17 WIRTH LAKE

HISTORY

Wirth Lake was historically known as Keegan's Lake and renamed Glenwood Lake in 1890. It was acquired by the Minneapolis Park and Recreation Board (MPRB) in 1909 and named after Theodore Wirth in 1938 at the end of his tenure as park superintendent. This 38-acre purchase enlarged the previously owned area of 64 acres that was purchased in 1889. An MPRB nursery was established in 1910 on the west side of the lake and provided the system with plantings through 1980. As with most other lakes in the MPRB system, thousands of cubic yards of sediment from Wirth were dredged. The spoils were used to create a beach on the east side of the lake.

Wirth Lake (Figure 17A) is generally dimictic but may mix during extreme events during the summer. Historically, the lake was considered infertile to moderately fertile. Early restoration projects included rotenone in 1977 to remove rough fish and subsequent stocking of channel catfish, largemouth bass, walleye and blue gills. A summer aerator was in operation beginning in the early 1980s but was no longer in use by 1991. A portable winter aerator was used for a few years before a permanent hypolimnetic aeration system was put in place in 2002. This was done in cooperation with the Minnesota Department of Natural Resources (MDNR). Figure 17B shows a bathymetric map of Wirth Lake. The stage and bleachers described on the map were used for the Aquafollies from 1941–1964 but are no longer present. Table 17A shows the Wirth Lake morphometric data.

Figure 17A. Wirth Lake.

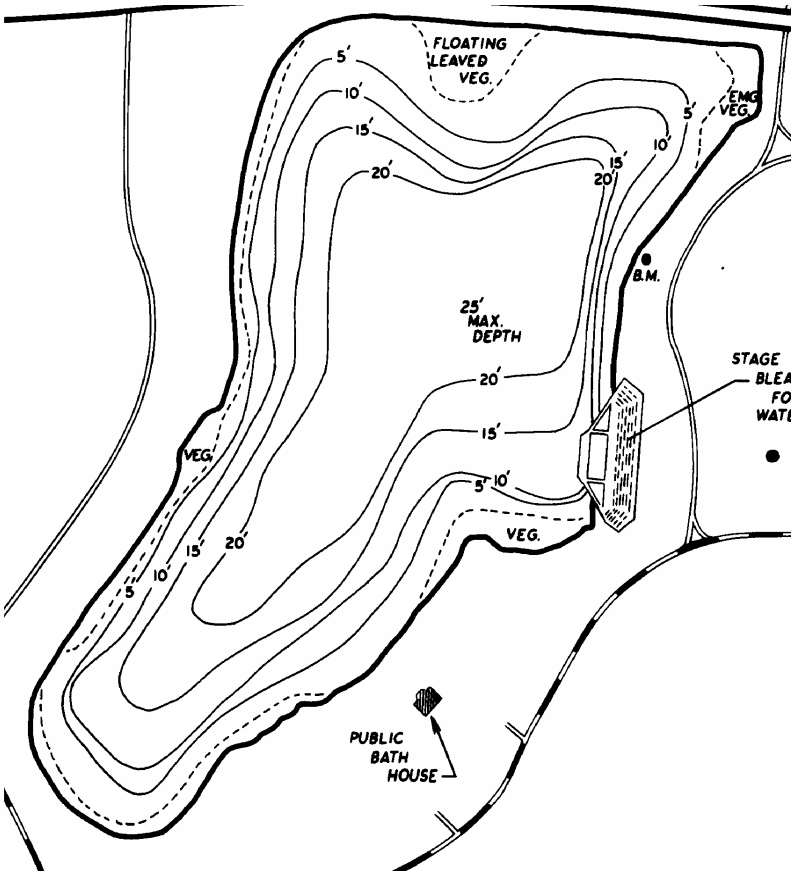

Figure 17B. Bathymetric map of Wirth Lake. Map courtesy of the MDNR.

Table 17A. Wirth Lake morphometric data. * Littoral area was defined as less than 15 feet deep.

