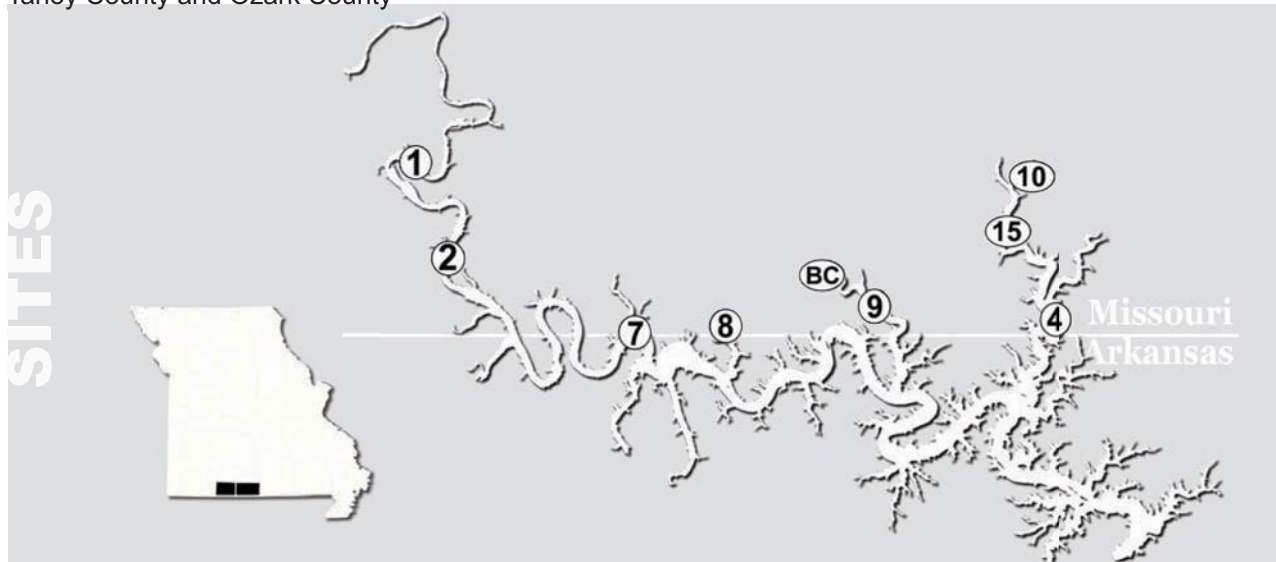


Bull Shoals Lake

Taney County and Ozark County



SITES

2006 SUMMARY

LMVP volunteers monitored nine sites on Bull Shoals Lake during the 2006 sample season. Three sites were in the main lake channel (1, 2, 7), two sites were in the Big Creek tributary (BC, 9), three sites in the North Fork tributary (4, 10, 15), and one site in the tributary of Shoal Creek (8).

Water quality varied among sites, which is to be expected given the sites' different hydrology and proximity to nutrient sources. Average phosphorus values at sites 1, 10 and 15 ranged from 12 to 22 $\mu\text{g/L}$, while the remaining sites had average phosphorus values of less than 10 $\mu\text{g/L}$. Phosphorus concentrations at site 1 reflect nutrients in water coming from Lake Taneycomo, while the proximity of sites 15 and 10 to Theodosia (and lower water volume) likely contributes to their relatively high nutrient concentrations.

It is common for up-lake sites to have concentrations of phosphorus that are higher than observed at the dam. The lake volume increases and flow slows nearer the dam, which allows for particulates (e.g. phosphorus and sediments) to settle out. Bull Shoals is no exception, with phosphorus concentrations decreasing from site 10 to site 4 (North Fork) and from site 1 to site 7 (Main channel).

Average nitrogen concentrations varied less than phosphorus. Only the groundwater-influenced Big Creek site (BC) had an average

nitrogen value that was $>500 \mu\text{g/L}$. The nitrogen does not remain long in the surface water, as nitrogen levels at the downstream Site 9 were under 300 $\mu\text{g/L}$. Most of the other sites were in the 300 $\mu\text{g/L}$ range.

Average chlorophyll ranged from a low of 1.1 $\mu\text{g/L}$ at Site BC to a high of 14.1 $\mu\text{g/L}$ at Site 10. Chlorophyll values at Site BC were extremely low and reflect the ground water source at this site. The higher nutrients at Site 10 are able to support greater algal biomass and thus the higher chlorophyll levels.

