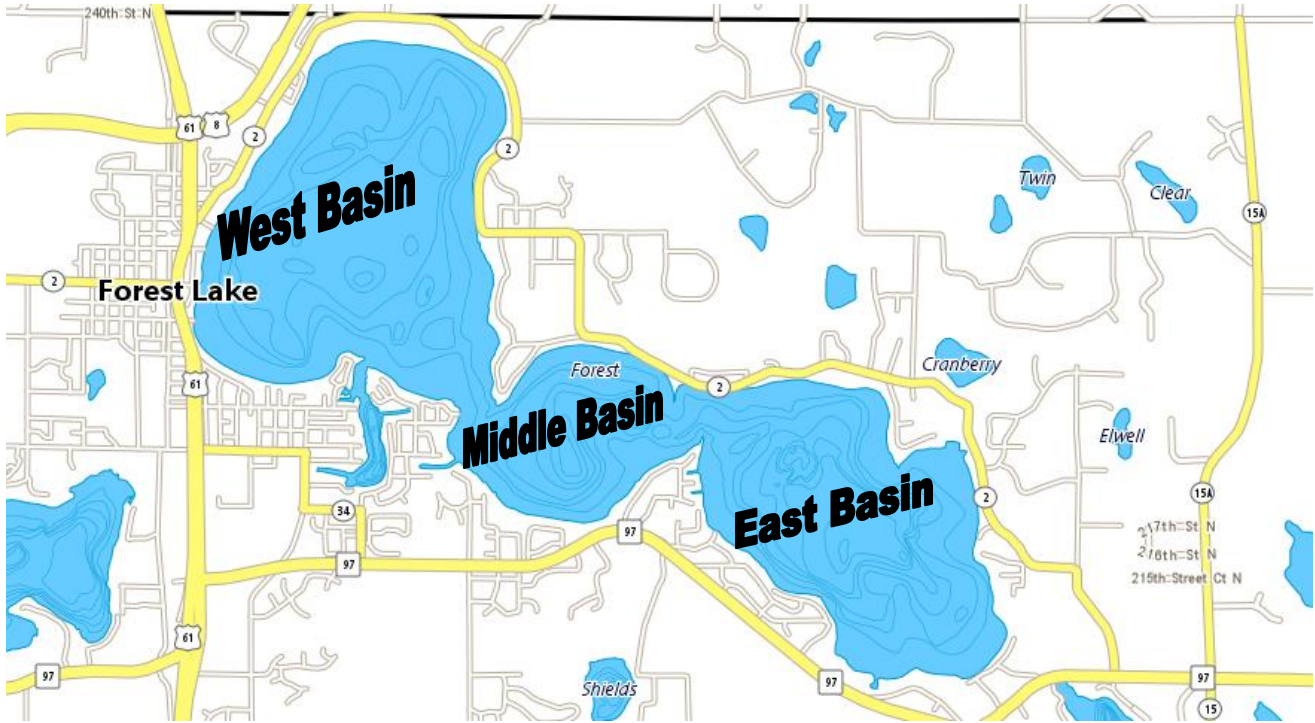


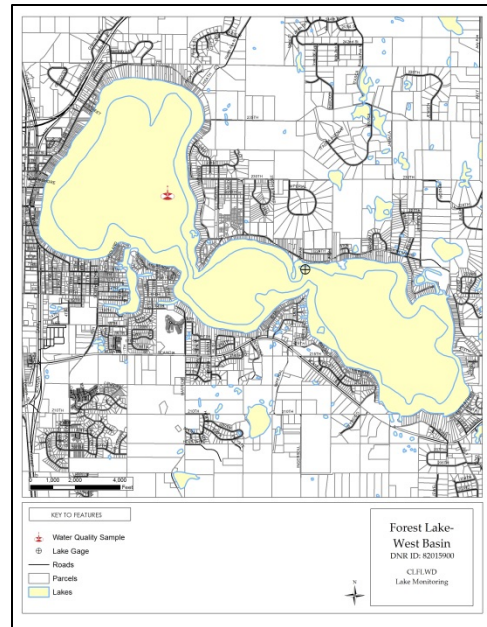
Forest Lake 2017 Water Quality Summaries



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.