Surface Area (acres)	Mean Depth (m)	Maximum Depth (m)	Littoral Area*	Volume (m^3)	Watershed Area (acres)	Watershed: Lake Area (ratio)
39	4.3	7.9	61%	$6.70x10^5$	348	9.4

LAKE LEVEL

Wirth Lake levels are recorded weekly during ice free conditions. The historical lake levels for Wirth Lake are shown in Figure 17C for the entire period of record. Mean sea level elevation can be calculated by adding the city datum (710.3 feet) to the elevations shown in Figure 17C.

See Section 18 for a comparison between other MPRB lake levels.

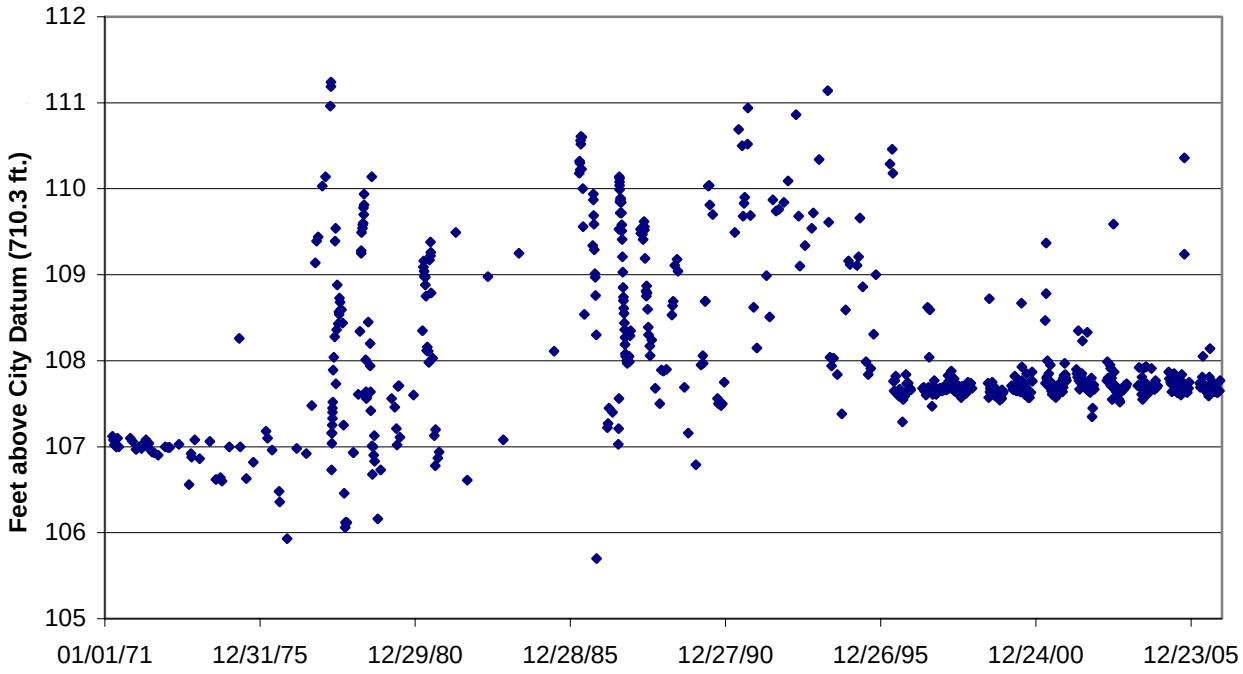

Figure 17C. Historical lake levels for Wirth Lake.

WATER QUALITY TRENDS (TSI)

Figure 17D shows the Wirth Lake linear regression to be decreasing as the TSI scores fall. A detailed explanation of TSI can be found in Section 1.

