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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.

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

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

Impairments and Standards

Under section 303(d) of the Clean Water Act, states, territories, and authorized tribes are required to develop lists of impaired waters. These are waters that are too polluted or otherwise degraded to meet the water quality standards set by states, territories, or authorized tribes. The law requires that these jurisdictions establish priority ranking for waters on the lists and develop Total Maximum Daily Loads (TMDL) for these waters. A TMDL is a calculation of the maximum amount of pollution that a waterbody can receive and still safely meet water quality standards. (United States Environmental Protection Agency)

The Minnesota Pollution Control Agency (MPCA) has set the standards for Total Phosphorus, Chlorophyll-a, and Secchi Disk Depth for lakes in Minnesota. A lake must have a minimum set of data to prove that it is Impaired (not meeting the MPCA standards) or Not Impaired (does meet the MPCA standards) before it is listed on the 303(d) Impaired Waters list, at which point a TMDL study is required.

Two lakes (Rabour and Mandall) in this report have not reached the minimum required sampling data to receive a listing on the 303(d) Impaired Waters list. They are reported here as meeting or not meeting the MPCA standards, and it is noted that they have not been assessed for 303(d) Impaired Waters listing.

Project Objective

The purpose of the 2014 Chisago County Water Quality and Aquatic Invasive Species Monitoring program is to help achieve goals identified in the Chisago County Local Water Management Plan and the Chisago Lakes Lake Improvement District Water Resource Management Plan.

Chisago County Local Water Management Plan:

Monitoring and Assessment

11. 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 in Chisago County, including lakes with public accesses and the main stems and selected tributaries of Rock Creek, Rush Creek, Goose Creek, Sunrise River, and Lawrence Creek.
12. Implement a County wide lake water quality monitoring plan.
14. Develop an annual water quality monitoring report for Chisago County describing the water resources that were monitored and what parameters they were monitored for. The annual report will provide a complete summary of the monitoring results.

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.

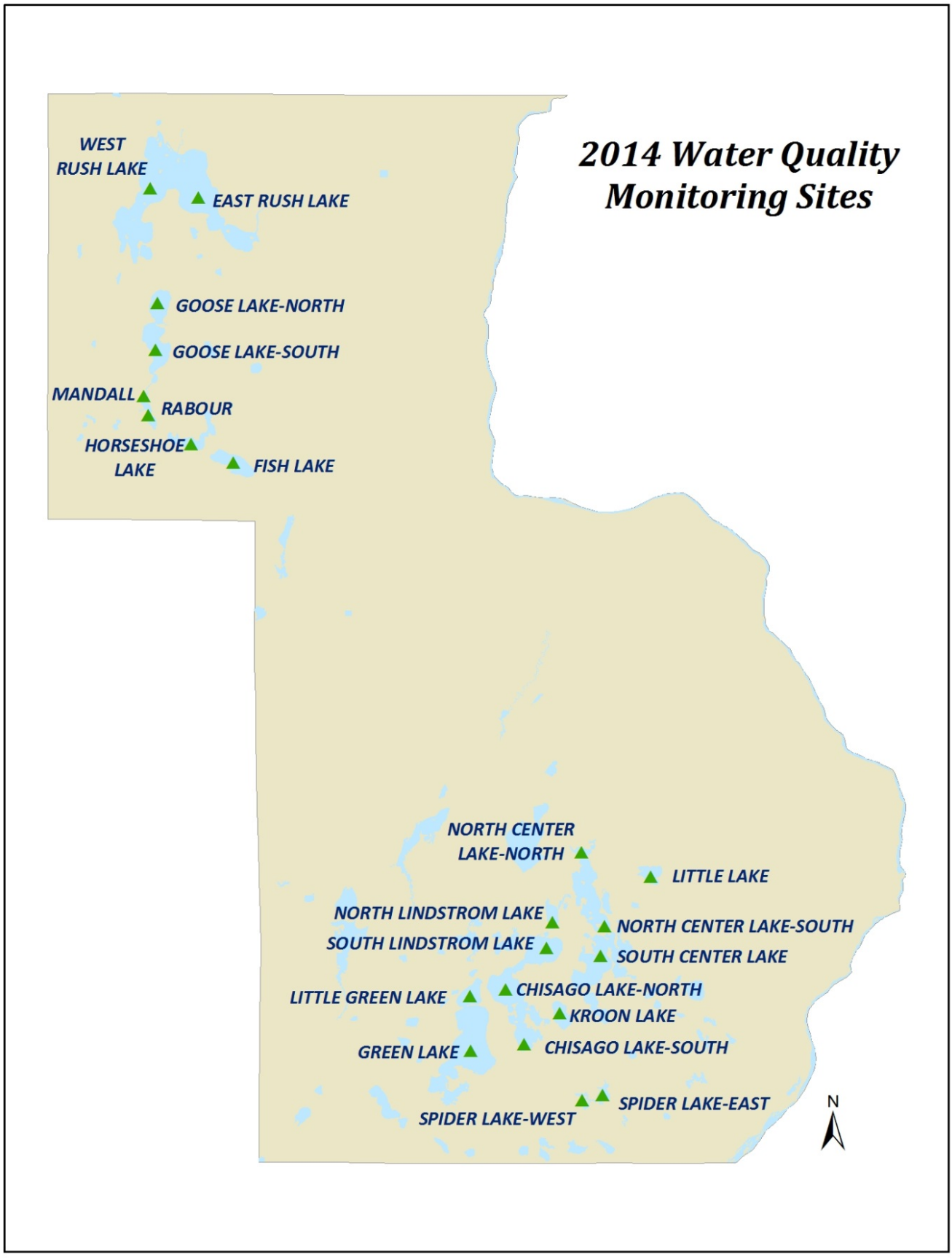
Visual inspections of the lakes were conducted looking for changes in the abundance or locations of aquatic invasive species, especially Eurasian Watermilfoil and Curly leaf Pondweed. Potential interference with navigation was the primary consideration.

Seventeen lakes were monitored through this program in 2014. 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 2014 data only. In some cases, 2009, 2010, 2011, 2012, and 2013 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	No Standard	No Standard	None
A lake that fails to meet two of the three standards (Chlorophyll-a, Secchi Disk, Total Phosphorus) does not meet standards. Impaired or Not Impaired status is based on the 303(d) Impaired Waters list.				

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.

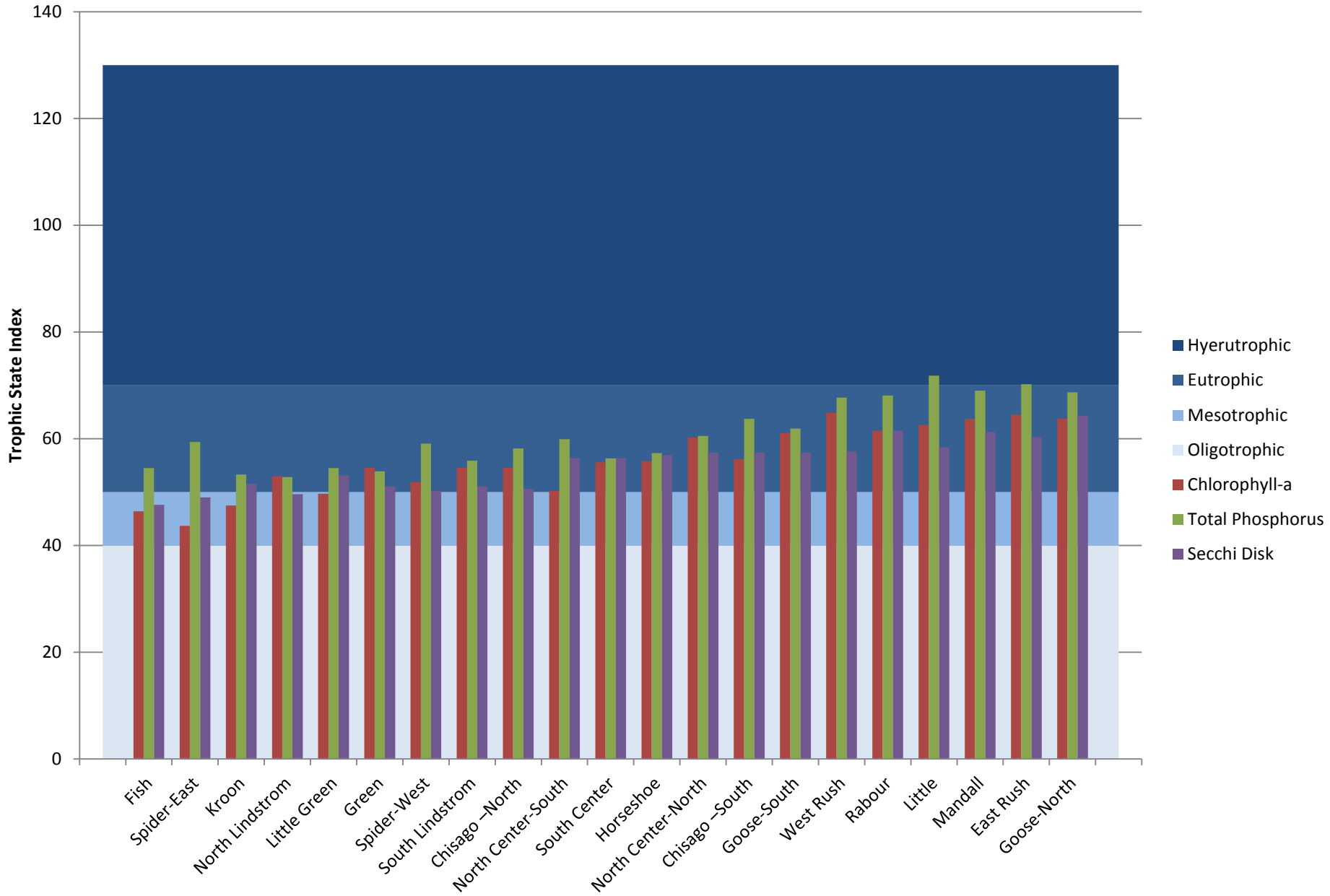
Rank of Lakes Monitored

2014 Rank	Lake	2014 Grade	2013 Grade	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	B	B	----	49.5	5.0	2.4	35.0	Mesotrophic	Deep	Y
2	Spider-East	C+	C	C	C	50.7	4.0	2.1	42.5	Mesotrophic	Shallow	Y
3	Kroon	B	B	C	B	50.8	6.3	1.7	30.3	Eutrophic	Deep	Y
4	North Lindstrom	B	B	C	B	51.8	12.0	1.8	31.5	Mesotrophic	Deep	Y
5	Little Green	B-	C	C-D	C	52.4	7.8	1.6	33.3	Eutrophic	Deep	Y
6	Green	C+	C	B-C	C	53.2	13.8	1.8	33.3	Eutrophic	Deep	Y
7	Spider-West	C+	B	B-C	----	53.7	10.5	1.9	49.0	Eutrophic	Shallow	Y
8	South Lindstrom	C+	C	C	B	53.9	14.0	1.7	40.3	Eutrophic	Deep	Y
9	Chisago –North	C+	C	C	B	54.5	14.0	1.8	40.3	Eutrophic	Deep	Y
10	**North Center-South**	**C+**	**C**	**C**	**C**	**55.5**	**8.5**	**1.2**	**52.5**	**Eutrophic**	**Shallow**	**Y**
11	**South Center**	**C+**	**C**	**C**	**C**	**56.1**	**14.5**	**1.3**	**38.3**	**Eutrophic**	**Deep**	**N**
12	**Horseshoe**	**C**	**C**	**C**	**----**	**56.7**	**12.5**	**1.2**	**40.3**	**Eutrophic**	**Deep**	**N**
13	Chisago –South	C	D	D	C	59.1	16.3	1.1	68.8	Eutrophic	Shallow	Y
14	**North Center-North**	**C**	**C**	**C**	**C**	**59.3**	**23.8**	**1.2**	**52.3**	**Eutrophic**	**Shallow**	**Y**
15	**Goose-South**	**D**	**C**	**C**	**----**	**60.1**	**27.0**	**1.1**	**58.0**	**Eutrophic**	**Deep**	**N**
16	**West Rush**	**D+**	**C**	**D**	**----**	**63.5**	**39.8**	**1.0**	**92.0**	**Eutrophic**	**Deep**	**N**
17	**Rabour**	**D**	**----**	**----**	**----**	**63.7**	26.3	0.8	90.5	**Eutrophic**	**Shallow**	**N**
18	**Little**	**D**	**C**	**D**	**C-**	**64.2**	**27.0**	**1.2**	**118.0**	**Eutrophic**	**Deep**	**N**
19	Mandall	D	----	----	----	64.6	32.3	0.9	94.3	Eutrophic	Shallow	N
20	**East Rush**	**D**	**C**	**D**	**----**	**65.0**	**35.8**	**0.9**	**110.0**	**Eutrophic**	**Deep**	**N**
21	**Goose-North**	**D**	**D**	**C**	**----**	**65.6**	**34.0**	**0.6**	**94.5**	**Eutrophic**	**Shallow**	**N**

*Shaded cells do not meet the Water Quality Standards in 2014

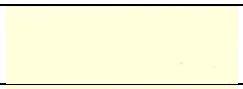
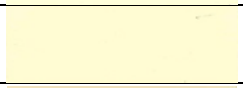
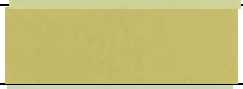
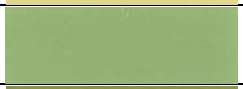
Lakes in **BOLD are listed as Impaired on the 303(d) Impaired Waters list (Mandall and Rabour Lakes have not been assessed)

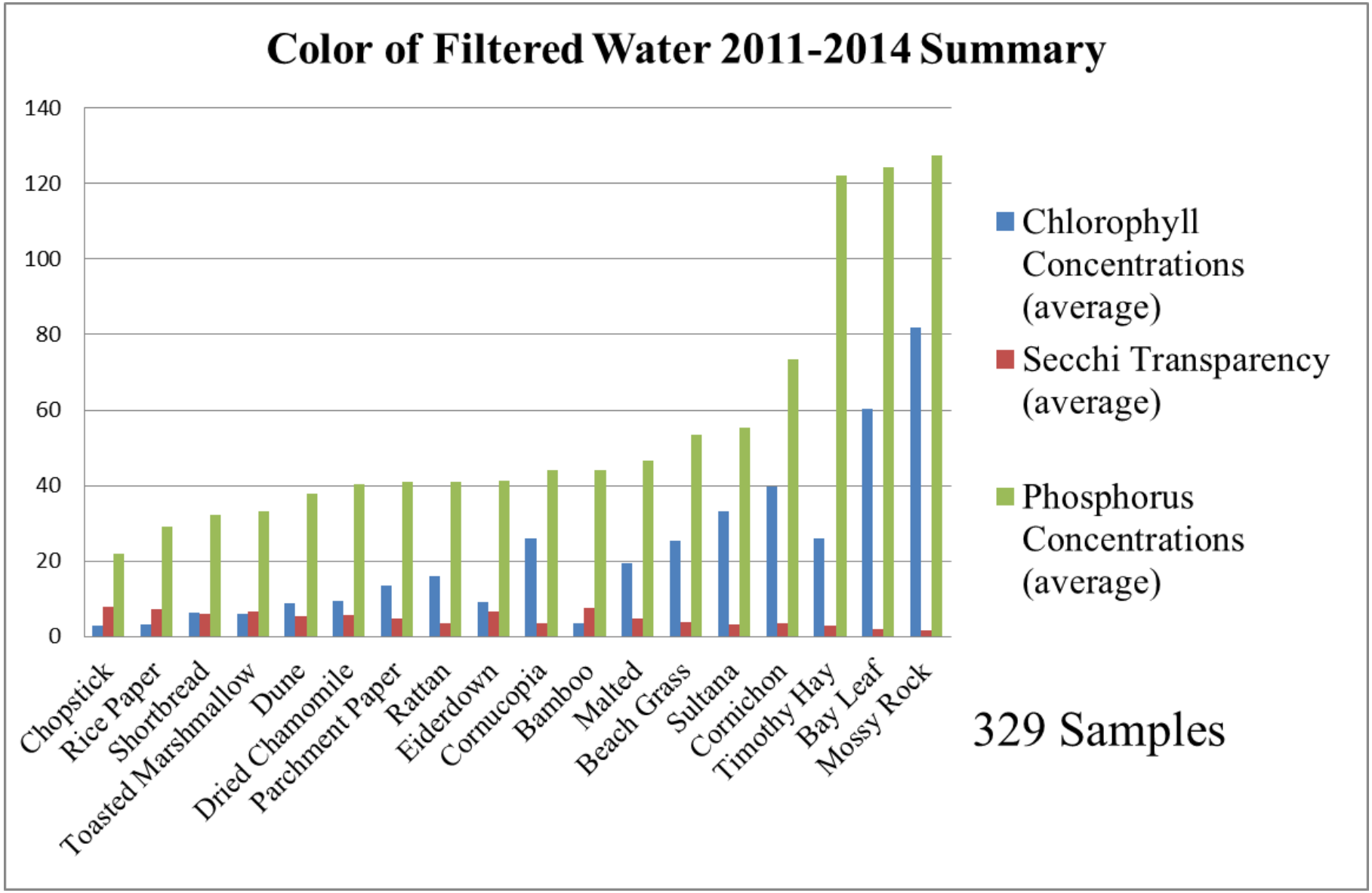
Lake Classification Chart



Explanation of Color Classification

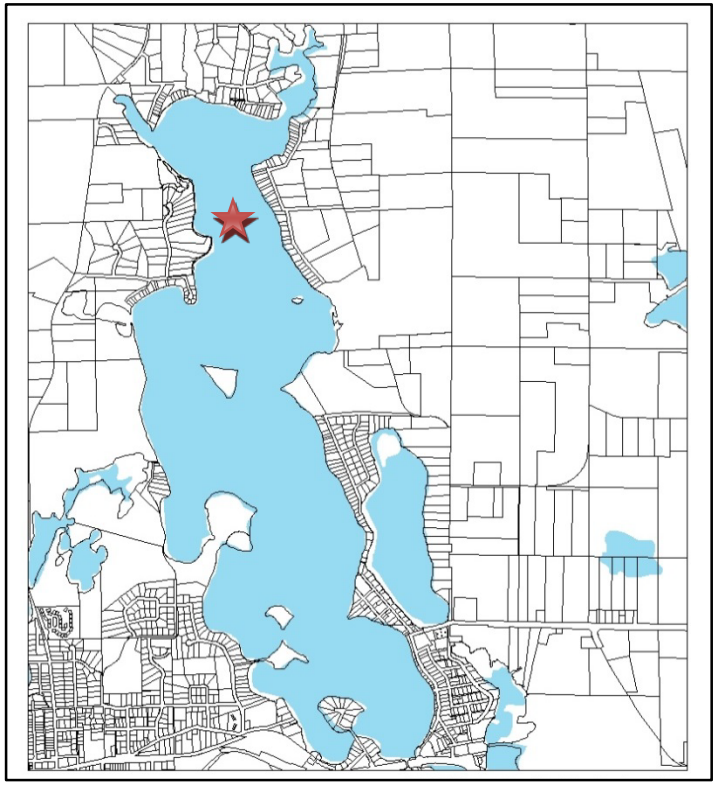
During each sample, water was run through filter paper. Algae remain on filter paper. The **color of the filter paper** was compared to Martha Stewart paint samples and matched as closely as possible. The averages for Chlorophyll-a, Secchi transparency, and Phosphorus concentration for each color were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

Color Name		Chlorophyll-a Concentrations (average µg/L)	Secchi Transparency (average M)	Phosphorus Concentrations (average µg/L)	Number of Samples
Rice Paper		3.2	7.2	29.2	13
Chopstick		2.9	7.9	21.8	9
Toasted Marshmallow		6	6.8	33.3	25
Shortbread		6.5	6.1	32.1	13
Eiderdown		9.1	6.7	41.2	10
Dune		8.7	5.5	38	3
Dried Chamomile		9.6	5.7	40.4	26
Parchment Paper		13.5	4.8	40.9	30
Cornucopia		26	3.5	44	1
Bamboo		3.7	7.5	44	3
Malted		19.5	4.9	46.5	4
Rattan		16	3.7	41	4
Beach Grass		25.4	3.9	53.6	84
Cornichon		39.7	3.4	73.3	66
Timothy Hay		26	3	122	1
Sultana		33.3	3.3	55.2	21
Bay Leaf		60.3	1.9	124.3	7
Mossy Rock		81.8	1.6	127.5	9


Color of Filtered Water 2011-2014 Summary
140
120
100
80
60
40
20
0
Chopstick
Rice Paper
Shortbread
Toasted Marshmallow
Dune
Dried Chamomile
Parchment Paper
Rattan
Eiderdown
Cornucopia
Bamboo
Malted
Beach Grass
Sultana
Cornichon
Timothy Hay
Bay Leaf
Mossy Rock
Chlorophyll Concentrations (average)
Secchi Transparency (average)
Phosphorus Concentrations (average)
329 Samples

North Center Lake-North

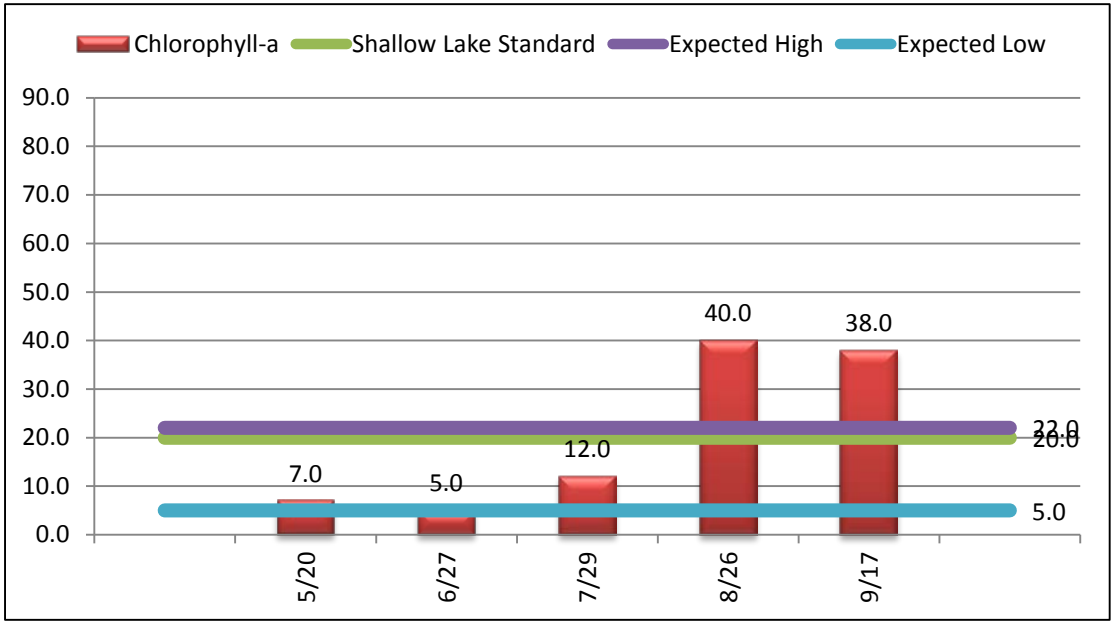
Lake 13-0032-01 Site 202



2014 Report Card: Shallow Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	C
MPCA Standards	Yes Impaired
2014 Ranking	14 of 21

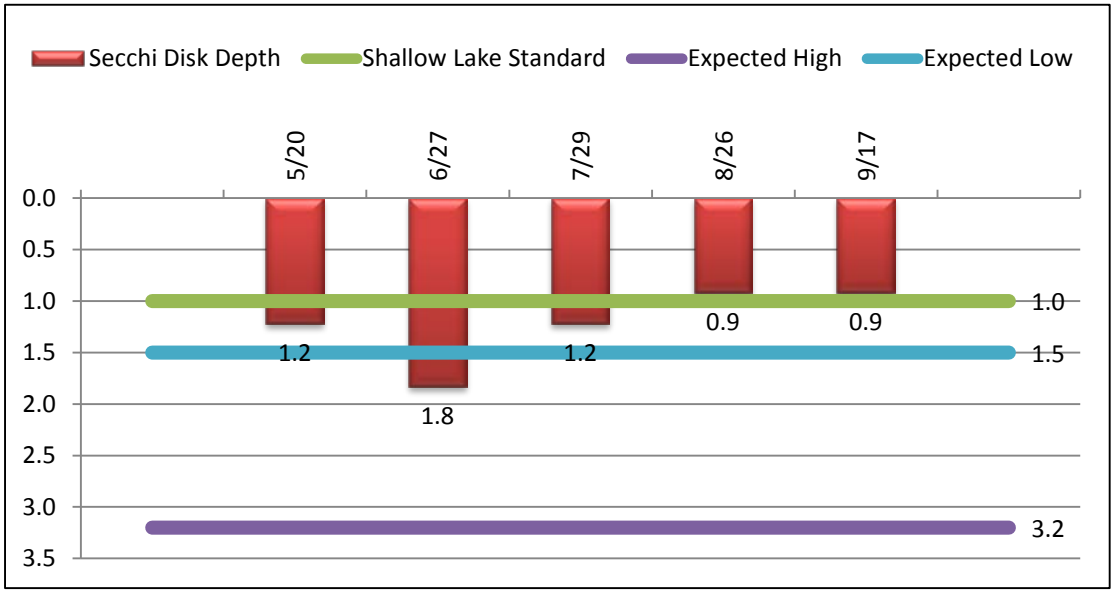
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	60.2	57.4	60.5	59.3
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic
2014 Average (May-Sept)	20.4 µg/L	1.2 meters	49.6 µg/L	-----
Grade	C	C-D	C	C
MPCA Standard (Shallow)	20.0 µg/L	>1 meter	60.0 µg/L	-----
2014 Average (June-Sept)	23.8 µg/L	1.2 meters	52.3 µg/L	-----
Meets Standard	No	Yes	Yes	Yes

Chlorophyll-a | Expected Range: 5.0-22.0 µg/L | Shallow Lake Standard: 20.0 µg/L | North Center Lake-North



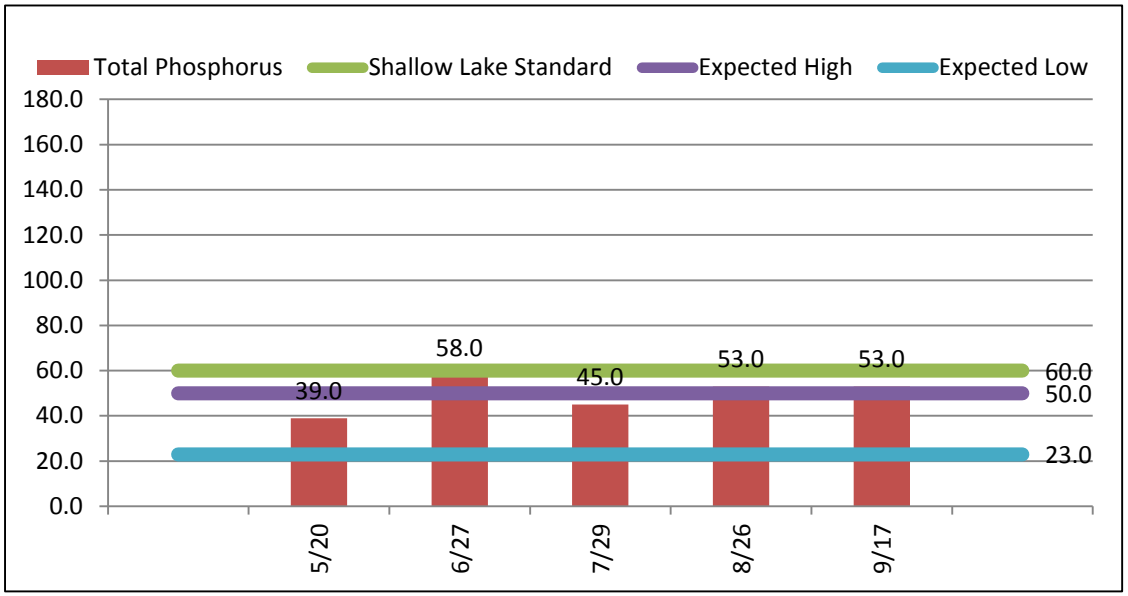
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	40.9	31.2	26.8	41.2	19.0	**20.4**
Grade	C	C	C	C	B	**C**
Average (June-Sept) µg/L	49.5	39.0	31.8	50.8	20.3	**23.8**
Meets Standard (20.0 µg/L)	No	No	No	No	Yes	**No**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Shallow Lake Standard: >1.0 meter | North Center Lake-North



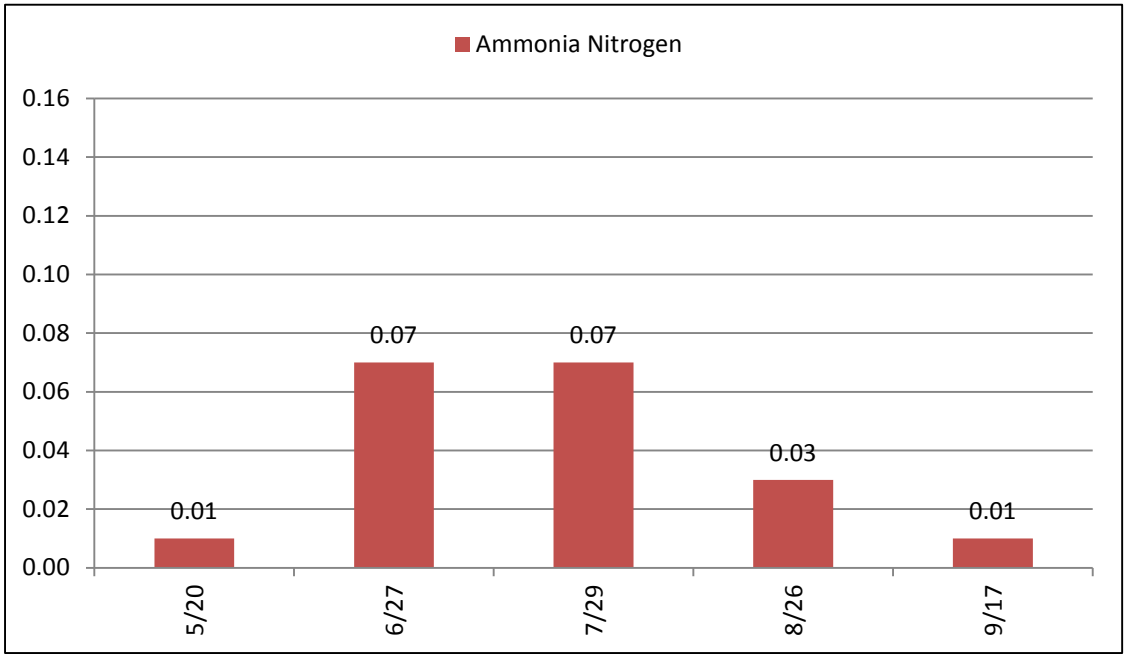
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	0.9	1.1	1.4	1.2	1.2	**1.2**
Grade	D	D	C	C-D	C-D	**C-D**
Average (June-Sept) meters	0.7	0.8	1.3	0.8	1.2	**1.2**
Meets Standard (>1.0 meter)	No	No	Yes	No	Yes	**Yes**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Shallow Lake Standard: 60.0 µg/L |North Center Lake-North



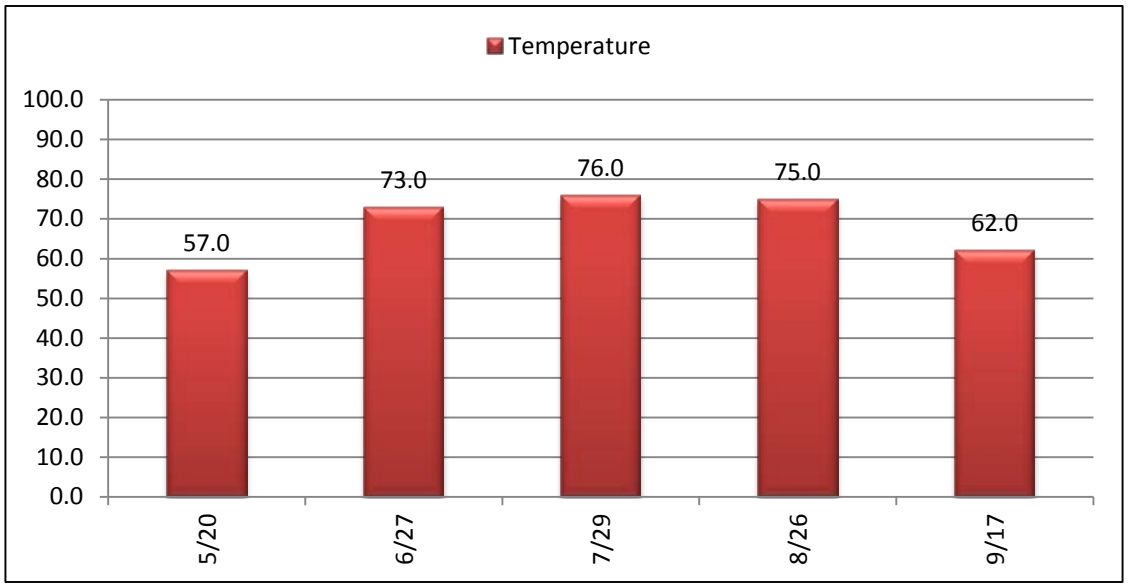
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	80.0	74.0	52.6	60.6	41.2	**49.6**
Grade	D	D	C	C	C	**C**
Average (June-Sept) µg/L	87.0	82.0	56.0	67.0	40.5	**52.3**
Meets Standard (60.0 µg/L)	No	No	Yes	No	Yes	**Yes**

Ammonia Nitrogen | Expected Range: None | Shallow Lake Standard: None | North Center Lake-North



Average mg/L	
2009	<0.05
2010	<0.05
2011	0.07
2012	0.17
2013	0.016
2014	0.04

Surface Water Temperature |Expected Range: None | Shallow Lake Standard: None | North Center Lake-North



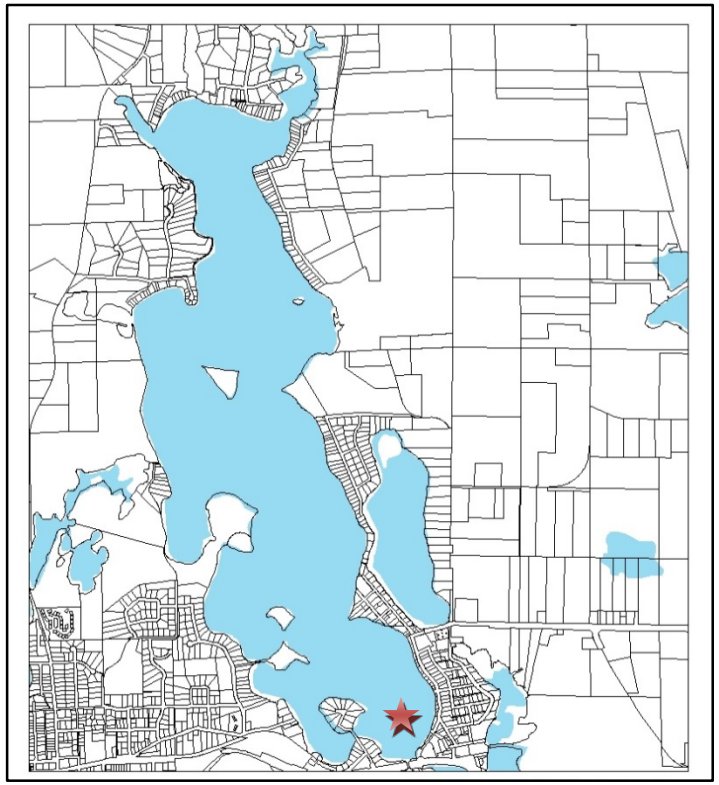
Year	Average ° F
2009	71.7
2010	No Data
2011	65.8
2012	70.0
2013	73.8
2014	68.6

General Observations | North Center Lake-North

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	Other Notes
May	2	2	Short Bread	Fish kill-winter 2013-2014; minimal aquatic vegetation present
June	2	2	Dried Chamomile	Higher water levels; minimal aquatic vegetation
July	3	3	Parchment Paper	
August	3	3	Beach Grass	Good control of Eurasian Watermilfoil for navigation
September	3	3	Beach Grass	

North Center Lake-South

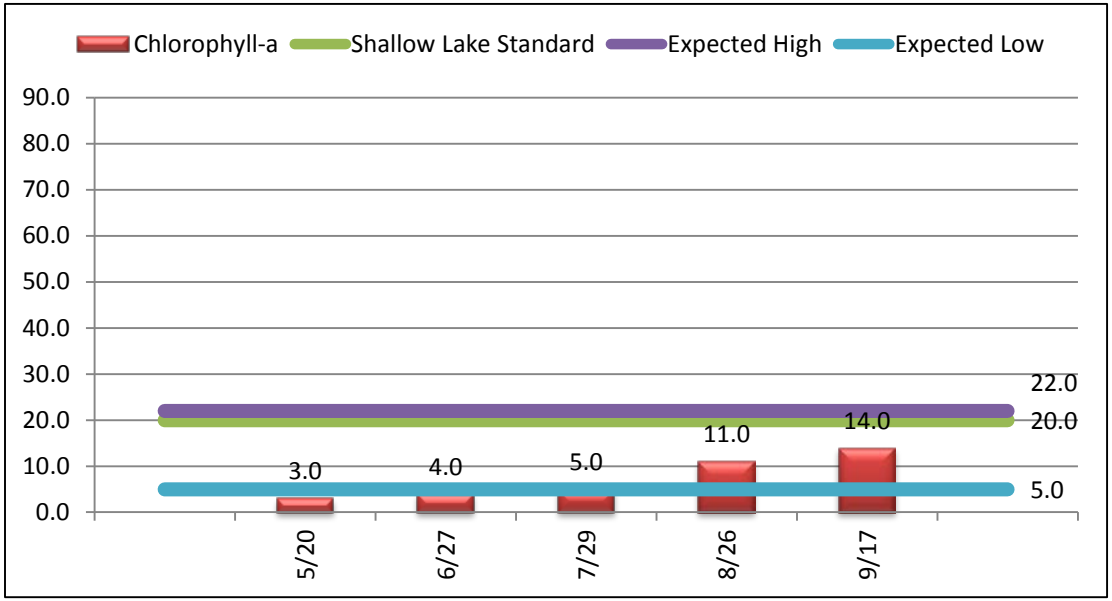
Lake 13-0032-01 Site 201



2014 Report Card: Shallow Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	C+
MPCA Standards	Yes Impaired
2014 Ranking	10 of 21

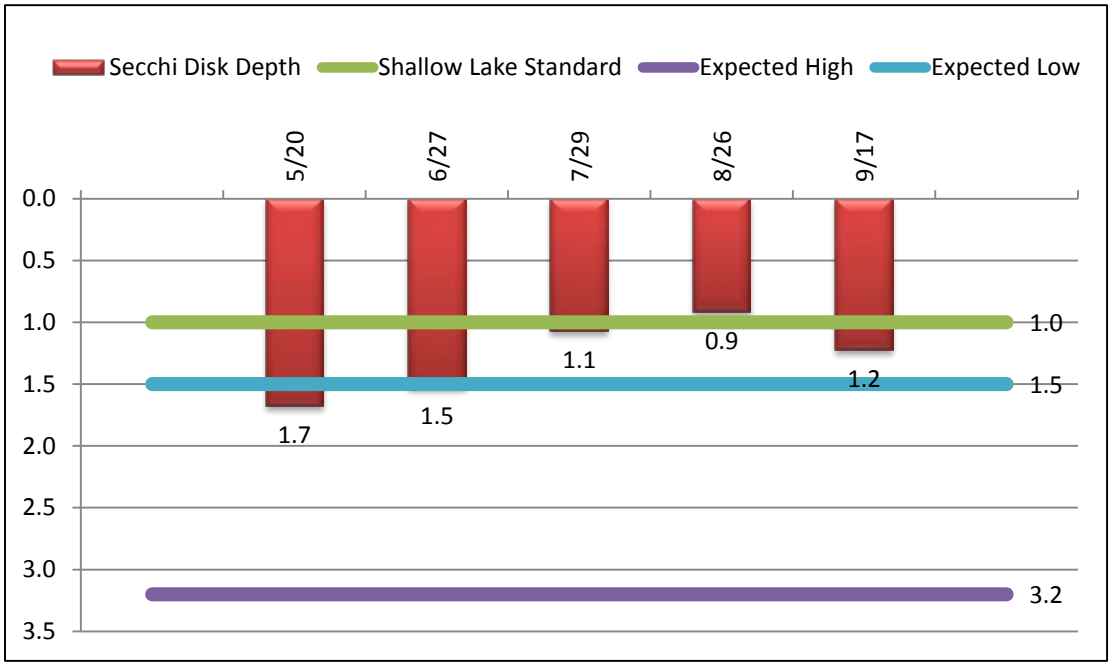
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	50.2	56.4	59.9	55.5
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic
2014 Average (May-Sept)	7.4 µg/L	1.3 meters	47.8 µg/L	-----
Grade	A	C	C	C+
MPCA Standard (Shallow)	20.0 µg/L	<1 meter	60.0 µg/L	-----
2014 Average (June-Sept)	8.5 µg/L	1.2 meters	52.5 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 | North Center Lake-South



