

# Harry S. Truman Lake Water Quality Summary

## 2006-2015



The **US Army Corps of Engineers (USACE)** Water Quality Program collects monthly water samples at Truman Lake\* from April through September. These figures present data collected between 2006-2015 from nine lake sites (#2, 3, 5, 6, 14, 15, 21, 28, 46) and the outflow (#1A) below the dam. Thirty-four chemical, physical and biological parameters are measured to evaluate water quality. USACE uses this data to describe conditions and changes from the inflow streams, within the main lake, and outflow focusing on eutrophication, nutrients, sediment, herbicides, metals, and contaminants.

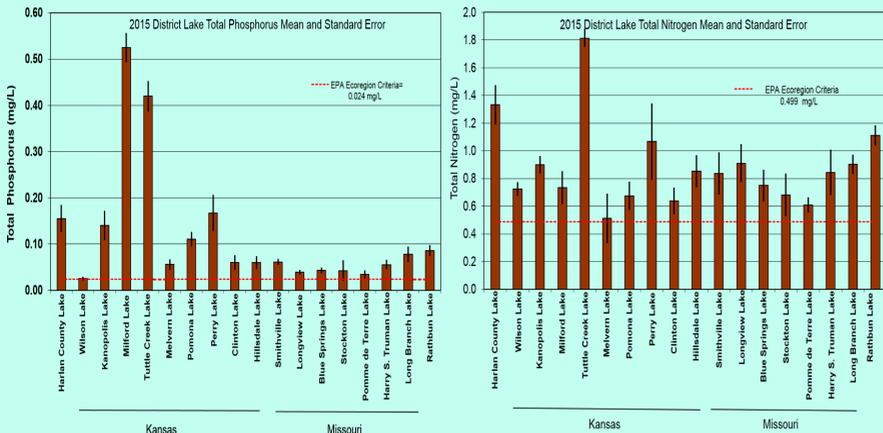
\*Note: The term "lake" is substituted for technically correct "reservoir" throughout this document for consistency.

### Truman Lake

- Built on Osage River reaching full pool in 1977.
- **Watershed** = 8,914 square miles/ 5,704,960 Surface Acres (SA)
- **Capacity:**
  - Flood Control: 4,005,392 Acre-feet (AF) / 209,048 SA
  - Multipurpose: 1,181,640 AF / 55,406 SA / 958 miles of shoreline
  - Avg. annual inflow (2006-2015) = 6,987,263 AF; 2015 inflow= 9,278,988 AF
- **Project Operating Purposes:** flood control, hydropower, recreation, fish & wildlife.
- **Water Quality** at Truman Lake in 2015 was beneficial to operating purposes listed above and dissolved oxygen in outflow remained above state standards. Water quality improves in Truman significantly as nutrients, herbicides and sediments are removed by settling, dilution, and biological processes as water moves from inflow streams to the dam. Western inflows originating in agricultural regions contribute higher nutrients and sediment to Truman Lake than inflow streams originating in Ozark border regions.