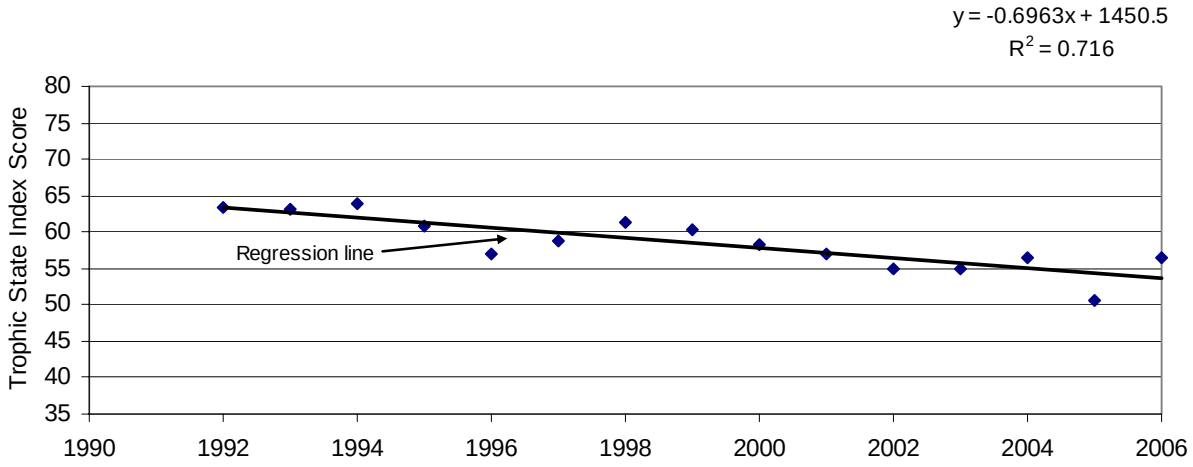

Figure 17D. Wirth Lake TSI scores and regression line.

Water quality is generally improving at Wirth Lake. The regression correlation is strong with an R^2 of 0.72. Wirth Lake has a TSI score that is average for this ecoregion. It falls slightly above the 50th percentile category for lakes in this ecoregion (based on calculations from the Minnesota Pollution Control Agency, using the Minnesota Lake Water Quality Data Base

Summary, 1998).

BOX AND WHISKER PLOTS

The box and whisker plots show in more detail the scatter within the years data set for the Secchi, chlorophyll-*a* and total phosphorus. Long-term lake monitoring is necessary to evaluate the seasonal and year-to-year variations seen in each lake and predict trends. Figure 17E shows box and whisker plot data from 1992-2005. A detailed explanation of box and whisker plots can be found in Section 1.

