

Upper Nechako Fisheries Baseline 2025



Prepared For

Nechako First Nations (Nadleh Whut'en, Stelat'en, Saik'uz), Rio Tinto Alcan, and Nechako Environmental Enhancement Fund Society

Prepared By

EDI Environmental Dynamics Inc.
3810 18th Ave
Prince George, BC V2N 4V5

EDI Contact

Andrew McDermot-Fouts
Fish Biologist, Project Manager

EDI Project

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Cover photo: Looking upstream into the Nechako Canyon from Scour Hole Lake in early May 2025.



EXECUTIVE SUMMARY

This report presents findings from a 2025 study to establish a current fisheries baseline for the upper Nechako watershed. The project is a collaboration between Nechako First Nations and Rio Tinto, with partial funding provided through the Nechako Environmental Enhancement Fund. The primary goal is to inform an adaptive management framework for future operations of the Nechako Reservoir. The study area encompasses three distinct areas: the Nechako Canyon, the upper Nechako River mainstem, and five major tributaries (Greer, Targe, Swanson, Cutoff, and Twin Creeks).

Monitoring was conducted using multiple methods that combined environmental DNA (eDNA) metabarcoding with conventional fish sampling methods (electrofishing, netting, snorkelling) and standardized Fish Habitat Assessment Procedures. Field studies were completed monthly from April to October in 2025 to capture shifts in habitat use and community composition.

Key Findings:

- **Nechako Canyon:** eDNA detected at least 10 species of fish, confirming that deep pools provide perennial habitat for resident fish populations, including suckers, sculpin, and *Oncorhynchus* species (likely resident rainbow trout), despite seasonal reductions in surface flow.
- **Mainstem River Dynamics:** Suckers and minnows remain the most abundant large-bodied residents in the upper Nechako River. Fish sampling and snorkelling confirmed the critical role of large woody debris as complex cover for juvenile Chinook salmon rearing. The 2025 spring discharge peak of 90 m³/s was found insufficient to flood expansive side-channel and back-channel habitats, limiting available rearing area compared to higher-flow years.
- **Tributaries as Thermal Refugia:** The study found that fish move to different areas based on water temperature. While the Nechako River reached 17°C to 20°C during the summer, Twin Creek remained a cool-water sanctuary (12°C to 15°C). Because Twin Creek stays cold even when the main river warms up, it provided a vital refuge for the highest numbers of young Chinook salmon observed in the study.
- **Seasonal Habitat Loss:** Several tributaries, including Swanson, Targe, and Cutoff creeks, experienced late-summer dewatering in their lower reaches. This lack of perennial connectivity creates a high risk of fish stranding and winter mortality.
- **Land Use Effects:** Habitat quality was consistently limited by high sediment loads and substrate embedment. Agriculture and cattle access, specifically in Greer and Swanson creeks, were identified as primary drivers of bank erosion and "Poor" spawning substrate ratings.
- **Species-Specific Observations:** Targe Creek was observed to be a vital seasonal spawning site for multiple sucker species. A notable knowledge gap persists regarding the specific rearing and migration life history of Nechako-spawned juvenile sockeye salmon.



AUTHORSHIP

Team members from EDI Environmental Dynamics Inc. who contributed to preparing this report include:

Leanne Matthews, BSc, BIT..... Contributing Author

Matthew Blackburn, BSc, RPBio.....Contributing Author, Temperature Analysis

Andrew McDermot-Fouts, MSc, RPBio..... Contributing Author, Technical Review

Eric O’Bryan, BSc, RPBio.....Senior Review



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ACRONYMS, ABBREVIATIONS AND UNITS

Acronym/Abbreviation/Unit	Definition
°C	degrees Celsius
<	less than
>	greater than
%	percent
µL	microlitre
µM	micromolar, a unit of concentration in chemistry
3'	3 prime, or “downstream” end of a single strand of DNA
5'	5 prime, or “upstream” end of a single strand of DNA, which is synthesized in the 5'-to-3' direction
bp	base pair(s), referring to DNA
cm	centimetre
DNA	deoxyribonucleic acid
EDI	EDI Environmental Dynamics Inc.
eDNA	environmental DNA
e.g.,	for example (Latin <i>exempli gratia</i>)
ESV	exact sequence variant
FHAP	Fish Habitat Assessment Procedure
et al.	and others (Latin <i>et alia</i>)
i.e.,	that is (Latin <i>id est</i>)
km	kilometre
L	litre
LWD	large woody debris
m	metre
m ²	square metre
m ³ /s	cubic metres per second
mL	millilitre
mm	millimetre
NFCP	Nechako Fisheries Conservation Program
PCR	polymerase chain reaction
spp.	two or more species within genus (e.g., <i>Oncorhynchus</i> spp. – multiple salmonid species)
STMP	Summer Temperature Management Program
SWD	small woody debris
WSC	Water Survey of Canada
YOY	young-of-the-year



1 INTRODUCTION

Building dams for water storage and power generation changes natural river flows and how channels form over time. The Nechako River ecosystem was altered in 1952 when a large portion of its flow was diverted to power the aluminum smelter in Kitimat, British Columbia (Roos 1991). This permanent transfer of water from the Nechako River basin to the Douglas Channel has changed physical processes, such as stream bank erosion and lateral shifts, gravel and sediment mobilization patterns, and instream and riparian vegetation establishment. These physical changes have altered fish community dynamics, moving the system towards a regulated state that differs from nearby unregulated tributaries of the Upper Fraser River (Bradford 1994).

Since 2021, EDI Environmental Dynamics Inc. (EDI) and the Nechako First Nations, including the communities of Nadleh Whut'en, Stelat'en, and Saik'uz, and Rio Tinto Alcan, have completed a variety of monitoring and stewardship projects in the upper Nechako watershed to characterize the current state of the biotic and abiotic factors affecting the Nechako River ecosystem. Monitoring in 2022 and 2023 indicated that seasonally flooded side channels likely provide superior feeding and growth opportunities for juvenile Chinook salmon compared to the primary channel, but these benefits are heavily dependent on the timing and duration of flooding (EDI Environmental Dynamics Inc. 2022a, 2024). Monitoring and baseline fisheries data are intended to inform an adaptive management framework that will help to guide adjustments to hydrograph and thermograph objectives associated with the current water management infrastructure. These data may also be used to inform potential future objectives should there be a change to Nechako Reservoir management infrastructure, such as a water release facility at the Kenney Dam.

Fisheries research completed in the Nechako watershed has been focused on salmonid species and is now dated (Ecofish Research Ltd. 2022). Salmon populations and habitats in the Nechako River have been some of the most intensively studied in British Columbia (Nechako Fisheries Conservation Program 2023), although the majority of this data was collected during the 1980s and 1990s (Ecofish Research Ltd. 2022). Less is known about non-anadromous salmonids such as rainbow trout and mountain whitefish, with limited historical information available for non-salmonid fish. Salmonids are species of socio-economic and cultural importance and are priorities for conservation and management. However, suckers were historically harvested by several First Nation's communities in the region (J. Yarmish, pers. comm. May 25, 2026). Furthermore, minnow and sucker species have been noted as the most numerous species in the Nechako River's fish community (Envirocon Ltd. 1984) and contribute to biodiversity and ecosystem functions within the watershed.

The Nechako River supports a wide array of fish species (Table 1) including, but not limited to resident species such as white sturgeon (*Acipenser transmontanus*), which is federally listed in the *Species at Risk Act*; provincially blue listed bull trout (*Salvelinus confluentus*); rainbow trout (*Oncorhynchus mykiss*); mountain whitefish (*Prosopium williamsoni*); and anadromous species including sockeye salmon (*Oncorhynchus nerka*) and Chinook salmon (*Oncorhynchus tshawytscha*) (Ecofish Research Ltd. 2022). While Chinook are the most abundant anadromous salmonid in the upper Nechako (Nechako Fisheries Conservation Program 2005), local populations have historically diverged from regional stocks due to poor juvenile survival, particularly in the reaches upstream of the Nautley River confluence (Bradford 1994). Historical observations have noted a small number of sockeye salmon (*Oncorhynchus nerka*) spawning in the Nechako River near Targe Creek and the town of



Vanderhoof (Nechako Fisheries Conservation Program 2005). Recent observations (EDI Environmental Dynamics Inc. 2024, 2025a) and environmental DNA (eDNA) research in the Nechako River (Murray and Booth 2023) suggests that sockeye spawning and rearing within the Nechako watershed may be more extensive than these historic records indicate.

Table 1. Fish species that utilize habitats within the Nechako River for at least part of their life cycle.

Family	Common Name	Scientific Name
Suckers	Longnose sucker	<i>Catostomus catostomus</i>
	White sucker	<i>Catostomus commersonii</i>
	Largescale sucker	<i>Catostomus macrocheilus</i>
	Bridgelip sucker	<i>Catostomus columbianus</i>
Sculpins	Prickly sculpin	<i>Cottus asper</i>
	Slimy sculpin	<i>Cottus cognatus</i>
Minnows	Brassy minnow	<i>Hybognathus hankinsoni</i>
	Lake chub	<i>Couesius plumbeus</i>
	Peamouth	<i>Mylocheilus caurinus</i>
	Northern pikeminnow	<i>Ptychocheilus oregonensis</i>
	Leopard dace	<i>Rhinichthys falcatus</i>
	Longnose dace	<i>Rhinichthys cataractae</i>
	Redside shiner	<i>Richardsonius balteatus</i>
Salmonids	Mountain whitefish	<i>Prosopium williamsonii</i>
	Rainbow trout	<i>Oncorhynchus mykiss</i>
	Chinook salmon	<i>Oncorhynchus tshawytscha</i>
	Coho salmon	<i>Oncorhynchus kisutch</i>
	Sockeye salmon	<i>Oncorhynchus nerka</i>
	Pink salmon	<i>Oncorhynchus gorbuscha</i>
	Bull trout	<i>Salvelinus confluentus</i>
Burbots	Burbot	<i>Lota lota</i>
Sturgeons	White sturgeon	<i>Acipenser transmontanus</i>
Lampreys	Pacific lamprey	<i>Entosphenus tridentatus</i>

Sources: (Ecofish Research Ltd. 2022, Murray and Booth 2023, Nechako Fisheries Conservation Program 2023, Government of British Columbia 2025)

The extent to which fish utilize peripheral habitats of the Nechako River, such as the canyon between the Kenney Dam and Cheslatta Falls, is a notable gap in baseline fisheries information. Accessing the Nechako Canyon is challenging and the only known fisheries study in the canyon reach is now 35 years old (Triton Environmental Consultants Ltd. and Klohn Leonoff Ltd. 1991). A Technical Working Group with representatives from the Nechako First Nations and Rio Tinto recognized the need for updated fish and fish habitat inventory within the Nechako Canyon.

Applications of environmental DNA (eDNA) represent one of the most important recent advances in aquatic species monitoring that could increase the effectiveness and efficiency of baseline monitoring. Researchers



from the University of Northern British Columbia have used species-specific eDNA techniques to detect salmonids in a variety of Nechako River tributaries (Murray and Booth 2023). Multi-species eDNA detection methods (eDNA metabarcoding) are well-suited to efficiently survey diverse fish communities. Incorporating eDNA methods into the baseline fisheries monitoring programs in the Nechako watershed will greatly increase the quantity and quality of the data that can be collected.

1.1 GOALS AND OBJECTIVES

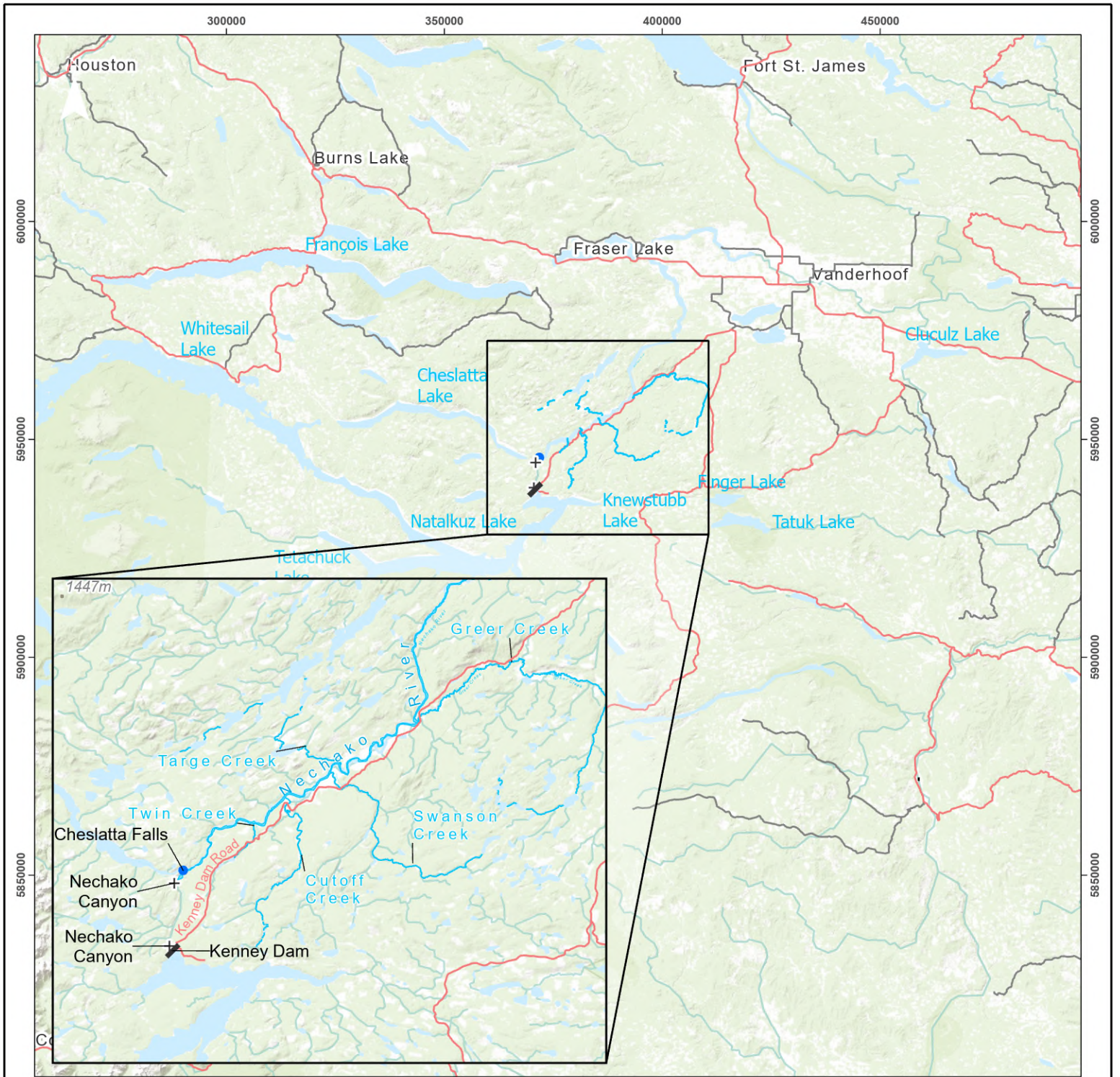
The primary goal of this project is to describe the current state (biodiversity, abundance and demographics) of the fish community and habitat in the upper Nechako watershed. To achieve this, input from the Nechako First Nations Technical Working Group was incorporated to establish the following objectives:

- Determine the relative abundance of key fish species and life stages in various habitats within the upper Nechako watershed and compare seasonal changes.
- Describe the distribution of key fish species and life stages in the upper Nechako watershed seasonally.
- Identify and evaluate important fish habitats such as biodiversity hotspots, temperature refugia, spawning grounds, and overwintering habitats.
- Describe potential limitations to fish production in the watershed and opportunities for habitat rehabilitation.

1.2 STUDY AREA

The Province of British Columbia has historically subdivided the Nechako River into three long reaches for the allocation and regulation of surface water (Rescan Environmental Services Ltd. 1999). The upper Nechako River refers to the reach from Cheslatta Falls to the confluence with the Nautley River. The middle river refers to the reach between the Nautley River and the confluence with the Stuart River. The remainder of the Nechako River downstream of the Stuart River to the confluence with the Fraser River is referred to as the lower Nechako River. The Nautley River (approximately 100 km downstream from the Kenney Dam), and the Stuart River (approximately 200 km downstream from the Kenney Dam) are the two largest tributaries to the Nechako River.

The upper Nechako River study area was divided into three sub-component areas for this study: Nechako Canyon, Nechako River, and five tributary streams. The Nechako Canyon refers to the reach of the old Nechako River channel between Kenney Dam and Cheslatta Falls (Figure 1. Nechako Watershed and Upper Nechako Study Area.). The Nechako River study area included the reach between the Cutoff Creek Recreation Site to just downstream of Targe Creek. The tributary streams surveyed for this study were Greer Creek, Targe Creek, Swanson Creek, Cutoff Creek and Twin Creek.



Legend

- Cheslatta Falls
- + Nechako Canyon Extent
- ▣ Kenney Dam
- Highway
- Primary Road
- Water course
- River

Nechako River Fish Survey Overview

Rio Tinto Alcan

Data Sources

- Base data. CanVec 1:50,000 and 1:1,000,000 Government of Canada, 2025.
- Forest Service Roads, BC Data Catalogue, Government of BC, 2023.
- Main Basemap, World Hillshade, Esri Canada, Sources: NRCAN, Esri Canada, and Canadian Community Maps contributors., Sources: Esri, Vantor, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA,

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Map Scale: 1:1,250,000 (printed on 8.5 x 11)
 Map Projection: NAD 1983 CSRS UTM Zone 10N

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Rio Tinto Alcan





1.3 FLOW REGULATION IN THE NECHAKO RIVER

The Kemano Power Project constructed the Kenney Dam in the Nechako Canyon, creating the Nechako Reservoir in the 1950s. Roughly 65% of the historical flows from the Nechako River were diverted into the Kemano drainage and the release of the remaining 35% into the Nechako River has been controlled through the Skins Lake Spillway (Nechako Fisheries Conservation Program 2023). However, water released from the Skins Lake Spillway does not flow directly into the Nechako River. Instead, it must first pass through the Cheslatta River, Cheslatta Lake, and Murray Lake before dropping over Cheslatta Falls. This chain of lakes acts like a giant natural sponge. It slows down the delivery of the water, spreading out the sudden rush from the spillway so that by the time the water reaches the Nechako River, the peak flow is delayed and much less extreme.

The *1987 Settlement Agreement* between Alcan (now Rio Tinto), the Government of Canada, and the Province of British Columbia outlined minimum flow requirements in the Nechako River downstream of Cheslatta Falls that were intended to conserve the Nechako River Chinook salmon and to protect migrating sockeye salmon populations (Figure 2). Mean monthly flows in the Nechako River below Cheslatta Falls between September and March were set at 31.1 m³/s and were considered the minimum flows required for Chinook salmon in the Nechako River (Nechako Fisheries Conservation Program 2005).

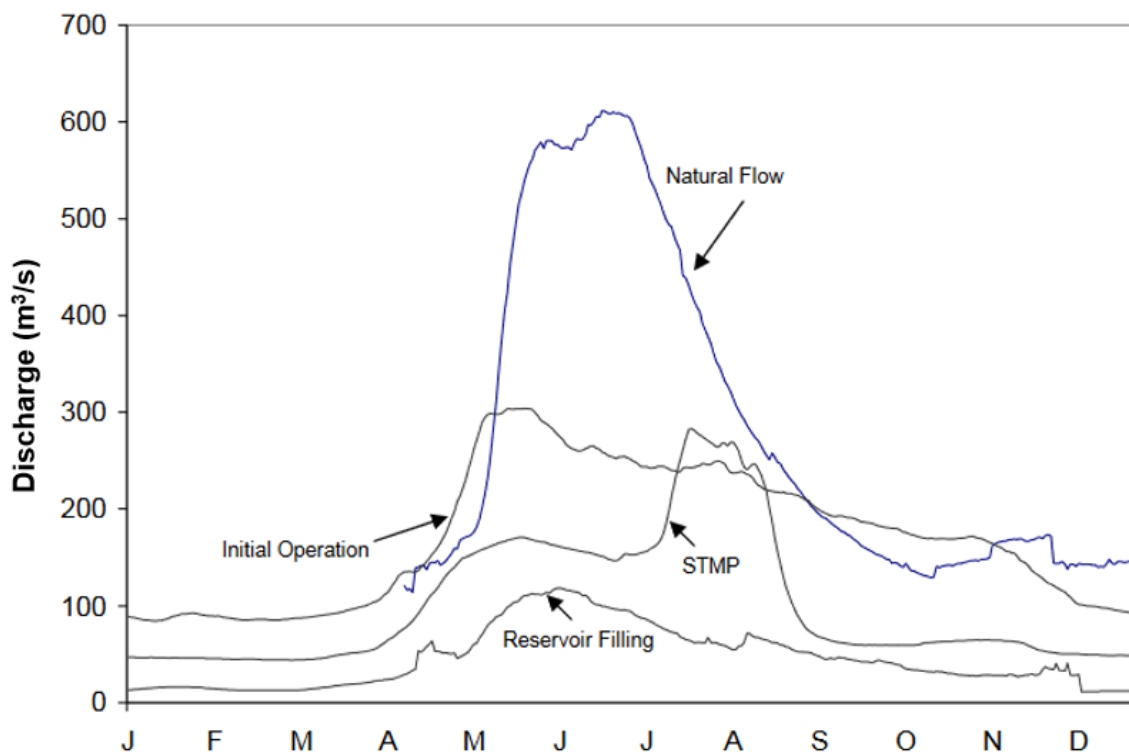


Figure 2. Mean daily discharge in the Nechako River at Vanderhoof during the entire year.

Note: Data spans the pre-dam, natural flow period (1950-52), the extreme low flows when the Nechako Reservoir was filling (1953-1956), the pre-STMP period during initial operation when greater water volume was released but releases were variable (1957-1982), and the most recent situation typified by more uniform releases of moderate volume for a 30 day period for STMP cooling (1983-present). Source: (Macdonald et al. 2007).



In addition, the Summer Temperature Management Program (STMP) was developed because of the *1987 Settlement Agreement* to minimize occurrences of water temperatures above 20°C in the Nechako River at Finnmore (upstream of the Stuart River confluence). The STMP's objective is achieved by increasing the discharge in the Nechako River through increased releases of water through the Skins Lake Spillway from July 20 to August 20 each year (Nechako Fisheries Conservation Program 2023). The STMP objectives focus on reducing thermal stress to adult sockeye salmon during their upstream migration to spawn but the changes to the natural hydrograph has negatively affected other species, like Chinook salmon (Bradford 1994, Sykes et al. 2009).

In 2025, Rio Tinto implemented flow changes in the Nechako River based on recommendations that were endorsed through a public engagement process known as the Water Engagement Initiative (Rio Tinto 2025). Two flow scenarios were proposed that would reshape the Nechako River hydrograph based on the amount of available water:

- Dry/normal years: increased flow release to coincide with actual freshet timing, based on inflows to the Nechako Reservoir within the existing water budget. For the 2025 dry/normal year scenario, the proposed operational plan involved a sharp increase to 92 cubic meters per second on May 10 and 11, followed by a sharp decrease down to 32 cubic meters per second starting May 31.
- Wet years: A higher, longer and stepped flow release (“extra water”) to more closely follow the timing and shape of the natural freshet. Choosing this scenario is dependent on adequate water being available.



2 METHODS

Between April and October 2025, a multi-method approach was used to assess fish community distribution and habitat quality across the Nechako Canyon, the upper Nechako River mainstem, and five major tributaries.

2.1 ENVIRONMENTAL DNA

Environmental DNA (eDNA) was collected at each site to identify the genetic 'fingerprints' that different species leave behind in the water.

2.1.1 SAMPLE COLLECTION

Environmental DNA was collected from surface water within the study area's three sub-component areas. Sampling occurred during three seasonal periods in 2025:

- Spring: April 30 and May 1;
- Summer: August 11 to 14; and,
- Fall: October 21 to 24.

Samples were collected from seven locations in the Nechako Canyon (Figure 3), three locations in the Nechako River (Figure 4) and at 10 locations within the five tributary streams (Figure 4 and Figure 5).

The eDNA samples were collected using Aquatic Environmental DNA Kits provided by Jonah Ventures, the commercial lab that performed the eDNA analysis. The kits included a 60 mL syringe to draw water from the sampling location and push it through an enclosed, 25 mm diameter filter with a 1.0 µm pore size. Water was pushed through the filters until they clogged. The volume of water filtered at each site varied depending on the concentration of suspended solids that clogged the filter (Appendix Table B-1).

Once filtered, samples were preserved with Triton X-100™. As a quality control measure to identify potential field contamination, the team processed a negative control sample (field blank) using de-ionized water once per day.

Samples were collected from flowing (lotic) well-mixed areas, and in a manner that avoided contamination. Water was sampled from shore wherever possible, however; if the wading was necessary to reach a well-mixed area, water was drawn from upstream of the individual collecting the samples.

370000

375000



Legend

- eDNA Sample Location
- eDNA Sample and Temperature Logger Site
- Secondary Road
- Forest Service Road
- Greer Creek

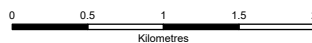
**Nechako Canyon
eDNA sample locations**

Rio Tinto Alcan

Data Sources

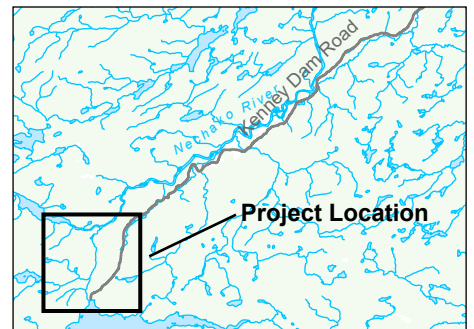
- Sample Locations. EDI. August 18, 2025.
- Base data. CanVec 1:50,000. Government of Canada. 2025.
- Forest Service Roads. BC Data Catalogue. Government of BC. 2023.
- Main Basemap. World Hillshade. Earthstar Geographics

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Map Projection: NAD 1983 CSRS UTM Zone 10N

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**RioTinto
Alcan**



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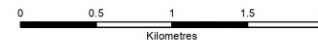
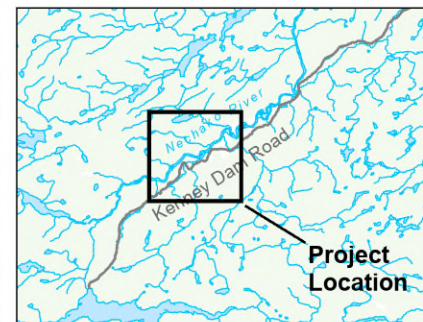


Nechako River and tributary streams study area

Rio Tinto Alcan

Legend

- Limits of Nechako River Survey
- eDNA Sample Location
- eDNA Sample and Temperature Logger Site
- General Sample Location
- Secondary Road
- Forest Service Road



Map scale: 1:50,000 (printed at 8.5x11)
Map Projection: NAD 1983 CSRS UTM Zone 10N

Data Sources

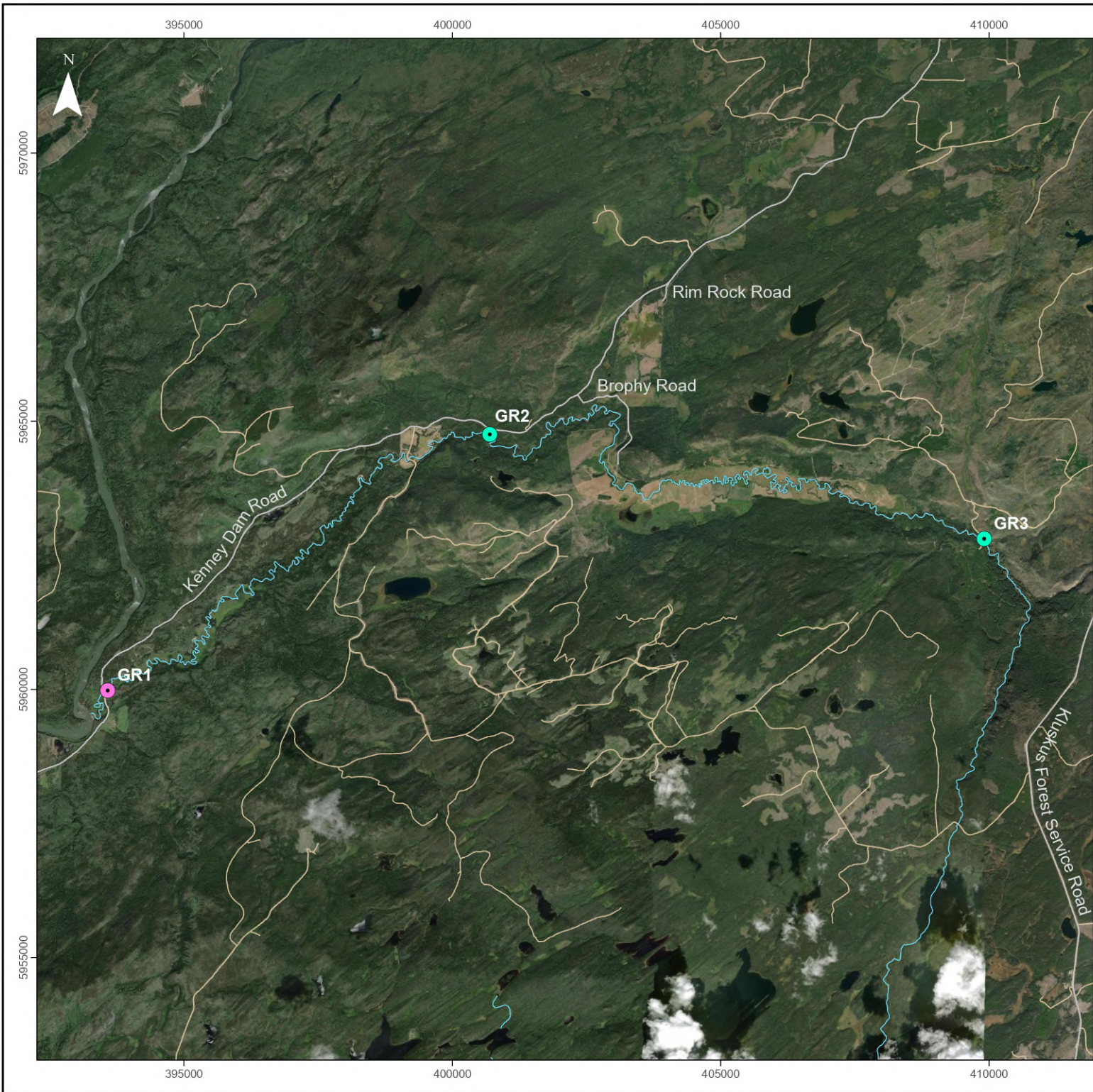
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- Base data. CanVec 1:50,000. Government of Canada. 2025.
- Forest Service Roads. BC Data Catalogue. Government of BC. 2023.
- Main Basemap. World Hillshade. Vantor

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Drawn: JM	Checked: AM	Figure 4	Date: 4/16/2026
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RioTinto Alcan



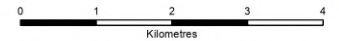
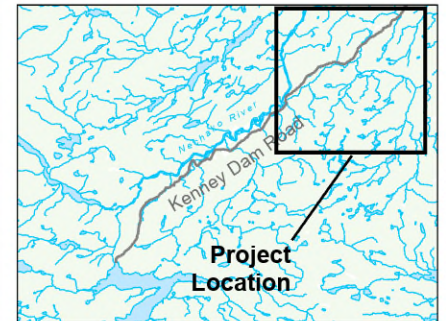


Greer Creek sample locations

Rio Tinto Alcan

Legend

- eDNA Sample and Temperature Logger Site
- General Sample Location
- Greer Creek
- Secondary Road
- Forest Service Road



Map scale: 1:100,000 (printed at 8.5x11)
Map Projection: NAD 1983 CSRS UTM Zone 10N

Data Sources

- Sample Locations. EDI. August 18, 2025.
- Base data. CanVec 1:50,000. Government of Canada. 2025.
- Forest Service Roads. BC Data Catalogue. Government of BC. 2023.
- Main Basemap. World Hillshade. Earthstar Geographics

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**RioTinto
Alcan**





In still-water (lentic) environments, samples were collected from the shore using a 1 L water bottle attached to an extendable pole. Water was drawn from these bottles into the syringe for filtering. All sampling bottles were sanitized and sealed in individual plastic bags before field use. The sanitization procedure included:

- Washing bottles with soap and water.
- Soaking in a 30% bleach solution for at least 15 minutes.
- Rinsing with de-ionized water and air drying.

The extendable pole was sprayed with a 30% bleach solution and rinsed with de-ionized water before use at each site. Additionally, each sample bottle was rinsed three times with ambient water from the sampling site before the final sample was collected.

2.1.2 LABORATORY SAMPLE PROCESSING

Preserved filters were sent to Jonah Ventures in Boulder, Colorado, USA, for analysis. Detailed lab procedures are provided in Appendix B. Briefly, eDNA was extracted from the filters, amplified in a Polymerase Chain Reaction (PCR) using the MiFish-U metabarcoding primer set (Miya et al. 2015), and sequenced. The raw sequencing data were processed through a bioinformatics pipeline and compared against a reference sequence database to assign a consensus taxonomy (i.e., fish species) to each Exact Sequence Variant (ESV).

