Stockton Lake

Site 1

2010 DATA

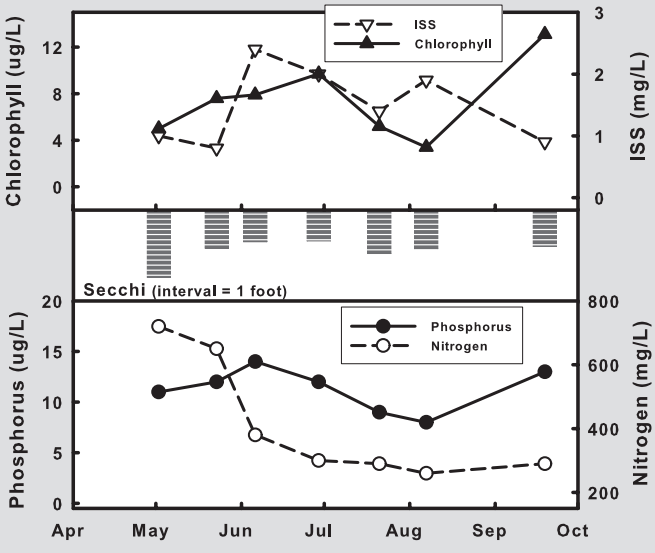
Cedar, Dade and Polk County
Latitude: 37.6863 Longitude: -93.7652

Date	5/2	5/23	6/6	6/29	7/21	8/7	X	9/19	Mean
Secchi (inches)	161	92	77	75	105	94		88	96
TP (µg/L)	11	12	14	12	9	8		13	11
TN (µg/L)	720	650	380	300	290	260		290	381
CHL (µg/L)	5.0	7.6	7.9	9.7	5.2	3.4		13.1	6.8
ISS (mg/L)	1.0	0.8	2.4	2.0	1.4	1.9		0.9	1.4

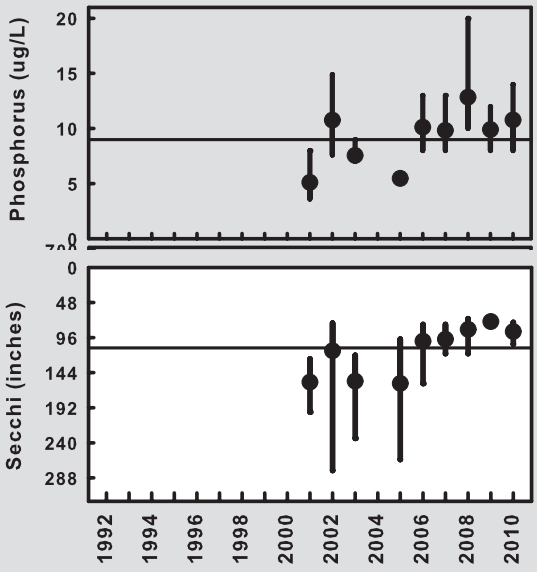
During 2010, the seasonal patterns of phosphorus and nitrogen at Site 1 differed from one another. Phosphorus remained fairly stable, with only minor fluctuations during the season. In contrast, nitrogen started out at 720µg/L, decreased by more than half by mid-season and remained low. While fluctuations in phosphorus were minor, they were enough to influence algal chlorophyll levels, which tracked the phosphorus across the season.

The summertime phosphorus mean has been slightly higher than the long-term mean for 5 consecutive years at Site 1. Above average precipitation and the increased runoff associated with it during the last three years may explain some of these higher values. During the sample seasons (April-September) of 2010, 2009 and 2008, rainfall was 9, 13 and 8.6 inches above average (based on last 40 years). Increased runoff in the watershed means more sediment (and attached phosphorus) coming into the lake. Not surprisingly, water clarity has suffered in the recent years with Secchi transparency measurements below average for the last 5 years.

