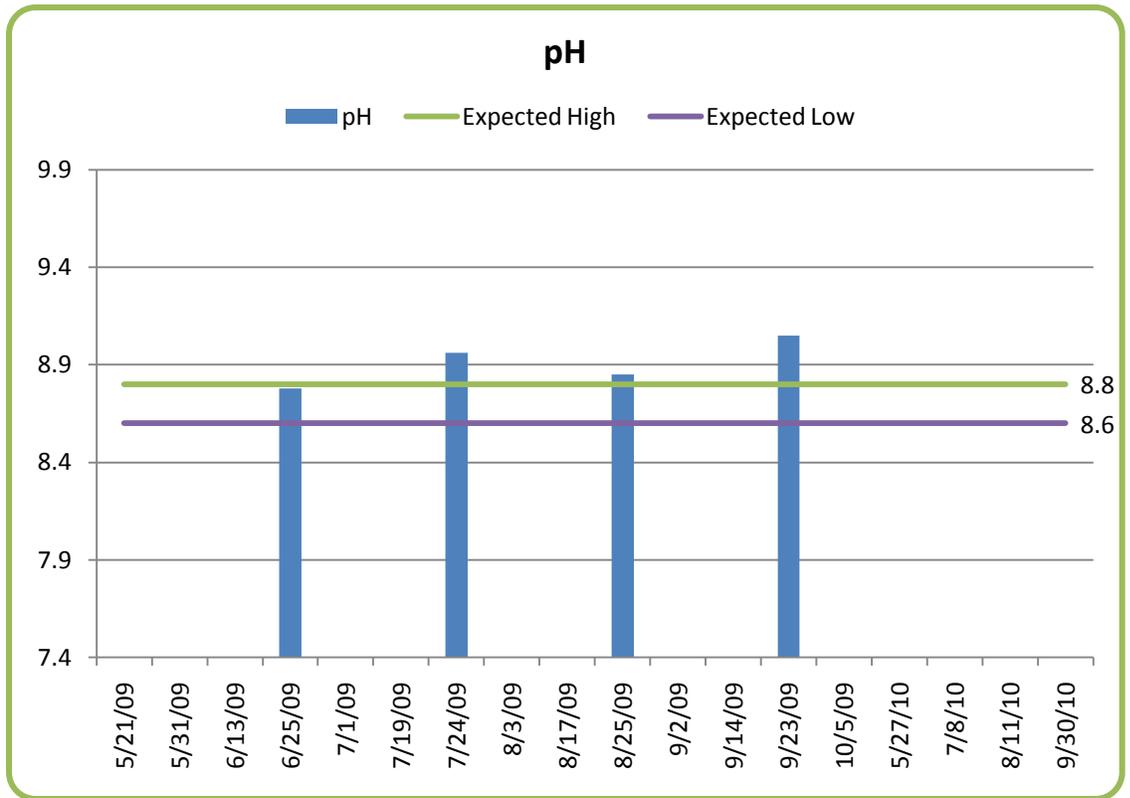
	2009	2010	2009-2010 Combined
Average	<0.05 mg/L	<0.05 mg/L	<0.05 mg/L

pH

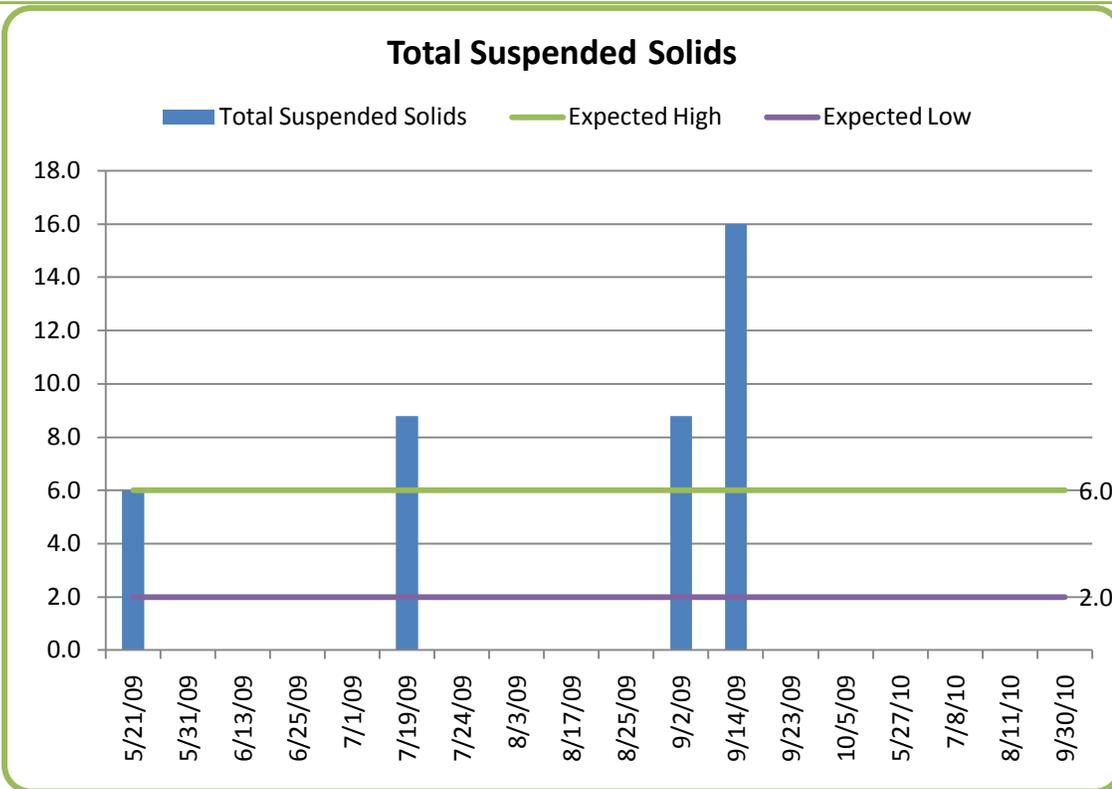
Expected Range:
8.6-8.8

Deep Lake Standard:
None

Four out of five samples were above the expected range. The average was just above the expected range.



	2009	2010	2009-2010 Combined
Average	8.9	NO DATA	8.9
Within Expected Range	No		No



Total Suspended Solids

Expected Range:
2.0-6.0 mg/L

Deep Lake Standard:
None

The averages were all well above the expected range.

