PACIFIC SALMON COMMISSION
JOINT CHINOOK TECHNICAL COMMITTEE REPORT

ANNUAL REPORT OF CATCH AND ESCAPEMENT FOR 2017

REPORT TCCHINOOK (18)-02

July 19, 2018

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List of Acronyms and Abbreviations

AABM	Aggregate Abundance Based Management
ADF&G	Alaska Department of Fish and Game
Agreement	June 30, 1999 PST Annex and the Related Agreement
AUC	Area-Under-the-Curve
BC	British Columbia
CBC	Central British Columbia (Kitimat to Cape Caution)
CI	Confidence Interval
CNR	Chinook Nonretention
CR	Chinook Retention
CPUE	Catch per unit effort
CRITFC	Columbia River Intertribal Fish Commission
CTC	Chinook Technical Committee
CV	Coefficient of Variation
CWT	Coded Wire Tag
CY	Calendar Year
DFO	Canadian Department of Fisheries and Oceans
ESA	US Endangered Species Act
FNC	First Nations Caucus
FR	Fraser River
FSC	Food, Social, and Ceremonial
GMR	Genetic Mark–Recapture
GW	Gitwinksihlkw
IM	Incidental Mortality
ISBM	Individual Stock Based Management
JDF	Juan De Fuca
LAT	Low Abundance Threshold
LC	Landed Catch
LGS	Lower Strait of Georgia
LIM	Legal Incidental Mortality
MOC	Mid-Oregon Coast
MR	Mark–Recapture
MRE	Mature-Run Equivalent
MSY	Maximum Sustainable Yield for a stock, in adult equivalents
NA	Not Available
NC	North Coastal
NBC	Northern British Columbia (Dixon Entrance to Kitimat including Queen Charlotte Islands)
NMFS	National Marine Fisheries Service
NOC	North Oregon Coast
NWIFC	Northwest Indian Fisheries Commission
ODFW	Oregon Department of Fish and Wildlife
ORC	Oregon Coast
PS	Puget Sound
PSC	Pacific Salmon Commission
PST	Pacific Salmon Treaty
QIN	Quinault Nation
QCI	Haida Gwaii (Queen Charlotte Islands)
SIM	Sublegal Incidental Mortality
SMSY	Escapement producing MSY
SEAK	Southeast Alaska Cape Suckling to Dixon Entrance
SSP	Sentinel Stocks Program
SUS	Southern US
TBR	Transboundary Rivers (Alsek, Taku, Stikine)
TM	Total Mortality
UAF	University of Alaska Fairbanks
UGS	Upper Strait of Georgia
UMT	Upper Management Threshold
UMSY	Exploitation Rate at MSY
USFWS	US Fish & Wildlife Service
US	United States
WAC	Washington Coast
WCVI	West Coast Vancouver Island excluding Area 20
WDFW	Washington Department of Fish and Wildlife

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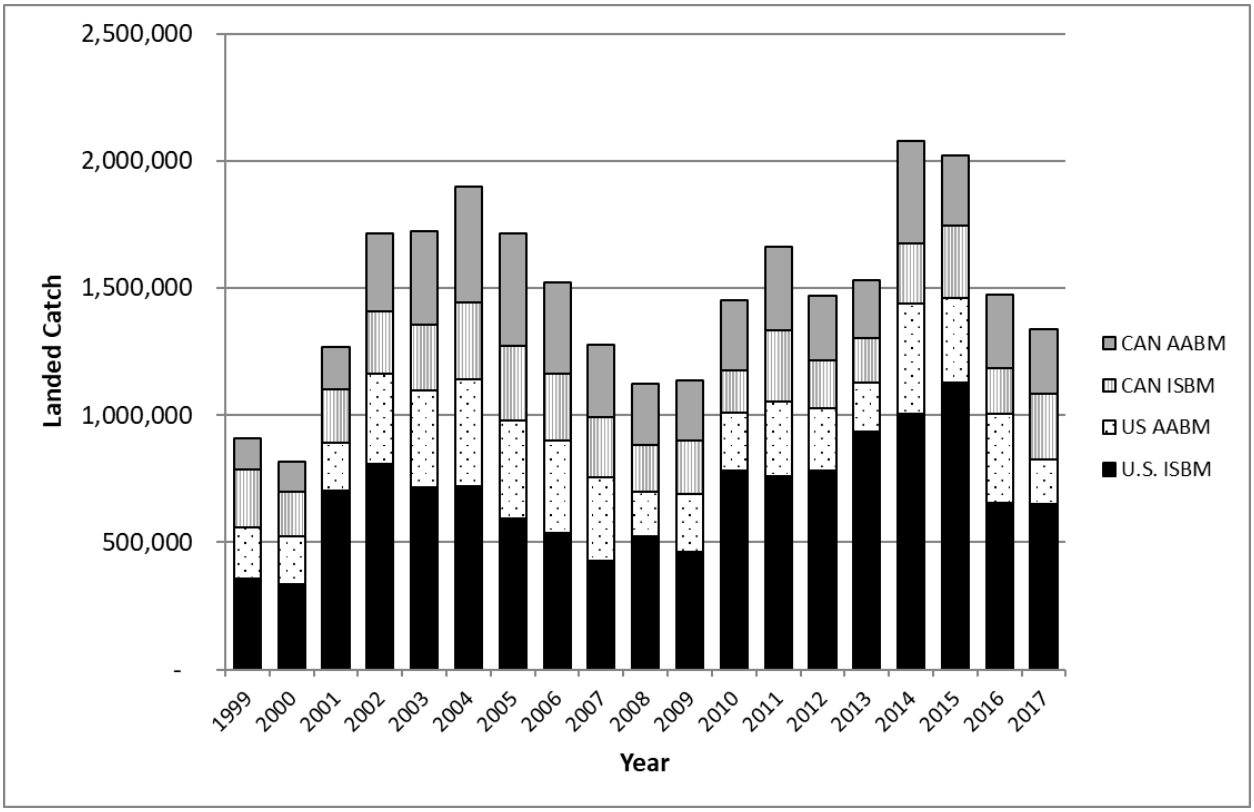
EXECUTIVE SUMMARY

The Pacific Salmon Treaty (PST) requires the Chinook Technical Committee (CTC) to report annual catch and escapement data for Chinook salmon stocks that are managed under the Treaty. The CTC provides an annual report to the Pacific Salmon Commission (PSC) to fulfill this obligation. This report contains three sections to provide an indication of stock performance in the context of management objectives for 2017: Chinook salmon catches, escapements, and stock status.

Section 1 summarizes, for 2017, fishery catches by region and available estimates of incidental mortality (IM) by fishery, with accompanying commentary on the fisheries, management, and derivation of IM. Canada and the US compile annual catch data for their respective jurisdictions within the PST area according to fishery regimes, regional locations, and gear type with estimates of IM. Landed catch (LC) is fully reported in the appendices 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 2017, 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.

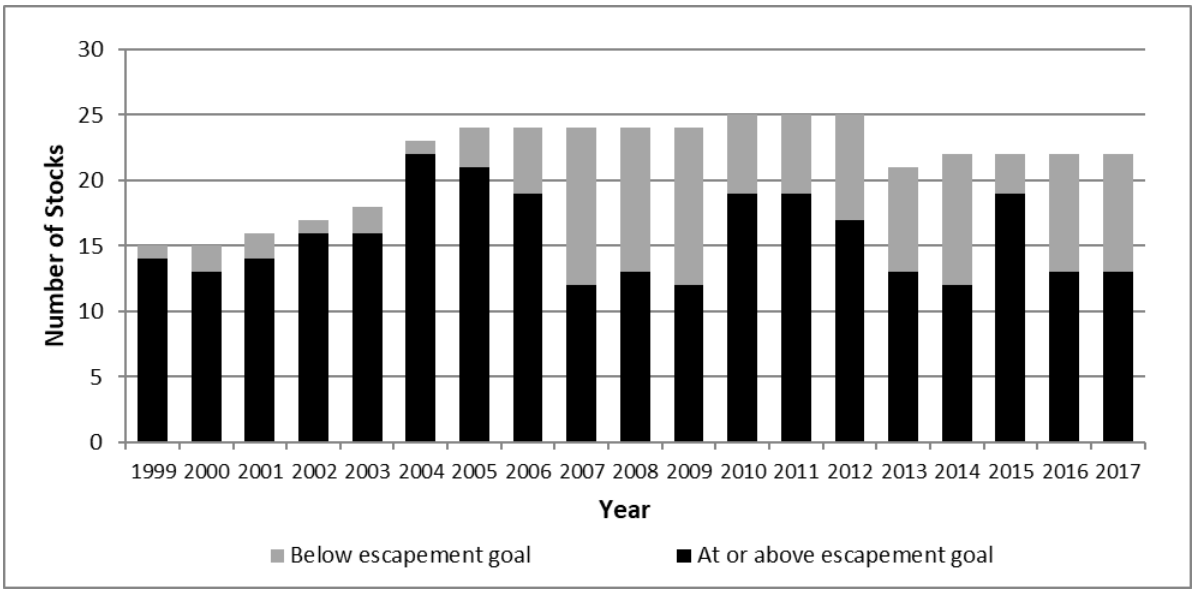


Estimates of landed catch for US and Canada AABM and ISBM fisheries, 1999–2017.

The preliminary estimate of Treaty LC of Chinook salmon for all PST fisheries in 2017 is 1,337,301, of which 827,211 were taken in US fisheries and 510,090 were taken in Canadian fisheries. Total estimated IM associated with this harvest is 194,264 nominal Chinook salmon. The TM for all PST fisheries in nominal fish was 1,531,565 Chinook salmon, of which 936,495 were taken in US fisheries and 595,070 occurred in Canadian fisheries. For US fisheries, 78% of the LC and 61% of IM occurred in ISBM fisheries; in Canada, 50% of the LC and 62% of IM occurred in ISBM fisheries. For some sport fisheries, 2017 LC and IM estimates are not yet available.

Section 2 includes an assessment of escapement for PST escapement indicator stocks/stock aggregates with PSC-agreed biologically based goals (22 stocks) as well as escapement data for the other indicator stocks/stock aggregates (24 stocks). For eight of the PST escapement indicator stocks/stock aggregates, the escapement goal is defined as a range; for the remaining 14, the escapement goal is the point estimate of S_{MSY} (escapement producing maximum sustained yield). Annual escapements that are more than 15% below the lower end 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 agencies.

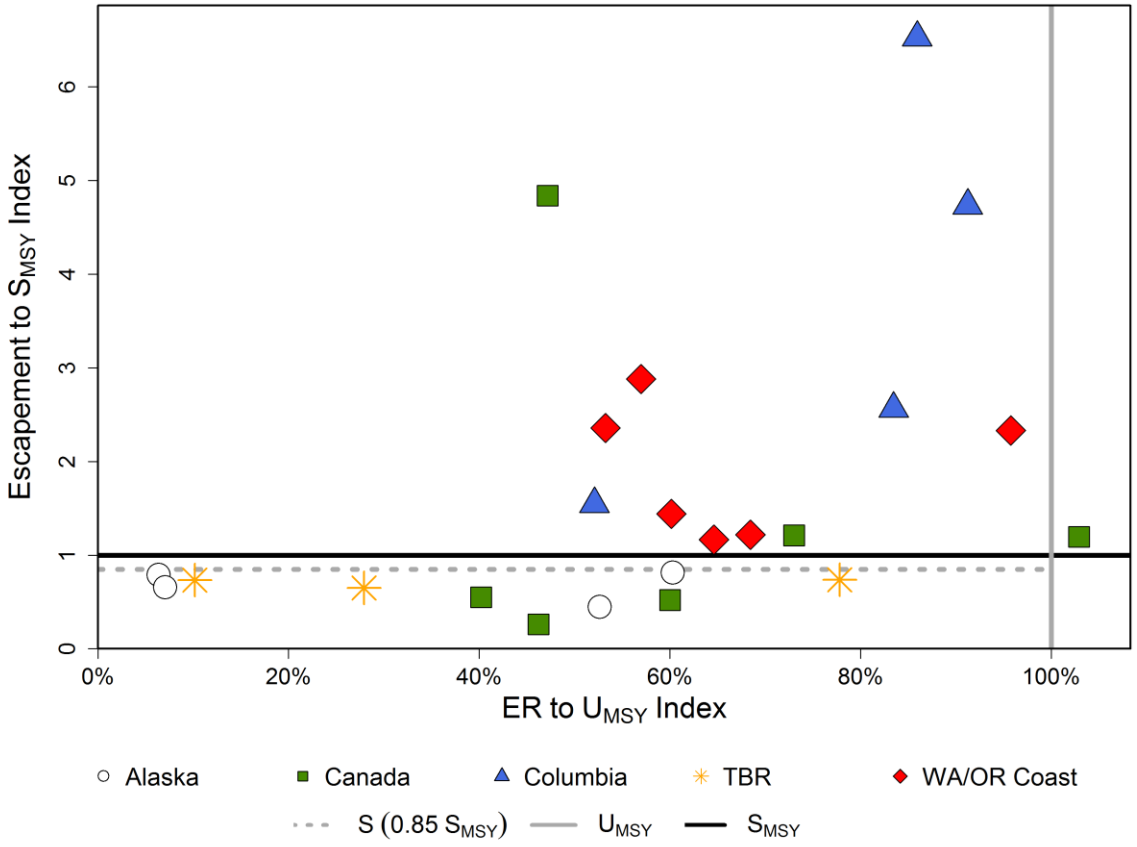
From 1999 to 2017, the percentage of stocks that met or exceeded escapement goals or goal ranges has varied from 50% to 96% (see figure below). In 2017, 13 of 22 stocks (59%) met or exceeded escapement objectives. Of the nine stocks below goal, three stocks (Unuk, Nehalem, and Siuslaw) were within 15% of the target goal. Six stocks were more than 15% below goal: Chilkat, Chickamin, Alsek, Taku, Stikine, and Harrison.



Number and status of stocks with PSC-agreed escapement goals, 1999–2017.

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, bringing the total number of current indicator stocks with PSC-agreed escapement goals to 22 since 2014.

Section 3 presents a synoptic evaluation of stock status that summarizes the performance of those stocks 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 and other information 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 clearly summarizes the performance of fisheries management relative to stocks achieving established or potential goals. A synoptic summary figure for 23 stocks with 2016 data shows that the majority of stocks were in the safe zone (exploitation below U_{MSY} and escapement above S_{MSY}). No stocks were in the high-risk zone and no stocks were in the buffer zone. One stock, Cowichan, experienced exploitation above U_{MSY} and still the escapement exceeded S_{MSY}. Ten stocks were in the low escapement and low exploitation zone: Alsek, Chickamin, Chilkat, Nicola, Shuswap, Harrison, Situk, Stikine, Taku and Unuk. In general, Columbia River and WA/OR Coast stocks showed a higher escapement to S_{MSY} index than the other regions.



Synoptic summary by region of stock status for stocks with escapement and exploitation rate data in 2016 (escapement and exploitation rate data for each stock was standardized to the stock-specific escapement goal and U_{MSY} reference points).

1. CHINOOK SALMON CATCH

The 1999 Pacific Salmon Treaty Annex and the Related Agreement (Agreement) substantially changed the objectives and structure of the PSC Chinook salmon fisheries 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 Agreement defines catch limits based on aggregate abundance for Chinook salmon in AABM fisheries, and 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 (and/or exploitation rates for 4 of the 49 named stocks) or to limit adult equivalent mortality rates for these stocks to a portion of the 1979 to 1982 base period or the average 1991 to 1996 rate. The 2009 Agreement imposed additional reductions to catch limits in West Coast Vancouver Island (WCVI) and Southeast Alaska (SEAK) fisheries.

This report assesses landed catch (LC), incidental mortality (IM) and total fishing mortality (TM) for all Pacific Salmon Treaty (PST) fisheries in 2017, both those targeting Chinook salmon (Chinook Retention; CR) as well as those directed at other salmon species (Chinook Nonretention; CNR). The LC, IM and TM estimates for the three AABM fisheries are presented by gear sector in Table 1.5 and Table 1.6 and similar estimates for Canada and US ISBM fisheries are summarized in Table 1.7 and Table 1.8. A summary of LC, IM, and TM estimates for Chinook salmon in all PST AABM and ISBM fisheries is presented in Table 1.9.

The CTC began reporting IM in AABM fisheries in 2004 (CTC 2004a) and in most ISBM fisheries in 2005 (CTC 2005). The current reporting of LC and IM estimates provides a comprehensive overview of all PST fisheries that harvest Chinook salmon. Commentary is provided to explain fisheries, management, and derivation of estimates of IM. Historical LC, IM, and TM data are given in Appendix A.

1.1 REVIEW OF AGGREGATE ABUNDANCE BASED MANAGEMENT FISHERIES

AABM fisheries for Chinook salmon are managed to an allowable catch associated with an annual abundance index (2009 PST Agreement, Annex IV, Chapter 3, Table 1). AABM fisheries are mixed stock salmon fisheries that intercept and catch migratory Chinook salmon from many stocks. There are three AABM fisheries (2009 PST Agreement, Annex IV, Chapter 3, paragraph 2):

(1) Southeast Alaska (SEAK) All Gear (Troll, Net, Sport)

(2) Northern British Columbia (NBC) Troll and Haida Gwaii (QCI) Sport

(3) West Coast Vancouver Island (WCVI) Troll and Outside Sport

Catches for these three fisheries are reported in Table 1.1.

Table 1.1.–Annual catch and hatchery add-on for AABM fisheries expressed in thousands of Chinook salmon.

Year	Southeast Alaska (T, N, S)			Northern British Columbia (T), Haida Gwaii (S)		West Coast Vancouver Island (T, S)	
	Treaty Catch		Hatchery Add-on[2]	Treaty Catch		Treaty Catch	
	Limit[1]	Observed		Limit[1]	Observed	Limit[1]	Observed
1999	184.2	198.8	47.7	126.1	84.3	107.0	38.5
2000	178.5	186.5	74.3	123.5	32.0	86.2	88.6
2001	250.3	186.9	77.3	158.9	43.3	145.5	120.3
2002	371.9	357.1	68.2	237.8	149.8	196.8	157.9
2003	439.6	380.2	57.2	277.2	194.8	268.9	173.6
2004	418.3	417.0	76.0	267.0	241.5	209.6	215.3
2005	387.4	388.6	64.4	240.7	243.6	179.7	199.5
2006	354.5	360.1	48.4	200.0	216.0	145.5	145.5
2007	259.2	328.3	68.4	143.0	144.2	121.9	140.6
2008	152.9	172.9	66.1	120.9	95.6	136.9	145.7
2009[3]	176.0	228.0	62.0	139.1	109.5	91.3	124.6
2010	215.8	230.6	53.6	160.4	136.6	142.3	139.0
2011	283.3	291.2	65.6	186.8	122.7	134.8	204.2
2012	205.1	242.8	51.4	149.5	120.3	113.8	134.5
2013	284.9	191.4	65.6	220.3	115.9	178.8	113.6
2014	378.6	435.2	56.6	262.6	216.9	191.7	188.4
2015	337.5	335.0	68.1	246.6	158.9	179.7	116.7
2016	288.2	350.9	35.4	183.9	190.2	104.8	99.6
2017	215.8	178.3	32.7	148.2	143.3	95.8	109.5
2018	144.5	TBA	TBA	131.3	TBA	88.3	TBA

Note: T = Troll, N = Net and S = Sport fisheries.

[1] Allowable treaty catches corresponds to the first postseason abundance index for years 1999 to 2017 and the preseason abundance index for 2018.

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

[3] 2009 was the first year the 2009 Agreement was implemented.

1.1.1 Southeast Alaska Fisheries

The SEAK Chinook salmon fishery is managed to achieve the annual all-gear PST allowable catch associated with the preseason abundance index, which is generated by the PSC Chinook model each spring. Catch is allocated through regulations established by the Alaska Board of Fisheries among troll, net, and sport fisheries. The current allocation plan reserves 1,000 fish for set gillnet fisheries and 4.3% and 2.9% of the remaining all-gear catch is allocated to the purse seine and drift 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 inseason 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 based on the preseason abundance index. Throughout the region, the commercial fishery harvest is monitored inseason using a fish ticket reporting system. Sport fishery harvests are monitored inseason using catch surveys and final estimates are computed using a mail-out survey and are available two years after the fishery occurs. Sampling programs are in place for all fisheries to recover coded wire tags (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 presented in CTC 2004b. 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 2004b)

(2) compliance with provisions established by the National Marine Fisheries Service (NMFS) in accordance with the US Endangered Species Act (ESA)

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

The preliminary total all-gear catch in 2017 was 211,008, with a PST catch of 178,348, an Alaska hatchery add-on of 32,659, and no terminal exclusion catch of Chinook salmon. SEAK Chinook salmon catch from 1975 to 2017 are reported in Table A1.

1.1.1.1 Troll Fisheries Catch

The accounting of treaty Chinook salmon harvested in the SEAK troll fisheries begins with the winter fishery and ends with the summer fishery. The winter troll fishery is managed for a guideline harvest level (GHL) of 45,000 non-Alaska hatchery-produced Chinook salmon, with a guideline harvest range of 43,000−47,000 fish, plus the number of Alaska hatchery produced Chinook salmon harvested during the winter fishery. The 2016–2017 winter troll fishery was open from October 11, 2016 through April 30, 2017 and harvested a total of 43,839 Chinook salmon. Of these, 2,908 (7%) were of Alaska hatchery origin, of which 2,023 counted toward the Alaska hatchery add-on, resulting in a treaty catch of 41,816 (Table 1.2).

The spring troll fisheries target Alaskan hatchery-produced Chinook salmon and are conducted along migration routes 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 PST Chinook salmon is limited according to the percentage of the Alaskan hatchery fish taken in the fishery. Non-Alaska hatchery fish are counted towards the annual PST quota of Chinook salmon, while most of the Alaska hatchery fish are not.

In 2017, spring troll fisheries were conducted between May 1–28, and from June 15–30. With SEAK/TBR wild stocks in a period of reduced productivity and Alaska hatchery returns well below recent and long term averages, all spring troll fisheries closed from May 29 to June 14. A total of 34 spring areas and seven terminal area fisheries opened in 2017 (Hagerman and Ehresmann 2017). The combined harvest for spring and terminal troll fisheries was 18,259 Chinook salmon, of which 3,750 (21%) were of Alaska hatchery origin and 2,795 counted toward the Alaska hatchery add-on.

The 2017 summer troll fishery included one Chinook salmon retention period, from July 1–4. Notwithstanding the remaining fish on the PST troll harvest limit, no second Chinook salmon retention period was conducted. This seasonal closure was implemented to protect the SEAK/TBR wild stocks that contribute to the late summer fishery that are in a period of low productivity. In addition to the first traditional summer retention period, an experimental mark selective fishery was conducted from July 5–21 during a coho-directed fishery (2,680 Chinook retained) (Hagerman et al. 2017). A total of 67,498 Chinook salmon were harvested in summer fisheries, of which 1,956 (3%) were of Alaskan hatchery origin and 1,361 counted toward the Alaska hatchery add-on. The resulting PST catch was 66,137 fish.

The total harvest for all troll fisheries in the 2017 accounting year was 129,596 Chinook salmon, of which 123,417 were PST harvest.

Table 1.2–Harvest of Chinook salmon in Southeast Alaska by gear type in 2017.

Gear	Total Catch	Alaska Hatchery Catch[1]	Alaska Hatchery Add-on[1]	Terminal Exclusion Catch[2]	AABM Catch[3]
Troll					
Winter	43,839	2,908	2,023	0	41,816
Spring	18,259	3,750	2,795	0	15,464
Summer	67,498	1,956	1,361	0	66,137
Troll subtotal	129,596	8,613	6,179	0	123,417
Sport[4]	56,368	11,827	8,898	0	47,470
Net					
Set Net	367			0	367
Drift gillnet	13,768	10,909	9,605	0	4,162
Seine	10,909	8,024	7,977	0	2,932
Net subtotal	25,044	18,933	17,582	0	7,462
Total	211,008	39,373	32,659	0	178,348

[1] The add-on is the total estimated Alaska hatchery catch, minus 5,000 base period Alaska hatchery catch, and minus the risk adjustment (product of standard error for the total estimated Alaska hatchery catch and a risk factor of 1.645).

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

[3] 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] Preliminary values until mail-out survey results are available.

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. With the exception of directed gillnet harvests of Chinook salmon in SEAK terminal areas as provided in the Transboundary Rivers chapter of the PST, harvests of Chinook salmon in net fisheries are incidental to the harvest of other species. The 2017 total net catch was 25,044 Chinook salmon, including 18,933 Alaska hatchery fish. There was an Alaska hatchery add-on of 17,582 and no terminal exclusion catch, resulting in a PST catch of 7,462 (Table 1.2).

The purse seine fishery is open from mid-June through early fall and is limited to specific areas and time periods established inseason by emergency order (Gray et al. 2015a). In 2017, the

purse seine fishery harvested a total of 10,909 Chinook, which included 8,024 Alaska hatchery fish and an Alaska hatchery add-on of 7,977, resulting in a PST catch of 2,932 (Table 1.2).

The drift gillnet fishery usually opens in late June, unless directed fishing is implemented in May to target surplus production of Chinook salmon bound for the Taku and Stikine rivers (Gray et al. 2015b) as detailed in Chapter 1 of the 2009 Agreement. In 2017, the preseason terminal run forecast for the Taku and Stikine rivers did not provide for an allowable catch. The SEAK drift gillnet fishery is limited to five traditional areas and time periods are established inseason by emergency order (Gray et al. 2015b). The 2017 drift gillnet fishery caught a total of 13,768 Chinook salmon, including 10,909 Alaska hatchery fish. There was an Alaska hatchery add-on of 9,605 and no terminal exclusion catch, resulting in a PST catch of 4,162.

The set gillnet fishery is managed to catch no more than 1,000 Treaty Chinook salmon, a limit which is based on an historic average. This fishery is open during the late spring and summer in the Yakutat area. The 2017 set gillnet fishery caught 367 Chinook salmon, all of which were PST fish.

1.1.1.3 Sport Fishery Catch

In 2017, the management plan required a daily bag limit of two Chinook salmon 71 cm (28 inches) or greater in length (tip of snout to fork-of-tail) for resident anglers. The nonresident angler daily bag limit was one fish and the nonresident annual limit was three Chinook salmon. In addition, residents were allowed to use two rods from October through March.

In 2016, 9 of the 11 Chinook stocks that ADF&G monitors for escapement did not meet management objectives, which, along with below-goal preseason forecasts, indicated that 2017 would be another poor return year. In March 2017 more restrictive sport regulations were enacted in the Yakutat, Haines/Skagway, Juneau, Petersburg/Wrangell, and Ketchikan management areas to protect SEAK wild Chinook stocks (Chadwick et al. 2017). Later in the season, after observing the worst Chinook returns on record, retention of Chinook salmon was prohibited in all SEAK sport fisheries from August 10 – September 30, 2017.

The preliminary 2017 total sport Chinook salmon catch was 56,368 with an estimate of 11,827 Alaska hatchery fish. There was an Alaska hatchery add-on of 8,898 fish, resulting in a catch of 47,470 Treaty Chinook salmon (Table 1.2).

1.1.2 British Columbia Fisheries

The NBC AABM fishery includes NBC troll catch in Statistical Areas 1–5 and QCI sport catch in Statistical Areas 1 and 2. The total NBC AABM catch in 2017 was 143,330. 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 2017 was 109,533 (Table 1.3).

1.1.2.1 Northern British Columbia AABM

The total NBC AABM catch (troll plus sport) between October 1, 2016 and September 30, 2017 was 143,330 Chinook salmon (Table 1.3).

Table 1.3–Harvest of Chinook salmon by gear for Northern British Columbia AABM fisheries in 2017.

NBC Fishery	Landed Catch	Legal Releases	Sublegal Releases
Troll			
Summer	97,730	10,706	23,412
CNR Troll	0	0	0
Troll subtotal	*97,730*	*10,706*	*23,412*
Sport	45,600	28,724	0
TOTAL	**143,330**	**39,430**	**23,412**

1.1.2.1.1 Northern British Columbia Troll Fishery Catch

The NBC troll fishery landed 97,730 Chinook salmon during openings for Chinook salmon fishing from June 21 to August 4 and from August 25 to September 30, 2017. The entire 2017 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 220 licenses were issued, but the total catch was landed by 142 vessels because much of the quota was transferred. Barbless hooks and revival boxes were mandatory in the troll fishery and the minimum size limit was 67 cm fork length (26.4 in). No troll test fisheries were conducted in 2017. A ribbon boundary around Langara Island and from Shag Rock to Cape Knox on Graham Island excluded the commercial troll fishery from areas within one nautical mile of the shore from June 21 to September 14, 2017. A ribbon boundary from Skonun Point to Shag Rock on Graham Island excluded the commercial troll fishery from areas within one nautical mile of the shore from June 21 to September 10, 2017.

1.1.2.1.2 Northern British Columbia Sport Fishery Catch

Sport caught Chinook salmon from Haida Gwaii (Pacific Fishery Management Areas 1, 2, 101, 102 and 142) are included in the AABM totals. Catches in the Haida Gwaii sport fisheries have been estimated since 1995 through lodge logbook programs, creel surveys, and independent observations by Canadian Department of Fisheries and Oceans (DFO) staff. The 2017 Haida Gwaii sport catch was 45,600 Chinook salmon.

1.1.2.2 West Coast Vancouver Island AABM

Under the 2009 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 2017 was 109,533 Chinook salmon (Table 1.4).

Table 1.4–Harvest of Chinook salmon by gear for West Coast Vancouver Island AABM fisheries in 2017.

WCVI Fishery	Landed Catch	Legal Releases	Sublegal Releases
Troll			
Winter	4,771	26	1,015
Spring	23,557	8	2,868
Summer	19,206	9	1,548
Food, social, and ceremonial	5,000	N/A	N/A
Maa-nulth	0	N/A	N/A
T'aaq-wiihak	6,877	0	305
Brooks Test Fishery	945	56	0
Troll subtotal	*60,356*	*99*	*5,736*
Sport	49,177	15,969	17,846
TOTAL	**109,533**	**16,068**	**23,582**

1.1.2.2.1 West Coast Vancouver Island Troll Fishery Catch

The West Coast of Vancouver Island (WCVI) troll fishery is conducted in Areas 21, 23-27, and Pacific Fishery Management Areas (PFMA) 121, 123-127. The PST accounting year begins October 1 and ends September 30 which covers two domestic management planning years that begin June 1, 2016 to May 31, 2017 and June 1, 2017 to May 31, 2018.

The Area G Troll annual management plan is designed to maintain conservative exploitation rates on stocks of concern within established limits through the use of fishing time and area closures in conjunction with fishing effort limits. Fishery openings are planned to distribute harvests proportionately over all fishery periods subject to constraints to protect stocks of concern. The management plan is subject to change when required to address specific conservation concerns. Conservation measures were introduced in the Area G troll fishery in 2011-12 and continued in the 2017 season to address low returns of Fraser River Spring 1.2, Spring 1.3 and Summer 1.3 Chinook. For Area G troll this includes fishery closures in the month of June and the opening was delayed until the third week of July.

Area G Troll Fishing Periods:

October 1 to March 15 (Winter): A precautionary harvest level is set to reflect the preliminary nature of the TAC and the low catch per unit effort that typically occurs at this time of year.

March 16 to April 18: A full time-area closure was maintained to reduce interception of Fraser River Spring 1.2.

April 19 to June 15 (Spring): From mid to late June there is increasing potential for interception of stocks of concern including Fraser River Spring 1.3 and Summer 1.3 Chinook and Interior Fraser coho. Harvest is managed by an effort based model and total effort (boat-days) was limited in areas of southwest Vancouver Island with Area 123 closed until May 7 and partial openings from May 2 to 7 in PFMA 124 in order to reduce interception of Fraser River Spring 1.2 Chinook and reduce encounters of sub-legal Chinook salmon.

June 16 to July 23 (Summer): A full time-area closure was maintained in PFMAs 125 to 127, and from June 16 to July 31 in PFMAs 123 and 124, to reduce interception of Fraser River Spring 1.2, Spring 1.3, and Summer 1.3 Chinook salmon.

July 24 through early August (Summer): The fishery was managed to minimize mortality on Interior Fraser River coho through: i) a maximum interception of coho and ii) the mandatory use of plugs. As well, the fishery was managed to minimize mortality of WCVI origin Chinook through the use of closures during time and areas where WCVI Chinook stocks are prevalent.

September (Summer): The Area G harvest level in September has the potential to increase if there is available remaining WCVI AABM TAC after accounting for First Nation FSC and recreational fisheries. However, if First Nations or the recreational sectors catches are larger than projected, the available commercial TAC is reduced.

The late July and August plug 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 (Coded Wire Tags, DNA and otolith samples).

From May 1 to September 30, 2017, the T'aaq-wiihak demonstration fishery occurred in portions of PFMAs 24 and 25, and 124–126. Fishing days were decreased during the June and July periods (as well as PFMAs 124–126 for the months of August and September) to minimize encounters with Interior Fraser coho and the WCVI Chinook salmon stocks of concern.

The catch for 2017 commercial Area G troll fisheries was 47,534 Chinook salmon (Table 1.4). The WCVI First Nations caught an estimated 5,000 Chinook salmon in food, social, and ceremonial fisheries and 6,877 in the T'aaq-wiihak demonstration fisheries. The Brooks Test Fishery project harvested 945 Chinook salmon for samples. Therefore, the total WCVI AABM troll catch for 2017 was 60,356 with 99 legal and 5,736 sublegal Chinook salmon.

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 (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 from August 1 to October 15. Areas inside the surf line and outside these AABM periods is included in ISBM fishery catch.

The WCVI AABM sport fishery occurs primarily in the Barkley Sound, outer Clayoquot Sound, and Nootka Sound areas. The majority of fishing effort occurs from mid-July through August in northwest Vancouver Island and August through mid-September in the Southwest Vancouver Island. Creel surveys were conducted from early June to mid-September. The Chinook salmon daily bag limit was two fish greater than 45 cm fork length (17.7 in). Barbless hooks were mandatory.

The 2017 WCVI AABM sport LC estimate during the creel period was 49,177 (Table 1.4). The WCVI First Nations caught an estimated 5,000 Chinook salmon in food, social, and ceremonial fisheries and 6,877 in the T'aaq-wiihak demonstration fisheries. The Brooks Test Fishery project harvested 945 Chinook salmon for samples. Therefore, the total WCVI AABM troll catch for

2017 was 60,356, and 99 legal and 5,736 sublegal Chinook salmon were released.

1.2 Estimates of Incidental Mortalities in AABM Fisheries

1.2.1 Southeast Alaska Fisheries

Estimates of encounters and IM in SEAK fisheries are shown for 2017 in Table 1.5 and in Appendix A for prior years. Estimates were converted from total IM into Treaty IM by multiplying the total encounters by the ratio of Treaty catch to LC for each respective fishery. The 2017 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 Catch Survey (mail-in survey) forms. 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 2004c). Encounter estimates are multiplied by the respective IM rate from CTC (1997) to obtain estimates of IM. The estimated TM in 2017 was 220,698 nominal Treaty fish, including 178,348 LC, and 42,349 IM (Table 1.5).

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), and total mortality (TM) in SEAK AABM fishery, 2017.

SEAK Fishery	LC	Legal Encounters	Sublegal Encounters	Total LIM[1]	Total SIM[1]	Total IM	Total Mortality
Treaty							
Troll CR	123,417	123,417	14,968	987	3,937	4,924	128,341
Troll CNR	0	61,979	41,046	13,573	10,795	24,369	24,369
Troll Total	123,417	185,396	56,015	14,561	14,732	29,293	152,710
Sport Total[2]	47,470	60,070	35,713	3,712	5,678	9,391	56,860
Gillnet	4,529	4,529	0	91	0	91	4,620
Seine CR	2,932	2,932	438	0	376	376	3,308
Seine CNR	0	1,300	3,451	663	2,537	3,199	3,199
Net Total	7,462	8,761	3,889	753	2,912	3,666	11,127
Treaty Total	**178,348**	**254,227**	**95,617**	**19,026**	**23,323**	**42,349**	**220,698**
Total SEAK							
Troll CR	129,596	129,596	15,718	1,037	4,134	5,171	134,767
Troll CNR	0	63,254	41,891	13,853	11,017	24,870	24,870
Troll Total	129,596	192,850	57,609	14,889	15,151	30,040	159,636
Sport Total[2]	56,368	71,330	42,408	4,408	6,743	11,151	67,519
Gillnet	14,135	14,135	0	283	0	283	14,417
Seine CR	10,909	10,909	1,630	0	1,398	1,398	12,307
Seine CNR	0	4,835	12,841	2,466	9,438	11,904	11,904
Net Total	25,044	29,879	14,470	2,749	10,836	13,585	38,629
SEAK Total	**211,008**	**294,059**	**114,487**	**22,046**	**32,730**	**54,776**	**265,784**

[1] Includes dropoff mortality. LIM = Legal Incident Mortality, SIM = Sublegal Incident 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.

1.2.2 British Columbia Fisheries

1.2.2.1 Northern British Columbia Fisheries

Table 1.6 summarizes estimates of LC, encounters and associated IM by size class during CR and CNR fishing periods for the 2017 NBC AABM fishery. Releases of Chinook salmon from the NBC troll fishery are based on logbook data. Encounters from the QCI sport fishery are based on creel survey and logbook programs. IM estimates were derived using gear- and size-specific rates from the CTC (1997). The estimated TM for 2017 was 162,629 nominal fish, which included 143,330 LC, and 19,299 IM.

1.2.2.2 West Coast Vancouver Island Fisheries

The estimated TM of Chinook salmon for the 2017 WCVI AABM fishery was 122,736 nominal fish, which included 109,533 LC and 13,203 IM (Table 1.6). The estimated IM included 7,507 legal and 5,696 sublegal nominal Chinook salmon. Table 1.6 also summarizes encounters for these fisheries by size class during CR and CNR fisheries.

Table 1.6–Estimates of total landed catch (LC), incidental mortality (IM; in nominal numbers of fish), and total mortality (TM) in NBC and WCVI AABM fisheries, 2017.

Fishery	LC	Legal Releases	Sublegal Releases	LIM[1] Drop-off	Total LIM[1]	Total SIM[1]	Total IM	Total Mortality
NBC								
Troll CR	147,381	1510	21,353	2,505	2,810	5,061	7,871	155,252
Troll CNR	0	0	0	0	0	0	-	-
Troll Total	147,381	1,510	21,353	2,505	2,810	5,061	7,871	155,252
Sport Total	42,800	29,711	0	1,541	6,265	0	6,265	49,065
NBC Total	190,181	31,221	21,353	4,046	9,075	5,061	14,136	204,317
WCVI								
Troll CR	49,472	40	5,043	841	849	1,195	2,044	51,516
Troll CNR	0	0	0	0	0	0	-	-
First Nations Troll[2]	11,359	25	2777	193	198	394	592	11,951
Troll Total	60,831	65	7,820	1,034	1,047	1,589	2,636	63,467
Sport Total	38,819	7,205	14,043	2,679	4,062	2,696	6,758	45,577
WCVI Total	99,650	7,270	21,863	3,713	5,109	4,285	9,394	109,044

[1] LIM = Legal Incident Mortality, SIM = Sublegal Incident Mortality.

[2] First Nations troll includes food, social, and ceremonial and the T'aaq-wiihak catch.

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 Attachments IV and V in Chapter 3, Annex IV, of the PST.

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 Taku River and Stikine River Chinook salmon occurring in Canada are also provided, although provisions for catch sharing arrangements between Canada and the US for these two Transboundary River stocks are described in Chapter 1 of the 2009 Agreement. ISBM obligations are not applicable to these stocks since they are not identified in the Attachments to Chapter 3. In 2017, a total of 257,227 nominal fish were caught in Canadian ISBM fisheries in British Columbia and Canadian sections of the Transboundary Rivers. Total estimated IM in 2017 was 52,478 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 A16 Table A7, Table A8, and Table A11 through Table A15.

Table 1.7–Landed catch and incidental mortalities in Canadian ISBM fisheries for 2017.

Region/Gear	Landed Catch	Release Legals	Release Sublegals	IM	Total Mortality
Transboundary Rivers	**927**	**263**	**9**	**301**	**1,228**
Net	568	263	9	283	851
Freshwater Sport	64	0	0	4	68
First Nations-FSC[2]	295	0	0	14	309
Northern British Columbia	**23,442**	**6,815**	**908**	**3,249**	**26,691**
Net	1,655	1,318	188	1,301	2,956
Tidal Sport	10,108	5,308	0	1,208	11,316
Freshwater Sport	1,240	189	720	260	1,500
First Nations-FSC	10,064	0	0	463	10,527
Tyee Test Fishery	375	0	0	17	392
Central British Columbia	**12,682**	**2,892**	**679**	**2,078**	**14,760**
Net	3,119	879	679	1,276	4,395
Tidal Sport	6,679	NA	NA	240	6,919
Freshwater Sport	977	0	0	67	1,044
First Nations-FSC	1,907	0	0	88	1,995
Troll	0	2,013	0	407	407
West Coast Vancouver Island	**90,017**	**4,982**	**14,166**	**11,295**	**101,312**
Net	30,486	41	646	4,031	34,517
Tidal Sport	41,998	4,920	13,520	6,438	48,436
First Nations-EO and FSC [3]	17,533	0	0	826	18,359
Johnstone Strait	**13,912**	**1,702**	**14,553**	**4,481**	**18,393**
Net	12	747	0	544	556
Tidal Sport	13,684	948	14,553	3,920	17,604
First Nations-FSC	216	7	0	17	233
Georgia Strait	**60,498**	**5,945**	**72,485**	**19,245**	**79,743**
Net	0	51	11	47	47
Tidal Sport	59,412	5,859	72,474	19,139	78,551
First Nations-FSC	1,086	2	0	52	1,138
Troll	0	33	0	7	7
Juan de Fuca	**28,419**	**7,976**	**20,404**	**8,422**	**36,841**
Net	50	1,870	0	1,374	1,424
Tidal Sport	28,369	6,106	20,404	7,047	35,416
Fraser River	**27,330**	**6,731**	**598**	**3,407**	**30,737**
Commercial& Test Net	3,904	207	0	764	4,668
First Nations-EO&FSC Net	14,955	519	0	790	15,745
Mainstem Catch & Trib Sport	8,471	6,005	598	1,852	10,323
Grand Total	**257,227**	**37,306**	**123,802**	**52,478**	**309,705**

[1] FSC = food, social, and ceremonial.

[2] EO = economic opportunity.

1.3.2 Southern US Individual Stock Based Management Fisheries

Southern US fisheries of interest to the PSC, generally those north of Cape Falcon, Oregon, are managed in accordance with legal obligations stemming from treaties between Indian tribes and the US, and where relevant, the conservation constraints set by the ESA. In 1974, *US v. Washington* set forth sharing obligations to meet treaty fishing rights in western Washington. Treaty rights of Columbia River tribes were defined by *US v. Oregon*, and the Columbia River Fisheries Management Plan was implemented in 1977. In reporting, these fisheries are termed *treaty Indian* if they are fishing under the Native American Treaty fishing rights and *non-Indian* otherwise. Currently, all southern US fisheries are ISBM fisheries (Table 1.8). Historical catches in these fisheries are provided in Table A16 through Table A22.

Table 1.8–Landed catch and incidental mortality in Southern US troll, net, and sport fisheries, 2015–2017.

		2017[1]			2016			2015		
Fishery	**Gear**	**LC**	**Release**	**IM**	**LC**	**Release**	**IM**	**LC**	**Release**	**IM**
	Net	50	NA	4	254	NA	20	831	NA	66
Juan de Fuca	Sport	10,840	29,415	9,455	9,651	26,188	8,418	11,811	32,364	10,386
	Troll	1,703	NA	43	578	NA	14	4,876	NA	122
Total		**12,593**	**29,415**	**9,502**	**10,483**	**26,188**	**8,453**	**17,518**	**32,364**	**10,575**
San Juans	Net	2,628	40	242	22	-	2	4,773	7,928	6,724
	Sport	7,980	12,542	4,518	6,173	9,702	3,495	8,551	11,542	4,333
Total		**10,608**	**12,582**	**4,760**	**6,195**	**9,702**	**3,497**	**13,324**	**19,470**	**11,057**
Puget Sound	Net	135,280	NA	10,802	79,484	NA	6,359	58,183	NA	4,655
	Sport	22,248	50,741	16,825	22,944	52,327	17,351	19,898	94,657	28,253
Total		**157,528**	**50,741**	**27,627**	**102,428**	**52,327**	**23,709**	**78,081**	**94,657**	**32,908**
Wash. Inside	Net	20,462	NA	408	14,134	NA	283	32,760	NA	655
Coastal	Sport	15,452	NA	1,066	14,004	NA	966	22,612	NA	1,560
Total		**35,914**	**-**	**1,474**	**28,138**	**-**	**1,249**	**55,372**	**NA**	**2,215**
Columbia	Net	29,943	0	898	35,716	1,887	1,600	61,084	3738	2,879
River- Spring	Sport	32,806	978	2,470	56,054	5,474	4,951	87,006	5,935	7,184
Summer	Net	18,111	0	543	27,764	0	833	52,500	0	1,575
	Sport	7,934	2,342	835	11,740	9,603	1,991	21,602	8,522	2,539
Fall	Net	148,196	0	4,446	203,271	0	6,098	358,514	0	10,755
	Sport	78,828	8,768	7,123	78,728	8,053	6,978	143,927	27,121	15,138
Total		**315,818**	**12,088**	**16,316**	**413,723**	**25,017**	**22,452**	**724,633**	**45,316**	**40,070**
WA/OR	Sport	21,945	18,604	3,383	17,948	21,133	3,654	42,179	15,219	3,422
North Falcon	Troll	60,024	NA	1,501	42,234	NA	1,056	125,384	NA	3,135
Total		**81,969**	**18,604**	**4,884**	**60,182**	**21,133**	**4,710**	**167,563**	**15,219**	**6,556**
Oregon	Sport[2]	34,362	NA	2,371	32,680	NA	2,255	69,790	NA	4,816
Inside	Troll[3]	70	NA	2	182	NA	5	1,164	NA	29
Total		**34,432**	-	**2,373**	**32,862**	-	**2,259**	**70,954**	0	**4,845**
GRAND TOTAL		**648,862**	**123,430**	**66,935**	**653,561**	**134,366**	**66,330**	**1,127,445**	**207,027**	**108,227**

Note: NA = Not available.

[1] Washington Department of Fish and Wildlife Catch Record Card estimates of LC were not yet available; LC and releases for 2016 were computed using 2015–2017 mean values.

[2] Values for 2017 LC and IM are estimates based on averages, not actual observed values. These will become available after the timeframe required for this report.

[3] 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.

1.3.2.1 Strait of Juan de Fuca and the San Juan Islands

The preliminary estimate of the 2017 Chinook salmon catch in Strait of Juan de Fuca (Area 4B, 5, 6, and 6C) net fisheries was 50 fish with the majority of these taken during fisheries targeting Fraser River sockeye salmon. There were 2,628 Chinook salmon harvested in the San Juan Islands net fisheries (Area 6A, 7, and 7A). The preliminary estimate of the 2017 Strait of Juan de Fuca treaty Indian troll fishery catch (through December 2016) is 1,703 Chinook salmon. The catch estimate does not include catches from Area 4B during the May to September Pacific Fisheries Management Council management period. Estimates for sport fisheries in 2017 are not yet available from the Washington Department of Fish and Wildlife (WDFW) Catch Record Card accounting system; thus, the preliminary estimates of sport catches and incidental mortalities in 2017 are approximated by averages of the three preceding years. Historic catch estimates are provided for the Strait of Juan de Fuca (Table A16) and San Juan areas (Table A17).

1.3.2.2 Puget Sound

The preliminary estimate of the net fishery harvest of Chinook salmon in Puget Sound marine and freshwater areas (excluding Strait of Juan de Fuca and the San Juan Islands) in 2017 is 135,280 (123,042 treaty Indian, 12,062 non-Indian). The harvests in treaty Indian fisheries include a preliminary estimate of 50,484 Chinook salmon in in-river fisheries. Estimates of the sport catch in 2017 are not yet available from the Washington Department of Fish and Wildlife (WDFW) Catch Record Card accounting system; thus, the preliminary estimate of sport catch reported here for 2017 is an average of the previous three years (22,248). Historic catch tables for Puget Sound (exclusive of the Strait of Juan de Fuca and San Juan Islands) are provided in Table A18.

1.3.2.3 Washington Coast Terminal

The preliminary 2017 estimate of harvest in Washington coastal net fisheries was 20,462 Chinook salmon. Harvest in treaty Indian fisheries include 13,879 harvested in north coastal rivers (Quinault, Queets, Hoh, and Quillayute rivers) and 3,607 in Grays Harbor and the Humptulips and Chehalis rivers within the basin. The 2017 non-Indian commercial net harvest was 30 Chinook salmon in Grays Harbor and 2,946 from Willapa Bay.

From Grays Harbor north, sport fisheries were implemented based upon preseason state–tribal agreements and were subject to inseason adjustment. Estimates of sport fishery catches for Washington coastal terminal fishing areas in 2017 are not yet available from the Catch Record Card accounting system, but are approximated here based on the average catch from the previous three years (15,452). Historic catch estimates for Washington Coastal inside fisheries are shown in Table A19.

1.3.2.4 North of Cape Falcon

Ocean fisheries off the coasts of Washington, Oregon, and California are managed under regulations recommended by the Pacific Fishery Management Council. The fisheries north of Cape Falcon also fall under the jurisdiction of the PST. For 2017, the estimated catch of Chinook salmon in commercial troll fisheries from Cape Falcon, Oregon, to the US-Canada border was 60,024 for non-Indian and treaty Indian fisheries combined. Estimated catch in the ocean sport

fishery north of Cape Falcon in 2017 was 21,945 Chinook salmon. Historic catch estimates for US ocean fisheries north of Cape Falcon are shown in 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 Table A21 with IM from *US v. Oregon* Technical Advisory Committee, WDFW, Oregon Department of Fish and Wildlife (ODFW), and Columbia River Intertribal 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 dropoff, whereas the Columbia River fishery management agencies do not estimate this type of fishery related mortality.

In 2017, the total annual harvest for all fisheries (spring, summer, and fall, both hatchery and wild) in the Columbia River basin was 315,818 Chinook salmon. This included non-Indian commercial net plus Wanapum and Colville tribal harvest of 50,694; sport harvest of 119,568; and treaty Indian commercial, ceremonial, and subsistence harvest of 145,556 (Table A21). The 2017 total annual Columbia River combined net and sport harvest consisted of 62,749 spring Chinook, 26,045 summer Chinook and 227,024 fall Chinook salmon (Table 1.8).

1.3.2.6 Oregon Coast Terminal

Most harvest in ocean fisheries off Oregon's coast is comprised of a mixture of southern Oregon and California Chinook salmon stocks not included in the PSC agreement. These stocks usually do not migrate north into the PSC jurisdiction to any great extent. Chinook salmon originating from Oregon streams north of Cape Blanco migrate north, and a majority of these populations are designated as the North Oregon Coast (NOC) aggregate and are included in the CTC Chinook model. On the mid-Oregon coast south of the NOC to north of Cape Blanco is a smaller population group designated as Mid-Oregon Coastal (MOC) aggregate populations. The NOC stocks are harvested only incidentally in Oregon ocean fisheries, while the contribution of MOC stocks to Oregon and Washington ocean fisheries is greater (based on CWT distribution data). Catch statistics for MOC are readily available for only one terminal ocean area troll fishery on a hatchery supplemented stock at the mouth of the Elk River. Late season (October to December) troll catch in the Elk River terminal troll fishery in 2017 was 70 Chinook salmon.

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 punch card accounting system. These estimates become available more than two years after the current season. Therefore, inriver and estuary sport catch punch card estimates are only provided through 2015 for the NOC. The 2016 punch card estimate of estuary and freshwater catch for the NOC group is 32,680 Chinook salmon. However, catch projections have been made for 2017 using correlations between escapement and punch card catch estimates from past years; these preliminary estimates of terminal sport catch for 2017 are presented in Table 1.8. Historical catch estimates for the troll fishery targeting Elk River and the estuary and freshwater sport fisheries targeting on NOC stocks are shown in Table A22.

1.3.3 Estimates of Incidental Mortality for Southern US Fisheries

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

1.4 Summary of 2017 Coastwide Landed Catch, Incidental Mortality, and Total Mortality in PSC Fisheries

Table 1.10 provides a coastwide summary of Chinook salmon catches and estimates of IM and TM in PST fisheries for 2017. It should be noted, for some component fisheries, that current 2017 LC and IM are not yet available; the preliminary estimates of LC and IM will be updated in future reports as observed data become available.

The preliminary estimate of Treaty LC of Chinook salmon for all PST fisheries in 2017 is 1,337,301, of which 827,211 were taken in US fisheries and 510,090 were taken in Canadian fisheries (Table 1.9). Total estimated IM associated with this harvest is 194,264 nominal Chinook salmon (11% of the TM) in nominal fish. The TM for all PST fisheries in nominal fish was 1,531,565 Chinook salmon, which is approximately 125,171 less than recorded for 2016 (Table A25). Of the 1,531,565 total PSC TM estimated for 2017, 936,495 occurred in US fisheries and 595,070 occurred in Canadian fisheries. For US fisheries, 78% of the LC and 61% of IM occurred in ISBM fisheries; in Canada, 50% of the LC and 62% of IM occurred in ISBM fisheries. For some component sport fisheries, 2017 LC and IM estimates are not yet available. Data for calculating summary information contained in Table 1.10 for 2017 and previous years can be found in 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 US and Canada AABM and ISBM fisheries in 2017.

Fishery	2017		
	LC	IM	TM
SEAK AABM	178,348	42,349	220,698
SEAK hatchery add-on and terminal exclusion	32,659	12,427	45,086
US ISBM	648,662	66,935	715,798
US TOTAL[1]	827,211	109,284	936,495
NBC AABM	143,330	19,299	162,629
WCVI AABM	109,533	13,203	122,736
CANADA ISBM	257,227	52,478	309,705
CANADA TOTAL	510,090	84,980	595,070
PST FISHERIES TOTAL[1]	1,337,301	194,264	1,531,565

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

2. CHINOOK SALMON ESCAPEMENTS

The 2009 PST Agreement (Annex IV, Chapter 3, Paragraph 2.a.ii) establishes a Chinook salmon fishery management program that

> *continues harvest regimes based on annual estimates of abundance that are responsive to changes in production, take into account all fishery induced mortalities and designed to meet MSY or other agreed biologically-based escapement and/or harvest rate objectives; with the understanding that harvest rate management is designed to provide a desired range of escapements over time; …*

The CTC compares annual estimates of escapement indicators that have MSY or other agreed biologically-based escapement goals established for Chinook salmon stocks. The CTC has accepted escapement goals for 22 stocks included in this report. Escapement goals reviewed by the CTC are based on analyses that follow the guidelines developed in the CTC escapement goal report (CTC 1999).Table 2.1 lists the PSC Chinook fisheries management regime, the applicable stock group in Attachments I-V, the represented region, CTC escapement indicator, and run timing of the indicator stock.

The Agreement (Annex IV, Chapter 3, Paragraph 2.b.iii) directs the CTC to

> *report annually on the escapement of naturally spawning Chinook salmon stocks in relation to the agreed escapement objectives …, evaluate trends in the status of stocks, and report on progress in the rebuilding of naturally spawning Chinook salmon stocks…*

The escapement goals and 2016–2017 escapements for those 22 stocks are listed in Table 2.2. For eight of these stocks, the escapement goal is defined as a range; for the remaining 14 stocks, the escapement goal is defined as a point estimate. In 2017, escapements were above the goal for 13 stocks and below the goal for 9 stocks.

This annual report includes a brief assessment of all indictor stock escapement estimates from 1999 to 2017 showing the number of stocks with PSC accepted escapement goals achieving or falling below goals (Figure 2.1). Section 2.2 provides escapement trends grouped into five regions: Southeast Alaska, Transboundary, British Columbia, Washington, and Columbia River-Oregon, and stock-specific assessments within those regions. In Section 3.3, a framework is used for escapement assessments with narratives and graphs for each stock that include a description of escapement methodology, escapement goal basis, and agency comments.

Table 2.1.–Pacific Salmon Commission Chinook salmon escapement indicator stocks.

Presence in Treaty Attachments[1]					Stock Group in Attachment I–V	Escapement Indicator	Region[1]	Run
SEAK	NBC/ QCI	WCVI	BC ISBM	SUS ISBM				
						Situk	Yakutat	Spring
						Chilkat	N. Inside	Spring
						Unuk	S. Inside	Spring
						Chickamin	S. Inside	Spring
						Alsek	TBR	Spring
						Taku	TBR	Spring
						Stikine	TBR	Spring
✓	✓		✓		North/Central British Columbia	Yakoun	NBC-Area 1	Summer
✓	✓		✓		North/Central British Columbia	Nass	NBC-Area 3	Spring/Summer
✓	✓		✓		North/Central British Columbia	Skeena	NBC-Area 4	Spring/Summer
			✓		North/Central British Columbia	Dean	CBC-Area 8	Spring
						Rivers Inlet	CBC-Area 9	Spring/Summer
✓	✓		✓		WCVI Falls	Artlish, Burman, Kaouk, Tahsis, Tashish, Marble	WCVI	Fall
✓	✓		✓		UGS	Klinaklini , Kakwiekan, Wakeman, Kingcome, Nimpkish	UGS	Summer/Fall
			✓		LGS	Cowichan/Nanaimo[2]	LGS	Fall
✓	✓		✓		Fraser Early[3] (Spr/Sum)	Fraser Spring 1.3	FR	Spring
✓	✓		✓		Fraser Early[3] (Spr/Sum)	Fraser Spring 1.2	FR	Spring
✓	✓		✓		Fraser Early[3] (Spr/Sum)	Fraser Summer 1.3	FR	Summer
✓	✓		✓		Fraser Early[3] (Spr/Sum)	Fraser Summer 0.3	FR	Summer
		✓	✓	✓	Fraser Late	Harrison	FR	Fall
			✓	✓	North Puget Sound Natural springs	Nooksack	NC/PS	Spring
			✓	✓	North Puget Sound Natural Springs	Skagit Spring	NC/PS	Spring
		✓	✓	✓	Puget Sound Natural Summer/Falls	Skagit Summer/Fall	NC/PS	Summer/Fall
		✓	✓	✓	Puget Sound Natural Summer/Falls	Stillaguamish	NC/PS	Summer/Fall
		✓	✓	✓	Puget Sound Natural Summer/Falls	Snohomish	NC/PS	Summer/Fall
		✓	✓	✓	Puget Sound Natural Summer/Falls	Lake Washington	NC/PS	Summer/Fall
		✓	✓	✓	Puget Sound Natural Summer/Falls	Green	NC/PS	Summer/Fall
✓	✓			✓	Washington Coastal Fall Natural	Hoko	WAC/JDF	Fall
						Quillayute Summer	WAC/JDF	Summer
✓	✓			✓	Washington Coastal Fall Natural	Quillayute Fall	WAC/JDF	Fall

–continued–

Table 2.1.–Page 2 of 2.

Presence in Treaty Attachments[1]					Stock Group in Attachment I–V	Escapement Indicator	Region[1]	Run
SEAK	NBC/ QCI	WCVI	BC ISBM	SUS ISBM				
						Hoh Spring/Summer	WAC/JDF	Summer
✓	✓			✓	Washington Coastal Fall Natural	Hoh Fall	WAC/JDF	Fall
						Queets Spring/Summer	WAC/JDF	Summer
✓	✓			✓	Washington Coastal Fall Natural	Queets Fall	WAC/JDF	Fall
						Grays Harbor Spring	WAC/JDF	Spring
✓	✓			✓	Washington Coastal Fall Natural	Grays Harbor Fall[4]	WAC/JDF	Fall
						Columbia Upriver Spring	COLR	Spring
✓	✓	✓		✓	Columbia River Upriver Summers	Mid-Columbia Summers	COLR	Summer
✓	✓	✓		✓	Columbia River Falls	Upriver Brights	COLR	Fall
✓	✓	✓		✓	Columbia River Falls	Lewis	COLR	Fall
✓	✓	✓		✓	Columbia River Falls	Deschutes	COLR	Fall
✓	✓			✓	Far North Migrating Oregon Coastal	Nehalem	NOC	Fall
✓	✓			✓	Far North Migrating Oregon Coastal	Siletz	NOC	Fall
✓	✓			✓	Far North Migrating Oregon Coastal	Siuslaw	NOC	Fall
						South Umpqua	MOC	Fall
						Coquille	MOC	Fall

Note: Shading indicates that there is not a PSC-agreed escapement goal.

[1] Refer to List of Acronyms for definitions.

[2] An escapement goal was established for the Cowichan in 2005; a goal for Nanaimo is still pending.

[3] The escapement indicator stocks listed in the Annex tables for this group are Upper Fraser, Middle Fraser, and Thompson. The Fraser River spring/summer group is split into these four escapement indicators to represent the stock group by life history type rather than geographically.

[4] An escapement goal for Grays Harbor fall was accepted by the CTC in February 2014.

Table 2.2–Escapement goals, 2016–2017 escapements, and 2018 forecasts for stocks with PSC-agreed goals.

Stock	Region[1]	Stock Group	Escapement Goal	2016 Escapement[2]	2017 Escapement[2]	2018 Forecast[2]
Situk[3]	SEAK	Yakutat	500–1,000	**329 (66%)**	1,187 (237%)	730 (146%)
Chilkat[3]	SEAK	Northern Inside	1,750–3,500	**1,380 (79%)**	**1,173 (67%)**	**1,030 (59%)**
Unuk[3]	SEAK	Southern Inside	1,800–3,800	**1,463 (81%)**	1,203 (67%)	**865 (48%)**
Chickamin	SEAK	Southern Inside	2,150–4,300	**964 (45%)**	**722 (34%)**	NA
Alsek	TBR	Transboundary Rivers	3,500–5,300	**2,574 (74%)**	**1,718 (50%)**	NA
Taku[4]	TBR	Transboundary Rivers	19,000–36,000	**12,381 (65%)**	**8,754 (46%)**	**4,700 (25%)**
Stikine[4]	TBR	Transboundary Rivers	14,000–28,000	**10,343 (74%)**	**7,206 (51%)**	6,900 (69%)
Harrison	BC	Fraser River	75,100–98,500	**41,327 (55%)**	**29,799 (40%)**	64,476 (86%)
Cowichan	BC	Lower Strait of Georgia	6,500	7,787 (177%)	10,590 (163%)	NA
Quillayute Fall[4]	WAC	Washington Coast	3,000	3,654 (122%)	3,927 (131%)	6,837 (228%)
Queets Spr/Sum[4]	WAC	Washington Coast	700	704 (101%)	825 (118%)	NA
Queets Fall[4]	WAC	Washington Coast	2,500	2,915 (117%)	2,721 (109%)	3,336 (133%)
Hoh Spr/Sum[4]	WAC	Washington Coast	900	1,144 (127%)	1,778 (198%)	1,092 (121%)
Hoh Fall[4]	WAC	Washington Coast	1,200	2,831 (236%)	1,405 (117%)	2,584 (215%)
Grays Harbor Fall[4]	WAC	Washington Coast	13,326	11,685 (87%)	13,469 (101%)	16,399 (123%)
Mid-Columbia Summers[5]	COLR	Columbia River Summers	12,143	79,253 (653%)	56,265 (463%)	55,500 (457%)
Upriver Brights[5]	COLR	Columbia River Falls	40,000	189,358 (473%)	120,582 (301%)	84,900 (212%)
Deschutes Fall	COLR	Columbia River Falls	4,532	11,628 (257%)	4,943 (109%)	11,903 (263%)
Lewis[5]	COLR	Columbia River Falls	5,700	8,957 (157%)	6,058 (106%)	6,100 (107%)
Nehalem	ORC	Oregon Coast	6,989	10,074 (144%)	6,473 (93%)	6,510 (93%)
Siletz	ORC	Oregon Coast	2,944	8,479 (288%)	7,364 (250%)	5,139 (175%)
Siuslaw	ORC	Oregon Coast	12,925	30,135 (233%)	10,957 (85%)	11,015 (85%)

[1] Refer to List of Acronyms for definitions.

[2] Percentages relative to the point goal or the lower end of the range are in parentheses. Escapements below the goal or lower bound of the escapement range are shaded; escapements or forecasts below the 85% threshold applicable to Attachment I–III are bold.

[3] The forecasts for Situk and Unuk Chinook salmon are for total run and Chilkat Chinook salmon is for inriver run; these are not forecasts of escapement.

[4] Forecasts for are for terminal run and are not forecasts of escapement.

[5] Projected escapement in 2018 is based on applying 2017 post season escapement rate (i.e., observed escapement divided by terminal run) to the 2018 terminal run forecast.

2.1 ESCAPEMENT GOAL ASSESSMENTS

The CTC has now assessed the status of stocks with PSC-agreed goals for return years 1999 through 2017. The number of stocks with PSC-agreed goals has increased from 15 to 22 (Figure 2.1) and the percentage of stocks that met or exceeded escapement goals or goal ranges has varied between 50% and 96%. In 2017, the percentage of stocks that met or exceeded goal was 59%. Of the 9 stocks below goal, 3 stocks (Unuk, Nehalem, and Siuslaw) were within 15% of the target goal and 6 stocks were more than 15% below goal: Chilkat, Chickamin, Alsek, Taku, Stikine, and Harrison.

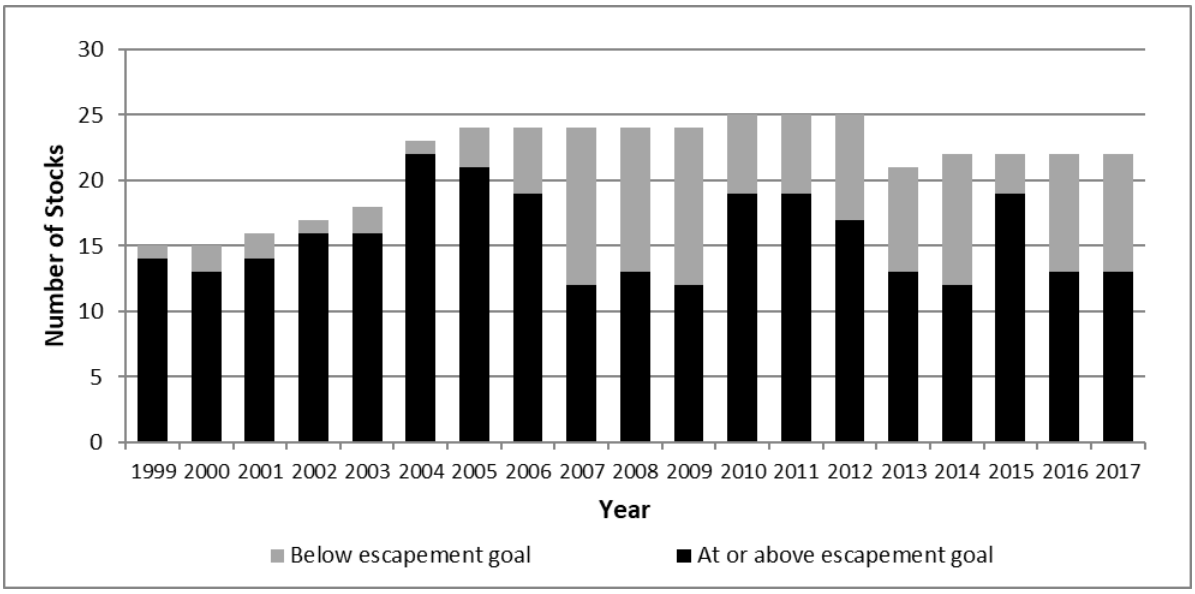


Figure 2.1–Number and status of stocks with PSC-agreed escapement goals, 1999–2017.

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, bringing the total number of current indicator stocks with PSC-agreed escapement goals to 22 since 2014.

2.2 TRENDS FOR ESCAPEMENT INDICATOR STOCKS

The evaluation of escapement trends in Chinook salmon is based on the 1999 to 2017, time series of escapement, using a state-space exponential growth model (Dennis et al. 2006) and parameterized through restricted maximum likelihood (Humbert et al. 2009). This model estimates rates of change that are generally superior to those produced through maximum likelihood analysis alone (Staples et al. 2004). Assuming the true population is generated by stochastic exponential growth, this method separates observation error and process noise and produces variances and confidence intervals (CIs) that fully represent the annual variability associated with environmental stochasticity, along with sampling or observation error (Humbert et al. 2009). The first year in the time series corresponding with the 1999 Agreement was used; however, CIs would improve with a longer time series (Humbert et al. 2009). For some stocks, the time series is shorter due to changes in escapement sampling methodology;

trends are based on estimates using consistent methodology. Stock-specific escapement trends are characterized by the long-term mean rate of change (μ) and corresponding 80% CIs, where μ = 0.00 indicates that escapement has been stable on average for the selected time period. If the ratio of process noise and observation error is constant, the CIs represent the inter-annual variability in escapement rates of change (Humbert et al. 2009). Stocks are grouped into five regions: Southeast Alaska, Transboundary, British Columbia, Washington, and Columbia River-Oregon.

2.2.1 Escapement Trends for Southeast Alaska Stocks

Escapement trends for 1999–2017 showed that three of four SEAK stocks of Chinook salmon (Chilkat, Chickamin, Unuk) demonstrated variable trends and were not significantly different from zero (Figure 2.2). Escapements have declined significantly for the Situk stock. Poor productivity associated with SEAK Chinook salmon and especially with outside-rearing stocks started with the 2002 brood year and was manifested in the 2008 return year this has led to some below-goal escapements for the Situk stock.

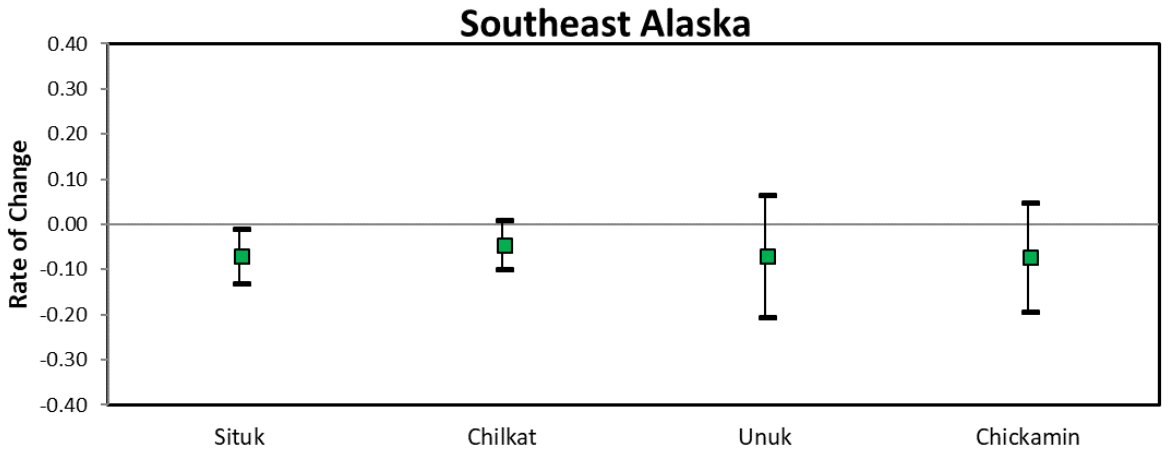


Figure 2.2.–Long-term annual rates of change in escapements for SEAK Chinook salmon stocks.

Note: Squares represent mean rate of change and bars represent 80% CIs. All of these stocks have PSC-agreed escapement goals.

2.2.2 Escapement Trends for Transboundary Stocks

Escapement trends for 1999–2017 showed that all three TBR stocks of Chinook salmon (Alsek, Taku, and Stikine) demonstrated variable trends and were not significantly different from zero (Figure 2.3).

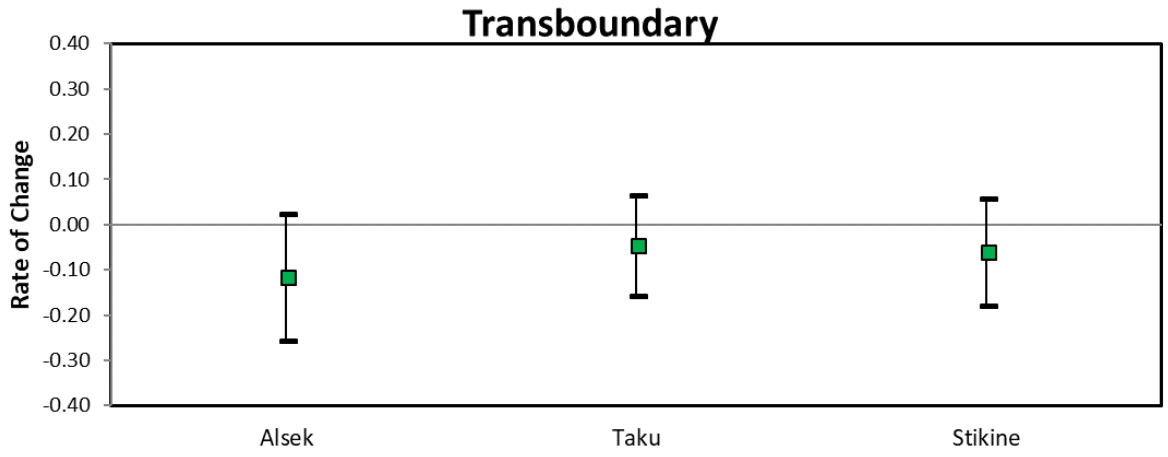


Figure 2.3–Long-term annual rates of change in escapements for TBR Chinook salmon stocks.

