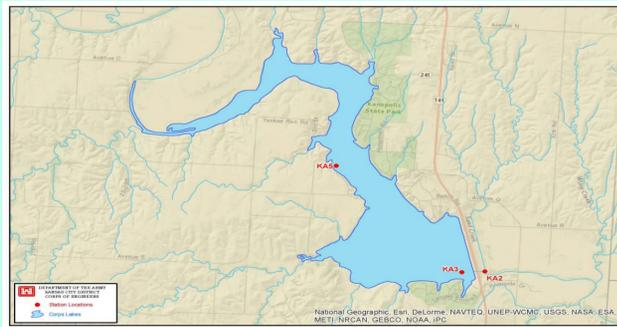


Kanopolis Lake Water Quality Summary

2005 - 2014

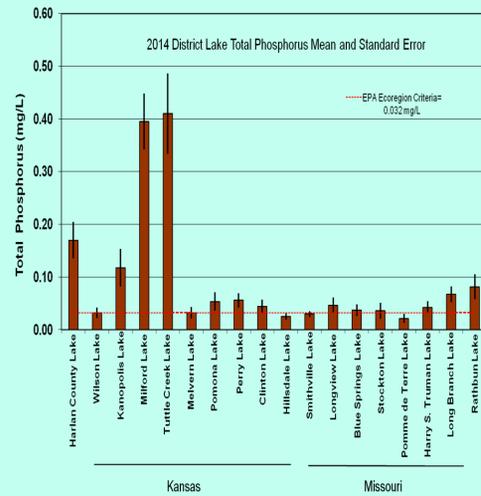
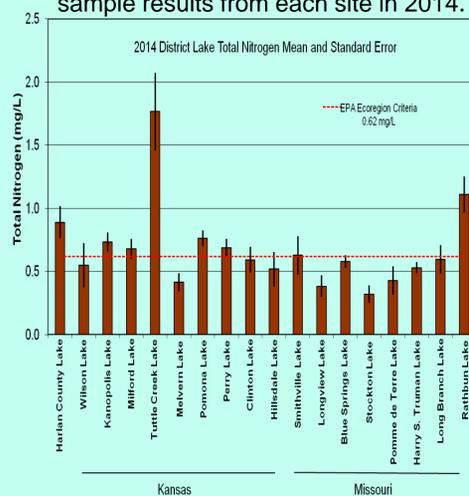


Kanopolis Lake:

- Built on Smoky Hill River reaching full pool in 1948.
- **Watershed** = 5,365 square miles/ 3,433,600 Surface Acres (SA)
- **Capacity:** Flood Control: 191,890 A-F / 10,790 surface acres
 - Multipurpose: 143,878 A-F / 3,406 surface acres / 41 miles of shoreline
 - 10-year avg. annual inflow = 111,665 AF; 2014 inflow=84,806 AF
- **Operating project purposes:** flood control, water quality, recreation, fish and wildlife, and water supply.
- **Water Quality** at Kanopolis Lake in 2014 was beneficial for authorized purposes listed above and measured parameters did not exceed KS State WQ Standards for designated uses.

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 process in lakes. This rapid aging process, called eutrophication, is responsible for changes in plant and aquatic life in lakes and water bodies including algal blooms, low dissolved oxygen that affect fish survival, and taste and odor issues in drinking water. Kanopolis Lake is listed as "impaired" on the 2014 Kansas 303(d) list due to accelerated eutrophication with a TMDL for phosphorus and nitrogen load reduction since 2003 and has a low priority TMDL for sulfates and chloride. KDHE and EPA are working with water quality partners, landowners and an active Big Creek Middle Smoky Hill River Watershed (Kanopolis Reservoir) Restoration and Protection Strategy (WRAPS) group. Together they provide recommended best management practices to meet long term nutrient reduction goals for the watershed. Working in the watershed to reduce nutrient and sediment runoff will slow the eutrophication process improving water quality to maintain operating purposes of Kanopolis Lake. In 2014, nutrient concentrations at Kanopolis Lake were above USACE Kansas City District lake averages for total phosphorus (0.094 mg/L) and total nitrogen (0.68 mg/L) and EPA Ecoregion recommended criteria measured at the site nearest the dam. Standard error bars in the graphs below illustrate the variation in sample results from each site in 2014.