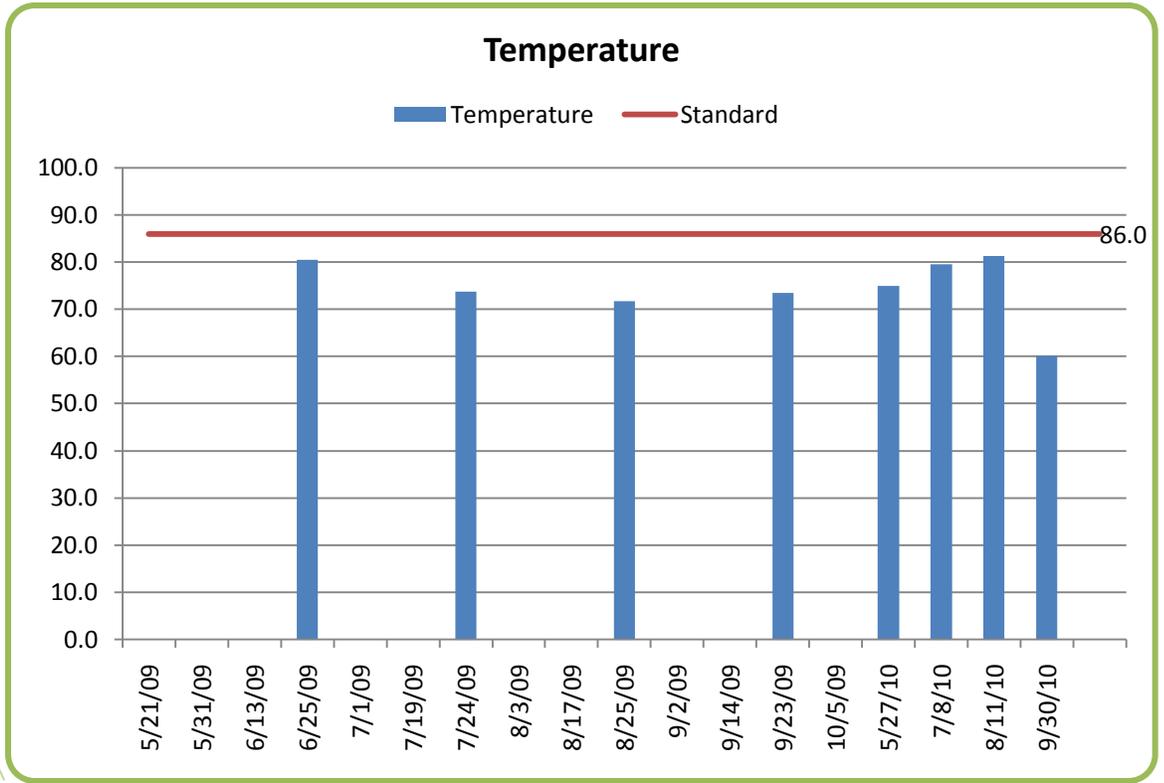
	2009	2010	2009-2010 Combined
Average	9.9 mg/L	NO DATA	9.9 mg/L
Within Expected Range	No		No

Temperature

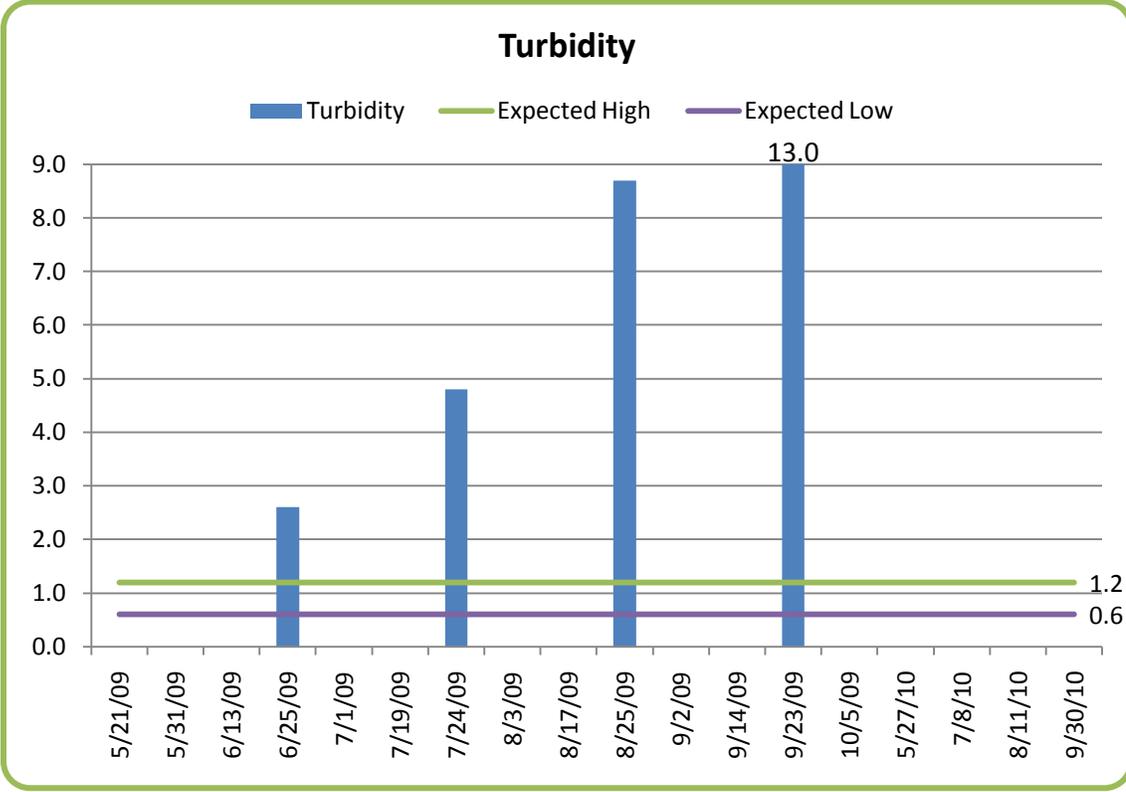
Expected Range:
None

Deep Lake Standard:
The daily average shall not exceed 86.0°F

The temperatures were between 60 and 85°F.