Note: Squares represent mean rate of change and bars represent 80% CIs. All of these stocks have PSC-agreed escapement goals.

2.2.3 Escapement Trends for Canadian Stocks

Long-term rates of change in escapement for Canadian stocks were based on 1999–2017 time series of escapement for 16 of the 17 stocks evaluated. Escapement time series started in 2000 for Lower Shuswap due to changes in escapement estimation methodologies. Few Canadian stocks exhibited clearly positive or negative tendencies in long-term rates of change in escapement generally due to large variability in annual rates of change (as indicated by the 80% CIs; Figure 2.4). Eleven stocks showed negative mean rates of change but only Chuckwalla-Killbella, Harrison (which has a CTC-agreed escapement goal), Lower Shuswap, and Skeena showed significant negative trends. Six stocks showed positive mean rates of change in escapement but none of them showed a significant positive trend. Chinook salmon from Fraser Summer 0.3, Harrison, Nanaimo, and Skeena exhibited the lowest variability in annual rates of change in escapement whereas Chinook salmon from Fraser Spring 1.2, Fraser Spring 1.3, Fraser Summer 1.3, and Nicola exhibited the largest variability amongst all Canadian stocks. The highest positive annual long-term mean rate of change in escapement for a Canadian stock was 4.8% for Chinook salmon from the Wannock River, and the lowest negative mean rate of change in escapement was -10.3% for Chinook salmon from the Chuckwalla-Killbella aggregate.

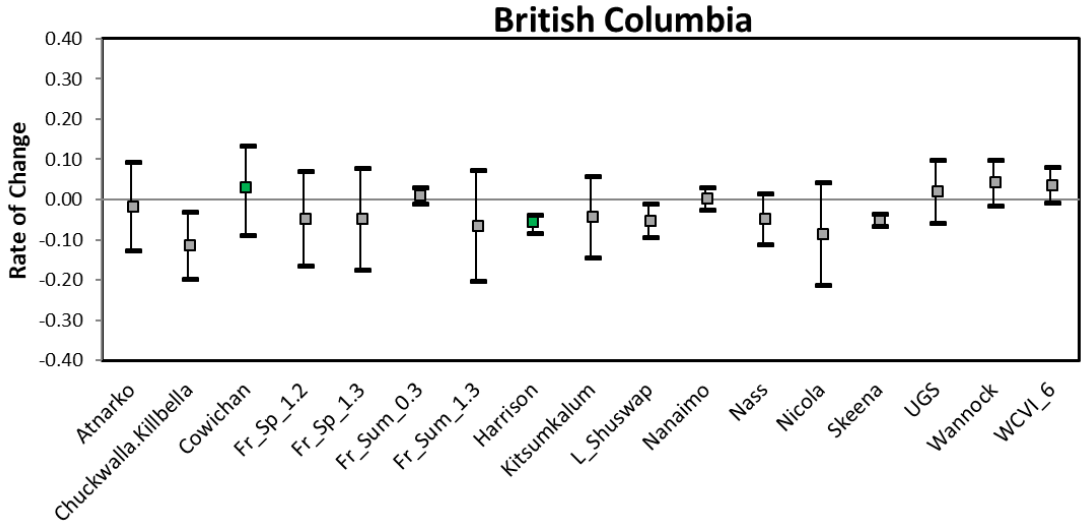


Figure 2.4.–Long-term annual rates of change in escapements for Canadian Chinook salmon stocks.

Note: Squares represent mean rate of change and bars represent 80% CIs. The color green in the squares indicate these stocks have PSC-agreed escapement goals, grey colored squares indicate the stocks do not have PSC-agreed escapement goals. Escapement time series for Nanaimo started in 2005 due to changes in escapement estimation methodologies.

2.2.4 Escapement Trends for Washington Stocks

Escapement trends for 1999–2017 revealed several noteworthy patterns for Puget Sound and Washington Coastal escapement indicator stocks (Figure 2.5). Of the seven Puget Sound indicator stocks, rates of change in escapement declined significantly for Stillaguamish (-3.8%) and increased significantly for Skagit Spring (5.1%) and Lake Washington (3.3%). Confidence intervals around the rates of change, as well as point estimates, for the remaining four Puget Sound indicator stocks indicate no significant trends. However, due to widely varying escapements, there is considerable uncertainty around rate of change estimates for Skagit River summer/fall, Snohomish River, Green River, and Nooksack spring stocks. Although Puget Sound indicator stocks have largely met their agency management objectives (i.e., exploitation rate ceilings) for the 1999–2017 time period, none of them have CTC-approved escapement goals against which trends can be evaluated. Of the nine Washington Coast indicator stocks, 3 showed a significant trend in escapement for 1999–2017. Rates of change in escapement decreased significantly for the Grays Harbor spring stock (–3.3%) and Hoh fall (-2.1%), while the rate increased significantly for the Queets spring/summer stock (3.2%). Six of the coastal indicator stocks have CTC-approved goals, which have been consistently met for summer/fall (Queets, Quillayute, Hoh), but not spring/summer (Hoh, Queets) run timing groups. Three of the stocks—Hoko, Hoh spring/summer, and Grays Harbor fall—have wide CIs relative to other coastal indicator stocks. In the case of the Hoh and Queets spring/summer Chinook, despite regularly missing goals and returning at levels consistently lower than observed historically, the rate of change in escapement for Queets is increasing, while the rate of change for Hoh is insignificant, indicating stable escapement.

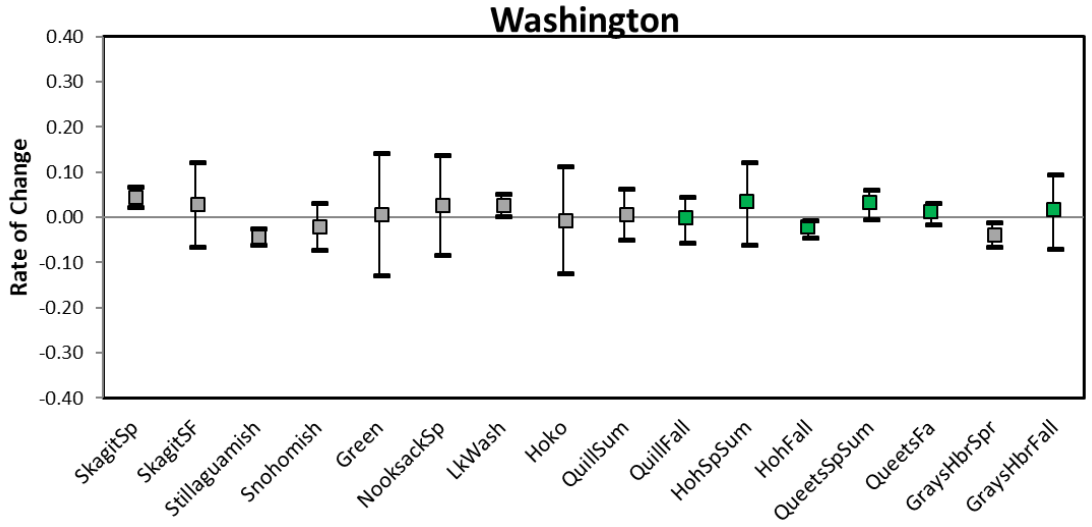


Figure 2.5.–Long-term annual rates of change in escapements for Washington Chinook salmon stocks.

Note: Squares represent mean rate of change and bars represent 80% CIs. The color green in the squares indicate these stocks have PSC-agreed escapement goals, grey colored squares indicate the stocks do not have PSC-agreed escapement goals. The 2016 Nooksack spring escapement estimate was not available for this analysis.

2.2.5 Escapement Trends for Columbia River/Oregon Stocks

Rates of annual change averaged 5% for the Columbia River stocks, and ranged from -2.21% (Deschutes) to 12.15% (Coweeman). Rates of change for the Oregon Coast stocks averaged 0.5%, ranging from -2.99% for the Siuslaw to 6.36% for Umpqua. None of the Columbia River/Oregon stocks showed rates of change significantly different than zero (Figure 2.6).

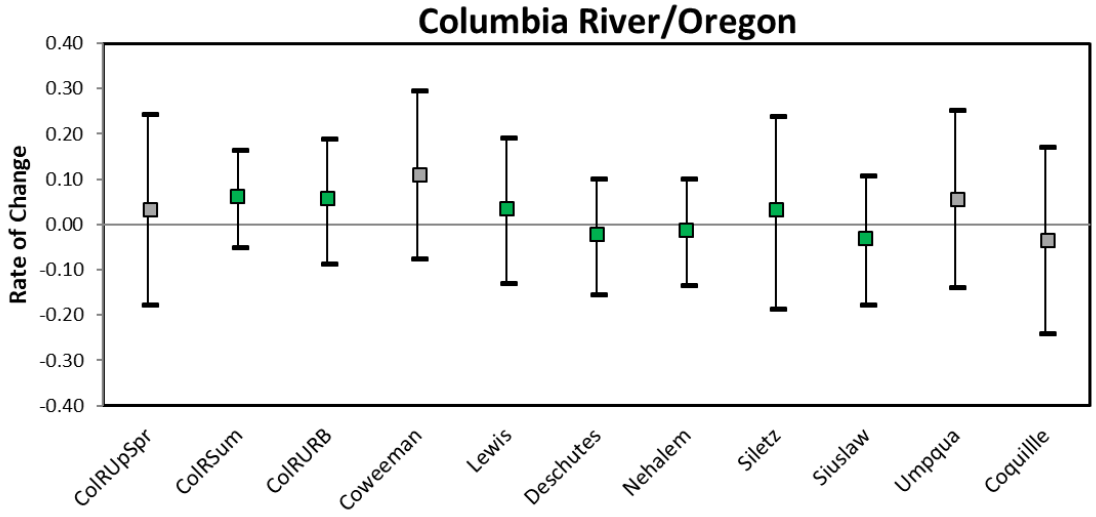


Figure 2.6.–Long-term annual rates of change in escapements for Columbia River/Oregon Chinook salmon stocks.

Note: Squares represent mean rate of change and bars represent 80% CIs. The color green in the squares indicate these stocks have PSC-agreed escapement goals; grey colored squares indicate the stocks do not have PSC-agreed escapement goals.

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 adult number by calendar year (CY). Escapement goals accepted by the CTC are shown as horizontal reference lines. Historical escapement and terminal run data are provided in Appendix B.

2.3.1 Southeast Alaska Stocks

Estimates for the four SEAK escapement indicator stocks are germane to large fish, defined by size (≥ 660 mm length from mid eye to tail fork) for the Situk, Unuk and Chickamin stocks or by age (≥ age 1.3) for the Chilkat stock. Estimates of large fish include mostly ocean-age-3, -4, and -5 fish, which include almost 100% of the females in the population, and the length threshold criterion excludes males of ocean-age-1 and -2. 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 MR escapement estimation. Escapement estimates for the Unuk and Chickamin rivers are expanded aerial counts of large spawners. Biological escapement goals (BEGs) for each of these stocks 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. Inside-rearing stocks include those vulnerable to SEAK fisheries as immature fish, as well as mature, migrating fish, and include stocks returning to the Chilkat, Unuk, and Chickamin rivers. Outside-rearing stocks, sometimes referred to as "far north migrating stocks," have limited marine rearing time in SEAK and are harvested primarily during their spawning migrations through marine waters in the spring; this includes the stock returning to the Situk River.

In 1981, ADF&G established a 15-year rebuilding program which included developing interim point escapement goals for all the SEAK stocks based on the highest observed escapement count prior to 1981. Since then, more rigorous escapement goal analyses by ADF&G have been reviewed and accepted by the CTC. The ADF&G uses escapement goal ranges for management, based on the State of Alaska Policy for Statewide Salmon Escapement Goals and Policy for the Management of Sustainable Salmon Fisheries (Title 5 of the Alaska Administrative Code, Chapter 39, sections and 222 and 223: 5 AAC 39.222 and 39.223).

2.3.1.1 Situk River

The Situk River is a non-glacial system near Yakutat, Alaska that supports a moderate-sized, outside-rearing stock. Most Situk-origin Chinook salmon are caught in sport, commercial, 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 Management Plan (5 AAC 30.365)) to achieve escapements within the escapement goal range.

Escapement Methodology: Escapement estimates include weir counts minus all upstream sport

fishery harvest, as estimated by a freshwater creel survey and a postseason mail-out survey. The weir has been operated from 1928 to 1955 and annually since 1976. Counts of large Chinook salmon are reported as the spawning stock. Counts of small Chinook (jacks, ocean-age-1 and -2 fish, not included in Figure 2.7) have ranged from 1,200-4,000 since 1989. Escapements have been continuously enumerated since 1976 and 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)[1], and in 1997, the goal was revised to a range of 500– 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 in 2003, leading to a 2004 recommended new goal range of 450–1,050, but this proposal was not accepted by the CTC.

Escapement Evaluation: Productivity of the Situk River stock has declined significantly over the last decade. Annual escapements less than 85% of the lower bound of the goal have occurred in six of the last ten years; however, the 2017 estimated escapement of 1,187 large Chinook was the largest observed escapement since 2003 and also the first time that the upper bound of the BEG range (1,000) was surpassed in nearly 15 years. Similar to 2015 and 2016, all terminal fisheries were closed in 2017 to pass as many fish to escapement as possible. There was no harvest above the weir in 2017 and therefore an exact count of escapement was obtained (Figure 2.7).

Agency Comments: Total calendar year exploitation rates (and all harvests within the PSC area) for all gear groups combined averaged about 53% from 1990 to 2003 and these rates have been substantially lower since 2004 because this stock has experienced poor marine survival. Terminal sport and commercial fisheries have been curtailed to reduce impacts from 2010 to 2017.

[1] Scott A. McPherson, ADF&G, to Keith Weiland, ADF&G. 1991 memorandum. Available from author, Douglas Island Center Building, 802 3rd Street, P. O. Box 240020, Douglas, AK 99824-0020.

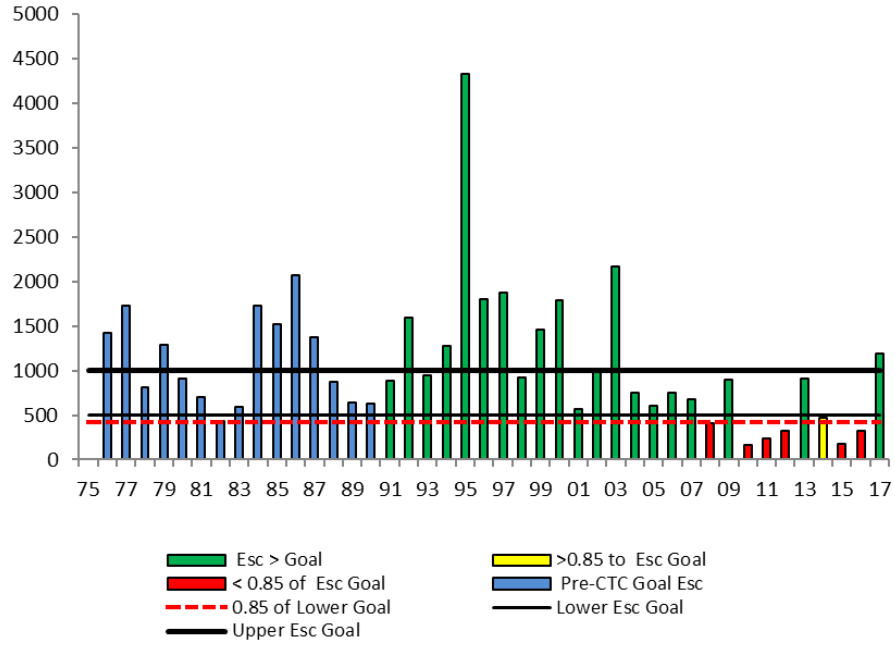


Figure 2.7.–Situk River escapements of Chinook salmon, 1976–2017.

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 ≥ age-1.3. Coded-wire tags 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. Calendar year exploitation rates averaged 15% with a range of 3% to 28% in the current fishing regime.

Escapement Methodology: Escapements of large spawners have been estimated with a MR program annually since 1991 (Ericksen and McPherson 2004). CVs for annual escapement estimates averaged about 15% since 1991, and assessments have met CTC bilateral data standards in most years. From 1975 to 1992, aerial survey counts were conducted on two small tributaries with relatively clear water and results from these estimates were inconsistent; radio-telemetry studies conducted in 1991 and 1992 found that these two tributaries represented less than 5% of the total escapement. Therefore, aerial surveys were discontinued.

Escapement Goal Basis: The 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 1,750–3,500 large spawners (Ericksen and McPherson 2004), based on MR estimates of escapement and limited CWT information, was reviewed and accepted by ADF&G and the Alaska Board of Fisheries in 2003 and by the CTC in 2004.

Escapement Evaluation: Escapements to the Chilkat River have been ≥ 85% of the goal in all years except 2007, 2016, and 2017. The 2017 escapement estimate of 1,173 large fish (CV=20%) is below the 85% threshold of the lower bound of the escapement goal range (Figure 2.8).

Agency Comments: Like other Chinook stocks in Alaska, the Chilkat stock has recently experienced a decline in productivity. Despite restrictive management in mixed stock fisheries and in terminal areas which has greatly reduced harvest rates in recent years, the Chilkat stock has failed to meet management objectives and therefore similar and even more restrictive measures will be in place during 2018.

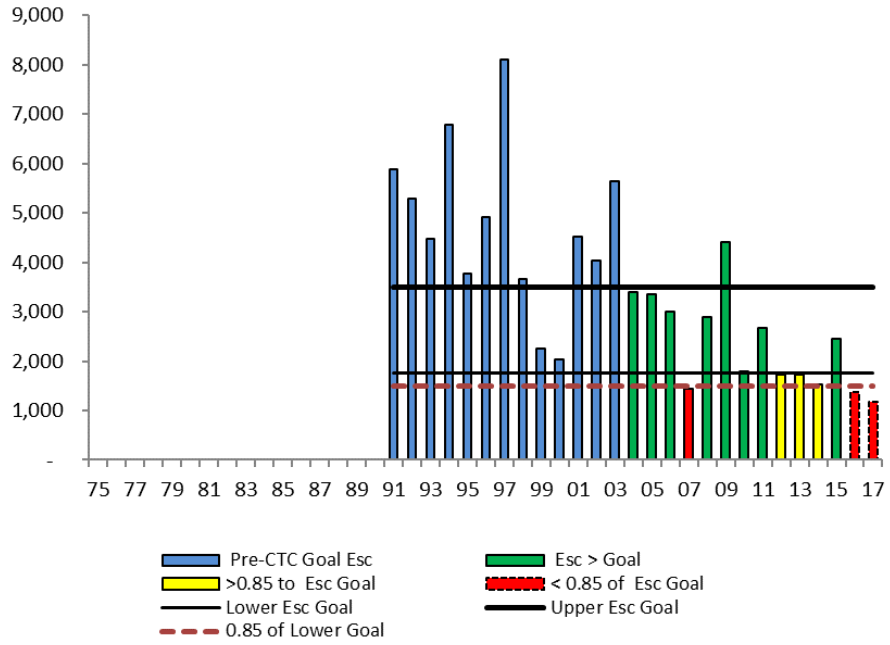


Figure 2.8.–Chilkat River escapements of Chinook salmon, 1991–2017.

2.3.1.3 Unuk River

The Unuk River is a moderate-sized glacial system in Behm Canal near Ketchikan, Alaska, that supports an inside-rearing stock. Escapement estimates are germane to large spawners. Coded-wire tags have been applied to wild smolt at relatively high rates (7–10%) beginning with brood year 1992. Harvest of immature and mature fish occurs predominately in SEAK commercial and sport fisheries although some fish are also caught in NBC commercial net and troll fisheries**.**

Escapement Methodology: Escapements of large spawners are derived from MR estimates of total escapement from 1997 to 2011, and expanded survey counts from 1977 to 1996 and 2012 to present. Radio telemetry studies in 1994 and 2007 showed that the surveys are conducted where 80% of the spawning occurs; the expansion factor for survey counts is 4.83 (Hendrich et al. 2008). Escapement assessments for Unuk River Chinook salmon consistently meet CTC data standards. Since 1997, CVs of MR estimates have averaged 11% and in all but one year (2011) the annual estimates had CVs of 15% or less. The CV of expanded survey counts performed since 2012 is 12%. These escapement assessments meet both U.S. and 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 accepted in 1994. In 1997, ADF&G revised the goal to a range of 650–1,400 large spawners

observed during index counts, as recommended in the McPherson and Carlile (1997) report, which the CTC reviewed and accepted in 1998. Since the expansion factor for surveys was unknown at that time, the goal was expressed as an index peak survey count. In 2008, a more extensive analysis was completed using the 1982-2001 brood years with spawners, recruitment, and fishing mortality expressed in total numbers of fish (Hendrich et al. 2008). In 2009, the CTC accepted a BEG range of 1,800–3,800 large spawners, with a point estimate of 2,764 fish.

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 stock has recently declined dramatically, and escapements were below the 85% threshold of the lower bound of the escapement goal range in 2012, 2013, 2016, and 2017. The 2017 escapement estimate is 1,203 large Chinook salmon (CV = 12%) which is below the 85% threshold of the lower bound of the goal range. The Unuk River stock, similar to other SEAK stocks, is experiencing a period of low productivity (Figure 2.9).

Agency Comments: The large reduction in run strength of the Unuk River stock in recent years is unexpected given its history of consistent production. There are no directed fisheries that target this stock; sport fishing in freshwater is closed, marine sport fishing in East Behm Canal is closed during the spring and summer, and commercial fishing in nearby marine waters is closed. Additional management measures to reduce exploitation of this stock in the SEAK fishery were implemented from 2014 to 2017 and restrictions will increase in 2018. These measures include bag limit reductions and area closures of the marine sport fishery and reduced spring troll fishery openings near Ketchikan.

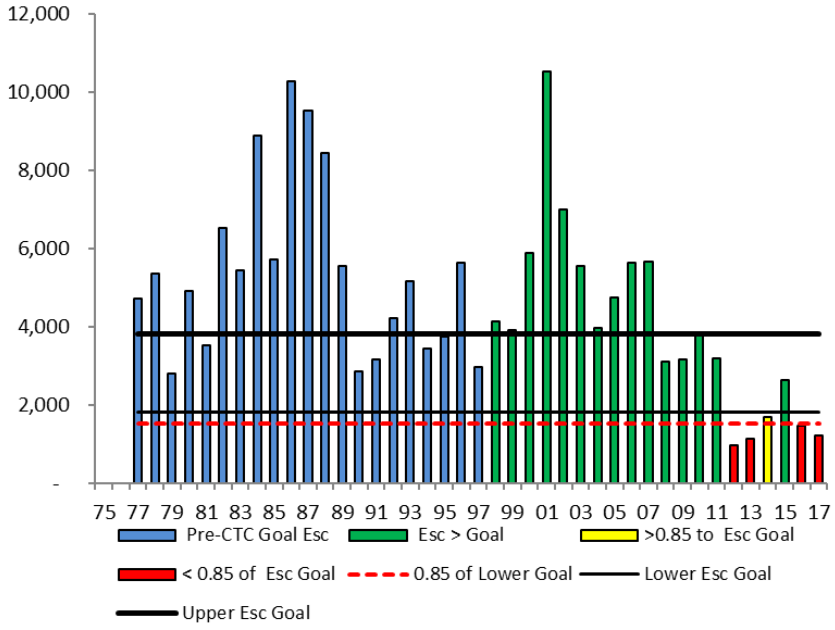


Figure 2.9.–Unuk River escapements of Chinook salmon, 1977–2017.

2.3.1.4 Chickamin River

The Chickamin River is a moderate-sized glacial system in Behm Canal near Ketchikan, Alaska that supports a run of inside-rearing Chinook salmon. Escapement estimates are germane to large fish. Coded-wire tags were applied to wild smolt from brood years 1982–1986 (Pahlke 1995) and again for brood years 2000–2005. There is no terminal fishery targeting this stock; harvests of immature and mature fish occur predominately in SEAK. Most harvest occurs in the southern inside quadrant of SEAK by commercial troll and sport gear sectors. There are no subsistence or freshwater fisheries on any of the Behm Canal Chinook salmon stocks.

Escapement Methodology: Escapements of large spawners are derived from MR estimates of total escapement in 1995, 1996, and 2001 to 2005, and expanded survey counts in eight tributaries of the Chickamin River using standardized methodology (Pahlke 2003) from 1975 to 1994, 1997 to 2000, and 2006 to present. Comparison of MR and survey counts found revealed that about 21% of the total escapement is counted during peak surveys on average (Weller et al. 2007). A radio telemetry study in 1996 indicated that the annual surveys are conducted in stream reaches where over 80% of all spawning occurs. The expansion factor is estimated at 4.75 for survey counts using the results from the 1995, 1996, and 2001 to 2005 studies, and these assessments meet both U.S. and bilateral CTC data standards.

Escapement Goal Basis: In 1994, ADF&G revised the goal to an index count of 525, which expands to an escapement goal range of 2,150 to 4,300 large spawners as recommended in the McPherson and Carlile (1997) report. The index count and escapement goal were reviewed and accepted by the CTC in 1998.

Escapement Evaluation: The Chickamin River stock has displayed a cyclic pattern of escapement since 1975. Annual escapements less than 85% of the goal have occurred eight times from 1975 to 1998, and again in 2016 and 2017. The 2017 escapement index is 152 large spawning Chinook salmon, which expands to 722 fish (CV = 15%) and is below the lower bound of the escapement goal range (Figure 2.10).

Agency Comments: The Chickamin River produces the largest-bodied Chinook salmon of the four SEAK escapement indicator stocks. The time series of survey counts follows two cycles: counts from 1975 to 1981 and 1992 to 1998 were below the goal range, and those from 1982 to 1991 and 1999 to 2011 were all within or slightly above the range. The 2013–2015 escapements for this stock were slightly higher than the previous low point observed in 2012; however, the 2016 escapement plummeted to the second lowest estimate, followed by the lowest estimate in 2017 in the time series. Overall, the Chickamin River stock has displayed different escapement patterns than the majority of SEAK Chinook salmon stocks.

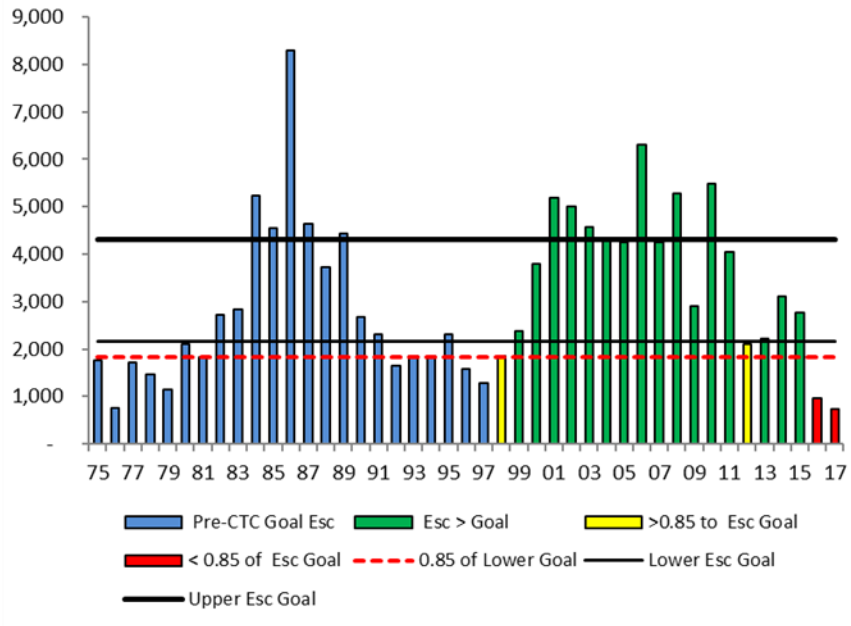


Figure 2.10.– Chickamin River escapements of Chinook salmon, 1975–2017.

2.3.2 Transboundary River Stocks

The transboundary (TBR) stocks include Chinook salmon returning to the Alsek, Taku, and Stikine rivers. Escapement estimates in the Taku and Stikine rivers are germane to large fish, defined as Chinook salmon $\geq$ 660 mm length mid eye to tail fork, and includes ocean age-3 through age-5 fish, which contain almost 100% of the females in the population. Escapement estimates in the Alsek River are germane to age-1.2 and older fish. Survey methods have been standardized since 1973 in the Taku River, since 1975 in the Alsek and Stikine rivers, and BEGs exist for each of these stocks.

All three TBR stocks are classified as outside rearing based on ocean rearing distributions. These fish have limited marine rearing time in SEAK and are harvested primarily during their spawning migrations each spring. These fish are also mostly yearling smolt and return as ocean-age-1 through ocean-age-5 adults.

In response to low abundance, a 15-year rebuilding program was established by the ADF&G in 1981 (ADF&G 1981). At the same time, ADF&G established interim escapement goals for all three systems, based on the highest observed escapement count prior to 1981. Escapement goals for all three TBR stocks have subsequently been revised by ADF&G and DFO which have been reviewed and accepted by the CTC, Canadian Centre for Science Advice Pacific, and the TBR Panel. Escapement goal ranges are used by ADF&G for management, as described in the State of Alaska Policy for Statewide Salmon Escapement Goals and Policy for the Management of Sustainable Salmon Fisheries.

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 east of Yakutat, Alaska. This river supports a run of outside-rearing Chinook salmon.

Escapement Methodology: Since 1976, escapements have been monitored by a weir operated in the Yukon Territory, Canada on the Klukshu River, which is one of 51 tributaries of the Tatshenshini River, the principal salmon-producing branch of the Alsek River. At the Klukshu River weir, counts of returning age-1.2 and older Chinook have been collected from 1976 to present. Concurrent with the weir counts, Alsek River drainage-wide escapement estimates were produced from 1998 to 2004 using direct MR through a cooperative effort among the Champagne and Aishihik First Nations, DFO, and ADF&G. The average expansion factor of 4.0 is used to convert the Klukshu River inriver run to Alsek River drainage-wide inriver run estimates. Once Canadian inriver harvest is subtracted from inriver abundance, drainage-wide escapement is estimated for the Alsek River stock. The associated CV of 35% for the expansion factor meets U.S. CTC data standards yet fails to meet bilateral CTC data standards.

Escapement Goal Basis: A revised goal of 3,500 to 5,300 age-1.2 and older fish was accepted by the CTC, ADF&G, and Canadian Science Advisory Pacific, based on analysis in Bernard and Jones (2010). Prior to this, the goal was based on the run seen in the Klukshu River (McPherson et al. 1998).

Escapement Evaluation: Annual escapements of less than 85% of the goal have been observed four times since 1976, and all have occurred in recent years. Calendar year exploitation rates exerted on the stock have averaged 10% since 1999. If no harvest had occurred in 2006-2008 or 2016-2017, the stock would still have failed to achieve the lower bound of the escapement goal range. The 2017 escapement estimate is 1,718 (CV = 0.37) age-1.2 and older Chinook salmon, which is below the 85% threshold of the lower bound of the escapement goal range (Figure 2.11).

Agency Comments: Directed sport and Aboriginal fisheries occur in Canada in various upriver sections of the Alsek River and mostly in the Yukon Territory. Some Chinook salmon are caught incidentally in the U.S. directed sockeye salmon fishery that operates in U.S. waters in the lower river, and a small number are also caught in a U.S. subsistence fishery that takes place in the same area. Overall, calendar year exploitation rates have averaged only 12% since 1976 (Bernard and Jones 2010).

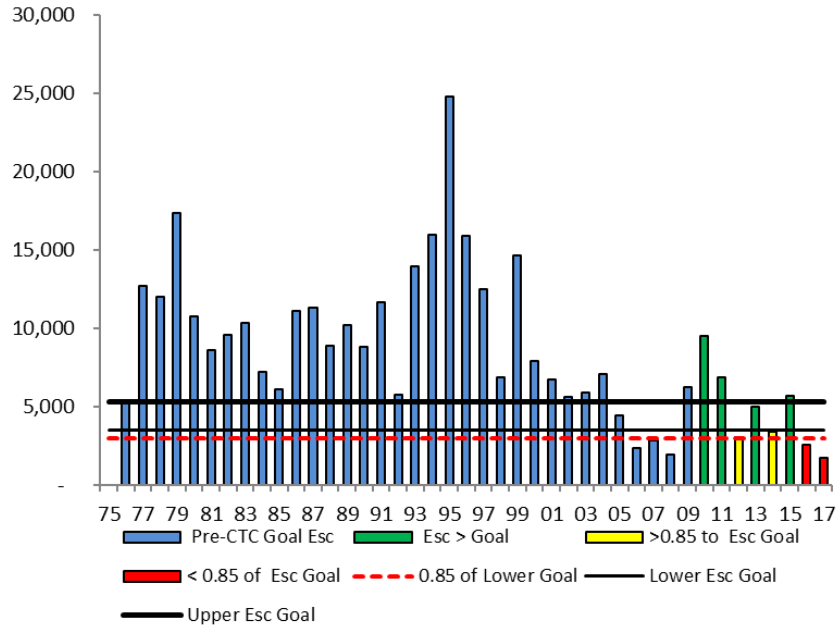


Figure 2.11.–Alsek River escapements of Chinook salmon, 1976–2017.

2.3.2.2 Taku River

The Taku River is a large glacial system that originates in Northwest British Columbia, Canada, flows into marine waters of SEAK near Juneau, Alaska, and supports a run of outside-rearing Chinook salmon. Taku River Chinook salmon are sporadically caught in SEAK fisheries, but most catch occurs in terminal areas including District 111 in SEAK and in the Canadian portion of the lower Taku River. Directed gillnet fisheries take place in terminal U.S. (District 111 of SEAK) and Canadian inriver fisheries when forecasted abundance or inseason assessment exceeds predetermined levels as described in the 2009 Agreement under Chapter One, Transboundary Rivers 3(b)(3). In other years, Taku River Chinook are also incidentally harvested in terminal directed sockeye salmon gillnet fisheries, sport fisheries near Juneau, Alaska, and inriver in Aboriginal fisheries in Canada.

Escapement Methodology: Escapement estimates of large Chinook salmon have been generated through MR experiments in 1989, 1990, 1995–1997, 1999–2012, and 2014–2017. The MR estimates are from cooperative stock assessment efforts among the Taku River Tlingit First Nations, DFO, and ADF&G. Taku River Chinook salmon MR escapement assessments have an average CV of 15% and since 1995 have ranged 9% to 38%; most assessments meet bilateral CTC data standards. Standardized aerial survey counts have been performed by ADF&G since 1973. Counts prior to 1989, 1991–1995, 1998, and 2013 were expanded by a factor of 5.2, which is the average of the 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 about 30%.

Escapement Goal Basis: **Escapement Goal Basis**: Prior to 1999, several drainage-wide or index goals were developed by the U.S. and Canada using limited data. A goal based upon maximizing

smolt production was in place from 1999 to 2009 (McPherson et al. 2000). In 2009, a BEG of 19,000 to 36,000 large Chinook salmon was accepted by the CTC based upon stock–recruit analysis (McPherson et al. 2010).

Escapement Evaluation: The Taku River Chinook salmon stock had annual escapements of less than 85% of the lower bound of the goal range occur five times since 1975 (1975, 1983, 2007, 2016, 2017). The 2017 escapement estimate is 8,754 (CV = 9%) large Chinook salmon, which is below the 85% threshold of the lower bound of the escapement goal range and approximately one-third of the S_{MSY} point goal of 25,500 (Figure 2.12).

Agency Comments: Taku River Chinook salmon are both an escapement and an exploitation rate indicator stock. Currently, DFO and ADF&G operate joint programs to mark and tag smolt with adipose fin clips and CWTs, to estimate smolt abundance and adult production, in addition to estimating harvest in mixed stock fisheries and exploitation rates. Despite reaching escapement goals in the majority of the time series and similar to Stikine River Chinook salmon and other SEAK stocks, the Taku River stock has shown declining productivity in recent years and the primary factor is reduced marine survival. Until these conditions improve, it is unlikely that directed fisheries will be prosecuted.

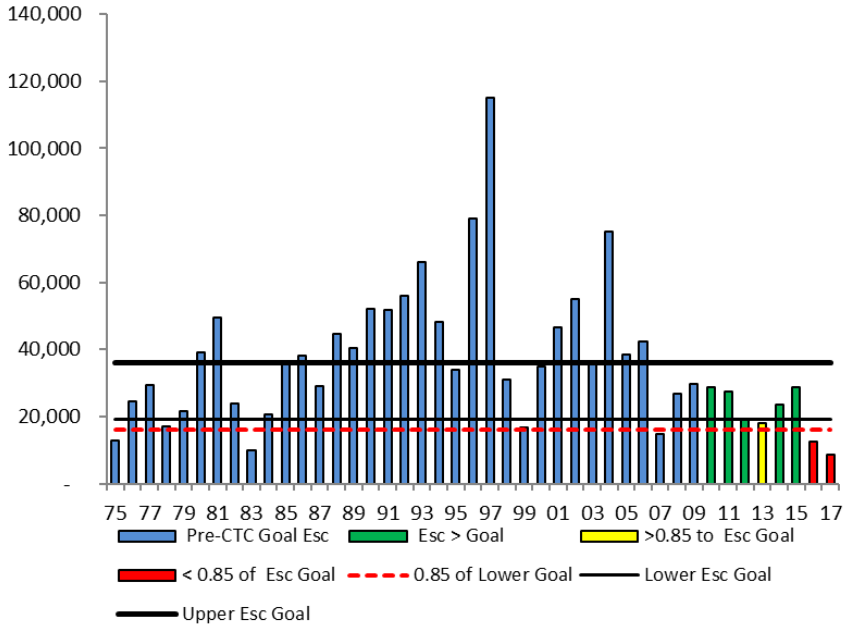


Figure 2.12.–Taku River escapements of Chinook salmon, 1975–2017.

2.3.2.3 Stikine River

The Stikine River drainage is the largest in SEAK, originating in British Columbia, Canada, and flowing into the marine waters in central SEAK near the towns of Petersburg and Wrangell. 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 near Petersburg and Wrangell. There are also commercial gillnet and Aboriginal fisheries in the

Canadian portion of the drainage. Stikine Chinook salmon are also harvested outside of the terminal areas in SEAK spring troll fisheries, and to a more limited extent, in SEAK sport 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 inriver 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 placed in the Little Tahltan River operated by the Tahltan First Nations. Since 1996, MR studies were conducted annually to estimate total escapement. The MR estimates are cooperative stock assessment efforts among the Tahltan First Nations, DFO, and ADF&G. Combined, these efforts indicated weir counts represented 17% to 20% of the total escapement (Pahlke and Etherton 1999). Since 1996, 43% of the escapement estimates have had CVs that meet bilateral CTC data standards, and overall CVs ranged from 7% to 28%.

Escapement Goal Basis: A BEG of 14,000 to 28,000 large Chinook salmon was established in 1999 after review and acceptance by the CTC, ADF&G, TBR Panel, and Canadian Science Advisory Pacific, based on the analysis in Bernard et al. (2000). Previously, several drainage-wide or index goals were developed by the U.S. and Canada and were based on limited data.

Escapement Evaluation: The Stikine River stock had annual escapements of less than 85% of the lower bound occur seven times since 1975 and only twice in the past 28 years (2009 and 2017). The 2017 escapement estimate is 7,206 (CV = 29%) large Chinook salmon, which is below the 85% threshold of the lower bound of the escapement goal range (Figure 2.13).

Agency Comments: Currently DFO and ADF&G operate joint programs to mark and tag smolt with CWTs, to estimate smolt abundance and adult production in addition to estimating harvest in mixed stock fisheries and exploitation rates. Since 1985, escapements to the Stikine River have been within or above the escapement goal range except in 2009, 2016 and 2017. Despite reaching escapement goals in the majority of the time series and similar to Taku River Chinook salmon and other SEAK stocks, the Stikine River stock has demonstrated declining productivity in recent years due to poor marine survival. Until production improves, it is unlikely that directed terminal fisheries will be prosecuted.

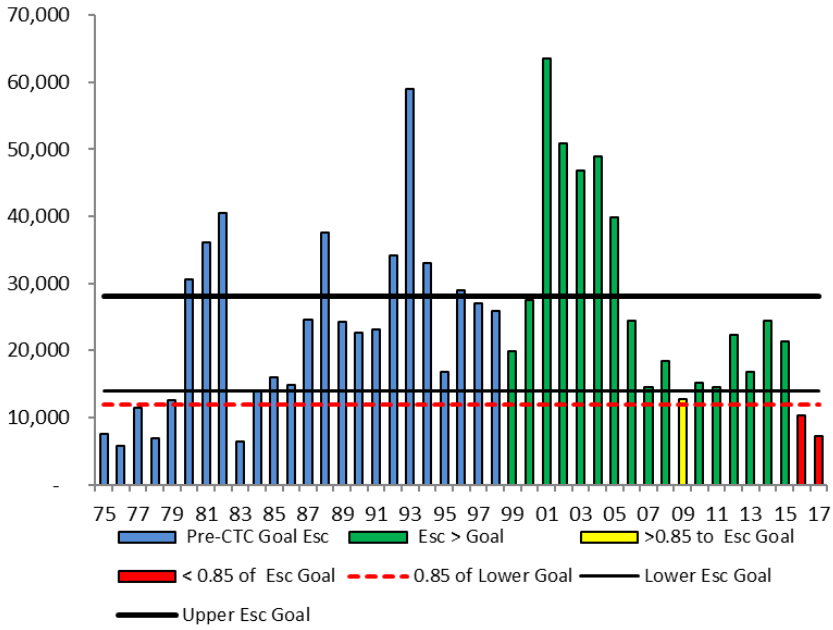


Figure 2.13.–Stikine River escapements of Chinook salmon, 1975–2017.

2.3.3 Canadian Stocks

Since the beginning of the Chinook salmon rebuilding program of the 1985 PST, escapement goals for Canadian Chinook stocks were generally based on doubling the average escapements recorded from 1979 to 1982. The doubling was based on the premise that Canadian Chinook 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; two stocks (Harrison and Cowichan) have PSC-agreed escapement goals.

2.3.3.1 Northern British Columbia

2.3.3.1.1 Yakoun River

The CTC was unable to assess stock performance because Yakoun River Chinook salmon escapements have not been estimated since 2005. See Appendix Table B3 for escapement estimates up to 2005.

2.3.3.1.2 Nass River

The Nass River is the largest river in Area 3, representing a group of approximately 25 streams. 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 drains an area of approximately 18,000 km^2 and is constrained by a canyon at Gitwinksihlkw (GW). The canyon 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. Nass River Chinook salmon are primarily (97%) stream-type and are thought to be far north migrating.

Escapement Methodology: Prior to 1992, DFO observations of Nass River Chinook salmon escapement were based on visual counts. Programs using MR have been conducted since 1992 by the 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 canyon and occasionally two wheels at Grease Harbor further upstream to apply tags. The Meziadin River fishway, a weir on the Kwinageese River, and a deadpitch 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. Three tributaries with Chinook populations—the Kincolith, Ishkeenickh and the Iknouk—enter the Nass River below Gitwinksihlkw. Visual estimates of these systems were augmented by fence counts of the Kincolith River in 2001, 2002, 2005, and 2007 to estimate escapements below the fish wheels.

Escapement Goal Basis: There is no CTC accepted escapement goal for this 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 on Nass River Chinook salmon would be recommended. The median estimate of S_{MSY} for the Nass River 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 2.14).

The 2017 escapement estimate for the Nass River above Gitwinksihlkw was 4,207 (Appendix Table B3; Figure 2.14).

Agency Comments: Chinook salmon escapement estimates produced before 1992 have been calibrated to the MR estimates. The Nisga'a Fisheries Working group, including DFO, has accepted the historical escapement and terminal run values. The Sentinel Stocks Program (SSP) funded a project on the Kwinageese River and Damdochax Creek designed to increase recoveries and improve the escapement estimates for the Nass Chinook aggregate.

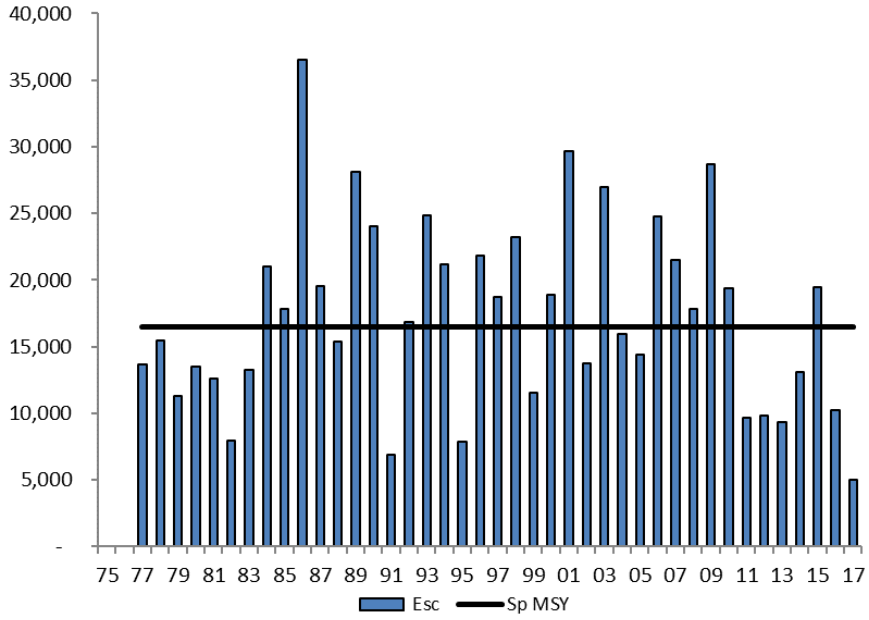


Figure 2.14.–Nass River escapements of Chinook salmon, 1977–2017.

2.3.3.1.3 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 with over 75 separate spawning populations. Four large lake-stabilized tributaries, Kitsumkalum, Morice, Babine and Bear rivers, genetics studies show these populations account for 63% of the total abundance in the Skeena River. The Kitsumkalum River is glacially turbid and visual methods for enumerating salmon are not possible. By comparison, the Morice, Bear, Babine, and Kispiox rivers run relatively clear, especially in late summer when most of the Chinook salmon spawning occurs. 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 River and the Upper Bulkley River.

Escapement Methodology: Most of the escapement estimates are based on visual observations from helicopter, fixed-wing aircraft and/or from stream walking surveys but fish counting weirs are present on the Babine, Sustut, and Kitwanga 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 escapement index is the sum of Chinook salmon escapements measured using different methods of enumeration employed on the system. The Kitsumkalum represents approximately 30% of the spawners measured by the Skeena escapement index. The Bear and Morice river populations have contributed 20% and 26% respectively to the escapement index since 1984. The Bear and Morice populations account for 46% of the total Skeena escapement index which overestimates their actual contribution when compared to GSI-based estimates.

Chinook salmon returns to the Skeena River have also been estimated using the proportion of Kitsumkalum River fish measured from genetic samples collected at the Tyee test fishery and

from Kitsumkalum Chinook escapement estimates from independent MR programs (Figure 2.15, checkered bars). Preliminary estimates are available from 1984 to 2017 as a result of SSP and Northern Fund projects. The genetic-based estimates represent an improvement over the historic indices because they include estimates of variance which cannot be produced for the historic indices. Also, comparisons between 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 conservation unit contributes, on average, 18% to the Skeena River aggregate. The Morice, Bear, and Babine populations make up the Skeena Large Lake conservation unit and contribute 31%, 7.4% and 6.6% to the aggregate respectively. An average contribution of 45% makes the Skeena Large Lake conservation unit the largest in the watershed. The estimated 2017 escapement for the Skeena stock was 11,920 using the historic index and 18,480 using the genetic estimate (Appendix Table B3; Figure 2.15).

Escapement Goal Basis: There is no PSC-agreed escapement goal for the Skeena River aggregate. The estimate of S_{MSY} for the Kitsumkalum indicator stock is 8,621 Chinook salmon based on stock–recruitment analyses (McNicol 1999; updated in Parken et al. 2006). Habitat-based estimates of S_{MSY} and other reference points are available for stocks within the Skeena River, but estimates of total escapement (or calibration of the visual indices) are needed to make them effective (Parken et al. 2006). Future assessments will partition this large aggregate into stocks by run timing, life history, and geographic areas.

Agency Comments: Terminal fisheries in the Skeena River include commercial gillnet in the terminal exclusion area (River Gap Slough, Area 4), inriver sport, and aboriginal fisheries. Estimates of inriver sport catch were not available from 1997 to 2002 but creel surveys were conducted on the Lower Skeena below Terrace in 2003 and 2010–2015. Consequently, the total terminal run estimates in these years include lower-river sport catch but no estimate of upper-river sport catch. Prior to 2017 spawning escapements to the Kitsumkalum River exceeded the point estimate of S_{MSY} in every year since 1998 (Figure 2.16).

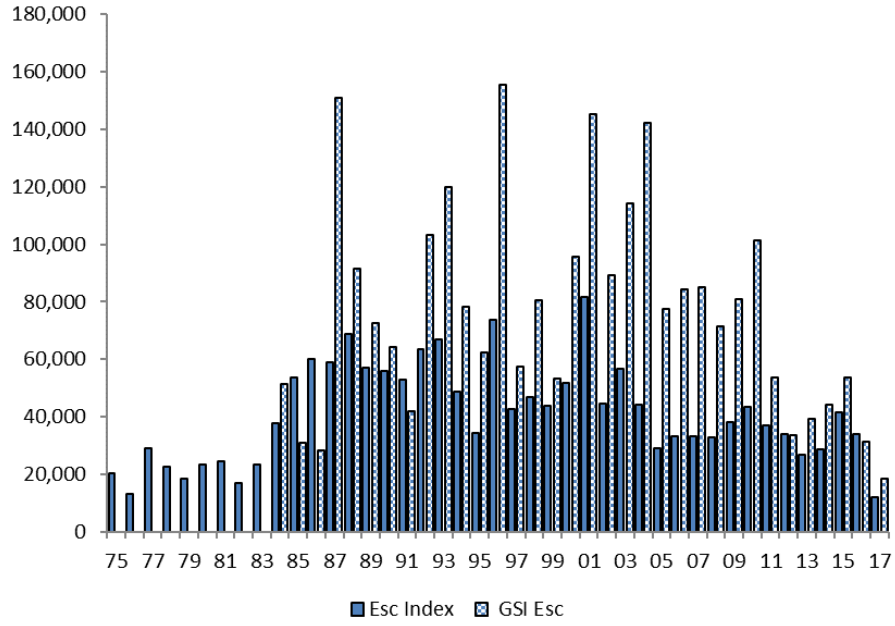


Figure 2.15.–Skeena River escapements of Chinook salmon, 1975–2017.

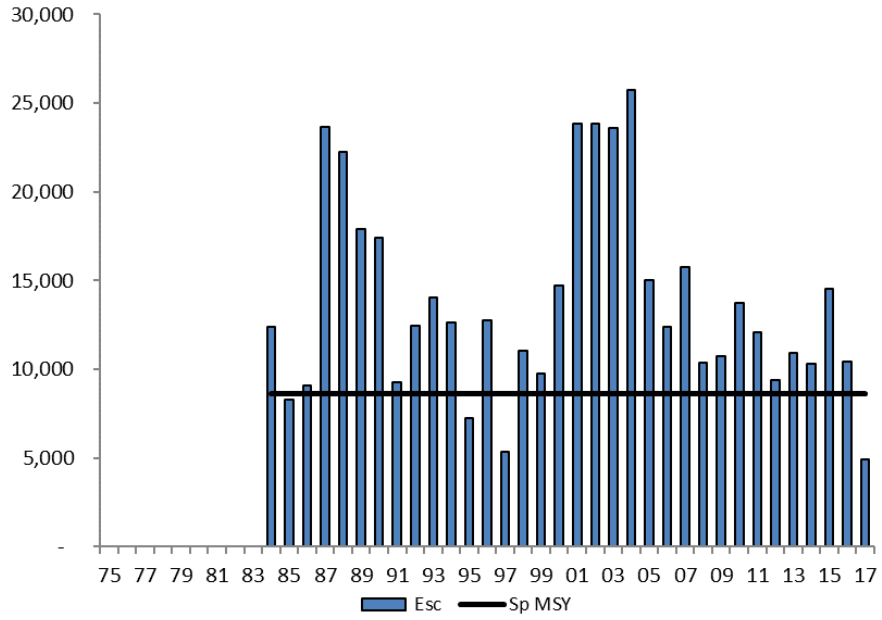


Figure 2.16.–Kitsumkalum River escapements of Chinook salmon, 1984–2017.

2.3.3.2 Central British Columbia

2.3.3.2.1 Dean River

Chinook salmon populations in Area 8 consist of seven non-enhanced systems, and two enhanced systems, the Bella Coola and Atnarko River system. The Dean River originates at Nimpo Lake approximately 150 km east of the community of Bella Coola and flows in a northwesterly direction for approximately 253 km before entering the Dean Channel. Chinook returning to the Dean River exhibit summer run timing and are predominantly stream type (94%). The estimated total escapement for the Dean in 2017 was 725 (Appendix Table B3; Figure 2.17).

Several tributaries provide salmon spawning habitat between Nimpo Lake and Dean Channel including the Takia River, Tahyesco River, and Sakumtha Creek. Salmon House Falls near the confluence of the Takia River and Dean River is the upstream limit to the migration of spawning salmon. Spawning Chinook have been observed in the Takia River near the lower Tanya Lake, in Tahyesco River as far as Compass Creek, and in Sakumtha Creek near Skuce Creek.

Escapement Methodology: Since 2001 the Chinook salmon escapement index for the Dean River has been derived using area-under-the-curve (AUC) methodology based on three aerial counts. In years where viewing conditions were poor, a maximum likelihood procedure has been used (e.g., 2004). A Chinook salmon MR program was conducted on the Dean River in 2006 to develop an expansion factor for converting the escapement indices into estimates of total escapement.

Escapement Goal Basis: There is no PSC-agreed escapement goal for this stock. Biologically based goals for this complex of Chinook spawning populations have not yet been developed. Habitat-based estimates of S_{MSY} and other stock–recruitment reference points are available (median S_{MSY}=3,646, CV=14%), but estimates of total escapement are needed to make them effective.

Agency Comments: Terminal fisheries in the Dean River included commercial and inriver sport fisheries.

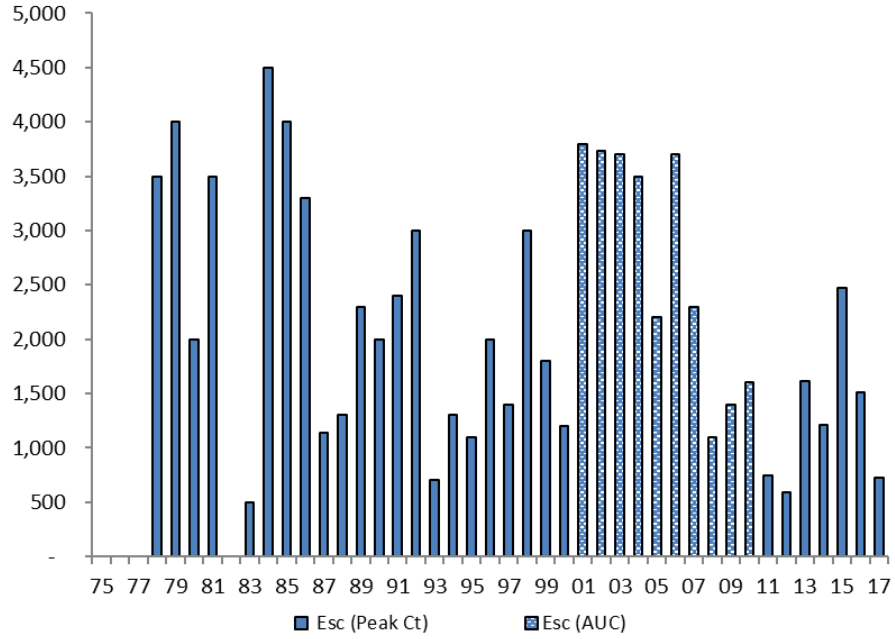


Figure 2.17.–Dean River escapements of Chinook salmon, 1978–2017.

2.3.3.2.2 Rivers Inlet

The Rivers Inlet escapement index consists of an aggregate of Chinook salmon 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 in the central coast of British Columbia. This ocean-type stock exhibits fall run timing and is renowned for its large body size, due to ocean-age-4 and age-5 year components in the return. The Kilbella and Chuckwalla river systems share an estuary on the north shore of Rivers Inlet. These systems are relatively small and 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. The 2017 estimated escapement was 1,817 for the Wannock, and 267 for the Chuckwalla/Kilbella rivers (Appendix Table B3; Figure 2.18).

Escapement Methodology: Chinook salmon escapement estimates for the Wannock River are produced from an annual carcass recovery program. Estimates are derived by expanding the

number of carcasses pitched based on historical recovery rate assumptions. Expansion factors are somewhat subjective and take into consideration water clarity, river height, and recovery effort. The visual index estimate for Wannock Chinook salmon in 2017 was 1,817 based on expansion of carcasses recoveredduring the traditional dead-pitch program. 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 bias as well as imprecision in the MR estimates leads to uncertainty in calibration of the carcass estimates.

Chinook salmon escapements for the Chuckwalla and Kilbella rivers are estimated using AUC methods applied to visual counts from helicopter surveys. Typically four flights are made during the spawning period. The 2017 estimated escapement to the Chuckwalla River and to Kilbella River was estimated only as adults present.

Escapement Goal Basis: There is no PSC-agreed escapement goal for these stocks. 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. Habitat-based escapement goals may overestimate S_{MSY} for the Wannock River because the stock is limited by the relatively small amount of spawning area available (Parken et al. 2006).

Agency Comments: A small hatchery enhancement program occurs on the Wannock River but the contribution to the total population is unknown. Production from enhancement of the Kilbella and Chuckwalla rivers from 1990 to 1998 is thought to have had significant influence on escapements from 1994 to 2003, but estimates of the enhanced component are not available. However, estimated returns to the Kilbella and Chuckwalla rivers averaged 1,300 Chinook salmon during the period of enhancement. Recent returns have averaged less than 500 Chinook salmon for both rivers combined; it is unclear if these populations have returned to pre-enhancement levels or are experiencing an unrelated decline.

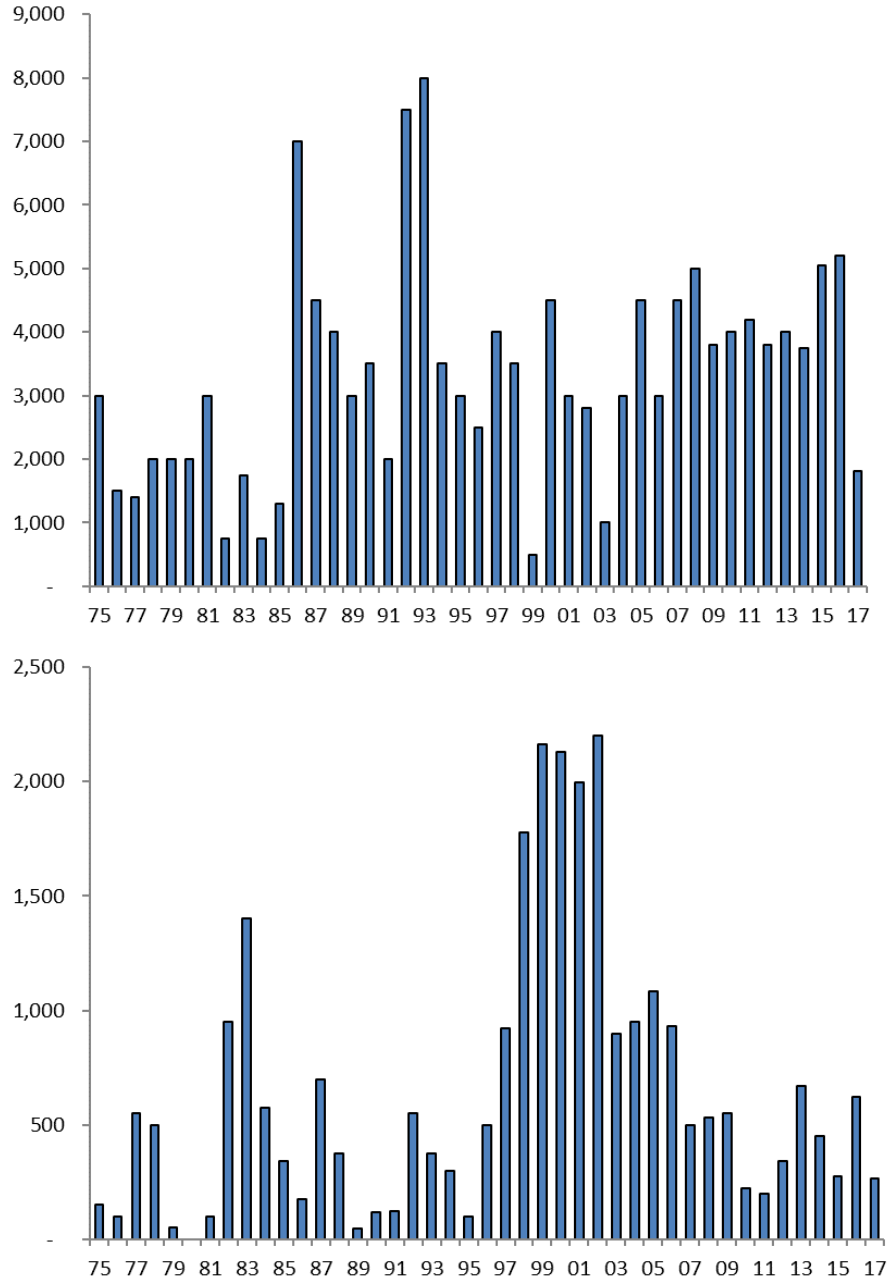


Figure 2.18.–Rivers Inlet escapement index of Chinook salmon, 1975–2017, including Wannock River (upper) and Kilbella and Chuckwalla rivers (lower).

2.3.3.2.3 Atnarko River

Following the 2009 PST Agreement, the CWT Improvement Program highlighted the lack of a Chinook salmon indicator in the Central British Columbia region. In order to convert the existing Atnarko Chinook Assessment program into an exploitation rate indicator, a series of objectives were identified including the application of 250,000 additional CWTs, sampling of the terminal commercial, sport, and First Nations fisheries, and reintroduction of an MR program to improve escapement estimates (Velez-Espino et al. 2011). Implementation of these changes began in

2009 (Velez-Espino et al. 2010) and subsequent MR programs have yielded escapement estimates with corresponding CVs of less than 15% for all years (Velez-Espino et al. 2014). The estimated total escapement for the Atnarko in 2017 (excluding jacks) was 10,308 with a wild escapement of 5,464 (Appendix Table B3; Figure 2.19).

The Northern/Central CTC model stock group is represented by Kitsumkalum River which is a stream-type stock, while the Atnarko River, which feeds the Bella Coola River and is situated in Statistical Area 8 on the Central Coast of British Columbia, is predominantly an ocean-type stock. It constitutes the largest complex of Chinook salmon in Central British Columbia. Hatchery releases of Atnarko Chinook salmon have averaged around 2 million annually with recent CWT releases in excess of 400,000. Atnarko CWT recoveries occur in both U.S. and Canadian AABM fisheries as well as coastal British Columbia ISBM fisheries.

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) catch per unit effort (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 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 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. 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 2001–2003 and 2009–2017. 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 less than 15% for all years, except 1995 (17.9%) and 2006 (15.6%; Velez-Espino et al. 2014).

Escapement Goal Basis: There is no PSC-agreed escapement goal for Atnarko Chinook salmon. A habitat-based escapement goal (Parken et al. 2006) of 5,009 wild fish has been developed for Atnarko Chinook salmon (Vélez-Espino et al. 2014). This habitat-based escapement goal represents a first iteration in the process of refinement required to quantify the spawning escapement at S_{MSY} for this stock (Figure 2.19).

Agency Comments: The Atnarko River has been developed as an exploitation rate indicator stock (Velez-Espino et al. 2011). MR estimates with corresponding CVs less than 15% have been attained in all years (2001–2003 and 2009–2017). The estimation 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, provide a method 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 2017, because MR studies took place for Atnarko Chinook salmon.

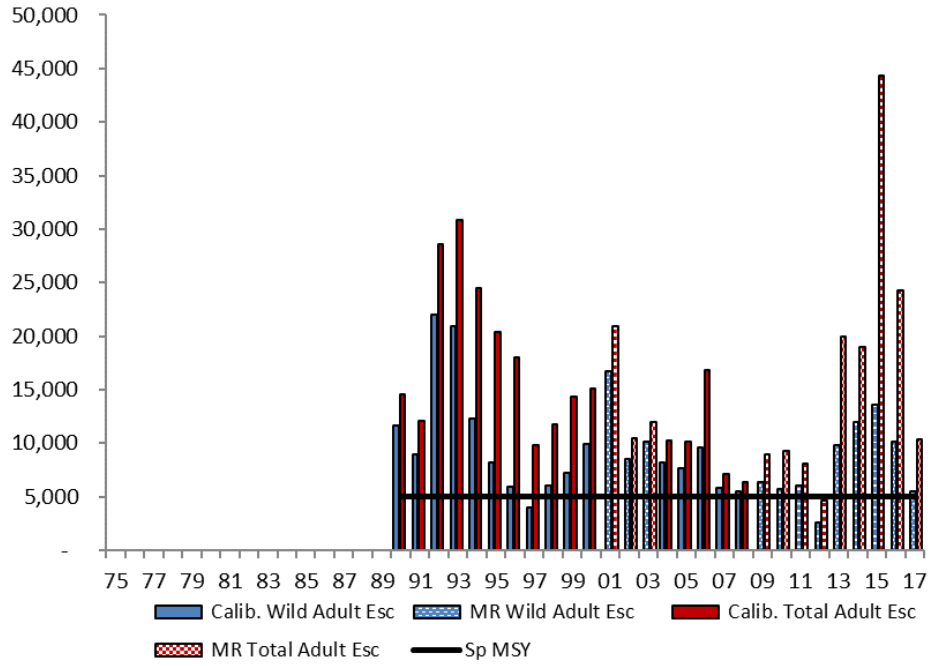


Figure 2.19.–Atnarko River escapements of wild adult (excluding jacks) and total adult (hatchery and wild, excluding jacks) Chinook salmon, 1990–2017.

2.3.3.3 West Coast Vancouver Island and Georgia Strait

2.3.3.3.1 West Coast Vancouver Island

Escapement Methodology: The WCVI index represents the sum of escapements for six rivers (Marble, Tahsis, Burman, Artlish, Kaouk, and Tahsish), which were chosen to provide an index of escapement for wild WCVI stocks in general. These stocks were chosen based on historical consistency of data quality. However, the escapement methodology changed in 1995 and earlier estimates have not been calibrated to the new methodology. DFO also developed a 14-stream expanded index (Figure 2.20), which includes escapements to the 6-stream index plus the following WCVI streams: Colonial/Cayegle (Area 26); Leiner (Area 25); Megin, Bedwell/Ursus, Moyeha (Area 24); Sarita, Nahmint (Area 23); and San Juan (Area 21). An MR program in the Burman River started in 2006 in addition to the regular AUC methodology based on swim and foot surveys. Robust estimation of escapement using open-population models within a model selection framework (see Velez-Espino et al. 2016) started in 2009. A comparison of these escapement estimates with those produced by the AUC method is shown in Figure 2.21. For consistency between aggregate components, the Burman River escapement estimate used for the 6-stream and 14-stream indices, however, is based on the swim and foot survey method instead of the MR estimates. The escapement indices in 2017 were 9,533 Chinook salmon for the 6-stream index and 17,163 for the 14-stream index (Appendix B5).

Despite a positive trend in Burman escapement between 2009 and 2017 determined from open-population MR estimates (Figure 2.21), a large proportion of Burman-hatchery Chinook and stray Chinook originating from Conuma hatchery have contributed to the overall

escapement in the Burman River, with the highest number of Conuma-hatchery stray Chinook occurring in 2015 Burman River, with the highest number of Conuma-hatchery stray Chinook occurring in 2015 (Figure 2.22). The DFO is taking steps to limit hatchery contributions and reduce stray levels following departmental guidelines specifically developed for Chinook salmon and described in Withler et al. (2018). The number of wild Burman River Chinook increased substantially during 2015–2017.

Over the last decade, the PSC Sentinel Stocks and Endowment Fund programs conducted 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 Process workshops were held with the objective of evaluating the escapement estimation methodology used to assess the abundance of WCVI indicator stocks. The reviews produced several recommendations for further work and potential improvements. It is anticipated that this work may eventually result in revised escapement data, with measures of precision, which are better quality than the estimates presented in Figure 2.20.

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), but estimates of total escapement are needed to make them effective. Escapements have remained low at non-enhanced streams since 1999 despite terminal fishing restrictions in effect in Areas 24–26 from July to September each year. Escapement indices to all non-enhanced Clayoquot Sound and Kyuquot Sound Chinook salmon streams remain below 500 fish.

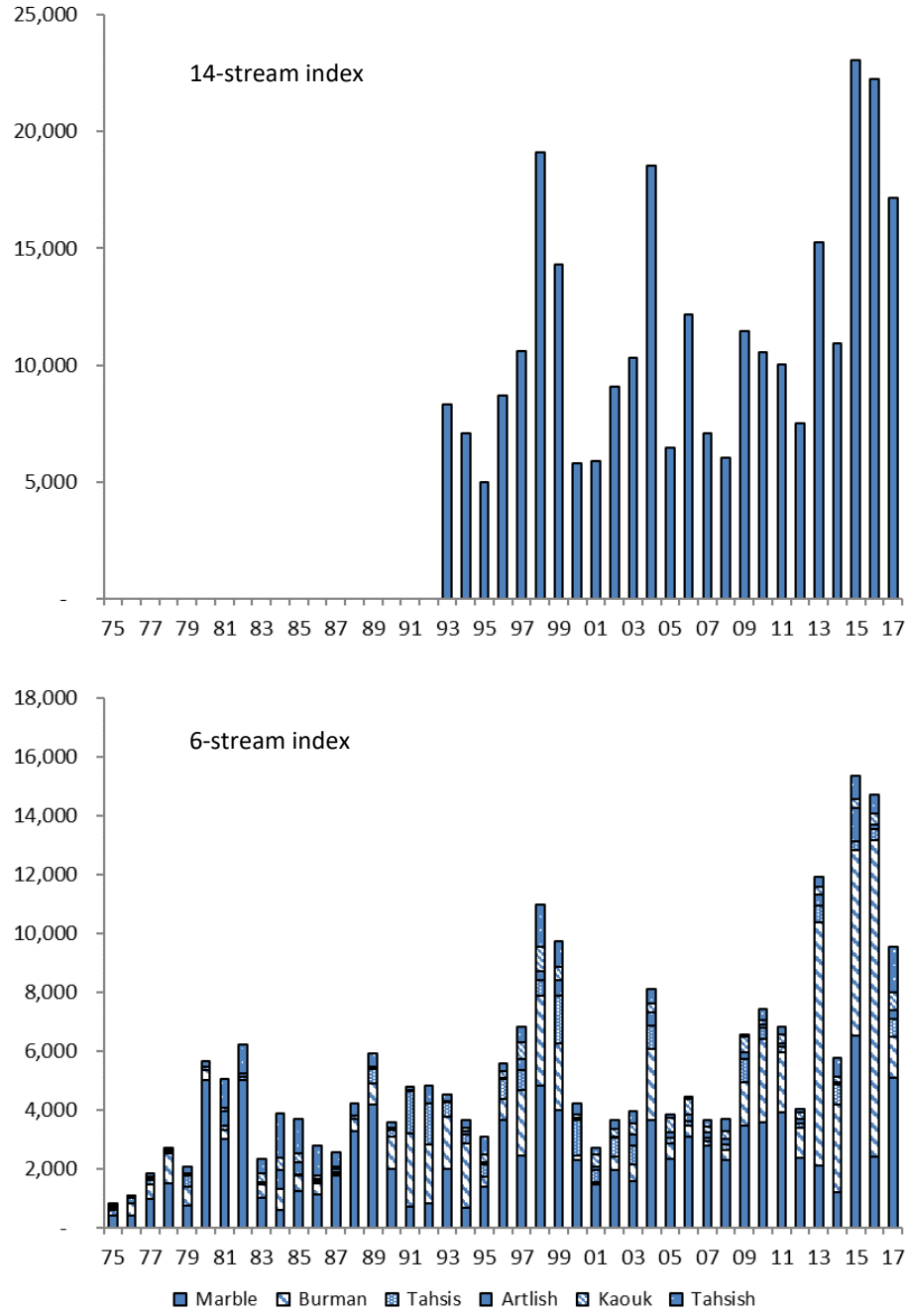


Figure 2.20.–WCVI 14-stream and 6-stream indices of escapement of Chinook salmon, 1975–2017.