2.1.3 INTERPRETATION OF LAB RESULTS

The ESV and processed data produced by Jonah Ventures were manually filtered and reviewed for accuracy. While the analysis is designed to target fish, the DNA sequences collected often include other vertebrates that share the watershed. Any ESVs that were matched to non-fish species (e.g., birds, mammals, invertebrates) were discarded. The taxonomic assignments for ESVs produced by the bioinformatics pipeline were reviewed and compared to the list of 23 species known to occur in the Nechako River and its tributaries (Table 1).

The MiFish assay and bioinformatics pipeline could not always resolve an ESV to the species level. However, some ESVs were still easily assigned to species because the level of taxonomic resolution was only appropriate for a single species in the Nechako watershed. For example, ESVs assigned to the genus *Ptychocheilus* were unambiguously interpreted as northern pikeminnow because they are the only species in that genus in the region.

Some ESVs could only be resolved to the genus or family level because there are multiple species in the Nechako watershed. This was the case for ESVs that were resolved to the genus *Oncorhynchus*. The two most prominent *Oncorhynchus* species in the Nechako watershed are Chinook salmon and rainbow trout, while other salmon species have been detected previously in lower abundances. In cases where a single species could not be confidently assigned to an ESV, the lowest taxonomic level that the bioinformatics pipeline identified was listed in the results tables.

The level of detection certainty for a particular ESV was evaluated based on the eDNA read count in a sample. Read counts were summed between all ESVs that were assigned to the same taxon. Detection levels were then



grouped into four, subjectively assigned categories that represented four orders of magnitude. Less than 100 reads were considered a “weak” detection. Read counts between 100 and 999 were considered “good”. Read counts between 1,000 and 9,999 were considered a “strong” detection and read counts greater than 10,000 were considered “very strong” detections.

2.2 FISH SAMPLING

Fish sampling in the Nechako River and its tributaries included boat and backpack electrofishing, seine netting, snorkel survey and visual observations (Table 2). Fish sampling was not completed in the Nechako Canyon.

Fish sampling in the Nechako River focused on habitat associated with woody debris features within the reach that was roughly bounded by the Cutoff Creek boat launch and the large pool downstream of Targe Creek (Figure 4). The artificial side channels at Site 7 were sampled opportunistically in July when the temperature loggers were downloaded. The Nechako River was otherwise sampled by boat electrofishing in May, beach seining in July and a snorkel survey in September (Table 2). Electrofishing in the Nechako River was scheduled for early June, but was shifted to late May to coincide with increased flow from the Nechako Reservoir and natural freshet flows (Rio Tinto 2025).

Fish sampling in the tributary streams was completed in the same locations that eDNA was collected in (Appendix Table B-1). The sample site at each location was approximately 100 m long, although the distance varied based on access, water levels, safety, and the habitat. Sampling was completed in all habitat units (e.g., pools, riffles, runs, log jams) so that the catch was as inclusive and as representative as possible.

Visual observations of fish were recorded in tributaries to the Nechako River during the Fish Habitat Assessment Procedure (FHAP) assessments in September because conditions in fish sampling permits did not allow for backpack electrofishing. Other methods, such as seine netting, were not feasible due to uneven cobble substrate, or deep water that would not allow for net deployment by foot. Visually observing and identifying fish species was relatively easy in September due to the low and clear water. However, correctly identifying fish to species was sometimes challenging (e.g., juvenile suckers), and the numbers of fish in larger groups were estimated rather than counted.



Table 2. Summary of the fish sampling methods implemented in the upper Nechako study area.

Stream/Site	Date	Sampling Method	Effort	Distance (m)	Comments/Conditions
Nechako River					
	May 28	Boat electrofishing	1,540 seconds	500	Nechako River discharge at 84 m ³ /s.
	July 8	Backpack electrofishing	520 seconds	300	Sampling at Site 7 artificial channels.
	July 14	Beach seine	3 passes	100	Nechako River discharge at 43 m ³ /s.
	September 5	Snorkel survey	1 pass	5,400	Nechako River discharge at 33 m ³ /s.
Greer Creek					
GR1	June 12	Backpack electrofishing	627 seconds	100	
	July 10	Backpack electrofishing	428 seconds	100	
	September 22	Visual observation	1 pass	305	During habitat surveys.
GR2	June 12	Backpack electrofishing	625 seconds	100	
	July 10	Backpack electrofishing	715 seconds	100	
	September 23	Visual observation	1 pass	300	During habitat surveys.
GR3	June 10	Backpack electrofishing	322 seconds	100	
	July 10	Backpack electrofishing	669 seconds	100	
	September 25	Visual observation	1 pass	300	During habitat surveys.
Greer Creek Falls	June 13	Backpack electrofishing	680 seconds	100	
Targe Creek					
TA1	May 30	Backpack electrofishing and visual observation.	593 seconds	100	Visual observation of longnose suckers spawning.
	July 9	Backpack electrofishing	907 seconds	300	
	September 24	Visual observation	1 pass	306	During habitat surveys.
Swanson Creek					
SW1	June 11	Backpack electrofishing	471 seconds	330	
	July 8	Backpack electrofishing	1,278 seconds	250	
	September 24	Visual observation	1 pass	270	During habitat surveys.
SW2	June 11	Backpack electrofishing	329 seconds	100	
	July 9	Backpack electrofishing	645 seconds	100	



Stream/Site	Date	Sampling Method	Effort	Distance (m)	Comments/Conditions
SW3	September 22	Visual observation	1 pass	230	During habitat surveys.
	June 11	Backpack electrofishing	329 seconds	100	
	July 9	Backpack electrofishing	602 seconds	100	
	September 25	Visual observation	1 pass	286	During habitat surveys.
Cutoff Creek					
CO1	May 30	Backpack electrofishing	1,040 seconds	100	
	July 9	Backpack electrofishing	333 seconds	50	
	September 26	Visual observation	1 pass	300	During habitat surveys.
CO2	June 10-11	Minnow traps	8x traps overnight set	N/A	
	July 8-9	Minnow traps	8x traps overnight set	N/A	
Twin Creek					
TW1	June 10	Backpack electrofishing	208 seconds	100	
	July 8	Backpack electrofishing	206 seconds	100	
	September 23	Visual observation	1 pass	108	During habitat surveys.

N/A = not applicable.



2.2.1 SNORKEL SURVEY

A snorkel survey was completed in the Nechako River study area beginning at Cutoff Creek Recreation Site (Upstream Limit) to approximately 5.4 km downstream, ending at Site NR2 (Figure 4) on September 9, 2025. Nechako River discharge was 33 m³/s during the survey and water temperature ranged from 18°C to 20°C. The snorkel survey was completed in approximately three hours.

Snorkelling is efficient for covering long stretches of a stream in shorter time periods and is well-suited for collecting visual observations of fish species and enumeration during low-flow periods in the Nechako River (BC Ministry of Environment 1997). The objectives of the snorkel survey were to record fish species composition, estimate counts of fish, and observe fish activity along the margins of the primary channel, in large pools, and large woody debris (LWD) habitats encountered on the swim.

A crew of three people equipped with dry suits, snorkels, swift-water safety equipment, and a jetboat was set up in a two-person configuration to swim the primary channel margins. The third crew member operated as a safety boater to identify downstream hazards, record fish count estimates, find potential fish habitat, and log visual observations and locations of fish sightings. The jetboat was rowed down the middle of the Nechako River and positioned 20 to 30 m behind snorkelers to avoid disturbing fish activity. Snorkelling survey methods and visual observation considerations were referenced from *Fish Collection Methods and Standards, Version 4.0* (BC Ministry of Environment 1997). Whenever possible, crews identified fish to species and counted individuals. When large groups of fish were observed, counts were estimated. Suckers were difficult to identify accurately to species and were simply counted as suckers (general).

2.3 FISH HABITAT ASSESSMENTS

A modified version of the Level 1 Fish Habitat Assessment Procedure (FHAP) was used to guide the collection of physical habitat data at sample sites in the five tributary streams (Johnston and Slaney 1996). The Level 1 FHAP serves as a standardized reconnaissance-level tool designed to identify physical factors limiting salmonid production by evaluating current habitat conditions against established biological requirements. The FHAP surveys were completed at the general sample locations on Greer Creek, Swanson Creek, Cutoff Creek, Targe Creek, and Twin Creek (Figure 4 and Figure 5) from September 23 to 26, 2025. Each site was divided into distinct, naturally occurring habitat units which were sampled to characterize the average conditions within the reach. Site photos from the habitat surveys are provided in Appendix D. Fish habitat data for individual sites are provided in Appendix E.

Data collection focused on primary habitat features essential for juvenile salmonid life stages, including pool frequency, residual pool depth, and the abundance of instream and overhead cover. Substrate composition was visually estimated to determine the percentage of fines, gravel, and cobble, with particular emphasis placed on identifying the degree of gravel embedment. Embedment—the extent to which larger particles are surrounded or buried by fine sediment—was assessed as a critical indicator of potential spawning habitat.



The FHAP survey methodology was originally developed to investigate the habitat requirements of salmonids. This includes both redd-building salmonids, such as Chinook salmon, and broadcast spawning salmonids, such as mountain whitefish. In this study, the habitat assessments considered all the species that were identified in reaches during the extensive amount of fish sampling that was completed in 2025. Spawning, rearing, and overwintering habitat criteria were considered for each species and inferences about habitat use were made based on species and life stages that were observed or detected during sampling efforts.

Bankfull and residual pool depths were measured using a metre stick. Residual pool depth was calculated by subtracting the maximum depth at the riffle crest from the maximum pool depth (Johnston and Slaney 1996). The mean and range of residual pool depths were calculated for each sample site. A Sunto clinometer was used to determine the slope percentage of each measured habitat unit. Channel and wetted widths were measured at representative locations with Esilon tapes or laser range finders. Stream substrates were measured with a metre stick and size classes within each habitat unit were recorded using standard substrate classes as shown in Table 3.

Table 3. Substrate sizes for each class of bed materials.

Substrate Class	Substrate Size	Description
Fines	<2 mm	Clays, silts and sands smaller than a pea
Gravels	2-64 mm	Pea to tennis ball sized
Cobbles	64-256 mm	Tennis ball to basketball sized
Boulder	>256 mm	Larger than a basketball
Rock/Bedrock	>4,000 mm	Large boulders >4 m and bedrock

Cover was documented at each habitat unit including:

- pools;
- boulders;
- instream and overhanging vegetation;
- undercut banks;
- large woody debris (LWD); and,
- small woody debris (SWD).

Following FHAP standards, habitat quality was rated using a three-tier system (Good, Fair, Poor) based on the specific species and life stages observed within the study area (Table 4)Table 4. Diagnostics of salmonid habitat condition at reach level (Johnston and Slaney 1996).. Spawning ratings integrated substrate suitability with the probability of wetted depths remaining stable throughout incubation periods. Rearing habitat ratings were derived from the abundance of flow refugia, such as large woody debris (LWD) and undercut banks, while overwintering potential was evaluated based on the likelihood of deep pools remaining wetted and maintaining sufficient dissolved oxygen levels through the winter months. Migration impediments were documented, including features such as beaver dams and sections of dewatered channel.



The FHAP diagnostics are specific to salmonids, but the interpretation was extended to other include the non-salmonid species that were identified in the reach.

The FHAP assessments were not conducted in the Nechako Canyon or on the Nechako River. However, a habitat summary is provided in the results section for both areas based on observations that were made in 2025.

Table 4. Diagnostics of salmonid habitat condition at reach level (Johnston and Slaney 1996).

Habitat Parameter	Gradient and Mean Bankfull Width	Use	Quality		
			Poor	Fair	Good
Percent pool (by area)	<2%, <15 m wide	Summer/winter rearing habitat	<40%	40-55%	>55%
Percent pool (by area)	2%-5%, <15 m	Summer/winter rearing habitat	<30%	30-40%	>40%
Boulder cover in gravel cobble riffles	All	Summer/winter rearing habitat	<10%	10-30%	>30%
Overhead cover	All	Summer/winter rearing habitat	<10%	10-20%	>20%
Substrate	All	Winter rearing habitat	Interstices filled: sand or small gravel subdominant in cobble or boulder dominant	Interstices reduced: sand subdominant in some units with cobble or boulder dominant	Interstices clear: sand or small gravel rarely subdominant in any habitat unit
Off-channel habitat	<3%, all widths	Winter rearing habitat	Few or no backwaters, no off-channel ponds	Some backwaters	Backwaters with cover and pond, oxbows and other low energy off-channel areas
Holding pools	All	Adult migration	Few pools/km > 1 m deep with good cover, cool	–	Adequate pools/km, > 1 m deep with good cover, cool
Access to spawning areas	All	Adult migration	Access blocked by low water, culvert, falls, temperature	–	No blockages
Gravel quantity	All	Spawning and incubation	Absent or little	–	Frequent spawning areas
Gravel quality	All	Spawning and incubation	Sand is dominant substrate at some sites	Sand is subdominant substrate at some sites	Sand is never dominant or subdominant substrate



2.4 TEMPERATURE MONITORING

Temperature monitoring in the upper Nechako River has been completed since 2021 (EDI Environmental Dynamics Inc. 2022b, a, 2024, 2025b). Temperature loggers have been deployed across a total of 21 monitoring stations that include three broad habitat types: the margins of the mainstem; large flowing secondary channels; and backwater locations (with little to no obvious flows). Temperature loggers at these previously established sites were maintained in 2025.

Temperature loggers were also deployed in the five tributary streams that were assessed in 2025, as well as the Nechako Canyon. Temperature loggers were placed in the downstream survey reaches of Greek Creek (GR1), Targe Creek (TA1), Swanson Creek (SW1), Cutoff Creek (CO1), Twin Creek (TW1) and at the lower end of the Nechako Canyon (NC3). These temperature loggers were installed on April 30 and May 1, 2025 and were retrieved on October 27, 2025. Temperature logger locations are presented in the following figures:

- Nechako Canyon (Figure 3);
- tributary streams (Figure 4 and Figure 5);
- Sites 1 and 3 (North, Figure 6); and,
- Sites 4, 5, and 7 (South, Figure 7).

HOBO Pendant MX Water Temperature Data Loggers were mounted face-up on railway tie plates and submerged at the maximum possible depth at each site. All equipment was secured to stable shore anchors using polyvinyl chloride (PVC)-coated galvanized steel cable and zinc-plated hardware, while sites were marked discreetly with low-visibility flagging tape to prevent tampering. These loggers were programmed to record temperatures every 30 minutes, a frequency that supports an estimated battery life of six years.

To safeguard against data loss, two temperature loggers were installed to each railway tie in the tributaries in the spring, and at Nechako River Sites 1 and 5 in August 2025. During the August field visit, several equipment losses were recorded. Loggers at Site 4-3 were lost due to a broken anchor wire; this site has historically faced challenges with low-flow conditions and dewatering, so no replacements were installed. Similarly, loggers at Site 7-1 and 7-Channel 1 Lower were lost and not replaced, as the five remaining loggers in the Site 7 side channels provide sufficient data coverage for the area.

During the 2025 season, data were downloaded over four routine site visits: loggers at Site 7 were downloaded on July 8 to 9, the long-term Nechako River sites were downloaded on August 13 to 14, and the loggers deployed to sample sites in the five tributary streams and Nechako Canyon were downloaded on September 26, and October 27. Any loggers that failed to download due to battery depletion or mechanical malfunction were replaced.

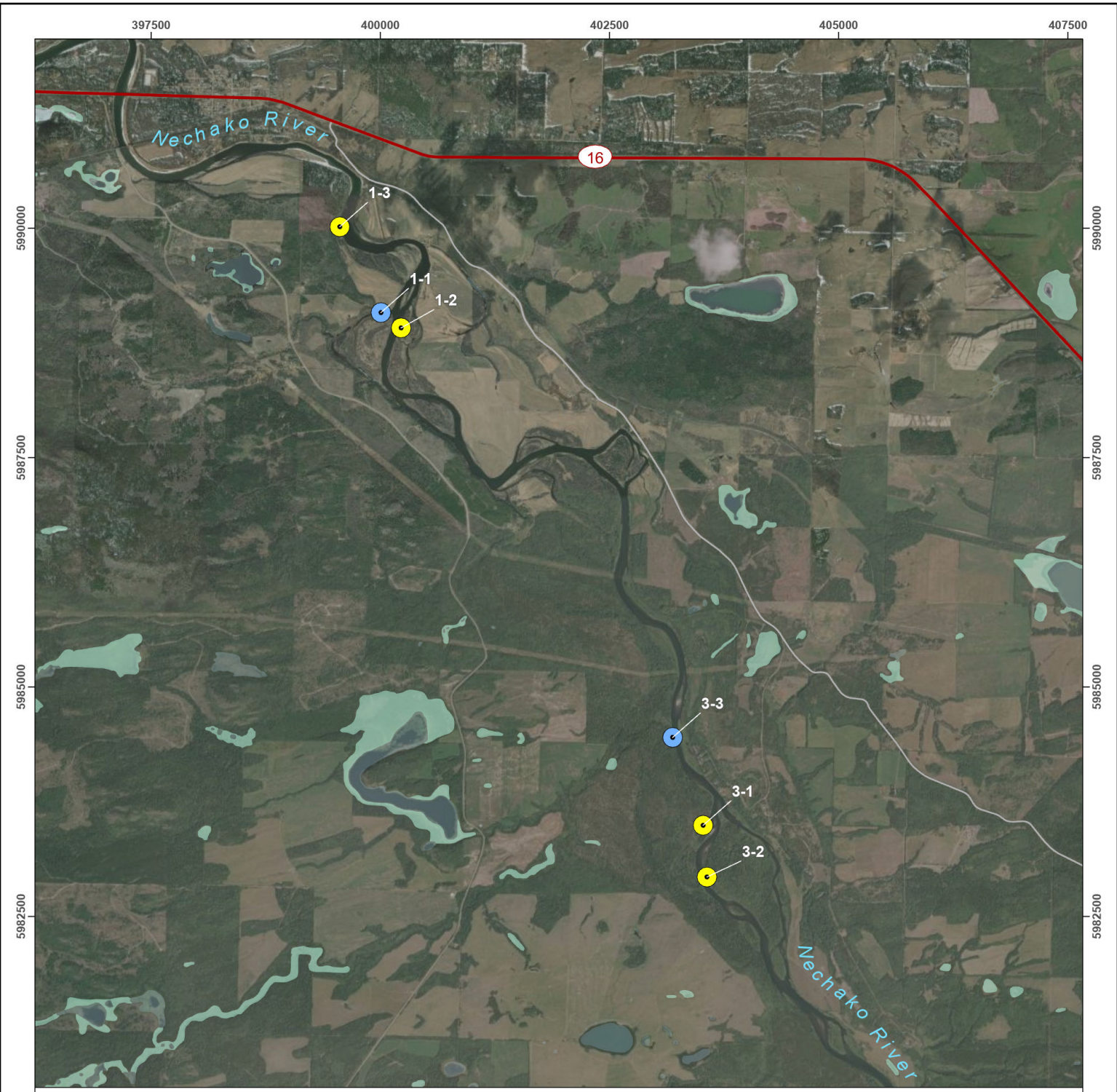
Some loggers became dewatered as water levels receded over the season. Periods when the temperature loggers were dewatered were identified in the data by unnaturally high daily temperature fluctuations, and the affected data periods were subsequently removed during analysis.



Temperature data were compiled and finalized for presentation using Aquarius Water Data Management Software (Aquatic Informatics 2025). Mean daily water temperature was determined across available Nechako River sites and habitat types from 2021 to 2025. Water temperature profiles were established for the Nechako Canyon site and tributary streams in 2025.

The Water Survey of Canada (WSC) maintains a hydrometric river monitoring station that records water temperatures in the Nechako River (WSC Station 08JA017) further upstream from the monitoring locations in this study (Water Survey of Canada 2026). The WSC temperature data from the Nechako River were included in the time-series data as a background reference and used for identification of distinct temperature trends at the Site 7 study area.

Appendix C includes temperature logger location details and replacement dates for all sites in 2025 (Nechako Canyon, Nechako River, and tributary streams).



Legend

- Temperature Logger
- Temperature Logger with Duplicate
- Highway
- Primary Road
- Waterbody
- Wetland

Temperature Logger Locations North

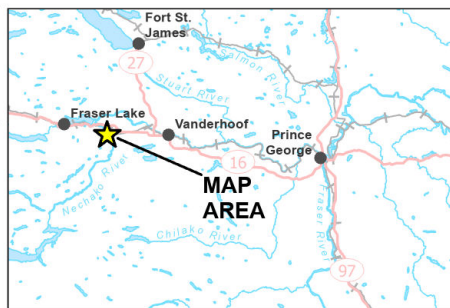
Data Sources
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 • Highway, Primary Road, Digital Road Atlas, Government of British Columbia, 2024.
 • Watercourses, Waterbodies, Wetlands, Freshwater Atlas, Government of British Columbia, 2024.
 • Inset Basemap, World Imagery, Earthstar Geographics

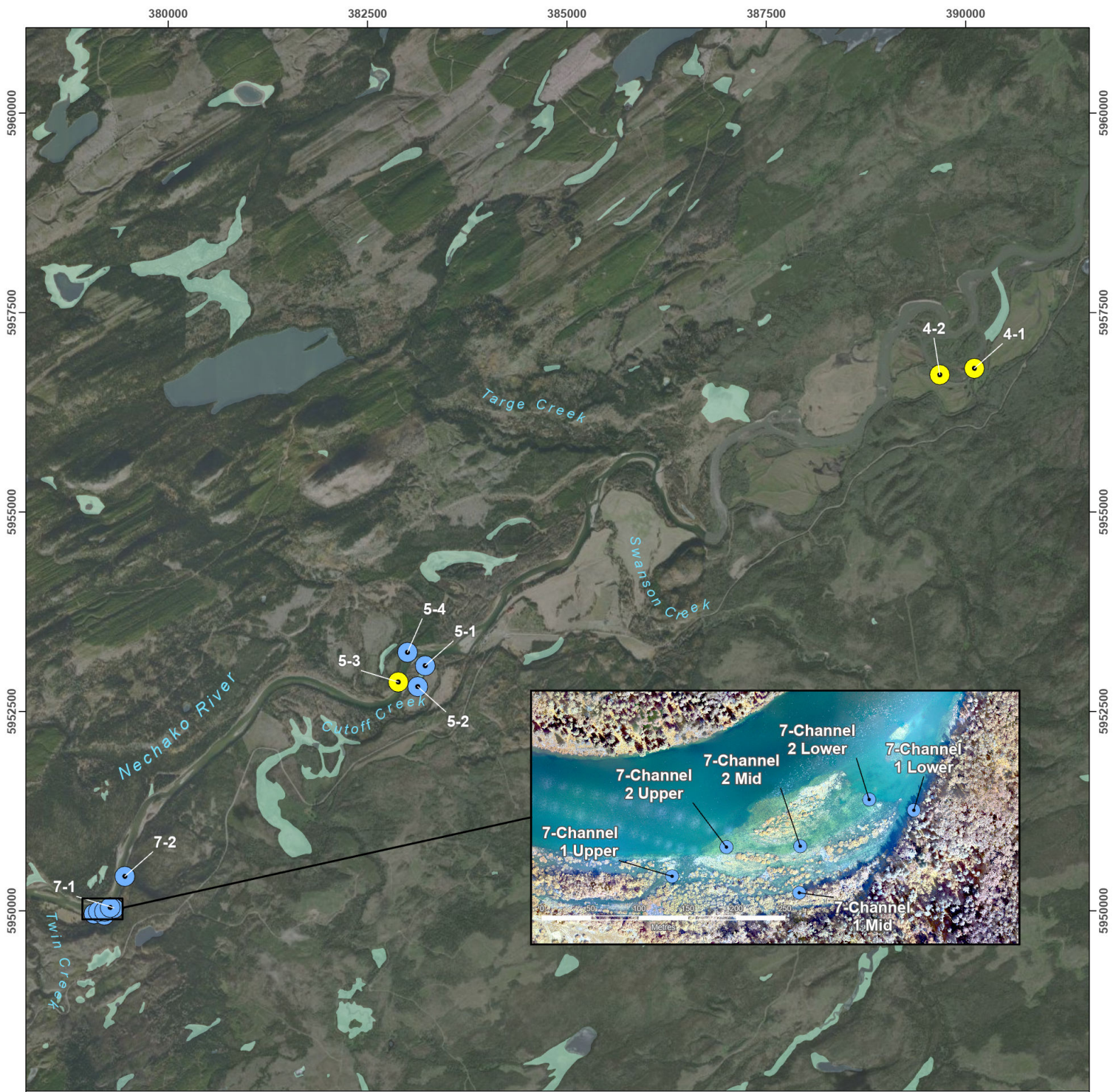
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Map Scale: 1:60,000 (printed on 8.5 x 11)
 Map Projection: NAD 1983 CSRS UTM Zone 10N

Drawn: P. Hesse	Checked: L. Matthews	Figure 6	Date: 3/19/2026
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Legend

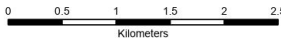
- Temperature Logger
- Temperature Logger with Duplicate
- Wetland
- Waterbody

Temperature Logger Locations South

Data Sources

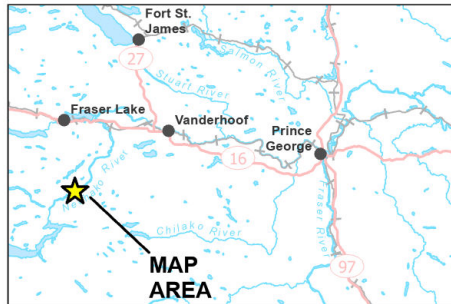
- Project Data, EDI, 2025
- Highway, Primary Road, Digital Road Atlas, Government of British Columbia, 2024.
- Watercourses, Waterbodies, Wetlands, Freshwater Atlas, Government of British Columbia, 2024.
- Inset Basemap, World Imagery, Earthstar Geographics

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Map Scale: 1:70,000 (printed on 8.5 x 11)
 Map Projection: NAD 1983 CSRS UTM Zone 10N

Drawn: P. Hesse	Checked: L. Matthews	Figure 7	Date: 3/19/2026
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3 RESULTS AND DISCUSSION

The findings of the 2025 monitoring program describe a fish community and habitat network heavily influenced by managed water releases and ongoing regional climate conditions. Because of drought conditions in the region for the past three years, flow releases from the Nechako Reservoir into the Nechako River in 2025 were consistent with the dry year scenario (Figure 8).

Flow through the Skins Lake Spillway increased slightly between mid-May and mid-June. Discharge rates in the upper Nechako River increased from approximately 41 m³/s on May 11 to a peak of approximately 85 m³/s on May 29 and 30; these rates were reduced to below 45 m³/s by June 15. This managed spring increase served as the environmental backdrop for the fish distribution and habitat quality results described in the following sections.

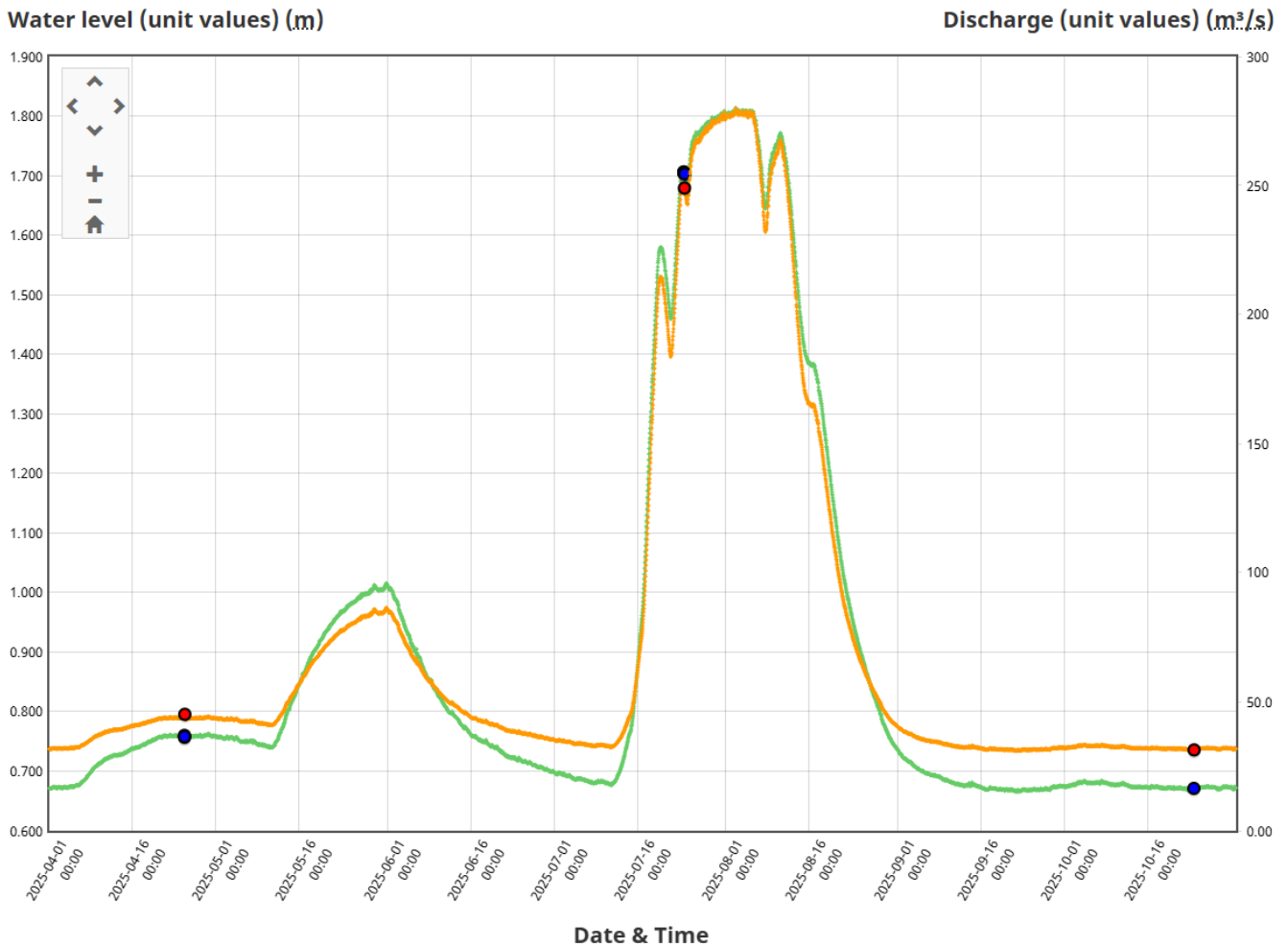


Figure 8. Real-time hydrometric data graph for Nechako River below Cheslatta Falls (08JA017) between April 1 and October 31, 2025.

Note: Discharge data are shown with the yellow line and water level data are shown with the green line (Water Survey of Canada 2026).



3.1 NECHAKO CANYON

3.1.1 ENVIRONMENTAL DNA

The eDNA sampling detected at least 10 fish species between Cheslatta Falls and the Kenney Dam (Table 5, Table 6 and Table 7). Species diversity was highest downstream in the reach spanning the Cheslatta Fan, Scour Hole Lake, and the downstream entrance to the canyon (Sites NC1–NC3). While species detections remained consistent at NC1 and NC3 across all seasons, eDNA detections from Scour Hole Lake (NC2) fluctuated. The ESVs matched to *Oncorhynchus* spp. were never detected from Scour Hole Lake and only weakly detected at NC1, yet they were consistently detected at NC3.

The species assemblage detected from NC1 to NC3 was similar to the most prominent fish species found further downstream in the Nechako River (Table 8), with the primary exception being the lack of mountain whitefish detections in the canyon. At site NC1, a single fall sample yielded a weak detection of three-spined stickleback.

Further into the canyon at NC4 and NC5, diversity dropped to only four taxa: longnose suckers, sculpin, lake chub, and *Oncorhynchus* spp. Sculpin were the most persistent species throughout the canyon and were the only species detected at the furthest upstream sites, NC6 and NC7.

Table 5. Detection strength of fish species in eDNA sampled from seven locations in the Nechako Canyon upstream of Cheslatta Falls in spring (April 30 and May 1, 2025).

Taxon	NC1	NC2	NC3	NC4	NC5	NC6	NC7
Longnose sucker	341		1,215	1,505	22,776		
White sucker	6,690		50				
Sucker (general) ¹	7,070		2,081		325		
Sculpin (general) ¹	11,493	10	18,571	15,000	11,253	1,882	
Lake chub			2,456	10,154	36,592		
Peamouth	4,828		56				
N. pikeminnow	2,705						
Longnose dace	93		827				
Dace (general) ¹	12		141				
Redside shiner	14,460		10,696				
Minnows (general) ²	3,918		380		475		
<i>Oncorhynchus</i> spp. ¹	90		8,469	21,365	4,157		

¹ Sequences that were only resolved to genus level.

² Sequences that were only resolved to family level.

Note: The absolute number of DNA sequence reads for each taxon (species, genus, or family) is noted along with a fill colour that represents the relative strength of detection.

Detection strength: <100 reads: Weak 100-999 reads: Good 1,000-9,999: Strong >10,000: Very Strong



Table 6. Detection strength of fish species in eDNA sampled from seven locations in the Nechako Canyon upstream of Cheslatta Falls in summer (August 11 to 14, 2025).