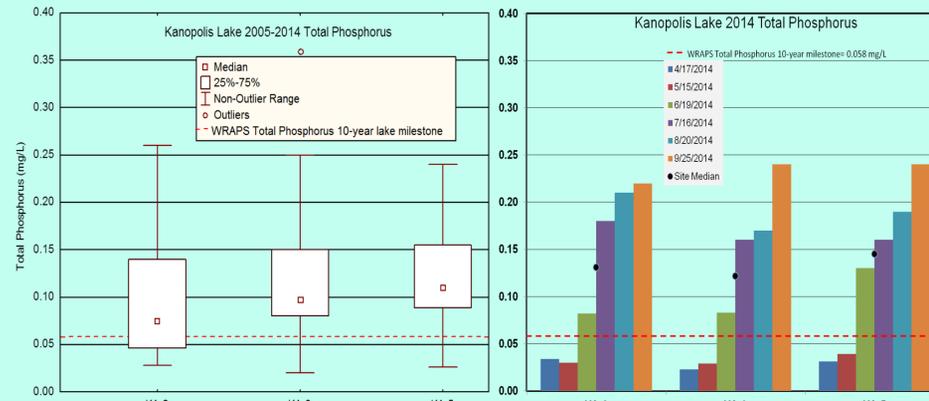


The **US Army Corps of Engineers** (USACE) Water Quality Program collects monthly water samples at Kanopolis Lake* and inflows from April through September. These figures present data collected between 2005-2014 from two lake sites (#3, 5) and the outflow (#2) below the dam. Thirty-four chemical, physical 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 used rather than the technically correct "reservoir" throughout this report for consistency.

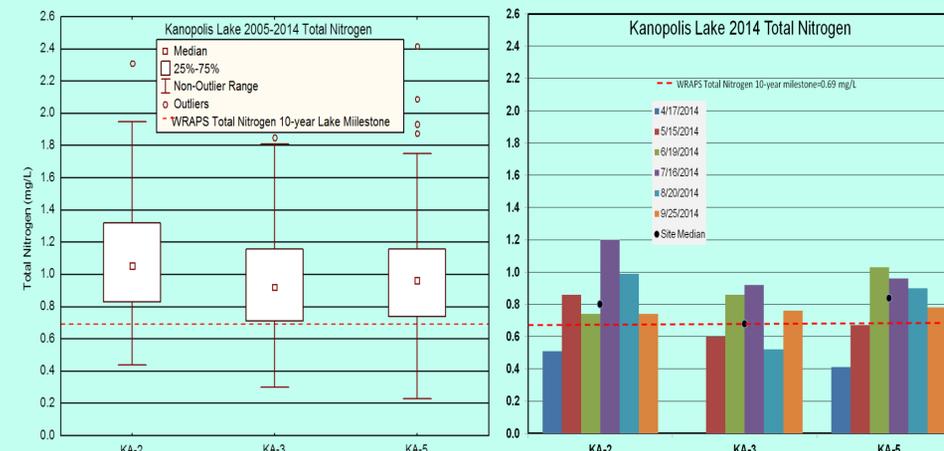
Total Phosphorus

Total phosphorus (TP) concentrations from 2014 Kanopolis Lake samples were at least double WRAPS 10-year lake milestone of 0.058mg/L. Median TP at all Kanopolis Lake sites were near hypereutrophic indicating excessive nutrients and high biological productivity associated with dense algae production and high densities of warm water fish species. In 2014, Kanopolis TP concentrations were similar to 10-year trends. Phosphorus concentrations increased steadily in late summer months from internal sources found in lake sediments not related to summer runoff events. Similar to most impoundments, higher TP concentrations and a wider range of data is usually found in the upper lake sites and inflows due to mobilized nutrients bound to silt particles in moving water and biological uptake or consumption of nutrients as the water flows through the lake.



