

Table Rock Lake

Region - Ozark Highlands

Table Rock Lake is a 43,100 acre Army Corps of Engineers reservoir located in southwest Missouri. This lake is in the White River system and is preceded upstream by Beaver Lake in northwest Arkansas. The lake consists of a long, winding main branch and three major arms. Kings River and Long Creek flow north out of Arkansas to enter Table Rock Lake while the James River flows south from the central Ozark Highlands Region. The majority of the lake's watershed is forested, but development around the lake and urban areas on the lake's tributaries threaten water quality.

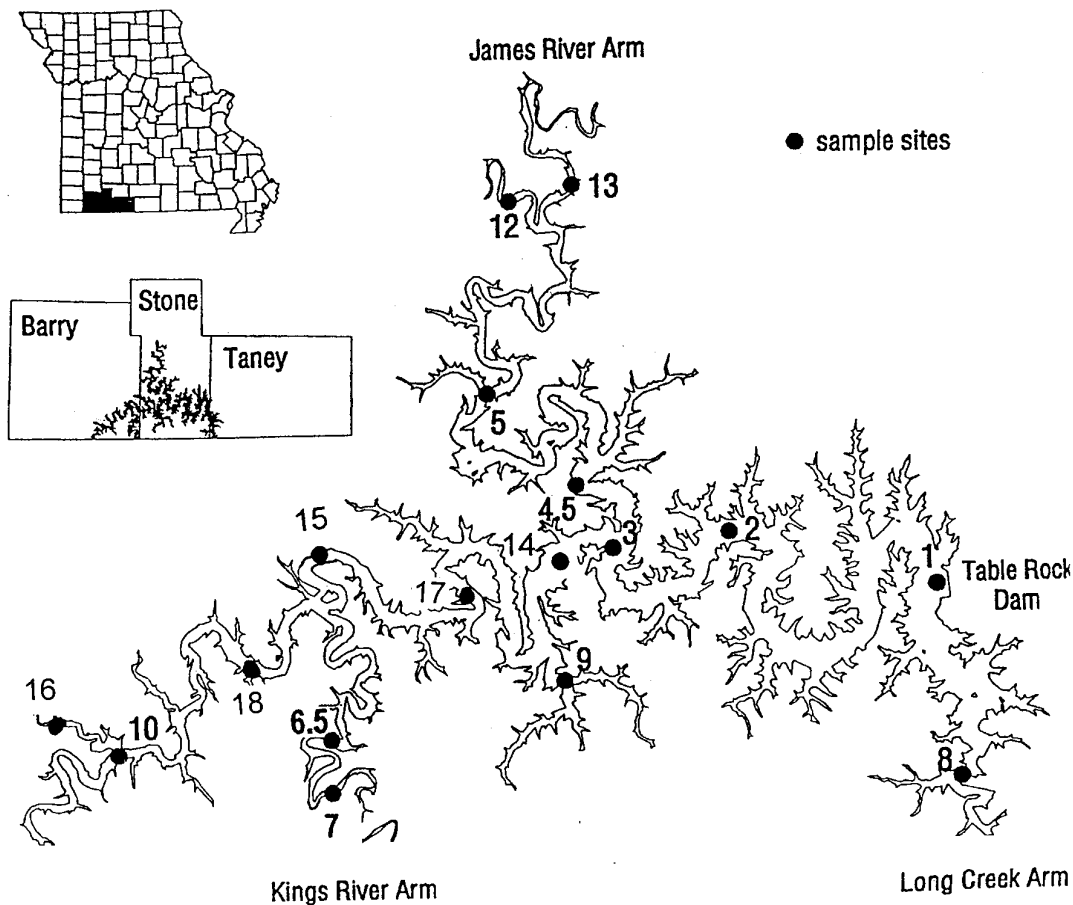


Figure 43. Location of Table Rock Lake sample sites.

