

Melvorn Lake Water Quality Data 2010-2019

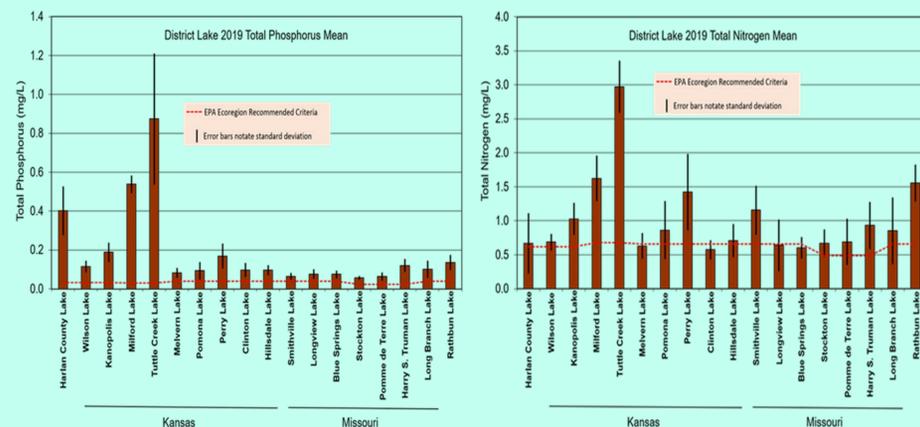


Melvorn Lake

- Built on Marais des Cygnes River reaching multipurpose pool in 1975.
- **Watershed** = 349 square miles / 223,360 Surface Acres (SA)
- **Capacity (2010 sediment survey):**
 - Flood Control: 209,005 Acre-feet (AF) / 14,010 SA
 - Multipurpose: 149,630 AF / 6,951 SA / 101 miles of shoreline
 - Multipurpose pool sediment reserve: 12,630 AF
 - Avg. annual inflow (2010-2019)= 150,257 AF; 2019 inflow= 440,353 AF
- **Operating project purposes:** flood control, water quality, recreation, fish and wildlife, and water supply.
- **Water Quality (WQ)** at Melvorn Lake in 2019 was beneficial to operating purposes listed above. Water quality improves as nutrients, herbicides and sediments are removed by settling, dilution, and biological processes as water moves from inflow streams toward the dam. July sampling documented low D.O. conditions near the dam caused by movement of bottom water through the water column from flood releases during stratified conditions.

Nutrient enrichment

Nutrients (i.e. phosphorus and nitrogen) are essential for aquatic life and are the primary factor driving fish and aquatic plant growth rates and productivity. Excess nutrients from urban, agricultural or natural sources increases the natural aging, or eutrophication, process in lakes. This can alter plant and aquatic life in lakes and water bodies, cause algal blooms, and lead to low dissolved oxygen. Melvorn Lake was below average for Kansas City District Lakes for average total phosphorus (TP) (0.18 mg/L) and total nitrogen (TN) (1.0 mg/L) measured at the site near the dam. Median TP at the site near the dam on Melvorn exceeded EPA Ecoregion Recommended Criteria. Total phosphorus during summer months was in the range of moderate productivity, or mesotrophic, according to Carlson Trophic Classification, which is ideal productivity for a healthy aquatic food web with quality aquatic plant, plankton, invertebrate and fish growth.

