Fisheries and Oceans Canada | Pêches et Océans Canada

PACIFIC SALMON OUTLOOK

PACIFIC REGION

2023

Canada

2023 SALMON OUTLOOK - PACIFIC REGION

PURPOSE

The purpose of this document is to provide an 'Outlook' of expected abundance of salmon in 2023 to inform the harvest planning process.

The Outlook provides either an expected abundance for those stocks with statistical forecasts or a categorical abundance expectation based expert opinion.

OUTLOOK FORMAT

The Outlook document contains:

1. CU groupings with stock management units (SMUs) to better inform decision-making consistent with *Fishery Act* and IFMP requirements.
2. SMUs with statistical forecasts.
3. SMUs without statistical forecasts, have a standardized interpretation of SMU status in relation to Outlook categories.
4. Information on SMU biological benchmarks and management references (where defined) for additional context.

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BACKGROUND

Stock Management Units

For the 2023 Outlook, 'Stock Management Units' (SMUs) are used to describe stock aggregates that inform development of Integrated Fisheries Management Plans (IFMPs) for salmon. This is required for implementation of the fisheries-related revisions to the *Fishery Act*.

For salmon, the working definition of a 'stock management unit' (SMU) is a 'group of one or more conservation units (CUs) that are managed together with the objective of achieving a joint status', meaning harvest control rules would apply to the aggregate, at least in a coarse sense. Use of SMUs does not preclude considerations related to conserving CU-level diversity, but rather is a practical aggregation of CUs for harvest planning and reporting purposes. That is, it is the scale at which harvest management plans or management and assessment procedures, are developed in Integrated Fisheries Management Plans (IFMPs). In many cases, elements of the Precautionary Approach are implemented at finer scales of organization within a SMU.

Biological and Management References

The purpose of a stock forecast or outlook is to provide information for harvest managers to potentially adjust harvest plans according to the expected stock abundance. Ideally, the status of the stock management unit (or sub-unit) is assessed against specified limits and targets and pre-defined harvest strategies (or harvest control rules) are in place that define the actions required to meet targets and avoid limits.

Therefore, where biological benchmarks and/or limit reference points are defined for CUs or SMUs, respectively, they are noted in the Outlook/Forecast tables below. Similarly, if management targets are in place they are identified. Lack of these references is a gap and work is on-going to develop methods and complete the analyses to define these references. The

summary below describes how these biological and management references are applied and interpreted.

WSP Lower Biological Benchmarks and Limit Reference Points (LRPs)

For implementation of the Wild Salmon Policy, the status of salmon Conservation Units (CU) is assessed against 'biological benchmarks'. The lower biological benchmark allows for substantial buffer between it and the level of abundance at which the stock would be considered at risk of extinction (red zone) and is generally estimated as S_{GEN}. The upper biological benchmark delineates the 'amber' from 'green' WSP status zone and is generally estimated as .80 S_{MSY}. For more data-limited systems (i.e. where it is not possible to numerically estimate stock-recruit parameters), proxies for lower and upper biological benchmarks may be applied. For example, the lower and upper biological benchmarks are estimated as .25 and .60 percentiles of the long-term observed spawning abundance. These benchmarks and reference points do not apply to enhanced populations.

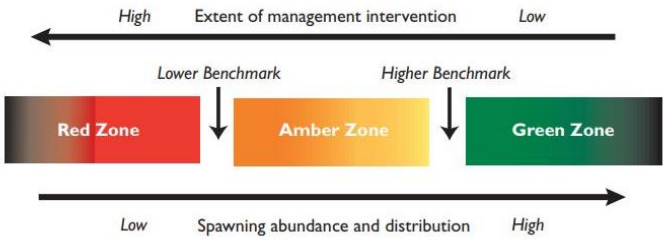

Figure 1. Benchmarks and biological status zones for CU assessments.

Under DFO's Precautionary Approach (PA), the stock management unit (SMU) limit reference point (LRP) is a biologically defined reference that delineates the 'critical zone' from the 'cautious zone' for harvest management. It represents the status below which serious harm is occurring to the stock. There may also be resultant impacts to the ecosystem, associated species and a long-term loss of harvest opportunities.

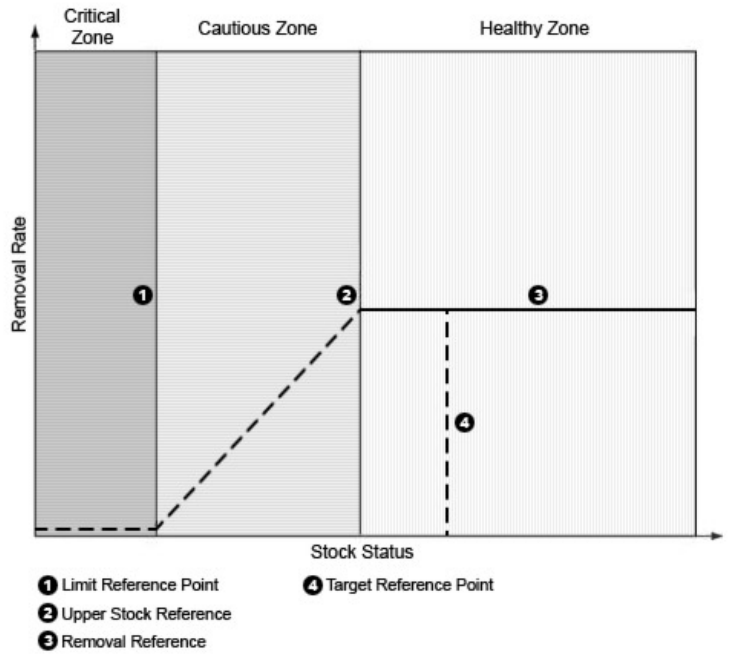

Figure 2. Schematic of a generalized harvest strategy under DFO's PA.

Given the intent is similar between the WSP and DFO's PA, it is practical to equate the SMU LRPs with lower biological benchmarks at the CU level. However, the WSP recognizes that serious harm to species occurs when CUs are depleted or lost. Therefore, to be consistent with the WSP, LRPs at the SMU scale should consider CU-scale biodiversity. Methodological approaches for defining LRPs are being developed to ensure CU-level biodiversity is considered and for both data-rich and data-limited assessment systems.

Management Targets and Operational Control Points

While management targets or operational control points are often informed by biological benchmarks and stock-recruit reference points, they also consider other objectives such as maximizing sustainable harvest, avoiding over-fishing, maintaining stable access and opportunity, allocation objectives such as how catch is distributed among harvesters, etc. As such, management targets and operational control points are tightly linked to the harvest strategy and fishery management measures.

In some cases, the management target may be a simple trigger such as when a 'surplus-to-escapement-target' harvest control rule is in place. In other cases, there may be multiple management targets (or operational control points) used to adjust the harvest control rule at different levels of abundance.

Note that an SMU can be below its management target (and therefore subject to some level of harvest restriction as per the harvest control strategy), but well above levels that represent a serious conservation concern (i.e. the LRP or LBB). In other situations, an SMU may be well above its target but subject to harvest restrictions because the stock rears or co-migrates in mixed-stock fishing areas with other SMUs (or CUs) that are near or below their LRP (or LBB).

STOCK OUTLOOKS

Categorical stock outlooks

For the 'Preliminary Outlook' and for those SMUs for which statistical forecasts are not produced, either because the SMU is not intensively managed and/or is more data limited, categorical 'outlooks' are assigned. These outlooks are based on expert opinion qualified with information from monitoring programs. For each stock grouping an outlook of expected spawning abundance is assigned based on a scale of 1 to 4.

For CUs or SMUs with references in place (i.e. either lower (LBB) and upper biological benchmarks (UBB) and/or lower reference points (LRP) and upper stock references (USR) and Target Reference Point (TRP), these references are used to assign Outlook category. For more data-limited CUs or SMUs (i.e. those without defined stock or management references), expected spawning abundance is compared to average or median abundance based on available information.

SMUs for which insufficient data area available to determine an Outlook are noted as 'Data Deficient'.

Outlook Category	CUs or SMUs with references		Data Limited CUs or SMUs	
	Wild Salmon Policy (CU Level)	Precautionary Approach (SMU Level)	Category Definition	Expected spawning abundance
1	Red Zone (i.e. below the LBB)	Critical Zone (i.e. below the LRP)	Well below average	<25th percentile
2	Amber Zone (i.e. above the LBB, below the UBB)	Cautious Zone (i.e. above the LRP below the USR)	Below Average	25 to 40th percentile
3	Green Zone (i.e. above the UBB)	Healthy Zone (i.e. above the USR)	Near Average	40 to 60th percentile
4	Green Zone (i.e. at or above the TRP)	Healthy Zone (at or above the TRP)	Abundant	>60th percentile
Data Deficient			Insufficient information	Unknown

YUKON RIVER AND TRANSBOUNDARY

YUKON RIVER

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast /Outlook
YUKON CHINOOK	Aggregate includes 9 CUs	**55,000** (ESC. AVG. 2005+)		**48,750** (42,500 – 55,000) Escapement Target (S_{MSY})	**<41,000** (41,000-62,000) Outlook Category 1
	Porcupine Aggregate 3 CUs	Data Deficient (Mainstem as indicator)		N/A	
	The spawning escapement of Canadian-origin Yukon River mainstem Chinook salmon in 2022 was well below average at 12,290. The current spawning escapement goal endorsed by the U.S./Canada Yukon River Panel for Mainstem Chinook is 42,500-55,000 Chinook salmon and has been met only 40% of the time over the last decade. Five and six year old fish dominate returns. Recent total production observed in Canadian-origin Yukon River Chinook salmon stocks is well below past years: averaging around 67,900 over the last ten years compared to 150,000 in the 1980s and 1990s. Recent (last 3 years) forecast accuracy of escapement into Canada has been poor, likely due to en route mortality and at this time is predicted to be <41,000. Assessment of Porcupine Chinook continues (limited data). Outlook Category 1.				
YUKON COHO	Porcupine CU	Data Deficient (US stocks as indicator)			**Data Deficient**
	Very little is known about Coho salmon stock status within Canadian portions of the Yukon River drainage. Data from the U.S. portion of the drainage suggest runs to the drainage have been below average in three of the past five years, with a declining trend. No assessment programs are currently undertaken in Canada and the current stock status is unknown. It is known that coho salmon primarily return as 4-year-olds and overlap with the tail end of the fall chum run.				
YUKON CHUM	Mainstem – includes 5 CUs	**182,000** (ESC. AVG 2006+)		**87,000** (70,000 - 104,000) Escapement Target (S_{MSY})	**<70,000** (28,000-150,500) Outlook Category 1-2
	The spawning escapement of Canadian-origin Yukon River mainstem Chum salmon in 2022 was the lowest on record, at 22,075. The run is typically dominated by four year old fish. The current mainstem spawning escapement goal endorsed by the Yukon River Panel is 70,000 – 104,000 Chum salmon, which has been met every year in the past decade except 2020, 2021 and 2022, where escapement into Canada has reached historical low values. Outlook Category 1-2.				
	Porcupine – includes 2 CUs	**46,000** (ESC. 1972 – 2020 AVG) **22,000** (ESC. 5-year AVG)		**35,500** (22,000 - 49,000) Escapement Target (S_{MSY})	**<22,000** (4,500-24,000) Outlook Category 1-2
	The spawning escapement of Fishing Branch River Chum salmon in 2022 was also historically low, at 2,695. The current spawning escapement goal for the Porcupine River (as assessed at the Fishing Branch River) endorsed by the U.S./Canada Yukon River Panel is 22,000-49,000 Chum salmon. Runs over the last decade have been well below expected, failing to meet the escapement goal in six of the past ten years. Recent past 3 years have seen unprecedented low returns. Outlook Category 1-2.				

TRANSBOUNDARY AREA

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast/ Outlook
ALSEK SOCKEYE	Alsek	**74,000** (ESC. 10-year Avg.)		**29,700** (esc. goal range 24,000 – 33,500)	**118,000**
	Klukshu	**11,100** (TR, 10-year Avg.)		**9,700** (esc. goal range 7,500 – 11,000)	**27,200**
	Based on brood year escapements below the MSY target range and stock-recruitment relations from historical records, a below average, but within the escapement goal range run is expected. This aggregate stock is dominated by lake and river type age 5 fish. In 2021 and 2022, the Outlook Category was 2.				Outlook Category 3
ALSEK CHINOOK	Alsek	**5400** (ESC. 10-year Avg.)		**4,700** (esc. goal range 3,500 – 5,300)	**5,300**
	Klukshu	**1,00** (TR. 10-year Avg.)		**1,000** (esc. goal range 800 – 1,200)	**1,300**
	Alsek CU (CK-67) includes 5 rivers (Alsek, Blanchard, Goat, Klukshu and Takhanne). Based on brood year escapements that were both above and below average but near the MSY target range and recent sibling survival data, an average run within the escapement goal range is expected. Alsek Chinook are stream type dominated by 5- and 6-year olds.				Outlook Category 3
ALSEK COHO	Alsek CU				Outlook Category 2
	Only a partial weir count is carried out. Brood year counts were slightly below average. Run is dominated by 4 year olds				
STIKINE SOCKEYE	Tahltan CU	**61,000:** **34,000** (wild) **27,000** (enhanced) (TR. 10-year Avg.)		**24,000** (18,000 to 30,000) Escapement Target (S_{MSY})	**57,000** Outlook Category 3
	Mainstem (Christina and Chutine CUs)	**39,000** (TR. 10-year Avg.)		**30,000** (20,000 to 40,000) Escapement Target (S_{MSY})	**29,000** Outlook Category 2
	Based on a combination of primary brood year smolt counts and sibling-based predictions, an average run is anticipated for 2022 and it is anticipated escapement objectives will be achieved. Recent poor marine survival may influence this. This is an aggregate stock of lake and river type 5 year olds.				
STIKINE CHINOOK	Aggregate includes 2 CUs	**17,400** (TR. 10-year Avg.)		**17,400** (14,000 - 28,000) Escapement Target (S_{MSY})	**11,700** (Standard Error) = 3,200) Outlook Category 1
	2023 run is forecast to be well below the 10-year average of 17,400 and below the escapement goal range of 14,000 – 28,000. The anticipated run size does not provide for directed fisheries. Stikine Chinook are stream type dominated by 5- and 6-year olds.				
STIKINE COHO	Stikine CU				

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast/ Outlook
	Reliable brood year escapement data are limited, and ancillary observations are sometimes contradictory.				**Data Deficient**
TAKU SOCKEYE	Aggregate includes 4 CUs	**150,000** (TR. 10-year Avg.)		**58,000** (Esc. Goal Range 40,000 - 75,000)	**169,000** Outlook Category 3
	Enhanced (Tatsamenie)	**8,300** (TR. 10-year Avg.)	n/a (hatchery)		**8,000** Outlook Category 3
	Enhanced (Trapper)	**1,000** (TR. 10-year Avg.)			**1,000** Outlook Category 3
	Based on stock-recruitment data, the 2023 run is expected to be near the 10 year average of 150,000 but well over the management objective of 58,000. This is an aggregate stock of lake and river type 5- year olds.				
TAKU CHINOOK	Aggregate includes 3 CUs	**16,000** (TR. 10-year Avg.)		**25,500** (19,000 - 36,000) Escapement Target (S_{MSY})	**23,000** (SE = 4,600 Outlook Category 3
	2023 is expected to be above the 10-year average of 16,000 and within the escapement goal range of 19,000-36,000. The anticipated run size does not provide for directed fisheries as it falls below the management objective of 25,500. The forecast includes a stronger than normal component of Age 4 fish. Taku chinook are stream type dominated by 5- and 6- year olds.				
TAKU COHO	Aggregate includes 3 CUs	**117,000** (TR. 10-year Avg.)		**70,000** (50,000 - 90,000) Escapement Target (S_{MSY})	**102,000** Outlook Category 3
	Based on preliminary smolt abundance in 2022 combined with recent smolt-to-adult survival rates, an average run above the management target of 70,000 is expected for 2023. Run is dominated by 3- year olds.				
TRANSBOUNDARY CHUM	Taku Chum CU				**Data Deficient**

NORTH COAST AREA

HAIDA GWAII

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast\ Outlook
HAIDA GWAII SOCKEYE	Aggregate includes 10 CUs	1990-present avg. spawners ~ 25000		Under development for several CUs	**Outlook Category 3**
HAIDA GWAII PINK – ODD	Aggregate includes 6 CUs (even and odd year)				**Data Deficient**
	Due to historically consistent low abundance, there is not a lot of data that is collected on Haida Gwaii odd-year Pinks				
HAIDA GWAII CHINOOK	Aggregate includes 2 CUs				**Data Deficient**
	An assessment program commenced on the Yakoun in 2021 and is not being reported yet.				
HAIDA GWAII COHO	Aggregate includes 3 CUs				**Data Deficient**
	Limited assessments since 2002. Returns to enumeration sites such as Tlell and Deena have been generally good over the past decade, with weaker than average escapement observed at Tlell and the Deena in 2021.				
HAIDA GWAII CHUM	Aggregate includes 5 CUs				**Outlook Category 1**
	Poor productivity has been observed for the past decade. East Haida Gwaii, West Haida Gwaii, and North Haida Gwaii CUs are expected to continue to be well below average. Outlook Category in 2022 was 1.				

SKEENA AND NASS RIVERS

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast\ Outlook
NASS SOCKEYE	**Aggregate incudes 7 CUs**	**263,369** (Avg. ESC, 1982+)		250,000 (Escapement Target)	**Model 1 (5-yr Avg): 390,000** (244,000 to 623,000) **Model 2 (Sibling): 455,000** (231,000 to 910,000) (Total return) Outlook Category 4
	Improved return in 2021 and 2022 compared with 2020 (which was the lowest return to the Nass since 1992) but below average compared with historical returns.				
SKEENA SOCKEYE	**Aggregate (wild and hatchery)**	**2,584,000** (Avg. Return 1973+)	**Under review**	**Under review, esc target is 900,000, 400,000 lower operational control point**	**Model 1 (5-yr Avg): 1,794,376** (794,701 to 4,051,567) **Model 2 (Sibling): 3,207,029** (1,506,297 to 6,828,028) (Skeena aggregate, Total Return) Outlook Category 4
	Skeena – Wild Aggregate includes 30 CUs	Variable	Under review	Included in Skeena aggregate, under review	
	Rates of return have become more uncertain in recent years, with greater variability among the wild Skeena stock components compared with the Skeena aggregate. Overall, we saw a strong aggregate return in 2022 which consisted mostly of enhanced sockeye originating from the Babine Lake Development Project spawning channels and managed systems. Low returns were observed for wild Babine sockeye populations and average returns for most other Skeena sockeye CUs. Like 2022, abundant aggregate returns are forecasted for 2023. Note that the 5 year old component of 2023 returns follows severe drought conditions that were experienced by brood year spawners in 2018. For some populations, returns may be affected by sockeye that did not make it to their spawning grounds due to low water and heavy predation, which was observed for some populations.				
	Babine Lake - Enhanced		Under review	Spawning channel capacity = 470,000	
	Strong age-5 aggregate returns expected in 2023 based on higher than average age-4 returns in 2022. Average abundance forecast in 2022 for age-4 Sockeye were based on average age-3 returns in 2022.				
MAINLAND COASTAL SOCKEYE	Areas 3 to 6				**Outlook Category 3**
	Average to above average for surveyed systems. Many unsurveyed systems throughout area. Data limited.				
NASS PINK-ODD	Aggregate includes 5 CUs				**Data Deficient**
	A revised 1950-Present assessment suggest below average returns in recent years with improved escapements seen in some streams for the 2021 brood year. However, the 2023 Outlook category is considered to be data deficient as abundance related to brood years do not correlate.				
SKEENA PINK-ODD	Aggregate includes 3 CUs				**Outlook Category 2**
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Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast\ Outlook
NASS CHINOOK		**30,000 (TRTC 1994-2022)**		15,000 (ESC target)	**Model 1 (5-yr Avg: 21,000** (19,000-23,000) **Model 2 (Sibling): 32,000** (19,000-54,000) Terminal RTC Outlook Category 3
	The 2023 return is uncertain after record low escapements in 2017 and low water levels in 2018 that may have affected the brood year. Preliminary forecast model average is for 27,000 (19,000-39,000) return to Canada (Nisga'a Fish & Wildlife). There is generally low productivity among stream-type stocks in the northwest Pacific				
SKEENA CHINOOK	Aggregate includes 12 CUs	**61,000** POPAN best model estimate **70,000** Petersen estimate (GSI mark-recapture based on KLM estimates 1984-2022)			**35,388** Outlook Category 2
	Kitsumkalum Indicator Stock	**10,000** POPAN best model estimate **13,000** Petersen estimate (KLM mark-recapture 1984-2022)			
	Below average returns are expected for both summer and spring timed Skeena Chinook. The 2023 return is uncertain after record low escapements in 2017, a higher return in 2018 and low return again in 2019. There is generally low productivity among stream-type stocks in the northwest Pacific. Escapement estimates were revised using POPAN models (Velez-Espino et al. 2016. N. Am. J. Fish. Manage. 36:183-206; Winther et al. 2021. Can. Manuscr. Rep. Fish. Aquat. Sci. 3217: ix + 131p.)				
NASS COHO	Aggregate includes 3 CUs				**Outlook Category 4**
SKEENA COHO	Aggregate includes 4 CUs				**Outlook Category 3**
SKEENA - NASS CHUM	Nass CU	**13,632 (**1950-Present)	none	Under Review. MEG is 72,000	**Outlook Category 3-4**

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast\ Outlook
	Skeena CU Aggregate includes 2 CUs				**Outlook Category 1**
	Well below average data limited for both CUs.				

