Fisheries and Oceans Canada / Pêches et Océans Canada
Ecosystems and Oceans Science / Sciences des écosystèmes et des océans

Pacific Region
Canadian Science Advisory Secretariat
Science Advisory Report 2026/008

STOCK ASSESSMENT OF YUKON RIVER 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 2009) be developed for Yukon River Chinook salmon (*Oncorhynchus tshawytscha*, 2024-25 Yukon River IFMP). This request includes a review of possible fishing scenarios and rebuilding actions for Yukon River Chinook salmon that could contribute to stock rebuilding, and that the stock status be assessed relative to the reference points.

This Science Advisory Report is from the regional peer review of June 4-5, 2025, on Estimating Precautionary Approach Reference Points and Assessing Consequences of Harvest Control Rules for Canadian Origin Yukon Chinook Salmon. 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 anticipated Yukon River Chinook salmon major fish stock is comprised of two Stock Management Units (SMU) – Yukon Chinook SMU and Porcupine Chinook SMU.
- The major stock is below its Conservation Unit (CU)-status based Limit Reference Point, based on Wild Salmon Policy (WSP) rapid status approach, because at least one CU is in the *Red* status zone. Five of nine CUs in the Yukon Chinook SMU, and two of three CUs in the Porcupine SMU, are assessed as in the *Red* status zone.
- Spawner abundance over the most recent generation (2019–2024) in the Yukon Chinook SMU was 25,852 which is below a proposed Fishery Reference Point – Lower of 31,000 and an Upper Stock Reference Point of 86,000. The SMU harvest rate over this same time period averaged 16% which is well below a proposed Maximum Removal Reference Point of 36%.
- Recent (2019–2024) estimates of spawner abundance to the Porcupine SMU averaged 695, but with data limited to two CUs. Harvest of Porcupine Chinook is not well characterized but Chinook salmon from the SMU are assumed to experience similar harvest rates to those experienced by the Yukon SMU in in-river fisheries in Alaska.

Trends

- Total returns to the Yukon Chinook SMU averaged ~175,000 from the 1980s to the mid-1990s, and have declined to the lowest observed returns on record 2021–2024 (an 87% decline from 1981–2024). In contrast, spawning abundance has varied from year to year but has been relatively stable over time with the exception of very low spawning abundances in recent years (2021–2024).

- Model based harvest rates in the predominantly mixed-stock fishery in mainstem of the Yukon River in Alaska and Yukon territory ranged from an average of 68% in the late 1980s and early 1990s to 18% over the most recent decade. In the last four return years, harvest rates were dramatically reduced and ranged from 3%–8%.
- Female Yukon River Chinook salmon are returning at younger ages and the proportion of the total return that is females has declined, leading to a reduction in eggs per spawner (by approximately 25% from the late 1980s to the early 2020s).
- Intrinsic productivity has declined by an average of approximately 60% across CUs from the late 1980s to the early 2020s.

Ecosystem and Climate Change Considerations

- Rapid and ongoing climate and ecosystem change occurring throughout the freshwater and marine habitats Yukon River Chinook salmon use is expected to result in conditions that continue to keep population productivity relatively depressed.
- Factors affecting adult Yukon River Chinook salmon during their upriver migration and spawning include the Whitehorse dam, Ichthyophoniasis disease, low water levels, and warm stream temperatures which may all contribute to increased pre-spawn mortality.
- Changes in the Bering Sea ecosystem that Yukon River Chinook salmon use through their marine life include increased competition with other salmon, shifts in prey availability, and increased predator abundance which may contribute to decreased fitness and survival.
- The consequences of ecosystem and climate change were implicitly taken into account in the evaluation of harvest control rules (HCRs) by using population models with intrinsic productivity estimated from recent brood years (2012–2017).

Stock Advice

Harvest Advice

- Closed loop simulations to 2050 were used to evaluate alternative HCRs assuming productivity remains the same as it was over the most recent generation. A subset of these HCRs included: recently implemented seven-year agreement[1], which limits harvest unless border passage is expected to exceed 71,000; the Interim Management Escapement Goal that was in place prior to the seven year agreement (lower bound of 42,500 aggregate spawners); and a Precautionary Approach compliant HCR, which allowed harvest at lower abundances than other HCRs considered, and limited harvest rates at large run sizes.
- Extending the seven-year agreement until 2050 is expected to allow for limited rebuilding of some CUs and modest harvest opportunities. Under the agreement, spawner abundances are projected to exceed their CU-specific lower biological benchmarks for six CUs, and exceed upper biological benchmarks for four of those six.
- Using the lower bound of the Interim Management Escapement Goal after the seven-year agreement is expected to allow for higher average harvests than if the agreement remains in

[1] Agreement of April 1, 2024 regarding Canadian-origin Yukon River Chinook Salmon for 2024 through 2030

place, but at the cost of one additional CU in the Yukon Chinook SMU falling below its lower biological benchmark.

- Implementing an alternative Precautionary Approach-compliant HCR after the seven-year agreement expires, which allows harvest at lower abundances than other HCRs considered, has similar biological and fishery performance to the seven year agreement, but reduces the frequency of fishery closures from four in every five years to one in every two.
- Under simulations that assume productivity remains very depressed (35% below most recent generation average), all HCRs resulted in very limited opportunities for harvest and at least four of nine CUs within the Yukon Chinook SMU falling below their lower biological benchmarks.

Enhancement Advice

- An analysis to determine feasibility and a risk-benefit assessment would inform appropriate enhancement for rebuilding activities following enhanced contribution guidelines. If enhancement is undertaken, the development and implementation of an enhancement plan that summarizes recovery goals, recovery phases, benchmarks, triggers, and intended outcomes in collaboration with Yukon First Nations and stakeholders is strongly recommended.

BASIS FOR ASSESSMENT

Assessment Details

Year Assessment Approach was Approved

2022

Assessment Type

Full assessment

Most Recent Assessment Date

1. Last Full Assessment: 2022 (Connors et al 2023, JTC 2025)
2. Last Interim-Year Update: N/A

Stock Assessment Approach

1. Broad category: Multiple Approaches: single stock assessment model, closed-loop simulation model, Wild Salmon Policy rapid-status assessment process
2. Specific category: State-space run reconstruction and stock-recruitment relationship, closed-loop simulation model

At stock aggregate scale a state-space run reconstruction and spawner-recruitment model was fit to data from assessment projects that estimate mainstem passage, harvests, tributary escapements, stock proportions, and age composition to derive annual estimates of total harvest, escapement and returns, by age, for Yukon River Chinook salmon SMU (i.e., not including Porcupine Chinook salmon). At CU scale, genetic information and border passage models were used to estimate spawner abundances for nine Yukon River CUs. These estimates were combined with age composition and harvest data to characterize population dynamics, estimate biological benchmarks, assess CU status, and quantify expected biological and fishery consequences of current and alternative harvest management measures via closed loop simulations.[2]

Operating Models

To implicitly account for the cumulative consequences of ecosystem and climate driven change on the productivity of Yukon River Chinook salmon the simulation evaluation of HCRs was conducted under three operating model scenarios[1]:

1. reference scenario: intrinsic productivity of CUs returns to most recent generation average,
2. robustness scenario 1: a "worst-case" scenario where productivity is assumed to remain severely depressed (~35% below most recent generation average), and
3. robustness scenario 2: a "best-case" scenario where productivity is assumed to revert to its long-term average.

