PACIFIC SALMON COMMISSION
JOINT CHINOOK TECHNICAL COMMITTEE REPORT

ANNUAL REPORT OF CATCH AND ESCAPEMENT FOR 2018 REPORT TCCHINOOK (19)-01

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NOTE: Dr. Robert Kope, Dr John H. Clark, and Mr. Robert Clark helped with the production of this report.

## 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 2018: Chinook salmon catches, escapements, and stock status.

Section 1 summarizes, for 2018, 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 2018, 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, 1999-2018.

The preliminary estimate of Treaty LC of Chinook salmon for all PST fisheries in 2018 is 1,038,937, of which 572,965 were taken in US fisheries and 465,972 were taken in Canadian fisheries. Total estimated IM associated with this harvest is 198,472 nominal Chinook salmon. The TM for all PST fisheries in nominal fish was 1,237,408 Chinook salmon, of which 673,425 were taken in US fisheries and 563,983 occurred in Canadian fisheries. The TM for all PST fisheries in 2018 was approximately 373,172 fish less than that estimated for 2017. For US fisheries, $78 \%$ of the LC and 71\% of IM occurred in ISBM fisheries; in Canada, $58 \%$ of the LC and $69 \%$ of IM occurred in ISBM fisheries. For some sport fisheries, 2018 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 $S_{\text {MSY }}$ (escapement producing maximum sustained yield). Annual escapements that are more than $15 \%$ below the lower end of the range or the SMSY point estimate are noted. The CTC will continue to review escapement goals for stocks as they are provided by respective agencies.

From 1999 to 2018, the percentage of stocks that met or exceeded escapement goals or goal ranges has varied from $41 \%$ to $96 \%$ (see figure below). In 2018, 9 of 22 stocks ( $41 \%$ ) met or exceeded escapement objectives; the lowest number during the period of record. Of the 13 stocks below goal, 5 stocks (Chickamin, Hoh spring/summer, Lewis, Deschutes, and Nehalem,) were within $15 \%$ of the target goal. Eight stocks were more than $15 \%$ below goal: Situk, Chilkat, Taku, Stikine, Harrison, Queets spring/summer, Queets fall, and Siuslaw.


Number and status of stocks with PSC-agreed escapement goals, 1999-2018.
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.

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 2017 data shows that the majority of stocks were in the safe zone (exploitation below $U_{\text {MSY }}$ and escapement above $\mathrm{S}_{\text {MSY }}$ ). One stock, Siuslaw, was in the high-risk zone. One stock, Nehalem, was in the buffer zone. No stocks experienced exploitation above $U_{\text {MSY }}$ and still the escapement exceeded $\mathrm{S}_{\text {MSY }}$. Nine stocks were in the low escapement and low exploitation zone: Alsek, Stikine, Taku, Unuk, Chickamin, Chilkat, Kitsumkalum, Nicola, and Harrison. In general, Columbia River stocks showed a higher escapement to $\mathrm{S}_{\text {MSy }}$ index than the other regions.


Synoptic summary by region of stock status for stocks with escapement and exploitation rate data in 2017 (escapement and exploitation rate data for each stock was standardized to the stock-specific escapement goal and $U_{M S Y}$ 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. The Agreement also requires that ISBM fisheries be managed on a national basis to meet stock-specific agreed-to maximum sustainable yield (MSY) or other biologically based escapement objectives (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 2018, 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 <br> 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 | 135.2 |
| 2013 | 284.9 | 191.4 | 65.6 | 220.3 | 115.9 | 178.8 | 116.9 |
| 2014 | 378.6 | 435.2 | 56.6 | 262.6 | 216.9 | 191.7 | 192.7 |
| 2015 | 337.5 | 335.0 | 68.1 | 246.6 | 158.9 | 179.7 | 119.0 |
| 2016 | 288.2 | 350.9 | 35.4 | 183.9 | 190.2 | 104.8 | 103.1 |
| 2017 | 215.8 | 178.3 | 32.7 | 148.2 | 143.3 | 95.8 | 117.4 |
| 2018 | 118.7 | 127.8 | 37.0 | 115.7 | 109.0 | 88.3 | 85.3 |
| $2019{ }^{4}$ | $140.3^{5}$ |  |  | 124.8 |  | 79.9 |  |

Note: T = Troll, $\mathrm{N}=$ Net and $\mathrm{S}=$ Sport fisheries.
1 Allowable treaty catches corresponds to the first postseason abundance index for years 1999 to 2018 and the preseason abundance index for 2019.
2 Treaty catch does not include hatchery add-on or exclusions (see Table A1).
32009 was the first year the 2009 Agreement was implemented.
42019 is the first year the 2019 Agreement is being implemented.
${ }^{5}$ The SEAK preseason allowable catch is based on the CPUE method. The CLB1905 2019 preseason abundance index for SEAK would be a non-tiered allowable catch of 133,600 if the Pacific Salmon Commission Chinook Model was being used.

### 1.1.1 Southeast Alaska Fisheries

The SEAK Chinook salmon fishery has been 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 2018 was 164,742, with a PST catch of 127,776, an Alaska hatchery add-on of 36,966 , and no terminal exclusion catch of Chinook salmon. SEAK Chinook salmon catch from 1975 to 2018 are reported in Table A1.

### 1.1.1.1 Troll Fisheries Catch

The accounting of treaty Chinook salmon harvested by the troll fleet 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 $43,000-47,000$ non-Alaska hatchery-produced fish, plus the number of Alaska hatchery-produced Chinook salmon harvested during the winter fishery. The 2017-2018 winter troll fishery was open from October 11, 2017 through March 15, 2018. To help reduce encounters of wild SEAK and TBR Chinook during the winter season, the fishery was closed from March 16 through April 30, prior to reaching the GHL. A total of 11,967 Chinook salmon were harvested. Of these, 744 (6\%) were of Alaska hatchery origin, of which 472 counted toward the Alaska hatchery add-on, resulting in a PST harvest of 11,495 (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 2018, spring troll fisheries were conducted between May 1 and June 30. To help reduce encounters of wild SEAK and TBR Chinook salmon during May and June, spring troll fisheries
located in known wild Chinook migration corridors were not opened. A total of eight spring areas and seven terminal area fisheries were opened in 2018. The combined harvest for spring and terminal troll fisheries was 8,395 Chinook salmon, of which 4,131 (49\%) were of Alaska hatchery origin and 2,878 counted toward the Alaska hatchery add-on, resulting in a PST harvest of 5,517.

The 2018 summer troll fishery included two Chinook salmon retention periods, from July 1-14 and August 15-19. A total of 87,203 Chinook salmon were harvested, of which 4,326 (5\%) were of Alaskan hatchery origin and 2,746 counted toward the Alaska hatchery add-on. The resulting PST harvest was 84,457 fish.

The total harvest for all troll fisheries in the 2018 accounting year was 107,565 Chinook salmon, of which 101,469 counted as PST harvest.

Table 1.2-Harvest of Chinook salmon in Southeast Alaska by gear type in 2018.

| Gear | Total Catch | Alaska Hatchery Catch ${ }^{1}$ | Alaska Hatchery Add-on ${ }^{1}$ | Terminal Exclusion Catch ${ }^{2}$ | AABM Catch ${ }^{3}$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Troll |  |  |  |  |  |
| Winter | 11,967 | 744 | 472 | 0 | 11,495 |
| Spring | 8,395 | 4,131 | 2,878 | 0 | 5,517 |
| Summer | 87,203 | 4,326 | 2,746 | 0 | 84,457 |
| Troll subtotal | 107,565 | 9,201 | 6,096 | 0 | 101,469 |
| Sport ${ }^{4}$ | 26,400 | 6,859 | 5,157 | 0 | 21,243 |
| Net |  |  |  |  |  |
| Set Net | 86 | 0 | 0 | 0 | 86 |
| Drift gillnet | 14,128 | 11,198 | 10,060 | 0 | 4,067 |
| Seine | 16,563 | 15,653 | 15,653 | 0 | 910 |
| Net subtotal | 30,777 | 26,851 | 25,714 | 0 | 5,063 |
| Total | 164,742 | 42,911 | 36,966 | 0 | 127,776 |

1 The add-on is the total estimated Alaska hatchery catch, minus 5,500 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 1.282).
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. A total of 14,128 Chinook salmon were harvested in the drift gillnet fisheries in 2018, of which 11,198 (79\%) were of Alaska hatchery origin and 10,060 counted toward the Alaska hatchery add-on, resulting in a PST harvest of 4,067 fish(Table 1.2). A total of 16,563 Chinook salmon were harvested in the purse seine fisheries, of which 15,653 ( $93 \%$ ) were of Alaska hatchery origin and 15,653 counted toward the Alaska hatchery add-on, resulting in a PST harvest of 910 fish. A total of 86 Chinook salmon were harvested in the set gillnet fisheries, none of which were of Alaska hatchery origin, resulting in a PST harvest of 86 fish (Table 1.2).

With the exception of directed gillnet harvests of Chinook salmon in SEAK terminal area regulatory Districts 108 and 111, as provided in the Transboundary River agreement (Chapter 1), harvests of Chinook salmon in the net fisheries are primarily incidental to the harvest of other species and only constituted a small fraction ( $<1.0 \%$ ) of the total net harvest of all species.

### 1.1.1.3 Sport Fishery Catch

In 2018, the management plan required a daily bag limit of one Chinook salmon 71 cm ( 28 inches) or greater in length (tip of snout to fork-of-tail) for resident and nonresident anglers. The nonresident annual limit was 3 Chinook salmon between January 1 and June 30 and one Chinook salmon thereafter (July 1 - December 31); any Chinook salmon harvested by a nonresident angler during the earlier period (January 1 - June 30) applied towards the one-fish annual limit of the later period.
Below-escapement goal preseason forecasts along with low returns in 2017 indicated that 2018 would likely be another poor return year. In March 2018 more restrictive sport regulations were enacted in Yakutat, and the inside waters of Haines/Skagway, Juneau, Petersburg/Wrangell, and Ketchikan management areas to protect SEAK wild Chinook stocks, including 2 Chinook stocks identified as stocks of concern (Lum and Fair 2018a, 2018b). These more restrictive measures-effectively fishery closures-remained in place through mid-June for northern SEAK, mid-July for central SEAK, and mid-August for southern SEAK.

The preliminary 2018 total sport Chinook salmon catch was 26,400 with an estimate of 6,859 Alaska hatchery fish. There was an Alaska hatchery add-on of 5,157 fish, resulting in a catch of 21,243 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 2018 was 108,976. 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 2018 was 85,330 (Table 1.3).

### 1.1.2.1 Northern British Columbia AABM

The total NBC AABM catch (troll plus sport) between October 1, 2017 and September 30, 2018 was 108,976 Chinook salmon (Table 1.3).

Table 1.3-Harvest of Chinook salmon by gear for Northern British Columbia AABM fisheries in 2018.

| NBC Fishery | Landed Catch | Legal Releases | Sublegal Releases |
| :--- | ---: | ---: | ---: |
| Troll |  |  |  |
| Summer | 0,276 | 15,946 | 5,732 |
| CNR Troll | 72,276 | 0 | 0 |
| Troll subtotal | 36,700 | 40,946 | 5,732 |
| Sport | $\mathbf{1 0 8 , 9 7 6}$ | $\mathbf{5 6 , 0 2 5}$ | 0 |
| TOTAL | $\mathbf{5 , 7 3 2}$ |  |  |

### 1.1.2.1.1 Northern British Columbia Troll Fishery Catch

The NBC troll fishery landed 72,276 Chinook salmon during openings for Chinook salmon fishing from July 10 to August 6 and from August 20 to September 30, 2018. The entire 2018 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 221 licenses were issued, but the total catch was landed by 140 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 2018. 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 July 10 to September 14, 2018. 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 July 10 to September 10, 2018.

### 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 2018 Haida Gwaii sport catch was 36,700 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 2018 was 85,330 Chinook salmon (Table 1.4).

Table 1.4-Harvest of Chinook salmon by gear for West Coast Vancouver Island AABM fisheries in 2018.

| WCVI Fishery | Landed Catch | Legal Releases | Sublegal Releases |
| :--- | ---: | ---: | ---: |
| Troll |  |  |  |
| Winter | 512 | 6 | 322 |
| Spring | 11,009 | 6 | 784 |
| Summer | 7,635 | 26 | 707 |
| Food, social, and ceremonial | 5,000 | $\mathrm{~N} / \mathrm{A}$ | $\mathrm{N} / \mathrm{A}$ |
| Maa-nulth | 1,752 | $\mathrm{~N} / \mathrm{A}$ | $\mathrm{N} / \mathrm{A}$ |
| T'aaq-wiihak | 9,684 | 540 | 0 |
| Brooks Test Fishery | 473 | 4 | 0 |
| Troll subtotal | 36,065 | 582 | 1,813 |
| Sport | 49,265 | 14,822 | 45,391 |
| TOTAL | $\mathbf{8 5 , 3 3 0}$ | $\mathbf{1 5 , 4 0 4}$ | $\mathbf{4 7 , 2 0 4}$ |

### 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, 2017 to May 31, 2018 and June 1, 2018 to May 31, 2019.

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 2018 season to address low returns of Fraser River Spring 1.2, Spring 1.3 and Summer 1.3 Chinook. For Area G troll, this included 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): During the period from October 1 to March 15, a harvest level of approximately 20\% of the Area G annual TAC was recommended, based on the PST Chinook model calibration and assigned harvest levels for the outer WCVI area.

March 16 to April 18: A full time-area closure was maintained from March 16 to April 18 annually to avoid interception of Fraser River Spring 1.2 and Fraser Spring \& Summer 1.3 Chinook.

April 19 to June 15 (Spring): During the period from April 19 to June 15, a harvest of approximately $40 \%$ of the Area $G$ annual TAC is permitted, based on the PST Chinook model calibration and assigned harvest levels for the outer WCVI area. In addition, total effort (boat-days) was limited and areas of southwest Vancouver Island were closed
until May 7 (partial openings from May 2 to 7), in order to avoid interception of Fraser River Spring 1.2, Spring 1.3, and Summer 1.3 Chinook.

June 16 to July 23 (Summer): A full time-area closure was maintained from June 15 to July 23 in Management Areas 125 to 127, and from June 16 to July 31 in Management Areas 123 to 124, to avoid interception of Fraser River Spring 1.2, Spring 1.3, and Summer 1.3 Chinook.

July 24 through early August (Summer): During this period, a harvest of approximately 20\% of the Area G annual TAC is permitted, based on the PST Chinook model calibration and assigned harvest levels for the outer WCVI area. In addition, the fishery is managed to minimize mortality on wild coho through: a) a maximum interception of Coho; and b) the mandatory use of large (minimum 6") plugs. As well, the fishery is managed to minimize mortality of WCVI origin Chinook through the use of time-area closures of near shore areas where WCVI Chinook stocks are prevalent.

September (Summer): During the September period, a harvest of approximately 20\% of the Area $G$ annual TAC is permitted based on the PST Chinook model calibration and assigned harvest levels for the WCVI AABM area. 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. During harvest opportunities between September 15 and December 31 retention of marked Coho by-catch may be permitted.

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 4--31 and June 12-August 28, 2018, the T'aaq-wiihak demonstration fishery occurred in portions of PFMAs 24 and 26, 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 2018 commercial Area G troll fisheries was 19,156 Chinook salmon (Table 1.4). The WCVI First Nations caught an estimated 5,000 Chinook salmon in food, social, and ceremonial fisheries, 1,752 Maa-nulth and 9,684 in the T'aaq-wiihak demonstration fisheries. The Brooks Test Fishery project harvested 473 Chinook salmon for samples. Therefore, the total WCVI AABM troll catch for 2018 was 36,065 with 582 legal and 1,813 sublegal Chinook salmon releases.

### 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 are 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 2018 WCVI AABM sport LC estimate during the creel period was 48,436 with an additional 829 Chinook reportedly caught in the non creel periods through an electronic reporting system (iREC) (Table 1.4).

### 1.2 Estimates of Incidental Mortalities in AABM Fisheries

### 1.2.1 Southeast Alaska Fisheries

Estimates of encounters and IM in SEAK fisheries are presented for 2018 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 2018 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 2018 was 157,063 nominal Treaty fish, including $127,776 \mathrm{LC}$, and 29,287 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, 2018.

| SEAK Fishery | LC | Legal <br> Encounters | Sublegal <br> Encounters | Total <br> LIM $^{\mathbf{1}}$ | Total SIM ${ }^{\mathbf{1}}$ | Total IM | Total <br> Mortality |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Treaty |  |  |  |  |  |  |  |
| Troll CR | 101,469 | 101,469 | 28,710 | 812 | 7,551 | 8,362 | 109,832 |
| Troll CNR | 0 | 35,600 | 23,577 | 7,796 | 6,201 | 13,997 | 13,997 |
| Troll Total | 101,469 | 137,069 | 52,287 | 8,608 | 13,751 | 22,360 | 123,829 |
| Sport Total ${ }^{2}$ | 21,243 | 33,711 | 24,277 | 2,747 | 3,860 | 6,607 | 27,850 |
| Gillnet | 4,153 | 4,153 | 0 | 83 | 0 | 83 | 4,237 |
| Seine CR | 910 | 910 | 25 | 0 | 22 | 22 | 932 |
| Seine CNR | 0 | 88 | 233 | 45 | 171 | 216 | 216 |
| Net Total | 5,063 | 5,151 | 258 | 128 | 193 | 321 | 5,384 |
| Treaty Total | $\mathbf{1 2 7 , 7 7 6}$ | $\mathbf{1 7 5 , 9 3 1}$ | $\mathbf{7 6 , 8 2 2}$ | $\mathbf{1 1 , 4 8 3}$ | $\mathbf{1 7 , 8 0 4}$ | $\mathbf{2 9 , 2 8 7}$ | $\mathbf{1 5 7 , 0 6 3}$ |
| Total SEAK |  |  |  |  |  |  |  |
| Troll CR | 107,565 | 107,565 | 30,435 | 861 | 8,004 | 8,865 | 116,430 |
| Troll CNR | 0 | 36,757 | 24,343 | 8,050 | 6,402 | 14,452 | 14,452 |
| Troll Total | 107,565 | 144,322 | 54,778 | 8,910 | 14,407 | 23,317 | 130,882 |
| Sport Total ${ }^{2}$ | 26,400 | 41,894 | 30,170 | 3,414 | 4,797 | 8,211 | 34,611 |
| Gillnet | 14,214 | 14,214 | 0 | 284 |  | 0 | 284 |
| Seine CR | 16,563 | 16,563 | 457 | 0 | 392 | 392 | 16,955 |
| Seine CNR | 0 | 1,597 | 4,241 | 814 | 3,117 | 3,932 | 3,932 |
| Net Total | 30,777 | 32,374 | 4,698 | 1,099 | 3,509 | 4,608 | 35,385 |
| SEAK Total | $\mathbf{1 6 4 , 7 4 2}$ | $\mathbf{2 1 8 , 5 9 1}$ | $\mathbf{8 9 , 6 4 6}$ | $\mathbf{1 3 , 4 2 3}$ | $\mathbf{2 2 , 7 1 2}$ | $\mathbf{3 6 , 1 3 6}$ | $\mathbf{2 0 0 , 8 7 8}$ |

${ }^{1}$ 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 2018 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 2018 was 123,389 nominal fish, which included 108,976 LC, and 14,413 IM.

