Fisheries and Oceans Canada | Pêches et Océans Canada

PACIFIC SALMON OUTLOOK

PACIFIC REGION

2022

Canada

PURPOSE

The purpose of this document is to provide an 'Outlook' of expected abundance of salmon in 2022 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.

CHANGES TO THE OUTLOOK

Changes were made to the Outlook document in order to:

1. Align CU groupings with stock management units (SMUs) to better inform decision-making consistent with *Fishery Act* and IFMP requirements.
2. For those SMUs with statistical forecasts, consolidate and report them in the Outlook Document.
3. For those SMUs without statistical forecasts, standardize the interpretation of SMU status in relation to outlook categories;
4. Remove language regarding fishery consequences.
5. Add information on SMU 'stock trajectories' and biological benchmarks and management references (where defined) for additional context. (In Progress)

It is hoped these changes will result in a document that provides more useful and relevant information to inform decision-making. These changes will continue in the 2022 Outlook.

BACKGROUND

Stock Management Units

For the 2022 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 better, 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 to harvest managers to potentially adjust harvest plans according to the expected stock abundance. Ideally in that regard, 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 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.

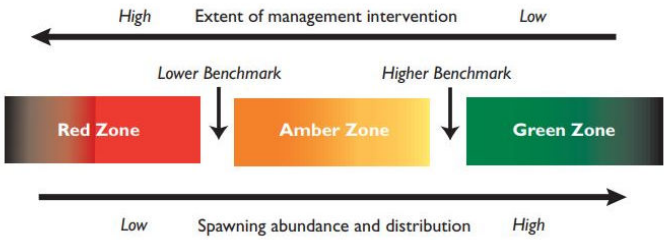

Figure 1. Benchmarks and biological status zones for CU assessments.

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. The LRP 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.

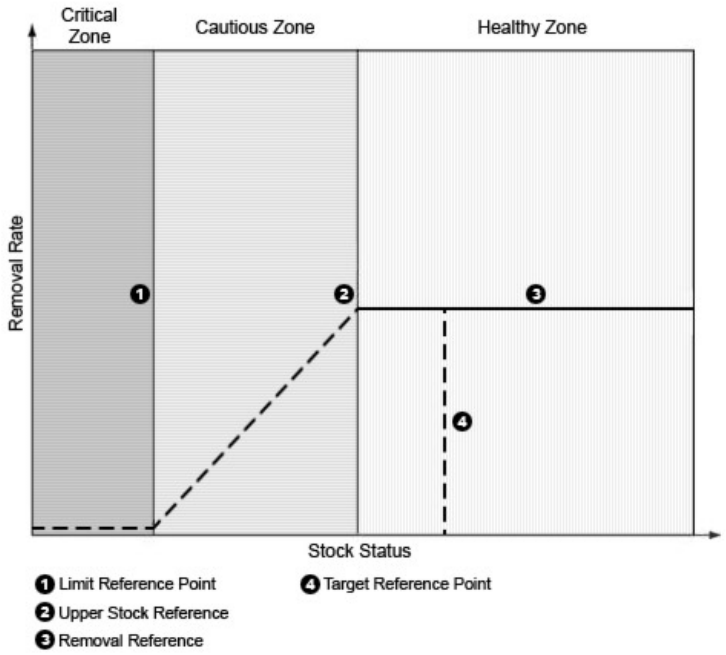

Figure 2. Schematic of a generalized harvest strategy under DFO's PA.

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 taken into account 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 take into account 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, they 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 an 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 are 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. below 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	2022 Forecast /Outlook
YUKON CHINOOK	Aggregate includes 9 CUs	**55,000** (ESC. AVG. 2005+)		**48,750** (42,500 – 55,000) Escapement Target (S_{MSY})	**50,000 (41,000-62,000)**
	Porcupine Aggregate 3 CUs	Data Deficient (Mainstem as indicator)		N/A	
	The spawning escapement of Canadian-origin Yukon River mainstem Chinook salmon in 2021 was well below average, at 31,800. 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. Assessment of Porcupine Chinook continues (limited data).				
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})	**28,000 (20,000 – 37,000)**
	The spawning escapement of Canadian-origin Yukon River mainstem Chum salmon in 2021 was the lowest on record, at 23,120. 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 and 2021.				
	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})	**4,000 (3,000 – 6,000)**
	The spawning escapement of Fishing Branch River Chum salmon in 2021 was also historically low, at 2,413. 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.				

TRANSBOUNDARY AREA

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2022 FORECAST/ OUTLOOK
ALSEK SOCKEYE	Alsek	**96,000** (ESC. 10-year Avg.)		**29,700** (esc. Goal range 24,000 – 33,500)	**49,000**
	Klukshu	**14,200** (TR, 10-year Avg.)		**9,700** (esc. Goal range 7,500 – 11,000)	**11,300**
	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. 2022 Outlook Category is 2, like 2021.				
ALSEK CHINOOK	Alsek	**5400** (ESC. 10-year Avg.)		**4,700** (esc. Goal range 3,500 – 5,300)	**4,000**
	Klukshu	**1,200** (TR. 10-year Avg.)		**1,000** (esc. Goal range 800 – 1,200)	**1,000**
	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.				
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})	**42,000 (12,000 wild, 30,000 enhanced)**
	Mainstem (Christina and Chutine CUs)	**39,000** (TR. 10-year Avg.)		**30,000** (20,000 to 40,000) Escapement Target (S_{MSY})	**21,000**
	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})	**7,400 (3,600-11,200)**
	2022 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				**Data Deficient**
	Reliable brood year escapement data are limited and ancillary observations are sometimes contradictory.				

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2022 FORECAST/ OUTLOOK
TAKU SOCKEYE	Aggregate includes 4 CUs	**150,000** (TR. 10-year Avg.)		**58,000** (Esc. Goal Range 40,000 - 75,000)	**128,000**
	Enhanced (Tatsamenie)	**8,300** (TR. 10-year Avg.)	n/a		**5,000**
	Enhanced (Trapper)	**1,000** (TR. 10-year Avg.)			**500**
	Based on stock-recruitment data, the 2022 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})	**6,600 (4,000 - 9,200)**
	2022 is expected to be well below the 10-year average of 16,000 and well below the escapement goal range of 19,000-36,000. The anticipated run size does not provide for directed fisheries. Taku chinook are stream type dominated by 5 and 6 year olds.				
TAKU COHO	Aggregate includes 3 CUs	**99,000** (TR. 10-year Avg.)		**70,000** (50,000 - 90,000) Escapement Target (S_{MSY})	**87,000**
	Based on preliminary smolt abundance in 2021 combined with recent smolt-to-adult survival rates, an average run above the management target of 70,000 is expected for 2022. 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	2022 FORECAST/ OUTLOOK
HAIDA GWAII SOCKEYE	Aggregate includes 10 CUs	1990-present avg. spawners ~ 25000	None	Under development for several CUs	**Outlook Category 2 (low to average)**
	Low to average returns for systems that were surveyed in 2020 (Copper, Yakoun, Awun, Naden, total count for 4 biggest systems was ~15K).				
HAIDA GWAII PINK – EVEN	Aggregate includes 6 CUs (even and odd year)				**Outlook Category 2-3**
	Near average returns are expected East and North Haida Gwaii CUs. Below average returns for West Haida Gwaii CU, low returns since 2016.				
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 (Data Deficient)**
	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 (1).				

SKEENA AND NASS RIVERS

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2022 FORECAST/ OUTLOOK
NASS SOCKEYE	**Aggregate incudes 7 CUs**	**261,790** (Avg. ESC, 1982+)		250,000 (Escapement Target)	**Model 1 (5-yr Avg): 351,000 (254,000 to 484,000)** **Model 2 (Sibling): 560,000 (267,000 to 1,200,000)** **(Total return)**
	Improved return in 2021 compared with (2020 which was the lowest return to the Nass since 1992) but below average compared with historical returns. Forecast for 2022 is for similar returns to 2021. (2)				
SKEENA SOCKEYE	**Aggregate (wild and hatchery)**	**2,584,000** (Avg. Return 1973+)	**Under review**	**Under review, esc target is 1,050,000, 400,000 lower operational control point**	**Model 1 (5-yr Avg): 1,338,864 (835,442 to 2,145,638)** **Model 2 (Sibling): 2,133,787 (1,004,867 to 4,453,993)** **(Skeena aggregate, Total Return)**
	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 modest aggregate return in 2021, with low returns for wild Babine sockeye populations and average returns for other Skeena sockeye CUs. Modest returns are forecast for 2022. Note that the 4-year old component of 2022 returns follow 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	
	Overall, expecting a moderate return in 2022 unless age-4 Sockeye return is weaker than expected. Strong age-4 returns expected in 2022 based on higher than average age-3 returns in 2020. Weaker abundance forecast in 2021 for age-5 Sockeye based on low age-4 returns in 2021.				
MAINLAND COASTAL SOCKEYE	Areas 3 to 6				**Outlook Category 2 / Data Deficient**
	Below average (2). Some very low returns in dominant brood years.				
NASS PINK-EVEN	Aggregate includes 5 CUs				**Outlook Category 4**
	Expected to be abundant (4) based on recent trends. The Upper Nass CU is data deficient, however above average brood year returns reported throughout its other CUs.				
SKEENA PINK-EVEN	Aggregate includes 3 CUs				**Outlook Category 1 - 2**
	The brood year return was poor in 2020 but an increase from low returns in 2016 and 2018. Middle-Upper Skeena CU expected to be below average (1), while Nass-Skeena Estuary CU expected to be average.				
NASS CHINOOK		**30,500 (TRTC 1994-2021)**		15,000 (ESC target)	**Model 1 (5-yr Avg: 19,000**

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2022 FORECAST/ OUTLOOK
NASS CHINOOK	The 2022 return is uncertain after record low escapements in 2017. Preliminary forecast model average is for 22,000 returns to Canada (Nisga'a Fish & Wildlife). There is generally low productivity among stream-type stocks in the north-west				**(11,000-31,000)** **Model 2 (Sibling): 26,000 (15,000-45,000)** **Terminal RTC**
SKEENA CHINOOK	Aggregate includes 12 CUs	**71,000** (GSI mark-recapture based on KLM Petersen estimates 1984-2021)			**Outlook Category 2**
	Kitsumkalum Indicator Stock	13,100 (KLM Petersen mark-recapture 1984-2021)			
	Below average returns are expected for both summer and spring timed Skeena Chinook. The 2022 return is highly uncertain after record low escapements in 2017. There is generally low productivity among stream-type stocks in the north-west. Escapement estimates are being 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 1-2**
	Total escapement is expected to be below average in 2022. The 2021 run size was above average.				
SKEENA COHO	Aggregate includes 4 CUs				**Outlook Category 1-2**
	Lower productivity over previous years is forecasted based on below average returns in 2021 for both interior and coastal coho populations and continuance of lower marine survivals.				
SKEENA - NASS CHUM	Nass CU	**13,632 (**1950-Present)	none	Under Review. MEG is 72,000	**Outlook Category 2-3**
	Portland Canal-Observatory CU is expected to be average to above average in 2022. The other Nass CUs are DD.				
	Skeena CU Aggregate includes 2 CUs				**Outlook Category 1**
	Well below average (1), data limited for both CUs.				

CENTRAL COAST

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2022 FORECAST/ OUTLOOK
CENTRAL COAST SOCKEYE	Areas 7 and 8 45 CUs				**Variable – Data Deficient, Outlook Category 1-2**
	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 (Atnarko, Koeye, Kadjusdis, Namu). Atnarko sockeye 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 2**
	2021 return to Rivers Inlet based on DIDSON-ARIS estimate was average relative to recent years. Low to average returns are expected in Areas 9 and 10.				
	Smith: Long Lake CU	62,000 (Avg. ESC, 2000+)			**Data Deficient**
	Docee Fence (Area 10/Smith Inlet/Long Lake) sockeye is not operational, no escapement information for this system available since 2017.				
CENTRAL COAST PINK	Area 6			MEG - 1,447,000	**Outlook Category 3-4**
	Area 7			MEG – 444,720	**Outlook Category 2**
	Area 8			MEG – 1,520,400	**Outlook Category 2-3**
	Area 9			MEG – 342,450	**Outlook Category 1**
	Area 10			MEG – 65,600	**Data Deficient**
	Area 6 returns are expected to be moderate. Below average to average returns are expected in Areas 7 and 8. Hectate Lowlands CU has seen low returns since 2016 with some improvement in 2020, expect a below average (2) return in 2022.				
CENTRAL COAST CHINOOK	Atnarko Indicator Stock Bella Coola-Bentinck CU	**15,500** (Maximum likelihood model 1990-2021)		**5009 (Atnarko wild)** Escapement Target (S_{MSY})	**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 north-west. Assessments are of poor quality.				
	Areas 7 and 8 3 CUs –				**Outlook Category 3 / Data Deficient**
	2022 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				**Outlook Category 3 / 2 / Data Deficient**
CENTRAL COAST CHINOOK	Wannock River Chinook returns are expected to be average. The spring-run stocks including the Owikeno tributary stocks and Chuckwalla/Kilbella stocks are expected to be below average based on recent trends; however, assessments are of poor quality or are no longer conducted.				
CENTRAL COAST COHO	Area 6 – Aggregate includes 3 CUs				**Outlook Category 2 (Low)**

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2022 FORECAST/ OUTLOOK
	Lower productivity over previous years is forecasted based on low Area 6 returns in 2019 and continuance of lower marine survivals. However, returns in Area 6 were above average in 2021.				
	Areas 7 to 10 – Aggregate includes 4 CUs				**Outlook Category 2 (Low)**
	Lower productivity over previous years is forecasted based on low returns in 2019 for both interior and coastal coho populations and continuance of lower marine survivals. However, there is very little data to review to develop an overall assessment.				
CENTRAL COAST CHUM	Area 5				**Data Deficient**
	Area 6 2 CUs				**Outlook Category 1 (Data Deficient)**
	Area 7 1 CU				**Outlook Category 1**
	Area 8 3 CUs				**Outlook Category 2**
	Area 9 2 CUs				**Outlook Category 1 (Data Deficient)**
	Area 10 1 CU				**Data Deficient**
	Trends in wild brood year escapements variable in Areas 8 but low in other areas. In Area 8, low returns in 2020 and 2021, coming off moderate brood years suggesting a reduction in ocean survival.				

