Fisheries and Oceans Canada | Pêches et Océans Canada
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Pacific Region

Canadian Science Advisory Secretariat
Science Advisory Report 2026/053

STOCK ASSESSMENT OF FRASER SPRING 5_2 (1.3) CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA*) IN 2024

CONTEXT

The Fisheries Management sector of Fisheries and Oceans Canada (DFO) has requested that reference points consistent with the DFO Precautionary Approach (DFO 2006) be developed for Fraser Spring 5_2 (1.3) Chinook salmon (*Oncorhynchus tshawytscha*). This request includes a review of possible fishing scenarios and stock productivity scenarios for the Fraser Spring 5_2 (1.3) Chinook salmon that could contribute to stock rebuilding, and that the stock status be assessed relative to the reference points.

This Fisheries Science Advisory Report is from the regional peer review meeting of March 3-5, 2026 on Fraser Spring 5-2 and Summer 5-2 Chinook Salmon (*Oncorhynchus tshawytscha*) Stock Assessment in 2024. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

SCIENCE ADVICE

Status

- The Fraser Spring 5_2 (1.3) Chinook salmon Stock Management Unit (SMU) consists of five Conservation Units (CUs) – Lower Fraser SP 1.3, Middle Fraser-Fraser Canyon SP 1.3, Middle Fraser SP 1.3, Upper Fraser SP 1.3 and North Thompson SP 1.3.
- This SMU is below the CU status-based Limit Reference Point (LRP), based on the Wild Salmon Policy (WSP) Rapid Status Approach because two of the five CUs in the Spring 5_2 (1.3) SMU are assessed as *Red* status. The WSP defines *Red* status CUs as being in poor status with a high risk of extinction.
- Lower Fraser SP 1.3 CU is *Red* since it falls below the long-term trend metric lower threshold. Middle Fraser-Canyon SP 1.3 CU is *Red* since it falls below the absolute abundance metric lower threshold. These CUs were approximately 1.5% and 0.5%, respectively, of the surveyed abundance of the SMU over the most recent generational average (2020-2024).

Trends

- In 2024, an estimated 13,900 spawners returned to the surveyed proportion of the Fraser Spring 5_2 (1.3) SMU, which is 57% of the 1975-2024 average. The estimated number of returning spawners in the Fraser Spring 5_2 (1.3) SMU ranged from ~20,000 – 45,000 in the 1980s to mid-1990s, with substantial variation over the last decade (3,200 – 35,000).
- Hatchery production has been relatively limited for this SMU. Releases were highest in the 1980s and 1990s (averaging 900,000 annually), followed by a period of minimal production.

Production increased in 2020, averaging 250,000 releases per year for conservation and assessment objectives.

- Following declines in abundance, management measures have been implemented to progressively reduce fisheries impact. The Fishery Mortality Index (FMI) between 2019 and 2024 ranges between 3 and 8% in Canada for the Fraser Spring 5_2 (1.3) SMU. FMI was used because calendar year exploitation rate (CYER) from coded wire tag recoveries (used to assess fisheries impacts on other Fraser Chinook SMUs) is currently unavailable.

Ecosystem and Climate Change Considerations

- The consequences of habitat and climate change impacts were qualitatively taken into account in the WSP Rapid Status Assessment approach. We expect with climate change and ongoing land-use activities that upstream migratory, spawning, and rearing conditions will continue to degrade.
- Current freshwater habitat conditions are poor due to elevated stream temperatures and low flows in the summer period. These are expected to increase pre-spawn mortality and reduce fry production due to decreased summer rearing habitat.
- Major disturbances, such as recent landslides in the Fraser River mainstem (Big Bar 2019) and Chilcotin River (July 2024) that limited Fraser Spring 5_2 (1.3) adult access to spawning grounds are expected to increase in frequency.
- Effects of climate change were indirectly considered in model simulations of future Chinook abundance by testing a broad range of possible future stock productivities.

Stock Advice

- A simulation analysis was developed to determine the SMU level impacts of different exploitation rates. In simulation, no combinations of Canadian exploitation rate and productivity produced enough spawners for all CUs to have an *Amber* or better status with high probability. Thus, an exploitation rate-based fisheries reference point lower (FRP-L) could not be identified. This result was driven by two CUs (Lower Fraser SP 1.3 and Fraser Canyon SP 1.3) with very small accessible watershed areas, which had a low or very low probability of exceeding the 1,500 spawner threshold.
- In simulation, despite little variation in future outcomes with respect to the CU status based LRP, various combinations of Canadian exploitation rate and productivity resulted in different outcomes for individual CUs in achieving certain WSP statuses, and surpassing 20% S_{max} thresholds.
- The relationship between the FMI and the Canadian CYER was investigated, and they were weakly correlated with high uncertainty. Given this, the FMI-based data provided on catch, recruitment, and fisheries impact should be interpreted cautiously.
- Comprehensive stock advice and a complete suite of reference points requires a stock-recruit time series for salmon. Currently, absolute spawner abundance estimates and exploitation rate by age are unavailable. To address these data gaps improved monitoring of escapement and development of an indicator stock program for the Lower Chilcotin River Spring Chinook population are recommended.

BASIS FOR ASSESSMENT

Assessment Details

The methods used to assess the status of Pacific Salmon CUs in this paper were identified and approved in 2009 (Holt et al. 2009; Grant 2013; Pestal et al. 2023; DFO 2024) and the Pacific Salmon SMU LRP methods were approved in 2022/2023 (Holt et al. 2023).

Year Assessment Approach was Approved

2022

Assessment Type

Full Assessment

Most Recent Assessment Date

1. Last Full Assessment: 2022 (Weir et al 2022, Doutaz et al 2021).
2. Last Interim-Year Update: 2018 (COSEWIC 2018).

Stock Assessment Approach

1. Broad category: Multiple Approaches: Index-based, Wild Salmon Policy Rapid Status Approach, adaptation of closed loop simulation models.
2. Specific category: Stock-recruitment Relationship, Relationship between Fisheries Mortality Index (FMI) and the Canadian portion of Calendar Year Exploitation Rate (CYER).

This Fraser Spring 5_2 (1.3) Chinook assessment used a mix of previously-established peer-reviewed methods and new methods because Chinook data time series for Fraser Spring 5_2 (1.3) Chinook stocks are short (i.e., exploitation rate and escapement/recruitment by age timeseries spans return years 2019-2024) and uncertain (dominated by escapement data type classification 4)[1]. For status assessment, the WSP Rapid Status Approach was used. For the remaining elements of this assessment, new methods were developed:

1. to estimate stock recruitment parameters;
2. to describe the relationship between two different measures of fishery impacts (Fisheries Mortality Index vs Canadian Calendar Year Exploitation Rate); and
3. to simulate future CU-level abundance for the Fraser Spring 5_2 (1.3) Chinook SMUs across a range of potential harvest rates and productivity scenarios.

The Wild Salmon Policy Rapid Status Approach was used to assign a ‘Red’ (poor), ‘Amber’ (intermediate), or ‘Green’ (good) status with ‘Low’, ‘Medium’, or ‘High’ confidence rating to WSP conservation units (CU) with applicable data. SMU status (above or below the LRP) was determined using the CU status-based method where all CUs must achieve an Amber or better status for the SMU to exceed its LRP. CU statuses are generated by applying available CU data to a computer-coded WSP rapid status decision tree. Methods and best practices are described in greater detail in (Grant et al. 2026; Pestal et al. 2023; DFO 2024).