2010 GRAPHS

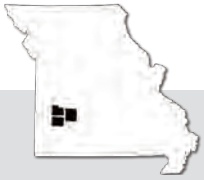


TREND GRAPHS



See pages 10-11 for help interpreting graphs

Stockton Lake



Site 2

2010 DATA

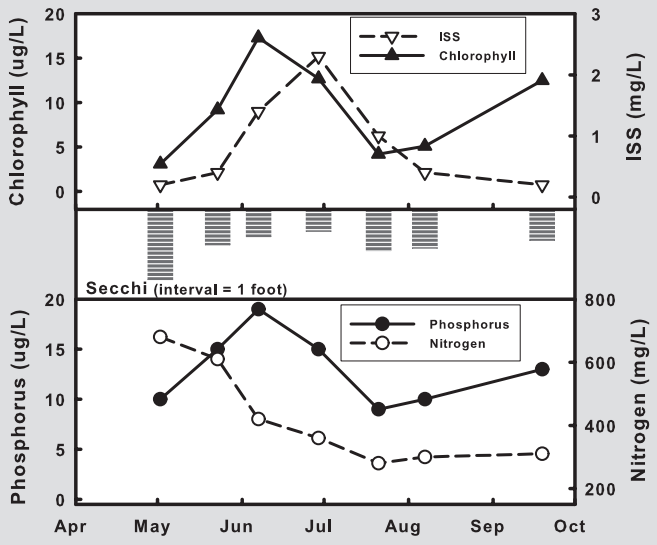
Cedar, Dade and Polk County
Latitude: 37.6248 Longitude: -93.7365

Date	5/2	5/23	6/7	6/29	7/21	8/7	X	9/19	Mean
Secchi (inches)	201	103	80	65	119	112		90	104
TP (µg/L)	10	15	19	15	9	10		13	13
TN (µg/L)	680	610	420	360	280	300		310	400
CHL (µg/L)	3.1	9.2	17.3	12.7	4.2	5.1		12.5	7.7
ISS (mg/L)	0.2	0.4	1.4	2.3	1.0	0.4		0.2	0.6

Water quality at Site 2 was quite similar to that at Site 1 during 2010. The average Secchi reading for the two sites differed by only 8 inches. As seen at the dam, chlorophyll concentrations tracked phosphorus closely. Nitrogen exhibited a typical pattern, high in the spring and decreasing as the season progressed. As at the dam site, suspended sediments were low, exceeding 2 mg/L on only one sample day.

The past 3 years have seen higher than average chlorophyll concentrations at Site 2. While the 2010 summer mean is the nearer to the long-term mean than any of the last 3 years' values, it was the most variable. The higher chlorophyll concentrations and slightly higher levels of suspended sediment (graph not shown) have led to a decrease in the average summertime Secchi reading as well as a decrease in the variability in water clarity during the last three years.

2010 GRAPHS



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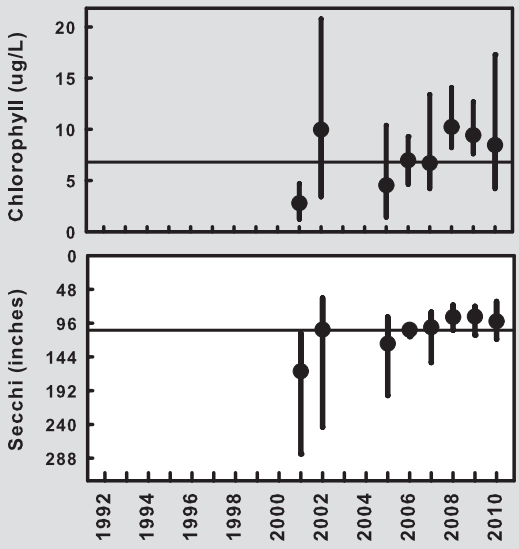


See pages 10-11 for help interpreting graphs

Stockton Lake

Site 215

2010 DATA

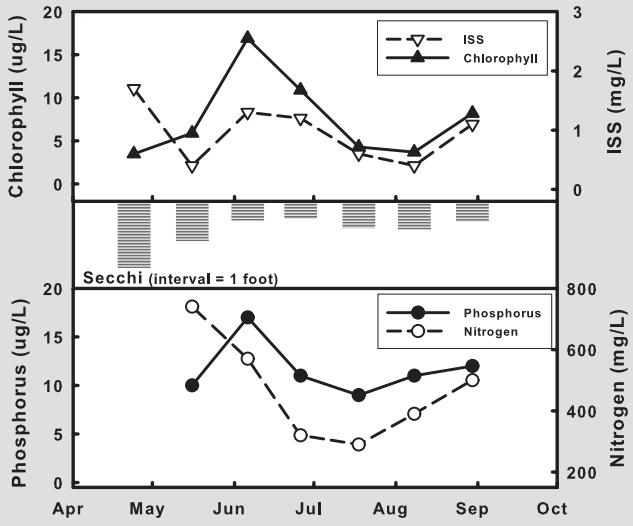
Cedar, Dade and Polk County
Latitude: 37.6219 Longitude: -93.7794