Taxon	NC1	NC2	NC3	NC4	NC5	NC6	NC7
Longnose sucker	1,999		1,059	1,967	63,721		
White sucker	17,291	13,367	43,207				
Sucker (general) ¹	40,140	2,056	11,281		449		
Sculpin (general) ¹		7,594	8,399	18,920	9,465		
Lake chub	1,524		988	76,401	59,661		
Peamouth	73	18,944	620				
N. pikeminnow	22,538	10,695					
Redside shiner	39,184	21,566	54,002				
Minnows (general) ²	2,091	7,794	892		976		
<i>Oncorhynchus</i> spp. ¹	330		1,530		6,166		

¹ Sequences that were only resolved to genus level.

² Sequences that were only resolved to family level.

Note: The absolute number of DNA sequence reads for each taxon (species, genus, or family) is noted along with a fill colour that represents the relative strength of detection.

Detection strength: <100 reads: Weak 100-999 reads: Good 1,000-9,999: Strong >10,000: Very Strong

Table 7. Detection strength of fish species in eDNA sampled from seven locations in the Nechako Canyon upstream of Cheslatta Falls in the fall (October 21 to 24, 2025).

Taxon	NC1	NC2	NC3	NC4	NC5	NC6	NC7
Longnose sucker	1,171		291	3,161	18,079		
White sucker	4,012	1,875	2,767				
Sucker (general) ¹	5,690	1,088	121	200	167		
Sculpin (general) ¹	94		5,292	938	3,237	914	100
Lake chub				14,302	21,609		
Peamouth		841	139				
N. pikeminnow	2,452	487					
Redside shiner	13,297		24,134				
Minnows (general) ²	47		101		198		
<i>Oncorhynchus</i> spp. ¹	129		920	4,244	1,861		
Three-spined stickleback	194						

¹ Sequences that were only resolved to genus level.

² Sequences that were only resolved to family level.

Note: The absolute number of DNA sequence reads for each taxon (species, genus, or family) is noted along with a fill colour that represents the relative strength of detection.

Detection strength: <100 reads: Weak 100-999 reads: Good 1,000-9,999: Strong >10,000: Very Strong



3.1.2 FISH SAMPLING

Fish were not sampled in the Nechako Canyon.

3.1.3 QUALITATIVE FISH HABITAT OVERVIEW

Fish habitats within the Nechako Canyon were characterized by a series of large pools connected by sections of stream channel that exhibited substantial seasonal variability, flowing during the spring freshet and transitioning to a nearly dry channel by late summer. Beaver dams were frequently observed at the downstream ends of larger pools, acting as primary hydraulic controls that helped maintain wetted depths in these isolated habitats (Appendix Photo D-1).

Although specific pool depths were not quantified, visual assessments indicated that the depths of Scour Hole Lake (Site NC2; Appendix Photo D-2) and the pool at NC5 (Appendix Photo D-3) were substantial. While the pool upstream of NC3 was difficult to observe directly, it also appeared to be deep (Appendix Photo D-4). In contrast, the pools at NC4, NC6, and NC7 were all much shallower (typically less than 2 metres deep), and aquatic vegetation was abundant in the late summer (Appendix Photo D-5).

3.1.4 TEMPERATURE MONITORING

Water temperatures recorded in the Nechako Canyon (Site NC3) from initial deployment in May 2025 through logger removal in October 2025 are presented in Figure 9. Data were successfully retrieved during two field visits in August and October. Visual observations during eDNA sampling and when analyzing the data indicated that the loggers remained wetted throughout the sampling period in 2025.

The 2025 data show a seasonal warming trend from early spring to late fall. Temperatures remained below 15°C from the start of monitoring until early June, and again from mid-September through late October. During the peak summer period from mid-June to mid-September, daily temperatures fluctuated between 16°C and 21°C. Daily temperature fluctuations during the summer months were greater than in the spring and fall.

Due to its distance upstream, Site NC3 is unaffected by backwatering from the Nechako River/Cheslatta Falls confluence during the Summer Temperature Management Program (STMP).

Time Series Data Report
Nechako Canyon Water Temperature

Dec 8, 2025 | 1 of 1

Period Selected: Entire Record UTC Offset: -07:00

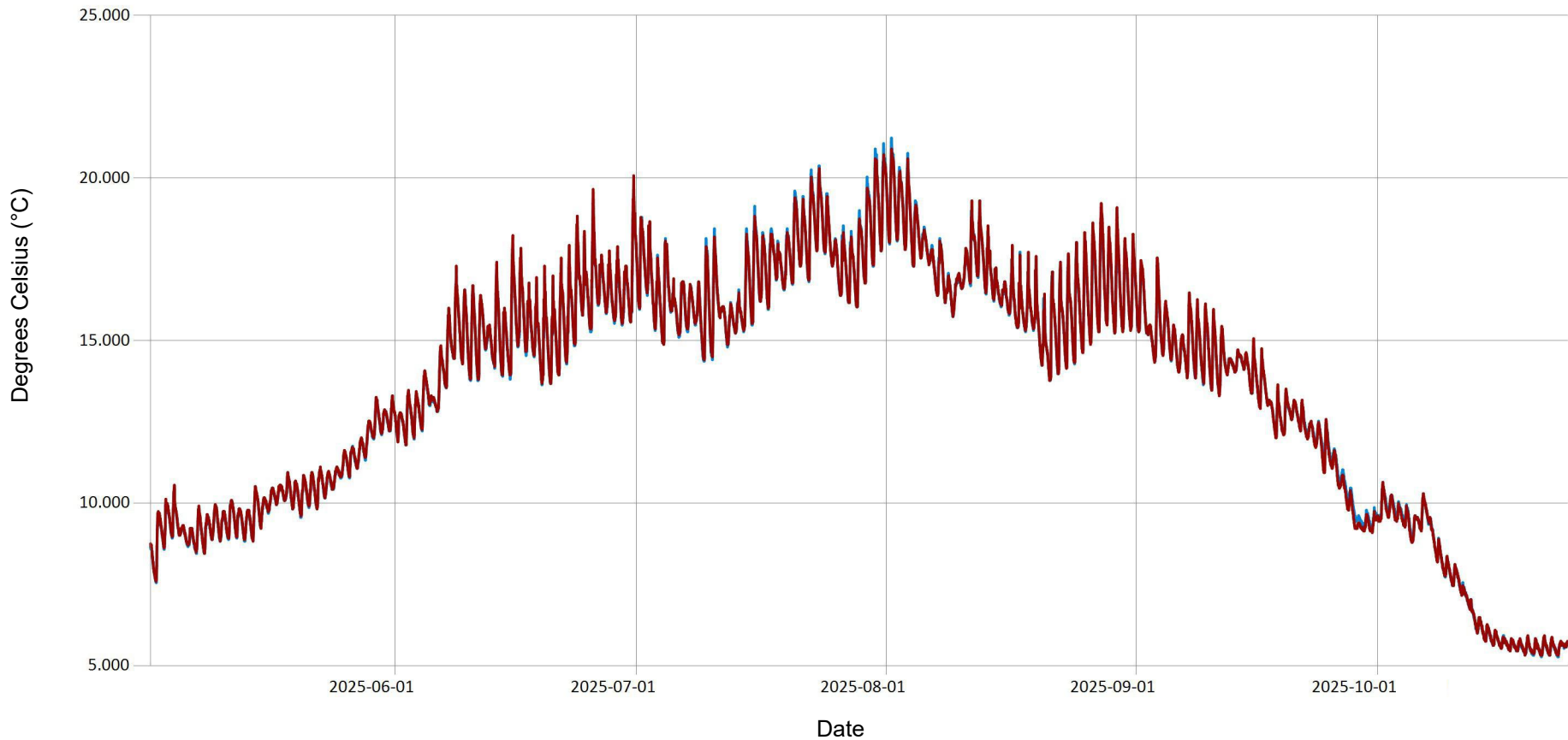


Figure 9. Nechako Canyon (NC2) water temperature data from May to October 2025.

— Water Temp@BC0024 - Nechako Canyon NC2 - 22102411 — Water Temp@BC0024 - Nechako Canyon NC2 - 22102527



3.1.5 NECHAKO CANYON SUMMARY

The Nechako Canyon revealed a complex environment where physical habitat structure and connectivity directly influence the resident fish community. The qualitative habitat assessment characterized the Nechako Canyon as a series of large pools connected by sections of stream channel that exhibited seasonal variability, flowing during the spring and becoming mostly dry by late summer. The eDNA results identified a diverse fish community of at least 10 species between Cheslatta Falls and Kenney Dam, which suggests that despite seasonal surface flow reductions, perennial habitat is available within the canyon to support resident fish.

A notable finding was the seasonal fluctuation of eDNA detections within Scour Hole Lake (NC2), where detections were reduced during spring and fall despite high summer diversity. The eDNA results aligned with visual observations from the spring sampling event, where survey crews noted a conspicuous lack of fish activity. In August however, small-bodied fish (likely minnows or juveniles) were observed in abundance amongst the aquatic near shore vegetation. It is unclear why fish might be avoiding the habitat in Scour Hole Lake in the spring.

Further into the canyon at NC4 and NC5, species diversity was reduced to four taxa: longnose suckers, sculpin, lake chub, and *Oncorhynchus* spp. Given that the canyon is largely isolated by numerous beaver dams, detections of *Oncorhynchus* spp. are assumed to represent resident rainbow trout populations rather than anadromous salmonids. The distinct downstream-to-upstream gradient of species diversity suggests that seasonal dewatering and the high frequency of beaver dams are acting as barriers to fish movement within the canyon. Deep pools, such as the pool observed at Site NC5, likely function as critical local overwintering and summer temperature refugia for these seasonally isolated resident populations.

Temperature data was recorded at Site NC3, and but temperatures in the Nechako Canyon would have been influenced by a variety of local factors. Between July and August 2025, daily average temperatures at NC3 fluctuated and peaked at 21.0°C. These summer peaks are well above the 9.0°C to 15.0°C optimal rearing window for cold-water species like Chinook salmon (Bjornn and Reiser 1991) or bull trout, and exceeded the upper end of the optimal range (13.0°C to 19.0°C) for rainbow trout (Roberge et al. 2002, McPhail 2007). This thermal regime suggests that resident species likely rely on larger, deeper pools to avoid physiological stress during the warmest periods. Under low-flow conditions, water temperatures in the various canyon pools are likely determined more by local conditions such as pool size, depth, and shading. While Site NC3 provides a local reference, the depths of Scour Hole Lake and NC5 likely offer cooler, more stable thermal environments compared to the shallower, vegetated pools at NC4, NC6, and NC7.

The detection of three-spined stickleback in a single eDNA from NC1 in the fall is unverified and unlikely to be a true detection because the species is not known to inhabit the Nechako River and was not detected anywhere else in the upper Nechako Watershed in 2025. This result is likely a false positive.



3.2 NECHAKO RIVER

3.2.1 ENVIRONMENTAL DNA

Environmental DNA in the primary channel of the Nechako River detected at least 13 species of fish across the three mainstem sites (NR1, NR2, and NR3). Sucker species and mountain whitefish were detected most consistently across all seasons and with the highest read counts (Table 8).

In addition to these dominant taxa, several other species were consistently identified across sites and seasons, including sculpin, Chinook salmon, and a diverse assemblage of minnows—specifically northern pikeminnow, longnose dace, redbside shiner, and lake chub. Detections of *Oncorhynchus* spp. occurred at all three mainstem sites throughout the year, although read counts remained relatively low. Sockeye salmon detections exhibited a distinct seasonal pattern, as they were identified at all three mainstem sites exclusively during the summer sampling period.

Table 8. Detection strength of fish species in eDNA sampled from three locations in the upper Nechako River in spring, summer, and fall of 2025.

Taxon	NR1			NR2			NR3		
	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall
Longnose sucker	33,199	3,535	260	61	971	108	38,140	476	196
White sucker	1,215	1,401	656	439	2,181	680	583	1,065	355
Sucker (general) ¹	29,557	50,170	22,197	18,830	48,118	21,121	23,959	43,160	15,268
Sculpin (general) ¹	322	2,153	477	5,796	2,152	600	198	1,956	517
Lake chub	448	342	65	180	773	14	566	484	
Peamouth		1,129	120	286	1,075	136		819	193
N. pikeminnow	419	5,918	2,532	779	6,031	1,482	190	3,803	967
Longnose dace	172	14,600	3,676	6,521	9,793	5,302	226	11,390	4,458
Dace (general) ¹	257		1,721	1,320		1,061	508		747
Redside shiner	1,406	2,074	1,205	1,043	4,420	635	282	387	591
Minnows (general) ²	1,215	1,384	204	589	1,192	174	879		
Mtn. whitefish	84	55,347	11,921	22,356	47,414	12,636	116	71,615	11,786
Chinook salmon	36	1,425	759	698	1,044	520		893	323
Sockeye salmon		252			420			1,072	
<i>Oncorhynchus</i> spp. ¹	60	1,598	1,151	84	506	949	131	1,794	984
Bull trout									17
<i>Salvelinus</i> spp. ¹				206		572			105
Burbot		268	70			112			54

¹ Sequences that were only resolved to genus level.

² Sequences that were only resolved to family level.

Note: The absolute number of DNA sequence reads for each taxon (species, genus, or family) is noted along with a fill colour that represents the relative strength of detection.

Detection strength: <100 reads: Weak 100-999 reads: Good 1,000-9,999: Strong >10,000: Very Strong



3.2.2 FISH SAMPLING

Fish sampling and observations within the primary channel of the upper Nechako River indicated that the gravel fan at the outflow of Targe Creek is an important spawning location for suckers. The field crew encountered a large congregation of adult suckers while boat electrofishing near the confluence with Targe Creek on May 28. The crew observed approximately 75 suckers: most likely white or largescale suckers, rather than longnose suckers (Table 9). Because the suckers were likely spawning, fish were not captured to confirm species. This congregation of suckers was only a few hundred metres upstream from the eDNA sample that was taken a month earlier at Site NR1 (Table 8). A similar concentration of suckers was observed upstream in Targe Creek a week later (Section 3.4.2).

Most fish observed and captured during sampling were concentrated near woody debris features, and the number of individuals observed was positively related to the size and complexity of the feature. In May, relatively few juvenile Chinook were captured while boat electrofishing near fallen trees that were sparsely distributed along the margins of the primary channel. However, capture rates increased for juvenile Chinook and minnows at a shoreline beaver house near the HSP Ranch in May and July. Similar results were recorded by beach seining at the woody debris accumulated upstream of the Cutoff Creek boat launch in July. Seine netting along a well-vegetated shoreline of the large pool near eDNA sample site NR1 caught many juvenile northern pikeminnow, juvenile suckers and redbreasted shiners on July 14. Few fish were caught or observed with any sampling method in areas with uniform-sized gravels that lacked cover from woody debris or aquatic vegetation. One notable exception to this was the occasional observation of large adult suckers in open habitat.

Sampling at Site 7 was limited to a single day on July 8 (Table 9). Leopard dace and juvenile northern pikeminnow were the only species observed.

Table 9. Fish sampling results from the primary channel of the Nechako River.

Species	Fish Count by Sample Date		
	May 28	July 8	July 14
Longnose sucker	-	-	1
White sucker	-	-	2
Sucker (general)	75	-	22
Peamouth	-	-	1
N. pikeminnow	3	7	108
Leopard dace	31	35	236
Redside shiner	14	-	-
Mtn. whitefish	3	-	-
Rainbow trout	1	-	-
Chinook salmon	14	-	20

Note: Information about gear types, effort, and sample dates are included in Table 2.

Dashes (-) indicate no fish were caught.



3.2.2.1 Snorkel Survey

In September, over 1,000 fish were observed in the primary channel, consisting of five species. (Table 10). Adult suckers were the most numerous species noted during the survey; adult sockeye salmon and mountain whitefish were the next most abundant. Relatively few adult Chinook salmon were documented.

Table 10. Snorkel survey results from Cutoff Creek to Site NR2 on September 9, 2025.

Snorkel Survey Section	Fish Species and Estimated Counts	Habitat Type
Cutoff Creek to 2 km downstream	Chinook salmon: 10 adults (1 mortality) Mountain whitefish: 50 adults Rainbow trout: 10 adults Sockeye salmon: 20 adults Sucker (general): 500+ adults	Channel margins, shallow cobble-gravel bars, and large, deep pools.
2 to 4 km downstream	Chinook salmon: 1 adult, 3 juveniles Mountain whitefish: 50 adults Sockeye salmon: 30 adults Sucker (general): 150+ adults	Channel margins, shallow cobble-gravel bars, LWD, and large, deep pools.
4 km downstream to Site NR2	Chinook salmon: 1 adult (mortality) Mountain whitefish: 30 adults Sockeye salmon: 70 adults Sucker (general): 150+ adults	Channel margins, and large, deep pools.

The largest concentrations of fish were found in large, deep pools along the primary channel's river margins. Sockeye and Chinook salmon were often observed resting or migrating along shallow cobble-gravel bars (Appendix Photo D-6).

Chinook were not observed on redds and did not appear to be spawning at the time. Two Chinook salmon mortalities were observed during the swim with one adult retrieved for inspection in the Cutoff Creek to 2 km downstream section (Appendix Photo D-7). Based on the condition of the fish, it appeared to be a recent mortality. One LWD structure was investigated in the 2 to 4 km downstream section, but no fish were observed there. The LWD structure was an accumulation of woody debris on four vertical rail track posts (Appendix Photo D-8). Three juvenile Chinook salmon were observed in the 2 to 4 km downstream snorkel reach in the shallow channel margin. All other observations recorded in the snorkel survey were adult fish.

3.2.3 QUALITATIVE FISH HABITAT OVERVIEW

The primary channel of the upper Nechako River is characterized as a large river system that offers relatively little cover for resident and anadromous fish. Habitat availability is notably more limited during baseline low-flow conditions, typically when discharge from the Skins Lake Spillway is less than 100 m³/s.

Areas that provide much of the cover and habitat complexity for fish (e.g., side channels, back channels, overhanging vegetation, fallen trees, undercut and overhanging banks) are not usually wetted or accessible to



fish at these lower flows. The dominant meso-habitat type is long, uniform runs lacking diversity and cover for smaller-bodied fish, such as minnows and juvenile salmonids. While deeper pools and riffle habitats are present, they constitute a smaller proportion of the total available habitat compared to the expansive runs.

Substrate throughout most of the upper Nechako River was uniform, consisting primarily of gravels and cobbles. Finer substrates were observed in larger pools, on the margins of gravel bars, and in areas with eroding banks, but these features are less frequent. Uniform substrate runs provide habitat for large-bodied adults; schools of suckers and mountain whitefish were frequently observed in these areas. The large areas of uniform gravel and cobble substrates are also used extensively by adult Chinook salmon for spawning in the fall (Nechako Fisheries Conservation Program 2005).

Complex cover features created by accumulations of woody debris were focal points for small-bodied and juvenile fish aggregations within the primary channel. The abundance and diversity of fish observed were proportional to the size and complexity of these woody features. A few fish were usually observed in simple woody cover like fallen trees, but larger clusters of LWD and beaver dams hosted hundreds of juvenile northern pikeminnows, redbreast shiners, and juvenile Chinook. Chinook juveniles were particularly numerous near LWD features adjacent to higher velocity flows, which likely provide optimal drift-feeding opportunities near cover.

Site-specific variations in habitat were noted at the large bend downstream of Targe Creek (Site NR3). Unlike most of the primary channel, aquatic vegetation was abundant along the channel margins, supporting numerous northern pikeminnow of all age classes and a few juvenile Chinook.

September snorkel surveys provided additional insights into fish habitat use of the Nechako River during low-flow periods. The largest concentrations of fish were documented in large, deep pools along the river margins, primarily occupied by large groups of suckers and mountain whitefish. Adult sockeye and Chinook were often observed resting or migrating along shallow cobble-gravel bars rather than occupying deep pools.

3.2.4 TEMPERATURE MONITORING

Mean daily temperatures from loggers deployed in the Nechako River's primary channel, side, and back-channel habitats for each site are presented in Figure 10. The data spans from August 2021 to August 2025. Data from loggers were downloaded during two periods from July 8 to 9 and August 13 to 14, 2025.

Because some temperature loggers in the main river were lost or failed, there are data gaps for mid-April and the period from late June to early July. However, the data collected during May, June, and July shows that average water temperatures in the main channel were similar to historical levels for those months. Unlike the main river, side and back-channel sites have complete data for 2025. These areas continue to show more frequent temperature changes compared to the steadier main river channel.

In the summer, the back and side channel habitats in the Nechako River exhibit a warming trend with mean daily temperatures typically 1°C to 2°C higher than the primary channel during late June and early July. Conversely, during the 2024 to 2025 winter, the shallower back and side channel habitats demonstrated a distinct cooling trend, reaching 0°C as early as November while the primary channel remained approximately



2°C warmer (fluctuating between 1°C to 4°C) for much of the season. This overall temperature trend is consistent with observations from 2024 (EDI Environmental Dynamics Inc. 2025b), where shallow habitats responded more rapidly to both seasonal warming and cooling compared to Nechako River primary channel.

Mean daily temperatures from loggers deployed in the two side channels at Site 7 (side channel 1 and 2, respectively) are presented in Figure 11 and Figure 12. Channel 1 is closer to shore and the canyon wall and may have higher potential for groundwater influence (EDI Environmental Dynamics Inc. 2022a). The data span the period from early spring of the initial deployment year (June 2024) to the most recent download period (July 2025).

Due to the loss or malfunction of loggers deployed in Site 7 side channels, there is no temperature data presented for Channel 1-lower and Channel 2-mid loggers during the deployment period. However, available data from the loggers show distinct seasonal deviations when compared to the Water Survey of Canada Nechako River temperature data (Water Survey of Canada 2026).

Both the mid and upper loggers from Site 7 Channel 1 consistently recorded temperatures lower than the main Nechako River. While Nechako River temperature peaked above 20°C in summer 2024, the side channel remained notably cooler, often by several degrees. The side channel's upper logger maintained a slightly warmer environment compared to the mid logger and Nechako River locations during the coldest winter months (November 2024 to March 2025). In the spring of 2025, the side channel temperatures began to rise earlier and more sharply compared to the main river. By July 2025, the mid logger demonstrated temperature spikes, occasionally exceeding the Nechako River's temperature. The upper logger maintained cooler temperatures (11°C to 14°C) compared to the mid logger and Nechako River (14°C to 17°C) during the same period.

Upper and lower loggers from Site 7 Channel 2 recorded temperatures more consistent with the Nechako River throughout 2024 and did not demonstrate a summer cooling effect like Channel 1. Beginning in November 2024, temperatures recorded at both Channel 2 loggers dropped sharply compared to the Nechako River, staying at or near 0°C for the duration of the 2024 to 2025 winter. In contrast to the slightly warmer environment observed in Channel 1, Channel 2 reached near freezing temperatures faster than the Nechako River. During the spring of 2025, Channel 2 temperatures began to rise sharply. By May and June, both Channel 2 loggers were frequently warmer than the Nechako River, demonstrating more temperature spikes. Throughout the full monitoring period, Channel 2's upper and lower loggers remained highly synchronized, showing near identical temperature records with little difference ($\pm 1^\circ\text{C}$) throughout each season.

Individual logger plots according for each Nechako River habitat type, including Site 7 side channels during 2024/2025 STMP, are presented in Appendix C.

The data available for 2025 indicates a similar seasonal water temperature pattern to previous years, with a sharp increase from April to a July peak, followed by a brief decline coinciding with the STMP period.

Time Series Data Report
Nechako WT Means_all locations

Dec 8, 2025 | 1 of 1

Period Selected: Entire Record UTC Offset: -07:00

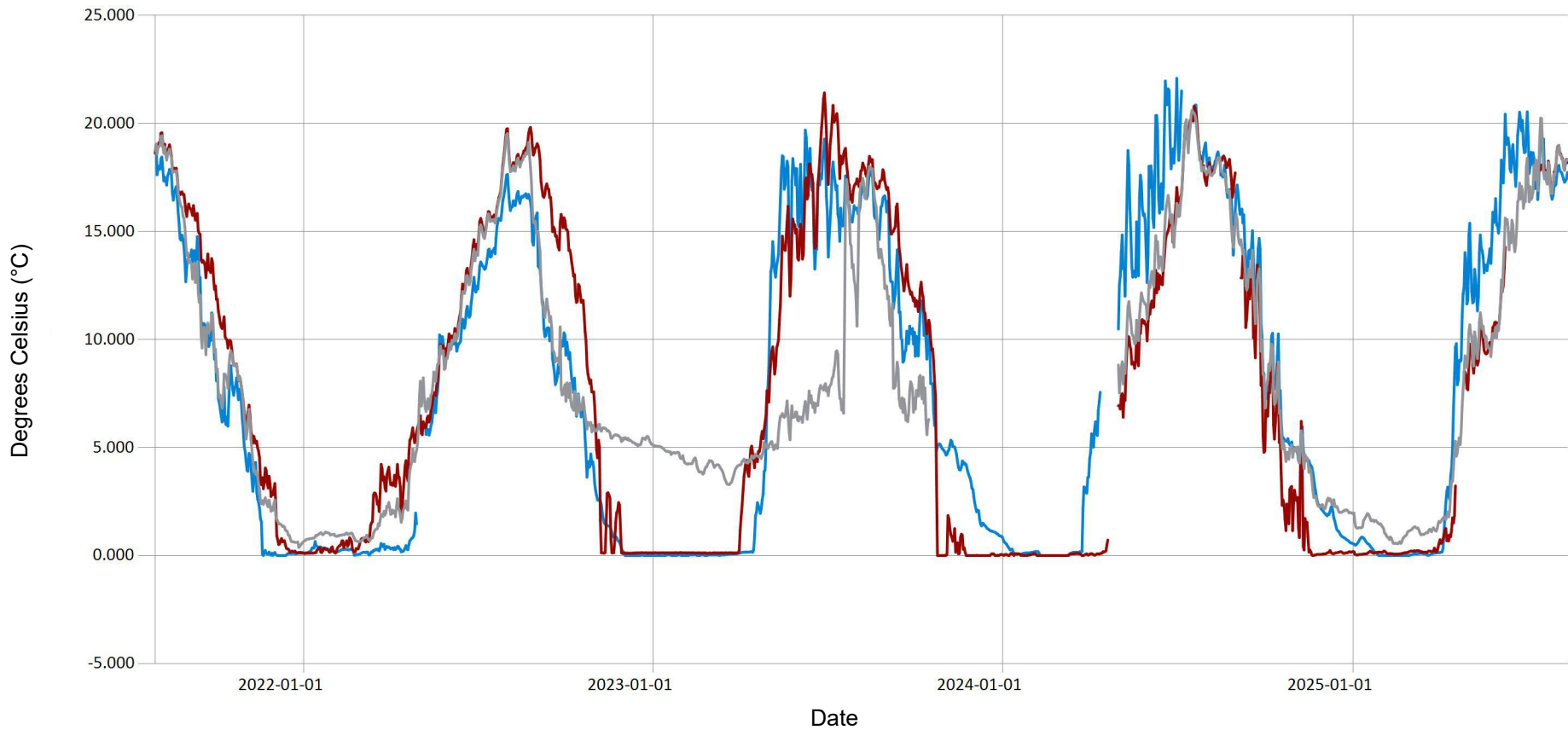


Figure 10. Mean water temperature data for Nechako River primary channel, large side channel and back channel habitat units from August 2021 to August 2025.

— Water Temp@BC0024 - Mean - Back Channel — Water Temp@BC0024 - Mean - Primary Channel — Water Temp@BC0024 - Mean - Side Channel

Time Series Data Report

Nechako River - Side Channel Site 7 Ch 01 Water Temperature

Mar 2, 2026 | 1 of 1

Period Selected: 2024-06-01 00:00 - 2025-07-09 23:59

UTC Offset: -07:00



Figure 11. Mean daily water temperature data for Site 7 side channel 1 compared to WSC Station 08JA017 from June 2024 to July 2025.

— Mid Site 7 - Ch01 Side Daily Mean — Upper Site 7 - Ch01 Side Daily Mean — WSC - 08JA017 Daily Mean

Time Series Data Report

Nechako River - Side Channel Site 7 Ch 02 Water Temperature

Mar 2, 2026 | 1 of 1

Period Selected: 2024-06-01 00:00 - 2025-07-09 23:59

UTC Offset: -07:00

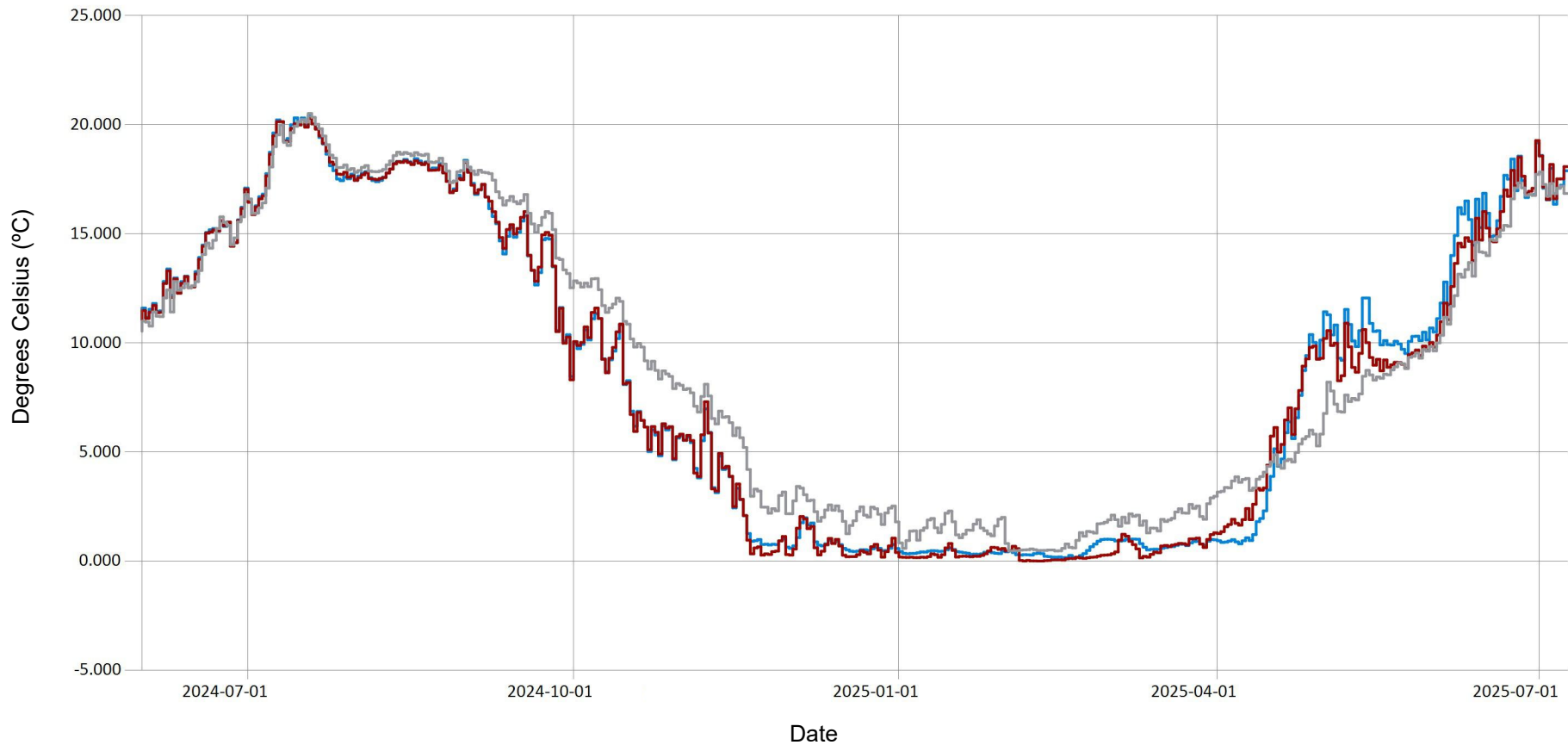


Figure 12. Mean daily water temperature data for Site 7 side channel 2 compared to WSC Station 08JA017 from June 2024 to July 2025.

— Lower Site 7 - Ch02 - Side Daily Mean — Upper Site 7 - Ch02 Side Daily Mean — WSC - 08JA017 Daily Mean



3.2.5 NECHAKO RIVER SUMMARY

The upper Nechako River has seasonal variations in distribution and abundance of fish communities strongly influenced by available cover and the flow regime. Sucker species were the most abundant species observed or detected by all survey methods. This is consistent with other studies that have identified these species as the dominant large-bodied resident taxa in the system (Envirocon Ltd. 1984, Ecofish Research Ltd. 2022). While mountain whitefish were consistently detected across all methods, they were visually observed to be much less numerous than suckers. The high visibility of adult suckers and whitefish, attributed to their large size and susceptibility to electrofishing, emphasized their strong representation in catch results compared to more cryptic species. Although sculpin and longnose dace were absent from physical catch results in the Nechako River, they were consistently detected with eDNA and may be abundant in swifter, riffle habitats that were not easily sampled with conventional methods.