SOUTH COAST AREA

WEST COAST VANCOUVER ISLAND

Stock Management Unit	Conservation Unit /Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2022 FORECAST/ OUTLOOK
WCVI - BARKLEY SOCKEYE	**Somass Aggregate (GCL + SPL)**	**740,000** (Avg. Run Size 1977+)		**170,000** Run Size – lower operational control point	**400,000**
	Great Central Lake CU	400,000 (Avg. Run Size 1977+)	29,290 LBB		**Outlook Category 3**
	Sproat Lake CU	340,000 (Avg. Run Size 1977+)	41,350 LBB		**Outlook Category 3**
	The two main contributing brood years to the 2022 run are 2017 and 2018 and the two main contributing smolt years are 2019 and 2020. Brood abundance was near average in 2017 but below average in 2018. Smolt abundance low in 2019 and is not yet available for 2020. Based on ocean indicators, marine survival rates for the 2019 and 2020 smolt years are likely to be low. Given the considerations above, expectations are for a below average Somass Sockeye return in 2022.				
	Henderson Lake CU	34,000 (Avg. Run Size 1978+)	5000 LBB	9% max. harvest rate at run sizes <15,000	**<15,000**
	For the 2022 return, the two main contributing brood years are 2017 and 2018 and the two main contributing smolt years are 2019 and 2020. Brood abundances were near average in both 2017 and 2018. Based on ocean indicators, marine survival rates for the 2019 and 2020 smolt years are likely to be low. Therefore, expectations are for a continued low Henderson sockeye return in 2022.				
WCVI - OTHER SOCKEYE	22 CUs are associated with this stock management unit.				**Data Deficient**
	Assessment data are not available to forecast other systems. However, WCVI populations tend to covary. 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.				

Stock Management Unit	Conservation Unit /Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2022 FORECAST/ OUTLOOK
WCVI CHINOOK	Southwest Vancouver Island CU			10 – 15% maximum exploitation rate in key 'pre-terminal' CDN fisheries	**Outlook Category 1**
	Nootka and Kyuquot CU				
	Northwest Vancouver Island CU				
	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 slight improvement relative to last year but even with the slight contribution of enhanced Chinook to Bedwell the return is hovering around the lower benchmark. Survival rates of natural production is thought to be less than half that of hatchery production; similarly productivity remains relatively 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)	**135,000 (100,000-170,000)**
	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.	**40,000 (24,000-56,000)**
	Nitinat Hatchery	25,000 (Avg terminal run 1995-2010)	n/a	10,000 ESC including brood stock	**27,000 (18,000-36,000)**
	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 benchmarks (C. Holt lead).	Varies by individual river; see local plans for details.	**38,000 (25,000-51,000)**
	Overall returns in 2022 will likely be similar to 2021 which was higher than average abundance in the SWVI and near average abundance in NWVI				

Stock Management Unit	Conservation Unit /Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2022 FORECAST/ OUTLOOK
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 improved Coho marine survival relative to the 2020 returns; for example, escapement through Stamp Falls was in 70th percentile of all returns since 2010 and well above the 2018 brood. For 2022, most of the return will originate from the 2019 brood year that went to sea in 2021. Robertson Hatchery Coho jacks in 2021 were higher than the 2010-2020 average suggesting improvement in 2022 with average returns expected. Prior to 2021, most WCVI Coho spawning populations had seen declines in productivity.				
WCVI CHUM	Area 23 (Barkley) – Southwest Vancouver Island CU	**69,000** (Avg. Return, 1995+)		48,000 Run size – lower operational control point, 15% max harvest rate	**8,000 (6,000-12,000)**
	Area 24 (Clayoquot) – Southwest Vancouver Island CU	**57,000** (Avg. Return, 1995+)		42,000 Run size – lower operational control point, 15% max harvest rate	**11,000 (9,000-15,000)**
	Area 25 (Nootka) – Southwest Vancouver Island CU	**41,000** (Avg. Return, 1995+)		26,000 Run size – lower operational control point, 20% max harvest rate	**11,000 (8,000-15,000)**
	Area 25 (Esperanza Inlet) – Southwest Vancouver Island Cu	**49,000** (Avg. Return, 1995+)		24,000 Run size – lower operational control point, 15% max harvest rate	**9,000 (4,000 -21,000)**
	Area 26 (Kyuquot) – Southwest Vancouver Island CU	**60,000** (Avg. Return, 1995+)		25,000 Run size – lower operational control point, 15% max harvest rate	**13,000 (8,000-21,000)**
	Area 27 (Quatsino Sound) – Northwest Vancouver Island CU				**Data Deficient**
	Area 25 (Conuma Hatchery) – Southwest Vancouver Island CU	**88,000** (Avg. Return, 1995+)			**24,000 (14,000 - 43,000)**
	Nitinat Hatchery	**491,000** (Avg. Return, 1995+)	n/a	225,000 Run size – lower operational control point	**121,000 (89,000-176,000)**

WCVI CHUM	Preliminary 2021 returns of WCVI Chum were well below average continuing a trend in reduced Chum productivity. Brood years 2017, 2018 and 2019 will contribute to the 2022 return as age 5, 4 and 3, respectively. The 2017-2019 brood year returns were below average abundances, and the 2018 and 2019 sea entry years resulted in below average to average survival. This will limit both the age 4 (dominant age class) and 5 contributions to the 2022 return. The recent stock status of wild WCVI Chum has generally been poor with spawning abundance for wild indicator stocks frequently below upper biological benchmarks. In addition, hatchery production has declined in recent years. 2022 Outlook Category 2.	

EAST COAST VANCOUVER ISLAND/MAINLAND INLETS

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2022 FORECAST/ OUTLOOK
ECVI / MAINLAND SOCKEYE	Nimpkish	60,000 median spawners			**Outlook Category 2-3**
	Sockeye returns to this system in 2021 were below average at approximately 40,000 adults. For the 2022 return, the two main contributing brood years are 2017 (30,029 adults) and 2018 (83,796), which are below and above average respectively. The two main contributing smolt years are 2019 and 2020. Recent escapement to nearby systems from Coho and Pink Salmon are encouraging and may indicate that marine conditions are improving. Further, Nimpkish Sockeye returns are biased towards 4 year old fish (57%), so the higher than average escapement in 2018 should result in slightly improved overall escapement. Given the considerations above, expectations are for an escapement that approaches the average return.				
	Area 16 (Sakinaw)	**116** (Avg. Return, 1995+)	2,440	4,470	**Outlook Category 1**
	Of the 75,823 smolts that left Sakinaw Lake in 2019 a total of 26 adult Sockeye returned in 2021. Marine survival continues to be extremely low; for the 2019 ocean entry year the smolt-to-adult survival declined to 0.024% for hatchery-origin fish but improved to 0.55% for natural-origin smolts. Smolt production increased dramatically to 184,964 in 2020 although the 2019 fry release was not clipped so estimating natural production was not possible (only 2 natural spawners in 2018). If marine survival is near the 4-year average, a total of 94 adults are expected in 2022. The forecast could increase to 265 fish if marine survival is similar for the 2018 and 2020 ocean entry years.				
	Other (Areas 11 to 13)	Heydon: 2,600 median spawners Quaste: 2,200 median spawners			**Outlook Category 2-3**
	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 1 (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)**
	Even Year: 2020 saw varied returns throughout the South Coast with poor returns in Northern Vancouver Island and generally improved/strong returns to the systems from Adam River south to Campbell River on the Island. Very				

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2022 FORECAST/ OUTLOOK
ECVI / MAINLAND PINK	poor (well below average) returns to Area 12 Mainland Inlets and very strong recovery and returns observed on the Philips River in Area 13 Mainland Inlets. Expectations for 2022 are for continued but improving low abundance for the NVI/Northern Mainland Inlet systems and average to above average returns from Adam River to Campbell River and Southern Mainland Inlets. Historically, Pink returns to this area have been highly variable and expectations continue to be highly uncertain. **Odd Year:** 2021 saw varied returns throughout South Coast. Generally Northern Vancouver Island is well below the historical adult abundance, although with clear signs of improvement since escapement hit its lowest point in 2016/2017. In contrast, the mainland inlets saw continued poor escapement of Pink Salmon. Returns to the Adam River approached the generational average, and the Campbell/Quinsam saw very strong returns. Abundance was above average for central ECVI systems with over 150K to Tsolum River and near average for Nanaimo/Qualicum. Aerial counts of Jervis Inlet systems indicated a moderate improvement with an aggregate estimate of 240K.				
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, and 2021 was the first year where directed stock assessment activities were undertaken here since the early 2000's. A video counter was installed on Devereux Creek (Knight Inlet) to count adult Chinook Salmon, and data review is currently underway. Stock Assessment also collected baseline samples from Chinook from the Southgate and Homathko Rivers (Bute Inlet), as well as the Toba River (Toba Inlet). Chinook in all systems were relatively common, although insufficient data are available for a population estimate. 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+)			**10,756 Esc**
	We saw above average escapement in 2021 for the Quinsam/Campbell River, and other systems in the region also saw average to above average escapement. Expectations in 2022 are for maintenance or slight improvements of present Chinook escapement, especially if harvest restrictions on early timed Fraser Chinook continue.2022 Outlook Category 3-4.				

Stock Management Unit	Conservation Unit /Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2022 FORECAST/ OUTLOOK
MIDDLE GEORGIA STRAIT CHINOOK	Puntledge and Big Qualicum Rivers Fall Run Enhanced	**14,385** (AVG. Terminal Run Index, 1995+)	7,193		**27,283 Esc**
	The Puntledge River saw an above average return of 11,200 fall Chinook in 2021. Escapement to the Big Qualicum River was also above the four year average of 7,500 at 11,800. Stable production levels and modest survivals for several hatchery indicators combined with above average marine abundance of 2-year olds suggests average to above average returns are likely for 2022. 2022 Outlook Category 4.				
	Nanaimo and Puntledge Spring Summer Enhanced CK-83	1,712 AVG. Terminal Run Index, 2004+)			**516 Esc**
	A combination of additional snorkel surveys and a DIDSON project in the Nanaimo River produced an estimate of 992 fish in 2021 which was up from 583 in 2020 and above the 12 year average of 600. Puntledge summer Chinook were below the 4-year average of 820 fish at 517. 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. 2022 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})	**21,917 Esc**
	Adult Chinook returns to the Cowichan River in 2021 exceeded the target escapement of 6,500 naturally spawning adults for the sixth consecutive year. The preliminary number of jacks in the population was above average at 7.8K but less than 2020. Preliminary adult abundance was strong at 15.6K but dominated by 3 year old returns. The 2022 outlook is for average to above average returns while 2021 escapement estimates have yet to be finalized. Wild production continues to drive the escapement with the proportion of hatchery fish in the population estimated at 10% for adult age classes in 2021. A similar rebuilding trend has not been observed in the Nanaimo River although 2021 counts of 4.4K were above the 4 year average of 2.9K. Swim counts will be run through an AUC model prior to finalizing estimates. Expectations for 2022 are for average to above average returns. 2022 Outlook Category 4.				

Stock Management Unit	Conservation Unit /Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2022 FORECAST/ OUTLOOK
JOHNSTONE STRAIT / MAINLAND INLET COHO	Area 12	2700 AVG Terminal Run Index (1998+)			**Outlook Category 2-3**
	Area 12 Coho returns are continuing to improve 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 ongoing periods of poor marine survival remain a significant risk. Our preliminary escapement at the Keogh is 2,000 adults, which is approaching the average for this system. Estimated escapement has steadily increased from that observed in 2016 (230). Productivity on the Keogh began improving in 2011, and the annual smolt production since has remained above the long term average. The return in 2021 stems from an above average smolt abundance of 86,770. The 2021 smolt migration was the highest ever observed at 129,200. We expect stronger returns in 2022 due to the high smolt output and slightly improved marine survival conditions.				
	Area 13 - North				**Outlook Category 2**
	Hatchery indicators for this outlook unit are Quinsam and Big Qualicum. Adult returns to the Quinsam were below average, while the Big Qualicum saw above average returns. General observations to date suggest the forecasted returns are in line with observations, albeit with varied returns across the region. Village Bay Creek on Quadra Island is being monitored by video and has observed higher than average abundance of Coho through the fence. The wild indicator is Black Creek (included below in the Georgia Strait OU). The Area 13 forecast is 9% higher than the 2018 observed indices. Coho abundance in this region can be characterized as 'well below average'				
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. 2021 adult returns of 11,400 to the Big Qualicum were above the four year average but less than 22,300 in 2020. An unplanned reduction in smolt output in 2018 produced a low return of 2,600 fish in 2019. Production levels are back to normal and 2022 returns are expected to be average to above average. The wild indicator is Black Creek. This year's estimate of 2,604 adults is slightly better than 2020 (1,935 adults) but below the long-term average. The modest increase to escapement was likely a result of a bump in 2020 smolt production to just over 80K from 40K in 2019. Jack returns were similar to last year and 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 than expected. Smolt production in 2021 (85K) is significantly above the long-term average which will likely lead to an average or slightly above average return for 2022, although a continuation of low marine survival remains a risk to this forecast.				

