TCCHINOOK (25-02)

Annual Report of Catch and Escapement for 2024

Prepared by the

CHINOOK TECHNICAL COMMITTEE

for the

PACIFIC SALMON COMMISSION

July 2025

PACIFIC SALMON COMMISSION
CHINOOK TECHNICAL COMMITTEE REPORT

ANNUAL REPORT OF CATCH AND ESCAPEMENT FOR 2024

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List of Acronyms and Abbreviations

AABM	Aggregate Abundance Based Management
ADF&G	Alaska Department of Fish and Game
AI	Abundance Index
AUC	Area-Under-the-Curve
BC	British Columbia
BEG	Biological Escapement Goal
BY	Brood Year
C2	Catch and Escapement Indicator Improvement and Coded-Wire Tag and Recovery
CEII	Catch and Escapement Indicator Improvement
CI	Confidence Interval
CMR	Carcass Mark-Recovery
CMRE	Cumulative Mature-Run Equivalent
CNR	Chinook Non-retention
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPUE	Catch per unit effort
CR	Chinook Retention
CRITFC	Columbia River Intertribal Fish Commission
CSAF	Commercial Salmon Allocation Framework
CSAP	Canadian Centre for Science Advice Pacific
CSAS	Canadian Science Advisory Secretariat
CTC	Chinook Technical Committee
CU	Canadian Conservation Units
CV	Coefficient of Variation
CWT	Coded-Wire Tag
CWT&R	Coded-Wire Tag and Recovery
CY	Calendar Year
CYER	Calendar Year Exploitation Rate
DFO	Canadian Department of Fisheries and Oceans
DSL	Discounted Survey lide
DU	Canadian Designatable Units
ELS	Electronic Licensing System
ER	Exploitation Rate
ERA	Exploitation Rate Analysis
ESA	U.S. Endangered Species Act
FLHAP	Fish Life History Analysis Program
FNC	First Nations Caucus
FSC	Food, Social, and Ceremonial
HOR	Hatchery origin
IDF&G	Idaho Department of Fish and Game
IM	Incidental Mortality
iREC	Internet Reporting System
ISBM	Individual Stock Based Management
LAT	Low Abundance Threshold
LC	Landed Catch
LIM	Legal Incidental Mortality
MEF	Mid-eye to tail fork
MOC	Mid-Oregon Coast
MR	Mark–Recapture
MRE	Mature-Run Equivalent
MSF	Mark Selective Fishery
MSY	Maximum Sustainable Yield
NBC	Northern British Columbia (Dixon Entrance to Kitimat including Haida Gwaii)
NEVI	North East Vancouver Island
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOC	North Oregon Coast
NWVI	North West Vancouver Island
NOR	Natural-Origin spawner
NPFMC	North Pacific Fishery Management Council
NWIFC	Northwest Indian Fisheries Commission
ODFW	Oregon Department of Fish and Wildlife
OR	Oregon
PFMA	Pacific Fishery Management Areas
PFMC	Pacific Fishery Management Council
PSC	Pacific Salmon Commission
PST	Pacific Salmon Treaty
QDNR	Quinault Department of Natural Resources
QIN	Quinault Indian Nation
RM	River Mile
SARA	Canadian Species at Risk Act
SaSI	Salmon Stock Inventory System
SEAK	Southeast Alaska-Cape Suckling to Dixon Entrance
SIM	Sublegal Incidental Mortality
$\mathbf{S_{MSY}}$	Escapement producing MSY
SSP	Sentinel Stocks Program
SWVI	South West Vancouver Island
TAC	Total Allowable Catch
t. run	Terminal Run

TBD	To Be Determined
TBR	Transboundary Rivers (Alsek, Taku, Stikine)
tGMR	Transgenerational Genetic Mark Recapture
TM	Total Mortality
TTC	Transboundary Technical Committee
U.S.	United States
UAF	University of Alaska Fairbanks
U_{MSY}	Exploitation Rate at MSY
UMT	Upper Management Threshold
USFWS	U.S. Fish and Wildlife Service
WA	Washington
WCVI	West Coast Vancouver Island excluding Area 20
WDFW	Washington Department of Fish and Wildlife

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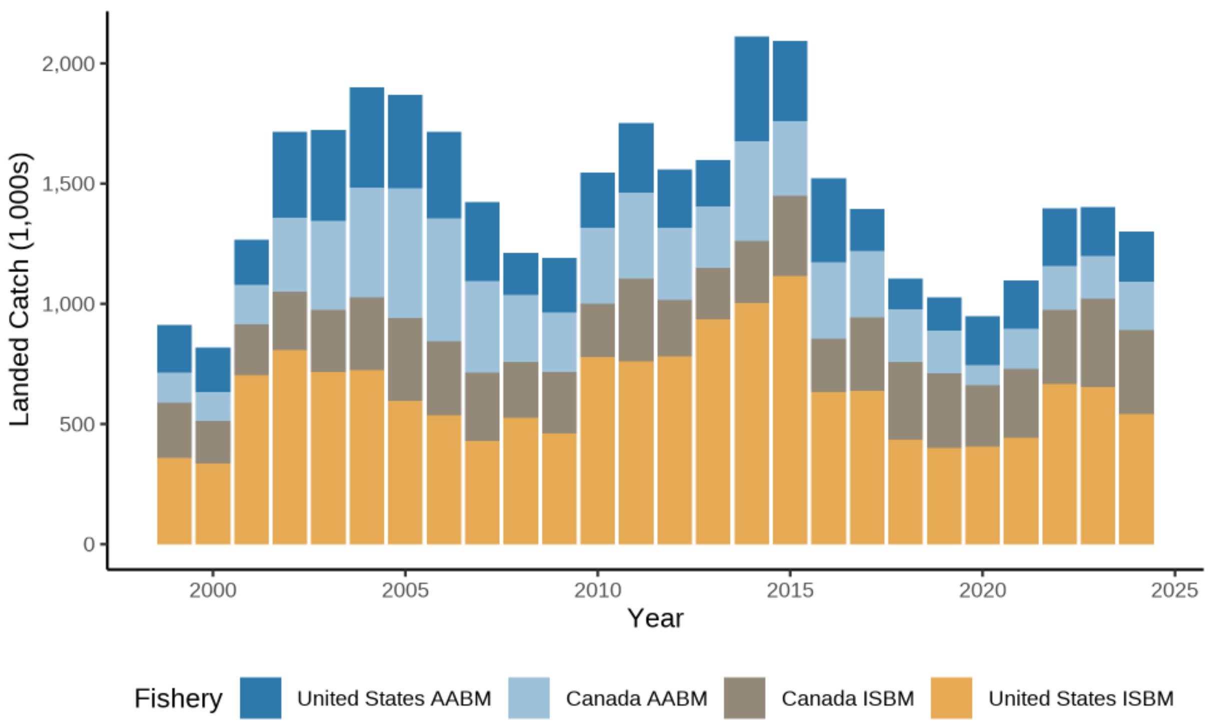
EXECUTIVE SUMMARY

The Pacific Salmon Treaty (PST, Treaty) requires the Chinook Technical Committee (CTC) to provide the Pacific Salmon Commission (PSC) annual catch and escapement data for Chinook salmon stocks managed under the Treaty. This report contains three sections that indicate stock performance in the context of management objectives for 2024: Chinook salmon catches, escapements, and stock status.

Section 1 summarizes fishery catches by region and available estimates of incidental mortality (IM) by fishery for 2024, with accompanying commentary on the fisheries, management, and derivation of IM. Canada and the U.S. compile annual catch data and estimates of IM for their respective jurisdictions within the PST area according to fishery regimes, regional locations, and gear type. Landed catch (LC) is fully reported in Appendix A for each geographic area covered under the PST. A summary for all PSC Aggregate Abundance Based Management (AABM) and Individual Stock Based Management (ISBM) fisheries, from 1999 to 2024, is provided in the figure below. Time series of available IM estimates are provided in Appendix A for individual fisheries. Appendix A also includes a coastwide summary of the historical time series of LC, IM, and their sum, total mortality (TM), across all AABM and ISBM fisheries. Appendix C documents recent updates to historical landed catch and release estimates in Canadian recreational fisheries.



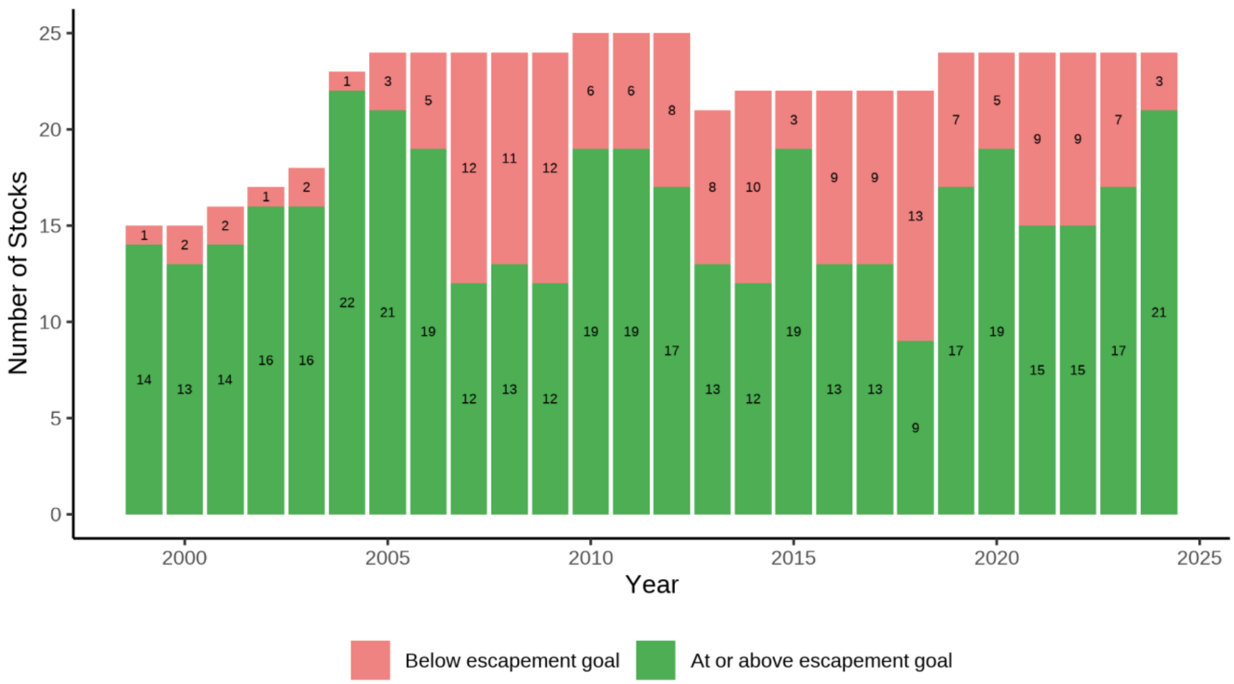
Estimates of landed catch for U.S. and Canada aggregate abundance-based management (AABM) and individual stock-based management (ISBM) fisheries, 1999–2024.

The preliminary estimate of Treaty LC of Chinook salmon for all PST fisheries in 2024 is 1,300,997, of which 750,446 were taken in U.S. fisheries and 550,551 were taken in Canadian fisheries. By fishery, 16% of the LC occurred in the SEAK AABM, 8% in NBC AABM, 7% in WCVI AABM, 27% in Canada ISBM, and 42% in U.S. ISBM. Total estimated IM associated with this harvest is 219,947 (14% of the TM) in nominal fish. The TM for all PST fisheries in nominal fish was 1,520,945 Chinook salmon, which is 121,644 less than recorded for 2023 (Appendix Table A25). Of the total PSC TM estimated for 2024, 846,696 occurred in U.S. fisheries and 674,249 occurred in Canadian fisheries. For U.S. fisheries, 72% of the LC and 58% of IM occurred in ISBM fisheries; in Canada, 63% of the LC and 77% of IM occurred in ISBM fisheries.

Paragraph 4(e) requires the CTC to provide a description of causes (if identifiable) of significant changes in rates or patterns of IM in all fisheries and paragraph 4(f) specifies IM limits for AABM fisheries. No AABM fisheries exceeded their IM limits in 2024 (Figure 1.1). The U.S. AABM, Canadian AABM, and U.S. ISBM fisheries had no identifiable changes in rates or patterns of IM. Canadian ISBM IM has been decreasing in recent years after peaking in 2022, but remained higher than what had previously been observed since 2020, despite a LC in 2024 only slightly larger than what has been observed in the last five years (347,600 fish in 2024 compared to the 5-year average (2019–2023) of 306,008). The main fishery contributing to this increase was the Strait of Georgia ISBM in 2021, in which releases of sublegal and super-legal fish peaked at 250,326 along with LC (53,573) and IM (51,758). In 2024, releases in this fishery decreased to 172,050 and IM decreased to 38,036, although LC increased to 72,698. The high number of releases and increased IM is attributed to a few factors including extended periods of Chinook non-retention that commenced in 2019, changes in the legal size limits and fishery regulations. Additional restrictions were applied in 2023 and continued in 2024 by reducing the Chinook daily limit from 2 per day to 1 per day from July 15 – 31 in Areas 121 and 123 to minimize impacts on Fraser summer 5.2 Chinook.

Section 2 includes an assessment of escapement for 52 PST escapement indicator stocks. Some of the indicator stocks are stock aggregates. There are 24 stocks that currently have PSC-agreed biologically-based goals, six of which have escapement goals defined as a range and 18 having escapement goals that are the point estimate of S_{MSY} (escapement producing maximum sustained yield). Annual escapements that are more than 15% below the lower bound of the range or the S_{MSY} point estimate are noted. The CTC will continue to review escapement goals for stocks as they are provided by respective management entities.

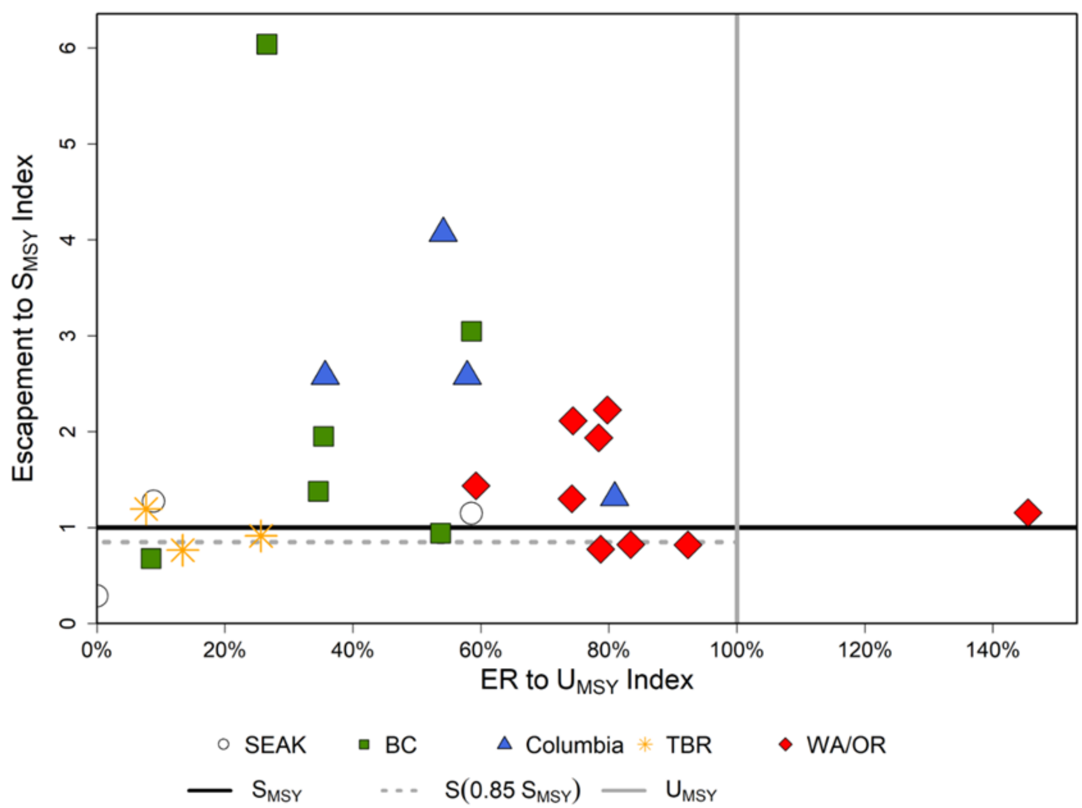
Since 1999, the percentage of stocks that met or exceeded escapement objectives (at or above point estimate or lower end of range) has varied between 41% and 96%. In 2024, the percentage of stocks that met or exceeded goal was 88%. Of the three stocks below goal (Stikine, Nehalem, and Siuslaw), all three had escapements that were less than 85% of their escapement objective.



Number and status of stocks with PSC-agreed escapement goals, 1999–2024.

Note: The Keta, Blossom, and King Salmon rivers and Andrews Creek stocks were dropped as escapement indicator stocks in 2013 and Grays Harbor fall was added in 2014. In 2019, the Deschutes and Chickamin rivers stocks were dropped and the Atnarko, Lower Shuswap, Skagit spring, and Skagit summer/fall stocks were added bringing the total number of current indicator stocks with PSC-agreed escapement goals to 24 (the 22 stocks with management objectives identified in Attachment I to Chapter 3 of the 2019 PST agreement, and Hoh spring/summer and Queets spring/summer).

Section 3 presents a synoptic evaluation of stock status that summarizes the performance relative to established goals over time for many of the escapement indicator stocks. This evaluation draws upon catch information (Section 1), escapement information (Section 2), and exploitation rates to evaluate the status of stocks. Synoptic plots present both the current status of stocks and the history of the stocks relative to PST management objectives; this information summarizes the performance of fisheries management relative to stocks achieving established or potential goals. The synoptic summary figure below shows that, of the 24 stocks with synoptic evaluations for 2023, most of the stocks were in the safe zone (exploitation below exploitation rate at maximum sustainable yield [U_{MSY}] and escapement above S_{MSY}). Two stocks, Kitsumkalum and Stikine, were in the buffer zone. Six stocks were in the low escapement and low exploitation zone: Situk, Taku, Nicola, Queets fall, Grays Harbor fall, and Siuslaw. One stock, Skagit spring, experienced exploitation above U_{MSY} with escapements exceeding S_{MSY} (i.e. high escapement and high exploitation).



Synoptic summary by region of stock status for stocks with escapement and exploitation rate data in 2023 (escapement and exploitation rate data for each stock was standardized to the stock-specific escapement goal and U_{MSY} reference points).

Note: SEAK = Southeast Alaska, BC = British Columbia, TBR = Transboundary Rivers, WA/OR = Washington/Oregon, ER = exploitation rate, U_{MSY} = exploitation rate at maximum sustainable yield, S_{MSY} = escapement producing maximum sustainable yield.

Note: Note one stock, Columbia River Upriver Brights, appears twice in the figure because there are two exploitation rate indicator stocks (URB and HAN) listed in Attachment I.

Section 4 provides a summary of the 2024 projects supporting the Catch and Escapement Indicator Improvement and Coded-Wire Tag and Recovery (C2) program, as required per subparagraph 2(b)(ix) of Chapter 3 of the 2019 PST Agreement. The C2 program is intended to fill in key data gaps and to improve data quality and timelines. In 2024, there were four Canadian and four U.S. projects supporting the C2 initiatives. They include development of a mainland British Columbia Chinook salmon indicator stock, updates to Fraser River Chinook salmon indicator stocks, development of escapement goals for Nass and Skeena rivers, development of an in-season forecasting model for Skeena River, improving the ability to provide timely and reliable estimates of harvest for the Umpqua River escapement indicator stock on the Oregon Coast, verifying and recalibrating estimated spawner abundance for the Grays Harbor escapement indicator stock on the Washington Coast, purchasing and repairing coded-wire tag wands for Oregon Coast, and enhancing coded-wire tag monitoring in the Southeast Alaska sport fishery.

1. CATCH

The 1999 Pacific Salmon Treaty Annex and the Related Agreement (1999 PST Agreement) substantially changed the objectives and structure of the fishery management framework by eliminating the previous ceiling and pass-through fisheries and replacing them with Aggregate Abundance Based Management (AABM) and Individual Stock Based Management (ISBM) fisheries. The 2019 PST Agreement defines catch (landed retained catch) limits based on an Abundance Index (AI) for Chinook salmon in Northern British Columbia (NBC) and West Coast Vancouver Island excluding Area 20 (WCVI) AABM fisheries derived from annual calibrations of the Pacific Salmon Commission (PSC) Chinook Model. Catch limits in the Southeast Alaska-Cape Suckling to Dixon Entrance (SEAK) AABM fishery for 2019–2022 were based on the winter troll catch per unit effort (CPUE) index and, in response to provisions in Chapter 3, paragraph 7(b)(ii) of the 2019 PST agreement, for 2023, were based on the combination of the pre-season and projection AIs and the CPUE index, and 2024 reverted back to the AI and Table 1. The 2019 PST Agreement also requires that ISBM fisheries be managed on a national basis to meet stock-specific agreed-to maximum sustainable yield (MSY) or other biologically-based escapement objectives or, if escapement goals are not met or no escapement objectives are in place, to limit calendar year exploitation rates (CYER) to the levels specified in Chapter 3 Attachment I.

In addition, the 2019 PST Agreement requires that the Chinook Technical Committee (CTC) provide estimates of encounters, incidental mortality (IM), and total mortality (TM) in all fisheries, including:

- post-season estimates of IM that include estimates from mark-selective fisheries (MSF) (paragraph 4(e)(ii))
- causes of significant changes in rates or patterns of IM (paragraph 4(e)(iii))
- whether IM exceeds 59,400 for SEAK AABM, and 38,600 for the combined aggregate of NBC and WCVI AABM (paragraph 4(f)).

This section assesses landed catch (LC), IM, and TM for all PST Chinook Retention (CR) fisheries, hatchery add-ons, terminal exclusions, and mark selective fisheries, as well as those directed at other salmon species (Chinook Non-retention; CNR) in 2024. Historical LC, IM, and TM data are provided in Appendix A.

In 2024, Canadian members of the CTC presented Canadian domestic data revisions based on updated estimation methods applied to both recreational fishery catch and coded-wire-tags (CWT) in Pacific Region marine waters. These updates included improved and replicable methods for calculating catch and release estimates, particularly in areas and time periods with low submission rates and sparse data. These updates generally resulted in an increase in Canadian recreational catch (kept and released) from 2005 to 2023. These recent updates to historical landed catch and release estimates in Canadian recreational fisheries are provided in Appendix C.

1.1 REVIEW OF AGGREGATE ABUNDANCE BASED MANAGEMENT FISHERIES

The Treaty defines an AABM fishery as an abundance-based regime that constrains catch or total mortality to a numerical limit that is set pre-season annually. AABM fisheries are mixed stock salmon fisheries that catch migratory Chinook salmon from many stocks. There are three AABM fisheries (2019 PST Agreement, Annex IV, Chapter 3, paragraph 3 (a)):

(1) SEAK Troll, Net, and Sport

(2) NBC Troll and Haida Gwaii Sport

(3) WCVI Troll and Outside Sport

Table 1.1–Reported catches and hatchery add-ons for aggregate abundance-based management (AABM) fisheries expressed in thousands of Chinook salmon.

	Southeast Alaska (Troll, Net, Sport)		Northern British Columbia (Troll), Haida Gwaii (Sport)	West Coast Vancouver Island (Troll, Sport)
Year	Estimated Catch	Hatchery Add-on[1]	Estimated Catch	Estimated Catch
2019	140.3	34.6	94.4	81.9
2020	204.6	30.2	38.0	46.1
2021	202.1	34.1	87.8	77.6
2022	238.6	37.2	85.4	99.1
2023	202.7	32.4	85.1	92.7
2024	207.8	28.3	106.8	96.1

[1] Estimated catch does not include hatchery add-on or exclusions (see Table A1).

Note: Estimated catch for NBC and WCVI AABM fisheries was updated in 2025 based on improvements to Canadian recreational catch and release estimates.

1.1.1 Southeast Alaska Fisheries

The 2024 SEAK Chinook salmon fishery was managed to stay within the all-gear PST total annual catch limit determined by the Chinook Model AI. The Alaska Board of Fisheries allocates this total catch limit among troll, net, and sport fisheries via the *Southeast Alaska King Salmon Management Plan*. The current allocation plan allocates 4.3% to purse seine fisheries, 2.9% to drift gillnet fisheries and reserves 1,000 fish for set gillnet fisheries. After the net quotas are subtracted, 80% of the remainder is allocated to the commercial troll fishery and the other 20% to sport fisheries. The commercial troll and net fisheries are managed in-season according to procedures outlined in gear-specific management plans. Sport fishery bag and possession limits as well as annual limits are established prior to the season, allocated as described above and in the *Southeast Alaska King Salmon Management Plan* (State of Alaska 5 AAC 47.055). Throughout the region, the commercial fishery harvest is monitored in-season using a fish ticket reporting system. Sport fishery harvests are monitored in-season using integrated data from port sampling (creel) and charter logbook reporting programs. Sampling programs are in place for all fisheries to recover CWTs from tagged Chinook salmon and the number of Alaska hatchery fish caught is estimated accordingly. The regulatory history and maps for each SEAK fishery are contained within annual management reports for the troll and net fisheries and in Administrative Announcements and Emergency Orders for the sport fisheries, all of which can be found on the Alaska Department of Fish and Game (ADF&G) website (https://www.adfg.alaska.gov/). In addition, the SEAK AABM fishery is managed for the following:

(1) Alaska hatchery add-on (CTC 1992) and exclusion of Chinook salmon catches in selected terminal areas (CTC 2004a);

(2) compliance with provisions established by the National Marine Fisheries Service (NMFS) in accordance with the U.S. Endangered Species Act (ESA); and

(3) consistency with the provisions of the PST as required by the Salmon Fishery Management Plan of the North Pacific Fishery Management Council (NPFMC) that was established by the U.S. Magnuson-Stevens Act.

The total all-gear catch in 2024 was 236,076, with a PST catch of 207,811 and an Alaska hatchery add-on of 28,265 (Table 1.2). The 2024 Treaty catch of 207,811 was below the 2024 AI-based catch limit of 211,400. SEAK Chinook salmon catch data from 1975 to 2024 are reported in Appendix Table A1.

Table 1.2–Harvest of Chinook salmon in Southeast Alaska by gear type, 2024.

	Total Catch	Alaska Hatchery Catch	Alaska Hatchery Add-on[1]	Terminal Exclusion Catch[2]	AABM Catch[3]
Troll					
Winter	48,099	2,835	1,916	0	46,183
Spring	16,416	5,911	4,062	0	12,354
Summer	86,326	1,766	1,194	0	85,132
Other[4]	514	337	228	0	286
Subtotal	151,355	10,849	7,400	0	143,955
Sport					
	59,322	8,750	6,563	0	52,759
Net					
Set Gillnet	105	0	0	0	105
Drift Gillnet[5]	6,412	5,418	5,018	0	1,394
Purse Seine[5]	18,882	10,072	9,284	0	9,598
Subtotal	25,399	15,490	14,302	0	11,097
Total	**236,077**	**35,089**	**28,265**	**0**	**207,811**
CPUE-based tier catch limit					**211,400**
Underage					**3,589**

[1] The Alaska hatchery add-on is the total estimated Alaska hatchery catch, minus 5,500 base Alaska hatchery catch, and minus the risk adjustment (product of standard error for the total estimated Alaska hatchery catch and a risk factor of 1.282).

[2] Terminal exclusion catch is a result of the harvest sharing arrangement on the Taku and Stikine rivers.

[3] AABM Catch (Treaty catch) is the total catch minus Alaska hatchery add-on minus terminal exclusion catch. Totals may not equal the sum of the individual values due to rounding.

[4] Other includes confiscated fish and Annette Island Metlakatla Indian Community Treaty troll harvest.

[5] Includes Annette Island Metlakatla Indian Community Treaty harvest.

Note: In general, a blank cell represents no data or estimate available for a fishery or that a fishery did not occur, and a zero (0) represents a fishery that was open but had no harvest. Further information on the specifics of a blank cell or zero may be found in the narrative of that fishery.

Note: small discrepancies between cumulative columns may be due to rounding.

Note: Annette Island Metlakatla Indian Community tribal harvest of 2,055 Chinook salmon are included of which 1,130 were Treaty fish. This includes a total tribal harvest of 489 troll, 472 drift gillnet, and 1,094 purse seine fish, of which 261 troll, 152 drift gillnet, and 717 purse seine were Treaty fish.

1.1.1.1 Troll Fisheries Catch

The accounting of Treaty Chinook salmon harvested by trollers begins with the winter fishery and ends with the summer fishery. The winter troll fishery is managed for a guideline harvest level of 45,000 non-Alaska hatchery-produced Chinook salmon, with a guideline harvest range of 43,000–47,000 non-Alaska hatchery-produced fish, plus the number of Alaska hatchery-produced Chinook salmon harvested during the winter fishery. The 2023–2024 winter troll fishery was open from October 11, 2023, through March 31, 2024. The period of the late winter fishery after March 15 was limited to select outer coastal areas which provided additional harvest opportunities but maintained conservation actions for SEAK and transboundary (TBR) wild Chinook salmon stocks. A total of 48,099 Chinook salmon were harvested. Of these, 2,835 (6%) were of Alaska hatchery origin, of which 1,916 counted toward the Alaska hatchery add-on, resulting in a Treaty harvest of 46,183 (Table 1.2).

The spring troll fisheries target Alaska hatchery-produced Chinook salmon and are conducted along hatchery migration corridors or close to hatchery release sites. Terminal area fisheries, which begin during the spring, occur directly in front of hatcheries or at remote release sites. While there is no ceiling on the number of Chinook salmon harvested in the spring fisheries, the take of Treaty Chinook salmon is limited according to the percentage of the Alaskan hatchery fish harvested in the fishery. Non-Alaska hatchery fish are counted towards the annual Treaty catch limit of Chinook salmon, while most of the Alaska hatchery (add-on) fish are not. A total of 16,416 spring and terminal troll Chinook salmon were harvested in 2024, of which 5,902 (36%) were of Alaska hatchery origin. With an Alaska hatchery add-on of 4,062, the Treaty Chinook salmon harvest was 12,354.

The 2024 summer troll fishery included two Chinook salmon retention periods, from July 1–8, and a limited harvest (per permit fishery) from September 1-10. In 2024, effort continued to decline compared to recent years. The ability of troll permit holders to target coho or hatchery chum salmon during Chinook salmon retention periods also contributed to the reduced number of vessels targeting Chinook salmon. A total of 86,326 Chinook salmon were harvested during summer. Of this total, 1,766 (2%) were of Alaska hatchery origin and 1,194 counted toward the Alaska hatchery add-on. The resulting Treaty Chinook salmon harvest was 85,132 fish.

The total harvest for all troll fisheries in the 2024 accounting year was 151,355 Chinook salmon, of which 143,955 were Treaty Chinook salmon. This includes a total harvest of 489 in the Annette Island Metlakatla Indian Community tribal troll fishery of which 261 were Treaty Chinook salmon, and 25 confiscated Chinook.

1.1.1.2 Net Fisheries Catch

There are three types of commercial net fisheries conducted in SEAK: purse seine, drift gillnet, and set gillnet. A total of 6,412 Chinook salmon were harvested in the drift gillnet fisheries in 2024, of which 5,418 (84.5%) were of Alaska hatchery origin and 5,018 counted toward the Alaska hatchery add-on, resulting in a Treaty harvest of 1,394 fish (Table 1.2). A total of 18,882 Chinook salmon were harvested in the purse seine fisheries, of which 9,581 (51%) were of Alaska hatchery origin and 9,284 counted toward the Alaska hatchery add-on, resulting in a Treaty harvest of 9,598 fish. A total of 105 Chinook salmon were harvested in the set gillnet fisheries, none of which were of Alaska hatchery origin, resulting in a Treaty harvest of 105 fish (Table 1.2).

With the exception of directed gillnet harvests in SEAK terminal area regulatory Districts 108 and 111 as provided for in the Transboundary Rivers chapter of the 2019 PST Agreement, harvests of Chinook salmon in net fisheries are primarily incidental to harvest of other species and only constituted a small fraction (<1%) of the total net harvest of all species.

1.1.1.3 Sport Fishery Catch

The Southeast Alaska Chinook salmon sport fishery is managed under the directives of the *Southeast Alaska King Salmon Management Plan.* This plan prescribes management measures based upon the preseason AI and the harvest management plan adopted by the Alaska Board of Fisheries in March 2022 and formulated through regulation in July of the same year. In 2024, 39,036 Treaty Chinook salmon were allocated to the sport fishery.

2024 Management Overview:

- Chinook non-retention periods were implemented in the inside waters of Southeast Alaska (Haines, Skagway, Juneau, Petersburg, Wrangell, and Ketchikan) from early spring through mid-summer to protect Alaska wild stocks and transboundary river stocks; longer periods of non-retention or closed waters were implemented to provide additional protection in select locations.
- Focused opportunity was provided to target Alaska hatchery-produced Chinook in select terminal areas and times.

The following regional regulations were established at the beginning of the year and applied during the 2024 sport fishery as dictated by the *Southeast Alaska King Salmon Management Plan*:

Alaskan Resident

- The resident bag and possession limit is two king salmon, 28 inches or greater in length;
- From October 1, 2023, through March 31, 2024, a resident sport angler may use two rods when fishing for Chinook salmon, a person using two rods under this regulation may only retain salmon, of any species.

Nonresident

- The nonresident bag and possession limit is one Chinook salmon, 28 inches or greater in length;
- From January 1 through June 30, the nonresident annual harvest limit is three Chinook salmon, 28 inches or greater in length;
- From July 1 through July 15, the nonresident annual harvest limit is two Chinook salmon, 28 inches or greater in length; any Chinook salmon harvested from January 1 through June 30 will apply towards the two fish annual harvest limit;
- From July 16 through December 31, the nonresident annual harvest limit is one Chinook salmon, 28 inches or greater in length; any Chinook salmon harvested from January 1 through July 15 will apply towards the one fish annual harvest limit; and

- Immediately upon landing and retaining a Chinook salmon, a nonresident must enter the species, date, and harvest location on their sport fishing license or on a nontransferable harvest record.

The *Southeast Alaska King Salmon Management Plan* (revised in 2022) provides stability to the sport fishery by eliminating the need for in-season management while maintaining the existing domestic allocation between sport and commercial troll fisheries over time. Under this plan the sport fishery is expected to be under its allocation in high abundance years and above allocation in low abundance years. The sport fishery was monitored closely throughout the 2024 season, and managers were provided with weekly projections of harvest. In accordance with the newly revised management plan; no in-season management actions were taken in the sport fishery. The 2024 sport fishery had an estimated total harvest of 59,322 Chinook salmon, of which 52,759 counted as Treaty harvest (Table 1.2).

1.1.1.4 Alaska Hatchery Add-on and Treaty Catch

The yearly calculation of the Alaska hatchery add-on requires three pieces of information: the estimated total catch of Alaska hatchery-origin Chinook salmon in SEAK fisheries, a base (base level of catch) and a risk adjustment. The calculation of the add-on consists of subtracting the base and the risk adjustment from the estimated total number of Alaska hatchery Chinook salmon caught. The add-on would not be applied (assumed to be zero) if the estimated catch of Alaska hatchery produced Chinook salmon in a particular year did not exceed the sum of the risk adjustment and the base.

The total Alaska hatchery contribution estimate is the sum of multiple gear-specific contribution estimates. The non-terminal Alaska hatchery contribution estimates are estimated using expanded CWT recoveries and use “preferred” expansion strata that vary by gear and fishery using estimation procedures contained in Bernard and Clark (1996).

The risk adjustment is a penalty that is incurred due to uncertainty in the estimation of the contribution of Chinook salmon from Alaska hatcheries which results from coded-wire tagging and sampling at less than 100%. The risk adjustment is the result of a statistical calculation (the margin of error associated with a one-sided lower confidence limit) and is inversely related to the level of coded-wire tagging of Alaska hatchery-produced Chinook salmon and to the level of CWT sampling that takes place in SEAK.

The base (or base level catch) consists of two components, a pre-Treaty base and a post-Treaty base. The original pre-Treaty base of 5,000 Chinook salmon was the estimated catch of Alaska hatchery-produced Chinook salmon in SEAK fisheries in 1984 (just prior to the signing of the PST in 1985). A post-Treaty base of 500 Chinook salmon was added in 1996 to account for production of Chinook from SEAK hatcheries that began producing in the early 1990s (initially with releases at the Hidden Falls Terminal Harvest Area (THA) after the signing of the Treaty. Therefore, a current base of 5,500 Chinook salmon (the sum of the pre- and post-Treaty base) is used in the add-on calculation each year. In years where the Chinook catch in the Hidden Falls THA is less than 500 Chinook (e.g., 2021), the post-Treaty base equals the number of Chinook harvested in the Hidden Falls THA.

The 2024 preterminal Alaska hatchery contribution to the troll fishery was 10,617 Chinook and the hatchery terminal area catch was 232 Chinook. The preterminal Alaska hatchery contribution to the net fisheries was 2,151 Chinook and the hatchery terminal area catch was 13,339. In nearly all years, the majority of the commercial hatchery terminal area Chinook catch is taken by the seine fleet, which was true in 2024. By the time Alaska hatchery Chinook return to the hatchery terminal areas, they are no longer actively feeding and are difficult to catch using hook and line gear (as in commercial troll and the sport fishery). The most efficient gear type for harvesting the fish that have made it past the preterminal fisheries is by using seine gear. The 2024 preterminal Alaska hatchery contribution to the sport fishery was 6,750 Chinook and the hatchery terminal area catch was 2,000. Taken together, the all-gear Alaska hatchery contribution estimate for 2024 was 35,089 Chinook and the variance of the all-gear contribution estimate was 1,066,892 (Table 1.2).

$$Risk\ Adjustment = Risk\ Level * Standard\ Error\ (AK\ Hatchery\ Contribution)$$

where

$Risk\ Level$ = 1.282 (a one-tail 90% normal deviation from the mean),
Therefore, the 2024 risk adjustment was: 1,324

and

$$Hatchery\ Add\text{-}on = AK\ Hatchery\ Contribution - Base\ Level\ Catch - Risk\ Adjustment$$

Therefore, the 2024 hatchery add-on was: 35,089 – 5,500 – 1,324 = 28,265

There were no directed terminal gillnet fisheries for Chinook near the Taku and Stikine rivers in 2024 due to continued poor returns that resulted in only the Taku stock achieving its escapement goal. Likewise, there was no directed Chinook fishing in the Yakutat area which encompasses the Alsek and Situk rivers.

$$Treaty\ Catch = Total\ Catch - Hatchery\ Addon - Terminal\ Exclusions(Situk \& TBR)$$

Therefore, the 2024 Treaty catch was: 236,076 – 28,265 - 0 = 207,811.

1.1.2 British Columbia Fisheries

The NBC AABM fishery includes NBC troll catch in Statistical Areas 1–5 and Haida Gwaii sport catch in Statistical Areas 1 and 2. The total NBC AABM catch in 2024 was 106,823 (Table 1.3). The WCVI AABM fishery includes the WCVI commercial and First Nations troll and a portion of the WCVI sport fishery (defined below). The total WCVI AABM catch in 2024 was 96,128 (Table 1.4).

1.1.2.1 Northern British Columbia AABM

The total NBC AABM catch (troll plus sport) between October 1, 2023 and September 30, 2024 was 106,823 Chinook salmon (Table 1.3).

Table 1.3–Harvest of Chinook salmon by gear for Northern British Columbia aggregate abundance-based management (AABM) fisheries, 2024.

	Landed Catch	Legal Releases[1]	Sublegal Releases
Troll			
CR	76,590	24	7,766
CNR	0	3,730	2,679
Subtotal	*76,590*	*3,754*	*10,445*
Sport			
	30,233	37,628	
TOTAL	**106,823**	**41,382**	**10,445**

[1] Sport releases are not split into legal and sublegal release categories.

Note: In general, a blank cell represents no data or estimate available for a fishery or that a fishery did not occur, and a zero (0) represents a fishery that was open but had no harvest. Further information on the specifics of a blank cell or zero may be found in the narrative of that fishery.

1.1.2.1.1 Northern British Columbia Troll Fishery Catch

The NBC troll fishery landed 76,590 Chinook salmon from August 16 to September 30, 2024. The entire 2024 NBC troll fishery was conducted under a system of individual transferable quotas. All landings of Chinook salmon caught in the NBC troll fishery were made at designated landing sites and catches were validated by an independent contractor. Validation of landings has occurred since 2005.

A total of 186 licenses were issued. Approximately 89 vessels participated in the Chinook opening with daily participation averaging 73 vessels through the first ten days with an average CPUE of 77 Chinook per vessel-day. Maximum daily participation was 82 vessels. Effort declined sharply when the average CPUE dropped to fewer than 20 fish per vessel-day after September 11th. Only a handful of vessels remained after September 15th. Barbless hooks and revival boxes were mandatory in the troll fishery and the minimum size limit was 67 cm fork length (26.4 in). In addition to the maximum 3.2% exploitation objective on WCVI Chinook, further precautionary opening time restrictions designed to protect at-risk Fraser Chinook stocks and to provide increased availability of not-at-risk Chinook salmon for First Nations harvest opportunities were implemented again in 2024. These actions resulted in delaying the start of the Area F Troll Chinook fishery until August 20th in 2019, August 15th in 2020, August 12th in 2021, August 10th in 2022, and August 16th in 2023 and 2024.

1.1.2.1.2 Northern British Columbia Sport Fishery Catch

Sport-caught Chinook salmon from Haida Gwaii (Pacific Fishery Management Areas [PFMA] 1, 2, 101, 102, and 142) are included in the AABM totals. The 2024 Haida Gwaii sport catch was 30,233 Chinook salmon. The majority of Haida Gwaii based recreational harvest occurs between Massett and Langara Island along the north shore of Graham Island (PFMA 1), followed by PFMA 2W. In addition to a fleet made up of independent anglers and charter operators working out of Masset there are 4 fly-in lodge operations (floating and land based) within PFMA 1, including 3 at Langara Island and 1 in Naden Harbour. In 2024 the daily and possession limits for Chinook Salmon were reduced to 1 and 2 from June 14 to July 31 to protect passing Skeena and Nass River Chinook and Fraser River Summer 5-2 Chinook. The annual Chinook limit remained at 10 across the region as a precautionary measure towards protection of Southern at-risk Chinook stocks.

1.1.2.2 West Coast Vancouver Island AABM

Under the 2019 PST Agreement, the WCVI AABM fishery includes the WCVI troll and the outside WCVI sport fishery (defined below). The total AABM LC in the commercial troll, outside tidal sport, and First Nations troll in 2024 was 96,128 Chinook salmon (Table 1.4).

Table 1.4–Harvest of Chinook salmon by gear for West Coast Vancouver Island aggregate abundance-based management (AABM) fisheries, 2024.

	Landed Catch	Legal Releases	Sublegal Releases
Troll			
Winter	2,721	0	759
Spring	1,419	0	171
Summer	20,014	12	462
Food, Social, & Ceremonial	3,545		
Maa-nulth	3,506		
Five Nations	17,267		
Brooks Test Fishery			
Subtotal	*48,472*	*12*	*1,392*
Sport			
	47,656	22,630	34,808
TOTAL	**96,128**	**22,642**	**36,200**

Note: In general, a blank cell represents no data or estimate available for a fishery or that a fishery did not occur, and a zero (0) represents a fishery that was open but had no harvest. Further information on the specifics of a blank cell or zero may be found in the narrative of that fishery.

1.1.2.2.1 West Coast Vancouver Island Troll Fishery Catch

The WCVI troll fishery is conducted in PFMAs 23-27 and 123–127. The 2024 PST accounting year begins October 1, 2023 and ends September 30, 2024 which is situated within two domestic management planning years: June 1, 2023 to June 30, 2024 and July 1, 2024 to June 30, 2025 (DFO 2023; DFO 2024).

The Area G Troll annual management plan is designed to maintain conservative exploitation rates on stocks of concern within established limits through fishing time and area closures in conjunction with fishing effort limits. Fishery openings are planned to distribute harvest proportionately over all fishery periods subject to constraints to protect stocks of concern.

To protect returning Fraser Chinook stocks of concern, the Area G troll spring fishery was closed in the offshore waters of the WCVI and the summer fishery did not occur until August 16, 2024. The minimum size limit was 55 cm fork length (head on) and 44 cm (head off). The August and September fisheries utilized plug gear only and troll fisheries were monitored to determine encounter rates of other species and estimate numbers of released Chinook. Biological sampling was conducted for size distributions and stock compositions (CWT, DNA and otolith samples). Area G also has an offshore winter fishery, which opened from December 1, 2023, to March 15, 2024, with PMFAs 123 and 124 closed on February 29, 2024. Area G also conducted a CSAF (Commercial Salmon Allocation Framework) demonstration fishery in all inside areas of WCVI, inside the surf line, from April 1 to May 16, 2024 for a 3,000 piece TAC.

To address WCVI wild Chinook continuing to be a stock of concern, management measures consistent with previous years were implemented to protect this stock. The objective for commercial troll fisheries was to avoid encounters with WCVI Chinook by restricting the troll fishery to offshore areas during the summer period. Specifically, there was a 5 nautical mile inside boundary in Areas 123 to 126 and a 2 nautical mile boundary in Area 127 and Subarea 126-4 during the period when WCVI Chinook return to the West Coast of the island.

A 27-day rolling window closure to the Area G troll fishery was implemented in 2019 and remains in effect to protect Interior Fraser River Steelhead in September and October, as well as periods of Chinook non-retention from April 1 to July 14, 2024 to protect Fraser summer 5.2 Chinook. Additionally, from July 15 to October 31st, Area 21, and portions of Subareas 121-1 and 121-2, identified as key foraging areas for Southern Resident Killer Whales, were closed to recreational and commercial salmon fishing.

In 2024, the Five Nations (Ahousaht, Ehattesaht, Hesquiaht, Mowachaht/Muchalaht, and Tla-o-qui-aht) rights-based commercial fishery was delayed until July 15 in areas seaward of 1 nautical mile from the surf line on the West Coast of Vancouver Island. Measures following this delayed opening included a maximum 80 cm size limit from July 15 to July 31 and plugs were required for vessels equipped with commercial troll gear. Fishing was open prior to July 15 in areas shoreward of 1 nautical mile from the surf line, but offshore areas beyond 1 nautical mile were closed from April 1 to July 14. A winter AABM Chinook fishery opened December 1, 2023, however the majority of catch occurred from March 15 to March 31, 2024. Their fishery was closed on August 4, 2024, as the total allowable catch was achieved. The Five Nations rights-based sale fisheries occurred in their Court Defined Area, which includes portions of PFMAs 24–26 and 124–126. After the Five Nations AABM Chinook fishery closed, they were permitted to fish some of the uncaught Area G AABM TAC under the Area G Conditions of License. This fishery occurred August 16 to 18 and August 30 to September 15, 2024.

The catch for 2024 commercial Area G troll fisheries was 24,154 Chinook salmon (Table 1.4). The WCVI First Nations caught an estimated 3,545 Chinook salmon in food, social, and ceremonial fisheries, and there were 3,506 in the Maa-nulth and 17,267 in the Five Nations rights-based sale fisheries. The Brooks Test Fishery did not occur in 2024. The total WCVI AABM troll catch for 2024 was 48,472 with 12 legal and 1,392 sublegal Chinook salmon releases (Table 1.4).

1.1.2.2.2 West Coast Vancouver Island Sport Fishery Catch

The AABM sport fishery includes northwest WCVI (Areas 25–27, 125–127) from October 16 to June 30, and outside of the surf line for 125–127 (about one nautical mile offshore) from July 1 to October 15, plus southwest WCVI (Areas 21, 23, 24, 121, 123, and 124) from October 16 through July 31, and outside one nautical mile offshore of 21, 121, 123, 124 from August 1 to

October 15. Areas inside the surf line and outside these AABM periods are included in the ISBM fishery catch. WCVI Areas 121, and 123-127 seaward of 1 nautical mile outside of the surf line were Chinook non-retention from April 1 to July 14 in efforts to address conservation concerns for Fraser River Chinook Salmon. Furthermore, a maximum size limit of 80 cm was in place from July 15 to 31.

Recreational fishers have a total annual limit of ten Chinook from any tidal waters in BC, which has been in place since 2019. An additional reduction was applied in 2023, and continued in 2024, to reduce the Chinook daily bag limit from 2 per day to 1 per day in Areas 121 and 123 from July 15 until July 31st to address conservation concerns for Fraser summer 5.2 Chinook.

The WCVI AABM sport fishery occurs primarily in the Barkley Sound, outer Clayoquot Sound, and Nootka Sound areas, and most fishing effort occurs from late July through August. Most creel surveys are conducted from early June to August with some areas extending into mid-September.

In 2024, Chinook non-retention was in effect April 1 – July 14 along WCVI and portions of Juan de Fuca Strait. The Chinook salmon daily bag limit was two fish greater than 45 cm fork length from July 15 – March 31, with an upper size limit of 80 cm in place from July 15 – 31 in PFMA 121 and 123 – 127 seaward of the 1 nautical mile boundary line. Barbless hooks were mandatory. The 2024 WCVI AABM sport landed catch estimate was 47,656 (Table 1.4).

1.2 Estimates of Incidental Mortalities in AABM Fisheries

1.2.1 Southeast Alaska Fisheries

Estimates of encounters and IM in SEAK fisheries are presented for 2024 in Table 1.5 and for prior years in Appendix Table A2 and Table A3. The 2024 troll encounters were estimated from regressions of historical encounter estimates and troll effort. The regression predicts encounters from troll effort using encounter estimates obtained from direct fishery observation programs conducted during a series of years. The CR and CNR sublegal regressions use a data series from 1998 to 2006, while the CNR legal regression uses a data series from 1985 to 1988 and 1998 to 2006 (CTC 2011). Sport fishery releases were computed from the number of Chinook salmon caught and released as recorded on the annual Statewide Harvest Survey (mail-in survey). Legal and sublegal CNR purse seine encounters were calculated using a modified catch per landing approach that uses the relationship between the yearly catch and the magnitudes of legal and sublegal CNR encounters for years for which direct observational data are available (CTC 2011). For the gillnet fishery, drop-off mortality was estimated as a percentage of the LC using the region-specific drop-off rate for SEAK (CTC 2004b). Encounter estimates are multiplied by the respective IM rate from the CTC (1997) to obtain estimates of IM. Estimates were converted from total IM into Treaty IM by multiplying the total encounters by the ratio of Treaty catch to total LC for each respective fishery. The estimated TM in 2024 was 248,316 nominal Treaty fish, including 207,811 LC, and 40,505 IM (Table 1.5).

Chapter 3, Paragraph 4(f) of the 2019 PST Agreement establishes a limit for the level of Treaty IM in the SEAK AABM fishery of 59,400 Chinook salmon. The 2024 Treaty IM for SEAK AABM fishery is 40,505, which is below the 59,400 limit.

Table 1.5–Estimates of Treaty and total (includes total Treaty, terminal exclusion, and hatchery add-on catch and estimates of incidental mortality) landed catch (LC), incidental mortality (IM; in nominal numbers of fish), sublegal incidental mortality (SIM), and total mortality (TM) in the Southeast Alaska (SEAK) aggregate abundance-based management (AABM) fishery, 2024.

		Landed Catch	Legal Encounters	Sublegal Encounters	Legal Incidental Mortality[1]	Sublegal Incidental Mortality[1]	Total Incidental Mortality	Total Mortality
Treaty - Troll	**CR**	143,955	143,955	14,825	1,152	3,899	5,051	149,006
	CNR	0	22,163	14,678	4,854	3,860	8,714	8,714
	Subtotal	**143,955**	**166,119**	**29,503**	**6,005**	**7,759**	**13,765**	**157,720**
Treaty - Sport[2]		52,759	83,134	53,332	6,729	8,480	15,209	67,968
Treaty - Net	**Gillnet**	1,499	11,499	0	30	0	30	1,529
	Purse Seine CR	9,598	9,598	3,327	0	2,855	2,855	12,453
	Purse Seine CNR	0	3,587	9,275	1,829	6,817	8,646	8,646
	Gillnet CR	0	0	0	0	0	0	0
	Subtotal	**11,097**	**24,684**	**12,602**	**1,859**	**9,672**	**11,531**	**22,628**
Treaty		**207,811**	**273,937**	**95,437**	**14,594**	**25,911**	**40,505**	**248,316**
Total SEAK - Troll	**CR**	151,355	151,355	15,587	1,211	4,099	5,310	156,666
	CNR	0	22,532	14,922	4,935	3,925	8,859	8,859
	Subtotal	**151,355**	**173,887**	**30,509**	**6,145**	**8,024**	**14,169**	**165,525**
Total SEAK - Sport[2]		59,322	93,476	59,966	7,566	9,535	17,101	76,423
Total SEAK - Net	**Gillnet**	6,517	6,517	0	130	0	130	6,648
	Purse Seine CR	18,882	18,882	6,546	0	5,616	5,616	24,498
	Purse Seine CNR	0	7,057	18,246	3,599	13,411	17,010	17,010
	Subtotal	**25,399**	**32,456**	**24,792**	**3,729**	**19,027**	**22,757**	**48,156**
Total SEAK		**236,077**	**299,820**	**115,267**	**17,441**	**36,586**	**54,027**	**290,103**

[1] Includes drop-off mortality.

[2] Catch data are preliminary estimates from creel survey expansions; IM for the SEAK sport fishery is estimated from the preliminary LC and the previous year IM to LC ratios. Final estimates are available from mail-out surveys in October one year post fishing season and will be reported in Table A2 and Table A3 of the next annual Catch and Escapement Report.

Note: In general, a blank cell represents no data or estimate available for a fishery or that a fishery did not occur, and a zero (0) represents a fishery that was open but had no harvest. Further information on the specifics of a blank cell or zero may be found in the narrative of that fishery.

Note: small discrepancies between cumulative columns may be due to rounding.

1.2.2 British Columbia Fisheries

Chapter 3, Paragraph 4(f) of the 2019 PST Agreement established a 38,600 limit for Treaty IM for the combined NBC and WCVI AABM fisheries. The 2024 IM for the NBC and WCVI AABM fisheries was 28,666, which is below the limit The estimated IM included 8,167 legal and 7,234 sublegal nominal Chinook salmon. Table 1.6 summarizes estimates of LC, encounters, and associated IM by size class during CR and CNR fishing periods for the 2024 NBC and WCVI AABM fisheries. IM estimates were derived using gear- and size-specific rates from CTC (1997).

In 2024, a domestic data revision took place for Canadian marine recreational fisheries to update the estimation methods used for both recreational fishery catch and coded-wire-tags (CWT) in the Pacific Region marine waters. The objective of this work was to incorporate direct catch estimates and improve CWT estimates, and to standardize how the data is integrated into a recreational CWT estimate. These updates leverage direct measurements and consistent methods to better reflect the recreational impacts on CWT indicator stocks.

1.2.2.1 Northern British Columbia Fisheries

Incidental mortality from releases of Chinook salmon from the NBC troll fishery are based on logbook data. Previously, encounters from the Haida Gwaii sport fishery were based on creel survey and logbook programs, but the sport fishery estimates are now generated from the updated Canadian recreational catch and release estimate framework, which was modelled back to 2005. The estimated TM for 2024 was 120,088 nominal fish, which included 106,823 LC and 13,265 IM (Table 1.6).

1.2.2.2 West Coast Vancouver Island Fisheries

Incidental mortality from releases of Chinook salmon from the WCVI troll fishery are based on logbook data, while encounters in the WCVI sport fishery are based on creel survey data. The sport fishery estimates, which previously were based on logbook and creel survey data, are now generated from the updated Canadian recreational catch and release estimate framework, which was modelled back to 2005. The estimated TM of Chinook salmon for the 2024 WCVI AABM fishery was 112,984 nominal fish, which included 97,583 LC and 15,401 IM (Table 1.6). The estimated IM included 8,167 legal and 7,234 sublegal nominal Chinook salmon.

Table 1.6–Estimates of total landed catch (LC), incidental mortality (IM; in nominal numbers of fish), and total mortality (TM) in Northern British Columbia and West Coast of Vancouver Island aggregate abundance-based management (AABM) fisheries, 2024.

		Landed Catch	Legal Releases	Sublegal Releases	Legal Incidental Mortality	Sublegal Incidental Mortality	Total IM	Total Mortality
Northern British Columbia - Troll	**CR**	76,590	24	7,766	1,307	3,074	4,381	80,971
	CNR	0	3,730	2,679	753	1,060	1,813	1,813
	Subtotal	76,590	3,754	10,445	2,060	4,134	6,194	82,784
Northern British Columbia - Sport		30,233	37,628		7,071		7,071	37,304
Northern British Columbia - Total		**106,823**	**41,382**	**10,445**	**9,131**	**4,134**	**13,265**	**120,088**
West Coast Vancouver Island - Troll[1]	**CR**	48,472	12	1,392	851	551	1,402	49,874
	CNR	0	0	0	0	0	0	0
	Subtotal	48,472	12	1,392	851	551	1,402	49,874
West Coast Vancouver Island - Sport		47,656	22,630	34,808	7,316	6,683	13,999	61,655
West Coast Vancouver Island - Total		**96,128**	**22,642**	**36,200**	**8,167**	**7,234**	**15,401**	**111,529**

[1] CR includes commercial, First Nations troll food, social, and ceremonial and Maa-nulth and Five Nations catch and Brooks test fishery.

Note: In general, a blank cell represents no data or estimate available for a fishery or that a fishery did not occur, and a zero (0) represents a fishery that was open but had no harvest. Further information on the specifics of a blank cell or zero may be found in the narrative of that fishery.

1.3 Review of Individual Stock-Based Management Fisheries

ISBM fisheries include all British Columbia Chinook salmon fisheries that are not included in the NBC and WCVI AABM fisheries, and all marine and freshwater Chinook salmon fisheries in Washington and Oregon. ISBM fisheries are managed with the intent of meeting management objectives for individual stocks listed in Chapter 3, Attachment I, Annex IV, of the 2019 PST Agreement.

1.3.1 Canadian Individual Stock Based Management Fisheries

The Canadian ISBM fisheries include all fisheries that catch or release Chinook salmon in British Columbia that are not AABM fisheries. Catches of Alsek, Taku, and Stikine River Chinook salmon occurring in Canada are also provided, although provisions for catch sharing arrangements between Canada and the U.S. for these three transboundary river stocks are described in Chapter 1 of the 2019 Agreement. ISBM obligations are not applicable to these stocks since they are not identified in Chapter 3, Attachment I. In 2024, a total of 347,600 nominal fish were caught in Canadian ISBM fisheries in British Columbia and Canadian sections of the transboundary rivers. Total estimated IM in 2024 was 95,032 Chinook salmon. The distribution of LC and estimated IM are presented in Table 1.7. Historical catches in these fisheries are provided in Appendix Table A4, Table A7, Table A8, and Table A11 through Table A15.

Table 1.7–Landed catch (LC) and incidental mortalities (IM) in Canadian individual stock-based management (ISBM) fisheries, 2024.

		Landed Catch	Releases	Incidental Mortality	Total Mortality
Transboundary Rivers	**Net**	0	248	124	124
	Freshwater Sport	0	0	0	0
	First Nations - FSC	111	0	6	117
	Subtotal	111	248	130	241
Northern British Columbia	**Net**	0	1,535	1,209	1,209
	Tidal Sport	10,523	12,405	2,351	12,874
	Freshwater Sport	1	24	5	6
	First Nations - FSC	1,847	54	136	1,983
	Tyee Test Fishery	475	7	28	503
	Subtotal	12846	14,025	3,729	16,575
Central British Columbia	**Net**	146	24	24	170
	Tidal Sport	19,671	22,828	4,338	24,009
	Freshwater Sport				
	First Nations - FSC				
	Troll				
	Subtotal	19817	22852	4362	24179
West Coast Vancouver Island	**Net**	30,387	459	7,512	37,899
	Tidal Sport	51,896	43,533	11,939	63,835
	FN-EO & FSC	40,009	1	1,841	41,850
	Subtotal	122,292	43993	21,292	143,584
Johnstone Strait	**Commercial & Test Net**	0	132	95	95
	Tidal Sport	12,788	14,896	3,742	16,530
	First Nations - FSC	1,975	41	130	2,105
	Subtotal	14,763	15069	3967	18,730
Georgia Strait	**Net**	0	2	2	2
	Tidal Sport	72,027	169,453	37,505	109,532
	Freshwater Sport	0	2,595	498	498
	First Nations - FSC	671		31	702
	Troll				
	Subtotal	72698	172050	38036	110734
Juan de Fuca	**Commercial & Test Net**	0	667	480	480
	Tidal Sport	29,267	44,070	10,481	39,748
	Subtotal	29,267	44,737	10,961	40,228
Fraser River	**Commercial & Test Net, FN-EO**	4,106	324	495	4,601
	First Nations - FSC Net	36,828	65	1,756	38,584
	Mainstem Catch & Trib Sport	34,872	41,137	10,304	45,176
	Subtotal	75,806	41526	12555	88,361
Grand Total		**347,600**	**354,500**	**95,032**	**442,632**

Note: In general, a blank cell represents no data or estimate available for a fishery or that a fishery did not occur, and a zero (0) represents a fishery that was open but had no harvest. Further information on the specifics of a blank cell or zero may be found in the narrative of that fishery.

Note: FN = First Nations, FSC = Food, Social, & Ceremonial, EO = economic opportunity

1.3.2 Southern U.S. Individual Stock Based Management Fisheries

Southern U.S. fisheries in the Treaty area south of the U.S./Canada border are managed in accordance with legal obligations under the PST, several treaties between Native American tribes and the U.S., and conservation constraints on weak stocks protected by the ESA. Two court cases in the 1970s, *U.S. v. Washington* and *U.S. v. Oregon*, re-affirmed treaty fishing rights and set forth harvest sharing obligations. Catches herein are termed *treaty tribal* if harvested under these Native American Treaty fishing rights cases and *non-treaty* otherwise. Tribal catches not harvested under these court cases are included in non-treaty catch. Sport fishery landed catch and IM estimates lag by one year because of processing delays incurred by the paper Catch Record Card accounting system used by WDFW. Therefore, sport landed catch for the current year is preliminary and a recent three-year average is used to derive the release and IM estimates. Currently, all southern U.S. fisheries are managed as ISBM fisheries (Table 1.8). Historical catches in these fisheries are provided in Appendix Table A16 through Table A22. Harvest data for the current year is considered preliminary, and historic estimates are subject to change in future reports as data is updated to reflect the most accurate information available.

Table 1.8–Landed catch (LC) and incidental mortality (IM) in Southern U.S. troll, net, and sport fisheries, 2022–2024.

		2022			2023			2024		
		LC	**Release**	**IM**	**LC**	**Release**	**IM**	**LC**[1]	**Release**[1]	**IM**
Juan de Fuca	**Net**	4,117	0	329	858	0	69	591	0	47
	Sport	14,133	31,036	10,367	11,162	21,949	7,501	13,070	25,701	8,783
	Troll	2,091	0	52	3,852	0	96	6,511	0	163
	Subtotal	20,341	31,036	10,748	15,872	21,949	7,666	20,172	25,701	8,993
San Juan Islands	**Net**	4,732	178	521	14,906	441	1,545	337	22	45
	Sport	3,205	2,681	1,183	5,475	3,488	1,729	3,889	2,478	1,228
	Subtotal	7,937	2,859	1,704	20,381	3,929	3,274	4,226	2,500	1,273
Puget Sound	**Net**	70,612	0	5,649	69,781	0	5,582	55,231	0	4,418
	Sport	37,639	22,031	11,362	42,716	44,837	18,210	38,935	40,868	16,598
	Subtotal	108,251	22,031	17,011	112,497	44,837	23,792	94,166	40,868	21,016
Inside Coastal (Washington)	**Net**	16,934	0	339	14,813	0	296	10,618	0	212
	Sport	4,698		324	6,073		419	6,635		458
	Subtotal	21,632	0	663	20,886	0	715	17,253	0	670
Columbia River (Washington/Oregon)	**Net - Spring**	39,258	0	1,178	35,438	0	1,063	28,940	0	773
	Sport - Spring	51,146	4,915	4,504	27,812	1,704	2,264	27,059	1,395	2,152
	Net - Summer	17,372	0	522	12,885	0	386	7,098	0	213
	Sport - Summer	9,205	3,526	1,069	7,331	2,453	808	873	1,324	223
	Net - Fall	217,276	0	6,518	194,104	0	5,824	157,092	0	4,713
	Sport - Fall	69,254	24,626	9,507	82,287	20,326	9,580	79,174	22,626	9,807
	Subtotal	403,511	33,067	23,298	359,857	24,483	19,925	300,236	25,345	17,881
North of Cape Falcon (Washington/Oregon)	**Sport**	24,829	12,233	2,505	30,119	12,153	2,636	24,469	13,940	2,752
	Troll	60,656		1,516	66,182		1,655	56,956		1,424
	Subtotal	85,485	12,233	4,021	96,301	12,153	4,291	81,425	13,940	4,176
Oregon Coastal Inside[2]	**Sport**	18,498		1,276	26,514		1,829	25,157		1,736
	Troll				217		5			
	Subtotal	18,498	—	1,276	26,731	—	1,834	25,157	—	1,736
GRAND TOTAL		**665,655**	**101,226**	**58,721**	**652,525**	**107,351**	**61,497**	**542,635**	**108,354**	**55,745**

[1] WDFW Catch Record Card estimates of LC were not yet available; LC for 2024 was computed using 2021–2023 mean values. Releases for 2024 were computed using the ratio of releases to landed catch from 2023.

[2] The value represented by Troll is the concentrated fishery off of the mouth of the Elk River which is designed to specifically exploit returning Elk River Chinook salmon.

Note: In general, a blank cell represents no data or estimate available for a fishery or that a fishery did not occur, and a zero (0) represents a fishery that was open but had no harvest. Further information on the specifics of a blank cell or zero may be found in the narrative of that fishery.

1.3.2.1 Strait of Juan de Fuca and the San Juan Islands

The 2024 preliminary landed catch estimate across all fisheries is 20,172 in the Strait of Juan de Fuca and 44,226 in the San Juan Islands. For the Strait of Juan de Fuca (Areas 4B, 5, 6, and 6C) net fisheries, the landed catch estimate was 591 fish. There were 337 Chinook salmon landed in the San Juan Islands net fisheries (Areas 6A, 7, and 7A). In the Strait of Juan de Fuca treaty tribal troll fishery, the catch estimate was 6,511 (Areas 5, 6; Area 4B from Jan 1 – Apr 30 and Oct 1 – Oct 30). The troll catch estimate does not include catches from Area 4B between May and September because those are considered to be Pacific Fishery Management Council (PFMC) fisheries and are included in the North of Falcon ocean fishery catches (see section 1.3.2.4 below). Historic catch estimates are provided in the appendices for the Strait of Juan de Fuca (Appendix Table A16) and San Juan areas (Appendix Table A17).

1.3.2.2 Puget Sound

The preliminary landed catch estimate for all Puget Sound fisheries (excluding the Strait of Juan de Fuca and the San Juan Islands) in 2024 was 94,166. Net fishery landed catch in Puget Sound was 55,231 (41,977 treaty, 13,254 non-treaty). The in-river treaty tribal fishery catch estimate was 21,826 Chinook. The preliminary sport catch estimate (marine and freshwater), calculated from a recent three-year average, was 38,935. Historic catch tables for Puget Sound (excluding the Strait of Juan de Fuca and San Juan Islands) are provided in Appendix Table A18.

1.3.2.3 Washington Coast Terminal

The 2024 landed catch estimate for all Washington Coast terminal fisheries for was 17,253, of which 10,618 were reported caught in net fisheries, while 6,635 were expected caught in sport fisheries (based on a recent three-year average). Landed catch in the treaty fisheries in the north coastal rivers (Quinault, Queets, Hoh, and Quillayute Rivers) was 6,330; and in Grays Harbor, including the Humptulips and Chehalis Rivers, it was 956. Non-treaty commercial net landed catch was 12 Chinook salmon in Grays Harbor and 3,320 in Willapa Bay. Historic catch estimates for Washington coastal inside fisheries are shown in Appendix Table A19.

1.3.2.4 North of Cape Falcon

Ocean fisheries off the coasts of Washington, Oregon, and California are managed through the PFMC. The fisheries north of Cape Falcon also fall under the jurisdiction of the PST. For 2024, the estimated catch of Chinook salmon in commercial troll fisheries from Cape Falcon, Oregon, to the U.S.-Canada border was 56,956 for non-treaty and treaty tribal fisheries combined. Estimated catch in the ocean sport fishery north of Cape Falcon in 2024 was 24,469 Chinook salmon. Historic catch estimates for U.S. ocean fisheries north of Cape Falcon are shown in Appendix Table A20.

1.3.2.5 Columbia River

Chinook salmon from the Columbia River are divided into eight stock groups for management purposes. These groups are delineated by run timing and area of origin: (1) spring run originating below Bonneville Dam, (2) spring run originating above Bonneville Dam, (3) summer run originating above Bonneville Dam, (4) fall run returning to Spring Creek Hatchery, (5) fall run originating in hatchery complexes below Bonneville Dam, (6) wild fall run originating below Bonneville Dam, (7) Upriver Bright fall run, and (8) Mid-Columbia Bright fall hatchery fish.