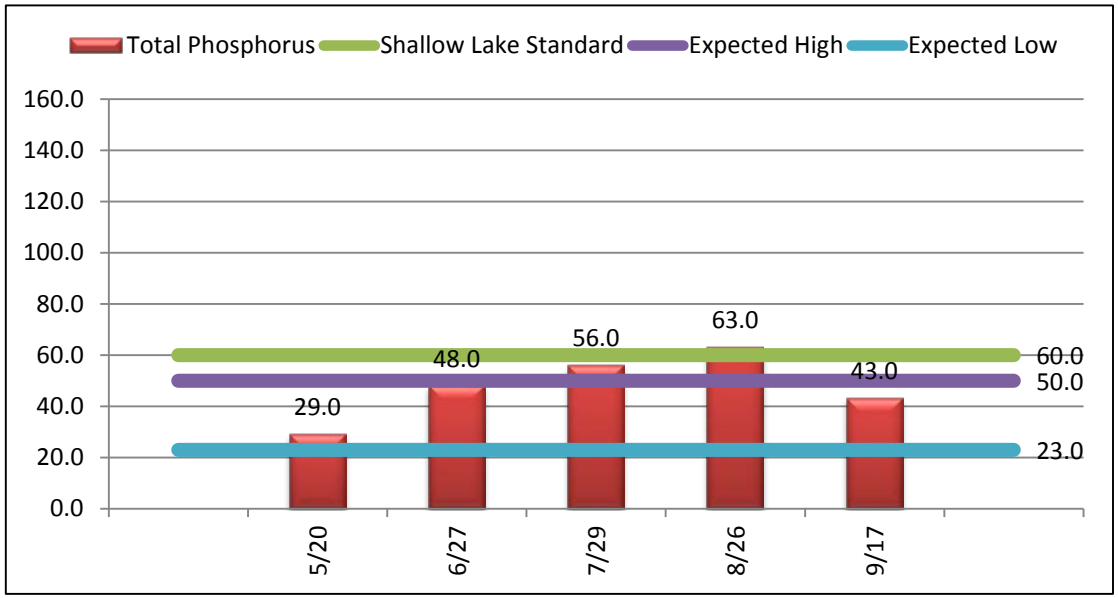
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	24.9	19.5	17.2	38.4	14.4	**7.4**
Grade	C	B	B	C	B	**A**
Average (June-Sept) µg/L	29.9	22.8	20.5	47.0	15.3	**8.5**
Meets Standard (20.0 µg/L)	No	No	No	No	Yes	**Yes**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Shallow Lake Standard: >1.0 meter | North Center Lake-South



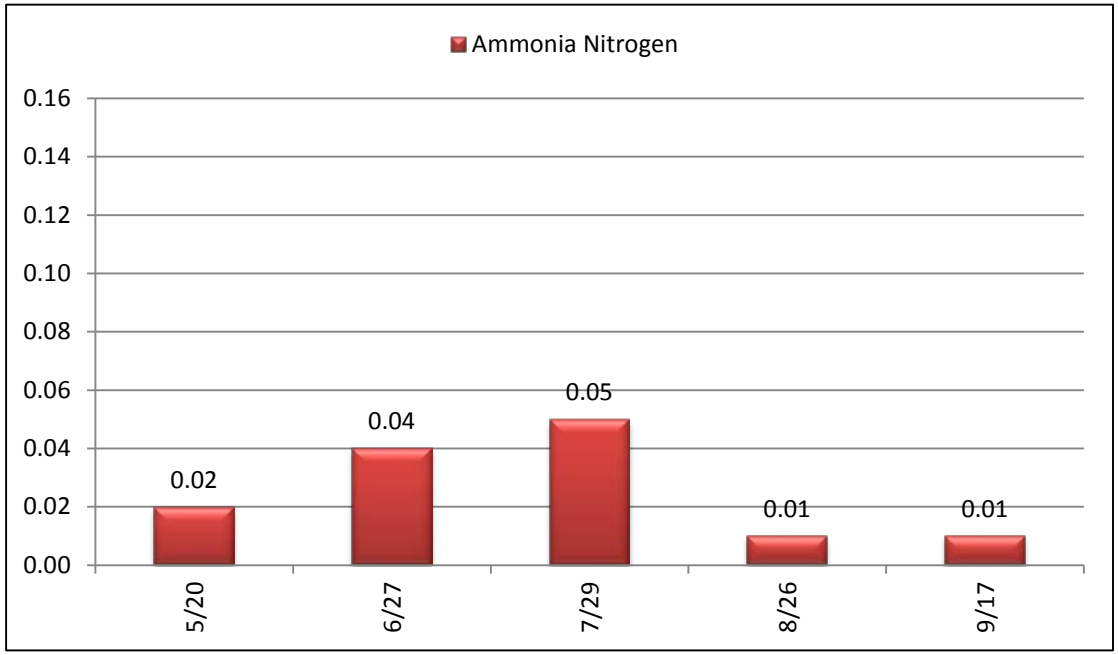
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	1.6	1.4	1.2	1.1	1.2	**1.3**
Grade	C	C	C-D	D	C-D	**C**
Average (June-Sept) meters	1.4	1.2	1.0	0.9	1.2	**1.2**
Meets Standard (>1.0 meter)	Yes	Yes	No	No	Yes	**Yes**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Shallow Lake Standard: 60.0 µg/L | North Center Lake-South



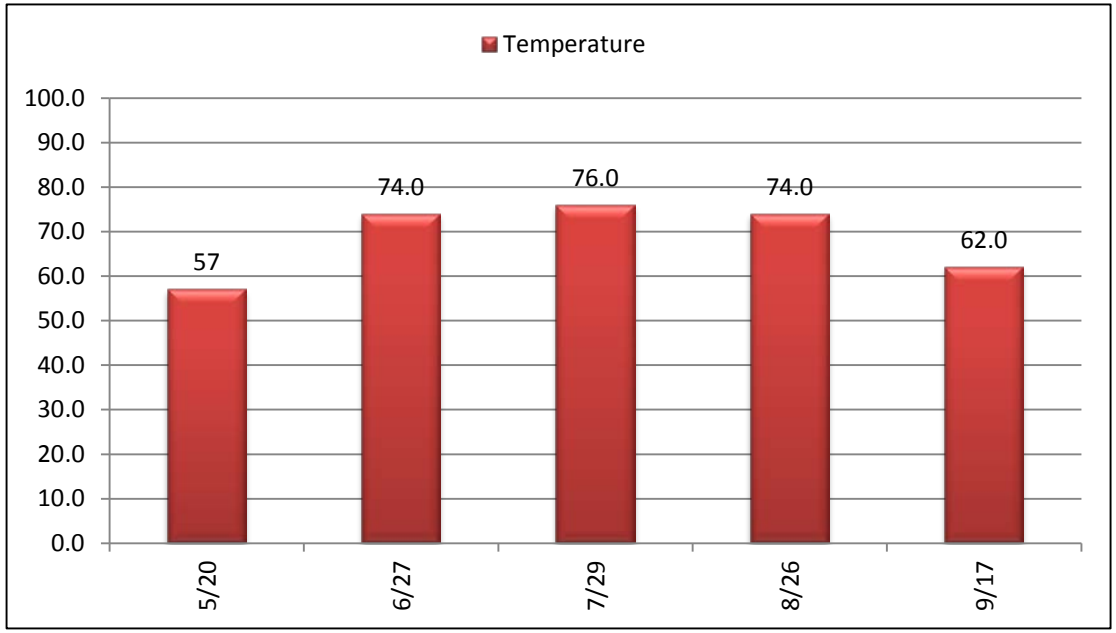
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	70.0	60.0	61.0	54.8	47.2	**47.8**
Grade	D	C	C	C	C	**C**
Average (June-Sept) µg/L	78.0	65.0	62.3	60.3	49.8	**52.5**
Meets Standard (60.0 µg/L)	No	No	No	No	Yes	**Yes**

Ammonia Nitrogen | Expected Range: None | Shallow Lake Standard: None | North Center Lake-South



Average mg/L	
2009	<0.05
2010	<0.05
2011	0.06
2012	0.08
2013	0.05
2014	0.03

Surface Water Temperature |Expected Range: None | Shallow Lake Standard: None | North Center Lake-South



Year	Average ° F
2009	69.8
2010	No Data
2011	65.4
2012	69.6
2013	73.0
2014	68.8

General Observations | North Center Lake-South

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	2	2	Toasted Marshmallow	Fish kill winter 213-2014; minimal aquatic vegetation present
June	2	2	Dried Chamomile	Higher water levels; minimal aquatic vegetation
July	3	3	Parchment Paper	
August	3	3	Beach Grass	Good control of Eurasian Watermilfoil for navigation
September	3	3	Beach Grass	

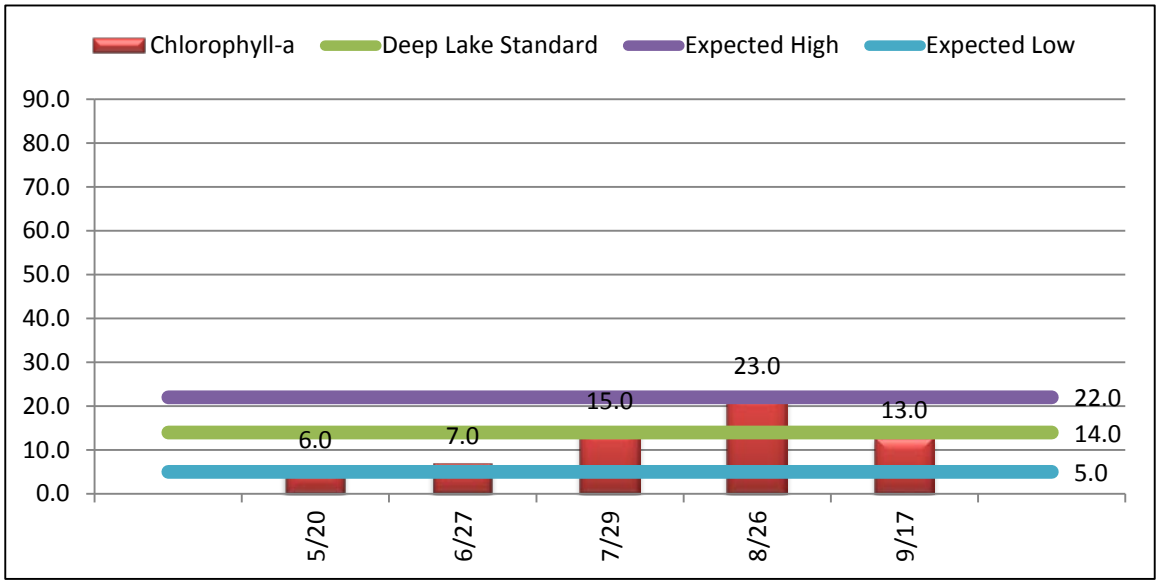
South Center Lake

Lake 13-0027-00 Site 207

2014 Report Card: Deep Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	C+
MPCA Standards	No Impaired
2014 Ranking	11 of 21

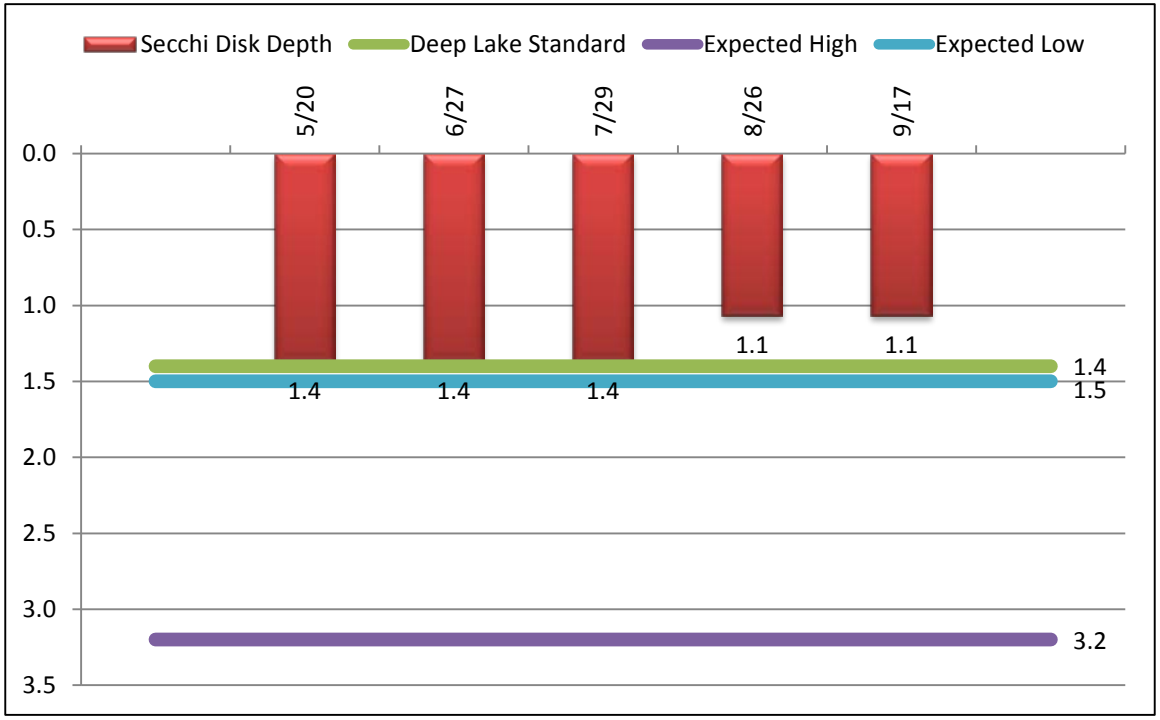
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	55.6	56.4	56.3	56.1
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic
2014 Average (May-Sept)	12.8 µg/L	1.3 meters	37.2 µg/L	-----
Grade	B	C	C	C+
MPCA Standard (Deep)	14.0 µg/L	<1.4 meters	40.0 µg/L	-----
2014 Average (June-Sept)	14.5 µg/L	1.3 meters	38.3 µg/L	-----
Meets Standard	No	No	Yes	No

Chlorophyll-a | Expected Range: 5.0-22.0 µg/L | Deep Lake Standard: 14.0 µg/L | South Center Lake



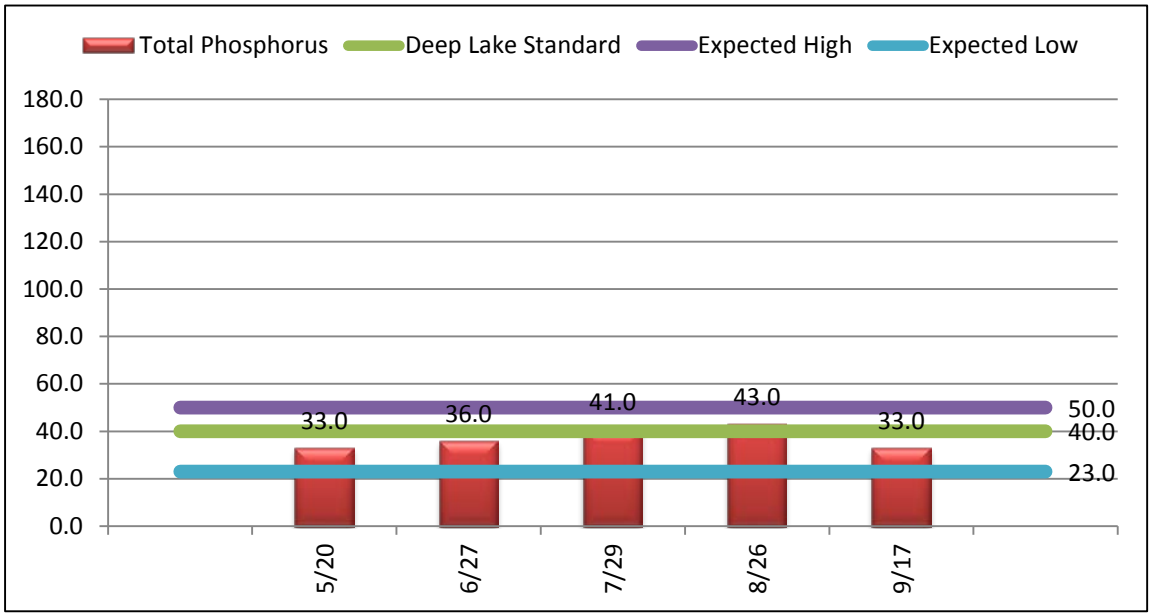
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	17.4	36.4	14.0	**12.8**
Grade	No Data	No Data	B	C	B	**B**
Average (June-Sept) µg/L	No Data	No Data	21.0	44.0	16.0	**14.5**
Meets Standard (14.0 µg/L)	No Data	No Data	No	No	No	**No**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Deep Lake Standard: >1.4 meters | South Center Lake



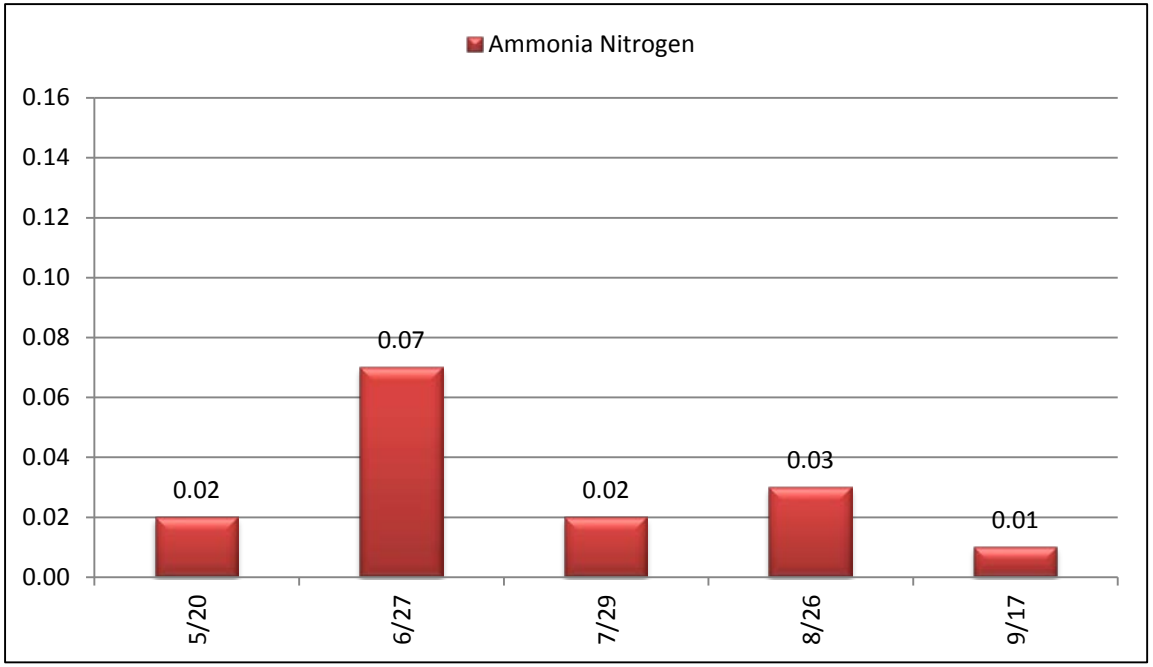
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	No Data	No Data	1.2	1.3	1.6	**1.3**
Grade	No Data	No Data	C-D	C	C	**C**
Average (June-Sept) meters	No Data	No Data	1.0	0.7	1.5	**1.3**
Meets Standard (>1.4 meters)	No Data	No Data	No	No	Yes	**No**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Deep Lake Standard: 40.0 µg/L | South Center Lake



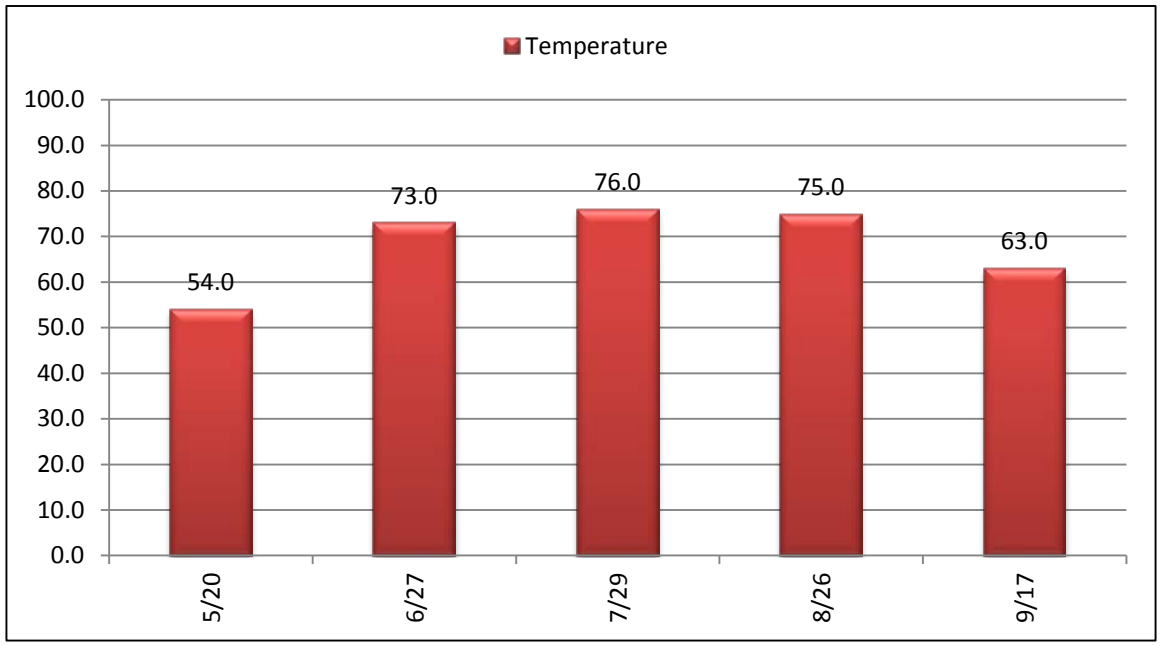
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	43.6	39.4	33.8	**37.2**
Grade	No Data	No Data	C	C	C	**C**
Average (June-Sept) µg/L	No Data	No Data	47.5	44.3	34.8	**38.3**
Meets Standard (40.0 µg/L)	No Data	No Data	No	No	Yes	**Yes**

Ammonia Nitrogen | Expected Range: None | Deep Lake Standard: None | South Center Lake



Average mg/L	
2009	No Data
2010	No Data
2011	0.04
2012	0.07
2013	0.02
2014	0.03

Surface Water Temperature |Expected Range: None | Deep Lake Standard: None | South Center Lake



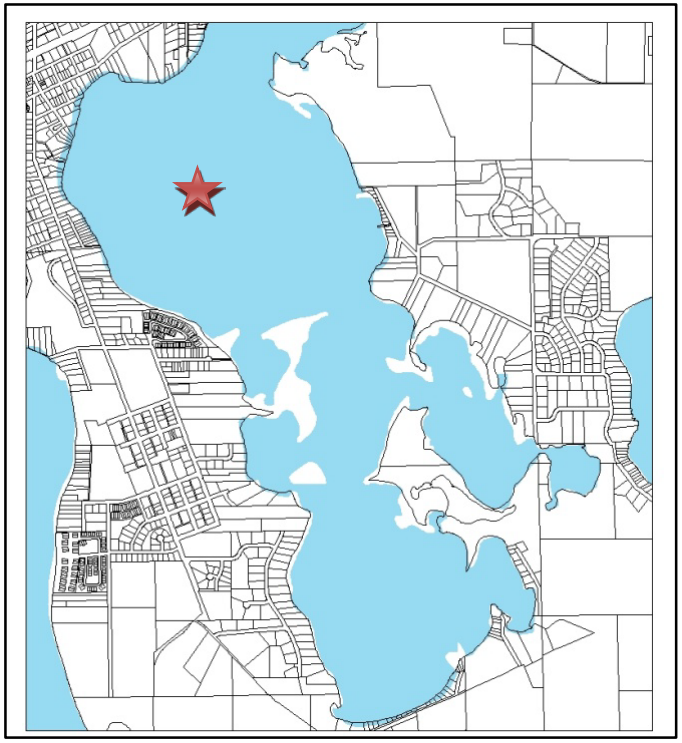
Year	Average ° F
2009	No Data
2010	No Data
2011	No Data
2012	70.0
2013	71.8
2014	68.2

General Observations | South Center Lake

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	2	2	Short Bread	Minimal aquatic vegetation
June	2	2	Beach Grass	Higher water levels; minimal aquatic vegetation
July	3	3	Beach Grass	
August	3	3	Beach Grass	Reduced aquatic plant and algae growth compared to previous years
September	3	3	Beach Grass	

Chisago Lake-North

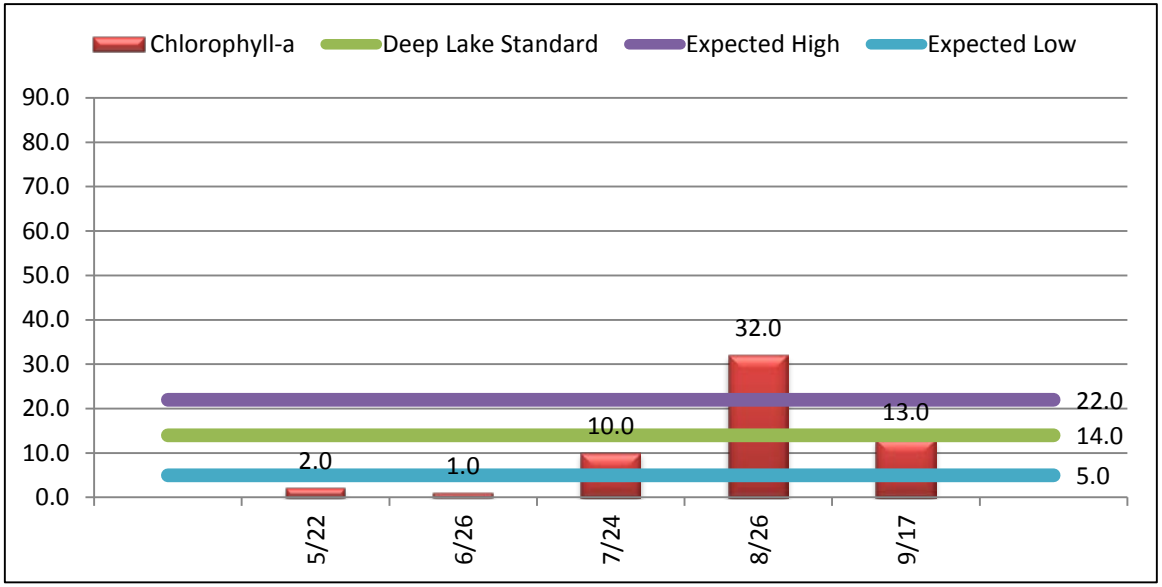
Lake 13-0012-01 Site 202



2014 Report Card: Deep Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	C+
MPCA Standards	Yes Not Impaired
2014 Ranking	9 of 21

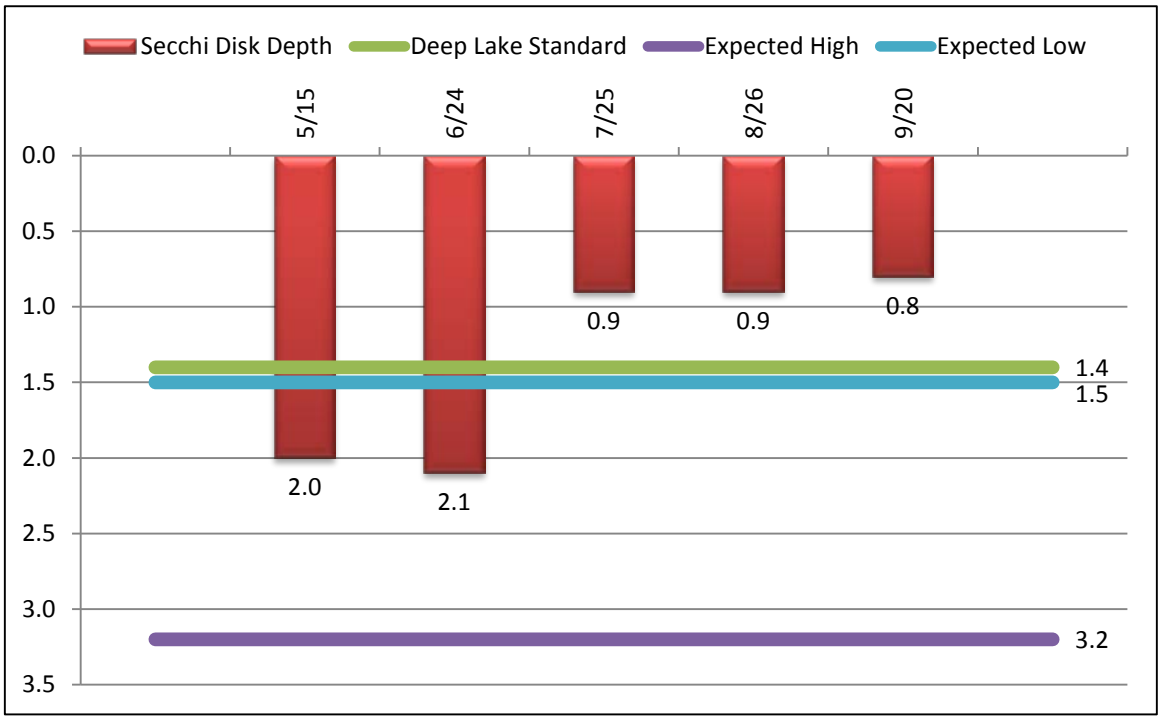
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	54.6	50.6	58.2	54.5
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic
2014 Average (May-Sept)	11.6 µg/L	1.9 meters	42.4 µg/L	-----
Grade	B	C	C	C+
MPCA Standard (Deep)	14.0 µg/L	<1.4 meters	40.0 µg/L	-----
2014 Average (June-Sept)	14.0 µg/L	1.8 meters	40.3 µg/L	-----
Meets Standard	Yes	Yes	No	Yes

Chlorophyll-a | Expected Range: 5.0-22.0 µg/L | Deep Lake Standard: 14.0 µg/L | Chisago Lake-North



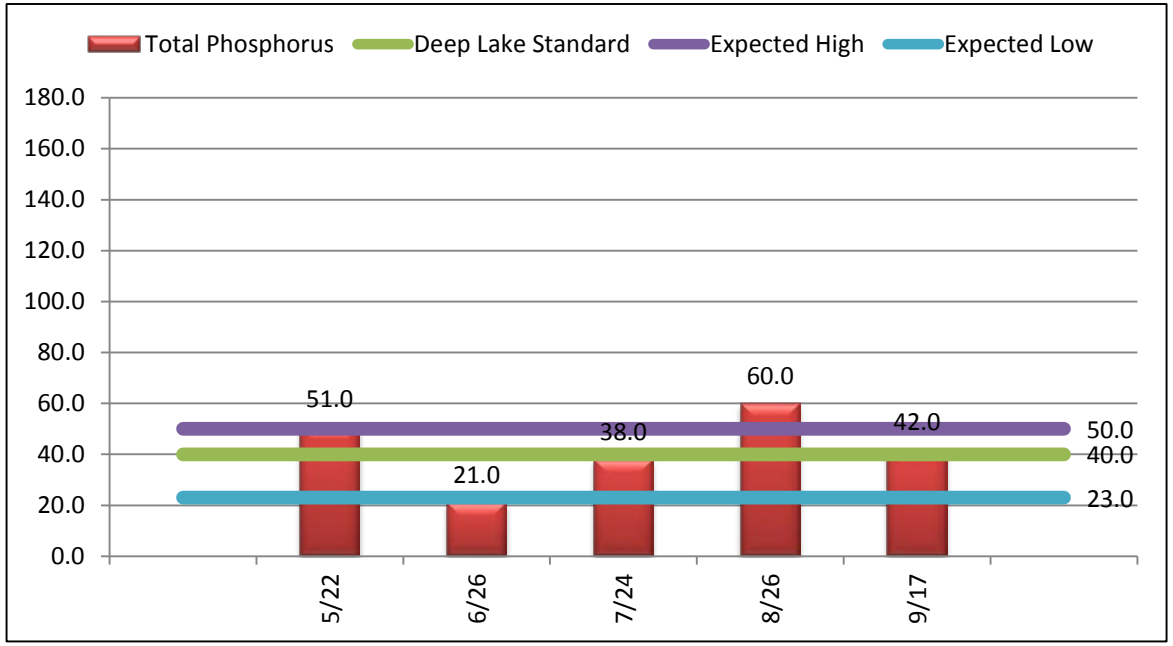
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	12.2	31.3	10.4	41.6	27.4	**11.6**
Grade	B	C	B	C	C	**B**
Average (June-Sept) µg/L	13.7	31.3	12.8	51.5	33.5	**14.0**
Meets Standard (14.0 µg/L)	Yes	No	Yes	No	No	**Yes**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Deep Lake Standard: >1.4 meters | Chisago Lake-North



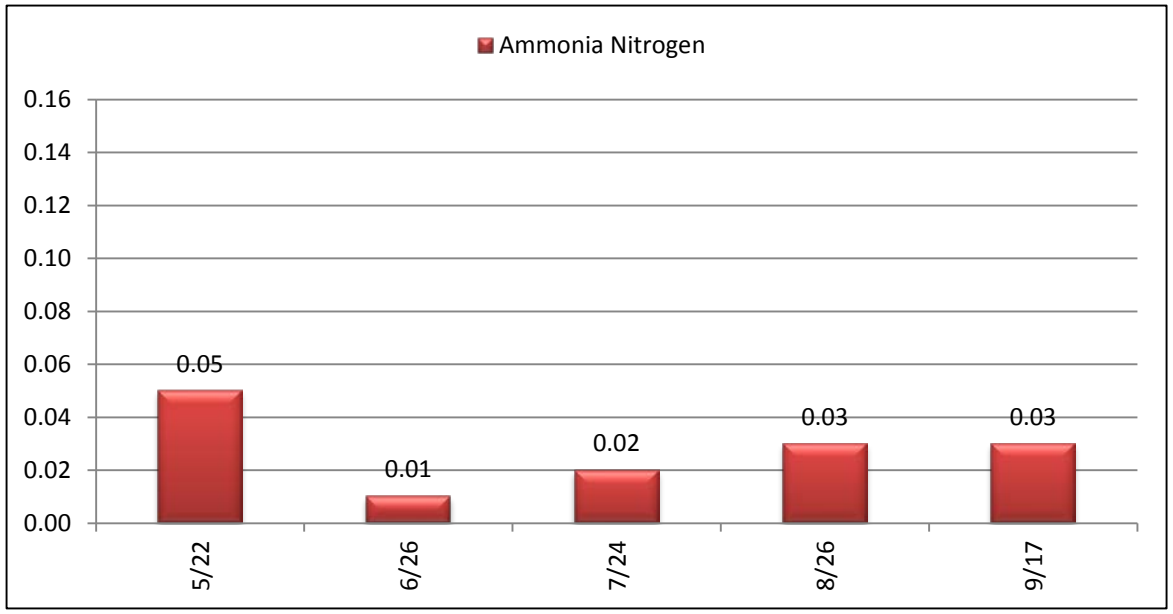
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	2.3	1.8	2.2	1.3	1.3	**1.9**
Grade	B	C	C	C	C	**C**
Average (June-Sept) meters	2.0	1.8	1.9	0.9	1.2	**1.8**
Meets Standard (>1.4 meters)	Yes	Yes	Yes	No	No	**Yes**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Deep Lake Standard: 40.0 µg/L | Chisago Lake-North



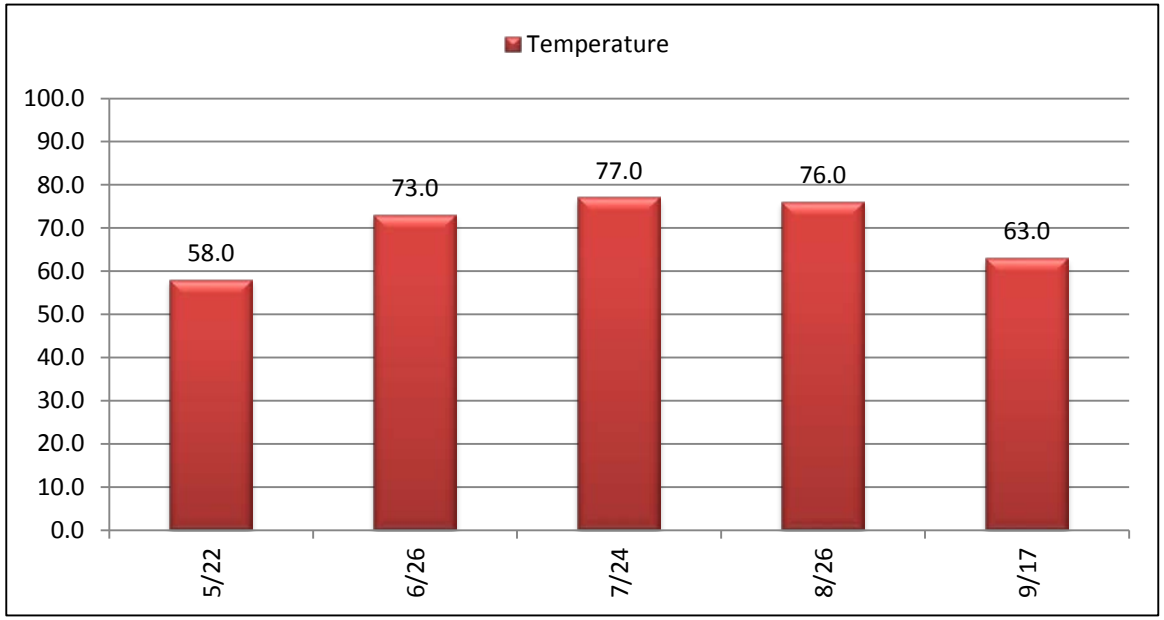
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	28.0	48.0	37.8	66.8	48.4	**42.4**
Grade	B	C	C	C	C	**C**
Average (June-Sept) µg/L	28.0	48.0	42.8	79.0	53.3	**40.3**
Meets Standard (40.0 µg/L)	Yes	No	No	No	No	**No**

Ammonia Nitrogen | Expected Range: None | Deep Lake Standard: None | Chisago Lake-North



Average mg/L	
2009	<0.05
2010	<0.05
2011	0.04
2012	0.07
2013	0.04
2014	0.03

Surface Water Temperature |Expected Range: None | Deep Lake Standard: None | Chisago Lake-North



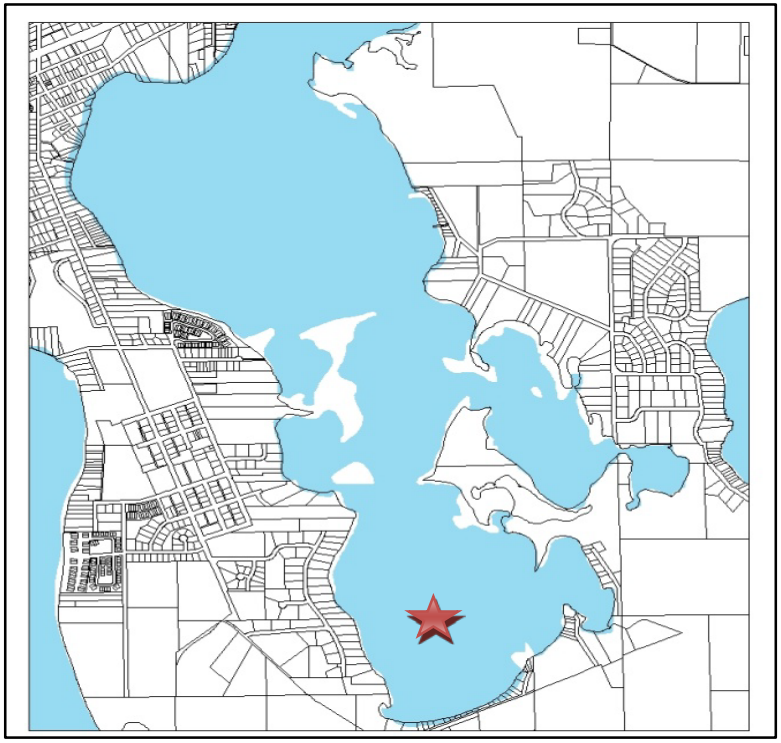
Year	Average ° F
2009	71.8
2010	73.0
2011	65.6
2012	72.4
2013	72.0
2014	69.4

General Observations | Chisago Lake-North

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	2	2	Toasted Marshmallow	Minimal aquatic vegetation present; Slimmers Slough navigable
June	2	2	Rice Paper	Higher water levels; minimal aquatic vegetation
July	3	3	Beach Grass	Low aquatic plant density
August	2	2	Sultana	Reduced aquatic plant and algae growth compared to previous years. Purple loosestrife identified by lake association.
September	3	3	Beach Grass	Purple loosestrife identified by lake association

Chisago Lake-South

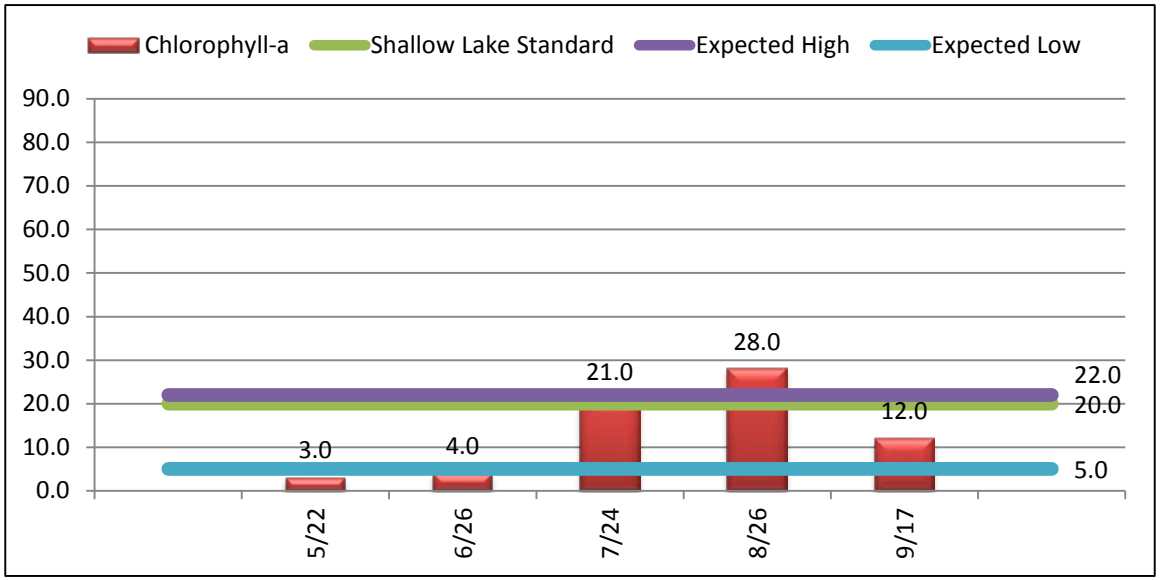
Lake 13-0012-02 Site 201



2014 Report Card: Shallow Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	C
MPCA Standards	Yes Not Impaired
2014 Ranking	13 of 21