CENTRAL COAST

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast\ Outlook
CENTRAL COAST SOCKEYE Excluding Rivers/Smith	Areas 7 and 8 45 CUs				**Outlook Category 1-3**
	Most systems in areas 7 and 8 are data deficient. Average returns relative to recent period (2000+) for systems that were surveyed in Area 8 (Koeye, Kadjusdis, Namu are an Outlook Category of 3). The Atnarko sockeye outlook category is an Outlook Category of 1 as returns are well below historic and population is in recovery.				
RIVERS / SMITH SOCKEYE	Rivers – Aggregate includes 2 CUs (Wannock River and Owikeno Lake)	272,000 (Avg. ESC, 2000+)	Under development	None	**Outlook Category 1**
	Smith: Long Lake CU	62,000 (Avg. ESC, 2000+)			**Outlook Category 1, Data Deficient**
	Docee Fence (Area 10/Smith Inlet/Long Lake) sockeye is currently under review .				
CENTRAL COAST PINK - ODD	**Area 6** *(PKE-5/PKO-12*)			MEG - 1,447,000	**Outlook Category 3**
	Area 7 (*PKE-6/PKO-13*)			MEG – 444,720	**Outlook Category 2**
	Area 8 (*PKO-8*)			MEG – 1,520,400	**Outlook Category 1**
	Area 9 (*PKO-8*)			MEG – 342,450	**Outlook Category 1**
	Area 10 (*PKO-8*)			MEG – 65,600	**Data Deficient**
	Area 6 returns are expected to be above average. Below average to average returns are expected in Areas 7 and 8. In 2021, Area 8 odd year 8 Pinks had one of the lowest returns since 1969.				
CENTRAL COAST CHINOOK	Atnarko Indicator Stock Bella Coola-Bentinck CU	**15,500** including hatchery component **9,000** wild (Maximum likelihood model 1990-2022)		**5009** (Atnarko wild) Escapement Target (S_{MSY})	**9,308** Outlook Category 2
	These stocks are generally depressed and this pattern is expected to continue or worsen given generally low productivity among stocks in the northwest Pacific				
	Areas 7 and 8 3 CUs –				**Outlook Category 2 / Data Deficient**
	2023 Bella Coola returns are expected to be below average based on returns in recent years.. Other assessments are of poor quality.				
	Areas 9 and 10 – Aggregate includes 3 CUs				**Data Deficient**
	Assessments of Wannock River, Owikeno tributary stocks and Chuckwalla/Kilbella are of poor quality or are no longer conducted.				

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast\ Outlook
CENTRAL COAST COHO	Area 6 – Aggregate includes 3 CUs				**Outlook Category 3**
	Areas 7 to 10 – Aggregate includes 4 CUs				**Outlook Category 3**
CENTRAL COAST CHUM	**Area 6** 2 CUs (*CM-18: Hecate Lowlands, CM-20: Douglas-Gardner*)				**Outlook Category 3**
	Area 7 1 CU (*CM-19: Mussel-Kynoch*)				**Outlook Category 2**
	Area 8 3 CUs (*CM-15: Spiller-Fitz Hugh Burke, CM-16:Bella Coola - Dean, CM-17: Bella Coola River -Late*)				**Outlook Category 3**
	Area 9 2 CUs (*CM-13: Rivers Inlet, CM-14: Wannock)*				**Data Deficient**
	Area 10 1 CU (*CM-12: Smith Inlet)*				**Data Deficient**

SOUTH COAST AREA

WEST COAST VANCOUVER ISLAND

Stock Management Unit	Conservation Unit /Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast\ Outlook
WCVI - BARKLEY SOCKEYE	**Somass Aggregate (GCL + SPL)**	**663,000** (Avg. Run Size 1977+)		**170,000** Run Size – lower operational control point	**500,000**
	Great Central Lake CU	322,000 (Avg. Run Size 1977+)	29,290 LBB		**Outlook Category 3**
	Sproat Lake CU	235,000 (Avg. Run Size 1977+)	41,350 LBB		**Outlook Category 3**
	The two main contributing brood years to the 2023 run are 2018 and 2019 and the two main contributing smolt years are 2020 and 2021. Brood abundance was below average in 2018 and 2019 particularly in Great Central Lake. Smolt abundances were low in Great Central Lake but average in Sproat Lake in 2020 and are not yet available for 2021. Based on ocean indicators and returns to date, marine survival rates for the 2020 smolt year are high and are likely to be even better for 2021. Given the considerations above, expectations are for an average Somass Sockeye return in 2023.				
	Henderson Lake CU	34,000 (Avg. Run Size 1978+)	5000 LBB	9% max. harvest rate at run sizes <15,000	**15,000 - 25,000** Outlook Category 2
	For the 2023 return, the two main contributing brood years are 2018 and 2019 and the two main contributing smolt years are 2020 and 2021. Brood abundances were near average in both 2018 and 2019. Based on ocean indicators, marine survival rates for the 2020 and 2021 smolt years are likely high to very high. Therefore, expectations are for a near-average Henderson sockeye return in 2023.				
WCVI - OTHER SOCKEYE	22 CUs are associated with this stock management unit.				**Data Deficient**
	Assessment data are not available to forecast others systems. However, WCVI populations tend to co-vary. Therefore, expectations are for low-to-moderate returns based on the outlooks for Somass and Henderson.				
WCVI PINK	3 CUs are associated with this stock management unit.				**Data Deficient**
	Since the collapse of WCVI pinks in the mid-1960s there has been negligible catch and only opportunistic assessment of returns during assessment of other species. The available data suggest WCVI pink salmon populations continue to persist at very low relative to historic levels with high variability.				
WCVI CHINOOK	Southwest Vancouver Island CU, *CK-31*			10 – 15% maximum exploitation rate in key 'pre-terminal' CDN fisheries	**Outlook Category 1**
	Nootka and Kyuquot CU,*CK-32*				

Stock Management Unit	Conservation Unit /Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast\ Outlook
	Northwest Vancouver Island CU,*CK-33*				
	Escapements of WCVI Chinook natural populations remain low. There has been improvement in Kyuquot (NWVI wild indicators) in recent years. The Clayoquot area (SWVI wild indicators) which remains the biggest concern saw a drop relative to the slight improvement over the previous two years. It is assumed survival rates of natural production are well below that associated with hatchery production and may be related to reduced survival of smaller natural out-migrating smolts; productivity is anticipated to remain low. WCVI wild Chinook remain a stock of concern.				
	Somass/Robertson (Hatchery)	68,000 (Avg terminal run 1995-2020)	n/a	39M eggs (spawner target is adjusted for expected age/sex composition)	**114,000** (85,000-144,000) Outlook Category 4
	Conuma Hatchery	37,000 (Avg terminal run 1995-2020)	n/a	10,000 ESC target but varies to ensure escapement of eggs associated with an average 10,000 escapement.	**36,000** (22,000-49,000) Outlook Category 4
	Nitinat Hatchery	25,000 (Avg terminal run 1995-2010)	n/a	10,000 ESC including brood stock	**25,000** (18,000-34,000) Outlook Category 4
	WCVI Other Hatchery Supplemented (e.g. Burman R, Sarita R.)	Varies by individual river; see local plans for details.	Work is underway to develop lower bench marks (C. Holt lead).	Varies by individual river; see local plans for details.	**38000** (26,000-51,000) Outlook Category 3-4
	Hatchery returns should be average to above average in 2023 similar to what was observed in 2022.				
WCVI COHO	3 CUs are associated with this stock management unit.				**Outlook Category 3**
	Information to forecast Coho returns is limited. Therefore, there is considerable uncertainty in this assessment. Data suggests average Coho marine survival relative to recent years; for example, 2022 escapement through Stamp Falls was in 67th percentile of all returns since 2010 and well above the 2018 brood. Preliminary 2022 escapement to Carnation Creek wild indicator stock (151) was slightly above the 12-year average (130) and a significant improvement over the 2018 brood (95). For 2023, most of the return will originate from the 2020 brood year that went to sea in 2022. Robertson Hatchery Coho jacks in 2022 were higher than the 2010-2021 average, suggesting improvement in 2023 with average returns expected. Prior to 2021, most WCVI Coho spawning populations had seen declines in productivity.				

Stock Management Unit	Conservation Unit /Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast\ Outlook
WCVI CHUM	Area 23 (Barkley) – Southwest Vancouver Island CU	**59,000** (Avg. Return, 1995+)		48,000 Run size – lower operational control point, 15% max harvest rate	**25,000** (19,000-34,000)
	Area 24 (Clayoquot) – Southwest Vancouver Island CU	**54,000** (Avg. Return, 1995+)		42,000 Run size – lower operational control point, 15% max harvest rate	**17,000** (9,000-30,000)
	Area 25 (Nootka) – Southwest Vancouver Island CU	**39,000** (Avg. Return, 1995+)		26,000 Run size – lower operational control point, 20% max harvest rate	**9,000** (5,000-16,000)
	Area 25 (Esperanza Inlet) – Southwest Vancouver Island Cu	**37,000** (Avg. Return, 1995+)		24,000 Run size – lower operational control point, 15% max harvest rate	**17,000** (9,000-35,000)
	Area 26 (Kyuquot) – Southwest Vancouver Island CU	**38,000** (Avg. Return, 1995+)		25,000 Run size – lower operational control point, 15% max harvest rate	**20,000** (12,000-34,000)
	Area 27 (Quatsino Sound) – Northwest Vancouver Island CU				**Data Limited**
	Area 25 (Conuma Hatchery) – Southwest Vancouver Island CU	**84,000** (Avg. Return, 1995+)			**22,000** (13,000-39,000)
	Nitinat Hatchery	**464,135** (Avg. Return, 1995+)	n/a	225,000 Run size – lower operational control point	**87,000** (64,000-122,000)
	Preliminary 2022 returns of WCVI Chum were well below average continuing a trend in reduced Chum productivity. Below average brood years 2018, 2019 and 2020 will contribute to the 2023 return as age 5, 4 and 3, respectively. The 2019-2021 sea entry years resulted in some improvements in survival to other salmon such as Sockeye, Coho and Pinks. These improvements will hopefully help to buffer the production coming from these weak Chum brood years. The recent status of wild WCVI Chum stocks is generally poor with returns well below average for most populations. In addition, hatchery production has declined in recent years. 2023 Outlook Category 2.				**Outlook Category 2**

EAST COAST VANCOUVER ISLAND/MAINLAND INLETS

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast\ Outlook
ECVI / MAINLAND SOCKEYE	Nimpkish	60,000 median spawners			**Outlook Category 2**
	High water during the Nimpkish Sockeye migration precluded the installation of the DIDSON counter, therefore a complete Sockeye count is not available for 2022. Crews observed 3,253 adult Sockeye during snorkel surveys, but this should be considered a partial count, as a portion of the return resides in lakes that are not readily surveyed. Recent returns were below average, but improving from a low observed in 2017. For the 2023 return, the two main contributing brood years are 2018 (83,796), and 2019 (60,418), which are above and slightly below average respectively. The two main contributing smolt years are 2020 and 2021. Recent escapement to nearby systems from Coho and Pink salmon are encouraging, and may indicate that marine conditions are improving. Nimpkish Sockeye returns are biased towards 4 year old fish (57%), so the improved escapement in 2018 and 2019 should result in slightly improved overall escapement in 2023. Given the considerations above, expectations are for an escapement that approaches the average return.				
	Area 16 (Sakinaw)	**119** (Avg. Return, 1995+)	2,440	4,470	**Outlook Category 1**
	Of the 209,044 smolts that left Sakinaw Lake in 2020 a total of 213 adult Sockeye returned in 2022. Marine survival continues to be extremely low; for the 2020 ocean entry year the smolt-to-adult survival declined to 0.059% for hatchery-origin fish while too few natural-origin smolts were present in 2020 to generate an estimate. The return rate for clipped smolts primarily from the new smolt release trial (n=24,080) was estimated at 0.54%. Smolt production in 2021 was above average at 169,190 including 8,630 clipped smolts from the new release trials (bulk of hatchery releases are still fry). If marine survival is near the 4-year average, a total of 152 adults are expected in 2023.				
	Other (Areas 11 to 13)	Heydon: 2,600 median spawners Quaste: 2,200 median spawners			**Outlook Category 2**
	Expectations for other populations such as Quatse, Heydon and Phillips are similar to Nimpkish.				
ECVI / MAINLAND PINK	Areas 11 to 13	Reconstructed Median Returns Southern Fjords (Even): 1.6 million Southern Fjords (Odd): 613K Nahwitti (Odd): 12K			**Outlook Category 2** (NEVI and Area 12 Mainland Inlets)
	Georgia Strait	Strait of Georgia (Odd): 536K Strait of Georgia (Even): 142K			**Outlook Category 3** (Southern portion of area on ECVI)

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast\ Outlook
	Odd Year: 2021 saw varied returns throughout South Coast. Generally Northern Vancouver Island was well below the historical adult abundance, although with clear signs of improvement since escapement was at its lowest point in 2016/2017. In contrast, the mainland inlets in Area 12 saw continued poor escapement of Pink Salmon. Expectations north of Adam River are for continued improvements in 2023, but returns are unlikely to exceed the long-term average escapement. Strong adult counts in other areas of the South Coast, particularly from Adam River south to Jervis Inlet, as well as promising fry counts from the Quinsam River suggest that we will see average to above average escapements for systems south of Adam River. **Even Year:** 2022 saw improved returns throughout the South Coast with generally improved returns to systems on Vancouver Island and in the Mainland Inlets. Returns were somewhat below the long-term average for the mainland, but most systems exceeded the recent (3 cycle) generational average. Weather conditions were extremely dry. Expectations for 2024 are for a stabilization of abundance for Pink salmon returning to ECVI and the mainland. Pink returns are highly variable, and confidence in the forecasted return in 2024 is low, but average returns to this region are expected in 2024				
MAINLAND INLET CHINOOK	This aggregate includes 4 CUs				**Data Deficient**
	Includes Homathko and Klinaklini. DFO is working to expand our programs into the Mainland Inlets. In 2021, and 2022, a video counter was installed on Devereux Creek and estimates will be available shortly for these years . In 2022, an intensive mark-recapture project was undertaken on the Southgate River in Bute Inlet. An estimated 5,175 (range 1,462-8,818) adult Chinook Salmon returned to the Southgate River in 2022. Stock Assessment also collected additional baseline samples from Chinook from the Southgate and Homathko Rivers (Bute Inlet), as well as the Toba River (Toba Inlet). Efforts were made to collect baseline samples in Jervis Inlet but were unsuccessful. Although still data deficient, efforts are underway to understand population abundance and trends in these areas.				
UPPER GEORGIA STRAIT CHINOOK	Quinsam River Fall Run	**7,072** (AVG. Terminal Run Index, 1979+)			**9,096** Outlook Category 3-4
	We saw below average escapement in 2022 for the Quinsam/Campbell River, and other systems in the region also saw a similar trend. Although escapement estimates were lower than average, ancillary information suggests estimates may be somewhat biased low, due to extended drought and increased predator (bear) activity that targeted fresh carcasses. Average returns for the brood years contributing to the return in 2023, continuing restrictions on early-timed Fraser Chinook, and relatively stable marine survival in recent years suggests we will see average returns in 2023. Outlook category 3-4.				
MIDDLE GEORGIA STRAIT CHINOOK	Puntledge and Big Qualicum Rivers Fall Run Enhanced	**14,385** (AVG. Terminal Run Index, 1995+)	7,193		**19,880** Outlook Category 4
	The Puntledge River saw an above long term average return of 8,300 fall Chinook in 2022. Escapement to the Big Qualicum River was also above the four year average of 7,500 at 9,500. Stable production levels and modest				

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast\ Outlook
	survivals for several hatchery indicators combined with above average marine abundance of 2-year olds suggests average to above average returns are likely for 2023. 2023 Outlook Category 4.				
	Nanaimo and Puntledge Spring Summer Enhanced CK-83	1,712 AVG. Terminal Run Index, 2004+)			**Outlook Category 2-3**
	A combination of additional snorkel surveys and a DIDSON project in the Nanaimo River produced an estimate of 390 fish in 2022 which was down from 992 in 2021 and below the 12 year average of 600. Puntledge summer Chinook were below the 4-year average of 820 fish at 405. Most of the reduction can be attributed to reduced smolt releases in preceding years. Rebuilding efforts for these populations are continuing with recovery potential assessments underway. At these levels, rebuilding will take several generations even with improved survival. 2023 Outlook Category 2-3.				
LOWER GEORGIA STRAIT CHINOOK	Cowichan River Fall Run Unenhanced (<20% hatchery origin)	**6,826** (AVG. Terminal Run Index, 1982+)	3,413	**6500 (Cowichan)** Escapement Target (S_{MSY})	**28,239** Outlook Category 4
	Adult Chinook returns to the Cowichan River in 2022 exceeded the target escapement of 6,500 naturally spawning adults for the seventh consecutive year. Escapements were below target from 2001-2015 recovering from a low of 540 natural spawners in 2009. Preliminary 2020 jack returns are estimated at 4,200 down from 8,975 in 2021. Preliminary adult escapement shows another strong cohort at 17.7K with an above average proportion of 4 year old returns. The 2023 outlook is for average to above average returns. Wild production continues to drive the escapement with the proportion of hatchery fish in the population estimated at 10% for adult age classes in 2022. A similar rebuilding trend has not been observed in the Nanaimo River although 2022 count of 7.5K was well above the 4 year average of 2.9K. Swim counts will be run through an AUC model prior to finalizing the estimate which is expected to exceed 10K for the first time in more than 18 years. Expectations for 2023 are for average to above average returns				
JOHNSTONE STRAIT / MAINLAND INLET COHO	Area 12	2700 AVG Terminal Run Index (1998+)			**852** Outlook Category 2-3
	Area 12 Coho returns appear to have stabilized in recent years, after improving substantially against the extremely poor escapement in 2016. Returns are now approaching the long-term average, which is very promising. Throughout the downturn in abundance, smolt production remained consistent but future periods of poor marine survival remain a significant risk. Our preliminary escapement at the Keogh is 2,675 adults, which is approaching the average for this system. Freshwater productivity on the Keogh began improving in 2011, and the annual smolt production since has remained above the long-term average. The return in 2022 stems from the highest smolt migration observed at 129,200. Smolt abundance in 2022 was somewhat lower than in recent years (75,174), although this count is incomplete due to a flood event that likely coincided with peak migration. We				