When comparing the IM estimates in Table 1.8 and Appendix Table A21 with IM from *U.S. v. Oregon* Technical Advisory Committee, WDFW, Oregon Department of Fish and Wildlife (ODFW), and Columbia River Inter-Tribal Fish Commission (CRITFC) reports, readers should keep the following in mind:

(1) The Columbia River fishery management agencies include release mortality in some of their catch estimates whereas the tables in this report show LC in terms of retained fish only.

(2) Release mortality rates used by Columbia River fishery management agencies differ from those used by the CTC for this report.

(3) The tables in this report include estimates of IM from net dropout and hook and line drop-off, whereas the Columbia River fishery management agencies do not estimate this type of mortality. In 2024, the total annual landed catch for all fisheries (spring, summer, and fall, both hatchery and wild) in the Columbia River basin was 300,236 Chinook salmon. The 2024 total annual Columbia River combined net and sport landed catch consisted of 55,999 spring Chinook, 7,971 summer Chinook and 236,266 fall Chinook salmon (Table 1.8).

1.3.2.6 Oregon Coast Terminal

Most landed catch in ocean fisheries off Oregon's coast is comprised of a mixture of southern Oregon and California Chinook salmon stocks not included in the PST Agreement. These stocks usually do not migrate north into the PST fisheries to any great extent. Chinook salmon originating from Oregon streams north of Cape Blanco migrate north, and most of these populations (Siuslaw River and northward) are included in the North Oregon Coast (NOC) aggregate in the PSC Chinook model. South of the Siuslaw River to north of Cape Blanco is a smaller population group designated as the Mid-Oregon Coastal (MOC) aggregate population. Based on CWT distribution data, NOC stocks are minimally harvested in Oregon ocean fisheries, while the contribution of MOC stocks to Oregon and Washington ocean fisheries is greater. Commercial catch statistics for the MOC are readily available for only one terminal ocean area troll fishery on a hatchery supplemented stock at the mouth of the Elk River. The late season (October–December) troll fishery in the Elk River terminal troll area was open in 2023 and closed in 2024.

Sport catch of these two stock groups occurs primarily in estuary and freshwater areas as mature fish return to spawn, and catch is reported through a mobile phone based electronic licensing and tagging system. Historically, these estimates become available more than two years after the current season. Within the past few years, ODFW has transitioned to a mobile phone-based tagging and reporting system referred to as Electronic Licensing System (ELS) that allows for greater accuracy and shorter reporting times, and now those terminal catch estimates of Chinook from the previous catch year are available within the PSC report publication period. The 2023 and 2024 catch estimates are 26,514 and 25,157, respectively (Table 1.8). These estimates are the product of both NOC and MOC aggregated catch estimates, whereas previously supplied estimates of terminal catch (2018 and previous years) only consisted of the catch occurring in the NOC. This is congruent with the catch stratification accounted for between the previous Chinook model and the current phase II Chinook model's catch accounting. Historical catch estimates for the October–December troll fishery targeting Elk River Hatchery returns and the estuary and freshwater sport fisheries of NOC and MOC stocks are shown in Appendix Table A22.

1.3.3 Estimates of Incidental Mortality for Southern U.S. Fisheries

Table 1.8 shows IM estimates for southern U.S. fisheries in marine and river fisheries in Puget Sound, the Washington and Oregon coasts north of Cape Falcon, Oregon coast terminal fisheries, and in Columbia River fisheries. Incidental mortality was calculated using the release mortality, drop-out, and drop-off mortality rates assigned for areas and gears in CTC (1997). Numbers of fish released were derived from creel interviews, voluntary trip reports, fishery monitoring, or extrapolated from similarly structured fisheries with known release information.

1.4 Summary of Coastwide Landed Catch, Incidental Mortality, and Total Mortality in PSC Fisheries

Table 1.9 provides a coastwide summary of Chinook salmon catches and estimates of IM and TM in PST fisheries for 2024. The preliminary estimate of Treaty LC of Chinook salmon for all PST fisheries in 2024 is 1,300,997, of which 750,446 were taken in U.S. fisheries and 550,551 were taken in Canadian fisheries (Table 1.9). By fishery, 16% of the LC occurred in the SEAK AABM, 8% in NBC AABM, 7% in WCVI AABM, 27% in Canada ISBM, and 42% in U.S. ISBM. Total estimated IM associated with this harvest is 219,947 (14% of the TM) in nominal fish. The TM for all PST fisheries in nominal fish was 1,520,945 Chinook salmon, which is 121,644 less than recorded for 2023 (Appendix Table A25). Of the total PSC TM estimated for 2024, 846,696 occurred in U.S. fisheries and 674,249 occurred in Canadian fisheries. For U.S. fisheries, 72% of the LC and 58% of IM occurred in ISBM fisheries; in Canada, 63% of the LC and 77% of IM occurred in ISBM fisheries. For some component sport fisheries, 2024 LC and IM estimates are not yet available. The preliminary estimates of LC and IM will be updated in future reports as data become available. Data for calculating summary information contained in Table 1.9 for 2024 and previous years can be found in Appendix Table A23, Table A24, and Table A25.

Table 1.9–Summary in nominal fish of preliminary estimates for landed catch (LC), incidental mortality (IM), and total mortality (TM) for U.S. and Canada aggregate abundance-based management (AABM) and individual stock-based management (ISBM) fisheries, 2024.

		Landed Catch	Incidental Mortality	Total Mortality
United States	**SEAK AABM**	207,811	40,505	248,316
	SEAK hatchery add-on and terminal exclusion	28,265	13,522	41,788
	U.S. ISBM	542,635	55,745	598,380
	U.S. Total[1]	750,446	96,249	846,696
Canada	**Northern British Columbia AABM**	106,823	13,265	120,088
	West Coast Vancouver Island AABM	96,128	15,401	111,529
	Canadian ISBM	347,600	95,032	442,632
	Canada Total	550,551	123,698	674,249
Total	**PST Fisheries Total**[1]	1,300,997	219,947	1,520,945

[1] Does not include SEAK AABM fishery non-Treaty catch from hatchery add-on and terminal exclusion.

Note: small discrepancies between cumulative columns may be due to rounding.

Landed catch and IM in PST fisheries since 1999 is summarized for AABM and ISBM fisheries of each party in Figure 1.1. The total mortality across all four fishery groups averaged 1,643,854 Chinook during the 1999 PST Agreement (1999–2008) and averaged 1,810,249 during the 2009 PST Agreement (2009–2018). The ISBM total mortality averages increased for both U.S. and Canadian fisheries between the two PST Agreements by approximately 187,100 fish and 34,400 fish, respectively; the averages for the U.S. and Canadian AABM fishery groups decreased by approximately 41,200 in the U.S. and 13,900 in Canada. During the 1999 PST Agreement, 21% of the average total PST-related fishery mortality occurred in U.S. AABM fisheries, 22% in Canadian AABM fisheries, 39% in U.S. ISBM fisheries, and 18% in Canadian ISBM fisheries. During the 2009 PST Agreement the distribution shifted slightly such that 17% of TM occurred in U.S. AABM fisheries, 19% in Canadian AABM fisheries, 46% in U.S. ISBM fisheries, and 18% in Canadian ISBM fisheries. In 2024, 16% of the total PST-related fishery mortality occurred in U.S. AABM fisheries, 15% in Canadian AABM fisheries, 29% in Canadian ISBM fisheries, and 39% in U.S. ISBM fisheries.

Paragraph 4(e) requires the CTC to provide a description of causes (if identifiable) of significant changes in rates or patterns of IM in all fisheries and paragraph 4(f) specifies IM limits for AABM fisheries. No AABM fisheries exceeded their IM limits in 2024 (Figure 1.1). The U.S. AABM, Canadian AABM, and U.S. ISBM fisheries had no identifiable changes in rates or patterns of IM.

Canadian ISBM IM has been decreasing in recent years after peaking in 2022, but remained higher than what had previously been observed since 2020, despite a LC in 2024 only slightly larger than what has been observed in the last five years (347,600 fish in 2024 compared to the 5-year average (2019–2023) of 306,008). The main fishery contributing to this increase was the Strait of Georgia ISBM in 2021, in which releases of sublegal and super-legal fish peaked at 250,326 along with LC (53,573) and IM (51,758). In 2024, releases in this fishery decreased to 172,050 and IM decreased to 38,036, although LC increased to 72,698. The high number of releases and increased IM is attributed to a few factors including extended periods of Chinook non-retention that commenced in 2019, changes in the legal-size limits and fishery regulations. Additional restrictions were applied in 2023 and continued in 2024 by reducing the Chinook daily limit from 2 per day to 1 per day from July 15 – 31 in Areas 121 and 123 to minimize impacts on Fraser summer 5.2 Chinook.

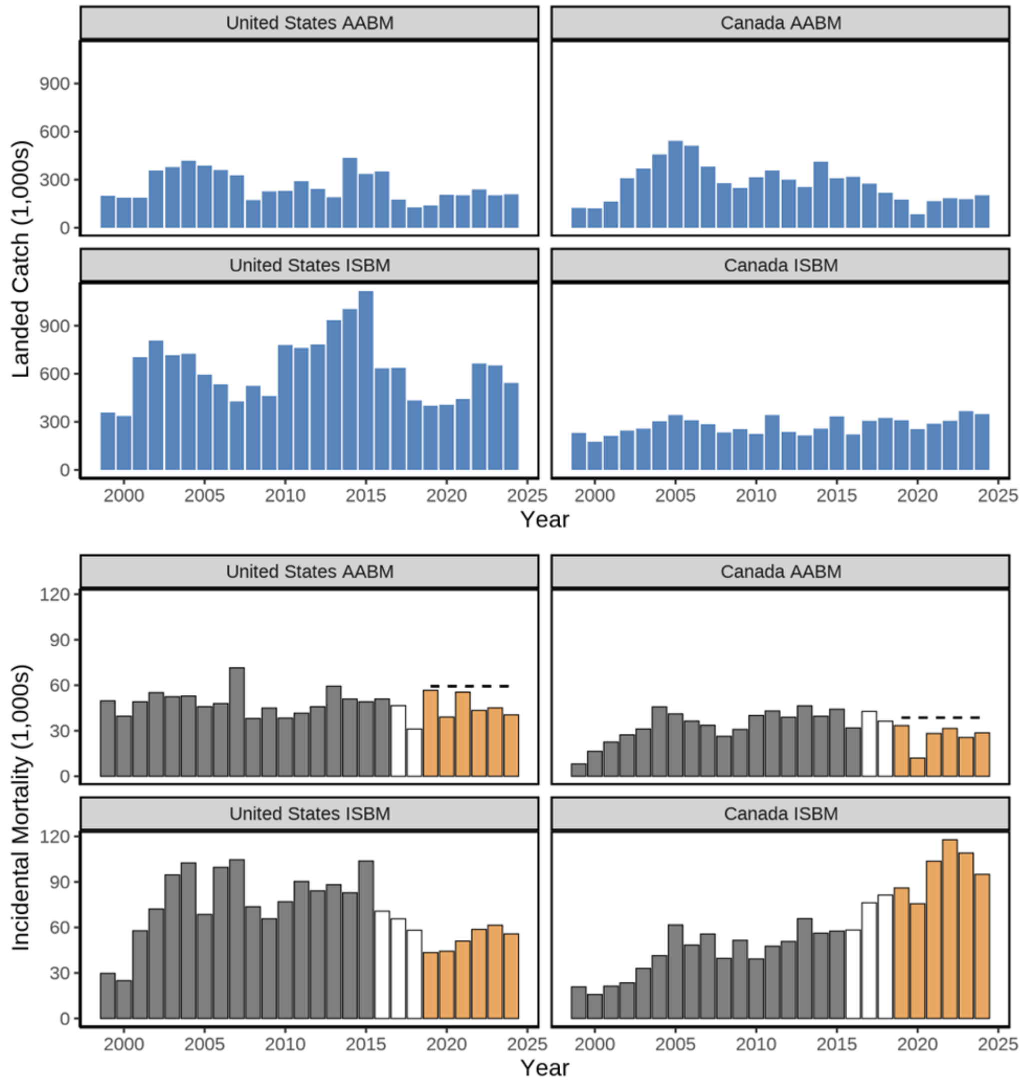


Figure 1.1–Estimates of landed catch (LC; top) and incidental mortality (IM; bottom) for U.S. and Canada aggregate abundance-based management (AABM) and individual stock-based management (ISBM) fisheries, 1999–2024.

Note: Gray bars indicate reference years for assessing changes in patterns of IM, per subparagraph 4(e)(iii). For AABM fisheries, horizontal dashed lines represent Treaty IM limits that apply beginning in 2019 as specified in paragraph 4(f).

2. CHINOOK SALMON ESCAPEMENTS

The 2019 PST Agreement (Annex IV, Chapter 3, Paragraph 2(a)) establishes a comprehensive and coordinated Chinook salmon fishery management program that:

> *"...(iii) uses harvest regimes based on annual indices of abundance that are responsive to changes in production, that take into account all fishery induced mortalities, and that are designed to meet maximum sustainable yield (MSY) or other agreed biologically-based numeric escapement or exploitation rate objectives, including those set out in Attachment I.*
>
> *...(iv) contributes to the improvement in trends in spawning escapements of depressed Chinook salmon stocks and is consistent with improved Chinook salmon production."*

Paragraph 2(b)(iii) and Appendix A (1)(c) direct the CTC to *"report annually on naturally spawning Chinook stocks in relation to the agreed MSY or other agreed biologically-based escapement objectives, rebuilding exploitation rate objectives, or other metrics, and evaluate trends in the status of stocks and progress in rebuilding naturally spawning Chinook stocks."*

In addition, paragraph 7(a)(iv) directs the CTC to annually provide the Commission with:

> *"the status concerning the achievement of stock-specific management objectives; specifically, a table of agreed-to management objectives for each stock included in Attachment I and the annual stock-specific metrics, if available, with the identification of stocks that achieved less than 85% of the point estimate (or lower end range) of the management objective for three consecutive years beginning in 2019*;"

Attachment I of Chapter 3 of the 2019 PST Agreement lists 37 escapement indicator stocks or aggregates, including 22 stocks with escapement goals and 15 stocks with escapement goals to be determined. In addition, the Canadian Okanagan stock is being evaluated, per paragraph 5(b), for future inclusion as an indicator stock.

This chapter presents escapement and performance relative to PSC-agreed management objectives in Section 2.1, escapement trends in Section 2.2, and profiles of escapement indicator stocks in Section 2.3. Supporting data are presented in Appendix B, for which the most current information is also available on the PSC website.

2.1 ESCAPEMENT GOAL ASSESSMENTS

This section assesses performance for 24 escapement indicator stocks, 22 of which are included in Attachment I, as well as the Hoh spring/summer and Queets spring/summer stocks, which have CTC-accepted goals but are not included in Attachment I. Twenty-two of the stocks assessed in this section have CTC-accepted escapement goals or escapement goal ranges[1] and two have agency escapement goals that have been agreed to by the PSC but have not undergone CTC review (Atnarko, Lower Shuswap). Per subparagraph 2(b)(iv) of the 2019 Agreement, one responsibility of the CTC is to "*evaluate and review escapement objectives that fishery management agencies have set for Chinook stocks subject to this Chapter for consistency*

[1]Escapement goals reviewed by the CTC are based on analyses that follow the guidelines developed in CTC (1999).

with MSY or other agreed biologically-based escapement goals". In September 2024, the CTC was presented with revised escapement goals for the Skagit spring and Skagit summer/fall indicator stocks, developed by the Puget Sound state-tribal comanagers (CSCWG 2024). Following their review, the CTC accepted, and the PSC agreed to the revised escapement goals of 1,024 for Skagit spring (previously 690) and 8,201 for Skagit summer/fall (previously 9,202) (CSCWG 2024). These updated goals supplant those goals listed in Attachment I.

The status of stocks in Attachment I with agreed management objectives is shown for 2022 through 2024 in Table 2.1. In 2024, three of these (Stikine, Nehalem, and Siuslaw) had escapements below 85% of their escapement goals. For 2022 to 2024, the Siuslaw escapement indicator stock also failed to achieve 85% of its management objective in three consecutive years.

Table 2.1– Attachment I escapement indicator stocks, management objectives, and escapement performance, 2022–2024. For stocks with PSC-agreed management objectives, escapements above the goal or lower bound escapement range are highlighted in green, escapements within 85% are in yellow, and escapements below the 85% threshold are in red.

Stock Group	Run	Escapement Indicator	Management Objective	2022	2023	2024	3 yrs < 85%
Southeast Alaska							
Yakutat	Spr	Situk	500-1,000	890	144	517	No
Northern Inside	Spr	Chilkat	1,750-3,500	1,582	2,234	2,070	No
Southern Inside	Spr	Unuk	1,800-3,800	1,304	2,072	1,980	No
Transboundary Rivers							
Transboundary Rivers	Spr	Alsek	3,500-5,300	3,351	4,185	4,771	No
Transboundary Rivers	Spr	Taku	19,000-36,000	12,722	14,571	24,518	No
Transboundary Rivers	Spr	Stikine	14,000-28,000	9,090	12,795	9,835	No
North/Cantral B.C.							
Northern B.C.	Sum	Skeena	TBD	24,724	26,044	29,883	
Central B.C.	Sum	Atnarko	5,009	5,139	6,903	10,479	No
Vancouver Island							
East Vancouver Is.	Fall	EVIN	TBD	NA	NA	NA	
West Vancouver Is.	Fall	NWVI Natural	TBD	2,588	1,745	2,471	
West Vancouver Is.	Fall	SWVI Natural	TBD	331	607	300	
Fraser River							
Spring-Run 1.2	Spr	Nicola	TBD	7,438	4,482	2,056	
Spring-Run 1.3	Spr	Chilcotin	TBD	4,126	1,707	1,577	
Summer-Run 1.3	Sum	Chilko	TBD	13,532	7,091	4,666	
Summer-Run 0.3	Sum	Lower Shuswap	12,300	33,914	74,517	16,445	No
Fraser Fall 0.3	Fall	Harrison	75,100	81,649	146,498	131,544	No
Strait of Georgia							
Lower Strait of Georgia	Fall	Cowichan	6,500	17,574	19,855	22,938	No
Upper Strait of Georgia	Fall	Phillips	TBD	2,070	3,277	4,202	
Puget Sound							
Puget Sound Natural	Spr	Nooksack Spring	TBD	4,319	4,205	NA	
Puget Sound Natural	Spr	Skagit Spring	1,024	3,487	1,184	2,276	No
Puget Sound Natural	Sum/Fall	Skagit Sum/Fall	8,201	17,323	11,788	9,386	No
Puget Sound Natural	Sum/Fall	Stillaguamish	TBD	1,530	792	1,139	
Puget Sound Natural	Sum/Fall	Snohomish	TBD	5,635	2,843	6,593	
Washington Coast							
WA Coast Fall Natural	Fall	Hoko	TBD	1,168	4,018	2,489	
WA Coast Fall Natural	Fall	Quillayute	3,000	8,369	6,682	5,378	No
WA Coast Fall Natural	Fall	Hoh	1,200	1,866	2,323	2,158	No
WA Coast Fall Natural	Fall	Queets	2,500	1,643	2,058	4,068	No
WA Coast Fall Natural	Fall	Grays Harbor	13,326	14,259	10,943	13,803	No
Columbia River							
Columbia River Summers	Sum	CAN Okanagan[1]	TBD	NA	NA	NA	
Columbia River Summers	Sum	Mid-Col Summers	12,143	64,497	49,410	41,142	No
Columbia River Falls	Fall	Upriver Brights	40,000	95,558	103,116	101,051	No
Columbia River Falls	Fall	Lewis	5,700	6,833	7,607	12,954	No
Columbia River Falls	Fall	Coweeman	TBD	494	478	416	
Oregon Coast							
North Oregon Coastal	Fall	Nehalem	6,989	4,434	9,095	4,065	No
North Oregon Coastal	Fall	Siletz	2,944	4,694	6,220	4,871	No
North Oregon Coastal	Fall	Siuslaw	12,925	7,394	10,029	9,557	Yes
Mid Oregon Coastal	Fall	South Umpqua	TBD	2,604	3,924	616	
Mid Oregon Coastal	Fall	Coquille	TBD	846	633	341	

[1] Management objective and escapement estimates for the Canadian Okanagan escapement indicator stock are pending the review specified in paragraph 5(b) of Chapter 3 and a subsequent Commission decision.

The status of 24 stocks with agreed goals (22 Attachment I stocks, plus the Hoh and Queets spring/summer stocks) is shown in Figure 2.1. From 2009 to 2024 the percentage of stocks that met or exceeded escapement objectives (at or above point estimate or lower end of range) has varied between 41% and 96%. In 2024, the percentage of stocks that met or exceeded goal was 88%. Of the three stocks below goal (Stikine, Nehalem, and Siuslaw), all three were below 85% of their escapement objective.

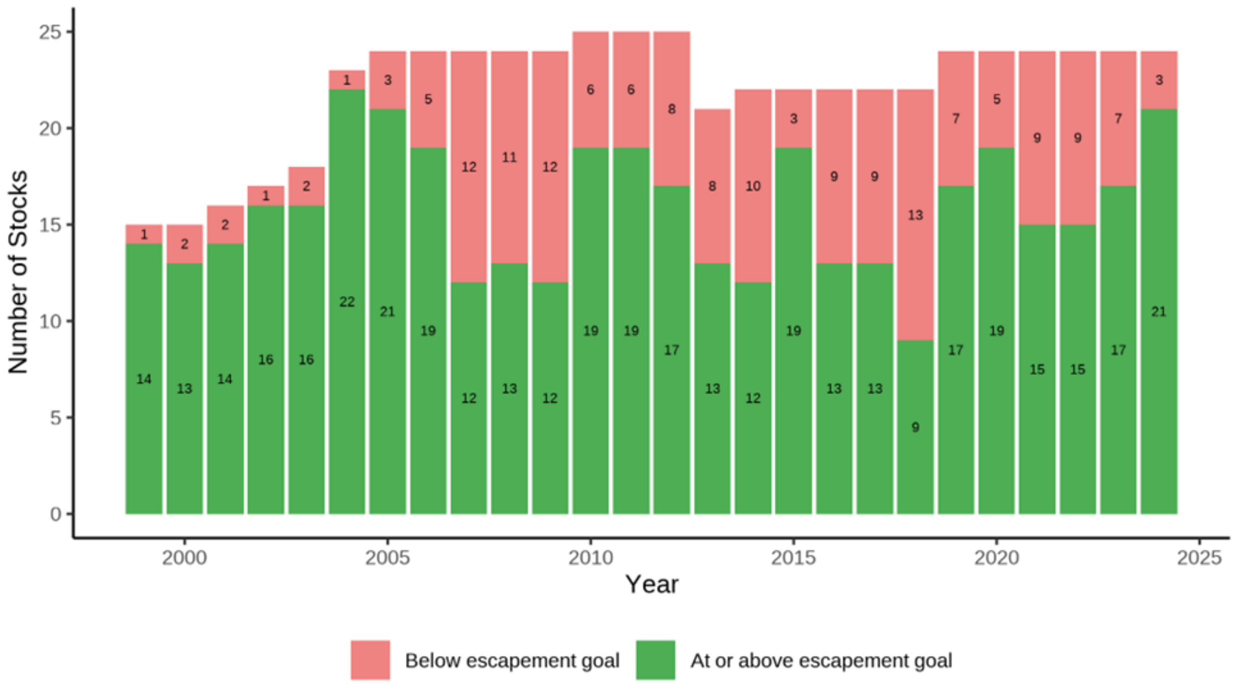


Figure 2.1– Number and status of stocks with Pacific Salmon Commission (PSC)-agreed escapement goals, 1999–2024.

Note: The Keta, Blossom, and King Salmon rivers and Andrews Creek stocks were dropped as escapement indicator stocks in 2013 and Grays Harbor fall was added in 2014. In 2019, the Deschutes and Chickamin rivers stocks were dropped and the Atnarko, Lower Shuswap, Skagit spring, and Skagit summer/fall stocks were added bringing the total number of current indicator stocks with PSC-agreed escapement goals to 24 (the 22 stocks with management objectives identified in Attachment I to Chapter 3 of the 2019 PST agreement, in addition to Hoh spring/summer and Queets spring/summer).

2.2 Trends for Escapement Indicator Stocks

Trends in escapement are analyzed using a state-space exponential growth model (Dennis et al. 2006) parameterized through restricted maximum likelihood (Humbert et al. 2009). The estimates produced by this model are generally superior to those produced through maximum likelihood analysis alone (Staples et al. 2004). Assuming the true population size is generated by stochastic exponential growth, this method separates observation error and process noise and produces variances and confidence intervals (CIs) that represent the annual variability associated with environmental stochasticity, along with sampling error (Humbert et al. 2009). Stock-specific escapement trends are characterized by the mean rate of change (μ) and corresponding 80% CI, where μ = 0.00 represents equilibrium, indicating that escapement has been stable on average for the selected time period. In this analysis, if 80% CIs did not overlap zero, the stock-specific escapement trend was considered statistically significant. Variability in escapement rates of change, denoted by the magnitude of CIs presented in subsequent sections, can be affected by both the length of the time series used and the ratio of process noise to observation error (Humbert et al. 2009).

Stocks are grouped into five regions: Southeast Alaska, Transboundary, British Columbia, Washington, and Columbia River/Oregon. For most stocks, the first year in the time series corresponds with the start of the 1999 Agreement with 2024 being the last year. However, for Lower Shuswap, the escapement time series starts in 2000 due to changes in escapement estimation methodology. The last available escapement value for Nooksack springs was 2023, therefore the trend analysis for Nooksack spring was based on years 1999–2023.

2.2.1 Escapement Trends for Southeast Alaska Stocks

Escapement trends for the Situk, Chilkat, and Unuk stocks were variable and none were significantly different from zero (Figure 2.2).

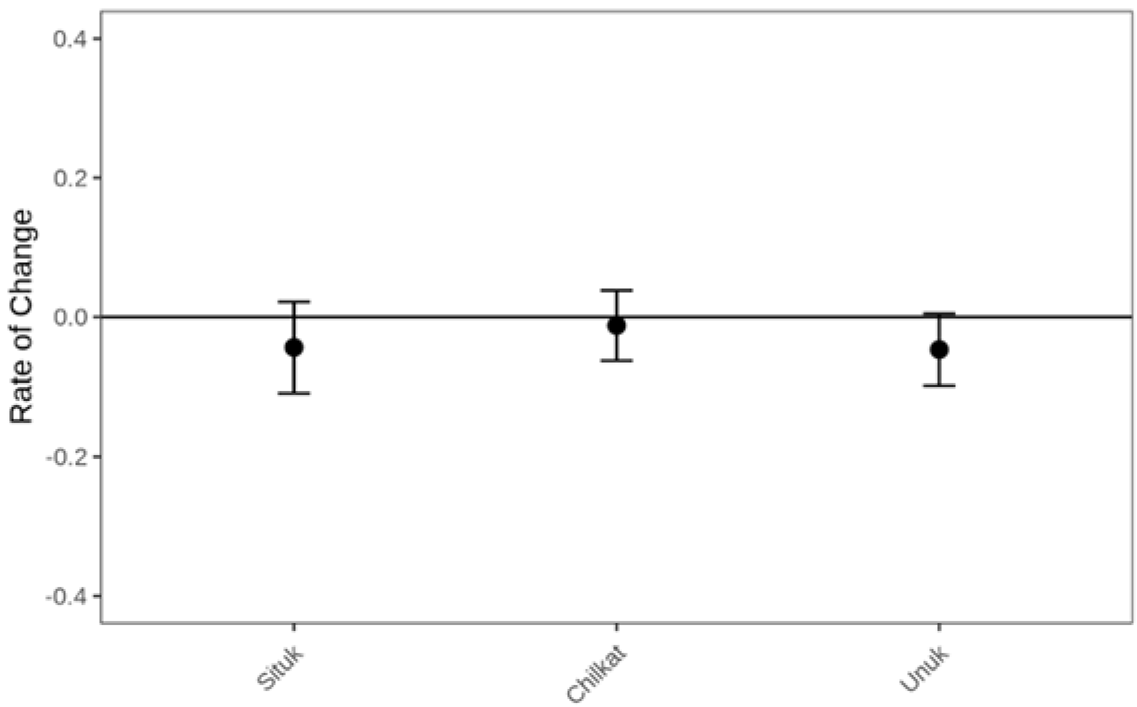


Figure 2.2—1999–2024 mean annual rates of change in escapements for Southeast Alaska Chinook salmon stocks; error bars represent 80% confidence intervals.

2.2.2 Escapement Trends for Transboundary Stocks

For transboundary river stocks (Alsek, Taku, and Stikine), the wide confidence intervals in Figure 2.3 indicate the mean annual rates of change have been variable. This indicates high variability in escapements, which have had contrasts (i.e., the ratio of highest and lowest escapement) of eight to ten over the 1999–2024 period. Values greater than eight are considered high (Clark et al. 2014). None of the mean rates of change were significantly different from zero (Figure 2.3).

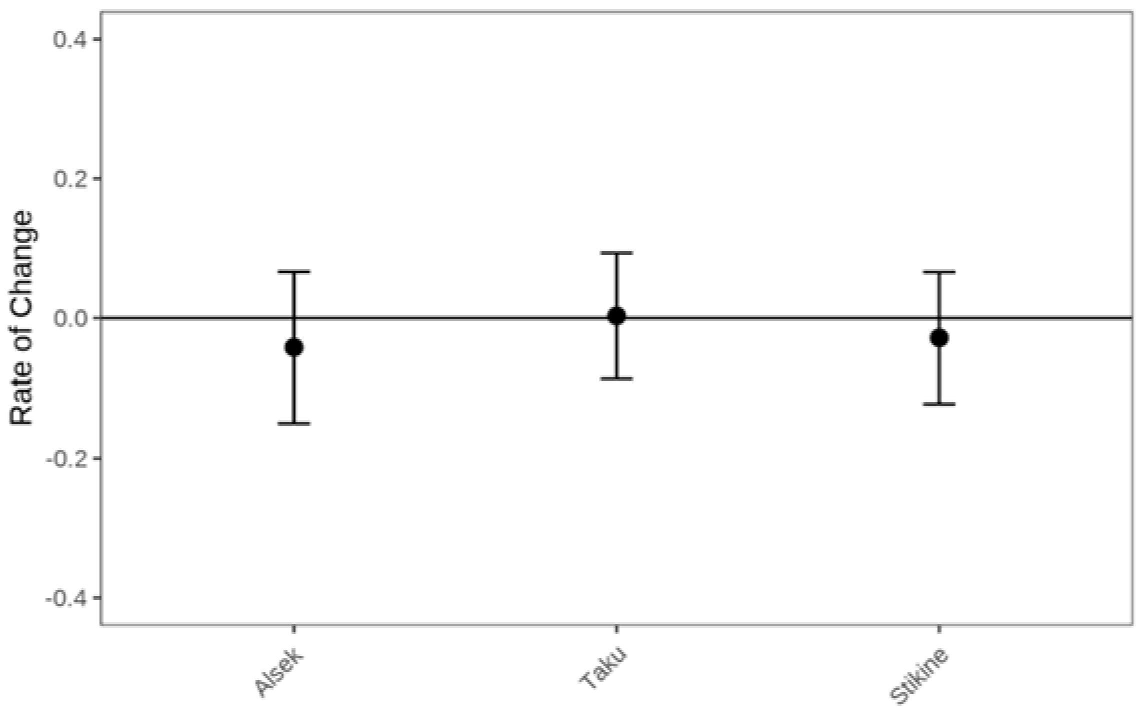


Figure 2.3– 1999–2024 mean annual rates of change in escapements for Transboundary River Chinook salmon stocks; error bars represent 80% confidence intervals.

2.2.3 Escapement Trends for Canadian Stocks

Long-term rates of change for Canadian stocks were based on 1999–2024 time series of escapement for 18 of the 19 stocks evaluated. Escapement time series started in 2000 for Lower Shuswap due to a change in estimation methods. Few Canadian stocks exhibited consistently positive or negative trends in long-term rates of change in escapement with generally large variability in annual rates of change (as indicated by the 80% CI; Figure 2.4). Eleven stocks exhibited negative mean rates of change in escapement, but these were clearly negative only for Skeena (-5.24%), Kitsumkalum (-3.35%), and Chuckwalla-Kilbella (-13.55%). Eight stocks had positive mean rates of change, with Phillips having the largest positive trend (11.65%). Cowichan (6.69%), Nanaimo (5.15%), and Fraser summers 0.3 (4.16%) also had a clearly positive trend. Chinook salmon from Nass, Skeena, Kitsumkalum, Wannock, WCVI-14, and Fraser summer 0.3 had the lowest variability in annual rates of change in escapement whereas Chinook salmon from Chuckwalla-Killbella, Phillips, Cowichan, Fraser spring 1.2, Fraser spring 1.3, Fraser summer 1.3, and Nicola exhibited the largest variability amongst all Canadian stocks. Regional patterns in rates of change are noticeable with declining trends in escapement for Northern BC and a subset of Fraser stocks. Similarly, positive trends in escapement can be observed for Georgia Strait stocks.

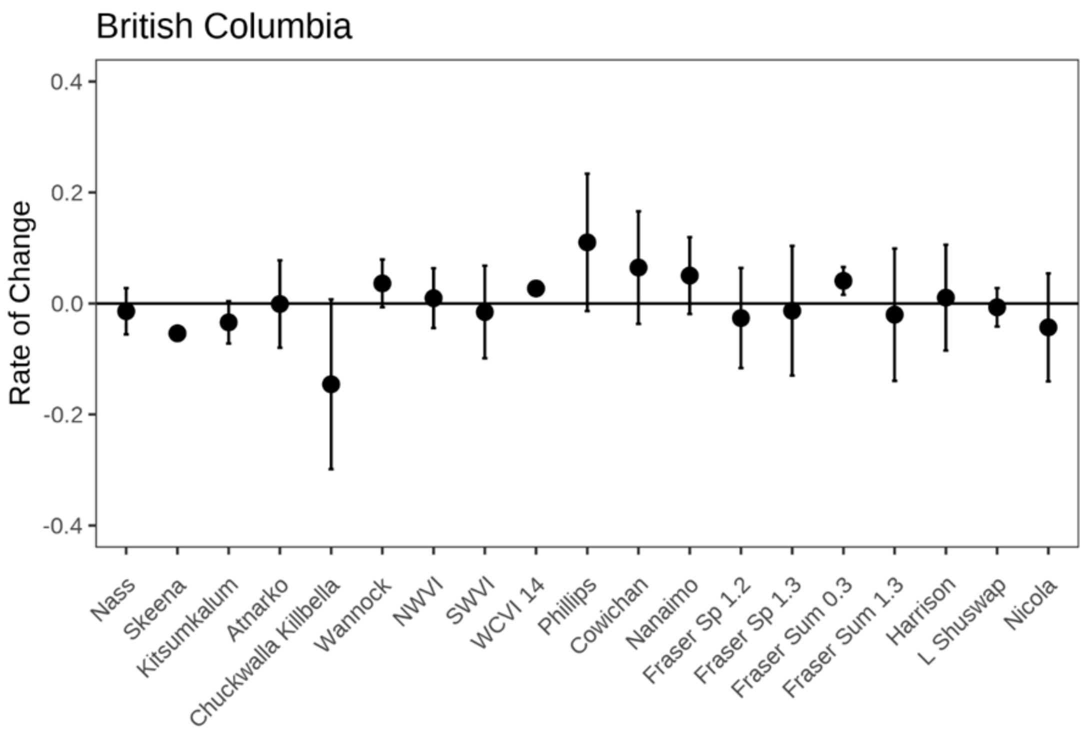


Figure 2.4–1999–2024 mean annual rates of change in escapements for Canadian Chinook salmon stocks; error bars represent 80% confidence intervals.

Note: Escapement time series for Lower Shuswap started in 2000.

2.2.4 Escapement Trends for Washington Stocks

Escapement trends between 1999 and 2024 revealed several noteworthy patterns for Puget Sound and Washington Coastal escapement indicator stocks (Figure 2.5). Of the seven Puget Sound and nine Washington coast indicator stocks, the instantaneous rate of change in escapement was significantly negative for Stillaguamish (-3.1%) and significantly positive for Skagit spring (3.44%) and Queets spring/summer (1.40%). The remaining indicator stocks (four Puget Sound and eight Washington Coast stocks) showed no significant positive or negative trends in escapement. There is considerable uncertainty, however, around the rate of change estimates for a number of these stocks (e.g., Nooksack spring, Skagit summer/fall, Green River, Hoko, Quillayute summer and fall, Hoh spring/summer, and Grays Harbor fall) due to high interannual variability. At least one stock, Snohomish, which was in significant decline at -3.07% as recently as 2023 (CTC 2024), no longer has a significantly negative escapement trend. This is likely related to increased hatchery production efforts at the Wallace River hatchery starting in 2019. The 2024 escapement estimate for Snohomish was 6,593, compared to its recent 3-year average of 3,826; escapements higher than 6,000 fish were last observed in 2017.

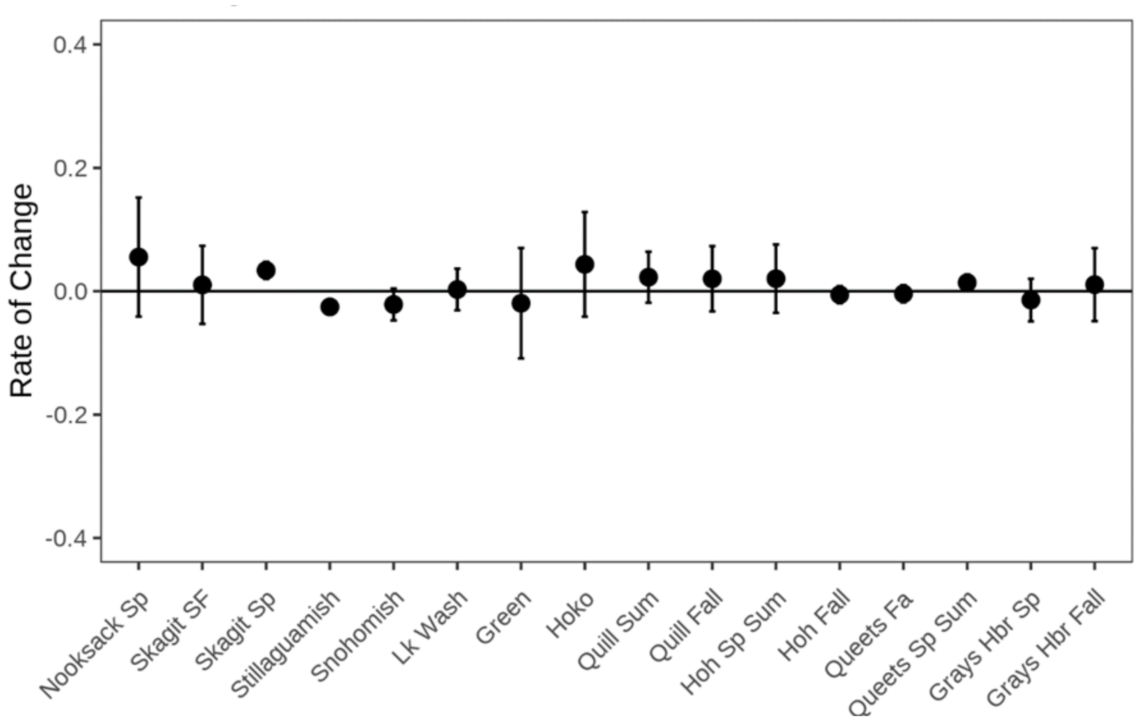


Figure 2.5–1999–2024 mean annual rates of change in escapements for Washington Chinook salmon stocks; error bars represent 80% confidence intervals.

Note: The 2024 Nooksack spring escapement estimate was not available to be included in this analysis.

2.2.5 Escapement Trends for Columbia River/Oregon Stocks

There was substantial variation in mean annual rates of change in escapement for this region (Figure 2.6) with all four Columbia River stocks having positive escapement trends, in contrast to Oregon coast stocks, where four of five stocks had negative escapement trends. The Coquille, while showing high variability, had the greatest negative change out of all stocks examined by the CTC for 1999 through 2024. The historically low escapements observed in the Coquille from 2018 through 2024 (e.g., ~7% of the long-term average) include seven consecutive years in which this stock's escapement has been below 1,000 compared to an average escapement of roughly 9,100 fish between 1975 and 2017. This stock's collapse is chiefly attributed to large increases in abundance of striped and smallmouth bass populations. In response, a Chinook Conservation hatchery program was recently established by the Coquille Indian Tribe and ODFW.

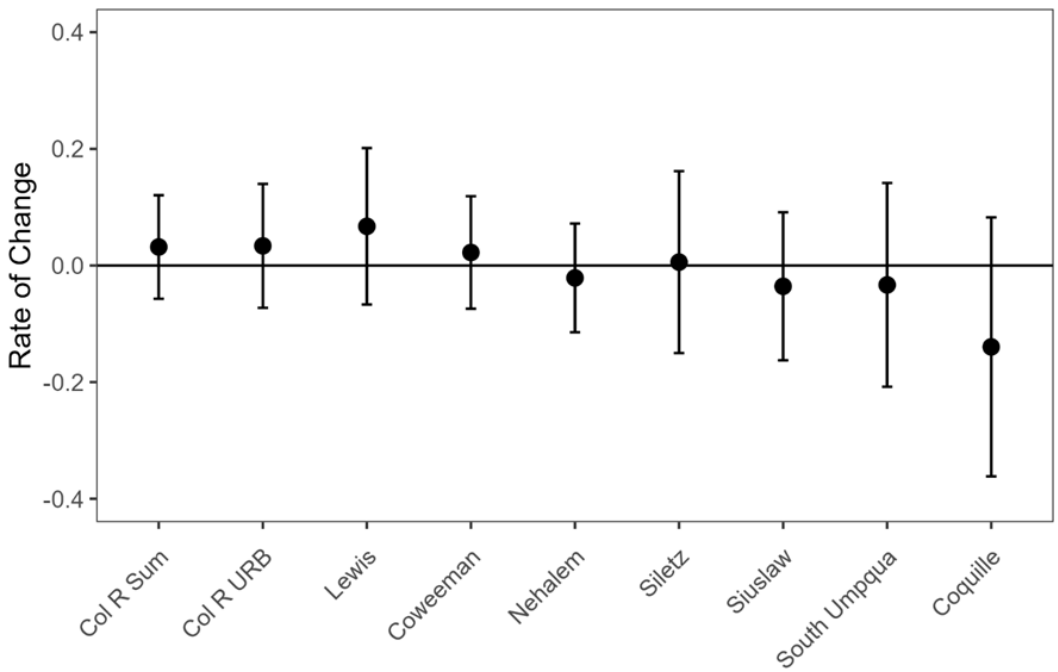


Figure 2.6–1999–2024 mean annual rates of change in escapements for Columbia River and Oregon Chinook salmon stocks; error bars represent 80% confidence intervals.

Note: In 2016, no escapement data was collected from the South Umpqua. . To calculate the escapement trend for this stock, the average escapement value across all other years (excluding 2015, which was anomalously high) was used for 2016.

2.3 Profiles for Escapement Indicator Stocks

Escapements are graphed for stocks from Alaska, Canada, Puget Sound, Coastal Washington, Columbia River, and Oregon Coast regions. For each stock a commentary describes escapement methodology, escapement goal basis, escapement evaluation, and agency comments. Escapement is usually reported as the number of adults by calendar year (CY). Escapement goals accepted by the CTC are shown as solid horizontal reference lines; escapement goals not accepted by the CTC but provided by the agencies are shown as dashed horizontal reference lines, which may change throughout the time series. Historical escapement and terminal run data are provided in Appendix B.

2.3.1 Southeast Alaska Stocks

Estimates for the three SEAK escapement indicator stocks are germane to large fish, defined as Chinook salmon ≥ 660 mm length mid-eye to tail fork (MEF) for the Situk and Unuk stocks, or as fish ≥ ocean-age-3 for the Chilkat stock. Length-based estimates of large fish include mostly ocean-age-3, -4, and -5 fish, and almost 100% of the females in the population, while excluding ocean-age-1 and most ocean-age-2 males. All SEAK indicator stocks produce primarily yearling smolt (freshwater-age-1) except the Situk River, which produces around 90% subyearling (freshwater-age-0) smolt. Survey methods have been standardized since 1975 except for the Chilkat River, which was standardized in 1991 concurrent with the initiation of mark-recapture

(MR) escapement estimation. Currently, escapement is estimated for the Unuk stock using aerial counts of large spawners. Biological escapement goals (BEGs) for each of these stocks have been reviewed and accepted by the CTC and consist of an S_{MSY} point estimate and an escapement goal range.

Based on CWT recoveries, SEAK stocks are classified into two categories of ocean migration patterns: inside-rearing and outside-rearing. Recoveries of CWTs suggest that a portion of fish from inside-rearing stocks rear in SEAK for at least part of the year, whereas outside-rearing stocks strictly rear outside of SEAK in the Gulf of Alaska and Bering Sea. For instance, only a few CWTs from outside-rearing stocks have been recovered in SEAK between September and January. However, coded-wire-tagged inside-rearing stocks are frequently recovered in SEAK during these months. Inside-rearing stocks include fish returning to the Chilkat and Unuk rivers and are vulnerable to SEAK fisheries both as immature rearing fish and migrating adult fish returning to their natal rivers. Outside-rearing stocks, sometimes referred to as “far north migrating stocks,” are harvested during their spawning migrations through marine waters in the spring and include the Situk River stock.

In 1981, ADF&G established a 15-year rebuilding program which included developing interim point escapement goals for 11 SEAK and TBR stocks that ADF&G monitors, based on the highest observed escapement count prior to 1981. Since then, more rigorous escapement goal analyses have been adopted and used for management, based on the State of Alaska *Policy for Statewide Salmon Escapement Goals and Policy for the Management of Sustainable Salmon Fisheries* (Alaska State Legislature 2023b; Alaska State Legislature 2023c).

2.3.1.1 Situk River

The Situk River is a non-glacial system near Yakutat, Alaska that supports an outside-rearing stock. Most harvest of Situk-origin Chinook salmon occurs in a commercial fishery, which operates in the estuary and nearby terminal marine waters, and in sport and subsistence fisheries located in-river, in the estuary, and in nearby marine waters. These fisheries are prosecuted under a State of Alaska management plan: “Situk-Ahrnklin Inlet and Lost River King Salmon Fisheries Management Plan” (Alaska State Legislature 2023d) to achieve escapements within the escapement goal range.

Escapement Methodology: The escapement is enumerated through a weir placed across the lower river and the escapement estimate is the count of fish passing upstream of the weir minus any sport and subsistence harvest that might occur above the weir. Sport harvest is estimated using a creel survey and/or a postseason mail-out survey, and subsistence harvest is enumerated using a subsistence permit reporting program. The weir was operated from 1928 to 1955 and continuously since 1976 including escapement enumeration. Escapement estimates meet U.S. and bilateral CTC data standards.

Escapement Goal Basis: In 1991, ADF&G revised the escapement goal to 600 large spawners (McPherson and Weiland 1991), and in 1997, the goal was revised to a range of 500 to 1,000 large spawners to conform to ADF&G’s escapement goal policy. The CTC reviewed and accepted this range in 1998. The analysis was updated by ADF&G using a longer time series of spawner and recruit information along with up-to-date escapement goal methodologies in 2003, leading to a proposed range of 450 to 1,050, but this was not accepted by the CTC.

Escapement Evaluation: Productivity of the Situk River stock has generally been poor over the last decade, with annual escapements less than 85% of the lower bound of the goal occurring in four out of the last ten years. However, after a poor escapement of 420 fish in 2018, the 2019-2022 escapements were all well above the lower bound of the BEG. Like 2015 through 2023, all terminal fisheries were closed in 2024 to allow as many fish as possible to reach spawning grounds. There was also no harvest above the weir in 2024; therefore, the weir count was a direct measure of escapement (Figure 2.7).

Agency Comments: Because this stock experienced consistent poor production starting with 2008, conservative management was implemented through 2024, with complete closures in the terminal areas since 2017. Prior to these actions, total CYERs (all harvests within the PST area) averaged about 53% from 1990 to 2003 but because of conservative management and fishery closures, rates dropped to 26% from 2004 to 2016 and less than 1% since 2017.

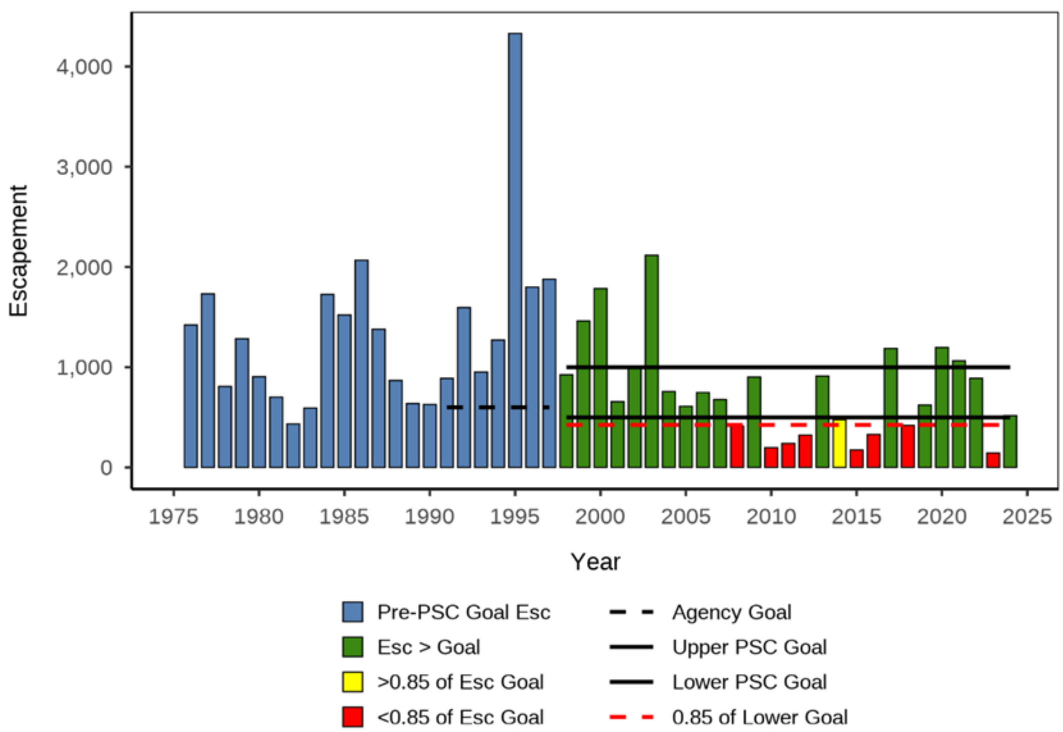


Figure 2.7–Situk River escapements of Chinook salmon, 1976–2024.

2.3.1.2 Chilkat River

The Chilkat River is a moderate-sized glacial system near Haines, Alaska, which supports an inside-rearing stock. Escapement estimates are germane to spawners that are ocean-age-3 and older. CWTs have been applied to wild smolt at relatively high rates (8–10%) beginning with the 1999 brood year; additional wild stock tagging occurred for three broods prior to that time. Relatively small terminal marine sport and subsistence fisheries target this stock. This stock is also caught in SEAK commercial troll, drift gillnet, and sport fisheries.

Escapement Methodology: Escapements of large spawners have been estimated with a MR program annually since 1991 (Ericksen and McPherson 2004). Annual escapement estimates have an average coefficient of variation (CV) of about 15% since 1991 meeting the U.S. CTC data standard. From 1975 to 1992, aerial survey counts were conducted on two small tributaries with relatively clear water and results from these estimates were inconsistent with radio telemetry studies conducted in 1991 and 1992. Results from these radio telemetry studies indicated that these two tributaries represented less than 5% of the total escapement and as a result, aerial surveys were discontinued.

Escapement Goal Basis: An initial 1981 escapement goal was 2,000 large fish, based on an assumed fraction of the total escapement represented by aerial survey counts. A revised escapement goal range of 1,750 to 3,500 large spawners, based on MR estimates of escapement and limited CWT information (Ericksen and McPherson 2004) was reviewed and accepted by the CTC in 2004.

Escapement Evaluation: Escapements to the Chilkat River were ≥ 85% of the goal in all years except 2007 and from 2016 to 2018. The 2019 to 2021 escapement estimates were each above the lower bound of the escapement goal range, below goal in 2022, and made the goal in 2023 and 2024. The 2024 escapement estimate of 2,070 (CV = 25%) large spawners continued this recent trend of meeting the lower bound of the BEG (Figure 2.8).

Agency Comments: Like other Chinook salmon stocks in Alaska, the Chilkat stock has been experiencing a decline in productivity, and restrictive management measures have been in place since 2018. From 2004 through 2017, calendar year harvest rates averaged 24%. These rates dropped to 6% with the implementation of conservative management in 2018 and these actions will continue in 2025.

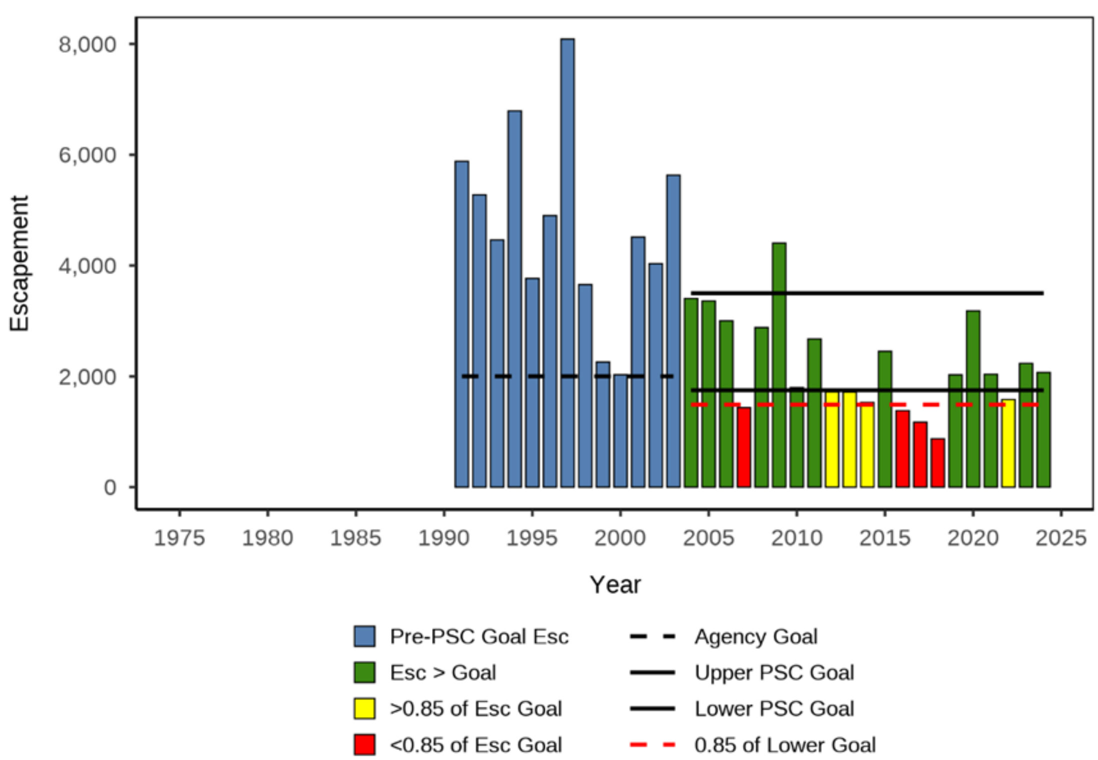


Figure 2.8–Chilkat River escapements of Chinook salmon, 1991–2024.

2.3.1.3 Unuk River

The Unuk River is a moderate-sized glacial system that flows into Behm Canal northeast of Ketchikan, Alaska, which supports an inside-rearing stock. CWTs have been implanted in wild smolt at relatively high rates (3–18%) beginning with the 1992 brood year. Harvest of immature and mature fish occurs predominately in SEAK commercial and sport fisheries, although some fish have been historically caught in NBC fisheries**.**

Escapement Methodology: Escapements of large spawners were derived from MR estimates of total escapement from 1997 to 2011, and from expanded survey counts from 1977 to 1996 and 2012 to present. Radio telemetry studies in 1994 and 2007 demonstrated that survey area coverage includes approximately 80% of the spawning population; the expansion factor for survey counts is 4.83 (Hendrich et al. 2008). From 1997 to 2011, CVs of the MR escapement estimates averaged 11% and were less than 15% in all but one year (2011). The average CV is 12% for expanded survey counts performed since 2012 and thus meet bilateral CTC data standards.

Escapement Goal Basis: In 1994, ADF&G revised the Unuk River escapement goal to 875 large spawners observed during survey (index) counts (unpublished work), which the CTC reviewed and the PSC accepted. In 1997, ADF&G revised the goal to a range of 650 to 1,400 large spawners observed during index counts (McPherson and Carlile 1997), which the CTC reviewed and the PSC accepted in 1998. Since the expansion factor for surveys was unknown at that time, the goal was expressed in terms of peak survey counts. In 2008, a more extensive analysis was completed using the 1982 to 2001 brood years with the goal expressed in terms of total escapement (Hendrich et al. 2008). From this analysis, a factor of 4.83 was developed to expand the peak survey counts to total escapement, and in 2009, the CTC accepted a goal range of 1,800 to 3,800 large spawners with an S_{MSY} value of 2,764 fish. For comparisons, historical goals shown in Figure 2.9 are expanded to total escapement.

Escapement Evaluation: The Unuk River stock had annual escapements from 1977 to 2011 that were within or above the escapement goal range. However, productivity of the Unuk River stock has been poor over the last decade with annual escapements less than 85% of the lower bound of the goal occurring in four of the last ten years. The 2024 estimated escapement was 1,980 (CV = 12%) large spawners, which exceeds the lower bound of the BEG (Figure 2.9).

Agency Comments: The large reduction in run strength of the Unuk River stock in recent years was unexpected given its history of consistent production. There are no directed fisheries that target this stock; sport fishing in fresh water is closed, marine sport fishing in East Behm Canal is closed during the spring and summer, and commercial fishing in nearby marine waters in upper Behm Canal is closed. Additional management measures have been in place since 2017 to limit harvest of this stock in SEAK fisheries and restrictions will continue in 2025.

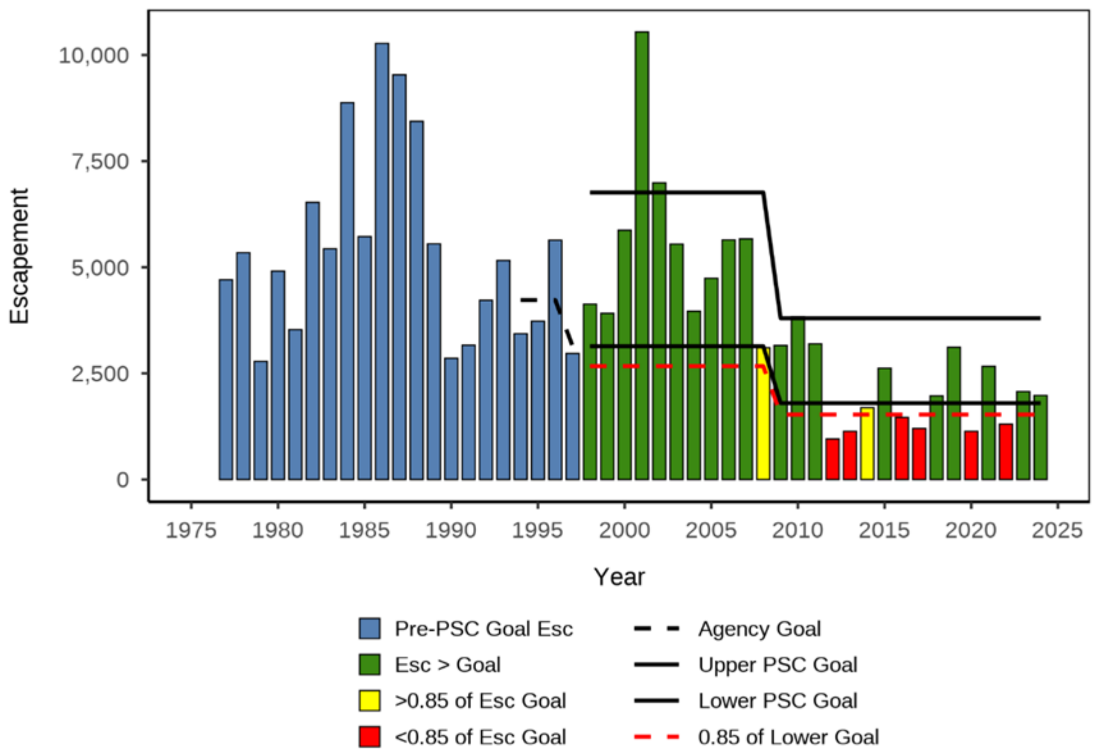


Figure 2.9–Unuk River escapements of Chinook salmon, 1977–2024.

2.3.2 Transboundary River Stocks

The transboundary stocks include Chinook salmon returning to the Alsek, Taku, and Stikine rivers. Escapement estimates in the Alsek River are for ocean-age-2 fish and older. Escapement estimates in the Taku and Stikine rivers are for large fish only, defined as Chinook salmon $\geq$ 660 mm length mid-eye to tail fork, which includes ocean-age-3 through ocean-age-5 fish and almost 100% of the females in the population. Survey methods have been standardized since 1973 in the Taku River, since 1975 in the Alsek and Stikine rivers, and each of these stocks have PSC-agreed Biological Escapement Goals (BEG).

All three TBR stocks are classified as outside-rearing based on marine CWT recovery patterns. These stocks emigrate as yearling smolts and have limited marine rearing in SEAK waters; therefore, they are harvested primarily during their spawning migrations each spring and early summer.

In response to low abundance, a 15-year rebuilding program was established in 1981 (ADF&G 1981). Concurrently, ADF&G established interim escapement goals for all three stocks, based on the highest observed escapement prior to 1981. Escapement goals for all three TBR stocks have been revised by ADF&G and DFO, and have been reviewed by the CTC, Canadian Centre for Science Advice Pacific (CSAP), and the Transboundary Technical Committee (TTC) and subsequently accepted by the TBR Panel and the PSC. Escapement goal ranges are used by ADF&G for domestic management, as described in the State of Alaska *Policy for Statewide Salmon Escapement Goals* and *Policy for the Management of Sustainable Salmon Fisheries* (Alaska State Legislature 2023b; Alaska State Legislature 2023c). Escapement goal ranges are also used by the U.S. and Canada for implementation of Annex IV, Chapter 1 of the PST.

2.3.2.1 Alsek River

The Alsek River is a large glacial system that originates in Southwest Yukon Territory and Northwest British Columbia, Canada, and flows into the Gulf of Alaska about 50 miles (80 km) east of Yakutat, Alaska. This river supports a run of outside-rearing Chinook salmon.

Escapement Methodology: Since 1976, escapements have been monitored using a weir on the Klukshu River, one of 51 tributaries of the Tatshenshini River, the principal salmon-producing tributary of the Alsek River. Through 2015, the weir comprised a trap box that captured representative returns of ocean-age-2 and older Chinook. Since 2016, the trap box was replaced with a 24-hour video enumeration system. Concurrent with the weir counts, Alsek River drainage-wide MR escapement estimates were generated from 1998 to 2004 through a cooperative effort among the Champagne and Aishihik First Nations, DFO, and ADF&G. The resulting expansion factor of 4.0 is used to convert the Klukshu River in-river run (weir count plus any below-weir harvest) to Alsek River above border drainage-wide in-river run estimates. Drainage-wide MR studies were once again conducted from 2022 through 2024. The MR estimates are cooperative stock assessment efforts among the Champagne and Aishihik First Nations, DFO, and ADF&G. As part of Event 1 of the two-event MR study, fish were captured using set gillnets and marked in the lower Alsek River near Dry Bay, Alaska, and as part of Event 2, fish were sampled for marks at multiple locations further upriver in the Yukon Territory and in British Columbia. Total drainage-wide in-river run is estimated by adding the above border in-river run plus any U.S. harvests. Previous assessments using the expansion factor have a CV of 35% (Bernard and Jones 2010), failing to meet bilateral CTC data standards (CTC 2013).

Escapement Goal Basis: Spawner-recruit analysis in 2010 resulted in a recommended BEG of 3,500 to 5,300 ocean-age-2 and older Chinook salmon, which was reviewed by the CTC, TTC, ADF&G, and CSAP and accepted by the TBR Panel and PSC Commissioners (Bernard and Jones 2010). The previous goal was based solely on the Klukshu River run (McPherson et al. 1998) but this goal was germane to the Alsek River run and from this analysis a factor of 4.0 (CV = 35%) was developed to expand the Klukshu River run to Alsek River drainage-wide run and ultimately escapement after accounting for in-river harvests. For comparison purposes, the historical goal depicted in Figure 2.10 is expanded to drainage-wide total escapement.

Escapement Evaluation Annual escapements of less than 85% of the lower bound of the current goal range have been observed five times since 1976, and all have occurred in the last 17 years (2006, 2007, 2008, 2016 and 2017). Beginning in 2018, escapement estimates have been above the lower bound of the BEG with the exception of 2022; the MR-derived 2024 escapement estimate is 4,771 (CV=13%) ≥ ocean-age-2 Chinook salmon (Figure 2.10).

Agency Comments: Most harvest of Alsek-origin Chinook salmon occurs in the U.S. commercial fishery in Dry Bay and in Aboriginal fisheries in the upper watershed in Canada. Some fish are also harvested in sport fisheries in each country. CYERs averaged 7% with a range of 2% to 26% since 2014.

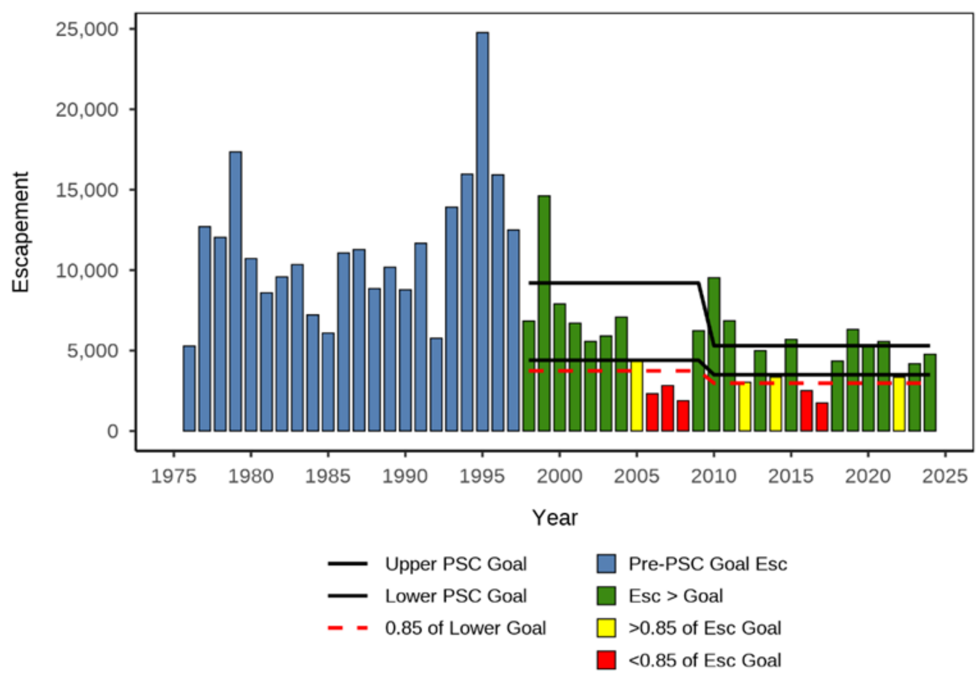


Figure 2.10–Alsek River escapements of ocean age-2 and older Chinook salmon, 1976–2024.

2.3.2.2 Taku River

The Taku River is a large glacial system that originates in Northwest British Columbia and flows into marine waters of SEAK, about 20 miles (30 km) northeast of Juneau, Alaska. The Taku River supports a run of outside-rearing Chinook salmon, most of which are caught in terminal marine waters of SEAK and in the lower river in Canada. Directed gillnet fisheries take place in terminal U.S. (District 111 of SEAK) and Canadian in-river fisheries when forecasted abundance or in-season assessments exceed predetermined levels as described in the 2019 PST Agreement under Annex IV, Chapter 1, paragraph 3(b)(3). Taku River Chinook are incidentally harvested in terminal directed sockeye salmon gillnet fisheries in the U.S. and Canada, in sport fisheries near Juneau, Alaska, and in-river in Aboriginal and sport fisheries in Canada and in a U.S. personal use fishery just below the border. Taku Chinook salmon are also harvested outside of the terminal area, primarily in SEAK sport and troll fisheries.

Escapement Methodology: Escapement estimates of large Chinook salmon have been generated using MR experiments in 1989, 1990, 1995 to 1997, 1999 to 2010, 2014 to 2020, and 2022 to 2024. Standardized aerial survey counts have been performed by ADF&G since 1973. Counts prior to 1989, from 1991 to 1994, 1998, 2011 to 2013, and 2021 were expanded by a factor of 5.2, which is the average ratio of the MR estimates to aerial survey counts. Escapement estimates based upon expanded aerial survey counts are assumed to be unbiased and have a CV of 34% (McPherson et al. 2010) which does not meet CTC data standards (CTC 2013). The MR estimates are from cooperative stock assessment efforts among the Taku River Tlingit First Nation, DFO, and ADF&G. As part of Event 1 of the two-event MR study, fish were captured using drift gillnets and fish wheels and marked in the lower Taku River near Canyon Island, Alaska, and as part of Event 2, fish were sampled for marks upriver just across the border and in the headwaters at multiple locations in British Columbia. Since 1995, MR escapement estimates had an average CV of 15%, ranging from 9% to 24%, and most assessments met bilateral CTC data standards.

