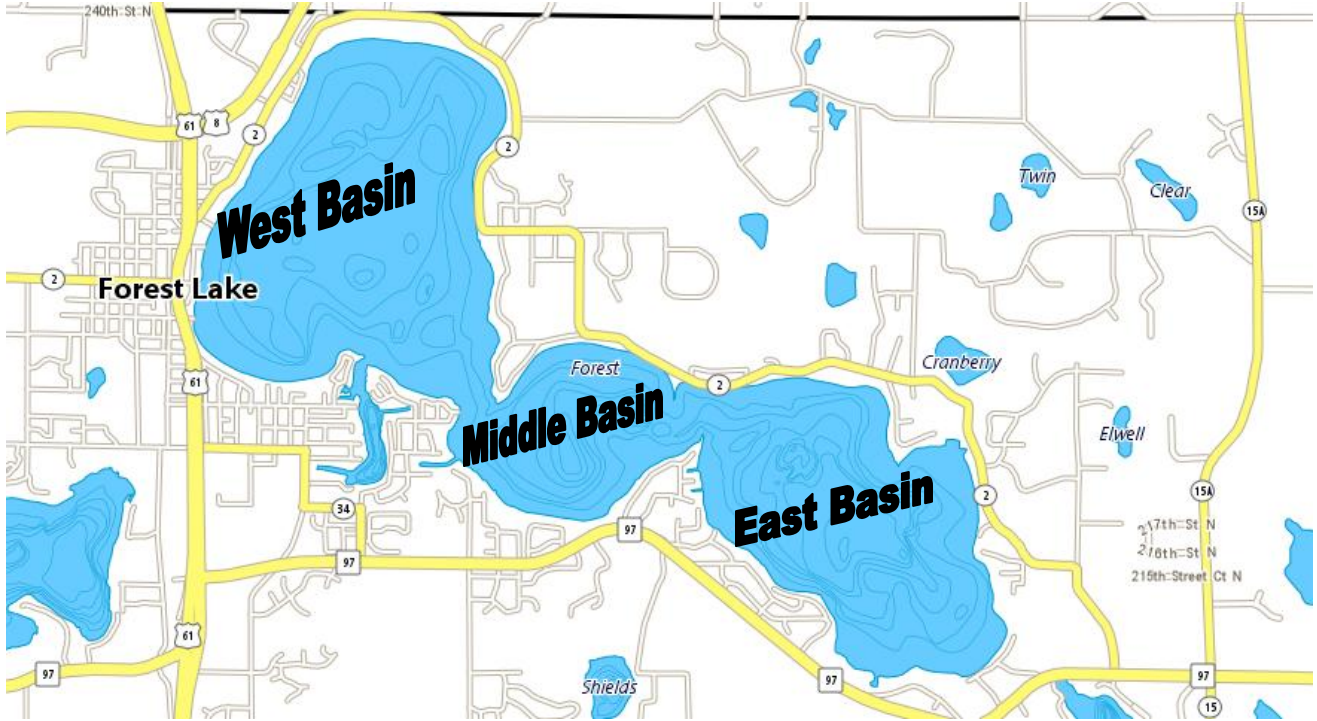


Forest Lake 2014 Water Quality Summaries

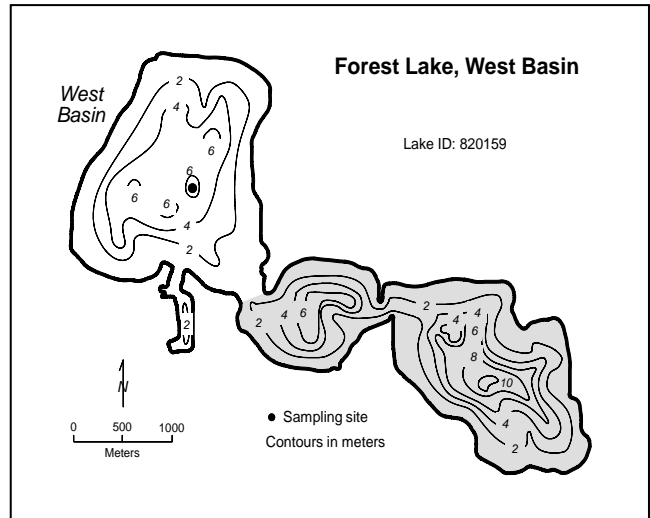


Water quality sampling for Forest Lake is conducted on each of the three basins shown above. The following pages include a summary for each of the three basins and one page on lake level statistics.