Date	4/24	5/16	6/6	6/26	7/18	8/8	8/30	X	Mean
Secchi (inches)	270	162	80	73	110	115	84		115
TP (µg/L)	.	10	17	11	9	11	12		11
TN (µg/L)	.	740	570	320	290	390	500		444
CHL (µg/L)	3.5	5.9	16.9	10.9	4.3	3.7	8.2		6.5
ISS (mg/L)	1.7	0.4	1.3	1.2	0.6	0.4	1.1		0.8

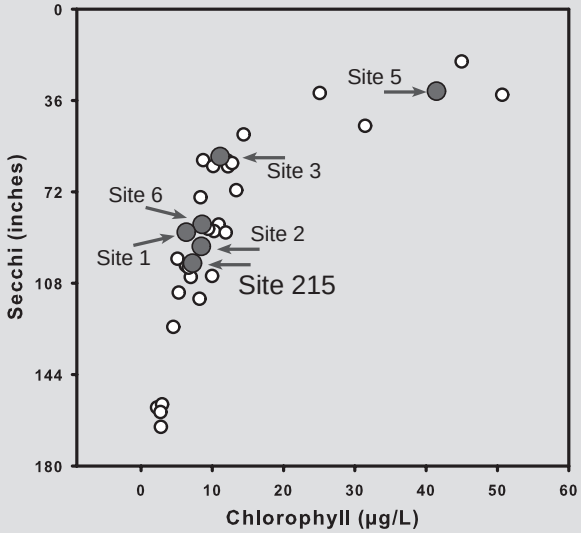
Site 215, at the Highway 215 Bridge over the Sac River Arm, was sampled on 7 occasions in 2010. Average concentrations and seasonal patterns of phosphorus and nitrogen at Site 215 were similar to that seen at sites 1 and 2. Chlorophyll levels tracked phosphorus values during the season, indicating that phosphorus limits algal growth. While inorganic suspended sediment values varied over the sample season, they were generally low. Moderate levels of chlorophyll and low suspended sediment explain why the average Secchi transparency reading at Site 215 was about three times deeper than the state average.

When 2010 average chlorophyll and Secchi are plotted against past averages from Stockton Lake we find four of the sites have very similar water quality. Sites in the mid to upper portion of the Sac River Arm have higher chlorophyll and subsequently lower clarity. We also find that 2010 was only an average year in terms of water clarity.

2010 GRAPHS

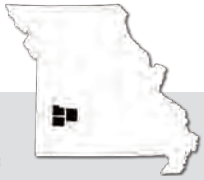


The Chlorophyll/Secchi Relationship in Stockton Lake, 2010



See pages 10-11 for help interpreting graphs

Stockton Lake



Site 3

2010 DATA

Cedar, Dade and Polk County
Latitude: 37.5547 Longitude: -93.7832

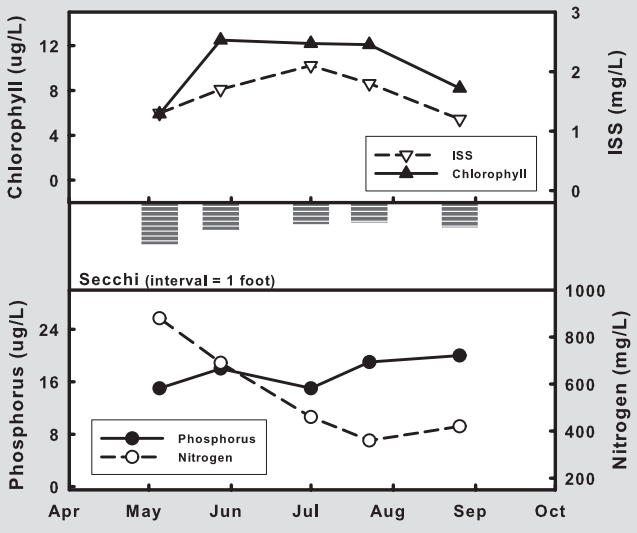
Date	5/5	5/28	X	7/1	7/23	8/26	X	X	Mean
Secchi (inches)	103	68		54	50	62			65
TP (µg/L)	15	18		15	19	20			17
TN (µg/L)	880	690		460	360	420			531
CHL (µg/L)	5.9	12.5		12.2	12.1	8.2			8.8
ISS (mg/L)	1.3	1.7		2.1	1.8	1.2			1.7

Site 3 is located near the Mutton Creek Public Use Area on the Sac River arm of Stockton Lake and was monitored on 5 occasions in 2010.