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast\ Outlook
	expect relatively stable returns in 2022 due to the continued high smolt output and slightly improved marine survival conditions.				
	Area 13 - North				**309** Outlook Category 2-3
	Hatchery indicators for this outlook unit are Quinsam and Big Qualicum. Adult returns to the Quinsam were below average, although low flows limited Coho migration into the Quinsam system. Reports from Quinsam Hatchery staff indicate that large numbers of Coho were present lower in the Quinsam than previously seen. The wild Coho indicator at Black Creek saw lower than average adult (1,045) and jack (928) returns than average, despite strong smolt production in 2021 and 2022, suggesting marine survival may have decreased somewhat. General observations to date suggest the 2022 forecast slightly over-estimated returns, but the extended drought may have driven many of these observations. Expectations for 2023 are for average or slightly below average escapement.				
STRAIT OF GEORGIA COHO	Quinsam				**Outlook Category 2-3**
	Big Qualicum				
	Black Creek				
	Hatchery indicators for this Outlook Unit are the Quinsam and Big Qualicum rivers. 2022 adult returns of 7,500 to the Big Qualicum were below the short and long term averages of 12-13,000. An unplanned reduction in smolt output in 2018 produced a low return of 2,600 fish in 2019 followed by a large return of 22K in 2020. Production levels are back to normal and 2023 returns are expected to be near average. Quinsam River returns were below average in fall 2022 although below normal flows affected run timing at the hatchery. The wild indicator is Black Creek. This year's estimate of 1,045 adults is below the long-term average but was also protracted due to low fall flows. Jack returns were also reduced comparted to last year at 928 but are still contributing to a large proportion of the total return. Improvement to marine survival was evident from 2019 to 2020 but fewer adults returned in 2021 and 2022 than expected. Smolt production in 2022 (58,000) is slightly above the long-term average but survival has been lower than expected which will likely lead to an average or slightly below average return for 2023.				
INNER SOUTH COAST CHUM - Non-Fraser	Johnstone Strait Area and Mainland Inlets (Areas 11 to 13)				**Outlook Category 1-2**
	Summer run Chum Salmon stocks in 2022 appear to have done poorly, but slightly improved relative to recent years. Small improvements in summer Chum abundance are likely in 2023, as marine survival appears to have improved but brood year abundance was generally poor across the South Coast. Fall-run Chum returns in 2022 appears to be below average in most systems surveyed. Productivity of these stocks has declined over the last 5 years and has been attributed to poor marine conditions for salmon. There is some indication that survivals have slightly improved in the Southern range of the distribution of Inside Southern Chum down to Puget Sound. For the 2023 return, below average parental brood abundances in both 2019 and 2020 combined with a 4+ year decline in Chum productivity will likely mean below average return of fall Chum in 2023. Recovery initiatives				

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast\ Outlook
	continue for the Nimpkish Chum stock within this area with low thousands observed in fall 2022. Expect continued variability in Chum returns on a north-south gradient favoring higher survival in southern systems.				
	Jervis/Narrows Inlet (Brittian, Deserted, Skwawka, Tzoonie, Vancouver)	**51,151** (Avg. Return, 2004+)		85,000	**3,100** (Like Last Year) (12,000 normal)
	Mid-Vancouver Island (Puntledge, Big Qualicum, Little Qualicum)	**225,697** (Avg. Return, 1995+)		230,000	**17,900** (Like Last Year) (37,600 normal)
	Nanaimo River	**61,288** (Avg. Return, 2004+)		40,000	**18,900** (Like Last Year) (44,900 normal)
	Cowichan River	**177,032** (Avg. Return, 2006+)		160,000	**68,600** (Like Last Year) (126,400 normal)
	Goldstream River	**27,070** (Avg. Return, 2000+)		15,000	**19,700** (Like Last Year) (30,400 normal)
	Data for 2022 continues to indicate well below target escapements for systems in mid to northern Georgia Strait and Jervis/Narrows Inlets. Returns to Nanaimo, Cowichan and Goldstream were improved relative to 2021 with 2 of 3 systems reaching escapement targets. Productivity for all stocks is still below long term averages. For 2023, Mid-Island systems (Puntledge, Little Qualicum, Big Qualicum) are expected to remain well below target levels. Abundance of stocks in the southern Georgia Strait such as Cowichan, Nanaimo, and Goldstream is uncertain: expectations are for Cowichan and Nanaimo to come in below escapement targets if low survivals persist or near target if survival returns to normal. Goldstream is forecast to be above the escapement target of 15K based on both the normal and conservative (LLY) models. Jervis/Narrows Inlet stocks are forecast to be below target abundance.				**Outlook Category 1-2**

LOWER AND INTERIOR FRASER AREA

FRASER SOCKEYE SALMON

Quantitative forecasts for Fraser Sockeye stocks and Pink salmon are produced annually and biannually (only odd years), respectively. The 2023 forecasts will be presented to the Fraser River Panel at the Pacific Salmon Treaty meeting in February 2023. This document provides a precursor look at the upcoming 2023 Sockeye and Pink forecast. The dominant age-of-maturity for most Fraser Sockeye stocks is four years, so Sockeye returning in 2023 as four-year-old originate from the 2019 brood year. Five-year-olds returning in 2023 originate from the 2018 brood year. Fraser Pink has a two-year life cycle with 2023 returns originating from the 2021 brood year. The Outlook is intended to provide a categorical assessment of brood-year escapements relative to Wild Salmon Policy (WSP) benchmarks and historical returns. Stocks that were affected by the Big Bar landslide in 2019 are denoted by '*' next to the name of each population/conservation unit. Categorical outlook status ranges from poor return (1) to good return (4). Definitions of the technical terms used in this document and descriptions of how each metric is calculated are provided in Appendix 1.

AVERAGE AGGREGATE RETURN (ALL CYCLES, ALL STOCKS): 12,680,008

Stock management Unit: EARLY STUART

Average aggregate return (all cycles): 148,381

<table>
<tr><th>Conservation Unit</th><th>Average Return (all cycles)</th><th>LRP / LBB</th><th>Management Target</th><th>WSP / COSEWIC Status</th><th>2023 Forecast\ Outlook</th></tr>
<tr><td rowspan="2">Early Stuart*
(CU: Takla-Trembleur-EStu)
- Cyclical: Yes</td><td>148,381 (cyc-year average; 1952-2019)</td><td></td><td></td><td>WSP – RED
COSEWIC – END</td><td rowspan="2">23,000

Outlook Category 1</td></tr>
<tr><td colspan="4">Very poor returns are expected in 2023. The 2019 brood-year effective total spawners (ETS; 89) and effective female spawners (EFS; 46) were extremely small, far below all the metrics. This includes the WSP lower benchmark for ETS (86,738), and the long-term and recent cycle line average EFS (22,641 and 1,678,respectively). This stock was heavily impacted by the Big Bar landslide in 2019 and experienced a high degree of en-route mortality associated with the additional effort and delay in reaching their spawning grounds. There was a small release of 20,000 hatchery-origin fry into the watershed from fish that were captured below the slide.</td></tr>
</table>

Stock management Unit: EARLY SUMMER

Average aggregate return (all cycles): 485,557

Conservation Unit	Average Return (all cycles)	LRP / LBB	Management Target	WSP / COSEWIC Status	2023 Forecast\ Outlook
LOWER FRASER					
Upper Pitt River *(CU: Pitt-ES)* - Cyclical: No	66,253 (1952-2019)			WSP – Green COSEWIC – NAR	**31,000** Outlook Category 1
	Poor returns are expected in 2023 relative to the all-year average returns of 66,253 (1954-2017). Pitt has a higher proportion of 5-year-old recruits (~78%) relative to 4-year-old recruits. The 2018 brood-year ETS (9,672) was slightly below the WSP lower benchmark ETS (10,627) and EFS (4,984) was below both the long-term and recent average EFS (13,142 and 9,347, respectively). The 2019 brood-year ETS and EFS were 1,208 and 708, respectively, smaller than all the aforementioned metrics. Note: these comparisons include the Upper Pitt River spawning channel escapements to be consistent with Grant et al (2020).				
Chilliwack *(CU: Chilliwack-ES)* - Cyclical: Yes*		8,000		WSP – AM/GR COSEWIC – NAR	**2,000** Outlook Category 1
	*While this stock exhibits cyclical returns, limited data preclude cycle-specific benchmarks (Grant et al 2020). The 5-year-old component has contributed a considerable amount of the stock for this cycle line. The uncertainty in both the age structure and relevant benchmarks for comparison is reflected in the outlook status. Poor returns are expected. Both the 2018 and 2019 brood year ETS (1,347 and 1,910, respectively) were below the WSP lower benchmark of 8,000. The 2018 and 2019 EFS (975 and 619, respectively) was less than half of the long-term (2,000) and recent (1,780) average levels				
Nahatlatch River *(CU: Nahatlatch-ES)* - Cyclical: No				WSP – Amber COSEWIC – SC	**2,000** Outlook Category 1
	Reliable recruitment data are not available for this CU, thus no WSP benchmarks are available for comparison (see Appendix). The 5-year-old component has contributed a considerable amount of the stock for this cycle line. Poor returns are expected since the 2019 brood-year EFS (644) was below both the long-term and recent average (2,058 and 949, respectively). EFS of 987 in the 2018 brood year was half of the long-term average but similar with the recent average.				
SOUTH THOMPSON					
Seymour River and Scotch Creek *(CU: Shuswap-ES)* Two populations represent this CU, but they share one set of benchmarks. - Cyclical: Yes & Yes	Seymour: 140,564 (1952-2019); Scotch: 17,860 (1980-2019; Cyc-year average)			WSP – Amber COSEWIC – NAR	**18,000** Outlook Category 1
	Poor returns are expected for this CU given that both the Seymour River and Scotch Creek brood-year ETS (1,024 and 1,664 respectively, combined 2,688) were well below the WSP lower benchmark (39,741). Seymour River and Scotch Creek brood-year EFS (611 and 992, respectively) was also much smaller than its respective long-term (16,993 and 2,215, respectively) and recent average escapement (4,522 and 5,434, respectively) for this cycle line.				

Conservation Unit	Average Return (all cycles)	LRP / LBB	Management Target	WSP / COSEWIC Status	2023 Forecast\ Outlook
NORTH THOMPSON					
North Barriere (incl. Fennell Creek) *(CU: North Barriere-ES)* Cyclical: No	20,479 (1971-2019)			WSP – Amber COSEWIC – Threat.	**2,000** Outlook Category 1
	Poor returns are expected in 2023 relative to the historical average of 20,479. The 2019 brood-year ETS (511) was below the lower benchmark of 640. The brood-year escapement (EFS: 256) was less than half of recent average (EFS: 652) and much lower than the long-term average (EFS: 3,723).				
MID AND UPPER FRASER					
Gates *(CU: Anderson-Seton-ES)* - Cyclical: No	49,442 (1972-2019)			WSP – AM/GR COSEWIC – NAR	**12,000** Outlook Category 2
	Below-average returns are expected for this CU. The 2019 brood-year ETS (9,473) was above the WSP lower benchmark (3,662) but below the upper benchmark (22,534). The brood-year escapement (EFS: 4,969) was above the long-term (4,309) and recent average EFS (3,320). It is important to note that these comparisons included the Gates Spawning Channel, but as of January 2020, the channel was not operated, which may influence interpretation of these trends moving forward (Grant et al. 2020).				
Nadina *(CU: Nadina-Francois-ES)* - Cyclical: No	81,137 (1977-2019)			WSP – AM/GR COSEWIC – NAR	**76,000** Outlook Category 3
	Average or above-average returns are expected for this CU. Historically, the four-year-old component dominates the escapement (~80%) but five-year-old component can contribute to up to 50% in some years. The 2019 ETS (22,198) was slightly above the lower benchmark of 21,694, whereas the 2018 five-year-old ETS (111,175) was far above the WSP upper benchmark (68,273). Escapement of 58,024 in 2018 brood year was more than five times of the long-term average (10,495) and double of recent average EFS (21,467), but the 2019 EFS was much smaller (8,351). However, this stock experienced a high degree of en-route mortality associated with the additional effort and delay in reaching their spawning grounds. Note: These comparisons include the Nadina spawning channel escapement estimates to be consistent with Grant et al (2020).				
Bowron River * *CU: Bowron-ES)* - Cyclical: No	33,399 (1952-2019)			WSP – RED COSEWIC – END	**2,000** Outlook Category 2
	Below-average returns are expected in 2023 compared with the all-year average of 33,399. Five-year-old component is expected to contribute a much higher proportion than average to this population for this cycle line (overall 30-40%). The ETS and EFS in the 2019 brood year (4-year old) were extremely low (20 and 10, respectively), well below the lower benchmark of 5,249. However, the 2018 brood year (5-yer old) ETS (8,087) was above the WSP lower benchmark but below the upper benchmark (19,369). The 2018 EFS (4,722) was also above both the long-term (3,951) and recent average (1,231). This stock was impacted by the Big Bar landslide in 2019 and 2020 return years and experienced a high degree of en-route mortality associated with the additional effort and delay in reaching their spawning grounds. Enhancement efforts due to the slide were made for this CU in 2019 but were unfortunately unsuccessful. Hatchery fry releases for this CU began in the 2020 brood year.				

Conservation Unit	Average Return (all cycles)	LRP / LBB	Management Target	WSP / COSEWIC Status	2023 Forecast\ Outlook
Taseko* *(CU: Taseko-ES)* - Cyclical: No				WSP – RED COSEWIC – END	**10** Outlook Category 1
	Reliable return data are not available for this CU, thus no WSP benchmarks are available (see Appendix). Poor returns are typically expected for this CU. The 2019 brood-year escapement is unavailable due to operational program constraints and difficulty of surveying the low number of fish which adds further uncertainty in its outlook. Limited sample size also precludes statements about the age structure of sockeye in Taseko Lake. This has been addressed going forward with the introduction of a sonar program. This stock was heavily impacted by the Big Bar landslide in 2019 and 2020 return years, and experienced a high degree of en-route mortality associated with the additional effort and delay in reaching their spawning grounds. Enhancement efforts due to the slide were made for this CU in 2019 but were unfortunately unsuccessful. Hatchery fry releases for this CU began in the 2020 brood year.				

Stock management Unit: SUMMER RUN

Average aggregate return (all cycles): 3,610,331

Conservation Unit	Average Return (all cycles)	LRP / LBB	Management Target	WSP / COSEWIC Status	2023 Forecast\ Outlook
Harrison River *(CU: Harrison (River-Type)-S)* - Cyclical: No	119,585 (1952-2020)			WSP – Green COSEWIC – NAR	**51,000** Outlook Category 2
	Below-average to average returns are expected for this CU, but this will strongly depend not only on the survival, but also the maturation rate for the 2019 and 2020 broods. This stock has an exceptional life history (River-Type), different age structure relative to other Fraser Sockeye stocks (returns are mostly comprised of 3and 4year olds) and has seen improved productivity in recent years. The 2019 ETS (3,689) was about 10% of the WSP lower benchmark (38,928), whereas the 2020 brood year ETS (75,113) was nearly double of the lower benchmark. However, the 2020 ETS was below the upper benchmark of 122,165. Similarly, the 2020 EFS of 51,062 greatly exceeded the long-term average (29,234) and recent average (18,329). The 2019 EFS (1,338) was well below those.				
Raft River *(CU: Kamloops-ES)* - Cyclical: No	28,850 (1952-2019)			WSP – Amber COSEWIC – SC	**9,000** Outlook Category 1
	Very poor returns are expected in 2023 relative to the average returns of 28,850 (1952-2017). The ETS (609) was very small in the 2019 brood year, well below WSP lower benchmark of 4,958. Brood-year EFS (362) was far below both the long-term (4,195) and recent average (2,035). This stock can have a five-year-old component of up to 30% in some years, but it is variable and inconsistent, thus only 4-year-old were considered..				
Quesnel* *(CU: Quesnel-S)* - Cyclical: Yes	1,207,391 (1952-2019; Cyc-year average)			WSP – RED/AM COSEWIC – END	**319,000** Outlook Category 1
	Poor returns are expected for this cyclical CU in 2023. The 2019 brood-year ETS of 20,552 was only about 12% of the WSP lower benchmark of 172,260. Escapement in the 2019 brood year (EFS: 14,301) was about half of the long-term (27,793) and recent average (22,646) in this cycle line. These comparisons included the Horsefly River spawning channel escapements. Additional caution should be observed for this CU given that there was an unusually low number of 4- year olds returning for this cycle year (14%). This stock was impacted by the Big Bar landslide in 2019 and 2020 return years and experienced en-route mortality associated with the additional effort in reaching their spawning grounds.				
Stellako River* *(CU: Francois-Fraser-S)* - Cyclical: No	433,537 (1952-2019)			WSP – AM/GR COSEWIC – SC	**157,000** Outlook Category 2
	Below-average returns are expected in 2023. The 2019 brood-year ETS (45,720) was above the WSP lower benchmark (24,256) but below the upper benchmark (122,612). Brood-year escapement (EFS; 26,723) was only about half of the long-term (55,614) and recent average (46,971). This stock was impacted by the Big Bar landslide in 2019 and 2020 return years and experienced en-route mortality associated with the additional effort in reaching their spawning grounds				
Chilko* *(CUs: Chilko-S and Chilko-ES)* - Cyclical: No	1,329,585 (1952-2019)			WSP – Green COSEWIC – NAR	**591,000** Outlook Category 2
	Below-average returns are expected in 2023 relative to the historical average of 1,329,585 (1952-2017). The 2019 brood-year ETS of 165,920 was above the lower benchmark (64,220) but below the upper benchmark (353,863). Escapement (EFS; 74,636) in the brood year was far below both				

	the long-term (224,194) and recent average EFS (185,585). Out-migratory smolt counting in 2021 was 16.8 million which is lower than the historic average of 22.1 million. This stock was impacted by the Big Bar landslide in 2019 and 2020 return years and experienced en-route mortality associated with the additional effort in reaching their spawning grounds. However, the smolt to adult relationship for brood year 2019 suggests that spawning success and recruitment were normal for adults that did manage to reach their spawning grounds.				
Late Stuart* *(CU: Takla-Trembleur-Stuart-S)* - Cyclical: Yes	491,383 (1952-2019; Cyc-year average)			WSP – RED/AM COSEWIC – END	**39,000** Outlook Category 1
	Poor returns are expected for this CU. The 2019 brood-year ETS of 5,801 was only 5% of the WSP lower benchmark for ETS (103,286). Escapement (EFS: 3,045) in the brood year was below the long-term average (9,353) but comparable with the recent average EFS (3,079) for this cycle line. This stock was impacted by the Big Bar landslide in 2019 and 2020 return years and experienced en-route mortality associated with the additional effort in reaching their spawning grounds.				

Stock management Unit: LATE RUN

Average aggregate return (all cycles): 2,853,541

Conservation Unit	Average Return (all cycles)	LRP / LBB	Management Target	WSP / COSEWIC Status	2023 Forecast\ Outlook
Cultus Lake *(CU: Cultus-L)* - Cyclical: No	32,323 (1952-2019)			WSP – RED COSEWIC – END	**20** Outlook Category 1
	Poor returns are expected for this CU. Brood-year effective total spawners was only 12, extremely small relative to the WSP lower benchmark for ETS (15,454). Brood-year EFS of 11 was also far below the long-term (820) and recent average (143). Out-migratory smolt counting in 2021 was only 408 (the lowest on record by a large margin), falling well below the average of 128,553 during 2001-2018.				
Portage Creek *(CU: Seton-L)* - Cyclical: No	38,617 (1953-2019)			WSP – RED COSEWIC – END	**7,000** Outlook Category 1
	Poor returns are expected for this CU. Brood-year ETS of 520 was very small and far below the WSP lower benchmark of 2,193. Brood-year EFS of 260 was also well below both the long-term (4,287) and recent average (5,779).				
South Thompson *(CU: Shuswap-L)* - Cyclical: Yes	1,157,384 (1952-2019; Cyc-year average)			WSP – AM/GR COSEWIC – NAR	**25,000** Outlook Category 1
	Poor returns are expected for this CU. Brood-year EFS (5,220) was far below the cycle-specific WSP lower benchmark (429,435). Brood-year EFS (3,424) was also well below the long-term (153,089) and recent average EFS (21,231).				
Birkenhead River *(CU: Lillooet-Harrison-L)* - Cyclical: No	300,792 (1952-2019)			WSP – Amber COSEWIC – SC	**92,000** Outlook Category 1
	Low returns are expected for this CU. This stock has a considerable five-year-old component historically (~40%). The 2018 and 2019 brood-year ETS was 13,830 and 2,975, respectively, below the WSP lower benchmark of 15,685. The 2018 and 2019 brood-year EFS (7,233 and 1,984, respectively) was also below both the long-term (39,788) and recent average EFS (8,147).				