Forest Lake (West Basin)

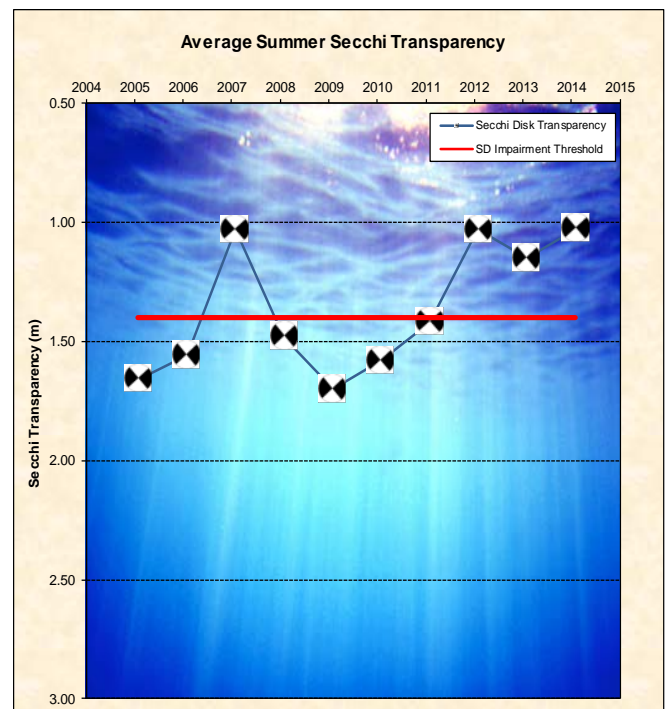
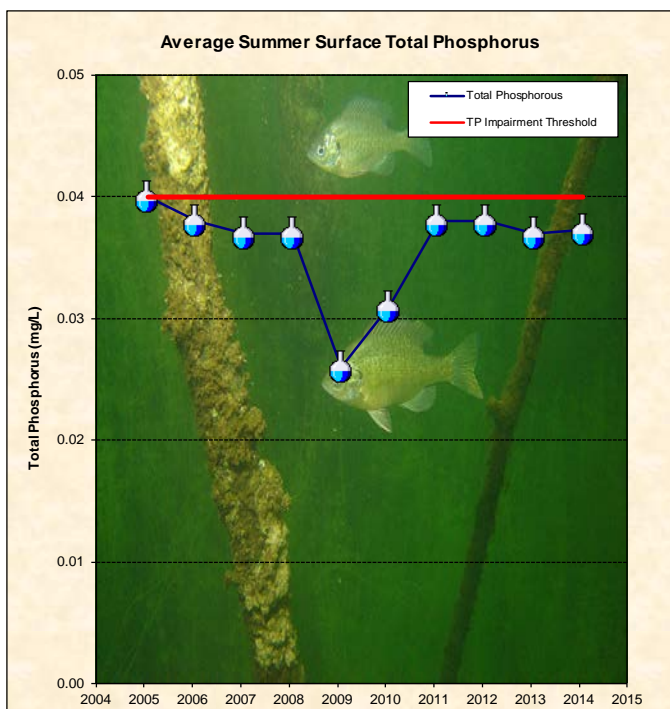
2014 Lake Grade: C

- DNR ID #: 82015900
- Municipality: City of Forest Lake
- Location: Section 9 T32N-R21W
- Lake Size: 1,086.08 acres
- Maximum Depth (2014): 21 ft.
- Ordinary High Water Mark: 901.8 ft.
- 67% Littoral
Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.