Chlorophyll and inorganic suspended sediment values varied only two-fold during the course of the season and were low compared to most Missouri lakes. Water clarity was a little deeper during the first sample date, corresponding to low levels of both chlorophyll and suspended sediment. Similar to the other Stockton Lake sites, phosphorus concentrations were low and stable during the season, while nitrogen levels were high in spring and low during the second half of the season.

The long-term mean algal chlorophyll value is skewed by the high measurements in 2003. As a result, all other seasons have had lower than average chlorophyll concentrations. Nonetheless, there was less measured algal biomass in 2010 than any year since 2006. Average water clarity in 2010 was typical of the site. Overall, the average values of water clarity have been consistent at Site 3, with the exception of 2003. Maximum summertime Secchi values have varied, with 2008 showing a high clarity value (over 8 feet) compared to 2010 (less than 6 feet).

2010 GRAPHS



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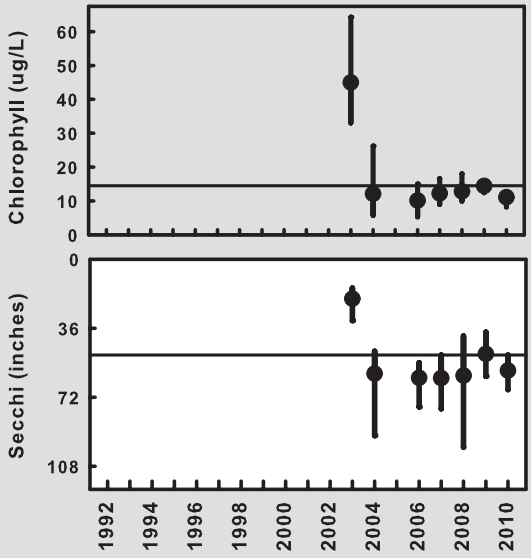

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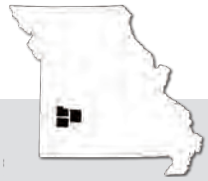
Stockton Lake



Site 5

Cedar, Dade and Polk County
Latitude: 37.4532 Longitude: -93.7773

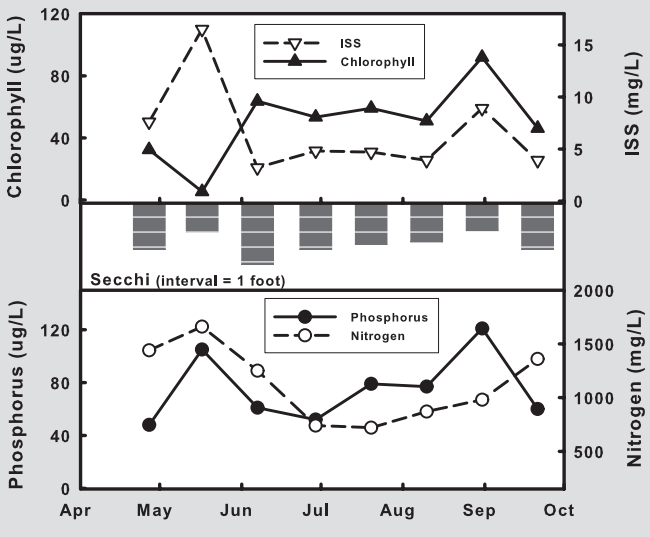
2010 DATA

Date	4/27	5/17	6/7	6/29	7/20	8/10	8/31	9/21	Mean
Secchi (inches)	38	24	50	38	34	32	23	38	34
TP (µg/L)	48	105	61	52	79	77	121	60	72
TN (µg/L)	1440	1660	1250	740	720	870	980	1360	1080
CHL (µg/L)	32.4	5.4	63.6	53.4	59.1	50.9	91.9	46.2	40.7
ISS (mg/L)	7.6	16.5	3.2	4.8	4.7	3.9	8.9	3.9	5.8