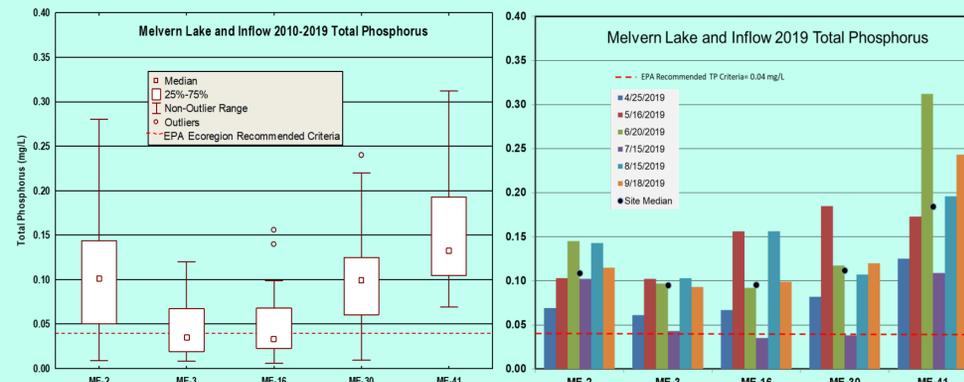


The **US Army Corps of Engineers (USACE)** Water Quality Program collects monthly water samples at Melvorn Lake* from April through September. These figures present data collected between 2010-2019 from lake sites (ME-3, ME-16, and ME-30) and the outflow (ME-2) below the dam. Thirty-four chemical, physical and biological parameters are measured to evaluate water quality. USACE uses this data to describe water quality history, conditions and changes from the inflow streams, within the main lake, and outflow focusing on eutrophication, nutrients, sediment, herbicides, metals, and contaminants.

*Note: The term "lake" is substituted for technically correct "reservoir" throughout this document for consistency.

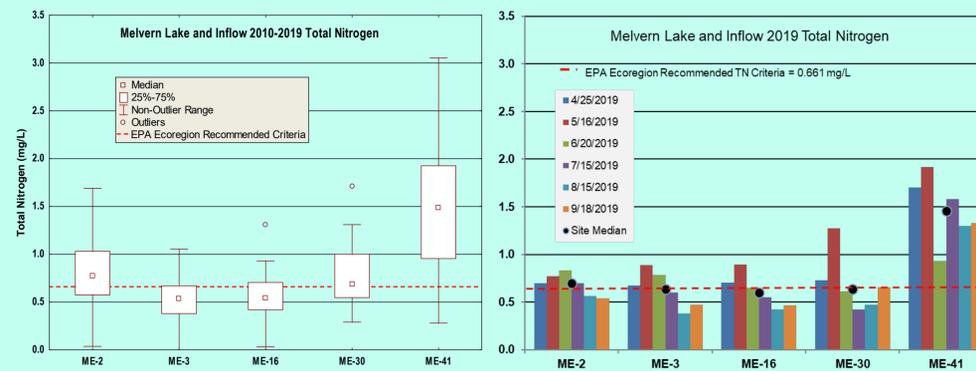
Total Phosphorus

Total phosphorus (TP) median concentrations from 2019 Melvorn Lake samples were higher than 75% of all 2010-2019 TP records at the mid and lower lake sites ME-3 and ME-16. Upper lakes sites and outflow 2019 median TP concentration did not exceed the 75% quartile of the respective 10-year TP sample data. Similar to most impoundments, higher TP concentrations and a wider range of data is usually found in the upper lake sites due to influences from inflow streams and biological uptake or utilization of TP as the water moves through the lake to the dam. In 2019, flood elevation and increased water residency time allowed for significant settling of sediment bound phosphorus as well as biological uptake by algae to remove soluble phosphorus from the water column. Increased algae density at lower lake sites led to a proportional increase in TP compared to most years.



