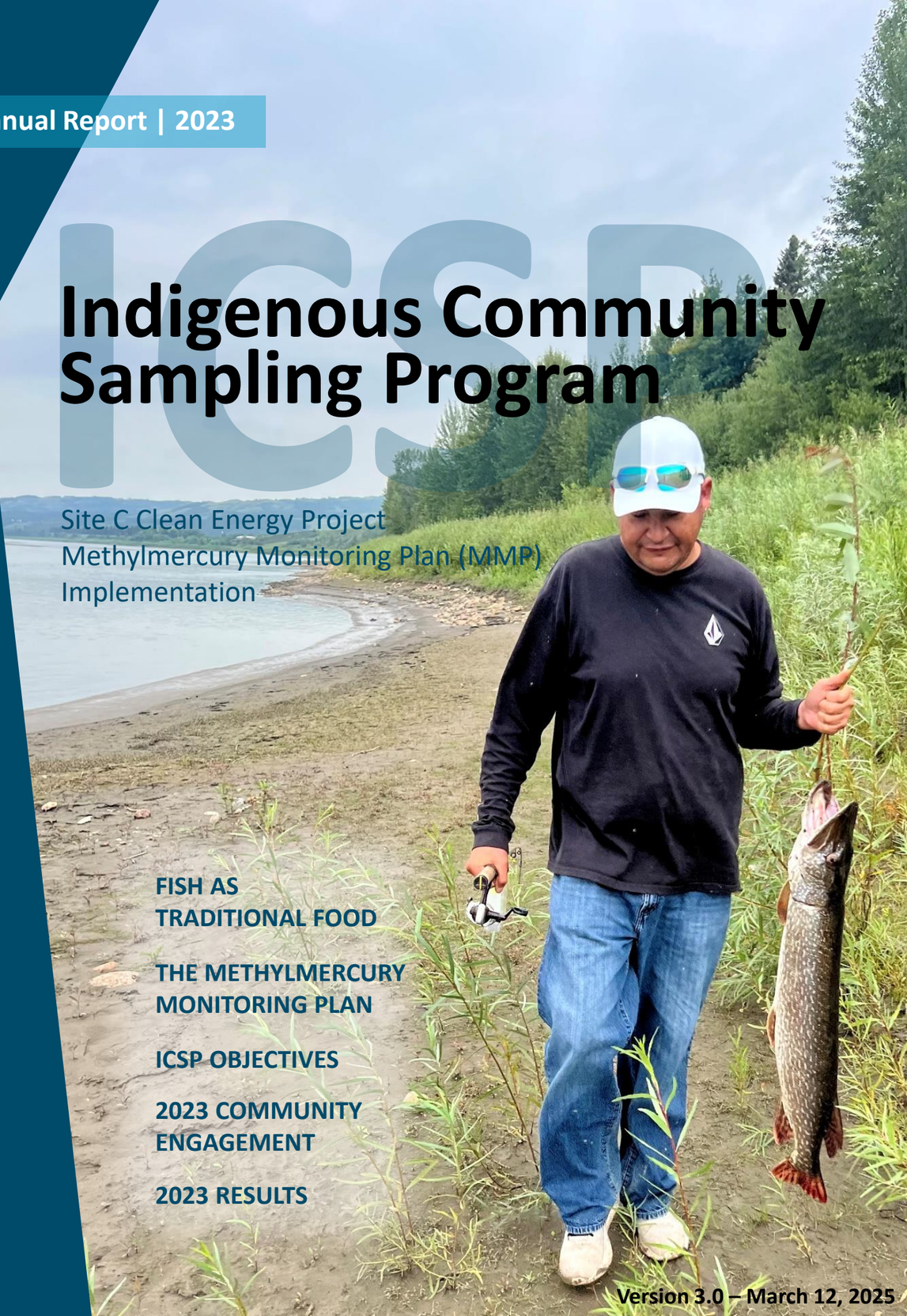
ICSP

Annual Report | 2023

Indigenous Community Sampling Program

Site C Clean Energy Project
Methylmercury Monitoring Plan (MMP)
Implementation



FISH AS TRADITIONAL FOOD

THE METHYLMERCURY MONITORING PLAN

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Version 3.0 – March 12, 2025

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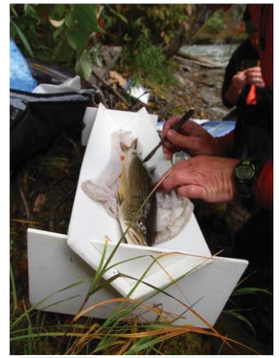


ICSP

Indigenous Community Sampling Program

Cover: Photo 1 by Brendan Bushy

AZIMUTH

FISH IS GOOD FOR YOU

HEALTH BENEFITS OF EATING FISH

Eating fish can provide numerous health benefits due to fish's rich nutritional profile.

- Studies have shown that traditional diets are healthier than non-traditional diets.
- Compared to other types of meat, fish have higher levels of good fats (omega-3 fats) and lower levels of bad fats (saturated fats).
- Fish are high in beneficial vitamins and minerals, like vitamin D and the essential elements selenium, and iron.
- Replacing store-bought processed foods with fish can help achieve a more balanced diet.

Photo 2 by Deborah Prince

FISH AS TRADITIONAL FOOD

In 2009 the First Nations Food, Nutrition and Environment Study concluded work in BC with the following findings:

- Fish is a culturally, spiritually, economically, and nutritionally important traditional food for many Indigenous Peoples in Canada.
- About half of Indigenous people in Canada face food insecurity.
- The current diet of many Indigenous people in Canada is nutritionally inadequate.
- Increased access to fish that is safe to eat can help address these issues.

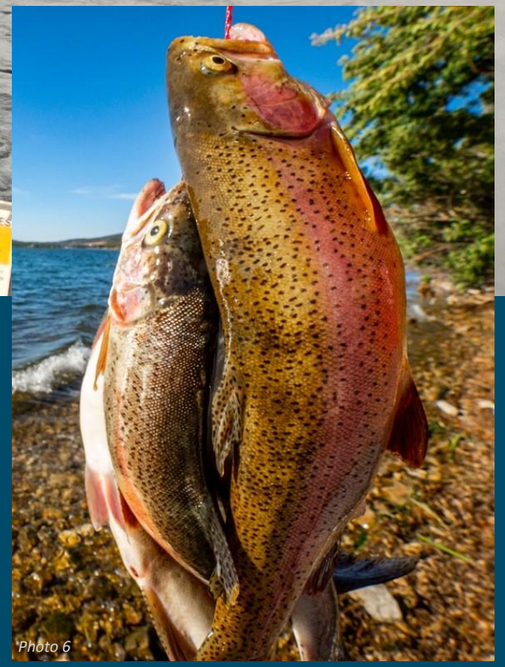


Photo 6

FISH METHYLMERCURY
in NATURAL HABITATS

Mercury is a naturally occurring element that is found in low levels everywhere – in air, water, soil, plants, animals, and humans.

BIOMAGNIFICATION UP THE FOOD CHAIN

Bacteria in the bottom of lakes and rivers transform naturally occurring mercury into methylmercury (MeHg; see figure).

Methylmercury levels naturally increase up the food chain. Predatory fish have higher levels of methylmercury than fish lower down the food chain. That's why Lake Trout, Bull Trout and Walleye have more methylmercury than Kokanee, Mountain Whitefish or Rainbow Trout.

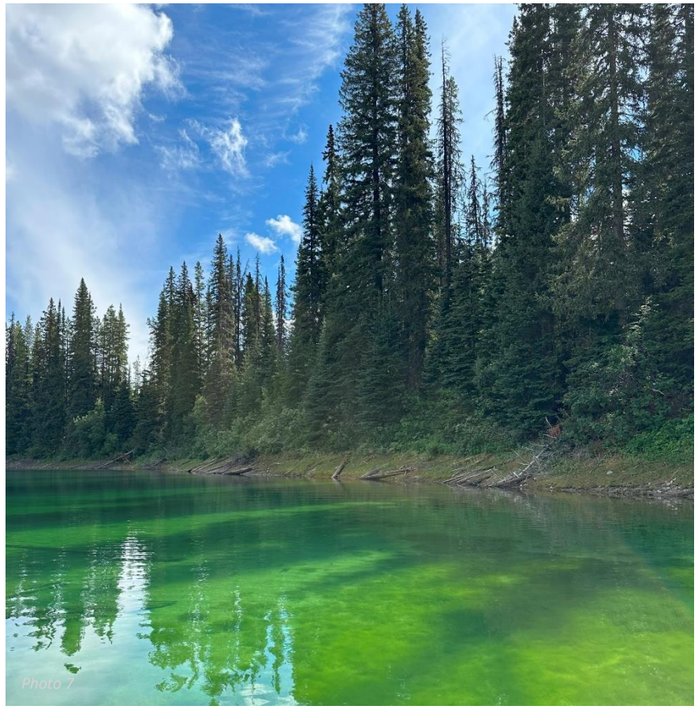
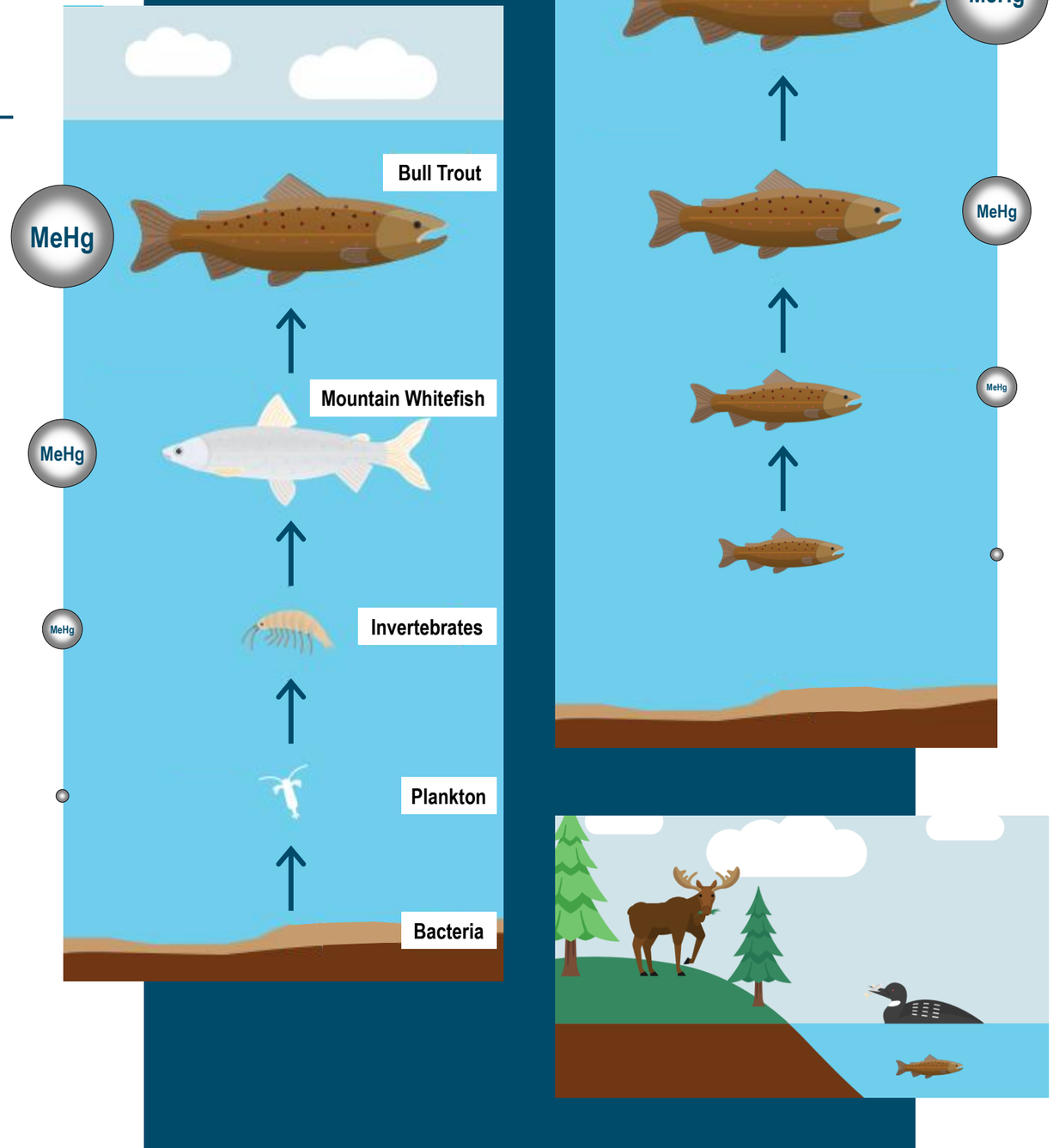


Photo 7



BIOACCUMULATION IN OLDER FISH

Larger, older fish of all species accumulate higher concentrations of methylmercury in their tissue compared to younger smaller fish (MeHg; see figure).


Photo 8

METHYLMERCURY IN ANIMALS

The amount of methylmercury in an animal depends on the amount and type of fish it eats. Non-fish-eating animals like moose have low levels, while fish-eating wildlife like loons can have higher methylmercury levels.

Humans consume small amounts of methylmercury when we eat fish.

For more information, scan below.

SCAN ME

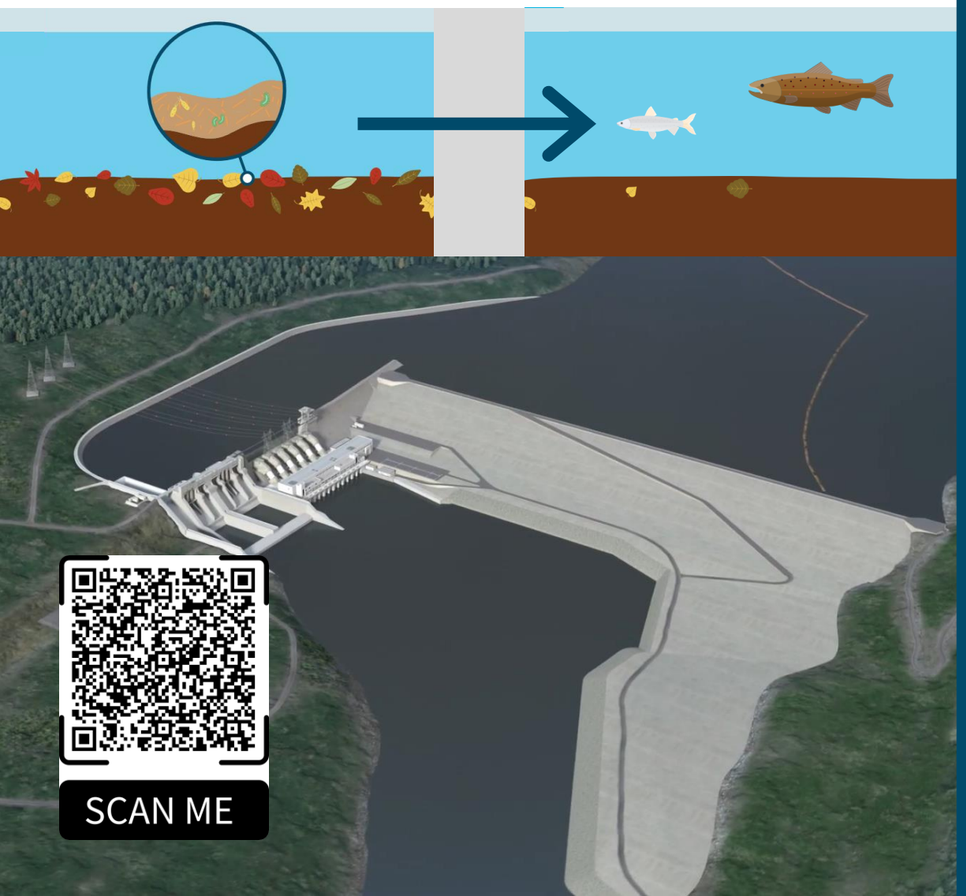
SITE C and changes in FISH METHYLMERCURY

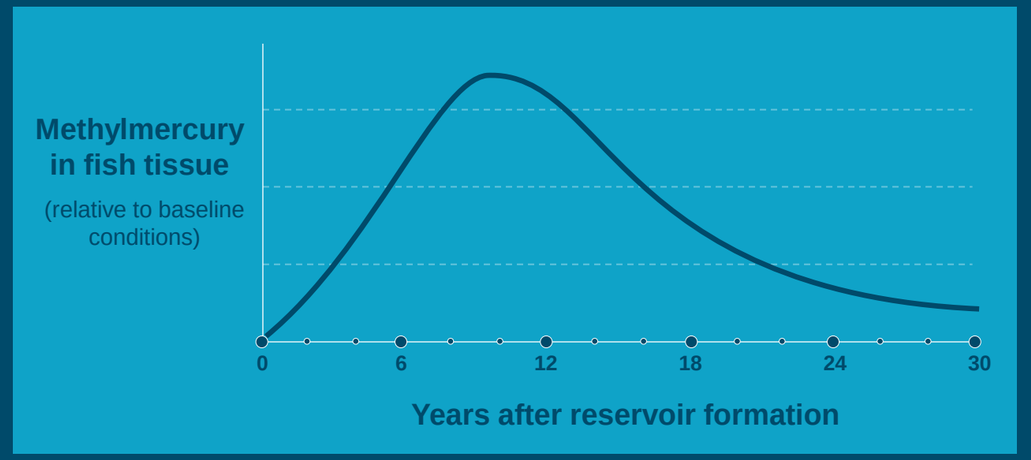
RESERVOIR EFFECT

Currently, Peace River fish have low methylmercury levels, similar to other B.C. water bodies.