[1] Bailey, C.J., Borea, I., Freshwater, C., Greenberg, D., Wor, C., Parken C., and Strait, A. In prep. Stock Status, Exploitation Rate Conversion, and Simulation Analysis of Future Stock Status under Varying Productivity and Exploitation Rate Scenarios for Fraser River Spring and Summer 1.3 (5_2) Chinook Salmon (*Oncorhynchus tshawytscha*). DFO Can. Sci. Advis. Sec. Res. Doc.

Fraser Spring 5_2 (1.3) Chinook stock recruitment parameters were estimated at the SMU-level for Ricker α and at the CU-level for Ricker β. The Ricker α parameter was estimated by using stock-recruit data from the most closely-related Fraser Chinook stock (Fraser Spring 4_2 (1.2) Chinook) and adjusting the parameter based on proportional differences in fecundity between the stocks. Information on differences in fecundity are not available at the CU-level for all CUs, so a single Ricker α value was estimated for the entire SMU. The Ricker β parameter for each CU was estimated using the Parken Habitat Model (Parken et al. 2006 - details available in the code repository (Bailey et al. 2026) and the accompanying research document)[1].

Both the CYER and FMI provide imperfect estimates of fishing impacts. The former is a multidecadal time series and has received extensive validation given its role in Pacific Salmon Treaty processes (Pacific Salmon Commission 2023). Conversely, year-specific estimates of FMI only began to track year-to-year changes in fishery impacts since 2019 and the methods used to estimate FMI continue to be revised, suggesting it may have greater uncertainty (DFO 2025b). Furthermore, contemporary CYER time series do not exist for the Fraser Spring 5_2 (1.3) Chinook SMU. Thus, fisheries management objectives have recently been evaluated using FMI. The relationship between FMI and CYER was quantified using a measurement error model to better understand how managing fisheries using FMI may result in deviations between target and realized exploitation rates (i.e., implementation error)[1].

Previously used closed-loop simulation methods (DFO in press; Holt et al. 2023) were adapted to evaluate the performance of fixed Canadian ER scenarios for the Fraser Spring 5_2 (1.3) SMU. Specifically, these were used to assess the probability that each CU would exceed either 1,500 spawners or their respective lower benchmarks (whichever value was larger; this is an approximation of a WSP Rapid Status Assessment), that each CU would exceed their lower biological benchmarks (20% S_{max}, regardless of whether the value exceeds 1,500 spawners or not), and that each SMU would exceed its CU status-based LRP. The simulations were parameterized with:

1. Ricker stock-recruit parameters estimated using methods described above;
2. correlations among the natural-origin spawner escapement time series for each CU;
3. estimates of the mean and variance in spawner proportions-at-age; and
4. ER implementation error[1].

Additional detail on the methods described above are available both in a code repository (Bailey et al. 2026) and in the accompanying research document[1] for this FSAR.

Stock Structure Assumption

The Fraser Spring 5_2 (1.3) Chinook Salmon SMU consists of five Conservation Units (CUs; Table 1). The CUs are defined based on ecology, life history, genetics and ecological characterizations (Holtby and Ciruna 2007). The extent of spawning in the Fraser Spring 5_2 (1.3) SMU covers a geographical area that encompasses the Lower, Middle, and Upper Fraser River watershed, as well as tributaries of the North Thompson River (Figure 1). Chinook Salmon in this SMU exhibit stream-type life history, spending at least one year rearing as juveniles in freshwater prior to migrating to the ocean returning to freshwater as adults for up to several weeks before spawning. Greater than 50% of Spring 5_2 (1.3) Chinook spawners have migrated through the Lower Fraser River by July 15th (Weir et al. 2022; Dionne et al. 2023). There are limited age-structure data available for this SMU, however, available data suggest that the dominant age class of adults returning to freshwater to spawn is 5-year-olds with observations of 3, 4 and 6-year olds. There has been a variable history of hatchery enhancement of all five

Fraser Spring 5_2 (1.3) CUs since 1983. Enhancement continues for conservation and assessment purposes in two of the CUs (Middle Fraser SP 1.3 and Upper Fraser SP 1.3).

Table 1. List of Conservation Units (CUs) within the Fraser Spring 52 (1.3) Stock Management Unit with corresponding Designatable Units (DUs), Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status, and Wild Salmon Policy (WSP) Rapid Statuses.

Stock Management Unit	Conservation Unit ID	Conservation Unit name	Designatable Unit ID	Designatable Unit	COSEWIC Status (2018, 2020)	WSP Rapid Status (2024)
Fraser River Spring 5_2 (1.3) Chinook Salmon	CK-04	Lower Fraser SP 1.3	DU3	Lower Fraser, Stream, Spring (Birkenhead)	Endangered	Red, medium confidence
	CK-08	Middle Fraser-Fraser Canyon SP 1.3	DU7	Middle Fraser River, Stream, Spring (Nahatlatch)	Endangered	Red, high confidence
	CK-10	Middle Fraser SP 1.3	DU9	Middle Fraser River, Stream, Spring	Threatened	Amber, low confidence
	CK-12	Upper Fraser SP 1.3	DU11	Upper Fraser River, Stream, Spring	Endangered	Amber, low confidence
	CK-18	North Thompson SP 1.3	DU16	North Thompson, Stream, Spring	Endangered	Amber, low confidence

