

2024 FFRC Project: *Identifying Lake Trout (*Salvelinus namaycush*) genetic ancestry and oxy-thermal habitat in Dollar Lake and Big Indian Lake - Final Report; Matthew Warner*

Primary Results

Dollar Lake

Sampling

Following the confirmation of suitable habitat via mapping and temperature monitoring, and the presence Lake Trout in Dollar Lake via eDNA in October, 2023, a follow-up sampling effort from May – September, 2024 took place. After > 600 hours of angling and gill netting Dollar Lake for the species, **no Lake Trout were captured**, nor were any reported by civilian anglers.

The majority of the sampling effort took place in May and June, and the majority of angling efforts took place using trolling-type methods at various depths. Gill nets used for the majority of the project were a 80 x 6 ft, 5 in mesh net, and a 30 x 60 ft, 4 in mesh net. **No species of any fish were captured using these nets.** In mid-August, a 150 x 6 ft, 1.5 in mesh net was acquired and deployed for several effort days, which captured some small White Suckers and some small Brook Trout, but no Lake Trout.

Habitat Monitoring

A vertical temperature line of HOBO temperature loggers was deployed in early spring to measure the development of a Lake Trout-suitable hypolimnion, but this data will not be able to be retrieved until late spring of 2025. Several actively measured water column surveys using an Aqua-Troll 500 (see **Figure 1**) identified that Dollar Lake was highly suitable for Lake Trout throughout the year. Around September is typically when a hypolimnion is the most vertically compressed (smallest), the warmest, and contains the lowest concentration of dissolved oxygen (DO) of any other time of year, however, hypolimnetic conditions within Dollar Lake stayed suitable below 12m. This depth range provides more suitable hypolimnetic habitat conditions than Sherbrooke Lake. In 2023, the pH of Dollar Lake was measured at typically unsuitable levels for lake trout (< 4.5), likely from excess surface runoff from the high precipitation, however, the pH in Dollar in 2024 stayed within a suitable range of ~ 6.5.

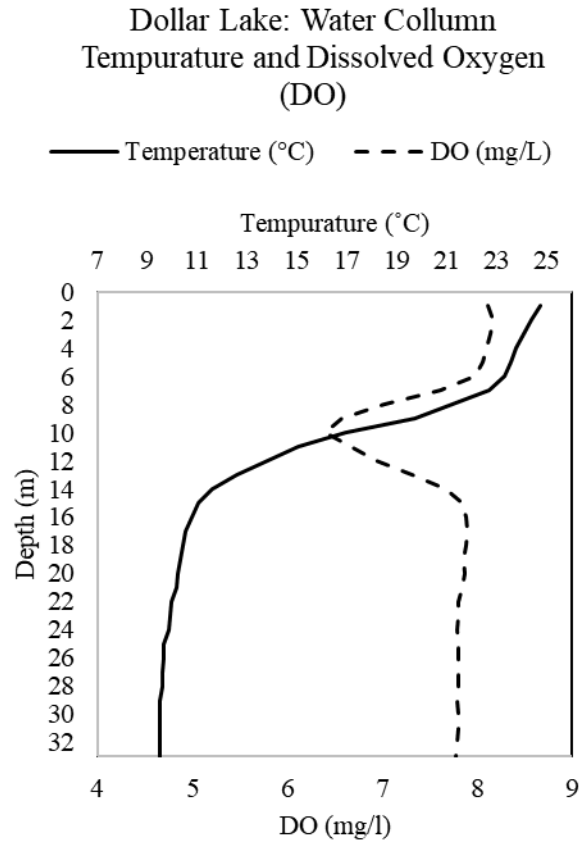


Figure 1: Water column Temperature (°C) and dissolved oxygen (DO;mg/l) for each meter of depth in the deepest part of Dollar Lake during September, 2024.

Misc. Observations

Dollar Lake seems to host a plethora of other native species, including a seemingly healthy population of Brook Trout, minnows and killifish, American Eel, and Brown Bullhead catfish. No anadromous alewife were observed migrating upstream into Dollar Lake from the Musquodoboit River, despite the passage being confirmed as passable, and the species confirmed in the system that year. Large schools of unidentified “bait fish” were also observed on sonar (see **Figure 2**). These observations indicate that there may be suitable forage for Lake Trout in Dollar Lake, despite their elusivity.