Stock Structure Assumption

- The major stock slated to be prescribed under the *Fisheries Act* consists of two SMUs: Yukon Chinook salmon spawning in the Canadian portion of the Yukon River and its tributaries in south-central Yukon, and Porcupine Chinook salmon which spawn in tributaries of the Porcupine River in northern Yukon, which itself joins the Yukon River in Alaska (Figure 1).
- The Yukon Chinook SMU consists of nine CUs and the Porcupine Chinook salmon SMU consists of three CUs (Table 1).

There is ongoing and modest enhancement in the Yukon Chinook SMU at the Whitehorse Rapids Fish Hatchery, some small-scale in-stream incubation activities, and enhancement has historically occurred at three other facilities.

Table 1. Structure and status of Yukon Chinook salmon major stock. Stock Management Units (SMU) and component Conservation Units (CUs) referenced in this assessment, with corresponding Designatable Units (DUs) used in other assessments, and CU status as assessed by Wild Salmon Policy (WSP) Rapid Status tool.

SMU	Conservation Unit ID	Conservation Unit name	Designatable Unit ID	Designatable Unit name	Wild Salmon Policy Rapid Status assessment 2025
Yukon Chinook Salmon	CK-68	Yukon River-Teslin headwaters	60	Yukon-Teslin Headwaters, Stream, Summer	Red with medium confidence
Yukon Chinook Salmon	CK-69	Upper Yukon River	60	Yukon-Teslin Headwaters, Stream, Summer	Red with medium confidence

[2] Connors, C., A. O'Dell, H. Hunter, D. Glaser, J. Gill, S. Rossi, and C. Churchland. In prep. Stock Status and Biological and Fishery Consequences of Alternative Harvest and Rebuilding Actions for Yukon River Chinook Salmon (*Oncorhynchus tshawytscha*). DFO Can. Sci. Advis. Sec. Res. Doc.

SMU	Conservation Unit ID	Conservation Unit name	Designatable Unit ID	Designatable Unit name	Wild Salmon Policy Rapid Status assessment 2025
Yukon Chinook Salmon	CK-70	Big Salmon	61	Big Salmon River, Stream, Summer	Amber with high confidence
Yukon Chinook Salmon	CK-71	Nordenskiold	62	Nordenskiold, Stream, Summer	Red with high confidence
Yukon Chinook Salmon	CK-71	Pelly	64	Pelly-Stewart, Stream, Summer	Amber with high confidence
Yukon Chinook Salmon	CK-73	Middle Yukon River and tributaries	63	Mid-Yukon River and Trib, Stream, Summer	Amber with high confidence
Yukon Chinook Salmon	CK-74	Stewart	64	Pelly-Stewart, Stream, Summer	Red with high confidence
Yukon Chinook Salmon	CK-75	White and tributaries	65	White River and Trib, Stream, Summer	Red with high confidence
Yukon Chinook Salmon	CK-76	North Yukon River and tributaries	66	N Yukon River and Trib, Stream, Summer	Amber with medium confidence
Porcupine Chinook Salmon	CK-77	Salmon Fork	NA	NA	Data deficient
Porcupine Chinook Salmon	CK-78	Porcupine	67	Porcupine River, Stream, Summer	Red with high confidence
Porcupine Chinook Salmon	CK-79	Old Crow	68	Old Crow River, Stream, Summer	Red with high confidence