- ▶ Data was collected at 17 sites on Table Rock Lake during 2000.
- ▶ Sites monitored for all parameters had at least eight samples collected with the exception of Site 16 which was sampled six times, Site 3 was sampled seven times and Site 10 was sampled five times.

Table 22. Trophic classifications for 2000 based on average phosphorus, nitrogen and chlorophyll values.

Main Lake Channel	Tributaries	James River Arm
Site 1 - mesotrophic	Site 6.5 - eutrophic	Site 4.5 - mesotrophic
Site 2 - mesotrophic	Site 7 - eutrophic	Site 5 - eutrophic
Site 3 - mesotrophic	Site 8 - mesotrophic	Site 13 - hypereutrophic
Site 14 - mesotrophic	Site 9 - mesotrophic	
Site 15 - mesotrophic	Site 12 - eutrophic	
Site 10 - mesotrophic	Site 16 - eutrophic	
Site 17 - mesotrophic		
Site 18 - mesotrophic		

- ▶ The trophic states from at least two out of three parameters were used to determine the trophic state of the site. All sites were either mesotrophic, eutrophic or hypereutrophic. No sites were in the oligotrophic range.
- ▶ Site 13 is the northern site in the James River Arm. There is a gradient from Site 13 to Site 4.5, the site closest to the main lake channel, of decreasing amounts of nutrients and algal chlorophyll.
- ▶ See page 78 for long term trend analysis.

Table 23. Descriptive statistics from the main lake channel sites on Table Rock Lake - 2000.

Parameter		Site 10	Site 18	Site 15	Site 17	Site 14	Site 3	Site 2	Site 1
Nitrogen ($\mu\text{g/L}$)	average	428	405	374	388	353	337	353	314
	median	410	400	370	365	345	330	375	310
	minimum	270	340	280	250	280	290	180	170
	maximum	660	510	520	520	450	410	510	470
Phosphorus ($\mu\text{g/L}$)	average	16	15	18	11	12	9	10	9
	median	15	13	16	11	12	10	10	9
	minimum	12	10	12	7	9	5	9	6
	maximum	22	23	29	19	15	12	13	14
Chlorophyll ($\mu\text{g/L}$)	average	6.5	6.5	6.1	4.5	2.9	5.0	4.3	3.4
	median	6.4	5.3	6.1	4.5	3.1	4.7	4.7	3.3
	minimum	4.5	3.5	4.2	2.9	2.1	3.4	2.1	2.0
	maximum	9.2	13.6	8.6	7.8	3.6	7.3	6.0	4.8
Secchi (inches)	average	79	85	115	110	114	112	136	151
	median	77	83	115	113	113	132	134	150
	minimum	72	72	91	63	72	53	117	123
	maximum	87	111	154	138	149	144	156	188

- ▶ Nutrient values show moderate variability at individual sites. Although values were relatively stable across the lake, there was a slight decrease in the average nutrient values from Eagle Rock (Site 10) to the dam (Site 1).
- ▶ Chlorophyll values had low to moderate variability at individual sites, but were comparable to each other.
- ▶ Note that the Secchi values demonstrate more variability than the chlorophyll. See page 64 for an explanation of this Secchi to chlorophyll relationship.

Table 24. Descriptive statistics from sites on the James River Arm of Table Rock Lake - 2000.

Parameter		Site 13	Site 5	Site 4.5
Nitrogen ($\mu\text{g/L}$)	average	980	536	371
	median	920	465	365
	minimum	560	330	240
	maximum	1540	1020	530
Phosphorus ($\mu\text{g/L}$)	average	179	30	12
	median	119	33	12
	minimum	76	18	9
	maximum	347	37	16
Chlorophyll ($\mu\text{g/L}$)	average	68.2	16.5	5.8
	median	66.7	17.8	5.5
	minimum	35.5	9.8	3.7
	maximum	109.0	22.1	9.8
Secchi (inches)	average	33	66	95
	median	33	61	95
	minimum	26	54	61
	maximum	39	112	139

- ▶ Values for Site 13 are quite variable for all parameters, excluding Secchi. While average nitrogen values are 2.5 to 3 times greater at Site 13 than the main lake channel, the phosphorus values are almost 20 times greater than some average values in the main lake channel.
- ▶ Note the longitudinal gradient with higher values at Site 13 which decrease moving down to Site 4.5. Values at Site 4.5 (Oswald Bluff) are comparable to the values in the main lake channel.