### 1.2.2.2 West Coast Vancouver Island Fisheries

The estimated TM of Chinook salmon for the 2018 WCVI AABM fishery was 101,759 nominal fish, which included 85,330 LC and 16,429 IM (Table 1.6). The estimated IM included 6,996 legal and 9,433 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, 2018.

| Fishery | LC | Legal <br> Releases | Sublegal <br> Releases | Total <br> LIM $^{\mathbf{1}}$ | Total <br> SIM $^{\mathbf{1}}$ | Total <br> IM | Total <br> Mortality |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| NBC |  |  |  |  |  |  |  |
| Troll CR | 72,276 | 15,946 | 5,732 | 4,450 | 2,269 | 6,719 | 78,995 |
| Troll CNR | 0 | 0 | 0 | 0 | 0 | - | - |
| Troll Total | 72,276 | 15,946 | 5,732 | 4,450 | 2,269 | 6,719 | 78,995 |
| Sport Total | 36,700 | 40,079 | 0 | 7,694 | 0 | 6,265 | 49,065 |
| NBC Total | 108,976 | 56,025 | 5,732 | 12,144 | 2,269 | 14,413 | 123,389 |
| WCVI |  |  |  |  |  |  |  |
| Troll CR |  |  |  |  |  |  |  |
| Troll CNR | 36,065 | 582 | 1,813 | 751 | 718 | 1,469 | 37,534 |
| Troll Total | 0 | 0 | 0 | 0 | 0 | - | - |
| Sport Total | 49,265 | 14,822 | 45,391 | 6,245 | 8,715 | 14,960 | 64,225 |
| WCVI Total | 85,330 | 15,404 | 47,204 | 6,996 | 9,433 | 16,429 | 101,759 |

${ }^{1}$ LIM $=$ Legal Incident Mortality, SIM = Sublegal Incident Mortality.
${ }^{2}$ Includes commercial , First Nations troll food, social, and ceremonial and Maa-nulth and T'aaq-wiihak catch and Brooks test fishery.

### 1.3 Review of Individual Stock Based Management Fisheries

ISBM fisheries include all British Columbia Chinook salmon fisheries that are not included in the NBC and WCVI AABM fisheries, and all marine and freshwater Chinook salmon fisheries in Washington and Oregon. ISBM fisheries are managed with the intent of meeting management objectives for individual stocks listed in 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 2018, a total of 271,140 nominal fish were caught in Canadian ISBM fisheries in British Columbia and Canadian sections of the Transboundary Rivers. Total estimated IM in 2018 was 67,145 Chinook salmon. The distribution of LC and estimated IM are presented in Table 1.7. Historical catches in these fisheries are provided in Appendix Table A4, Table A7, Table A8, and Table A11 through Table A15.

Table 1.7-Landed catch and incidental mortalities in Canadian ISBM fisheries for 2018.

| Region/Gear | Landed Catch | Releases | IM | Total Mortality |
| :---: | :---: | :---: | :---: | :---: |
| Transboundary Rivers | 193 | 0 | 9 | 202 |
| Net | 21 | 0 | 1 | 22 |
| Freshwater Sport | 0 | 0 | 0 | 0 |
| First Nations-FSC ${ }^{2}$ | 172 | 0 | 8 | 180 |
| Northern British Columbia | 18,258 | 7,378 | 2,870 | 21,128 |
| Net | 0 | 1,378 | 1,119 | 1,119 |
| Tidal Sport | 5,821 | 5,980 | 1,160 | 6,981 |
| Freshwater Sport | 0 | 0 | 0 | 0 |
| First Nations-FSC | 11,766 | 0 | 541 | 12,307 |
| Tyee Test Fishery | 671 | 20 | 50 | 721 |
| Central British Columbia | 14,979 | 2,085 | 2,087 | 17,066 |
| Net | 5,162 | 1,989 | 1,684 | 6,846 |
| Tidal Sport | 7,704 | 96 | 293 | 7,997 |
| Freshwater Sport | 546 | 0 | 38 | 584 |
| First Nations-FSC | 1,567 | 0 | 72 | 1,639 |
| Troll | 0 | 0 | 0 | 0 |
| West Coast Vancouver Island | 79,880 | 20,508 | 12,937 | 92,817 |
| Net | 21,663 | 257 | 5,507 | 27,170 |
| Tidal Sport | 33,631 | 20,131 | 6,186 | 39,817 |
| First Nations-EO and FSC ${ }^{3}$ | 24,586 | 120 | 1,244 | 25,830 |
| Johnstone Strait | 14,580 | 17,112 | 5,413 | 19,993 |
| Net | 28 | 1,678 | 1,458 | 1,486 |
| Tidal Sport | 14,045 | 15,434 | 3,932 | 17,977 |
| First Nations-FSC | 507 | 0 | 23 | 530 |
| Georgia Strait | 76,666 | 94,676 | 23,456 | 100,122 |
| Net | 0 | 0 | 0 | 0 |
| Tidal Sport | 76,159 | 94,676 | 23,433 | 99,592 |
| First Nations-FSC | 507 | 0 | 23 | 530 |
| Troll | 0 | 0 | 0 | 0 |
| Juan de Fuca | 37,653 | 61,062 | 14,981 | 52,634 |
| Net | 29 | 1,214 | 894 | 923 |
| Tidal Sport | 37,624 | 59,848 | 14,087 | 51,711 |
| Fraser River | 28,931 | 4,308 | 5,392 | 34,323 |
| Commercial\& Test Net | 1,953 | 3,542 | 3,441 | 5,394 |
| First Nations-EO\&FSC Net | 17,687 | 463 | 1,252 | 18,939 |
| Mainstem Catch \& Trib Sport | 9,291 | 303 | 699 | 9,990 |
| Grand Total | 271,140 | 207,129 | 67,145 | 338,285 |

${ }^{1}$ FSC = food, social, and ceremonial.
${ }^{2}$ EO $=$ economic opportunity.

### 1.3.2 Southern US Individual Stock Based Management Fisheries

Southern US fisheries north of Cape Falcon, Oregon, are managed in accordance with legal obligations under the PST, several treaties between Native American tribes and the US, and conservation constraints of the ESA. Two court cases in the 1970s, US v. Washington and US v. Oregon, litigated treaty fishing rights and set forth harvest sharing obligations Catches herein are termed treaty Indian if harvested under these Native American Treaty fishing rights cases and non-Indian otherwise. Tribal catches not harvested under these court cases are included in non-treaty catch. 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, 2016-2018.

| Fishery | Gear | $2018{ }^{1}$ |  |  | 2017 |  |  | 2016 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | LC | Release | IM | LC | Release | IM | LC | Release | IM |
| Juan de Fuca | Net | 1,838 | NA | 147 | 50 | NA | 4 | 254 | NA | 20 |
|  | Sport | 10,452 | 46,987 | 14,108 | 9,894 | 44,479 | 13,355 | 9,651 | 26,188 | 8,418 |
|  | Troll | 1,764 | NA | 44 | 1,703 | NA | 43 | 578 | NA | 14 |
| Total |  | 14,054 | 46,987 | 14,299 | 11,647 | 44,479 | 13,402 | 10,483 | 26,188 | 8,453 |
| San Juans | Net | 4,256 | 41 | 373 | 2,630 | 40 | 242 | 22 |  | 2 |
|  | Sport | 8,682 | 9,652 | 3,846 | 11,321 | 12,587 | 5,015 | 6,173 | 9,702 | 3,495 |
| Total |  | 12,938 | 9,693 | 4,219 | 13,951 | 12,627 | 5,257 | 6,195 | 9,702 | 3,497 |
| Puget Sound | Net | 111,606 | NA | 8,928 | 135,553 | NA | 10,844 | 79,525 | NA | 6,362 |
|  | Sport | 28,065 | 90,696 | 28,376 | 41,352 | 133,637 | 41,811 | 22,944 | 52,327 | 17,351 |
| Total |  | 139,671 | 90,696 | 37,304 | 176,905 | 133,637 | 52,655 | 102,469 | 52,327 | 23,713 |
| Wash. Inside Coastal | Net | 4,143 | NA | 83 | 20,491 | NA | 410 | 14,134 | NA | 283 |
|  | Sport | 16,747 | NA | 1,156 | 13,626 | NA | 940 | 14,004 | NA | 966 |
| Total |  | 20,890 | - | 1,238 | 34,117 | - | 1,350 | 28,138 | - | 1,249 |
| Columbia River- Spring | Net | 31,519 | 0 | 946 | 30,406 | 0 | 912 | 35,716 | 1,887 | 1,600 |
|  | Sport | 23,912 | 1,938 | 2,036 | 33,852 | 978 | 2,543 | 56,054 | 5,474 | 4,951 |
| Summer | Net | 10,858 | 0 | 326 | 18,111 | 0 | 543 | 27,764 | 0 | 833 |
|  | Sport | 5,560 | 2,033 | 634 | 9,495 | 5,011 | 1,271 | 11,911 | 10,838 | 2,155 |
| Fall | Net | 69,893 | 0 | 2,097 | 139,608 | 0 | 4,188 | 198,819 | 0 | 5,965 |
|  | Sport | 32,778 | 5,689 | 3,354 | 77,917 | 8,768 | 7,060 | 78,728 | 8,053 | 6,978 |
| Total |  | 174,520 | 9,660 | 9,392 | 309,388 | 14,757 | 16,518 | 408,992 | 26,252 | 22,482 |
| WA/OR <br> North Falcon | Sport | 10,603 | 10,321 | 1,834 | 21,945 | 18,604 | 3,383 | 17,948 | 21,133 | 3,654 |
|  | Troll | 47,792 | NA | 1,195 | 59,974 | NA | 1,499 | 42,234 | NA | 1,056 |
| Total |  | 58,395 | 10,321 | 3,029 | 81,919 | 18,604 | 4,882 | 60,182 | 21,133 | 4,710 |
| Oregon Inside | Sport ${ }^{2}$ | 24,398 | NA | 1,683 | 29,559 | NA | 2,040 | 31,967 | NA | 2,206 |
|  | Troll ${ }^{3}$ | 322 | NA | 8 | 70 | NA | 2 | 182 | NA | 5 |
| Total |  | 24,720 | - | 1,692 | 29,629 | - | 2,041 | 32,149 | - | 2,210 |
| GRAND TOTAL |  | 445,188 | 167,358 | 71,173 | 657,556 | 224,104 | 96,105 | 648,608 | 135,601 | 66,314 |

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 2017 were computed using 2016-2018 mean values.
${ }^{2}$ Values for 2018 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 2018 Chinook salmon catch in Strait of Juan de Fuca (Area 4B, 5,6 , and 6 C) net fisheries was 1,838 fish with the majority of these taken during fisheries targeting Fraser River sockeye salmon. There were 4,256 Chinook salmon harvested in the San Juan Islands net fisheries (Area 6A, 7, and 7A). The preliminary estimate of the 2018 Strait of Juan de Fuca treaty Indian troll fishery catch (through December 2018) is 1,764 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 2018 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 2018 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 2018 is 111,606 (97,915 treaty Indian, 13,691 non-Indian). The harvests in treaty Indian fisheries include a preliminary estimate of 42,104 Chinook salmon in in-river fisheries. Estimates of the sport catch in 2018 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 2018 is an average of the previous three years $(28,065)$. 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 2018 estimate of harvest in Washington coastal net fisheries was 4,143 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 2018 non-Indian commercial net harvest was 45 Chinook salmon in Grays Harbor and 1,534 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 2018 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 $(16,747)$. 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 2018, the estimated catch of Chinook salmon in commercial troll fisheries from Cape Falcon, Oregon, to the US-Canada border was 47,792 for non-Indian and treaty Indian fisheries combined. Estimated catch in the ocean sport
fishery north of Cape Falcon in 2018 was 10,603 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 In 2018, the total annual harvest for all fisheries (spring, summer, and fall, both hatchery and wild) in the Columbia River basin was 174,520 Chinook salmon. This included nonIndian commercial net plus Wanapum and Colville tribal harvest of 33,676 ; sport harvest of 62,251; and treaty Indian commercial, ceremonial, and subsistence harvest of 78,594 (Table A21). The 2018 total annual Columbia River combined net and sport harvest consisted of 55,431 spring Chinook, 16,418 summer Chinook and 102,671 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 2018 was 322 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 2016 for the NOC. The 2017 punch card estimate of estuary and freshwater catch for the NOC group is 29,559 Chinook salmon. However, catch projections have been made for 2018 using correlations between escapement and punch card catch estimates from past years; these preliminary estimates of terminal sport catch for 2018 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). Numbers of fish released were derived from creel interviews, voluntary trip reports, fishery monitoring, or extrapolated from similarly structured fisheries with known release information.

### 1.4 Summary of 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 2018. It should be noted, for some component fisheries, that current 2018 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 2018 is 1,038,937, of which 572,965 were taken in US fisheries and 465,972 were taken in Canadian fisheries (Table 1.9). Total estimated IM associated with this harvest is 198,472 ( $16 \%$ of the TM) in nominal fish. The TM for all PST fisheries in nominal fish was $1,237,408$ Chinook salmon, which is approximately 373,172 less than recorded for 2017 (Table A25). Of the 1,237,408 total PSC TM estimated for 2018, 673,425 occurred in US fisheries and 563,983 occurred in Canadian fisheries. For US fisheries, $78 \%$ of the LC and $71 \%$ of IM occurred in ISBM fisheries; in Canada, $58 \%$ of the LC and $69 \%$ of IM occurred in ISBM fisheries. For some component sport fisheries, 2018 LC and IM estimates are not yet available. Data for calculating summary information contained in Table 1.10 for 2018 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 2018.

| Fishery | $\mathbf{2 0 1 8}$ |  |  |
| :--- | ---: | ---: | ---: |
|  | LC | IM | TM |
| SEAK AABM | 127,776 | 29,287 | 157,063 |
| SEAK hatchery add-on and terminal exclusion | 36,966 | 6,848 | 43,814 |
| US ISBM | 445,188 | 71,173 | 516,362 |
| US TOTAL $^{1}$ | 572,965 | 100,461 | 673,425 |
| NBC AABM | 108,976 | 14,413 | 123,389 |
| WCVI AABM | 85,330 | 16,429 | 101,759 |
| CANADA ISBM | 271,666 | 67,169 | 338,835 |
| CANADA TOTAL $^{\text {PST FISHERIES TOTAL }}{ }^{1}$ | 465,972 | 98,011 | 563,983 |

${ }^{1}$ 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 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 CTC compares annual escapement estimates of indicator stocks to agreed escapement goals. The CTC has accepted escapement goals for 22 stocks included in this report (Table 2.1). Escapement goals reviewed by the CTC are based on analyses that follow the guidelines developed in TCCHINOOK (99)-3 ( https://www.psc.org/publications/technical-reports/technical-committee-reports/chinook/).

The escapement goals and 2017-2018 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 2018, escapements were above the goal for 11 stocks and below the goal for 11 stocks.

Section 2.1 provides a brief assessment of all indicator stock escapement estimates from 1999 to 2018 showing the number of stocks achieving or falling below goals (Figure 2.1). Section 2.2 discusses regional escapement trends. In Section 2.3, each stock is assessed individually, including 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 <br> in Attachment I-V | Escapement Indicator | Region ${ }^{1}$ | Run |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| SEAK | $\begin{gathered} \text { NBC/ } \end{gathered}$ | WCVI | $\begin{gathered} \text { BC } \\ \text { ISBM } \end{gathered}$ | $\begin{aligned} & \text { SUS } \\ & \text { ISBM } \end{aligned}$ |  |  |  |  |
|  |  |  |  |  |  | Situk | Yakutat | Spring |
|  |  |  |  |  |  | Chilkat | N. Inside | Spring |
|  |  |  |  |  |  | Unuk | S. Inside | Spring |
|  |  |  |  |  |  | Chickamin | S. Inside | Spring |
|  |  |  |  |  |  | Alsek | TBR | Spring |
|  |  |  |  |  |  | Taku | TBR | Spring |
|  |  |  |  |  |  | Stikine | TBR | Spring |
| $\checkmark$ | $\checkmark$ |  | $\checkmark$ |  | North/Central British Columbia | Yakoun | NBC-Area 1 | Summer |
| $\checkmark$ | $\checkmark$ |  | $\checkmark$ |  | North/Central British Columbia | Nass | NBC-Area 3 | Spring/Summer |
| $\checkmark$ | $\checkmark$ |  | $\checkmark$ |  | North/Central British Columbia | Skeena | NBC-Area 4 | Spring/Summer |
|  |  |  | $\checkmark$ |  | North/Central British Columbia | Dean | CBC-Area 8 | Spring |
|  |  |  |  |  |  | Rivers Inlet | CBC-Area 9 | Spring/Summer |
| $\checkmark$ | $\checkmark$ |  | $\checkmark$ |  | WCVI Falls | Artlish, Burman, Kaouk, Tahsis, Tashish, Marble | WCVI | Fall |
| $\checkmark$ | $\checkmark$ |  | $\checkmark$ |  | UGS | Klinaklini , Kakwiekan, Wakeman, Kingcome, Nimpkish | UGS | Summer/Fall |
|  |  |  | $\checkmark$ |  | LGS | Cowichan/Nanaimo ${ }^{2}$ | LGS | Fall |
| $\checkmark$ | $\checkmark$ |  | $\checkmark$ |  | Fraser Early ${ }^{3}$ (Spr/Sum) | Fraser Spring 1.3 | FR | Spring |
| $\checkmark$ | $\checkmark$ |  | $\checkmark$ |  | Fraser Early ${ }^{3}$ (Spr/Sum) | Fraser Spring 1.2 | FR | Spring |
| $\checkmark$ | $\checkmark$ |  | $\checkmark$ |  | Fraser Early ${ }^{3}$ (Spr/Sum) | Fraser Summer 1.3 | FR | Summer |
| $\checkmark$ | $\checkmark$ |  | $\checkmark$ |  | Fraser Early ${ }^{3}$ (Spr/Sum) | Fraser Summer 0.3 | FR | Summer |
|  |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | Fraser Late | Harrison | FR | Fall |
|  |  |  | $\checkmark$ | $\checkmark$ | North Puget Sound Natural springs | Nooksack | NC/PS | Spring |
|  |  |  | $\checkmark$ | $\checkmark$ | North Puget Sound Natural Springs | Skagit Spring | NC/PS | Spring |
|  |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | Puget Sound Natural Summer/Falls | Skagit Summer/Fall | NC/PS | Summer/Fall |
|  |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | Puget Sound Natural Summer/Falls | Stillaguamish | NC/PS | Summer/Fall |
|  |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | Puget Sound Natural Summer/Falls | Snohomish | NC/PS | Summer/Fall |
|  |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | Puget Sound Natural Summer/Falls | Lake Washington | NC/PS | Summer/Fall |
|  |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | Puget Sound Natural Summer/Falls | Green | NC/PS | Summer/Fall |
| $\checkmark$ | $\checkmark$ |  |  | $\checkmark$ | Washington Coastal Fall Natural | Hoko | WAC/JDF | Fall |
|  |  |  |  |  |  | Quillayute Summer | WAC/JDF | Summer |
| $\checkmark$ | $\checkmark$ |  |  | $\checkmark$ | Washington Coastal Fall Natural | Quillayute Fall | WAC/JDF | Fall |

