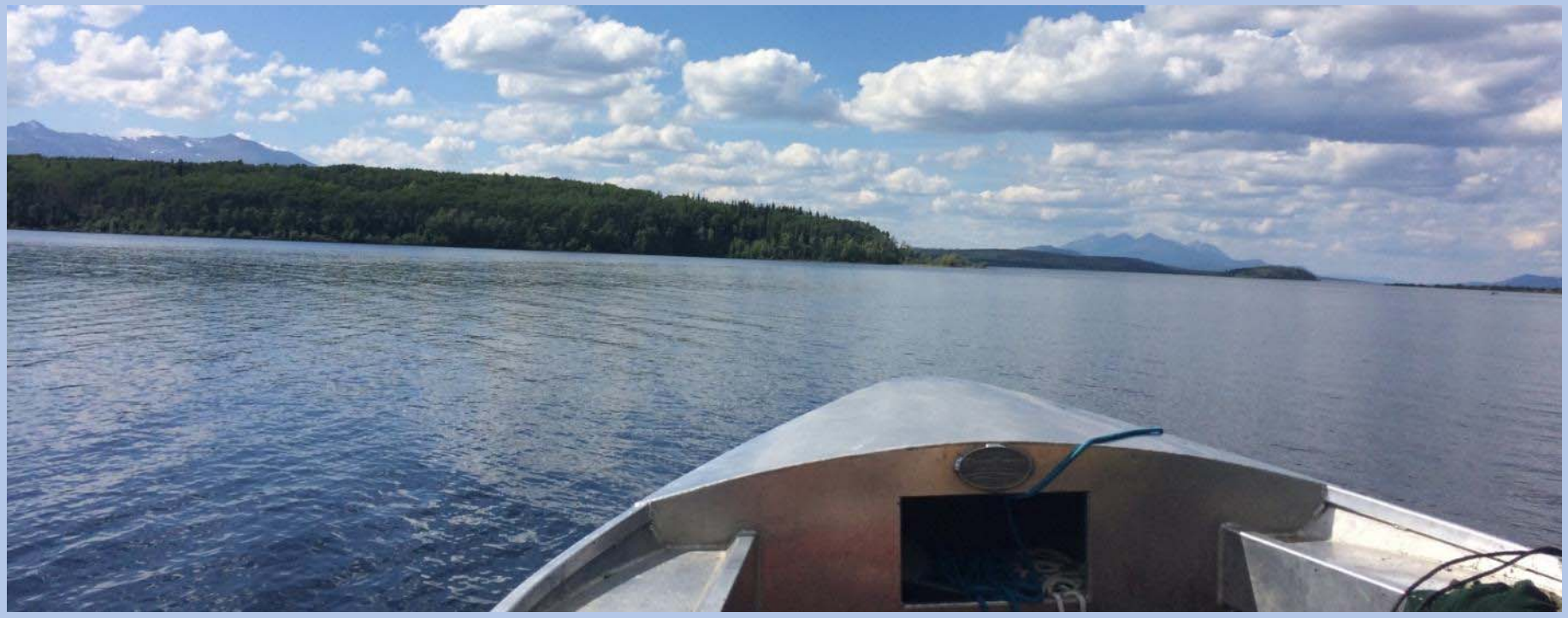
Teslin Lake: Lake Trout Spawning Site Identification and Mixed Stock Genetics Analysis

Project Summary

April 2018



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EDI Environmental Dynamics Inc.

Lake Trout in Teslin Lake

Lake Trout are the most sought after fish species in Yukon lakes, including Teslin Lake

Lake trout populations need to be carefully managed and consider a number of things including:

- How many lake trout are in the lake?
- How many are harvested per year?
- How many can be produced by the lake per year?

Lake trout are slow growing and long lived. The average lake trout sampled in the 2015 angler harvest survey was 54 cm long and 13 years old.

Clear, cold lakes such as Teslin can produce fewer fish than warmer lakes or those located further south.

