



NONPOINT SOURCE SUCCESS STORY

Minnesota

Watershed and In-Lake Treatment Approaches Improve Bryant Lake Water Quality

Waterbody Improved

Bryant Lake is a 161-acre lake in Eden Prairie, Minnesota. The lake is used primarily for recreation and fishing, and provides some wildlife habitat. Bryant Lake was placed on Minnesota's Clean Water Act (CWA) section 303(d) list of impaired waters in 2008 for exceeding eutrophication criteria. In lieu of developing a total maximum daily load (TMDL) to address this issue, a two-phased in-lake alum treatment was implemented in 2008 and 2013. Wetland restoration and other various stormwater best management practices were also implemented. As a result of this work, Bryant Lake now meets water quality standards and was proposed for delisting in 2018.

Problem

Bryant Lake (27-0067-00), is a 161-acre lake in the city of Eden Prairie in Hennepin County, Minnesota (Figure 1). It is defined as a deep lake, and has a maximum depth of 45 feet. Bryant Lake is in the North Central Hardwood Forests (NCHF) ecoregion. The lake is used primarily for recreation and fishing and provides some wildlife habitat as well. The Bryant Lake watershed encompasses a combination of residential and mixed-use developments, as well as parks and recreational areas, including Bryant Lake Regional Park on the northeast shore. This diversity of land use generates multiple sources of nutrient-rich overland runoff that contribute to elevated phosphorus concentrations in the lake.

Phosphorus levels exceeding the deep lake NCHF eutrophication standard (growing season averages of 40 micrograms per liter ($\mu\text{g/L}$) total phosphorus, 14 $\mu\text{g/L}$ chlorophyll *a*, and not less than 1.4 meter [m] Secchi disk depth) were observed in Bryant Lake. The data in 2007 showed growing season averages of 57 $\mu\text{g/L}$ total phosphorus, 34.5 $\mu\text{g/L}$ chlorophyll *a* and 1.2 m Secchi disk depth. For this reason, Bryant Lake was listed as impaired in 2008.

Story Highlights

Actions that contributed to reduction in phosphorus loading include both in-lake management and external loading reduction projects implemented

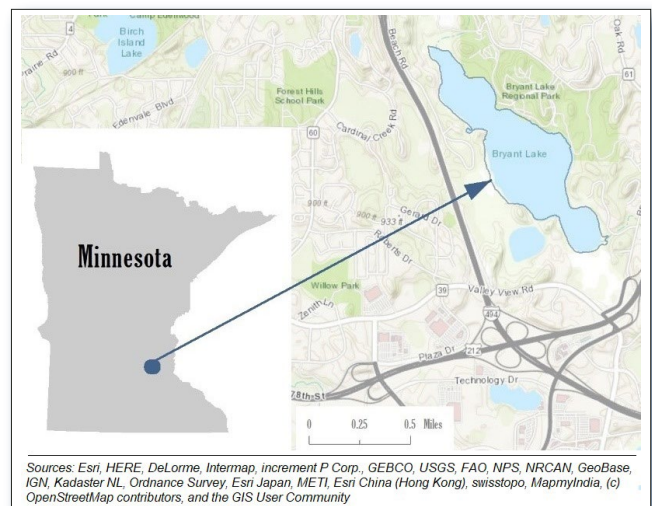


Figure 1. Bryant Lake is in eastern Minnesota.

by the Nine Mile Creek Watershed District and local partners. To address nutrient loading from surrounding residential and commercial land uses, multiple watershed-scale best management practices (BMPs) were implemented. Wetland restoration occurred in the subwatershed west of Bryant Lake, and included the construction of permeable weirs, runoff diversion structures, and permanent pool storage areas. Additional stormwater BMPs, including the construction of wet detention ponds, were completed in subwatersheds both north and east of Bryant Lake. Collectively, these external BMPs were designed to address 47 percent of annual phosphorus loading to Bryant Lake.

Additionally, a two-phased in-lake alum treatment was employed in 2008 and 2013 to address in-lake phosphorus loading resulting from sediment phosphorus release and recycling (Figure 2). In-lake phosphorus inputs from the lake's bottom sediment contribute to roughly 26 percent of Bryant Lake's annual phosphorus load. The first treatment occurred before the wetland restoration and stormwater BMPs were completed; the second treatment occurred after the external loading reduction projects were completed.

In-lake water quality monitoring will continue in Bryant Lake to evaluate trends over time and to inform the need to modify in-lake management. Additionally, opportunities for additional stormwater treatment will continue to be explored.

Results

Recent water quality data (2009–2015) collected in Bryant Lake indicates growing season averages of 29 µg/L total phosphorus, 8.6 µg/L chlorophyll *a* and 2.6 m Secchi disk depth. This data shows that Bryant Lake now meets the phosphorus water quality standard, along with the standards for both response variables (chlorophyll *a* or Secchi disk). For this reason, the lake was proposed for delisting on the draft 2018 CWA section 303(d) list of impaired waters.

Partners and Funding

Bryant Lake restoration project relied on multiple partners including the Nine Mile Watershed District, the City of Eden Prairie, and the Three Rivers Park District.



Figure 2. Alum treatment in progress on Bryant Lake.



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