Note: The escapement methodology changed for the 6-stream index in 1995 and prior estimates have not been calibrated to the new methodology.

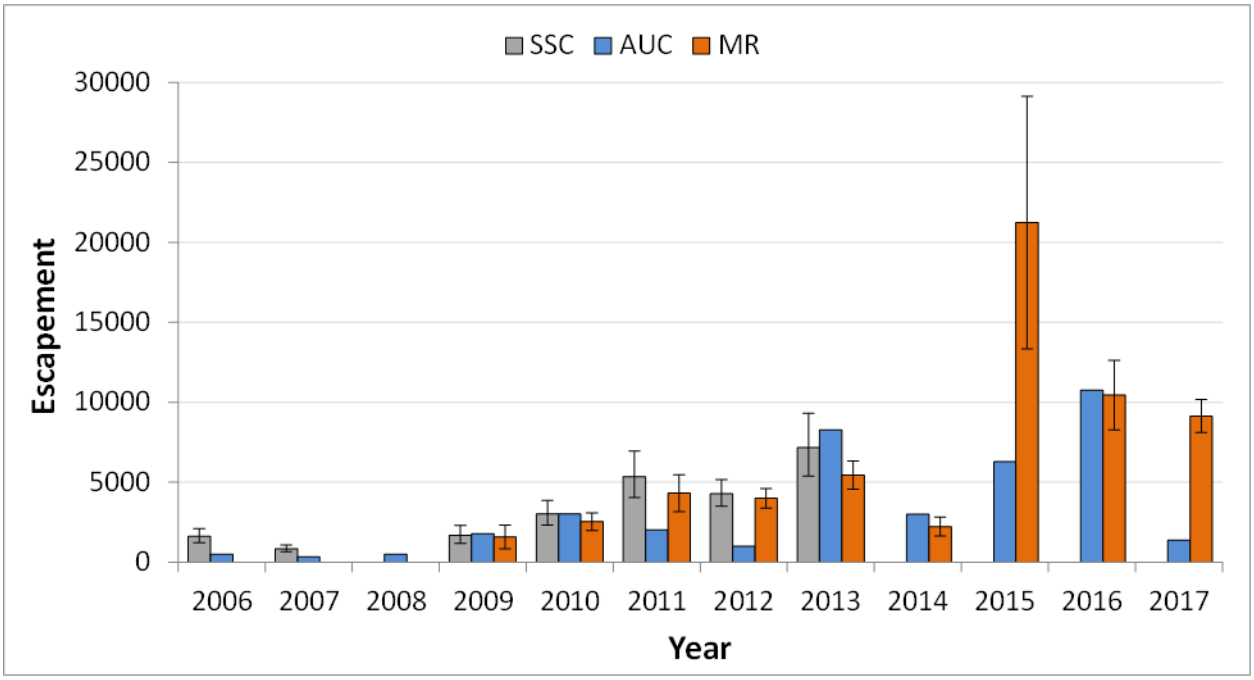


Figure 2.21.– Burman River Chinook escapement based on Petersen estimates from the Sentinel Stock Committee (SSC; 2006–2013), AUC-based agency estimates (2006–2017), and open-population mark–recapture estimates (MR; 2009–2017).

Note: 95% CIs are shown for SSC and MR estimates.

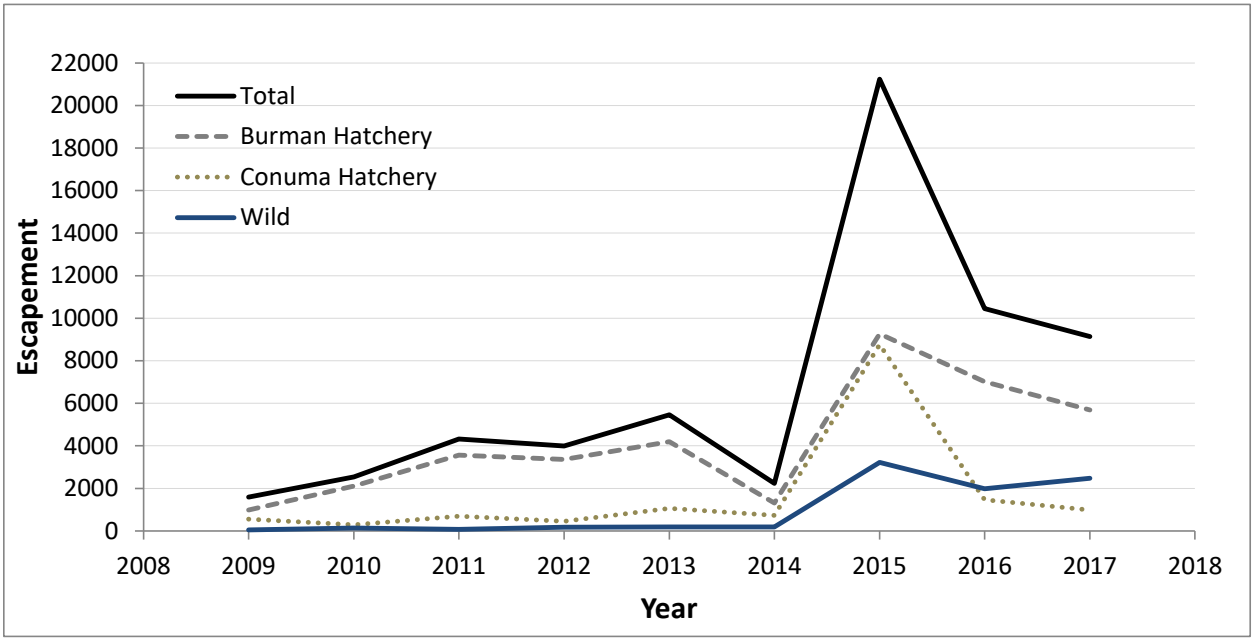


Figure 2.22.– *Burman River Chinook escapement based on open-population MR methodology, 2009–2017.*

Note: Total escapement is the sum of Burman-hatchery origin, Conuma-hatchery strays and wild Chinook escaping into the Burman River.

2.3.3.3.2 Upper Strait of Georgia

The Upper Strait of Georgia (UGS) stock index consists of five rivers (Klinaklini, Kakweiken, Wakeman, Kingcome, Nimpkish). Four rivers are in Johnstone Strait mainland inlets and the Nimpkish River is on northeast Vancouver Island. Klinaklini's hydrology is glacial with spring freshet and elevated flows in the summer with glacial melt and then elevated flows in fall. Kakweiken's hydrology is extremely flashy and fed by a small lake. The Wakeman's hydrology is glacial with spring freshet and elevated flows in the summer. The Kingcome's hydrology is glacial with spring freshet and elevated flows in the summer with glacial melt and then elevated flows in fall. The Nimpkish is a lake-based system with low summer flows and high fall flows, especially when lakes are saturated and do not drop quickly. With exception of the Nimpkish, all of these rivers are remote and only accessible by boat or air.

The estimated escapement for the UGS stock group in 2017 was 20,115 (Appendix Table B4; Figure 2.23) based on direct estimation of escapement only for the Nimpkish River (1,004) and assuming that this river represented 8.8% (i.e., 1975-2002 average proportion) of the entire UGS stock group escapement (Figure 2.24). The last year escapement was measured in all five rivers was 2002.

Escapement Methodology: The accuracy of escapement estimates in the mainland inlet systems is poor, most likely due to low visibility of glacial systems, remote access, and timing of surveys. Furthermore, escapement estimates have primarily been based 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. However, only the Nimpkish escapement estimates are based on direct methods (swim surveys and stream walks) up to 2017. A fish wheel program occurred on Klinaklini River from 1997 to 2003. Direct escapement estimation ended in 2002 for the Kakweiken, and in 2014 for both the Kingcome and the Wakeman.

Escapements to rivers missing escapement data for some years (i.e., no surveys) are estimated using the procedures described by English et al. (2007), which assume that the unsurveyed rivers had escapements in the same relative proportions as measured during earlier parts of the time series. Although escapement estimates are reported for the unsurveyed UGS stock group rivers in Appendix B, these estimates are of poorer quality and are more uncertain than escapements reported for other rivers

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 conservation units to better represent differences in population dynamics and both freshwater and smolt survival.

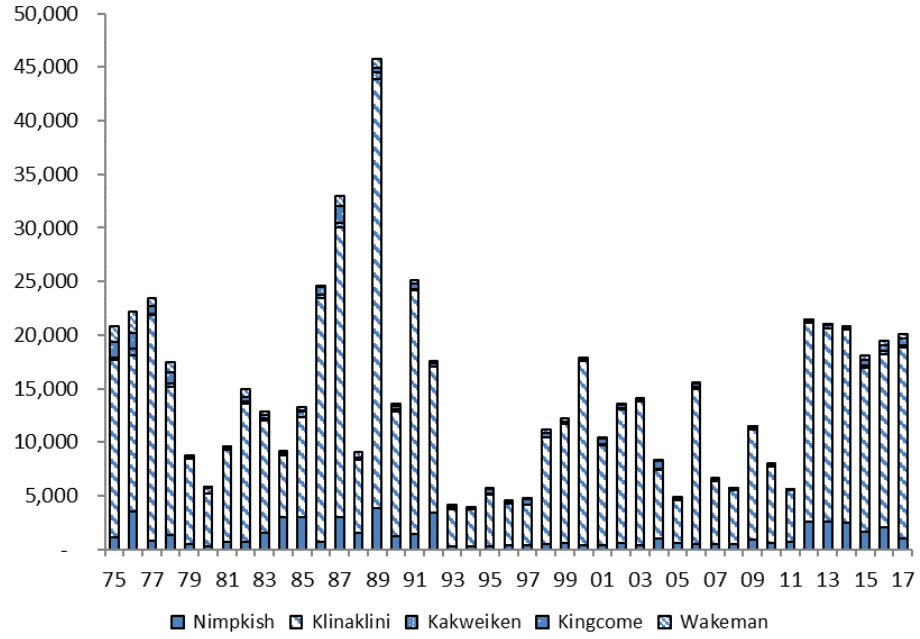


Figure 2.23.–Upper Georgia Strait stock group escapements of Chinook salmon, 1975–2017.

Note: The hatched bars in the histogram represent years when escapements to the Klinaklini River were estimated using Fishwheel mark–recapture methods while the solid bars indicate estimates based on visual surveys.

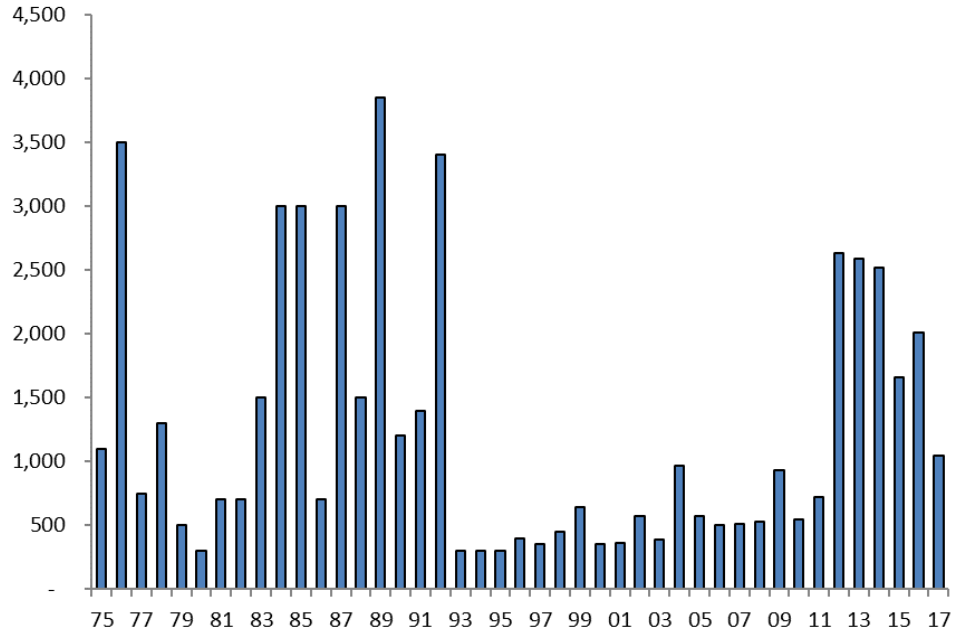


Figure 2.24.–Nimpkish escapement of Chinook salmon, 1975–2017.

Note: Nimpkish is the only stock in the UGS aggregate with direct escapement estimates throughout the entire time series.

2.3.3.3.3 Lower Strait of Georgia

The Lower Strait of Georgia rivers monitored for naturally spawning fall Chinook salmon escapement are the Cowichan and Nanaimo rivers (Figure 2.25 and Figure 2.26). The estimated escapement in 2017 was 10,590 Chinook salmon for the Cowichan River and 2,108 for 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 used in the Cowichan River. Between 1995 and 2004, carcass MR surveys were used in the Nanaimo River, and since 2005, AUC methods have been used. Survey life is based on a tagging study in 2006.

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 increases in escapement in 1995 and 1996, followed by a rapid decline to conservation concern levels of more than 15% below the escapement goal. Significant Canadian fishery management actions have been used to reduce exploitation levels on the Lower Strait of Georgia natural stock group.

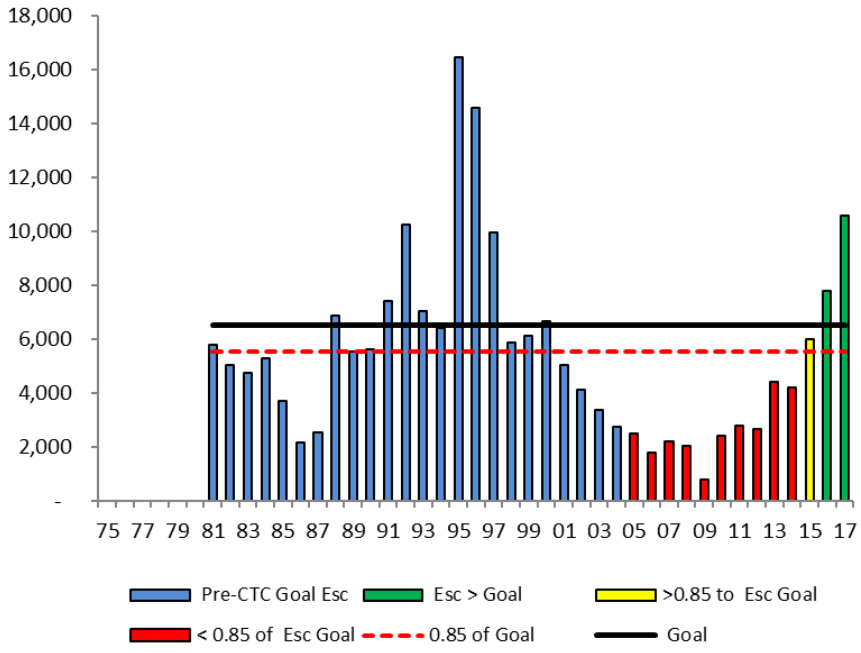


Figure 2.25.–Cowichan River escapements of Chinook salmon, 1981–2017.

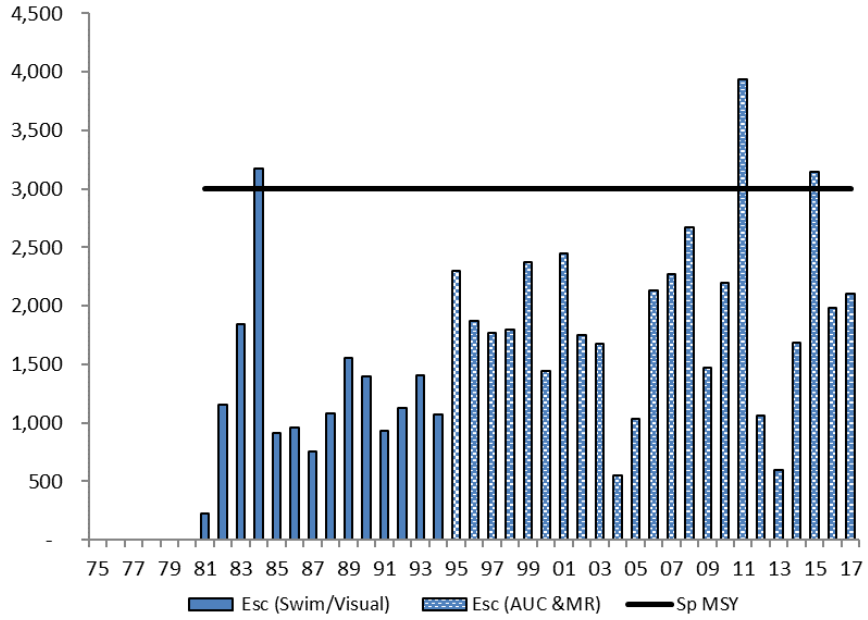


Figure 2.26.–Nanaimo River escapements of Chinook salmon, 1981–2017.

2.3.3.4 Fraser River Stocks

A large and diverse group of Chinook salmon spawning in Canada occurs in the Fraser River watershed, with many local populations (CTC 2002b; Candy et al. 2002).

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 to be precise (Parken et al. 2003). Visual survey data are generated from aerial surveys and the escapement estimate is usually obtained by dividing the peak count by 0.65 (Farwell et al. 1999; Bailey et al. 2000). The CDFO 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 and using resistivity counters. Occasionally escapement estimates could not be determined for reasons including forest fires and extreme weather events that cause resistivity outages and cancellation of visual surveys. When this occurs, the missing estimate is infilled using the English method (English et al. 2007).

Currently, Fraser River Chinook are assessed as five 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 Fraser-Late), but are only represented by two stocks in the CTC Model (Fraser Early and Fraser Late). As part of the CTC Model Improvements program, the Fraser Early model stock is being separated into four model stocks to better represent population dynamics. The Fraser Late model stock is being separated into two stocks: natural (Harrison) and hatchery (Chilliwack).

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

includes reported catches for all stocks, not just those for CTC stocks.

Within the Fraser, there are five current CWT-indicator stocks; Nicola River (Fraser Spring-Run 1.2), Lower Shuswap (Fraser Summer-Run 0.3), Middle Shuswap (Fraser Summer-Run 0.3), and Harrison River and Chilliwack River (Fraser Late). The Dome Creek CWT-indicator stock (Fraser Spring-Run 1.3) was discontinued in 2005.

Only the Harrison River has a CTC-approved escapement goal. For the remaining four stock groups, habitat-based models have been developed to estimate spawning capacity and the spawner abundance required to produce maximum sustained yield, S_{MSY} (Parken et al. 2006). In 2014, a Canadian Centre for Science Advice Pacific meeting examined the status and benchmarks for Southern BC Chinook conservation units (CUs), including Fraser. Benchmarks and status were accepted for non-enhanced CUs, but further work on enhanced CUs was required to evaluate status.

Escapements to the three stock groups with yearling smolt life history declined steeply from 2003 to 2009, and yearling smolts that entered the ocean in 2005 and 2007 experienced especially low survival. Recently, escapements have remained low and escapements to many of the stock groups failed to attain brood year levels. In contrast, escapements to the Fraser Summer-Run 0.3 increased during the 1990s and remained abundant until 2012, 2016, and-2017; when escapements were very low compared to levels observed over the previous decade.

For the Fraser late stock group, the Harrison River had very low escapements from 2012– 2017 (except 2015) with escapements more than 15% below the lower bound of the escapement goal (Figure 2.33). Escapement exceeded the upper bounds of the escapement goal in 2015 (101,516); however, was well below the lower bound of the escapement goal in 2014, 2016 and 2017 and the 2017 escapement estimate is the second lowest on record (Appendix Table B6).

2.3.3.4.1 Fraser River Spring Run: Age 1.3

The Fraser River spring run age-1.3 aggregate includes spring-run populations of the Mid- and Upper Fraser, North Thompson, and South Thompson, but excludes the Lower Thompson tributaries (CTC 2002b).

Escapements are typically estimated by expanded peak counts of spawners, holders and carcasses, surveyed from helicopters or on foot. Escapement decreased again in 2017 from levels observed in 2016 and was estimated at 8,154, which was lower than parental brood in 2012 and lower than base period values (Figure 2.27).

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, 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 and electronic resistivity counter methods.

Agency Comments: The stock group has declined substantially over the last decade and is a stock of conservation concern.

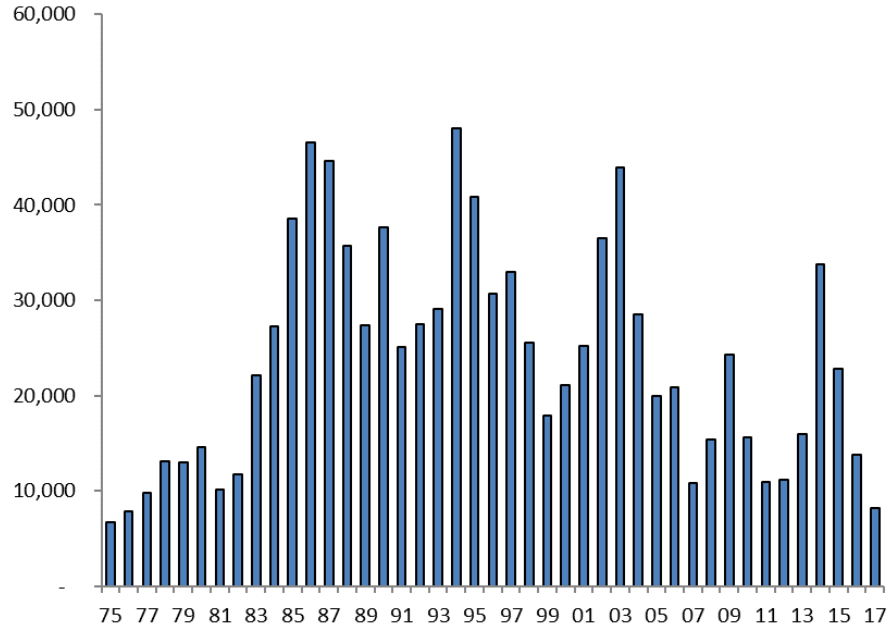


Figure 2.27.–Fraser River spring run age-1.3 stock group escapements of Chinook salmon, 1975–2017.

2.3.3.4.2 Fraser River Spring Run: Age 1.2

The Fraser Spring-run Age 1.2 stock group includes six smaller body size populations 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 2002b). 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.

Escapement Methodology: For the CTC time series, escapements are estimated visually using expanded peak counts of spawners, holders and carcasses in Spius Creek, Coldwater River, Louis Creek and Bessette Creek. Escapements to the Deadman and Bonaparte rivers are estimated by resistivity counter. Mark-recapture and calibrated visual surveys are used to estimate escapement to the Nicola River. Escapement decreased again in 2017 from levels observed in 2016 and was estimated at 5,105, which was lower than parental brood escapement in 2013 (Figure 2.28).

The Nicola River is the exploitation rate indicator stock for the Fraser Spring-run Age 1.2 stock group. Since 1995, high precision escapement estimates (by age and sex) have been generated using an MR program where Petersen disk tags are applied 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. 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 mark-recapture data and is used prior to 1995 in the Fraser Spring-run Age 1.2 aggregate time series (Figure 2.28 and

Figure 2.29).

The MR estimated escapement of 1,702 in 2017 is lower than the 2016 escapement and represents 49% of the 2013 parental brood. Since 1995 hatchery origin fish have averaged 25% of the spawning escapement.

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 survey indices to total escapements estimated by MR and electronic resistivity counter methods. Since 2004, the Nicola River escapements have been less than the median estimate of S_{MSY} (9,300; CV 21%).

Agency Comments: The stock group has declined substantially over the last decade and is a stock of conservation concern.

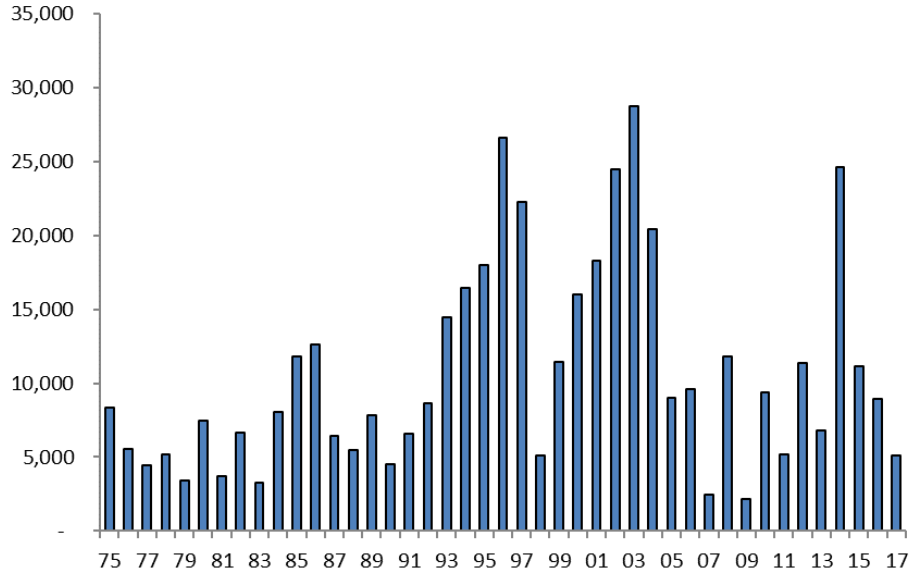


Figure 2.28.–Fraser River spring run age-1.2 stock group escapements of Chinook salmon, 1975–2017.

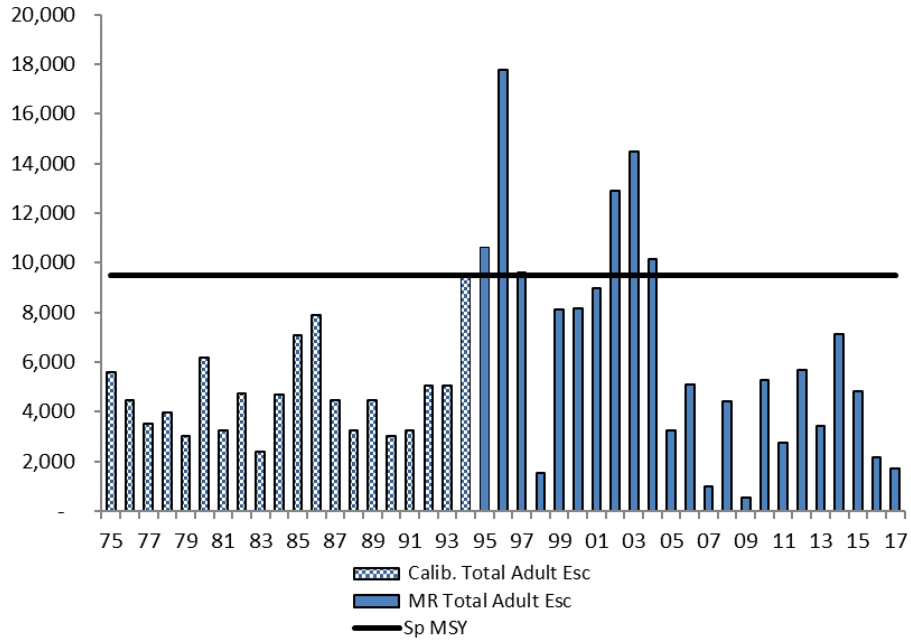


Figure 2.29.–Nicola River escapements of Chinook salmon, 1975–2017.

2.3.3.4.3 Fraser River Summer Run: Age 1.3

The Fraser River summer run age-1.3 aggregate includes 10 populations spawning in large rivers, mostly below the outlets of large lakes. These include the Nechako, Chilko, and Quesnel rivers in the Mid-Fraser and the Clearwater River in North Thompson watershed (CTC 2002b). The aggregate escapement was estimated at 6,459 in 2017, which is substantially lower from those observed in 2016 and in the parental brood in 2012. This is the lowest escapement on record for this aggregate (Figure 2.30).

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.

Escapement Goal Basis: There is currently no PSC-agreed 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 survey indices to total escapements estimated by MR and AUC methods.

Agency Comments: The stock group declined over the last decade and has been a conservation concern for several years. In 2017 it declined to the lowest level observed in 42 years.

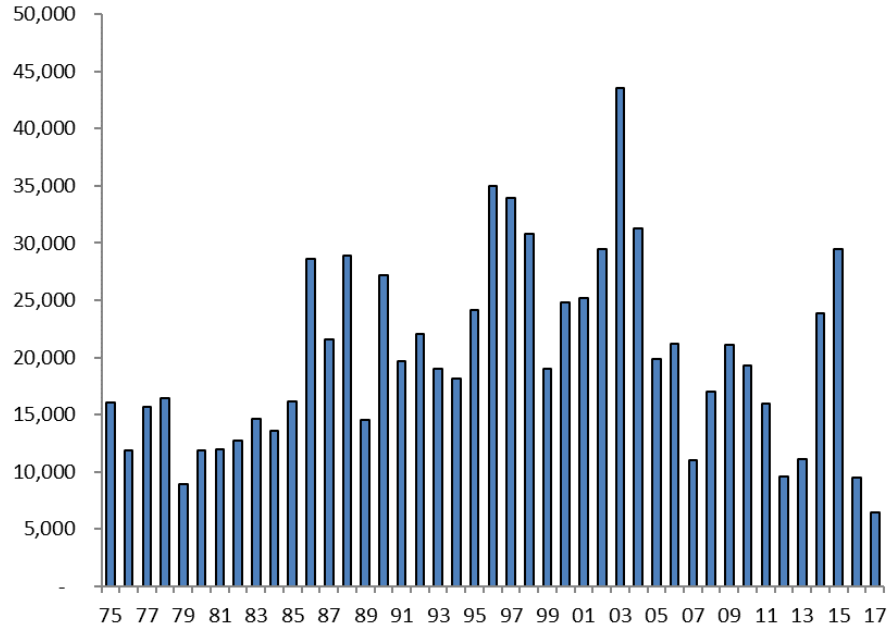


Figure 2.30.–Fraser River summer run age-1.3 stock group escapements of Chinook salmon, 1975–2017.

2.3.3.4.4 Fraser River Summer Run: Age 0.3

The Fraser Summer-Run Age 0.3 aggregate includes six 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 2002b). Escapements to this stock group were low in 2017, although there was some variation within the stocks in the aggregate. Escapements were estimated at 84,470 in 2017 (Figure 2.31).

Escapement Methodology: Escapements are estimated using peak count visual survey and mark-recapture methods. Since 2000 (with the exception of 2003), the Lower Shuswap River has been an exploitation rate indicator stock for the Fraser Summer-run Age 0.3 stock group, and an MR program provides high precision estimates of escapement by age and sex. Tags have been applied to live fish by seining and salmon carcasses were examined later for the presence of marks. In addition, there are multiple years of MR and CWT data for the Middle Shuswap River. The estimated escapement for Lower Shuswap in 2017 was 13,430 which is less than half of the parental brood (Appendix Table B6). Since 2000, hatchery-origin fish averaged 11% of the escapement (range: 4%-22%; Figure 2.32), and were estimated to be 12% of the escapement in 2017.

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for the 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 survey indices to total escapements estimated by MR methods and novel methods developed during the Sentinel Stocks Program. Peak count estimates for the Lower Shuswap River from 1975 to 1999, and for 2003 have been calibrated to mark-recapture

equivalents. In the past two decades, with the exception of 2012 and 2016, Lower Shuswap River escapements have exceeded the median estimate of S_{MSY} (12,300; CV=17%).

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 the 2012 and 2016 escapement (the progeny of the 2012 brood year escapement).

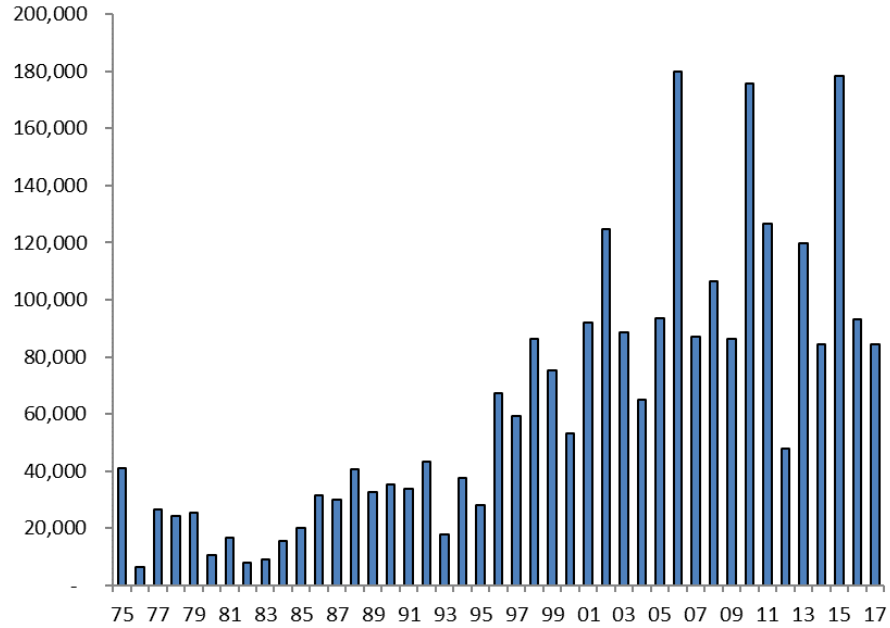


Figure 2.31.–Fraser River summer run age-0.3 stock group escapements of Chinook salmon, 1975–2017.

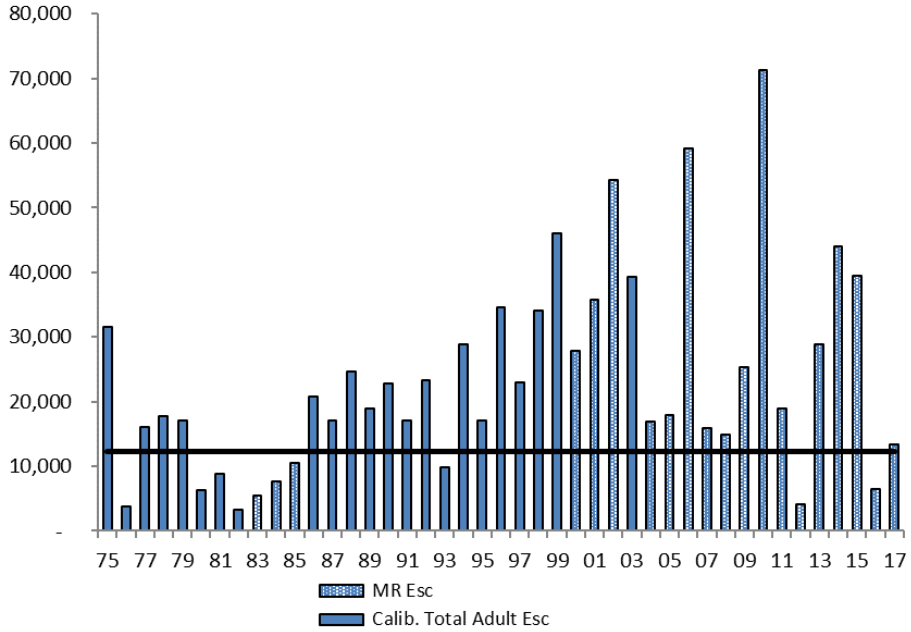


Figure 2.32.–Lower Shuswap River escapements of Chinook salmon, 1975–2017.
The visual escapement estimates have been calibrated with the mark–recapture estimates.

2.3.3.4.5 Fraser River Late Run (Harrison River)

Harrison River Chinook salmon are white-fleshed fish that return to spawn during the fall. They 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 246,984 adults in 2003 (Figure 2.31). Escapements were more than 15% below the lower bound of the escapement goal from 2012–2017 (excluding 2015), the estimated escapement in 2017 was only 27,799 adult Chinook salmon (Figure 2.33).

Escapement Methodology: Since 1984, MR studies have been conducted annually on the Harrison River to obtain reliable estimates of spawning escapements.

Escapement Goal Basis: Due to their natural abundance and importance in numerous British Columbia 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 Pacific Salmon Treaty. 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 2002b). The escapement goal range that was proposed 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. Escapements have fluctuated substantially with no apparent trend in the time series, until the recent period of poor returns. Average contribution of enhanced fish is 4%.

Agency Comments: The stock was identified as a conservation concern in 2016 due its low escapement in five of the past six years relative to the escapement goal.

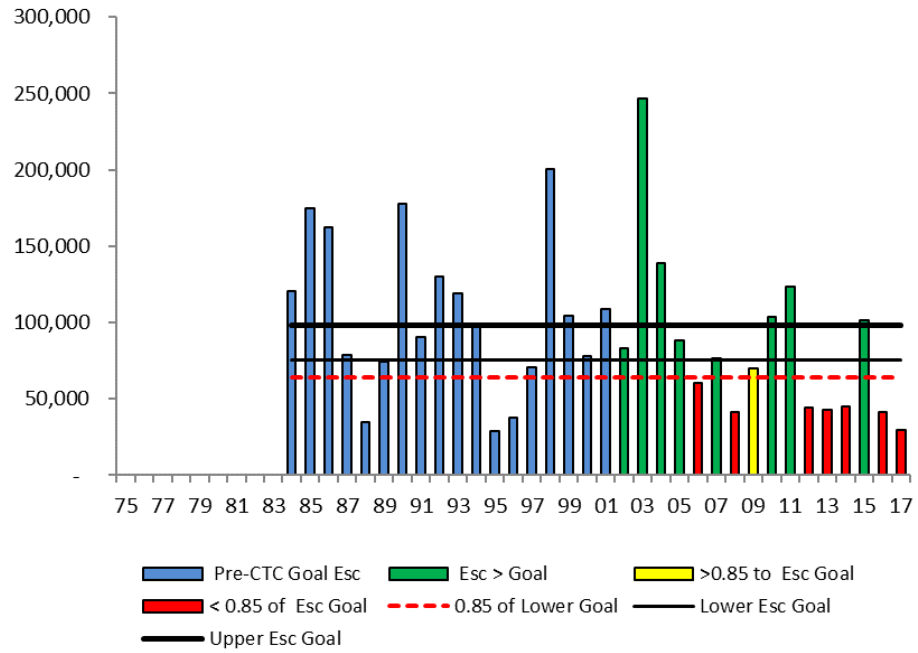


Figure 2.33.–Harrison River escapements of Chinook salmon, 1984–2017.

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. Far north migrating Chinook salmon from the mid-Oregon Coast are currently being incorporated in the PSC Chinook model in this year's base period recalibration. There are currently no CTC-agreed escapement indicator stocks for the Mid-Oregon Coastal group, although there have been two proposed (the South Umpqua and Coquille). The indicator stocks include a variety of run timings and ocean distributions.

Biologically based escapement goals have been reviewed and accepted by the CTC for four fall stocks (Queets, Quillayute, Hoh, and Grays Harbor) and two spring/summer stocks (Queets and Hoh) in coastal Washington, four Columbia River stocks (Lewis, Upriver Brights, Deschutes, 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 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 distribution than most coastal and Columbia River stocks and are caught primarily in WCVI AABM fisheries, and Canadian and US ISBM fisheries. Escapement for these stocks is defined as the total number of natural- and hatchery-origin fish spawning naturally on the spawning grounds.

2.3.4.1.1 Nooksack River

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

Escapement Methodology: Estimates of the spring run type escapement in the South Fork have traditionally been based on the number of redds observed prior to the first of October expanded by 2.5 spawners per redd. Since 1999, this estimate has been refined using CWTs, adipose fin clips, and thermal otolith marks to estimate the number of hatchery origin strays, and subsequently natural origin fish, in the spawning populations. A more recent refinement has been to use micro-satellite DNA 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, and spring or fall run type. The majority of the run and the escapement to the spawning grounds is composed of hatchery-origin returns from two supplementation programs. Owing to the influence of glacial runoff, estimates of escapement in the North and Middle Forks are based on a combination of field methods, e.g., redd and carcass counts in clear tributaries and during clear/low-flow mainstem conditions. Due to spawn timing differences, North and Middle Fork escapement estimates are assumed to be spring Chinook salmon only. Proportions of hatchery-origin fish are calculated from the number of fish identifiable to hatchery origin out of the total observed during carcasses sampling. In 2014, the estimated total escapement was 1,606, with 91 natural-origin spawners in the North and Middle Fork and 78 natural-origin fish in the South Fork (22 SF origin and 56 NF/MF origin). A preliminary 2015 estimate of total spawners is 1,852, with 401 natural-origin spawners in the North and Middle Fork and 46 natural-origin spawners in the South Fork (7 SF origin and 39 NF/MF (Figure 2.34). Escapement estimates from 2016 and 2017 are not yet available for either population.

Since the 2008 return year, WDFW has been investigating the use of transgenerational genetic mark-recapture (tGMR) methods to estimate spawning escapement of spring Chinook. Among the results of the tGMR study was a finding that escapement estimates using the tGMR techniques ranged from 1.2 to 3.1 times higher than escapement estimates obtained from carcass and redd count data (Figure 2.35). These results are consistent with tGMR studies conducted with Stillaguamish River Fall Chinook because the tGMR estimates will include fish from the entire river basin, rather than potentially incomplete expansions of sampled reaches. The co-managers are currently reviewing results of the tGMR studies, investigating analytical techniques that would adjust estimates calculated from field sampling data to a tGMR equivalent estimate that would more appropriately incorporate un-sampled areas.

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

Agency Comments: The state–tribal escapement goal established for this Chinook salmon management unit is an upper management threshold (UMT) of 4,000 spawners and a low abundance threshold (LAT) of 2,000 natural-origin fish (CCMP 2010). The UMT established by the state–tribal managers is generally considered as the adult (age 3+) escapement level associated with maximum sustained harvest. The LAT is the escapement level below which dramatic declines in long-term productivity could occur. Since listing in 1999 as threatened under the ESA, annual fishery management for this stock has been for a ceiling exploitation rate

rather than for a UMT or LAT escapement.

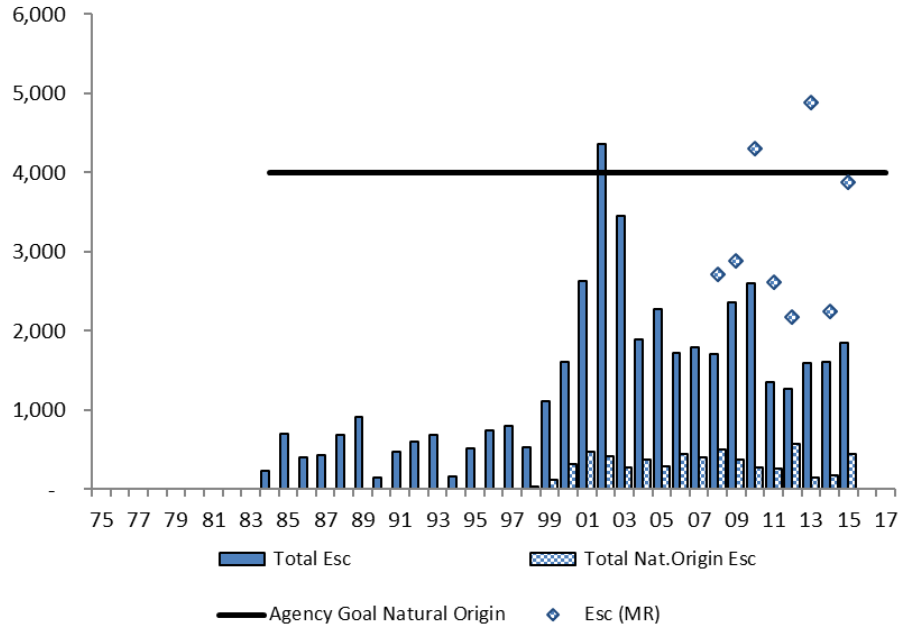


Figure 2.34.–Nooksack River escapement of total (natural- and hatchery-origin) and natural-origin spring Chinook salmon, 1984–2015.

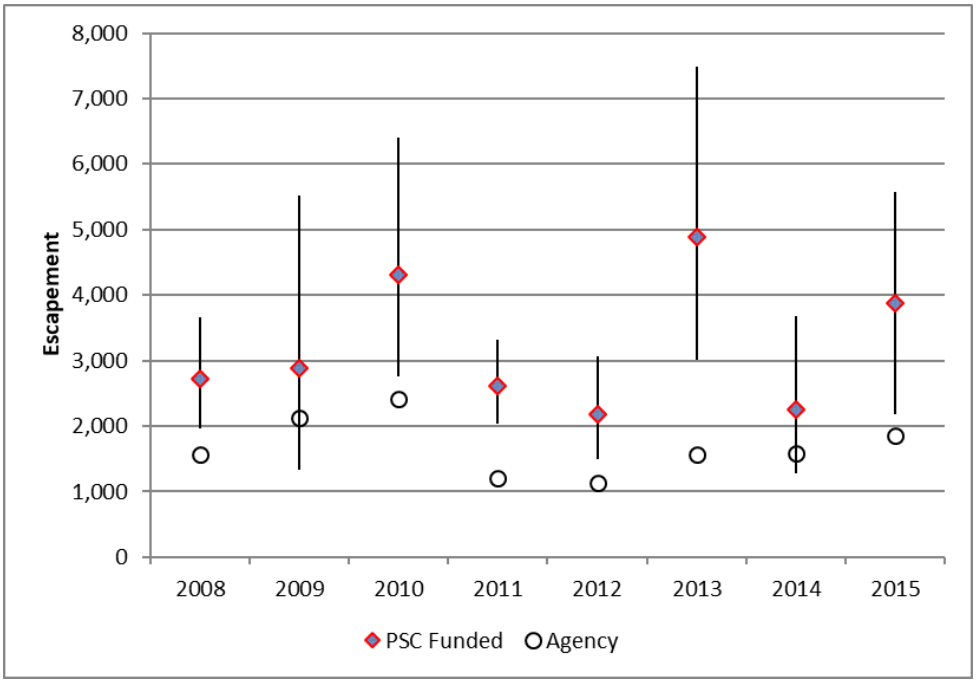


Figure 2.35.–Nooksack River escapements of Chinook salmon to the spawning grounds in years when both agency expanded redd counts were used (circles) and when transgenerational genetic mark–recapture estimates (diamonds are point estimates and the bars are 95% CIs) were conducted with Treaty-related funding.

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, Cascade, and Suiattle rivers.

Escapement Methodology: Due to changes in spawning index areas, beginning in 1992 for the Cascade stock and 1994 for the Sauk and Suiattle stocks, escapements are not directly comparable to previous numbers. In the Upper Sauk, cumulative redd counts are conducted from river mile 31.0 to 39.7 (Cascade 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 (river mile 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 river mile 8.1 to the forks at 18.6 in 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 2017 escapement estimate is 2,851 natural spawners, the largest return in the entire time series since 1975 (Figure 2.36).

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

Agency Comments: The current UMT used by the state and tribal co-managers for the Skagit River spring Chinook salmon management unit is 2,000 with a LAT of 576 (CCMP 2010). Since listing in 1999 as threatened under the ESA, annual fishery management for this stock has been for a total exploitation rate ceiling rather than for a UMT or LAT escapement.

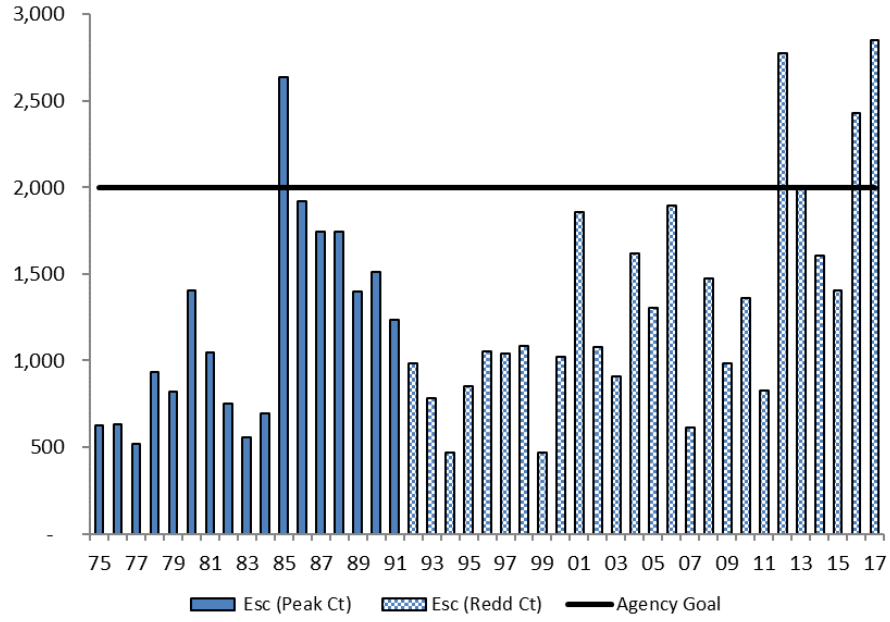


Figure 2.36.–Skagit River escapement of spring Chinook salmon to the spawning grounds, 1975–2017.

Note: This includes early-timed populations returning to the Upper Sauk, 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 for each estimated redd. Natural 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 preliminary 2017 escapement estimate is 12,784 natural spawners (Figure 2.37).

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

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 a recent assessment of freshwater productivity and accounting for variability and biases in management error (CCMP 2010). The LAT is 4,800 spawners. Since its listing as threatened under the ESA in 1999, annual fishery management for this stock has been for a total exploitation rate 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 ceiling exploitation rate.

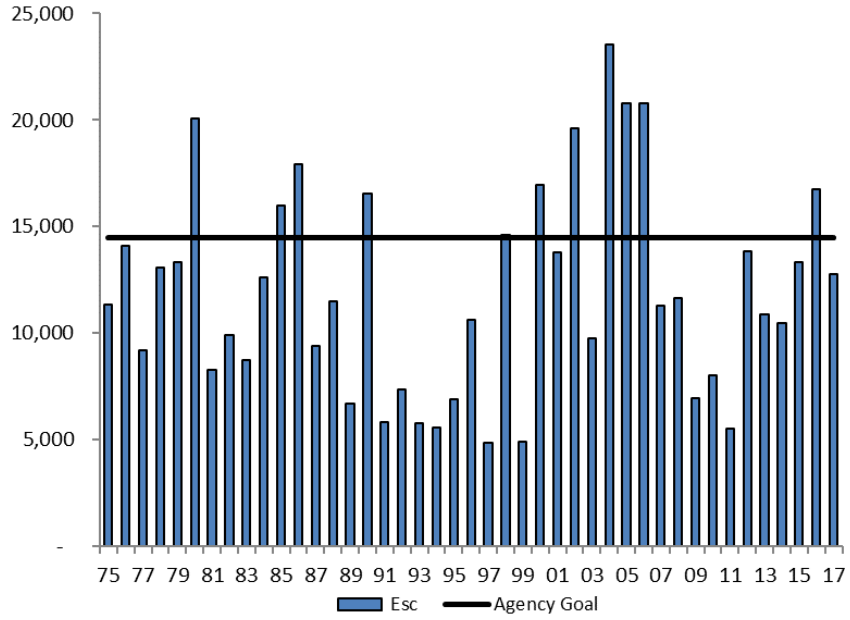


Figure 2.37.–Skagit River escapement of summer/fall Chinook salmon to the spawning grounds, 1975–2017.

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 the majority of spawning occurring in the North Fork and its major tributaries, including Boulder River, and Deer, Grant, French, and Squire Creeks. A much smaller, natural-origin fall stock spawns primarily in the mainstem and South Fork Stillaguamish; in Pilchuck, Jim, and Canyon Creeks; and in the North Fork Stillaguamish. Escapement is currently estimated as South Fork and North Fork Stillaguamish rather than summer and fall populations of Chinook salmon.

Escapement Methodology: Escapement estimates for Stillaguamish Chinook salmon were based on redd count expansions, assuming a 21-day redd life. Between 1988 and 2007, the North Fork of the Stillaguamish River was surveyed with one to three aerial surveys and AUC redd estimates. Starting in 2008, field methods to obtain redd counts in the North Fork changed to ground based surveys. Escapement estimates for the south fork of the Stillaguamish River use a peak redd count and assumes 2.5 fish per redd. Boulder and Squire Creeks on the North Fork Stillaguamish River and Jim Creek on the South Fork Stillaguamish River are also surveyed. Spawning escapement estimates of fall Chinook salmon are biased low due to incomplete redd counts using visual sampling methods (Figure 2.38). Evidence of this is supported by tGMR studies in 2008 through 2016 funded through Treaty-related sources where escapement estimates were 0.97 times to 1.61 times higher than those calculated from redd count data Figure 2.39). Natural escapement excludes brood stock taken for the wild stock indicator

program after 1987, but does include spawning hatchery fish from this production. Total natural spawning escapement in 2017 is estimated at 1,075. An additional 76 natural-origin and 66 hatchery-origin fish were collected for broodstock from the spawning grounds.

Recently, the co-managers agreed to revise escapement estimates from 1988 to 2007 to a tGMR equivalent estimate. The first step is to adjust aerial survey based escapement estimates from the North Fork to a ground survey based equivalent using data collected in 2008, 2009, 2016, and 2017 when aerial and ground surveys were conducted concurrently. South Fork escapements are added to the new NF escapements to arrive at a new total escapement for historic aerial surveys. The new total 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.

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

Agency Comments: State–tribal co-managers have established a UMT for this management unit of 900 natural-origin spawners (600 from the North Fork of the Stillaguamish River and 300 from the South Fork of the Stillaguamish River and mainstem) with an LAT of 700 (CCMP 2010). 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 its current objective is to release 200,000 tagged fingerling smolts per year. Since 2000, an average of approximately 140 adults have been collected annually from the spawning population for this program. Most releases into the North Fork are from acclimation sites. Relatively small numbers of smolts have been released into the South Fork of the Stillaguamish River. Since listing as threatened under the ESA in 1999, annual fishery management for this stock has been for a ceiling exploitation rate rather than for a UMT or LAT escapement.

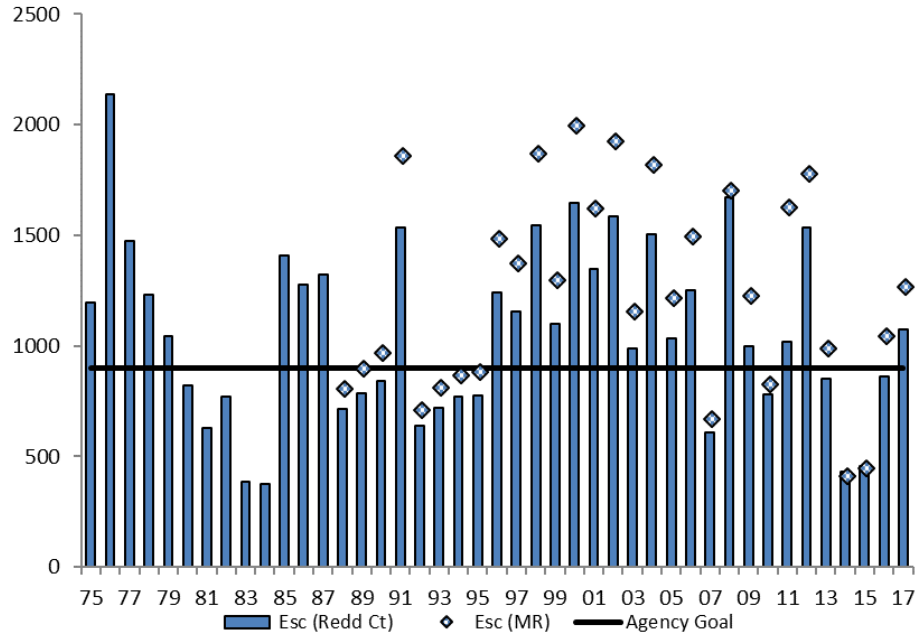


Figure 2.38.–Stillaguamish River escapement of Chinook salmon to the spawning grounds, 1975–2017.

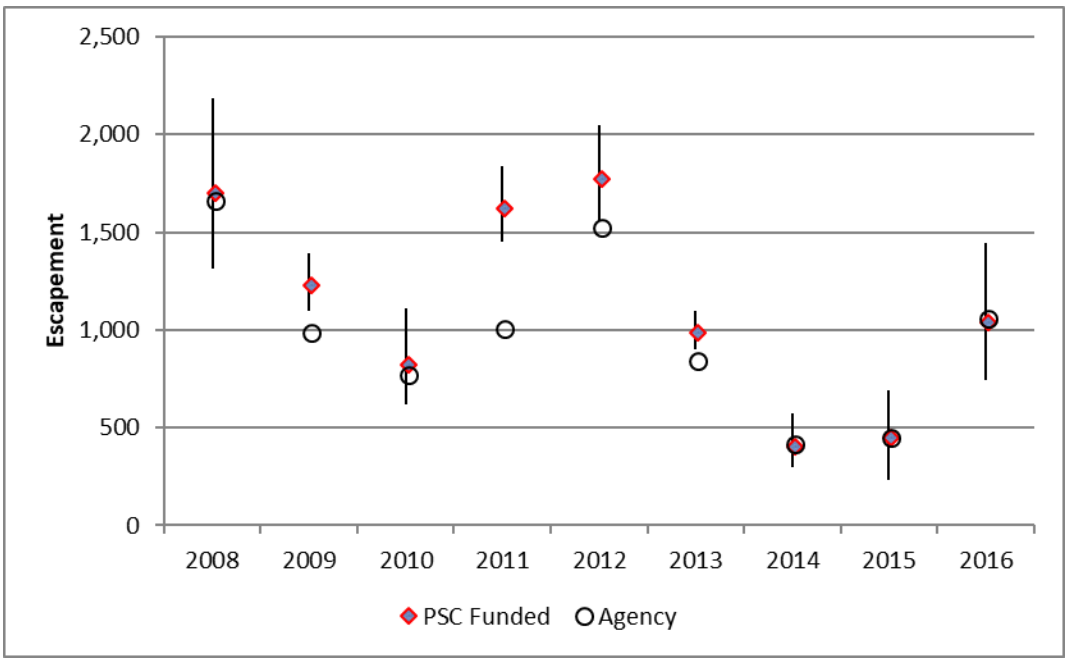


Figure 2.39.–Stillaguamish River escapements of Chinook salmon to the spawning grounds in years when both agency expanded redd counts were used (circles) and when transgenerational genetic mark–recapture (tGMR) estimates (diamonds are point estimates and the bars are 95% CIs) were conducted with Treaty-related funding.

2.3.4.1.5 Snohomish River

The Snohomish River is located in 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 river mile 49.6 and river mile 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 (river mile 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 expansion of redd counts conducted by a combination of helicopter, float, and foot surveys, and from fish counts at the Sunset Falls fishway. The natural escapement estimate includes a significant contribution of hatchery strays from the Wallace and Bernie Kai-Kai Gobin (Tulalip Tribe) facilities. Annual tGMR studies funded under the SSP were conducted from 2011–2015 (Figure 2.40 and Figure 2.41). The 2017 escapement is estimated at 6,119 natural spawners using redd counts.

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

Agency Comments: The state–tribal co-managers have a UMT for this stock of 4,600 natural-origin spawners (CCMP 2010). The LAT for Snohomish River summer/fall Chinook salmon is 2,800. Since listing as threatened under the ESA in 1999, annual fishery management for this stock has been for a ceiling exploitation rate rather than for a UMT or LAT escapement. In 2014, WDFW and the Tulalip Tribe reviewed, reconciled, and updated the historic escapement time

series for the Snohomish Basin; this resulted in minor changes to the data series.

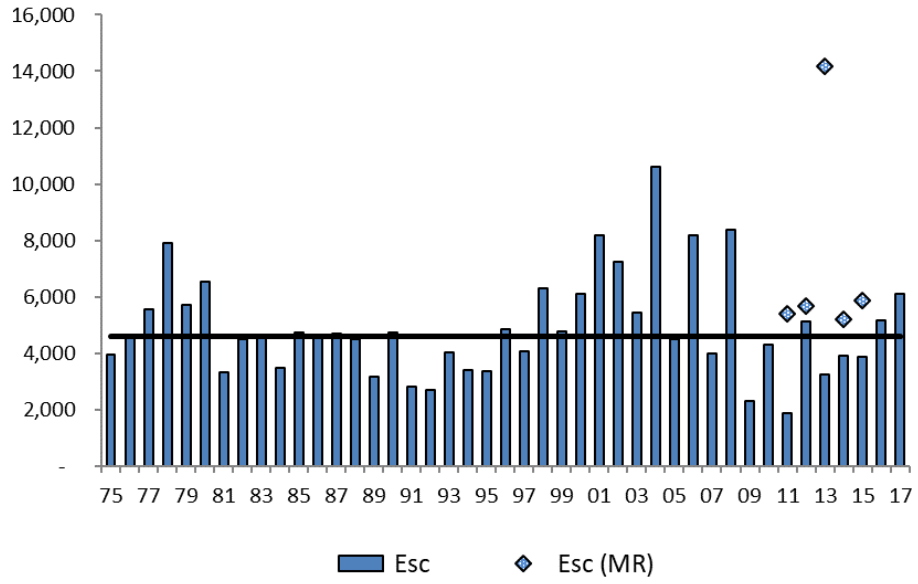


Figure 2.40.–Snohomish River escapement of Chinook salmon to the spawning grounds, 1975–2017.

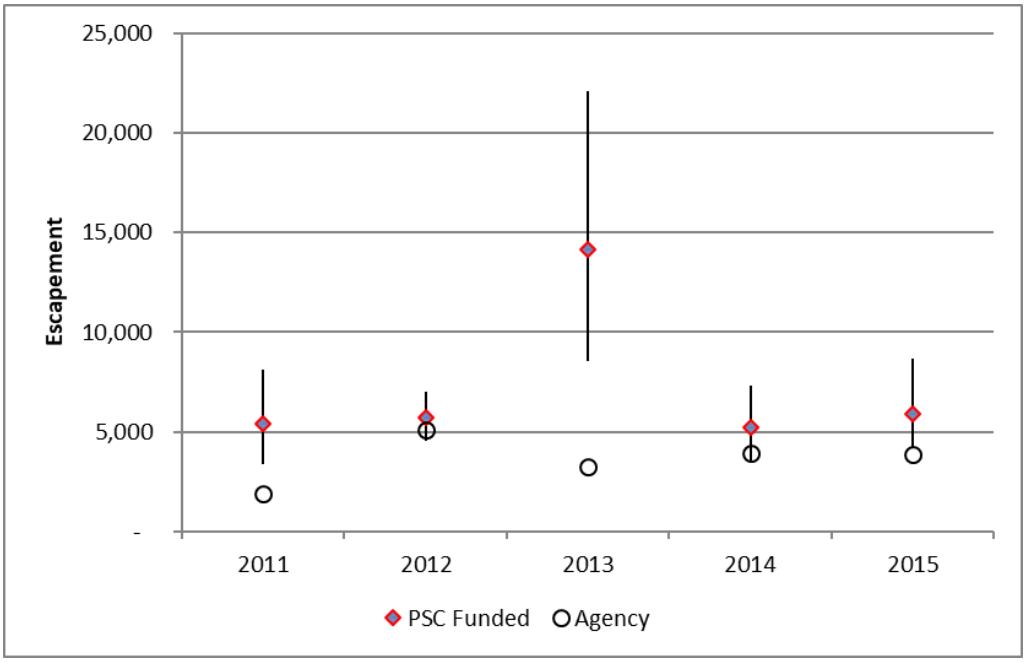


Figure 2.41.–Snohomish River escapements of Chinook salmon to the spawning grounds in years when both agency expanded redd counts were used (circles) and when transgenerational genetic mark–recapture (tGMR) estimates (diamonds are point estimates and the bars are 95% CIs) were conducted with Treaty-related funding.

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 north Lake Washington tributaries of Bear, Cottage, and Issaquah Creeks. A hatchery is located on Issaquah Creek, and Chinook salmon spawning in that area is not included in the natural escapement 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. Past AUC estimates have been converted to redd-based estimates using simple linear regression. Escapement estimates are considered a complete census 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 23% of the spawners from 2003 to 2008 were adipose clipped from mass-marked hatchery production, presumably from Issaquah Hatchery (CCMP 2010). Escapement to tributaries in north Lake Washington 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 (considered a non-index area). 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 of natural spawners in Bear and Cottage Lake Creeks are hatchery-origin fish, likely strays from the Issaquah hatchery. The 2017 naturally spawning escapement estimate for Lake Washington is 2,467; 2,033 in the Cedar River and 262 (of which 84 were natural-origin fish) in Bear and Cottage Lake Creeks (Figure 2.42).

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

Agency Comments: A state–tribal interim UMT escapement goal of 1,200 Chinook salmon for an index reach in the Cedar River was established in 1993 based on average escapements from 1965 to 1969. This goal for the index reach was converted to 1,680 Chinook salmon for the entirety of the river downstream of the dam and reflects a redd-based escapement value consistent with the interim escapement goal derived using AUC methodology. Since listing in 1999 as threatened under the ESA, annual fishery management for this stock has been for a ceiling exploitation rate rather than for a UMT or LAT escapement in the Cedar River; however, when the UMT is expected to be exceeded, some additional fishing in Lake Washington is considered.

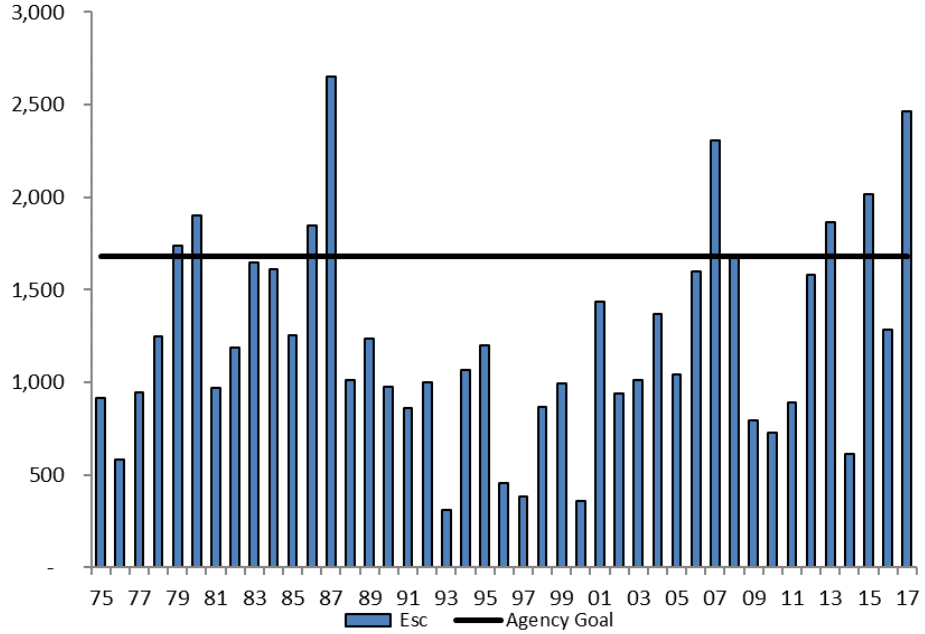


Figure 2.42.–Escapement of Chinook salmon to the spawning grounds in the tributaries of Lake Washington (Cedar River and Bear and Cottage Lake Creeks), 1975–2017.

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 US 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 that the redd counts 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. Some parts of the river (i.e., the Gorge) are only surveyed by air. Boat surveys are generally conducted once a week, or twice a week in years with large numbers of pink salmon. One aerial survey is made during the peak of spawning, more if budgets permit. Certain index reaches of the river are surveyed every week by boat to develop a cumulative redd count total for those reaches. These index reaches are distributed throughout the river. Visible redds are counted for the entire floatable part of the river by boat each week and for the entire river by helicopter during the peak. The ratio of visible redds seen by boat to those seen by air (boat surveys assumed to be best) is used to estimate how many redds would be seen by boat in the unfloated reaches. This provides an estimate of how many visible redds exist during the peak of

spawning. To get from peak redds to cumulative total redds, the visible redds in the index reaches during the peak are compared to the season total for those index reaches. Different areas of the river have different ratios of peak visible redds to season totals. Expansion of nonindex visible redds to season total redds uses the ratio from nearby index reaches of the same general character. 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 US Letter of Agreement were about 2.5 times higher than the escapement estimate from redd count expansion. In 2010, 2011 and 2012, tGMR based escapements from studies funded under the SSP were once again more than twice as high as the redd count expansion estimates (Figure 2.43 and Figure 2.44). There is a large hatchery program in this basin and these fish comprise a large portion of the return. Hatchery fish contribution to the natural escapement ranged from 53% to 65% for the years 2004 to 2007. The 2017 redd-based estimate of naturally spawning escapement is 8,357 mixed hatchery- and natural-origin Chinook salmon.

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

Agency Comments: The state–tribal UMT escapement goal of 5,800 naturally spawning adults is the average of the 1965 to 1976 escapements (Ames and Phinney 1977). The LAT is 1,800 fish. Since its listing as threatened under the ESA in 1999, annual fishery management for this stock has been a ceiling exploitation rate in the southern US preterminal fisheries, and a UMT in the terminal fisheries.

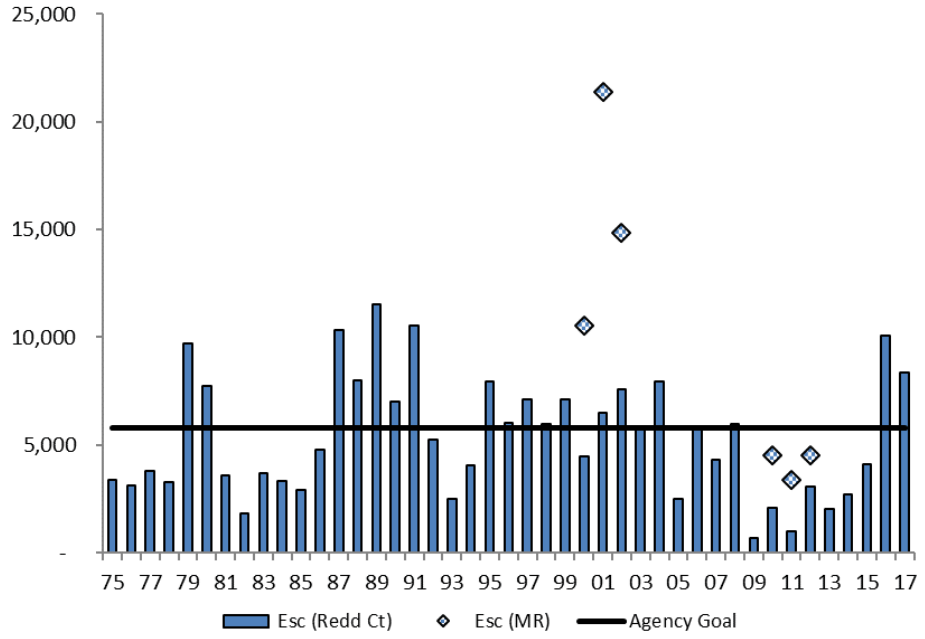


Figure 2.43.–Green River escapement of Chinook salmon to the spawning grounds, 1975–2017.

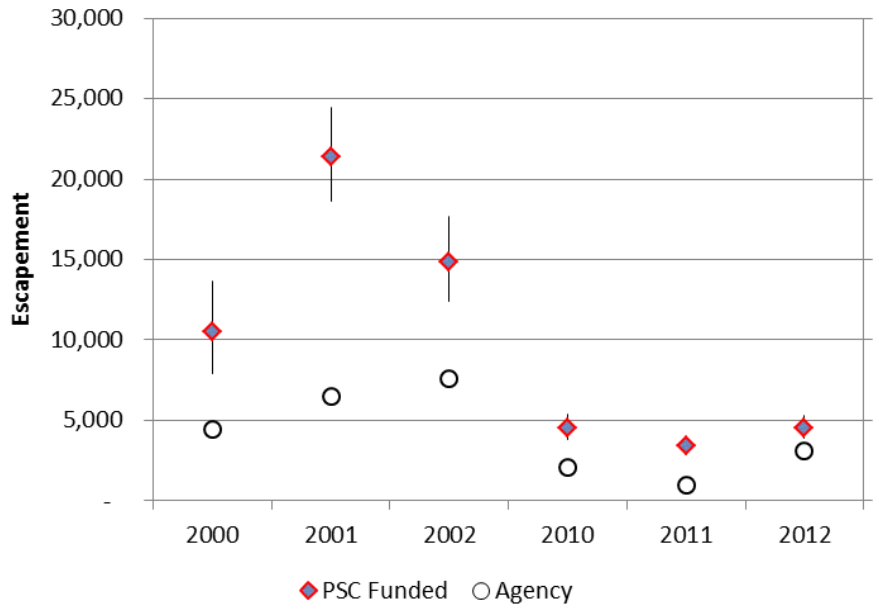


Figure 2.44.– Green River escapements of Chinook salmon to the spawning grounds in years when both agency expanded redd counts were used (circles) and when conventional (2001–2002) and genetic (2010–2012) mark–recapture estimates (diamonds are point estimates and the bars are 95% CIs) were conducted with Letter of Agreement or SSP funding.