Table 2.1.-Page 2 of 2.

| Presence in Treaty Attachments ${ }^{1}$ |  |  |  |  | Stock Group <br> in Attachment I-V | Escapement Indicator | Region ${ }^{1}$ | Run |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| SEAK | $\begin{gathered} \hline \text { NBC/ } \\ \text { QCI } \end{gathered}$ | WCVI | $\begin{gathered} \text { BC } \\ \text { ISBM } \end{gathered}$ | $\begin{aligned} & \hline \text { SUS } \\ & \text { ISBM } \end{aligned}$ |  |  |  |  |
|  |  |  |  |  |  | Hoh Spring/Summer | WAC/JDF | Summer |
| $\checkmark$ | $\checkmark$ |  |  | $\checkmark$ | Washington Coastal Fall Natural | Hoh Fall | WAC/JDF | Fall |
|  |  |  |  |  |  | Queets Spring/Summer | WAC/JDF | Summer |
| $\checkmark$ | $\checkmark$ |  |  | $\checkmark$ | Washington Coastal Fall Natural | Queets Fall | WAC/JDF | Fall |
|  |  |  |  |  |  | Grays Harbor Spring | WAC/JDF | Spring |
| $\checkmark$ | $\checkmark$ |  |  | $\checkmark$ | Washington Coastal Fall Natural | Grays Harbor Fall ${ }^{4}$ | WAC/JDF | Fall |
|  |  |  |  |  |  | Columbia Upriver Spring | COLR | Spring |
| $\checkmark$ | $\checkmark$ | $\checkmark$ |  | $\checkmark$ | Columbia River Upriver Summers | Mid-Columbia Summers | COLR | Summer |
| $\checkmark$ | $\checkmark$ | $\checkmark$ |  | $\checkmark$ | Columbia River Falls | Upriver Brights | COLR | Fall |
| $\checkmark$ | $\checkmark$ | $\checkmark$ |  | $\checkmark$ | Columbia River Falls | Lewis | COLR | Fall |
| $\checkmark$ | $\checkmark$ | $\checkmark$ |  | $\checkmark$ | Columbia River Falls | Deschutes | COLR | Fall |
| $\checkmark$ | $\checkmark$ |  |  | $\checkmark$ | Far North Migrating Oregon Coastal | Nehalem | NOC | Fall |
| $\checkmark$ | $\checkmark$ |  |  | $\checkmark$ | Far North Migrating Oregon Coastal | Siletz | NOC | Fall |
| $\checkmark$ | $\checkmark$ |  |  | $\checkmark$ | 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, 2017-2018 escapements, and 2019 forecasts for stocks with PSCagreed goals.

| Stock | Region ${ }^{1}$ | Stock Group | Escapement Goal | $2017$ <br> Escapement ${ }^{2}$ | 2018 <br> Escapement ${ }^{2}$ | $\begin{gathered} 2019 \\ \text { Forecast }^{2} \end{gathered}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Situk ${ }^{3}$ | SEAK | Yakutat | 500-1,000 | $\begin{gathered} \hline 1,187 \\ (237 \%) \\ \hline \end{gathered}$ | $\begin{gathered} 420 \\ (84 \%) \end{gathered}$ | $\begin{gathered} \hline 300 \\ (60 \%) \end{gathered}$ |
| Chilkat ${ }^{3}$ | SEAK | Northern Inside | 1,750-3,500 | $\begin{aligned} & 1,173 \\ & (67 \%) \end{aligned}$ | $\begin{gathered} 873 \\ (67 \%) \end{gathered}$ | $\begin{aligned} & 1,000 \\ & (59 \%) \end{aligned}$ |
| Unuk ${ }^{3}$ | SEAK | Southern Inside | 1,800-3,800 | $\begin{aligned} & 1,203 \\ & (67 \%) \end{aligned}$ | $\begin{gathered} \hline 1,971 \\ (110 \%) \end{gathered}$ | $\begin{gathered} 3,050 \\ (169 \%) \end{gathered}$ |
| Chickamin | SEAK | Southern Inside | 2,150-4,300 | $\begin{gathered} 722 \\ (34 \%) \\ \hline \end{gathered}$ | $\begin{aligned} & 2,052 \\ & (95 \%) \\ & \hline \end{aligned}$ | NA |
| Alsek | TBR | Transboundary Rivers | 3,500-5,300 | $\begin{aligned} & 1,718 \\ & (50 \%) \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 4,312 \\ (123 \%) \\ \hline \end{gathered}$ | NA |
| Taku ${ }^{4}$ | TBR | Transboundary Rivers | 19,000-36,000 | $\begin{aligned} & \hline 8,754 \\ & (46 \%) \end{aligned}$ | $\begin{aligned} & \hline 7,271 \\ & (38 \%) \end{aligned}$ | $\begin{aligned} & \hline 9,050 \\ & (48 \%) \end{aligned}$ |
| Stikine ${ }^{4}$ | TBR | Transboundary Rivers | 14,000-28,000 | $\begin{aligned} & 7,206 \\ & (51 \%) \\ & \hline \end{aligned}$ | $\begin{aligned} & 8,355 \\ & (60 \%) \\ & \hline \end{aligned}$ | $\begin{aligned} & 8,250 \\ & (59 \%) \\ & \hline \end{aligned}$ |
| Harrison | BC | Fraser River | 75,100-98,500 | $\begin{gathered} 29,799 \\ (40 \%) \\ \hline \end{gathered}$ | $\begin{aligned} & 46,094 \\ & \text { (61\%) } \end{aligned}$ | $\begin{aligned} & \hline 78,758 \\ & (105 \%) \\ & \hline \end{aligned}$ |
| Cowichan | BC | Lower Strait of Georgia | 6,500 | $\begin{aligned} & \hline 10,590 \\ & (163 \%) \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 14,353 \\ & (184 \%) \\ & \hline \end{aligned}$ | NA |
| Quillayute Fall ${ }^{4}$ | WAC | Washington Coast | 3,000 | $\begin{gathered} \hline 3,604 \\ (120 \%) \end{gathered}$ | $\begin{gathered} \hline 4,031 \\ (134 \%) \end{gathered}$ | $\begin{gathered} \hline 6,646 \\ (222 \%) \end{gathered}$ |
| Queets Spr/Sum ${ }^{4}$ | WAC | Washington Coast | 700 | $\begin{gathered} \hline 825 \\ (118 \%) \end{gathered}$ | $\begin{gathered} \hline 484 \\ (69 \%) \end{gathered}$ | $\begin{gathered} 642 \\ (92 \%) \end{gathered}$ |
| Queets Fall ${ }^{4}$ | WAC | Washington Coast | 2,500 | $\begin{gathered} \hline 2,721 \\ (109 \%) \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 2,095 \\ & (84 \%) \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 4,239 \\ (170 \%) \\ \hline \end{gathered}$ |
| Hoh Spr/Sum ${ }^{4}$ | WAC | Washington Coast | 900 | $\begin{gathered} \hline 1,778 \\ (198 \%) \\ \hline \end{gathered}$ | $\begin{gathered} 793 \\ (88 \%) \\ \hline \end{gathered}$ | $\begin{gathered} \hline 1,023 \\ (114 \%) \\ \hline \end{gathered}$ |
| Hoh Fall ${ }^{4}$ | WAC | Washington Coast | 1,200 | $\begin{gathered} \hline 1,405 \\ (117 \%) \end{gathered}$ | $\begin{gathered} \hline 1,638 \\ (137 \%) \end{gathered}$ | $\begin{gathered} \hline 2,536 \\ (211 \%) \end{gathered}$ |
| Grays Harbor Fall ${ }^{4}$ | WAC | Washington Coast | 13,326 | $\begin{aligned} & \hline 13,469 \\ & (101 \%) \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 22,037 \\ & (163 \%) \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 17,996 \\ & (135 \%) \\ & \hline \end{aligned}$ |
| Mid-Columbia Summers ${ }^{4}$ | COLR | Columbia River Summers | 12,143 | $\begin{aligned} & 56,265 \\ & (463 \%) \end{aligned}$ | $\begin{aligned} & 38,816 \\ & (320 \%) \end{aligned}$ | $\begin{aligned} & 35,900 \\ & (296 \%) \\ & \hline \end{aligned}$ |
| Upriver Brights ${ }^{4}$ | COLR | Columbia River Falls | 40,000 | $\begin{gathered} 120,582 \\ (301 \%) \\ \hline \end{gathered}$ | $\begin{aligned} & 55,349 \\ & (138 \%) \\ & \hline \end{aligned}$ | $\begin{aligned} & 158,400 \\ & (396 \%) \\ & \hline \end{aligned}$ |
| Deschutes Fall | COLR | Columbia River Falls | 4,532 | $\begin{gathered} \hline 4,943 \\ (109 \%) \\ \hline \end{gathered}$ | $\begin{aligned} & 4,158 \\ & (92 \%) \\ & \hline \end{aligned}$ | $\begin{gathered} \hline \mathrm{x} \\ (\mathrm{x} \%) \\ \hline \end{gathered}$ |
| Lewis ${ }^{4}$ | COLR | Columbia River Falls | 5,700 | $\begin{gathered} \hline 6,058 \\ (106 \%) \end{gathered}$ | $\begin{aligned} & \hline 5,299 \\ & (93 \%) \end{aligned}$ | $\begin{aligned} & 13,700 \\ & (240 \%) \end{aligned}$ |
| Nehalem | ORC | Oregon Coast | 6,989 | $\begin{aligned} & 6,473 \\ & (93 \%) \\ & \hline \end{aligned}$ | $\begin{aligned} & 6,420 \\ & (92 \%) \\ & \hline \end{aligned}$ | $\begin{gathered} 8,538 \\ (122 \%) \\ \hline \end{gathered}$ |
| Siletz | ORC | Oregon Coast | 2,944 | $\begin{gathered} 7,364 \\ (250 \%) \end{gathered}$ | $\begin{gathered} \hline 4,929 \\ (167 \%) \end{gathered}$ | $\begin{gathered} \hline 5,683 \\ (193 \%) \end{gathered}$ |
| Siuslaw | ORC | Oregon Coast | 12,925 | $\begin{aligned} & 10,957 \\ & (85 \%) \end{aligned}$ | $\begin{aligned} & 4,481 \\ & (35 \%) \\ & \hline \end{aligned}$ | $\begin{aligned} & 9,297 \\ & (72 \%) \\ & \hline \end{aligned}$ |

${ }^{1}$ 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.

### 2.1 EsCAPEMENT GOAL AsSESSMENTS

The status and number of stocks with agreed goals for return years 1999 through 2018 is shown in Figure 2.1 and the percentage of stocks that met or exceeded escapement goals or goal ranges has varied between $41 \%$ and $96 \%$. In 2018, the percentage of stocks that met or exceeded goal was the lowest on record at $41 \%$. Of the 13 stocks below goal, 5 stocks (Chickamin, Hoh spring/summer, Lewis, Deschutes, and Nehalem,) were within $15 \%$ of the target goal and 8 stocks were more than $15 \%$ below goal: Situk, Chilkat, Taku, Stikine, Harrison, Queets spring/summer, Queets fall, and Siuslaw.


Figure 2.1-Number and status of stocks with PSC-agreed escapement goals, 1999-2018.
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 is based on the 1999 to 2018 time series of escapement using a state-space exponential growth model (Dennis et al. 2006) parameterized through restricted maximum likelihood (Humbert et al. 2009). Estimates of rates of change produced by this model are generally superior to those produced through maximum likelihood analysis alone (Staples et al. 2004). Assuming the true population size is generated by stochastic exponential growth, this method separates observation error and process noise and produces variances and confidence intervals (CIs) that fully represent the annual variability associated with environmental stochasticity, along with sampling error (Humbert et al. 2009). The first year in the time series corresponding with the 1999 Agreement was used; however, Cls 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 ( $\mu$ ) and corresponding $80 \% \mathrm{Cls}$, where $\mu=0.00$ 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 Cls 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.

## Escapement Trends for Southeast Alaska Stocks

Escapement trends for 1999-2018 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, however. 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 $80 \%$ Cls. All of these stocks have PSC-agreed escapement goals.

### 2.2.1 Escapement Trends for Transboundary Stocks

Escapement trends for 1999-2018 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 $80 \%$ Cls. All of these stocks have PSC-agreed escapement goals.

### 2.2.2 Escapement Trends for Canadian Stocks

Long-term rates of change in escapement for Canadian stocks were based on 1999-2018 time series of escapement for 14 of the 17 stocks evaluated. Escapement time series started in 2000 for Lower Shuswap due to changes in escapement estimation methodologies whereas flow conditions prevented the generation of escapement estimates in 2018 for Wannock and Chuckwalla-Killbella. 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 $80 \% \mathrm{Cls}$; Figure 2.4). Eleven stocks had negative mean rates of change in escapement measured, but these were significant trends for only Chuckwalla-Killbella (-10.3\%), Harrison (-5.3\%), Lower Shuswap (-4.4\%), and Skeena (-3.8\%). Six stocks had positive mean rates of change, but only WCVI showed a clearly positive trend (3.6\%). Chinook salmon from Fraser Summer 0.3, Harrison, Lower Shuswap, Nanaimo, Skeena, and WCVI 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.


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 $80 \% \mathrm{Cls}$. 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.

### 2.2.3 Escapement Trends for Washington Stocks

Escapement trends for 1999-2018 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 (-4.1\%) and increased significantly for Skagit Spring (5.2\%) and Lake Washington (2.5\%). 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 the Skagit River summer/fall stock and the 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 1999-2018 time period, none of them have CTCapproved escapement goals against which trends can be evaluated. Of the 9 Washington Coast indicator stocks, 3 showed significant trends in escapement for 1999-2018. Rates of change in escapement decreased significantly for the Grays Harbor spring ( $-4.6 \%$ ) and Hoh fall ( $-2.1 \%$ ) stocks, whereas the rate increased significantly for the Queets spring/summer stock (2.9\%). 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 Cls 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 $80 \%$ Cls. 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 2017 and 2018 Nooksack spring escapement estimates were not available for this analysis.

### 2.2.4 Escapement Trends for Columbia River/Oregon Stocks

Rates of annual change averaged 2.6\% for the Columbia River stocks, and ranged from -3.0\% (Deschutes) to 5.6\% (Coweeman). Rates of change for the Oregon Coast stocks averaged 3.5\%, ranging from $-13.4 \%$ for the Coquille to $4.2 \%$ 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 $80 \%$ Cls. 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 ( $\geq 660 \mathrm{~mm}$ length from mid eye to tail fork) for the Situk, Unuk and Chickamin stocks or by age ( $\geq$ age 1.3) for the Chilkat stock. Estimates of large fish include mostly ocean-age-3, -4, and 5 fish, and almost $100 \%$ of the females in the population, while excluding ocean-age-1 and -2 males. All SEAK indicator stocks produce primarily yearling smolt (freshwater-age-1) except the Situk River, which produces around $90 \%$ subyearling (freshwater-age-0) smolt. Survey methods have been standardized since 1975 except for the Chilkat River, which was standardized in 1991 concurrent with the initiation of 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 SMSY 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 an outside-rearing stock. Most harvest of Situk-origin Chinook salmon occurs in a commercial fishery, which operates in the estuary and nearby marine waters, and in sport and subsistence fisheries located in-river, in the estuary, and in nearby marine waters. These fisheries are prosecuted under a State of Alaska management plan (Situk-Ahrnklin Inlet and Lost River King Salmon Management Plan (5 AAC 30.365)) to achieve escapements within the escapement goal range.

Escapement Methodology: The escapement is enumerated using a weir in the lower river, minus sport harvest above the weir which is estimated by a creel survey and a postseason mailout survey. The weir was operated from 1928 to 1955 and continuously since 1976 including escapement enumeration. Escapement estimates meet U.S. and bilateral CTC data standards.

Escapement Goal Basis: In 1991, ADF\&G revised the escapement goal to 600 large spawners (McPherson and Weiland, 1991) ${ }^{1}$, and in 1997, the goal was revised to a range of 500 to 1,000 large spawners to conform to ADF\&G's escapement goal policy and 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 to 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. After an above goal run in 2017 ( 1,187 ), the 2018 estimated escapement was 420 large Chinook salmon, below the lower bound of the BEG. Similar to 2015 through 2017, all terminal fisheries were closed in 2018 to pass as many fish to escapement as possible. There was also no harvest above the weir in 2018 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. Because this stock has experienced poor marine survival and declining production, exploitation rates have been substantially curtailed since 2004.


Esc $>$ Goal
$<0.85$ of Esc Goal
$=-=0.85$ of Lower Goal
Upper Esc Goal
$\longrightarrow 0.85$ to Esc Goal
$\longrightarrow$ Pre-CTC Goal Esc
Figure 2.7.-Situk River escapements of Chinook salmon, 1976-2018.

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### 2.3.1.2 Chilkat River

The Chilkat River is a moderate-sized glacial system near Haines, Alaska, which supports an inside-rearing stock. Escapement estimates are germane to spawners that are ocean age-3 and older. 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). Annual escapement estimates have an average CV of about $14 \%$ since 1991 and therefore have met the CTC bilateral data standard of CV<=15\%. From 1975 to 1992, aerial survey counts were conducted on two small tributaries with relatively clear water and results from these estimates were inconsistent with radio-telemetry studies conducted in 1991 and 1992. The studies found that these two tributaries represented less than 5\% of the total escapement. Therefore, aerial surveys were discontinued.

Escapement Goal Basis: An initial escapement goal was 2,000 large fish, created in 1981 and based on an assumed fraction of the total escapement represented by aerial survey counts. A revised escapement goal range of 1,750 to 3,500 large spawners, based on MR estimates of escapement and limited CWT information, (Ericksen and McPherson 2004) was reviewed and accepted by ADF\&G, the Alaska Board of Fisheries in 2003 and by the CTC in 2004.

Escapement Evaluation: Escapements to the Chilkat River were $\geq 85 \%$ of the goal in all years except 2007 and from 2016 to 2018. The 2018 escapement estimate of 873 large fish (CV=19\%) is the lowest in the time series and 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 recent years, the Chilkat stock has failed to meet management objectives since 2016.


Figure 2.8.-Chilkat River escapements of Chinook salmon, 1991-2018.