Stock Management Unit	Conservation Unit /Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2022 FORECAST/ OUTLOOK
INNER SOUTH COAST CHUM - Non-Fraser	Johnstone Strait Area and Mainland Inlets (Areas 11 to 13)				
	Summer run Chum Salmon stocks in 2021 appear to have done poorly relative to recent years and remained below average throughout the area. This will likely continue through 2022, as the first fish from poor brood abundance begin to return. Fall run Chum returns in 2021 appears to be below average in most systems surveyed. Productivity of these stocks has declined over the last 4 years and has been attributed to poor marine conditions for salmon. There is some indication that survivals have been better in the Southern range of the distribution of Inside Southern Chum. For the 2022 return, below average parental brood abundances in both 2017 and 2018 and a 4 year decline in Chum productivity will likely mean below average return of fall Chum in 2022. Recovery initiatives continue for the Nimpkish Chum Stock within this area. Expect variability in Chum returns.				**Outlook Category 1-2**
	Jervis/Narrows Inlet (Brittian, Deserted, Skwawka, Tzoonie, Vancouver)	**51,151** (Avg. Return, 2004+)		85,000	**418 (Like Last Year) (12,000 normal)**
	Mid-Vancouver Island (Puntledge, Big Qualicum, Little Qualicum)	**225,697** (Avg. Return, 1995+)		230,000	**18,400 (Like Last Year) (67,200 normal)**
	Nanaimo River	**61,288** (Avg. Return, 2004+)		40,000	**21,017 (Like Last Year) (106,400 normal)**
	Cowichan River	**177,032** (Avg. Return, 2006+)		160,000	**18,077 (Like Last Year) (188,000 normal)**
	Goldstream River	**27,070** (Avg. Return, 2000+)		15,000	**17,750 (Like Last Year) (56,800 normal)**
	Data for 2021 suggest well below target escapements for systems in mid to northern Georgia Strait and Jervis/Narrows Inlets. Returns to Nanaimo, Cowichan and Goldstream which have been near or slightly above target shifted to well below forecast values in 2021.				

INNER SOUTH COAST CHUM - Non-Fraser	For 2022, 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 well below escapement targets if low survivals persist or slightly above target if survival returns to normal. 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 are produced annually. The 2022 forecasts will be presented to the Fraser River Panel at the Pacific Salmon Treaty meeting in February. This document provides a precursor look at the upcoming 2022 Sockeye forecast. The outlook is intended to provide a categorical assessment of brood-year escapements relative to Wild Salmon Policy (WSP) benchmarks and historical returns. Categorical outlook status ranges from poor return (1) to good return (4). Details about the definition of the outlook status and calculation of each metric are outlined in the Appendix.

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

Stock management Unit: EARLY STUART

Average aggregate return (all cycles): 107,649

Conservation Unit	Average Return (all cycles)	LRP / LBB	Management Target	WSP / COSEWIC STATUS	2022 FORECAST/ OUTLOOK
Early Stuart *(CU: Takla-Trembleur-EStu)* - Cyclical: Yes	107,649 (cyc-year average)			WSP – RED COSEWIC – END	
	Below average returns are expected for this CU. The 2018 brood-year effective total spawners (ETS; 39,676) was below the WSP lower benchmark for ETS (111,753). Brood-year effective female spawners (EFS; 21,450) was above the long-term cycle line average EFS (18,852) but below the recent cycle line average EFS (23,715). This stock was heavily impacted by the Big Bar landslide in 2019 and 2020 return years, with potentially additional en-route mortality. The situation is likely to be alleviated for 2022 with significant progress of the ongoing Big Bar site improvement.				**105,000 (39,000 – 268,000)**

Stock management Unit: EARLY SUMMER

Average aggregate return (all cycles): 983,626

Conservation Unit	Average Return (all cycles)	LRP / LBB	Management Target	WSP / COSEWIC STATUS	2022 FORECAST
LOWER FRASER					
Upper Pitt River *(CU: Pitt-ES)* - Cyclical: No	66,907			WSP – Green COSEWIC – NAR	**35,000 (13,000 – 89,000)**
	Good returns are expected for this CU. The five-year-old component has contributed substantially to this stock in the past, especially for this cycle line. The 2017 brood-year effective total spawners (ETS; 23,612) was above the WSP lower benchmark ETS (10,627) but below the upper benchmark (26,845). As well, brood-year effective female spawners (EFS; 13,297) was above the recent average EFS (11,031) and slightly below the long-term average EFS (13,322). 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	**10,000 (2,000 – 37,000)**
	*While this stock exhibits cyclical returns, limited data preclude cycle-specific benchmarks (Grant et al 2020). The five-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. Below average returns are expected for this CU. Both four-year-old (2018) and five-year-old (2017) effective total spawners (ETS; 1,910 and 6,525, respectively) were below the WSP lower benchmark (8,000). The 2018 effective female spawners (EFS; 975) was below both the long-term (1,388) and recent (1,196) average EFS, but the 2017 EFS (2,536) was above them.				
Nahatlatch River *(CU: Nahatlatch-ES)* - Cyclical: No				WSP – Amber COSEWIC – SC	**8,000 (2,000 – 29,000)**
	Reliable recruitment data are not available for this CU, thus no WSP benchmarks are available for comparison (see Appendix). Low-to-moderate returns are expected for this CU. Brood-year effective female spawners (EFS; 987) was below both the long-term average EFS (2,091) and recent average EFS (1,127).				
SOUTH THOMPSON					
(CU: Shuswap-ES) Two populations represent this CU, but they share one set of benchmarks. - Cyclical: Yes & Yes	Seymour: 353,951; Scotch: 377,826 (Cyc-year average)			WSP – Amber COSEWIC – NAR	**Seymour: 236,000 (70,000 – 920,000)** **Scotch: 199,000 (45,000 – 825,000)**
	Good returns are expected for this CU given that both the Seymour River effective total spawners (ETS; 100,622) and Scotch Creek ETS (62,654) combined (163,276) were well above both the WSP lower (36,380) and upper (141,746) benchmarks. Seymour River brood-year EFS (52,420) was slightly above the long-term average EFS (48,688) but below the recent average EFS (109,301) for this cycle line. Scotch Creek brood-year effective female spawners (EFS; 29,348) was below both the long-term (32,714) and recent average EFS (111,187) for this cycle line.				
Misc. (ESHU)					**804,000 (184,000 – 2,850,000)**

Conservation Unit	Average Return (all cycles)	LRP / LBB	Management Target	WSP / COSEWIC STATUS	2022 FORECAST
MID AND UPPER FRASER					
(CU: Anderson-Seton-ES) - Cyclical: No	50,019			WSP – AM/GR COSEWIC – NAR	**36,000 (11,000 – 126,000)**
	Below-average returns are expected for this CU. The 2018 brood-year effective total spawners (ETS; 2,635) was below the WSP lower benchmark for ETS (3,662). Also, the brood-year effective female spawners (EFS; 1,573) was below the long-term (4,299) and recent average EFS (4,499). It is important to note that these comparisons include the Gates Spawning Channel, but as of January 2020 the channel operations are discontinued which may influence interpretation of these trends moving forward (Grant et al. 2020).				
(CU: Nadina-Francois-ES) - Cyclical: No	80,399			WSP – AM/GR COSEWIC – NAR	**193,000 (51,000 – 703,000)**
	Good 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 2018 effective total spawners (ETS; 111,175) was above the WSP upper benchmark (68,273), whereas the 2017 ETS (4,428) was below the lower benchmark of 21,694. The four-year-old (2018) effective female spawners (EFS; 58,024) was above both the long-term (10,495) and recent average EFS (21,467). However, the five-year-old (2017) EFS (2,323) was below both the long-term and recent average EFS. Note: These comparisons include the Nadina spawning channel escapement estimates to be consistent with Grant et al (2020).				
CU: Bowron-ES) - Cyclical: No	34,044			WSP – RED COSEWIC – END	**21,000 (5,000 – 87,000)**
	Low-to-moderate returns are expected for this CU. The 2018 brood-year effective total spawners (ETS; 8,087) was above the WSP lower benchmark (5,249) but lower than the upper benchmark (19,369). The brood-year effective female spawners (EFS; 4,722) was above both the long-term (4,008) and recent average EFS (1,777). This stock was heavily impacted by the Big Bar landslide in 2019 and 2020 return years, with potentially additional en-route mortality. The situation is likely to be alleviated for 2022 with significant progress of the ongoing Big Bar site improvement.				
Taseko-ES				WSP – RED COSEWIC – END	**200 (40 – 600)**
	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. Brood-year effective female spawners (EFS; 35) was far below both the long-term (1,196) and recent average EFS (152). Limited sample size precludes statements about the age structure of sockeye in Taseko Lake. This stock was heavily impacted by the Big Bar landslide in 2019 and 2020 return years, with potentially additional en-route mortality. The situation is likely to be alleviated for 2022 with significant progress of the ongoing Big Bar site improvement.				

Stock management Unit: SUMMER RUN

Average aggregate return (all cycles): 3,268,656

Conservation Unit	Average Return (all cycles)	LRP / LBB	Management Target	WSP / COSEWIC STATUS	2022 FORECAST/ OUTLOOK
Harrison River *(CU: Harrison (River-Type)-S)* - Cyclical: No	117,498			WSP – Green COSEWIC – NAR	**13,000 (2,000 – 94,000)**
	Below-average returns are expected for this CU. Historically, this stock can have a considerable three-year-old component. Both the four-year-old (2018) and three-year-old (2019) effective total spawners (ETS; 14,998 and 3,689, respectively) were below the WSP lower benchmark for ETS (38,928). The 2018 and 2019 effective female spawners (EFS; 8,171 and 1,338, respectively) were also below both the long-term (29,627) and recent average EFS (32,569).				
Raft River *(CU: Kamloops-ES)* - Cyclical: No	29,367			WSP – Amber COSEWIC – SC	**10,000 (3,000 – 34,000)**
	Below-average returns are expected for this CU. Brood-year effective total spawners (ETS; 3,361) was below the WSP lower benchmark for ETS (4,958). Brood-year effective female spawners (EFS; 1,756) was also below the long-term (4,251) and recent average EFS (4,143). This stock occasionally has a five-year-old component, but it is variable and inconsistent, thus only four-year-old was considered.				
Quesnel *(CU: Quesnel-S)* - Cyclical: Yes	1,167,892 (Cyc-year average)			WSP – RED/AM COSEWIC – END	**1,907,000 (485,000 – 8,531,000)**
	Above-average returns are expected for this CU. The 2018 brood-year effective total spawners (ETS; 667,272) was above the WSP lower benchmark for ETS (197,467) but below the upper benchmark (1,307,742). Brood-year effective female spawners (EFS; 332,730) was above both the long-term (149,930) and recent average EFS (246,291). These comparisons include the Horsefly River spawning channel escapements. This stock was heavily impacted by the Big Bar landslide in 2019 and 2020 return years, with potentially additional en-route mortality. The situation is likely to be alleviated for 2022 with significant progress of the ongoing Big Bar site improvement.				
Stellako River *(CU: Francois-Fraser-S)* - Cyclical: No	434,078			WSP – AM/GR COSEWIC – SC	**536,000 (185,000 – 1,491,000)**
	Good returns are expected for this CU. Brood-year effective total spawners (ETS; 176,667) was above the WSP upper benchmark (122,612). Also, brood-year effective female spawners (EFS; 95,963) was above the long-term (56,033) and recent average EFS (52,194). This stock was heavily impacted by the Big Bar landslide in 2019 and 2020 return years, with potentially additional en-route mortality. The situation is likely to be alleviated for 2022 with significant progress of the ongoing Big Bar site improvement.				
Chilko *(CUs: Chilko-S and Chilko-ES)* - Cyclical: No	1,334,527			WSP – Green COSEWIC – NAR	**1,463,000 (482,000 – 4,732,000)**
	Good returns are expected for this CU. Brood-year effective total spawners (ETS; 609,460) was above the upper benchmark (353,863) for ETS. As well, brood-year effective female spawners (EFS; 388,737) was above both the long-term (226,361) and recent average EFS (274,197). No out-migratory smolt counting was conducted in 2020 due to the COVID pandemic restriction. These comparisons include the historical Chilko River spawning channel escapement. This stock was heavily impacted by the Big Bar landslide in 2019 and 2020 return years, with potentially additional en-route mortality. The situation is likely to be alleviated for 2022 with significant progress of the ongoing Big Bar site improvement.				

Stock Management Unit	Conservation Unit /Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2022 FORECAST/ OUTLOOK
Late Stuart *(CU: Takla-Trembleur-Stuart-S)* - Cyclical: Yes	485,126			WSP – RED/AM COSEWIC – END	**458,000 (80,000 – 2,520,000)**
	Below-average returns are expected for this CU. Brood-year effective total spawners (ETS; 111,455) was below the WSP lower benchmark for ETS (132,547). However, brood-year effective female spawners (EFS; 67,449) was above the long-term (27,440) and recent average EFS (38,269) for this cycle-line. This stock was heavily impacted by the Big Bar landslide in 2019 and 2020 return years, with potentially additional en-route mortality. The situation is likely to be alleviated for 2022 with significant progress of the ongoing Big Bar site improvement.				

