Water Engagement Initiative

Virtual main table meeting

25 June 2025

Agenda

- Introductions
- Cultural Share
- Hydrology report
- Annual report and effectiveness monitoring report
- Phase 1 implementation
- Technical Working Group update
- Nechako Infrastructure Studies Update
- Research and Monitoring Report
- Q&A

Cultural Share

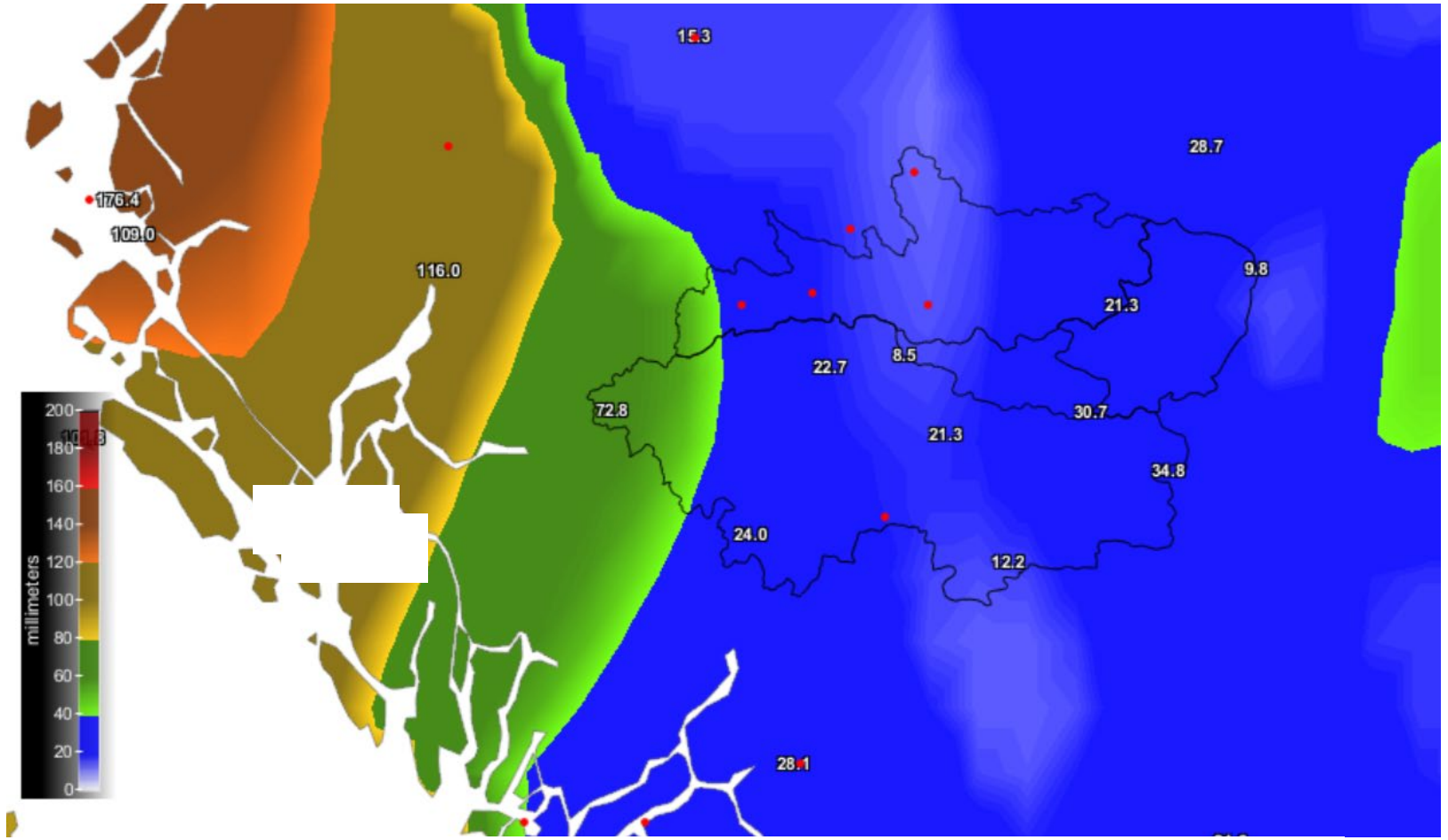
Mike Robertson, Cheslatta Carrier Nation

Hydrology

Andrew Czornohalan, Director of Energy and Watershed Partnerships,

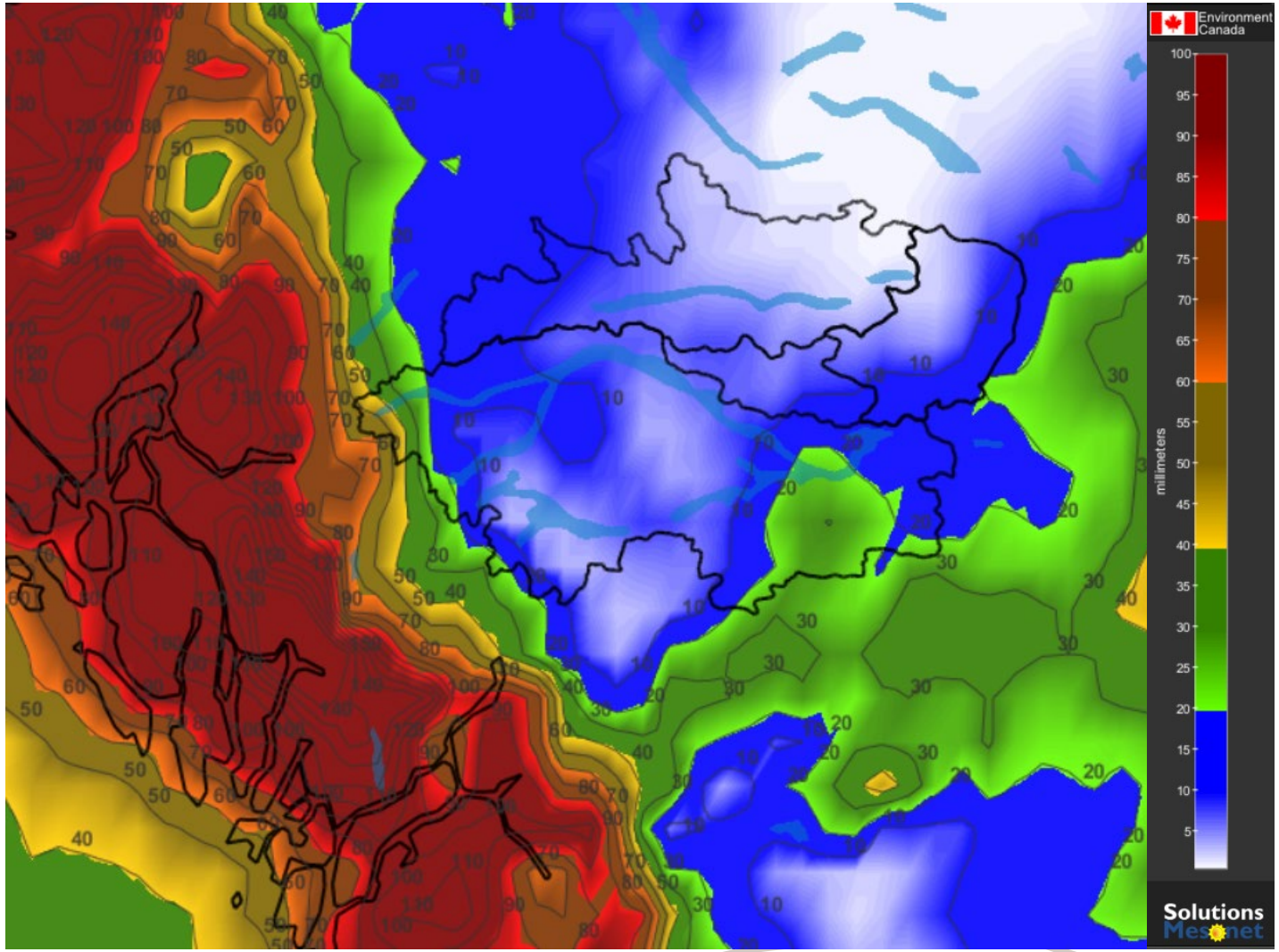
Rio Tinto BC Works

Precipitation: Last 30 days



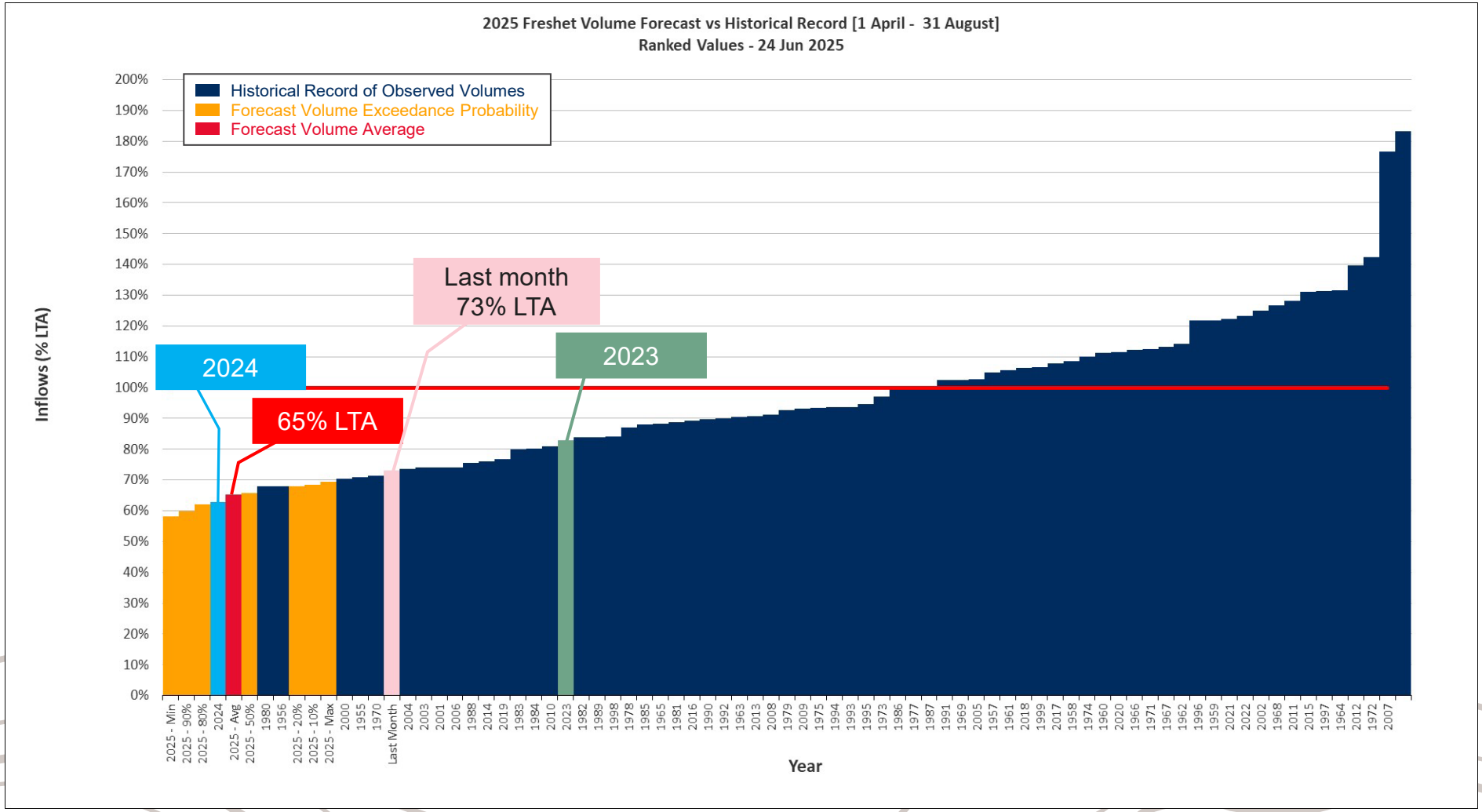
Nechako Reservoir watershed area-average = 25 mm (51% LTA)