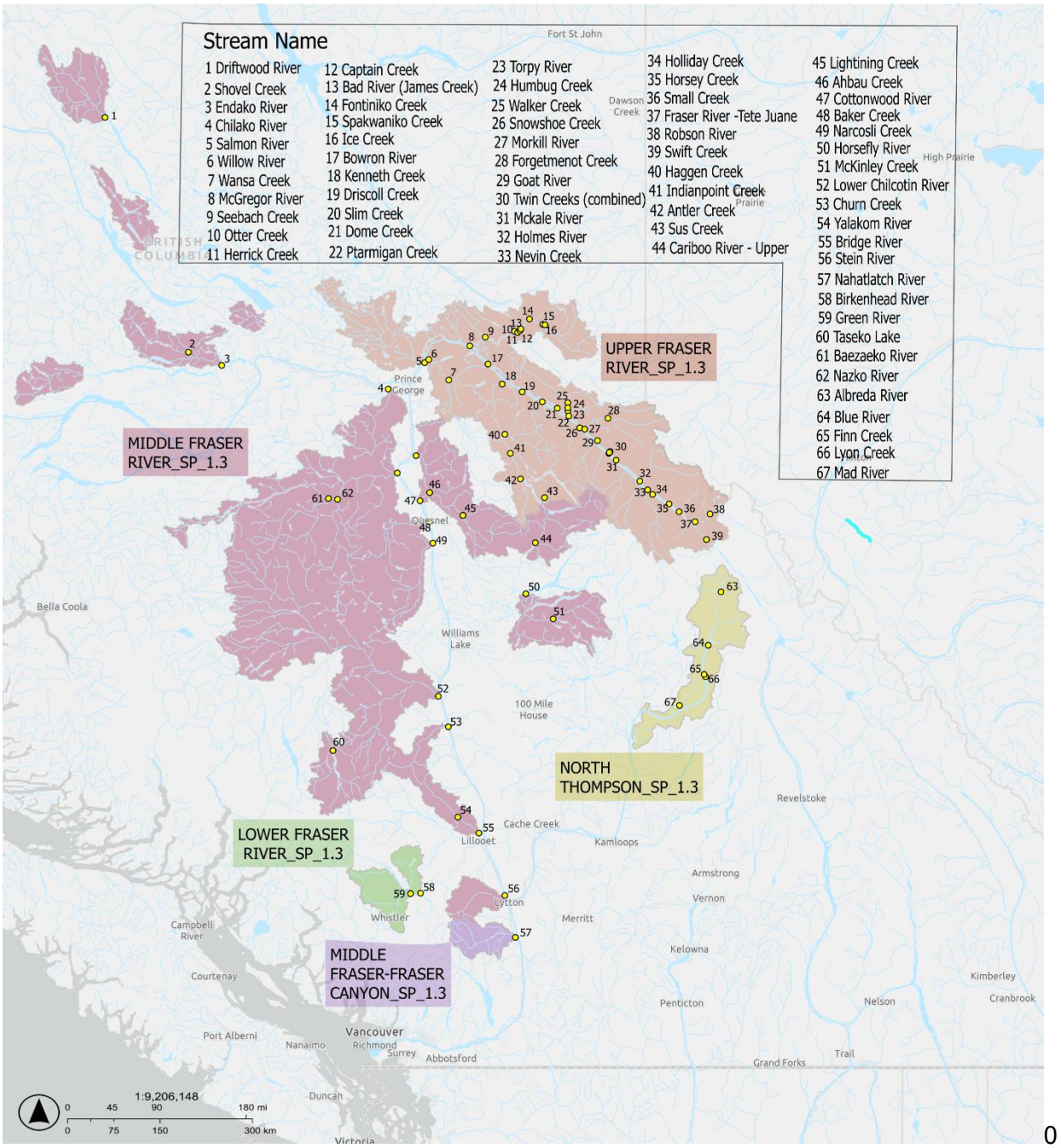


Figure 1. Fraser Spring 5_2 (1.3) Chinook Salmon Conservation Units and surveyed spawning populations. Adapted from Fisheries and Oceans Canada (2026). Salmon Space. Government of Canada.

Reference Points

Reference points for the Fraser Spring 5_2 (1.3) Chinook Salmon SMU were developed based on Ricker stock-recruit parameter estimates described in the accompanying research document[1]. The status of the Fraser Spring 5_2 (1.3) Chinook salmon SMU was determined using a CU status-based limit reference point (LRP), where an SMU is below its LRP if there is at least one CU in the red status zone, and above its LRP if all CUs are WSP Amber or better status.

Reference points were developed using natural-origin recruit and spawner data from a proxy population (Nicola River, Fraser Spring 4_2 (1.2) Chinook salmon SMU) and fecundity data from the proxy and Fraser Spring 5_2 (1.3) Chinook sampled during the Big Bar landslide response, and pertain only to the natural-origin component of the SMU. While Fraser Spring 4_2 (1.2) Chinook salmon present the most suitable Fraser River proxy to Fraser Spring 5_2 (1.3) Chinook salmon from a life-history perspective, it is important to note that the latter mature later and that the Nicola River Chinook population experience extreme environmental conditions that are not representative of the average spawning conditions for Fraser Spring 5_2 (1.3) Chinook. Besides the LRP, only rate-based references points were developed or attempted to be developed because the SMU spawner abundances are primarily relative index abundance data (i.e., not valid for comparing against absolute abundance-based reference points). These include U_{MSY} (maximum sustainable exploitation rate; also known as the Removal Reference) and the Lower Fisheries Reference Point (FRP-L). U_{MSY} was estimated from a non-traditional estimate of the SMU-level Ricker α for Fraser Spring 5_2 (1.3) Chinook (methods described in detail in accompanying research document)[1]. Estimating a Lower fishery reference point (FRP-L) was attempted, but there were no simulation scenarios that produced greater than a 4% probability of the SMU exceeding its CU status-based LRP (Table 2).

Table 2. Fraser River Spring 52 (1.3) Chinook Stock Management Unit (SMU) proposed reference points. Uncertainty in these values is large, thus the 95% CIs are presented first as a hypothetical range of plausible values, followed by the median in brackets.

SMU scale Reference Point	Description	Value
Lower fishery reference point (FRP-L)	Greatest Exploitation Rate (ER) that allows all CUs to exceed WSP *Amber* status	NA[1]
U_{MSY}	Discrete fishing mortality (U) that will produce Maximum Sustainable Yield (MSY) under equilibrium conditions	0.17 – 0.74 (0.42)[1]

Data

Enumeration Methods

The number of adult Chinook Salmon that return to the spawning grounds has been estimated using a variety of survey methods from 1975-2024 across CUs within this SMU. Since 1995, 80-99% of observed spawners within the 5 Fraser Spring 5_2 (1.3) CUs have been enumerated using standardized visual methods (stream walks, float counts, aerial surveys) and a peak count expansion factor of 1.54 is applied to generate the final escapement estimate (Parken et al. 2003). These estimates are considered an index of escapement rather than an absolute count, and are only appropriate for describing trends in abundance through time. To generate abundance estimates, SONAR and resistivity counters were installed in the Bridge River from 2014-2022 and in the Lower Chilcotin River (Middle Fraser CU) since 2008. The Lower Chilcotin River population is developing an Exploitation Rate Indicator Stock (ERIS) for the Fraser Spring 5_2 (1.3) Chinook SMU applying coded wire tags (CWT) since 2019 to estimate survival, exploitation rate, marine and freshwater distribution, and age structure (Chinook Technical Committee 2025a).

Data Quality Filtering

Spawner escapement timeseries included in this assessment only include sites where the number of natural-origin spawners could be estimated or are expected to make up greater than 97% of the population. Key steps in processing escapement data for the purposes of the Rapid Status Assessment and model simulations are described in the accompanying research document[1]. Briefly, data quality is assessed based on the number and completeness of surveys, coverage of the spawning period, visibility and reliability of records, and level of hatchery enhancement. There are a total of 60 survey sites across the five Fraser Spring 5_2 (1.3) CUs, 44 of which are included as sites with acceptable survey data quality. Four sites are excluded from the assessment due to enhancement and the remaining 12 are considered data deficient. The average spawner data quality is considered moderate throughout the time series for all CUs (classified as data Types 3-4)[1], with occasional high-quality data where SONAR or resistivity counters have been implemented (classified as data Types 1-2)[1].

Exploitation Rate

Since the 2019 PST Agreement (Pacific Salmon Commission 2023), the Lower Chilcotin population is both a developing escapement indicator stock and CWT ERIS. Historically, Dome Creek (Upper Fraser SP 1.3) was used as the CWT ERIS, but the tagging program at the Dome Creek hatchery was discontinued in 2005. Once enough CWT recoveries are obtained annually, the Lower Chilcotin population's CYER will be estimated annually and the population will be subject to CYER limits for Individual Stock Based Management (ISBM) fisheries (Pacific Salmon Commission 2023; Chinook Technical Committee 2025a). The Lower Chilcotin CWT program is in an earlier phase of development compared to the Chilko Summer 5_2 (1.3) ERIS population where enough data was available as of 2026 to calculate a CYER (Chinook Technical Committee 2025a). For this reason, fishing impact for the Spring 5_2 (1.3) SMU is currently estimated using the Fishing Mortality Index (FMI) approach.

