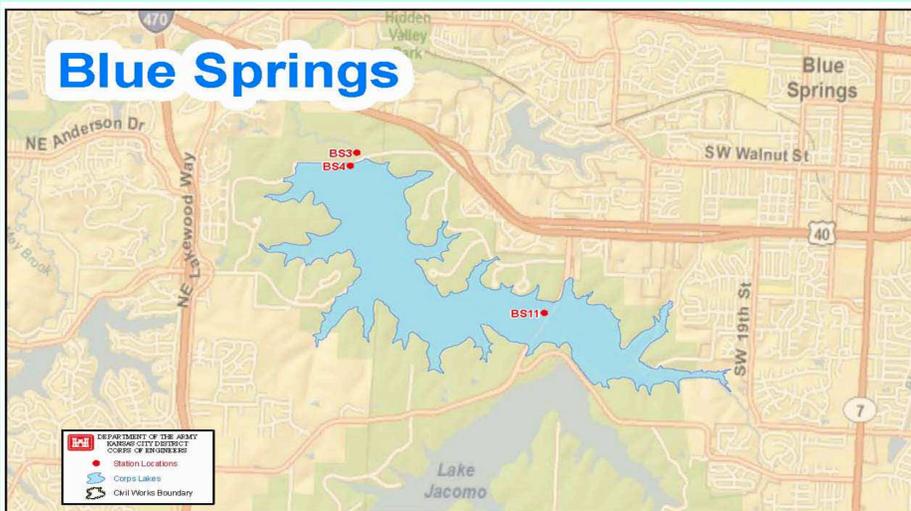


# Blue Springs Lake Water Quality Data

## 2001-2011

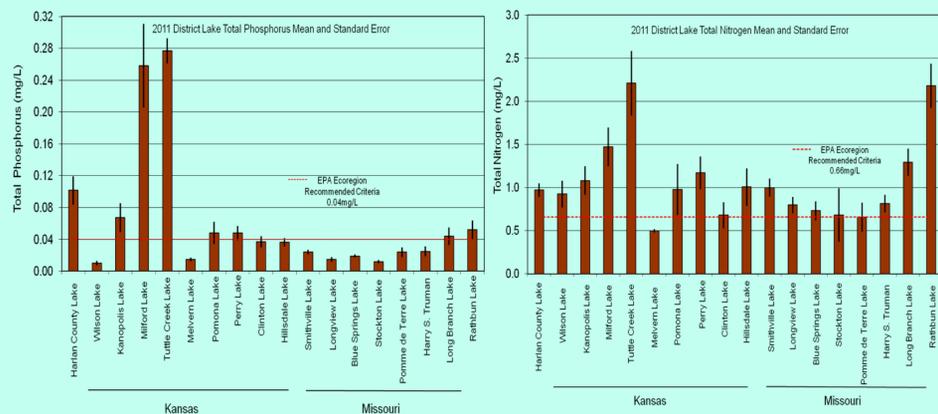


### Blue Springs Lake

- Built on East Fork Little Blue River reaching full pool in 1990.
- Watershed = 33 square miles/ 21,120 Surface Acres (SA)
- Capacity:
  - Flood Control: 15,715 Acre-feet (AF) / 982 SA
  - Multipurpose: 10,842 AF / 722 SA / 12 miles of shoreline
  - Avg. annual inflow (2001-2011)= 28,300 AF; 2011=16,900 AF
- Project Operating purposes: flood control, recreation, and fish and wildlife

### Nutrient Enrichment

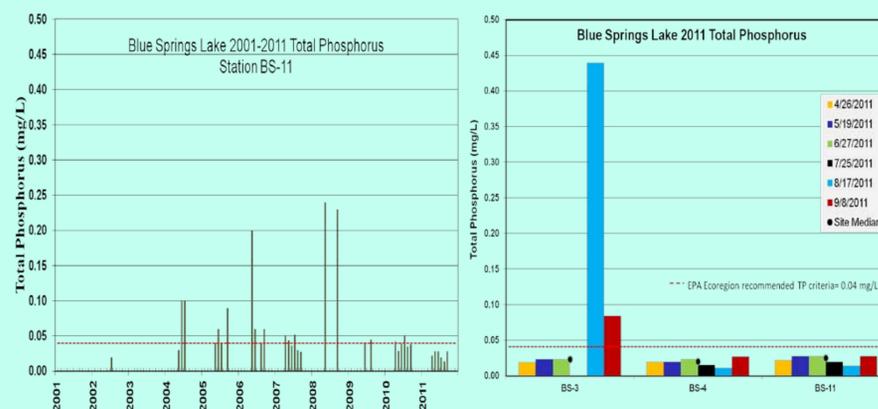
Nutrients (i.e. phosphorus and nitrogen) are essential for aquatic life and are the primary factor driving fish and aquatic plant growth rates and productivity. Excess nutrients from urban, agricultural or natural sources increases the natural aging or eutrophication process in lakes. This can alter 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. Despite urban influences, nutrient concentrations at Blue Springs Lake are typically stable and measured at moderate levels. In 2011, Blue Springs Lake average total nitrogen concentration was slightly higher than average for District Lakes (1 mg/L), but below District Lake average (0.06 mg/L) for total phosphorus at the site nearest the dam. Blue Springs Lake average TP concentration was below the EPA Ecoregion recommended criteria and in the mesotrophic range (i.e. 0.012-0.024 mg/L) as described by Carlson's trophic class system. However, summer chlorophyll values and secchi disk measurements also used to calculate trophic status indicate that Blue Springs Lake is eutrophic (e.g. TSI=60). Standard error bars in the figures below illustrate the variation in sample results from each site in 2011.