### 2.3.1.3 Unuk River

The Unuk River is a moderate-sized glacial system that flows into Behm Canal northeast of Ketchikan, Alaska. This river supports an inside-rearing stock of Chinook salmon and escapement estimates are germane to large spawners (greater than 659 mm MEF in length). Coded-wire tags have been applied to wild smolt at relatively high rates ( $7-10 \%$ ) beginning with the 1992 brood year. 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 were derived from MR estimates of total escapement from 1997 to 2011, and from expanded survey counts from 1977 to 1996 and 2012 to present. Radio telemetry studies in 1994 and 2007 demonstrated that the surveys are conducted where approximately $80 \%$ of the spawning occurs; the expansion factor for survey counts is 4.83 (Hendrich et al. 2008). From 1997 to 2011, CVs of the MR escapement estimates averaged $11 \%$ and were less than $15 \%$ in all but one year (2011). The average CV for expanded survey counts performed since 2012 is $12 \%$, and these estimates 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 1997, ADF\&G revised the goal to a range of 650 to 1,400 large spawners observed during index counts (McPherson and Carlile 1997), which the CTC reviewed and 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 to 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 to 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, and escapements were below the $85 \%$ threshold of the lower bound of the escapement goal range in 2012, 2013, 2016, and 2017. The 2018 escapement estimate is 1,971 large Chinook salmon (CV = 12\%) which met the lower bound of the BEG of 1,800 fish. Despite this slight upturn in 2018, 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 was 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 2018 and restrictions will continue in 2019.


Figure 2.9.-Unuk River escapements of Chinook salmon, 1977-2018.

### 2.3.1.4 Chickamin River

The Chickamin River is a moderate-sized glacial system flowing into Behm Canal near Ketchikan, Alaska that supports a run of inside-rearing Chinook salmon. Estimated escapements are for large spawners (greater than 659 mm MEF in length). 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 were derived from MR estimates of total escapement in 1995, 1996, and 2001 to 2005, and from 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. Comparisons of MR estimates and survey counts determined that approximately $21 \%$ of the total escapement was counted during peak surveys (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 was estimated to be 4.75 for survey counts using the results from the 1995, 1996, and 2001 to 2005 studies. Expanded escapement estimates 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 is equivalent to a drainage-wide escapement goal range of 2,150 to 4,300 large spawners as recommended in the (McPherson and Carlile 1997). The index count and resulting 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 2018 escapement estimate is 2,052 large Chinook salmon ( $\mathrm{CV}=15 \%$ ), which 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 escapement estimates shows above average abundance from 1982 to 1990, and again from 2000 to 2010. Other years have below average estimates including recent poor runs in 2016 to 2018. 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, 1975-2018.

### 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 for large fish only, defined as Chinook salmon $\geq 660 \mathrm{~mm}$ length mid eye to tail fork, and include ocean age-3 through age- 5 fish, which contain almost $100 \%$ of the females in the population. Escapement estimates in the Alsek River are for ocean age-2 fish and older. 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 marine CWT recovery patterns. These stocks emigrate as yearling smolt and have limited marine rearing time in SEAK, and therefore are harvested primarily during their spawning migrations each spring.

In response to low abundance, a 15-year rebuilding program was established in 1981 (ADFG 1981). Concurrently, 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 (CSAP), 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 using a weir on the Klukshu River; one of 51 tributaries of the Tatshenshini River, the principal salmon-producing tributary of the Alsek River. Counts of returning ocean age-2 and older Chinook have been collected from 1976 to present. Concurrent with the weir counts, Alsek River drainage-wide MR escapement estimates were generated from 1998 to 2004 through a cooperative effort among the Champagne and Aishihik First Nations, DFO, and ADF\&G. An expansion factor of 4.0 is used to convert the Klukshu River weir counts to Alsek River drainage-wide inriver run estimates. Canadian inriver harvest is subtracted from the estimated inriver abundance to yield the estimate of drainage-wide escapement. The associated CV of $35 \%$ for the expansion factor fails to meet U.S. CTC data standards of $20 \%$ and bilateral CTC data standards of $15 \%$.

Escapement Goal Basis: A drainage-wide revised goal of 3,500 to 5,300 ocean age-2 and older fish was accepted by the CTC, ADF\&G, and CSAP based on analysis in Bernard and Jones (2010). The previous goal was based solely on the Klukshu River return (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. Even in the absence of exploitation from 2006 to 2008 and from 2016 to 2017, the stock would still have failed to achieve the lower bound of the escapement goal range. The 2018 escapement estimate is 4,312 (CV = 0.37) ocean age- 2 and older Chinook salmon, which is above the lower bound of the BEG 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 U.S. subsistence and U.S. directed sockeye salmon fisheries that operate in the lower river. Overall, calendar year exploitation rates have averaged only 8\% since 1976.


Figure 2.11.-Alsek River escapements of Chinook salmon, 1976-2018.

### 2.3.2.2 Taku River

The Taku River is a large glacial system that originates in Northwest British Columbia, 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 assessments exceed predetermined levels as described in the 2009 Agreement under Chapter One, Transboundary Rivers 3(b)(3). In other years, Taku River Chinook are 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 using MR experiments in 1989, 1990, 1995 to 1997, 1999 to 2012, and 2014 to 2018. The MR estimates are from cooperative stock assessment efforts among the Taku River Tlingit First Nations, DFO, and ADF\&G. The MR escapement estimates have an average CV of $15 \%$ and since 1995 , CVs have ranged from $9 \%$ 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, from 1991 to 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: Prior to 1999, several drainage-wide or index goals were developed by the U.S. and Canada using limited data. A BEG based upon maximizing smolt production was accepted by the CTC and used for management from 1999 to 2009 (McPherson et al. 2000). Then 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: Escapements of less than $85 \%$ of the lower bound of the goal range occurred six times since 1975 (1975, 1983, 2007, 2016-2018). The 2018 escapement estimate is 7,271 (CV = 11\%) large Chinook salmon, which is below the $85 \%$ threshold of the lower bound of the escapement goal range and approximately one-third of the SmSY $_{\text {moint goal of }}$ 25,500 (Figure 2.12).

Agency Comments: Like the Stikine River stock of Chinook salmon and other SEAK stocks, the Taku River stock has shown declining productivity in recent years, largely related to reduced marine survival. Until these conditions improve, it is unlikely that directed fisheries will occur.


Figure 2.12.-Taku River escapements of Chinook salmon, 1975-2018.

### 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 on 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, $52 \%$ of the escapement estimates have had CVs that meet bilateral CTC data standards, and overall CVs ranged from $7 \%$ to $35 \%$.

Escapement Goal Basis: In 1999, a BEG of 14,000 to 28,000 large Chinook salmon was reviewed and accepted by the CTC, ADF\&G, TBR Panel, and CSAP, 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 eight times since 1975 and only three times in the past 29 years (2009, 2017, and 2018). The 2018 escapement estimate is 8,355 ( $C V=35 \%$ ) large Chinook salmon, which is below the $85 \%$ threshold of the lower bound of the escapement goal range (Figure 2.13).

Agency Comments: Despite achieving escapement goals most of the time 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 occur.


Figure 2.13.-Stikine River escapements of Chinook salmon, 1975-2018.

### 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 (Appendix Table B3).

### 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 $18,000 \mathrm{~km}^{2}$ 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 fish wheels at Grease Harbor further upstream to capture fish for tag application. 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 using 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 $S_{\text {MSY }}$ for the Nass River upstream of Gitwinksihlkw using the habitat model was 16,422 (CV = 23\%) Chinook salmon based on a watershed area of $15,244 \mathrm{~km}^{2}$ (Parken et al. 2006; Figure 2.14).
The 2018 escapement estimate for the Nass River above Gitwinksihlkw was 12,626 (Appendix Table B3; Figure 2.14).

Agency Comments: Chinook salmon escapement estimates produced before 1992 have been calibrated to the MR estimates. The Sentinel Stocks Program (SSP) and Northern Fund have funded projects 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, 1977-2018.

### 2.3.3.1.3 Skeena River

The Skeena River is the second largest river in British Columbia and drains an area of approximately $54,400 \mathrm{~km}^{2}$. It supports the second largest aggregate of Chinook salmon stocks in British Columbia with over 75 separate spawning populations. There are four large lakestabilized tributaries, Kitsumkalum, Morice, Babine and Bear rivers, and 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. In contrast, the Morice, Bear, Babine, and Kispiox rivers are relatively clear, especially in late summer when most of the Chinook salmon spawning occurs, allowing for visual counts. Skeena River Chinook salmon are primarily stream-type salmon (97\%) and are far north migrating. Most of the Skeena River Chinook salmon populations are summer run but spring run fish occur in the Cedar 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 genetic-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 2018 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 2018 escapement for the Skeena stock was 37,481 using the historic index and 33,802 using the genetic-based 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 $S_{\text {MSY }}$ for the Kitsumkalum indicator stock is 8,621 Chinook salmon based on stock-recruitment analyses (McNicol 1999; updated in Parken et al. 2006). Habitatbased estimates of $S_{\text {msy }}$ 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 only included in the total terminal run estimates when data were available from creel surveys. Creel surveys were conducted on the Lower Skeena below Terrace in 2003 and from 2010 to 2017. The inriver sport fishery was closed in 2018. Spawning escapements to the Kitsumkalum River exceeded the point estimate of $\mathrm{S}_{\text {MSY }}$ in every year except 1998 and 2017 (Figure 2.16).


Figure 2.15.-Skeena River escapements of Chinook salmon, 1975-2018.


Figure 2.16.-Kitsumkalum River escapements of Chinook salmon, 1984-2018.

### 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) but high water levels precluded surveys and total escapement estimates in 2018.

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. Habitatbased estimates of $\mathrm{S}_{\text {MSY }}$ and other stock-recruitment reference points are available (median $\left.S_{M S Y}=3,646, C V=14 \%\right)$, 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.
An escapement estimate is not available for 2018 because high water levels precluded surveys.

### 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); however, high water levels precluded surveys and resulting escapement estimates in 2018

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 recovered during 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. Habitatbased estimates of $S_{\text {MSY }}$ 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 $\mathrm{S}_{\text {MSy }}$ 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 preenhancement 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).

Escapement estimates are not available for 2018 because high water levels precluded surveys.

### 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 2018 (excluding jacks) was 12,774 with a wild escapement of 5,328 (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) 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 to 2003 and 2009 to 2018. 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 $\mathrm{S}_{\mathrm{MSY}}$ 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) and MR estimates with corresponding CVs less than $15 \%$ have been attained in all years (2001-2003 and 2009-2018). The estimation model used for the 1990 to 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 2018 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, 1990-2018.

### 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 the total 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 2018 were 7,637 Chinook salmon for the 6 -stream index and 12,173 for the 14-stream index (Appendix B5).

Despite a positive trend in Burman escapement between 2009 and 2018 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 (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 and decreased again in 2018 although not to the low levels observed from 2009-2014. Also, the proportion of wild contributions has increased in recent years although hatchery is still dominating the escapement throughout the time series.

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 $S_{\text {MSY }}$ 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 in 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, 19752018.

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 (2006-2018), and openpopulation mark-recapture estimates (MR; 2009-2018).

Note: $95 \%$ Cls are shown for SSC and MR estimates.


Figure 2.22.- Burman River Chinook escapement based on open-population MR methodology, 2009-2018.

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 2018 was 10,911 (Appendix Table B4; Figure 2.23) based on direct estimation of escapement only for the Nimpkish River (872) 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, 1975-2018.
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, 1975-2018.
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 2018 was 14,353 Chinook salmon for the Cowichan River and 2,961 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 $\mathrm{S}_{\text {MSY }}$ 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, 1981-2018.


Figure 2.26.-Nanaimo River escapements of Chinook salmon, 1981-2018.

### 2.3.3.4 Fraser River Stocks

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).

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, SmsY (Parken et al. 2006). In $^{\text {In }}$ 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, and 20162018; 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 2012-2018 (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, 20162018. Although the 2018 escapement estimate was higher than the 2017 estimate, it was still less than $85 \%$ of the lower escapement goal (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 rose slightly in 2018 from levels observed in 2017 and was estimated at 8,457, which was lower than parental brood in 2013 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 $S_{\text {MSY }}$ 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, 19752018.

### 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 springrun 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 2018 from levels observed in 2017 and was estimated at 2,100, which was less than $10 \%$ of parental brood escapement in 2014 (Figure 2.28).

In 2018, the Bonaparte river fish way suffered a catastrophic failure due to extremely high runoff. Passage of Chinook salmon above the fish way was extremely limited. An aerial count of the river upstream of the fish way resulted in an estimate of five Chinook salmon for the entire system. The 2014 parental brood for the Bonaparte river was estimated to be 12,659 Chinook salmon (Appendix Table B6).

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 1,627 in 2018 is lower than the 2017 escapement and represents $22 \%$ of the 2014 parental brood. Since 1995, hatchery origin fish have averaged $25 \%$ of the spawning escapement; however, in 2018, hatchery origin fish represented $73 \%$ of the spawning escapement.

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for this aggregate. Habitat-based estimates of $S_{\text {MSY }}$ 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 $\mathrm{S}_{\text {MSY }}(9,300 ;$ 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, 19752018.


Figure 2.29.-Nicola River escapements of Chinook salmon, 1975-2018.

### 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 5,443 in 2018, which is slightly lower from those
observed in 2017 and only 49\% of the parental brood in 2013. 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 $S_{\text {MSV }}$ 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 2018 it declined to the lowest level observed in 43 years.


Figure 2.30.-Fraser River summer run age-1.3 stock group escapements of Chinook salmon, 1975-2018.

### 2.3.3.4.4 Fraser River Summer Run: Age $\mathbf{0 . 3}$

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 2018, with aggregate estimate of 46,543 (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 2018 was 17,120, which is $55 \%$ of the 2014 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 $15 \%$ of the escapement in 2018.

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for the aggregate. Habitat-based estimates of $\mathrm{S}_{\text {MSY }}$ 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 $S_{\text {MSY }}(12,300 ; C V=17 \%)$.

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). However, the 2018 escapement was well below the 2014 brood escapement.


Figure 2.31.-Fraser River summer run age-0.3 stock group escapements of Chinook salmon, 1975-2018.


Figure 2.32.-Lower Shuswap River escapements of Chinook salmon, 1975-2018. 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 2012-2018 (excluding 2015), the estimated escapement in 2018 was 46,094 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 $75,100-98,500(C V=15 \%)$ 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 1\% but was 6\% in 2018.

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, 1984-2018.

### 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: 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 (beginning in 2008) 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 2015, the preliminary estimated total escapement was 1,783 , with 447 total natural origin spawners. A preliminary 2016 estimate of total spawners is 1,774, with 700 total natural origin spawners (Figure 2.34). Escapement estimates from 2017 and 2018 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 naturalorigin spring Chinook salmon, 1984-2016.


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 earlytimed 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 2018 escapement estimate is 2,376 natural spawners (Figure 2.36).

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for this stock.
Agency Comments: State-tribal co-managers and NOAA are in the process of establishing new domestic management objectives and escapement goals for the Skagit Spring stock. In 2018, the co-managers implemented an UMT of 2,000 natural origin spawners and a LAT of 690 natural origin spawners. 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, 19752018.

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 2018 escapement estimate is 10,903 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, 1975-2018.

### 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 2018 is estimated at 665 . An additional 152 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 and NOAA are in the process of establishing new domestic management objectives and escapement goals for the Stillaguamish stock. In 2018, the co-managers implemented an UMT of 1,500 natural spawners, a LAT of 1,200 natural spawners, and a Lower Bound Threshold of 900 natural spawners. The summer Chinook salmon supplementation program, which collects brood stock from the North Fork of the Stillaguamish River return, was initiated in 1986 as a PST indicator stock program, and 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, 1975-2018.


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\% Cls) 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 2018 escapement is estimated at 4,210 natural spawners using redd counts.


Escapement Goal Basis: There is currently no PSC-agreed escapement goal for this stock.
Agency Comments: State-tribal co-managers and NOAA are in the process of establishing new domestic management objectives and escapement goals for the Snohomish stock. In 2018, the co-managers implemented an UMT of 4,900 natural spawners and a LAT of 3,375 natural spawners. There were additional escapement goals in 2018 for the Snoqualmie (UMT = 1,300; LAT = 1,066; Lower Bound = 700) and Skykomish (UMT = 3,600; LAT = 2,092; Lower Bound = 1,745 ) portions of the stock. 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.

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 naturalorigin 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, 19752018.


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\% Cls) 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 reddbased 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 hatcheryorigin fish, likely strays from the Issaquah hatchery. The 2018 naturally spawning escapement estimate for Lake Washington is 968; 803 in the Cedar River and 165 (of which 38 were naturalorigin 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: State-tribal co-managers and NOAA are in the process of establishing new domestic management objectives and escapement goals for the Lake Washington stock. In 2018, the co-managers implemented an UMT of 500 natural spawners and a LAT of 200 natural spawners. 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), 1975-2018.

### 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 2018 redd-based estimate of naturally spawning escapement is 6,891 mixed hatchery- and natural-origin Chinook salmon.

Escapement Goal Basis: There is currently no PSC-agreed escapement goal for this stock.
Agency Comments: State-tribal co-managers and NOAA are in the process of establishing new domestic management objectives and escapement goals for the Lake Washington stock. In 2018, the co-managers implemented an UMT of 3,800 natural spawners and a LAT of 805 natural spawners. 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, 1975-2018.


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 (20012002) 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 primarily caught in SEAK and NBC AABM fisheries. They are also caught in southern US terminal net fisheries primarily as mature fish during their spawning migrations.

### 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 Hoko River mainstem and tributaries found between river mile 1.5 and 21.7, which represents the entire range of spawning habitat utilized by Chinook salmon. Redd counts are multiplied by 2.5 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, Carpenter, South Fork Carpenter, Sunnybrook, and three unnamed Creeks (numbered 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 193 fish annually through 2018. In 2018, 236 fish were retained for the supplementation program leaving a total natural spawning escapement estimate of 2,115 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, 1986-2018.

### 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 2018 escapement estimate for summer Chinook salmon was 1,185 (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, 1976-2018.

### 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 2018 escapement estimate was 4,031 (Figure 2.47).

Escapement Goal Basis: In 2004, the PSC agreed upon 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, 1980-2018.

### 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 2018 natural escapement estimate was 793 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 from 2006 to 2014. Terminal fisheries are managed to catch $31 \%$ of the river run, with an escapement floor of 900 fish. This objective was designed to allow a wide range of spawner escapements from which to eventually develop an MSY objective or proxy while protecting the long-term productivity of the stock.


Figure 2.48.-Hoh River escapement of spring/summer Chinook salmon to the spawning grounds, 1976-2018.

### 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 naturalorigin fish. The 2018 escapement estimate is 1,638 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 $40 \%$ on the terminal run, with an escapement floor of 1,200 spawners. This objective was designed to allow a wide range of spawner escapements from which to eventually develop an MSY objective or proxy while protecting the long-term productivity of the stock.


Figure 2.49.-Hoh River escapement of fall Chinook salmon to the spawning grounds, 19762018.

### 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 2018 estimate of natural escapement was 484 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, 1976-2018.

### 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 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 2018 estimate of Queets River fall Chinook salmon natural escapement was 2,095 (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, 19762018.

### 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. Surveys are also conducted infrequently in additional monitored stream areas that are outside of the index reaches and 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 2018 escapement was 493 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 comanagers 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, 1976-2018.