Stock management Unit: LATE RUN

Average aggregate return (all cycles): 8,320,077

Conservation Unit	Average Return (all cycles)	LRP / LBB	Management Target	WSP / COSEWIC STATUS	2022 FORECAST/ OUTLOOK
Cultus Lake *(CU: Cultus-L)* - Cyclical: No	33,370			WSP – RED COSEWIC – END	**1,000 (400 – 5,000)**
	Below-average returns are expected for this CU. Brood-year effective total spawners (EFS; 252) was far below the WSP lower benchmark for ETS (15,454). Brood-year effective female spawners (EFS; 153) was below the long-term mean EFS (831) but slightly above the recent mean EFS (140). No out-migratory smolt counting was conducted in 2020 due to the COVID pandemic restriction.				
Portage Creek *(CU: Seton-L)* - Cyclical: No	38,472			WSP – RED COSEWIC – END	**107,000 (27,000 – 444,000)**
	Good returns are expected for this CU. Brood-year effective total spawners (EFS; 35,459) was far above the WSP upper benchmark for ETS (13,453). Similarly, brood-year effective female spawners (EFS; 22,395) was above both the long-term (4,362) and recent average EFS (5,718).				
South Thompson *(CU: Shuswap-L)* - Cyclical: Yes	7,645,476 (Cyc-year average)			WSP – AM/GR COSEWIC – NAR	**3,418,000 (645,000 – 17,166,000)**
	Good returns are expected for this CU. Brood-year effective total spawners (EFS; 1,502,077) was far above the cycle-specific WSP lower benchmark for ETS (310,783), below the upper benchmark (1,794,869) but above 75% of the upper benchmark. However, brood-year effective female spawners (EFS; 801,099) was below the long-term (1,176,919) and recent average EFS (1,524,604). These comparisons include the historical Adams River spawning channel escapements.				
Birkenhead River *(CU: Lillooet-Harrison-L)* - Cyclical: No	302,983			WSP – Amber COSEWIC – SC	**61,000 (21,000 – 196,000)**
	Low-to-moderate returns are expected for this CU. Historically, this stock has a considerable five-year-old component. The 2018 brood-year effective total spawners (ETS; 13,830) was slightly below the WSP lower benchmark (15,685). The 2017 brood-year ETS (17,667) was slightly above the lower benchmark but far below the upper benchmark (81,023). The 2018 and 2017 brood-year effective female spawners (EFS; 7,233 and 9,900) were below both the long-term (40,336) and recent average EFS (14,323).				
	299,776			WSP – RED COSEWIC – END	

Conservation Unit	Average Return (all cycles)	LRP / LBB	Management Target	WSP / COSEWIC STATUS	2022 FORECAST/ OUTLOOK
Weaver Creek *(CU: Harrison (U/S)-L)* - Cyclical: No	Low-to-moderate returns are expected for this CU. Brood-year effective total spawners (EFS; 14,702) was above the WSP lower benchmark (10,731), but below the upper benchmark (84,597). Brood-year effective female spawners (EFS; 8,574) was below the long-term average EFS (20,844) but above the recent average EFS (6,039). These comparisons include the Weaver Creek spawning channel escapements to be consistent with Grant et al (2020).				**85,000 (16,000 – 423,000)**
Big Silver Creek *(CU: Harrison (D/S)-L)* - Cyclical: No				WSP – AM/GR COSEWIC – SC	**16,000 (2,000 – 51,000)**
	Reliable return data are not available for this CU, thus no WSP benchmarks are available (see Appendix). Below-average returns are expected for this stock. Brood-year effective female spawners (EFS; 496) was below the long-term (1,650) and recent average EFS (2,225).				
Widgeon Slough *(CU: Widgeon (River-Type))* - Cyclical: No				WSP – RED COSEWIC – Threat.	**600 (70-2,000)**
	Reliable return data are not available for this CU, thus no WSP benchmarks are available (see Appendix). Below average returns are expected for this CU. The 2017 effective female spawners (EFS; 83) was below the long-term average EFS (324) and the recent average EFS (94). This population may have contribution from the 3-year-old component, but this is uncertain due to small population and sample sizes over time. For reference, the 2018 EFS (68) was below the long-term average EFS and below the recent average EFS.				

FRASER PINK

Conservation Unit	Average Return	LRP / LBB	Management Target	WSP / COSEWIC STATUS	2022 FORECAST/ OUTLOOK
Fraser - Odd only (CU: Fraser River)	11,500,000				**NA**

FRASER CHINOOK

Stock Management Unit	Conservation Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	WSP / COSEWIC STATUS	2022 FORECAST/ OUTLOOK
SPRING RUN 4_2 CHINOOK SALMON	**Aggregate SMU**	**10,352** (CTC ESC[1] 1975-2020)		**22,146** Escapement Target (S_{MSY})		**8,293 Terminal Run**
	CK-17 Lower Thompson	**10,182** (ESC 1975-2020) **5,312** (Last Gen)	4000		WSP – Red COSEWIC – END.	
	CK-16 South Thompson-Bessette Creek	**123** (ESC 1975-2020) **10** (Last Gen)	1000		WSP – Red	
	The 2021 escapement estimates are below the long term average and near the parent brood escapement in 2017. Expectations are for continued depressed abundance in 2022 due to low parental escapements in 2018, ongoing unfavorable marine and freshwater survival conditions and low productivity. The Bonaparte fishway failure and flash flooding in 2018 resulted in an extremely low escapement and will affect the 2022 escapement. Drought conditions in 2018 created unfavorable water levels and temperatures that will have negatively impacted spawning for most populations, based on past evidence. (2022 Outlook Category 1)					
SPRING RUN 5_2 CHINOOK SALMON	**Aggregate SMU**	**24,219** (CTC ESC[1] 1975-2020)		**42,165** Escapement Target (S_{MSY})		**16,876 Terminal Run**
	CK-04 Lower Fraser	**456** (ESC 1975-2020) **214** (Last Gen)	1,000		COSEWIC – Special Concern	
	CK-08 Middle Fraser- Fraser Canyon	**61** (ESC 1975-2020) **37** (Last Gen)	1,000		WSP – Data D. COSEWIC – END	
	CK-10 Middle Fraser	**7,454** (ESC 1975-2020) **2,433** (Last Gen)	5,300		WSP – Red COSEWIC – Threat.	
	CK-12 Upper Fraser	**17,867** (ESC 1975-2020) **7,345** (Last Gen	5,300		WSP – Red COSEWIC – END	
	CK-18 North Thompson	**701** (ESC 1975-2020) **245** (Last Gen)	1,000		WSP – Red COSEWIC – END	

[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	2022 FORECAST/ OUTLOOK
SPRING RUN 52 CHINOOK SALMON	Estimates for 2021 indicate that on average they are near the parental brood escapement in 2016, but below the long-term average. However, there is considerable variation among these populations. Expectations are for continued low abundance in 2022 related to depressed parental escapements in both 2017 and 2018 and continuing unfavorable marine and freshwater survival conditions and low productivity. Additionally, drought conditions in 2018 created unfavorable water levels and temperatures, which may have impacted spawners and parr, hence returning 4 and 5 year olds in 2022. (2022 Outlook Category 1)					
SUMMER RUN 5_2 CHINOOK SALMON	**Aggregate SMU**	**19,534** (CTC ESC[1] 1975-2020)		**23,567** Escapement Target (S_{MSY})		**15,398 Terminal Run**
	CK-05 Lower Fraser – Upper Pitt	**251** (ESC 1975-2020) **72** (Last Gen)	1,000		WSP – Data D. COSEWIC – END	
	CK-06 Lower Fraser	**61** (ESC 1975-2020) **54** (Last Gen)	1,000		WSP – Data D. COSEWIC – Threat.	
	CK-09 Middle Fraser - Portage	**136** (ESC 1975-2020) **57** (Last Gen)	1,000		WSP – Red COSEWIC – END	
	CK-11 Middle Fraser	**14,732** (ESC 1975-2020) **6,126** (Last Gen)	5,800		WSP – Amber COSEWIC – Threat.	
	CK-14 South Thompson	**1,287** (ESC 1975-2020) **889** (Last Gen)	1,000		WSP – Amber	
	CK-19 North Thompson	**4,270** (ESC 1975-2020) **1,590** (Last Gen)	1,800		WSP – Red COSEWIC – END	
	The escapement estimates appear to indicate that on average they are near the parental brood escapement in 2016, but below the long-term average. However, there is considerable variation amongst the populations in the stock group. Expectations are for continued overall low abundance related to low parental escapements, low marine and freshwater survival, and low productivity. Drought conditions in 2018 created lower than average flow conditions, but the impacts to this MU are expected to be limited. (2022 Outlook Category 1)					
SUMMER RUN 4_1 CHINOOK SALMON		**64,777** (CTC ESC[1] 1975-2020)		**120,322** Escapement Target (S_{MSY})		**128,800 Esc**
	CK-13 South Thompson	**42,168** (ESC 1975-2020) **92,001** (Last Gen)	23,600		WSP – Green COSEWIC – Not at Risk	

Stock Management Unit	Conservation Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	WSP / COSEWIC STATUS	2022 FORECAST/ OUTLOOK
SUMMER RUN 41 CHINOOK SALMON	CK-15 Shuswap River	**25,894** (ESC 1975-2020) **23,181** (Last Gen)	2,100		COSEWIC – Not at Risk	
	CK-07 Maria Slough	**286** (ESC 1975-2020) **100** (Last Gen)	1,000		Not assessed.	**Outlook Category 1**
	The 2021 escapement estimates indicate that the aggregate escapement will exceed the long-term average and parental brood from 2017. One exception is Maria Slough where abundance remained extremely low. This extremely low abundance at Maria is expected to continue in 2022, as there was zero escapement into Maria in 2018 due to low flows preventing access to the spawning grounds. The Lower Shuswap indicator will exceed the PST Management Objective of 12,300 spawners in 2021 and is the 5th consecutive year the target has been met, with only 2 of the last 10 years not meeting the target. Flow and temperature issues existed for all stocks in 2018 creating unfavorable water levels and temperatures which may have negatively affected some populations. Additionally, we saw low fecundities at both Lower and Middle Shuswap in 2018. Despite these issues it is expected that escapement for CUs other than Maria will continue to be high and exceed brood in 2022 as in recent years. (2022 Outlook Category 1 (Maria) / 4)					
FALL RUN 41 CHINOOK SALMON	**Aggregate**	**131,822** (ESC 1984-2020)				
	(P) Chilliwack Hatchery Exclusion	**34,739** (ESC 1984-2020) **36,039** (Last Gen)	n/a (hatchery stock)		Not assessed.	**77,109 Esc**
	CK:Lower Fraser River-fall timing (white) - Harrison	**90,890** (ESC 1984-2020) **41,042** (Last Gen)	**15,300**	**75,100** Escapement Target (S_{MSY})	WSP – Green COSEWIC – Threat.	**68,388 Esc**
	The 2021 Harrison (natural) escapement estimate appears to be near the low parental brood escapement of 29,799 in 2017; and below both the long term average and PST escapement goal. Current marine conditions and stock productivity appear to be unfavorable, with the Harrison River escapement estimate not meeting the escapement goal in the last six years, and only once in the past ten years. Chilliwack hatchery production, marine survival, and recent fishery exploitation are expected to return sufficient abundance to achieve hatchery production objectives. (2022 Outlook Category 1 (Harrison) / 4 (Chilliwack))					

FRASER COHO

STOCK MANAGEMENT UNIT	Conservation Unit / Sub Unit	Average Return	LRP / LBB	Management Target	WSP / COSEWIC STATUS	2022 FORECAST /OUTLOOK
Interior Fraser Coho	**Aggregate**	**37,034 (ESC 1998 – 2020)**		**35,935**	COSEWIC - Threat	**83,600**
	Fraser Canyon	**3,313** (ESC 1998 – 2020)	**1,000**			
	Interior Fraser	**4,970** (ESC 1998 – 2020)	**1,800**			
	North Thompson	**12,928** (ESC 1998 – 2020)	**2,600**			
	Lower Thompson	**8,060** (ESC 1998 – 2020)	**1,400**			
	South Thompson	**7,763** (ESC 1998 – 2020)	**2,300**			
		A PST MU status will remain low, as the survival target of 3% has not been met since 1999 and three successive years of survival over 3% are required to move into a higher MU status. The 2017 brood year marine survival was 1.6%. (2022 Outlook Category 1)				
Lower Fraser Coho	**Aggregate – includes 3 CUs**	Not Available				**Outlook Category 1**
		A formal forecast for Inch Creek hatchery smolt-adult survival will be produced in the spring. The observed 2017 brood year survival was 7.5%, which was higher than 2016 and much higher than the forecast. The retrospective analysis showed that the best performing model has remained the NPGO climate index. The 2021 forecast for survival for this indicator was 2.3%. (2021 Outlook Category was 1)				

FRASER CHUM

Stock Management Unit	Conservation Unit	Average Return (all cycles)	LRP / LBB	Management Target	WSP / COSEWIC STATUS	2022 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 in 2017 fell below the 800,000 goal for the first time since 2010 and has failed to reach the escapement goal in each subsequent year (2017-2020). Spawning escapement in 2019 was estimated at 300,000 Chum; this is the lowest recorded escapement in over 20 years. Returns in 2022 will be dominated by 4 year old brood from the 2018 escapement (680,000 spawners). Spawning escapements for the past 4 years (2017-2020) have failed to outperform brood. The October 22, 2021 in-season estimate of the Fraser Chum terminal return was 481,000 fish with an 80% probability the terminal return would be between 400,000 and 570,000 Chum. Escapement assessments in 2021 are currently underway but early indications are the terminal return will be close to the lower end of the range and will likely be the 2nd lowest recorded escapement in over 20 years (with only 2019 escapement being lower). An estimate of the 2021 spawning escapement will be available by April 2022. (2021 Outlook Category was 2)				