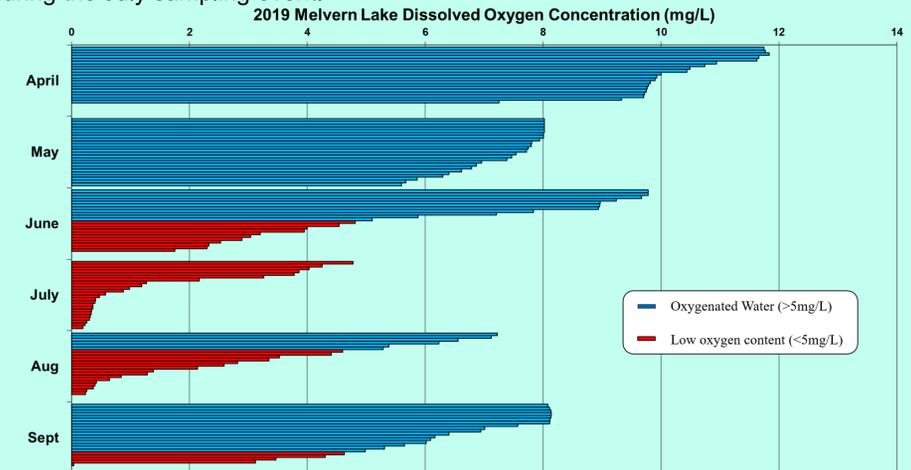
Total Nitrogen

Total nitrogen (TN) median concentrations from 2019 Melvorn Lake samples were similar (i.e. within 25% to 75% quartile) to 2010-2019 TN records at all lake sites and outlet. Median TN concentration was slightly below EPA Ecoregion recommended criteria (0.6 mg/L) at Melvorn Lake. TN concentrations can be highly variable between sites and years related to inflows, watershed factors (i.e. soils, inflows, atmospheric input, and farming practices), and in-lake biological processes/cycling. Nitrogen cycling and denitrification from biological processes was apparent as TN steadily decreased May-September.



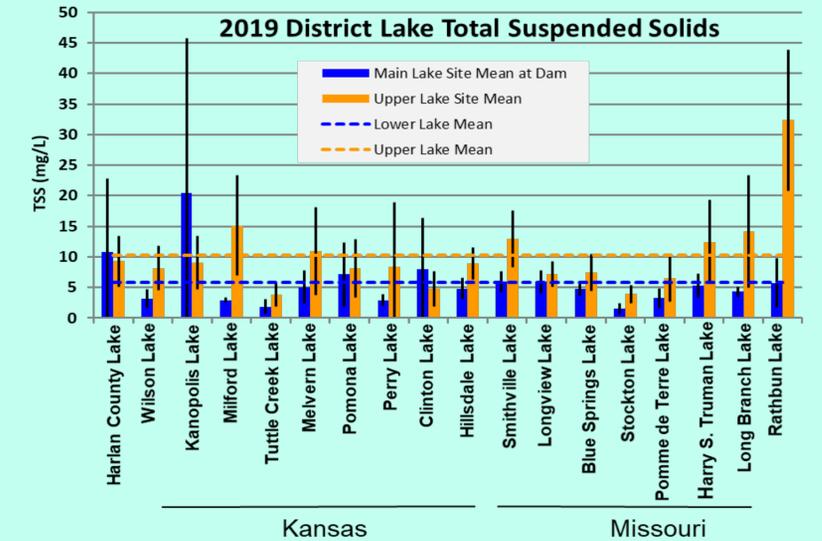
Dissolved Oxygen

Dissolved oxygen is a factor in aquatic species location, growth, and ultimately survival in lakes. The graph below shows dissolved oxygen measured in the water column in one-meter intervals (e.g. each row in each month represents one meter of depth) from April-September. Melvorn Lake stratification has increased with increases in the algae population. Flood releases in late June and early July led to a D.O. sag at the site near the dam. Other lake sites had normal D.O. profiles during the July sampling event.



Total Suspended Solids

Total suspended solids (TSS) or filterable solids in streams and lakes is a function of watershed characteristics including soil composition, land use, weather patterns, algae populations, and characteristics of inflowing streams. TSS is an indicator of erosion in watersheds, sedimentation or filling rates of downstream reservoirs, algae growth, and is also closely linked to nutrient and contaminant transport through river systems. In 2019, Melvorn Lake mean TSS values at the lower lake sites was slightly less than average of comparable sites at all District lakes. In 2019, 53% of TSS settled out of the water column as it moved from the upper lake to the dam.



Water Quality Concerns:

- Nutrients
- Sediment inputs



US Army Corps of Engineers
Environmental Resources Section
Kansas City, MO