Precipitation Forecast: Next 10 days

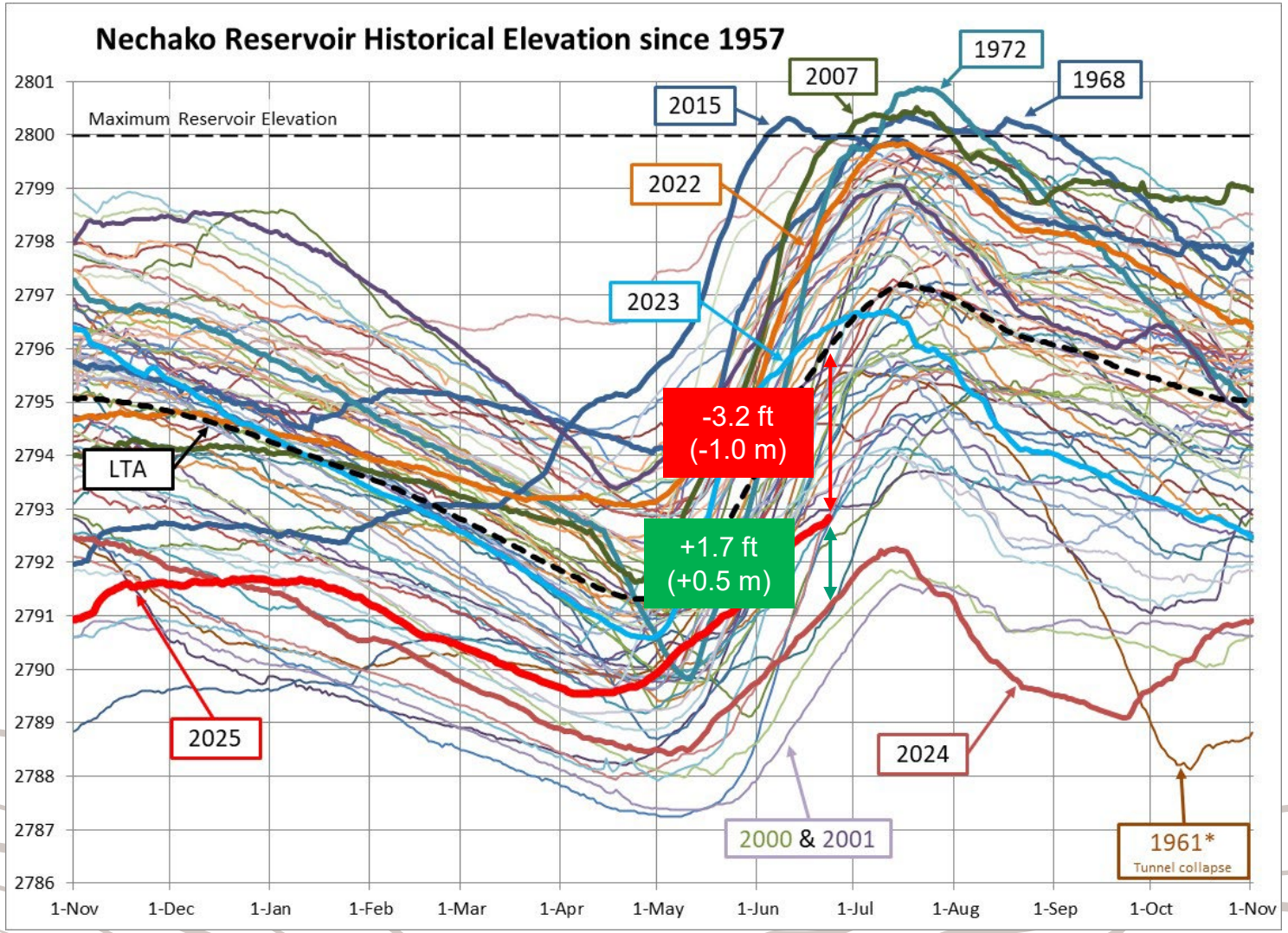


Nechako Reservoir watershed area-average = 14 mm (64% LTA)

