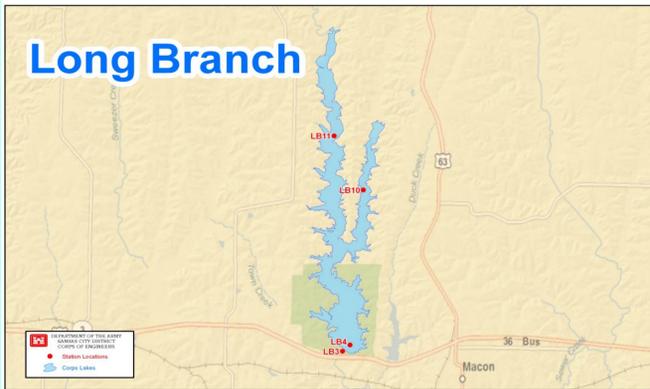


# Long Branch Lake Water Quality Summary

## 2005-2014



### Long Branch Lake

- Built on East Fork Little Chariton River reaching full pool in 1976.
- **Watershed:** 109 square miles / 69,760 Surface Acres (SA)
- **Capacity:**
  - Flood Control: 3,663 SA
  - Multipurpose: 1,181,640 AF / 2,429 SA / 24 miles of shoreline
  - Avg. annual inflow (05-14) = 84,826 AF, 2014 avg. inflow= 66,718 AF
- **Operating project purposes:** flood control, water quality, recreation, fish and wildlife, and water supply.
- **Water Quality** at Long Branch Lake in 2014 was beneficial to operating purposes listed with documented exception of dissolved oxygen levels measured below MO State WQ Standards for "Protection of Aquatic Life-AQL" at LB-4 in August. This exception is attributed to biological processes not resulting from introduced contaminants as regulated in state code (10 CSR 20-7.031).

### Nutrient Enrichment

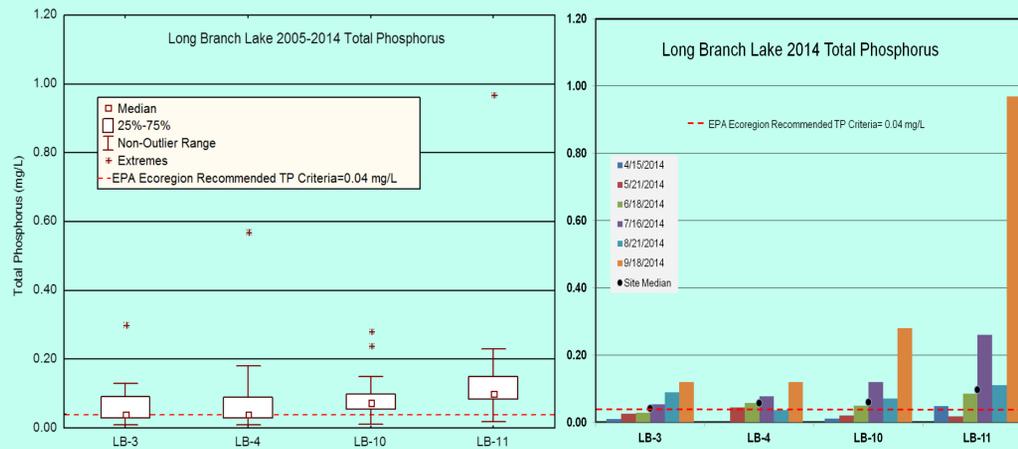
Nutrients (i.e. phosphorus and nitrogen) are essential for aquatic life and are the primary factor driving fish and aquatic plant growth rates and productivity. Excess nutrients from urban, agricultural or natural sources increases the natural aging process in lakes. This rapid aging process, called 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. In 2014, Long Branch Lake total nitrogen concentration and total phosphorus concentration was less than District Lake average of 0.68 mg/L and 0.094 mg/L, respectively. Long Branch Lake average TN concentration was below the EPA ecoregion recommended criteria, while the TP concentration was well above. Most of the lake can be classified in the eutrophic range (i.e. 0.24-0.96 mg/L) for summer total phosphorus as described by Carlson trophic class system. A high level of biological productivity and algae growth combine with shallow average depth at Long Branch Lake causing low dissolved oxygen concentrations during late summer months. Standard error bars in the figures 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 Long Branch Lake\* from April through September. These figures present data collected between 2005-2014 from four lake sites (#4, 10, 11), and the outflow (#3) 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.