ASSESSMENT

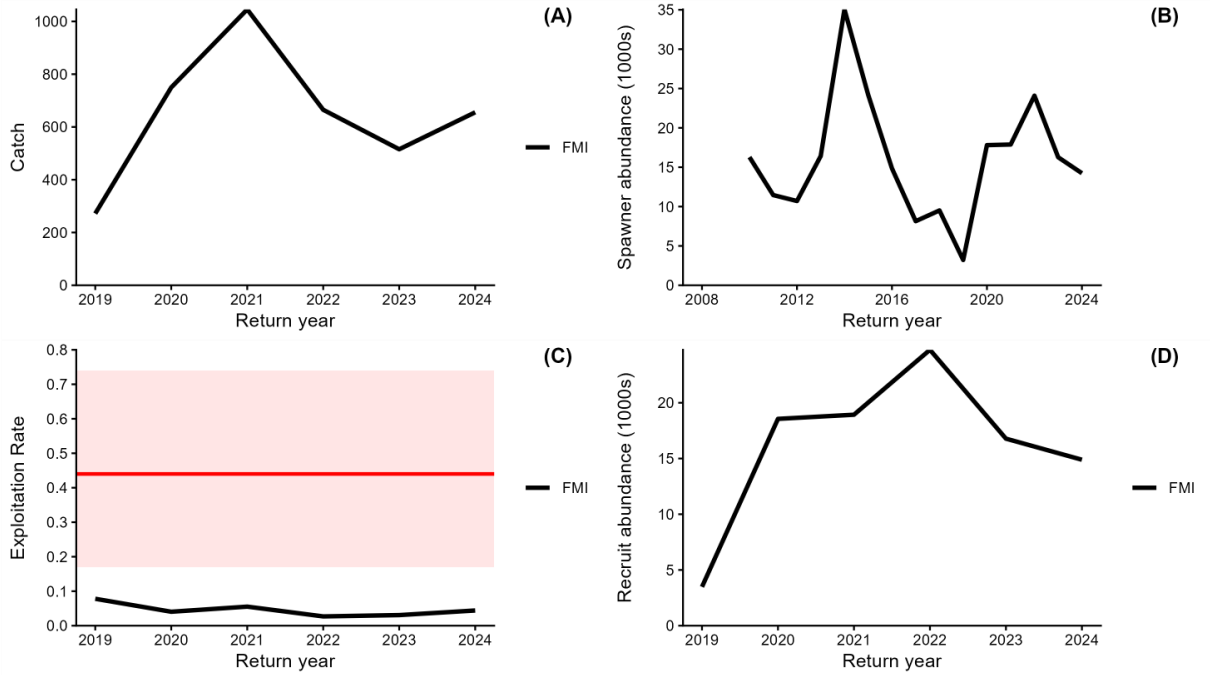


Figure 2. Fraser Spring 5_2 (1.3) Chinook (A) aggregate catch derived from the Fishing Mortality Index (FMI), (B) aggregate index spawner abundance for all spawning populations included in the WSP Rapid Status Assessment, (C) Exploitation rate (FMI) in relation to fishing mortality that results in maximum sustainable yield (U_{msy} - represented by the solid red horizontal line, with upper and lower 95% Credible Intervals represented by the red shaded band), (D) recruit abundance. Note the different x-axis limits for plot (B) as catch, exploitation rate and recruit abundance data are derived from FMI data that are only available from 2019-2024.

Stock Status and Trends

Current Status

Two of five CUs in the Fraser Spring 5_2 (1.3) Chinook salmon SMU are assessed as in the WSP Red Status Zone (Figure 3), therefore the Fraser Spring 5_2 (1.3) SMU is below its CU status-based LRP. Statuses for four CUs (Lower Fraser SP 1.3, Middle Fraser SP 1.3, Upper Fraser SP 1.3, North Thompson SP 1.3) within this SMU were determined using trend-based metrics under the WSP Rapid Status Approach because of the quality of survey data available. Status for the Middle Fraser-Fraser Canyon SP 1.3 CU was assessed using the absolute abundance metric under the WSP Rapid Status Approach due to its small population size. This CU is well below the 1,500 spawner threshold for all available years in the time series.

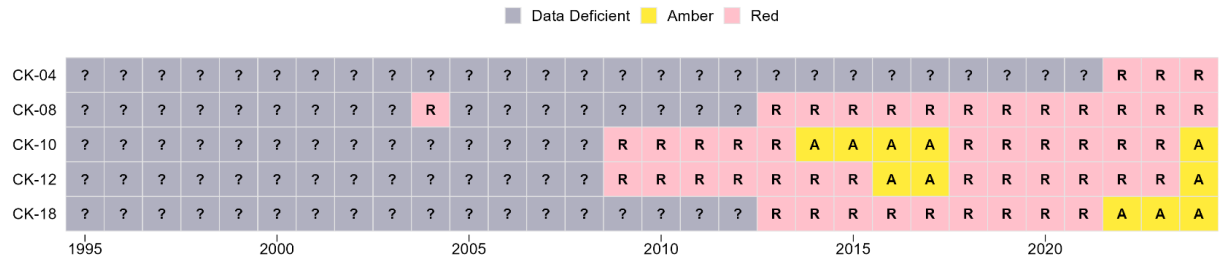


Figure 3. Fraser Spring 5_2 (1.3) Chinook (CK-04 Lower Fraser SP 1.3; CK-08 Middle Fraser-Fraser Canyon SP 1.3; CK-10 Middle Fraser SP 1.3; CK-12 Upper Fraser SP 1.3; CK-18 North Thompson SP 1.3) Wild Salmon Policy Rapid Status time series for years with applicable data. Each row summarizes the statuses available for each Conservation Unit.

Escapement

Escapement estimates of Fraser Spring 5_2 (1.3) Chinook have varied substantially over the last decade (Figure 2B). For historical context, the Chinook Technical Committee (CTC) 2024 Fraser River Spring 5_2 (1.3) escapement estimate was 13,900 spawners – 57% of the CTC 1975-2024 average of 24,300 spawners (Chinook Technical Committee 2025b). In this paper, we report only natural-origin (as opposed to total) spawner abundances using WSP data filtering and updated escapements, thus the shorter timeseries (2010-2024) with escapements ranging from ~3,200 – 35,000 adults, and a 2024 estimate of 14,234 adults. Escapement estimates were expected to remain below average for 2024 due to the 5-year-old adults returning from the brood year that was severely impacted by the 2019 Big Bar landslide. Both small population CUs (Lower Fraser and Middle Fraser-Fraser Canyon) spawn in tributaries that meet the Fraser River mainstem downstream of Big Bar.

Exploitation Rate

Between 2019 and 2024 the FMI ranged between 3 and 8% (Figure 2C). However, given the uncertainty in the FMI metric, that it estimates Canadian fisheries impact with a subset of Canadian fisheries, and the relatively weak correlation between FMI and CYER[1] (Figure 4), this FMI-based time series of ER (and thus catch (Figure 2A) and recruit abundance (Figure 2D)) should be interpreted cautiously. The results of the measurement error model (Figure 4) warrant using caution when interpreting the FMI - even assuming conservative observation error in both indices (CV = 0.1), the relationship between the indices is positive but weak and highly uncertain. At low levels of the FMI (< 0.12), Canadian CYER is overestimated, and at higher levels of the FMI (> 0.12) CYER is underestimated. Note that this relationship is built off of paired CYER and FMI estimates from Fraser Chinook indicator populations entirely from other SMUs, and thus describes the average relationship and uncertainty among these mortality measures rather than the specific relationship for the Fraser Spring 5_2 (1.3) Chinook SMU.