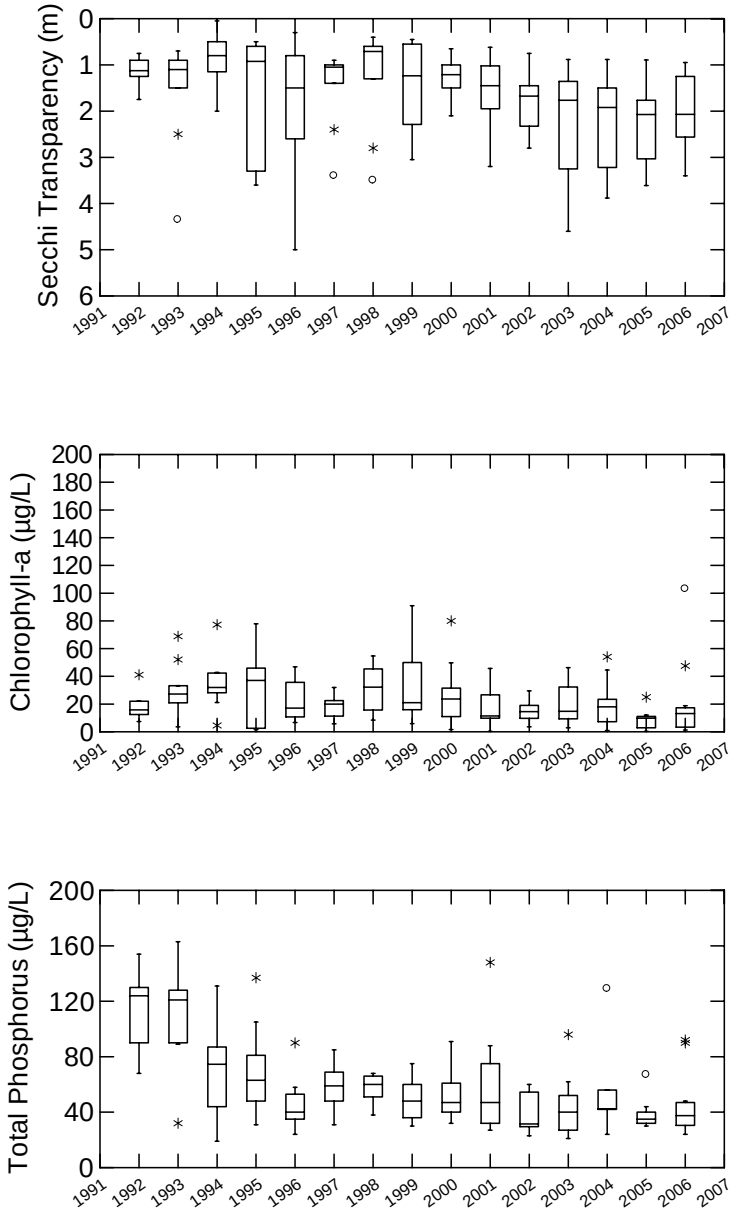

Figure 17E. Box and whisker plots of Wirth Lake.

Since the early 1990's, the median phosphorus levels appear to be decreasing and the Secchi readings appear to be increasing, pointing to improved water quality.

BEACH MONITORING

Bacteria levels were monitored at one location on Wirth Lake at Wirth Beach. Wirth Beach had the lowest season long geometric mean and the lowest median value for *E. coli* of all MPRB beaches and was open for the entire season. The values are listed in table 17B. Figure 17F illustrates the box and whisker plot of *E. coli* sampling results (per 100 mL) for 2003-2006. The box and whisker plot shows in more detail the scatter, within the years, of the data set.

Table 17B. Summary of *E. coli* results (per 100 mL) for Wirth Beach in 2006.

Statistical Calculation	Wirth Beach
Minimum Value	2
Maximum Value	17
Median Value	2
Geometric Mean	3
Standard Deviation	4
Number of Samples Taken	41

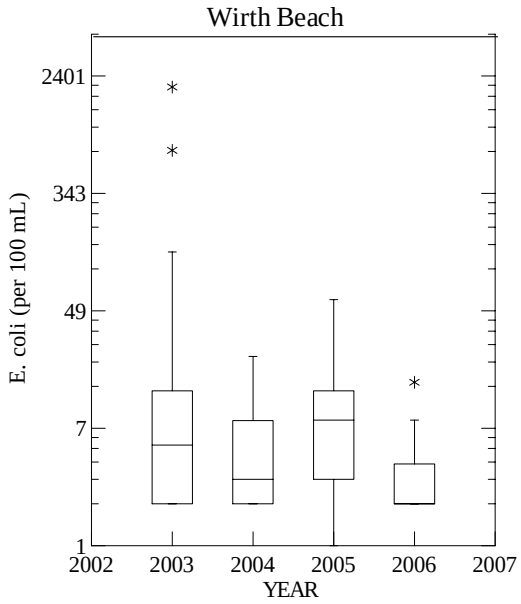

Figure 17F. Box and whisker plot of Wirth Beach *E. coli* results (per 100 mL), 2003–2006. Note the log scale on the Y-axis.

Table 17C gives the parameters that correlated best with the *E. coli* at Wirth beach. Strong positive correlations existed between *E. coli* and lake elevation, wind direction, rainfall, rainfall duration, and rainfall intensity. Strong negative correlations existed with dissolved oxygen, percent dissolved oxygen, and specific conductivity.

Table 17C. Selected correlations (r) between *E. coli* and select variables at Wirth Beach in 2006.

