

Hillsdale Lake Water Quality Data

2001-2011

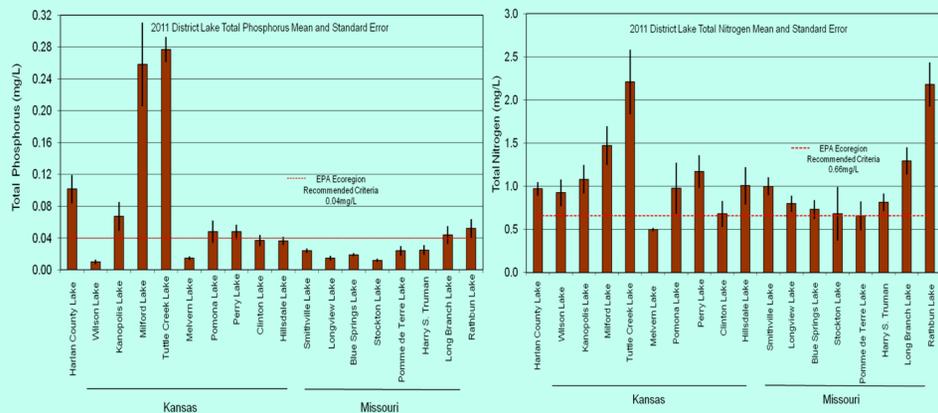


Hillsdale Lake:

- Built on Big Bull Creek 29.1 km (18.2 miles) upstream of the confluence with the Marais des Cygnes River
- Watershed = 144 sq miles (92,160 Acres)
- Capacity:
 - Flood Control: 83,000 Acre Feet (AF)/ 7,413 surface acres (SA)
 - Multipurpose: 76,300 AF / 4,575 SA / 51 miles of shoreline
- Operating project purposes: flood control, water quality, recreation, fish and wildlife, and water supply.
- Avg. annual inflow (1980-2011)=90,600 AF: 2011 inflow=48,800 AF

Nutrient Enrichment

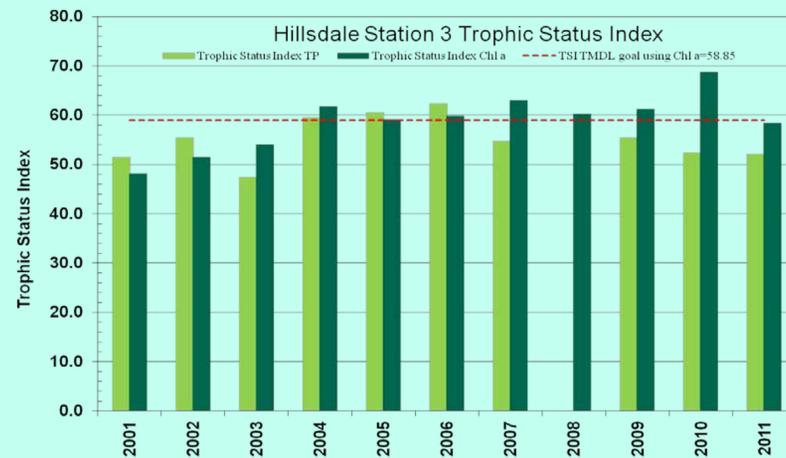
Nutrients (i.e. phosphorus and nitrogen) are essential for aquatic life and are the primary factor driving fish and aquatic plant growth rates and productivity. Excess nutrients from urban, agricultural or natural sources increases the natural aging or eutrophication process in lakes. This can alter plant and aquatic life in lakes and water bodies, cause algal blooms, create low dissolved oxygen that affect fish survival, and lead to taste and odor issues in drinking water. Hillsdale Lake is listed on the approved 2010 Ks 303(d) list of impaired waters due eutrophication. EPA and KDHE are working with water quality partners, landowners to focus watershed conservation efforts on priority or target areas in the watershed to reduce nutrient and sediment runoff. This approach is designed to improve water quality and reduce designated impairments at Hillsdale Lake. In 2011, Hillsdale Lake was near average total nitrogen in the Kansas City District, but below average (0.06 mg/L) for total phosphorus measured at the site nearest the dam. Average TP at Hillsdale Lake was below EPA Ecoregion recommended criteria while TN exceeded recommendations. Standard error bars in the graphs below illustrate the variation in sample results from each site in 2011.



The US Army Corps of Engineers Water Quality Program collects monthly data (April – September) at Hillsdale Lake. These graphs present data collected between 2001-2011 from up to 7 sites. Three lake sites (#3, 6,11), and the outflow (#2) were sampled in 2011. Thirty-four chemical, physical and biological parameters are measured to evaluate water quality. COE use this data to describe conditions and changes from the inflows through the lake and outflow focusing on eutrophication, nutrients, sediment, herbicides, metals, and contaminants.