Conservation Unit	Average Return (all cycles)	LRP / LBB	Management Target	WSP / COSEWIC Status	2023 Forecast\ Outlook
Weaver Creek *(CU: Harrison (U/S)-L)* - Cyclical: No	296,816 (1966-2019)			WSP – RED COSEWIC – END	**64,000** Outlook Category 1
	Low returns are expected for this CU. The 2019 brood-year ETS (1,764) was below the WSP lower benchmark (10,731). Brood-year EFS (1,015) was also far below the long-term (20,477) and recent average EFS (6,009). These comparisons included the Weaver Creek spawning channel escapements to be consistent with Grant et al (2020).				
Big Silver Creek *(CU: Harrison (D/S)-L)* - Cyclical: No				WSP – AM/GR COSEWIC – SC	**Outlook Category 1**
	Reliable return data are not available for this CU, thus no WSP benchmarks are available (see Appendix). Poor returns are expected for this stock, since the 2019 brood-year EFS (50) was very small compared to the long-term (1,627) and recent average EFS (1,248).				
Widgeon Slough *(CU: Widgeon (River-Type))* - Cyclical: No				WSP – RED COSEWIC – Threat.	**Outlook Category 1**
	Reliable return data are not available for this CU, thus no WSP benchmarks are available (see Appendix). Poor returns are expected in 2023. This population may have contribution from the 3-year-old component, but this is uncertain due to small population and sample sizes over time. The 2019 and 2020 escapement (EFS; 88 and 94) was smaller than the long-term average EFS (316) but similar with the recent average of 83.				

FRASER PINK

Conservation Unit	Average Return	LRP / LBB	Management Target	WSP / COSEWIC Status	2023 Forecast\ Outlook
Fraser Pink - Odd year only (CU: Fraser River: *PKO-2*)	11,386,857 (1959-2021)				**6,135,000** Outlook Category 2
	Below-average returns are expected in 2023 relative to the historic average returns of 11.4 million. Total spawning escapement in 2021 (7,827,445) was above long-term average (6,236,972; 1957-2021). However, the out-migrating Pink Salmon abundance estimated in the Mission Juvenile Pink project was 225.9 million in the spring of 2022. This fry abundance is one of the lowest on record and about half of the historic average of 480.3 million (1968-2018). It is highly probable that the low abundance of outmigrating Pink fry may be related to the significant flooding that occurred in Lower Fraser River during the fall in 2021 which could have negatively impacted egg survival during the incubation period. While Fraser Pink salmon do not have associated Wild Salmon Policy benchmarks, and have not been assessed by COSEWIC, there is an spawning escapement target of 6,000,000 when returns are above 7,059,000. When returns are below 7,059,000, exploitation rate declines with decreasing return abundance linearly from 15% to 0%. When returns are above 20,000,000 there is an exploitation rate cap of 70%. These fisheries reference points provide insight into stock status. 2021 returns and escapements satisfied both the "lower" reference point of 7.059 million, and the spawning escapement goal of 6,000,000. The outlook for Fraser Pink salmon should be approached with caution considering the low fry abundance observed in 2022 and significant flooding 2021.				

FRASER CHINOOK

Stock Management Unit	Conservation Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	WSP / COSEWIC Status	2023 Forecast\ Outlook
SPRING RUN 4_2 CHINOOK SALMON	**Aggregate SMU**	**10,300** (CTC ESC[1] 1975-2021)		**22,100** Escapement Target (S_{MSY})		**8,900** Terminal Run Outlook Category 2
	CK-17 Lower Thompson	**9,900** (ESC 1975-2021) **7,600** (Last Gen)	4000		WSP – Red COSEWIC – END.	
	CK-16 South Thompson-Bessette Creek	**100** (ESC 1975-2021) **10** (Last Gen)	1000		WSP – Red	
	The 2021 escapement estimates were near the long term average above the 2018 parental brood escapement. Expectations are for continued low abundance in 2023 due to below average parental escapements in 2019 and uncertainty around marine survival and productivity. The 2022 Outlook Category was 1.					
SPRING RUN 5_2 CHINOOK SALMON*	**Aggregate SMU**	**24,500** (CTC ESC**Error! Bookmark not defined.** 1975-2022)		**42,200** Escapement Target (S_{MSY})		**23,600** Terminal Run Outlook Category 2
	CK-04 Lower Fraser	**400** (ESC 1975-2022) **200** (Last Gen)	1,000		COSEWIC – Special Concern	
	CK-08 Middle Fraser- Fraser Canyon	**60** (ESC 1975-2022) **50** (Last Gen)	1,000		WSP – Data D. COSEWIC – END	
	CK-10 Middle Fraser	**7,700** (ESC 1975-2022) **3,700** (Last Gen)	5,300		WSP – Red COSEWIC – Threat.	
	CK-12 Upper Fraser	**17,700** (ESC 1975-2022) **9,600** (Last Gen	5,300		WSP – Red COSEWIC – END	
	CK-18 North Thompson	**700** (ESC 1975-2022) **300** (Last Gen)	1,000		WSP – Red COSEWIC – END	
	There continues to be considerable escapement variation among these conservation units. On average, the 2022 escapement estimates were near the					

[1] Average aggregate escapement is based on the set of systems used for analysis by the CTC which does not always include every system in each CU due to data standard requirements for consistent methodology and complete or near complete time series.

Stock Management Unit	Conservation Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	WSP / COSEWIC Status	2023 Forecast\ Outlook
	long-term average and above the 2017 parental brood escapement, but still below the escapement target. Expectations are for continued low abundance compared to the escapement target in 2023. In addition to below average parental escapement in 2018 and uncertainty around marine survival and productivity, the 2019 Big Bar landslide resulted in high mortality which affects the 4 year old component of the 2023 escapement for CK-10 and CK-12. The 2022 Outlook Category was 1.					
SUMMER RUN 5_2 CHINOOK SALMON*	**Aggregate SMU**	**19,500** (CTC ESC[Error! Bookmark not defined.] 1975-2022)		**23,600** Escapement Target (S_{MSY})		**28,200** Terminal Run Outlook Category 3
	CK-05 Lower Fraser – Upper Pitt	**200** (ESC 1975-2022) **70** (Last Gen)	1,000		WSP – Data D. COSEWIC – END	
	CK-06 Lower Fraser	**60** (ESC 1975-2022) **40** (Last Gen)	1,000		WSP – Data D. COSEWIC – Threat.	
	CK-09 Middle Fraser - Portage	**100** (ESC 1975-2022) **60** (Last Gen)	1,000		WSP – Red COSEWIC – END	
	CK-11 Middle Fraser	**14,900** (ESC 1975-2022) **9,400** (Last Gen)	5,800		WSP – Amber COSEWIC – Threat.	
	CK-14 South Thompson	**1,300** (ESC 1975-2022) **1,400** (Last Gen)	1,000		WSP – Amber COSEWIC – END	
	CK-19 North Thompson	**4,300**(ESC 1975-2022) **3,100** (Last Gen)	1,800		WSP – Red COSEWIC – END	
	There continues to be considerable escapement variation among these conservation units. On average, the 2022 escapement estimates were above the long-term average, the 2017 parental brood and near the Smsy escapement target. Expectations are for overall moderate abundance in 2023, based on the forecast. However, it is important to note that in addition to below average parental escapement in 2018 and uncertainty around marine survival and productivity, the 2019 Big Bar landslide resulted in high mortality which affects the 4 year old component of the 2023 escapement for the Middle Fraser CU (CK-11), which makes up a large component of the SMU. The 2022 Outlook Category was 1.					
SUMMER RUN 4_1 CHINOOK SALMON		**67,900** (CTC ESC[Error! Bookmark not		**120,300** Escapement Target (S_{MSY})		**130,300** Terminal Run

Stock Management Unit	Conservation Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	WSP / COSEWIC Status	2023 Forecast\ Outlook
		defined. 1975-2022)				Outlook Category 3
	CK-13 South Thompson	**44,900** (ESC 1975-2022) **120,061** (Last Gen)	23,600		WSP – Green COSEWIC – Not at Risk	
	CK-15 Shuswap River	**26,100** (ESC 1975-2022) **31,588** (Last Gen)	2,100		COSEWIC – Not at Risk	
	CK-07 Maria Slough	**300** (ESC 1975-2022) **100** (Last Gen)	1,000		Not assessed.	**Outlook Category 1**
	The 2022 escapement estimate for the aggregate exceeded both the long-term average and the parental brood escapement (with the exception of Maria Slough) and is expected to be the case again in 2023. The Lower Shuswap indicator once again exceeded the PST Management Objective of 12,300 spawners, making 2022 the 6th consecutive year the target has been met. Expectations are for continued high abundance for CUs other than Maria Slough in 2023 given high parental escapement in 2019.					
FALL RUN 4$_1$ CHINOOK SALMON	**Aggregate**	**125,000** (ESC 1984-2022)				**Outlook Category 4**
	(P) Chilliwack Hatchery Exclusion	**35,800** (ESC 1984-2022) **53,800** (Last Gen)	n/a (hatchery)		Not assessed.	Chilliwack Terminal Run **73,200** Outlook Category 4
	CK::Lower Fraser River-fall timing (white) - Harrison	**89,300** (ESC 1984-2022) **51,600** (Last Gen)	**15,300**	**75,100** Escapement Target (S_{MSY})	WSP – Green COSEWIC – Threat.	Adult Escapement **118,100** Outlook Category 4
	The 2022 Harrison escapement estimate was near the long-term average and above the parental brood escapement in 2018. For the first time since 2015, and only the second time in the last 11 years, Harrison exceeded the PST escapement goal of 75,100. The forecast for 2023 is for high abundance and for Harrison to exceed the escapement goal, based partially on the higher return of 3 year-olds seen in 2022. Chilliwack hatchery production, marine survival, and fishery exploitation are expected to return sufficient abundance to achieve hatchery production objectives. The 2022 Outlook Category was 1 (Harrison) and 4 (Chilliwack).					

FRASER COHO

STOCK MANAGEMENT UNIT	Conservation Unit / Sub Unit	Average Return	LRP / LBB	Management Target	WSP / COSEWIC Status	2023 Forecast\ Outlook
Interior Fraser Coho	**Aggregate**	**35,900 (ESC 1998 – 2021)**		**34,100 + 3 years of survival ≥3%**	COSEWIC - Threat	**87,079** Outlook Category 2
	Fraser Canyon	**3,300** (ESC 1998 – 2021)	**1,000**			
	Interior Fraser	**5,000** (ESC 1998 – 2021)	**1,800**			
	North Thompson	**12,900** (ESC 1998 – 2021)	**2,600**			
	Lower Thompson	**7,000** (ESC 1998 – 2021)	**1,400**			
	South Thompson	**7,700** (ESC 1998 – 2021)	**2,300**			
		The SMU status will remain low. The survival target of 3% was met in 2021 for the first time since 1999; however, three successive years of survival over 3% are required to change to the "Moderate" SMU status. The preliminary survival estimate for 2022 is below 3%, currently estimated at 1.9%. Outlook category is a 2 due to recent escapements exceeding the limit reference point, but survival remains below the moderate SMU management reference point.				
Lower Fraser Coho	**Aggregate – includes 3 CUs**	Not Available				**Data Deficient**
		Inch Creek hatchery smolt-adult survival is a proxy for changes in the relative abundance for the SMU. The 2023 forecast for marine survival for this indicator is 5.5%, a decrease (-34%) from the observed level in 2022 An outlook category cannot be determined as there is no limit reference point or escapement time series.				

FRASER CHUM

Stock Management Unit	Conservation Unit	Average Return (all cycles)	LRP / LBB	Management Target	WSP / COSEWIC Status	2023 Forecast\ Outlook
Inner South Coast Chum - Fraser	Lower Fraser CU			There is a management goal of 800,000 wild spawners.		**Outlook Category 2**
		Fraser River Chum Salmon spawning escapement has failed to reach the management goal in five of the past six years (2017-2021). The October 21, 2022 in-season terminal return estimate was 879,000 fish (80% probability interval of 547,000 and 1,424,000 Chum), and the 2022 spawning escapement will be available by April 2023. Returns in 2023 will be dominated by 4-year-old brood from the 2019 escapement of 300,000 spawners, which was the lowest escapement in over 20 years. Spawning escapements have failed to outperform brood in five of the past six years (2017-2021).				

HOWE SOUND / BURRARD INLET

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast\ Outlook
PINK	Part of the Southern Fjords odd and even CUs				**Data Deficient**
CHINOOK	Part of the South Coast – Southern Fjords CU				**Data Deficient**
	Some years with good information for the Indian River.				
Strait of Georgia Coho	Howe Sound – Burrard Inlet CU				**Data Deficient**
INNER SOUTH COAST CHUM – Non-Fraser	Howe Sound – Burrard Inlet CU				**Data Deficient**

BOUNDARY BAY

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2023 Forecast\ Outlook
CHINOOK	CK-01 Boundary Bay	**200** (Little Campbell ESC 1980-2021)	1,000	2,100	**Outlook Category 1**
	Data are available for the Little Campbell River (CK-01). The 2021 escapement was 370 fish. CK-01 is currently undergoing review for listing under the *Species at Risk Act*.				
COHO	Boundary Bay CU				**Data Deficient**
INNER SOUTH COAST CHUM – Non-Fraser	Boundary Bay CU				**Data Deficient**

OKANAGAN

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	WSP / COSEWIC Status	2023 Forecast\ Outlook
OKANAGAN SOCKEYE	Osoyoos			58,730 adults at Wells Dam or 29,365 as peakcounts in the terminal index area		**129,000 to 174,000** adults Outlook Category 2
	Forecast is below the average as calculated since 2008 (when improved water management started to affect the stock). The 2022 Outlook Category was 1.					
OKANAGAN CHINOOK	Okanagan Summer	**30** (ESC 2006- 2022)	1,000	**3,400**	COSEWIC - END	**Outlook Category 1**
	The 2021 escapement was 73 spawners. Escapement information for 2022 is 23 spawners. Expectations for 2023 are for continued depressed abundance related to low parental escapements, low marine and freshwater survival, low productivity, and low hatchery production. The 2021 and 2022 Outlook Category was 1.					

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APPENDIX - SOCKEYE

When considering the term “target” used for defining outlook categories, we considered upper WSP benchmarks to be the target (not the lower benchmark).

- Outlook status 1: population/CU is below the lower WSP benchmark
- Outlook status 2: population/CU is above the lower benchmark, but less than 50% of the upper benchmark
- Outlook status 3: population/CU is between 50-75% of the upper benchmark
- Outlook status 4: population/CU is over 75% of the upper benchmark

Details on how each metric was calculated or obtained for comparison.

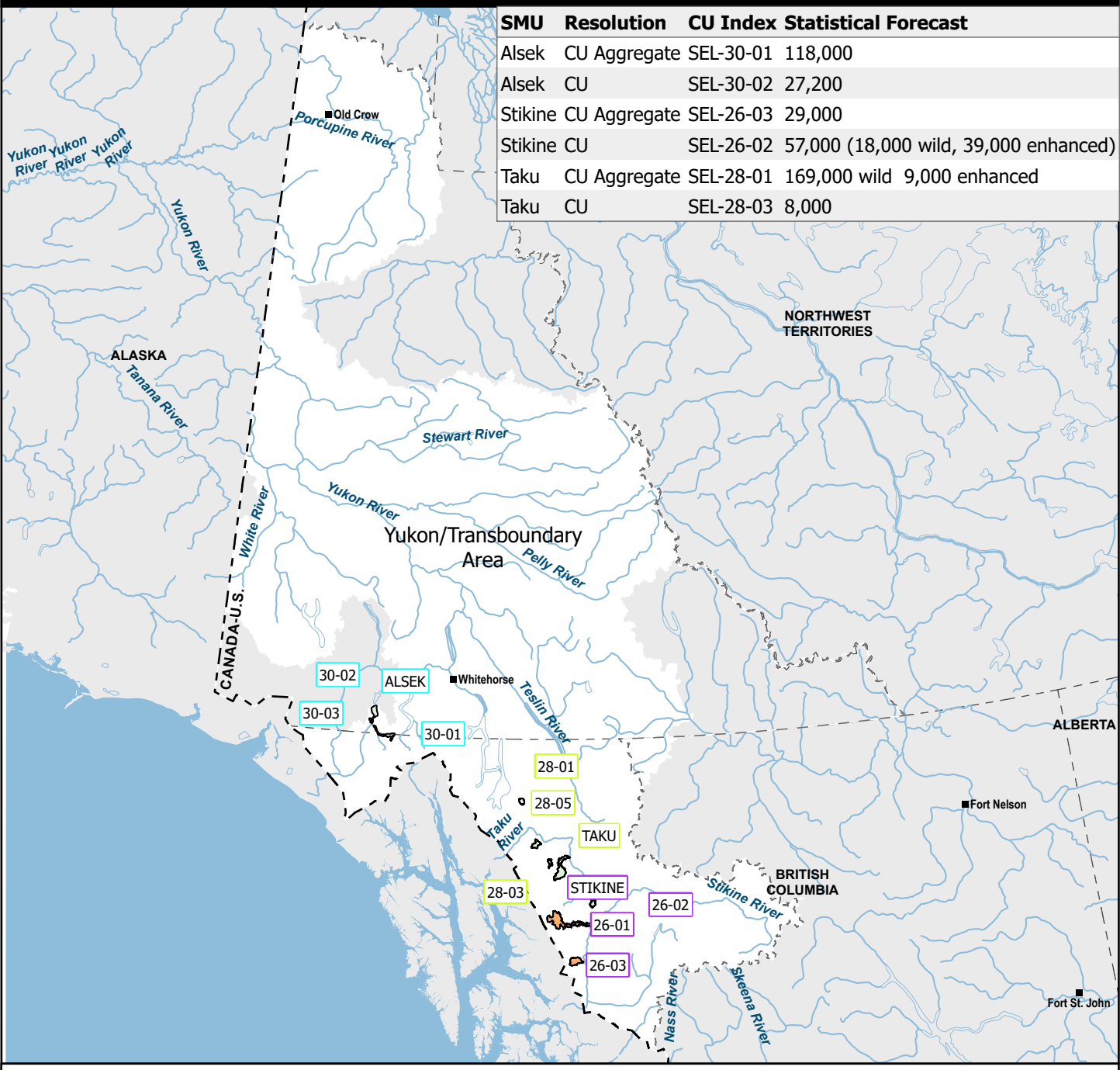
- Long-term average EFS was calculated from the start date identified in Grant et al (2020) up to and including the brood year of interest (for the 2022 Outlook, that would be 2018). This obviously may not hold true for stocks with predominantly 3- or 5-year old cohorts, but it is not expected to change the outcome drastically.
  - For cyclical stocks, long-term average EFS was calculated based on the cycle line average EFS. For example, for Seymour River, the long-term average EFS is the average of the 2022 cycle line escapements from 1950-2018.
  - For non-cyclical stocks, long-term average EFS was calculated across all years in the time series. For example, Harrison River long term average EFS is the average of each year’s EFS from 1948-2018.
- Short term average EFS is calculated from the most recent 4 years of escapements. The purpose is to capture brood year relative to recent trends in escapement.
  - For cyclical stocks, this is the most recent 4 years in that cycle line (e.g., for the 2022 outlook, the average is calculated from 2018, 2014, 2010 and 2006 EFS).
  - For non-cyclical stocks, this is the most recent 4 years available up to the brood year of interest (e.g., for the 2022 Outlook, it is calculated from 2015-2018, inclusive. Note the most recent year, in this case 2021, is not available at the time the Outlook is calculated).
- Most systems compare the average EFS of the 4- year old component (2018) to the long term average EFS and benchmarks. However, it is prudent to consider 3- and 5-year old components for some stocks. These stocks were identified visually using the PSC Age Composition Comparison App online (Brkic 2020). Note that for some cyclical stocks, this will have to be revisited in future years depending on the cycle line. For example, Mitchell and Horsefly Rivers (Quesnel-Summer) have much lower 4 year old contribution on the 2019 cycle line.
- Escapement benchmarks were manually compiled from Grant et al 2020. Note that this methods uses CUs; while Scotch and Seymour are reported separately here, they are part of the same CU and so have the same 4-year median and benchmarks. These need to be updated annually for cyclical stocks as each cycle line has its own benchmarks.
- Effective total spawners (ETS) was calculated to compare to the Wild Salmon Policy (WSP) benchmarks as they are calculated in terms of ETS (apples to apples). Grant et al 2020 outlines how ETS is calculated; briefly, ETS=(annual_male_escapement +

annual_female_escapement)*annual_spawn_success, where spawn success is the spawn success of the females (based on egg retention in carcasses).

