

Platte Lake (Benzie County, 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 stagnicolae*, 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.

Site description

The following excerpts were taken from a MI-DNR Assessment Report of the Platte Lake (Tonello, 2010).

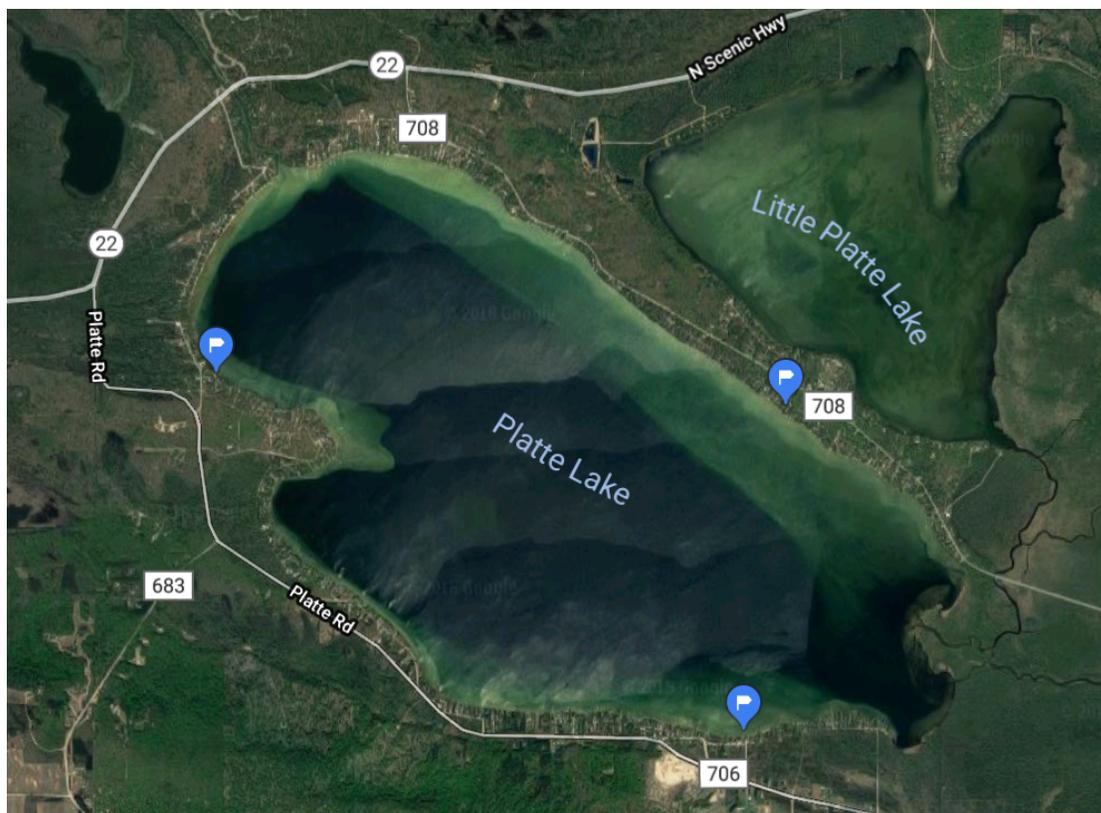


Figure 1. Satellite view of Platte Lake (Benzie County, MI)

Platte Lake (Figure 1) is 2,516 acres in size and located several miles northwest of the city of Honor, in northwestern Benzie County, Michigan, in the northwestern Lower Peninsula. The maximum depth of Platte Lake is about 90 feet, with the average depth being about 25 feet. Approximately one third of the lake is shallower than 15 feet. Platte Lake is in the Platte River watershed, with the Platte River flowing into the southeastern shore of the lake and flowing out of the northwestern shore; there is no lake-level control structure. Platte Lake is accessible to migrations of fish from Lake Michigan, although a seasonal salmon weir is operated by the Michigan Department of Natural Resources (DNR) on the lower Platte River.

The shoreline of Platte Lake is heavily developed with homes and cottages, except for the southeastern shore where the Platte River flows into Platte Lake. Shallow, near-shore areas of Platte Lake are predominately sand, with large stretches of gravel shoals in 2 to 10 feet of water. The remaining deep water areas are marl, or a muck/marl combination (Seites 2010). In addition to the Platte River, there are several other small, unnamed, coldwater spring-fed creeks that flow into Platte Lake. The surrounding landscape is mostly hilly and forested, with predominately sandy soils, although the area directly to the east of Platte Lake is a large lowland area locally known as the Deadstream Swamp. Public access to Platte Lake is available through a DNR boat launch on the southwestern corner of the lake.