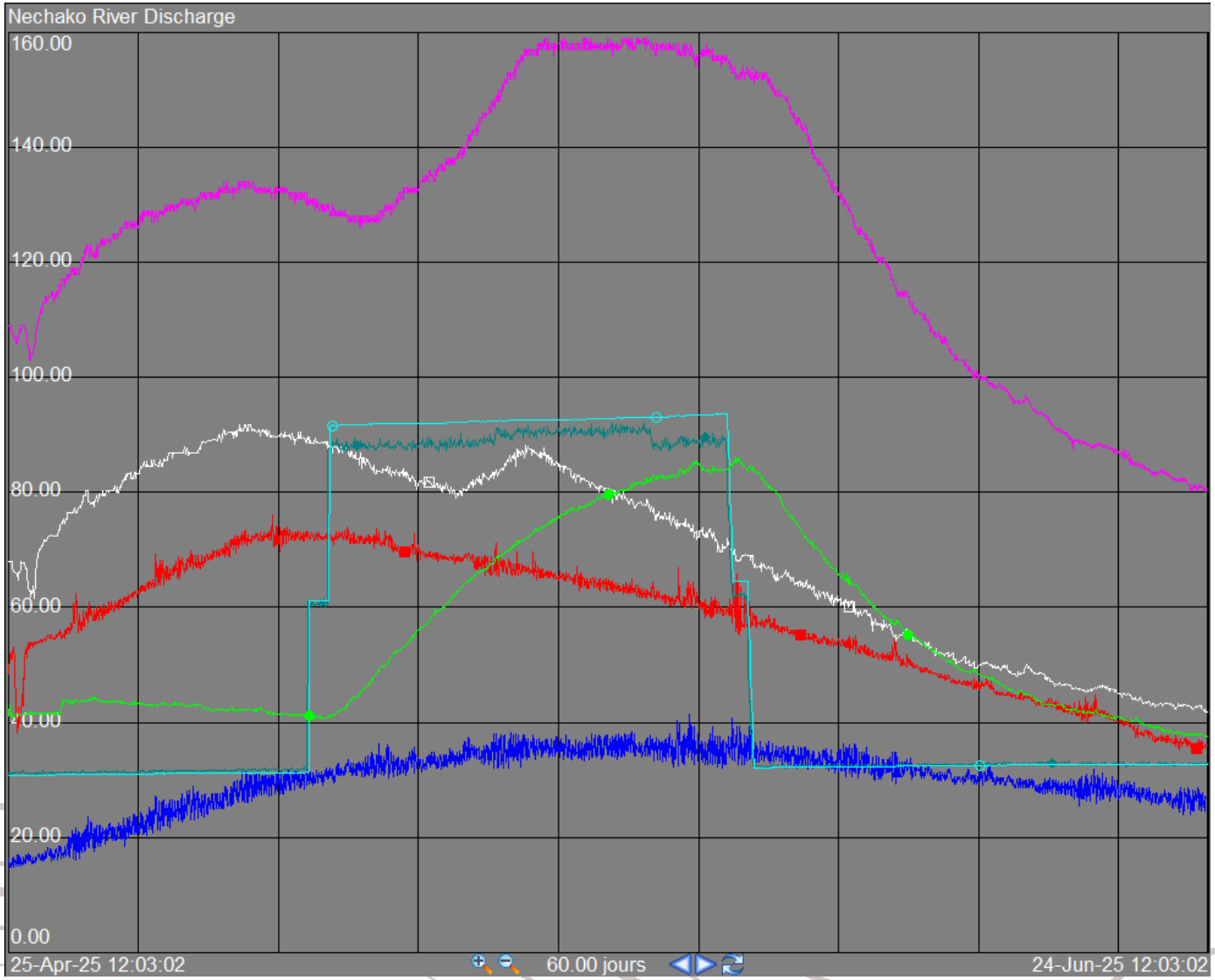
Spring Freshet Volume Forecast



Reservoir Elevation

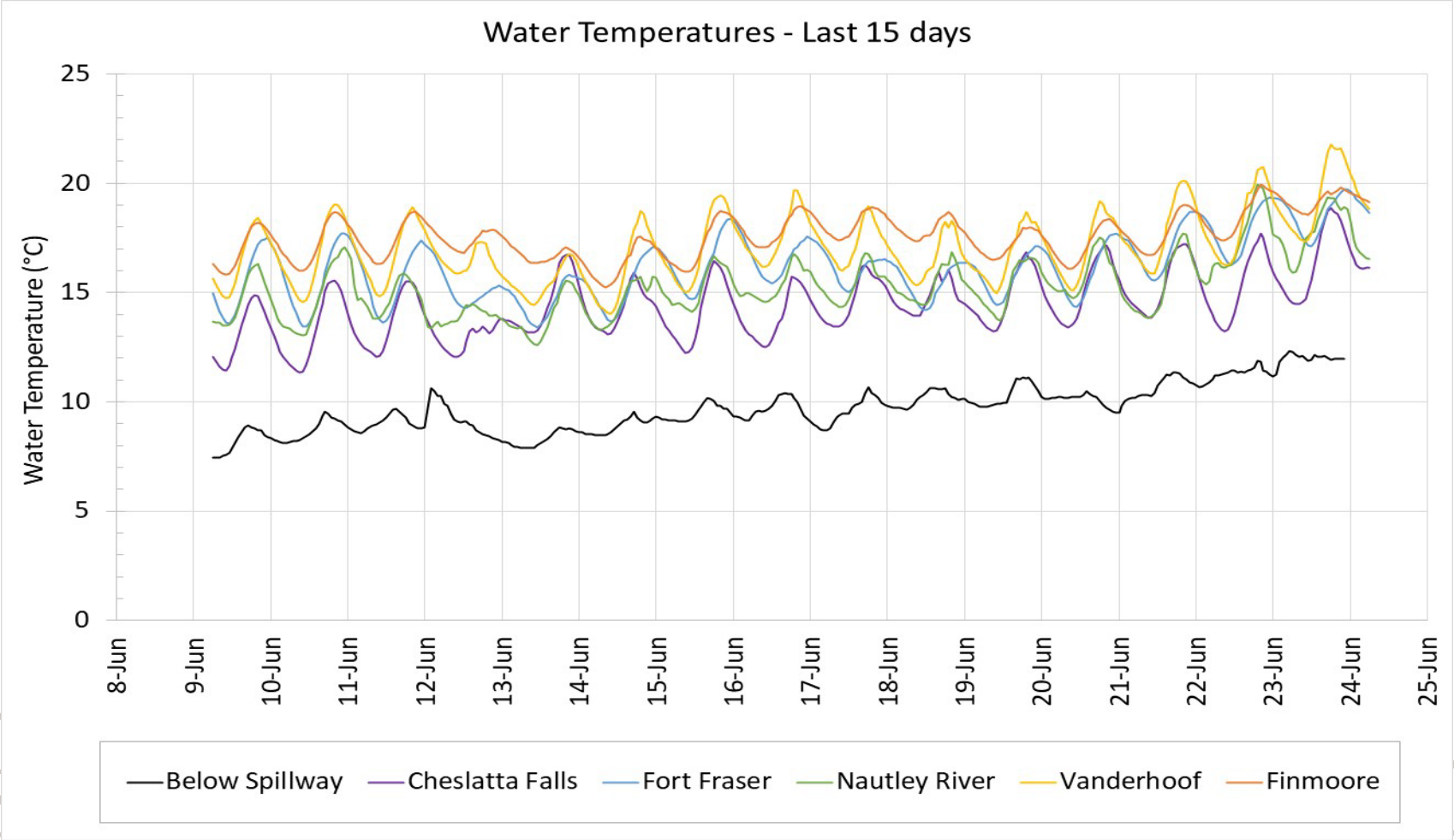


Flows – Last 60 days



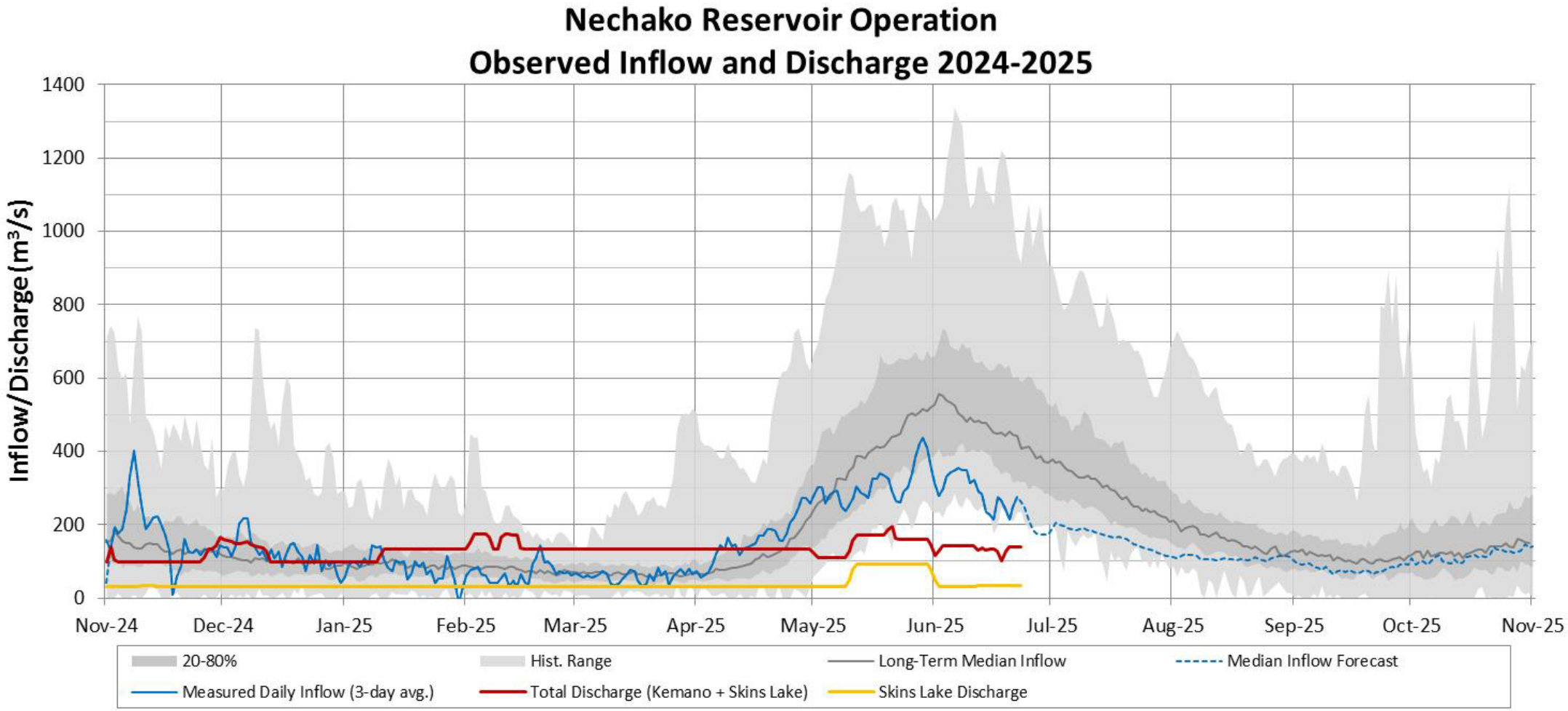
Current values (m^3/s)	
Vanderhoof	81
Skins Lake	33
Cheslatta Falls	38
Nautley	36
Stellako	27

Observed Water Temperatures – Last 15 days

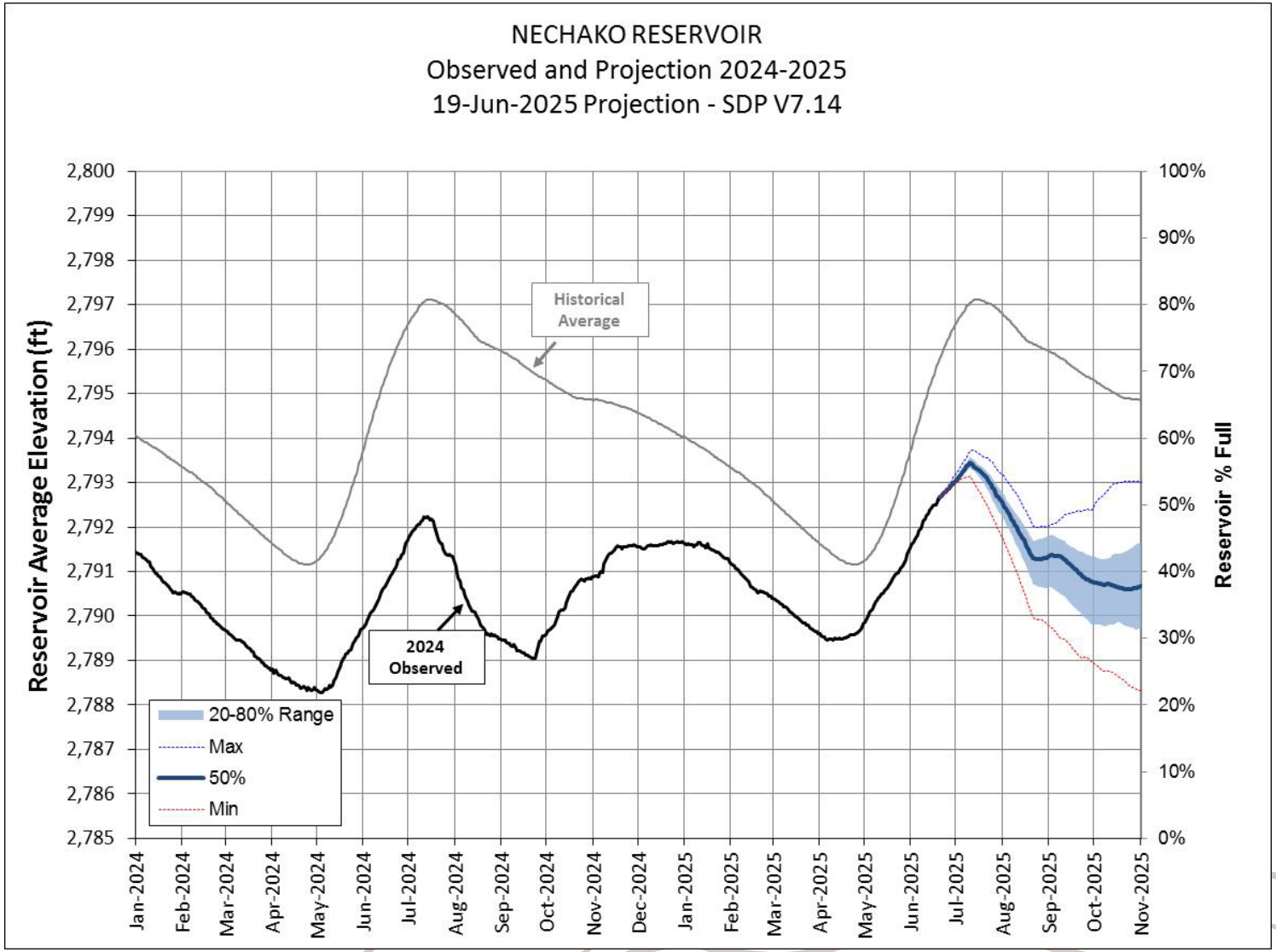


Average – Last 24h (°C)	
Below spillway	**11.9**
Cheslatta Falls	**16.7**
Fort Fraser	**18.6**
Nautley River	**17.9**
Vanderhoof	**19.6**
Finmoore	**19.2**