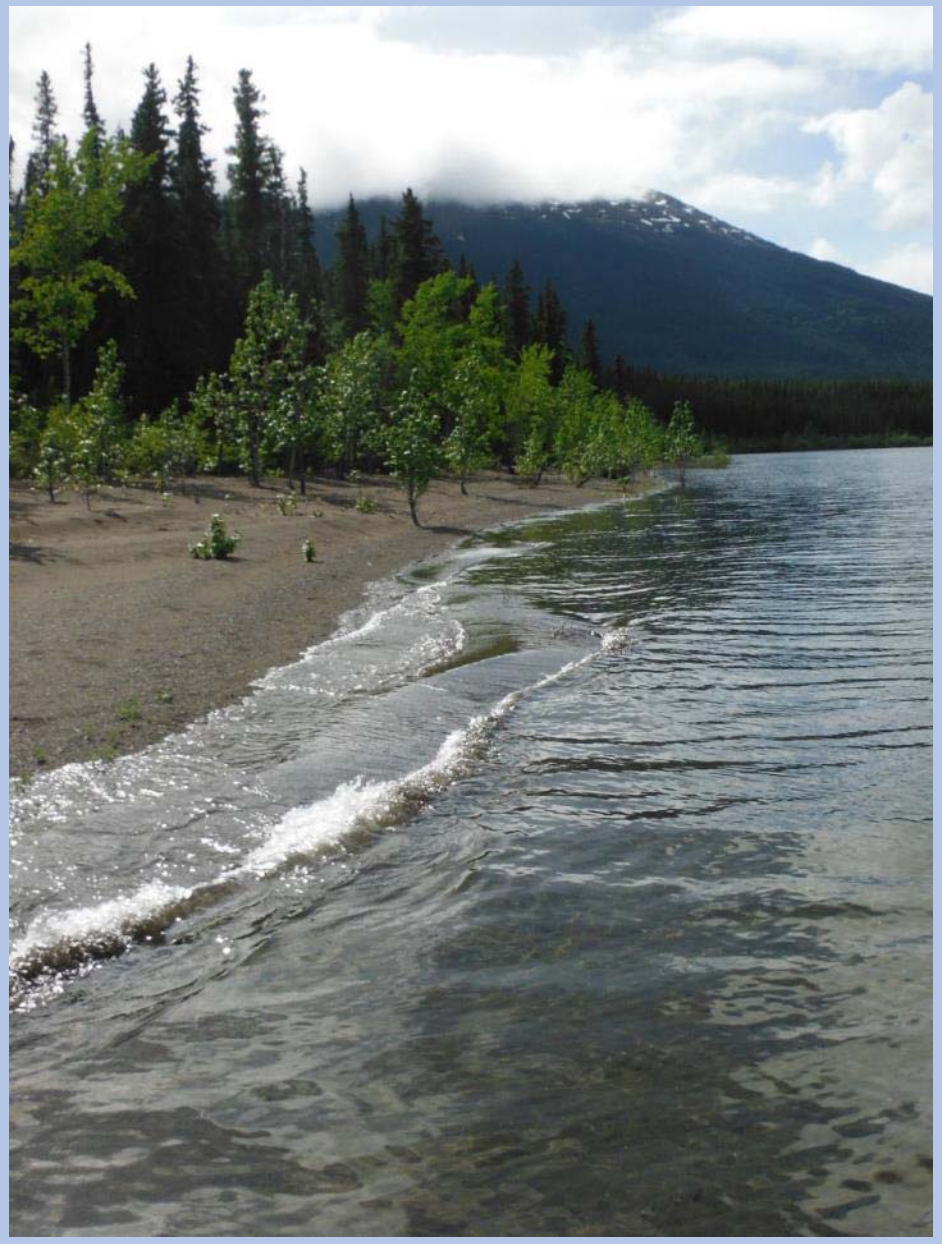
The Project

During 2016 and 2017, the Teslin RRC partnered with Whitehorse based contractor EDI Environmental Dynamics to undertake a lake trout research project on Teslin lake.

The general goals of this project were:

- Identify where the lake trout spawn.
- Collect DNA from lake trout at spawning areas throughout the lake (baseline).
- Compare the DNA baseline to the DNA from harvested lake trout

This project could help guide future lake trout management on the lake and ensuring good fishing in the future.



Locating Spawning Areas – Beach Seining

One of the methods used to find spawning areas was beach seining.

The fine mesh net is slowly drug along the shoreline and then circled together. All fish captured are placed in a holding container, identified to species and measured.

During the early summer when the young lake trout are very small, catching them means that a spawning area is very close by. Genetic samples (DNA) were collected from all lake trout to provide a baseline of all spawning areas in the lake.

Beach seining at the Big Island near 10 Mile

Locating Spawning Areas – Beach Seining

Beach seining near the BC Border

Locating Spawning Areas – Beach Seining

During June 2016 and 2017, over 250 beach seine hauls were done throughout all areas of the lake from Brooks Brook to Stormy Bay.

10 species of fish were captured, with the most common being slimy sculpin, burbot (lingcod), lake whitefish/broad whitefish and lake trout. A number of juvenile Chinook salmon were also captured.

A total of 659 juvenile lake trout were captured. Very few (2) were captured in the north end of the lake (Deadman, Timber Point/Brooks Brook).

Juvenile lake trout were captured in over half of the beach seine hauls throughout the lake with the most captured near the BC Border and Morley Bay.

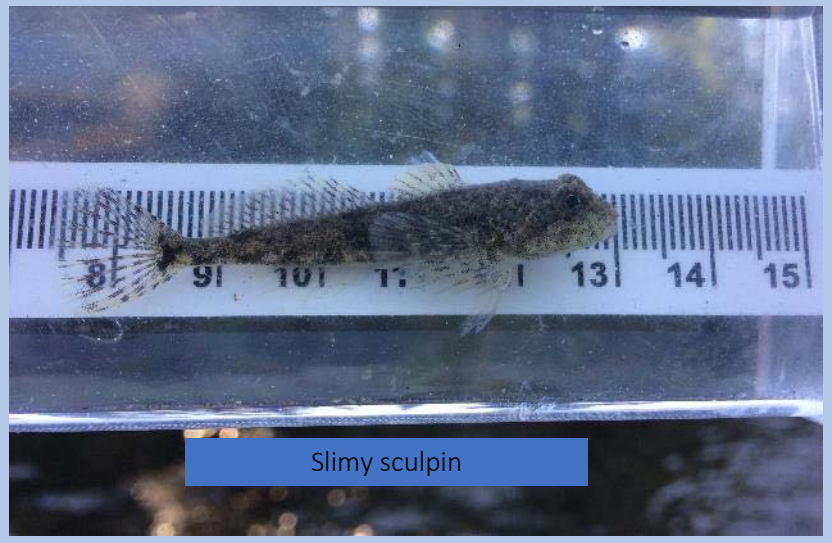
Juvenile lake trout captured near the BC Border, June 6, 2016

Juvenile lake trout captured near 10 Mile, June 27, 2016

Locating Spawning Areas – Beach Seining

Juvenile Chinook salmon

Juvenile Burbot



Slimy sculpin

Juvenile lake whitefish/broad whitefish
(these species are hard to identify as juveniles)

Locating Spawning Areas – Fall Spawner Sampling

The second method used to locate spawning areas were short-set, small mesh gillnet sets at suspected spawning locations during the fall spawning period.

By using very short sets (less than 20 minutes) and very small mesh sizes (2 inch), the lake trout only become tangled by their teeth/fins and can be released alive.

Fish were placed in a large live well with recirculating lake water to allow them to recover after being caught.

Lake trout only spawn at night, so all sampling was done in the dark.