The high relative abundance of juvenile Chinook, northern pikeminnow, and redbside shiner around large woody debris (LWD) aligns with decades of regional research. The preference of juvenile Chinook for complex woody habitats in the Nechako River is well-documented in the Nechako Fisheries Conservation Program technical reviews (Nechako Fisheries Conservation Program 2005), which identified LWD as the preferred cover component for rearing Chinook salmon in the mainstem. Observations in 2025, where hundreds of small-bodied fish (<100 mm Fork Length) were found in LWD clusters and beaver dams, reinforce previous studies that demonstrated a relationship between habitat complexity and fish density (Nechako Fisheries Conservation Program 2005, EDI Environmental Dynamics Inc. 2022b, a, 2024). Juvenile Chinook favour "velocity refugia" provided by LWD cover adjacent to higher velocity flows to optimize energy expenditure while drift-feeding (Bjornn and Reiser 1991).

The flow regime trialled in 2025 did not appear to result in a large expansion of available rearing habitat for juvenile Chinook salmon across the broader watershed. The spring discharge peak of 90 m³/s noted in Figure 8 was insufficient to flood the expansive side-channel and back-channel habitats of the upper Nechako River. Previous EDI studies have identified that when these habitats are inundated, particularly margins with submerged willows and grasses, they provide high-value rearing habitat for juvenile Chinook that offer both food sources and protection from predators (EDI Environmental Dynamics Inc. 2022a, 2024). The lack of bankfull or overbank flows in 2025 meant these highly productive areas remained dry, limiting the total wetted habitat compared to higher-flow years such as 2022. However, the 2025 flow increase did have a localized effect on specific low-elevation habitats. Most notably, the lower reach of Cutoff Creek (CO1) experienced backwatering and flooding from the Nechako River (Section 3.6.3) during the simulated freshet that peaked on May 30. While the discharge was not high enough to activate many other peripheral habitats, it was sufficient to temporarily flood this low-lying tributary confluence, providing a brief expansion of wetted habitat for the fish observed at this site.

Although the overall expansion of physical rearing habitat was limited, the actual timing of the 2025 spring flow increase was likely favourable for juvenile Chinook migration. Based on migration data from Sykes et al. (2009) and Bradford et al. (2021), the natural delay and smoothing effect caused by the Cheslatta lake system aligned the highest water levels with the biological needs of juvenile Chinook. The onset and rate of age-1+ juvenile (smolt) migration to the ocean is primarily driven by temperature experience (accumulated thermal



units). Unlike many river systems where increased flow facilitates migration, Sykes et al. (2009) found that in the Nechako River, increasing flows can slow down or stop downstream smolt migrations. The timing of peak spring flows in the last days of May and first days of June in 2025 would likely have given Chinook smolts time to naturally migrate downstream as the river warmed up and before the highest flows arrived. The increase in spring flows may also have improved survival for migrating juveniles by mimicking the benefits of a natural spring flood. Bradford (1994) suggested that the loss of the spring freshet in the upper Nechako River likely contributed to poorer juvenile Chinook survival, as it resulted in the loss of rearing habitat and higher rates of predation. In unregulated rivers, higher spring flows help protect young fish by making the water murkier (increasing turbidity) and spreading out predators, which makes it harder for them to hunt efficiently. Higher water velocities also help juvenile Chinook move through the river more quickly, reducing the time they are exposed to predators. The timing and duration of increased spring flows in 2025 overlapped well with the time when newly hatched Chinook (age-0+ fry) migrate downstream (Bradford et al. 2021).

Many adult sockeye salmon were observed in the upper Nechako River during the 2025 snorkel survey. Sockeye spawning in the Nechako River has been previously documented but was thought to be restricted primarily to two reaches near Targe Creek and Vanderhoof (Nechako Fisheries Conservation Program 2005). The 2025 snorkel data (supported by snorkel observations in 2023) suggests that the distribution of sockeye spawners in the upper Nechako River may spawn in a broader area than previously thought, although this may be related to the size of that sockeye run. The number of sockeye that returned to the Fraser River in 2025 was the highest in many years (Pacific salmon Commission 2025), which may have resulted in an unusually larger number of sockeye in the upper Nechako River in early September. Fraser Lake is the nearest lake that juvenile sockeye could use to rear in after emerging from the gravels, but the detection of juvenile sockeye in multiple tributaries across 2024 and 2025 suggests that some juvenile sockeye remain in the upper Nechako watershed. The small number of juvenile sockeye observed in the upper river suggests that most are migrating to downstream habitats after they emerge.

Chinook spawning is often concentrated in the upper Nechako River (Bradford 1994, Nechako Fisheries Conservation Program 2005, Bradford et al. 2021) but the number of adult Chinook observed during the snorkel survey in 2025 was less than the number of sockeye. The snorkel crew likely observed fewer adult Chinook in 2025 because the survey was completed before the peak of Chinook spawning in the upper Nechako River.

Peak summer temperatures in the primary channel of the Nechako River favour warm water tolerant species such as minnows and suckers, which were abundantly observed compared to other species. Salmonids like mountain whitefish and juvenile Chinook that are less tolerant of warmer water temperatures and rely on faster, well-oxygenated runs or areas with cooling groundwater influences to navigate the summer thermal peaks that otherwise approach the upper limits for stress.



3.3 GREER CREEK

3.3.1 ENVIRONMENTAL DNA

Environmental DNA sampled from Greer Creek detected at least 12 species of fish in 2025 (Table 11). A distinct downstream-to-upstream gradient in the diversity and composition of species was also detected, with the greatest number of species detected at GR1 and the lowest diversity found at GR3.

Sucker species were detected at GR1 throughout the year, however detections decreased at upstream sites. They were identified at GR2 in the spring and summer, but not in the fall and were only detected at GR3 during the summer sampling period. Aside from the spring sample at GR1, longnose dace were detected at all sites across all seasons. Mountain whitefish followed a similar trend, with detections in all seasons at GR1 and GR2, though they were notably absent from the eDNA record at GR3. The furthest upstream site, GR3, was characterized by a stable assemblage of four primary taxa: sculpin, longnose dace, Chinook salmon, and *Oncorhynchus* spp.

Table 11. Detection strength of fish species in eDNA sampled from three locations in Greer Creek in spring, summer, and fall of 2025.

Taxon	GR1			GR2			GR3		
	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall
Longnose sucker	5,583	1,506	144	157	183				
White sucker	3,838	2,956							
Sucker (general) ¹	6,998	74,227	14,259	163	27,096			215	
Sculpin (general) ¹		544	73	136	80		5,694	1,207	525
Lake chub	33				1,381				
Peamouth			1,220						
N. pikeminnow		477	241						
Longnose dace		35,783	8,293	9,065	49,179	186	4,116	21,531	5,685
Redside shiner	66	1,663	229		91				
Minnows (general) ²		861		35					26
Mtn. whitefish	32	1,575	1,271	11,149	10,053	1,500			
Chinook salmon		19,202	5,623		18,614		431	3,477	1,078
<i>Oncorhynchus</i> spp. ¹		13,628	2,412	4,844	29,639	2,134	19,466	133,557	40,000
<i>Salvelinus</i> spp. ¹		72							
Burbot		113	598						

¹ Sequences that were only resolved to genus level.

² Sequences that were only resolved to family level.

Note: The absolute number of DNA sequence reads for each taxon (species, genus, or family) is noted along with a fill colour that represents the relative strength of detection.

Detection strength: <100 reads: Weak 100-999 reads: Good 1,000-9,999: Strong >10,000: Very Strong



3.3.2 FISH SAMPLING

June catch results at GR1 were the most diverse and featured large numbers of juvenile Chinook salmon and juvenile suckers (Table 12). Fewer Chinook were caught at GR1 in July, but the number of juvenile suckers was substantially higher. Most fish captured in Greer Creek were associated with pool and large woody debris (LWD) habitats. Suckers and longnose dace were caught consistently at GR1 and GR2 in June and July. The importance of pool habitat was further highlighted during the September FHAP assessments at GR1, where juvenile suckers were observed in large numbers within these units.

Rainbow trout were caught at all three sample sites in July, and they were the most numerous species caught in the upper reaches of Greer Creek. Rainbow trout were the only species caught at GR3 and were more abundant than at downstream sample sites. The pool and riffle downstream of Greer Creek falls was sampled in June, and rainbow trout were the most prominent species caught.

Table 12. Fish sampling results from Greer Creek.

Species	Count at GR1			Count at GR2			Count at GR3			Greer Creek Falls
	June 12	July 10	Sept 22	June 12	July 10	Sept 23	June 10	July 10	Sept 25	June 13
Sucker (general)	10	186	200	2	1	1	-	-	-	-
Prickly sculpin	-	-	-	-	-	-	-	-	-	2
Peamouth	1	-	-	-	-	-	-	-	-	-
Longnose dace	1	6	-	13	25	-	-	-	-	-
Redside shiner	1	-	-	-	-	-	-	-	-	-
Mtn. whitefish	1	-	-	-	-	-	-	-	-	-
Rainbow trout	-	1	-	-	1	-	3	4	-	7
Chinook salmon	9	3	-	-	1	1	-	-	-	-

Note: Information about gear types and effort by sample date is included in Table 2.

Dashes (-) indicate no fish were caught.

3.3.3 FISH HABITAT ASSESSMENT

Greer Creek exhibits high suspended sediment loads during the spring freshet compared to several other tributaries assessed in the upper Nechako watershed. Qualitatively, spring water clarity in Greer Creek was notably lower than in adjacent tributaries (Appendix Photo D-9).

Following the freshet, flow in Greer Creek declined steadily into the summer months but adequate stream depths to support fish were maintained at all sites from April through October. As wetted widths contracted in late summer, available cover—such as overhanging vegetation and undercut banks—became increasingly limited (Appendix Photo D-10). Flows remained stable enough between June and July to allow sampling at



all sites. During the September FHAP surveys, fish were observed concentrating primarily in pools and around large woody debris (LWD).

In Greer Creek, FHAP assessments were completed at three sites (GR1, GR2, and GR3), where the average channel width was 11.7 m with an average gradient of 1%. Glides and pools were the most frequently observed habitat units, while riffles were the least common (Table 13). The average channel width increased upstream; 9.9 m at GR1, 12.3 m and 12.9 m at GR2 and GR3, respectively. GR1 was frequently influenced by beaver impoundments; dammed pools were typically larger and deeper than scoured pools (Table 14). While many of these dams are likely passable during spring flows, they likely present seasonal barriers to fish movement during low flow (Appendix Photo D-11).

Table 13. Physical habitat characteristics from three survey sites in Greer Creek.

Sample Site	Survey Distance (m)	Percent Area per Habitat Type (%)			Number of Pools	Mean Residual Pool Depth (m)
		Riffle Area (%)	Glide Area (%)	Pool Area (%)		
GR1	304.9	9.28	32.3	58.3	4	1.20
GR2	297.5	15.7	41.3	42.9	4	0.90
GR3	297.2	33.1	48.9	17.9	2	0.89

Applying the FHAP diagnostics of salmonid habitat condition (Table 4), Greer Creek presents a range of conditions from poor to good:

- Pool Frequency and Depth:** With pool areas ranging from 17.9% to 58.3% and mean residual depths of 0.89 to 1.20 m, Greer Creek generally meets "Good" standards for summer and winter rearing habitat (>55% pool area at GR1). These deep pools provide thermal stable-zones and overwintering refugia.
- Substrate and Spawning Suitability:** Spawning potential for salmonids is limited at the downstream sites (GR1 and GR2) due to "Poor" ratings for substrate quality. Interstitial spaces were frequently filled with fines, particularly at GR1 where cattle-induced bank erosion was evident. In contrast, the upstream site (GR3) exhibited "Good" gravel quality with clear interstices (low embeddedness).
- Off-Channel Habitat and Cover:** The presence of beaver impoundments and side-channel habitats maintained by functional LWD at GR2 provides "Good" off-channel rearing and winter habitat.



Table 14. Pool measurements from three survey sites in Greer Creek.

Site Name	Habitat Unit	Pool Type	Pool Length (m)	Max Pool Depth (m)	Residual Pool Depth (m)
GR1	Pool 2	Scour	24.7	1.40	1.30
	Pool 6	Scour	17.0	1.50	1.35
	Pool 8	Dammed	107.0	1.20	1.20
	Pool 10	Scour	16.9	1.40	0.95
GR2	Pool 1	Dammed	23.0	1.05	0.90
	Pool 3	Dammed	51.3	1.50	1.40
	Pool 8	Scour	20.3	0.70	0.55
	Pool 11	Scour	24.3	1.00	0.90
GR3	Pool 7	Scour	14.0	0.75	0.62
	Pool 12	Dammed	37.9	1.20	1.15

Fines and gravels were the dominant substrate at GR1, with fines particularly prevalent in pools and slow-moving glides (Appendix Photo D-12). Although the site featured large riffle-pool transitions, gravels were heavily embedded by fines possibly attributed to bank erosion and mobilization of fine textured soils (Appendix Photo D-13). Of note was a beaver dam that created a pool comprising over one-third of the surveyed area, with a mean residual depth of 1.20 m (Appendix Photo D-14). This pool provided rearing and overwintering potential within the reach. Shrubs dominated the riparian vegetation and cover was abundant in the form of overhanging vegetation, but canopy cover was low due to a lack of large trees near the stream. Large woody debris (LWD) was present in moderate amounts, though pieces were generally unstable or observed partially floating (Appendix Photo D-15).

Substrates at GR2 were primarily gravel and cobble, yet the interstitial spaces were frequently observed to be filled with sediment (Appendix Photo D-16). The high degree of embedment likely restricts spawning suitability. The site contained two beaver dams and two scour pools, with residual depths reaching a mean of 0.90 m (Table 13). Suitable rearing and overwintering habitat was provided by these units. Moderate cover was provided by functional LWD, which maintained side-channel and scour-pool features.

In contrast to the downstream sites, GR3 featured gravel and cobble substrates with low embeddedness. Stream banks were relatively stable, though fine sediment from upstream sources was still evident. One scour pool and one pool created by a beaver dam were identified, both providing suitable depth and cover for fish, though the beaver dam likely acts as a seasonal impediment to passage (Appendix Photo D-18). Cover from small woody debris (SWD) and stable LWD was abundant throughout the site. The mature mixed forest riparian zone provided trace canopy closure of 0% to 10%.

3.3.4 TEMPERATURE MONITORING

Water temperatures were recorded at Site GR1 between April and mid-August 2025 and are illustrated in Figure 13. Stream flows decreased over the summer, dewatering the temperature loggers and affecting data integrity. The loggers were relocated into deeper water twice, once in July and again in August, after finding



the device exposed. Consequently, data from early June to early July and from mid-August until October were excluded from the analysis because pronounced diurnal fluctuations confirmed the logger had been dewatered during those intervals.

The remaining valid data revealed a seasonal warming trend in Greer Creek that peaked between late July and early August. During this time window, daily temperatures at Site GR1 fluctuated between 16°C and 22°C. This range is consistent with temperatures recorded in the Nechako River during the same period (17°C to 20°C), when discharge was elevated due to STMP flow regulation. Because the monitoring site was located 1.2 km upstream from the confluence, these readings reflect the creek's natural thermal profile and were not influenced by backwatering from the Nechako River.

Time Series Data Report
Greer Creek Water Temperature

Dec 8, 2025 | 1 of 1

Period Selected: Entire Record UTC Offset: -07:00

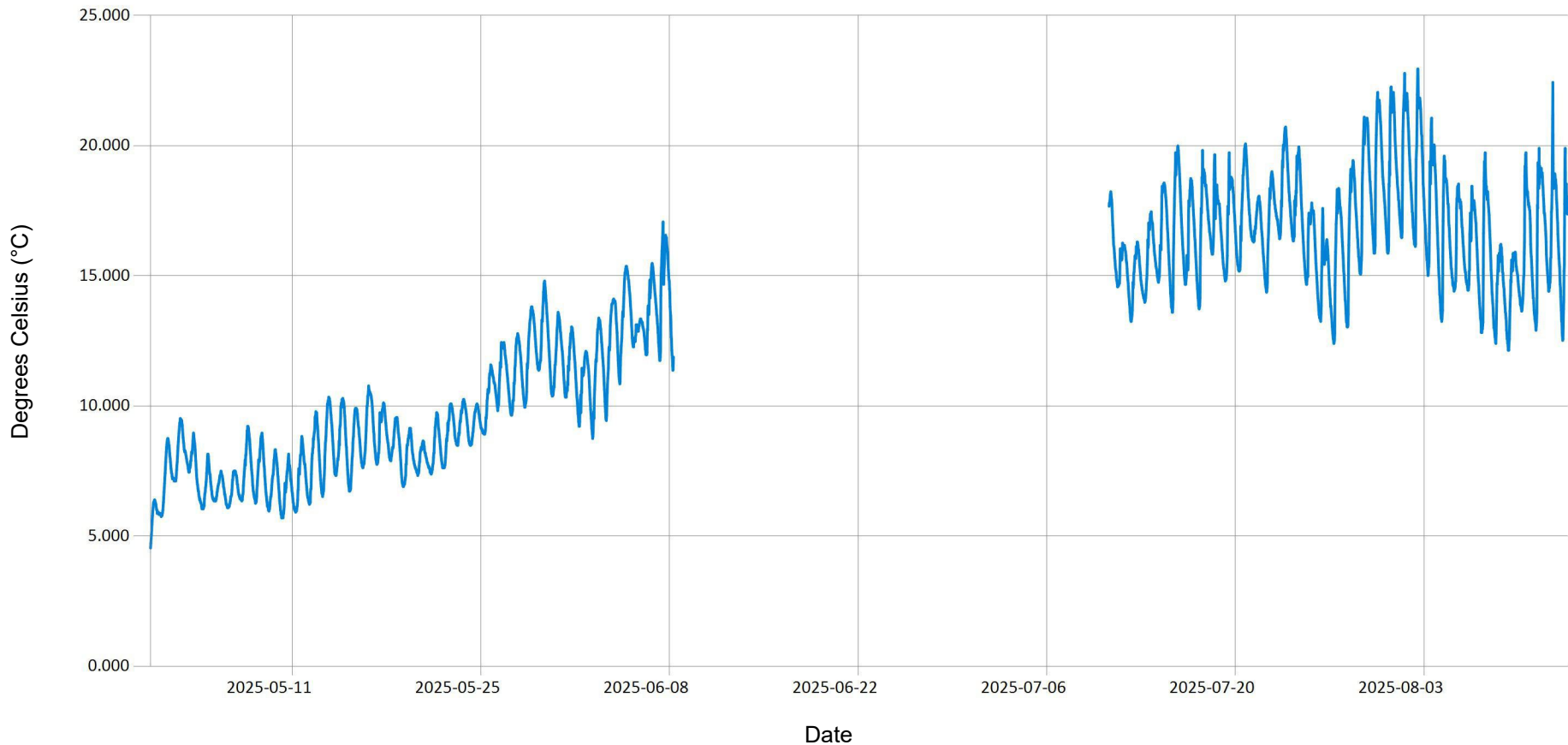


Figure 13. Greer Creek (GR1) water temperature data from April to August 2025.

— Water Temp@BC0024 - Trib Greer 21115518



3.3.5 GREER CREEK SUMMARY

The 2025 multi-method fish habitat assessment of Greer Creek reveals a complex, seasonally dynamic system where fish distribution is governed by life-history timing, water quality, and physical barriers. Integrating eDNA, fish sampling, and habitat data shows that Greer Creek provides stable, perennial habitat; a rarity in the upper Nechako watershed where many tributaries are prone to late-summer dewatering.

Seasonal Dynamics and Reach-Specific Trends

Fish community composition within Greer Creek follows a distinct longitudinal and seasonal pattern. The lower reach near GR1 appears to be an important rearing area for juvenile suckers, with consistent eDNA and physical detections from June through October. The increase in physical catches of juvenile suckers in July suggests an influx of 1+ year-old fish moving into the reach to rear. While early spring eDNA detections at GR1 were low, diversity peaked in August and October, coinciding with receding flows and improved water clarity.

In contrast, the upper reach near GR3 is an environment dominated by a resident assemblage of rainbow trout, sculpin, and longnose dace. Fish sampling at GR3 in June only caught juvenile rainbow trout, suggesting that the spring eDNA detections of *Oncorhynchus* spp. were likely from resident rainbow trout rather than Chinook.

Salmonid Utilization and Migration Bottlenecks

The 2025 results suggest that juvenile Chinook salmon use the lower reaches of Greer Creek primarily as transient rearing habitat. Newly emerged fry were captured at GR1 in early June, but detections declined markedly by July. Physical captures at the mid-reach (GR2) were limited (single fish in July), and no Chinook were caught or visually observed at GR3.

This transient behaviour is supported by habitat data; while the deep beaver-dammed pools at GR1 and GR2 provide "Good" rearing and overwintering depths (mean 0.89 to 1.20 m), the dams themselves likely act as seasonal impediments to upstream migration during summer low-flow periods. The eDNA detections of Chinook at GR3 should therefore be interpreted with caution.

Historical Temperature and Habitat Comparison

Historical comparison with a study from 1998 (Arc Environmental Ltd. 1998) highlights shifts in the watershed's sediment loading and habitat quality. While the 1998 study documented spawning potential in the middle-reaches (near GR2), 2025 FHAP results at GR1 and GR2 found these areas to be "Poor" for spawning due to heavy substrate embedment. High spring turbidity visual observations, driven by agricultural land use and cattle-induced bank erosion, appears to be a primary contributor to this decline in substrate quality.

Furthermore, although sculpin and longnose dace were absent from 2025 catches at GR3, their consistent detection across all seasons via eDNA indicates they remain a stable part of the resident community, as documented in 1998. Their cryptic nature and preference for benthic riffle habitats likely made these species difficult to capture with the 2025 electrofishing efforts.



Thermal monitoring shows that Greer Creek currently offers little thermal relief from the Nechako mainstem during peak summer months. In 1998, Arc Environmental recorded Greer Creek reaching 15.0°C by June 23, with a maximum temperature of 21.3°C on July 27. The monitoring in 2025 at GR1 showed a similar but slightly higher peak of 22.0°C. These peaks approach the upper lethal limits for rainbow trout (24.0°C) and prickly sculpin (24.0°C) and far exceed the 12.0°C to 14.0°C optimal range for juvenile Chinook (Bjornn and Reiser 1991, Roberge et al. 2002, Ecofish Research Ltd. 2023). The fact that salmonids were captured at GR1 in June but were absent in July suggests that as the creek's thermal profile mirrors the mainstem's peak temperatures, these lower reaches become unsuitable rearing habitat, likely triggering a migration to more favourable thermal environments.

3.4 TARGE CREEK

3.4.1 ENVIRONMENTAL DNA

The eDNA results from Targe Creek identified a fish community of at least nine species, including suckers and a seasonal detection of minnow species (Table 15). Longnose suckers were the most consistently detected species, representing the only species identified across all three sampling seasons.

Table 15. Detection strength of fish species in eDNA sampled from a single location in Targe Creek (TA1) in spring, summer, and fall of 2025.

Taxon	TA1		
	Spring	Summer	Fall
Longnose sucker	1,043	1,713	602
White sucker	486		
Sucker (general) ¹	488	124,830	20,783
Sculpin (general) ¹		13	62
Peamouth		125	
N. Pikeminnow		6,377	258
Longnose dace		242	1,815
Redside shiner		3,762	78
Minnows (general) ²		1,973	307
Mountain whitefish		4,183	
Rainbow trout	74		
Chinook salmon	66	60	
<i>Oncorhynchus</i> spp. ¹			23

¹ Sequences that were only resolved to genus level.

² Sequences that were only resolved to family level.

Note: The absolute number of DNA sequence reads for each taxon (species, genus or family) is noted along with a fill colour that represents the relative strength of detection.

Detection strength: <100 reads: Weak 100-999 reads: Good 1,000-9,999: Strong >10,000: Very Strong



At least one ESV for Chinook salmon, rainbow trout, or the *Oncorhynchus* genus was detected in every sampling season; however, the detection strength for these salmonid markers was consistently weak throughout the year.

Additional resident species were detected as the year progressed. Northern pikeminnow, longnose dace, and redbside shiner were all detected in both summer and fall samples, though they were absent from the spring eDNA record.

3.4.2 FISH SAMPLING

Spring sampling results suggest that the lower reach of Targe Creek is seasonally important to sucker species. Large schools of longnose suckers were observed spawning in Targe Creek near the Nechako River on May 30 (Appendix Photo D-19). Many larger, adult suckers (white and/or largescale suckers) were observed spawning in the Nechako River near the confluence with Targe Creek (Section 3.2.2). Sampling efforts in May avoided the spawning areas but visual observation was used to identify species and estimate counts (Table 16).

Suckers were conspicuously absent from the same reach of Targe Creek during subsequent visits in early July and September. Longnose dace, redbside shiner, juvenile Chinook salmon, and juvenile northern pikeminnow were relatively abundant in early July compared to other sampling periods. In September, visual observations detected prickly sculpins and small-bodied minnows (predominantly juveniles) that could not be identified to species. These fish were numerous and highly concentrated in shallow, isolated pools during the late-summer low-flow period.

Table 16. Fish sampling results from Targe Creek.

Species	Fish Count		
	May 30	July 9	Sept 23
Longnose sucker	50	-	-
White sucker	2	-	-
Prickly sculpin	1	-	50
N. pikeminnow	1	4	-
Leopard dace	1	1	-
Longnose dace	1	8	-
Redside shiner	2	10	-
Mtn. whitefish	-	2	-
Chinook salmon	1	14	-
Sockeye salmon	-	1	-
Unidentified minnows ¹	-	-	25

¹Fish were identified as minnows during FHAP surveys. High amounts of algae made species identification difficult.

Note: Information about gear types and effort by sample date is included in Table 2.

Dashes (-) indicate no fish were caught.



3.4.3 FISH HABITAT ASSESSMENT

Targe Creek experienced moderate seasonal fluctuations in flows in 2025. Spring freshet flows were relatively high, correlated with decreased water clarity (visual observation).

Water levels in Targe Creek dropped substantially through June and early July, and by August, the creek had ceased flowing. While many sections dewatered in the summer, the lower 250 m reach remained backwatered due to higher flows in the Nechako River during STMP flows in July and August. By September and October, Targe Creek was completely disconnected from the Nechako River, with only a few small, isolated residual pools remaining in the lower reach. These residual pools often contained dense algae growth and stranded small-bodied fish.

An FHAP assessment was completed at TA1 extending over 300 m. Applying the diagnostics of salmonid habitat condition (Table 4), Site TA1 exhibited the following characteristics:

- **Pool Frequency and Depth:** Pool area comprised 26.7% of the total surveyed area (Table 17), which is rated as "Poor" (<30% for a <5% gradient stream). However, the mean residual pool depth of 1.20 m is rated as "Good," providing rearing potential while wetted.
- **Substrate Quality:** Substrate quality is rated as "Poor," because embeddedness was high in most habitat units.
- **Off-Channel Habitat:** Connectivity is rated as "Poor," because the site lacks persistent side channels and dewatered entirely by late summer, eliminating access to the Nechako River.

Table 17. Sample site habitat composition in TA1.

Sample Site	Survey Distance (m)	Percent Area per Habitat Type (%)			Number of Pools	Mean Residual Pool Depth (m)
		Riffle Area (%)	Glide Area (%)	Pool Area (%)		
TA1	306	55.7	39.3	26.7	4	1.20

Fines and gravels were the dominant substrate types. Bank erosion, likely exacerbated by adjacent agricultural activity (i.e., cattle), appears to be a primary contributor to the sediment loading and substrate embedment observed (Appendix Photo D-21). The channel was characterized by abundant, partially vegetated gravel bars, while riffle-pool transition zones were infrequent.

Several beaver dams impound water for a short duration during spring freshet (Appendix Photo D-22), though the substrate was notably porous, allowing water to seep through rather than maintaining deep, persistent pools. These impoundments are likely passable for fish only during high-flow conditions.

Moderate amounts of cover were available, primarily from SWD and LWD, but also from undercut banks and overhanging vegetation which became unavailable to fish as the wetted width contracted in the summer (Appendix Photo D-23). The riparian zone was dominated by shrubs with trace amounts of mature deciduous forest. Canopy closure was generally absent, with isolated areas reaching 20% coverage.



3.4.4 TEMPERATURE MONITORING

Surface water temperatures for Targe Creek (Site TA1) from deployment in April 2025 through late September 2025 are presented in Figure 14. Data were retrieved during field visits in September and October. During the late September visit, loggers at TA1 were found buried in sediment; after being cleared, they remained in a wetted pool that had become isolated by receding stream flows. Consequently, data from late September until final removal in October were excluded from the analysis. While both loggers provided consistent data through late June, one unit subsequently malfunctioned, leaving a single logger to provide data for the remainder of the year.

The validated data show a gradual warming trend that peaks between mid-July and mid-August. During this period, Targe Creek maintained a daily temperature range of 16°C to 18°C, which is consistent with the Nechako River's profile of 17°C to 20°C during the STMP regulation period (Environment Canada 2025). The low gradient of Site TA1 and its close proximity to the Nechako River made it susceptible to backwatering from the Nechako River during STMP flows which influenced the water temperatures (Figure 14).

Time Series Data Report
Targe Creek Water Temperature

Mar 19, 2026 | 1 of 1

Period Selected: 2025-05-01 00:00 - 2025-09-30 23:59

UTC Offset: -07:00

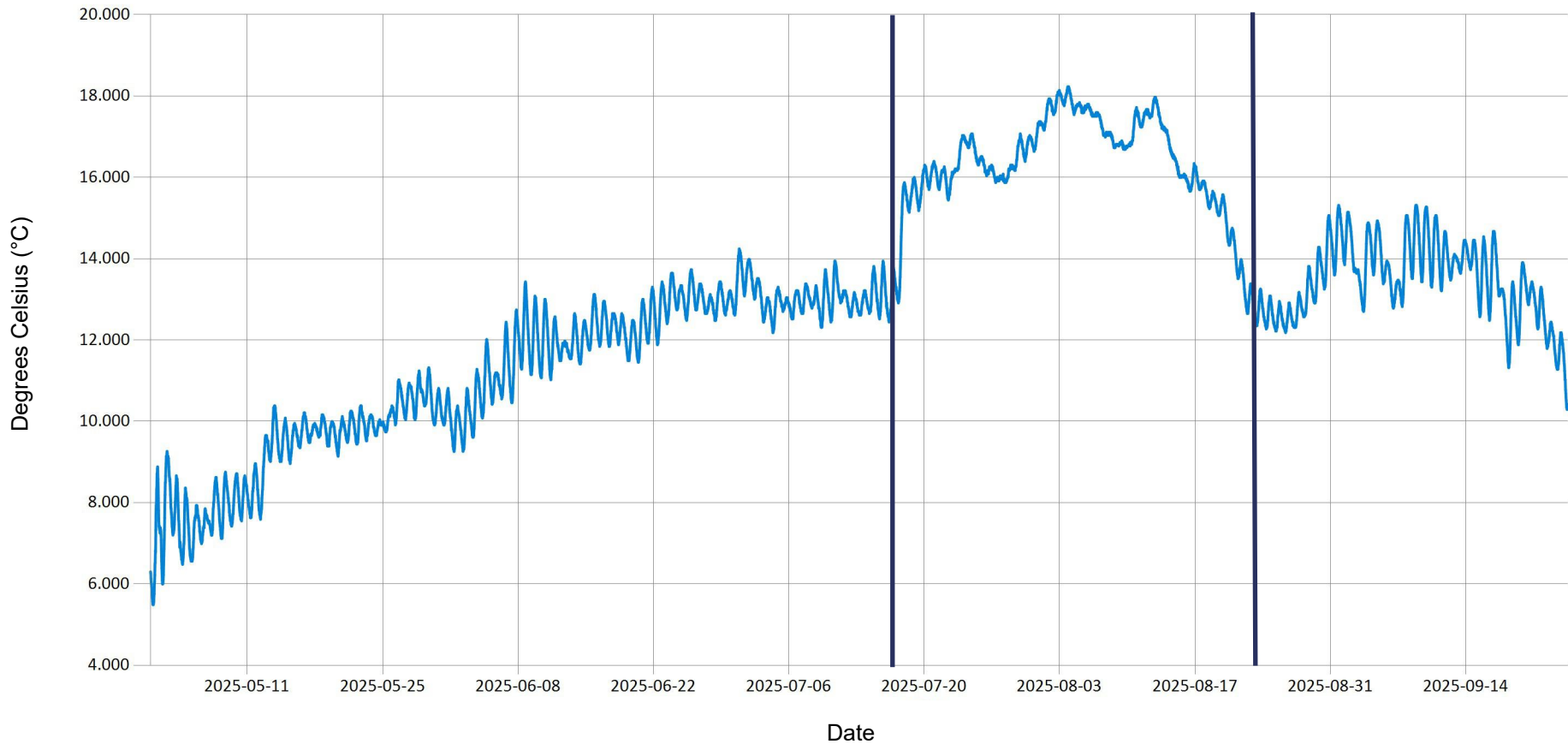


Figure 14. Targe Creek (TA1) water temperature data from April to September 2025.

Water Temp@BC0024 - Rio Tinto - Nechako | Summer Temperature Management Program



3.4.5 TARGE CREEK SUMMARY

Targe Creek is characterized by highly seasonal stream flows. While the creek provides critical spawning habitat for suckers and suitable rearing habitat in the spring, its lack of perennial flow and poor substrate quality are notable limitations for long-term fish production.