Observed Inflows & Discharge vs Historical

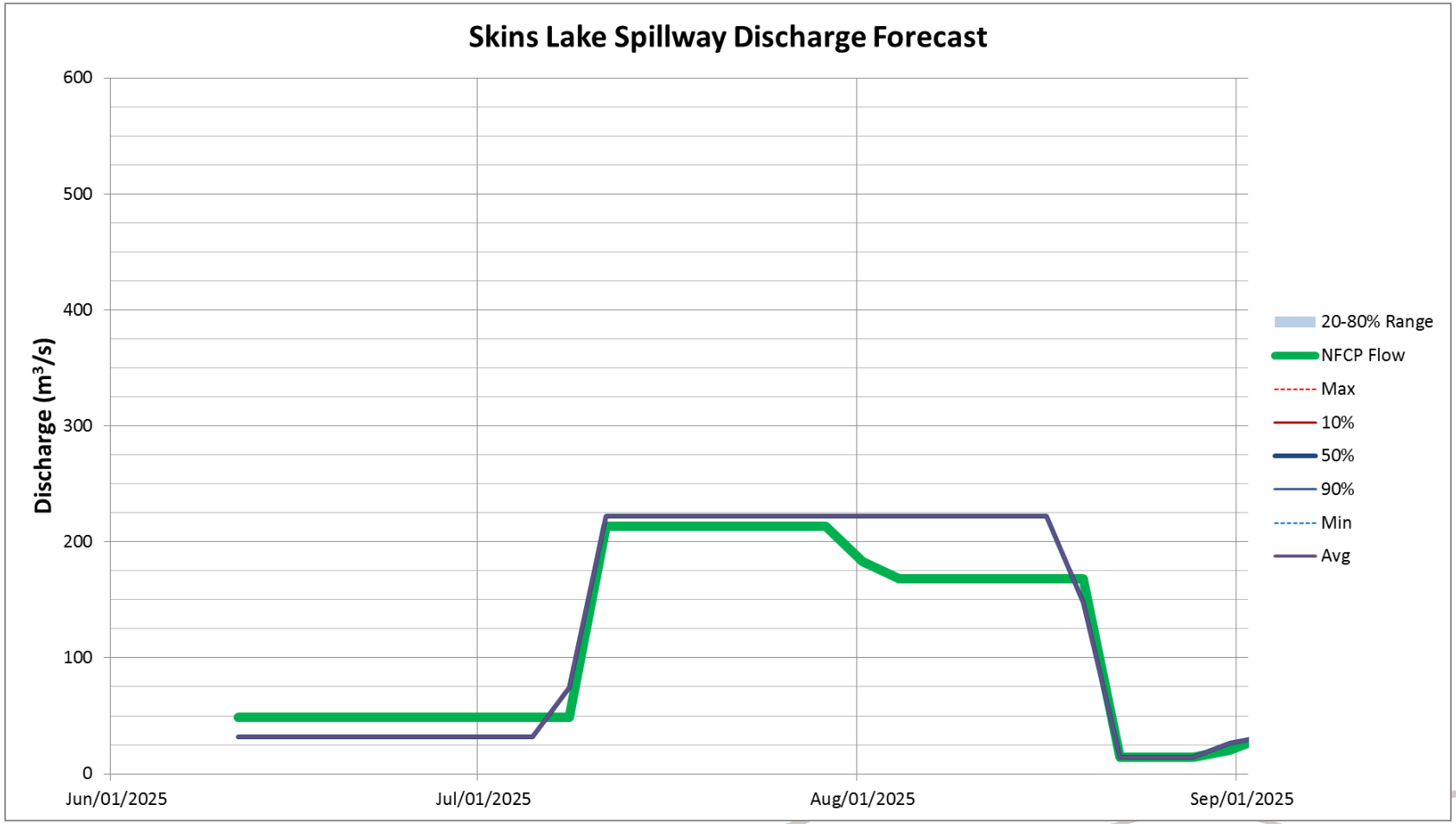


Reservoir Level Projection

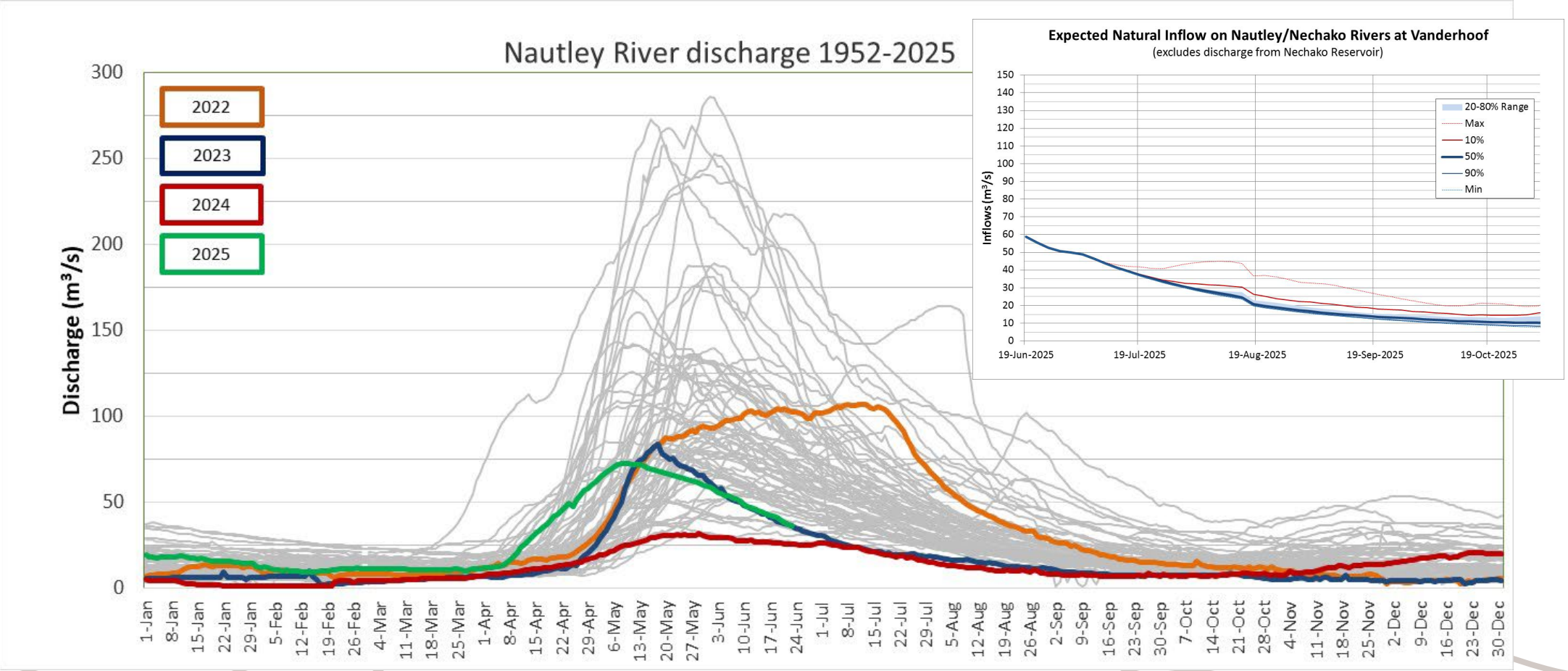


Skins Lake Spillway Release - Forecast

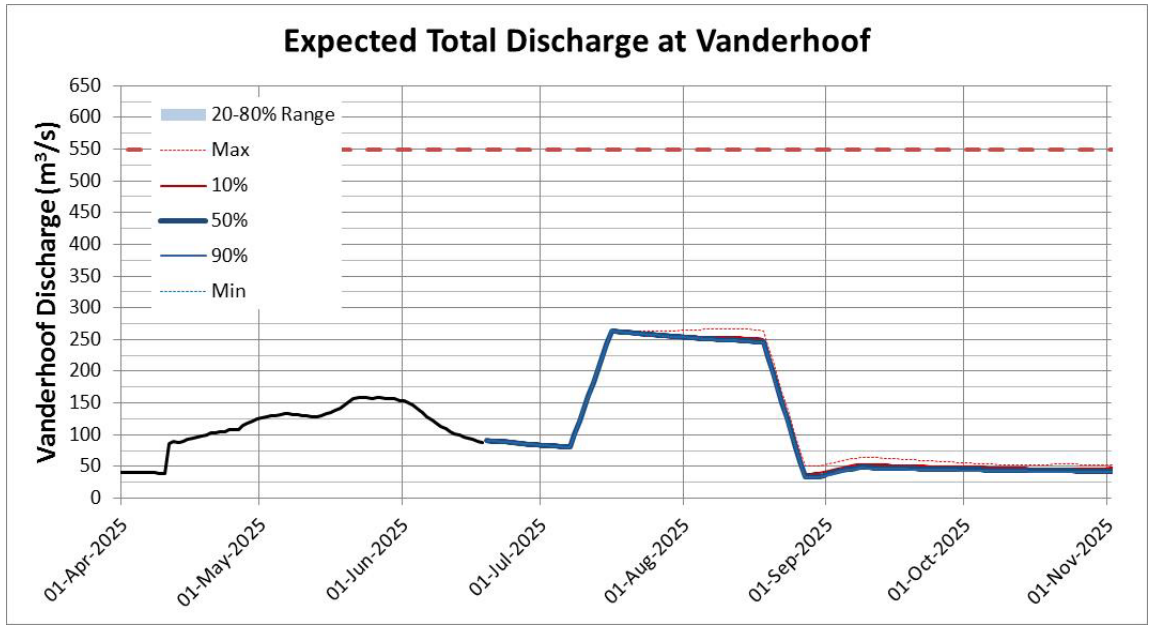
- Current release = **33 m³/s**

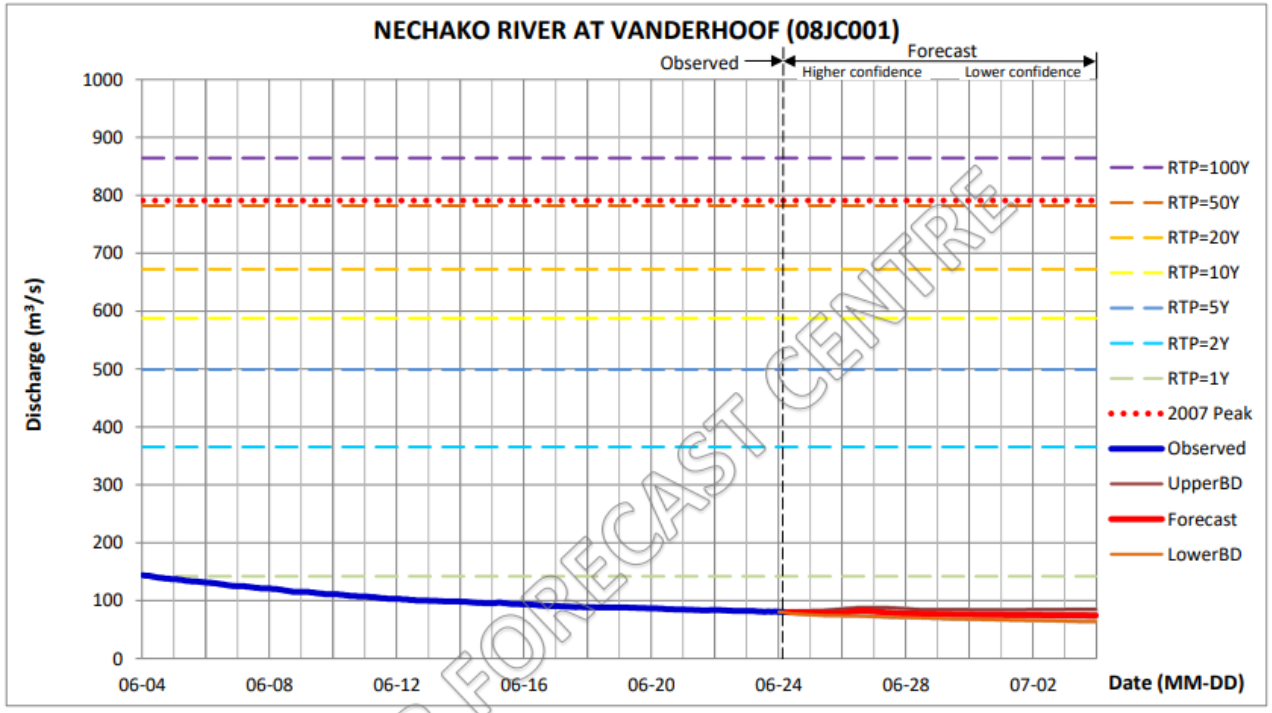


Nautley River Flows, Forecast



Forecast - Vanderhoof





Reading at 07 AM (m^3/s)	Forecast Daily Discharge (m^3/s):	UPPER BOUND / AVERAGE / LOWER BOUND								
Tue	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu
2025-06-24	2025-06-24	2025-06-25	2025-06-26	2025-06-27	2025-06-28	2025-06-29	2025-06-30	2025-07-01	2025-07-02	2025-07-03
	82.2	83.4	87.9	88.0	84.7	84.7	84.2	84.4	84.5	85.3
80.0	**79.9**	**78.8**	**81.3**	**79.2**	**77.3**	**76.4**	**75.8**	**75.3**	**74.9**	**74.5**
	77.4	74.3	73.6	71.4	70.0	68.4	67.4	66.2	65.3	63.8

Color Scheme for Return Periods:	RTP=1Y	RTP=2Y	RTP=5Y	RTP=10Y	RTP=20Y	RTP=50Y	RTP=100Y	2007 Peak
	142.1	365.5	499.1	587.5	672.3	782.1	864.4	791.0 (m^3/s)

Remark: This station is labeled as "regulated", and the forecast is the sum of natural flows and extended regulated flow from 08JA017.

Source : RFC's Clever model - 08JC001.PDF(gov.bc.ca)

Annual Report and Effectiveness Monitoring Report

Jayson Kurtz, Ecofish Research

2024 Effectiveness Monitoring Report

Report completed: Early June 2025

- Flow Alt6a was not implemented in 2024 due to drought and limited time for implementation planning and required consultations with First Nations, governments, and communities following December MT endorsement.
- 2024 monitoring compared predicted PM results (i.e., those used in Phase 1 decision making) to 2024 data under **Status Quo**