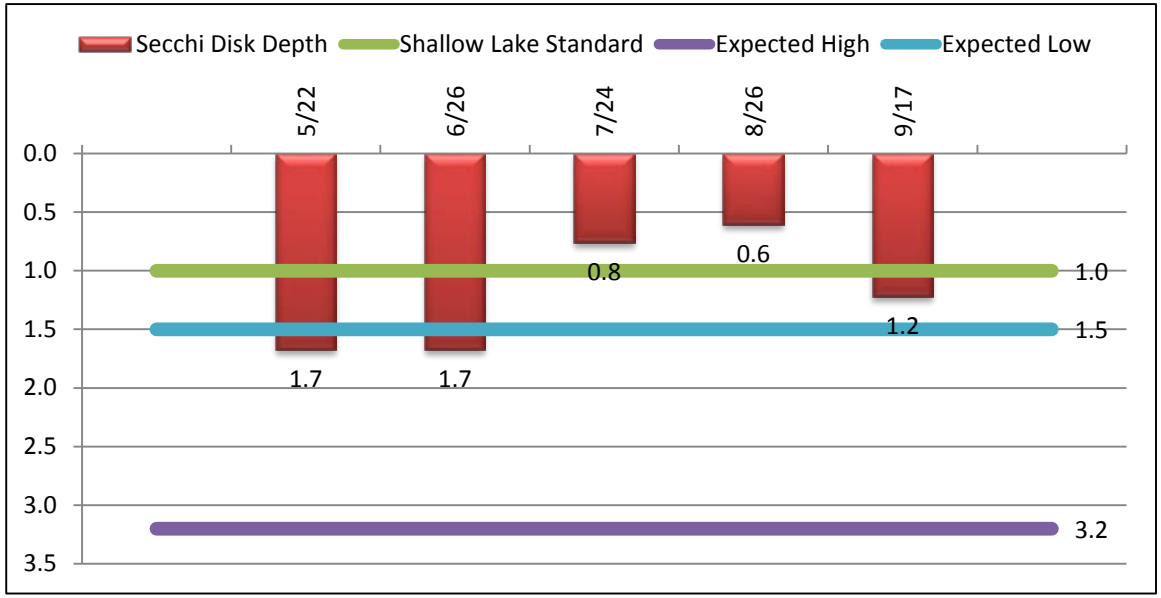
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	56.2	57.4	63.7	59.5
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic
2014 Average (May-Sept)	13.6 µg/L	1.2 meters	62.2 µg/L	-----
Grade	B	C-D	C	C
MPCA Standard (Shallow)	20.0 µg/L	<1.0 meter	60.0 µg/L	-----
2014 Average (June-Sept)	16.3 µg/L	1.1 meters	68.8 µg/L	-----
Meets Standard	Yes	Yes	No	Yes

Chlorophyll-a | Expected Range: 5.0-22.0 µg/L | Shallow Lake Standard: 20.0 µg/L | Chisago Lake-South



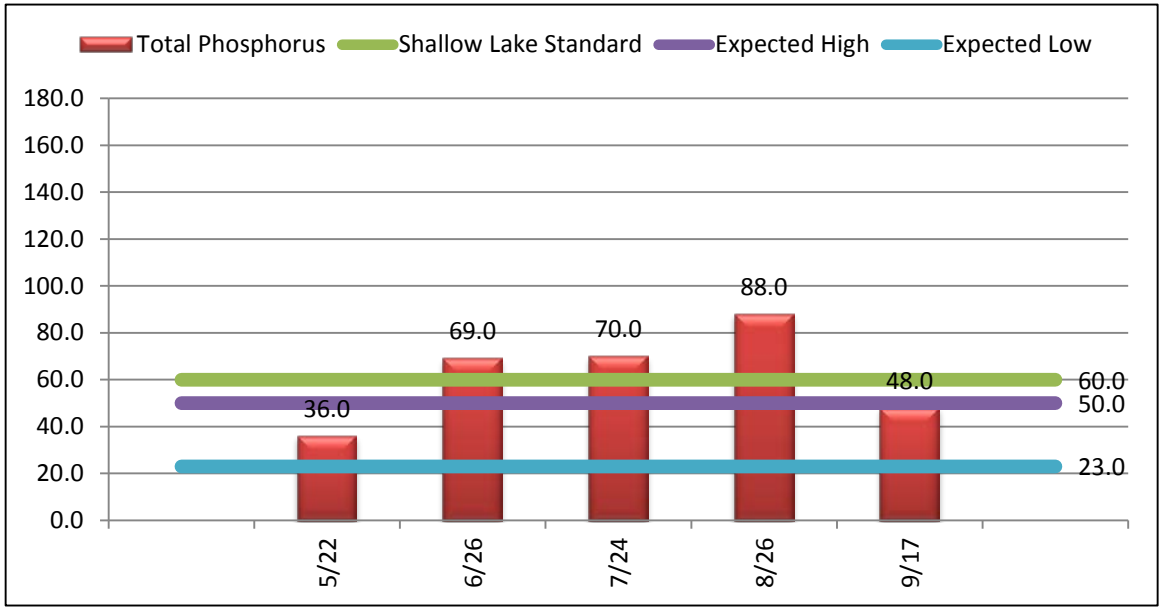
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	15.8	42.6	15.0	56.8	31.8	**13.6**
Grade	B	C	B	D	C	**B**
Average (June-Sept) µg/L	19.1	57.7	18.3	70.3	38.5	**16.3**
Meets Standard (20.0 µg/L)	Yes	No	Yes	No	No	**Yes**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Shallow Lake Standard: >1.0 meter | Chisago Lake-South



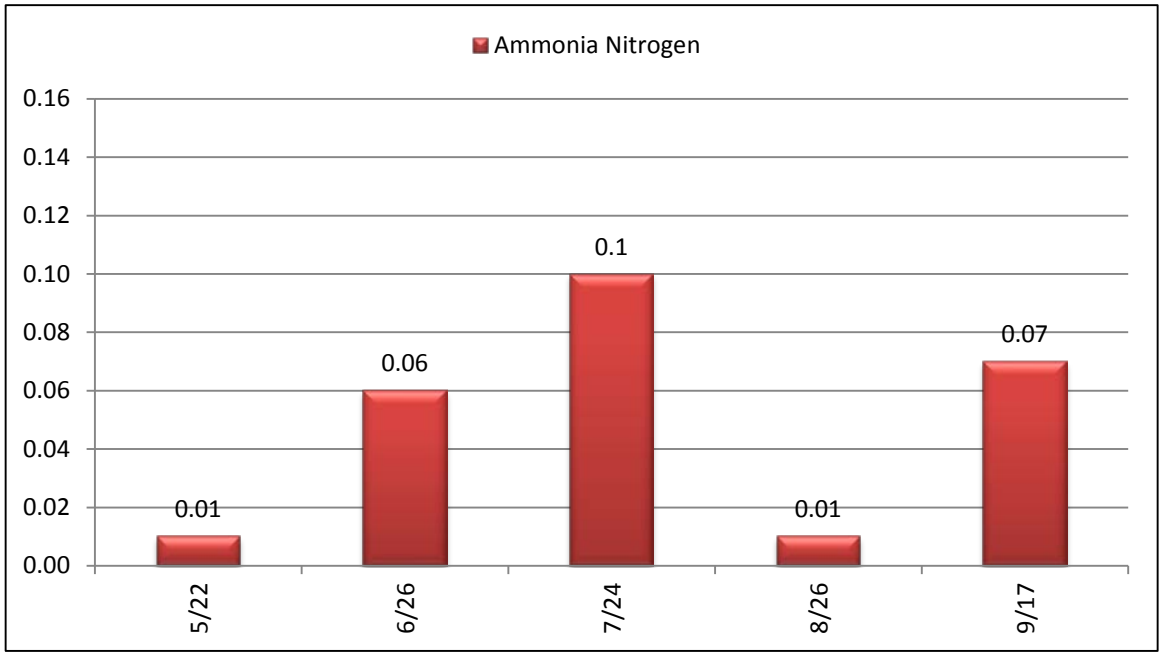
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	1.8	1.3	1.8	2.4	1.0	**1.2**
Grade	C	C	C	B	D	**C-D**
Average (June-Sept) meters	1.7	1.1	1.2	1.6	0.9	**1.1**
Meets Standard (>1.0 meter)	Yes	Yes	Yes	Yes	No	**Yes**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Shallow Lake Standard: 60.0 µg/L | Chisago Lake-South



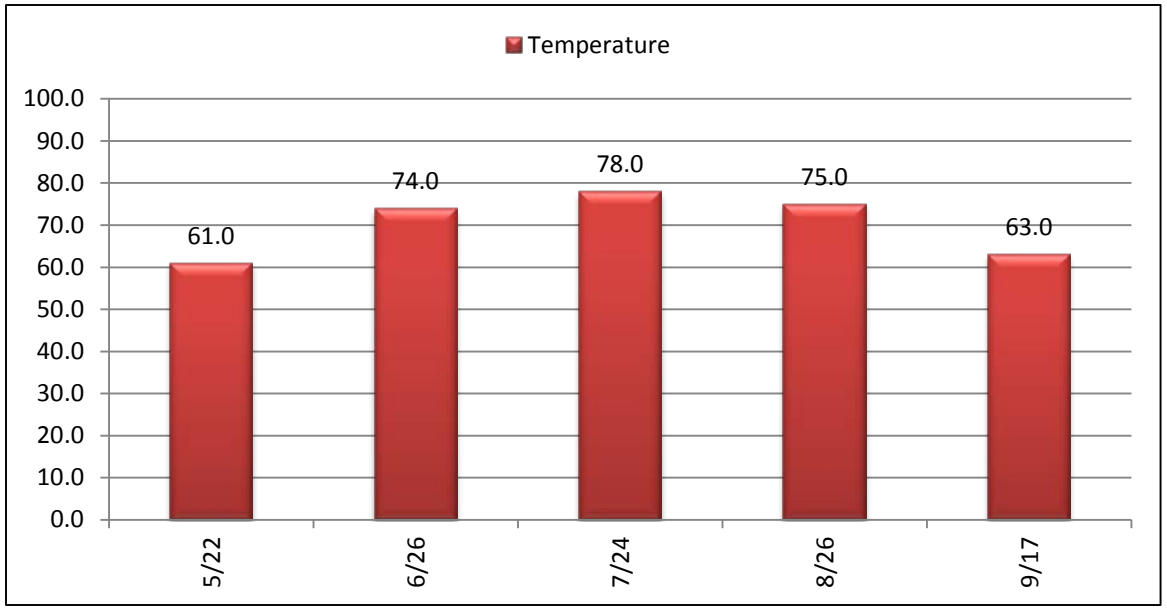
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	38.0	69.0	52.8	99.0	76.0	**62.2**
Grade	C	D	C	D	D	**C**
Average (June-Sept) µg/L	42.0	80.0	60.8	117.3	83.8	**68.8**
Meets Standard (60.0 µg/L)	Yes	No	No	No	No	**No**

Ammonia Nitrogen | Expected Range: None | Shallow Lake Standard: None | Chisago Lake-South



Average mg/L	
2009	<0.05
2010	<0.05
2011	0.03
2012	0.08
2013	0.04
2014	0.05

Surface Water Temperature |Expected Range: None | Shallow Lake Standard: None | Chisago Lake-South



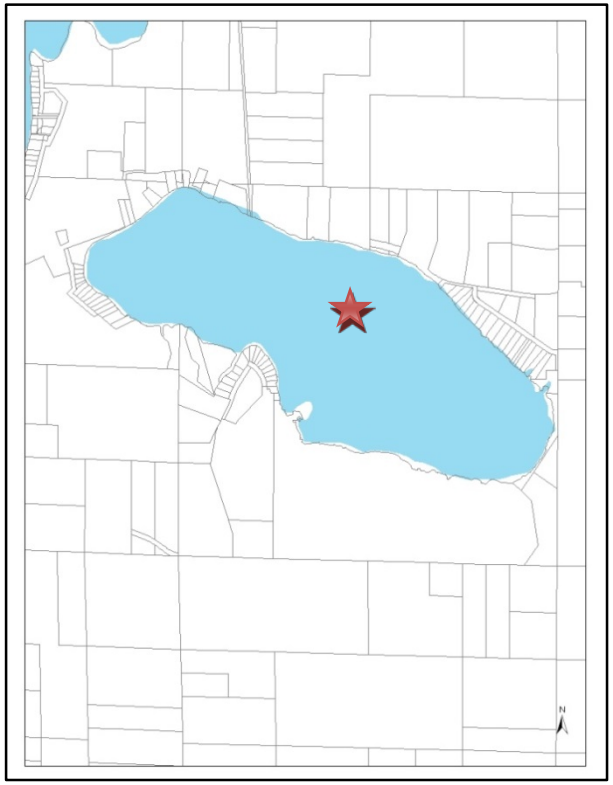
Year	Average ° F
2009	No Data
2010	No Data
2011	64.0
2012	72.8
2013	73.5
2014	70.2

General Observations | Chisago Lake-South

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	2	2	Toasted Marshmallow	Minimal aquatic vegetation present
June	2	2	Dried Chamomile	Higher water levels; minimal aquatic vegetation
July	3	3	Sultana	
August	2.5	2.5	Sultana	Reduced aquatic plant and algae growth compared to previous years. Purple loosestrife identified by lake association
September	3	3	Beach Grass	Purple loosestrife identified by lake association

Fish Lake

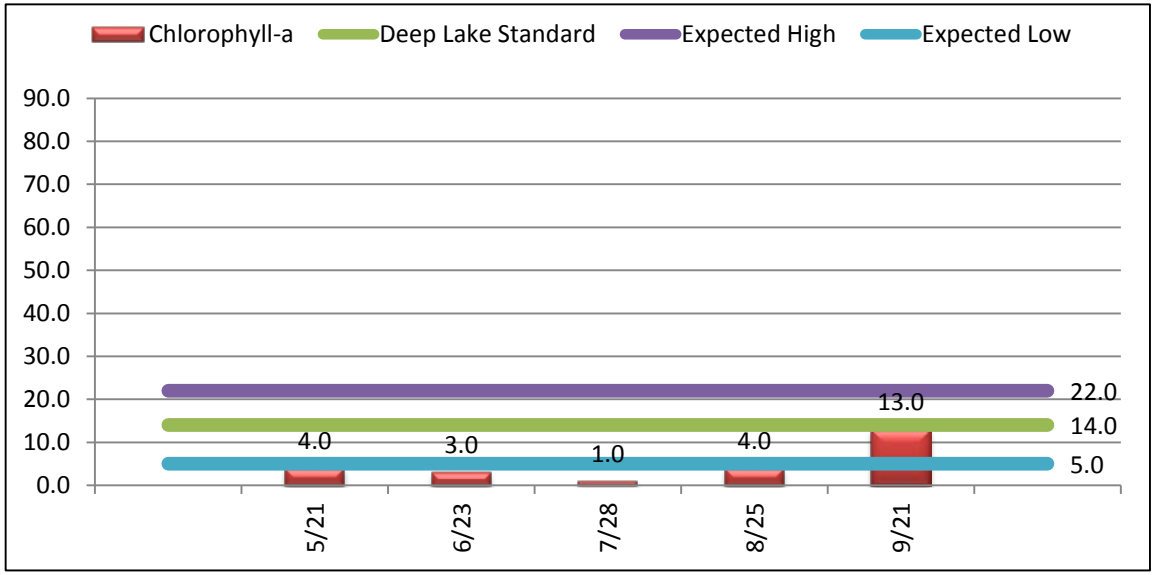
Lake 13-0068-00 Site 101



2014 Report Card: Deep Lake	
Lake Classification	Mesotrophic
Overall Lake Quality Grade	B
MPCA Standards	Yes Not Impaired
2014 Ranking	1 of 21

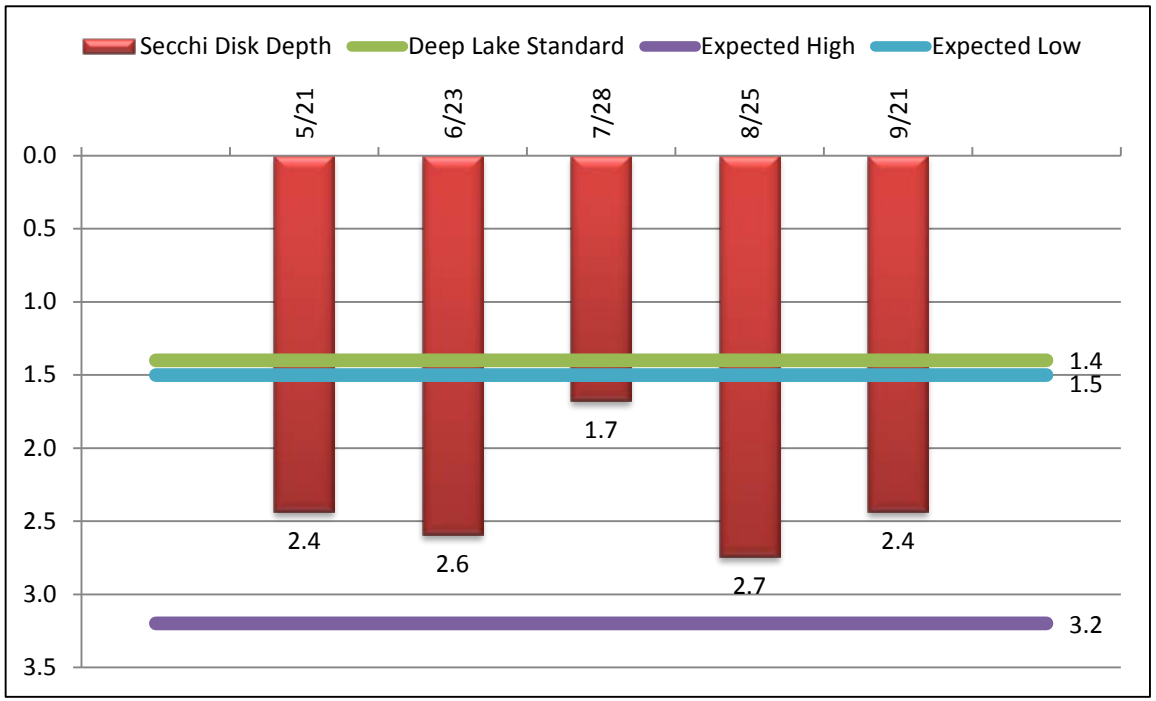
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	46.4	47.3	54.5	49.5
Classification	Mesotrophic	Mesotrophic	Eutrophic	Mesotrophic
2014 Average (May-Sept)	5.0 µg/L	2.4 meters	32.8 µg/L	-----
Grade	A	B	C	B
MPCA Standard (Deep)	14.0 µg/L	<1.4 meters	40.0 µg/L	-----
2014 Average (June-Sept)	5.3 µg/L	2.4 meters	35.0 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 | Fish Lake



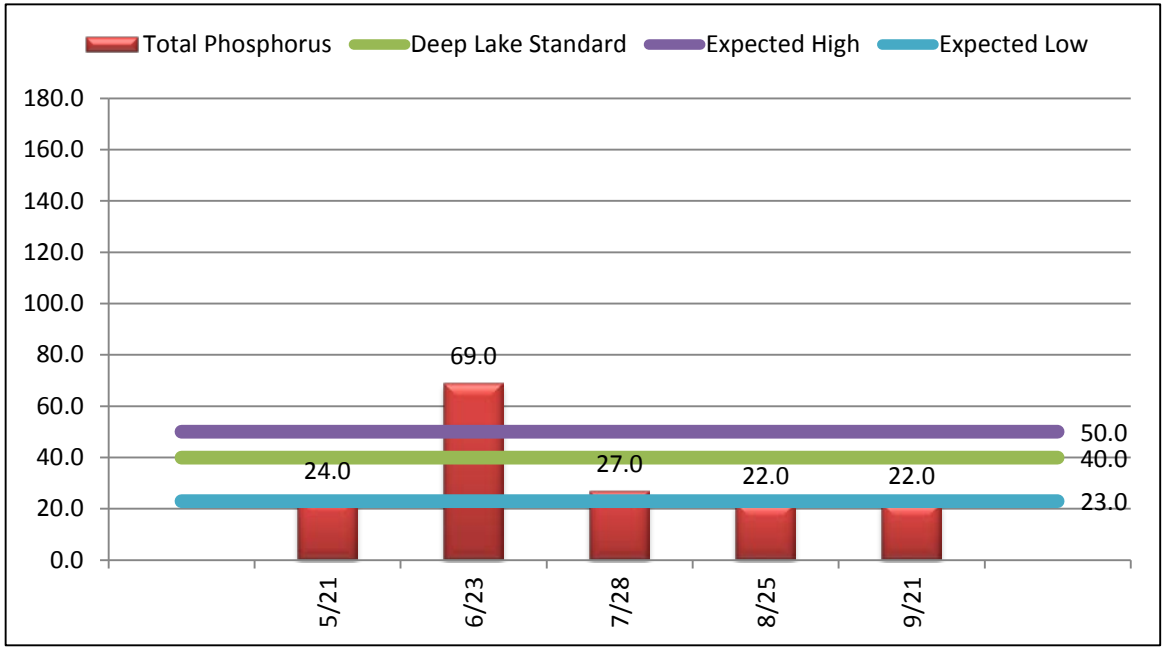
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	6.8	4.0	**5.0**
Grade	-----	-----	-----	A	A	**A**
Average (June-Sept) µg/L	No Data	No Data	No Data	7.3	4.0	**5.3**
Meets Standard (14.0 µg/L)	-----	-----	-----	Yes	Yes	**Yes**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Deep Lake Standard: >1.4 meters | Fish Lake



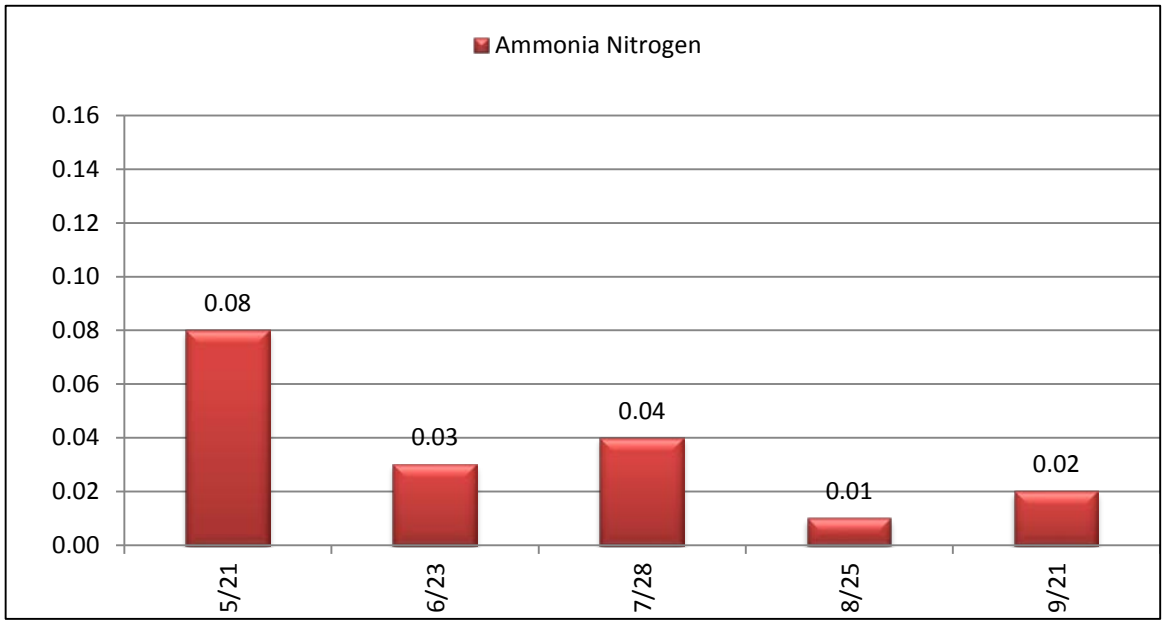
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	No Data	No Data	No Data	2.7	2.6	**2.4**
Grade	-----	-----	-----	B-C	B	**B**
Average (June-Sept) meters	No Data	No Data	No Data	2.1	2.9	**2.4**
Meets Standard (>1.4 meters)	-----	-----	-----	Yes	Yes	**Yes**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Deep Lake Standard: 40.0 µg/L | Fish Lake



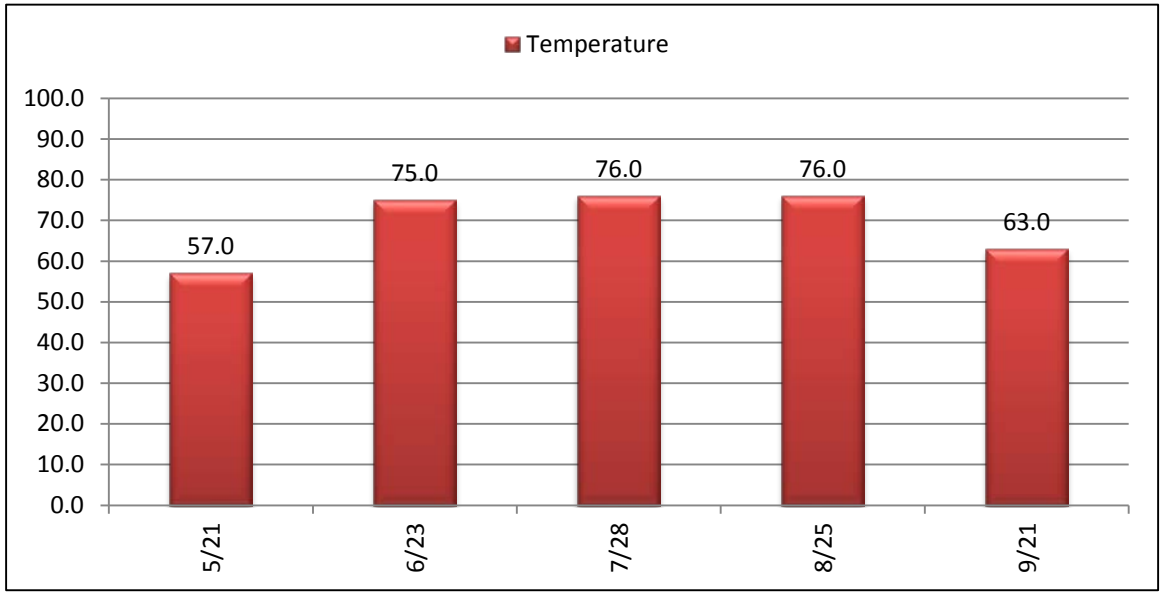
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	22.8	23.0	**32.8**
Grade	-----	-----	-----	A	B	**C**
Average (June-Sept) µg/L	No Data	No Data	No Data	21.8	20.5	**35.0**
Meets Standard (40.0 µg/L)	-----	-----	-----	Yes	Yes	**Yes**

Ammonia Nitrogen | Expected Range: None | Deep Lake Standard: None | Fish Lake



Average mg/L	
2009	No Data
2010	No Data
2011	No Data
2012	0.07
2013	0.01
2014	0.04

Surface Water Temperature |Expected Range: None |Deep Lake Standard: None | Fish Lake



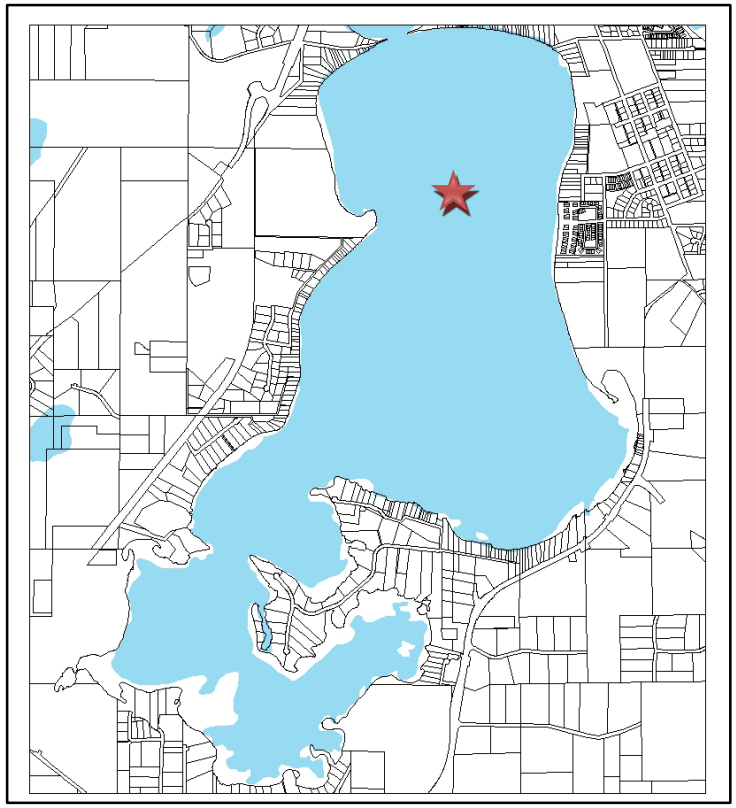
Year	Average ° F
2009	No Data
2010	No Data
2011	No Data
2012	71.6
2013	72.6
2014	69.4

General Observations | Fish Lake

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	1.5	1.5	Toasted Marshmallow	High water levels; minimal aquatic vegetation present
June	2	2	Toasted Marshmallow	Higher water levels; minimal aquatic vegetation present
July	2	2	Eiderdown	Eurasian Watermilfoil in shallows
August	2	2	Parchment Paper	Good overall condition; reduced aquatic plant abundance
September	1.5	1.5	Dried Chamomile	Beautiful

Green Lake

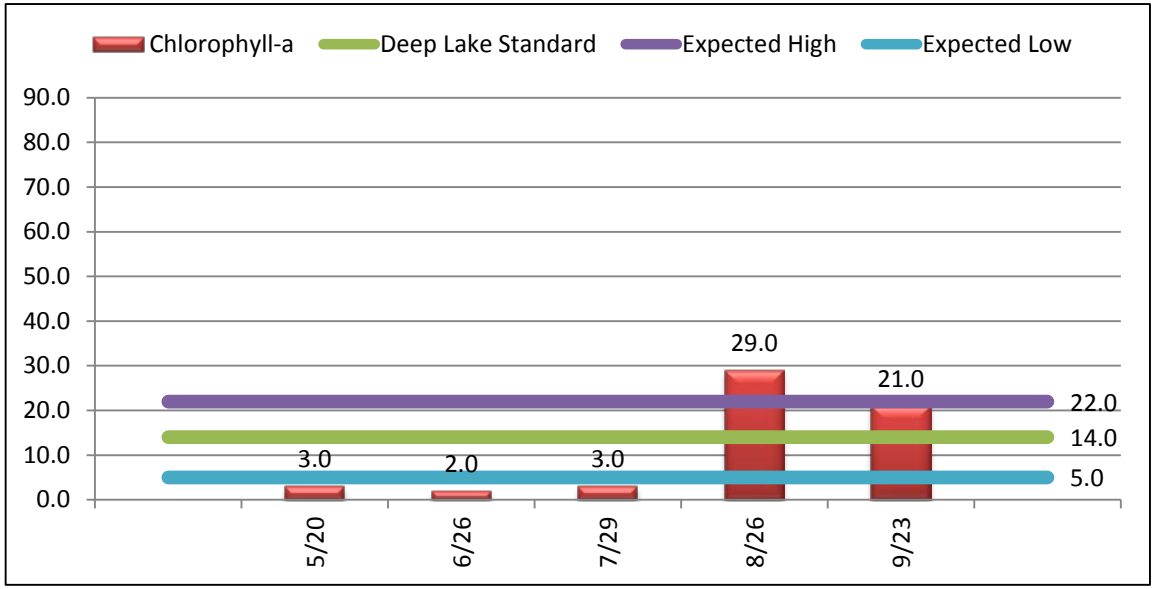
Lake 13-0041-02 Site 202



2014 Report Card: Deep Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	C+
MPCA Standards	Yes Not Impaired
2014 Ranking	6 of 21

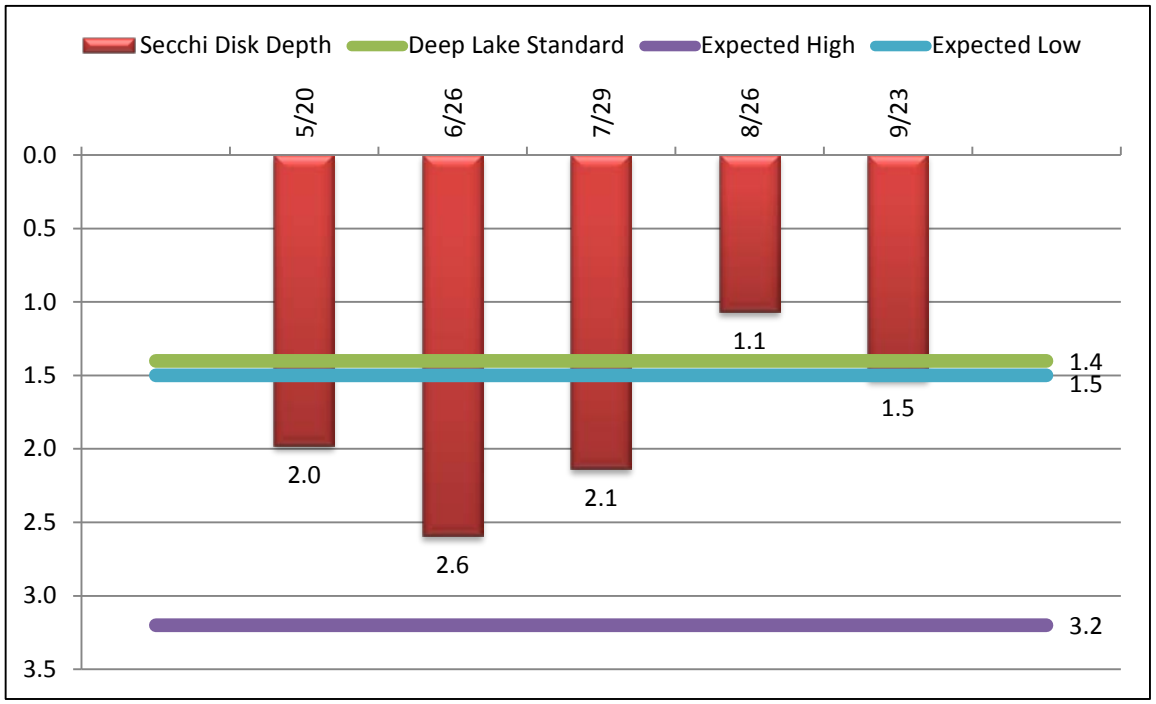
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	54.6	51.1	53.9	53.2
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic
2014 Average (May-Sept)	11.6 µg/L	1.9 meters	31.4 µg/L	-----
Grade	B	C	C	C+
MPCA Standard (Deep)	14.0 µg/L	<1.4 meters	40.0 µg/L	-----
2014 Average (June-Sept)	13.8 µg/L	1.8 meters	33.3 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 | Green Lake



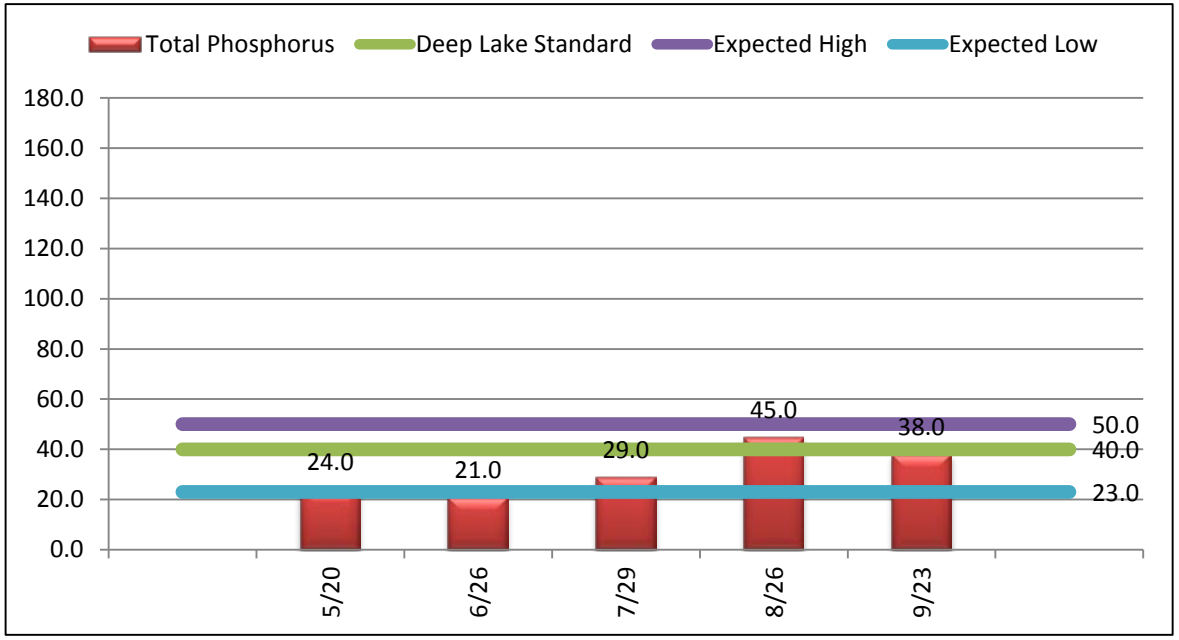
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	28.4	14.0	16.8	16.4	16.8	**11.6**
Grade	C	B	B	B	B	**B**
Average (June-Sept) µg/L	34.8	20.2	18.8	19.5	20.3	**13.8**
Meets Standard (14.0 µg/L)	No	No	No	No	No	**Yes**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Deep Lake Standard: >1.4 meters | Green Lake



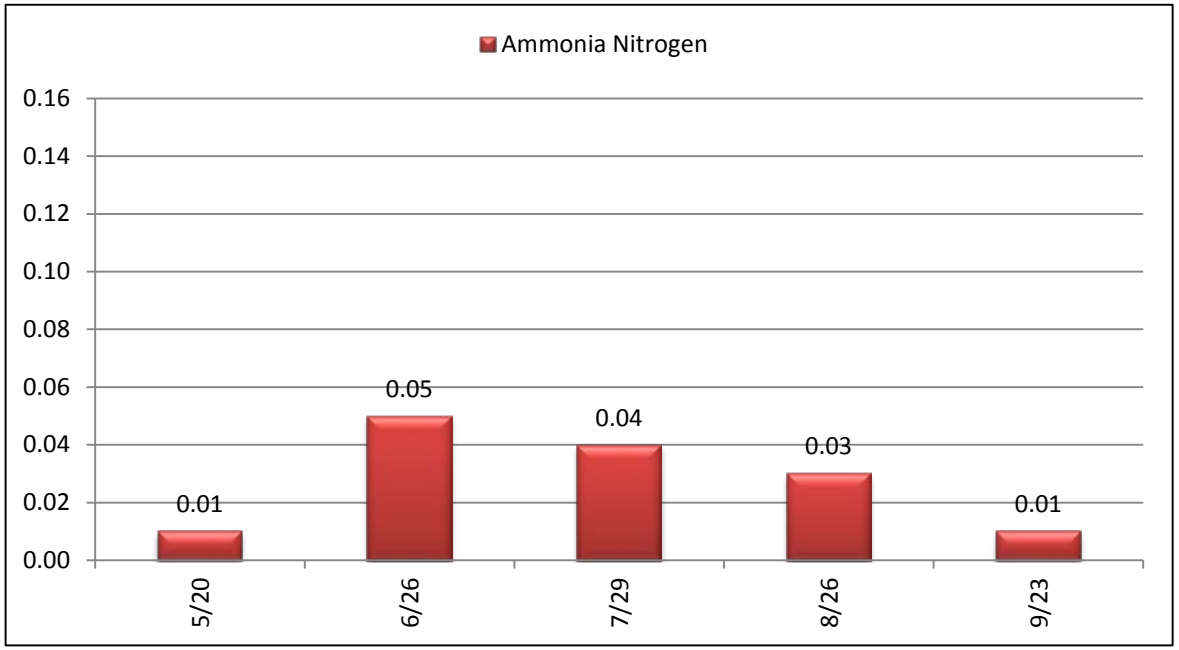
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	2.5	2.4	1.6	2.1	1.8	**1.9**
Grade	B	B	C	C	C	**C**
Average (June-Sept) meters	2.4	1.5	1.3	1.9	1.6	**1.8**
Meets Standard (>1.4 meters)	Yes	Yes	No	Yes	Yes	**Yes**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Deep Lake Standard: 40.0 µg/L | Green Lake



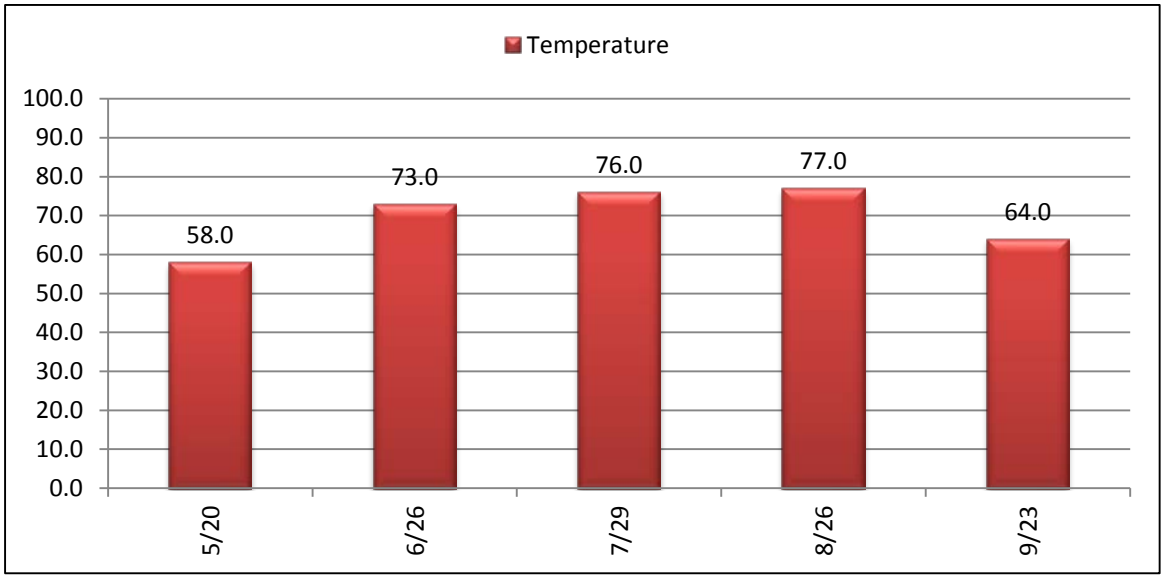
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	51.0	22.0	40.6	32.4	42.6	**31.4**
Grade	C	A	C	B-C	C	**C**
Average (June-Sept) µg/L	57.0	24.0	45.5	35.8	48.3	**33.3**
Meets Standard (40.0 µg/L)	No	Yes	No	Yes	No	**Yes**