### 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 2018 escapement was 22,037 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 stockperformance evaluations on a stock aggregate basis. This goal, however, is the sum of tributaryspecific 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, 19762018.

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 fisheries are managed under the 2018-2027 US v. Oregon Management Agreement, using six harvest indicators, and eleven abundance indicators.

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

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

Columbia Upriver Spring Chinook are comprised of all spring Chinook above Bonneville Dam and summer Chinook from the Snake River and are predominantly hatchery fish from the Snake River. These fish have stream-type life histories, migrate quickly offshore, and have fishery impacts that are predominantly terminal.

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

Columbia River Fall Chinook have ocean-type life histories and coastal distributions, but there are two distinctive races. Lower Columbia River "tule" Chinook return below Bonneville Dam, mature quickly, are caught mainly in the WCVI AABM and U.S. ISBM fisheries, and are represented by the Coweeman Tule Fall Chinook PSC escapement indicator. In addition, PSC monitors Lewis River Wild fall Chinook production below Bonneville Dam. Upriver Bright Fall Chinook, which have more prolonged maturation, are comprised of production above McNary Dam, and in the Deschutes and Snake rivers. Upriver Bright Fall Chinook above McNary Dam have a northerly distribution, and comprise substantial proportions of catch in SEAK, WCVI, and US ISBM fisheries, while Snake and Deschutes river production is predominantly impacted in WCVI and US ISBM fisheries.

Abundance indicator stocks are defined by the US v. Oregon Management Agreement to further monitor status of natural-origin populations that may limit Columbia River fisheries:

| Abundance Indicator Stocks |  |
| :--- | :--- |
| Stock | Performance Measure |
| Upriver spring/summer Chinook | Snake R natural-origin spring/ summer <br> Chinook |
| Snake R natural-origin spring/ summer Chinook | Upper Columbia R natural-origin spring <br> Chinook |
| Upper Columbia R natural-origin spring Chinook | Upriver Columbia R natural-origin spring |
| Upriver Columbia R natural-origin spring Chinook |  |


| Abundance Indicator Stocks |  |  |
| :--- | :--- | :---: |
| Stock | Performance Measure |  |
| (Wenatchee, Entiat, Methow) | Chinook (Wenatchee, Entiat, Methow) |  |
| Snake R spring/summer Chinook index stocks (Bear <br> Valley, Marsh, Sulphur, Minam, Catherine Cr., Imnaha, <br> Poverty Flats, Johnson) | Snake R spring/summer Chinook index <br> stocks (Bear Valley, Marsh, Sulphur, Minam, <br> Catherine Cr., Imnaha, Poverty Flats, <br> Johnson) |  |
| John Day natural-origin spring Chinook | John Day natural-origin spring Chinook |  |
| Warm Springs natural-origin spring Chinook Upper Columbia Summer Chinook |  |  |
|  |  |  |
| Upper Columbia R summer Chinook |  |  |
| Upall Chinook Columbia R summer Chinook |  |  |
| Hanford natural-origin adult fall Chinook | Hanford natural-origin adult fall Chinook |  |
| Snake River adult fall Chinook | Snake River adult fall Chinook |  |
| Snake River adult fall Chinook | Snake River adult fall Chinook |  |
| Deschutes River natural- origin adult fall Chinook | Deschutes River natural- origin adult fall <br> Chinook |  |

### 2.3.4.3.1 Columbia Upriver Spring

Escapement graphs include only 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). This is only a small portion of Upriver Spring Chinook as defined above under the US v. Oregon Management Agreement, but is consistent with the goal of monitoring natural-origin escapements under PSC. Although it is not a 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).

Escapement Goal Basis: Under the 2018-2027 US v. Oregon Management Agreement, this stock is not managed for an escapement goal. Rather, it is managed according to a treaty Indian ceremonial and subsistence entitlement of 10,000 spring/summer Chinook, abundance, a sliding harvest rate schedule for natural-origin fish (2018-2027 US v. Oregon Management Agreement, Appendix A, Table A1), and catch balancing between non-treaty and treaty fisheries.

Agency Comments: 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. 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 . Escapement in 2018 was the second lowest in the last 11 years.


Figure 2.54.- Columbia upriver spring Chinook salmon escapements, 1980-2018.

### 2.3.4.3.2 Mid-Columbia Summer

Escapement Methodology: Figure 2.55; displays adult Chinook salmon passing Rock Island Dam between June 18 and August 17; these counts include hatchery fish but are more consistent with the PSC Chinook Model data (hatchery and natural-origin combined) used to develop the interim escapement goal.

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 addition years of data, so the interim goal remains. The 20182027 US v. Oregon Management Agreement calls for reviewing goals.

Agency Comments: Upper Columbia Summer Chinook are managed for 29,000 adults at the river mouth, based on a spawning escapement goal of 20,000 adults at Priest Rapids Dam. Although management is not constrained by individual components, sub-basin objectives are 13,500 Wenatchee/Entiat/Chelan naturally spawning fish, 3,500 Methow/Okanogan natural fish and 3,000 hatchery brood stock. Catches are based on an abundance-based harvest rate schedule (2018-2027 US v. Oregon Management Agreement, Table A2). Harvest rates are near $5 \%$ for run sizes up to 16,000 , and $15 \%$ to $17 \%$ for run sizes up to 36,250 ( $125 \%$ of 29,000 ). Between 36,250 and 50,000, harvestable surplus is run size less 29,000, and above 50,000, $75 \%$ of the additional run becomes harvestable surplus, while the other $25 \%$ is foregone to escapement. Rock Island Dam counts have shown a steep decline of over $50 \%$ since 2015 , but are still well above goal.


Figure 2.55.-Adult passage of Mid-Columbia Summer Chinook salmon at Rock Island Dam, 1979-2018.

### 2.3.4.3.3 Columbia Upriver Brights

Escapement Methodology: Figure 2.56 displays the McNary Dam count minus adult Hanford Reach sport catch, Wanapum tribal catches, and broodstock taken at Priest Rapids, Ringold and Snake River hatcheries.

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: Upriver Fall Chinook are managed according to an abundance-based harvest rate schedule (2018-2027 US v. Oregon Management Agreement, Table A3), and a minimum management goal of 60,000 adult fall Chinook salmon at McNary Dam, which includes Snake River production. The US v. Oregon Parties also agreed to a minimum goal of 43,500 Upriver Bright escapement to provide spawning in the Hanford Reach, Lower Yakima River, and mainstem Columbia River above Priest Rapids Dam, as well as Priest Rapids Hatchery production. Fall 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 Upriver Bright fisheries include the $15 \%$ harvest rate limit on commingled ESA-listed B-run summer steelhead ( $>78 \mathrm{~cm}$ ) for forecast runs of less than 20,000, ESA-listed Snake River wild fall Chinook salmon impacts, and the need for 7,000 tule fall Chinook salmon for brood stock at Spring Creek Hatchery. Almost identical to Mid-Columbia Summer Chinook, Upriver Bright escapement has shown a steep decline since 2015, but is still well above the escapement goal.


Figure 2.56.- Columbia Upriver Bright Chinook salmon escapements, 1975-2018.

### 2.3.4.3.4 Coweeman River Tules

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

Escapement Methodology: From 2002 to 2011, PSC funding was used to conduct intensive studies to estimate Chinook escapement (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. Escapement was estimated using MR methodologies from 2002 to 2004, and in 2011; live-count AUC methodologies in 2005 and 2006; redd-based methodologies in 2007 and 2008; and genetic mark-recapture (GMR) methodologies 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 and further details for each year is now available on WDFW's Salmon Stock Inventory (SaSI) system (https://data.wa.gov/Natural-Resources-Environment/WDFW-Salmonid-Stock-Inventory-Population-Escapemen/fgyz-n3uk/data). The data graphed are total naturally spawning fish expanded from redd counts from the mouth of Mulholland Creek (RM 18.4) downstream to the Jeep Club Bridge (RM13.1). Escapement decreased in 2018 to less thanone quarter of the agency goal, the lowest level since 1983 (Figure 2.57).

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 2.57.-Coweeman River tule fall Chinook salmon escapements, 1975-2018.

### 2.3.4.3.5 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 (Mclsaac 1990) and was verified by studies from 1999 to 2001. Wild smolt have been coded-wire tagged since 1977.

Escapement Goal Basis: The escapement goal of 5,700 fall Chinook in the Lewis River was developed by Mclsaac (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: Until 2018, Lewis River escapements were above the escapement goal since 1979, except for 1999, and 2007-2009. In 2018, escapement dipped below goal, but remained above 85\% of goal (Figure 2.58).


Figure 2.58.-Lewis River fall Chinook salmon escapements, 1975-2018.

### 2.3.4.3.6 Deschutes River

Escapement Methodology: Escapement estimates are based on MR estimates above Sherars Falls and expanded for redd counts below Sherars Falls (Figure 2.59). From 2000 to 2007, the Confederated Tribes of the Warm Springs Reservation of Oregon conducted MR studies for the entire river to validate the expansion methodology. Figure 2.60 compares the whole river MR estimates with the expanded index redd count estimates. For historic years when redd counts were conducted in index areas rather than censused, the time series was adjusted (Sharma et al., unpub.).

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: Like Lewis River, escapements have declined steeply since 2015, and this is the first year since 1992 that Deschutes River fall Chinook salmon escapements have fallen below goal (Figure 2.59).



Figure 2.59.-Deschutes River fall Chinook salmon escapements, 1977-2018.


Figure 2.60.-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).

### 2.3.4.4 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, however, work is underway to include MOC stocks in 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 2018 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 Cls 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 2018 escapement of 6,420 adult
spawners. This is $92 \%$ of the current escapement goal. Based on multiple forecasting models, the Nehalem stock is forecasted to meet the escapement goal in 2019. 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, 1975-2018.


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 observed 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 Cl 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 4,929 fall Chinook salmon ( $167 \%$ of goal) in 2018. 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 2019.


Figure 2.63.-Siletz River fall escapements of Chinook salmon, 1975-2018.


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 2018. 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 2018 for the Siuslaw stock, estimated based on standard habitat expansion methods, was 4,481 adult spawners ( $72 \%$ of the escapement goal). MR based calibration factor estimates for this return year produced an estimate of 2,484 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 2019.


Figure 2.65.-Siuslaw River fall escapements of Chinook salmon, 1975-2018.


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, 1978-2018.

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 2018 was secured, and the agency was able to reinstitute the sampling programs required to generate an estimate for the 2018 return year. The 2018 escapement estimate is 2,983 Chinook salmon, which is below the long term average.


Figure 2.67.-South Umpqua River escapement of fall Chinook salmon, 1978-2018.

### 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 2018. 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 470 for Coquille Basin spawners in 2018. The traditional habitat expansion-based estimate is 514 fish. These estimates are historical low point for this basin. Standard surveys dating back to the 1950s indicate that this is the lowest escapement ever recorded since these surveys began.

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, 1975-2018.

## 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 ( $U_{\text {MSY }}$ ) and two for escapement abundance ( $\mathrm{S}_{\text {MSY }} 0.85 * \mathrm{~S}_{\text {MSY }}$ ) 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 $0.85{ }^{*} \mathrm{~S}_{\text {MSY }}$ 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 ( $U_{\text {SMSY }}$ ) is the exploitation rate at $\mathrm{S}_{\text {MSY }}$ 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 $U_{\text {MSY }}$ 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 UMS 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 UMSY limit, and in the lower left (Low Escapement Low Exploitation), fishing is occurring below the UMSY 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

$$
\text { CYER } \left._{C Y}=\frac{\text { OceanMorts }}{C Y}+\text { TermMorts }_{C Y}{ }_{(\text {OceanMorts }}^{C Y} \text { }+ \text { TermMorts }_{C Y}+\text { OESC }_{C Y}\right) ~
$$

Cumulative MRE exploitation rates are computed as

$$
C M R E E R_{C Y}=1-\left(\frac{O E S C_{C Y}}{P E S C_{C Y}}\right)
$$

where

$$
\begin{aligned}
O E S C_{C Y} & =\sum_{a=\text { startage }}^{\text {maxage }}
\end{aligned} \text { OESC }_{C Y, a},
$$

and

$$
\text { PESC }_{C Y, a}=\frac{\text { OESC }_{C Y, a}}{\text { CumSurvRte }_{C Y-a, a}} .
$$

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

$$
\text { CumSurvRte }_{B Y, a}=\text { TermSurvRte }_{B Y, a} * \prod_{i=\text { startage }^{a} \text { PreTermSurvRte }_{B Y, i} .}
$$

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

$$
\text { CumSurvRte }_{B Y, a}=\prod_{i=\text { startage }}^{a} \text { PreTermSurvRte } e_{B Y, i} .
$$

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

$$
\text { PreTermH }_{B Y, a}=\frac{\text { OceanMorts }_{B Y, a}}{\text { CohortSizeANM }_{B Y, a}} .
$$

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

$$
\text { PreTermSurvRte }_{B Y, a}=1-\text { PreTermHR }_{B Y, a} .
$$

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

| Parameter | Description |
| :---: | :---: |
| $a=$ | age |
| $B Y=$ | Brood year |
| $C Y=$ | Calendar year |
| $C^{\text {CMREER }}$ CY $=$ | Cumulative MRE exploitation rate for calendar year CY |
| CohortSizeANM ${ }_{B Y, a}=$ | Cohort size after natural mortality for brood year $B Y$ and age $a$ |
| CumSurvRte $_{B Y, a}=$ | Cumulative survival rate for brood year $B Y$ and age $a$ |
| $C Y E R_{C Y}=$ | Calendar year exploitation rate for calendar year CY |
| OceanMorts $_{B Y, a}=$ | Ocean mortalities for brood year BY and age a |
| OESC $C_{C Y}=$ | Observed escapement for calendar year CY |
| $O^{-E S C} C_{C Y, a}=$ | Observed escapement for calendar year $C Y$ and age a |
| $P E S C_{C Y}=$ | Potential escapement for calendar year $C Y$ |
| $P E S C_{C Y, a}=$ | Potential escapement for calendar year CY and age $a$ |
| PreTermHR ${ }_{B Y, a}=$ | Pre-terminal harvest rate for brood year $B Y$ and age $a$ |
| PreTermSurvRte $_{B Y, a}=$ | Pre-terminal survival rate for brood year $B Y$ and age $a$ |
| TermMorts ${ }_{C Y}=$ | Terminal mortalities for calendar year CY |
| TermSurvRte ${ }_{B Y, a}=$ | 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 | Smsy | 85\% of Smsy ${ }^{2}$ | Exploitation Rate Indicator | UMSY | 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]A synoptic summary figure for 23 stocks with 2017 data shows that the majority of stocks were in the safe zone (exploitation below UMSy and escapement above $S_{m s y ;}$ Figure 3.2). One stock, Siuslaw, was in the high-risk zone. One stock, Nehalem, was in the buffer zone. No stocks experienced exploitation above $U_{\text {MSY }}$ and still the escapement exceeded $\mathrm{S}_{\text {msy }}$. Nine stocks were in the low escapement and low exploitation zone: Alsek, Stikine, Taku, Unuk, Chickamin, Chilkat, Kitsumkalum, Nicola, and Harrison. In general, Columbia River stocks showed a higher escapement to $\mathrm{S}_{\text {Msy }}$ 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 2017.

Note: Escapement and exploitation rate data were standardized to the stock-specific escapement goal and $U_{\text {MSY }}$ 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 27 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 exhibit two consistent rearing behaviors. Outside-rearing behavior includes rearing in the Gulf of Alaska and Bering Sea after leaving the freshwater environment. Insiderearing behavior involves rearing in the nearshore environment of SEAK for a significant amount of time. The Situk stock is an outside-rearing stock and the Chilkat, Unuk, and Chickamin stocks are inside-rearing. However, CWT recovery data suggests at least a small proportion of the inside-rearing fish exhibit some outside-rearing behavior. Productivity has decreased for groups of fish and 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 27 stocks of Chinook salmon in Alaska (the Unalakleet, Goodnews, Kuskokwim and Nushagak 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, Kenai Early and Kenai Late in Cook Inlet, the Copper in the northeastern Gulf of Alaska, and the Situk, Alsek, Chilkat, Taku, King Salmon, Andrews, Stikine, Unuk, Chickamin, Blossom and Keta in Southeastern Alaska).

The Situk stock has failed to meet the escapement goal seven times since 2009. Over the recent decade, this stock has demonstrated the poorest performance among the four SEAK escapement indicator stocks. This failure cannot be explained by fishery impacts which have been extremely low with a recent 10-year average exploitation rate of $16 \%$. And because harvests are mostly in-river 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 stock have never exceeded the UMSy threshold of 81\% (Figure 3.4). Generally, poor runs and escapement result primarily from decreased productivity, and mirror the very low productivity of other Alaskan stocks. Conservation measures have been in place to reduce harvests in the effort to pass as much of the run to escapement as possible and these efforts will continue in 2019.


Figure 3.4-Calendar year exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement for large (greater than 659 mm MEF in length) Situk River Chinook salmon, 1976-2018.

Chilkat River Chinook salmon return to northern SEAK and are mostly inside rearing. The Chilkat River stock failed to achieve its escapement goal six 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 has been in place since the 1999 brood year to estimate the harvest of Chilkat Chinook salmon. Recoveries of CWTs indicate some age-4 Chilkat fish are harvested while rearing in SEAK, primarily in the net fisheries. The majority of the harvest is mature fish from sport and commercial troll and drift gillnet fisheries in SEAK. In general, exploitation rates on the Chilkat stock are some of the lowest observed in the region, with a recent 10-year average exploitation rate of $22 \%$, well below the threshold reference value of $40 \%$ (Figure 3.5 ).

Smolt abundance and survival have been estimated for the Chilkat stock since the 1999 brood year. Since the 2008 brood year, there has been no apparent trend in freshwater survival; however, marine survival has been below average for the five 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 $\geq o c e a n ~ a g e-3 ~ C h i l k a t ~ R i v e r ~ C h i n o o k ~ s a l m o n, ~$ 2004-2018.


Figure 3.6-Freshwater and marine survival indices (standardized to a mean of zero) for the Chilkat River stock of Chinook salmon, 1999-2012 brood years.

The Unuk and Chickamin rivers flow into Behm Canal in southern SEAK and Chinook salmon from these rivers are 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 2012 and from 2016 to 2018. 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 four 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 below threshold 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 Chinook salmon is considerably larger and thus these fish are recruited into sport and troll hook and line fisheries as legal sized fish (i.e, 28 inches and larger) at younger ages.

A CWT program was implemented beginning with the 1992 brood year to estimate harvest for the Unuk stock. In sharp contrast to other SEAK stocks, exploitation rates for the Unuk stock have been high in recent years. Some Unuk Chinook salmon are caught while rearing in SEAK but most harvest is germane to 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 $U_{\text {msץ }}$ 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 of large (greater than 659 mm MEF in length) Unuk River Chinook salmon, 1997-2018.

