

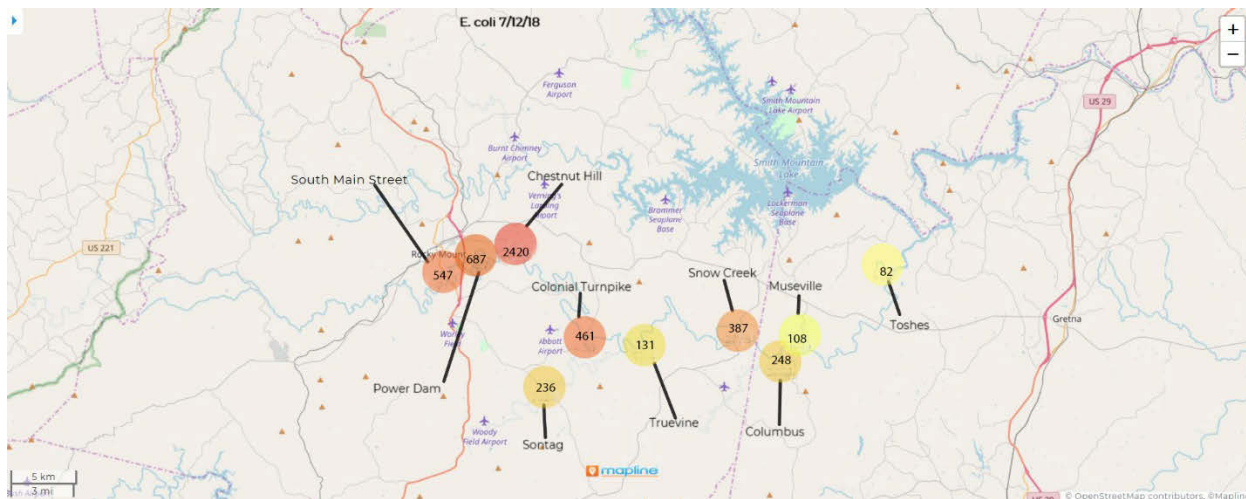
## LVL Water Quality Update for Fall 2020

This water quality report provides an update on water quality issues that Leesville Lake faces as we conclude the 2020 season. The team that works on these issues includes members of our Association's Water Quality Committee (Tony Capuco, Dave Waterman and Kathleen Giangi), our collaborator at the University of Lynchburg, Dr. Thomas Shahady, in the Department of Environmental Science, University of Lynchburg. As with most issues in our lives during 2020, our water monitoring included precautions for Covid-19. Most notably, due to University closures, Dr. Shahady has not had the assistance of students. Fortunately, his son graciously assisted with most samplings.

Since our report in the Spring, water monitoring has continued to demonstrate that Leesville Lake remains healthy. Bacterial counts have remained low and well below the Virginia standards for recreational use. At the conclusion of the season we can analyze the bacterial and chemical data to fully assess the maturation and health of our lake.

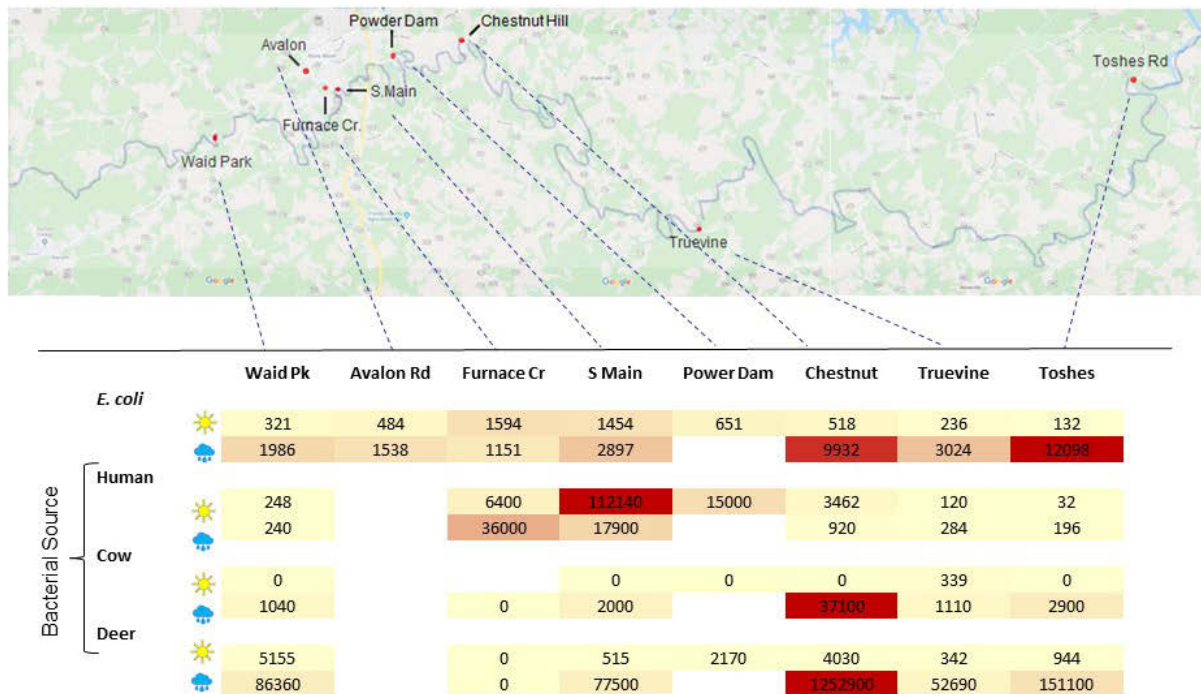
Despite the general health of Leesville Lake, inflow from the Pigg River presents challenges to the lake, particularly after storms. After heavy rains, runoff provides for an inflow of sediment and bacteria into the lake. The elevation in bacterial counts at these times appears restricted to the region encompassing the mouth of the Pigg River and Toler Bridge (or a short distance downstream of the bridge). With this knowledge you can make informed decisions based on conditions. These issues are common to streams and small lakes in Virginia.