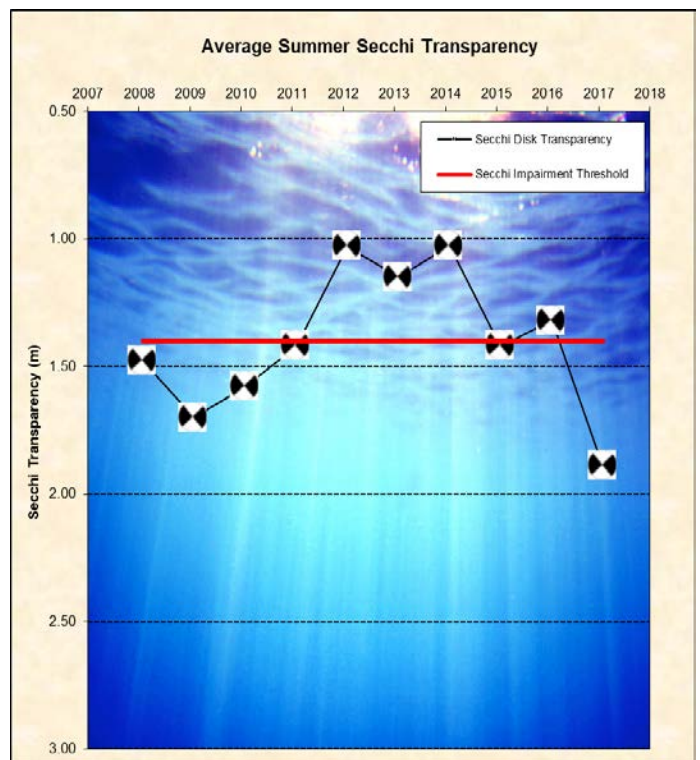
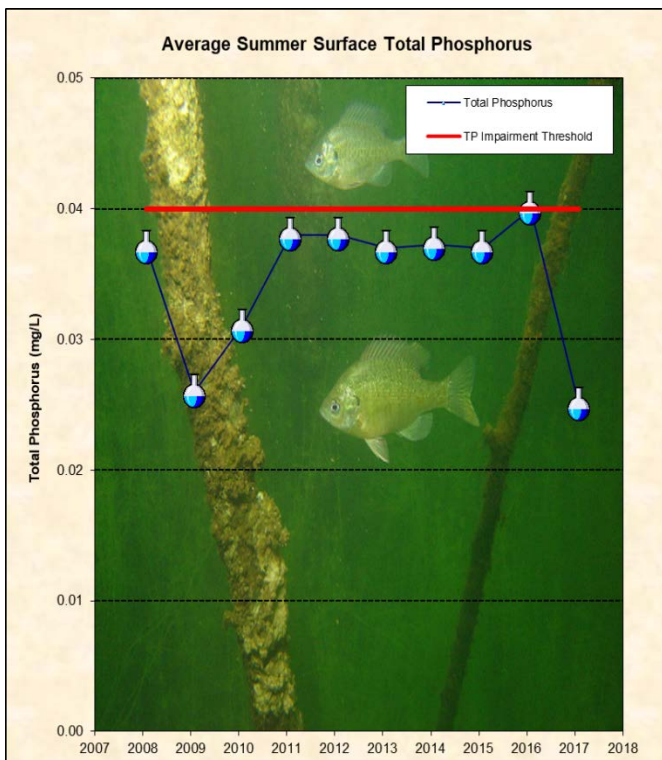
Forest Lake (West Basin) 2017 Lake Grade: B

- DNR ID #: 82015900
- Municipality: City of Forest Lake
- Location: Section 9 T32N-R21W
- Lake Size: 1,086.08 acres
- Maximum Depth (2017): 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.

