

# Glen Lake Project 2018

## SUNY Adirondack Environmental Studies Collaboration Group

Holly Ahern, Assoc. Prof. of Microbiology, SUNY Adirondack

Linda Hare, Director of Laboratories, SUNY Adirondack

Zachary Miller, Cameron Rogers and Malora Trent, SUNY Adirondack ESC

### Summary

SUNY Adirondack Environmental Studies Collaboration (ESC) is a project to encourage participation in undergraduate research by community college students under the mentorship of college faculty. In 2017, the ESC group was contacted by The Glen Lake Protective Association (GLPA) of Queensbury, NY, to investigate the potential for human-associated chemical and biological contamination of the lake ecosystem, and to provide data that could help the Lake Association address ecological concerns common to other small lakes with a large residential population.

Previous research conducted by the ESC group has shown that the concurrent detection of both fecal coliform bacteria (specifically *Escherichia coli*) and free chlorine (hypochlorous or hypochlorite), can be an indicator of potential septic system contamination. In a preliminary study conducted in August 2017, near shore water samples were obtained from 24 sites around the Glen Lake. These sites were selected based on discussions with GLPA members and visual evidence of increased growth of aquatic plant species. All 24 sites were tested for fecal coliform bacteria and free chlorine. Six locations were identified as potential sites where septic system contamination might be occurring. These 6 sites were tested again in October 2017 using the same sampling and testing procedures. Only two locations remained positive for both indicators, as described in the ESC Report to GLPA, 2017. This observation correlates to the overall decrease in the lake's residential population and lake usage patterns, which historically occurs at the end of August.

In 2018, the investigation of Glen Lake continued as a collaborative project that included the GLPA, SUNY Adirondack ESC, and the Warren County Soil and Water Conservation District. Sites to be tested were mapped using both visual and GPS coordinates. Testing began in early May and was conducted once monthly through October, using the same two indicators (*E. coli* and free chlorine) as in 2017. Results confirm findings from 2017 and indicate that two areas may be impacted by human-associated contamination, one along the Glen Lake shoreline and the other in the graminoid fen.

## Method

Testing was conducted at selected sites once a month, from May through October. With consideration of the cost of testing, not all sites identified in 2017 were tested each month. Each sampling location was identified using visual and GPS coordinates.

At each site, a “grab” sample was obtained approximately 10-20 cm below the surface of the water in sterile 250 ml Nalgene bottles. All samples were stored in a cooler with ice and transferred to the Microbiology Research Laboratory at SUNY Adirondack where they were processed within 4 hours of collection.

In the laboratory, each sample was tested for the presence of *Escherichia coli* (a fecal coliform bacteria) using the IDEXX Colilert testing system according to manufacturer specifications and standard microbiology procedures. The samples were also tested for free chlorine (hypochlorous acid and hypochlorite) using a Hach DR/800 colorimeter and HACH reagents according to manufacturer recommendations. For this study, we used a cutoff value for “positive” as the lower limit of detection (0.02 mg/L) since this assay detects only the forms of chlorine associated with human activity.

