

A decorative graphic consisting of several thin, light blue lines that curve from the top left towards the center. To the right of these lines is a large teal-colored shape that resembles a quarter-circle or a stylized wave. The year '2012' is printed in black text within this teal shape.

2012

Chisago County

Water Quality and Aquatic Invasive Species Monitoring

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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 0.07 mg/L. Any samples below 0.07 mg/L are reported as 0.07 mg/L or <0.07 mg/L.

Chlorophyll-a (Chl-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.

Color of Filtered Water: This is a description of the color of the algae which remains after lake water is drawn through a filter. In order to provide an accurate description of the color, which can be compared year to year, the colors of the filtered water are compared to those colors illustrated in the Martha Stewart Living – complete color palette.

Secchi Disk (SD): 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.

Physical Condition: Describe the physical condition of the lake water at your sampling site.			Recreational Suitability: Describe your opinion of how suitable the lake water is for recreation and aesthetics at your sampling site.		
1	Crystal clear water	4	High algae levels limited clarity and/or mild odor apparent	1	Beautiful, could NOT be better
2	Not quite crystal clear – a little algae present/visible	5	Severely high algae levels with the following: massive floating scums, strong foul odor, fish kill	2	4 Desire to swim and level of enjoyment of the lake substantially reduced because of algae levels (would not swim but boating okay)
3	Definite algae green, yellow, or brown color			3	

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 in the hypolimnion (area below the thermocline or cold layer that separates the upper mixed portion of the lake and the lower calm portion of the lake). 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.

Carlson Trophic State Index (Carlson, R.E. and J. Simpson. 1996. *A Coordinator's Guide to Volunteer Lake Monitoring Methods*. North American Lake Management Society.)

TSI	<30	30-40	40-50	50-60	60-70	70-80	>80
Chl-a (µg/L)	<0.95	0.95-2.6	2.6-7.3	7.3-20	20-56	56-155	>155
SD (m)	>8	8-4	4-2	2-1	0.5-1	0.25-0.5	<0.25
TP (µg/L)	<6	6-12	12-24	24-48	48-96	96-192	192-384

Project Objective

The purpose of the 2012 Chisago County Water Quality and Aquatic Invasive Species Monitoring program is to help achieve goals identified in the 2010 Chisago County Local Water Management Plan and the 2012 Chisago Lakes Lake Improvement District Water Resource Management Plan.

Chisago County Local Water Management Plan:

Priority Concern 3: Projects and Practices recommended in additional TMDL studies are implemented. Objective 3.2: Develop a County wide annual water quality monitoring plan for nutrients, aquatic life and other parameters to determine ambient water quality concentration trends and loading for all public waters within Chisago County.

Chisago Lakes Lake Improvement District Water Resource Management Plan:

Goal 1: Preserve, protect, and enhance water quality within the Chisago Chain of Lakes watershed. Objective 2: Annually monitor nutrients, aquatic life, and other parameters to determine water quality concentrations, trends, and loading. The resultant report will provide information about lake water quality and interpretation of trends.

Goal 8: Promote the reduction or control of non-native aquatic invasive species.

Past water quality monitoring has been useful in determining long term water quality trends. In addition, water quality monitoring data is essential for completing the Total Maximum Daily Load Studies within the County. Continuing the water quality monitoring will help determine progress in obtaining water quality goals.

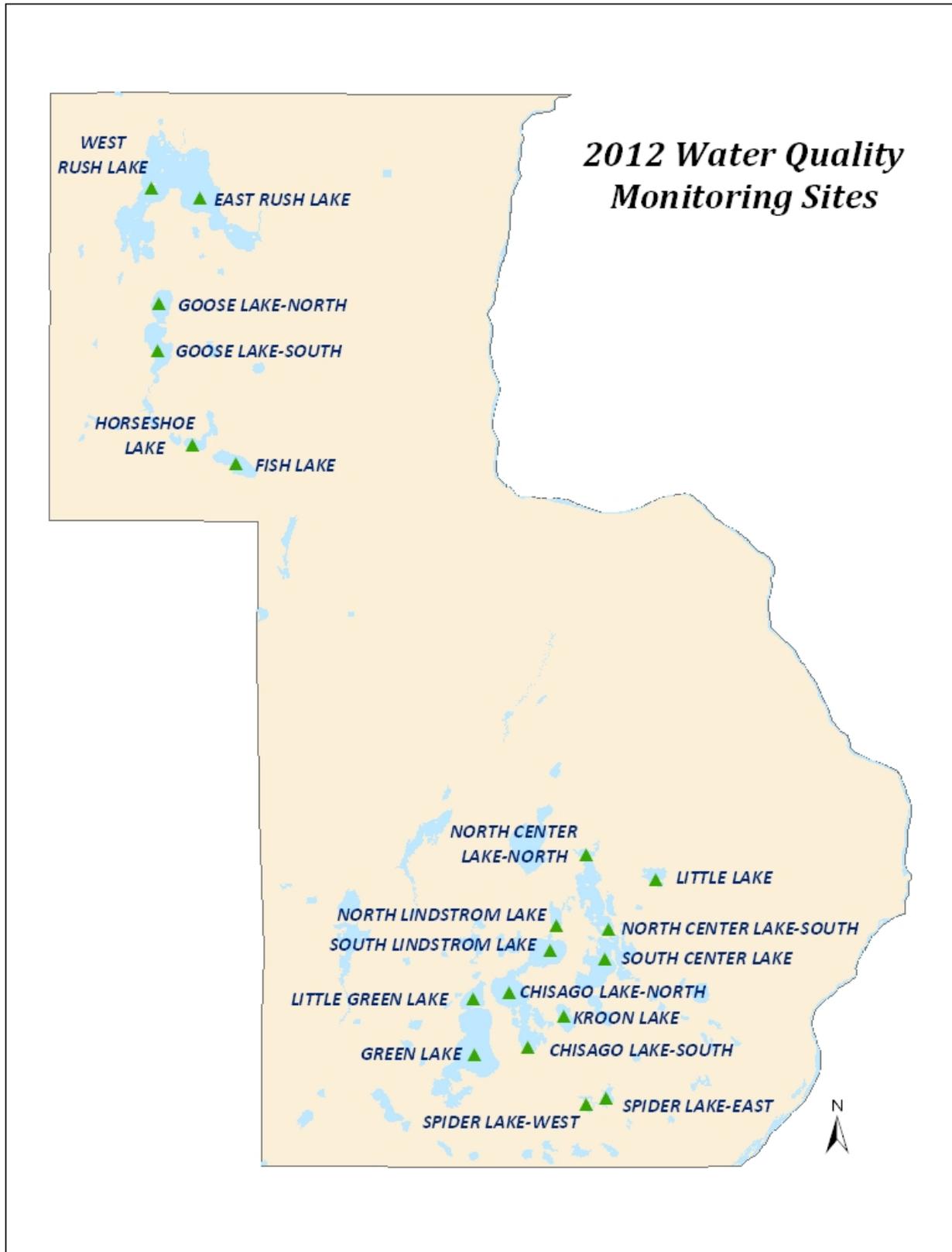
Visual inspections of the lakes were conducted looking for changes in the abundance or locations of aquatic invasive species, especially Eurasian Water Milfoil and Curly-leaf Pondweed. Potential interference with navigation was the primary consideration.

Fifteen lakes were monitored through this program in 2012. Four of these lakes (Chisago, North Center, Spider, and Goose) had 2 monitoring locations each. Each lake was monitored 5 times, once a month, May through September. Samples were collected at the deepest part of the lakes.

Graphs represent 2012 data only. In some cases, 2009, 2010, and 2011 data is listed below the chart for comparison.

- Thanks to the Chisago Lakes Lake Improvement District and Chisago County Water Plan for providing partial staff and funding for the program.
- Thanks to the Chisago Soil & Water Conservation District for providing review of data, interpretation, submittal to MPCA's EQuIS program, and preparation of this report.
- Special thanks to the Chisago County Sherriff's Department for use of a Water Patrol boat to collect samples.

Monitoring Locations



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 0.07. Samples reported as 0.07 are actually 0.07 or less.				
Total Phosphorus	µg/L	40.0	60.0	23.0-50.0
Temperature	°F	Daily average should not exceed 86°F	Daily average should not exceed 86°F	None
A lake that fails to meet two of the three standards (Chlorophyll-a, Secchi Disk, Total Phosphorus) may be 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	Hypereutrophic
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

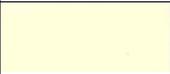
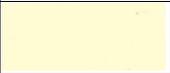
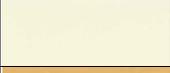
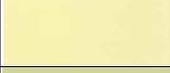
Source: Metropolitan Council-pg. 12,

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

Grades are based on May-September average.

Explanation of Color Classification

During each sample, water was run through filter paper. The color of the filter paper was compared to Martha Stewart paint samples and matched as closely as possible. The averages for Chlorophyll-a, Secchi transparency, and Phosphorus concentration for each color were determined from the average values of the samples within that color.

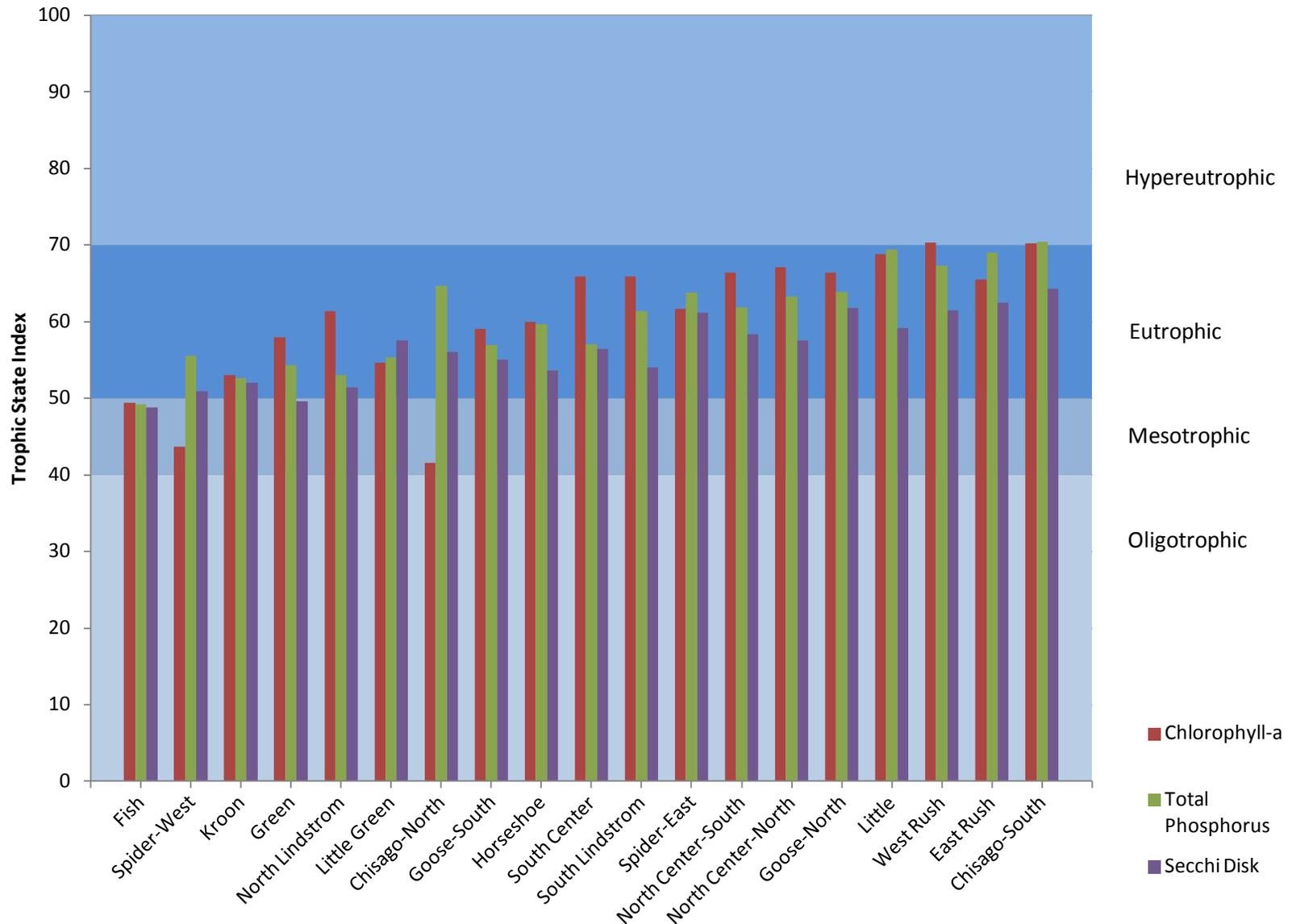
Color Name		Chlorophyll-a Concentrations (average $\mu\text{g/L}$)	Secchi Transparency (average M)	Phosphorus Concentrations (average $\mu\text{g/L}$)	Number of Samples
Rice Paper		2.5	6.25	26	2
Chopstick		3	8	20.3	3
Toasted Marshmallow		5.7	6.7	31.3	9
Shortbread		7.3	6.6	28.5	4
Eiderdown		9.3	8.7	23	3
Dune		10	4.5	45	1
Dried Chamomile		11.3	5.9	39	7
Parchment Paper		15.2	4.8	40.2	13
Hemp		19	2.5	39	1
Cornucopia		26	3.5	44	1
Rattan		27	2.5	58	1
Beach Grass		27	3.9	52.5	36
Cornichon		37.7	3.4	68.8	34
Sultana		41.6	3.2	49.4	7
Bay Leaf		70.4	1.8	119.4	5
Mossy Rock		106.3	1.17	132.7	3

Rank of Lakes Monitored

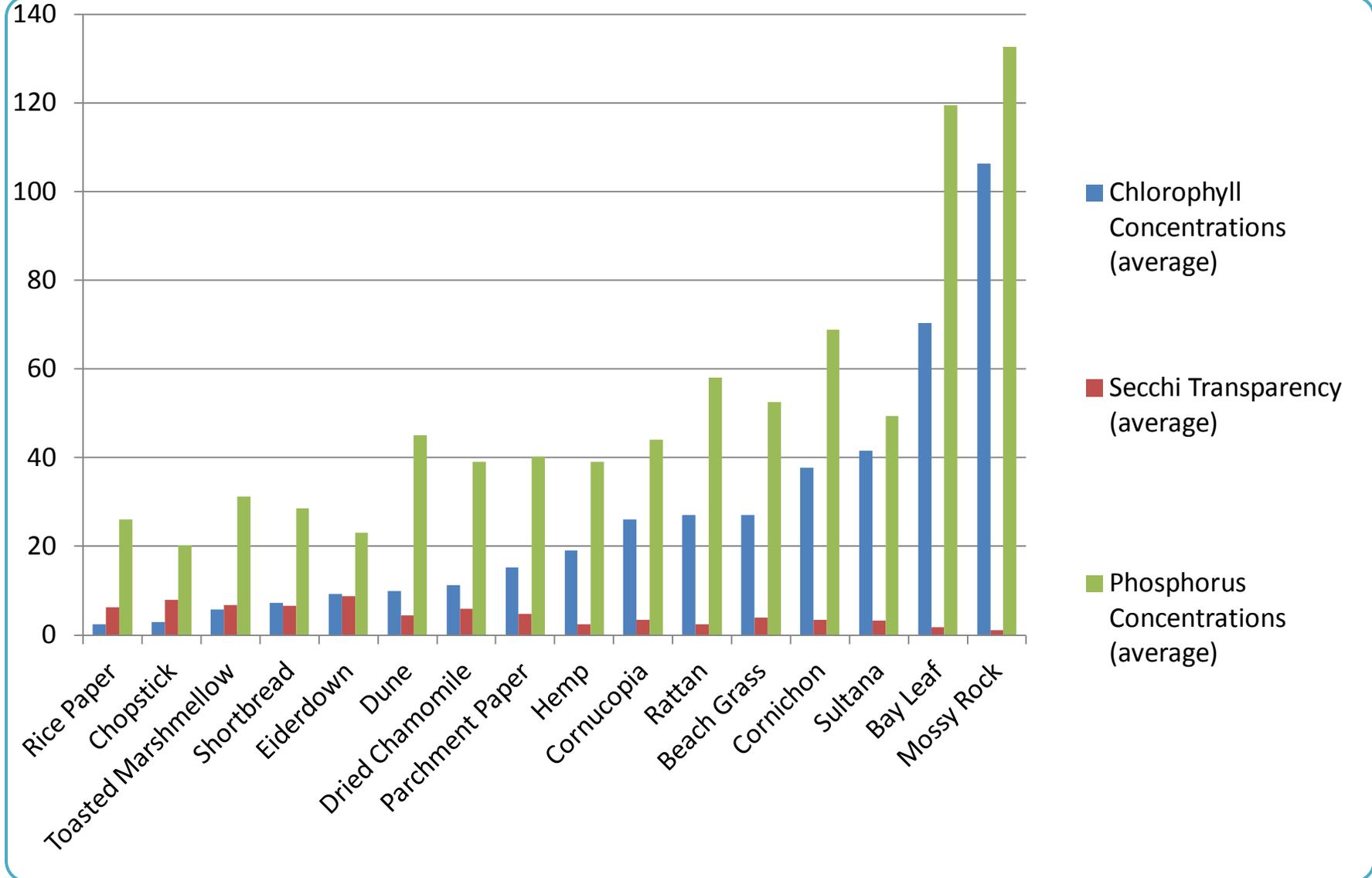
2012 Rank	Lake	2012 Grade	2011 Grade	Trophic State Index	Chlorophyll-a (ug/L)	Secchi Disk (meters)	Total Phosphorus (ug/L)	Classification	Shallow versus Deep	Meets MPCA Standards
1	Fish	B		49.4	7.3	2.1	21.8	Mesotrophic	Deep	Yes
2	Spider-West	B-C		50.0	4.5	1.9	35.5	Eutrophic	Shallow	Yes
3	Kroon	C	B	52.5	11.3	1.4	30.5	Eutrophic	Deep	Yes
4	Green	B-C	C	54.0	19.5	1.9	35.8	Eutrophic	Deep	Yes
5	North Lindstrom	C	B	55.2	28.0	1.6	28.0	Eutrophic	Deep	Yes
6	Little Green	C-D	C	55.8	13.5	1.0	35.5	Eutrophic	Deep	Yes
7	Chisago-North	C	B	57.0	51.5	0.9	79.0	Eutrophic	Deep	No
8	Goose-South	C		57.0	20.5	1.4	38.0	Eutrophic	Deep	Yes
9	Horseshoe	C		57.8	16.5	1.7	43.5	Eutrophic	Deep	No
10	South Center	C	C	59.8	44.0	0.7	44.3	Eutrophic	Deep	No
11	South Lindstrom	C	B	60.3	43.0	1.1	61.8	Eutrophic	Deep	No
12	Spider-East	C	C	62.2	25.5	0.9	56.8	Eutrophic	Shallow	No
13	North Center-South	C	C	62.2	47.0	0.9	60.3	Eutrophic	Shallow	No
14	North Center-North	C	C	62.7	50.8	0.8	67.0	Eutrophic	Shallow	No
15	Goose-North	C		64.1	42.5	0.8	68.8	Eutrophic	Shallow	No
16	Little	D	C-	65.8	60.3	0.9	102.5	Eutrophic	Deep	No
17	West Rush	D		66.4	67.8	0.7	88.0	Eutrophic	Deep	No
18	East Rush	D		67.1	65.5	0.7	101.3	Eutrophic	Deep	No
19	Chisago-South	D	C	68.3	70.3	0.5	117.3	Hypereutrophic	Shallow	No

*Shaded cells do not meet the Water Quality Standards in 2012

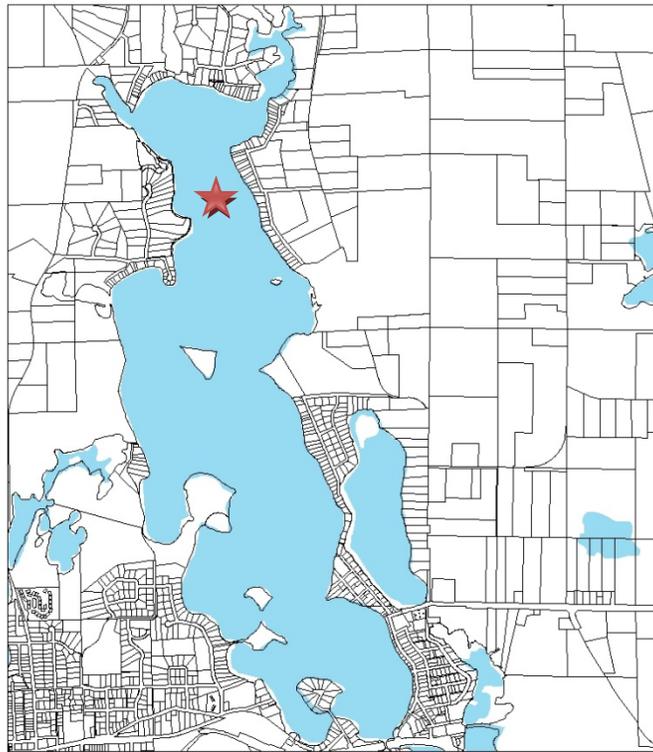
Lake Classification Chart



Filter Color Classification Chart



North Center Lake



Shallow Lake

Lake Classification: EUTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	67.1	57.6	63.3	62.7
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	41.2 µg/L	1.2 meters	60.6 µg/L		
Grade	C	C-D	C	C	14 th /19

MPCA Standards: Impaired

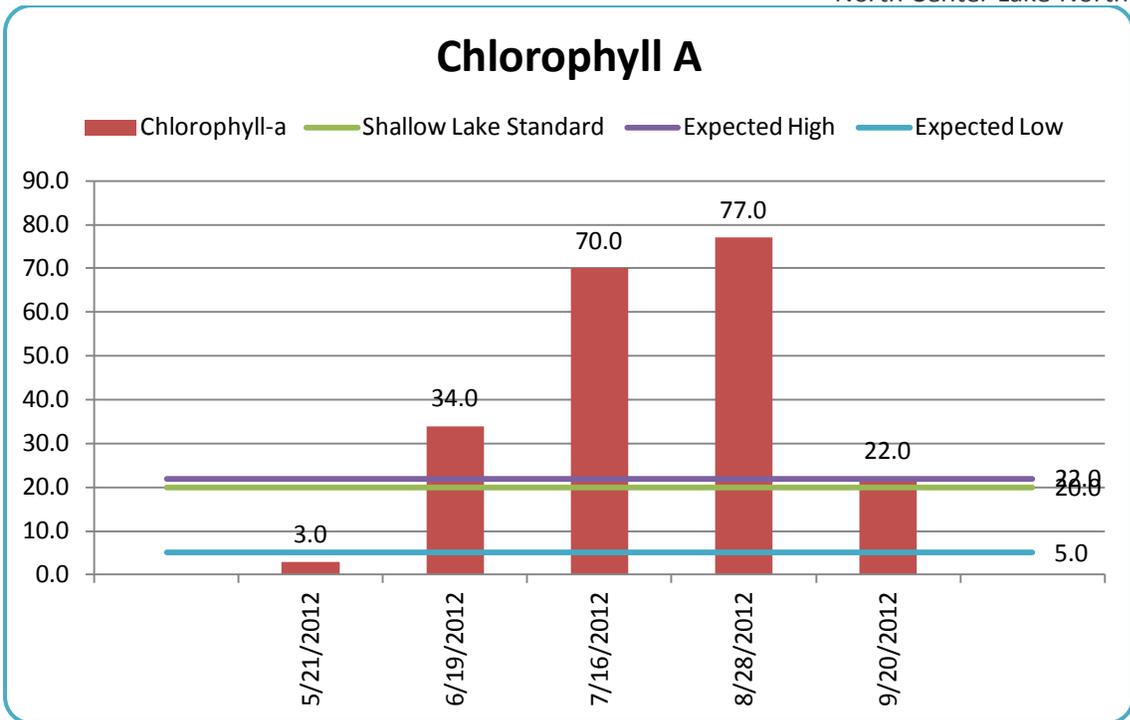
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Shallow lake)	20.0 µg/L	>1.0 meters	60.0 µg/L	
2012 Average (June-Sept)	50.8 µg/L	0.8 meters	67.0 µg/L	
Meets Standard	No	No	No	No

Chlorophyll-a

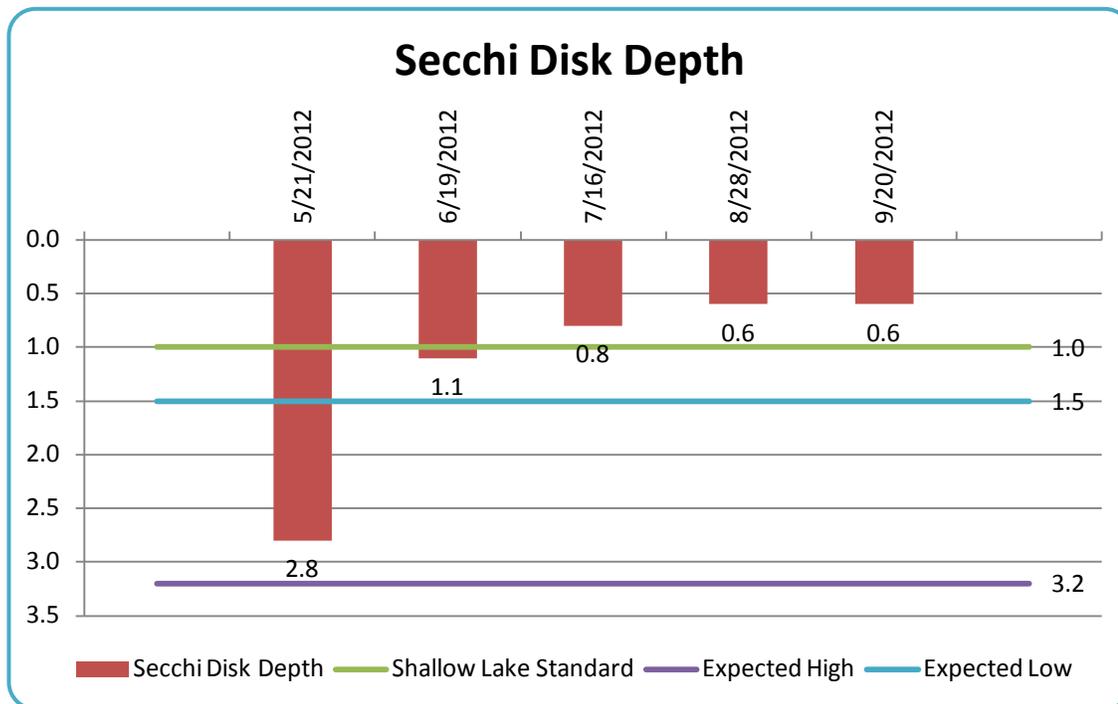
Expected Range:
5.0-22.0 µg/L

Shallow Lake
Standard: 20.0 µg/L

Four of five readings were above the standard and outside the expected range. The average does not meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	40.9 µg/L	31.2 µg/L	26.8 µg/L	41.2 µg/L
Grade	C	C	C	C
Average (June-Sept)	49.5 µg/L	39.0 µg/L	31.8 µg/L	50.8 µg/L
Meets Standard (20.0 µg/L)	No	No	No	No



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Shallow Lake
Standard: >1.0 meters

Clarity in this lake does not meet the standard.

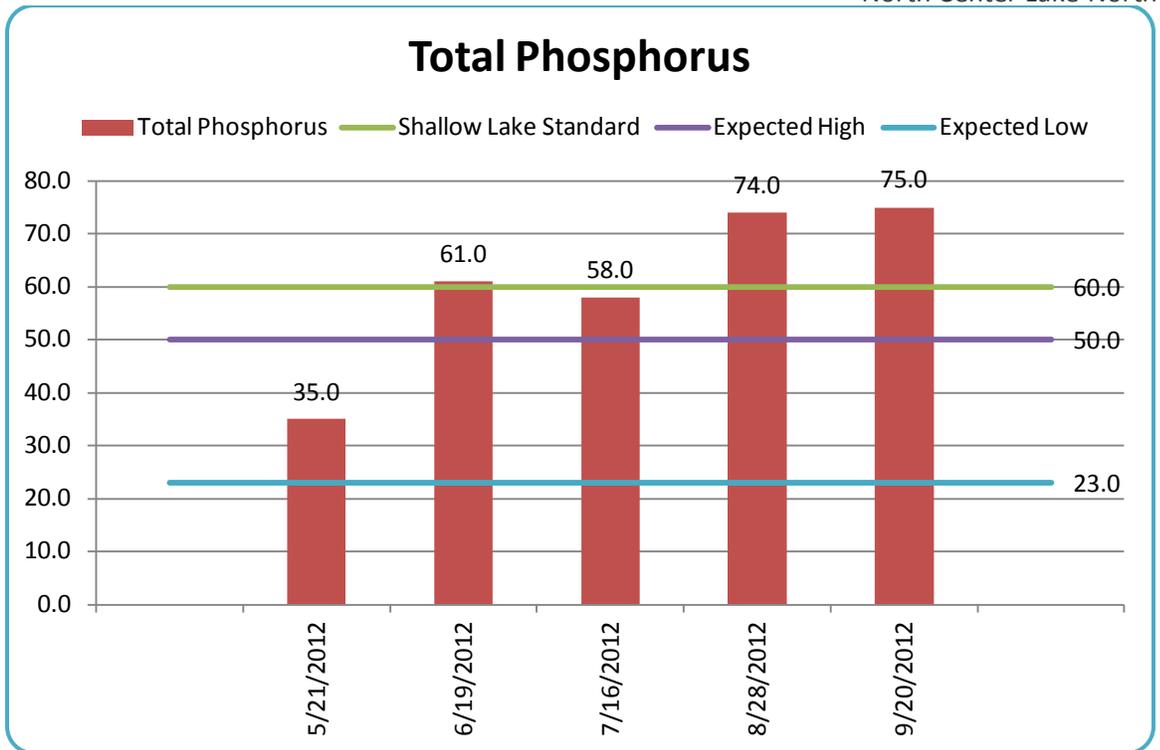
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	0.9 meters	1.1 meters	1.4 meters	1.2 meters
Grade	D	D	C	C-D
Average (June-Sept)	0.7 meters	0.8 meters	1.3 meters	0.8 meters
Meets Standard (>1.0 m)	No	No	Yes	No

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

Shallow Lake
Standard: 60.0 µg/L

Three of five
samples exceeded
the standard. The
average did not
meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	80.0 µg/L	74.0 µg/L	52.6 µg/L	60.6 µg/L
Grade	D	D	C	C
Average (June-Sept)	87.0 µg/L	82.0 µg/L	56.0 µg/L	67.0 µg/L
Meets Standard (60.0 µg/L)	No	No	Yes	No

Ammonia Nitrogen

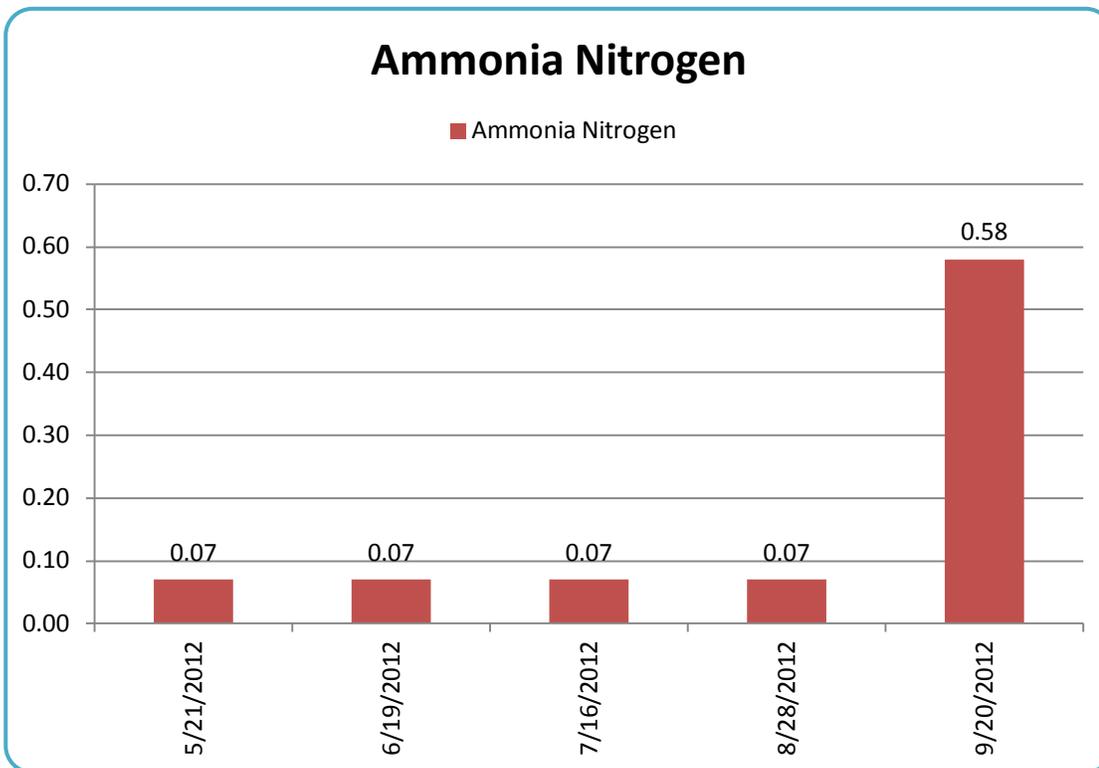
Ammonia Nitrogen

Expected Range: None

Shallow Lake Standard:
None

Samples were low
except for the
September sample.
This could be explained
by agricultural runoff or
a failing septic system.

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011	2012
Average	<0.05 mg/L	<0.05 mg/L	0.07 mg/L	0.17 mg/L

Temperature

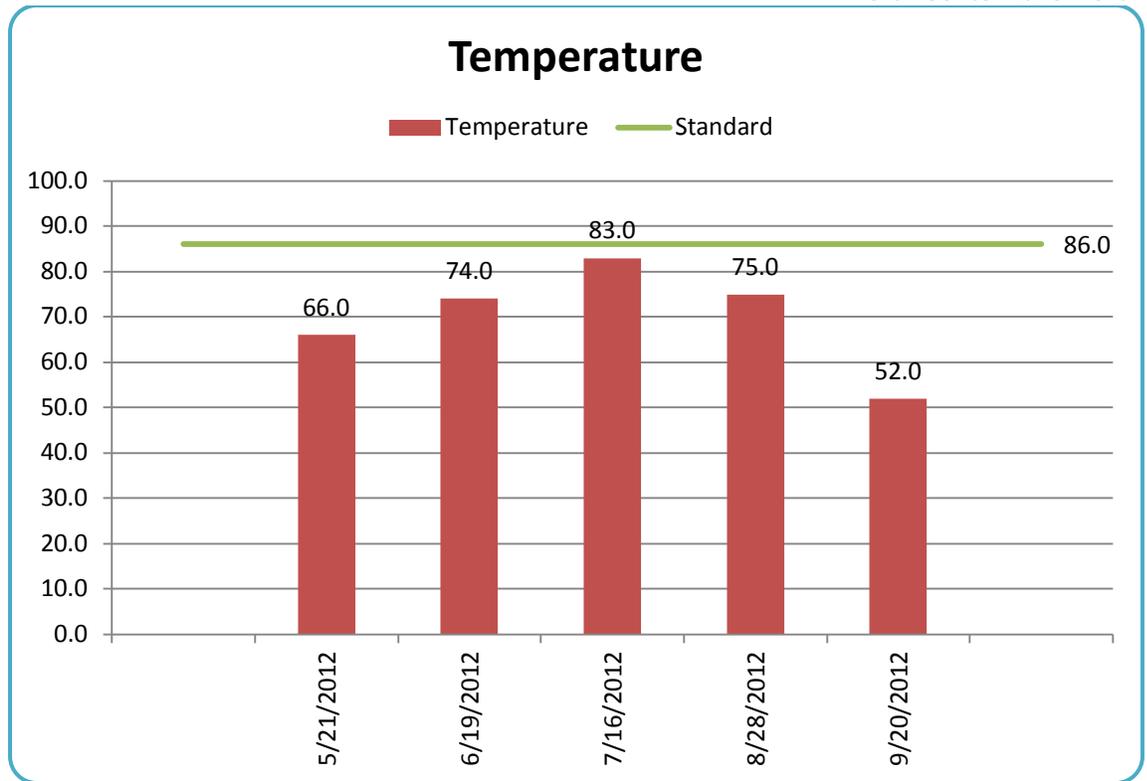
Expected Range:

None

Shallow Lake

Standard: The daily average shall not exceed 86.0°F

The temperatures were below 86°F.

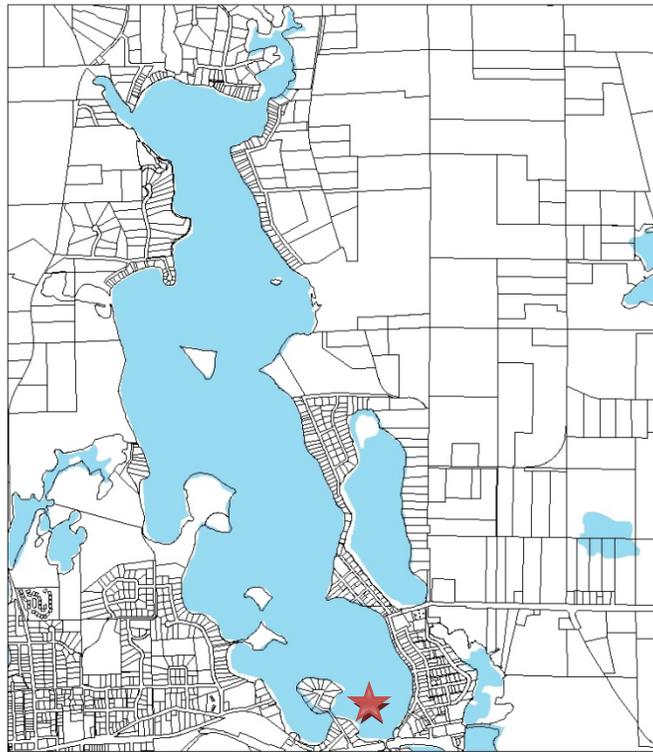


	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	71.7 °F	NO DATA	65.8°F	70.0°F
Meets Standard (Not to exceed 86.0°F)	Yes		Yes	Yes

North Center Lake-North General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	OTHER NOTES
May	2	2	Dried Chamomile	Curlyleaf pondweed surfacing throughout the lake up to 15' depth.
June	3	3	Cornichon	Cloudy; weed pressure low in navigation lanes.
July	3.5	3.5	Sultana	Curlyleaf pondweed gone; turions floating. Good navigational control of Eurasian watermilfoil. Watermilfoil still found in shallow water <5'.
August	4	4	Cornichon	Many floating turions.
September	3	3	Beach Grass	No notes.

North Center Lake



Shallow Lake

Lake Classification: EUTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	66.4	58.4	61.9	62.2
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	38.4 µg/L	1.1 meters	54.8 µg/L		
Grade	C	C	C	C	13 th /19

MPCA Standards: Impaired

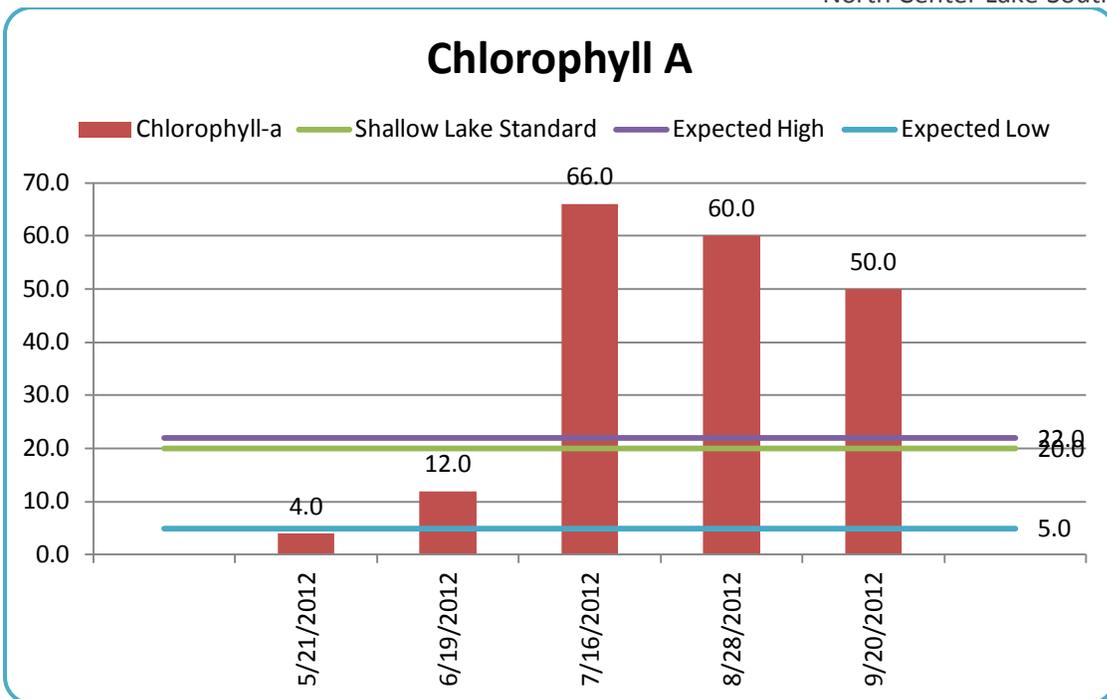
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Shallow lake)	20.0 µg/L	>1.0 meters	60.0 µg/L	
2012 Average (June-Sept)	47.0 µg/L	0.9 meters	60.3 µg/L	
Meets Standard	No	No	No	No

Chlorophyll-a

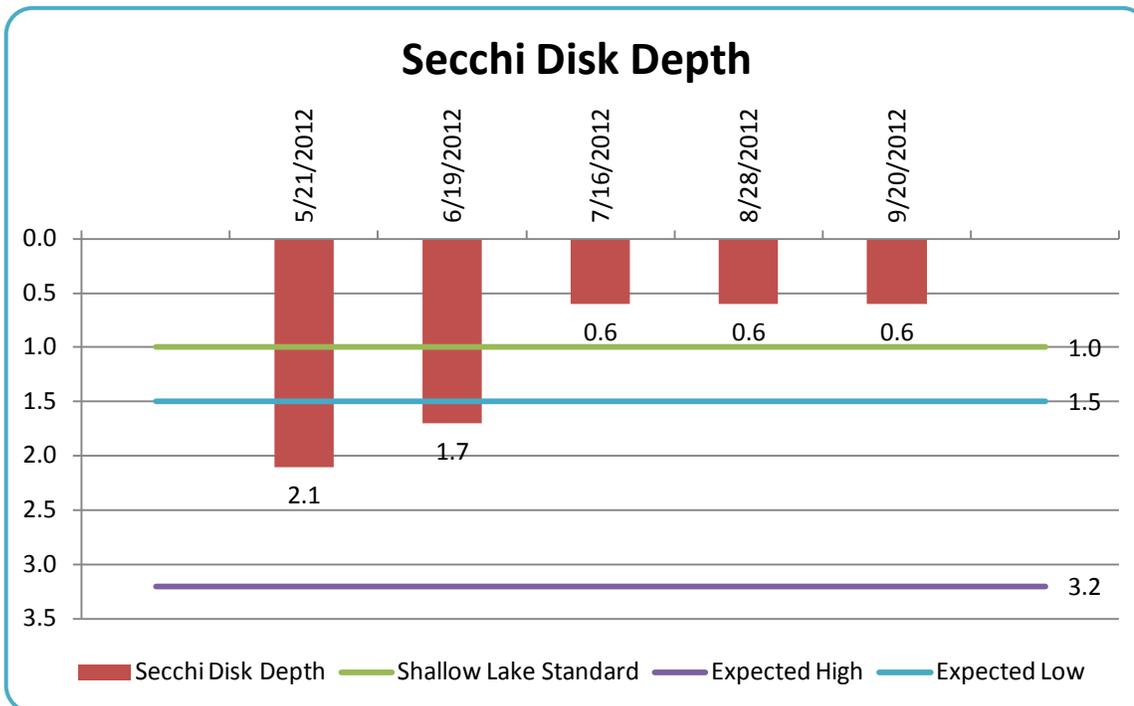
Expected Range:
5.0-22.0 µg/L

Shallow Lake Standard:
20.0 µg/L

Although the early readings were below or within the expected range, the late season samples exceeded the standard significantly. The average does not meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	24.9 µg/L	19.5 µg/L	17.2 µg/L	38.4 µg/L
Grade	C	B	B	C
Average (June-Sept)	29.9 µg/L	22.8 µg/L	20.5 µg/L	47.0 µg/L
Meets Standard (20.0 µg/L)	No	No	No	No



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Shallow Lake Standard: >1.0 meters

Secchi disk depths for July, August, and September did not meet the standard. The average also did not meet the standard, although it is close.