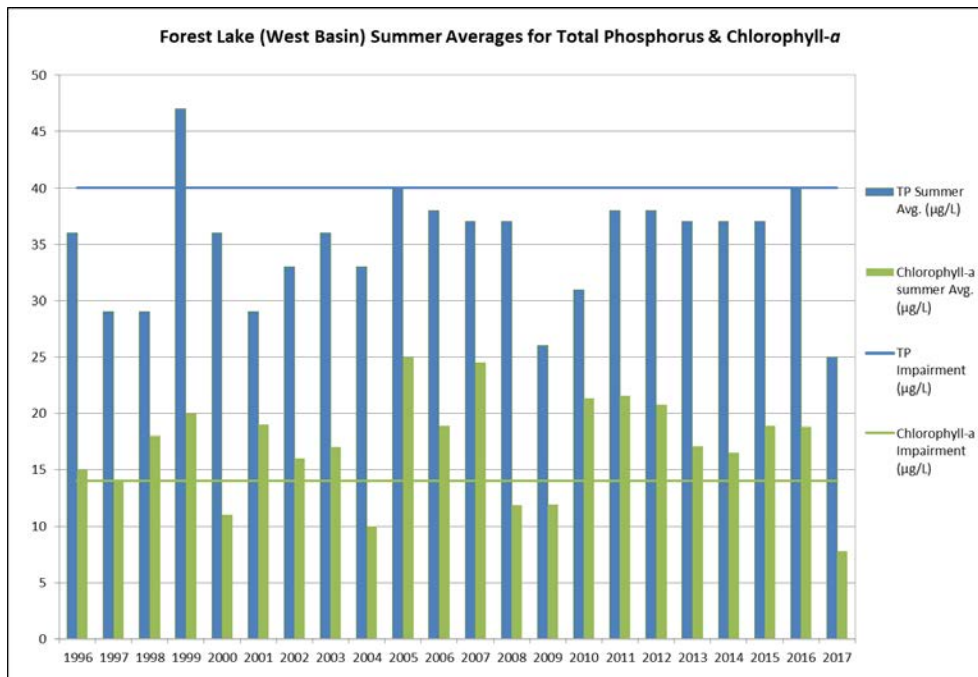


Summary Points

- Based on the chlorophyll-*a* results Forest Lake (West Basin) was considered mesotrophic in 2017, according to the Carlson Trophic State Index.
- Using the 2-tailed Kendall Tau correlation test ($p < 0.05$) there is no trend for the average total phosphorus, chlorophyll-*a*, or average Secchi transparency at this time.
- The major land use is urban.
- The lake did not stratify in 2017.
- Eurasian watermilfoil, Flowering rush, Curly-leaf pondweed (invasive aquatic plants), and Zebra mussels are present in this lake.



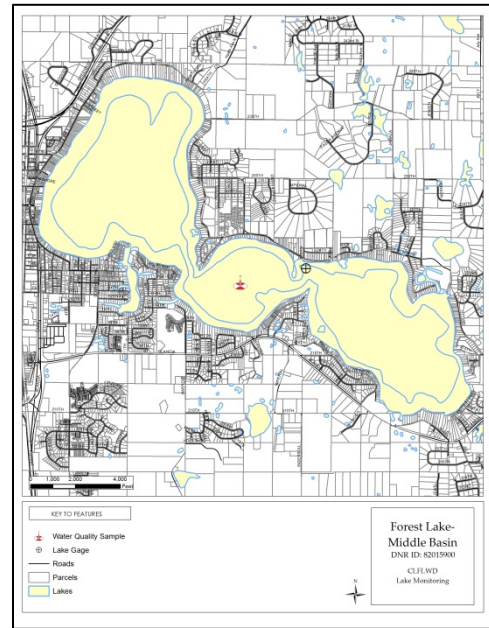
Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-a (µg/L)	Pheophytin-Corrected Chlorophyll-a (µg/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/17/2017 13:05	0.014	4.5	3.3	0.75	2.29	11.7	11.07
5/4/2017 11:11	0.020	4.9	4.5	0.88	1.98	10.2	11.37
5/15/2017 13:05	0.016	2.8	2.3	0.67	2.29	18.6	10.13
5/31/2017 12:10	0.023	4.7	3.9	0.86	2.29	16.2	8.29
6/13/2017 11:43	0.022	6.5	5.9	0.84	1.98	23.0	7.93
6/27/2017 13:18	0.027	8.7	7.9	0.94	1.98	20.5	8.54
7/13/2017 12:20	0.023	6.7	6.1	0.79	1.98	24.8	7.40
7/27/2017 12:28	0.028	6.4	6.2	0.95	1.68	25.8	8.20
8/8/2017 12:44	0.030	8.5	8.3	0.98	1.98	24.1	8.75
8/22/2017 12:49	0.026	10.0	9.3	0.82	1.98	22.2	8.06
9/7/2017 13:21	0.021	10.0	9.7	0.86	1.83	18.6	8.36
9/19/2017 13:03	0.025	10.0	9.3	0.84	1.68	19.3	8.05
10/5/2017 8:57	0.026	18.0	18.0	1.00	1.68	16.3	8.68
10/26/17 9:10	0.027	7.2	6.5	0.83	1.98	10.4	10.19
2017 Average	0.023	7.8	7.2	0.86	1.97	18.7	8.93
2017 Summer Average	0.025	8.4	7.8	0.88	1.89	22.3	8.16
Volunteer Data							
04/22/2017 13:00	0.022	4.1	3.5	0.81	2.15	12.2	NA
05/07/2017 13:20	0.018	2.3	2.3	0.70	1.85	14.2	NA
05/19/2017 13:45	0.018	4.8	4.4	0.72	1.85	16.3	NA
06/05/2017 12:40	0.020	3.0	3.2	0.71	2.65	21.5	NA
06/16/2017 13:30	0.022	7.0	6.3	0.78	1.55	24.0	NA
07/02/2017 13:30	0.021	4.9	5.5	0.69	1.90	24.8	NA
07/15/2017 14:51	0.021	6.4	5.6	0.70	1.55	25.5	NA
07/29/2017 09:00	0.023	6.5	6.1	0.72	1.85	26.2	NA
08/10/2017 14:00	0.031	11.0	12.0	0.78	1.45	22.9	NA
08/24/2017 13:00	0.024	11.0	10.0	0.80	1.60	21.8	NA
09/08/2017 13:00	0.026	12.0	10.0	0.75	1.45	18.7	NA
09/19/2017 12:15	0.024	11.0	9.5	0.73	1.45	19.4	NA
10/10/2017 16:00	0.033	16.0	15.0	0.89	1.60	14.6	NA
10/17/2017 15:30	0.022	9.2	8.5	0.71	1.95	12.8	NA
2017 Average	0.023	7.8	7.3	0.75	1.78	19.6	NA
2017 Summer Average	0.024	8.7	8.1	0.74	1.60	22.9	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		
2017 Elevation (ft)	901.88	5/31/2017	901.38	9/19/2017	901.58		
*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."							