Spawning and Migration Timing

The lower reach of Targe Creek serves as vital seasonal habitat for suckers. Temporal data supports a narrow window of adult longnose sucker residency; they were absent during eDNA collection on April 30, numerous spawning adults were observed on May 30, and they were absent by early July. This phenology aligns with historical observations that resident suckers utilize small tributaries for broadcast spawning over coarse substrates once temperatures reach optimal spring thresholds (Roberge et al. 2002).

The presence of larger adult white and largescale suckers spawning on the gravel bar in the Nechako River at the confluence suggests that Targe Creek acts as a focal point for multiple species. Because sampling in May was reduced to avoid disturbing these schools, the potential under-representation of smaller, less conspicuous species must be considered; however, the departure of adult suckers by July revealed a more diverse juvenile assemblage.

Seasonal Turnover and Detection Shifts

The shift in species abundance observed in July characterized by a high relative abundance of redbside shiner, longnose dace, juvenile Chinook, and northern pikeminnow suggests these taxa move into Targe Creek after adult suckers vacate the reach. Alternatively, these species may simply become easier to detect or catch once the dominant spawning schools are no longer present.

This trend is reinforced by August eDNA results for Targe Creek, which showed a variety of species being detected more readily than in the spring. Sucker eDNA was detected in August and into October, likely attributed to the presence of rearing juveniles in residual pools. While sculpin and longnose dace likely remain in the system for much of the year, other minnows and salmonids appear to vacate Targe Creek as water levels drop in late summer.

Habitat Degradation and Historical Comparison

Comparing the 2025 FHAP results to the study from 1998 (Arc Environmental Ltd. 1998) reveals a continuity in the physical limitations of the system. In 1998, Targe Creek was characterized by low-flow conditions and beaver activity that led to "Poor" ratings for pool frequency and LWD cover within those pools.

The results for 2025 show a similar trend, with pool area (26.7%) maintaining a "Poor" rating in Targe Creek. However, a concerning observation in 2025 was the "Poor" rating for substrate quality, with interstitial spaces between gravels and cobbles found completely filled with fines. While beaver dams continue to influence Targe Creek, their porous nature in 2025 prevented the maintenance of persistent deep pools, further restricting habitat during the summer drawdown.



Thermal Regime and Backwatering Effects

The temperature profile for Targe Creek in 2025 is influenced by the monitoring location's proximity to the Nechako River and historical warming trends. The 1998 Arc Environmental study recorded Targe Creek reaching 15°C by June 24 and hitting a maximum temperature of 21.6°C on July 27. In 2025, the warming trend observed from July through August (16.0°C to 18.0°C) was slightly lower than the 1998 peak but consistently mirrored the mainstem's STMP-regulated regime.

This thermal similarity is largely due to the low gradient of Targe Creek, which allows high Nechako flows to backwater the lower 250 m of the tributary. While these temperatures remain suitable for warm water-tolerant minnows and suckers (optimal 15.0°C to 25.0°C), they represent the upper threshold of suitability for juvenile Chinook, which typically favour 12.0°C to 14.0°C (Bjornn and Reiser 1991, Roberge et al. 2002, Ecofish Research Ltd. 2023).

Ecological Sink and Stranding Risk

Targe Creek has the potential to be an ecological sink. Unlike the perennial flow of Greer Creek, Targe Creek stopped flowing by August, leaving isolated residual pools with numerous prickly sculpins and juvenile minnows stranded. These small, isolated pools are highly susceptible to freezing solid over the winter, which likely results in total mortality for stranded individuals. Reduced species diversity in October eDNA samples further highlights the isolated nature of these habitats and the lack of connectivity to the Nechako mainstem.

3.5 SWANSON CREEK

3.5.1 ENVIRONMENTAL DNA

Environmental DNA (eDNA) metabarcoding throughout Swanson Creek in 2025 identified a distinct shift in fish species composition, moving from a diverse group at the Nechako River confluence to a less diverse community in the upper reaches (Table 18). Apart from the downstream site (SW1), which was dry during the fall sampling period and could not be sampled, suckers were the most consistently detected in Swanson Creek sites, unless the site was dewatered.

Other fish, including Chinook salmon and *Oncorhynchus* spp., were detected consistently across all sample sites in Swanson Creek but there were differences in where and when they were found. Chinook salmon were detected at SW1 in both spring and summer, but they were not detected further upstream at SW2 and SW3 until the summer and fall sampling periods.

Species diversity decreased further from the Nechako River, similar to the trends observed in Greer Creek. SW1 had the greatest number of species detected, particularly in the summer, when detections included several different minnow species. In contrast, diversity was lower at the upstream sites; longnose dace were the only minnow species detected regularly at SW2 and SW3. Notably, the only salmonid ESV detected at the furthest upstream site (SW3) during the spring was attributed to the *Salvelinus* genus.



Table 18. Detection strength of fish species in eDNA sampled from three locations in Swanson Creek in spring, summer, and fall of 2025.

Taxon	SW1			SW2			SW3		
	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall
Longnose sucker		1,249	NS	14	117		198		17
White sucker	11,590	424	NS	3,376	895		3,429	649	185
Sucker (general) ¹	21,278	44,879	NS	18,981	42,360	1,950	17,344	9,607	4,954
Sculpins (general) ¹		264	NS		84	47		162	
Lake chub	1,987		NS				140		
Peamouth		916	NS	204					
N. pikeminnow		11,152	NS			26			
Longnose dace		1,069	NS		7,170	324		2,396	
Redside shiner	213	1,020	NS						
Minnnows (general) ²	199	770	NS	98	239				
Mtn. whitefish	929	1,717	NS						
Chinook salmon	420	178	NS		51,390	16,030		76,356	17,756
Coho salmon			NS			84			
<i>Oncorhynchus</i> spp. ¹	5,852	65	NS	32	46,680	26,267		39,853	23,183
<i>Salvelinus</i> spp. ¹			NS				42		
Burbot		684	NS						

¹ Sequences that were only resolved to genus level.

² Sequences that were only resolved to family level.

NS = not sampled, SW1 was dewatered in the fall of 2025

Note: The absolute number of DNA sequence reads for each taxon (species, genus, or family) is noted along with a fill colour that represents the relative strength of detection.

Detection strength: <100 reads: Weak 100-999 reads: Good 1,000-9,999: Strong >10,000: Very Strong

3.5.2 FISH SAMPLING

Fish sampling and visual observations in Swanson Creek identified a fish community consisting of only four species: suckers, rainbow trout, Chinook salmon, and longnose dace (Table 19). Suckers, rainbow trout, and Chinook salmon were the most prevalent, exhibiting the greatest relative abundance across all sampling periods. Longnose dace were detected the least; a single individual captured at site SW2 during the spring, and two were captured at site SW1 in the summer.

All rainbow trout, Chinook salmon, and suckers captured or observed in Swanson Creek were juveniles. The size ranges recorded for these species were as follows:

- Rainbow trout - between 65 mm and 141 mm fork length.
- Chinook salmon were all less than 100 mm fork length.
- Suckers - between 40 mm and 75 mm fork length.



The sampling effort in Swanson Creek was greater in July than in June (Table 2) which affected the total number of fish caught at each visit (Table 19); Regardless, juvenile Chinook salmon captures showed large seasonal increases that exceeded the 2- to 3-fold increase in electrofishing effort. Chinook captures at SW1 increased more than five times between June and July, while catches at the furthest upstream site (SW3) increased more than 30 times over the same period.

Chinook salmon observations increased from July to September at SW2; two juvenile Chinook were caught in July and approximately 130 were in September. Conversely, fewer Chinook were observed at SW3 in September compared to July. Rainbow trout observations and catches increased at SW1 and SW2 between July and September, while remaining stable at SW3 throughout that period. No fish were observed at SW1 in September because the channel had completely dewatered.

Table 19. Fish sampling results from Swanson Creek.

Species	Count at SW1			Count at SW2			Count at SW3		
	June 11	July 8	Sept 24 ¹	June 11	July 9	Sept 22	June 11	July 9	Sept 25
Sucker (general)	7	16	-	2	1	-	1	6	-
Longnose dace	-	2	-	1	-	-	-	-	-
Rainbow trout	1	5	-	-	2	10	1	6	5
Chinook salmon	8	42	-	2	2	130	2	61	22

¹Site conditions were completely dry at the time of survey.

Note: Information about gear types and effort by sample date is included in Table 2.

Dashes (-) indicate no fish were caught.

3.5.3 FISH HABITAT ASSESSMENT

Swanson Creek followed a typical seasonal flow pattern characterized by high-energy, turbid freshet conditions followed by substantial summer drawdowns, particularly in the lower reaches. Freshet flows were visibly turbid at all three sites in Swanson Creek (Appendix Photo D-24), mirroring conditions in Greer Creek.

By August, the downstream reach of Swanson Creek (SW1) was backwatered by the Nechako River during STMP flows and Swanson Creek at SW1 had ceased flowing. By September, the channel at SW1 was completely dewatered and dry. In contrast, the upstream sites (SW2 and SW3) maintained sufficient water flows and pool depths to support fish throughout the entire sampling season (Appendix Photo D-25).

FHAP assessments were completed at three sites in Swanson Creek in September (Table 20). Applying the diagnostics of salmonid habitat condition (Table 4), the sites exhibited the following characteristics:

- Pool Frequency and Depth:** Pool area at all sites combined averaged 30.2%, which is rated as "Fair" (20% to 40%). Pool frequency was highest at SW1 (45.9% area) and lowest at SW3 (7.1% area). Mean residual pool depths were rated as "Good" at SW1 and SW2 (0.89 m) but "Poor" at SW3 (0.58 m) (Table 21).



- **Substrate Quality:** Substrate quality is rated as "Poor" across all sites. Substrates were embedded with fines in more than half of the habitat units surveyed at SW2 and SW3, and were similarly embedded at SW1.
- **Off-Channel Habitat:** Connectivity is rated as "Poor" for the system overall due to the complete seasonal dewatering of the lower reach (SW1), which eliminates late-summer access to the Nechako River.

Table 20. Sample site habitat composition in SW1, SW2 and SW3.

Sample Site	Survey Distance (m)	Percent Area per Habitat Type (%)			Number of Pools	Mean Residual Pool Depth (m)
		Riffle Area (%)	Glide Area (%)	Pool Area (%)		
SW1	403.0	46.5	7.59	45.9	6	0.89
SW2	264.6	53.7	21.4	24.9	2	0.89
SW3	288.0	73.3	19.6	7.10	2	0.58

The surveyed reach at SW1 was 403 m long with an average channel width of 10.0 m, the widest in the system. Gravel was the dominant substrate, but was highly embedded. Bank erosion from cattle access and vegetation clearing was frequently observed and appeared to be a source of sediment (Appendix Photo D-26). Cover was abundant and evenly distributed throughout the site, primarily from SWD and LWD.

SW2 was dominated by gravel and cobble substrates. While abundant cover for juveniles (10% to 20%) was provided by boulders and cobbles (Appendix Photo D-27), high embedment was noted. One patch of unembedded gravel approximately 3 m² was documented. Large log jams, containing up to 17 pieces of LWD, provided overhead cover in scour pools where juvenile Chinook and rainbow trout were frequently observed (Appendix Photo D-27).

The furthest upstream site in Swanson Creek (SW3) featured gravel and cobble mixed with large boulders. Steep, eroding banks were noted, contributing sand and gravel directly into the channel (Appendix Photo D-29). Pools at Site SW3 were a mix of dammed and scour types. Boulders and LWD were the primary cover types, with large log jams (up to 16 pieces) providing complex rearing habitat for juvenile fish (Appendix Photo D-30).



Table 21. Pool measurements from three survey sites in Swanson Creek.

Site Name	Habitat Unit	Pool Type	Pool Length (m)	Max Pool Depth (m)	Residual Pool Depth (m)
SW1	Pool 1	Scour	27.0	1.10	0.90
	Pool 5	Scour	58.0	0.90	0.70
	Pool 8	Scour	38.0	1.05	0.90
	Pool 10	Scour	20.0	0.95	0.85
	Pool 14	Scour	22.0	1.15	0.60
	Pool 17	Scour	31.0	1.45	0.95
SW2	Pool 4	Scour	16.5	1.35	1.02
	Pool 6	Scour	10.5	0.90	0.75
SW3	Pool 2	Scour	5.00	0.60	0.35
	Pool 10	Dammed	13.0	0.90	0.80

3.5.4 TEMPERATURE MONITORING

Water temperatures for Swanson Creek (Site SW1) between May and October 2025 are presented in Figure 15. Data were retrieved during field visits in August and October, though the time series was adjusted due to stream conditions and equipment performance. Specifically, the loggers were found in a dewatered section of the channel in September; as a result, data from late August to mid-October were removed from the analysis. Pronounced diurnal fluctuations confirmed the loggers had been recording the temperature of the air, not water.

The available data for Swanson Creek shows a typical temperature profile warming until a peak between late July and mid-August. Daily temperatures ranged from 16°C to 20°C, remaining consistent with the Nechako River's temperature profile of 17°C to 20°C during the STMP period (Environment Canada 2025). Due to its low gradient and proximity to the confluence, the Swanson Creek monitoring site is subject to backwatering from the Nechako River during STMP flow regulation.

Time Series Data Report
Swanson Creek Water Temperature

Mar 19, 2026 | 1 of 1

Period Selected: 2025-05-01 00:00 - 2025-10-31 23:59

UTC Offset: -07:00

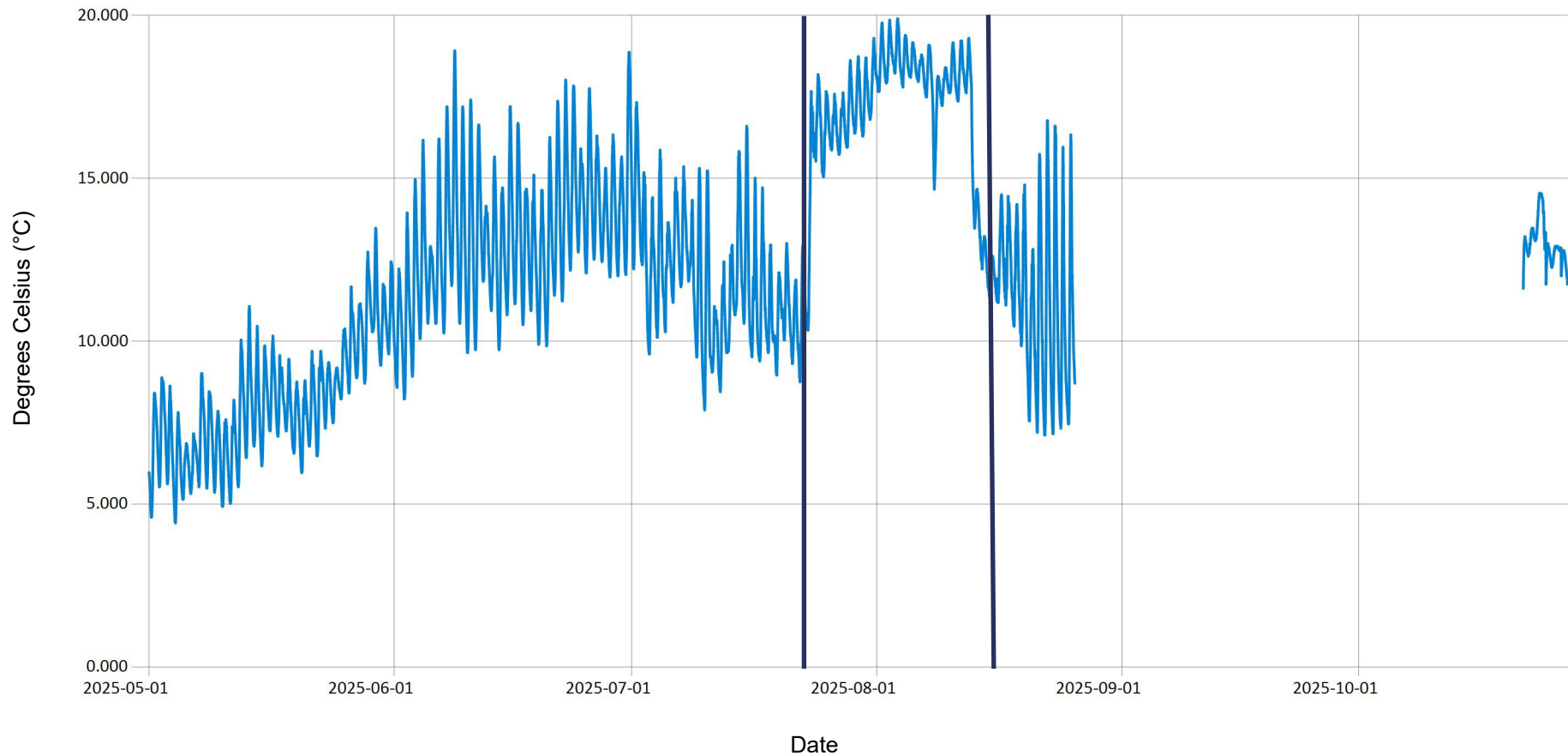


Figure 15. Swanson Creek (SW1) water temperature data from May to October 2025.

— Water Temp@BC0024 - Rio Tinto - Nechako | Summer Temperature Management Program



3.5.5 SWANSON CREEK SUMMARY

Swanson Creek is a highly productive stream for a portion of the year, but habitat becomes limited in the summer due to low flows. While the creek supports an abundance of juvenile salmonids, the seasonal dewatering near the Nechako River confluence suggests it may function as an ecological trap for fish that move upstream during the spring and early summer.

Seasonal Species Distribution and Successional Use

Fish distributions and abundances vary seasonally. In the spring, both eDNA and conventional sampling confirmed that juvenile suckers and juvenile salmonids were primarily concentrated in the lower river near SW1, where species diversity was highest. Towards July and August, juvenile Chinook abundance increased further upstream at SW2 (approximately 2.2 km upstream) and SW3 (approximately 3.7 km upstream). A less pronounced shift in abundance was observed for other species.

Swanson Creek appears to be utilized by a variety of species for juvenile rearing. Nearly all the fish captured or observed in Swanson Creek were juveniles. The 30-fold increase in juvenile Chinook captures at SW3 in July, supported by strong eDNA signals and nearly 130 individuals observed at SW2 in September, demonstrates that these upper reaches are important rearing habitats for Chinook.

While eDNA detected a wider variety of species than conventional sampling, both methods indicated the dominance of suckers, rainbow trout, and Chinook. The additional species identified via eDNA likely reflect the presence of cryptic or relatively rare fish, like sculpins and dace, which are difficult to capture or observe among the large cobbles and boulders that dominate the upstream habitat.

Historical Comparison and Habitat Quality

A comparison with the 1998 Arc Environmental Ltd. study suggests that the physical limitations of Swanson Creek have remained consistent over the last several decades. Historically, the lower reach of the creek was noted for high turbidity and "Poor" substrate quality due to agricultural land use (Arc Environmental Ltd. 1998). These conditions were also evident in 2025, where gravel and cobble embedment was high.

In the upper reaches, historical assessments identified high rearing potential but flagged low summer flows as a recurring limitation. Our data supports this and confirmed that conditions remain similar in 2025. Despite the abundant cover provided by log jams and boulders, the persistent bank erosion continues to contribute sediment that limits the quality of spawning and rearing substrates.

Thermal Regime and Backwatering

Stream temperatures in the lower reach of Swanson Creek near SW1 are closely related to those in the Nechako River, reaching a peak of 20.0°C in 2025. This temperature peak is nearly identical to the historical maximum of 20.4°C recorded in 1998 (Arc Environmental Ltd. 1998). However, the temperature loggers from 2025 were located near the confluence with the Nechako River and were influenced by backwatering of the Nechako River. Temperatures near the Nechako River reach the upper limits for optimal salmonid growth,



which likely encourages juvenile Chinook to move past the confluence and seek the more stable, perennial flows found in the upper reaches of the creek.

Overwintering Potential and Stranding Risk

The most critical limiting factor for Swanson Creek is the loss of late-season connectivity. Once the backwatering effect from the Nechako River subsides, the lower reach completely dewateres, effectively trapping juvenile fish in the upper reaches (SW2 and SW3) for the winter.

The ability of these fish to survive in Swanson Creek until the following spring is entirely dependent on the quality of the overwintering habitat. While SW2 offered reasonable pool depths that may support overwintering, overall pool frequency was low. SW3 was rated as "Poor" for both pool frequency and depth providing limited opportunity. Further investigation regarding overwintering survivorship would provide a better understanding of winter survival in Swanson Creek.

3.6 CUTOFF CREEK

3.6.1 ENVIRONMENTAL DNA

eDNA identified 10 fish species at two sites (CO1 and CO2)(Table 22). In the spring, species detections were low at CO1, and Chinook salmon was the only species identified. This finding was supported by field observations of small schools of juvenile Chinook and the absence of other taxa during a period when flows were characterized as low and slow. In August, species diversity at CO1 increased and nine species were detected. Species detections decreased at CO1 in the fall with only suckers and redbside shiners identified.

In contrast to the seasonal fluctuations noted downstream, species detections at the upstream site (CO2) remained consistent throughout the year. Suckers, lake chub, and redbside shiners, were detected during every sampling event at CO2. *Oncorhynchus* spp. were only detected at CO2 in the spring and fall.



Table 22. Detection strength of fish species in eDNA sampled from two locations in Cutoff Creek in spring, summer, and fall of 2025.

Taxon	CO1			CO2		
	Spring	Summer	Fall	Spring	Summer	Fall
Longnose sucker		2,190		2,805	3,871	3,695
White sucker		2,355				
Sucker (general) ¹		97,777	39,966	257	434	
Sculpin (general) ¹		142				
Lake chub				24,053	52,314	1,815
Peamouth		5,059				
N. pikeminnow		28,967				
Longnose dace		1,014				
Redside shiner		6,904	2,490	8288	119,463	8,656
Minnnows (general) ²		6,215		1,404		
Mountain whitefish		716				
Chinook salmon	6	120				
<i>Oncorhynchus</i> spp. ¹				729		169

¹ Sequences that were only resolved to genus level.

² Sequences that were only resolved to family level.

Note: The absolute number of DNA sequence reads for each taxon (species, genus or family) is noted along with a fill colour that represents the relative strength of detection.

Detection strength: <100 reads: Weak 100-999 reads: Good 1,000-9,999: Strong >10,000: Very Strong

3.6.2 FISH SAMPLING

Fish sampling and visual observations in Cutoff Creek revealed a fish community diversity that fluctuated in the lower reach (CO1) but remained more consistent in the upper reach (CO2).

Lower Reach Dynamics (CO1)

Species presence varied considerably between May and September. On May 30, during a period of increased flows from the Skins Lake Spillway intended to mimic a natural freshet, diversity at CO1 was high (Table 23). With the exception of several larger leopard dace, all fish captured at CO1 were juveniles under 90 mm fork length.

By July, water levels at the confluence of Cutoff Creek and the Nechako River dropped to less than 30 cm and temperatures reached a critical range of 23°C to 27°C. Very few fish were observed in the shallow sections; the only fish captured were located in deep pools (>0.5 m) situated between the first small beaver dam and a larger upstream impoundment. These pools provided a thermal refuge, with water temperatures measured at 18.0°C and abundant cover provided. Fish were not documented at CO1 during visual surveys in September.



Upstream Reach Stability (CO2)

In contrast to the lower reach, species presence at CO2 were consistent between June and July. Lake chub and redbreasted shiners were very abundant during both periods, with suckers also captured in lower numbers (Table 23). No visual observations or physical sampling were conducted at CO2 in September.

Table 23. Fish sampling results from Cutoff Creek.

Species	Count at CO1			Count at CO2	
	May 30	July 9	Sept 26	June 11	July 9
Longnose sucker	-	-	-	1	8
White sucker	29	-	-	-	-
Largescale sucker	-	-	-	1	-
Lake chub	-	-	-	119	204
N. Pikeminnow	10	-	-	-	-
Leopard dace	12	-	-	-	-
Redside shiner	-	-	-	57	80
Rainbow trout	-	1	-	-	-
Chinook salmon	35	5	-	-	-
Sockeye salmon	2	2	-	-	-

Note: Information about gear types and effort by sample date is included in Table 2.

Dashes (-) indicate no fish were caught.

3.6.3 FISH HABITAT ASSESSMENT

Cutoff Creek hydrology is influenced by a stable upstream wetland complex and a lower reach that is influenced by water level fluctuations of the Nechako River.

CO1 did not exhibit the typical spring freshet spike observed in other tributaries (Appendix Photo D-31). The upstream beaver dam and wetland complex moderated flows and because CO1 is situated at a very low elevation, it is susceptible to backwatering and flooding from the Nechako River. Backwatering was observed during the simulated freshet flows that peaked around May 30 (Figure 8) and more substantially during the STMP period when the Nechako River backwatered the lower reach of Cutoff Creek flooding the channel upstream to the first upstream beaver dam, approximately 450 m from the confluence (Appendix Photo D-32). After the STMP, water levels receded and flows at CO1 reduced considerably (Appendix Photo D-33).

An FHAP assessment was completed at CO1 in September 2025 (Table 24). Applying the diagnostics of salmonid habitat condition (Table 4), site CO1 exhibited the following characteristics:

- Pool Frequency and Depth:** Pool habitat was non-existent (0% area) at CO1, which is rated as "Poor". The habitat was highly homogenous, split almost evenly between riffles (50.4%) and glides (49.6%).



- **Substrate Quality:** Substrate quality is rated as "Poor" at CO1. Fines and gravels were the dominant types, but no unembedded substrates were present.
- **Off-Channel Habitat:** Connectivity is rated as "Poor" at CO1 due to a large beaver impoundment approximately 450 m upstream from the confluence, which appears to be a year-round impediment to fish passage.

Table 24. Sample site habitat composition in CO1.

Sample Site	Survey Distance (m)	Percent Area per Habitat Type (%)			Number of Pools	Mean Residual Pool Depth (m)
		Riffle Area (%)	Glide Area (%)	Pool Area (%)		
CO1	227.0	50.4	49.6	0.00	0	0.00

CO1 had an average channel width of 4.77 m and a gradient of <1.5%. The adjacent habitat is heavily influenced by cattle, which has led to visible bank erosion and degradation (Appendix Photo D-34). Cover was limited to trace amounts of instream vegetation, undercut banks, and SWD. The site lacked canopy closure, and the riparian zone consisted primarily of shrubs and grasses (Appendix Photo D-33).

Site CO2 consists of a beaver dam and wetland complex that characterizes most of Cutoff Creek (Appendix Photo D-35). Water levels at CO2 remained consistent throughout the year, and spring freshet timing did not have a substantial effect on the rate of flow at the road culvert. Because site CO2 is a wetland and does not follow a typical stream channel morphology, a standard FHAP was not completed.

3.6.4 TEMPERATURE MONITORING

Water temperature in Cutoff Creek (Site CO1) between April and September 2025 are presented in Figure 16. Data were retrieved during field visits in September and October, with both loggers performing reliably and providing consistent data most of the time. However, during the September visit to CO1, the loggers were found in a shallow, isolated pool. Because pronounced diurnal fluctuations suggested the site was effectively dewatered, data from late September until final logger removal were excluded from the time series.

Temperatures in early June fluctuated around 16°C until just after the STMP period began in late July. Temperatures increased quickly in late July and then gradually declined throughout the remainder of the year. During the STMP peak, Cutoff Creek's daily temperatures ranged from 18°C to 22°C, which is slightly warmer than, yet generally consistent with, the Nechako River's 17°C to 20°C profile during the STMP period (Environment Canada 2025).

The thermal profile of Cutoff Creek presented in Figure 16 is a result of its unique site characteristics and stream conditions. The loggers were positioned between two beaver dams near the Nechako River confluence: an upstream dam impounding a large volume of water to the north, and a smaller downstream dam that created a deep, well-shaded pool protected by dense overhead cover.



Field measurements taken on July 9 highlighted large temperature variation across CO1. Downstream of the temperature loggers, where the channel was mostly dewatered, readings from a handheld thermometer ranged from 22°C to 27°C, while the temperature upstream of the larger dam was 22°C. In contrast, the shaded pool between the dams where the loggers were deployed recorded a much cooler 14°C. While this pool is subject to backwatering from the Nechako River during the STMP period, the lower temperatures observed earlier in the summer suggest the area may also be influenced by groundwater discharge.

Time Series Data Report
Cutoff Creek Water Temperature

Mar 19, 2026 | 1 of 1

Period Selected: 2025-05-01 00:00 - 2025-09-30 23:59

UTC Offset: -07:00

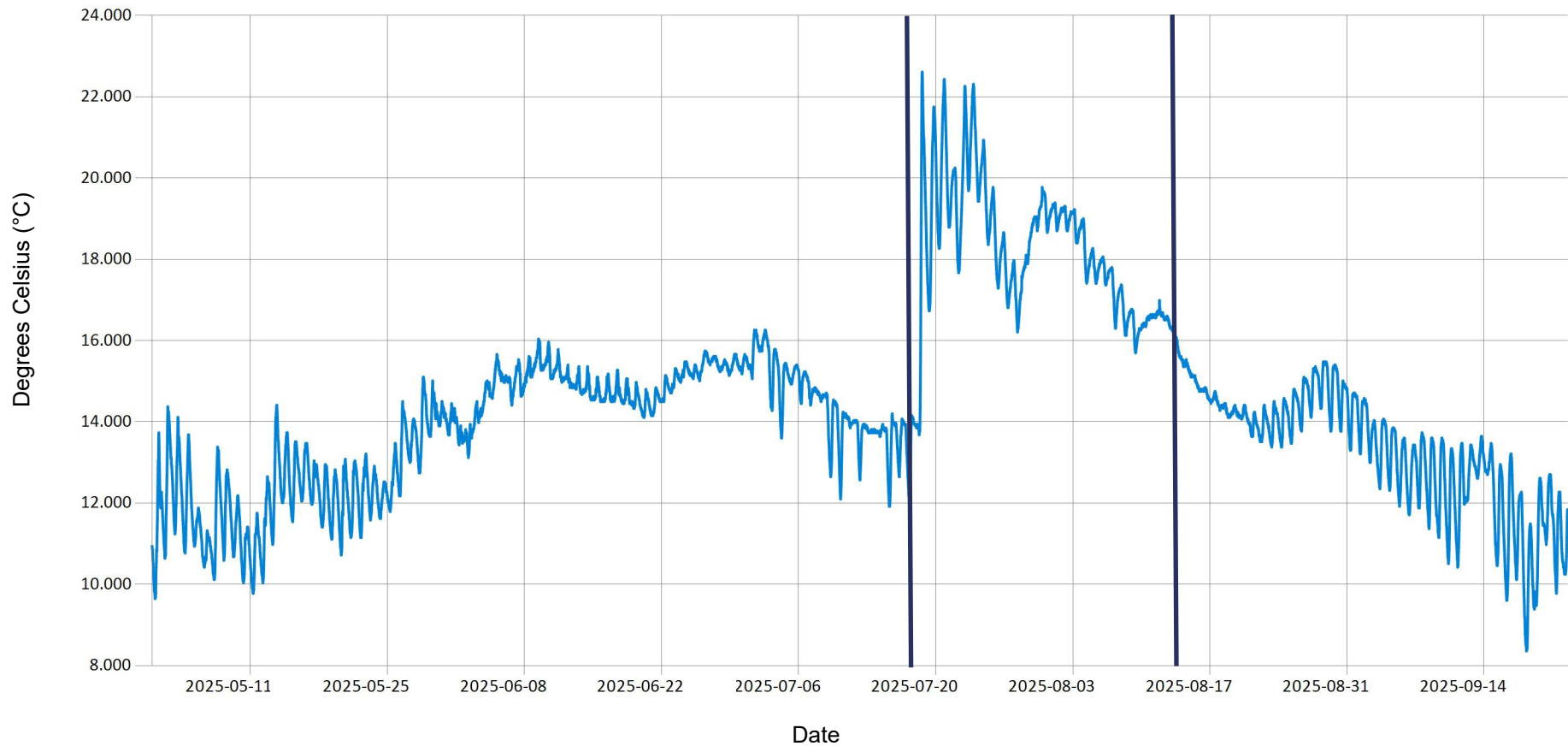


Figure 16 Cutoff Creek (C) water temperature data from May to September

Water Temp@BC0024 - Rio Tinto - Nechako | Summer Temperature Management Program



3.6.5 CUTOFF CREEK SUMMARY

Cutoff Creek appears to be defined by two distinct hydrological regimes: a stable, isolated upstream wetland complex and a lower reach that is influenced by the regulated water levels of the Nechako River.

Hydrology and Backwater Influence

Unlike other tributaries, the lower reach of Cutoff Creek (CO1) does not experience a typical spring freshet. The extensive beaver dam and wetland complex upstream of the confluence act as a hydrological buffer, which maintains minimal flows throughout the year.

However, CO1 habitat availability is influenced by the Nechako River. This reach is subject to backwatering even during minor increases in Nechako River discharge. This effect was observed on May 30, when the simulated freshet peak of approximately 90 m³/s caused the lower reach to flood, temporarily expanding the wetted area and available fish habitat.

Seasonal Fish Distribution and Successional Use

The fish community in Cutoff Creek shows a clear split between transient and resident populations. In the spring, CO1 was primarily occupied by small schools of juvenile Chinook salmon, with almost no other species detected. As Nechako backwatering peaked during the STMP period, species diversity at CO1 surged to at least nine species, including suckers, dace, and various minnows. By the fall, as the Nechako River receded and the reach nearly dewatered, only a few juvenile suckers and redbreast shiners remained.