Variables	Wirth
Dissolved Oxygen	-0.372
Lake Elevation	0.650
Percent Dissolved Oxygen	-0.329
Rainfall	0.245
Rainfall Duration	0.569
Rainfall Intensity	0.816
Specific Conductivity	-0.299
Wind Direction	0.341

LAKE AESTHETIC AND USER RECREATION INDEX (LAURI)

The LAURI for Wirth Lake is shown in Figure 17G. Wirth Lake scored "excellent" for aesthetics, "good" for clarity, and "poor" for aquatic plant interferences. The lake also scored "excellent" for public health due to the extremely low *E. coli* values at the beach. Details on the LAURI can be found in Section 1.

Figure 17G. Wirth Lake LAURI for 2006.

Winter Ice Cover

Ice came off Wirth Lake on April 6, 2006, which is five days later than average ice off. Ice came on to the lake for the winter on December 1, 2006, which is three days later than average. Details on winter ice cover records can be found in Section 1, and a comparison with other lakes can be found in Section 18.

Exotic Aquatic Plant Management

The MDNR requires a permit to remove or control Eurasian watermilfoil. These permits limit the area from which milfoil can be harvested to protect fish habitat. The permits issued to the MPRB allowed for harvesting primarily in swimming areas, boat launches and in shallow areas where dense growth occurred. The permitted area on Wirth Lake was 15 acres, which is 38% of the total lake surface area. Wirth Lake was harvested for Eurasian watermilfoil in late-June of 2006 due to nuisance milfoil growth near the beach. See Section 1 for details on aquatic plants.

Phytoplankton and Zooplankton

Phytoplankton and zooplankton are the microscopic plant and animal life that form the basic food web of lake ecology. The greenness of a lake is measured by chlorophyll-*a* (chl-*a*) as an expression of the phytoplankton present. Figures 17H and 17I show the phytoplankton and Chlorophyll-*a* data, respectively. During the 2006 sampling season bacillariophyta (diatoms) dominated in the spring. Pyrrhophyta (dinoflagellates) dominated through the summer, and diminished as cyanophyta (blue-green algae) increased its dominance. The peak chl-*a* value was over 100 μg/L, and was during the mid-summer. This peak correlates with the beginning of the late summer bloom of cyanobacteria. Zooplankton populations fluctuated in Wirth Lake in 2007 (Figure 17J). Both arthropod and rotifer populations peaked in April-May and July-August. Arthropods peaked again in October. Protozoa were only present at detectable levels in May (2% of the total sample).

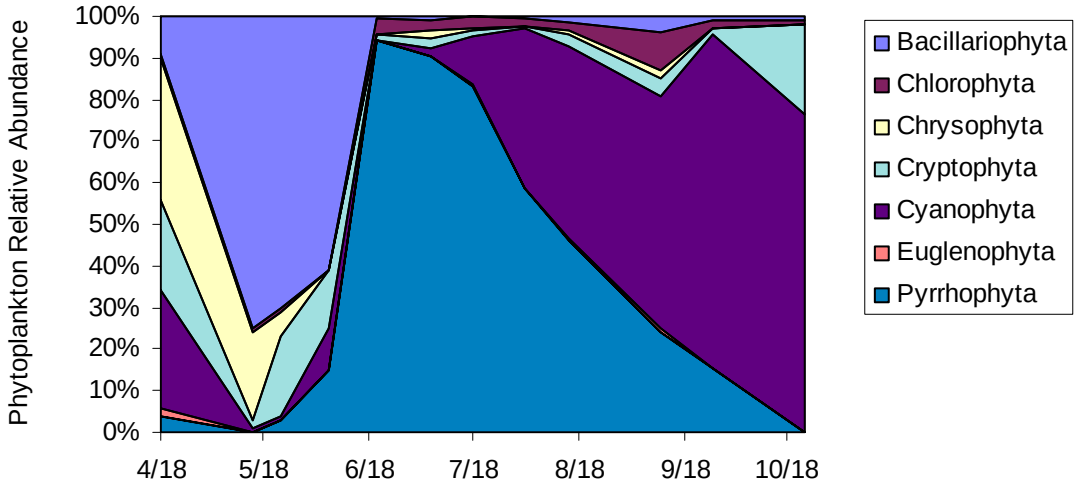

Figure 17H. Wirth Lake dominant phytoplankton divisions during the 2006 sampling season.