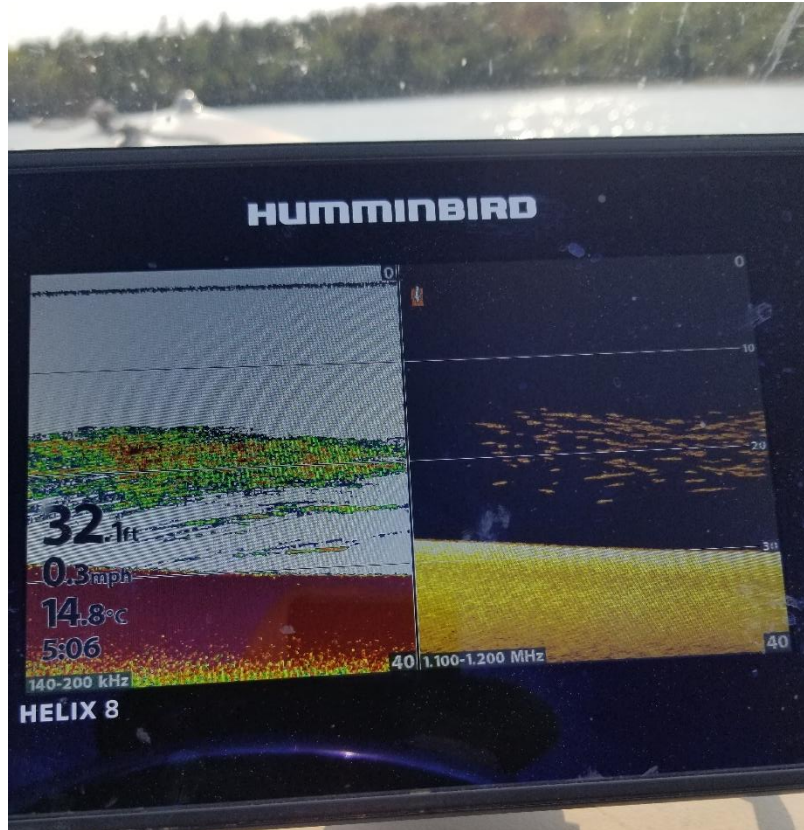


Figure 2: A school of “bait fish” of unknown species identified on sonar in Dollar Lake, June, 2024.

Big Indian Lake

Sampling

Only three days of sampling (May, June, and September) were possible on Big Indian Lake in 2024 due to boat and truck accessibility issues, and because efforts on Dollar Lake were judged to be more likely to produce a Lake Trout. A combination of angling and Gill netting over these days on Big Indian Lake produced **no Lake Trout**.

The majority of angling efforts took place using trolling-type methods at various depths. Gill nets used for the majority of the project were a 80 x 6 ft, 5 in mesh net, and a 30 x 60 ft, 4 in mesh net. **No species of any fish were captured using these nets.** In mid-August, a 150 x 6 ft, 1.5 in mesh net was acquired and deployed for several effort days, which captured many small Yellow and White Perch.

Habitat Monitoring

A vertical temperature line of HOBO temperature loggers was deployed in late spring to measure the development of a Lake Trout-suitable hypolimnion, but this data will not be able to be retrieved until late spring of 2025. Several actively measured water column surveys using an Aqua-Troll 500 (see **Figure 3**) identified that Big Indian Lake may be suitable for Lake Trout, but conditions during 2024 would not be sustainable for a population if these hypolimnetic conditions were annually consistent. A hypolimnion was present below 11m, however DO was < 5 mg/l, and there was little volume of the lake below this depth.

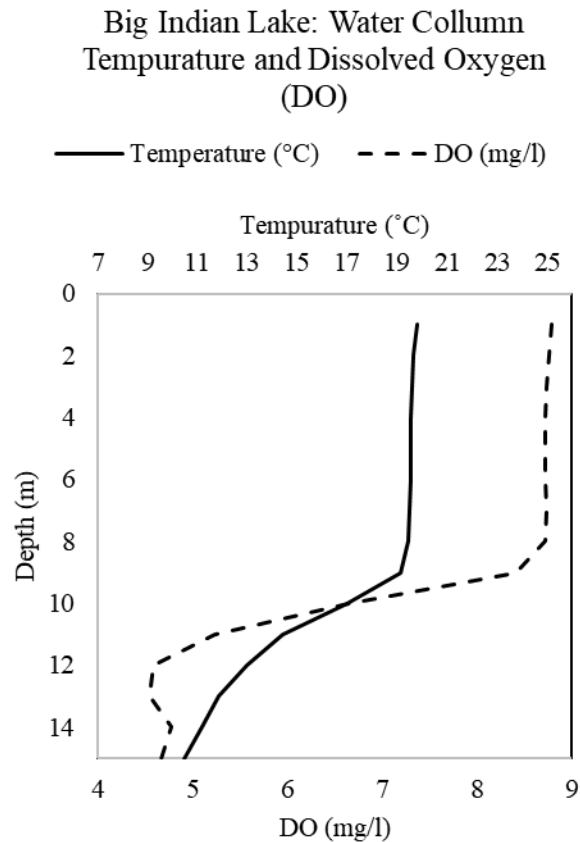


Figure 3: Water column Temperature (°C) and dissolved oxygen (DO;mg/l) for each meter of depth in the deepest part of Big Indian Lake during September, 2024.

