



NWT Environmental

Research Bulletin (NERB)



NWT Cumulative Impact Monitoring Program (NWT CIMP)

A source of environmental monitoring and research in the NWT. The program coordinates, conducts and funds the collection, analysis and reporting of information related to environmental conditions in the NWT.

NWT Environmental Research Bulletin (NERB)

A series of brief plain language summaries of various environmental research findings in the Northwest Territories. If you're conducting environmental research in the NWT, consider sharing your information with northern residents in a bulletin. These research summaries are also of use to northern resource decision-makers.

Ecological monitoring of Lake Trout in the Great Slave Lake

Lake Trout are a valued recreational, commercial and cultural freshwater fish species in Canada. However, the population status in Great Slave Lake (GSL) is not well understood. Lake Trout are highly vulnerable to human and natural disturbances due to their slow growth and low reproduction rates. Among other factors, fishing, habitat alteration, water level changes, and climate change can impact Lake Trout populations. Understanding these impacts on Lake Trout requires information about their changing population status, stock structure and susceptibility to harvest.

Why is this research important?

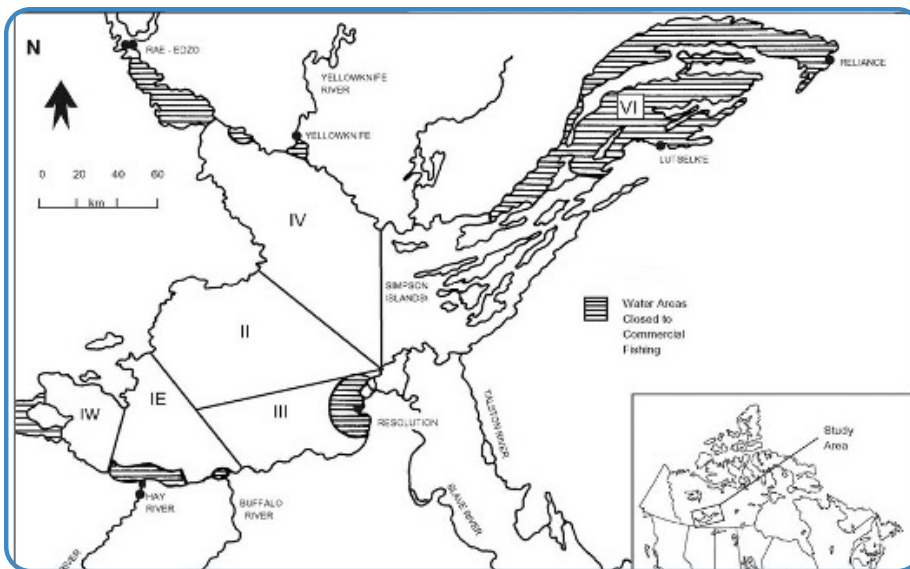
Commercial fishing efforts were once more broadly distributed across GSL, but are now mainly concentrated on Management Areas 1E and 1W, near the remaining active fish plant in Hay River (see map below). Lake Trout and Lake Whitefish share a combined catch quota in GSL despite having very different biology and associated resilience. High commercial fishing pressure from 1945 through the 1950s led to declining Lake Trout availability in GSL and commercial harvests of this species have remained relatively low since the 1960s. Although Lake Whitefish still make up the bulk of commercial harvest, there has been a gradual increase in the proportion of Lake Trout over the past decade (from < 10% up to 30%). We continue to study the impacts of fishing on Lake Trout in GSL to better understand its current status, and are evaluating sustainable harvest levels to inform commercial quotas. The results of these studies will contribute to an Integrated Fisheries Management Plan for GSL.

What did we do?

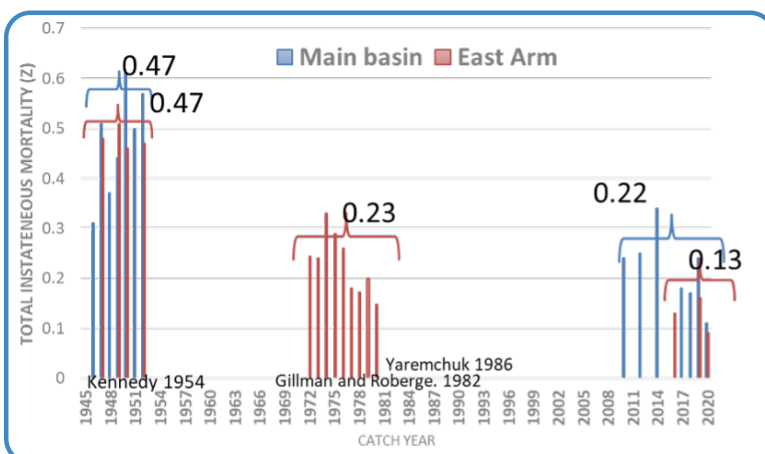
Lake Trout harvest, catch rates and biological data were collected from published reports, records and databases in Department of Fisheries and Oceans Canada (DFO), and other sources. New data on their catch rates and biology were collected from 2017 to 2021 in collaboration with local communities and commercial fishers, and added to the existing database. This information is being used to model the historical and present number of individuals, mortality and sustainable harvest levels of Lake Trout stocks in GSL. Meetings were held with local communities to gather local knowledge on impacts and population trends in Lake Trout to validate the model against community observations.

What did we find?

- Mortality rates of Lake Trout in the commercially-fished main basin and lightly harvested East Arm (see figure below), appear to be decreasing compared to historic levels.
- Preliminary results indicate overall Lake Trout numbers/biomass may be increasing in the main basin of GSL, but these stocks are still rebuilding and high area-specific harvests (e.g., in Areas IE & IW) could impact localized stocks.



DFO's management areas of Great Slave Lake in the Main Basin (Areas I-IV) and East Arm (V-VI)



Trout mortality in in Great Slave Lake's Main Basin (blue) and East Arm (red).

What does this mean?

- The observed reduction in mortality rates together with historical changes in catch suggest that harvest has likely been a key driver of overall Lake Trout abundance and availability in the GSL fishery.
- Although Lake Trout in the main basin of GSL may be increasing overall, this could be impacted if harvest rates were to increase substantially or if there are sustained high harvests in localized areas.

What's next?

- Determining status, modelled abundance, mortality levels and sustainable harvest levels of Lake Trout for specific management areas of GSL.
- Studying Lake Trout movements in GSL under an advanced tagging program.
- Studying Lake Trout stock structure in GSL using advanced genetic approaches (genomics).
- Project results will be peer-reviewed in 2023 as part of the DFO Canadian Science Advisory Secretariat process to generate science advice.
- Peer-reviewed science advice will contribute to an Integrated Fisheries Management Plan that will guide the sustainable management of fisheries on GSL.

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