In contrast, the upstream site (CO2) maintained a consistent resident community of lake chub, redbreast shiners, and suckers throughout the year. This stability is due to the perennial nature of the wetland habitat and its relative isolation from the Nechako River by a series of downstream beaver dams, which appear to limit the movement of mainstem species into the upper watershed.

Comparison to Historical Studies

Cutoff Creek habitat in 2025 remains similar to that noted during the 1998 FHAP assessments (Arc Environmental Ltd. 1998). Historically, the lower reach of Cutoff Creek was characterized as a low-gradient, silty environment with "Poor" substrate quality, a condition that remained unchanged in 2025. In the upstream reach that includes CO2, Arc Environmental identified a stable wetland environment with high rearing potential for non-salmonid species but noted that beaver activity created substantial impediments for fish moving up from the Nechako. Habitat assessments in 2025 confirm the continued influence of the wetland and beaver dams and resident fish community.

Thermal Micro-refugia vs. Reach-wide Stress

The thermal profile of Cutoff Creek is highly localized. While temperature loggers recorded a stable, cool 14.0°C in early summer, this result was likely due to their placement in a unique, potentially groundwater-influenced pool between two beaver dams. This specific location does not represent the broader thermal environment of the lower reach of Cutoff Creek.



During the July drawdown, measurements with a handheld thermometer at CO1 recorded temperatures between 22.0°C and 27.0°C. The small volume of water in the shallow lower reach heats up rapidly, reaching levels that exceed the optimal range most fish in the Nechako watershed (Roberge et al. 2002, Ecofish Research Ltd. 2023). While the beaver-impounded pools in Cutoff Creek provide critical micro-refugia, the rapid receding of Nechako water levels and the high temperatures in the unshaded channel segments create a high probability of stranding or thermal mortality for juvenile fish that do not retreat to the mainstem by late summer.

3.7 TWIN CREEK

3.7.1 ENVIRONMENTAL DNA

The eDNA results from Twin Creek sampling identified a fish community dominated by salmonids, with a total of at least 10 species detected across all sampling seasons (Table 25).

Table 25. Detection strength of fish species in eDNA sampled from a single location in Targe (TA1) and Twin Creeks (TW1) in spring, summer, and fall of 2025.

Taxon	TW1		
	Spring	Summer	Fall
Longnose sucker		2,643	
Sucker (general) ¹		83,548	
Prickly sculpin			51
Sculpins (general) ¹		1,172	9
Peamouth		1,396	
N. pikeminnow		13,698	
Longnose dace		5,990	
Redside shiner		5,266	
Minnows (general) ²		1,326	
Rainbow Trout	2,306		
Mountain whitefish		6,188	
Chinook salmon	30,503	39,456	30,971
<i>Oncorhynchus</i> spp. ¹	14,815	16,374	15,967
<i>Salvelinus</i> spp.		81	

¹ Sequences that were only resolved to genus level.

² Sequences that were only resolved to family level.

Note: The absolute number of DNA sequence reads for each taxon (species, genus or family) is noted along with a fill colour that represents the relative strength of detection.

Detection strength: <100 reads: Weak 100-999 reads: Good 1,000-9,999: Strong >10,000: Very Strong

Chinook salmon and *Oncorhynchus* spp. were the most prominent taxa detected throughout the year. The ESVs for these taxa showed very strong signals in every sampling event, appearing as nearly the only detections



during the spring and fall sampling periods. Species diversity in Twin Creek peaked during the summer sampling period.

3.7.2 FISH SAMPLING

Fish sampling in Twin Creek was focused on the lower 100 m of habitat across three field visits in 2025 (Table 26). Only a few fish were caught on June 10; juvenile Chinook salmon a single juvenile rainbow trout and a longnose dace. Fish abundance peaked in July, and juvenile Chinook and rainbow trout were the only species caught. All rainbow trout were under 90 mm except for one 155 mm individual. In September, juvenile Chinook and juvenile rainbow trout remained numerous in the reach. These fish were primarily concentrated in residual pools and areas of instream cover.

Table 26. Fish sampling results from Twin Creek.

Species	Fish Count		
	June 10	July 9	Sept 23
Longnose dace	1	-	-
Rainbow trout	1	13	20
Chinook salmon	5	114	30

Note: Information about gear types and effort by sample date is included in Table 2.

Dashes (-) indicate no fish were caught.

3.7.3 FISH HABITAT ASSESSMENT

Twin Creek exhibited stable hydrologic conditions with minimal fluctuations in flow in 2025. Low turbidity levels were observed through both spring freshet and summer base flows (Appendix Photo D-36). Twin Creek's small scale and stable banks limited sediment input throughout the study period.

Twin Creek typically dewateres within 200 m of the Nechako River confluence. Although fish habitat is substantially reduced in this area, upstream flows appear to be influenced by groundwater inputs, which is likely responsible for the moderated water temperatures in Twin Creek compared to the Nechako River (Figure 17). Although the wetted width remained consistent throughout the season, depths decreased in line with flows in the fall, resulting in a reduction of total functional habitat (Appendix Photo D-38).

An FHAP assessment was completed at one site in Twin Creek (TW1) over a 162 m reach (Table 27). Applying the diagnostics of salmonid habitat condition (Table 4), TW1 exhibited the following characteristics:

- **Pool Frequency and Depth:** Pool habitat was rated as "Poor" at TW1, comprising only 11.4% of the total area. Only one pool was identified within the survey reach, which was a result of a small beaver impoundment. The mean residual pool depth was 0.50 m (Appendix Photo D-38).
- **Substrate Quality:** Substrate quality is rated as "Poor" at TW1. Gravel was the dominant substrate, but high embedment rates were noted in each habitat unit.



- **Off-Channel Habitat:** Connectivity is rated as "Fair" at TW1. A small beaver dam was observed that likely allows passage during spring flows but may act as an impediment during late-summer low flows.

Table 27. Sample site habitat composition in TW1.

Sample Site	Survey Distance (m)	Percent Area per Habitat Type (%)			Number of Pools	Mean Residual Pool Depth (m)
		Riffle Area (%)	Glide Area (%)	Pool Area (%)		
TW1	162.27	55.1	33.5	1.12	1	0.50

TW1 had an average channel width of 2.09 m and a low gradient ($< 2\%$). The habitat was relatively homogenous, dominated by riffles (55.1%) and glides (33.5%). The banks were generally stable, although some material input was visible from the existing road crossing. Bank armoring has reduced some erosion risk.

Abundant cover was provided by overhanging vegetation, undercut banks, SWD, and LWD (Appendix Photo D-39). Juvenile Chinook salmon were observed in abundance throughout the stream, particularly associated with woody debris. Riparian vegetation consisted primarily of shrubs with scattered mature coniferous trees, providing very little canopy closure (0% in most units).

3.7.4 TEMPERATURE MONITORING

Water temperature data was collected at TW1 between May and October 2025 (Figure 17). In September the loggers were found in shallow water, prompting the need to relocate to a deeper section of the channel for the remainder of the season. This created a notable gap in the time series (Figure 17).

Two distinct temperature peaks were noted; one in early June and another between mid-July and mid-August. During the latter peak, daily temperatures ranged from 12°C to 15°C . This range is notably cooler than the Nechako River's profile of 17°C to 20°C during the same STMP period (Figure 10). This data suggests that the Twin Creek monitoring location is less influenced by backwatering from the Nechako River and remains cooler than the other tributaries monitored in 2025.

Time Series Data Report
Twin Creek Water Temperature

Mar 19, 2026 | 1 of 1

Period Selected: 2025-05-01 00:00 - 2025-10-31 23:59

UTC Offset: -07:00

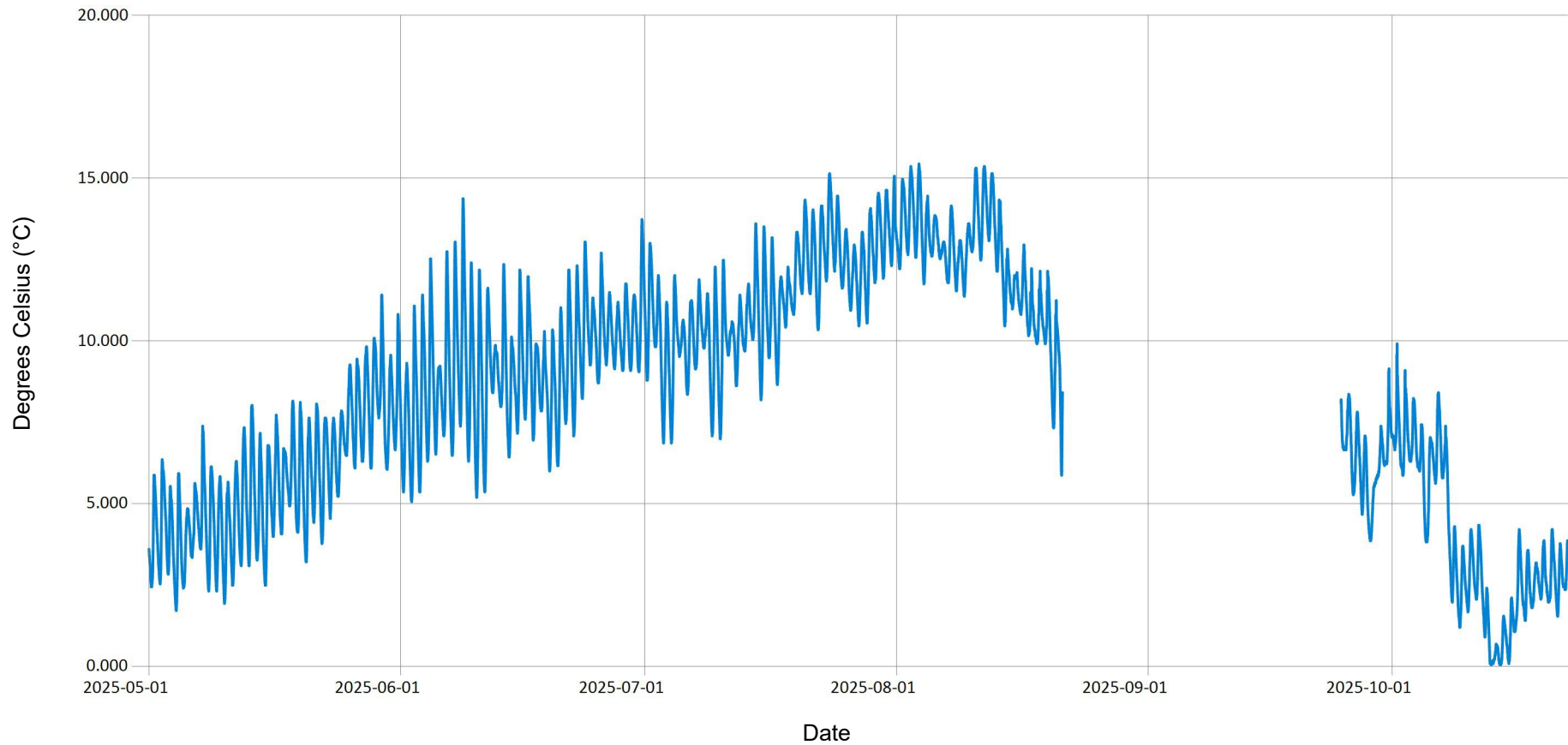


Figure 17. Twin Creek (TW1) water temperature data from May to October.

— Water Temp@BC0024 - Rio Tinto - Nechako



3.7.5 TWIN CREEK SUMMARY

Twin Creek distinguishes itself as having high-quality rearing habitat, with clear, cold water most of the year. Despite its limited spatial extent, the creek supports the highest observed densities of juvenile salmonids among the tributaries monitored in 2025.

Thermal Independence and Habitat Quality

Unlike the other tributaries surveyed, Twin Creek remains thermally independent of the Nechako River. While the Nechako River ranged from 17°C to 20°C during the STMP period, Twin Creek remained notably cooler, ranging from 12°C to 15°C, possibly due to groundwater inputs.

While the physical habitat quantity in Twin Creek is limited and there is a seasonal dewatering of the lower 200 meters, rearing habitat quality for salmonids is high. Although the FHAP diagnostics rated pool frequency as "Poor" (11.4% area), the abundant cover from overhanging vegetation, SWD, and LWD provides the necessary complexity to support high densities of fish in a small area.

Seasonal Fish Distribution and Density

Twin Creek provides thermal refuge for juvenile Chinook salmon and rainbow trout. Salmonid abundance in Twin Creek reached its seasonal peak in July with over 100 juvenile Chinook and at least 13 rainbow trout caught within 150 m. The size of these fish (Chinook <110 mm; rainbow trout mostly <90 mm) confirms that the creek provides important rearing opportunities for juvenile fish.

eDNA collected in August identified at least 10 species, a sharp increase from the salmonid-only detections in spring and fall. Since the thermal data rules out Nechako backwatering, it is likely that juveniles of other species (such as suckers and minnows) actively move into the cooler waters of Twin Creek from the mainstem during the peak of the STMP period to escape higher river temperatures and flows.

Historical Context

The importance of Twin Creek for salmonid rearing is documented in the Nechako Fisheries Conservation Program (NFCP) long-term records (Nechako Fisheries Conservation Program 2005, 2023). Past NFCP summaries have identified small, cold-water tributaries like Twin Creek as critical components of the non-natal rearing strategy for Nechako Chinook salmon.

Historically, NFCP monitoring has emphasized that even small-scale features with limited pool habitat can support disproportionately high juvenile densities if they provide thermal relief and complex cover. The observations from 2025 reinforce these historical assessments, confirming Twin Creek's value as thermal refuge.



4 CONCLUSION

The 2025 baseline assessment characterizes fish distribution and abundance in the upper Nechako River and its tributaries, suggesting that their movement is largely driven by water temperature and the connection between river and tributary habitats. Suckers and minnows were the most commonly detected fish, which matches historical observations (Envirocon Ltd. 1984). These fish thrive in warmer water, allowing them to tolerate the peak temperatures in the Nechako River and the lower sections of most tributaries throughout the summer. Salmon and trout need cooler water and were observed seeking temperature refugia in the summer months. While mountain whitefish were found in moderate numbers as adults in the main river, bull trout were not observed during any of the field surveys. However, highly sensitive eDNA testing did detect trace amounts of bull trout DNA, suggesting they may still exist in the system in very low numbers. These cold-water species prefer temperatures below 12.0°C (McPhail and Baxter 1996) and would rely on temperature refugia such as groundwater-fed streams to stay in the upper Nechako Watershed.

The specific temperature preferences of different species create a seasonal shift in fish distribution. While rainbow trout can tolerate and will inhabit water up to 19.0°C, juvenile Chinook salmon prefer a much cooler range of 12.0°C to 15.0°C (Bjornn and Reiser 1991, Roberge et al. 2002). When the primary channel of the Nechako River became too warm in July and August, juvenile Chinook and rainbow trout abundance increased dramatically in cooler habitats such as Twin Creek. This small stream acts as a vital cool-water refuge, possibly fed by cold underground flows. Twin Creek had the highest density of young salmon and trout of all the tributaries, despite having the smallest channel and wetted widths. The health of fish habitats in the upper Nechako watershed is affected by the increased frequency and duration of drought and expansive land use. The lower sections of many streams dewatered in late summer, leaving fish stranded in shallow pools. Furthermore, the effects of cattle and agriculture are evident throughout the upper Nechako River, but especially in Greer and Swanson creeks, attributing to increased erosion and substrate embedment.

While species diversity and distribution in the upper Nechako River and its tributaries is similar to historical documentation, including Chinook salmon, we still don't have a clear picture of juvenile sockeye salmon rearing and migration timing downstream. Sockeye juveniles likely migrate downstream after they emerge in the spring, but little is known about the specific life history of the upper Nechako River population.



5 RECOMMENDATIONS

To support fish habitat conservation and improve our understanding of the upper Nechako watershed, the following recommendations should be considered:

- **Studying the Effects of Spring Flows on Chinook Migration:** This report assumes the 2025 timing was likely beneficial based on the research of Sykes et al. (2009) and Bradford (1994, 2021). However, a dedicated study of how different age classes (Age-0+ and Age-1+) respond to the new flow regime in the spring would be beneficial. This is particularly important because Sykes et al. (2009) found that Nechako Chinook are unique; unlike many other populations where higher flows typically help fish move, Nechako smolts may actually slow down or stop migrating if flows increase. A study would help move past these assumptions and provide a better understanding of how the "simulated freshet" affects fish movement and survival.
- **Twin Creek Habitat Enhancement:** Twin Creek is an important thermal refuge for juvenile salmonids in the Nechako River, but the quantity and quality of the available habitat is currently limited. Making pools deeper and adding more logs or branches for cover would help more young salmon survive the summer heat.
- **Addressing Agricultural Effects:** Investigate opportunities to restrict cattle access into Greer and Swanson Creeks to prevent accelerated erosion and sediment loading.
- **Overwintering Survival in Swanson Creek:** Juvenile Chinook and rainbow trout that migrate into Swanson Creek in the early summer become trapped in late fall when the lower reach of the creek dewater. Water quality and fish sampling in late winter and early spring would help to understand whether fish are surviving the winter and whether juvenile Chinook are able to migrate downstream.
- **Sockeye Salmon Investigation:** Further studies are needed to better understand the life history of upper Nechako sockeye. Specifically, studies should focus on juveniles' movements and migration.
- **The Canyon Survey:** Carry out a more detailed study of the Nechako Canyon to understand the potential effects of restoring flows to the canyon. This study should include fish and wildlife baseline investigations.



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APPENDICES



**APPENDIX A JONAH VENTURES EDNA
LABORATORY METHODS**



The methods detailed in this Appendix were used to process the water samples collected from the Nechako River watershed for this study. The descriptions have been provided by Jonah Ventures, the commercial lab that did the eDNA analysis.

Sample Process

Sample barcodes were recorded and assigned a corresponding lysate tube. Sample filters, lysis buffer, and proteinase K were heated to 56°C for one hour. Under a laminar flow hood, warm lysis buffers were pushed through the filter housing, and all supernatant was collected in the corresponding lysate tube. Tubes were placed in an incubator overnight at 56°C. After incubation the lysate tubes were immediately processed.

Extraction

Genomic DNA from samples was extracted using the Omega Biotek Mag-Bind Blood & Tissue DNA HDQ 96 Kit (4x96 Preps) (Cat. No./ID: M6399-01) according to the manufacturer's protocol. Whole (25 mm or 47 mm) filters were used for genomic DNA extraction. The extraction protocol was automated and completed using a Hamilton Microlab Starlet. Genomic DNA was eluted into 100 µL and frozen at -20°C.

Polymerase Chain Reaction (PCR)

Portions of hyper-variable regions of the mitochondrial 12S ribosomal RNA (rRNA) gene were PCR amplified from each genomic DNA sample using the MiFish-U primers (Miya et al. 2015) with spacer regions. Both forward and reverse primers also contained a 5' adaptor sequence to allow for subsequent indexing and Illumina sequencing. PCR amplification was performed in replicates of six and all six replicates were not pooled and kept separate. Each 25 µL PCR reaction was mixed according to the Promega PCR Master Mix specifications (Promega catalogue #M5133, Madison, WI) which included 12.5 µL Master Mix, 0.5 µM of each primer, 1.0 µL of gDNA, and 10.5 µL DNase/RNase-free H₂O. DNA was PCR amplified using the following conditions: initial denaturation at 95°C for 3 minutes, followed by 45 cycles of 20 seconds at 98°C, 30 seconds at 60°C, and 30 seconds at 72°C, and a final elongation at 72°C for 10 minutes.

Forward Primer sequence: 5'-GTCGGTAAAACCTCGTGCCAGC-3'

Reverse Primer sequence: 5'-CATAGTGGGGTATCTAATCCCAGTTTIG-3'

Gel

To determine amplicon size and PCR efficiency, each reaction was visually inspected using a 2% agarose gel with 5 µL of each sample as input.

Polymerase Chain Reaction (PCR) Amplicon Cleanup

Amplicons were cleaned by incubating amplicons with Exo1/SAP for 30 minutes at 37°C following by inactivation at 95°C for 5 minutes and stored at -20°C.



Barcoding Polymerase Chain Reaction (PCR)

A second round of PCR was performed to complete the sequencing library construct, appending the final Illumina sequencing adapters and integrating sample-specific, dual index sequences (2 x 10 base pairs (bp)). The indexing PCR included Promega Master mix, 0.5 μ m of each primer and 2 μ L of template DNA (cleaned amplicon from the first PCR reaction) and consisted of an initial denaturation of 95°C for 3 minutes followed by 8 cycles of 95°C for 30 seconds, 55°C for 30 seconds and 72°C for 30 seconds.

Polymerase Chain Reaction (PCR) Normal Pool

Final indexed amplicons from each sample were cleaned and normalized using mag-bind normalization. A 15 μ L aliquot of PCR amplicon was purified and normalized using Cytiva SpeedBead magnetic carboxylate modified particles (#45152105050250). Samples were then pooled together by adding 5 μ L of each normalized sample to the pool.

Sequencing

Sample library pools were sent for sequencing on an Illumina MiSeq (San Diego, CA) at the Texas A&M Agrilife Genomics and Bioinformatics Sequencing Core facility using the v2 500-cycle kit (cat#MS-102-2003). Quality control measures were performed at the sequencing centre prior to sequencing the sample library pools.

Bioinformatics

Raw sequence data were demultiplexed using phenix v2.1.0 (Galanti et al. 2024), enforcing strict matching of sample barcode indices (i.e., no errors). Cutadapt v3.4 (Martin 2011) was then used to remove gene primers from the forward and reverse reads, discarding any read pairs where one or both primers (including a 6 bp, fully degenerate prefix) were not found at the expected location (5') with an error rate <0.15. Read pairs were then merged using vsearch v2.15.2 (Rognes et al. 2016), discarding resulting sequences with a length of <130 bp, >210 bp, or with a maximum expected error rate (Edgar and Flyvbjerg 2015) >0.5 bp.

For each sample, reads were then clustered using the UNOISE2 denoising algorithm (Edgar 2016) as implemented in vsearch, using an alpha value of 5 and discarding unique raw sequences observed less than 8 times. Counts of the resulting exact sequence variants (ESVs) were then compiled and putative chimeras were removed using the uchime3 algorithm, as implemented in vsearch.

For each final ESV, a consensus taxonomy was assigned using a custom best-hits algorithm and a reference database consisting of publicly available sequences (Benson et al. 2005) as well as Jonah Ventures voucher sequences records. Reference database searching used an exhaustive semi-global pairwise alignment with vsearch, and match quality was quantified using a custom, query-centric approach, where the percent match ignores terminal gaps in the target sequence, but not the query sequence. The consensus taxonomy was then generated using either all 100% matching reference sequences or all reference sequences within 1% of the top match, accepting the reference taxonomy for any taxonomic level with >90% agreement across the top hits.



**APPENDIX B EDNA SAMPLING
INFORMATION**



Appendix Table B-1. Individual eDNA sample data.

Sample Site ¹	UTM Coordinates	Filtered Volume (mL)		
		Spring	Summer	Fall
NC1	10U 371687 5945486	750	240	240
NC2	10U 371131 5944758	650	250	300
NC3	10U 371315 5944149	1,500	500	540
NC4	10U 371481 5941937	1,100	230	420
NC5	10U 370906 5940653	268	500	280
NC6	10U 370617 5939176	140	600	210
NC7	10U 370671 5939055	420	500	300
NR1	10U 386689 5954698	550	600	960
NR2	10U 385031 5954344	600	700	1,000
NR3	10U 382988 5953051	600	700	1,200
TA1	10U 386288 5955574	370	220	360
SW1	10U 385342 5954827	155	280	- ²
SW2	10U 386268 5953320	125	1,500	480
SW3	10U 387525 5953662	128	1,500	1,200
GR1	10U 393581 5959983	40	700	480
GR2	10U 400696 5964757	70	600	540
GR3	10U 409910 5962811	140	1,000	600
CO1	10U 383531 5953109	850	170	300
CO2	10U 381439 5951961	950	200	255
TW1	10U 378259 5950124	1,200	450	1,920

¹Sample sites are coded with two letters that represent the waterbody, and numbers are ascending from downstream to upstream locations.

²No sample was taken as conditions were completely dry.



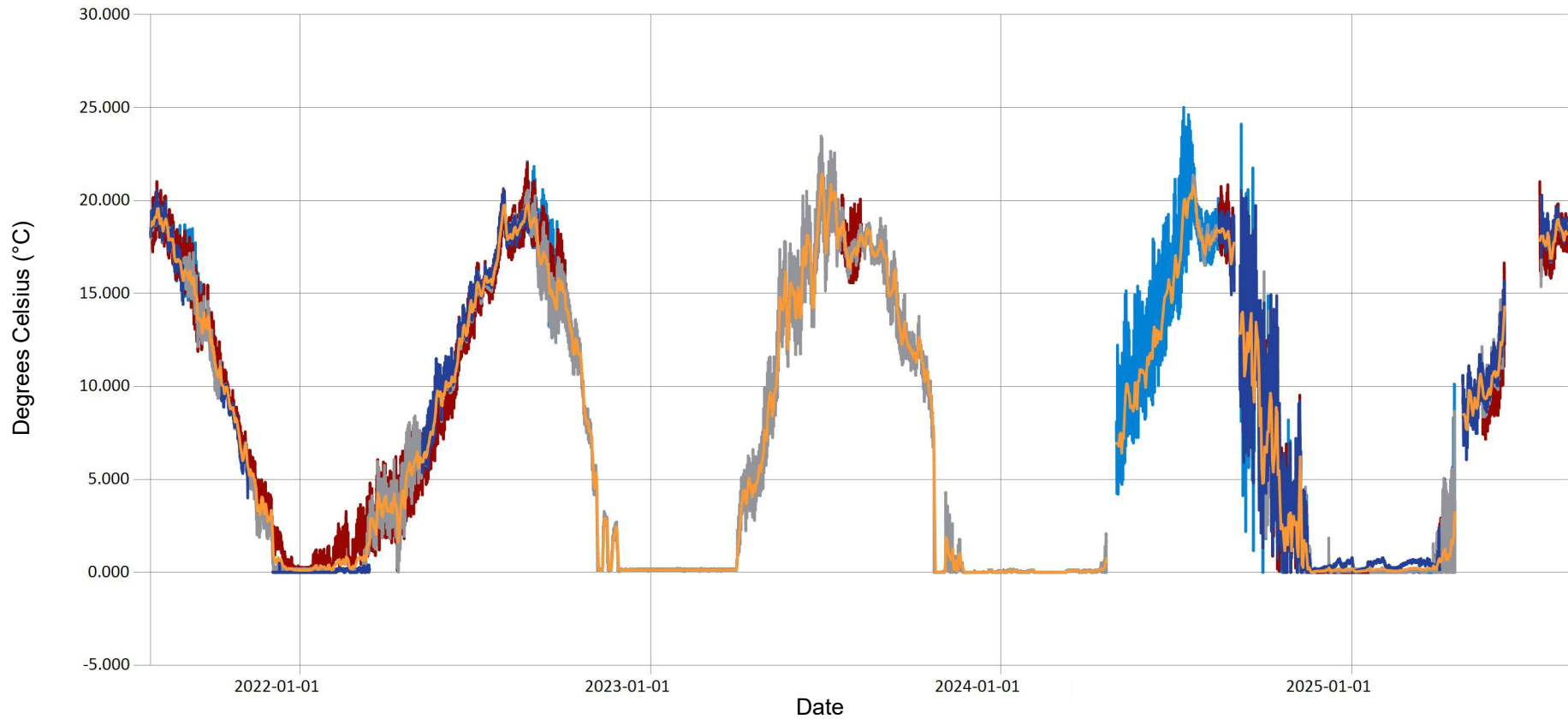
**APPENDIX C TEMPERATURE LOGGER
RECORD AND
SUPPLEMENTARY FIGURES**

Time Series Data Report

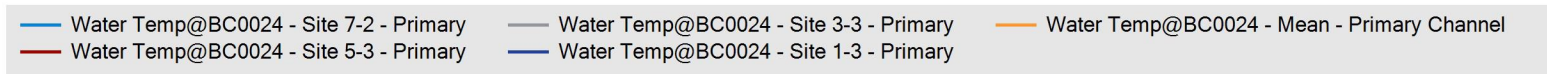
Nechako River - Primary Channel Water Temperature

Dec 8, 2025 | 1 of 1

Period Selected: Entire Record UTC Offset: -07:00



Appendix C: Figure 1.Nechako River primary channel mean temperature data according to individual loggers.

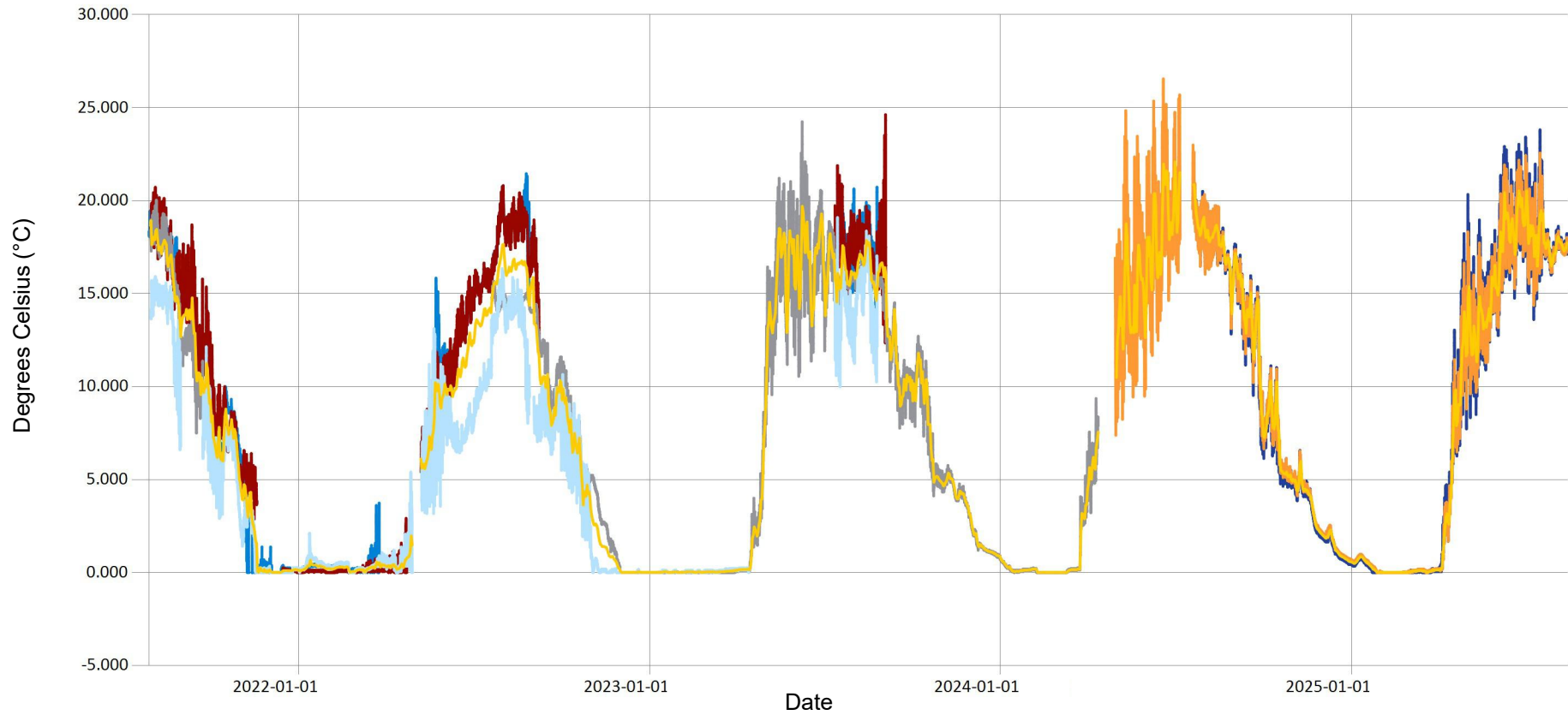


Time Series Data Report

Nechako River - Back Channel Water Temperature

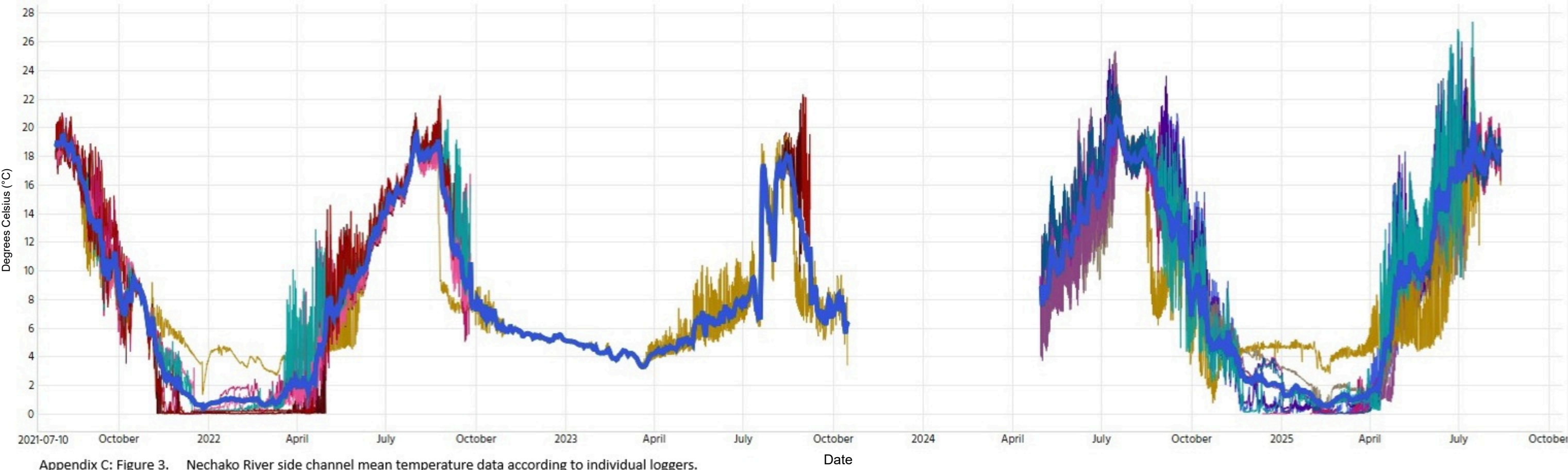
Dec 8, 2025 | 1 of 1

Period Selected: Entire Record UTC Offset: -07:00



Appendix C: Figure 2. Nechako River back channel mean temperature data according to individual loggers.