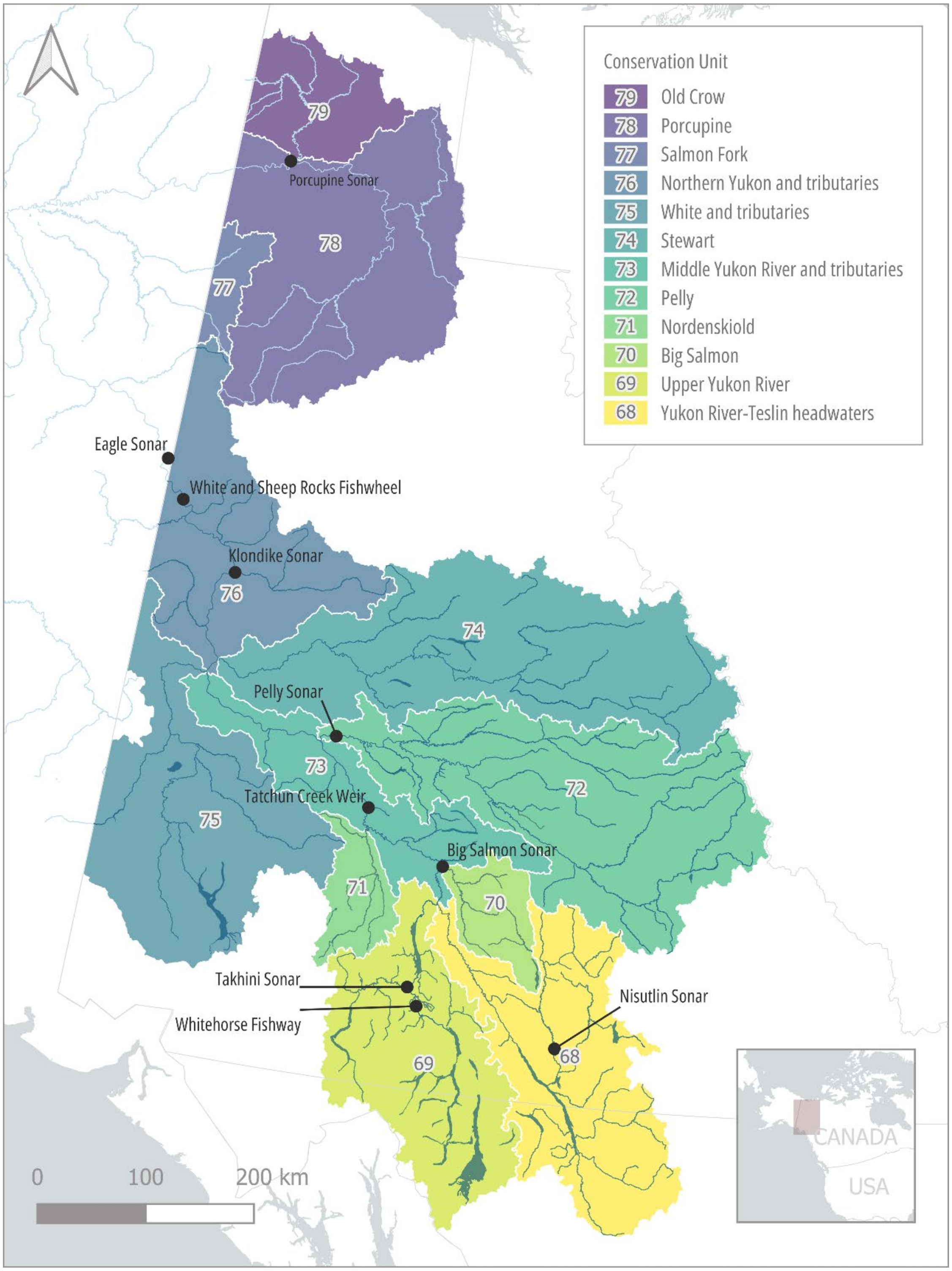

Figure 1. Yukon Chinook salmon Conservation Units and select assessment projects.

Reference Points

Reference points for the Yukon Chinook SMU were developed as part of this assessment. These are used above and throughout this document to evaluate Yukon Chinook SMU status (Table 2 and 3).

Table 2. Yukon Chinook Stock Management Unit (SMU) proposed reference points

SMU scale Reference Point	Description	Value
Limit Reference Point (LRP)	CU status-based – SMU is below LRP if any CU is in WSP Red zone	N/A
Fishery Reference Point – Lower	Aggregate average spawner abundance associated with no greater than 50% chance of at least CUs falling below its lower biological benchmark	31,000
Upper Stock Reference (USR)	Approximately SMSR, when explicitly accounting for recent reproductive output (demographics from 2009-2019), as estimated in Connors et al. (2022)	86,000
Removal Reference (RR)	Long-term average UMSY for the least productive component CU	36%

Table 3. Conservation Unit (CU) biological benchmarks and proposed rebuilding targets. Values listed are median values (in thousands).

Conservation Unit	Lower Biological Benchmark (20% SMSR)	Upper Biological Benchmark (40% SMSR)	Rebuilding Target - SMSR (2019-2024 demographics)
Big Salmon	1,370	2,74	6,420
Middle Yukon R. and tribs.	3,890	7,780	18,210
Nordenskiold	320	640	1,570
Northern Yukon R. and tribs.	1,610	3,220	8,670
Pelly	2,770	5,540	11,520
Stewart	800	1,590	4,620
Upper Yukon R.	1,080	2,160	6,900
White and tribs	1,350	2,700	6,400
Yukon R. Teslin Headwaters	1,020	2,040	7,800

Data

- The number of adult Chinook salmon entering the Canadian portion of the mainstem Yukon River are estimated near the U.S. - Canada border. From the 1980s to the early 2000s, fishwheels and mark-recapture methods were used, and a sonar site and drift gillnet test fishery were established after 2005. Genetic material recovered from samples at border assessments have been used to assign fish passing the border to one of the nine Yukon Chinook salmon CUs within the Yukon Chinook SMU.

- A run-reconstruction model uses border passage, harvest, and age composition data from various sources to derive escapement, harvest, and returns by age for the Yukon Chinook SMU (i.e., not including the Porcupine).
- The number of adult Chinook salmon entering the Canadian portion of the Porcupine River has been estimated using sonar since 2014. This accounts for Chinook salmon in the Porcupine and Old Crow CUs. The sonar site is near the community of Old Crow.

ASSESSMENT

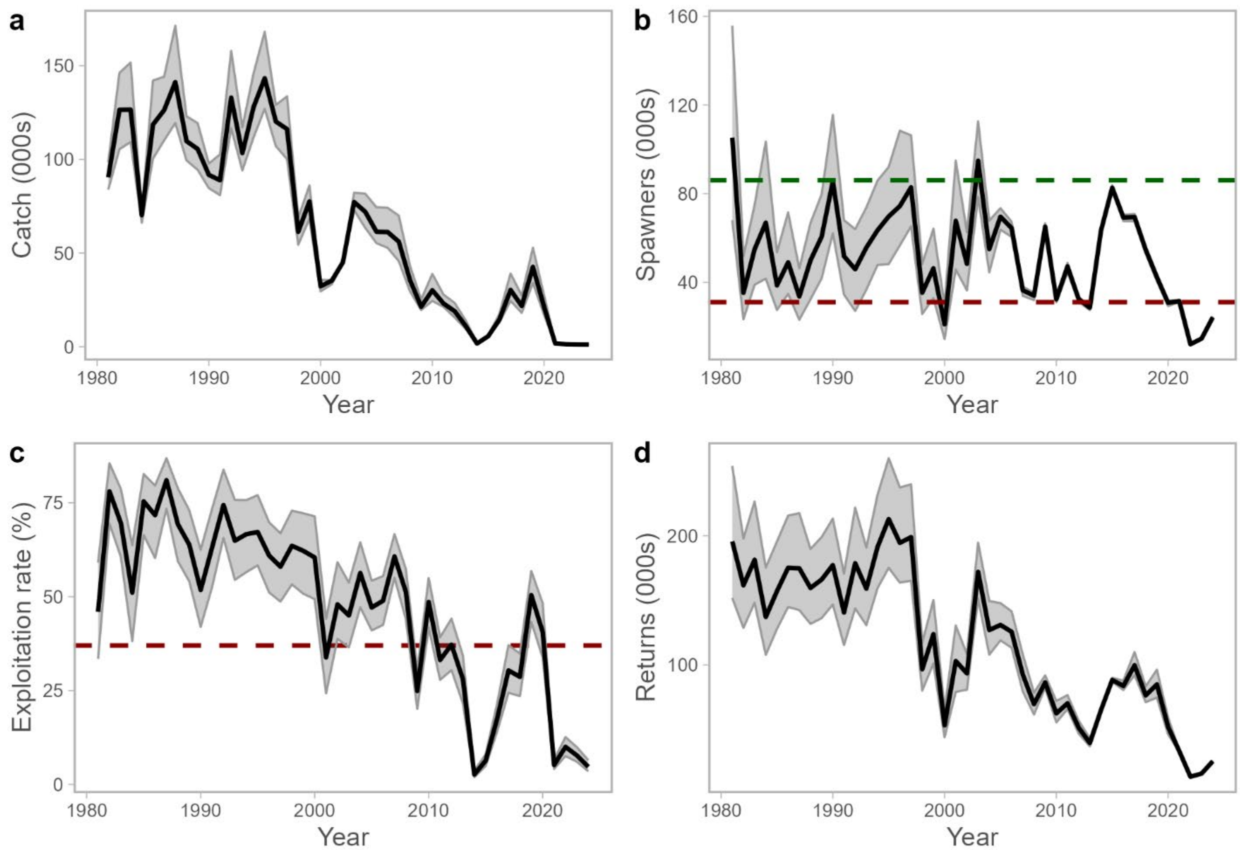

Figure 2. (a) Total catch estimates (including all harvest in Alaska and Yukon Territory), (b) Number of spawners in relation to the proposed Fishery Reference Point-Lower in red (FRP-L; 31,000) and Upper Stock Reference in green (USR; 86,000), (c) Exploitation rate in relation to the Removal Reference in red (RR; 36%), (d) Total number of returns. Note that these plots are only for Yukon Chinook SMU due to data limitations for the Porcupine SMU.