Site 5 had substantially higher levels of phosphorus, nitrogen, algal chlorophyll and inorganic suspended sediment than the other sites. This is to be expected given the location of Site 5, up-lake in the Sac River Arm of Stockton. This site is closer to inflows coming off of the watershed, which means nutrients and suspended sediment are not diluted out or settled out of the water column. Along with higher average values, Site 5 displays much larger variations in water quality. There were no real seasonal patterns for any of the parameters, though phosphorus values over the season mimicked the suspended sediment levels. This is not surprising as phosphorus often binds to sediment particles.

During the last three summers there have been high levels (>10mg/L) of inorganic suspended sediment measured at Site 5. The higher amounts of suspended sediment have resulted in low and stable Secchi transparency readings at this site.

2010 GRAPHS



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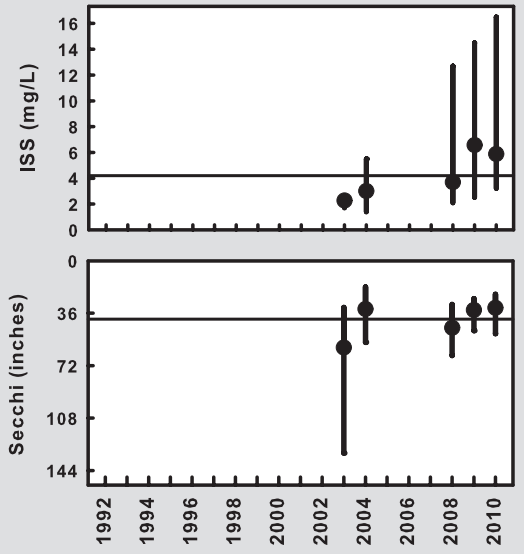


See pages 10-11 for help interpreting graphs

Stockton Lake

Site 6

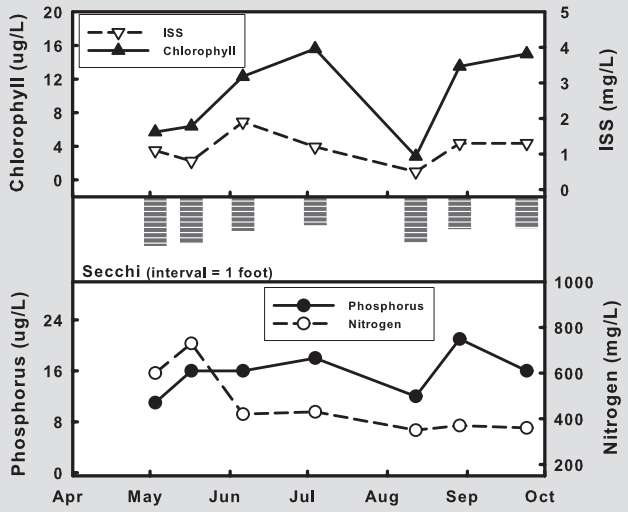
2010 DATA

Cedar, Dade and Polk County
Latitude: 37.4532 Longitude: -93.7773

Date	5/3	5/17	6/6	7/4	X	8/12	8/29	9/24	Mean
Secchi (inches)	113	107	79	66		105	75	73	87
TP (µg/L)	11	16	16	18		12	21	16	15
TN (µg/L)	600	730	420	430		350	370	360	449
CHL (µg/L)	5.7	6.4	12.3	15.6		2.8	13.5	15.0	8.8
ISS (mg/L)	1.1	0.8	1.9	1.2		0.5	1.3	1.3	1.1

Site 6 is located about 2/3 of the way up the Little Sac River Arm of the lake, approximately 6.3 miles up-lake of Site 2. Comparing 2010 data from the two sites show marginally higher levels of nutrients, algal chlorophyll and inorganic suspended sediment at Site 6. This slight gradient within the arm is expected as nutrients and sediment are generally highest up-lake, and settle out of the water column as sites move down-lake. As observed at the other Stockton Lake sites, nitrogen started the season high, decreased and remained low during the second half of the sample season. None of the other water quality parameters displayed any true seasonal pattern.

2010 GRAPHS



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See pages 10-11 for help interpreting graphs