- Outlook status ranges from 1-4, with 1 being the poorest outlook/lowest return, and 4 being the highest. They are informed by the status definitions in FRAFS (2018) with slight modifications. Note some populations/CUs may receive dual statuses to represent uncertainty in data and/or evidence for multiple status categories (including the potential for multiple age classes). Status designation is determined by comparing brood-year effective total spawners (ETS) to the WSP benchmarks for ETS. If no benchmarks are available, it is manually/qualitatively assigned by comparing brood-year effective female spawners (EFS) to long-term and recent average EFS. In a case where benchmark rule is not consistent with brood-year EFS relative to the historical data, the Outlook status conforms to the former one.

2023 Salmon Outlook - Pacific Region

SMU	Resolution	CU Index	Statistical Forecast
Alsek	CU Aggregate	SEL-30-01	118,000
Alsek	CU	SEL-30-02	27,200
Stikine	CU Aggregate	SEL-26-03	29,000
Stikine	CU	SEL-26-02	57,000 (18,000 wild, 39,000 enhanced)
Taku	CU Aggregate	SEL-28-01	169,000 wild 9,000 enhanced
Taku	CU	SEL-28-03	8,000



SOCKEYE SALMON - YUKON/TRANSBOUNDARY AREA

Outlook Category

The purpose of the Outlook is to provide the expected abundance of salmon to inform the harvest planning process. The preliminary Outlook provides a categorical abundance expectation based expert opinion and the final outlook replaces 'categorical outlooks' with expected abundance for those stock units with statistical forecasts.

1 | 1-2 | 2 | 2-3 | 3 | 3-4 | 4 | 5

1. Poor status. This category is undesirable because of the risk of extirpation, and the loss of ecological benefits and salmon production. The presence of a SMU/CU in this category will initiate consideration of ways to protect the fish, increase their abundance, and reduce the potential risk of loss.
2. Marginal status. This category status implies caution in the management of the unit. While a unit in this category should be at a low risk of loss, there will be a degree of lost production. Higher management intervention.
3. Healthy status. Near average spawning abundance. Possible management intervention for social and economic considerations.
4. Abundant status. High spawning abundance and distribution. Low management intervention.
5. Data Deficient. SMUs for which insufficient data area available to determine an Outlook are noted as 'Data Deficient'.

Conservation Unit (CU) #

The index number is a code assigned to the CU that when prefixed by the species code becomes the CU index, e.g., Chinook: CK-1, Chum: CM-1, Coho: CO-1, River-Type Sockeye: SER-1, Lake-Type Sockeye: SEL-1, Even Year Pink: PKE-1, Odd Year Pink: PKO-1.

Stock Management Unit (SMU) SMU

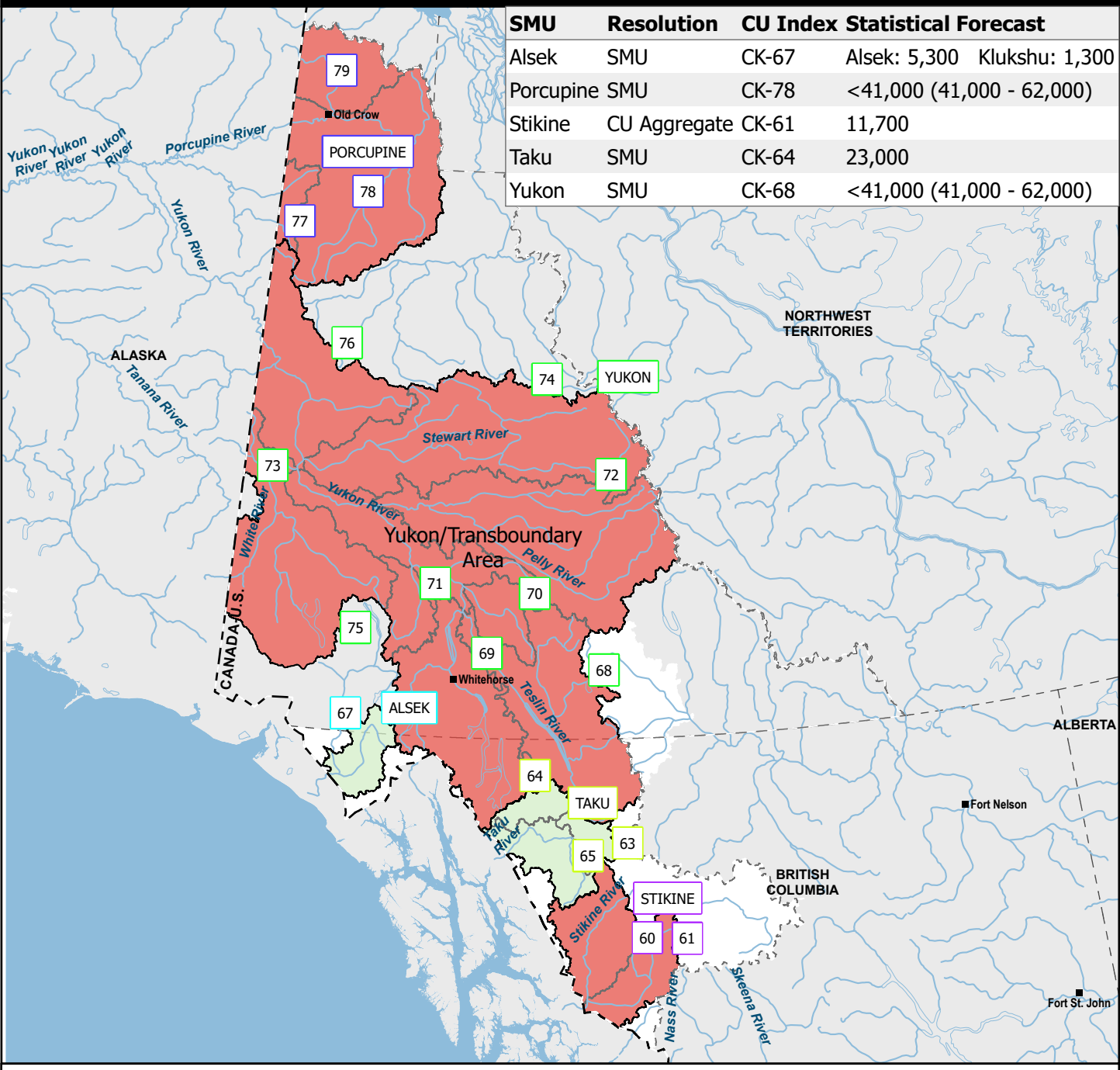
For salmon, the working definition of a 'stock management unit' is a 'group of one or more CUs that are managed together with the objective of achieving a joint status'.

For more information visit:
https://www.pac.dfo-mpo.gc.ca/pacific-smon-pacifique/science/research-recherche/smon-summ-somm-eng.html

Projection: NAD 1983 Yukon Albers
Production Date: 10/16/2023
Produced By: Coastal Resource Mapping Ltd for Fisheries and Oceans Canada

2023 Salmon Outlook - Pacific Region

SMU	Resolution	CU Index	Statistical Forecast
Alsek	SMU	CK-67	Alsek: 5,300 Klukshu: 1,300
Porcupine	SMU	CK-78	<41,000 (41,000 - 62,000)
Stikine	CU Aggregate	CK-61	11,700
Taku	SMU	CK-64	23,000
Yukon	SMU	CK-68	<41,000 (41,000 - 62,000)



CHINOOK SALMON - YUKON/TRANSBOUNDARY AREA

Outlook Category

The purpose of the Outlook is to provide the expected abundance of salmon to inform the harvest planning process. The preliminary Outlook provides a categorical abundance expectation based expert opinion and the final outlook replaces 'categorical outlooks' with expected abundance for those stock units with statistical forecasts.

1 | 1-2 | 2 | 2-3 | 3 | 3-4 | 4 | 5

1. Poor status. This category is undesirable because of the risk of extirpation, and the loss of ecological benefits and salmon production. The presence of a SMU/CU in this category will initiate consideration of ways to protect the fish, increase their abundance, and reduce the potential risk of loss.
2. Marginal status. This category status implies caution in the management of the unit. While a unit in this category should be at a low risk of loss, there will be a degree of lost production. Higher management intervention.
3. Healthy status. Near average spawning abundance. Possible management intervention for social and economic considerations.
4. Abundant status. High spawning abundance and distribution. Low management intervention.
5. Data Deficient. SMUs for which insufficient data area available to determine an Outlook are noted as 'Data Deficient'.

Conservation Unit (CU) #

The index number is a code assigned to the CU that when prefixed by the species code becomes the CU index, e.g., Chinook: CK-1, Chum: CM-1, Coho: CO-1, River-Type Sockeye: SER-1, Lake-Type Sockeye: SEL-1, Even Year Pink: PKE-1, Odd Year Pink: PKO-1.

Stock Management Unit (SMU) SMU

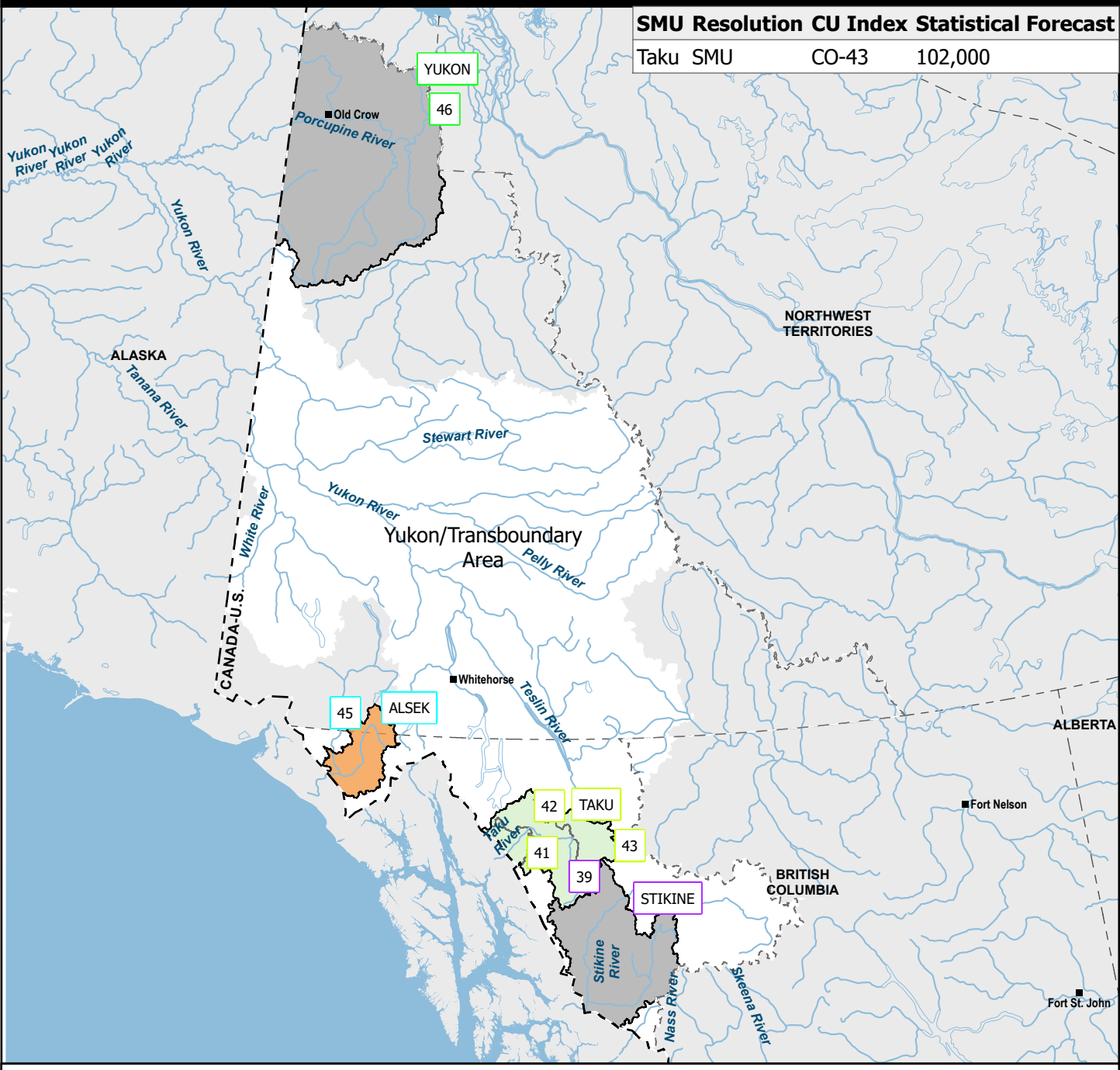
For salmon, the working definition of a 'stock management unit' is a 'group of one or more CUs that are managed together with the objective of achieving a joint status'.

For more information visit:
https://www.pac.dfo-mpo.gc.ca/pacific-smon-pacifique/science/research-recherche/smon-summ-somm-eng.html

Projection: NAD 1983 Yukon Albers
Production Date: 9/15/2023
Produced By: Coastal Resource Mapping Ltd for Fisheries and Oceans Canada

2023 Salmon Outlook - Pacific Region

SMU	Resolution	CU Index	Statistical Forecast
Taku	SMU	CO-43	102,000



COHO SALMON - YUKON/TRANSBOUNDARY AREA

Outlook Category

The purpose of the Outlook is to provide the expected abundance of salmon to inform the harvest planning process. The preliminary Outlook provides a categorical abundance expectation based expert opinion and the final outlook replaces 'categorical outlooks' with expected abundance for those stock units with statistical forecasts.

1 | 1-2 | 2 | 2-3 | 3 | 3-4 | 4 | 5

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Conservation Unit (CU) #

The index number is a code assigned to the CU that when prefixed by the species code becomes the CU index, e.g., Chinook: CK-1, Chum: CM-1, Coho: CO-1, River-Type Sockeye: SER-1, Lake-Type Sockeye: SEL-1, Even Year Pink: PKE-1, Odd Year Pink: PKO-1.

Stock Management Unit (SMU) SMU

For salmon, the working definition of a 'stock management unit' is a 'group of one or more CUs that are managed together with the objective of achieving a joint status'.

For more information visit:
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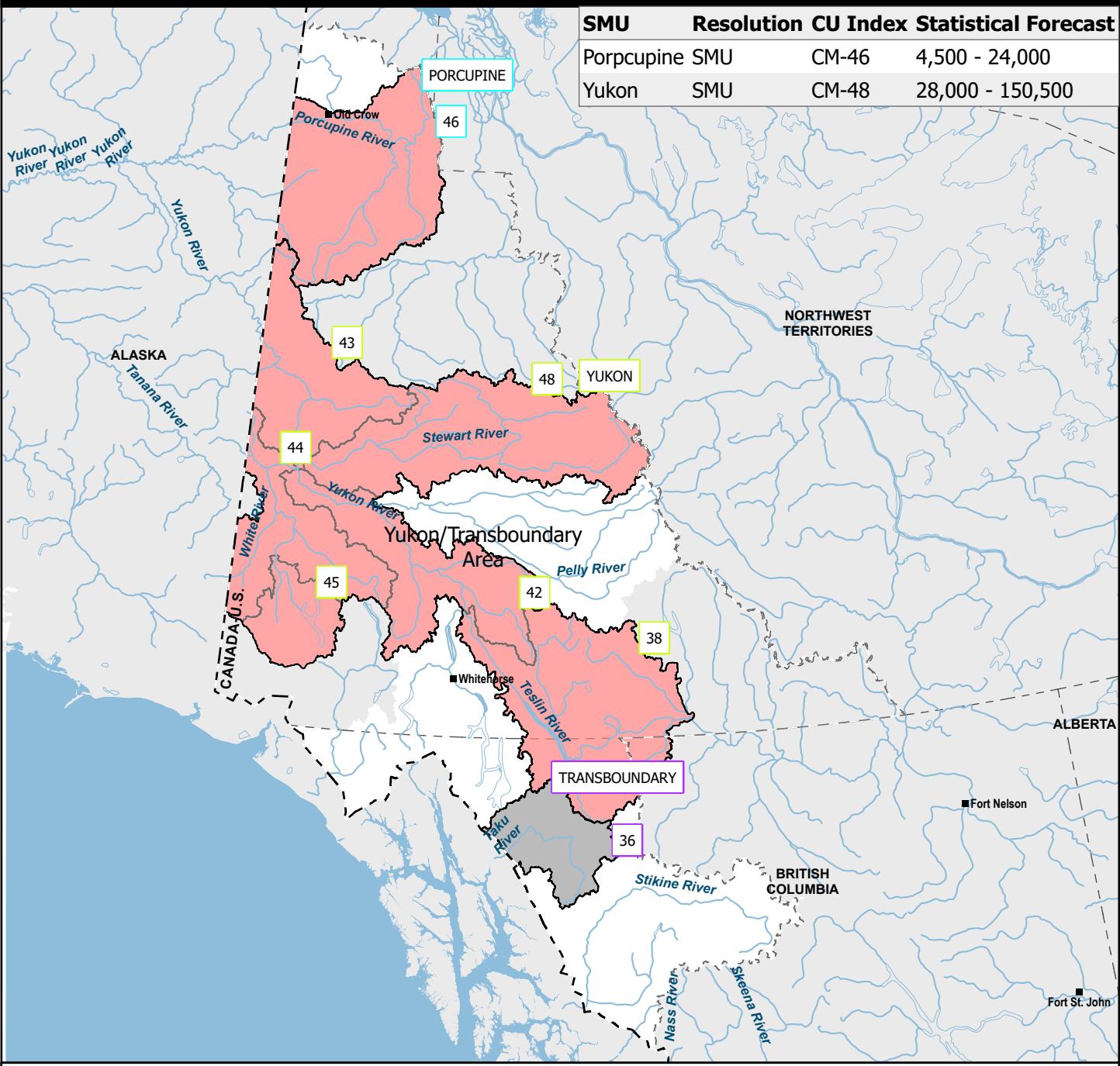
Production Date: 9/15/2023
Produced By: Coastal Resource Mapping Ltd for Fisheries and Oceans Canada

2023 Salmon Outlook - Pacific Region

SMU	Resolution	CU Index	Statistical Forecast
Porpcupine	SMU	CM-46	4,500 - 24,000
Yukon	SMU	CM-48	28,000 - 150,500



CHUM SALMON - YUKON/TRANSBOUNDARY AREA

Outlook Category

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1 | 1-2 | 2 | 2-3 | 3 | 3-4 | 4 | 5