The creation of the Site C reservoir will lead to an initial increase in methylmercury as bacteria decompose organic material, converting inorganic mercury to methylmercury.

Over the years, as organic matter diminishes, methylmercury production will slow, causing levels to drop across the food chain.





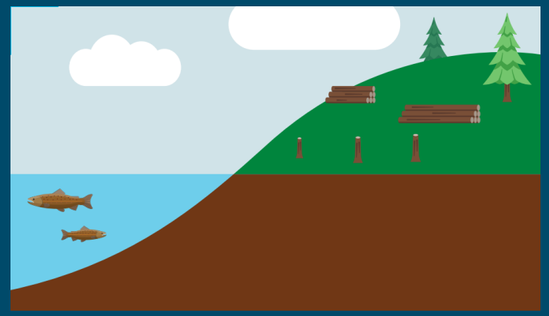
MONITORING

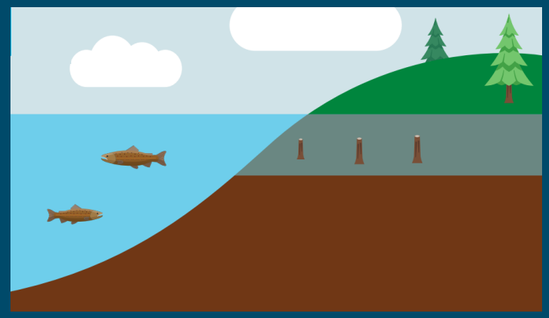
To verify the predicted affects that the Site C project will have on fish methylmercury levels, BC Hydro is working with Indigenous groups, communities and health authorities to implement a Methylmercury Monitoring Plan (MMP).

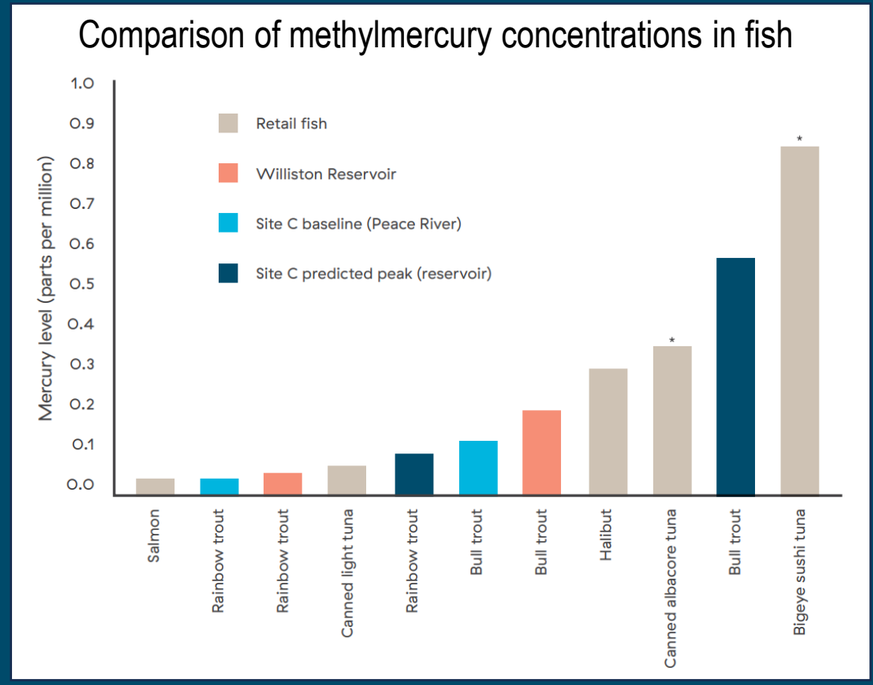
METHYLMERCURY INCREASES

When the Site C reservoir is created, levels of methylmercury in fish will increase for approximately 10 years. Tissue methylmercury concentrations of fish in the reservoir are predicted to increase by 3-4 times current levels, while concentrations in downstream fish are only expected to peak at 2x baseline (downstream of Many Islands, AB no increases are expected). lakes and rivers in the area. This is followed by a decrease over the next 20-30 years to levels that are similar to natural

The bar chart below compares baseline methylmercury concentrations to predicted peak concentrations, as well as concentrations in the Williston Reservoir and common retail fish.







**Refer to Health Canada for consumption guidelines for canned albacore tuna and fresh tuna: https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/chemical-contaminants/environmental-contaminants/mercury/mercury-fish-questions-answers.html#ca2*

THE MMP
Methylmercury Monitoring Plan

WHAT IS THE MMP?

The Methylmercury Monitoring Plan (MMP) was developed to measure changes to levels of methylmercury in fish after the creation of the Site C Reservoir and provide information on how much fish is safe for people to eat.

The three components (figure right): the Core MMP, the Fish Consumption Program, and the Indigenous Community Sampling Program (ICSP).

The Core MMP targets six species of fish (see below) for mercury analysis, using non-lethal sampling.

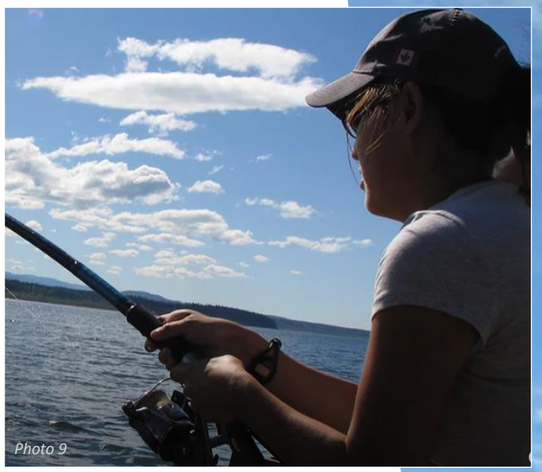


Photo 9

TARGET FISH FOR THE CORE MMP:

Bull Trout

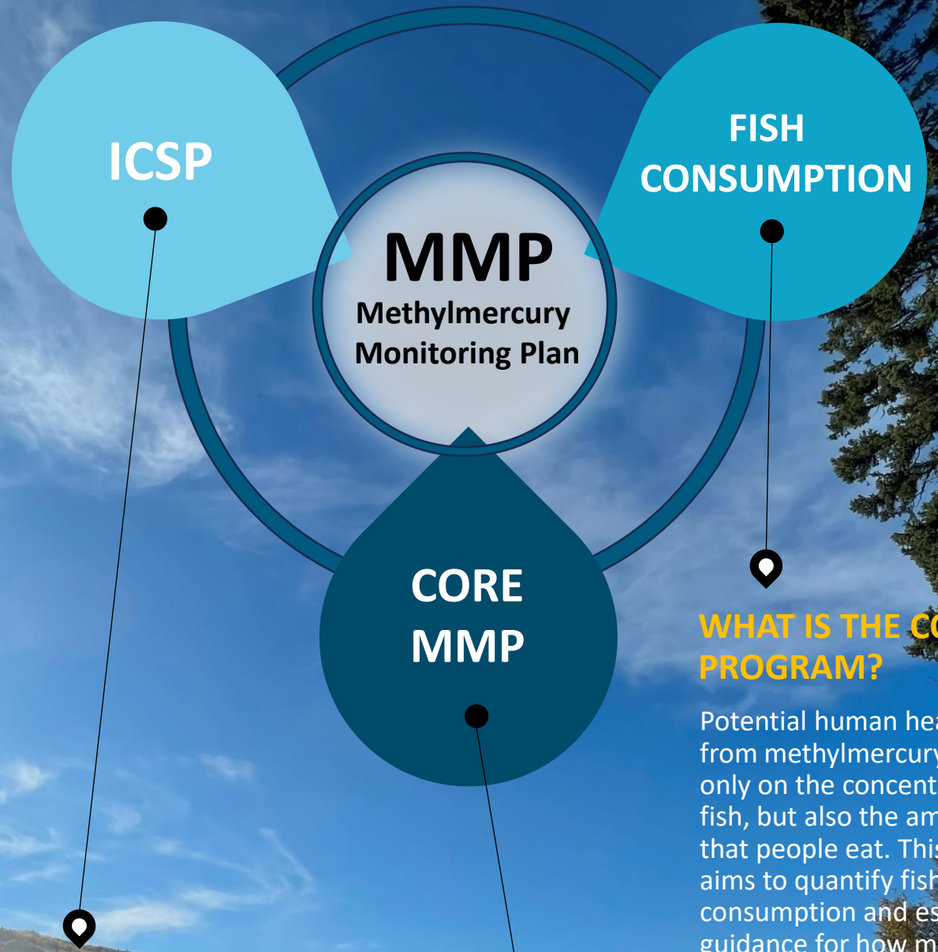
Walleye

Rainbow Trout

Mountain Whitefish

Longnose Sucker

Redside Shiner



WHAT IS THE ICSP?

The ICSP is an Indigenous community methylmercury monitoring program targeting fish commonly consumed by people, but distinct from the sampling locations and species covered under the Core MMP.

WHAT IS THE CONSUMPTION PROGRAM?

Potential human health risks from methylmercury depend not only on the concentration in fish, but also the amount of fish that people eat. This program aims to quantify fish consumption and establish guidance for how much fish is safe to eat.

WHAT IS THE CORE MMP?

It is the primary MMP sampling program, monitoring methylmercury in fish in the Peace River at the site of the future Site C reservoir and downstream to Many Islands, AB. The program also monitors mercury in water, sediment, porewater, and bugs.

SCAN ME

Photo 10

THE ICSP

Indigenous Community Sampling Program

An Indigenous community methylmercury monitoring program that samples fish people eat, but is distinct from the sampling locations and species covered under the Core MMP.

ICSP OBJECTIVES

There are three main objectives of the ICSP Program:

- Test the levels of methylmercury in fish that people eat, but which are not monitored in the Core MMP.
- Provide opportunities for Indigenous communities to participate in monitoring changes to the environment from the Site C Project.
- Improve food security and food sovereignty for Indigenous communities by building skills and knowledge related to methylmercury in fish.

Photo 11 by Brendon Bushy

Photo 13 by Brendon Bushy

Photo 12 by Ben Jackson

COMMUNITY CHAMPIONS are trained to collect fish tissue samples and are the link between BC Hydro and Indigenous communities.

THE ICSP

Indigenous Community Sampling Program

2023 COMMUNITY ENGAGEMENT

In 2023, the ICSP provided baseline data on fish methylmercury levels before reservoir filling.

Two training events were conducted, one at McLeod Lake and one at Northern Lights College on June 27 and 28. The sessions covered methylmercury in reservoirs, an MMP overview, and hands-on training in fish tissue sampling.

CHAMPIONS TRAINED IN 2023

10 Blueberry River First Nation

12 McLeod Lake Indian Band


Photo 17


Photo 14


Photo 15

Each Community Champion received a "Fish Kit" for sampling.

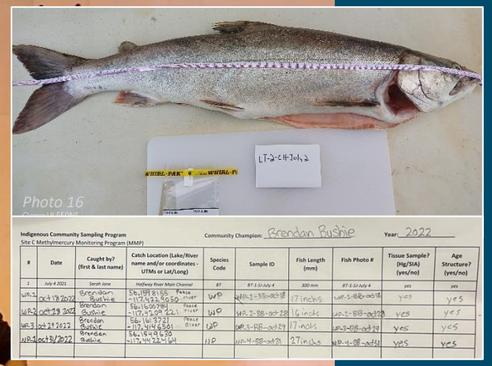
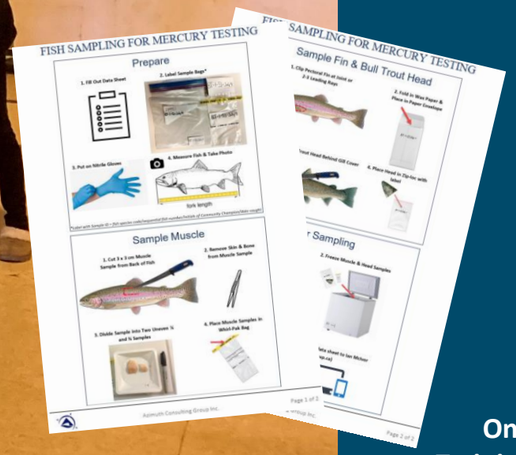


Photo 16

Trained Community Champions sampled fish throughout summer, reporting data and submitting tissue samples for mercury analysis.



In 2022 and 2023, Azimuth created a "Quick Start Guide" and an online training video as reference guides. A Peace River Fish ID Key is also available.

Online Training Video

SCAN ME

Fish ID Guide

SCAN ME

ICSP

2023 SAMPLES

Blueberry River

Doig River

Halfway River

Fort St. John

Taylor

Hudson's Hope

Saulteau

McLeod Lake

Dene Tha

2023 ICSP AT A GLANCE

Community Champions from Dene Tha', McLeod Lake, and Saulteau First Nation collected 90 fish samples (listed right) below the Site C project area (Peace-Smoky River confluence), and in tributary systems (Moberly Lake, Pine River, McLeod Lake areas)

- Sampling from July through September 2023
- 3 Nations: Dene Tha', McLeod Lake, and Saulteau
- 90 fish samples from 7 species.
- Samples from McLeod Lake area (60), Moberly Lake (4), Pine River (4)Peace-Smoky River confluence (22)

14	Northern Pike
1	Burbot
6	Bull Trout
1	Lake Whitefish
9	Walleye
58	Rainbow Trout
1	Goldeye

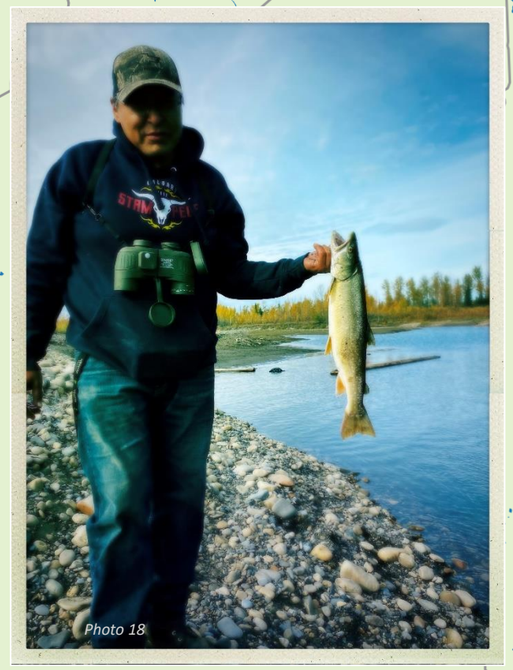


Photo 18

ICSP
2023 RESULTS

DATA ANALYSIS

When the ICSP fish methylmercury data were analyzed, the following variables were included:

- Mercury – total mercury concentrations in fish tissues.*
- Fork Length – fish length (nose to tail fork) was used as an indicator of fish size and age.