Lake Water Quality Summary										
	Lake Grades									
	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
Total Phosphorus (mg/L)	B	C	C	C	C	C	C	B-	B	C
Chlorophyll-a (µg/L)	B	B	B	B	B	C	C	C+	B+	B
Secchi depth (ft)	B	C	C	D	D	D	B	C	C	C
Overall	B	C+	C+	C	C	C-	C	C+	B	C+

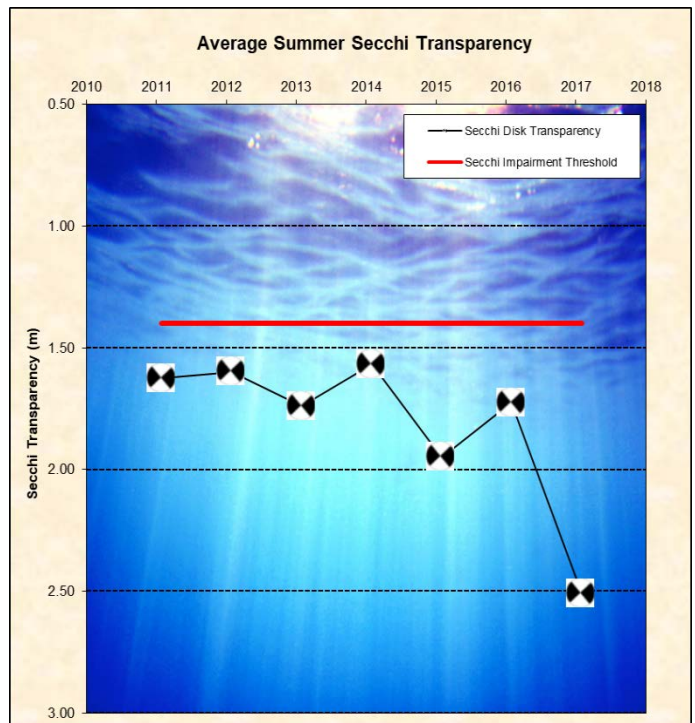
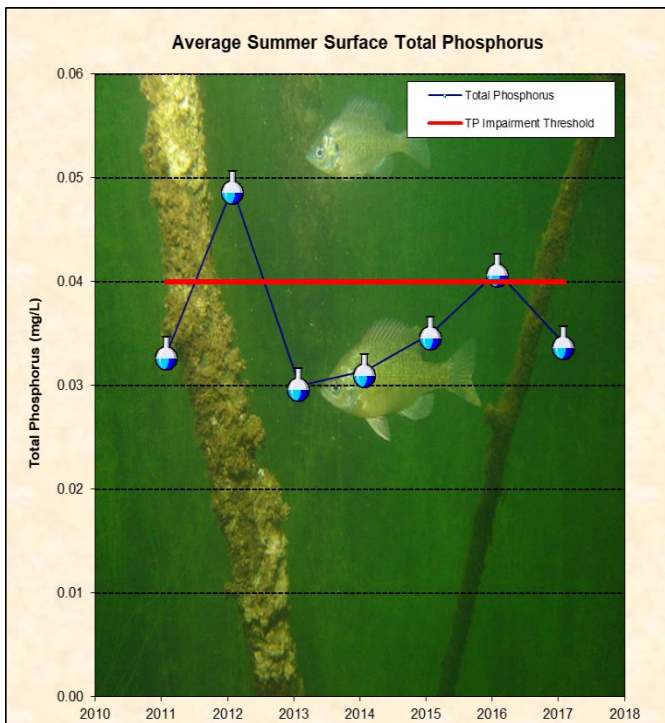
Forest Lake (Middle Basin) 2017 Lake Grade: B

- DNR ID #: 82015900
- Municipality: City of Forest Lake
- Location: Section 9 T32N-R21W
- Lake Size: 363.80 acres
- Maximum Depth (2017): 35 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.