	2009	2010	2009-2010 Combined
Average	74.9 °F	74.0 °F	74.4 °F
Meets Standard (Not to exceed 86.0°F)	Yes	Yes	Yes



Turbidity

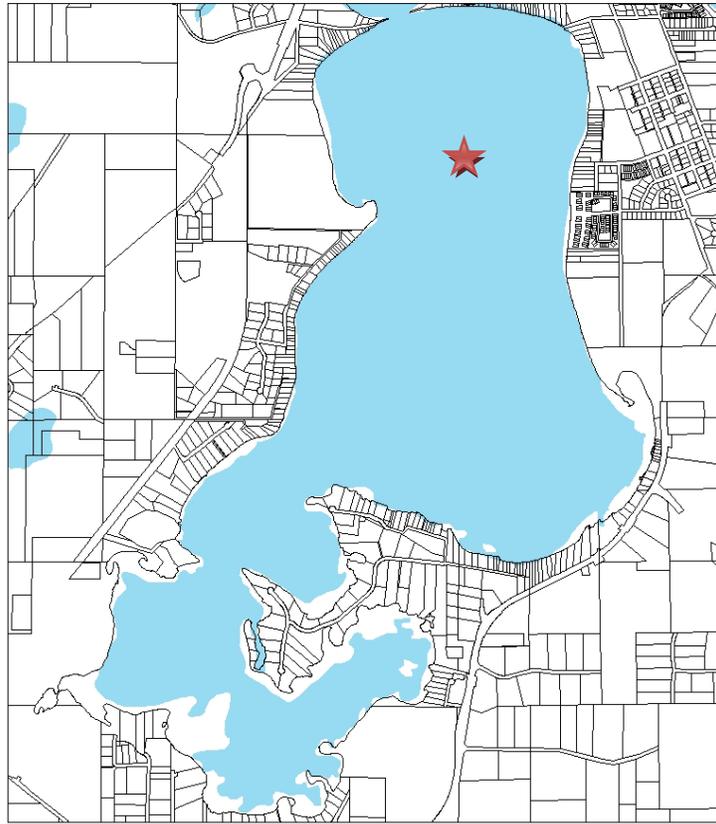
Expected Range: 1.0-2.0 NTU

Deep Lake Standard: None

All samples exceeded the expected range, with several samples extremely high. The average was well above the expected range as well.

	2009	2010	2009-2010 Combined
Average	7.3 NTU	NO DATA	7.3 NTU
Within Expected Range	No	No	No

Green Lake



Deep Lake

Lake Classification: EUTROPHIC

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	55.9	46.9	58.7	55.9
Classification	Eutrophic	Mesotrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C+

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2009-2010 Average (May-Sept)	25.1 µg/L	2.5 meters	44.0 µg/L		
Grade	C	B	C	C+	5 th /13

MPCA Standards: Potentially Impaired

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Deep lake)	14.0 µg/L	>1.4 meters	40.0 µg/L	
2009-2010 Average (June-Sept)	31.9 µg/L	2.2 meters	50.0 µg/L	
Meets Standard	No	Yes	No	No

Chlorophyll A

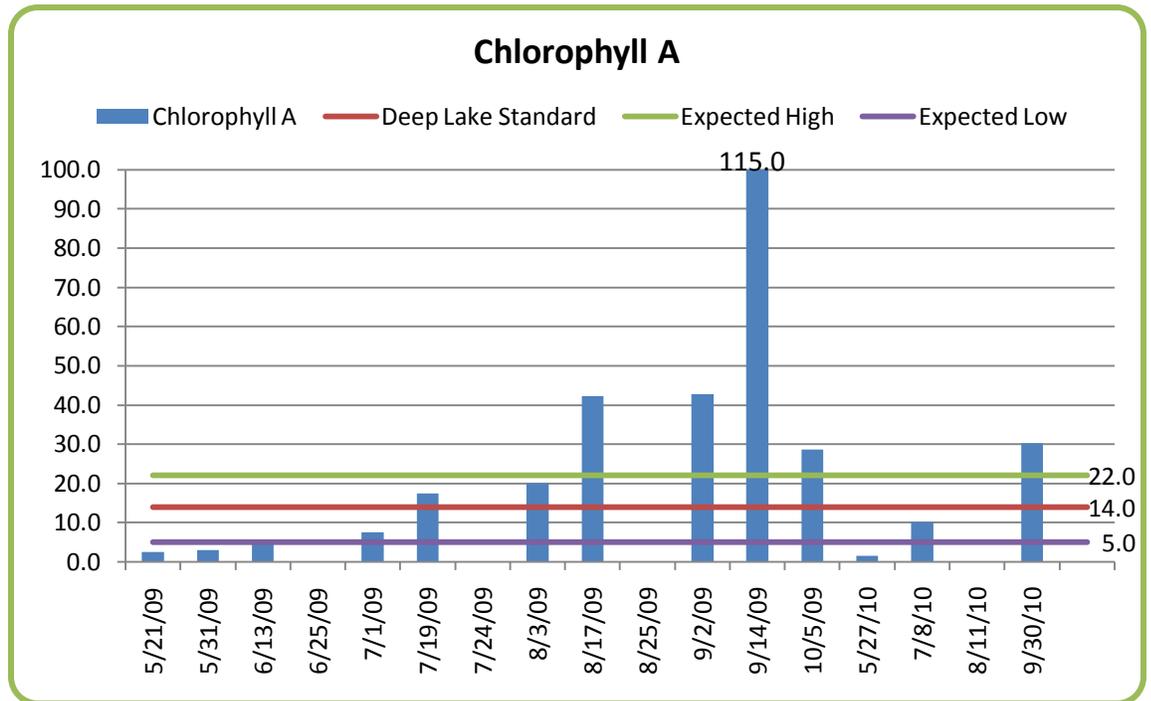
Expected Range:

5.0-22.0 µg/L

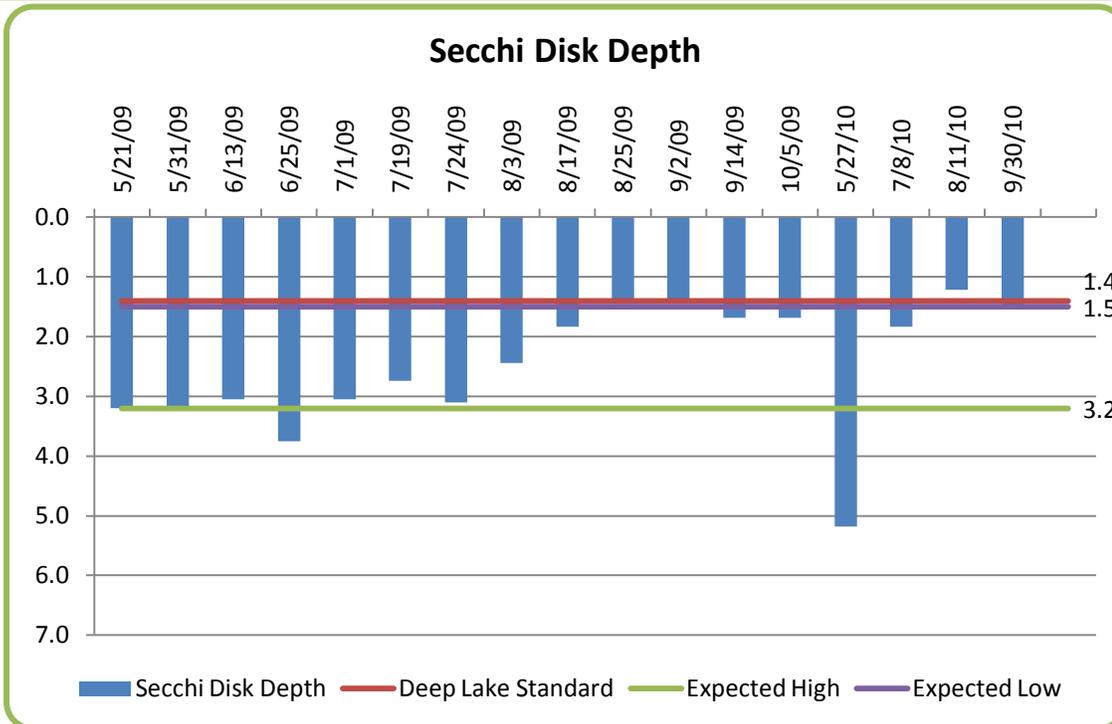
Deep Lake Standard:

14.0 µg/L

The combined average does not meet the standard.