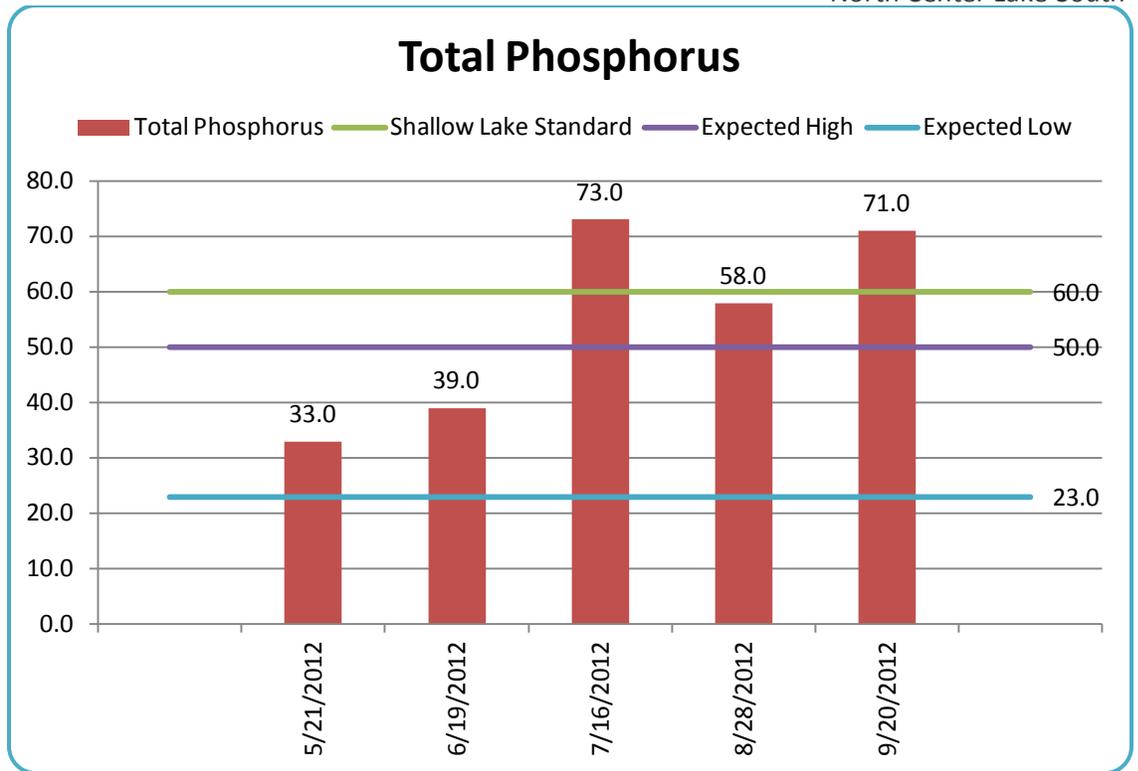
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	1.6 meters	1.4 meters	1.2 meters	1.1 meters
Grade	C	C	C-D	D
Average (June-Sept)	1.4 meters	1.2 meters	1.0 meter	0.9 meters
Meets Standard (>1.0 m)	Yes	Yes	No	No

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

Shallow Lake
Standard: 60.0 µg/L

Although only two samples exceeded the standard, the average of all five months does not meet the standard. It is very close to the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011	2012
Average (May-Sept)	70.0 µg/L	60.0 µg/L	61.0 µg/L	54.8 µg/L
Grade	D	C	C	C
Average (June-Sept)	78.0 µg/L	65.0 µg/L	62.3 µg/L	60.3 µg/L
Meets Standard (60.0 µg/L)	No	No	No	No

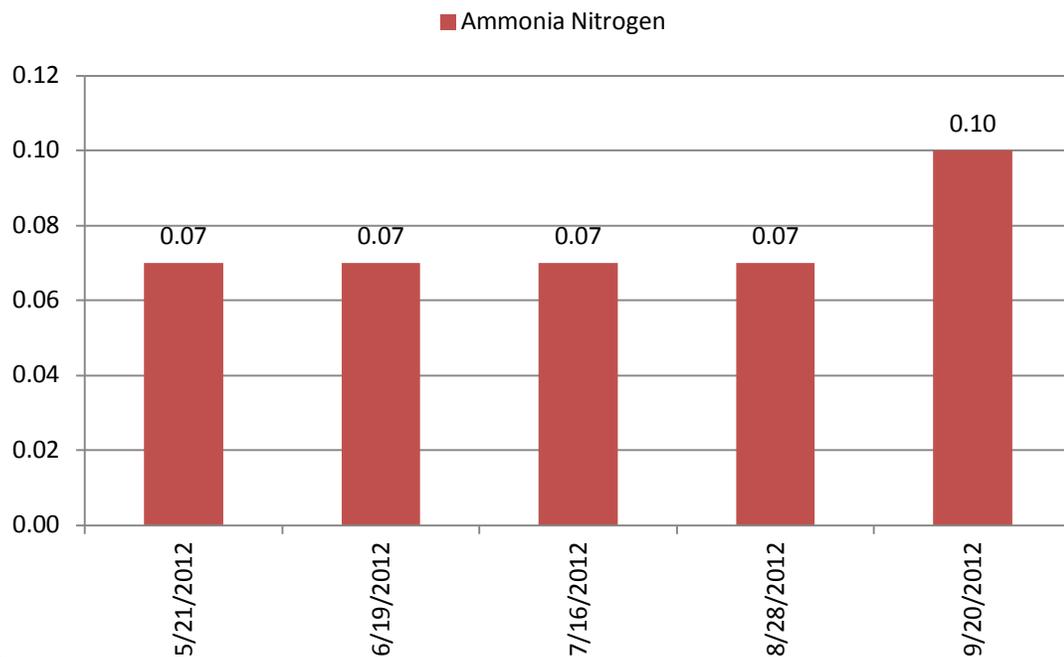
Ammonia Nitrogen

Ammonia Nitrogen

Expected Range: None

Shallow Lake Standard: None

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	<0.05 mg/L	<0.05 mg/L	0.06 mg/L	0.08 mg/L

Temperature

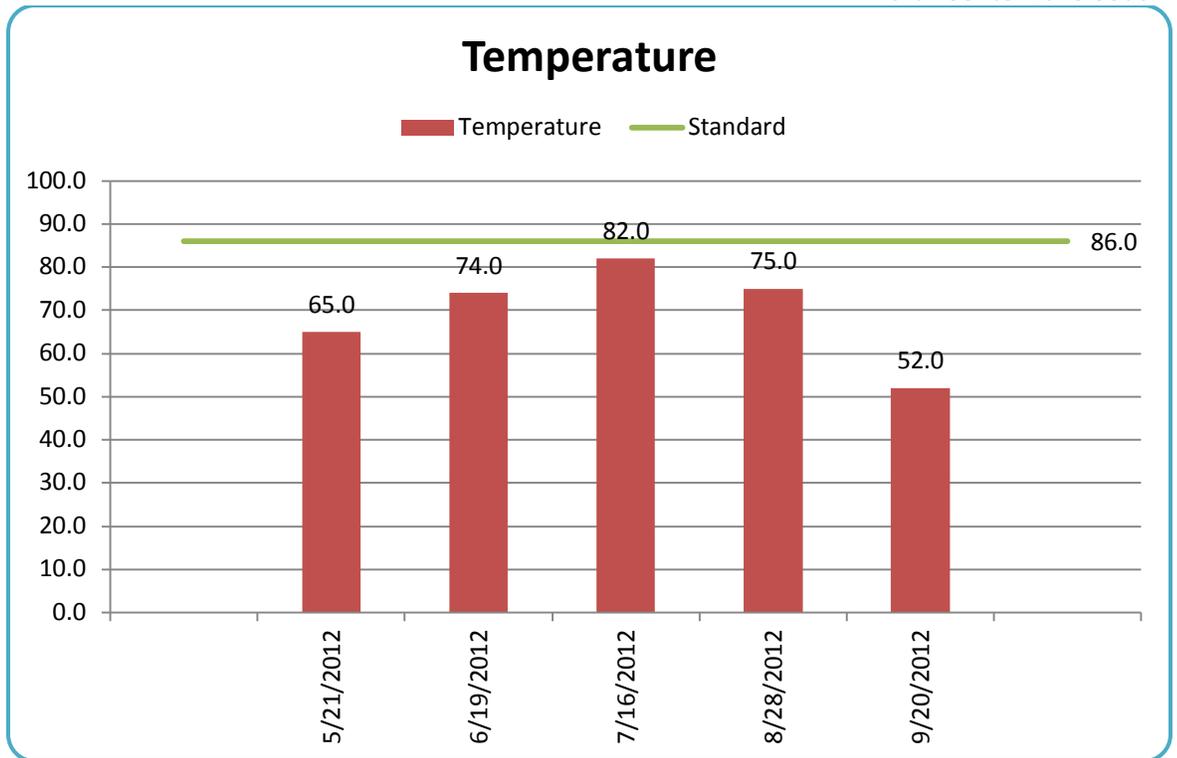
Expected Range:

None

Shallow Lake

Standard: The daily average shall not exceed 86.0°F

No temperatures exceeded the standard.

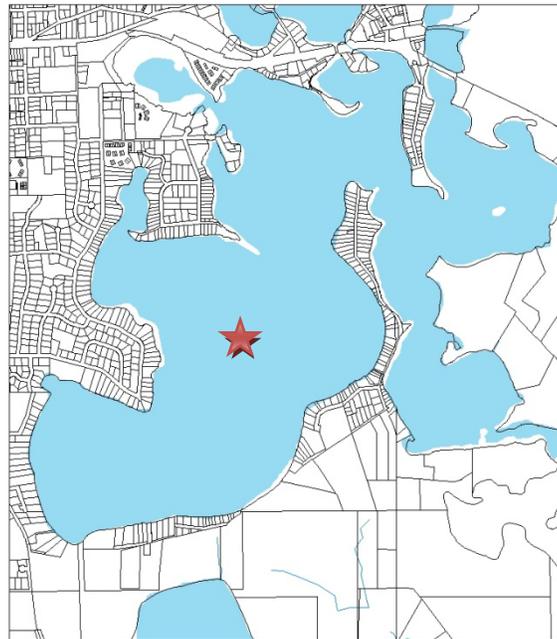


	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	69.8 °F	NO DATA	65.4 °F	69.6°F
Meets Standard (Not to exceed 86.0°F)			Yes	Yes

North Center Lake-South General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	GENERAL LAKE OBSERVATIONS/ AQUATIC INVASIVE SPECIES
May	2	2	Dried Chamomile	Curlyleaf pondweed surfacing throughout the lake up to 15' depth.
June	2.5	2.5	Cornichon	Cloudy; Weed pressure low in navigation lanes.
July	3.5	3.5	Cornichon	Curlyleaf pondweed gone; turions floating. Good navigational control of Eurasian watermilfoil. Watermilfoil still found in shallow water <5'.
August	3.5	3.5	Cornichon	Many floating turions.
September	3	3	Cornichon	No notes.

South Center Lake



Deep Lake

Lake Classification: EUTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	65.9	56.4	57.1	59.8
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	36.4 µg/L	1.3 meters	39.4 µg/L		
Grade	C	C	C	C	10 th /19

MPCA Standards: Impaired

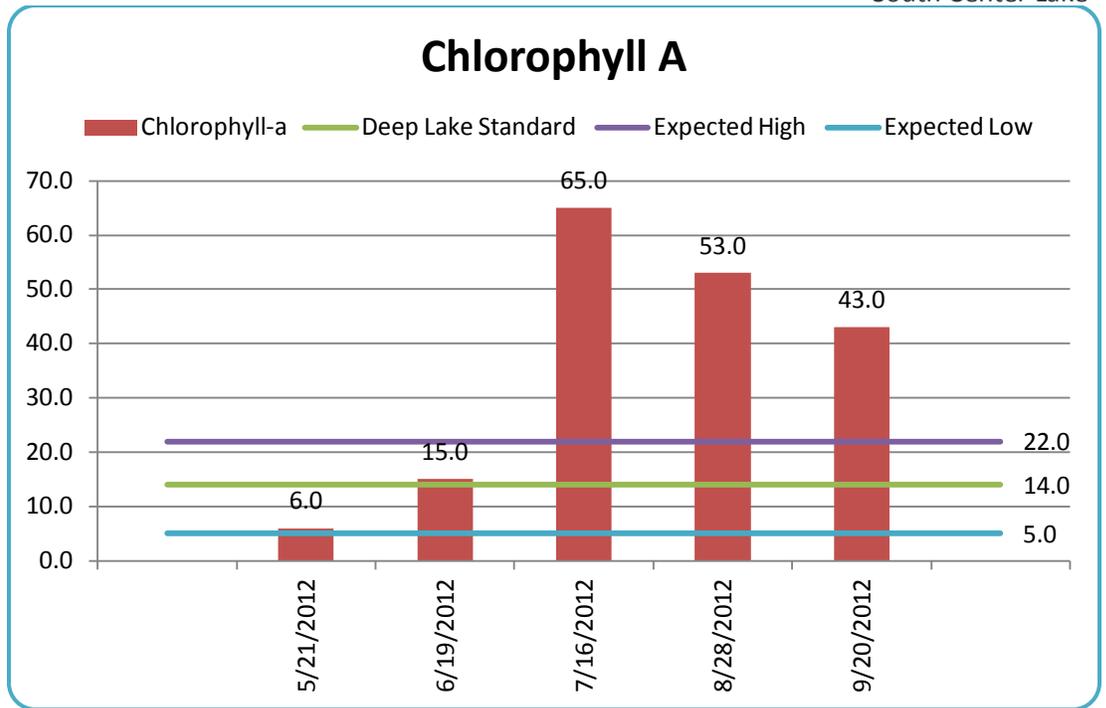
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Deep lake)	14.0 µg/L	>1.4 meters	40.0 µg/L	
2012 Average (June-Sept)	44.0 µg/L	0.7 meters	44.3 µg/L	
Meets Standard	No	No	No	No

Chlorophyll-a

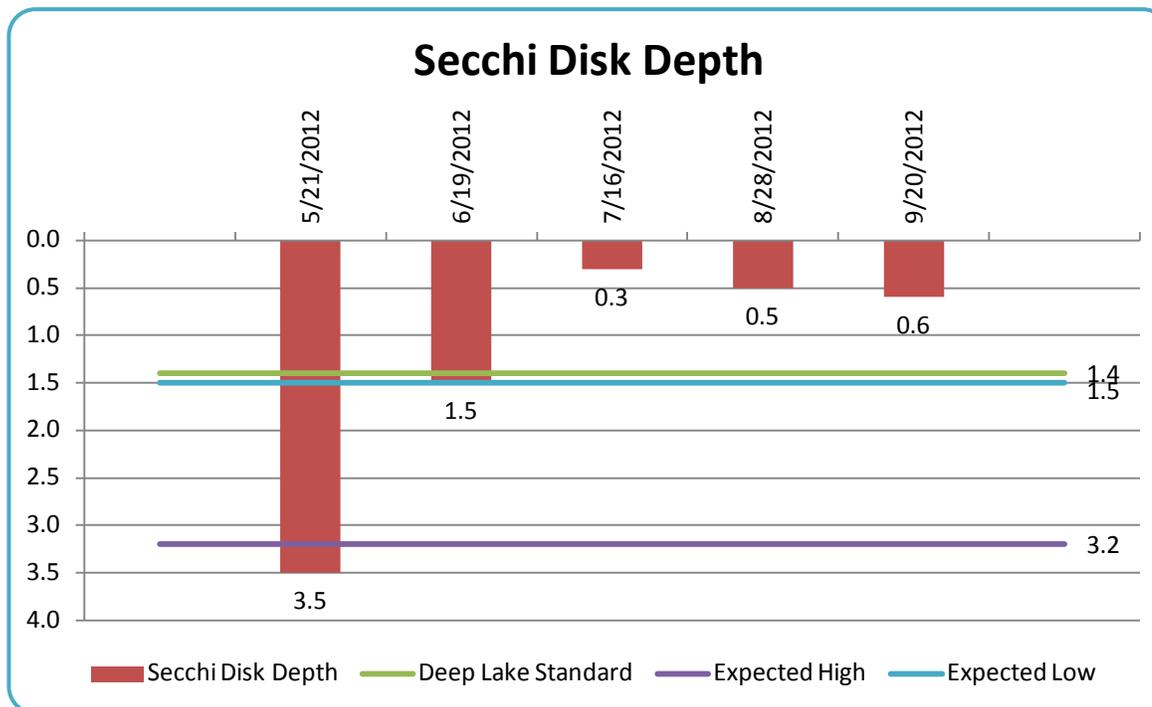
Expected Range: 5.0-22.0 µg/L

Deep Lake Standard: 14.0 µg/L

June through September readings are all above the standard. The average does not meet the standard. The Chl-a levels were much higher than 2011.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	17.4 µg/L	36.4 µg/L
Grade			B	C
Average (June-Sept)	NO DATA	NO DATA	21.0 µg/L	44.0 µg/L
Meets Standard (14.0 µg/L)			No	No



Secchi Disk Depth

Expected Range: 1.5-3.2 meters

Deep Lake Standard: >1.4 meters

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

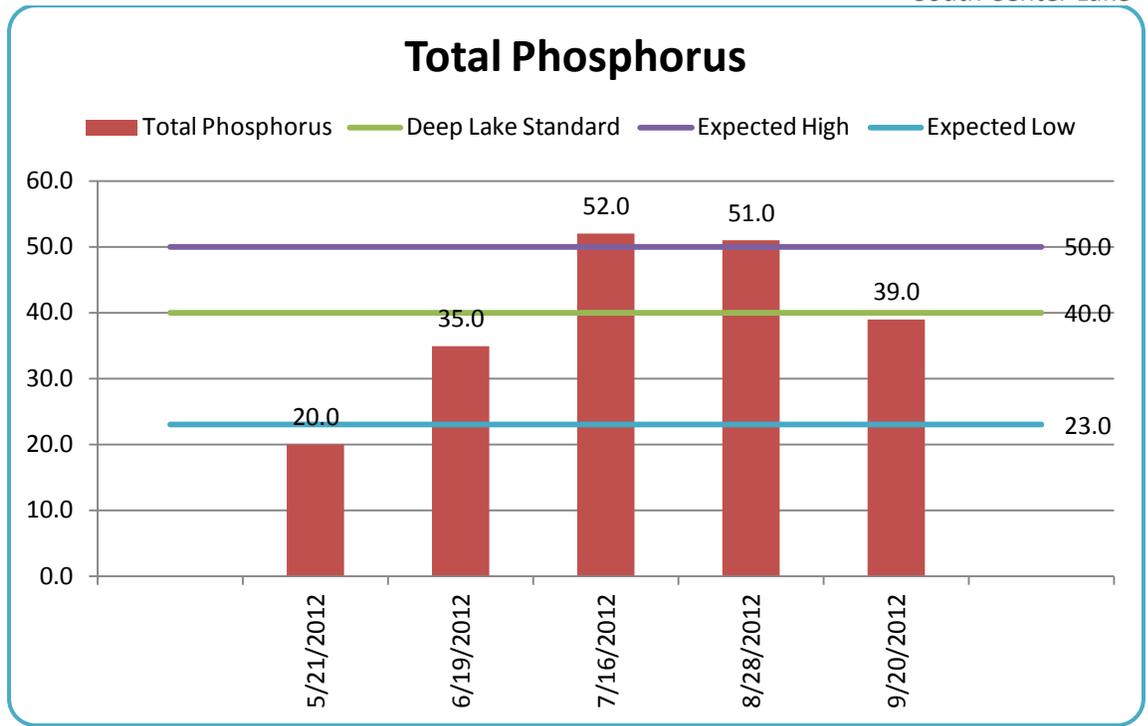
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	1.2 meters	1.3 meters
Grade			C-D	C
Average (June-Sept)	NO DATA	NO DATA	1.0 meter	0.7 meters
Meets Standard (>1.0 m)			No	No

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

Deep Lake Standard:
40.0 µg/L

Two of five samples were above the standard. The average for the season does not meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	43.6 µg/L	39.4 µg/L
Grade			C	C
Average (June-Sept)	NO DATA	NO DATA	47.5 µg/L	44.3 µg/L
Meets Standard (40.0 µg/L)			No	No

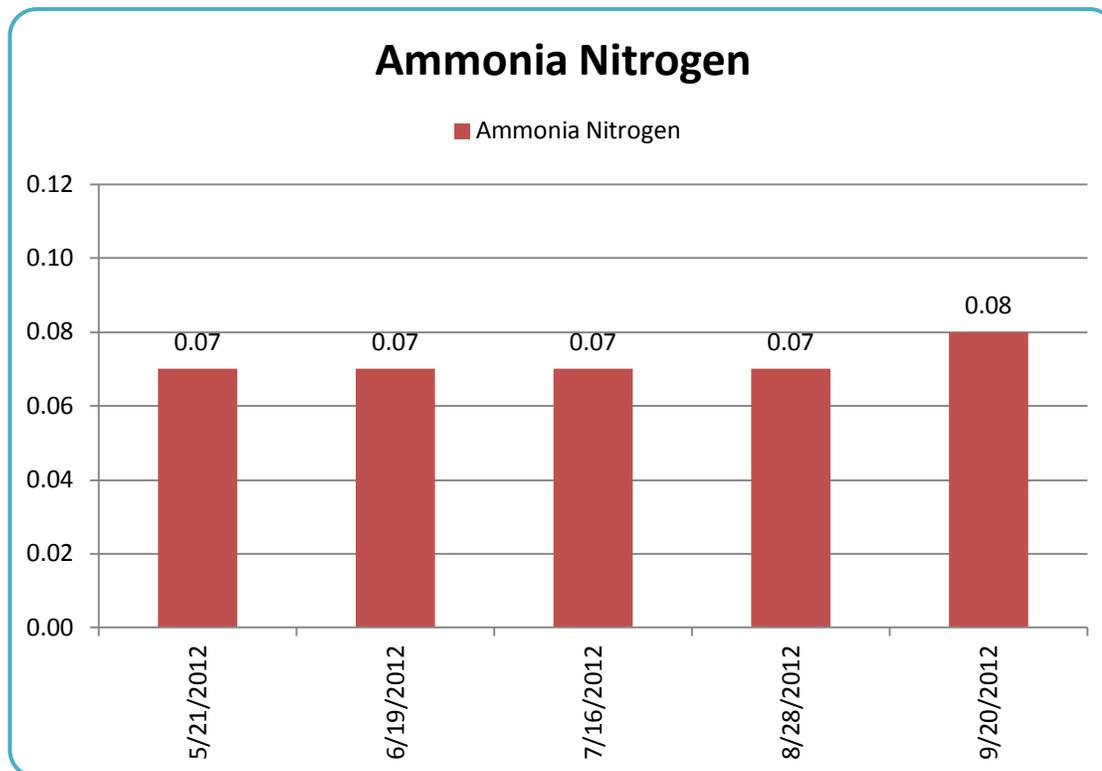
Ammonia Nitrogen

Ammonia Nitrogen

Expected Range: None

Deep Lake Standard:
None

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



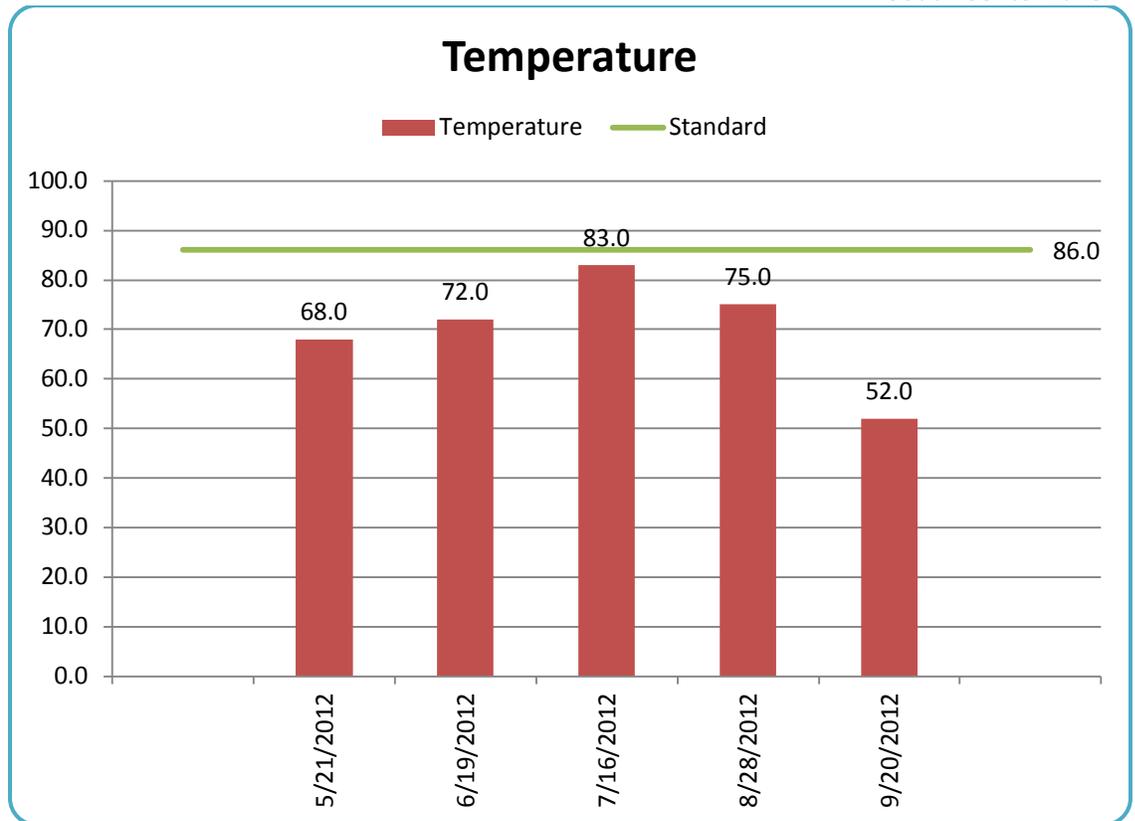
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	0.04 mg/L	0.07 mg/L

Temperature

*Expected Range:
None*

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

All temperatures
were below the
standard.

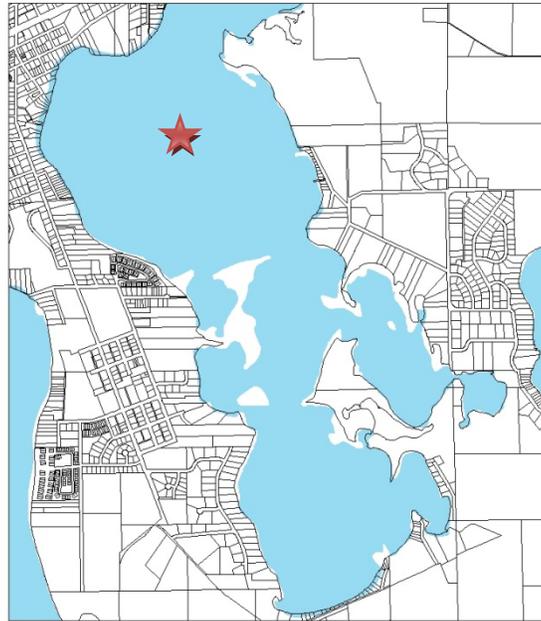


	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	NO DATA	70.0°F
Meets Standard (Not to exceed 86.0°F)				Yes

South Center Lake General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	GENERAL LAKE OBSERVATIONS/ AQUATIC INVASIVE SPECIES
May	2	2	Parchment Paper	Curlyleaf pondweed in south east bay. Eurasian watermilfoil in channel between lakes.
June	2.5	2.5	Beach Grass	Cloudy; Weed pressure low in navigation lanes.
July	3	3	Sultana	Curlyleaf pondweed gone; turions floating. Good navigational control of Eurasian watermilfoil. Watermilfoil still found in shallow water <5'.
August	3.5	3.5	Sultana	No notes.
September	3	3	Sultana	No notes.

Chisago Lake



Deep Lake

Lake Classification: EUTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	41.6	56.0	64.7	57.0
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	41.6 µg/L	1.3 meters	66.8 µg/L		
Grade	C	C	C	C	7 th /19

MPCA Standards: Does Not Meet Standards

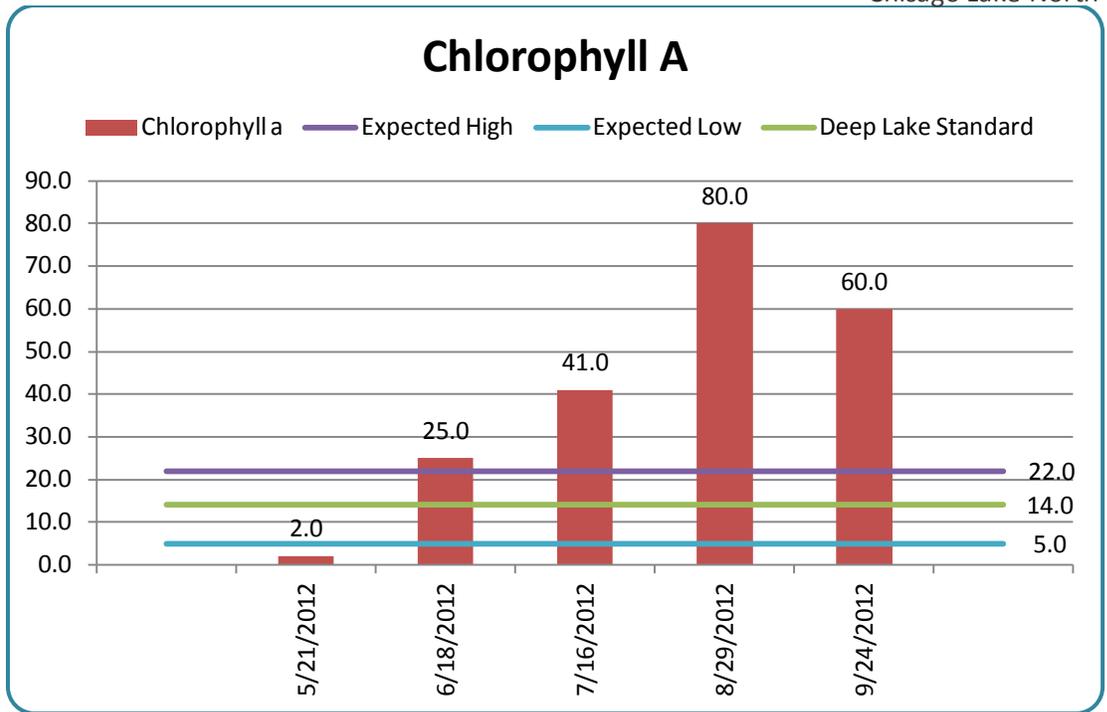
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Deep lake)	14.0 µg/L	>1.4 meters	40.0 µg/L	
2012 Average (June-Sept)	51.5 µg/L	0.9 meters	79.0 µg/L	
Meets Standard	No	No	No	No

Chlorophyll-a

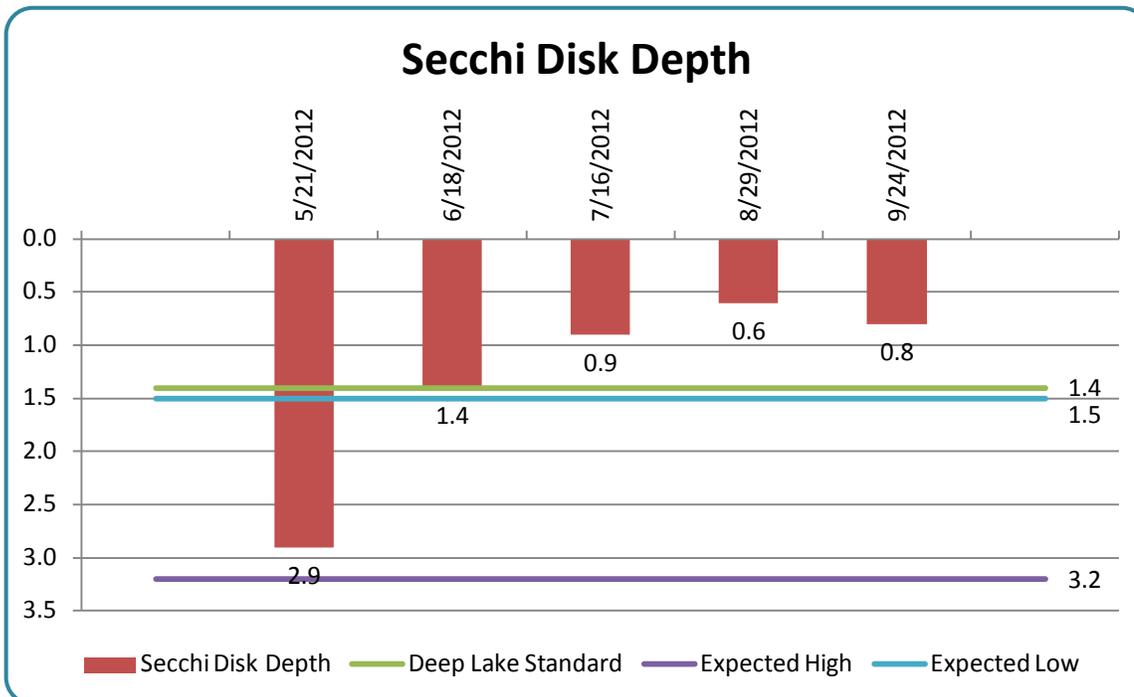
Expected Range:
5.0-22.0 µg/L

Deep Lake Standard:
14.0 µg/L

All but one sample exceeded the standard as well as the expected range. The lake did not meet the standard and is significantly higher than 2011.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	12.2 µg/L	31.3 µg/L	10.4 µg/L	41.6 µg/L
Grade	B	C	B	
Average (June-Sept)	13.7 µg/L	31.3 µg/L	12.8 µg/L	51.5 µg/L
Meets Standard (14.0 µg/L)	Yes	No	Yes	No



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Deep Lake Standard:
>1.4 meters

Only one reading was clearer than the standard. The average clarity in this lake did not meet the standard.

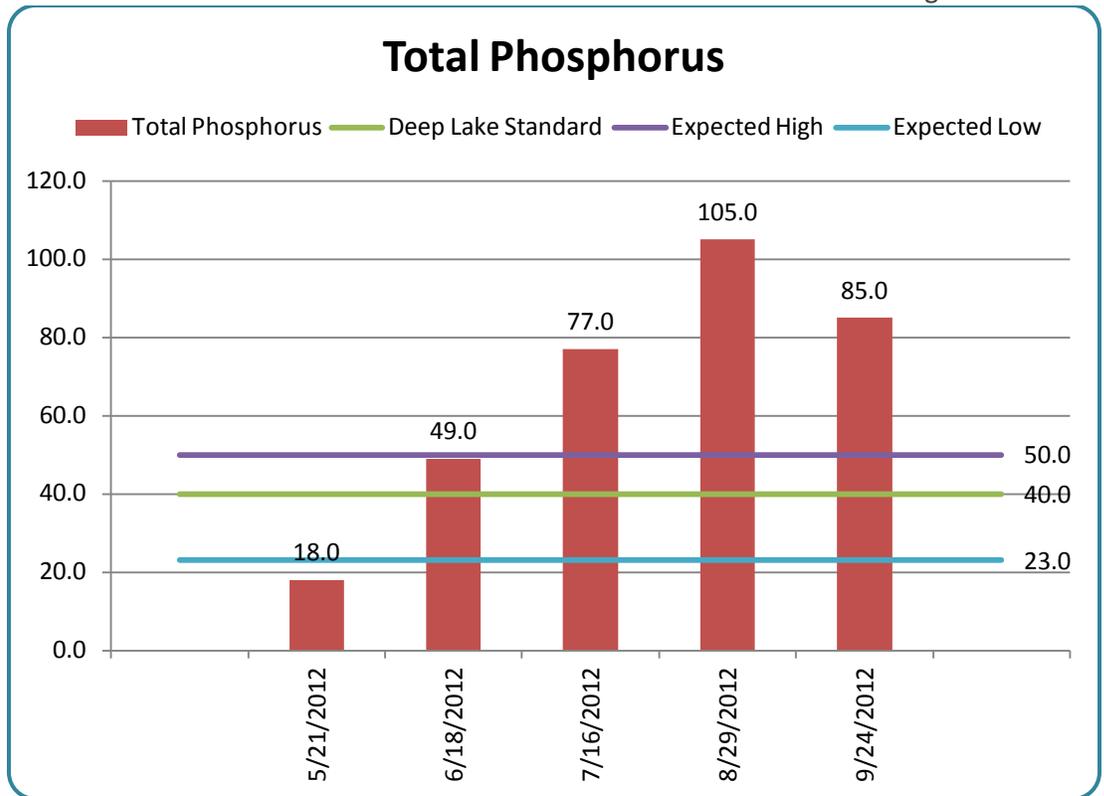
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	2.3 meters	1.8 meters	2.2 meters	1.3 meters
Grade	B	C	C	C
Average (June-Sept)	2.0 meters	1.8 meters	1.9 meters	0.9 meters
Meets Standard (>1.4 m)	Yes	Yes	Yes	No

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

Deep Lake Standard:
40.0 µg/L

All but the May sample exceeded the standard. The phosphorus levels were much higher this year than in the past three years.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	28.0 µg/L	48.0 µg/L	37.8 µg/L	66.8 µg/L
Grade	B	C	C	C
Average (June-Sept)	28.0 µg/L	48.0 µg/L	42.8 µg/L	79.0 µg/L
Meets Standard (40.0 µg/L)	Yes	No	No	No

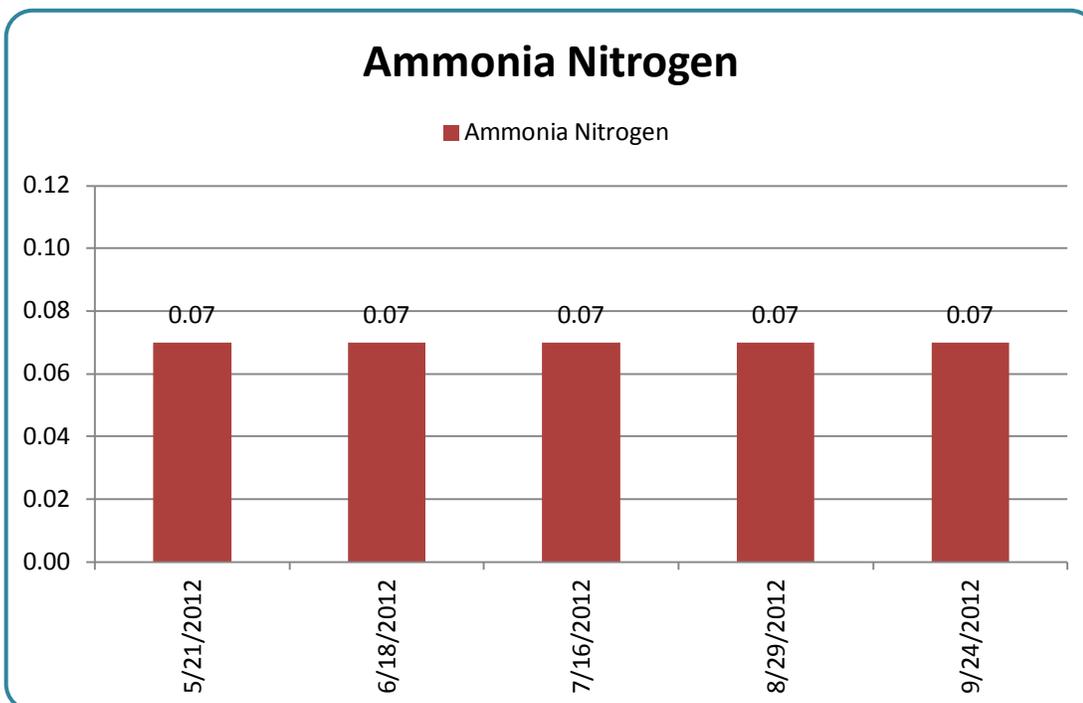
Ammonia Nitrogen

Ammonia Nitrogen

Expected Range: None

Deep Lake Standard:
None

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	<0.05 mg/L	<0.05 mg/L	0.04 mg/L	0.07 mg/L

Temperature

Expected Range:

None

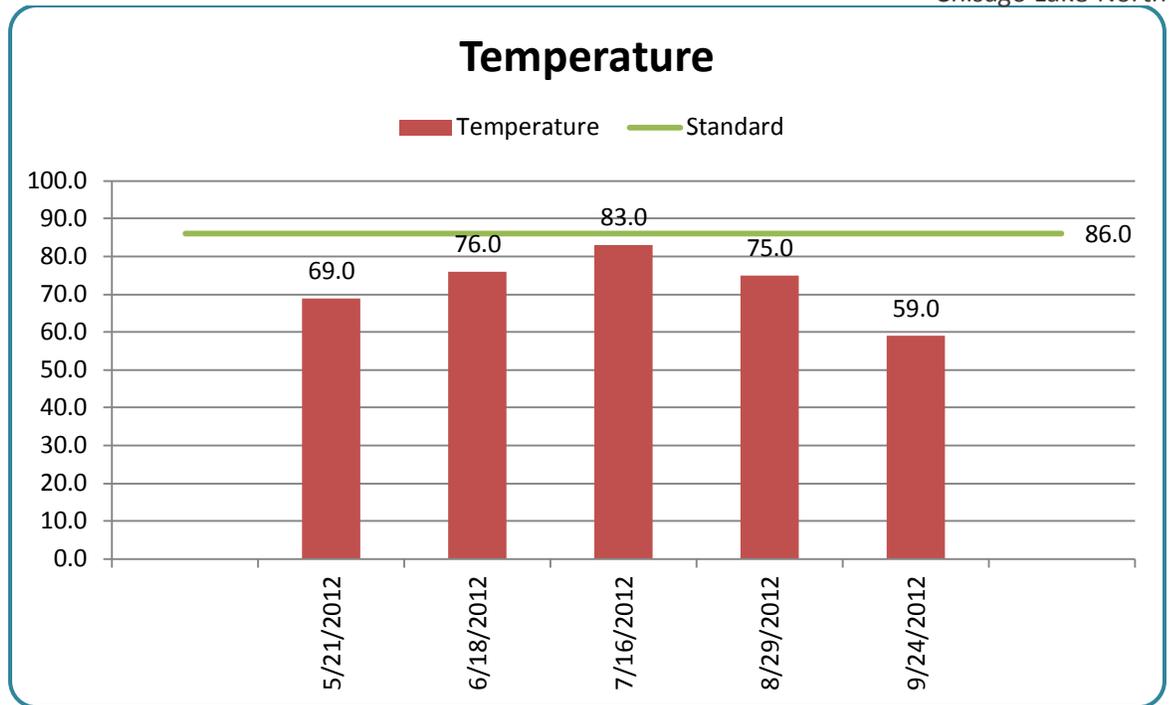
Deep Lake Standard:

The daily average

shall not exceed

86.0°F

The temperatures were all below the standard.