Escapement Goal Basis: With the signing of the PST in 1985, the goal was to achieve 25,600 to 30,000 large spawners in the Canadian portion of the Taku River. In 1991, the U.S. and Canada agreed to an index survey goal of 13,200 large spawners but these early goals were based on limited data and professional judgement. A BEG based upon maximizing smolt production was reviewed by the CTC, TTC, ADF&G, and CSAP and agreed to by the TBR Panel and PSC Commissioners and used for management from 1999 to 2009 (McPherson et al. 2000). Spawner-recruit analysis in 2009 resulted in an updated BEG of 19,000 to 36,000 large Chinook salmon (McPherson et al. 2010).

Escapement Evaluation: Escapements of less than 85% of the lower bound of the current goal range occurred eleven times since 1975 and most notably in eight consecutive years from 2016-2023. The 2024 escapement estimate is 24,518 (CV = 17%) large Chinook salmon, which is above the lower bound of the escapement goal range and close to the S_{MSY} point goal of 25,500 (Figure 2.11).

Agency Comments: Like the Stikine River stock of Chinook salmon and some SEAK stocks, the Taku River stock has been experiencing a decline in productivity, largely due to poor marine survival. Restrictive management measures have been in place since 2018 and will continue in 2025. Until marine survival improves, it is unlikely that productivity will improve enough to allow directed fisheries. CYERs averaged 14% with a range of 5% to 29% since 2014.

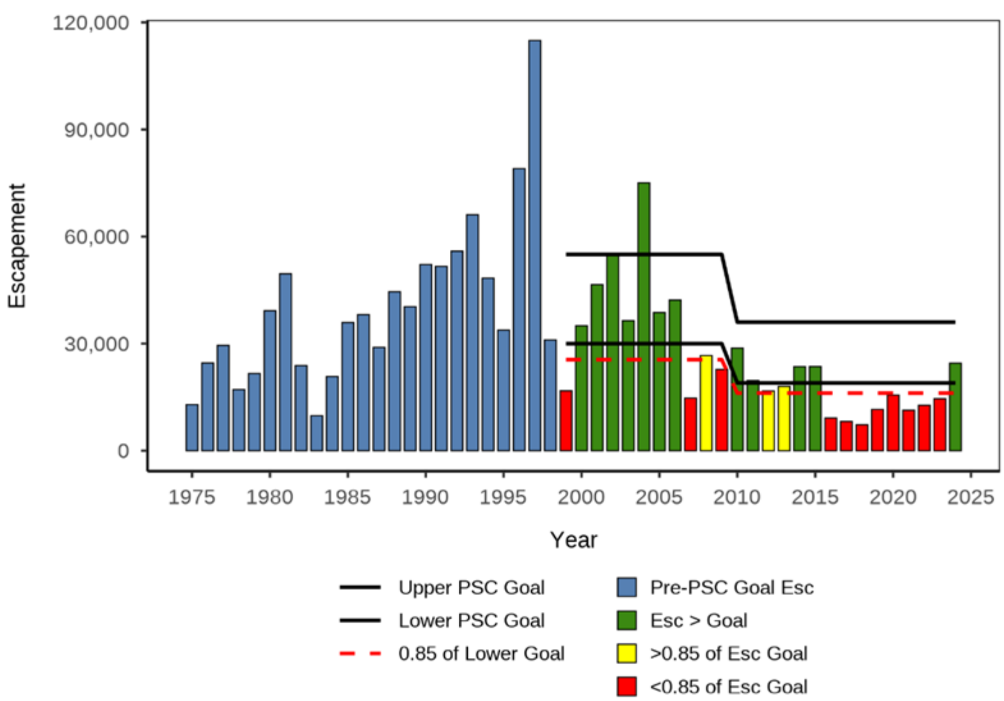


Figure 2.11–Taku River escapements of large (>=600 METF) Chinook salmon, 1975–2024.

2.3.2.3 Stikine River

The Stikine River drainage is the largest in SEAK, originating in British Columbia and flowing into the marine waters in central SEAK, about 12 miles (19 km) northeast of Wrangell, Alaska and 25 miles (40 km) southeast of Petersburg, Alaska. The Stikine River supports a run of outside-rearing Chinook salmon and most harvest occurs in terminal areas, including U.S. commercial gillnet and sport fisheries in District 108. There are also commercial gillnet, Aboriginal, and recreational fisheries in the Canadian portion of the drainage. Stikine Chinook salmon are also harvested outside of the terminal areas in SEAK sport and troll fisheries. Starting in 2005, during years of surplus production to the Stikine River, directed Chinook salmon fisheries were allowed in District 108 marine waters and in-river in Canada.

Escapement Methodology: From 1975 to 1984, index escapement estimates were generated using survey counts performed by ADF&G, and since 1985 counts were made through a weir on the Little Tahltan River operated by DFO and the Tahltan First Nation. Escapement estimates of large Chinook salmon have been generated using MR experiments from 1996–2022. The MR estimates are cooperative stock assessment efforts among the Tahltan First Nation, DFO, and ADF&G. As part of Event 1 of the two-event MR study, fish were captured with drift gillnets and marked in the lower Stikine River near Kakwan Point, Alaska, and as part of Event 2, fish were sampled for marks upriver across the border at multiple locations in British Columbia. Combined, these efforts indicated weir counts represented 17% to 20% of the total escapement as estimated by MR results (Pahlke and Etherton 1999). The MR escapement estimates had an average CV of 18%, ranging from 7% to 34%, about half of which met bilateral CTC data standards (CTC 2013). In 2023 and 2024, a CPUE model was used to estimate escapement due to incomplete data from the MR experiment. The CPUE model was developed using catch and effort data collected during Event 1 of the MR study and the MR-based escapement estimates from 1996–2022. The 2024 escapement estimate is 9,835 (CV = 32%) large Chinook salmon, which did not meet CTC data standards (CTC 2013).

Escapement Goal Basis: With the signing of the PST in 1985, the escapement goal was to achieve 19,800 to 25,000 large spawners in the Canadian portion of the Stikine River. This goal was loosely based on observer counts of spawning fish in years believed to be free from overfishing and expansions based on professional judgment. A detailed spawner-recruit analysis in 1999 resulted in a BEG of 14,000 to 28,000 large Chinook salmon, which was reviewed by the CTC, TTC, ADF&G, and CSAP, agreed upon by the TBR Panel and PSC Commissioners, and used for management from 2000 to present (Bernard et al. 2000). Previously, several drainage-wide or index goals were developed by the U.S. and Canada that were based on limited data.

Escapement Evaluation: Escapements of less than 85% of the lower bound of the current goal range occurred twelve times since 1975 and most notably in 7 of the last 9 years. The 2024 escapement estimate is 9,835 (CV=32%) large Chinook salmon, which is below the 85% threshold of the lower bound of the escapement goal range (Figure 2.12).

Agency Comments: Like the Taku River stock of Chinook salmon and some SEAK stocks, the Stikine River stock has been experiencing a decline in productivity, largely due to poor marine survival. Restrictive management measures have been in place since 2018 and will continue in

2025. Until marine survival improves, it is unlikely that productivity will improve enough to allow directed fisheries. CYERs averaged 17% with a range of 3% to 37% since 2014.

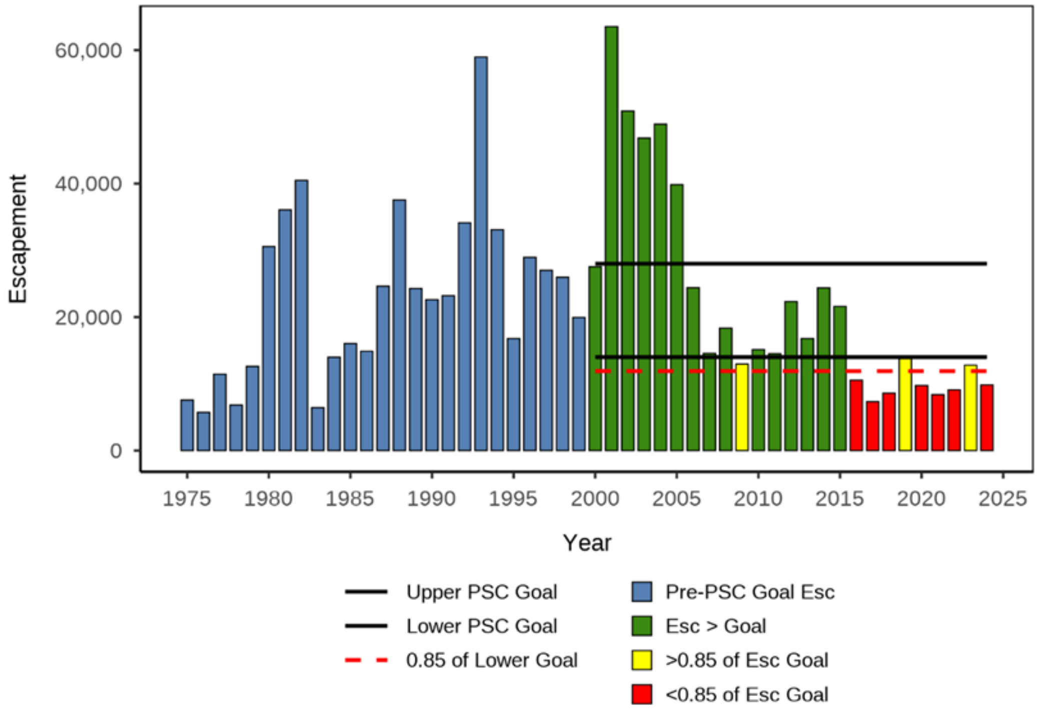


Figure 2.12–Stikine River escapements of Chinook salmon, 1975–2024.

2.3.3 Canadian Stocks

Since the beginning of the Chinook salmon rebuilding program of the 1985 PST Agreement, escapement goals for Canadian Chinook salmon stocks were generally based on doubling the average escapements recorded from 1979 to 1982. This methodology was based on the premise that Canadian Chinook salmon stocks were overfished and that doubling the escapement would still be less than the optimal escapement estimated for the aggregate of all Canadian Chinook salmon populations (PSC 1991). Doubling was also expected to be a large enough change in escapements to allow detection of the change in numbers of spawners and the subsequent production. The escapement goals of most Canadian stocks are currently being reviewed; four stocks (Lower Shuswap, Harrison, Cowichan, and Atnarko) have PSC-agreed escapement goals. Kitsumkalum is the Skeena exploitation rate indicator stock and has an agency goal but there is not yet a PSC-agreed Skeena escapement goal.

2.3.3.1 Northern British Columbia

2.3.3.1.1 Nass River

The Nass River is the largest river in Area 3, draining an area of approximately 18,000 km^2. It flows southwest from the interior of British Columbia into Portland Inlet and the estuary is located 30 km south of the Alaska/British Columbia border. The Nass River is constrained by a canyon at Gitwinksihlkw that was formed by the Tseax Volcano in 1775 and is approximately 40 km upstream from the estuary. The mainstem of the Nass River is extremely turbid with visibility near zero for most of the year. Among the major Chinook salmon producing tributaries, the Bell Irving River is glacially turbid while the Meziadin, Cranberry/Kiteen, Kwinageese and Damdochax rivers are relatively clear. The Nass River Chinook salmon stock is primarily (97%) stream-type and are far north migrating.

Escapement Methodology: Prior to 1992, DFO observations of Nass River Chinook salmon escapement was based on visual counts. Programs using MR have been conducted since 1992 by Nisga'a Fisheries to estimate total spawning escapement in the Nass River. The Nass MR program uses two fish wheels at Gitwinksihlkw in the Lower Nass River canyon and two fish wheels at Grease Harbor further upstream to capture fish for tag application. The Meziadin River fishway, a weir across the Kwinageese River, and a dead pitch program on the Damdochax River are used for tag recovery. Tags were also recovered in upriver fisheries and on the spawning grounds. A modified Petersen model was used to estimate the total population of Chinook salmon past the tagging location. Spawning escapements were calculated as the estimated population past Gitwinksihlkw from the MR studies, minus upriver catches in sport and First Nations fisheries. These MR methods are currently under review. Three tributaries with Chinook salmon populations—the Kincolith, Ishkeenickh, and the Iknouk rivers — enter the Nass River below Gitwinksihlkw. Visual estimates of Chinook salmon in these systems were augmented using fence counts on the Kincolith River in 2001, 2002, 2005, and 2007 to estimate escapements below the fish wheels.

Escapement Goal Basis: There is no PSC-agreed escapement goal for the Nass River aggregate of Chinook salmon, and it is not listed in Annex IV, Chapter 3 as an escapement indicator stock. The Fisheries Operational Guidelines define two goals for managing Chinook salmon fisheries: an operational escapement target of 20,000 fish and a minimum escapement target of 10,000 fish. If escapements are projected to be below 10,000 fish, then no fishing for Nass River Chinook salmon would be recommended. The median estimate of S_{MSY} upstream of Gitwinksihlkw using the habitat model was 16,422 (CV = 23%) Chinook salmon based on a watershed area of 15,244 km^2 (Parken et al. 2006; Figure 2.13). The 2024 escapement estimate for the Nass River was 11,855 fish (Appendix Table B3; Figure 2.13).

Agency Comments: Chinook salmon escapement estimates produced before 1992 have been calibrated to the MR estimates. The Sentinel Stocks Program (SSP) and Northern Endowment Fund have funded projects on the Kwinageese River and Damdochax Creek designed to increase CWT recoveries and improve the escapement estimates for the Nass River aggregate of Chinook salmon.

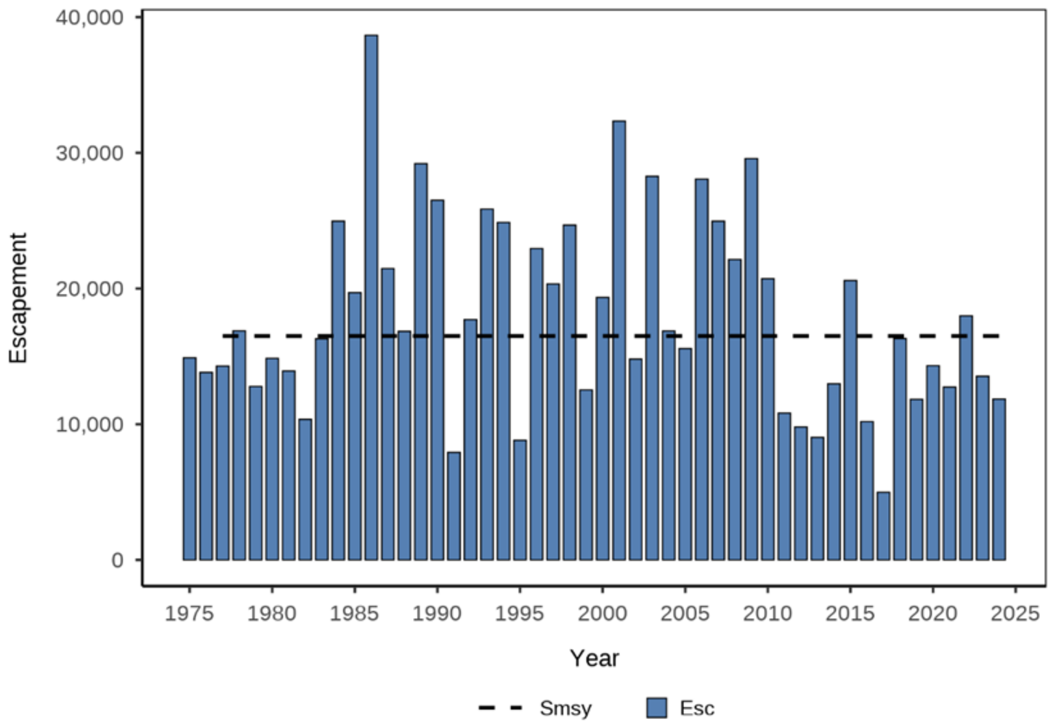


Figure 2.13–Nass River escapements of Chinook salmon, 1977–2024.

Note: Estimates prior to 1992 are based on DFO visual estimates and since 1992 are based on a Nisga'a Fisheries mark-recapture program.

2.3.3.1.2 Skeena River

The Skeena River is the second largest river in British Columbia and drains an area of approximately 54,400 km^2. It supports the second largest aggregate of Chinook salmon stocks in British Columbia and within the drainage, DFO Salmon Escapement Data System includes records of 102 unique Chinook salmon spawning locations across 12 Chinook salmon conservation units (CUs) (Holtby and Ciruna 2007). There are four large lake-stabilized tributaries including the Kitsumkalum, Morice, Babine and Bear rivers, and genetics studies show escapements in these areas typically account for greater than 60% of the total abundance in the Skeena River. The Kitsumkalum River is glacially turbid and visual counts of salmon are not possible. In contrast, the Morice, Bear, Babine, and Kispiox rivers tributaries are relatively clear, especially in late summer when most of the Chinook salmon spawning occurs, allowing for visual counts. Skeena River Chinook salmon are primarily stream-type salmon (97%) and are far north migrating. Most of the Skeena River Chinook salmon populations are summer run, but spring run fish occur in the Cedar and Upper Bulkley rivers. Kitsumkalum River Chinook salmon are renowned for their large body size, resulting from high proportions of ocean-age-4 and ocean-age-5 fish in returns, however recently fewer fish in these age classes have been found (Winther et al. 2021).

Escapement Methodology: Historically most of the escapement estimates were based on visual counts made during helicopter, fixed-wing aircraft and/or from stream walking surveys, but counts also occur at weirs across the Babine, Sustut, Kitwanga, and Bear rivers. The

Kitsumkalum River is the exploitation rate indicator stock for Northern British Columbia, and the spawning population has been estimated using a MR program since 1984. The Skeena River multi-method escapement index was the sum of Chinook salmon enumerated using various methods on these systems but is no longer used.

Chinook salmon runs to the Skeena River are now estimated using the proportion of Kitsumkalum River fish measured from genetic samples collected at the Tyee test fishery and from Kitsumkalum River Chinook salmon escapement estimates from independent MR programs (Figure 2.14, checkered bars). The genetic-based estimates represent an improvement over the historic indices because they include measures of uncertainty. Also, comparisons among years are valid since the method is consistent across the time series, whereas methods used for the historic indices varied through time.
The genetic studies found that the Kitsumkalum River CU contributes, on average, 18% to the Skeena River aggregate. The Morice, Bear, and Babine rivers populations (Large Lake CU) contribute an average of 45%, making this the largest of the twelve CUs in the watershed. The estimated 2024 escapement for the Skeena River aggregate was 29,883 fish using the genetic-based estimate (Appendix Table B3; Figure 2.14).

Escapement Goal Basis: There is no PSC-agreed escapement goal for the Skeena River aggregate of Chinook salmon. The estimate of S_{MSY} for the Kitsumkalum indicator stock is 5,214 based on a robust model approach (POPAN; Winther et al. 2021) and 8,621 Chinook salmon based on stock–recruitment analyses (McNicol 1999; updated in Parken et al. 2006). The Kitsumkalum (KLM) stock is listed as an indicator in Attachment I. Spawning escapement to the Kitsumkalum River was above the robust model S_{MSY} in 2024 (Figure 2.15).

Agency Comments: Terminal fisheries in the Skeena River include commercial gillnet in the terminal exclusion area (River Gap Slough, Area 4; closed since 2017), in-river sport (closed or limited since 2018) and First Nations fisheries. Estimates of in-river sport catch were included in the total terminal run estimates only when data were available from creel surveys. Creel surveys were conducted on the lower Skeena River below Terrace in 2003 and from 2010 to 2017. The in-river sport fishery was closed in 2018, limited in 2019 and 2020, and closed in 2021-2024.

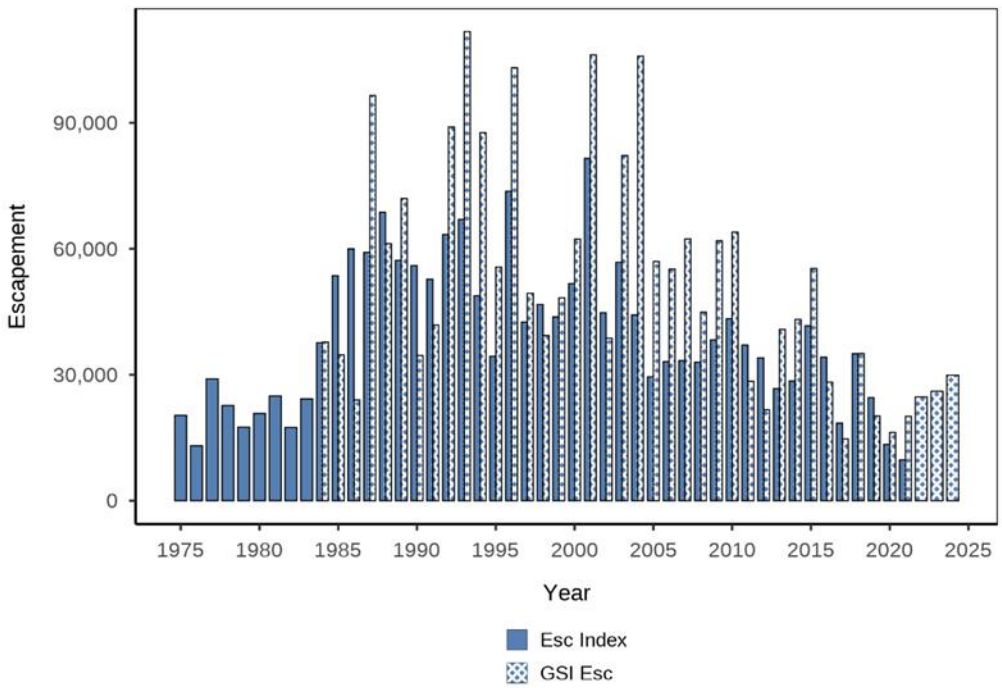


Figure 2.14–Skeena River escapements of Chinook salmon, 1975–2024.

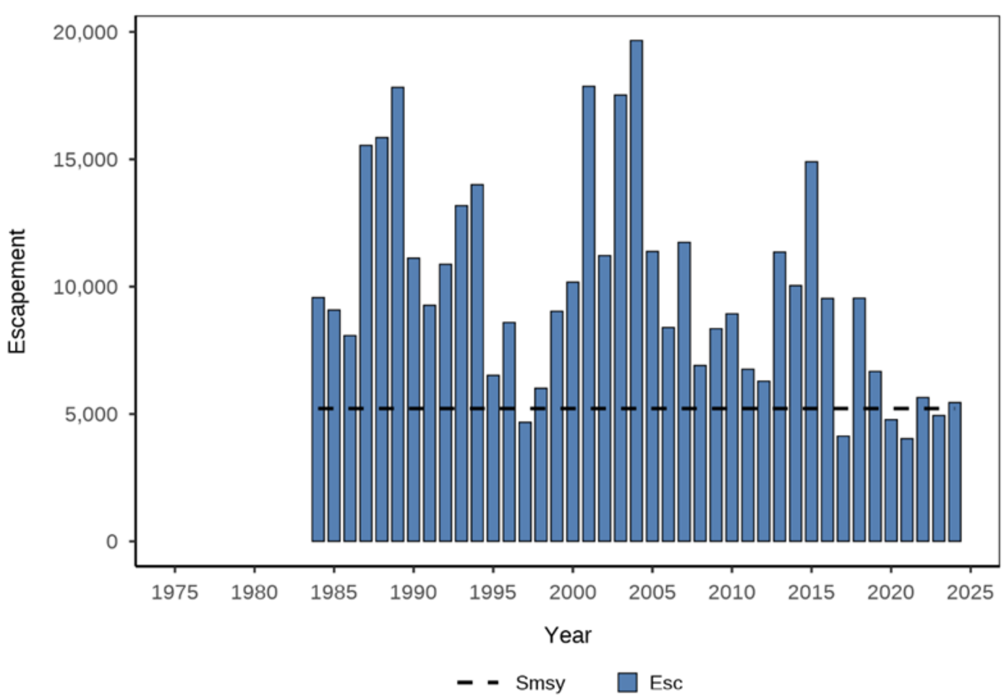


Figure 2.15–Kitsumkalum River escapements of Chinook salmon, 1984–2024.

2.3.3.2 Central British Columbia

2.3.3.2.1 Rivers Inlet

The Rivers Inlet aggregate of Chinook salmon is not listed in Attachment I of Chapter 3 of the PST as an escapement indicator, but is monitored using an index of escapements to the Wannock, Kilbella, and Chuckwalla rivers. The Wannock River drains Owikeno Lake into the head of Rivers Inlet. It is about 6 km long, over 100 m wide, and is glacially turbid. Wannock Chinook salmon are genetically distinct from other Chinook salmon populations from the central coast of British Columbia. This ocean-type stock exhibits fall run timing and is renowned for its large body size, due to historical high proportions of ocean-age-4 and ocean-age-5 fish in the return. The Kilbella and Chuckwalla rivers systems share an estuary on the north shore of Rivers Inlet. These systems are relatively small and generally run clear, but the degree of turbidity fluctuates with seasonal precipitation. The Chinook salmon populations in the Chuckwalla and Kilbella rivers have summer run timing and are stream-type salmon. The largest contributor to the index is the Wannock River, which represents an average of 76% of the production for this index over the past decade, and over 95% since 2010. From 2016 to 2022, environmental conditions and limited resources precluded direct estimates of escapement to the Wannock, Kilbella, and Chuckwalla rivers. Covariation analysis and regressions involving robust escapement estimates for Atnarko Chinook salmon (the Central Coast CWT Indicator stock) were used to infill escapement estimates in the Wannock River from 2016 to 2023, and Chuckwalla and Kilbella rivers from 2018 to 2022 (Appendix Table B3; Figure 2.16). In 2024, favorable environmental conditions and resources allowed visual estimates to be completed for the Chuckwalla and Kilbella rivers. In 2024, the indirect Chinook salmon escapement estimate was 4,422 fish for the Wannock River and the direct estimate was 56 fish for the Chuckwalla and Kilbella rivers.

Escapement Methodology: Chinook salmon escapement estimates for the Wannock River stock are produced from an annual carcass recovery program which was not conducted in 2024. Estimates were derived by expanding the number of carcasses pitched using historical recovery rates. Expansion factors are somewhat subjective and take into consideration water clarity, river height, and recovery effort. Programs to calibrate carcass recoveries with population estimates from MR experiments were conducted from 1991 to 1994 and again in 2000. Results suggest the estimates based on the subjective expansions of carcass recoveries may underestimate the Wannock Chinook salmon population. Inherent biases typical in carcass recovery programs as well as imprecision in the MR estimates led to uncertainty in calibration of the carcass estimates.

Chinook salmon escapements in the Chuckwalla and Kilbella rivers are estimated using Area Under the Curve (AUC) methods applied to visual counts from helicopter surveys. Typically, four flights are made during the spawning period. However, environmental conditions often prevent sufficient robust surveys to generate an AUC.

Escapement Goal Basis: There are no PSC-agreed escapement goals for the Rivers Inlet aggregate of Chinook salmon. Habitat-based estimates of S_{MSY} and other stock–recruitment reference points are available but estimates of total escapement are needed to apply them.

Habitat-based escapement goals may overestimate S_{MSY} for the Wannock River stock because the river has a relatively small amount of available spawning area (Parken et al. 2006).

Agency Comments: Hatchery enhancement programs occur on the Wannock, Kilbella, and Chuckwalla rivers but the contribution to the total population is unknown.

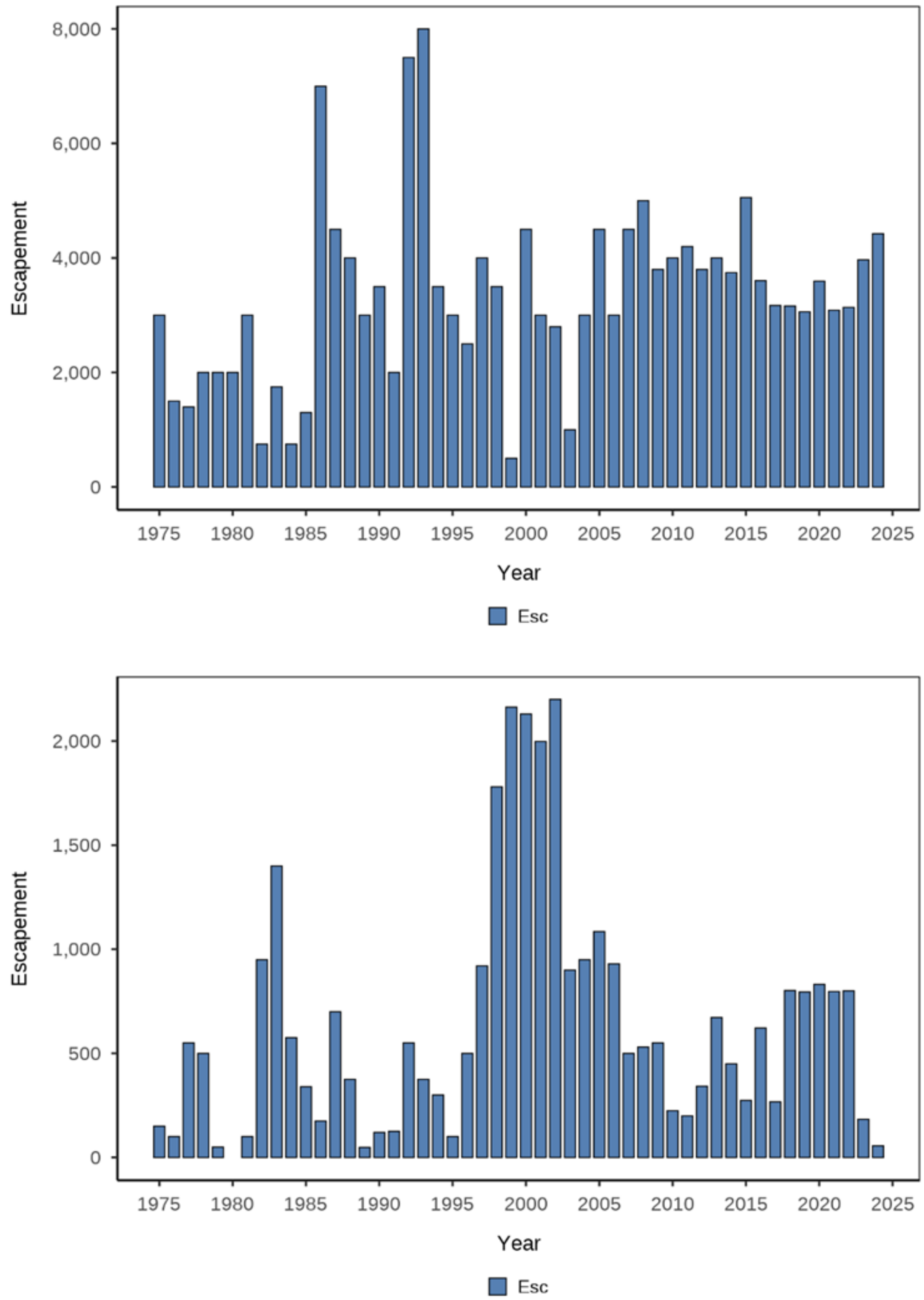


Figure 2.16– Rivers Inlet escapement index of Chinook salmon, 1975–2024, including Wannock River (upper graph) and Kilbella and Chuckwalla rivers (lower graph).

2.3.3.2.2 Atnarko River

The Atnarko River feeds the Bella Coola River on the Central Coast of British Columbia. Chinook salmon spawning in this river are predominantly ocean-type but stream-type Chinook are also observed. This constitutes the largest complex of Chinook salmon in Central British Columbia. Hatchery releases of Atnarko Chinook salmon have averaged around 2 million smolts annually with recent CWT releases averaging 400,000 fish. Atnarko CWT recoveries occur in both U.S. and Canadian AABM fisheries as well as coastal British Columbia ISBM fisheries.

Following the 2009 PST Agreement, the CWT Improvement Program highlighted the lack of a Chinook salmon indicator in the Central British Columbia region. To convert the existing Atnarko River Chinook salmon assessment program into an exploitation rate indicator, a series of objectives were identified including the release of an additional 250,000 CWTs, sampling of the terminal commercial, sport, and First Nations fisheries, and reintroduction of an MR program to improve escapement estimates (Vélez -Espino et al. 2011). Implementation of these changes began in 2009 (Vélez -Espino et al. 2010) and subsequent MR programs have yielded escapement estimates with corresponding CVs of 15% or lower for all years (Vélez -Espino et al. 2014; Fisheries and Oceans Canada unpublished data). The estimated total escapement in the Atnarko River in 2024 was 15,187(CV = 0.09) naturally spawning adults, including 10,479 natural-origin spawners (Appendix Table B3; Figure 2.17). The wild escapement for 2024 was above the agency escapement goal of 5,009 fish.

Escapement Methodology: Three methods have been used since 1990 to generate independent estimates of Chinook salmon escapement in the Atnarko River. These methods are based on (1) CPUE during broodstock collection, (2) carcass counts during dead pitching, and (3) the number of spawners observed during drift boat surveys. The simplicity and low cost of these three methods has allowed the continuous monitoring of Atnarko River escapement, and the average of these three population estimates (3MA method) has been used as escapement estimates in years without MR studies. A serious flood event in the fall of 2010 impacted the Atnarko River by altering flow dynamics and creating a sequence of obstructive log jams. As a result, the use of rafts to obtain drift counts was no longer feasible moving forward. Robust maximum likelihood estimates within a model selection framework have been developed for escapement of total and wild Atnarko Chinook salmon, based on MR data for years 2001 to 2003 and 2009 to 2024. Escapement estimates for years without MR studies were calibrated using Generalized Linear Models based on these high-quality MR escapement estimates, and data routinely collected for the 3MA method (Vélez-Espino et al. 2014). The estimation model used for time series calibration also serves as a tool to generate reliable escapement estimates based on broodstock CPUE and carcass counts. The calibrated escapement estimates have yielded escapement estimates with corresponding CVs of 15% or lower for all years, except 1995 (17.9%) and 2006 (15.6%; Velez-Espino et al. 2014); average CVs meet bilateral CTC data standards.

Escapement Goal Basis: An agency goal of 5,009 natural-origin adult spawners was developed using a habitat-based approach (Parken et al. 2006; Vélez-Espino et al. 2014). This escapement goal was accepted by the PSC (without review by the CTC) and appears in Attachment I of Chapter 3 of the 2019 PST Agreement.

Agency Comments: The Atnarko River has been developed as an exploitation rate indicator stock (Vélez-Espino et al. 2011) and MR estimates with corresponding CVs of 15% or less have been attained in all years (2001–2003 and 2009–2024), achieving bilateral data standards. The model used for the 1990–2013 time series calibration can also generate reliable escapement estimates based on broodstock CPUE and carcass counts. In future years when MR data are absent, carcass counts used with a calibrated time series of escapement will be used to produce escapement estimates. Future calibrations would be required for years without MR data and will include new data derived from subsequent MR studies. This was not necessary for 2024 because MR studies took place for Atnarko River Chinook salmon.

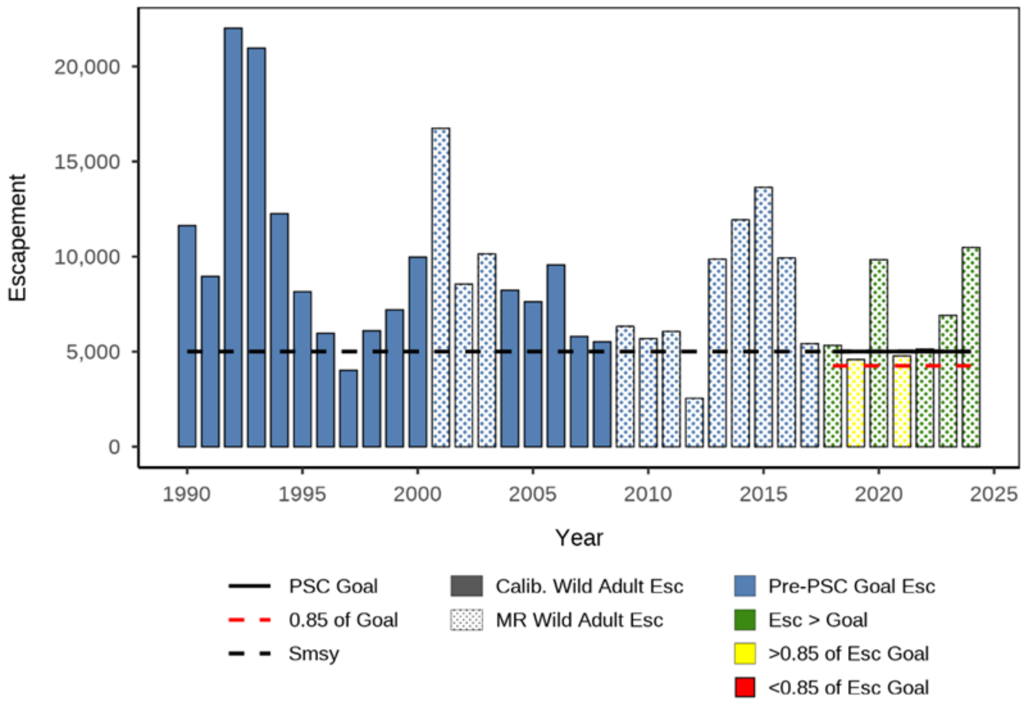


Figure 2.17– Atnarko River escapements of natural-origin adult spawners, 1990–2024.

2.3.3.3 West Coast Vancouver Island and Strait of Georgia

2.3.3.3.1 West Coast Vancouver Island

Under the 2019 PST Agreement, two escapement indices are reported to represent escapement to systems with little or no hatchery influence in Northwest Vancouver Island (NWVI) and Southwest Vancouver Island (SWVI) areas. The NWVI aggregate represents the sum of the total escapements for four rivers (Colonial-Cayeagle, Tashish, Artlish, and Kaouk), and the SWVI aggregate represents the sum of the total escapement for three rivers (Bedwell-Ursus, Megin, and Moyeha). DFO also developed a 14-stream expanded index (Figure 2.18), which includes escapements to the NWVI and SWVI indices plus the following WCVI streams: Marble (Area 27); Leiner, Burman (see below), and Tahsis (Area 25); Sarita, Nahmint (Area 23); and San Juan (Area 20).

The escapement indices in 2024 were 2,471 Chinook salmon for NWVI index, 300 Chinook salmon for the SWVI index and 13,101 for the 14-stream index (Appendix Table B5; Figure 2.18).

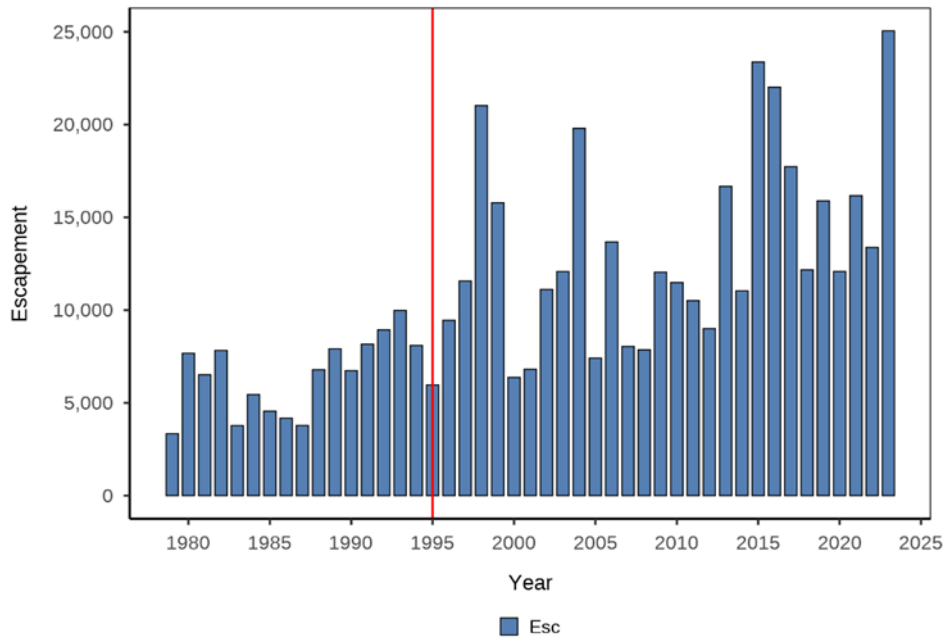
Escapement Methodology: The systems listed above were chosen to provide an index of escapement for naturally-spawning WCVI stocks based on historical consistency of quality data. Escapement data prior to 1995 was not based on standardized, repeatable methods. From 1995 onward, standardized, repeated visual surveys covering the duration of migration and spawning were implemented on all systems as the primary enumeration method.

A MR program in the Burman River, part of the NWVI 14-stream index, was conducted from 2006 to 2018 in addition to the regular AUC method from swim and foot surveys to estimate escapement. Through the Sentinel Stocks Program, the Burman River was selected for development of improved estimates of escapement of age 3 and older Chinook compared to AUC estimates. Robust estimation of escapement using open-population MR models within a model selection framework (Velez-Espino et al. 2016) began in 2009. In 2019 and 2020, a Discounted Survey Life (DSL) index method was used (Dunlop 2019). DSL was calculated by dividing raw AUC fish-days by the MR population size estimates from 2009–2018 to provide an index of spawning area residence time. There is ongoing interest in expanding the DSL method to other systems in WCVI to make current escapement estimates more robust.

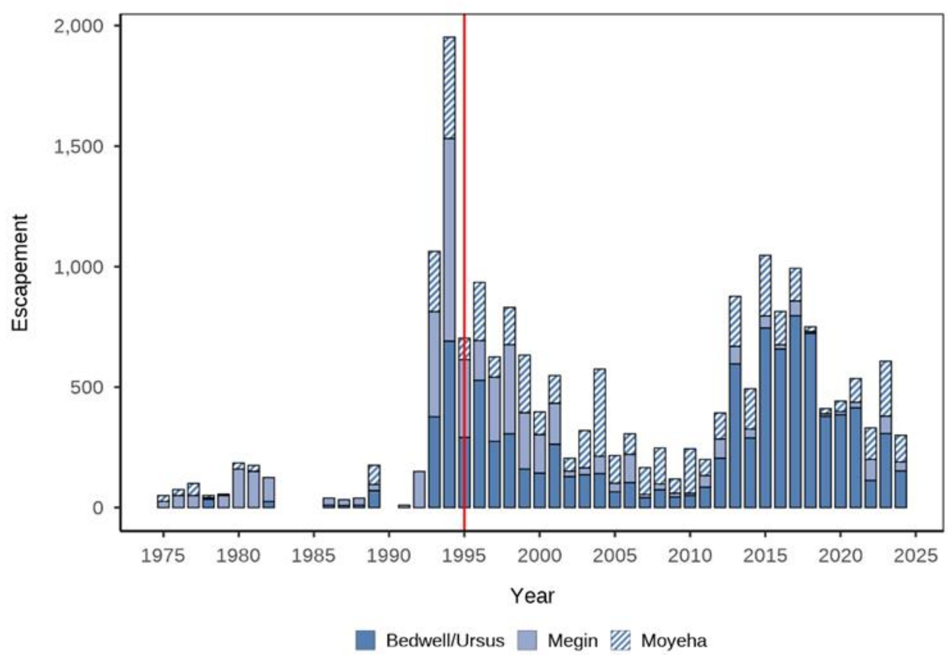
Over the last decade, the PSC Sentinel Stocks Program and Endowment Fund programs funded several studies aimed at producing high quality escapement estimates that are consistent with the CTC data quality standards (CTC 2013). In 2013 and 2014, Canadian Science Advisory Secretariat (CSAS) process workshops were held with the objective of evaluating the escapement estimation methodology used to assess the abundance of WCVI indicator stocks (summarized in DFO 2014). The reviews produced several recommendations for further work and potential improvements. It is anticipated that this work will eventually result in revised escapement data, with improved measures of precision and escapement estimates.

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for this stock group.

Agency Comments: Habitat-based estimates of S_{MSY} and other stock-recruitment reference points are available for these stocks (Parken et al. 2006); however, estimates of total escapement are needed to make them effective. Although recent improvements in escapements began in 2013 in some non-enhanced systems, some systems have not improved or even decreased in productivity (e.g., Megin) despite terminal fishing restrictions in effect in PFMAs 24–26 from July to September each year.



Escapement
25,000
20,000
15,000
10,000
5,000
0
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
Year
Esc



Escapement
2,000
1,500
1,000
500
0
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
Year
Bedwell/Ursus
Megin
Moyeha

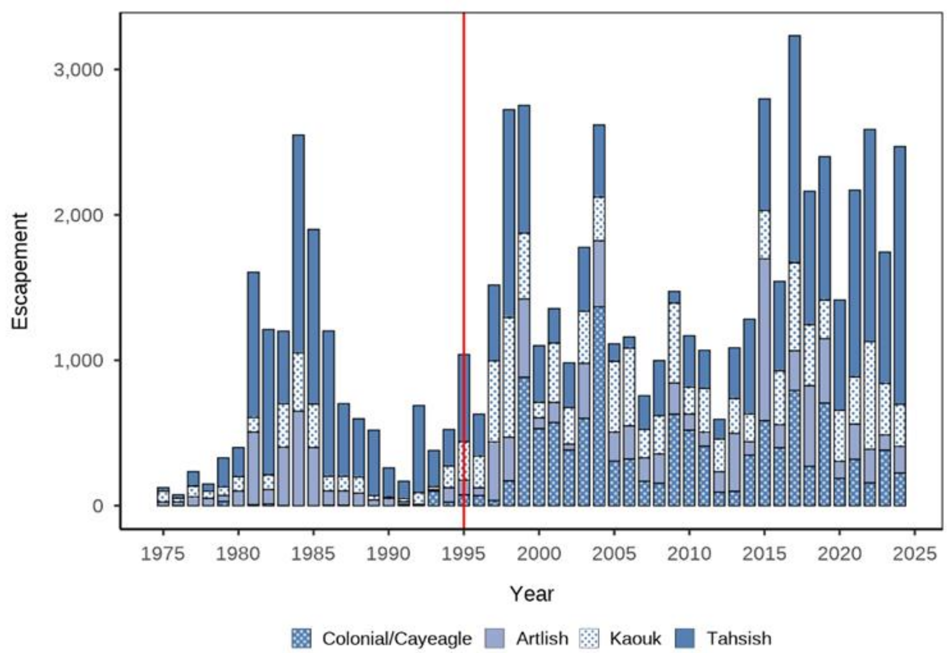


Figure 2.18–West Coast Vancouver Island (WCVI) 14-stream (top), South West Vancouver Island (SWVI) 3-stream (middle) and North West Vancouver Island (NWVI) 4-stream (bottom) indices of escapement of Chinook salmon, 1975–2024.

Note: The escapement methodology changed for all WCVI index streams in 1995 (indicated by the vertical red line) and prior estimates have not been calibrated to the new methodology.

2.3.3.3.2 Upper Strait of Georgia

Under the 2019 PST Agreement, two escapement indicators are identified within the Upper Strait of Georgia, but only one is currently reporting data. Phillips River fall Chinook salmon is an enhanced escapement indicator for the mainland inlets area, and a yet to be determined system will represent the Northeast Vancouver Island (NEVI) area. Work is ongoing to identify the most suitable escapement indicator for the NEVI area, which is not reported this year.

The estimated escapement for Phillips River, representing the mainland inlets portion of the Upper Strait of Georgia stock group was 4,202 in 2024 (CV = 20.3%) (Appendix Table B4; Figure 2.19). The 2024 return year was the last year that marked fish would be returning; future years should be all natural-origin fish.

Escapement Methodology: The accuracy of most escapement estimates for mainland inlet systems is poor due to low visibility in glacial systems, remote access, and timing of surveys. Furthermore, these escapement estimates have been based primarily on aerial counts targeting other salmon species, which may not coincide with the main spawning period for Chinook salmon. Escapement estimates for these systems have been reported since 1975.

Historically, Phillips Chinook salmon escapements were obtained via helicopter, bank walks, and swim surveys. Between 2001–2011, escapement estimates were derived from either AUC or Peak Live + Dead spawner counts. In 2009, an MR program was initiated for the Phillips River, and since 2012, escapement estimates have been based on MR results derived from a modified Petersen estimator (Chapman formula). Work is ongoing to develop a more robust open population model for future years. Over the 2012–2023 period, program precision (i.e., CV) averaged 17.4%, but in more recent years (2015–2024) it has averaged 15.4%. Broodstock and other removals were also included in the total return as Phillips Chinook were enhanced from 1988–2019. Over that time juveniles were coded-wire tagged to varying degrees and multiple release strategies occurred. The 2019 brood was the final enhanced release of Phillips Chinook. MR assessment is planned to continue into future years.

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for this stock group.

Agency Comments: Assessment of stock status is highly uncertain and the escapement time series requires standardization to better represent this stock group in the PSC Chinook Model. Differences in ocean distributions, run timing, and life-history indicate that future assessments should separate the stock group into CUs to better represent differences in population dynamics and both freshwater and smolt survival.

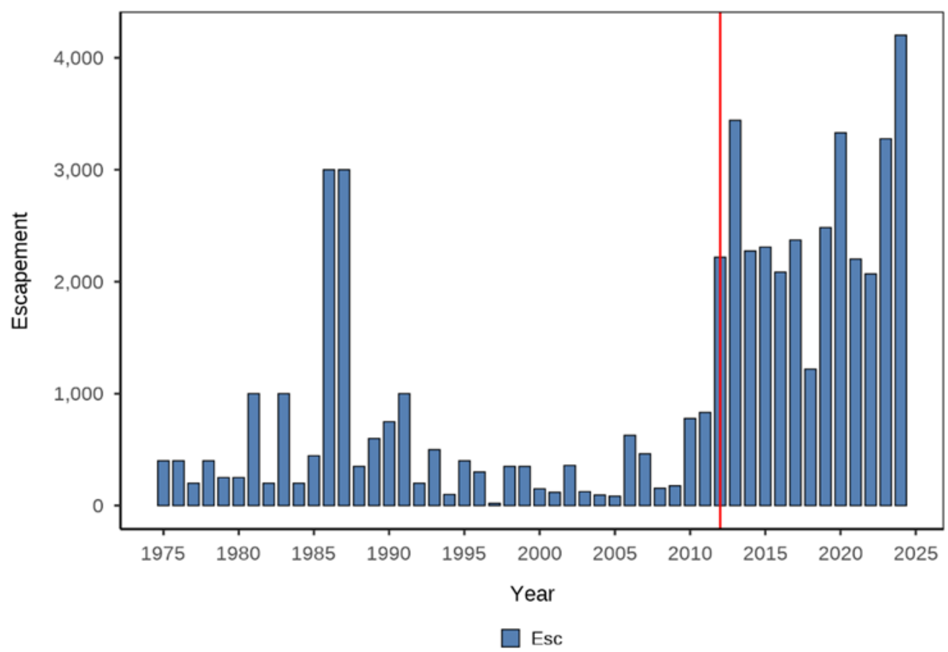


Figure 2.19 – Phillips River escapements of Chinook salmon, 1975–2024.

Note: Since 2012, the escapement estimates have been derived through an intensive mark-recapture program, as indicated by the red vertical line. Prior to that, escapement estimates were based on a variety of visual surveys. No calibration between the pre- and post-2012 methods have been made.

2.3.3.3.3 Lower Strait of Georgia

The Lower Strait of Georgia region is represented by naturally-spawning fall Chinook salmon in the Cowichan and Nanaimo rivers (Figure 2.20 and Figure 2.21). In 2024, the estimated total return (including escapement, broodstock, and terminal First Nation fishery removals) was 25,914 adult Chinook salmon (22,938 natural spawner escapement) in the Cowichan River and 5,065 (4,430 natural spawner escapement) in the Nanaimo River (Appendix Table B4).

Escapement Methodology: Total Chinook salmon returns have been estimated since 1975. Prior to 1988, escapement estimates from the Cowichan River were derived from swim and aerial surveys. This approach was also used for the Nanaimo River prior to 1995. Since 1988, a counting fence has been operated on the lower Cowichan River. Between 1995 and 2003, a counting fence and adult carcass mark-recovery (CMR) surveys were used in the Nanaimo River, and since 2004, AUC snorkel survey methods have been used. Survey life used in the AUC estimate is based on a tagging study completed in 2006.

Cowichan River fence operations rarely span the entirety of the fall Chinook migration due to rainfall driven flow increases exceeding operational limits, particularly in recent years. As a result, the proportion of the natural spawning population enumerated at the fence varies between years. Expansion methods to achieve a population estimate have included snorkel surveys, CMR and generalized run timing curves. A PIT tag-based method has been used since 2017 to produce a MR Petersen estimate (Tompkins et al. 2005). This began as a five-year project funded by the PSC Southern Endowment Fund to investigate alternative escapement methods for Cowichan River Chinook salmon and is now a continuing operational program.

Escapement Goal Basis: An escapement goal of 6,500 (CV = 33%) for the Cowichan River was accepted by the CTC in 2005 (Tompkins et al. 2005). There is currently no PSC-agreed escapement goal for the Nanaimo River; however, there is a habitat-based estimate for S_{MSY} of 3,000 spawners (median; CV = 14%; Parken et al. 2006).

Agency Comments: The Cowichan River stock showed considerable increase in escapement in 1995 and 1996, followed by a rapid decline to conservation concern levels, particularly for 20052009, of over 15% below the escapement goal. Significant Canadian fishery management actions were used to reduce exploitation levels on the Lower Strait of Georgia natural stock group. Following a low point in 2009, the population has shown a strong rebuilding trend driven mainly by natural-origin Chinook, prompting relaxation of several area-specific marine fishery closures. Hatchery production has been reduced from a peak of 3M to 650K smolts, and hatchery-origin fish currently contribute approximately 10% of the natural spawning population. A large-scale habitat restoration project conducted in 2006 at Stoltz Bluff significantly reduced fine sediment inputs to the lower 25 km. Considerable focus has also been put on water management in recent years.

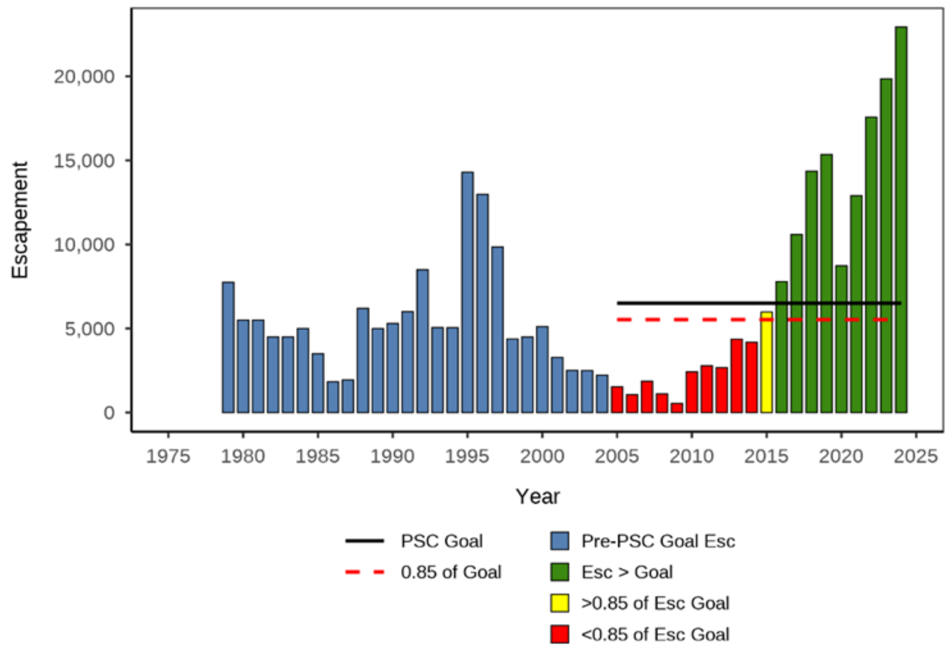


Figure 2.20–Cowichan River escapements of Chinook salmon, 1979–2024.

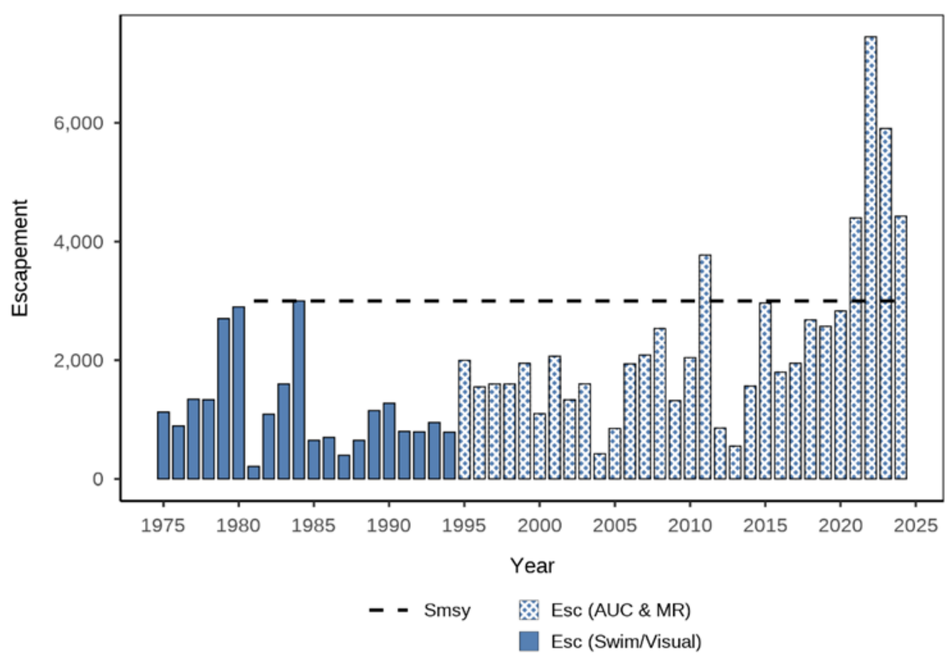


Figure 2.21—Nanaimo River escapements of Chinook salmon, 1975–2024.

2.3.3.4 Fraser River Stocks

Fraser River Chinook are assessed as five naturally spawning stock groups for PSC management: Fraser spring-Run 1.2, Fraser spring-Run 1.3, Fraser summer-Run 1.3, Fraser summer-Run 0.3, and the Harrison River (fall-run 0.3; Appendix Table B6). Historically, they were only represented by two stocks in the CTC Model (Fraser Early and Fraser Late). As part of the CTC Model Improvements program and the 2019 Agreement, the Fraser Early model stock has been separated into four model stocks to better represent population dynamics, ocean fishery distribution and maturation patterns, and the Fraser Late (Fraser fall 0.3) model stock has been separated into two stocks, Harrison (natural) and Chilliwack (hatchery), to represent differences in production dynamics and maturation.

Much of the knowledge about the status of Fraser Chinook salmon is based on spawner-escapement data. Most of these data are from visual surveys, which are generally biased low, although many estimates are considered precise (Parken et al. 2003). Escapement estimates determined from visual survey data are usually obtained by dividing the peak count of spawners, holders, and carcasses by an expansion factor of 0.65 (Farwell et al. 1999; Bailey et al. 2000). DFO continues to evaluate the accuracy and regularly updates estimates based on the peak count method through calibration studies on Middle Shuswap, Lower Chilcotin, Chilko, and periodically, Lower Shuswap. Escapement has also been estimated at several locations using MR methods, and direct counts at fences or from electronic data collected using sonar and resistivity counter technology. Occasionally, escapement estimates could not be determined for reasons including forest fires and extreme weather events that cause power outages at electronic counters, or cancellation of visual surveys. When this occurs, missing estimates are infilled using the English method (English et al. 2007).

The terminal run estimates in Appendix Table B6 include catch estimates derived from the Fraser run reconstruction model for CTC stocks only (English et al. 2007).

Within the Fraser River basin, prior to the 2019 Agreement, there were five CWT-indicator stocks; Nicola River (Fraser spring-Run 1.2), Lower Shuswap (Fraser summer-Run 0.3), Harrison River and Chilliwack River (Fraser fall 0.3), and Dome Creek (Fraser spring-Run 1.3), which was discontinued in 2005. In the 2019 Agreement, two new CWT-indicator stocks were added as under development: Lower Chilcotin (Fraser spring 1.3) to replace Dome Creek, and Chilko River (Fraser summer 1.3). Additionally, CWTs are applied and recovered at Middle Shuswap to increase recoveries in the Fraser summer-Run 0.3 stock group and analyzed as part of the CTC Exploitation Rate Analysis (ERA). Middle Shuswap contributes to the escapement estimation for all Fraser summer-Run 0.3 Chinook spawning in the Thompson River, with most in the South Thompson tributary (PSC SSC 2018).

Lower Shuswap and Harrison rivers have PSC-agreed management goals identified in the 2019 PST Agreement. For the spring and summer stock groups, habitat-based models have been developed to estimate spawning capacity and the spawner abundance required to produce maximum sustainable yield, S_{MSY} (Parken et al. 2006). In 2014 during a CSAP meeting, status and benchmarks for Southern BC Chinook CUs where examined which included Fraser stocks. Benchmarks and status were accepted for non-enhanced CUs, but further work on enhanced CUs is required to evaluate status.

In 2019, the Big Bar Landslide on the Fraser River mainstem restricted migration of some populations in the Fraser spring-Run 1.3 and Fraser summer-Run 1.3 stock groups, including both the developing indicator stocks in Lower Chilcotin River and Chilko River, causing significant on-route loss. The slide impacted spring 1.3 migration in 2020, but zero mortality or delay was observed for the summer 1.3s. The 2021 and 2022 monitoring results indicate there was no mortality or delay in migration due to the Big Bar landslide for any of the spring 1.3 and summer 1.3 stocks. On July 31st, 2024, a landslide occurred on the Chilcotin River and completely blocked fish passage for multiple weeks during the migration of the Chilko and Lower Chilcotin Chinook populations. A portion of those populations were already on the spawning grounds when the slide occurred, and SONAR data showed that migration past the slide area resumed in early September. On-route mortality caused by the initial blockage and subsequent debris load flushed downstream has not been quantified, and impacts on productivity will not be evident until the return years.

Escapements for the Fraser fall ocean-type stock group were improved in 2022, 2023, and 2024 compared to the recent (2016–2021) below average escapements. This is particularly evident for the Harrison River (fall 0.3) escapement meeting the PSC-agreed goal for the third year in a row, which prior to 2022 had only been met one other time in the past 11 years (Figure 2.30). 2024 escapements remained below average for the spring and summer 1.3s and decreased compared to 2023. Low escapements were expected in 2024 for these stock groups due to the returning 5-year-olds coming off the extremely low escapements in 2019 due to Big Bar. The spring 1.2s stayed below the long-term average with their lowest escapement since 2018, and the Nicola River failed to meet its escapement goal for the second consecutive year. Overall, the stream-type stock groups (spring 1.2, spring 1.3, summer 1.3) had low escapements below their respective long-term averages, while the ocean-type fall stock group (fall 0.3) had improved above-average escapements and met its escapement goal.

After a record-breaking escapement year in 2023, the Fraser summer-Run 0.3 2024 escapement remained above the long-term average, but closer to the 2019-2022 average. Maria Slough in the Lower Fraser had its highest escapement since 2015. The 2024 Lower Shuswap escapement was the lowest since 2017, but still met the PSC-agreed escapement goal.

2.3.3.4.1 Fraser River Spring Run: Age 1.3

The Fraser River spring-Run age 1.3 stock group includes spring-run populations of the Lower, Middle, and Upper Fraser, as well as the North and South Thompson tributaries, but excludes the Lower Thompson tributaries (CTC 2002). The 2024 Fraser spring 1.3 escapement estimate (13,946) is 57% of the 1975–2024 average escapement (24,298) but is above the 2019 brood year record low escapement from the Big Bar slide (Figure 2.22).

Escapement Methodology: Escapements for systems in this aggregate are typically estimated by expanded peak counts of spawners, holders, and carcasses, surveyed from helicopters or on foot. The Lower Chilcotin River is a new escapement indicator and is being developed as a CWT exploitation rate indicator stock, with escapement for this system estimated by conducting electronic counts and recovering carcasses for sex and age composition (Figure 2.23). The Lower Chilcotin River estimated escapement of 1,577 in 2024 was 52% of the time series average (3,060; Figure 2.23).

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for this stock group. Habitat-based estimates of S_{MSY} and other stock-recruitment reference points are available, but estimates of total escapement are needed to make them effective. Work is currently underway to estimate total escapements by developing factors that calibrate the visual peak count estimates to total escapements estimated by electronic counter methods. The Lower Chilcotin is the indicator for the spring-Run 1.3 stock group identified in Attachment I of the 2019 Agreement. Since 2015, the Lower Chilcotin River escapements have been less than the median habitat-based estimate of S_{MSY} (4,400).

Agency Comments: The Fraser spring 1.3 stock group is of high conservation concern as escapement estimates have declined substantially over the last decade. There have been four recent years of very low returns and 2019 had the lowest escapement estimate in 44 years, largely due to the substantial mortality from the Big Bar Landslide obstruction. The escapement in 2024 still represents an increase over the 2016–2019 period and is above the 5-year-old brood year escapement. In this stock group there are six CUs, used for the DFO Wild Salmon Policy, and six Designatable Units (DUs), assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as part of Canada's Species at Risk Act (SARA). Four of the DUs were identified as Endangered, one as Threatened, and one as Special Concern.

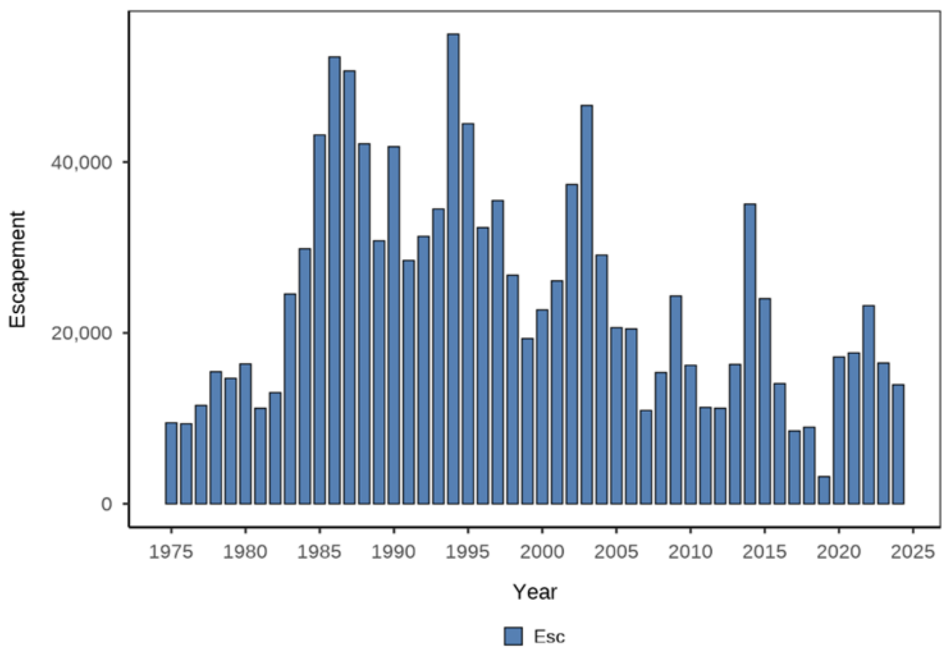


Figure 2.22–Fraser River spring run age-1.3 stock group escapements of Chinook salmon, 1975–2024.

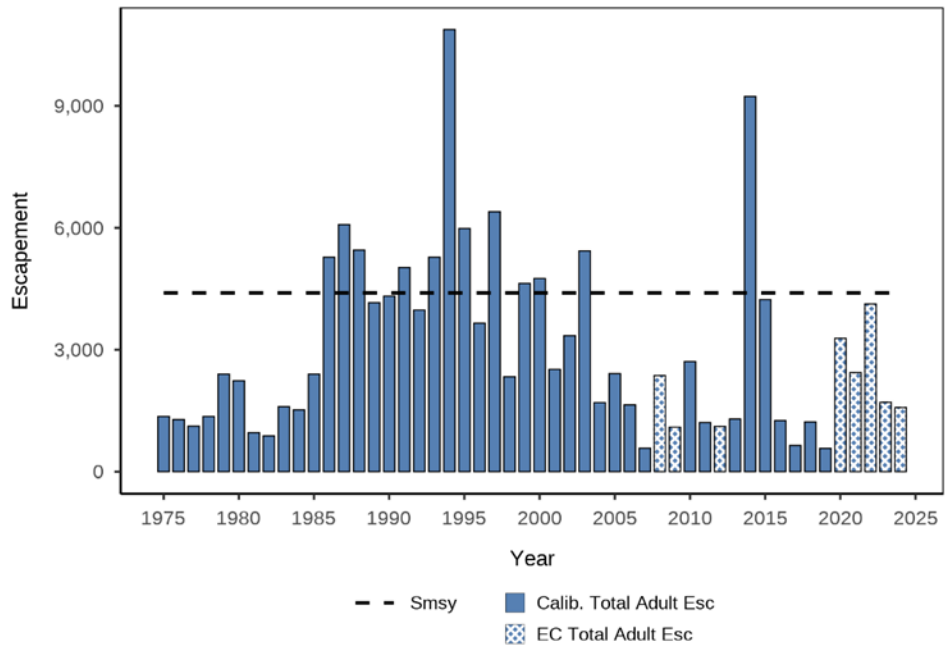


Figure 2.23–Lower Chilcotin River escapements of Chinook salmon, 1975–2024.

