Lazy Lake Watershed Water Modeling Summary Report

June 2016

Watershed Description:

Lazy Lake is located in the southeast portion of Columbia County. Lazy Lake is part of the Upper Crawfish River Watershed, 164 square miles which includes the Crawfish River above the dam at Columbus and the entire North Branch of the Crawfish River. The predominate land use in the watershed is agriculture, mostly cash cropping, dairy and/or feeder animals. The watershed is 73% agricultural land (WDNR. 2002).

Lake Description:

Lazy Lake is approximately 200 acres and is an impoundment of the North Branch of the Crawfish River with maximum depth of about 8 feet and a mean depth of 4 feet (WDNR 2005). This impoundment is considered eutrophic and has extensive aquatic plant and algal growth. Lazy Lake has a storage capacity of 578 acre feet with a normal water elevation of 98.6 feet. Lazy Lake has 4.2 miles of shoreline. Lazy Lake is similar to other southern shallow water impoundments sharing problems such as high turbidity, low dissolved oxygen, excessive algae blooms and weed growth (WDNR, 2002).

Background and Water Quality Results:

In the summer of 2009 Columbia County began collecting and compiling water quality and discharge data in portions of the Lazy Lake watershed. Samples and measurements were taken about every two weeks at the sites noted above and were taken between the dates of 7/21/2009 and 10/27/2009 at five tributaries sites in the Lazy Lake watershed (Table 1. Table of Sampling Site Locations in the Lazy Lake Watershed). Site two proved to be a poor monitoring location and was discontinued.

Figure 1: Map of Lazy Lake Watershed and tributary sampling sites

Table 1. Table of Sampling Site Locations in the Lazy Lake Watershed

Site	Tributary Name	Adjacent Roadway
LL01	North Branch Crawfish River	County Road D/Main St.
LL02	North Branch Crawfish River	County Road DG
LL03	North Branch Crawfish River	County Road DG
LL04	North Branch Crawfish River	County Road Z
LL05	Unnamed	County Road Cd

Methods

Stream levels (stages) were recorded over time using pressure transducers (Solinst, Georgetown, ON). The loggers were set to record a new stream level during any time that the stream level was changing. Software that was provided with the logger was used to correct the measurement for barometric pressure. The resulting file provided date, time and the water level relative to an unspecified datum.

Stream flow was estimated from the barometrically corrected logger data. The logger data was adjusted for a zero-flow offset and then fitted with a log-linear relationship between logger reading and measured stream flow. The resulting power function ($Q=aH^b$), where Q is the stream flow and H is the adjusted logger reading) was used to estimate stream flow for the other logging periods. The stream flow estimates were used to calculate the total water flow between logging points. The total flow during the recording period was calculated by summing all of the flow quantities between logging points.

Stream concentration measurements were used to develop a relationship between stream flow and total phosphorus concentration. A log-linear power function (C=aQb) was used to assign a concentration to each logging period flow. The phosphorus mass associated with each of those periods was calculated by multiplying the total flow volume in the period times and the estimated total phosphorus concentration. The total exported phosphorus mass was estimated by summing the phosphorus load from each logging period.

The Wisconsin Lake Modeling Suite (WiLMS) model is a lake water quality-planning tool was run for Lazy Lake as well. The model was run over the watershed as a whole.

Results:
Site LL 02 on County Road DG did into produce data that allowed for modeling. It is believed that the down water impacts in Lazy Lake created a back water effect that gave very little variation in the level logger and the staff gauge readings despite wide variation in the flow and water chemistry data. LL04 and LL05 had corrupted data baralogger files that were unusable for the modeling exercise.

Within the Lazy Lake Watershed the Total Phosphorus or TP median concentrations were all above the proposed DNR phosphorus standard of 75 µg/l for wadeable streams with the

exception of site 1 (74 µg/l). TP concentrations ranged from 38-255 µg/l at site 1, 56-287µg/l at site 3, 50-221µg/l at site 4, and 42-212µg/l at site 5. Generally, the Soluble Reactive Phosphorus (SRP) increased with an increase in TP at all sites.

Nitrate (NO3+NO2-N) accounted for a majority of nitrogen concentrations at all sites. NO3+NO2-N concentrations ranged from detection levels to 5.3 mg/l with the higher concentrations measured in samples collected at sites 4 and 5. The source appears to be attributed to ground water inputs with the exception of site 1. Ammonia concentrations were all below .07 mg/l, with sites 1, 3, and 5 averaging 0.05 mg/l.

Total Suspended Solids or TSS concentration medians at all sites were below 10 mg/l.

Lazy Lake Growing Season TP							
	Name	**2009**	**2009**	**2010**	**2010**	**WilMs Low**	**WilMs High**
		July-December TP	Average Per Second Q	March - December TP	Average Per Second Q	39,101.0 ac.	39,101.0 ac
		Total Phosphorus		Total Phosphorus		Total Phosphorus	Total Phosphorus
Units		lbs.	cfs	lbs	cfs	lbs	lbs
Site ID							
LL 01	Dam Outlet	1316.53	46.9	4782.47	63.19		
LL03	Upstream Hwy DG	2953.41	35.05	3388.97	26.16		
Total TP		**4236.94**		**8171.44**		**14,189.9**	**83,385.5**

Table 2. Lazy Lake Growing Season Watershed TP Modeling with Wilms Modeling