In the following pages, mercury data are presented for each species sampled in the ICSP program from 2021 to 2023 compared to results from the Core program. Note that the graphs all use the same scale to help visualize mercury content across species.

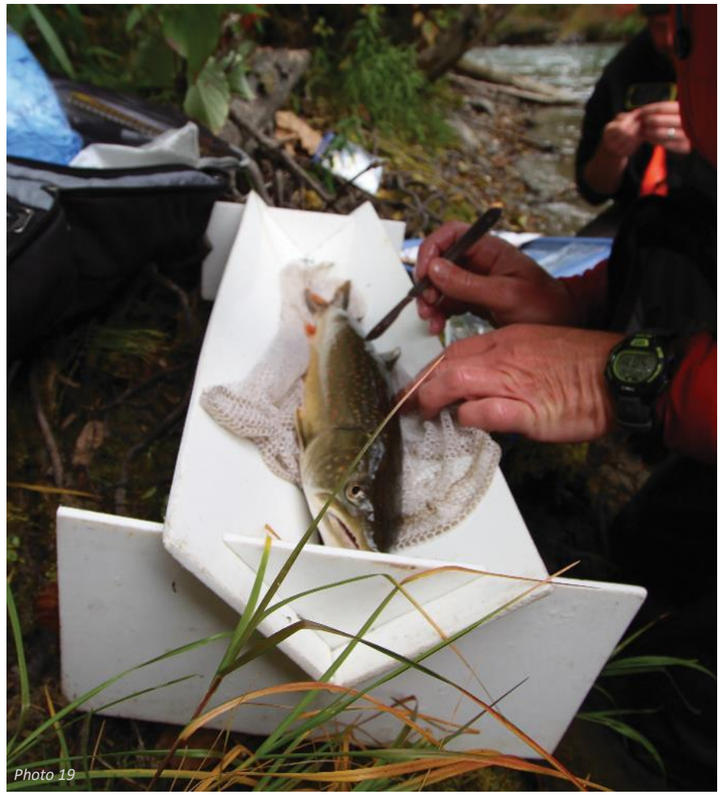


Photo 19

*Note that it is assumed that all mercury in fish tissues is present as methylmercury.

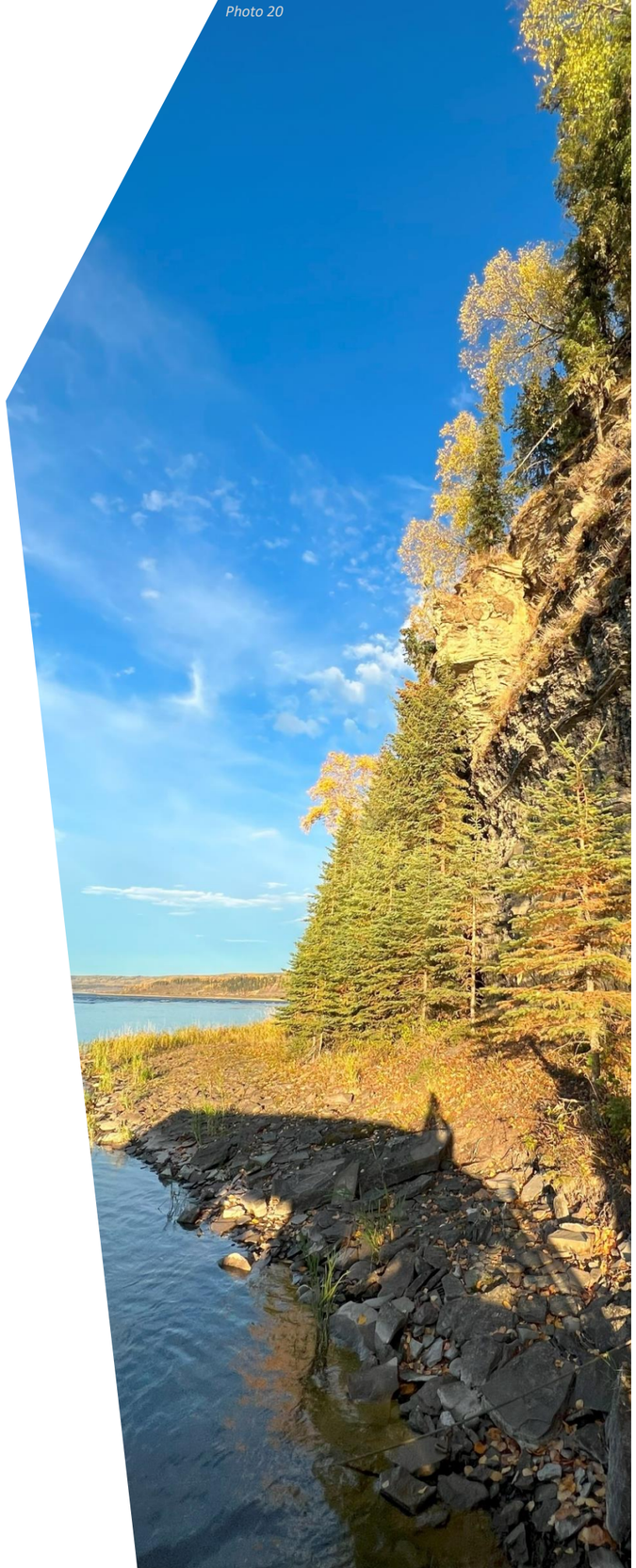


Photo 20

FISH MERCURY CONCENTRATIONS

Average mercury concentrations in muscle tissue for fish species collected in the Core MMP (2017-2022) and ICSP (2021-2023) programs from the Peace River watershed are summarized below. Bug-eating species such as Rainbow Trout and Mountain Whitefish tend to have lower mercury levels, while fish-eating species higher in the food web, such as Walleye and Northern Pike, have higher mercury concentrations.

These results are meant to provide a rough idea of the amount of mercury in these fish. Actual mercury concentrations will vary from place to place and over time, particularly once the reservoir is created. See the annual MMP reports for specific concentrations for targeted locations and species.

Fish Species	Mercury (mg/kg ww)
Walleye	0.28
Goldeye	0.25
Northern Pike	0.16
Lake Trout	0.15
Bull Trout	0.13
Burbot	0.13
White Sucker	0.10
Longnose Sucker	0.08
Mountain Whitefish	0.05
Rainbow Trout	0.03

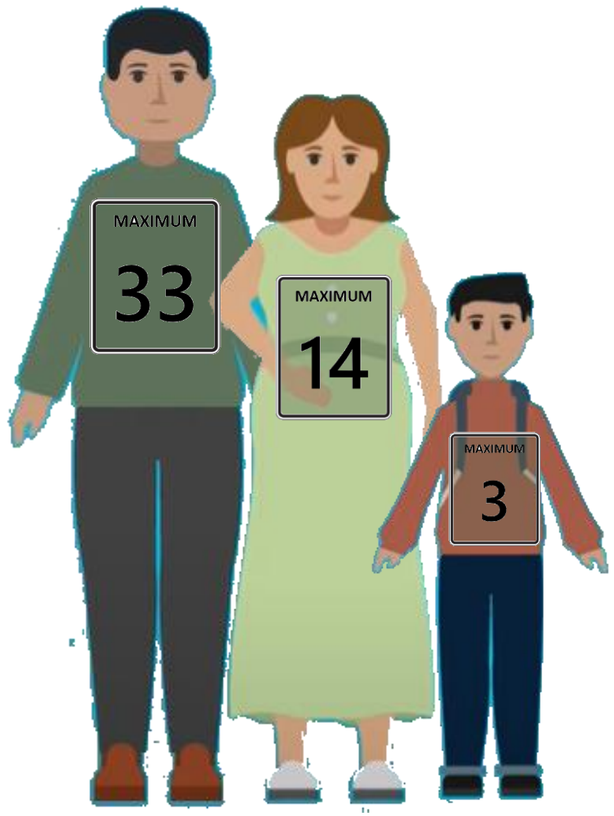
How Much Fish Can I Eat?

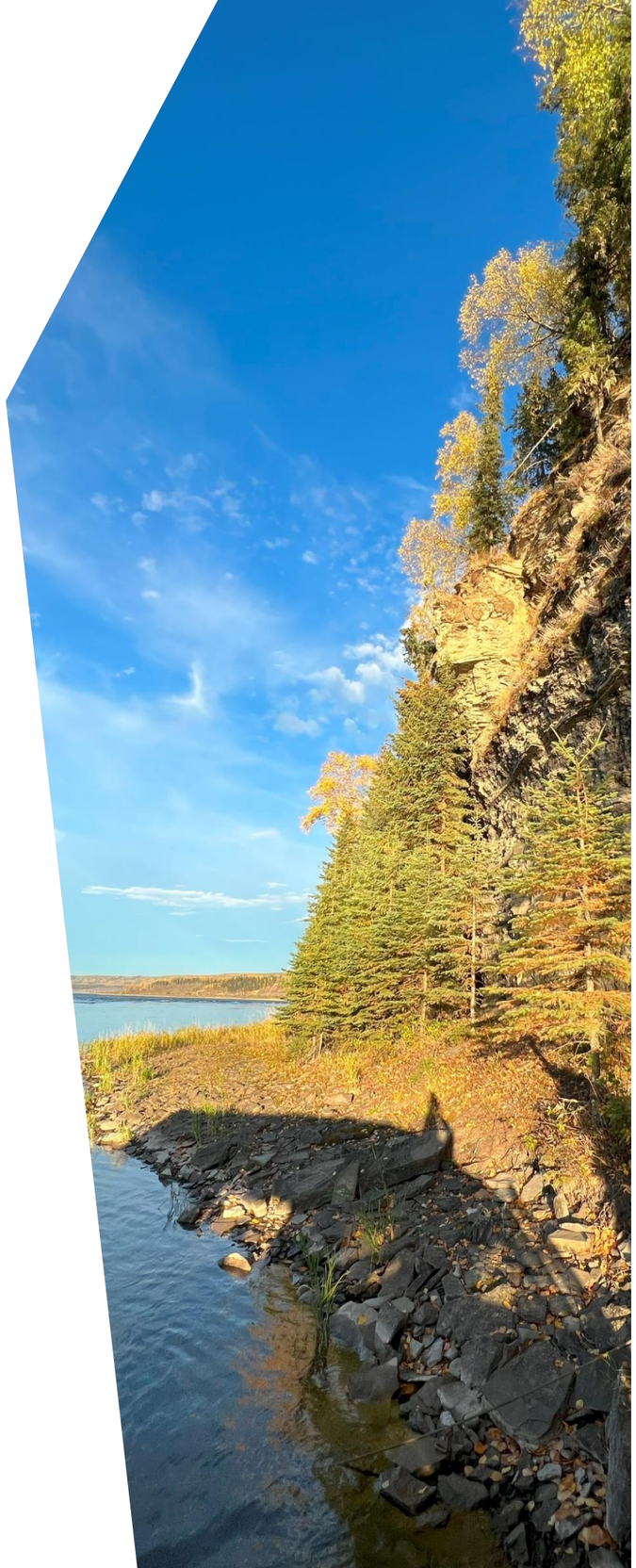
Health Canada guidance on safe levels of exposure

Methylmercury occurs naturally in fish and people are exposed to small amounts of methylmercury when they eat fish. People can safely tolerate exposure to some methylmercury, but exposure to too much methylmercury can be harmful to the brain and nerves.

Health Canada provides guidance on how much methylmercury people can be exposed to without risk of harm. These amounts vary, depending on a person's age and if they are, or could be pregnant.

Health Canada's guidance on methylmercury exposure are like speed limits – people won't necessarily be harmed if they exceed them, but it is best to keep exposure below them.





This brochure provides information on how much fish a person can safely eat

Information on the amount of methylmercury in fish was used to calculate how many servings of fish people can eat every month without going over Health Canada's safe levels of exposure for methylmercury. An example for Northern Pike is shown below.

Guidance is provided for different lengths of fish, measured in millimeters or inches

Guidance is provided for children less than 12 years old (C), people who are or could be pregnant (P), and others (O)

Northern Pike

Size[mm|in] | Mercury[ppm]	C	P	O
400|16 | 0.06	24	43	101
550|22 | 0.12	12	21	50
700|28 | 0.22	6	11	27

Safe to Eat

- Once Every Day
- Once Every Other Day
- Twice a Week
- Once a Week
- Twice a Month
- Once a Month

The number of servings of fish a person can safely eat every month. The squares are coloured according to the legend to the left.

For people fishing in the Peace River, the MMP provides detailed guidance for different locations:

SCAN ME

HOW BIG IS A SERVING OF FISH?

100 g (0.2 lbs) serving size for children.

163 g (0.4 lbs) serving size for adult.

Walleye

OVERVIEW

- Walleye, a top predator in the Peace River, primarily eats other fish. It's high position in the food chain means that Walleye have higher levels of mercury. They are predominately found downstream of the Site C Dam.
- In 2023, all nine Walleye were caught at the Peace-Smoky River confluence (lower plot; blue points) with lengths comparable to fish captured in the Core MMP (grey points).

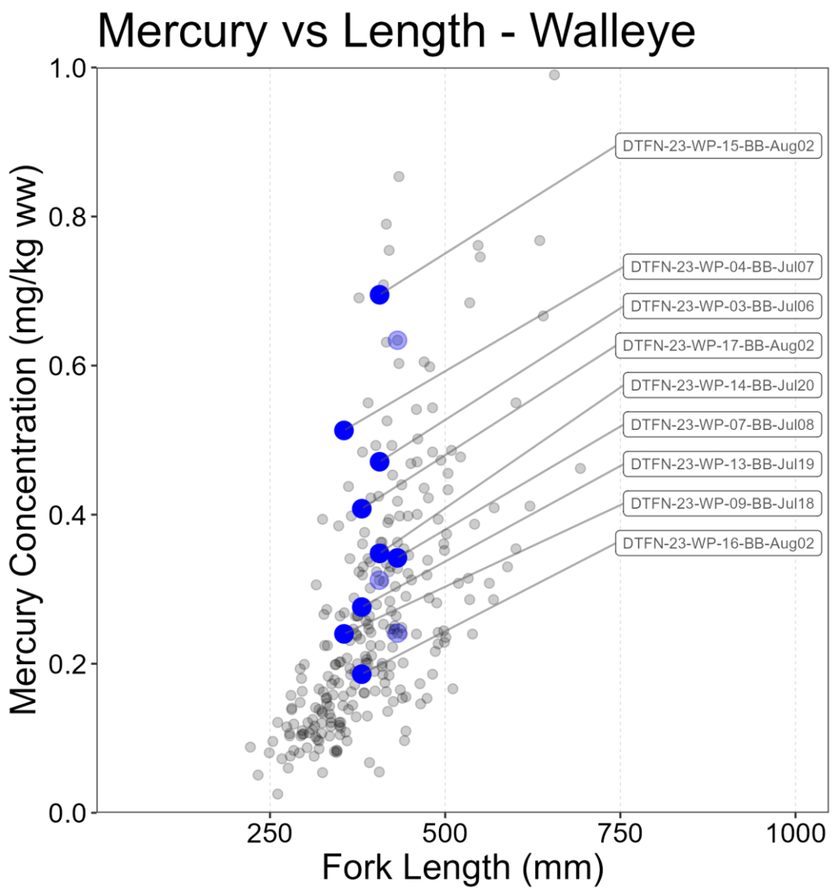


Photo 21

FISH MERCURY RESULTS

- ICPS Results in 2023 showed a large amount of variation in mercury concentrations. A length-mercury relationship is less clear since each of the nine fish collected were of similar size.
- 2023 ICSP results are consistent with the Core MMP data.