2.3.4.2 Coastal Washington

Coastal Washington stocks include spring, summer, and fall Chinook salmon from the Hoko, Quillayute, Hoh, and Queets rivers, and from Grays Harbor. Coastal Washington stocks have a northerly distribution and are vulnerable to southern US fisheries primarily as mature fish during their spawning migrations. They are caught primarily in SEAK and NBC AABM fisheries and in terminal net fisheries.

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 a population listed under the ESA as part of the Puget Sound Chinook Salmon Endangered Species Unit. 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 mainstem (Hoko) 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 adults per redd. There are 10 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 unnamed Creeks 19.0215, 19.0216, and 19.0218. Escapement excludes brood stock collected from the spawning grounds for the supplementation program which started in 1988 and has collected an average of 192

fish annually through 2017. In 2017, 275 fish were retained for the supplementation program leaving a total natural spawning escapement estimate of 695 mixed natural-and hatchery-origin returns from the supplementation program (Figure 2.45).

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. The escapement goal was calculated using a habitat-based approach (rather than a stock–recruitment analysis) by estimating the amount of available spawning habitat, then expanded utilizing assumed optimal redds per mile and fish per redd values (Ames and Phinney 1977).

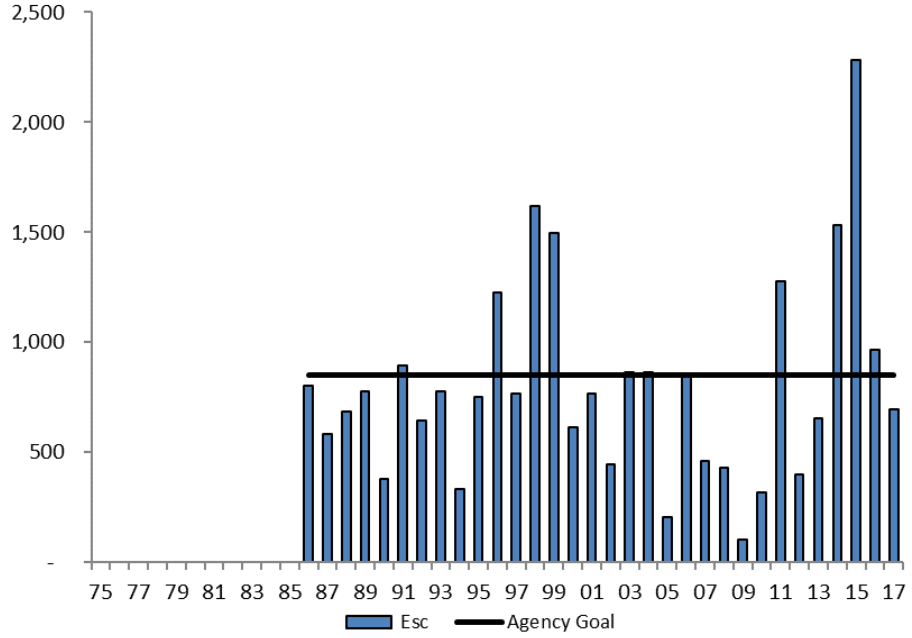


Figure 2.45.–Hoko River escapement of Chinook salmon to the spawning grounds, 1986–2017.

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 has been used consistently in the Quillayute River System since the 1970s. Surveys are conducted by foot, raft, drift boat, and helicopter Index areas are surveyed either weekly or biweekly as conditions allow. Supplemental surveys are done once a season during the peak spawning period. Redd counts from these supplemental surveys are then expanded by the index surveys to estimate redd construction within the supplemental survey areas for the entire season. Using an appropriate redds per mile assignment, the information from index and supplemental surveys is then applied to other unsurveyed streams and segments with historical fish presence. These areas comprise the Quillayute River system stream mileage base that is

consistently calculated to estimate escapement numbers. The number of redds is multiplied by 2.5 to estimate fish escapement. The 2017 escapement estimate for summer Chinook salmon was 1,146 (Figure 2.46).

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 2003).

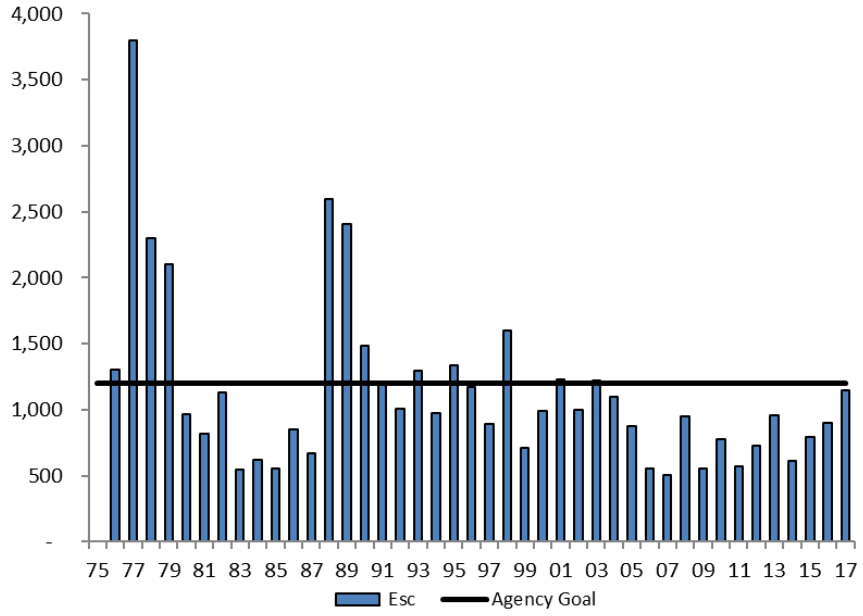


Figure 2.46.–Quillayute River escapement of summer Chinook salmon to the spawning grounds, 1976–2017.

2.3.4.2.3 Quillayute River Fall

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. It 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, Calawah rivers and several other smaller tributaries in the basin. This has been used consistently in the Quillayute River System since the 1970s. Surveys are conducted by foot, raft, drift boat, helicopter. Index areas are surveyed either weekly or biweekly as conditions allow. Supplemental surveys are done once a season during the peak spawning period. Redd counts from these supplemental surveys are then expanded by the index surveys to estimate redd construction within the supplemental survey areas for the entire season. Using an appropriate redds per mile assignment, the information from index and supplemental surveys is then applied to other streams and segments that have historically had fish presence, but were not surveyed. These areas comprise the Quillayute River system stream mileage base that is consistently calculated to estimate

escapement numbers. The number of redds is multiplied by 2.5 to estimate fish escapement. The 2017 escapement estimate was 3,927 (Figure 2.47).

Escapement Goal Basis: In 2004, the PSC-agreed an escapement goal for Quillayute fall Chinook salmon of 3,000 natural spawners based on a spawner–recruit analysis developed by 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 spawner escapements from which to eventually develop an MSY objective or proxy while protecting the long-term productivity of the stock.

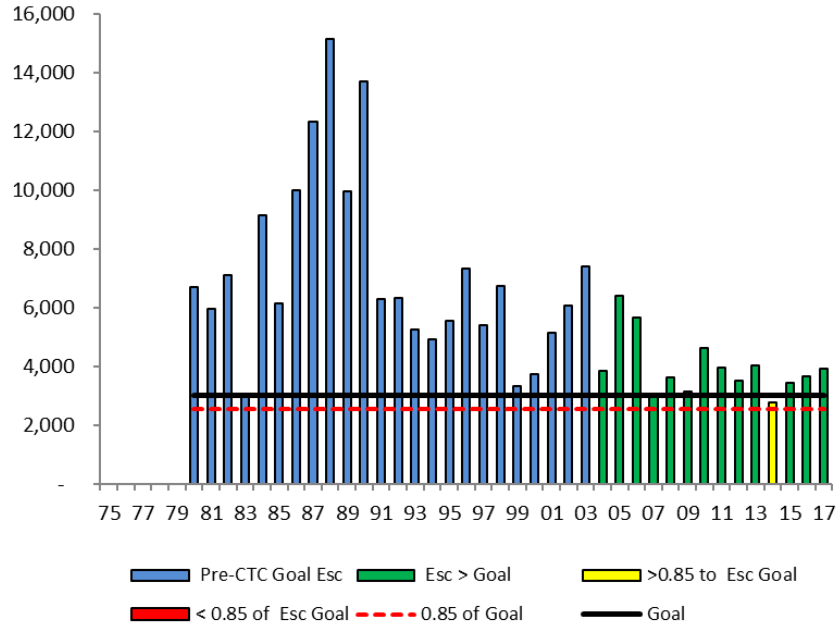


Figure 2.47.–Quillayute River escapement of fall Chinook salmon to the spawning grounds, 1980–2017.

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. Surveys are conducted by foot, boat, and helicopter. Intensively monitored index reaches are surveyed weekly to record new and visible redds. Cumulative redd counts for each index reach represents the total spawner abundance for that particular spawning area. Weekly visible redd counts in index reaches are used to estimate spawning timing curves by calculating the proportion of season cumulative redds that are visible on each weekly survey date. Surveys are also conducted in reaches too large or remote to intensively monitor throughout the season. These surveys are timed as close as possible to peak spawning activity,

and spawner abundance estimates are derived using index timing curves. For areas with suitable habitat but not regularly surveyed, redd densities (cumulative redds per river mile) from surveyed reaches with similar habitat type are used to estimate escapement into these reaches of known stream length. The total natural spawning escapement is calculated assuming 2.5 fish per redd. There is no hatchery program in this system. The 2017 natural escapement estimate was 1,778 fish (Figure 2.48).

Escapement Goal Basis: Escapement floor policy of 900 for the Hoh spring/summer Chinook salmon was developed by QDNR (1982) and Cooney (1984) based on spawner–recruit analyses, and was accepted by the CTC in 2004. Stock production analysis of spawning escapement for brood years 1969 to 1976 was utilized to determine the initial escapement floor.

Agency Comments: Similar to 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 had rebounded in 2001 before declining again since 2005. 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.

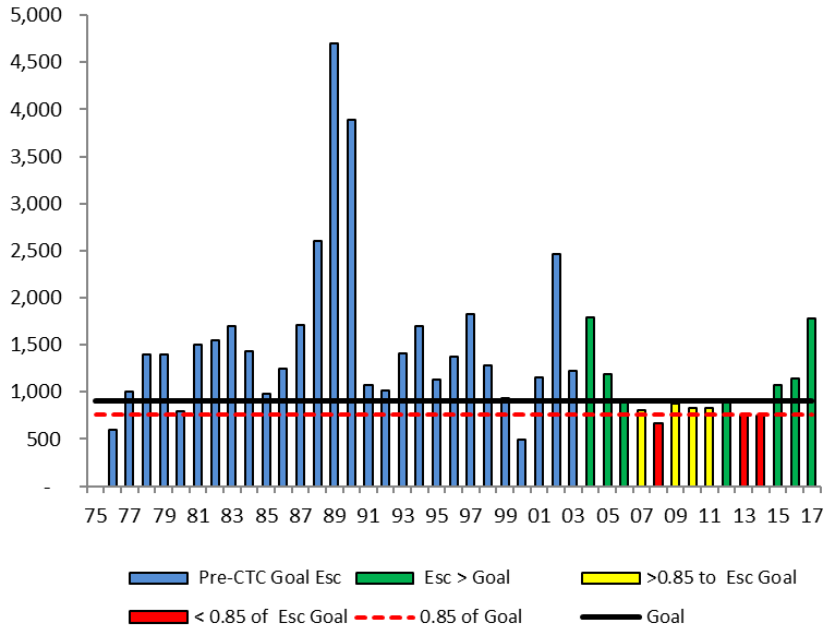


Figure 2.48.–Hoh River escapement of spring/summer Chinook salmon to the spawning grounds, 1976–2017.

2.3.4.2.5 Hoh River Fall

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. 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 in index areas, supplemental surveys in the mainstem and south fork Hoh River, and in tributaries with spawning habitat. Surveys are conducted by foot, boat, and helicopter. Intensively monitored index reaches are surveyed weekly to record total new and visible redds observed each week. Cumulative redd counts for each index reach represents the total spawner abundance for that particular spawning area. Weekly visible redd counts in index reaches are used to estimate spawning timing curves by calculating the proportion of season cumulative redds that are visible on each weekly survey date. Extensive surveys are also conducted infrequently in additional monitored stream areas utilized by spawning Chinook salmon. These reaches encompass areas too large or remote to intensively monitor throughout the season. Surveys are timed as close as possible to peak spawning activity. Spawner abundance estimates from the extensive surveys are derived using index timing curves. For areas with suitable habitat but not regularly surveyed, redd densities (cumulative redds per river mile) from surveyed reaches with similar habitat type are used to estimate escapement into these reaches of known stream length. The total natural spawning escapement is calculated assuming 2.5 fish per redd. 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. The 2017 escapement estimate is 1,405 fish (Figure 2.49).

Escapement Goal Basis: The escapement floor of 1,200 for the Hoh fall Chinook salmon was developed by QDNR (1982) and Cooney (1984) based on spawner–recruit analyses, and was accepted by the CTC in 2004 as the escapement goal. Stock production analyses of spawning escapements from 1968 to 1982 were utilized to determine the initial escapement floor.

Agency Comments: The state–tribal management plan for this stock includes a harvest rate of 40% of 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.

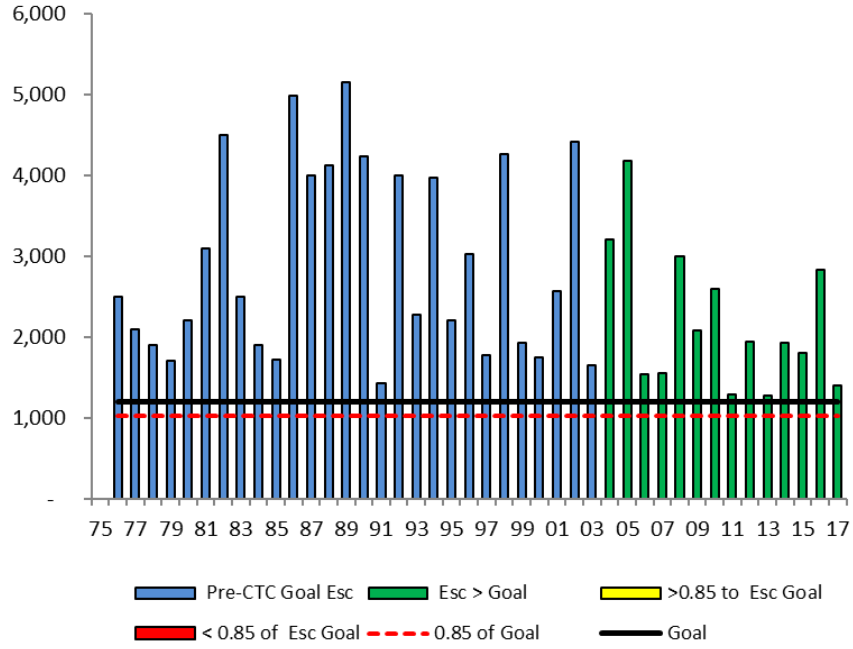


Figure 2.49.–Hoh River escapement of fall Chinook salmon to the spawning grounds, 1976–2017.

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. Surveys are conducted by foot, boat, and helicopter. Intensively monitored index reaches are surveyed weekly to record total new and visible redds observed each week. Cumulative redd counts for each index reach represents the total spawner abundance for that particular spawning area. Weekly visible redd counts in index reaches are used to estimate spawning timing curves by calculating the proportion of season cumulative redds that are visible on each weekly survey date. Extensive surveys are also conducted infrequently in additional monitored stream areas utilized by spawning Chinook salmon. These reaches encompass areas too large or remote to intensively monitor throughout the season and the surveys are timed as close as possible to peak spawning activity. Spawner abundance estimates from the extensive surveys are derived using index timing curves. For areas with suitable habitat but not regularly surveyed, redd densities (cumulative redds per river mile) from surveyed reaches with similar habitat type are used to estimate escapement into these reaches of known stream length. The total natural spawning escapement is calculated under the assumption of 2.5 fish per redd. The 2017 estimate of natural escapement was 825 fish (Figure 2.50).

Escapement Goal Basis: An escapement floor policy of 700 for Queets spring/summer Chinook salmon was developed by QDNR (1982) and Cooney (1984) based on spawner–recruit analyses, and was accepted by the CTC in 2004 as the escapement goal. Stock production analysis of spawning escapements for brood years 1969 to 1976 were used to determine the initial

escapement floor.

Agency Comments: Terminal fisheries are managed by the state and tribes to catch 30% of the river run size, 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 directed 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.

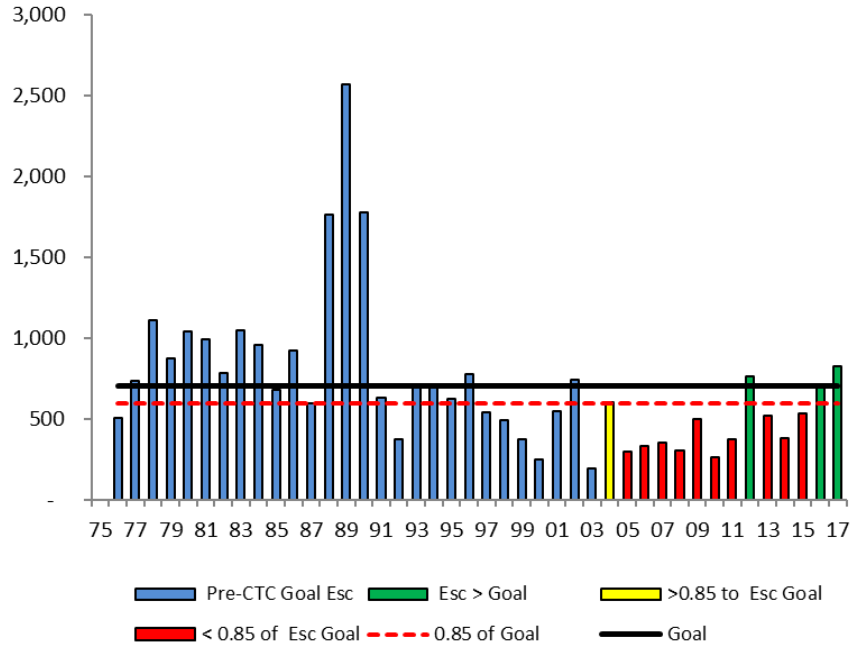


Figure 2.50.–Queets River escapement of spring/summer Chinook salmon to the spawning grounds, 1976–2017.

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. Surveys are conducted by foot, boat, and helicopter. Intensively monitored index reaches are surveyed weekly to record total new and visible redds observed. Cumulative redd counts for each index reach represents the total spawner abundance for that particular spawning area. Weekly visible redd counts in index reaches are used to estimate spawning timing curves by calculating the proportion of season cumulative redds that are visible on each weekly survey date. Extensive surveys are also conducted infrequently in additional monitored stream areas used by spawning Chinook salmon that are too large or remote to intensively monitor throughout the season. These surveys are timed as

close as possible to peak spawning activity. Spawner abundance estimates from these larger areas are derived using index timing curves. For areas with suitable habitat but not regularly surveyed, redd densities (cumulative redds per river mile) from surveyed reaches with similar habitat type are used to estimate escapement into these reaches of known stream length. The total natural spawning escapement is calculated under the assumption of 2.5 fish per redd. The 2017 estimate of Queets River fall Chinook salmon natural escapement was 2,721 (Figure 2.51).

Escapement Goal Basis: The escapement floor policy of 2,500 for the Queets fall Chinook salmon was developed by QDNR (1982) and Cooney (1984) based on spawner–recruit analyses, and was accepted by the CTC in 2004 as the escapement goal. Stock production analyses of spawning escapements from 1967 to 1982 were used to determine the initial escapement floor.

Agency Comments: Terminal fisheries are managed by the state and tribes to catch 40% of the river return, 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.

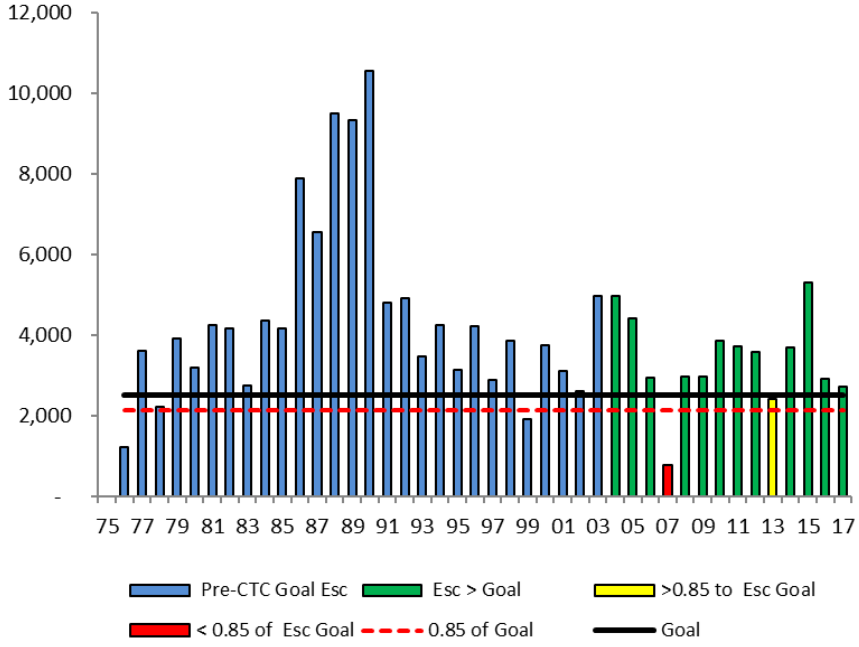


Figure 2.51.–Queets River escapement of fall Chinook salmon to the spawning grounds, 1976–2017.

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 by redd counts from August 15 to October 15 for spring/summer Chinook salmon. Surveys are conducted by foot, boat, and helicopter. Intensively monitored index reaches are surveyed weekly to record total new and visible redds observed. Cumulative redd counts for each index reach represent the total spawner abundance for that particular spawning area. Weekly visible redd counts in index reaches are used to

estimate spawning timing curves by calculating the proportion of season cumulative redds that are visible on each weekly survey date. Extensive Surveys are also conducted infrequently in additional monitored stream areas used by spawning Chinook salmon that are too large or remote to intensively monitor throughout the season. These surveys are timed as close as possible to peak spawning activity. Spawner abundance estimates from these larger areas are derived using index timing curves. For areas with suitable habitat but not regularly surveyed, redd densities (cumulative redds per river mile) from surveyed reaches with similar habitat type are used to estimate escapement into these reaches of known stream length. The total natural spawning escapement is calculated under the assumption of 2.5 fish per redd. The 2017 escapement was 1,384 Chinook salmon (Figure 2.52).

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 2003). This single targeted goal was developed as an MSY proxy. This objective was derived from actual spawning data from the mid- to late 1970s, and expanded to include additional habitat not covered by spawner surveys.

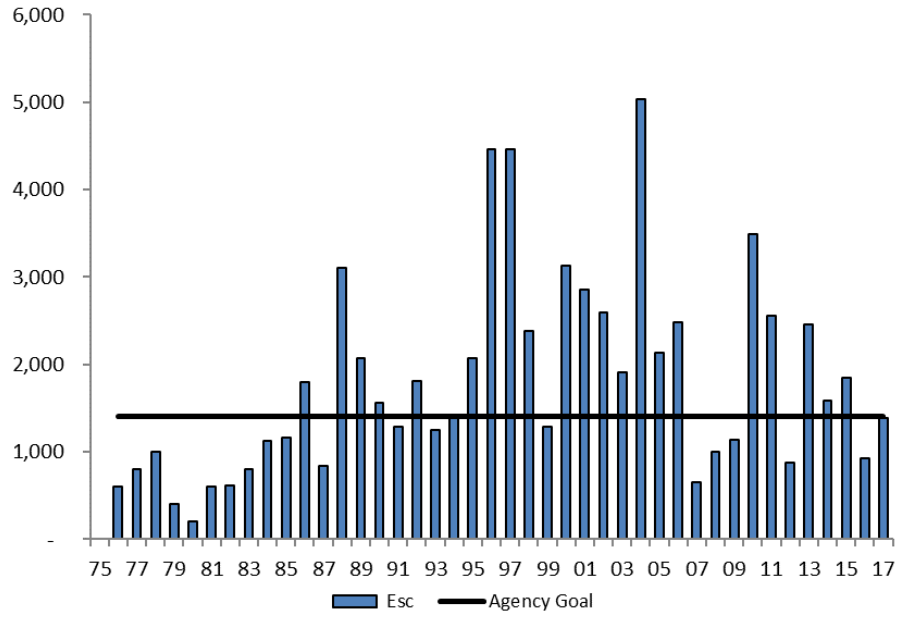


Figure 2.52.–Grays Harbor escapement of spring Chinook salmon to the spawning grounds, 1976–2017.

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. Surveys are conducted by foot, boat, and helicopter. Intensively monitored index reaches are surveyed weekly to record total new and visible redds observed. Cumulative redd counts for each index reach represents the total spawner abundance for that particular spawning area. Weekly visible redd counts in index reaches are used to estimate spawning timing curves by calculating the proportion of season cumulative redds that are visible on each weekly survey date. Extensive Surveys are also conducted infrequently in additional monitored stream areas used by spawning Chinook salmon that are too large or remote to intensively monitor throughout the season. These surveys are timed as close as possible to peak spawning activity. Spawner abundance estimates from these larger areas are derived using index timing curves. For areas with suitable habitat but not regularly surveyed, redd densities (cumulative redds per river mile) from surveyed reaches with similar habitat type are used to estimate escapement into these reaches of known stream length. The total natural spawning escapement is calculated under the assumption of 2.5 fish per redd. The 2017 escapement was 13,469 spawners (Figure 2.53).

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: Consistent with the stock group in Attachments I, II, and V of the 2009 Agreement, 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.

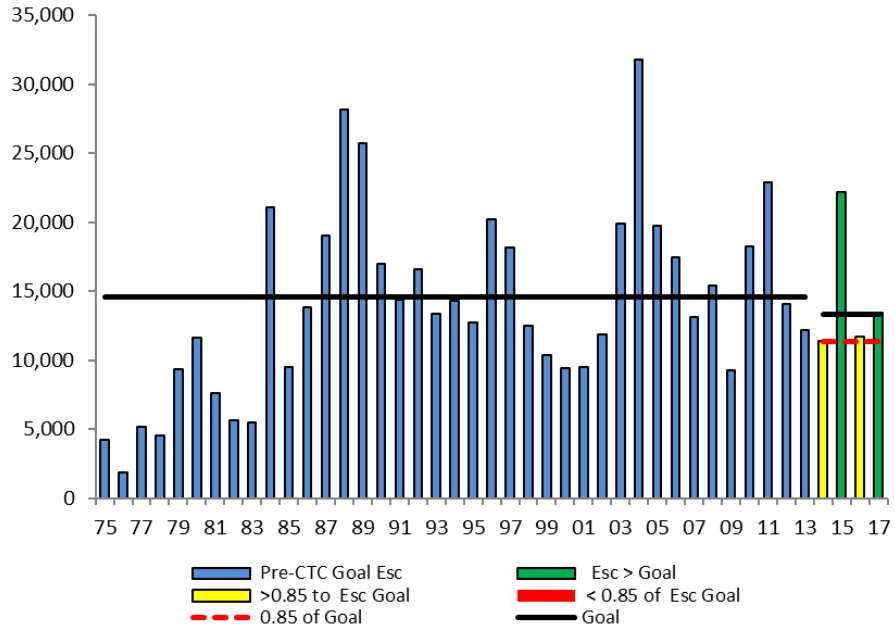


Figure 2.53.–Grays Harbor escapement of fall Chinook salmon to the spawning grounds, 1976–2017.

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

2.3.4.3 Columbia River

Columbia River stocks include spring, summer, and fall run Chinook salmon from the Columbia River and its tributaries. Runs may have different marine distributions with different vulnerabilities to ocean fisheries. Upriver spring stocks generally have stream-type life histories, migrate offshore, and are rarely retained in ocean salmon fisheries. As a result, they are not identified in Attachments I–V of the PST. Most summer and fall stocks have ocean-type life histories, with northern distributions, and are caught in SEAK and WCVI AABM fisheries, and in US ISBM fisheries. Lower Columbia River tule fall Chinook salmon also have an ocean-type life history with a more local distribution and are caught mainly in the WCVI AABM fishery and US ISBM fisheries.

2.3.4.3.1 Columbia Upriver Spring

Escapement Methodology: To provide consistency with the *US v. Oregon* Technical Advisory Committee's annual Joint Staffs Reports, escapement graphs include wild escapement of adult upper Columbia spring Chinook salmon at Rock Island Dam plus wild adult Snake River spring/summer Chinook salmon at Lower Granite Dam (Joint Columbia River Management Staff, Tables 8 and 9). However, for purposes of fishery management and allocation under *US v. Oregon*, Columbia Upriver spring stock includes all hatchery and wild fish destined to return past Bonneville from January 1 through June 15. There are additional tributary spawning escapements (e.g., Deschutes and John Day rivers) that comprise the Columbia Upriver spring management unit that are not included in the graph. Although it is not a completely comprehensive estimate of the naturally spawning Columbia Upriver spring escapement past Bonneville, this time series provides a consistent and annually documented index of the abundance trend of naturally spawning fish (Figure 2.54). Escapements decreased in 2017 for the third year in a row.

Escapement Goal Basis: Under the 2008–2017 *US v. Oregon Management Agreement*, this stock is not managed for an escapement goal. "Abundance indicators" for measuring performance include natural origin Snake R spring/summer Chinook at Lower Granite Dam and natural origin spring Chinook at Priest Rapids Dam.

Agency Comments: The 2008–2017 *US v. Oregon Management Agreement* provides for a minimum annual mainstem treaty Indian ceremonial and subsistence entitlement of 10,000 spring and summer Chinook salmon. "Harvest indicators" are based on adult returns at the Columbia River mouth, including the total number of Upriver spring and Snake River spring/summer Chinook, and the numbers of natural origin Snake spring/summer and upper Columbia spring Chinook. Fishery impacts are managed using harvest rate schedules based on total upriver spring Chinook salmon run size or the natural origin Snake River spring/summer run size if it is less than 10% of the total run size (2008–2017 *US v. Oregon Management Agreement*, Appendix A, Table A1). The harvest rate schedule ranges from less than 5.5% at run sizes less than 27,000 up to 17% at run sizes exceeding 488,000.

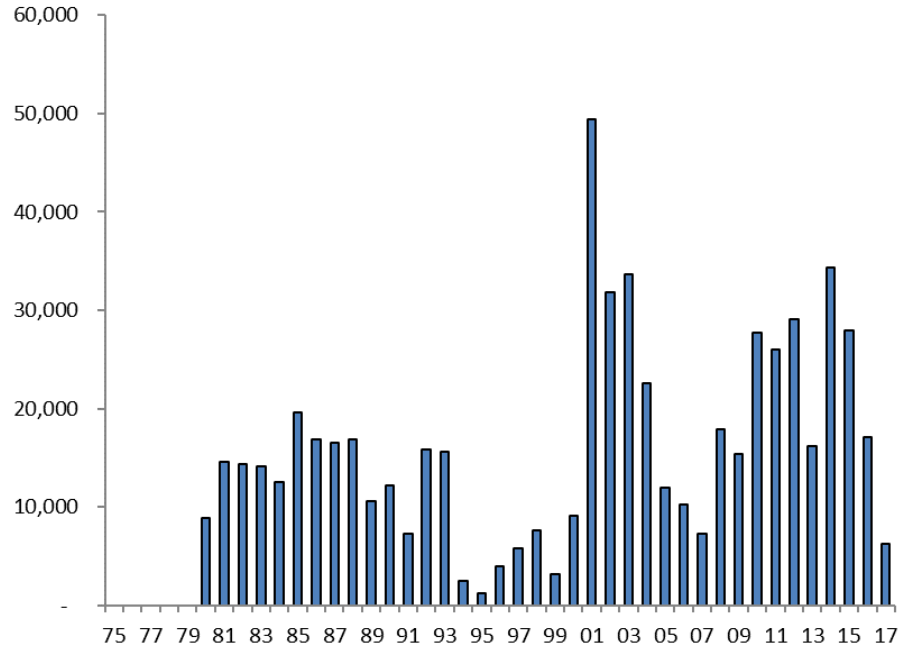


Figure 2.54.– Columbia upriver spring Chinook salmon escapements, 1980–2017.

2.3.4.3.2 Mid-Columbia Summer

Escapement Methodology: The estimated count of adult Chinook salmon passing Rock Island Dam between June 18 and August 17 are graphed in Figure 2.55; these counts include hatchery fish but are more consistent with the model data (hatchery and wild combined) used to develop the interim escapement goal. Rock Island dam counts decreased in 2017 for the second year in a row.

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. A 2008 analysis of actual escapement data resulted in a higher estimate, but the CTC requested the addition of even more years of data, rather than accepting the proposed goal. Therefore, the interim goal remains. The *2018–2027 US v. Oregon Management Agreement* calls for reviewing goals.

Agency Comments: Currently, Columbia Summer Chinook fishery management is based on a "harvest indicator" of 29,000 adults at the river mouth, and on an "abundance indicator" of 20,000 adults at Priest Rapids Dam. This includes subbasin performance measures of 13,500 Wenatchee/Entiat/Chelan natural fish, 3,500 Methow/Okanogan natural fish and 3,000 hatchery fish, although management is not constrained by those. The summer management period is from June 16 to July 31. Catches of Chinook salmon during this period are in accord with a harvest rate schedule that varies based on expected river mouth abundance (2008–2017 *US v. Oregon Management Agreement*, Table A2). Harvest rates vary from 5% to 7% for run sizes up to 16,000, and 15% to 17% for run sizes up to 36,250 (125% of 29,000). Between run sizes of 36,250 and 50,000, harvestable surplus is run size less 29,000, and above that 75% of the additional run becomes harvestable surplus.

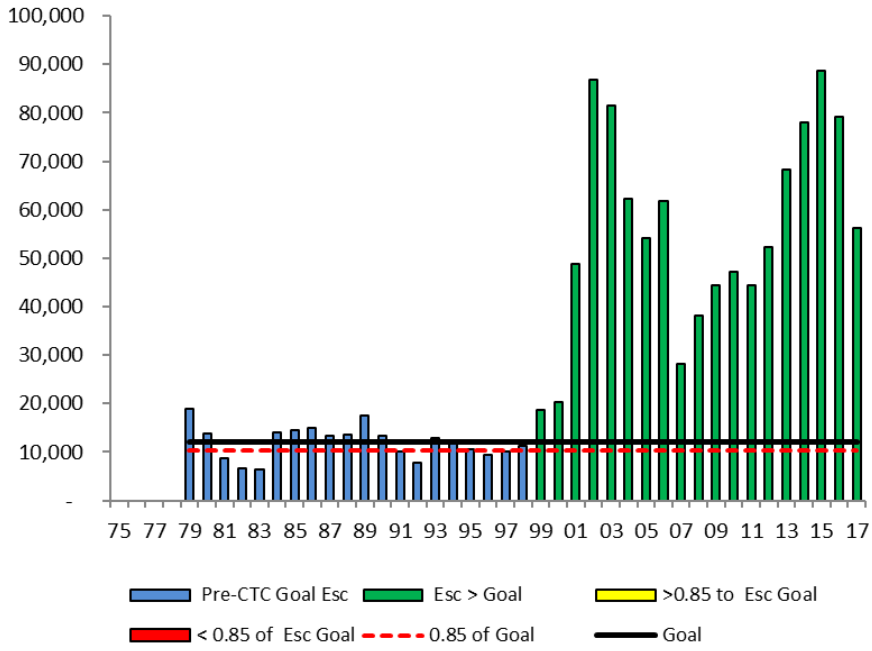


Figure 2.55.–Adult passage of Mid-Columbia Summer Chinook salmon at Rock Island Dam, 1979–2017.

2.3.4.3.3 Coweeman River Tules

The Coweeman River is a third-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 do intensive studies to estimate Chinook escapement (fish > 59 cm) for the entire basin using a variety of methods. These estimates were on average 23% higher than the traditional estimates based on expanding peak fish counts, but study estimates for 2005 and 2007 were nearly double the traditional estimates. MR estimates were done from 2002 to 2004, and in 2011; live-count AUC estimates were done in 2005 and 2006; redd-based escapement estimates were done in 2007 and 2008; and genetic mark–recapture (GMR) estimation was done 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 has been used. A time series of expanded escapement estimates is now available on WDFW's SaSI inventory system. Further details for each year can be found online. The data graphed are total naturally spawning fish (natural and hatchery origin) expanded from redd counts from the mouth of Mulholland Creek (RM 18.4) downstream to the Jeep Club Bridge (RM13.1). Escapement increased in 2017 to nearly twice the 2016 estimate (Figure 2.56).

Escapement Goal Basis: The Coweeman stock has no PSC-agreed goal. It is managed according to an abundance-based exploitation rate ceiling schedule for Lower Columbia River Tule Chinook salmon under ESA fishery consultation standards. The agency 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: Coweeman Tule stock is listed as threatened under the US ESA.

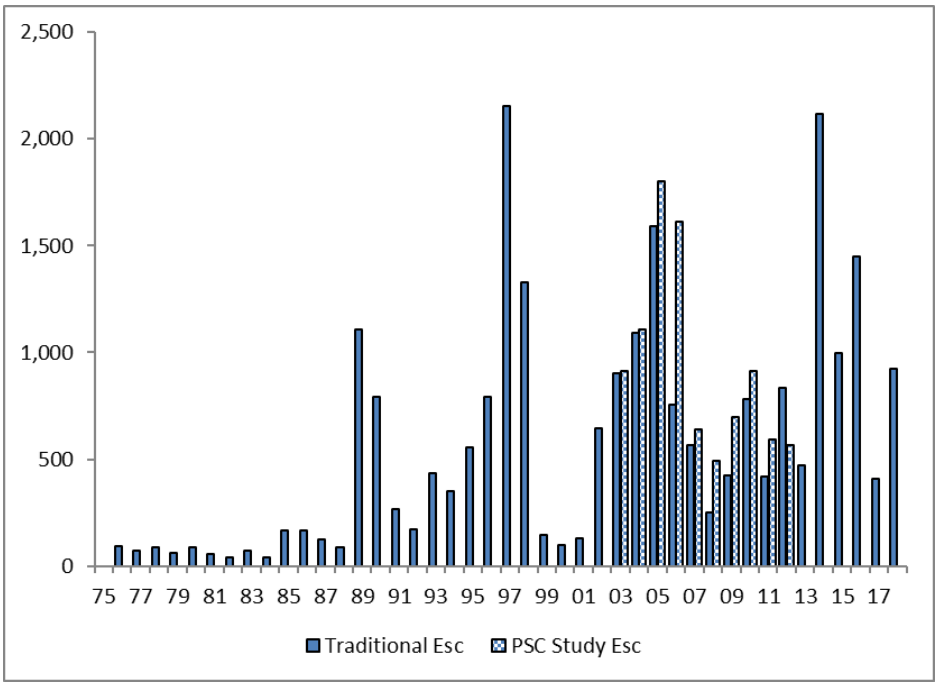


Figure 2.56.–Coweeman River tule fall Chinook salmon escapements, 1975–2017.

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. In this report, the escapements and goal are for the Lewis River component. Peak weekly counts of live and dead fish in the 6.4 km area below Merwin Dam (river km 31.4) are expanded by a factor of 5.29 to estimate total spawning escapement (hatchery and wild). This expansion factor was derived from a carcass tagging and recapture study in 1976 (McIsaac 1990) and was verified by studies from 1999 to 2001. Wild smolt have been coded-wire tagged since 1977. Escapement in 2017 decreased but still exceeded the goal (Figure 2.57).

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 biologically based goal.

Agency Comments: Lewis River escapements have been above the escapement goal since 1979, with the exception of 1999, and 2007–2009.

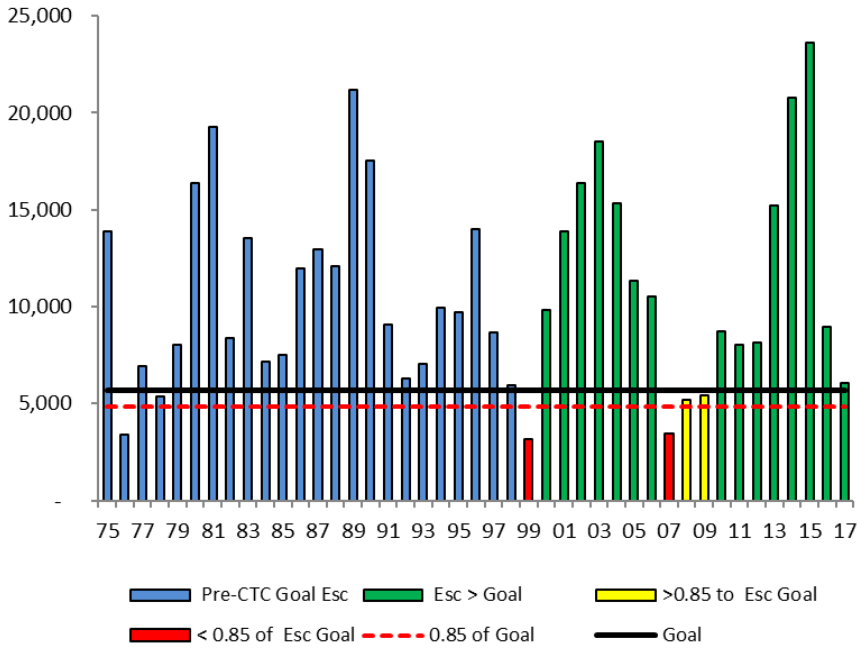


Figure 2.57.–Lewis River fall Chinook salmon escapements, 1975–2017.

2.3.4.3.5 Deschutes River

Escapement Methodology: Escapement estimates are based on MR estimates above Sherars Falls and expanded for redd counts below Sherars Falls. From 2000 to 2007, Confederated Tribes of the Warm Springs Reservation of Oregon did MR studies for the entire river to validate the expansion methodology. For historic years when redd counts were done in index areas rather than censused, the time series was adjusted (Sharma et al., unpub.). The estimated escapement in 2017 decreased substantially but still exceeded the goal (Figure 2.58).

Escapement Goal Basis: A PSC-agreed escapement goal of 4,532 adult fish was derived from the adjusted historical time series (Sharma et al., unpub.).

Agency Comments: Deschutes River fall Chinook salmon escapements have been maintained above goal since 1992. Figure 2.59 compares the whole river MR estimates with the expanded index redd count estimates.

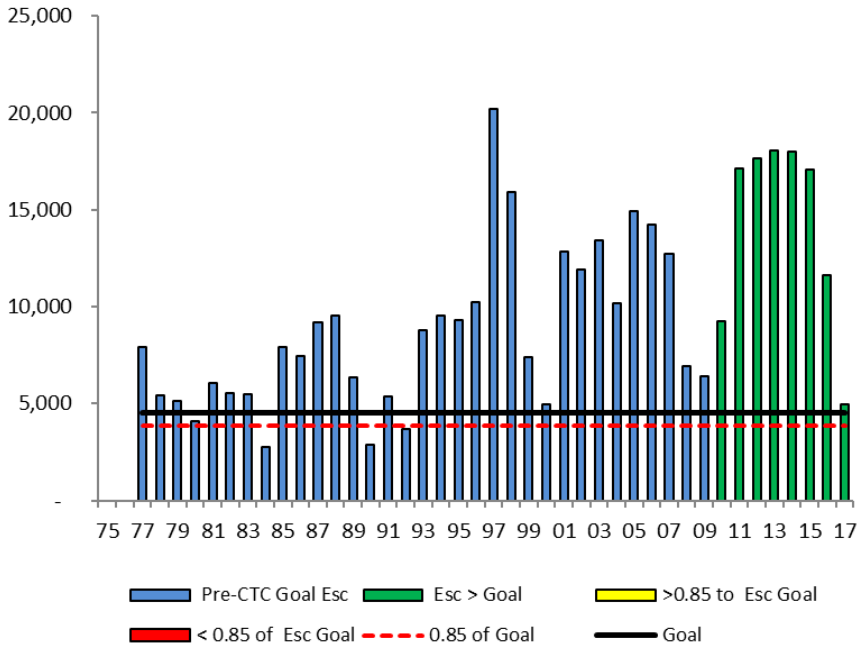


Figure 2.58.–Deschutes River fall Chinook salmon escapements, 1977–2017.

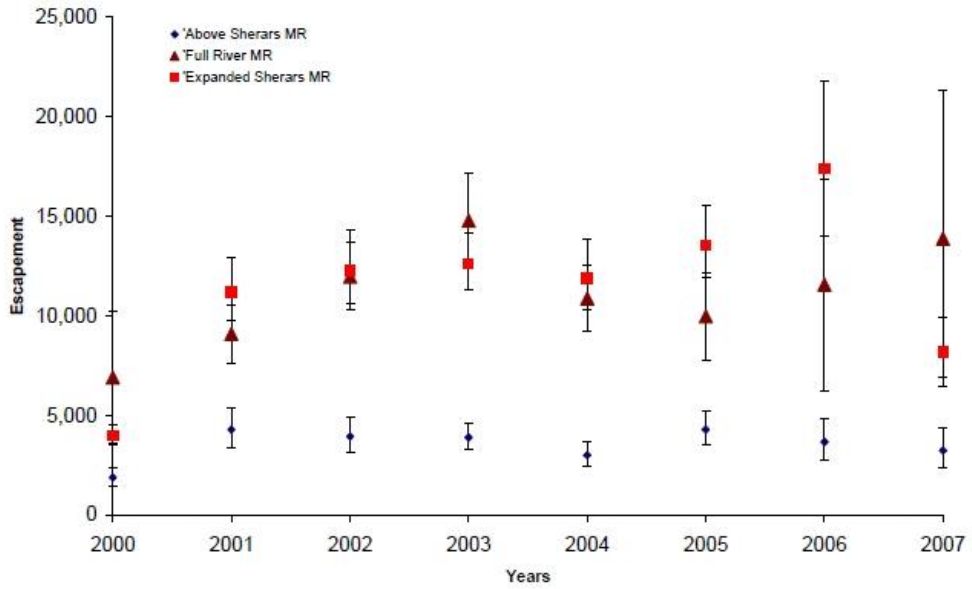


Figure 2.59.–The results of adjusting traditional MR estimates above Sherars Falls using the expansion factor developed from doing MR for the entire river (with 90% CIs).

2.3.4.3.6 Columbia Upriver Brights

Escapement Methodology: CTC escapement estimates are calculated as the McNary Dam count minus Hanford Reach adult sport, Wanapum tribal catches, and broodstock taken by Priest Rapids, Ringold and Snake River hatcheries. The 2017 escapement decreased for the

second year in a row, but is still well above the escapement goal (Figure 2.60).

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

Agency Comments: Under the 2008–2017 *US v. Oregon Management Agreement*, the minimum combined Columbia River and Snake River Upriver Bright management goal at McNary Dam is 60,000 adult fall Chinook salmon, which includes both hatchery and natural production for all areas above McNary Dam. The 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 Chinook salmon fisheries are managed according to a harvest rate schedule ranging from 21.5% to 45%, depending on either (1) the expected river mouth run size of the aggregate fall 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 Columbia Upriver Bright production include the 15% harvest rate limit on commingled ESA listed B-run summer steelhead (>78 cm) for forecast runs of less than 20,000, ESA listed Snake River wild fall Chinook salmon impacts, and of the need for 7,000 broodstock at Spring Creek Hatchery for tule fall Chinook salmon production.

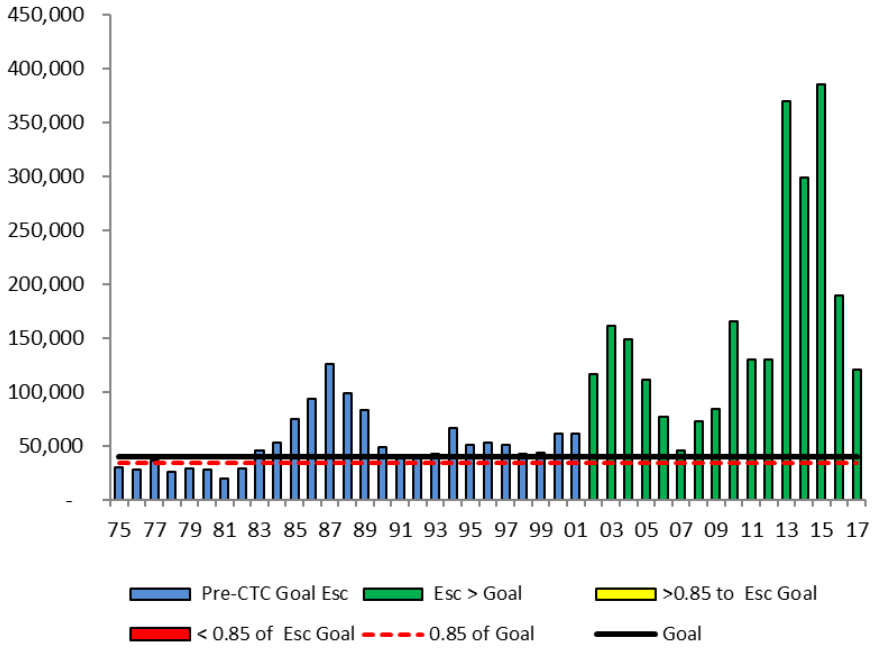


Figure 2.60.– Columbia Upriver Bright Chinook salmon escapements, 1975–2017.

2.3.4.4 Coastal Oregon

2.3.4.4.1 Oregon Coastal North Migrating

The North Oregon Coast (NOC) and Mid-Oregon Coast (MOC) Chinook salmon are aggregates with stocks migrating to northern treaty regions in SEAK and NBC. Currently, only NOC fall Chinook salmon are accounted for in PSC management, while work is underway to include MOC stocks into the PST Chinook model. The NOC Chinook salmon production consists mostly of naturally spawned, fall-returning, ocean-type life history. Adult spawning escapement is dominated by 4- and 5-year-old fish with smaller proportions of 3- and 6-year-old fish. 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.

Stocks in the NOC aggregate are those salmon spawning from the Necanicum 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.

2.3.4.4.1.1 Nehalem River

Escapement Methodology: Both historically conducted surveys and MR based calibrations, which are expanded to represent available habitat (the normative agency methods), were used to estimate escapement in the Nehalem during the 2017 return year. Standard estimates were generated from peak abundance observed during surveys of historically walked standard 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 run encountered during the peak count, and the bias observed between these predefined surveys and other survey areas that were randomly selected. Figure 2.61 represents escapement estimates generated using normative agency methodologies, which are directly comparable to the established escapement goal. Comparison between those standard estimates and MR estimates of adult spawning escapement funded by the PSC indicates that in most years (6 out of 9) standard agency escapement estimates fall within the CIs around the comparable MR point estimates for the Nehalem stock (Figure 2.62).

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 standard survey methodology.

Agency Comments: Methods of escapement estimation comparable to those used to generate the agreed-to escapement goal for the Nehalem indicate a 2017 escapement of 6,473 adult

spawners. This is 93% of the current escapement goal. Based on multiple forecasting models, the Nehalem stock is forecasted not to meet the escapement goal in 2018. ODFW is currently engaged in analysis from recent MR experiments to reconstruct historic estimates from peak survey counts, and to apply those estimates towards an updated escapement goal.

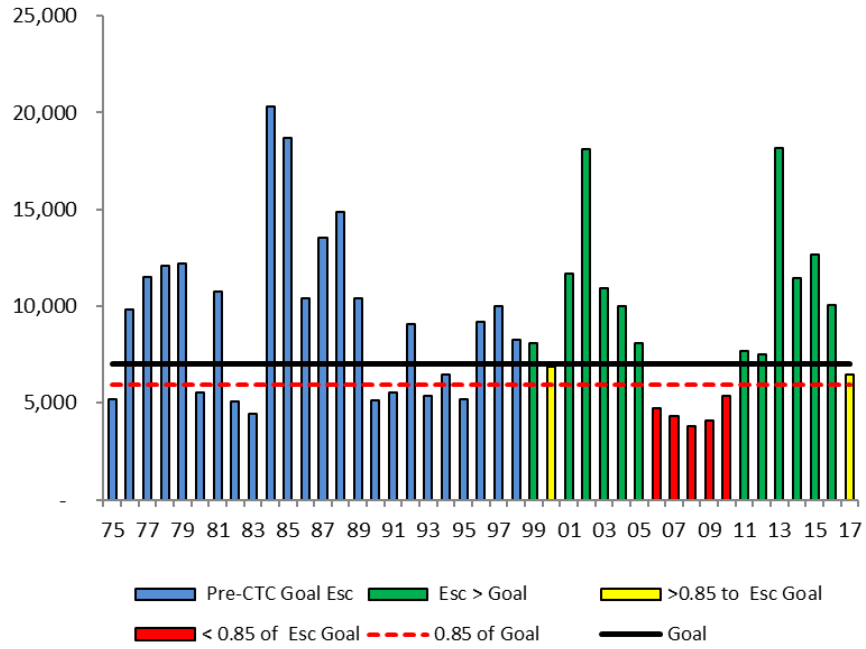


Figure 2.61.–Nehalem River escapements of Chinook salmon, 1975–2017.

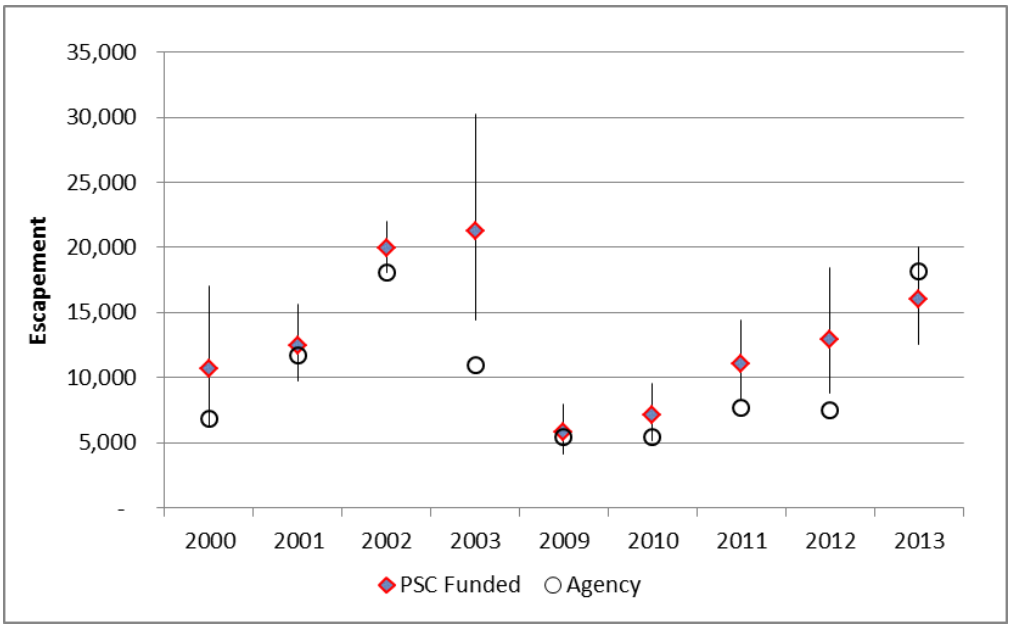


Figure 2.62.–Nehalem River escapements of Chinook salmon in years when both agency historical expanded surveys were used (circles) and when mark–recapture estimates (diamonds are point estimates and the bars are 95% CIs) were conducted with Letter of Agreement or SSP funding from the PST.

2.3.4.4.1.2 Siletz River Fall

Escapement Methodology: Standard 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 run encountered during the peak, and the bias seen between these predefined surveys and other survey areas that are randomly selected. Escapement estimates generated using standard agency methodologies were used to develop the current escapement goal, and are presented for comparison with that goal (Figure 2.63).

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 methodology.

Comparison between standard estimates and estimates from MR studies funded by the PSC reveals that for those MR-based estimates with CVs less than 30%, two standard estimates are within the CI around the MR-based estimate; in 2008 and 2009, the two sets of estimates were nearly identical (Figure 2.64).

Agency Comments: This stock has been studied with funds from the SSP to improve escapement estimation using MR methods. However, traditional methods of escapement estimation remain in place until MR experiment-based estimation and a goal based on MR calibrated surveys is complete. The estimate derived from standard methods was 7,364 fall Chinook salmon (250% of goal) in 2017. Following a period of failing to meet escapement goals between 2007 through 2009, this stock has met its escapement goal each year since 2010. This stock is forecasted to exceed its escapement goal in 2018.

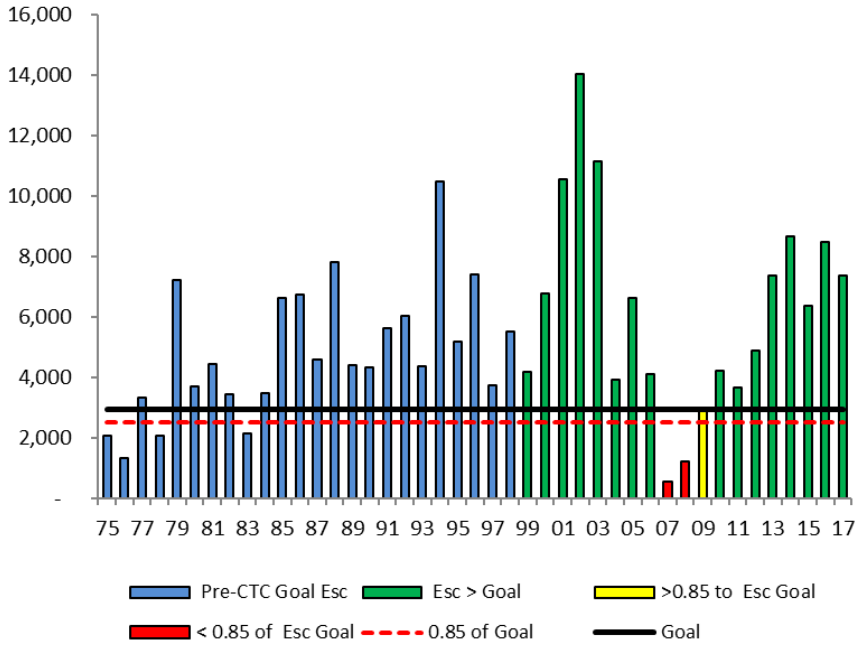


Figure 2.63.–Siletz River fall escapements of Chinook salmon, 1975–2017.

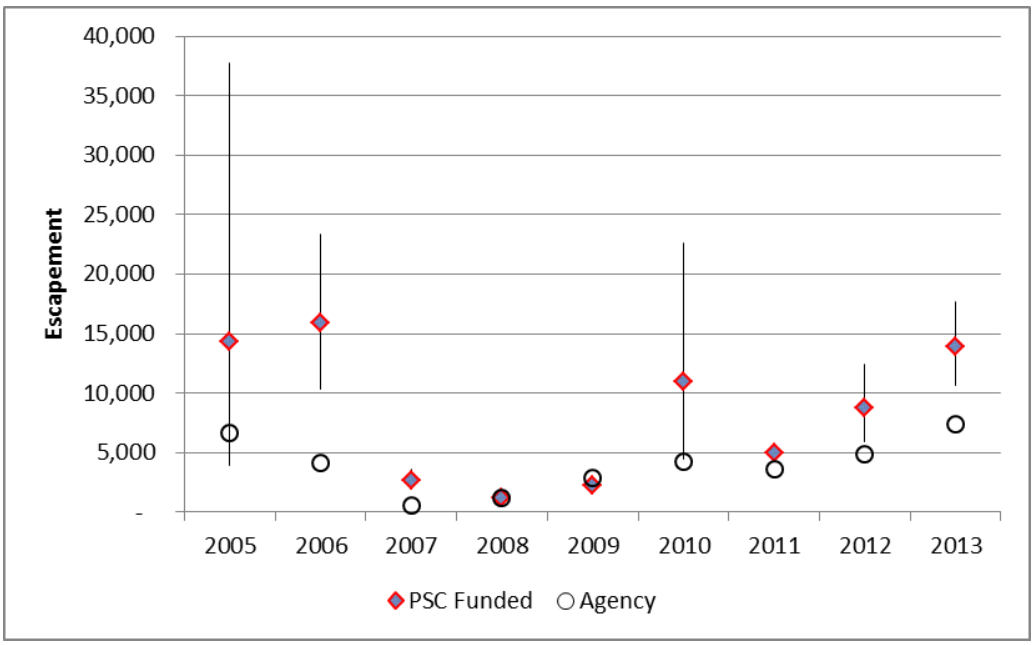


Figure 2.64.–Siletz River escapements of Chinook salmon in years when both agency historical expanded surveys were used (circles) and when mark–recapture estimates (diamonds are point estimates and the bars are 95% CIs) were conducted with Letter of Agreement or SSP funding from the PST.

2.3.4.4.1.3 Siuslaw River Fall

Escapement Methodology: Historically conducted standard surveys and updated estimates based on MR calibration factors were used to measure escapement in the Siuslaw basin during 2016. 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 those that are randomly selected. These standard estimates were used to derive the current escapement goal, and are used for comparison with that goal (Figure 2.65). Comparison of the standard agency escapement estimates with PSC-funded MR estimates reveals a clear pattern with the standard estimates being consistently higher that the MR estimates (Figure 2.66). This bias in the agency based estimate will need to be addressed in upcoming revisions of the escapement goal for the Siuslaw River.

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 methodology.

Agency Comments: Escapement in 2017 for the Siuslaw stock, estimated based on standard habitat expansion methods, was 10,597 adult spawners (85% of the escapement goal). MR based calibration factor estimates for this return year produced an estimate of 7,433 adult spawners. The current escapement goal estimate was based on the standard escapement estimates, similar to other basins on the Oregon coast. Ultimately, a new goal should be

developed from a calibrated historical data series. This stock is not forecast to meet the current escapement goal in 2018.

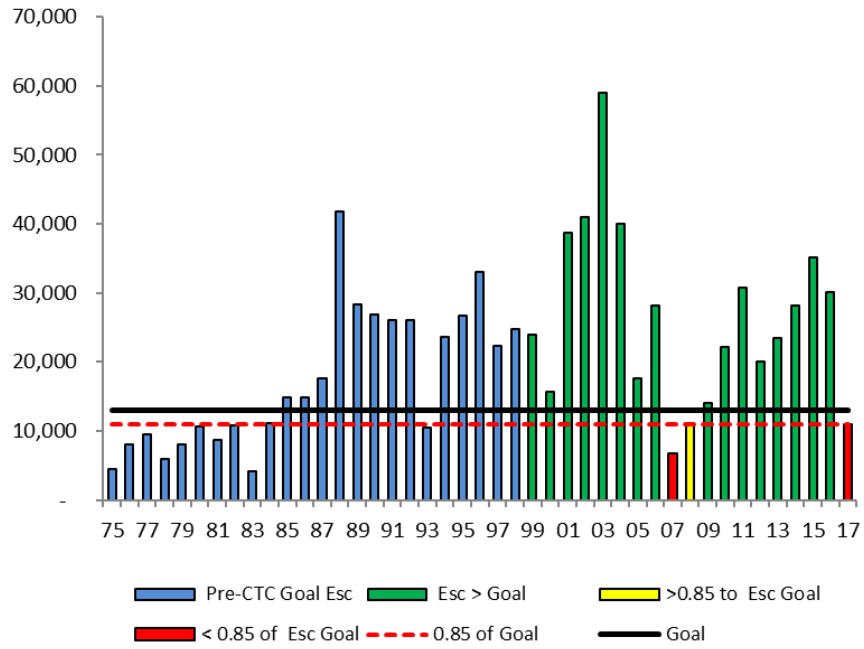


Figure 2.65.–Siuslaw River fall escapements of Chinook salmon, 1975–2017.

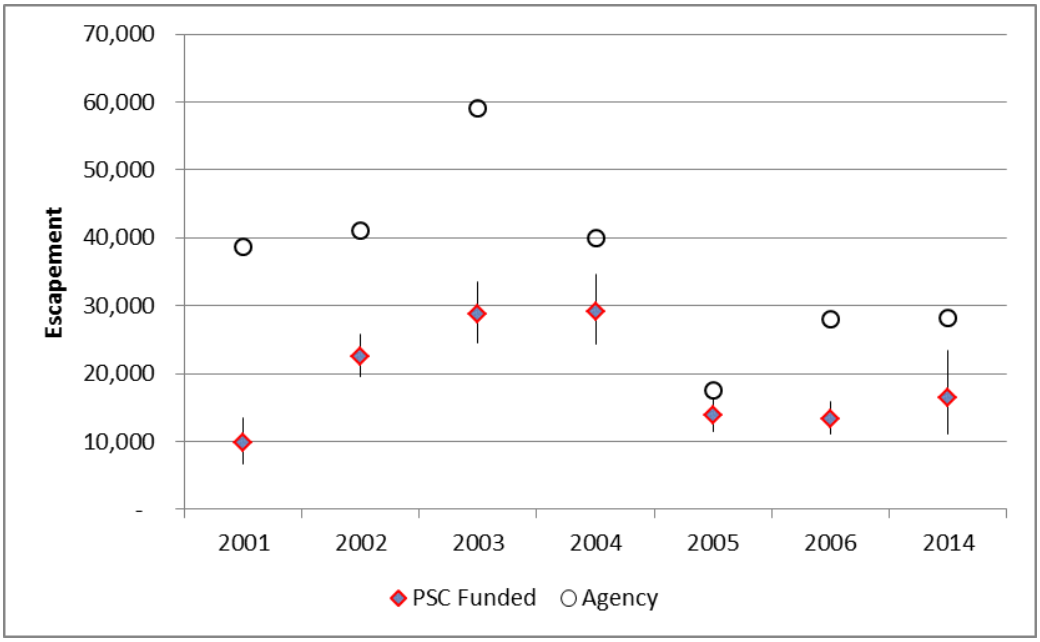


Figure 2.66.–Siuslaw River escapements of Chinook salmon in years when both agency historical expanded surveys were used (circles) and when mark–recapture estimates (diamonds are point estimates and the bars are 95% CIs) were conducted with Letter of Agreement funding from the PST.

2.3.4.4.2 Mid-Oregon Coast

The South Umpqua and the Coquille stocks are two proposed MOC escapement indicator stocks for inclusion in PSC management. This area is bounded by the Umpqua River on the north and the Elk River Basin on 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, both of which return in the fall and follow an ocean-type life history. The largest age class proportions which normally contribute to spawning escapement are 4- and 5-year-old fish with smaller proportions of 3- and 6-year-old fish. These Chinook salmon are caught primarily in SEAK, NBC, PFMC fisheries and in terminal fisheries.

Forecasts for MOC stocks, except for the Elk River stock, are based on sibling regression relationships developed for each discrete population in 2008 and updated with each year's additional information. 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: Aerial spawning surveys for fall Chinook salmon had been conducted by the ODFW on both the South Umpqua River and Cow Creek since 1978; the 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 caused a change in methodology. The change in methods involves a visual index of abundance that serves as an alternative to aerial survey counts. The visual index includes a sum of dead count from two spawning ground surveys within the South Umpqua drainage. Results from a calibration assessment of dead Chinook salmon to MR estimates indicated a strong correlation from two reaches in the basin. 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 2.67 shows South Umpqua River escapement of fall Chinook salmon, 1978–2017.

Escapement Goal Basis: ODFW is currently engaged in analysis which will produce an escapement goal for this stock.

Agency Comments: Recoveries of CWTs from fall run Chinook salmon from the Umpqua River indicate that they are caught in PST fisheries. Budget constraints precluded the field work required for 2016 estimates. Funding for the sampling required to provide for an estimate in 2017 was secured, and the agency was able to reinstitute the sampling programs required to generate an estimate for the 2017 return year. The 2017 escapement estimate is 5,514 Chinook salmon, which is below the long term average.

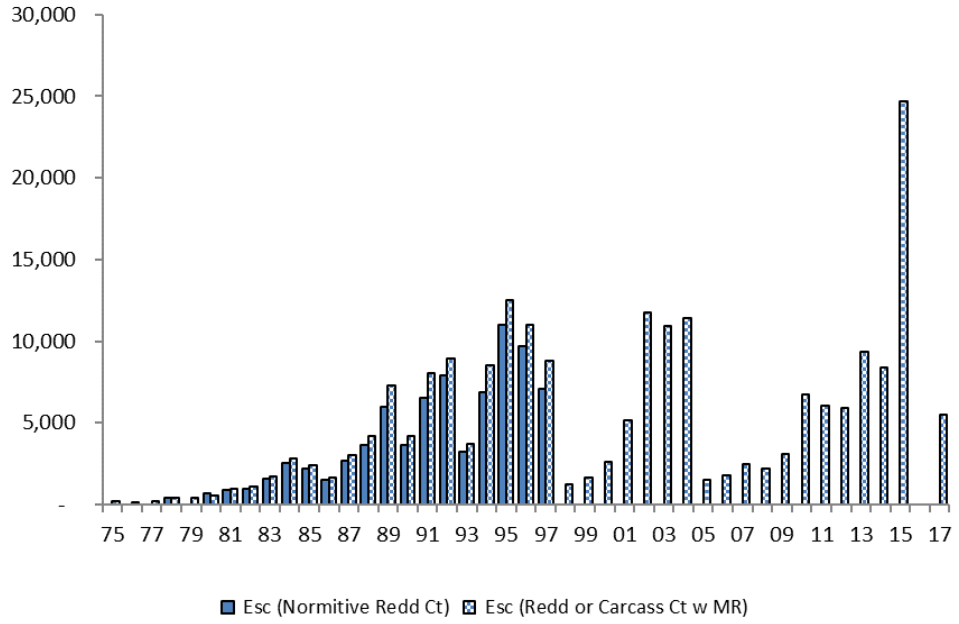


Figure 2.67.–South Umpqua River escapement of fall Chinook salmon, 1978–2017.

2.3.4.4.2.2 Coquille River Fall

Escapement Methodology: Both MR based calibration factors (Figure 2.68 and historically conducted surveys were used to measure escapement in 2017. Standard survey methods are identical to those described in the Siuslaw, Siletz and Nehalem basins. Values presented in Figure 2.68 are based on standard habitat survey estimations along with values calibrated to MR estimates. Both standard and MR calibrated estimates may be found in the appendix tables (Appendix Table B12).

Escapement Goal Basis: ODFW is currently engaged in analysis which will produce an escapement goal for this stock.

Agency Comments: Methods based on MR-calibrated analysis yield an adult Chinook salmon escapement estimate of 6,470 for Coquille Basin spawners in 2017. The traditional habitat expansion-based estimate is 4,693 fish. Both estimates are comparable to that downturn experienced by this stock and other Oregon coastal stocks back in 2007.

Improvements in applying those calibrated values towards the estimation of this and other Oregon Coastal stocks are currently being reviewed and discussed within the agency. It is anticipated that historical time series for each of the basins which have MR calibration studies (Nehalem, Nestucca, Siletz, Siuslaw, South Umpqua, Coos and Coquille rivers) will be updated in a subsequent reporting cycle.