HOWE SOUND / BURRARD INLET

Stock Management Unit	Conservation Unit / Sub-Unit	Average Run / Avg. Spawners	LRP / LBB	Management Target	2022 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	2022 FORECAST/ OUTLOOK
CHINOOK	CK-01 Boundary Bay	**250** (Little Campbell ESC 1980-2017)	1,000	2,100	**Outlook Category 1**
	Data are available from the Little Campbell fence program (CK-01). 2020 escapement was about 660 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	2022 FORECAST/ OUTLOOK
OKANAGAN SOCKEYE	Osoyoos			58,730 adults at Wells Dam or 29,365 as peak counts in the terminal index area		**75,000 - 85,000 (wild)** **82,000 - 100,000 total returns (wild+hatch)**
OKANAGAN SOCKEYE	Returns of Okanagan Sockeye adults to the Columbia and Okanagan rivers in 2022 will be derived from smolt cohorts from brood years 2017-2019 that migrated seaward in spring 2019 (returning as 5-year-olds), 2020 (returning as 4-year-olds) and 2021 (returning as 3-year-olds). Although year-specific smolt-to-adult survival values for these specific cohorts are not available as yet, Okanagan Sockeye marine survival variations are known to be similar to Barkley Sound sockeye in that above- and below-average survivals occur in association with either cold-ocean (La Niña) or warm ocean (El Niño) events, respectively. Examination of the association between historic smolt-to-adult return (SAR) variations and NOAA Fisheries "stop-light" ocean condition indicators (including the Oceanic Niño Index (ONI)[2]) suggests that, starting in 2020 (brood year 2018), out-migrating smolts were likely to have experienced a modest improvement in survival rates during ocean entry, relative to a likely lower survival associated with El Niño conditions during 2019. Applying a 2% SAR to the 2019 sea-entry year, 3.6% to the 2020 sea-entry year, and 4% SAR to the 2021 sea-entry year, yields an estimate of approximately 166,000 age 3, 4, and 5 adults contributing to the 2022-2024 return years. Allocation of this production to specific return years based on average age-at-return values for Okanagan Sockeye suggests a total return in 2022 of 80,000 ± 5,000 Okanagan wild-origin fish. Production of hatchery-origin fish from Skaha Lake may increase these returns by 10-20% for an overall maximum return of 82,500 - 100,000 Sockeye of Okanagan/Skaha origin in 2022, of which, typically, 91% are age 4 or 5. 2022 Outlook Category 1.					

[2] NOAA California Current System indicators for 2021 not yet available (21.12.10), though ONI 3.4 and other ENSO indices indicate the development of La Niña conditions since 2020, associated with higher marine survival for SY2021.

OKANAGAN CHINOOK	Okanagan Summer	**28** (ESC 2009- 2020)	1,000	**3,400**	COSEWIC - END	**Outlook Category 1**
	Escapement estimates for 2020 were produced by both index AUC (79) and from the new PIT tag total mark-recapture program (195). Calibrations between the two methods will occur after several years of concurrent estimates are available. Expectations for 2022 are for continued depressed abundance related to low parental escapements, low marine and freshwater survival, low productivity, and low hatchery production. (2021 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.

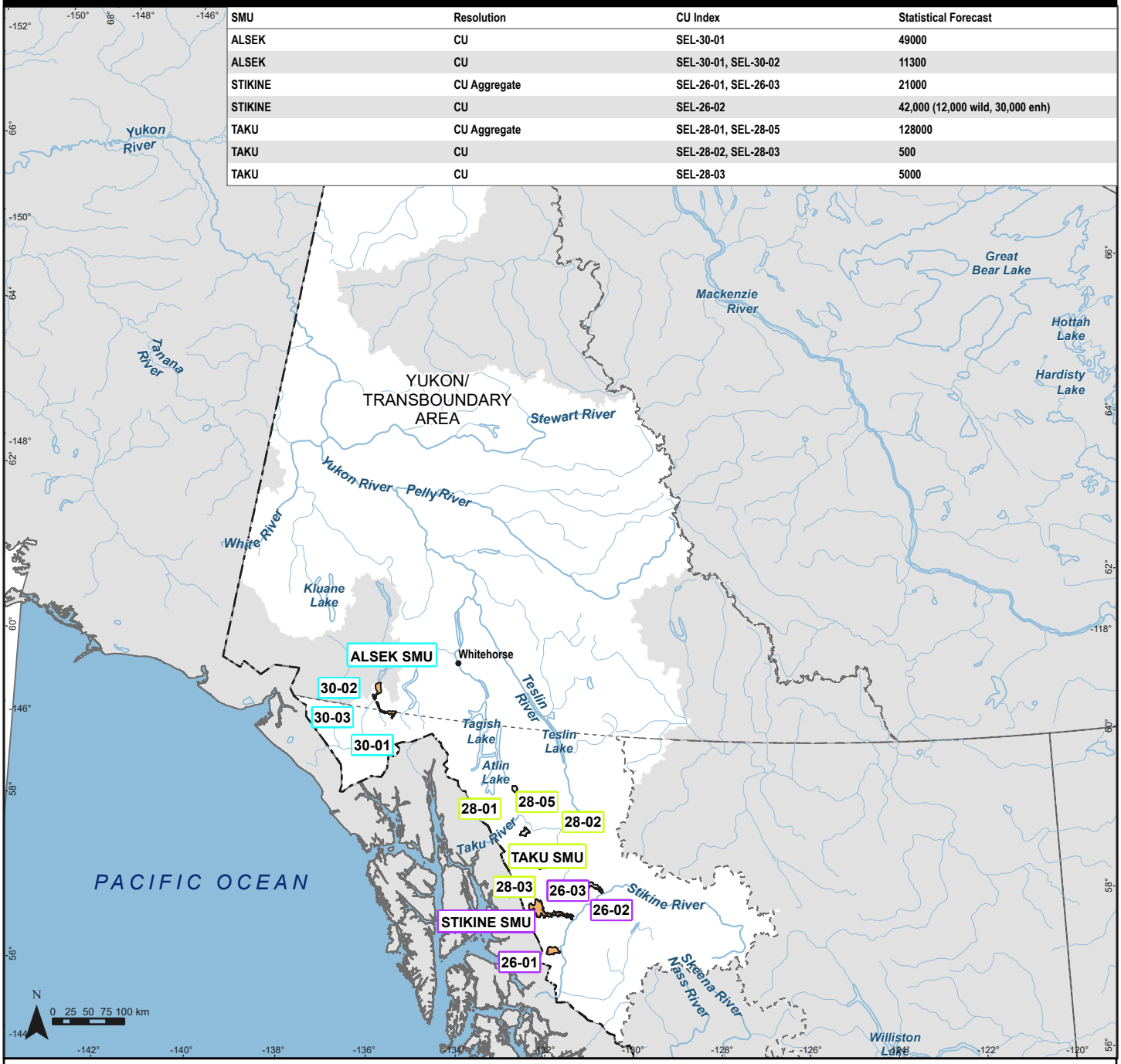
- Long-term average EFS was calculated from the start date identified in Grant et al (2020) up to and including the brood year of interest (for the 2022 outlook, that would be 2018). This obviously may not hold true for stocks with predominantly 3- or 5-year old cohorts, but it is not expected to change 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 deals with 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 those 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 to this specific document. 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.

2022 Salmon Outlook - Pacific Region

SMU	Resolution	CU Index	Statistical Forecast
ALSEK	CU	SEL-30-01	49000
ALSEK	CU	SEL-30-01, SEL-30-02	11300
STIKINE	CU Aggregate	SEL-26-01, SEL-26-03	21000
STIKINE	CU	SEL-26-02	42,000 (12,000 wild, 30,000 enh)
TAKU	CU Aggregate	SEL-28-01, SEL-28-05	128000
TAKU	CU	SEL-28-02, SEL-28-03	500
TAKU	CU	SEL-28-03	5000



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'.

Disclaimer: *This map is provided for illustrative purposes only by Fisheries and Oceans Canada, without warranty of any kind, expressed or implied, as to the accuracy, currency, or completeness of the information.*

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

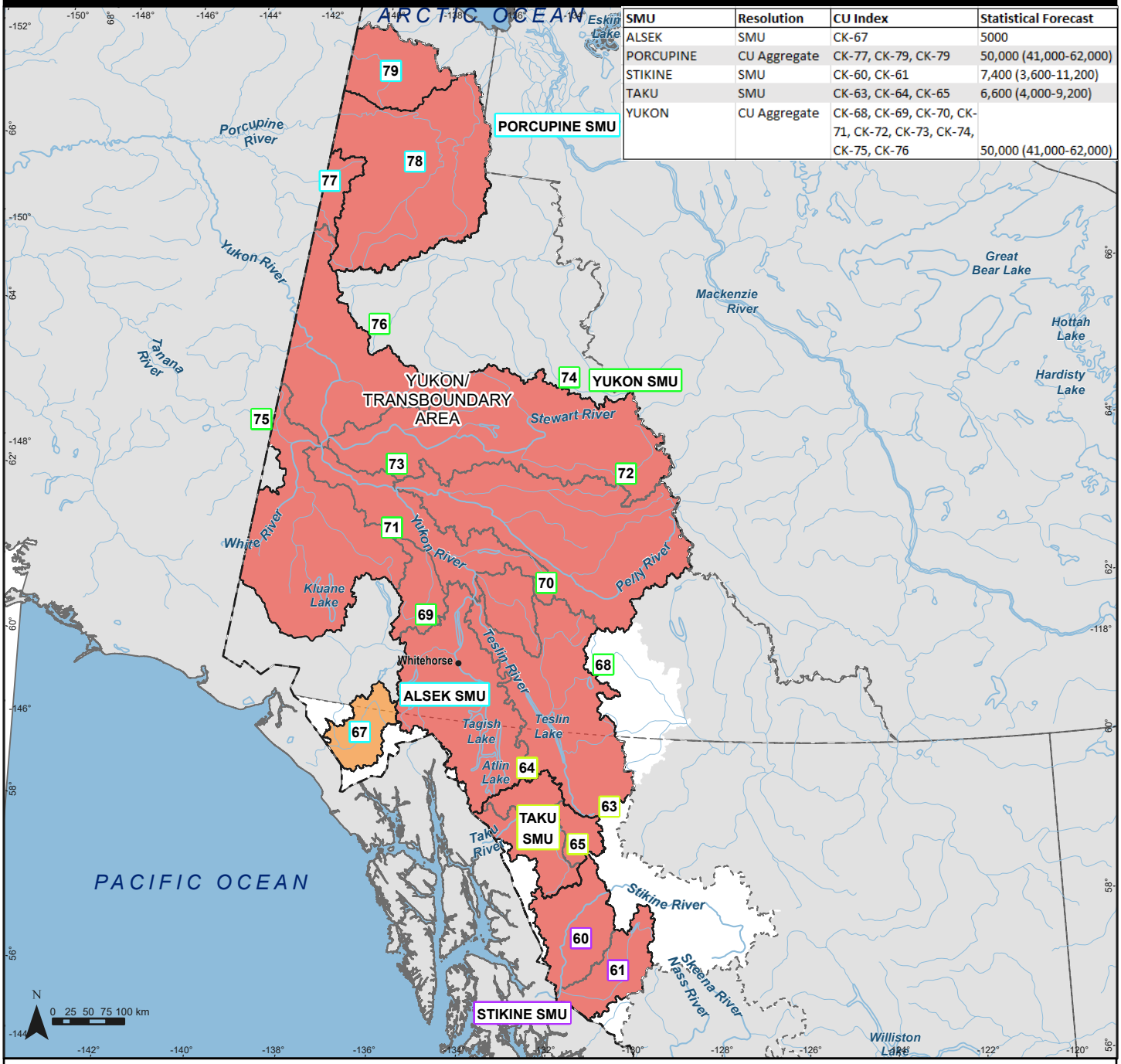
Projection: NAD 1983 BC Environment Albers
Production Date: 11/16/2022
Produced By: Coastal Resource Mapping Ltd for Fisheries and Oceans Canada

Fisheries and Oceans Canada

Canada

2022 Salmon Outlook - Pacific Region

SMU	Resolution	CU Index	Statistical Forecast
ALSEK	SMU	CK-67	5000
PORCUPINE	CU Aggregate	CK-77, CK-79, CK-79	50,000 (41,000-62,000)
STIKINE	SMU	CK-60, CK-61	7,400 (3,600-11,200)
TAKU	SMU	CK-63, CK-64, CK-65	6,600 (4,000-9,200)
YUKON	CU Aggregate	CK-68, CK-69, CK-70, CK-71, CK-72, CK-73, CK-74, CK-75, CK-76	50,000 (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.