	2009	2010	2009-2010 Combined
Average (May-Sept)	28.4 µg/L	14.0 µg/L	25.1 µg/L
Grade	C	B	C
Average (June-Sept)	34.8 µg/L	20.2 µg/L	31.9 µg/L
Meets Standard (14.0 µg/L)	No	No	No



Secchi Disk Depth

Expected Range: 1.5-3.2 meters

Deep Lake Standard: >1.4 meters

The samples were all within or above the expanded range, indicating good water clarity. The averages all met the standard.

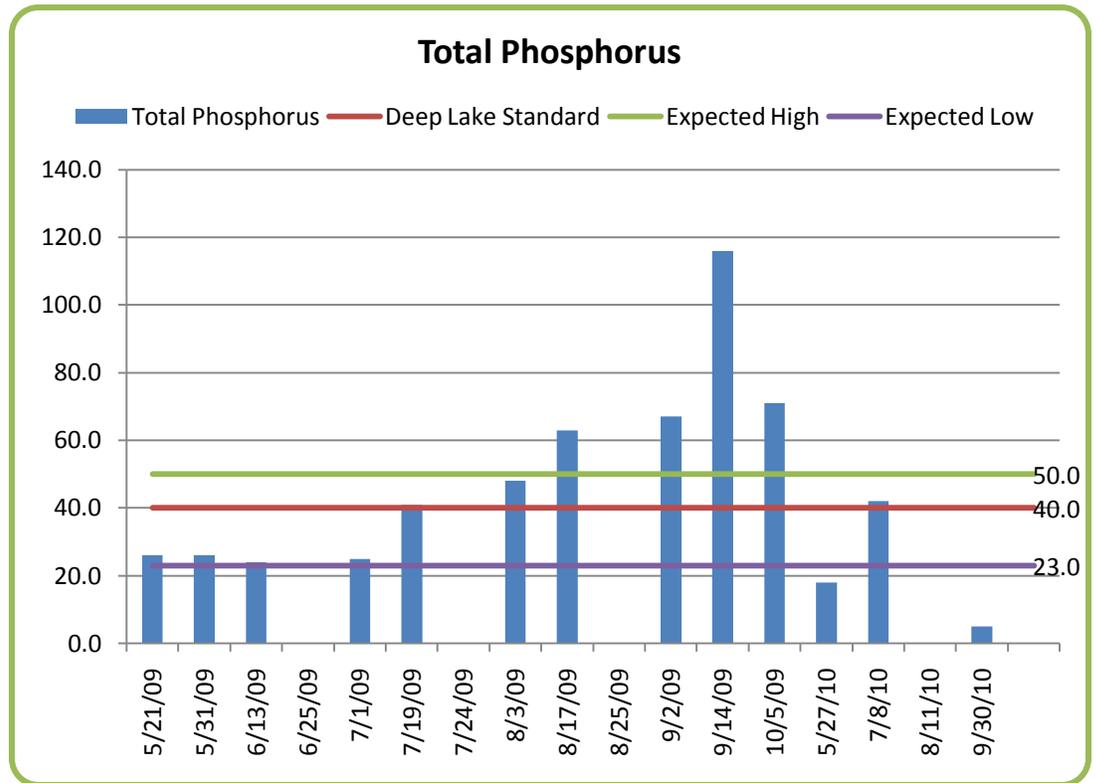
	2009	2010	2009-2010 Combined
Average (May-Sept)	2.5 meters	2.4 meters	2.5 meters
Grade	B	B	B
Average (June-Sept)	2.4 meters	1.5 meters	2.2 meters
Meets Standard (>1.4 m)	Yes	Yes	Yes

Total Phosphorus

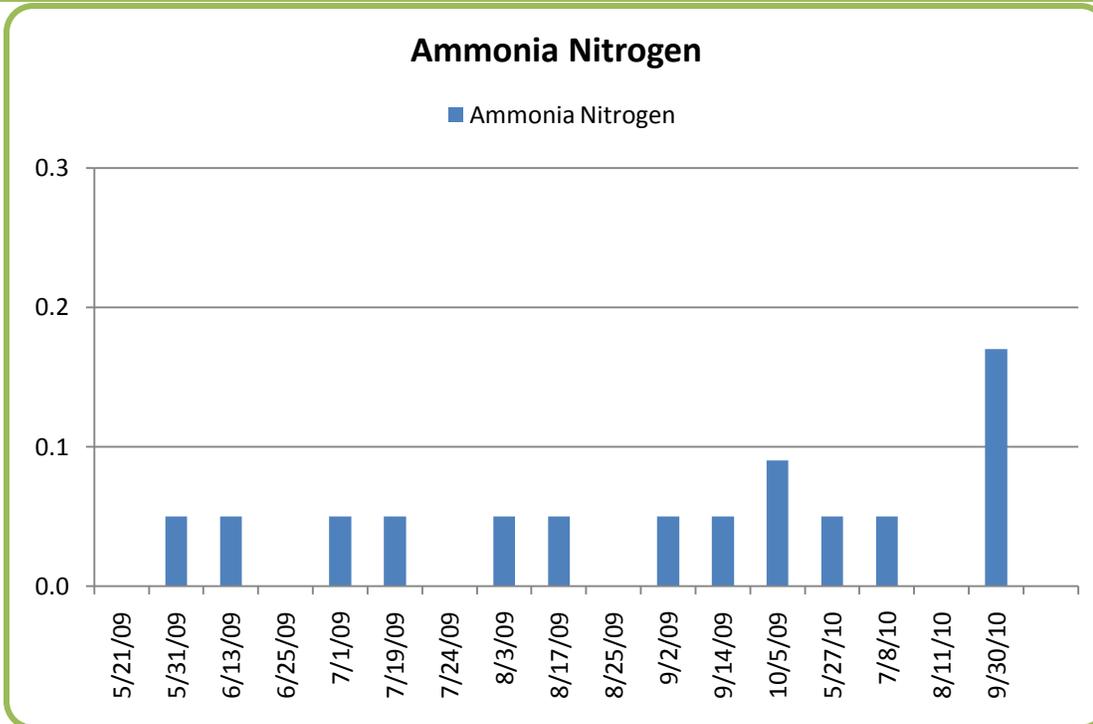
Expected Range:
23.0-50.0 µg/L

Deep Lake Standard:
40.0 µg/L

The 2009 average did not meet the standard; 2010 did meet the standard. The overall 2009-2010 average did not meet the standard.