Water Temp@BC0024 - Site 1-2 - Back	Water Temp@BC0024 - Site 4-1a - Back	Water Temp@BC0024 - Site 5-4 - Back
Water Temp@BC0024 - Site 3-2 - Back	Water Temp@BC0024 - Site 4-1b - Back	Water Temp@BC0024 - Mean - Back Channel
Water Temp@BC0024 - Site 4-1 - Back		



Appendix C: Figure 3. Nechako River side channel mean temperature data according to individual loggers.

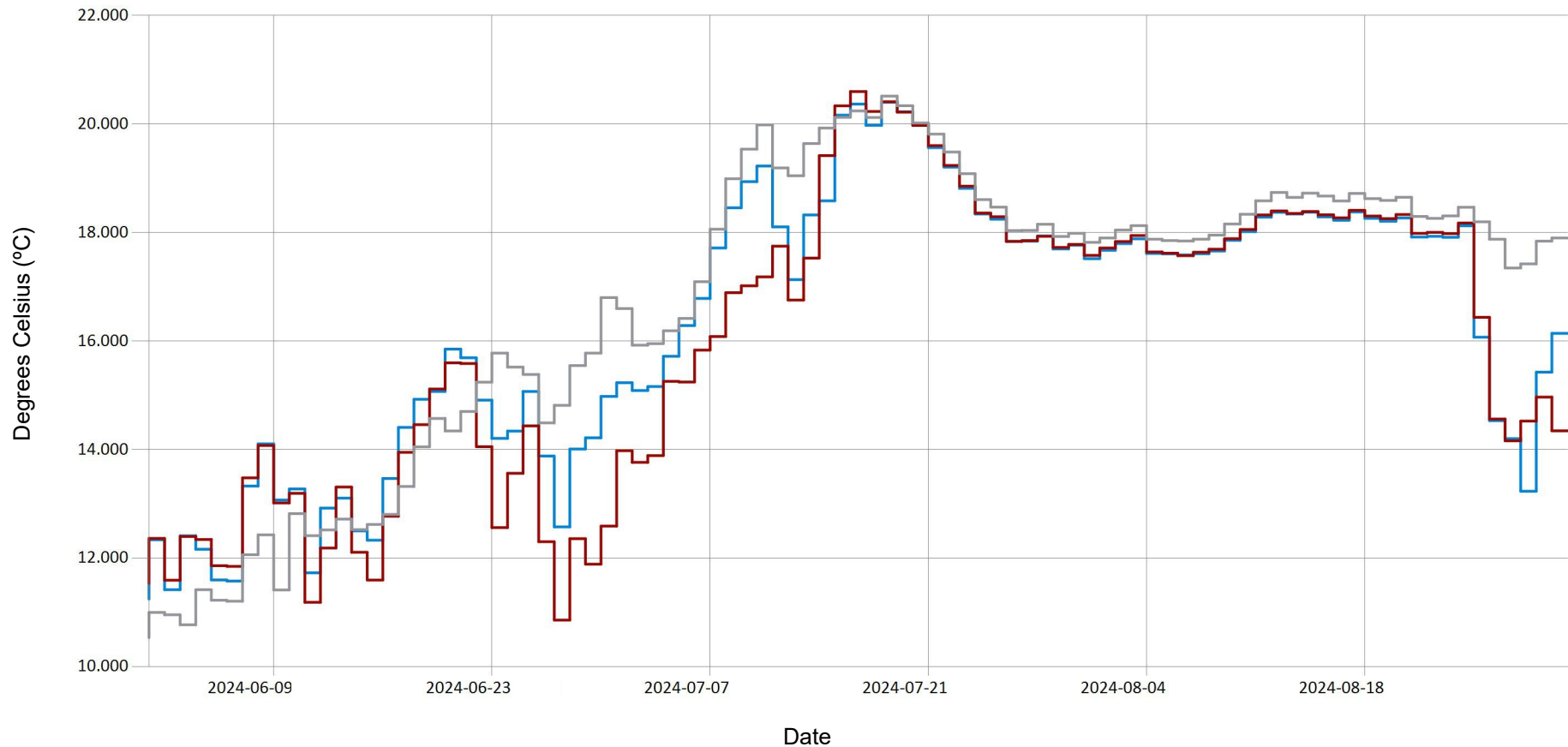
Time Series Data Report

Nechako River - Side Channel Site 7 Ch 01 Water Temperature

Mar 2, 2026 | 1 of 1

Period Selected: 2024-06-01 00:00 - 2024-08-31 23:59

UTC Offset: -07:00



Appendix C: Figure 4. Site 7 Side Channel 1 water temperature data according to upper and mid-channel loggers from June to August 2024.

— Mid Site 7 - Ch01 Side Daily Mean
 — Upper Site 7 - Ch01 Side Daily Mean
 — WSC - 08JA017 Daily Mean

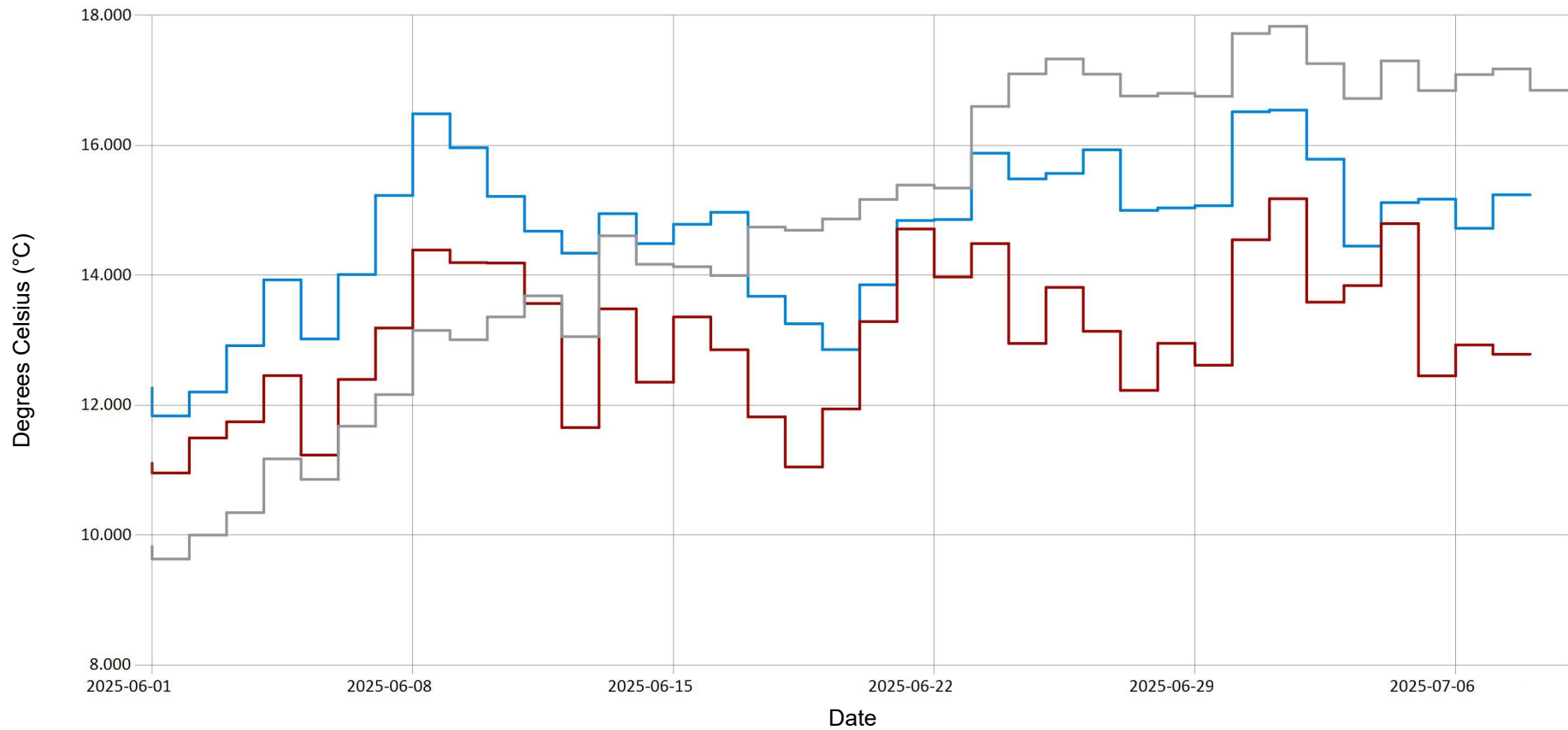
Time Series Data Report

Nechako River - Side Channel Site 7 Ch 01 Water Temperature

Mar 19, 2026 | 1 of 1

Period Selected: 2025-06-01 00:00 - 2025-07-09 23:59

UTC Offset: -07:00



Appendix C: Figure 5. Site 7 Side Channel 1 water temperature data according to upper and mid-channel loggers from June to July 2025.

— Mid Site 7 - Ch01 Side Daily Mean — Upper Site 7 - Ch01 Side Daily Mean — WSC - 08JA017 Daily Mean

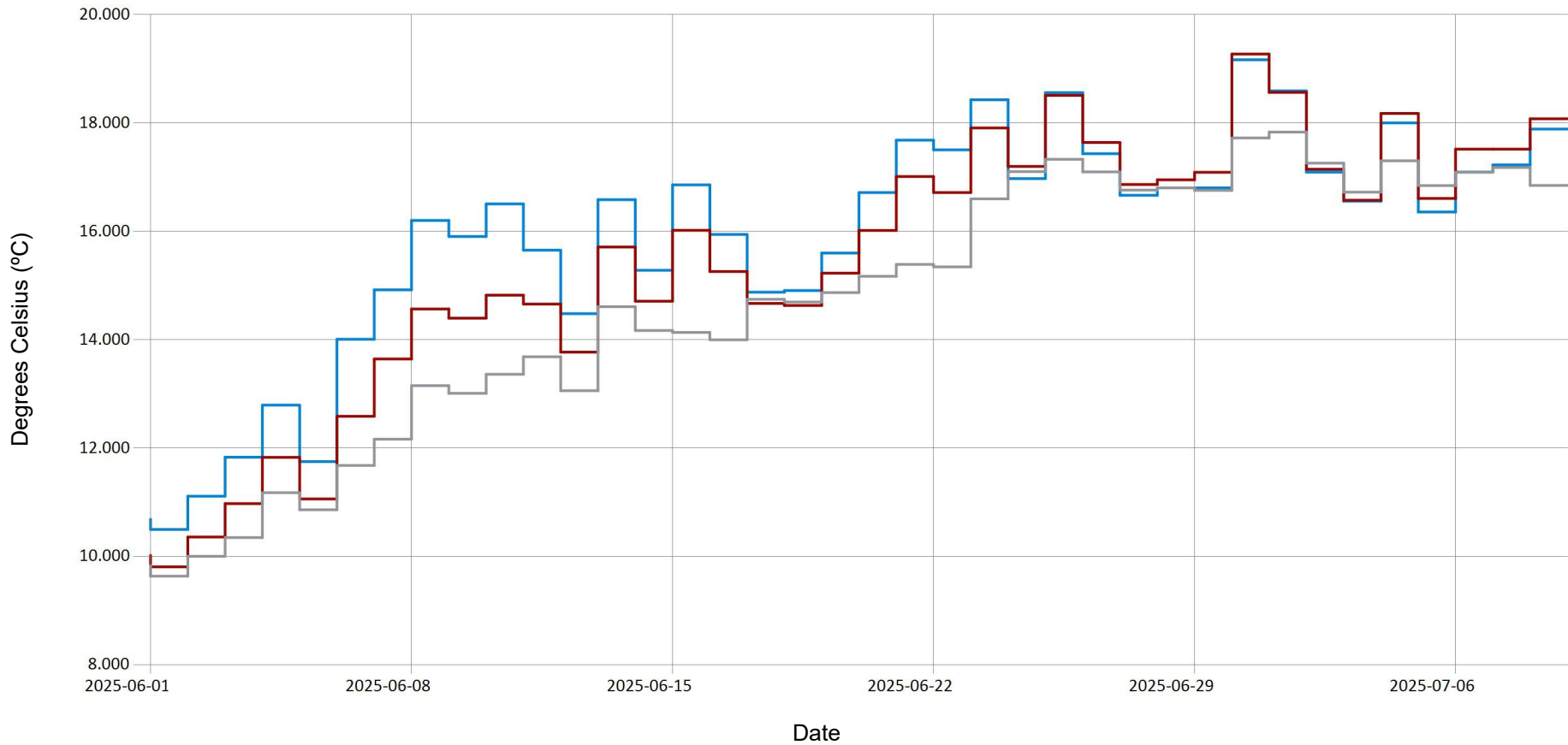
Time Series Data Report

Nechako River - Side Channel Site 7 Ch 02 Water Temperature

Mar 2, 2026 | 1 of 1

Period Selected: 2025-06-01 00:00 - 2025-07-09 23:59

UTC Offset: -07:00



Appendix C: Figure 6. Site 7 Side Channel 2 water temperature data according to upper and lower channel loggers from June to July 2025.

— Lower Site 7 - Ch02 - Side Daily Mean — Upper Site 7 - Ch02 Side Daily Mean — WSC - 08JA017 Daily Mean

Appendix C: Table 1. 2024-2025 Temperature Logger Record

Logger Number	SN	SN Replacement	Download Date	Site	Crew (initials)	Habitat	UTM Easting	UTM Northing
1	21694532	22203346	12-Aug-25	1-1	MB/TR	Side	400007	5989081
2	21694547	22103343	12-Aug-25	1-2	MB/TR	Back	400227	5988914
3	-	22203337	12-Aug-25	1-2 (Duplicate)	MB/TR	Back	400227	5988914
4	21694534	-	12-Aug-25	1-3	MB/TR	Primary	399558	5990016
5	-	22103338	12-Aug-25	1-3 (Duplicate)	MB/TR			
6	21694546	-	12-Aug-25	3-1	MB/TR	Side	403521	5983493
7	21694531	-	12-Aug-25	3-1 (duplicate)	MB/TR	Side	403521	5983493
8	21697035	22203354	12-Aug-25	3-2	MB/TR	Back	403563	5982930
9	21697032	-	12-Aug-25	3-2 (duplicate)	MB/TR	Back	403563	5982930
10	21697044	-	12-Aug-25	3-3	MB/TR	Primary	403189	5984451
11	21694533	-	13-Aug-25	4-1	MB/TR	Back	390110	5956801
12	21694564	-	13-Aug-25	4-1 (duplicate)	MB/TR	Back	390110	5956801
13	21694563	-	13-Aug-25	4-2	MB/TR	Side	389676	5956721
14	21697043	-	13-Aug-25	4-2 (duplicate)	MB/TR	Side	389676	5956721
15	21694562	Lost, did not replace.	13-Aug-25	4-3	MB/TR	Side	390425	5957794
16	21697038	Lost, did not replace.	13-Aug-25	4-3 (duplicate)	MB/TR	Side	390425	5957794
17	21697033	-	13-Aug-25	5-1	MB/TR	Side	383224	5953073
18	21697036	-	13-Aug-25	5-2	MB/TR	Side	383130	5952811
19	21694545	-	13-Aug-25	5-3	MB/TR	Primary	382886	5952869
20	-	22203347	13-Aug-25	5-3 Duplicate	MB/TR			
21	21697034	22203329	13-Aug-25	5-4	MB/TR	Back	383002	5953241
22	21697041	Lost, did not replace.	8-Jul-25	7-1	MB/TR	Side	379318	5950038
23	21697040	-	13-Aug-25	7-2	AMF/CN	Primary	379458	5950432
24	21697042	-	8-Jul-25	7-Channel 1 Upper	MB/TR	Side	379070	5949964
25	21694549	-	8-Jul-25	7-Channel 1 Mid	MB/TR	Side	379201	5949947
26	21697041	Lost, did not replace.	8-Jul-25	7-Channel 1 Lower	MB/TR	Side	379319	5950032
27	21694550	-	8-Jul-25	7-Channel 2 Upper	MB/TR	Side	379126	5949994
28	21697039	-	8-Jul-25	7-Channel 2 Mid	MB/TR	Side	379202	5949995
29	21694551	-	8-Jul-25	7-Channel 2 Lower	MB/TR	Side	379273	5950043
30	21115430	-	30-Apr-25	Targe Creek	LM/TG	Tributary	385994	5956019
31	21115515	-	30-Apr-25	Targe Creek (Duplicate)	LM/TG	Tributary	385994	5956019
32	21115432	-	30-Apr-25	Swanson Creek	LM/TG	Tributary	385355	5954822
33	21115527	-	30-Apr-25	Swanson Creek (Duplicate)	LM/TG	Tributary	385355	5954822
34	21115517	-	30-Apr-25	Cutoff Creek	LM/TG	Tributary	383549	5953109
35	21115435	-	30-Apr-25	Cutoff Creek (Duplicate)	LM/TG	Tributary	383549	5953109
36	22102480	-	30-Apr-25	Twin Creek	LM/TG	Tributary	378263	5950125
37	22102410	-	30-Apr-25	Twin Creek (Duplicate)	LM/TG	Tributary	378263	5950125
38	21115518	-	30-Apr-25	Greer Creek	LM/TG	Tributary	393570	5959980
39	22102411	-	1-May-05	Nechako Canyon (NC2)	LM/TG	Tributary	371214	5944316
40	22102527	-	1-May-05	Nechako Canyon (NC2, Duplicate)	LM/TG	Nechako Canyon	371214	5944316

All UTM coordinates are in Zone 10 U.



APPENDIX D PHOTOS



Appendix Photo D-1. Large pooling created by beaver dam at NC 5. May 1, 2025.



Appendix Photo D-2. Deep body of water observed at Scour Hole Lake (NC2). May 1, 2025.



Appendix Photo D-3. Overview of large, deep pool at NC5 in the Nechako Canyon. May 1, 2025.



Appendix Photo D-4. Overhead view of large pool with substantial depth above NC3. May 1, 2025.



Appendix Photo D-5. Shallow areas of the canyon with abundant aquatic vegetation observed at NC 6. May 1, 2025.



Appendix Photo D-6. Large concentration of fish observed along shallow cobble-gravel bar in the Nechako River. September 9, 2025.



Appendix Photo D-7. Adult Chinook salmon mortality found by snorkelling crew in the Nechako River. September 9, 2025.



Appendix Photo D-8. LWD structure investigated for fish presence in the 2 to 4 km downstream section of the Nechako River snorkel survey. September 9, 2025.



Appendix Photo D-9. High turbidity levels observed throughout Greer Creek during freshet conditions. May 1, 2025.



Appendix Photo D-10. Reduced cover in low summer flow conditions observed at GR3 and throughout Greer Creek. July 10, 2025.



Appendix Photo D-11. One of many beaver dams observed along Greer Creek at GR2 that may impede fish passage during low flow conditions. September 25, 2025.



Appendix Photo D-12. Slow-moving section of GR1 with abundant fines. September 09, 2025.



Appendix Photo D-13. Section of bank erosion observed at GR2. September 23, 2025.



Appendix Photo D-14. Beaver dam creating the largest pool habitat feature within GR1. September 23, 2025.



Appendix Photo D-15. Floating pieces of LWD within a pool observed at GR1. September 23, 2025.



Appendix Photo D-16. Interstitial spacing filled between gravels at GR2. September 23, 2025.



Appendix Photo D-17. Large cutbank eroding sand and fines into Pool 1 at GR2. September 23, 2025.



Appendix Photo D-18. Dammed pool at GR3 that may be an impediment to fish passage during low flows. September 23, 2025.



Appendix Photo D-19. Longnose suckers spawning in Targe Creek near the Nechako River. May 30, 2025.



Appendix Photo D-20. Moderate turbidity levels observed at Targe Creek during freshet conditions. April 30, 2025.



Appendix Photo D-21. Bank erosion observed along Targe Creek. April 30, 2025.



Appendix Photo D-22. One of several beaver dams identified along TA1. September 24, 2025.



Appendix Photo D-23. Dry channel at TA1. September 24, 2025.



Appendix Photo D-24. Turbid freshet conditions observed at SW3, representative of all three sites on Swanson Creek. April 30, 2025.



Appendix Photo D-25. Flow levels observed at SW2, representative of the middle and upper Swanson Creek sites. September 22, 2025.



Appendix Photo D-26. Eroded banks with signs of cattle activity and vegetation clearing observed at SW1. September 24, 2025.



Appendix Photo D-27. Cobble and boulder cover observed at SW2. September 24, 2025.



Appendix Photo D-28. A large LWD jam providing substantial overhead cover for juvenile salmonids in SW2. September 24, 2025.



Appendix Photo D-29. Steep, eroding bank contributing sediment load at SW3. September 24, 2025.



Appendix Photo D-30. A large LWD jam providing overhead cover at SW3. September 24, 2025.



Appendix Photo D-31. Spring flows observed in CO1 during freshet. April 30, 2025.



Appendix Photo D-32. Low water conditions at CO1 near the Nechako River confluence. July 9, 2025.



Appendix Photo D-33. Reduced flows present throughout CO1 in the fall. September 26, 2025.



Appendix Photo D-34. Bank erosion and signs of cattle activity observed at CO1. September 26, 2025.



Appendix Photo D-35. Overview of wetland complex observed at CO2. June 11, 2025.



Appendix Photo D-36. Consistent low turbidity observed at TW1 throughout the sampling season. September 23, 2025.



Appendix Photo D-37. Low flow present in the fall, reducing cover utilization at TW1. September 23, 2025.



Appendix Photo D-38. Small pool created by a beaver impoundment at TW1. September 23, 2025.



Appendix Photo D-39. Cover observed at TW1. September 23, 2025.



**APPENDIX E FISH HABITAT ASSESSMENT
PROCEDURE SITE DATA**

Appendix E: Table 1. Greek Creek 1 Fish Habitat Assessment Form.

Habitat Unit	Habitat Type	Length (m)	Channel Width (m)	Area of Habitat Unit (m)	Gradient (%)	Pool Depth (m)	Fines (%)	Gravels (%)	Cobble (%)	Boulders (%)	Interstitial Spacing	Total LWD	LWD % Pool Coverage	Pool count
1	Glide	13.3	9.50	126.35	1.0	0	55	40	5	0	Filled	0	0	0
2	Pool	24.7	8.32	205.50	0.5	1.30	80	15	5	0	Filled	0	0	1
3	Glide	55.5	8.80	488.40	0.5	0	80	20	0	0	Filled	1	30	0
4	Riffle	32.7	5.07	165.79	1.5	0	5	70	25	0	Filled	1	0	0
5	Glide	26.8	5.15	138.02	1.0	0	20	45	35	0	Filled	1	0	0
6	Pool	17.0	12.00	204.00	0.5	1.35	80	20	0	0	Filled	1	5	1
7	Riffle	9.5	15.50	147.25	1.0	0	5	75	20	0	Filled	0	0	0
8	Pool	107.0	12.50	1337.50	0.5	1.20	40	35	25	0	Filled	5	10	1
9	Glide	36.8	9.20	338.56	0.5	0	40	50	10	0	Filled	1	0	0
10	Pool	16.9	13.10	221.39	0.5	0.95	60	25	15	0	Filled	2	5	1
Average			9.91		0.8	1.15						1.2		5
Totals		340.2		3246.41			465	395	140			12		4

Diagnostic	Rating	Result	Rationale
Percent pool by area	Good	61%	> 55% pool by area. < 2% slope, < 15m wide. Beaver dam pond at unit 8 skewed results for percent. pools by area.
Pool frequency (mean pool spacing)	Poor	8.58	>4 channel widths per pool.
LWD pieces per bankfull channel width	Poor	0.35	< 1 piece of LWD per channel width.
% wood cover in pools	Poor	5.00	Most pools in low category (0-5 %).
Boulder cover in gravel-cobble riffles	Poor	0.00	< 10% boulder cover in gravel-cobble riffles.
Substrate (winter rearing habitat)	Poor		Intertices filled.
Off-channel habitat	Poor		None.
Holding pools	Good		Adequate pools/km, > 1 m deep with good cover. Backwatered pools.
Access to spawning areas	Good		No blockages.
Gravel quantity	Poor		Absent or little detected.
Gravel quality	Poor		Sand is dominant substrate at some sites.
Habitat Composition (%)	-	-	Riffles 9.6 Glides 33.6 Pool 60.6

Appendix E: Table 2. Greek Creek 2 Fish Habitat Assessment Form.

Habitat Unit	Habitat Type	Length (m)	Channel Width (m)	Area of Habitat Unit (m)	Gradient (%)	Pool Depth (m)	Fines (%)	Gravels (%)	Cobble (%)	Boulders (%)	Interstitial Spacing	Total LWD	LWD % Pool Coverage	Pool count
1	Pool	23.00	12.90	296.70	0.5	0.90	40	30	25	5	Filled	2	0	1
2	Riffle	9.97	17.72	176.67	0.5	0	15	40	40	5	Filled	0	0	0
3	Pool	51.30	12.80	656.64	0.5	1.40	45	15	15	5	Filled	13	35	1
4	Glide	28.10	9.44	265.26	1.5	0	10	50	30	10	Filled	0	0	0
5	Riffle	10.20	10.57	107.81	2.5	0	20	40	20	20	Filled	0	0	0
6	Glide	57.80	9.05	523.09	1.0	0	20	50	20	10	Filled	1	5	0
7	Riffle	8.90	11.83	105.29	2.5	0	10	30	40	20	Filled	1	0	0
8	Pool	20.30	8.90	180.67	0.5	0.55	40	30	15	5	Filled	5	15	1
9	Glide	25.50	16.90	430.95	1.5	0	10	45	35	10	Filled	3	5	0
10	Riffle	10.20	13.30	135.66	3.0	0	15	45	35	15	Filled	0	0	0
11	Pool	24.30	12.50	303.75	0.5	0.90	50	20	25	5	Filled	2	5	1
12	Glide	12.70	12.70	161.29	1.0	0	15	30	45	10	Filled	3	0	0
Average			12.38		1.3	0.94				10		2.5	5.4	
Totals		282.27		3343.78			290	425	345	120		30		4

Diagnostic	Rating	Result	Rationale
Percent pool by area	Fair	43%	40 - 55% pool by area. < 2% slope, < 15m wide. Beaver dam pond at unit 8 skewed results for percent pools by area.
Pool frequency (mean pool spacing)	Poor	5.70	>4 channel widths per pool.
LWD pieces per bankfull channel width	Good	1.32	1-2 pieces of LWD per channel width.
% wood cover in pools	Fair	5.42	Most pools in low category (0-5 %).
Boulder cover in gravel-cobble riffles	Fair	10.00	10% boulder cover in gravel-cobble riffles
Substrate (winter rearing habitat)	Poor		Intertices filled.
Off-channel habitat	Poor		None.
Holding pools	Poor		Adequate pool coverage, one pool > 1m deep with good cover.
Access to spawning areas	Good		No blockages.
Gravel quantity	Poor		Absent spawning areas due to unsuitable gravels (embedded with fines).
Gravel quality	Poor		Sand is dominant substrate at some sites.
Habitat Composition (%)	-	-	Riffles 15.7 Glides 41.3 Pool 43.0

Appendix E: Table 3. Greek Creek 3 Fish Habitat Assessment Form.

Habitat Unit	Habitat Type	Length (m)	Channel Width (m)	Area of Habitat Unit (m)	Gradient (%)	Pool Depth (m)	Fines (%)	Gravels (%)	Cobble (%)	Boulders (%)	Interstitial Spacing	Total LWD	LWD % Pool Coverage	Pool count
1	Glide	21.20	11.31	239.77	1.00	0	15	20	60	5	Filled	1	0	0
2	Riffle	4.08	15.67	63.93	2.00	0	0	15	55	30	Reduced	3	0	0
3	Glide	14.30	14.47	206.92	1.00	0	15	65	15	5	Filled	2	5	0
4	Riffle	6.30	15.10	95.13	2.00	0	5	50	40	5	Clear	2	5	0
5	Glide	36.40	12.59	458.28	0.50	0	10	30	55	5	Filled	6	5	0
6	Riffle	15.70	14.43	226.55	2.50	0	10	50	30	10	Clear	7	20	0
7	Pool	14.00	11.78	164.92	0.50	0.62	65	25	10	0	Filled	4	30	1
8	Glide	32.20	11.20	360.64	1.00	0	20	30	50	0	Reduced	10	5	0
9	Riffle	17.90	14.55	260.45	2.50	0	5	40	40	5	Clear	0	0	0
10	Glide	12.30	10.42	128.17	1.00	0	50	25	25	0	Filled	2	5	0
11	Riffle	36.90	15.05	555.35	2.50	0	10	45	40	5	Reduced	6	5	0
12	Pool	37.90	12.89	488.53	0.50	1.15	40	30	25	5	Filled	10	10	1
13	Glide	48.00	7.98	383.04	0.50	0	15	35	45	5	Reduced	8	5	0
Average			12.88		1.3	0.89				6.2		4.7	7.3	
Totals		297.2		3631.67			260	460	490	80		61		2

Diagnostic	Rating	Result	Rationale
Percent pool by area	Poor	18%	<40% pool by area. < 2% slope, < 15m wide.
Pool frequency (mean pool spacing)	Poor	11.54	>4 channel widths per pool.
LWD pieces per bankfull channel width	Good	2.64	> 2 pieces of LWD per channel width.
% wood cover in pools	Fair	7.31	Most pools in moderate category (6-20 %).
Boulder cover in gravel-cobble riffles	Poor	6.15	< 10% boulder cover in gravel-cobble riffles
Substrate (winter rearing habitat)	Fair		Intertices reduced/clear for at least 50% of the HU
Off-channel habitat	Poor		None.
Holding pools	Poor		Few pools/km, < 1.0 m deep.
Access to spawning areas	Good		Beaver dam observed, but are not considered full barriers.
Gravel quantity	Good		Frequent spawning areas, some with partially embedded gravels
Gravel quality	Poor		Sand is dominant substrate at some sites.
Habitat Composition (%)	-	-	Riffles 33.1 Glides 48.9 Pool 18.0

Appendix E: Table 4. Swanson Creek 1 Fish Habitat Assessment Form.

Habitat Unit	Habitat Type	Length (m)	Channel Width (m)	Area of Habitat Unit (m)	Gradient (%)	Pool Depth (m)	Fines (%)	Gravels (%)	Cobble (%)	Boulders (%)	Interstitial Spacing	Total LWD	LWD % Pool Coverage	Pool count
1	Pool	27.0	13.16	355.32	1.0	0.9	35	60	5	0	Filled	3	20	1
2	Riffle	18.0	9.73	175.14	3.5	0	15	75	10	0	Filled	1	0	0
3	Glide	11.0	12.71	139.81	0.5	0	40	55	5	0	Filled	2	5	0
4	Riffle	19.0	22.90	435.10	0.5	0	15	80	5	0	Filled	2	0	0
5	Pool	58.0	12.30	713.40	1.5	0.7	30	65	5	0	Filled	15	40	1
6	Riffle	51.0	12.86	655.86	1.0	0	10	75	5	0	Filled	1	0	0
7	Pool	38.0	12.50	475.00	1.5	0.9	25	70	5	0	Filled	0	0	1
8	Riffle	25.0	11.76	294.00	1.0	0	10	65	25	0	Reduced	6	0	0
9	Pool	20.0	4.34	86.80	0.5	0.85	30	55	15	0	Reduced	1	10	1
10	Riffle	20.0	9.39	187.80	1.0	0	10	75	15	0	Reduced	0	0	0
11	Glide	13.0	6.53	84.89	1.5	0	10	75	10	5	Reduced	0	0	0
12	Riffle	13.0	7.04	91.52	2.0	0	10	70	20	0	Filled	6	10	0
13	Pool	22.0	6.68	146.96	2.5	0.6	20	70	10	0	Filled	8	10	1
14	Glide	12.0	8.10	97.20	1.0	0	30	60	10	0	Reduced	0	0	0
15	Riffle	25.0	5.31	132.75	1.0	0	10	60	30	0	Reduced	0	0	0
16	Pool	31.0	5.52	171.12	1.0	0.95	45	45	10	0	Filled	8	10	1
Average			10.05		1.3	0.82				0.4		3.5	6.6	
Totals		403.0		4242.67			345	1055	185	5		53		6

Diagnostic	Rating	Result	Rationale
Percent pool by area	Fair	46%	40-55% pool by area. < 2% slope, < 15m wide.
Pool frequency (mean pool spacing)	Poor	6.68	>4 channel widths per pool.
LWD pieces per bankfull channel width	Fair	1.32	1-2 pieces of LWD per channel width.
% wood cover in pools	Fair	6.56	Most pools in moderate category (6-20 %).
Boulder cover in gravel-cobble riffles	Poor	0.38	< 10% boulder cover in gravel-cobble riffles
Substrate (winter rearing habitat)	Poor		Intertices filled.
Off-channel habitat	Poor		None.
Holding pools	Poor		Few pools/km, < 1.0 m deep.
Access to spawning areas	Seasonally dependant		Good (spring), Poor (fall) access blocked in late summer/fall due to low water conditions.
Gravel quantity	Good		Frequent spawning areas, some with partially embedded gravels
Gravel quality	Poor		Sand and small gravel are dominant substrates at some sites.
Habitat Composition (%)	-	-	Riffles 46.5 Glides 7.6 Pool 45.9

Appendix E: Table 5. Swanson Creek 2 Fish Habitat Assessment Form.