2.3.3.4.2 Fraser River Spring Run: Age 1.2

The Fraser spring run age-1.2 stock group includes six populations of smaller body size that spawn in the Lower Thompson River tributaries, Louis Creek of the North Thompson and the spring-run fish of Bessette Creek in the South Thompson (CTC 2002). This stock group has an early maturation schedule for a stream-type life history, with an average generation time of 4.1 years (brood years 1985–1986), which results in smaller body size and lower fecundity compared to other stock groups. The 2024 Fraser 1.2 stock group escapement estimate was 5,984, which is 57% of the 1975–2024 average escapement (10,550; Figure 2.24).

Escapement Methodology: For the CTC time series, escapements are estimated using expanded visual peak counts of spawners, holders, and carcasses in Spius Creek, Coldwater River, and Louis Creek. Escapements to the Deadman and Bonaparte rivers are estimated by resistivity counter. MR and calibrated visual surveys are used to estimate escapement to the Nicola River.

The Nicola River is the indicator for the Fraser spring 1.2 stock group in Attachment I of the 2019 Agreement, and it is also the exploitation rate indicator stock. Since 1995, high precision escapement estimates (by age and sex) have been generated using an MR program where Petersen disk tags are applied to fish captured by angling and post-spawned carcasses are examined for the presence of marks. Estimates of escapement have been generated using pooled Petersen and stratified Darroch methods (Plante et al 1998). The expanded peak count time series for the Nicola River is generally less than the MR estimates (Parken et al. 2003); therefore, the Nicola peak count series has been calibrated to the MR data and is used prior to 1995 in the Fraser spring-run Age 1.2 aggregate time series (Figure 2.24 and Figure 2.25).

The Nicola River MR estimated escapement of 2,056 in 2024 was 38% of the time series average (5,437). Since 1995, hatchery origin fish have averaged 34% of Nicola spawning escapement (range: 4%–78%); and comprised 70% of the spawning escapement in 2024.

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for this aggregate. Habitat-based estimates of S_{MSY} and other stock-recruitment reference points are available for this stock group (Parken et al. 2006), but estimates of total escapement are needed to make them effective. Work is currently underway to estimate total escapements by developing factors that calibrate the visual peak count estimates to total escapements estimated by MR and electronic resistivity counter methods. In 2019, the habitat-based S_{MSY} for the Nicola was updated to 6,600 by removing unsuitable habitat upstream of Nicola Lake and adjusting for the lower-than-average fecundity, to account for the females having a small body size as the majority mature at age 1.2.

Agency Comments: The stock group has declined substantially over the last decade and is a stock of conservation concern. In this stock group there are two CUs, used for the DFO Wild Salmon Policy, and two DUs assessed by COSEWIC as part of SARA. Both of the DUs have been assessed by COSEWIC as Endangered.

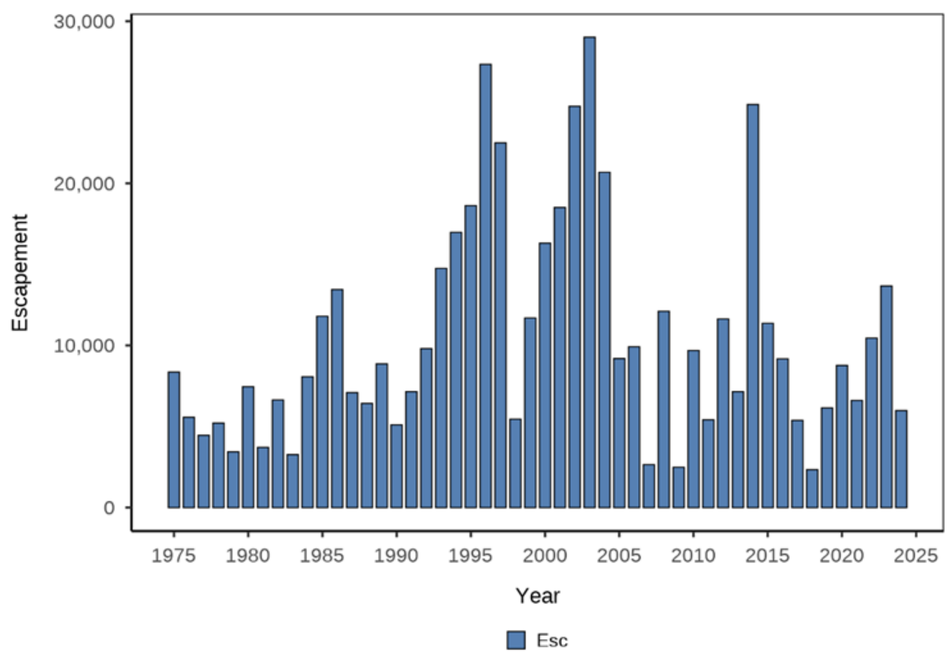


Figure 2.24–Fraser River spring run age-1.2 stock group escapements of Chinook salmon, 1975–2024.

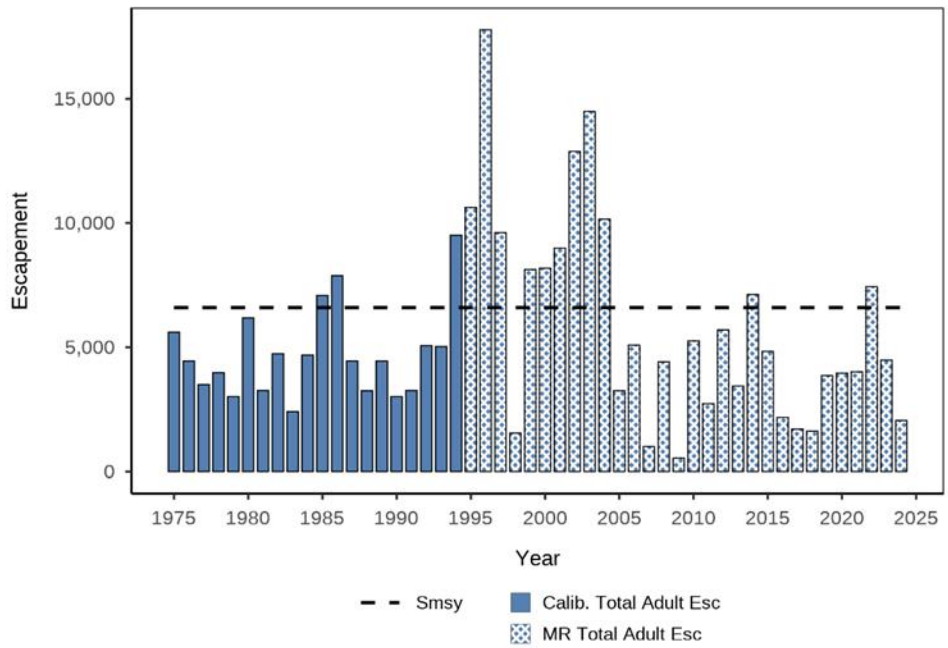


Figure 2.25–Nicola River escapements of Chinook salmon, 1975–2024.

2.3.3.4.3 Fraser River Summer Run: Age 1.3

The Fraser River summer run age-1.3 aggregate includes ten populations spawning in large rivers, mostly below the outlets of large lakes. These include the Chilko, Nechako, and Quesnel rivers in the Mid-Fraser and the Clearwater River in the North Thompson watershed (CTC 2002). The 2024 Fraser summer 1.3 escapement estimate (11,894) was 60% of the 1975–2024 average escapement of 19,754 (Figure 2.26).

Escapement Methodology: Escapements are estimated by expanded peak counts of spawners, holders, and carcasses surveyed from helicopters. Surveys of the Stuart River and North Thompson River were discontinued in 2004 due to unreliable counting conditions and removed from the data series. MR and calibrated visual surveys are used to estimate escapement to the Chilko River. From 2010–2018 and 2020 –2023 MR methods were used at Chilko River with tags being applied to live fish captured by angling and seining, and salmon carcasses being examined later for the presence of marks. Estimates of escapement have been generated using pooled Petersen and stratified Darroch methods. The Chilko River estimated escapement of 4,666 in 2024 was 55% of the time series average (8,521; Figure 2.27).

Escapement Goal Basis: There is currently no CTC–accepted escapement goal for the aggregate. Habitat-based estimates of S_{MSY} and other stock–recruitment reference points are available for this stock group but estimates of total escapement are needed to make them effective. Work is currently underway to estimate total escapements by developing factors that calibrate the visual peak count estimates to total escapements estimated by MR and AUC methods. The Chilko River is the indicator stock for the summer-run 1.3 stock group and for the fifth consecutive year the escapement estimate was higher than the median habitat-based estimate of S_{MSY} (4,500).

Agency Comments: The Fraser summer 1.3 stock group is of high conservation concern as escapement estimates have declined substantially over the last decade. Recently there were four consecutive years of very low returns including 2018 and 2019, which are the two lowest escapement estimates in 44 years. The 2024 escapement is an improvement over 2018 and 2019, but still below both the long-term average and escapement goal. In this stock group there are five CUs, used for the DFO Wild Salmon Policy, and five DUs, assessed by COSEWIC as part of SARA. Three of the DUs were identified as Endangered, and two as Threatened.

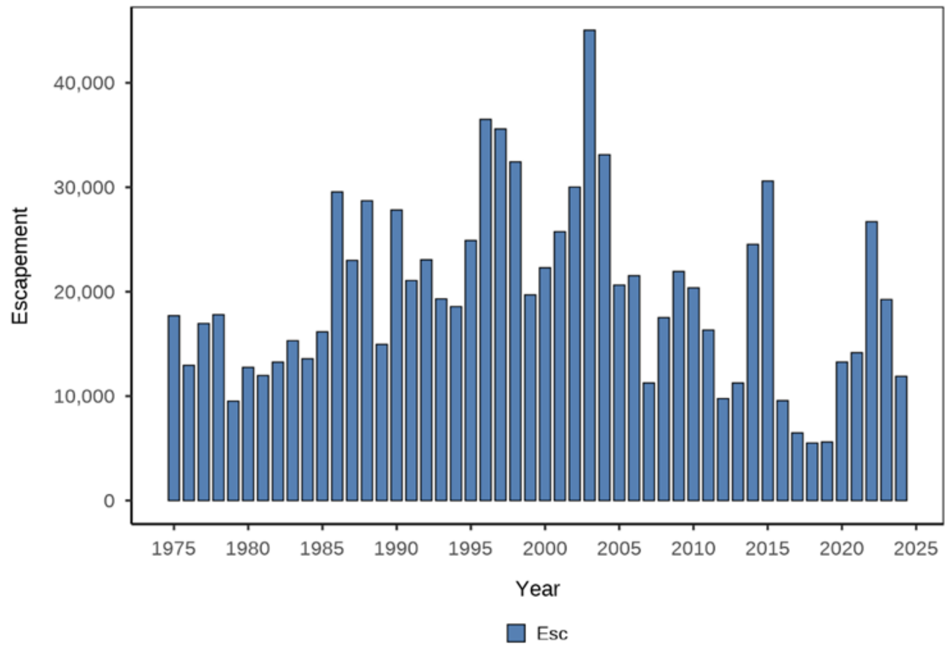


Figure 2.26–Fraser River summer run age-1.3 stock group escapements of Chinook salmon, 1975–2024.

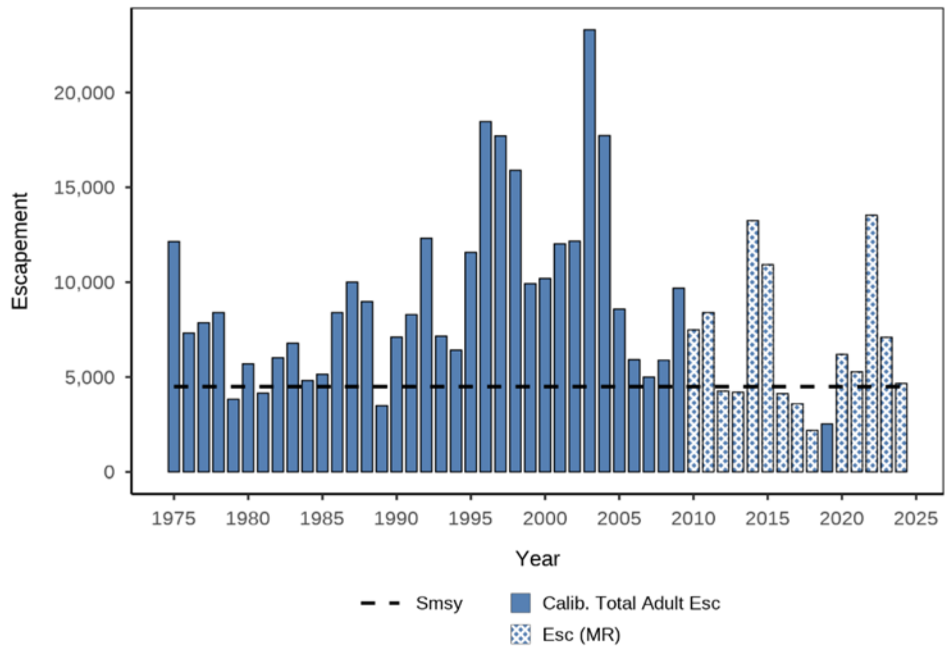


Figure 2.27–Chilko River escapements of Chinook salmon, 1975–2024.

2.3.3.4.4 Fraser River Summer Run: Age 0.3

The Fraser summer run age-0.3 aggregate includes five populations spawning in the South Thompson watershed and one in the lower Fraser. These include the Middle Shuswap, Lower Shuswap, Lower Adams, Little River, and the South Thompson River mainstem in the BC interior, and Maria Slough in the lower Fraser (CTC 2002). The 2024 escapement estimate of 167,751 is 205% of the 1975–2024 average for this stock group (81,670; Figure 2.28).

Escapement Methodology: Escapements are estimated using peak count visual survey and MR methods. A pilot MR was initiated on Little River in 2023 to evaluate the feasibility of the survey methodology to improve the accuracy of the escapement estimate. The Lower Shuswap River is the escapement indicator stock identified in Attachment I of the 2019 Agreement and is also the exploitation rate indicator stock. Since 2000 (with the exception of 2003), a MR program has provided high precision estimates of escapement by age and sex at the Lower Shuswap River. Tags have been applied to live fish by seining and salmon carcasses are later examined for the presence of marks. Estimates of escapement are generated using pooled Petersen and stratified Darroch methods. In addition, there are multiple years of MR and CWT data for the Middle Shuswap River.

The Lower Shuswap escapement in 2024 was 16,445, which is only 67% of the time series average and the lowest escapement since 2017. Since 2000, hatchery-origin fish averaged 11% of the Lower Shuswap escapement (range: 3%–23%); and comprised 7% of the escapement in 2024, however this number would not represent the full number of hatchery returns, as many of the hatchery fish from the 2019 brood year (5 year-old return) were released unmarked due to COVID-19.

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for the Fraser summer run age-0.3 aggregate. However, the Lower Shuswap indicator has a PSC-agreed escapement goal of 12,300. Habitat-based estimates of S_{MSY} and other stock-recruitment reference points are available for this stock group (Parken et al. 2006), but estimates of total escapement are needed to make them effective. Work is currently underway to estimate total escapements by developing factors that calibrate the visual survey indices to total escapements estimated by MR methods and novel methods developed during the Sentinel Stocks Program. Visual peak count estimates for the Lower Shuswap River from 1975 to 1999 and 2003 have been calibrated to MR equivalents. In the past two decades, with the exception of 2012 and 2016, Lower Shuswap River escapement estimates have exceeded the PSC-agreed management objective of 12,300, which is the median habitat-based estimate of S_{MSY} (Figure 2.29).

Agency Comments: Escapements had been increasing for this stock group over the last decade, and the stock group has been healthy and abundant, with the exception of return years 2012 and 2018. The 2023 return was an unprecedented escapement. In this stock group there are three CUs used for the DFO Wild Salmon Policy, and two DUs assessed by COSEWIC as part of Canada's SARA. One DU was identified as Endangered by COSEWIC and the other as not being at risk of extinction.

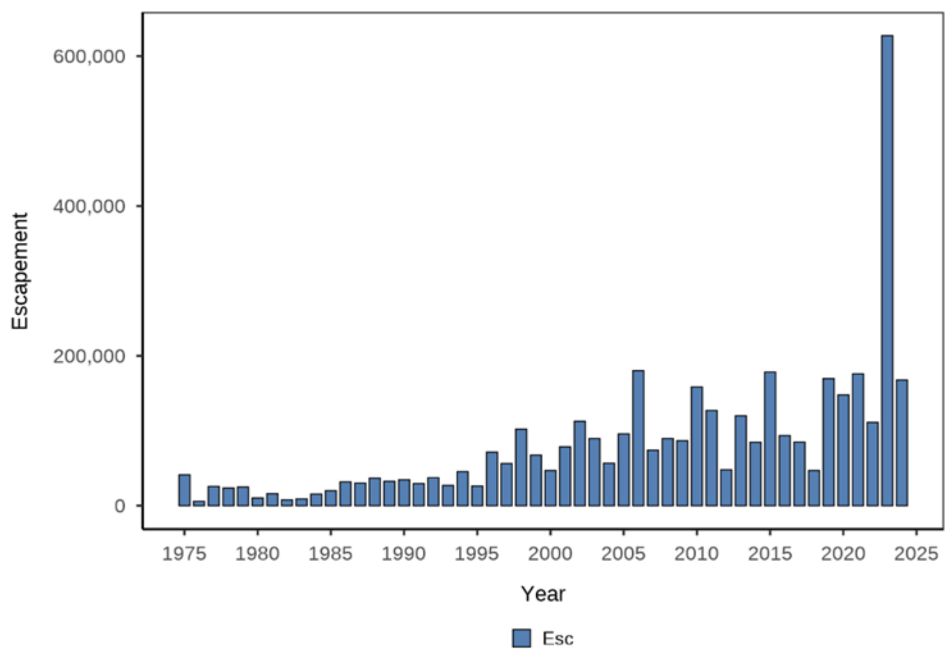


Figure 2.28–Fraser River summer run age-0.3 stock group escapements of Chinook salmon, 1975–2024.

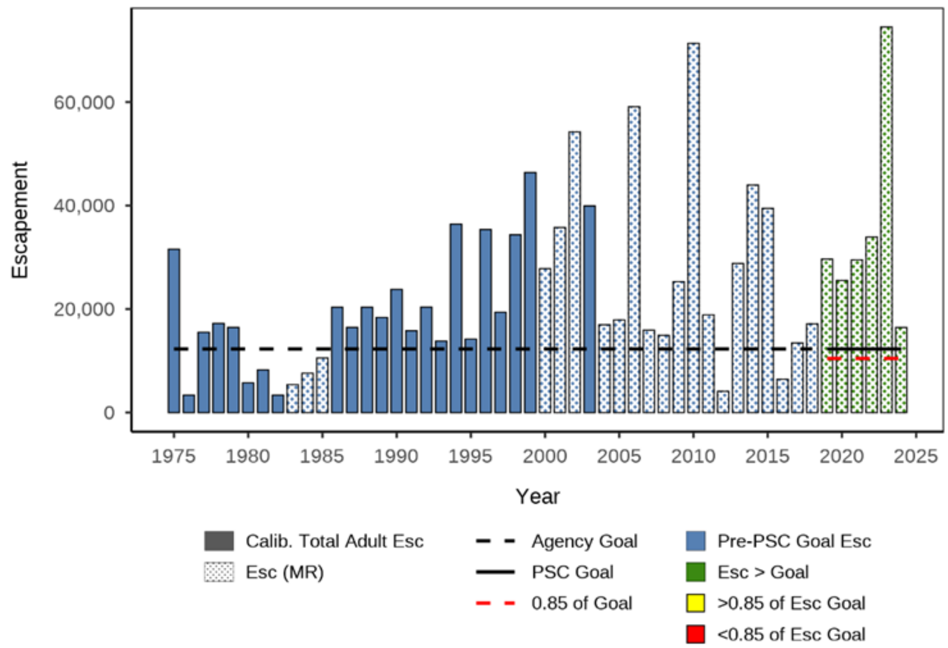


Figure 2.29–Lower Shuswap River escapements of Chinook salmon, 1975–2024.

2.3.3.4.5 Fraser River Late Run (Harrison River)

The Fraser River fall run age-0.3 stock group only includes the Harrison River; a population of white-fleshed fish that return to spawn during the fall. These Chinook salmon are unusual in that the fry migrate into the lower Fraser River and estuary shortly after emergence. This stock spends 2–4 years in the coastal marine environment before returning to spawn. When healthy, the Harrison River stock is one of the largest naturally spawning Chinook salmon populations in the world and makes important contributions to fisheries in southern BC, and Washington state. Spawning escapements to the Harrison River have varied widely from a low of 28,616 adults in 1995 to a high of 246,986 adults in 2003 (Figure 2.30). Escapements have been below 85% of the lower bound of the escapement goal since 2012, with the exception of 2015 and recently 2022, 2023 and 2024; the estimated escapement in 2024 was 131,544 adult Chinook salmon.

Escapement Methodology: Since 1984, MR studies have been conducted annually on the Harrison River to obtain reliable estimates of spawning escapements by age and sex. Tags have been applied to live fish by seining and salmon carcasses are examined later for the presence of marks. Since 1984, hatchery-origin fish averaged 2% of the escapement (range: 0%–6%) and were estimated to be 5% of the escapement in 2024. The estimated number of hatchery origin fish in 2024 would not represent the full number of hatchery returns, as all the releases from the 2019 brood year (5 year-old return) were unmarked due to COVID-19.

Escapement Goal Basis: Due to their natural abundance and importance in numerous BC and Washington state fisheries, Harrison River Chinook salmon were designated as an escapement indicator stock (i.e., 'key stream' indicator) to aid in fulfilling commitments under the 1985 PST. In 1986, an interim escapement goal for Harrison River Chinook salmon was established at 241,700 fish, based on doubling of the escapement estimate obtained from a MR program in

1984. In 2001, an escapement goal range was developed for Harrison Chinook salmon using a Ricker stock-recruit approach (CTC 2002). The proposed escapement goal range was 75,100–98,500 (CV = 15%) with the upper bound equal to the upper 75% confidence limit derived from a bootstrap procedure. This range was reviewed and accepted by the CTC. Attachment I of the 2019 Agreement identifies a management objective of 75,100 and the upper bound was removed. Escapements have fluctuated substantially with no apparent trend in the time series, until the recent period of poor returns followed by 3 consecutive years of escapements above the goal.

Agency Comments: The Fraser Fall 0.3 stock group is of conservation concern due to very low escapement estimates relative to the escapement goal for the past ten years, excluding 2015 and the last 3 years(2022,2023 and 2024). In this stock group there is one CU, used for the DFO Wild Salmon Policy, and one DU, assessed by COSEWIC as part of Canada's SARA. The Harrison DU was identified as Threatened by COSEWIC in 2018.

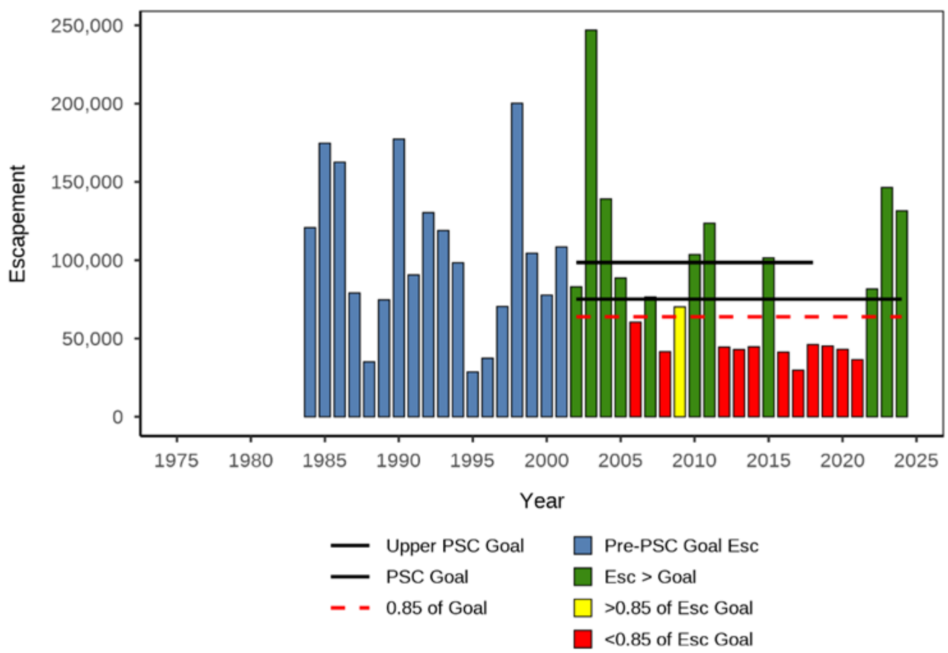


Figure 2.30–Harrison River escapements of Chinook salmon, 1984–2024.

2.3.4 Puget Sound, Coastal Washington, Columbia River, and Coastal Oregon Stocks

The PSC escapement indicator stocks in Washington and Oregon are currently separated into four regional groups: Puget Sound, Washington Coastal, Columbia River, and North Oregon Coastal. As part of the 2019 PST Agreement, the PSC dropped Deschutes fall Chinook as an escapement indicator stock, which is part of the Upriver Bright management group. Biologically based escapement goals have been reviewed and accepted by the CTC for two Puget Sound stocks (Skagit spring and Skagit summer/fall), four fall stocks (Queets, Quillayute, Hoh, and Grays Harbor) and two spring/summer stocks (Queets and Hoh) in the Washington coastal stock group, three Columbia River stocks (Lewis, Upriver Brights, and Mid-Columbia summers), and three far north migrating Oregon coastal stocks (Nehalem, Siletz, and Siuslaw).

2.3.4.1 Puget Sound

Puget Sound escapement indicator stocks include natural- and hatchery-origin spring, summer/fall, and fall Chinook salmon stocks from the Nooksack, Skagit, Stillaguamish, Snohomish, Lake Washington, and Green River systems. They tend to have a more local marine distribution than most coastal and Columbia River stocks and are caught primarily in WCVI AABM fisheries and Canadian and U.S. ISBM fisheries. Escapement for these stocks is defined as the total number of natural- and hatchery-origin fish observed on the spawning grounds.

2.3.4.1.1 Nooksack River

The Nooksack River drains into Puget Sound north of Bellingham. The Nooksack spring Chinook stock includes early-timed populations returning to the North, Middle, and South forks of the river.

Escapement Methodology: Prior to 1999, estimates of the spring-run type escapement in the South Fork were based on the number of redds observed prior to October 1, expanded by 2.5 spawners per redd. Since 1999, this South Fork estimate has been refined using CWTs, adipose fin clips, and thermal otolith marks to estimate the number of hatchery- and natural-origin fish in the spawning population. Beginning in 2008 and applied retroactively back to 1999, micro-satellite DNA has been used to assign fish sampled through the first week of October to geographic and run type origin, i.e., North and Middle Fork, South Fork, or hatchery-origin, and spring- or fall-run type. Most of the escapement is composed of hatchery-origin returns from two supplementation programs. Estimates of escapement in the North and Middle Fork are based on a combination of field methods, dictated by the influence of glacial runoff; methods include redd and carcass counts in clear tributaries as well as in mainstem (turbid) reaches during clear/low-flow conditions. While spring-run Chinook returning to all forks are considered together as the spring Chinook stock, note that the South Fork spring fish have a slightly later run timing than those returning to the North and Middle Fork tributaries. There are no natural Nooksack fall Chinook populations and, though there have been hatchery releases in the past, fall releases have been discontinued in recent years. Proportions of hatchery-origin fish are calculated from the number of fish identifiable to hatchery-origin out of the total observed during carcass sampling. The 2023 estimate of total spawners is 4,205, with a total of 348 natural-origin spawners (NOR) (Figure 2.31). Escapement estimates from 2024 are not yet available.

For brood years 2008–2019, WDFW estimated the spawning escapement of Nooksack spring Chinook using transgenerational genetic MR (tGMR) methods supported by dedicated PSC funding. One finding of the tGMR study (Seamons and Rawding, 2017) was that escapement estimates derived using the tGMR techniques were 1.2 to 3.4 times higher than those derived from carcass and redd count data (Figure 2.31; Appendix Table B7). These tGMR results represent estimates from the combined populations (all forks) and do not differentiate between hatchery-origin or natural-origin. The co-managers plan to review results of the tGMR studies to determine the applicability of these methods over other escapement estimation methods to this system.

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for this stock. The state-tribal co-manager low abundance threshold (LAT) for Nooksack spring established in 2022 is 400 natural-origin spawners for the North Fork/Middle Fork population and 200 natural-origin spawners for the South Fork population. For the purposes of representation in this figure, we used 600 as an agency goal, which is a combination of the two populations, despite there not being a defined aggregate population LAT agency goal. Note that prior to 2022 and back to 2017, the LAT agency goal for Nooksack spring was 800 natural-origin spawners in the North Fork/Middle Fork and 400 in the South Fork. Prior to 2017, the LAT agency goal was 1,000 natural-origin spawners for each population. For readability, only the current agency goal is shown in Figure 2.31.

Agency Comments: The state–tribal escapement goal established for this Chinook management unit is an upper management threshold (UMT) of 1,000 combined North and Middle Fork natural-origin spawners and a UMT of 500 South Fork natural-origin spawners. The LAT is 400 combined North and Middle Fork natural-origin spawners and 200 South Fork natural-origin spawners. The UMT established by the state–tribal managers is the adult (age 3+) escapement corresponding to maximum sustained harvest (i.e., S_{MSY}). The LAT is the escapement below which dramatic declines in long-term productivity could occur. Since being listed as threatened under the ESA in 1999, annual fishery management for this stock has operated under a ceiling exploitation rate.

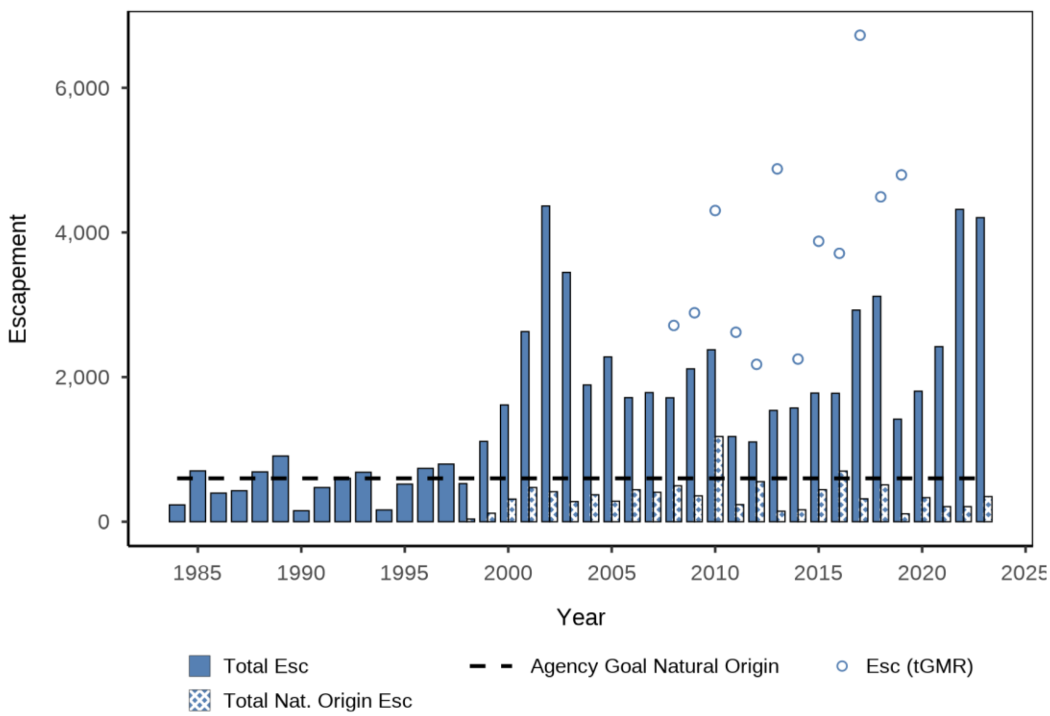


Figure 2.31–Nooksack River escapement of total (natural- and hatchery-origin) spring Chinook salmon, 1984–2023.

2.3.4.1.2 Skagit River Spring

The Skagit River drains into northern Puget Sound near Mount Vernon and is the largest drainage basin in Puget Sound. The Skagit River spring Chinook salmon stock includes early-timed populations returning to the Upper Sauk, Upper Cascade, and Suiattle rivers.

Escapement Methodology: Due to changes in spawning index areas and estimation methodology that began in 1992 for the Cascade stock, and 1994 for the Sauk and Suiattle stocks, escapement estimates for years prior to the changes are not directly comparable with estimates for years after the changes occurred. In the Upper Sauk, cumulative redd counts are conducted from river mile (rm) 31.0 to 39.7 (Sauk below White Chuck River mouth to the confluence of the North and South Fork Sauk), in the North Fork Sauk from the mouth to the falls, and in the South Fork Sauk (rm 0 to 5.0). This method replaced the peak live and dead count approach used in prior years. In the Cascade River, cumulative redds are counted in the mainstem upstream of rm 8.1 to the forks at rm 18.6, encompassing the lower North Fork and South Fork, and in Found, Kindy, and Marble Creeks. In the Suiattle Basin, cumulative redds are counted in mainstem Suiattle, and in Big, Tenas, Straight, Circle, Buck, Lime, Downey, Sulphur, and Milk creeks. Prior to 1994, peak live and dead fish counts in Big, Tenas, Buck, and Sulphur creeks were used. Escapement may include very small numbers of hatchery strays in these natural production areas. Past PSC-funded studies on straying of Marblemount Hatchery spring Chinook salmon focused on the area immediately adjacent to the hatchery, which is outside the survey reach for natural production. The 2024 escapement estimate is 2,276 natural spawners (Figure 2.32).

Escapement Goal Basis: Attachment I of the 2019 PST Agreement lists an escapement goal of 690 for the Skagit spring Chinook stock. In September 2024, however, the CTC reviewed and accepted a revised escapement goal of 1,024 (CSCWG 2024). The escapement goal is the median estimate of escapement that would produce the S_{MSY}. The estimate of S_{MSY} was calculated using a Bayesian state-space model with two major components: a process model describing the production of age-specific recruits, and observation models to account for errors in the estimates of spawning escapement and age composition. The stock-recruit relationship used to estimate S_{MSY} was a Ricker curve, which was chosen instead of a Hockey Stick or Beverton-Holt model as these models tended to overestimate recruitment at low abundances for the Skagit spring stock.

Agency Comments: State-tribal co-managers have a UMT of 2,000 natural-origin spawners and a LAT of 1,024 natural-origin spawners for the Skagit spring stock. Since being listed in 1999 as threatened under the ESA, annual fishery management for this stock has been operated under a total exploitation rate ceiling rather than for a UMT or LAT escapement.

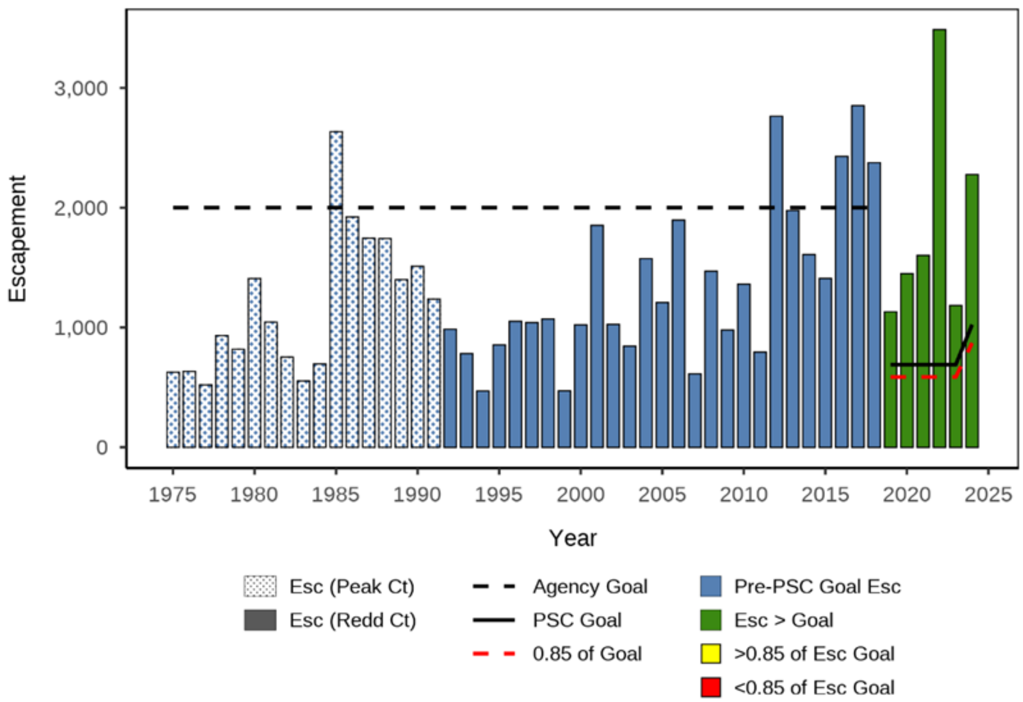


Figure 2.32–Skagit River escapement of spring Chinook salmon to the spawning grounds, 1975–2024.

Note: This includes early-timed populations returning to the Upper Sauk, Upper Cascade, and Suiattle rivers.

2.3.4.1.3 Skagit River Summer/Fall

The Skagit River summer/fall Chinook salmon stock includes the Upper Skagit River summer, Sauk summer, and Lower Skagit River fall run populations.

Escapement Methodology: Escapement of Skagit River summer/fall Chinook salmon was estimated using expansion of redd counts from helicopter surveys of mainstem areas and foot surveys of smaller tributaries. The counts are expanded by the AUC method (Smith and Castle 1994). This method assumes a 21-day redd life and 2.5 adult spawners per redd. Natural-spawning escapement is predominantly offspring from natural-origin spawners; the remainder are hatchery-origin fish from the wild stock tagging program that started in 1994. Natural escapement does not include the brood stock collected for this program. The 2024 escapement estimate is 9,386 natural spawners (Figure 2.33).

Escapement Goal Basis: Attachment I of the 2019 PST Agreement lists an escapement goal of 9,202 for Skagit River summer/fall Chinook. In September 2024, however, the CTC reviewed and accepted a revised escapement goal of 8,201 (CSCWG 2024). The escapement goal is the median estimate of escapement that would produce the S_{MSY}. The estimate of S_{MSY} was calculated using a Bayesian state-space model with a Ricker curve stock-recruit relationship as described in section 2.3.4.1.2.

Agency Comments: The UMT used by the state-tribal comanagers for the Skagit River summer/fall Chinook salmon management unit is 14,500, based on an assessment of freshwater productivity and accounting for variability and biases in management error (CCMP 2022). The LAT is 8,201 spawners. Since its listing as threatened under the ESA in 1999, annual fishery management for this stock has been operated under an exploitation rate ceiling rather than for a UMT or LAT escapement. In years when the UMT is expected to be exceeded, terminal fisheries can be expanded subject to the overall total ceiling exploitation rate.

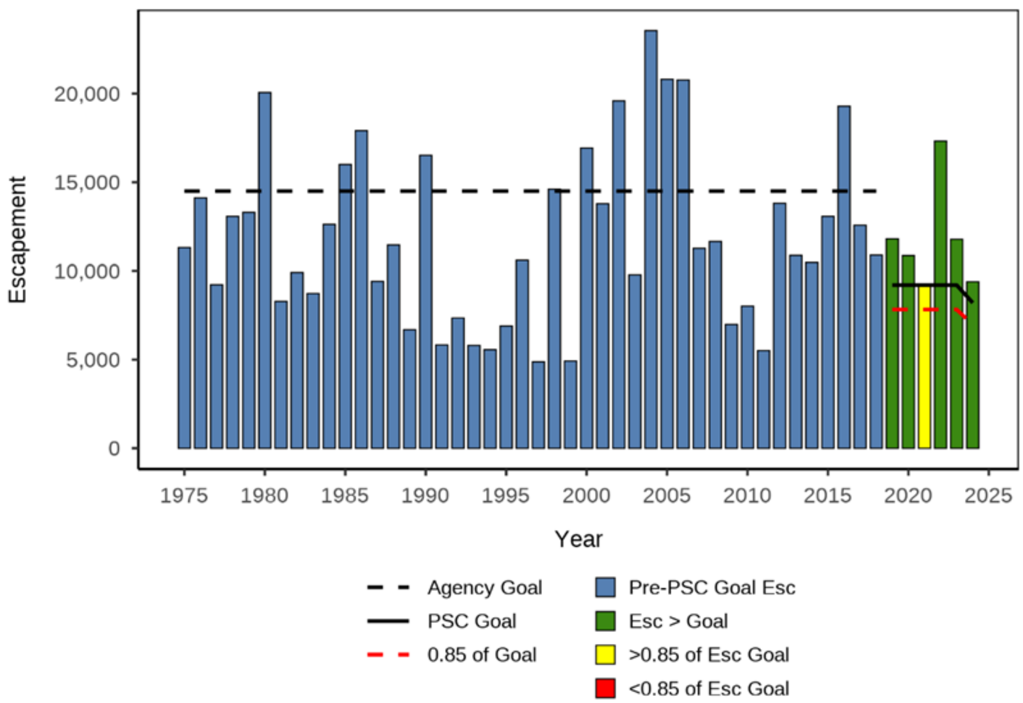


Figure 2.33–Skagit River escapement of summer/fall Chinook salmon to the spawning grounds, 1975–2024.

2.3.4.1.4 Stillaguamish River

The Stillaguamish River drains into northern Puget Sound between Everett and Mount Vernon. The Stillaguamish River has two populations of Chinook salmon distinguished by genetic characteristics—a summer-timed run and a fall-timed run. These two populations overlap in spawn timing and distribution with both populations spawning in both forks of the river. The summer-timed run is a composite of natural- and hatchery-origin supplemental production, with most spawning occurring in the North Fork and its major tributaries, including Boulder River, and Deer, Grant, French, and Squire Creeks, and with some spawning also occurring in the South Fork Stillaguamish. The fall-timed run is a natural-origin fall stock with recent increases in supplementation with hatchery-origin production that spawns primarily in the mainstem and South Fork Stillaguamish, in Pilchuck, Jim, and Canyon Creeks, and a small portion spawning in the North Fork Stillaguamish River. Escapement is currently estimated as total watershed abundance, including both summer and fall populations of Chinook salmon.

Escapement Methodology: Historically, geographic based (North Fork/South Fork) escapement estimates for Stillaguamish Chinook salmon were based on a peak redd count expansion, assuming 2.5 fish per redd.

Spawning escapement estimates based on redd counts were biased low due to incomplete counts using visual sampling methods (Figure 2.34). Bias in the redd count estimates is supported by evidence from PSC-funded tGMR studies that have occurred in recent years (Small et al. 2020). Escapement estimates based on these tGMR studies were 1.46 (0.97–2.85) times higher on average than those calculated from redd count data (Figure 2.34).

Therefore, the co-managers agreed to revise escapement estimates from 1988 to 2007 to a tGMR equivalent estimate. First, aerial survey-based escapement estimates for total watershed are adjusted to a ground survey-based equivalent using data collected in 2008, 2009, 2016, and 2017 when aerial and ground surveys were conducted concurrently. The adjusted ground count escapements are converted to a tGMR equivalent using a regression relationship derived from ground based and tGMR escapements from the period 2008 to 2016 when both methods were used concurrently. Since 2008, funding has been available to continue the tGMR study, with results of the genetics lab hypergeometric estimate adopted as final agreed to escapement estimates. The tGMR naturally spawning escapement estimate for 2023 is 792. For 2024, until the final tGMR-based estimate becomes available, a tGMR equivalent placeholder estimate of 1,139 is being used, derived using the same regression relationship described above.

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for this stock group. The agency LAT of 900 hatchery and natural-origin Chinook established in 2017 describes the terminal run size (escapement + broodstock + freshwater harvest), which is a different metric than the escapement data presented in Figure 2.34. Between 2017 and 2021, the average broodstock collection in the freshwater was 133 Chinook and the average freshwater harvest was 1 Chinook. Prior to 2017, the agency goal for Stillaguamish Chinook was 500 natural-origin spawners for the summer population and 200 natural-origin spawners for the fall population. For readability, only the current agency goal (LAT: 900) is shown in Figure 2.34.

Agency Comments: State-tribal co-managers have a UMT of 1,500 total (hatchery plus natural--origin) spawners and a LAT of 900 total spawners. The summer Chinook salmon supplementation program, which collects brood stock from the North Fork of the Stillaguamish River return, was initiated in 1986 as a PST indicator stock program, and the current objective is to release 220,000 coded-wire tagged and adipose fin clipped fingerling smolts per year from Whitehorse Ponds Hatchery facility in the upper North Fork Stillaguamish. Since 2000, an average of 140 adults have been collected annually from the spawning population for this program. In 2009, a captive brood fall timed hatchery program which collects broodstock from juvenile outmigrants, was implemented at Brenner Creek Hatchery facility in the upper South Fork Stillaguamish, and the first release was in 2013. The current objective is 200,000 coded-wire tagged and adipose fin clipped fingerling smolts per year, with recent releases slightly above 100,000 and increasing. Since listing as threatened under the ESA in 1999, annual fishery management for this stock has been operated under a ceiling exploitation rate determined by the forecast abundance tier.

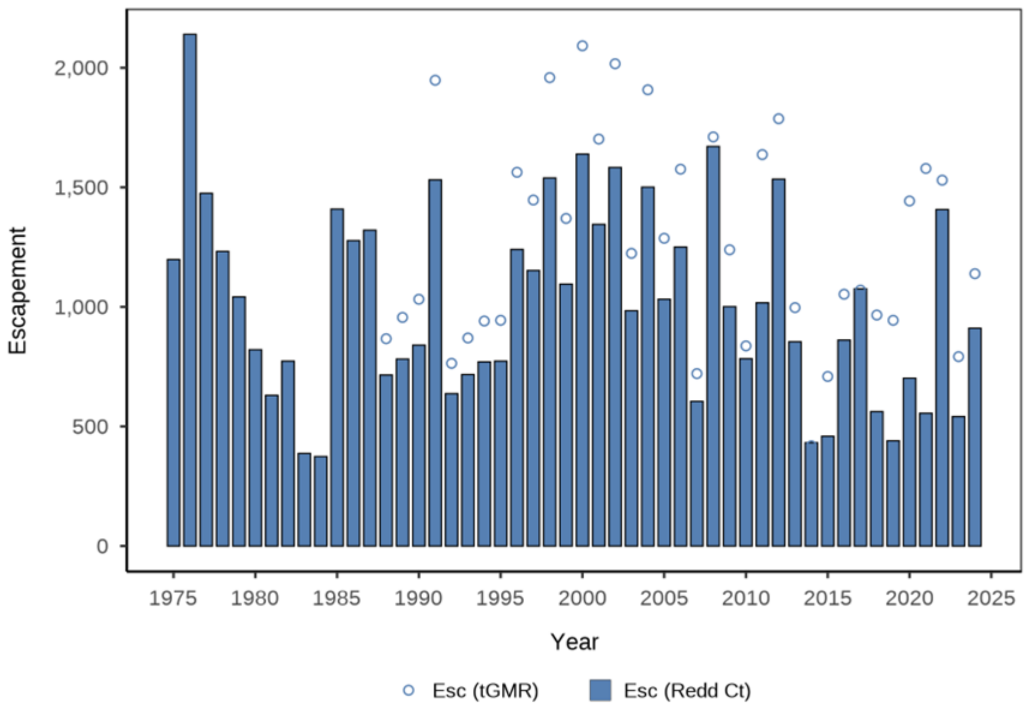


Figure 2.34–Stillaguamish River escapement of Chinook salmon to the spawning grounds, 1975–2024.

Note: For 1988–2007, tGMR estimates represent ground-based estimates converted to a tGMR equivalent using a regression relationship derived from ground-based and tGMR-based escapement estimates from 2008–2016 when both methods were used concurrently.

2.3.4.1.5 Snohomish River

The Snohomish River empties into northern Puget Sound near Everett. The Snohomish Chinook salmon stock includes the Skykomish and Snoqualmie summer/fall run populations. Skykomish Chinook salmon spawn in the mainstem of the Skykomish River and its tributaries—including the Wallace and Sultan rivers, Bridal Veil Creek, the South Fork of the Skykomish River between rm 49.6 and rm 51.1, above Sunset Falls (fish have been transported around the falls since 1958), and the North Fork of the Skykomish River up to Bear Creek Falls (rm 13.1). Snoqualmie Chinook salmon spawn in the Snoqualmie River and its tributaries, including the Tolt River, Raging River, and Tokul Creek.

Escapement Methodology: Escapement was estimated using expanded redd counts obtained by a combination of helicopter, float, and foot surveys, and from fish counts at the Sunset Falls fishway. The natural spawning escapement estimate includes a significant contribution of hatchery strays from the Wallace and Bernie Kai-Kai Gobin (Tulalip Tribes) facilities. Natural spawning escapement refers to any Chinook, regardless of origin, spawning in the river (i.e., in-river spawners). Annual tGMR studies were conducted for 2011–2015 under funding from the SSP and for 2016 and 2017 under funding from the Southern Endowment Fund (Figure 2.35; Appendix Table B7). The 2024 escapement is estimated at 6,593 natural spawners.

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for this stock. The agency LAT of 3,250 natural-origin Chinook spawners was established in 2022. From 2017 through 2021, a LAT of 3,375 natural-origin spawners was used as an agency goal. Prior to 2017, a LAT of 2,800 natural-origin spawners was used as an agency goal. Note that the escapement shown in this graphic represents combined hatchery and natural spawners, but the agency goal represents just natural-origin spawners. On average in recent years (2016 to 2020), natural-origin fish represented approximately 68% of the spawners. For readability, only the current agency goal is shown in Figure 2.35.

Agency Comments: The state-tribal co-managers have a UMT for this stock of 4,900 natural-origin spawners. The LAT for Snohomish River summer/fall Chinook salmon is 3,250. Since listed as threatened under the ESA in 1999, annual fishery management for this stock has been for a ceiling exploitation rate determined by the forecast abundance tier.

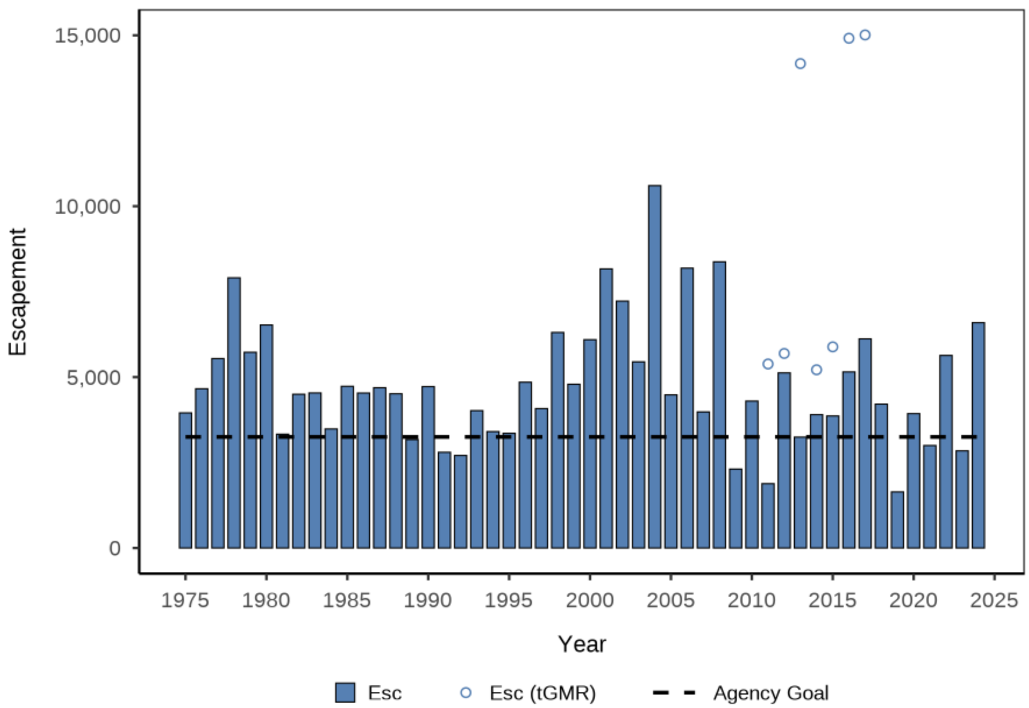


Figure 2.35–Snohomish River escapement of Chinook salmon to the spawning grounds, 1975–2024.

2.3.4.1.6 Lake Washington

The Lake Washington Chinook salmon stock includes the fall run populations in the Cedar River and in the Sammamish River tributaries of Bear, Cottage, and Issaquah creeks. The Issaquah Salmon Hatchery is located on Issaquah Creek, and Chinook salmon at the hatchery rack are not included in the natural escapement estimates for Lake Washington.

Escapement Methodology: Escapement in the mainstem Cedar River is estimated using expansion of total redd counts. Prior to 1999, live counts and AUC methods were used to estimate spawning abundance in the Cedar River. Past AUC estimates have been converted to redd-based estimates using simple linear regression. Escapement estimates are considered to represent the entire watershed because redd surveys encompass the entire Chinook production area of the Cedar River. It should be noted that although there are no hatchery fish released into the Cedar River, an average of 25% of the spawners from 2003 to 2021 were hatchery-origin strays, originating primarily from Issaquah Hatchery. Escapement to the Sammamish River tributaries is estimated using live counts and AUC methods in Bear and Cottage Lake creeks. Index surveys in Bear Creek began in 1981; index surveys in lower Cottage Lake Creek began in 1983 and were expanded in 1997 to include upper Cottage Lake Creek. Spawning escapement based on AUC methods in Issaquah Creek below the Issaquah Creek Hatchery rack and East Fork Issaquah Creek were initiated in 1999. Past AUC estimates of index areas have been converted to AUC estimates of both index and non-index areas using simple linear regression. The majority (90%) of spawners in the Sammamish River tributaries are hatchery-origin, likely strays from the Issaquah hatchery. The 2024 naturally spawning escapement estimate for Lake Washington is 939 (Figure 2.36).

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for this stock. Prior to the current agency goal, an escapement goal of 1,200 was used starting in 1993, which was later updated to 1,680. In 2017, a goal of 500 total natural spawners (hatchery origin [HOR] + NOR) was established. This represents an MSY of 324 (calculated in 2022), buffered due to uncertainty in stock dynamics. For readability, only the current agency goal (500 natural spawners) is shown in Figure 2.36.

Agency Comments: Between 1999 (with ESA listing) and 2017, annual fishery management for the Cedar River stock operated under a ceiling exploitation rate. In 2018, co-managers began managing for a spawning escapement goal, and in 2022 they developed a MSY based escapement goal (324) for the Cedar River population but are managing for 500 natural spawners with an LAT of 200 natural spawners.

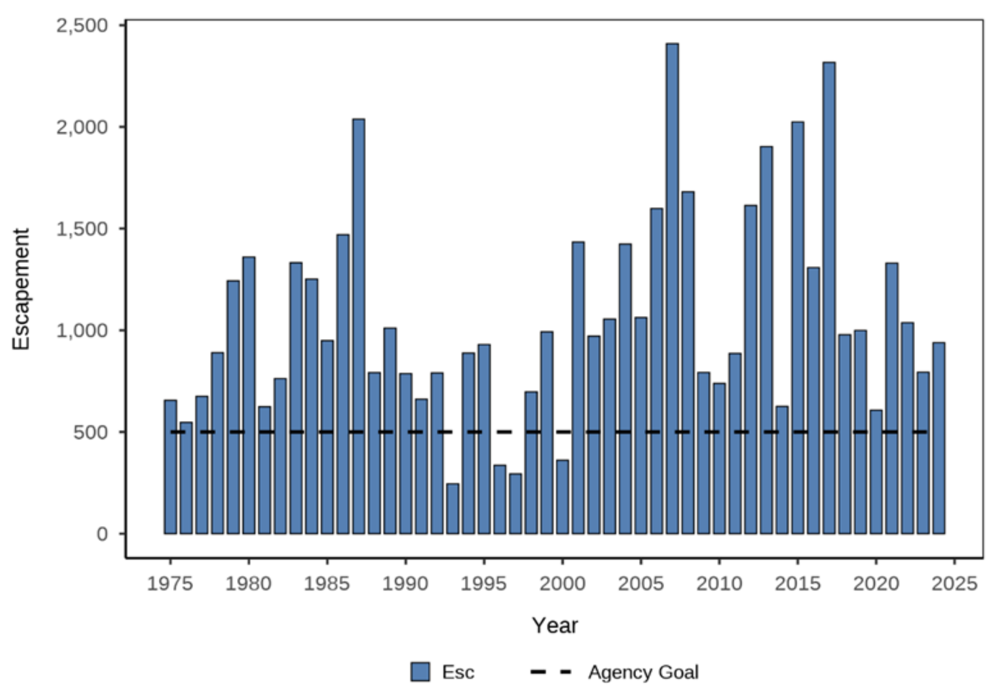


Figure 2.36–Escapement of Chinook salmon to the spawning grounds in the tributaries of Lake Washington (Cedar River and Bear and Cottage Lake Creeks), 1975–2024.

2.3.4.1.7 Green River

The Green River fall Chinook salmon stock consists of a single population spawning in the mainstem Green River and two of its major tributaries, Newaukum and Soos Creeks.

Escapement Methodology: Escapement is estimated from a redd count expansion method that has varied over the time series by the extent of spawning survey coverage. The method used until about 1996 involved an index area redd count multiplied by 2.6 to estimate total redds, then multiplied by 2.5 fish per redd to produce estimated escapement. The 2.6 index to total redd expansion factor was based on a 1976 to 1977 U.S. Fish and Wildlife Service MR study (Ames and Phinney 1977). Since 1996, the survey areas have been broadened and the associated expansion factor of 2.6 has been reduced to the point where redd count surveys in 2009 have complete spawning reach coverage. The method used in recent years provides natural escapement estimates for the mainstem Green River and Newaukum Creek. Newaukum Creek redds are counted during foot surveys. The mainstem Green River is surveyed by boat and by air, and other parts of the river are surveyed using escapement methodology detailed in (CTC 2022). The CTC considers these estimates from redd counts as index values rather than estimates of total escapement. Estimates of total escapement from MR studies in 2000, 2001, and 2002 funded through the U.S. Letter of Agreement were about 2.5 times higher than the escapement estimate from redd count expansion. In 2010, 2011, and 2012, tGMR-based escapement estimates from studies funded under the SSP were once again more than twice as high as the redd count expansion estimates (Figure 2.37; Appendix Table B7). There is a large hatchery program in this basin and these fish comprise a large portion of the return. Hatchery contribution to the natural escapement in the Green River averaged 57% from 2004–2021 and ranged from 27% to 75%. The 2024 redd-based estimate of naturally spawning escapement is 5,644 mixed hatchery- and natural-origin Chinook salmon.

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for this stock. Prior to the current agency goal, an escapement goal of 5,800 total natural spawners (HOR + NOR) was established in 1977. The escapement goal was updated in 2017 to 2,013, and to 2,744 in 2022. Though the spawning stock MSY for Green River was calculated as 1,396, the co-managers agreed to use the conservative goal of 2,744 adult Chinook on the Green River spawning grounds. For readability, only the current agency goal (2,744) is shown in Figure 2.37.

Agency Comments: In 2022, the co-managers agreed to use an escapement goal of 2,744 and implemented a multi-tiered natural spawning escapement threshold of 4,500 (UMT1) and 6,700 (UMT2) natural spawners and a LAT of 1,098 natural spawners that regulated exploitation rates for this stock (WDFW and Puget Sound Indian Tribes 2022). Since being listed as threatened under the ESA in 1999, annual fishery management for this stock has used a ceiling exploitation rate in the southern U.S. preterminal fisheries, and a UMT in the terminal fisheries.

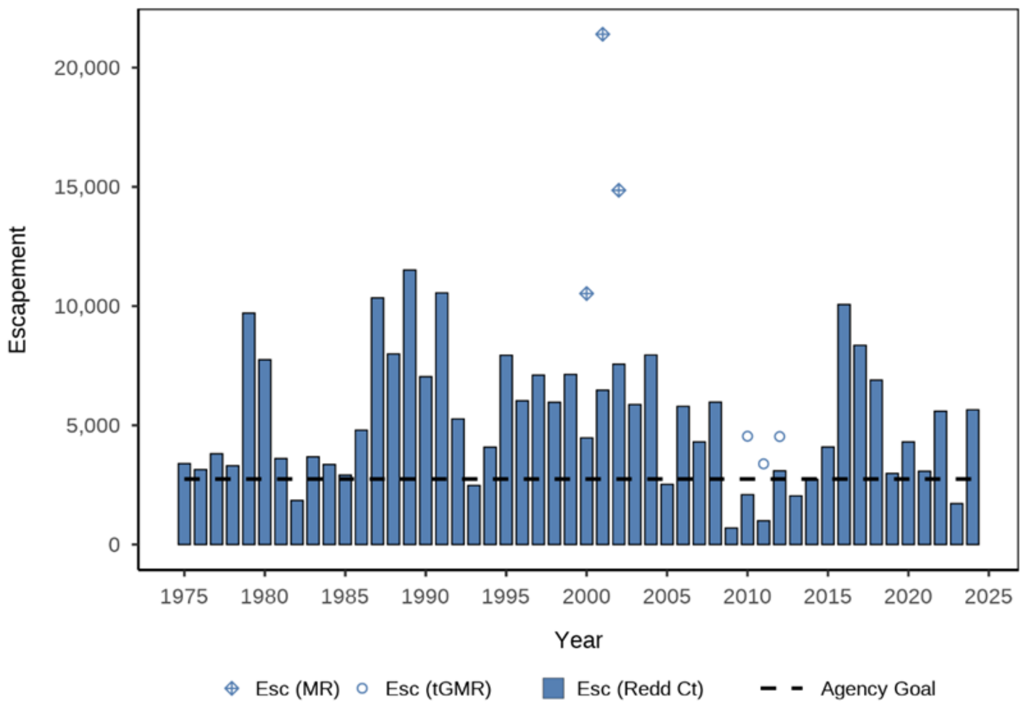


Figure 2.37–Green River escapement of Chinook salmon to the spawning grounds, 1975–2024.

2.3.4.2 Coastal Washington

Coastal Washington stocks include spring, summer, and fall Chinook salmon from the Hoko, Quillayute, Hoh, and Queets rivers, as well as from Grays Harbor, including the Chehalis and Humptulips rivers. Coastal Washington stocks have a northerly distribution and are primarily caught in SEAK and NBC AABM fisheries; however, they are also caught as mature fish in terminal SUS ISBM net fisheries during spawn migrations.

Escapement estimates for all coastal Washington indicator stocks are derived from redd counts. Surveys are conducted by foot, boat, and/or helicopter. For each stock, intensively monitored index reaches are surveyed weekly, or biweekly as conditions allow, to record total new and visible redds observed. Cumulative redd counts for each index reach represent the total spawner abundance for that reach. Weekly visible redd counts in index reaches are used to estimate timing curves by calculating the proportion of the season's cumulative redds that are visible on each weekly survey date. For each stock, extensive but infrequent supplemental surveys are also conducted in additional monitored spawning areas that are too large or remote to be intensively monitored. These surveys are timed as close as possible to peak spawning activity. Redd counts from these supplemental surveys are expanded based on run timing curves, estimated from the principal index surveys, to estimate cumulative redd counts within the supplemental survey areas. Redd densities (cumulative redds per river mile) from sampled surrogate reaches of similar habitat composition are applied in the following situations: 1) defined lengths of seldomly surveyed reaches, or 2) streams with historical fish presence, or which have suitable potential spawning habitat. These methods are consistent for all stocks except Hoko River, which only includes intensively monitored index reaches. Total estimated redd counts for a given season are then multiplied by an assumed 2.5 spawners per redd, yielding the estimated escapement per reach or stream (CCMP 2022). The total escapement for a given indicator stock is then calculated as the sum of escapement estimates from all reaches and streams comprising the length of defined spawning habitat for that stock.

2.3.4.2.1 Hoko River

The Hoko River is located at the extreme western end of the Strait of Juan de Fuca and is not listed as part of the Puget Sound Chinook Salmon Endangered Species Unit under the ESA (National Oceanic and Atmospheric Administration [NOAA] 2023). Hoko River Chinook salmon spawn primarily in the mainstem of the Hoko River, with limited spawning in larger tributaries.

Escapement Methodology: The Makah Tribe and WDFW conduct ground surveys using cumulative redd counts for the Hoko River mainstem and tributaries found between river mile 1.5 and 21.7, which represents the entire range of spawning habitat utilized by Chinook salmon. Redd counts are multiplied by 2.5 fish, yielding the estimated escapement per reach. There are ten mainstem reaches plus 13 tributary reaches, including Little Hoko, Browne's, Herman, North Fork Herman, Ellis, Bear, and Cub rivers, which are all upper mainstem tributaries. The tribe also surveys the mainstem Sekiu River, and Carpenter, South Fork Carpenter, Sunnybrook, and three unnamed creeks (numbered 19.0215, 19.0216, and 19.0218). Escapement excludes fish used as broodstock to support the supplementation program, which started in 1988 and targets 200 fish each year.

Escapement Estimate: The 2024 total in-river spawning escapement estimate was 2,489 mixed natural- and hatchery-origin Chinook (Figure 2.38).

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for this stock.

Agency Comments: The UMT escapement goal established by state and tribal co-managers is 850 naturally spawning adults. Instead of a stock–recruitment analysis, the escapement goal was derived using a habitat-based approach where estimates of available spawning habitat were expanded by assumed optimal redds per mile and fish per redd values (Ames and Phinney 1977).

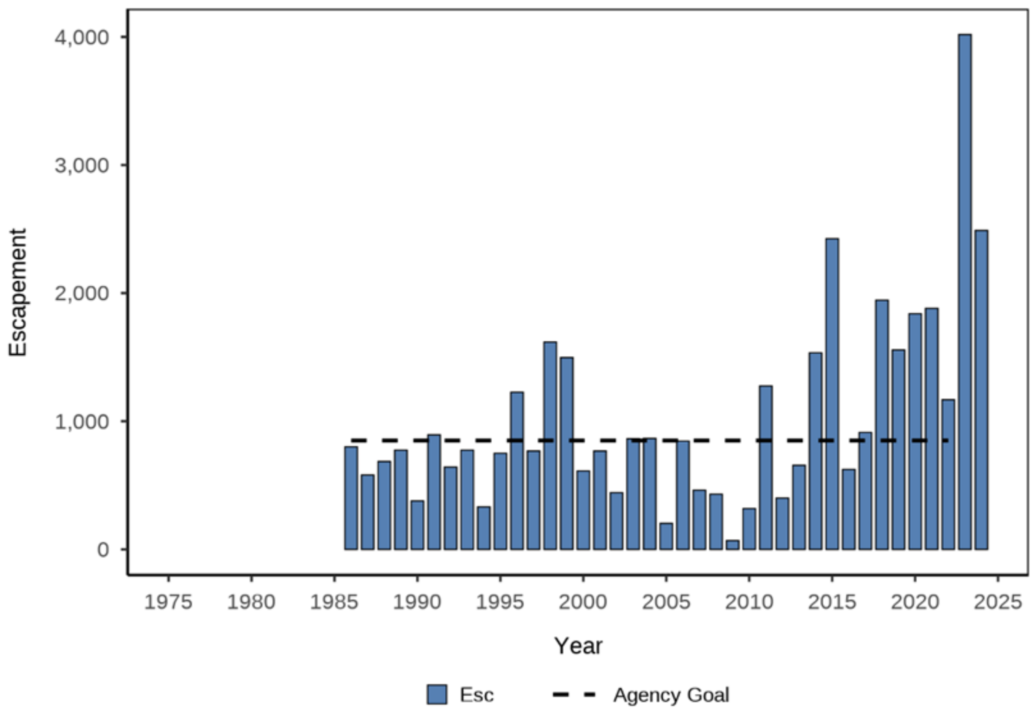


Figure 2.38–Hoko River escapement of Chinook salmon to the spawning grounds, 1986–2024.

2.3.4.2.2 Quillayute River Summer

The Quillayute River drains from the northwest side of the Olympic Mountains into the Pacific Ocean, south of Cape Alava on the north Washington coast.

Escapement Methodology: Escapement estimates are based on redd counts in index areas and from supplemental surveys on the Bogachiel, mainstem Calawah, North Fork Calawah, and Sitkum rivers. This approach has been used consistently in the Quillayute River system since the 1970s.

Escapement Estimate: The 2024 natural escapement estimate was 1,275 summer Chinook (Figure 2.39).

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for this stock.

Agency Comments: The state–tribal management goal for this stock is 1,200 adults and jacks combined (PFMC 2016).