Table 25. Descriptive statistics from tributary sites on Table Rock Lake - 2000.

Parameter		Site 12	Site 16	Site 9	Site 8	Site 7	Site 6.5
Nitrogen ($\mu\text{g/L}$)	average	954	742	354	353	748	523
	median	815	830	340	360	690	535
	minimum	500	490	290	250	370	300
	maximum	1650	1000	480	430	1400	720
Phosphorus ($\mu\text{g/L}$)	average	54	32	12	13	101	51
	median	39	31	12	12	77	49
	minimum	11	26	10	9	57	26
	maximum	187	42	15	16	206	86
Chlorophyll ($\mu\text{g/L}$)	average	28.3	13.6	4.7	5.6	29.4	22.2
	median	2.3	13.0	4.6	5.7	28.2	21.5
	minimum	0.6	7.4	2.9	4.0	4.0	8.3
	maximum	155.6	19.9	7.3	8.0	60.3	36.7
Secchi (inches)	average	50	64	108	117	35	41
	median	43	66	102	120	31	40
	minimum	24	57	60	84	25	31
	maximum	93	70	168	150	55	62

- ▶ Site 12, located in Flat Creek off of the James River Arm near Cape Fair, had elevated values compared to the main lake channel. Due to dry spring and low lake levels, the volunteer was not always able to reach the site, therefore some samples were collected downstream of the site. Values from Site 12 were variable and comparable to those at Site 13.
- ▶ Sites 7 and 6.5, in the Kings River, have elevated values when compared to the main lake channel. Note the longitudinal gradient from Site 7 to Site 6.5. The average phosphorus value at Site 7 was over 10 times greater than the average phosphorus value measured at the dam (Site 1).
- ▶ Site 9 (Indian Creek) and Site 8 (Long Creek) have values similar to the main lake channel.
- ▶ Site 16, added this year, is in the Roaring River. All parameters, except Secchi, were approximately 1.5 to 2 times greater that the main lake channel.

Table 26. Trophic assessment of sites on Table Rock Lake based on average chlorophyll values.

Site	1992	1993	1994	1995	1996	1997	1998	1999	2000
1		M	M	E	O	M	M	M	M
2		M	E	E	M	M	M	E	M
3	E	E	E	E	M	M	M	E	M
4.5				E	M	M	E	E	M
5	E	E		E	E	E	E		E
6.5					E	E	E	E	E
7					E	E	E	E	E
8		M	E	E	M	M	E	E	M
9			E	E	M	M	M	E	M
10			M	E	M	M	M	E	M
11				E	E	E	E		
12				H	E	E	H	H	E
13				H	H	H	H	E	H
14								E	O
15								E	M
16									E
17									M
18									M