The average Secchi transparency ranged from a low of 45 inches at Site 10 to over 120 inches at sites 4 and 7. The minimum average Secchi corresponds to the site with the highest algal chlorophyll, while sites 4 and 7 had two of the lowest average chlorophyll values (Secchi was not measured at Site BC, were minimum chlorophyll was measured).

Inorganic suspended sediment was measured at Site BC. Suspended sediment can be thought of as soil material that is small enough to remain suspended in water (though sedimentation will generally occur over time). Measurements of ISS at Site BC ranged from 0.8 to 2.2 mg/L , with an average of 1.4 mg/L . This range and average level of ISS is similar to values found during the prior three years at this site.

Bull Shoals Lake

Taney County and Ozark County

2006 SUMMARY

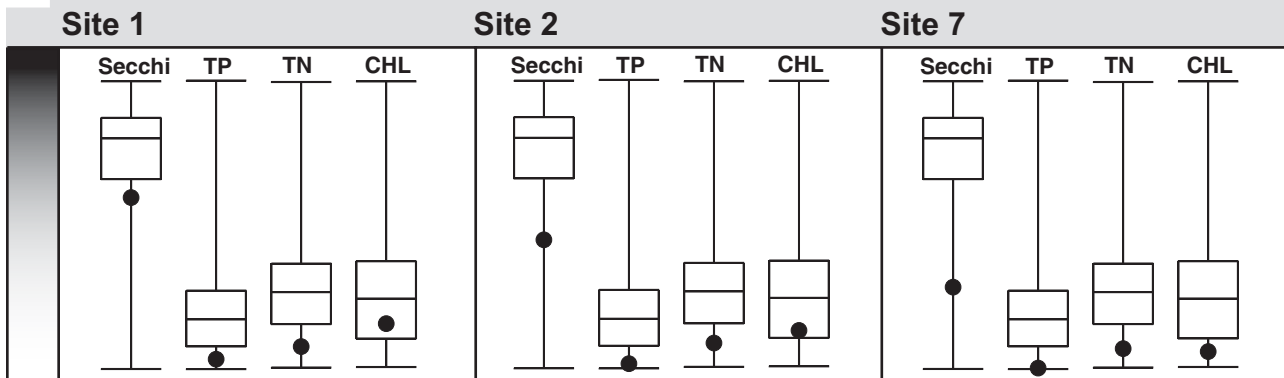
Parameter		1	2	7	8	BC	9	10	15	4
Secchi	Mean	72	96	122	79		107	45	72	129
	Min	58	67	106	58		84	34	53	97
	Max	82	124	138	108		144	69	99	168
TP	Mean	13	9	7	9	8	6	22	12	5
	Min	10	6	5	4	3	4	11	9	4
	Max	17	18	10	13	12	9	38	20	7
TN	Mean	347	366	332	327	516	291	445	364	307
	Min	240	250	280	270	340	260	290	240	210
	Max	620	620	370	440	800	310	700	460	420
CHL	Mean	9.4	8.0	4.1	6.7	1.1	2.7	14.1	7.6	2.8
	Min	5.8	5.1	2.2	3.3	0.7	1.4	6.6	3.4	1.0
	Max	23.3	17.6	6.6	11.7	1.6	10.8	34.4	17.3	7.9
ISS	Mean					1.4				
	Min					0.8				
	Max					2.2				

RELATIVE RANK

RELATIVE RANK

For the most part, water quality at the various sites on Bull Shoals Lake is some of the best in the state. Nutrient levels tend to be lower than that found in 75% of Missouri lakes, with phosphorus being near the low end of what can be expected in Missouri lakes. Chlorophyll concentrations were also low relative to Missouri's lakes. The site with the highest chlorophyll was Site 10, where the mean chlorophyll level was right around the state's median level. The remainder of the sites had chlorophyll

levels that were below the state's median, with some being down in the very lowest range of what we find in the state. Because algal biomass is low and suspended sediments are not prevalent, water clarity in Bull Shoals Lake is exceptional, with all sites (except Site 10) having greater Secchi clarity than 75% of Missouri lakes.