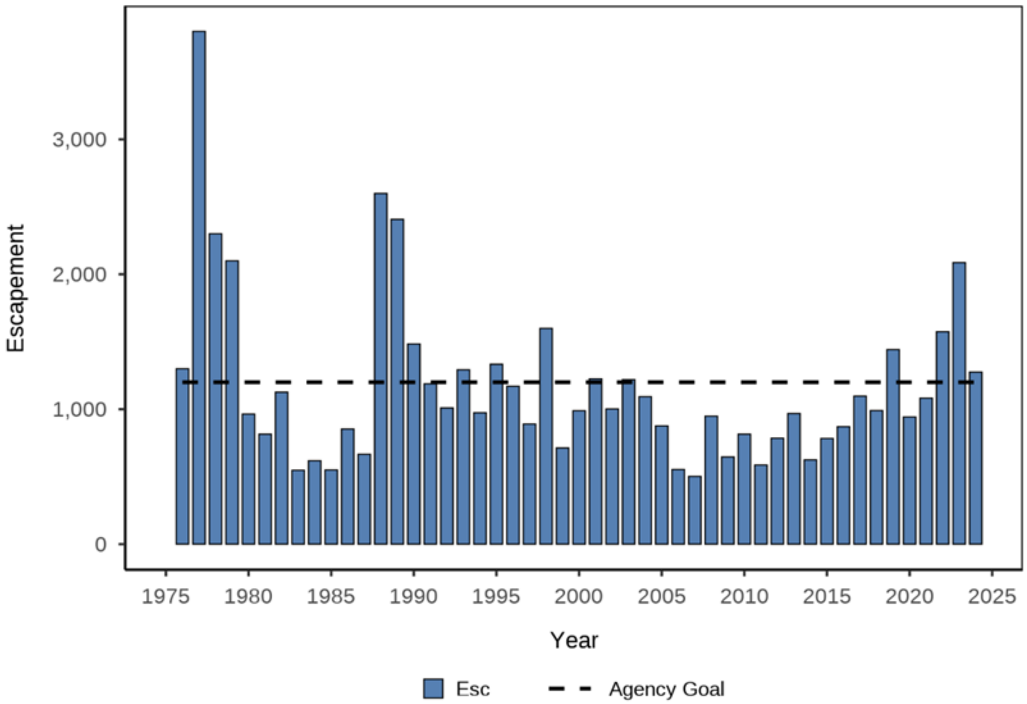


Figure 2.39–Quillayute River escapement of summer Chinook salmon to the spawning grounds, 1976–2024.

2.3.4.2.3 Quillayute River Fall

The Quillayute River is one of four Washington coast river systems that contain fall Chinook salmon with PSC-agreed escapement goals.

Escapement Methodology: Escapement estimates are based on redd counts in index areas and from supplemental surveys on the Bogachiel, Sol Duc, Dickey, and Calawah rivers, and several other smaller tributaries in the basin. Methods have been consistent in the Quillayute River system since the 1970s.

Escapement Estimate: The 2024 natural escapement estimate was 5,378 fall Chinook (Figure 2.40).

Escapement Goal Basis: In 2004, the CTC accepted an escapement goal of 3,000 natural spawners for Quillayute fall Chinook salmon based on a spawner–recruit analysis developed by the Quinault Department of Natural Resources (QDNR 1982) and Cooney (1984).

Agency Comments: Terminal fisheries are managed for a harvest rate of 40%, with an escapement floor of 3,000 fish. This objective was designed to allow a wide range of escapements from which to eventually develop an MSY objective or proxy while protecting the long-term productivity of the stock.

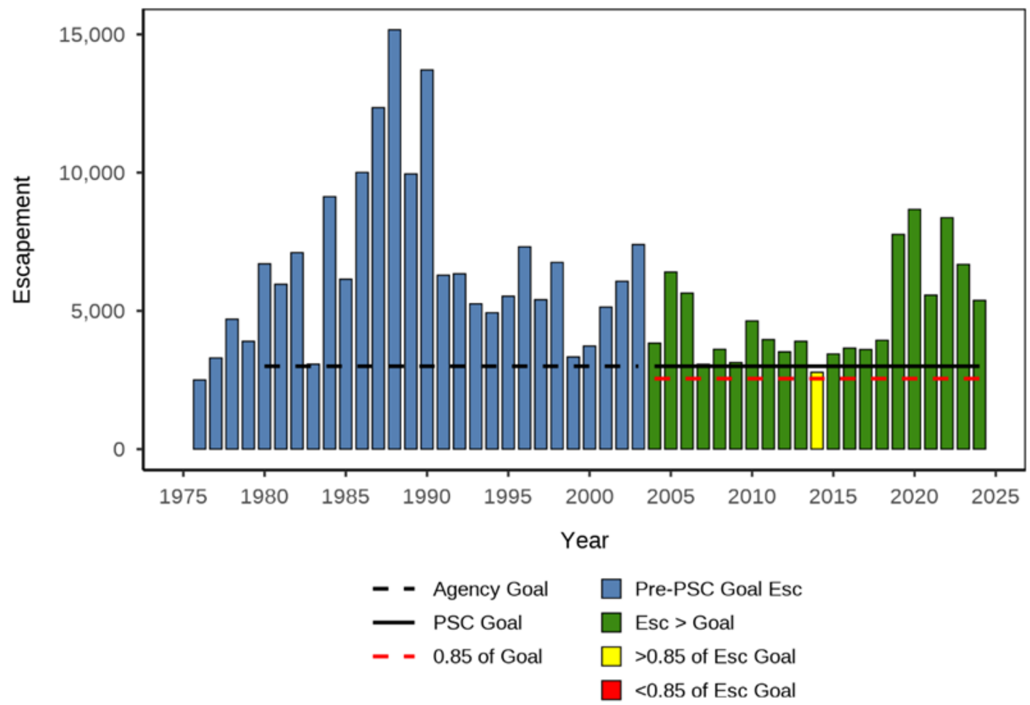


Figure 2.40–Quillayute River escapement of fall Chinook salmon to the spawning grounds, 1976–2024.

2.3.4.2.4 Hoh River Spring/Summer

The Hoh River drains from the western side of the Olympic Mountains on the north Washington coast between the Quillayute River to the north and the Queets River to the south.

Escapement Methodology: Escapement is estimated from redd counts in index areas, supplemental surveys in the mainstem and south fork of the Hoh River, and in tributaries with spawning habitat. There is no hatchery program in this system.

Escapement Estimate: The 2024 natural escapement estimate was 1,835 fish (Figure 2.41).

Escapement Goal Basis: In 2004, the CTC accepted an escapement floor goal of 900 for the Hoh spring/summer Chinook salmon, that was developed by QDNR (1982) and Cooney (1984) based on spawner–recruit analyses for brood years 1969 to 1976.

Agency Comments: Like many of the other Washington coastal stocks, Hoh River spring/summer escapements have been relatively stable except for much larger returns in 1988, 1989, and 1990. The terminal return for this stock declined from 1997 to 2000 and rebounded in 2001 before declining again from 2006 to 2014. Terminal fisheries are managed to catch 31% of the river run, with an escapement floor of 900 fish. This objective was designed to allow a wide range of spawner escapements from which to eventually develop an MSY objective or proxy while protecting the long-term productivity of the stock.

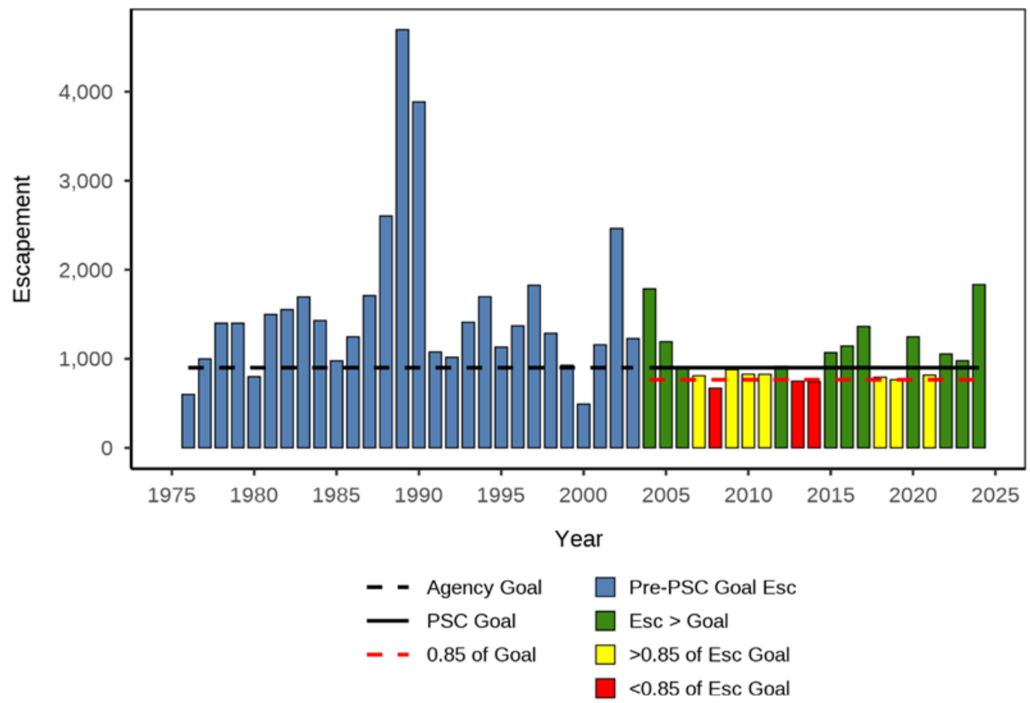


Figure 2.41–Hoh River escapement of spring/summer Chinook salmon to the spawning grounds, 1976–2024.

2.3.4.2.5 Hoh River Fall

The Hoh River is one of four Washington coast river systems that contain fall Chinook salmon with PSC-agreed escapement goals.

Escapement Methodology: Escapement is estimated from redd counts in index areas, supplemental surveys in the mainstem and south fork Hoh River, and in tributaries with spawning habitat. The natural escapement estimates for Hoh River fall Chinook include a small number of fish taken for an experimental hatchery program from 1983 to 1986, but otherwise should be considered natural-origin fish.

Escapement Estimate: The 2024 natural escapement estimate was 2,158 fish (Figure 2.42).

Escapement Goal Basis: In 2004, the CTC accepted an escapement floor goal of 1,200 for Hoh fall Chinook salmon, developed by QDNR (1982) and Cooney (1984) based on spawner–recruit analyses of data from 1968 to 1982.

Agency Comments: The state-tribal management plan for this stock includes a harvest rate of 40% on the terminal run, with an escapement floor of 1,200 spawners. This objective was designed to allow a wide range of spawner escapements from which to eventually develop an MSY objective or proxy while protecting the long-term productivity of the stock.

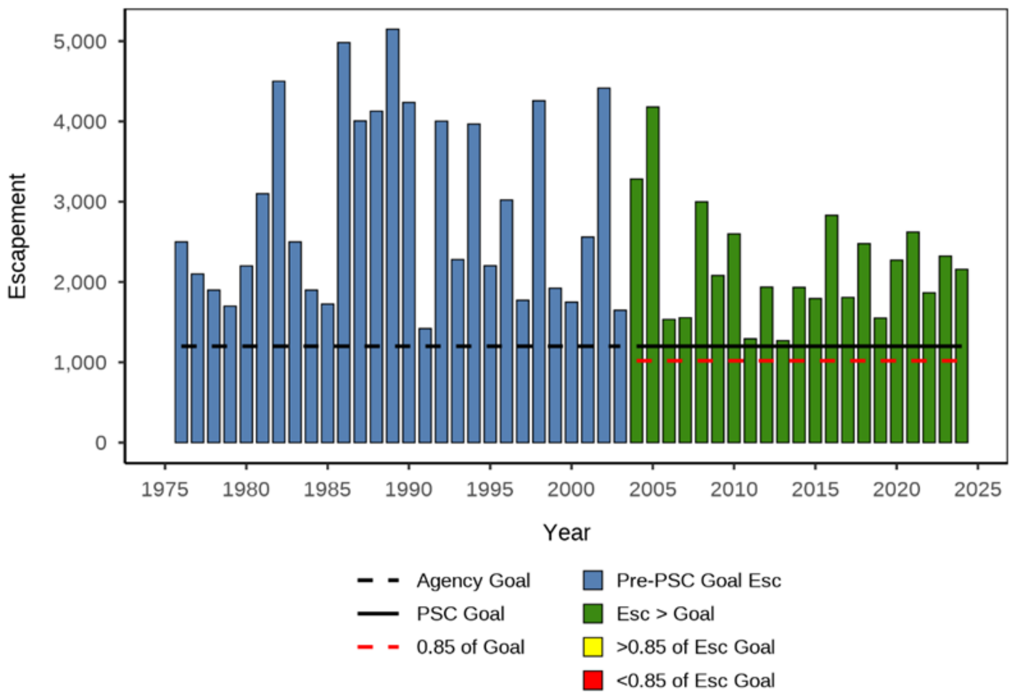


Figure 2.42–Hoh River escapement of fall Chinook salmon to the spawning grounds, 1976–2024.

2.3.4.2.6 Queets River Spring/Summer

The Queets River drains from the western side of the Olympic Mountains on the north Washington coast and is south of the Hoh River.

Escapement Methodology: Escapement is estimated from redd counts from August 15 to October 15 for spring/summer Chinook salmon.

Escapement Estimate: The 2024 estimate of natural escapement was 750 fish (Figure 2.43).

Escapement Goal Basis: In 2004, the CTC accepted an escapement floor goal of 700 for Queets spring/summer Chinook salmon, developed by QDNR (1982) and Cooney (1984) based on spawner–recruit analyses for brood years 1969 to 1976.

Agency Comments: Terminal fisheries are managed by the state and tribes to catch 30% of the terminal run, with an escapement floor of 700 fish. This objective was designed to allow a wide range of spawner escapements from which to eventually develop an MSY objective or proxy while protecting the long-term productivity of the stock. Since 1990, terminal fisheries on this stock have been limited, as returns to the river have rarely exceeded the escapement floor. Since 2000, sport anglers have been required to release all Chinook salmon during the summer, and tribal fisheries have been limited to one tribal netting day for ceremonial and subsistence purposes.

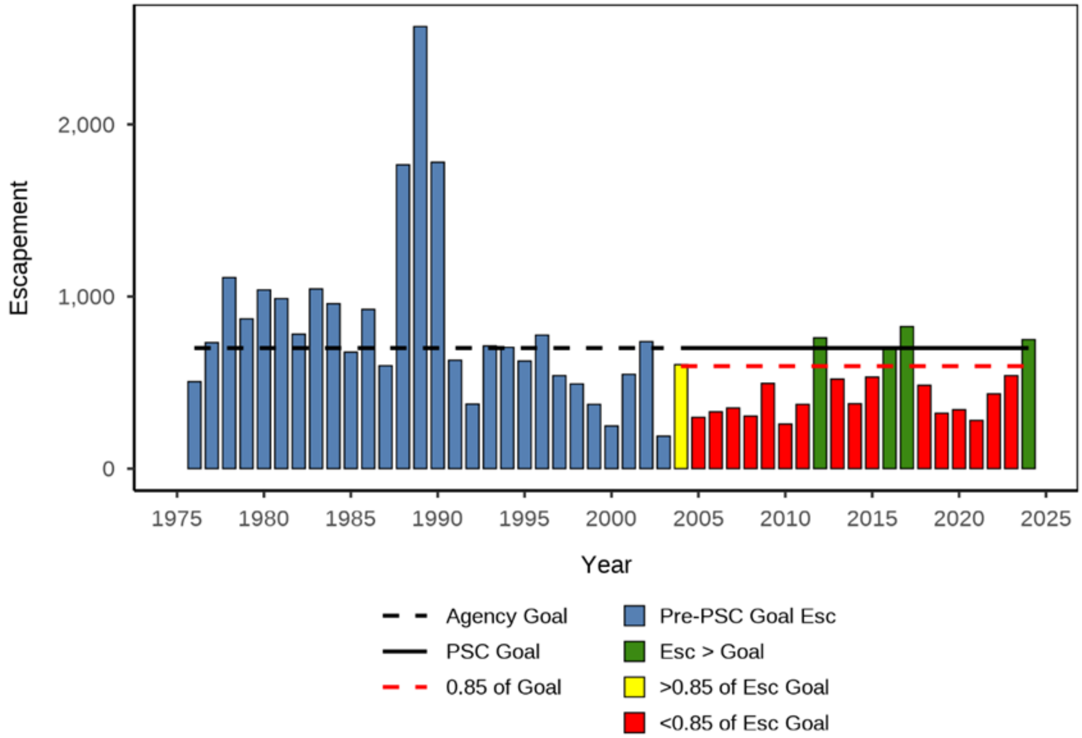


Figure 2.43–Queets River escapement of spring/summer Chinook salmon to the spawning grounds, 1976–2024.

2.3.4.2.7 Queets River Fall

The Queets River drains from the western side of the Olympic Mountains on the north Washington coast and is south of the Hoh River. It is one of four Washington coast river systems that contain fall Chinook salmon with PSC-agreed escapement goals.

Escapement Methodology: Escapement is estimated from redd counts from October 15 to December 1 for fall Chinook salmon.

Escapement Estimate: The 2024 estimate of Queets River fall Chinook salmon natural escapement was 4,068 fish (Figure 2.44).

Escapement Goal Basis: In 2004, the CTC accepted an escapement floor goal of 2,500 for the Queets fall Chinook salmon, developed by QDNR (1982) and Cooney (1984) based on spawner–recruit analyses of data from 1967 to 1982.

Agency Comments: Terminal fisheries are managed by the state and tribes to catch 40% of the terminal run, with an escapement floor of 2,500 spawners. This objective was designed to allow a wide range of spawner escapements from which to eventually develop an MSY objective or proxy while protecting the long-term productivity of the stock.

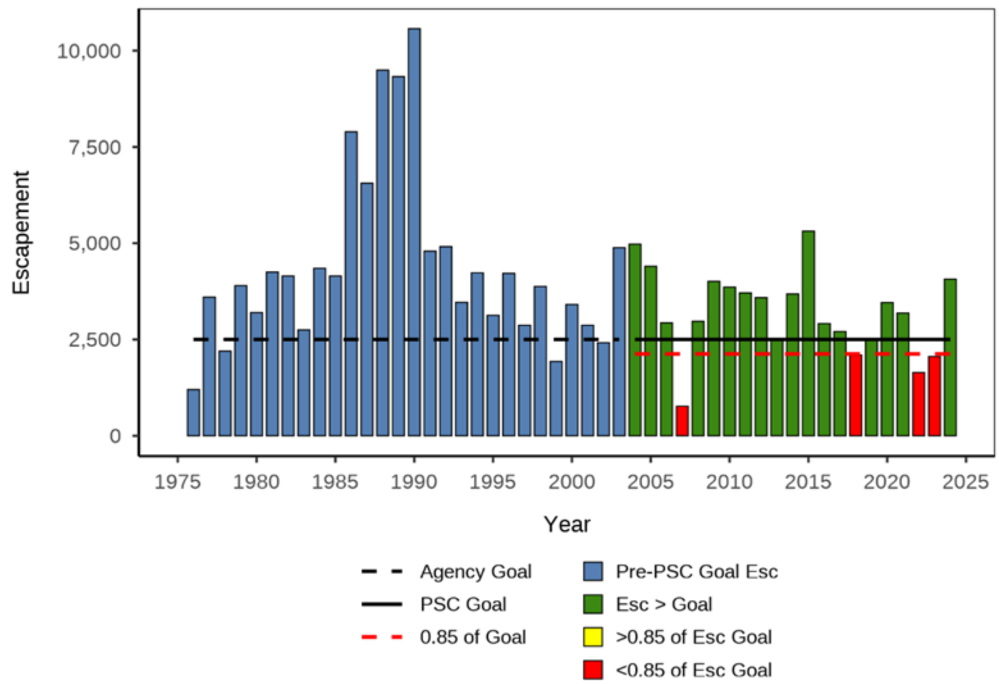


Figure 2.44–Queets River escapement of fall Chinook salmon to the spawning grounds, 1976–2024.

2.3.4.2.8 Grays Harbor Spring

Grays Harbor spring Chinook salmon spawn primarily in the upper reaches of the mainstem Chehalis River and its tributaries.

Escapement Methodology: Escapement is estimated from redd counts from August 15 to October 15 for spring Chinook salmon.

Escapement Estimate: The 2024 natural escapement estimate was 1,775 Chinook salmon (Figure 2.45).

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for this stock group.

Agency Comments: The natural spawning escapement goal established by the state–tribal co-managers for Grays Harbor spring Chinook salmon is 1,400 adult fish (PFMC 2016). This goal was developed as an MSY proxy, derived from actual spawning data from the mid- to late 1970s, and expanded to include additional habitat not covered by spawner surveys.

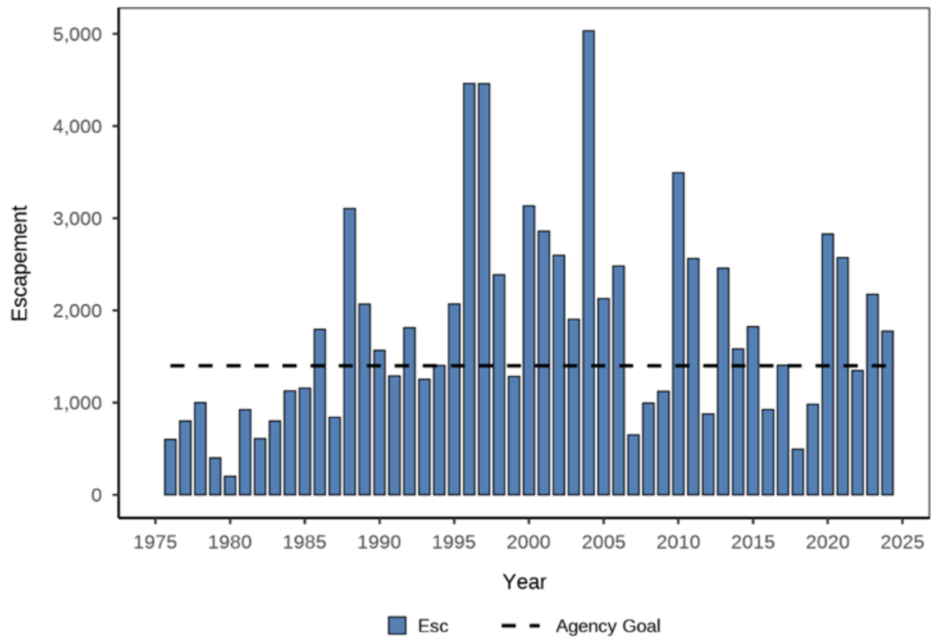


Figure 2.45–Grays Harbor escapement of spring Chinook salmon to the spawning grounds, 1976–2024.

2.3.4.2.9 Grays Harbor Fall

Grays Harbor fall Chinook salmon spawn primarily in the mainstem Chehalis River, in the Humptulips and Satsop rivers where fall Chinook salmon hatchery facilities are located, and in smaller tributaries such as the Wishkah and Hoquiam rivers that flow directly into the harbor. The Grays Harbor fall Chinook stock is one of four Coastal Washington fall Chinook stocks that have PSC-agreed escapement goals.

Escapement Methodology: Escapement is estimated from redd counts from October 15 to December 1 for fall Chinook salmon.

Escapement Estimate: The 2024 natural escapement was 13,803 spawners (Figure 2.46).

Escapement Goal Basis: In 2014, the CTC accepted an escapement goal for Grays Harbor fall Chinook salmon of 13,326 natural spawners based on a spawner-recruit analysis developed by QDNR and WDFW (2014)**.**

Agency Comments: The Grays Harbor fall Chinook salmon escapement goal will be applied in CTC stock-performance evaluations on a stock aggregate basis. This goal, however, is the sum of tributary-specific goals that were derived separately for the Chehalis and Humptulips rivers.

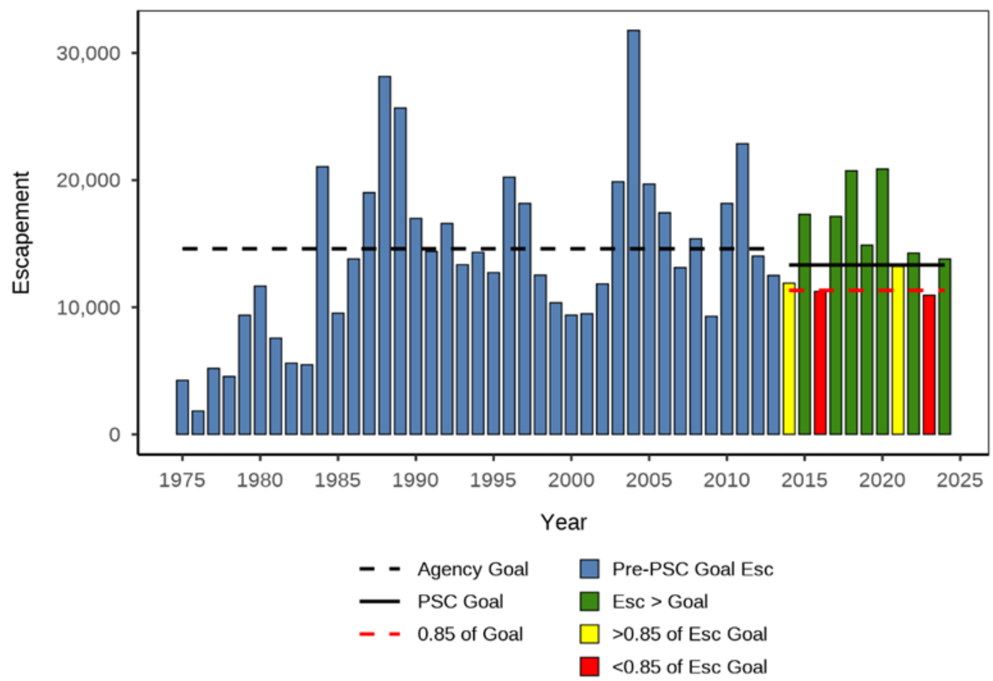


Figure 2.46–Grays Harbor escapement of fall Chinook salmon to the spawning grounds, 1975–2024.

Note: The displayed agency goal line (14,600) relates to the agency goal in effect through 2013; the Pacific Salmon Commission-agreed escapement goal (13,326) will be used in assessments from 2014 onward.

2.3.4.3 Columbia River

Columbia River fisheries are managed under the 2018–2027 *U.S. v. Oregon Management Agreement*, using six harvest indicators, and eleven abundance indicators.

Harvest indicators are used to directly manage fisheries during three fishing periods, based on the number of adults returning to the river mouth:

Run (Fishing Period)	Harvest Indicator
Spring 1 January – 15 June	Upriver spring and Snake River spring/summer Chinook
	Natural-origin Snake River spring/summer Chinook
	Natural-origin Upper Columbia spring Chinook
Summer 16 June – 31 July	Upper Columbia summer Chinook
Fall 1 August – 31 December	Upriver Bright fall Chinook
	Snake River natural-origin fall Chinook

Harvest indicators for spring fisheries above Bonneville Dam include all spring Chinook above Bonneville Dam and summer Chinook originating from the Snake River. These fish have stream-type life histories, migrate quickly offshore, and have fishery impacts that are predominantly terminal. Since they are not listed in Attachment I, they are not addressed in this report.

Upper Columbia summer Chinook have a northern coastal distribution, demonstrate both ocean- and stream-type life histories, are defined as all summer Chinook above Bonneville Dam during the summer period, and are represented by the Mid-Columbia summer Chinook PSC indicator stock.

Most natural-origin Columbia River fall Chinook have ocean-type life histories and coastal distributions with two distinctive races. Lower Columbia River "tule" Chinook return below Bonneville Dam, mature quickly, are caught in the WCVI AABM and U.S. ISBM fisheries, and are represented by the Coweeman Tule fall Chinook PSC escapement indicator. Upriver Bright fall Chinook, which have more prolonged maturation, are comprised of production from above McNary Dam and from the Deschutes and Snake rivers. Upriver Bright fall Chinook above McNary Dam have a northerly distribution, and comprise substantial proportions of catch in SEAK, WCVI and southern U.S. ISBM fisheries. Lewis River wild fall Chinook are monitored by the CTC as an indicator of the Lower River Wild fall Chinook management group, which is comprised of "bright" Chinook below Bonneville Dam.

Abundance indicator stocks and specific performance measures are defined by the *2018-2027 U.S. v. Oregon Management Agreement* to further monitor status of natural-origin populations that may limit Columbia River fisheries:

Abundance Indicator Stocks	
Stock	**Performance Measure**
Upriver spring/summer Chinook	
Snake R natural-origin spring/ summer Chinook	Returning adults at Lower Granite Dam
Upper Columbia R natural-origin spring Chinook	Returning adults at Priest Rapids Dam
Upriver Columbia R natural-origin spring Chinook (Wenatchee, Entiat, Methow)	Sub-basin run size
Snake R spring/summer Chinook index stocks (Bear Valley, Marsh, Sulphur, Minam, Catherine Cr., Imnaha, Poverty Flats, Johnson)	Redd counts
John Day natural-origin spring Chinook	Redd counts
Warm Springs natural-origin spring Chinook	Number of returning adults at Warm Springs NFH weir
Upper Columbia summer Chinook	
Upper Columbia R summer Chinook	Priest Rapids Dam counts
Fall Chinook	
Hanford natural-origin adult fall Chinook	Population estimates
Snake River adult fall Chinook	Number of hatchery and natural adults at Lower Granite Dam
Snake River adult fall Chinook	Redd counts between Lower Granite Dam and Hells Canyon Dam and in Clearwater River
Deschutes River natural- origin adult fall Chinook	Population estimates

2.3.4.3.1 Mid-Columbia Summers

Escapement Methodology: The number of adult Chinook salmon passing Rock Island Dam between June 18 and August 17 (Figure 2.47) serves as a performance measure for the escapement of mid-Columbia summer run Chinook. Escapements for the last 20 plus years have been far above the goal. Some fishing can occur above Rock Island Dam, but harvests have been less than 7,700 except for 2015 and have not affected whether or not the escapement goal has been achieved.

Escapement Goal Basis: The CTC (1999) developed an interim escapement goal of 12,143 adult summer Chinook salmon past Rock Island Dam, using PSC Chinook model predictions of escapement and recruitment.

Agency Comments: Upper Columbia summer Chinook allowable catch in terminal fisheries is determined by an abundance-based harvest rate schedule (2018–2027 U.S. v. Oregon Management Agreement, Appendix Table A2). The harvest rate schedule is "based on an interim management goal of 29,000 hatchery and natural origin adults as measured at the Columbia River mouth. The management goal is based on an interim combined spawning escapement goal of 20,000 hatchery and natural adults" (2018–2027 U.S. v. Oregon Management Agreement), and average inter-dam loss (IDL) estimates. The harvest rate schedule allows rates near 5% for adult run sizes up to 16,000, and 15% to 17% for run sizes up to 36,250 (125% of 29,000). Between returns of 36,250 and 50,000 fish, harvestable surplus is the run size less 29,000, and above 50,000, 75% of the additional run becomes harvestable surplus, while the other 25% is foregone to escapement. Although management is not constrained by individual stock components, sub-basin objectives are 13,500 Wenatchee/Entiat/Chelan spawners, 3,500 Methow/Okanogan spawners and 3,000 hatchery brood stock.

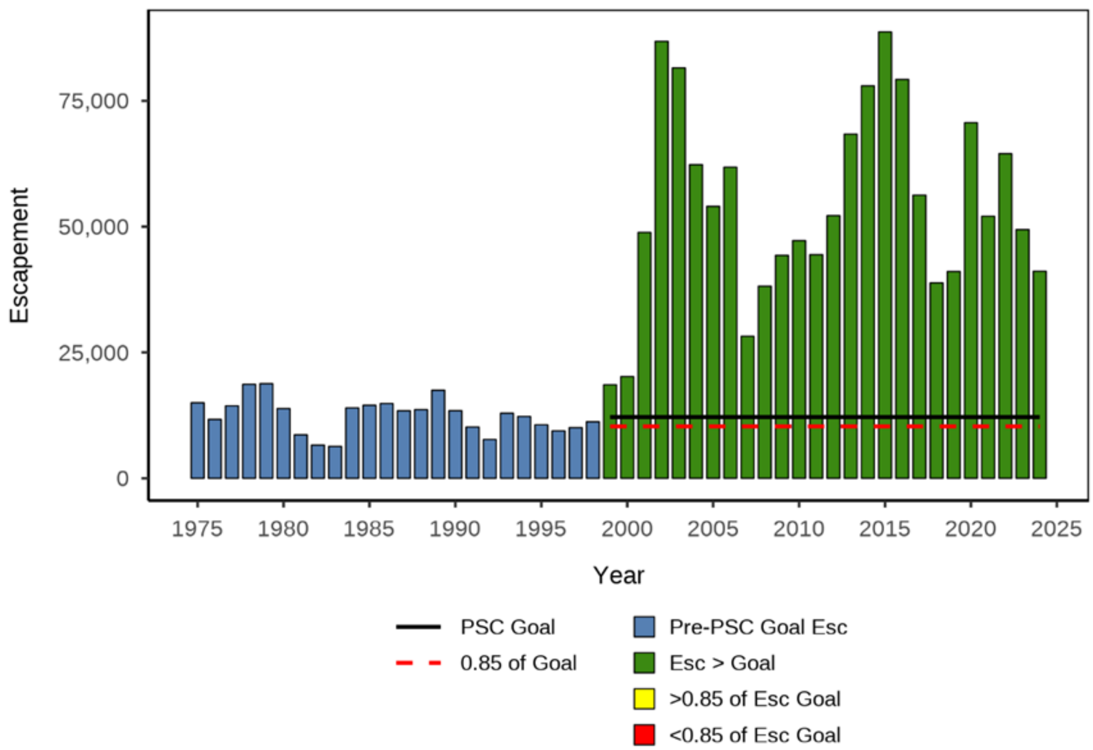


Figure 2.47–Adult passage of Mid-Columbia summer Chinook salmon at Rock Island Dam, 1975–2024.

2.3.4.3.2 Columbia Upriver Brights

Escapement Methodology: The escapement (Figure 2.48) is computed as the McNary Dam count from August 9th through December 31st minus adult Hanford Reach sport catch, Wanapum tribal catches, and brood stock taken at Priest Rapids, Ringold and Snake River hatcheries. Since the early 2020s escapements have been above goal; with exceptionally large escapements in 2013 –2015.

Escapement Goal Basis: The PSC-agreed escapement goal for Columbia Upriver Brights is 40,000 naturally spawning fish past McNary Dam based on stock–recruitment analyses.

Agency Comments: Upriver Brights are managed according to an abundance-based harvest rate schedule (2018–2027 U.S. v. Oregon Management Agreement, Appendix Table A3), with intent to achieve a minimum management goal of 60,000 adult fall Chinook salmon at McNary Dam. This goal includes migrants to both the upper Columbia and the Snake Rivers. The *U.S. v. Oregon* Parties also agreed to a minimum goal of 43,500 Upriver Bright escapement to provide spawning in the Hanford Reach, Lower Yakima River, and mainstem Columbia River above Priest Rapids Dam, as well as Priest Rapids Hatchery production. Fall Bright Chinook salmon fisheries are managed according to a harvest rate schedule ranging from 21.5% to 45% of Upriver Brights, depending on either (1) the expected river mouth run size of the aggregate Upriver Bright Chinook salmon run, or (2) the Snake River natural-origin Chinook salmon run—if that run size is associated with a lower harvest rate. Constraints on fall Chinook salmon fisheries also include the 15% harvest rate limit on commingled ESA-listed B-run summer steelhead (>78 cm) when the forecast for the latter is for less than 20,000, projected fishery impacts on ESA-listed Snake River wild fall Chinook, as well as fishery impacts on meeting hatchery broodstock goals (e.g., tule fall Chinook salmon at Spring Creek Hatchery).

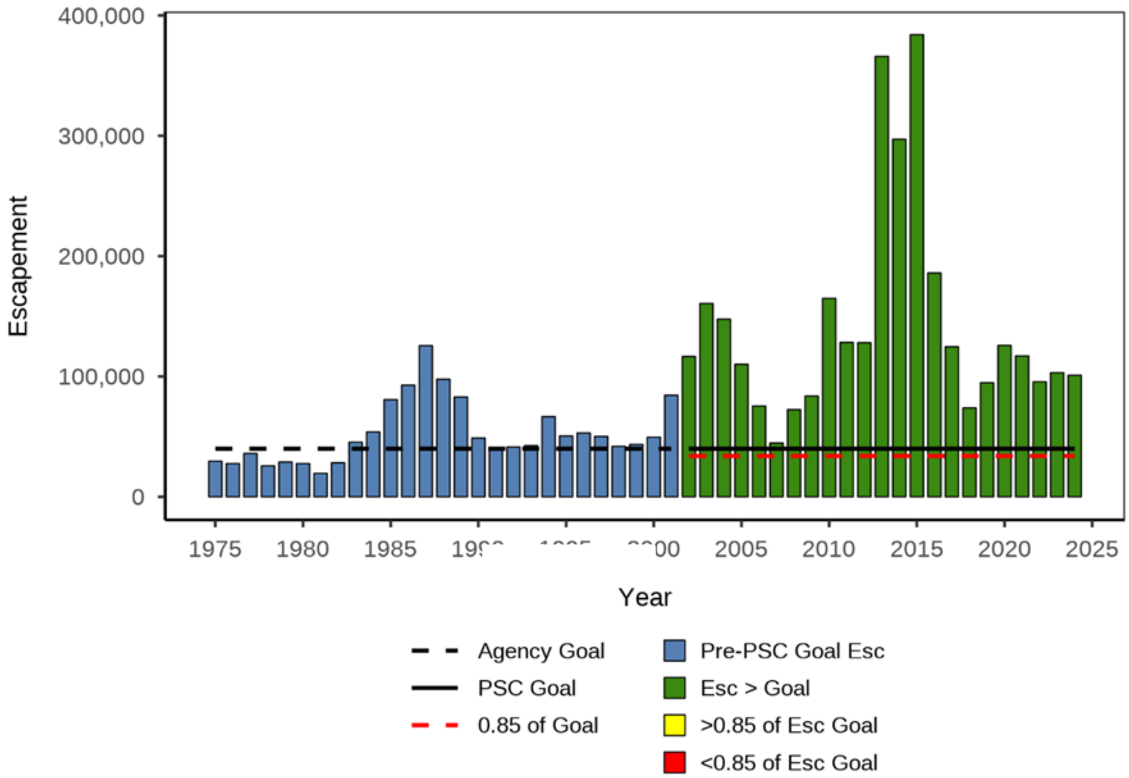


Figure 2.48–Upriver Bright Chinook salmon escapements, 1975–2024.

2.3.4.3.3 Coweeman River Tules

The Coweeman River is a 3rd order tributary to the Cowlitz River located in Cowlitz County, Washington and drains approximately 329 km^2. This watershed supports a small population of mostly natural-origin 3 and 4-year-old tule fall Chinook salmon. The Coweeman escapement indicator stock represents ESA listed natural tule fall Chinook salmon production from the Lower Columbia River.

Escapement Methodology: From 2002 to 2011, PSC funding was used to conduct intensive studies to estimate Chinook escapement for fish > 59 cm in the basin using a variety of methods. Escapement was estimated using **m**ark-**r**ecovery methodologies from 2002 to 2004, and in 2011. Live-count area under the curve (AUC) abundance estimation methodologies were used in 2005 and 2006. Redd-based methodologies were used in 2007 and 2008, and genetic mark–recapture (GMR) methodologies were used in 2009 and 2010. Since 2011, a combination of physical MR of fish above the weir and redd count expansion for fish spawning below the weir have been used. A time series of expanded escapement estimates and further details for each year are available on WDFW's Salmon Stock Inventory (SaSI) system (WDFW 2023). Those estimates of Figure 2.49total naturally spawning fish from the mouth of Mulholland Creek (rm 18.4) downstream to the Jeep Club Bridge (rm 13.1) are graphed in Figure 2.49 as "Traditional

Esc”. The estimates from these studies were on average 23% higher than those based on expanding peak fish counts, but study estimates for 2005 and 2007 were nearly double the peak count estimates.

Escapement Goal Basis: The Coweeman stock has no PSC-agreed goal. It is managed according to an abundance-based exploitation rate ceiling schedule (30–41%), which includes ocean and in-river fisheries, for Lower Columbia River Tule Chinook salmon under ESA fishery consultation standards. The ESA recovery goal is 3,600 with a maximum recovery exploitation rate determined by NOAA, and an interim minimum natural escapement goal of 1,000.

Agency Comments: Escapements since 2014 have been less than the Agency minimum natural escapement goal of 1,000 (Figure 2.49).

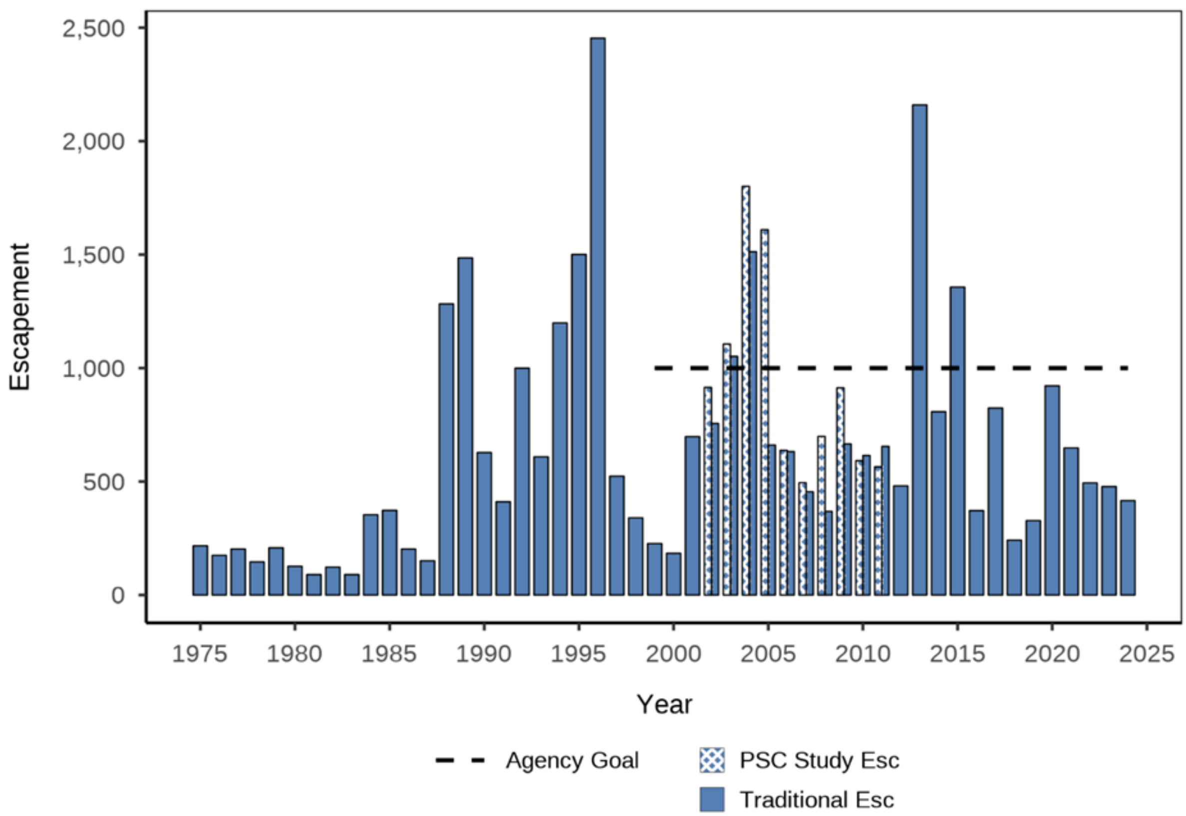


Figure 2.49–Coweeman River tule fall Chinook salmon escapements, 1975–2024.

2.3.4.3.4 Lewis River Fall

Escapement Methodology: Most natural bright fall Chinook salmon production below Bonneville Dam occurs in the North Fork Lewis River. The Lewis River Wild stock is the main component of the Lower River Wild management unit for fall Chinook salmon, which also includes small amounts of wild production from the Cowlitz and Sandy River basins. Escapement goal and estimates in Figure 2.50 are specific to the Lewis River component.

Since the mid-1960s, the Washington Department of Fish and Wildlife (WDFW) has surveyed Chinook salmon spawning in the mainstem North Fork Lewis River below Merwin Dam. While estimation methods have varied historically, WDFW has used a consistent mark-recapture approach with Jolly-Seber open-population analysis since 2013 (Bentley et al. 2018). Wild Lewis smolts have been coded-wire-tagged since 1977. In addition to supporting estimates of fishing mortality, CWT recoveries from spawning surveys are used to partition natural-origin escapement by population (i.e., tule- and bright-run NF Lewis Chinook).

Escapement Goal Basis: The escapement goal of 5,700 fall Chinook in the Lewis River was developed by McIsaac (1990) based on spawner–recruit analysis of the 1964 to 1982 broods and CWT recoveries from the 1977 to 1979 broods. This analysis was updated by the CTC (1999) using brood years 1964 to 1991 and 5,700 was accepted as a PSC goal.

Agency Comments: Lewis River escapements have been above the escapement goal since 1979, except for 1999, 2006–2008, and 2018 (Figure 2.50).

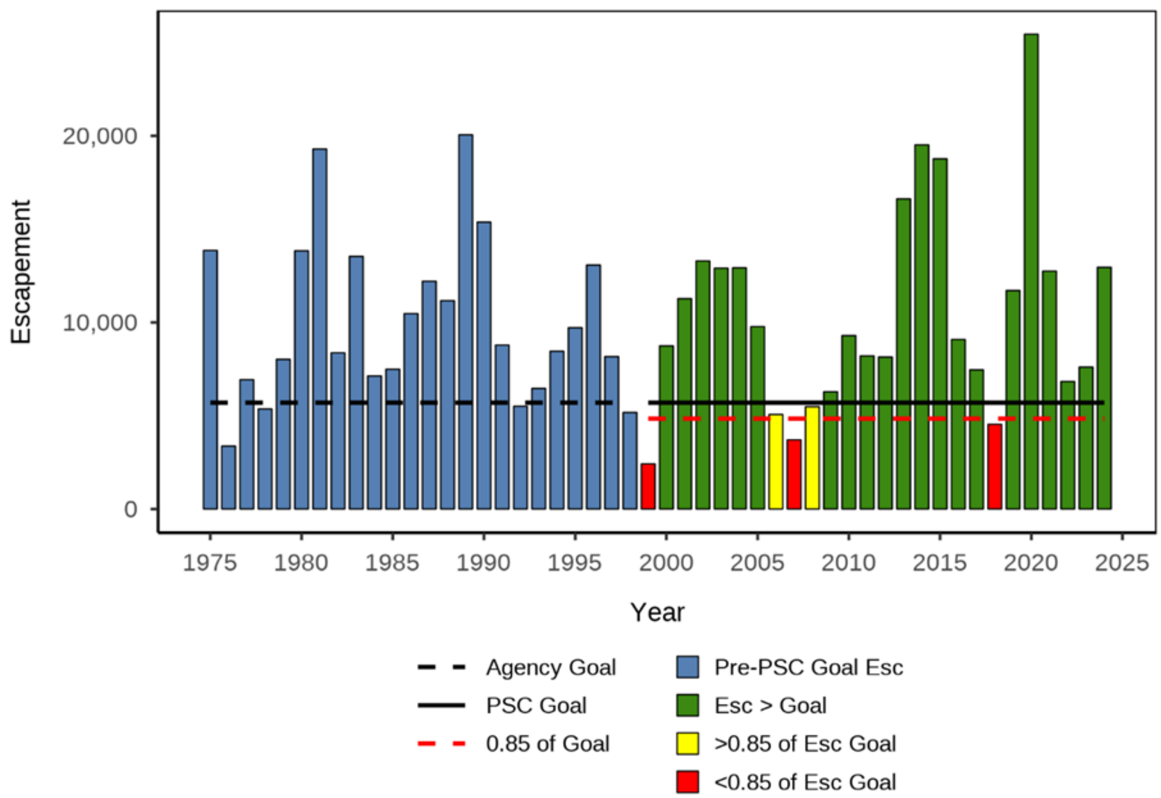


Figure 2.50–Lewis River fall Chinook salmon escapements, 1975–2024.

2.3.4.4 Coastal Oregon

The North Oregon Coast (NOC) and Mid-Oregon Coast (MOC) Chinook salmon are aggregates with stocks migrating to SEAK, NBC, and WCVI AABM fisheries. With the adoption of the 2019 PSC Chinook Model containing updated base period information, both NOC and MOC aggregates are now accounted for in PSC management.

2.3.4.4.1 North Oregon Coast

Stocks in the NOC aggregate are Chinook salmon spawning from the Nehalem River in the north through the Siuslaw Basin in the south. Three escapement indicator stocks represent the production of NOC Chinook salmon: the Nehalem, Siletz, and Siuslaw stocks. Other stocks in the NOC aggregate include the Nestucca, Yaquina, Alsea, and Tillamook stocks. The Tillamook stock includes several substocks from the Kilchis, Miami, Trask, Tillamook and Wilson rivers.

The NOC Chinook salmon production consists predominantly of naturally spawned, fall-returning fish, with an ocean-type life history. Adult spawning escapement is dominated by 4-year-old, particularly, and 5-year-old fish, with smaller proportions of 3-year-olds, as well as relatively small proportions of 6-year-olds. These Chinook salmon from the NOC aggregate are caught primarily in SEAK, NBC, and in terminal fisheries.

Forecasts for the NOC aggregate are based on forecast models developed for each discrete stock, both indicator and non-indicator stocks. The aggregate forecast for NOC is the sum of the forecasts for the individual basins within the geographic range. Forecasting methods were developed in 2008 and are continually refined with each year's additional information. Prior to 2008, the aggregate forecast (and each of the indicator stock forecasts) was based on a running 3-year average.

Of the three escapement indicators for the NOC aggregate, only the Siletz has met its escapement goal this past year. The Nehalem has exhibited mixed performance since 2019, with 4 years meeting goal and 2 years not meeting goal. The third escapement indicator stock within the NOC, the Siuslaw, has suffered from protracted low escapement since 2017, with a single year (2020) within this time series in which this stock attained its goal.

2.3.4.4.1.1 Nehalem River Fall

Escapement Methodology: Both stream surveys and Mark-Recapture (MR) experiment-based calibrations, expanded to represent available habitat (the historic agency methods), were used to estimate escapement in the Nehalem during the 2024 return year. Standard estimates were generated from peak abundance observed during surveys of historically walked index areas of known spawning habitat within the basin. These observations were then adjusted by estimates of the total available habitat, estimated observer bias, the total escapement encountered during the peak count, and the bias observed between these predefined surveys and other survey areas that were randomly selected. Figure 2.51 represents escapement estimates generated using historical agency methodologies as compared to the established escapement goal. Since the adoption of the Phase II base period PSC Chinook Model in 2019, escapement estimates based on calibration factors derived and directly tied to MR studies in this basin have been employed to provide for relatively accurate and precise assessments of this basin's adult Chinook escapement but are not displayed in those graphs depicting the basin's escapement goal.

Escapement Goal Basis: The current point goal of 6,989 spawners was derived by Zhou and Williams (1999) and was based on assessments of escapement made through historical survey methodology.

Agency Comments: Methods of escapement estimation comparable to those used to generate the agreed-to escapement goal for Nehalem indicate a 2024 escapement of 4,065 adult spawners. This is 58% of the current escapement goal. Based on multiple forecasting models, the Nehalem stock is not forecasted (4,994) to meet the escapement goal in 2025.

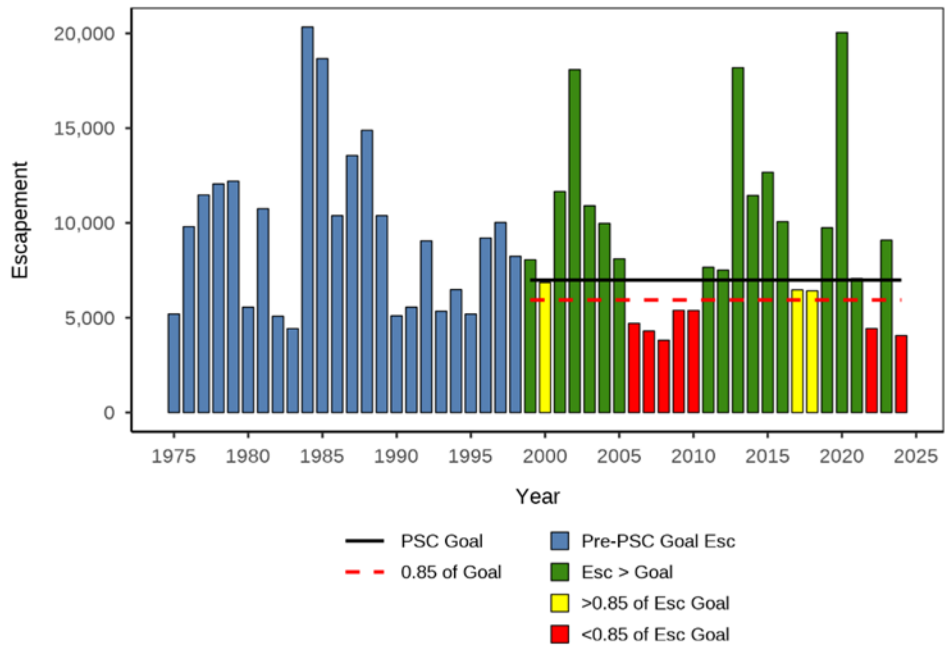


Figure 2.51–Nehalem River escapements of Chinook salmon, 1975–2024.

2.3.4.4.1.2 Siletz River Fall

Escapement Methodology: Escapement estimates were generated from peak abundance observed in historically walked predefined areas of known spawning habitat within the basin. These observations were then adjusted by estimates of the total available habitat, estimated observer bias, the total escapement encountered during the peak, and the bias observed between these predefined surveys and randomly selected survey areas. Escapement estimates generated using this method were used to develop the escapement goal and are presented in (Figure 2.52).

Escapement Goal Basis: The current point goal of 2,944 spawners is from Zhou and Williams (2000) and was based on assessments of escapement made through standard survey count expansion methodology.

Agency Comments: This stock has been studied with funds from the SSP to improve escapement estimation using MR methods. However, traditional/standard methods of escapement estimation continue until a goal based on MR calibrated surveys is complete. The estimate derived from standard methods was 5,547 fall Chinook salmon (188% of goal) in 2024. Since the goal was adopted, the Siletz stock has not met it in only 2007-2009, years of generally low returns coastwide. This stock is forecasted (5,567) to exceed its escapement goal in 2025.

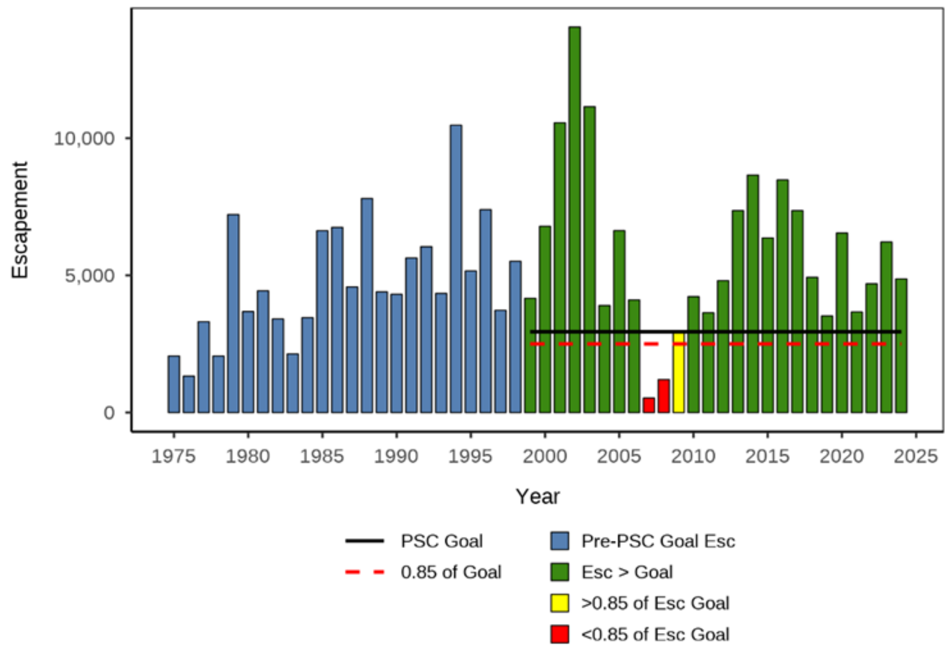


Figure 2.52–Siletz River fall escapements of Chinook salmon, 1975–2024.

2.3.4.4.1.3 Siuslaw River Fall

Escapement Methodology: Standard habitat-based expansion methodology and updated estimates based on MR calibration (experiments conducted in 2001-06 and 2014) factors were used to represent the escapement in the Siuslaw basin during 2024. Standard estimates were generated from observation of peak abundance in historically walked, predefined areas of known spawning habitat within the basin. These observations were then adjusted by estimates of the total available habitat, estimated observer bias, the total run encountered during the peak, and the bias observed between these predefined surveys and randomly selected surveys. These standard estimates were used to derive the current escapement goal and are used for comparison (Figure 2.53).

Escapement Goal Basis: The current point goal of 12,925 spawners was derived in 2000 by Zhou and Williams (2000) and was based on assessments of escapement made through standard survey/expansion methodology.

Agency Comments: Escapement in 2024 for the Siuslaw stock, estimated based on standard habitat expansion methods, was 9,557 adult spawners (74% of the escapement goal). Terminal fishery reductions in 2020 aided in reaching goal; such restrictions continued into 2021, and the terminal sport fishery in the Siuslaw was closed for the 2022 return year. This stock is forecasted (10,382) to not meet the escapement goal in 2025.

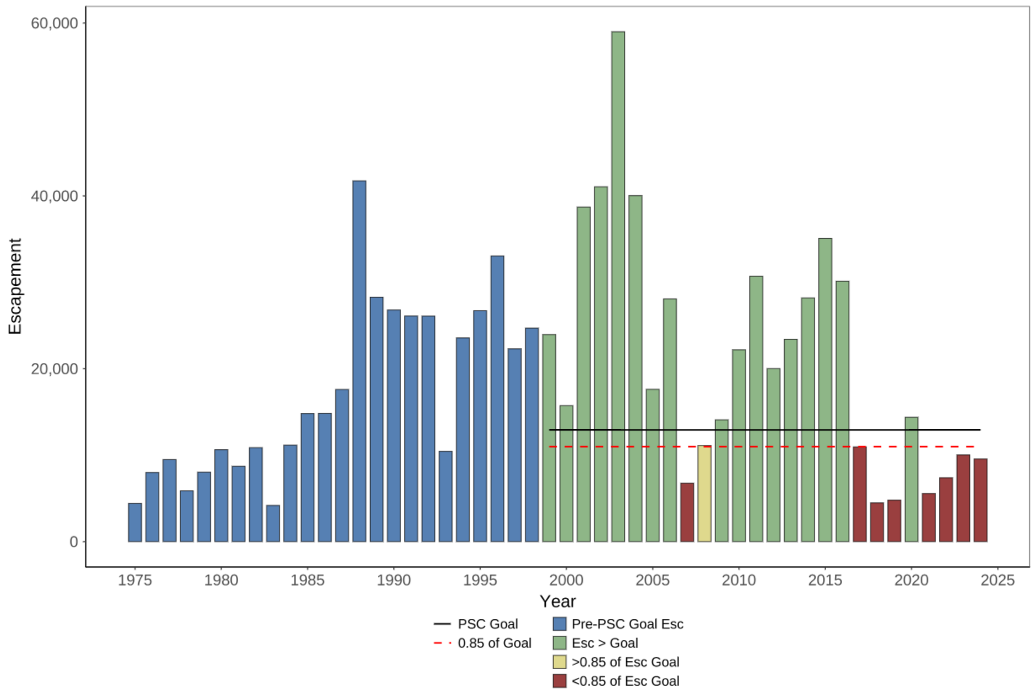


Figure 2.53–Siuslaw River fall escapements of Chinook salmon, 1975–2024.

2.3.4.4.2 Mid-Oregon Coast

The South Umpqua and the Coquille stocks are the two escapement indicator stocks for the MOC aggregate. This area is bounded by the Umpqua River in the north and the Elk River Basin in the south, and includes two additional major basins, the Coos and Coquille, and two small basins, Floras Creek and the Sixes River.

The MOC consists of a mixture of natural and hatchery-produced salmon, mostly natural, both of which return in the fall and follow an ocean-type life history. The largest age class proportion typical among spawners is 4-year-old fish, followed by 3-year-olds, then 5-year-olds, with some very rare 6-year-old fish. These Chinook salmon are caught primarily in SEAK, NBC, WCVI, and PFMC fisheries and in terminal fisheries. Basins within this aggregate have, generally, experienced an escapement downturn since 2017, with the Coquille stock plummeting to numbers far below those observed historically.

Forecasts for MOC stocks, except for the Elk River stock, are based on multiple forecasting models which are updated and reassessed annually. Forecasts for the Elk River stock are based on projected survival rates of hatchery releases and recent proportions of wild adults in the aggregate return.

2.3.4.4.2.1 South Umpqua River Fall

Escapement Methodology: Between 1987 and 2013, aerial spawning surveys for fall Chinook salmon were conducted by the ODFW on both the South Umpqua River and Cow Creek. These surveys were started as part of Douglas County’s mitigation plan for the construction and operation of Galesville Dam on upper Cow Creek.

However, following a 2013 crash that injured two ODFW employees and the pilot, ODFW aerial surveys were discontinued and methods changed. The new method includes a sum of dead count from two combined spawning ground surveys within the South Umpqua drainage that together have strong correlation with MR escapement estimates. This strong relationship to the MR estimates allows for both the long-term redd count data and more contemporary sum of dead counts to correlate to known fish abundance. Figure 2.54 shows Umpqua basin escapement of fall Chinook salmon, 1978–2024.

Escapement Goal Basis: There is no Umpqua escapement goal, and when developed it will be based on MR experiment derived escapement estimates; experiments were conducted in 1998-2004, which ODFW hopes to supplement with additional, more current experiments.

Agency Comments: Recoveries of CWTs from fall run Chinook salmon from the Umpqua River indicate that they are caught in PST AABM fisheries, particularly SEAK and NBC. Budget constraints precluded 2016 field work required for S. Umpqua escapement estimation. Sampling in 2024 generated an escapement estimate of 616 adult Chinook salmon in S. Umpqua, the lowest since 1980. Umpqua basin return is forecasted (4,710) to continue to rebuild in the coming return year 2025.

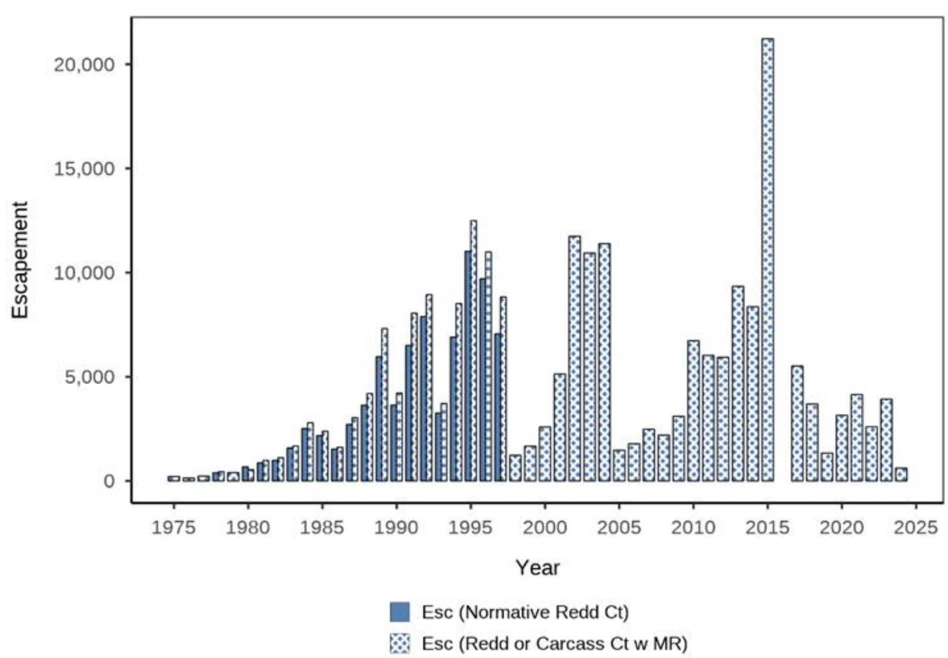


Figure 2.54–Umpqua basin escapement of fall Chinook salmon, 1975–2024.

2.3.4.4.2.2 Coquille River Fall

Escapement Methodology: MR-calibrated conducted surveys based on average peak count density of adult spawners (maximum number of all live, dead and previously handled fish on all survey areas) were used to measure escapement in 2024. Values presented in Figure 2.55 are based on calibration to MR estimates (2001-04) and may also be found in Appendix Table B11.

Escapement Goal Basis: ODFW has engaged in analysis to produce an escapement goal for this stock, but this would not be useful/applicable until Coquille Chinook recover from their current depressed state.

Agency Comments: The trend since 2018 of very low Coquille adult escapement relative to previous years continued in 2024. This is the seventh year in a row in which this stock has exhibited very poor escapement performance and consequently ODFW has elected to continue the closure of terminal fishing for Chinook in this basin for the 2025 season, and a new Conservation Hatchery program has begun operation.

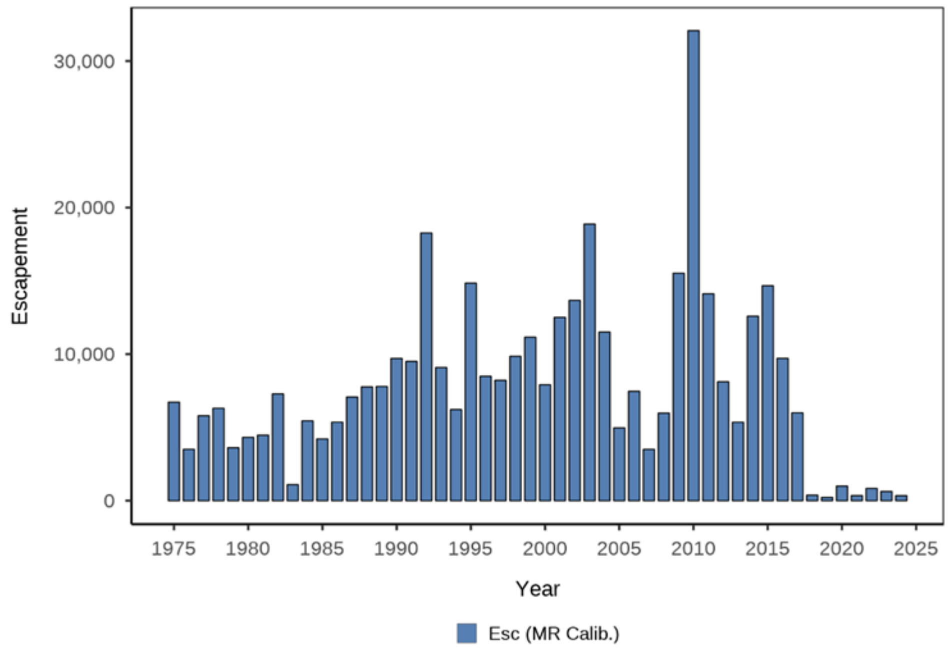


Figure 2.55–Coquille River escapement of fall Chinook salmon, 1975–2024.

3. Stock Status

3.1 Synoptic Evaluation of Stock Status

The following sections in this report evaluate stock status. Central to this assessment are synoptic evaluations, which provide summary information for individual escapement indicator stocks and present both the current stock status and the history of the stock status relative to PST management regimes. Information used in these figures includes (1) escapement data; (2) PSC-agreed MSY management objectives (or, in some cases, habitat model or other agency escapement objectives that have yet to be agreed upon by the CTC); and (3) exploitation rates from CWT indicator stocks, which together summarize the performance of the stocks and fisheries management relative to established or potential goals.

Synoptic evaluation plots resemble those presented for groundfish in Garcia and De Leiva Moreno (2005). A general depiction of the plots is provided in Figure 3.1. The plot shows the exploitation rate (x-axis) and escapement (y-axis) of each stock for available years of data. There are three reference lines, two horizontal lines for escapement benchmarks related to PSC- or agency-defined management objectives that produce MSY (i.e., S_{MSY}) and one vertical line representing the exploitation rate associated with MSY (i.e., U_{MSY}). Unless stated otherwise, management objectives are defined in Chapter 3, Attachment I of the 2019 Agreement. For stocks with point escapement goals, the upper horizontal line is S_{MSY}, and the lower line is 85% of S_{MSY}. For stocks with escapement objectives defined as ranges (i.e., SEAK and TBR stocks), the upper horizontal line is the lower bound of the escapement range and the lower line is 85% of the lower bound.