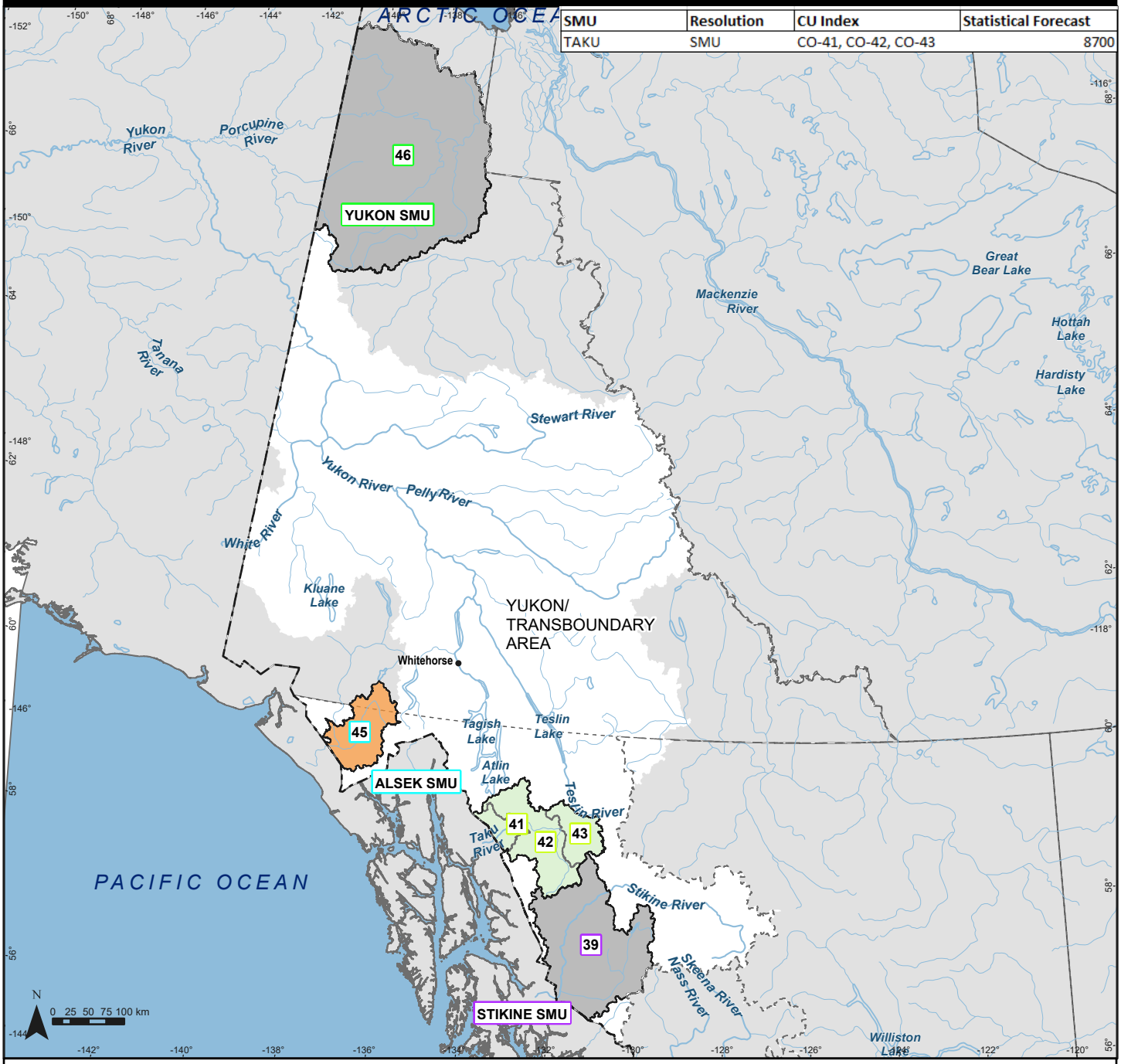
Stock Management Unit (SMU) SMU

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 BC Environment Albers
Production Date: 11/16/2022
Produced By: Coastal Resource Mapping Ltd for Fisheries and Oceans Canada

2022 Salmon Outlook - Pacific Region



SMU	Resolution	CU Index	Statistical Forecast
TAKU	SMU	CO-41, CO-42, CO-43	8700

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

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.
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Stock Management Unit (SMU) SMU

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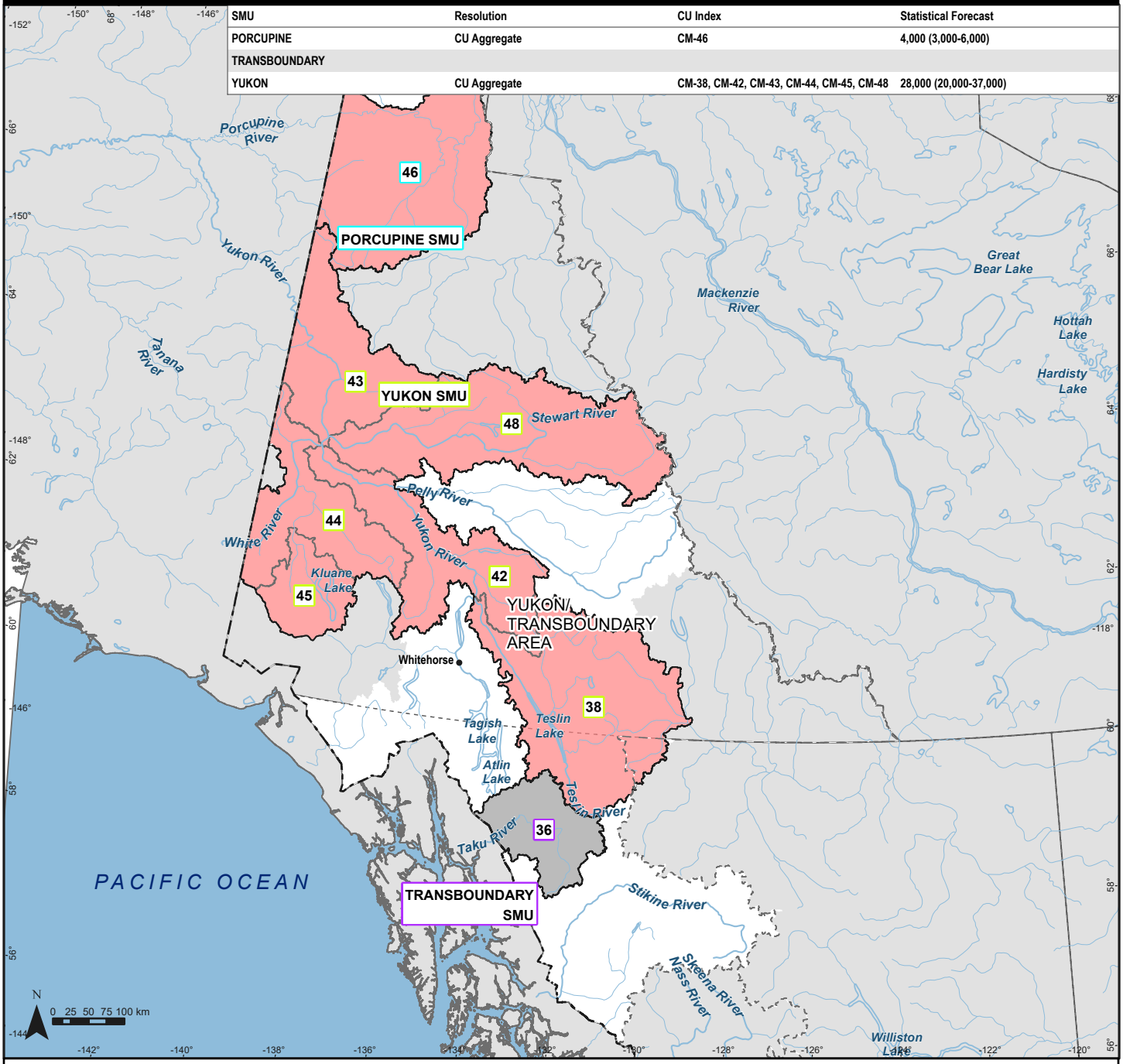
2022 Salmon Outlook - Pacific Region

SMU	Resolution	CU Index	Statistical Forecast
PORCUPINE	CU Aggregate	CM-46	4,000 (3,000-6,000)
TRANSBOUNDARY			
YUKON	CU Aggregate	CM-38, CM-42, CM-43, CM-44, CM-45, CM-48	28,000 (20,000-37,000)



CHUM SALMON - YUKON/TRANSBOUNDARY AREA

Outlook Category

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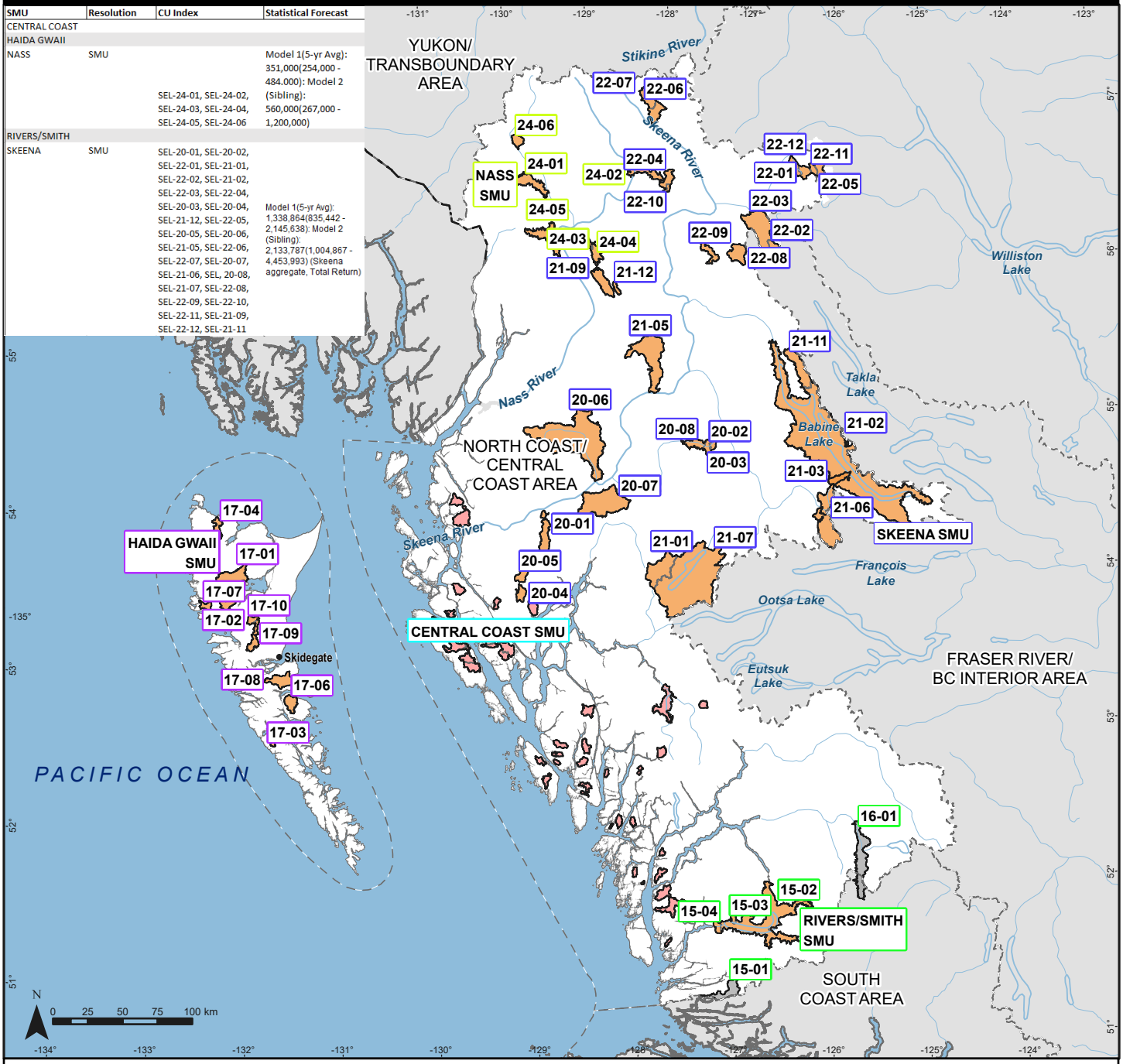
2022 Salmon Outlook - Pacific Region

SMU	Resolution	CU Index	Statistical Forecast
CENTRAL COAST			
HAIDA GWAII			
NASS	SMU		Model 1(5-yr Avg): 351,000(254,000 - 484,000): Model 2 (Sibling): 560,000(267,000 - 1,200,000)
		SEL-24-01, SEL-24-02, SEL-24-03, SEL-24-04, SEL-24-05, SEL-24-06	
RIVERS/SMITH			
SKEENA	SMU	SEL-20-01, SEL-20-02, SEL-22-01, SEL-21-01, SEL-22-02, SEL-21-02, SEL-22-03, SEL-22-04, SEL-20-03, SEL-20-04, SEL-21-12, SEL-22-05, SEL-20-05, SEL-20-06, SEL-21-05, SEL-22-06, SEL-22-07, SEL-20-07, SEL-21-06, SEL, 20-08, SEL-21-07, SEL-22-08, SEL-22-09, SEL-22-10, SEL-22-11, SEL-21-09, SEL-22-12, SEL-21-11	Model 1(5-yr Avg): 1,338,864(835,442 - 2,145,638): Model 2 (Sibling): 2,133,787(1,004,867 - 4,453,993) (Skeena aggregate, Total Return)