FISH CONSUMPTION GUIDANCE

- For Walleye caught in the Peace River, follow consumption guidance based on the Core MMP data (table below):

Walleye			
Size$^{mm\|in}$ | Mercury^{ppm}	C	P	O
300|12 | 0.15	9	17	40
400|16 | 0.28	5	9	21
500|20 | 0.47	3	5	13

Mercury estimates from CORE MMP fish (up to 20") in the Peace River (between Peace Canyon Dam and Many Islands); see 2022 Annual Report (Appendix F) for details.

Burbot

OVERVIEW

- Burbot are bottom dwellers, more common in the lower reaches of the Peace River study area. They are long-lived and may eat other fish, meaning they can contain higher levels of mercury.
- To date, all Burbot caught in the ICSP have been from Moberly Lake, with one caught in 2023 there (lower plot; labeled blue point). Core MMP fish are shown as grey points.

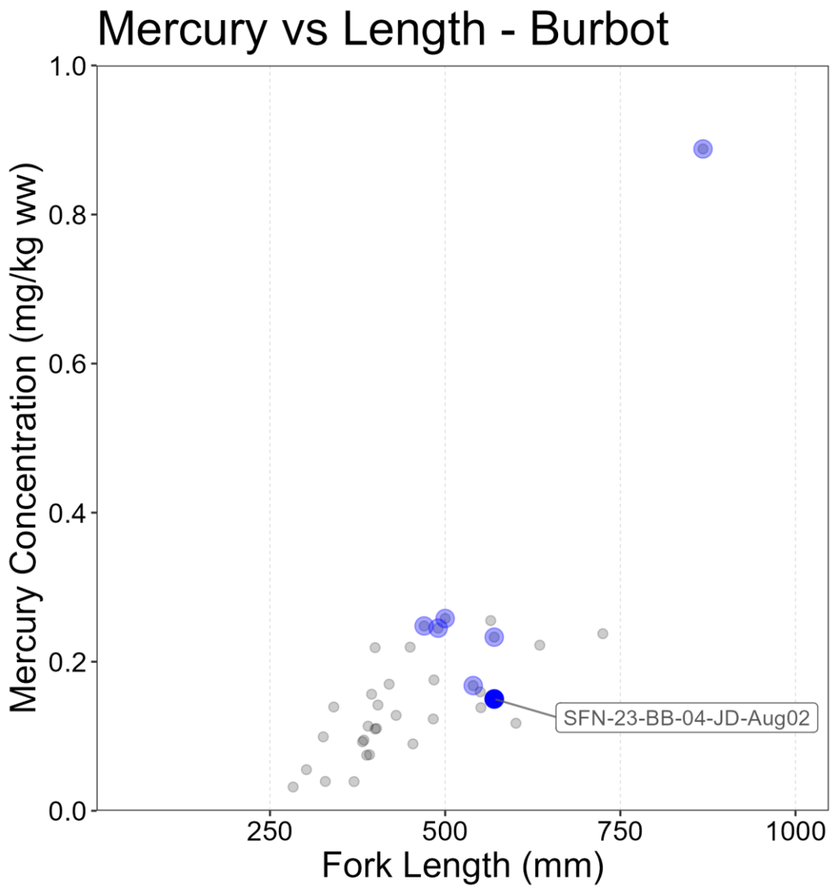


Photo 22

FISH MERCURY RESULTS

- Positive relationship between mercury and fish length. Larger/older fish have higher levels than smaller/younger fish.
- ICSP results consistent with the Core MMP data. Highest mercury concentration is from a large Burbot (868 mm) caught in 2022.

FISH CONSUMPTION GUIDANCE

- All ICSP Burbot samples have been collected from Moberly Lake. Consumption guidance for Burbot in Moberly Lake is provided in **Appendix A at the end of the brochure**.
- For Burbot caught in the Peace River, follow consumption guidance based on the Core MMP data (table below):

Burbot			
Size$^{mm\|in}$ | Mercury^{ppm}	C	P	O
325|13 | 0.08	18	32	76
450|18 | 0.13	11	20	47
575|23 | 0.21	7	12	29

Mercury estimates from CORE MMP fish (up to 23") in the Peace River (between Peace Canyon Dam and Many Islands); see 2022 Annual Report (Appendix F) for details.

Northern Pike

OVERVIEW

- Northern Pike prefer side channel and confluence habitat along the Peace River. As opportunistic ambush predators, they occupy a high position in the food chain and have higher levels of mercury.
- 2023 Northern Pike ICSP results are shown in the plot below as labeled blue points compared to 2022 ICSP (faded blue points) and Core MMP fish (grey points). All of the ICSP pike in 2023 were caught at the Peace-Smoky River confluence with the exception of one fish from Moberly Lake (SFN-23-NP-01-JD-Jul31).

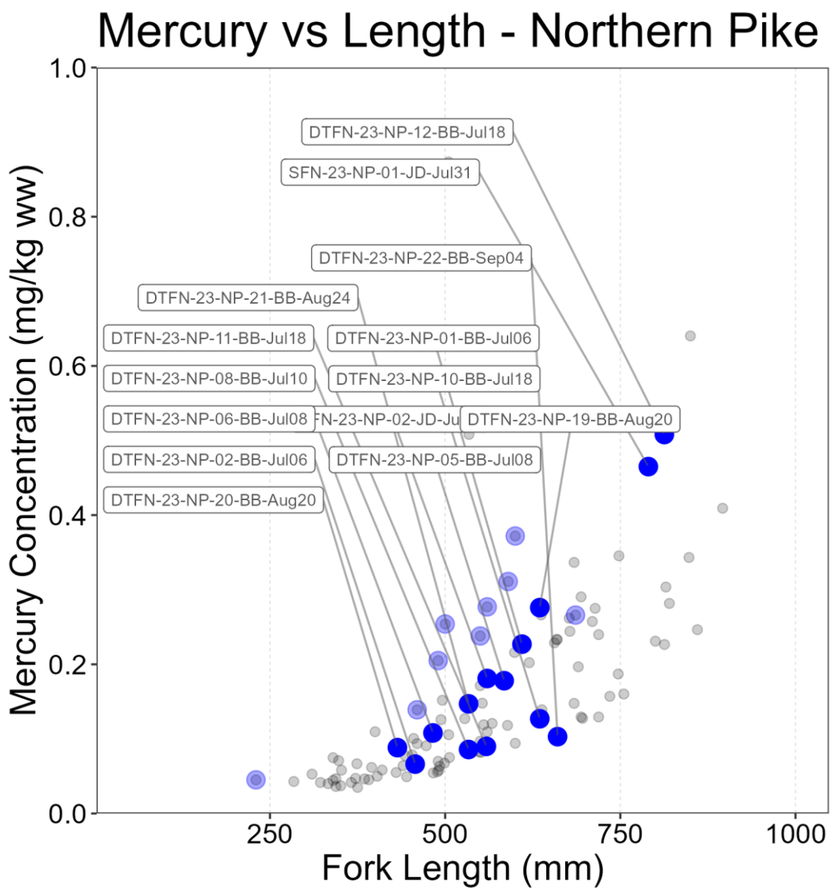



Photo 23

FISH MERCURY RESULTS

- Positive relationship between mercury and fish length.
- The Northern Pike Caught at the Peace-Smoky River confluence appear to be consistent with the Core MMP data.
- Fish from Moberly Lake (2022) appear to have higher mercury concentrations than the Core MMP for a given fish length.

FISH CONSUMPTION GUIDANCE

- For Pike caught in Moberly Lake, Azimuth has provided separate consumption advice in **Appendix A at the end of the brochure**.
- For Pike caught in the Peace River, follow consumption guidance based on the Core MMP data (table below):

Northern Pike			
Size$^{mm\|in}$ | Mercury^{ppm}	C	P	O
400|16 | 0.06	24	43	101
550|22 | 0.12	12	21	50
700|28 | 0.22	6	11	27

Mercury estimates from CORE MMP fish (up to 28") in the Peace River (between Peace Canyon Dam and Many Islands); see 2022 Annual Report (Appendix F) for details.

Lake Trout

OVERVIEW

- Lake Trout are rare in the Peace River, but common in the upstream reservoirs. Young trout eat invertebrates, shifting to preying on other fish as they mature.
- No Lake Trout were caught in 2023. Three ICSP Lake Trout were caught in the Williston Reservoir in 2022 (lower plot; blue points) with lengths comparable to fish captured in the Core MMP (grey points).

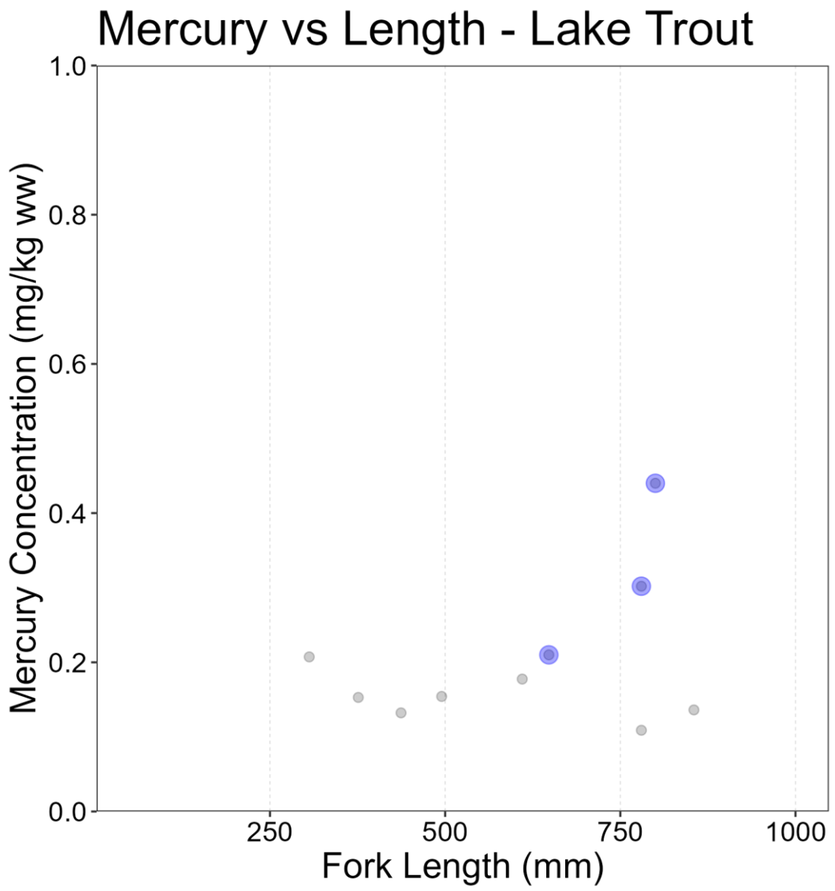



Photo 24

FISH MERCURY RESULTS

- ICSP results appear to show a positive relationship between mercury and fish length.
- Core MMP results do not demonstrate a positive length-mercury relationship.
- 2022 ICSP results are not directly comparable to the Core MMP results, since the ICSP fish were collected in Williston Reservoir.

FISH CONSUMPTION GUIDANCE

- For Lake Trout (up to 22”) from Williston Reservoir and tributaries, follow FWCP guidance (QR code and bold text in table below):

SCAN ME

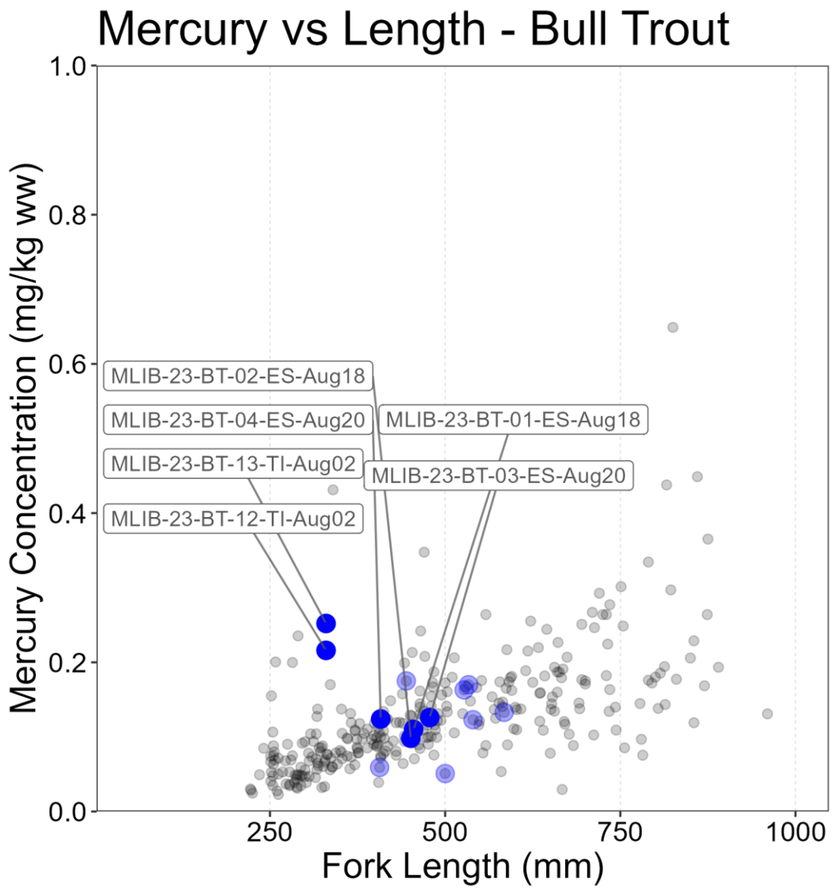
Williston Reservoir & Tributaries - Monthly Servings				
Fish type	Size mm|in	C	P	O
LAKE TROUT	**560|22**	**7**	**12**	**28**
Bull Trout	560|22	7	12	28
Lake Whitefish	305|12	10	18	42
Kokanee	305|12	19	33	78
Rainbow Trout	305|12	30	53	124

Mercury estimates from FWCP fish caught in Williston Reservoir or tributaries

Bull Trout
Sa-pa*

OVERVIEW

- Bull Trout are most abundant upstream of the Peace-Beaton confluence, utilizing specific spawning habitat on the Halfway River. As opportunistic predators, they feed on invertebrates and fish, altering their diet depending on prey availability.
- Six Bull Trout were caught in 2023 on the Pine and Pack Rivers (labeled blue points). Seven were caught in 2021 on the Halfway River (faded blue points). These are shown in the plot below relative to the Core MMP data (grey points).



**Indigenous name from the Beaver language. Names provided to BC Hydro by the Halfway River First Nation.*


Photo 25

FISH MERCURY RESULTS

- Positive relationship between mercury and fish length. Larger/older fish have higher levels than smaller/younger fish.
- The two 2023 ICSP samples collected on the Pack River appear to have higher concentrations than the Core MMP. The Pack drains into Williston Reservoir; see separate guidance below.