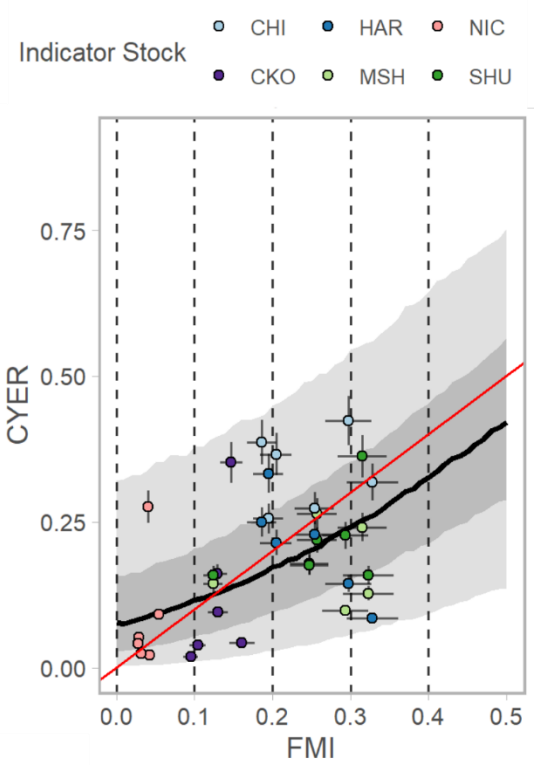


Figure 4. Posterior predictions, in proportional space, of a Generalized Linear Model estimating the relationship between the Fisheries Mortality Index (FMI) and Calendar Year Exploitation Rate (CYER). The model assumes equal error (CV = 0.1) for observations of both CYER and FMI. The black line represents the median, dark and light ribbons represent the 50th and 90th percentile intervals, respectively. The Red line shows the one-to-one line rep5resenting a perfect correlation between indices. Points represent individual Exploitation Rate Indicator Stock (ERIS) and year observations. Whiskers represent the assumed CVs described above. Vertical dashed black lines align with the horizontal coloured lines in the kernel density plots in column a) of the simulation results figures shown below (Figures 8-10). ERISes are: Chilliwack (CHI; Fall 4_1 (0.3) SMU), Harrison (HAR; Fall 4_1 (0.3) SMU), Nicola (NIC; Spring 5_2 (1.2) SMU), Chilko (CKO; Summer 5_2 (1.3) SMU), Middle Shuswap (MSH; Summer 4_1 (0.3) SMU), and Shuswap (SHU, Summer 4_1 (0.3) SMU).

History of Management

History of Management Objectives and Outcomes

The Pacific Salmon Treaty framework for Chinook Salmon consists of two fisheries management regimes: Aggregate Abundance-based management (AABM) and Individual Stock-Based Management (ISBM) (Pacific Salmon Commission 2023). AABM fisheries are managed to an annual total allowable catch (TAC) under a variable harvest rate strategy. ISBM fisheries are managed domestically under a fixed exploitation rate cap strategy for multiple stocks, where the limit is defined by the CYER (Pacific Salmon Commission 2023).

In response to low abundance, directed commercial and recreational fisheries for stream-type Fraser Chinook Salmon have been restricted and First Nations Food, Social and Ceremonial (FSC) fisheries have also been significantly limited (DFO 2025a). Between 2000-2008, management measures implemented to mitigate exploitation impacts from the Northern BC and West Coast of Vancouver Island (WCVI) commercial troll fisheries led to closures that also reduced impacts on co-migrating stream-type Fraser Chinook stocks, including the Spring 5_2

(1.3) Chinook SMU. Similarly, FSC fisheries management measures including area closures, limited catch and effort, and included gear restrictions to reduce impacts on early-timed Fraser Chinook. The temporal restrictions were extended through June-July to protect the Fraser Spring and Summer 5_2 aggregate (Dobson et al. 2020).

Fraser River Chinook stocks are impacted by marine recreational fisheries in Juan de Fuca Strait and Strait of Georgia (Doutaz et al. 2021). To reduce impacts on early-timed Fraser Chinook wild retention limits, additional size limits (Dobson et al. 2020) were implemented in 2008. An additional maximum size limit of 80 cm was introduced in 2019 for many areas. In 2018 area closures and Chinook non-retention were introduced in the southern area of the Strait (Dobson et al. 2020). In 2008, time and area closures (including non-retention and full salmon closures), additional size limits on retained catch, and reduced bag limits were also implemented for the Fraser River recreational fishery to reduce impacts on early-timed Chinook, and in 2012 were extended to protect the Fraser Spring and Summer 5_2 (1.3) aggregate (Dobson et al. 2020). As of 2019, with few exceptions for terminal areas, there is generally no fishing for salmon or non-retention of Chinook in the Fraser River recreational fishery year-round. Since 2012, the Albion gill-net test fishery was delayed to late-April to reduce impacts on stream-type Fraser Chinook (Dobson et al. 2020).

There is currently no quantitative escapement goal for Fraser Spring 5_2 (1.3) Chinook at the SMU level (Chinook Technical Committee 2025a); however, the objective of Spring 5_2 (1.3) Chinook management outlined in the 2025 Southern BC Salmon Integrated Fisheries Management Plan was to manage Canadian fisheries in a highly precautionary manner to allow as many fish to pass through the spawning grounds as possible (DFO 2025a). This approach was implemented in 2019 and reduced fishery-related mortalities of Spring 5_2 (1.3) Chinook from 23.7% (2014-2018 average) to 4.4% (2019-2024 average; DFO 2025b).

History of Hatchery and Supplementation

Hatchery enhancement of Fraser Spring 5_2 Chinook was more prolific during the mid-1980's to early 1990's (Figure 5). Historically there are 3 main release strategies for hatchery-produced Fraser Spring 5_2 (1.3) Chinook: fed-fry, sub-yearling smolts, and yearling smolts. Fed-fry are released 1 week to 1 month after hatching and are fed before release. Sub-yearling smolts are released the same year they hatched, and are grown at an accelerated rate for a few months after hatching and then released (an ocean-type release strategy applied to stream-type Chinook in this case). Yearling smolts are hatched and grown in the hatchery through their first winter post-hatching and released in the following spring (matching the natural stream-type life history). In the Lower Fraser SP 1.3 CU, over 100,000 sub-yearling smolts were released into the Birkenhead River in brood years 2002 and 2003. In the Middle Fraser-Fraser Canyon SP 1.3 CU, only fed-fry have been released into the Nahatlatch River. Enhancement continues for the Middle and Upper Fraser SP 1.3 CUs across five hatchery facilities (located on Spius Creek, Chehalis River, N`Quatqua River, Nechako River, and Quesnel River), under assessment, rebuilding, and conservation objectives. Enhancement in Middle Fraser SP 1.3 and Upper Fraser SP 1.3 increased to a peak of ~300,000 fry in 2022 and ~100,000 yearling smolts in 2023 primarily for production plans in response to the Big Bar Landslide in 2019. For CUs Middle Fraser SP 1.3 and Upper Fraser SP 1.3, it is too early to calculate the proportion of hatchery fish in the spawning population using empirical data. Given this, hypothetical pHOS values were modeled for a range of likely release sizes and spawning abundances[1].