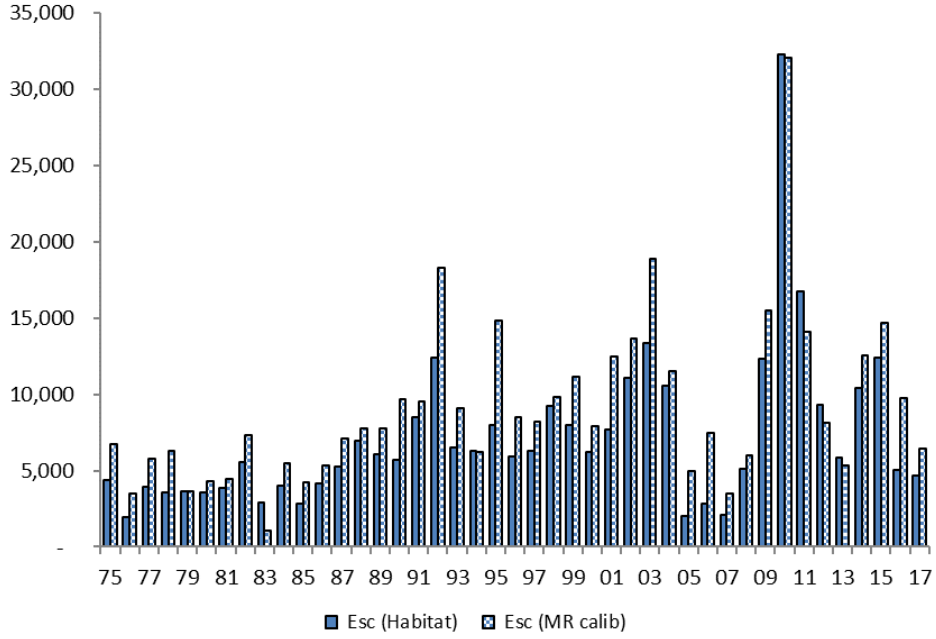


Figure 2.68.–Coquille River escapement of fall Chinook salmon, 1975–2017.

3. STOCK STATUS

3.1 SYNOPTIC EVALUATION OF STOCK STATUS

The following sections include graphics to display stock status information with spawning escapement on one axis and exploitation rate on the other. These synoptic plots display summary information for individual escapement indicator stocks. The figures present both the current status of stocks and the history of the stocks relative to PST management objectives. Information used in these figures includes (1) escapement data; (2) PSC-agreed MSY management objectives (or, in some cases, habitat model or agency stock–recruitment-based escapement objectives that have yet to be submitted to the CTC or agreed upon by the CTC); and (3) exploitation rates from related CWT indicator stocks to clearly summarize the performance of the stocks and fisheries management relative to established or potential goals.

The plots resemble those presented for groundfish in Garcia and De Leiva Moreno (2005). A general depiction of the plots with three reference lines is provided in Figure 3.1. The plots show the annual observations of a stock with regard to fishing rate (x-axis) and escapement abundance (y-axis) from one year to the next. There are three reference lines, one for fishing mortality (U_{MSY}) and two for escapement abundance (S_{MSY}, $0.85*S_{MSY}$) that define five zones on the plots. The definition of reference points for PST Chinook salmon stocks is based on the management objectives (escapement and exploitation rate) identified in the 2009 Agreement. The lower reference line for escapement on the synoptic plots is set at $0.85*S_{MSY}$ due to language in Paragraph 13 of the 2009 Agreement. For stocks with escapement objectives defined as ranges (SEAK, TBR, and the Harrison River), the lower reference line has been defined as 85% of the lower bound of the escapement range and the upper reference line has been set as the lower bound of the escapement range. The exploitation rate reference line (U_{SMSY}) is the exploitation rate at S_{MSY} for stocks with escapement objectives.

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 concurrent stock spawning abundance is above the escapement goal. The area of high risk (High Risk) is shaded red, and represents an area fishing mortality is above U_{MSY} and escapement abundance is below the escapement goal. The two yellow zones (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 region is the PSC buffer zone.

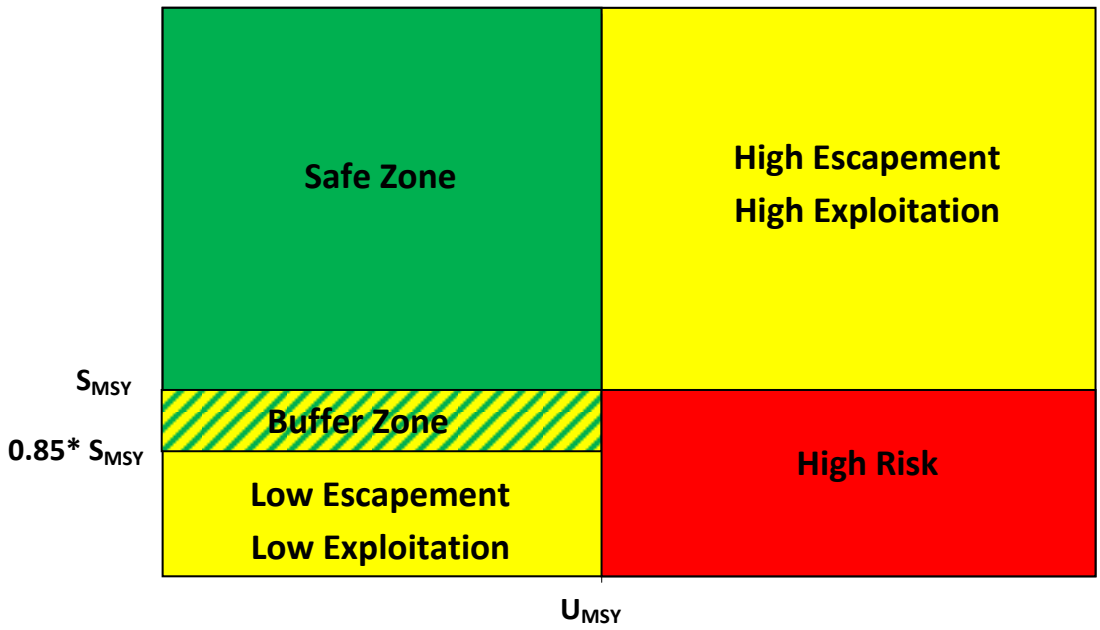


Figure 3.1–Precautionary plot for synoptic evaluations of PST Chinook salmon stocks.

Exploitation rates used in the synoptic plots are one of the following: CY exploitation rates, preterminal cumulative mature-run equivalent (MRE) exploitation rates, or total (preterminal and terminal) cumulative MRE exploitation rates. Total cumulative MRE exploitation rates cannot be used when there is a terminal fishery that is directed on the hatchery indicator stock because the terminal exploitation will differ from that on the wild stock being represented. The ages used in the escapement and exploitation rate calculations are not the same for each stock presented in the synoptic charts below, and typically exclude age 2 for ocean-type stocks and age 3 for stream-type stocks. See Table 3.1 for parameter definitions.

Calendar year exploitation rates are computed as

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

Cumulative MRE exploitation rates are computed as

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

where

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

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

and

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

When computing total (preterminal and terminal) MRE exploitation rates, the cumulative survival rate is computed for each age in a brood year as

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

When computing preterminal MRE exploitation rates the cumulative survival rate is computed for each age in a brood year as

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

The preterminal harvest rates for each age in a brood year are computed as

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

The preterminal survival rates for each age in a brood year are computed as

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

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

Parameter	Description
$a =$	age
$BY =$	Brood year
$CY =$	Calendar year
$CMREER_{CY} =$	Cumulative MRE 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*
$OceanMorts_{BY,a} =$	Ocean mortalities for brood year *BY* and age *a*
$OESC_{CY} =$	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*
$TermMorts_{CY} =$	Terminal mortalities for calendar year *CY*
$TermSurvRte_{BY,a} =$	Terminal survival rate for brood year *BY* and age *a*

Data necessary to plot the stock trajectories are available for most escapement indicator stocks (Table 3.2). Most escapement indicator stocks have companion exploitation rate indicator stocks that are assumed capable of reflecting the exploitation rates in pre-terminal areas. Exploitation rate data may not be available for some stocks in the period 1975–84 with those plots showing a different start year in the figure legend. With suitable assumptions about terminal area fisheries, the total exploitation rates on stocks can be estimated. Most areas along the coast have escapement indicator stocks. Notable exceptions are the UGS area, the WCVI area and the Fraser River early stocks (spring and summer). For UGS, the CTC in the past has reported escapement for an aggregate. The Fraser early stock consists of additional complexities for escapement indicator stocks, which are delineated on the basis of life history, and the stocks listed in Attachments I, II, and IV, which are based on geography. Region-specific synoptic evaluations of Chinook salmon stocks are presented in Section 3.2.

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

Region[1]	Escapement Indicator	S_{MSY}	85% of S_{MSY}[2]	Exploitation Rate Indicator	U_{MSY}	Type of Exp. Rate[3]
SEAK	Situk	600	425	Situk wild	0.81	CY
SEAK	Chilkat	2,200	1,488	Chilkat wild	0.40	CY
SEAK	Unuk	2,764	1,530	Unuk wild	0.60	CY
SEAK	Chickamin	2,494	1,828	Alaska Hatchery (Neets, Whitman, Deer) and Unuk wild	0.72	CMRE
TBR	Alsek	4,677	2,975	Alsek wild	0.58	CY
TBR	Taku	25,500	16,150	Taku wild	0.59	CY
TBR	Stikine	17,400	11,900	Stikine wild	0.42	CY
BC	Harrison	75,072	63,811	Chilliwack	0.57	CMRE
BC	Cowichan	6,514	5,537	Cowichan	0.69	CMRE
BC	Kitsumkalum	8,621	7,328	Kitsumkalum	0.61	CMRE
BC	Atnarko	5,009	4,258	Atnarko	0.77	CMRE
BC	Nicola	8,337	7,086	Nicola	0.59	CMRE
BC	Lower Shuswap	12,339	10,488	Lower Shuswap	0.73	CMRE
COLR	Columbia Upriver Summer	12,143	10,322	Columbia Summers	0.75	CMRE
COLR	Columbia Upriver Brights	40,000	34,000	Upriver Brights	0.56	CMRE
COLR	Deschutes River Fall	4,532	3,852	Lewis River Wild	0.79	CMRE
COLR	Lewis River Fall	5,791	4,922	Lewis River Wild	0.79	CMRE
WAC	Quillayute Fall	3,000	2,550	NA		NA
WAC	Queets Spring/Summer	700	595	NA		NA
WAC	Queets Fall	3,000	2,550	Queets Fall Fingerlings	0.74	CMRE
WAC	Hoh Spring/Summer	900	765	NA		NA
WAC	Hoh Fall	1,200	1,020	NA		NA
ORC	Nehalem	6,989	5,941	Salmon River	0.69	CMRE
ORC	Siletz	2,944	2,502	Salmon River	0.81	CMRE
ORC	Siuslaw	12,925	10,986	Salmon River	0.61	CMRE

[1] See List of Acronyms for definitions.

[2] Stocks with an escapement goal range use 85% of the lower bound.

[3] Two types of exploitation rates were used: cumulative mature-run equivalents (CMRE) and calendar year (CY) which are based off of actual stock assessment data gathered annually for each stock.

A synoptic summary figure for 23 stocks with 2016 data shows that the majority of stocks were in the safe zone (exploitation below U_{MSY} and escapement above S_{MSY}; Figure 3.2). No stocks were in the high-risk zone, two stocks (Situk and Nicola) were in the low escapement and low exploitation zone and no stocks were in the buffer zone. One stock, Cowichan, experienced exploitation above U_{MSY} but the escapement exceeded S_{MSY}. Ten stocks were in the low escapement and low exploitation zone: Alsek, Chickamin, Chilkat, Nicola, Shuswap, Harrison, Situk, Stikine, Taku and Unuk. In general, Columbia River and WA/OR Coast stocks showed a higher escapement to S_{MSY} index than the other regions.

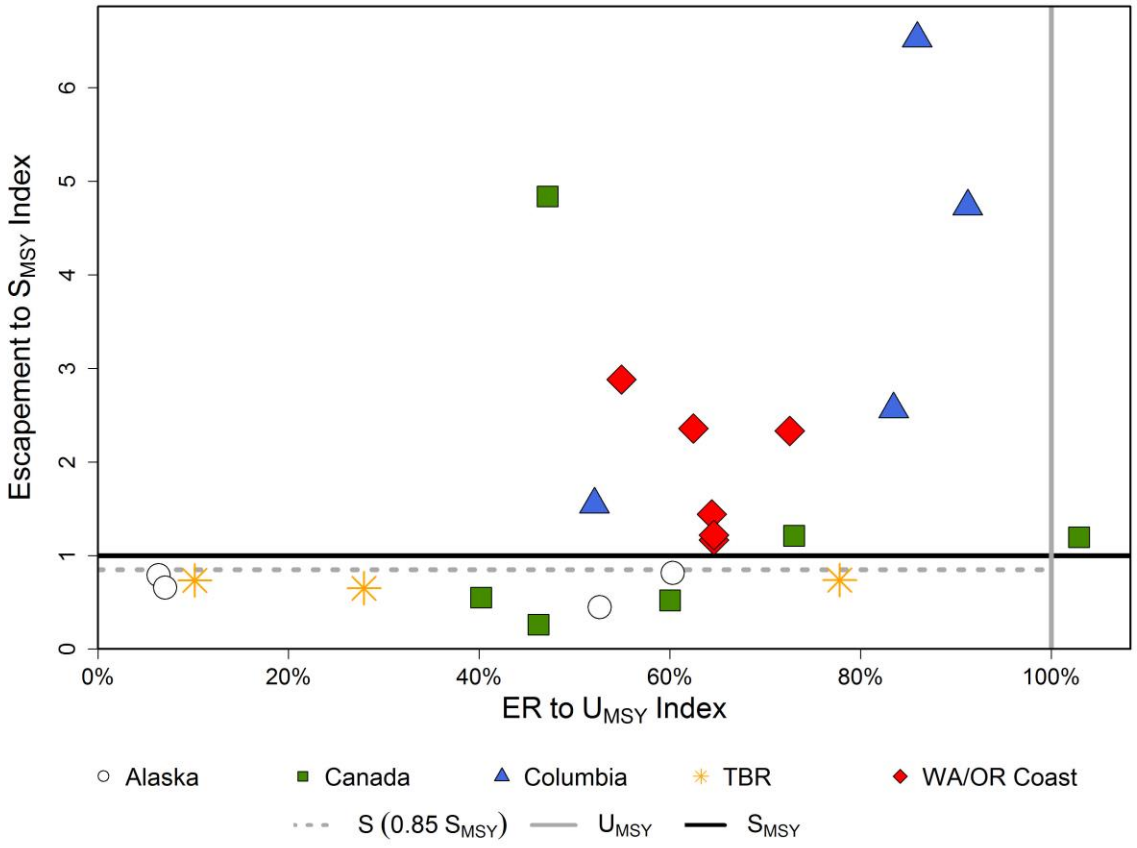


Figure 3.2–A synoptic summary by region of stock status for stocks with escapement and exploitation rate data in 2016.

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, Unuk, and Chickamin Rivers

Recent declines in Chinook salmon productivity and abundance are widespread and persistent throughout Alaska. Available run abundance data indicate significant 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 21 stocks in Alaska show substantial variability and moderate to no coherence among stocks prior to 2004 (Figure 3.3). This is consistent with downward trends in productivity and similar declines of SEAK Chinook salmon stocks.

The SEAK stocks have two main rearing behaviors that are consistent and predictable. 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 a significant amount of time. Outside-rearing stocks include the Situk River stock, and the transboundary Alsek, Taku, and Stikine stocks; the majority of these fish strictly adhere to this behavior. Inside-rearing stocks include the Chilkat, Unuk, and Chickamin stocks, and although the vast majority rear in the nearshore environment, CWT recovery data suggests at least a small proportion of these fish exhibit outside-rearing behavior. Productivity has decreased for both outside- and inside-rearing stocks; the decline is far reaching, extends beyond SEAK, and has affected most Alaska Chinook stocks.

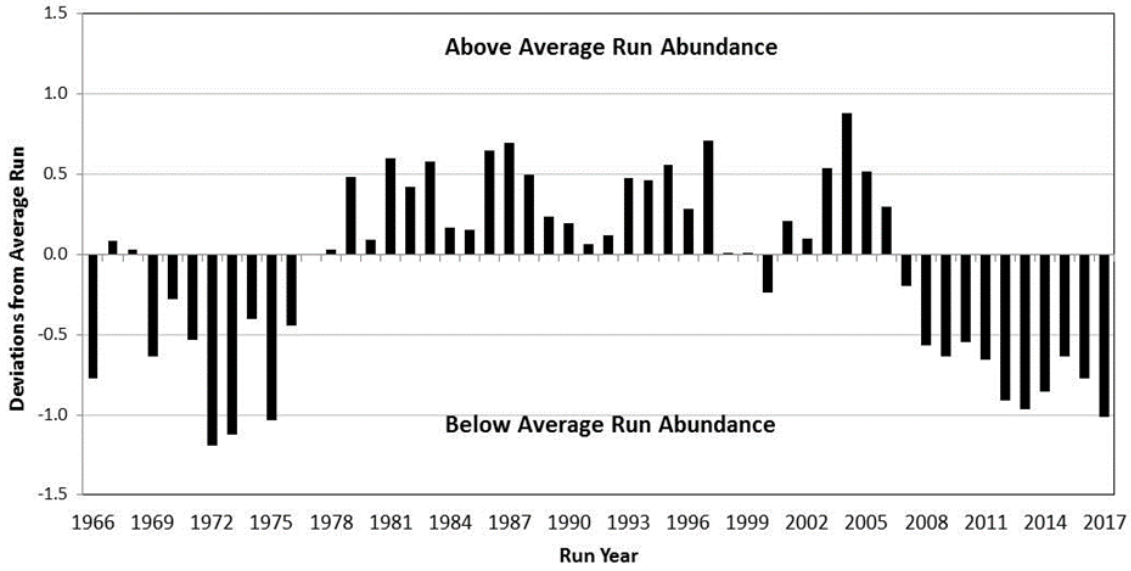


Figure 3.3–Average of standardized deviations from average run abundance for 21 stocks of Chinook salmon in Alaska (the Unalakleet, Nushagak, Goodnews and Kuskokwim in western Alaska; the Chena and Salcha on the Yukon River; the Canadian Yukon, the Chignik and Nelson on the Alaska Peninsula; the Karluk and Ayakulik on Kodiak Island; the Deshka, Anchor and late run Kenai in Cook Inlet, the Copper in the northeastern Gulf of Alaska, and the Situk, Alsek, Chilkat, Taku, Stikine, and Unuk in Southeastern Alaska).

The Situk River stock has failed to meet the escapement goal six times since 2009. Over the recent decade, this stock has demonstrated the poorest performance among the four SEAK escapement indicator stocks. It is unlikely that this failure is attributable to fishery impacts that are among the lowest in the region. Because harvests are mostly inriver or in the estuary, detailed catch accounting programs enumerate the majority of the harvest, yielding CY estimates of exploitation. Because this stock is outside rearing, it is not exposed to SEAK harvest before maturation. Calendar year exploitation rates for the Situk River stock have never exceeded the U_{MSY} threshold of 81%. During the recent ten years of poor escapements, Situk River exploitation rates have averaged 20%, including a low of 3% in 2011, when estimated escapement was less than half (48%) of the goal, and in 2017, when estimated escapement exceeded the upper bound of the goal range (Figure 3.4). Generally, poor runs and escapement result primarily from decreased productivity, and mirror the very low productivity of other Alaska stocks that rear in the Gulf of Alaska and Bering Sea. Conservation measures have been in place to reduce harvests and increase escapement, which will continue in 2018.

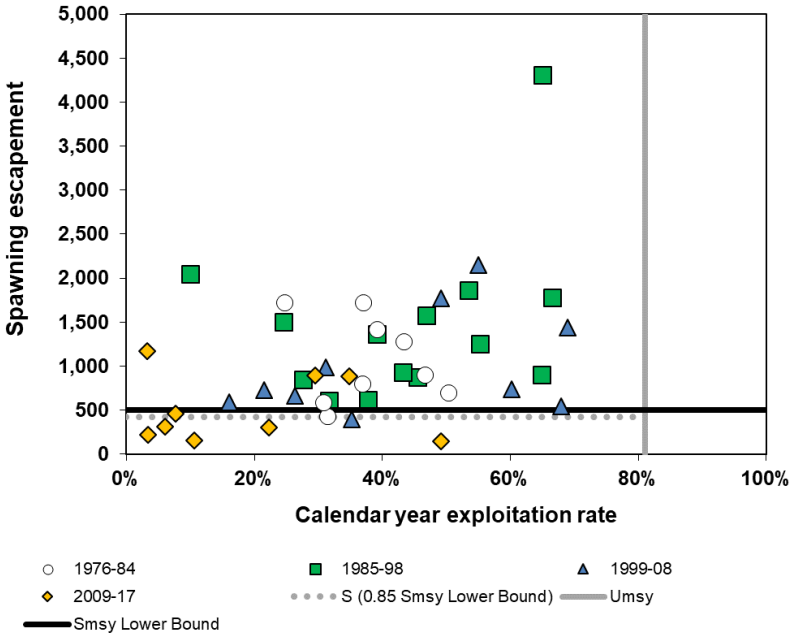


Figure 3.4–Calendar year exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement for ≥ocean age-2 Situk River Chinook salmon, 1976–2017.

Chilkat River Chinook salmon return to northern SEAK and are mostly inside rearing. The Chilkat River stock failed to achieve its escapement goal five times since 2009. The Chilkat River is located at the northern end of Lynn Canal; gillnet and sport fisheries in the region are managed to conserve this stock.

A CWT program is in place to estimate harvest of Chilkat River Chinook salmon. Recoveries of CWTs indicate some age-4 Chilkat River fish are harvested while rearing in SEAK, primarily in net fisheries. The majority of harvest is of mature fish from sport, commercial troll, and drift gillnet fisheries in SEAK. In general, exploitation rates on the Chilkat River stock are some of the lowest

observed in the region, with a recent 10-year average exploitation rate of 15%, well below the threshold reference value of 40% (Figure 3.5).

Smolt abundance and survival have been estimated for the Chilkat River 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 broods (Figure 3.6). Below average marine survival has negatively affected abundance; continued low exploitation rates are needed to achieve the escapement goal until productivity improves.

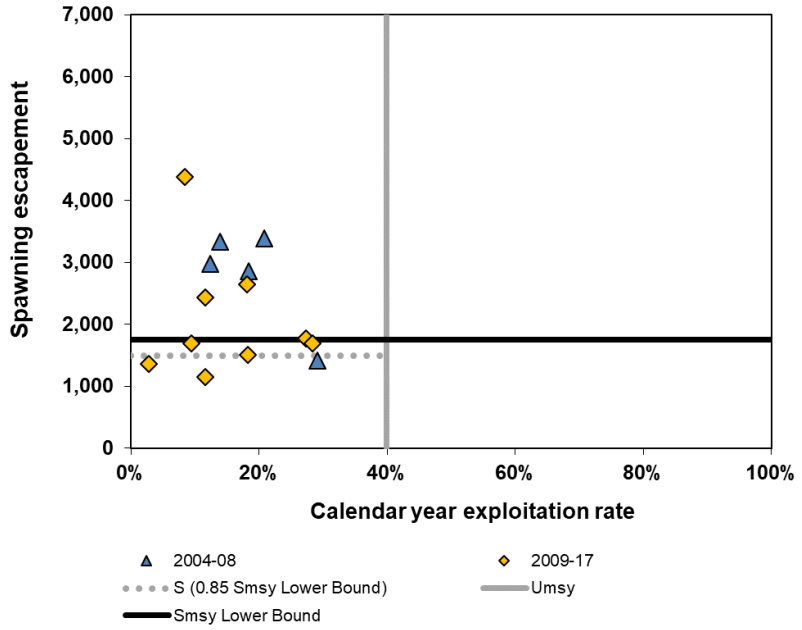


Figure 3.5–Calendar Year exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement for ≥ocean age-3 Chilkat River Chinook salmon, 2004–2017.

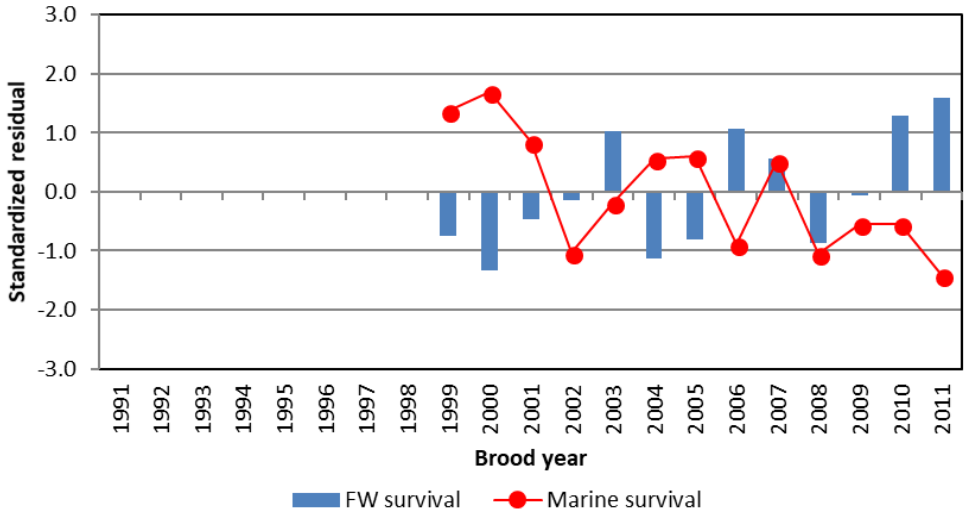


Figure 3.6–Freshwater and marine survival indices (standardized to a mean of zero) for the Chilkat River stock of Chinook salmon, 1999–2011 brood years.

The Unuk and Chickamin rivers flow into Behm Canal in southern SEAK and Chinook salmon from these rivers are mostly inside-rearing. Escapements to the Unuk River were below the escapement goal from 2012 to 2014, and again in 2016 and 2017. Escapements to the Chickamin River also failed to reach the escapement goal in 2014 and 2016-2017. For the Unuk River, these were the only occasions when the escapement goal was missed in the past 40 years; for the Chickamin River these were the only three years in over a decade that the goal was not attained. There are no Chinook salmon fisheries in these rivers or in most marine waters of the adjacent Behm Canal. Most southern SEAK stocks are harvested at relatively low rates while rearing and maturing, and they are not harvested in terminal areas due to management closures. Although Chinook salmon that return to the Unuk River are similar in size at age to other northern SEAK stocks, size at age for Chickamin River Chinook salmon is considerably larger and thus these fish are recruited into sport and troll fisheries as legal sized fish at younger ages.

A CWT program is in place to estimate harvest for the Unuk River stock. In sharp contrast to other SEAK stocks, the Unuk River exploitation rates have been high in recent years. Some Unuk River Chinook salmon are caught while rearing in SEAK but most harvest is of mature fish. Exploitation rates on this stock have averaged about one-half the threshold reference value but during the recent period of poor production, rates have been the highest on record, including an over the U_{MSY} threshold exploitation rate of 72% 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.

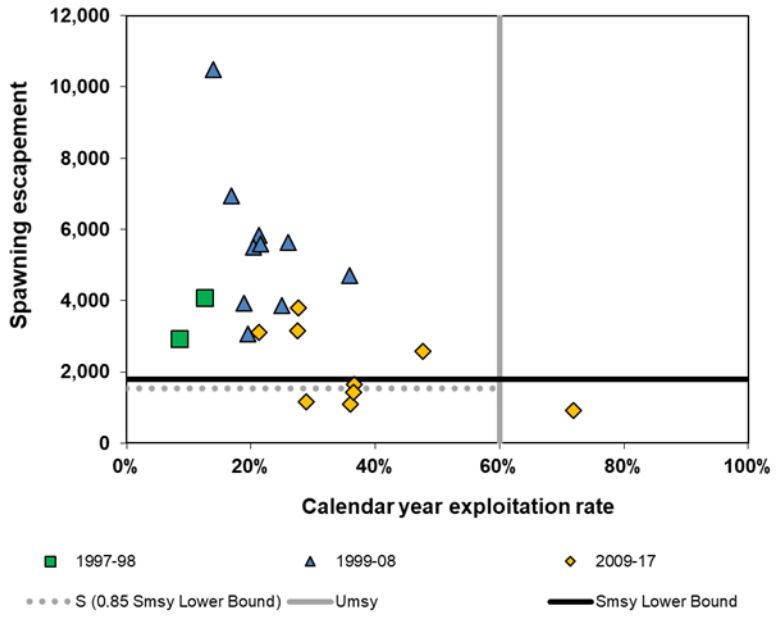


Figure 3.7–Calendar Year exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement for ≥ocean age-3 Unuk River Chinook salmon, 1997–2017.

Smolt abundance and survival have been estimated for the Unuk River stock since 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, like the Chilkat River stock, the 2006 brood year showed the best freshwater survival observed since the project began. Unfortunately, the high freshwater survival for the 2006 brood year coincided with the lowest marine survival, and the highest marine survival for the 2005 brood year coincided with the lowest freshwater survival. Marine survival was near-average and cycled annually over the 1991–2005 brood years. However, the 2006–2009 brood years exhibited some of the lowest marine survivals over the range of data (Figure 3.8).

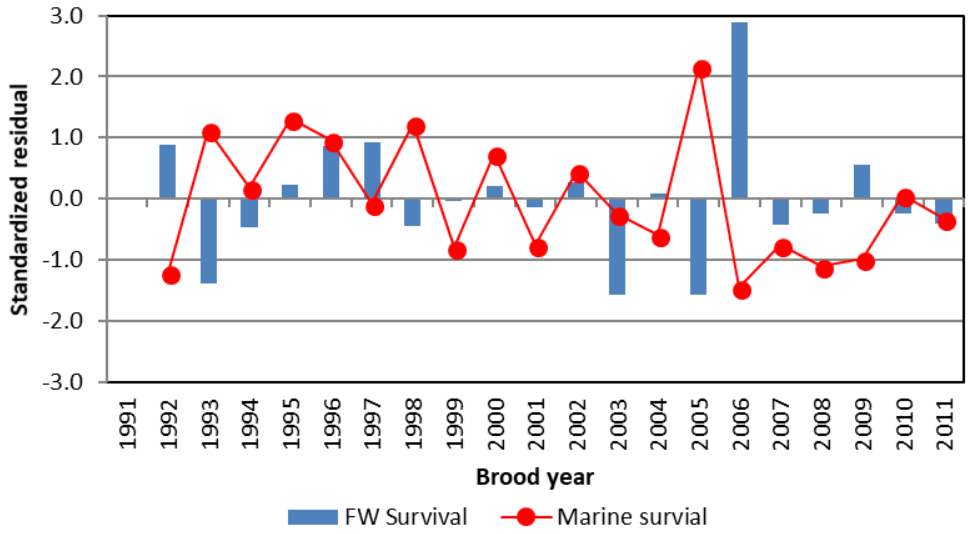


Figure 3.8–Freshwater and marine survival indices (standardized to a mean of zero) for the Unuk River stock of Chinook salmon, 1992–2011 brood years.

There is no CWT program for the Chickamin River. MRE exploitation rates from the nearby Neets Bay and Whitman Lake hatcheries are used as surrogate values, after discounting terminal hatchery harvests. These hatcheries use the Chickamin River stock as a brood source and fish produced in these hatcheries are available to harvest both as rearing and mature fish in SEAK. Due to the larger size of Chickamin River Chinook salmon, the majority of ocean-age-2 Chickamin fish exceed the 28-inch legal length for harvest and they recruit to sport and troll fisheries up to a year earlier than the nearby Unuk River stock. Despite this early recruitment, the Chickamin River stock has displayed relatively low exploitation rates, has never exceeded the threshold reference line, and has averaged less than one-half the threshold reference value (Figure 3.9).

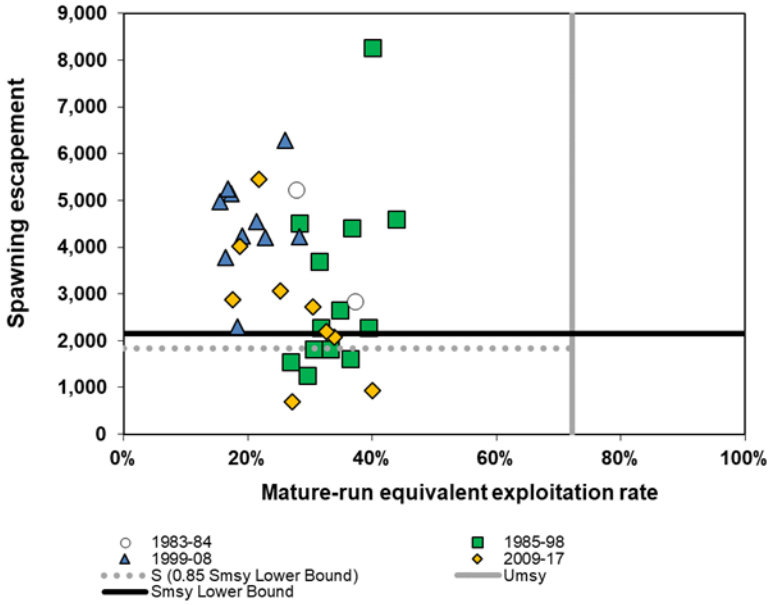


Figure 3.9–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement for ≥ocean age-2 Chickamin River Chinook salmon, 1983–2017.

3.2.2 Transboundary Rivers: Alsek, Taku, and Stikine Rivers

The Alsek River stock has failed to achieve the escapement goal four times since 2009, and of the three TBR stocks, the Alsek River stock has missed the escapement goal most frequently. It is unlikely that this failure can be explained by over-harvest, as the Alsek River stock has one of the lowest exploitation rates among the CTC escapement indicator stocks, averaging 7% between 1976 and 2017. Harvests occur inriver in the U.S. and Canada. Detailed catch accounting and age, sex, length, and genetic sampling programs are in place for U.S. harvests. In Canada, programs are in place to enumerate sport and Aboriginal harvests; age, sex, length, and genetic information are also gathered at a weir across the Klukshu River. The Klukshu River is an index tributary of the Alsek River, and along with sampling information provides a complete census of the inriver run. Similar to Situk River Chinook salmon, this stock is outside rearing, and is not exposed to SEAK fisheries while rearing. Exploitation rates have never approached the U_{MSY} threshold of 58%, and since 2009 have averaged 10% (Figure 3.10). Poor runs and escapement are primarily the result of decreased productivity and mirror other Alaskan stocks that rear in the Gulf of Alaska and Bering Sea. Management measures have been in place to reduce harvests and increase escapement during this period of poor production.

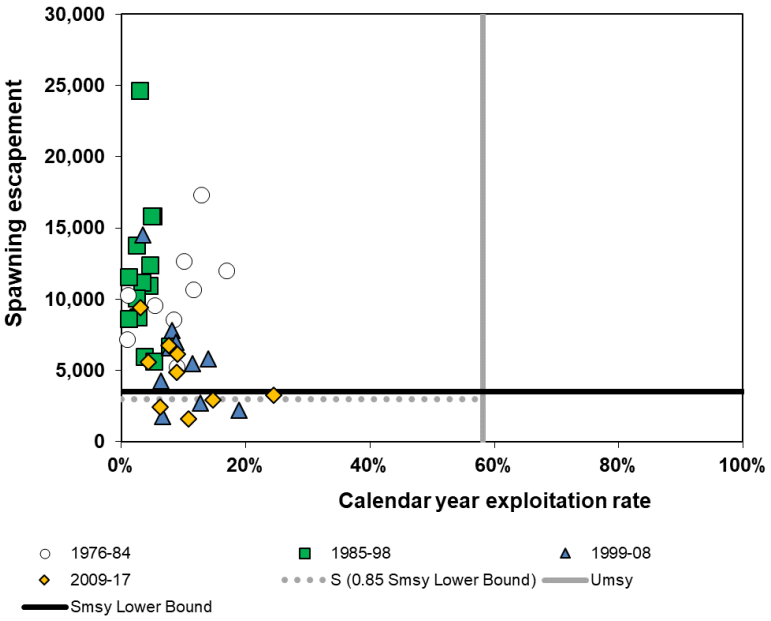


Figure 3.10–Calendar year exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement ≥ocean age-2 Alsek River Chinook salmon, 1976–2017.

The Taku and Stikine river stocks have experienced reduced productivity recently which has affected forecasting accuracy. Preseason forecasts are developed for each of these stocks by December 1 per obligations specified in Chapter 1 of the PST. The preseason forecasts trigger directed Chinook salmon fisheries in the U.S. and Canada during years of surplus production, and in-season estimates are used to refine fishery management. In recent years, forecasts have overestimated the run size, and to account for this, forecasts have been adjusted by the five-year average percentage error. This method has performed well. Despite reduced productivity, escapement goals have been achieved for both stocks in all but three years since 2009.

In years of surplus production, exploitation rates have been increased accordingly. For the Stikine River stock, this has resulted in the threshold reference value being exceeded three times since directed fisheries were developed in 2005; however, escapement goals were achieved in those three years. These stocks rear in the Gulf of Alaska and Bering Sea and as a result, have reduced exposure to SEAK fisheries as immature fish; the primary harvest on these stocks is on mature adults.

Between 1976 and 2004, terminal commercial fisheries targeting these two stocks were closed or severely restricted. Both stocks are harvested in local marine sport fisheries and incidentally in U.S. and Canadian traditional sockeye salmon gillnet fisheries that take place near the end of the Chinook salmon runs. Both stocks are also caught outside of the terminal districts in commercial spring troll fisheries, and to some extent, in outside sport and net fisheries. Still, most harvest takes place in-river and in the terminal districts, and detailed genetic stock identification programs are in place to identify Taku and Stikine Chinook salmon in the mixed stock marine waters. These programs, when coupled with the assessment methods described in

McPherson et al. (2010) for CYs 1977–2007 for the Taku River stock and in Bernard et al. (2000) for CYs 1981–1997 for the Stikine River stock, has been used to provide CY harvest estimates since 2005. Exploitation rates for the Taku River have never exceeded the U_{MSY} threshold of 59%. Since 2009, calendar-year exploitation rates averaged 21%, and escapements failed to meet the escapement goal in 2013, 2016, and 2017. Between 1975 and 2008, the average exploitation rate was 14%, and escapements were below the goal in 5 years (Figure 3.11).

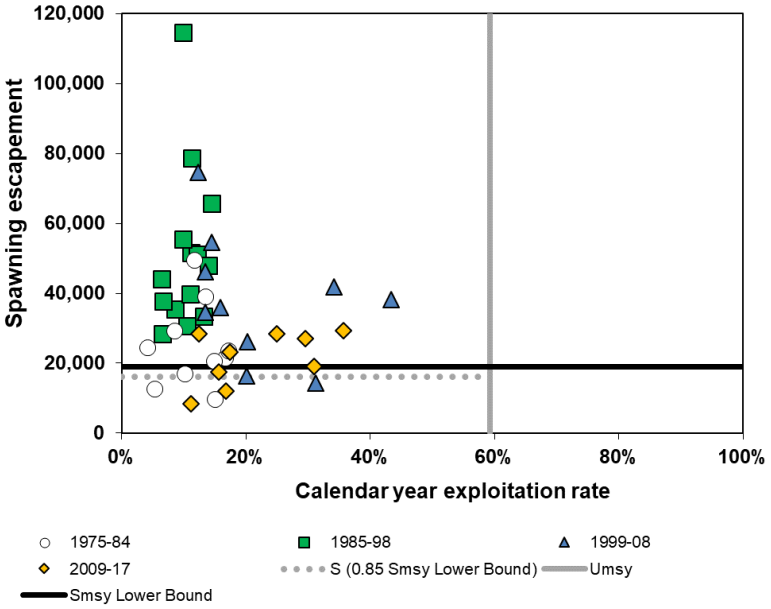


Figure 3.11–Calendar year exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement for ≥ocean age-3 Taku River Chinook salmon, 1975–2017.

Since 2009, Stikine River Chinook CY exploitation rates averaged 21%, and escapements failed to meet the escapement goal in 2009, 2016, and 2017. Substantial directed fishing occurred from 2005 to 2008 with exploitation rates averaging 47%, which was over the U_{MSY} threshold value of 42%; however, the escapement goal was achieved annually during this period. Prior to 2005, the average exploitation rate was 20%, and escapements were above the goal in all but 7 years (Figure 3.12).

Exploitation rates on Alsek, Taku, and Stikine river stocks will need to remain low until production improves.

Chinook salmon smolt abundance and survival have been monitored for the Taku River stock since the 1991 brood year. Freshwater survival has been above average in recent years; however, marine survival has undergone cycles throughout this period and the most recent ten brood years have been below average (Figure 3.13).

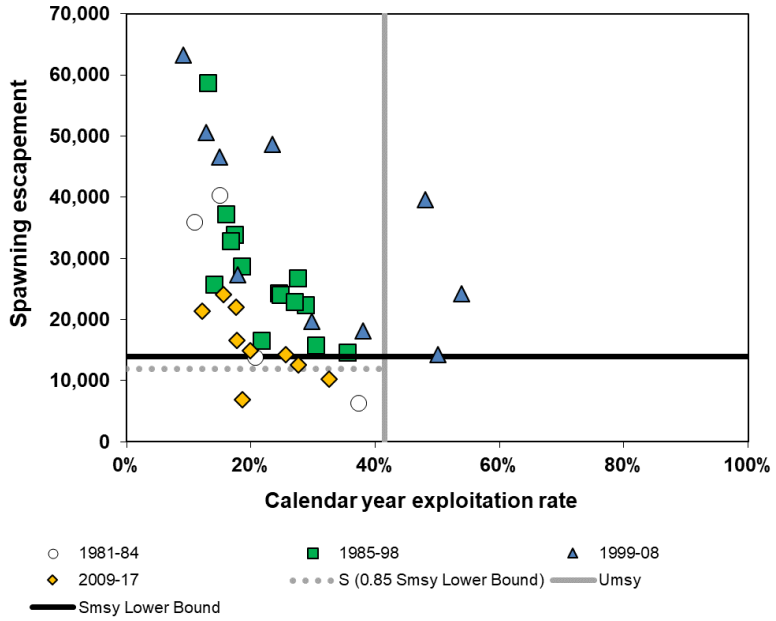


Figure 3.12–Calendar year exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement for ≥ocean age-3 Stikine River Chinook salmon, 1981–2017.

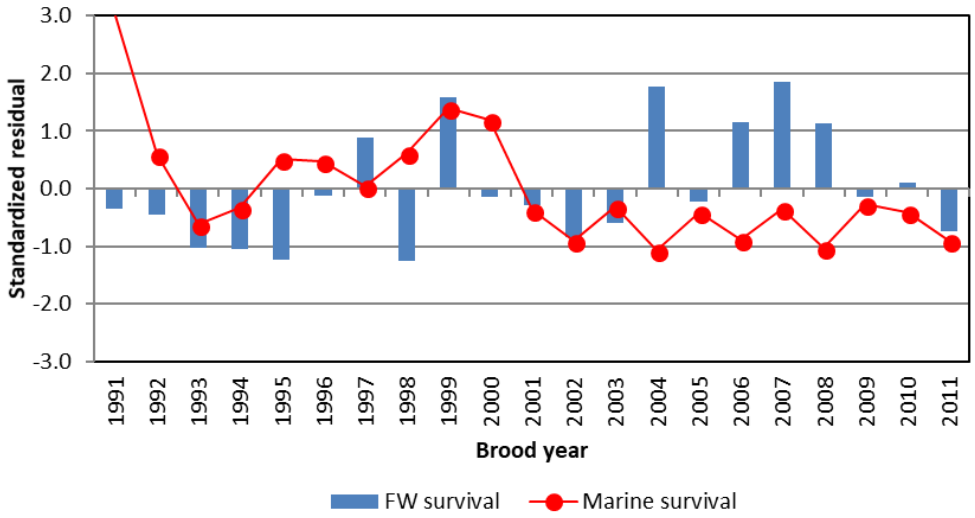


Figure 3.13–Freshwater and marine survival indices (standardized to a mean of zero) for the Taku River stock of Chinook salmon, 1991–2011 brood years.

Smolt abundance and survival have been monitored for Stikine River Chinook salmon since the 1998 brood year. No trends are apparent in freshwater survival; however, similar to Taku River, marine survival has been below average for the most recent ten brood years (Figure 3.14).

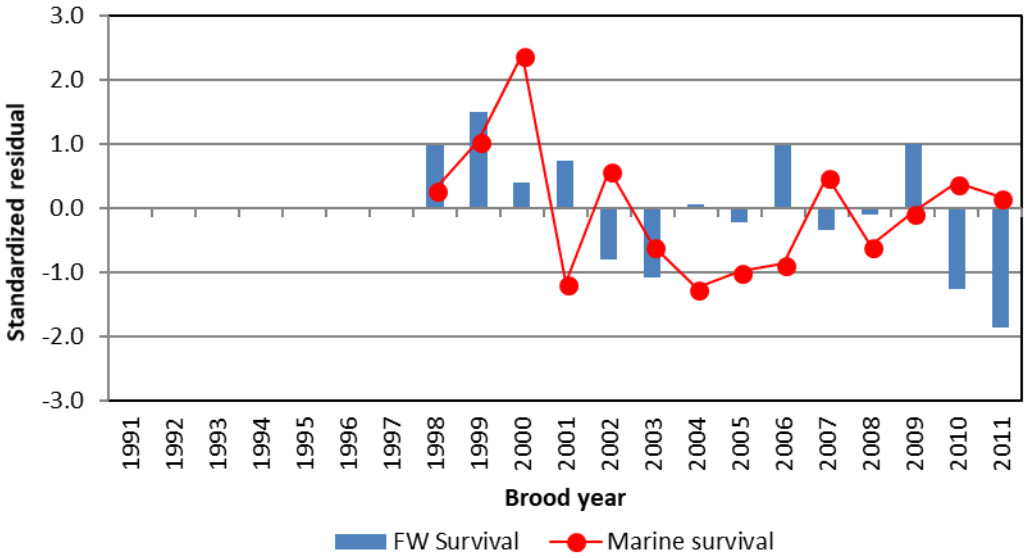


Figure 3.14–Freshwater and marine survival indices (standardized to a mean of zero) for the Stikine River stock of Chinook salmon, 1998–2011 brood years.

3.2.3 Canadian Stocks

3.2.3.1 Northern British Columbia: Kitsumkalum River

The North/Central BC model stock group includes the Yakoun, Nass, and Skeena escapement indicators in Northern BC. Currently, none of these indicator stocks have CTC-agreed escapement goals. The exploitation rate indicator stock for the North/Central model stock group is the Kitsumkalum in the Lower Skeena River; high quality MR escapement estimates have been produced for this stock annually since 1984. This stock has had a very low level of enhancement relative to the CWT indicator stock targets (mean enhanced contribution = 3.4%, range = 0.4–9.4%, run years 1985–2016). McNicol (1999) reviewed these data and estimated the stock–recruit relationship, which was updated by Parken et al. (2006). Marine survival was below average for 2007 to 2010 brood years and above average for the 2011 brood year (Figure 3.15). The mature-run equivalent exploitation rates have been below the threshold reference line in all years (Figure 3.16). Spawning escapements have exceeded S_{MSY} reference line in all years but three. In the earliest period (1985–1998), there were two years in which the stock was in the buffer zone and one of the years the stock was in the low escapement and low exploitation zone. Recently (1999–2016), the stock has been in the safe zone except for 2017 when the stock was in the low escapement and low exploitation zone.

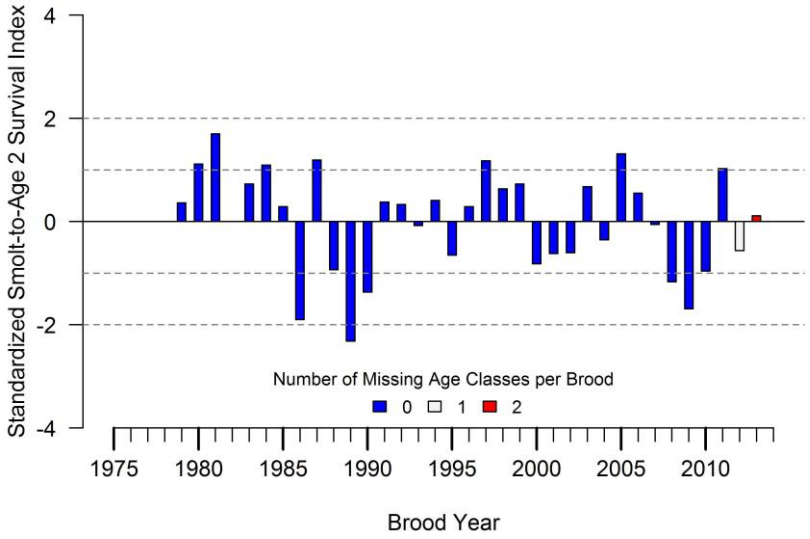


Figure 3.15–Marine survival index (standardized to a mean of zero) for the Kitsumkalum River stock of Chinook salmon, 1979–2013 brood years.

Note: Brood year 1982 was not represented by CWTs; thus no datum is available.

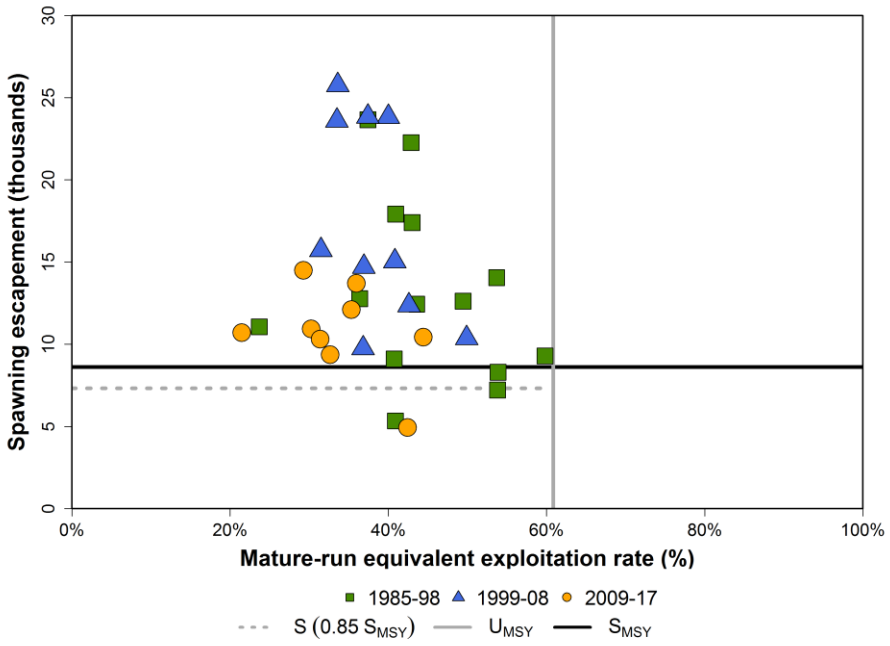


Figure 3.16–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by CY for the Kitsumkalum River stock of Chinook salmon, 1985–2017.

3.2.3.2 Central British Columbia: Atnarko River

The North/Central BC model stock group includes the Dean and Atnarko escapement indicators in Central BC. Currently, none of these indicator stocks have CTC-agreed escapement goals. 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 (Vélez-Espino et al. 2014).

This stock has had a moderate level of enhancement relative to the CWT indicator stock targets (mean enhanced contribution = 37%, range: 13-67%, run years 1990–2017). The largest hatchery contributions occurred in the mid-1990s, reaching 67% in 1996, whereas the lowest (13%) took place in 2008. Recent increases in hatchery contribution are partly due to the implementation of yearling releases in addition to the subyearling releases. Adjustments have been made to escapement estimates to remove hatchery fish in order to make inferences for non-enhanced stocks in Central British Columbia (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 adults has been developed for Atnarko Chinook salmon (Vélez-Espino et al. 2014).

The average marine survival (i.e., age-2 cohort survival) of Atnarko Chinook salmon is 2.3 (for brood years 1986–2013), with an increasing survival from brood year 1986 to brood year 1991, and remaining below average for most years from brood year 1992 up to brood year 2009. For brood years 2010–2013, marine survival increased to a level comparable to that achieved for brood year 1990 and reached the highest recorded level (6.1%) for brood year 2011 (Figure 3.17).

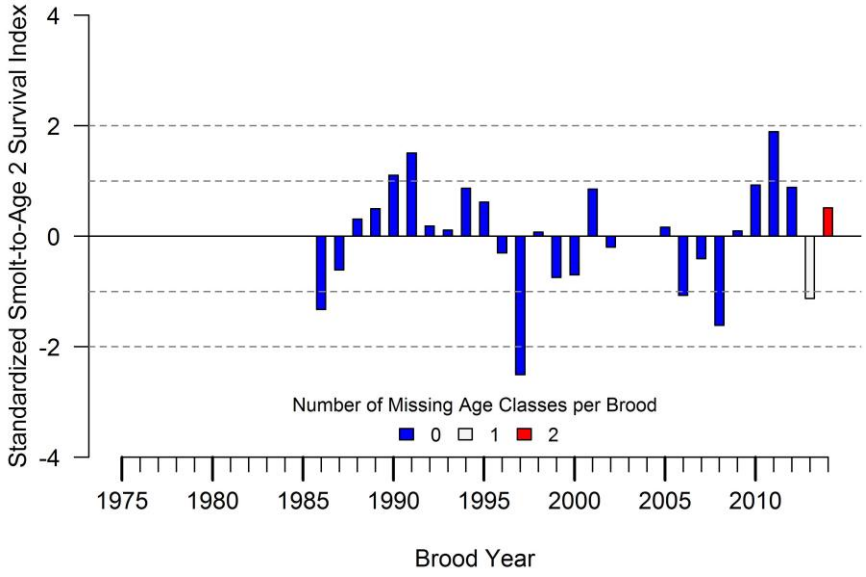


Figure 3.17–Marine survival index (standardized to a mean of zero) for subyearling releases of the Atnarko River stock of Chinook salmon, 1986–2014 brood years. There were no CWT releases for brood years 2003 and 2004.

Estimates of total large adults (wild and hatchery, excluding jacks) have exceeded S_{MSY} in all years except in 2012 when the escapement estimate was 4,622. The 2012 escapement of large adults was, however, greater than the 0.85 S_{MSY} lower threshold of 4,258, thus falling in the escapement buffer zone (Figure 3.18 and Figure 3.19). 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 all years except in 2012 (Figure 3.19). Wild large Atnarko Chinook have also exceeded S_{MSY} in all years except in 1997 and 2012, when the escapement estimates were below S_{MSY} at 4,013 and 2,542, respectively (Figure 3.18).

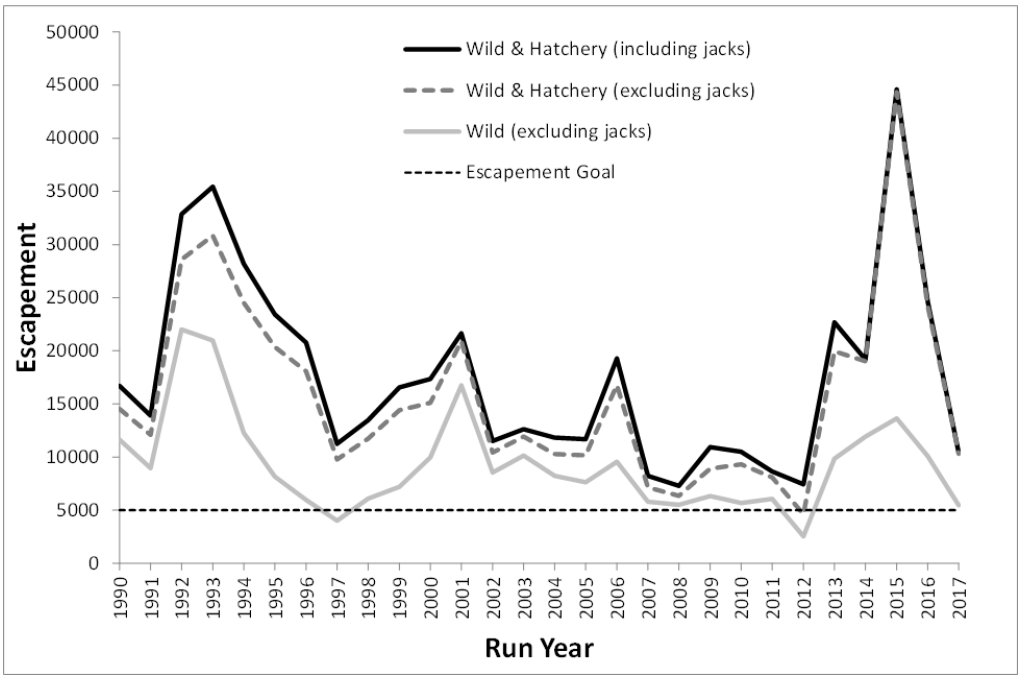


Figure 3.18–Time series of Atnarko Chinook escapement integrating the calibrated values from best Generalized Linear Model and the best Maximum Likelihood estimates for years with mark–recapture studies (2001–2003 and 2009–2017).

Note: The horizontal dashed line shows the habitat-based escapement goal of 5,009 large adults.

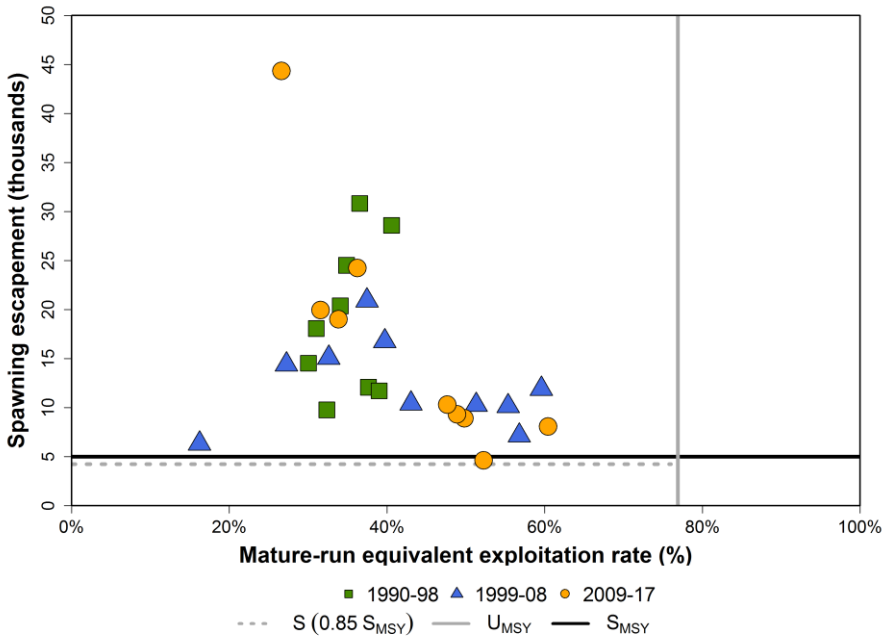


Figure 3.19–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by CY for the Atnarko River stock of Chinook salmon, 1990–2017.

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 the 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 high level of enhancement (mean enhanced contribution = 22%) for years 1982–2016 (Figure 3.20), with the largest contribution in 2002 (62%). 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.

Marine survival was generally above average for brood years 1985 to 1992, below average from 1993 to 2008, and slightly above average in 2009to 2011 (Figure 3.21). Similarly the mature run equivalent exploitation rates were above the threshold reference line in the majority of years from 1985-1998. Escapements were below S_{MSY} between 1997 and 2015, and exceeded S_{MSY} in 2016 and 2017 (Figure 3.22). The stock has rarely been in the safe zone of the synoptic plot, only twice during the last 27 years, with most of the recent years in the high risk zone. The stock experiences the highest exploitation of the stocks examined in Section 3.

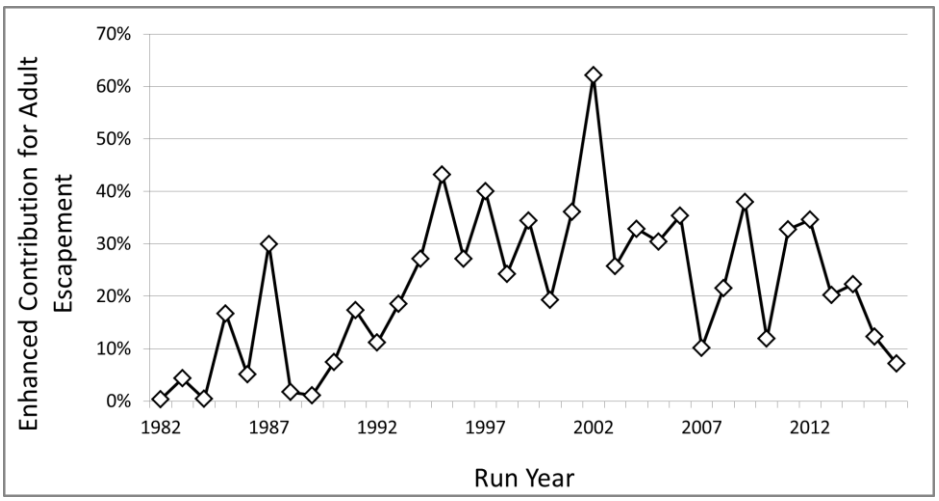


Figure 3.20–The percentage of first generation hatchery-origin Chinook salmon in the Cowichan River adult escapement, 1982–2016.

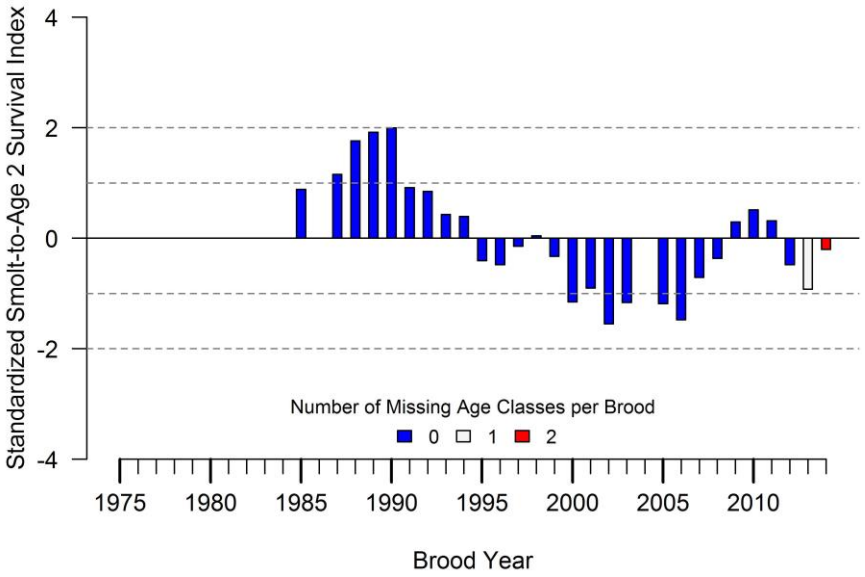


Figure 3.21–Marine survival index (standardized to a mean of zero) for the Cowichan River stock of Chinook salmon, 1985–2014 brood years. Brood years 1986 and 2004 were not represented by CWTs, thus no data are available.

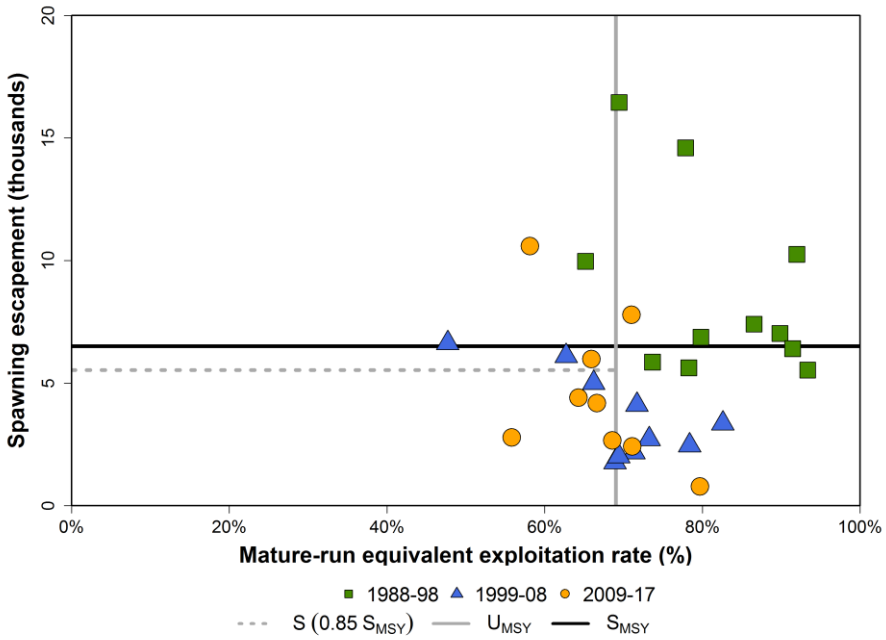


Figure 3.22–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by CY for the Cowichan River stock of Chinook salmon, 1988–2017.

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-based 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, and Louis Creek in the North Thompson River. The Nicola River is an exploitation rate indicator stock that has escapement estimates produced by MR methods. Currently, there are no CTC-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. This stock has had a moderate level of enhancement (mean enhanced contribution 28%, years 1987–2017, range 4–79%), which influences its representativeness for stocks in the stock group (Figure 3.23).

The threshold reference lines in Figure 3.24 were estimated from habitat-based methods (Parken et al. 2006). The Nicola River stock has been in the low escapement and low

exploitation zone of the synoptic plot since 2009, which corresponds to a period of low productivity for many Chinook stocks (Dorner et al. 2018).

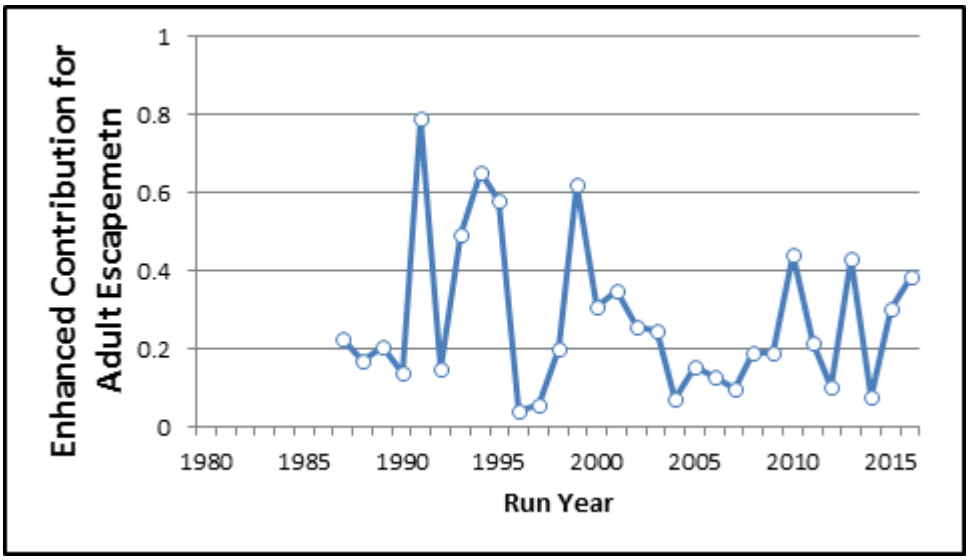


Figure 3.23–The percentage of first generation hatchery-origin Chinook salmon in the Nicola River escapement, 1987–2016.

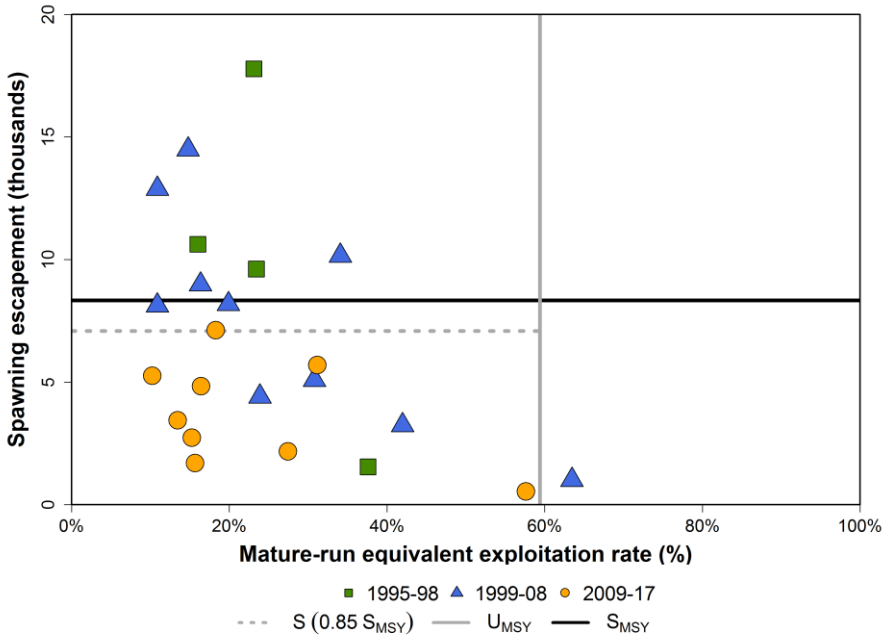


Figure 3.24–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by CY for the Nicola River stock of Chinook salmon, 1995–2017.

Survivals decreased steeply starting with the 2000 brood (2002 ocean entry) and subsequently have remained at or below average, with the modest exception of the 2006 brood (2008 ocean entry; Figure 3.25). The very low survival for the 1992 brood year was caused by a *Myxobacteria* infection at Spius hatchery, and the survival for the 1994 brood year was affected by high pre-spawn mortality in 1998 (not measured). Marine survival has been low since BY 2000 with some exceptions (BY 2006).

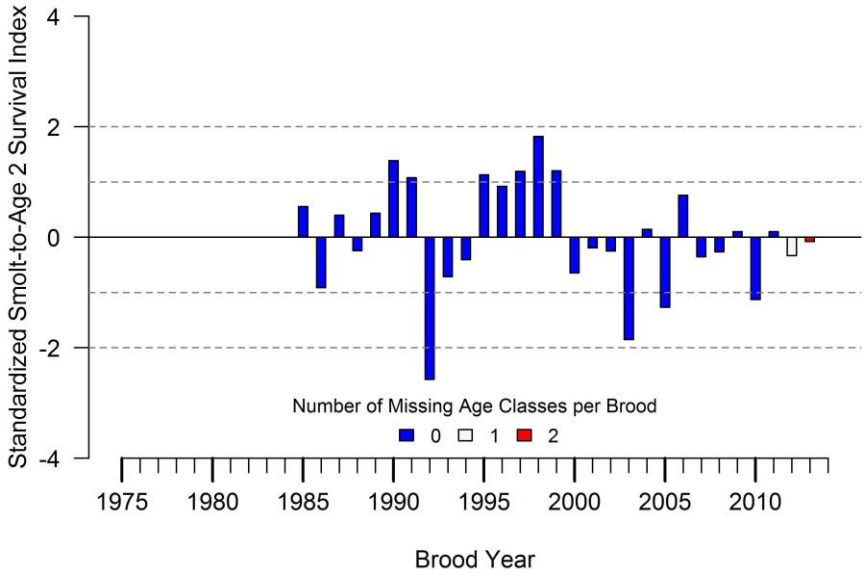


Figure 3.25–Marine survival index (standardized to a mean of zero) for the Nicola River stock of Chinook salmon, 1985–2013 brood years.

3.2.3.4.2 Fraser River Summer Run Age 0.3: Lower Shuswap

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. 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. Escapements to this stock group increased from about 25,000 through the 1980s to more than 85,000 between 2006 and 2011, peaking in 2010 at an estimated 180,000 fish, and declining steeply in 2012 to about 48,000 fish. Escapements have increased since 2014, with approximately 84,000 returning in 2017. The Lower Shuswap River is an exploitation rate indicator stock that has escapement estimates produced by MR methods since 2000. Currently, there are no CTC-agreed escapement goals for this group and the reference lines were estimated from habitat-based methods (Parken et al. 2006). The Lower Shuswap has had a low to moderate level of enhancement (mean enhanced contribution 10%, years 1987–2017), which influences its effects for non-enhanced stocks in the stock group (Figure 3.26).

Marine survival has been fluctuating since 1984; however, many of the brood years since 2000 have experienced below average survivals (Figure 3.26). Survival increased considerably for the 2010 brood year, leading to a high abundance of age-3 fish in the 2013 and age-4 fish in 2014

escapements, but survival has declined in subsequent broods. The cumulative exploitation rates have been below the threshold reference line in all but two years and escapements have exceeded S_{MSY} in all but three years (1993, 2012 and 2016, Figure 3.27). The Lower Shuswap CWT stock has been in the safe zone of the synoptic plot in all but five years. Since implementation of the 2009 Agreement, six years were in the safe zone and two years (2012 and 2016) were in the low escapement and low exploitation zone.