O = Oligotrophic

M = Mesotrophic

E = Eutrophic

H = Hypereutrophic

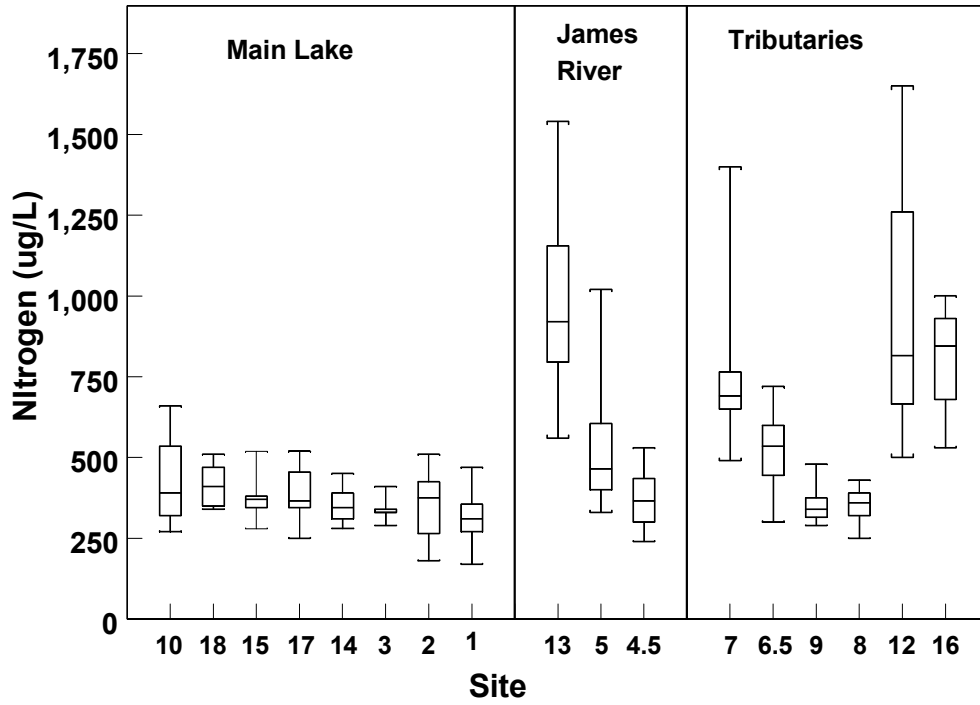


Figure 44. Nitrogen values for Table Rock Lake - 2000.

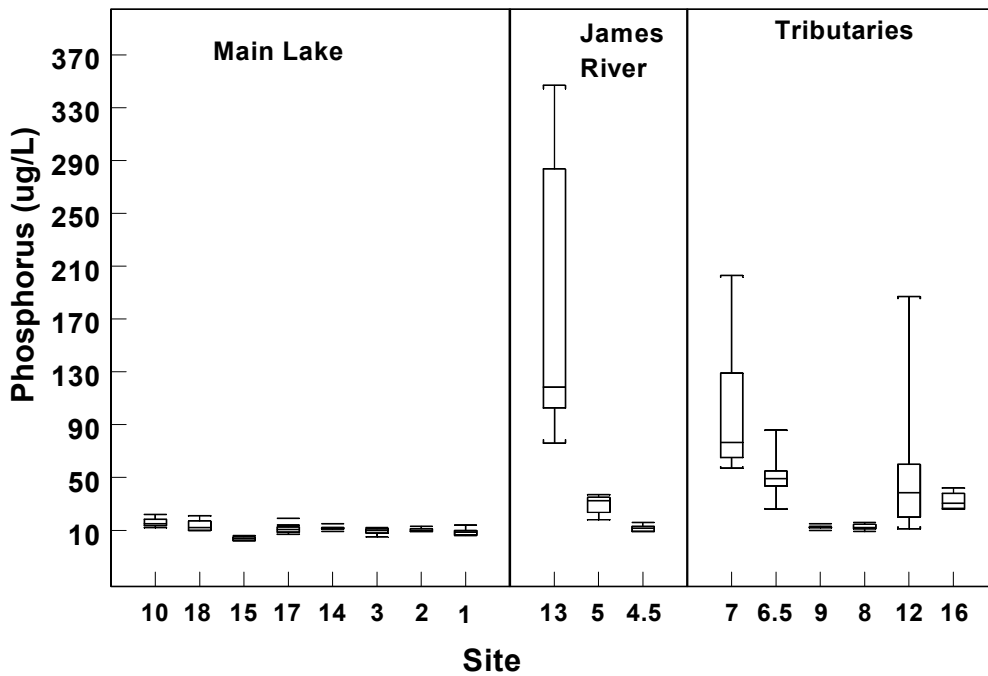


Figure 45. Phosphorus values for Table Rock Lake - 2000.