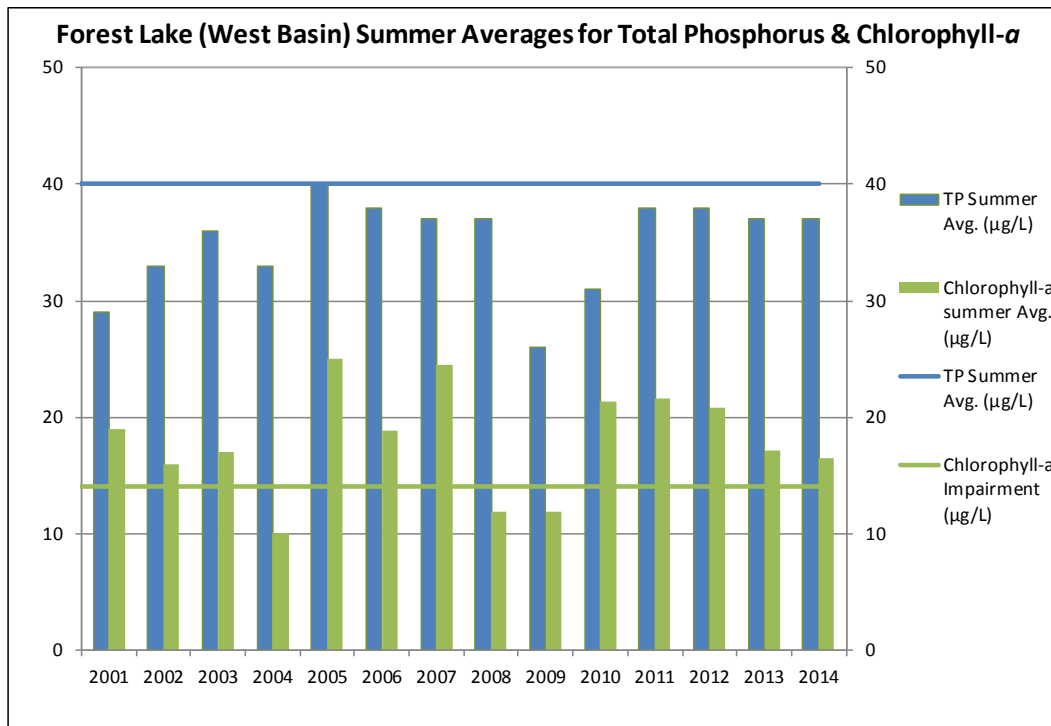


Summary Points

- Based on the chlorophyll-*a* results Forest Lake (West Basin) was considered eutrophic in 2014, according to the Carlson Trophic State Index.
- Using the Kendall Tau correlation test ($p < 0.01$) there is no trend for the average total phosphorus at this time and a statistically significant **declining** trend for the average Secchi transparency.
- The major land use is urban.
- The lake did not stratify in 2014.
- Flowering rush and Curly-leaf pondweed (invasive aquatic plants) are present in this lake.



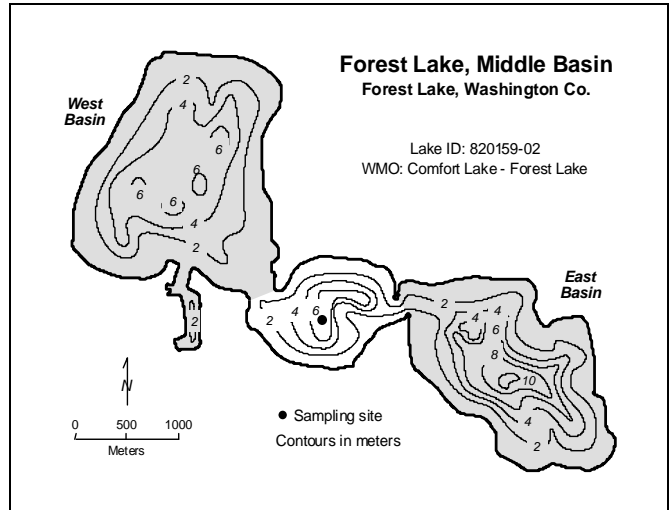
Date	Total Phosphorus (mg/L)	Chlorophyll-a (µg/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
5/15/14	0.026	11.0	1.10	1.83	12.1	10.32
5/28/14	0.013	2.1	0.82	2.29	21.0	9.29
6/13/14	0.034	6.7	0.88	1.52	20.4	9.05
6/23/14	0.030	6.4	0.77	1.22	25.2	10.16
7/8/14	0.024	14.0	0.84	0.91	23.1	8.54
7/23/14	0.049	16.0	0.98	0.76	25.2	8.97
8/7/14	0.025	12.0	0.75	1.07	25.2	9.54
8/20/14	0.039	19.0	1.00	1.22	24.0	9.14
9/4/14	0.054	36.0	1.00	0.76	21.6	8.73
9/17/14	0.040	22.0	1.10	0.76	16.7	9.43
10/1/14	0.035	17.0	1.10	0.91	16.4	8.43
10/13/14	0.019	10.0	0.91	1.37	11.0	9.68
2014 Average	0.032	14.4	0.94	1.22	20.2	9.27
2014 Summer Average	0.037	16.5	0.92	1.03	22.7	9.20
Volunteer Data						
4/28/14	0.016	6.4	0.74	1.80	2.4	NA
5/11/14	0.017	10.0	0.81	1.70	8.4	NA
5/19/14	0.011	6.8	0.64	1.80	13.3	NA
6/6/14	0.014	3.6	0.68	NA	NA	NA
6/20/14	0.034	17.0	0.86	1.00	21.8	NA
7/6/14	0.020	10.0	0.87	0.90	24.1	NA
7/17/14	0.025	7.2	0.73	NA	NA	NA
7/31/14	0.029	10.0	0.87	0.70	24.9	NA
8/17/14	0.031	22.0	0.94	0.90	25.0	NA
8/30/14	0.040	24.0	1.00	0.70	22.3	NA
9/13/14	0.045	21.0	1.10	0.70	17.4	NA
9/24/14	0.027	13.0	0.96	1.00	17.9	NA
10/11/14	0.022	6.2	0.85	1.30	11.1	NA
10/24/14	0.021	5.4	0.83	2.00	11.1	NA
2014 Average	0.025	11.6	0.85	1.21	16.6	NA
2014 Summer Average	0.029	14.2	0.89	0.84	21.9	NA
Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*						
Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*						
	High	High Date	Low	Low Date	Average	
2014 Elevation (ft)	902.23	5/2/2014	901.07	10/1/2014	901.56	
*MPCA description of Impaired Lake's Listing criteria: "At a minimum, a decision that a given lake is impaired for the 303(d) list due to excessive nutrients will be supported by data for both causal and response factors. Data requirements for 303(d) listing consist of 12 or more TP measurements collected from June through September over the most recent 10-year period. Ideally this should represent 12 separate visits to the lake over the course of two summers; however it might also reflect four monthly samples over the course of three years (a typical sampling regimen for many lake monitoring programs). In addition to exceeding the TP guideline thresholds, lakes to be considered for 303(d) listing should have at least 12 Secchi measurements and 12 chlorophyll-a measurements. This amount of data will allow for at least one season (preferably more) for paired TP, chlorophyll-a, and Secchi disk data and provide a basis for evaluating their interrelationships and hence the trophic status of the lake."						