The US Army Corps of Engineers (COE) Water Quality Program collects monthly water samples (April – September) at Blue Springs Lake. These graphs present data collected between 2001-2011 from 3 sites. The sites include inflow (#24), three lake sites (#4,11) and the outflow (#3). 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.

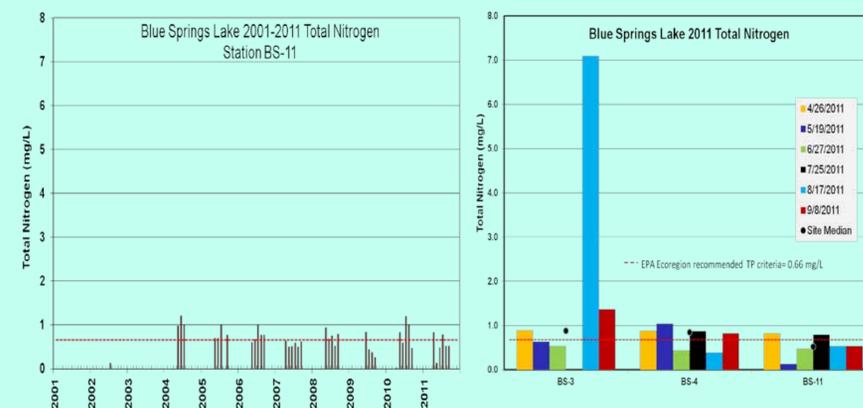
### Total Phosphorus

Total phosphorus (TP) median concentrations from 2011 Blue Springs Lake samples were lower than EPA Ecoregion Criteria (0.04 mg/L). The one exceptional TP measurement occurred in August in the outflow which included a large concentration of dead Asian carp that had been stranded in July. Median 2011 TP at all Blue Springs Lake sites are in the range of moderate biological productivity. From 2001-2011, Blue Springs Lake average TP (0.06 mg/L) concentration was slightly higher than with EPA Ecoregion recommended criteria as a result of spring pulses of phosphorus rich water in some years. Similar to most impoundments, higher TP concentrations and a wider range of data is 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 decline of TP as the water moves through the lake. Upstream impoundments dampen this effect at Blue Springs Lake.



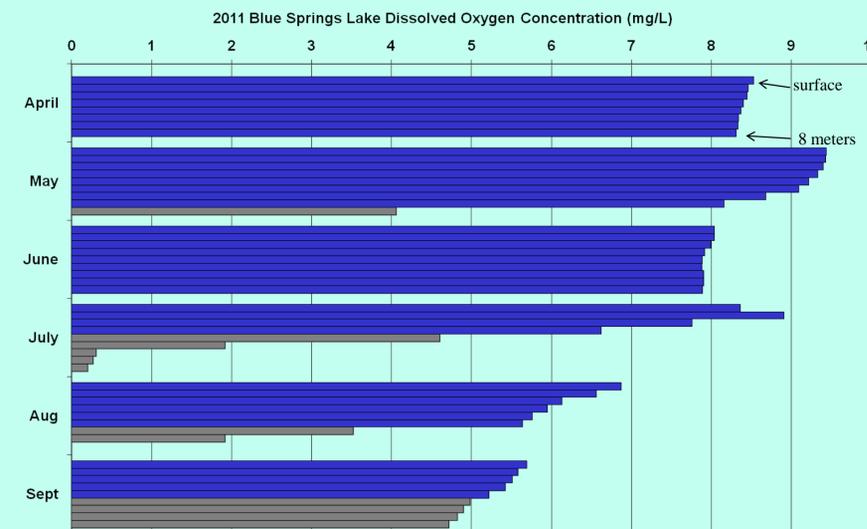
### Total Nitrogen

Total nitrogen concentrations at Blue Springs Lake sites occasionally exceed EPA Ecoregion recommended criteria of 0.66 mg/L from 2001-2011. Total nitrogen concentrations are less variable between sites and years at Blue Springs Lake than most lakes due to stable inflow levels and other watershed factors (i.e. stable soils and limited farming practices).



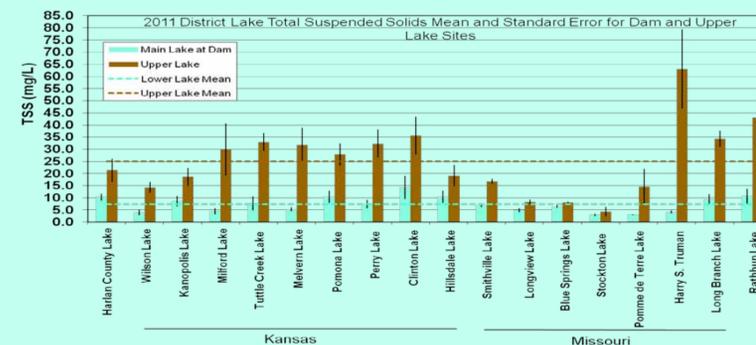
### Dissolved Oxygen

Dissolved oxygen is a 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. Blue Springs Lake typically stratifies for a short period of the summer, but adequate (5 mg/L) dissolved oxygen is typically available. In 2011, the top 4 meters of the lake was well oxygenated for fish and aquatic life throughout the summer.



### 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, and characteristics of inflowing streams. TSS is 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. In 2011, Blue Springs Lake TSS values were below average for District indicating a stable watershed primarily due to settling of runoff and inflows in upstream impoundments.



### Water Quality Concerns:

- Eutrophication
- Nutrients

