

Briggs Lake Golden Clam Project Update

In 2020 a Big Lake family participating in the University of Minnesota AIS Detectors Program's annual [Starry Trek](#) event visited Briggs Lake to search for potential non-native plants and animals. The family's 12-year old son tossed a sampling rake out into the water and pulled up two small, yellow/brown clams. Right away, he thought these clams did not resemble the native clams that should be in the lake. The clams were collected and later confirmed by the Minnesota Department of Natural Resources as being freshwater golden clams (*Corbicula fluminea*). This finding represents the first time live freshwater golden clams have been found in an inland Minnesota lake. Previous occurrences have been documented in rivers, mostly where a power plant or other facility is discharging water that keeps a portion of that river warmer year-round. Minnesota has otherwise previously been thought to be outside of the potential range for this species due to our cold winters, however this recent finding is challenging that theory.

Since this discovery occurred, staff from the Sherburne Soil and Water Conservation District (SWCD) and Minnesota Aquatic Invasive Species Research Center (MAISRC) have visited the lake numerous times each year during both winter and summer to assess the clams and conditions they are surviving in. In 2022 a report was published that outlined the following:

- Over 800 clams found
- 70% of clams were alive
- Clams surviving cold winter temperatures
- Multiple age classes confirm reproduction



Approximate location of known golden clam infestation range, Briggs Lake.

The findings of this study challenge previously held thoughts about how tolerant golden clams are of cold temperatures. Additionally, the findings highlight a need for improving current models for where in the continental United States golden clams are likely to be able to establish surviving populations.

In 2022, staff from Sherburne SWCD, MAISRC, and the Minnesota Department of Natural Resources visited Briggs Lake in June and August to assess the population. Clams were searched for using multiple techniques including direct observation in shallow water, snorkeling, and sifting through sediment with a D-net and straining the sand (similar to the technique used in 2020-2021). The field crews were in for a surprise when no live clams were observed in each of the 2022 surveys. In fact, fewer dead clam shells were observed as well.

The results of June and August 2022 surveys were unexpected given the regularity of live clams turning up in samples collected during 2020 and 2021 from Briggs Lake. To attempt to explain this observation, MAISRC staff evaluated environmental data from 2020-2022. Previous research suggests that Golden Clams have some level of intolerance to colder temperatures, although exact thresholds are not exactly known. These cold temperatures may impact clams either through shorter term extreme temperatures (acute exposure) or through longer term exposures of cold temperatures (chronic exposure).

An examination of temperature data from the Minnesota Department of Natural Resources Climatology Office for 2019-2022 shows the following:

- Average winter monthly temperatures (Figure 1) were higher in winter 2019-2020 and winter 2020-2021 than much colder in winter 2021-2022. The temperature in early winter (January) was remarkably colder in 2022 compared to previous years.
- In examining extremely low temperatures, winter of 2021-2022 had more days below 0°F compared to 2019-2020 and 2020-2021 (Figure 2). Each month of 2021-2022 had a higher number of days below 0°F, again with a dramatic in the month of January.