- Used existing data collected by RT (reservoir elevation, river discharge & elevation, river temperature, power output)

Effectiveness Monitoring: Results

- Most PMs were within range predicted from historical data
- 6 of 19 PMs fell outside historical data range, indicating more extreme conditions than usual
- Main drivers of PM performance were drought & high summer water temperatures

Effectiveness Monitoring Results: Examples

Drought impacts:

- Lower reservoir elevation led to decreased reservoir wetland habitat & caribou land link PM performance

High temperature impacts:

- Near-record STMP flow releases needed
  - Higher flow requirements decreased performance of several PMs (e.g., Cheslatta fish habitat, reservoir productivity)
  - Despite STMP, more temperature exceedances than normal which decreased salmon temperature PM performance

Effectiveness Monitoring Results: Key Takeaways

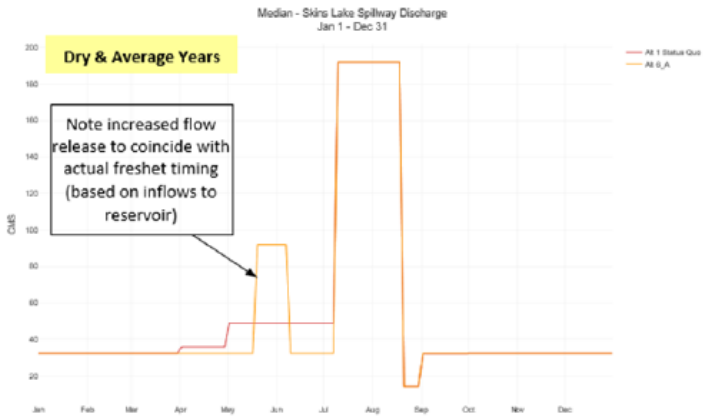
- Results offer benchmark for assessing flow impacts on interests/issues
- 2024 results under status quo highlight climate effects on PMs and importance of adaptive management
- Ongoing monitoring post-implementation of Alt 6a will be key to evaluating success and guiding future WEI decisions

2024 Annual Report

Report completed: Early June 2025

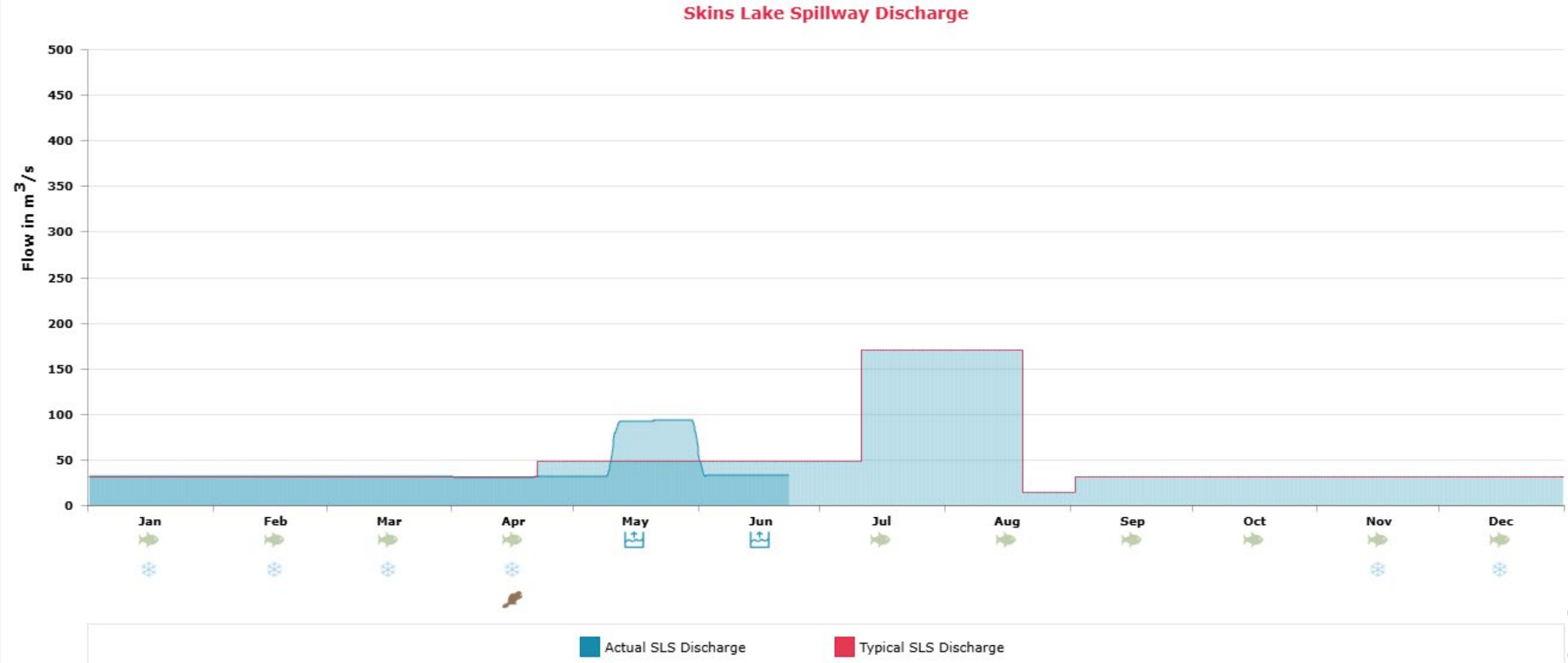
- Provides summaries of all work completed in 2024 (i.e., by MT, SSWG, TWG) and outlines key decisions, milestones, and action items
- Summarizes the 2024 hydrological conditions
- Outlines Phase 1 implementation including data gap study and physical works planning and implementation and annual effectiveness monitoring