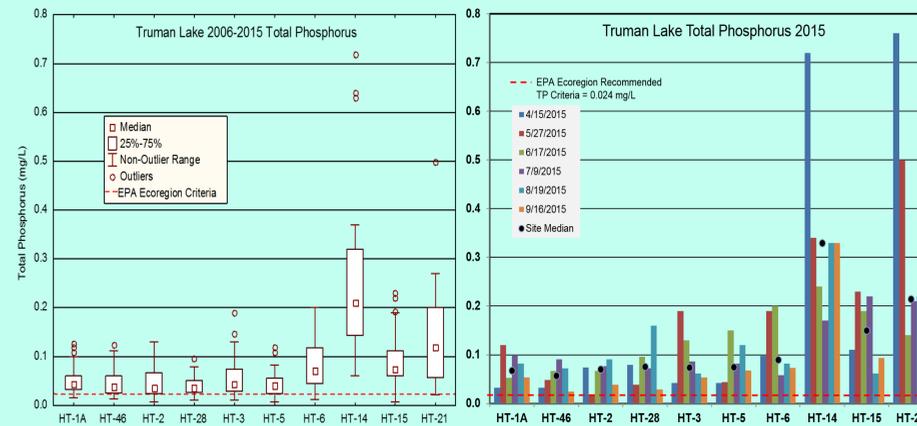
### Nutrient Enrichment

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 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 affecting fish and invertebrate survival. Above average inflows in 2015 transport sediment and nutrients via inflow streams that settle out in Truman Lake. In 2015, Truman and other Missouri Corps' lakes ranked low in the Kansas City District for nutrient measures at sites near the dam. In 2015, Truman Lake exceeded EPA ecoregion recommended criteria for total nitrogen and total phosphorus.



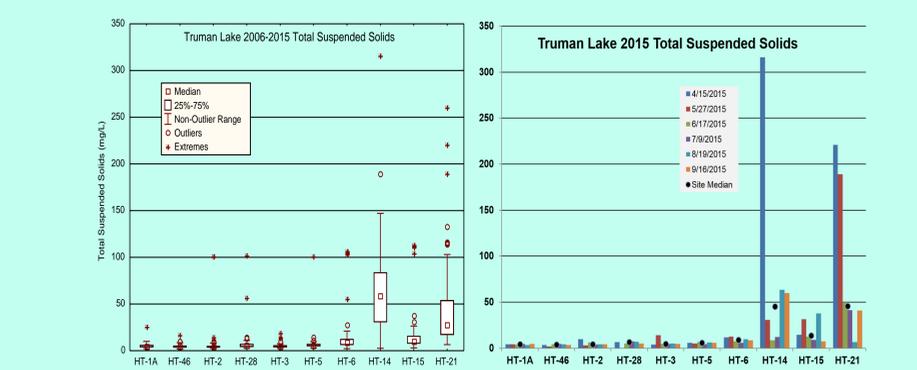
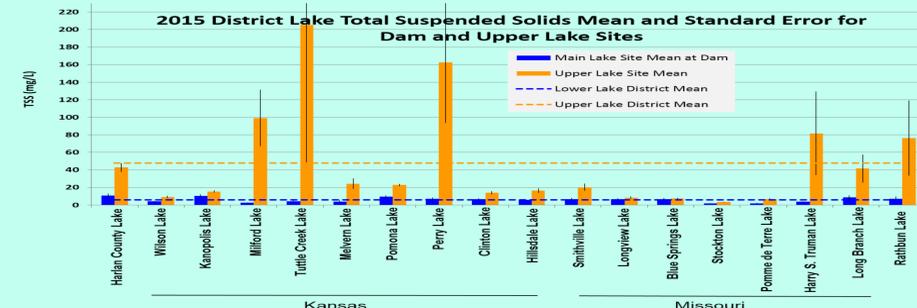
### Total Phosphorus

Truman Lake total phosphorus (TP) concentrations at most sites are near the low end of eutrophic range (0.024-0.096 mg/L) providing nutrients which benefit planktonic algae species and fish growth. All lake sites have higher total phosphorus than recommended by EPA ecoregion criteria, but negative effects such as fish kills and toxic algae blooms have not been documented at Truman in 2015. Due to large inflows, total phosphorus median concentrations in 2015 were significantly higher than 75% of all 2006-2015 data except at HT-6 on the Grand R. Arm. The South Grand River (HT-14) and Osage River (HT-21) arms typically have the highest total phosphorus measurements. These western streams drain fertile cropland, which contributes to much of total phosphorus entering the lake compared to other inflow streams. Excess phosphorus from these upper sites move through each arm to lower lake bound to suspended sediment particles. As water passes through Truman, settling and biological processes (i.e. algae conversion) reduce silt and nutrients before they reach the dam as demonstrated by the decline in TP from HT-21 to HT-2 on the Osage Arm. The same trend exists on the S. Grand between HT-14 and HT-6.