Ammonia Nitrogen | Expected Range: None | Deep Lake Standard: None | Green Lake



Average mg/L	
2009	<0.05
2010	0.09
2011	0.04
2012	0.07
2013	0.04
2014	0.03

Surface Water Temperature |Expected Range: None |Deep Lake Standard: None | Green Lake



Year	Average ° F
2009	74.8
2010	72.9
2011	65.8
2012	71.0
2013	71.0
2014	69.6

General Observations | Green Lake

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	2	2	Rattan	Minimal aquatic vegetation present
June	2	2	Short Bread	Higher water levels; minimal aquatic vegetation
July	2.5	2.5	Eiderdown	
August	3	3	Beach Grass	Good control of Eurasian Watermilfoil for navigation
September	2.5	2.5	Beach Grass	

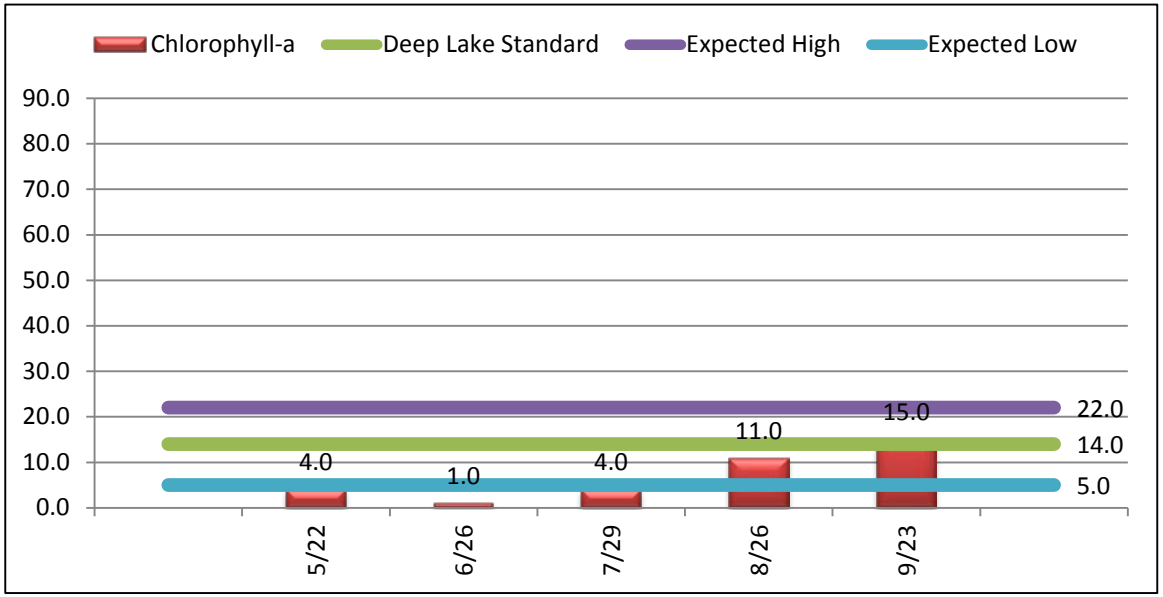
Little Green Lake

Lake 13-0041-01 Site 202

2014 Report Card: Deep Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	B-
MPCA Standards	Yes Not Impaired
2014 Ranking	5 of 21

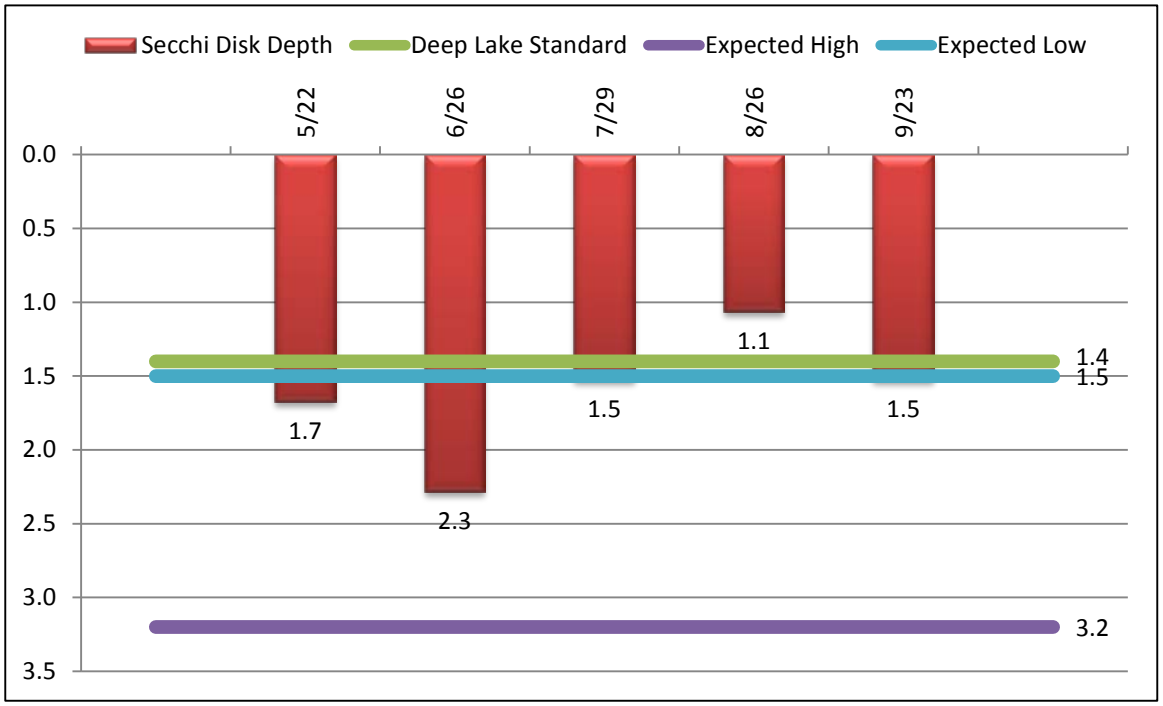
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	49.7	53.1	54.5	52.4
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic
2014 Average (May-Sept)	7.0 µg/L	1.6 meters	32.8 µg/L	-----
Grade	A	C	C	B-
MPCA Standard (Deep)	14.0 µg/L	<1.4 meters	40.0 µg/L	-----
2014 Average (June-Sept)	7.8 µg/L	1.6 meters	33.3 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 | Little Green Lake



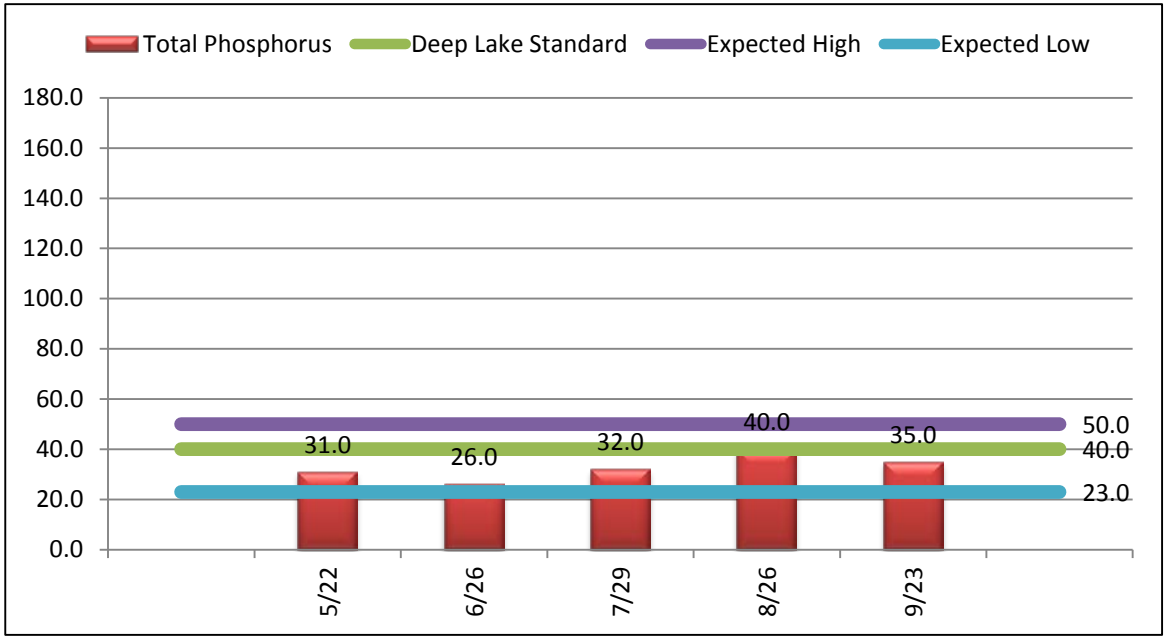
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	14.6	10.0	13.2	11.6	13.4	**7.0**
Grade	B	B	B	B	B	**A**
Average (June-Sept) µg/L	16.8	14.4	15.3	13.5	15.0	**7.8**
Meets Standard (14.0 µg/L)	No	No	No	Yes	No	**Yes**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Deep Lake Standard: ›1.4 meters | Little Green Lake



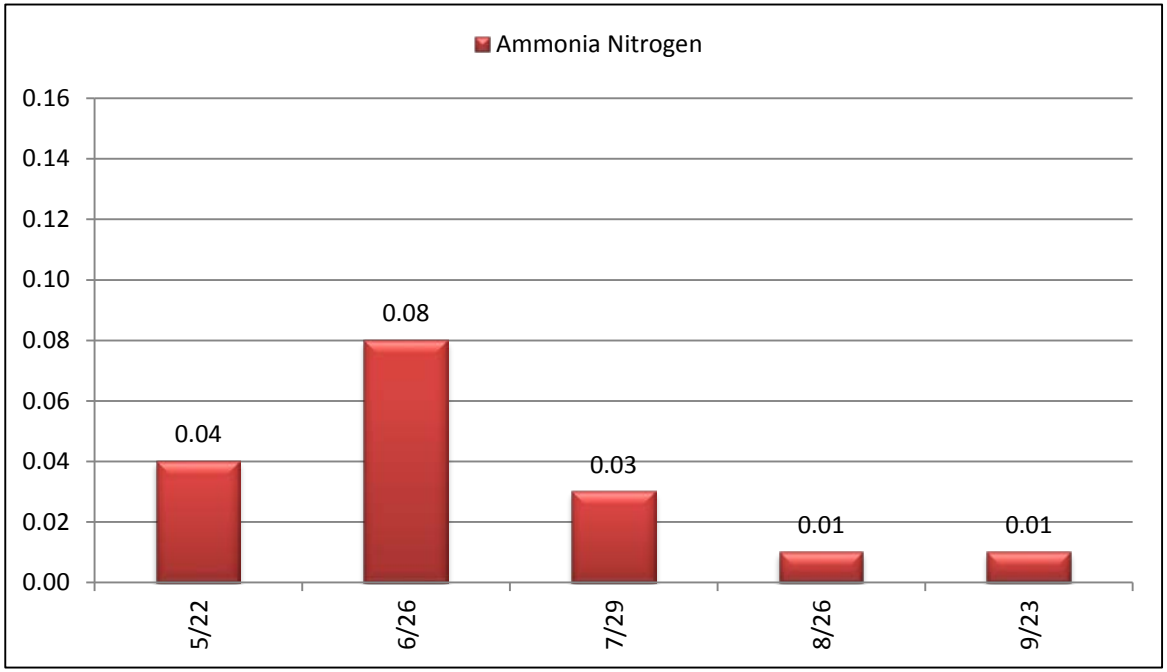
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	1.4	1.8	1.2	1.2	1.3	**1.6**
Grade	C	C	C-D	C-D	C	**C**
Average (June-Sept) meters	1.3	1.1	1.0	1.0	1.2	**1.6**
Meets Standard (>1.4 meters)	No	No	No	No	No	**Yes**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Deep Lake Standard: 40.0 µg/L | Little Green Lake



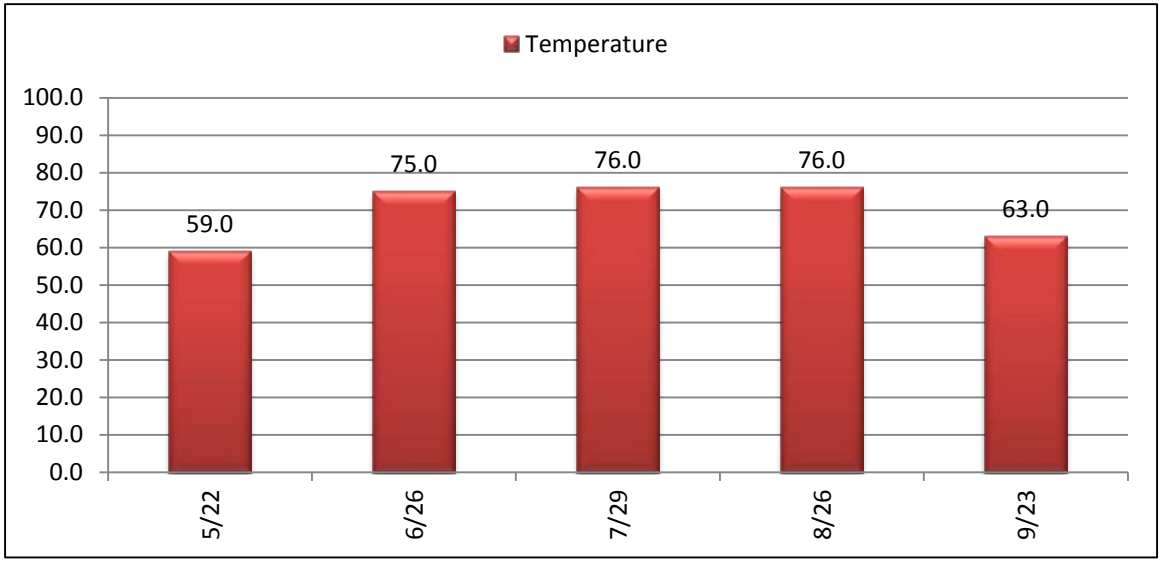
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	54.0	32.0	40.0	34.6	32.4	**32.8**
Grade	C	B-C	C	C	C	**C**
Average (June-Sept) µg/L	58.0	41.0	39.9	35.5	32.8	**33.3**
Meets Standard (40.0 µg/L)	No	No	Yes	Yes	Yes	**Yes**

Ammonia Nitrogen | Expected Range: None | Deep Lake Standard: None | Little Green Lake



Average mg/L	
2009	<0.05
2010	<0.05
2011	0.03
2012	0.07
2013	0.02
2014	0.03

Surface Water Temperature |Expected Range: None |Deep Lake Standard: The daily temperature shall not exceed 86.0° F | Little Green Lake



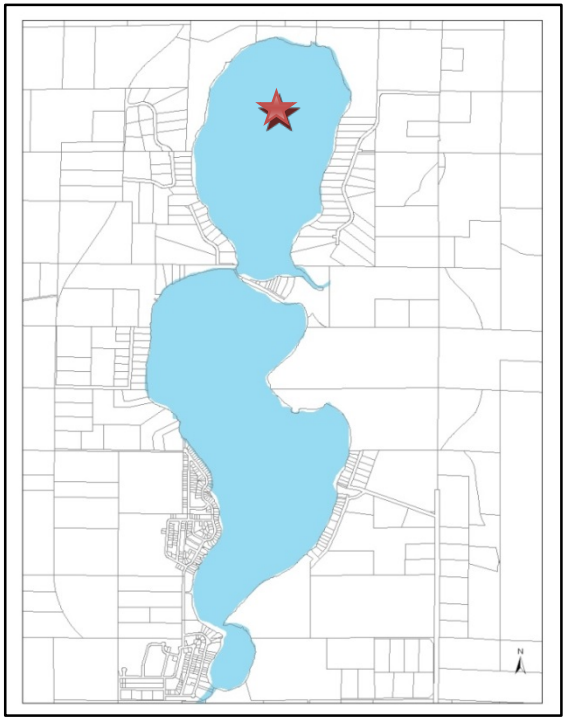
Year	Average ° F
2009	74.9
2010	74.0
2011	63.4
2012	71.8
2013	71.8
2014	69.8

General Observations | Little Green Lake

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	Other Notes
May	2	2	Chopstick	Minimal aquatic vegetation present
June	2	2	Dried Chamomile	Higher water levels; minimal aquatic vegetation
July	3	3	Dried Chamomile	
August	3	3	Parchment Paper	Good control of Eurasian Watermilfoil for navigation
September	2.5	2.5	Dried Chamomile	

Goose Lake-North

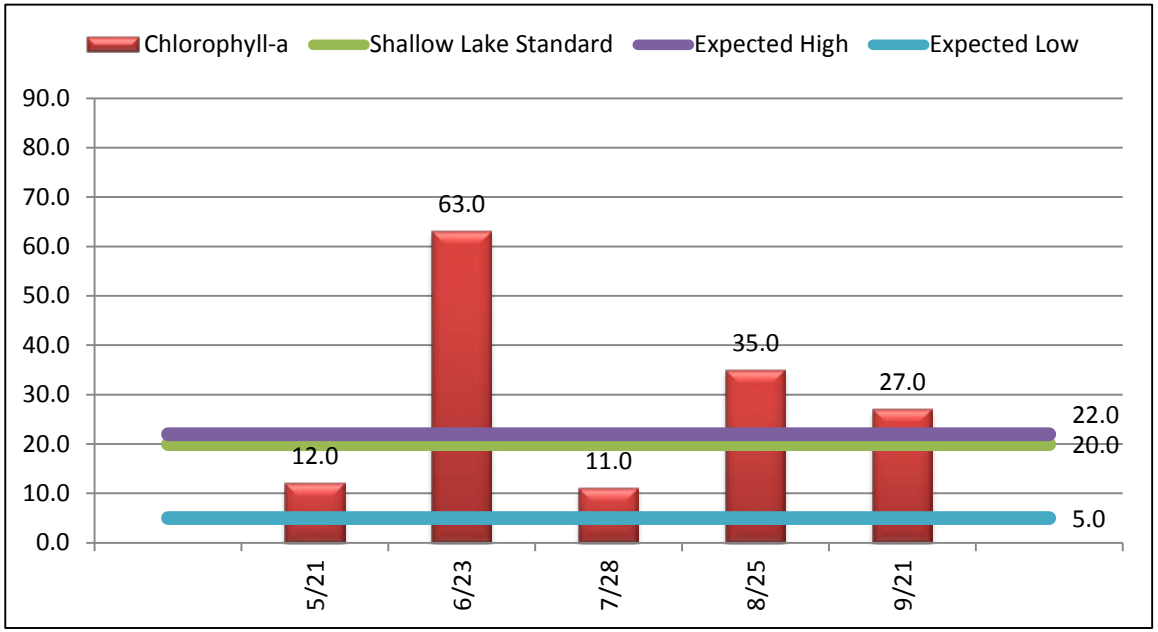
Lake 13-0083-01 Site 202



2014 Report Card: Shallow Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	D
MPCA Standards	No Impaired
2014 Ranking	21 of 21

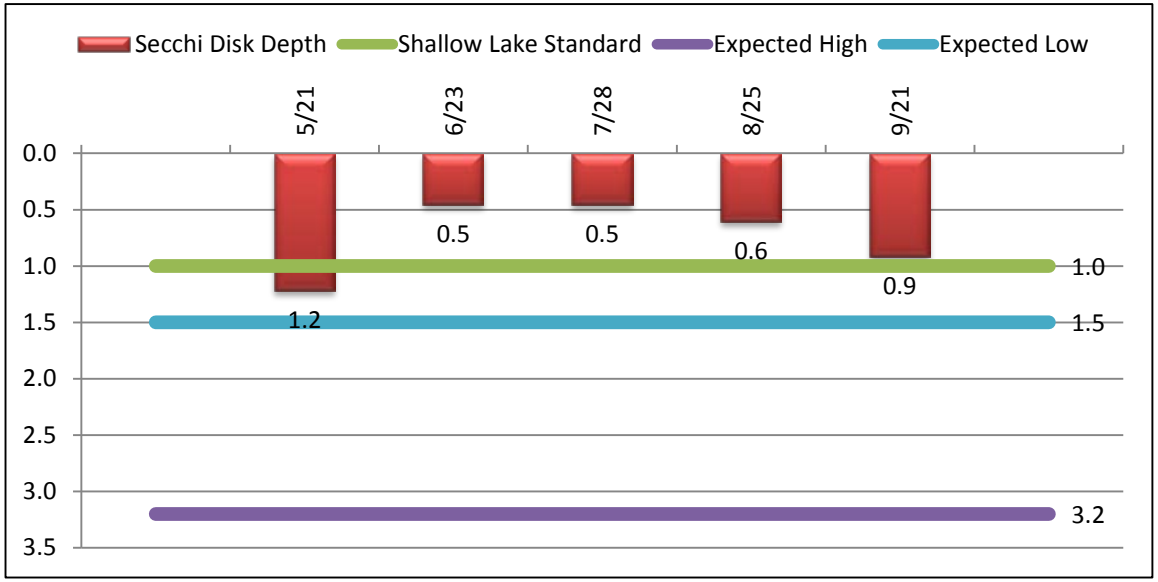
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	63.8	64.3	68.7	65.6
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic
2014 Average (May-Sept)	29.6 µg/L	0.7 meters	88.0 µg/L	-----
Grade	C	D-F	D	D
MPCA Standard (Shallow)	20.0 µg/L	<1.0 meter	60.0 µg/L	-----
2014 Average (June-Sept)	34.0 µg/L	0.6 meters	94.5 µg/L	-----
Meets Standard	No	No	No	No

Chlorophyll-a | Expected Range: 5.0-22.0 µg/L | Shallow Lake Standard: 20.0 µg/L | Goose Lake-North



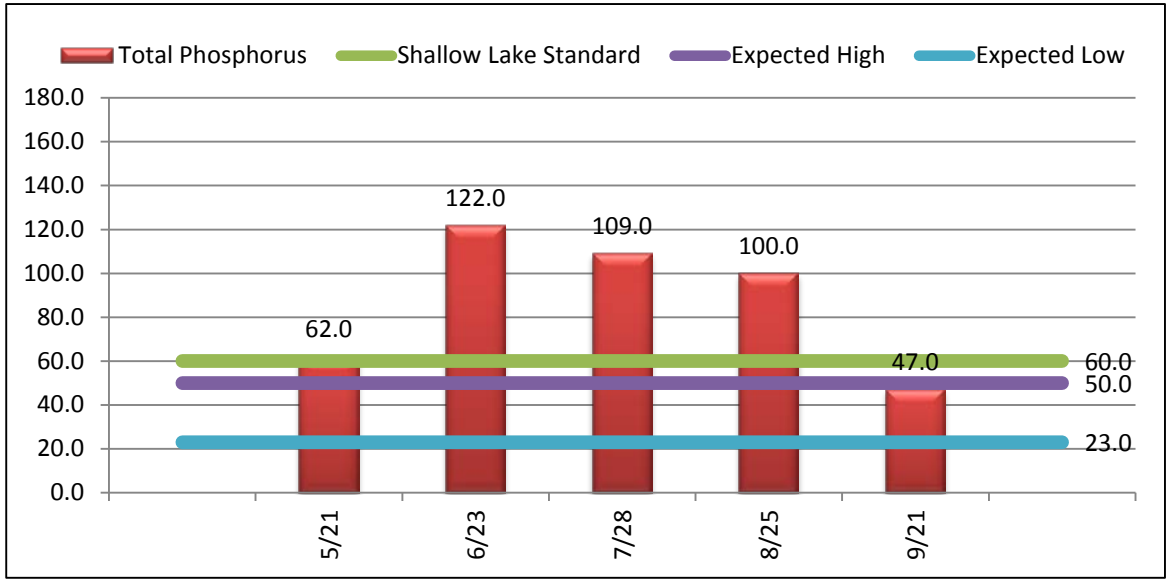
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	38.6	37.0	**29.6**
Grade	-----	-----	-----	C	C	**C**
Average (June-Sept) µg/L	No Data	No Data	No Data	42.5	43.3	**34.0**
Meets Standard (20.0 µg/L)	-----	-----	-----	No	No	**No**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Shallow Lake Standard: >1.0 meter | Goose Lake-North



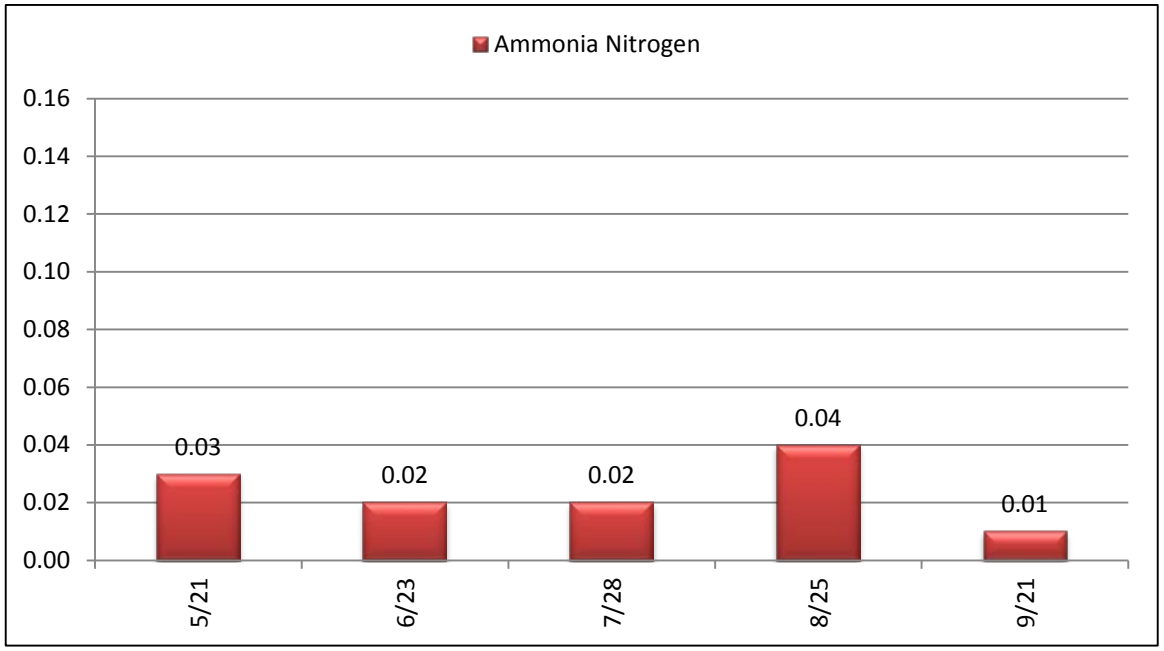
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	No Data	No Data	No Data	0.9	1.0	**0.7**
Grade	-----	-----	-----	D	D	**D-F**
Average (June-Sept) meters	No Data	No Data	No Data	0.8	1.0	**0.6**
Meets Standard (>1.0 meter)	-----	-----	-----	No	No	**No**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Shallow Lake Standard: 60.0 µg/L | Goose Lake-North



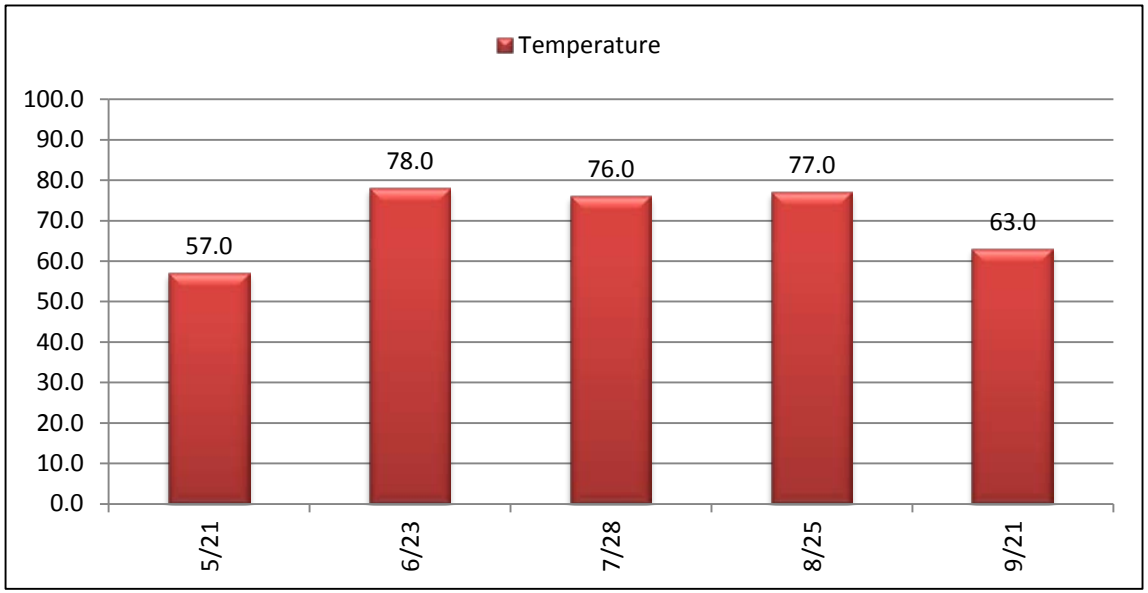
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	63.2	77.6	**88.0**
Grade	-----	-----	-----	C	D	**D**
Average (June-Sept) µg/L	No Data	No Data	No Data	68.8	85.8	**94.5**
Meets Standard (40.0 µg/L)	-----	-----	-----	No	No	**No**

Ammonia Nitrogen | Expected Range: None | Shallow Lake Standard: None | Goose Lake-North



Average mg/L	
2009	No Data
2010	No Data
2011	No Data
2012	0.07
2013	0.02
2014	0.02

Surface Water Temperature |Expected Range: None |Shallow Lake Standard: None | Goose Lake-North



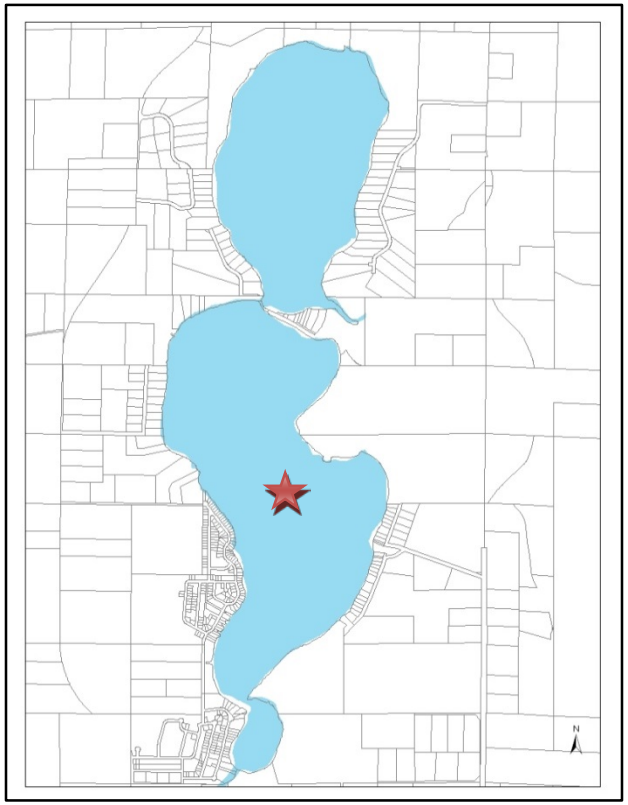
Year	Average ° F
2009	No Data
2010	No Data
2011	No Data
2012	71.0
2013	72.8
2014	70.2

General Observations | Goose Lake-North

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	2	2	Dried Chamomile	High water levels; minimal aquatic vegetation present
June	3	3	Mossy Rock	High water levels; minimum aquatic vegetation present
July	3	3	Cornichon	Shoreland erosion from high water this past spring
August	3	3	Cornichon	Overall improved water quality and reduced abundance of aquatic plant growth
September	3	3	Malted	

Goose Lake-South

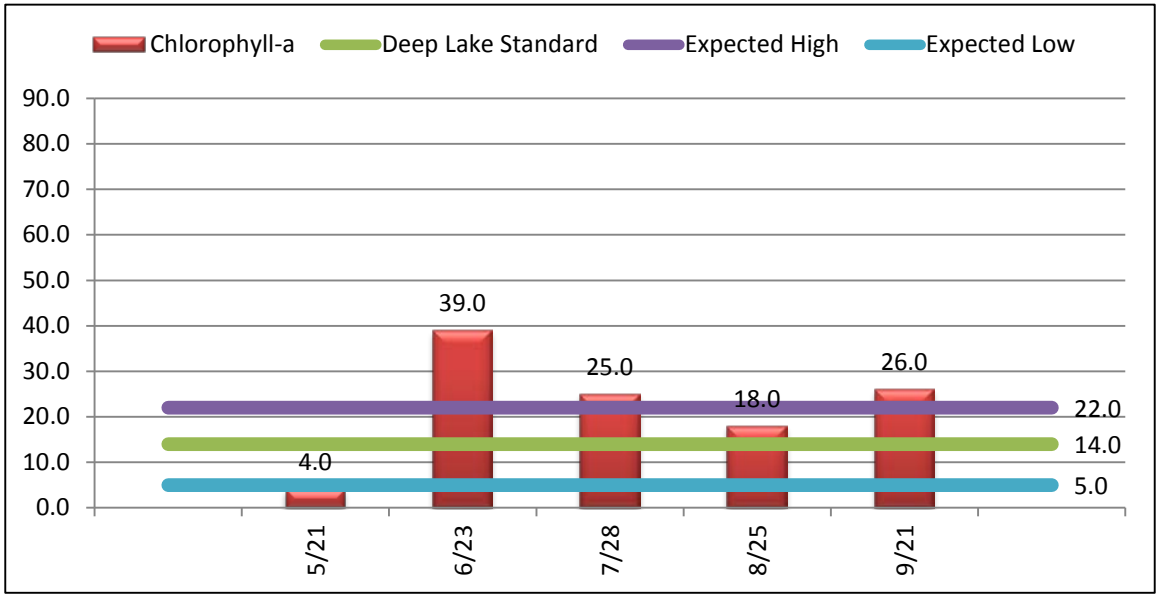
Lake 13-0083-02 Site 201



2014 Report Card: Deep Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	D
MPCA Standards	No Impaired
2014 Ranking	15 of 21

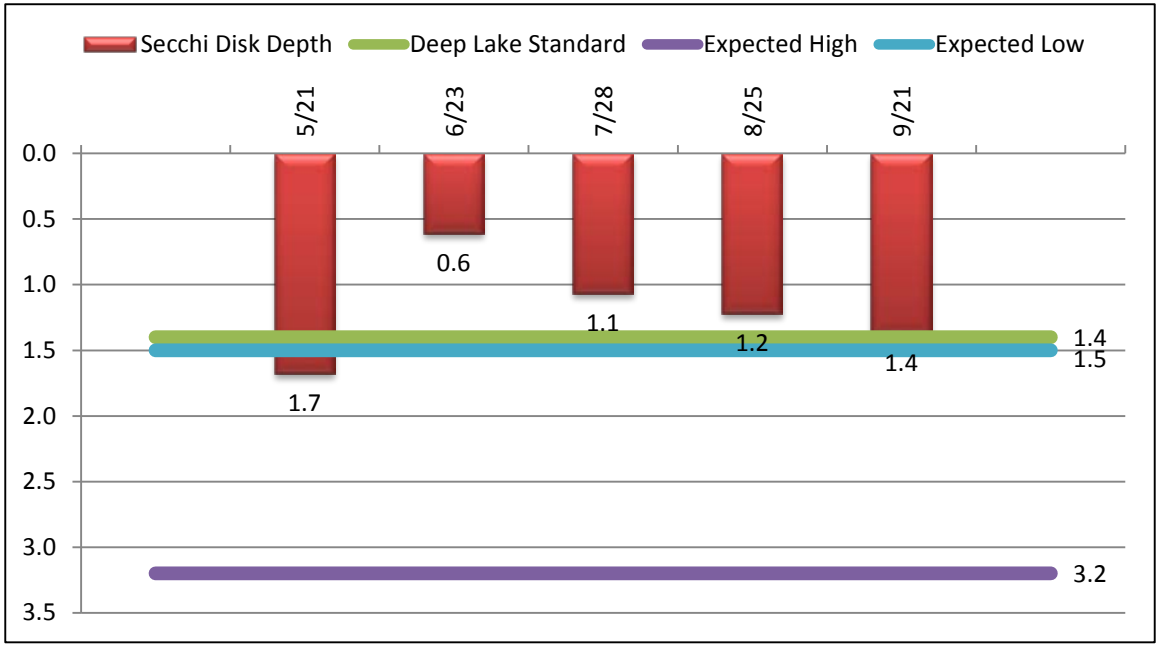
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	61.1	57.4	61.9	60.1
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic
2014 Average (May-Sept)	22.4 µg/L	1.2 meters	54.8 µg/L	-----
Grade	C	C-D	C	C
MPCA Standard (Deep)	14.0 µg/L	<1.4 meters	40.0 µg/L	-----
2014 Average (June-Sept)	27.0 µg/L	1.1 meters	58.0 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 | Goose Lake-South



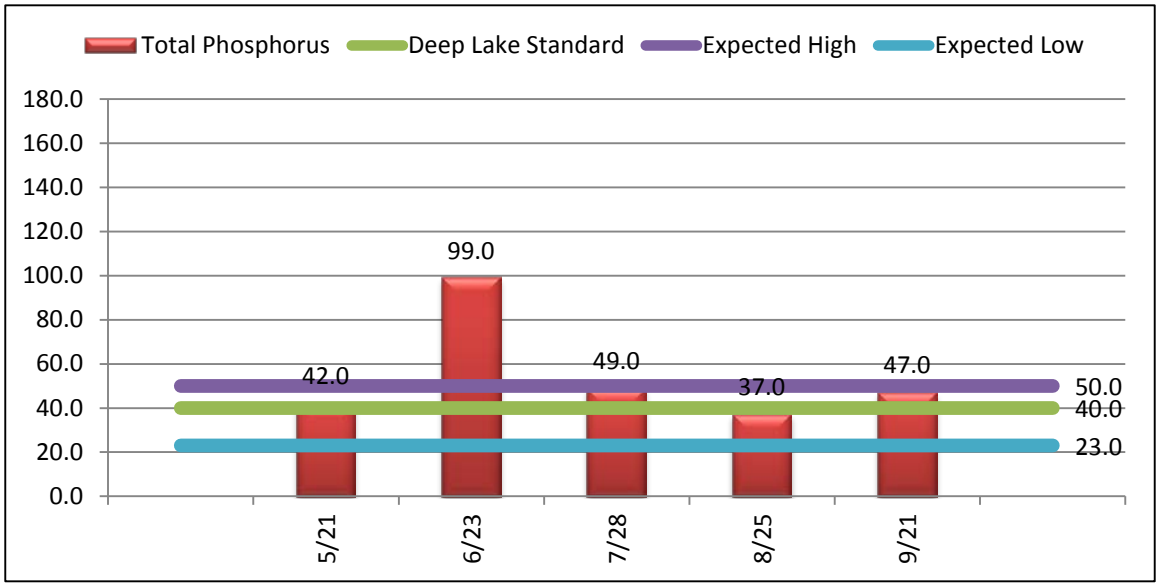
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	18.2	17.0	**22.4**
Grade	-----	-----	-----	B	B	**C**
Average (June-Sept) µg/L	No Data	No Data	No Data	20.5	19.5	**27.0**
Meets Standard (14.0 µg/L)	-----	-----	-----	No	No	**No**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Deep Lake Standard: >1.4 meters | Goose Lake-South



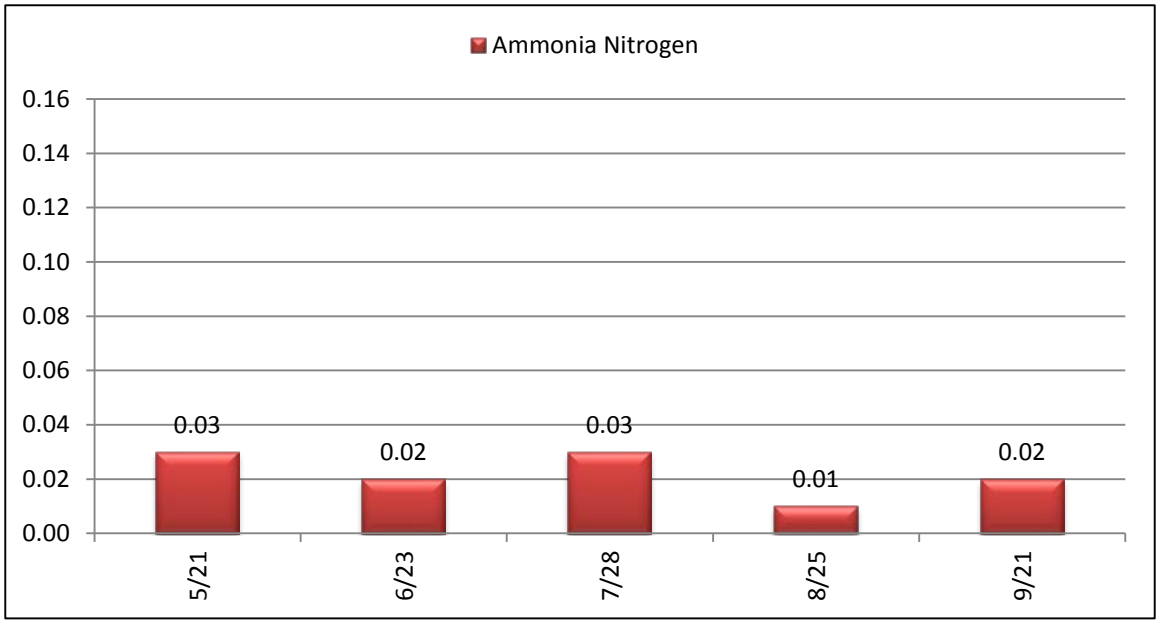
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	No Data	No Data	No Data	1.4	1.5	**1.2**
Grade	-----	-----	-----	C	C	**C**
Average (June-Sept) meters	No Data	No Data	No Data	1.4	1.3	**1.1**
Meets Standard (>1.4 meters)	-----	-----	-----	Yes	No	**No**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Deep Lake Standard: 40.0 µg/L | Goose Lake-South