Estimates of smolt abundance and survival are available back to the 1992 brood year. Freshwater survival has, for the most part, shown no apparent pattern. The 2003 and 2005 brood year freshwater survival estimates were some of the lowest on record; however, high freshwater survival occurred in 2006 and in 2012. Unfortunately, freshwater and marine survival have shown an inverse relationship in the time series. The highest freshwater survival for the 2012 brood year coincided with the lowest marine survival, while the highest marine survival for the 2005 brood year coincided with the lowest freshwater survival. Marine survival was near-average and cycled annually over the 1991 to 2005 brood years. However, the 2006 to 2012 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, 1992-2012 brood years.

There is no current CWT program for the Chickamin River. The 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 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 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 $\geq$ ocean age-2 Chickamin River Chinook salmon, 1983-2018.

### 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, similar to the other TBR stocks (Taku and Stikine). This failure cannot be simply explained by overharvest, as the Alsek River stock has one of the lowest exploitation rates for a Chinook salmon stock on the entire Pacific Coast, averaging 8\% between 1976 and 2018. All known harvests occur inriver in the U.S. and Canada and detailed catch accounting and age, sex, length, and genetic sampling programs are in place for U.S. harvests and for sport and Aboriginal harvests in Canada. Most age, sex, length and genetic information is gathered from samples taken at weir across the Klukshu River, an index tributary of the Alsek River. Similar to Situk River Chinook salmon, the Alsek stock is outside rearing and is not exposed to SEAK fisheries while rearing. Exploitation rates have never approached the UMSY threshold of 58\% (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. During this period of poor production, management measures have been in place to reduce harvests in both countries in the effort to pass as much of the run to escapement as possible.


Figure 3.10-Calendar year exploitation rate, spawning escapement, and threshold reference lines for exploitation rate and spawning escapement $\geq 0 c e a n ~ a g e-2 ~ A l s e k ~ R i v e r ~ C h i n o o k ~ s a l m o n, ~$ 1976-2018.

The Taku and Stikine river stocks have also recently experienced reduced productivity and changing return-at-age, 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 and this method has performed well. Since 2009, the escapement goals for these two stocks have been missed four times and in all years since 2016.

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 have essentially no exposure to SEAK fisheries as immature fish and the primary harvest on these stocks is on mature adults.

Both stocks are harvested in terminal marine sport fisheries and incidentally in U.S. marine and Canadian inriver 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 and net fisheries, along with outside sport fisheries. The majority of 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 UMSy threshold of $59 \%$. Since 2009, calendar-year exploitation rates averaged $20 \%$, and escapements failed to meet the escapement goal in 2013 and from 2016 to 2018. Between 1975 and 2008, the average exploitation rate was $14 \%$, and escapements were below the goal in only 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 large (greater than 659 mm MEF in length) Taku River Chinook salmon, 1975-2018.

Since 2009, Stikine River Chinook CY exploitation rates averaged 28\%, and escapements failed to meet the escapement goal in 2009 and from 2016 to 2018. Substantial directed fishing occurred from 2005 to 2008 with exploitation rates averaging $47 \%$, which was over the $U_{\text {MSY }}$ threshold value of $42 \%$; however, the escapement goal was achieved in each of these years. 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 large (greater than 659 mm MEF in length) Stikine River Chinook salmon, 1981-2018.


Figure 3.13-Freshwater and marine survival indices (standardized to a mean of zero) for the Taku River stock of Chinook salmon, 1991-2012 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 low 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, 1998-2012 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 $S_{\text {MSY }}$ 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 and 2018 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, 1979-2014 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, 1985-2018.

### 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 $=38 \%$, range: $13-67 \%$, run years 1990-2018). 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 customary subyearling releases. Adjustments are 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 $S_{\text {MSY }}$ (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, 1986-2015 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 $\mathrm{S}_{\text {msy }}$ 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 $_{\text {MSY }}$ 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 $\mathrm{S}_{\text {MSY }}$ in all years except in 1997 and 2012, when the escapement estimates were below $\mathrm{S}_{\text {MSY }}$ 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 2009-2018).

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, 1990-2018.

Note: Spawning escapement excludes jacks to be consistent with the units represented by the $S_{\text {msr-based }}$ 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\%); data for 2017 are not currently available. Escapement estimates are produced by counting fence (weir) and MR methods. A habitat-based estimate of $\mathrm{S}_{\text {MSY }}$ is available for the Nanaimo River; however, the exploitation rate indicator monitoring program was discontinued after brood year 2004.

Marine survival was generally above the mean for twelve brood years 1985 to 1994, and 2009 to 2011. Fourteen brood years were below the mean from 1995 to 1997, 1999 to 2003, 20052008 and 2012 to 2013. Two brood years were slightly above average in $(1998,2014)$ (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 $\mathrm{S}_{\text {MSY }}$ between 1997 and 2015, and exceeded S MSy from 2016 to 2018 (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, 1985-2015 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, 1988-2018.

### 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, and is currently being assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) for potential for listing under the Canadian Species at Risk Act (SARA). This stock has had a moderate level of enhancement (mean enhanced contribution $30 \%$, years 1987-2018, 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, 1987-2018.


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, 1995-2018.

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).


Figure 3.25-Marine survival index (standardized to a mean of zero) for the Nicola River stock of Chinook salmon, 1985-2014 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 1980 s 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 to this stock group have declined since 2015, with approximately 46,500 returning in 2018. 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 $12 \%$, years 1987-2018), which influences its representativeness for non-enhanced stocks in the stock group.

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 Smsy 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, 1984-2015 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, 1989-2018.

### 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 2018, 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 six of the past seven 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 UMSY. 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, 1981-2015 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, 1984-2018.

### 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 32 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 2018 have not been reviewed by co-managers, although indications are that catches were lower than those in 2017.

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.

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 2018, 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 23,534 in 2018, which is similar to the long term average. 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 2018 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 20,000 in the four 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 2009-2018 was about $18 \%$ lower than the long-term average during 1999-2018 with exception of Lake

Washington, which 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 recent years $(2016,2017)$. 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 $8 \%$ in 2017. 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 (Figure 3.33). Similar to the Washington Coast spring/summer stocks, Washington coastal fall stocks are characterized by escapement declines since the highs of the late 1980s, and generally stable escapements in recent years (Section 2.3.4.2). Over the entire 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 terminal fishery harvest rates that can vary considerably from year to year.

A simultaneous evaluation of spawning escapements and assumed cumulative MRE exploitation rates shows management of Queets River fall Chinook salmon (Figure 3.34) in the safe zone with exploitation rates below Umsy in all years and spawning escapement exceeding $85 \%$ of $S_{\text {MSY }}$ 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 UMSY 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 $\mathrm{U}_{\mathrm{MSr}}$. 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 maturerun 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 below $U_{\text {MSY }}$. 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 1,268 and sport catches above Priest Rapids Dam were 3,385 , so escapement was still well above goal. The synoptic evaluation shows the mid-Columbia Summer stock group in the safe zone in all but two years since 1998 (Figure 3.37). Until this 2015 brood, mid-Columbia Summers demonstrated positive survival deviations since 1995, within less than 1.5 standard deviations (Figure 3.38).


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. Oregon Management Agreement, the Upriver Bright Fall Chinook 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. From 1998-2017, MRE exploitation rates for Upriver Bright and Deschutes stocks have varied between about 40-80\%, while escapements exceeded $\mathrm{S}_{\mathrm{MSY}}$, placing them in the safe zone or the high escapement/high exploitation zone (Figure 3.39, Figure 3.40).

For Lewis River Wild fall Chinook salmon, exploitation rates since 1980 have never exceeded the estimated UMSY, 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) went from positive to negative for the most recent brood, while standardized survivals for Lewis River wild fall Chinook went from negative to slightly positive (Figure 3.44).


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


Figure 3.40-Deschutes River fall Chinook salmon spawning escapement and cumulative maturerun 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 (20092018) average for aggregate escapement is approximately 67,000 . Estimated escapement in 2018 was 58,616 . The abundance forecast expressed in terms of spawning escapement is approximately 73,720 for 2019.
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 $92 \%$ 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 lower-than-normal marine survival, as indicated in Figure 3.45The 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 1976-2012 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 2017 (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 $U_{\text {MSY }}$ presented in this chapter. All of the observed points of escapement and exploitation are within the safe zone. Recent year's escapements (2010-2017) 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 $\mathrm{S}_{\text {MSY }}$ 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, 1979-2017.


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, 1979-2017.


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, 1979-2017.

### 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 110,576 in 2015. The 10-year average (2009-2018) escapement for the MOC is about 49,000. Estimated escapement for the MOC stock group in 2018 was about 17,000. Forecasted escapement for the 2019 return year is at about 25,000 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. The most recent indication that marine survival is on the downswing for this aggregate (Figure 3.49), there is call for skeptical portrait of expectations for the coming year's terminal return in 2019.


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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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 | 35,673 | 664 | 350,704 |
| 2017 | 129,649 | 25,097 | 52,306 | 207,052 | 31,638 | - | 175,414 |
| $2018{ }^{1}$ | 107,565 | 30,777 | 26,400 | 164,742 | 36,966 | - | 127,776 |

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 as treaty catch.
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 IM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | LIM | SIM | LIM | SIM | LIM | SIM |  |
| 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 | 9,825 | 20,897 | 4,649 | 7,111 | 99 | 8,399 | 50,978 |
| 2017 | 14,557 | 14,744 | 5,706 | 8,018 | 754 | 2,902 | 46,681 |
| $2018{ }^{1}$ | 8,608 | 13,751 | 2,747 | 3,860 | 128 | 193 | 29,287 |

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 sport fishery is estimated from 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.

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

| Year | Troll |  | Sport |  | Net |  | Total $I^{1}{ }^{1}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 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 | 9,977 | 21,529 | 5,345 | 8,176 | 280 | 11,692 | 57,000 |
| 2017 | 14,871 | 15,146 | 6,764 | 9,504 | 2,748 | 10,833 | 59,867 |
| $2018{ }^{2}$ | 8,910 | 14,407 | 3,414 | 4,797 | 1,099 | 3,509 | 36,136 |

${ }^{1}$ 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 Ianded catch (LC), releases (Rel.), and incidental mortality (IM).

| Year | Transboundary Rivers |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | First Nations |  |  | Net |  |  | Sport |  |  | Total |  |  |
|  | 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 |
| 2018 | 172 | 0 | 8 | 21 | 0 | 1 | 0 | 0 | 0 | 193 | 0 | 9 |

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 |
| 2018 | 72,276 | 36,700 | 108,976 |

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 IM |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | LIM | SIM | LIM | SIM |  |
| 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 |
| 2018 | 4,450 | 2,269 | 7,694 | 0 | 14,413 |

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 <br> 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 |
| -continued- |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Table A7.-Page 2 of 2.

|  | Area 1-5 First Nations |  |  | Area 1-5 Net |  |  | Tyee Test Fishery |  |  | Area 3-5 Sport |  |  | Area 1-5 <br> Freshwater Sport |  |  | Total |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Year | 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 | 0 | 26 | 7,017 |  | 253 | 421 |  | 29 | 16,990 | 3,067 | 3,346 |
| 2013 | 8,557 |  | 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 |  | 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 | 0 | 237 | 36,910 | 2,309 | 3,636 |
| 2016 | 9,051 |  | 416 | 1,222 | 2,219 | 1,851 | 392 | 0 | 18 | 10,043 | 2,190 | 710 | 2,246 | 0 | 155 | 22,954 | 4,409 | 3,151 |
| 2017 | 9,015 |  | 415 | 1,655 | 1,506 | 1,301 | 375 | 0 | 17 | 10,108 | 5,308 | 1,208 | 1,240 | 909 | 260 | 22,393 | 7,723 | 3,201 |
| 2018 | 11,766 |  | 541 | 0 | 1,378 | 1,119 | 671 | 20 | 50 | 5,821 | 5,980 | 1,160 | 0 | 0 | 0 | 18,258 | 7,378 | 2,870 |

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 |

[^2]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 |  | 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 |
| 2018 | 1,567 |  | 72 | 5,162 | 1,989 | 1,684 | 0 | 0 | 0 | 7,704 | 96 | 293 | 546 |  | 38 | 14,979 | 2,085 | 2,087 |

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 | 66,156 | 135,210 |
| 2013 | 49,526 | 67,345 | 116,871 |
| 2014 | 133,499 | 59,206 | 192,705 |
| 2015 | 68,522 | 50,452 | 118,974 |
| 2016 | 60,478 | 42,615 | 103,093 |
| $2017{ }^{4}$ | 60,356 | 57,060 | 117,416 |
| 2018 | 36,065 | 49,265 | 85,330 |

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]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 | 11,186 | 3,658 | 16,687 |
| 2013 | 852 | 1,734 | 11,350 | 3,522 | 17,458 |
| 2014 | 2,293 | 3,161 | 9,447 | 3,642 | 18,543 |
| 2015 | 1,383 | 932 | 7,471 | 1,765 | 11,551 |
| 2016 | 1,047 | 1,853 | 4,412 | 2,868 | 10,180 |
| $2017{ }^{6}$ | 1,048 | 2,270 | 7,105 | 3,540 | 13,963 |
| 2018 | 751 | 718 | 6,245 | 8,715 | 16,429 |

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).

| 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 |
| 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 |

-continued-

Table A11.-Page 2 of 2.

| Year | West Coast Vancouver Island ISBM |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | First ${ }^{\text {Nations }}{ }^{1}$ |  |  | 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 | 26,693 | 17,555 | 5,212 | 0 | 0 | 0 | 46,607 | 18,076 | 6,576 |
| 2013 | 1,101 | 0 | 51 | 8,854 | 259 | 597 | 23,152 | 19,965 | 5,431 | 0 | 0 | 0 | 33,107 | 20,224 | 6,079 |
| 2014 | 4,280 |  | 197 | 19,090 | 53 | 928 | 28,756 | 19,183 | 5,667 | 0 | 0 | 0 | 52,126 | 19,236 | 6,792 |
| 2015 | 9,743 |  | 448 | 10,131 | 362 | 751 | 34,838 | 17,125 | 5,692 | 0 | 0 | 0 | 54,712 | 17,487 | 6,891 |
| 2016 | 14,091 | 0 | 648 | 5,125 | 925 | 913 | 23,843 | 27,827 | 6,988 | 0 | 0 | 0 | 43,059 | 28,752 | 8,549 |
| 2017 | 17,533 | 21 | 826 | 30,486 | 687 | 4,031 | 40,107 | 18,440 | 6,308 | 0 | 0 | 0 | 88,126 | 19,148 | 11,165 |
| 2018 | 24,586 | 120 | 1,244 | 21,663 | 257 | 5,507 | 33,631 | 20,131 | 6,186 | 0 | 0 | 0 | 79,880 | 20,508 | 12,937 |

Note: NA = Not available.
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).

| 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 |
| 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 | 8,512 | 8,494 | 2,218 | 8,870 | 9,006 | 2,588 |
| 2013 | 258 | 0 | 12 | 35 | 241 | 181 | 0 | 0 | 0 | 8,894 | 7,555 | 2,064 | 9,187 | 7,796 | 2,257 |
| 2014 | 1,637 | 0 | 75 | 311 | 3,634 | 2,840 | 0 | 0 | 0 | 10,093 | 7,592 | 2,154 | 12,041 | 11,226 | 5,070 |
| 2015 | 261 |  | 12 | 54 | 1,162 | 848 | 0 | 0 | 0 | 13,475 | 10,694 | 2,983 | 13,790 | 11,856 | 3,843 |
| 2016 | 347 | 0 | 16 | 0 | 15 | 13 | 0 | 0 | 0 | 9,261 | 8,021 | 2,179 | 9,608 | 8,036 | 2,208 |
| 2017 | 216 | 7 | 17 | 12 | 747 | 544 | 0 | 0 | 0 | 14,053 | 15,984 | 4,038 | 14,281 | 16,738 | 4,599 |
| 2018 | 507 | 0 | 23 | 28 | 1,678 | 1,458 | 0 | 0 | 0 | 14,045 | 15,434 | 3,932 | 14,580 | 17,112 | 5,413 |

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).

| 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 |
| 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 ${ }^{1}$ |  |  | $\text { Troll }{ }^{1,2}$ |  |  | 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 | 28,194 | 59,954 | 13,457 | 31,290 | 59,954 | 13,599 |
| 2013 | 843 | 0 | 39 | 4 | 188 | 138 | 0 | 0 | 0 | 45,769 | 106,655 | 23,636 | 46,616 | 106,843 | 23,813 |
| 2014 | 28 | 1 | 2 | 0 | 44 | 32 | 0 | 0 | 0 | 51,661 | 59,451 | 14,979 | 51,689 | 59,496 | 15,013 |
| 2015 |  |  |  | 0 | 13 | 10 | 0 | 17 | 3 | 76,684 | 47,325 | 14,378 | 76,684 | 47,355 | 14,391 |
| 2016 | 650 | 0 | 30 | 3 | 136 | 115 | 0 | 42 | 8 | 50,713 | 88,169 | 20,428 | 51,366 | 88,347 | 20,581 |
| 2017 | 1,086 | 2 | 52 | 0 | 62 | 47 | 0 | 33 | 7 | 68,234 | 108,417 | 25,524 | 69,320 | 108,514 | 25,629 |
| 2018 | 1,033 | 0 | 48 | 0 | 0 | 0 | 0 | 0 | 0 | 76,159 | 94,676 | 23,433 | 77,192 | 94,676 | 23,480 |

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 ${ }^{1}$ |  |  | $\mathrm{Net}^{2}$ |  |  | Freshwater Sport ${ }^{\text {3,4 }}$ |  |  | 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 ${ }^{1}$ |  |  | $\mathrm{Net}^{2}$ |  |  | Freshwater Sport ${ }^{\text {3,4 }}$ |  |  | 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 |
| 2018 | 17,687 | 463 | 1,252 | 1,953 | 3,542 | 3,441 | 9,291 | 303 | 699 | 28,931 | 4,308 | 5,392 |

${ }^{1}$ 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 |  |  | $\mathrm{Net}^{1}$ |  |  | 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 | 24,510 | 21,436 | 5,807 | 24,794 | 22,560 | 6,660 |
| 2013 | 0 |  |  | 251 | 1,411 | 1,098 | 34,725 | 30,005 | 8,157 | 34,976 | 31,416 | 9,255 |
| 2014 | 0 |  |  | 137 | 495 | 475 | 21,704 | 19,002 | 5,146 | 21,841 | 19,497 | 5,621 |
| 2015 | 0 |  |  | 17 | 2,610 | 1,885 | 47,051 | 42,327 | 11,373 | 47,068 | 44,937 | 13,258 |
| 2016 | 0 |  |  | 0 | 1,256 | 924 | 30,852 | 48,395 | 11,421 | 30,852 | 49,651 | 12,345 |
| 2017 | 0 |  |  | 50 | 1,870 | 1,374 | 37,608 | 46,601 | 11,542 | 37,658 | 48,471 | 12,917 |
| 2018 | 0 |  |  | 29 | 1,214 | 894 | 37,624 | 59,848 | 14,087 | 37,653 | 61,062 | 14,981 |

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 |

Table A16.-Page 2 of 2.