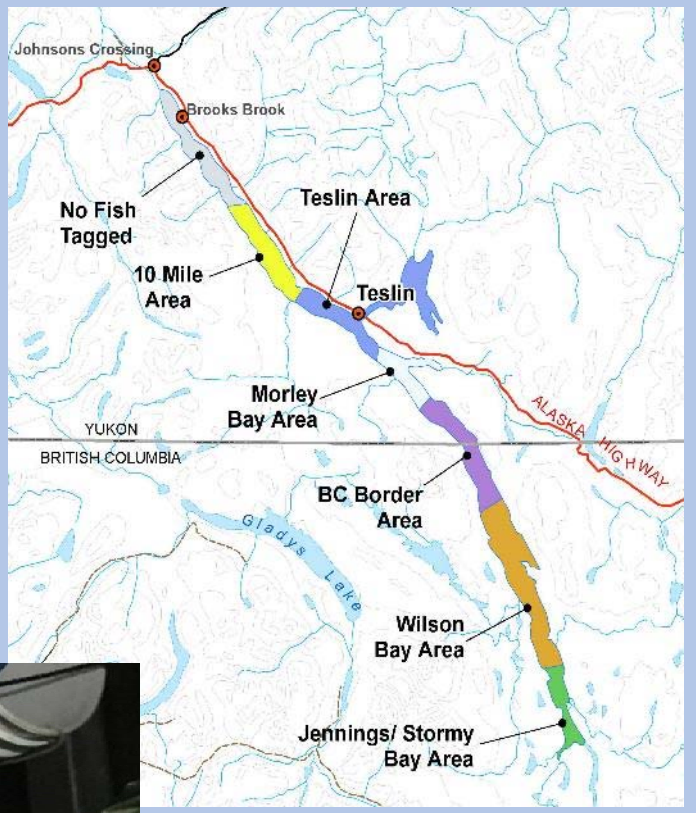
Pulling short set gillnets in the dark

Locating Spawning Areas – Fall Spawner Sampling

All fish captured were identified to species, measured and released; there was only one lake trout mortality. Genetic (DNA) samples were collected from all lake trout. A very small piece of tissue was collected from the adipose fin (the size of a nail clipping).

All lake trout were tagged with a brightly colored and number tag which was inserted below the dorsal fin.

Different colors of tags were used in different areas of the lake.



Tagging and measuring a lake trout spawner

Locating Spawning Areas – Fall Spawner Sampling

10 Mile area – YELLOW

159 tagged during 2016 and 2017 combined

The spawners caught in the 10 Mile area were larger than elsewhere in the lake

Locating Spawning Areas – Fall Spawner Sampling

Teslin area – BLUE

51 tagged during 2016 and 2017 combined

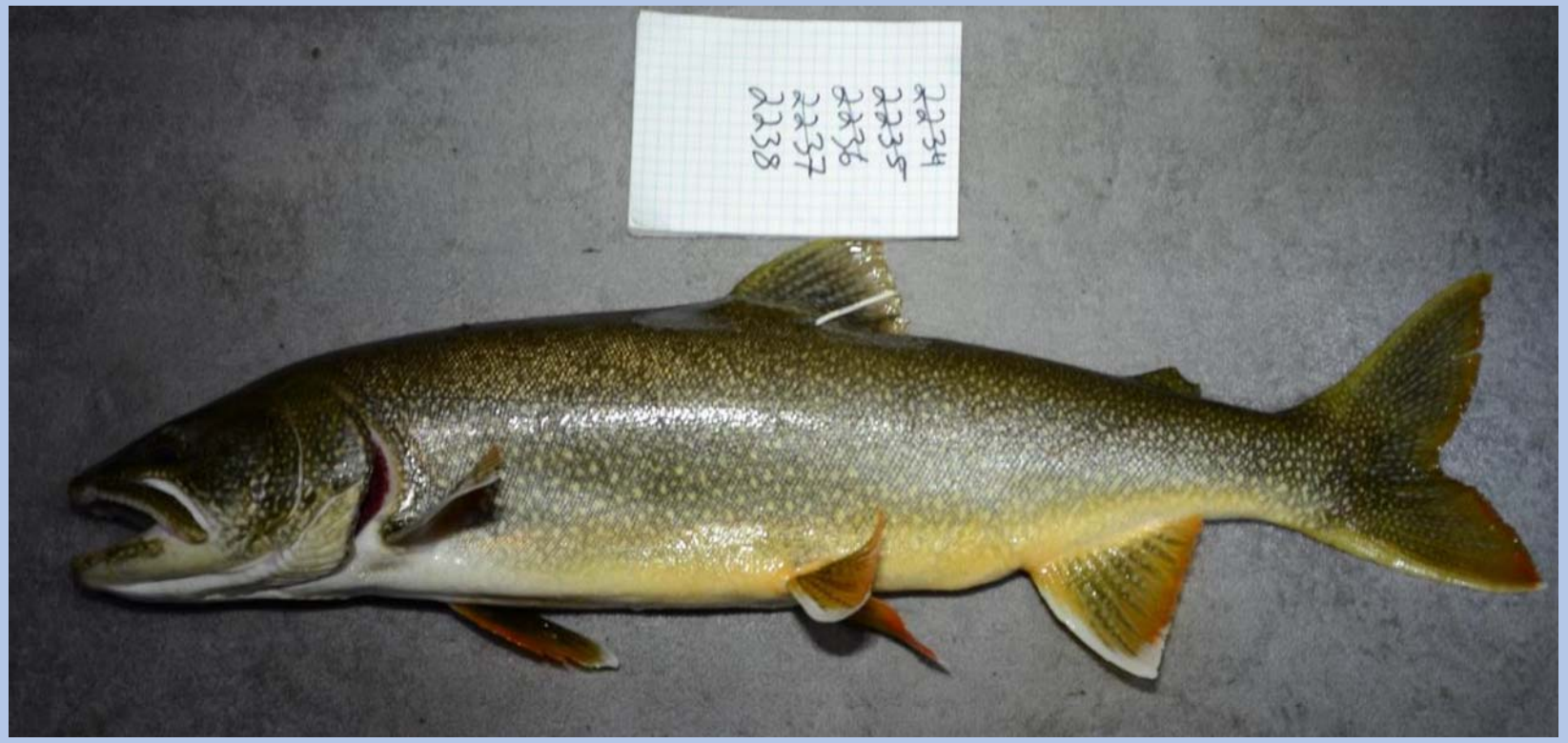
Relatively few spawners were caught in the area around Teslin despite a lot of effort

Locating Spawning Areas – Fall Spawner Sampling

Morley Bay area – WHITE

73 tagged during 2016 and 2017 combined

Moderate numbers of spawners were captured around Morley Bay and were spread over a large area.



Locating Spawning Areas – Fall Spawner Sampling

BC Border area – PURPLE

247 tagged during 2016 and 2017 combined

The highest numbers of spawners were captured in the BC Border sampling area. There is very good spawning habitat in this area of the lake.

Locating Spawning Areas – Fall Spawner Sampling

Wilson Bay area – ORANGE

47 tagged during 2016 and 2017 combined

Spawners in the Wilson Bay area were only found in a few locations.

Locating Spawning Areas – Fall Spawner Sampling

Jennings-Stormy Bay area – GREEN

145 tagged during 2016 and 2017 combined

A high number of spawners were captured in the Jennings Stormy Bay area

The spawners from this area were the smallest compared to elsewhere in the lake and most were very dark in coloration

Locating Spawning Areas – Fall Spawner Sampling

A variety of other fish species were captured during the fall sampling with the most common species being lake whitefish, round whitefish, least cisco and broad whitefish. Nearly all fish were able to be released alive.