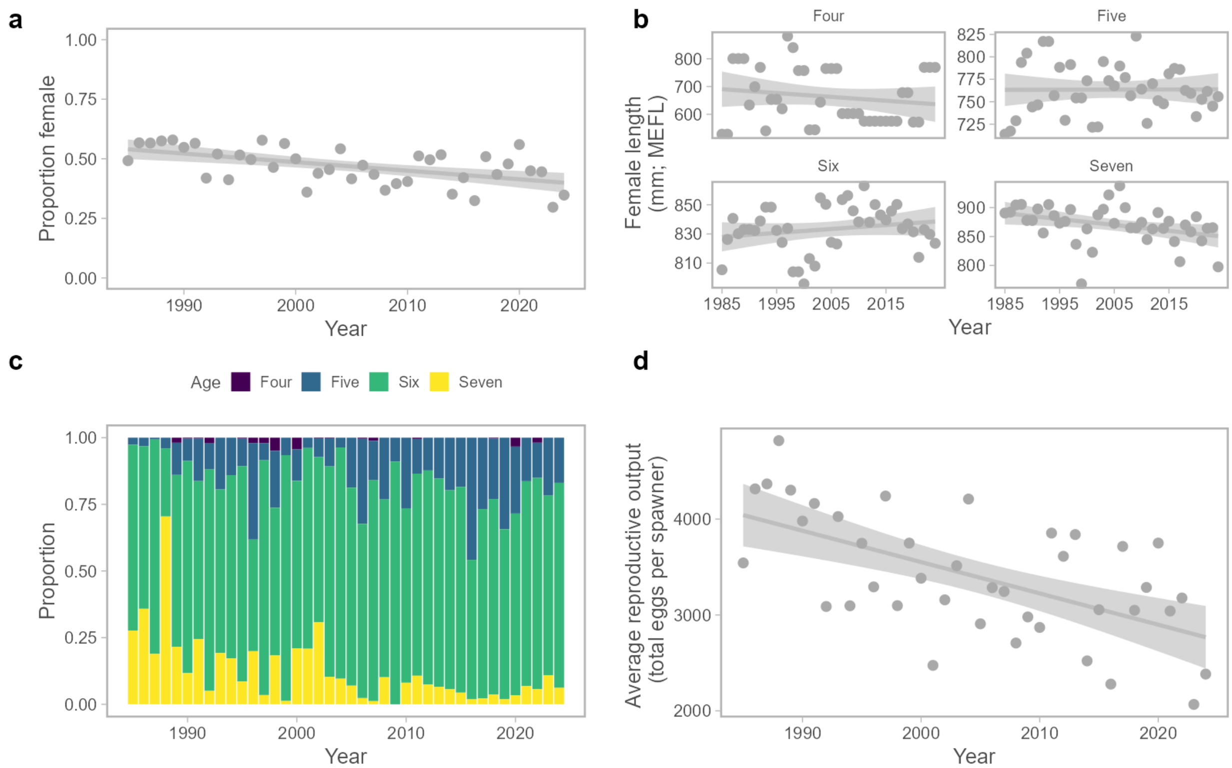

Figure 3. (a) Sex ratio, shown as the proportion of female spawners, (b) length-at-age of female spawners, (c) proportion of returning females in each age class, and (d) the average reproductive output per spawner, as a function of time for the Yukon Chinook SMU. Age, sex, and length data are from samples at the U.S. - Canada border.