| 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 | 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 | 1,703 | NA | 43 | 50 | NA | 4 | 9,894 | 44,479 | 13,355 | 11,647 | 44,479 | 13,402 |
| $2018{ }^{1}$ | 1,764 | NA | 44 | 1,838 | NA | 147 | 10,452 | 46,987 | 14,108 | 14,054 | 46,987 | 14,299 |

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, 4 B 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 |

[^4]Table A17.-Page 2 of 2.

| 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 | 0 | NA | 0 | 2,630 | 40 | 242 | 11,321 | 12,587 | 5,015 | 13,951 | 12,627 | 5,257 |
| $2018{ }^{1}$ | 0 | NA | 0 | 4,256 | 41 | 373 | 8,682 | 9,652 | 3,846 | 12,938 | 9,693 | 4,219 |

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 |

[^5]Table A18.-Page 2 of 2.

| 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 | 58,201 | NA | 4,656 | 19,898 | 94,657 | 28,253 | 78,099 | 94,657 | 32,909 |
| 2016 | 79,525 | NA | 6,362 | 22,944 | 52,327 | 17,351 | 102,469 | 52,327 | 23,713 |
| 2017 | 135,553 | NA | 10,844 | 41,352 | 133,637 | 41,811 | 176,905 | 133,637 | 52,655 |
| $2018{ }^{1}$ | 111,606 | NA | 8,928 | 28,065 | 90,696 | 28,376 | 139,671 | 90,696 | 37,304 |

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 |

Table A19.-Page 2 of 2.

| 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 | 20,491 | NA | 410 | 13,626 | NA | 940 | 34,117 | NA | 1,350 |
| $2018{ }^{1}$ | 4,143 | NA | 83 | 16,747 | NA | 1156 | 20,890 | NA | 1,238 |

Note: Net = Areas $2 \mathrm{~A}-2 \mathrm{M}$ and Areas $72 \mathrm{~B}-73 \mathrm{H}$; 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 |
| 1998 | 20,615 | 12,496 | 3,577 | 0 | 0 | 0 | 2,292 | 2,676 | 463 | 22,907 | 15,172 | 4,040 |

-continued-

Table A20.-Page 2 of 2.

| Year | Washington/Oregon North of Cape Falcon |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Troll |  |  | Net |  |  | Sport |  |  | Total |  |  |
|  | LC | Rel. | IM | LC | Rel. | IM | LC | Rel. | IM | LC | Rel. | IM |
| 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 | 59,974 | NA | 1,499 | 0 | 0 | 0 | 21,945 | 18,604 | 3,383 | 81,919 | 18,604 | 4,882 |
| $2018{ }^{1}$ | 47,792 | NA | 1,195 | 0 | 0 | 0 | 10,603 | 10,321 | 1,834 | 58,395 | 10,321 | 3,029 |

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 |
| 19791,2 | 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 |
| 2000 | 21,760 | NA | 653 | 78,717 | 0 | 2,362 | 49,631 | NA | 3,425 | 150,108 | NA | 6,439 |

[^6]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 |
| 2001 | 43,278 | 3,348 | 2,236 | 201,673 | 0 | 6,050 | 141,853 | 16,406 | 12,984 | 386,804 | 19,754 | 21,270 |
| 2002 | 72,683 | 6,699 | 4,056 | 196,619 | 0 | 5,899 | 150,736 | 21,619 | 14,587 | 420,038 | 28,317 | 24,542 |
| 2003 | 76,797 | 2,395 | 2,975 | 159,067 | 0 | 4,772 | 149,156 | 15,966 | 13,276 | 385,021 | 18,361 | 21,023 |
| 2004 | 77,877 | 5,061 | 3,869 | 168,220 | 0 | 5,047 | 148,961 | 14,787 | 13,061 | 395,058 | 19,847 | 21,977 |
| 2005 | 46,102 | 1,685 | 1,855 | 138,197 | 0 | 4,146 | 91,018 | 32,236 | 12,429 | 275,317 | 33,921 | 18,430 |
| 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 | 88,868 | 10,070 | 8,030 | 290,907 | 11,700 | 14,548 |
| 2009 | 55,675 | 921 | 1,928 | 121,760 | 0 | 3,653 | 90,213 | 10,095 | 8,040 | 267,648 | 11,016 | 13,621 |
| 2010 | 90,673 | 1,684 | 3,192 | 218,915 | 0 | 6,567 | 166,147 | 12,152 | 13,603 | 475,735 | 13,836 | 23,362 |
| 2011 | 92,396 | 1,765 | 3,266 | 183,204 | 0 | 5,496 | 150,135 | 11,157 | 12,263 | 425,734 | 12,922 | 21,025 |
| 2012 | 75,891 | 1,260 | 2,630 | 166,440 | 0 | 4,993 | 153,034 | 16,067 | 13,376 | 395,366 | 17,327 | 20,999 |
| 2013 | 122,782 | 1,037 | 3,974 | 259,213 | 0 | 7,776 | 164,018 | 30,147 | 16,688 | 546,012 | 31,184 | 28,438 |
| 2014 | 135,519 | 2,182 | 4,677 | 324,783 | 0 | 9,743 | 184,820 | 45,257 | 20,723 | 645,122 | 47,439 | 35,144 |
| 2015 | 135,390 | 3,738 | 5,108 | 336,688 | 0 | 10,101 | 252,400 | 42,931 | 25,018 | 724,477 | 46,669 | 40,227 |
| 2016 | 88,080 | 1,887 | 3,171 | 174,219 | 0 | 5,227 | 146,694 | 24,365 | 14,085 | 408,992 | 26,252 | 22,482 |
| 2017 | 50,600 | 0 | 1,518 | 137,525 | 0 | 4,126 | 121,263 | 14,757 | 10,874 | 309,388 | 14,757 | 16,518 |
| $2018{ }^{3}$ | 33,676 | 0 | 1,010 | 78,594 | 1 | 2,358 | 62,251 | 9,660 | 6,023 | 174,520 | 9,661 | 9,392 |

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 |

-continued-

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 | 69,790 | NA | 4,816 | 70,954 | NA | 4,845 |
| 2016 | 182 | NA | 5 | 31,967 | NA | 2,206 | 32,862 | NA | 2,210 |
| 2017 | 70 | NA | 2 | 29,559 | NA | 2,040 | 34,432 | NA | 2,041 |
| $2018{ }^{1}$ | 322 | NA | 8 | 24,398 | NA | 1,683 | 24,720 | NA | 1,692 |

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 NonTreaty | US ISBM ${ }^{4}$ | US Total | $\begin{gathered} \text { NBC } \\ \text { AABM }^{2} \end{gathered}$ | $\begin{aligned} & \text { WCVI } \\ & \text { AABM }^{2} \end{aligned}$ | 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 |
| 1998 | 243,152 | 27,441 | 250,453 | 493,604 | 143,202 | 9,317 | 201,190 | 353,709 | 847,313 |

-continued-

Table A23.-Page 2 of 2.

| Year ${ }^{1}$ | Southeast <br> Alaska <br> AABM ${ }^{2,3}$ | Southeast Alaska NonTreaty | US ISBM ${ }^{4}$ | US Total ${ }^{6}$ | $\begin{gathered} \text { NBC } \\ \text { AABM }^{2} \end{gathered}$ | $\begin{aligned} & \text { WCVI } \\ & \text { AABM }^{2} \end{aligned}$ | Canada ISBM ${ }^{4,5}$ | Canada <br> Total | PSC Total ${ }^{6}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1999 | 198,842 | 52,178 | 358,878 | 557,721 | 84,324 | 38,540 | 229,952 | 352,816 | 910,537 |
| 2000 | 186,493 | 76,797 | 336,259 | 522,752 | 32,048 | 88,617 | 174,855 | 295,520 | 818,272 |
| 2001 | 186,919 | 78,815 | 704,387 | 891,306 | 43,334 | 120,304 | 211,549 | 375,187 | 1,266,494 |
| 2002 | 357,133 | 69,401 | 806,960 | 1,164,092 | 149,831 | 157,920 | 244,613 | 552,364 | 1,716,457 |
| 2003 | 380,152 | 59,284 | 717,942 | 1,098,094 | 194,797 | 173,561 | 258,408 | 626,766 | 1,724,860 |
| 2004 | 417,019 | 82,249 | 722,507 | 1,139,526 | 241,508 | 215,252 | 302,426 | 759,186 | 1,898,712 |
| 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 | 524,952 | 697,858 | 95,647 | 145,726 | 184,055 | 425,428 | 1,123,285 |
| 2009 | 227,954 | 65,693 | 463,158 | 691,112 | 109,470 | 124,617 | 209,710 | 443,797 | 1,134,909 |
| 2010 | 230,611 | 54,141 | 780,189 | 1,010,800 | 136,613 | 139,047 | 165,961 | 441,621 | 1,452,421 |
| 2011 | 291,161 | 66,213 | 761,066 | 1,052,228 | 122,660 | 204,232 | 283,031 | 609,923 | 1,662,151 |
| 2012 | 242,821 | 52,498 | 782,830 | 1,025,650 | 120,306 | 135,210 | 201,258 | 456,774 | 1,482,424 |
| 2013 | 191,388 | 65,864 | 935,767 | 1,127,155 | 115,914 | 116,871 | 200,802 | 433,587 | 1,560,742 |
| 2014 | 435,195 | 57,327 | 1,004,891 | 1,440,086 | 216,901 | 192,705 | 242,054 | 651,660 | 2,091,746 |
| 2015 | 335,026 | 68,313 | 1,127,307 | 1,462,333 | 158,903 | 118,974 | 306,229 | 584,106 | 2,046,439 |
| 2016 | 350,704 | 36,338 | 649,321 | 1,000,025 | 190,181 | 103,093 | 195,195 | 488,469 | 1,488,494 |
| 2017 | 175,414 | 31,638 | 662,359 | 837,773 | 143,330 | 117,416 | 272,717 | 533,463 | 1,371,236 |
| 2018 | 127,776 | 36,966 | 445,188 | 572,965 | 108,976 | 85,330 | 271,666 | 465,972 | 1,038,937 |

${ }^{1}$ 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.
${ }_{6}{ }^{\text {Does not include SEAK AABM fishery nontreaty catch from hatchery add-on and terminal exclusion. }}$

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 NonTreaty | 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 | 60,932 | 99,055 | 6,335 | 12,312 | 24,828 | 43,475 | 142,529 |
| 2009 | 44,963 | 11,052 | 69,674 | 114,637 | 9,705 | 15,817 | 38,911 | 64,433 | 179,069 |
| 2010 | 38,420 | 5,523 | 74,315 | 112,735 | 12,739 | 16,017 | 24,717 | 53,473 | 166,208 |
| 2011 | 41,613 | 9,864 | 87,967 | 129,580 | 18,619 | 17,005 | 32,967 | 68,591 | 198,171 |
| 2012 | 45,890 | 19,635 | 92,053 | 137,944 | 11,556 | 16,687 | 39,338 | 67,581 | 205,525 |
| 2013 | 59,382 | 42,839 | 101,672 | 161,054 | 19,926 | 17,458 | 57,961 | 95,345 | 256,399 |
| 2014 | 50,945 | 7,647 | 85,133 | 136,078 | 17,276 | 18,543 | 52,860 | 88,679 | 224,757 |
| 2015 | 49,148 | 21,647 | 108,385 | 157,533 | 21,673 | 11,551 | 50,614 | 83,838 | 241,371 |
| 2016 | 50,978 | 6,021 | 66,314 | 117,292 | 14,136 | 10,180 | 51,228 | 75,544 | 192,836 |
| 2017 | 46,681 | 13,187 | 96,105 | 142,786 | 19,299 | 13,963 | 63,297 | 96,559 | 239,344 |
| 2018 | 29,287 | 6,848 | 71,173 | 100,461 | 14,413 | 16,429 | 67,169 | 98,011 | 198,472 |

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 <br> Alaska <br> AABM | Southeast Alaska NonTreaty | US ISBM | US Total ${ }^{2}$ | NBC AABM | WCVI <br> 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 | 585,884 | 796,912 | 101,982 | 158,038 | 208,882 | 468,902 | 1,265,815 |
| 2009 | 272,917 | 76,746 | 532,832 | 805,749 | 119,175 | 140,434 | 248,621 | 508,230 | 1,313,978 |
| 2010 | 269,031 | 59,664 | 854,503 | 1,123,535 | 149,352 | 155,064 | 190,678 | 495,094 | 1,618,629 |
| 2011 | 332,774 | 76,076 | 849,033 | 1,181,808 | 141,279 | 221,237 | 315,998 | 678,514 | 1,860,322 |
| 2012 | 288,711 | 72,133 | 874,883 | 1,163,594 | 131,862 | 151,897 | 240,596 | 524,355 | 1,687,949 |
| 2013 | 250,770 | 108,703 | 1,037,439 | 1,288,210 | 135,840 | 134,329 | 258,763 | 528,932 | 1,817,142 |
| 2014 | 486,141 | 64,974 | 1,090,024 | 1,576,164 | 234,177 | 211,248 | 294,914 | 740,339 | 2,316,503 |
| 2015 | 384,174 | 89,960 | 1,235,692 | 1,619,865 | 180,576 | 130,525 | 356,843 | 667,944 | 2,287,810 |
| 2016 | 401,683 | 42,359 | 715,635 | 1,117,317 | 204,317 | 113,273 | 246,423 | 564,013 | 1,681,331 |
| 2017 | 222,094 | 44,825 | 758,464 | 980,558 | 162,629 | 131,379 | 336,014 | 630,022 | 1,610,580 |
| 2018 | 157,063 | 43,814 | 516,362 | 673,425 | 123,389 | 101,759 | 338,835 | 563,983 | 1,237,408 |

${ }^{1}$ 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, 1975-2018

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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 | 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 | 0.13 | 3,165 | 0.12 | 2,313 | 0.15 |
| 1992 | 1,595 | 0.01 | 5,277 | 0.15 | 4,223 | 0.12 | 1,644 | 0.15 |
| 1993 | 952 | 0.03 | 4,463 | 0.15 | 5,160 | 0.12 | 1,848 | 0.15 |
| 1994 | 1,271 | 0.03 | 6,792 | 0.12 | 3,435 | 0.12 | 1,843 | 0.15 |
| 1995 | 4,330 | 0.04 | 3,768 | 0.18 | 3,730 | 0.12 | 2,309 | 0.11 |
| 1996 | 1,800 | 0.10 | 4,902 | 0.13 | 5,639 | 0.12 | 1,587 | 0.19 |
| 1997 | 1,878 | 0.10 | 8,089 | 0.12 | 2,970 | 0.09 | 1,292 | 0.15 |
| 1998 | 924 | 0.14 | 3,656 | 0.11 | 4,132 | 0.10 | 1,857 | 0.15 |
| 1999 | 1,461 | 0.10 | 2,258 | 0.14 | 3,914 | 0.13 | 2,337 | 0.15 |
| 2000 | 1,785 | 0.08 | 2,029 | 0.13 | 5,872 | 0.11 | 3,805 | 0.15 |
| 2001 | 656 | 0.03 | 4,514 | 0.16 | 10,541 | 0.11 | 5,177 | 0.14 |
| 2002 | 1,000 | 0.01 | 4,034 | 0.11 | 6,988 | 0.12 | 5,007 | 0.14 |
| 2003 | 2,117 | 0.03 | 5,631 | 0.12 | 5,546 | 0.08 | 4,579 | 0.15 |
| 2004 | 698 | 0.03 | 3,406 | 0.13 | 3,963 | 0.08 | 4,268 | 0.13 |
| 2005 | 595 | 0.00 | 3,361 | 0.16 | 4,742 | 0.08 | 4,257 | 0.15 |
| 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 | 0.12 | 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. | CV |
| 2012 | 322 |  | 1,723 | 0.15 | 956 | 0.12 | 2,109 | 0.15 |
| 2013 | 912 |  | 1,719 | 0.19 | 1,135 | 0.12 | 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 | 329 |  | 1,380 | 0.14 | 1,463 | 0.12 | 964 | 0.15 |
| 2017 | 1,187 |  | 1,173 | 0.20 | 1,203 | 0.12 | 722 | 0.15 |
| $2018^{2}$ | 420 |  | 873 | 0.19 | 1,971 | 0.12 | 2,052 | 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.
${ }^{2}$ Preliminary data.