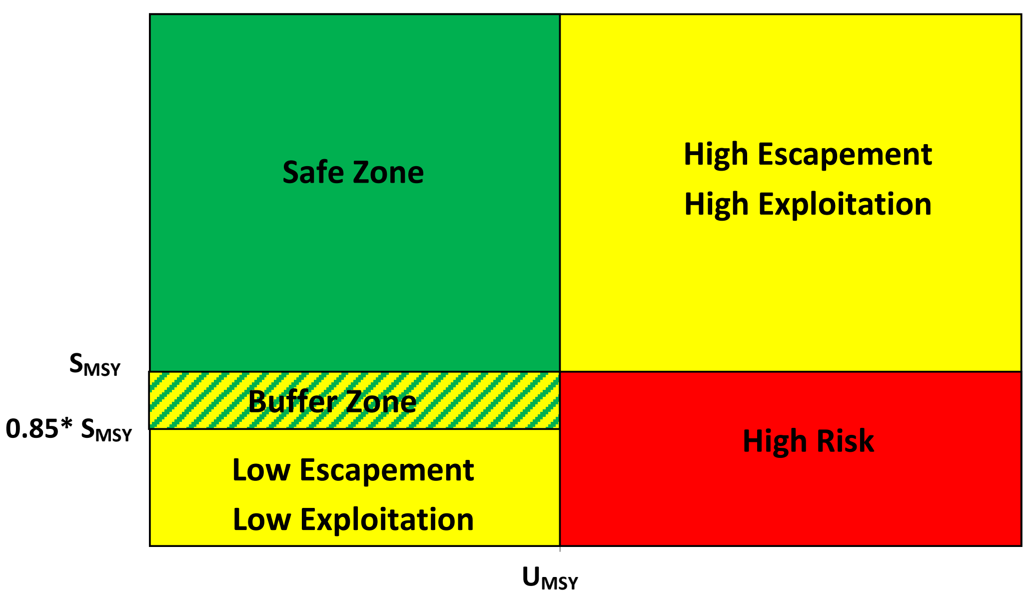


Figure 3.1– Example plot for synoptic evaluations of Pacific Salmon Treaty Chinook salmon stocks showing the three reference lines and the five status zones.

The three reference lines produce five zones in the synoptic plots. The green area (Safe Zone) in Figure 3.1 represents a healthy stock status where fishing is below U_{MSY}, and the stock escapement is above the management objective. The red area (High Risk) represents a stock in which exploitation is above U_{MSY} and escapement is below the management objective. The two yellow areas (High Escapement High Exploitation, Low Escapement Low Exploitation) represent situations in which the stock could be in danger of falling into an area of conservation concern; in the upper right (High Escapement High Exploitation), escapement is at a healthy level, but fishing mortality is above the U_{MSY} limit, and in the lower left (Low Escapement Low Exploitation), fishing is occurring below the U_{MSY} limit but the population failed to attain a desired minimum escapement. The cross-hatched area is the Buffer Zone, where fishing mortality is below U_{MSY} and escapement, though below the management objective, falls within the expected range of measurement error.

Exploitation rates used in the synoptic plots are one of the following: calendar year exploitation rates, preterminal cumulative mature-run equivalent (MRE) exploitation rates, or total (preterminal and terminal) cumulative mature-run equivalent exploitation rates. Total cumulative mature-run equivalent exploitation rates are not used when there is a terminal fishery targeting an indicator stock because the terminal exploitation on that stock will differ from that of the stock being represented. The ages used in the escapement and exploitation rate calculations are not the same for each stock and typically exclude the youngest age (i.e., age 2 for ocean-type stocks and age 3 for stream-type stocks).

Calendar year exploitation rates, $CYER_{CY}$, are computed as

$$CYER_{CY} = \frac{OceanMorts_{CY} + TermMorts_{CY}}{(OceanMorts_{CY} + TermMorts_{CY} + OESC_{CY})}$$

Cumulative mature-run equivalent exploitation rates, $CMREER_{CY}$, are computed as

$$CMREER_{CY} = 1 - \left(\frac{OESC_{CY}}{PESC_{CY}}\right)$$

Observed escapement for calendar year *CY*, $OESC_{CY}$, is computed as

$$OESC_{CY} = \sum_{a=startage}^{maxage} OESC_{CY,a},$$

Potential escapement for calendar year *CY*, $PESC_{CY}$, is computed as

$$PESC_{CY} = \sum_{a=startage}^{maxage} PESC_{CY,a},$$

Potential escapement for calendar year *CY* and age *a*, $PESC_{CY,a}$, is computed as

$$PESC_{CY,a} = \frac{OESC_{CY,a}}{CumSurvRte_{CY-a,a}}.$$

When computing total (preterminal and terminal) cumulative mature-run equivalent exploitation rates, the cumulative survival rate for brood year *BY* and age *a*, $CumSurvRte_{BY,a}$, is computed as

$$CumSurvRte_{BY,a} = TermSurvRte_{BY,a} * \prod_{i=startage}^{a} PreTermSurvRte_{BY,i}$$

And when computing preterminal cumulative mature-run equivalent exploitation rates, the cumulative survival rate for brood year *BY* and age *a*, $CumSurvRte_{BY,a}$, is computed as

$$CumSurvRte_{BY,a} = \prod_{i=startage}^{a} PreTermSurvRte_{BY,i}$$

Preterminal harvest rates for brood year *BY* and age *a*, $PreTermHR_{BY,a}$, are computed as

$$PreTermHR_{BY,a} = \frac{OceanMorts_{BY,a}}{CohortSizeANM_{BY,a}}$$

Preterminal survival rates for brood year *BY* and age *a*, $PreTermSurvRte_{BY,a}$, are computed as

$$PreTermSurvRte_{BY,a} = 1 - PreTermHR_{BY,a}$$

See Table 3.1 for parameter definitions.

Table 3.1–Parameter definitions for all equations used to estimate calendar year exploitation rates and cumulative mature-run exploitation rates.

Parameter	Description
a	Age
BY	Brood year
CY	Calendar year
$CMREER_{CY}$	Cumulative mature-run equivalent exploitation rate for calendar year *CY*
$CohortSizeANM_{BY,a}$	Cohort size after natural mortality for brood year *BY* and age *a*
$CumSurvRte_{BY,a}$	Cumulative survival rate for brood year *BY* and age *a*
$CYER_{CY}$	Calendar year exploitation rate for calendar year *CY*
$maxage$	Oldest age
$OceanMorts_{BY,a}$	Ocean mortalities for brood year *BY* and age *a*
$OceanMorts_{CY}$	Ocean mortalities for calendar year *CY*
$OESC_{CY}$	Observed escapement for calendar year *CY*
$OESC_{CY,a}$	Observed escapement for calendar year *CY* and age *a*
$PESC_{CY}$	Potential escapement for calendar year *CY*
$PESC_{CY,a}$	Potential escapement for calendar year *CY* and age *a*
$PreTermHR_{BY,a}$	Pre-terminal harvest rate for brood year *BY* and age *a*
$PreTermSurvRte_{BY,a}$	Pre-terminal survival rate for brood year *BY* and age *a*
$startage$	Youngest age
$TermMorts_{CY}$	Terminal mortalities for calendar year *CY*
$TermSurvRte_{BY,a}$	Terminal survival rate for brood year *BY* and age *a*

The information needed to conduct synoptic evaluations are available for most escapement indicator stocks (Table 3.2). Most escapement indicator stocks have a companion exploitation rate indicator stock and, with suitable assumptions, a cumulative mature-run equivalent exploitation rate can be estimated. Most areas along the West Coast have escapement indicator stocks. Exploitation rate data may not be available for some years, so associated plots may have different start years. Similarly, there are some stocks for which data are unavailable in the most recent year, particularly in the Southern U.S. because sport fishery catches needed for CWT expansions are generally not available in the most recent year. Region-specific synoptic evaluations of Chinook stocks are presented in Section 3.2. Stock-specific synoptic plots presented in this section are grouped by Treaty period: pre-Treaty (1975–1984), 1985–1998, 1999–2008, 2009–2018, and 2019–2028.

Table 3.2–Summary of information available for synoptic stock evaluations.

Note: Shaded rows indicate stocks that cannot be evaluated because of data gaps.

Stock Region[1]	Escapement Indicator	Management Objective[2]	S_{MSY}[3]	85% of S_{MSY}[3]	U_{MSY}[3]	Exploitation Rate Indicator[3]	Exp. Rate Type[4]
SEAK	Situk	500-1,000	600	425[5]	0.81	TBD	CY
SEAK	Chilkat	1,750-3,500	2,200	1,488[5]	0.40	CHK	CY
SEAK	Unuk	1,800-3,800	2,764	1,530[5]	0.60	UNU	CY
TBR	Alsek	3,500-5,300	4,677	2,975[5]	0.58	TBD	CY
TBR	Taku	19,000-36,000	25,500	16,150[5]	0.59	TAK	CY
TBR	Stikine	14,000-28,000	17,400	11,900[5]	0.42	STI	CY
NBC	Kitsumkalum[6]	TBD	5,235	4,450	0.63	KLM	CMRE
BC	Skeena	TBD	TBD	TBD	TBD	KLM	CMRE
BC	Atnarko	5,009[7,8]	5,009	4,258	0.77	ATN	CMRE
BC	NWVI Natural Aggregate	TBD	TBD	TBD	TBD	RBT adjusted[9]	CMRE
BC	SWVI Natural Aggregate	TBD	TBD	TBD	TBD	RBT adjusted[9]	CMRE
BC	East Coast Vancouver Island North	TBD	TBD	TBD	TBD	QUI adjusted[9]	CMRE
BC	Phillips	TBD	TBD	TBD	TBD	PHI	CMRE
BC	Cowichan	6,500	6,514	5,537	0.69	COW	CMRE
BC	Nicola	TBD	6,600[10]	5,600[10]	0.60[10]	NIC	CMRE
BC	Chilcotin	TBD	TBD	TBD	TBD	TBD	CMRE
BC	Chilko	TBD	TBD	TBD	TBD	CKO(TBD)[9]	CMRE
BC	Lower Shuswap	12,300[7]	12,339	10,488	0.73	SHU	CMRE
BC	Harrison	75,100	75,072	63,811	0.57	HAR	CMRE
WA/OR	Nooksack spring	TBD	TBD	TBD	TBD	NSF	CMRE
WA/OR	Skagit spring	1,024	1,024	870	0.45	SKF	CMRE
WA/OR	Skagit summer/fall	8,201	8,201	6,971	0.59	SSF	CMRE
WA/OR	Stillaguamish	TBD	TBD	TBD	TBD	STL	CMRE
WA/OR	Snohomish	TBD	TBD	TBD	TBD	SKY	CMRE
WA/OR	Hoko	TBD	TBD	TBD	TBD	HOK	CMRE
WA/OR	Grays Harbor fall	13,326	13,326	11,327	0.67	QUE adjusted[9]	CMRE
WA/OR	Queets fall	2,500	2,500	2,125	0.87	QUE	CMRE
WA/OR	Quillayute fall	3,000	3,000	2,550	0.87	QUE adjusted[9]	CMRE
WA/OR	Hoh fall	1,200	1,200	1,020	0.90	QUE adjusted[9]	CMRE
Columbia	Upriver Brights	40,000	40,000	34,000	0.56	URB HAN	CMRE
Columbia	Lewis River fall	5,700	5,791	4,922	0.79	LRW	CMRE
Columbia	Coweeman	TBD	TBD	TBD	TBD	CWF	CMRE
Columbia	Mid-Columbia summers	12,143	12,143	10,322	0.75	SUM	CMRE
WA/OR	Nehalem	6,989	6,989	5,941	0.69	SRH adjusted[9]	CMRE
WA/OR	Siletz	2,944	2,944	2,502	0.81	SRH adjusted[9]	CMRE
WA/OR	Siuslaw	12,925	12,925	10,986	0.61	SRH adjusted[9]	CMRE
WA/OR	South Umpqua	TBD	TBD	TBD	TBD	ELK adjusted[9]	CMRE
WA/OR	Coquille	TBD	TBD	TBD	TBD	ELK adjusted[9]	CMRE

[1] See List of Acronyms for region definitions.
[2] TBD = to be determined after review specified in paragraph 2(b)(iv) of Chapter 3 of 2019 PST Agreement.
[3] TBD = to be determined because the requisite data are not available.
[4] Two types of exploitation rates are used: cumulative mature-run equivalents (CMRE), which are based on coded-wire tag (CWT) recovery data, and calendar year (CY), which are based on actual stock assessment data gathered annually.
[5] Stocks with an escapement goal range use 85% of the lower bound.
[6] Kitsumkalum is not an Attachment I escapement indicator stock.

[7] Agency escapement goal has the same status as PSC-agreed escapement goal for implementation of Chapter 3.
[8] Natural origin spawners.
[9] CWT exploitation rate indicator stocks and fishery adjustments described in CTC (2016), CTC (2019), and CTC (2021).
[10] Revised habitat-based values that also include an adjustment for the lower-than-average fecundity of this stock.

A summary plot of the 24 stocks with synoptic evaluations for 2024 shows most stocks were in the safe zone (exploitation below U_{MSY} and escapement above S_{MSY}; Figure 3.2). Note one escapement indicator stock, Columbia River Upriver Brights, appears twice in the figure because it has two exploitation rate indicator stocks (URB and HAN) listed for it in Attachment I. No stocks were in the high-risk zone. Two stocks, Kitsumkalum and Stikine, were in the buffer zone. Seven stocks were in the low escapement and low exploitation zone: Grays Harbor fall, Nicola, Queets fall, Situk, Siuslaw, and Taku. One stock, Skagit spring, experienced exploitation above U_{MSY} with escapements exceeding S_{MSY} (i.e. high escapement and high exploitation).

Note that there were several updates that occurred during the 2025 Exploitation Rate Analysis (ERA) that may have resulted in differences between the synoptic evaluation plots in the current report compared to previous C&E reports. This includes the switch from the utilization of marked to unmarked exploitation rates in the synoptic evaluation plots and updated Canadian recreational catch data (2005 – 2024) utilized in the ERA which in turn generally increased exploitation rates.

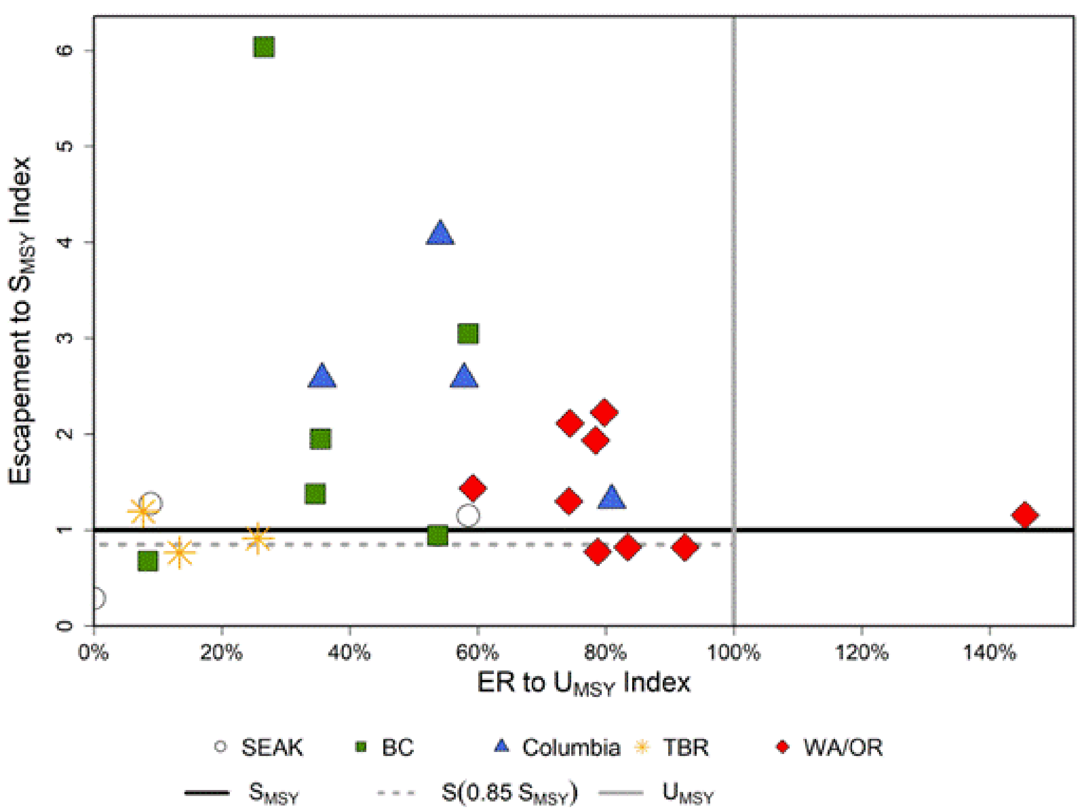


Figure 3.2–Summary of synoptic evaluations by region for stocks with escapement and

exploitation rate data in 2023.

Note: Escapement and exploitation rate data were standardized to the stock-specific escapement goal and U_{MSY} reference points.

3.2 REGIONAL TRENDS AND PROFILES

3.2.1 Southeast Alaska: Situk, Chilkat, and Unuk Rivers

Recent declines in Chinook salmon productivity and abundance are persistent throughout Southeast Alaska. Available run abundance data indicate substantial declines were first fully detected in 2007 from a persistent decline in productivity that began with returns from brood year 2001. Run abundance data available from 11 stocks in Southeast Alaska show substantial variability prior to 2004 (Figure 3.3). The decline since 2007 is consistent with previously observed downward trends in productivity of SEAK Chinook salmon stocks. This decline is also observed for most Chinook stocks statewide.

The SEAK stocks exhibit two different marine rearing behaviors. Outside-rearing behavior includes rearing in the Gulf of Alaska and Bering Sea after leaving the freshwater environment. Inside-rearing behavior involves rearing in the nearshore environment of SEAK for the majority of the marine lifestage. However, CWT recoveries data show that a small portion of inside-rearing stocks can be found offshore.

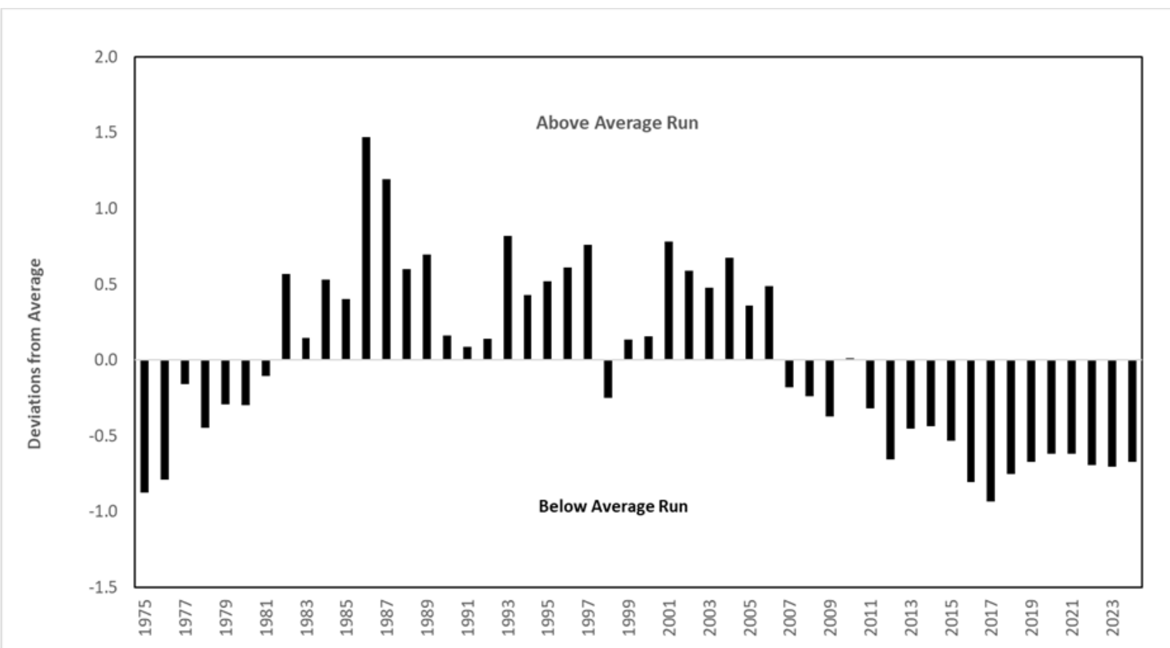


Figure 3.3–Average of standardized deviations from average run abundance for 11 stocks of Chinook salmon in Southeast Alaska: Situk, Alsek, Chilkat, Taku, King Salmon, Andrews, Stikine, Unuk, Chickamin, Blossom and Keta stocks.

The Situk stock, located just south of Yakutat Bay, is an outside-rearing stock and has failed to meet the escapement goal four times over the recent decade, like several other SEAK escapement indicator stocks. This failure cannot be explained by fishery impacts; they have been extremely low, with a recent 10-year average calendar year exploitation rate of only 4%. The harvest mostly occurs in-river or in the estuary where intensive monitoring programs are in place. The available data show it is not harvested beyond the estuary before maturation. Calendar year exploitation rates for the Situk stock have never exceeded the U_{MSY} threshold of 81% (Figure 3.4). Generally, poor runs and escapement result primarily from decreased ocean productivity. Conservation measures have been in place since 2017 to reduce harvests in the effort to pass as much of the run to escapement as possible and these efforts will continue in 2025.

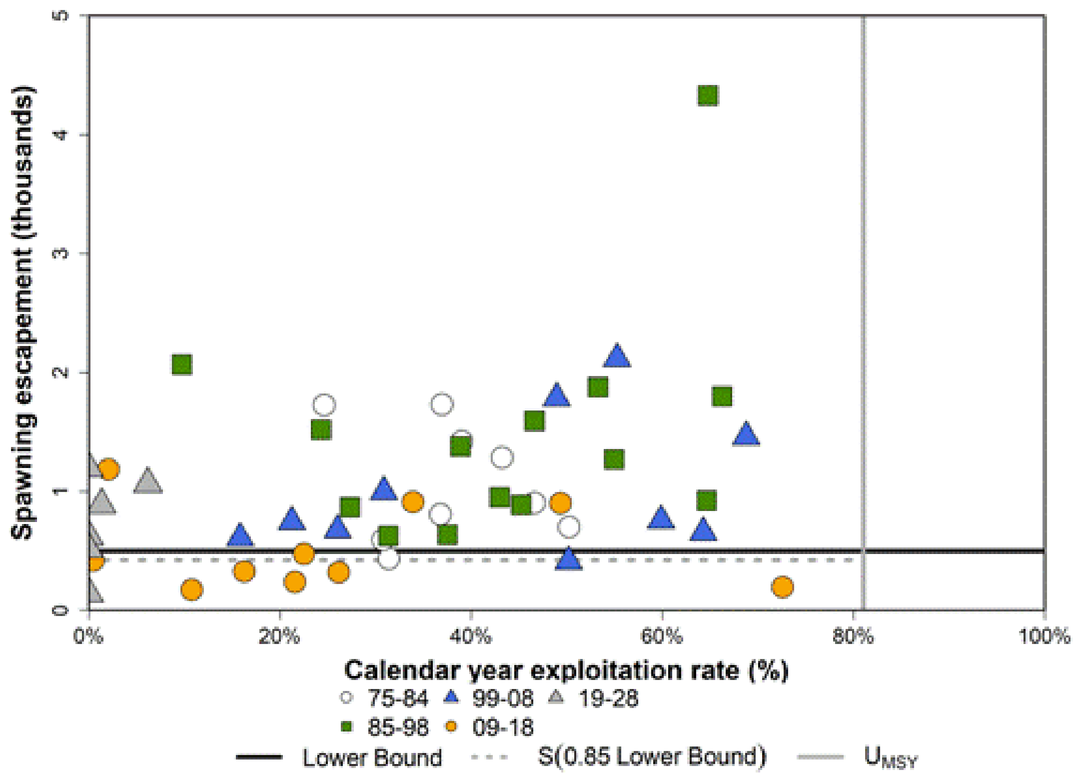


Figure 3.4–Calendar year exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement for large (≥ 660 mm MEF in length) Situk River Chinook salmon, 1976–2024.

The Chilkat River is located in northern Lynn Canal near Haines. Chilkat Chinook salmon are mostly inside-rearing. The Chilkat River stock failed to achieve its escapement goal four times in the most recent decade, but has met the management objective 5 out of the last 6 years. Southeast Alaska gillnet, troll and sport fisheries are intensively managed to conserve this stock.

A CWT program has been in place since the 1999 brood year to estimate the harvest of Chilkat Chinook salmon. Recoveries of CWTs indicate some age-4 Chilkat fish are harvested while rearing as immature fish in SEAK. However, most of the harvest is older, mature fish from sport and commercial troll and drift gillnet fisheries in SEAK. In general, exploitation rates on the Chilkat stock are some of the lowest observed in the region, with a recent 10-year average CY exploitation rate of 11%, well below the U_{MSY} threshold reference value of 40% (Figure 3.5).

Smolt abundance and survival have been estimated for the Chilkat stock since the 1999 brood year. Since the 2008 brood year, there has been no apparent trend in freshwater survival; however, marine survival has been below average for the four most recent brood years 2014-2017 (Figure 3.6).

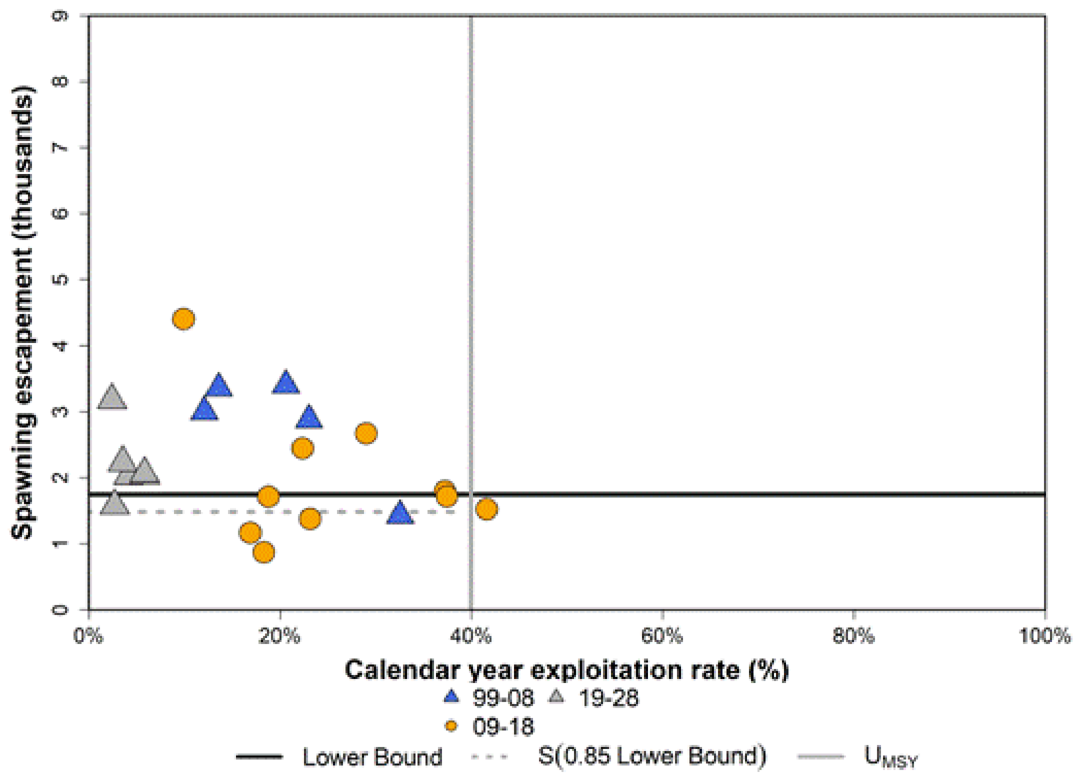


Figure 3.5–Calendar year exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement for ≥ ocean age-3 Chilkat River Chinook salmon, 2004–2024.

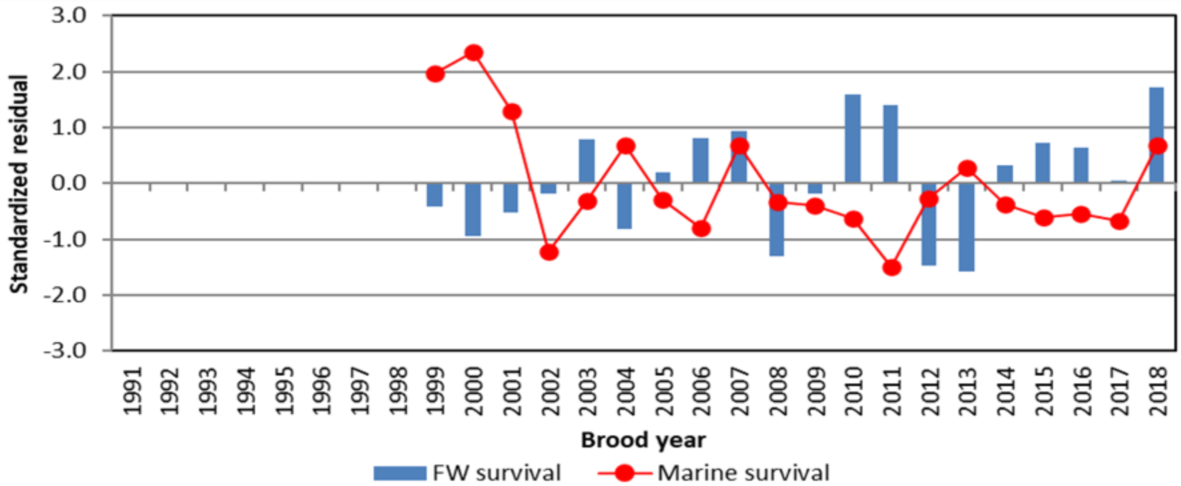


Figure 3.6–Freshwater and marine survival indices (standardized to a mean of zero) for the Chilkat River stock of Chinook salmon, 1999–2018 brood years.

The Unuk River flows into Behm Canal in southern SEAK and Chinook salmon from the Unuk River are mostly inside-rearing. Like other SEAK indicator stocks, production has been poor, and escapements to the Unuk River were below the escapement goal five times in the most recent decade. There are no Chinook salmon fisheries in the Unuk River or in most marine waters of the adjacent Behm Canal. A CWT program was implemented beginning with the 1992 brood year that allows for estimates of harvest in the mixed-stock fisheries. Exploitation rates for the Unuk stock have been higher than other SEAK stocks, with a recent 10-year average CY exploitation rate of 34%. Some Unuk Chinook salmon are caught while immature, on the inside waters of SEAK, but most of the harvest is mature fish. Exploitation rates on this stock have historically averaged about one-half of the U_{MSY} threshold reference value of 60%. However, during the recent period of poor productivity, rates have been the highest on record, including an all-time high exploitation rate of 74% in 2012 (Figure 3.7). As a result, additional domestic management measures have been imposed to reduce exploitation rates and pass more fish to escapement.

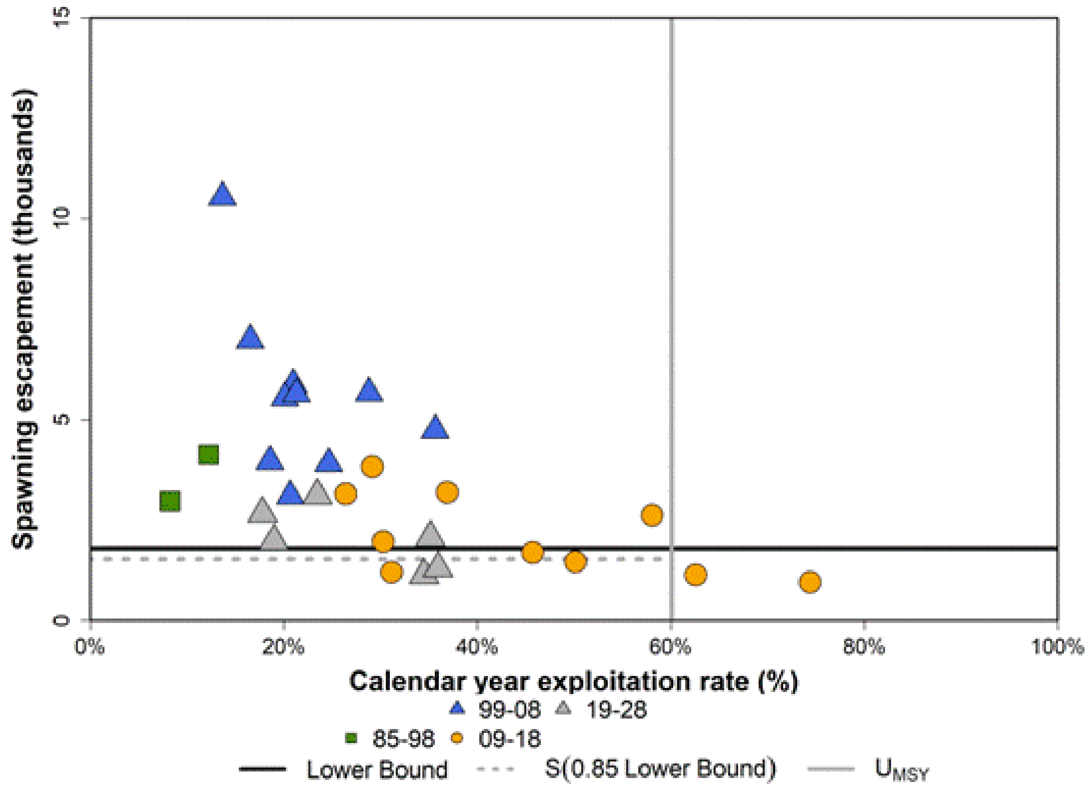


Figure 3.7–Calendar year exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement of large (≥ 660 mm MEF in length) Unuk River Chinook salmon, 1997–2024.

Estimates of smolt abundance and survival for Unuk Chinook are available beginning with the 1992 brood year. Freshwater survival has, for the most part, shown no apparent pattern. The 2003 and 2005 brood year freshwater survival estimates were some of the lowest on record. However, high freshwater survival occurred in the 2006 and 2012 brood years. Freshwater and marine survival have generally shown an inverse relationship in the time series. The highest freshwater survival for the 2012 brood year coincided with the lowest marine survival, while the highest marine survival for the 2005 brood year coincided with the lowest freshwater survival. Marine survival was near-average and showed high inter-annual variability over the 1991 to 2005 brood years. However, the 2006 to 2013 brood years exhibited some of the lowest marine survivals over the range of data; recent brood years have conversely trended above average (Figure 3.8).

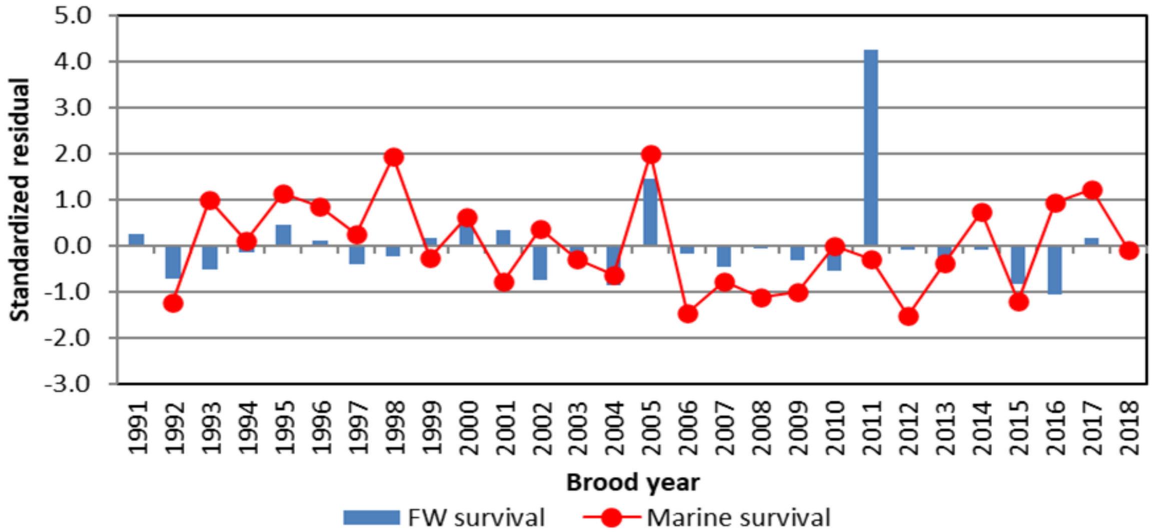


Figure 3.8–Freshwater and marine survival indices (standardized to a mean of zero) for the Unuk River stock of Chinook salmon, 1992–2018 brood years.

3.2.2 Transboundary Rivers: Alsek, Taku, and Stikine Rivers

Transboundary stocks include Chinook salmon originating from the Alsek, Taku, and Stikine rivers. Although the Alsek River stock has failed to achieve the lower bound of the escapement goal three times out of the most recent ten years, only one of those times has been in the last seven years. The Taku River stock achieved the lower bound of the escapement goal in 2024 after missing the goal in the previous eight years, and the Stikine River stock has failed to achieve the lower bound of the escapement goal in nine consecutive years.

The Alsek River stock has one of the lowest exploitation rates of any Chinook salmon stock on the Pacific Coast, averaging 5% over the past decade. All known harvests occur in-river in the U.S. and Canada, and detailed catch accounting in addition to age, sex, length, and genetic sampling programs are in place for U.S. harvests and for sport and Aboriginal harvests in Canada. Most escapement samples are taken at a weir located in the Klukshu River, an index tributary of the Alsek River. Like nearby Situk River Chinook salmon, the Alsek River stock is not exposed to SEAK fisheries while rearing and exploitation rates for the stock have never approached the U_{MSY} threshold of 58% (Figure 3.9). Low exploitation rates are one reason the Alsek River stock meet the lower bound of the escapement goal range in recent years, but overall total runs remain below the long-term average. This is likely due to decreased marine survival, which mirrors other Alaskan stocks rearing in similar areas of the Gulf of Alaska and Bering Sea. Conservative management measures remain in place to reduce harvests in both countries to pass as much of the run to escapement as possible.

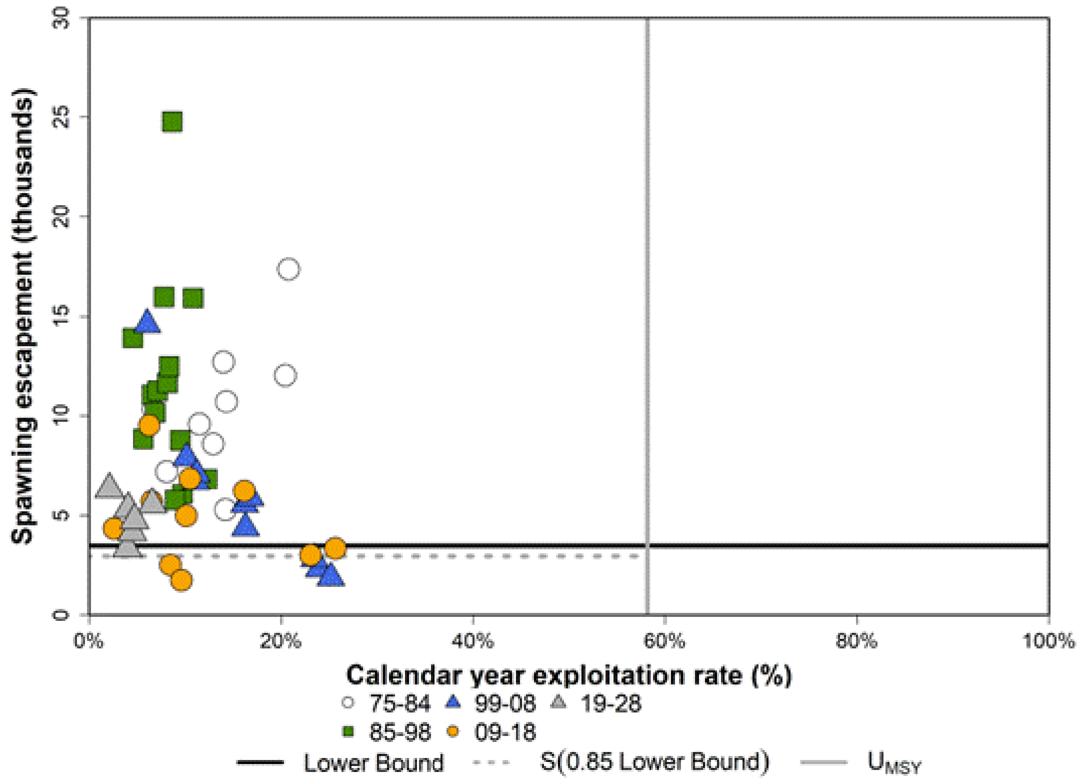


Figure 3.9–Calendar year exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement ≥ ocean age-2 Alsek River Chinook salmon, 1976–2024.

Like the Alsek River stock, the Taku and Stikine River stocks have experienced reduced productivity in recent years, as well as changing age composition, both of which have affected forecasting accuracy. Preseason forecasts are developed for the Taku and Stikine River stocks by December 1 per obligations specified in Chapter 1 of Annex IV. Annual forecasts are adjusted by applying the recent five-year average percentage error, and this approach has improved forecast performance. preseason forecasts can trigger directed Chinook salmon fisheries in the U.S. and Canada. In-season estimates of abundance are used to more precisely regulate allowable fishing time and area.

Because Taku and Stikine River stocks rear offshore, they are not vulnerable to the fisheries of Southeast when immature. Mature fish are vulnerable to sport, and commercial fisheries in the inside waters of Southeast and to Canadian in-river fisheries. In years of high abundance, directed fisheries occur. In years of low abundance, some fish are incidentally taken in directed fisheries for sockeye towards the end of the Chinook migration. A few fish are also harvested in the in-river U.S. personal use fishery in the Taku River and in the in-river U.S. subsistence fishery in the Stikine River. There are genetic stock identification programs in place to identify Taku and Stikine River Chinook salmon caught in terminal marine fisheries. These programs, when coupled with other facets of the stock assessment programs, described in McPherson et al. (2010) for CYs 1977 to 2007 for the Taku River stock and in Bernard et al. (2000) for CYs 1981 to 1997 for the Stikine River stock, have been used to provide CY harvest estimates since 1975.

Taku River calendar year exploitation rates averaged 14% over the recent decade, however escapements have failed to achieve the lower bound of the escapement goal range in eight of those years (2016–2023). Large runs of Chinook salmon occurred between 2005 to 2008 and directed Chinook salmon fisheries resulted in exploitation rates averaging 35%. exploitation rates remained below the U_{MSY} threshold of 59% during the entire time series (Figure 3.10). Between 1979 and 2004, the average exploitation rate was 12%, and escapements were below the lower bound of the escapement goal range in only two years over this 26-year period.

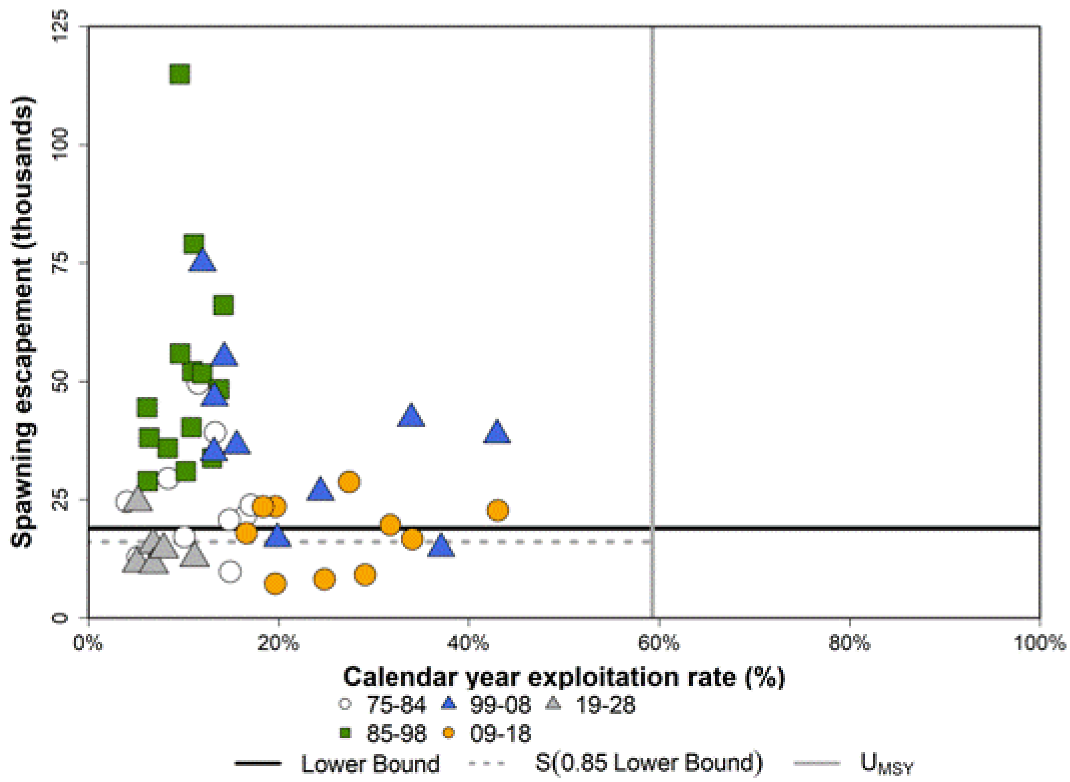


Figure 3.10–Calendar year exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement for large (> 600 mm MEF in length) Taku River Chinook salmon, 1975–2024.

Stikine River Chinook salmon CY exploitation rates averaged 16% over the most recent 10-year period, and escapements failed to meet the lower bound of the escapement goal range in the most recent nine years (2016–2024)Figure 3.11. Like the Taku River, large runs of Chinook salmon were observed from 2005 to 2008 and directed Chinook salmon fisheries were implemented. During this time exploitation rates averaged 53%, which is above the U_{MSY} threshold value of 42% (Figure 3.11). Nevertheless, the lower bound of the escapement goal range was achieved each of those years. From 1981 to 2004, the average exploitation rate was 21%, and escapements were above the goal in all but two years over this 24-year period.

Taku River Chinook salmon smolt abundance and survival has been estimated since the 1991 brood year. In the recent decade, freshwater survival has been above the long-term average; however, marine survival has been below average in all years and until this improves overall production will likely remain below average (Figure 3.12).

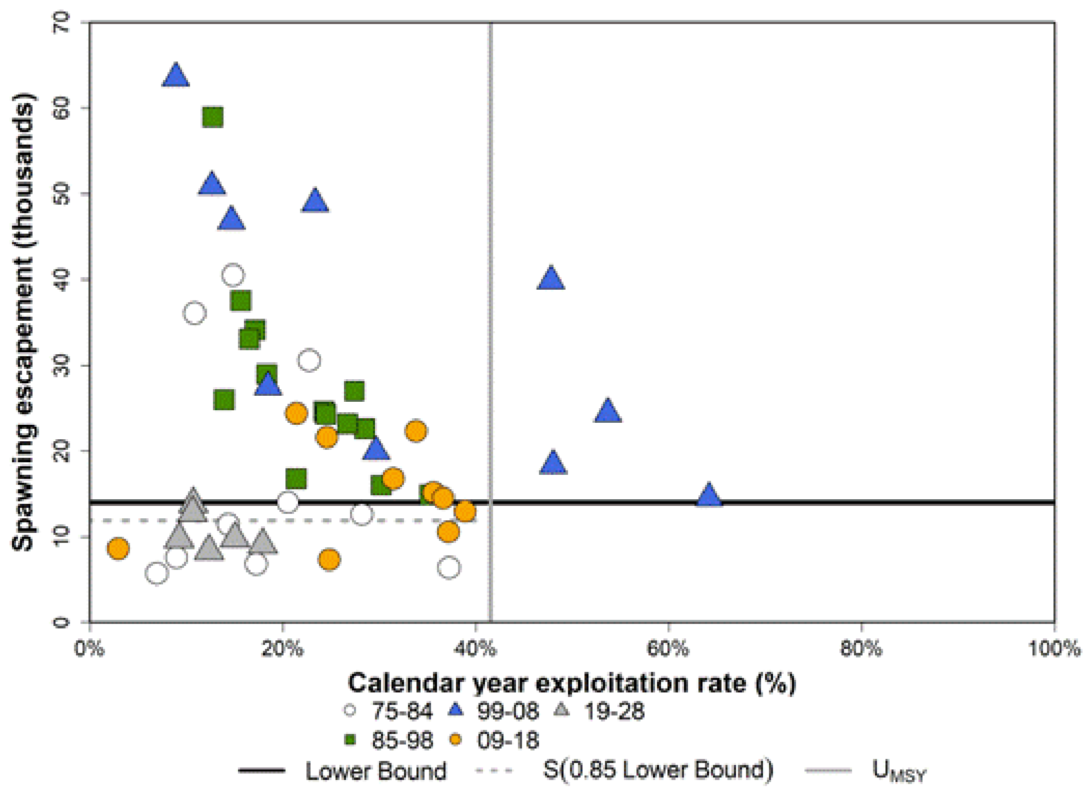


Figure 3.11–Calendar year exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement for large (> 600 mm MEF in length) Stikine River Chinook salmon, 1975–2024.

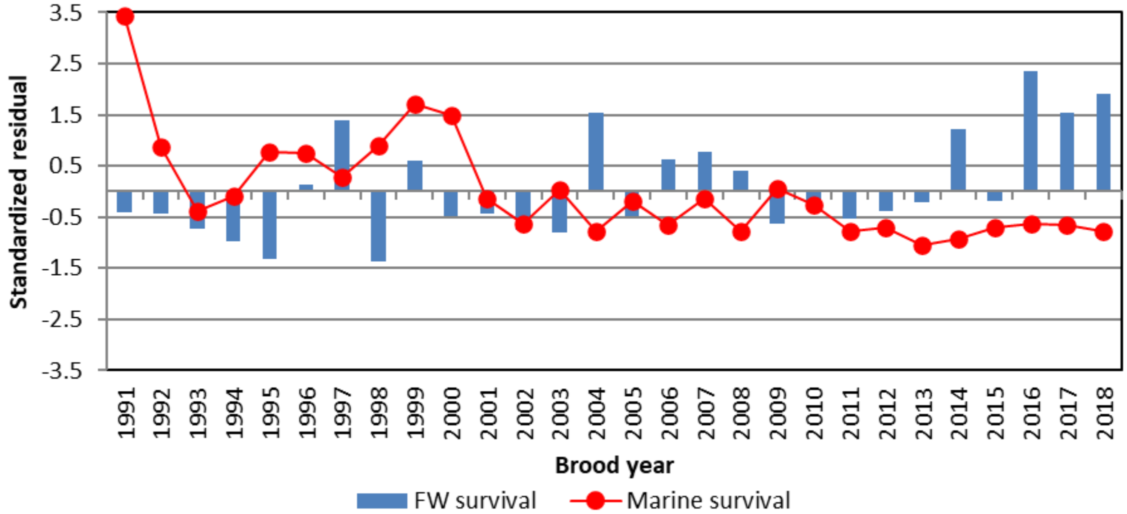


Figure 3.12–Freshwater and marine survival indices (standardized to a mean of zero) for the Taku River stock of Chinook salmon, 1991–2018 brood years.

Stikine River smolt abundance and survival have been estimated since the 1998 brood year. Freshwater survival has been declining over this time, and in the recent decade, marine survival has been below the long-term average; until this improves overall production will likely remain below average (Figure 3.13).

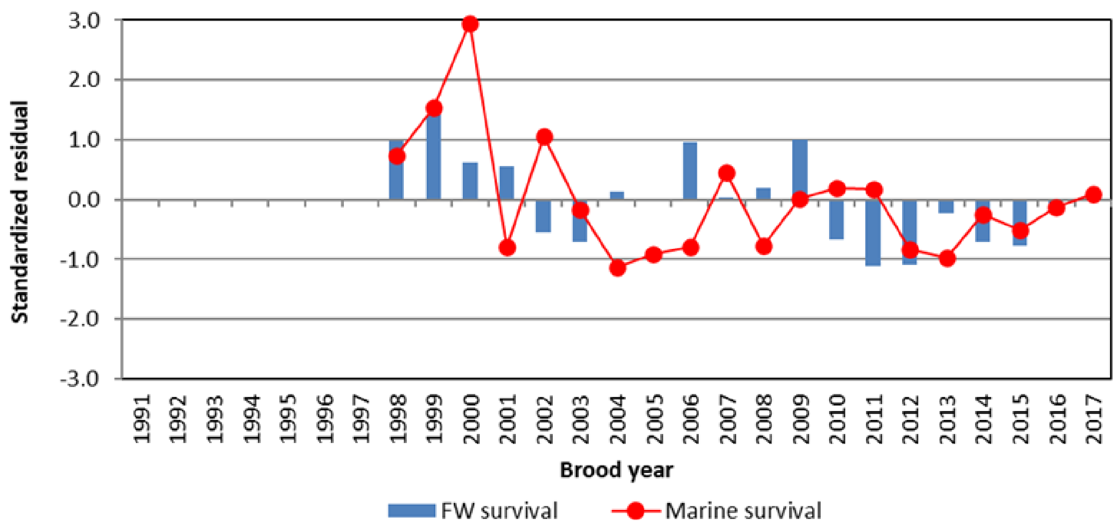


Figure 3.13–Freshwater and marine survival indices (standardized to a mean of zero) for the Stikine River stock of Chinook salmon, 1998–2017 brood years.

3.2.3 Canadian Stocks

3.2.3.1 Northern British Columbia: Kitsumkalum River

The Skeena River is an escapement indicator stock in NBC and it does not have a PSC-agreed escapement goal. The Kitsumkalum River is a tributary of the Skeena River and is the CWT indicator stock for the Skeena River. High quality MR escapement data have been collected for

Kitsumkalum River Chinook salmon annually since 1984. The method for determining escapement estimates was revised in 2019 to use a best model approach (Winther et al. 2021). Revised escapement estimates from the best model approach were lower in most years than previous estimates, as were the stock-recruit parameters (e.g., S_{MSY} = 5,214). Prior to 2019 the closed population MR escapement estimates were produced using the Petersen method. Under the closed population models, McNicol (1999) estimated the stock-recruit relationship (S_{MSY} = 8,876) which was then updated by Parken et al. (2006) (S_{MSY} = 8,621).

The Kitsumkalum River stock has had very low levels of enhancement relative to the CWT indicator stock targets. The mean proportion of hatchery fish in the returns was 5.0% and ranged from 0.5% in 1988 to 15.4% in 2018.

Early marine survival of Kitsumkalum Chinook has ranged from 0.13% to 1.94% and averaged 0.77% (Figure 3.14). Survival for the last complete brood (2018) was 0.82%. Spawning escapements have exceeded the open model S_{MSY} reference line in all years but four in the current and previous Treaty period (Figure 3.15). In the current Treaty period, the stock was in the buffer zone in 2020 and 2023, below the 0.85 S_{MSY} in 2021 and above S_{MSY} in 2019,2022, and 2024. The mature-run equivalent exploitation rates have been below the threshold reference line (U_{MSY} = 0.626) in all years in the current and previous Treaty period (Figure 3.15).

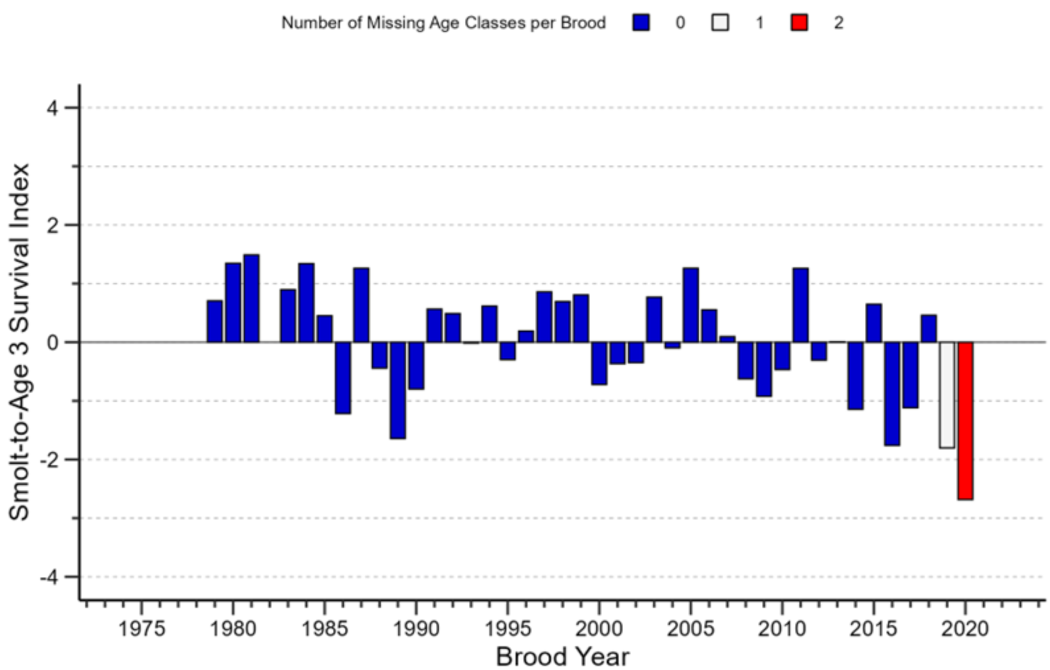


Figure 3.14–Marine survival index (standardized to a mean of zero) for the Kitsumkalum River stock of Chinook salmon, 1979–2020 brood years.

Note: Brood year 1982 was not represented by coded-wire tags; thus, no datum is available.

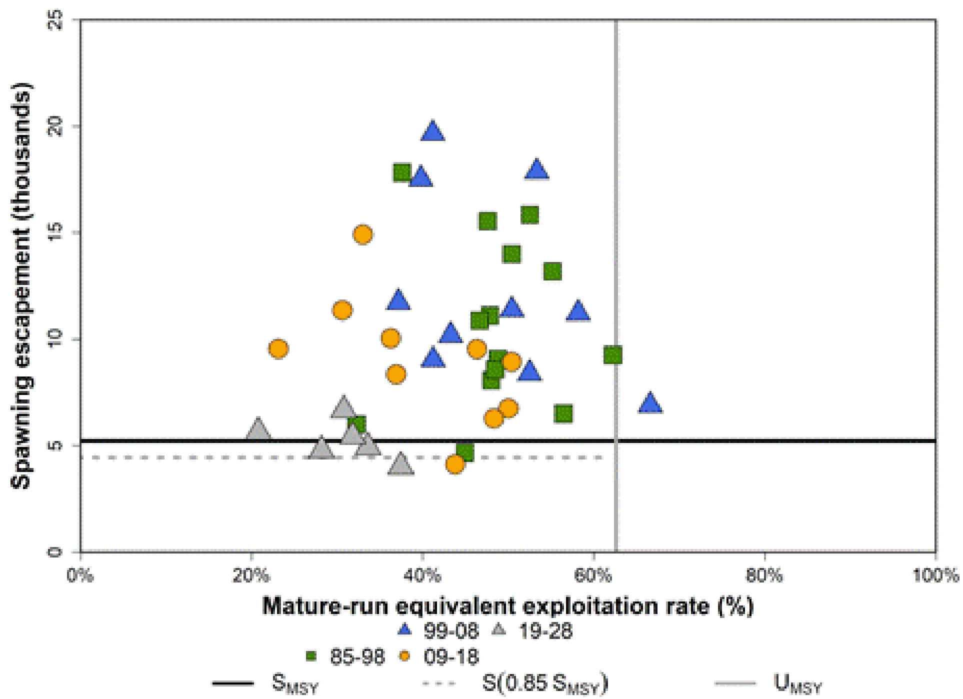


Figure 3.15–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by calendar year for the Kitsumkalum River stock of Chinook salmon, 1985–2024.

3.2.3.2 Central British Columbia: Atnarko River

The Central BC model stock group includes the Wannock, Chuckwalla-Kilbella and Atnarko escapement indicators. Currently, only the Atnarko has a PSC-agreed escapement goal in Chapter 3, Attachment I of the 2019 PST Agreement, but it has not been reviewed by the CTC. The Atnarko River was added as an exploitation rate indicator stock in Area 8 in 2012 (Vélez-Espino et al. 2011) with MR escapement estimates produced annually (Vélez-Espino et al. 2010). These estimates were used to calibrate the time series of existing carcass count based escapement estimates and broodstock CPUE back to 1990 based on a generalized linear model approach (Vélez-Espino et al. 2014).

The Atnarko River stock has had a moderate level of enhancement relative to the CWT indicator stock targets (mean enhanced contribution = 40%, range: 13–69%, run years 1990–2024). The largest hatchery contributions occurred in in 1996, 2015, and 2021 with 67%, 69%, and 64%, respectively, whereas the lowest (13%) took place in 2008. Increases in hatchery contribution during the early 2010s were partly due to the implementation of a yearling-release strategy in addition to the customary subyearling releases. Adjustments are made to escapement estimates to remove hatchery fish to make inferences for non-enhanced stocks in Central BC (Vélez-Espino et al. 2014). A stock–recruitment relationship has not yet been generated; however, a habitat-based estimate of S_{MSY} (Parken et al. 2006) of 5,009 large wild adults has been developed for Atnarko Chinook salmon (Vélez-Espino et al. 2014).

The average early marine survival (i.e., age-2 cohort survival) of Atnarko Chinook salmon has ranged from 0.51 to 6.21% and averaged 2.20% for complete brood years 1986–2019 (Figure 3.16). Survival for the last complete brood (2019) was 1.10%. Escapement estimates for large wild adults were below the S_{MSY} goal of 5,009 fish in 1997, 2012, 2019, and 2021 and below the 0.85 S_{MSY} threshold of 4,258 in 1997 and 2012 (Figure 3.17). Since mature-run equivalent exploitation rates have been below the threshold reference line in all years, this stock has been in the safe zone for most years.

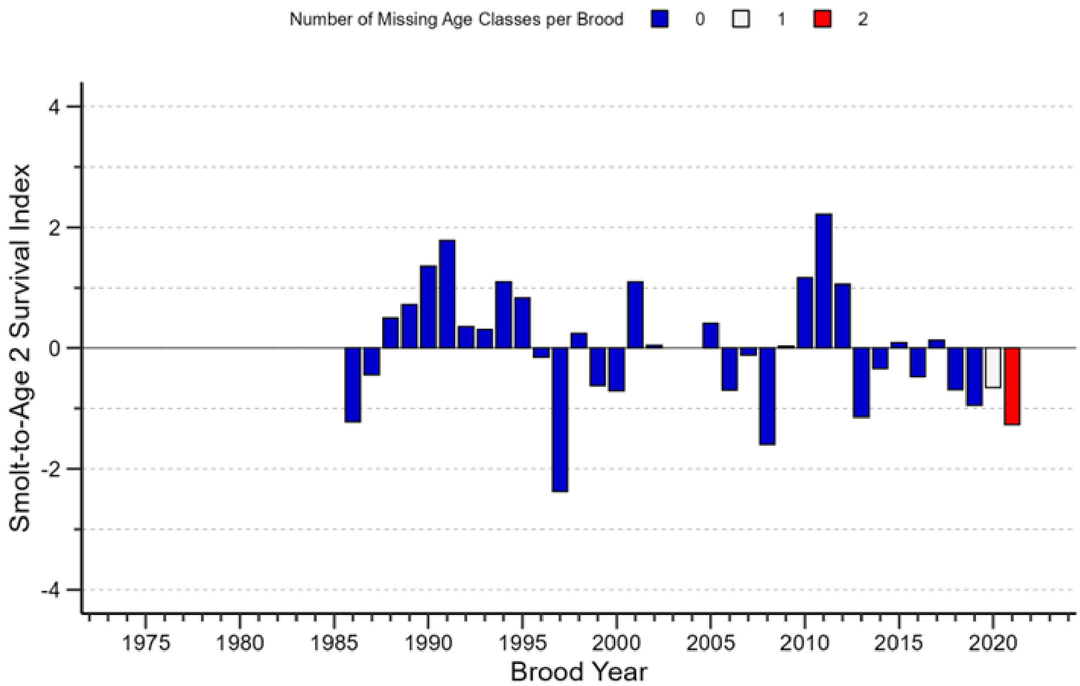


Figure 3.16–Marine survival index (standardized to a mean of zero) for subyearling releases of the Atnarko River stock of Chinook salmon, 1986–2021 brood years.

Note: There were no coded-wire tag releases for brood years 2003 and 2004.

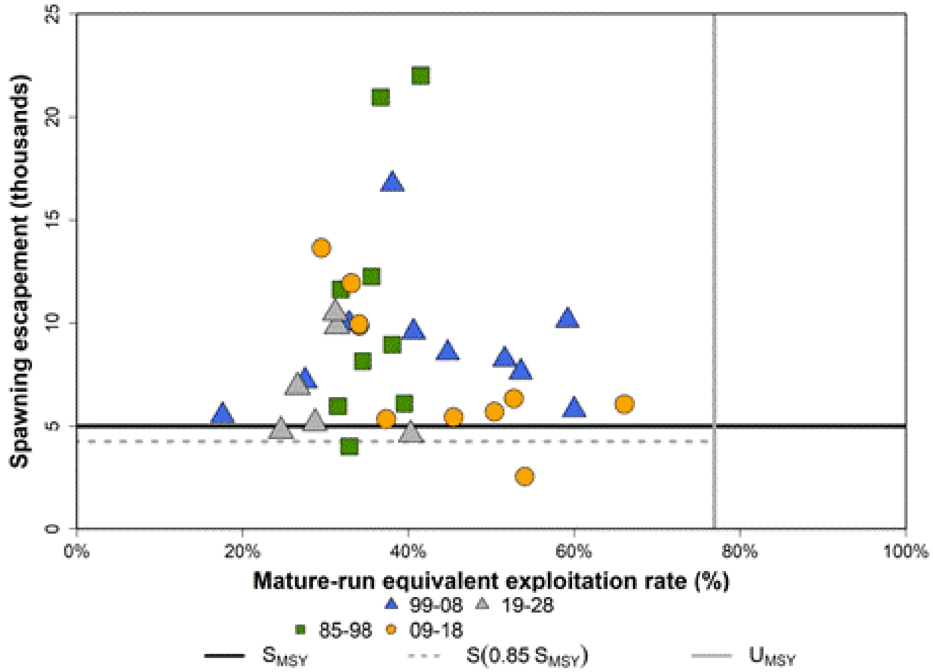


Figure 3.17–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by calendar year for the Atnarko River stock of Chinook salmon, 1990–2024.

Note: Spawning escapement excludes jacks to be consistent with the units represented by the S_{MSY}-based escapement goal.

3.2.3.3 Lower Strait of Georgia: Cowichan River

The Lower Strait of Georgia natural stock group includes the Cowichan River and Nanaimo River escapement indicators. Currently, only Cowichan has a PSC-agreed escapement goal and an estimated stock-recruitment relationship (Tomkins et al. 2005). The Cowichan River is an exploitation rate indicator stock with a historically high level of enhancement (up to 72% in 2002) that has declined to 5-10% in recent years up to 2024 due to reduced hatchery production. Escapement estimates are produced by counting fence (weir) and MR methods. A habitat-based estimate of S_{MSY} is available for the Nanaimo River; however, the exploitation rate indicator monitoring program was discontinued after brood year 2004.

For assessment across years, marine survival was standardized to zero, that is, with annual survival being above or below the mean of zero. Survival was above the mean for 15 brood years (1985, 1987–1994, 2005, only slightly in 2007, and 2008–2011). Eighteen of the completed brood years were below mean survival (1995–2003, 2006, 2012–2013, only slightly in 2014, and 2015-2019) and the 2020 incomplete brood year was also below the mean survival while the 2021 incomplete brood year was above. Current and upcoming recruitment will likely be lower than previous years due to low or below-average marine survival in recent years (including years based on incomplete broods, 2018–2021) (Figure 3.18).

The stock has historically experienced among the highest exploitation of the stocks examined in Section 3, specifically during annex periods 1985–1998, 1999–2008, and 2009–2018, where most years exceed the U_{MSY} threshold. However, exploitation rates have been reduced in the present annex (2019–2028) from previous levels to be under U_{MSY}. Conversely, escapements were below S_{MSY} in most of the historical periods (1985–1998, 1999–2008, and 2009–2018), but above S_{MSY} in the most recent Treaty period (2019–2028) (Figure 3.19). As these trends indicate, the stock has rarely been in the safe zone, only six times over the last 36 years, with five of those years in the most recent period (2019–2028). It has been in the high-risk zone frequently (20 of 36 years), although not since 2018. The data point for 2014 was excluded from the plot as it could not be computed.