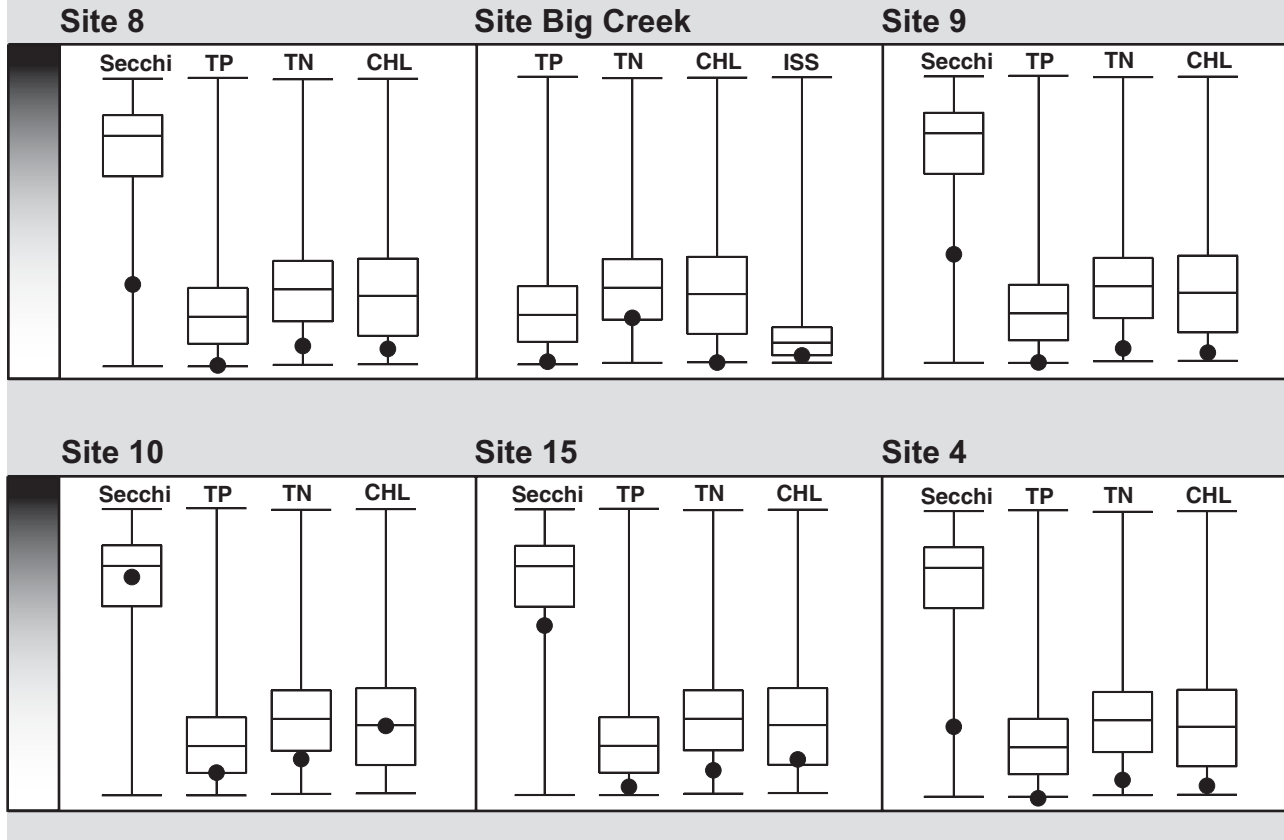


Bull Shoals Lake

Taney County and Ozark County

RELATIVE RANK

See page 11 for details

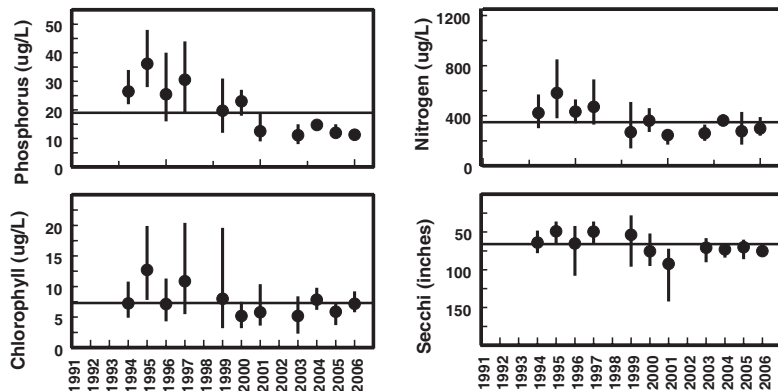


Three sites on Bull Shoals Lake have been monitored for 6 or more years. Two of these sites are along the main channel, below Taneycomo's Powersite Dam. The third is below Theodosia, in the Little North Fork Arm, the eastern most arm in Missouri.

Nutrient concentrations and chlorophyll levels at Site 1 have generally been lower since 1999. This reduction in nutrients (especially phosphorus) probably reflects lower inputs coming from Lake Taneycomo due to phosphorus removal at the treatment plants in Branson and Springfield, as well as a small shift in the sample site location between 1997 and 1999.