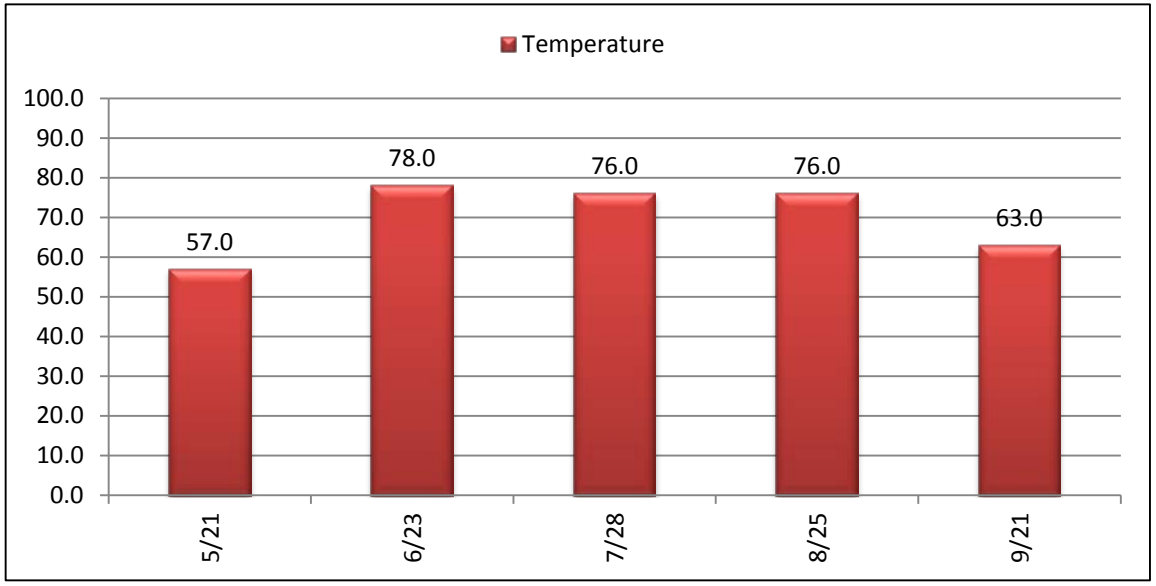
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	39.0	34.8	**54.8**
Grade	-----	-----	-----	C	C	**C**
Average (June-Sept) µg/L	No Data	No Data	No Data	38.0	34.0	**58.0**
Meets Standard (60.0 µg/L)	-----	-----	-----	Yes	Yes	**No**

Ammonia Nitrogen | Expected Range: None | Deep Lake Standard: None | Goose Lake-South



Average mg/L	
2009	No Data
2010	No Data
2011	No Data
2012	0.10
2013	0.03
2014	0.02

Surface Water Temperature |Expected Range: None |Deep Lake Standard: None | Goose Lake-South



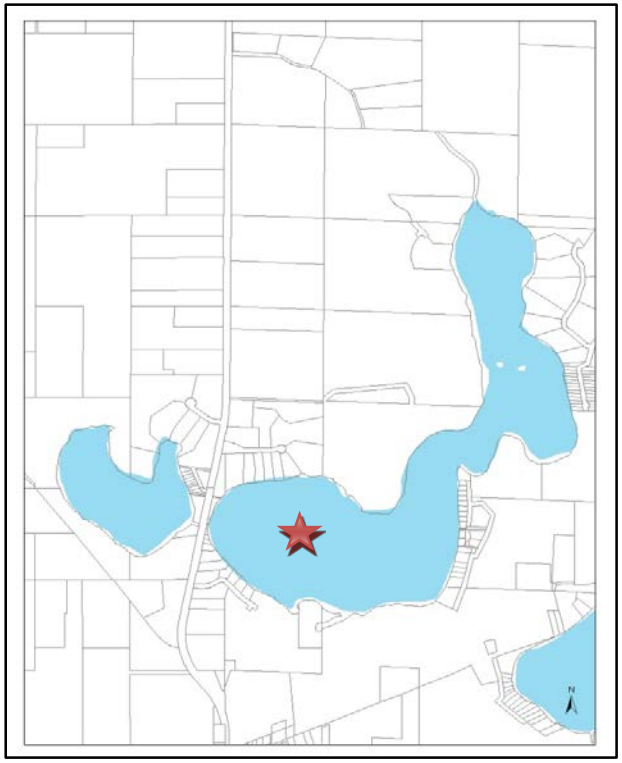
Year	Average ° F
2009	No Data
2010	No Data
2011	No Data
2012	71.2
2013	73.0
2014	70.0

General Observations | Goose Lake-South

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	2	2	Short Bread	High water levels; minimal aquatic vegetation present
June	3	3	Mossy Rock	High water levels; minimal aquatic vegetation present; algae bloom near channel
July	3	3	Cornichon	Shoreland erosion from high water this past spring
August	3	3	Beach Grass	Overall improved water quality and reduced abundance of aquatic plant growth
September	2.5	2.5	Beach Grass	Abundance of painted turtles in channels

Horseshoe Lake

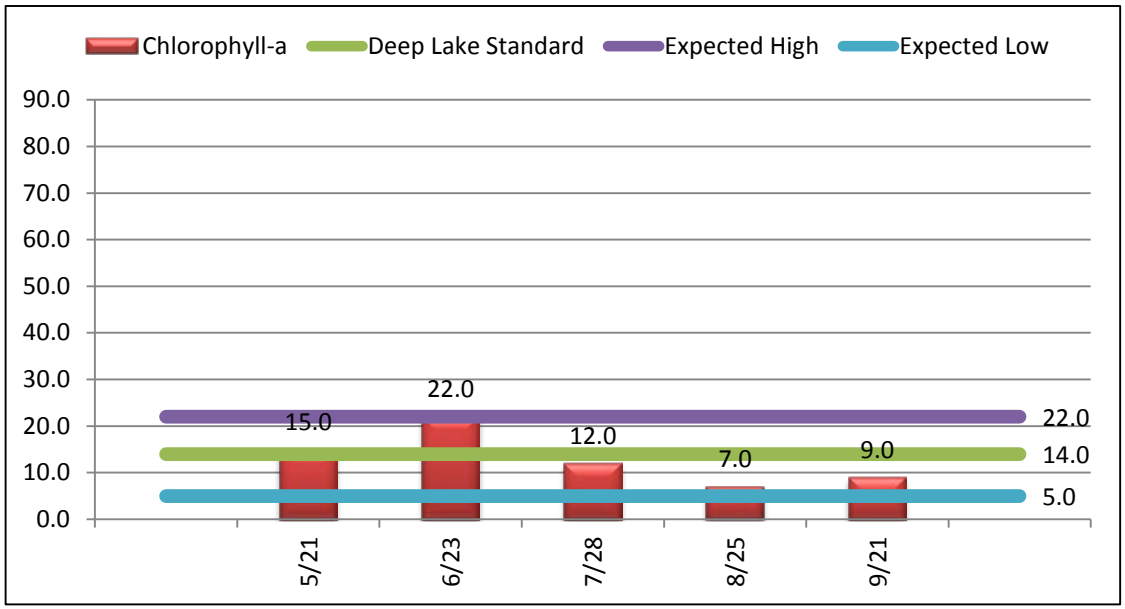
Lake 13-0073-00 Site 201



2014 Report Card: Deep Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	C
MPCA Standards	No Impaired
2014 Ranking	12 of 21

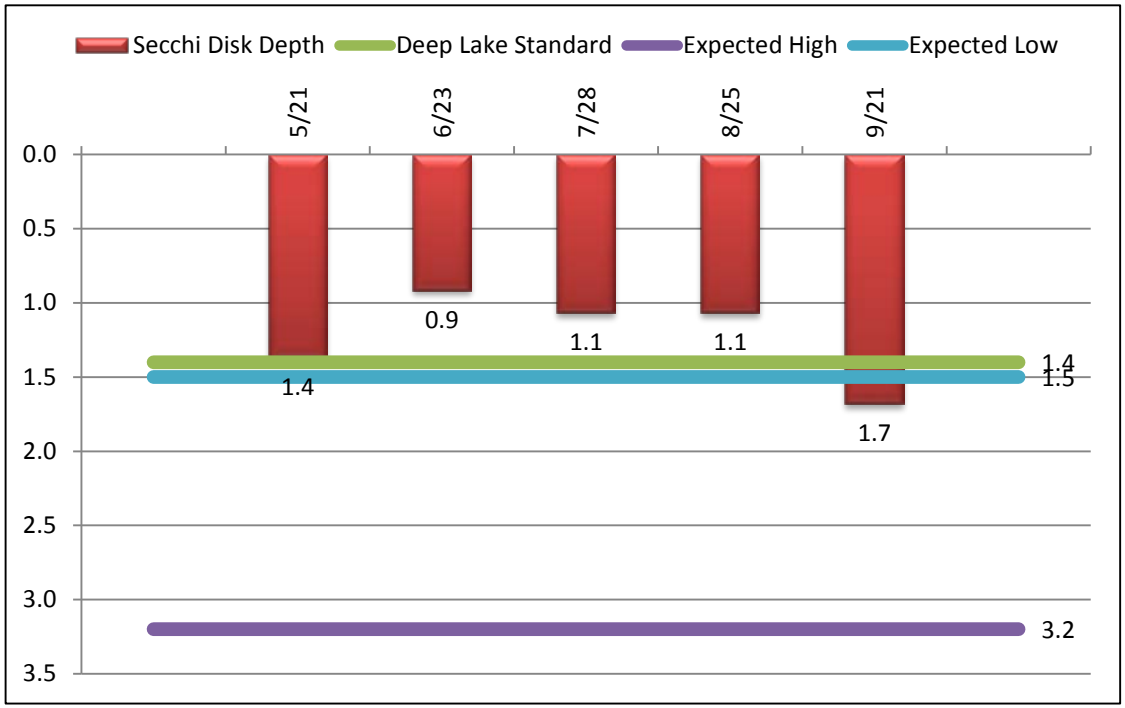
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	55.8	56.9	57.3	56.7
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic
2014 Average (May-Sept)	13.0 µg/L	1.2 meters	40.0 µg/L	-----
Grade	B	C-D	C	C
MPCA Standard (Deep)	14.0 µg/L	<1.4 meters	40.0 µg/L	-----
2014 Average (June-Sept)	12.5 µg/L	1.2 meters	40.3 µg/L	-----
Meets Standard	Yes	No	No	No

Chlorophyll-a | Expected Range: 5.0-22.0 µg/L | Deep Lake Standard: 14.0 µg/L | Horseshoe Lake



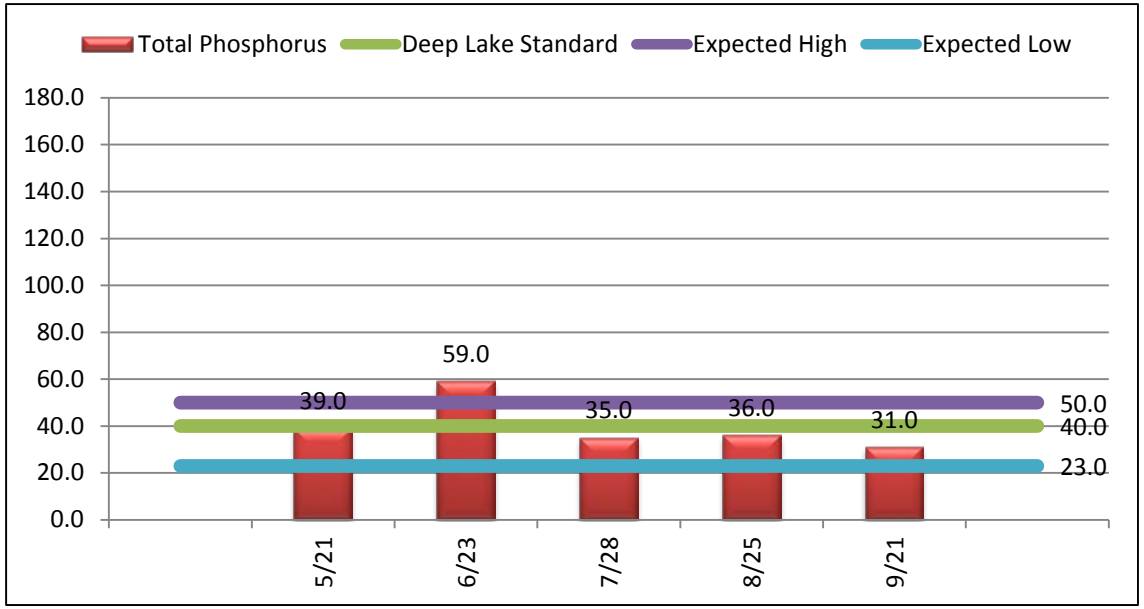
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	20.0	17.4	**13.0**
Grade	-----	-----	-----	B-C	B	**B**
Average (June-Sept) µg/L	No Data	No Data	No Data	16.5	18.8	**12.5**
Meets Standard (14.0 µg/L)	-----	-----	-----	No	No	**Yes**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Deep Lake Standard: >1.4 meters | Horseshoe Lake



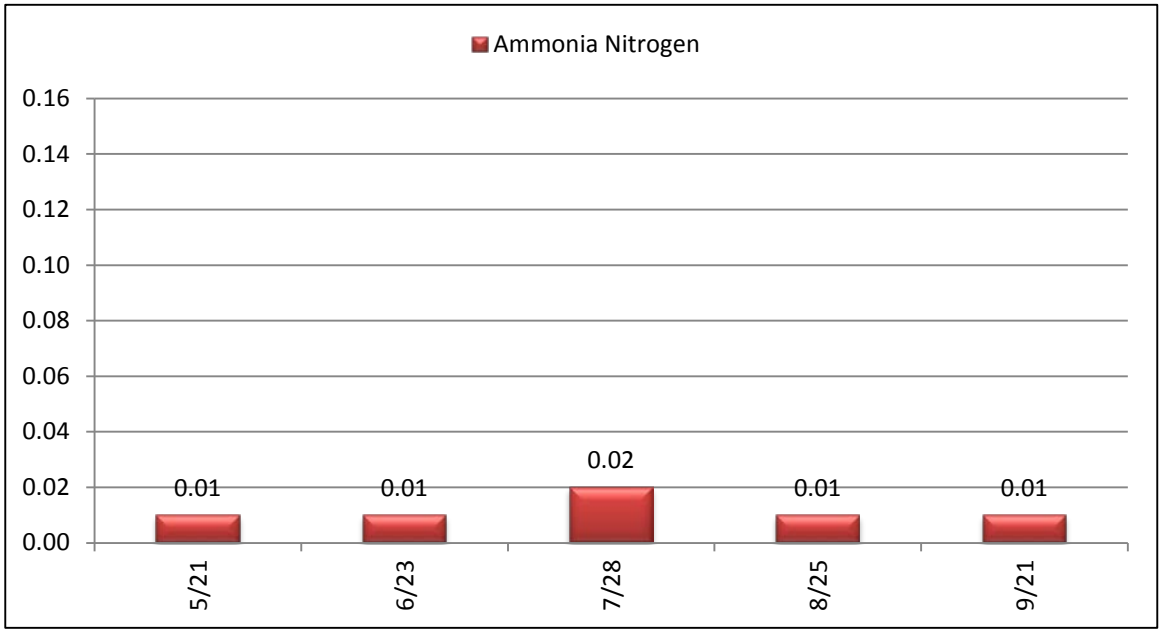
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	No Data	No Data	No Data	1.6	1.5	**1.2**
Grade	-----	-----	-----	C	C	**C-D**
Average (June-Sept) meters	No Data	No Data	No Data	1.7	1.6	**1.2**
Meets Standard (>1.4 meters)	-----	-----	-----	Yes	Yes	**No**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Deep Lake Standard: 40.0 µg/L | Horseshoe Lake



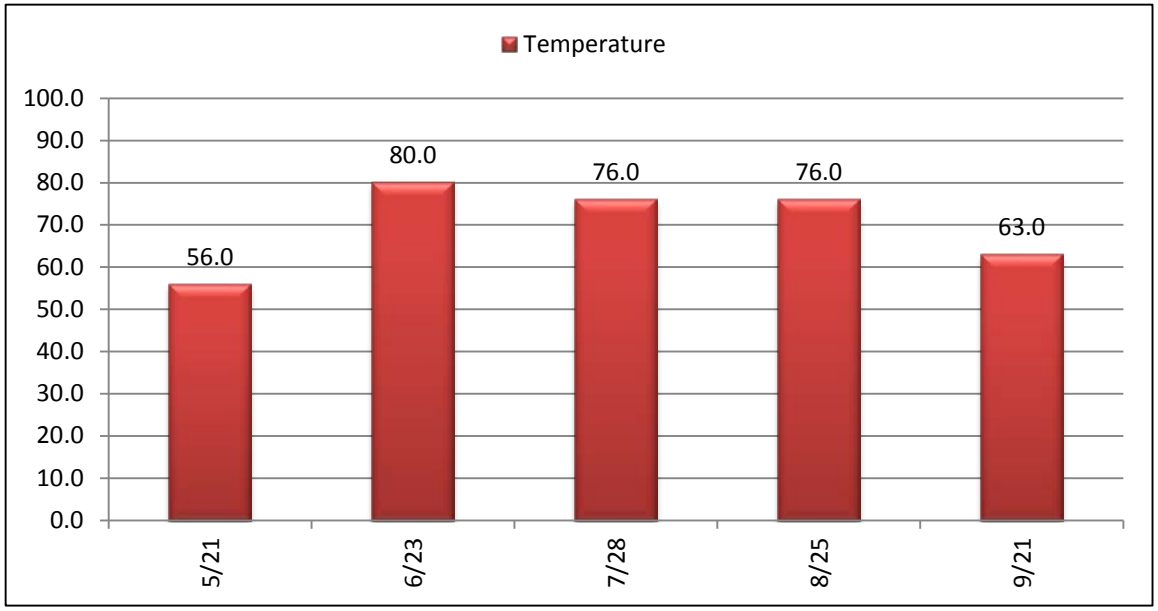
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	47.0	38.0	**40.0**
Grade	-----	-----	-----	C	C	**C**
Average (June-Sept) µg/L	No Data	No Data	No Data	43.5	37.5	**40.3**
Meets Standard (60.0 µg/L)	-----	-----	-----	No	Yes	**No**

Ammonia Nitrogen | Expected Range: None | Deep Lake Standard: None | Horseshoe Lake



Average mg/L	
2009	No Data
2010	No Data
2011	No Data
2012	0.07
2013	0.03
2014	0.01

Surface Water Temperature |Expected Range: None |Deep Lake Standard: None | Horseshoe Lake



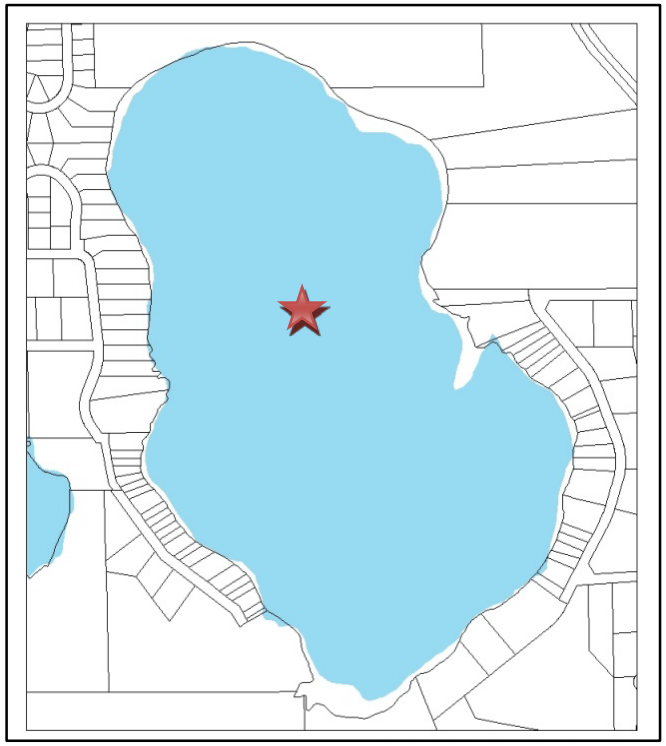
Year	Average ° F
2009	No Data
2010	No Data
2011	No Data
2012	71.4
2013	72.6
2014	70.2

General Observations | Horseshoe Lake

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	2	2	Dried Chamomile	High water levels; minimal aquatic vegetation present
June	3.5	3.5	Beach Grass	High water levels; minimal aquatic vegetation present; algae bloom near access
July	2.5	2.5	Cornichon	
August	2.5	2.5	Parchment Paper	
September	2.5	2.5	Dried Chamomile	Beautiful

Kroon Lake

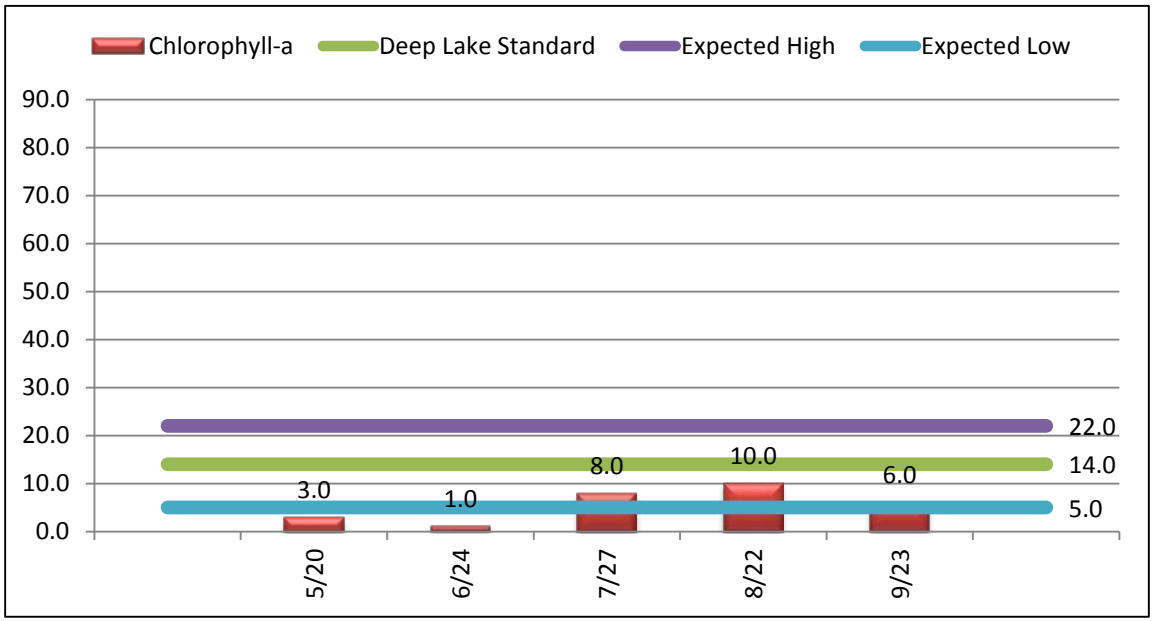
Lake 13-0013-00 Site 202



2014 Report Card: Deep Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	B
MPCA Standards	Yes Not Impaired
2014 Ranking	3 of 21

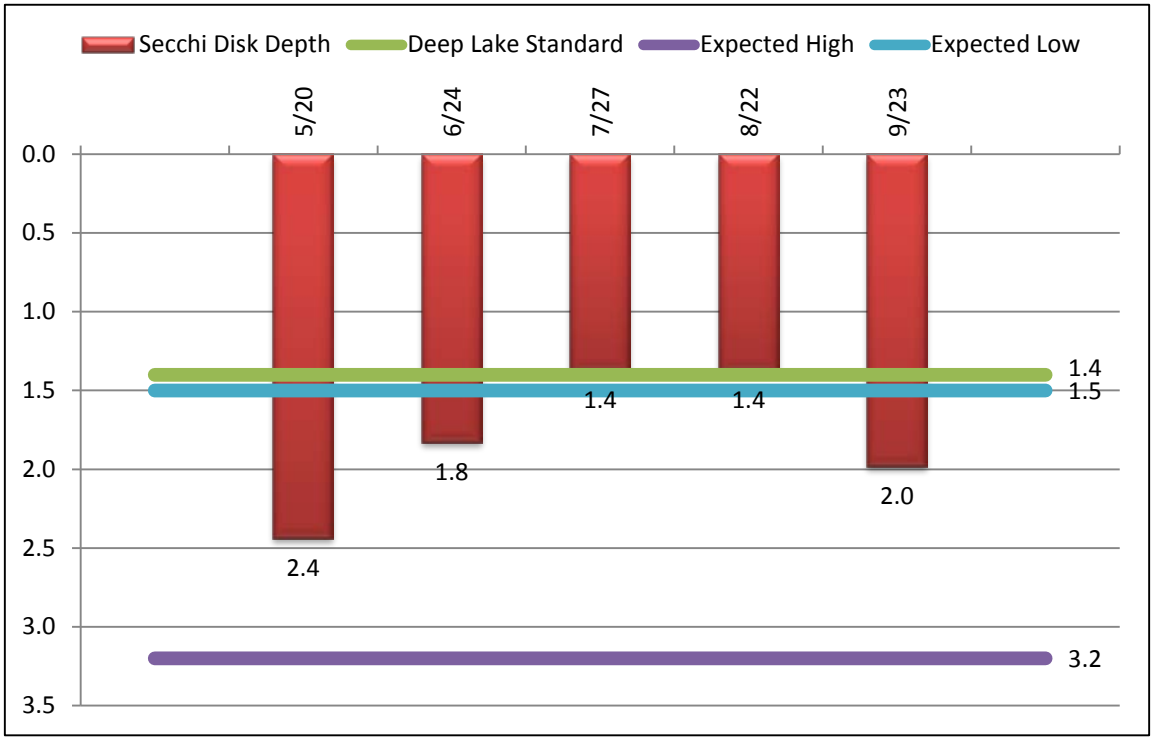
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	47.5	51.5	53.3	50.8
Classification	Mesotrophic	Eutrophic	Eutrophic	Eutrophic
2014 Average (May-Sept)	5.6 µg/L	1.8 meters	30.2 µg/L	-----
Grade	A	C	B	B
MPCA Standard (Deep)	14.0 µg/L	<1.4 meters	40.0 µg/L	-----
2014 Average (June-Sept)	6.3 µg/L	1.7 meters	30.3 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 | Kroon Lake



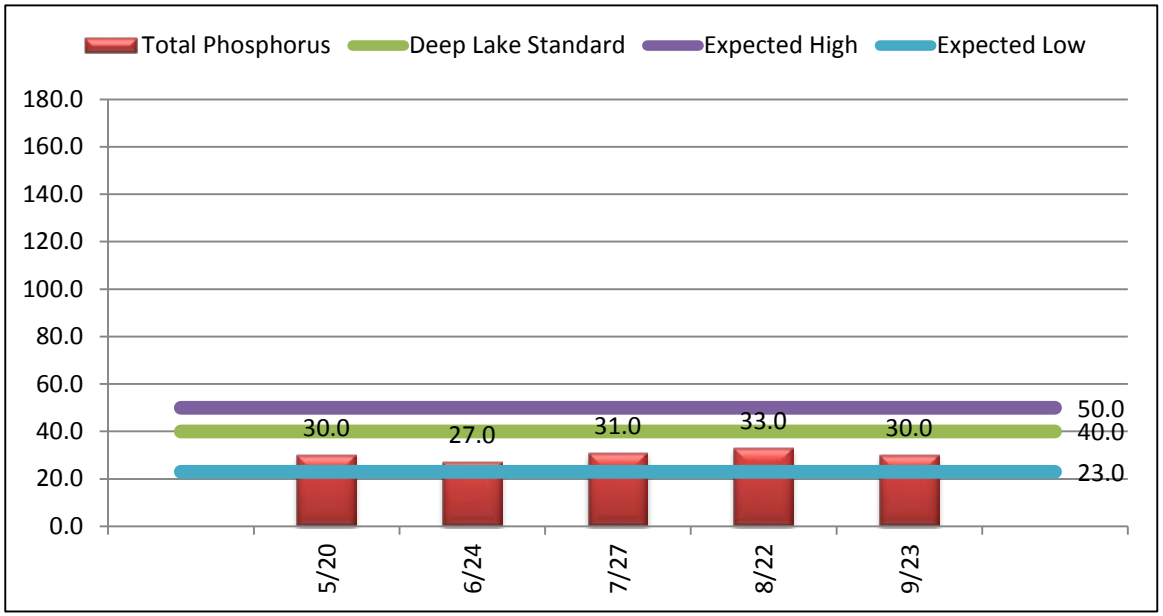
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	10.8	20.3	8.6	9.8	7.4	**5.6**
Grade	B	C	A	A	A	**A**
Average (June-Sept) µg/L	13.6	20.3	10.0	11.3	9.0	**6.3**
Meets Standard (14.0 µg/L)	Yes	No	Yes	Yes	Yes	**Yes**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Deep Lake Standard: ›1.4 meters | Kroon Lake



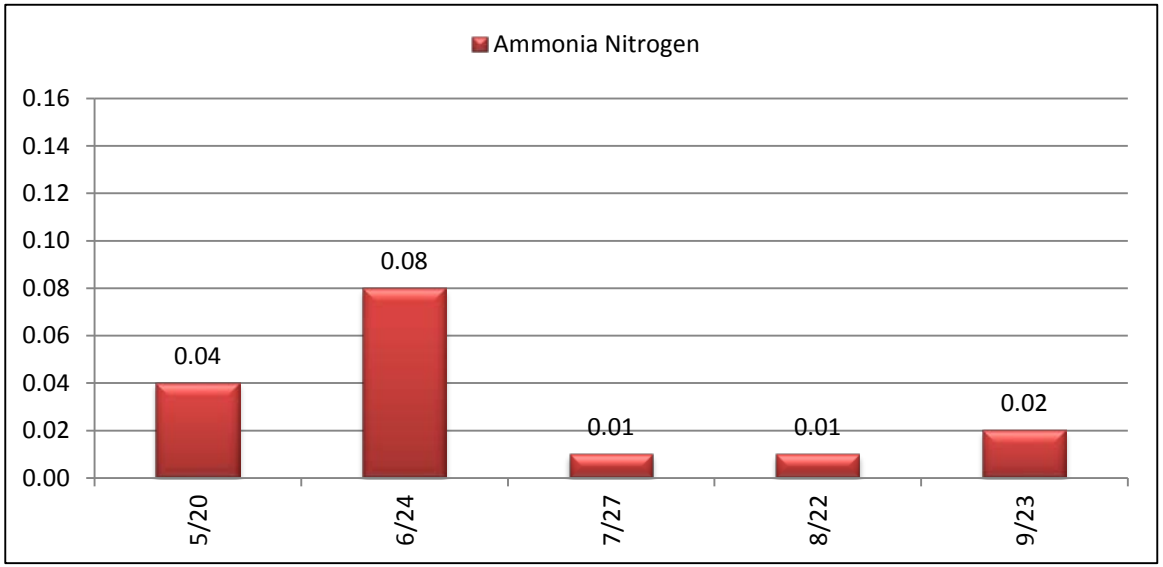
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	1.9	1.7	2.0	1.7	2.0	**1.8**
Grade	C	C	C	C	C	**C**
Average (June-Sept) meters	1.3	1.7	1.6	1.4	1.5	**1.7**
Meets Standard (>1.4 meters)	No	Yes	Yes	Yes	Yes	**Yes**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Deep Lake Standard: 40.0 µg/L | Kroon Lake



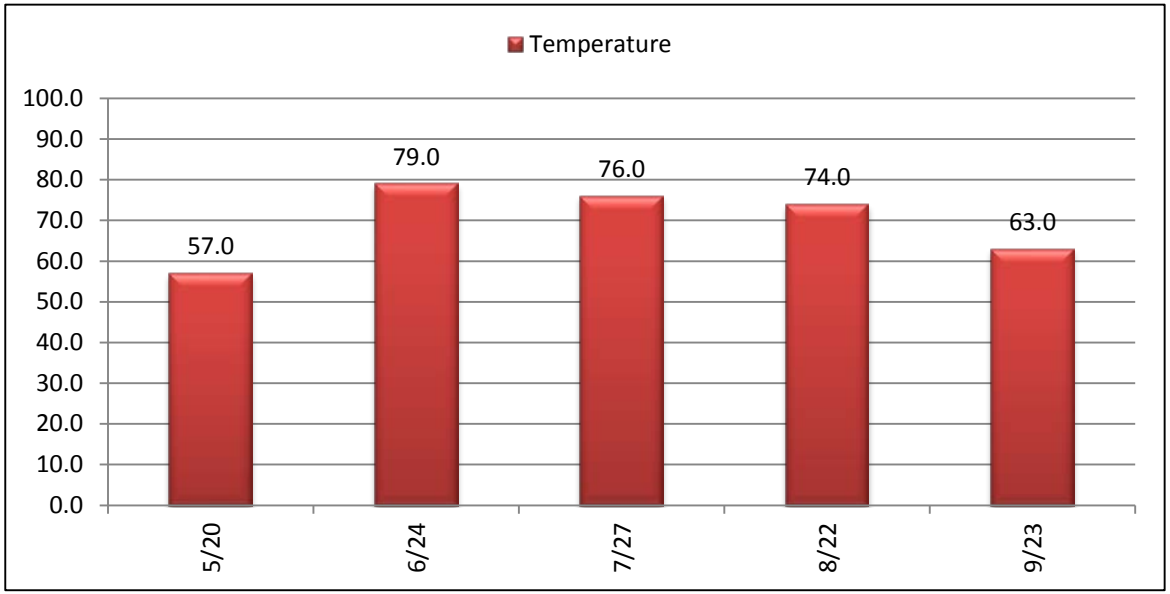
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	35.0	31.0	35.6	28.8	28.2	**30.2**
Grade	C	B	C	B	B	**B**
Average (June-Sept) µg/L	37.0	31.0	38.3	30.5	29.0	**30.3**
Meets Standard (40.0 µg/L)	Yes	Yes	Yes	Yes	Yes	**Yes**

Ammonia Nitrogen | Expected Range: None | Deep Lake Standard: None | Kroon Lake



Average mg/L	
2009	0.09
2010	<0.05
2011	0.08
2012	0.07
2013	0.04
2014	0.03

Surface Water Temperature |Expected Range: None |Deep Lake Standard: None | Kroon Lake



Year	Average ° F
2009	73.3
2010	No Data
2011	64.0
2012	72.2
2013	75.0
2014	69.8

General Observations | Kroon Lake

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	2	2	Bamboo	Minimal aquatic vegetation present
June	2	2	Rice Paper	Higher water levels; minimal aquatic vegetation
July	2	2	Dried Chamomile	Weed density increasing in shallows
August	2.5	2.5	Malted	Minimal growth of curly leaf pondweed
September	2	2	Parchment Paper	

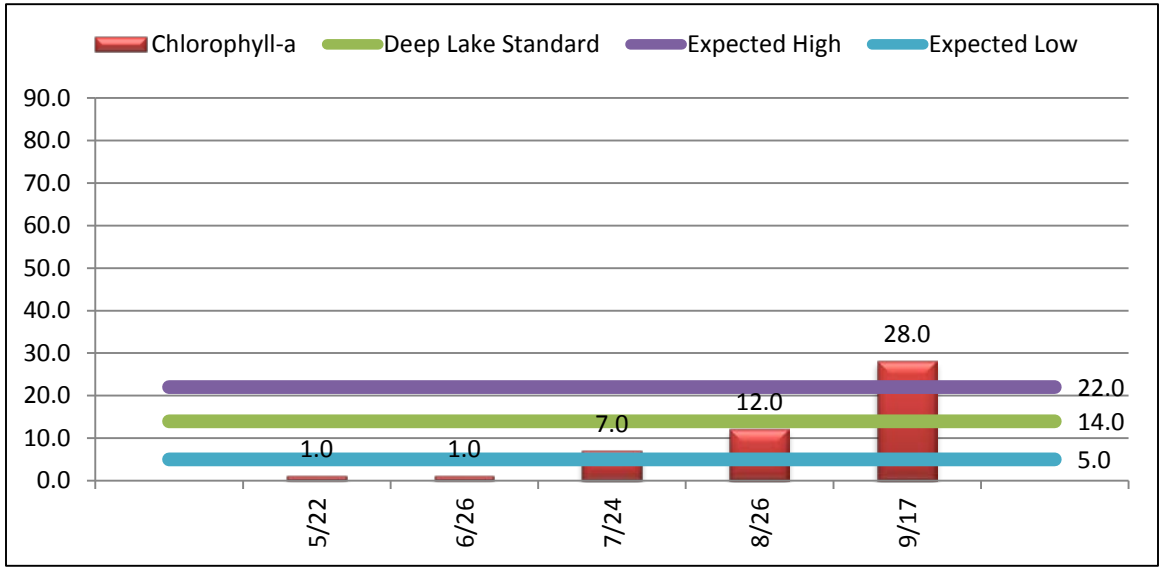
North Lindstrom Lake

Lake 13-0035-00 Site 201

2014 Report Card: Deep Lake	
Lake Classification	Mesotrophic
Overall Lake Quality Grade	B
MPCA Standards	Yes Not Impaired
2014 Ranking	4 of 21

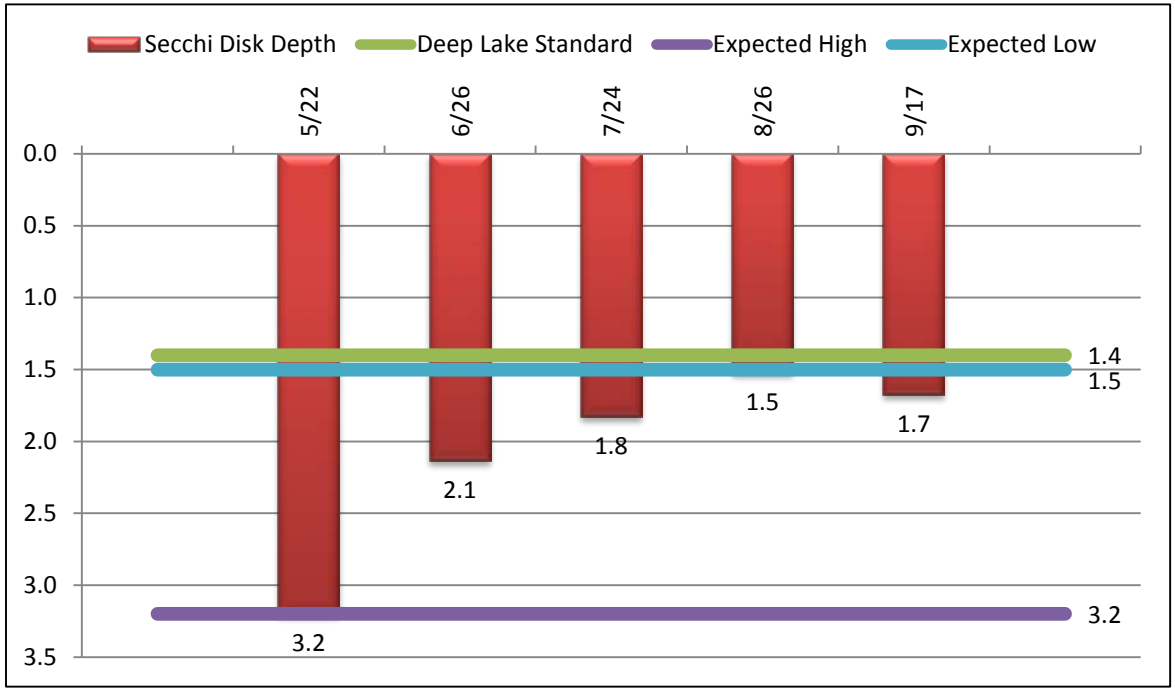
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	53.0	49.6	52.8	51.8
Classification	Oligotrophic	Mesotrophic	Eutrophic	Mesotrophic
2014 Average (May-Sept)	9.8 µg/L	2.1 meters	29.2 µg/L	-----
Grade	A	C	B	B
MPCA Standard (Deep)	14.0 µg/L	<1.4 meters	40.0 µg/L	-----
2014 Average (June-Sept)	12.0 µg/L	1.8 meters	31.5 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 | North Lindstrom Lake



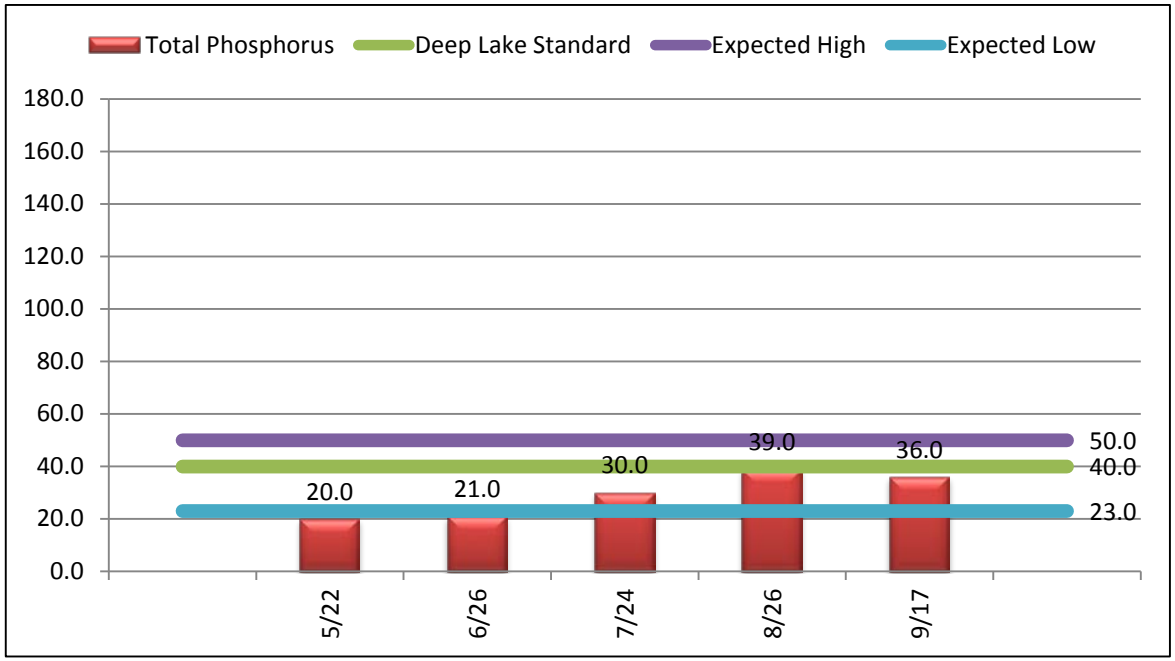
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	14.0	17.7	9.4	23.0	9.2	**9.8**
Grade	B	B	A	C	A	**A**
Average (June-Sept) µg/L	15.6	19.6	11.5	28.0	10.8	**12.0**
Meets Standard (14.0 µg/L)	No	No	Yes	No	Yes	**Yes**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Deep Lake Standard: >1.4 meters | North Lindstrom Lake



