

Lake Wappapello



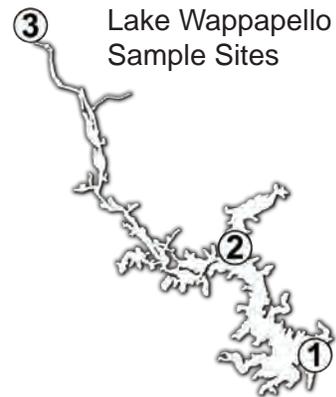
Site 1

2010 DATA

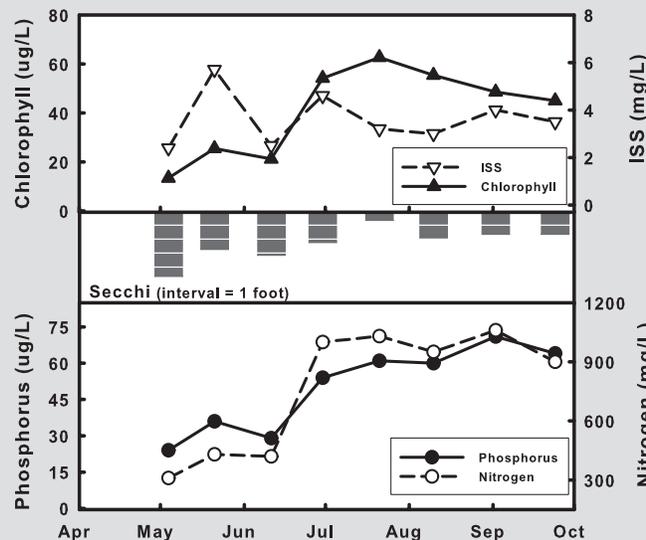
Butler and Wayne County
 Latitude: 36.9337 Longitude: -90.2833

Date	5/4	5/21	6/11	6/30	7/21	8/10	9/2	9/24	Mean
Secchi (inches)	56	33	38	27	8	24	20	20	25
TP (µg/L)	24	36	29	54	61	60	71	64	47
TN (µg/L)	310	430	420	1000	1030	950	1060	900	691
CHL (µg/L)	13.4	25.5	21.2	54.2	62.7	55.4	48.6	45.0	36.3
ISS (mg/L)	2.4	5.7	2.5	4.6	3.2	3.0	4.0	3.5	3.5

The 2010 sample season is the first in which a full complement of samples was collected. This monitoring effort allows us to document the seasonal pattern that previous monitoring in Lake Wappapello had suggested. While most Missouri lakes have maximum nutrient levels during spring and decreasing values through summer, Site 1 on Lake Wappapello displays the opposite seasonal pattern. Previous data has suggested, and 2010 data support, the pattern of low nutrients early in the season, with increasing values as summer progresses. The algal chlorophyll values mimicked the nutrients, with end of the season values that were three times higher than early season values.



2010 GRAPHS



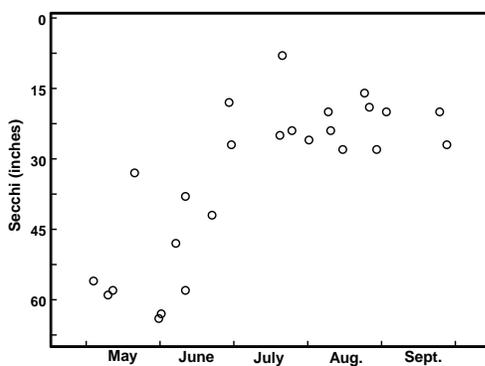
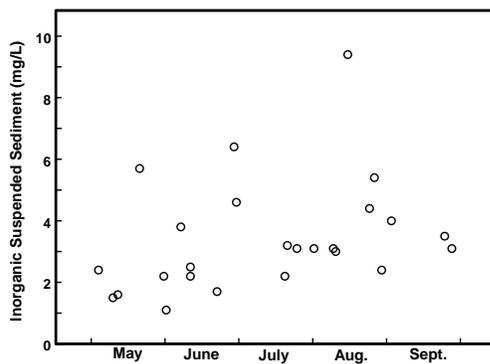
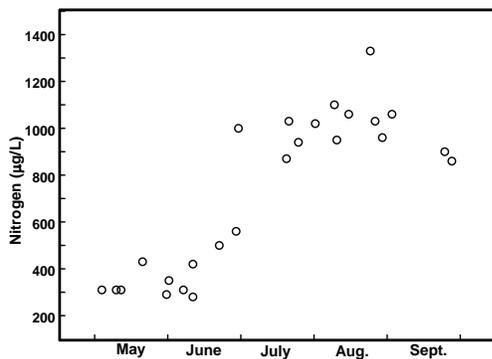
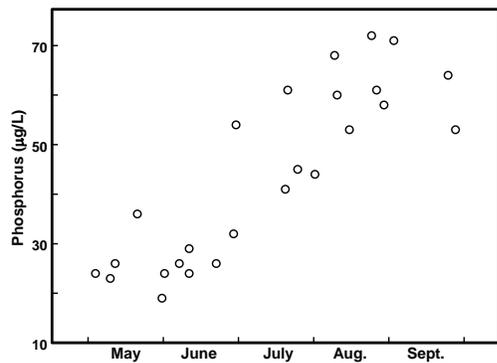
TREND GRAPHS