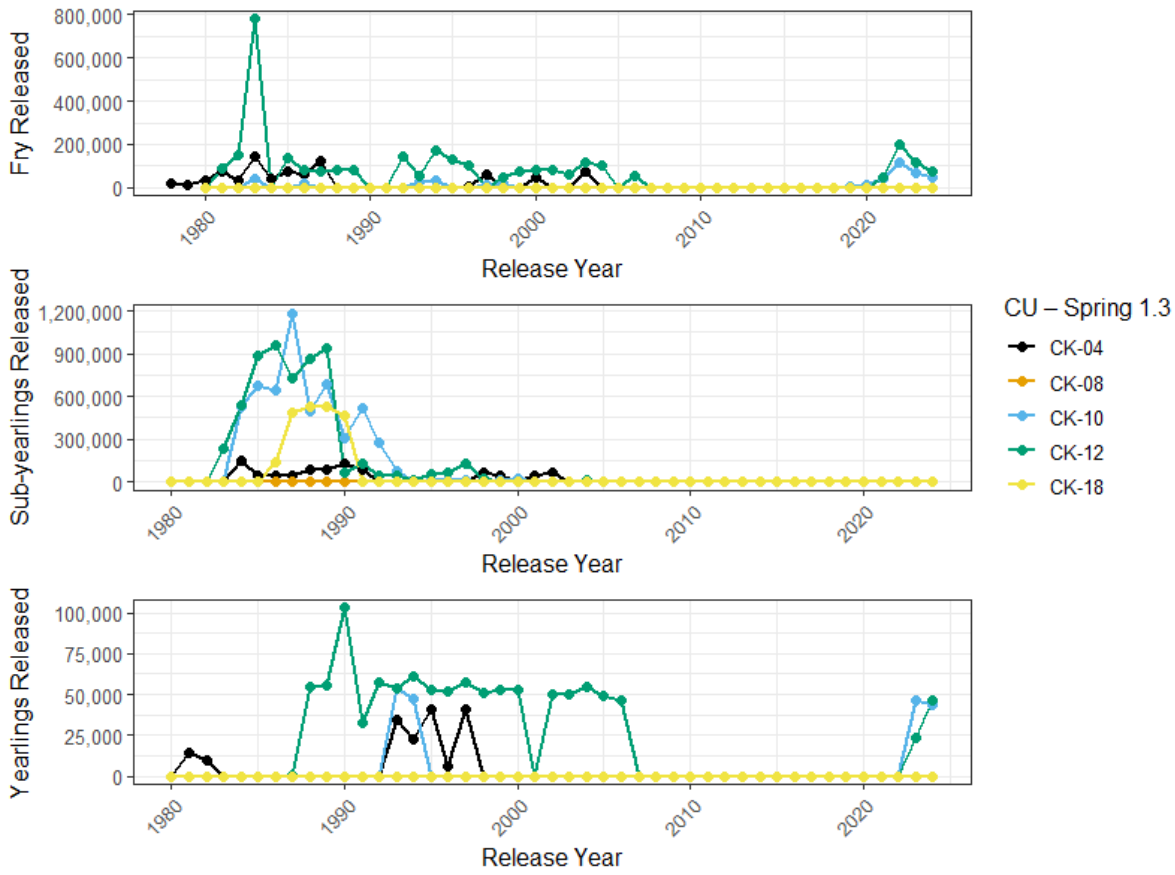


Figure 5. Hatchery releases by life stage (Fry, Sub-yearling Smolts, Yearling Smolts) and Conservation Unit (CK-04 Lower Fraser SP 1.3; CK-08 Middle Fraser-Fraser Canyon SP 1.3; CK-10 Middle Fraser SP 1.3; CK-12 Upper Fraser SP 1.3; CK-18 North Thompson SP 1.3) for the Fraser Spring 5_2 (1.3) Stock Management Unit.

History of Freshwater Habitat Impacts

Fraser Spring 5_2 (1.3) Chinook spend a significant portion of their life cycle in freshwater as a result of their stream-type life history strategy (Weir et al. 2022; Dionne et al. 2023). Juveniles rear in their natal streams as well as in off-channel mainstream habitats and non-natal tributaries of the Thompson and Fraser Rivers, dispersing and rearing downstream of their natal stream as far as the lower Fraser River (Murray and Rosenau 1989; Bradford and Taylor 1997, 2023). Many systems in this SMU are highly susceptible to extreme weather events such as wildfires, landslides, high water temperatures, and extreme high or low flows, although flexibility in the timing of spawning ground arrival and dispersal of juveniles throughout the Fraser watershed helps buffer impacts on upstream migration and rearing. Since the beginning of the colonization of British Columbia, the Lower Fraser River and Estuary has been heavily modified for floodplain control and agricultural development, which has drastically altered conditions in off-channel habitat used by Chinook juveniles for rearing. Construction of the Kenny Dam in the early 1950s significantly impacted and continues to impact local ecosystems in the Nechako River basin, where large areas of land were flooded or drained causing displacement of salmon and other fish species. General impacts to Middle Fraser Spring 5_2 (1.3) Chinook are expected to be minimal due to the large geographic range of the CU (Doutaz et al. 2021). Construction of

the Terzaghi Dam on the Bridge River (Middle Fraser CU) in 1960 cut-off important spawning and rearing habitat that was historically used by the Bridge River Chinook population, and resulted in dewatering of ~4km of habitat downstream of the dam (Bradford et al. 2011; Weir et al. 2022). The Bridge river population currently accounts for ~3% of the Spring 5_2 (1.3) SMU. Most recently substantial adult en-route mortality occurred during the 2019 Big Bar Landslide on the Fraser River mainstem. This slide impacted Spring 5_2 (1.3) migration in 2020, however there was no significant mortality or delay in migration detected at Big Bar in 2021 or 2022 (Chinook Technical Committee 2025b; DFO 2025b). In July of 2024, a landslide occurred on the Chilcotin River, blocking fish passage for weeks during the migration period of the 52 (out of an SMU total of 61) populations that spawn upstream from the slide. SONAR data showed that migration resumed in early September, mortality due to the initial blockage and downstream debris flow has not been quantified (Chinook Technical Committee 2025a). Because none of the Fraser Spring 5_2 (1.3) Chinook streams are actively monitored for habitat changes and juvenile production, we are not able to quantify the impacts of these events.

Ecosystem and Climate Change Considerations

Fraser Spring 5_2 (1.3) Chinook migration routes and spawning habitat encompasses a large geographic area, therefore they encounter a wide range of ecosystems and climatic conditions during their life-cycle (Doutaz et al. 2021; Weir et al. 2022; Dionne et al. 2023). Table 3 summarizes major ecosystem and climate considerations by life-stage for this SMU. An in-depth summary of the major climate threats to specific CUs and recommended management actions to address these threats are outlined in the associated Recovery Potential Assessments (RPAs; Doutaz et al. 2021; Weir et al. 2022; Dionne et al. 2023).

Table 3. Fraser River Spring 5_2 (1.3) Chinook required habitats and the effect of top threats by life stage. Information adapted from (Doutaz et al. 2021).

Life stage	Top threats	Mechanisms of threats
Egg/alevin	• Modifications to catchment surfaces • Climate change increasing freshwater environmental variation	• Increased likelihood of dewatering or egg/alevin-scouring flood events
Fry/parr	• Modifications to catchment surfaces • Climate change increasing freshwater environmental variation	• Alters freshets, affecting the timing and duration of access to off-channel rearing habitat • Increases variation in stream temperature and the number of metabolically stressful days
Smolt	• Modifications to catchment surfaces. • Climate change increasing freshwater and marine environmental variation.	• Alters freshets, timing of smolt migration and ocean entry. • Influences early marine survival through competition and predation.
Immature adult	• Climate change increasing marine environmental variation.	• Influences growth rates and survival through competition and predation.
Spawning adult	• Modifications to catchment surfaces. • Climate change increasing freshwater environmental variation.	• Alters surface and groundwater availability, determining whether salmon can access spawning areas.

Life stage	Top threats	Mechanisms of threats
		• Watersheds heavily impacted by wildfires are more susceptible to landslides that can restrict salmon access to spawning areas.

Simulations

Simulations of future Fraser Spring 5_2 (1.3) Chinook abundance explored a range of Canadian ERs (0-0.45) and smolt survival/productivity rates (Ricker ln(α) 0.36-2.12) to determine whether any combination of these could result in:

1. Spawner escapement that would exceed the WSP lower biological abundance benchmarks (20% S_{max} and/or 1,500 spawners; Figure 6).
2. Spawner escapement that would exceed the WSP lower biological benchmarks (20% S_{max} only; Figure 7).
3. Spawner escapement that would exceed the SMU-based LRP (Figure 8).

The simulations resulted in the following insights:

- No combinations of ER and productivity escaped enough spawners to exceed Rapid Status Approach thresholds (20% Smax or 1,500 spawners) for all CUs, thus an FRP-L could not be identified for the SMU.
- The small population CUs (Lower Fraser and Fraser Canyon) were unlikely to exceed the 1,500 spawner threshold, but moderately to highly likely to exceed the 20% Smax threshold.