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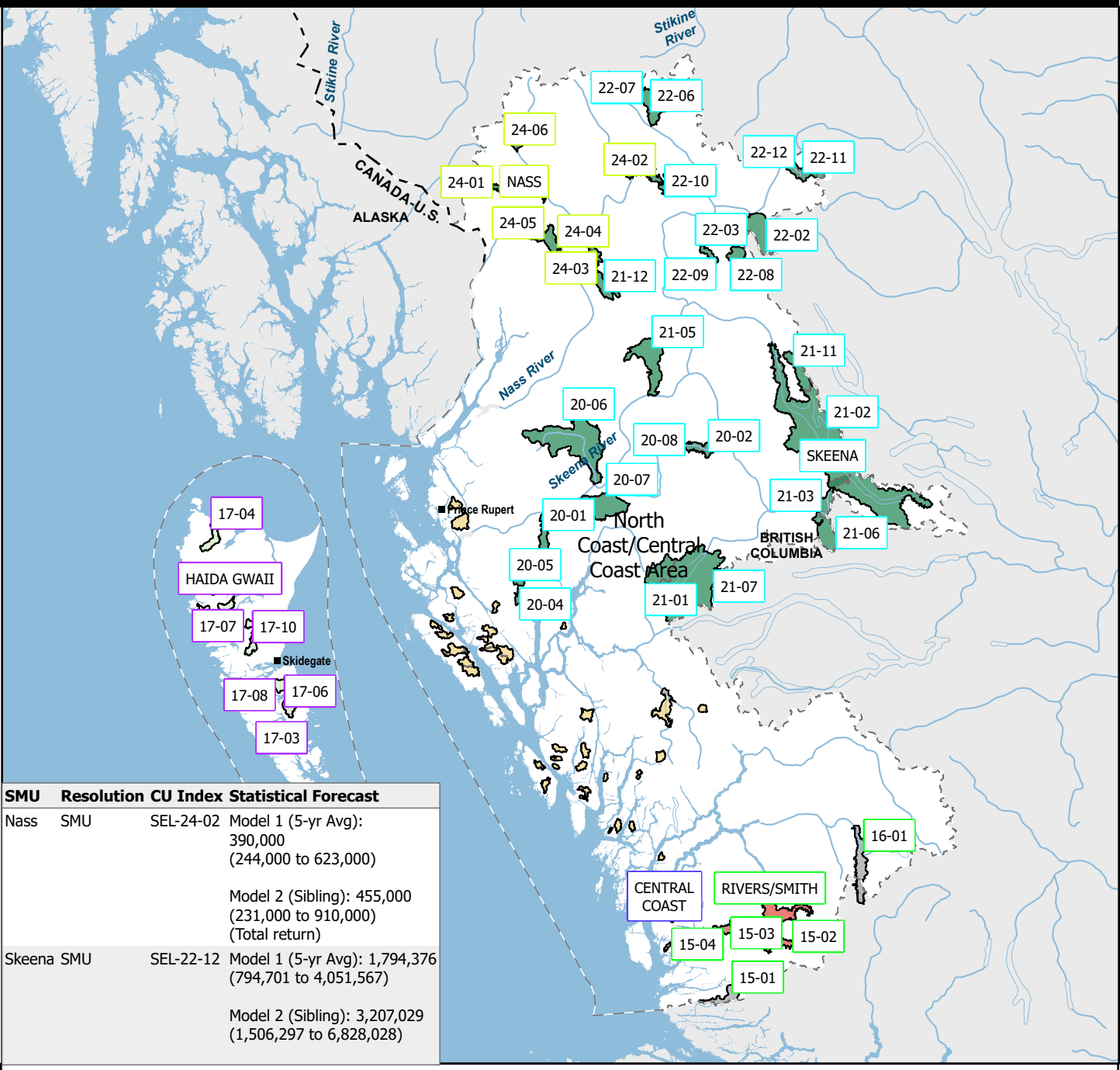
2023 Salmon Outlook - Pacific Region



SMU	Resolution	CU Index	Statistical Forecast
Nass	SMU	SEL-24-02	Model 1 (5-yr Avg): 390,000 (244,000 to 623,000) Model 2 (Sibling): 455,000 (231,000 to 910,000) (Total return)
Skeena	SMU	SEL-22-12	Model 1 (5-yr Avg): 1,794,376 (794,701 to 4,051,567) Model 2 (Sibling): 3,207,029 (1,506,297 to 6,828,028)

SOCKEYE SALMON - NORTH COAST/CENTRAL COAST AREA

Outlook Category

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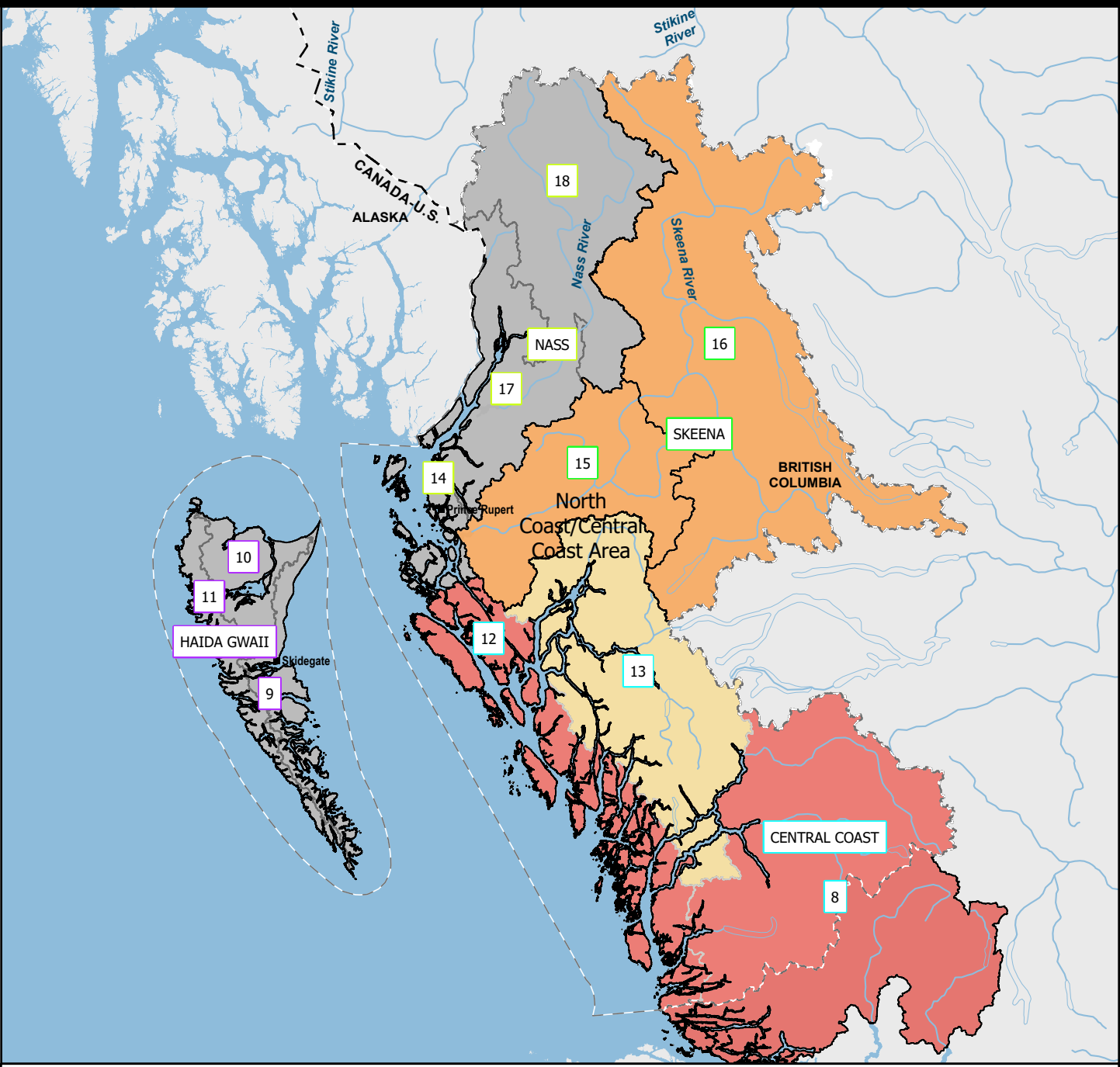
2023 Salmon Outlook - Pacific Region



PINK SALMON - NORTH COAST/CENTRAL COAST AREA

Outlook Category

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Stock Management Unit (SMU) SMU

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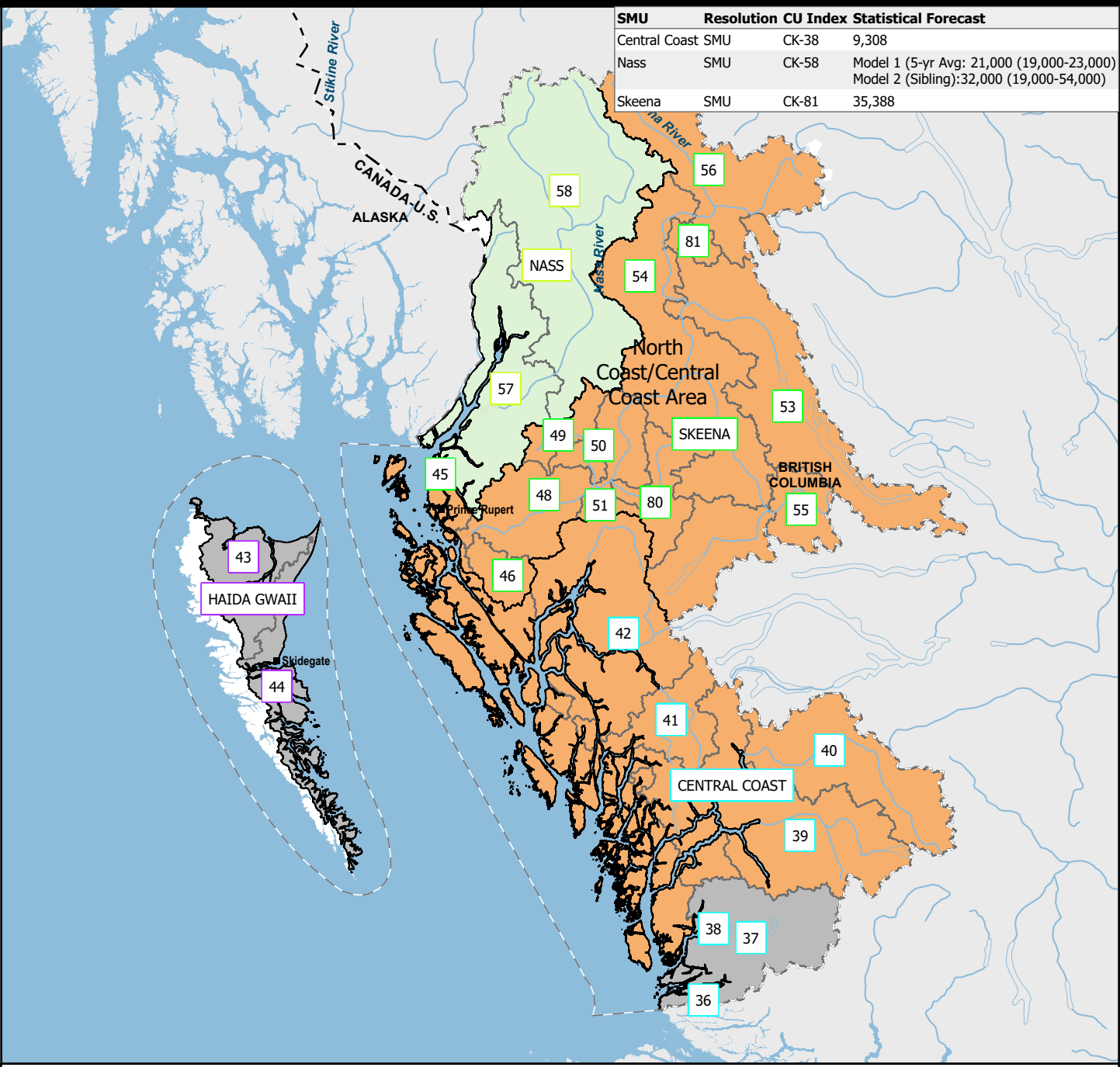
2023 Salmon Outlook - Pacific Region

SMU	Resolution	CU Index	Statistical Forecast
Central Coast	SMU	CK-38	9,308
Nass	SMU	CK-58	Model 1 (5-yr Avg: 21,000 (19,000-23,000) Model 2 (Sibling):32,000 (19,000-54,000)
Skeena	SMU	CK-81	35,388



CHINOOK SALMON - NORTH COAST/CENTRAL COAST AREA

Outlook Category

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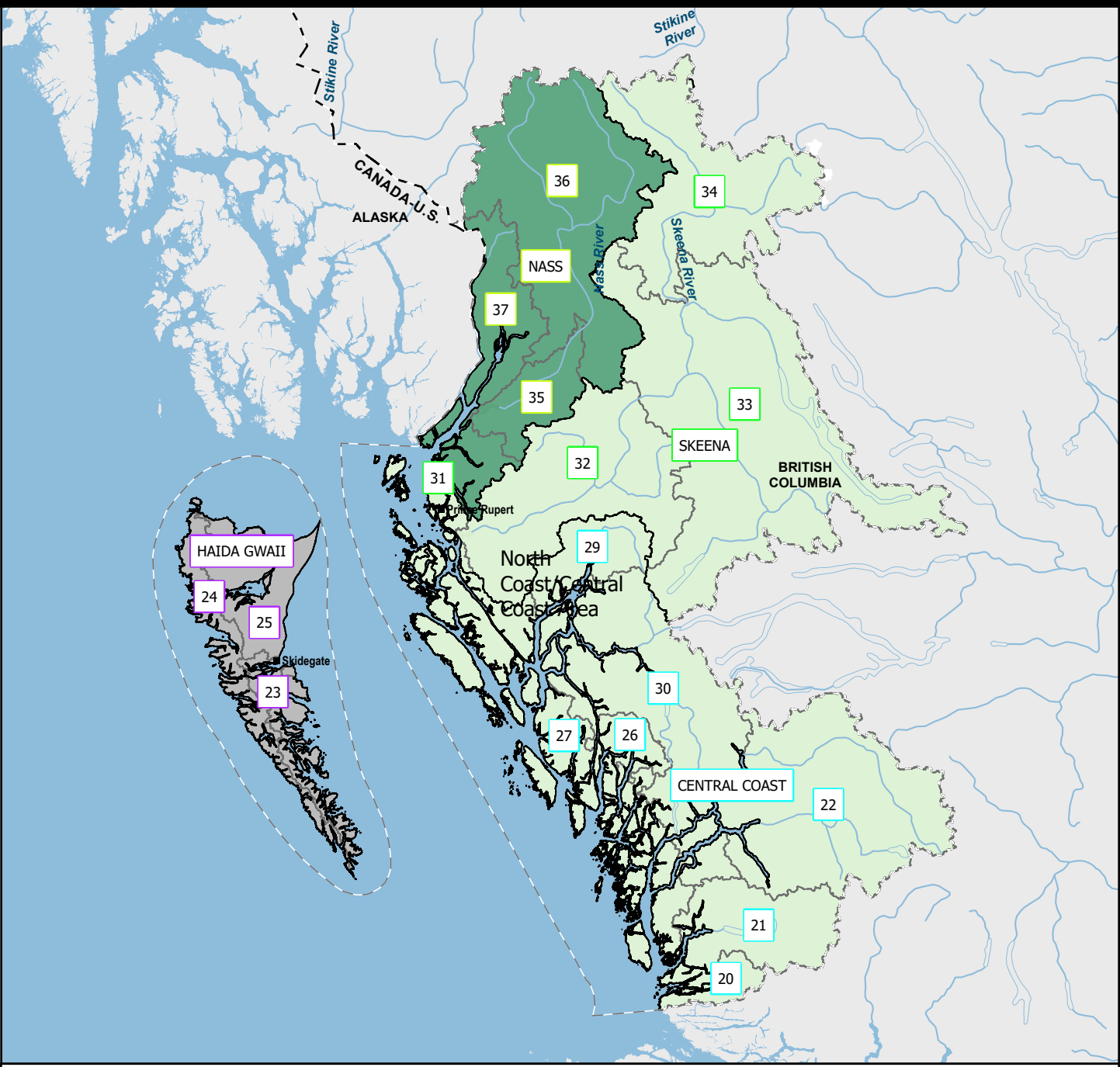
2023 Salmon Outlook - Pacific Region



COHO SALMON - NORTH COAST/CENTRAL COAST AREA

Outlook Category

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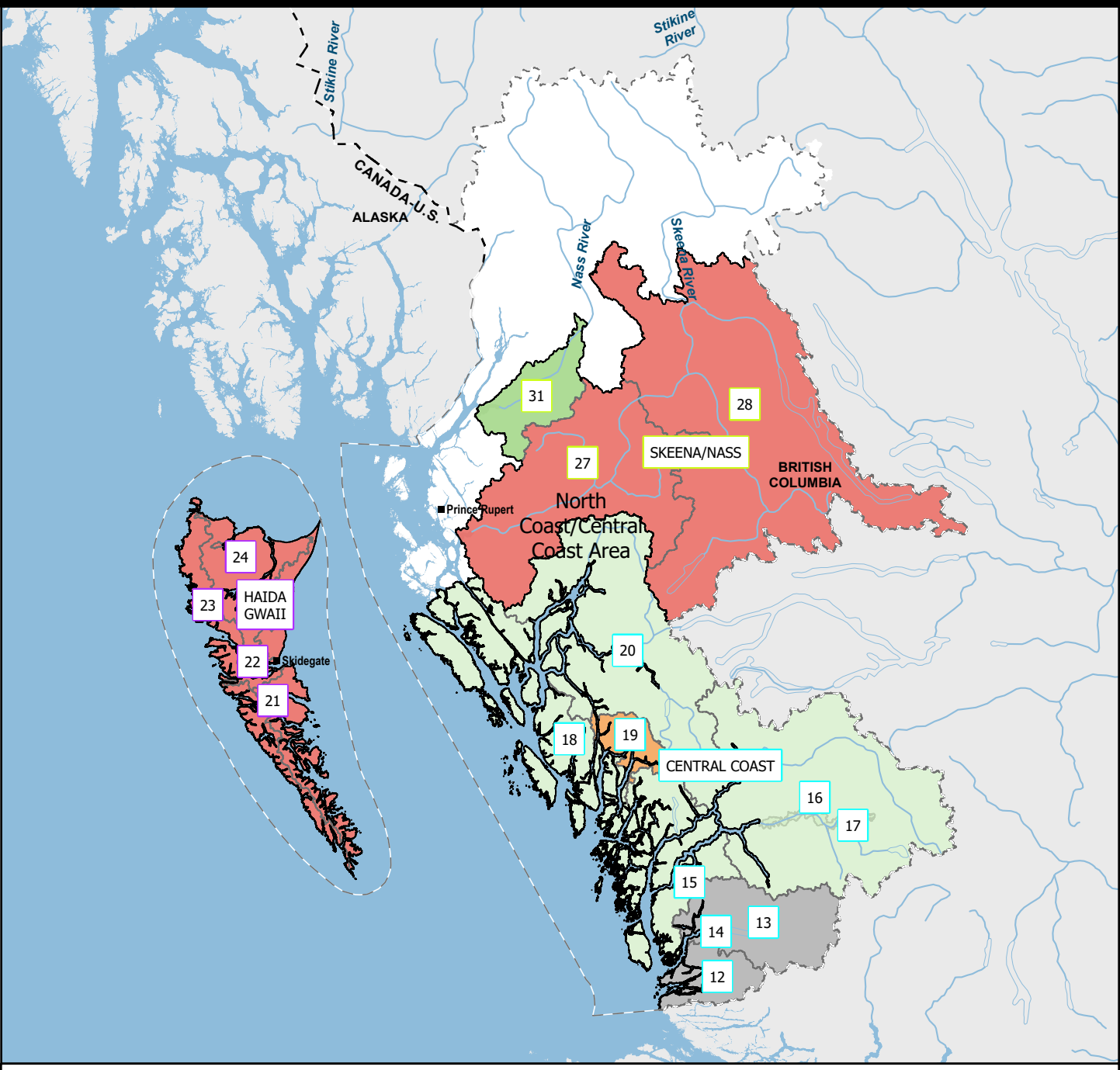
2023 Salmon Outlook - Pacific Region