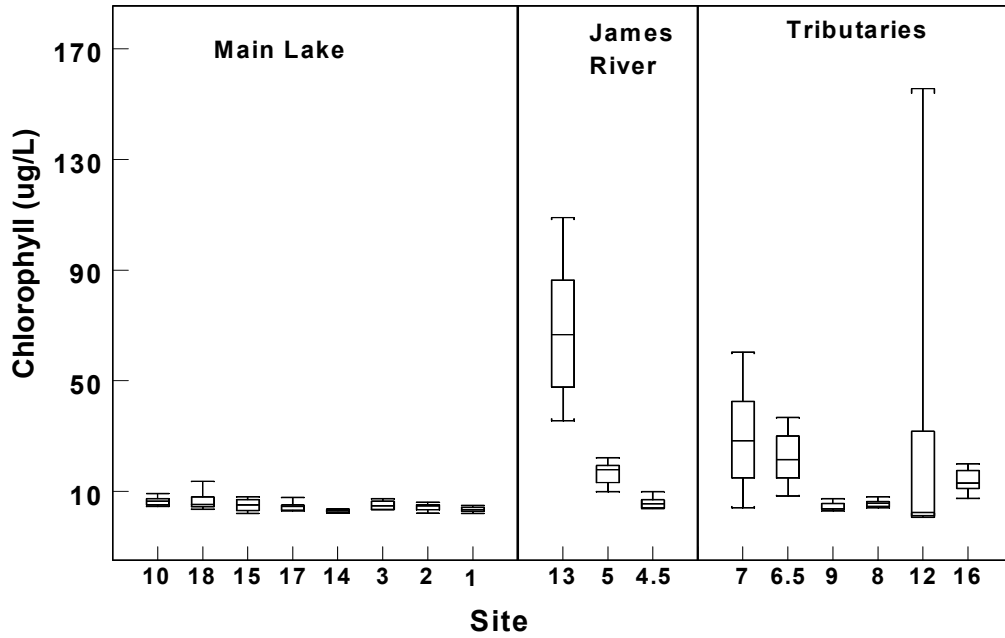


Figure 46. Chlorophyll values for Table Rock Lake - 2000.