Lake Water Quality Summary										
	Lake Grades									
	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005
Total Phosphorus (mg/L)	C	C	C	C	B-	B	C	C	C	C
Chlorophyll-a (µg/L)	B	B	C	C	C+	B+	B	C	B	C+
Secchi depth (ft)	D	D	D	B	C	C	C	C	C	C
Overall	C	C	C-	C	C+	B	C+	C	C+	C

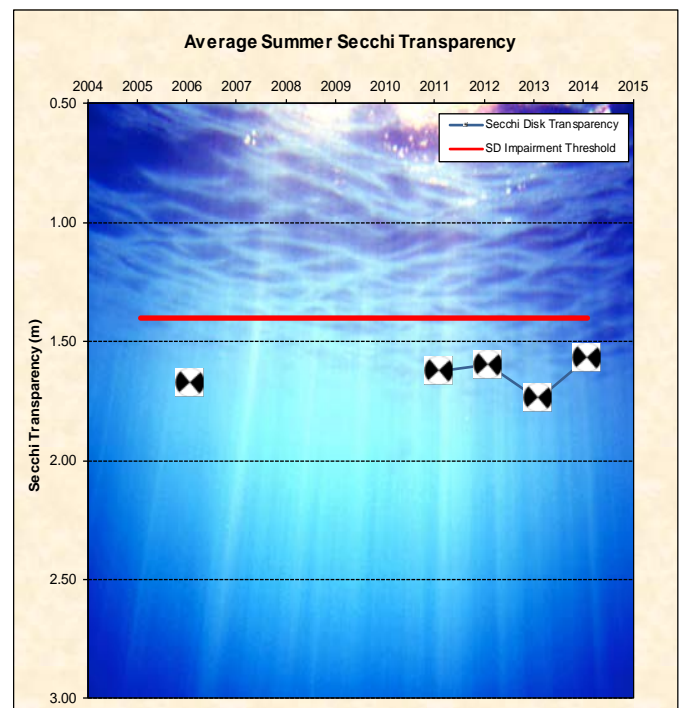
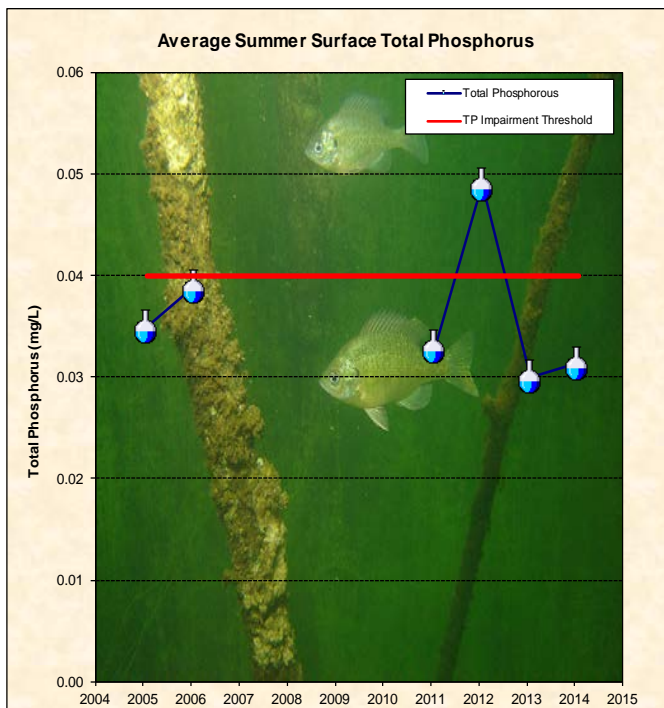
Forest Lake (Middle Basin) 2014 Lake Grade: B-