In the Platte River watershed, Platte Lake is a significant feature. Only Long Lake, at the very headwaters of the watershed, is larger. The Platte River watershed begins in Long Lake, in western Grand Traverse County. The outlet from Long Lake flows downstream into Lake Dubonnet, and then into Lake Ann and several smaller lakes, including Bronson Lake. From there, the Platte River flows for approximately 15 miles before flowing into Platte Lake. About one mile downstream of Platte Lake, the Platte River flows into Loon Lake. From Loon Lake, the Platte River flows for about two miles before entering Platte Bay of Lake Michigan.

The Platte River watershed drains approximately 93,000 surface acres (Wicklund and Dean 1958). Approximately 82% of the landcover of the Platte River watershed is forest, open land, and wetlands. Agricultural and urban are the other two land uses of the Platte Lake watershed (Anonymous 2005). Approximately 76% of the watershed is publicly owned either by the National Park Service as part of the Sleeping Bear Dunes National Lakeshore, or the State of Michigan as state forest land.

The Platte River is a relatively small river, with annual flows averaging approximately 124 cubic feet per second (Canale et al. 2009). The Platte River is a very stable, groundwater-fed river with flows that show only minor fluctuations with precipitation. This is due to the sandy soils found in the watershed that allow rainwater to percolate into the soil to become groundwater. There is one lake association on Platte Lake, the Platte Lake Improvement Association (PLIA). The PLIA is a non-profit, voluntary organization composed of lakeshore residents and property owners as well as other interested individuals. The PLIA was formed in 1978, and was founded "for the express purpose of restoring, protecting and preserving Platte Lake, one of Michigan's finest natural resources" (www.platte-lake.org).

Analyses Methods and Results

Trichobilharzia stagnicolae

Currently, there are three methods of determining whether the avian schistosome species, *Trichobilharzia stagnicolae*, is cycling in a lake: 1) microscopic examination of a sample population of its snail intermediate host (i.e., "shedding snails"), 2) DNA analyses of lake water samples (i.e., qPCR), and 3) microscopic examination/DNA analyses of miracidia in common mergansers fecal samples.

Snails and water samples were collected from four different locations (Sites 1-4) around Platte Lake on June 8, 2018 (Figure 2). Very few living snails of any species were observed, and the only evidence of *Stagnicola emarginata* in those four locations was the discovery of a few dead shells. Two separate water samples for qPCR testing were taken at each of the 4 sites.

Five weeks later, on July 10, 2018, the search for living *Stagnicola emarginata* was expanded to include a total of 7 locations (Figure 2). Again, only dead *Stagnicola emarginata* shells were found. With the possibility that snail populations might be restricted to water depths greater than 4 feet, more snail surveys were conducted by scuba diving to a depth of approximately 20 feet. No snails were found in water deeper than 6 feet. A total of three living *Stagnicola emarginata* were found, all in very shallow water, near site 7. We also took water samples for qPCR testing at the 3 additional new locations (Sites 5-7).



Figure 2. Snail and water collection sites on Platte Lake (Benzie, MI).

Only three species of snails were found at our collection sites: two pulmonate species (*Stagnicola* sp. and *Helisoma* sp.) and one operculated species (*Pleurocera* sp.). None of the 70 avian schistosome species utilize operculated snails or *Helisoma* sp. as hosts, so only *Stagnicola* sp. snails were individually isolated and examined.

A microscope examination of the 3 living *Stagnicola emarginata* snails revealed 1 individual to be infected with *Trichobilharzia stagnicolae*, and DNA analyses of the cercariae shed from this snail confirmed this species identification.

Water samples were analyzed by qPCR and 5 of 7 locations tested positive for schistosomes. A lab technique called rhAmp was able to confirm that the species present in the water samples was *Trichobilharzia stagnicolae*.

Conclusion: *Trichobilharzia stagnicolae* is present in Platte Lake, as evidenced by one infected *Stagnicola emarginata* snail, and by 8 of 14 water samples that tested positive for avian schistosomes.

Common mergansers (*Mergus merganser*)

A lake-wide bird survey of Platte Lake was conducted on June 8, 2018 and again on July 31, 2018. Only one common merganser brood was observed on the lake in both surveys, but the number of ducklings in her

brood increased from 9 on the June survey to 17 individuals seven weeks later. This observed increase in duckling number is most likely the results of two different broods crèching. Residents also indicated that they consistently see at least one common merganser brood on the lake every summer.

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

Summary Findings

Platte Lake meets the first two 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* sp. snail and in water samples taken from Platte Lake.