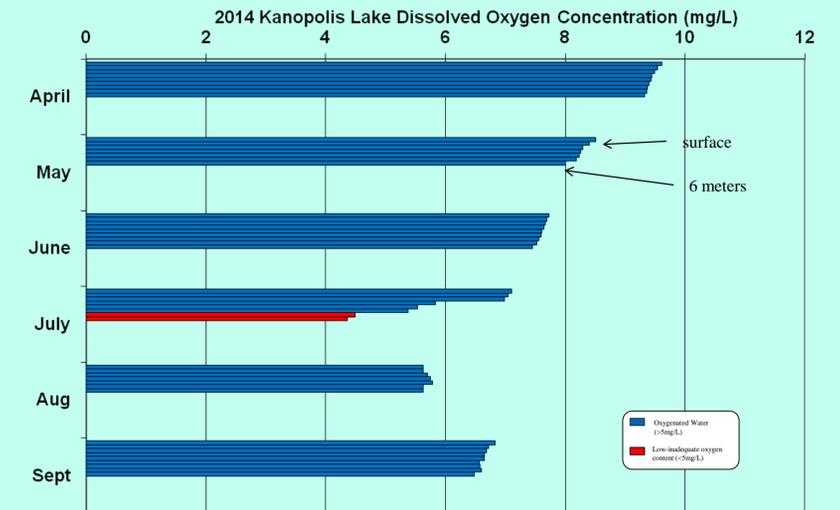
Total Nitrogen

Total nitrogen concentrations exceed WRAPS 10-year lake milestone of 0.69 mg/L and EPA Ecoregion recommended criteria of 0.62 mg/L in 60% of samples from all sites. Median TN concentrations in 2014 were slightly lower than 10-year median from all sites likely due to reduced inflows. Total nitrogen concentrations are highly variable between sites and years and mostly related to inflows and watershed factors (i.e. run off, soil type, farming and livestock practices).



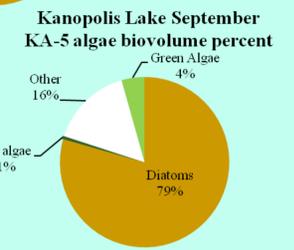
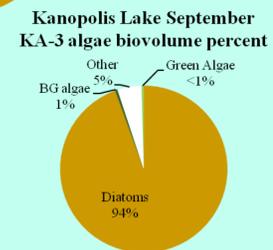
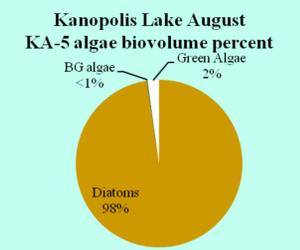
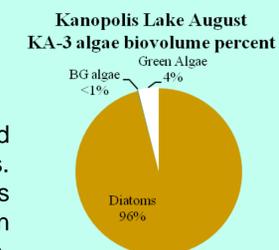
Dissolved Oxygen

Dissolved oxygen (D.O.) is an important factor in aquatic species location, growth, and ultimately survival in lakes. Low dissolved oxygen (<5 mg/L shown in red) can be a concern due to the shallow average depth of Kanopolis. Kanopolis showed weak stratification in July, but oxygen remained optimal for aquatic life in 2014.



Algae

Algae and green plants are the base of the food chain in a lake and function to convert nutrients and CO₂ via photosynthesis into biomass for all aquatic life. In 2014, the Kanopolis Lake algae community was repressed from lack of sunlight penetration due to turbid water and suspended sediment. August and Sept. phytoplankton sampling indicated that 79-98% of the algae species were diatoms in the upper and lower lake with 1% or less blue green algae. Algal cell counts were very low with maximum count at 6,388 cells/mL at KA-5 in September. USACE toxin samples collected in July-Sept did not contain any algal toxins.



Water Quality Concerns:

- Sediment inputs
- Eutrophication
- Dissolved Oxygen
- Sulfate



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