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

| Year | Transboundary River Stocks |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Alsek R. |  | Taku R. |  | Stikine R. |  |
|  | Esc | CV | Esc | CV | Esc | CV |
| 1975 |  |  | 12,920 | 0.38 | 7,571 | 0.21 |
| 1976 | 5,282 | 0.38 | 24,582 | 0.38 | 5,723 | 0.16 |
| 1977 | 12,706 | 0.37 | 29,496 | 0.38 | 11,445 | 0.16 |
| 1978 | 12,034 | 0.37 | 17,124 | 0.38 | 6,835 | 0.21 |
| 1979 | 17,354 | 0.39 | 21,617 | 0.38 | 12,610 | 0.21 |
| 1980 | 10,862 | 0.36 | 39,239 | 0.38 | 30,573 | 0.16 |
| 1981 | 8,502 | 0.37 | 49,559 | 0.26 | 36,057 | 0.21 |
| 1982 | 9,475 | 0.37 | 23,847 | 0.26 | 40,488 | 0.16 |
| 1983 | 10,344 | 0.37 | 9,795 | 0.30 | 6,424 | 0.21 |
| 1984 | 7,238 | 0.38 | 20,778 | 0.30 | 13,995 | 0.21 |
| 1985 | 6,127 | 0.38 | 35,916 | 0.34 | 16,037 | 0.15 |
| 1986 | 11,069 | 0.36 | 38,110 | 0.26 | 14,889 | 0.15 |
| 1987 | 11,141 | 0.37 | 28,935 | 0.27 | 24,632 | 0.15 |
| 1988 | 8,717 | 0.36 | 44,524 | 0.25 | 37,554 | 0.15 |
| 1989 | 10,119 | 0.37 | 40,329 | 0.14 | 24,282 | 0.15 |
| 1990 | 8,609 | 0.38 | 52,143 | 0.18 | 22,619 | 0.15 |
| 1991 | 11,625 | 0.38 | 51,645 | 0.24 | 23,206 | 0.15 |
| 1992 | 5,773 | 0.37 | 55,889 | 0.26 | 34,129 | 0.15 |
| 1993 | 13,855 | 0.36 | 66,125 | 0.28 | 58,962 | 0.15 |
| 1994 | 15,863 | 0.36 | 48,368 | 0.29 | 33,094 | 0.15 |
| 1995 | 24,772 | 0.37 | 33,805 | 0.15 | 16,784 | 0.15 |
| 1996 | 15,922 | 0.38 | 79,019 | 0.11 | 28,949 | 0.10 |
| 1997 | 12,494 | 0.37 | 114,938 | 0.16 | 26,996 | 0.11 |
| 1998 | 6,833 | 0.34 | 31,039 | 0.32 | 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 | 0.20 | 50,875 | 0.12 |
| 2003 | 5,904 | 0.45 | 36,435 | 0.18 | 46,824 | 0.13 |
| 2004 | 7,083 | 0.52 | 75,032 | 0.14 | 48,900 | 0.08 |
| 2005 | 4,478 | 0.36 | 38,725 | 0.13 | 40,501 | 0.07 |
| 2006 | 2,323 | 0.35 | 42,296 | 0.12 | 24,405 | 0.28 |
| 2007 | 2,827 | 0.36 | 14,854 | 0.30 | 14,560 | 0.15 |
| 2008 | 1,885 | 0.35 | 27,383 | 0.11 | 18,352 | 0.16 |
| 2009 | 6,239 | 0.36 | 22,801 | 0.10 | 11,086 | 0.22 |
| 2010 | 9,518 | 0.36 | 29,302 | 0.09 | 15,180 | 0.13 |
| 2011 | 6,668 | 0.36 | 27,523 | 0.15 | 14,569 | 0.11 |
| 2012 | 2,660 | 0.36 | 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 |  |
| 2013 | 5,044 | 0.36 | 18,002 | 0.38 | 16,735 | 0.17 |  |
| 2014 | 3,357 | 0.36 | 23,532 | 0.09 | 24,360 | 0.18 |  |
| 2015 | 5,697 | 0.36 | 28,850 | 0.14 | 21,343 | 0.16 |  |
| 2016 | 2,574 | 0.36 | 12,381 | 0.12 | 10,343 | 0.19 |  |
| 2017 | 1,718 | 0.36 | 8,754 | 0.10 | 7,206 | 0.29 |  |
| 2018 | 4,312 | 0.15 | 7,271 | 0.11 | 8,355 | 0.35 |  |
| 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.

| Year |  | Northern British Columbia |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Area 1 Yakoun R. Esc | Area $3^{1}$ <br> Nass R. |  |  | Area 4 <br> Skeena R. |  |  | Area 8 Dean R. index | Area $\mathbf{8}^{\mathbf{2}}$ Atnarko R. |  | Wild ${ }^{4}$ | Area 9 <br> Rivers Inlet | Area 10 Smith Inlet ${ }^{5}$ |
|  |  | Above GW ${ }^{1}$ | Esc | t. run | Total Esc | GSI ${ }^{3}$ esc | GSI ${ }^{3} \mathbf{S D}$ |  | 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 |

[^7]Table B3.-Page 2 of 2.

| Year |  | Northern British Columbia |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Area 1 Yakoun R. Esc | Area $\mathbf{3}^{1}$ <br> 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 | NA |  |
| 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 | NA |  |
| 2017 | NA | 4,207 | 4,984 | 8,891 | 11,920 | 18,480 | 4,709 | 725 | 10,308 | 0.046 | 5,464 | NA |  |
| 2018 | NA | 12,626 | 14,957 | 19,732 | 37,481 | 33,802 | 5,416 | NA | 12,774 | 0.071 | 5,328 | NA |  |

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.

| Year | Lower Strait of Georgia |  | Upper Strait of Georgia ${ }^{1,2}$ |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 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 |
| 2018 | 2,961 | 14,353 | 872 | 9,336 | 142 | 302 | 259 | 10,911 |
| 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.

| Year | WCVI ${ }^{1}$ |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 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 |
| 2018 | 723 | 3,579 | 1,442 | 555 | 420 | 918 | 7,637 |

${ }^{1}$ 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.

| Year | Fraser River |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Fraser <br> Spring <br> Age 1.2 <br> Esc | Fraser <br> Spring <br> Age 1.3 <br> Esc | Fraser Summer Age 0.3 Esc | Fraser Summer Age 1.3 Esc | Fraser <br> Spring/ Summer <br> t. run | Harrison |  | Lower Shuswap ${ }^{1}$ |  |
|  |  |  |  |  |  | Esc | CV | Esc | CV |
| 1975 | 8,360 | 7,656 | 41,134 | 17,294 | 74,445 |  |  | 31,570 | 0.35 |
| 1976 | 5,575 | 9,050 | 5,909 | 12,754 | 33,288 |  |  | 3,347 | 0.41 |
| 1977 | 4,458 | 11,213 | 25,780 | 16,748 | 58,236 |  |  | 15,503 | 0.36 |
| 1978 | 5,209 | 15,092 | 23,644 | 17,561 | 61,549 |  |  | 17,220 | 0.36 |
| 1979 | 3,437 | 14,062 | 24,892 | 9,462 | 109,910 |  |  | 16,453 | 0.36 |
| 1980 | 7,460 | 15,800 | 10,237 | 12,634 | 74,127 |  |  | 5,723 | 0.39 |
| 1981 | 3,718 | 10,927 | 16,032 | 11,879 | 67,248 |  |  | 8,248 | 0.37 |
| 1982 | 6,637 | 12,729 | 7,708 | 13,086 | 73,291 |  |  | 2,894 | 0.42 |
| 1983 | 3,264 | 24,081 | 9,206 | 15,091 | 73,102 |  |  | 5,396 | 0.14 |
| 1984 | 8,068 | 29,471 | 15,427 | 13,447 | 97,068 | 120,835 | 0.08 | 7,582 | 0.08 |
| 1985 | 11,800 | 42,380 | 20,103 | 16,020 | 119,724 | 174,776 | 0.11 | 10,539 | 0.06 |
| 1986 | 12,604 | 49,399 | 31,083 | 28,549 | 150,924 | 162,594 | 0.07 | 20,334 | 0.35 |
| 1987 | 6,434 | 48,322 | 29,318 | 21,631 | 130,854 | 79,036 | 0.06 | 16,453 | 0.36 |
| 1988 | 5,501 | 39,903 | 40,434 | 27,948 | 134,516 | 35,114 | 0.07 | 24,331 | 0.35 |
| 1989 | 7,794 | 29,700 | 31,990 | 14,494 | 112,808 | 74,683 | 0.11 | 18,378 | 0.36 |
| 1990 | 4,482 | 40,689 | 35,190 | 27,096 | 136,765 | 177,373 | 0.10 | 22,319 | 0.35 |
| 1991 | 6,589 | 27,182 | 33,689 | 19,898 | 114,932 | 90,636 | 0.11 | 16,453 | 0.36 |
| 1992 | 8,656 | 30,226 | 43,313 | 22,415 | 123,456 | 130,409 | 0.08 | 22,920 | 0.35 |
| 1993 | 14,540 | 33,201 | 18,773 | 19,041 | 115,359 | 118,997 | 0.07 | 9,117 | 0.37 |
| 1994 | 16,440 | 52,275 | 37,768 | 18,085 | 157,741 | 98,342 | 0.07 | 28,743 | 0.35 |
| 1995 | 18,000 | 42,974 | 27,938 | 24,323 | 145,663 | 28,616 | 0.00 | 16,453 | 0.36 |
| 1996 | 26,627 | 31,379 | 67,978 | 35,339 | 197,386 | 37,392 | 0.06 | 34,757 | 0.35 |
| 1997 | 22,251 | 33,920 | 59,170 | 34,397 | 203,977 | 70,514 | 0.10 | 22,519 | 0.35 |
| 1998 | 5,105 | 26,163 | 86,790 | 31,542 | 182,483 | 200,258 | 0.09 | 34,255 | 0.35 |
| 1999 | 11,409 | 18,185 | 68,007 | 19,205 | 147,333 | 104,415 | 0.11 | 47,271 | 0.36 |
| 2000 | 16,002 | 21,542 | 46,488 | 21,868 | 142,948 | 77,754 | 0.10 | 27,800 | 0.03 |
| 2001 | 18,210 | 25,479 | 78,150 | 25,302 | 190,639 | 108,502 | 0.15 | 35,744 | 0.03 |
| 2002 | 24,477 | 36,563 | 112,089 | 29,561 | 242,685 | 83,011 | 0.08 | 54,219 | 0.03 |
| 2003 | 28,740 | 45,349 | 89,299 | 44,109 | 259,860 | 246,986 | 0.08 | 39,910 | 0.35 |
| 2004 | 20,427 | 28,706 | 56,471 | 32,339 | 197,356 | 139,126 | 0.05 | 16,963 | 0.03 |
| 2005 | 8,983 | 20,029 | 93,785 | 20,181 | 183,598 | 88,589 | 0.06 | 17,893 | 0.02 |
| 2006 | 9,601 | 20,077 | 179,791 | 21,362 | 273,035 | 60,421 | 0.13 | 59,084 | 0.03 |
| 2007 | 2,474 | 10,789 | 73,583 | 11,124 | 124,752 | 76,483 | 0.07 | 15,926 | 0.03 |
| 2008 | 11,774 | 15,373 | 89,405 | 17,340 | 175,193 | 41,603 | 0.07 | 14,922 | 0.03 |
| 2009 | 2,173 | 24,321 | 86,318 | 21,596 | 175,005 | 70,142 | 0.06 | 25,288 | 0.02 |
| 2010 | 9,406 | 15,584 | 158,003 | 20,377 | 239,622 | 103,558 | 0.06 | 71,353 | 0.02 |
| 2011 | 5,181 | 10,998 | 126,679 | 16,332 | 216,117 | 123,647 | 0.05 | 18,895 | 0.02 |
| 2012 | 11,359 | 11,186 | 47,695 | 9,769 | 113,575 | 44,467 | 0.09 | 4,091 | 0.03 |

-continued-

Appendix B6.-Page 2 of 2.

| Year | Fraser River |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Fraser Spring Age 1.2 Esc | Fraser Spring Age 1.3 <br> Esc | Fraser Summer Age 0.3 Esc | Fraser Summer Age 1.3 Esc | Fraser <br> Spring/ <br> Summer <br> t. run | Harrison |  | Lower Shuswap ${ }^{1}$ |  |
|  |  |  |  |  |  | Esc | CV | Esc | CV |
| 2013 | 6,821 | 16,009 | 119,609 | 11,263 | 175,791 | 42,953 | 0.07 | 28,797 | 0.01 |
| 2014 | 24,614 | 32,905 | 84,308 | 24,424 | 210,318 | 44,686 | 0.09 | 43,952 | 0.03 |
| 2015 | 11,150 | 22,990 | 179,162 | 30,537 | 283,454 | 101,516 | 0.07 | 40,682 | 0.02 |
| 2016 | 8,904 | 13,781 | 93,206 | 9,522 | 138,873 | 41,327 | 0.11 | 6,438 | 0.06 |
| 2017 | 5,103 | 8,343 | 84,470 | 6,390 | 123,632 | 29,799 | 0.08 | 13,430 | 0.03 |
| 2018 | 2,100 | 8,482 | 46,543 | 5,443 | 84,373 | 46,094 | 0.07 | 17,120 | 0.04 |
| Goal <br> 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 <br> 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 | 867 | 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 | 956 | 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 | 1,032 | 842 | 1,867 |  | 4,722 | 6,913 | 974 | 1,098 |  | 7,035 | 15,483 |
| 1991 |  | 473 |  | 1,236 | 1,273 | 5,824 | 8,604 | 1,948 | 1,536 | 2,969 |  | 2,800 | 3,980 | 864 | 1,115 |  | 10,548 | 15,451 |
| 1992 |  | 601 |  | 986 | 1,010 | 7,348 | 9,021 | 764 | 639 | 1,279 |  | 2,708 | 3,269 | 999 | 1,212 |  | 5,267 | 10,165 |
| 1993 |  | 684 |  | 782 | 812 | 5,801 | 7,097 | 870 | 719 | 1,259 |  | 4,019 | 4,524 | 307 | 324 |  | 2,476 | 5,507 |
| 1994 |  | 163 |  | 470 | 496 | 5,549 | 5,912 | 941 | 773 | 1,323 |  | 3,406 | 3,715 | 1,068 | 926 |  | 4,078 | 8,368 |
| 1995 |  | 520 |  | 855 | 887 | 6,877 | 9,239 | 944 | 775 | 1,495 |  | 3,356 | 3,871 | 1,202 | 966 |  | 7,939 | 9,935 |
| 1996 |  | 738 |  | 1,051 | 1,078 | 10,613 | 10,828 | 1,563 | 1,244 | 2,276 |  | 4,851 | 5,352 | 457 | 362 |  | 6,026 | 8,664 |
| 1997 |  | 797 |  | 1,041 | 1,064 | 4,872 | 6,092 | 1,447 | 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 | 1,959 | 1,544 | 2,434 |  | 6,306 | 6,658 | 869 | 711 |  | 5,963 | 7,777 |
| 1999 |  | 1,111 | 117 | 471 | 476 | 4,924 | 5,229 | 1,370 | 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 | 2,092 | 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 | 1,702 | 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 | 2,017 | 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 | 1,224 | 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 | 1,908 | 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 | 1,287 | 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 | 1,576 | 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 | 721 | 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 | 1,711 | 1,671 | 1,861 |  | 8,373 | 8,506 | 1,681 | 2,917 |  | 5,971 | 10,290 |

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 | 1,239 | 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 | 1,637 | 1,017 | 1,264 | 5,384 | 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 | 1,787 | 1,534 | 1,733 | 5,692 | 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 | 14,173 | 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 | 5,214 | 3,901 | 3,949 | 614 | 649 |  | 2,730 | 2,910 |
| 2015 | 3,878 | 1,852 | 447 | 1,408 | 1,491 | 13,315 | 14,580 | 709 | 459 | 468 | 5,885 | 3,863 | 3,948 | 2,014 | 2,022 |  | 4,087 | 4,181 |
| 2016 | 3,711 | 1,880 | 685 | 2,429 | 2,584 | 16,761 | 18,337 | 1,053 | 861 | 882 | 12,211 | 5,153 | 5,277 | 1,287 | 1,308 |  | 10,063 | 10,103 |
| 2017 |  | NA | NA | 2,851 | NA | 12,784 | 13,998 | 1,070 | 1,075 | 1,117 |  | 6,119 | 6,609 | 2,302 | 2,422 |  | 8,357 | 10,513 |
| 2018 |  |  |  | 2,376 |  | 10,903 |  | 665 | 562 |  |  | 4,210 |  | 968 |  |  | 6,891 |  |

${ }^{1}$ 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 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Year | Hoko Fall |  | Quillayute Summer |  | Quillayute Fall |  | Hoh Spr/Sum |  | Hoh <br> Fall |  | Queets Spr/Sum |  | Queets Fall |  | Grays Harbor Spring |  | Grays Harbor Fall |  |
|  | 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 |

Table B8.-Page 2 of 2.

| Washington Coast |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Year | Hoko Fall |  | Quillayute Summer |  | Quillayute Fall |  | Hoh Spr/Sum |  | Hoh Fall |  | Queets Spr/Sum |  | Queets Fall |  | Grays Harbor Spring |  | Grays Harbor Fall |  |
|  | 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 | 3,901 | 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 | 783 | 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 | 871 | 1,171 | 3,654 | 5,005 | 1,144 | 1,158 | 2,831 | 3,012 | 704 | 777 | 2,915 | 3,888 | 926 | 1,056 | 11,685 | 16,397 |
| 2017 | 695 | 970 | 1,060 | 1,362 | 3,604 | 7,957 | 1,778 | 1,798 | 1,405 | 1,907 | 825 | NA | 2,721 | 4,462 | 1,384 | 1,391 | 13,469 | 17,872 |
| 2018 | 2,115 | 2,351 | 1,185 | 1,445 | 4,031 | 6,638 | 793 | NA | 1,638 | NA | 484 | NA | 2,095 | NA | 493 | 526 | 22,037 | 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.

| Year | Columbia Upriver Springs ${ }^{1}$ |  |  |  |  |  | Mid-Columbia Summers ${ }^{2}$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Upper Columbia R. |  | Snake R. Spr/Sum |  | Total |  |  |  |
|  | 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 | 1,096 | 1,101 | 14,957 | 20,513 | 16,052 | 21,613 | 44,295 | 53,881 |
| 2010 | 2,470 | 3,110 | 26,642 | 34,899 | 29,112 | 38,009 | 47,220 | 72,346 |
| 2011 | 2,145 | 2,659 | 24,562 | 30,757 | 26,706 | 33,416 | 44,432 | 80,574 |
| 2012 | 4,375 | 5,871 | 25,679 | 35,510 | 30,054 | 41,381 | 52,184 | 58,300 |
| 2013 | 2,462 | 3,475 | 14,586 | 22,481 | 17,048 | 25,956 | 68,380 | 67,603 |
| 2014 | 4,356 | 6,287 | 32,118 | 45,993 | 36,474 | 52,279 | 77,982 | 78,254 |
| 2015 | 5,994 | 7,246 | 22,605 | 30,193 | 28,598 | 37,439 | 88,691 | 126,882 |
| 2016 | 3,601 | 5,111 | 16,188 | 23,635 | 19,789 | 28,746 | 79,253 | 91,048 |
| 2017 | 1,593 | 2,527 | 4,425 | 7,204 | 6,019 | 9,731 | 56,265 | 68,204 |
| 2018 |  |  |  |  |  |  |  |  |
| Goal |  |  |  |  |  |  | 12,143 |  |

## Table B9.-Page 2 of 2.

${ }^{1}$ 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.

| Year | Coweeman |  | Lewis River ${ }^{1}$ |  | Columbia Upriver Fall Chinook |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Total Esc | $\begin{gathered} \text { CV } \\ \text { (Total) } \end{gathered}$ |  |  | Deschutes River ${ }^{2}$ |  |  | Upriver Brights ${ }^{3}$ |  |
|  |  |  | 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-

Table B10.-Page 2 of 2.

| Year | Coweeman |  | Lewis River ${ }^{1}$ |  | Columbia Upriver Fall Chinook |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Total Esc | $\begin{gathered} \text { CV } \\ \text { (Total) } \\ \hline \end{gathered}$ |  |  | Deschutes River ${ }^{2}$ |  |  | Upriver Brights ${ }^{3}$ |  |
|  |  |  | 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 | 120,576 | 291,193 |
| 2018 | 230 |  | 5,299 | 6,099 |  | 4,157 | 4,798 | 55,349 | 144,245 |
| 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.

| Year | Oregon Coastal |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Nehalem R. |  | Siletz R. |  | Siuslaw R. |  | Coquille R. |  |
|  | 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 | 8,043 | 7,364 | 13,147 | 10,957 | 15,163 | 4,693 | 6,441 |
| 2018 | 6,420 | NA | 4,929 | NA | 4,481 | NA | 514 | 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 Esc | Coquille R. |  |
|  | Esc | t. run | Esc | t. run | Esc | t. run |  | 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 | 9,895 | 14,063 | 19,846 | 7,433 | 11,639 | 5,514 | 6,470 | 8,218 |
| 2018 | 5,633 | NA | 5,757 | NA | 2,484 | NA | 2,983 | 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.


[^0]:    ${ }^{1}$ Scott A. McPherson, ADF\&G, to Keith Weiland, ADF\&G. 1991 memorandum. Available from author, Douglas Island Center Building, $8023^{\text {rd }}$ Street, P. O. Box 240020, Douglas, AK 99824-0020.

[^1]:    ${ }^{1}$ 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.

[^2]:    -continued-

[^3]:    ${ }^{3}$ 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.

[^4]:    -continued-

[^5]:    -continued-

[^6]:    -continued-

[^7]:    -continued-