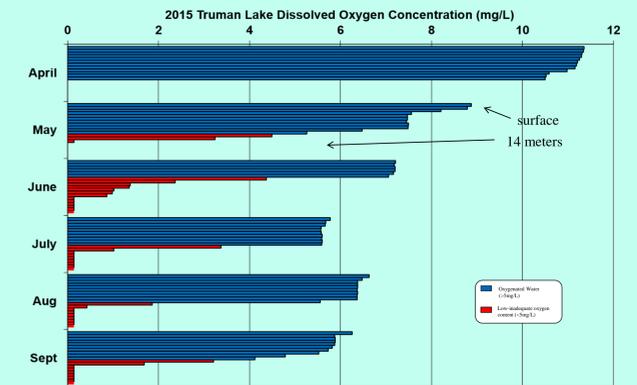
### Total Suspended Solids

Total suspended solids (TSS) in streams and lakes is a function of watershed characteristics including soil composition, land use, biological process and weather patterns. TSS may be an indicator of erosion in watersheds, sedimentation or filling rates of downstream reservoirs, and is also closely linked to nutrient and contaminant transport through river systems. Depending on particle size and soil characteristics, a high percentage of suspended solids carried by streams settles out before it reaches lower end of the lake. In 2015, approximately 96% of suspended solids settled out as water moved from the upper lake to the dam. TSS results from 2006-2015 show high concentrations of TSS and high sample variation measured from streams originating in the west portion of the watershed with low levels of suspended solids found in lower Truman Lake sites.



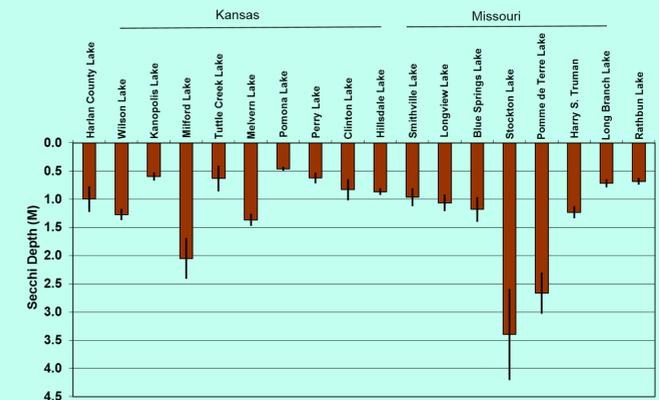
### Dissolved Oxygen

Dissolved oxygen is a factor in aquatic species location, growth, and ultimately survival in lakes. The figure below shows dissolved oxygen measured in the water column at one-meter intervals from surface to bottom (e.g. each row in each month represents one meter of depth) from April through September. Truman Lake typically stratifies for throughout the summer, however adequate (>5 mg/L) dissolved oxygen is typically available in the lake. In 2015, Truman Lake had adequate oxygen in the top 6 meters during the worst conditions in July and August. Strong stratified layers were evident May-Sept. Dissolved oxygen below the dam (HT-1a) maintained adequate dissolved oxygen all summer despite high water and high temperature conditions. Temperature and D.O. are monitored hourly below the dam from May-Sept.



### Secchi Depth

Secchi depth is a measure of water transparency or visibility in lakes. Organic (i.e. planktonic algae) and inorganic (i.e. suspended sediment) turbidity reduces transparency. Total phosphorus and TSS are inversely related to transparency as seen in Truman and all District Lakes. Lakes with the least nutrients and turbidity have high secchi measurements and transparency providing sunlight penetration for aquatic plants and algae.



### Fecal Bacteria

E. Coli is sampled at six Corps owned swim beaches on Truman Lake protective of whole body contact recreation during the summer. Large numbers of geese and wildlife can occupy Corps swim beaches leading to e. coli counts exceeding EPA and Missouri criteria when sampling coincides with high water levels or recent rain events. Shawnee Bend and Berry Bend beaches both had test results exceeding state e. coli criteria in 2015 causing beach closures or preventing beaches from opening. Flood waters also inundated Truman Lake beaches in 2015 causing closures at all beaches. Signs are posted at beaches outlining safety concerns as well as on Truman Lake public web page. <http://www.nwk.usace.army.mil/Locations/DistrictLakes/HarryS Truman Lake.aspx>