- DNR ID #: 82015900
- Municipality: City of Forest Lake
- Location: Section 9 T32N-R21W
- Lake Size: 363.80 acres
- Maximum Depth (2014): 33 ft.
- Ordinary High Water Mark: 901.8 ft.
- 67% Littoral
Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



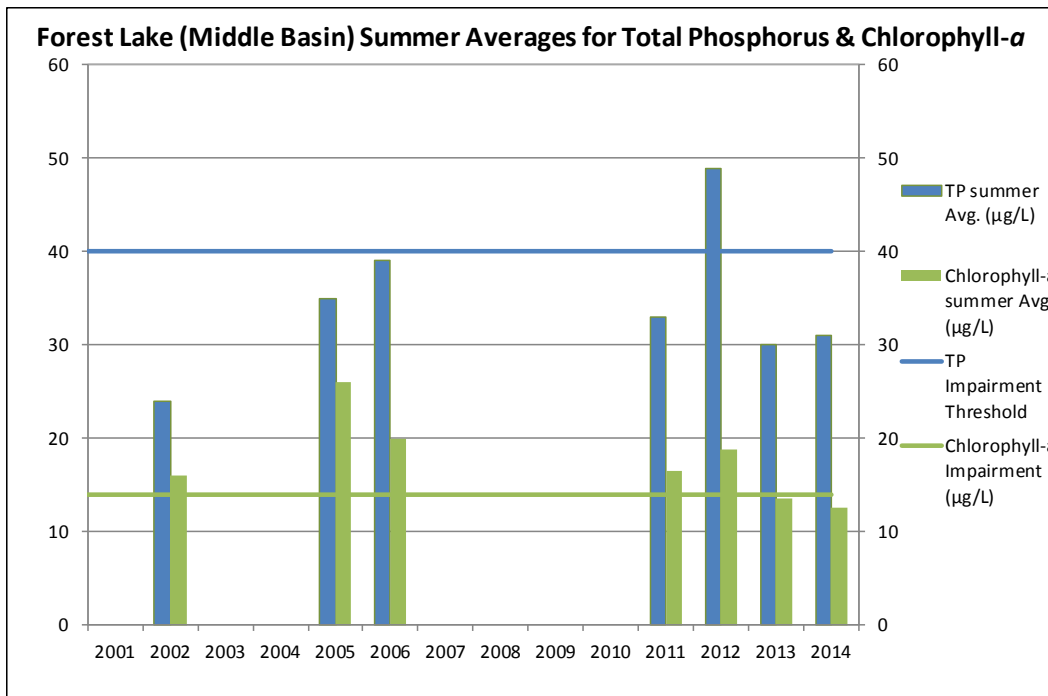
Summary Points

- Based on the chlorophyll-*a* results Forest Lake (Middle Basin) was considered eutrophic in 2014, according to the Carlson Trophic State Index.
- Using the Kendall Tau correlation test ($p < 0.01$) there is no trend for the average total phosphorus and for the average Secchi transparency at this time.
- The major land use is urban and rural/agricultural.
- The lake stratified in 2014 with the thermocline varying between 6 and 7 meters.
- Flowering rush and Curly-leaf pondweed (invasive aquatic plants) are present in this lake.



Date	Total Phosphorus (mg/L)	Chlorophyll-a (µg/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
5/15/14	0.024	11.0	0.83	2.13	12.0	10.28
5/28/14	0.018	4.0	0.91	2.29	21.1	9.30
6/13/14	0.038	5.2	1.00	2.44	20.0	8.76
6/23/14	0.020	8.0	0.88	1.98	24.6	10.72
7/8/14	0.045	11.0	0.97	1.52	23.0	8.13
7/23/14	0.033	12.0	0.83	1.52	25.5	8.77
8/7/14	0.020	10.0	0.92	1.22	25.3	9.86
8/20/14	0.024	10.0	1.00	1.58	24.0	8.30
9/4/14	0.032	18.0	0.88	1.22	21.7	8.49
9/17/14	0.039	27.0	1.10	1.07	16.9	9.27
10/1/14	0.032	19.0	0.96	1.22	16.6	8.72
10/13/14	0.033	12.0	1.00	1.83	11.3	9.93
2014 Average	0.030	12.3	0.94	1.67	20.2	9.21
2014 Summer Average	0.031	12.7	0.95	1.57	22.6	9.04
Volunteer Data						
5/10/14	0.022	6.9	0.68	2.00	13.4	NA
5/23/14	0.013	2.6	0.63	2.00	19.3	NA
6/8/14	0.022	2.7	0.75	3.00	21.8	NA
6/20/14	0.015	16.0	0.38	2.00	23.7	NA
7/3/14	0.017	7.2	0.80	1.70	23.6	NA
7/17/14	0.019	8.4	0.84	1.80	23.6	NA
7/29/14	0.024	8.9	0.82	1.60	24.2	NA
8/17/14	0.018	11.0	0.87	1.70	24.0	NA
8/30/14	0.022	15.0	0.80	1.80	23.1	NA
9/14/14	0.037	19.0	0.90	1.40	17.3	NA
9/27/14	0.043	22.0	0.83	1.50	20.0	NA
10/12/14	0.024	13.0	0.86	2.00	10.9	NA
10/20/14	0.022	10.0	0.79	2.10	10.2	NA
2014 Average	0.023	11.0	0.77	1.89	19.6	NA
2014 Summer Average	0.024	12.2	0.78	1.83	22.4	NA
Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*						
Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*						
	High	High Date	Low	Low Date	Average	
2014 Elevation (ft)	902.23	5/2/2014	901.07	10/1/2014	901.56	