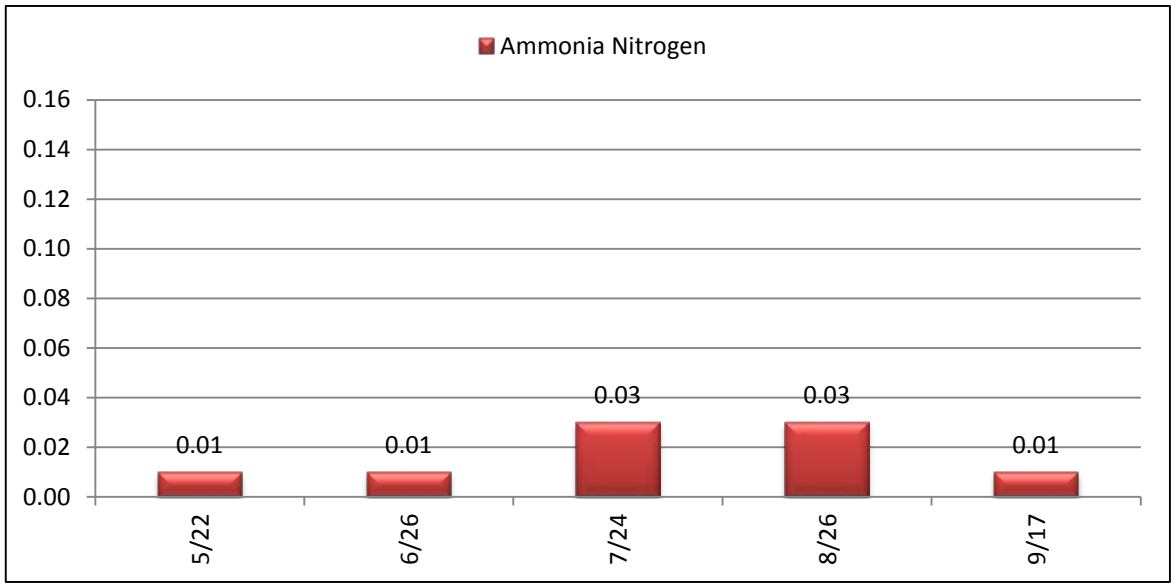
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	2.0	2.1	2.8	1.8	2.7	**2.1**
Grade	C	C	B	C	B	**C**
Average (June-Sept) meters	1.5	2.1	2.5	1.6	2.7	**1.8**
Meets Standard (>1.4 meters)	Yes	Yes	Yes	Yes	Yes	**Yes**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Deep Lake Standard: 40.0 µg/L | North Lindstrom Lake



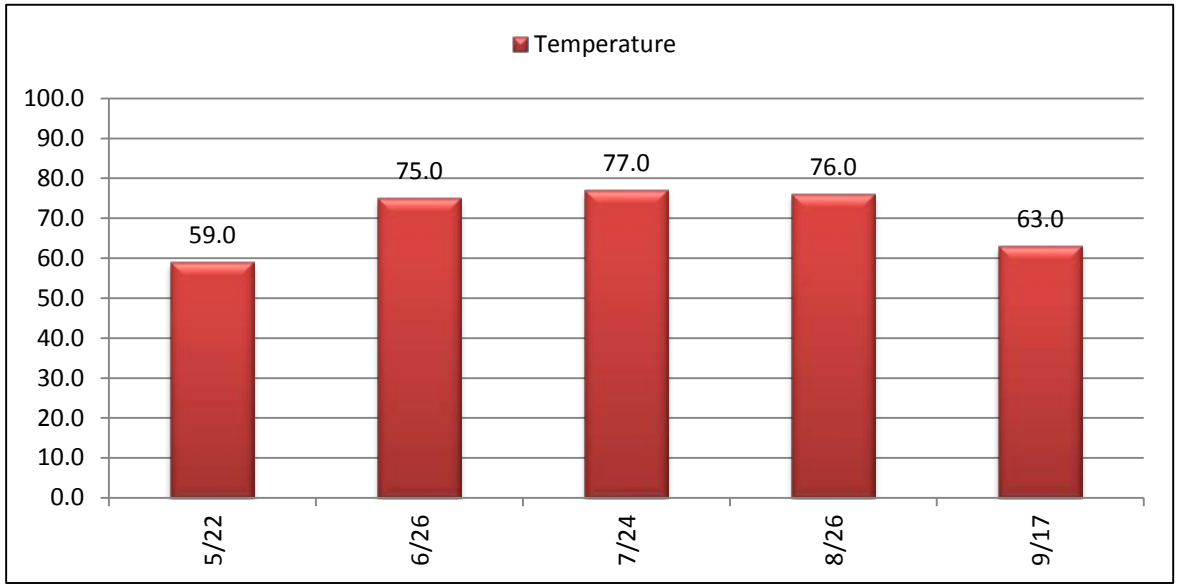
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	33.0	34.0	25.0	29.6	23.4	**29.2**
Grade	C	C	B	B	B	**B**
Average (June-Sept) µg/L	32.0	33.0	26.0	32.5	23.0	**31.5**
Meets Standard (40.0 µg/L)	Yes	Yes	Yes	Yes	Yes	**Yes**

Ammonia Nitrogen | Expected Range: None | Deep Lake Standard: None | North Lindstrom Lake



Average mg/L	
2009	0.1
2010	0.1
2011	0.05
2012	0.12
2013	0.03
2014	0.02

Surface Water Temperature |Expected Range: None |Deep Lake Standard: None | North Lindstrom Lake



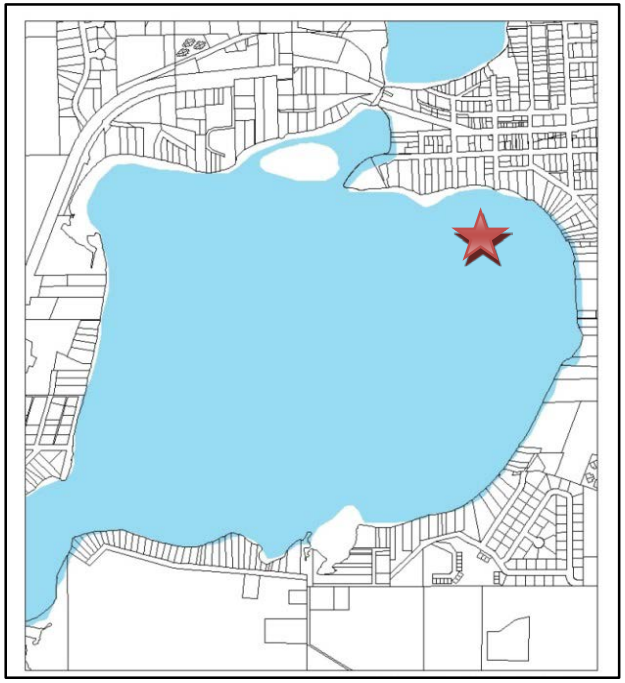
Year	Average ° F
2009	No Data
2010	No Data
2011	65.8
2012	69.8
2013	73.0
2014	70.0

General Observations | North Lindstrom Lake

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	1.5	1.5	Rice Paper	Minimal aquatic vegetation present
June	1.5	1.5	Rice Paper	Higher water levels; minimal aquatic vegetation
July	2	2	Toasted Marshmallow	
August	2	2	Eiderdown	New vegetation growing on banks of channel
September	3	3	Beach Grass	

South Lindstrom Lake

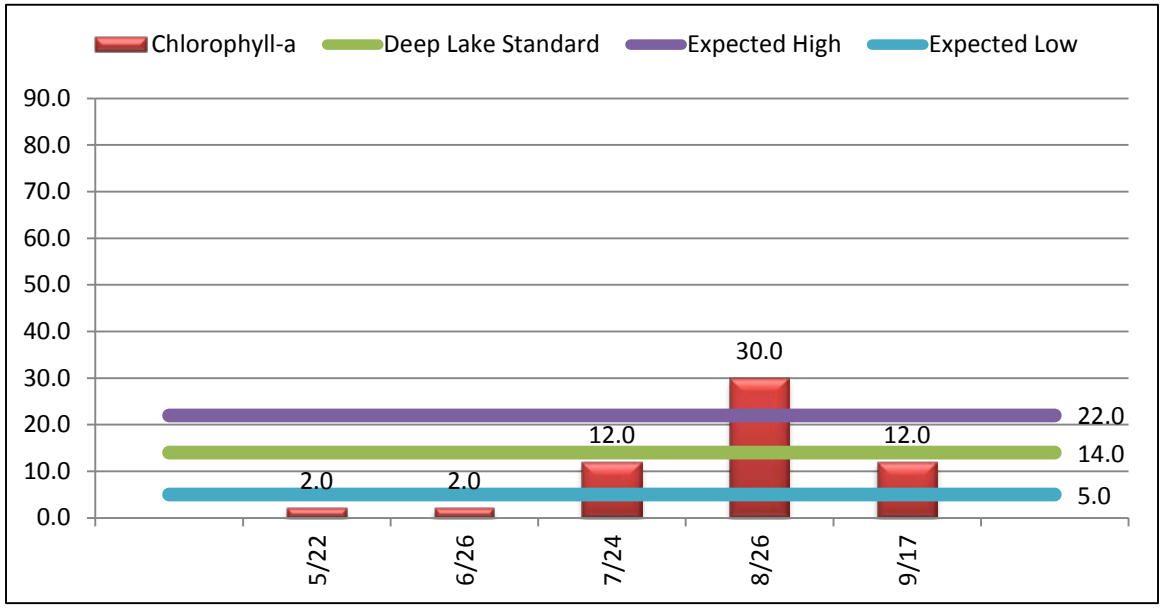
Lake 13-0028-00 Site 203



2014 Report Card: Deep Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	C+
MPCA Standards	Yes Not Impaired
2014 Ranking	8 of 21

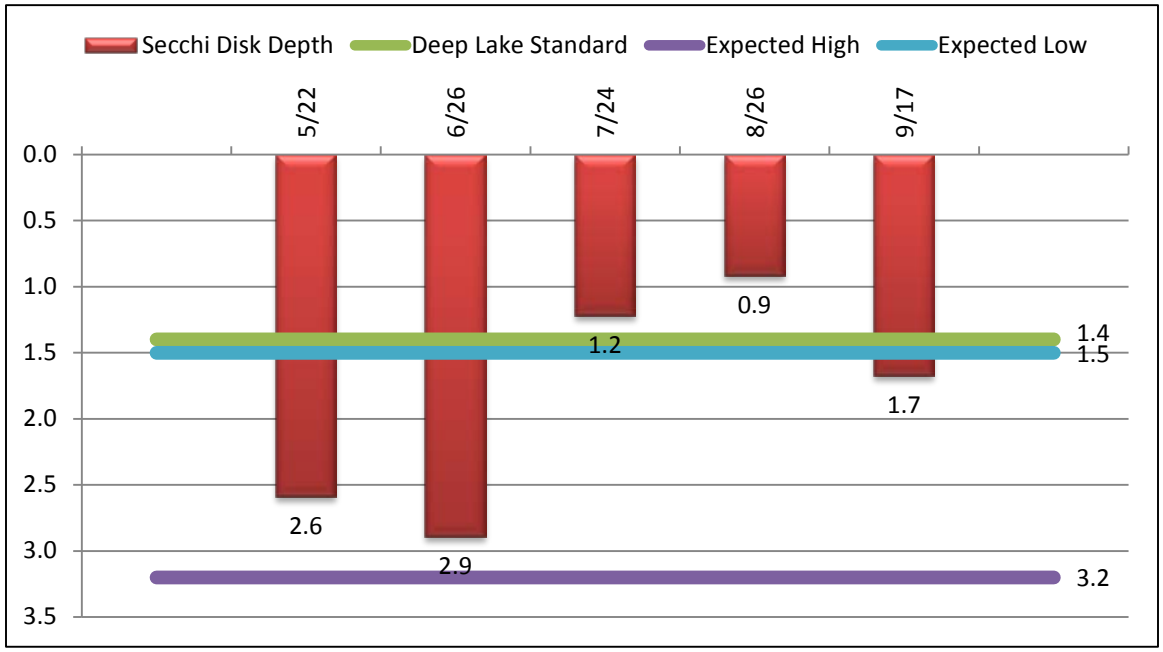
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	54.6	51.1	55.9	53.9
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic
2014 Average (May-Sept)	11.6 µg/L	1.9 meters	36.2 µg/L	-----
Grade	B	C	C	C+
MPCA Standard (Deep)	14.0 µg/L	<1.4 meters	40.0 µg/L	-----
2014 Average (June-Sept)	14.0 µg/L	1.7 meters	40.3 µg/L	-----
Meets Standard	Yes	Yes	No	Yes

Chlorophyll-a | Expected Range: 5.0-22.0 µg/L | Deep Lake Standard: 14.0 µg/L | South Lindstrom Lake



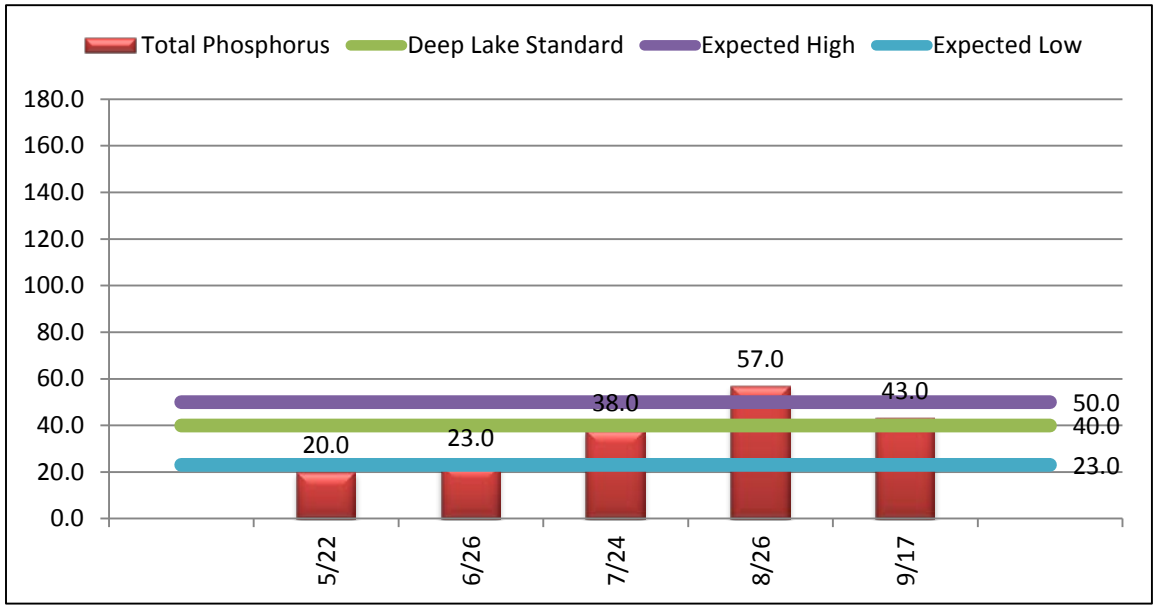
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	11.8	20.0	11.2	35.0	16.8	**11.6**
Grade	B	B	B	C	B	**B**
Average (June-Sept) µg/L	13.2	20.0	13.8	43.0	19.5	**14.0**
Meets Standard (14.0 µg/L)	Yes	No	Yes	No	No	**Yes**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Deep Lake Standard: >1.4 meters | South Lindstrom Lake



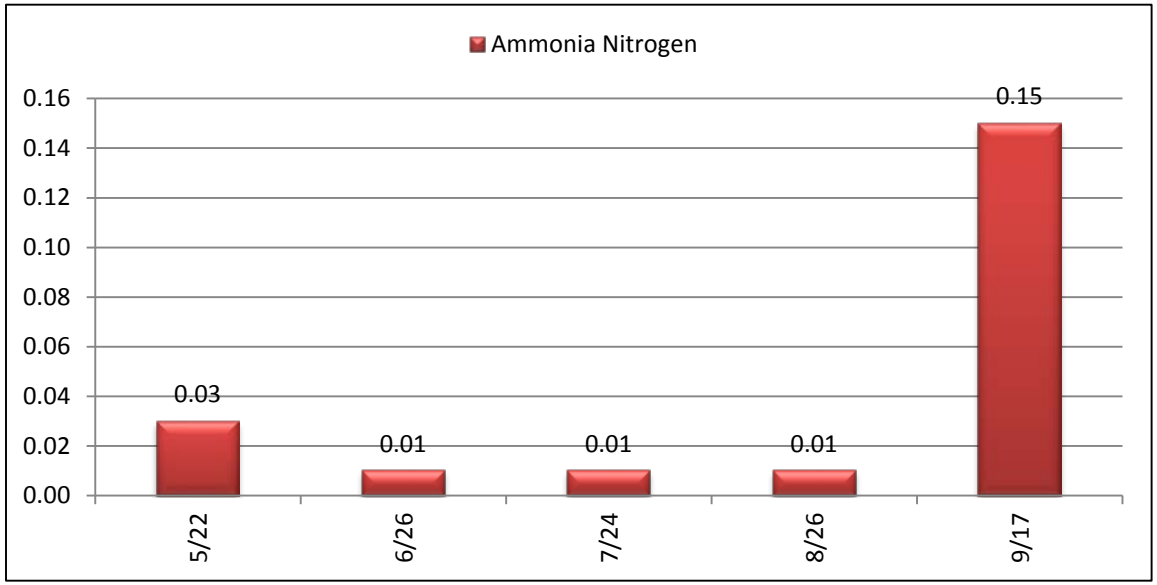
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	3.3	1.9	2.3	1.5	1.8	**1.9**
Grade	A	C	B	C	C	**C**
Average (June-Sept) meters	2.9	1.9	1.9	1.1	1.9	**1.7**
Meets Standard (>1.4 meters)	Yes	Yes	Yes	No	Yes	**Yes**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Deep Lake Standard: 40.0 µg/L | South Lindstrom Lake



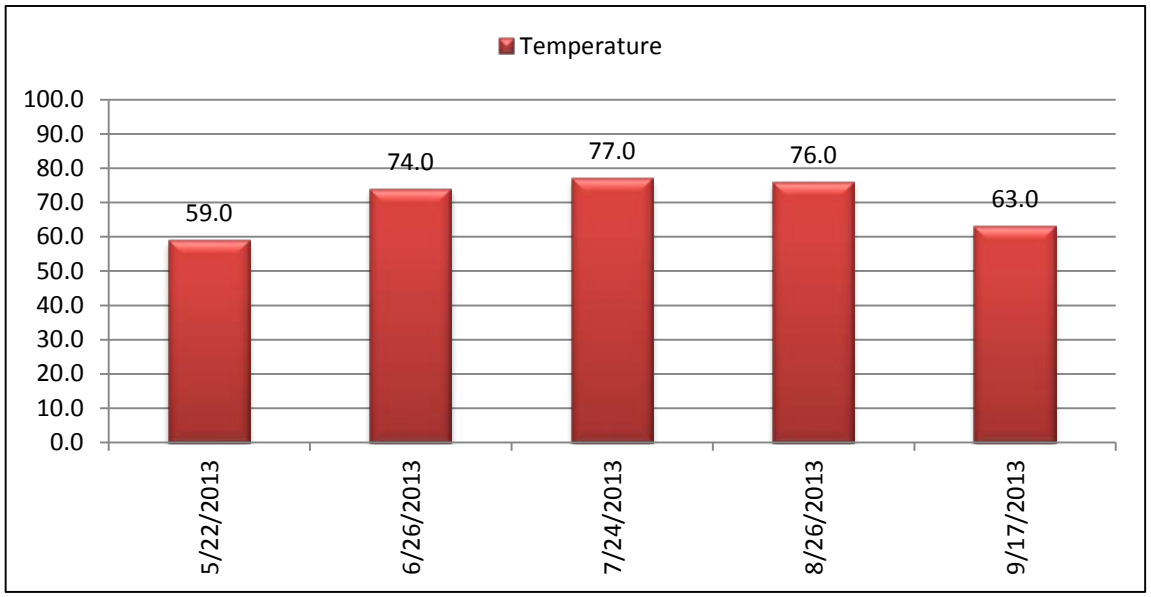
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	26.0	38.0	34.6	53.0	42.6	**36.2**
Grade	B	C	C	C	C	**C**
Average (June-Sept) µg/L	27.0	38.0	38.5	61.8	46.3	**40.3**
Meets Standard (40.0 µg/L)	Yes	Yes	Yes	No	No	**No**

Ammonia Nitrogen | Expected Range: None | Deep Lake Standard: None | South Lindstrom Lake



Average mg/L	
2009	<0.05
2010	<0.05
2011	0.03
2012	0.07
2013	0.04
2014	0.04

Surface Water Temperature |Expected Range: None |Deep Lake Standard: None | South Lindstrom Lake



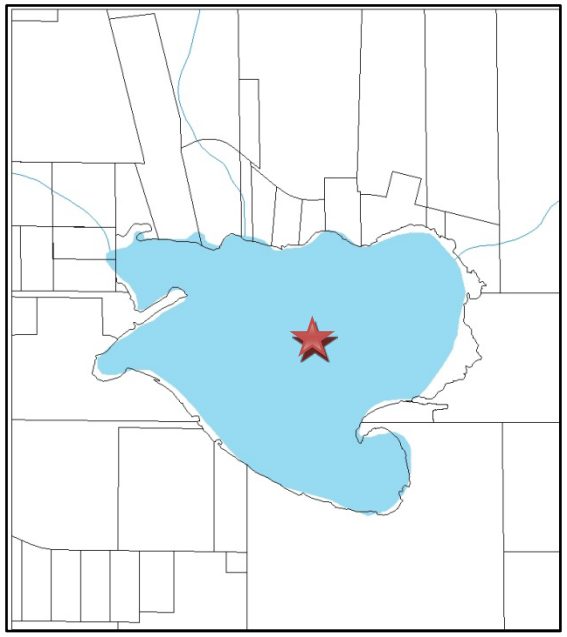
Year	Average ° F
2009	73.2
2010	72.5
2011	66.2
2012	72.6
2013	70.6
2014	69.8

General Observations | South Lindstrom Lake

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	2	2	Chopstick	Minimal aquatic vegetation
June	2	2	Chopstick	Higher water levels; minimal aquatic vegetation
July	3	3	Sultana	Low aquatic plant density
August	2	2	Eiderdown	Good control of Eurasian Watermilfoil for navigation
September	3	3	Beach Grass	

Little Lake

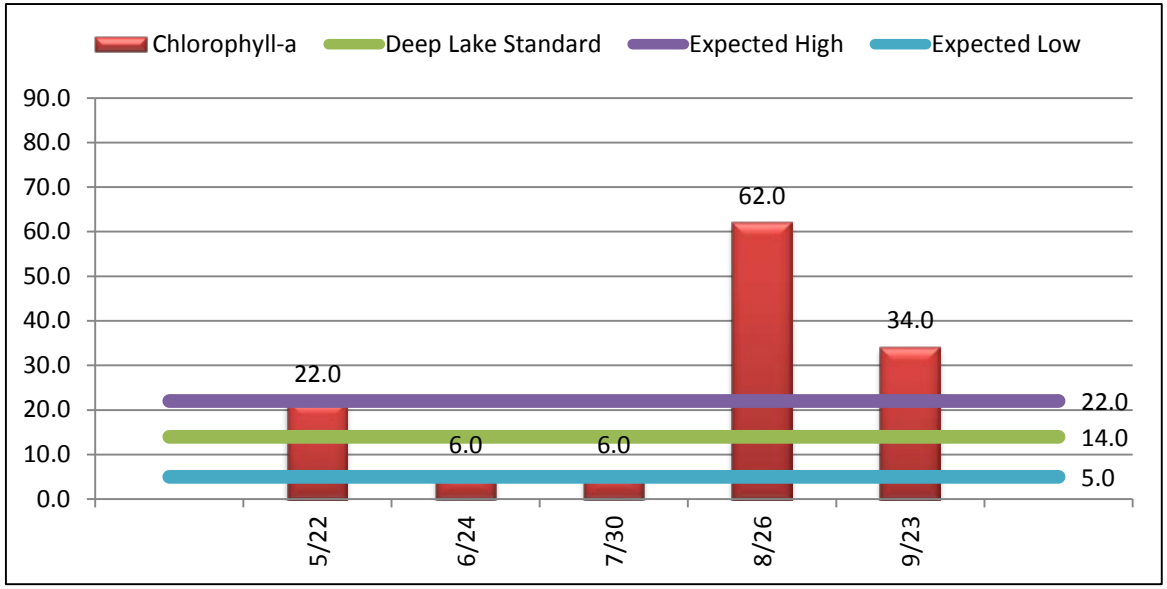
Lake 13-0033-00 Site 201



2014 Report Card: Deep Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	D
MPCA Standards	No Impaired
2014 Ranking	18 of 21

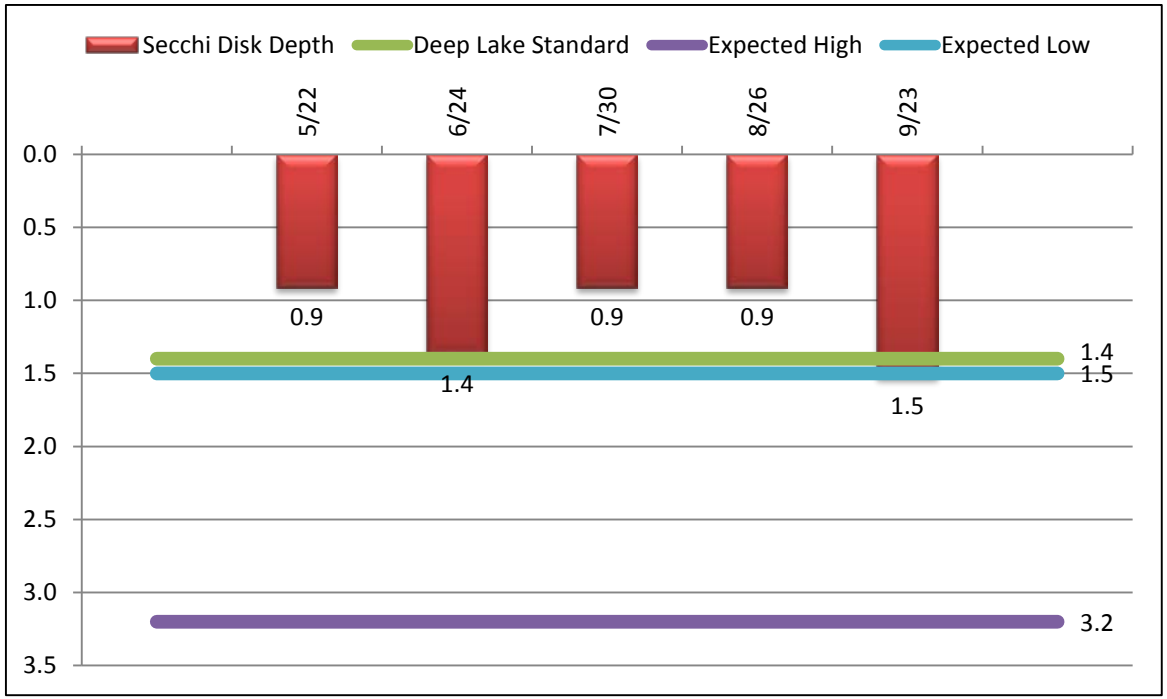
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	62.6	58.4	71.8	64.2
Classification	Eutrophic	Eutrophic	Hyper-eutrophic	Eutrophic
2014 Average (May-Sept)	26.0 µg/L	1.1 meters	109.0 µg/L	-----
Grade	C	D	D	D
MPCA Standard (Deep)	14.0 µg/L	<1.4 meters	40.0 µg/L	-----
2014 Average (June-Sept)	27.0 µg/L	1.2 meters	118.0 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 | Little Lake



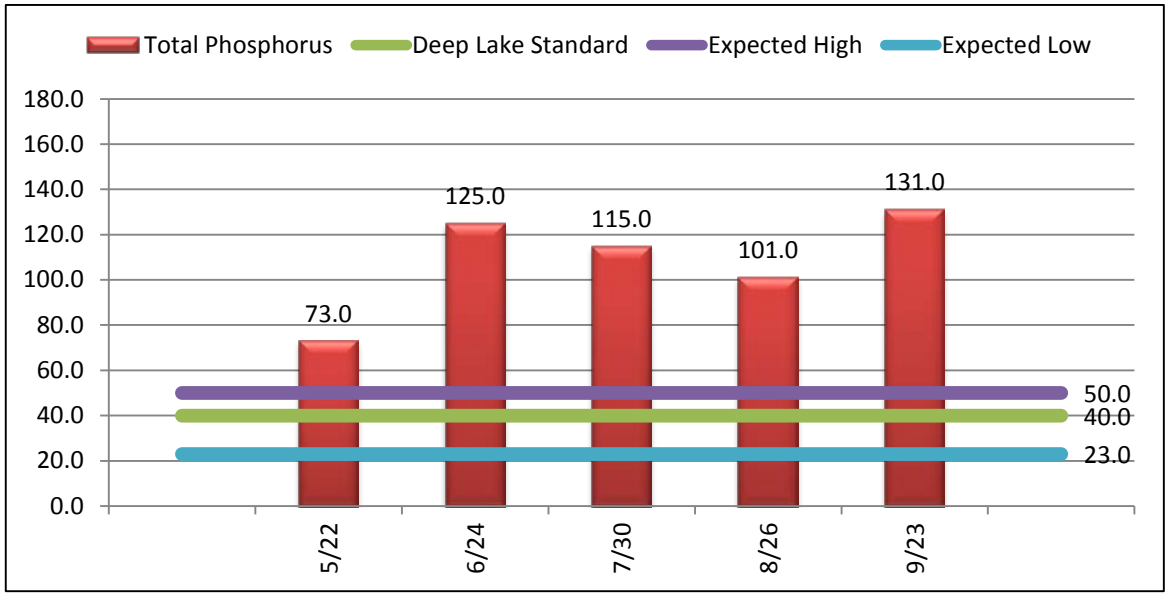
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	43.2	49.0	38.8	**26.0**
Grade	-----	-----	C	D	C	**C**
Average (June-Sept) µg/L	No Data	No Data	52.5	60.3	48.0	**27.0**
Meets Standard (14.0 µg/L)	-----	-----	No	No	No	**No**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Deep Lake Standard: >1.4 meters | Little Lake



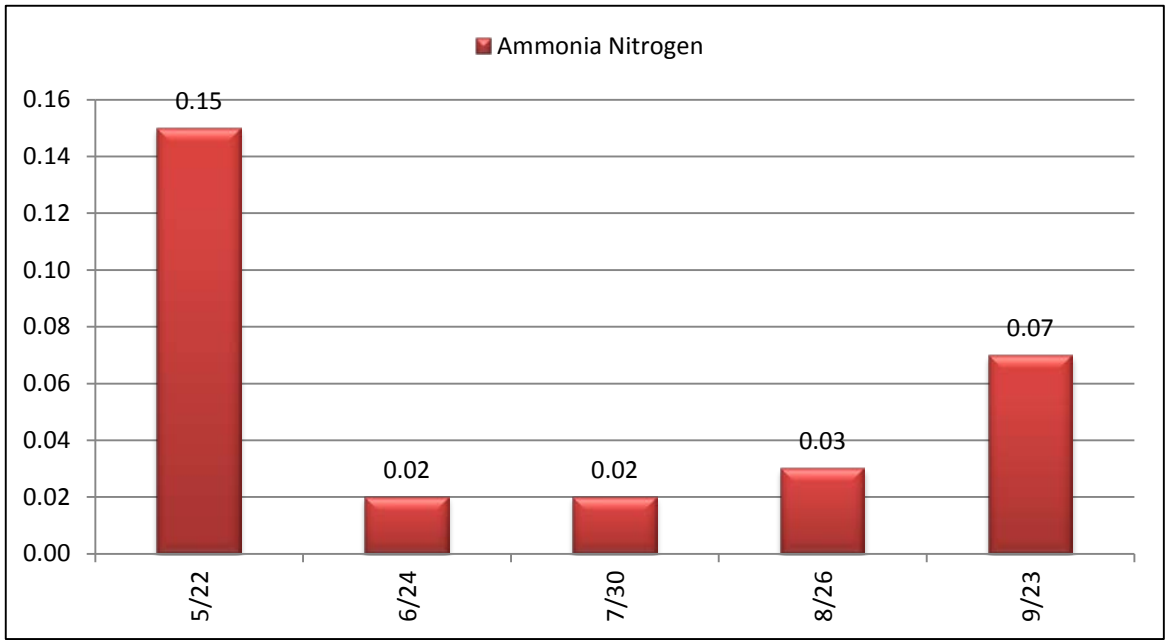
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	No Data	No Data	1.2	1.8	1.5	**1.1**
Grade	-----	-----	C-D	D	C	**D**
Average (June-Sept) meters	No Data	No Data	0.9	0.9	1.2	**1.2**
Meets Standard (>1.4 meters)	-----	-----	No	No	No	**No**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Deep Lake Standard: 40.0 µg/L | Little Lake



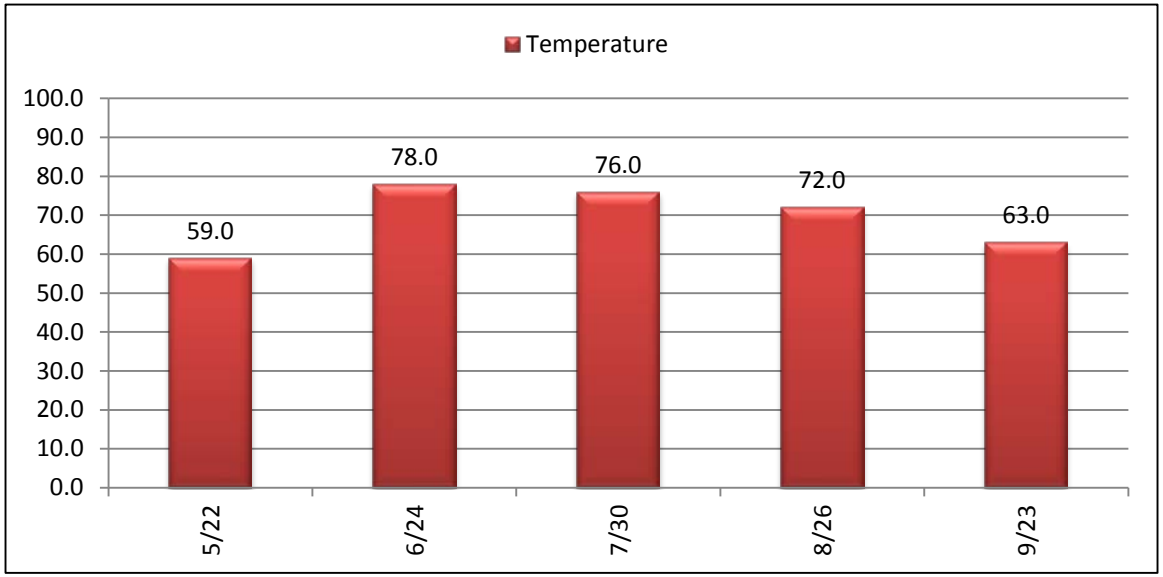
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	117.0	92.0	73.2	**109.0**
Grade	-----	-----	D	D	D	**D**
Average (June-Sept) µg/L	No Data	No Data	125.5	102.5	75.5	**118.0**
Meets Standard (40.0 µg/L)	-----	-----	No	No	No	**No**

Ammonia Nitrogen | Expected Range: None | Deep Lake Standard: None | Little Lake



Average mg/L	
2009	No Data
2010	No Data
2011	0.24
2012	0.15
2013	0.05
2014	0.06

Surface Water Temperature |Expected Range: None |Deep Lake Standard: None | Little Lake



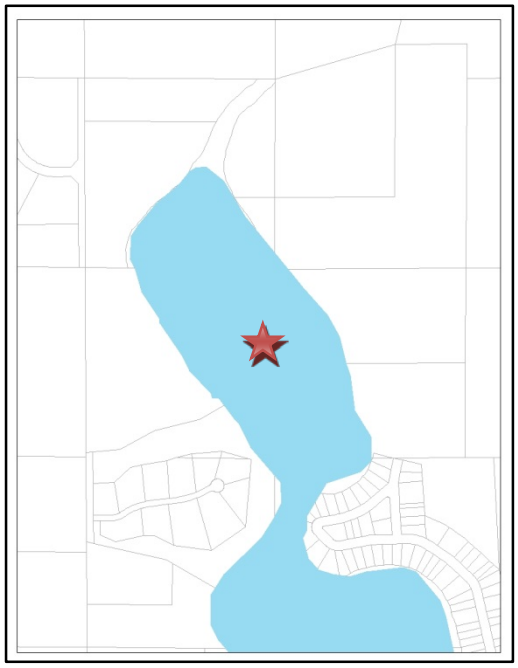
Year	Average ° F
2009	No Data
2010	No Data
2011	61.6
2012	70.8
2013	76.6
2014	69.6

General Observations | Little Lake

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	2	2	Toasted Marshmallow	Fish kill winter 2013-2014; minimal aquatic vegetation present
June	2	2	Eiderdown	Higher water levels; minimal aquatic vegetation present
July	3	3	Beach Grass	
August	2.5	2.5	Beach Grass	Few boats; low fishing pressure because of winter kill
September	2.5	2.5	Cornichon	

Mandall Lake

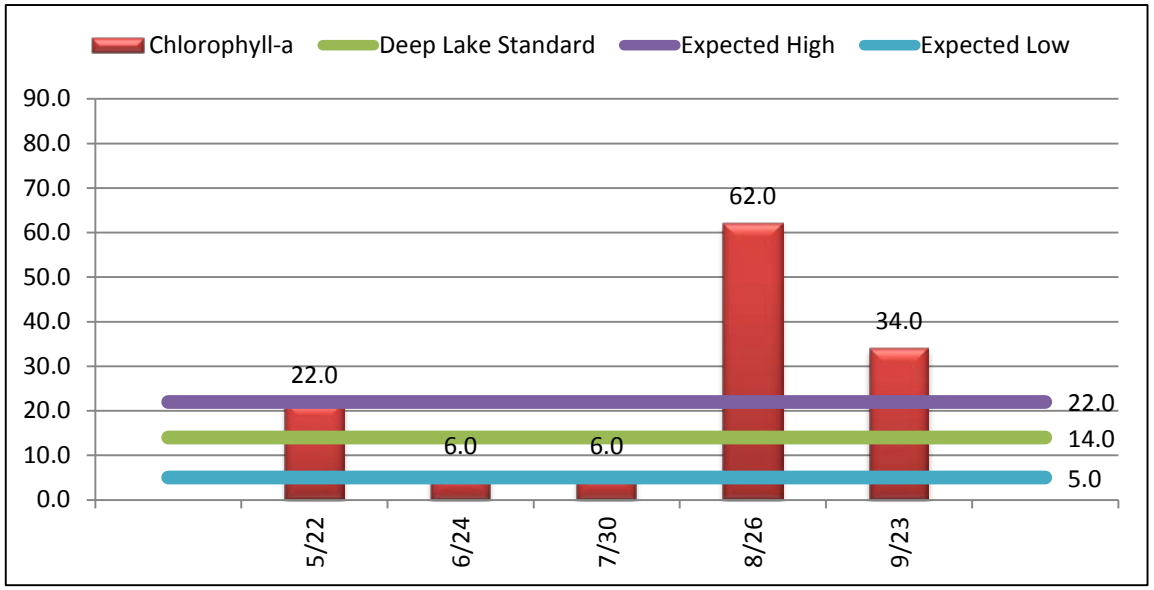
Lake 13-0074-00 Site 201



2014 Report Card: Shallow Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	D
MPCA Standards	No *Not assessed for 303(d) impairment status
2014 Ranking	19 of 21

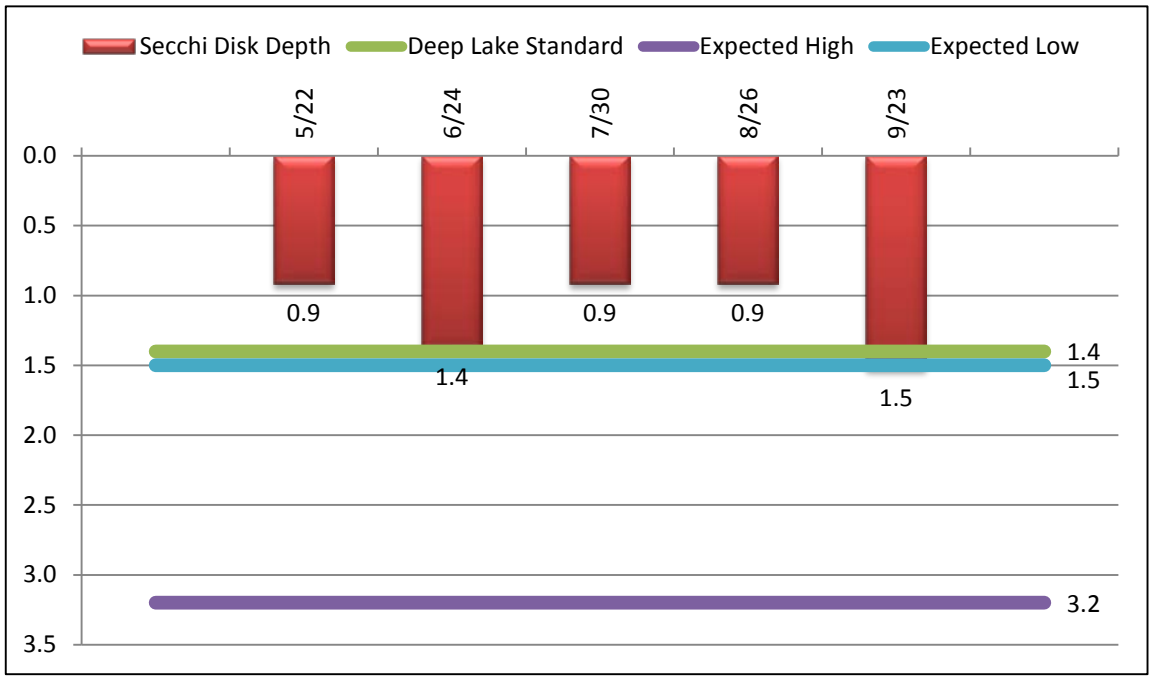
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	63.7	61.2	69.0	64.6
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic
2014 Average (May-Sept)	29.2 µg/L	0.9 meters	89.9 µg/L	-----
Grade	C	D	D	D
MPCA Standard (Shallow)	20.0 µg/L	<1.0 meter	60.0 µg/L	-----
2014 Average (June-Sept)	32.3 µg/L	0.9 meters	94.3 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 | Mandall Lake