	2009	2010	2009-2010 Combined
Average (May-Sept)	51.0 µg/L	22.0 µg/L	44.0 µg/L
Grade	C	A	C
Average (June-Sept)	57.0 µg/L	24.0 µg/L	50.0 µg/L
Meets Standard (40.0 µg/L)	No	Yes	No



Ammonia Nitrogen

Expected Range: None

Deep Lake Standard:
None

Two samples were elevated, but the averages were still low.

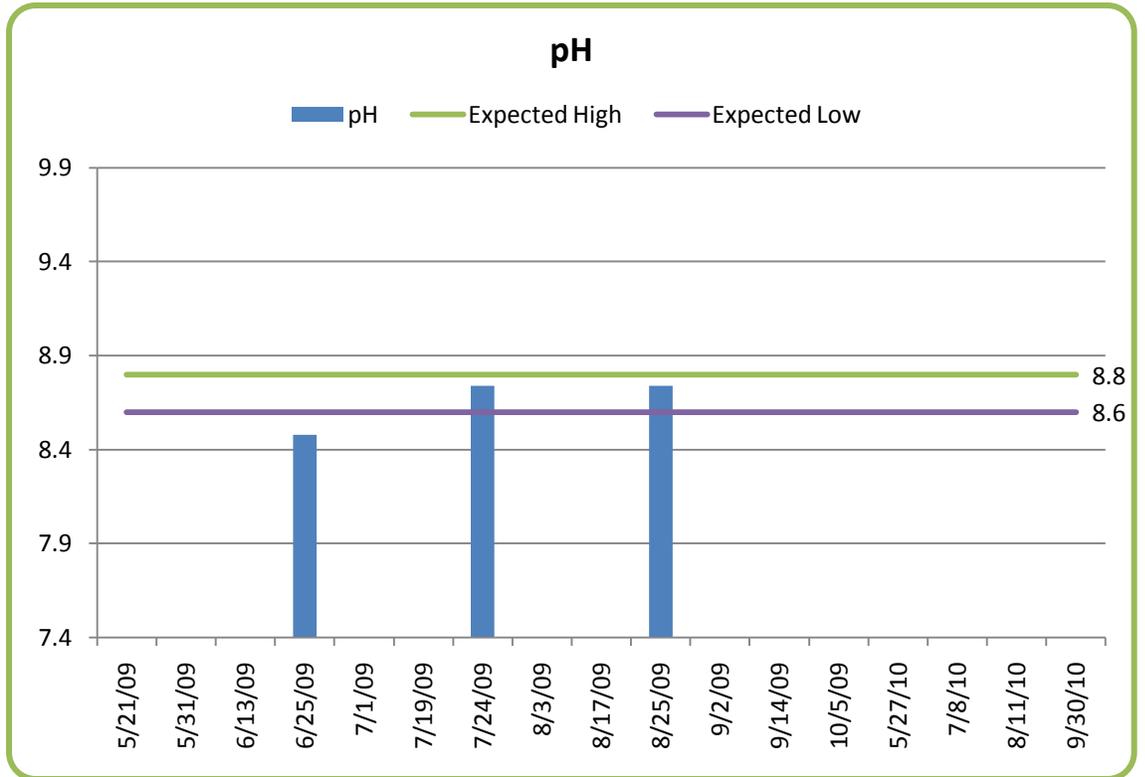
	2009	2010	2009-2010 Combined
Average	<0.05 mg/L	0.09 mg/L	0.07 mg/L

pH

Expected Range:
8.6-8.8

Deep Lake Standard:
None

Two of three samples were within the expected range. One was below the expected range. The average was within the expected range.



	2009	2010	2009-2010 Combined
Average	8.7	NO DATA	8.7
Within Expected Range	Yes		Yes

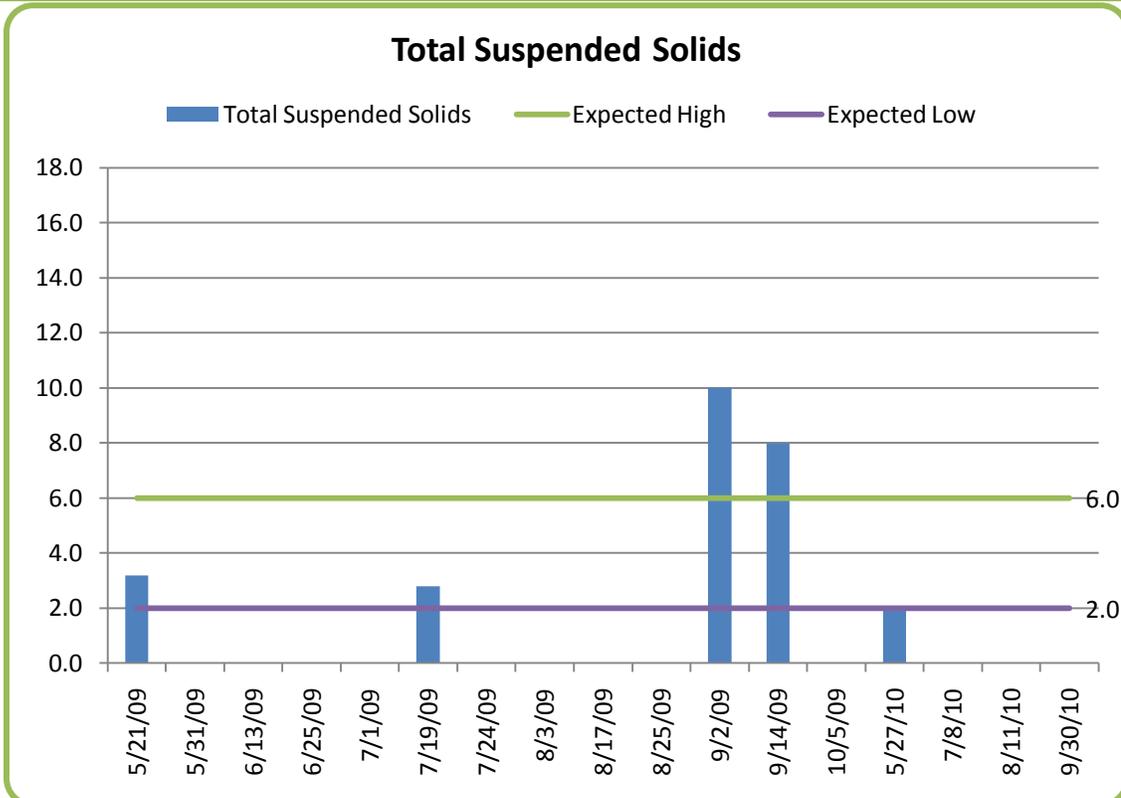
Total Suspended Solids

Total Suspended Solids

Expected Range:
2.0-6.0 mg/L

Deep Lake Standard:
None

The averages were within the expected range.