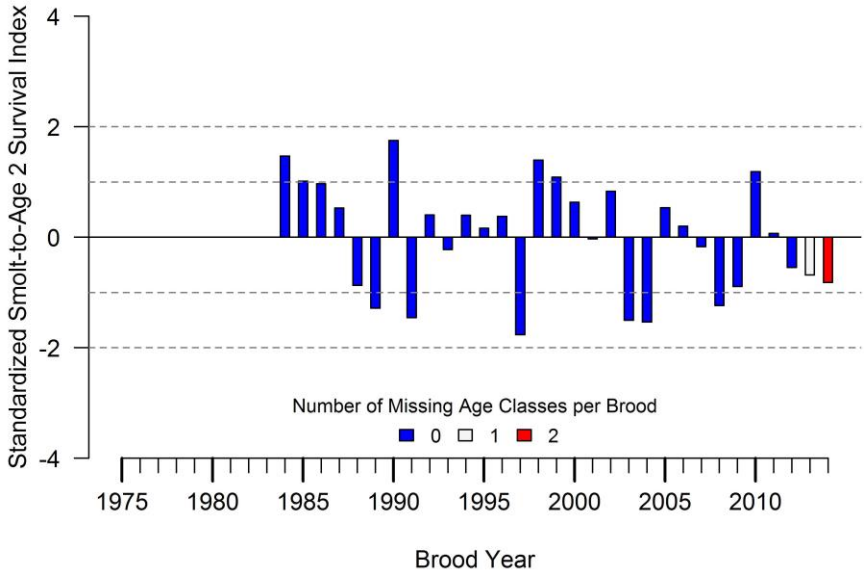


Figure 3.26–Marine survival index (standardized to a mean of zero) for the Lower Shuswap River stock of Chinook salmon, 1984–2014 brood years.

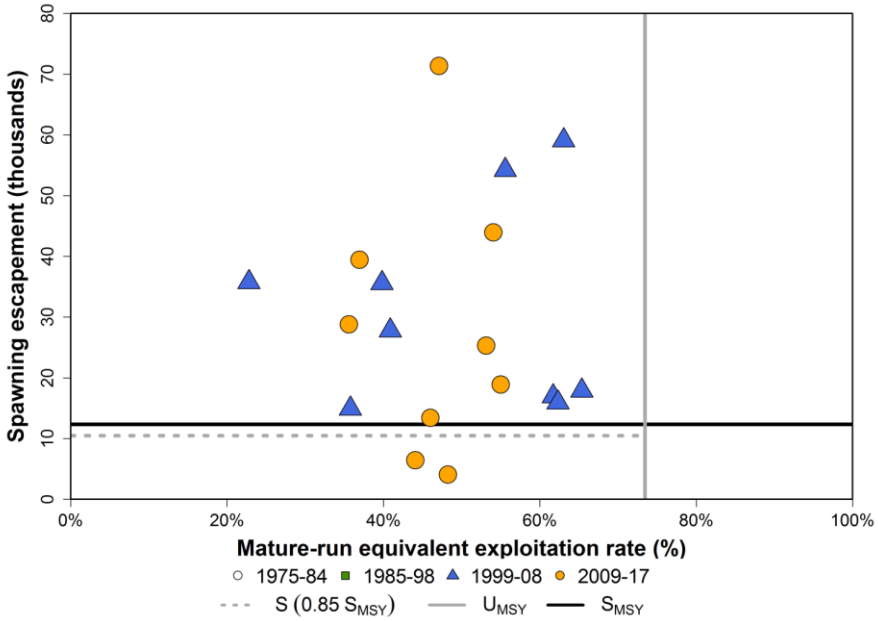


Figure 3.27–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by CY for the Lower Shuswap River stock of Chinook salmon, 1989–2017.

3.2.3.5 Fraser Late Run Age 0.3: Harrison River

The Fraser late stocks are 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 2017, the enhanced contribution to this stock has averaged 4% (range: 0–17%). With a few exceptions, marine survivals have been below average since 1990 (Figure 3.28). Spawning escapements have been below the goal range for four of the past five years (Figure 3.29). The synoptic plot shows the stock with exploitation rates higher than the reference line in the majority of years from 1985 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 the majority of 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 three years have been in the safe zone since 2009. The recent low escapements and low exploitation rates correspond with a period of low productivity for many Chinook stocks (Dorner et al. 2018).

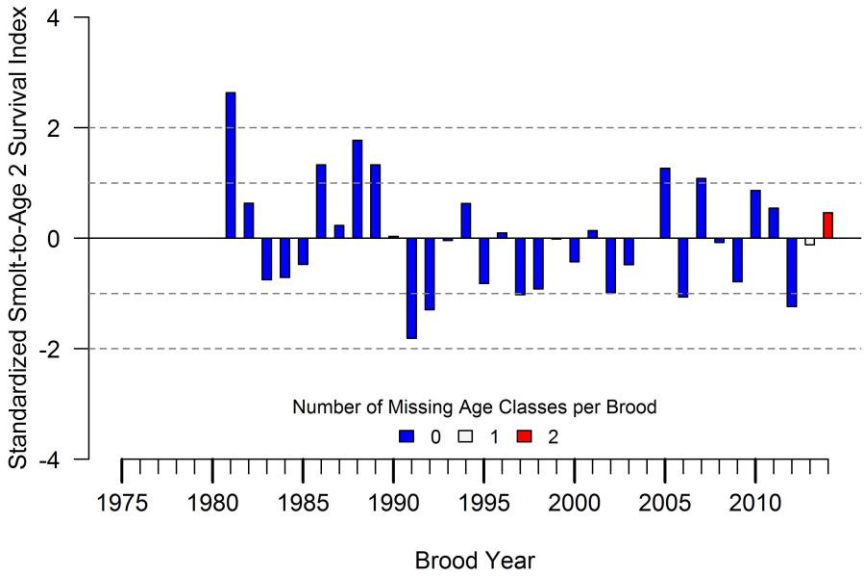


Figure 3.28–Marine survival index (standardized to a mean of zero) for the Harrison River stock of Chinook salmon, 1981–2014 brood years. No data are available for brood year 2004.

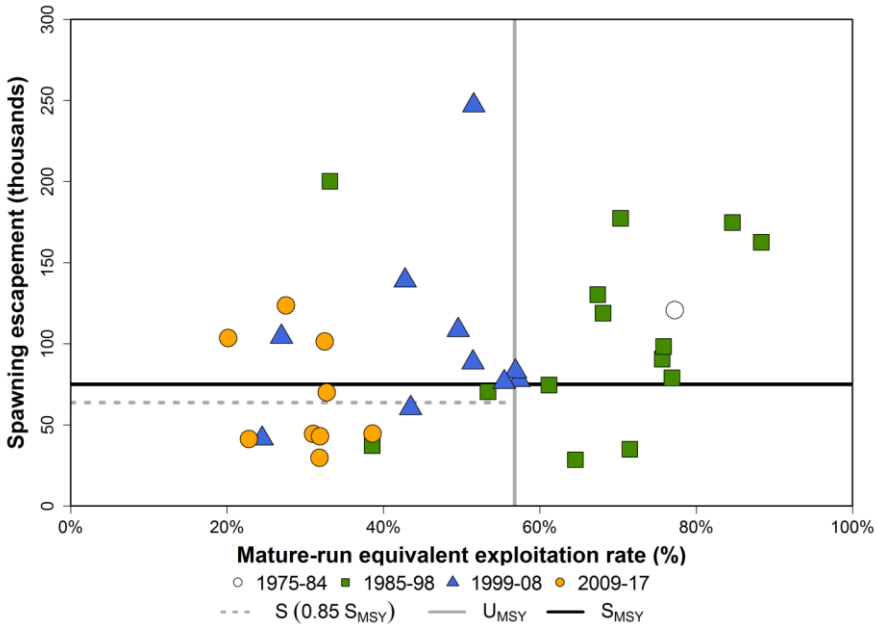


Figure 3.29–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by CY for the Harrison River stock of Chinook salmon, 1984–2017.

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 influences both the fisheries within Puget Sound, and escapement to the spawning grounds. The hatchery stocks contribute to terminal fisheries and in some cases many hatchery strays escape to the spawning grounds. Consequently, historic patterns of wild Puget Sound Chinook salmon abundance may be obscured because of the interaction of hatchery- and natural-origin production in the fishery and escapement accounting. Hatchery programs in Puget Sound have annually released between about 23 million (1976) to over 56 million (1989) Chinook salmon (Figure 3.30). Since Puget Sound Chinook salmon were listed as threatened under the ESA in 1999, hatchery production has averaged about 33 million releases 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 40% and 60% in the early 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 fish. Directed terminal fisheries do not occur on Snohomish River,

Stillaguamish River, and Lake Washington Chinook salmon. Terminal harvest data for 2017 have not been reviewed by co-managers, although indications are that catches were higher than those in 2016.

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. The majority of Chinook salmon production from Puget Sound is comprised of summer/fall run ocean-type stocks. Skagit River summer/fall Chinook salmon is the largest 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 Stillaguamish has a supplementation program that uses broodstock collected from the spawning grounds. Basins with large hatchery programs include the Snohomish and Green CTC escapement indicators as well as the Samish, Puyallup, Nisqually and Skokomish rivers. In addition, net-pen programs in Bellingham and Tulalip bays release large number of juvenile Chinook salmon.

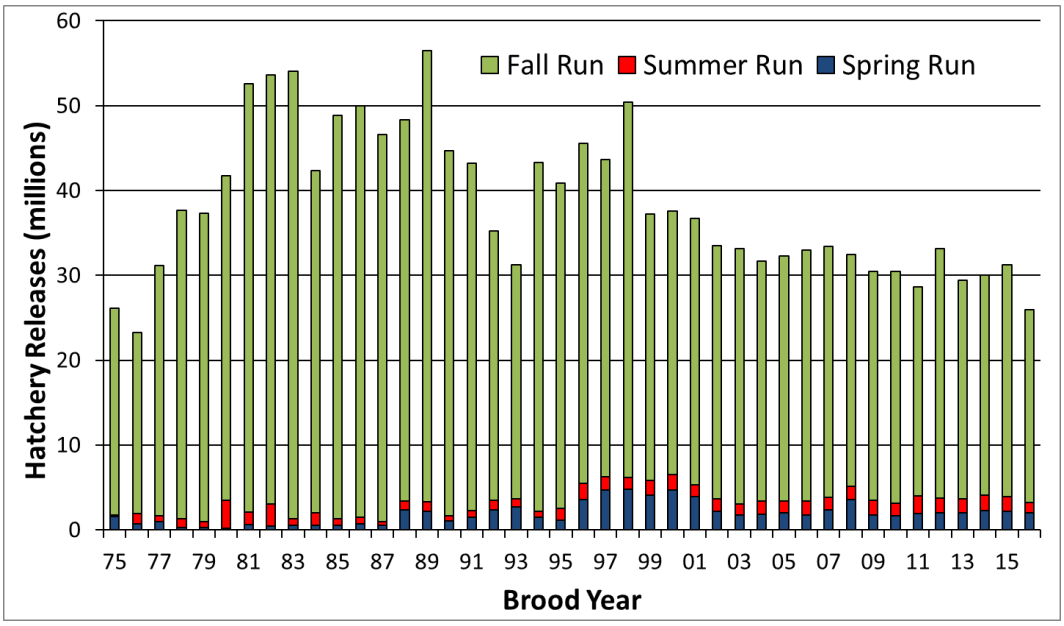


Figure 3.30–Chinook salmon released from Puget Sound hatcheries, 1975–2016 brood years.

Estimates of total production for the Puget Sound CTC escapement indicator stocks have not been made in part because of the lack of long-term representative tag groups for the natural stocks (except Green River). The trend in the escapement of Puget Sound summer/fall CTC escapement indicator stocks is driven primarily by the status of Skagit River summer/fall stocks. 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 is especially true when the escapement of Skagit River summer/fall Chinook salmon averaged 17,900 from 2000 to 2006, and exceeded 20,000

from 2004 to 2006. For the period of 1975 to 2014, the aggregate escapement of Puget Sound summer/fall indicator stocks ranged from a low of about 10,300 in 2011, to a high of 45,000 in 2004 Figure 3.31). The aggregate escapement was 30,800 in 2017, which is the second-highest aggregate escapement since 2006, behind only 2016. None of the Puget Sound Chinook salmon stocks have PSC-agreed escapement goals.

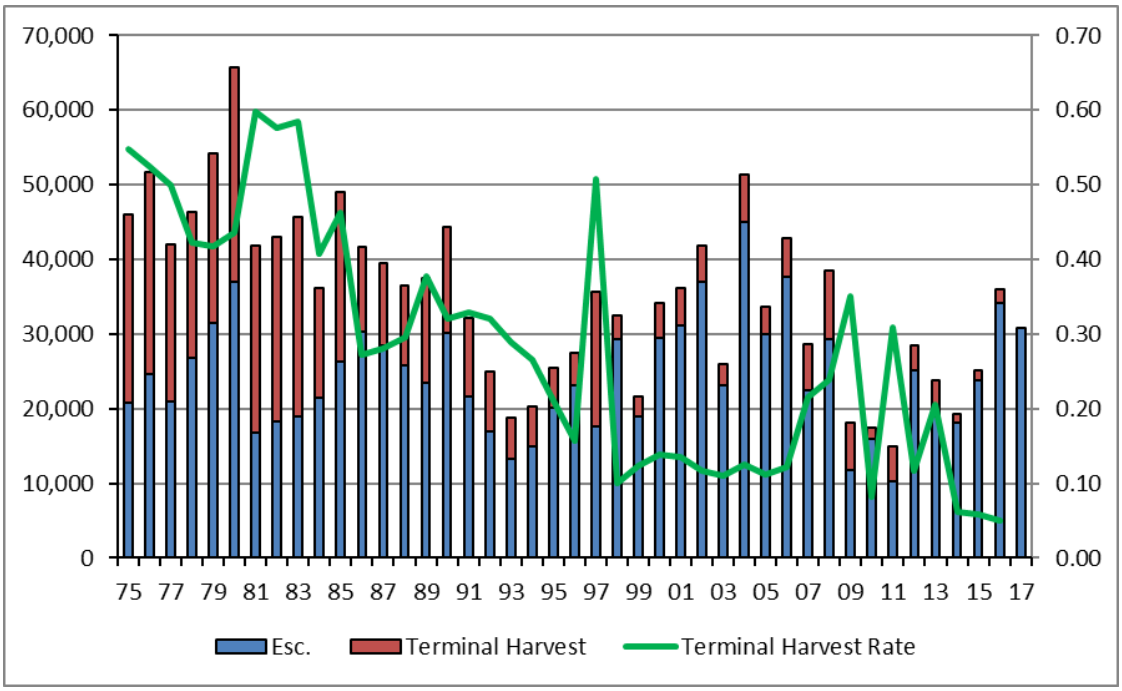


Figure 3.31–Escapement and terminal fishery harvest for the aggregate of Puget Sound summer/fall Chinook salmon PSC escapement indicator stocks.

Note: Terminal harvest not available for last year.

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 2016 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. Over the past two decades, aggregated summer/fall escapements have varied considerably, peaking at approximately 45,000 in 2004 then declining to a low of around 10,000 in 2011. Since then escapements have been increasing with estimates greater than 30,000 in the two most recent years. Some variation on this general theme emerges at the individual stock level (Section 2.3.4). The average summer/fall escapement in 2009–2017 was about 19% lower than the long-term average during 1999–2017 with exception of Lake Washington that remained nearly the same (Appendix 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.

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 consider, but still has to balance conservation needs with state and tribal co-management, federal fishery management plans, and international agreement under the PST. Additionally, compared to Puget Sound, the confounding influence of hatchery production on trend assessments is considerably less.

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 2,316 in 2007 (Figure 3.32). Since 1999, the Quillayute River summer Chinook population has only met its PSC escapement goal two times. Over the same time period the Queets River spring/summer population only met its PSC escapement goal four times, although two of those were in the most recent two years. Both the Quillayute and Hoh stocks exhibit escapement trends indicating considerable decline since the late 1980s but stability since the 1999 PST went into effect (Section 2.3.4.2). Terminal harvest rates on these stocks have averaged less than 15% since the mid-1990s, and were 12% in 2016. There is no CTC exploitation rate indicator stock that is considered representative of this stock group. However, Chinook with CWTs were released from Sol Duc Salmon Hatchery in the Quillayute Basin in the early 1990s and discontinued for about 10 years before starting new tagging programs 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 area sampling appears inadequate in some years to appropriately index exploitation rates.

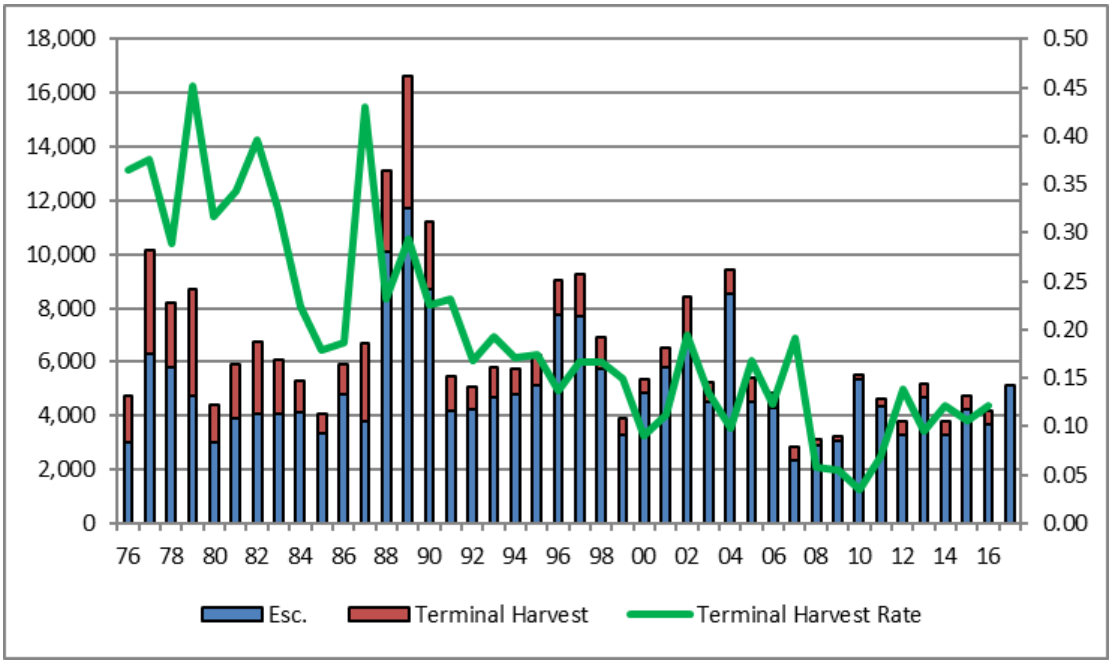


Figure 3.32–Escapements, terminal harvests, and terminal harvest rates for the aggregate of Washington coastal spring/summer Chinook salmon PSC escapement indicator stocks.

Note: Terminal harvest not available for last year.

Coastal Washington fall Chinook salmon escapement indicator stocks include Quillayute, Hoh, Queets, and Grays Harbor, which have PSC-accepted escapement goals, along with the Hoko stock that does not have a PSC escapement goal. The coastal fall Chinook salmon aggregate escapement has ranged from a low of 13,801 in 1983 to a high of 57,634 in 1988 (**Error! Reference source not found.**). 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 1975 to 2015 time period, terminal harvest rates have varied substantially without a definitive trend, and have averaged about 32% since 1999. With the exception of the Hoko where there are no terminal fisheries, harvest in terminal fisheries is a mixture of directed catch on Chinook salmon stocks and incidental catch while targeting other species (Figure 3.33).

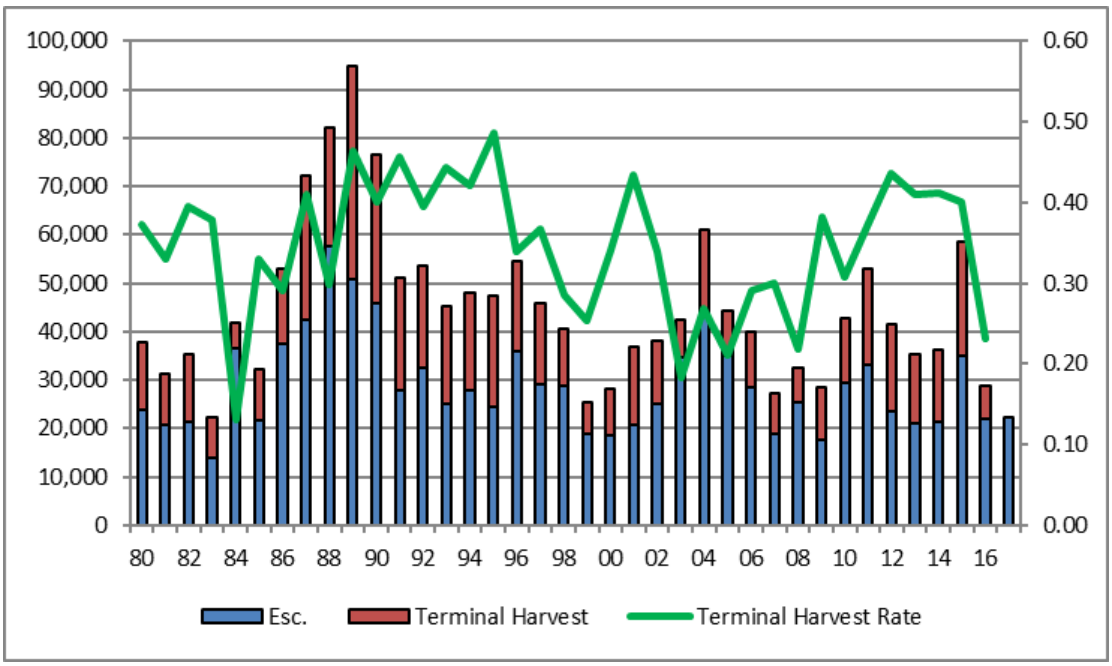


Figure 3.33–Escapement, terminal harvest, and terminal harvest rates for the aggregate of Washington coastal fall Chinook salmon PSC escapement indicator stocks.

Note: Terminal harvest not available the last year.

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 trend are speculative without a full CWT-based run reconstruction that can account for total production. Ocean fishery impacts for these stocks, however, 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 from 1985 to 2014 (CTC 2017), while terminal returns have declined over the same period. Further investigation and analysis is needed to confirm whether the Queets indicator stock truly is a suitable surrogate for other Washington Coast fall Chinook salmon stocks.

Queets CWT indicator tag releases were used to produce plots for a synoptic evaluation of

three coastal Washington fall Chinook salmon stocks with PSC escapement goals—Quillayute, Hoh, and Queets rivers. A synoptic plot was not produced for Grays Harbor because of the short time since the escapement goal was accepted by the CTC. Queets CWT indicator stock releases were assumed to be representative of the exploitation and ocean distribution of Queets, Quillayute and Hoh natural stocks. All three stocks have active terminal fisheries with similar terminal fishery harvest rates that have averaged between 30 and 37% over the past decade.

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 with exploitation rates below U_{MSY} in all years and spawning escapement exceeding 85% of S_{MSY} in all years except 1999 and 2007. Management for escapement and MRE exploitation rate was in the safe zone in all years for Quillayute (Figure 3.35) and Hoh (Figure 3.36) rivers. 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 that 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, it is a worthwhile exercise to re-examine these relationships. 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).

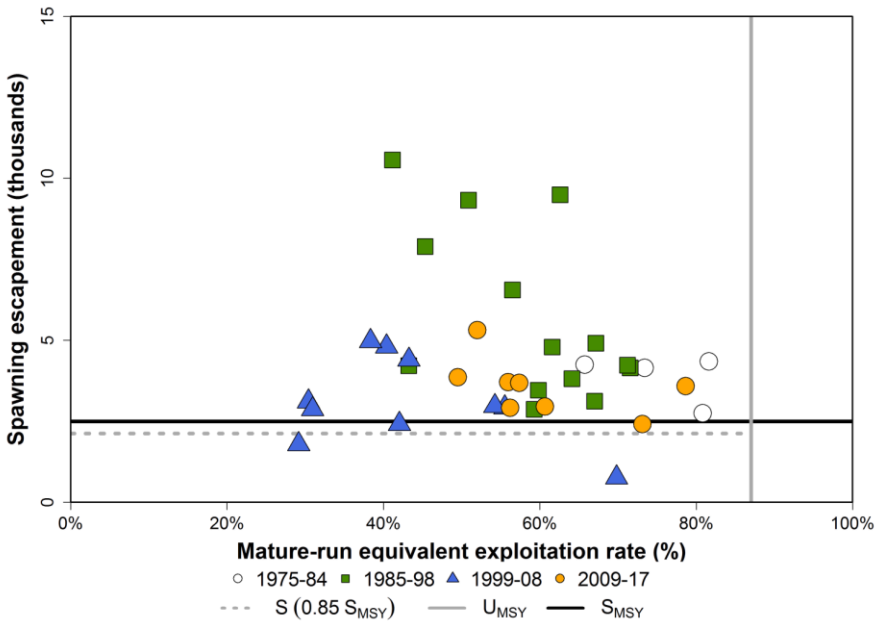


Figure 3.34–Queets River fall Chinook salmon spawning escapement and cumulative mature-run equivalent exploitation rate calculated from Queets River PSC indicator CWTs.

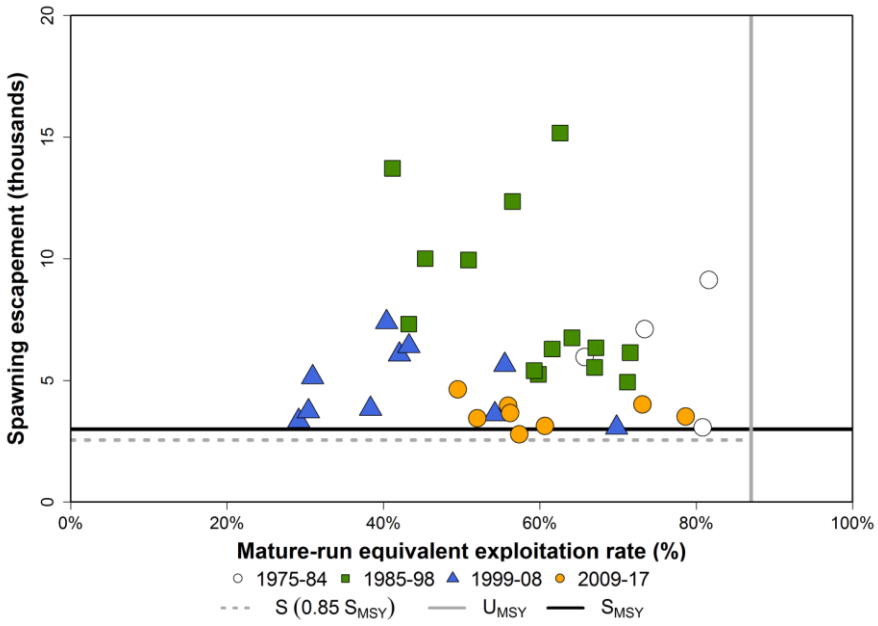


Figure 3.35–Quillayute River fall Chinook salmon spawning escapement and cumulative mature-run equivalent exploitation rate calculated from Queets River PSC indicator CWTs.

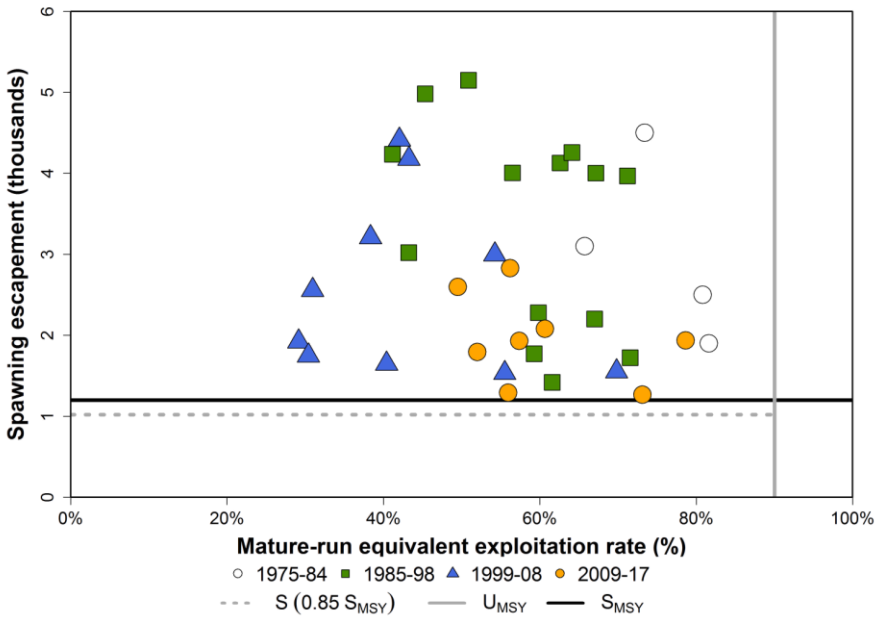


Figure 3.36–Hoh River fall Chinook salmon spawning escapement and cumulative mature-run equivalent exploitation rate calculated from Queets River PSC indicator CWTs.

3.2.4.3 Columbia River

3.2.4.3.1 Columbia River Summers

Mid-Columbia Summer Chinook includes populations in the Okanogan, Methow, and Wenatchee rivers as well as hatchery production from Wells and Chief Joseph hatcheries. Since 2008, Mid-Columbia Summer Chinook have been managed for a spawning escapement of 17,000, and an additional 3,000 fish for hatchery brood stock, using a sliding scale of harvest rates based on expected terminal run size.

The synoptic evaluation (Figure 3.37) shows Rock Island Dam counts as escapement for this stock group. These counts have exceeded 40,000 since 2009, while the stock experienced MRE exploitation rates of 51% to 71%. The CTC goal of 12,143 adult Chinook salmon past Rock Island Dam was developed prior to sport and non-treaty tribal fisheries that now take place above Rock Island Dam, so the dam counts are consistent with the goal but overestimate escapement. In 2017, Colville tribal catches above Rock Island Dam were 1,578 and sport catches above Priest Rapids Dam were 4,325, so escapement was still well above goal. The synoptic evaluation shows the Mid-Columbia r Summer stock group in the safe zone from 2009 to 2017. Mid-Columbia Summers have demonstrated normal variation in survivals (within 2 standard deviations for all but one brood years). Survivals have been positive since 1995, and have varied between zero and 1.5 (Figure 3.38). While the 2010 brood had a much smaller survival index than fall Chinook, the 2011 brood index was higher than for fall Chinook (Figure 3.42).

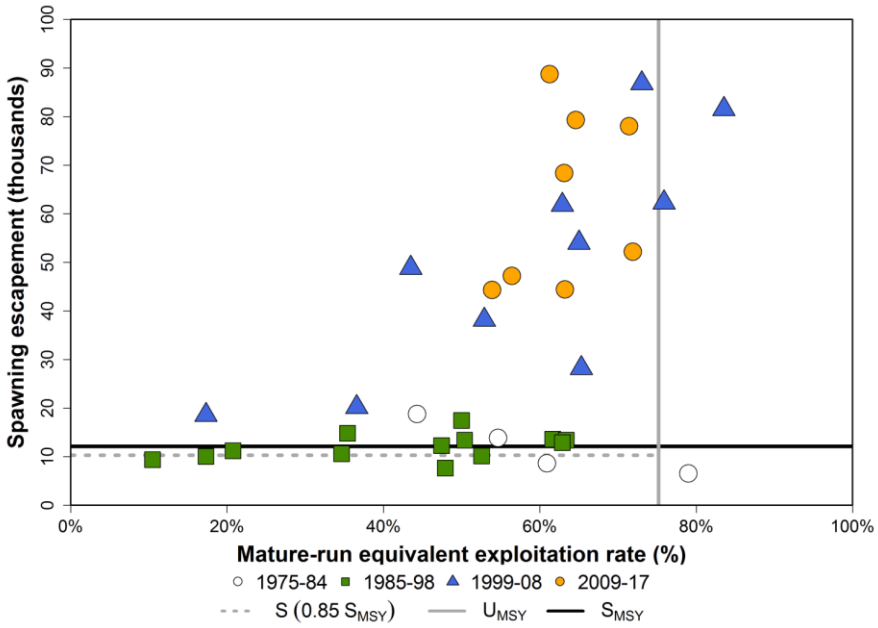


Figure 3.37–Columbia Upriver Summer Chinook salmon spawning escapement past Rock Island Dam and cumulative mature-run equivalent exploitation rate calculated from Wells Hatchery PSC indicator CWTs.

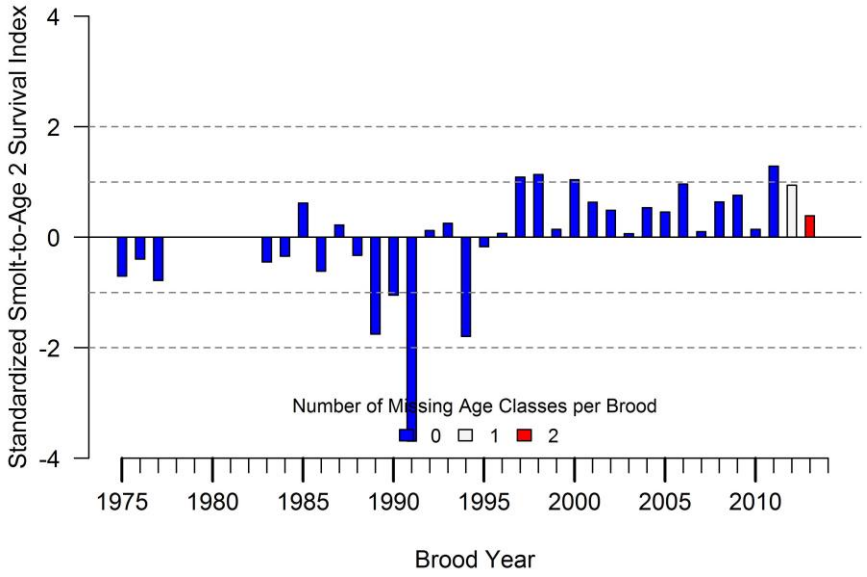


Figure 3.38–Marine survival index (standardized to a mean of zero) for Columbia Upriver Summer Chinook salmon.

3.2.4.3.2 Columbia River Fall

The Columbia River Falls stock group has three escapement indicator stocks: Upriver Brights, Deschutes, and Lewis. In *US v. OR*, the Upriver Bright management unit is comprised of all bright fall Chinook populations returning above Bonneville Dam, including those in the Deschutes, upper Columbia and Snake rivers, but the Upriver Bright escapement indicator only represents fall Chinook in the Columbia River above McNary Dam. PSC-agreed goals have been met since 1983 for the Upriver Bright indicator stock, and since 1993 for the Deschutes River indicator stock, while MRE exploitation rates based on the Upriver Bright indicator stock have varied widely between 36% and 88% since 1983 (Figure 3.39, Figure 3.40). The synoptic evaluations show management of Upriver Brights (Figure 3.39) and Deschutes River (Figure 3.40) fall Chinook in the safe zone or the high escapement/high exploitation zone in all years since 1999.

For Lewis River Wild fall Chinook salmon, exploitation rates since 1980 have never exceeded the estimated U_{MSY}, and the PSC-agreed escapement goal has been met since 2009, so the synoptic evaluation shows 2009-2017 management of Lewis River Wild fall Chinook in the safe zone (Figure 3.41).

Standardized survival indices for Columbia River falls have been positive based on wild Hanford Reach CWT data (Figure 3.42) and Priest Rapids Hatchery CWT data (Figure 3.43) for the 2009 through 2013 broods. Standardized survivals for Lewis River wild fall Chinook were near average for brood years 2007–2010, but have been mostly negative since 2001, including the recent 2011-2013 broods – contrary to the other fall Chinook indicators (Figure 3.44).

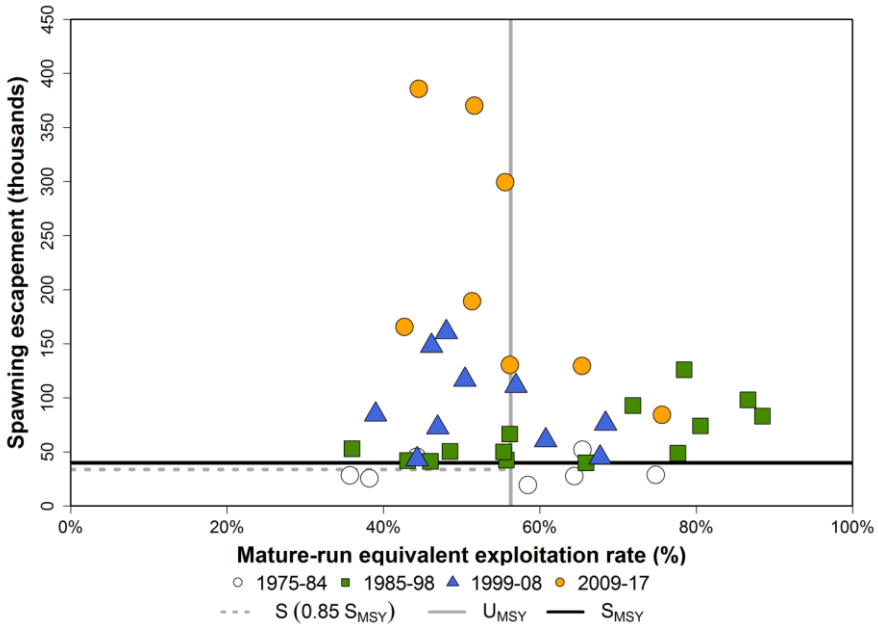


Figure 3.39–Upriver Bright fall Chinook salmon spawning escapement and cumulative mature-run equivalent exploitation rate calculated from Priest Rapids Hatchery PSC indicator CWTs.

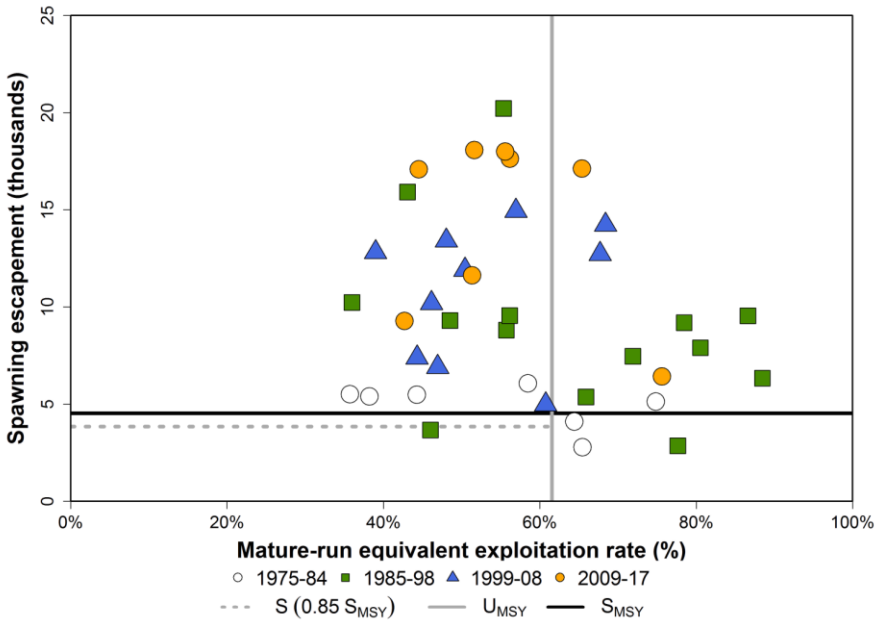


Figure 3.40–Deschutes River fall Chinook salmon spawning escapement and cumulative mature-run equivalent exploitation rate calculated from Priest Rapids Hatchery PSC indicator CWTs.

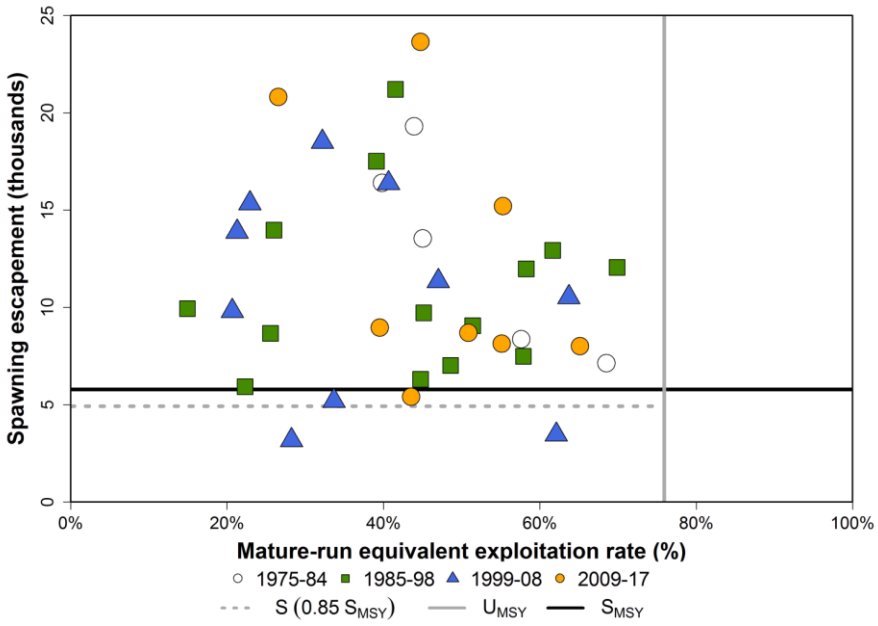


Figure 3.41–Lewis River Wild fall Chinook salmon spawning escapement and cumulative mature-run equivalent exploitation rate calculated from Lewis River Wild PSC indicator CWTs.

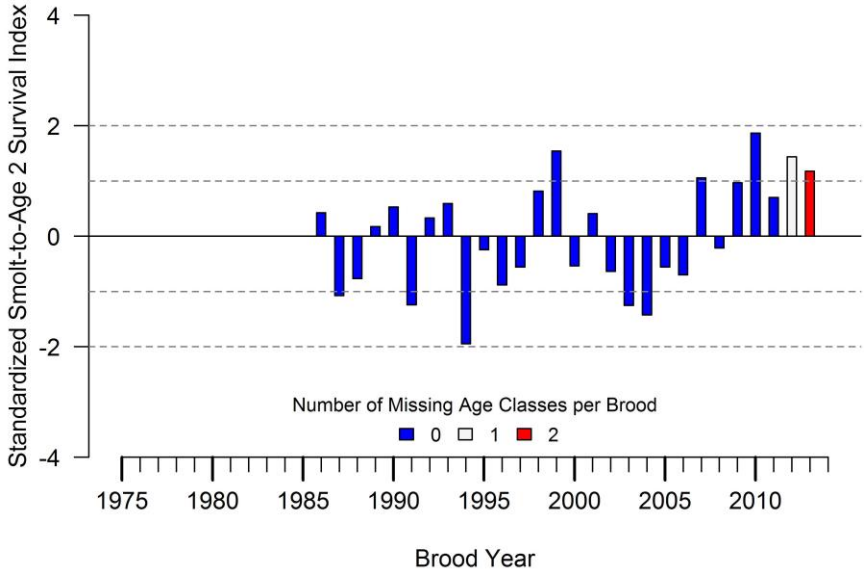


Figure 3.42–Marine survival index (standardized to a mean of zero) for Upriver Bright Chinook salmon, as represented by Hanford Reach Wild Chinook salmon.

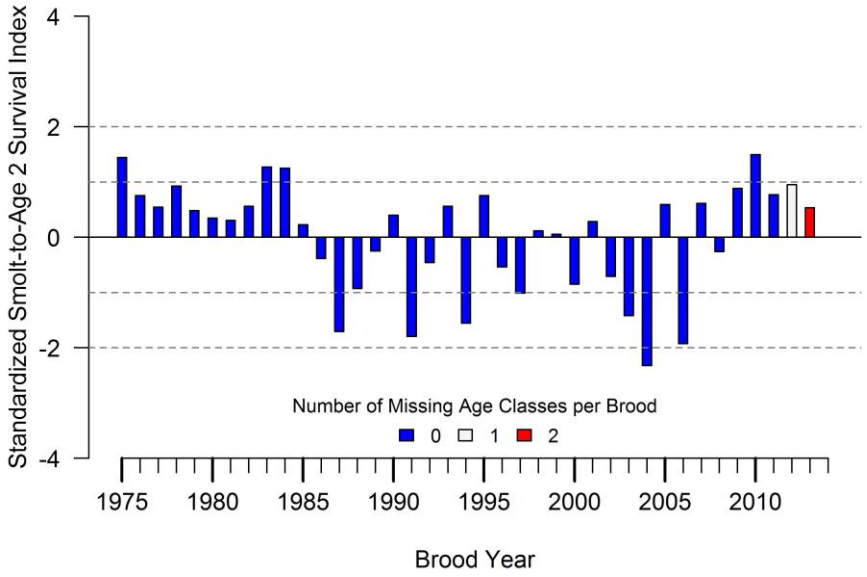


Figure 3.43–Marine survival index (standardized to a mean of zero) for Upriver Bright Chinook salmon, as represented by Priest Rapids Hatchery Chinook salmon.

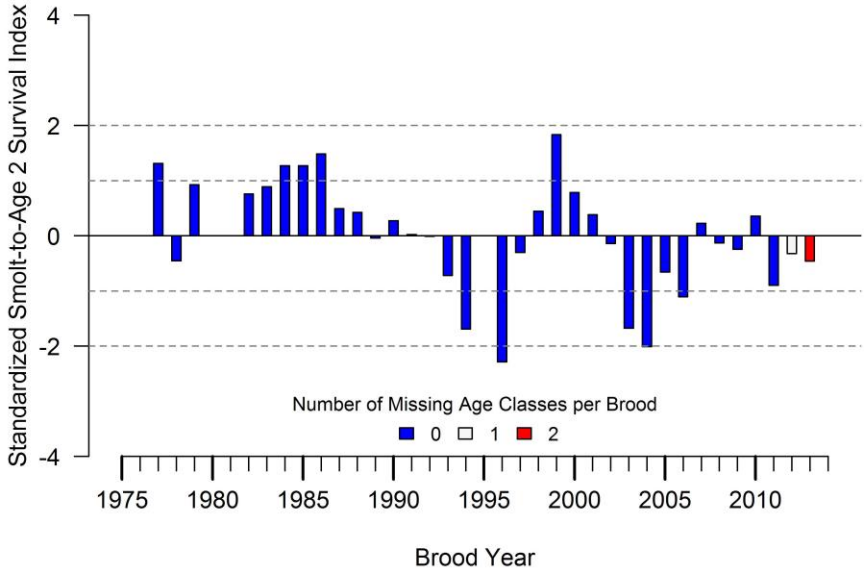


Figure 3.44–Marine survival index (standardized to a mean of zero) for Lewis River Wild fall Chinook salmon.

3.2.4.4 Coastal Oregon

3.2.4.4.1 Oregon Coastal North Migrating

Total estimated spawning escapement for the NOC aggregate stock has ranged from approximately 39,000 Chinook salmon in 2008 to 190,000 in 1988. The recent 10-year (2008–2017) average for aggregate escapement is approximately 94,000. Estimated escapement in 2017 was 79,462. The abundance forecast expressed in terms of spawning escapement is approximately 68,939 for 2018.

After low escapements from 2007 to 2009, the NOC stock aggregate had returned to average or above-average escapement from 2013 onwards through 2016. All three NOC escapement indicator stocks—the Nehalem, Siuslaw, and Siletz stocks—failed to achieve their escapement objectives in 2007 and 2008. The Nehalem stock did not attain its goal in 2009 and 2010.The most recent year's escapement for the NOC showed mixed results, with the Nehalem attaining within 85% of its goal, the Siletz exceeding its escapement goal, and the Siuslaw failing to reach within 85% of its escapement goal. It is likely that the NOC has recently experienced a period of higher-than-normal marine survival, as indicated in Figure 3.45. The later years in the survival index are generated from incomplete broods, and although tempting to interpret these initial signals in both fisheries recruitment and robust escapement, these results are only preliminary.

Management actions in terminal fisheries, along with reductions in AABM fisheries, and better-than-average survival rates (Figure 3.45) appear to have contributed to the increased escapements following a period of escapement decline in the 2007–2009 return years. Despite these indications of robust survival and management action positively affecting those NOC stocks, this past year's observations showed two out of three of the NOC escapement indicator stocks failure to meet escapement goals.

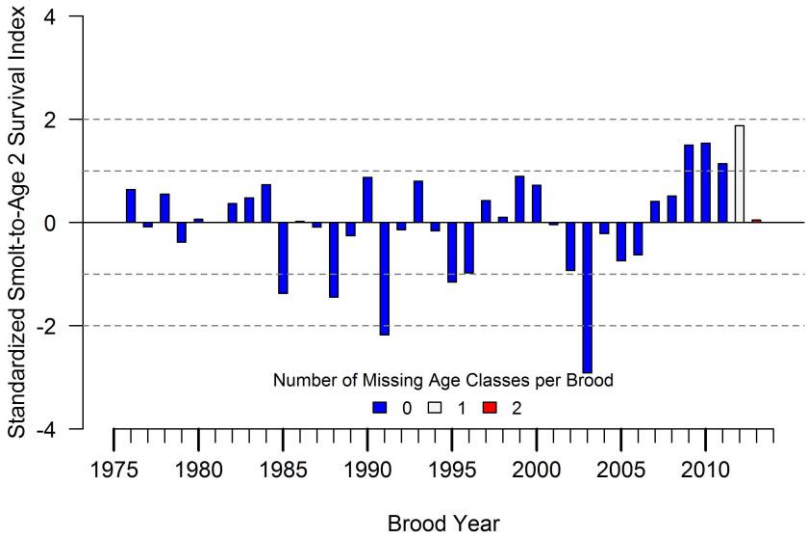


Figure 3.45–Marine survival index (standardized to a mean of zero) for the Salmon River hatchery stock of Chinook salmon.

Note: Brood years 1976–2011 are shown, with the exception of 1981, for which there is no information.

For the first year of reporting the MRE graphs for the NOC stocks, terminal harvest is now accounted for independently of the ERIS stock for each of the EIS stocks in the NOC. Those narrative warnings to take previously produced MRE ER plots generated for the NOC stocks with a grain of salt have proven accurate now that these plots have been re-cast with independently observed values representing those terminal fisheries for each of the Nehalem, Siletz and Siuslaw EIS stocks. Prior graphs depicted much greater cumulative ER than had been surmised due to their reliance on the Salmon River Hatchery stock as an indicator of terminal harvest. As suspected, and now shown, those terminal harvests on each of the NOC's EIS stocks is much less than that observed specific to the Salmon River's basin and hatchery-based stock. Whereas the previously presented graphs were depicted as "worst case scenarios", these new and improved graphs are the product of independent observation for each of the EIS.

A review of the synoptic plots shows that three NOC escapement indicator stocks have spent most years in the upper left sector. Exploitation rates have been lower and escapements have been higher than required for MSY for the majority of years in each stock. Of the three stocks, the Nehalem stock has spent more years below the escapement objective than the others, and the Siuslaw stock has the most years with high exploitation rates.

The Nehalem River stock of Chinook salmon has experienced a wide array of both exploitation and escapement from 1979 to 2016 (Figure 3.46 From 2006 to 2010 this stock failed to meet 85% of its escapement goal (Figure 3.47).

The Siletz River stock of Chinook salmon exhibit high productivity as demonstrated by one of the higher U_{MSY}s presented in this chapter. All of the observed points of escapement and exploitation are within the safe zone. Recent year's escapements (2010–2016) have increased over lower escapements observed in return years 2007 to 2009.

The Siuslaw stock of Chinook salmon, similar to the Nehalem stock, has experienced a wide array of both escapement and exploitation since 1979 (Figure 3.48). Most of the observations of escapement below S_{MSY} occurred during the pre-Treaty period of 1979 to 1984.

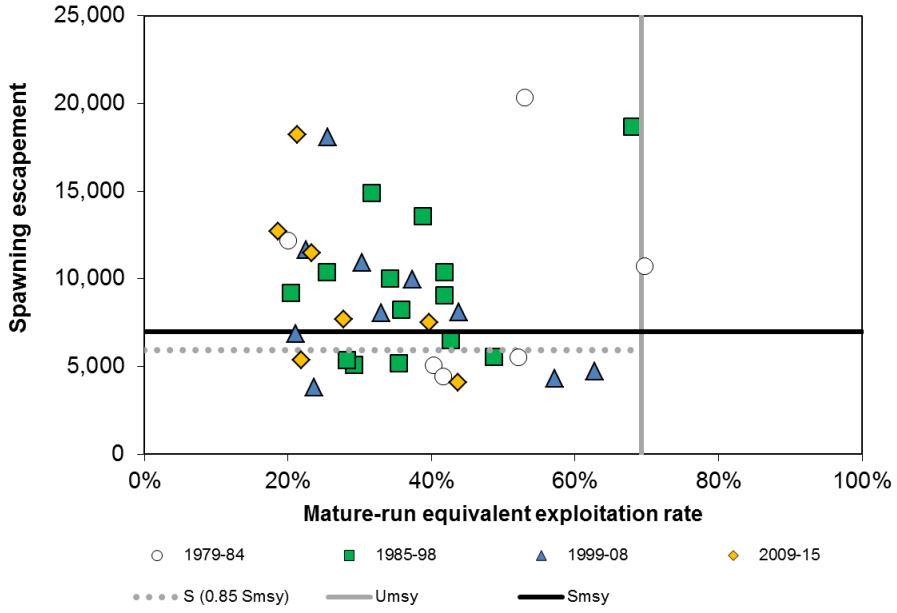


Figure 3.46–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by CY for the Nehalem River stock of Chinook salmon, 1979–2016.

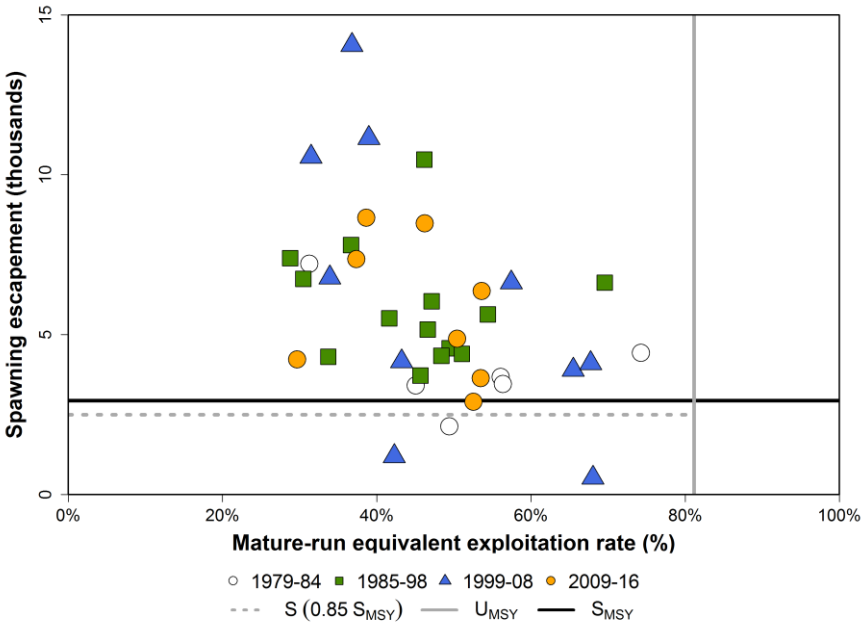


Figure 3.47–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by CY for the Siletz River stock of Chinook salmon, 1979–2016.

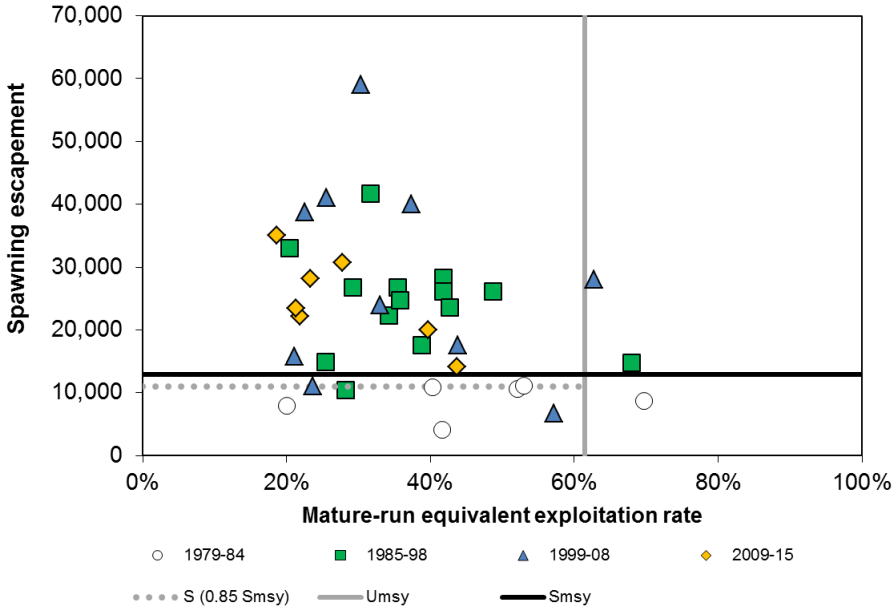


Figure 3.48–Mature-run equivalent exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement by CY for the Siuslaw River stock of Chinook salmon, 1979–2016.

3.2.4.4.2 Mid-Oregon Coast

After a period of declines in escapement from 2005 to 2008, the MOC stock aggregate rebounded to historical averages during the 2010–2016 return years. Total aggregated estimated escapement for the MOC has ranged from a low of 6,981 in 1976 to a high of 56,021 in 2010. The 10-year average (2007–2016) escapement for the MOC is about 29,000. Estimated escapement for the MOC stock group in 2016 was about 18,000. Forecasted escapement for the 2017 return year is quite similar to the observed 2016 values at about 18,000 spawning adults. Last year's narrative warning that the two most recent marine survival brood year metrics showed below average survival and would translate into reduced expectations for this aggregate's production have proven true. Just over half of the 2015 observed return was seen in the 2016 return year. Despite the most recent indication that marine survival is on the upswing for this aggregate (Figure 3.49), there is call for skeptical portrait of expectations for the coming year's terminal return in 2017.

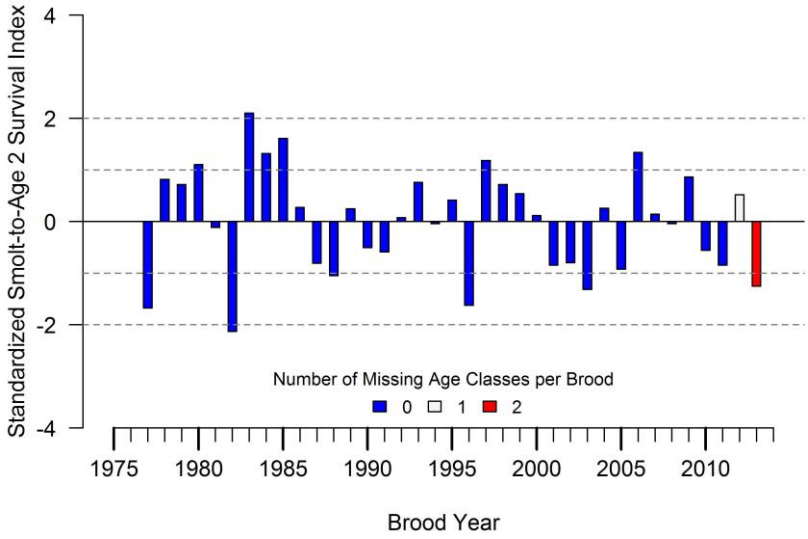


Figure 3.49–Marine survival index (standardized to a mean of zero) for the Elk River hatchery stock of Chinook salmon.

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APPENDICES

APPENDIX A. LANDED CHINOOK SALMON CATCHES BY REGION AND GEAR, 1975–2017

Appendix **Page**

Appendix **Page**

Table A1.–Southeast Alaska AABM Chinook salmon catches.

Year	Southeast Alaska						
	Troll	Net	Sport	Total	Add-on	Terminal Exclusion	Treaty Catch
1975	287,342	13,365	17,000	317,707	NA	NA	NA
1976	231,239	10,523	17,000	258,762	NA	NA	NA
1977	271,735	13,443	17,000	302,178	NA	NA	NA
1978	375,919	25,492	17,000	418,411	NA	NA	NA
1979	337,672	28,388	16,581	382,641	NA	NA	NA
1980	303,643	20,114	20,213	343,970	NA	NA	NA
1981	248,782	18,952	21,300	289,034	NA	NA	NA
1982	241,938	46,992	25,756	314,686	NA	NA	NA
1983	269,821	19,516	22,321	311,658	NA	NA	NA
1984	235,622	32,405	22,050	290,077	NA	NA	NA
1985	215,811	33,870	24,858	274,539	6,246	NA	268,293
1986	237,703	22,099	22,551	282,353	11,091	NA	271,262
1987	242,562	15,532	24,324	282,418	17,095	NA	265,323
1988	231,364	21,788	26,160	279,312	22,525	NA	256,787
1989	235,716	24,245	31,071	291,032	21,510	NA	269,522
1990	287,939	27,712	51,218	366,869	45,873	NA	320,996
1991	264,106	34,864	60,492	359,462	61,476	NA	297,986
1992	183,759	32,140	42,892	258,791	36,811	NA	221,980
1993	226,866	27,991	49,246	304,103	32,910	NA	271,193
1994	186,331	35,654	42,365	264,350	29,185	NA	235,165
1995	138,117	47,955	49,667	235,739	58,800	NA	176,939
1996	141,452	37,298	57,509	236,259	72,599	8,663	154,997
1997	246,409	25,069	71,524	343,002	46,463	9,843	286,696
1998	192,066	23,514	55,013	270,593	25,021	2,420	243,152
1999	146,219	32,720	72,081	251,020	47,725	4,453	198,842
2000	158,717	41,400	63,173	263,290	74,316	2,481	186,493
2001	153,280	40,163	72,291	265,734	77,287	1,528	186,919
2002	325,308	31,689	69,537	426,534	68,164	1,237	357,133
2003	330,692	39,374	69,370	439,436	57,228	2,056	380,152
2004	354,658	64,038	80,572	499,268	75,955	6,295	417,019
2005	338,451	68,176	86,575	493,202	64,408	40,154	388,640
2006	282,315	67,436	85,794	435,545	48,404	27,047	360,094
2007	268,146	53,688	82,849	404,683	68,364	8,051	328,268
2008	151,936	43,127	49,265	244,328	66,149	5,273	172,905
2009	175,644	48,438	69,565	293,647	61,960	3,733	227,954
2010	195,620	30,629	58,503	284,752	53,640	501	230,611
2011	242,569	48,230	66,575	357,374	65,474	739	291,161
2012	209,074	39,750	46,495	295,319	51,392	1,106	242,821
2013	149,541	51,319	56,392	257,252	65,598	266	191,388
2014	355,570	50,010	86,942	492,522	56,592	736	435,195
2015	269,862	53,718	79,759	403,339	68,097	216	335,026
2016	276,432	42,263	68,347	387,042	35,438	664	350,939
2017[1]	129,596	25,044	56,368	211,008	32,659	-	178,348

Note: Troll, net, sport and total catches include catch of SEAK hatchery-origin fish and terminal exclusion catch; catches that count towards the all-gear ceiling (with hatchery add-on and terminal exclusion subtracted) are shown in the treaty catch column.

Note: NA = Not Available.

[1] Preliminary value until sport mail-out survey results are available.

Table A2.–Estimates of incidental mortality associated with Southeast Alaska AABM Chinook salmon treaty catches.

Year	Troll		Sport		Net		Total Treaty
	LIM	SIM	LIM	SIM	LIM	SIM	IM
1985	15,319	79,828	2,397	3,413	6,545	41,606	149,107
1986	21,169	63,137	1,982	2,823	6,880	25,268	121,259
1987	35,097	66,688	2,112	3,007	1,142	10,730	118,776
1988	11,997	34,995	2,315	3,297	6,563	15,046	74,213
1989	24,573	47,841	2,788	3,970	7,305	32,912	119,390
1990	20,490	49,423	4,494	15,554	3,401	16,562	109,925
1991	22,633	41,165	2,831	5,292	3,605	18,803	94,330
1992	24,737	43,468	4,832	7,129	24,728	103,344	208,238
1993	20,148	44,953	4,277	5,979	2,580	12,194	90,131
1994	24,611	45,623	2,747	6,051	8,937	39,091	127,060
1995	13,745	29,666	3,020	5,291	3,440	12,441	67,602
1996	14,576	27,280	3,404	4,242	221	427	50,149
1997	11,452	25,423	6,768	6,219	729	3,049	53,640
1998	5,791	11,728	4,479	5,246	1,173	6,860	35,278
1999	16,517	15,618	5,924	8,835	514	2,357	49,764
2000	9,746	19,040	4,525	5,593	222	536	39,661
2001	11,020	24,406	5,633	5,993	426	1,621	49,100
2002	8,440	33,248	5,690	6,089	249	1,429	55,145
2003	10,678	20,196	5,147	6,804	415	9,232	52,471
2004	14,061	15,482	7,060	7,233	4,901	4,177	52,913
2005	11,915	13,961	5,793	9,321	143	4,781	45,913
2006	10,256	17,291	6,106	8,706	223	5,393	47,975
2007	10,628	21,673	5,245	8,834	4,126	21,010	71,517
2008	11,711	16,582	4,608	4,686	246	290	38,123
2009	11,620	18,361	4,817	6,434	136	3,595	44,963
2010	12,763	16,942	3,754	4,558	142	261	38,420
2011	10,400	14,809	6,144	7,231	379	2,651	41,613
2012	7,315	22,797	3,703	4,948	1,414	5,712	45,890
2013	14,569	14,930	6,662	8,381	2,987	11,853	59,382
2014	14,441	16,445	6,376	7,950	105	5,630	50,945
2015	10,761	11,747	7,538	8,192	1,859	9,051	49,148
2016	9,830	20,908	4,653	7,118	99	8,404	51,012
2017[1]	14,561	14,732	3,712	5,678	753	2,912	42,349

Note: LIM = Legal Incident Mortality, SIM = Sublegal Incident Mortality.

[1] Preliminary estimates for Sport IM and Total IM. Legal dropoffs in sport retention fishery estimated from creel estimate while all other IM for the Southeast Alaska 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 this appendix in the next annual catch and escapement report.

Table A3.–Estimates of incidental mortality associated with Southeast Alaska Chinook salmon total catches.

Year	Troll		Sport		Net		Total IM[1]
	LIM	SIM	LIM	SIM	LIM	SIM	
1985	15,584	81,237	2,587	3,684	6,575	41,746	151,412
1986	21,690	64,744	2,346	3,342	7,224	26,491	125,837
1987	36,565	69,648	2,531	3,604	1,200	11,058	124,607
1988	12,502	36,744	2,722	3,876	6,813	15,442	78,100
1989	25,226	49,392	3,233	4,604	8,785	39,395	130,636
1990	21,761	53,067	5,565	19,262	4,499	21,260	125,414
1991	23,659	43,731	3,794	7,092	4,548	22,738	105,561
1992	25,574	45,574	5,863	8,651	26,524	110,309	222,497
1993	20,758	46,882	4,935	6,899	3,353	15,090	97,917
1994	25,489	47,395	3,281	7,228	10,987	47,326	141,706
1995	15,106	33,534	4,225	7,403	7,970	29,946	98,184
1996	15,502	30,411	5,022	6,259	1,349	4,968	63,512
1997	11,829	26,906	9,082	8,345	1,737	7,536	65,434
1998	5,939	12,211	5,322	6,233	2,013	11,680	43,398
1999	17,101	16,419	8,033	11,980	1,419	7,068	62,021
2000	10,483	21,726	6,898	8,526	828	2,675	51,136
2001	11,668	27,697	9,105	9,686	1,383	6,027	65,566
2002	8,787	35,345	8,695	9,305	573	4,116	66,822
2003	11,085	21,501	7,252	9,585	711	12,642	62,776
2004	14,742	16,618	10,266	10,516	6,959	5,776	64,878
2005	12,572	15,151	7,919	12,742	966	7,148	56,499
2006	10,619	18,178	7,552	10,766	849	8,636	56,601
2007	11,136	23,598	6,975	11,749	6,829	33,435	93,721
2008	12,336	18,551	6,963	7,081	736	1,102	46,770
2009	12,141	19,722	6,964	9,302	389	7,498	56,015
2010	13,237	17,992	4,956	6,018	498	1,243	43,944
2011	10,786	15,760	7,580	8,921	1,104	7,325	51,477
2012	7,631	24,601	4,565	6,099	4,437	18,192	65,525
2013	15,073	15,702	8,675	10,914	10,505	41,352	102,221
2014	14,749	16,917	7,496	9,346	453	9,632	58,592
2015	11,107	12,261	9,225	10,025	4,892	23,284	70,795
2016	9,981	21,532	5,345	8,176	280	11,692	57,007
2017[2]	14,889	15,151	4,408	6,743	2,749	10,836	54,776

[1] Includes total treaty, terminal exclusion, and hatchery add-on estimates of incidental mortality.

[2] Preliminary estimates for Sport IM and Total IM. Legal dropoffs in sport retention fishery estimated from creel estimate while all other IM for the Southeast Alaska 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 this appendix in the next annual catch and escapement report.

Table A4.–Canadian Transboundary Rivers (Taku, Stikine, Alsek) ISBM Chinook salmon landed catch (LC), releases (Rel.), and incidental mortality (IM).

	Transboundary Rivers											
	First Nations			Net			Sport			Total		
Year	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1975	1,024	0	47	178	0	8	0	0	0	1,202	0	55
1976	1,074	0	49	236	0	11	200	0	14	1,510	0	74
1977	450	0	21	62	0	3	300	0	21	812	0	44
1978	750	0	35	100	0	5	300	0	21	1,150	0	60
1979	2,150	0	99	872	0	40	734	0	51	3,756	0	190
1980	822	0	38	1,869	0	86	354	0	24	3,045	0	148
1981	736	0	34	977	0	45	556	0	38	2,269	0	117
1982	1,018	0	47	1,823	0	84	429	0	30	3,270	0	160
1983	1,375	0	63	1,553	0	71	355	0	24	3,283	0	159
1984	802	0	37	515	0	24	569	0	39	1,886	0	100
1985	1,066	0	49	759	0	35	654	0	45	2,479	0	129
1986	1,707	0	79	1,668	0	77	570	0	39	3,945	0	195
1987	1,491	0	69	1,512	0	70	823	0	57	3,826	0	195
1988	1,445	0	66	2,170	0	100	780	0	54	4,395	0	220
1989	1,433	0	66	2,799	0	129	722	0	50	4,954	0	244
1990	1,094	0	50	3,703	0	170	1,001	0	69	5,798	0	290
1991	1,572	0	72	2,717	0	125	834	0	58	5,123	0	255
1992	1,311	0	60	2,629	0	121	608	0	42	4,548	0	223
1993	1,248	0	57	2,830	0	130	909	0	63	4,987	0	250
1994	1,297	0	60	3,551	0	163	744	0	51	5,592	0	274
1995	1,464	0	67	3,567	0	164	1,465	0	101	6,496	0	333
1996	1,389	0	64	5,489	0	252	1,134	0	78	8,012	0	395
1997	1,584	0	73	6,336	0	291	811	0	56	8,731	0	420
1998	864	0	40	3,288	0	151	662	0	46	4,814	0	237
1999	1,516	0	70	4,117	0	189	662	0	46	6,295	0	305
2000	1,616	0	74	3,882	0	179	633	0	44	6,131	0	297
2001	954	0	44	2,461	0	113	659	0	45	4,074	0	203
2002	1,450	0	67	2,499	0	115	963	0	66	4,912	0	248
2003	1,659	0	76	3,839	0	177	651	0	45	6,149	0	298
2004	2,454	0	113	6,969	0	321	455	0	31	9,878	0	465
2005	952	0	44	20,334	0	935	323	0	22	21,609	0	1,001
2006	962	0	44	17,076	0	785	243	0	17	18,281	0	847
2007	781	0	36	14,715	0	677	145	0	10	15,641	0	723
2008	920	0	42	10,831	0	498	327	0	23	12,078	0	563
2009	940	0	43	10,031	510	944	140	0	10	11,111	510	997
2010	1,090	0	50	9,410	124	550	247	0	17	10,747	124	617
2011	999	0	46	7,769	158	507	299	275	73	9,067	433	626
2012	764	0	35	9,119	63	479	254	367	88	10,137	430	602
2013	1,454	0	67	4,858	38	259	160	197	49	6,472	235	375
2014	1,252	0	58	5,830	23	290	181	166	44	7,263	189	392
2015	1,226	0	56	5,385	0	248	225	48	25	6,836	48	329
2016	726	0	33	4,149	0	191	20	0	1	4,895	0	226
2017	295	0	14	568	272	283	64	0	4	927	272	301

Table A5.–Northern British Columbia (NBC) AABM Chinook salmon catches.