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

Evidence: A common merganser brood of 17 ducklings was observed on Platte 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 three-day, thorough snail surveying effort of Platte Lake resulted in the collection of only 3 living *Stagnicola emarginata* snails. However, one of those individuals was positive for *Trichobilharzia stagnicolae*, which yields a lake-wide snail infection level of 33.0%. Five of seven sites were positive for *T. stagnicolae*, with a range of 1-108 cercariae/25 L (Figure 3). Among all positive samples, the average for Platte Lake was 12.2 cercariae/25 L. If negative sites are included, the average for Platte Lake was 10.5 cercariae/25 L. 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 Platte 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, and qPCR measured a moderate lake-wide average with a couple locations that were quite high.

Literature Cited

Tonello, Mark A. 2010. Platte Lake. Michigan Department of Natural Resources and Environment, Status of the Fishery Resource Report. Ann Arbor, Michigan.

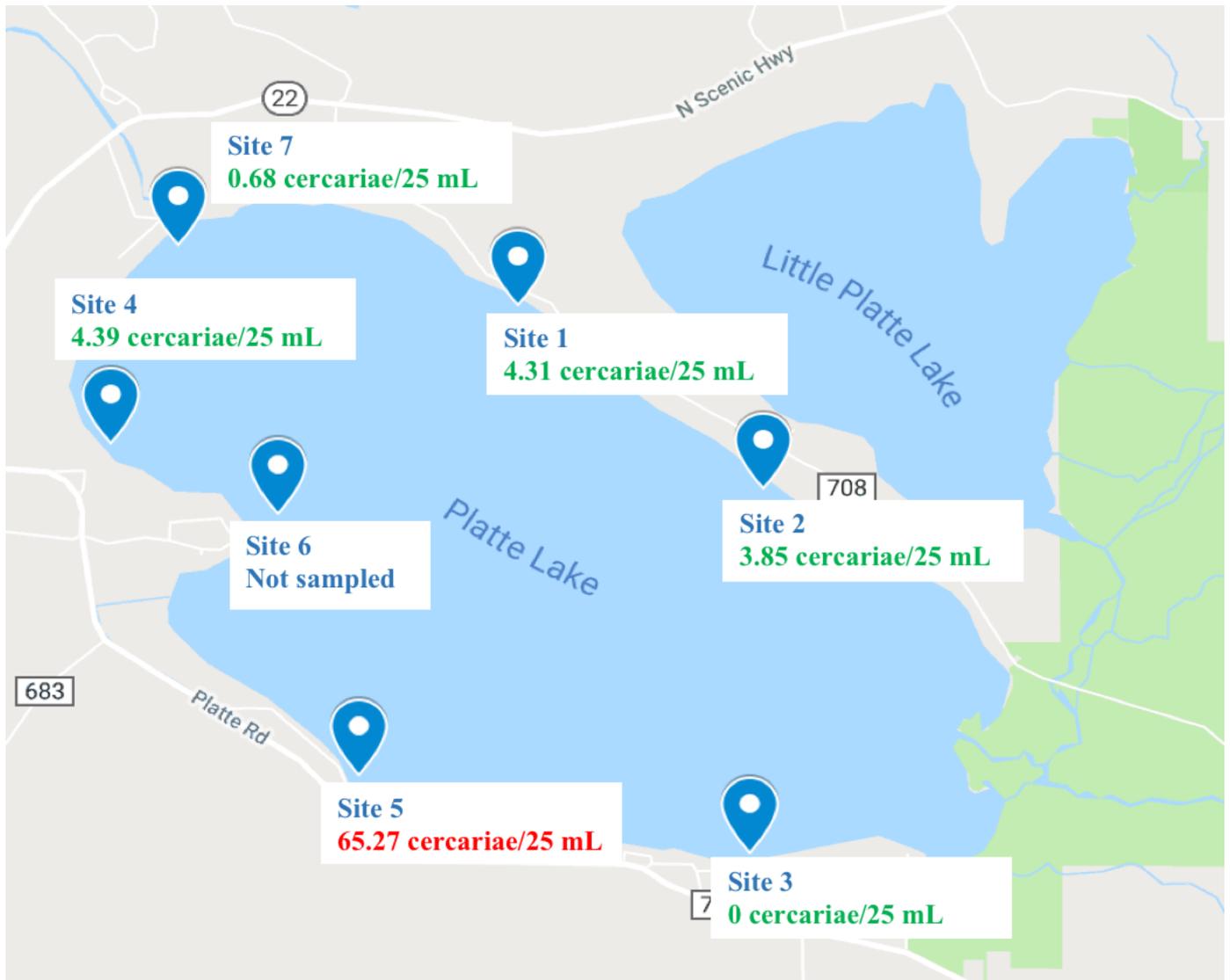


Figure 3. Number of avian schistosomes/25 mL water in samples taken from Platte Lake (Benzie, MI).