## Results and Discussion

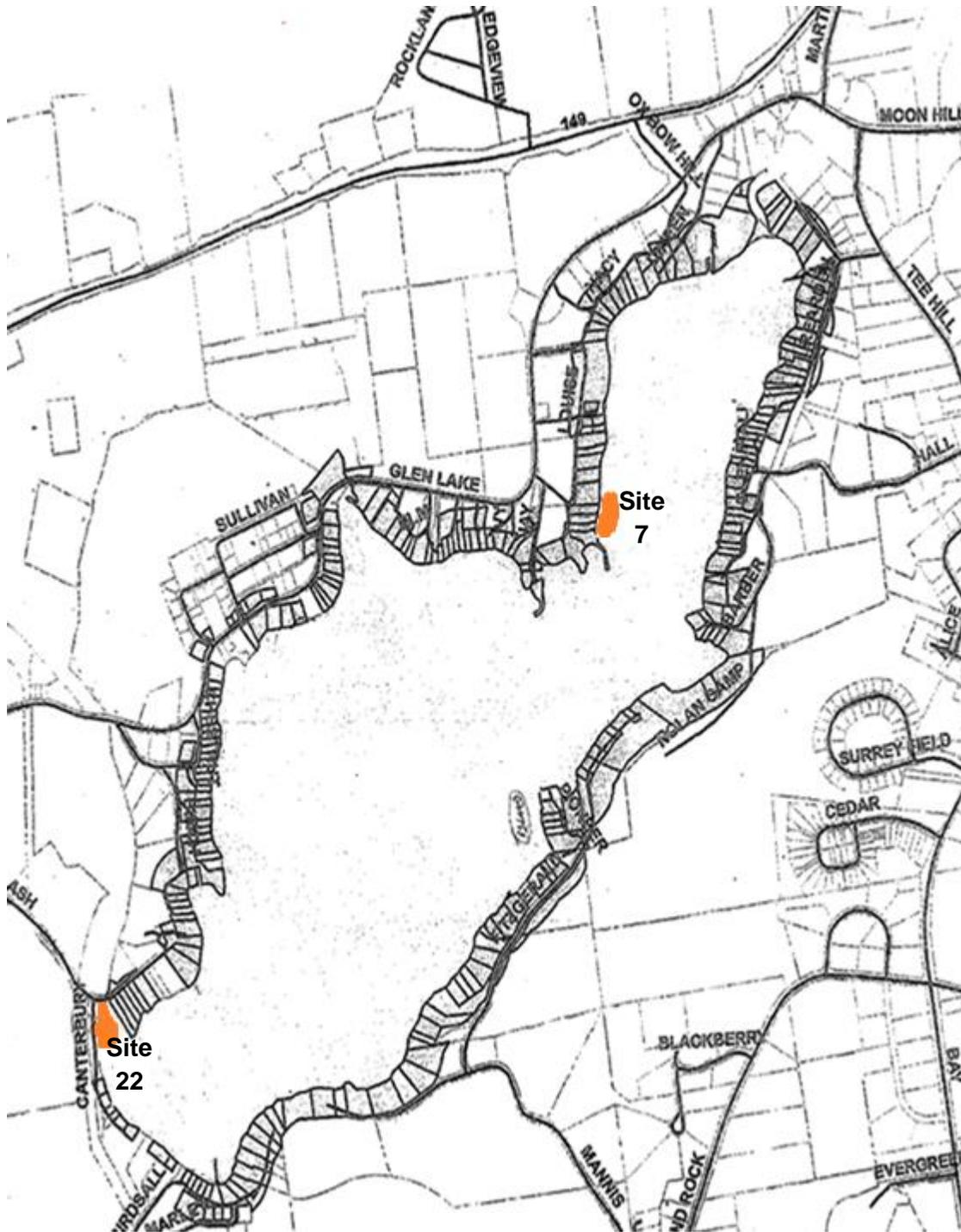
The total number of sites around the lake that tested positive for both *E. coli* and free chlorine were the highest during the months of May and August 2018. Pertinent to this outcome is the observation that average rainfall totals for the Glen Lake area during these months was approximately double the average rainfall recorded in 2017. Therefore there is a positive correlation between rainfall totals and an increase in the number of shoreline sites where contamination was detected.

Based on the frequency of concurrent detection of both indicators, two areas of the lake were identified as locations where human-associated contamination may be occurring. Both of these sites are highlighted on the map in Figure 1. At these two sites, the number of testing dates where the samples were positive for both *E. coli* and free chlorine exceeded the frequency of positives at other sites over the two year sampling period.

One site, identified as Site 7 (corresponding to 43.368°N, 73.667°W) on the Glen Lake shoreline, was positive for both *E. coli* and free chlorine 5/8 of the sampling dates over two years; 2/2 in 2017 and 3/6 in 2018.



Figure 1: Map showing the two areas of the Glen Lake shoreline where both *E. coli* and free chlorine were detected with frequency in 2017.



## Conclusion

There is substantial evidence that Glen Lake and the graminoid fen are receiving biological and chemical contaminants derived from human sources through either the groundwater or surface water entering the lake. The number of sites where both *E. coli* and free chlorine were detected was increased during the months in which there was a documented increase in rainfall. Two locations, one shoreline and one related to the fen, were repeatedly positive regardless of the rainfall levels.

The fen spanning from Glen Lake to Route 9 and including Rush Pond, was consistently found to have detectable levels of free chlorine, with the concentrations often being 5 to 10 times higher than the detection limit of the assay. Since there are no known natural sources of free chlorine in aquatic ecosystems, this finding warrants further study.