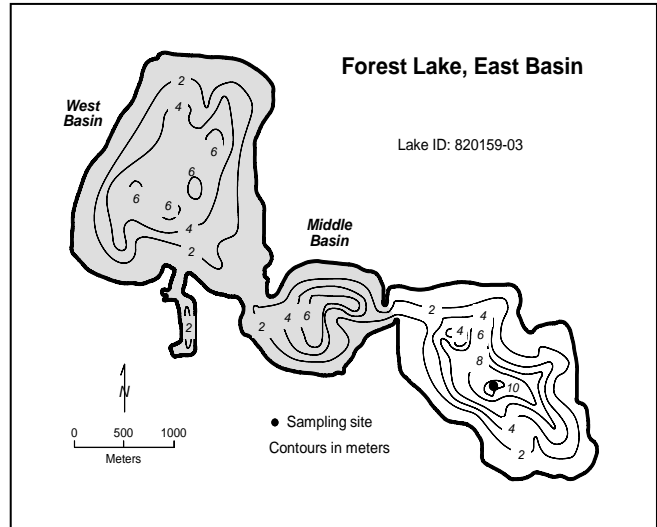
*MPCA description of Impaired Lake's Listing criteria: "At a minimum, a decision that a given lake is impaired for the 303(d) list due to excessive nutrients will be supported by data for both causal and response factors. Data requirements for 303(d) listing consist of 12 or more TP measurements collected from June through September over the most recent 10-year period. Ideally this should represent 12 separate visits to the lake over the course of two summers; however it might also reflect four monthly samples over the course of three years (a typical sampling regimen for many lake monitoring programs). In addition to exceeding the TP guideline thresholds, lakes to be considered for 303(d) listing should have at least 12 Secchi measurements and 12 chlorophyll-a measurements. This amount of data will allow for at least one season (preferably more) for paired TP, chlorophyll-a, and Secchi disk data and provide a basis for evaluating their interrelationships and hence the trophic status of the lake."



Lake Water Quality Summary										
	Lake Grades									
	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005
Total Phosphorus (mg/L)	B	B	C	C	NA	NA	NA	NA	C	C
Chlorophyll-a (µg/L)	B	B	B	B	NA	NA	NA	NA	B	C
Secchi depth (ft)	C	C	C	C	NA	NA	NA	NA	C	NA
Overall	B-	B-	C+	C+	NA	NA	NA	NA	C+	NA