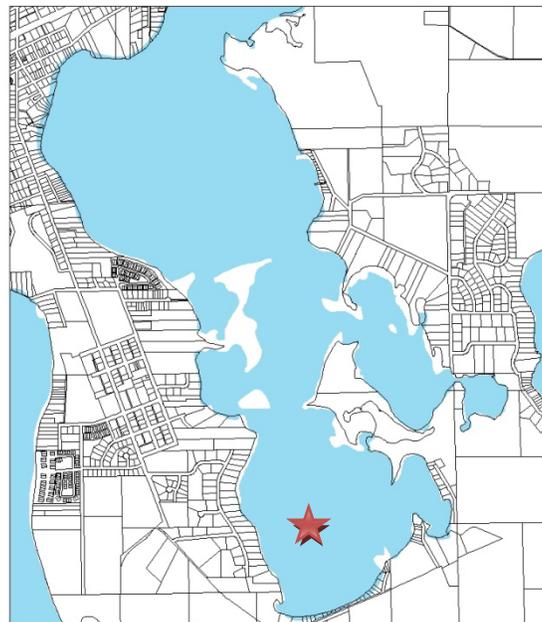


	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	71.8 °F	73.0 °F	65.6 °F	72.4 °F
Meets Standard (Not to exceed 86.0°F)	Yes	Yes	Yes	Yes

Chisago Lake-North General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	GENERAL LAKE OBSERVATIONS/ AQUATIC INVASIVE SPECIES
May	2	2	Chopstick	Beautiful
June	2.5	2.5	Cornichon	Nothing noted
July	2.5	2.5	Beach Grass	Curlyleaf pondweed gone. Low levels of Eurasian watermilfoil.
August	3	3	Bay Leaf	Algae blooms likely to appear soon
September	3	3	Beach grass	Putting in North Lindstrom/South Lindstrom bridge; low water levels.

Chisago Lake



Shallow Lake

Lake Classification: **HYPEREUTROPHIC**

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	70.2	64.3	70.4	68.3
Classification	Hypereutrophic	Eutrophic	Hypereutrophic	Hypereutrophic

Overall Lake Quality Grade: **D**

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	56.8 µg/L	0.7 meters	99.0 µg/L		
Grade	D	D	D	D	19 th /19

MPCA Standards: Does Not Meet Standards

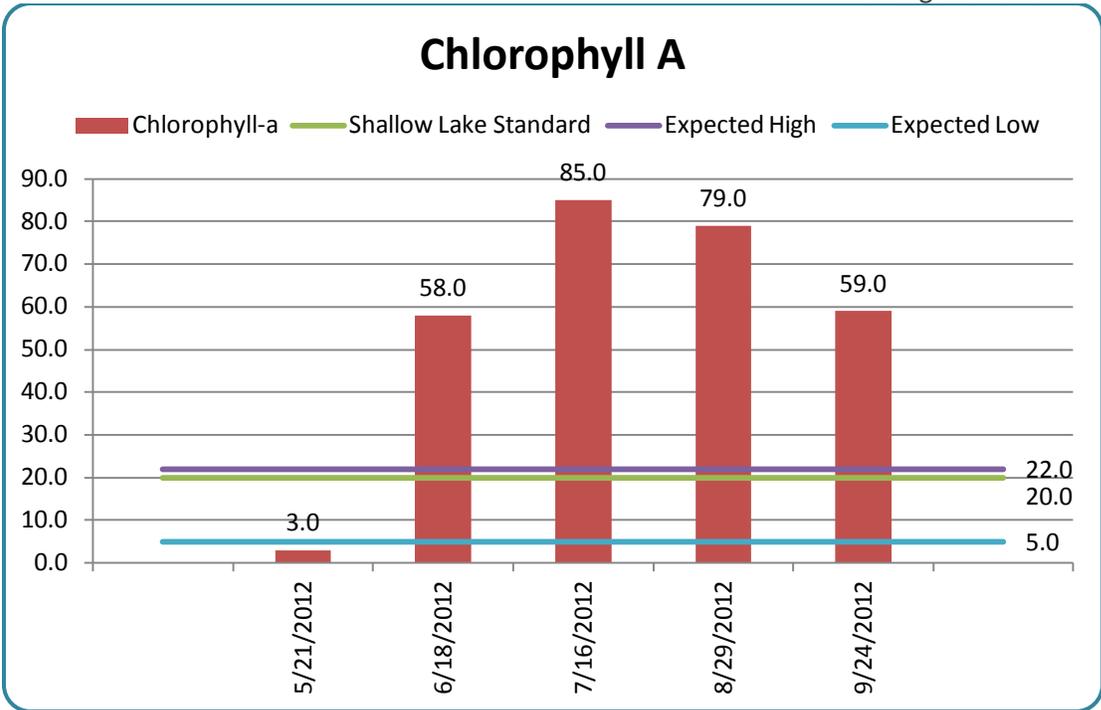
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Shallow lake)	20.0 µg/L	>1.0 meters	60.0 µg/L	
2012 Average (June-Sept)	70.3 µg/L	0.5 meters	117.3 µg/L	
Meets Standard	No	No	No	No

Chlorophyll-a

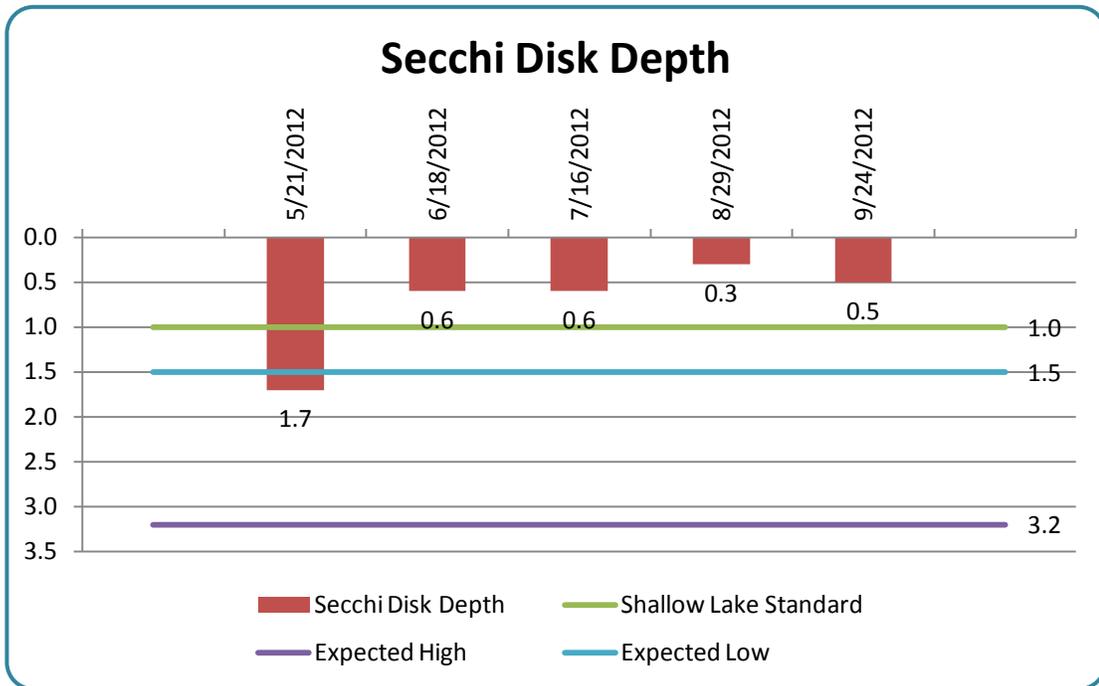
Expected Range:
5.0-22.0 µg/L

Shallow Lake
Standard: 20.0 µg/L

All samples except for the May sample were substantially higher than the standard. The 2012 readings are also significantly higher than previous years' readings.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	15.8 µg/L	42.6 µg/L	15.0 µg/L	56.8 µg/L
Grade	B	C	B	D
Average (June-Sept)	19.1 µg/L	57.7 µg/L	18.3 µg/L	70.3 µg/L
Meets Standard (20.0 µg/L)	Yes	No	Yes	No



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Shallow Lake
Standard: >1.0 meters

All samples were clear enough to meet the standard.

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

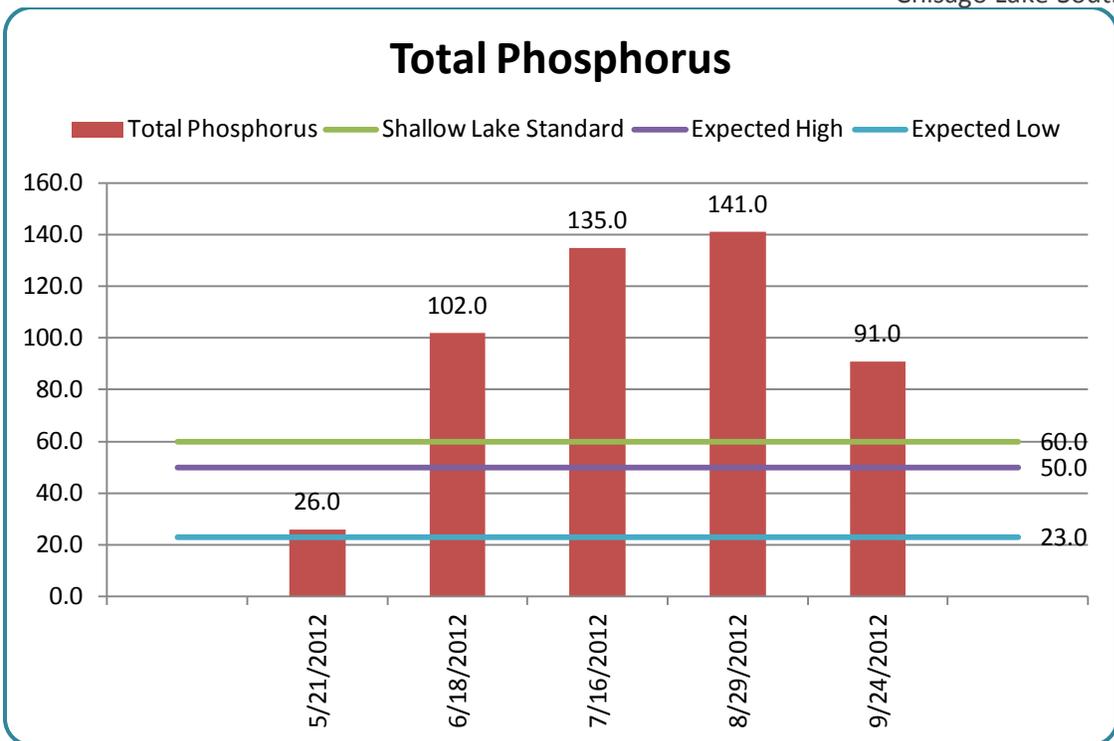
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	1.8 meters	1.3 meters	1.8 meters	2.4 meters
Grade	C	C	C	B
Average (June-Sept)	1.7 meters	1.1 meters	1.2 meters	1.6 meters
Meets Standard (>1.0 m)	Yes	Yes	Yes	Yes

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

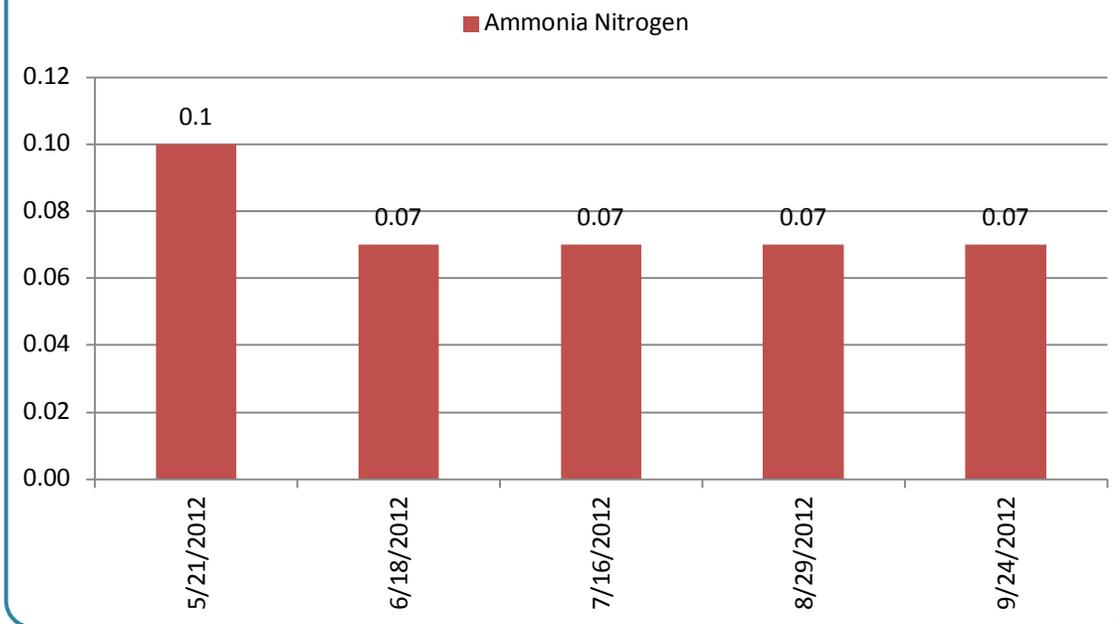
Shallow Lake
Standard: 60.0 µg/L

Most of the samples were significantly higher than the standard. The reading for 2012 is also much higher than the 2011 reading.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	38.0 µg/L	69.0 µg/L	52.8 µg/L	99.0 µg/L
Grade	C	D	C	D
Average (June-Sept)	42.0 µg/L	80.0 µg/L	60.8 µg/L	117.3 µg/L
Meets Standard (60.0 µg/L)	Yes	No	No	No

Ammonia Nitrogen



Ammonia Nitrogen

Expected Range: None

Shallow Lake Standard: None

Nitrogen levels were low, except for the May sample, which was slightly elevated. This could be due to spring runoff.

	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	<0.05 mg/L	<0.05 mg/L	0.03 mg/L	0.08 mg/L

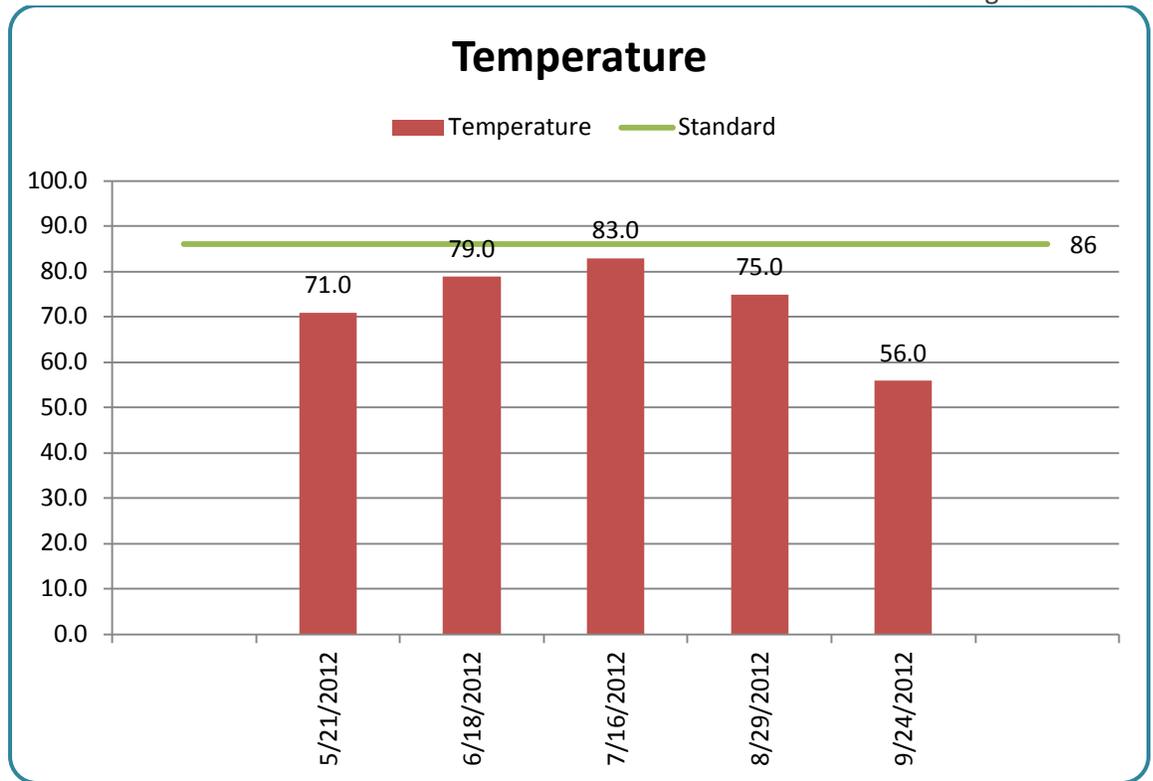
Temperature

Expected Range:

None

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

All temperatures were below the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	No Data	No Data	64.0 °F	72.8 °F
Within Expected Range			Yes	Yes

Chisago Lake-South General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	GENERAL LAKE OBSERVATIONS/ AQUATIC INVASIVE SPECIES
May	2	2	Parchment Paper	Curlyleaf pondweed soon to surface throughout the bay.
June	3	3	Cornichon	Slimmers Slew navigable.
July	3	3	Cornichon	Curlyleaf pondweed gone. Low levels of Eurasian watermilfoil.
August	3.5	3.5	Mossy Rock	Algae blooms likely to appear soon.
September	3	3	Cornichon	No notes.

Fish Lake



Deep Lake

Lake Classification: MESOTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	49.4	48.8	49.2	49.1
Classification	Mesotrophic	Mesotrophic	Mesotrophic	Mesotrophic

Overall Lake Quality Grade: A-

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	6.8 µg/L	2.2 meters	22.8 µg/L		
Grade	A	B-C	A	A-	1 st /19

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	
2012 Average (June-Sept)	7.3 µg/L	2.1 meters	21.8 µg/L	
Meets Standard	Yes	Yes	Yes	Yes

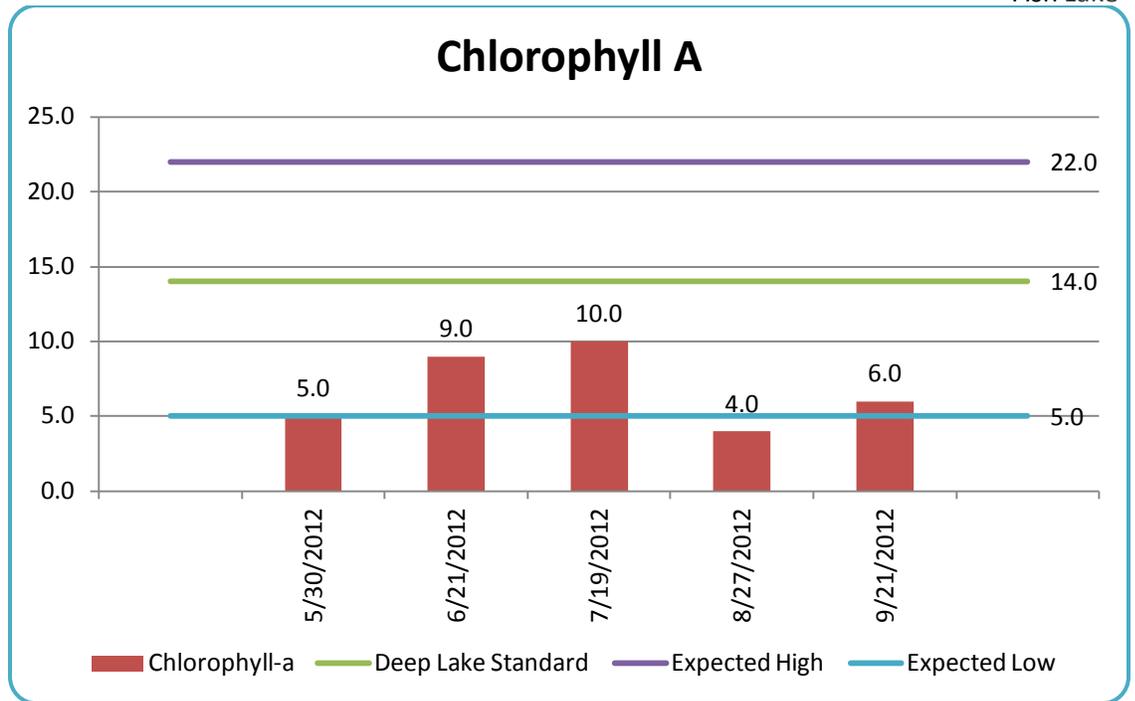
Chlorophyll-a

Expected Range:
5.0-22.0 µg/L

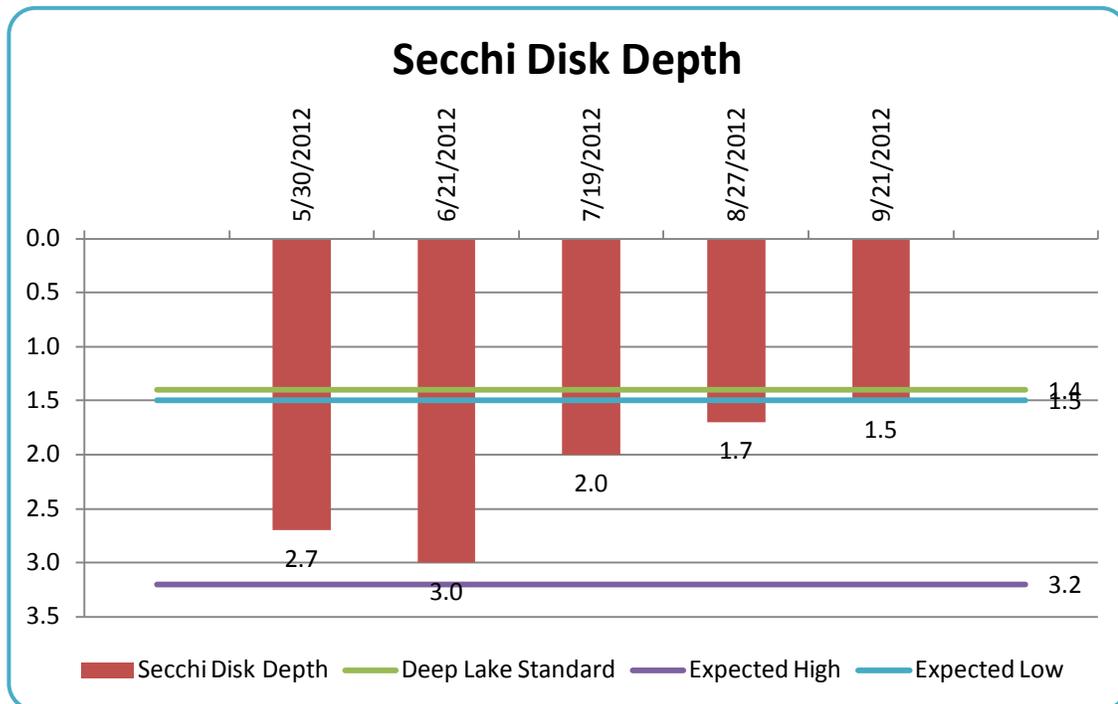
Deep Lake Standard:
14.0 µg/L

The average was within the expected range and does meet the standard.

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	6.8 µg/L
Grade				A
Average (June-Sept)	NO DATA	NO DATA	NO DATA	7.3 µg/L
Meets Standard (14.0 µg/L)				Yes



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Deep Lake Standard:
>1.4 meters

Clarity was good in this lake. The average does meet the standard.

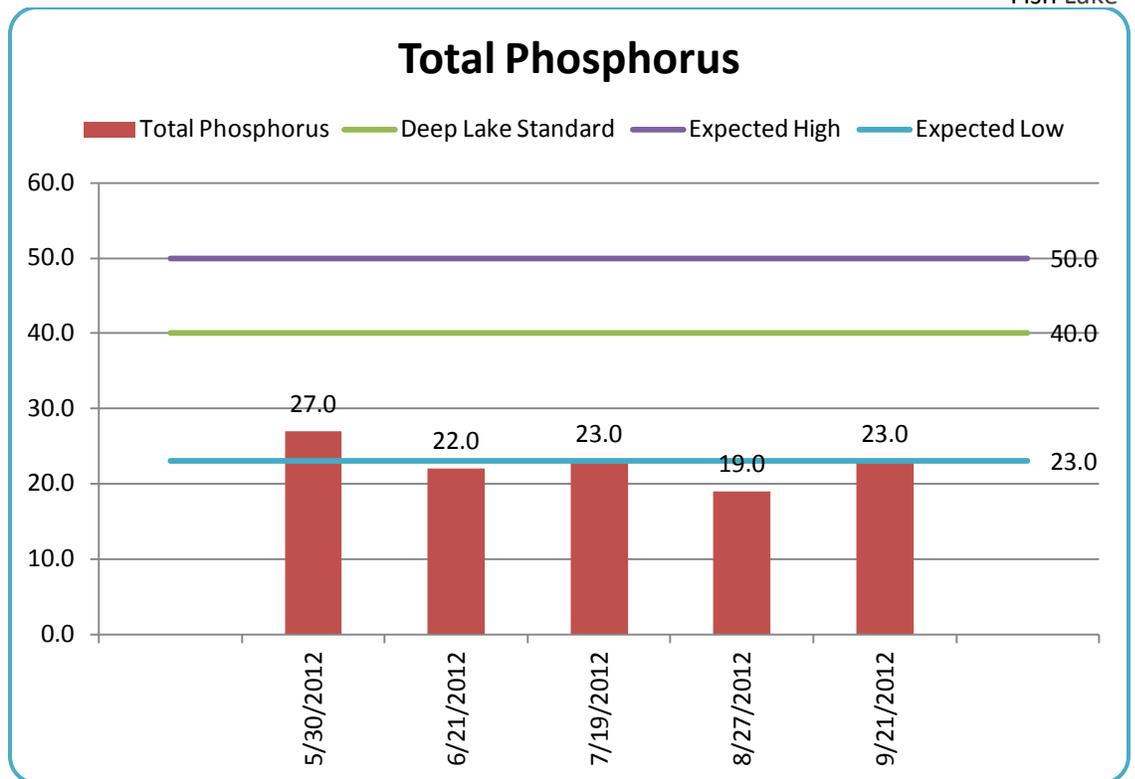
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	2.7 meters
Grade				B-C
Average (June-Sept)	NO DATA	NO DATA	NO DATA	2.1 meters
Meets Standard (>1.4 m)				Yes

Total Phosphorus

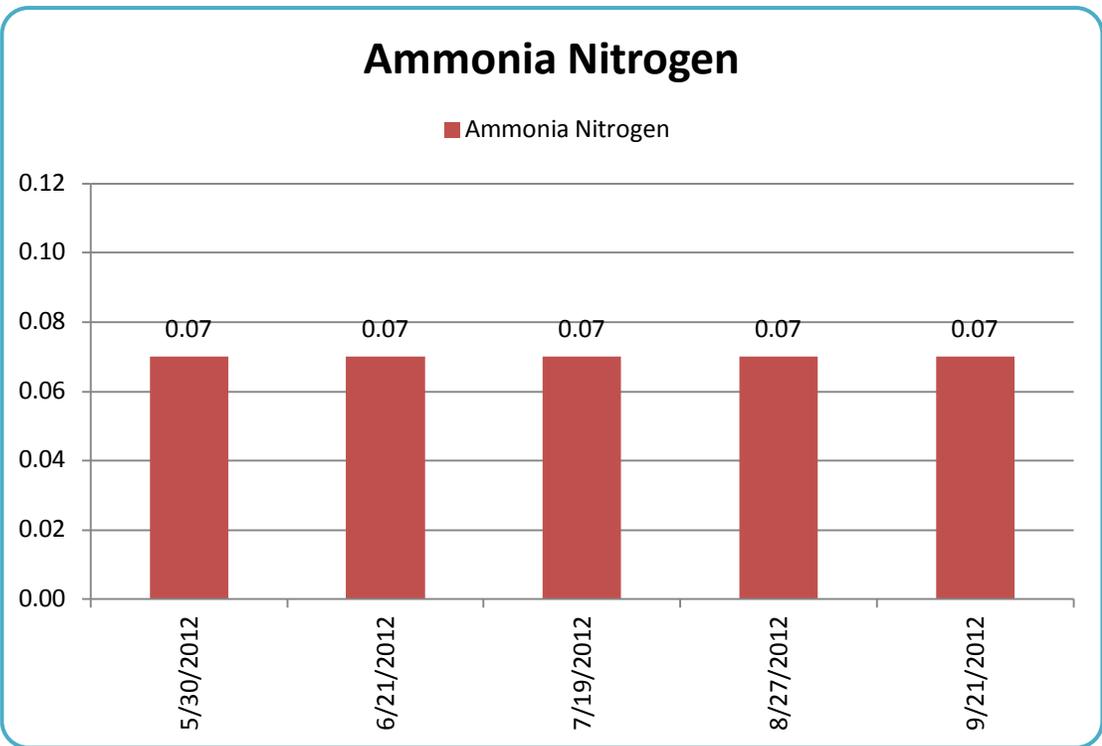
Expected Range:
23.0-50.0 µg/L

Deep Lake Standard:
40.0 µg/L

Most samples were below the expected range. The average easily meets the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	22.8 µg/L
Grade				A
Average (June-Sept)	NO DATA	NO DATA	NO DATA	21.8 µg/L
Meets Standard (40.0 µg/L)				Yes



Ammonia Nitrogen

Expected Range: None

Deep Lake Standard: None

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

	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	NO DATA	0.07 mg/L

Temperature

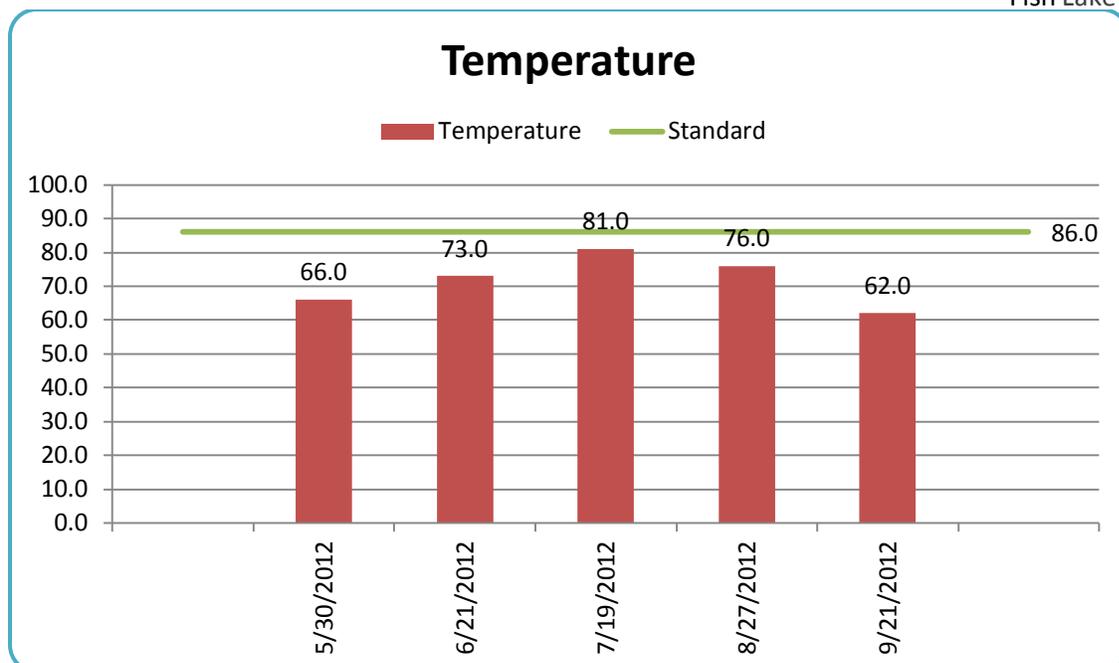
Expected Range:

None

Deep Lake Standard:

The daily average shall not exceed 86.0°F.

The temperatures met the standard.

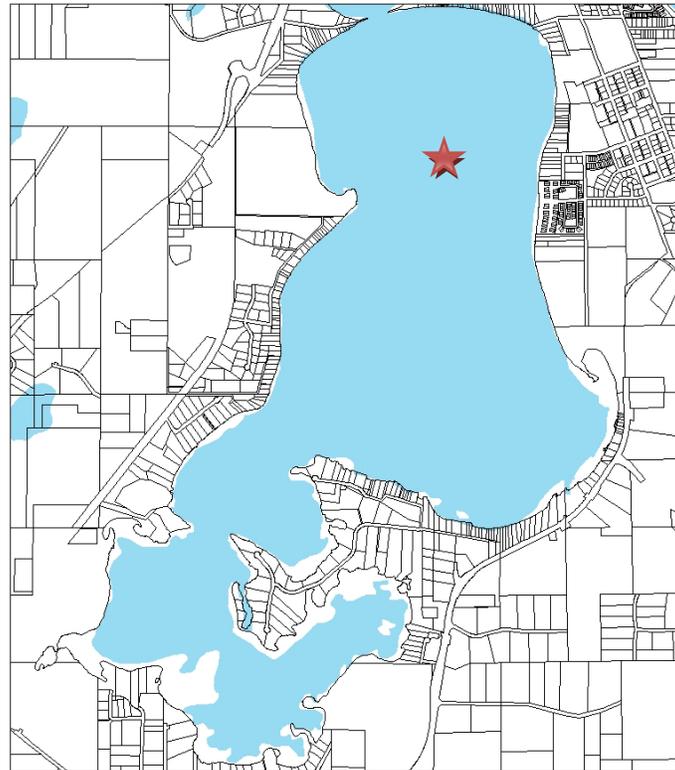


	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	NO DATA	71.6°F
Meets Standard (Not to exceed 86.0°F)				Yes

Fish Lake General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	GENERAL LAKE OBSERVATIONS/ AQUATIC INVASIVE SPECIES
May	2	2	Toasted Marshmallow	Mayfly hatch.
June	2	2	Beach Grass	High water levels, windy.
July	2	2	Parchment Paper	Beautiful.
August	2.5	2.5	Toasted Marshmallow	Eurasian watermilfoil in shallow areas by boat launch.
September	2.5	2.5	Toasted Marshmallow	No notes.

Green Lake



Deep Lake

Lake Classification: EUTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	58.0	49.6	54.3	54.0
Classification	Eutrophic	Mesotrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: B-C

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	16.4 µg/L	2.1 meters	32.4 µg/L		
Grade	B	C	B-C	B-C	4 th /19

MPCA Standards: Meets Standards

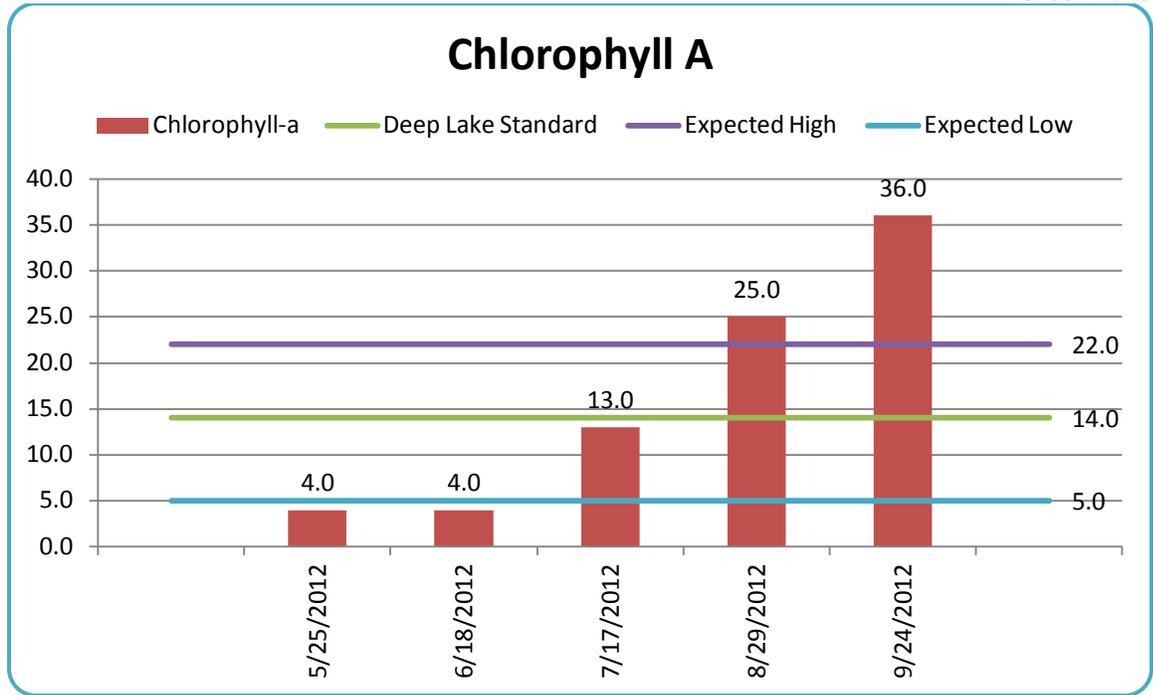
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Deep lake)	14.0 µg/L	>1.4 meters	40.0 µg/L	
2012 Average (June-Sept)	19.5 µg/L	1.9 meters	35.8 µg/L	
Meets Standard	No	Yes	Yes	Yes

Chlorophyll-a

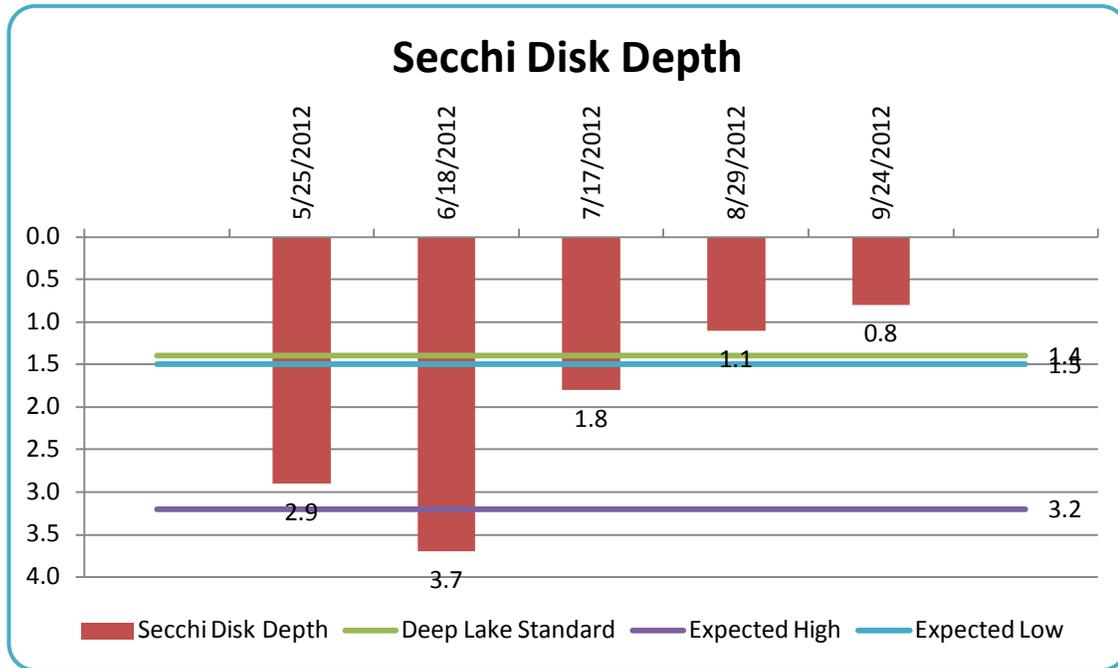
Expected Range:
5.0-22.0 µg/L

Deep Lake Standard:
14.0 µg/L

Late season samples were well above the standard and the expected range. The average did not meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	28.4 µg/L	14.0 µg/L	16.8 µg/L	16.4 µg/L
Grade	C	B	B	B
Average (June-Sept)	34.8 µg/L	20.2 µg/L	18.8 µg/L	19.5 µg/L
Meets Standard (14.0 µg/L)	No	No	No	No



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Deep Lake Standard:
>1.4 meters

Clarity improved from last year and did meet the standard this year, although late season samples were poor clarity.