	2009	2010	2009-2010 Combined
Average	6.0 mg/L	2.0 mg/L	5.2 mg/L
Within Expected Range	Yes	Yes	Yes

Temperature

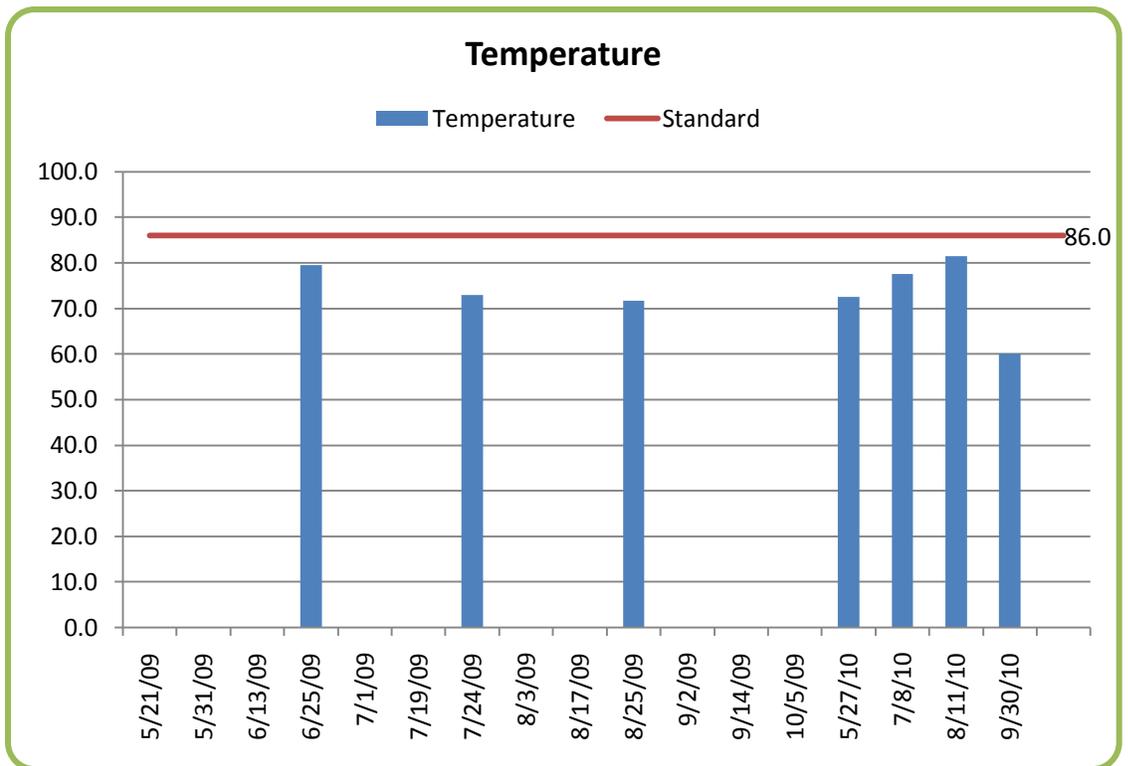
Expected Range:

None

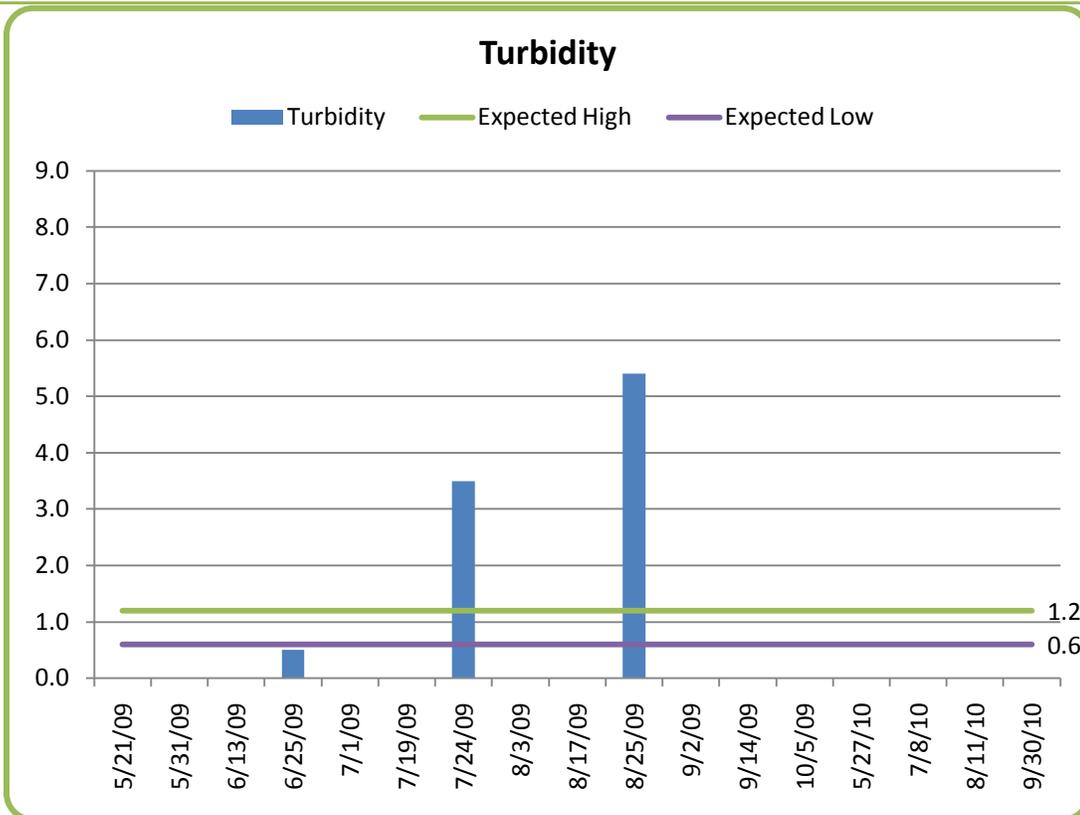
Deep Lake Standard:

The daily average shall not exceed 86.0°F.