Phase 1 Implementation

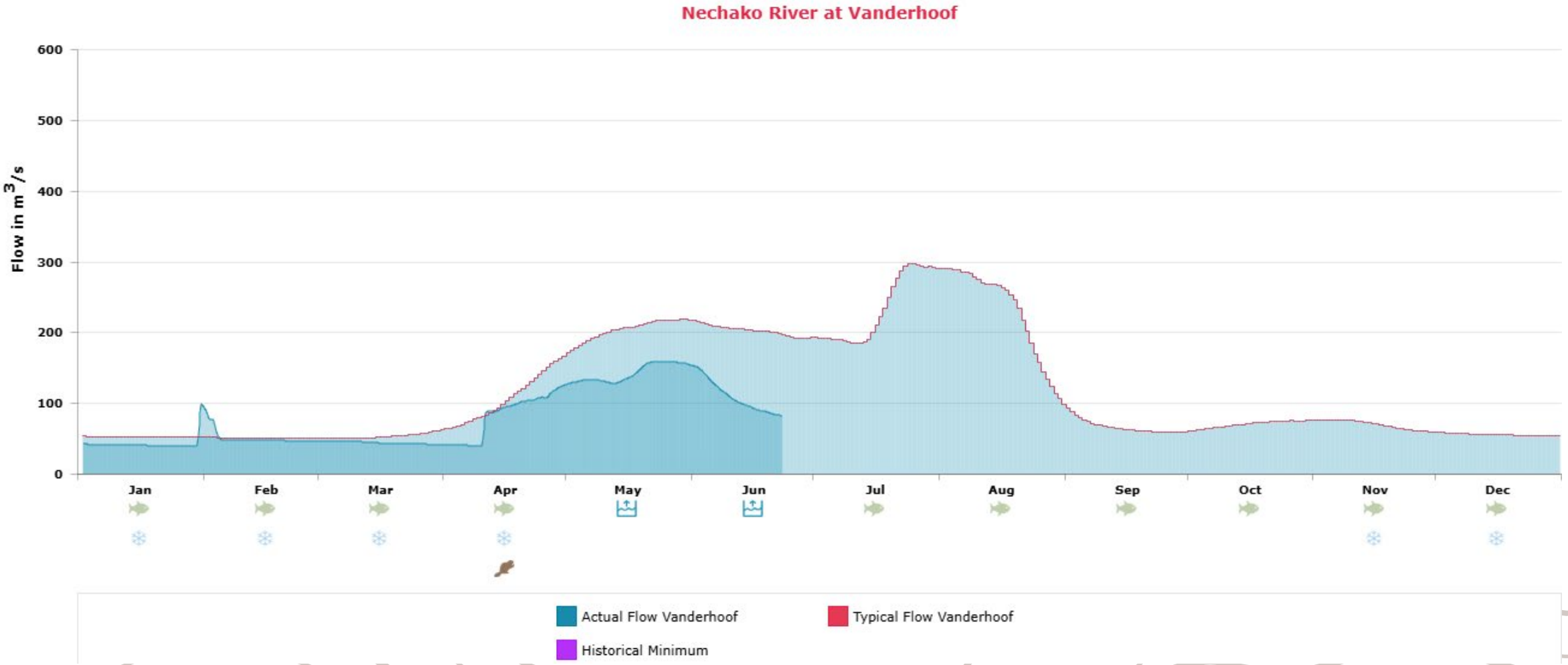
Name	Description – New Round 2E Alternatives
Alt 6A (orange) New concept hybrid alternative Reshaped existing water budget minimum flows in "dry/normal" years, flow targets (extra water) in "wet years" Flow releases earlier in the year reduces uncertainty between known water availability (i.e., pre-freshet spills) and desired release timing. Releases timed to align with freshet and minimize impacts to Tier 2 power generation Same "wet" and "dry/normal" years as Alt 4E and Alt 5E	

- Increased flow release in May 2025 to coincide with freshet timing, based on inflows to the reservoir within the existing water budget
- Flows were gradually increased to 92 cubic meters per second on 10 and 11 May.
- A stepped decrease was done with multiple gate changes at Skins Lake Spillway from 92 to 32 cubic meters per second starting 31 May.
- Post-monitoring ecological research was conducted by Ecofish Research as part of the pilot year for this flow regime

Phase 1 – 2025


Skins Lake Spillway Discharge
Flow in m3/s
500
450
400
350
300
250
200
150
100
50
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Actual SLS Discharge
Typical SLS Discharge

Phase 1 – 2025


Nechako River at Vanderhoof
Flow in m3/s
600
500
400
300
200
100
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Actual Flow Vanderhoof
Typical Flow Vanderhoof
Historical Minimum

Technical Working Group Update

Jayson Kurtz, Ecofish Research

One meeting (May 21) since last MT meeting

Technical work ongoing, focused on:

- 2024 Annual Report
- 2024 Effectiveness Monitoring Report
- Supporting implementation of Phase 1 flows
- Non-flow components (data gaps studies & physical works)

Non-Flow Components

- Physical works and data gap studies
- Prioritized by TWG/MT
- Physical works:
  - Habitat or other physical improvements to provide benefits in lieu of, or addition to, flow changes
- Data gaps:
  - Targeted studies to refine existing PMs &/or develop new PMs
  - Research to address uncertainties regarding the current state of ecological components
- Projects on a Page (PoP)
- Study Plans
- Updated Technical Memos

Projects on a Page

Developed to support data gaps and physical works:

- Provide context to managers for funding and prioritization
- Aid in development of detailed study and implementation plans,

Objectives to summarize:

- Key background on relevant WEI issue(s)
- Main table context
- Data gap study / physical works objective(s)
- Provide advice on technical approach for studies / physical works
- Identify location(s), schedule/timing, cost, & required resources
- Summarize HSE hazards, project risks, & other relevant considerations

13 Physical Works PoPs

POP #	Relevant Issue(s)/Topics(s)	Proposed Project	Location
1	Caribou movements	Large woody debris removal on calving islands	Nechako Reservoir
2	Caribou island land links	Dredge land bridges between known caribou calving islands	Nechako Reservoir
3a	Osprey nesting habitat	At-risk nesting site relocation	Nechako Reservoir
3b	Osprey nesting habitat	At-risk nesting sites tree removal	Nechako Reservoir
7a	Chinook & resident fish rearing & overwintering habitat	Mainstem instream woody debris structures	Nechako River
7e	River fish habitat	Mainstem instream woody debris structures	Cheslatta watershed
12a	Chinook & resident fish rearing & overwintering habitat	Side channel trenching	Nechako River
12b	Chinook & resident fish rearing & overwintering habitat	Side channel instream woody debris structures	Nechako River
12c	Chinook & resident fish rearing & overwintering habitat	Side channel excavation	Nechako River
13	Open water flooding	Flood protection	Nechako River

Physical Work PoP Example

PHASE 1 Physical Works #12c: Nechako River Side Channel Inlet Excavation

1. BACKGROUND

Side channels are abundant along the Nechako River, including relatively equal bifurcation of the mainstem, multi-thread/braided channels variously across the mainstem, and smaller single thread channels along the mainstem channel margins. Many of these features were formed before the Nechako River was impounded and reduced river discharge by ~70%. There is concern that the current flow regime is inadequate to create new side channels, to scour and maintain existing side channels (i.e., they are filling with sediment), or to deliver sufficient depth within existing side channels to provide suitable fish habitat and ensure fish access.

Side channels (and off-channel and tributary habitats) are well-known to support a variety of salmonid and other fish species, particularly during juvenile life history stages. These habitats provide refuge from strong mainstream flows, cover from predators, and are often highly productive feeding areas. Although most historical fish studies in the Nechako River focussed on mainstem habitats and did not investigate side channels, recent observations have confirmed abundant juvenile Chinook Salmon in specific side channels. This recent work has demonstrated, however, that shallow water depth, encroachment by reed canary grass, and susceptibility to stranding when flows change likely limit side channel habitat suitability. Other work specifically for the Nechako Water Engagement Initiative also concluded that fish access and habitat suitability is limited in many side channels.

2. MAIN TABLE CONTEXT AND PROJECT OBJECTIVES

During Nechako Water Engagement Initiative Phase One, the Main Table was very interested in side channel fish habitat. A single performance measure (PM) was developed to directly consider fish access into side channels (PM #6), and other related PMs were also considered related to side channel habitat suitability. However, uncertainty in the PM, along with broader data gaps surrounding Nechako River side channels, limited the usefulness of the PM in flow alternative decision-making. Therefore, the Main Table recommended a combination of data gap studies (see data gap study #1: Nechako River fish and fish habitat) and physical works to address the issue.

The objective of the proposed physical work is to improve fish access into, and flow through side channels (and thus improve habitat suitability) along the Nechako River. Additional physical works are also proposed to improve side channel fish habitat suitability and reduce stranding (see physical work #12a and 12b).

Physical Work PoP Example

3. PROPOSED PHYSICAL WORKS

1. Approach

Planning, implementing, and monitoring physical works is complex and will require multiple steps, which may include adaptive management actions. Work should include:

- Candidate site selection: Candidate sites should be identified using existing remote imaging (e.g., satellite or air photos) and site visits. Site selection should include multiple factors such as existing and potential fish access, habitat condition/suitability, groundwater depth, and ease of heavy equipment access.
- Design. Although some work may be “field fit”, proper engineering design will likely be required to meet the objectives and reduce risk. Consider pre-construction topographical and water level surveys, excavation/disposal volume calculations, flow and water level calculations, ballast and erosion calculations, bioengineering/replanting, and engineering design plans.
- Excavation trials. To confirm the potential improvements to fish habitat and stranding, one or more sites should be tested before large-scale implementation along the river. The trial should focus on areas of known juvenile Chinook Salmon presence (e.g., the spawning reach ~10-40 km downstream of Kenney Dam).
- Post-construction site monitoring and maintenance: Monitoring should focus on assessing post-construction characteristics (e.g., flow, depth) and the long-term stability of excavation work (i.e., monitoring changes in excavated side channel connectivity to river mainstem over time). Excavated side-channel maintenance and modification may be needed.
- Post-construction biological monitoring: Monitoring should assess usage of modified side channel habitat by juvenile Chinook Salmon and other relevant species by documenting fish presence and habitat suitability. Results should be compared to pre-excavation conditions or control locations. A variety of assessment techniques may be appropriate (e.g., visual observation, snorkeling, electrofishing, trapping). This monitoring could be incorporated into other data gap studies (i.e., #1: Nechako River fish and fish habitat), especially if survival rates and outmigration timing/behaviour data is desired using techniques such as out-migration trapping, mark-recapture, or movement tracking.
- Contingent on initial physical works/monitoring and data gap study results, additional work could include expansion of side channel habitat inlet excavation to additional side channels in the spawning reach and other sites downstream.

Physical Work PoP Example

2. **Location**

- Initial work should occur within the Chinook Salmon spawning reach of the upper Nechako River (i.e., 10-40 km downstream of Kenney Dam). Subsequent work could include any suitable location along the entire Nechako River.

3. **Cost**

- $50,000 – > $250,000, contingent on the number, size, and location of sites.

4. **Resources**

- Jet boat and operator, depending on site location.
- River engineer/hydrologist and survey equipment.
- Heavy construction equipment (e.g., excavator).

5. **Schedule/Timing**

- This is likely a multi-year project.
- Project construction should occur during the summer low flow period, with multi-season monitoring.