Although the Pigg River has not negatively impacted the health and productivity of Leesville Lake, our water quality team began studying the Pigg River in 2018 and continues to do so this season. Our goal remains to identify regions where bacterial and nutrient runoff is elevated and where appropriate action can safeguard the future health of our lake. As you know, last season we identified an influx of human waste at Rocky Mount and reported the issue to appropriate authorities. This issue remains under investigation by authorities at Rocky Mount. The bacteria of human origin at Rocky Mount diminished to 0.02 to 0.5% of their maximal concentration by the time the river reached Leesville Lake and seemingly poses little risk to the lake population. As the Pigg River approached Leesville Lake, bacteria in the waters were primarily derived from cattle and deer. It is this agricultural and wildlife contamination that primarily impacts our lake. The bacterial content of Pigg River waters is presented in the following figures to illustrate the aforementioned issues.



**Figure 1.** *E. coli* content in the Pigg River during a dry period (7/12/18). The *E. coli* concentration at each site is presented as colony forming units per 100 ml. The concentration of *E. coli* is reflected by the color of the symbol, according to a scale in which the highest bacterial content is presented by intense red and lowest content by pale yellow.

Figure 1 depicts the bacterial content of the Pigg River at 10 sites on a single day in 2018, in the absence of significant runoff. The concentration of *E. coli* is provided within the symbol and is reflected by the color of the symbol, according to a scale in which the highest bacterial content is presented by intense red and lowest content by pale yellow. Under these dry conditions, the concentrations of *E. coli* were greater upstream toward Rocky Mount than downstream toward Leesville Lake. The greatest concentration was observed at Chestnut Hill. Even in the absence of runoff, the *E. coli* content at most sites was in excess of Virginia standards for recreational use (225 cfu/100ml), but was actually below state standards as the water approached Leesville Lake.



**Figure 2:** Bacterial content in the Pigg River during the fall of 2019. The map depicts the areas sampled from Rocky Mount to near Leesville Lake (specifically Waid Park to Toshes Rd). The *E. coli* content of the water and the source (human, cow, deer) of bacteria are tabulated below the map. The source of bacteria was not evaluated for every sampling site. Data for sampling on dry days are designated by the sun icon and on rainy days by the cloud/rain icon. The *E. coli* number tabulated is the colony forming units per 100 ml and the bacterial source information as the molecular marker copy number per 100 ml. Values for rain events are for a single sample per site. Values for the dry periods are the mean of two samples per site. The color reflects the quantity of the item from high (intense red) to low (pale yellow).

The bacterial content of the Pigg River during the fall of 2019 is depicted in Figure 2. The sites sampled are shown on the map and the data are tabulated below the map. As in 2018 (Figure 1), the *E. coli* content under dry conditions was greater upstream and diminished to concentrations that were within state guidelines as the water approached Leesville Lake. However, under wet conditions the *E. coli* content was greatest as the water approached Leesville Lake. Analysis of the species that contributed bacteria to the waters showed a large influx of bacteria from human waste in the region of Rocky Mount (Furnace Creek/South Main), bacteria that were largely absent as the water approached Leesville Lake. Importantly, this analysis indicated that waste from cows and deer were the major contributing factors in waters closer to Leesville Lake. Under dry conditions, cattle contributed very little bacteria to the waters. However, during runoff events bacteria from cattle were major contributors to the waters approaching Leesville Lake. A similar situation was

apparent for bacteria of deer origin. Concentrations in the water increased greatly during runoff events and hotspots for influx of bacteria from cows and deer both appeared to be in the regions of Chestnut Hill and Toshes Rd.

Of primary importance to our lake is identifying regions bacterial contamination derived from cattle and deer, as these are the major sources of bacteria in the waters entering Leesville Lake. The influx from these agricultural and wildlife species increased during runoff events and appeared to be greatest in the same regions of the River. These locales need to be investigated and means to reduce the influx of bacteria at these sites attempted. Additionally, our monitoring this season will investigate the human waste issue at Rocky Mount, not because it impacts our lake but to promote health of the Pigg River for residents of Franklin County.

On behalf of the water quality team,

Tony Capuco