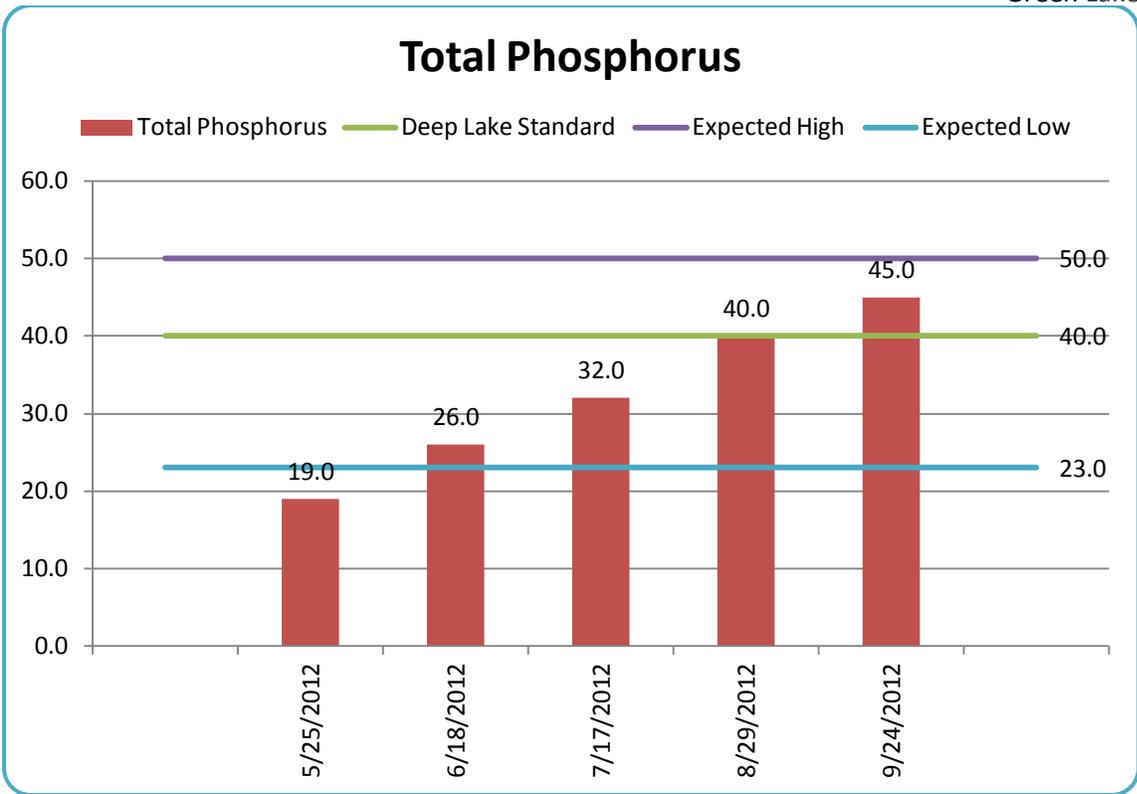
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	2.5 meters	2.4 meters	1.6 meters	2.1 meters
Grade	B	B	C	C
Average (June-Sept)	2.4 meters	1.5 meters	1.3 meters	1.9 meters
Meets Standard (>1.4 m)	Yes	Yes	No	Yes

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

Deep Lake Standard:
40.0 µg/L

Only one sample exceeded the standard. The average did meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	51.0 µg/L	22.0 µg/L	40.6 µg/L	32.4 µg/L
Grade	C	A	C	B-C
Average (June-Sept)	57.0 µg/L	24.0 µg/L	45.5 µg/L	35.8 µg/L
Meets Standard (40.0 µg/L)	No	Yes	No	Yes

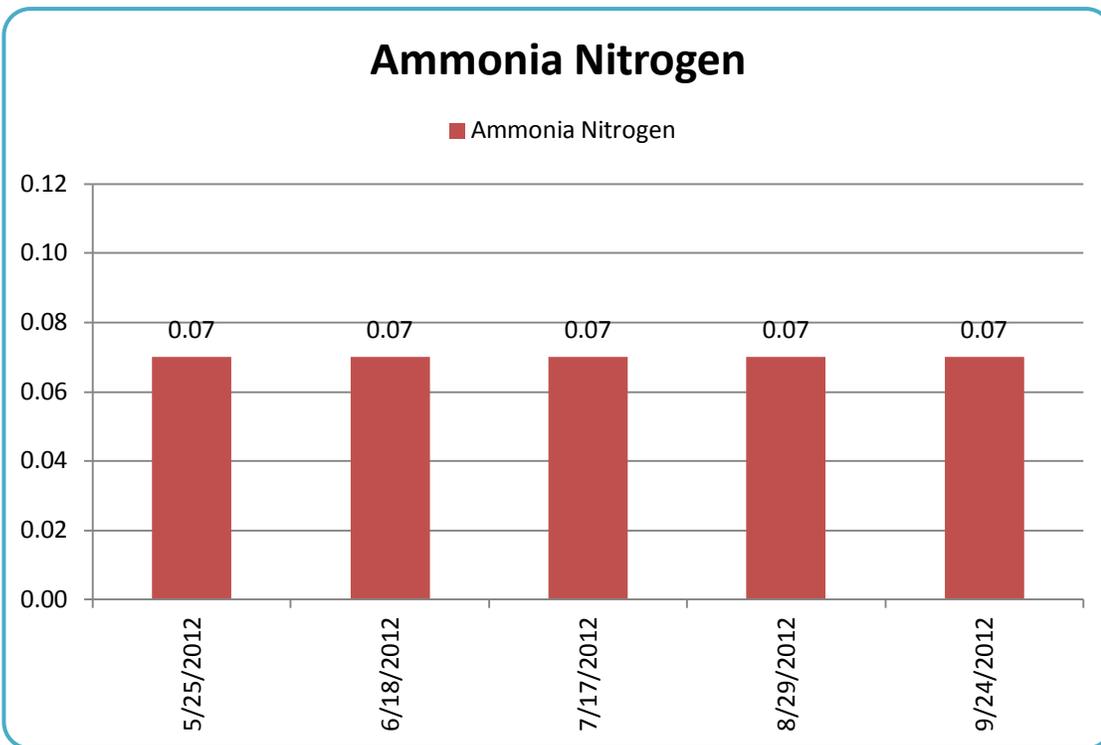
Ammonia Nitrogen

Ammonia Nitrogen

Expected Range: None

Deep Lake Standard: None

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	<0.05 mg/L	0.09 mg/L	0.04 mg/L	0.07 mg/L

Temperature

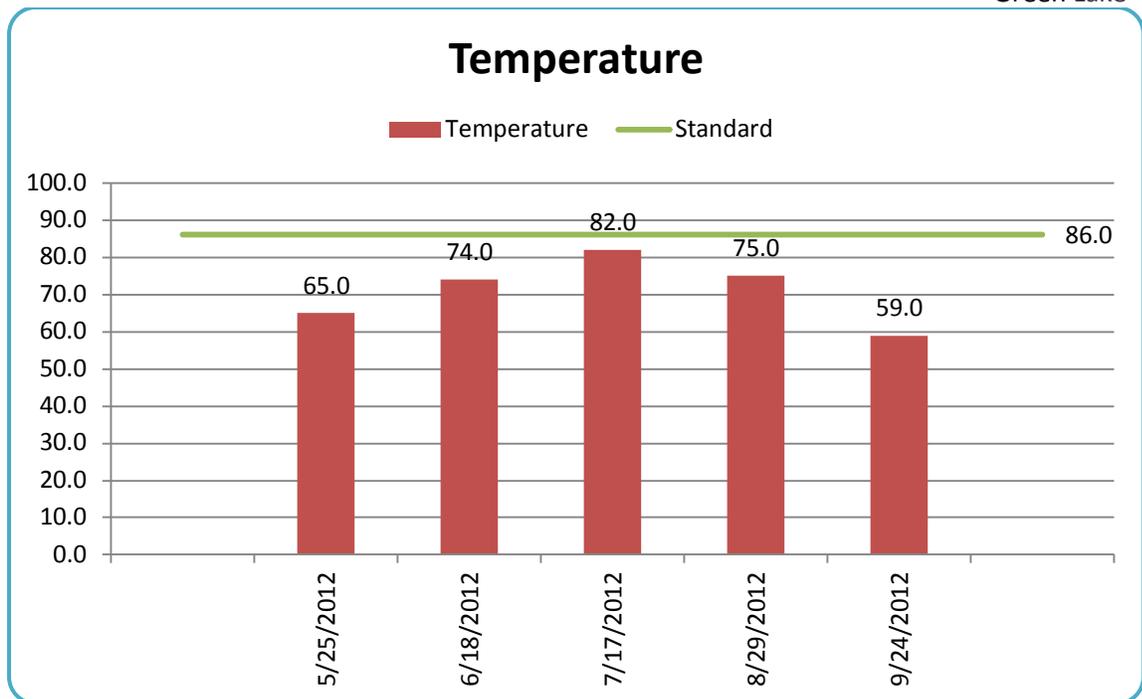
Expected Range:

None

Deep Lake Standard:

The daily average shall not exceed 86.0°F.

The temperatures met the standard.

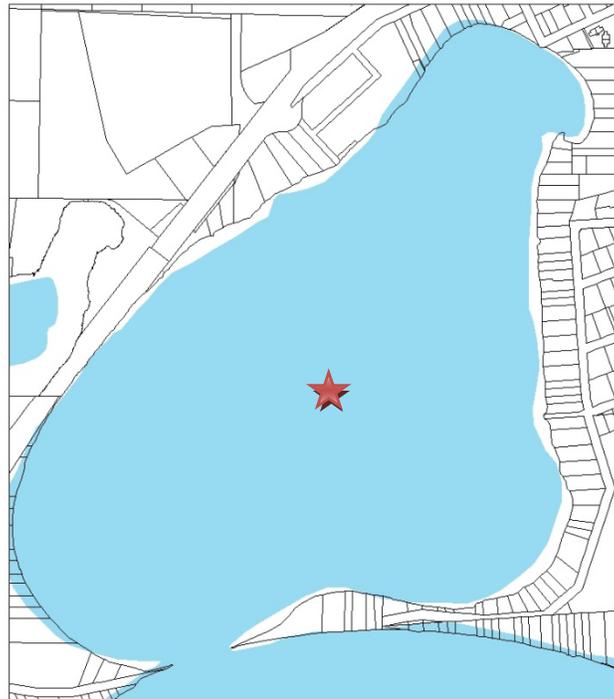


	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	74.8 °F	72.9 °F	65.8 °F	71.0°F
Meets Standard (Not to exceed 86.0°F)	Yes	Yes	Yes	Yes

Green Lake General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	GENERAL LAKE OBSERVATIONS/ AQUATIC INVASIVE SPECIES
May	2	2	Short Bread	Thick Eurasian watermilfoil in the south west bay.
June	2	2	Toasted Marshmallow	Recently sprayed Eurasian watermilfoil (6/12/12); limited effectiveness so far.
July	2	2	Beach Grass	Sprayed areas appear less weedy.
August	3	3	Beach Grass	Eurasian watermilfoil appears to be resurfacing in south west bay treated areas.
September	3	3	Parchment Paper	No notes.

Little Green Lake



Deep Lake

Lake Classification: EUTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	54.6	57.6	55.3	55.8
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C-D

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	11.6 µg/L	1.2 meters	44.6 µg/L		
Grade	D	C-D	C	C-D	6 th /19

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	
2012 Average (June-Sept)	13.5 µg/L	1.0 meters	35.5 µg/L	
Meets Standard	Yes	No	Yes	Yes

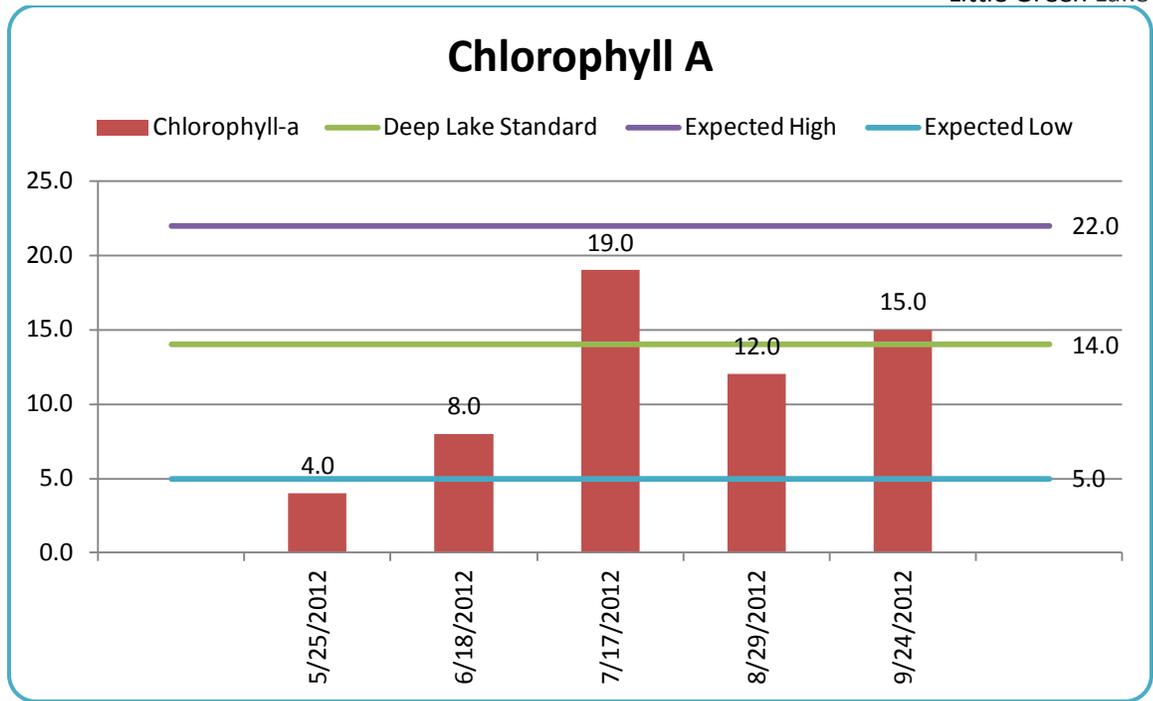
Chlorophyll-a

Expected Range:
5.0-22.0 µg/L

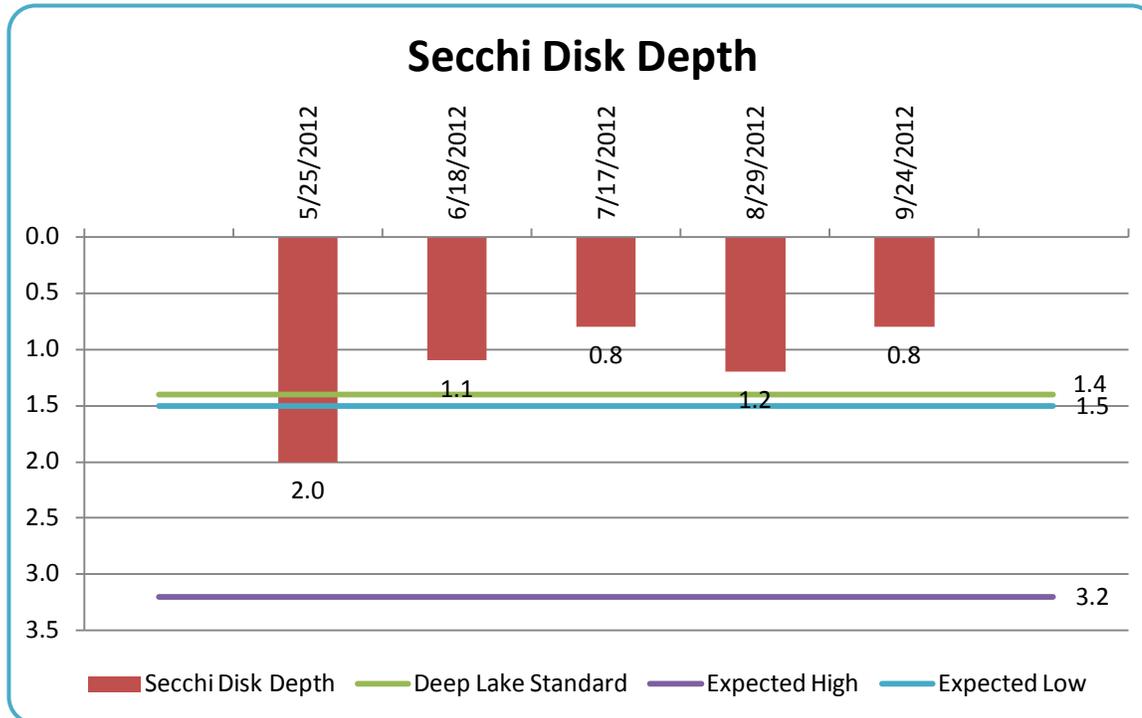
Deep Lake Standard:
14.0 µg/L

The average meets the standard.

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	14.6 µg/L	10.0 µg/L	13.2 µg/L	11.6 µg/L
Grade	B	B	B	B
Average (June-Sept)	16.8 µg/L	14.4 µg/L	15.3 µg/L	13.5 µg/L
Meets Standard (14.0 µg/L)	No	No	No	Yes



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Deep Lake Standard:
>1.4 meters

Four of the five samples did not meet the standard. The average also did not meet the standard.

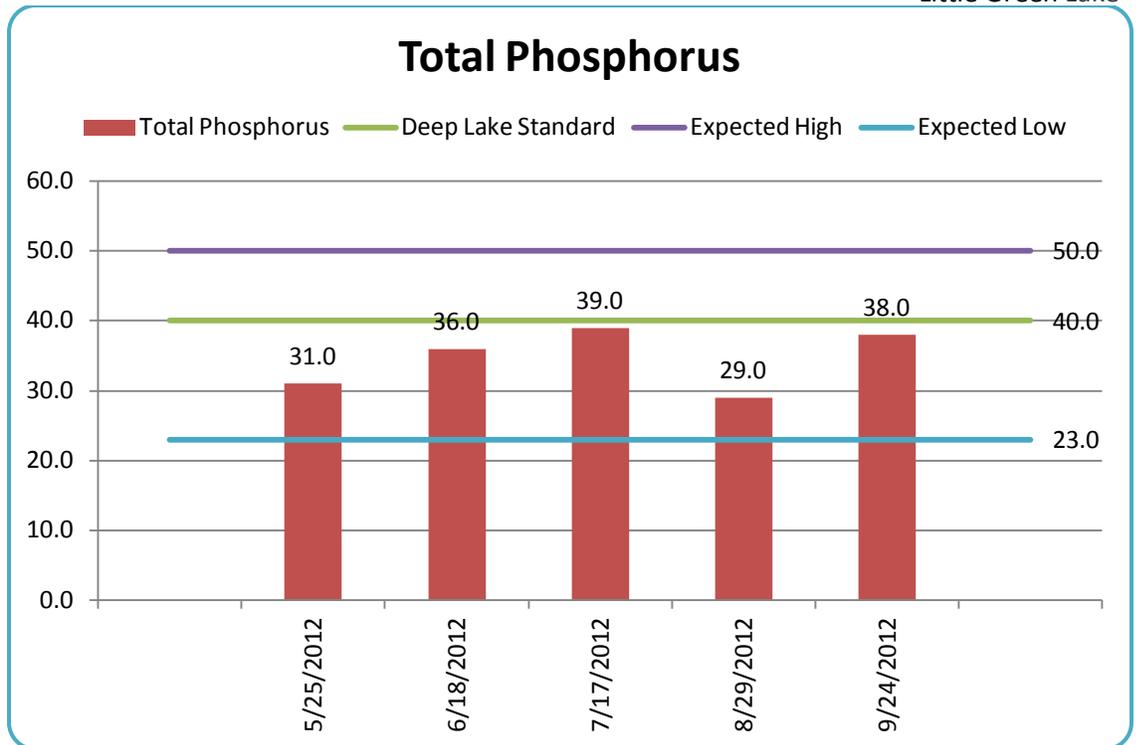
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	1.4 meters	1.8 meters	1.2 meters	1.2 meters
Grade	C	C	C-D	C-D
Average (June-Sept)	1.3 meters	1.1 meters	1.0 meter	1.0 meter
Meets Standard (>1.4 m)	No	No	No	No

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

Deep Lake Standard:
40.0 µg/L

All five samples were within the expected range and met the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	54.0 µg/L	32.0 µg/L	40.0 µg/L	34.6 µg/L
Grade	C	B-C	C	C
Average (June-Sept)	58.0 µg/L	41.0 µg/L	39.3 µg/L	35.5 µg/L
Meets Standard (40.0 µg/L)	No	No	Yes	Yes

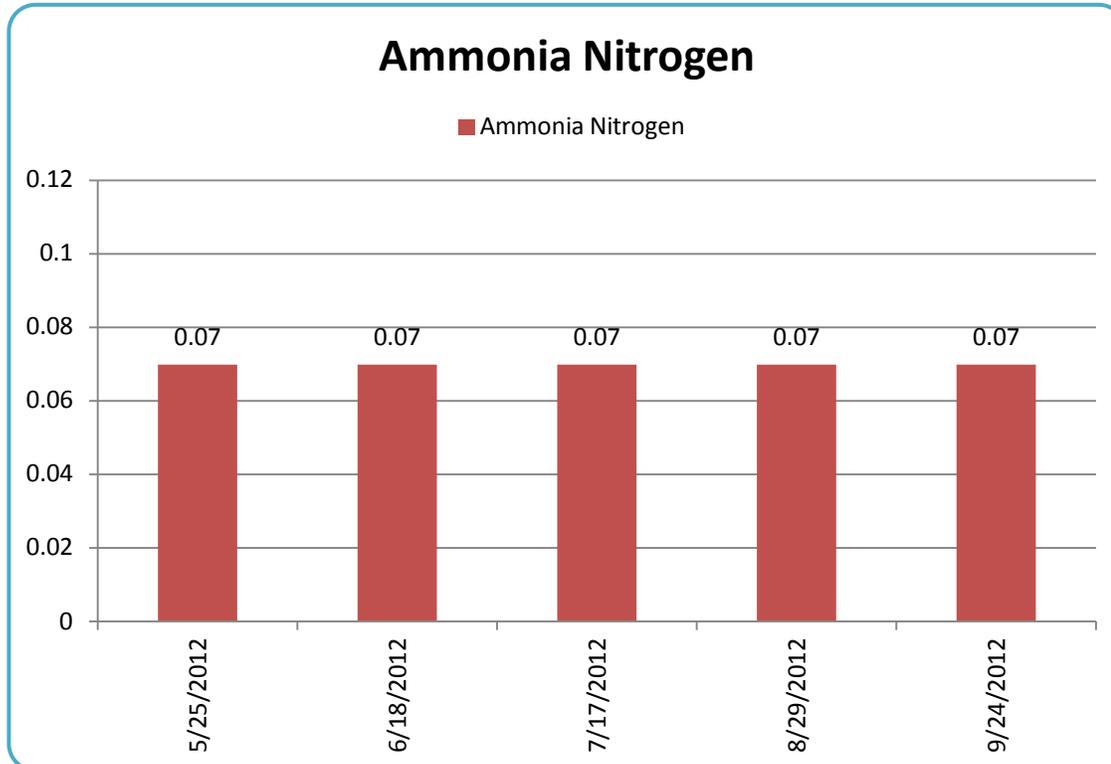
Ammonia Nitrogen

Ammonia Nitrogen

Expected Range: None

Deep Lake Standard: None

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



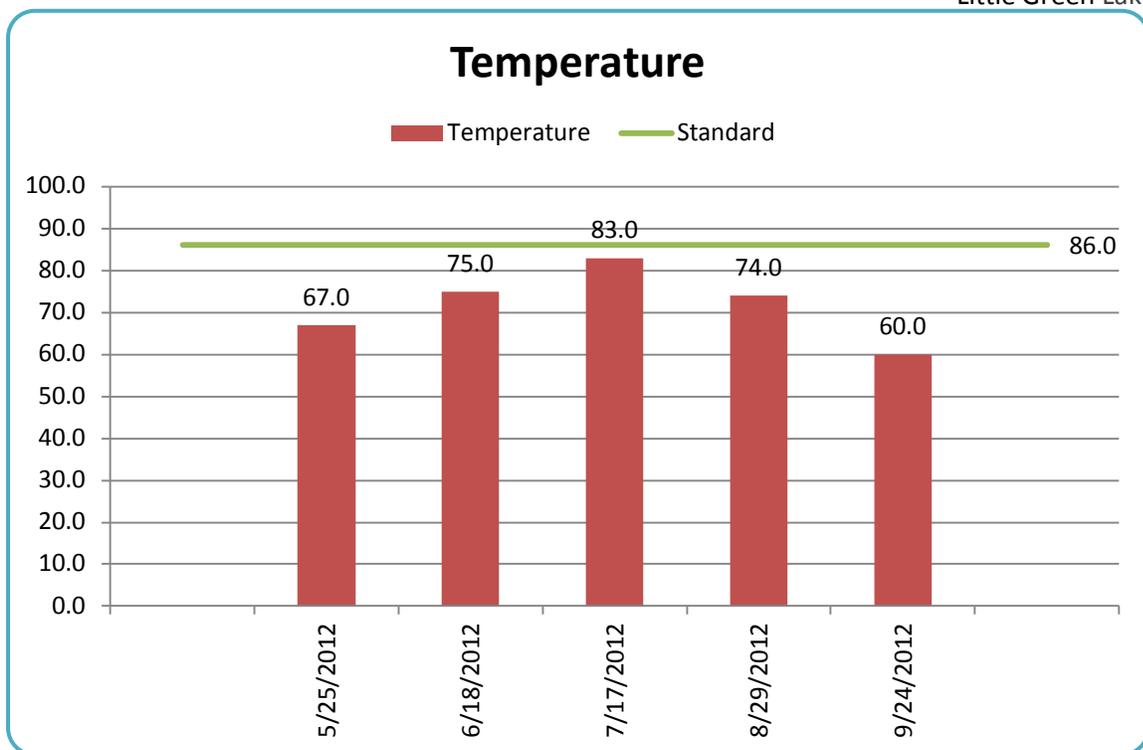
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	<0.05 mg/L	<0.05 mg/L	0.03 mg/L	0.07 mg/L

Temperature

Expected Range:
None

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

The temperatures meet the standard.

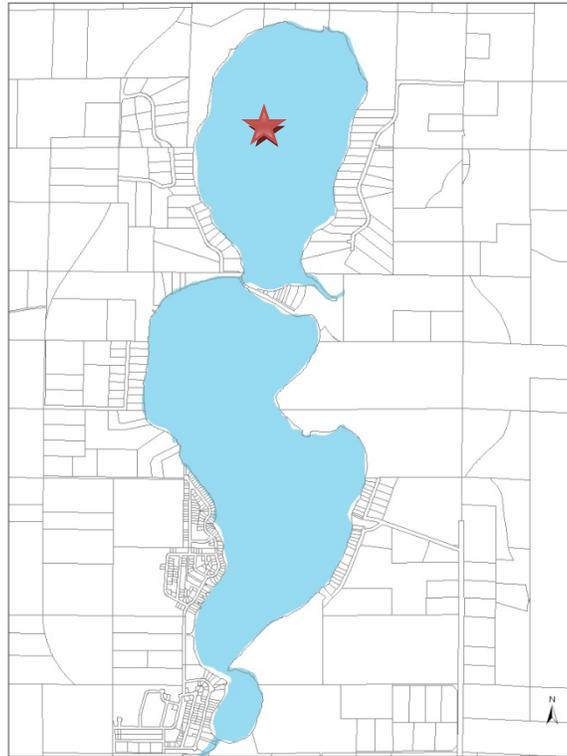


	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	74.9 °F	74.0 °F	63.4 °F	71.8 °F
Meets Standard (Not to exceed 86.0°F)	Yes	Yes	Yes	Yes

Little Green Lake General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	OTHER NOTES
May	2	2	Short Bread	Curlyleaf pondweed present; Eurasian watermilfoil piled up on shore.
June	3	3	Parchment Paper	Recently sprayed Eurasian watermilfoil (6/12/12). Limited effectiveness so far.
July	2	2	Hemp	Low weed pressure.
August	2.5	2.5	Parchment Paper	Navigation good.
September	3	3	Toasted Marshmallow	No notes.

Goose Lake



Shallow Lake

Lake Classification: EUTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	66.4	61.8	63.9	64.1
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	38.6 µg/L	0.9 meters	63.2 µg/L		
Grade	C	D	C	C	15 th /19

MPCA Standards: Impaired

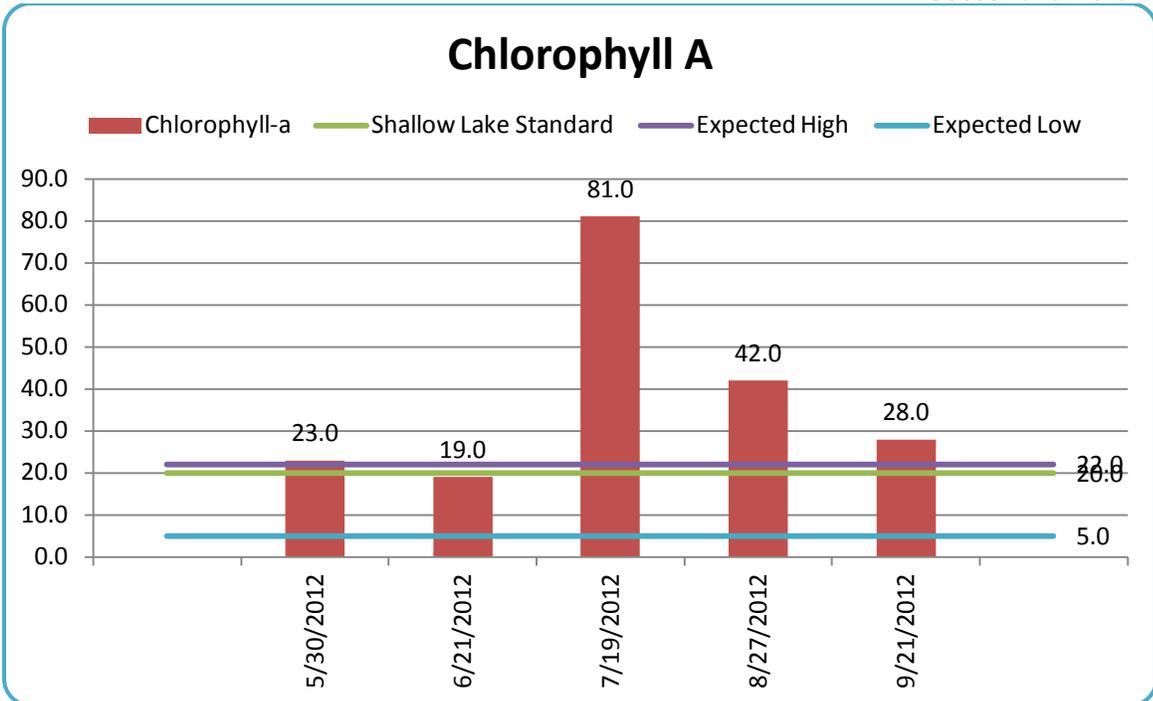
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Shallow lake)	20.0 µg/L	>1.0 meters	60.0 µg/L	
2012 Average (June-Sept)	42.5 µg/L	0.8 meters	68.8 µg/L	
Meets Standard	No	No	No	No

Chlorophyll-a

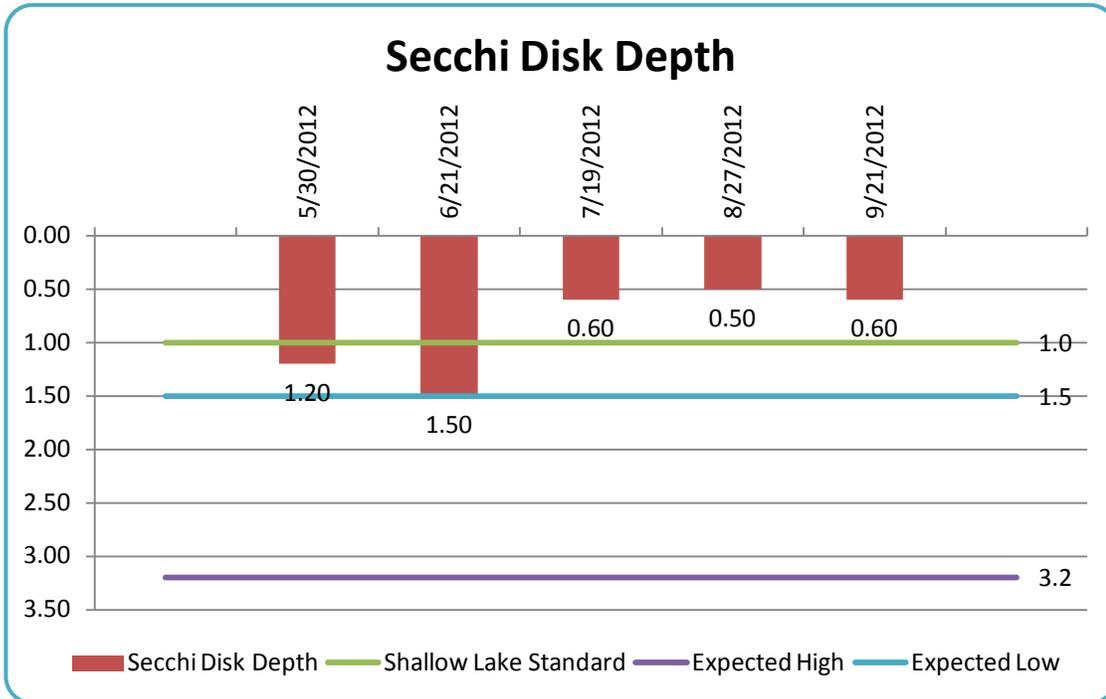
Expected Range:
5.0-22.0 µg/L

Shallow Lake
Standard: 20.0 µg/L

The July sample was very high compared to all others. The lake average does not meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	38.6 µg/L
Grade				C
Average (June-Sept)	NO DATA	NO DATA	NO DATA	42.5 µg/L
Meets Standard (20.0 µg/L)				No



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Shallow Lake
Standard: >1.0 meters

Clarity in this lake was poor throughout the year and does not meet the standard.

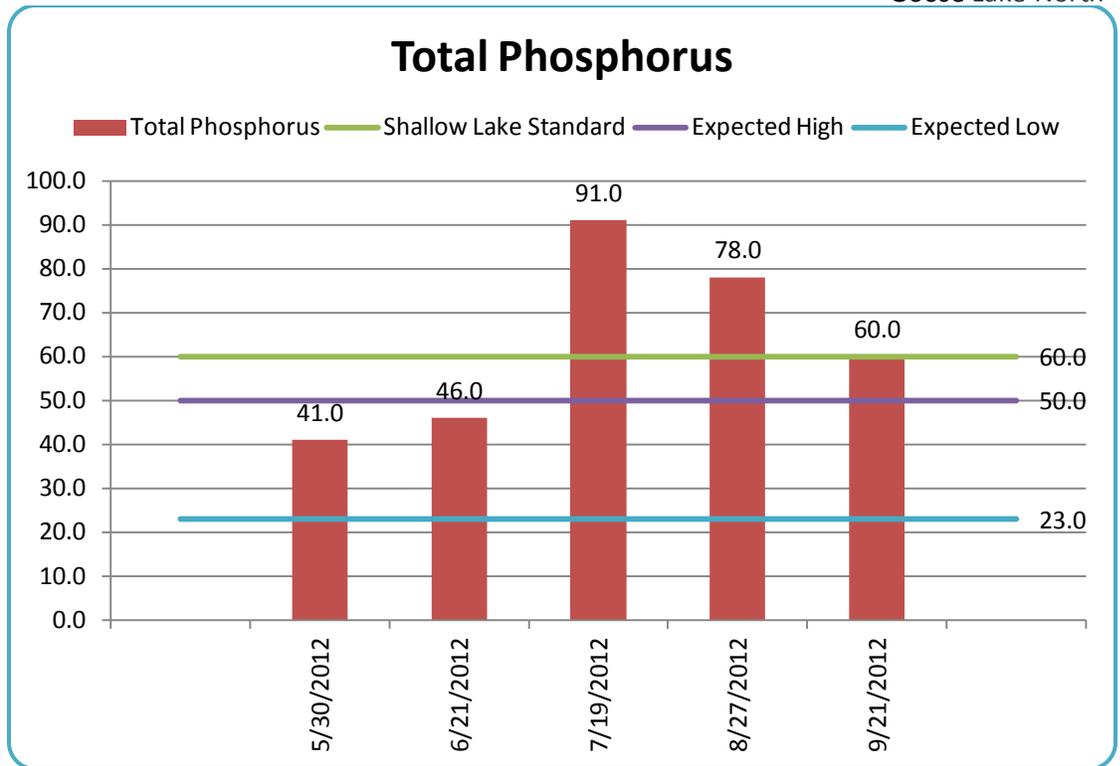
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	0.9 meters
Grade				D
Average (June-Sept)	NO DATA	NO DATA	NO DATA	0.8 meters
Meets Standard (>1.0 m)				No

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

Shallow Lake
Standard: 60.0 µg/L

Three of five samples were higher than the standard. The average does not meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	63.2 µg/L
Grade				C
Average (June-Sept)	NO DATA	NO DATA	NO DATA	68.8 µg/L
Meets Standard (60.0 µg/L)				No

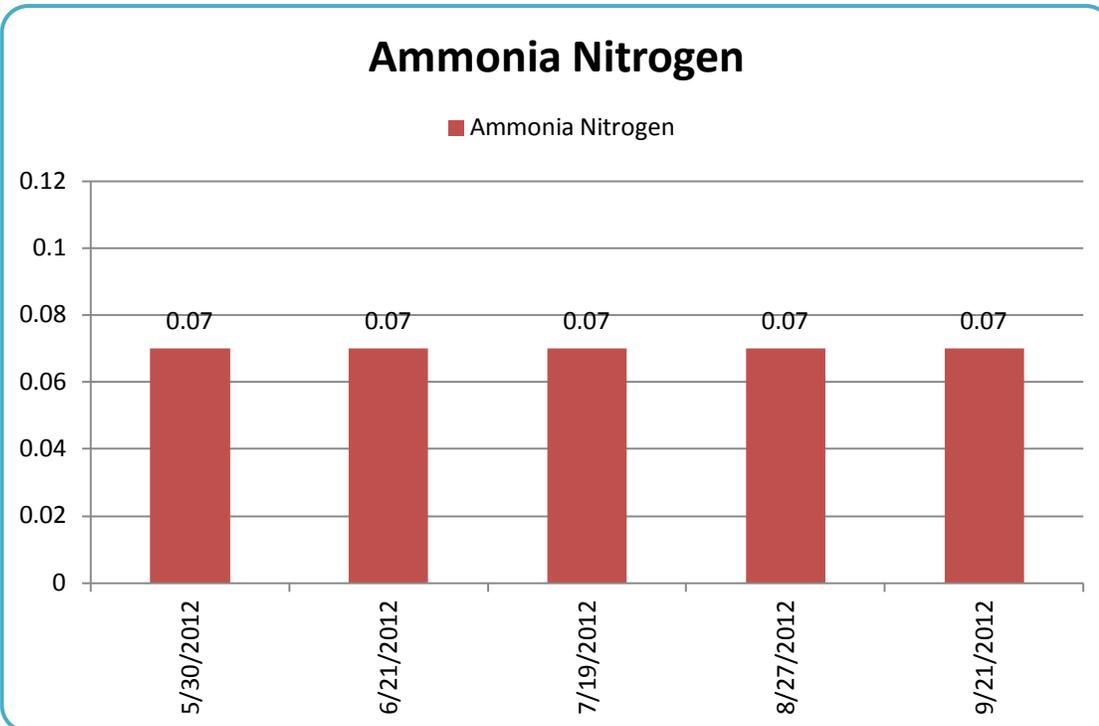
Ammonia Nitrogen

Ammonia Nitrogen

Expected Range: None

Shallow Lake Standard: None

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	NO DATA	0.07 mg/L

Temperature

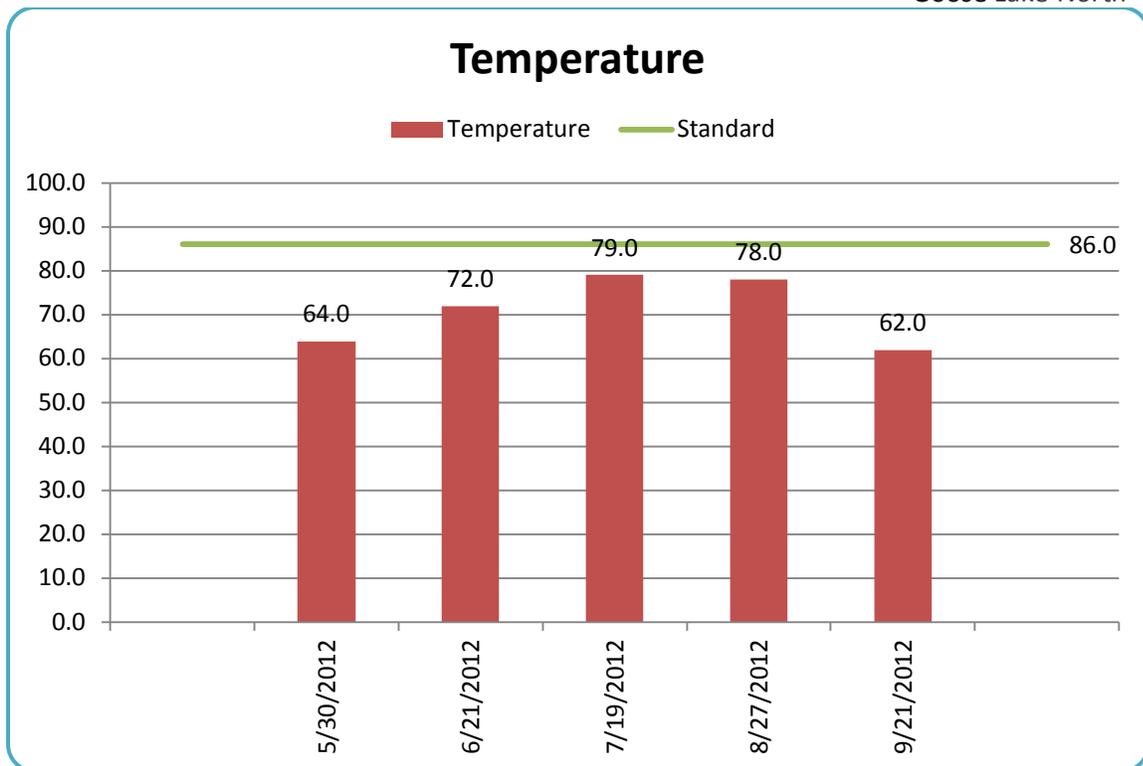
Expected Range:

None

Shallow Lake

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

The temperatures met the standard.