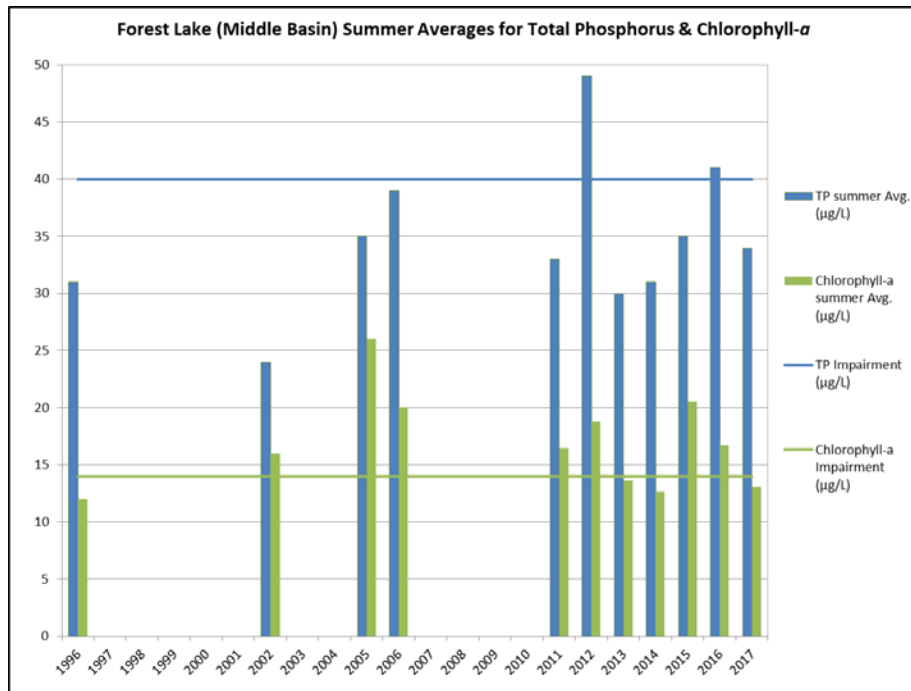


Summary Points

- Based on the chlorophyll-*a* results Forest Lake (Middle Basin) was considered eutrophic in 2017, according to the Carlson Trophic State Index.
- Using the 2-tailed Kendall Tau correlation test ($p < 0.05$) there is no trend for the average total phosphorus, chlorophyll-*a*, and Secchi transparency at this time.
- The major land use is urban and rural/agricultural.
- The lake stratified in 2017 with the thermocline varying between 5 and 6 meters.
- Eurasian watermilfoil, Flowering rush, Curly-leaf pondweed (invasive aquatic plants), and Zebra mussels are present in this lake.



Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-a (µg/L)	Pheophytin-Corrected Chlorophyll-a (µg/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/17/2017 13:41	0.019	3.4	2.8	0.66	3.20	12.1	10.00
5/4/2017 13:10	0.031	2.5	2.1	0.90	3.96	11.1	10.78
5/15/2017 12:19	0.019	3.4	3.0	0.65	3.35	18.3	10.10
5/31/2017 13:06	0.020	3.4	2.6	0.82	3.81	16.0	7.85
6/13/2017 13:09	0.027	4.3	3.8	0.76	3.96	23.2	7.67
6/27/2017 13:52	0.029	10.0	9.6	0.87	2.44	20.6	8.87
7/13/2017 12:09	0.031	9.8	8.9	0.76	2.90	24.8	7.73
7/27/2017 12:43	0.025	4.8	4.5	0.92	2.90	26.3	8.32
8/8/2017 12:57	0.051	11.0	11.0	1.00	2.29	23.8	8.62
8/22/2017 13:26	0.037	24.0	23.0	0.92	1.68	22.4	8.42
9/7/2017 13:34	0.035	22.0	21.0	0.90	1.83	19.1	7.37
9/19/2017 11:45	0.035	24.0	23.0	0.91	2.13	19.4	8.20
10/5/2017 9:13	0.037	6.9	5.6	0.71	2.90	16.6	7.19
10/26/17 9:54	0.023	7.0	5.8	0.68	2.90	11.0	9.91
2017 Average	0.030	9.8	9.1	0.82	2.87	18.9	8.65
2017 Summer Average	0.034	13.7	13.1	0.88	2.51	22.5	8.15
Volunteer Data							
05/07/2017 15:00	0.020	1.5	1.0	0.70	3.60	16.3	NA
05/21/2017 18:00	0.027	2.9	2.4	0.72	3.10	15.3	NA
06/03/2017 16:30	0.052	2.5	1.8	0.66	3.50	22.0	NA
06/18/2017 18:30	0.085	7.0	6.0	0.72	2.70	22.8	NA
07/02/2017 18:00	0.020	3.5	3.0	0.62	2.70	24.5	NA
07/14/2017 18:00	0.020	5.4	3.9	0.61	2.40	26.0	NA
07/30/2017 18:30	0.050	4.6	4.3	0.65	2.90	27.8	NA
08/12/2017 15:00	0.027	16.0	14.0	0.82	2.00	25.0	NA
08/28/2017 19:00	0.043	31.0	29.0	0.91	1.50	21.2	NA
09/10/2017 16:00	0.025	15.0	13.0	0.56	1.90	19.2	NA
09/24/2017 15:00	0.031	14.0	13.0	0.70	2.20	22.9	NA
10/08/2017 14:30	0.052	6.6	5.9	0.82	3.00	17.9	NA
10/22/2017 14:30	0.023	8.4	7.0	0.69	3.40	13.5	NA
2017 Average	0.037	9.1	8.0	0.71	2.68	21.1	NA
2017 Summer Average	0.039	11.0	9.8	0.69	2.42	23.5	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		
2017 Elevation (ft)	901.88	5/31/2017	901.38	9/19/2017	901.58		
*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."							