A juvenile bull trout was captured in the Yukon portion of the lake near the BC Border and provided one of the first records of this species in the lake.

Spawning least cisco were captured in a number of locations.

Juvenile bull trout

Spawning least cisco

Tag Recaptures

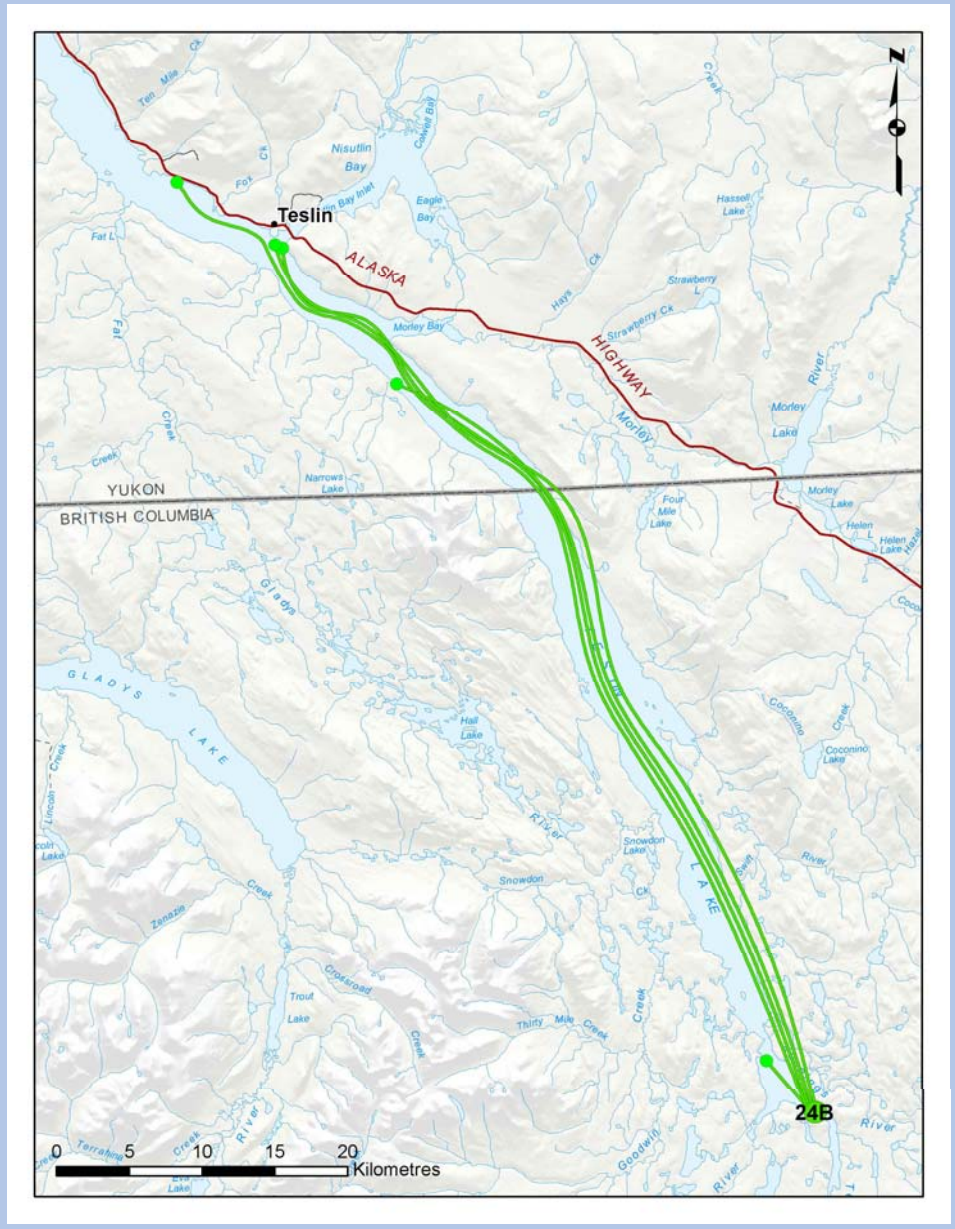
As of April 2018, a total of 13 of the tagged lake trout have been recaptured by anglers and subsistence fishers.

Most fish show a northward movement.

Some interesting tag recaptures to date include:

- The spawners tagged in Stormy Bay appear to move throughout the lake. Five ‘green’ tags have been recaptured to date, including four in the Morley Bay-Teslin area (see map to the right).

- The spawners tagged around Teslin don’t seem to leave the area. Three ‘blue’ tags have been caught near Teslin to date.

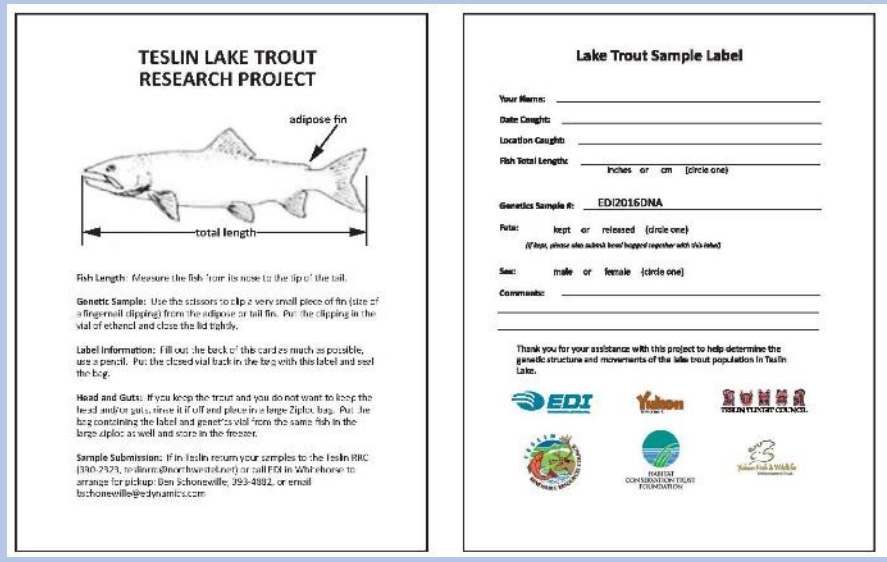


Collection of Genetic (DNA) Samples from Harvested Lake Trout

Genetic (DNA) samples were collected from lake trout harvested on the lake during 2016 and 2017.