The temperatures were between 60 and 85°F.



	2009	2010	2009-2010 Combined
Average	74.8 °F	72.9 °F	73.7 °F
Meets Standard (Not to exceed 86.0°F)	Yes	Yes	Yes



Turbidity

Expected Range:

1.0-2.0 NTU

Deep Lake Standard:

None

The average exceeded the expected range.

	2009	2010	2009-2010 Combined
Average	3.1 NTU	NO DATA	3.1 NTU
Within Expected Range	No		No

Lake Ellen



Shallow Lake

Lake Classification: EUTROPHIC

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	59.92	62.77	61.13	61.27
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C

	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2009-2010 Average (May-Sept)	19.9 µg/L	0.8 meters	52.0 µg/L		
Grade	B	D	C	C	10 th /13

MPCA Standards: Impaired

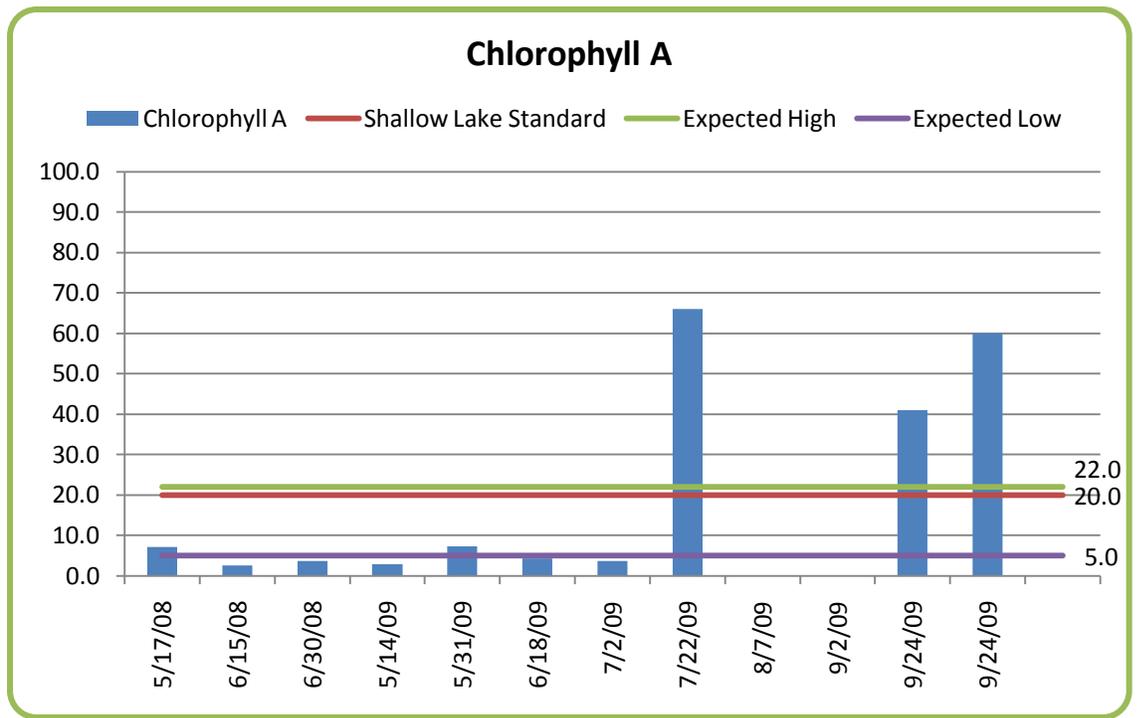
	Chlorophyll A	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Deep lake)	20.0 µg/L	>1.0 meters	60.0 µg/L	
2009-2010 Average (June-Sept)	25.9 µg/L	0.8 meters	60.0 µg/L	
Meets Standard	No	No	Yes	No

Chlorophyll A

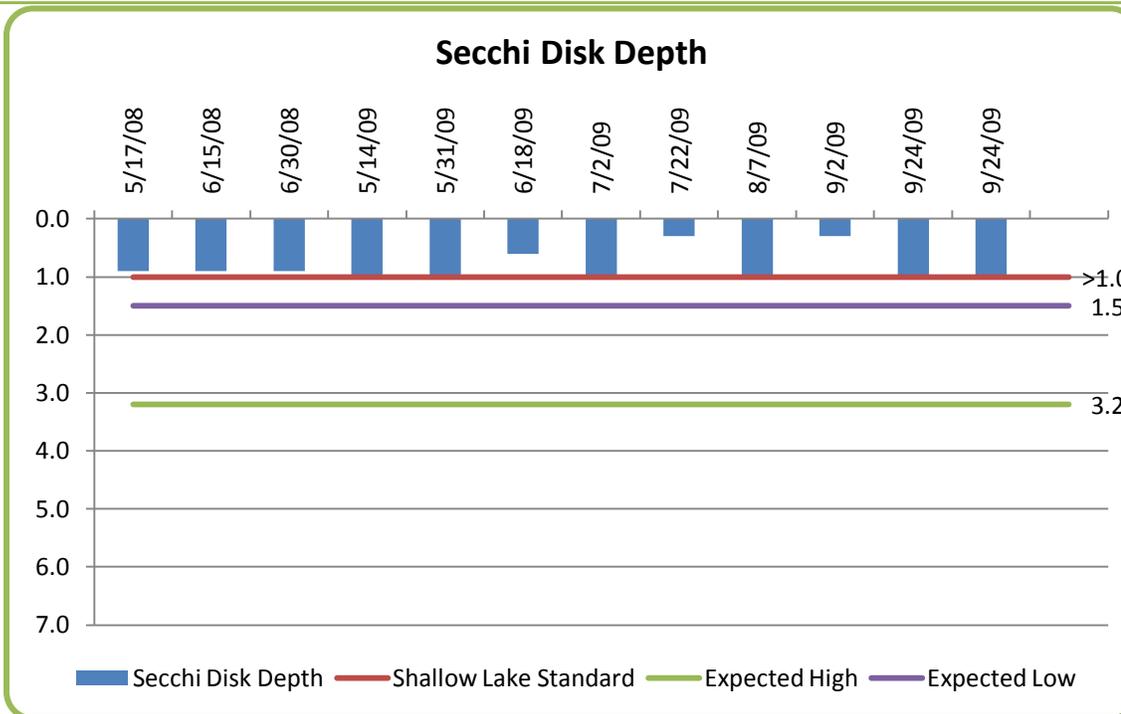
Expected Range:
5.0-22.0 µg/L

Shallow Lake
Standard: 20.0 µg/L

Samples taken early in the season were within or below the expected range, but late season samples were well above the standard. Overall, the lake does not meet the standard.