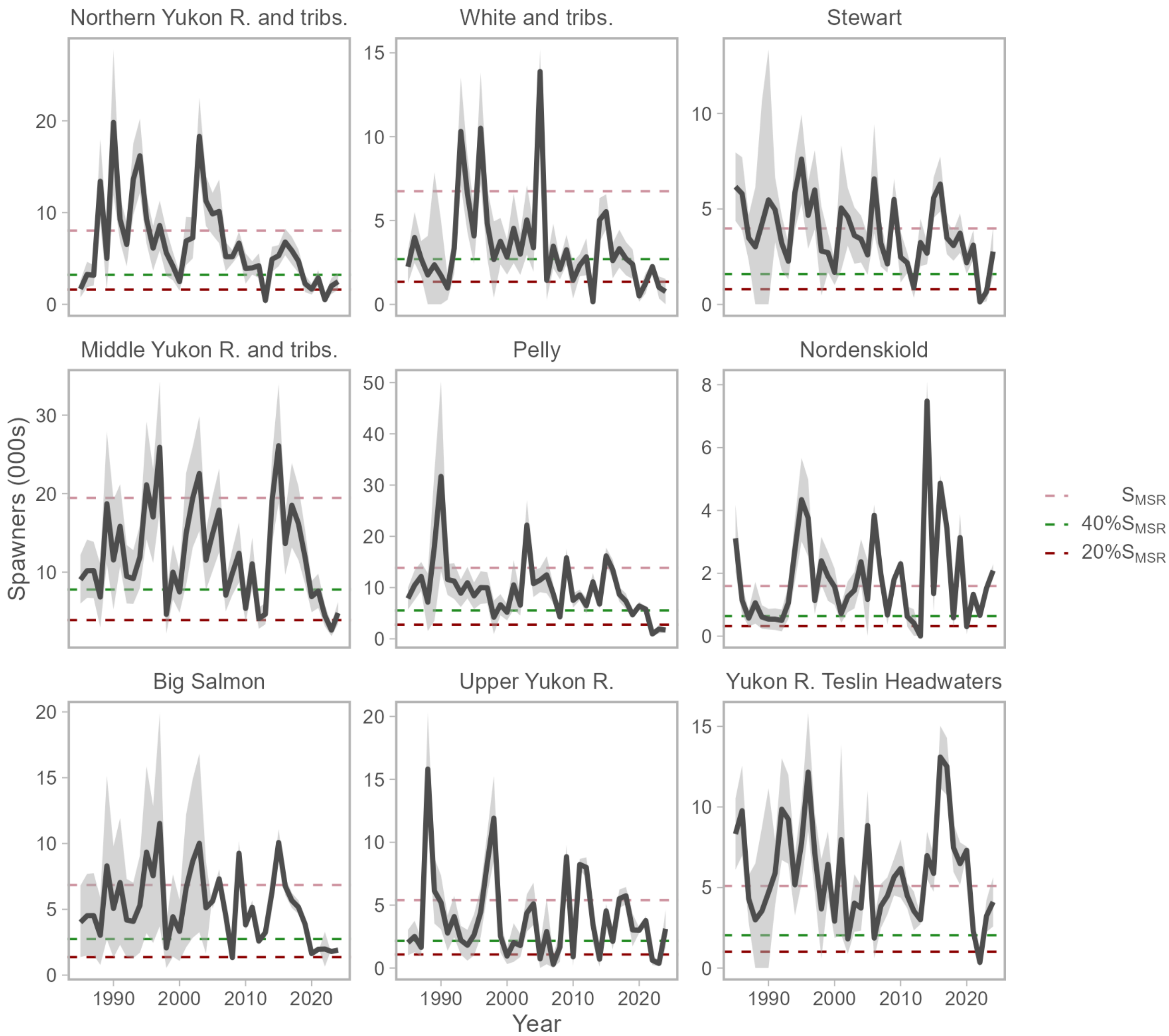

Figure 4. Number of spawners by CU in relation to CU-specific biological benchmarks (lower/red = 20% S_{MSR}, upper/green = 40% S_{MSR}), both based on spawner recruitment models, and rebuilding target (pink = S_{MSR}) based on egg mass recruitment models that explicitly attempts to account for recent (2019–2024) demographic characteristics of the stock. Note that WSP status assessments are based on smoothed spawner abundances and consideration of additional criteria (e.g., absolute abundance thresholds) and so the inclusion of benchmarks in this figure is for illustrative purposes only.

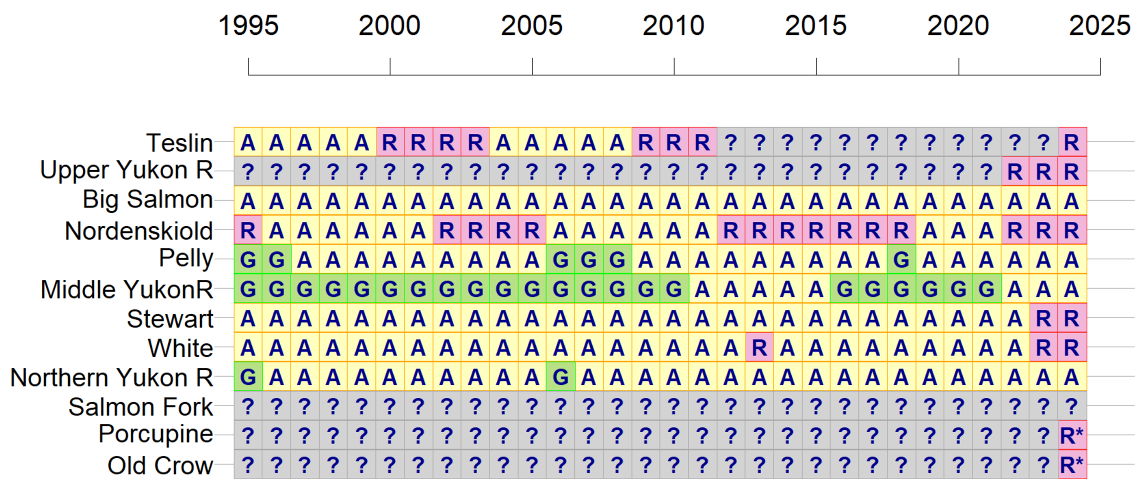

*Figure 5. Yukon Chinook Wild Salmon Policy statuses for years with applicable data. Each row summarizes the assessed statuses for each Conservation Unit. The * for the Porcupine and Old Crow statuses indicates they are based on a combined assessment.*

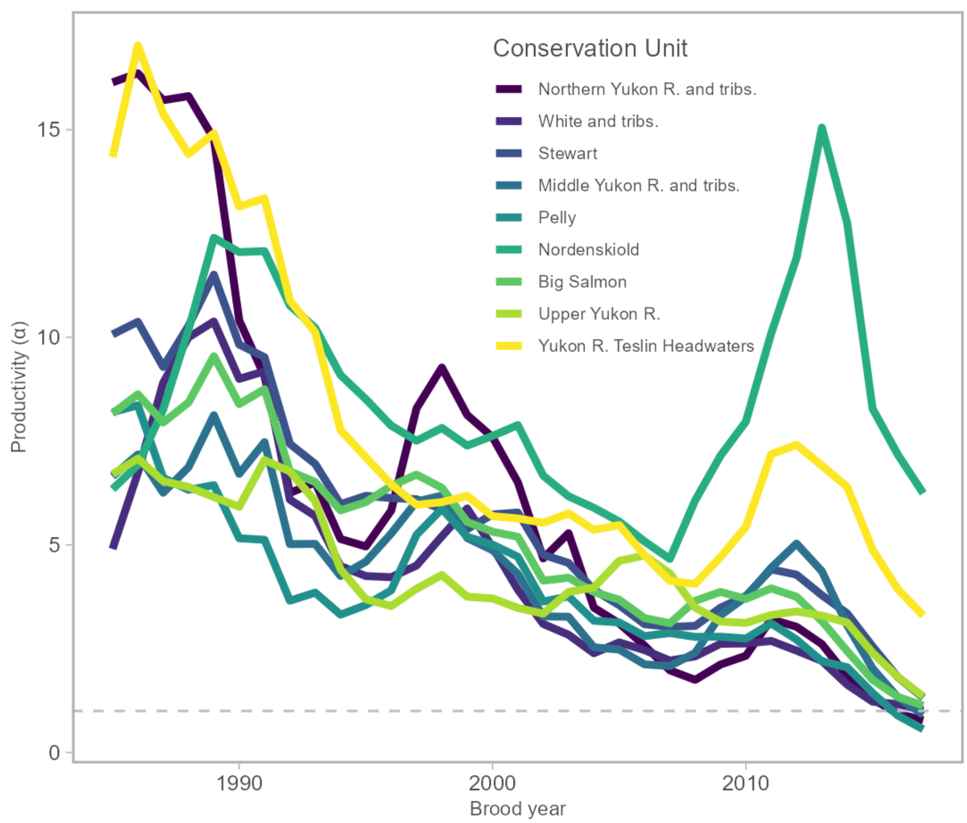

Figure 6. Estimated average intrinsic productivity (Ricker α parameter; maximum recruits per spawner) over time by Conservation Unit in the Yukon Chinook Salmon Stock Management Unit. The dashed grey line is replacement (recruits equal spawners).