An original plan under this FFRC project was also to map Big Indian Lake, however, this would have produced inaccurate data during 2024, as water levels were drawn down < 3m by the dam at the base of the lake due to drought conditions. These artificial conditions would likely have a negative and annually occurring impact on the hypolimnion each year, which may have lead to the extirpation of Lake Trout in Big Indian Lake since it's damming. This is only a working hypothesis.

Secondary Results

Sherbrooke Lake

Tracking

All but one acoustically tagged Lake Trout from the 2021/22 tracking study in Sherbrooke Lake were alive and accounted for prior to the tag batteries dying in late May – early June, 2024.

Sampling

In the spring of 2024, many recreational anglers reported captured of juvenile (~30 cm) and potentially young adult Lake Trout (~45 cm). In the summer of 2024, three days of angling were spent to confirm the presence of healthy adult and juvenile Lake Trout in Sherbrooke Lake as anecdotal passive monitoring. One notably small juvenile (~15 cm) was captured and released, confirming at least one recent year of successful Lake Trout spawning. Three more juveniles (~30 cm) were also captured, with no adults.



Figure 4: Juvenile Lake Trout (*Salvelinus namaycush*) (~15 cm) captured via angling from Sherbrooke Lake, August 3, 2024.

Gill net sampling in October for spawning Lake Trout to sampling eggs yielded no Lake Trout after 10 nights of sampling, except for one confirmed large (~64 cm) adult Lake Trout that escaped the net. After referring to watercolumn data in December, 2024, it seems that the

spawning window, immediately when the surface drops to ~13.5 °C, may have happened two weeks earlier than it did in the successful 2023 efforts. This sampling for Lake Trout eggs will continue in 2025, as the unique native predator/prey interaction of Lake Trout and Alewife in Sherbrooke Lake is still of interest to the international community for Lake Trout conservation.

Alewife Thiaminase

30 Alewife were lethally sampled from the LaHave river in early summer, 2024, to be tested for total Thiaminase activity. Whole, flash-frozen adult alewife were packed and shipped to Freya Rowland of the USGS for testing for total Thiaminase activity. Preliminary results suggest that the anadromous Alewife in the LaHave River that are consumed by Lake Trout in Sherbrooke Lake are high in Thiaminase. If confirmed, these results would indicate that there are other factors at play that allow our Lake Trout to overcome the thiaminase deficiency that is commonly seen in Lake Trout that consume invasive Alewife in the Great Lakes.

Pockwock Lake

Sampling

After four days of sampling Pockwock Lake, from June – October, **no Lake Trout were produced.** There was one anecdotal occurrence when a seemingly large fish took a lure attached to a “down rigger” similarly to how a Lake Trout does from Sherbrooke Lake. This fish immediately severed a 14 lb fluorocarbon leader on the hook set, and pulled on the rod much harder than any large Brook Trout (~ 48 cm) had.

History

An anonymous and previous angler of Pockwock attended two sampling efforts on Pockwock Lake, where he showed pictures confirmed capture of Lake Trout by him before the lake had been closed to recreation angling in 1961. He also described a memory of when Pockwock lake was “drained” for the dam construction in the 1960’s. He describes, from his memory, that the lake was more than half of its depth for an entire summer season. This temporary yet extreme alteration to the lake habitat may be the culprit to the extirpation of Lake Trout in Pockwock lake, despite the lakes seemingly pristine state today.

Wrights Lake

History

The same anonymous person that attended the sampling efforts on Pockwock Lake also **newly confirmed the historic presence of Lake Trout in Wrights Lake through photo evidence.** Photos provided would have likely been taken in the 1960’s, but Lake Trout presence in Wrights Lake would be likely due to its proximity and connection through watershed to Big Indian Lake and Pockwock Lake. This new evidence warrants exploration of Wrights Lake

through sampling efforts for Lake Trout, and habitat measuring and monitoring. Reliable lake access was not confirmed in 2024, and will be explored in 2025.

Future Research

There is still incredible value to learning more about Nova Scotia's Lake Trout genetics and natural history, and I will continue researching the species as often as possible. As of now the Sherbrooke Lake population may be Nova Scotia's endemic population of Lake Trout until another is confirmed. Opportunistic sampling efforts on Dollar, Pockwock, Big Indian, and Wrights Lake in 2025 may still yield Lake Trout, as the large 1.5 in mesh gill net was under utilized in 2024, and new angling tactics have been developed in since sampling efforts on East Grand Lake (NB/ME) were highly successful.

The Nova Scotia Department of Fisheries and Aquaculture can still expect summarized data from the yet-to-be retrieved Dollar Lake and Big Indian Lake temperature lines, and a completed map of Wrights Lake and Big Indian Lake. The department can also expect further publication of data on the Sherbrooke Lake population, and sampling for eggs will presume next fall with a greater understanding on timing.