TRENDS

Site 1



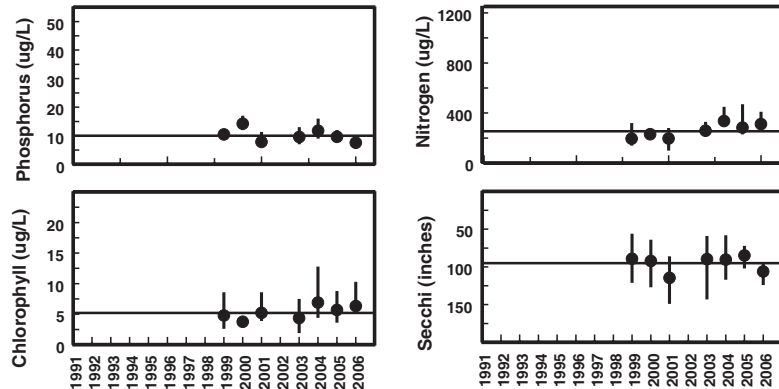
Bull Shoals Lake

Taney County and Ozark County

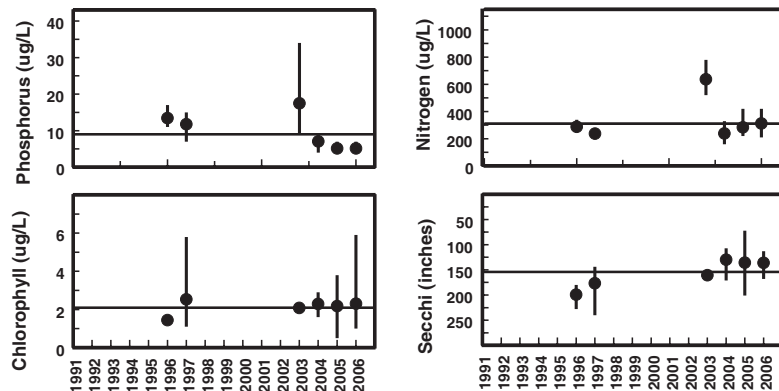
TRENDS

Phosphorus concentrations and Secchi depths have not changed over time at Site 2, but the nitrogen and chlorophyll levels have increased slightly. Nitrogen levels during 1999-2001 averaged around 200 µg/L, while nitrogen during the past four years have been over 300 µg/L. The increase in chlorophyll is minimal, but worth watching in future years.

Site 2



Site 4



Secchi transparency at Site 4 has decreased, with median values during the last four years being about 40 inches lower than those from 1996 and 1997. This decrease in clarity does not seem to relate to an increase in algal chlorophyll or changes in nutrient levels.

Bull Shoals Lake

Taney County and Ozark County

TRENDS

Site 7 is the main channel site closest to the dam.

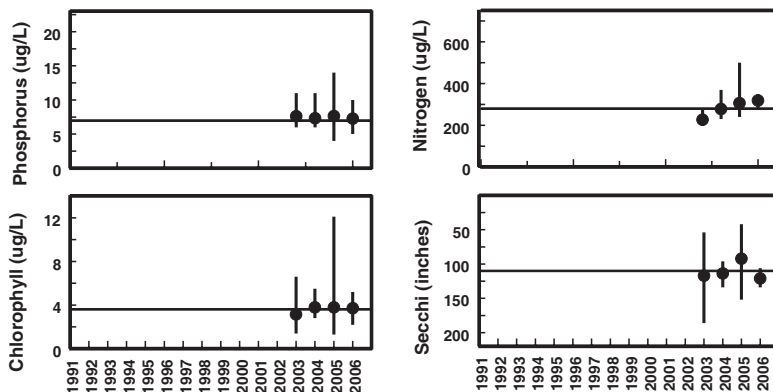
There are no apparent water quality trends. Only through continued monitoring will we be able to determine if the minor increase in nitrogen concentrations constitutes a trend.

The two Big Creek sites reveal no water quality trends.

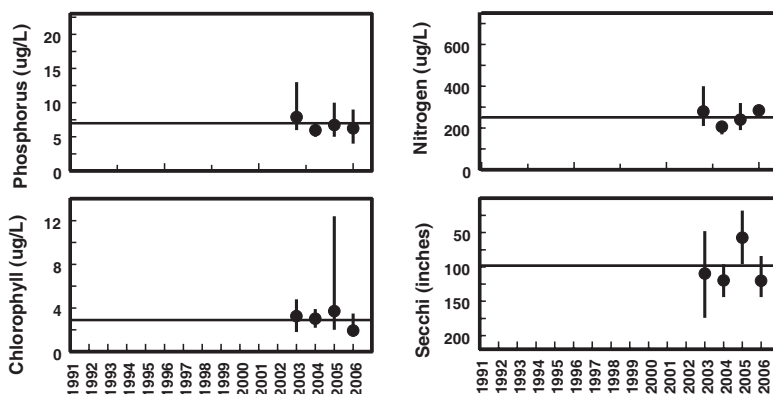
Secchi at site 9 was unusually low in 2005, due to some relatively high peak chlorophyll values.

