

Black Lake (Cheboygan/Presque Isle Counties, MI) Swimmer's Itch Assessment Report 2018

Introduction/Background

Swimmer's itch is a dermatitis caused by the group of parasitic flatworms (Platyhelminthes: Trematoda) called avian schistosomes. These parasites naturally infect a variety of waterfowl species, and all live as larvae in a snail intermediate host species. Because the life cycles of avian schistosomes require the alternation of living within a bird and snail host, successful swimmer's itch control strategies have focused on trapping infected waterfowl and relocating them to areas devoid of the suitable snail intermediate host species. This approach breaks the parasite's life cycle for one year, and dramatically reduces swimmer's itch cases on affected lakes.

Throughout lakes in the northern US, the most common avian schistosome affecting humans is *Trichobilharzia stagnicola*, which uses the common merganser (*Mergus merganser*) and a lymneid snail as its definitive and intermediate host, respectively. In February of 2018, The Michigan Natural Resources Commission approved a new Common Merganser Control Policy for lake associations that want to combat swimmer's itch. As part of that policy, the Michigan Department of Natural Resources is requiring that permit applicants conduct swimmer's itch assessment work as the first step in the permitting process. This report addresses that assessment work.

Avian Schistosome Species Assessment Elements

The BLPS contracted with Swimmer's Itch Solutions to conduct a swimmer's itch assessment of Black Lake, which was to include the following components:

- Snail and water sample analyses at five different locations around Black Lake
- A bird survey of the entire shoreline of Black Lake
- Two educational outreach sessions for the Black Lake community

Analyses Methods and Results

Collection of snails and water samples. Snails and water samples were collected from eight different locations around Black Lake over a three-week period in July (Figure 1). In addition, snails were looked for at several other sites (with minimal success, see below) in an effort to increase the number of snails examined.

Snails are neither as abundant or ubiquitous on Black Lake as compared to other lakes in the area (i.e., Mullet Lake, Burt Lake, and Douglas Lake). After many hours of searching in all 8 locations (and nearby areas), 281 *Helisoma* sp., 155 *Stagnicola emarginata*, and 19 *Lymnaea stagnalis* were collected. Microscope examination revealed 1 *S. emarginata* snail to be infected with *Trichobilharzia stagnicola*, and DNA analyses of the cercariae shed from this snail confirmed this species identification. *T. stagnicola* is the avian schistosomes species that is carried by common mergansers. An unidentified schistosome, possibly one that can cause swimmer's itch, was also found in 1 of the *Helisoma* sp. snails.

Water samples were analyzed by qPCR and 5 of 8 locations tested positive for schistosomes (Figure 2). Only the Pine Grove Beach area can be considered a swimmer's itch "hotspot" with over 100 cercariae/ 25 L lake water. Multiple lab techniques were able to confirm that *Trichobilharzia stagnicola* was a species present in the water samples.

Conclusion: *Trichobilharzia stagnicola* is present in Black Lake, as evidenced by one infected *Stagnicola emarginata* snail, and by 5 of 8 water samples that tested positive for avian schistosomes.

Waterfowl survey. A survey of the entire Black Lake shoreline was conducted on July 20, 2019. Mallards and Canada geese are commonly found on the lake, and we also observed 1 brood of common mergansers and a small number of adult red-breasted mergansers. (Figure 3). Casual conversations with Black Lake riparians also indicated that common merganser broods are consistently seen on the lake every summer.

Conclusion: Common mergansers, and their broods, are present on Black Lake.

Educational Outreach. A Powerpoint presentation was given at the BLPS Annual Meeting on July 6, 2019, and we offered a swimmer's itch workshop/demonstration at Onaway State Park on the morning of July 24, 2019.

Summary Findings

Black Lake meets the three biological requirements for a permit specified in the Common Merganser Control Policy:

Biological Requirement 1: Documentation of the swimmer's itch lifecycle present on the lake, including presence of the swimmer's itch parasite and evidence that Common Mergansers are the host associated with the parasite's lifecycle on the lake.

Evidence: *Trichobilharzia stagnicolae* cercariae, which mature into adult parasite worms in common mergansers, were found in a *Stagnicola emarginata* snail and in water samples taken from Black Lake.

Biological Requirement 2: Evidence of the presence of Common Merganser broods on the lake.

Evidence: A common merganser brood of 8 ducklings was observed on Black Lake.