Physical Work PoP Example

6. HSE Hazards, Project Risks, and Other Considerations

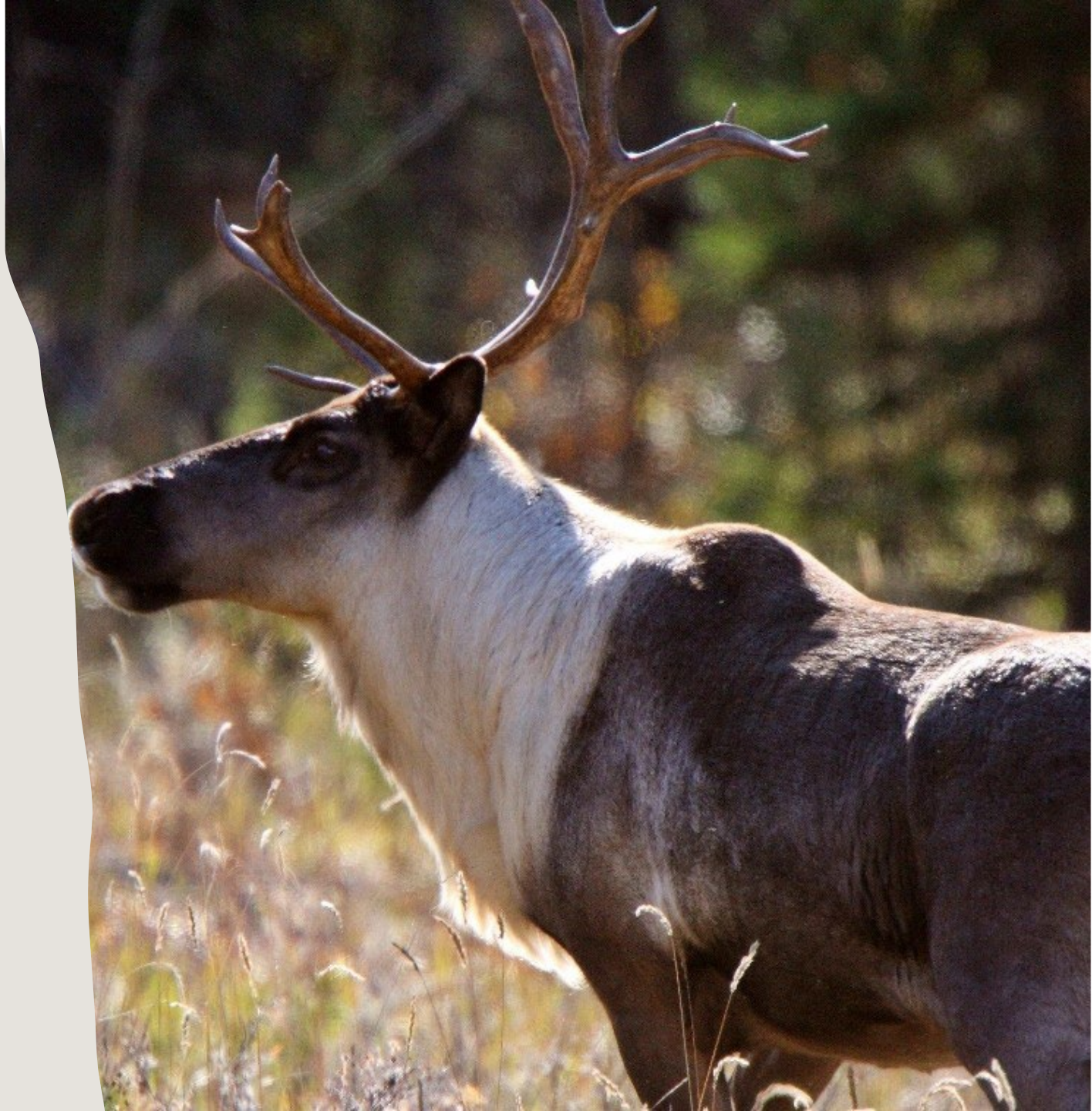
- Remote work, drowning, and heavy equipment (physical injury). These risks can be easily mitigated with standard procedures, equipment, and PPE.
- Moderate risk of public interactions.
- Not contingent on other work; however, there are opportunities to efficiently collaborate with similar data gap studies (#1: Nechako River fish and fish habitat) and physical works (#12a: side channel trenching, #12b: side channel LWD complexing).
- The proposed physical works approach is based on best practices for enhancing salmonid habitat. However, there is uncertainty in how effective these works will be, and whether they will require maintenance.
- The extent to which this physical work increases habitat area/suitability and ultimately fish productivity/abundance depends on the design and success of each work (see above) but also the total number of sites. No specific measurable benefit is currently available.
- Permitting will be required under the federal *Fisheries Act*, the BC *Water Sustainability Act*, and/or BC *Wildlife Act*. These permits will require some pre-assessment work and detailed submissions but should be easily attainable.
- To prevent ancillary environmental effects, additional mitigation may be required during construction such as erosion and sediment control measures, fish salvage, vegetation protection/replanting, etc.

Physical Works Update: Osprey

- Snag removal in 2024
- Awaiting permits for at-risk nest removal

Physical Works Update: Caribou

- Shoreline LWD removal planned for fall 2025 by Cheslatta
- Supported by RT, BC government, and HCTF



18 Data Gaps PoPs

POP #	Relevant Issue(s)/Topics(s)	Proposed Study Approach/Topic(s)	Location
1	Fish & fish habitat	Abundance & demographics (mainstem & off-channel habitats)	Nechako River
2a	Fish & fish habitat	Abundance & demographics (e.g., littoral & pelagic surveys)	Nechako Reservoir
2b	Fish spawning & migration	Migration & spawning surveys	Nechako Reservoir
3	Lake bathymetry	Depth measurements & bathymetric modelling	Cheslatta watershed
4	Reed canary grass	Literature review; abundance & distribution field assessments	Nechako River
5	River productivity	Temperature profiles; water quality, macrophyte, plankton, & macroinvertebrate sampling	Nechako River
6	Reservoir limnology / productivity	Temperature profiles; water quality, macrophyte, plankton, & macroinvertebrate sampling	Nechako Reservoir
7	Reservoir bathymetry	Depth measurements & bathymetric modelling	Nechako Reservoir
8	Reservoir hydrology	Basin water level monitoring	Nechako Reservoir

18 Data Gaps PoPs

POP #	Relevant Issue(s)/Topics(s)	Proposed Study Approach/Topic(s)	Location
9	Limnology / productivity	Temperature profiles; water quality, macrophyte, plankton, & macroinvertebrate sampling	Cheslatta watershed
10	Fish & fish habitat	Abundance & demographics (e.g., littoral & pelagic surveys); spawner & migration surveys	Cheslatta watershed
11	Hydrology	Lake water level & river discharge monitoring	Cheslatta watershed
12	Salmon & resident fish water temperature	Literature review (**complete**); research workshops; laboratory & in situ research	Nechako River
13	Freshwater mussels	Abundance & distribution field survey	Nechako River
14	White Sturgeon	Communication w/ NWSRI	Nechako River
15	Archeological sites	Shoreline baseline survey; ramping rate trials; shoreline & gravesite follow-up surveys	Cheslatta watershed
16	Ice processes	Ice regime; ice thickness & overwinter habitat; & ice scour assessments	Nechako River
17	Fish stranding	Document at-risk habitat and assess fish isolated in pools, entangled in reed grass, or stranded on beaches	Nechako River

Study Plans

- More detailed plan
- Informs procurement (development of RFP)
- Informs implementation of work

Study Plan: Nechako River Fish Overwintering

Objectives: Confirm contemporary ice regime and assess how different types of river ice (e.g., frazil, anchor, surface ice) influence winter fish habitat conditions

Proposed assessment components:

1. River ice regime
2. Ice thickness and overwinter habitat
3. Ice scour

Proposed study designed as first step to fill the data gap and identify necessary subsequent research

Study Plan: Proposed Assessment Summaries

1. **Ice regime:** Use imaging (stationary camera, satellite) & local observers to document site-specific & broader scale ice conditions

2. **Ice thickness & overwinter habitat:**

a. Identify potential fish overwinter habitat by helicopter prior to freeze up

b. Drill holes at identified overwinter sites & adjacent to known Chinook Salmon spawning locations to assess ice thickness & evaluate ice penetration

3. **Ice scour: Post ice-breakup assessments**

a. Assess potential for scour in areas where ice extends to or near the substrate, based on ice thickness and overwinter habitat assessments

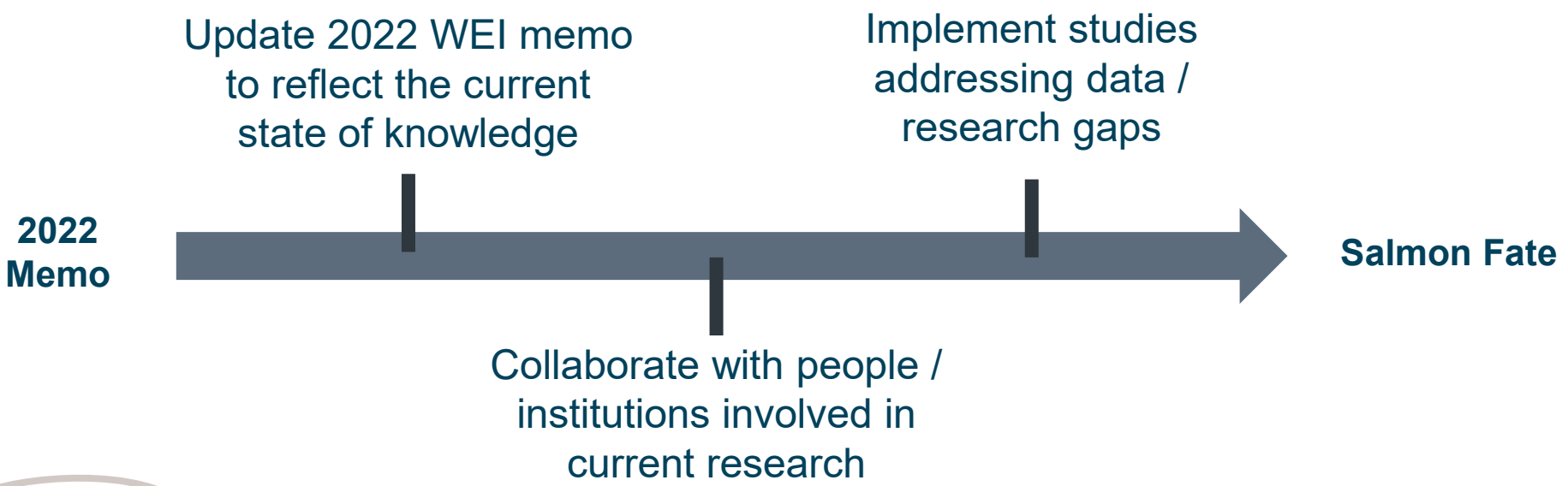
b. Assess other areas to identify if ice jams scour deeper habitats