	2009	2010	2009-2010 Combined
Average (May-Sept)	4.5 µg/L	26.5 µg/L	19.9 µg/L
Grade	A	C	B
Average (June-Sept)	3.15 µg/L	35.0 µg/L	25.9 µg/L
Meets Standard (20.0 µg/L)	Yes	No	No



Secchi Disk Depth

Expected Range: 1.5-3.2 meters

Shallow Lake
Standard: >1.0 meters

All samples were below the expected range and do not meet the standard.

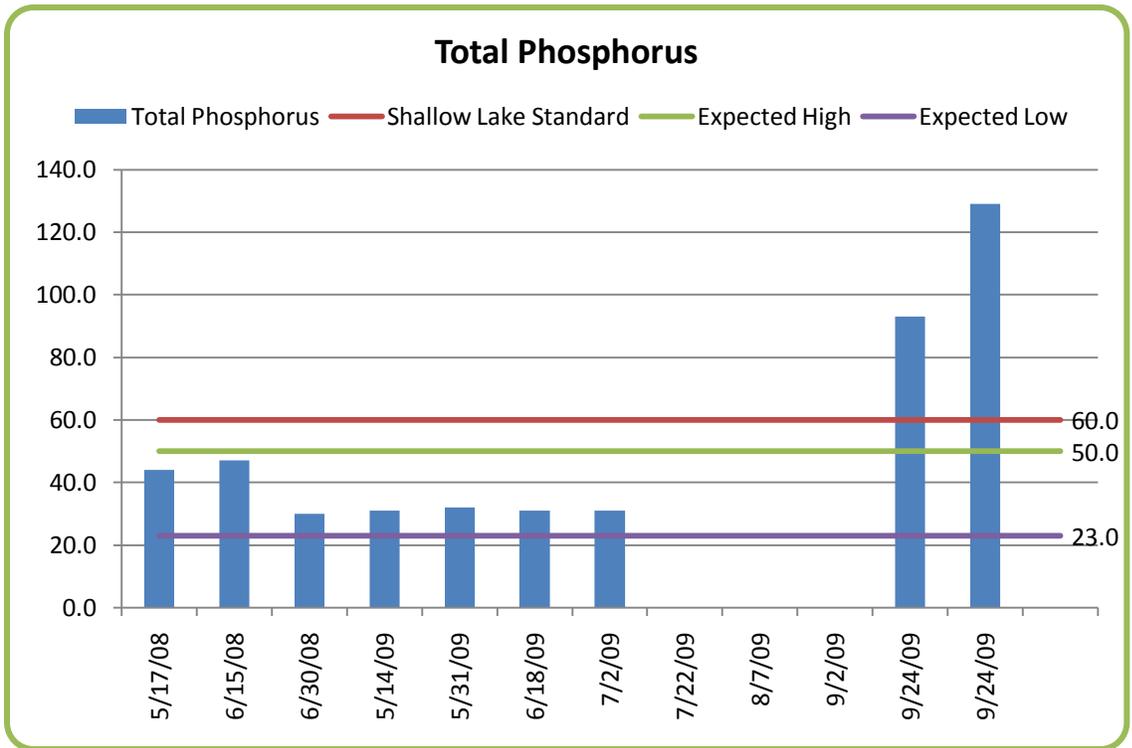
	2009	2010	2009-2010 Combined
Average (May-Sept)	0.9 meters	0.8 meters	0.8 meters
Grade	D	D	D
Average (June-Sept)	0.9 meters	0.7 meters	0.8 meters
Meets Standard (>1.0 m)	No	No	No

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

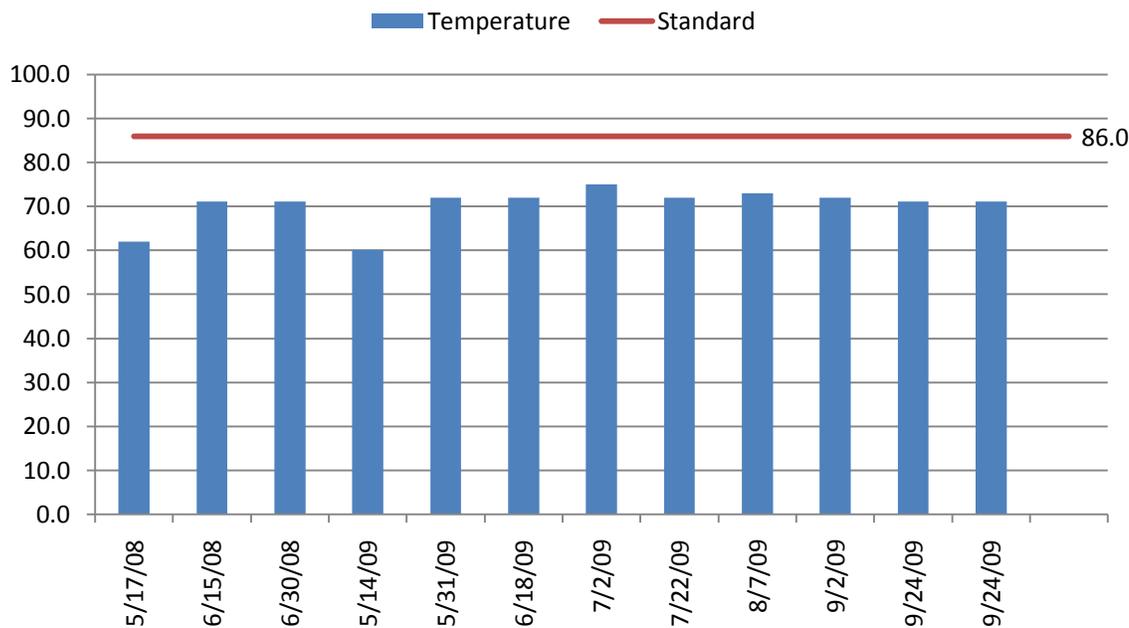
Shallow Lake
Standard: 60.0 µg/L

Most samples were within the expected range. The overall average was at the uppermost limit to meet the standard.



	2009	2010	2009-2010 Combined
Average (May-Sept)	40.0 µg/L	58.0 µg/L	52.0 µg/L
Grade	C	C	C
Average (June-Sept)	38.5 µg/L	71.0 µg/L	60.0 µg/L
Meets Standard (60.0 µg/L)	Yes	No	Yes

Temperature



Temperature

Expected Range:
None

Shallow Lake
Standard: The daily
average shall not
exceed 86.0°F.

The temperatures
were between 60
and 85°F.

	2009	2010	2009-2010 Combined
Average	74.8 °F	72.9 °F	73.7 °F
Meets Standard (Not to exceed 86.0°F)	Yes	Yes	Yes