Biological Requirement 3: One of the following criteria must be met to be eligible for participation in Common Merganser control:

- Snail infection rate for the lake is greater than 0.5% with a minimum sample of 1,000 snails taken from a minimum of 5 sampling locations.
- A qPCR assessment of the lake that is greater than 50 cercariae/25 L of water with a minimum of 5 sampling locations

Evidence: A multi-day, thorough snail surveying effort of Black Lake resulted in the collection of only 155 living *Stagnicola emarginata* snails. However, one of those individuals was positive for *Trichobilharzia stagnicolae*, which yields a lake-wide snail infection level of 0.64%. Five of eight sites were positive for *T. stagnicolae*, with a range of 1-500 cercariae/25 L (Figure 2). While *Stagnicola* snails were not common, the frequency of sites and samples that were positive suggest that there are isolated, low-density populations of *Stagnicola* around the lake, and that some percentage (probably relatively high) of snails are infected.

Conclusion: There are multiple pieces of evidence that suggest that common merganser control would be effective on Black Lake. Though the low density of *Stagnicola* snails precluded reaching the minimum sample size, the data suggest that if a larger number of snails could be collected, there would be a relatively high number infected. Despite a low-density of snails, people report swimmer's itch at multiple locations, and qPCR measured a moderate lake-wide average with at least one location that was quite high.



Figure 1. Snail and water collection sites on Black Lake (Cheboygan/Presque Isle Counties, MI)

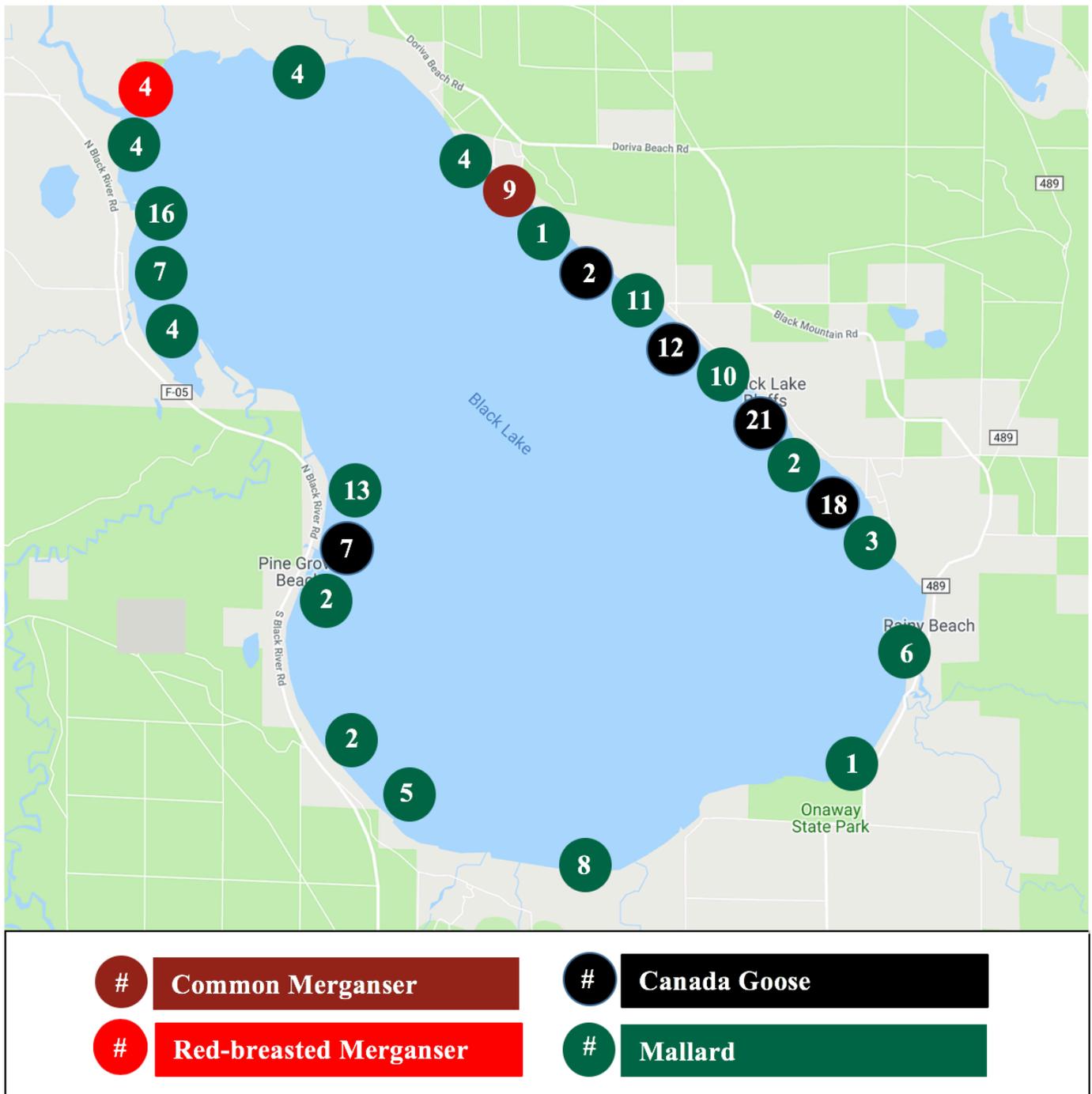


Figure 2. Waterfowl species observed on a July 20, 2019 shoreline survey of Black Lake (Cheboygan/Presque Isle Counties, MI). Numbers in circles represent the total number of individuals of that particular species.