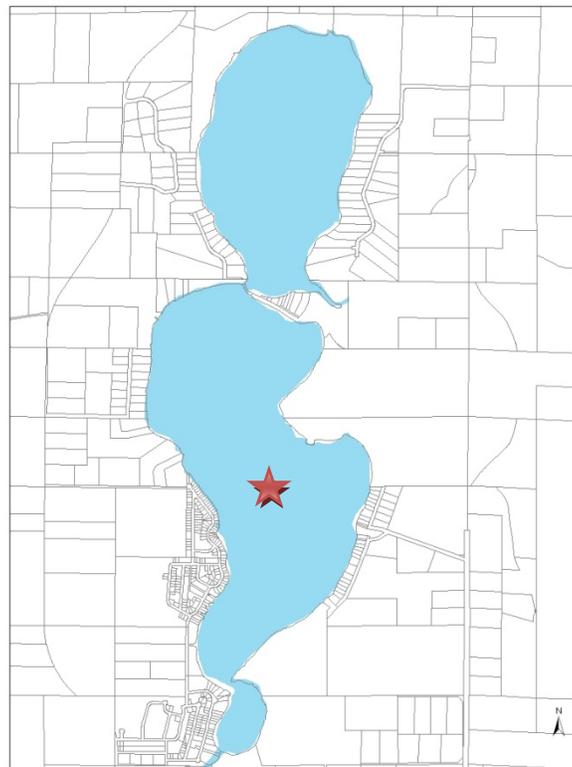


	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	NO DATA	71.0°F
Meets Standard (Not to exceed 86.0°F)				Yes

Goose Lake-North General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	GENERAL LAKE OBSERVATIONS/ AQUATIC INVASIVE SPECIES
May	2	2	Beach Grass	No notes.
June	2.5	2.5	Beach Grass	High water levels.
July	3.5	3.5	Cornichon	Algae blooms forming at public access.
August	3	3	Cornichon	No Eurasian watermilfoil observed. Lake level appears 2' lower than spring.
September	4	4	Dried Chamomile	No notes.

Goose Lake



Deep Lake

Lake Classification: EUTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	59.1	55.0	57.0	57.0
Classification	Eutrophic	Mesotrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	18.2 µg/L	1.4 meters	39.0 µg/L		
Grade	B	C	C	C	8 th /19

MPCA Standards: Impaired, but Meets Standards for 2012

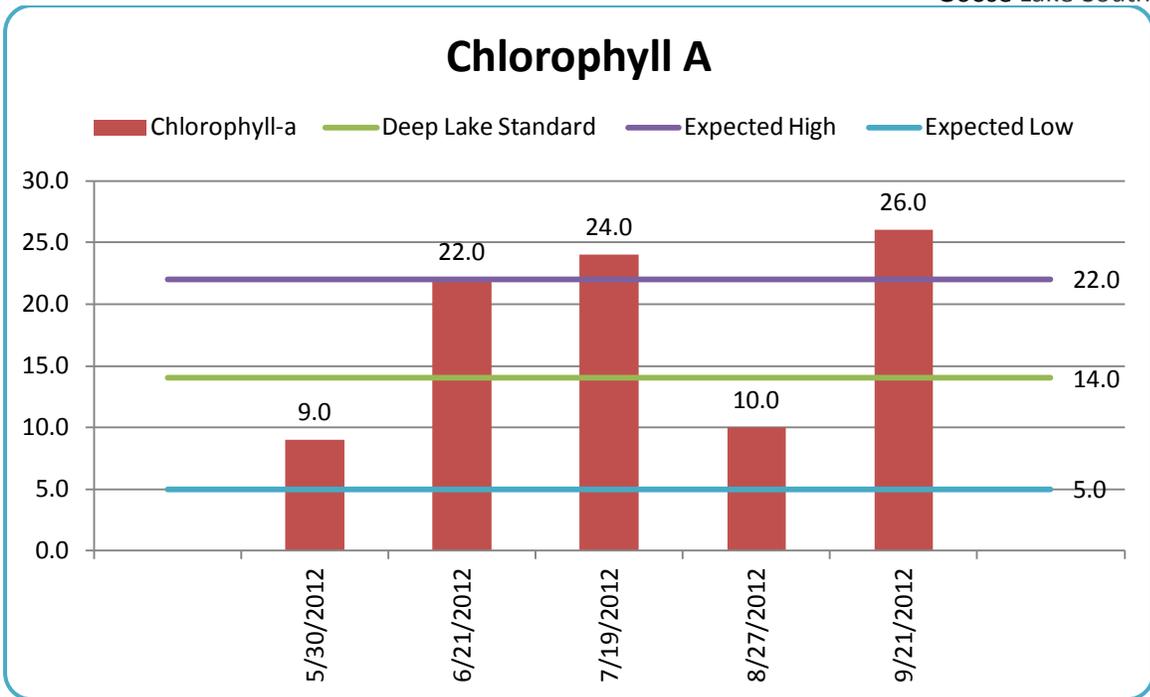
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Deep lake)	14.0 µg/L	>1.4 meters	40.0 µg/L	
2012 Average (June-Sept)	20.5 µg/L	1.4 meters	38.0 µg/L	
Meets Standard	No	Yes	Yes	Yes

Chlorophyll-a

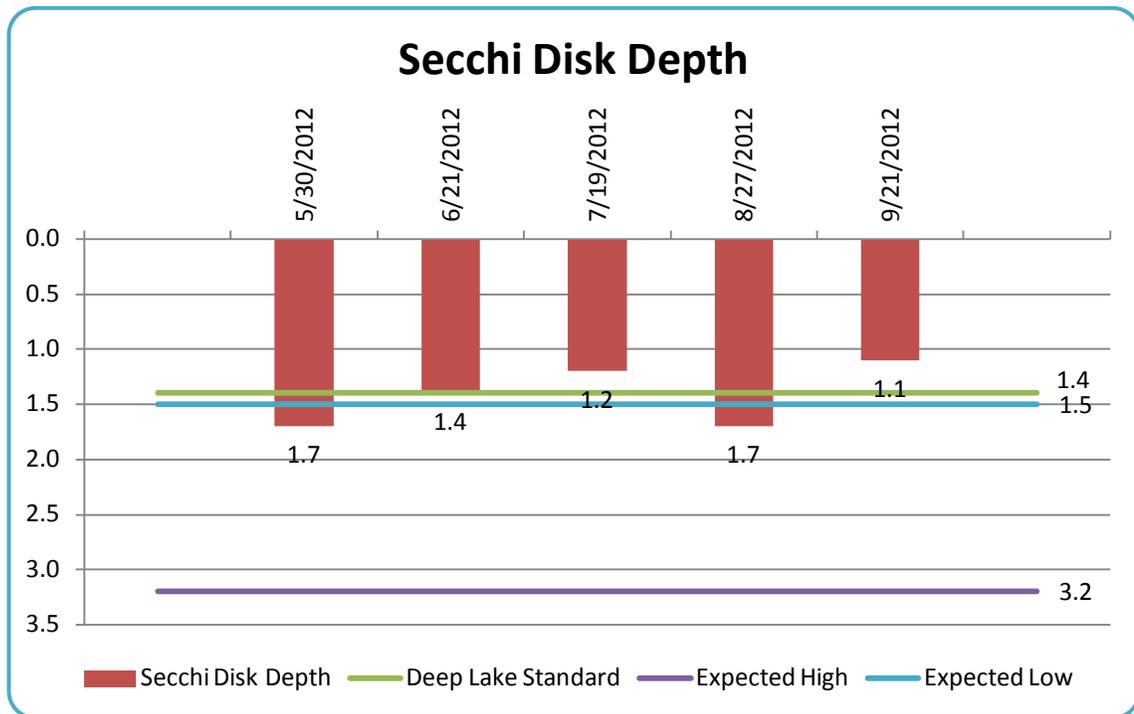
Expected Range:
5.0-22.0 µg/L

Deep Lake Standard:
14.0 µg/L

Three of five samples were above the standard. The average does not meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	18.2 µg/L
Grade				B
Average (June-Sept)	NO DATA	NO DATA	NO DATA	20.5 µg/L
Meets Standard (14.0 µg/L)				No



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Deep Lake Standard:
>1.4 meters

The average for this lake is right at the standard.

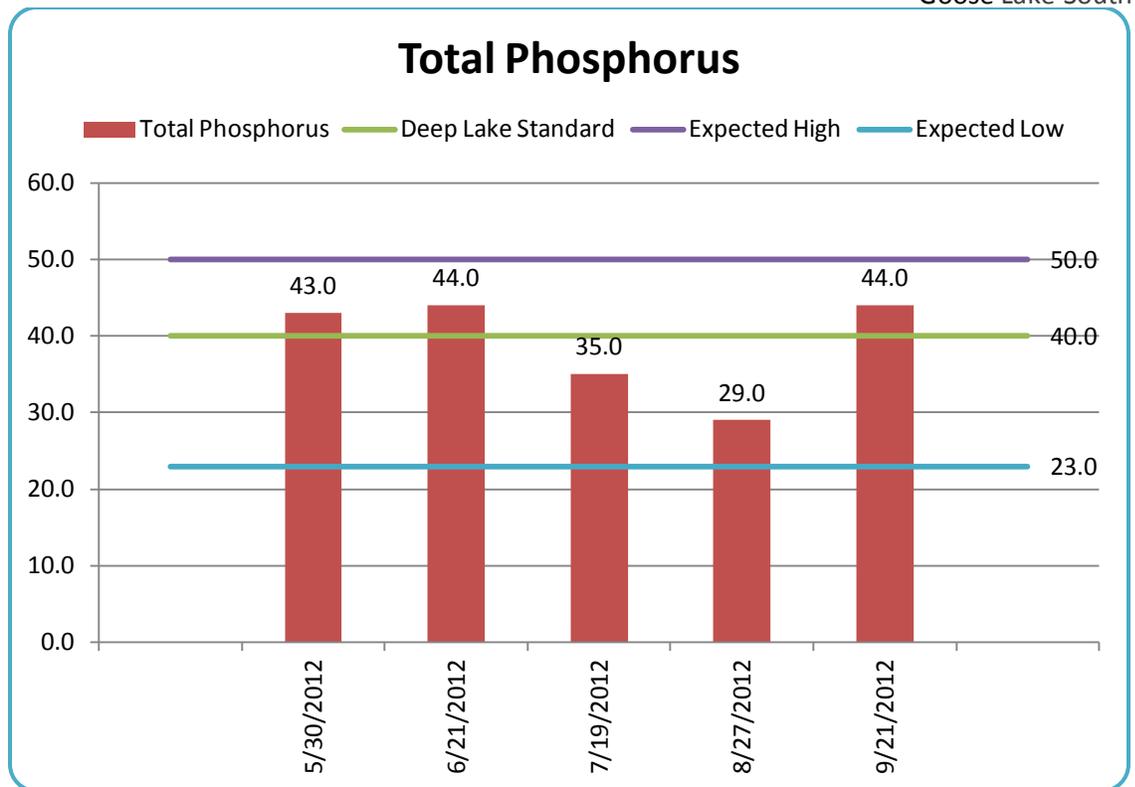
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	1.4 meters
Grade				C
Average (June-Sept)	NO DATA	NO DATA	NO DATA	1.4 meters
Meets Standard (>1.4 m)				Yes

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

Deep Lake Standard:
40.0 µg/L

Although three of five samples exceeded the standard, the average does meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	39.0 µg/L
Grade				C
Average (June-Sept)	NO DATA	NO DATA	NO DATA	38.0 µg/L
Meets Standard (40.0 µg/L)				Yes

Ammonia Nitrogen

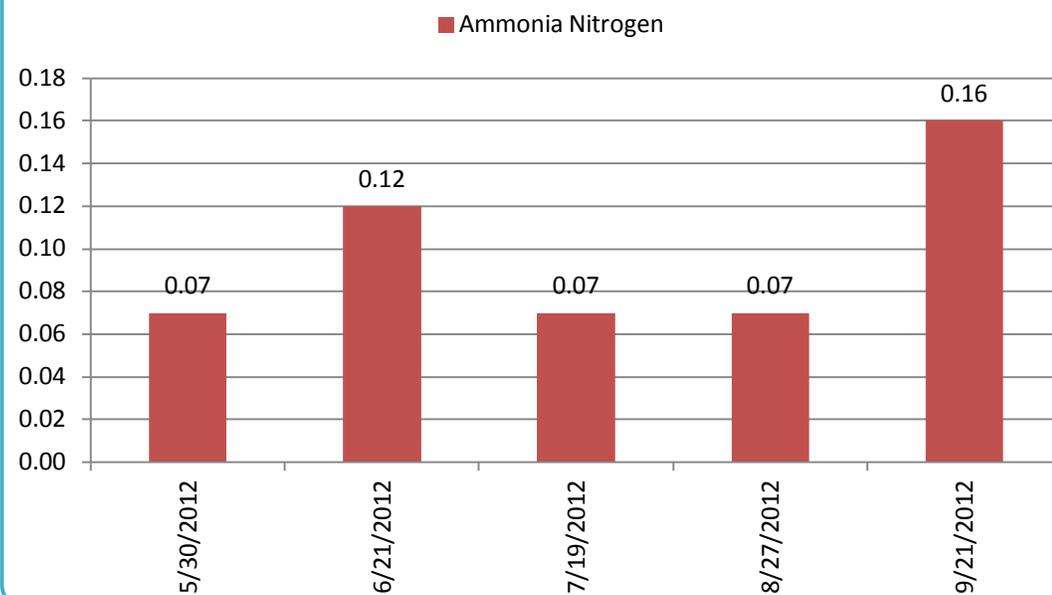
Ammonia Nitrogen

Expected Range: None

Deep Lake Standard: None

The June and September samples were elevated. These could be due to runoff events.

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	NO DATA	0.10 mg/L

Temperature

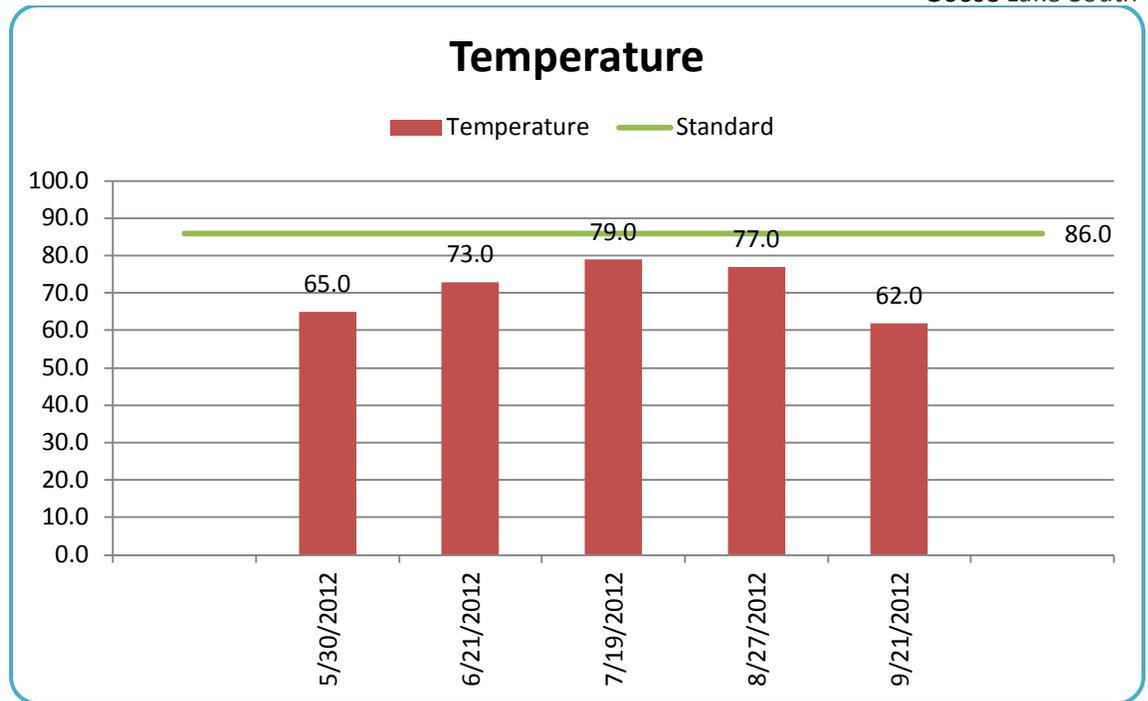
Expected Range:

None

Deep Lake Standard:

The daily average shall not exceed 86.0°F.

The temperatures met the standard.

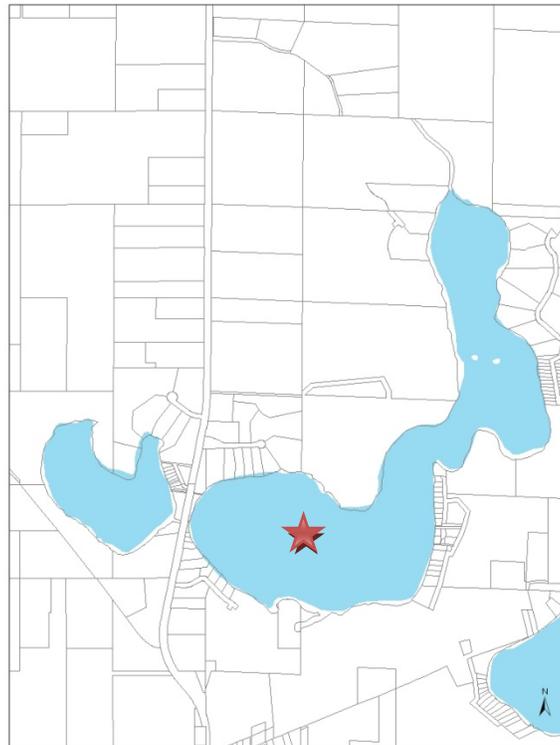


	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	NO DATA	71.2°F
Meets Standard (Not to exceed 86.0°F)				Yes

Goose Lake-South General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	GENERAL LAKE OBSERVATIONS/ AQUATIC INVASIVE SPECIES
May	2	2	Beach Grass	No notes.
June	2.5	2.5	Beach Grass	High water levels.
July	3	3	Beach Grass	No notes.
August	2.5	2.5	Beach Grass	No Eurasian watermilfoil observed. Lake level appears 2' lower than spring.
September	2.5	2.5	Cornucopia	No notes.

Horseshoe Lake



Deep Lake

Lake Classification: EUTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	60.0	53.6	59.7	57.8
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	20.0 µg/L	1.6 meters	47.0 µg/L		
Grade	B-C	C	C	C	9 th /19

MPCA Standards: Impaired

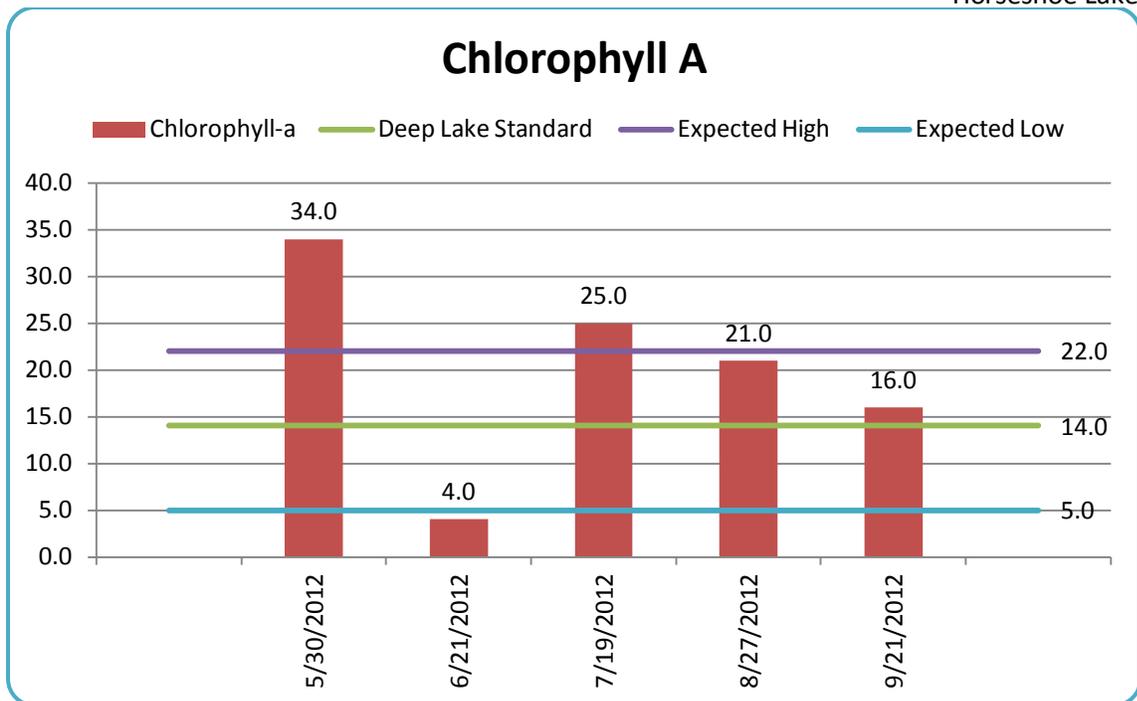
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Deep lake)	14.0 µg/L	>1.4 meters	40.0 µg/L	
2012 Average (June-Sept)	16.5 µg/L	1.7 meters	43.5 µg/L	
Meets Standard	No	Yes	No	No

Chlorophyll-a

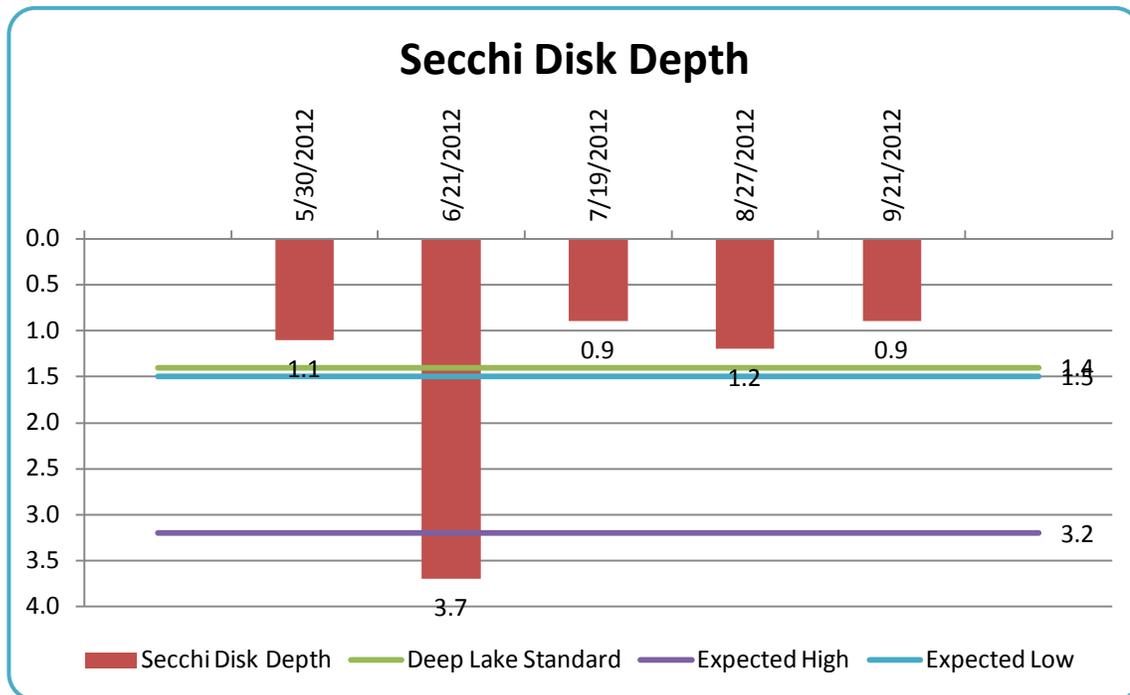
Expected Range:
5.0-22.0 µg/L

Deep Lake Standard:
14.0 µg/L

Four of five samples were above the standard. The average did not meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	20.0 µg/L
Grade				B-C
Average (June-Sept)	NO DATA	NO DATA	NO DATA	16.5 µg/L
Meets Standard (14.0 µg/L)				No



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Deep Lake Standard:
>1.4 meters

One extremely clear sample skews the average so that it meets the standard, although the other four samples do not meet the standard.

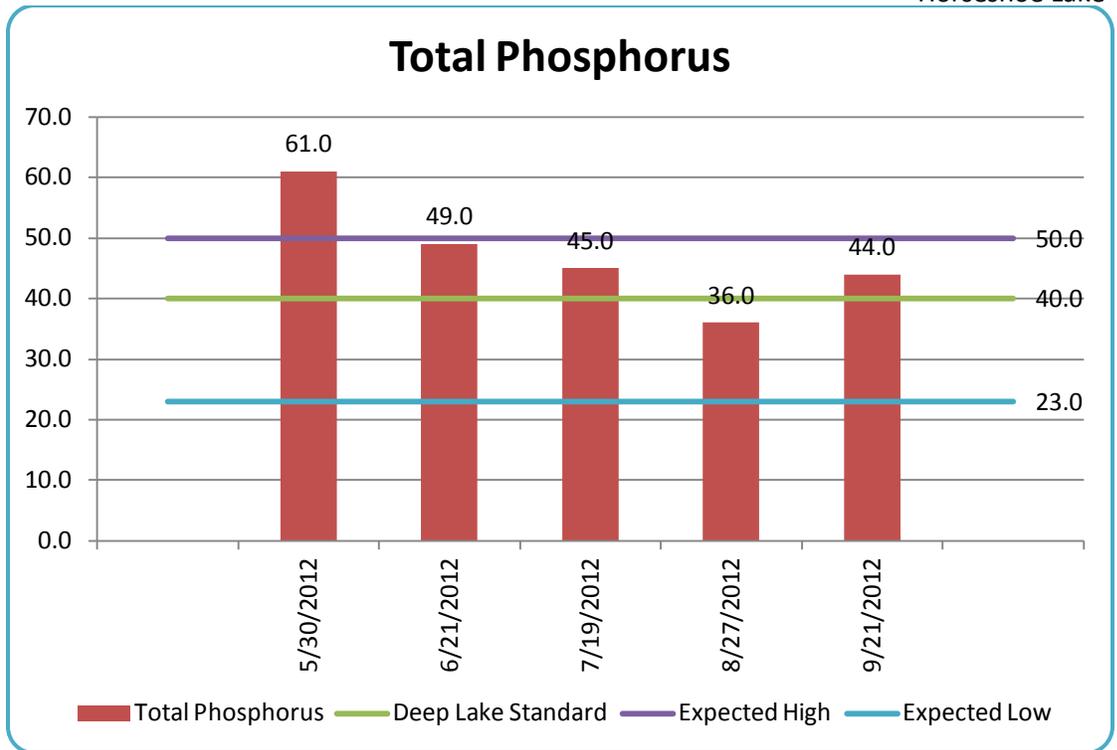
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	1.6 meters
Grade				C
Average (June-Sept)	NO DATA	NO DATA	NO DATA	1.7 meters
Meets Standard (>1.4 m)				Yes

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

Deep Lake Standard:
40.0 µg/L

Four of five samples, as well as the average, do not meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	47.0 µg/L
Grade				C
Average (June-Sept)	NO DATA	NO DATA	NO DATA	43.5 µg/L
Meets Standard (40.0 µg/L)				No

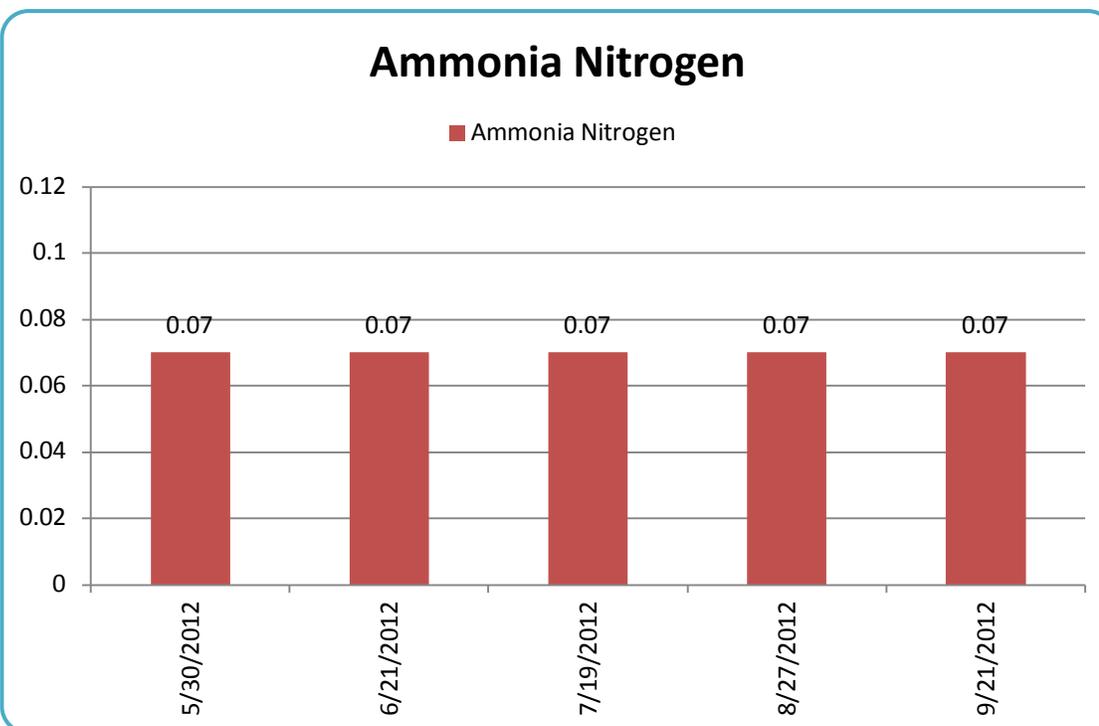
Ammonia Nitrogen

Ammonia Nitrogen

Expected Range: None

Deep Lake Standard: None

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	NO DATA	0.07 mg/L

Temperature

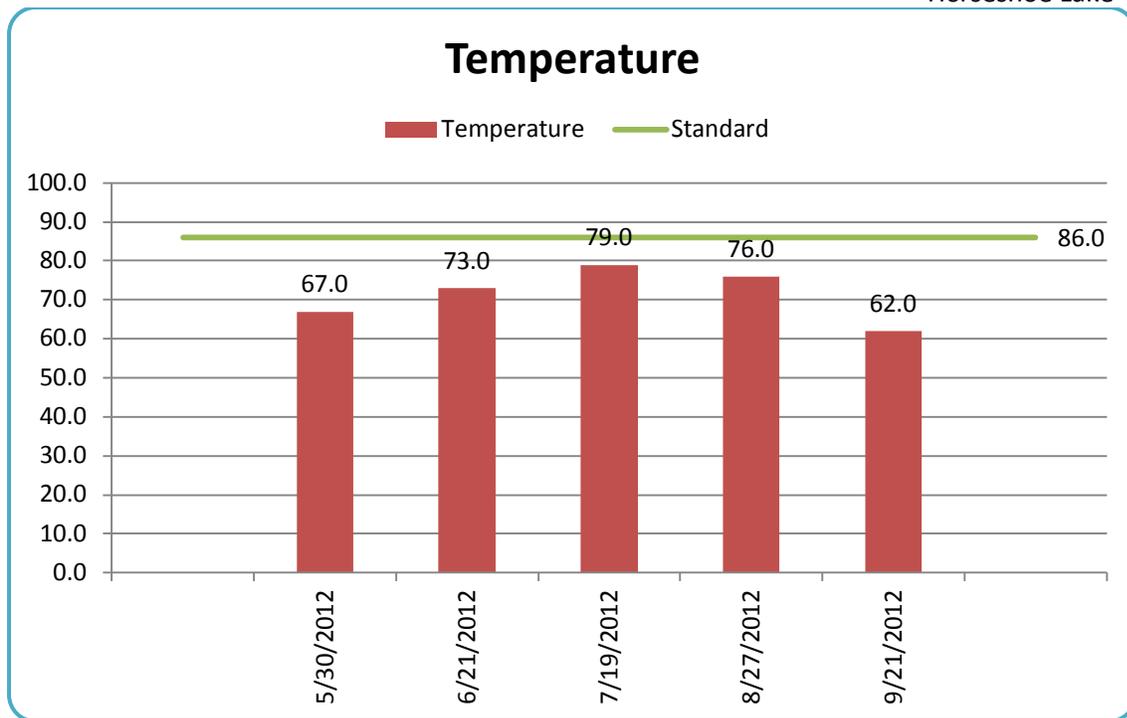
Expected Range:

None

Deep Lake Standard:

The daily average shall not exceed 86.0°F.

The temperatures met the standard.

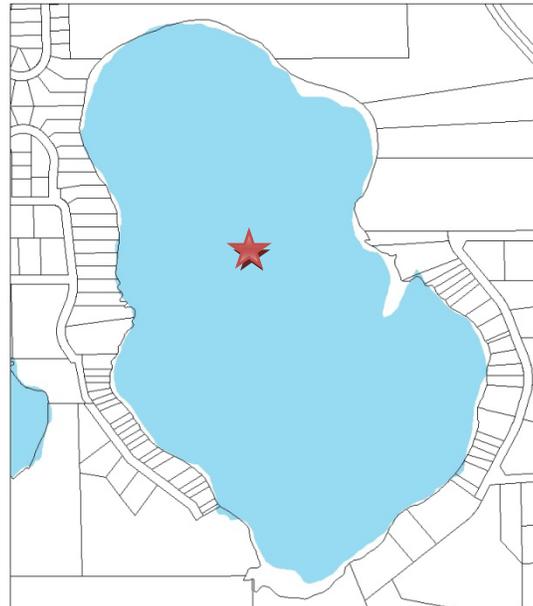


	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	NO DATA	71.4°F
Meets Standard (Not to exceed 86.0°F)				Yes

Horseshoe Lake General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	GENERAL LAKE OBSERVATIONS/ AQUATIC INVASIVE SPECIES
May	2.5	2.5	Cornichon	Curlyleaf pondweed surfacing and turions present. Filamentous algae in shallow areas.
June	2	2	Cornichon	High water levels, windy.
July	2.5	2.5	Beach Grass	No notes.
August	3	3	Parchment Paper	No Eurasian watermilfoil observed.
September	2.5	2.5	Parchment Paper	No notes.

Kroon Lake



Deep Lake

Lake Classification: EUTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	53.0	52.0	52.6	52.5
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	9.8 µg/L	1.7 meters	28.8 µg/L		
Grade	D	C	C	C	3 rd /19

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	
2012 Average (June-Sept)	11.3 µg/L	1.4 meters	30.5 µg/L	
Meets Standard	Yes	Yes	Yes	Yes

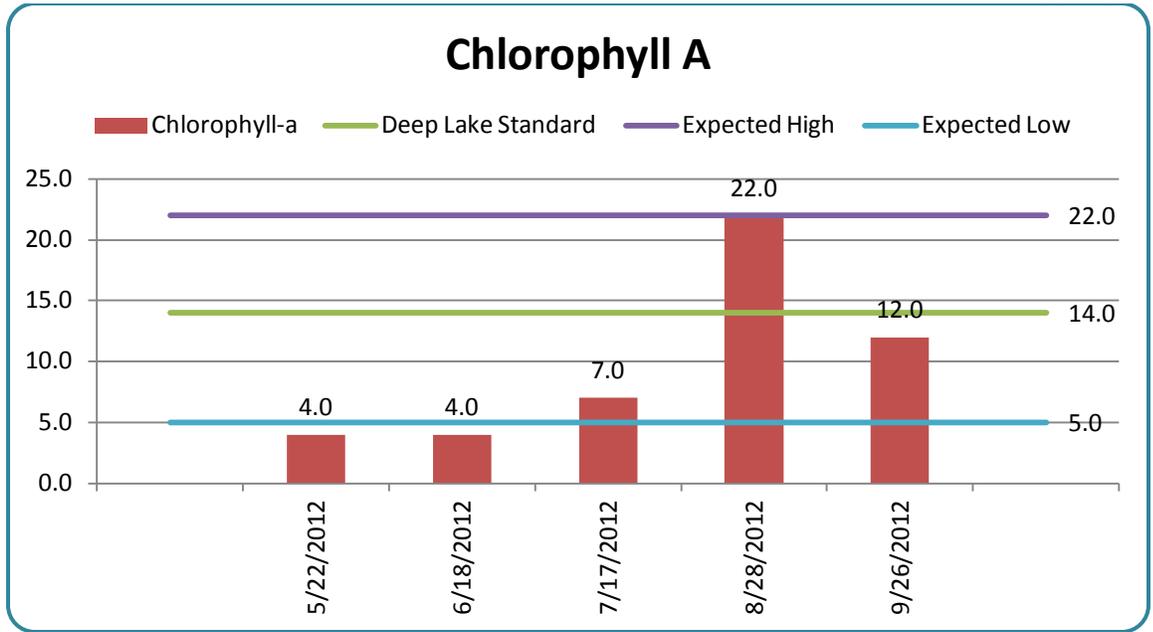
Chlorophyll-a

Expected Range:
5.0-22.0 µg/L

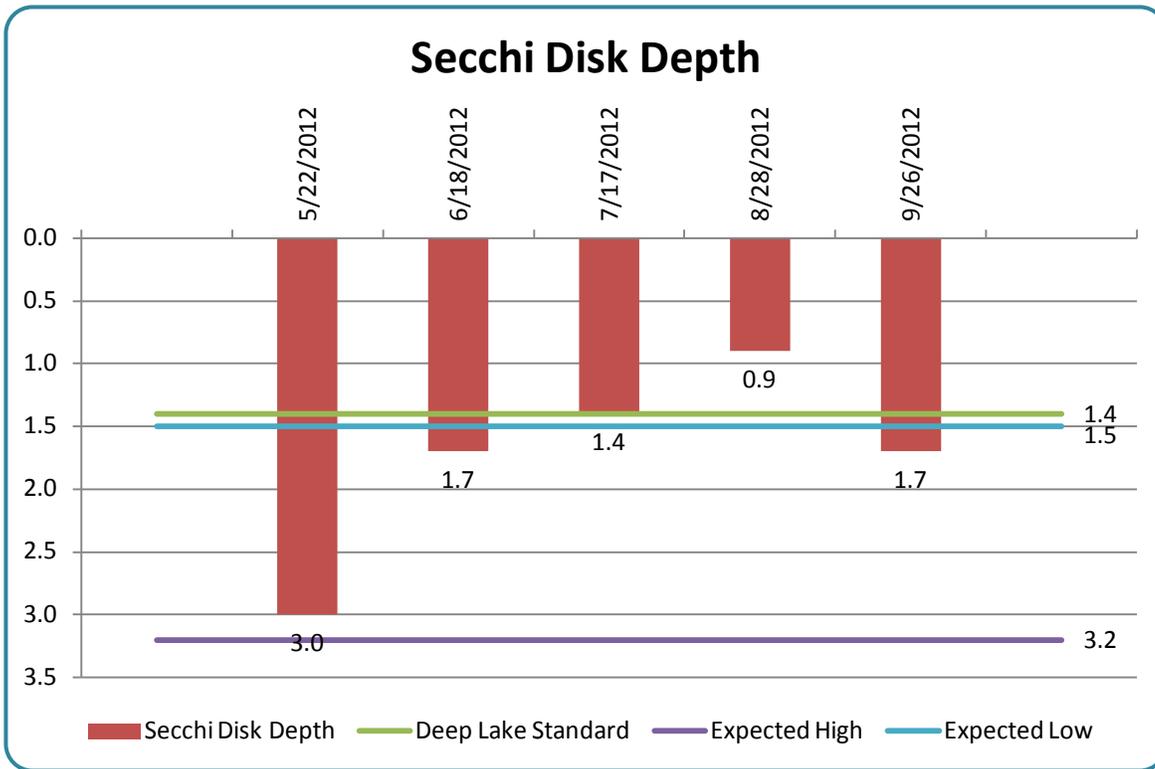
Deep Lake Standard:
14.0 µg/L

The average meets the standard.