CHUM SALMON - NORTH COAST/CENTRAL COAST AREA

Outlook Category

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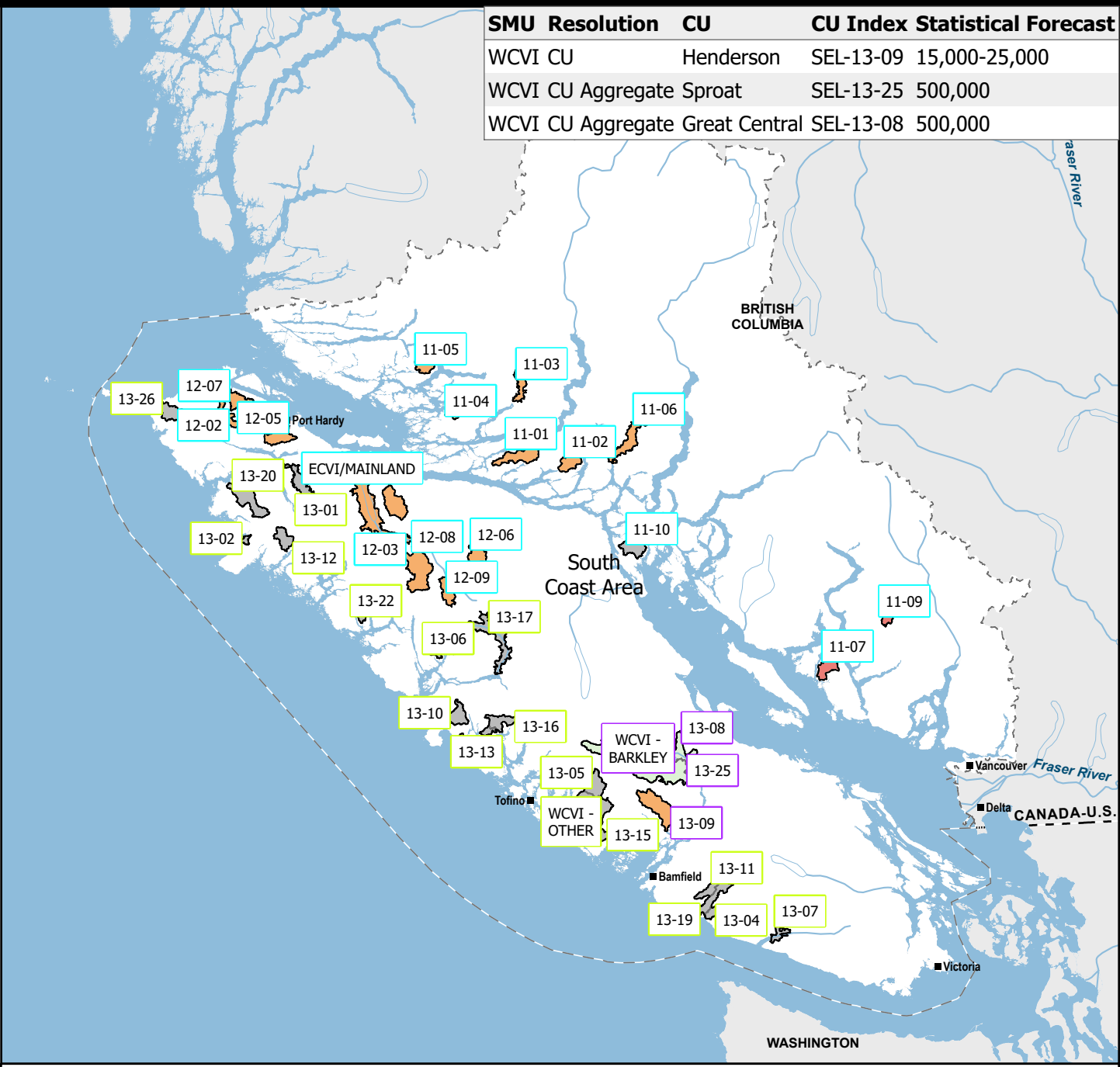
2023 Salmon Outlook - Pacific Region

SMU	Resolution	CU	CU Index	Statistical Forecast
WCVI	CU	Henderson	SEL-13-09	15,000-25,000
WCVI	CU Aggregate	Sproat	SEL-13-25	500,000
WCVI	CU Aggregate	Great Central	SEL-13-08	500,000



SOCKEYE SALMON - SOUTH COAST AREA

Outlook Category

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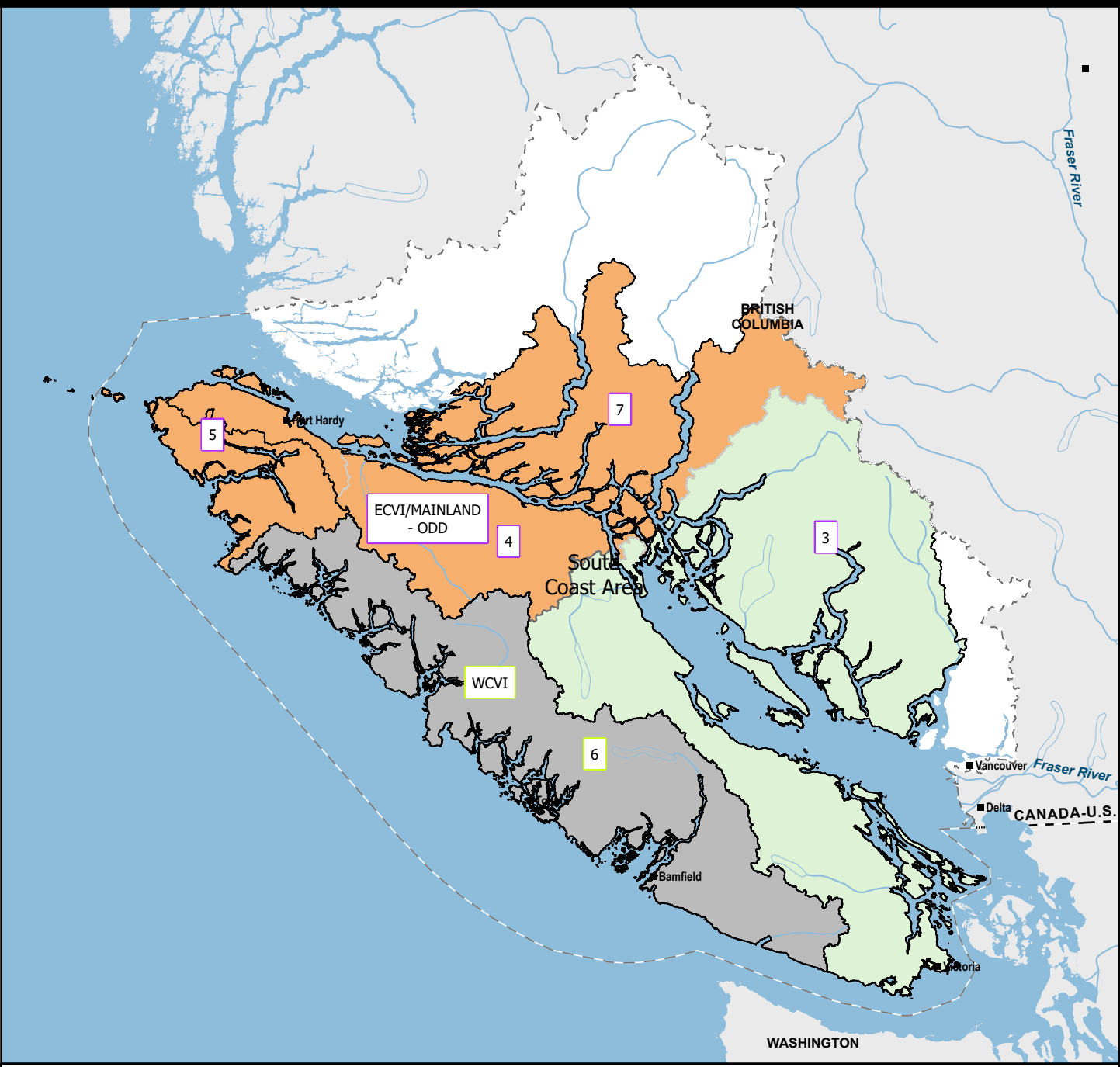
2023 Salmon Outlook - Pacific Region



PINK SALMON - SOUTH COAST AREA

Outlook Category

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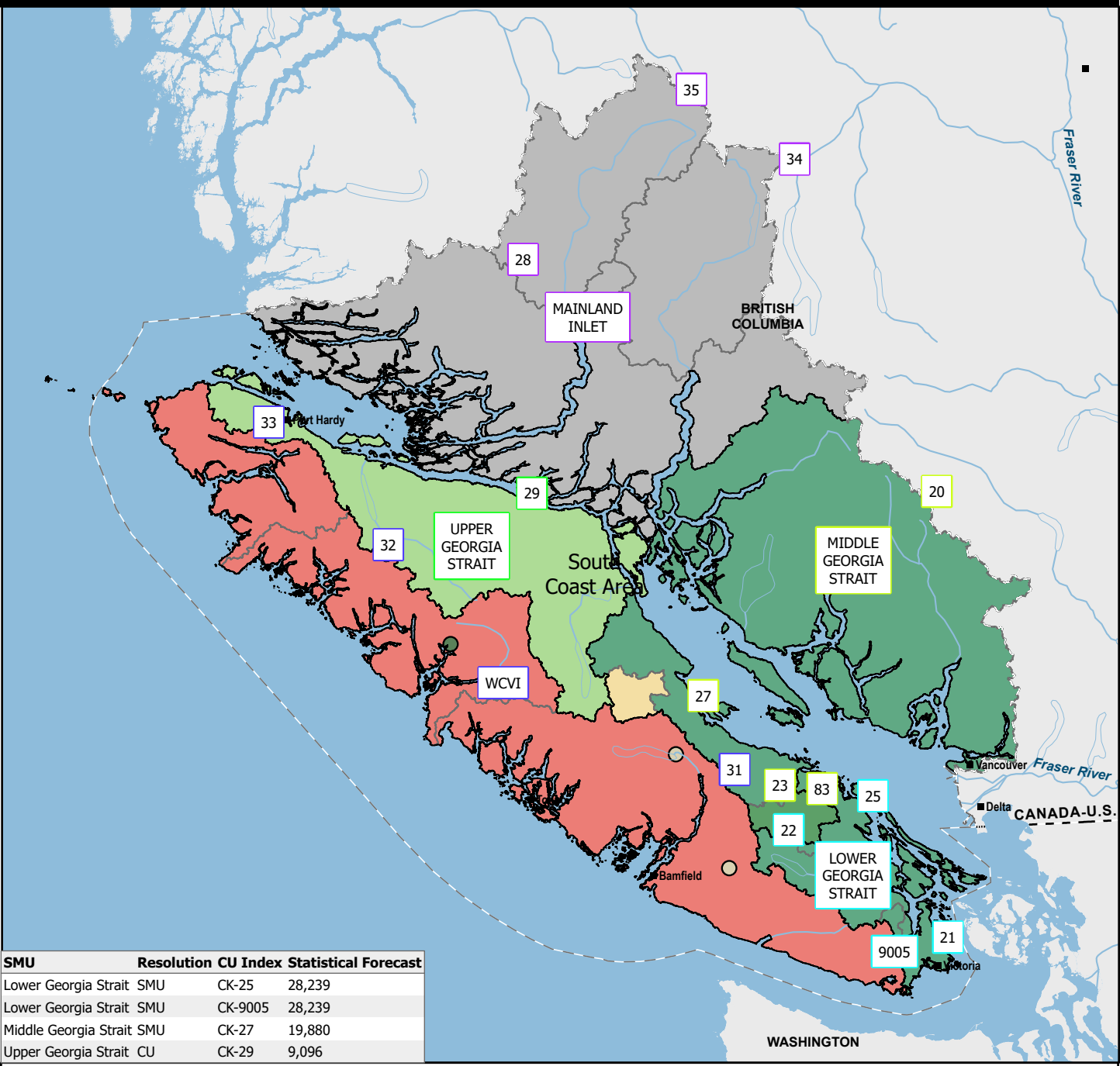
2023 Salmon Outlook - Pacific Region



SMU	Resolution	CU Index	Statistical Forecast
Lower Georgia Strait	SMU	CK-25	28,239
Lower Georgia Strait	SMU	CK-9005	28,239
Middle Georgia Strait	SMU	CK-27	19,880
Upper Georgia Strait	CU	CK-29	9,096

CHINOOK SALMON - SOUTH COAST AREA

Outlook Category

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Produced By: Coastal Resource Mapping Ltd for Fisheries and Oceans Canada

2023 Salmon Outlook - Pacific Region

COHO SALMON - SOUTH COAST AREA

Outlook Category

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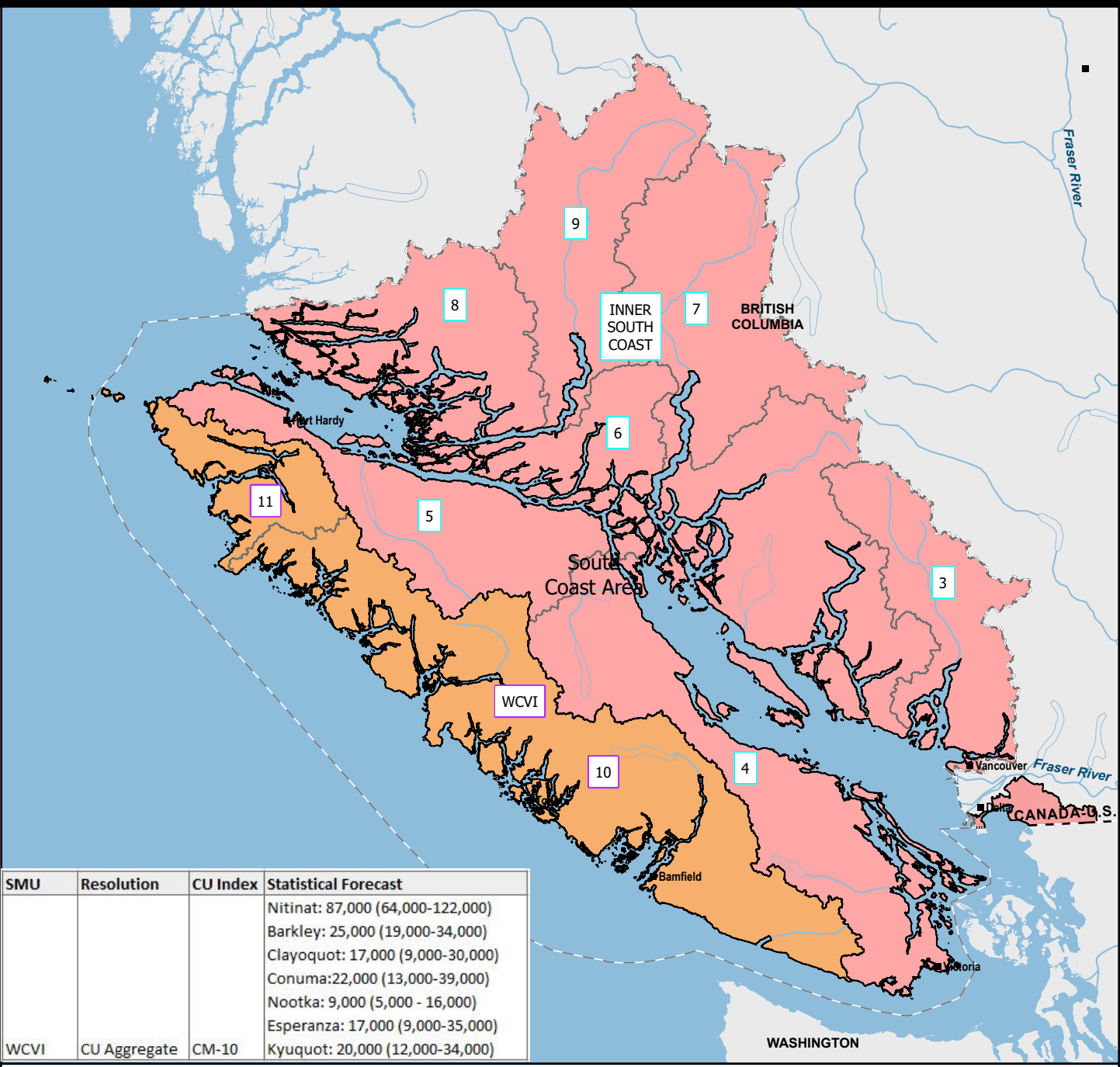
2023 Salmon Outlook - Pacific Region



SMU	Resolution	CU Index	Statistical Forecast
			Nitinat: 87,000 (64,000-122,000)
			Barkley: 25,000 (19,000-34,000)
			Clayoquot: 17,000 (9,000-30,000)
			Conuma:22,000 (13,000-39,000)
			Nootka: 9,000 (5,000 - 16,000)
			Esperanza: 17,000 (9,000-35,000)
WCVI	CU Aggregate	CM-10	Kyuquot: 20,000 (12,000-34,000)

CHUM SALMON - SOUTH COAST AREA

Outlook Category

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The index number is a code assigned to the CU that when prefixed by the species code becomes the CU index, e.g., Chinook: CK-1, Chum: CM-1, Coho: CO-1, River-Type Sockeye: SER-1, Lake-Type Sockeye: SEL-1, Even Year Pink: PKE-1, Odd Year Pink: PKO-1.

Stock Management Unit (SMU) SMU

For salmon, the working definition of a 'stock management unit' is a 'group of one or more CUs that are managed together with the objective of achieving a joint status'.