Sampling cards were used to make it easier for people to record the correct information.

The location where samples were collected was recorded.



TESLIN LAKE TROUT RESEARCH PROJECT

Fish Length: Measure the fish from its nose to the tip of the tail.

Genetic Sample: Use the scissors to clip a very small piece of fin (size of a fingernail clipping) from the adipose or tail fin. Put the clipping in the vial of ethanol and close the lid tightly.

Label Information: Fill out the back of this card as much as possible, use a pencil. Put the closed vial back in the bag with this label and seal the bag.

Head and Guts: If you keep the trout and you do not want to keep the head and/or guts, rinse it if off and place in a large Ziploc bag. Put the bag containing the label and genetics vial from the same fish in the large ziploc as well and store in the freezer.

Sample Submission: If in Teslin return your samples to the Teslin RRC (390-2323, trrdining@northwestel.net) or call EDI in Whitehorse to arrange for pickup: Ben Schoneville, 393-4882, or email bschoneville@eydynamics.com

Lake Trout Sample Label

Your Name: _____

Date Caught: _____

Location Caught: _____

Fish Total Length: _____
Inches or cm (circle one)

Genetics Sample #: EDI2016DNA

Fate: kept or released (circle one)
(If kept, please also submit head tagged together with this note)

Sex: male or female (circle one)

Comments: _____

Thank you for your assistance with this project to help determine the genetic structure and movements of the lake trout population in Teslin Lake.

EDI

Signs were set up at the Teslin and 10 Mile boat launches during 2017 to inform fishers about the project and allow them to drop off samples.

Collection of Genetic (DNA) Samples from Harvested Lake Trout

A total of 338 genetic (DNA) samples were provided by recreational and subsistence fishers during 2016 and 2017 combined.

Samples were provided from all areas of the lake, although the majority (40 %) were provided from the area near Teslin.

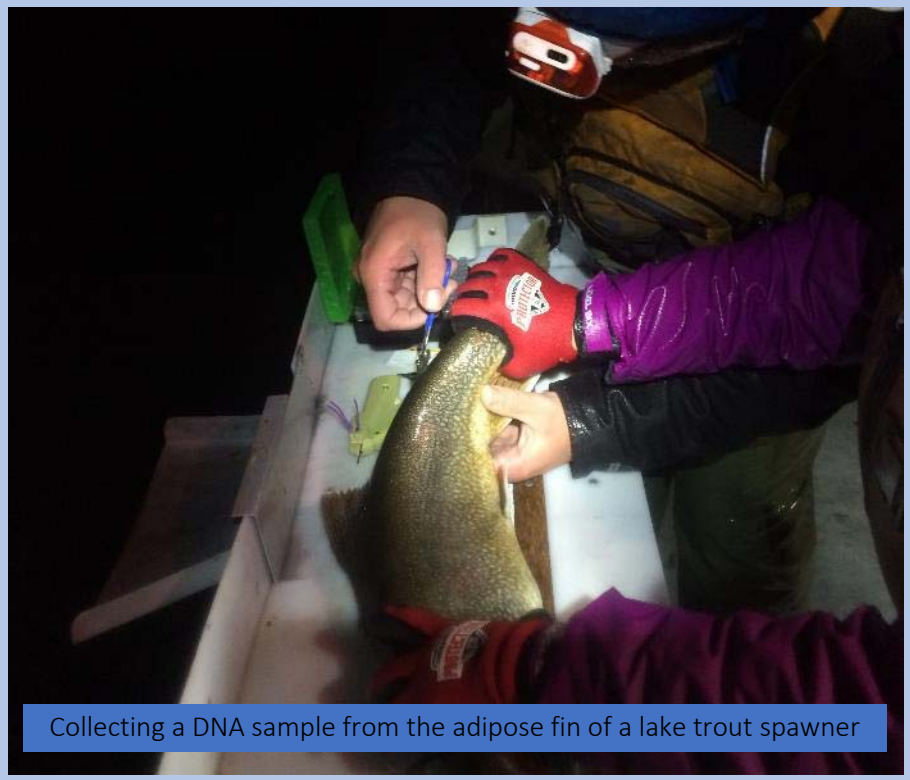
AREA	Number of Samples
Brooks Brook	6
Timber Point	11
Deadman Creek	9
10 Mile	37
Teslin	134
Morley Bay	18
Beaver Creek	24
BC Border	21
Jake's Portage	6
Wilson Bay	16
Across Wilson Bay	1
Gladys River	8
Swift River	4
Jennings River	20
Stormy Bay	9
Unknown Location	14
ALL AREAS	338

Mixed Stock Analysis
Baseline Genetic (DNA) Analysis

The genetic (DNA) samples collected from the juvenile and spawning lake trout were combined to look at the variation in lake trout in all areas of the lake (the baseline).

This involved a total of 1,270 samples collected during 2016 and 2017 combined.