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	10.8 µg/L	20.3 µg/L	8.6 µg/L	9.8 µg/L
Grade	B	C	A	A
Average (June-Sept)	13.6 µg/L	20.3 µg/L	10.0 µg/L	11.3 µg/L
Meets Standard (14.0 µg/L)	Yes	No	Yes	Yes



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Deep Lake Standard:
>1.4 meters

The samples varied widely over the year. The average is right at the cutoff to meet the standard.

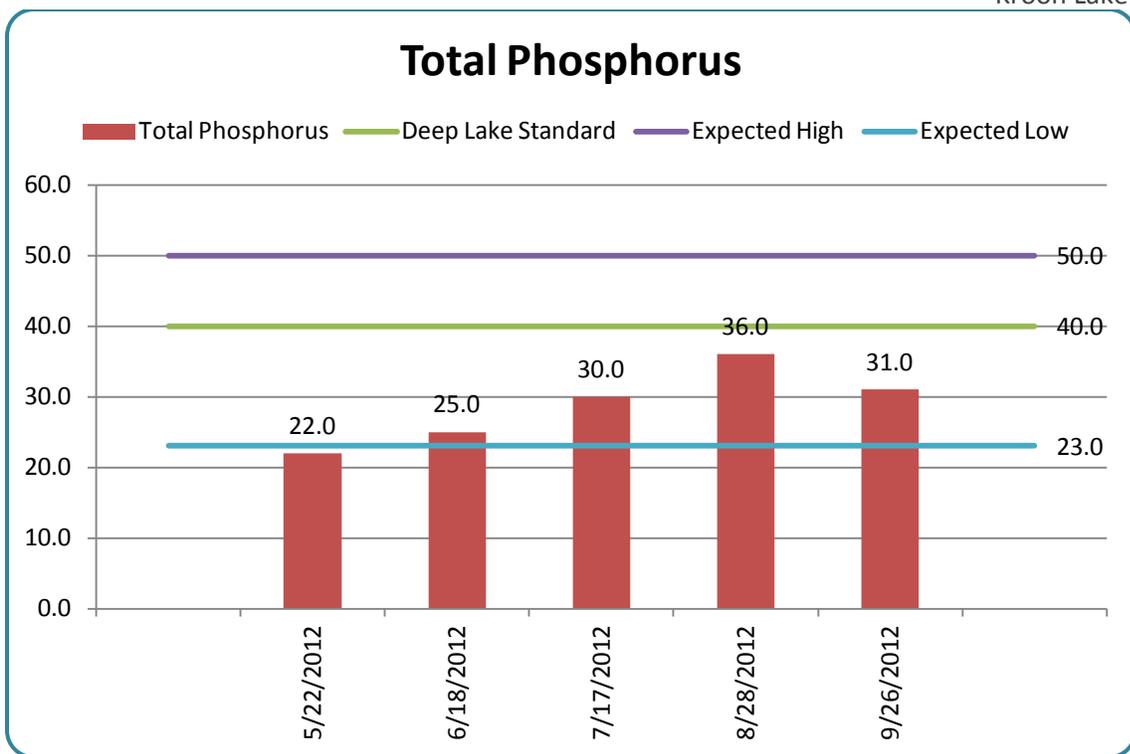
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	1.9 meters	1.7 meters	2.0 meters	1.7 meters
Grade	C	C	C	C
Average (June-Sept)	1.3 meters	1.7 meters	1.6 meters	1.4 meters
Meets Standard (>1.4 m)	No	Yes	Yes	Yes

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

Deep Lake Standard:
40.0 µg/L

All samples except for the May sample were within the expected range and the average met the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	35.0 µg/L	31.0 µg/L	35.6 µg/L	28.8 µg/L
Grade	C	B	C	B
Average (June-Sept)	37.0 µg/L	31.0 µg/L	38.3 µg/L	30.5 µg/L
Meets Standard (40.0 µg/L)	Yes	Yes	Yes	Yes

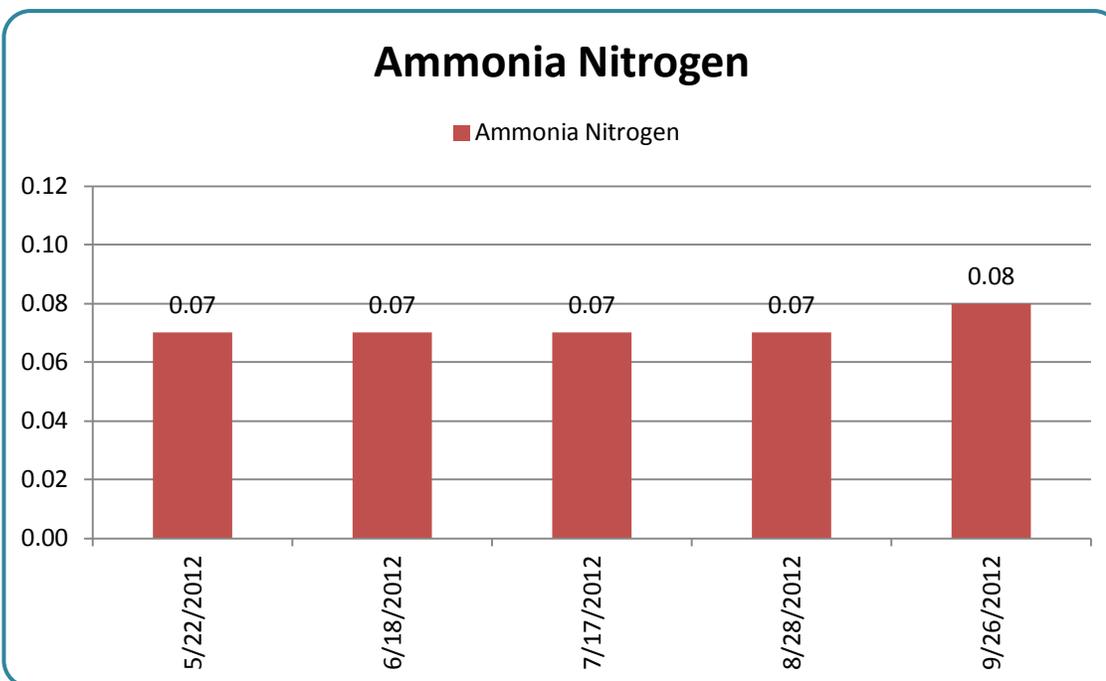
Ammonia Nitrogen

Ammonia Nitrogen

Expected Range: None

Deep Lake Standard: None

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	0.09 mg/L	<0.05 mg/L	0.08 mg/L	0.07 mg/L

Temperature

Expected Range:

None

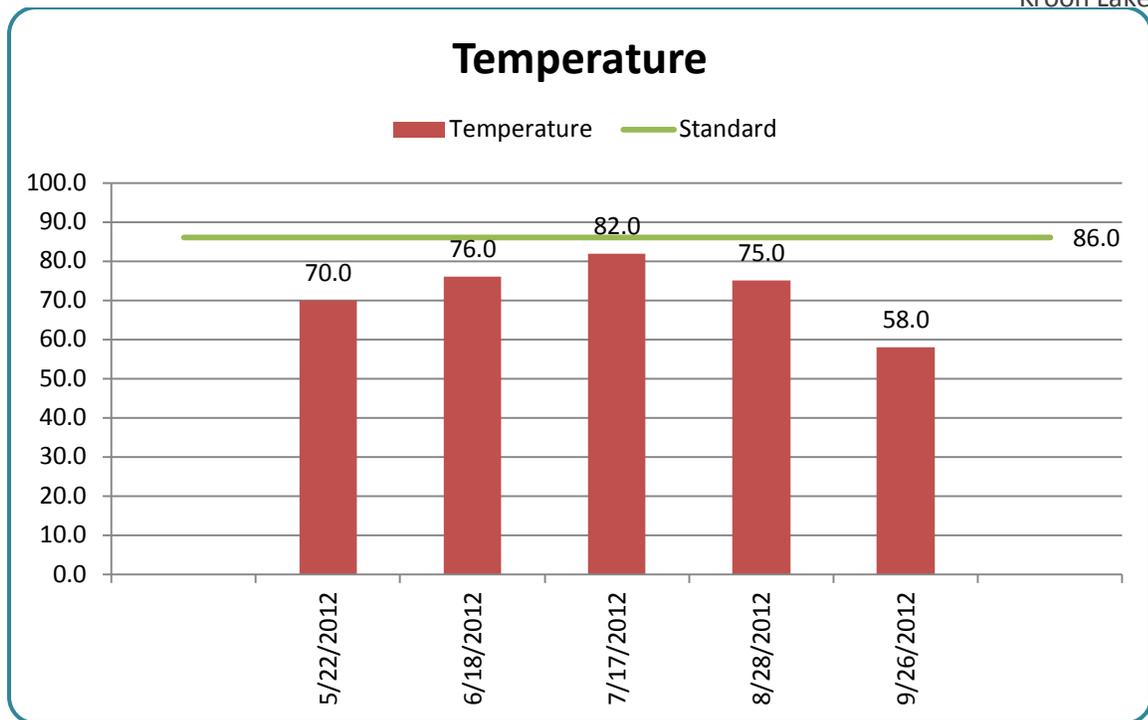
Deep Lake Standard:

The daily average

shall not exceed

86.0°F

All temperatures met the standard.

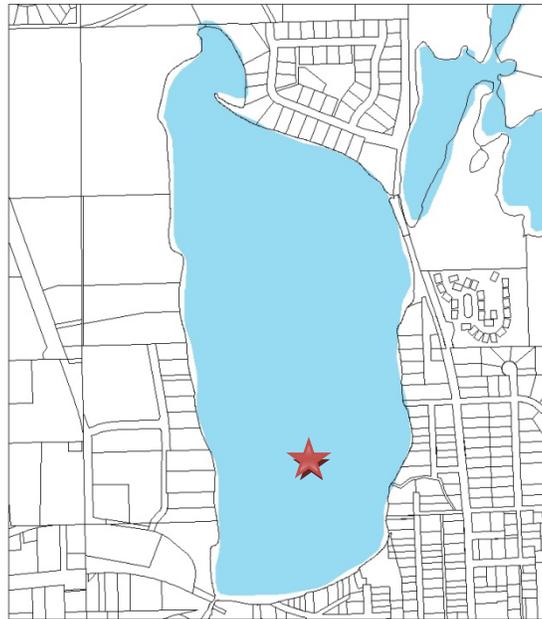


	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	73.3 °F	NO DATA	64.0 °F	72.2 °F
Meets Standard (Not to exceed 86.0°F)	Yes		Yes	Yes

Kroon Lake General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	GENERAL LAKE OBSERVATIONS/ AQUATIC INVASIVE SPECIES
May	2	2	Dried Chamomile	Curlyleaf, flat stem, and Illinois pondweeds in South Bay.
June	2.5	2.5	Chop Stick	Curlyleaf pondweed and filamentous algae in shallow areas.
July	2.5	2.5	Short Bread	Curlyleaf pondweed gone; no Eurasian watermilfoil sited.
August	2.5	2.5	Eider Down	Aquatic vegetation pressure reduced from previous years.
September	2.5	2.5	Parchment Paper	No notes.

North Lindstrom Lake



Deep Lake

Lake Classification: EUTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	61.4	51.4	53.0	55.2
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	29.6 µg/L	1.8 meters	23.0 µg/L		
Grades	B	C	C	C	5 th /19

MPCA Standards: Meets standards

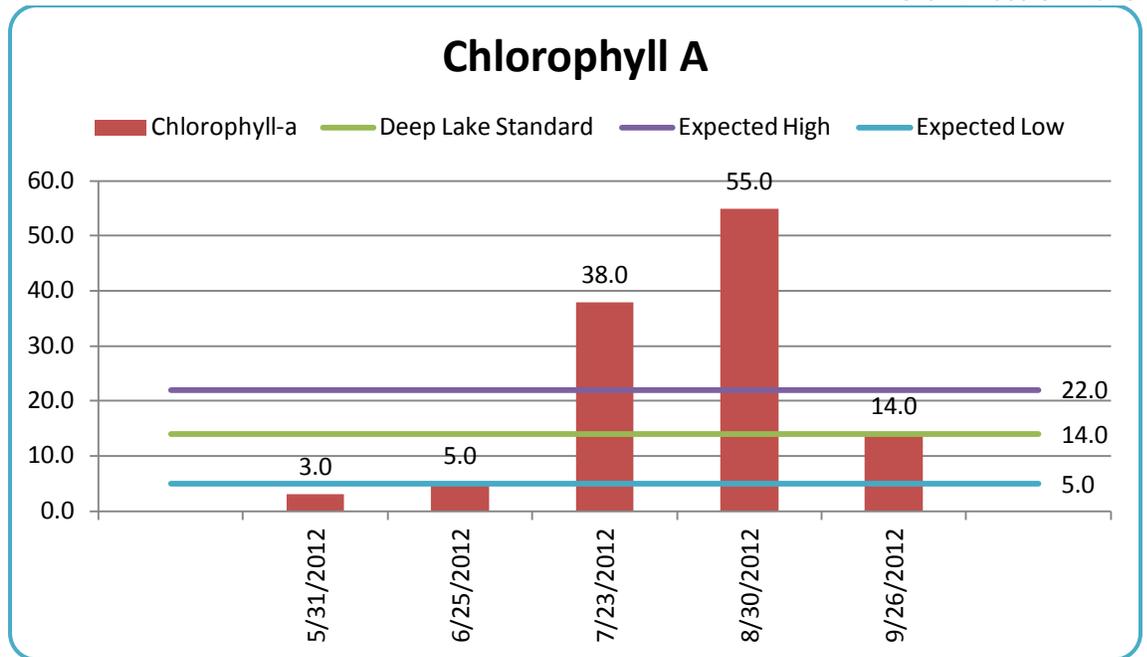
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Deep lake)	14.0 µg/L	>1.4 meters	40.0 µg/L	
2012 Average (June-Sept)	28.0 µg/L	1.6 meters	28.0 µg/L	
Meets Standard	No	Yes	Yes	Yes

Chlorophyll-a

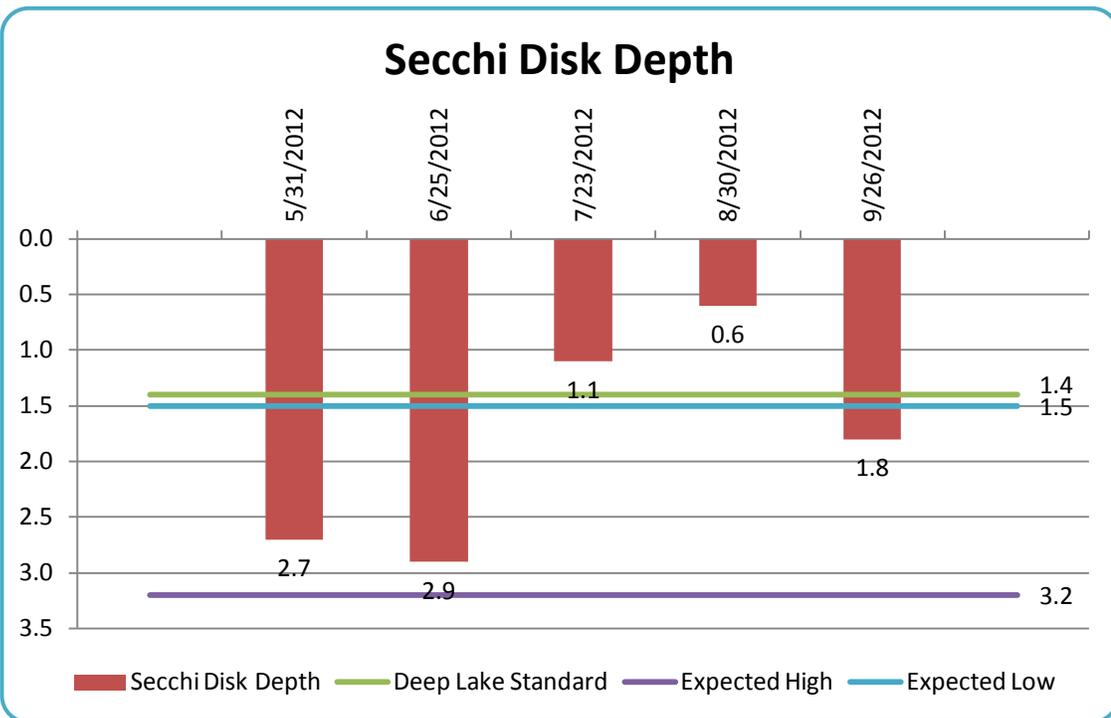
Expected Range:
5.0-22.0 µg/L

Deep Lake Standard:
14.0 µg/L

Two samples were above the standard and one was right at the standard. The overall average does not meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	14.0 µg/L	17.7 µg/L	9.4 µg/L	23.0 µg/L
Grade	B	B	A	C
Average (June-Sept)	15.6 µg/L	19.6 µg/L	11.5 µg/L	28.0 µg/L
Meets Standard (14.0 µg/L)	No	No	Yes	No



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Deep Lake Standard:
>1.4 meters

Water clarity is very good at the beginning of the season, but falls below standard during the summer. However, the overall average does meet the standard.

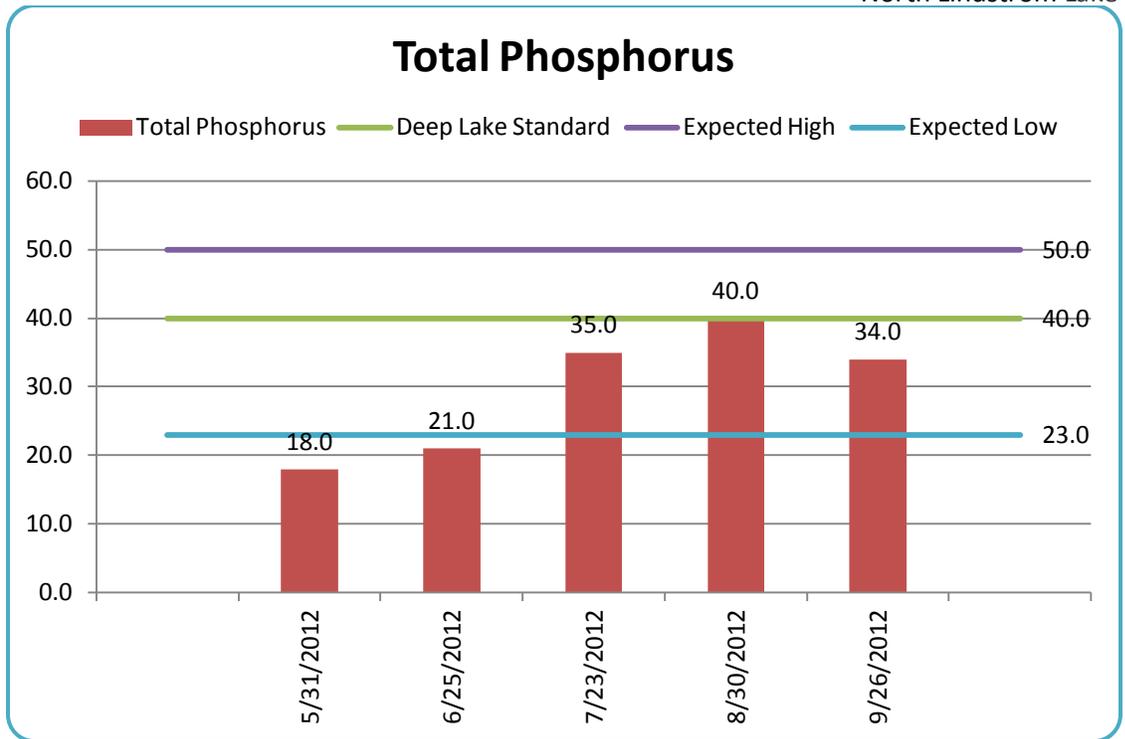
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	2.0 meters	2.1 meters	2.8 meters	1.8 meters
Grade	C	C	B	C
Average (June-Sept)	1.5 meters	2.1 meters	2.5 meters	1.6 meters
Meets Standard (>1.4 m)	Yes	Yes	Yes	Yes

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

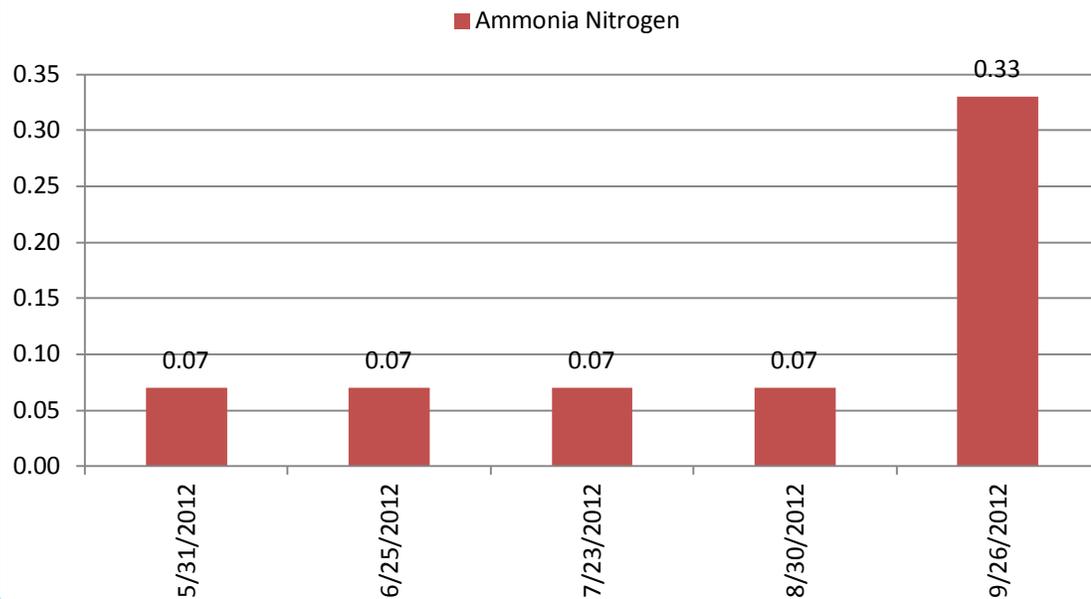
Deep Lake Standard:
40.0 µg/L

Early season samples were low and July through September samples were within the expected range. The average meets the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	33.0 µg/L	34.0 µg/L	25.0 µg/L	29.6 µg/L
Grade	C	C	B	B
Average (June-Sept)	32.0 µg/L	33.0 µg/L	26.0 µg/L	32.5 µg/L
Meets Standard (40.0 µg/L)	Yes	Yes	Yes	Yes

Ammonia Nitrogen



Ammonia Nitrogen

Expected Range: None

Deep Lake Standard: None

The September sample was elevated. This could be caused by agricultural or urban runoff events or failing septic systems.

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

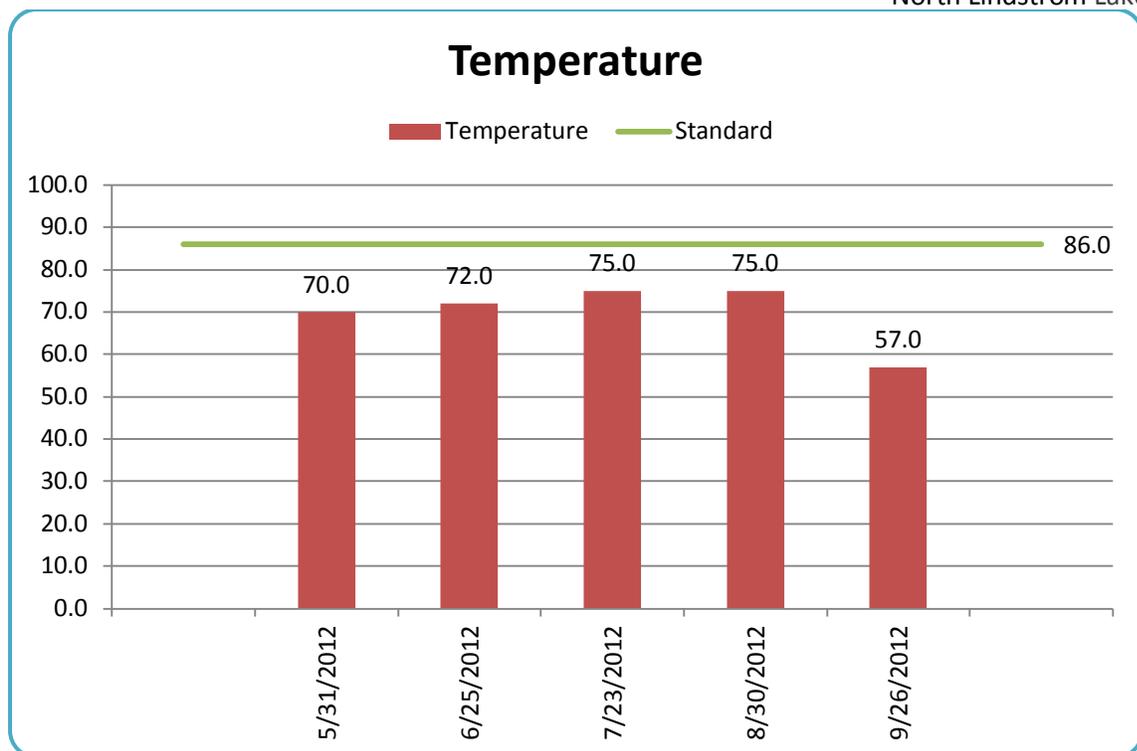
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	0.1 mg/L	0.1 mg/L	0.05 mg/L	0.12 mg/L

Temperature

Expected Range:
None

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

The temperatures meet the standard.

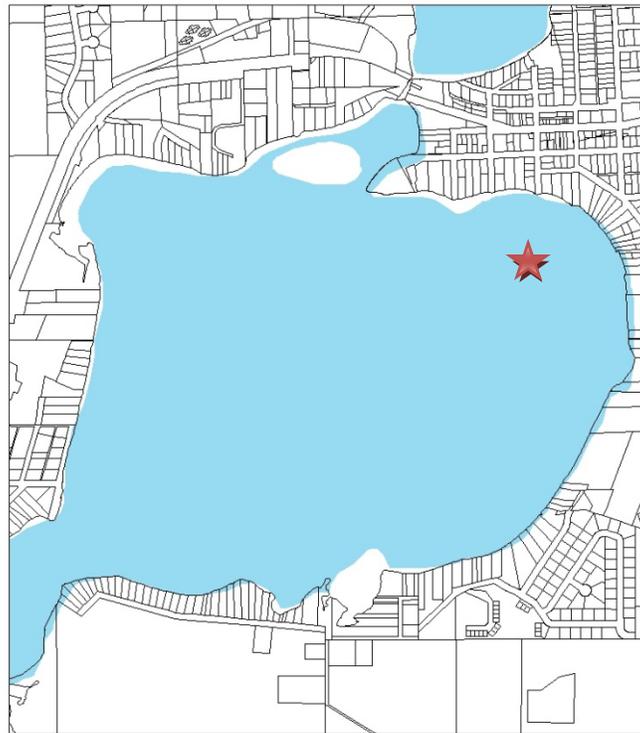


	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	65.8 °F	69.8°F
Meets Standard (Not to exceed 86.0°F)			Yes	Yes

North Lindstrom Lake General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	GENERAL LAKE OBSERVATIONS/ AQUATIC INVASIVE SPECIES
May	2	2	Chopstick	Eurasian watermilfoil along edges and shallow areas.
June	2	2	Toasted Marshmallow	Eurasian watermilfoil, cabbage, filamentous algae along shoreline areas.
July	3	3	Sultana	Eurasian watermilfoil along shallow edges.
August	3	3	Beach Grass	No notes.
September	2.5	2.5	Short Bread	No notes.

South Lindstrom Lake



Deep Lake

Lake Classification: EUTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	65.9	54.0	61.4	60.3
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	35.0 µg/L	1.5 meters	53.0 µg/L		
Grade	D	C	C	C	11 th /19

MPCA Standards: Does Not Meet Standards

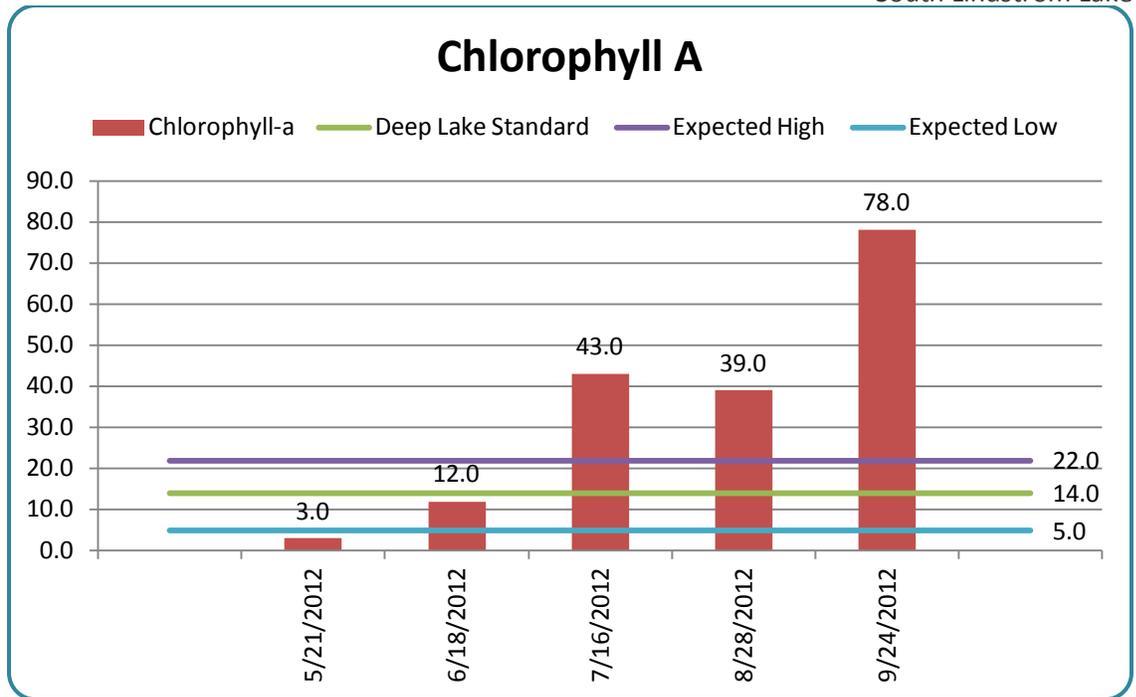
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Deep lake)	14.0 µg/L	>1.4 meters	40.0 µg/L	
2012 Average (June-Sept)	43.0 µg/L	1.1 meters	61.8 µg/L	
Meets Standard	No	No	No	No

Chlorophyll-a

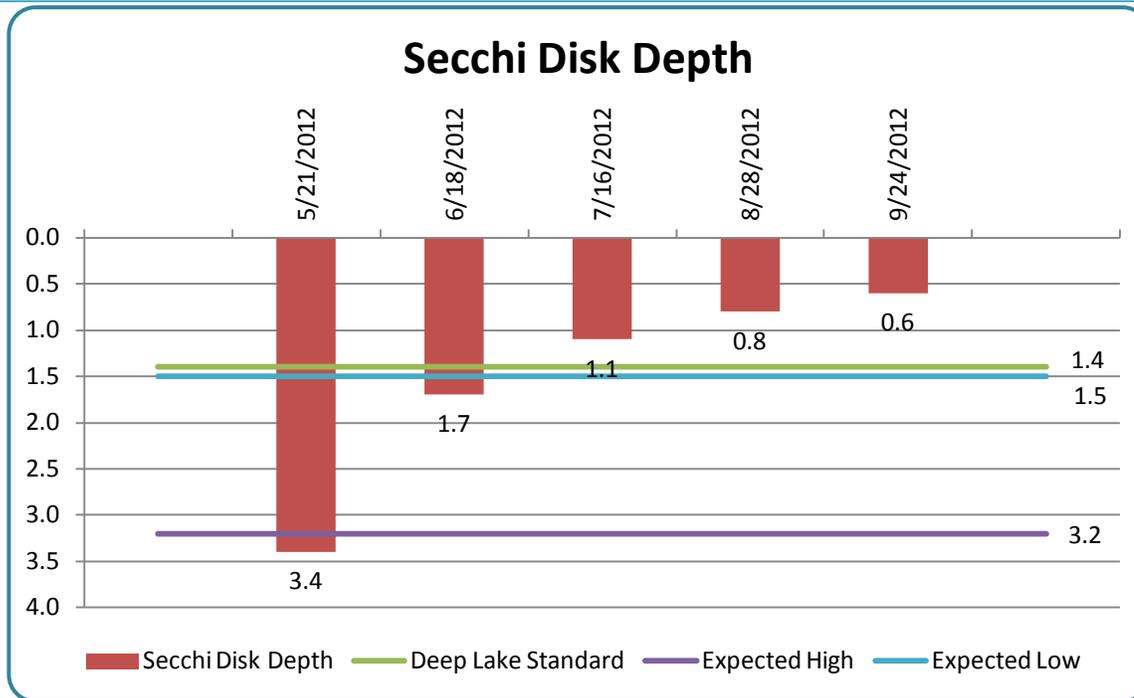
Expected Range:
5.0-22.0 µg/L

Deep Lake Standard:
14.0 µg/L

Late season samples were substantially higher than the standard. The average reading did not meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	11.8 µg/L	20.0 µg/L	11.2 µg/L	35.0 µg/L
Grade	B	B	B	C
Average (June-Sept)	13.2 µg/L	20.0 µg/L	13.8 µg/L	43.0 µg/L
Meets Standard (14.0 µg/L)	Yes	No	Yes	No



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Deep Lake Standard:
>1.4 meters

For the first time in the past four years, the clarity in this lake did not meet the standard.

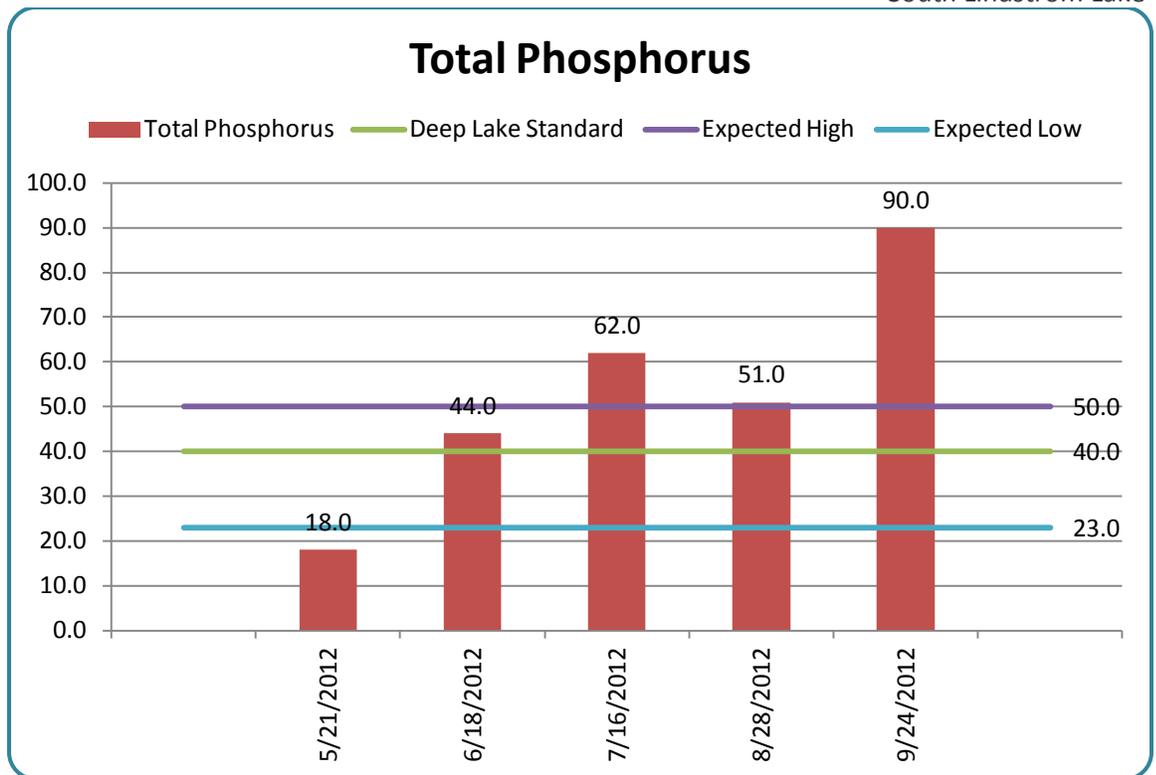
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	3.3 meters	1.9 meters	2.3 meters	1.5 meters
Grade	A	C	B	C
Average (June-Sept)	2.9 meters	1.9 meters	1.9 meters	1.1 meters
Meets Standard (>1.4 m)	Yes	Yes	Yes	No

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

Deep Lake Standard:
40.0 µg/L

Most of the samples exceeded the standard. The average does not meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	26.0 µg/L	38.0 µg/L	34.6 µg/L	53.0 µg/L
Grade	B	C	C	C
Average (June-Sept)	27.0 µg/L	38.0 µg/L	38.5 µg/L	61.8 µg/L
Meets Standard (40.0 µg/L)	Yes	Yes	Yes	No

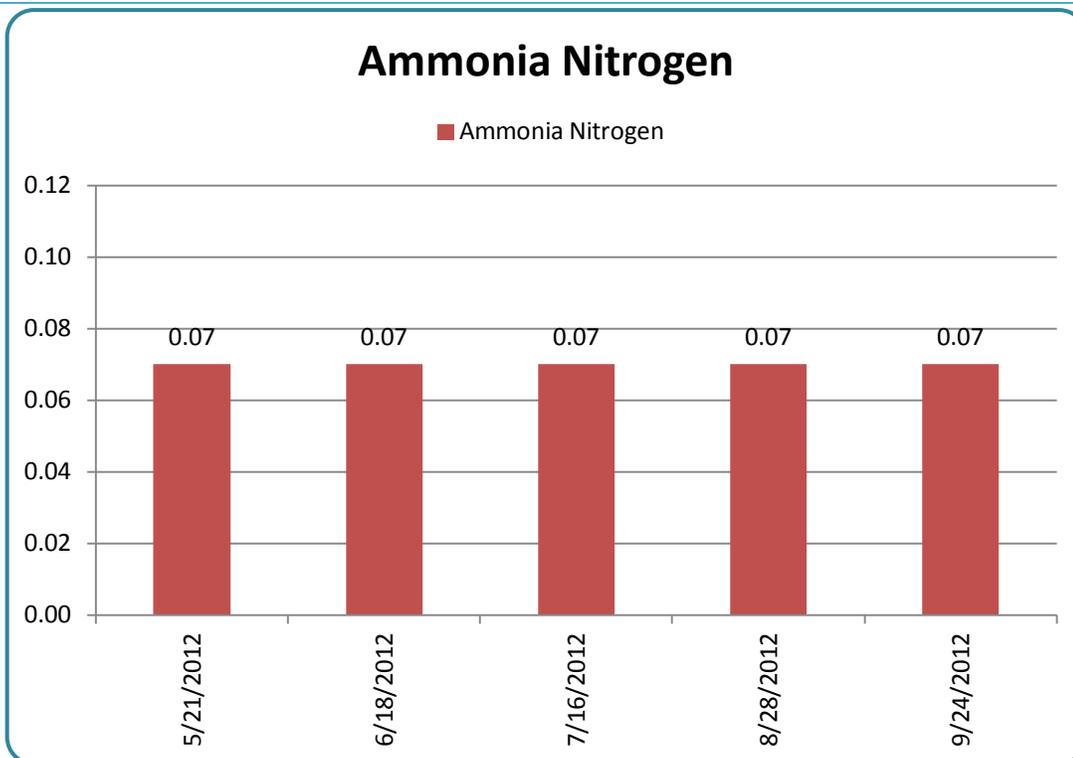
Ammonia Nitrogen

Ammonia Nitrogen

Expected Range: None

Deep Lake Standard: None

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



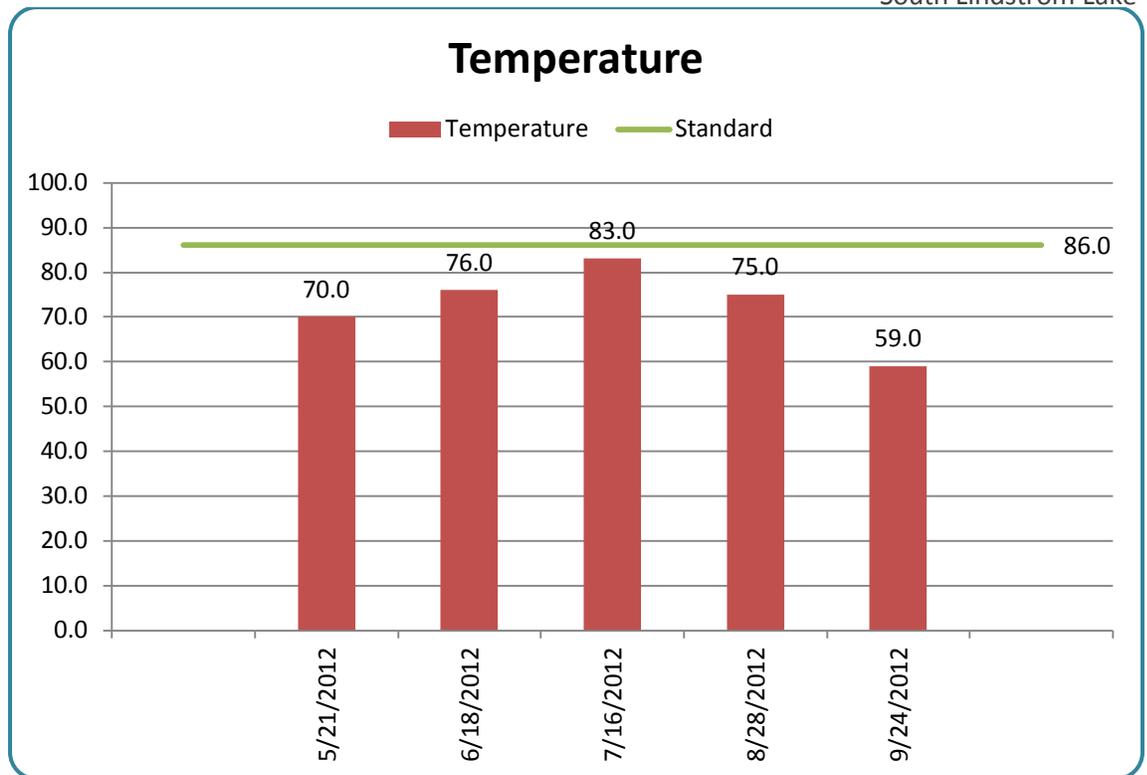
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	<0.05 mg/L	<0.05 mg/L	0.03 mg/L	0.07 mg/L

Temperature

Expected Range:
None

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

All temperatures were below the standard.