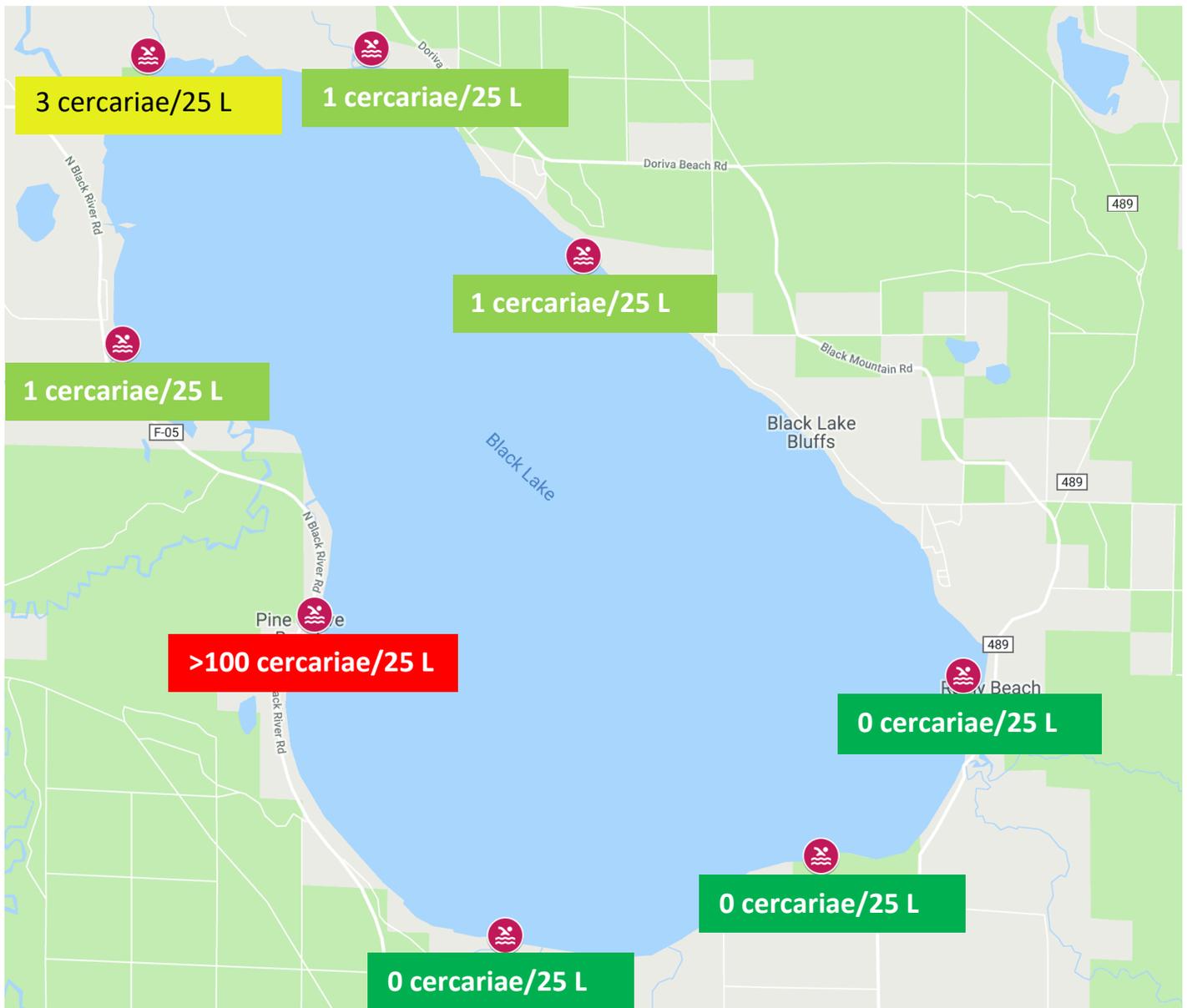


Figure 3. Number of avian schistosomes/25 L water in samples taken from Black Lake (Cheboygan/Presque Isle Counties, MI).