Juvenile lake trout



Collecting a DNA sample from the adipose fin of a lake trout spawner

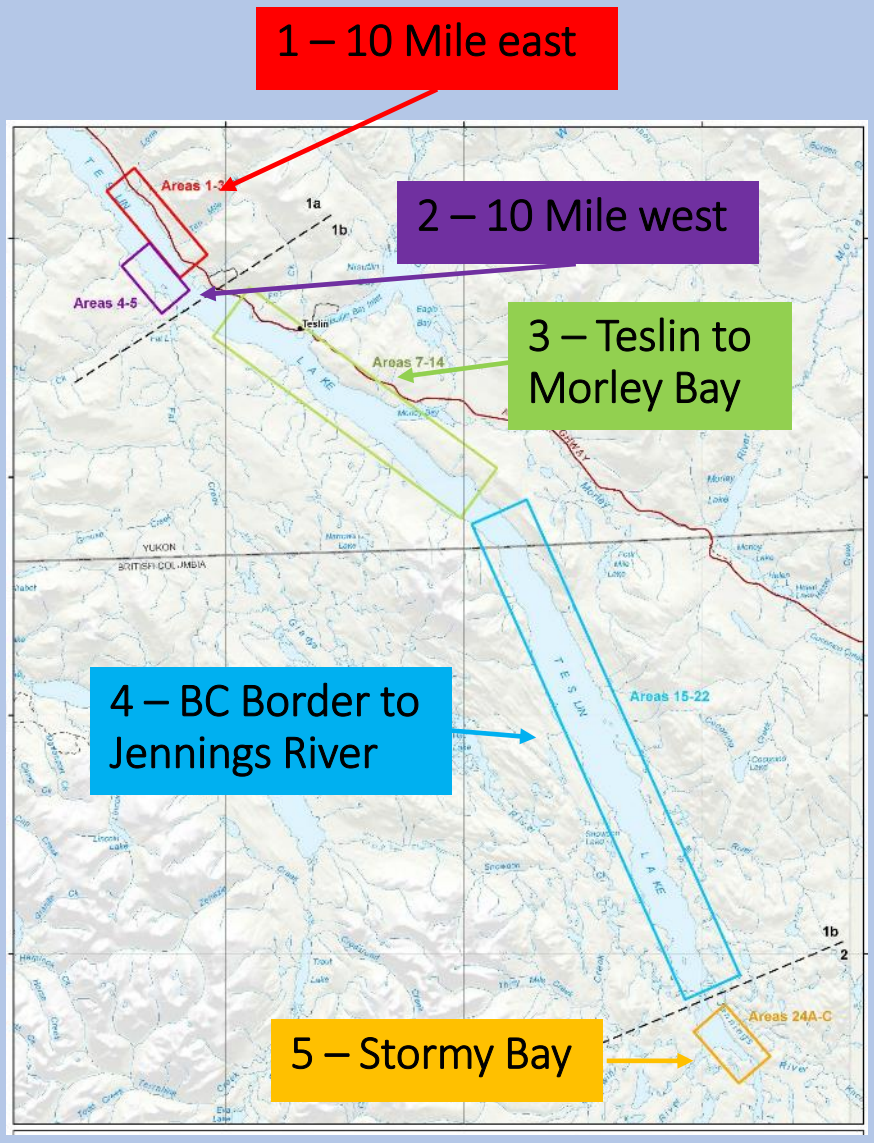
Mixed Stock Analysis
Baseline Genetic (DNA) Analysis

The genetic (DNA) analysis was done by Dr. Allan Costello with the University of Northern British Columbia in Prince George, BC.

Very detailed analysis done in the lab found that there were 5 different groups of lake trout, or 'sub-populations', present in the lake (see map to the right)

These different subpopulations develop over time due to juvenile lake trout returning to spawn at the same place they were born.

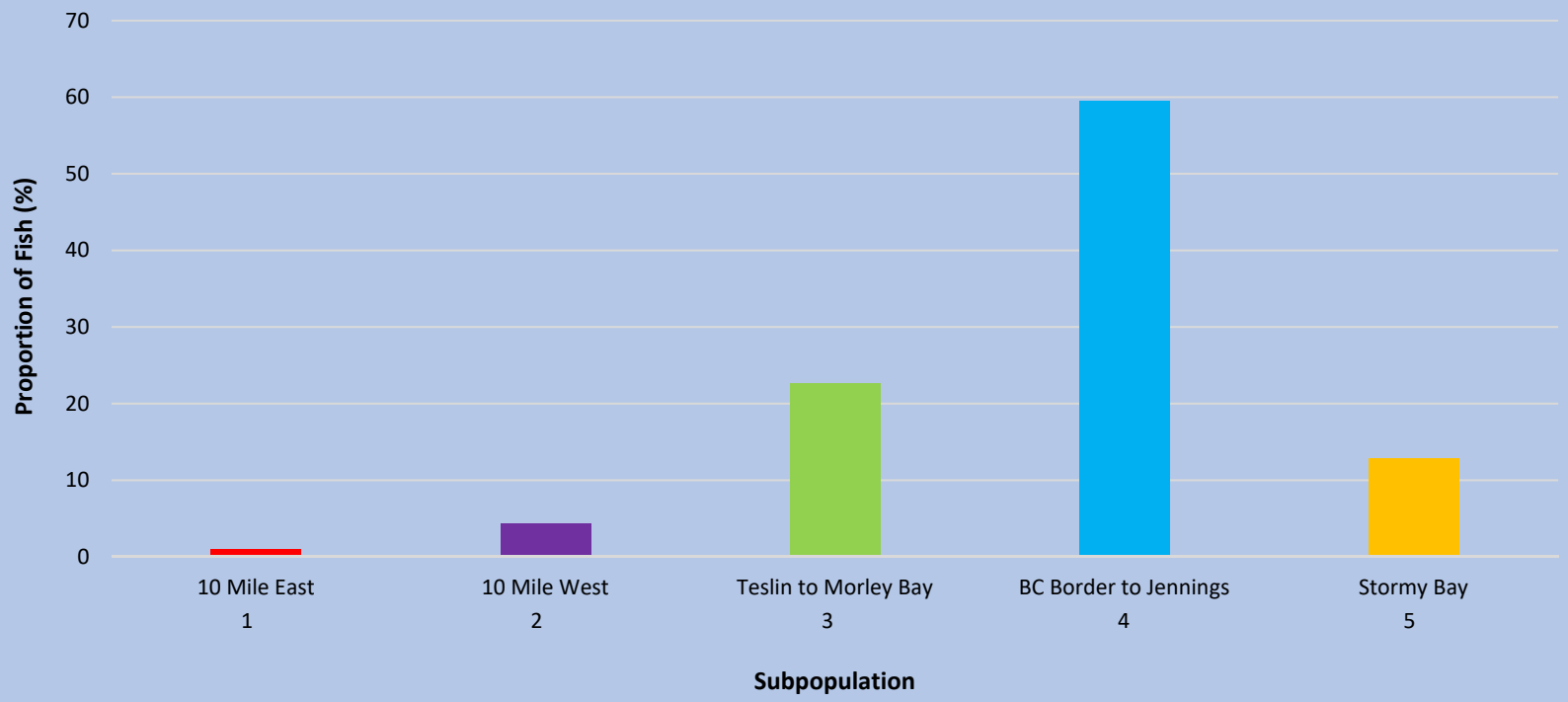
Subpopulations sometimes differ in their shape/size, colour, etc.



Mixed Stock Analysis
Assignment of Fishery Samples

The genetic (DNA) ‘fingerprint’ of the harvested lake trout was compared to the lake wide baseline to determine which subpopulation they were from.

Across all areas where harvested fish were captured, nearly 60% were from subpopulation 4 which primarily originates from spawning areas between the BC Border and the Jennings River.

