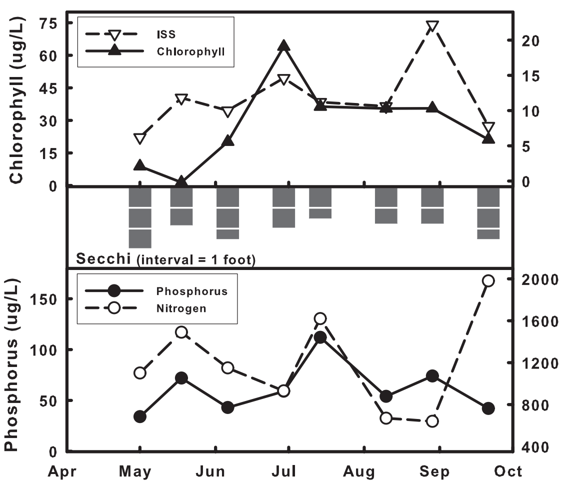
Lake Springfield

Site 1 2010 Data

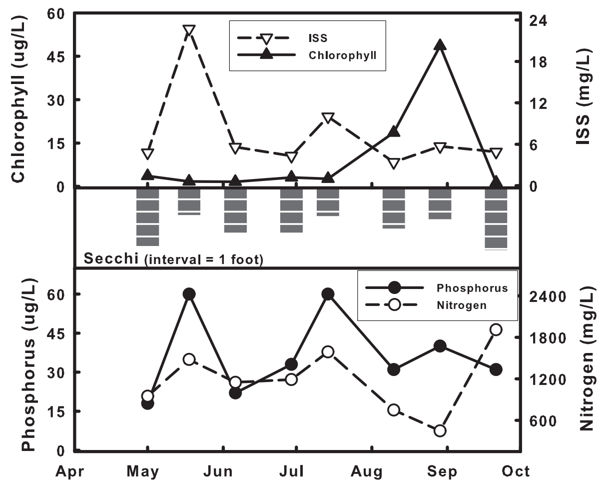
Greene County
Latitude: 37.1122 Longitude: -93.2608

Date	5/1	5/18	6/6	6/29	7/14	8/10	8/29	9/21	Mean
Secchi (inches)	36	22	30	24	18	21	21	30	25
TP (µg/L)	34	72	43	59	112	54	74	42	57
TN (µg/L)	1100	1490	1150	930	1620	670	640	1980	1116
CHL (µg/L)	8.9	1.5	20.2	64.0	36.4	35.5	35.6	21.2	19.0
ISS (mg/L)	6.2	11.8	10.0	14.6	11.2	10.6	22.2	7.8	11.0

Site 1



Site 2



The shift in water quality across Lake Springfield's two sites is interesting in that it differs from the norm. Missouri lakes tend to have lower levels of nutrients and inorganic suspended sediment near the dam compared to up-lake sites due to sedimentation. In Lake Springfield we find higher phosphorus and inorganic suspended sediment at Site 1. Interestingly, nitrogen concentrations were very similar on sample dates for the two sites (though variable from sample to sample).

Lake Springfield Sites

Site 2 2010 Data

Greene County
Latitude: 37.1263 Longitude: -93.2256

Date	5/1	5/18	6/6	6/29	7/14	8/10	8/29	9/21	Mean
Secchi (inches)	57	27	44	44	28	40	31	61	40
TP (µg/L)	18	60	22	33	60	31	40	31	34
TN (µg/L)	950	1480	1150	1190	1590	750	450	1910	1089
CHL (µg/L)	3.6	1.7	1.6	3.1	2.6	18.6	48.6	1.3	4.2
ISS (mg/L)	4.8	22.7	5.6	4.3	10.0	3.4	5.7	4.9	6.3

Lake Springfield (continued)

Lake Springfield differs from the average Missouri lake in two ways. First, the lake water is used to cool a nearby power plant. Warm water from the power plant re-enters the lake near the dam and the physical mixing caused by this input prevents sediment from settling to the lake bottom and acts to re-suspend any material that had settled.

The other factor that makes Lake Springfield different is its extremely high flushing rate. On average, the lake's volume is replaced every 5-6 days (actual time varies with flow in the James River). For comparison, other similar sized lakes in Missouri take 12 months to replace their volume! Lake Springfield's extremely high flushing rate limits the amount of sedimentation that can occur within the lake.

Combined, these two factors make Lake Springfield unique among LMVP lakes. The two adjoining graphs show how inorganic suspended sediment and phosphorus at Site 1 relate to flow within the James River. Discharge data were collected at a USGS gauging station located about 5 miles up-stream from Lake Springfield Dam.

In most Missouri lakes suspended sediment levels peak when turbid inflows into the lake are the highest. When inflows are low (during dry periods) there is less sediment coming into the lake, and the sediment that is in the lake has time to settle. Lake Springfield behaves the opposite in that an increase in up-stream discharge actually lowers the suspended sediment levels. This tells us that the majority of suspended sediment that is being measured during low discharge periods is being re-suspended from the lake bottom and not coming into the lake as turbid inflow. The decrease in suspended sediment values during high discharge reflects the movement of these materials out of the lake and down the James River. There is a slight hint of increasing suspended sediment when discharge values in the James River are>400cfs, a result of high flow in the river carrying eroded sediment from the watershed.

Phosphorus concentrations fluctuate with discharge in a fashion similar to suspended sediment. This is not surprising as phosphorus tends to bind to sediment particles. In contrast, nitrogen concentrations (graph not shown) do not decrease with increasing discharge, but show a tendency to increase. The nutrients behave differently because nitrogen has a gas phase and is probably lost to the atmosphere during periods of low discharge (thus it does not accumulate the same way phosphorus does). Also, groundwater readily picks up and transports nitrogen. As discharge in the James River increases there is probably an increase in nitrogen inputs into the lake.