With the strong and predictable seasonality that we find in Lake Wappapello, (as shown on the next page) care needs to be taken when analyzing for long-term trends. The timing of the sample collection during each summer is very important as May and June sampling one year would result in a very different water quality assessment compared to July and August sampling the following year. In order to make a valid trend analysis the data from all years would need to represent comparable time periods.

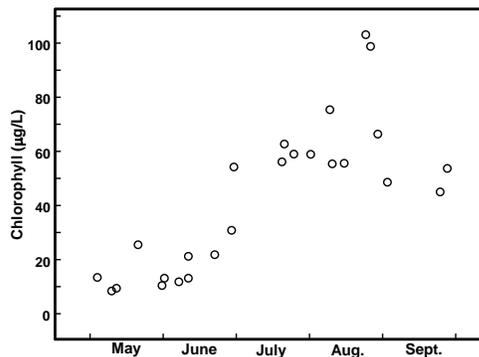
See pages 10-11 for help interpreting graphs

Lake Wappapello

Site 1



When we plot all of the data from Site 1 by the day of year in which the sample was collected, we find a distinct seasonal pattern in phosphorus concentrations. Most samples in May and June had phosphorus values that ranged between 20-30µg/L, while values during the second half of the season ranged between 40-72µg/L. The same pattern is observed when nitrogen and chlorophyll concentrations are plotted against sample date. Nitrogen and chlorophyll during the first half of the season ranged from 300-600µg/L and 8-32µg/l, respectively. During the second half of the season values ranged 850-1350µg/L and 45-105µg/L for nitrogen and chlorophyll.



The seasonal pattern observed in nutrient concentrations is not reflected by inorganic suspended sediment values. There is a slight increase in the minimum values measured across the season, but enough overlap in the data to suggest no true seasonal pattern. The difference in seasonal patterns between suspended sediment and nutrients suggest the increased nutrients during late summer/fall are not a result of erosional runoff from the watershed, as phosphorus inputs associated with nonpoint sources (i.e. runoff) is strongly correlated to suspended sediment concentrations.

Secchi transparency values at Site 1 in Lake Wappapello also show a seasonal pattern which reflects algal chlorophyll concentrations. During the early season, when chlorophyll levels are low, water clarity exceeds 30 inches and extends to past 60 inches. During the second half of the season Secchi transparency ranges from 8-28 inches.

Lake Wappapello



Site 2

2010 DATA

Butler and Wayne County
 Latitude: 36.9888 Longitude: -90.3351

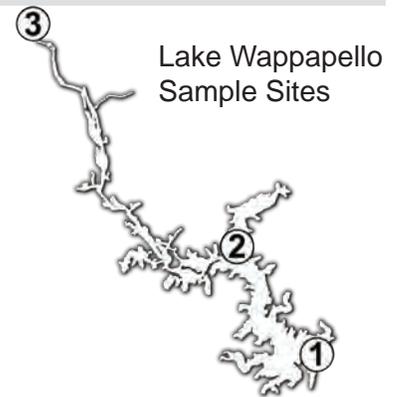
Date	5/4	5/21	6/11	6/30	7/21	8/10	9/2	9/24	Mean
Secchi (inches)	29	28	21	16	10	18	14	20	19
TP (µg/L)	30	46	48	73	81	.	93	62	58
TN (µg/L)	250	420	410	750	860	.	1140	640	573
CHL (µg/L)	17.6	27.9	32.3	55.1	58.0	47.1	134.3	44.6	44.1
ISS (mg/L)	3.7	9.4	8.1	34.4	12.8	9.4	9.3	6.4	9.6

Site 2, located in the Lost Creek Arm of Lake Wappapello, followed the same general seasonal patterns that were observed at Site 1. Phosphorus and inorganic suspended sediment levels were slightly higher at Site 2 compared to Site 1, a trend we expect given its up-lake location (up-lake sites tend to have higher nutrient and suspended sediment levels). Nitrogen concentrations did not follow this trend, with values at Site 2 that were equal to or lower than Site 1. The amount of algal chlorophyll at Site 2 ranged from 17.6 to 134.3µg/L. These chlorophyll values represent high levels relative to the nutrients. This was especially true given the suspended sediment concentrations that were high enough to cause some light limitation.