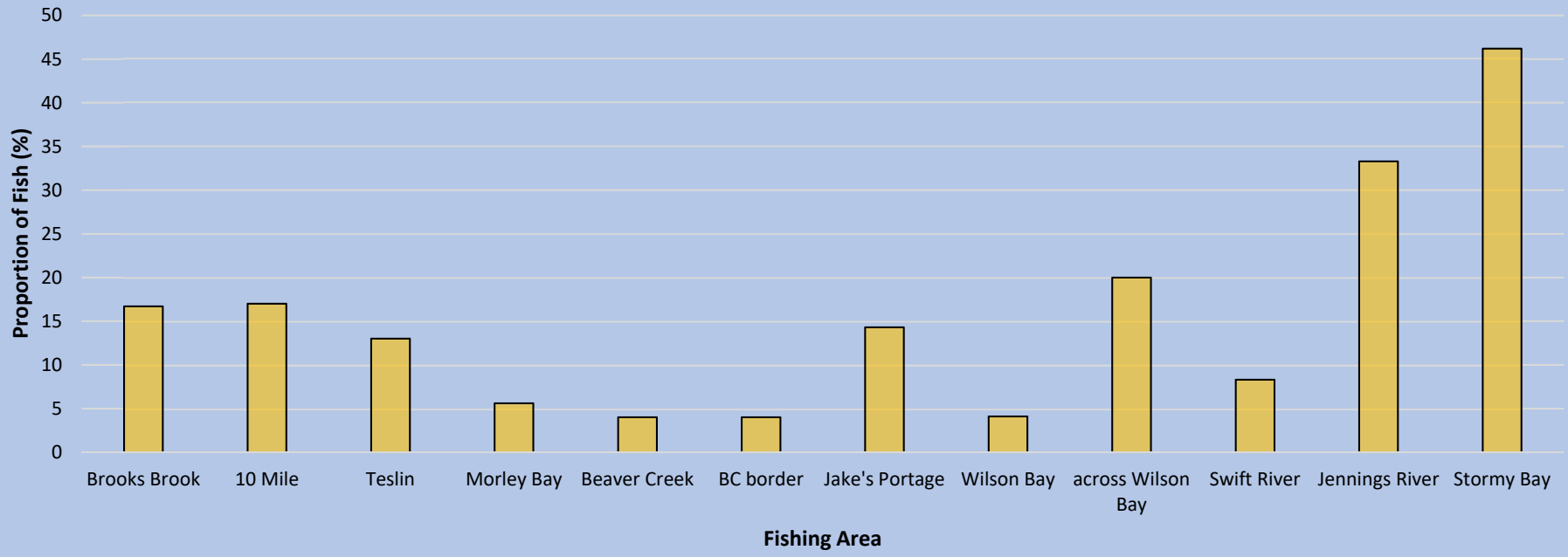


Mixed Stock Analysis
Assignment of Fishery Samples

Lake trout captured in the Teslin area originated from all 5 subpopulations, although subpopulation 4 from the BC Border-Jennings River were the most common (55%).

Lake trout from subpopulations 1 and 2 (10 Mile area) were most common in the north end of the lake.

Lake trout from subpopulation 5 (Stormy Bay) were most commonly caught in Stormy Bay and near the Jennings River but were captured almost everywhere else in the lake, even at Brooks Brook at the far north end of the lake (see graph below).



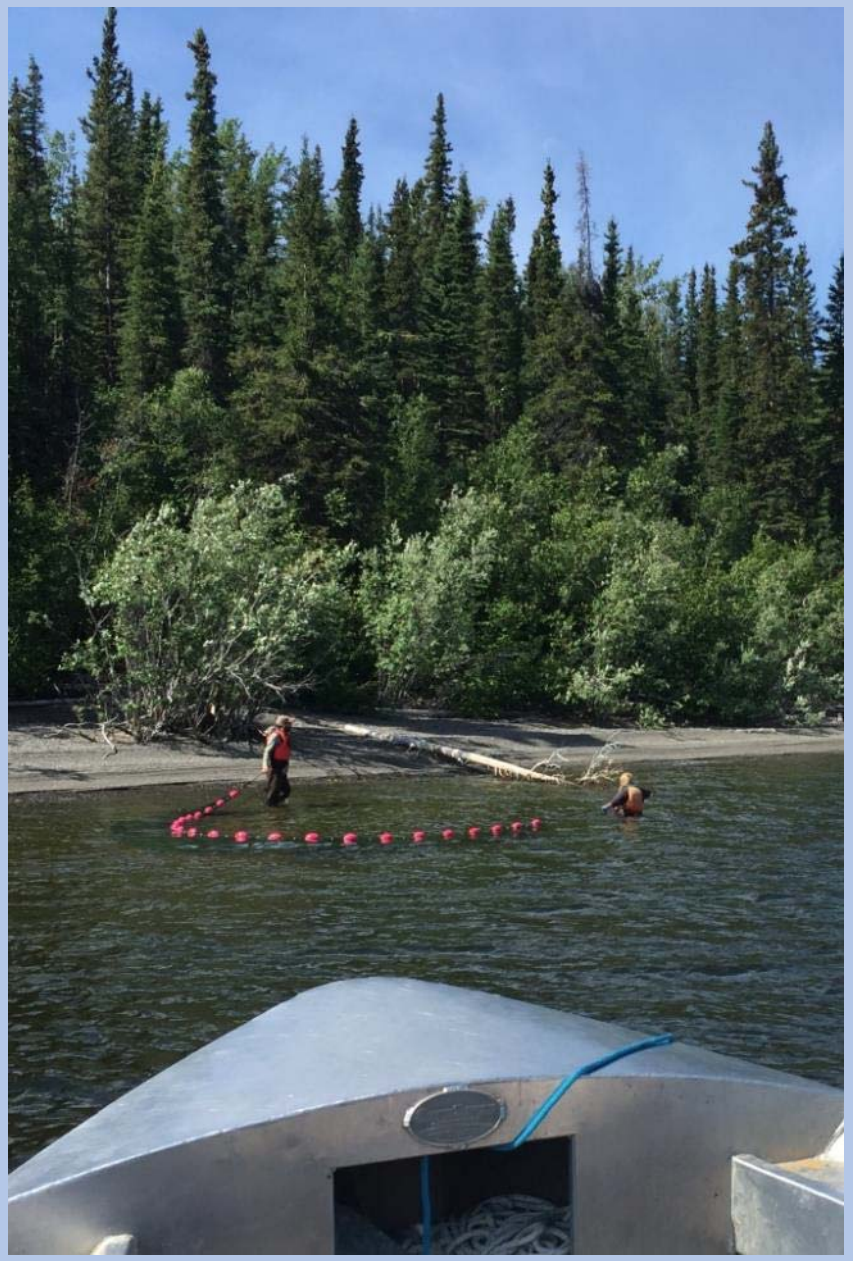
Summary

Lake trout spawning habitat is extensive in Teslin Lake with the area between the BC Border and the Jennings River producing the majority of the lake trout harvested.