Year	Northern British Columbia		
	Area 1-5 Troll[1,2]	Areas 1,2E, 2W Sport	Total
1975	228,121		228,121
1976	190,267		190,267
1977	130,899	106	131,005
1978	146,054	125	146,179
1979	147,576	0	147,576
1980	157,198	200	157,398
1981	153,065	184	153,249
1982	173,472	215	173,687
1983	162,837	90	162,927
1984	185,134	171	185,305
1985	165,845	600	166,445
1986	175,715	1,153	176,868
1987	177,457	2,644	180,101
1988	152,369	7,059	159,428
1989	207,679	20,652	228,331
1990	154,109	16,827	170,936
1991	194,018	15,047	209,065
1992	142,340	21,358	163,698
1993	161,686	25,297	186,983
1994	164,581	28,973	193,554
1995	56,857	22,531	79,388
1996	8	670	678
1997	83,261	27,738	110,999
1998	109,072	34,130	143,202
1999	54,097	30,227	84,324
2000	9,948	22,100	32,048
2001	12,934	30,400	43,334
2002	102,731	47,100	149,831
2003	140,497	54,300	194,797
2004	167,508	74,000	241,508
2005	174,806	68,800	243,606
2006	151,485	64,500	215,985
2007	83,235	61,000	144,235
2008	52,147	43,500	95,647
2009	75,470	34,000	109,470
2010	90,213	46,400	136,613
2011	74,660	48,000	122,660
2012	80,256	40,050	120,306
2013	69,264	46,650	115,914
2014	172,001	44,900	216,901
2015	106,703	52,200	158,903
2016	147,381	42,800	190,181
2017	97,730	45,600	143,330

Note: troll (Areas 1–5) and tidal sport (Areas 1, 2E, 2W) are the components of the NBC AABM fishery.

[1] Since 1998, the catch accounting year for troll fisheries was set from October 1 to September 30. To make comparisons to previous years more meaningful, the same catch accounting period was applied for years prior to 1998.

[2] Troll catches from 1996 to 2004 have been updated with data from DFO (2009).

Table A6.–Estimates of incidental mortality associated with Northern British Columbia (NBC) AABM Chinook salmon catches.

Year	Area 1-5 Troll[1]		Areas 1, 2E, 2W Sport		Total
	LIM	SIM	LIM	SIM	IM
1985	2,819	12,405	97	0	15,321
1986	2,987	19,637	204	0	22,828
1987	4,307	40,626	535	0	45,468
1988	4,829	40,749	1,505	0	47,083
1989	3,740	35,135	4,068	0	42,943
1990	5,195	46,172	3,248	0	54,615
1991	4,385	43,848	2,734	0	50,967
1992	4,985	49,332	3,634	0	57,951
1993	4,444	36,696	4,353	0	45,493
1994	3,709	27,882	4,524	0	36,115
1995	3,721	26,123	2,935	0	32,779
1996[2]	0		2,562	0	2,562
1997[2]	1,415		6,021	0	7,436
1998[2]	1,854		6,102	0	7,956
1999	920	674	3,605	0	5,199
2000	169	147	4,707	0	5,023
2001	376	276	5,955	0	6,607
2002	2,778	1,083	8,417	0	12,278
2003	4,772	740	9,519	0	15,031
2004	9,336	1,225	21,237	0	31,798
2005	7,896	446	12,221	0	20,563
2006	3,300	3,958	7,503	0	14,761
2007	2,282	3,771	7,870	0	13,923
2008	1,321	1,748	3,266	0	6,335
2009	2,069	3,625	4,011	0	9,705
2010	2,798	3,164	6,777	0	12,739
2011	7,732	1,773	9,114	0	18,619
2012	2,152	4,427	4,977	0	11,556
2013	7,236	3,390	9,300	0	19,926
2014	4,273	5,516	7,487	0	17,276
2015	5,442	2,785	13,446	0	21,673
2016	2,810	5,061	6,265	0	14,136
2017	3,824	9,266	6,209	0	19,299

Note: Troll (Areas 1–5) and tidal sport (Areas 1, 2E, 2W) are the components of the NBC AABM fishery.

Note: LIM = Legal Incident Mortality, SIM = Sublegal Incident Mortality.

[1] Since 1998, the catch accounting year for troll fisheries was set from October 1 to September 30. To make comparisons to previous years more meaningful, the same catch accounting period was applied for years prior to 1998.

[2] Release data are not yet available for 1996 to 1998.

Table A7.–Northern British Columbia (NBC) ISBM Chinook salmon landed catch (LC), releases (Rel.), and incidental mortality (IM).

Year	Area 1–5 First Nations			Area 1–5 Net			Tyee Test Fishery			Area 3–5 Sport			Area 1–5 Freshwater Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1975	4,055		187	24,786	0	1,140	309		14							29,150	0	1,341
1976	2,791		128	15,849	0	729	256		12							18,896	0	869
1977	6,998		322	43,926	0	2,021	270		12	1,670		60	2,158		149	55,022	0	2,564
1978	5,363		247	27,731	0	1,276	193		9	1,668		60	6,610		456	41,565	0	2,047
1979	5,266		242	40,208	0	1,850	432		20	2,523		91	1,960		135	50,389	0	2,338
1980	10,121		466	26,612	0	1,224	283		13	3,867		139	4,515		312	45,398	0	2,153
1981	11,115		511	41,379	0	1,903	345		16	2,760		99	2,613		180	58,212	0	2,710
1982	13,255		610	44,844	0	2,063	243		11	3,760		135	2,726		188	64,828	0	3,007
1983	15,532		714	16,752	0	771	362		17	4,092		147	5,374		371	42,112	0	2,020
1984	11,408		525	31,072	0	1,429	587		27	2,300		83	3,426		236	48,793	0	2,300
1985	15,794		727	39,543	0	1,819	545		25	3,600		130	3,186		220	62,668	0	2,920
1986	24,448		1,125	23,902	0	1,099	752		35	3,950		142	4,410		304	57,462	0	2,705
1987	16,329		751	17,494	0	805	725		33	4,150		149	3,625		250	42,323	0	1,989
1988	21,727		999	30,620	0	1,409	740		34	4,300		155	3,745		258	61,132	0	2,855
1989	21,023		967	38,403	0	1,767	653		30	4,150		149	5,247		362	69,476	0	3,275
1990	27,105		1,247	28,220	0	1,298	651		30	4,300		155	4,090		282	64,366	0	3,012
1991	23,441		1,078	40,782	0	1,876	591		27	4,256		153	4,764		329	73,834	0	3,463
1992	27,012		1,243	35,057	0	1,613	554		25	6,250		225	6,182		427	75,055	0	3,532
1993	21,353		982	33,351	0	1,534	776		36	3,279		118	7,813		539	66,572	0	3,209
1994	15,949		734	21,691	0	998	521		24	3,171		114	3,093		213	44,425	0	2,083
1995	13,635		627	18,076	0	831	464		21	2,475		89	3,503		242	38,153	0	1,811

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Table A7.–Page 2 of 2.

Year	Area 1–5 First Nations			Area 1–5 Net			Tyee Test Fishery			Area 3–5 Sport			Area 1–5 Freshwater Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1996	13,345		614	30,589	0	4,464	2,490		115	3,382		122	1,250		86	51,056	0	5,401
1997	14,610		672	20,831	0	2,399	1,524		70	0		0				36,965	0	3,141
1998	20,622		949	6,136	0	347	1,698		78	4,750		171				33,206	0	1,545
1999	27,399		1,260	8,662	0	408	2,724		125	11,700		421				50,485	0	2,215
2000	23,476		1,080	19,715	0	909	3,134		144	8,600		310				54,925	0	2,443
2001	23,508		1,081	22,667	0	1,043	2,743		126	11,000		396				59,918	0	2,646
2002	14,125		650	13,515	0	622	1,696		78	8,000		288				37,336	0	1,637
2003	20,950		964	13,400	0	616	1,830		84	8,000		288	5,711		394	49,891	0	2,346
2004	20,548		945	11,917	0	554	1,197		55	8,000		288				41,662	0	1,843
2005	17,553		807	5,416	5,502	4,368	1,136	0	52	8,000		288				32,105	5,502	5,515
2006	17,262		794	10,571	9,904	7,968	1,178	0	54	8,000		288				37,011	9,904	9,104
2007	14,087		648	9,520	10,273	8,011	1,302	0	60	8,000		288				32,909	10,273	9,007
2008	14,963	0	688	4,619	3,359	2,829	1,293	0	59	11,970	1,643	692	0	0	0	32,845	5,002	4,268
2009	13,083	0	602	4,348	2,003	1,642	1,189	0	55	9,177	1,703	601	0	0	0	27,797	3,706	2,900
2010	13,693		630	2,191	0	101	959		44	7,570	563	362	2,689		186	27,102	563	1,322
2011	10,863		500	3,586	0	165	976		45	14,677	2,246	885	2,540		175	32,642	2,246	1,770
2012	8,189		377	788	3,067	2,661	575		26	7,017		253	421		29	16,990	3,067	3,346
2013	8,557	0	394	2,126	3,163	2,739	547	0	25	10,259	560	458	2,024	958	324	23,513	4,681	3,940
2014	11,936	0	549	2,632	3,317	3,022	482	0	22	11,973	4,692	1,177	2,302	178	193	29,325	8,187	4,963
2015	17,524		806	2,434	2,300	2,090	750	9	43	12,760		459	3,442		237	36,910	2,309	3,636
2016	9,051	0	416	1,222	2,219	1,851	392		18	10,043	2,190	710	2,246	0	155	22,954	4,409	3,151
2017	10,064		463	1,655	1,506	1,301	375		17	10,108	5,308	1,208	1,240	909	260	23,442	7,723	3,249

Note: NA = Not available.

Table A8.–Central British Columbia ISBM Chinook salmon landed catch (LC), releases (Rel.), and incidental mortality (IM).

Year	Central British Columbia																	
	First Nations			Net[1]			Troll[1,2]			Tidal Sport			Freshwater Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1975				40,985	0	40,985	135,470		2,303							176,455	0	43,288
1976				32,669	0	32,669	145,204		2,468							177,873	0	35,137
1977	6,972		321	32,409	0	32,409	122,689		2,086	4,773		172	1,544		107	168,387	0	35,094
1978	7,944		365	35,708	0	35,708	91,025		1,547	5,694		205	1,770		122	142,141	0	37,948
1979	7,585		349	50,445	0	50,445	107,884		1,834	5,225		188	1,940		134	173,079	0	52,950
1980	6,240		287	27,715	0	27,715	95,377		1,621	4,802		173	988		68	135,122	0	29,864
1981	5,701		262	18,912	0	18,912	69,247		1,177	3,490		126	1,261		87	98,611	0	20,564
1982	9,112		419	32,419	0	32,419	69,748		1,186	5,419		195	1,293		89	117,991	0	34,308
1983	6,442		296	12,556	0	12,556	97,447		1,657	4,271		154	821		57	121,537	0	14,719
1984	9,736		448	4,630	0	4,630	78,120		1,328	4,354		157	1,332		92	98,172	0	6,655
1985	6,019		277	12,391	0	12,391	27,090		461	3,943		142	823		57	50,266	0	13,327
1986	6,353		292	23,032	0	23,032	54,407		925	4,566		164	1,245		86	89,603	0	24,499
1987	6,296		290	10,893	0	10,893	65,776		1,118	3,933		142	1,563		108	88,461	0	12,550
1988	6,000		276	12,886	0	12,886	36,125		614	3,596		129	1,496		103	60,103	0	14,009
1989	8,992		414	6,599	0	6,599	21,694		369	3,438		124	4,526		312	45,249	0	7,817
1990	9,811		451	18,630	0	18,630	29,882		508	4,053		146	5,626		388	68,002	0	20,123
1991	8,801		405	15,926	0	15,926	29,843		507	4,409		159	3,335		230	62,314	0	17,227
1992	8,533		393	18,337	0	18,337	47,868		814	4,891		176	3,204		221	82,833	0	19,940
1993	9,095		418	10,579	0	10,579	23,376		397	6,114		220	2,880		199	52,044	0	11,814
1994	5,383		248	14,424	0	14,424	18,976		323	4,303		155	973		67	44,059	0	15,216
1995	3,501		161	11,007	0	11,007	5,819		99	2,172		78	1,180		81	23,679	0	11,427

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Table A8.–Page 2 of 2.

Year	Central British Columbia																	
	First Nations			Net[1]			Troll[1,2]			Tidal Sport			Freshwater Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1996	6,922		318	7,201	0	7,201	0		0	2,936		106	3,986		275	21,045	0	7,900
1997	9,764		449	3,650	0	3,650	9,251		157	8,524		307	1,139		79	32,328	0	4,642
1998	6,671		307	5,467	0	5,467	2,211		38	5,514		199	779		54	20,642	0	6,064
1999	5,440		250	4,342	0	4,342	2,073		35	10,300		371	1,136		78	22,155	0	5,077
2000	4,576		210	3,197	0	3,197	0		0	7,400		266	1,363		94	15,173	0	3,768
2001	5,435		250	6,465	0	6,465	0		0	7,650		275	1,024		71	20,574	0	7,061
2002	3,292		151	4,676	0	4,676	482		8	7,330		264	723		50	16,503	0	5,149
2003	3,173		146	2,815	0	2,815	0		0	8,385	146	325	491		34	14,864	146	3,320
2004	4,003		184	5,404	0	5,404	0		0	10,677	77	397	524		36	20,608	77	6,021
2005	4,180		192	6,323	15,281	11,298	0		0	9,017	302	373	812		56	20,332	15,583	11,919
2006	4,013		185	5,231	1,391	1,247	0	818	168	9,400	428	406	870		60	18,644	2,637	2,066
2007	2,102	0	97	5,542	5,349	4,106	0	1,926	400	6,130	118	239	522	20	40	14,296	7,413	4,882
2008	3,018	0	139	1,133	181	182	9	795	164	2,909	607	201	276	0	19	7,345	1,583	706
2009	4,011		185	3,132	0	144	0		0	3,239	0	117	550		38	10,932	0	483
2010	3,710		171	1,549	0	71	0		0	4,043		146	646		45	9,302	0	432
2011	2,323		107	4,794	0	221	0		0	7,701	498	356	646		45	15,464	498	728
2012	1,745		80	3,624	500	533	0		0	5,861		211	524		36	11,754	500	860
2013	3,945	0	181	5,301	2,044	1,728	0	453	93	4,457		160	1,506		104	15,209	2,474	2,267
2014	2,909		134	2,238	498	463	0	0	0	7,800	0	281	2,134		147	15,081	498	1,025
2015	2,780		128	5,351	1,527	1,370	0	0	0	10,597		381	1,270		88	19,998	1,527	1,967
2016	1,912	0	88	3,192	1,050	931	0	287	58	5,769	60	217	1,493	0	103	12,366	1,397	1,397
2017	1,907		88	3,119	1,558	1,276	0	2,013	407	6,679		240	977		67	12,682	3,571	2,078

Note: NA = Not available.

[1] Troll and net catches from 1996 to 2004 have been updated with data from DFO (2009), catch excludes jacks and small red-fleshed Chinook salmon.

[2] Since 1998, the catch accounting year for troll fisheries was set from October 1 to September 30. To make comparisons to previous years more meaningful, the same catch accounting period was applied for years prior to 1998.

Table A9.–West Coast Vancouver Island (WCVI) AABM Chinook salmon catches.

Year	West Coast Vancouver Island AABM		
	Troll[1,2]	AABM Sport[3]	Total
1975	546,214		546,214
1976	665,010		665,010
1977	545,742		545,742
1978	568,705		568,705
1979	477,222		477,222
1980	486,303		486,303
1981	423,266		423,266
1982	538,510		538,510
1983	395,636		395,636
1984	471,294		471,294
1985	345,937	23,100	345,937
1986	350,227	17,100	350,227
1987	378,931	34,800	378,931
1988	408,668	12,800	408,668
1989	203,751	38,800	203,751
1990	297,858	35,000	297,858
1991	203,035	39,500	203,035
1992	340,146	18,518	358,664
1993	277,033	23,312	300,345
1994	150,039	10,313	160,352
1995	81,454	13,956	95,410
1996	4	10,229	10,233
1997	52,688	6,400	59,088
1998	5,140	4,177	9,317
1999	7,434	31,106	38,540
2000	64,547	24,070	88,617
2001	79,668	40,636	120,304
2002	126,417	31,503	157,920
2003	146,736	26,825	173,561
2004	176,166	39,086	215,252
2005	148,798	50,681	199,479
2006	109,004	36,507	145,511
2007	94,291	46,323	140,614
2008	95,170	50,556	145,726
2009	58,191	66,426	124,617
2010	84,123	54,924	139,047
2011	129,023	75,209	204,232
2012	69,054	65,414	134,468
2013	49,526	64,072	113,598
2014	133,499	54,875	188,374
2015	68,522	48,215	116,737
2016	60,478	38,819	99,297
2017[4]	60,356	49,177	109,533

Note: Troll = Areas 21, 23–27, and 121–127; Net = Areas 21, and 23–27; Sport = Areas 23a, 23b, 24–27.

[1] Since 1998, the catch accounting year for troll fisheries was set from October 1 to September 30. The same catch accounting period was applied for years prior to 1998.

[2] Troll catches from 1996 to 2004 have been updated with data from DFO (2009).

[3] AABM sport catch 1975 to 1991 is under review. No estimate available; it is currently included in ISBM catch in Appendix A11.

[4] Including 5,000 First Nations food, social, and ceremonial troll catch; 945 Brooks test fishery catch; and 6,877 T'aaq-wiihak troll catch.

Table A10.–Estimates of incidental mortality (IM) associated with West Coast Vancouver Island (WCVI) AABM Chinook salmon catches.

Year	Troll[1,2]		Outside Sport[3]		Total IM
	LIM	SIM	LIM	SIM	
1985	7,261	102,749	-	-	110,010
1986	5,954	66,075	-	-	72,029
1987	11,169	148,659	-	-	159,828
1988	16,284	169,260	-	-	185,544
1989	3,464	63,325	-	-	66,789
1990	5,064	91,521	-	-	96,585
1991	3,452	84,116	-	-	87,568
1992	5,782	95,731	-	-	101,513
1993	4,710	84,325	3,078	1,074	93,187
1994	2,551	76,372	1,218	475	80,616
1995	6,622	45,231	1,531	643	54,027
1996[4,5]					0
1997[4,5]					0
1998[4,5]					0
1999[4]	126	721	2,146		2,993
2000[4]	1,097	4,100	2,626	3,629	11,452
2001[4]	2,321	6,014	4,397	3,271	16,003
2002[4]	3,754	5,329	4,540	1,441	15,064
2003[4]	2,509	6,126	6,297	1,216	16,148
2004[4]	2,995	4,127	5,781	1,053	13,956
2005	2,641	4,088	7,207	878	14,814
2006	2,565	3,031	4,800	1,161	11,557
2007	1,653	3,414	4,343	2,993	12,403
2008	1,631	2,863	6,269	1,549	12,312
2009	1,059	1,653	7,755	5,350	15,817
2010	1,506	1,936	10,679	1,896	16,017
2011	2,281	2,313	9,660	2,751	17,005
2012	1,214	629	10,976	3,571	16,390
2013	852	1,734	10,714	3,306	16,606
2014	2,293	3,161	8,454	3,171	17,079
2015	1,383	932	7,021	1,635	10,971
2016	1,047	1,853	4,062	2,696	9,658
2017[6]	1,048	2,270	6,459	3,426	13,203

Note: Troll = Areas 21, 23–27, and 121–127; Net = Areas 21, and 23–27; Sport = Areas 23a, 23b, 24–27.

Note: LIM = Legal Incident Mortality, SIM = Sublegal Incident Mortality.

[1] Since 1998, the catch accounting year for troll fisheries was set from October 1 to September 30. The same catch accounting period was applied for years prior to 1998.

[2] Troll and net catches from 1996 to 2004 have been updated with data from DFO, 2009.

[3] Before 1992, catch was not reported as inside or outside, thus inside catch for those years represents total tidal sport catch.

[4] First Nations catch is mainly commercial catch 1996–2004 has been updated.

[5] Release data are not yet available for 1996–1998.

[6] Includes 5,000 First Nations food, social, and ceremonial troll catch; 945 Brooks test fishery catch; and 6,877 T'aaq-wiihak troll catch.

Table A11.–West Coast Vancouver Island (WCVI) ISBM Chinook salmon landed catch (LC), releases (Rel.), and incidental mortality (IM).

	West Coast Vancouver Island ISBM														
	First Nations[1]			Net[2]			Tidal Sport[3]			Freshwater Sport			Total		
Year	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1975	NA			19,233	0	19,233	NA			NA			19,233	0	19,233
1976	NA			17,492	0	17,492	NA			NA			17,492	0	17,492
1977	NA			13,745	0	13,745	NA			NA			13,745	0	13,745
1978	NA			25,143	0	25,143	NA			NA			25,143	0	25,143
1979	NA			35,623	0	35,623	NA			NA			35,623	0	35,623
1980	NA			34,732	0	34,732	NA			NA			34,732	0	34,732
1981	NA			36,411	0	36,411	NA			NA			36,411	0	36,411
1982	NA			41,172	0	41,172	NA			NA			41,172	0	41,172
1983	NA			37,535	0	37,535	NA			NA			37,535	0	37,535
1984	NA			43,792	0	43,792	NA			NA			43,792	0	43,792
1985	NA			11,089	0	11,089	NA			NA			11,089	0	11,089
1986	NA			3,276	0	3,276	NA			NA			3,276	0	3,276
1987	NA			478	0	478	3,483	2,689	757	NA			3,961	2,689	1,235
1988	NA			15,438	0	15,438	23,020	17,265	4,903	NA			38,458	17,265	20,341
1989	NA			40,321	0	40,321	16,439	11,343	3,312	NA			56,760	11,343	43,633
1990	1,199		55	29,578	0	29,578	34,723	22,605	6,736	NA			65,500	22,605	36,369
1991	41,322		1,901	60,797	0	60,797	46,483	27,518	8,491	NA			148,602	27,518	71,189
1992	8,315		382	9,486	0	9,486	46,968	28,322	8,679	NA			64,769	28,322	18,547
1993	5,078		234	28,694	0	28,694	65,604	37,263	11,681	NA			99,376	37,263	40,609
1994	1,515		70	2,369	0	2,369	52,526	26,000	8,616	NA			56,410	26,000	11,055
1995	5,868		270	458	0	458	21,675	9,797	3,377	NA			28,001	9,797	4,105

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Table A11.–Page 2 of 2.

Year	West Coast Vancouver Island ISBM														
	First Nations[1]			Net[2]			Tidal Sport[3]			Freshwater Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1996	NA			58	0	58	2,266	1,096	367	NA			2,324	1,096	425
1997	5,726		263	208	0	208	47,355	24,667	8,004	NA			53,289	24,667	8,475
1998	7,172		330	345	0	345	55,697	28,552	9,325	NA			63,214	28,552	10,000
1999	3,591		165	112	0	112	47,163	11,319	5,428	NA			50,866	11,319	5,705
2000	NA			126	0	126	5,443	13,954	3,055	NA			5,569	13,954	3,181
2001	NA			11	0	11	6,354	10,684	2,490	6,198		428	12,563	10,684	2,928
2002	10,893		501	260	0	260	36,073	14,629	5,298	77		5	47,303	14,629	6,064
2003	10,000		460	9,251	0	9,251	51,186	25,341	8,397	NA			70,437	25,341	18,108
2004	15,789		726	12,348	0	12,348	61,218	29,852	9,956	26		2	89,381	29,852	23,032
2005	35,000		1,610	23,599	354	4,687	43,577	9,534	4,837	6,225		430	108,401	9,888	11,564
2006	26,933	0	1,239	20,308	228	2,584	44,025	9,638	4,888	NA			91,266	9,866	8,711
2007	20,098		925	26,881	88	4,031	39,368	12,060	5,032	NA			86,347	12,148	9,987
2008	12,159	0	559	8,257	2	2,679	24,855	8,914	3,426	0	0	0	45,271	8,916	6,665
2009	9,026	0	415	9,765	0	2,200	31,921	16,641	5,398	0	0	0	50,712	16,641	8,013
2010	7,485	0	344	1,747	372	372	24,687	12,721	4,146	0	0	0	33,919	13,093	4,863
2011	22,794	0	1,049	21,843	355	1,337	52,131	15,539	6,581	NA			96,768	15,894	8,966
2012	9,700		446	10,214	521	917	25,890	13,047	4,291	0	0	0	45,804	13,568	5,655
2013	1,101	0	51	8,854	259	597	22,272	18,275	5,046	0	0	0	32,227	18,534	5,693
2014	4,280		197	19,090	53	928	28,679	19,183	5,662	0	0	0	52,049	19,236	6,787
2015	9,743		448	10,131	362	751	34,668	16,968	5,650	NA			54,542	17,330	6,849
2016	14,091	0	648	5,125	925	913	26,237	27,665	7,122	0	0	0	45,453	28,590	8,683
2017	17,533	21	826	30,486	687	4,031	41,998	18,440	6,438	0	0	0	90,017	19,148	11,295

Note: NA = Not available.

[1] First Nations catch is mainly commercial catch, 1996 to 2004 has been updated.

[2] Net catches from 1996 to 2004 have been updated with data from DFO Catch Finalization Project (2009).

[3] Prior to 1992, catch was not reported as inside or outside. Therefore, inside catch for those years represents total tidal sport catch.

Table A12.–Johnstone Strait ISBM Chinook salmon landed catch (LC), releases (Rel.), and incidental mortality (IM).

	Johnstone Strait														
	First Nations			Net[1]			Troll[1,2]			Tidal Sport[3]			Total		
Year	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1975	NA			30,295	0	1,394	18,065		307	NA			48,360	0	1,701
1976	NA			31,855	0	31,855	30,838		524	NA			62,693	0	32,379
1977	NA			49,511	0	49,511	26,868		457	NA			76,379	0	49,968
1978	NA			55,148	0	55,148	13,052		222	NA			68,200	0	55,370
1979	NA			31,291	0	31,291	13,052		222	NA			44,343	0	31,513
1980	NA			30,325	0	30,325	11,743		200	NA			42,068	0	30,525
1981	NA			28,620	0	28,620	13,035		222	NA			41,655	0	28,842
1982	NA			29,454	0	29,454	11,234		191	NA			40,688	0	29,645
1983	NA			28,364	0	28,364	14,653		249	NA			43,017	0	28,613
1984	NA			18,361	0	18,361	9,260		157	NA			27,621	0	18,518
1985	NA			38,073	0	38,073	3,567		61	NA			41,640	0	38,134
1986	NA			17,866	0	17,866	3,951		67	NA			21,817	0	17,933
1987	NA			13,863	0	13,863	1,780		30	NA			15,643	0	13,893
1988	NA			6,292	0	6,292	1,566		27	NA			7,858	0	6,319
1989	NA			29,486	0	29,486	1,825		31	NA			31,311	0	29,517
1990	NA			18,433	0	18,433	2,298		39	NA			20,731	0	18,472
1991	1,287		59	15,071	0	15,071	1,228		21	9,311		642	26,897	0	15,794
1992	29		1	9,571	0	9,571	2,721		46	15,470		1,067	27,791	0	10,686
1993	20		1	15,530	0	15,530	4,172		71	12,679		875	32,401	0	16,477
1994	0		0	8,991	0	8,991	2,231		38	5,433		375	16,655	0	9,404
1995	71		3	970	0	970	4		0	4,296		296	5,341	0	1,270
1996	107		5	472	0	472	0		0	3,057		211	3,636	0	688

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Year	Johnstone Strait														
	First Nations			Net[1]			Troll[1,2]			Tidal Sport[3]			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1997	179		8	1,018	0	1,018	1,246		21	4,047		279	6,490	0	1,327
1998	138		6	328	0	328	2,129		36	2,710		187	5,305	0	558
1999	469		22	472	0	472	273		5	8,985		620	10,199	0	1,118
2000	212		10	280	0	280	85		1	5,960		411	6,537	0	702
2001	370		17	332	0	332	453		8	4,150		286	5,305	0	643
2002	400		18	569	0	569	129		2	3,696		255	4,794	0	845
2003	130		6	306	0	306	719		12	9,851		680	11,006	0	1,004
2004	28		1	525	0	525	316		5	16,131		1,113	17,000	0	1,645
2005	NA			291	1,925	1,596	2		0	16,076	9,522	2,937	16,369	11,447	4,533
2006	200		9	244	5,304	4,073	0	838	189	10,532	4,526	1,596	10,976	10,669	5,867
2007	200		9	2	331	304	0	460	107	9,882	5,814	1,798	10,084	6,605	2,219
2008	324	0	15	48	447	325	0	0	0	4,436	3,985	1,071	4,808	4,432	1,411
2009	344	0	16	597	14	426	0		0	11,501	15,984	3,862	12,442	15,998	4,304
2010	250		12	55	2,510	1,983	2	715	169	10,016	9,092	2,437	10,323	12,317	4,601
2011	268	0	12	46	2,312	1,710	0	36	7	11,934	5,169	1,816	12,248	7,517	3,546
2012	321		15	37	468	346	0	44	9	7,874	7,899	2,060	8,232	8,411	2,429
2013	258	0	12	35	241	181	0	0	0	8,260	6,710	1,858	8,553	6,951	2,051
2014	1,637	0	75	311	3,634	2,840	0	0	0	9,339	6,906	1,970	11,287	10,540	4,886
2015	261		12	54	1,162	848	0	0	0	11,931	8,717	2,497	12,246	9,879	3,357
2016	347	0	16	0	15	13	0	0	0	8,734	7,299	2,004	9,081	7,314	2,033
2017	216	7	17	12	747	544	0	0	0	13,684	15,501	3,920	13,912	16,255	4,481

Note: Troll = Area 12; Net = Areas 11–13.

Note: Sport based on July and August creel census in Area 12 and northern half of Area 13.

[1] Troll and net catches from 1996 to 2004 have been updated with data from DFO (2009).

[2] Since 1998, the catch accounting year for troll fisheries was set from October 1 to September 30. The same catch accounting period was applied for years prior to 1998.

[3] Tidal sport creel catches include additional catch estimated using Argue et al. (1977).

Table A13.–Georgia Strait ISBM Chinook salmon landed catch (LC), releases (Rel.), and incidental mortality (IM).

	Georgia Strait														
	First Nations			Net[1]			Troll[1,2]			Tidal Sport			Total		
Year	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1975				0	0	0	174,001		2,958	398,000		27,462	572,001	0	30,420
1976				0	0	0	200,229		3,404	490,000		33,810	690,229	0	37,214
1977				0	0	0	248,082		4,217	372,000		25,668	620,082	0	29,885
1978				0	0	0	217,955		3,705	500,000		34,500	717,955	0	38,205
1979				0	0	0	255,057		4,336	350,000		24,150	605,057	0	28,486
1980				0	0	0	273,077		4,642	204,100		14,083	477,177	0	18,725
1981				0	0	0	239,266		4,068	197,239		13,609	436,505	0	17,677
1982				0	0	0	179,040		3,044	124,390		8,583	303,430	0	11,627
1983				0	0	0	105,133		1,787	198,433		13,692	303,566	0	15,479
1984				0	0	0	90,280		1,535	369,445		25,492	459,725	0	27,026
1985				0	0	0	55,888		950	234,838		16,204	290,726	0	17,154
1986				0	0	0	44,043		749	181,896		12,551	225,939	0	13,300
1987				0	0	0	38,084		647	121,081		8,355	159,165	0	9,002
1988				0	0	0	20,224		344	119,117		8,219	139,341	0	8,563
1989				0	0	0	28,444		484	132,846		9,166	161,290	0	9,650
1990				0	0	0	34,304		583	111,914		7,722	146,218	0	8,305
1991				0	0	0	32,412		551	115,523		7,971	147,935	0	8,522
1992				0	0	0	37,250		633	116,581		8,044	153,831	0	8,677
1993				0	0	0	33,293		566	127,576		8,803	160,869	0	9,369
1994				0	0	0	12,916		220	70,839		4,888	83,755	0	5,107
1995				0	0	0	138		2	62,173		4,290	62,311	0	4,292
1996				8	0	8	14		0	89,589		6,182	89,611	0	6,190

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Year	Georgia Strait														
	First Nations			Net[1]			Troll[1,2]			Tidal Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1997				1	0	1	806		14	56,332		3,887	57,139	0	3,902
1998				11	0	11	303		5	20,923		1,444	21,237	0	1,460
1999				0	0	0	219		4	43,588		3,008	43,807	0	3,011
2000				0	0	0	609		10	32,750		2,260	33,359	0	2,270
2001				3	708	512	311	169	39	31,259		2,157	31,573	877	2,708
2002				16	601	446	459	205	49	52,979		3,656	53,454	806	4,151
2003				18	1,368	999	279	189	43	19,981		1,379	20,278	1,557	2,421
2004				0	881	645	389	235	54	13,475		930	13,864	1,116	1,629
2005				20	703	520	0	206	42	11,972	10,102	2,766	11,992	11,011	3,327
2006				0	3	3	0	3	1	12,181	4,730	1,749	12,181	4,736	1,752
2007				0	200	144	0	0	0	14,561	25,595	5,919	14,561	25,795	6,063
2008	4,848		223	0	156	112	0	0	0	8,836	8,772	2,294	13,684	8,928	2,629
2009				239	0	171	0	135	27	17,884	21,644	5,390	18,123	21,779	5,588
2010	40	0	2	54	1,128	863	5	600	142	14,942	13,704	3,662	15,041	15,432	4,670
2011	2,379	17	126	3	113	86	0	177	36	21,651	20,327	5,397	24,033	20,634	5,644
2012	3,096		142	0	0	0	0	0	0	22,457	45,785	10,340	25,553	45,785	10,483
2013	843	0	39	4	188	138	0	0	0	25,036	74,417	16,016	25,883	74,605	16,193
2014	28	1	2	0	44	32	0	0	0	46,251	47,161	12,246	46,279	47,206	12,280
2015				0	13	10	0	17	3	59,460	38,217	11,440	59,460	38,247	11,454
2016	650	0	30	3	136	115	0	42	8	43,498	58,099	14,156	44,151	58,277	14,310
2017	1,086	2	52	0	62	47	0	33	7	59,412	78,333	19,139	60,498	78,430	19,245

Note: Troll = Areas 13–18; Net = Areas 14–19; Sport = Areas 13–18, 19a.

[1] Troll and net catches, 1996–2004, have been updated with data from DFO (2009).

[2] Since 1998, the catch accounting year for troll fisheries was set from October 1 to September 30. The same catch accounting period was applied for years prior to 1998.

Table A14.–Fraser River ISBM Chinook salmon landed catch (LC), releases (Rel.), and incidental mortality (IM).

Year	Fraser River Watershed											
	First Nations[1]			Net[2]			Freshwater Sport[3,4]			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1975	20,170	0	928	66,119	0	3,041	7,740	0	534	94,029	0	4,503
1976	19,189	0	883	73,018	0	3,359	6,354	0	438	98,561	0	4,680
1977	23,310	0	1,072	85,222	0	3,920	3,071	0	212	111,603	0	5,204
1978	19,541	0	899	50,247	0	2,311	3,627	0	250	73,415	0	3,461
1979	10,217	0	470	51,488	0	2,368	4,450	0	307	66,155	0	3,145
1980	10,528	0	484	40,061	0	1,843	7	0	0	50,596	0	2,328
1981	8,389	0	386	22,447	0	1,033	0	0	0	30,836	0	1,418
1982	29,043	0	1,336	23,792	0	1,094	96	0	7	52,931	0	2,437
1983	11,875	0	546	25,580	0	1,177	0	0	0	37,455	0	1,723
1984	17,111	0	787	27,929	0	1,285	80	0	6	45,120	0	2,077
1985	8,387	0	386	28,894	0	1,329	596	0	41	37,877	0	1,756
1986	12,274	0	565	31,401	0	1,444	1,421	0	98	45,096	0	2,107
1987	12,050	0	554	12,021	0	553	3,561	0	246	27,632	0	1,353
1988	12,063	0	555	8,446	0	389	3,702	0	255	24,211	0	1,199
1989	4,784	0	220	23,443	0	1,078	2,500	0	173	30,727	0	1,471
1990	14,180	0	652	15,689	0	722	2,982	0	206	32,851	0	1,580
1991	13,950	0	642	14,757	0	679	3,116	0	215	31,823	0	1,536
1992	10,067	0	463	7,363	0	339	4,677	0	323	22,107	0	1,124
1993	15,395	0	708	13,885	0	639	3,430	0	237	32,710	0	1,584
1994	17,892	0	823	13,693	0	630	3,195	0	220	34,780	0	1,673
1995	17,791	0	818	6,451	0	297	8,258	0	570	32,500	0	1,685
1996	12,665	0	583	12,910	0	594	7,635	0	527	33,210	0	1,703
1997	13,453	0	619	40,877	0	1,880	5,051	0	349	59,381	0	2,848

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Year	Fraser River Watershed											
	First Nations[1]			Net[2]			Freshwater Sport[3,4]			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1998	14,702	0	676	8,292	0	381	18,073	0	1,247	41,067	0	2,305
1999	17,999	0	828	4,005	0	184	8,509	0	587	30,513	0	1,599
2000	20,839	0	959	8,041	0	370	12,836	0	886	41,716	0	2,214
2001	18,429	0	848	10,052	28	489	25,023	0	1,727	53,504	28	3,063
2002	21,796	0	1,003	9,732	329	729	24,355	0	1,680	55,883	329	3,412
2003	28,137	0	1,294	11,204	287	787	19,520	0	1,347	58,861	287	3,428
2004	31,165	0	1,434	19,224	197	1,071	18,581	0	1,282	68,970	197	3,786
2005	19,832	0	912	9,088	97	510	22,688	13,322	4,123	51,608	13,419	5,545
2006	14,793	333	995	7,686	61	411	26,662	550	1,945	49,141	944	3,352
2007	13,714	759	1,349	6,795	44	354	12,945	8,694	2,562	33,454	9,497	4,266
2008	22,417	96	1,122	4,575	89	295	18,597	13,810	3,935	45,589	13,995	5,351
2009	27,288	105	1,355	7,848	146	499	17,485	15,845	4,249	52,621	16,096	6,102
2010	15,432	298	992	13,953	67	705	14,324	13,512	3,583	43,709	13,877	5,280
2011	33,118	96	1,614	17,989	1,073	1,843	20,349	9,022	3,136	71,456	10,191	6,593
2012	36,521	104	1,778	2,899	1,059	1,135	11,396	7,333	2,194	50,816	8,496	5,108
2013	17,092	113	893	3,124	6,537	6,328	11,506	10,211	2,754	31,722	16,861	9,975
2014	22,434	62	1,091	17,149	9,200	9,492	13,105	13,004	3,401	52,688	22,266	13,984
2015	24,693	73	1,205	7,051	1,928	2,148	18,487	8,703	2,947	50,231	10,704	6,300
2016	10,291	338	793	2,292	373	458	7,512	5,218	1,520	20,095	5,929	2,772
2017	14,939	109	790	3,920	617	764	8,471	6,603	1,852	27,330	7,329	3,407

[1] First Nations Chinook salmon catch includes food, social, and ceremonial from the mainstem and tributaries. Economic opportunity included in commercial net.

[2] Fraser River net includes commercial Area E Gillnet, test fisheries, First Nations economic opportunities, and scientific licenses.

[3] Freshwater sport catch includes Fraser mainstem and tributary Chinook salmon catch (adults only).

[4] Updated 1975 to 1980 sport catch from Fraser et al. 1982.

Table A15.–Canada: Strait of Juan de Fuca ISBM Chinook salmon landed catch (LC), releases (Rel.), and incidental mortality (IM).

Year	Canada: Strait of Juan de Fuca											
	First Nations			Net[1]			Tidal Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1975	NA			9,799	0	9,799	NA			9,799	0	9,799
1976	NA			13,004	0	13,004	NA			13,004	0	13,004
1977	NA			25,344	0	25,344	NA			25,344	0	25,344
1978	NA			9,725	0	9,725	NA			9,725	0	9,725
1979	NA			8,665	0	8,665	NA			8,665	0	8,665
1980	NA			3,438	0	3,438	37,900		2,615	41,338	0	6,053
1981	NA			9,982	0	9,982	29,832		2,058	39,814	0	12,040
1982	NA			7,072	0	7,072	30,646		2,115	37,718	0	9,187
1983	NA			328	0	328	30,228		2,086	30,556	0	2,414
1984	NA			6,237	0	6,237	24,353		1,680	30,590	0	7,917
1985	NA			17,164	0	17,164	27,843		1,921	45,007	0	19,085
1986	NA			17,727	0	17,727	34,387		2,373	52,114	0	20,100
1987	NA			6,782	0	6,782	24,878		1,717	31,660	0	8,499
1988	NA			4,473	0	4,473	31,233		2,155	35,706	0	6,628
1989	NA			21,238	0	21,238	32,539		2,245	53,777	0	23,483
1990	42		2	7,405	0	7,405	30,127		2,079	37,574	0	9,486
1991	250		12	8,893	0	8,893	19,017		1,312	28,160	0	10,217
1992	302		14	10,023	0	10,023	21,090		1,455	31,415	0	11,492
1993	317		15	2,287	0	2,287	13,967		964	16,571	0	3,265
1994	600		28	8,931	0	8,931	14,372		992	23,903	0	9,950
1995	751		35	631	0	631	14,405		994	15,787	0	1,659
1996	20		1	655	0	655	19,012		1,312	19,687	0	1,968
1997	42		2	657	0	657	17,080		1,179	17,779	0	1,837
1998	1,500		69	495	0	495	9,709		670	11,704	0	1,234
1999	53		2	771	0	771	14,808		1,022	15,632	0	1,795

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Year	Canada: Strait of Juan de Fuca											
	First Nations			Net[1]			Tidal Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
2000	273		13	199	0	199	10,973		757	11,445	0	969
2001	136		6	439	0	439	23,463		1,619	24,038	0	2,064
2002	0			345	0	345	24,084		1,662	24,429	0	2,007
2003	0			292	0	292	26,630		1,837	26,922	0	2,129
2004	0			187	0	187	40,877		2,821	41,064	0	3,008
2005	0			153	0	110	30,480	11,857	4,380	30,633	11,857	4,490
2006	0			155	801	606	26,437	5,079	2,799	26,592	5,880	3,405
2007	0			138	690	534	26,549	11,832	4,104	26,687	12,522	4,638
2008	0			172	573	442	22,263	6,540	2,792	22,435	7,113	3,234
2009	0			385	0	277	25,587	44,169	10,246	25,972	44,169	10,523
2010	0			206	1,239	920	15,612	4,868	2,012	15,818	6,107	2,932
2011	0			278	1,522	1,166	21,075	12,878	3,927	21,353	14,400	5,093
2012	0			284	1,124	853	22,154	10,603	3,564	22,438	11,727	4,417
2013	0			251	1,411	1,098	32,363	24,550	6,947	32,614	25,961	8,045
2014	0			137	495	475	20,290	15,771	4,428	20,427	16,266	4,903
2015	0			17	2,610	1,885	41,292	25,941	7,830	41,309	28,551	9,715
2016	0			0	1,256	924	22,965	23,863	6,166	22,965	25,119	7,090
2017	0			50	1,870	1,374	28,369	26,510	7,047	28,419	28,380	8,422

Note: NA = Not available.

Note: Net = Area 20; Sport = Areas 19b and 20.

[1] Net catches from 1996 to 2004 have been updated with data from DFO (2009).

Table A16.–Washington: Strait of Juan de Fuca ISBM Chinook salmon landed catch (LC), releases (Rel.), and incidental mortality (IM).

Year	Washington: Strait of Juan de Fuca											
	Troll			Net			Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1975	5,762	NA	144	8,048	NA	644	81,681	NA	11,844	95,491	NA	12,632
1976	10,486	NA	262	6,072	NA	486	75,308	NA	10,920	91,866	NA	11,668
1977	8,958	NA	224	16,794	NA	1,344	53,238	NA	7,720	78,990	NA	9,287
1978	10,002	NA	250	12,676	NA	1,014	62,299	NA	9,033	84,977	NA	10,297
1979	7,575	NA	189	13,479	NA	1,078	67,094	NA	9,729	88,148	NA	10,996
1980	10,688	NA	267	12,753	NA	1,020	56,415	NA	8,180	79,856	NA	9,468
1981	15,644	NA	391	21,607	NA	1,729	51,352	NA	7,446	88,603	NA	9,566
1982	18,952	NA	474	25,490	NA	2,039	29,842	NA	4,327	74,284	NA	6,840
1983	18,468	NA	462	16,761	NA	1,341	58,060	NA	8,419	93,289	NA	10,221
1984	15,805	NA	395	12,377	NA	990	48,003	NA	6,960	76,185	NA	8,346
1985	12,759	NA	319	12,965	NA	1,037	44,267	NA	6,419	69,991	NA	7,775
1986	30,346	NA	759	17,228	NA	1,378	69,000	NA	10,005	116,574	NA	12,142
1987	45,005	NA	1,125	11,439	NA	915	53,000	NA	7,685	109,444	NA	9,725
1988	49,755	NA	1,244	11,692	NA	935	39,000	NA	5,655	100,447	NA	7,834
1989	65,992	NA	1,650	10,306	NA	824	52,000	NA	7,540	128,298	NA	10,014
1990	46,940	NA	1,174	5,213	NA	417	50,903	NA	7,381	103,056	NA	8,971
1991	37,040	NA	926	3,750	NA	300	39,667	NA	5,752	80,457	NA	6,978
1992	31,370	NA	784	1011	NA	81	38,438	NA	5,574	70,819	NA	6,439
1993	10,422	NA	261	1,457	NA	117	32,434	NA	4,703	44,313	NA	5,080
1994	3,419	NA	85	5,895	NA	472	1,661	NA	241	10,975	NA	798
1995	6,406	NA	160	4,770	NA	382	6,349	NA	921	17,525	NA	1,462
1996	9,910	NA	248	604	NA	48	4,825	NA	700	15,339	NA	996
1997	847	NA	21	492	NA	39	12,238	NA	1,775	13,577	NA	1,835

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Year	Washington: Strait of Juan de Fuca											
	Troll			Net			Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1998	707	NA	18	266	NA	21	2,159	NA	313	3,132	NA	352
1999	658	NA	16	589	NA	47	1,990	NA	289	3,237	NA	352
2000	347	NA	9	800	NA	64	1,670	NA	242	2,817	NA	315
2001	1,974	NA	49	931	NA	74	4,819	NA	699	7,724	NA	823
2002	1,783	NA	45	1,074	NA	86	2,028	NA	294	4,885	NA	425
2003	436	NA	11	908	NA	73	5,290	28201	8325	6,634	28,201	8,408
2004	20,756	NA	519	593	NA	47	4,519	22275	6625	25,868	22,275	7,191
2005	5,350	NA	134	175	NA	14	2,700	10189	3122	8,225	10,189	3,270
2006	1,056	NA	26	994	NA	80	5,695	14823	4798	7,745	14,823	4,904
2007	4,346	NA	109	107	NA	9	6,967	23133	7210	11,420	23,133	7,327
2008	1,816	NA	45	4,579	NA	366	4,844	13359	4283	11,239	13,359	4,694
2009	3,359	NA	84	99	NA	8	11,167	46047	13960	14,625	46,047	14,052
2010	2,216	NA	55	2,220	NA	178	11,508	38036	11862	15,944	38,036	12,095
2011	3,818	NA	95	359	NA	29	9,504	20601	6899	13,681	20,601	7,023
2012	2,350	NA	59	1,544	NA	124	13,854	28,233	9,575	17,748	28,233	9,758
2013	3,295	NA	82	449	NA	36	14,900	59,364	18,070	18,644	59,364	18,188
2014	4,512	NA	113	1,314	NA	105	11,059	26,877	8,807	16,885	26,877	9,025
2015[1]	4,876	NA	122	831	NA	66	11,811	32,364	10,386	17,518	32,364	10,575
2016	578	NA	14	254	NA	20	9,651	26,188	8,418	10,483	26,188	8,453
2017[1]	1,703	NA	43	50	NA	4	10,840	29,415	9,455	12,593	29,415	9,502

Note: Troll: Areas 5, 6, and 6C; Area 4B from January 1 – April 30 and October 1 – December 31; Net = Areas 4B, 5, 6, and 6C; Sport = Areas 5 and 6, 4B Neah Bay "add-on" fishery.
Note: NA = Not available; for fisheries without estimate of releases, IM is dropoff/dropout only.
[1] Current year not available; values are average of previous three years.

Table A17.–Washington: San Juan ISBM Chinook salmon landed catch (LC), releases (Rel.), and incidental mortality (IM).

Year	Washington: San Juan											
	Troll			Net			Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1975	3	NA	0	90,100	NA	7,208	31,988	NA	4,638	122,091	NA	11,846
1976	0	NA	0	66,832	NA	5,347	34,505	NA	5,003	101,337	NA	10,350
1977	9	NA	0	82,452	NA	6,596	14,049	NA	2,037	96,510	NA	8,633
1978	0	NA	0	86,113	NA	6,889	15,083	NA	2,187	101,196	NA	9,076
1979	0	NA	0	51,210	NA	4,097	17,367	NA	2,518	68,577	NA	6,615
1980	0	NA	0	62,899	NA	5,032	12,231	NA	1,773	75,130	NA	6,805
1981	0	NA	0	47,611	NA	3,809	9,727	NA	1,410	57,338	NA	5,219
1982	0	NA	0	35,778	NA	2,862	6,953	NA	1,008	42,731	NA	3,870
1983	0	NA	0	27,792	NA	2,223	15,166	NA	2,199	42,958	NA	4,422
1984	0	NA	0	33,175	NA	2,654	25,759	NA	3,735	58,934	NA	6,389
1985	0	NA	0	33,232	NA	2,659	12,610	NA	1,828	45,842	NA	4,487
1986	0	NA	0	21,307	NA	1,705	15,000	NA	2,175	36,307	NA	3,880
1987	48	NA	1	28,692	NA	2,295	14,000	NA	2,030	42,740	NA	4,327
1988	118	NA	3	29,749	NA	2,380	9,000	NA	1,305	38,867	NA	3,688
1989	592	NA	15	15,690	NA	1,255	9,000	NA	1,305	25,282	NA	2,575
1990	443	NA	11	8,540	NA	683	7,370	NA	1,069	16,353	NA	1,763
1991	41	NA	1	11,304	NA	904	5,115	NA	742	16,460	NA	1,647
1992	99	NA	2	13,893	NA	1,111	6,788	NA	984	20,780	NA	2,098
1993	0	NA	0	13,951	NA	1,116	6,916	NA	1,003	20,867	NA	2,119
1994	0	NA	0	13,877	NA	1,110	5,795	NA	840	19,672	NA	1,950
1995	0	NA	0	5,332	NA	427	7,863	NA	1,140	13,195	NA	1,567
1996	0	NA	0	3,934	NA	315	12,674	NA	1,838	16,608	NA	2,152
1997	11	NA	0	29,593	NA	2,367	9,155	NA	1,327	38,759	NA	3,695

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Year	Washington: San Juan											
	Troll			Net			Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1998	7	NA	0	3,798	NA	304	3,069	NA	445	6,874	NA	749
1999	0	NA	0	3	NA	0	3,421	NA	496	3,424	NA	496
2000	7	NA	0	841	NA	67	4,447	NA	645	5,295	NA	712
2001	0	NA	0	970	NA	78	6,522	NA	946	7,492	NA	1,023
2002	0	NA	0	1,931	NA	154	4,827	NA	700	6,758	NA	854
2003	0	NA	0	4,827	NA	386	3,008	1,646	877	7,835	1,646	1,264
2004	0	NA	0	5,133	NA	411	1,971	1,190	605	7,104	1,190	1,015
2005	0	NA	0	4,358	491	741	2,703	1,544	806	7,061	2,035	1,547
2006	0	NA	0	5,241	439	770	4,168	1,278	947	9,409	1,717	1,717
2007	0	NA	0	2,584	476	588	4,955	3,933	1,773	7,539	4,409	2,360
2008	0	NA	0	48	76	65	5,829	2,673	1,562	5,877	2,749	1,626
2009	0	NA	0	1,014	2,012	1,691	4,077	5,375	2,032	5,091	7,387	3,722
2010	0	NA	0	6,129	4,972	4,468	3,157	2,402	1,102	9,286	7,374	5,570
2011	0	NA	0	5,630	11,893	9,965	6,193	6,603	2,668	11,823	18,496	12,632
2012	0	NA	0	420	218	208	5,764	5,688	2,360	6,184	5,906	2,568
2013	0	NA	0	3,908	12,160	10,041	9,502	7,328	3,342	13,410	19,488	13,382
2014	0	NA	0	6,826	5,711	5,115	9,216	9,075	3,768	16,042	14,786	8,883
2015	0	NA	0	4,773	7,928	6,724	8,551	11,542	4,333	13,324	19,470	11,057
2016	0	NA	0	22	0	2	6,173	9,702	3,495	6,195	9,702	3,497
2017[1]	0	NA	0	2,628	40	242	7,980	12,542	4,518	10,608	12,542	4,728

Note: Troll = Areas 6, 6A, 7, and 7A; Net = Areas 6, 6A, 7 and 7A.

Note: NA = Not available; for fisheries without estimate of releases, IM is dropoff/dropout only.

[1] Current year not available; values are average of previous three years.

Table A18.–Washington: Other Puget Sound ISBM Chinook salmon landed catch (LC), releases (Rel.), and incidental mortality (IM).

Year	Washington: Other Puget Sound								
	Net			Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1975	131,982	NA	10,559	173,086	NA	25,097	305,068	NA	35,656
1976	141,281	NA	11,302	151,246	NA	21,931	292,527	NA	33,233
1977	145,470	NA	11,638	97,761	NA	14,175	243,231	NA	25,813
1978	150,298	NA	12,024	116,979	NA	16,962	267,277	NA	28,986
1979	128,073	NA	10,246	156,402	NA	22,678	284,475	NA	32,924
1980	171,516	NA	13,721	142,799	NA	20,706	314,315	NA	34,427
1981	145,152	NA	11,612	106,048	NA	15,377	251,200	NA	26,989
1982	149,274	NA	11,942	85,703	NA	12,427	234,977	NA	24,369
1983	134,492	NA	10,759	123,752	NA	17,944	258,244	NA	28,703
1984	180,248	NA	14,420	102,740	NA	14,897	282,988	NA	29,317
1985	184,907	NA	14,793	92,603	NA	13,427	277,510	NA	28,220
1986	153,000	NA	12,240	88,000	NA	12,760	241,000	NA	25,000
1987	127,000	NA	10,160	59,000	NA	8,555	186,000	NA	18,715
1988	133,000	NA	10,640	63,000	NA	9,135	196,000	NA	19,775
1989	156,000	NA	12,480	75,000	NA	10,875	231,000	NA	23,355
1990	179,593	NA	14,367	71,000	NA	10,295	250,593	NA	24,662
1991	89,495	NA	7,160	48,859	NA	7,085	138,354	NA	14,244
1992	63,460	NA	5,077	51,656	NA	7,490	115,116	NA	12,567
1993	54,968	NA	4,397	41,034	NA	5,950	96,002	NA	10,347
1994	63,577	NA	5,086	44,181	NA	6,406	107,758	NA	11,492
1995	63,593	NA	5,087	61,509	NA	8,919	125,102	NA	14,006
1996	61,658	NA	4,933	58,538	NA	8,488	120,196	NA	13,421
1997	47,522	NA	3,802	43,961	NA	6,374	91,483	NA	10,176

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Year	Washington: Other Puget Sound								
	Net			Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1998	50,915	NA	4,073	30,016	NA	4,352	80,931	NA	8,426
1999	91,947	NA	7,356	34,116	NA	4,947	126,063	NA	12,303
2000	79,494	NA	6,360	29,328	NA	4,253	108,822	NA	10,612
2001	123,266	NA	9,861	40,170	NA	5,825	163,436	NA	15,686
2002	108,566	NA	8,685	35,031	NA	5,079	143,597	NA	13,765
2003	86,206	NA	6,896	32,210	93,129	29,629	118,416	93,129	36,526
2004	69,211	NA	5,537	22,650	64,586	20,593	91,861	64,586	26,130
2005	82,629	557	7,156	30,760	50,748	18,061	108,638	51,306	25,217
2006	109,557	NA	8,765	40,082	152,129	46,582	149,639	152,129	55,347
2007	118,628	NA	9,490	57,468	149,778	48,473	176,096	149,778	57,964
2008	101,322	NA	8,106	36,969	86,174	28,455	138,291	86,174	36,561
2009	68,764	NA	5,501	33,332	75,820	25,153	102,096	75,820	30,654
2010	80,599	NA	6,448	32,817	43,512	16,420	113,416	43,512	22,868
2011	100,353	NA	8,028	29,829	78,760	25,433	130,182	78,760	33,461
2012	117,259	NA	9,381	45,279	113,847	37,076	162,538	113,847	46,457
2013	105,104	NA	8,408	36,276	56,634	20,438	141,380	56,634	28,846
2014	50,767	NA	4,061	23,903	44,942	15,510	74,670	44,942	19,572
2015	58,183	NA	4,655	19,898	94,657	28,253	78,081	94,657	32,908
2016	79,484	NA	6,359	22,944	52,327	17,351	102,428	52,327	23,709
2017[1]	135,030	NA	10,802	22,248	50,741	16,825	157,278	50,741	27,627

Note: Net = Areas 6B, 6D, 7B, 7C, and 7E, Areas 8–13 (including all subareas), and Areas 74C–83F; Sport = Areas 8–13 and all Puget Sound rivers.

Note: NA = Not available; for fisheries without estimate of releases, IM is dropoff/dropout only.

[1] Current year not available; values are average of previous three years.

Table A19.–Washington: Inside Coastal ISBM Chinook salmon landed catch (LC), releases (Rel.), and incidental mortality (IM).

Year	Washington: Inside Coastal								
	Net			Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1975	34,859	NA	697	1,716	NA	118	36,575	NA	816
1976	51,995	NA	1,040	2,219	NA	153	54,214	NA	1,193
1977	72,467	NA	1,449	2,043	NA	141	74,510	NA	1,590
1978	32,662	NA	653	3,399	NA	235	36,061	NA	888
1979	36,501	NA	730	2,199	NA	152	38,700	NA	882
1980	47,681	NA	954	1,476	NA	102	49,157	NA	1,055
1981	36,880	NA	738	786	NA	54	37,666	NA	792
1982	33,271	NA	665	1,114	NA	77	34,385	NA	742
1983	16,210	NA	324	1,452	NA	100	17,662	NA	424
1984	16,239	NA	325	1,319	NA	91	17,558	NA	416
1985	25,162	NA	503	1,955	NA	135	27,117	NA	638
1986	29,000	NA	580	3,000	NA	207	32,000	NA	787
1987	51,000	NA	1,020	3,000	NA	207	54,000	NA	1,227
1988	74,000	NA	1,480	7,000	NA	483	81,000	NA	1,963
1989	85,000	NA	1,700	6,000	NA	414	91,000	NA	2,114
1990	57,770	NA	1,155	5,000	NA	345	62,770	NA	1,500
1991	54,397	NA	1,088	6,070	NA	419	60,467	NA	1,507
1992	64,223	NA	1,284	6,577	NA	454	70,800	NA	1,738
1993	59,285	NA	1,186	9,180	NA	633	68,465	NA	1,819
1994	46,059	NA	921	7,454	NA	514	53,513	NA	1,436
1995	46,490	NA	930	9,881	NA	682	56,371	NA	1,612
1996	55,408	NA	1,108	12,059	NA	832	67,467	NA	1,940
1997	28,269	NA	565	6,619	NA	457	34,888	NA	1,022
1998	20,266	NA	405	6,569	NA	453	26,835	NA	859
1999	11,400	NA	228	3,165	NA	218	14,565	NA	446
2000	15,660	NA	313	3,179	NA	219	18,839	NA	533
2001	19,480	NA	390	8,645	NA	597	28,125	NA	986
2002	23,372	NA	467	6,038	NA	417	29,410	NA	884
2003	18,443	NA	369	6,075	NA	419	24,518	NA	788
2004	21,965	NA	439	12,088	NA	834	34,053	NA	1,273
2005	20,668	NA	413	7,051	NA	487	27,719	NA	900
2006	27,414	NA	548	8,030	NA	554	35,444	NA	1,102
2007	12,353	NA	247	5,066	NA	350	17,419	NA	597

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Year	Washington: Inside Coastal								
	Net			Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
2008	15,028	NA	301	3,808	NA	263	18,836	NA	563
2009	18,728	NA	375	6,629	NA	457	25,357	NA	832
2010	12,794	NA	256	6,831	NA	471	19,625	NA	727
2011	39,034	NA	781	13,340	NA	920	52,374	NA	1,701
2012	29,232	NA	585	9,646	NA	666	38,878	NA	1,250
2013	31,111	NA	622	10,188	NA	703	41,299	NA	1,325
2014	39,514	NA	790	9,740	NA	672	49,254	NA	1,462
2015	32,760	NA	655	22,612	NA	1,560	55,372	NA	2,215
2016	14,134	NA	283	14,004	NA	966	28,138	NA	1,249
2017[1]	20,389	NA	408	15,452	NA	1,066	35,841	NA	1,474

Note: Net = Areas 2A–2M and Areas 72B–73H; Sport = All coastal rivers, Area 2.1, and Area 2.2 (when Area 2 is closed)
Note: NA = Not available; for fisheries without estimate of releases, IM is dropoff/dropout only.
[1] Current year not available; values are average of previous three years.

Table A20.–Washington/Oregon North of Cape Falcon ISBM Chinook salmon landed catch (LC), releases (Rel.), and incidental mortality (IM).

Year	Washington/Oregon North of Cape Falcon											
	Troll			Net			Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1975	268,971	NA	6,724	1,212	NA	24	265,785	NA	7,176	535,968	NA	13,925
1976	371,239	NA	9,281	203	NA	4	215,319	NA	5,814	586,761	NA	15,099
1977	244,491	NA	6,112	4	NA	0	197,563	NA	5,334	442,058	NA	11,447
1978	150,673	NA	3,767	4	NA	0	104,306	NA	2,816	254,983	NA	6,583
1979	133,035	NA	3,326	3	NA	0	84,977	NA	2,294	218,015	NA	5,620
1980	125,709	NA	3,143	1,215	NA	24	59,099	NA	1,596	186,023	NA	4,763
1981	109,519	NA	2,738	209	NA	4	96,151	NA	2,596	205,879	NA	5,338
1982	154,720	NA	3,868	267	NA	5	114,952	NA	3,104	269,939	NA	6,977
1983	63,584	NA	1,590	62	NA	1	51,789	NA	1,398	115,435	NA	2,989
1984	15,392	NA	385	0	NA	0	6,980	NA	188	22,372	NA	573
1985	55,408	NA	1,385	493	NA	10	30,189	NA	815	86,090	NA	2,210
1986	52,000	NA	1,300	0	NA	0	23,000	NA	621	75,000	NA	1,921
1987	81,000	NA	2,025	4,000	NA	80	44,000	NA	1,188	129,000	NA	3,293
1988	108,000	NA	2,700	3,000	NA	60	19,000	NA	513	130,000	NA	3,273
1989	74,600	NA	1,865	1,000	NA	20	20,900	NA	564	96,500	NA	2,449
1990	65,800	NA	1,645	0	0	0	32,900	NA	888	98,700	NA	2,533
1991	51,600	NA	1,290	0	0	0	13,300	NA	359	64,900	NA	1,649
1992	69,000	NA	1,725	0	0	0	18,900	NA	510	87,900	NA	2,235
1993	55,900	NA	1,398	0	0	0	13,600	NA	367	69,500	NA	1,765
1994	4,500	NA	113	0	0	0	0	NA	–	4,500	NA	113
1995	9,500	NA	238	0	0	0	600	NA	16	10,100	NA	254
1996	12,300	NA	308	0	0	0	200	NA	5	12,500	NA	313
1997	20,500	NA	513	0	0	0	4,100	NA	111	24,600	NA	623

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Year	Washington/Oregon North of Cape Falcon											
	Troll			Net			Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1998	20,615	12,496	3,577	0	0	0	2,292	2,676	463	22,907	15,172	4,040
1999	44,923	27,231	7,795	0	0	0	10,821	6,365	1,247	55,744	33,596	9,042
2000	20,152	12,215	3,497	0	0	0	9,242	8,392	1,508	29,394	20,607	5,005
2001	54,163	35,824	10,131	0	0	0	25,592	34,378	5,848	79,755	70,201	15,979
2002	106,462	60,250	17,423	0	0	0	60,575	68,561	11,920	167,037	128,810	29,342
2003	101,758	54,313	15,851	0	0	0	36,513	49,063	8,345	138,271	103,375	24,196
2004	88,225	83,219	22,594	0	0	0	27,090	69,900	11,216	115,315	153,119	33,811
2005	87,126	36,282	11,067	0	0	0	40,004	21,736	4,341	127,130	58,018	15,408
2006	57,313	52,482	14,291	0	0	0	11,176	9,630	1,746	68,489	62,112	16,037
2007	38,742	36,050	9,801	0	0	0	9,535	21,631	3,502	48,277	57,681	13,303
2008	35,100	NA	878	0	0	0	15,452	6,782	1,434	50,552	6,782	2,312
2009	25,410	NA	635	0	0	0	13,331	34,341	5,511	38,741	34,341	6,146
2010	88,565	NA	2,214	0	0	0	38,686	34,652	6,242	127,251	34,652	8,456
2011	61,433	NA	1,536	0	0	0	30,826	49,623	8,276	92,259	49,623	9,812
2012	99,792	NA	2,495	0	0	0	35,428	38,283	6,699	135,220	38,283	9,194
2013	91,915	NA	2,298	0	0	0	30,837	42,634	7,228	122,752	42,634	9,526
2014	116,489	NA	2,912	0	0	0	42,327	26,578	5,130	158,816	26,578	8,042
2015	125,384	NA	3,135	0	0	0	42,179	15,219	3,422	167,563	15,219	6,556
2016	42,234	NA	1,056	0	0	0	17,948	21,133	3,654	60,182	21,133	4,710
2017[1]	60,024	NA	1,501	0	0	0	21,945	18,604	3,383	81,969	18,604	4,884

Note: Troll = Oregon Area 2; Washington Areas 1, 2, 3 and 4: Area 4B from May 1 through September 30 (during Pacific Fishery Management Council management); Net = Washington Areas 1, 2, 3, 4, 4A; Sport = Oregon Area 2; Washington Areas 1, 1.1, 1.2, 2, 3, 4 and 2.2 (when Area 2 is open).

Note: For fisheries without estimate of releases, IM is dropoff/dropout only.

Note: NA = Not available.

[1] Current year not available; values are average of previous three years.

Table A21.–Columbia River ISBM Chinook salmon landed catch (LC), releases (Rel.), and incidental mortality (IM).

Year	Washington and Oregon Columbia River[1]											
	Nontreaty Net			Treaty Indian Net			Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1975[1,2]	323,000	0	9,690				34,870	NA	2,406	357,870	NA	12,096
1976[1,2]	288,400	0	8,652				42,527	NA	2,934	330,927	NA	11,586
1977[1,2]	255,600	0	7,668				58,838	NA	4,060	314,438	NA	11,728
1978[1,2]	189,100	0	5,673				56,582	NA	3,904	245,682	NA	9,577
1979[1,2]	169,691	0	5,091	7,865	0	236	38,700	NA	2,670	216,256	NA	7,997
1980	113,569	0	3,407	35,604	0	1,068	15,011	NA	1,036	194,526	NA	7,054
1981	35,881	0	1,076	54,190	0	1,626	21,151	NA	1,459	91,665	NA	3,655
1982	94,289	0	2,829	69,001	0	2,070	31,236	NA	2,155	179,785	NA	7,100
1983	32,877	0	986	35,582	0	1,067	23,206	NA	1,601	202,262	NA	7,840
1984	73,481	0	2,204	62,544	0	1,876	43,760	NA	3,019	346,410	NA	12,654
1985	74,982	0	2,249	81,836	0	2,455	45,444	NA	3,136	602,779	NA	22,211
1986	168,038	0	5,041	120,379	0	3,611	57,993	NA	4,002	606,811	NA	22,012
1987	340,931	0	10,228	156,013	0	4,680	105,835	NA	7,303	383,780	NA	14,949
1988	341,114	0	10,233	168,059	0	5,042	97,638	NA	6,737	242,026	NA	10,360
1989	146,739	0	4,402	148,953	0	4,469	88,088	NA	6,078	196,202	NA	8,977
1990	63,602	0	1,908	98,957	0	2,969	79,467	NA	5,483	124,640	NA	5,939
1991	53,935	0	1,618	63,007	0	1,890	79,260	NA	5,469	147,638	NA	6,964
1992	24,063	0	722	44,160	0	1,325	56,417	NA	3,893	69,532	NA	3,242
1993	19,929	0	598	62,714	0	1,881	64,995	NA	4,485	80,387	NA	3,831
1994	2,773	0	83	37,125	0	1,114	29,634	NA	2,045	124,318	NA	4,965
1995	777	0	23	43,216	0	1,296	36,394	NA	2,511	136,629	NA	5,892
1996	17,774	0	533	74,872	0	2,246	31,672	NA	2,185	89,992	NA	4,039
1997	11,268	0	338	79,377	0	2,381	45,984	NA	3,173	137,160	NA	5,873
1998	6,409	0	192	49,241	0	1,477	34,342	NA	2,370	194,526	NA	7,054
1999	10,090	NA	303	81,976	0	2,459	45,094	NA	3,111	91,665	NA	3,655

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Table A21.–Page 2 of 2.

Year	Washington and Oregon Columbia River[1]											
	Nontreaty Net			Treaty Indian Net			Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
2000	21,760	NA	653	78,717	0	2,362	49,631	NA	3,425	150,108	NA	6,439
2001	43,278	3,348	2,236	201,673	0	6,050	141,848	16,453	12,989	386,800	19,801	21,275
2002	72,683	6,699	4,056	196,619	0	5,899	150,735	21,625	14,588	420,037	28,323	24,542
2003	76,797	2,395	2,975	159,067	0	4,772	149,157	15,960	13,276	385,021	18,355	21,022
2004	77,877	5,061	3,869	168,220	0	5,047	148,966	14,743	13,056	395,063	19,803	21,972
2005	46,102	1,685	1,855	138,197	0	4,146	91,019	32,233	12,429	275,317	33,918	18,429
2006	45,401	2,332	2,015	115,966	0	3,479	72,495	4,786	5,943	233,862	7,118	11,437
2007	26,796	2,996	1,643	64,804	0	1,944	56,359	5,466	4,938	147,959	8,462	8,525
2008	53,402	1,630	2,058	148,638	0	4,459	88,738	11,365	8,180	290,778	12,995	14,698
2009	55,675	921	1,928	121,760	0	3,653	90,154	10,681	8,108	267,589	11,602	13,689
2010	90,673	1,684	3,192	218,915	0	6,567	166,247	11,150	13,486	475,835	12,834	23,246
2011	92,396	1,765	3,266	183,204	0	5,496	150,061	11,901	12,349	425,660	13,666	21,111
2012	75,891	1,260	2,630	166,440	0	4,993	152,726	19,152	13,734	395,057	20,412	21,357
2013	122,782	1,037	3,974	259,213	0	7,776	163,672	33,600	17,089	545,667	34,637	28,839
2014	135,519	2,182	4,677	324,783	0	9,743	184,812	45,342	20,733	645,113	47,524	35,153
2015	135,390	3,738	5,108	336,688	0	10,101	252,535	41,578	24,861	724,613	45,316	40,070
2016	88,080	1,887	3,171	178,671	0	5,360	146,523	23,130	13,921	413,273	25,017	22,452
2017[3]	50,694	0	1,521	145,556	0	4,367	119,568	12,088	10,428	315,818	12,088	16,316

Note: NA = Not available.

1 The historical time series of catches in this year's report has changed from previous year's report. Catches after 1980 have been broken out into nontreaty net and treaty Indian due to the inability to separate Treaty Indian commercial versus noncommercial. Non-treaty net includes catches by Wanapum and Colville tribes. Sport and total catches from 1975 to 1980 are consistent with previous year's reports.

2 The Treaty Indian Net catch estimates for 1975–1979 are not available, but are believed to be of the magnitude seen after 1979; the catch for 1979 represents spring-run catches and does not include catch estimates for summer and fall stocks. Sport and total catch estimates from 1975-1979 are consistent with previous year's reports, but the total is underestimated because of the missing estimates.

3 Preliminary.

Table A22.–Oregon ISBM Chinook salmon landed catch (LC), releases (Rel.), and incidental mortality (IM).