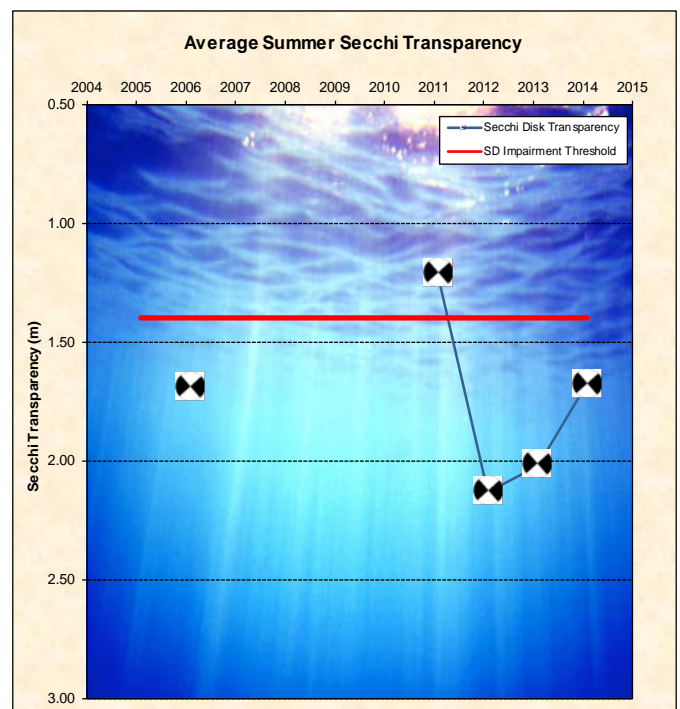
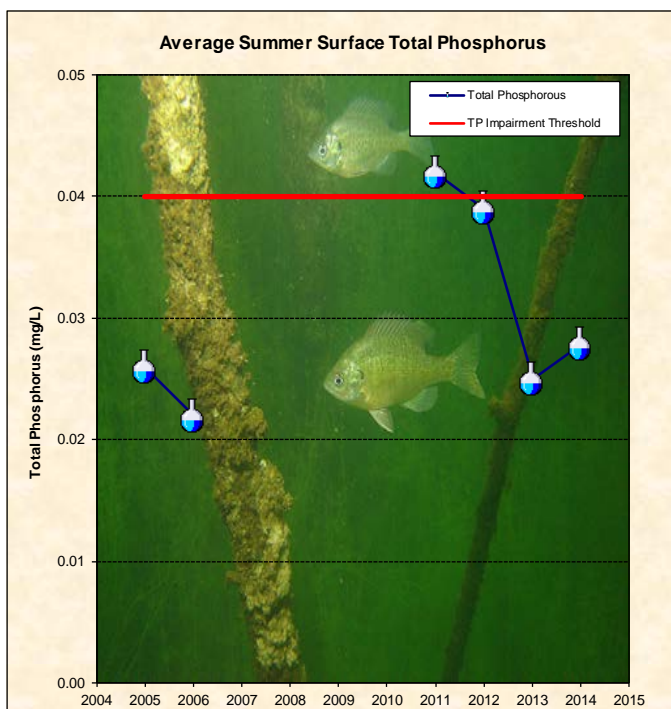
Forest Lake (East Basin) 2014 Lake Grade: B-

- DNR ID #: 82015900
- Municipality: City of Forest Lake
- Location: Section 9 T32N-R21W
- Lake Size: 789.58 acres
- Maximum Depth (2014): 33 ft.
- Ordinary High Water Mark: 901.8 ft.
- 67% Littoral
Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



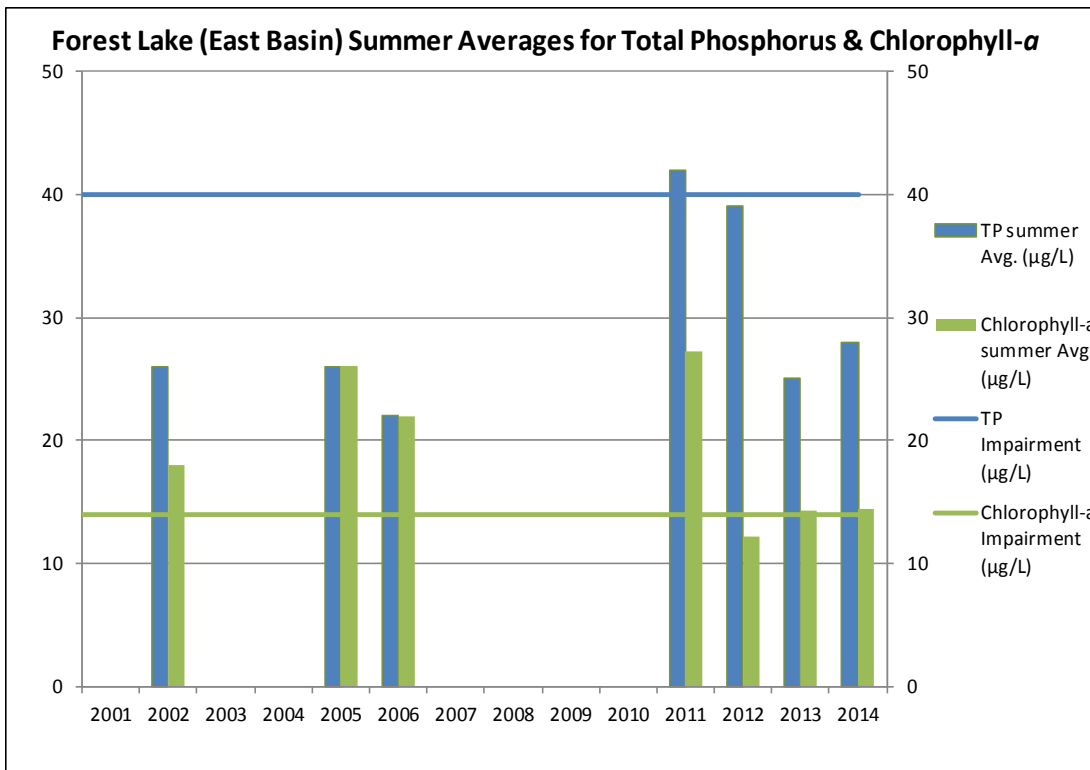
Summary Points

- Based on the chlorophyll-*a* results Forest Lake (East Basin) was considered eutrophic in 2014, according to the Carlson Trophic State Index.
- Using the Kendall Tau correlation test ($p < 0.01$) there is no trend for the average total phosphorus and for the average Secchi transparency at this time.
- The major land use is semi-urban and rural/agricultural.
- The lake stratified in 2014 with the thermocline varying between 6 and 8 meters.
- Flowering rush and Curly-leaf pondweed (invasive aquatic plants) are present in this lake.