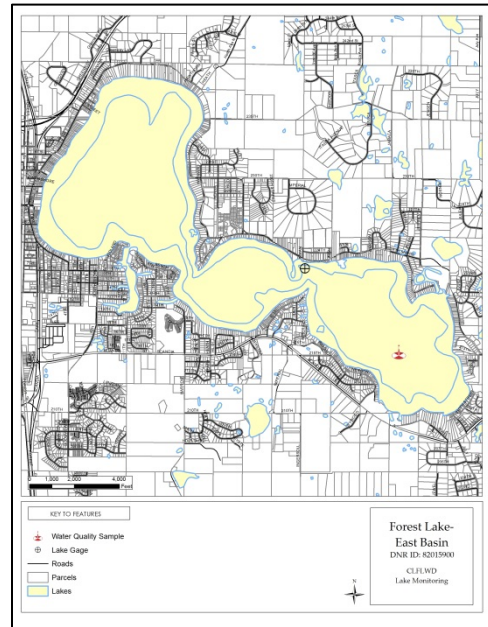


Lake Water Quality Summary										
	Lake Grades									
	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
Total Phosphorus (mg/L)	B	C	C	B	B	C	C	NA	NA	NA
Chlorophyll-a (µg/L)	B	B	C	B	B	B	B	NA	NA	NA
Secchi depth (ft)	B	C	C	C	C	C	C	NA	NA	NA
Overall	B	C+	C	B-	B-	C+	C+	NA	NA	NA

Forest Lake (East Basin)