In 2006, site BC had slightly higher concentrations of suspended sediments and slightly higher phosphorus concentrations than observed previously. These slightly higher ISS values may be within the normal range of variability for this site and does not necessarily represent a downturn in water quality.

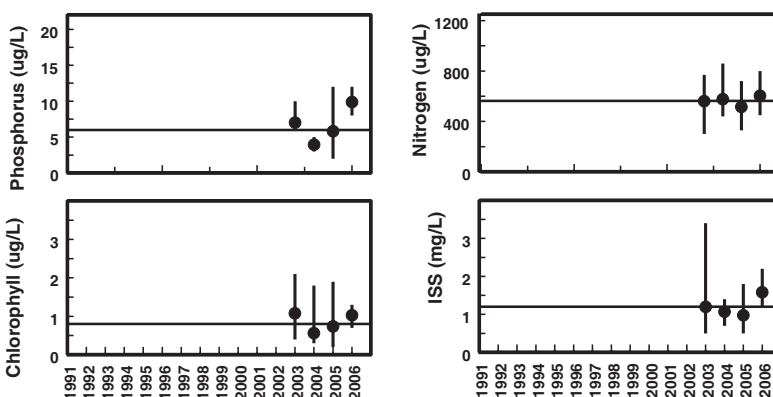
Site 7



Site 9



Site BC



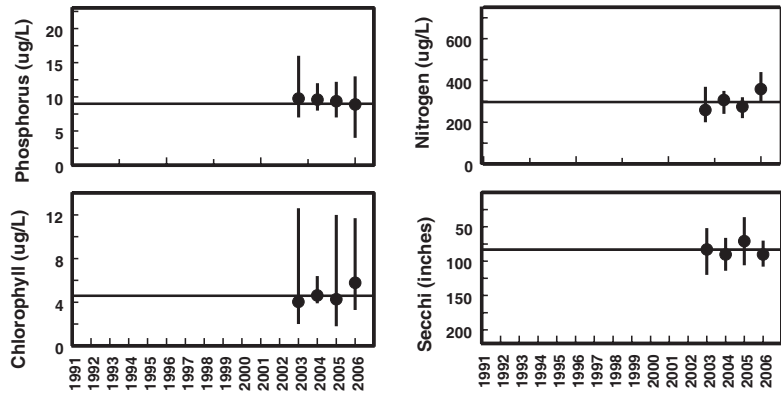
Bull Shoals Lake

Taney County and Ozark County

TRENDS

There is no observable trend apparent from the last four years of data from site 8. Only with additional years of data will we be able to determine if any trends are occurring at site 8.

Site 8

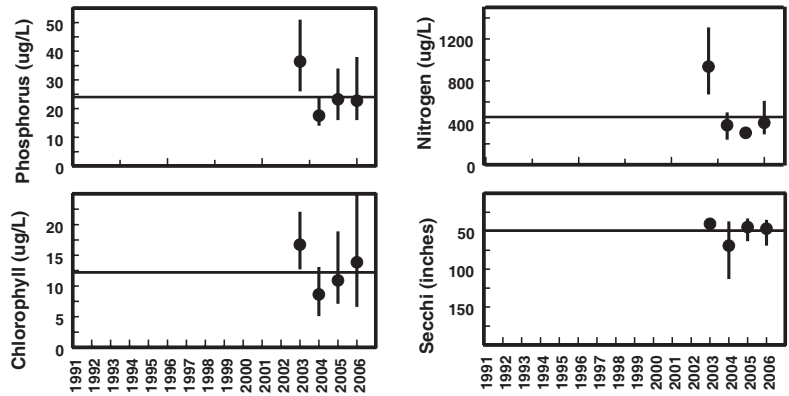


Site 10

Nutrients concentrations were high at site 10 in 2003. The mean chlorophyll concentration was also high that year as the algae took advantage of the abundant nutrients.

Site 15, roughly three miles down-lake, did not exhibit the elevated nutrient and chlorophyll concentrations witnessed at site 10 during 2003.

Conditions at site 15 have remained remarkably consistent over the last four years.



Site 15