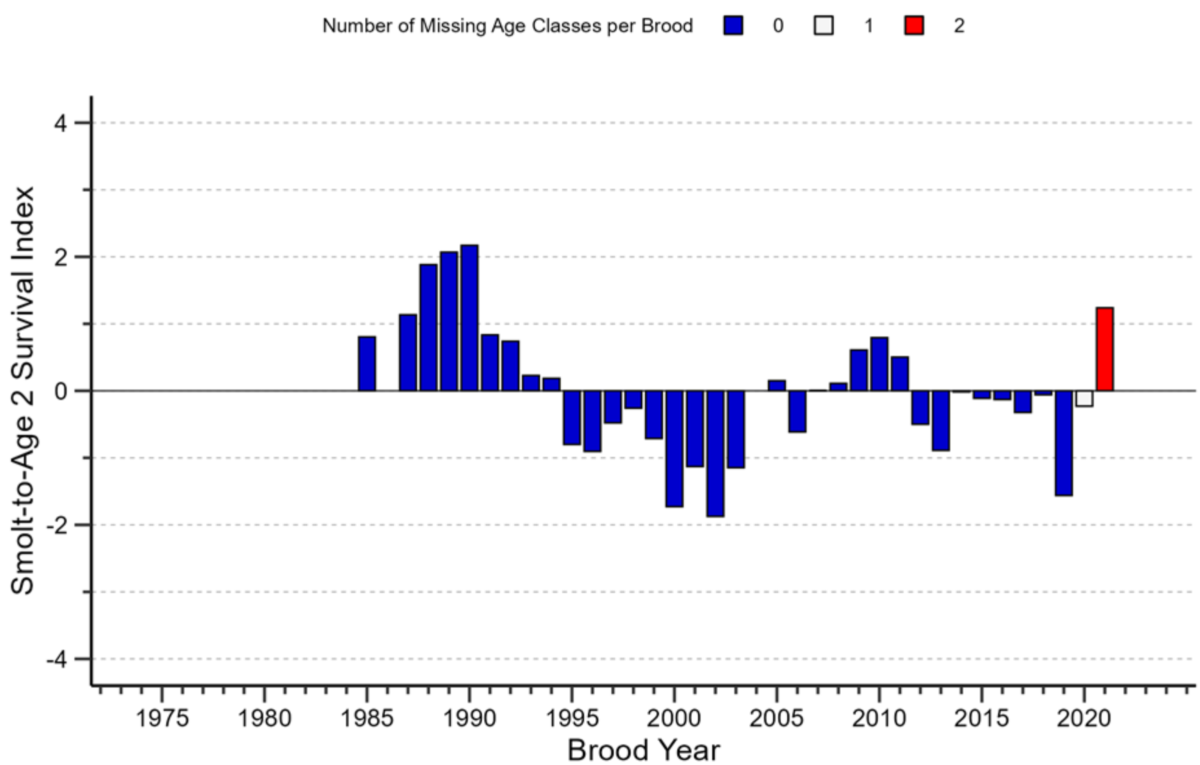


Figure 3.18–Marine survival index (standardized to a mean of zero) for the Cowichan River stock of Chinook salmon, 1985–2021 brood years.

Note: Brood years 1986 and 2004 were not represented by coded-wire tags, thus no data are available.
Note: 2014 and 2016 survival was very slightly above and 2015 was very slightly below the standardized mean.

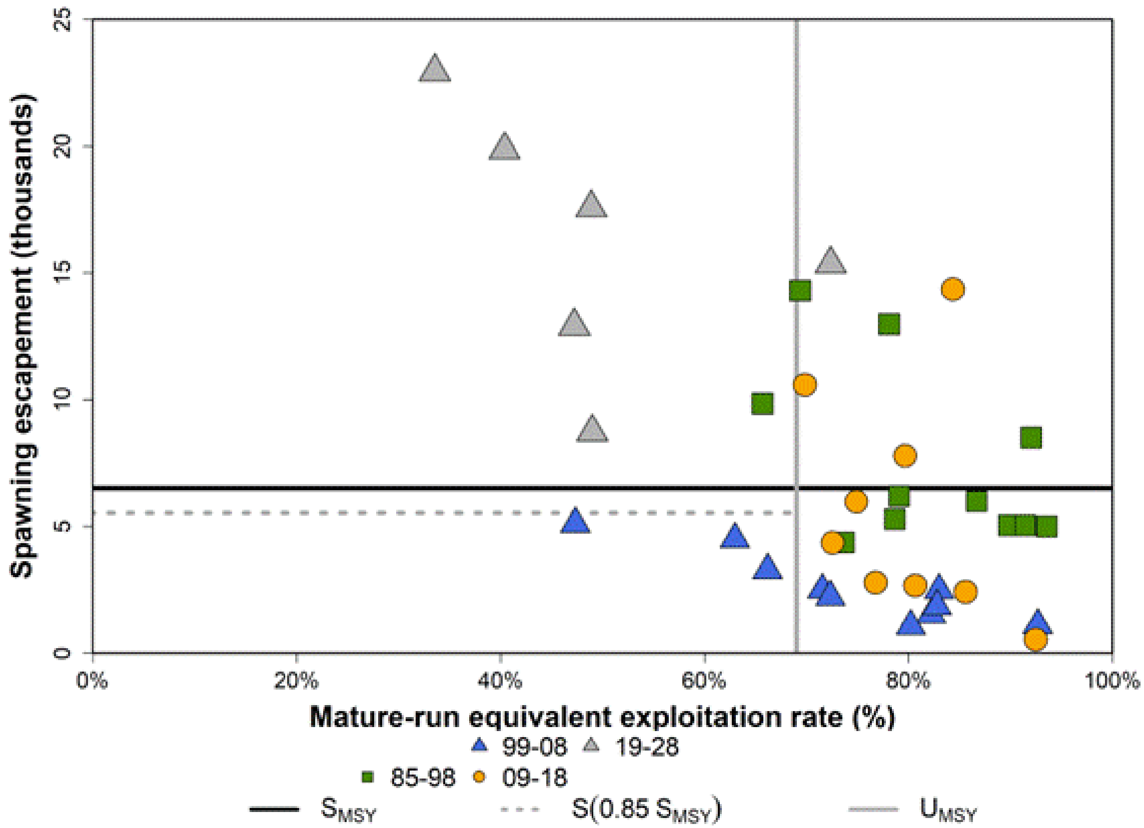


Figure 3.19–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by calendar year for the Cowichan River stock of Chinook salmon, 1988–2024.

3.2.3.4 Fraser River Stocks

Within the Fraser River, three of five escapement indicator stocks are currently represented by exploitation rate indicator stocks. The Fraser River spring run age 1.2, Fraser River summer run age 0.3, and Fraser River late run age 0.3 are represented by the exploitation rate indicator stocks at the Nicola, Lower Shuswap, and Harrison rivers, respectively. Fraser River spring run age 1.3 and Fraser River summer run age 1.3 are not currently represented by CWT indicator stocks.

3.2.3.4.1 Fraser River Spring Run Age 1.2: Nicola River

The Fraser River spring run age 1.2 stocks are small-bodied, early maturing stocks that spawn in tributaries to the Lower Thompson River, Louis Creek in the North Thompson River, and Bessette Creek in the South Thompson. The Nicola River has an exploitation rate indicator stock with escapement estimates produced using MR methods. Currently, there are no PSC-agreed escapement goals for this group. Harvest occurs almost exclusively during the return migration while passing through Juan de Fuca and Johnstone Straits and Fraser River fisheries. Estimated escapements declined steeply between 2003 and 2009 and have remained low; currently this is a stock group of concern for Canadian fishery planning, was assessed as “Endangered” by

COSEWIC in 2020, and is under consideration for listing under SARA. This stock has had a moderate level of enhancement (mean enhanced contribution 34%, years: 1987–2024, range: 4–79%), which influences its representativeness for stocks in the stock group (Figure 3.20).

The threshold reference lines in Figure 3.21 were estimated from habitat-based methods (Parken et al. 2006). In 2022, for the first time since 2014, the Nicola River stock climbed out of the low escapement and low exploitation zone (Figure 3.21), which corresponds to a period of low productivity for many Chinook salmon stocks (Dorner et al. 2018).

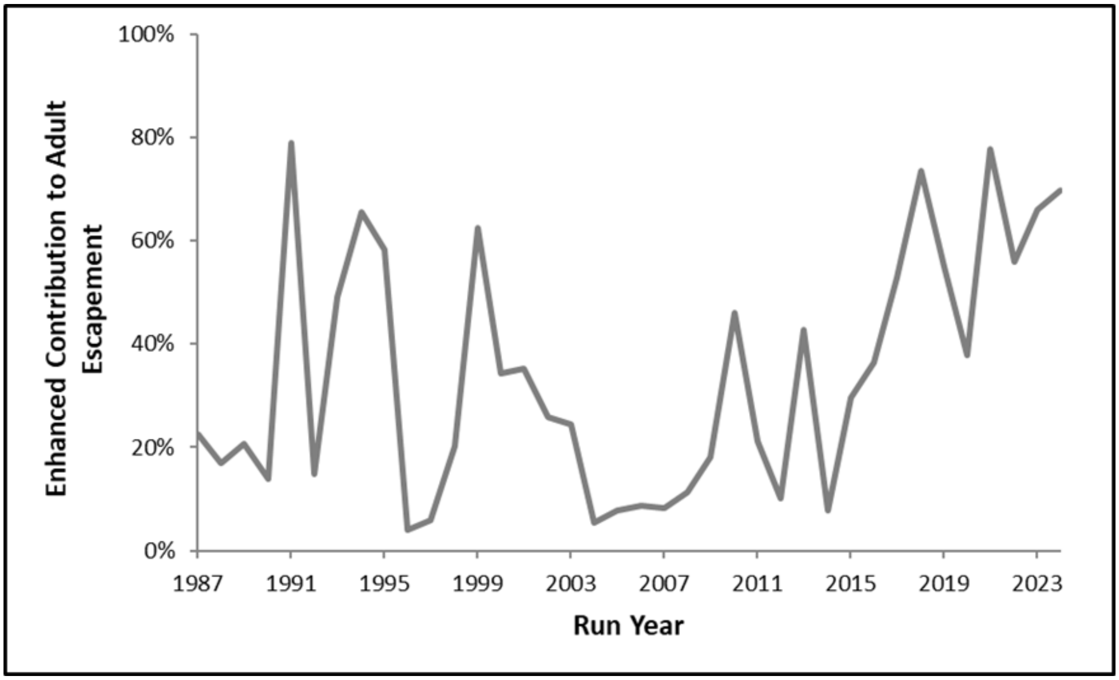


Figure 3.20–The percentage of first-generation hatchery-origin Chinook salmon in the Nicola River escapement, 1987–2024.

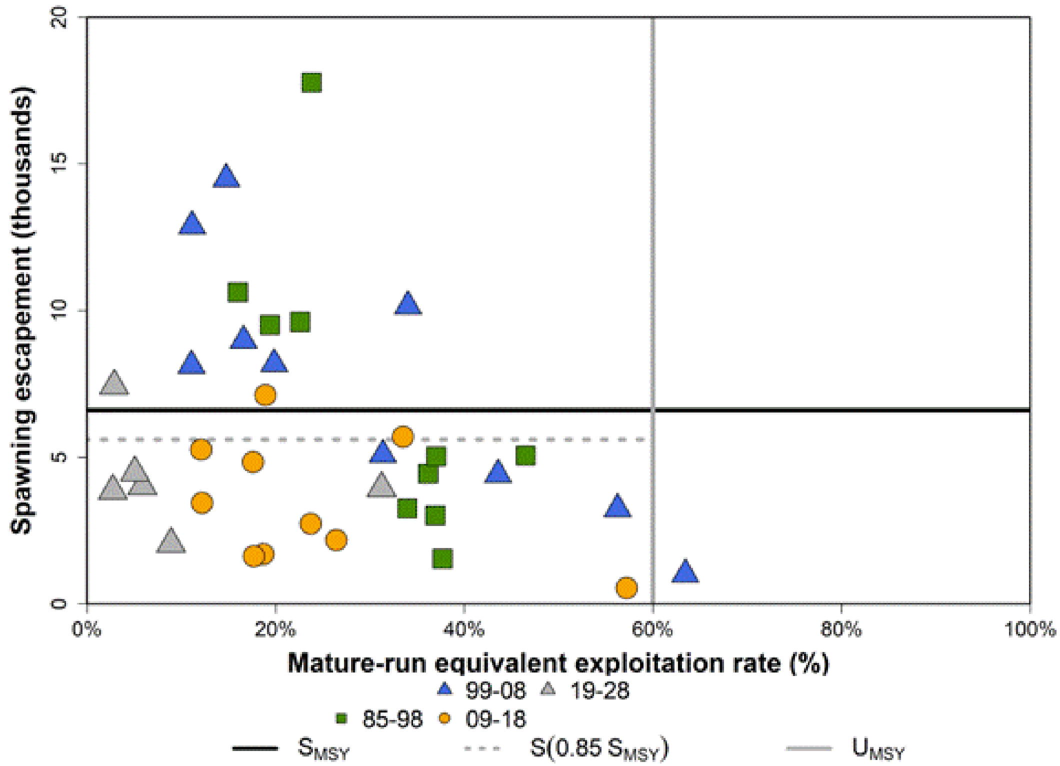


Figure 3.21–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by calendar year for the Nicola River stock of Chinook salmon, 1989–2024.

Survival decreased steeply starting with the 2000 brood (2002 ocean entry) and subsequently remained at or below average, with the exception of the 2006 brood, until brood year 2015 where we have seen modest increases in survival over the four most recent complete broods (Figure 3.22). The very low survival for the 1992 brood year was caused by a *Myxobacteria* infection at Spius hatchery, and the estimated survival for the 1994 brood year was affected by high pre-spawn mortality in 1998 that was unaccounted for in the calculations. Two cohorts (2021 eggs and 2020 parr) were impacted by a major flood event in the fall of 2021. There was complete loss of 2022 fry due to an incident at the Spius hatchery.

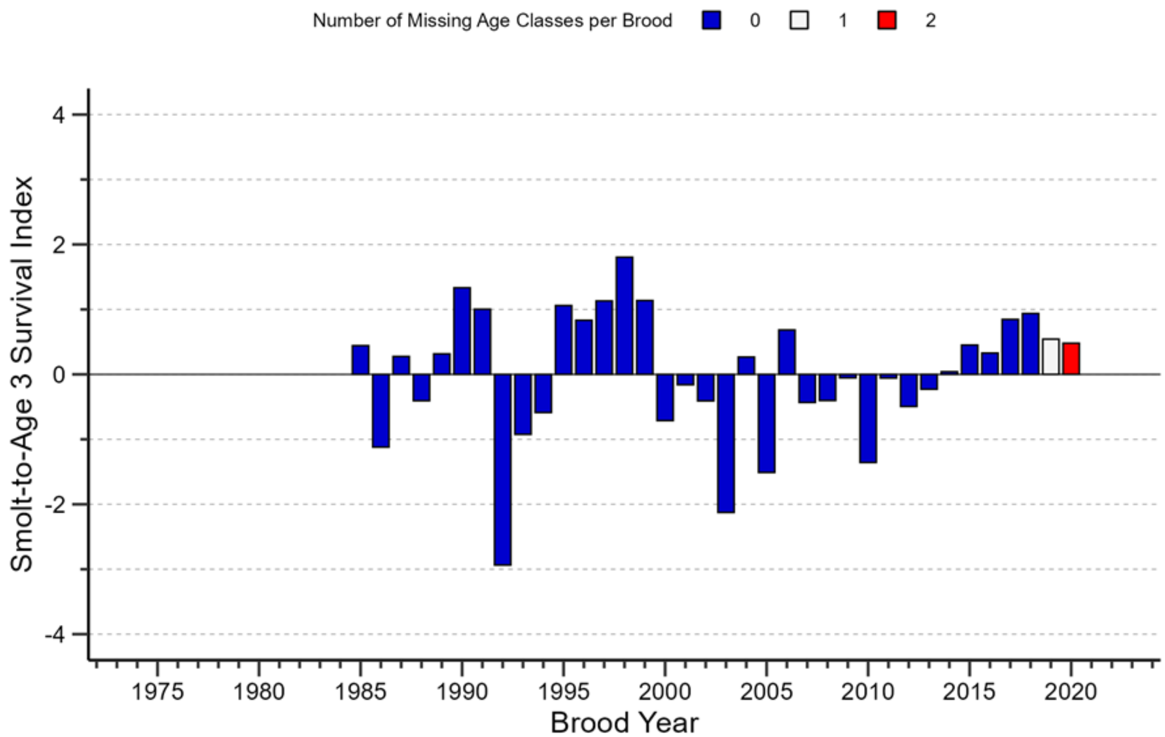


Figure 3.22–Marine survival index (standardized to a mean of zero) for the Nicola River stock of Chinook salmon, 1985–2020 brood years.

3.2.3.4.2 Fraser River Summer Run Age 0.3: Lower Shuswap River

The Fraser River summer run age 0.3 stocks are far north migrating, ocean-type stocks that spawn in Maria Slough (Lower Fraser River), the Lower Thompson River, and South Thompson River and tributaries. Marine survival has been fluctuating since 1984 with higher survival observed in three of the five most recent complete brood years (Figure 3.23). These fish remain on the continental shelf for their entire marine residence and are vulnerable to harvest throughout that period and during return migration, in both marine and Fraser River fisheries. Annual escapements for this stock group increased from about 25,000 fish through the 1980s to 45,000 or greater fish since 2006. Escapements to this stock group returned at a high level from 2019–2023, with an unprecedented 627,000 fish in 2023; however, the 2024 escapement of approximately 167,000 is a moderate level

The Lower Shuswap River is an exploitation rate indicator stock that has had escapement estimates produced using MR methods since 2000. The PSC adopted a management objective in the 2019 Agreement, which is the same value as the agency goal, estimated using habitat-based methods (Parken et al. 2006). The Lower Shuswap River has had a low to moderate level of enhancement (mean enhanced contribution 11%, years: 1987–2024, range: 3-23%), which influences its representativeness for non-enhanced stocks in the stock group. The Lower Shuswap CWT stock has been below the U_{MSY} reference line in the synoptic plot in all but five years since the Treaty was signed (Figure 3.24). Since 2009, 14 years have been in the safe zone and two years (2012 and 2016) were in the low escapement and low exploitation zone, below the U_{MSY} and S_{MSY} reference line.

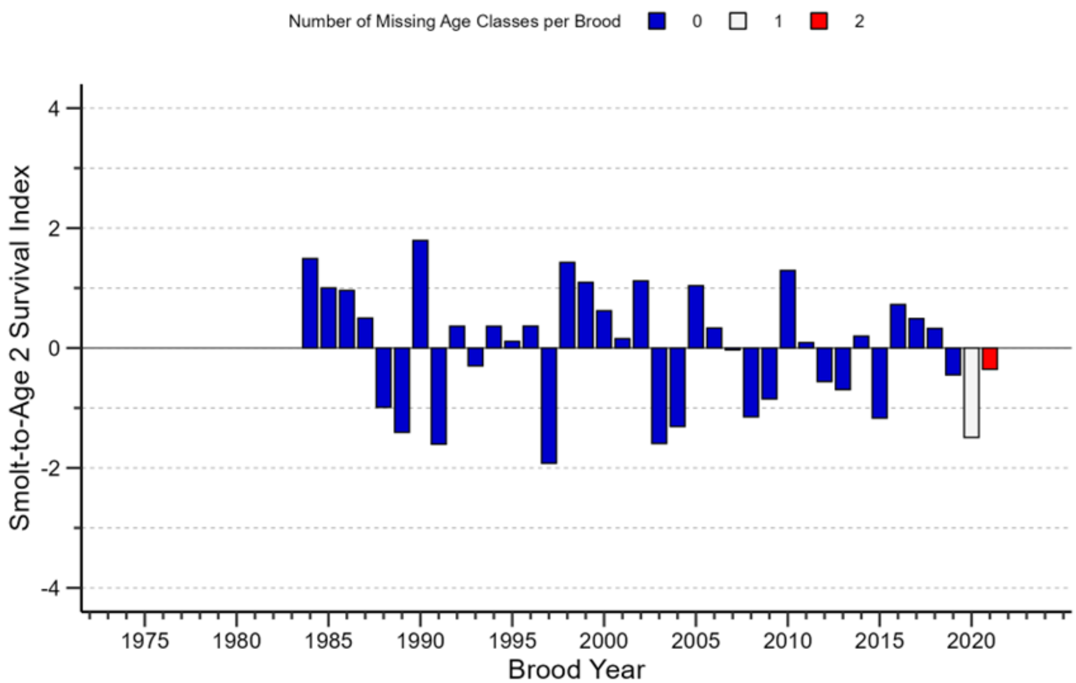


Figure 3.23–Marine survival index (standardized to a mean of zero) for the Lower Shuswap River stock of Chinook salmon, 1984–2021 brood years.

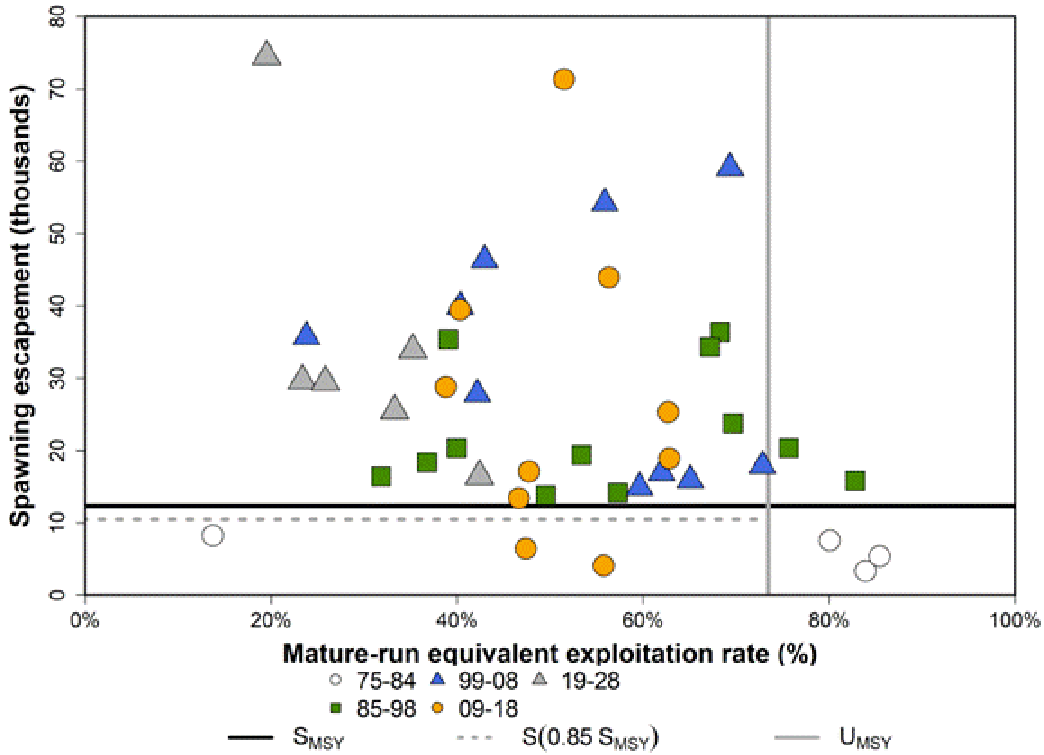


Figure 3.24–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by calendar year for the Lower Shuswap River stock of Chinook salmon, 1981–2024.

3.2.3.4.3 Fraser Late Run Age 0.3: Harrison River

The Fraser late stock is a white-fleshed fall-run Chinook salmon, originating from the Harrison River downstream of Harrison Lake in the Lower Fraser River. Juveniles migrate to the Fraser estuary immediately after emergence and remain in the estuary area for up to six weeks before moving into the Strait of Georgia. Their ocean distribution is principally in the Salish Sea, WCVI, and Coastal Washington, where they are vulnerable to fisheries throughout their ocean residence. From 1984 to 2024, the enhanced contribution to this stock has averaged 2% (range: 0–6%). Marine survival has mostly been below average since 1990; the most recent two full brood year were above average (Figure 3.25). Spawning escapements were below the spawning escapement goal for ten of the past 15 years; however, the goal was exceeded from 2022–2024 (Figure 3.26). The synoptic plot shows the stock with exploitation rates higher than the reference line in most years from 1984 to 1998, with two years in the high-risk zone and only one year in the safe zone. Cumulative exploitation rates were reduced under the 1999 Agreement, with most years having exploitation rates less than U_{MSY}. Exploitation rates were further reduced under the 2009 Agreement and exploitation rates have been below the reference line; however, only six years have been in the safe zone since 2009. The low escapements and low exploitation rates in the recent past corresponded with a period of low productivity for many Chinook salmon stocks (Dorner et al. 2018). The Harrison River fall-run Chinook stock was assessed as “Threatened” by COSEWIC (2018).

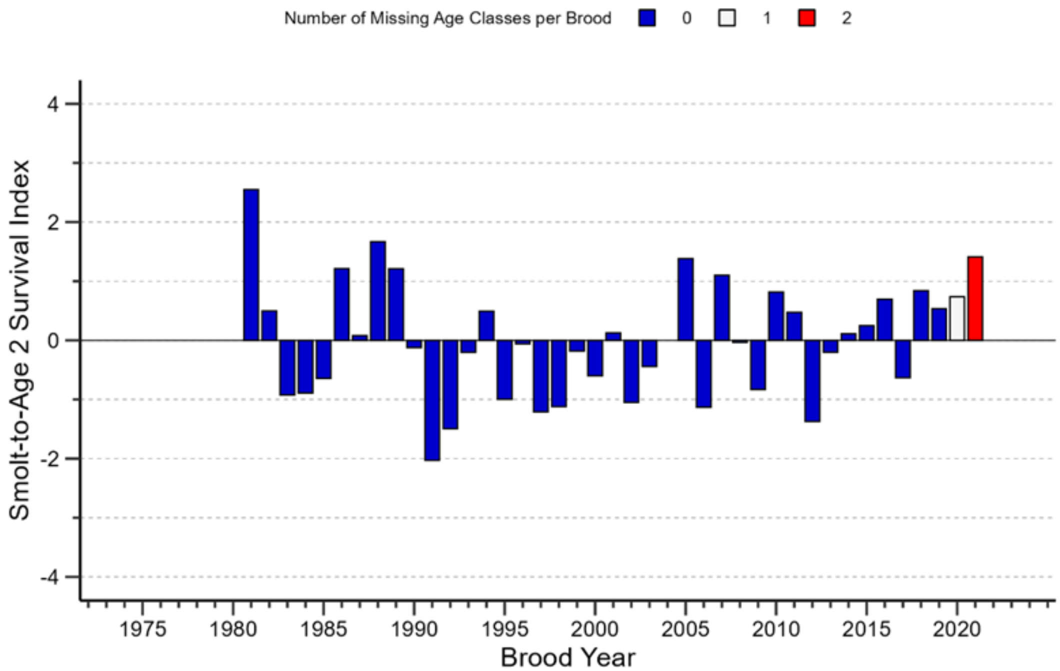


Figure 3.25–Marine survival index (standardized to a mean of zero) for the Harrison River stock of Chinook salmon, 1981–2021 brood years. No data are available for brood year 2004.

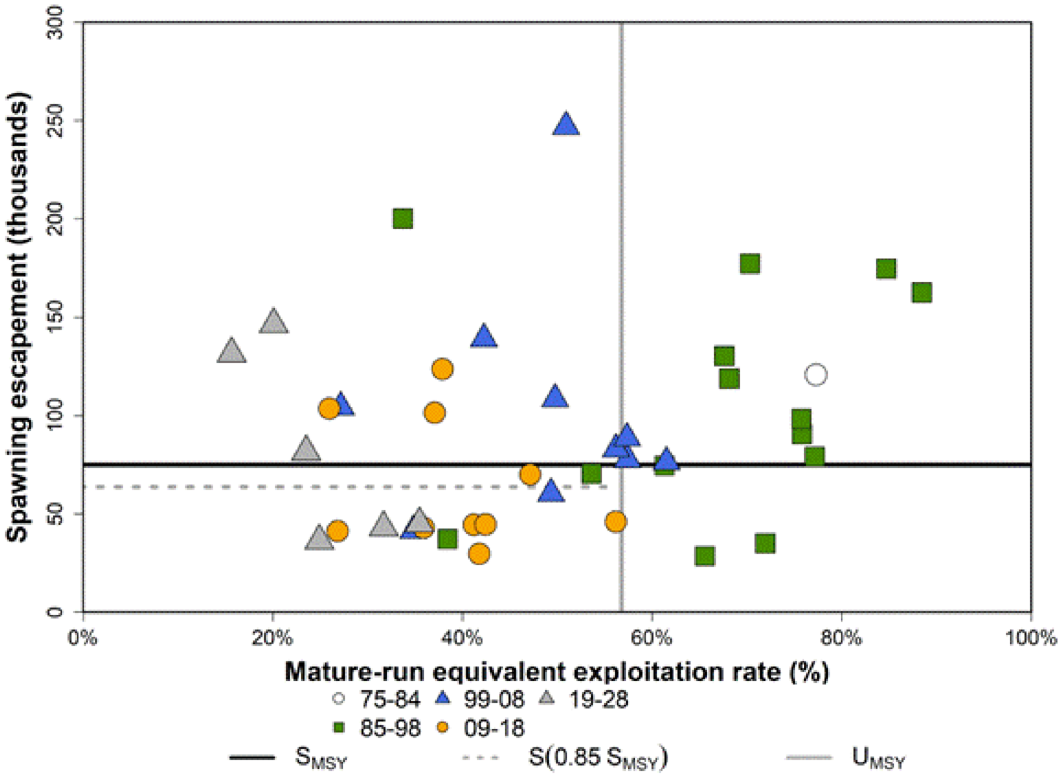


Figure 3.26–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by calendar year for the Harrison River stock of Chinook salmon, 1984–2024.

3.2.4 Puget Sound, Coastal Washington, Columbia River, and Coastal Oregon Stocks

3.2.4.1 Puget Sound

Puget Sound stocks are a mixture of natural- and hatchery-origin production of spring run and summer/fall run fish that influence both the fisheries within Puget Sound, and escapement to the spawning grounds. Because the hatchery stocks contribute to terminal fisheries, and in some cases, many hatchery strays escape to the spawning ground, historic patterns of wild Puget Sound Chinook salmon abundance may be obscured because of the interaction of hatchery- and natural-origin production. Hatchery programs in Puget Sound have annually released between about 23 million (1976) to over 56 million (1989) Chinook salmon (Figure 3.27). Since Puget Sound Chinook salmon were listed as threatened under the ESA in 1999, hatchery releases have averaged about 33 million annually. Although Puget Sound hatchery programs historically emphasized production for fisheries alone, many of today's programs are also associated with endangered species recovery or wild broodstock CWT indicator programs. The harvest rate in terminal fisheries for these stocks has generally declined from between 30% and 60% through the mid-1980s to about 10% at the time of listing under the ESA in 1999. In most years, the majority of the terminal fishery harvest has depended on the status of Green River Chinook salmon and to a lesser extent on Skagit River Chinook salmon. Directed terminal fisheries do not occur on Snohomish River, Stillaguamish River, and Lake Washington Chinook salmon. Terminal harvest data for 2024 are incomplete, as they have not yet all been reviewed by co-managers.

Spring run stocks in Puget Sound exhibit both ocean-type (age-0 fingerling outmigrants) and stream-type (age-1 yearling outmigrants) life histories. Key spring stocks are the CTC escapement indicators in the Nooksack and Skagit rivers, as well as the White River (CWT indicator), with associated hatchery programs in each. Escapement in the Nooksack River is predominately hatchery-origin fish, whereas on the Skagit River, hatchery-origin fish are rarely seen in the spawning areas. Summer/fall run ocean-type stocks make up the majority of Chinook salmon production from Puget Sound. Skagit River summer/fall Chinook salmon is the most abundant stock in Puget Sound and consists almost exclusively of natural-origin fish. The Skagit and Stillaguamish rivers have CWT exploitation rate indicator stocks but only the Stillaguamish River has a supplementation program that uses broodstock collected from the spawning grounds. Basins with large hatchery programs include the Snohomish and Green River CTC escapement indicator stocks as well as the Samish, Puyallup, Nisqually, and Skokomish rivers. In addition, net-pen rearing programs in Bellingham Bay and Tulalip Bay release large numbers of juvenile Chinook salmon.

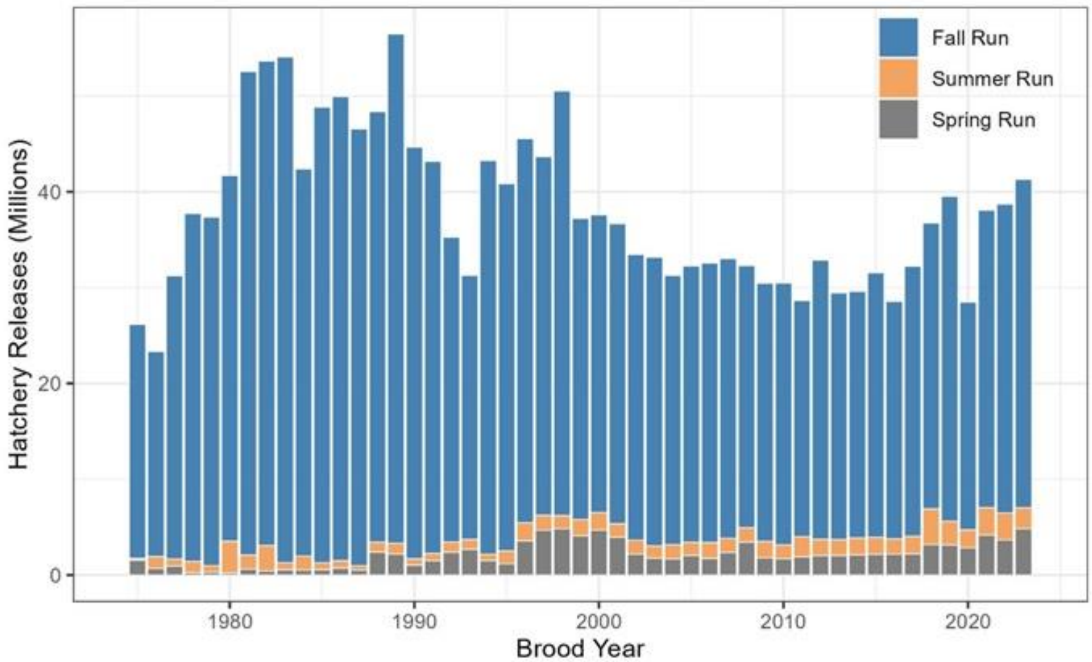


Figure 3.27–Chinook salmon released from Puget Sound hatcheries.

The long-term escapement trends for Puget Sound Chinook salmon stocks cannot be identified with certainty because of the inability to assess total production of natural stocks in Puget Sound, coupled with the changes in fishery patterns and hatchery production over the 1975 to 2024 time period. Data limitations notwithstanding, it is still possible to make some generalizations about the current status of Puget Sound escapement indicators based on the recent past at both the aggregate and individual population levels. Spring Chinook salmon in the Nooksack and Skagit rivers, for example, exhibit annual variability with no apparent escapement trend. Since ESA listing in 1999, aggregated summer/fall escapements have averaged around 25,000 with no apparent trend and high variation, peaking at approximately 45,000 in 2004 then declining to a low of around 10,300 in 2011 (Figure 3.28). The trend in the aggregated escapement of Puget Sound summer/fall CTC escapement indicator stocks is driven primarily by the status of the Skagit River summer/fall stock. In most years, the abundance of Skagit River fish is higher than the sum of the escapements of other Puget Sound CTC indicator stocks. This was especially true in the mid-2000s, when the escapement of Skagit River summer/fall Chinook salmon exceeded 20,000 annually. As part of the 2019 Agreement, escapement goals were included in Attachment I for the Skagit spring and Skagit summer/fall stocks.

The average aggregate escapement of Puget Sound summer/fall Chinook in 2009–2024 was about 14% lower than the long-term average during 1999–2024. Most individual Puget Sound summer/fall Chinook stocks also exhibit this pattern, with the exception of Lake Washington, which remained nearly the same (Appendix Table B7). Although it is important to acknowledge the influence of the time period choice on conclusions about recent abundance trends (i.e., near-record escapements were seen for many Puget Sound populations in the early 2000s), the observation of low escapements in recent years for multiple populations suggests this group of stocks remains depressed overall. Future assessments of escapement trends should attempt to separate hatchery strays from natural-origin spawners, where data permit.

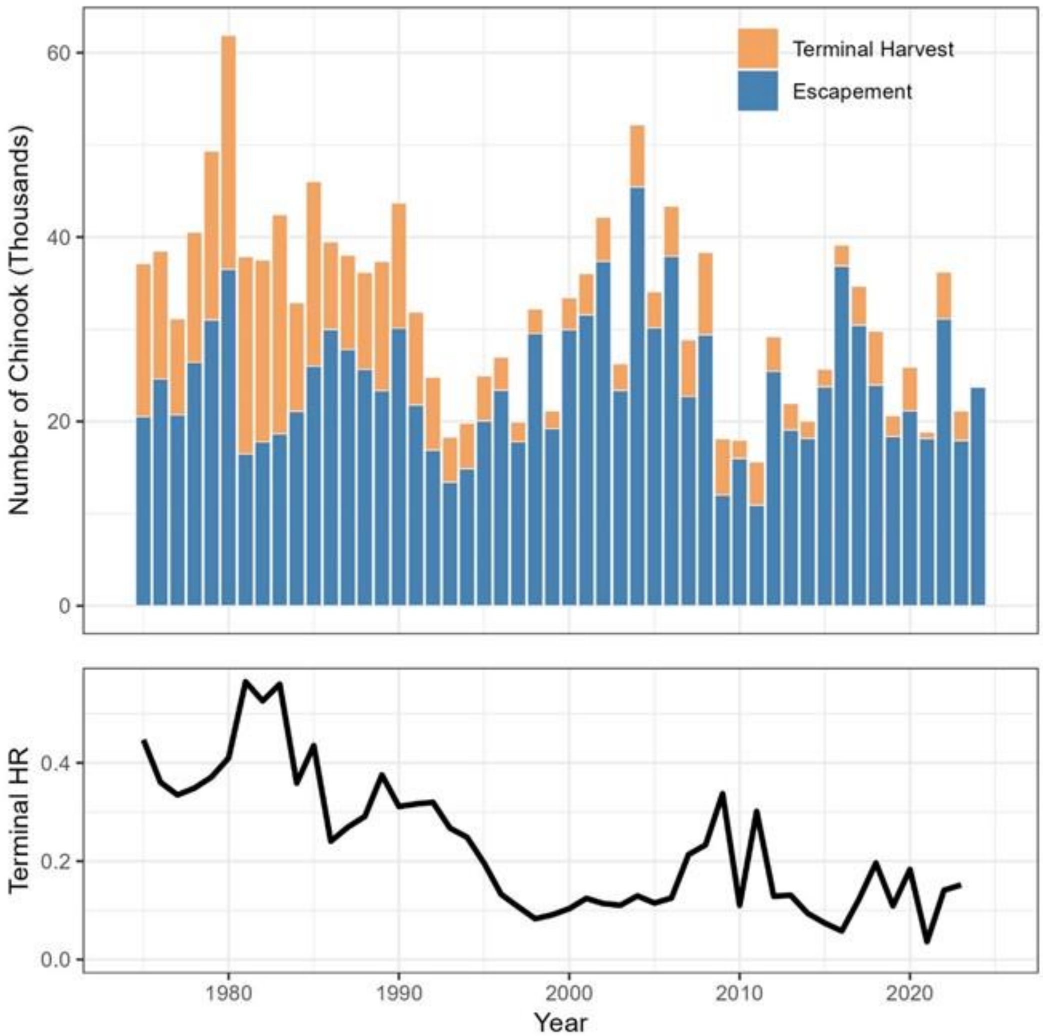


Figure 3.28–Escapement and terminal fishery harvest for the aggregate of Puget Sound summer/fall Chinook salmon Pacific Salmon Commission escapement indicator stocks.

Note: Terminal harvest for the most recent year is not yet available.

It is now possible to conduct synoptic evaluations of Puget Sound stocks with CTC-accepted escapement goals and implementation of mark-selective fishery algorithms. Only two Puget Sound indicator stocks, Skagit spring and Skagit summer/fall, have CTC-accepted escapement goals, which were most recently updated by the Skagit co-managers and adopted by the Commission in 2024 (CSCWG 2024). Mark-selective fishery algorithms were implemented by the CTC in 2024 and account for differential impacts from mark-selective fisheries, which are common within Puget Sound.

During the current treaty annex (2018–2028), Skagit spring spawning escapements have stayed above S_{MSY}, while at the same time cumulative mature-run exploitation rates have generally exceeded U_{MSY} (Figure 3.30).

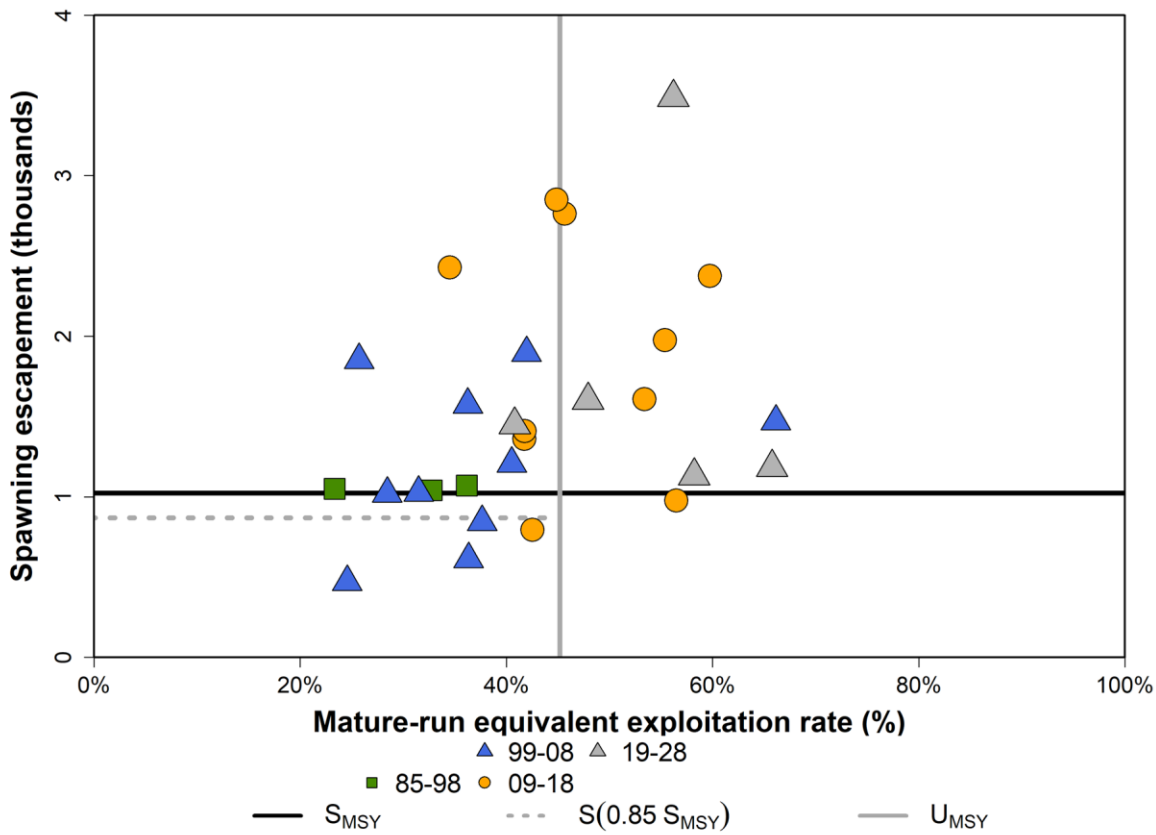


Figure 3.29–The distribution of escapement and exploitation rates from the current and previous annex (2009–2018) compared to the previous two annexes (1985–1998 and 1999–2008), suggests an increase in exploitation rates on this stock over time.

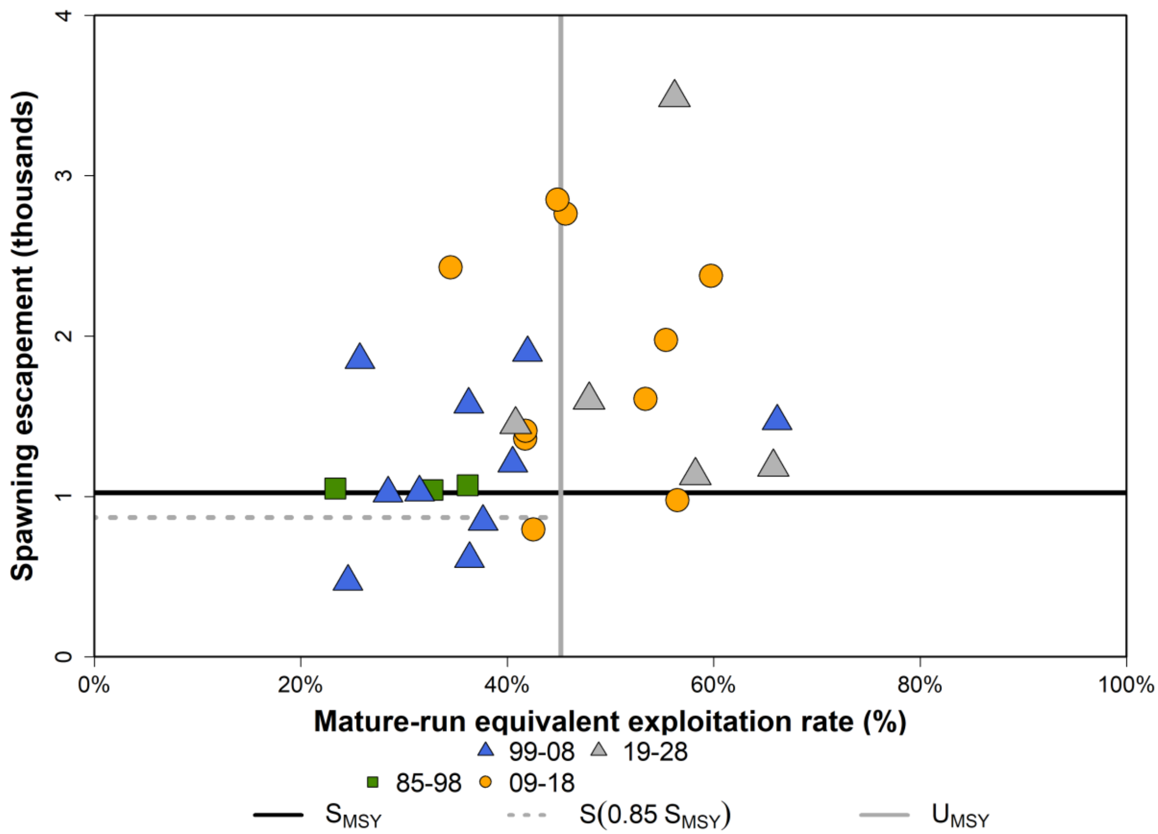


Figure 3.30–Skagit spring Chinook salmon spawning escapement and cumulative mature-run equivalent exploitation rate calculated from Marblemount Hatchery coded-wire tags.

Skagit summer/fall spawning escapements during the current annex have consistently been above S_{MSY}, while at the same time exploitation rates have held below U_{SMY} (Figure 3.31). The distribution of spawning escapements and exploitation rates during the current annex are consistent with those during the last treaty annex. Skagit summer/falls have generally experienced high spawning escapements and conservative exploitation rates under the PST; however, spawning escapement fell below S_{MSY} at least five times since the PST was signed in 1985, and in two of those years the exploitation rates also exceeded U_{MSY}.

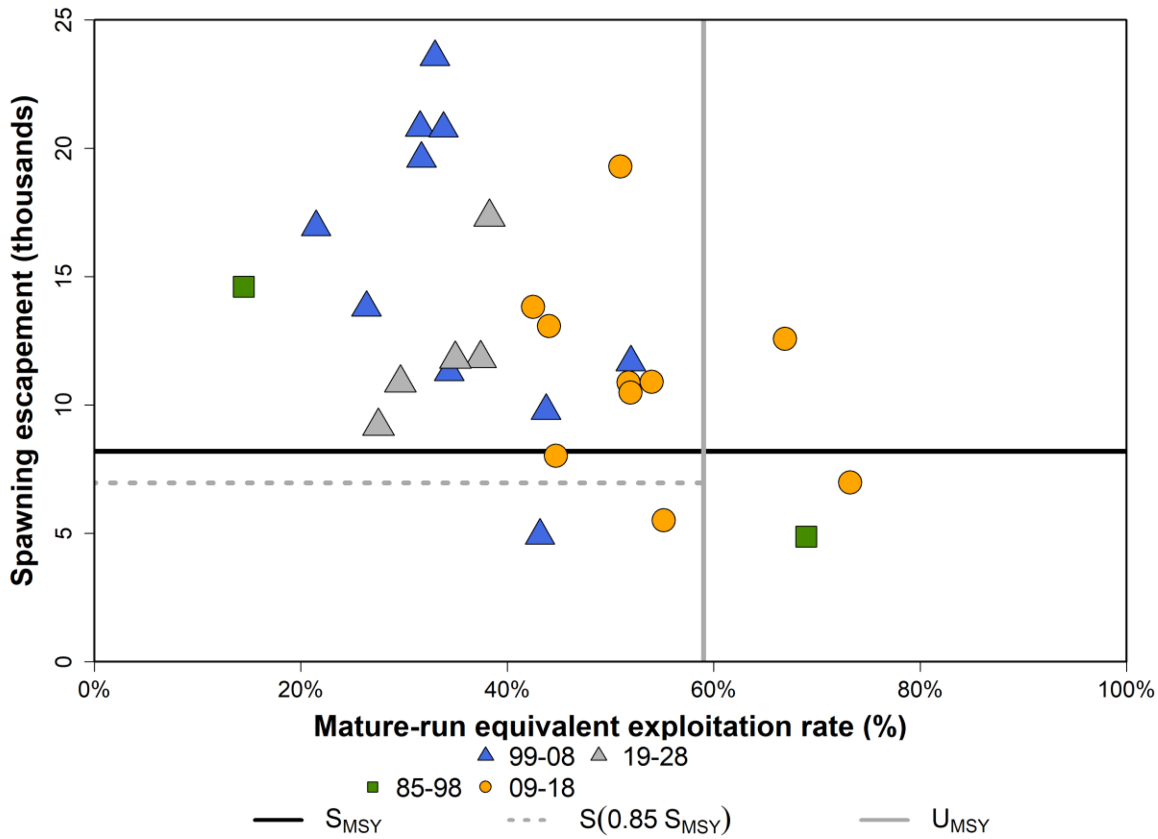


Figure 3.31–Skagit summer/fall Chinook salmon spawning escapement and cumulative mature-run equivalent exploitation rate calculated from Marblemount Hatchery coded-wire tags.

3.2.4.2 Coastal Washington

Coastal Washington is the only region in Washington accessible to anadromous salmonids where Chinook salmon are not listed under the U.S. Endangered Species Act. Consequently, salmon fishery management of the coastal Chinook salmon stocks in this region has one less regulatory framework to take into account but still has to balance conservation needs, state and tribal co-management, federal fishery management plans, and the PST. Hatchery production has less of a confounding influence on trend assessments compared to Puget Sound.

The aggregate escapement of spring and summer Chinook salmon CTC escapement indicator stocks in the Quillayute, Hoh, and Queets rivers and Grays Harbor ranged from a high of 11,740 in 1989 to a low of 2,315 in 2007 (Figure 3.32). The Hoh River spring/summer Chinook population has met its PSC escapement goal in 11 out of 21 years since it was accepted by the CTC in 2004. Over the same period, the Queets River spring/summer population has only met its PSC escapement goal four times. The terminal harvest rate on these stocks has averaged 9% since the 1999 PST Agreement went into effect and was 10% in 2024. This stock group has seen escapement declines since the highs of the late 1980s, with escapements in recent years that have rarely exceeded the long-term average.

There is no CTC exploitation rate indicator stock that is considered representative of this stock group. However, spring and summer Chinook salmon with CWTs were intermittently released from Sol Duc Salmon Hatchery in the Quillayute Basin through the mid-1990s and discontinued for about ten years before starting a new summer Chinook tagging program with the 2004 brood. Based on limited information from these tag recoveries that generally showed poor survival, the Quillayute summer stock has a northerly ocean catch distribution. Exploitation rates cannot be determined because recoveries are low and escapement sampling is inadequate in some years to appropriately index exploitation rates.

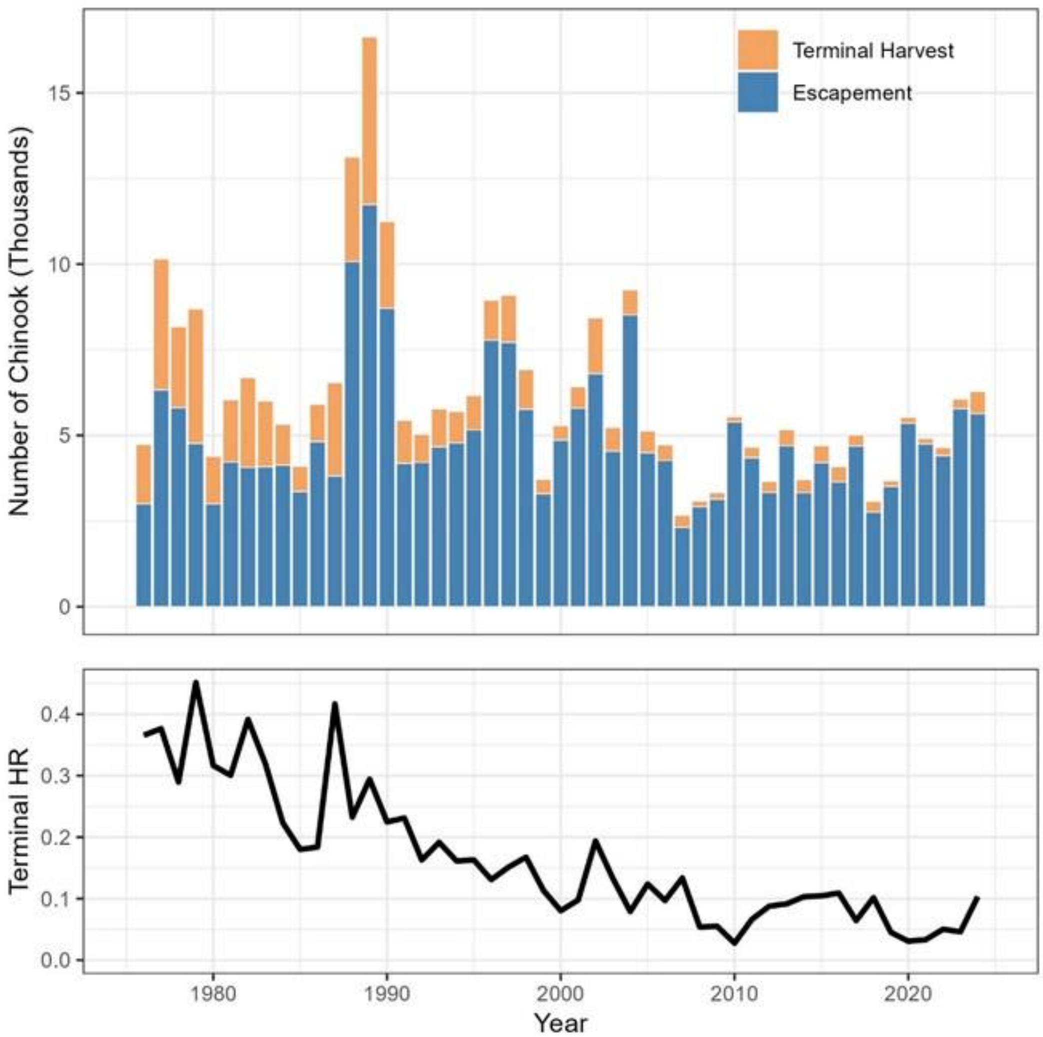


Figure 3.32–Escapements, terminal harvests, and terminal harvest rates for the aggregate of Washington coastal spring/summer Chinook salmon Pacific Salmon Commission escapement indicator stocks.

Note: Terminal harvest for the most recent year is preliminary.

Coastal Washington fall Chinook salmon escapement indicator stocks include Quillayute, Hoh, Queets, and Grays Harbor, which have PSC-agreed escapement goals, along with the Hoko stock that does not have a PSC-agreed escapement goal. The coastal fall Chinook salmon aggregate escapement has ranged from a low of nearly 8,000 in 1976 to a high of over 57,000 in 1988 (Figure 3.33). Similar to the Washington Coast spring/summer stocks, Washington coastal fall stocks are characterized by escapement declines since the highs of the late 1980s, and generally stable escapements in recent years (Section 2.3.4.2). Over the entire 1976 to 2024 time period, terminal harvest rates have varied between approximately 15% and 60% without a definitive trend and have averaged about 30% since 1999. With the exception of the Hoko where there are no terminal fisheries, harvest in terminal fisheries occurs predominantly as directed catch on Chinook salmon stocks with some incidental catch while targeting other species (Figure 3.33).

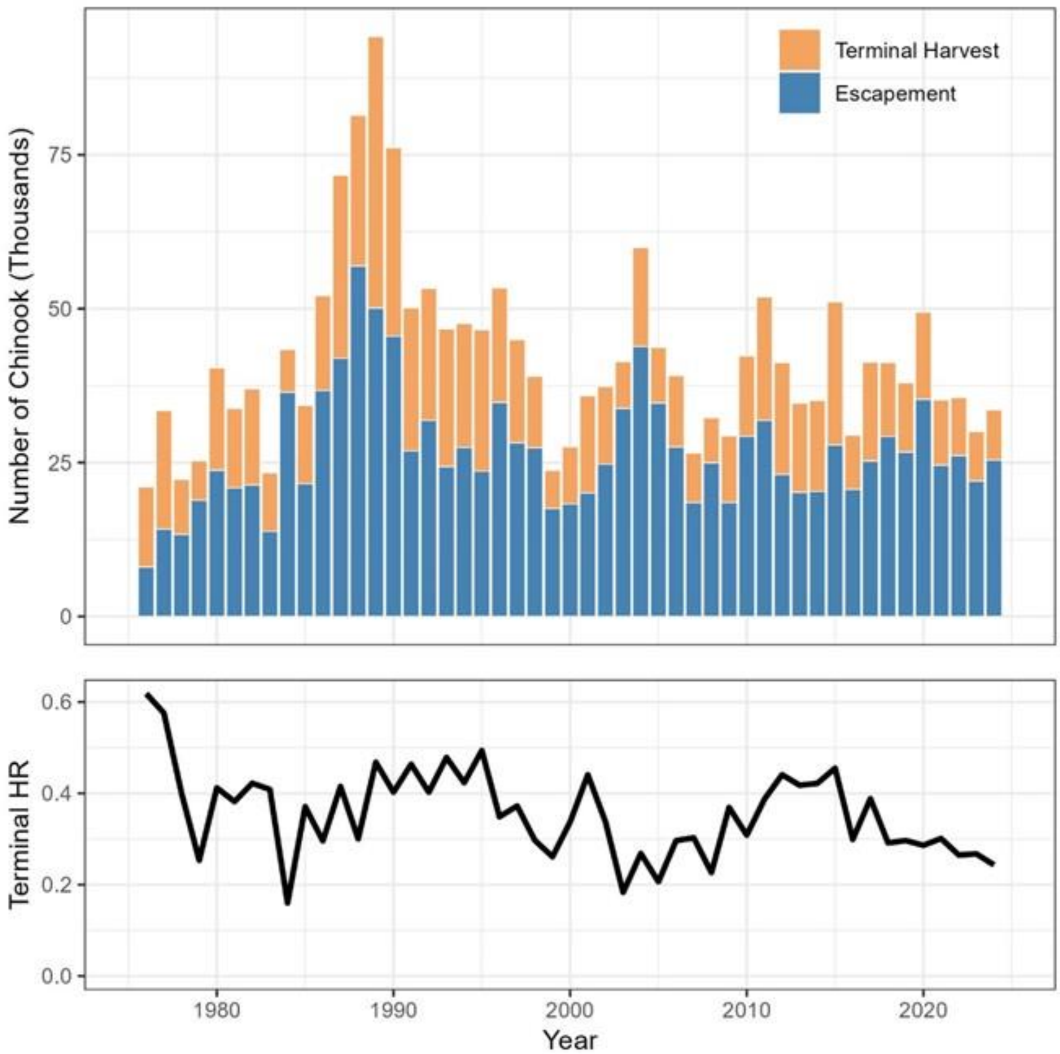


Figure 3.33–Escapement, terminal harvest, and terminal harvest rates for the aggregate of Washington coastal fall Chinook salmon Pacific Salmon Commission escapement indicator stocks.

Note: Terminal harvest for the most recent year is preliminary.

Fall Chinook salmon hatchery production is limited on the Washington Coast compared to Puget Sound, and not extensive in the CTC indicator stock basins. The current fall Chinook salmon hatchery programs include the Hoko Falls Hatchery that releases smolts for natural stock supplementation/CWT indicator stock purposes, Salmon River Fish Culture Hatchery in the Queets Basin, and Humptulips Salmon Hatchery in the Grays Harbor watershed. Other significant programs outside of the CTC escapement indicator stock programs include releases from Makah National Fish Hatchery on Tsoo-Yess River (formerly Sooes River), and Forks Creek Hatchery in Willapa Bay. All of these hatchery programs influence the management of terminal fisheries and the extent of directed harvest on fall run Chinook salmon of Washington Coast origin.

Despite a lack of clear trends in escapement for coastal Chinook salmon stocks (Section 2.3.4.2), conclusions on stock status and population trends are speculative without a full CWT-based run reconstruction that can account for total production. Ocean fishery impacts for these stocks are estimated using the Queets CWT indicator tag releases under the assumption that it is a suitable surrogate for the exploitation and ocean distribution of other fall Chinook stocks on the Washington Coast. From a simple fishery distribution basis, the portion of the Queets exploitation rate indicator stock impacted in ocean fisheries shows no apparent temporal trend and has averaged about 40% of the total accounting in all fisheries and escapements since the mid-1980s (CTC 2023), while terminal returns have declined over the same period (Appendix Table B8). Further analysis is needed to confirm whether the Queets indicator stock truly is a suitable surrogate for other Washington Coast fall Chinook salmon stocks; however, the data available to conduct such an analysis are limited.

Queets CWT indicator stock releases were used to produce plots for a synoptic evaluation of the four coastal Washington fall Chinook salmon stocks with CTC-accepted escapement goals—Quillayute, Hoh, and Queets rivers, and Grays Harbor. Queets CWT indicator stock releases were assumed to be representative of the exploitation and ocean distribution of Quillayute, Hoh, Queets, and Grays Harbor natural stocks. All four stocks have active terminal fisheries with harvest rates that can vary considerably from year to year.

A simultaneous evaluation of spawning escapements and assumed cumulative MRE exploitation rates shows management of Queets River fall Chinook salmon (Figure 3.34) in the safe zone in all but six years, with exploitation rates below U_{MSY} and spawning escapement exceeding S_{MSY}. Escapements in 2002 were in the buffer zone, while those in 1999, 2007, 2018, 2022, and 2023 were below $0.85*S_{MSY}$, putting them in the "Low Escapement Low Exploitation" zone. Management for escapement and MRE exploitation rate was in the safe zone in all years for the Quillayute (Figure 3.35) and Hoh (Figure 3.36) rivers, with the exception of the Quillayute in 2014, where escapement was in the buffer zone. As evidenced by the high U_{MSY} values (0.87 for Queets and Quillayute; 0.90 for Hoh), productivity of these stocks is assumed to be high and suggests less stringent management than is required for stocks with lower U_{MSY}. This assumption is supported by historical stock-recruit analyses that were conducted in the mid-1980's; however, given their age, a re-examination of these relationships is recommended. For Grays Harbor Chinook (Figure 3.37), the current escapement goal was accepted by the CTC in 2014. In the years since with available data, five were in the safe zone, two were in the buffer zone, two were in the "Low Escapement Low Exploitation" zone, and one was in the "High Escapement High Exploitation" zone. No years have fallen into the high risk category since the escapement goal was accepted in 2014.

From this synoptic evaluation perspective, these coastal Washington stocks exhibit a track record of sustainable management. Further, this view of the fishery impact and escapement data suggests that much of the variation in escapements for these stocks has been driven by non-fishing factors (e.g., anomalously high or low marine survival).

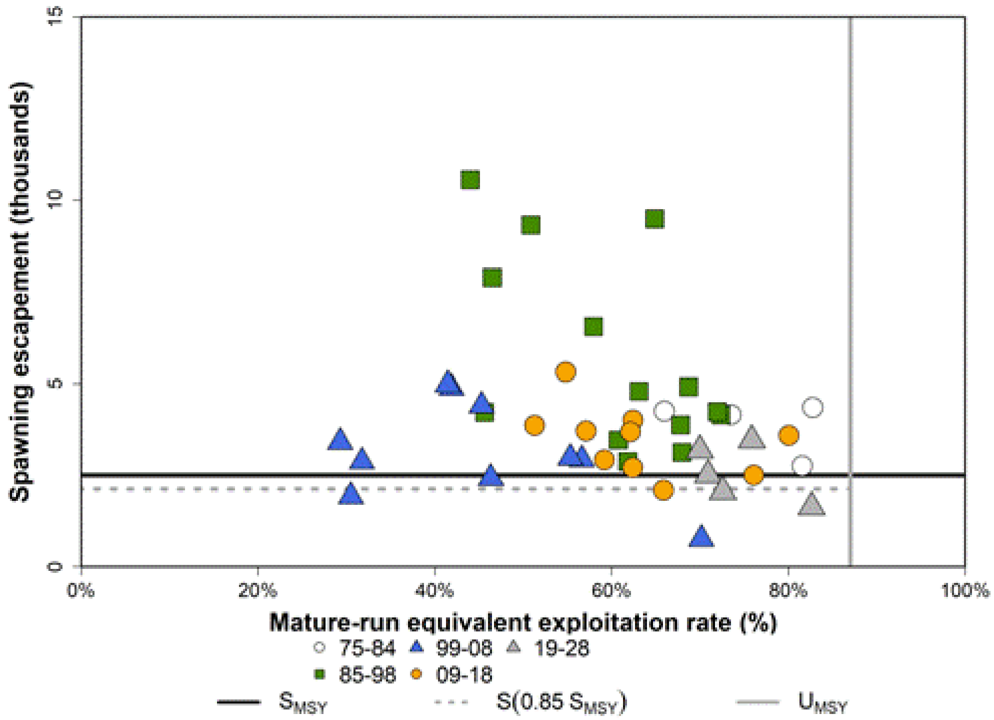


Figure 3.34–Queets River fall Chinook salmon spawning escapement and cumulative mature-run equivalent exploitation rate calculated from Queets River Pacific Salmon Commission indicator coded-wire tags.

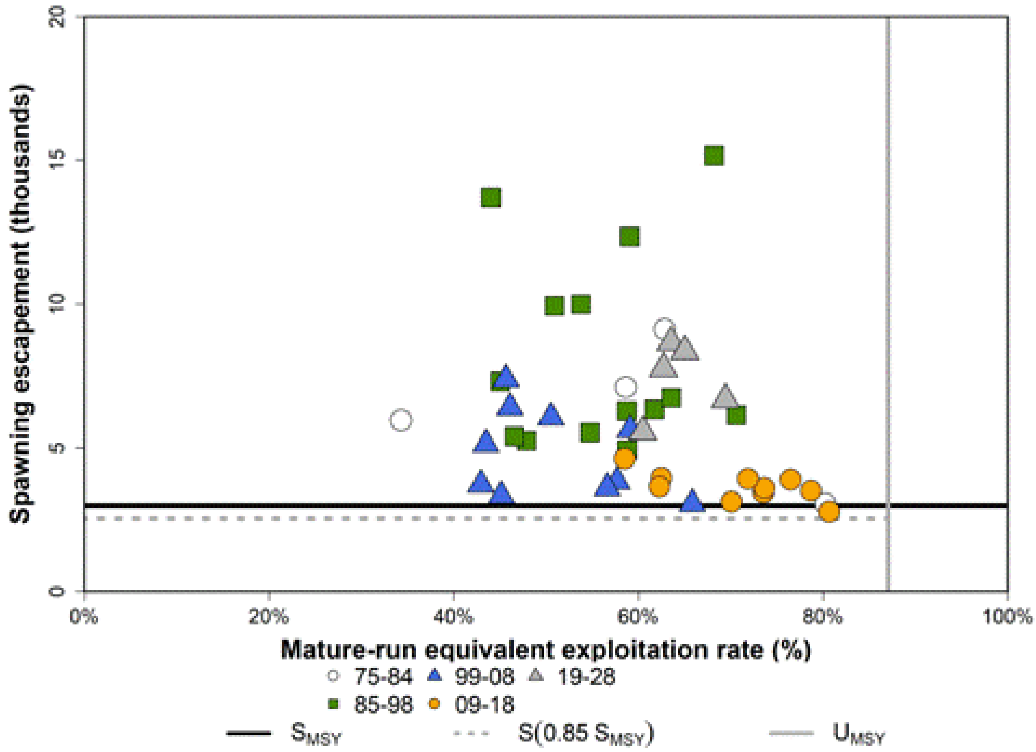


Figure 3.35–Quillayute River fall Chinook salmon spawning escapement and cumulative mature-run equivalent exploitation rate calculated from Queets River Pacific Salmon Commission indicator coded-wire tags.