Stock Status and Trends: Yukon Chinook SMU

Current Status

Five of ten Conservation Units (CUs) in the Yukon Chinook salmon Stock Management Unit (SMU), and two of three CUs in the Porcupine SMU, are assessed as in the WSP Red status zone (Figure 4 and 5), and so the Yukon Chinook salmon major fish stock is below its CU-status based Limit Reference Point.

Aggregate spawner abundance over the most recent generation (2019–2024) in the Yukon Chinook SMU was 25,852 which is slightly below a proposed Fishery Reference Point - Lower of 31,000 and well below the proposed Upper Stock Reference Point of 86,000 (Figure 2). The aggregate harvest rate over this same time period averaged 16% which is below the proposed maximum Removal Reference Point of 36%.

Run size

The Yukon Chinook SMU experienced relatively large run-sizes from 1981–1995, followed by a sharp decline in the late 1990s, a modest recovery in the mid-2000s, and then a general decline since with the lowest observed run-sizes on record in 2021–2024 (Figure 2d). Overall, the SMU declined by ~87% from 1981–2024.

Spawning escapement

In contrast to run size, spawning escapements have varied from year to year but have been relatively consistent over time (Figure 2b) with the exception of the very low spawning abundances in recent years. Spawning escapements were generally above the proposed lower fishery reference point until 2021 (Figure 2b).

Productivity

There is strong evidence of time-trends in recruitment and productivity over time with productivity estimated to have declined by an average of 60% across CUs between the late 1980s and the early 2020s (Figure 6).

Harvest

The SMU harvest rate has also varied over time, decreasing from an average of 68% in the late 1980s and early 1990s to 18% over the most recent decade (Figure 2c). The harvest rate was consistently above the proposed RR until the mid-2010s. In the last four return years, harvest was dramatically reduced to a rate of 3%–8%.

Age, sex, and length

The proportion of returning fish that were sexed as female declined from approximately 53% in the 1980s to 46% in the 2020s, with considerable interannual variation (Figure 3a). In contrast, there is little evidence of declines in female size at age (Figure 3b). The age composition of returning females in the 1980s was approximately 20% seven year olds and fewer than 10% five year olds, but is now nearly 25% five year olds and only 5% seven year olds. Applying the relationship between female size and fecundity from Ohlberger et al. (2020), these changes have resulted in a ~25% decline in total eggs produced per spawner between the 1980s and the 2020s (Figure 3d).

Stock Status and Trends: Porcupine SMU

Spawning escapement

Returning adults at the sonar assessment site on the Canadian portion of the Porcupine River averaged 2,566 fish for the most recent decade (2014–2024; no assessment in 2020), but only 434 in 2021–2024. This sonar measures the combined escapement for the Porcupine and Old Crow CUs, and these CUs are assessed as in the WSP Red status zone. The Salmon Fork CU is considered data deficient.

History of Management

History of Assessments

The number of adult Chinook salmon returning to the Yukon River has been estimated near the mouth of the river at Pilot Station since the mid-1980s and scale pattern analysis and more recently genetics have been used to apportion returns to populations spawning in the lower, middle, and upper (Canadian) portion of the river basin. Chinook salmon migrating into the Canadian portion of the mainstem Yukon River has been assessed using a variety of methods over the past four decades, largely focused on the Yukon Chinook SMU. Fishwheels and a mark-recapture program operated in several locations near the border (White and Sheep rocks) from the early 1980s to the mid-2000s to estimate abundance and collect biological samples. In 2005, a sonar site and drift gillnet test fishery were established near Eagle, Alaska, to also estimate border passage and collect biological samples, and this assessment project has continued to present. Within the Canadian portion of the Yukon River, spawning escapement has been enumerated at various tributaries using foot, aerial, and sonar based assessment methods. The number of adult Chinook salmon migrating into the Canadian portion of the Porcupine River has been estimated using sonar near the community of Old Crow since 2014.

Harvest of Chinook salmon in Yukon Territory has occurred in First Nations fisheries, commercial, domestic, and public angling fisheries, while in Alaska fisheries harvest Chinook have included subsistence, commercial, personal use, and sport. In Alaska, harvest of Chinook salmon was historically apportioned to lower, middle, and upper/Canadian stocks, by age, using scale pattern analysis. Since 2003, harvest of Yukon Chinook salmon in Alaska by age and stock of origin has been estimated using genetic methods. In Canada, harvests have been estimated or inferred from commercial landings, recreational catch cards, and from communal harvest information provided by individual First Nation Lands and Resources staff to DFO.

History of Hatchery and Supplementation

There has been modest enhancement in the system including hatcheries, incubation facilities, and in-stream incubation projects. The largest and longest-running facility has been the Whitehorse Rapids Fish Hatchery, which has a current annual release target of 150,000 age zero-plus smolts. The genetic risk of this prolonged hatchery enhancement has been assessed for populations spawning above the Whitehorse fishway. The population is considered to be partially integrated with gene flow between natural and hatchery origin populations, but natural salmon remain the majority and gene flow is dominated by the natural environment (‘integrated-transition’; proportionate natural influence (PNI) = 0.72; Figure 7).