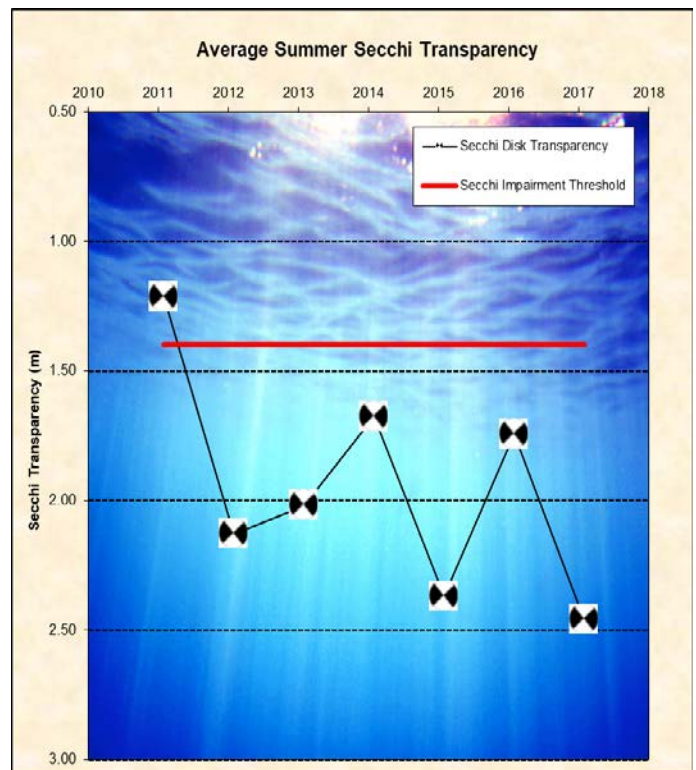
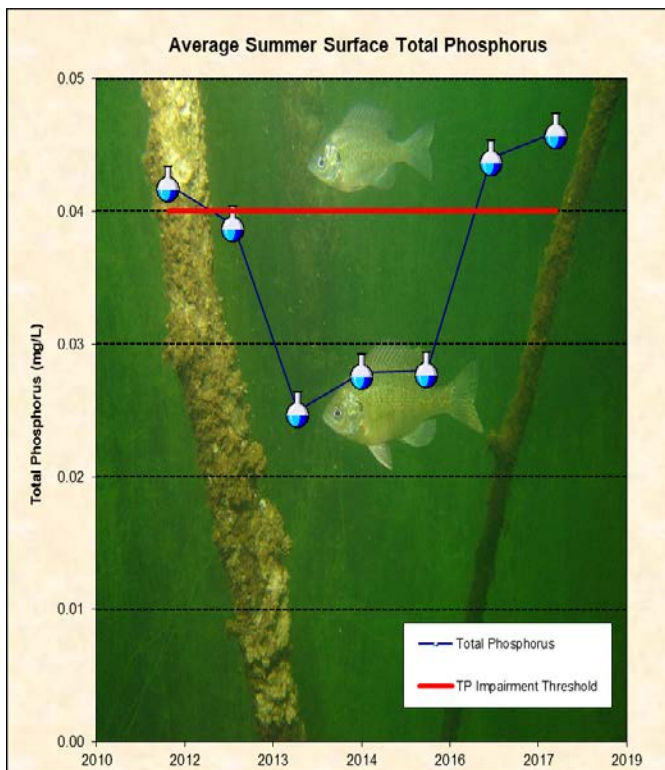
2017 Lake Grade: C+

- DNR ID #: 82015900
 - Municipality: City of Forest Lake
 - Location: Section 9 T32N-R21W
 - Lake Size: 789.58 acres
 - Maximum Depth (2017): 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.

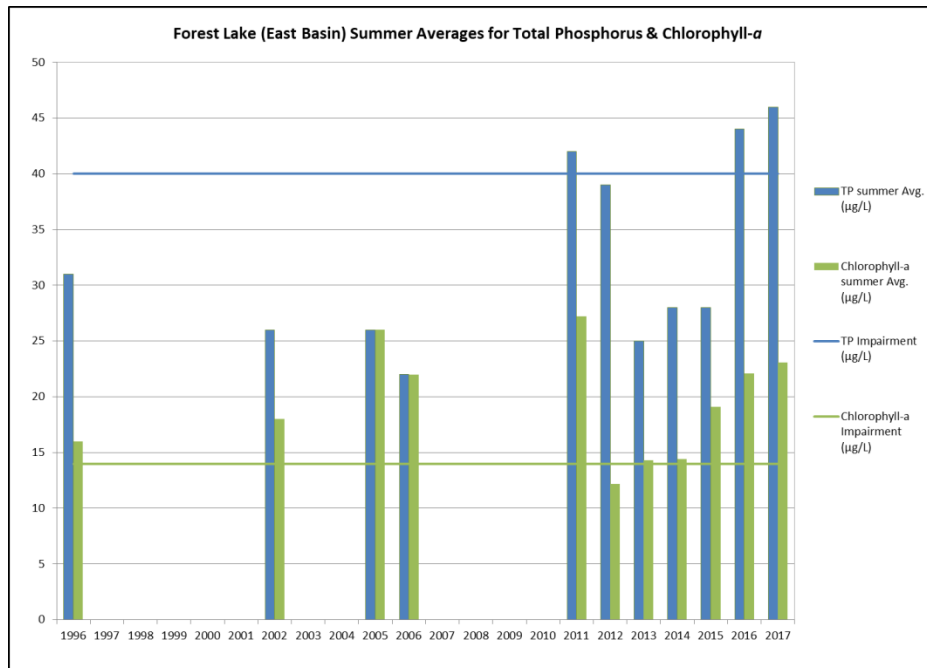


Summary Points

- Based on the chlorophyll-*a* results Forest Lake (East Basin) was considered eutrophic in 2017, according to the Carlson Trophic State Index.
- Using the 2-tailed Kendall Tau correlation test ($p < 0.05$) there is no trend for the average total phosphorus, chlorophyll-*a*, and Secchi transparency at this time.
- The major land use is semi-urban and rural/agricultural.
- The lake stratified in 2017 with the thermocline varying between 6 and 8 meters.
- Eurasian watermilfoil, Flowering rush, Curly-leaf pondweed (invasive aquatic plants), and Zebra mussels are present in this lake.
-