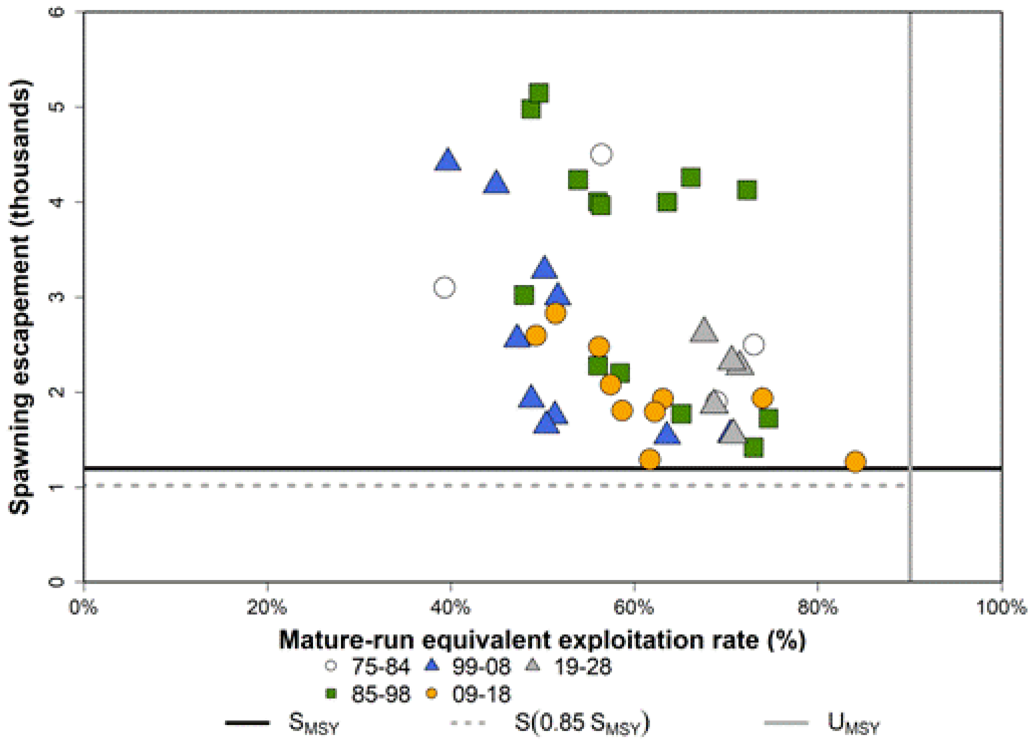


Figure 3.36–Hoh River fall Chinook salmon spawning escapement and cumulative mature-run equivalent exploitation rate calculated from Queets River Pacific Salmon Commission indicator CWTs.

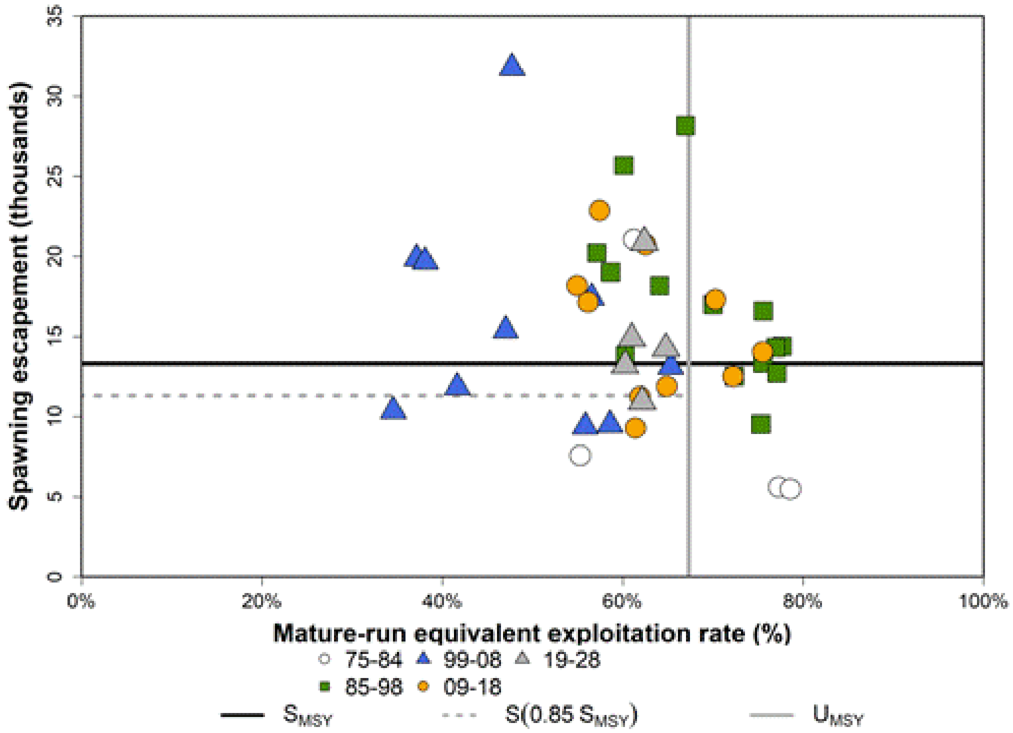


Figure 3.37–Grays Harbor fall Chinook salmon spawning escapement and cumulative mature-run equivalent exploitation rate calculated from Queets River Pacific Salmon Commission indicator coded-wire tags.

3.2.4.3 Columbia River

3.2.4.3.1 Columbia River Summers

The PSC Mid-Columbia summers indicator stock includes populations in the Okanagan, Methow, Entiat, and Wenatchee rivers as well as hatchery production from Wells and Chief Joseph hatcheries.

The synoptic evaluation (Figure 3.38) uses Rock Island Dam counts as the metric of escapement for this stock group (see Section 0 for more detail). Except for 2018, these counts have exceeded 40,000 since 2009, while the stock experienced MRE exploitation rates below U_{MSY}. The synoptic evaluation shows Mid-Columbia summers in the safe zone in all but two years since 1998 (Figure 3.38). Mid-Columbia summers have demonstrated positive survival deviations for complete broods since 1997, within less than 1.5 standard deviations (Figure 3.39).

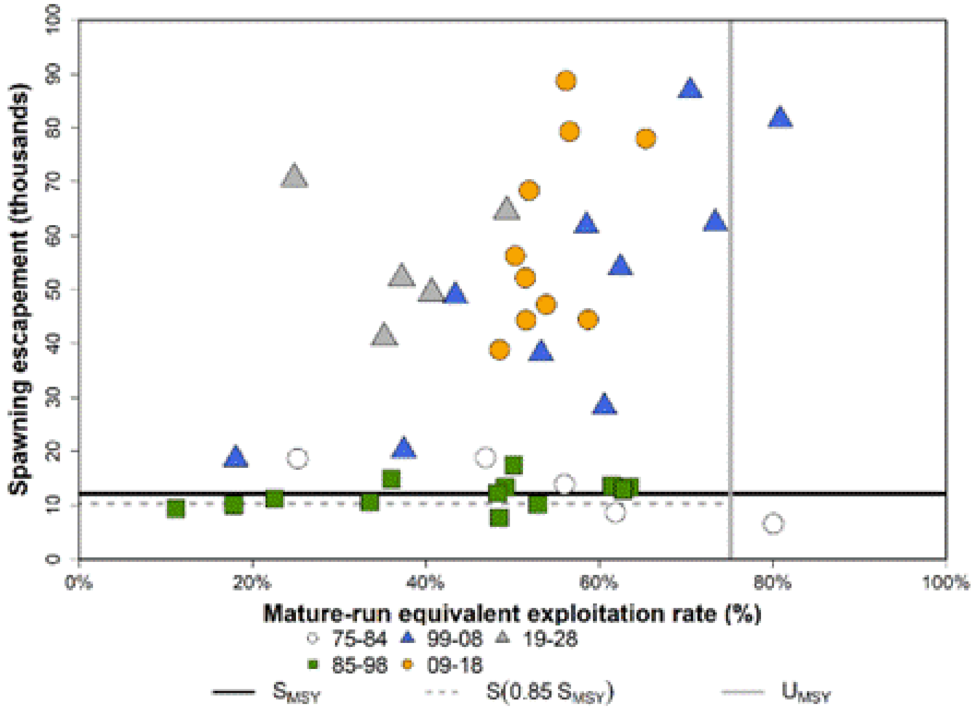


Figure 3.38–Mid-Columbia summer Chinook salmon spawning escapement past Rock Island Dam and cumulative mature-run equivalent exploitation rate calculated from Wells Hatchery coded-wire tags.

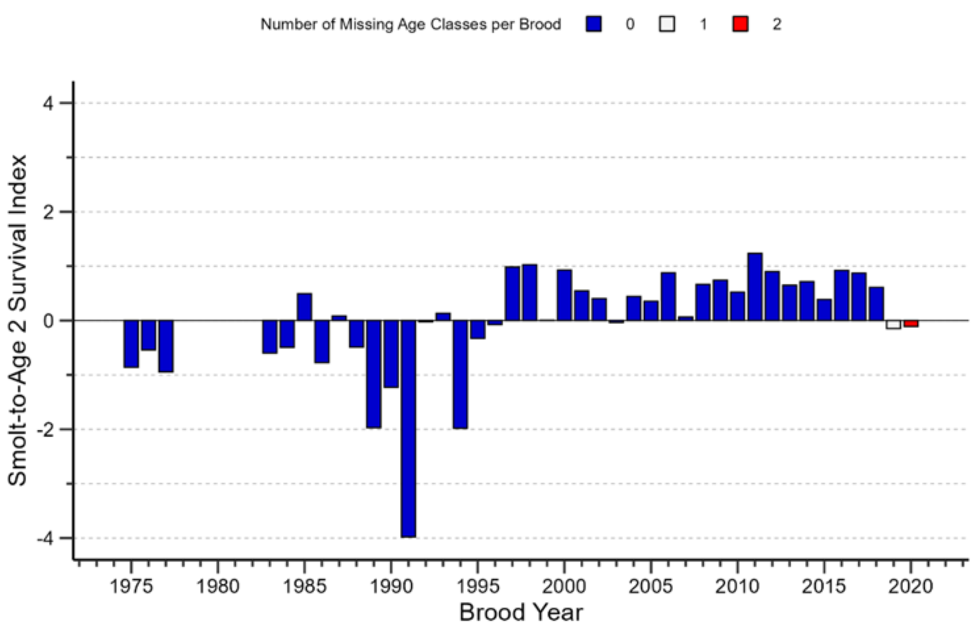


Figure 3.39–Marine survival index (standardized to a mean of zero) for Mid-Columbia summer Chinook salmon.

3.2.4.3.2 Columbia River Fall

There are three Columbia River fall escapement indicator stocks: Upriver Brights, Lewis River Wild, and Coweeman. In the *U.S. v. Oregon Management Agreement* (2018 –2027 U.S. v. Oregon Management Agreement), the Upriver Bright fall Chinook management unit is comprised of bright fall Chinook returning above Bonneville Dam, including the Deschutes, upper Columbia and Snake rivers, but the Upriver Brights escapement indicator only represents fall Chinook in the Columbia River above McNary Dam.

MRE exploitation rates for Upriver Brights have generally been lower since 2018 than in 2009–2018, while escapements have exceeded S_{MSY} since 1982 (Figure 3.39). The last six complete broods for wild Hanford Reach Upriver Brights have had negative survival deviations (Figure 3.40), while the three most recent complete broods of Priest Rapids Fall Chinook have had positive deviations (Figure 3.41).

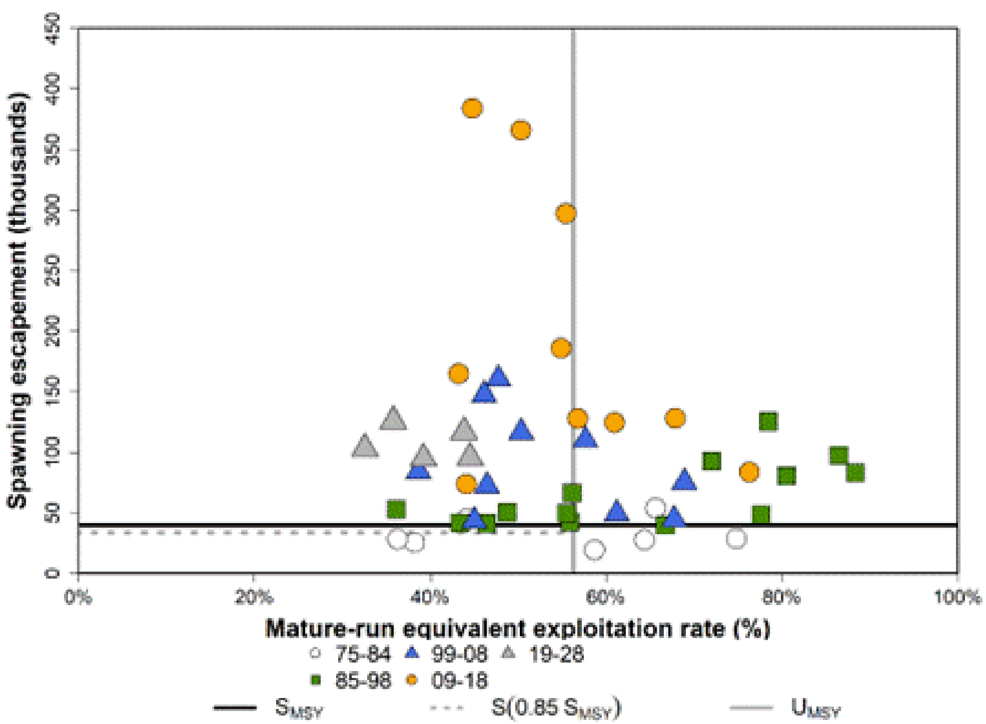


Figure 3.40–Upriver Bright fall Chinook salmon spawning escapement and cumulative mature-run equivalent exploitation rate calculated from Priest Rapids Hatchery Pacific Salmon Commission indicator coded-wire tags.

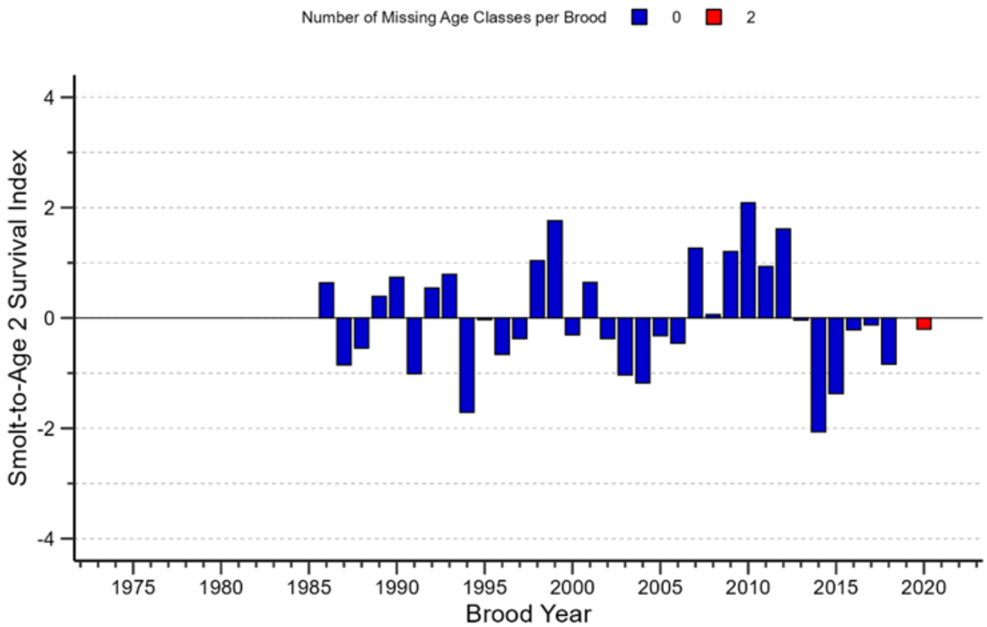


Figure 3.41–Marine survival index (standardized to a mean of zero) for Upriver Bright Chinook salmon, as represented by Hanford Reach Wild Chinook salmon.

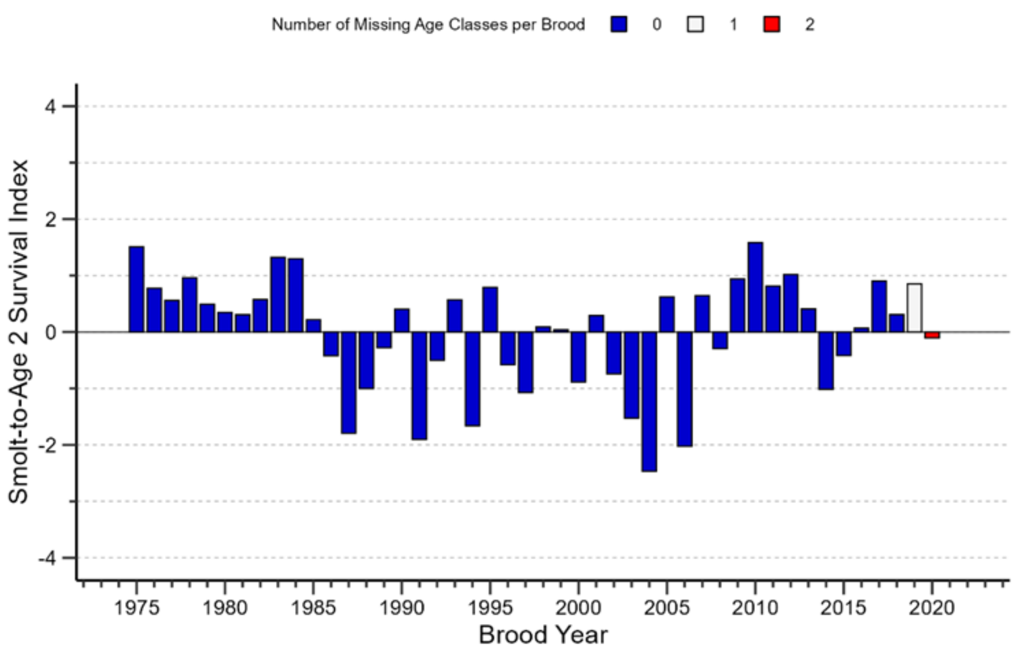


Figure 3.42–Marine survival index (standardized to a mean of zero) for Upriver Bright Chinook salmon, as represented by Priest Rapids Hatchery.

For Lewis River Wild fall Chinook salmon, MRE exploitation rates since 2008 have been below the estimated U_{MSY} of 76% and escapements have been above 85% of S_{MSY} (Figure 3.42). Survival indices for complete broods of Lewis River Wild appear to be declining since the 2016 brood (Figure 3.43).

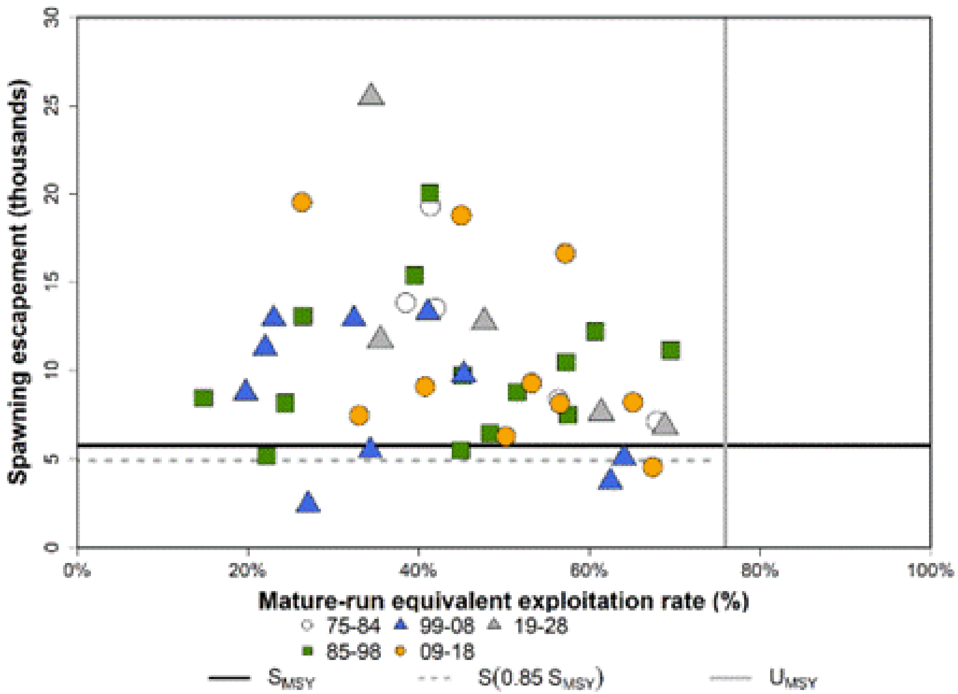


Figure 3.43–Lewis River Wild fall Chinook salmon spawning escapement and cumulative mature-run equivalent exploitation rate calculated from coded-wire tags in Lewis River wild Chinook salmon.

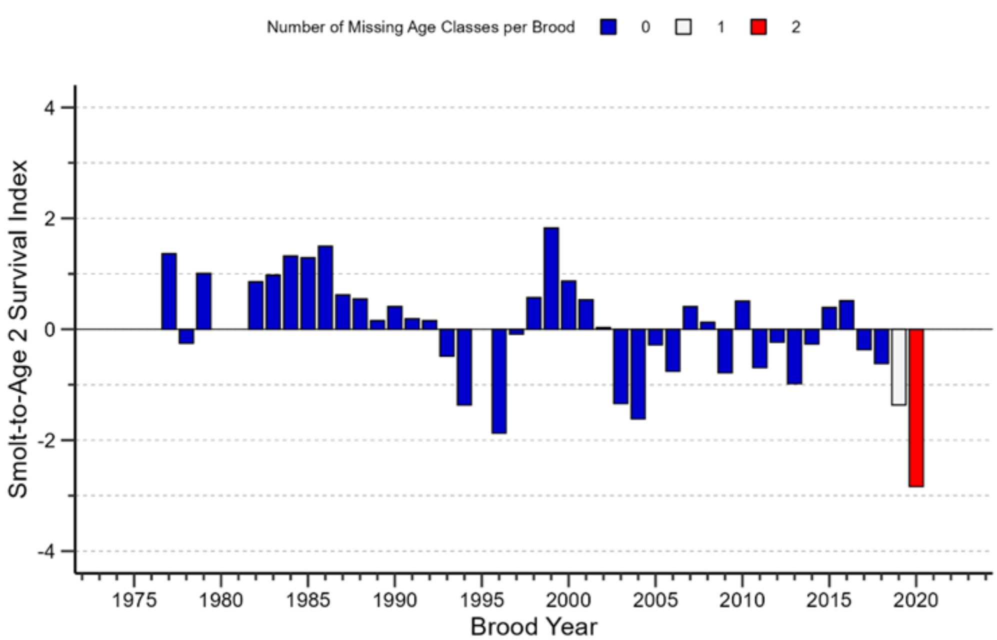


Figure 3.44–Marine survival index (standardized to a mean of zero) for Lewis River Wild fall Chinook salmon.

For Coweeman fall Chinook salmon, there is no PSC escapement goal or corresponding U_{MSY}. Cowlitz Hatchery fall Chinook are used as the CWT indicator for this wild tule stock, and those CWTs indicate negative survival deviations of near or more than one standard deviation for four of the last six complete broods (Figure 3.44).

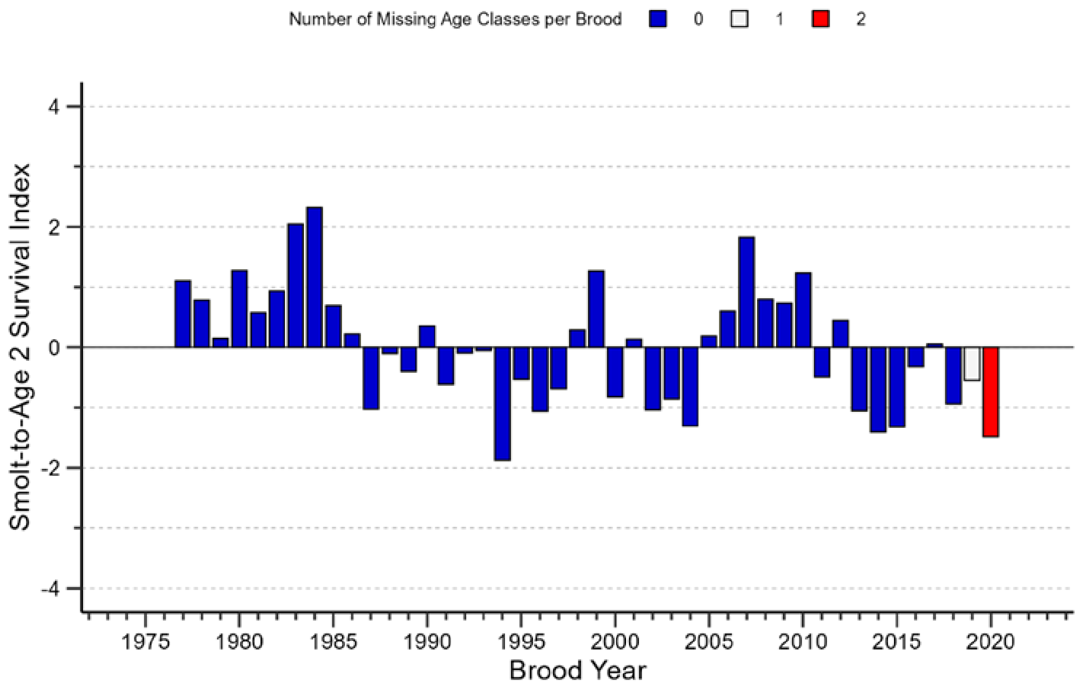


Figure 3.45– Marine survival index (standardized to a mean of zero) for Coweeman tule fall Chinook salmon, as represented by Cowlitz Hatchery fall Chinook coded-wire tags.

3.2.4.4 Coastal Oregon

3.2.4.4.1 North Oregon Coast

Total estimated spawning escapement for the NOC aggregate stock has ranged from approximately 24,000 Chinook salmon in 2008 to 139,000 in 1988 (Figure 3.45). The recent 10-year (2015–2024) average for aggregate escapement is approximately 58,600, including an escapement in 2024 of 49,400. The abundance forecast expressed in terms of spawning escapement is approximately 53,000 for 2025. After low escapements from 2007 to 2009, the NOC stock aggregate returned to average or above-average escapement from 2013 through 2016. All three NOC escapement indicator stocks—the Nehalem, Siuslaw, and Siletz—failed to achieve their escapement objectives in 2007 and 2008.

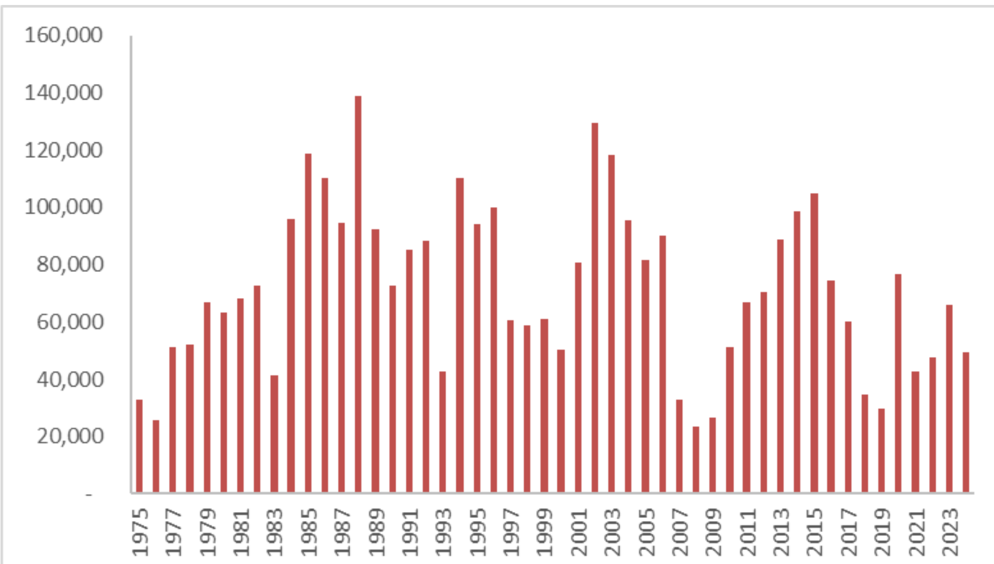


Figure 3.46– North Oregon Coast (NOC) aggregate escapements.

Since 2016, the NOC has experienced a period of mixed marine survival with no discernable trend, as indicated by the Salmon River Hatchery exploitation rate indicator stock Figure 3.47. The last year in the time-series suggests that the survival rate to age 2 has increased compared to the last 5 years. Because the survival index for the last two years in the data series were computed from incomplete broods, caution is recommended in concluding that survival has substantially increased.

Management actions in terminal fisheries, along with reductions in northern Treaty fisheries and better-than-average survival rates for the 2007–2012 brood years (Figure 3.47) appear to have contributed to the increased escapements following a period of decline in the 2007–2009 return years. More conservative terminal fishery management in 2020 perhaps contributed to above goal escapement performance for the Siuslaw. These terminal fisheries actions, paired with forgone fishing opportunity in both AABM and ISBM fisheries during the 2020 catch year due to COVID-19 related restrictions, also contributed to several stocks within the NOC aggregate outperforming escapement forecasts. Despite closure of the terminal sport fishery to retention of wild fish in 2022, poor marine survival resulted in escapement that was below goal for the Siuslaw basin.

A review of the synoptic plots (Figure 3.48, Figure 3.49 and Figure 3.50) shows that the three NOC escapement indicator stocks have generally exhibited exploitation rates lower and escapements that have been higher than required to achieve MSY. However, of the three stocks, the Siuslaw stock (Figure 3.50) has exhibited more years below the escapement objective and also has had the most years with high exploitation rates.

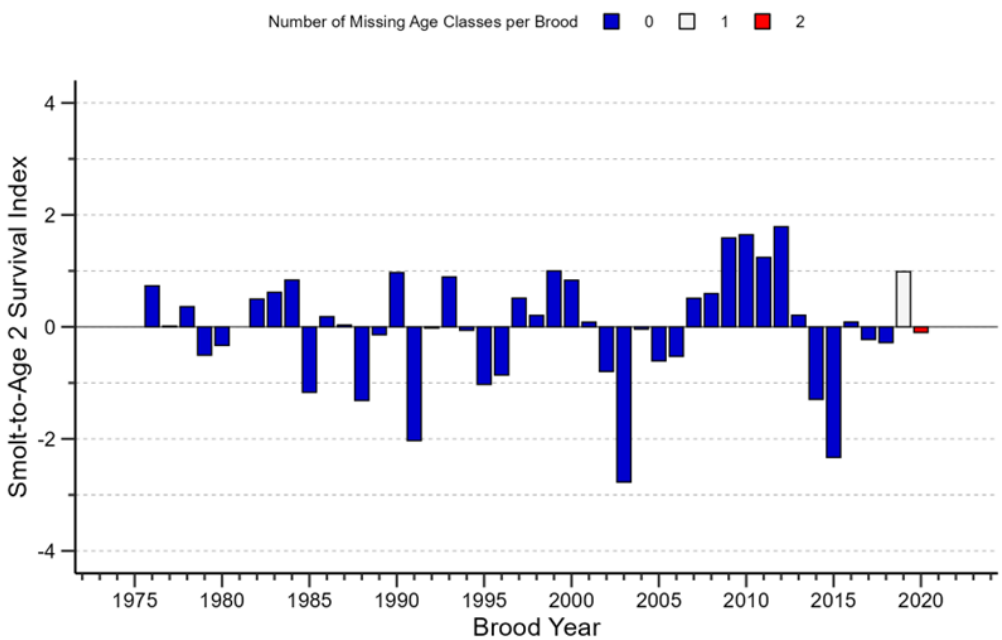


Figure 3.47–Marine survival index (standardized to a mean of zero) for the Salmon River hatchery stock of Chinook salmon.

Note: Brood years 1976–2020 are shown, with the exception of 1981, for which there is no information.

From 2006 to 2010, the Nehalem stock failed to meet 85% of its escapement goal (Figure 3.48). The escapement goal was attained from 2011–2016. In 2017and 2018 the Nehalem missed goal but was within 85% of the escapement goal, and afterward was below 85% of goal in 2022, making goal in 2019, 2020, 2021, and 2023. All but one of these years below 85% of goal was in the low escapement but also low exploitation zone; 2006, however, was in the high risk zone of low escapement but high exploitation. Of these years between 85%-100% of goal attainment, only 2017 was in that high risk zone.

The Siletz River stock of Chinook salmon exhibits high productivity as demonstrated by the high U_{MSY}. All but five of the observed data points of escapement and exploitation are within the “safe zone”, and only 2007 (below 85% of escapement goal, plus high exploitation) was in the high risk zone (Figure 3.49). Escapements from have increased since escapements observed in return years 2007 to 2009, with escapement having been above goal every year since 2010; likewise, from 1979-2006 escapement was above goal in all but 1983.

Since 2016 the Siuslaw stock has been above escapement goal in only 2020, but all but one of these below goal years were in the low escapement/low exploitation zone; 2018 was in the high risk zone (Figure 3.50). Within the periods of AABM management only two other years (2007 and 2008) had below goal escapement; 2007 was in the high risk zone, but 2008 was in the buffer zone above 85% of goal attainment. Recent poor escapement performance, high exploitation rate and low survival are flags suggesting cautious management; the terminal fishery was closed to harvest of wild fish in 2022 and strict bag limits have been in place since 2019, with the exception of 2021.

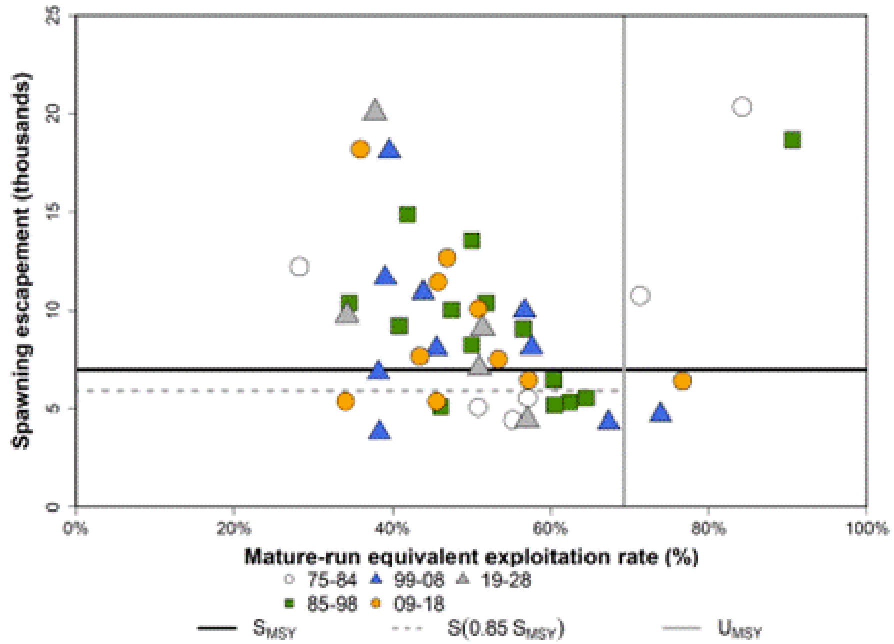


Figure 3.48–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by calendar year for the Nehalem River stock of Chinook salmon, 1979–2023.

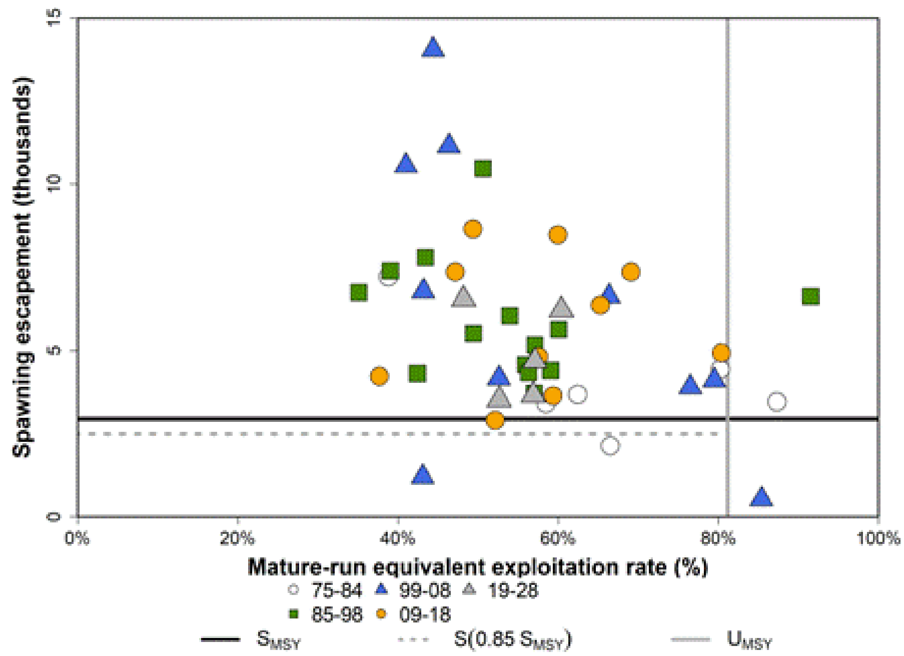


Figure 3.49–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by calendar year for the Siletz River stock of Chinook salmon, 1979–2023.

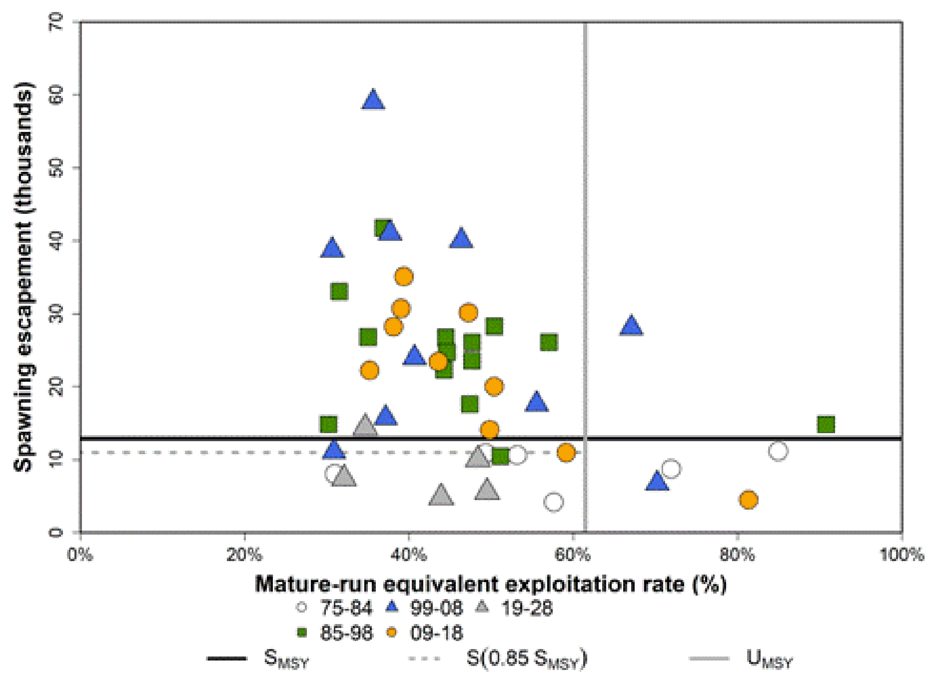


Figure 3.50–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by calendar year for the Siuslaw River stock of Chinook salmon, 1979–2023.

3.2.4.4.2 Mid-Oregon Coast

The Mid-Oregon Coast aggregate escapement indicator stocks do not have escapement goals, and thus calculations are unavailable for a synoptic plot. After a period of declining escapement from 2005 to 2008, the Mid-Oregon Coast stock aggregate rebounded to historical averages during the 2010–2016 return years, thereafter dropping to below average annual escapements (Figure 3.51). Total aggregated estimated escapement for the MOC has ranged from lows of about 11,000 in 1976 and again in 2024, to a high of 110,400 in 2015. The 10-year average (2015–2024) escapement for the MOC is about 28,000 (Figure 3.50). Forecasted escapement for the 2025 return year is about 17,000 spawning adults. In recent years, marine survival brood year metrics showed below average survival and translated into reduced expectations for this aggregate's production (Figure 3.52). Thus, there are low expectations for the coming year's terminal return in 2025.

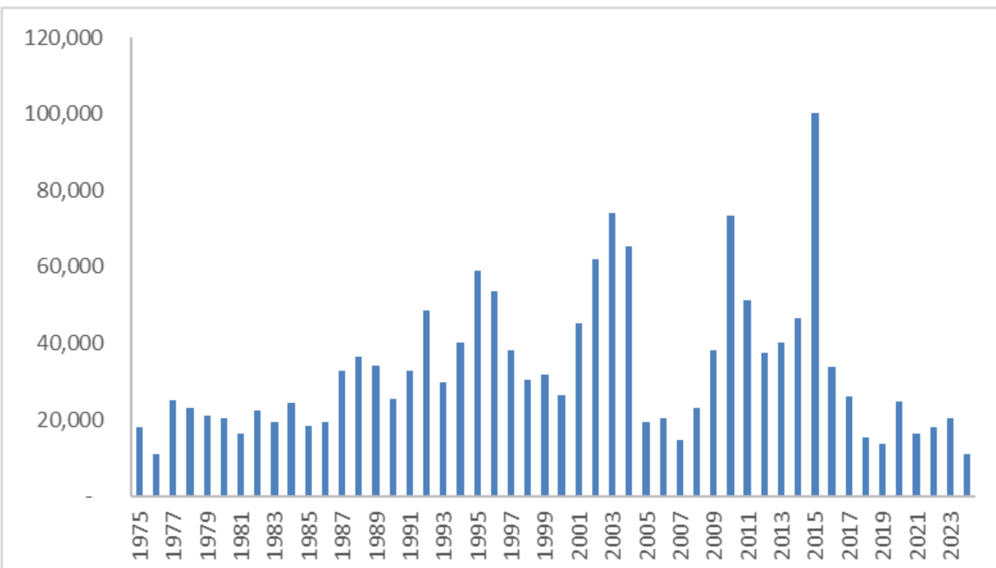


Figure 3.51– Mid Oregon Coast (MOC) aggregate escapements.

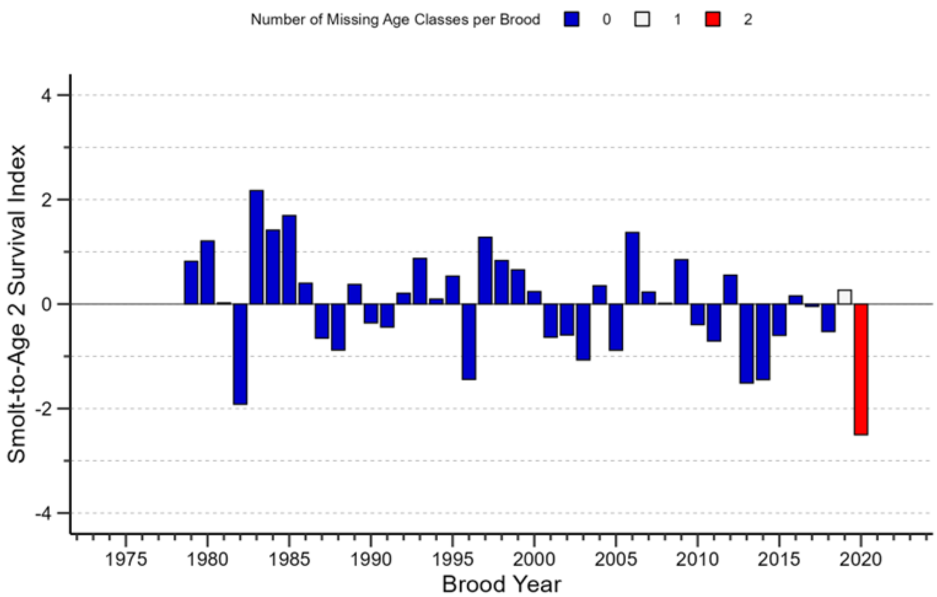


Figure 3.52–Marine survival index (standardized to a mean of zero) for the Elk River hatchery stock of Chinook salmon.

4. Catch and Escapement Indicator Improvement (CEII) and Coded-Wire Tag and Recovery (CWT&R) Project Summaries

During the negotiations within the PSC to amend the previous Chinook salmon regime, it became apparent that improvements were needed to the stock and fishery assessment programs to provide key data on Chinook salmon to support the implementation of Chapter 3. Accordingly, Chapter 3, paragraphs 2(c) and 2(d) of the 2019 PST Agreement call for a Catch and Escapement Indicator Improvement (CEII) and Coded-Wire Tag and Recovery (CWT&R) program to fill in key data gaps and to improve data quality and timeliness. The PSC subsequently created a bilateral work group, referred to as the C2 Work Group, to discuss programs initiated germane to these PST provisions and provide opportunities to exchange project results and conclusions and advancements in knowledge per paragraph 2(e). This section provides summaries of Canadian and U.S. projects supporting the C2 initiatives as required per paragraph 2(b)(ix) of Chapter 3 of the 2019 PST Agreement.

There are some nuanced differences in the Canadian and U.S. implementation of C2 initiatives. The U.S. section of the C2 Work Group receives specific funding to manage and disperse for C2 projects; the Canadian section does not. Funding for Canadian Chinook salmon stock and fishery assessment projects which support C2 initiatives has been increased in this Annex, but the dispersion of those funds is not overseen by the Canadian section of the C2 Work Group . Canadian C2 members do not undertake formal reviews of Canadian projects nor provide feedback directly to project proponents as members are not reviewing/approving funding proposals, while U.S. C2 members are involved in every stage of the process including soliciting project proposals, reviewing proposals and making funding recommendations to the U.S. Commissioners. Canadian C2 members are currently inventorying all projects that support C2 initiatives across DFO's Pacific Region, and for the remainder of this Agreement will track progress of such projects.

4.1 Canadian project summaries

In 2024, Canada bilaterally shared progress and results to date for several projects that directly address C2 themes. These projects aim to increase the number of exploitation rate indicator stocks to represent Chinook production and fishery exploitation rates for escapement indicator stocks, as well as develop analytical tools that involve catch and escapement data in the implementation of Chapter 3. Many of these projects are ongoing and updates and final results will continue to be shared bilaterally.

Summaries of the projects are provided below.

4.1.1 Development of a Mainland BC Chinook Salmon Indicator Stock (DFO)

Work continues to narrow focus on potential Chinook salmon stocks in the Mainland inlets of BC which could serve as long term PST Escapement and CWT Indicator stocks. There are currently no formal adult or juvenile programs on these systems. Efforts on Phillips River Chinook salmon were informative, and included in the PST for a time, but ultimately determined not to be representative of the dominant systems and Chinook salmon stocks in the area. Through work to date, focus has been narrowed to two potential systems: Klinaklini

River (Knight Inlet) and Southgate River (Bute Inlet). Both are large, glacial systems with unique Chinook salmon biology; large bodied, white fleshed, mixed ocean/stream type fish that appear to be far north migrants. It is unclear where and to what extent these populations interact with fisheries.

In Klinaklini River, historical MR abundance estimation techniques have been replaced by trial video weir enumeration, but the historical MR approach is being explored for redevelopment. Collaborations are being developed with local First Nations and expansions of assessment are planned, potentially including juvenile components and radio telemetry.

In Southgate River, projects utilizing acoustic and radio telemetry have been very informative on Chinook salmon behavior in the inlet, timing of migration and utilization of the watershed. MR techniques are being implemented and improved to estimate abundance, and egg takes on Southgate returns over brood years 2022 to 2024 have resulted in CWT juveniles being released back into the system from 2023 to 2025. The production target is 100,000 CWT releases. Fishery recoveries of CWT are anticipated to begin in 2025. These projects are currently anticipated to continue through at least one full life cycle.

4.1.2 Fraser River Chinook Salmon Indicator Stock Updates (DFO)

Chilko River and Lower Chilcotin River populations are identified as indicators in development for the summer and spring 1.3 stock groups, respectively, in Attachment I of Chapter 3 of the 2019 PST Agreement. The goal of these two projects is to provide high quality escapement estimate time series and to have robust CWT programs so these stocks may be suitable CWT indicator stocks.

In 2024 the C2 work group received updates on annual progress for these projects in addition to an update following the Chilcotin landslide that occurred 31 July 2024, completely blocking the river for several days. Fish passage was reestablished by 09 August 2024 and effects continue to be monitored.

The Chilko River MR program has been ongoing since 2010. This program produces high quality, precise escapement estimates and relevant biological information about age, sex and length. Aerial peak count surveys have been conducted in conjunction with the MR estimates and used to produce a calibrated time series of absolute escapement estimates back to 1975. The remaining factor for Chilko to become a full CWT indicator is meeting the CWT tagged smolt production target. Brood collection efforts started in 2014 and it has been a challenge to collect sufficient ripe brood stock. In 2023 large in-river raceways were installed with electric fencing to hold green fish until they were ripe. This was highly successful and will be the approach moving forward. With a lack of hatcheries in the project area, and hatcheries in other areas often fully subscribed, hatchery capacity to support this program has been difficult to procure; however, a partnership was recently announced between the Government of Canada and the Lheidli T’enneh First Nation to build a new hatchery in Prince George that will have capacity to support this project. In 2024 the MR program continued smoothly, and brood collection has begun with a production target of 220,000 smolts.

The Lower Chilcotin program is in the early phases of development relative to Chilko and has been run as a sonar and deadpitch program for the last three years. A time series of aerial surveys back to 1975 exists and a calibration relationship is in development as more years of paired data become available. Similar to Chilko, issues around brood collection and hatchery capacity exist for Lower Chilcotin. To date, only minimal releases of fed fry have occurred. Funding was requested to trial a dedicated angling program in 2024 for brood collection with in-river raceways for holding green fish, applying what was learned from Chilko. The Salmon Enhancement Program is actively looking into ways to solve the hatchery capacity issue. In 2024 the sonar and deadpitch program continued, and the dedicated angling program with in-river raceways has been successful. The new hatchery announced above will hopefully solve the capacity and production challenges.

2024 updates were received on additional C2-related projects in the Fraser, including the continuation of a MR program on Little River to improve escapement estimates of the summer 0.3 stock group, and a sonar on the Upper Fraser. The Upper Fraser sonar captures a large component of the Upper Fraser Chinook spring 1.3 CU and could replace many estimates produced through helicopter visual surveys, improving escapement estimates as many of these systems are glacial and difficult to count visually.

4.1.3 Development of biologically based escapement goals for Skeena and Nass Chinook salmon

The C2 work group received an update on progress in the development of escapement goals for Skeena and Nass Chinook salmon. Project objectives are to:

1. Develop a shared understanding of values and objectives for Chinook salmon management in the Skeena and Nass;
2. Characterize Chinook salmon biocomplexity (including status and trends) in the two river basins; and
3. Evaluate the ability of current and alternative management approaches (e.g., escapement goals and harvest caps) to meet objectives and examine trade-offs among them.

The full project has been substantially delayed due to funding and competing commitments. Effort to date has focused on background data compilation and synthesis for Skeena River Chinook (Winther et. al 2024). Key findings are that adult Chinook salmon are returning at younger ages, and there is broadscale evidence for declining productivity. Timelines were presented, targeting a CSAS peer reviewed report in spring/summer of 2026.

4.1.4 Development of an in-season run size forecasting model for Skeena River Chinook salmon

The C2 work group received an update on progress in the development and evaluation of models to improve in-season estimation of the terminal run size of Skeena River Chinook salmon. Details of data adjustments, model selection, and fit were shared. The top model (based on retrospective analysis) was piloted over the 2024 run.

4.2 U.S. PROJECT SUMMARIES

The U.S. funded four projects during the 2023–2024 C2 funding cycle that -directly address both the CWT&R and CEII component of the C2 initiatives. These projects were aimed at improving the ability to provide timely and reliable estimates of harvest for the Umpqua River escapement indicator stock on the Oregon Coast, purchasing and recalibrating CWT wands for sampling Oregon Coastal Chinook, verifying and recalibrating estimated spawner abundance for the Grays Harbor escapement indicator stock on the Washington Coast and increasing CWT sampling rates for Chinook salmon caught in marine sport fisheries in SEAK. Summaries of the work completed on these projects are provided below.

4.2.1 Umpqua River Fall-Run Chinook Salmon Escapement Indicator Harvest Estimate

The primary objective of this project was to improve the ability to provide timely, consistent, and reliable estimates of harvest for the Umpqua River, one of two escapement indicator stocks on the MOC aggregate. The ODFW estimated the terminal freshwater harvest at age of adult fall-run Chinook salmon from the Umpqua River by conducting an e-Creel (Riggers and Jones 2022). Harvest data from the ELS were analyzed along with the information gathered from anglers during interviews and sampling. The e-Creel survey design also provided staff the opportunity to increase the terminal scale collection of returning Chinook salmon substantially.

The ODFW implemented a hybrid "e-Creel" approach to produce robust Chinook salmon harvest estimates necessary for meeting PST management requirements for the Umpqua River basin. An e-Creel is a hybrid approach incorporating the efficiencies of angler electronic self-reporting with the validation requirements of traditional creel interviews (Riggers and Jones 2022).

In-person interviews were conducted from August 4th through November 4th, 2023. An estimate of 1,922 (CV 3.2%) adult fall-run Chinook salmon were harvested from the terminal fishery in the Umpqua River basin during the 2023 angling season that spanned from July 1st through November 30th, 2023. An estimated 1.1% of the 1,922 harvested adult fall-run Chinook salmon were of hatchery origin. It was estimated that 492 jack fall-run Chinook salmon were harvested, and 20 fall-run Chinook salmon were released during the 2023 angling season. The sample rate was calculated at 27.5%. ODFW applied a non-compliance rate of 3.7% for Chinook salmon, which represents the rate at which anglers harvested an adult fish but failed to immediately validate (e-tag) the fish. There was a marine location error rate of 0.0%. No bias testing has been performed as of the completion of this report; thus, no stratification was necessary at this time.

There were 487 scale samples collected during the e-Creel from which age structure was determined for the Umpqua River fall Chinook fishery in 2023. Age assessment was completed by the Fish Life History Analysis Program laboratory. Total sex and age structure of the harvested natural origin population of Umpqua River fall Chinook salmon (n=482, 99% of sampled fish) is depicted in Table 4.1. Most sampled natural-origin fish were age 4. Total sex and age structure of the harvested hatchery origin population of Umpqua River fall Chinook salmon (n=5, 1% of sampled fish) is depicted in Table 4.2. Most sampled hatchery origin fish were age 5.

Table 4.1-Age and sex structure of natural origin Chinook salmon harvested from the Umpqua River basin in 2023 (n=482). Jacks were defined by the angler.

Origin/Sex	Age 2	Age 3	Age 4	Age 5	Grand Total
Male	1%	1%	35%	2%	39%
Female	1%	1%	36%	1%	39%
Jack	22%	0%	0%	0%	22%
Natural Origin Total	**24%**	**2%**	**71%**	**3%**	**100%**

Table 4.2-Age and sex structure of hatchery origin Chinook salmon harvested from the Umpqua River basin in 2023 (n=5). Jacks were defined by the angler.

Origin/Sex	Age 2	Age 3	Age 4	Age 5	Grand Total
Male	0%	0%	20%	0%	20%
Female	0%	0%	20%	60%	80%
Jack	0%	0%	0%	0%	0%
Hatchery Total	**0%**	**0%**	**40%**	**60%**	**100%**

4.2.2 Coded Wire Tag Wands, Wand Repair, and Wand Recalibration for Pacific Salmon Treaty Exploitation Rate Indicator Stocks on the Oregon Coast: Elk and Salmon Rivers

Funds were used to purchase three new T-wands, holsters, and transport cases. Funds were also used to repair and refurbish three older T-wands. An additional five T-wand holsters were purchased to secure field transport and use of T-wands in the field.

Purchased and repaired T-wands were used when Chinook salmon were sampled from three components of the terminal return in the Salmon and Elk Rivers: spawning ground surveys, harvest, and hatchery. Purchased and repaired T-wands were also used when Chinook salmon were sampled from spawning ground surveys and during creel surveys on the Nestucca, Siletz, and Sixes rivers. These wands documented straying of coded wire tagged fish from Elk River Hatchery into the Sixes River (n=60 from spawning ground surveys and n=13 from creel surveys during the 2023-2024 return season) and straying of coded wire tagged fish from Salmon River Hatchery into the Siletz River (n=7 from creel surveys during the 2023 fishing season, n=0 from spawning ground surveys). No coded wire tag strays or other coded wire tagged fish were documented in the Nestucca River on spawning ground surveys or during creel surveys by CCRMP using the purchased T-wands during the 2023-2024 return season.

4.2.3 Comparison of multiple methods for estimating adult escapement of Grays Harbor fall Chinook

The primary objective of this project was to verify or recalibrate the estimated spawner abundance (escapement) of fall Chinook salmon, representing the Grays Harbor indicator stock in coastal Washington, by comparing the current approach with three alternative approaches.

The current escapement estimation method for Grays Harbor fall Chinook relies on redd (nest) counts in index areas and supplemental surveys, yet escapement estimates for this stock do not meet CTC assessment standards. The new escapement estimates were generated from: 1) redd counts across the entire spawning distribution, 2) transgenerational genetic mark recapture (tGMR), and 3) adult CMR, although this work was limited to the South Fork Newaukum tributary (Table 4.3).

Table 4.3-Adult escapement estimates for spring and fall Chinook from the Newaukum River sub-basin within Grays Harbor, Washington in 2023 using the current method generated from redd counts in index areas and supplemental surveys, redd counts across the entire Newaukum spawning distribution (full census), transgenerational genetic mark-recapture (tGMR), and carcass mark-recapture (CMR). Abundance of 2023 adults with 95% credible intervals for tGMR and CMR estimates only. Run timing assignments for tGMR estimates based on genetic run timing assignments for Chinook salmon parents sampled in 2023.

	Current Method	**Full Census**	**tGMR (95% CI)**	**CMR (95% CI)**
Spring Chinook	383	383	58	162 (87-521)
Fall Chinook	305	315	681	183 (116-517)
Heterozygote Chinook	-	-	195	-
Total	**688**	**698**	**934 (779-1,089)**	**351 (231-952)**

The current method estimated a total of 688 Chinook salmon adults in 2023, with 383 spring Chinook and 305 fall Chinook spawners. Estimates of abundance were based on 1) enumerated redds in index reaches, 2) enumerated and expanded redds in supplemental reaches, and 3) redd densities (redds mile-1) expanded for unsurveyed habitat where spawning may have occurred using a species-specific expansion factor. Species-specific expansion for Chinook salmon assumed 1.0 female adult per redd and 1.5 males per female, which is the standard expansion used for stock assessment in western Washington. Note that the current method would have estimated 80% less fall Chinook (n=61) if supplemental or “peak” surveys occurred one week later. The first alternative method based on spawning ground surveys across the entire Newaukum River spawning distribution (full census) estimated a total of 698 Chinook adults, with 383 spring Chinook and 315 fall Chinook spawners. Estimates of abundance were based on full census weekly spawning ground surveys. Spring Chinook estimates were the same for the current and full census methods, but the full census method estimated 3.3% more fall Chinook and 1.5% more Chinook salmon overall.

The second alternative method to estimate escapement was based on tGMR. In 2023, 118 Chinook carcasses were sampled for DNA to generate an escapement estimate using tGMR. This number was above our goal of 100 adult carcasses; however, DNA was only available from 96 samples. The tGMR method uses a closed-population two-sample mark recapture model to estimate abundance. In the first sampling event, spawners (i.e., adult carcasses) are sampled for tissue and genotyped. In the second sampling event, offspring of the spawners (i.e., outmigrating smolts) are sampled for tissue and genotyped. Spawners are “recaptured” when they are genetically identified as parents of sampled offspring. Fry and smolt trapping in 2024 collected 501 usable fry samples (n=380 from WF Environmental and n=121 from WDFW) and 618 smolt, all from WDFW (total = 1,119 juveniles).

For the tGMR analysis, there were 225 total (binomial) recaptures and 53 (hypergeometric) recaptures, which produced a total Chinook salmon escapement estimate of 934 (95% CI = 779-1,089) in 2023 with a CV of 8.5%. Run timing of Chinook in the tGMR estimate, based on genetic run types of sampled offspring, was 58 spring Chinook, 681 fall Chinook, and 195 heterozygotes. The hypergeometric estimate differed from the binomial estimate in that it was based on sampling without replacement. For the hypergeometric recaptures, we ran COLONY to estimate the total number of unique parents (sampled and unsampled) that gave rise to the juvenile data set. The unique number of parents was the capture value and the total number of unique assignments to sampled parents was our recapture value. The tGMR estimate for spring Chinook was 84.9% below the current and full census estimates, indicating that the field-based escapement method overestimates spring Chinook. By contrast, the tGMR estimate for fall Chinook was 123.3% above the current method and 116.2% above the full census estimate, which was much higher than 2022, when there was good coherence between field-based and tGMR fall Chinook escapement estimates. For total tGMR Chinook abundance in 2023, both field-based spawning ground survey methods (current method and full census method) fell below the lower confidence interval of the tGMR estimate, indicating that the spawning ground survey methods may be biased low.

The third alternative method to estimate escapement was based on CMR. In 2023, 67 carcasses were tagged to develop a CMR estimate of escapement. During spawning ground surveys, all Chinook salmon carcasses encountered in good condition, with both opercula present, received an operculum tag and were released back into the stream. Subsequent surveys examined carcasses for a tag by lifting the opercle to determine if a plastic tag was stapled to the inside. Carcass marking protocols were repeated throughout the spawning period until an estimate of carcass counts and marked carcass recoveries was tallied for the entire season. During the reporting period, 9 tags were recovered, which was a threefold increase from brood year 2022. The median 2023 escapement based on a Jolly-Seber open population estimator parameterized using a Bayesian framework was 351 (95% CI = 231-952) Chinook adults, with 162 spring Chinook (95% CI = 87-521) and 183 fall Chinook (95% CI = 116-517). The CMR method estimated 57.7% fewer spring Chinook than the current method, 40.0% fewer fall Chinook, and 49.0% fewer Chinook salmon overall. However, unlike the spawning ground survey methods, CMR did produce an estimate with known precision and the spawning ground point estimates fell within 95% CI of the CMR escapement. Efforts will be made to increase the total number of marked and re-captured carcasses in the next year of sampling. Also, a new method of estimating escapement using a spatiotemporal model utilizing spawning ground survey data is planned for the 2024 brood year escapement.

4.2.4 Chinook Salmon CWT Monitoring and Evaluation in the Southeast Alaska Marine Sport Fishery

Funds provided for this project were used to maintain CWT sampling rates for Chinook salmon caught in SEAK marine sport fisheries at or above the coastwide target objective of 20% or more, in addition to paying for the collection of relevant biological information (matched scale and genetic tissues) and Chinook salmon fishery catch, harvest, stock composition, and effort monitoring.

General methods for this project are outlined below. Detailed methods for all objectives and tasks are found in Jaenicke et al. 2024. Each year fishery technicians and biologists working for the ADF&G, Sport Fish Division sample marine sport fisheries in ports throughout SEAK to collect biological data from Chinook salmon landed, including recovery of CWTs. The contribution of Alaska hatchery and non-Alaska Chinook salmon, exploitation, survival, and other statistics are estimated using CWT sampling, harvest, and recovery information. A key objective of this program is to attain a CWT sampling rate of at least 20%. At most ports in recent years, this 20% sampling rate was achieved; however, the sampling rates have failed to reach this level in the Juneau and Ketchikan areas in recent years.

The ports in SEAK sampled for this work in the 2024 fishing season included Juneau, Sitka, Ketchikan, Elfin Cove, Petersburg, Wrangell, Craig, and Yakutat; the port of Gustavus—historically and annually sampled through 2021, was not sampled in 2022 to 2024 due to failed position recruitment and a lack of applicants, continuing a trend observed for all ports but especially remote ports and those outside of Juneau. A total of 26 field technicians participated in the sampling efforts during this report period.

The preliminary 2024 sampling rate for the region was 14.4%. A total of 8,285 Chinook salmon were examined onsite at eight ports for adipose fin-clips, and 5,224 of these were sampled for genetics and scales (*Table 4.4*). Due to concerns for the wild SEAK Chinook salmon stocks, the Haines and Skagway sport fisheries were closed to Chinook salmon retention in 2024, and all inside Southeast water ports (Juneau, Gustavus, Petersburg, Wrangell, and Ketchikan) were closed to retention of Chinook salmon through June 14 (with an extended closure through July 14 in the Petersburg and Wrangell areas). The port of Gustavus was not sampled due to continued and significant recruitment and hiring difficulties; the loss of Gustavus as a sampling port in the region contributed to a decrease in our overall regional CWT sampling rate, as this harvest component was simply not sampled. The SEAK Marine Harvest Studies program experienced additional hiring and recruitment challenges that contributed to falling short of the 20% or greater target.

Table 4.4- Preliminary summary of sport-harvested Chinook salmon sampled for adipose fin-clips and genetic tissue/scales samples in Southeast Alaska in 2024 by port.

Port	Sampled for CWT	Sampled for genetics/scales
Craig	1,899	1,266
Juneau	378	336
Ketchikan	657	559
Sitka	4,522	2,542
Yakutat	147	100
Wrangell	77	65
Petersburg	74	68
Haines / Skagway	0	0
Gusavus[1]	-	-
Elfin Cove	531	288
Total	8,285	5,224

[1] The port of Gustavus was not sampled in 2024

The field work for the 2024 season ended on September 8, and genetic tissues were inventoried and sent to the ADF&G Genetic Conservation Lab in Anchorage in late September for analysis. Staffing and recruitment continued to be a significant obstacle for this program to achieve and increase the regional Chinook salmon CWT sampling rate; the ADF&G, Division of Sport Fish has used flexible staffing and increased spending for travel and housing (from other state and federal sources of income) to minimize disruptions in sampling due to hiring limitations. The program remained within budget.

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APPENDICES

Appendix A. Landed Catch, Incidental Mortality, and Total Mortality of Chinook Salmon by Region and Gear

Appendix A tables, which contain landed catch, incidental mortality and total mortality estimates of Chinook salmon by region and gear can be downloaded from the PSC website here: https://www.psc.org/ctc-data-sets/tcchinook-25-02-appendix-a. A list of Appendix A tables and their table captions can be found below.

Appendix

APPENDIX B. ESCAPEMENTS AND TERMINAL RUNS OF PACIFIC SALMON COMMISSION CHINOOK TECHNICAL COMMITTEE CHINOOK SALMON ESCAPEMENT INDICATOR STOCKS, 2009–2024

Appendix B tables, which contain escapement and terminal run estimates of PSC CTC Chinook salmon escapement indicator stocks can be downloaded from the PSC website here: https://www.psc.org/ctc-data-sets/tcchinook-25-02-appendix-b. A list of Appendix B tables and their table captions can be found below.

Appendix

APPENDIX C. COMPARISON OF HISTORIC AND UPDATED CANADIAN RECREATIONAL CATCH AND RELEASE ESTIMATES

In 2024, Canadian members of the Chinook Technical Committee presented Canadian domestic data revisions based on updated estimation methods applied to both recreational fishery catch and coded-wire-tags (CWT) in Pacific Region marine waters. These updates included improved and replicable methods for calculating catch and release estimates, particularly in areas and time periods with low submission rates and sparse data. Overall, these updates resulted in a general increase in Canadian recreational catch (kept and released) from 2005 to 2023.

Appendix C tables, which contain the historic and updated catch and release estimates in Canadian recreational fisheries can be downloaded from the PSC website here: : https://www.psc.org/ctc-data-sets/tcchinook-25-02-appendix-c. A list of Appendix C tables List and their table captions can be found below.

Appendix

Table C1 – Central BC Sport catches and releases. Historical estimates are derived from logbook data, while updated estimates are from revised models that incorporate logbook and iREC (internet recreational effort and catch) survey data.

Table C2 – Georgia Strait Sport catches and releases. Historical estimates are derived from creel and logbook data, while updated estimates are from revised models that incorporate creel, logbook, and iREC (internet recreational effort and catch) survey data.

Table C3 – Juan de Fuca BC Sport catches and releases. Historical estimates are derived from creel and logbook data, while updated estimates are from revised models that incorporate creel, logbook, and iREC (internet recreational effort and catch) survey data.

Table C4 – Johnstone Strait Sport catches and releases. Historical estimates are derived from creel and logbook data, updated estimates are from revised models that incorporate creel, logbook, and iREC (internet recreational effort and catch) survey data.

Table C5 – Northern BC AABM Sport catches and releases. Historical estimates are derived from creel and logbook data, while updated estimates are from revised models that incorporate creel, logbook, and iREC (internet recreational effort and catch) survey data.

Table C6 – Northern BC ISBM Sport catches and releases. Historical estimates are derived from creel data, while updated estimates are from revised models that incorporate creel and iREC (internet recreational effort and catch) survey data.

Table C7 – West Coast Vancouver Island AABM Sport catches and releases. Historical estimates are derived from creel and logbook data, while updated estimates are from revised models that incorporate creel, logbook, and iREC (internet recreational effort and catch) survey data.

Table C8 – WCVI AABM total estimated catches and estimated incidental mortality (IM), including sport and troll fisheries. Historical sport estimates are derived from creel and logbook data, while updated sport estimates are from revised models that incorporate creel, logbook, and iREC (internet recreational effort and catch) survey data. Troll estimates remain unchanged. Note: IM includes legal incident mortality and sublegal incident mortality.

Table C9 – West Coast Vancouver Island ISBM Sport catches and releases. Historical estimates are *derived from creel and logbook data, while updated estimates are from revised models that incorporate creel, logbook, and iREC (internet recreational effort and catch) survey data.*

Table C10 – Northern BC AABM total estimated catches and estimated incidental mortality (IM), including sport and troll fisheries. Historical sport estimates are derived from creel and logbook data, while updated sport estimates are from revised models that incorporate creel, logbook, and iREC (internet recreational effort and catch) survey data. Troll estimates remain unchanged. Note: IM includes legal incident mortality and sublegal incident mortality.