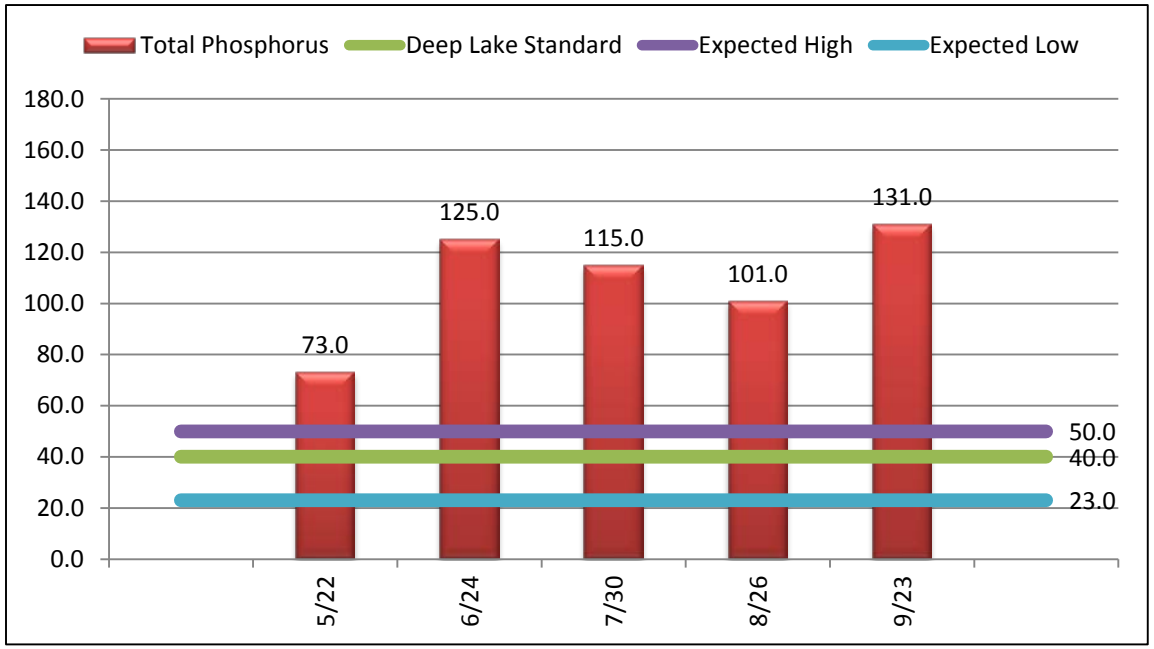
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	No Data	No Data	**29.2**
Grade	-----	-----	-----	-----	-----	**C**
Average (June-Sept) µg/L	No Data	No Data	No Data	No Data	No Data	**32.3**
Meets Standard (20.0 µg/L)	-----	-----	-----	-----	-----	**No**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Shallow Lake Standard: >1.0 meter | Mandall Lake



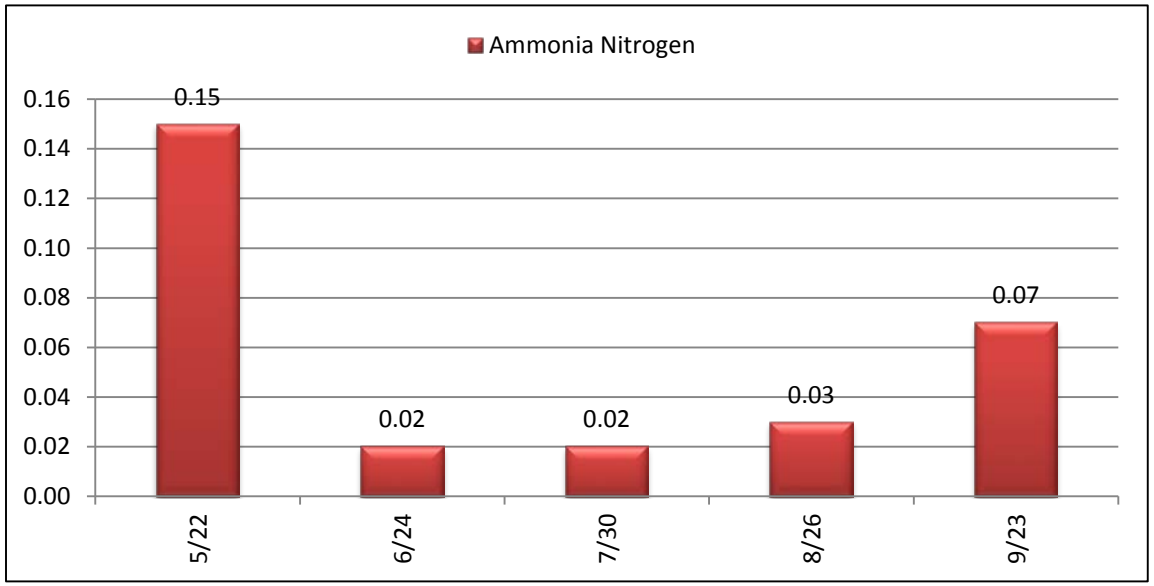
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	No Data	No Data	No Data	No Data	No Data	**0.9**
Grade	-----	-----	-----	-----	-----	**D**
Average (June-Sept) meters	No Data	No Data	No Data	No Data	No Data	**0.9**
Meets Standard (>1.0 meter)	-----	-----	-----	-----	-----	**No**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Shallow Lake Standard: 60.0 µg/L | Mandall Lake



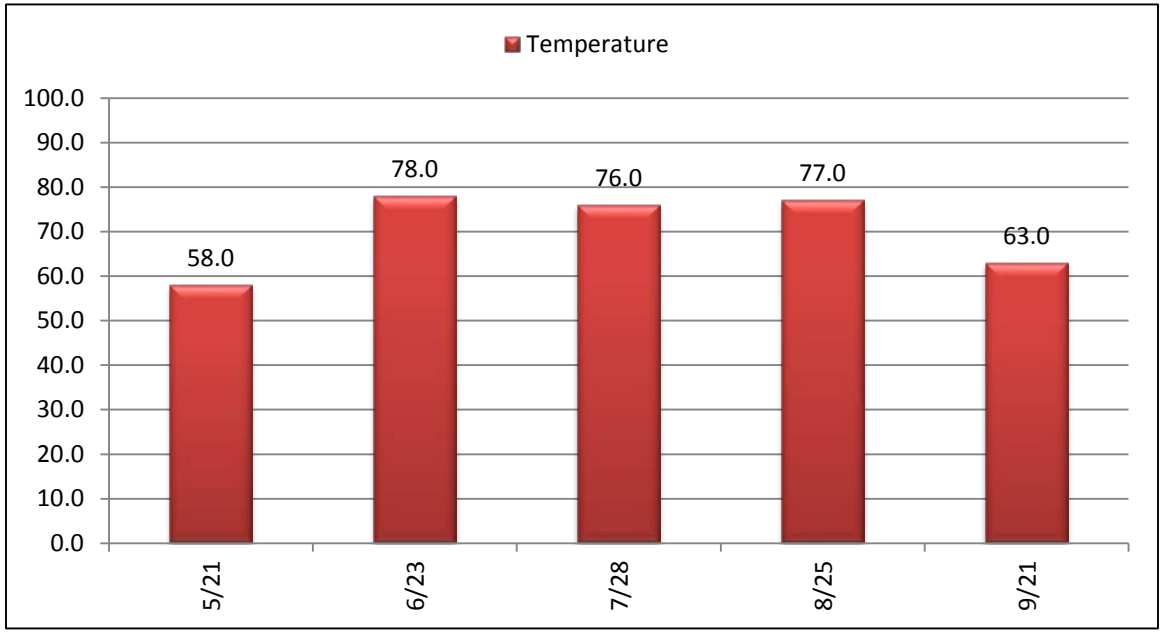
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	No Data	No Data	**89.8**
Grade	-----	-----	-----	-----	-----	**D**
Average (June-Sept) µg/L	No Data	No Data	No Data	No Data	No Data	**94.3**
Meets Standard (60.0 µg/L)	-----	-----	-----	-----	-----	**No**

Ammonia Nitrogen | Expected Range: None | Shallow Lake Standard: None | Mandall Lake



Average mg/L	
2009	No Data
2010	No Data
2011	No Data
2012	No Data
2013	No Data
2014	0.04

Surface Water Temperature |Expected Range: None |Shallow Lake Standard: None | Mandall Lake



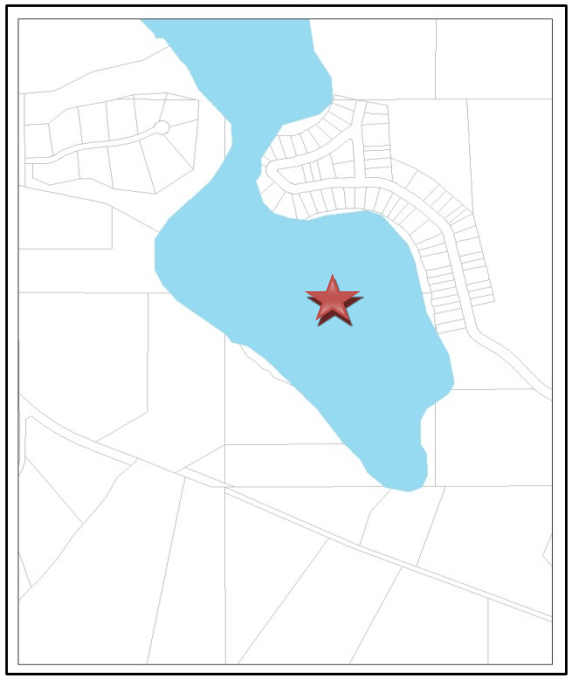
Year	Average ° F
2009	No Data
2010	No Data
2011	No Data
2012	No Data
2013	No Data
2014	70.4

General Observations | Mandall Lake

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	2	2	Dried Chamomile	High water levels; minimal aquatic vegetation present
June	3	3	Bay Leaf	High water levels; minimal aquatic vegetation present
July	3	3	Beach Grass	Shoreland erosion from high water this past spring
August	3	3	Beach Grass	Overall improved water quality and reduced abundance of aquatic plant growth
September	2.5	2.5	Cornichon	Abundance of painted turtles in channels

Rabour Lake

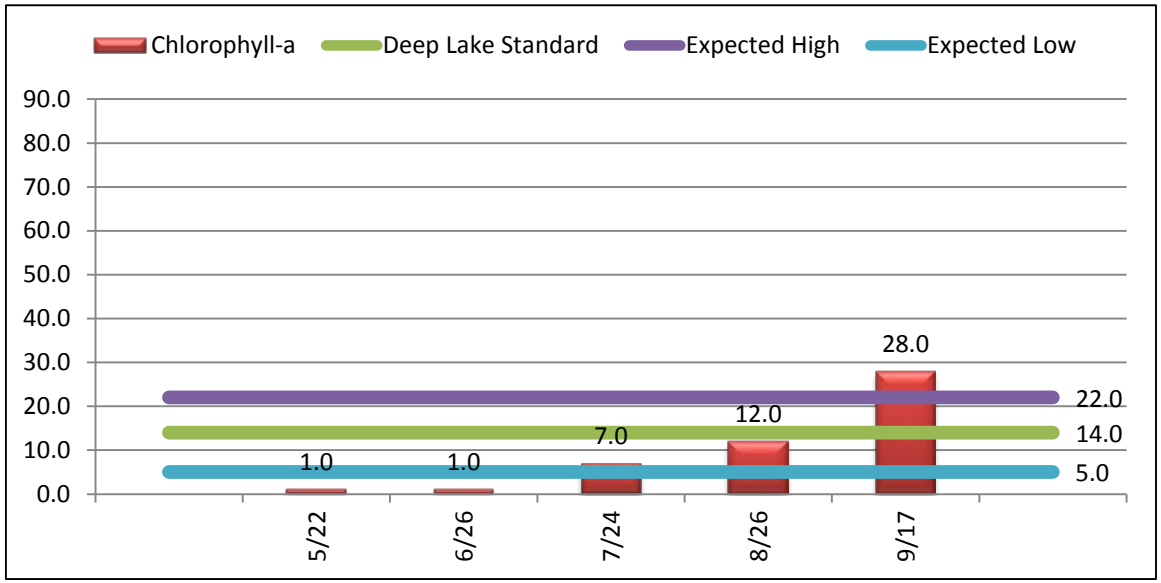
Lake 13-0079-00 Site 201



2014 Report Card: Shallow Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	D
MPCA Standards	No *Not assessed for 303(d) impairments list
2014 Ranking	17 of 21

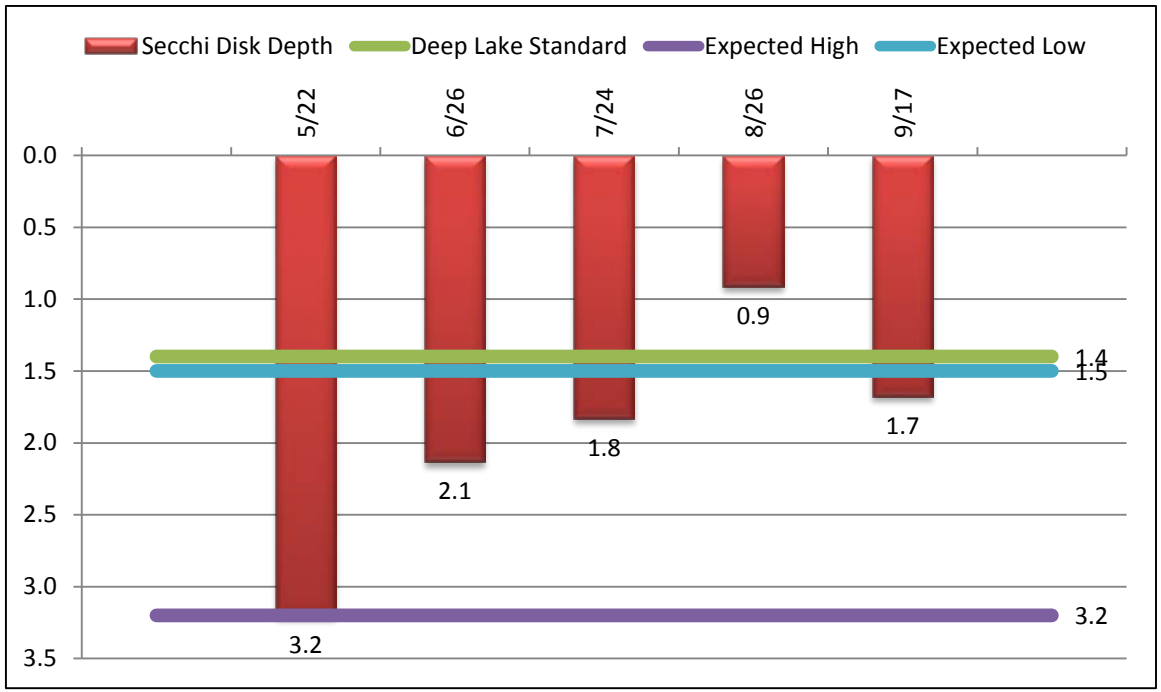
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	61.5	61.5	68.1	63.7
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic
2014 Average (May-Sept)	23.4 µg/L	0.9 meters	84.2 µg/L	-----
Grade	C	D	D	D
MPCA Standard (Shallow)	20.0 µg/L	<1.0 meter	60.0 µg/L	-----
2014 Average (June-Sept)	26.3 µg/L	0.8 meters	90.5 µg/L	-----
Meets Standard	No	No	No	No

Chlorophyll-a | Expected Range: 5.0-22.0 µg/L | Shallow Lake Standard: 20.0 µg/L | Rabour Lake



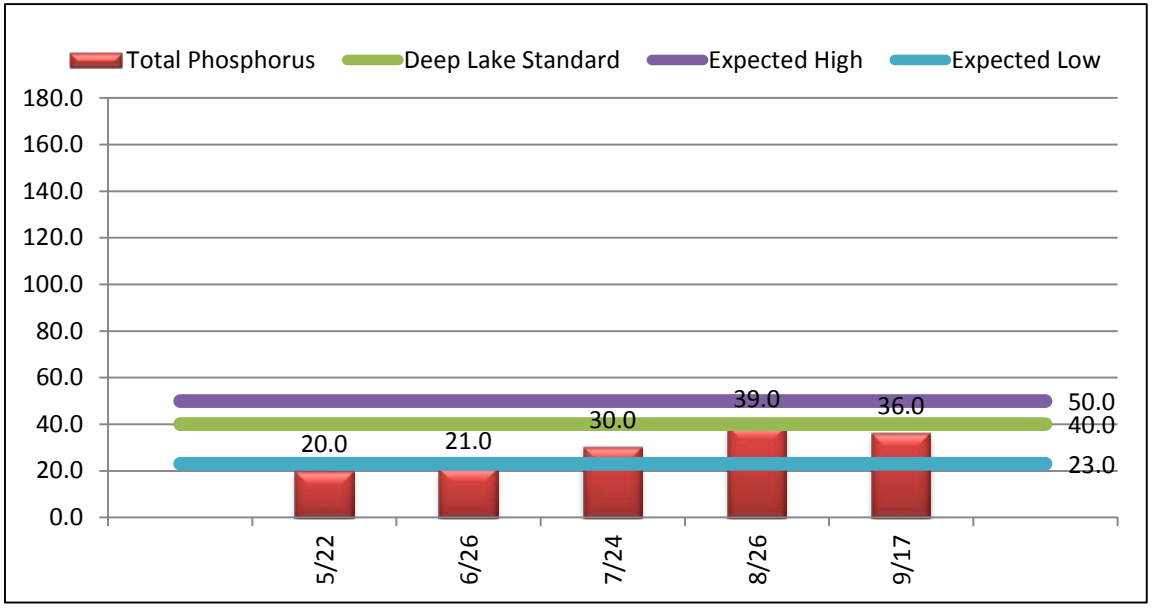
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	No Data	No Data	**23.4**
Grade	-----	-----	-----	-----	-----	**C**
Average (June-Sept) µg/L	No Data	No Data	No Data	No Data	No Data	**26.3**
Meets Standard (20.0 µg/L)	-----	-----	-----	-----	-----	**No**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Shallow Lake Standard: ›1.0 meter | Rabour Lake



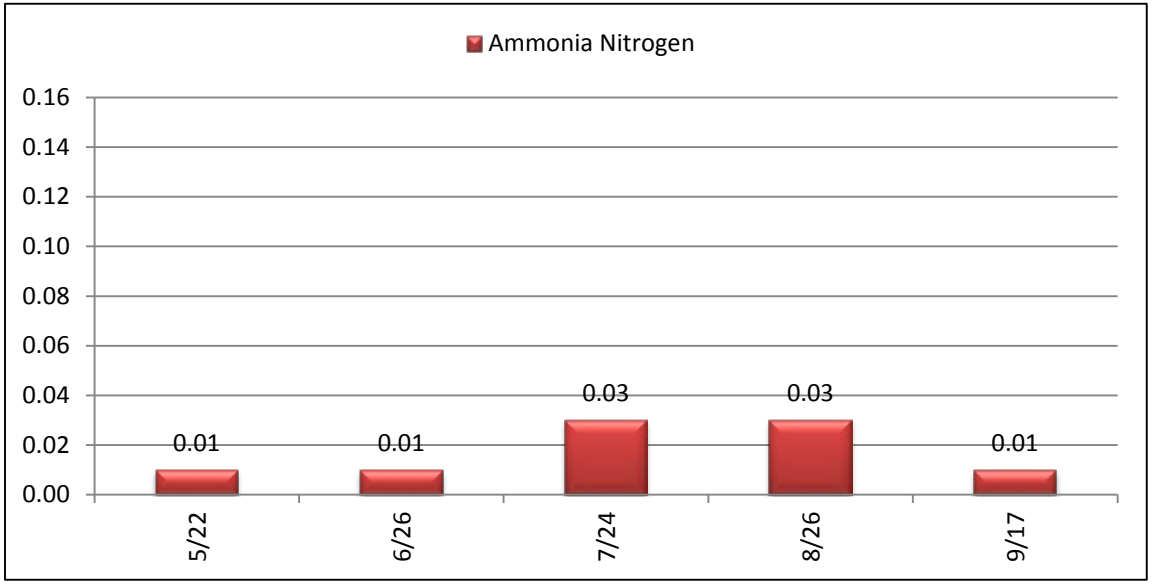
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	No Data	No Data	No Data	No Data	No Data	**0.9**
Grade	-----	-----	-----	-----	-----	**D**
Average (June-Sept) meters	No Data	No Data	No Data	No Data	No Data	**0.8**
Meets Standard (>1.0 meter)	-----	-----	-----	-----	-----	**No**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Shallow Lake Standard: 60.0 µg/L | Rabour Lake



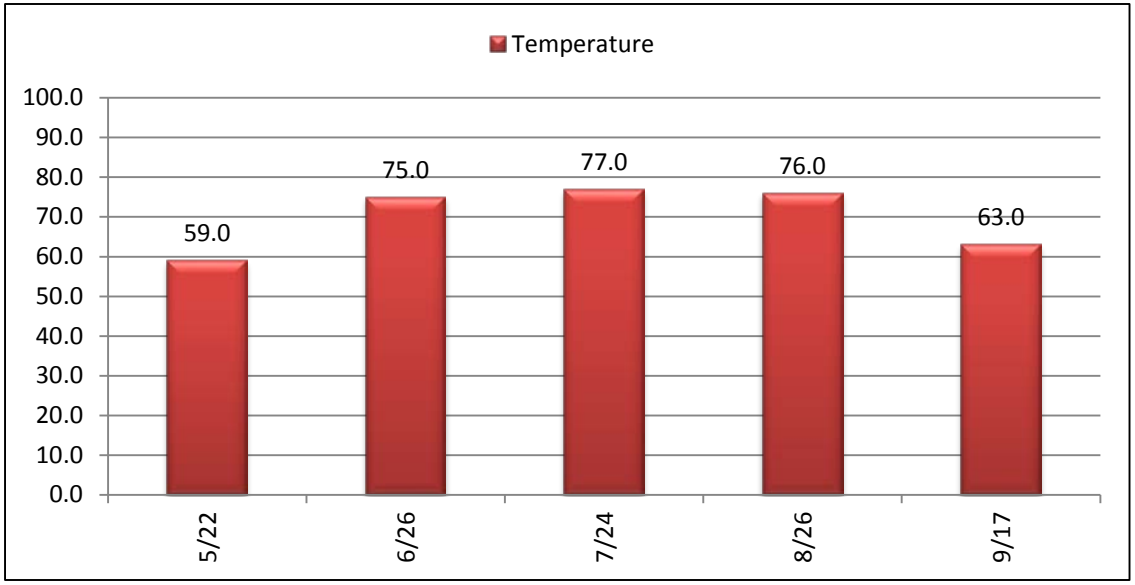
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	No Data	No Data	**84.2**
Grade	-----	-----	-----	-----	-----	**D**
Average (June-Sept) µg/L	No Data	No Data	No Data	No Data	No Data	**90.5**
Meets Standard (60.0 µg/L)	-----	-----	-----	-----	-----	**No**

Ammonia Nitrogen | Expected Range: None | Shallow Lake Standard: None | Rabour Lake



Average mg/L	
2009	No Data
2010	No Data
2011	No Data
2012	No Data
2013	No Data
2014	0.03

Surface Water Temperature |Expected Range: None |Shallow Lake Standard: None | Rabour Lake



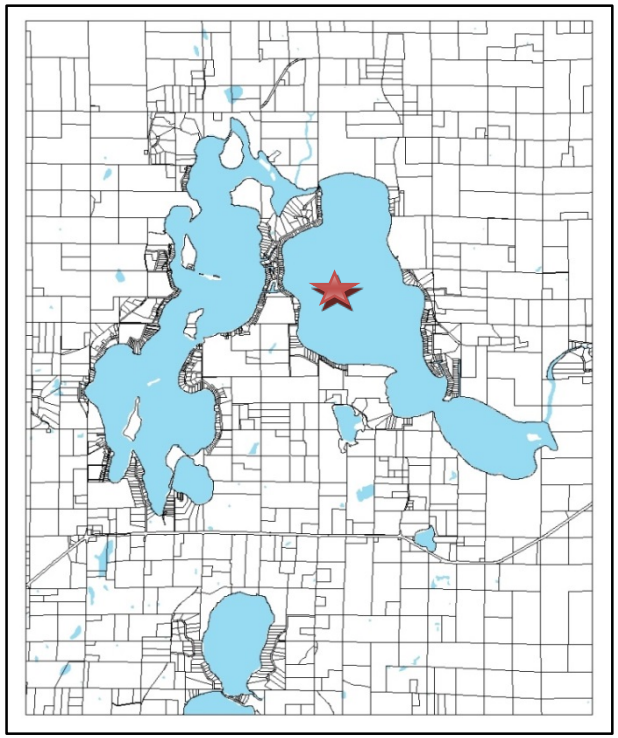
Year	Average ° F
2009	No Data
2010	No Data
2011	No Data
2012	No Data
2013	No Data
2014	70.8

General Observations | Rabour Lake

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	2	2	Malted	High water levels; minimal aquatic vegetation present
June	3	3	Timothy Hay	High water levels; minimal aquatic vegetation present
July	3	3	Beach Grass	Shoreland erosion from high water this past spring
August	3	3	Sultana	Overall improved water quality and reduced abundance of aquatic plant growth
September	2.5	2.5	Parchment Paper	Abundance of painted turtles in channel

East Rush Lake

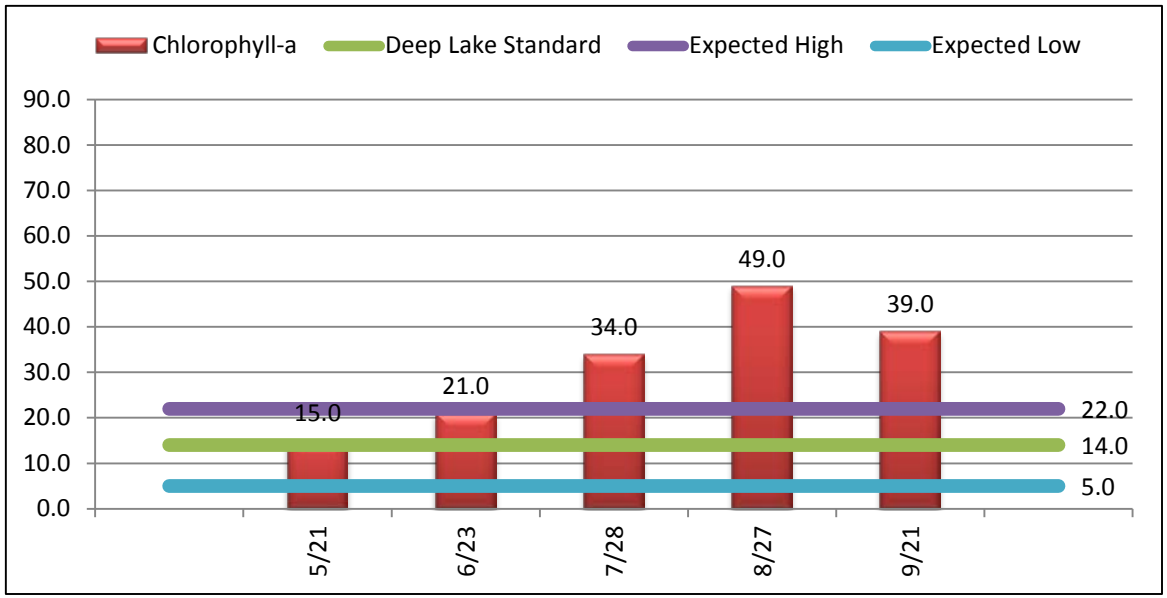
Lake 13-0069-01 Site 207



2014 Report Card: Deep Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	D
MPCA Standards	No Impaired
2014 Ranking	20 of 21

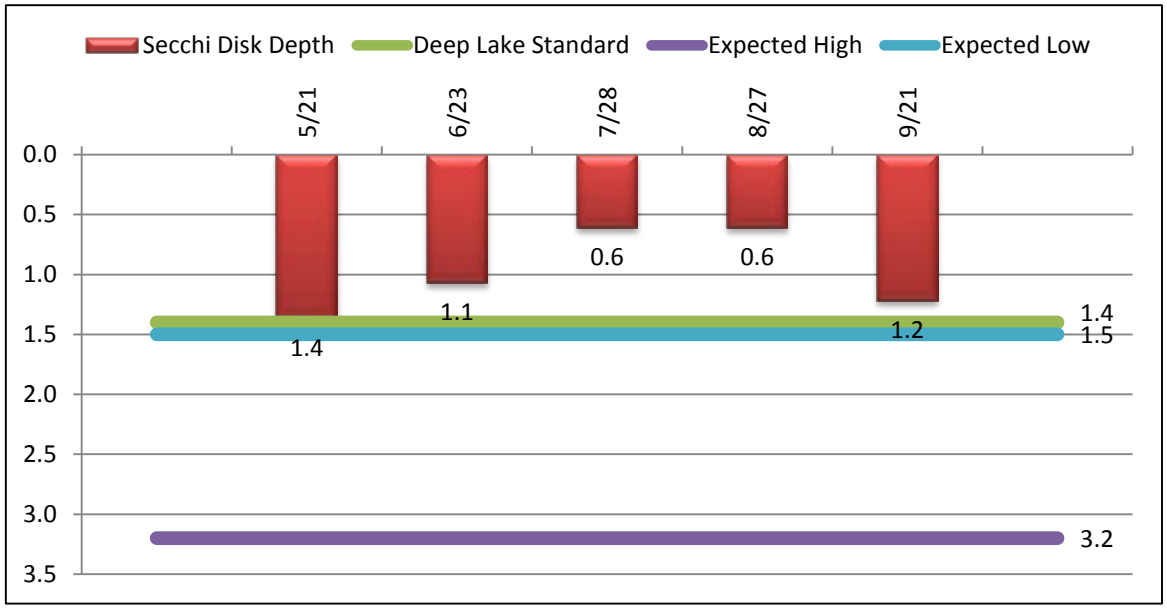
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	64.5	60.3	70.2	65.0
Classification	Eutrophic	Eutrophic	Hyper-eutrophic	Eutrophic
2014 Average (May-Sept)	31.6 µg/L	1.0 meter	97.2 µg/L	-----
Grade	C	D	D	D
MPCA Standard (Deep)	14.0 µg/L	<1.4 meters	40.0 µg/L	-----
2014 Average (June-Sept)	35.8 µg/L	0.9 meters	110.0 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 | East Rush Lake



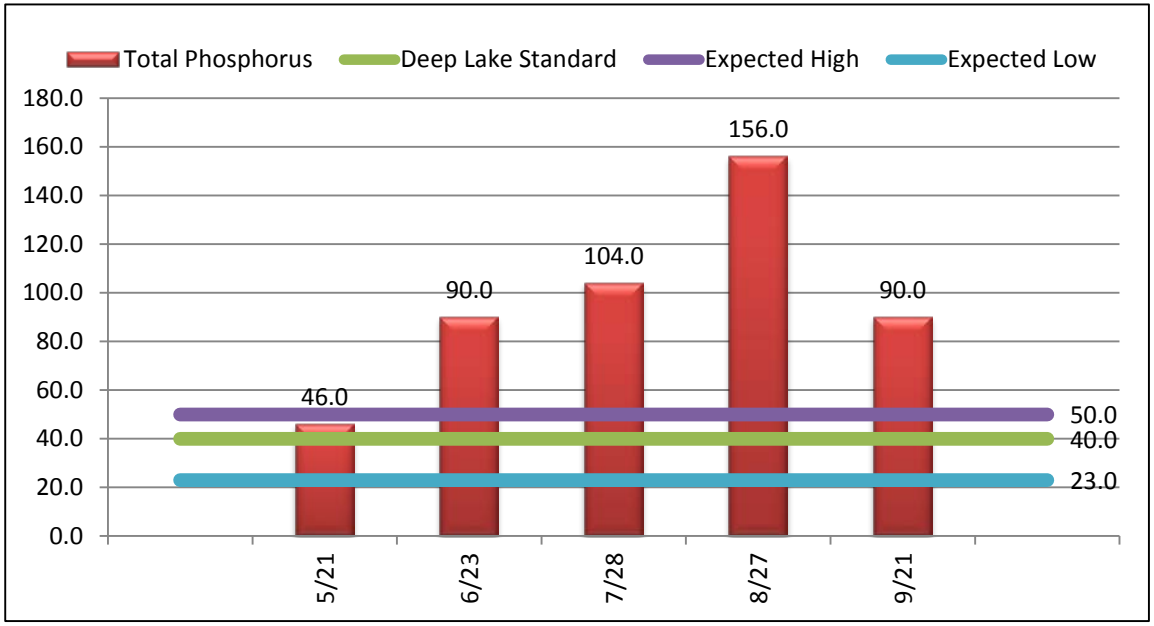
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	54.4	40.4	**31.6**
Grade	-----	-----	-----	D	C	**C**
Average (June-Sept) µg/L	No Data	No Data	No Data	65.5	49.0	**35.8**
Meets Standard (14.0 µg/L)	-----	-----	-----	No	No	**No**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Deep Lake Standard: >1.4 meters | East Rush Lake



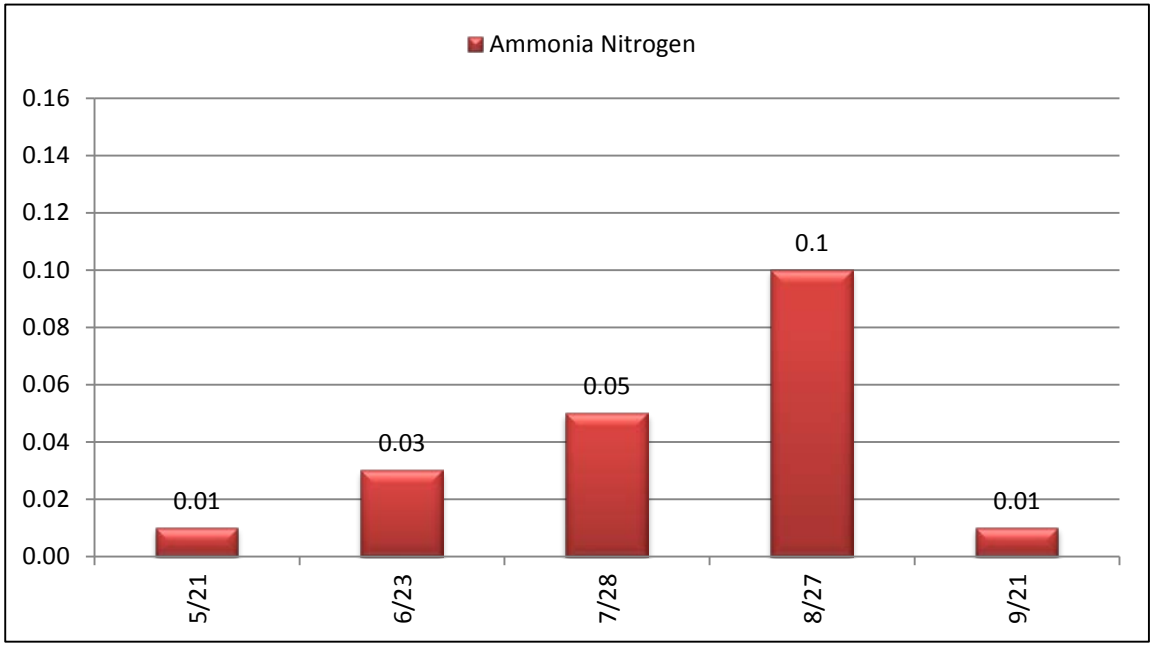
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	No Data	No Data	No Data	0.8	1.5	**1.0**
Grade	-----	-----	-----	D	C	**D**
Average (June-Sept) meters	No Data	No Data	No Data	0.7	1.3	**0.9**
Meets Standard (>1.4 meters)	-----	-----	-----	No	No	**No**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Deep Lake Standard: 40.0 µg/L | East Rush Lake



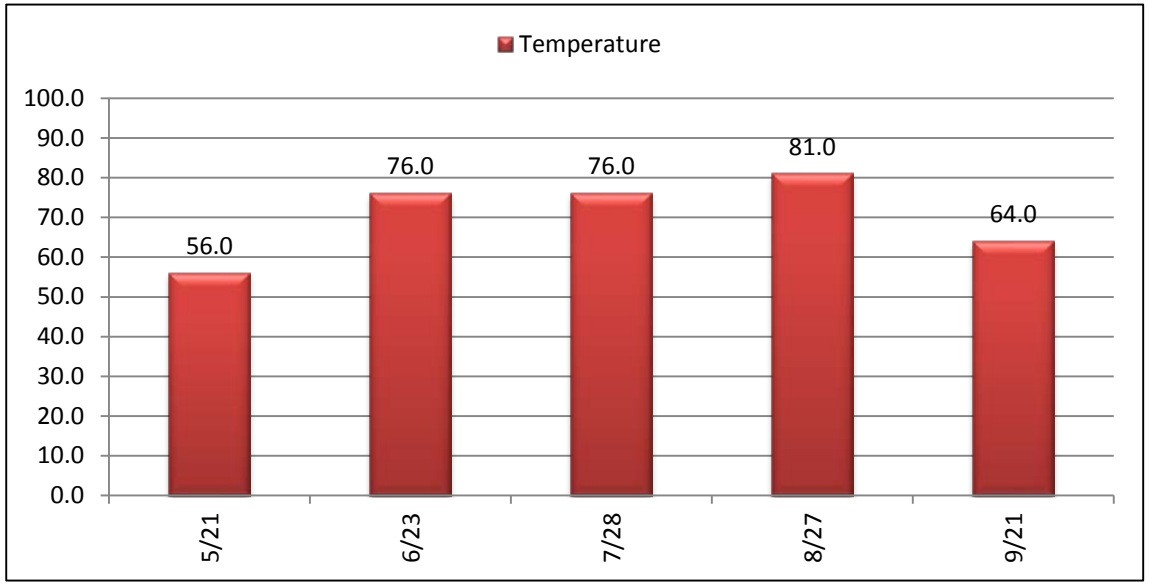
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	90.0	89.0	**97.2**
Grade	-----	-----	-----	D	D	**D**
Average (June-Sept) µg/L	No Data	No Data	No Data	101.3	97.3	**110.0**
Meets Standard (40.0 µg/L)	-----	-----	-----	No	No	**No**

Ammonia Nitrogen | Expected Range: None | Deep Lake Standard: None | East Rush Lake



Average mg/L	
2009	No Data
2010	No Data
2011	No Data
2012	0.07
2013	0.05
2014	0.04

Surface Water Temperature |Expected Range: None |Deep Lake Standard: None | East Rush Lake



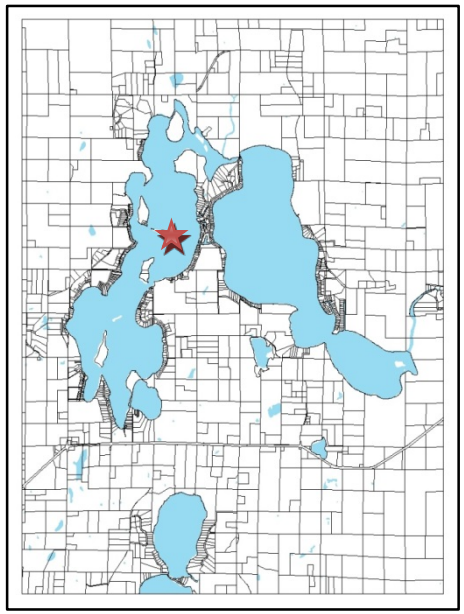
Year	Average ° F
2009	No Data
2010	No Data
2011	No Data
2012	70.6
2013	73.0
2014	70.6

General Observations | East Rush Lake

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	2	2	Short Bread	High water levels; minimal aquatic vegetation present
June	3	3	Beach Grass	High water levels; minimal aquatic vegetation present
July	3.5	3.5	Bay Leaf	High water; minimal aquatic plant density
August	4.5	4.5	Mossy Rock	Algae blooms near shore, center of lake, and channels; substantial decrease in abundance of Curly leaf pondweed
September	3	3	Cornichon	Substantially reduced algae growth floating on surface compared with August; algae bloom in channel

West Rush Lake

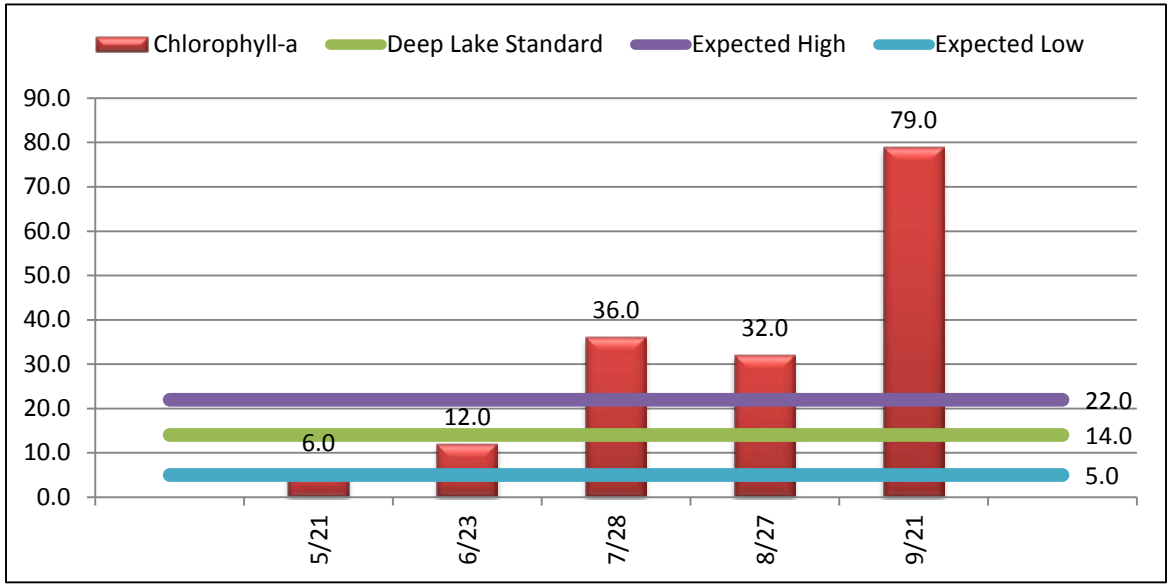
Lake 13-0069-02 Site 204



2014 Report Card: Deep Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	D+
MPCA Standards	No Impaired
2014 Ranking	16 of 21