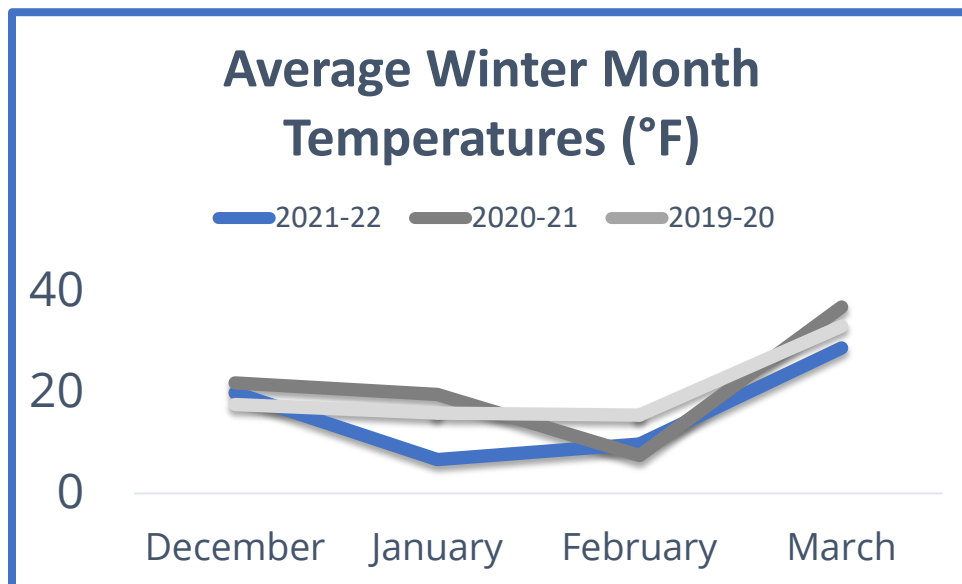


Figure 1. Average winter month temperatures in Central Minnesota, winters of 2019-2022. Grayscale lines indicate temperatures during times in which clams were observed, blue line data indicates winter temperature in 2021-2022 (living clams not found in 2022). Data from MN Climatology Office.

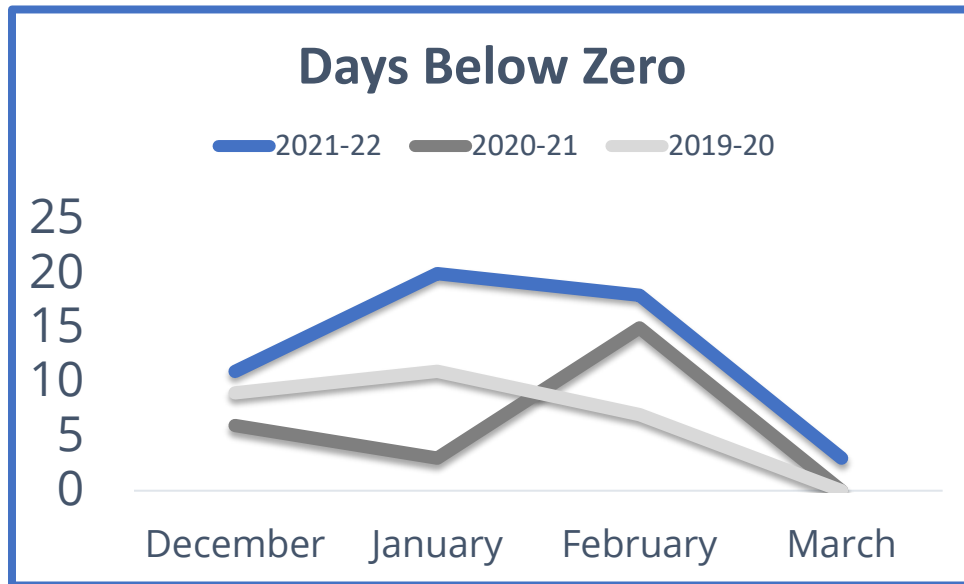


Figure 2. Days below zero in Central Minnesota, winters of 2019-2022. Grayscale lines indicate temperatures during times in which clams were observed, blue line data indicates winter temperature in 2021-2022 (living clams not found in 2022). Data from MN Climatology Office.

The difference in cold temperature, both in terms of the number of extremely low temperature days and the longevity of low temperatures through the winter season, may suggest that Briggs Lake clams were exposed to colder temperatures for a longer period of time, though there is uncertainty around how these colder air temperatures translate to water temperatures below the ice. If this is indeed the case, clams that had survived for 1-2 or more years in Briggs Lake under relatively moderate winter conditions may have not survived the very long and colder winter of 2021-2022. The relatively colder conditions may have resulted in a mass die-off of clams, which would explain why no living clams were observed in 2022.



Freshwater Golden Clam (non-native). Distinct, concentric rings that are ridged or raised. Yellow-green to brown in exterior color. Interior color may be white to light blue or purple. Triangular shape with two shells (bivalve) connected at a single smaller hinge point. Burrow in sandy or light organic sediment. Less than two inches in diameter.

The weather phenomenon described above is a leading theory that attempts to explain the odd circumstances observed in 2022. Continued annual monitoring of Briggs Lake will be an important step to document any changes to the clam population.