Date	Total Phosphorus (mg/L)	Chlorophyll-a (µg/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
5/15/14	0.029	9.1	0.95	2.44	11.9	10.15
5/28/14	0.016	3.0	0.79	2.44	20.0	9.97
6/12/14	0.020	4.3	0.72	2.13	21.4	8.92
6/23/14	0.028	12.0	0.93	1.98	24.3	11.04
7/8/14	0.022	7.5	0.74	1.98	22.9	7.88
7/23/14	0.036	7.6	0.75	1.98	24.9	8.59
8/7/14	0.023	16.0	0.98	1.22	25.6	9.81
8/20/14	0.027	12.0	1.00	1.52	24.0	7.96
9/4/14	0.029	28.0	0.91	1.37	21.7	8.68
9/17/14	0.038	28.0	1.50	1.22	17.0	8.68
10/1/14	0.027	15.0	0.96	1.83	16.7	8.64
10/13/14	0.023	11.0	0.90	2.74	11.5	9.54
2014 Average	0.027	12.8	0.93	1.91	20.2	9.16
2014 Summer Average	0.028	14.4	0.94	1.68	22.7	8.95
Volunteer Data						
5/11/14	0.024	14.0	0.70	1.60	13.3	NA
5/24/14	0.022	2.8	0.61	2.00	17.6	NA
6/8/14	0.022	1.4	0.59	2.00	22.4	NA
6/20/14	0.023	6.0	0.72	1.00	24.6	NA
7/3/14	0.018	5.1	0.72	1.60	23.2	NA
7/18/14	0.016	4.2	0.68	1.70	22.6	NA
8/2/14	0.020	9.6	0.58	1.30	25.1	NA
8/19/14	0.019	10.0	0.59	1.40	24.5	NA
8/30/14	0.022	9.3	0.82	1.40	23.1	NA
9/16/14	0.024	2.0	0.99	1.40	17.6	NA
9/25/14	0.030	16.0	0.90	1.60	20.3	NA
10/11/14	0.023	6.1	0.69	3.00	12.2	NA
2014 Average	0.022	7.2	0.72	1.67	20.5	NA
2014 Summer Average	0.022	7.1	0.73	1.49	22.6	NA
Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*						
Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth*						
	High	High Date	Low	Low Date	Average	
2014 Elevation (ft)	902.23	5/2/2014	901.07	10/1/2014	901.56	

*MPCA description of Impaired Lake's Listing criteria: "At a minimum, a decision that a given lake is impaired for the 303(d) list due to excessive nutrients will be supported by data for both causal and response factors. Data requirements for 303(d) listing consist of 12 or more TP measurements collected from June through September over the most recent 10-year period. Ideally this should represent 12 separate visits to the lake over the course of two summers; however it might also reflect four monthly samples over the course of three years (a typical sampling regimen for many lake monitoring programs). In addition to exceeding the TP guideline thresholds, lakes to be considered for 303(d) listing should have at least 12 Secchi measurements and 12 chlorophyll-a measurements. This amount of data will allow for at least one season (preferably more) for paired TP, chlorophyll-a, and Secchi disk data and provide a basis for evaluating their interrelationships and hence the trophic status of the lake."



Lake Water Quality Summary										
	Lake Grades									
	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005
Total Phosphorus (mg/L)	B	B	C	C	NA	NA	NA	NA	A	B
Chlorophyll-a (µg/L)	B	B	B	C	NA	NA	NA	NA	C	C
Secchi depth (ft)	C	C	C	C	NA	NA	NA	NA	C	NA
Overall	B-	B-	C+	C	NA	NA	NA	NA	B-	NA

Forest Lake Water Surface Elevation Statistics

Outlet Elevation (dam): 901.4 ft.

Ordinary High Water Level (OHW) Elevation: 901.8 ft.

100 Year Flood Elevation (CLFLWD): 902.4 ft.

Highest Recorded Elevation: 902.23 ft. (06/24/1993 and 05/02/2014)

Lowest Recorded Elevation: 899.45 ft. (10/07/1969)

Datum: NGVD 29 (ft.)