FISH CONSUMPTION GUIDANCE

- For Bull Trout caught in the Peace, Halfway, and Pine Rivers; follow consumption guidance based on the Core MMP data (table below):
- For Bull Trout from Williston Reservoir and tributaries, follow FWCP guidance (see table on page 13 or scan QR code below):

Bull Trout			
Size[mm|in] | Mercury[ppm]	C	P	O
400|16 | 0.11	13	23	55
550|22 | 0.15	9	17	40
700|28 | 0.18	8	14	33

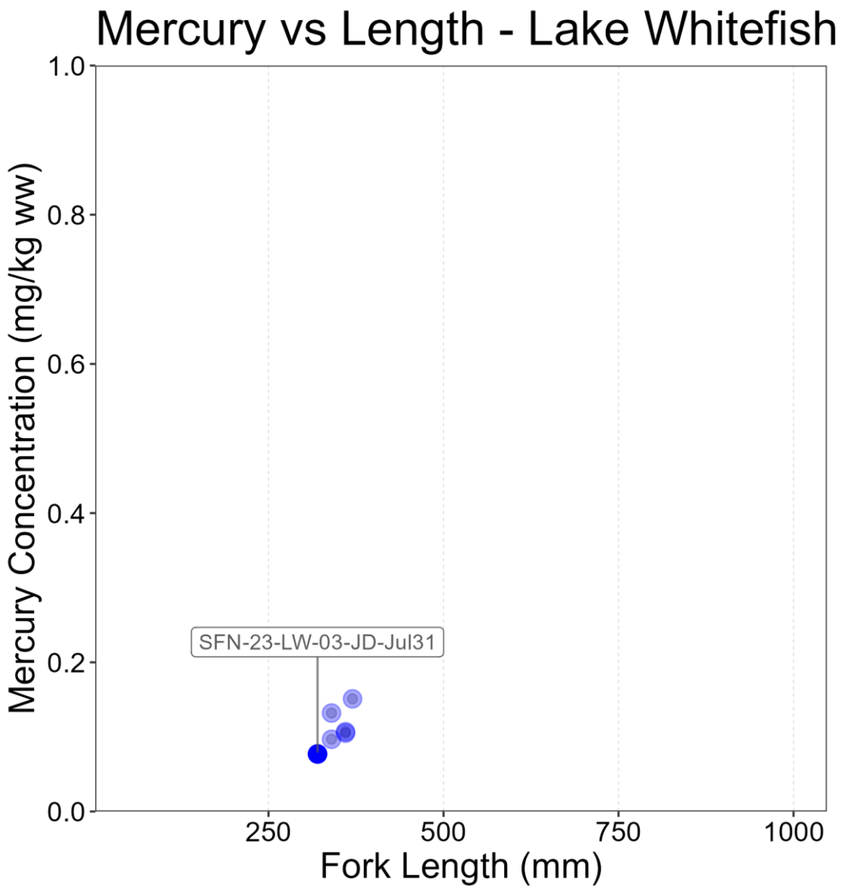
Mercury estimates from CORE MMP fish (up to 28") in the Peace River (between Peace Canyon Dam and Many Islands); see 2022 Annual Report (Appendix F) for details.

SCAN ME

Lake Whitefish Ihuwe-dak'ale*

OVERVIEW

- Lake Whitefish are more common in the lakes of the Peace River watershed. They are bottom dwelling, feeding primarily on benthic invertebrates.
- The single 2023 ICSP sample from Moberly Lake is shown as a labeled blue point in the plot below, with five also caught in 2022 in Moberly Lake. No data are available for Lake Whitefish from the Core MMP.



Indigenous name from the Beaver language. Names provided to BC Hydro by the Halfway River First Nation.

Photo 26

FISH MERCURY RESULTS

- Mercury concentrations appear to increase in larger fish, but are relatively low compared to other fish species caught in the ICSP.

FISH CONSUMPTION GUIDANCE

- Consumption guidance for Lake Whitefish caught in Moberly Lake is provided in **Appendix A at the end of the brochure.**
- For Lake Whitefish (up to 12") from Williston Reservoir and tributaries, follow FWCP guidance (QR code and bold text in table below):

SCAN ME

Williston Reservoir & Tributaries - Monthly Servings				
Fish type	Size mm|in	C	P	O
LAKE TROUT	560|22	7	12	28
Bull Trout	560|22	7	12	28
Lake Whitefish	**305|12**	**10**	**18**	**42**
Kokanee	305|12	19	33	78
Rainbow Trout	305|12	30	53	124

Mercury estimates from FWCP fish caught in Williston Reservoir or tributaries

Mountain Whitefish

OVERVIEW

- On the Peace River, Mountain Whitefish are most common above the Beatton River confluence, but also occur in many tributaries and lakes throughout the region. They are bottom dwelling, feeding mostly on invertebrates.
- No Mountain Whitefish were caught in 2023. Results for 2022 and 2021 (faded blue points) are compared to Core MMP data (grey points) in the plot below. Five fish were caught in 2022 in Moberly Lake, while three fish were caught in 2021 in the Halfway River.

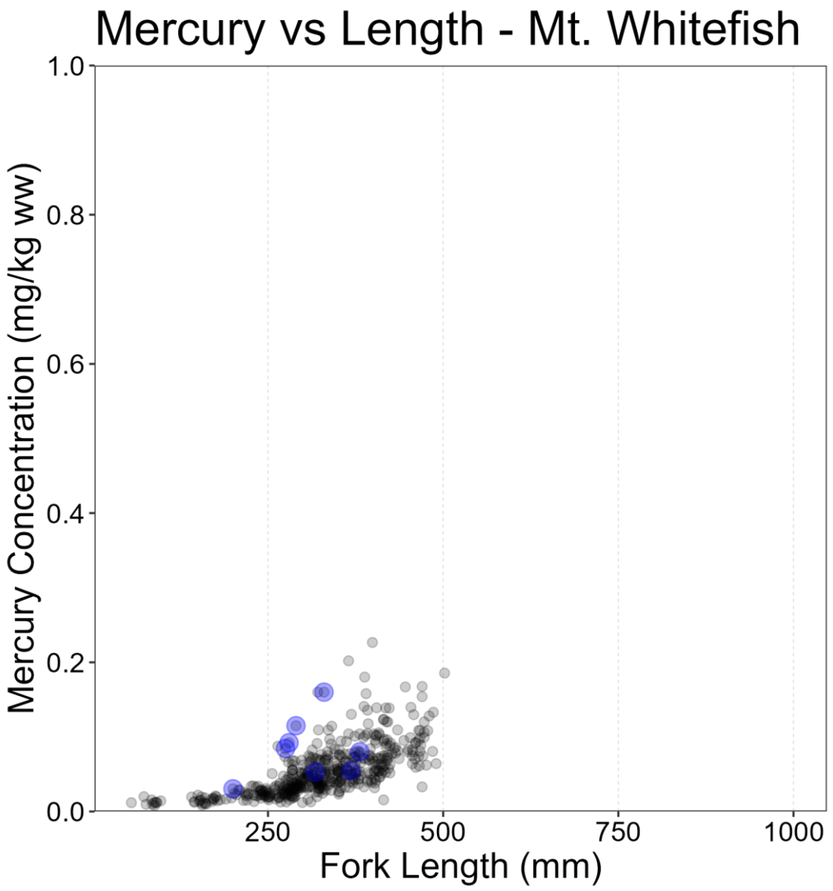


Photo 27

FISH MERCURY RESULTS

- Positive relationship between mercury and fish length.
- 2021 ICSP results from the Halfway River are consistent with the Core MMP data.
- 2022 ICSP results show that Moberly Lake fish generally have higher mercury than Core MMP fish for a given fish length.

FISH CONSUMPTION GUIDANCE

- Consumption guidance for Mountain Whitefish caught in Moberly Lake is provided in **Appendix A at the end of the brochure.**
- For Mountain Whitefish caught in the Peace or Halfway Rivers, follow consumption guidance based on the Core MMP data (table below):

Mountain Whitefish			
Size[mm|in] | Mercury[ppm]	C	P	O
275|11 | 0.04	37	65	152
350|14 | 0.05	29	52	122
425|17 | 0.08	18	32	76

Mercury estimates from CORE MMP fish (up to 17") in the Peace River (between Peace Canyon Dam and Many Islands); see 2022 Annual Report (Appendix F) for details.

White Sucker

OVERVIEW

- White Sucker are more common below the Site C Dam, but spawn on tributaries throughout the Peace River. They are also common in lakes across the region. Suckers feed in the bottom substrate, eating worms, clams, and insect larva.
- No ICSP White Suckers were caught in 2023. A single fish was caught in Moberly Lake in 2022 (lower plot; faded blue point) which was comparable in size to those captured in the Core MMP (grey points).

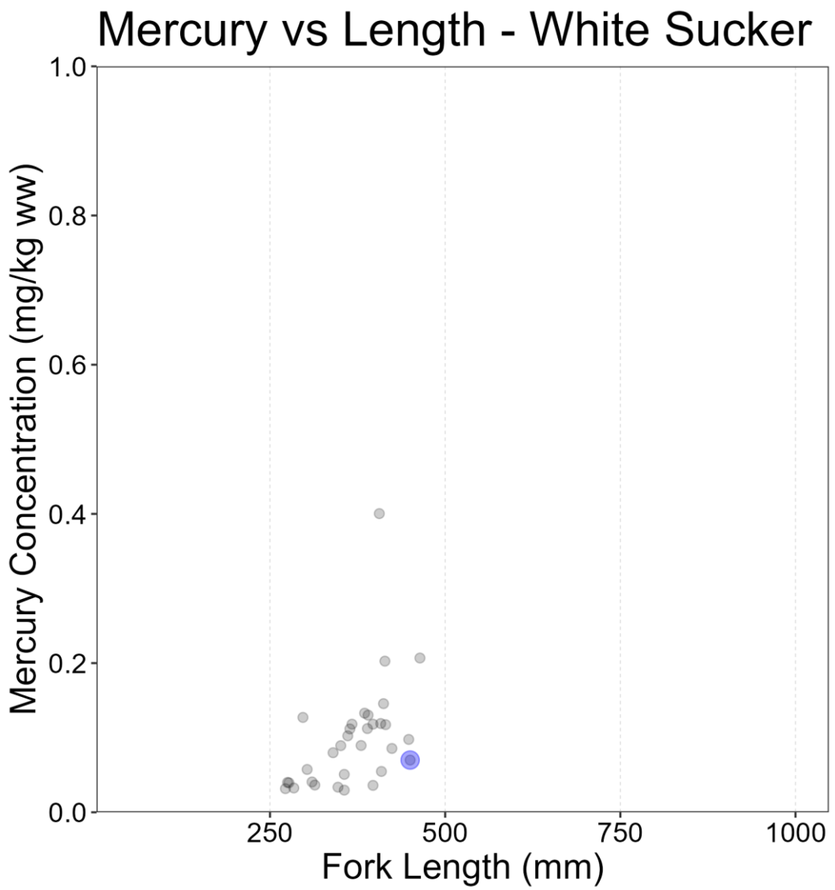


Photo 28

FISH MERCURY RESULTS

- Core MMP data show a positive length-mercury relationship. Larger/older fish have higher concentrations than smaller/younger fish.
- 2022 ICSP results are consistent with the Core MMP data.

FISH CONSUMPTION GUIDANCE

- Consumption guidance for White Sucker caught in Moberly Lake is provided in **Appendix A at the end of the brochure.**
- For White Sucker caught in the Peace River, follow consumption guidance based on the Core MMP data (table below):

White Sucker			
Size[mm|in] | Mercury[ppm]	C	P	O
325|13 | 0.06	24	43	101
375|15 | 0.09	16	28	67
425|17 | 0.14	10	18	43

Mercury estimates from CORE MMP fish (up to 17") in the Peace River (between Peace Canyon Dam and Many Islands); see 2022 Annual Report (Appendix F) for details.

Longnose Sucker

OVERVIEW

- Longnose Suckers are more common on the Peace River downstream of the Halfway River confluence. They are also common in the lakes of the region. Suckers feed in the bottom substrate, eating worms, clams, and insect larva.
- No ICSP Longnose Suckers were caught in 2023. In 2022 a single Longnose Sucker was caught in Moberly Lake (faded blue point) of comparable size to those captured in the Core MMP (grey points).

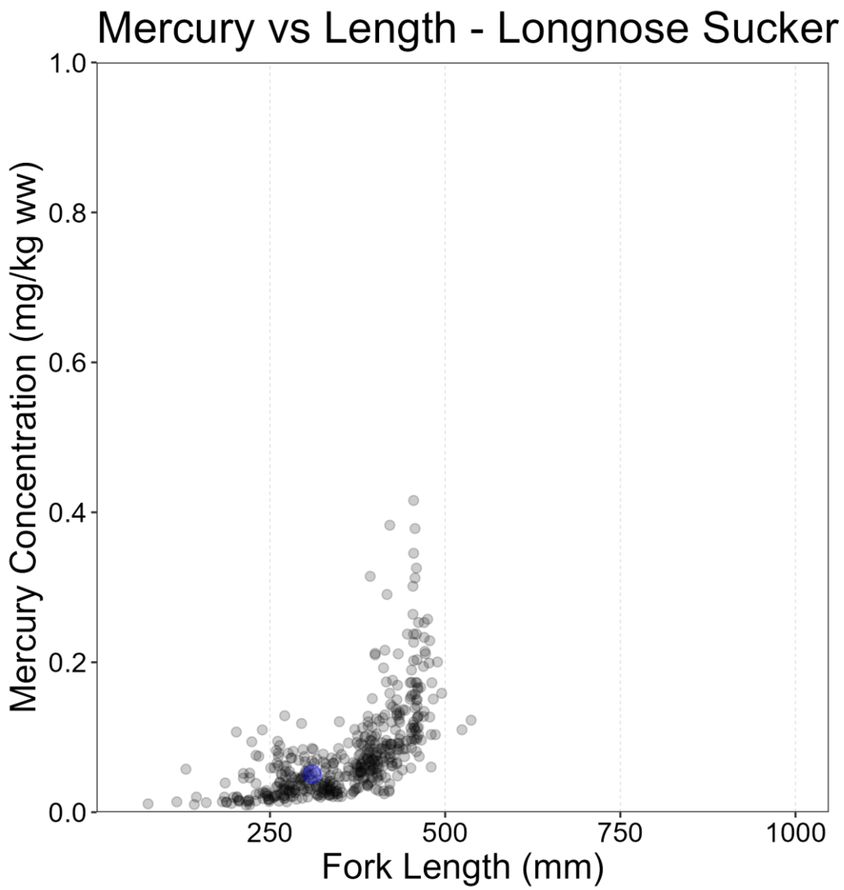


Photo 29

FISH MERCURY RESULTS

- Core MMP data show a positive length-mercury relationship. Larger/older fish have higher concentrations than smaller/younger fish.
- 2022 ICSP results are consistent with the Core MMP data.

FISH CONSUMPTION GUIDANCE

- Consumption guidance for Longnose Sucker caught in Moberly Lake is provided in **Appendix A at the end of the brochure.**
- For Longnose Sucker caught in the Peace River, follow consumption guidance based on the Core MMP data (table below):

Longnose Sucker			
Size$^{mm\|in}$ | Mercury^{ppm}	C	P	O
325|13 | 0.05	29	52	122
375|15 | 0.07	21	37	87
425|17 | 0.11	13	23	55

Mercury estimates from CORE MMP fish (up to 17") in the Peace River (between Peace Canyon Dam and Many Islands); see 2022 Annual Report (Appendix F) for details.

Rainbow Trout

OVERVIEW

- Rainbow Trout are most common upstream of the Site C Dam. They primarily eat insects like caddisflies, mayflies, and midges. Feeding lower on the food chain means that Rainbow Trout have lower levels of mercury.
- 58 Rainbow Trout were caught in the 2023 ICSP (blue points), all in lakes and rivers surrounding the McLeod Lake community. Lengths were comparable to fish captured in the Core MMP (grey points).