Date/Time	Total Phosphorus (mg/L)	Uncorrected Trichromatic Chlorophyll-a (µg/L)	Pheophytin-Corrected Chlorophyll-a (µg/L)	Total Kjeldahl Nitrogen (mg/L)	Secchi Disk Depth (m)	Surface Temperature (Celsius)	Surface Dissolved Oxygen (mg/L)
4/17/2017 14:00	0.014	4.0	2.9	0.66	3.51	11.9	10.48
5/4/2017 12:40	0.023	3.6	3.2	0.77	4.88	11.1	10.64
5/15/2017 12:32	0.021	2.9	2.3	0.62	4.27	17.8	10.32
5/31/2017 13:22	0.011	4.9	3.2	0.35	4.27	15.8	8.18
6/13/2017 13:24	0.018	7.6	6.7	0.69	4.27	22.8	8.01
6/27/2017 14:07	0.038	13.0	12.0	0.76	3.96	20.5	9.20
7/13/2017 11:54	0.046	16.0	15.0	0.78	2.59	24.7	7.77
7/27/2017 12:59	0.044	27.0	26.0	0.98	1.98	26.3	9.37
8/8/2017 13:13	0.051	28.0	25.0	1.10	1.68	23.9	10.35
8/22/2017 13:39	0.051	30.0	28.0	0.92	1.83	22.0	7.00
9/7/2017 13:48	0.053	28.0	27.0	0.97	1.83	19.2	7.42
9/19/2017 11:32	0.065	46.0	45.0	1.10	1.52	19.3	7.93
10/5/2017 9:30	0.048	8.1	6.8	0.83	3.05	16.7	5.84
10/26/17 10:09	0.034	6.6	5.2	0.65	3.35	11.1	8.87
2017 Average	0.037	16.1	14.9	0.80	3.07	18.8	8.67
2017 Summer Average	0.046	24.5	23.1	0.91	2.46	21.6	8.36
Volunteer Data							
4/17/2017 16:39	0.022	2.1	1.6	0.54	4.00	12.9	NA
5/14/2017 13:20	0.028	1.8	1.3	0.62	4.00	18.2	NA
5/27/2017 10:15	0.020	2.5	2.4	0.57		18.1	NA
6/1/2017 14:36	0.019	1.9	1.8	0.68	4.70	19.2	NA
6/17/2017 10:52	0.016	5.5	4.7	0.62	3.00	24.3	NA
7/5/2017 13:19	0.020	6.5	6.0	0.50	3.00	25.7	NA
7/6/2017 10:21	0.028	14.0	11.0	0.72			NA
7/10/2017 14:18	0.045	8.2	7.5	0.88	1.50	19.4	NA
7/15/2017 9:15	0.026	12.0	11.0	0.56	2.30	24.2	NA
7/20/2017 10:10	0.044	26.0	24.0	0.82	1.40	22.7	NA
7/24/2017 14:44	0.031	11.0	10.0	0.67	1.60	26.2	NA
8/6/2017 10:21					1.50	23.6	NA
9/21/2017 14:42	0.042	28.0	26.0	0.81	1.50	20.5	NA
10/8/2017 12:12	0.038	7.6	6.9	0.66	3.30	17.7	NA
2017 Average	0.029	9.8	8.8	0.67	2.65	21.0	NA
2017 Summer Average	0.030	12.6	11.3	0.70	2.28	22.9	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		
2017 Elevation (ft)	901.88	5/31/2017	901.38	9/19/2017	901.58		
*Data requirements and determinations of use assessment according to the MPCA's Guidance Manual for Assessing the Quality of Minnesota Surface Waters: "Samples must be collected over a minimum of 2 years and data used for assessments must be collected from June to September. Typically, a minimum of 8 individual data points for TP, corrected chlorophyll-a (chl-a corrected for pheophytin), and Secchi are required. Data used for phosphorus and chlorophyll-a calculations are limited to those collected from the upper most 3 meters of the water column (surface). If more than one sample is collected in a lake per day, these values are averaged to yield a daily average value. Following this step, all June to September data for the 10-year assessment window are averaged to determine summer-mean values for TP, corrected chl-a, and Secchi depth. These values are then compared to the standards and the assessment is made."							



Lake Water Quality Summary										
	Lake Grades									
	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
Total Phosphorus (mg/L)	C	C	B	B	B	C	C	NA	NA	NA
Chlorophyll-a (µg/L)	C	C	B	B	B	B	C	NA	NA	NA
Secchi depth (ft)	B	C	B	C	C	C	C	NA	NA	NA
Overall	C+	C	B	B-	B-	C+	C	NA	NA	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)

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

Datum: NGVD 29 (ft.)