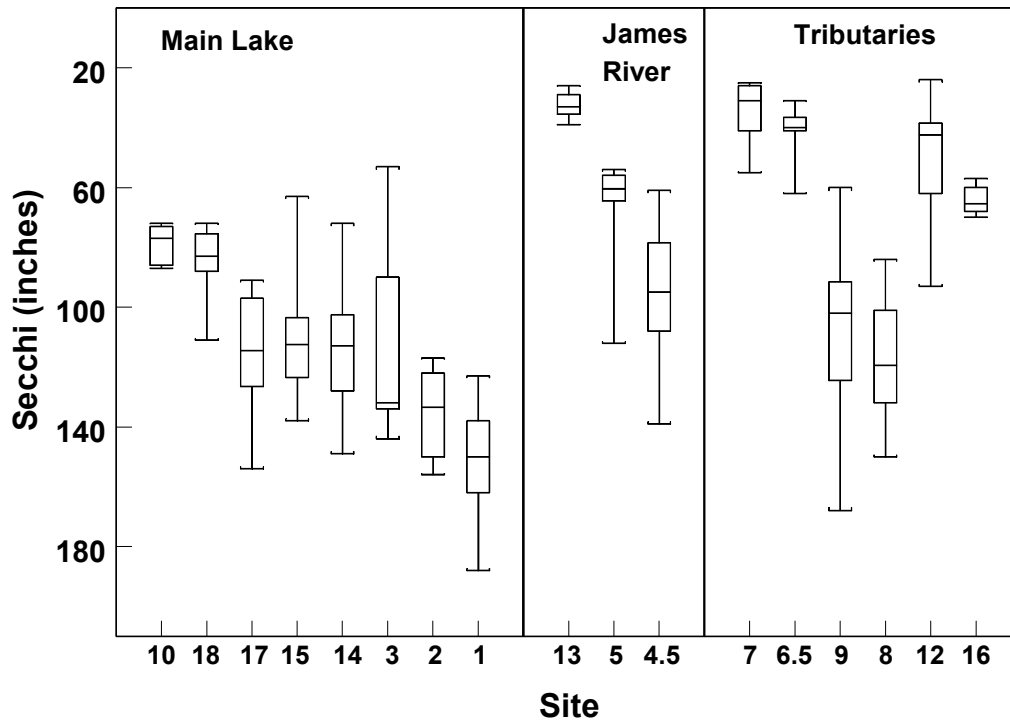


Figure 47. Secchi values for Table Rock Lake - 2000.

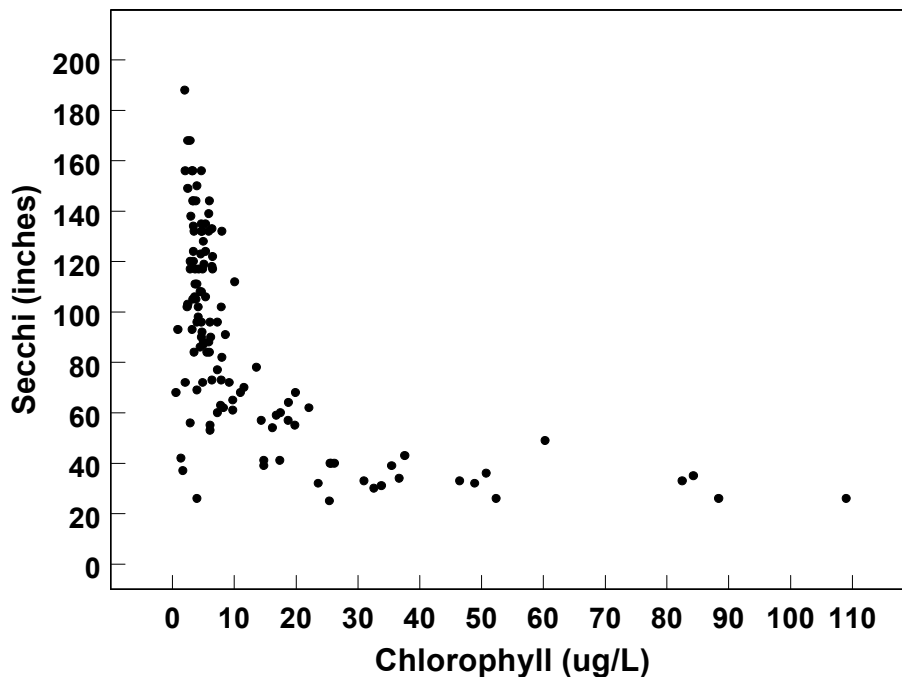


Figure 48. Chlorophyll-Secchi relationship for Table Rock Lake - 2000.

- ▶ Figure 48 shows the relationship between Secchi (water clarity) and volunteer chlorophyll data from the 2000 sample season.
- ▶ Relationship between chlorophyll and phosphorus is not a linear relationship.
- ▶ At low chlorophyll concentrations water clarity is much more sensitive to changes in chlorophyll. Note how Secchi can change from the 150 inch range down to the 80 inch range with very little change in the amount of chlorophyll.
- ▶ At higher chlorophyll concentrations, increases in chlorophyll do not lead to noticeable changes in water clarity. Note how relationship flattens out in the graph as chlorophyll values increase.
- ▶ Figure 48 is helpful to understand why the box plots in Figures 46 and 47 are not more alike, i.e. small changes in chlorophyll at low concentrations result in greater changes of water clarity.