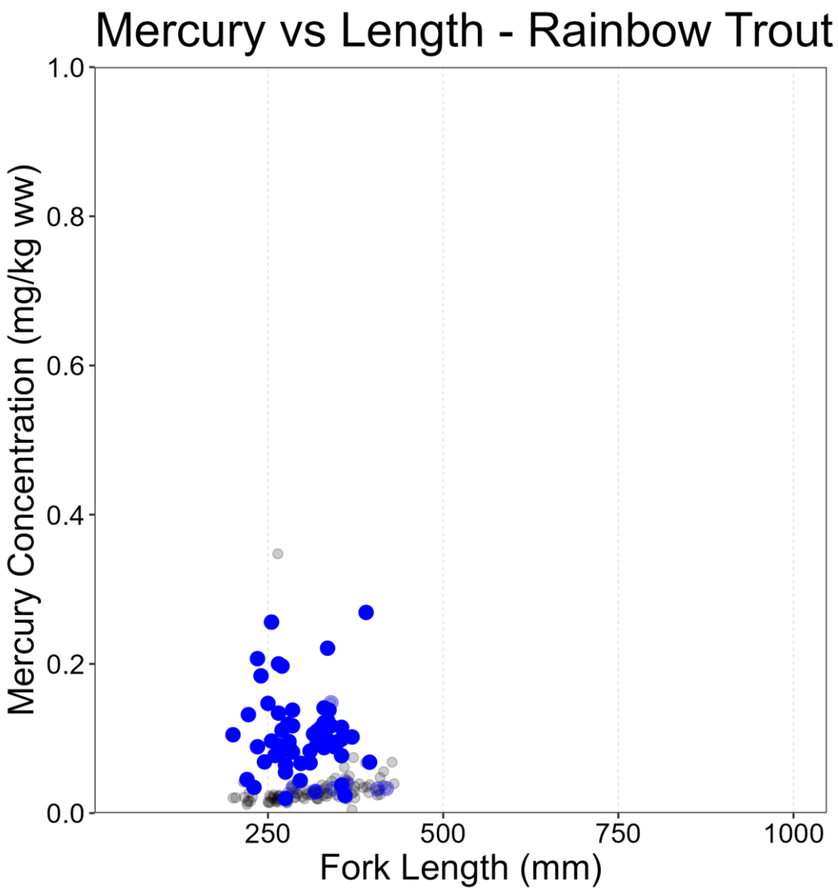



Photo 30

FISH MERCURY RESULTS

- Core MMP slight positive length-mercury relationship not evident in the 2023 ICSP results. Levels were higher in the lakes and rivers surrounding McLeod Lake, with a mean concentration of 0.11 ppm.

FISH CONSUMPTION GUIDANCE

- For Rainbow Trout caught in the McLeod Lake area (Pack and Crooked Watersheds), follow the consumption guidance below:

Rainbow Trout*				
Size mm|in	Mercury ppm	C	P	O
299|12	0.11	13	23	55

**size and mercury is a mean of McLeod Lake fish samples.*

- For Rainbow Trout caught in the Peace or Halfway Rivers, follow consumption guidance based on the Core MMP data (table below):

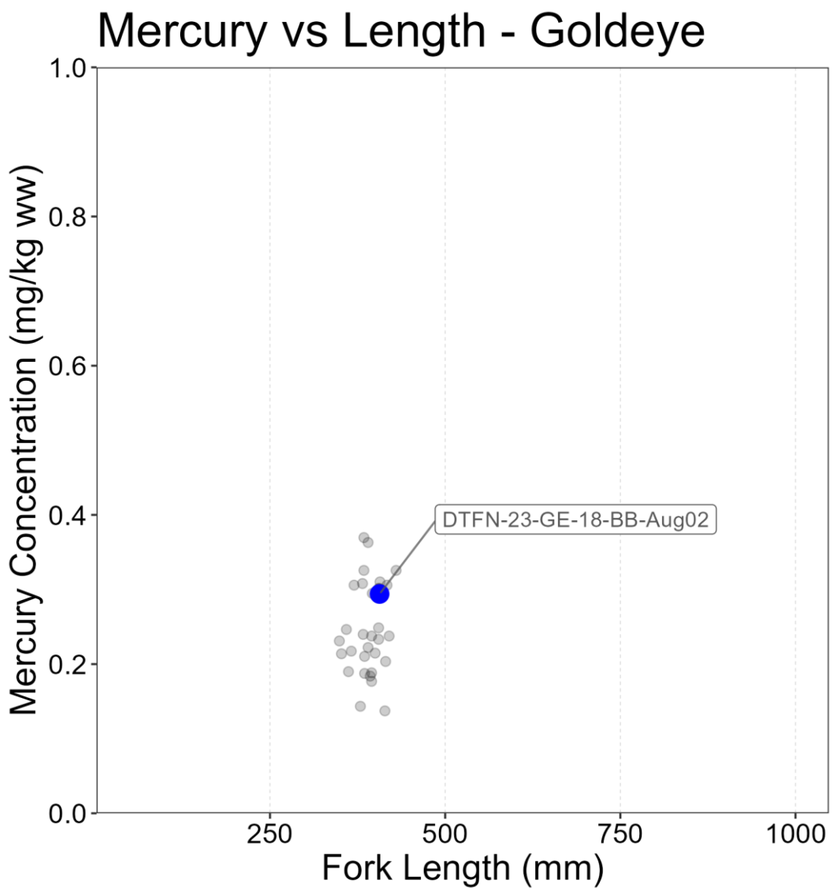
Rainbow Trout				
Size mm|in	Mercury ppm	C	P	O
250|10	0.02	74	130	305
325|13	0.03	49	86	203
400|16	0.04	37	65	152

Mercury estimates from CORE MMP fish (up to 16″) in the Peace River (between Peace Canyon Dam and Many Islands); see 2022 Annual Report (Appendix F) for details.

Goldeye

OVERVIEW

- Goldeye are found downstream of the Pine River. They are migratory and overwinter downstream of the town of Peace River, AB. Goldeye are primarily insect eaters, but will also eat small fish.
- The sample from 2023 is the first time this fish species has been captured in the ICSP program (blue point). The length of the fish captured is comparable to lengths captured in the Core MMP (grey points).



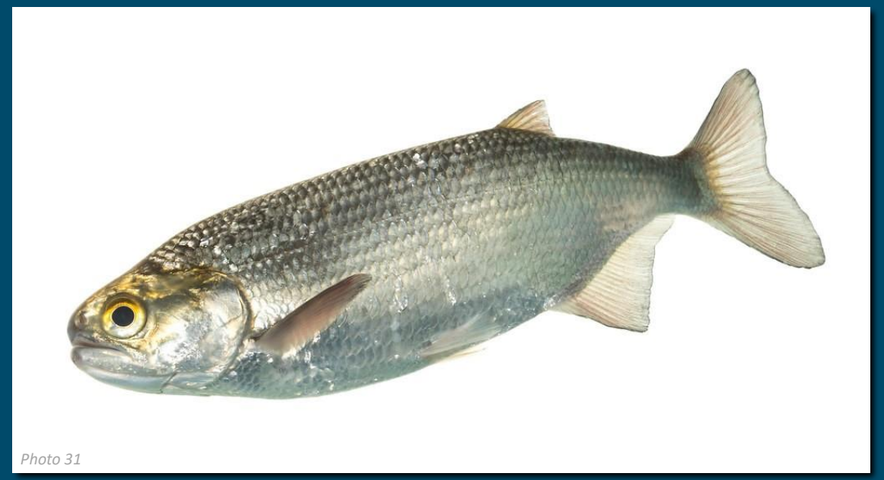


Photo 31

FISH MERCURY RESULTS

- A length-mercury relationship is not seen in the Core MMP data available for this species.
- The single sample obtained in 2023 falls within the mercury concentrations seen in the Core MMP.

FISH CONSUMPTION GUIDANCE

- For Goldeye caught in the Peace River, follow consumption guidance based on the Core MMP data (table below):

Goldeye*				
Size mm|in	Mercury ppm	C	P	O
395|16	0.24	6	10	25

Mercury estimates from CORE MMP fish in the Peace River (between Peace Canyon Dam and Many Islands); see 2022 Annual Report (Appendix F) for details.
**size and mercury is a mean of available fish samples.*


Photo 34

APPENDIX A:

Moberly Lake Fish Mercury & Consumption Guidance


Photo 33

Photo 32

ICSP 2023

APPENDIX A

Moberly Lake

OBJECTIVE

Appendix A provides fish consumption guidance for Moberly Lake. Unlike the Peace River, Moberly Lake has unique size-mercury relationships, requiring species-specific guidance. The data and advice presented are limited to species sampled in the ICSP program.

DATA ANALYSIS

This appendix presents mercury tissue data for Burbot, Northern Pike, Lake Whitefish, Mountain Whitefish, White Sucker, and Longnose Sucker sampled by Saulteau First Nation (SFN) in Moberly Lake during the 2022–2023 ICSP program. These data were pooled with samples collected earlier (2020–2021) by SFN through BC Hydro's Indigenous Traditional Use Fund (ITUF) program. The whole dataset is summarized in the table below.

	Fish Species*						
Program/Year	**BB**	**NP**	**LW**	**MW**	**LSU**	**WSU**	**Total**
ITUF							
2020	17	29	10	26	9	6	**97**
2021	2	15	4	-	12	4	**37**
ICSP							
2022	6	9	5	5	1	1	**27**
2023	1	2	1	-	-	-	**4**
Total	**26**	**55**	**20**	**31**	**22**	**11**	**165**

*Abbreviations include BB (Burbot), NP (Northern Pike), LW (Lake Whitefish), MW (Mountain Whitefish), LSU (Longnose Sucker), and WSU (White Sucker).

Photo 35

FISH MERCURY CONCENTRATIONS

Levels of methylmercury in several fish species from Moberly Lake were higher than levels seen in the Peace River. These results are not uncommon and are related to different characteristics between Moberly Lake and the Peace River. For example, differences in the levels of methylmercury at the base of the food web or in the fish communities present could lead to differences in length-mercury relationships between two locations (e.g., lakes and rivers).

FISH CONSUMPTION GUIDANCE FOR MOBERLY LAKE

On the following pages, length-mercury relationships are shown for the six fish target species. The pooled ITUF/ICSP dataset for Moberly Lake is compared to the Core MMP dataset for the Peace River for each species. Consumption guidance was determined using the following approach:

- ITUF/ICSP results *are comparable* to the Core MMP: if length-mercury relationships were comparable across the two datasets; data was pooled to establish consumption guidance for Moberly Lake.
- ITUF/ICSP results *are higher than* the Core MMP: if length-mercury relationships were *not* comparable across the two datasets; then only the ITUF/ICSP data was used for consumption guidance for Moberly Lake.

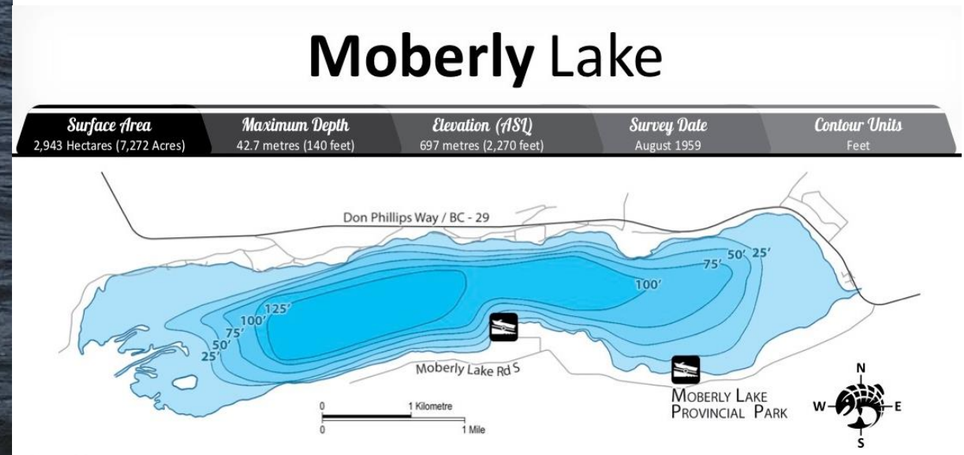
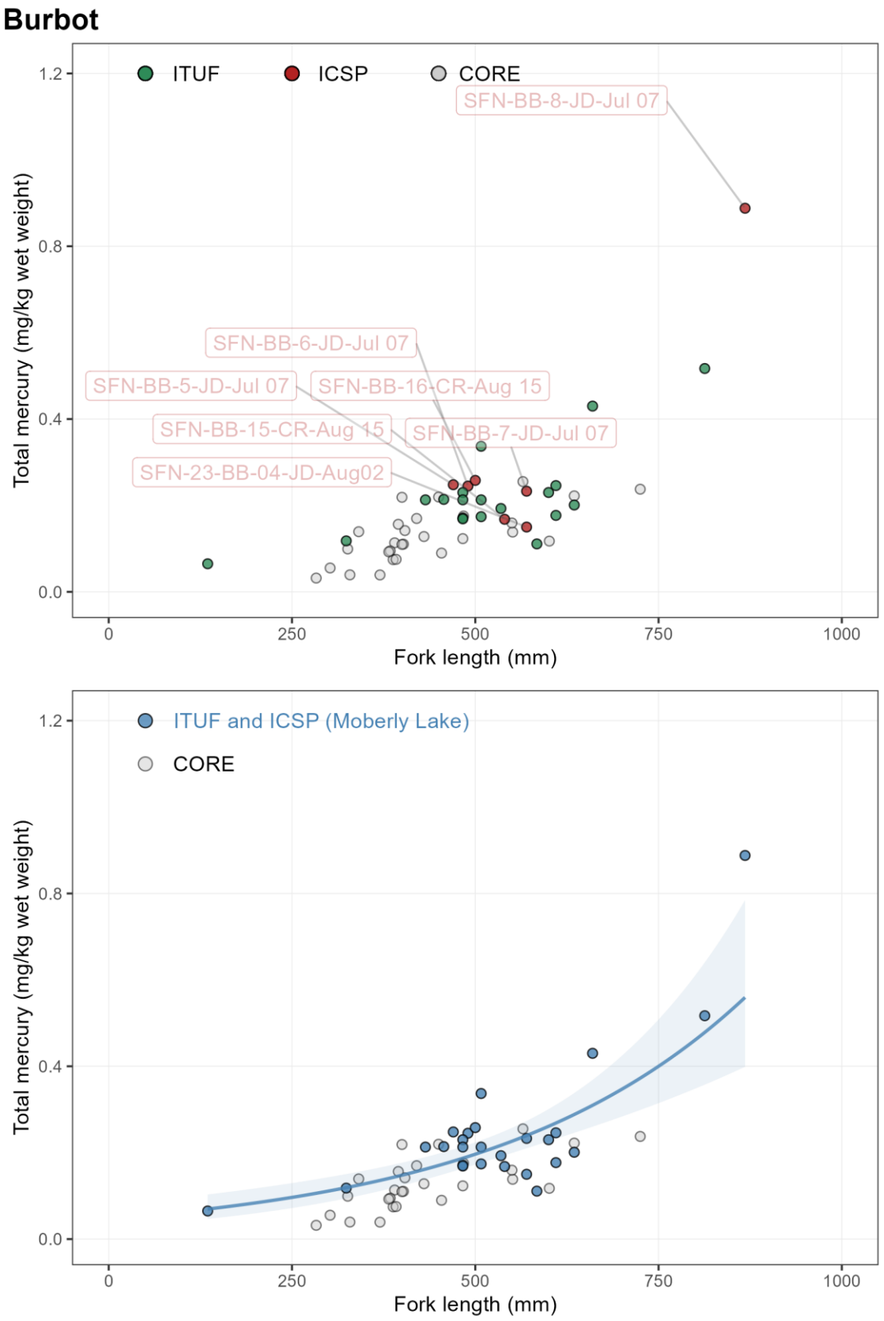


Photo 36

Burbot
in MOBERLY LAKE



FISH MERCURY RESULTS

UPPER LEFT PLOT

- Positive relationship between mercury and fish length in ICSP (red), ITUF (green), and Core MMP (grey) data. Larger/older fish have higher mercury levels than smaller/younger fish.
- ICSP/ITUF results from Moberly Lake are consistent with the Core MMP data from the Peace River.