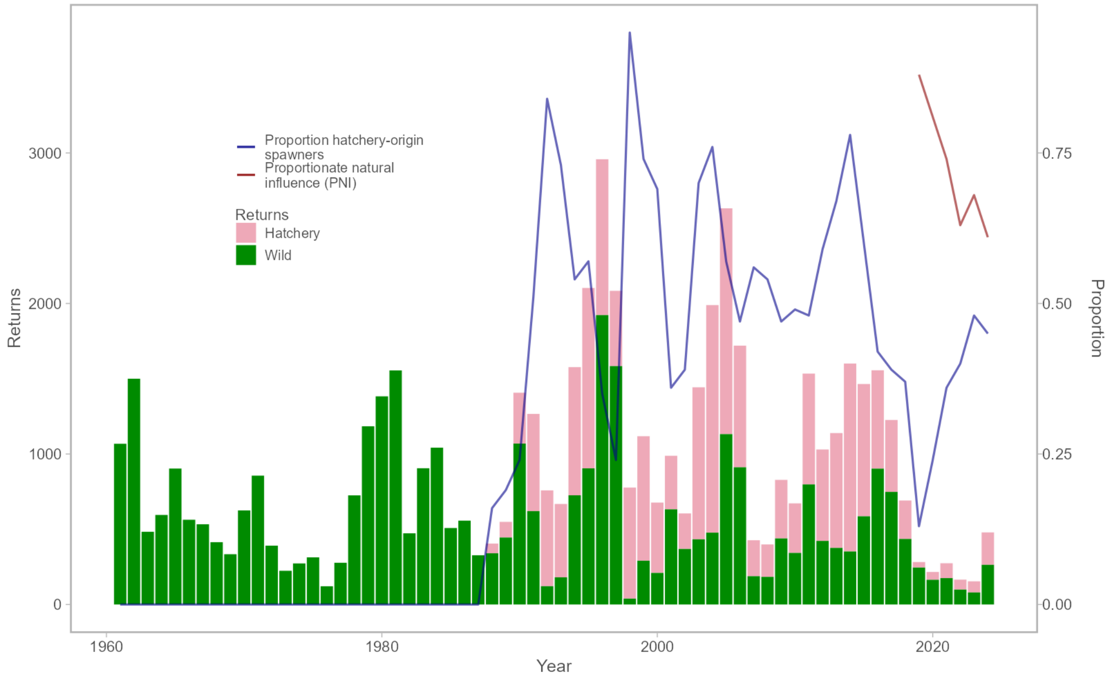

Figure 7. Chinook returns to Whitehorse Rapids fishway and proportion hatchery origin spawners (pHOS), based on observed adipose fin clip rates. Proportionate Natural Influence (PNI) for the last six years, calculated from adipose fin clip status and Parentage Based Tagging (PBT) results of broodstock, when available.

History of Freshwater Habitat Impacts

Overall, the Canadian portion of the Yukon River basin is minimally modified with relatively intact habitats. However, there are hydroelectric facilities on the Mayo River and at Whitehorse Rapids. The Mayo facility obstructs passage upstream of the dam and potentially reduces habitat quality downstream. There are fish ladders at Whitehorse Rapids, but efficacy is as low as 13% for females (Twardek et al. 2023a). Outmigrating juveniles pass the facility via spillways, fishway, and through turbines, which may cause up to 30% mortality (Twardek et al. 2023b). Additionally, widespread current and historical placer mining has damaged salmon habitats and caused changes in sedimentation, which affect egg and fry survival.

Ecosystem and Climate Change Considerations

Yukon River Chinook salmon undergo one of the longest freshwater migrations of any Pacific salmon to reach spawning grounds and encounter a wide range of ecosystem and climate conditions over the course of their life cycle.

Freshwater life stage

- High freshwater temperatures (above 18°C) and low discharge during return migrations are associated with reduced productivity, especially in tributary stream CUs.
- Warmer winter temperatures and earlier ice melt experienced by juveniles are associated with higher survival, but highly variable winter temperatures can cause fatal irregular ice formation

- *Ichthyophonus* is a pathogen that likely causes en-route mortality during spawning migrations

Marine life stage

- Competition with pink salmon in the Bering Sea is likely to be reducing marine survival.
- Climate change induced shifts in the Bering Sea food web have raised concerns for declining prey quality, which is associated with thiamine deficiency and Ichthyophonus infection in adult Yukon River Chinook salmon

There are various ecosystem and climate processes potentially impacting the stock and in many cases they are not yet well understood. Rather than directly modeling a set of environmental or ecosystem variables, we indirectly accounted for them via the inclusion of a time-varying productivity term in spawner-recruit models. Alternative assumptions about future productivity captured in alternative operating models are intended to shed light on fishery performance under uncertain future ecosystem and climate states.

Simulations

A simple closed loop forward simulation, conditioned on estimates of historical spawner abundance, harvest, age composition, and time-varying productivity was used to quantify expected biological and fishery consequences of current and alternative harvest management measures (i.e., HCRs; Table 3) for the Yukon Chinook SMU. Three operating model scenarios were considered:

1. Reference scenario: intrinsic productivity of CUs returns to most recent generation average
2. Robustness scenario 1: a “worst-case” scenario where productivity is assumed to remain severely depressed (~35% below most recent generation average)
3. Robustness scenario 2: a “best-case” scenario where productivity is assumed to revert to its long-term average

Table 4. Set of Harvest Control Rules (HCRs) evaluated using closed-loop simulation

Simulated HCR	Description	Reason for including
Moratorium (seven-year agreement)	Current agreement between ADF&G and DFO (aka ’moratorium’) that limits directed harvest unless border passage is expected to exceed 71,000 fish	Current harvest control rule
Interim Management Escapement Goal (IMEG)	No directed harvest if forecasted run-size <42,500 (lower bound of escapement goal); above this ‘surplus’ can be harvested	Rule in place prior to current moratorium
Moratorium w/ harvest cap	No directed harvest if forecasted border passage <71,000; above this all ‘surplus’ can be harvested up to the removal reference (RR).	Current harvest control rule with additional protection for least productive CUs
Interim Management Escapement Goal (IMEG) w/ harvest cap	No directed harvest if forecasted run-size <42,500; above this all ‘surplus’ can be harvested up to the RR.	Former harvest control rule with additional protection for least productive CUs

Simulated HCR	Description	Reason for including
Precautionary Approach (PA) alternative	No directed harvest if forecasted run-size <31,000 (lower fishery reference point) with progressive increase in allowable harvest rate up to the RR if run-size forecast >86,000 (USR)	Consistent with DFO's Precautionary Approach Framework (DFO 2009)

The simulations resulted in the following insights:

- Under the reference scenario:
  - The current seven-year agreement was projected to result in average annual escapements (~28,000) that fell below the Fishery Reference Point - Lower, with very modest harvest (~3,400) and a harvest rate well below the RR (~10%). Notably, >80% of years resulted in no harvest.
  - Three CUs are expected to be below their lower biological benchmarks should the agreement be continued until 2050.
  - Returning to the interim management escapement goal resulted in slightly lower average escapements and higher harvest, but at the risk of one additional CU being below its lower biological benchmark.
  - A harvest control rule consistent with the precautionary approach (PA; DFO 2009), which allowed some harvest if the stock surpassed its Fishery Reference Point - Lower, had similar projected escapement and harvest, as well as biological risk to CUs, but with fewer years of complete fishery closures (50% of years) compared to the moratorium harvest control rule (85% of years).
- Under the "worst case" robustness scenario all alternative harvest management measures considered resulted in very limited opportunities for harvest, and up to six CUs were projected to fall below their lower biological benchmarks by 2050, and another was projected to become extinct.
- Under the "best case" robustness scenario average annual escapements were projected to increase substantially to just below the USR, average annual harvest was projected to range from 20,000–40,000, and all CU were expected to exceed their lower biological benchmarks.

Fishery impacts on the Porcupine Chinook salmon SMU were not evaluated via simulation due to data limitations.