Technical Memo Updates

- Incorporate new information

Memo Update: Salmon Fate

Objective: Assess how elevated water temperatures in the Nechako River affect different salmon species across their life stages



Updated Memo Approach

- Focused on incorporating new literature from > 2020
- Used combination of literature review and expert consultation to identify new or missing key references
- Reviewed 39 research papers
  - **32** (2020-2024)
  - **7** (2011-2019)

Key Content Changes

- Minor **editorial corrections**
- Fish species **periodicity chart** updates (additional Coho and Chinook life stages)
- Additional **references** from new literature that support the original text
- **Content** updates based on new literature
- **Recommendation** updates and new **closure**
- New **annotated bibliography (appendix)** that summarizes all published information reviewed for this update

The Davis Enterprise/Ken W. Davis

Study Plan Implementation

- Intent is to implement study plans starting summer 2025
- Collaboration with infrastructure projects

Southside Working Group Update

Quinten Beach, Rio Tinto

- Held one working group meeting in 2025. Will set up another meeting in Q3
- Buoy program active
    - Deployed buoys, assessed anchors in June 2025 (improvements from 2023/24)
    - Built weights to enable buoys to stand perpendicular in water for better visibility
    - Attached weight to all buoys

Nechako Infrastructure Studies Update

Andrew Czornohalan, Rio Tinto

- Shaping workshop in March to define scope, project and process, identify data gaps and risks
- Currently in Order of Magnitude Stage which is forecasted to be complete in October
- Pre-feasibility study to approximately start in November 2025

The project aims to Improve the livelihood of communities and the environment and ensure the viability of the BC Works business

Project objectives

The Shaping[1] exercise validated the partners' alignment on the primary objectives of the Nechako Infrastructure project:

Improve the livelihood of communities and the environment

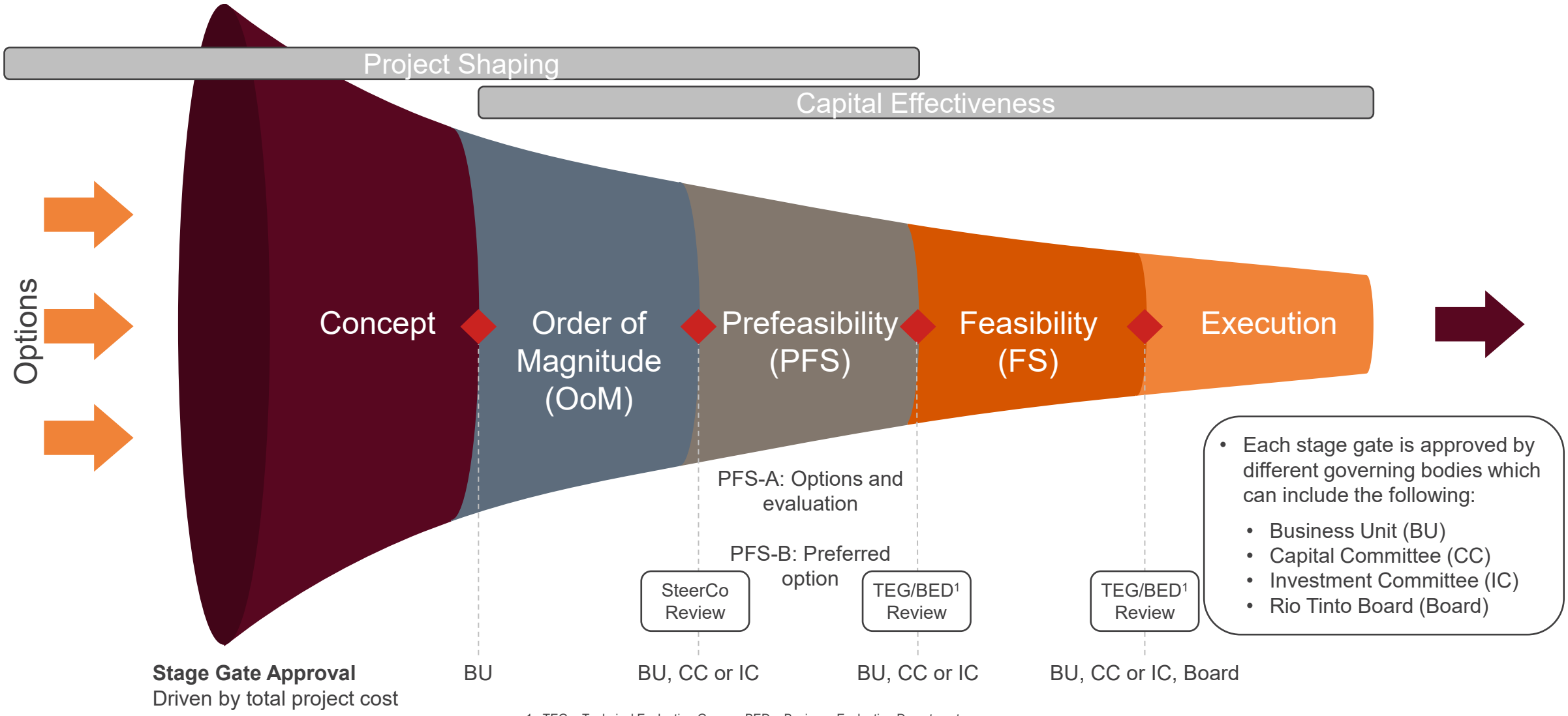
- Enhance the long-term ecological health of the ecosystem
- Preserve areas of cultural and historical significance (traditional harvesting)
- Create sustainable economic opportunities for surrounding communities

Ensure the viability of the BC Works business

- Optimize water management to ensure sufficient power generation and ecological flows during dry periods, and prevent flooding
- Foster strong community relationships and social licensing for projects
- Secure government funding by leveraging partnership alignment

Note: 1. The Project Shaping exercise included representatives from Nechako First Nations, including Cheslatta, Saik'uz, Stellat'en, and Nadleh Whut'en Nations

Major projects identify options early in a project's life and pass through multiple approvals to have one option in feasibility



1. TEG = Technical Evaluation Group BED = Business Evaluation Department

Research and Monitoring

Jayson Kurtz, Ecofish

There are numerous research and monitoring initiatives in the watershed, including:

- Academia (UNBC, UVic, UBC, INRS, ETS,
- Cheslatta and Nechako First Nations (Stellat’en, Nadleh Whut'en, Saik’uz)
- BC and Federal resource management agencies
- Local stewardship initiatives

Research Group(s)	Primary Researcher	Affiliation	Research Themes	Study/Thesis
RT NSERC Industrial Reseach Chair in Climate Change and Water Security Northern Hydrometerology Group Natural Resources and Environmental Studies Institute Integrated Watershed Research Group (IWRG)	Dr Stephen Dery	UNBC	Hydrometerology, climate change, stream temperatures	Longterm, hydrometerological data collection
				Effect of atmospheric rivers on hydrology
				Roles of regulation and climate on Nechako River discharge
				Climate change projection models.
				Variable Infiltration Capacity (VIC) hydrological model (Nechako flow simulation without diversion)
RT NSERC Industrial Reseach Chair Natural Resources and Environmental Studies Institute	Dr Eduard Martins	UNBC	fish ecology	Juvenile White Sturgeon habitat selection (fish movement/tagging, drone imagrey; lab temperature experiments)
				Rainbow trout thermal ecology (drone thermal mapping, temperature loggers, fish movement/tagging)
				Chinook Salmon model
Integrated Watershed Research Group (IWRG)	Dr. Phillip Owens	UNBC	Climate change, sediment, contaminants	Influence of landscape disturbances like forest harvesting and wildfires on sediment dynamics
				Effects of atmospheric rivers and severe wildfires on sediment and associated contaminants
				Nechako watershed portal (geospatial archival tool)
Adaptation to minimize the joint impacts of climate change and the management of hydraulic infrastructures in fish and fish habitat. **(Rio Tinto Collaborative Research and Development grant)**	Dr Francis Zwiers	UVic/Pacific Climate Impacts Consortium	climate change	Climate change projection models.
	Dr Andre St Hilaire	National Institute of Scientific Research (INRS)	hydrological and thermal modeling,	CEQUEAU hydro-thermal model
				Stuart Lake temperature model
	Dr Richard Arsenault	École de technologie supérieure (ÉTS)	hydrological and thermal modeling,	Management and development of tools to optimize water releases from the Nechako reservoir., HEC-RAS Modelling
	Dr Scott Hinch	UBC	Fish ecology, fish physiology	Juvenile and adult Chinook Salmon thermal preferences (lab-based)
				Adult Chinook Salmon habitat selection and thermoregulation (field based)
				Effects of water temperature on Chinook Salmon egg survival (field based)
				Juvenile Chinook Salmon habitat selection (field: tagging & thermal imagery, lab: thermal preference, habitat mod
	Dr. Colin Brauner	UBC	Fish physiology	Effects of water temperature on White Sturgeon (lab based)
Nechako White Sturgeon Recovery Initiative		BC MoE, DFO, FNs	Fish ecology	Habitat restoration – substrate cleaning, ID measures to restore habitat for juvenile rearing, community outreach
Nechako Environment and Watershed Stewardship Society NEWSS)	Wayne Salewski	-	Stream restoration, stewardship, fish distribution	Beaver dam analog construction and fish and fish habitat (e.g., water temperature) monitoring
NHC			hydrology, river geomorphology	HEC-RAS discharge and temperature model
				River survey cross-sections w/ flow and photos
				Geomorphic Atlas
Nechako First Nations		Stellat'en, Nadleh Whut'en, Saik'uz	Fish and fish habitat	SONAR fish fence
				Sidechannel excavation trials
				Fish use of sidechannels
				Instream fish habitat physical works
				LiDAR and drone imagery to characterize river floodplain at different flows
				Water temperature and water quality monitoring
Cheslatta Carrier Nation			fish, cultural resources	Burial site protection
				Fish stranding
				Fish and fish habitat assessments and Kokanee spawning survey


Q&A