LOWER LEFT PLOT

- ICSP/ITUF and Core MMP data pooled and length-mercury relationship quantified (blue regression line) for consumption guidance.

FISH CONSUMPTION GUIDANCE

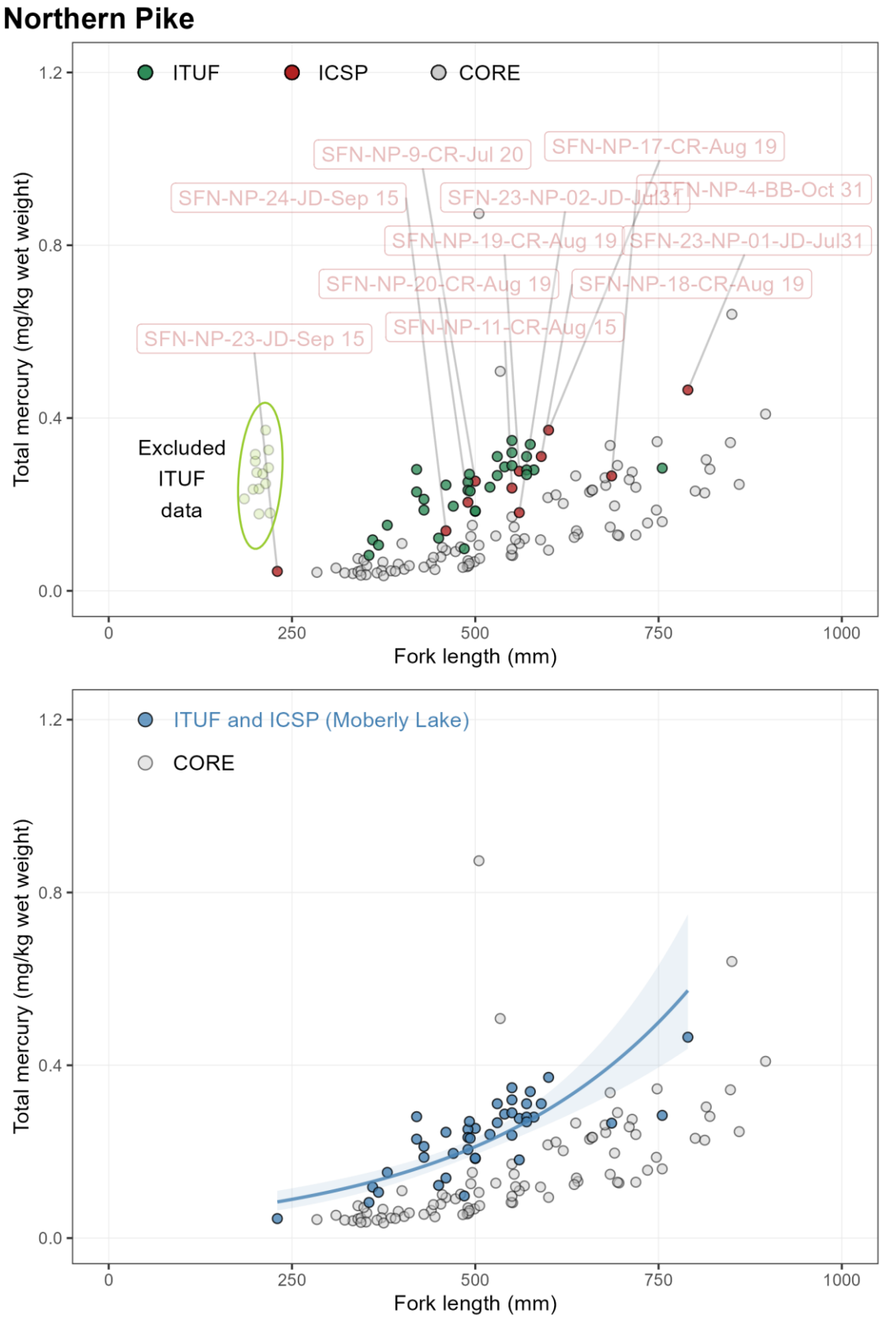
- For Burbot caught in Moberly Lake, follow consumption guidance based on ICSP/ITUF and Core MMP results (table below):

Moberly Burbot				
Size mm|in	Mercury ppm	C	P	O
325|13	0.12	12	21	50
450|18	0.17	8	15	35
575|23	0.24	6	10	25
750|30	0.4	3	6	15

Notes:

1. *Servings per month (SPM) are given in colour-coded columns for: children under 12 (C), people who are, or could be, pregnant (P), and others (O).*
2. *Colour codes for SPM:*
   Once every day [SPM ≥ 30]; Once every other day [15 ≤ SPM < 30]
   Twice a week [8 ≤ SPM < 15]; Once a week [4 ≤ SPM < 8];
   Twice a month [2 ≤ SPM < 4]; Once a month [SPM < 2]

Northern Pike
in MOBERLY LAKE



FISH MERCURY RESULTS

UPPER LEFT PLOT

- Positive relationship between mercury and fish length in ICSP (red), ITUF (green), and Core MMP (grey) data. Larger/older fish have higher mercury levels than smaller/younger fish.
- ICSP/ITUF results from Moberly Lake were generally higher than the Core MMP data from the Peace River, so the two datasets could not be pooled. Consumption guidance for Moberly Lake was developed using only the ICSP/ITUF data.

LOWER LEFT PLOT

- ICSP/ITUF length-mercury relationship quantified (blue regression line) for separate consumption guidance from the Core MMP.

FISH CONSUMPTION GUIDANCE

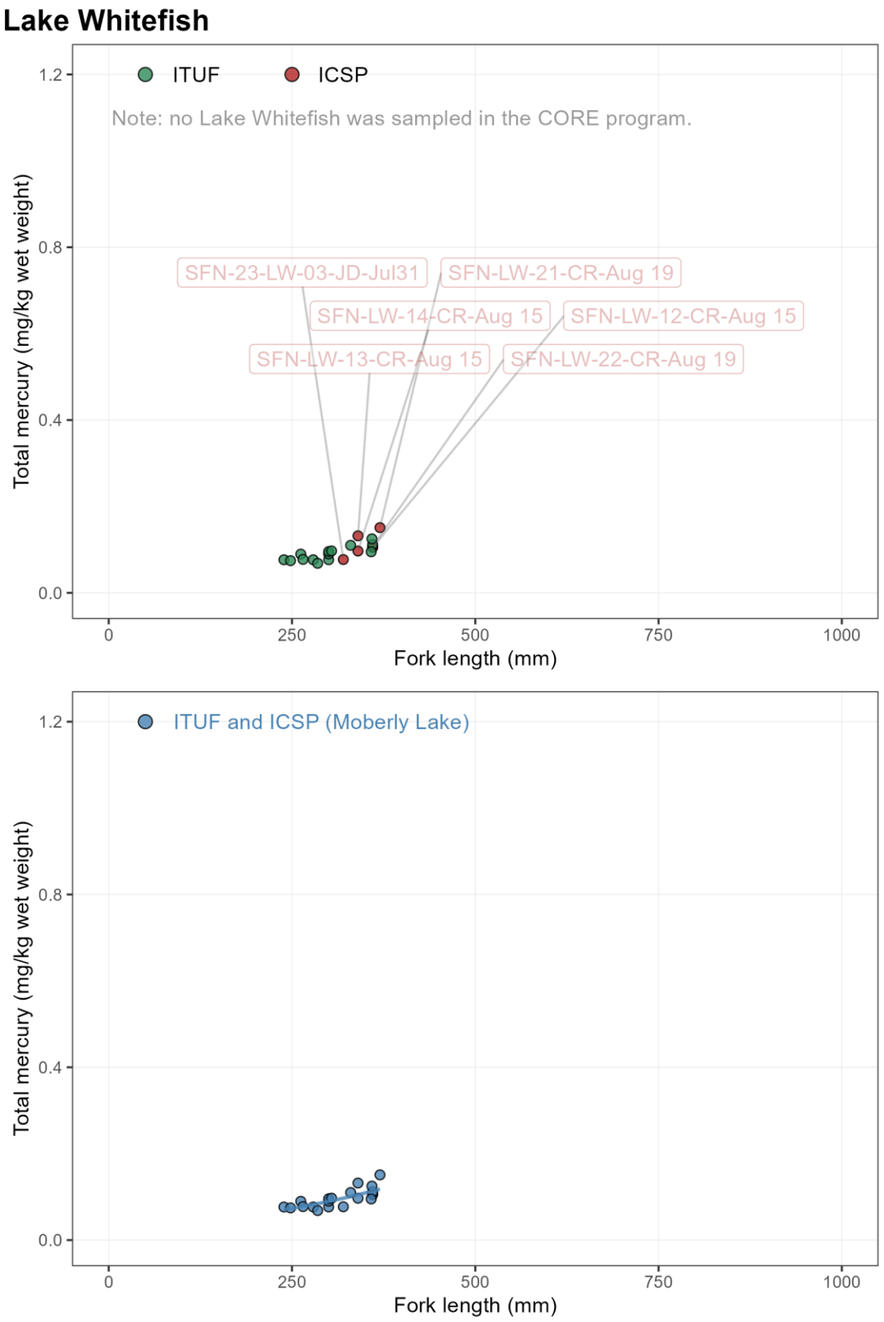
- For Northern Pike caught in Moberly Lake, follow consumption guidance based on the ICSP/ITUF data (table below):

Moberly Northern Pike				
Size mm|in	Mercury ppm	C	P	O
400|16	0.15	9	17	40
550|22	0.25	5	10	24
700|28	0.42	3	6	14

Notes:

1. *Servings per month (SPM) are given in colour-coded columns for: children under 12 (C), people who are, or could be, pregnant (P), and others (O).*
2. *Colour codes for SPM:*
   Once every day [SPM ≥ 30]; Once every other day [15 ≤ SPM < 30]
   Twice a week [8 ≤ SPM < 15]; Once a week [4 ≤ SPM < 8];
   Twice a month [2 ≤ SPM < 4]; Once a month [SPM < 2]

Lake Whitefish
in MOBERLY LAKE



FISH MERCURY RESULTS

UPPER LEFT PLOT

- Slight positive relationship between mercury and fish length in ICSP (red) and ITUF (green) data from Moberly Lake.
- No Core MMP data is available for Lake Whitefish since they have not been caught in the main stem of the Peace River in that program. Consumption guidance was based on the ICSP/ITUF data only.

LOWER LEFT PLOT

- ICSP/ITUF length-mercury relationship quantified (blue regression line) for Moberly Lake consumption guidance.

FISH CONSUMPTION GUIDANCE

- For Lake Whitefish caught in Moberly Lake, follow consumption guidance based on the ICSP/ITUF data (table below):

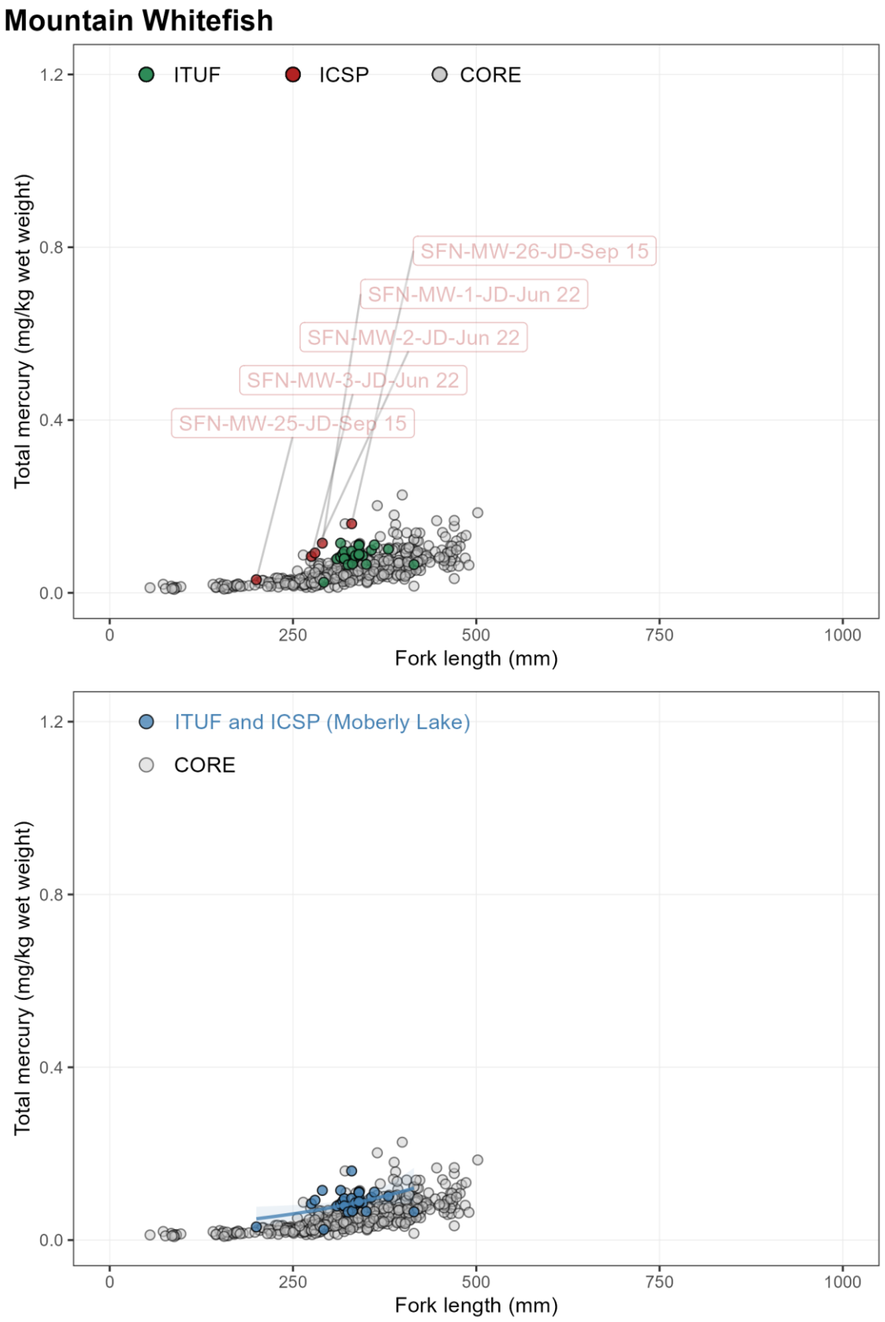
Moberly Lake Whitefish				
Size mm|in	Mercury ppm	C	P	O
300|12	0.09	16	28	67

Notes:

1. *Servings per month (SPM) are given in colour-coded columns for: children under 12 (C), people who are, or could be, pregnant (P), and others (O).*
2. *Colour codes for SPM:*
   Once every day [SPM ≥ 30]; Once every other day [15 ≤ SPM < 30]
   Twice a week [8 ≤ SPM < 15]; Once a week [4 ≤ SPM < 8];
   Twice a month [2 ≤ SPM < 4]; Once a month [SPM < 2]

Mountain Whitefish

in MOBERLY LAKE



FISH MERCURY RESULTS

UPPER LEFT PLOT

- Positive relationship between mercury and fish length in ICSP (red), ITUF (green), and Core MMP (grey) data.
- ICSP/ITUF results from Moberly Lake were generally higher than the Core MMP data from the Peace River, so the two datasets could not be pooled. Consumption guidance for Moberly Lake was developed using the ICSP/ITUF data only.

LOWER LEFT PLOT

- ICSP/ITUF length-mercury relationship quantified (blue regression line) for separate consumption guidance from the Core MMP.