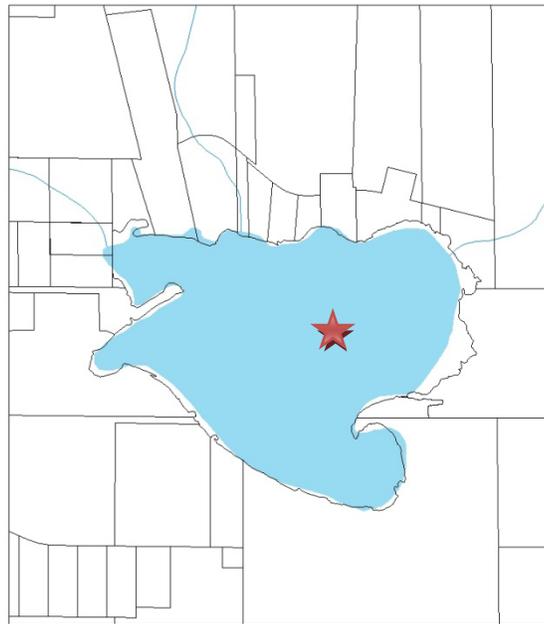


	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	73.2 °F	72.5 °F	66.2 °F	72.6 °F
Meets Standard (Not to exceed 86.0°F)	Yes	Yes	Yes	Yes

South Lindstrom Lake General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	GENERAL LAKE OBSERVATIONS/ AQUATIC INVASIVE SPECIES
May	2	2	Eider Down	Beautiful. Curlyleaf pondweed surfacing near Lindstrom Beach.
June	2.5	2.5	Beach Grass	Eurasian watermilfoil near Highway 8 bridge.
July	2.5	2.5	Cornichon	Curlyleaf Pondweed gone. Low levels of Eurasian watermilfoil.
August	3.5	3.5	Bay Leaf	Algae bloom forming in channel between South Lindstrom and Chisago Lakes.
September	3	3	Beach Grass	Putting in North Lindstrom/South Lindstrom bridge; low water levels.

Little Lake



Deep Lake

Lake Classification: EUTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	68.8	59.2	69.4	65.8
Classification	Hypereutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: D

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	49.0 µg/L	1.1 meters	92.0 µg/L		
Grades	D	D	D	D	16 th /19

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	
2012 (June-Sept)	60.3 µg/L	0.9 meters	102.5 µg/L	
Meets Standard	No	No	No	No

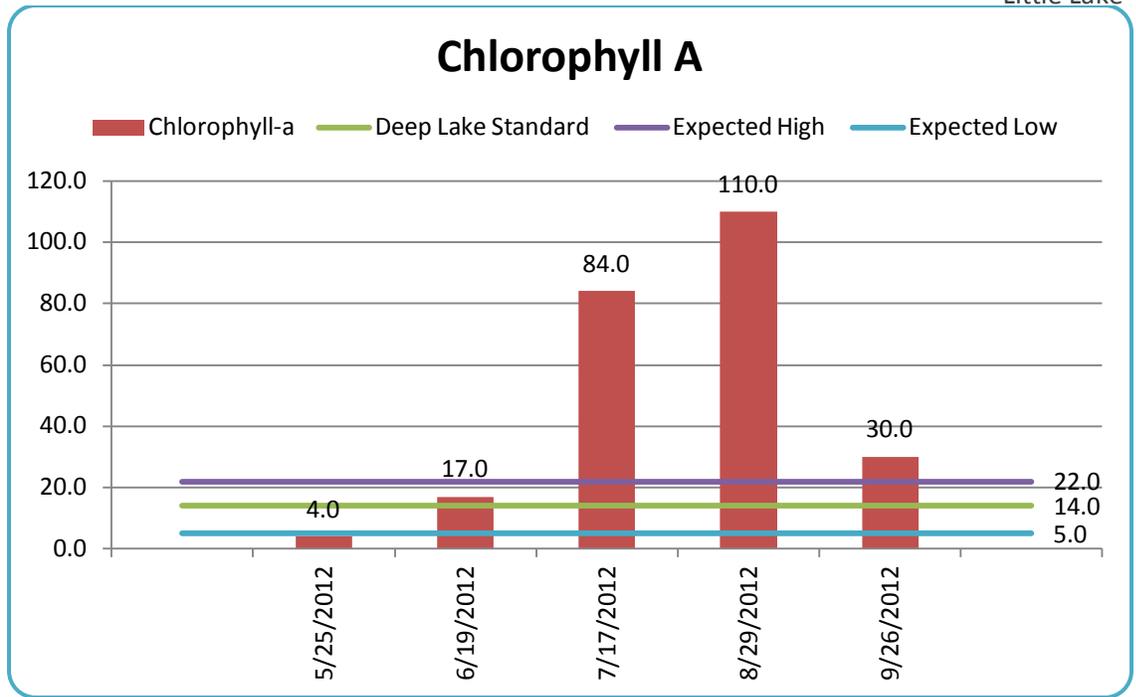
Chlorophyll-a

Expected Range:
5.0-22.0 µg/L

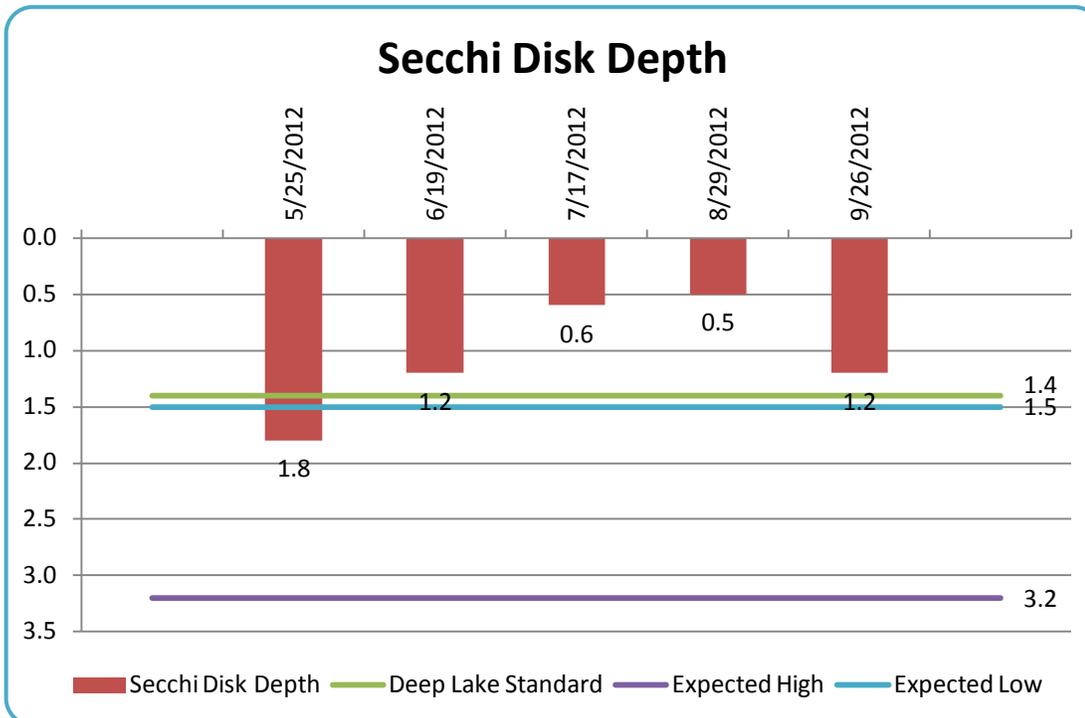
Deep Lake Standard:
14.0 µg/L

Four of five readings exceed the standard, with the July and August samples reading very high.

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	43.2 µg/L	49.0 µg/L
Grade			C	D
Average (June-Sept)	NO DATA	NO DATA	52.5 µg/L	60.3 µg/L
Meets Standard (14.0 µg/L)			No	No



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Deep Lake Standard:
>1.4 meters

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

	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	1.2 meters	1.8 meters
Grade			C-D	D
Average (June-Sept)	NO DATA	NO DATA	0.9 meters	0.9 meters
Meets Standard (>1.4 m)			No	No

Total Phosphorus

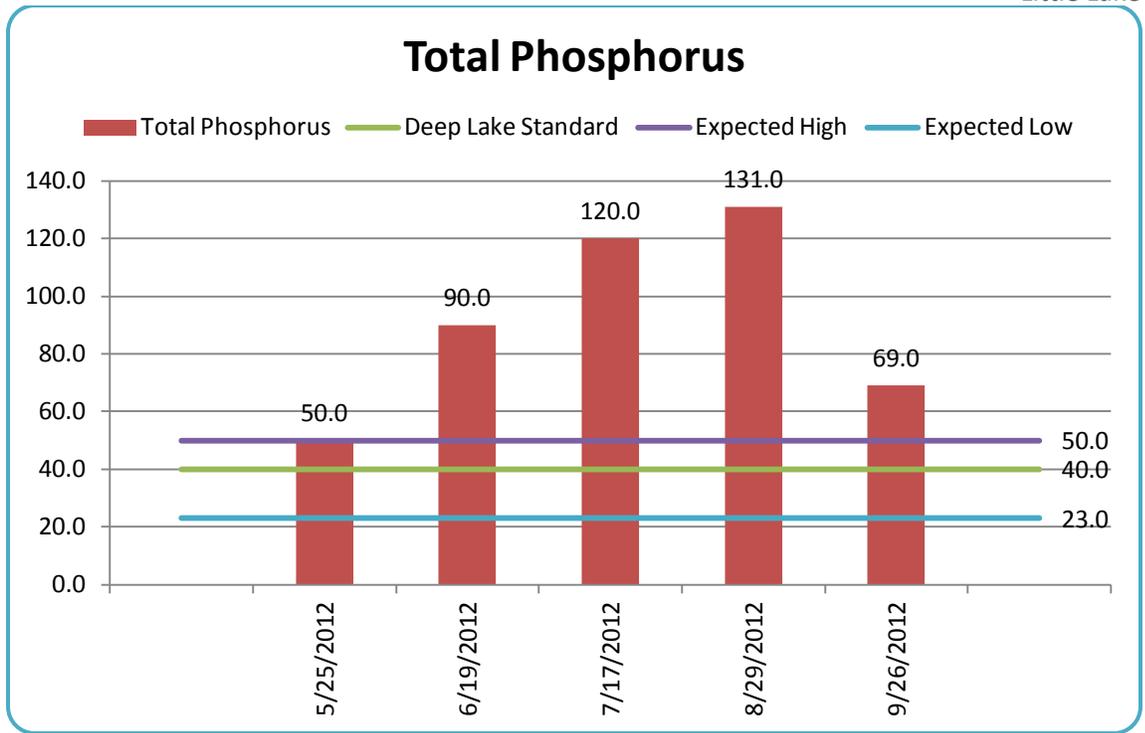
Expected Range:

23.0-50.0 µg/L

Deep Lake Standard:

40.0 µg/L

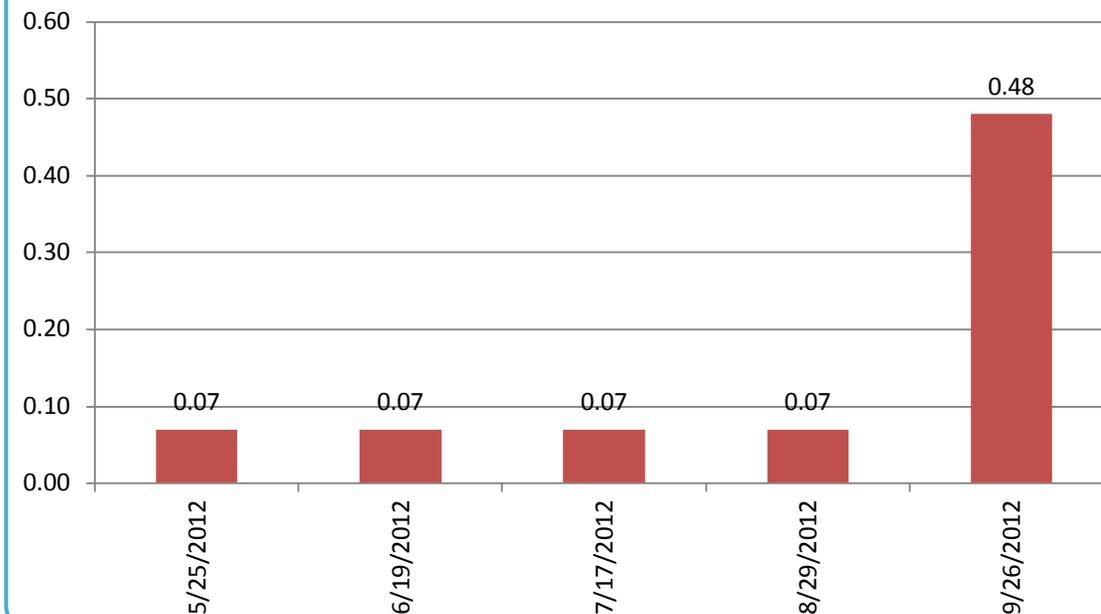
The readings are extremely high. This lake does not meet the standard. No samples were below the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	117.0 µg/L	92.0 µg/L
Grade			D	D
Average (June-Sept)	NO DATA	NO DATA	125.5 µg/L	102.5 µg/L
Meets Standard (60.0 µg/L)			No	No

Ammonia Nitrogen

Ammonia Nitrogen



Ammonia Nitrogen

Expected Range: None

Shallow Lake Standard: None

Samples were low except for the September sample. This could be explained by agricultural runoff or a failing septic system.

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

	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	0.24 mg/L	0.15mg/L

Temperature

Expected Range:

None

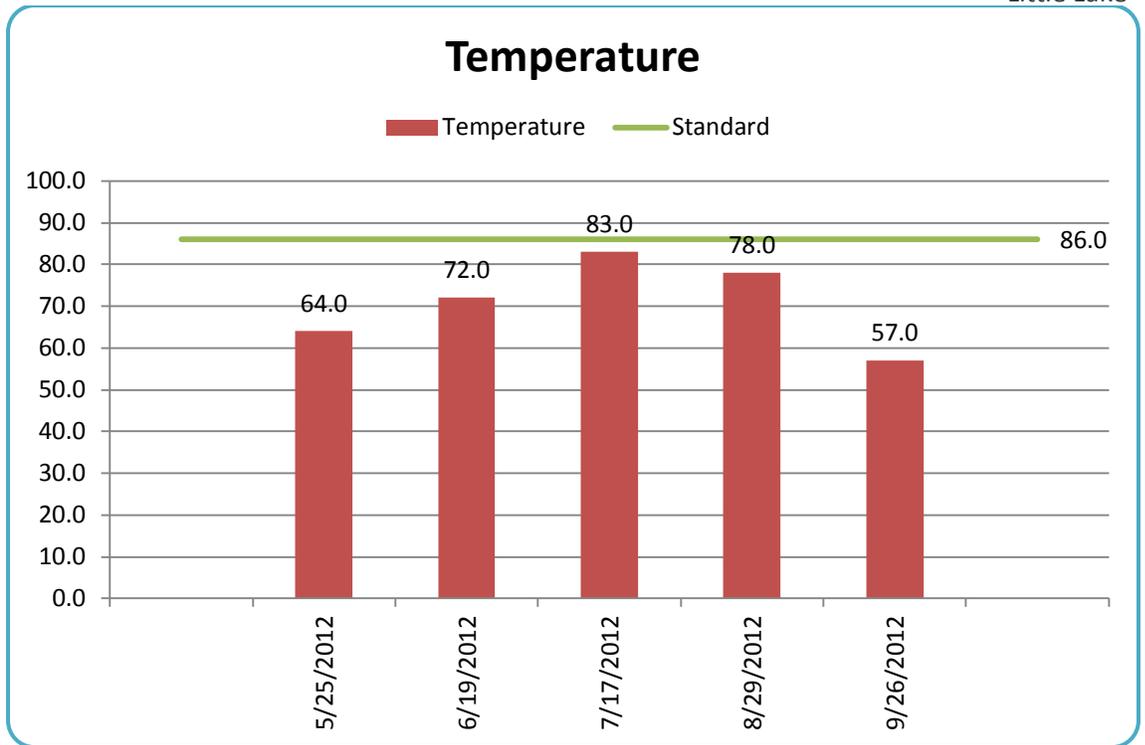
Deep Lake Standard:

The daily average

shall not exceed

86.0°F

The temperatures meet the standard.

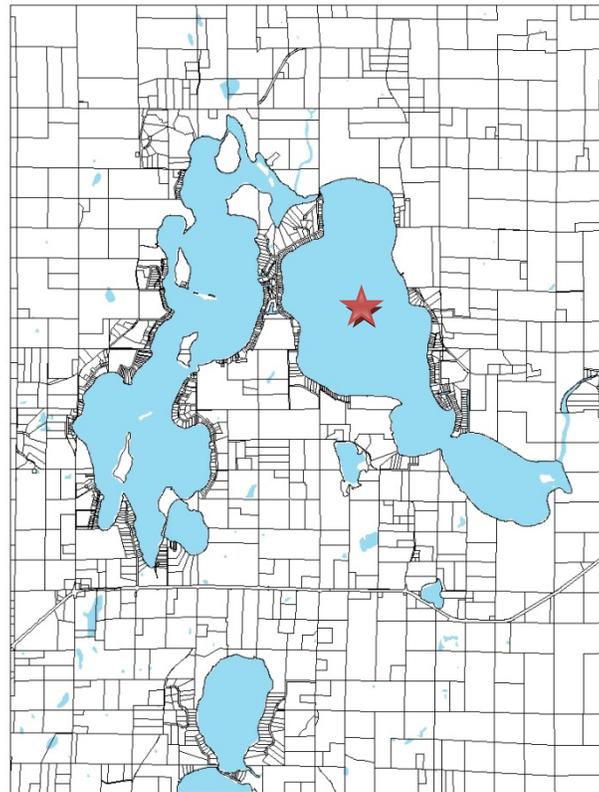


	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	61.6 °F	70.8 °F
Meets Standard (Not to exceed 86.0°F)			Yes	Yes

Little Lake General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	GENERAL LAKE OBSERVATIONS/ AQUATIC INVASIVE SPECIES
May	2	2	Toasted Marshmallow	Curlyleaf pondweed surfacing.
June	2.5	2.5	Beach Grass	Good.
July	3	3	Cornichon	Minimal weeds, but water murky.
August	3	3	Mossy Rock	No notes.
September	3	3	Parchment Paper	No notes.

East Rush Lake



Deep Lake

Lake Classification: EUTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	65.5	62.5	69.0	67.1
Classification	Hypereutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: D

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	54.4 µg/L	0.8 meters	90.0 µg/L		
Grade	D	D	D	D	18 th /19

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	
2012 Average (June-Sept)	65.5 µg/L	0.7 meters	101.3 µg/L	
Meets Standard	No	No	No	No

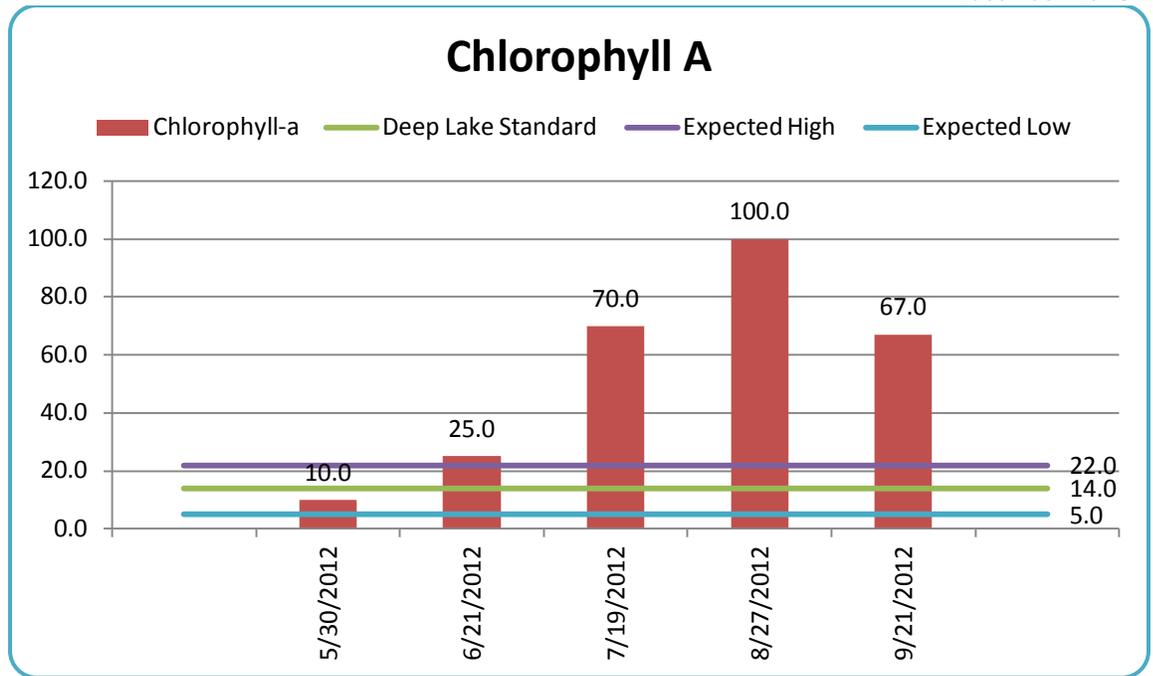
Chlorophyll-a

Expected Range:
5.0-22.0 µg/L

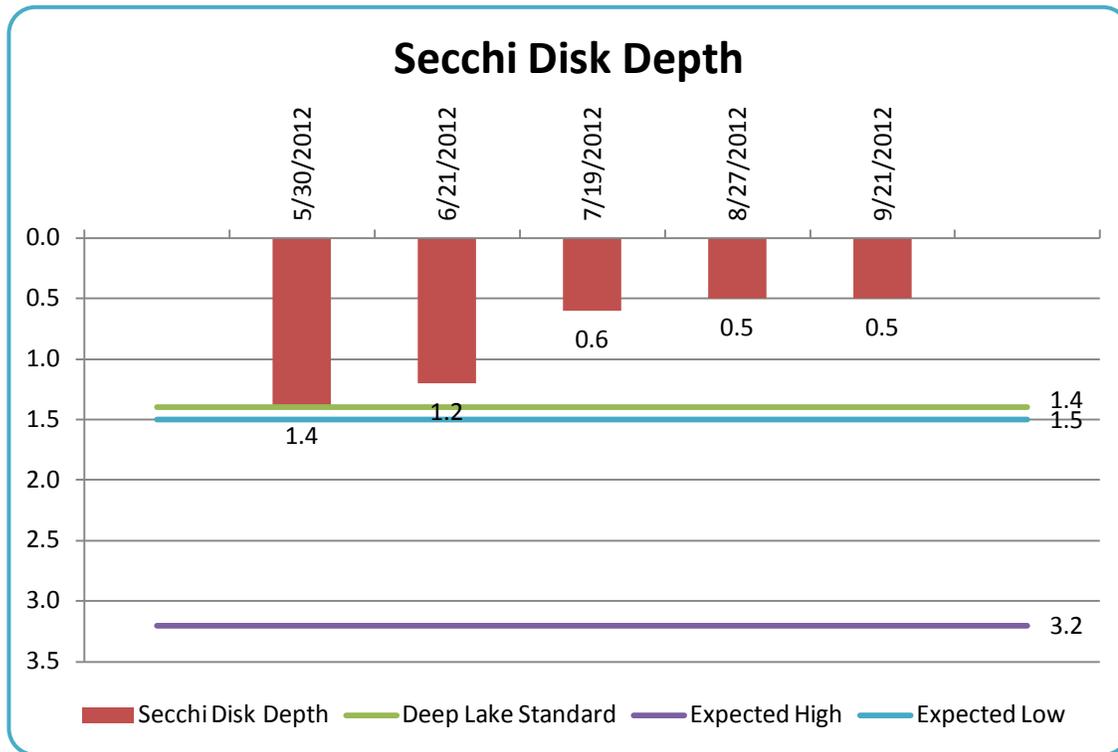
Deep Lake Standard:
14.0 µg/L

The average does not meet the standard.

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	54.4 µg/L
Grade				D
Average (June-Sept)	NO DATA	NO DATA	NO DATA	65.5 µg/L
Meets Standard (14.0 µg/L)				No



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Deep Lake Standard:
>1.4 meters

Clarity in this lake is poor. The average does not meet the standard.

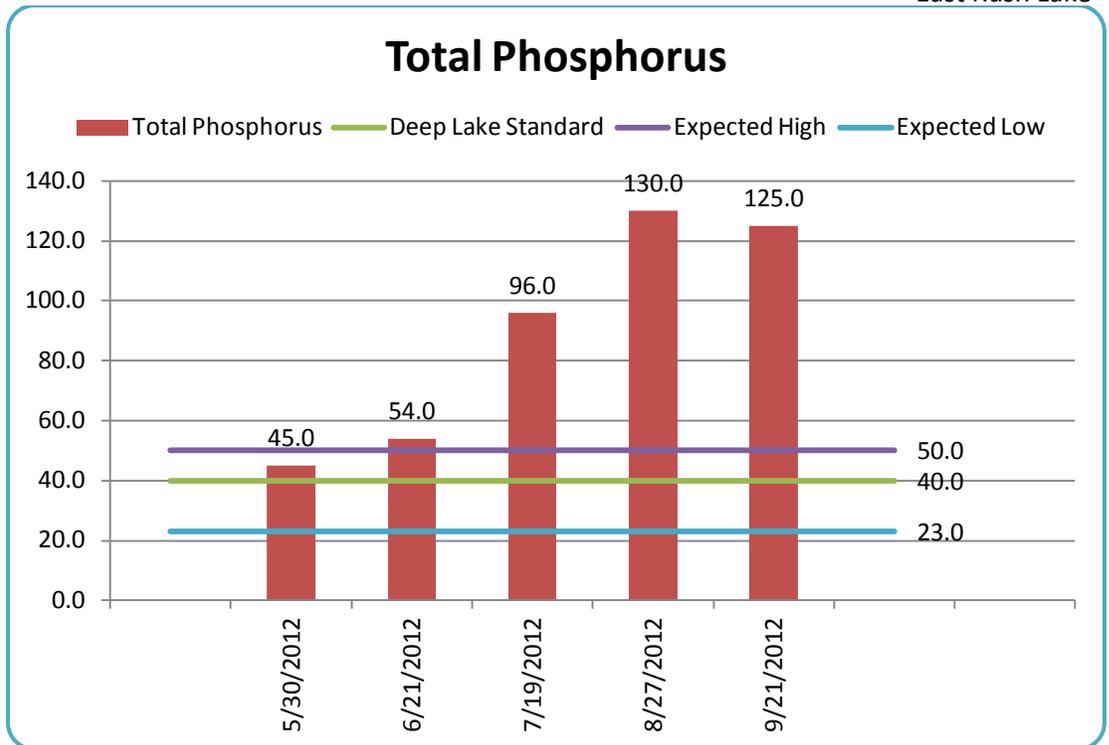
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	0.8 meters
Grade				D
Average (June-Sept)	NO DATA	NO DATA	NO DATA	0.7 meters
Meets Standard (>1.4 m)				No

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

Deep Lake Standard:
40.0 µg/L

All samples were above the standard. The phosphorous readings in this lake are very high. The average does not meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	90.0 µg/L
Grade				D
Average (June-Sept)	NO DATA	NO DATA	NO DATA	101.3 µg/L
Meets Standard (40.0 µg/L)				No

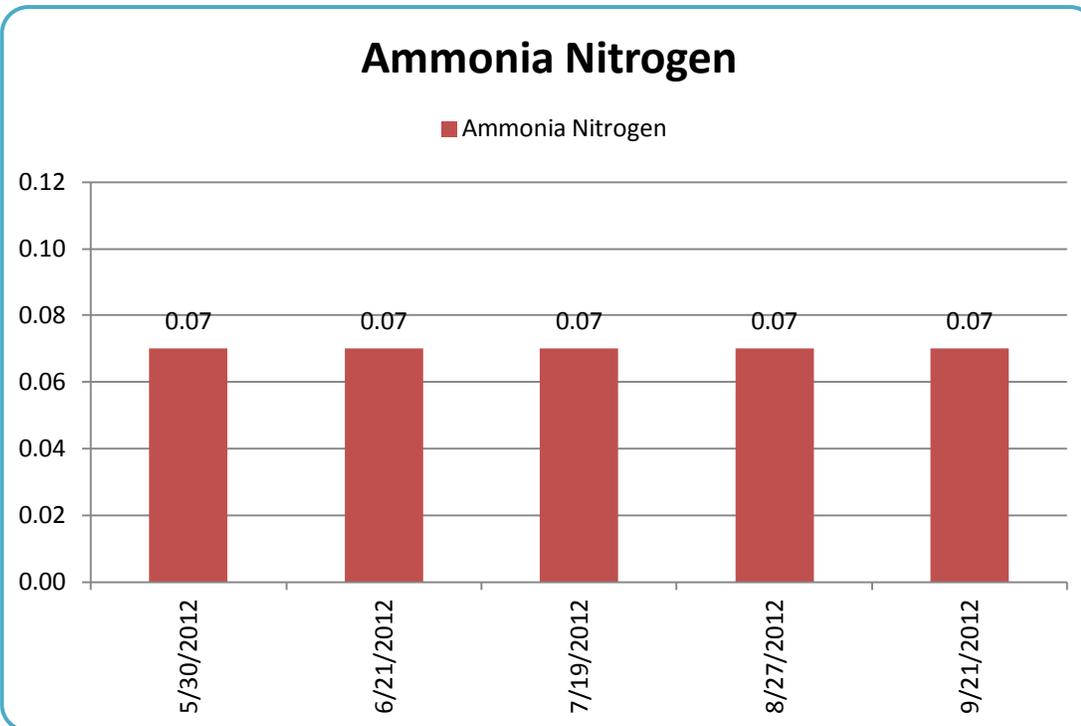
Ammonia Nitrogen

Ammonia Nitrogen

Expected Range: None

Deep Lake Standard: None

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	NO DATA	0.07 mg/L

Temperature

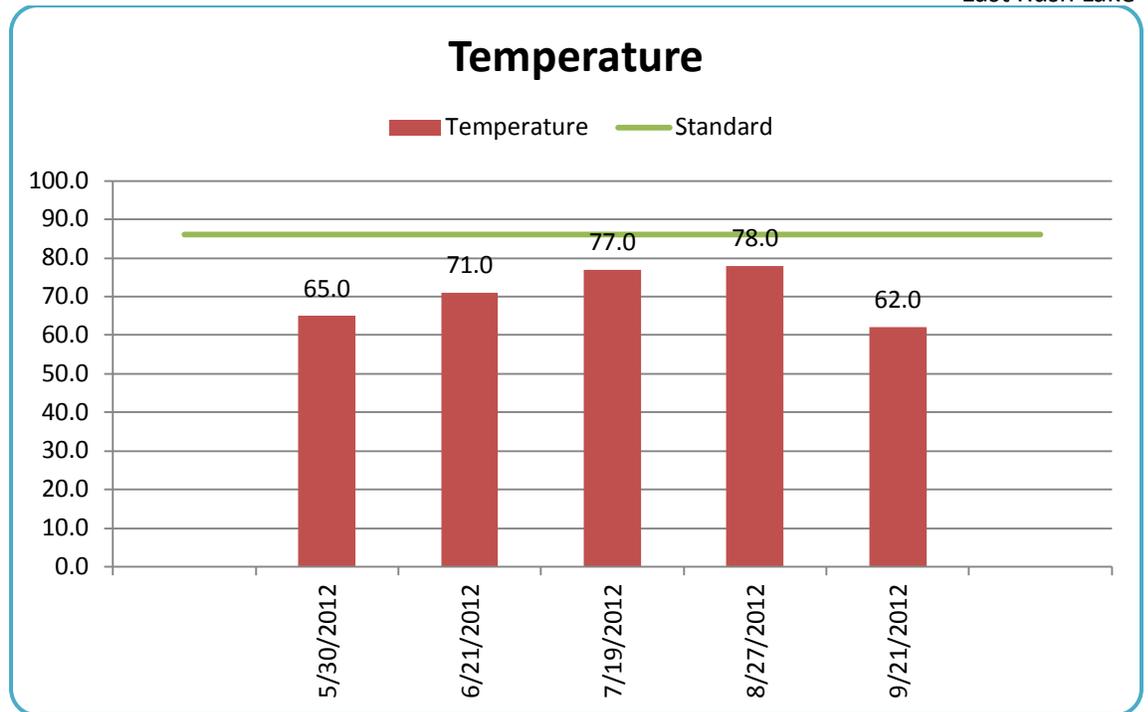
Expected Range:

None

Deep Lake Standard:

The daily average shall not exceed 86.0°F.

The temperatures met the standard.

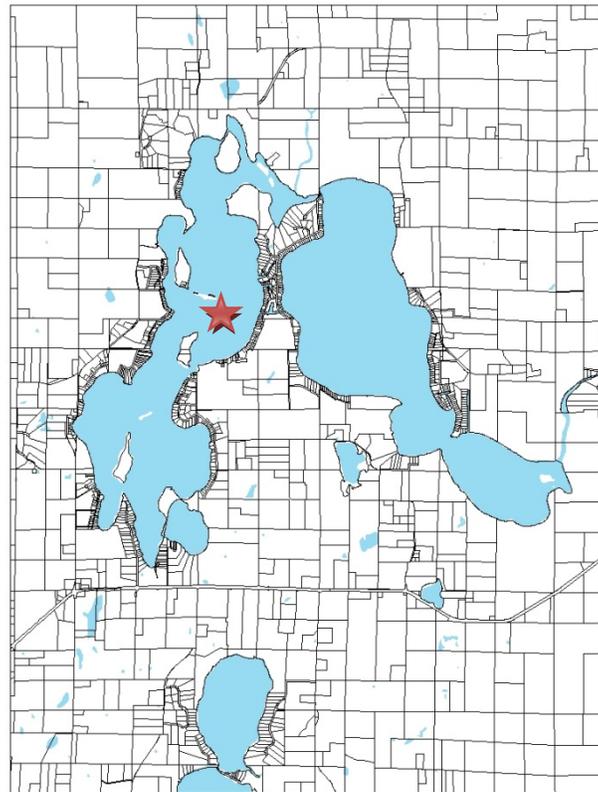


	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	NO DATA	70.6°F
Meets Standard (Not to exceed 86.0°F)				Yes

East Rush Lake General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	GENERAL LAKE OBSERVATIONS/ AQUATIC INVASIVE SPECIES
May	2.5	2.5	Dune	Filamentous algae in channels; Curlyleaf pondweed surfacing and matting.
June	2.5	2.5	Beach Grass	Rush Lake Improvement Association installing buoys for iron concentrate tests. No curlyleaf pondweed observed in test areas.
July	3.5	3.5	Cornichon	Curlyleaf pondweed gone; iron concentrate testing buoys in place.
August	4	4	Bay Leaf	Water looks like pea soup. Blue green algae bloom in channel.
September	4	4	Cornichon	Algae blooms in channel and public accesses.

West Rush Lake



Deep Lake

Lake Classification: EUTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	70.3	61.5	67.3	66.4
Classification	Hypereutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: D

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	57.2 µg/L	0.9 meters	80.0 µg/L		
Grade	D	D	D	D	17 th /19

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	
2012 Average (June-Sept)	67.8 µg/L	0.7 meters	88.0 µg/L	
Meets Standard	No	No	No	No

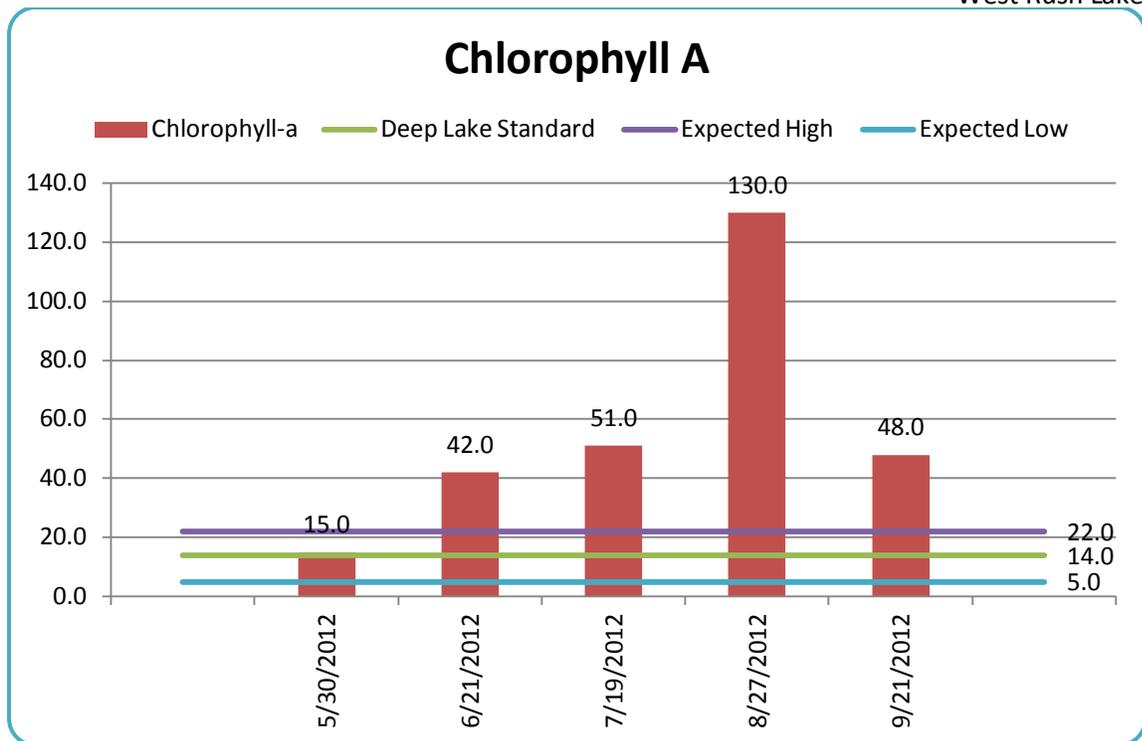
Chlorophyll-a

Expected Range:
5.0-22.0 µg/L

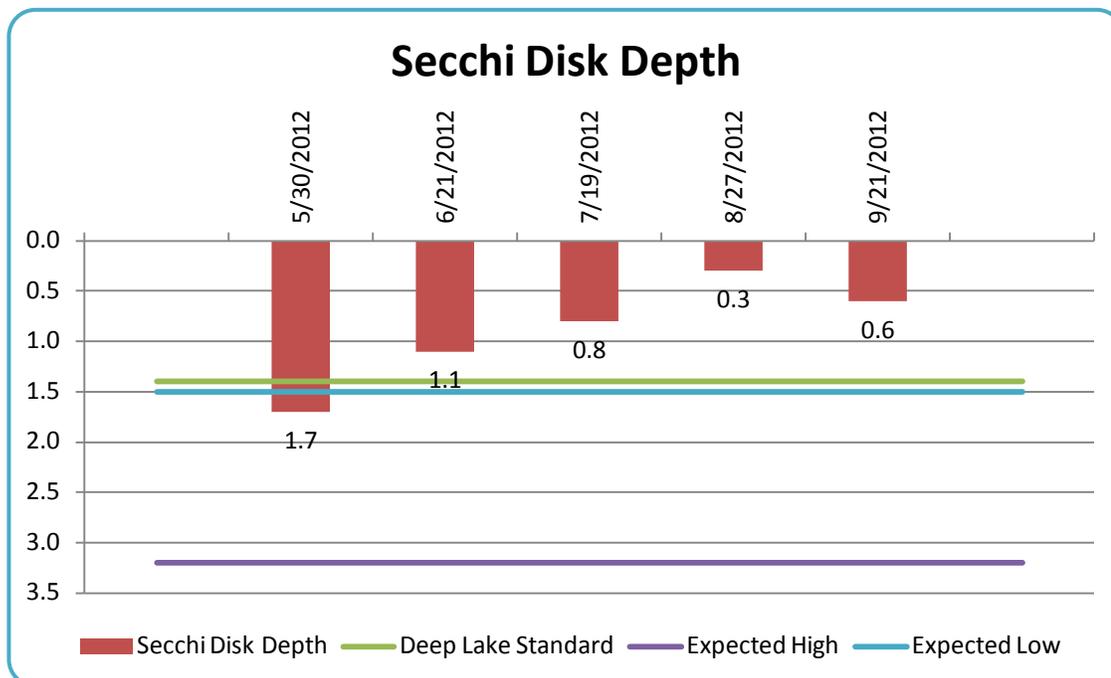
Deep Lake Standard:
14.0 µg/L

All samples were above the standard. The lake does not meet the standard.

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	57.2 µg/L
Grade				D
Average (June-Sept)	NO DATA	NO DATA	NO DATA	67.8 µg/L
Meets Standard (14.0 µg/L)				No



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Deep Lake Standard:
>1.4 meters

Clarity was very poor throughout the summer and fall. The average does not meet the standard.