Habitat Unit	Habitat Type	Length (m)	Channel Width (m)	Area of Habitat Unit (m)	Gradient (%)	Pool Depth (m)	Fines (%)	Gravels (%)	Cobble (%)	Boulders (%)	Interstitial Spacing	Total LWD	LWD % Pool Coverage	Pool count
1	Glide	10.0	7.00	70.00	1.5	0	15	35	20	30	Filled	0	0	0
2	Riffle	45.1	14.10	635.91	6.0	0	5	25	30	40	Reduced	9	0	0
3	Glide	6.0	10.30	61.80	1.0	0	15	70	10	5	Filled	0	0	0
4	Pool	46.5	12.00	558.00	1.0	1.02	50	40	10	0	Filled	17	10	1
5	Riffle	21.5	9.30	199.95	2.5	0	10	20	45	25	Reduced	1	0	0
6	Pool	10.5	8.80	92.40	0.5	0.75	50	20	15	15	Filled	10	30	1
7	Glide	33.2	7.45	247.34	1.5	0	5	40	45	10	Reduced	6	15	0
8	Riffle	68.7	8.25	566.78	3.0	0	5	35	35	25	Clear	1	0	0
9	Glide	23.1	7.73	178.56	1.0	0	15	50	30	5	Filled	0	0	0
Average			9.44		2.0	0.89				17.2		4.9	6.1	
Totals		264.60		2610.74			170	335	240	155		44		2

Diagnostic	Rating	Result	Rationale
Percent pool by area	Poor	25%	<40% pool by area. < 2% slope, < 15m wide.
Pool frequency (mean pool spacing)	Poor	14.02	>4 channel widths per pool.
LWD pieces per bankfull channel width	Fair	1.57	1-2 pieces of LWD per channel width.
% wood cover in pools	Fair	6.11	Most pools in moderate category (6-20 %).
Boulder cover in gravel-cobble riffles	Fair	17.22	10-30% boulder cover in gravel-cobble riffles.
Substrate (winter rearing habitat)	Fair		Interstices reduced or clear for almost 50% of the habitat units.
Off-channel habitat	Poor		None.
Holding pools	Poor		Few pools/km, one pool > 1.0 m deep.
Access to spawning areas	Good		No blockages.
Gravel quantity	Poor		Very small (3x2m) spawning area. Most areas are embedded with fines.
Gravel quality	Poor		Sand is the dominant substrate at some sites.
Habitat Composition (%)	-	-	Riffles 53.7 Glides 21.4 Pool 24.9

Appendix E: Table 6. Swanson Creek 3 Fish Habitat Assessment Form.

Habitat Unit	Habitat Type	Length (m)	Channel Width (m)	Area of Habitat Unit (m)	Gradient (%)	Pool Depth (m)	Fines (%)	Gravels (%)	Cobble (%)	Boulders (%)	Interstitial Spacing	Total LWD	LWD % Pool Coverage	Pool count
1	Riffle	36.0	10.80	388.80	4.0	0	10	25	30	35	Filled	15	10	0
2	Pool	5.0	11.51	57.55	0.5	0.35	20	15	20	45	Filled	8	60	1
3	Riffle	6.0	7.19	43.14	0.5	0	20	15	25	20	Filled	1	0	0
4	Glide	5.0	5.81	29.05	0.5	0	30	40	15	15	Filled	0	0	0
5	Riffle	14.0	8.10	113.40	1.0	0	10	25	35	30	Reduced	2	10	0
6	Glide	28.0	6.64	185.92	1.5	0	15	30	40	15	Filled	5	30	0
7	Riffle	51.0	6.98	355.98	1.5	0	10	30	45	15	Filled	9	0	0
8	Glide	7.0	6.80	47.60	1.0	0	20	40	25	15	Filled	2	0	0
9	Riffle	8.0	10.30	82.40	6.0	0	5	30	50	15	Reduced	1	10	0
10	Pool	13.0	8.08	105.04	1.0	0.8	35	25	30	10	Filled	13	35	1
11	Riffle	27.0	8.28	223.56	3.0	0	10	25	35	30	Reduced	16	15	0
12	Glide	16.0	7.05	112.80	1.0	0	2	15	40	25	Filled	4	0	0
13	Riffle	16.0	7.68	122.88	2.0	0	5	25	30	40	Filled	2	0	0
14	Glide	7.0	10.75	75.25	1.0	0	15	30	30	15	Filled	1	20	0
15	Riffle	49.0	7.29	357.21	2.0	0	15	30	30	35	Filled	3	0	0
Average			8.22		1.8	0.58				24.0		5.5	12.7	
Totals		288.0		2300.58			222	400	480	360		82		2

Diagnostic	Rating	Result	Rationale
Percent pool by area	Poor	7%	<40% pool by area. < 2% slope, < 15m wide.
Pool frequency (mean pool spacing)	Poor	17.52	>4 channel widths per pool.
LWD pieces per bankfull channel width	Good	2.08	> 2 pieces of LWD per channel width.
% wood cover in pools	Fair	12.67	Most pools in moderate category (6-20 %).
Boulder cover in gravel-cobble riffles	Fair	24.00	10-30% boulder cover in gravel-cobble riffles.
Substrate (winter rearing habitat)	Poor		Intersticed filled for most habitat units.
Off-channel habitat	Poor		None.
Holding pools	Poor		Few pools/km, < 1.0 m deep.
Access to spawning areas	Good		No blockages.
Gravel quantity	Fair		Few spawning areas, some sections of suitable gravel available where fines are reduced.
Gravel quality	Poor		Sand is the dominant substrate at some sites.
Habitat Composition (%)	-	-	Riffles 73.3 Glides 19.6 Pool 7.1

Appendix E: Table 7. Targe Creek 1 Fish Habitat Assessment Form.

Habitat Unit	Habitat Type	Length (m)	Channel Width (m)	Area of Habitat Unit (m)	Gradient (%)	Pool Depth (m)	Fines (%)	Gravels (%)	Cobble (%)	Boulders (%)	Interstitial Spacing	Total LWD	LWD % Pool Coverage	Pool count
1	Glide	23.1	8.79	203.05	1.0	0	15	80	5	0	Filled	4	5	0
2	Riffle	51.5	14.66	754.99	2.0	0	5	85	10	0	Reduced	4	5	0
3	Pool	20.3	8.41	170.72	0.5	0.5	80	15	5	0	Filled	3	15	1
4	Glide	36.4	9.38	341.43	1.0	0	50	40	10	0	Filled	0	20	0
5	Riffle	22.4	10.99	246.18	1.5	0	10	65	25	0	Filled	1	5	0
6	Glide	26.0	9.75	253.50	1.0	0	50	40	10	0	Filled	3	15	0
7	Riffle	62.9	10.47	658.56	1.5	0	35	60	5	0	Filled	2	15	0
8	Glide	43.5	12.22	531.57	1.0	0	15	75	10	0	Filled	11	10	0
9	Riffle	20.0	11.34	226.80	1.5	0	10	85	5	0	Reduced	4	15	0
Average			10.67			0.5				0		3.6	11.7	
Totals		306.1		3386.80			270	545	85	0		32		1

Diagnostic	Rating	Result	Rationale
Percent pool by area	Poor	7%	<40% pool by area. < 2% slope, < 15m wide.
Pool frequency (mean pool spacing)	Poor	28.69	>4 channel widths per pool.
LWD pieces per bankfull channel width	Fair	1.12	1-2 pieces of LWD per channel width.
% wood cover in pools	Fair	11.67	Most pools in moderate category (6-20 %).
Boulder cover in gravel-cobble riffles	Poor	0.00	<10% boulder cover in gravel-cobble riffles.
Substrate (winter rearing habitat)	Poor		Intersticed filled for majority of habitat units.
Off-channel habitat	Poor		None.
Holding pools	Poor		Few pools/km, < 1.0 m deep.
Access to spawning areas	Good		Beaver dam observed, but are not considered a full barrier.
Gravel quantity	Fair		Few spawning areas, some sections of suitable gravel available where fines are reduced.
Gravel quality	Poor		Sand is the dominant substrate at some sites.
Habitat Composition (%)	-	-	Riffles 55.7 Glides 39.3 Pool 5.0

Appendix E: Table 8. Twin Creek 1 Fish Habitat Assessment Form.

Habitat Unit	Habitat Type	Length (m)	Channel Width (m)	Area of Habitat Unit (m)	Gradient (%)	Pool Depth (m)	Fines (%)	Gravels (%)	Cobble (%)	Boulders (%)	Interstitial Spacing	Total LWD	LWD % Pool Coverage	Pool count
1	Glide	3.50	1.68	5.88	1.0	0	70	20	5	5	Filled	0	0	0
2	Riffle	2.16	2.12	4.58	1.5	0	40	60	0	0	Filled	0	0	0
3	Glide	5.80	2.12	12.30	0.5	0	75	20	5	0	Filled	1	0	0
4	Riffle	1.38	2.05	2.83	1.5	0	30	70	0	0	Filled	1	0	0
5	Glide	7.85	2.15	16.88	1.0	0	55	40	5	0	Filled	3	0	0
6	Riffle	3.70	2.10	7.77	1.5	0	10	85	5	0	Filled	0	0	0
7	Glide	5.01	2.21	11.07	1.0	0	30	60	10	0	Filled	0	0	0
8	Riffle	5.00	1.78	8.90	1.0	0	25	70	5	0	Filled	0	0	0
9	Glide	4.41	1.99	8.78	0.5	0	70	30	0	0	Filled	0	0	0
10	Riffle	55.8	1.43	79.79	1.5	0	25	70	5	0	Filled	1	5	0
11	Pool	12.9	2.73	35.22	0.5	0.5	95	5	0	0	Filled	3	10	1
12	Riffle	6.18	2.12	13.10	1.0	0	10	85	5	0	Filled	0	0	0
13	Glide	5.75	2.42	13.92	1.0	0	30	70	0	0	Filled	1	15	0
14	Riffle	2.44	1.90	4.64	1.5	0	5	75	10	0	Filled	2	20	0
15	Glide	2.70	2.25	6.08	1.0	0	50	50	0	0	Filled	2	20	0
16	Riffle	7.00	2.26	15.82	1.5	0	35	65	0	0	Filled	4	5	0
17	Glide	7.20	1.62	11.66	1.0	0	65	35	0	0	Filled	6	15	0
18	Riffle	9.10	1.61	14.65	1.5	0	60	30	10	0	Filled	8	15	0
19	Glide	5.49	3.18	17.46	1.0	0	60	30	0	0	Filled	2	30	0
20	Riffle	8.90	2.13	18.96	2.0	0	55	30	5	0	Filled	2	0	0
Average			2.09			0				0.33		1.8	6.75	
Totals		162.27		310.27			895	1000	70	5		36		1

Diagnostic	Rating	Result	Rationale
Percent pool by area	Poor	11%	<40% pool by area. < 2% slope, < 15m wide.
Pool frequency (mean pool spacing)	Poor	77.55	>4 channel widths per pool.
LWD pieces per bankfull channel width	Poor	0.46	1-2 pieces of LWD per channel width.
% wood cover in pools	Fair	6.75	Most pools in moderate category (6-20 %).
Boulder cover in gravel-cobble riffles	Poor	0.33	<10% boulder cover in gravel-cobble riffles.
Substrate (winter rearing habitat)	Poor		Interstitial spacing filled for all habitat units.
Off-channel habitat	Poor		None.
Holding pools	Poor		Few pools/km, < 1.0 m deep.
Access to spawning areas	Good		No blockage.
Gravel quantity	Poor		Absent spawning areas due to unsuitable gravels (embedded with fines).
Gravel quality	Poor		Sand is the dominant substrate at most sites.
Habitat Composition (%)	-	-	Riffles 55.1 Glides 33.5 Pool 11.4

Appendix E: Table 9. Cutoff Creek 1 Fish Habitat Assessment Form.

Habitat Unit	Habitat Type	Length (m)	Channel Width (m)	Area of Habitat Unit (m)	Gradient (%)	Pool Depth (m)	Fines (%)	Gravels (%)	Cobble (%)	Boulders (%)	Interstitial Spacing	Total LWD	LWD % Pool Coverage	Pool count
1	Riffle	10.0	7.52	75.20	1.0	0	50	45	5	0	Filled	0	0	0
2	Glide	13.0	5.63	73.19	1.0	0	50	45	5	0	Filled	1	0	0
3	Riffle	3.0	5.61	16.83	1.0	0	50	45	5	0	Filled	0	0	0
4	Glide	20.0	6.37	127.40	1.0	0	60	35	5	0	Filled	0	0	0
5	Riffle	8.0	5.44	43.52	0.5	0	30	60	10	0	Filled	0	0	0
6	Glide	10.0	4.55	45.50	0.5	0	40	50	10	0	Filled	0	0	0
7	Riffle	8.0	4.48	35.84	1.0	0	30	60	10	0	Filled	0	0	0
8	Glide	11.0	6.56	72.16	0.5	0	50	50	0	0	Filled	0	0	0
9	Riffle	25.0	4.42	110.50	0.5	0	40	60	10	0	Filled	0	0	0
10	Glide	5.0	4.80	24.00	0.5	0	80	20	0	0	Filled	0	0	0
11	Riffle	35.0	3.00	105.00	1.0	0	35	35	10	0	Filled	0	0	0
12	Glide	4.0	3.50	14.00	0.5	0	45	50	5	0	Filled	0	0	0
13	Riffle	14.0	4.65	65.10	1.0	0	25	70	0	5	Filled	0	0	0
14	Glide	9.0	3.82	34.38	1.5	0	65	30	5	0	Filled	0	0	0
15	Riffle	4.0	5.00	20.00	1.5	0	60	35	5	0	Filled	0	0	0
16	Glide	21.0	4.67	98.07	1.0	0	60	30	10	0	Filled	0	0	0
17	Riffle	12.0	4.48	53.76	1.0	0	30	70	10	0	Filled	0	0	0
18	Glide	8.0	3.42	27.36	1.0	0	60	35	5	0	Filled	0	0	0
19	Riffle	3.0	4.20	12.60	1.0	0	40	60	0	0	Filled	0	0	0
20	Glide	4.0	3.24	12.96	1.0	0	60	40	0	0	Filled	0	0	0
Average			4.77			0				0.25		0.05	0	0
Totals		227		1067.37			960	925	110	5		1		

Diagnostic	Rating	Result	Rationale
Percent pool by area	Poor	0%	No pools present.
Pool frequency (mean pool spacing)	Poor	N/A	No pools present.
LWD pieces per bankfull channel width	Poor	0.02	< 1 piece per channel width.
% wood cover in pools	Poor	0.00	No pools present.
Boulder cover in gravel-cobble riffles	Poor	0.25	<10% boulder cover in gravel-cobble riffles.
Substrate (winter rearing habitat)	Poor		Interstitial spacing filled for all habitat units.
Off-channel habitat	Poor		None.
Holding pools	Poor		No pools present.
Access to spawning areas	Poor		Low flow conditions may impede passage seasonally.
Gravel quantity	Poor		Absent spawning areas due to unsuitable gravels (embedded with fines).
Gravel quality	Poor		Sand is the dominant substrate at some sites.
Habitat Composition (%)	-	-	Riffles 50.4 Glides 49.6 Pool 0.0



APPENDIX F FISH SAMPLING DATA



Appendix F-1. Fish sampling data from assessments completed in 2025.

Site Name	Species	Stage1	Quantity	Actual Fork Length (mm)	Fork Length Min (mm)	Fork Length Max (mm)
Upper Nechako River	Chinook salmon	Juvenile	2	35	-	-
	Chinook salmon	Juvenile	1	47	-	-
	Chinook salmon	Juvenile	1	40	-	-
	Chinook salmon	Juvenile	1	36	-	-
	Chinook salmon	Juvenile	1	39	-	-
	Chinook salmon	Juvenile	7	-	-	-
	Chinook salmon	Juvenile	1	38	-	-
	Rainbow trout	Juvenile	1	24	-	-
	Mountain whitefish	Adult	1	330	-	-
	Mountain whitefish	Adult	1	215	-	-
	Mountain whitefish	-	1	-	-	-
	Largescale sucker	Adult	1	445	-	-
	Largescale sucker	Juvenile	1	107	-	-
	Largescale sucker	-	50	-	-	-
	Largescale sucker	Juvenile	1	90	-	-
	Largescale sucker	Juvenile	1	100	-	-
	Largescale sucker	Adult	1	490	-	-
	Largescale sucker	Adult	1	450	-	-
	Largescale sucker	-	7	-	-	-
	Largescale sucker	Juvenile	1	30	-	-
	Largescale sucker	Adult	1	430	-	-
	Largescale sucker	Adult	1	450	-	-
	Largescale sucker	-	24	-	-	-
	Longnose sucker	-	1	-	-	-
	White sucker	-	4	-	-	-
	White sucker	Juvenile	1	60	-	-
White sucker	Adult	1	400	-	-	



Site Name	Species	Stage1	Quantity	Actual Fork Length (mm)	Fork Length Min (mm)	Fork Length Max (mm)
Upper Nechako River	White sucker	Juvenile	1	109	-	-
	Sucker (general)	Juvenile	1	39	-	-
	Leopard dace	Juvenile	1	49	-	-
	Leopard dace	Juvenile	1	52	-	-
	Leopard dace	Juvenile	1	68	-	-
	Leopard dace	Juvenile	1	52	-	-
	Leopard dace	Juvenile	1	44	-	-
	Leopard dace	Juvenile	1	59	-	-
	Leopard dace	Juvenile	1	59	-	-
	Northern pikeminnow	Adult	1	405	-	-
	Northern pikeminnow	-	2	-	-	-
	Redside shiner	Adult	1	60	-	-
	Redside shiner	Adult	1	36	-	-
	Redside shiner	Adult	1	36	-	-
	Redside shiner	Adult	1	36	-	-
	Redside shiner	Adult	1	77	-	-
	Redside shiner	Adult	1	95	-	-
	Redside shiner	Adult	1	85	-	-
	Redside shiner	Adult	1	30	-	-
	Redside shiner	Adult	1	86	-	-
Redside shiner	Adult	1	30	-	-	
Redside shiner	Adult	4	-	-	-	
Nechako River	Chinook salmon	Juvenile	1	64	-	-
	Chinook salmon	Juvenile	1	63	-	-
	Chinook salmon	-	10	-	-	-
	Chinook salmon	Juvenile	1	85	-	-
	Chinook salmon	Juvenile	1	60	-	-
	Chinook salmon	Juvenile	1	56	-	-



Site Name	Species	Stage1	Quantity	Actual Fork Length (mm)	Fork Length Min (mm)	Fork Length Max (mm)
Nechako River	Chinook salmon	Juvenile	1	67	-	-
	Chinook salmon	Juvenile	1	61	-	-
	Chinook salmon	Juvenile	1	64	-	-
	Chinook salmon	Juvenile	1	65	-	-
	Chinook salmon	Juvenile	1	66	-	-
	Longnose sucker	Juvenile	1	84	-	-
	White sucker	Juvenile	1	83	-	-
	White sucker	Juvenile	1	88	-	-
	Sucker (general)	Juvenile	1	60	-	-
	Sucker (general)	Juvenile	1	55	-	-
	Sucker (general)	Juvenile	1	45	-	-
	Sucker (general)	Juvenile	1	58	-	-
	Sucker (general)	Juvenile	1	55	-	-
	Sucker (general)	Juvenile	1	55	-	-
	Sucker (general)	Juvenile	1	54	-	-
	Sucker (general)	Juvenile	1	48	-	-
	Sucker (general)	Juvenile	1	49	-	-
	Sucker (general)	Juvenile	12	-	45	55
	Sucker (general)	Juvenile	1	55	-	-
	Northern pikeminnow	Adult	1	76	-	-
	Northern pikeminnow	Adult	107	-	15	20
	Peamouth chub	Adult	1	67	-	-
	Redside shiner	Adult	1	77	-	-
	Redside shiner	Adult	1	78	-	-
	Redside shiner	Adult	1	74	-	-
	Redside shiner	Adult	1	73	-	-
	Redside shiner	Adult	1	57	-	-
	Redside shiner	Adult	1	67	-	-



Site Name	Species	Stage1	Quantity	Actual Fork Length (mm)	Fork Length Min (mm)	Fork Length Max (mm)
Nechako River	Redside shiner	Adult	1	71	-	-
	Redside shiner	Adult	1	66	-	-
	Redside shiner	Adult	1	68	-	-
	Redside shiner	Adult	1	77	-	-
	Redside shiner	Adult	169	-	-	-
	Redside shiner	Adult	1	77	-	-
	Redside shiner	Adult	57	30	-	-
Nechako River Site 7	Leopard dace	Adult	4	-	30	40
	Leopard dace	Adult	31	-	30	75
	Northern pikeminnow	Adult	7	-	-	-
GR1	Chinook salmon	Juvenile	1	55	-	-
	Chinook salmon	Juvenile	8	-	35	42
	Chinook salmon	Juvenile	2	-	65	66
	Chinook salmon	Juvenile	1	64	-	-
	Mountain whitefish	Adult	1	198	-	-
	Sucker (general)	Juvenile	10	-	35	48
	Sucker (general)	Juvenile	1	37	-	-
	Sucker (general)	Adult	185	-	20	46
	Longnose dace	Adult	1	32	-	-
	Longnose dace	Adult	6	-	39	56
	Peamouth chub	Adult	1	55	-	-
	Redside shiner	Adult	1	53	-	-
GR2	Chinook salmon	Juvenile	1	59	-	-
	Rainbow trout	Juvenile	1	105	-	-
	Sucker (general)	Juvenile	2	-	30	34
	Sucker (general)	Juvenile	1	50	-	-
	Longnose dace	Adult	7	-	40	45
	Longnose dace	Adult	6	-	65	69



Site Name	Species	Stage1	Quantity	Actual Fork Length (mm)	Fork Length Min (mm)	Fork Length Max (mm)
GR2	Longnose dace	Adult	2	-	49	57
	Longnose dace	Adult	23	-	32	77
GR3	Rainbow trout	Juvenile	1	76	-	-
	Rainbow trout	Juvenile	1	91	-	-
	Rainbow trout	Juvenile	1	67	-	-
	Rainbow trout	Juvenile	1	66	-	-
	Rainbow trout	Juvenile	1	93	-	-
	Rainbow trout	Juvenile	1	101	-	-
	Rainbow trout	Juvenile	1	68	-	-
TA1	Chinook salmon	Juvenile	1	57	-	-
	Chinook salmon	Juvenile	1	65	-	-
	Chinook salmon	Juvenile	4	70	-	-
	Chinook salmon	Juvenile	1	57	-	-
	Chinook salmon	Juvenile	1	-	70	52
	Chinook salmon	Juvenile	1	63	-	-
	Chinook salmon	Juvenile	1	54	-	-
	Chinook salmon	Juvenile	1	55	-	-
	Chinook salmon	Juvenile	1	55	-	-
	Chinook salmon	Juvenile	1	53	-	-
	Chinook salmon	Juvenile	1	52	-	-
	Sockeye salmon	Juvenile	1	47	-	-
	Mountain whitefish	Juvenile	1	52	-	-
	Mountain whitefish	Juvenile	1	60	-	-
	Rainbow trout	Juvenile	1	128	-	-
	White sucker	Juvenile	1	39	-	-
	White sucker	Juvenile	1	37	-	-
	Leopard dace	Adult	1	64	-	-
Leopard dace	Adult	1	58	-	-	



Site Name	Species	Stage1	Quantity	Actual Fork Length (mm)	Fork Length Min (mm)	Fork Length Max (mm)
TA1	Longnose dace	Adult	1	67	-	-
	Longnose dace	Adult	1	43	-	-
	Longnose dace	Adult	1	43	-	-
	Longnose dace	Adult	1	85	-	-
	Longnose dace	Adult	1	47	-	-
	Longnose dace	Adult	1	47	-	-
	Longnose dace	Adult	1	39	-	-
	Longnose dace	Adult	1	42	-	-
	Longnose dace	Adult	1	110	-	-
	Northern pikeminnow	Adult	1	100	-	-
	Northern pikeminnow	Adult	1	100	-	-
	Northern pikeminnow	Adult	1	83	-	-
	Northern pikeminnow	Adult	1	80	-	-
	Northern pikeminnow	Adult	1	74	-	-
	Redside shiner	Adult	1	80	-	-
	Redside shiner	Adult	1	71	-	-
	Redside shiner	Adult	1	90	-	-
	Redside shiner	Adult	1	77	-	-
	Redside shiner	Adult	1	72	-	-
	Redside shiner	Adult	1	71	-	-
	Redside shiner	Adult	1	73	-	-
	Redside shiner	Adult	1	83	-	-
	Redside shiner	Adult	1	73	-	-
	Redside shiner	Adult	1	93	-	-
Redside shiner	Adult	1	86	-	-	
Redside shiner	Adult	1	84	-	-	
Prickly sculpin	Adult	1	55	-	-	
SW1	Chinook salmon	Juvenile	1	82	-	-



Site Name	Species	Stage1	Quantity	Actual Fork Length (mm)	Fork Length Min (mm)	Fork Length Max (mm)
SW1	Chinook salmon	Juvenile	1	58	-	-
	Chinook salmon	Juvenile	1	63	-	-
	Chinook salmon	Juvenile	1	56	-	-
	Chinook salmon	Juvenile	38	-	33	60
	Chinook salmon	Juvenile	8	-	35	40
	Rainbow trout	Juvenile	1	92	-	-
	Rainbow trout	Juvenile	1	118	-	-
	Rainbow trout	Juvenile	3	-	118	122
	Rainbow trout	Juvenile	1	110	-	-
	Sucker (general)	Juvenile	16	-	41	75
	Sucker (general)	Juvenile	1	67	-	-
	Sucker (general)	Juvenile	1	66	-	-
	Sucker (general)	Juvenile	7	-	40	54
	Longnose dace	Adult	1	86	-	-
	Longnose dace	Adult	1	46	-	-
SW2	Chinook salmon	Juvenile	1	72	-	-
	Chinook salmon	Juvenile	1	65	-	-
	Chinook salmon	Juvenile	2	-	35	38
	Rainbow trout	Juvenile	1	92	-	-
	Rainbow trout	Juvenile	1	111	-	-
	Sucker (general)	Juvenile	1	78	-	-
	Sucker (general)	Juvenile	2	-	40	44
	Longnose dace	Adult	1	38	-	-
SW3	Chinook salmon	Juvenile	2	-	50	-
	Chinook salmon	Juvenile	59	-	68	-
	Chinook salmon	Juvenile	1	38	-	-
	Chinook salmon	Juvenile	1	33	-	-
	Rainbow trout	Juvenile	3	-	100	125



Site Name	Species	Stage1	Quantity	Actual Fork Length (mm)	Fork Length Min (mm)	Fork Length Max (mm)
SW3	Rainbow trout	Juvenile	1	102	-	-
	Rainbow trout	Adult	1	156	-	-
	Rainbow trout	Juvenile	1	141	-	-
	Rainbow trout	Juvenile	1	65	-	-
	Sucker (general)	Juvenile	5	-	51	78
	Sucker (general)	Juvenile	1	64	-	-
	Sucker (general)	Juvenile	1	45	-	-
CO1	Chinook salmon	Juvenile	1	33	-	-
	Chinook salmon	Juvenile	4	-	-	-
	Chinook salmon	-	12	-	-	-
	Chinook salmon	Juvenile	1	42	-	-
	Chinook salmon	Juvenile	1	44	-	-
	Chinook salmon	Juvenile	1	42	-	-
	Chinook salmon	Juvenile	1	46	-	-
	Chinook salmon	Juvenile	1	39	-	-
	Chinook salmon	Juvenile	1	35	-	-
	Chinook salmon	Juvenile	1	40	-	-
	Chinook salmon	Juvenile	1	35	-	-
	Chinook salmon	Juvenile	1	34	-	-
	Chinook salmon	Juvenile	1	49	-	-
	Chinook salmon	Juvenile	1	52	-	-
	Chinook salmon	Juvenile	1	53	-	-
	Chinook salmon	Juvenile	1	67	-	-
	Chinook salmon	Juvenile	1	39	-	-
	Chinook salmon	Juvenile	1	33	-	-
	Rainbow trout	Juvenile	1	33	-	-
	Sockeye salmon	Juvenile	1	31	-	-
	Sockeye salmon	Juvenile	1	32	-	-



Site Name	Species	Stage1	Quantity	Actual Fork Length (mm)	Fork Length Min (mm)	Fork Length Max (mm)
CO1	Sockeye salmon	Juvenile	1	50	-	-
	Sockeye salmon	Juvenile	1	43	-	-
	White sucker	Juvenile	1	40	-	-
	White sucker	Juvenile	1	43	-	-
	White sucker	-	24	-	-	-
	White sucker	Juvenile	1	33	-	-
	White sucker	Juvenile	1	37	-	-
	White sucker	Juvenile	1	89	-	-
	Leopard dace	Adult	1	28	-	-
	Leopard dace	Adult	1	54	-	-
	Leopard dace	Adult	1	46	-	-
	Leopard dace	Adult	1	28	-	-
	Leopard dace	Adult	1	44	-	-
	Leopard dace	Adult	7	-	-	-
	Northern pikeminnow	Adult	1	52	-	-
	Northern pikeminnow	Adult	1	30	-	-
	Northern pikeminnow	Adult	1	48	-	-
	Northern pikeminnow	Adult	1	40	-	-
	Northern pikeminnow	Adult	5	-	-	-
	Northern pikeminnow	Adult	1	34	-	-
CO2	Largescale sucker	Juvenile	1	143	-	-
	Longnose sucker	Juvenile	1	145	-	-
	Sucker (general)	Juvenile	1	116	-	-
	Lake chub	Adult	44	-	44	94
	Lake chub	Adult	61	-	-	-
	Lake chub	Adult	58	-	60	105
	Lake chub	Adult	1	65	-	-
	Lake chub	Adult	2	-	86	-



Site Name	Species	Stage1	Quantity	Actual Fork Length (mm)	Fork Length Min (mm)	Fork Length Max (mm)
CO2	Lake chub	Adult	119	-	38	125
	Lake chub	Adult	35	-	-	-
	Lake chub	Adult	3	-	84	87
	Redside shiner	Adult	9	-	46	72
	Redside shiner	Adult	42	-	-	-
	Redside shiner	Adult	15	-	65	85
	Redside shiner	Adult	68	-	48	75
	Redside shiner	Adult	3	-	47	75
TW1	Chinook salmon	Juvenile	1	74	-	-
	Chinook salmon	Juvenile	1	43	-	-
	Chinook salmon	Juvenile	1	38	-	-
	Chinook salmon	Juvenile	1	41	-	-
	Chinook salmon	Juvenile	1	83	-	-
	Chinook salmon	Juvenile	1	43	-	-
	Chinook salmon	Juvenile	1	34	-	-
	Chinook salmon	Juvenile	1	55	-	-
	Chinook salmon	Juvenile	1	56	-	-
	Chinook salmon	Juvenile	106	-	31	66
	Chinook salmon	Juvenile	1	40	-	-
	Chinook salmon	Juvenile	1	52	-	-
	Chinook salmon	Juvenile	1	55	-	-
	Chinook salmon	Juvenile	1	50	-	-
	Rainbow trout	Juvenile	1	90	-	-
	Rainbow trout	Juvenile	1	62	-	-
	Rainbow trout	Juvenile	10	-	51	80
	Rainbow trout	Juvenile	1	91	-	-
Rainbow trout	Adult	1	155	-	-	

¹ All minnow and sculpin species are assumed to be adult life stage (longnose dace, leopard dace, lake chub, northern pikeminnow, redbside shiner, and slimy sculpins). Suckers and salmonid species <150 mm are assumed to be juvenile life stage, fish > 150 mm are assumed to be adults. Rainbow trout smaller than 50 mm were assumed to be young-of-the-year (YOY).