For more information visit:
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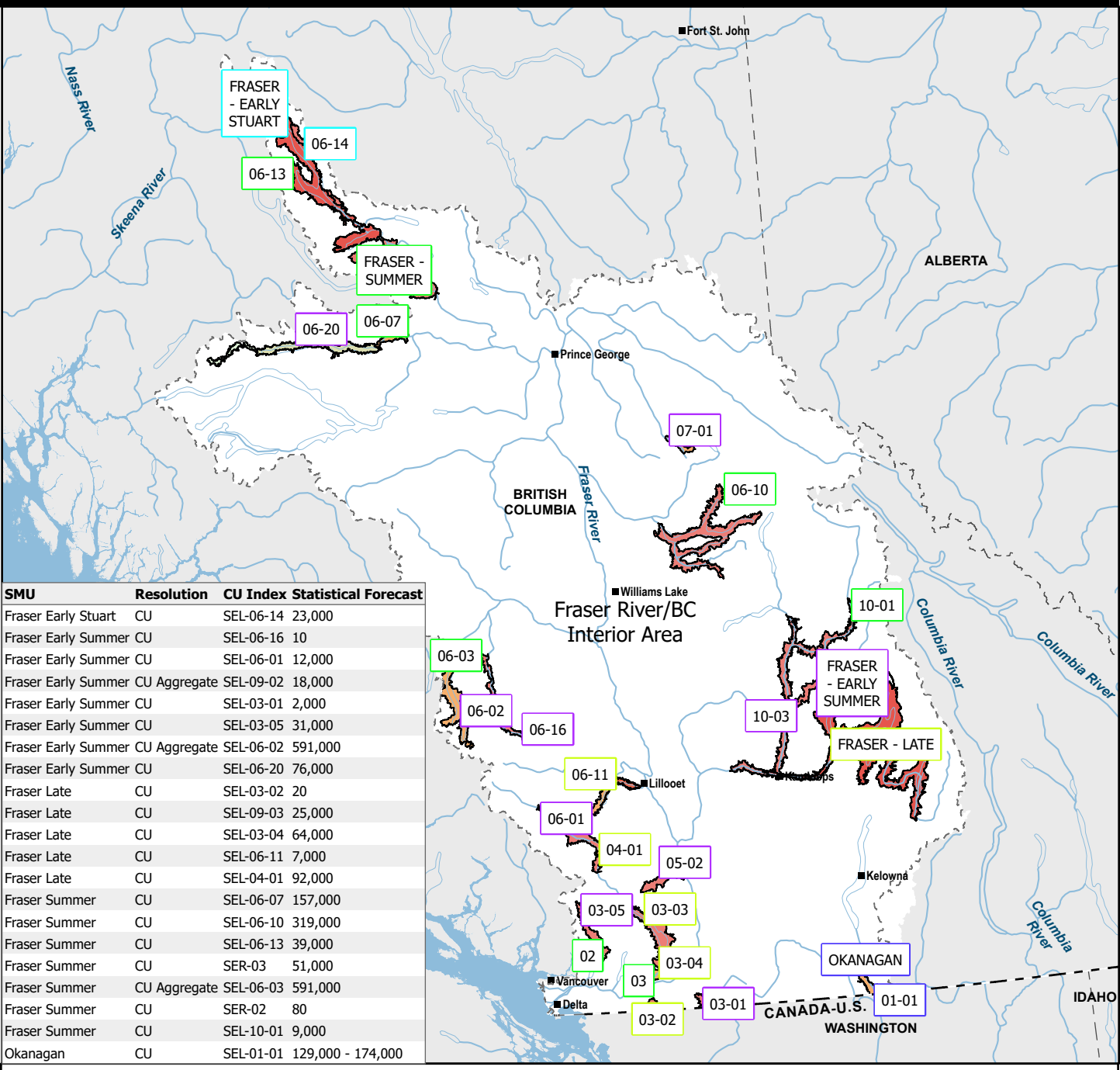
2023 Salmon Outlook - Pacific Region



SMU	Resolution	CU Index	Statistical Forecast
Fraser Early Stuart	CU	SEL-06-14	23,000
Fraser Early Summer	CU	SEL-06-16	10
Fraser Early Summer	CU	SEL-06-01	12,000
Fraser Early Summer	CU Aggregate	SEL-09-02	18,000
Fraser Early Summer	CU	SEL-03-01	2,000
Fraser Early Summer	CU	SEL-03-05	31,000
Fraser Early Summer	CU Aggregate	SEL-06-02	591,000
Fraser Early Summer	CU	SEL-06-20	76,000
Fraser Late	CU	SEL-03-02	20
Fraser Late	CU	SEL-09-03	25,000
Fraser Late	CU	SEL-03-04	64,000
Fraser Late	CU	SEL-06-11	7,000
Fraser Late	CU	SEL-04-01	92,000
Fraser Summer	CU	SEL-06-07	157,000
Fraser Summer	CU	SEL-06-10	319,000
Fraser Summer	CU	SEL-06-13	39,000
Fraser Summer	CU	SER-03	51,000
Fraser Summer	CU Aggregate	SEL-06-03	591,000
Fraser Summer	CU	SER-02	80
Fraser Summer	CU	SEL-10-01	9,000
Okanagan	CU	SEL-01-01	129,000 - 174,000

SOCKEYE SALMON - FRASER RIVER/BC INTERIOR AREA

Outlook Category

The purpose of the Outlook is to provide the expected abundance of salmon to inform the harvest planning process. The preliminary Outlook provides a categorical abundance expectation based expert opinion and the final outlook replaces 'categorical outlooks' with expected abundance for those stock units with statistical forecasts.

1 | 1-2 | 2 | 2-3 | 3 | 3-4 | 4 | 5

1. Poor status. This category is undesirable because of the risk of extirpation, and the loss of ecological benefits and salmon production. The presence of a SMU/CU in this category will initiate consideration of ways to protect the fish, increase their abundance, and reduce the potential risk of loss.
2. Marginal status. This category status implies caution in the management of the unit. While a unit in this category should be at a low risk of loss, there will be a degree of lost production. Higher management intervention.
3. Healthy status. Near average spawning abundance. Possible management intervention for social and economic considerations.
4. Abundant status. High spawning abundance and distribution. Low management intervention.
5. Data Deficient. SMUs for which insufficient data area available to determine an Outlook are noted as 'Data Deficient'.

Conservation Unit (CU) #

The index number is a code assigned to the CU that when prefixed by the species code becomes the CU index, e.g., Chinook: CK-1, Chum: CM-1, Coho: CO-1, River-Type Sockeye: SER-1, Lake-Type Sockeye: SEL-1, Even Year Pink: PKE-1, Odd Year Pink: PKO-1.

Stock Management Unit (SMU) SMU

For salmon, the working definition of a 'stock management unit' is a 'group of one or more CUs that are managed together with the objective of achieving a joint status'.

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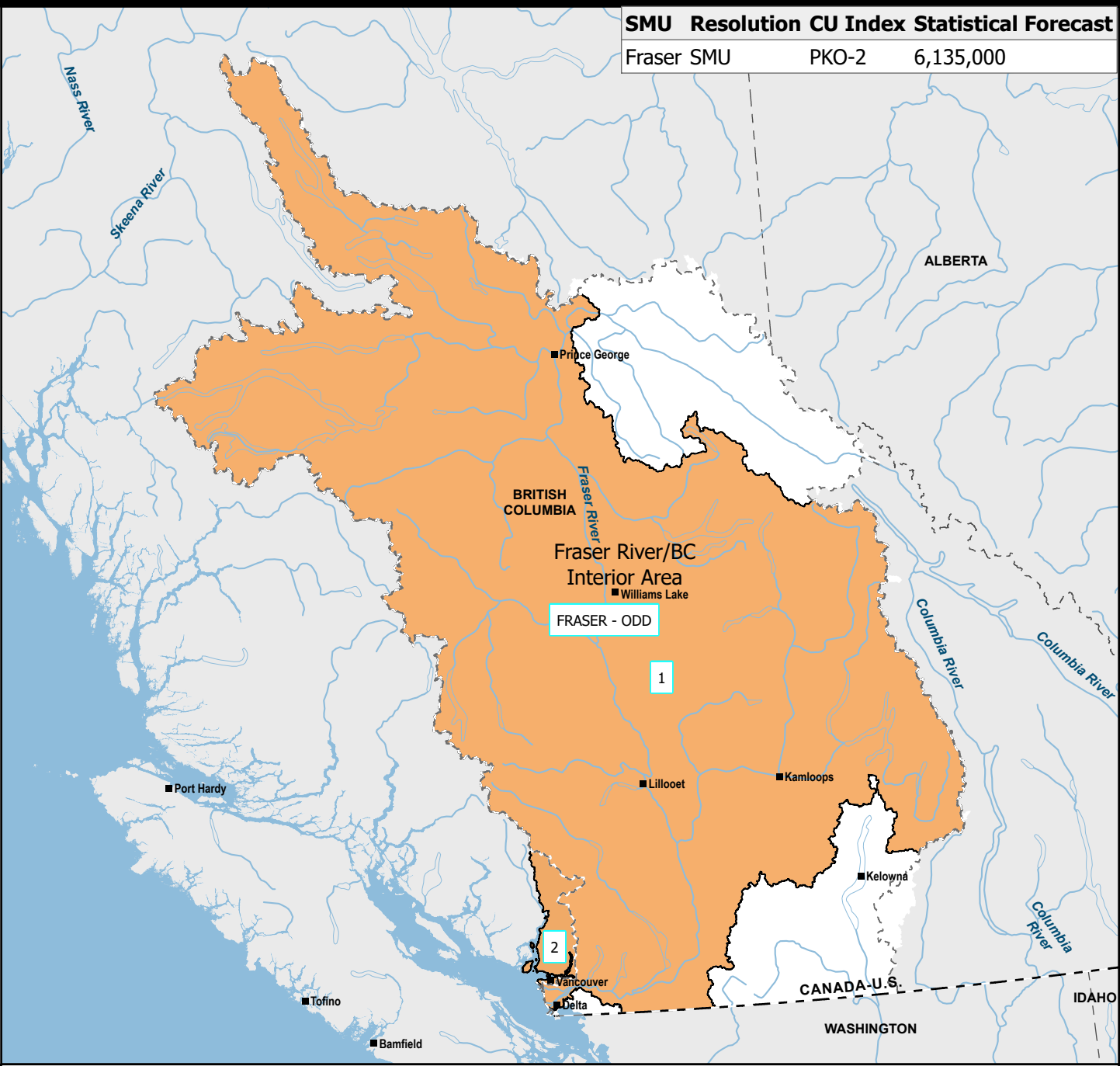
2023 Salmon Outlook - Pacific Region

SMU	Resolution	CU Index	Statistical Forecast
Fraser	SMU	PKO-2	6,135,000



PINK SALMON - FRASER RIVER/BC INTERIOR AREA

Outlook Category

The purpose of the Outlook is to provide the expected abundance of salmon to inform the harvest planning process. The preliminary Outlook provides a categorical abundance expectation based expert opinion and the final outlook replaces 'categorical outlooks' with expected abundance for those stock units with statistical forecasts.

1 | 1-2 | 2 | 2-3 | 3 | 3-4 | 4 | 5

1. Poor status. This category is undesirable because of the risk of extirpation, and the loss of ecological benefits and salmon production. The presence of a SMU/CU in this category will initiate consideration of ways to protect the fish, increase their abundance, and reduce the potential risk of loss.
2. Marginal status. This category status implies caution in the management of the unit. While a unit in this category should be at a low risk of loss, there will be a degree of lost production. Higher management intervention.
3. Healthy status. Near average spawning abundance. Possible management intervention for social and economic considerations.
4. Abundant status. High spawning abundance and distribution. Low management intervention.
5. Data Deficient. SMUs for which insufficient data area available to determine an Outlook are noted as 'Data Deficient'.

Conservation Unit (CU) #

The index number is a code assigned to the CU that when prefixed by the species code becomes the CU index, e.g., Chinook: CK-1, Chum: CM-1, Coho: CO-1, River-Type Sockeye: SER-1, Lake-Type Sockeye: SEL-1, Even Year Pink: PKE-1, Odd Year Pink: PKO-1.

Stock Management Unit (SMU) SMU

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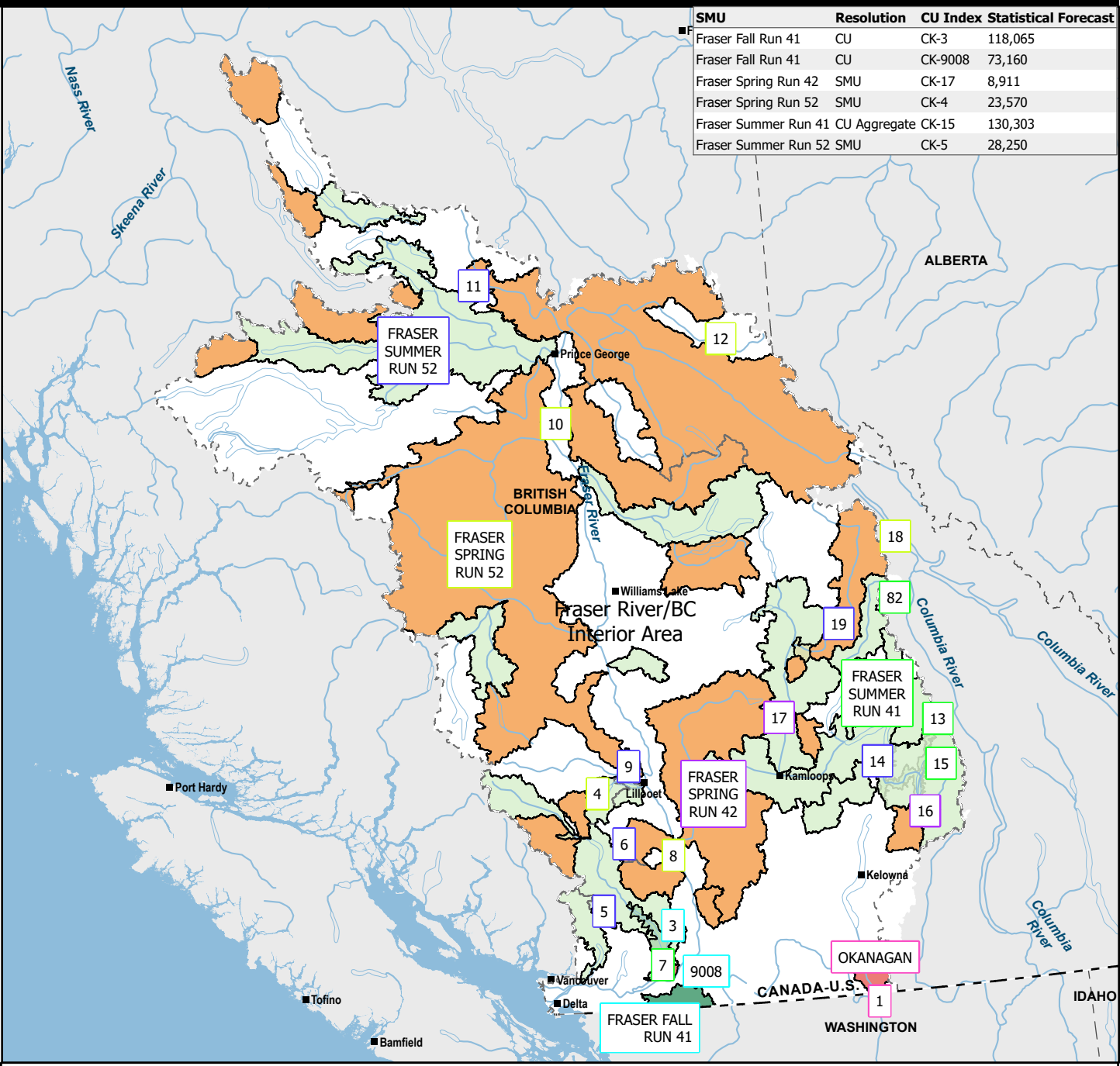
2023 Salmon Outlook - Pacific Region

SMU	Resolution	CU Index	Statistical Forecast
Fraser Fall Run 41	CU	CK-3	118,065
Fraser Fall Run 41	CU	CK-9008	73,160
Fraser Spring Run 42	SMU	CK-17	8,911
Fraser Spring Run 52	SMU	CK-4	23,570
Fraser Summer Run 41	CU Aggregate	CK-15	130,303
Fraser Summer Run 52	SMU	CK-5	28,250



CHINOOK SALMON - FRASER RIVER/BC INTERIOR AREA

Outlook Category

The purpose of the Outlook is to provide the expected abundance of salmon to inform the harvest planning process. The preliminary Outlook provides a categorical abundance expectation based expert opinion and the final outlook replaces 'categorical outlooks' with expected abundance for those stock units with statistical forecasts.

1 | 1-2 | 2 | 2-3 | 3 | 3-4 | 4 | 5

1. Poor status. This category is undesirable because of the risk of extirpation, and the loss of ecological benefits and salmon production. The presence of a SMU/CU in this category will initiate consideration of ways to protect the fish, increase their abundance, and reduce the potential risk of loss.
2. Marginal status. This category status implies caution in the management of the unit. While a unit in this category should be at a low risk of loss, there will be a degree of lost production. Higher management intervention.
3. Healthy status. Near average spawning abundance. Possible management intervention for social and economic considerations.
4. Abundant status. High spawning abundance and distribution. Low management intervention.
5. Data Deficient. SMUs for which insufficient data area available to determine an Outlook are noted as 'Data Deficient'.

Conservation Unit (CU) #

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Stock Management Unit (SMU) SMU

For salmon, the working definition of a 'stock management unit' is a 'group of one or more CUs that are managed together with the objective of achieving a joint status'.

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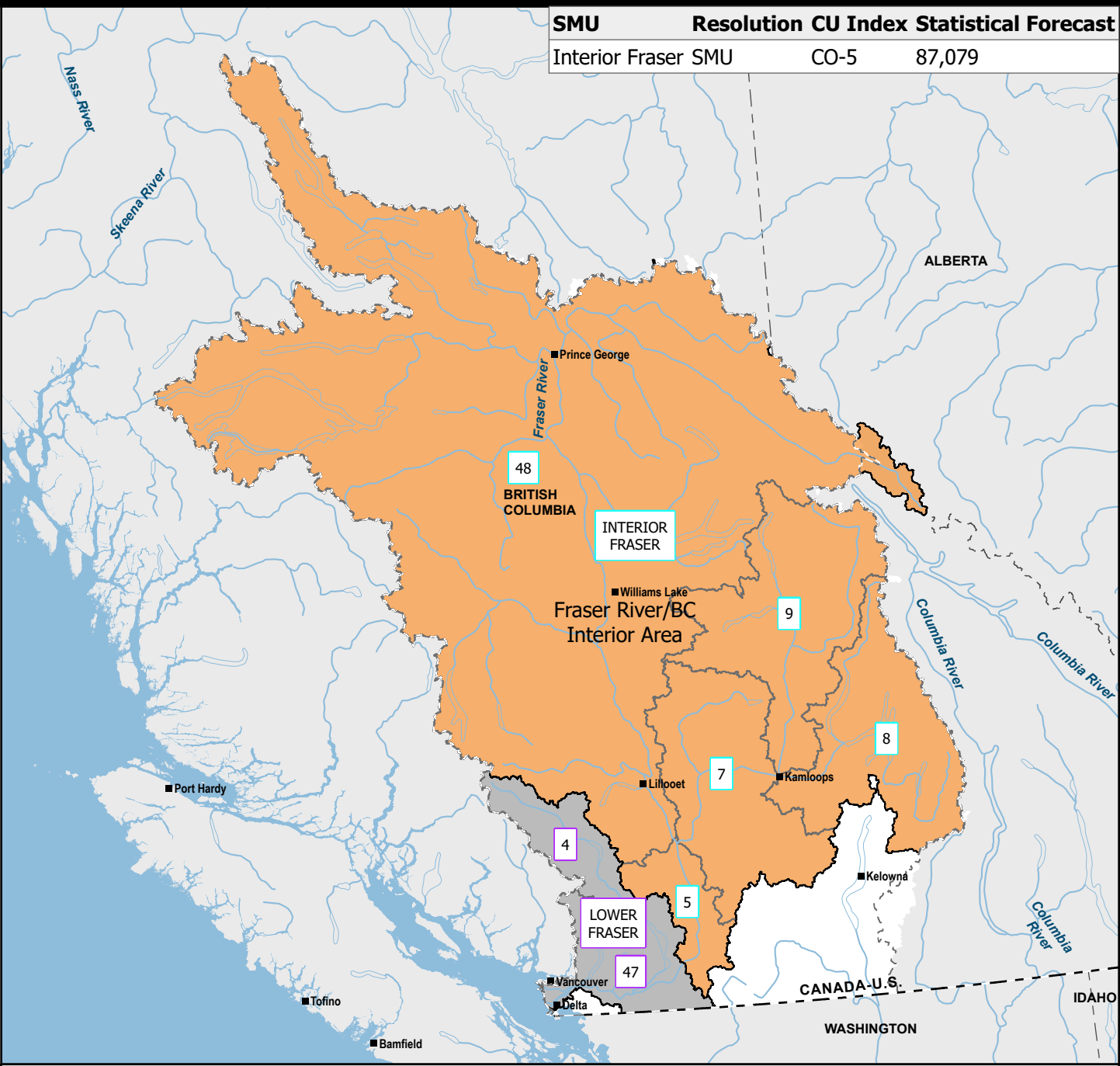
2023 Salmon Outlook - Pacific Region

SMU	Resolution	CU Index	Statistical Forecast
Interior Fraser SMU		CO-5	87,079



COHO SALMON - FRASER RIVER/BC INTERIOR AREA

Outlook Category

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1 | 1-2 | 2 | 2-3 | 3 | 3-4 | 4 | 5

1. Poor status. This category is undesirable because of the risk of extirpation, and the loss of ecological benefits and salmon production. The presence of a SMU/CU in this category will initiate consideration of ways to protect the fish, increase their abundance, and reduce the potential risk of loss.
2. Marginal status. This category status implies caution in the management of the unit. While a unit in this category should be at a low risk of loss, there will be a degree of lost production. Higher management intervention.
3. Healthy status. Near average spawning abundance. Possible management intervention for social and economic considerations.
4. Abundant status. High spawning abundance and distribution. Low management intervention.
5. Data Deficient. SMUs for which insufficient data area available to determine an Outlook are noted as 'Data Deficient'.

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Stock Management Unit (SMU) SMU

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CHUM SALMON - FRASER RIVER/BC INTERIOR AREA

Outlook Category

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1	1-2	2	2-3	3	3-4	4	5

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Stock Management Unit (SMU) SMU

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