SOCKEYE SALMON - NORTH COAST/CENTRAL COAST AREA

Outlook Category

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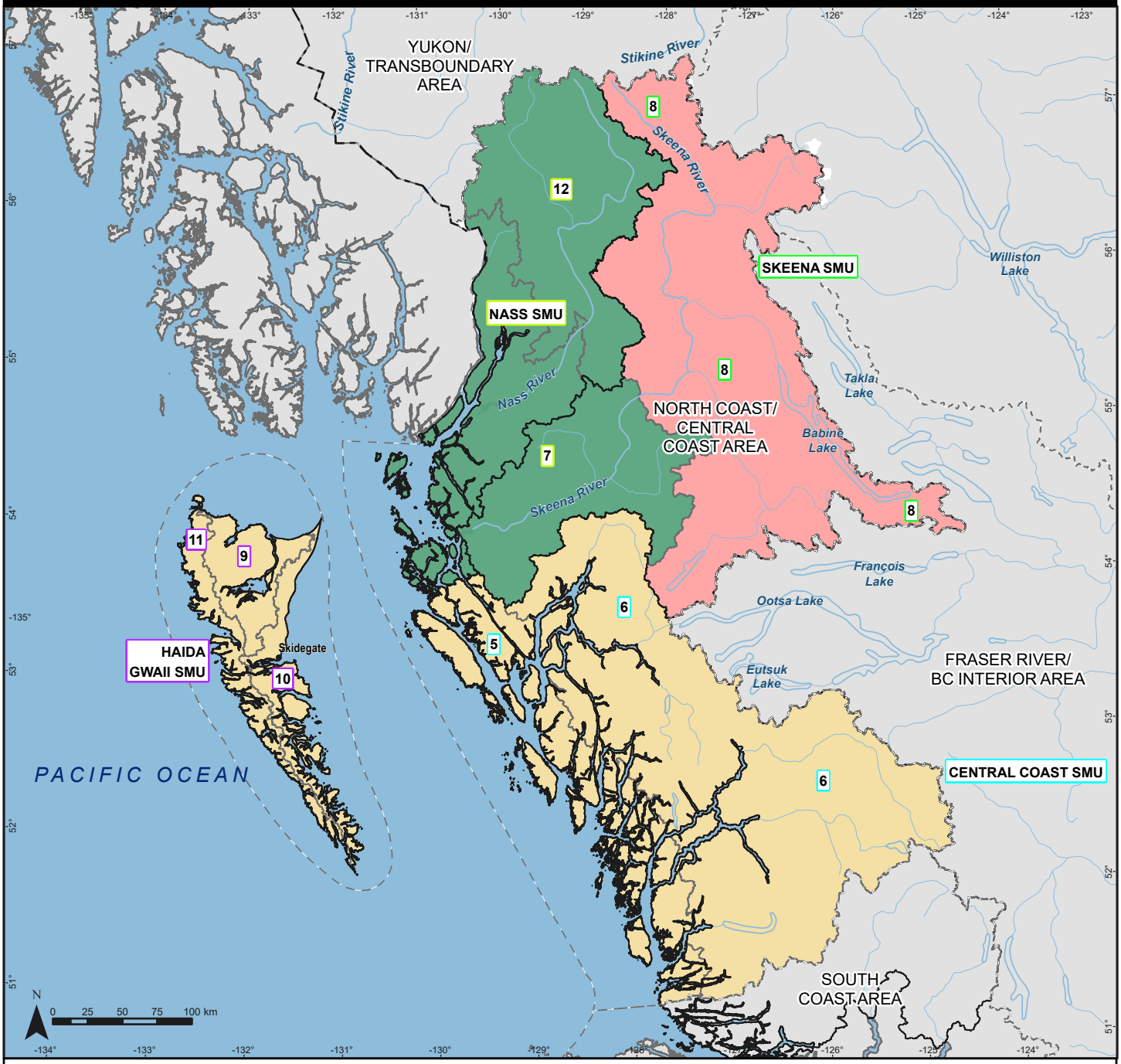

ODD YEAR PINK SALMON - NORTH COAST/CENTRAL COAST AREA

Outlook Category

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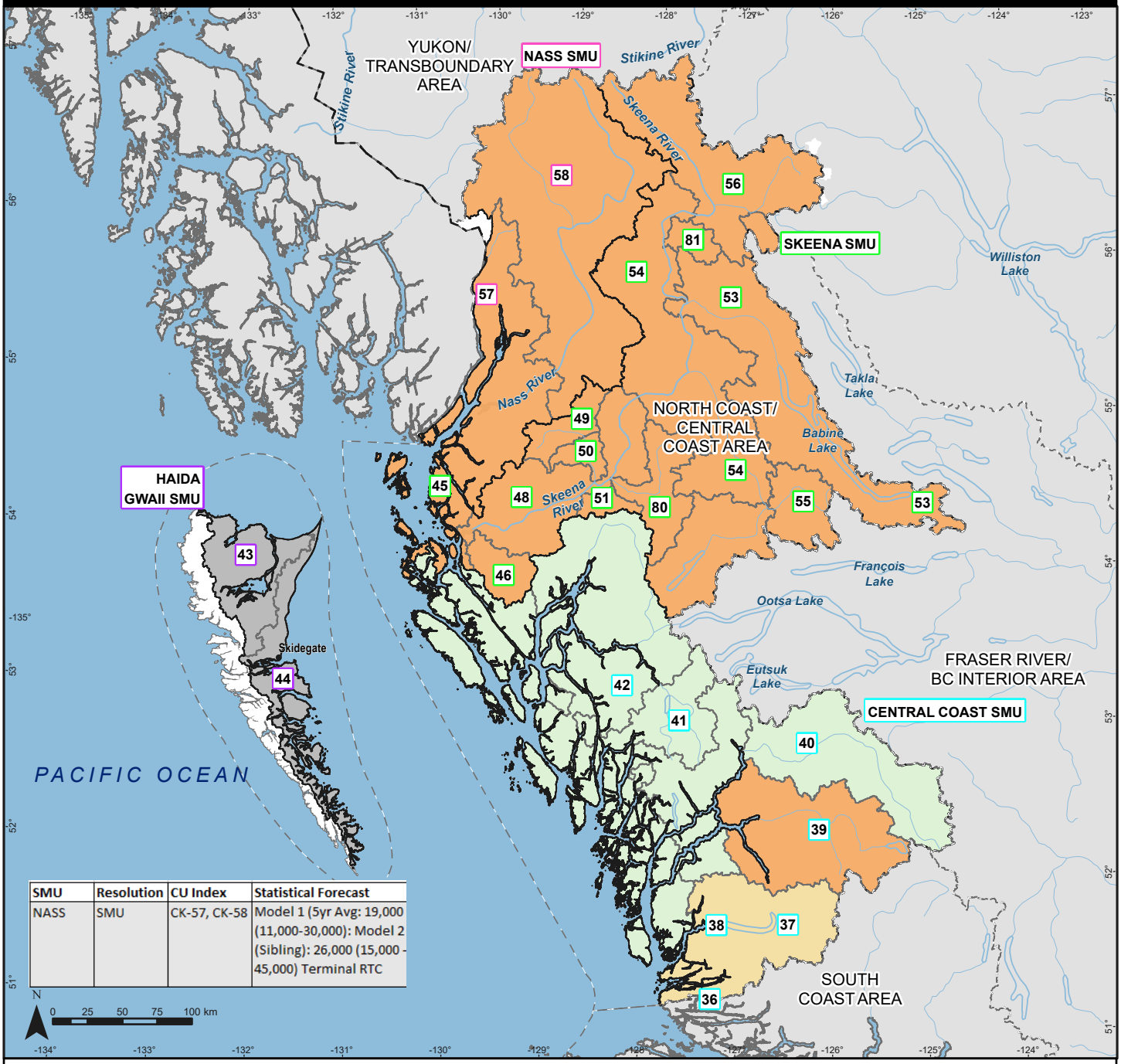
2022 Salmon Outlook - Pacific Region



SMU	Resolution	CU Index	Statistical Forecast
NASS	SMU	CK-57, CK-58	Model 1 (5yr Avg: 19,000 (11,000-30,000): Model 2 (Sibling): 26,000 (15,000 - 45,000) Terminal RTC

N

0 25 50 75 100 km

CHINOOK SALMON - NORTH COAST/CENTRAL COAST AREA

Outlook Category

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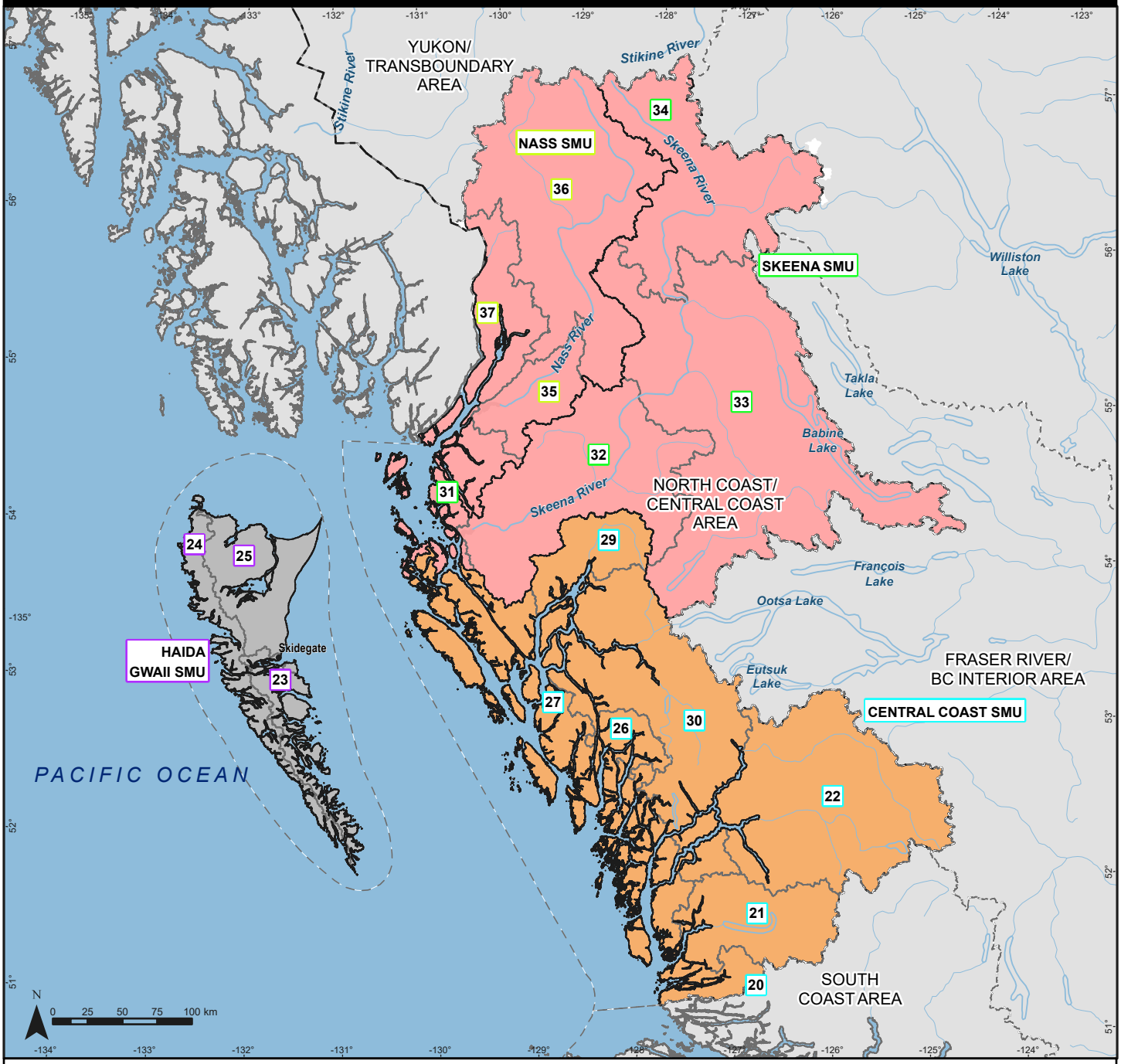

COHO SALMON - NORTH COAST/CENTRAL COAST AREA

Outlook Category

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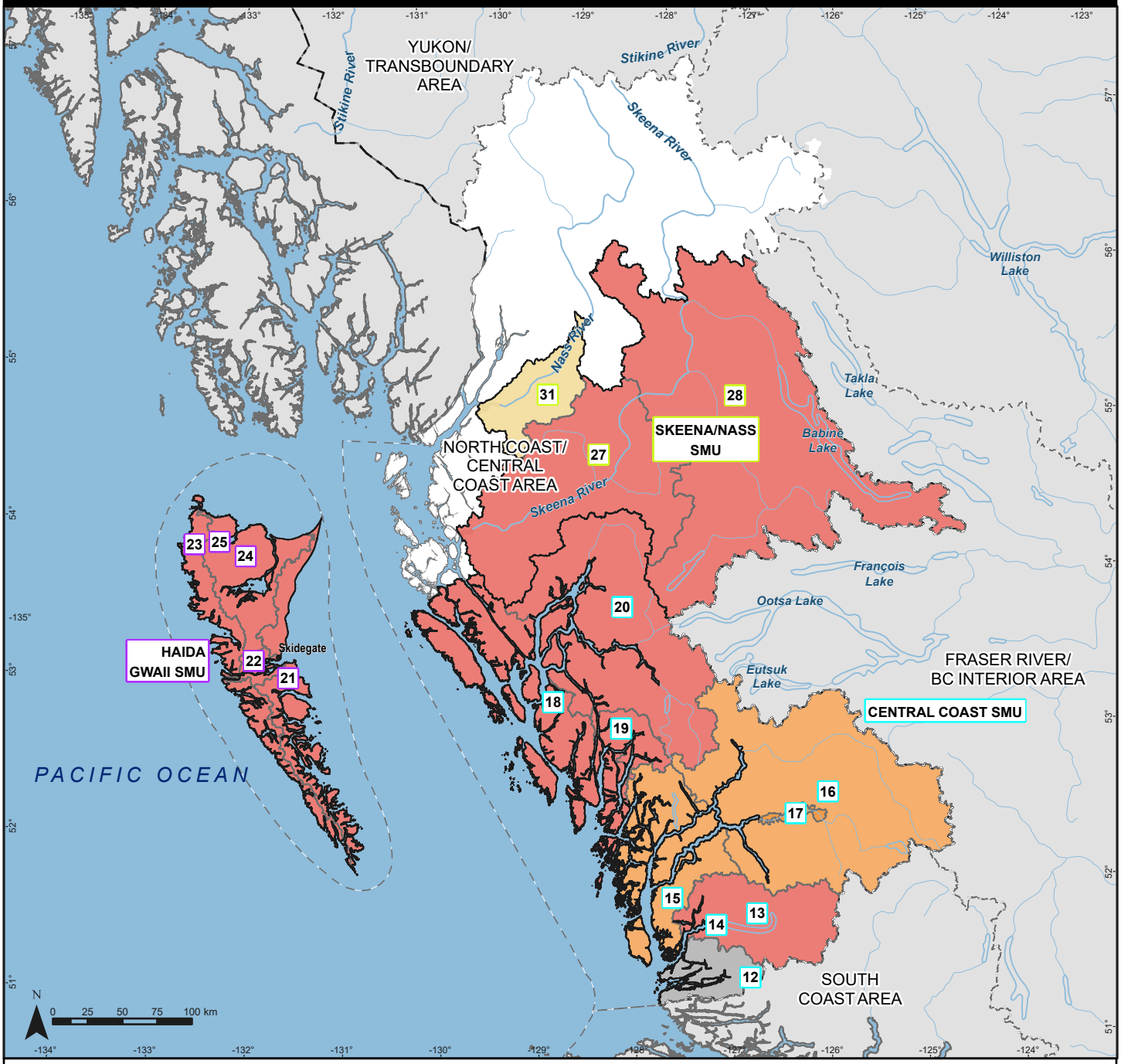
2022 Salmon Outlook - Pacific Region