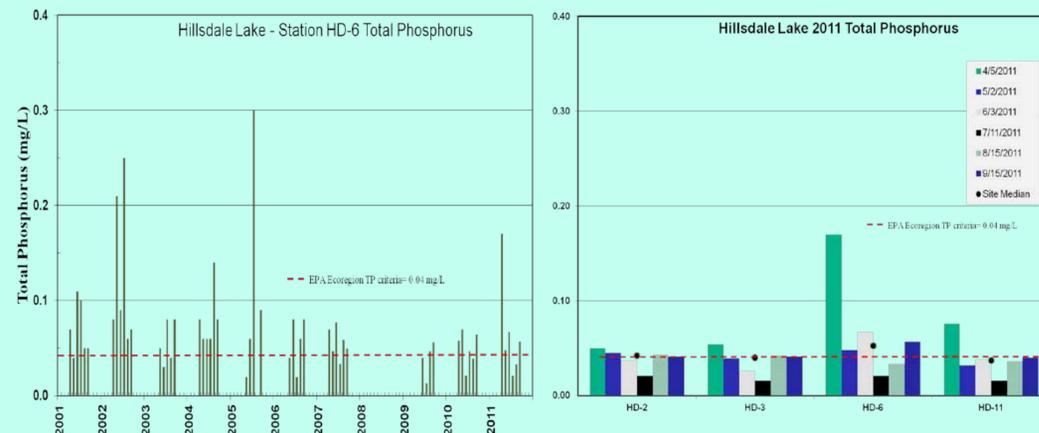
Trophic Status Index

Trophic Status Index is a calculation based on average summer chlorophyll a from algae, total phosphorous, or secchi measurements. It is used to describe eutrophication as related to the KS 303(d) impaired waters list. EPA has worked with water quality partners to develop Total Maximum Daily Loads (TMDL) to regulate nutrient enrichment to keep Hillsdale Lake water quality acceptable for recreational, aquatic life, drinking, and industrial needs. Hillsdale TSI values in 2011 were below the TMDL and classified Hillsdale as eutrophic. TSI values of less than 58 are the goal.



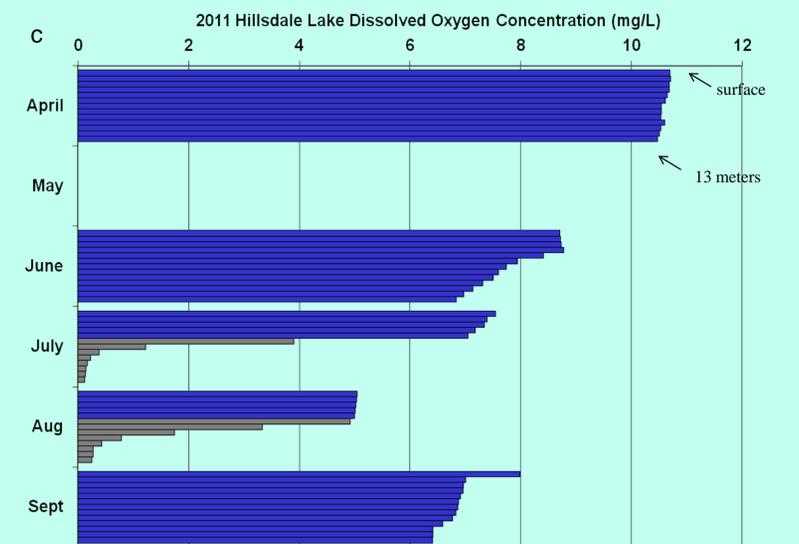
Total Phosphorus

Total phosphorus (TP) median concentrations from 2011 Hillsdale Lake samples were at or slightly higher than EPA Ecoregion recommended criteria (0.04 mg/L). Median TP at all Hillsdale Lake sites are in the range of high biological productivity leading to high algae populations and rapid fish growth as indicated by eutrophic class designation. Minor blue green algae bloom have occurred infrequently at Hillsdale including 2011, but conditions (i.e. nitrogen:phosphorus ratio, turbidity, lake turnover rate) tend to favor beneficial green algae species over toxic blue green species. In 2011, TP values were similar to long term trends which seem to be improving. The most recent 5 years of TP data in Big Bull Creek Arm of Hillsdale Lake (HD-6) were significantly less than 2001-2011 TP median of 0.07 mg/L.



Dissolved Oxygen

Dissolved oxygen (D.O.) is an important factor in aquatic species location, growth, and ultimately survival in lakes. Some lakes undergo a process called stratification or develop layers based on temperature and oxygen. This process begins in late spring, remains throughout the summer, and breaks apart (de-stratifies or 'turns over') in the fall. The figure 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 through September at the dam (HD3). Hillsdale Lake typically stratifies during summer months and lack of adequate (5 mg/L) dissolved oxygen can stress fish. In 2011, Hillsdale Lake stratification was apparent in July and August. During this period, the top 5 meters of Hillsdale had sufficient oxygen with D.O. concentrations nearing the 5 mg/L threshold.



Water Quality Concerns:

- Eutrophication
- Dissolved Oxygen- (shallow depth of stratification)



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