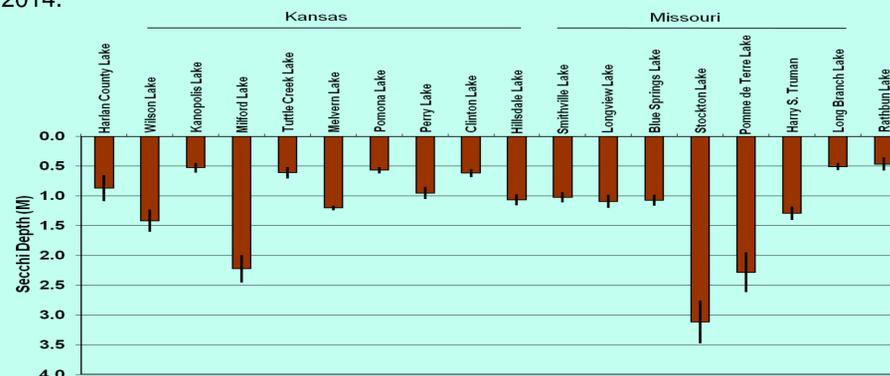
### Total Phosphorus

Total phosphorus (TP) median concentrations from 2014 Long Branch Lake samples were higher than EPA ecoregion recommended criteria (0.04 mg/L) for all lake sites. Median TP at all Long Branch 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. In 2014, Long Branch TP concentrations were similar to long term medians and trends with phosphorus concentrations highest in spring and fall months except for one extreme value in September. Similar to most impoundments, higher TP concentrations and a wider range of values are usually found in the upper lake sites due to mobilized nutrients bound to silt particles transported in moving water near the inflows and biological uptake or consumption of TP as the water moves through the lake.



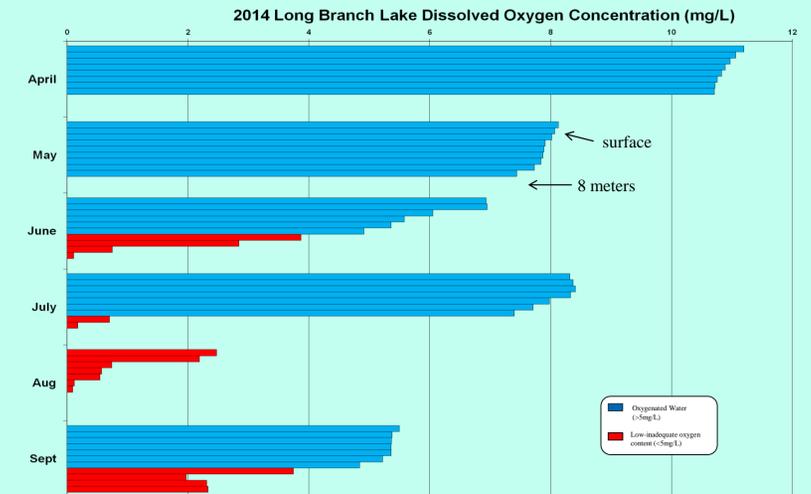
### Secchi depth

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. Lakes with low nutrients, turbidity, and total suspended solids typically have high secchi measurements. Long Branch has high levels of nutrients, planktonic algae, and inorganic turbidity which combine to reduce water visibility at Long Branch Lake. It has second the lowest average secchi measurements of all District Lakes for 2014.



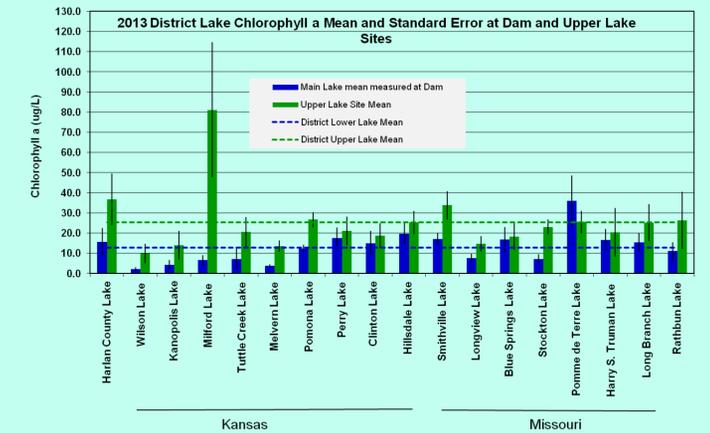
### Dissolved Oxygen

Dissolved oxygen is a critical factor in aquatic species location, growth, and ultimately survival in lakes. The figure below shows dissolved oxygen (D.O.) 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. Stratification can be seen during June and July before dropping to marginal levels (i.e. less than 5 mg/L) in August. Adequate (>5mg/L) D.O. was available in the top 5 meters during most of 2014 except the sample date in August.



### Algae

Algae and green plants are the base of the food chain in aquatic food webs converting nutrients and CO<sub>2</sub> through photosynthesis into biomass for all aquatic life. Chlorophyll A is a measure of the active green pigment present in beneficial algae and harmful blue-green algae (cyanobacteria) active in this process. Long Branch Lake typically has high levels (>20ug/L) of chlorophyll A in the upper and lower lake indicating excess nutrients and eutrophic conditions. Blue-green algae is present, but not typically dominant and toxic blooms have not been documented.



### Water Quality Concerns:

- Low Dissolved Oxygen
- Eutrophication
- Sediment inputs



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Environmental Resources Section  
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