Exceptional Circumstances

We recommend a re-assessment be triggered if any of the following occur:

- Stock productivity changes drastically, where the median estimate of time-varying productivity falls outside the 50th percentiles of the productivity used to condition our forward simulation under the "worst case" productivity scenario robustness test;
- Management measures, and performance statistics, other than those evaluated in this research document are considered by fisheries management;
- New information becomes available that results in changes to our understanding of stock structure (e.g., the current Conservation Unit delineations) and/or major drivers of stock dynamics; or

- New information becomes available that results in changes to the biological benchmarks and reference points used, or historical time-series of spawner abundance and/or catches used in this research document (e.g., historical estimates of migration mortality are derived and incorporated into the run-reconstructions).

SOURCES OF UNCERTAINTY

We made a number of simplifying assumptions in our analysis in order to provide a complete assessment of the stock. These included:

- All CUs are equally vulnerable to fisheries: we used reconstructed estimates of total Canadian-origin Yukon Chinook harvest from Connors et al. (2022) and reconstructed spawner abundances to estimate CU-specific harvest rates. Although CUs differ in their run timing and time spent in river, for those few years (2005-10) where genetic sampling of harvest in Alaska allowed for a comparison of CU composition in both border passage and harvest there was no evidence of consistent over/under-representation of individual CUs in Alaskan harvest.
- No en-route mortality after the U.S.-Canada border: our reconstructions assume that all fish that pass the border and are not harvested reach their spawning grounds. However, *Ichthyophonus hoferi* infection and high water temperatures are among the possible causes of mortality during this stage. A recently initiated tagging study aims to estimate this en-route mortality.
- Conservation Units do not differ in their age composition: our spawner-recruitment analyses assumed that all Canadian CUs share a common age structure. Genetic sampling at the border has allowed estimation of CU-specific age-at-return since 2005, but it is not possible to partition age samples to CUs prior to that. Available data from some years since 2005 does not show strong evidence of variability between CUs.
- Future productivity will remain similar to recent productivity: applying our closed-loop simulation model required us to make assumptions about what CU-scale intrinsic productivity was likely to be over the simulated years. We considered a scenario where the productivity of each CU was at its recent generation average, as well as scenarios where it continues to decline or reverts to its long-term average. These were illustrative examples but do not represent the full range of possible future productivity scenarios.

LIST OF MEETING PARTICIPANTS

Last Name	First Name	Affiliation
Agbayani	Selina	Centre for Science Advice Pacific (CSAP)
Anderson	Erika	DFO Science
Appleby	Tom	DFO Fish and Fish Habitat Protection Program
Bailey	Colin	DFO Science
Bradford	Mike	DFO Science
Bradley	Cheyenne	DFO Science
Burns	Chris	LGL Limited for Selkirk First Nation
Churchland	Carolyn	DFO Salmonid Enhancement Program
Connors	Brendan	DFO Science
Dennert	Allison	Raincoast Conservation Foundation

Last Name	First Name	Affiliation
Feddern	Megan	National Oceanic and Atmospheric Administration / National Marine Fisheries Service
Folkes	Michael	DFO Science
Gill	Jessica	DFO Fisheries Management
Glover	Luc	DFO Science Area
Grant	Sue	DFO Science
Greenberg	Dan	DFO Science
Hamazaki	Toshihide (Hamachan)	Alaska Department of Fish and Game (ADFG)
Holt	Carrie	DFO Science
Hunter	Hannah	DFO Science
Kendall	Jaclyn	DFO Fisheries Management
Knight	Karlie	Tr'ondëk Hwëchin First Nation
Liller	Zachary	Alaska Department of Fish and Game (ADFG)
MacDonald	Elizabeth	Yukon First Nation Salmon Stewardship Alliance; Council of Yukon First Nations
May	Chelsea	DFO Science
Milligan	Marina	Yukon First Nation Salmon Stewardship Alliance; Council of Yukon First Nations
Nelson	Christie	DFO Fisheries Management
O'Dell	Adam	DFO Science
O'Leary Baikie	Huey	Tr'ondëk Hwëchin First Nation
Parken	Chuck	DFO Science
Peacock	Stephanie	Pacific Salmon Foundation
Pestal	Gottfried	Solv Consulting
Rear	Lisa	First Nation of Na-Cho Nyäk Dun
Rossi	Steven	LGL Limited
Rourke	Gillian	Teslin Tlingit Council
Smith	Steve	DFO Fisheries Management
Tadey	Joe	DFO Salmonid Enhancement Program
Twardek	William	Ecofish Research for Kwanlin Dün First Nation
Winter-Sinnott	Gavin	First Nation of Na-Cho Nyäk Dun
Wor	Catarina	DFO Science

SOURCES OF INFORMATION

Connors, B.M., Bradley, C.A., Cunningham, C., Hamazaki, T., and Liller, Z.W. 2023. Estimates of biological benchmarks for the Canadian-origin Yukon River mainstem Chinook Salmon (*Oncorhynchus tshawytscha*) stock aggregate. DFO Can. Sci. Advis. Sec. Res. Doc. 2022/031: iv + 105 p. (Erratum: March 2025)

DFO. 2009. A fishery decision-making framework incorporating the precautionary approach.

JTC (Joint Technical Committee of the Yukon River U.S./Canada Panel). 2025. Yukon River salmon 2024 season summary and 2025 season outlook. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 25-01, Anchorage.

Twardek, W.M, S.J. Cooke, and N.W.R. LaPointe. 2023a. Fishway performance of adult Chinook salmon completing one of the world's longest inland salmon migrations to the upper Yukon River. Ecol. Eng. 187(106846).

Twardek, W., E. Vogt, B. Mercer, and I. Murphy. 2023b. Whitehorse Rapids Generating Station Juvenile Chinook Salmon Entrainment Assessment. Consultant's report prepared for Yukon Energy – Resource Planning Department by Ecofish Research Ltd., September 21, 2023.

THIS REPORT IS AVAILABLE FROM THE:

Center for Science Advice (CSA)
Pacific Region
Fisheries and Oceans Canada
3190 Hammond Bay Road
Nanaimo, BC V9T 6N7

E-Mail: DFO.PacificCSA-CASPacifique.MPO@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas-sccs/

ISSN 1919-5087
ISBN 978-0-660-97892-5 Cat. No. Fs70-6/2026-008E-PDF

Correct Citation for this Publication:

DFO. 2026. Stock Assessment of Yukon River Chinook Salmon (*Oncorhynchus Tshawytscha*) in 2024. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2026/008.

Aussi disponible en français :

*MPO. 2026. Évaluation du stock de saumon chinook du fleuve Yukon (*Oncorhynchus Tshawytscha*) en 2024. Secr. can. des avis sci. du MPO. Avis sci. 2026/008.*