Genetics analysis indicates that there are 5 distinct subpopulations of lake trout present in Teslin Lake.

The Teslin lake trout fishery is ‘mixed stock’ which means that all of the subpopulations are harvested throughout most areas of the lake.

Lake trout move considerably throughout Teslin Lake and this is supported by the genetics analysis and tag recaptures to date.



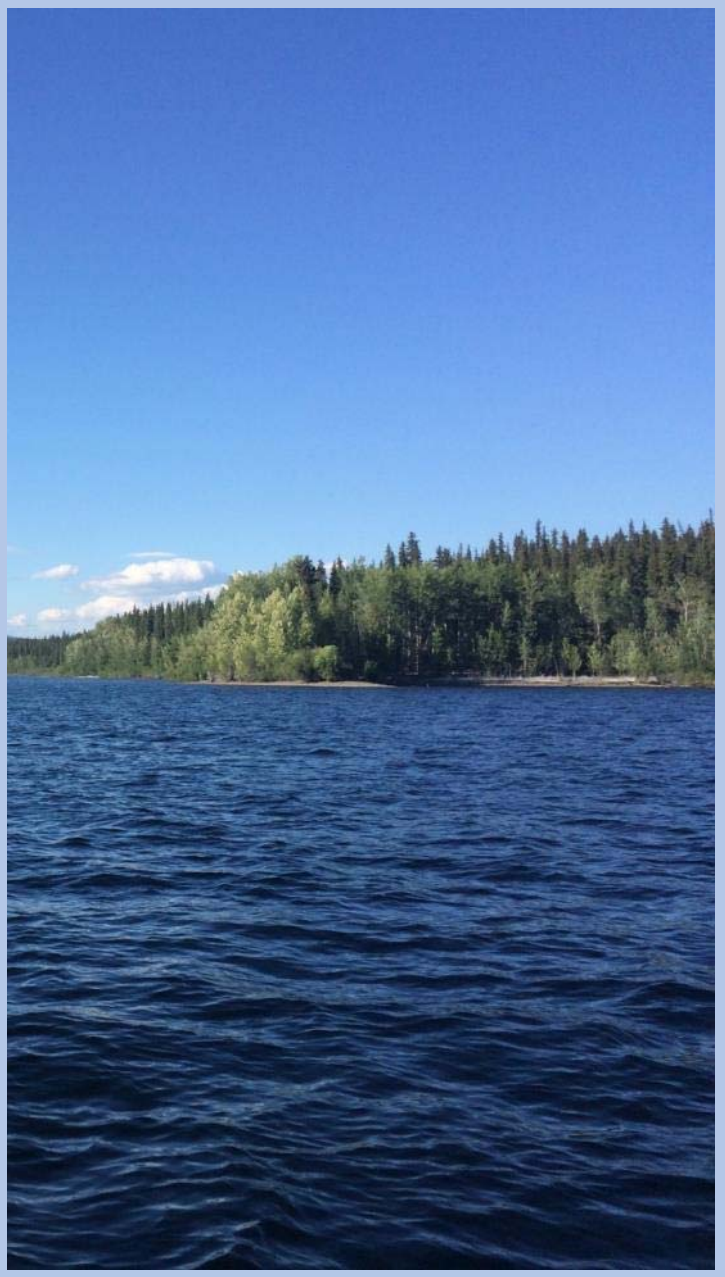
Summary

The very popular early summer lake trout fishery near Teslin at the mudline appears to harvest lake trout from all subpopulations and does not appear to be overharvesting a single subpopulation.

- ⟶ This is useful information for management given that the community has voiced concerns about potential overharvesting in this area which does not appear to be the cause from the perspective of subpopulations.

The subpopulations found the in 10 Mile area do not appear to move as much throughout the lake and there are likely fewer of them as compared to the other subpopulations. These lake trout are also larger than other areas of the lake.

- ⟶ This information should be taken into account when considering monitoring and harvest restrictions due to the accessibility of this portion of the lake.



Recommendations for Future Study

Some of the main recommendations for future study include:

- Continuation of fall spawner tagging at spawning areas to learn more about lake trout movements, how often the individual lake trout spawn and if they return to the same locations (site fidelity).
- Collection of additional genetic samples which are linked to capture locations at different times of year.
- Research of the different forms or 'ecomorphs' of lake trout in the lake. There are lake trout of all different shapes and sizes present in the lake and it may be possible to compare these differences with the results of this project.

Acknowledgements

Ben Schonewille of EDI was the field crew leader for this project was assisted by the following EDI personnel: Dawn Hansen, Joel MacFabe, Petra Szekeres, Annina Altherr, Gabe Rivest, Matt Power, Pat Tobler, Scott Cavasin and Scott Dilling. Other people who assisted with portions of the fieldwork included Gillian Rourke and Richard (Dick) Dewhurst from Teslin Tlingit Council and Oliver Barker with Environment Yukon. Teslin Tlingit Council staff also assisted considerably with collecting samples from harvested lake trout and reporting tag recaptures. Kyle Keenan allowed the field crew to stay at his cabin on the lake during the fall spawner sampling.

Numerous recreational and subsistence fishers provided samples from their harvested lake trout and this project would not have been successful without their contributions.

Allan Costello (ABC and Associates/University of Northern BC) contributed a tremendous amount of expertise and analysis to the genetics component and provided advice on general project direction.

The Teslin RRC managed the project and provided input on study design and overall project direction.

Funding for this project was provided by the Renewable Resource Council Surplus Fund, Yukon Fish and Wildlife Enhancement Trust Fund and the BC Habitat Conservation Trust Foundation.

Looking for more information?

This document is a summary of a detailed technical report which was prepared for this project. To request an electronic copy of the report, contact Ben Schonewille at EDI (contact information below).

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