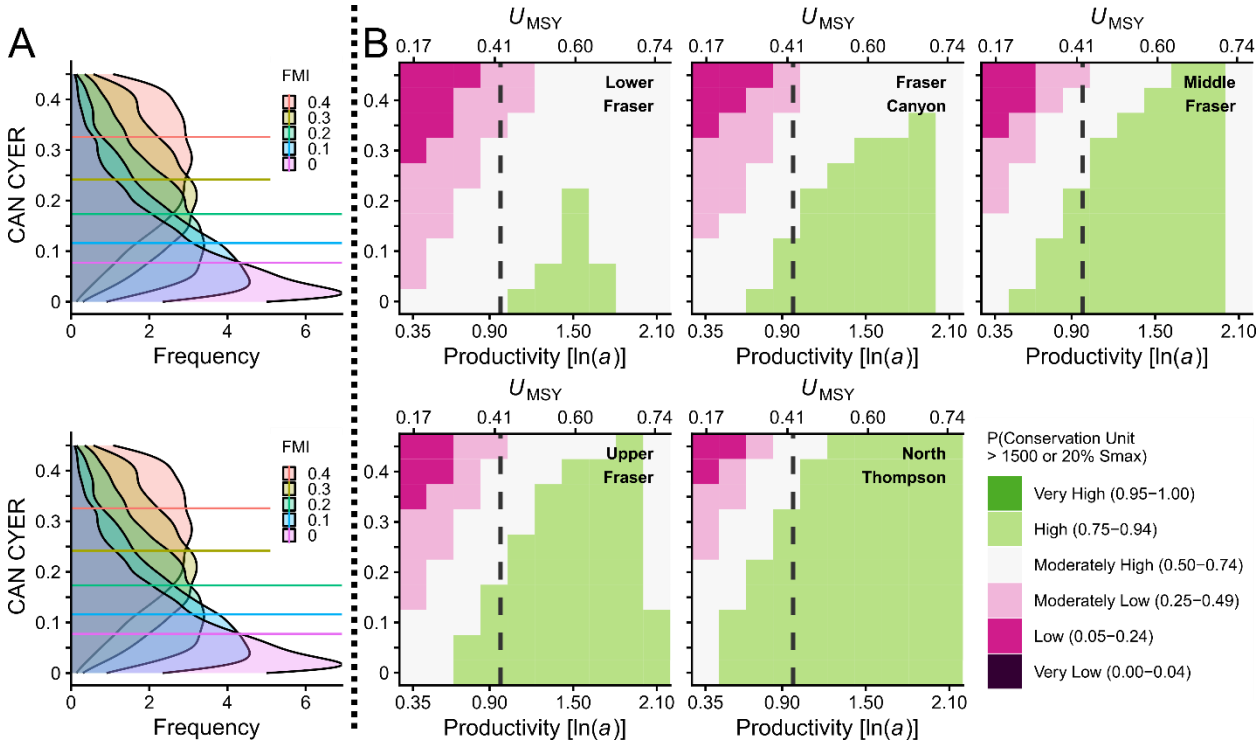


Figure 6. Simulated probability that Conservation Units (CUs) in the Fraser Spring 5_2 (1.3) Chinook Stock Management Unit (SMU) meet or exceed their Wild Salmon Policy (WSP) lower biological benchmarks. Horizontal lines in the A side plots represent median values of Calendar Year Exploitation Rate (CYER) for a given value of Fisheries Mortality Index (FMI), with associated posterior distributions describing the range of possible CYER outcomes for a given target FMI. The A-side plots are derived from a measurement error model of CYER ~ FMI assuming both indices include an observation error with CV = 0.1. B-side ice-cream plot results are based on CYER with implementation error (CV = 0.1) across a range of productivity values covering the 95% CI of estimated productivity (Ricker ln(alpha)). The secondary x-axis shows U_{MSY} values relative to productivity. Squares are colour-coded according to the probability that the geometric mean of the last generation (5 years) of spawner abundance for a given CU meets or exceeds 20% S_{max} or 1,500 spawners, whichever value is greater. The vertical dashed grey lines in the B-side plots indicates the median estimated productivity. Given the expectation that climate change will negatively impact the productivity of this SMU, scenarios to the left of the dashed grey lines are more likely.

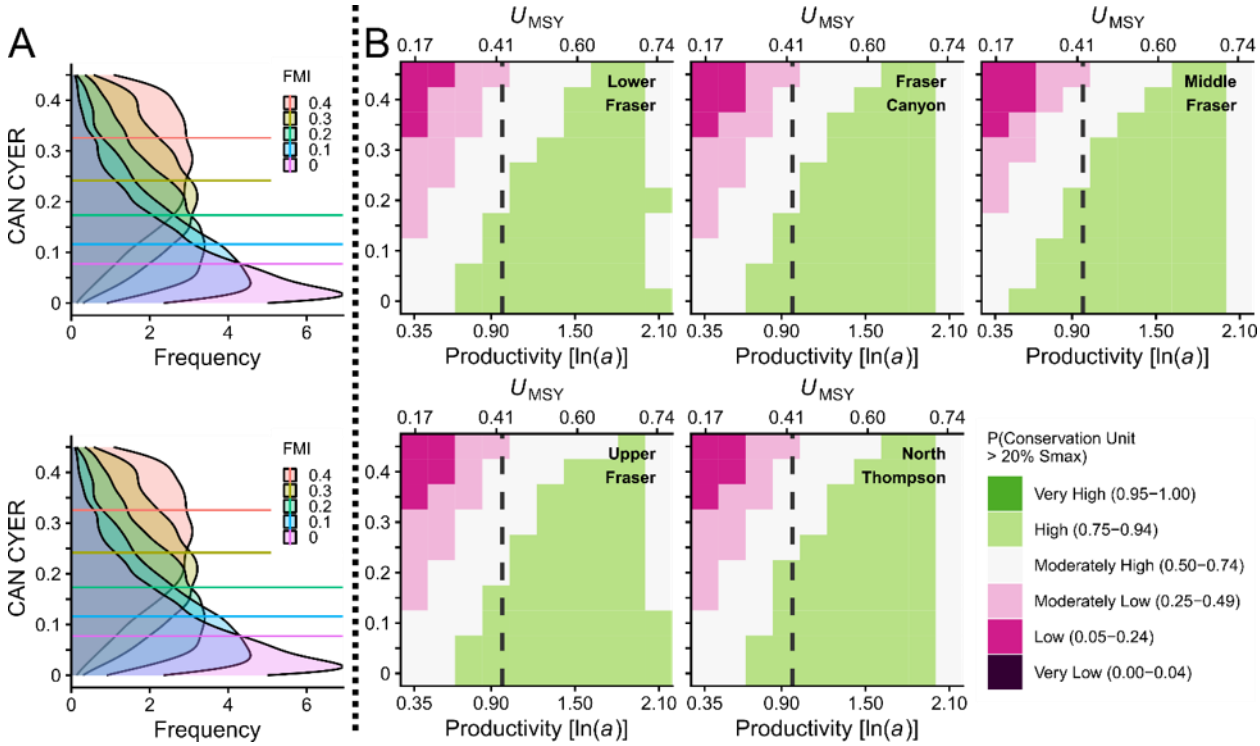


Figure 7. Simulated probability that Conservation Units (CUs) in the Fraser Spring 5_2 (1.3) Chinook Stock Management Unit (SMU) meet or exceed 20% S_{max}. Horizontal lines in the A side plots represent median values of Calendar Year Exploitation Rate (CYER) for a given value of Fisheries Mortality Index (FMI), with associated posterior distributions describing the range of possible CYER outcomes for a given target FMI. The A-side plots are derived from a measurement error model of CYER ~ FMI assuming both indices include an observation error with CV = 0.1. B-side ice-cream plot results are based on CYER with implementation error (CV = 0.1) across a range of productivity values covering the 95% CI of estimated productivity (Ricker ln(alpha)). The secondary x-axis shows U_{MSY} values relative to productivity. Squares are colour-coded according to the probability that the geometric mean of the last generation (5 years) of spawner abundance for a given CU meets or exceeds 20% S_{max}. The vertical dashed grey lines in the B-side plots indicates the median estimated productivity. Given the expectation that climate change will negatively impact the productivity of this SMU, scenarios to the left of the dashed grey lines are more likely.