Year	Oregon Coastal Inside								
	Troll			Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
1975	300	NA	5	19000	NA	1,311	19,300	NA	1,316
1976	1,000	NA	17	21000	NA	1,449	22,000	NA	1,466
1977	3,000	NA	51	34000	NA	2,346	37,000	NA	2,397
1978	1,000	NA	17	27,140	NA	1,873	28,140	NA	1,890
1979	800	NA	14	21,821	NA	1,506	22,621	NA	1,519
1980	300	NA	5	16,796	NA	1,159	17,096	NA	1,164
1981	300	NA	5	23,616	NA	1,630	23,916	NA	1,635
1982	500	NA	9	17,017	NA	1,174	17,517	NA	1,183
1983	700	NA	12	14,121	NA	974	14,821	NA	986
1984	1,088	NA	17	22,425	NA	1,547	23,513	NA	1,565
1985	1,700	NA	27	21,032	NA	1,451	22,732	NA	1,478
1986	1,900	NA	30	24,871	NA	1,716	26,771	NA	1,746
1987	3,600	NA	58	32,662	NA	2,254	36,262	NA	2,311
1988	4,800	NA	77	33,862	NA	2,336	38,662	NA	2,413
1989	4,500	NA	72	34,578	NA	2,386	39,078	NA	2,458
1990	0	NA	0	30,304	NA	2,091	30,304	NA	2,091
1991	0	NA	0	34,536	NA	2,383	34,536	NA	2,383
1992	384	NA	6	32,128	NA	2,217	32,512	NA	2,223
1993	649	NA	10	33,767	NA	2,330	34,416	NA	2,340
1994	371	NA	6	25,337	NA	1,748	25,708	NA	1,754
1995	206	NA	3	31,704	NA	2,188	31,910	NA	2,191
1996	989	NA	16	33,498	NA	2,311	34,487	NA	2,327
1997	513	NA	8	25,782	NA	1,779	26,295	NA	1,787
1998	858	NA	14	18,924	NA	1,306	19,782	NA	1,319
1999	1,233	NA	20	17,452	NA	1,204	18,685	NA	1,224
2000	1,860	NA	30	19,124	NA	1,320	20,984	NA	1,349
2001	1,184	NA	19	29,867	NA	2,061	31,051	NA	2,080
2002	1,633	NA	26	33,602	NA	2,319	35,235	NA	2,345
2003	1,459	NA	23	35,788	NA	2,469	37,247	NA	2,493
2004	2,258	NA	36	50,990	NA	3,518	53,248	NA	3,554
2005	1,956	NA	31	35,613	NA	2,457	37,569	NA	2,489

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Table A22.–Page 2 of 2.

Year	Oregon Coastal Inside								
	Troll			Sport			Total		
	LC	Rel.	IM	LC	Rel.	IM	LC	Rel.	IM
2006	1,884	NA	30	32,238	NA	2,224	34,122	NA	2,255
2007	1,018	NA	16	19,570	NA	1,350	20,588	NA	1,367
2008	208	NA	3	9,042	NA	624	9,250	NA	627
2009	293	NA	5	9,307	NA	642	9,600	NA	647
2010	1,315	NA	21	17,617	NA	1,216	18,932	NA	1,237
2011	1,954	NA	31	33,059	NA	2,281	35,013	NA	2,312
2012	636	NA	16	26,260	NA	1,812	26,896	NA	1,828
2013	1,188	NA	30	51,082	NA	3,525	52,270	NA	3,554
2014	847	NA	21	43,255	NA	2,985	44,102	NA	3,006
2015	1,164	NA	29	68,957	NA	4,758	70,954	NA	4,845
2016	182	NA	5	32,680	NA	2,255	32,862	NA	2,259
2017[1]	70	NA	2	34,362	NA	2,371	34,432	NA	2,373

Note: Troll = late season off Elk River mouth, Sport = estuary and inland.
Note: NA = Not available.
[1] Preliminary value based on average harvest rates.

Table A23.–Summary of landed catches (LC) of PSC AABM and ISBM fisheries.

Year[1]	Southeast Alaska AABM [2,3]	Southeast Alaska Non-Treaty	US ISBM[4]	US Total	NBC AABM[2]	WCVI AABM[2]	Canada ISBM[4,5]	Canada Total	PSC Total
1975	317,707		1,472,363	1,790,070	228,121	546,214	950,229	1,724,564	3,514,634
1976	258,762		1,479,632	1,738,394	190,267	665,010	1,080,258	1,935,535	3,673,929
1977	302,178		1,286,737	1,588,915	131,005	545,742	1,071,374	1,748,121	3,337,036
1978	418,411		1,018,316	1,436,727	146,179	568,705	1,079,294	1,794,178	3,230,905
1979	382,641		936,792	1,319,433	147,576	477,222	987,067	1,611,865	2,931,298
1980	343,970		885,761	1,229,731	157,398	486,303	829,476	1,473,177	2,702,908
1981	289,034		775,824	1,064,858	153,249	423,266	744,313	1,320,828	2,385,686
1982	314,686		868,359	1,183,045	173,687	538,510	662,028	1,374,225	2,557,270
1983	311,658		634,074	945,732	162,927	395,636	619,061	1,177,624	2,123,356
1984	290,077		661,335	951,412	185,305	471,294	755,699	1,412,298	2,363,710
1985	268,293	6,246	731,544	999,837	166,445	345,937	541,752	1,054,134	2,053,971
1986	271,262	11,091	874,062	1,145,324	176,868	350,227	499,252	1,026,347	2,171,671
1987	265,323	17,095	1,160,225	1,425,548	180,101	378,931	372,671	931,703	2,357,251
1988	256,787	22,525	1,191,787	1,448,574	159,428	408,668	371,204	939,300	2,387,874
1989	269,522	21,510	994,938	1,264,460	228,331	203,751	453,544	885,626	2,150,086
1990	320,996	45,873	803,802	1,124,798	170,936	297,858	441,040	909,834	2,034,632
1991	297,986	61,476	591,376	889,362	209,065	203,035	524,688	936,788	1,826,150
1992	221,980	36,811	522,567	744,547	163,698	358,664	462,349	984,711	1,729,258
1993	271,193	32,910	481,201	752,394	186,983	300,345	465,530	952,858	1,705,252
1994	235,165	29,185	291,658	526,823	193,554	160,352	309,579	663,485	1,190,308
1995	176,939	58,800	334,590	511,529	79,388	95,410	212,268	387,066	898,595
1996	154,997	81,262	390,915	545,912	678	10,233	228,581	239,492	785,404
1997	286,696	56,306	366,231	652,927	110,999	59,088	272,102	442,189	1,095,116

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Table A23.–Page 2 of 2.

Year[1]	Southeast Alaska AABM [2,3]	Southeast Alaska Non-Treaty	US ISBM[4]	US Total[6]	NBC AABM[2]	WCVI AABM[2]	Canada ISBM[4,5]	Canada Total	PSC Total[6]
1998	243,152	27,441	250,453	493,605	143,202	9,317	201,190	353,709	847,313
1999	198,842	52,178	358,878	557,720	84,324	38,540	229,952	352,816	910,536
2000	186,493	76,797	336,259	522,752	32,048	88,617	174,855	295,520	818,272
2001	186,919	78,815	704,383	891,302	43,334	120,304	211,549	375,187	1,266,489
2002	357,133	69,401	806,959	1,164,092	149,831	157,920	244,613	552,364	1,716,456
2003	380,152	59,284	717,942	1,098,094	194,797	173,561	258,408	626,766	1,724,861
2004	417,019	82,249	722,512	1,139,530	241,508	215,252	302,426	759,186	1,898,717
2005	388,640	104,561	591,659	980,299	243,606	199,479	293,049	736,134	1,716,433
2006	360,094	75,451	538,710	898,804	215,985	145,511	264,092	625,588	1,524,392
2007	328,268	76,414	429,298	757,566	144,235	140,614	233,980	518,829	1,276,394
2008	172,905	71,422	524,823	697,728	95,647	145,726	184,055	425,428	1,123,156
2009	227,954	65,693	463,099	691,053	109,470	124,617	209,710	443,797	1,134,850
2010	230,611	54,141	780,289	1,010,900	136,613	139,047	165,961	441,621	1,452,521
2011	291,161	66,213	760,992	1,052,154	122,660	204,232	283,031	609,923	1,662,077
2012	242,821	52,498	782,521	1,025,342	120,306	134,468	191,724	446,498	1,471,840
2013	191,388	65,864	935,422	1,126,810	115,914	113,598	176,193	405,705	1,532,515
2014	435,195	57,327	1,004,882	1,440,078	216,901	188,374	234,399	639,674	2,079,752
2015	335,026	68,313	1,127,425	1,462,450	158,903	116,737	281,532	557,172	2,019,622
2016	350,939	36,103	653,561	1,004,501	190,181	99,297	181,960	471,438	1,475,939
2017	178,348	32,659	648,862	827,211	143,330	109,533	257,227	510,090	1,337,301

[1] All LC from 1975 to 1984 were taken prior to implementation of the PST.

[2] LC in AABM fisheries from 1985 to 1994 were taken under fixed ceiling management per the 1985 PST Agreement. Catches from 1995 to 1998 were between agreements. LC from 1999 to present was taken commensurate with abundance-based management per the 1999 PST Agreement (1999–2008) and the 2009 PST Agreement (2009–present).

[3] Southeast Alaska nontreaty catches are primarily Alaska hatchery add-ons, but include terminal exclusions in some years from terminal catches from the Situk, Taku and Stikine rivers.

[4] US and Canadian ISBM fisheries had a pass-through obligation from 1985 to 1994 under the 1985 PST Agreement and have operated with ISBM index obligations since 1999, under the 1999 and 2009 Agreements

[5] Catches in the Canada ISBM column include catches in the Strait of Georgia (troll and sport), Central British Columbia troll, and Northern British Columbia net and mainland sport fisheries from 1985 to 1994 when these were AABM fisheries operating under fixed ceiling management provisions of the 1985 PST Agreement.

[6] Does not include SEAK AABM fishery nontreaty catch from hatchery add-on and terminal exclusion.

Table A24.–Estimated incidental mortality (LIM and SIM in nominal fish) associated with Chinook salmon catches in US and Canadian AABM and ISBM fisheries.[1]

Year	Southeast Alaska AABM[2]	Southeast Alaska Non-Treaty	US ISBM	US Total[5]	NBC AABM[2]	WCVI AABM[2]	Can ISBM[3]	Can Total	PSC Total[4, 5]
2005	45,913	10,586	67,260	113,173	20,563	14,814	47,895	83,272	196,445
2006	47,975	8,626	92,800	140,775	14,761	11,557	35,104	61,422	202,196
2007	71,517	22,204	91,442	162,958	13,923	12,403	41,784	68,110	231,068
2008	38,123	8,646	61,082	99,205	6,335	12,312	24,828	43,475	142,680
2009	44,963	11,052	69,742	114,705	9,705	15,817	38,911	64,433	179,137
2010	38,420	5,523	74,198	112,619	12,739	16,017	24,717	53,473	166,091
2011	41,613	9,864	88,053	129,666	18,619	17,005	32,967	68,591	198,257
2012	45,890	19,635	92,412	138,302	11,556	16,390	32,900	60,846	199,148
2013	59,382	42,839	102,073	161,455	19,926	16,606	48,540	85,072	246,527
2014	50,945	7,647	85,143	136,088	17,276	17,079	49,220	83,575	219,663
2015	49,148	21,647	108,226	157,374	21,673	10,971	43,606	76,250	233,624
2016	51,012	5,994	66,330	117,342	14,136	9,658	39,662	63,456	180,798
2017	42,349	12,427	66,935	109,284	19,299	13,203	52,478	84,980	194,264

Note: LIM = Legal Incident Mortality, SIM = Sublegal Incident Mortality.

[1] The IM estimates presented in this table are not equivalent to LC on a one-to-one fish basis because of the inclusion of SIMs, which are smaller, less mature fish.

[2] IM estimates (LIM + SIM) are available for AABM fisheries from 1985 to present (CTC 2011).

[3] IM estimates for the ISBM fisheries prior to 2005 were not available for many subcomponents of these fisheries at this printing, but will be included in next year's CTC catch and escapement report.

[4] The PST total needs to be viewed with caution per footnote 1.

[5] Does not include SEAK AABM fishery nontreaty catch from hatchery add-on and terminal exclusion.

Table A25.–Estimated total mortality (LC and IM) associated with Chinook salmon catches in US and Canadian AABM and ISBM fisheries.

Year	Southeast Alaska AABM	Southeast Alaska Non-Treaty	US ISBM	US Total[2]	NBC AABM	WCVI AABM	Can ISBM	Can Total	PSC Total[1,2]
2005	434,553	115,148	658,919	1,093,473	264,169	214,293	340,944	819,406	1,912,879
2006	408,069	84,077	631,510	1,039,579	230,746	157,068	299,196	687,010	1,726,588
2007	399,785	98,619	520,739	920,524	158,158	153,017	275,764	586,939	1,507,463
2008	211,028	80,069	585,905	796,933	101,982	158,038	208,882	468,902	1,265,835
2009	272,917	76,746	532,842	805,758	119,175	140,434	248,621	508,230	1,313,988
2010	269,031	59,664	854,487	1,123,519	149,352	155,064	190,678	495,094	1,618,613
2011	332,774	76,076	849,045	1,181,820	141,279	221,237	315,998	678,514	1,860,334
2012	288,711	72,133	874,933	1,163,643	131,862	150,858	224,624	507,344	1,670,988
2013	250,770	108,703	1,037,495	1,288,265	135,840	130,204	224,733	490,777	1,779,042
2014	486,141	64,974	1,090,025	1,576,166	234,177	205,453	283,619	723,249	2,299,415
2015	384,174	89,960	1,235,651	1,619,824	180,576	127,708	325,138	633,422	2,253,246
2016	401,952	42,097	719,891	1,121,843	204,317	108,955	221,622	534,894	1,656,736
2017	220,698	45,086	715,798	936,495	162,629	122,736	309,705	595,070	1,531,565

[1] Total mortality estimates prior to 2005 will be included in next year's CTC catch and escapement report when estimates from the ISBM fisheries are available.

[2] Does not include SEAK AABM fishery nontreaty catch from hatchery add-on and terminal exclusion.

APPENDIX B. ESCAPEMENTS AND TERMINAL RUNS OF PACIFIC SALMON COMMISSION CHINOOK TECHNICAL COMMITTEE CHINOOK SALMON ESCAPEMENT INDICATOR STOCKS, 1975–2017

Table B1.–Southeast Alaska estimates of escapement and CVs of Pacific Salmon Commission Chinook Technical Committee wild Chinook salmon escapement indicator stocks.

Southeast Alaska Chinook Stocks								
	Situk River		Chilkat R.		Unuk River		Chickamin R.	
Year	Esc	CV[1]	Esc	CV	Esc	CV	Esc[2]	CV
1975							1,758	0.15
1976	1,421						746	0.15
1977	1,732				4,706	0.12	1,724	0.15
1978	808				5,344	0.12	1,463	0.15
1979	1,284				2,783	0.12	1,135	0.15
1980	905				4,909	0.12	2,114	0.15
1981	702				3,532	0.12	1,824	0.15
1982	434				6,528	0.12	2,712	0.15
1983	592				5,436	0.12	2,845	0.15
1984	1,726				8,876	0.12	5,235	0.15
1985	1,521				5,721	0.12	4,541	0.15
1986	2,067				10,273	0.12	8,289	0.15
1987	1,379				9,533	0.12	4,631	0.15
1988	868	0.02			8,437	0.12	3,734	0.15
1989	637				5,552	0.12	4,437	0.15
1990	628				2,856	0.12	2,679	0.15
1991	889	0.01	5,882	0.17	3,165	0.12	2,313	0.15
1992	1,595	0.01	5,277	0.18	4,223	0.12	1,644	0.15
1993	952	0.03	4,463	0.19	5,160	0.12	1,848	0.15
1994	1,271	0.03	6,792	0.16	3,435	0.12	1,843	0.15
1995	4,330	0.04	3,768	0.21	3,730	0.12	2,309	0.31
1996	1,800	0.10	4,902	0.15	5,639	0.12	1,587	0.13
1997	1,878	0.11	8,089	0.15	2,970	0.09	1,292	0.15
1998	924	0.14	3,656	0.15	4,132	0.1	1,857	0.15
1999	1,461	0.10	2,258	0.18	3,914	0.13	2,337	0.15
2000	1,785	0.08	2,029	0.16	5,872	0.11	3,805	0.15
2001	656	0.03	4,514	0.16	10,541	0.11	5,177	0.19
2002	1,000	0.01	4,034	0.11	6,988	0.12	5,007	0.15
2003	2,117	0.03	5,631	0.12	5,546	0.08	4,579	0.13
2004	698	0.03	3,406	0.13	3,963	0.08	4,268	0.21
2005	595	0.01	3,361	0.16	4,742	0.08	4,257	0.14
2006	295		3,003	0.13	5,645	0.08	6,318	0.15
2007	677		1,435	0.16	5,668	0.08	4,242	0.15
2008	413		2,881	0.16	3,104	0.12	5,277	0.15
2009	902		4,406	0.13	3,157	0.11	2,902	0.15
2010	167		1,797	0.13	3,835	0.16	5,491	0.15
2011	240		2,674	0.10	3,195	0.21	4,052	0.15

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Table B1.–Page 2 of 2.

Southeast Alaska Chinook Stocks								
	Situk River		Chilkat R.		Unuk River		Chickamin R.	
Year	Esc	CV[1]	Esc	CV	Esc	CV	Esc.[2]	CV
2012	322		1,723	0.15	956	0.16	2,109	0.15
2013	912		1,719	0.19	1,135	0.16	2,223	0.15
2014	475		1,529	0.20	1,691	0.12	3,097	0.15
2015	174		2,456	0.11	2,623	0.12	2,760	0.15
2016[3]	329		1,386	0.14	1,463	0.12	964	0.15
2017	1,187		1,173	0.20	1,203	0.12	722	0.15
Lower	500		1,750		1,800		2,150	
Upper	1,000		3,500		3,800		4,300	

[1] Escapement is enumerated using a weir on the Situk River and CVs are only applicable for years having estimates of sport.

[2] Escapement is enumerated using index counts in the Chickamin River and these counts are not expanded to an estimate of total escapement; therefore, CVs are not applicable.

[3] Preliminary data.

Table B2.–Transboundary River estimates of escapement and CVs of Pacific Salmon Commission Chinook Technical Committee wild Chinook salmon escapement indicator stocks.

	Transboundary River Stocks					
	Alsek R.		Taku R.		Stikine R.	
Year	Esc	CV	Esc	CV	Esc	CV
1975			12,920	0.38	7,571	0.21
1976	5,282	0.35	24,582	0.38	5,723	0.16
1977	12,706	0.35	29,496	0.38	11,445	0.16
1978	12,034	0.35	17,124	0.38	6,835	0.21
1979	17,354	0.35	21,617	0.38	12,610	0.21
1980	10,862	0.35	39,239	0.38	30,573	0.16
1981	8,502	0.35	49,559	0.38	36,057	0.21
1982	9,475	0.35	23,847	0.38	40,488	0.16
1983	10,344	0.35	9,795	0.38	6,424	0.21
1984	7,238	0.35	20,778	0.38	13,995	0.21
1985	6,127	0.35	35,916	0.38	16,037	0.15
1986	11,069	0.35	38,110	0.38	14,889	0.15
1987	11,141	0.35	28,935	0.38	24,632	0.15
1988	8,717	0.35	44,524	0.38	37,554	0.15
1989	10,119	0.35	40,329	0.14	24,282	0.15
1990	8,609	0.35	52,143	0.18	22,619	0.15
1991	11,625	0.35	51,645	0.38	23,206	0.15
1992	5,773	0.35	55,889	0.38	34,129	0.15
1993	13,855	0.35	66,125	0.38	58,962	0.15
1994	15,863	0.35	48,368	0.38	33,094	0.15
1995	24,772	0.35	33,805	0.15	16,784	0.15
1996	15,922	0.35	79,019	0.12	28,949	0.10
1997	12,494	0.35	114,938	0.16	26,996	0.11
1998	6,833	0.33	31,039	0.38	25,968	0.15
1999	14,597	0.24	16,786	0.19	19,947	0.16
2000	7,905	0.25	34,997	0.15	27,531	0.12
2001	6,705	0.41	46,554	0.15	63,523	0.09
2002	5,569	0.61	55,044	0.2	50,875	0.12
2003	5,904	0.44	36,435	0.18	46,824	0.13
2004	7,083	0.52	75,032	0.14	48,900	0.08
2005	4,478	0.35	38,725	0.12	40,501	0.07
2006	2,323	0.35	42,296	0.13	24,405	0.28
2007	2,827	0.35	14,854	0.22	14,560	0.15
2008	1,885	0.35	27,383	0.09	18,352	0.16
2009	6,239	0.35	22,801	0.12	11,086	0.23
2010	9,518	0.35	29,302	0.09	15,180	0.13
2011	6,668	0.35	27,523	0.15	14,569	0.11
2012	2,660	0.35	19,429	0.12	22,671	0.17

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Table B2.–Page 2 of 2.

Year	Transboundary River Stocks					
	Alsek R.		Taku R.		Stikine R.	
	Esc	CV	Esc	CV	Esc	CV
2013	5,044	0.35	18,002	0.38	16,735	0.22
2014	3,357	0.51	23,532	0.09	24,360	0.15
2015	5,697	0.36	28,850	0.14	21,343	0.16
2016	2,574	0.35	12,381	0.12	10,343	0.19
2017	1,718	0.37	8,754	0.09	7,206	0.29
Lower	3,500		19,000		14,000	
Upper	5,300		36,000		28,000	

Table B3.–Northern British Columbia escapements and terminal runs (t. run) of Pacific Salmon Commission Chinook Technical Committee wild Chinook salmon escapement indicator stocks.

		Northern British Columbia											
	Area 1 Yakoun R. Esc	Area 3[1] Nass R.			Area 4 Skeena R.			Area 8 Dean R. index	Area 8[2] Atnarko R.		Wild[4]	Area 9 Rivers Inlet	Area 10 Smith Inlet[5]
Year		Above GW[1]	Esc	t. run	Total Esc	GSI[3] esc	GSI[3] SD		Total Esc	CV			
1975	1,500		14,895	17,874	20,319				3,600			3,280	960
1976	700		13,819	16,583	13,078				11,700			1,640	1,000
1977	800	13,688	14,288	18,410	29,018				10,800			2,225	1,050
1978	600	15,485	16,885	21,807	22,661			3,500	13,500			2,800	2,100
1979	400	11,253	12,783	16,229	18,488			4,000	4,050			2,150	500
1980	600	13,476	14,855	18,744	23,429			2,000	6,480			2,325	1,200
1981	750	12,625	13,925	17,606	24,523			3,500	4,050			3,175	1,020
1982	1,400	7,959	10,359	13,287	17,092				7,200			2,250	1,500
1983	600	13,252	16,301	20,516	23,562			500	7,740			3,320	1,050
1984	300	20,967	24,967	31,408	37,598	51,348	14,818	4,500	13,788			1,400	770
1985	1,500	17,782	19,694	24,768	53,599	30,875	5,648	4,000	24,804			3,371	230
1986	500	36,523	38,123	47,967	59,968	28,398	6,204	3,300	19,170			7,623	532
1987	2,000	19,540	20,986	26,568	59,120	150,874	27,774	1,144	12,983			5,239	1,050
1988	2,000	15,345	16,715	21,094	68,705	91,496	13,217	1,300	13,500			4,429	1,050
1989	2,800	28,133	29,175	36,594	57,202	72,422	10,457	2,300	19,800			3,265	225
1990	2,000	24,051	26,551	33,384	55,976	64,188	10,638	2,000	14,537	0.143	11,630	4,039	510
1991	1,900	6,907	8,259	13,136	52,753	41,940	7,364	2,400	12,098	0.132	8,952	6,635	500
1992	2,000	16,808	17,408	25,405	63,392	103,365	25,532	3,000	28,590	0.128	22,015	7,500	500
1993	1,000	24,814	26,508	36,678	66,977	119,780	22,066	700	30,824	0.126	20,961	10,000	500
1994	2,000	21,169	25,689	32,864	48,712	78,228	14,149	1,300	24,514	0.112	12,257	3,500	700
1995	1,500	7,844	8,776	16,187	34,390	62,272	16,627	1,100	20,376	0.179	8,150	3,196	400
1996	3,000	21,842	22,712	30,889	73,684	155,637	32,769	2,000	18,067	0.106	5,962	3,000	250
1997	2,500	18,702	20,584	27,658	42,539	57,368	12,437	1,400	9,788	0.088	4,013	4,980	100
1998	3,000	23,213	25,361	34,922	46,744	80,677	16,199	3,000	11,719	0.078	6,094	5,367	1,100
1999	3,200	11,544	13,118	22,310	43,775	53,418	8,204	1,800	14,398	0.141	7,199	2,739	500
2000	3,600	18,912	20,565	31,159	51,804	95,563	13,496	1,200	15,096	0.064	9,964	6,700	500

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Table B3.–Page 2 of 2.

Year	Area 1 Yakoun R. Esc	Northern British Columbia											
		Area 3[1] Nass R.			Area 4 Skeena R.			Area 8 Dean R. index	Area 8[2,4] Atnarko R.		Wild[4]	Area 9 Rivers Inlet	Area 10 Smith Inlet[5]
		Above GW[1]	Esc	t. run	Total Esc	GSI[3] esc	GSI[3] SD		Total Esc	CV			
2001	3,500	29,687	31,915	44,595	81,504	145,120	18,738	3,795	***20,929***	***0.034***	***16,743***	5,062	300
2002	3,000	13,773	15,382	21,528	44,771	89,235	11,984	3,731	***10,427***	***0.084***	***8,550***	5,031	
2003	4,000	26,940	28,330	36,503	56,758	114,346	16,234	3,700	***11,925***	***0.055***	***10,136***	1,900	
2004	4,500	15,912	18,185	25,137	44,243	142,141	19,631	3,500	10,287	0.089	8,230	3,950	
2005	5,000	14,363	16,595	24,067	29,067	77,531	9,783	2,200	10,159	0.110	7,619	5,585	
2006	NA	24,725	27,743	37,098	33,094	84,199	15,599	3,700	16,781	0.156	9,565	3,930	
2007	NA	21,459	25,524	34,221	33,352	85,179	17,559	2,300	7,160	0.061	5,799	5,000	
2008	NA	17,862	20,198	26,202	32,963	71,446	13,043	1,100	6,341	0.073	5,517	5,792	
2009	NA	28,710	30,334	36,865	38,297	80,900	16,297	1,400	***8,917***	***0.047***	***6,331***	4,580	
2010	NA	19,341	20,821	26,052	43,331	101,486	19,344	1,600	***9,317***	***0.059***	***5,683***	4,225	
2011	NA	9,639	10,415	15,092	37,073	53,682	12,239	750	***8,082***	***0.071***	***6,061***	4,400	
2012	NA	8,309	9,815	15,086	34,024	33,473	5,746	586	***4,622***	***0.060***	***2,542***	4,142	
2013	NA	8,011	9,306	13,525	26,699	39,179	4,903	1,613	***19,962***	***0.047***	***9,860***	4,672	
2014	NA	11,623	13,108	19,789	28,496	44,200	6,876	1.213	***19,011***	***0.046***	***11,935***	4,190	
2015	NA	16,433	19,465	28,557	41,658	53,770	6,700	2,470	***44,329***	***0.120***	***13,640***	5,328	
2016	NA	9,037	10,191	15,977	34,153	31,297	4,632	1,516	***24,234***	***0.047***	***10,100***	5,822	
2017	NA	4,207	4,984	8,891	11,920	18,480	4,709	725	***10,308***	***0.046***	***5,464***	2,084	

Note: NA = Not available.

[1] GW refers to Gitwinksihlkw, the location of the lower fish wheels on the Nass River used to capture Chinook salmon for the MR estimate.

[2] Estimates prior to 1990 are visual counts, 1990–2000 and 2004–2008 are based on time series calibration, 2001–2003 and 2009–2017 are maximum likelihood estimates based on MR estimates.

[3] Genetic Stock Identification.

[4] Large wild Atnarko Chinook salmon.

[5] The Docee River was dropped as an escapement indicator beginning in 2002 due to an inability to obtain reliable escapement estimates.

Table B4.–Southern British Columbia escapements of Pacific Salmon Commission Chinook Technical Committee wild Chinook salmon escapement indicator stocks.

	Lower Strait of Georgia		Upper Strait of Georgia[1,2]					
Year	Nanaimo	Cowichan	Nimpkish	Klinaklini	Kakweiken	Kingcome	Wakeman	Esc. index
1975	5,475		1,100	16,560	200	1,500	1,500	20,860
1976	4,340		3,500	14,569	650	1,500	2,000	22,219
1977	6,530		750	21,078	130	750	750	23,458
1978	6,495		1,300	13,848	350	1,000	1,000	17,498
1979	2,741	7,945	500	7,955	60	50	233	8,798
1980	2,982	5,837	300	4,883	500	32	35	5,750
1981	225	5,782	700	8,619	200	20	25	9,564
1982	1,152	5,034	700	12,887	196	450	750	14,983
1983	1,840	4,742	1,500	10,536	160	359	309	12,864
1984	3,178	5,278	3,000	5,776	88	197	169	9,230
1985	914	3,675	3,000	9,327	500	150	300	13,277
1986	958	2,147	700	22,697	344	774	100	24,616
1987	757	2,519	3,000	27,069	411	1,500	1,000	32,980
1988	1,079	6,878	1,500	6,800	103	200	500	9,103
1989	1,552	5,535	3,850	40,002	607	500	800	45,759
1990	1,397	5,626	1,200	11,650	177	300	300	13,626
1991	935	7,408	1,400	22,784	140	526	300	25,150
1992	1,127	10,250	3,400	13,643	50	316	152	17,561
1993	1,405	7,030	300	3,406	53	193	223	4,175
1994	1,072	6,407	300	3,427	30	108	79	3,944
1995	2,300	16,449	300	4,755	157	426	54	5,692
1996	1,870	14,595	399	3,857	50	124	108	4,538
1997	1,772	9,973	350	3,800	39	450	125	4,764
1998	1,800	5,858	450	9,980	6	450	250	11,136
1999	2,371	6,110	640	11,068	146	70	281	12,205
2000	1,446	6,638	350	17,202	30	228	31	17,841
2001	2,448	5,015	365	9,355	129	527	116	10,492
2002	1,747	4,115	570	12,529	33	301	73	13,506
2003	1,672	3,356	385	13,365	164	122	21	14,057
2004	550	2,721	969	6,310	96	744	32	8,150
2005	1,036	2,467	576	3,980	60	95	28	4,739
2006	2,135	1,775	500	14,228	216	316	145	15,405
2007	2,267	2,175	514	5,791	88	75	90	6,558
2008	2,671	2,015	532	4,915	75	35	35	5,592
2009	1,470	785	929	10,134	154	64	19	11,300
2010	2,201	2,419	543	7,119	108	55	26	7,851
2011	3,937	2,786	720	4,829	5	6	20	5,580
2012	1,063	2,668	2,630	18,174	276	4	20	21,103
2013	593	4,406	2,589	18,041	274	26	24	20,954
2014	1,689	4,185	2,520	17,899	272	18	17	20,725
2015	3,146	5,984	1,659	15,254	231	494	424	18,062
2016	1,982	7,787	2,008	16,220	246	525	451	19,450
2017	2,108	10,590	1,044	17,735	269	574	493	20,115
Goal		6,500						

[1] Upper Strait of Georgia Strait escapement updated with time series for 5-stream index.

[2] The escapement time series for the UGS stock includes estimates based on consistent methods within each river, and escapements to rivers missing escapement data for some years (i.e., no surveys) were estimated using the procedures described by English et al. (2007).

Table B5.–West Coast Vancouver Island 6-stream index escapements of Pacific Salmon Commission Chinook Technical Committee wild Chinook salmon escapement indicator stocks.

	WCVI[1]						
Year	Marble	Burman	Tahsis	Artlish	Kaouk	Tahsish	Esc. index
1975	400	200	75	25	75	25	800
1976	400	400	200	25	25	25	1,075
1977	950	500	150	60	75	100	1,835
1978	1,500	1,000	100	50	50	50	2,750
1979	750	650	348	40	60	200	2,048
1980	5,000	345	373	100	100	200	6,118
1981	3,000	300	150	500	100	1,000	5,050
1982	5,000	70	125	100	100	1,000	6,395
1983	1,000	475	50	400	300	500	2,725
1984	600	700	12	650	400	1,500	3,862
1985	1,250	500	50	400	300	1,200	3,700
1986	1,100	400	60	100	100	1,000	2,760
1987	1,750	100	20	100	100	500	2,570
1988	3,275	500	125			400	4,300
1989	4,181	780	500	40	30	450	5,981
1990	1,973	1,100	300	50	10	200	3,633
1991	710	2,767	1,515	20	20	120	5,152
1992	800	2,198	1,463	10	80	600	5,151
1993	2,000	1,750	578	10	20	250	4,608
1994	650	2,330	380	100	150	250	3,860
1995	1,626	594	525	99	266	600	3,710
1996	3,971	724	771	53	219	288	6,026
1997	2,638	2,354	722	402	558	523	7,197
1998	5,297	3,205	587	300	824	1,430	11,643
1999	4,185	2,399	1,731	539	453	879	10,186
2000	2,572	212	1,220	75	105	391	4,575
2001	1,450	107	389	139	409	237	2,731
2002	2,485	440	758	41	251	308	4,283
2003	1,749	768	762	379	358	440	4,456
2004	3,658	2,636	905	454	301	495	8,449
2005	2,354	642	182	199	488	121	3,986
2006	3,071	516	141	228	536	76	4,568
2007	2,764	353	133	162	193	234	3,839
2008	2,683	515	281	200	264	380	4,323
2009	3,440	1,800	780	214	550	80	6,864
2010	3,560	3,028	380	110	185	355	7,618
2011	3,910	2,020	220	100	300	260	6,810
2012	2,364	1,003	163	141	223	138	4,032
2013	2,081	8,285	545	399	240	350	11,900
2014	1,185	3,002	653	91	192	653	5,776
2015	6,516	6,292	310	1,113	331	768	15,330
2016	2,406	10,756	369	166	370	615	14,682
2017	5,078	1,380	635	274	605	1,561	9,533

[1] The escapement methodology changed for the WCVI streams in 1995, and the earlier estimates have not been calibrated.

Table B6.–Fraser River escapements and terminal runs (t. run) of Pacific Salmon Commission Chinook Technical Committee wild Chinook salmon escapement indicator stocks.

	Fraser River								
	Fraser Spring Age 1.2	Fraser Spring Age 1.3	Fraser Summer Age 0.3	Fraser Summer Age 1.3	Fraser Spring/ Summer	Harrison		Lower Shuswap[1]	
Year	Esc	Esc	Esc	Esc	t. run	Esc	CV	Esc	CV
1975	8,360	6,673	41,067	16,043	74,277			31,531	0.35
1976	5,575	7,875	6,320	11,849	33,761			3,776	0.41
1977	4,458	9,786	26,374	15,670	58,878			16,124	0.36
1978	5,209	13,150	24,211	16,415	62,151			17,804	0.36
1979	3,437	12,999	25,471	8,950	110,668			17,056	0.36
1980	7,460	14,583	10,771	11,883	74,835			6,281	0.39
1981	3,718	10,101	16,639	11,992	68,003			8,879	0.37
1982	6,637	11,718	8,079	12,715	73,794			3,289	0.42
1983	3,264	22,168	9,192	14,634	73,174			5,396	0.14
1984	8,068	27,242	15,393	13,550	97,226	120,835	0.08	7,582	0.08
1985	11,800	38,601	20,059	16,118	119,782	174,776	0.11	10,539	0.06
1986	12,604	46,606	31,528	28,568	151,469	162,594	0.07	20,828	0.35
1987	6,434	44,668	29,833	21,601	131,430	79,036	0.06	17,056	0.36
1988	5,501	35,658	40,690	28,914	135,740	35,114	0.07	24,669	0.35
1989	7,794	27,420	32,468	14,492	113,444	74,683	0.11	18,933	0.36
1990	4,482	37,612	35,383	27,151	137,082	177,373	0.10	22,741	0.35
1991	6,589	25,127	33,817	19,670	115,307	90,636	0.11	17,056	0.36
1992	8,656	27,531	43,185	22,064	123,486	130,409	0.08	23,317	0.35
1993	14,450	29,063	17,673	18,984	115,851	118,997	0.07	9,762	0.37
1994	16,440	48,063	37,461	18,156	157,780	98,342	0.07	28,864	0.35
1995	18,000	40,889	28,228	24,100	146,193	28,616	0	17,056	0.36
1996	26,627	30,670	67,443	34,989	196,519	37,392	0.06	34,520	0.35
1997	22,251	33,012	59,368	33,906	203,916	70,514	0.10	22,933	0.35
1998	5,105	25,578	86,294	30,759	181,751	200,258	0.09	34,050	0.35
1999	11,409	17,847	75,432	19,039	154,822	104,415	0.11	46,105	0.36
2000	16,002	21,107	53,100	24,854	153,805	77,754	0.10	27,800	0.03
2001	18,275	25,248	92,123	25,204	205,926	108,502	0.15	35,744	0.03
2002	24,477	36,563	124,877	29,458	255,460	83,011	0.08	54,219	0.03
2003	28,740	43,872	88,422	43,548	258,444	246,986	0.08	39,317	0.35
2004	20,427	28,541	65,007	31,254	205,345	139,126	0.05	16,963	0.03
2005	8,983	19,967	93,687	19,851	183,623	88,589	0.06	17,893	0.02
2006	9,601	20,858	179,792	21,149	274,824	60,421	0.13	59,085	0.03
2007	2,474	10,791	87,187	11,023	138,867	76,483	0.07	15,926	0.03
2008	11,774	15,373	106,587	17,032	193,035	41,603	0.07	14,922	0.03
2009	2,173	24,318	86,318	21,104	175,237	70,142	0.06	25,278	0.02
2010	9,406	15,582	175,657	19,324	256,317	103,558	0.06	71,354	0.02
2011	5,181	10,992	126,679	16,009	215,636	123,647	0.05	18,895	0.02
2012	11,359	11,186	47,695	9,626	113,121	44,467	0.09	4,091	0.03

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Year	Fraser River								
	Fraser Spring Age 1.2 Esc	Fraser Spring Age 1.3 Esc	Fraser Summer Age 0.3 Esc	Fraser Summer Age 1.3 Esc	Fraser Spring/ Summer t. run	Harrison		Lower Shuswap[1]	
						Esc	CV	Esc	CV
2013	6,821	16,009	119,609	11,075	176,102	42,953	0.07	28,797	0.04
2014	24,600	33,814	84,308	23,884	210,595	44,686	0.09	43,952	0.09
2015	11,150,	22,834	178,204	29,485	282,098	101,516	0.07	39,440	0.02
2016	8,907	13,769	93,158	9,449	138,541	41,327	0.11	6,438	0.06
2017	5,105	8,154	84,470	6,459	123,154	29,799	1.11	13,430	0.03
Goal Lower						75,100			
Goal Upper						98,500			

[1] Escapement was estimated by MR methods from 1983 to 1985, 2000 to 2002, and 2004 to 2012. All other years are calibrated values that have been estimated using a relationship between MR and peak methods.

Table B7.–Puget Sound escapements and terminal runs (t. run) of Pacific Salmon Commission Chinook Technical Committee wild Chinook salmon escapement indicator stocks.

Year	Puget Sound (includes hatchery strays in natural escapement unless noted otherwise)																
	Nooksack Spring			Skagit River Spring		Skagit River Summer/Fall		Stillaguamish River			Snohomish River			Lake Washington		Green River		
	MR esc[1]	Tot Esc[2]	NOR Esc[3]	Esc	t. run	Esc	t. run[4]	MR esc[1]	Esc	t. run[4]	MR esc[1]	Esc	t. run	Esc	t. run	MR esc[1]	Esc	t. run
1975				627	627	11,320	30,299		1,198	1,801		3,953	5,993	918	1,004		3,394	6,838
1976				633	633	14,120	28,589		2,140	4,241		4,659	9,740	582	937		3,140	8,246
1977				520	520	9,218	21,502		1,475	2,847		5,542	10,760	944	889		3,804	5,936
1978				932	932	13,075	24,285		1,232	2,159		7,905	13,747	1,245	1,353		3,304	4,766
1979				818	818	13,306	24,350		1,042	2,531		5,726	14,010	1,739	1,578		9,704	11,689
1980				1,408	1,408	20,058	31,250		821	2,818		6,526	18,683	1,903	1,683		7,743	11,248
1981				1,045	1,045	8,283	21,817		630	3,014		3,330	10,466	970	924		3,606	5,532
1982				753	753	9,910	24,259		773	3,229		4,498	9,820	1,189	1,384		1,840	4,271
1983				554	554	8,723	15,758		387	1,089		4,537	11,853	1,646	2,515		3,679	14,376
1984		520		696	696	12,628	15,616		374	920		3,484	9,554	1,610	4,211		3,353	5,890
1985		703		2,634	2,634	16,002	26,230		1,409	2,717		4,730	9,455	1,255	2,627		2,908	7,914
1986		396		1,922	1,922	17,908	22,906		1,277	2,499		4,534	7,322	1,846	2,863		4,792	6,114
1987		429		1,745	1,745	9,409	13,387		1,321	1,982		4,689	6,951	2,652	4,835		10,338	12,283
1988		689		1,743	1,743	11,468	15,262	819	717	1,245		4,513	7,529	1,015	2,829		7,994	9,667
1989		909		1,400	1,809	6,684	13,270	905	784	1,664		3,173	5,823	1,234	1,544		11,512	15,244
1990		152		1,511	1,546	16,521	18,950	979	842	1,867		4,722	6,913	974	1,098		7,035	15,483
1991		473		1,236	1,273	5,824	8,604	1868	1,536	2,969		2,800	3,980	864	1,115		10,548	15,451
1992		601		986	1,010	7,348	9,021	719	639	1,279		2,708	3,269	999	1,212		5,267	10,165
1993		684		782	812	5,801	7,097	822	719	1,259		4,019	4,524	307	324		2,476	5,507
1994		163		470	496	5,549	5,912	878	773	1,323		3,406	3,715	1,068	926		4,078	8,368
1995		520		855	887	6,877	9,239	893	775	1,495		3,356	3,871	1,202	966		7,939	9,935
1996		738		1,051	1,078	10,613	10,828	1494	1,244	2,276		4,851	5,352	457	362		6,026	8,664
1997		797		1,041	1,064	4,872	6,092	1382	1,156	17,298		4,078	4,259	385	302		7,101	7,778
1998		527	37	1,086	1,091	14,609	14,965	1879	1,544	2,434		6,306	6,658	869	711		5,963	7,777
1999		1,111	117	471	476	4,924	5,229	1307	1,098	2,264		4,791	4,964	992	791		7,135	8,376
2000		1,615	313	1,021	1,025	16,930	17,265	2008	1,645	3,065		6,095	6,613	361	393	10,526	4,473	6,880
2001		2,629	473	1,856	1,866	13,793	14,046	1629	1,349	2,051		8,166	8,709	1,434	1,555	21,402	6,473	9,721
2002		4,366	415	1,076	1,092	19,591	19,911	1935	1,588	2,219		7,223	7,444	941	663	14,857	7,564	11,539
2003		3,448	279	909	987	9,777	10,106	1165	988	1,320		5,447	5,810	1,010	826		5,864	7,871
2004		1,891	373	1,622	1,622	23,553	24,107	1829	1,506	1,974		10,602	11,051	1,371	794		7,947	13,498
2005		2,279	284	1,305	1,305	20,803	23,405	1227	1,036	1,493		4,480	4,974	1,043	788		2,523	2,987
2006		1,716	442	1,896	1,919	20,768	22,539	1507	1,254	1,543		8,188	8,681	1,597	1,433		5,790	8,604
2007		1,786	407	613	613	11,281	13,027	678	607	866		3,982	4,208	2,309	3,342		4,301	7,205
2008	2,714	1,714	497	1,472	1,472	11,664	14,995	1711	1,671	1,861		8,373	8,506	1,681	2,917		5,971	10,290

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Table B7.–Page 2 of 2.

Year	Puget Sound (includes hatchery strays in natural escapement unless noted otherwise)																	
	Nooksack Spring			Skagit River Spring		Skagit River Summer/Fall		Stillaguamish River			Snohomish River			Lake Washington		Green River		
	MR esc[1]	Tot Esc[2]	NOR Esc[3]	Esc	t. run	Esc	t. run[4]	MR esc[1]	Esc	t. run[4]	MR esc[1]	Esc	t. run	Esc	t. run	MR esc[1]	Esc	t. run
2009	2,889	2,360	372	983	983	6,955	12,460	1239	1,001	1,218		2,309	2,370	793	951		688	1,067
2010	4,303	2,596	277	1,361	1,537	8,037	9,060	837	783	1,014		4,299	4,435	729	734	4,541	2,092	2,112
2011	2,620	1,348	264	825	1,015	5,536	9,181	1637	1,017	1,264	10,399	1,880	1,972	890	1,034	3,382	993	1,464
2012	2,176	1,266	569	2,774	3,278	13,817	15,864	1787	1,534	1,733	7,763	5,124	5,216	1,581	1,875	4,528	3,091	3,804
2013	4,879	1,590	149	2,010	2,398	10,882	14,082	997	854	1,003	11,235	3,244	3,320	1,863	3,024		2,041	2,332
2014	2,249	1,606	169	1,608	1,746	10,457	11,387	419	432	440		3,901	3,949	614	649		2,730	2,910
2015	3,878	1,852	447	1,408	NA	13,315	14,580	459	459	468	5,885	3,863	3,948	2,014	2,022		4,087	4,181
2016		NA	NA	2,429	NA	16,761	18,337	1053	861	882		5,153	5,277	1,287	1,308		10,063	10,103
2017		NA	NA	2,851	NA	12,784	NA	1278	1,073	NA		6,119	NA	2,467	NA		8,357	NA

Note: NA = Not available.

[1] Escapement estimated from MR studies conducted with Treaty-related funding. For the Stillaguamish River, 1988-2007 estimates 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.

[2] Estimate of total natural spawners (hatchery + natural) during the spring Chinook salmon escapement accounting period (prior to Oct. 1); includes some early-timed summer/fall Chinook salmon in the south Fork but is assumedly spring Chinook salmon only in the north fork/middle fork Chinook salmon (due to spawn timing differences).

[3] Natural-origin spring Chinook salmon isolated from total natural spawners based on carcass mark–sampling details (otolith thermal marks, fin clips, CWTs) and genetic stock identification.

[4] Escapement excludes brood stock collected for supplementation program. Total run includes redd count based escapement of all natural spawners, terminal catch, and adult brood stock collected for supplementation and PSC indicator program.

Table B8.–Washington Coast escapements and terminal runs (t. run) of Pacific Salmon Commission Chinook Technical Committee wild Chinook salmon escapement indicator stocks.

Washington Coast																		
	Hoko Fall		Quillayute Summer		Quillayute Fall		Hoh Spr/Sum		Hoh Fall		Queets Spr/Sum		Queets Fall		Grays Harbor Spring		Grays Harbor Fall	
Year	Esc[1]	t. run	Esc	t. run	Esc	t. run	Esc	t. run	Esc	t. run	Esc	t. run	Esc	t. run	Esc	t. run	Esc	t. run
1976			1,300	1,700			600	1,300	2,500	3,100	505	737	1,200	2,500	600	1,000	1,836	10,313
1977			3,800	5,300			1,000	2,000	2,100	3,800	732	1,155	3,600	5,500	800	1,700	5,195	14,400
1978			2,300	2,700			1,400	2,472	1,900	2,900	1,110	1,406	2,200	3,100	1,000	1,600	4,555	8,372
1979			2,100	3,900			1,400	2,326	1,700	2,200	870	1,369	3,900	4,700	400	1,100	9,381	10,101
1980			964	1,500	6,700	7,600	800	1,079	2,200	2,800	1,038	1,213	3,200	5,800	200	600	11,656	21,639
1981			815	1,700	5,963	7,102	1,498	2,005	3,100	4,000	988	1,329	4,250	8,200	600	900	7,577	11,915
1982			1,126	2,700	7,107	9,651	1,553	2,125	4,500	5,800	781	1,244	4,150	6,600	610	669	5,606	13,296
1983			548	1,800	3,069	5,530	1,696	2,233	2,500	3,300	1,044	1,173	2,750	4,400	800	850	5,482	8,997
1984			618	1,000	9,128	10,447	1,430	2,005	1,900	2,600	958	1,189	4,350	6,300	1,128	1,130	21,058	22,616
1985			550	700	6,145	8,367	978	1,353	1,725	2,720	677	886	4,150	5,910	1,157	1,159	9,537	15,153
1986	801	801	853	1,000	10,006	13,380	1,248	1,912	4,981	6,000	925	1,193	7,894	9,180	1,795	1,826	13,808	23,535
1987	581	581	666	1,600	12,352	20,349	1,710	2,480	4,006	6,147	598	1,543	6,557	10,638	841	1,071	19,013	34,460
1988	686	776	2,599	3,943	15,168	22,115	2,605	3,708	4,128	6,873	1,765	2,267	9,494	12,505	3,106	3,208	28,158	39,895
1989	775	842	2,407	3,472	9,951	17,260	4,697	6,820	5,148	8,682	2,568	3,954	9,324	12,213	2,068	2,393	25,677	56,028
1990	378	493	1,483	1,840	13,711	16,914	3,886	5,294	4,236	6,327	1,780	2,480	10,569	13,155	1,567	1,630	16,995	39,735
1991	894	1,006	1,188	1,500	6,292	7,631	1,078	1,693	1,420	2,628	630	761	4,795	6,593	1,289	1,489	14,392	33,271
1992	642	740	1,009	1,271	6,342	7,750	1,018	1,443	4,003	5,139	375	505	4,911	6,880	1,813	1,851	16,592	33,276
1993	775	894	1,292	1,531	5,254	5,735	1,411	2,065	2,280	3,951	713	788	3,463	5,667	1,254	1,399	13,349	28,941
1994	332	428	974	1,187	4,932	5,692	1,699	2,372	3,967	4,322	705	727	4,233	6,854	1,403	1,479	14,320	30,718
1995	750	905	1,333	1,731	5,532	6,716	1,132	1,686	2,202	2,912	625	662	3,127	5,101	2,070	2,167	12,727	31,729
1996	1,227	1,265	1,170	1,388	7,316	9,293	1,371	2,083	3,022	4,061	776	891	4,218	5,927	4,462	4,655	20,227	34,040
1997	768	894	890	1,177	5,405	6,047	1,826	2,582	1,773	3,034	540	693	2,872	4,945	4,460	4,812	18,168	30,842
1998	1,618	1,722	1,599	1,829	6,752	7,940	1,287	1,880	4,257	5,388	492	537	3,815	5,173	2,388	2,679	12,529	20,319
1999	1,497	1,688	713	818	3,334	4,758	928	1,081	1,924	2,941	373	426	1,794	3,105	1,285	1,555	10,363	12,846
2000	612	731	989	1,149	3,730	4,794	492	529	1,749	2,632	248	250	3,114	4,147	3,135	3,424	9,385	15,943
2001	768	946	1,225	1,399	5,136	7,545	1,159	1,231	2,560	4,116	548	565	2,872	4,775	2,860	3,326	9,492	19,397
2002	443	680	1,002	1,100	6,067	9,512	2,464	3,375	4,415	5,716	738	755	2,419	5,571	2,598	3,217	11,841	16,610
2003	863	1,098	1,219	1,308	7,398	9,469	1,228	1,646	1,649	2,345	189	195	4,811	6,611	1,904	2,101	19,871	22,866
2004	866	1,086	1,093	1,259	3,831	6,133	1,786	2,239	3,211	4,410	604	619	4,978	6,874	5,034	5,330	31,773	42,515
2005	203	284	876	1033	6,406	8,319	1,193	1,389	4,180	5,323	298	306	4,401	6,755	2,130	2,683	19,695	23,565
2006	845	895	553	604	5,642	7,656	904	1,061	1,535	2,336	330	336	2,931	4,266	2,481	2,863	17,428	24,928
2007	462	568	502	568	3,066	4,137	810	1,023	1,556	2,427	352	358	768	1,595	652	915	13,117	18,420
2008	431	483	949	1,081	3,612	5,250	671	717	2,999	3,911	305	305	2,971	4,208	996	997	15,391	18,661
2009	103	385	555	682	3,130	5,874	880	913	2,081	2,747	495	495	2,960	4,918	1,133	1,150	9,290	14,498

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Table B8.–Page 2 of 2.

Washington Coast																		
	Hoko Fall		Quillayute Summer		Quillayute Fall		Hoh Spr/Sum		Hoh Fall		Queets Spr/Sum		Queets Fall		Grays Harbor Spring		Grays Harbor Fall	
Year	Esc[1]	t. run	Esc	t. run	Esc	t. run	Esc	t. run	Esc	t. run	Esc	t. run	Esc	t. run	Esc	t. run	Esc	t. run
2010	319	793	772	941	4,635	6,985	828	852	2,599	3,204	259	259	3,861	6,001	3,495	3,495	18,158	25,795
2011	1,275	1,504	569	823	3,963	6,765	827	885	1,293	2,163	373	373	3,710	6,649	2,563	2,573	22,870	35,829
2012	401	663	729	841	3,518	6,682	915	1,059	1,937	2,770	760	760	3,586	6,757	878	1,151	14,034	24,788
2013	656	1,406	957	1,148	4,017	6,993	750	873	1,269	3,287	520	520	2,413	4,967	2,459	2,638	12,582	18,830
2014	1,534	1,760	608	843	2,782	7,327	744	819	1,933	2,628	377	452	3,684	5,145	1,583	1,659	11,400	19,369
2015	2,282	2,877	794	1,006	3,440	6,676	1,070	1,096	1,795	2,439	532	576	5,313	7,452	1,841	2,065	22,200	39,096
2016	965	1,195	900	1,171	3,654	5,005	1,144	1,158	2,831	3,012	704	777	2,915	3,119	926	1,078	11,685	16,397
2017	695	970	1,146	1,409	3,927	9,002	1,778	1,798	1,405	1,907	825	NA	2,721	NA	1,384	NA	13,469	NA
Goal					3,000		900		1,200		700		2,500				13,326	

Note: NA = Not available.

[1] Escapement excludes brood stock for supplementation program. Total run includes redd-count-based escapement, terminal catch, and adult brood stock collected for supplementation and PSC indicator program.

Table B9.–Columbia upriver spring and Mid-Columbia summer escapements and terminal runs (t. run) of Pacific Salmon Commission Chinook Technical Committee Chinook salmon escapement indicator stocks.

	Columbia Upriver Springs[1]						Mid-Columbia Summers[2]	
	Upper Columbia R.		Snake R. Spr/Sum		Total			
Year	Esc	t.run	Esc	t.run	Esc	t.run.	Esc	t.run
1975								
1976								
1977								
1978								
1979							18,797	22,142
1980	2,772	7,128	6,646	20,968	9,418	28,095	13,854	22,498
1981	3,253	6,044	12,153	24,753	15,406	30,797	8,639	18,746
1982	3,015	6,314	11,819	27,601	14,834	33,914	6,587	14,369
1983	4,286	7,292	10,424	20,936	14,710	28,227	6,334	13,145
1984	4,608	6,706	8,266	14,119	12,874	20,826	13,984	18,765
1985	8,941	10,290	11,273	14,865	20,214	25,155	14,505	18,522
1986	5,519	7,903	11,989	20,085	17,508	27,987	14,850	18,752
1987	6,352	8,777	10,716	15,870	17,068	24,648	13,415	22,715
1988	5,658	7,503	11,573	17,368	17,231	24,872	13,634	22,720
1989	4,130	7,455	6,833	14,707	10,963	22,162	17,484	22,201
1990	2,808	4,437	9,850	17,581	12,658	22,018	13,432	18,794
1991	1,533	2,437	6,013	13,106	7,546	15,543	10,191	14,323
1992	3,163	4,261	13,056	20,637	16,219	24,897	7,706	9,428
1993	3,102	4,050	12,827	17,900	15,929	21,950	12,927	14,021
1994	611	1,044	1,954	3,721	2,565	4,765	12,292	14,691
1995	108	223	1,186	3,382	1,294	3,606	10,623	12,455
1996	317	575	3,783	9,037	4,100	9,612	9,417	12,080
1997	746	1,222	4,968	9,172	5,714	10,395	10,063	17,709
1998	367	550	7,365	13,785	7,732	14,335	11,225	15,536
1999	284	424	2,856	5,852	3,140	6,277	18,588	21,867
2000	904	1,371	8,255	13,961	9,159	15,332	20,218	22,595
2001	4,807	6,289	45,273	63,520	50,080	69,809	48,844	52,960
2002	1,957	3,035	30,248	52,950	32,205	55,985	86,825	89,524
2003	1,581	2,236	32,364	51,508	33,945	53,744	81,543	83,058
2004	1,641	2,356	21,400	33,797	23,041	36,154	62,311	65,623
2005	2,080	2,827	10,140	15,273	12,220	18,100	54,033	60,272
2006	933	1,463	9,495	16,846	10,428	18,309	61,821	77,573
2007	398	464	7,100	10,501	7,498	10,965	28,222	37,035
2008	675	833	17,587	24,041	18,262	24,874	38,171	55,532
2009	1,089	1,098	14,957	20,453	16,046	21,551	44,295	53,881
2010	2,476	3,110	26,642	34,889	29,118	37,999	47,220	72,346
2011	2,167	2,656	24,562	30,715	26,729	33,371	44,432	80,574
2012	4,238	5,669	25,679	35,626	29,917	41,295	52,184	58,300
2013	2,517	3,473	14,586	22,464	17,103	25,938	68,380	67,603
2014	4,415	6,286	32,118	45,926	36,533	52,212	77,982	78,254
2015	6,090	7,230	22,605	30,150	28,695	37,380	88,691	126,777
2016	4,100	1,660	16,188	23,606	20,288	25,266	79,253	91,048
2017	1,819	2,514	4,425	6,261	6,244	8,775	56,265	68,204
Goal							12,143	

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[1] For the purposes of *US v. Oregon* management and tribal treaty/nontreaty allocation, the Columbia Upriver spring stock includes all fish destined to pass Bonneville Dam during the spring management period, including those destined for major tributaries such as the Deschutes and John Day rivers. These estimates of river mouth return and escapement are for only the adult upper Columbia wild spring Chinook salmon and the adult Snake River wild spring/summer Chinook salmon components. Escapements are past Rock Island Dam and past Lower Granite Dam (plus Tucannon River escapement), respectively. These are reported annually by the *US v. Oregon* Technical Advisory Committee (Joint Columbia River Management Staff 2013, Tables 8 and 9).

[2] Based on a stock–recruitment analysis of model data which included both hatchery and wild fish, an interim goal of 12,143 adult Mid-Columbia summers at Rock Island Dam was developed. For consistency with the goal, the escapement time series reported here was changed to the total adult Rock Island Dam count. The terminal run is that reported for Upriver summer Chinook salmon in the Joint Staffs Reports as the Bonneville Dam Count plus catch in lower river fisheries. These were also changed to include both hatchery and wild returns, where previously only naturally spawning returns were reported.

Table B10.–Columbia River fall Chinook escapements and terminal runs (t. run) of Pacific Salmon Commission Chinook Technical Committee Chinook salmon escapement indicator stocks.

	Coweeman				Columbia Upriver Fall Chinook				
	Total	CV	Lewis River[1]		Deschutes River[2]			Upriver Brights[3]	
Year	Esc	(Total)	Esc	t.run	MR Esc	Esc	t.run	Esc	t.run
1975	296		13,859	13,859				29,600	164,105
1976	528		3,371	3,371				27,700	109,338
1977	337		6,930	6,930		7,903	9,764	36,060	85,336
1978	243		5,363	5,363		5,393	7,364	25,798	77,936
1979	344		8,023	8,023		5,126	6,718	28,926	82,482
1980	180		16,394	16,856		4,106	6,057	27,708	70,743
1981	116		19,297	20,298		6,070	7,907	19,520	58,693
1982	146		8,370	10,126		5,513	7,529	28,313	71,471
1983	122		13,540	14,489		5,491	6,987	45,567	79,113
1984	683		7,132	8,128		2,779	3,749	52,266	127,651
1985	491		7,491	8,241		7,902	8,709	74,206	187,691
1986	396		11,983	13,504		7,467	8,620	93,051	272,949
1987	386		12,935	14,173		9,187	11,244	126,153	409,412
1988	1,890		12,059	13,636		9,548	11,939	98,220	327,976
1989	2,549		21,199	22,813		6,339	8,069	83,281	253,233
1990	812		17,506	18,784		2,864	3,834	49,020	149,759
1991	340		9,066	10,354		5,374	5,528	40,132	97,758
1992	1,247		6,307	7,129		3,668	3,705	41,434	77,311
1993	890		7,025	8,106		8,809	8,820	42,515	94,088
1994	1,695		9,939	10,541		9,556	9,625	66,645	123,214
1995	1,368		9,718	12,155		9,304	9,340	50,595	97,119
1996	2,305		13,971	13,971		10,233	10,311	53,049	132,882
1997	689		8,670	8,670		20,208	20,341	50,215	141,386
1998	491		5,929	5,929		15,908	16,415	42,113	125,886
1999	299		3,184	3,184		7,389	7,762	43,313	158,044
2000	290		9,820	9,820		4,985	5,392	60,988	150,352
2001	802		13,886	14,186	9,527	12,817	9,861	84,652	222,630
2002	877	0.05	16,380	18,230	11,133	11,907	12,125	116,858	265,144
2003	1,106	0.03	18,505	20,505	14,265	13,413	15,343	161,005	357,848
2004	1,503	0.12	15,342	17,133	10,197	10,197	11,421	148,212	356,437
2005	853	0.2	11,348	13,348	9,355	14,937	10,190	111,148	258,554
2006	566	0.1	10,522	11,999	14,196	14,223	14,981	76,252	215,407
2007	251	0.19	3,468	3,606	13,181	12,721	13,968	44,962	98,657
2008	424	0.11	5,200	5,200		6,908	7,614	72,713	189,681
2009	783	0.07	5,410	5,760		6,429	7,116	84,327	204,932
2010	639	0.12	8,701	8,701		9,275	10,066	165,726	314,842
2011	566	0.08	8,009	11,025		17,117	18,168	129,496	305,940
2012	463		8,143	8,450		17,624	18,785	130,414	276,483
2013	2,035		15,197	20,267		18,068	20,305	370,267	764,029
2014	890		20,808	22,915		17,993	19,432	299,391	664,807
2015	1,449		23,631	25,327		17,074	18,194	385,774	777,721

–continued–

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Year	Coweeman		Lewis River[1]		Columbia Upriver Fall Chinook				
					Deschutes River[2]			Upriver Brights[3]	
	Total Esc	CV (Total)	Esc	t.run	MR Esc	Esc	t.run	Esc	t.run
2016	407		8,957	10,463		11,628	12,390	189,358	394,182
2017	921		6,058	6,740		4,942	5,931	120,582	291,193
Goal			5,700			4,532		40,000	

[1] This is the number of naturally spawning adult fish in the Lewis River. The terminal run given is the escapement plus the Lewis River sport catch of wild adults.

[2] The first column gives the estimate based on a MR project for the entire river, which was used to verify the Sherars Falls estimates. The second column is the estimate based on using the ratio of redds above and below Sherars Falls. The time series of data through 2009 were updated based on a comprehensive analysis by Warm Springs, ODFW and Columbia River Intertribal Fish Commission (CRITFC) staff (Sharma, R, J. Seals, J. Graham, E. Clemons, H. Yuen, M. McClure, K. Kostow, and S. Ellis. Unpublished. Deschutes River Chinook spawner escapement goal using US v. Oregon Technical Advisory Committee data).

[3] The Columbia River Fisheries Management Plan (1988) stated an interim escapement goal of 40,000 natural spawning Upriver Brights at McNary Dam, including 38,700 for Hanford Reach and 1,100 Snake River. In 1990, the escapement goal was increased to 45,000 for increased hatchery programs. In 1994, a management goal of 46,000 was established, and in 1995, the management goal was retained while the escapement goal was reduced to 43,500. In 2002, the Columbia River Fisheries Management Plan (1988) escapement goal of 40,000 was agreed to by the Chinook Technical Committee. Escapement numbers given are McNary adult dam count minus adult sport and broodstock above the dam. The terminal run is the Columbia River mouth terminal run of Upriver Brights minus the Deschutes River fall Chinook salmon terminal run.

Table B11.–Oregon Coastal escapements as estimated via traditional habitat expansion methods and terminal runs (t. run) of Pacific Salmon Commission Chinook Technical Committee wild Chinook salmon escapement indicator stocks.

	Oregon Coastal							
	Nehalem R.		Siletz R.		Siuslaw R.		Coquille R.	
Year	Esc	t. run	Esc	t. run	Esc	t. run	Esc	t. run
1975	5,197	5,303	2,062	2,689	4,427	4,548	4,408	NA
1976	9,807	9,908	1,326	2,036	7,999	8,153	1,980	NA
1977	11,478	12,093	3,314	3,919	9,492	10,362	3,922	NA
1978	12,059	12,244	2,062	3,700	5,872	6,879	3,543	4,882
1979	12,205	12,469	7,217	8,907	8,040	8,799	3,613	4,298
1980	5,555	5,832	3,680	4,820	10,630	11,183	3,599	4,207
1981	10,752	10,939	4,435	6,751	8,724	9,342	3,864	4,547
1982	5,085	5,282	3,415	4,514	10,870	11,774	5,581	6,197
1983	4,431	4,525	2,136	3,152	4,186	4,885	2,871	3,485
1984	20,341	21,623	3,461	4,552	11,168	12,437	4,031	4,693
1985	18,670	19,473	6,628	7,685	14,822	15,805	2,838	3,534
1986	10,389	11,920	6,748	7,799	14,844	15,965	4,194	4,849
1987	13,560	15,725	4,577	6,023	17,603	19,411	5,281	6,638
1988	14,889	17,185	7,805	9,257	41,746	44,380	6,965	8,149
1989	10,389	12,000	4,401	5,980	28,279	31,690	6,046	7,404
1990	5,104	6,789	4,313	5,373	26,799	29,593	5,676	7,179
1991	5,557	7,685	5,633	6,926	26,100	29,825	8,473	10,869
1992	9,060	11,863	6,044	7,460	26,090	28,350	12,396	15,014
1993	5,345	9,317	4,342	6,506	10,446	14,012	6,540	9,966
1994	6,486	9,412	10,475	12,188	23,570	25,890	6,265	8,263
1995	5,194	8,845	5,164	8,045	26,715	31,194	8,006	10,169
1996	9,211	13,285	7,394	10,274	33,051	39,705	5,944	7,822
1997	10,026	13,069	3,726	6,165	22,305	27,516	6,306	7,638
1998	8,245	10,869	5,516	7,175	24,708	28,882	9,269	11,582
1999	8,063	10,632	4,166	6,232	23,963	27,271	7,952	9,802
2000	6,855	9,119	6,787	9,462	15,730	19,588	6,252	8,205
2001	11,662	15,998	10,563	14,704	38,717	43,836	7,692	10,518
2002	18,089	22,657	14,054	19,019	41,058	47,905	11,052	13,798
2003	10,906	15,095	11,149	15,693	58,998	66,246	13,361	17,216
2004	9,975	14,792	3,902	10,419	40,033	46,062	10,586	13,235
2005	8,114	9,535	6,631	8,931	17,618	19,301	2,002	3,739
2006	4,711	5,902	4,108	6,194	28,082	29,926	2,801	5,085
2007	4,304	5,759	528	1,536	6,764	9,665	2,098	3,548
2008	3,810	4,865	1,202	1,682	11,119	12,405	5,081	6,128
2009	5,390	5,390	2,905	3,343	14,094	15,881	12,308	13,407
2010	5,384	7,254	4,225	5,118	22,197	25,846	32,318	35,810
2011	7,665	9,780	3,638	5,861	30,713	36,546	16,745	21,151
2012	7,515	10,068	4,812	6,657	20,018	24,112	9,300	12,541
2013	18,194	22,073	7,364	10,836	23,411	32,213	5,836	9,431
2014	11,452	16,210	8,655	13,136	28,200	34,750	10,418	14,684
2015	12,678	18,660	6,367	14,335	35,087	45,169	12,409	19,046
2016	10,074	12,109	8,479	12,917	30,135	35,645	5,048	7,443
2017	6,473	NA	7,364	NA	10,957	NA	4,693	NA
Goal	6,989		2,944		12,925			

Table B12.–Oregon Coastal escapements and terminal runs (t. run) as estimated by MR calibrated indexes of Pacific Salmon Commission Chinook Technical Committee wild Chinook salmon escapement indicator stocks. Estimates presented in boldface represent estimates generated from direct MR studies.

Year	Oregon Coastal								
	Nehalem R.		Siletz R.		Siuslaw R.		Umpqua R. S. Fork	Coquille R.	
	Esc	t. run	Esc	t. run	Esc	t. run	Esc	Esc	t. run
1975	5,196	5,060	4,508	NA	2,360	NA	212	6,726	NA
1976	9,742	9,446	4,435	NA	4,348	NA	136	3,506	NA
1977	11,402	11,552	9,262	NA	4,453	NA	230	5,804	NA
1978	11,979	12,836	6,303	7,944	2,806	3,813	439	6,307	7,646
1979	12,123	12,728	17,712	19,402	3,448	4,207	394	3,615	4,300
1980	6,495	7,265	10,344	11,487	5,193	5,746	537	4,326	4,934
1981	10,680	11,173	13,029	15,349	3,756	4,374	976	4,477	5,160
1982	5,051	5,598	9,695	10,794	5,090	5,994	1,109	7,294	7,910
1983	4,402	4,826	6,483	7,499	1,293	1,992	1,678	1,099	1,713
1984	20,206	21,438	9,598	10,708	3,817	5,086	2,794	5,452	6,114
1985	18,546	19,316	16,482	17,539	6,773	7,756	2,385	4,222	4,918
1986	13,471	14,932	14,671	15,722	6,609	7,730	1,616	5,361	6,016
1987	13,025	15,078	8,975	10,421	6,424	8,232	3,032	7,071	8,428
1988	14,071	16,250	19,267	20,719	16,818	19,452	4,194	7,772	8,956
1989	11,896	13,421	10,527	12,106	15,575	18,986	7,308	7,795	9,153
1990	5,998	7,567	11,596	12,656	16,532	19,326	4,211	9,708	11,211
1991	5,834	7,815	12,837	14,130	18,580	22,305	8,052	9,503	11,899
1992	9,418	12,059	14,587	16,003	15,956	18,216	8,938	18,267	20,885
1993	5,463	9,154	7,838	10,002	3,232	6,798	3,722	9,093	12,519
1994	7,460	10,202	22,004	23,717	12,114	14,434	8,514	6,220	8,218
1995	5,422	8,374	12,754	15,264	12,281	16,251	12,491	14,845	17,008
1996	9,616	12,574	20,293	22,514	18,349	23,547	10,989	8,492	10,370
1997	12,013	14,586	8,893	10,955	9,515	13,932	8,824	8,219	9,551
1998	9,378	11,424	14,754	16,144	6,481	10,003	1,231	9,854	12,167
1999	9,299	10,917	9,545	11,179	14,097	16,799	1,673	11,161	13,011
2000	**10,678**	**12,347**	**13,419**	**15,830**	5,385	8,936	2,591	7,913	9,866
2001	**12,431**	**15,295**	**30,896**	**34,043**	9,723	13,774	5,130	12,512	15,338
2002	**19,956**	**22,793**	**35,684**	**39,394**	22,506	27,794	11,740	13,675	16,421
2003	**21,283**	**23,940**	**20,749**	**24,268**	28,801	34,509	10,937	18,876	22,731
2004	12,675	16,856	7,838	14,271	29,119	35,506	11,384	11,514	14,163
2005	10,051	12,276	14,355	18,465	13,771	17,772	1,474	4,973	6,710
2006	5,916	7,465	15,891	19,140	13,380	16,643	1,779	7,471	9,755
2007	5,998	7,302	2,700	3,717	3,704	6,661	2,481	3,505	4,955
2008	5,415	6,270	1,218	1,620	4,328	5,408	2,198	5,981	7,028
2009	**5,786**	**5,869**	**2,201**	**2,656**	5,109	6,562	3,100	15,526	16,625
2010	**7,097**	**7,804**	**10,985**	**11,852**	12,155	15,668	6,725	32,071	35,563
2011	**11,084**	**13,179**	**4,985**	**7,846**	12,000	17,833	6,026	14,124	18,530
2012	**12,952**	**15,008**	**8,738**	**10,701**	16,234	20,328	5,929	8,117	11,358
2013	**15,989**	**19,766**	**13,878**	**17,350**	15,502	24,317	9,337	5,358	8,953
2014	13,145	17,231	16,895	21,069	16,395	22,395	8,356	12,586	16,852
2015	14,710	20,339	11,232	19,184	19,756	29,835	24,690	14,669	21,306
2016	12,456	14,413	17,327	21,765	8,586	14,096	NA	9,720	12,115
2017	8,325	NA	14,063	NA	7,433	NA	5,514	6,470	NA
Goal	pending		pending		pending		pending	pending	

Note: NA = Not available.

[1] Preliminary analysis has shown that terminal catch of South Fork Umpqua River fall Chinook salmon is negligible.