FISH CONSUMPTION GUIDANCE

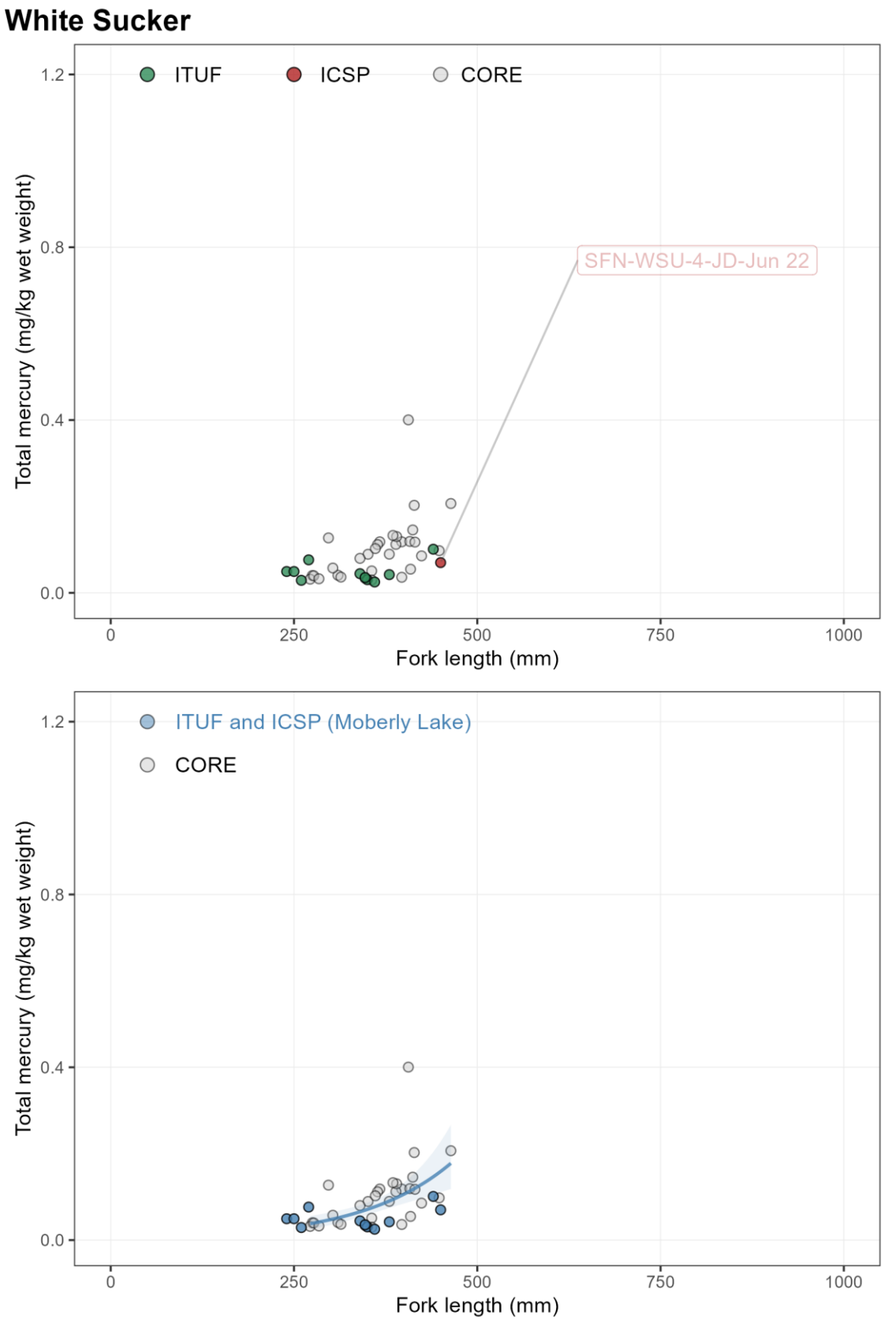
- For Mountain Whitefish caught in Moberly Lake, follow consumption guidance based on the ICSP/ITUF data (table below):

Moberly Mountain Whitefish				
Size mm|in	|Mercury ppm	C	P	O
275|11	|0.07	21	37	87
350|14	|0.09	16	28	67
415|16	|0.12	12	21	50

Notes:

1. *Servings per month (SPM) are given in colour-coded columns for: children under 12 (C), people who are, or could be, pregnant (P), and others (O).*
2. *Colour codes for SPM:*
   Once every day [SPM ≥ 30]; Once every other day [15 ≤ SPM < 30]
   Twice a week [8 ≤ SPM < 15]; Once a week [4 ≤ SPM < 8];
   Twice a month [2 ≤ SPM < 4]; Once a month [SPM < 2]

White Sucker
in MOBERLY LAKE



FISH MERCURY RESULTS

UPPER LEFT PLOT

- Positive relationship between mercury and fish length in ICSP (red), ITUF (green), and Core MMP (grey) data.
- ICSP/ITUF results from Moberly Lake were consistent to the Core MMP data from the Peace River.

LOWER LEFT PLOT

- ICSP/ITUF and Core MMP data pooled. Length-mercury relationship quantified (blue regression line) for consumption guidance.

FISH CONSUMPTION GUIDANCE

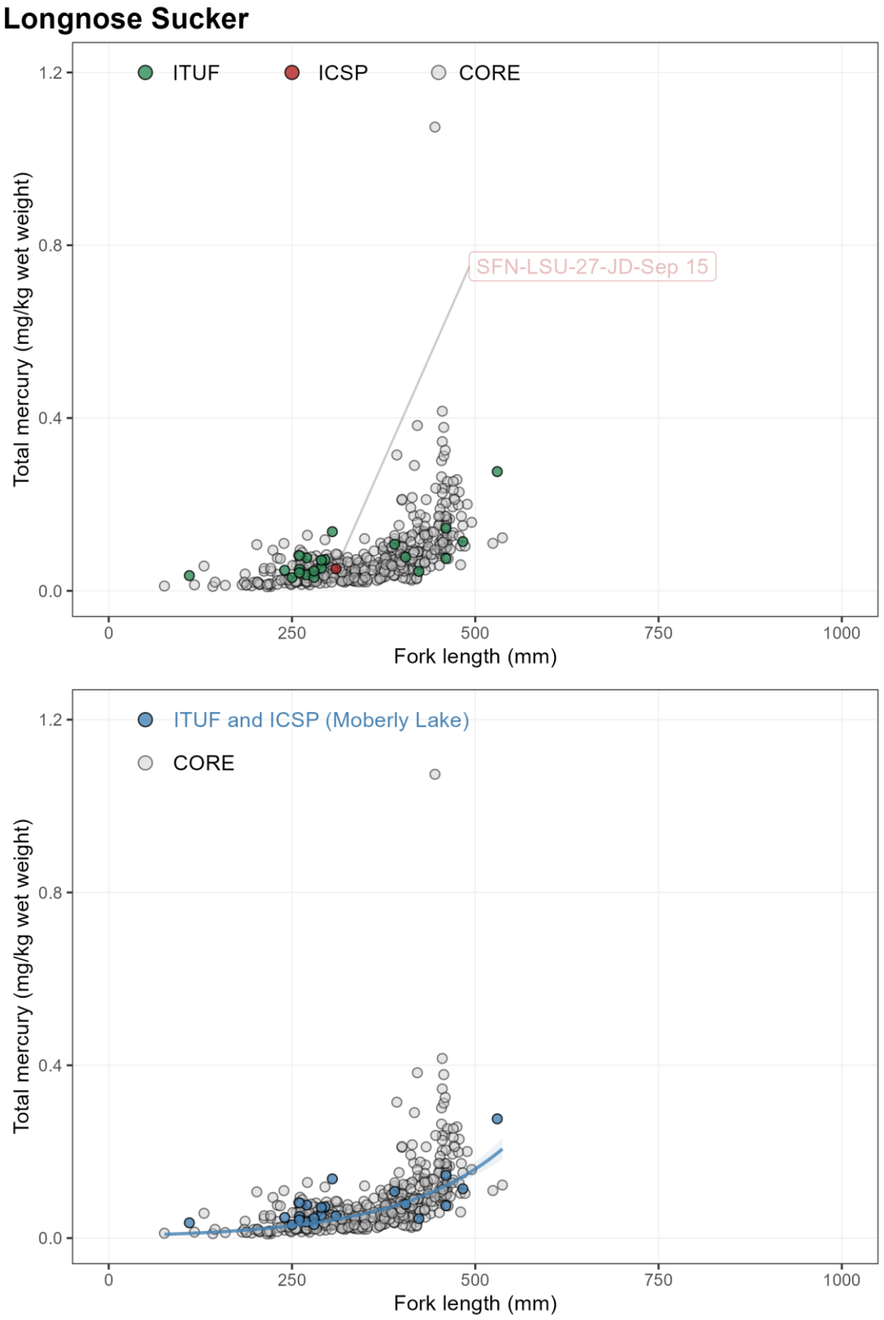
- For White Sucker caught in Moberly Lake, follow consumption guidance based on ICSP/ITUF and Core MMP results (table below):

Moberly White Sucker				
Size mm|in	Mercury ppm	C	P	O
325|13	0.06	24	43	101
375|15	0.09	16	28	67
425|17	0.13	11	20	47

Notes:

1. *Servings per month (SPM) are given in colour-coded columns for: children under 12 (C), people who are, or could be, pregnant (P), and others (O).*
2. *Colour codes for SPM:*
   Once every day [SPM ≥ 30]; Once every other day [15 ≤ SPM < 30]
   Twice a week [8 ≤ SPM < 15]; Once a week [4 ≤ SPM < 8];
   Twice a month [2 ≤ SPM < 4]; Once a month [SPM < 2]

Longnose Sucker
in MOBERLY LAKE



FISH MERCURY RESULTS

UPPER LEFT PLOT

- Positive relationship between mercury and fish length in ICSP (red), ITUF (green), and Core MMP (grey) data.
- ICSP/ITUF results from Moberly Lake were consistent to the Core MMP data from the Peace River.

LOWER LEFT PLOT

- ICSP/ITUF and Core MMP data pooled. Length-mercury relationship quantified (blue regression line) for consumption guidance.

FISH CONSUMPTION GUIDANCE

- For White Sucker caught in Moberly Lake, follow consumption guidance based on ICSP/ITUF and Core MMP results (table below):

Moberly Longnose Sucker				
Size mm|in	|Mercury ppm	C	P	O
325|13	|0.05	29	52	122
375|15	|0.07	21	37	87
425|17	|0.1	14	26	61

Notes:

1. *Servings per month (SPM) are given in colour-coded columns for: children under 12 (C), people who are, or could be, pregnant (P), and others (O).*
2. *Colour codes for SPM:*
   Once every day [SPM ≥ 30]; Once every other day [15 ≤ SPM < 30]
   Twice a week [8 ≤ SPM < 15]; Once a week [4 ≤ SPM < 8];
   Twice a month [2 ≤ SPM < 4]; Once a month [SPM < 2]

Image Reference List

In order of appearance:

MAIN BROCHURE----------

1. Photo by Brendan Bushy, 2023 ICSP sampling at the Peace-Smoky River confluence, provided by SMS on 29-Nov-2023.
2. Photo provided by Deborah Prince, 2023 ICSP sampling near McLeod Lake, provided by email on 27-Jul-2023.
3. A) rawpixel.com / U.S. Department of Interior (Source), Percussion Images, https://www.rawpixel.com/search/percussion?page=9&path=_topics&sort=curated
4. B) Flickr (Bezaire D, Havens-Bezaire S), Salmon filets hanging on a rack by a river in Alaska, https://www.flickr.com/photos/75988799@N00/3697623415
5. C) Vector Portal, Stock Silhouette Of A Runner 2 Vector Icon, https://vectorportal.com/vector/vector-silhouette-of-a-runner-2/12673
6. Flickr (USDA Photo by Preston Keres), A local catches a trout in at Georgetown Lake in the Pintler Ranger District of Beaverhead-Deerlodge National Forest Montana, https://www.flickr.com/photos/usdagov/48762226763/
7. Azimuth (photo by Ian McIvor), 2023 water sampling at Bralorne-Takla, taken on 1-Aug-2024.
8. US Fish and Wildlife Service (Ryan Hagerty), Comparison of Rainbow trout sizes including a 3 inch, 5 inch, and 10 inch fish, https://www.fws.gov/media/rainbow-trout-sizesjpg
9. Fish and Wildlife Compensation Program (FWCP), Online information video: Methylmercury and fish consumption information in the Peace River system, https://fwcp.ca/mercury/
10. Azimuth (photo by Gary Mann), 2022 MMP supporting media sampling near the Peace-Halfway River confluence, taken on 27-Sep-2022.
11. Photo by Brendan Bushy, 2023 ICSP sampling at the Peace-Smoky River confluence, provided by SMS on 29-Nov-2023.
12. Photo provided by Deborah Prince, 2023 ICSP sampling near McLeod Lake, provided by email on 27-Jul-2023.
13. Photo by Brendan Bushy, 2023 ICSP sampling at the Peace-Smoky River confluence, provided by SMS on 29-Nov-2023.
14. BC Hydro (photo by Dave Hunter), 2024 Fish Consumption Workshop - Dene Tha', taken on 29-Apr-2024.
15. Azimuth (photo by Laura Bekar), 2021 'Fish Kit' contents, taken on 27-Jul-2024.
16. Photo provided by Deborah Prince, Fish LT-2-CH-July2, provided by email on 27-Jul-2023.
17. Azimuth (photo by Ian McIvor), Photo from the 'How To Video', 24-Apr-2023.
18. Photo provided by Amanda Metecheah, Danny Apsassin fishing on the Halfway River, provided by email on 24-Sep-2021.
19. Photo by Mike Tilson (Tsay Keh Dene First Nation), 2019 Site C MMP Internal Technical Forum Presentation, 7 November 2019.
20. Azimuth (photo by Gary Mann), 2022 MMP supporting media sampling near Hudson Hope, taken on 26-Sep-2022.
21. Flickr (Sam Stukel, USFWS), Walleye (Sander vitreus), https://www.flickr.com/photos/usfwsmtnprairie/51745624627
22. Flickr, Trüsche, Quappe, https://www.flickr.com/photos/w-tommerdich/39974665553
23. Przemek Pietrak, Esox Lucius at Bydgoszcz Zoo, https://globalquiz.org/ru/иллюстрация-викторины/щука-1/
24. Flickr (Tom Hart), Lake Trout – BWCA – Seagull Lake, https://www.flickr.com/photos/thart2009/51218219333/in/faves-48599217@N08/
25. BC Hydro, Site C Project – Fish and methylmercury in the reservoir, https://www.sitecproject.com/sites/default/files/SiteC-methylmercury-info-sheet-updates.pdf
26. Modified from a photo provided by Jessica Eastman, 2023 ICSP sampling on Moberly Lake, provided by email on 27-Sep-2023.
27. Modified from a photo provided by Patricia Apannah, 2021 ICSP Pilot sampling on the Halfway River, sent in autumn 2021.
28. Flickr (Sam Stukel, USFWS), White Sucker, https://www.flickr.com/photos/usfwsmtnprairie/47383259832
29. BC Hydro, Peace River Fish Identification Key (Draft 2022-01-31), https://www.sitecproject.com/sites/default/files/Peace-River-Fish-Identification-Key.pdf
30. Wikipedia (Liquid Art), Rainbow trout (Oncorhynchus mykiss), swimming underwater of river Vrelo in Perucac, Serbia. Tributary of river Drina., https://en.m.wikipedia.org/wiki/File:Rainbow_Trout_(Oncorhynchus_mykiss)_(cropped).jpg
31. Flickr (Sam Stukel, USFWS), Goldeye (Hiodon alosoides), https://www.flickr.com/photos/usfwsmtnprairie/51241312465/

APPENDIX A----------

32-35. Azimuth (photos by Laura Bekar), 2021 ITUF Year 2 sampling, taken on 19-Aug-2021

36. Angler's Atlas – Moberly Lake, BC, https://www.anglersatlas.com/place/100805/moberly-lake