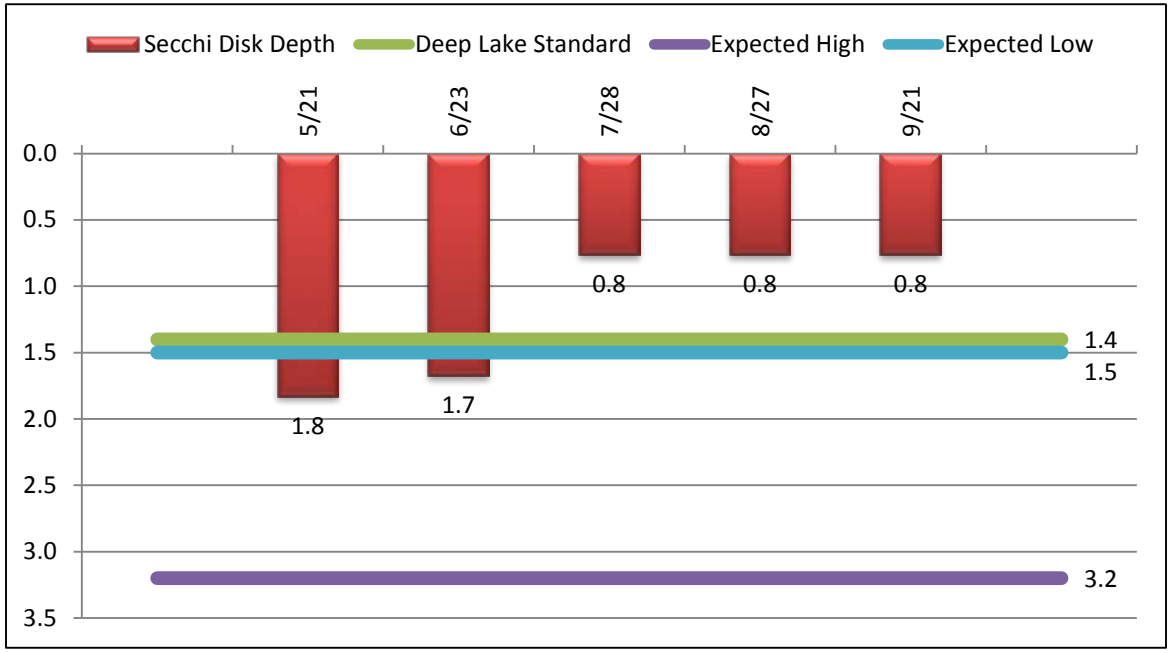
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	64.9	57.6	67.7	63.4
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic
2014 Average (May-Sept)	33.0 µg/L	1.2 meters	82.2 µg/L	-----
Grade	C	C-D	D	D+
MPCA Standard (Deep)	14.0 µg/L	<1.4 meters	40.0 µg/L	-----
2014 Average (June-Sept)	39.8 µg/L	1.0 meter	92.0 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 | West Rush Lake



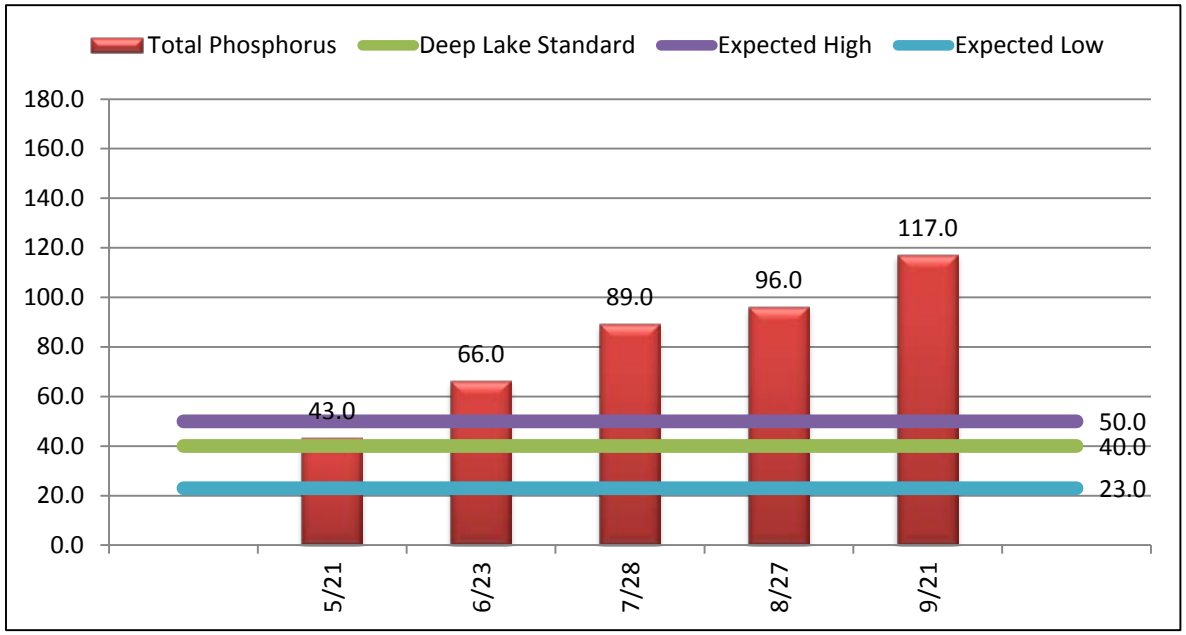
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	57.2	47.6	**33.0**
Grade	-----	-----	-----	D	C	**C**
Average (June-Sept) µg/L	No Data	No Data	No Data	67.8	59.3	**39.8**
Meets Standard (14.0 µg/L)	-----	-----	-----	No	No	**No**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Deep Lake Standard: >1.4 meters | West Rush Lake



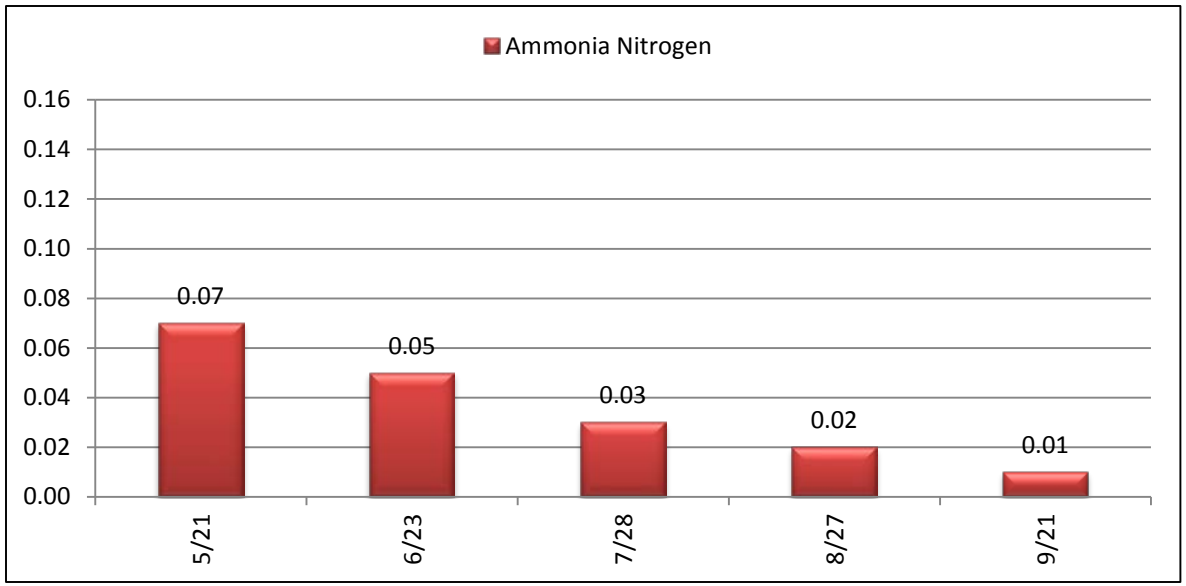
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	No Data	No Data	No Data	0.9	2.0	**1.2**
Grade	-----	-----	-----	D	C	**C-D**
Average (June-Sept) meters	No Data	No Data	No Data	0.7	0.9	**1.0**
Meets Standard (>1.4 meters)	-----	-----	-----	No	No	**No**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Deep Lake Standard: 40.0 µg/L | West Rush Lake



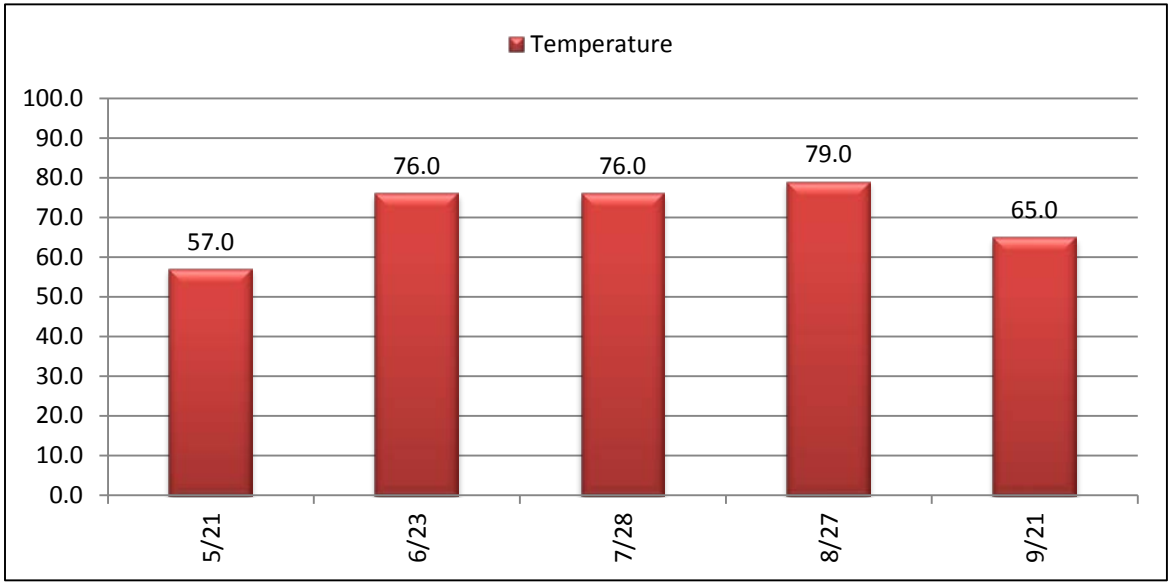
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	80.0	70.8	**82.2**
Grade	-----	-----	-----	D	D	**D**
Average (June-Sept) µg/L	No Data	No Data	No Data	88.0	77.5	**92.0**
Meets Standard (40.0 µg/L)	-----	-----	-----	No	No	**No**

Ammonia Nitrogen | Expected Range: None | Deep Lake Standard: None | West Rush Lake



Average mg/L	
2009	No Data
2010	No Data
2011	No Data
2012	0.10
2013	0.07
2014	0.04

Surface Water Temperature |Expected Range: None |Deep Lake Standard: None | West Rush Lake



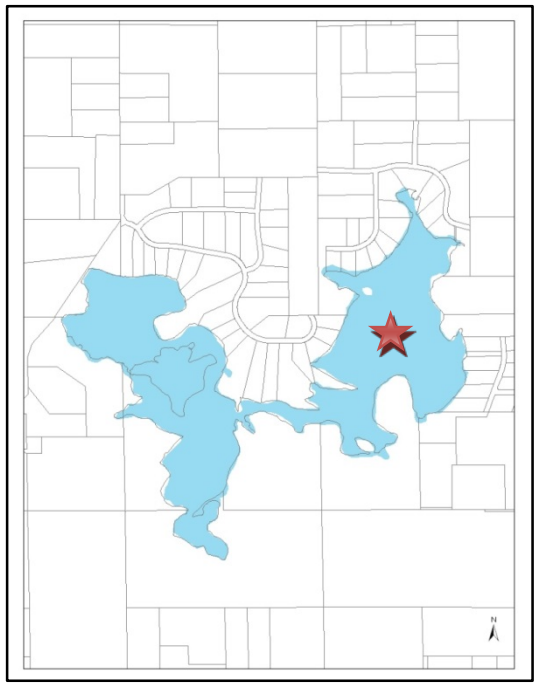
Year	Average ° F
2009	No Data
2010	No Data
2011	No Data
2012	70.6
2013	74.2
2014	70.6

General Observations | West Rush Lake

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	2	2	Short Bread	High water levels; minimal aquatic vegetation present
June	3	3	Beach Grass	High water levels; minimal aquatic vegetation present
July	3.5	3.5	Cornichon	High water; minimal aquatic plant density
August	4	4	Beach Grass	Algae blooms near shore and channels; substantial decrease in abundance of Curly leaf pondweed
September	3	3	Beach Grass	Substantially reduced algae growth floating on surface compared with August; algae bloom in channel

Spider Lake-East

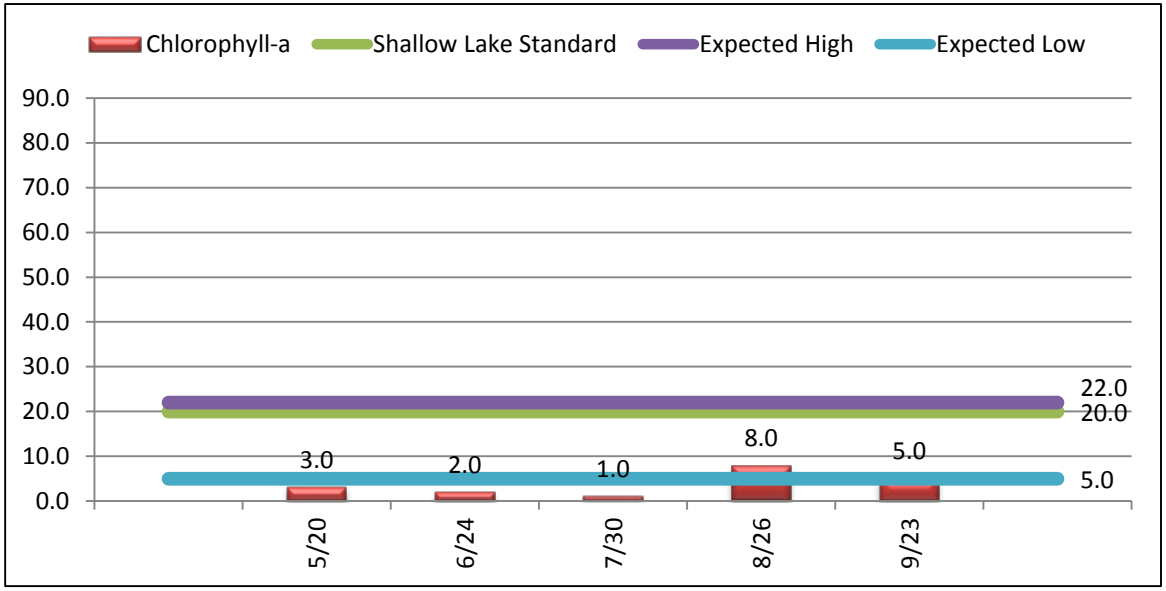
Lake 13-0019-00 Site 202



2014 Report Card: Shallow Lake	
Lake Classification	Mesotrophic
Overall Lake Quality Grade	C+
MPCA Standards	Yes Not Impaired
2014 Ranking	2 of 21

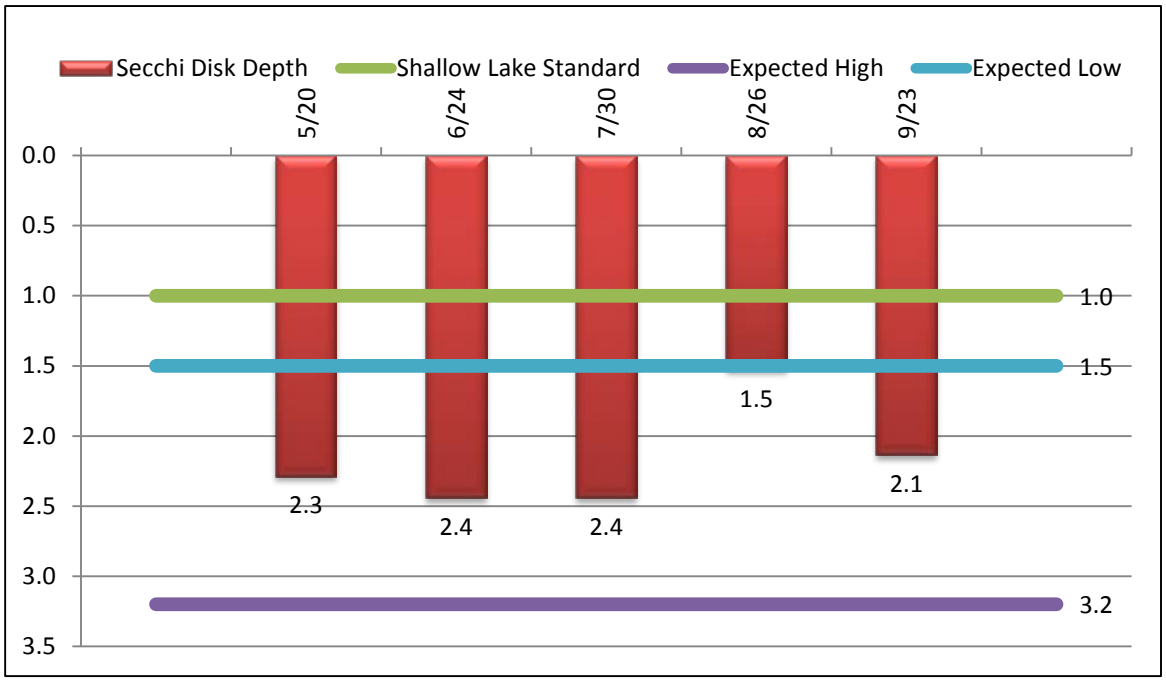
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	43.7	49.0	59.4	50.7
Classification	Mesotrophic	Mesotrophic	Eutrophic	Mesotrophic
2014 Average (May-Sept)	3.8 µg/L	2.1 meters	46.0 µg/L	-----
Grade	A	C	C	C+
MPCA Standard (Shallow)	20.0 µg/L	<1.0 meter	60.0 µg/L	-----
2014 Average (June-Sept)	4.0 µg/L	2.1 meters	42.5 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 | Spider Lake-East



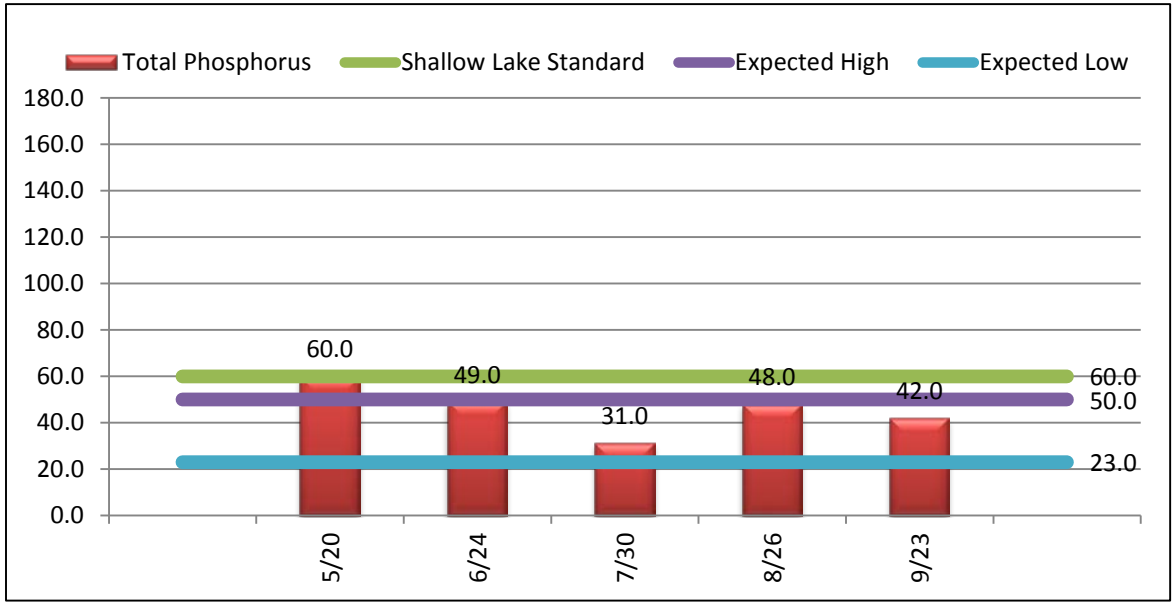
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	16.4	23.8	12.0	**3.8**
Grade	-----	-----	B	C	B	**A**
Average (June-Sept) µg/L	No Data	No Data	17.0	25.5	12.5	**4.0**
Meets Standard (20.0 µg/L)	-----	-----	Yes	No	Yes	**Yes**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Shallow Lake Standard: >1.0 meter | Spider Lake-East



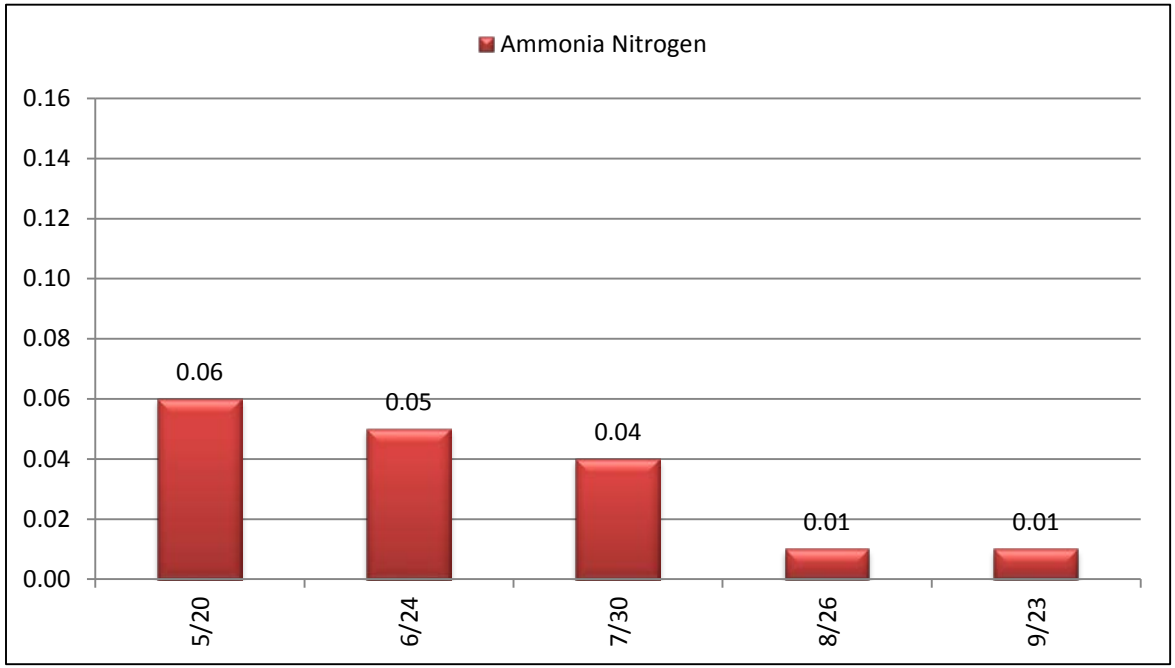
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	No Data	No Data	1.2	0.9	1.6	**2.1**
Grade	-----	-----	C	D	C	**C**
Average (June-Sept) meters	No Data	No Data	1.2	0.9	1.7	**2.1**
Meets Standard (>1.0 meter)	-----	-----	Yes	No	Yes	**Yes**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Shallow Lake Standard: 60.0 µg/L | Spider Lake-East



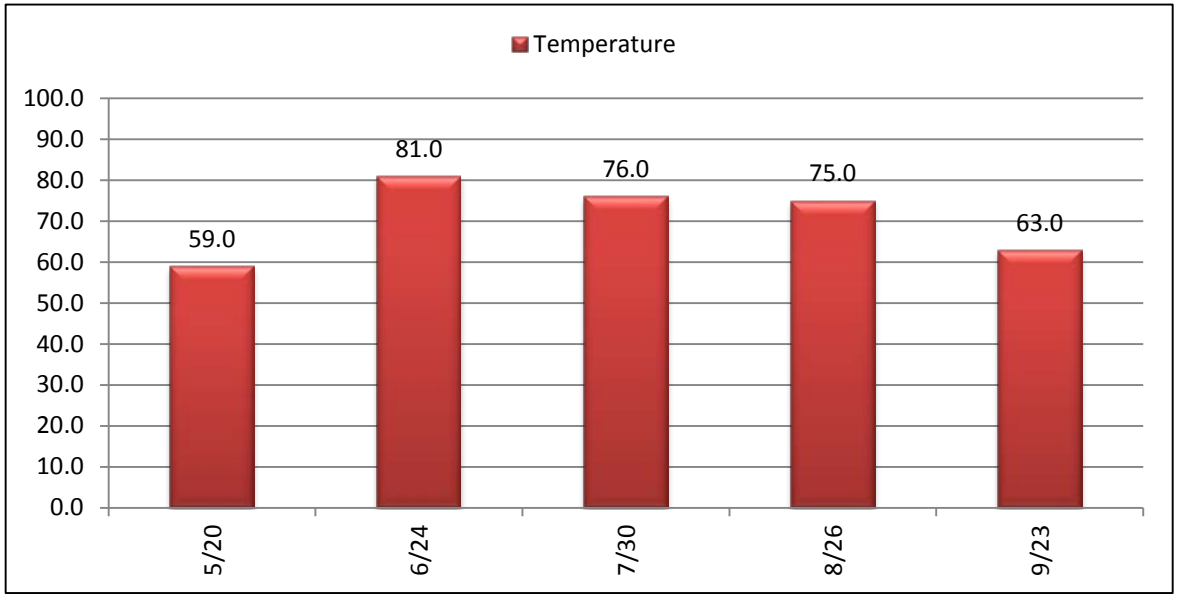
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	55.0	62.4	43.6	**46.0**
Grade	-----	-----	C	C	C	**C**
Average (June-Sept) µg/L	No Data	No Data	52.0	56.8	40.0	**42.5**
Meets Standard (60.0 µg/L)	-----	-----	Yes	Yes	Yes	**Yes**

Ammonia Nitrogen | Expected Range: None | Shallow Lake Standard: None | Spider Lake-East



Average mg/L	
2009	No Data
2010	No Data
2011	0.04
2012	0.07
2013	0.02
2014	0.03

Surface Water Temperature |Expected Range: None |Shallow Lake Standard: None | Spider Lake-East



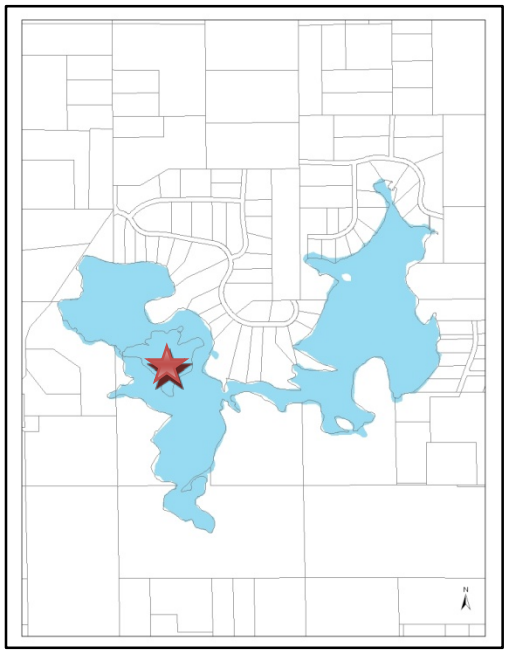
Year	Average ° F
2009	No Data
2010	No Data
2011	63.2
2012	72.6
2013	72.6
2014	70.8

General Observations | Spider Lake-East

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	2	2	Bamboo	Fish kill winter 2013-2014; minimal aquatic vegetation present
June	2	2	Rice Paper	Higher water levels; minimal aquatic vegetation
July	2.5	2.5	Rice Paper	Weed density increasing in shallows
August	2	2	Eiderdown	Reduced aquatic plant and algae growth compared to previous years
September	2	2	Bamboo	

Spider Lake-West

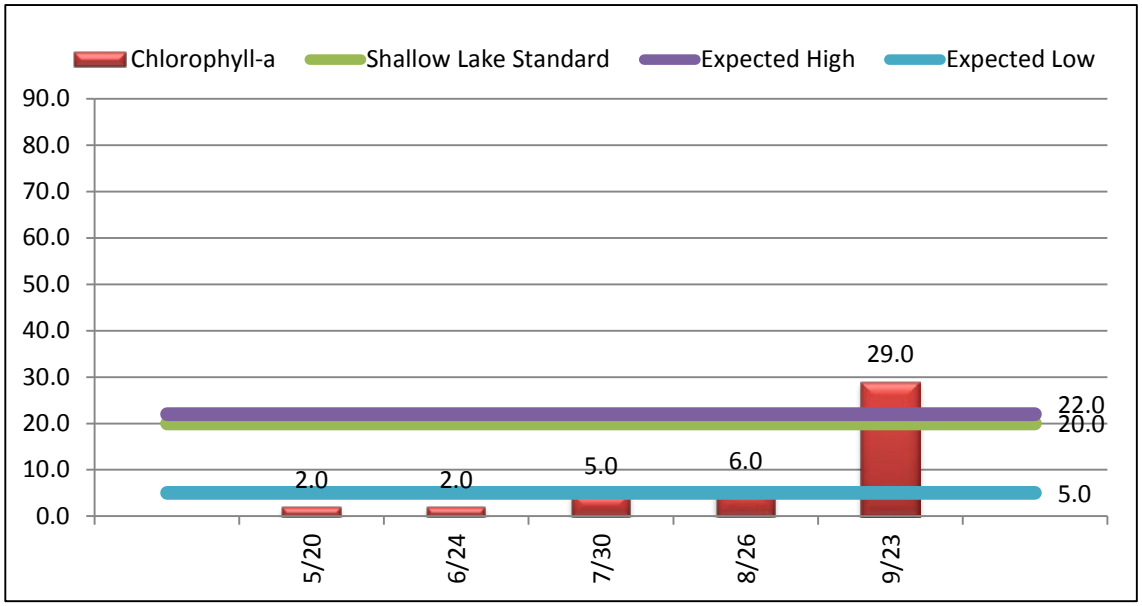
Lake 13-0019-00 Site 201



2014 Report Card: Shallow Lake	
Lake Classification	Eutrophic
Overall Lake Quality Grade	C+
MPCA Standards	Yes Not Impaired
2014 Ranking	7 of 21

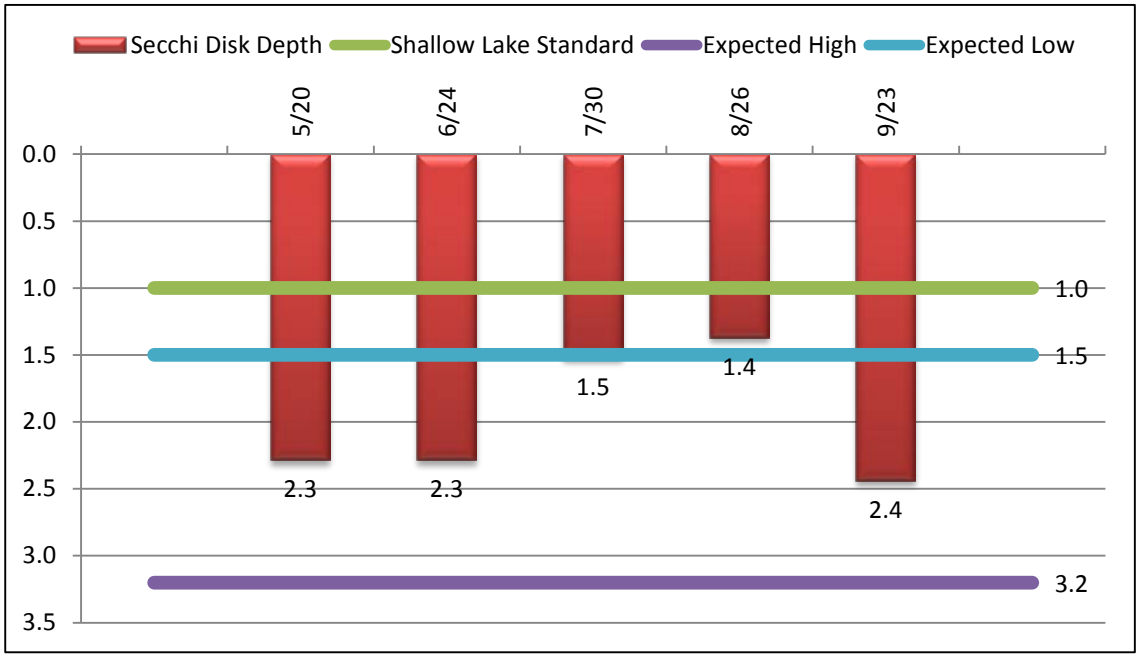
	Chlorophyll-a	Secchi Disk Depth	Total Phosphorus	Overall
Trophic State Index	51.9	50.2	59.1	53.7
Classification	Eutrophic	Eutrophic	Eutrophic	Eutrophic
2014 Average (May-Sept)	8.8 µg/L	2.0 meters	45.2 µg/L	-----
Grade	A	C	C	C+
MPCA Standard (Shallow)	20.0 µg/L	<1.0 meter	60.0 µg/L	-----
2014 Average (June-Sept)	10.5 µg/L	1.9 meters	49.0 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 | Spider Lake-West



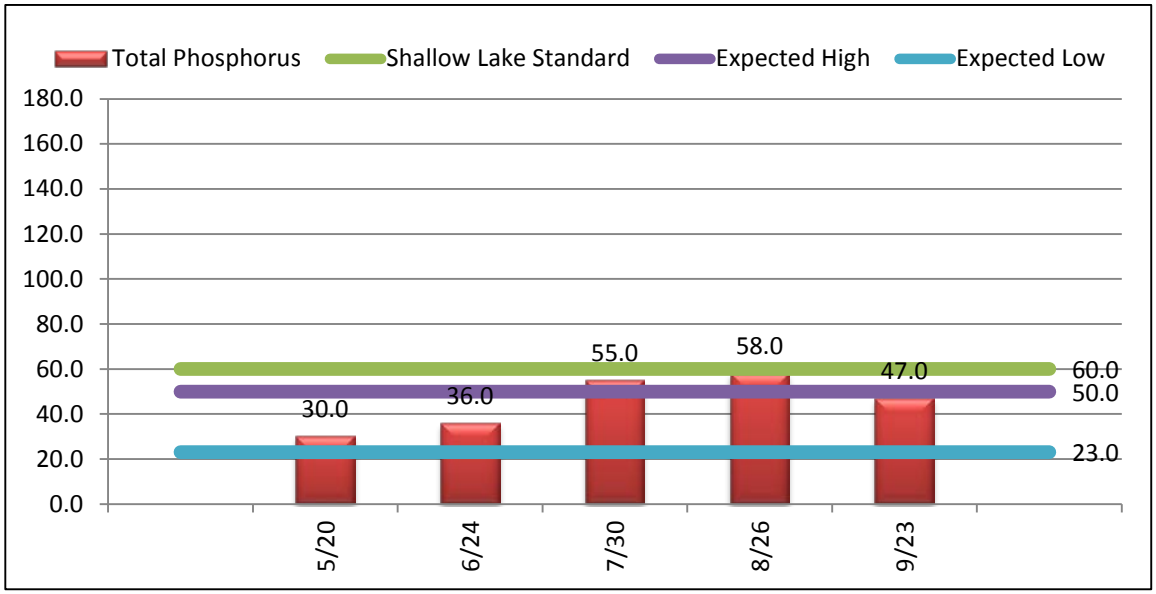
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	3.8	3.4	**8.8**
Grade	-----	-----	-----	A	A	**A**
Average (June-Sept) µg/L	No Data	No Data	No Data	4.5	3.8	**10.5**
Meets Standard (20.0 µg/L)	-----	-----	-----	Yes	Yes	**Yes**

Secchi Disk Depth | Expected Range: 1.5-3.2 meters | Shallow Lake Standard: >1.0 meter | Spider Lake-West



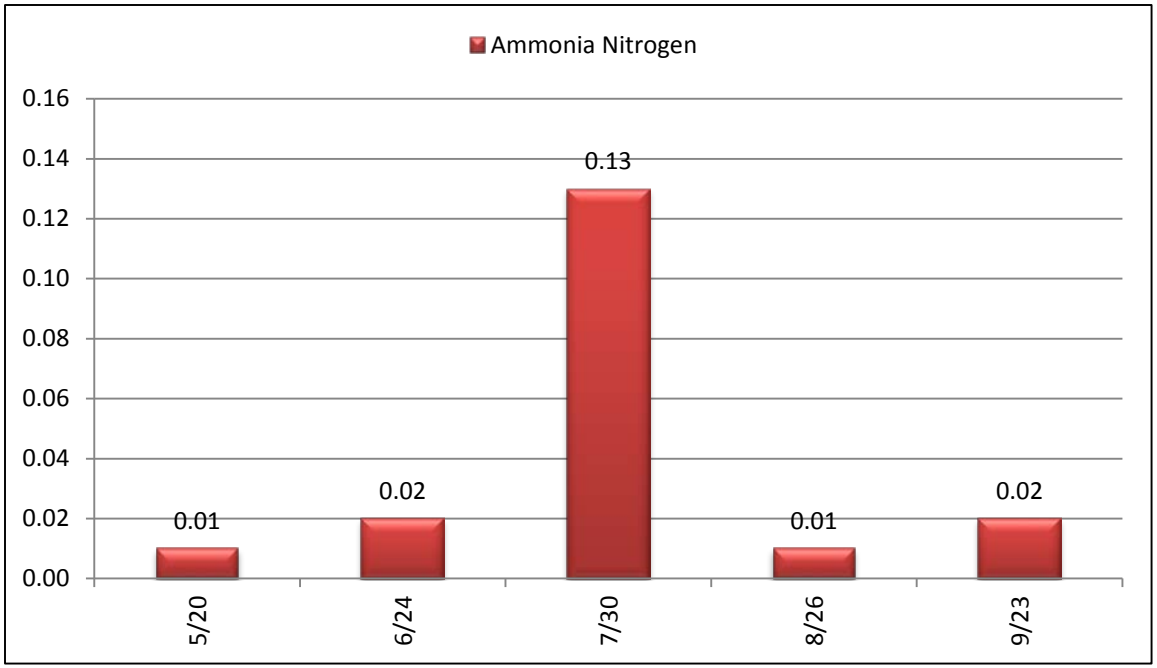
	2009	2010	2011	2012	2013	2014
Average (May-Sept) meters	No Data	No Data	No Data	1.9	1.9	**2.0**
Grade	-----	-----	-----	C	C	**C**
Average (June-Sept) meters	No Data	No Data	No Data	1.9	1.9	**1.9**
Meets Standard (>1.0 meter)	-----	-----	-----	Yes	Yes	**Yes**

Total Phosphorus | Expected Range: 23.0-50.0 µg/L | Shallow Lake Standard: 60.0 µg/L | Spider Lake-West



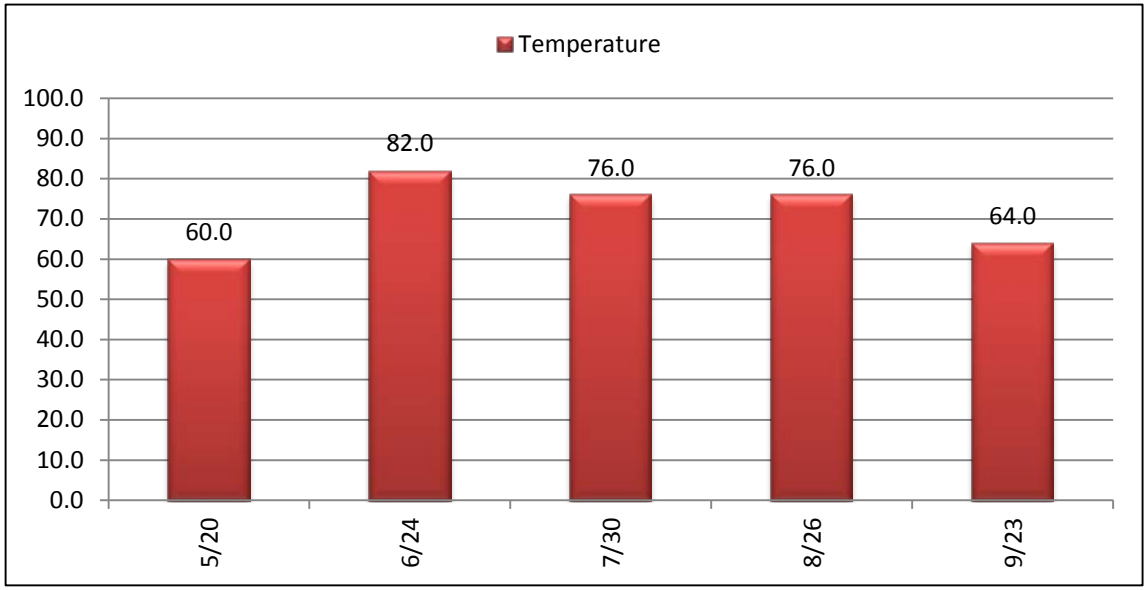
	2009	2010	2011	2012	2013	2014
Average (May-Sept) µg/L	No Data	No Data	No Data	35.2	31.8	**45.2**
Grade	-----	-----	-----	C	B	**C**
Average (June-Sept) µg/L	No Data	No Data	No Data	35.5	32.3	**49.0**
Meets Standard (60.0 µg/L)	-----	-----	-----	Yes	Yes	**Yes**

Ammonia Nitrogen | Expected Range: None | Shallow Lake Standard: None | Spider Lake-West



Average mg/L	
2009	No Data
2010	No Data
2011	No Data
2012	0.08
2013	0.03
2014	0.04

Surface Water Temperature |Expected Range: None |Shallow Lake Standard: None | Spider Lake-West



Year	Average ° F
2009	No Data
2010	No Data
2011	No Data
2012	72.6
2013	73.6
2014	71.6

General Observations | Spider Lake-West

Month	Physical Condition	Recreational Suitability	Color of Filtered Water	General Lake Observations/ Aquatic Invasive Species
May	2	2	Rice Paper	Fish kill winter 2013-2014; minimal aquatic vegetation present
June	2	2	Rice paper	Higher water levels; minimal aquatic vegetation present
July	2.5	2.5	Dried Chamomile	
August	2	2	Parchment Paper	Beautiful
September	2	2	Malted	


Chisago
COUNTY