**Leesville Lake Water Quality Update for January 2021**

*Overview*

The data from this season’s water monitoring efforts remains to be fully analyzed. However, there are a few issues worthy of discussion at this time. This season and last have been marked by rainfalls that produced flooding conditions on local rivers and streams. These events may be due to El Niniño-related changes in weather patterns or may be due to more permanent global climate change. In any event, the Pigg River has deposited large amounts of debris and sediment into the lake and increased the influx of bacteria in recent years.

Despite these heavy rainfalls, Leesville Lake (LVL) generally remains healthy. Although the increased bacterial load from the Pigg River presents a challenge to LVL, the bacterial (*E. coli*) counts throughout the majority of LVL remained well below state health guidelines. The possible exception to this is occurs within the upper region of LVL, in the vicinity of Toller Bridge. During heavy rains bacterial counts in this region are frequently above state standards. Furthermore, in this area of the Lake we have observed that the dissolved oxygen content of water is lower than desirable. This stresses the fish population and this fall Dr. Shahady has observed shad piping for air (see image below) and dead shad at the surface. However, other parameters of water quality seem in line with past observations and are indicative of a healthy maturing lake.



One of several dead shad retrieved by Dr. Shahady this fall, when fish were at the water surface seeking air.

*Dissolved oxygen*

Low oxygen content of water in the upper region of the lake, requires additional study to determine the frequency of this occurrence. Furthermore, oxygen content in this region is influenced by operation of the Smith Mountain Lake (SML) Dam. As we all know, during hydroelectric operation a tremendous amount of water is discharged from SML and this water, though pure, contains low dissolved oxygen. The reason for the low oxygen content is that the turbines are positioned at depths in the water column where the oxygen level is considerably lower than it is near the surface of SML. Appalachian Power has adopted operational procedures wherein turbines located nearer the surface are in operation for the longest period of time. Although this management has helped, it has not solved the problem and particularly during the fall months the oxygen content of tailwaters from the dam frequently do not meet operational standards. During the fall, oxygen generated by photosynthesis of aquatic plants and algae declines. But as the temperature drops, water can hold larger amounts of dissolved oxygen and the dissolved oxygen content increases again during winter. Appalachian Power is aware of this problem and we are working with them to find methods to oxygenate the water discharged at the dam.

*Impact on the upper lake*

Thus, there are two issues of concern that we are monitoring and hope to improve: the bacterial load delivered by the Pigg River during high rain events and the poorly oxygenated water that may be delivered during hydroelectric power generation. As stated earlier, the region of the LVL that is frequently impacted in the upper region of the lake, *i.e.*, the tailwaters of SML to approximately a mile downstream of Toller Bridge. During high rain events the discharge of bacterial laden water from the Pigg River flows downstream to Toller Bridge and beyond, where it ultimately is diluted. However, when the dam is pumping water back to SML rather than proceeding downstream most of the bacterial laden water is drawn into the tailwaters and pumped into SML. In that case, the tailwaters the tailwaters may contain excessive bacteria. Similarly, the oxygen content of water in the upper region of the lake may be impacted by dam operation. When the oxygen content of water released at the dam is low, hydroelectric generation pushes water with lower oxygen content into the tailwaters and toward Toller Bridge where it mixes with more oxygenated water from the Pigg River. When the dam is pumping back the tailwaters are derived from the more oxygenated waters of LVL and Pigg River.

*Bacteria*

From the perspective of water quality, our greatest concern on the Pigg River remains the sediment and bacteria suspended in its waters. This past season we continued our monitoring activities on the Pigg River during the fall (September and October). Overall we found that there was very little bacterial contamination from cattle, but significant contamination from other ruminants (deer). Human waste contamination at Rocky Mount was still evident, but not close to last season. Once again human waste contamination appeared to be largely evident at Furnace Creek. At the times sampled, the levels of bacteria derived from human waste did not appear concerning but provide evidence that a source of contamination remains at Rocky Mount. There is little concern regarding the impact of human-derived bacteria as water enters LVL. The main contaminant during rain events this past season appears to have been derived from deer.

Our bacterial monitoring activities have relied primarily on quantification of *E. coli* as an indicator organism. As such their number provides a basis for assessing the level of water contamination and the potential for health risk. The *E. coli* themselves are typically not pathogenic but can result in mild gastrointestinal disease. However, if the *E. coli* content of water is high it signals that more serious pathogens may be present in sufficient number to cause a health risk. On the Pigg River, we have use bacterial source tracking to determine the species that contribute to the bacterial contamination. This information is key to determining likely sources of contamination and degree of concern about pathogenicity. Of course, significant contamination with human waste runs the greatest risk of disease to humans.

*Annual report*

Our final report will be available in February. There is little reason for immediate concern about the quality of water in LVL, but our monitoring efforts are designed to identify potential issues and means to maintain the health of LVL.

Wishing you a Happy and Healthy 2021!

Tony Capuco and the LVL Water Quality Team