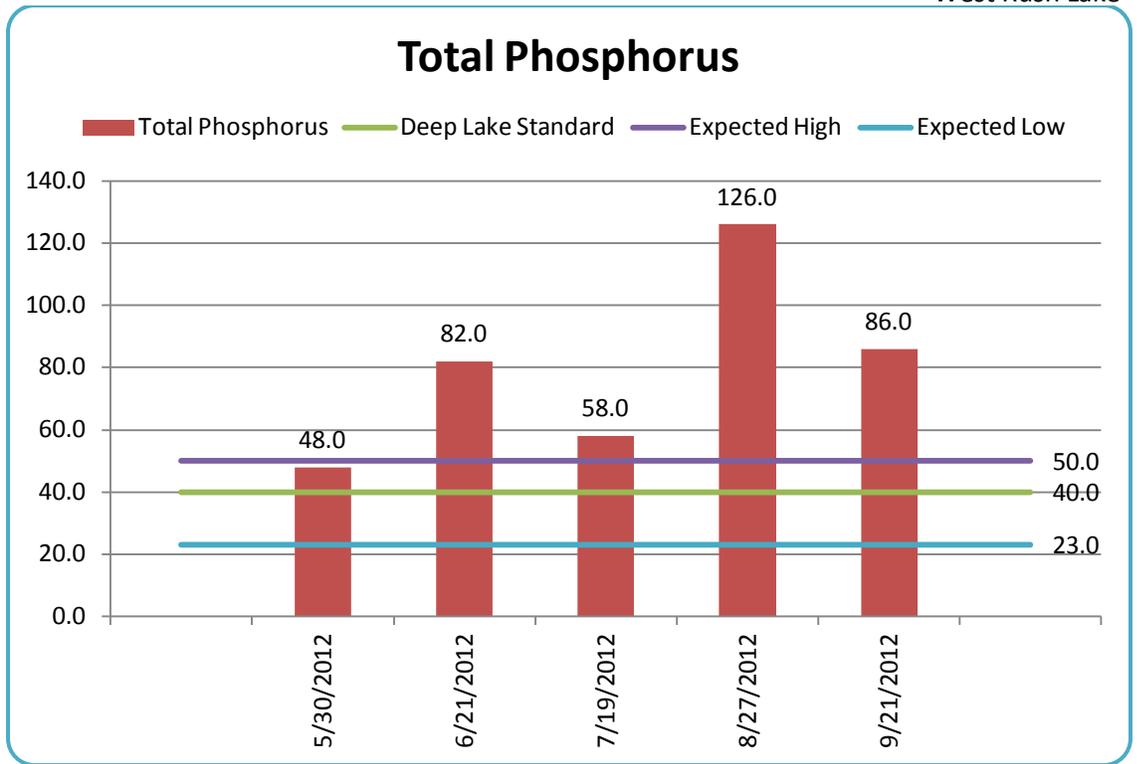
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	0.9 meters
Grade				D
Average (June-Sept)	NO DATA	NO DATA	NO DATA	0.7 meters
Meets Standard (>1.4 m)				No

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

Deep Lake Standard:
40.0 µg/L

All samples were above the standard. The August sample was very high. This lake does not meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	80.0 µg/L
Grade				D
Average (June-Sept)	NO DATA	NO DATA	NO DATA	88.0 µg/L
Meets Standard (40.0 µg/L)				No

Ammonia Nitrogen

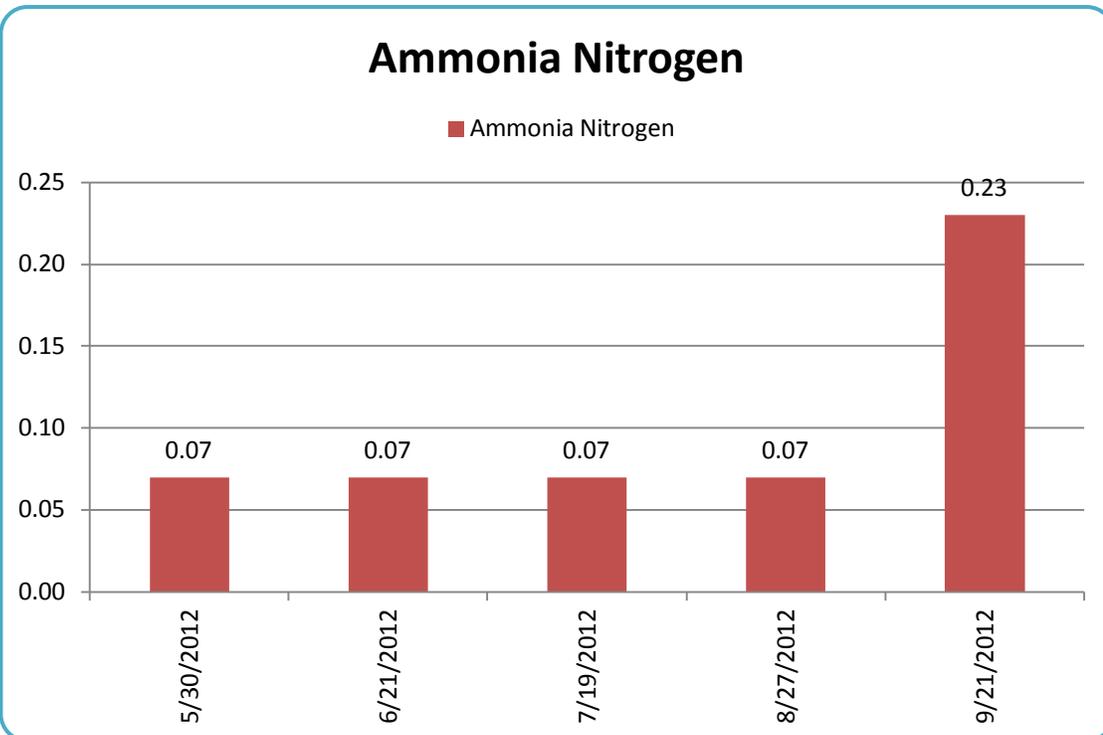
Ammonia Nitrogen

Expected Range: None

Deep Lake Standard: None

All samples were low except for the September sample, which was slightly elevated.

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	NO DATA	0.10 mg/L

Temperature

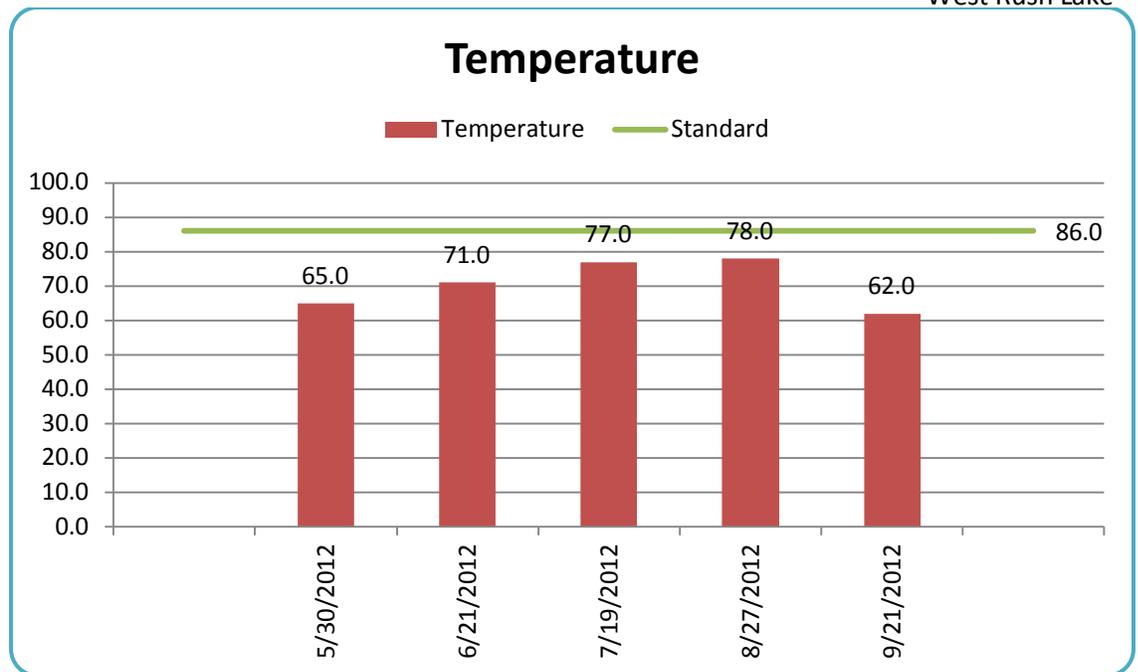
Expected Range:

None

Deep Lake Standard:

The daily average shall not exceed 86.0°F.

The temperatures met the standard.

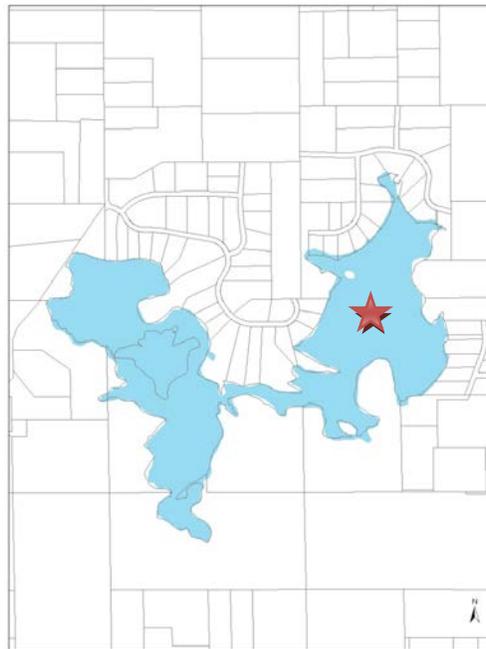


	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	NO DATA	70.6°F
Meets Standard (Not to exceed 86.0°F)				Yes

West Rush Lake General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	GENERAL LAKE OBSERVATIONS/ AQUATIC INVASIVE SPECIES
May	2.5	2.5	Cornichon	Filamentous algae in channels; Curlyleaf pondweed surfacing and matting.
June	3	3	Beach Grass	Frandsen Park has thick coontail and duckweed. Algae bloom; pondweeds in channel. Spray for navigation.
July	3	3	Beach Grass	Algae blooms forming in channel.
August	4	4	Mossy Rock	Water looks like pea soup. Blue green algae in bloom in channel.
September	4	4	Beach Grass	Algae blooms in channel and public accesses.

Spider Lake



Shallow Lake

Lake Classification: EUTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	61.7	61.2	63.8	62.2
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	23.8 µg/L	0.9 meters	62.4 µg/L		
Grade	C	D	C	C	12 th /19

MPCA Standards: Does Not Meet Standards

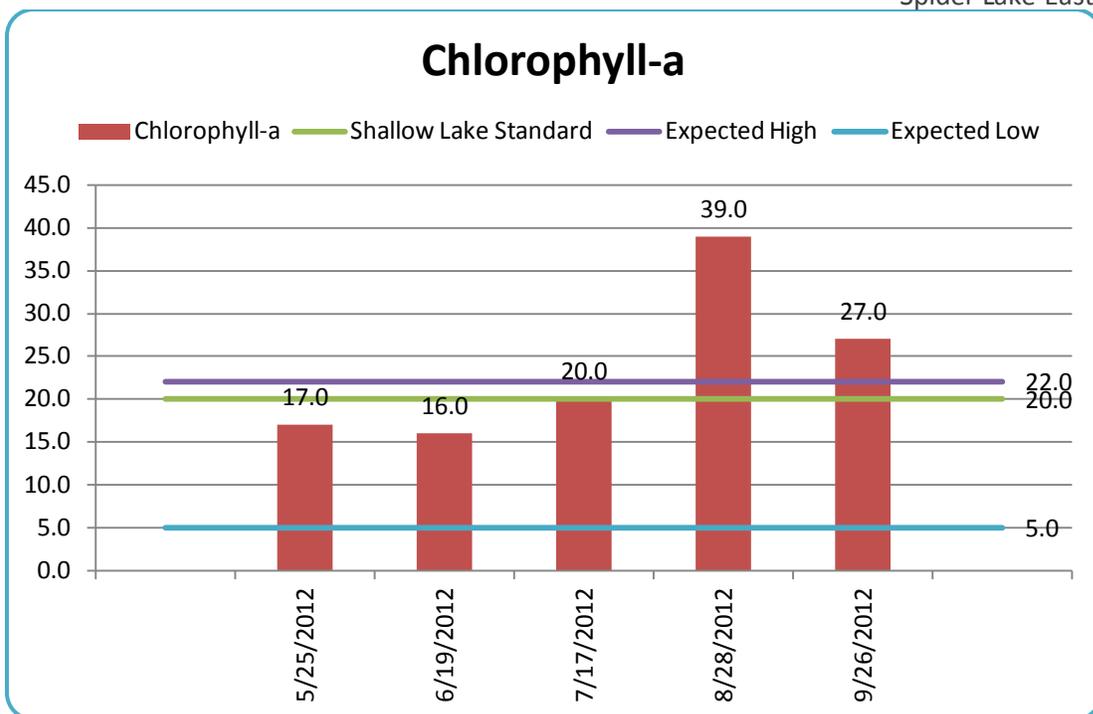
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
MPCA Standard (Shallow lake)	20.0 µg/L	>1.0 meters	60.0 µg/L	
2012 Average (June-Sept)	25.5 µg/L	0.9 meters	56.8 µg/L	
Meets Standard	No	No	Yes	No

Chlorophyll-a

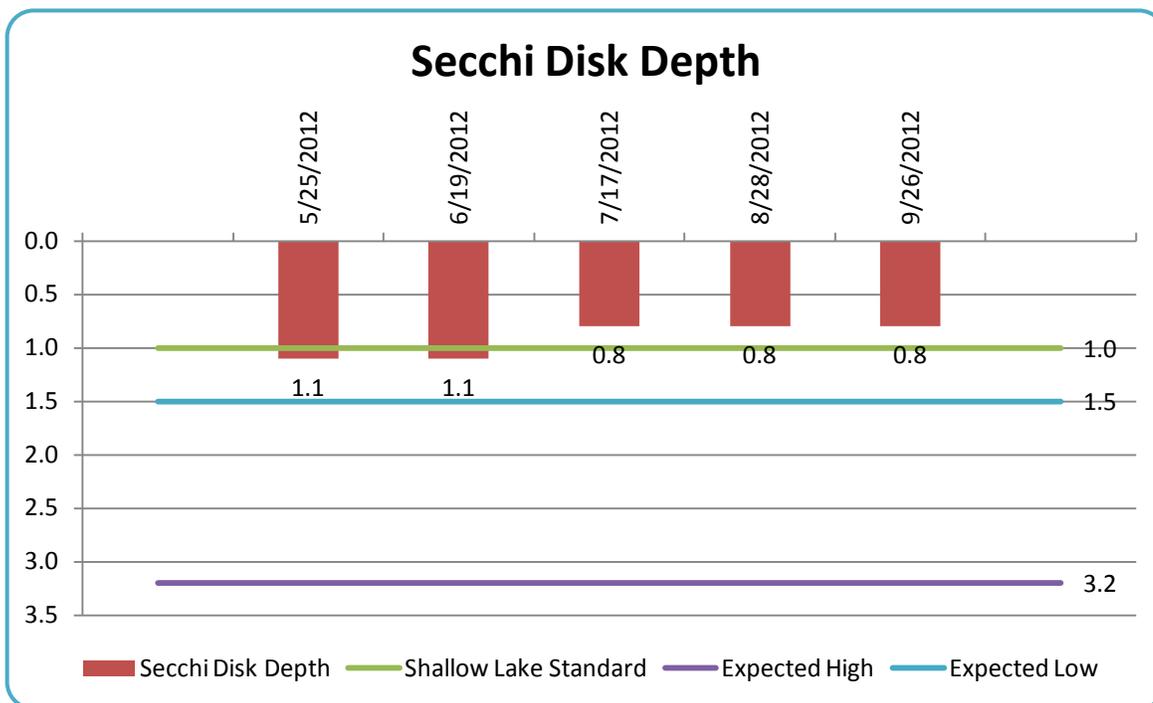
Expected Range:
5.0-22.0 µg/L

Shallow Lake
Standard: 20.0 µg/L

The August and September samples were high, while early season samples were within the expected range. The average does not meet the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	16.4 µg/L	23.8 µg/L
Grade			B	C
Average (June-Sept)	NO DATA	NO DATA	17.0 µg/L	25.5 µg/L
Meets Standard (20.0 µg/L)			Yes	No



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Shallow Lake
Standard: >1.0 meters

Clarity in this lake was poor. Three of the samples were below the standard, meaning the lake water was not clear.

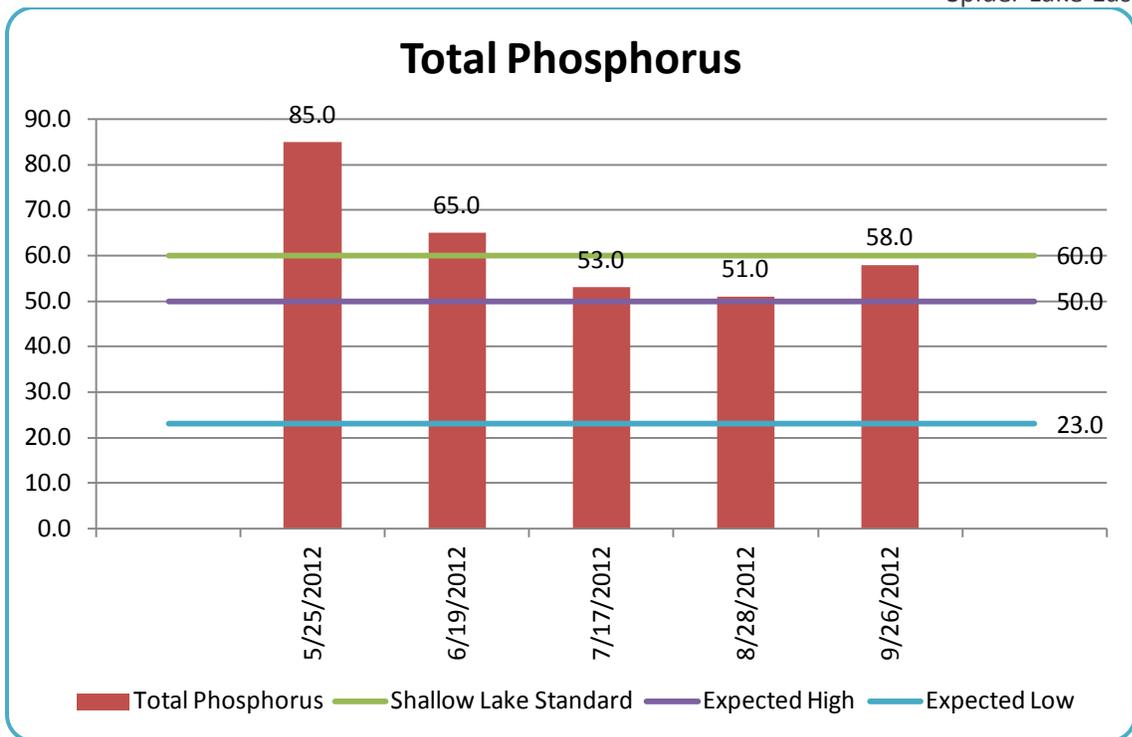
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	1.2 meters	0.9 meters
Grade			C	D
Average (June-Sept)	NO DATA	NO DATA	1.2 meters	0.9 meters
Meets Standard (>1.0 m)			Yes	No

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

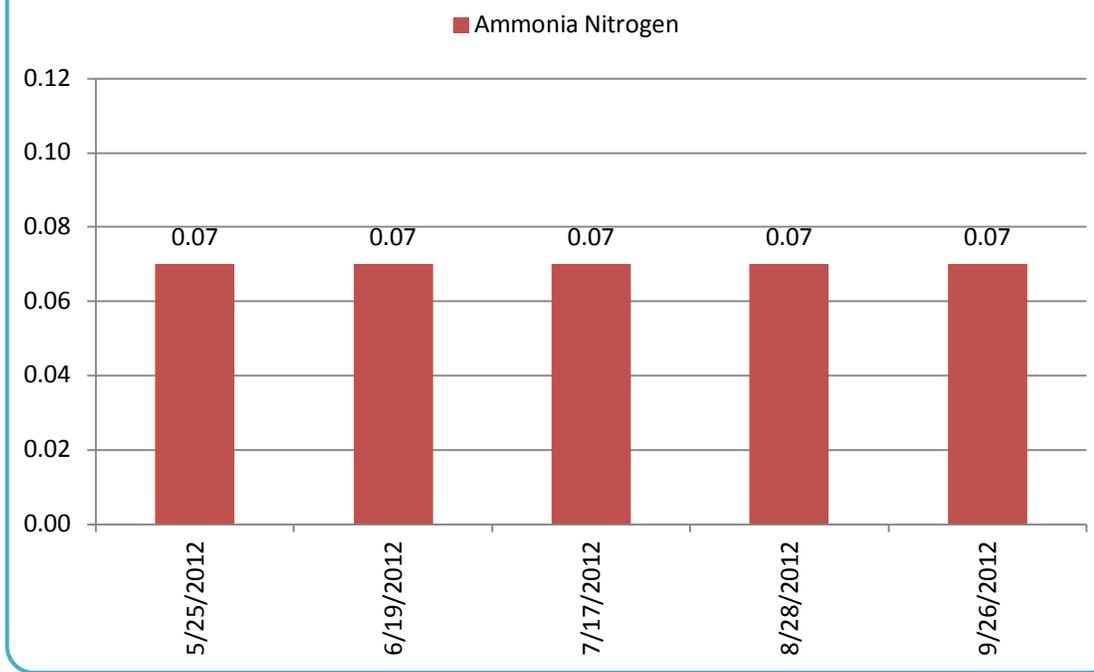
Shallow Lake
Standard: 60.0 µg/L

Two of the samples were above the standard, but the overall average meets the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	55.0 µg/L	62.4 µg/L
Grade			C	C
Average (June-Sept)	NO DATA	NO DATA	52.0 µg/L	56.8 µg/L
Meets Standard (60.0 µg/L)			Yes	Yes

Ammonia Nitrogen



Ammonia Nitrogen

Expected Range: None

Shallow Lake
Standard: None

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

	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	0.04 mg/L	0.07 mg/L

Temperature

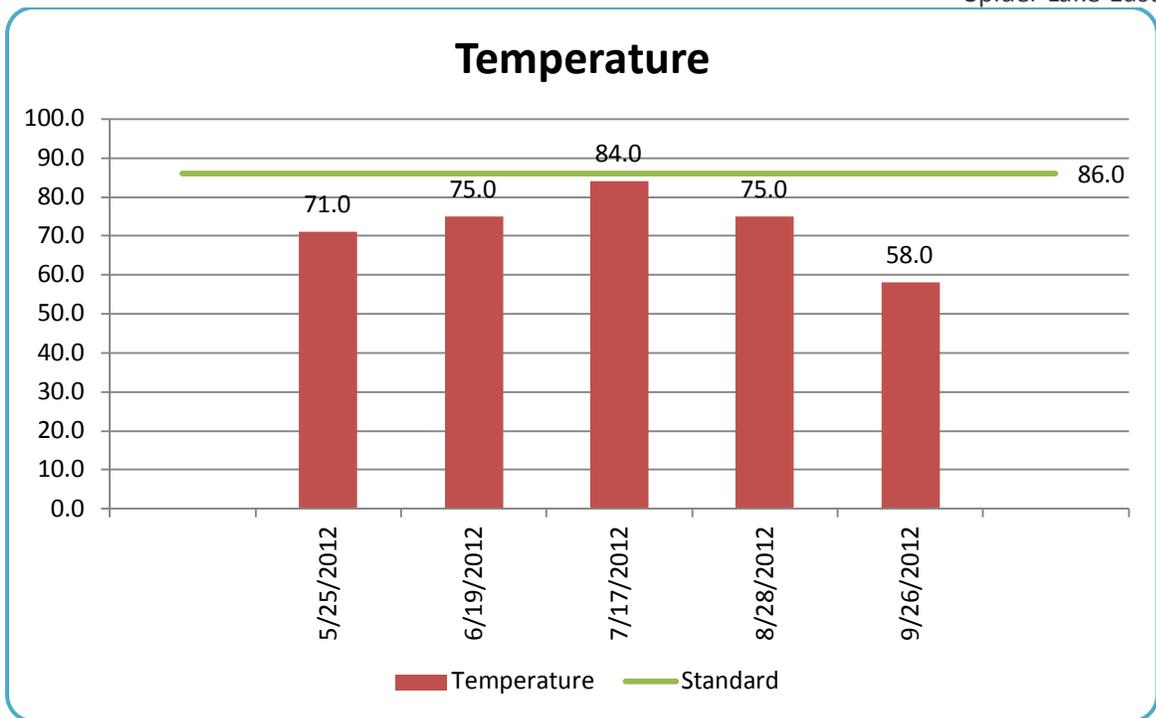
Expected Range:

None

Shallow Lake

Standard: The daily average shall not exceed 86.0°F

All temperatures were recorded below the standard.

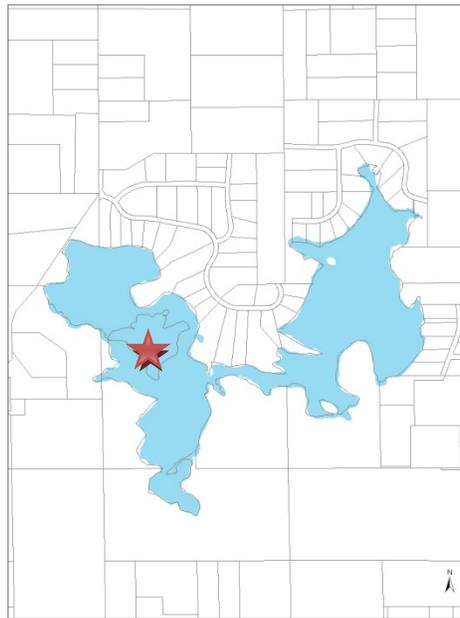


	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	63.2 °F	72.6°F
Meets Standard (Not to exceed 86.0°F)			Yes	Yes

East Spider Lake General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	GENERAL LAKE OBSERVATIONS/ AQUATIC INVASIVE SPECIES
May	3	3	Parchment Paper	Weedy and much algae.
June	2.5	2.5	Sultana	Curlyleaf pondweed and filamentous algae in shallow areas.
July	3	3	Cornichon	Fewer weeds than previous inspections.
August	3.5	3.5	Beach Grass	Less aquatic vegetation than previous monitoring trips.
September	3	3	Rattan	Fewer weeds than previous monitoring.

Spider Lake



Shallow Lake

Lake Classification: EUTROPHIC

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Classification
Trophic State Index	43.7	50.9	55.5	50.0
Classification	Mesotrophic	Eutrophic	Eutrophic	Eutrophic

Overall Lake Quality Grade: C

	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall Grade	Rank
2012 Average (May-Sept)	3.8 µg/L	1.9 meters	35.2 µg/L		
Grade	A	C	C	C	2 nd /19

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	
2012 Average (June-Sept)	4.5 µg/L	1.9 meters	35.5 µg/L	
Meets Standard	Yes	Yes	Yes	Yes

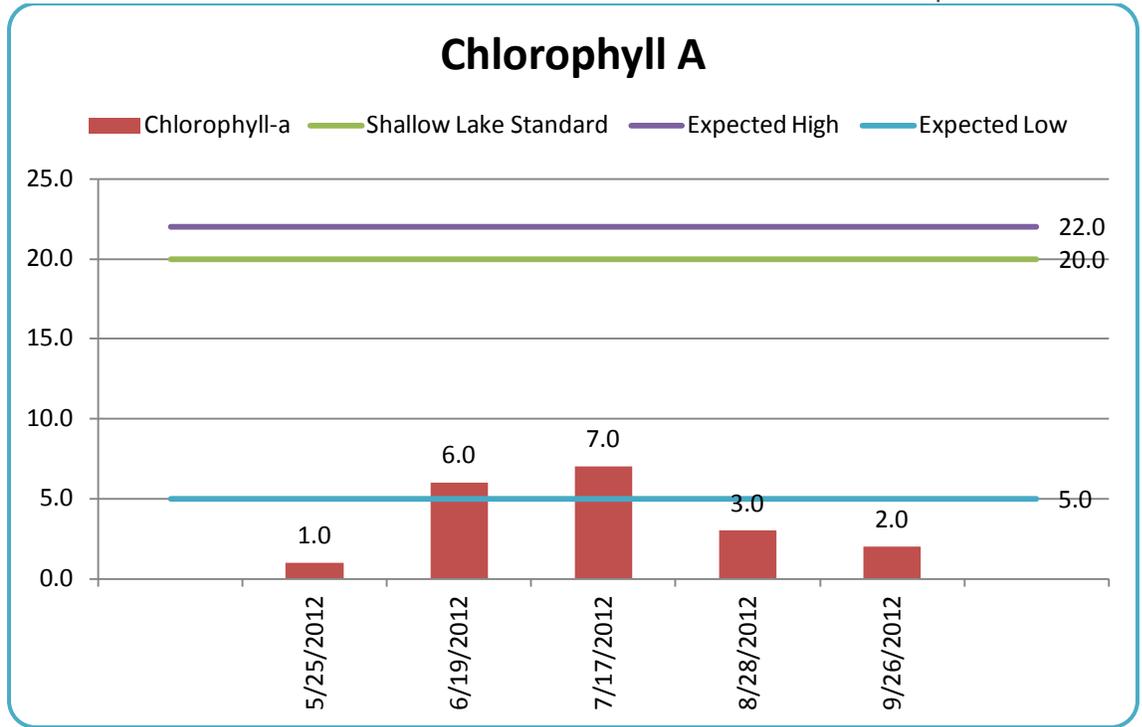
Chlorophyll-a

Expected Range:
5.0-22.0 µg/L

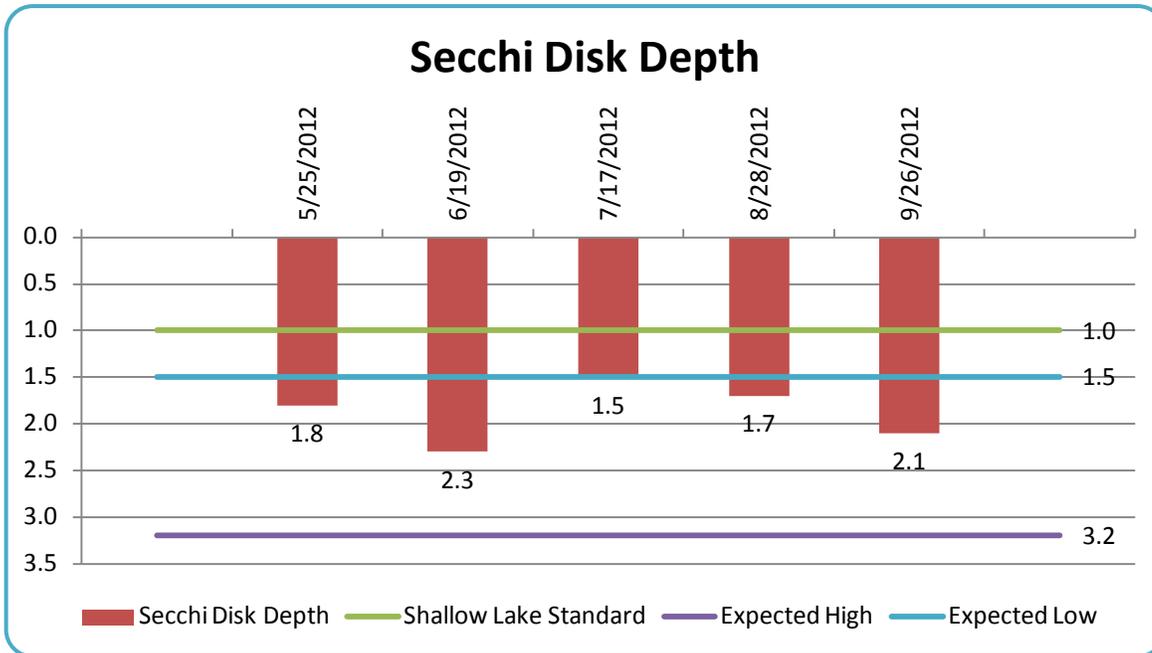
Shallow Lake
Standard: 20.0 µg/L

The Chl-a levels in this lake were exceptionally low.

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	3.8 µg/L
Grade				A
Average (June-Sept)	NO DATA	NO DATA	NO DATA	4.5 µg/L
Meets Standard (20.0 µg/L)				Yes



Secchi Disk Depth

Expected Range:
1.5-3.2 meters

Shallow Lake
Standard: >1.0 meters

Clarity was very good on this part of the lake. Each time the disk hit the lake bottom. Differences are due to changing lake depth.

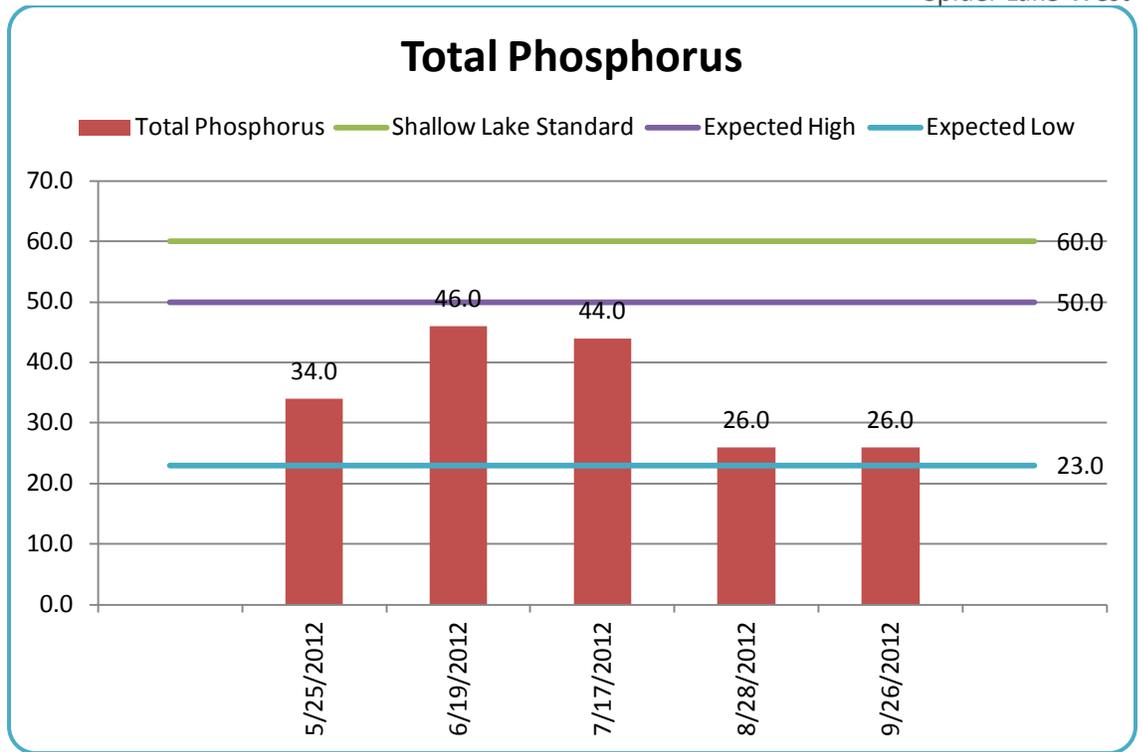
	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	1.9 meters
Grade				C
Average (June-Sept)	NO DATA	NO DATA	NO DATA	1.9 meters
Meets Standard (>1.0 m)				Yes

Total Phosphorus

Expected Range:
23.0-50.0 µg/L

Shallow Lake
Standard: 60.0 µg/L

All samples were within the expected range and below the standard. The average reading meets the standard for this part of the lake.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average (May-Sept)	NO DATA	NO DATA	NO DATA	35.2 µg/L
Grade				C
Average (June-Sept)	NO DATA	NO DATA	NO DATA	35.5 µg/L
Meets Standard (60.0 µg/L)				Yes

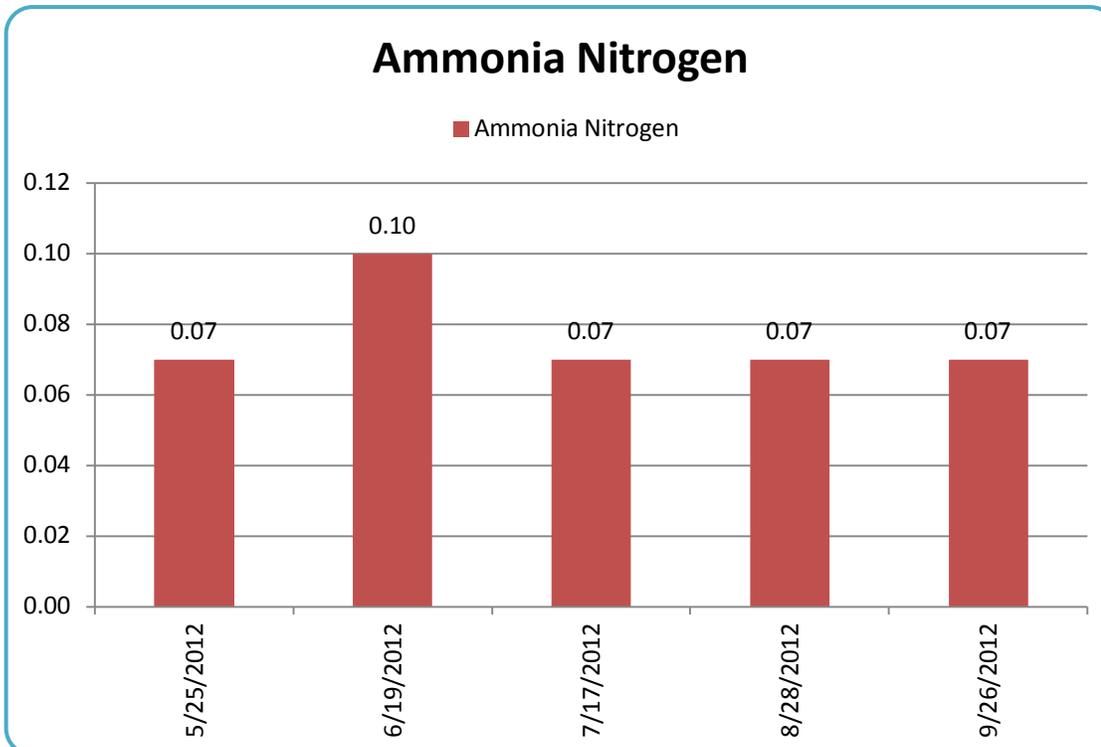
Ammonia Nitrogen

Ammonia Nitrogen

Expected Range: None

Shallow Lake
Standard: None

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



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	NO DATA	0.08 mg/L

Temperature

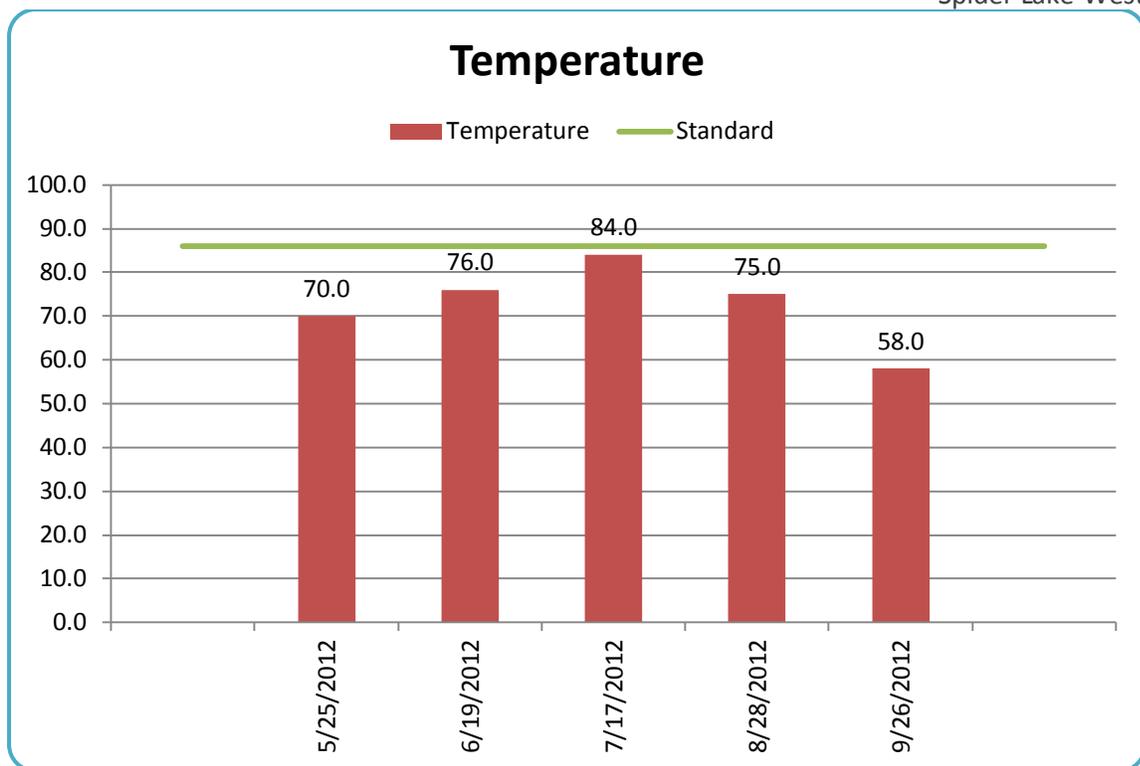
Expected Range:

None

Shallow Lake

Standard: The daily average shall not exceed 86.0°F

All temperatures were recorded below the standard.



	2009 (Not Graphed)	2010 (Not Graphed)	2011 (Not Graphed)	2012
Average	NO DATA	NO DATA	NO DATA	72.6°F
Meets Standard (Not to exceed 86.0°F)				Yes

West Spider Lake General Observations

MONTH	PHYSICAL CONDITION	RECREATIONAL SUITABILITY	COLOR OF FILTERED WATER	GENERAL LAKE OBSERVATIONS/ AQUATIC INVASIVE SPECIES
May	2	2	Toasted Marshmallow	Heron present. Looks good.
June	2	2	Sultana	Beautiful.
July	2	2	Toasted Marsh Mellow	No notes.
August	1.5	1.5	Rice Paper	Beautiful.
September	1.5	1.5	Rice Paper	No notes.