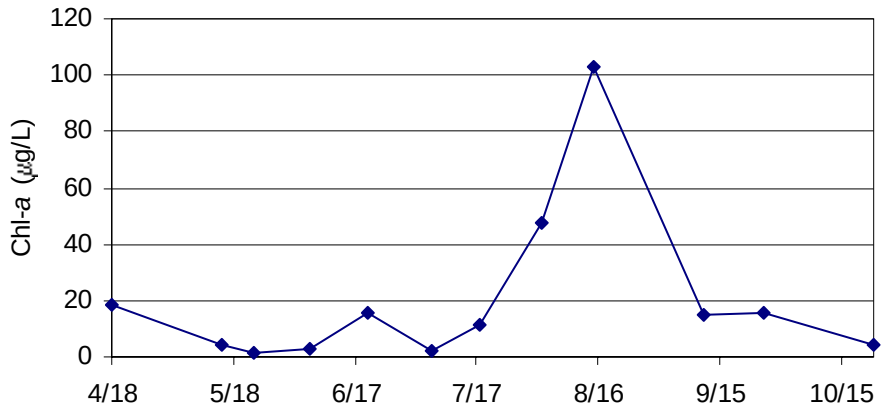

Figure 17I. Wirth Lake 2006 chlorophyll-*a* data.

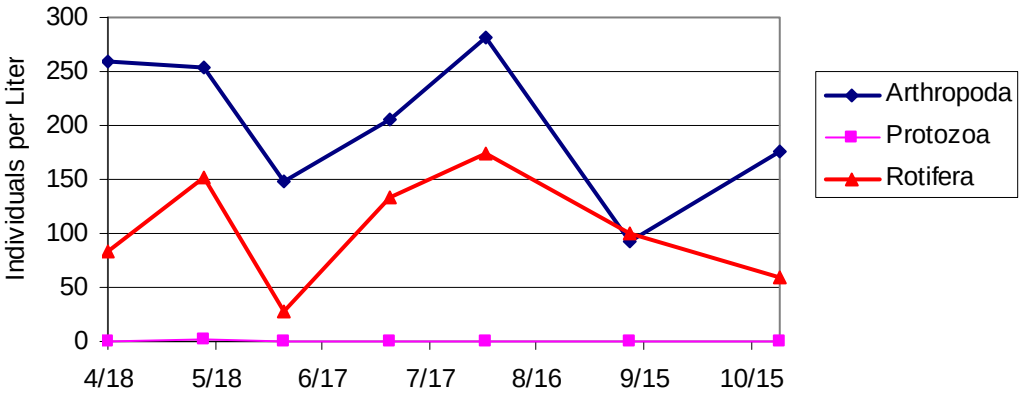

Table 17J. Wirth Lake 2006 zooplankton distribution.

FISH STOCKING

Additional information and a definition of fry, fingerling, yearling, and adult fish sizes can be found in Section 1.

Wirth Lake was stocked by MDNR in:
1998 with 290 adult Black Crappie 258 adult Bluegill Sunfish
1999 with 1,900 fingerling Channel Catfish
2000 with 1,900 fingerling Channel Catfish
2001 with 2,304 yearling Channel Catfish
2003 with 600 adult Walleye

WATER QUALITY PROJECTS

In 2006, two species of emergent plants, *Sagittaria latifolia* and *Pontederia cordata* (broad-leaved arrowhead and pickerelweed), were planted in Wirth Lake as a small-scale lakeshore restoration project providing wildlife habitat and aesthetic value to the lake. The plot selected for the planting was located on the northeast corner of the lake just south of Highway 55.

The Wirth Beach bathhouse underwent an extensive rehabilitation in 2004 – 2005. The new bathhouse used the footings from the 1957 bathhouse. A bench wall around the beach was also constructed. This is part of a larger renovation project for the Wirth Beach area with different phases being implemented at different times due to installment funding from the legislature and the Metropolitan Council. More details on the project can be found at: http://www.minneapolisparks.org/default.asp?PageID=738