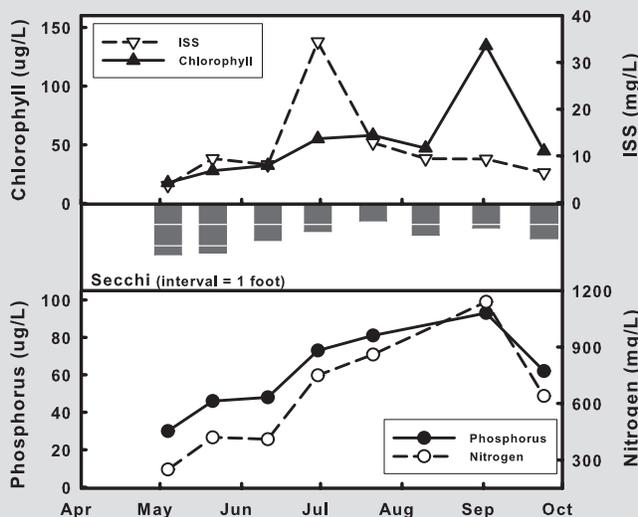
Site 2 generally followed the same seasonal trend observed at Site 1, with low nutrient,

chlorophyll and suspended sediment concentrations during May and June.

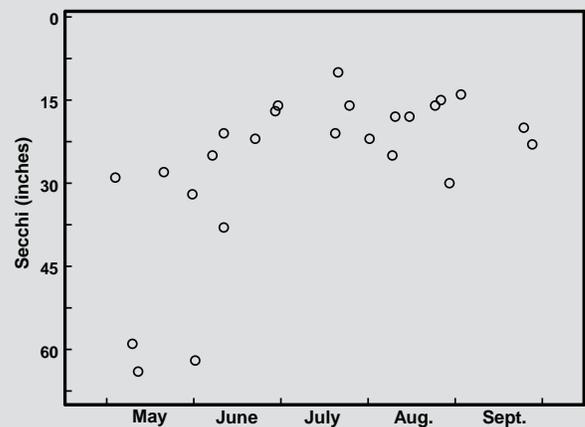
The seasonal trend of Secchi transparency at Site 2 did differ from that observed at Site 1 as shallow Secchi readings were collected throughout the sample season. The slightly higher levels of chlorophyll and suspended sediment at Site 2 limit clarity in most samples.



2010 GRAPHS



TREND GRAPHS



See pages 10-11 for help interpreting graphs

Lake Wappapello



Site 3

2010 DATA

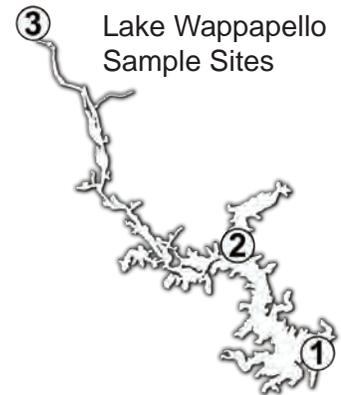
Butler and Wayne County
 Latitude: 37.1945 Longitude: -90.5037

Date	5/4	5/21	6/11	6/30	7/21	8/10	X	9/24	Mean
Secchi (inches)
TP (µg/L)	17	51	23	19	24	25		22	24
TN (µg/L)	350	440	250	150	230	240		150	241
CHL (µg/L)	2.5	6.9	17.6	9.4	7.5	5.8		3.0	6.2
ISS (mg/L)	2.4	19.9	5.2	.	6.5	1.7		0.1	3.4

The seasonal pattern of nutrient concentrations at Site 3, located in the St. Francois River, was for maximum values early in the season, followed by low and relatively stable levels throughout the remainder of the year. Chlorophyll does not reach maximum until the sample after nutrients peak, even though algal growth is directly tied to nutrient levels. During high flow periods, when nutrients levels are greatest, water movement through Site 3 is probably fast enough to keep algal cells from fully utilizing the available nutrients.

Site 3 does not display the same seasonal trend as the other sites. This is to be expected as Site 3 is a river site and water quality is directly related to flow, while water quality at the lake sites is greatly influenced by internal loading. The highest phosphorus and nitrogen values measured at Site 3 occur during

the early part of the season, when runoff from the watershed tends to be highest. Data from the USGS stream gauge located at the site indicates a 10-fold difference in average discharge between April and August (2400 cubic feet/second versus 242 cubic feet/second, respectively).



Review of the data indicate that the five highest nitrogen measurements at Site 3 occurred when discharge was >1500cfs. For comparison, the normal range of discharge is 50-300cfs. The four highest phosphorus values were also measured during these high flow periods (one high flow phosphorus value was 17µg/L, a value comparable to the normal range).

2010 GRAPHS