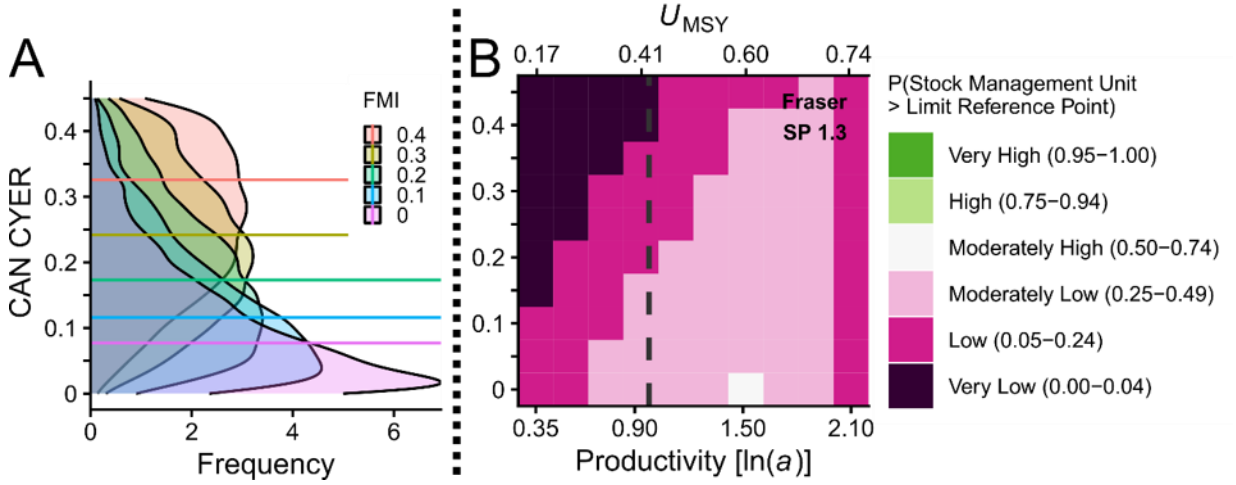


Figure 8. Simulated probability the Fraser Spring 5_2 (1.3) Chinook Stock Management Unit (SMU) meets or exceeds the Conservation Unit (CU) status-based Limit Reference Point (LRP). Horizontal lines in the A-side plots represent median values of Calendar Year Exploitation Rate (CYER) for a given value of Fisheries Mortality Index (FMI), with associated posterior distributions describing the range of possible CYER outcomes for a given target FMI. The-A side plots are derived from a measurement error model of CYER ~ FMI assuming both indices include an observation error with CV = 0.1. B side ice-cream plot results are based on CYER with implementation error (CV = 0.1) across a range of productivity values covering the 95% CI of estimated productivity (Ricker ln(alpha)). The secondary x-axis shows U_{MSY} values relative to productivity. Squares are colour-coded according to the probability that the geometric mean of the last generation (5 years) of spawner abundance for all CUs meets or exceeds CU-specific 20% S_{max} or 1,500 spawners, whichever value is greater. The vertical dashed grey line in the B-side plot indicates the median estimated productivity. Given the expectation that climate change will negatively impact the productivity of this SMU, scenarios to the left of the dashed grey lines are more likely.

Exceptional Circumstances

A re-assessment of the Fraser Spring 5_2 (1.3) SMU is recommended if any of the following occur:

- New information becomes available that results in significant changes to the time-series of spawner abundance, exploitation rate and/or catch data used in this research document.
- New information becomes available that results in changes to stock structure (e.g., CU designations) and/or major drivers of stock dynamics.
- New information becomes available regarding the recent landslide impacts on spawner abundance and the susceptibility of CUs to future landslides.

BYCATCH

Enhanced monitoring of the Pacific region groundfish trawl fishery was initiated in 2022 to provide accurate estimates of Pacific Salmon bycatch by species and assess stock composition using genetics (Lagasse et al. 2025). CWT recoveries and/or DNA samples were taken from a random sample of Chinook Salmon bycatch from each fishery region to determine the CU of origin. Fraser Spring 5_2 (1.3) Chinook Salmon represented a very low proportion (less than 3%) of Chinook bycatch sampled in 2023, totaling approximately 36 sampled fish across all Canadian groundfish fisheries (Lagasse et al. 2025). Note that these impacts are not accounted for in the FMI estimate of fisheries impact.

SOURCES OF UNCERTAINTY

The escapement data introduced uncertainty into the assessment. 80-99% of observed spawners within the Spring 5_2 (1.3) SMU are based on visual survey methods, with an expansion factor applied to estimate spawner escapement. This expansion factor is not adjusted for stream-specific factors that affect observer efficiency, such as turbidity, stream size and morphology, and fish density and estimates tend to be biased low[1].

The relationship between the FMI and Canadian CYER is positive, but relatively weak. Parameter estimates indicate low values of FMI (e.g., less than 0.1) are associated with estimates of CYER that are slightly higher, while high values of FMI are associated with estimates of CYER that are moderately lower. Importantly, these general patterns become more extreme as observation error in both indices increases[1]. Although there appear to be qualitative differences in the mean relationship between indices among SMUs, there are too few observations for each ERIS to estimate these effects with high precision. Given that CYER is not currently available for this SMU, FMI is the best available method for estimating fishing mortality. While CYER is an imperfect measure of fishing mortality, it has received more validation and includes a greater number of fisheries (including US fisheries) than the FMI, thus we recommend continuing to improve monitoring of escapement and development of an indicator stock program for the Lower Chilcotin River Spring Chinook population.

The way in which the Ricker stock-recruit parameters were estimated for this assessment is a source of uncertainty for both the generation of reference points and the simulation outcomes. A single fecundity-based estimate of productivity was used for the entire SMU. In reality, each CU should have its own intrinsic productivity (due to differences in ecosystems and potential genetic variation among CUs). Similarly, the estimate of the CU-specific Ricker β values introduces uncertainty as they are not based directly on CU-specific stock-recruit data, based on accessible watershed area, which fails to account for differences in ecosystems and potential genetic variation among CUs. Thus, if the resources were available, there would ideally be an ERIS for each CU rather than a single ERIS in development (Lower Chilcotin River) to represent the entire SMU.

For the simulation results, there were two more major sources of uncertainty. First, initial spawner abundance could not be based on observed absolute spawner abundance data (many CUs only had relative index data). Simulations were initialized using stochastic projections from assumed Ricker parameters, so starting conditions likely did not reflect current spawner abundances (i.e., the starting abundances of spawners in the simulations were not grounded in current reality). Second, the simulations assumed perfect observation of spawner abundances, comparing simulated true spawner abundance against absolute abundance reference points (20% S_{max}). In reality, Fraser Summer 5_2 (1.3) Chinook CUs are dominated by relative index abundance data for which status assessment occurs with trend-based metrics using the Rapid Status Approach. Thus, the simulation results may not accurately reflect future statuses because trend-based metrics rather than absolute abundance metrics will likely determine future statuses.

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