CHUM SALMON - NORTH COAST/CENTRAL COAST AREA

Outlook Category

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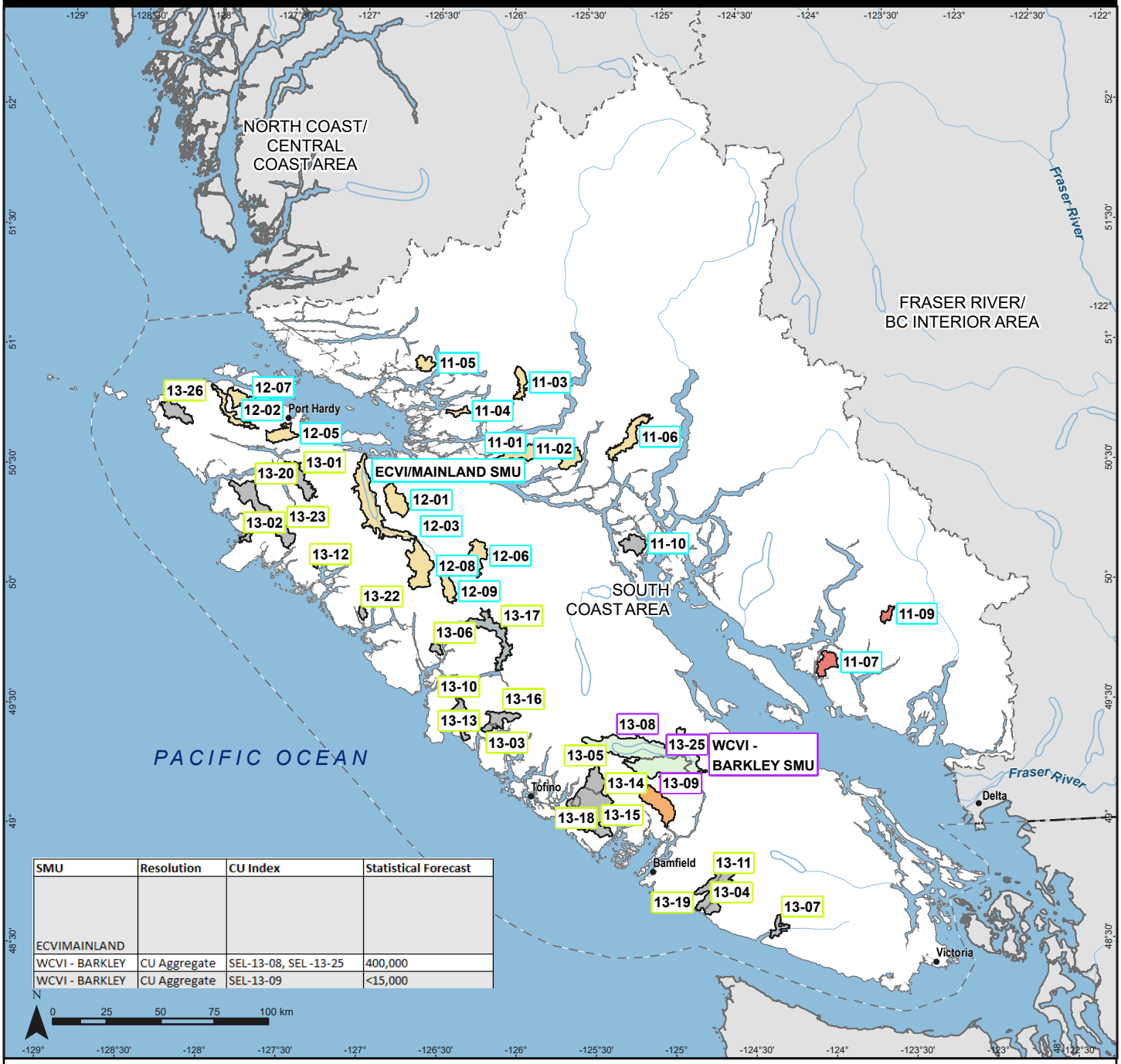

SMU	Resolution	CU Index	Statistical Forecast
ECVIMAINLAND			
WCVI - BARKLEY	CU Aggregate	SEL-13-08, SEL -13-25	400,000
WCVI - BARKLEY	CU Aggregate	SEL-13-09	<15,000

SOCKEYE SALMON - SOUTH COAST AREA

Outlook Category

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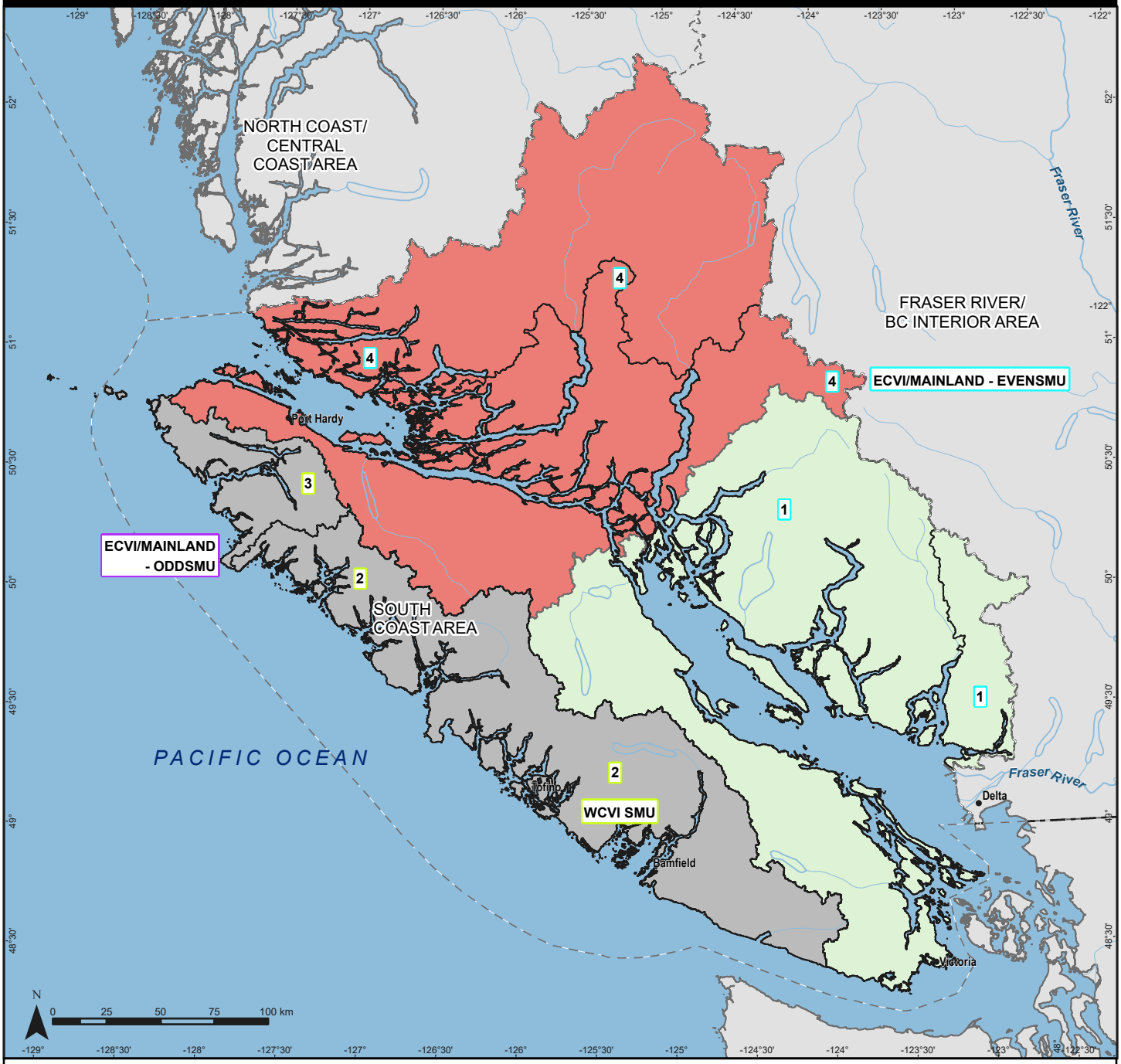

ODD YEAR PINK SALMON - SOUTH COAST AREA

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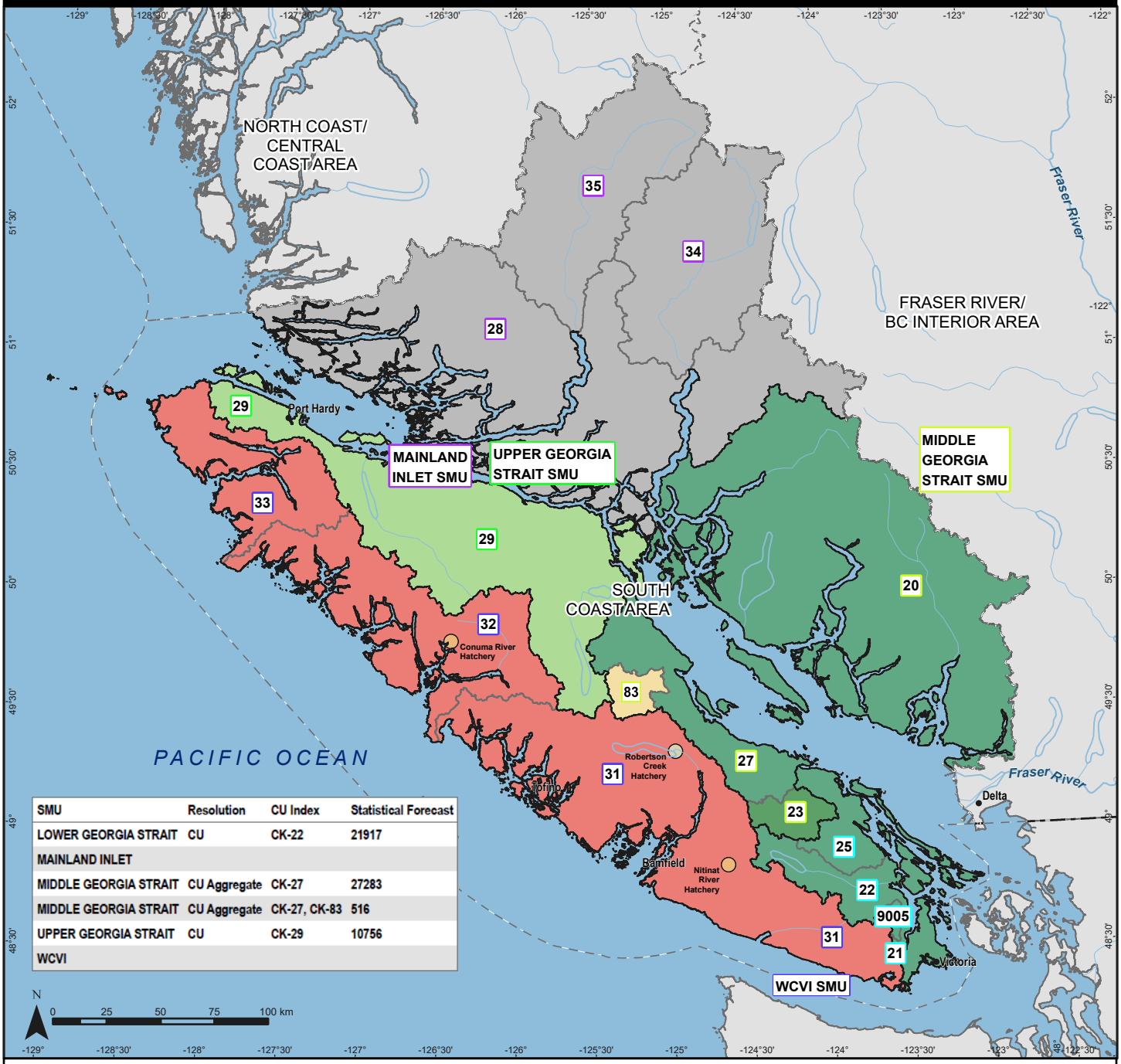

SMU	Resolution	CU Index	Statistical Forecast
LOWER GEORGIA STRAIT	CU	CK-22	21917
MAINLAND INLET			
MIDDLE GEORGIA STRAIT	CU Aggregate	CK-27	27283
MIDDLE GEORGIA STRAIT	CU Aggregate	CK-27, CK-83	516
UPPER GEORGIA STRAIT	CU	CK-29	10756
WCVI			

CHINOOK SALMON - SOUTH COAST AREA

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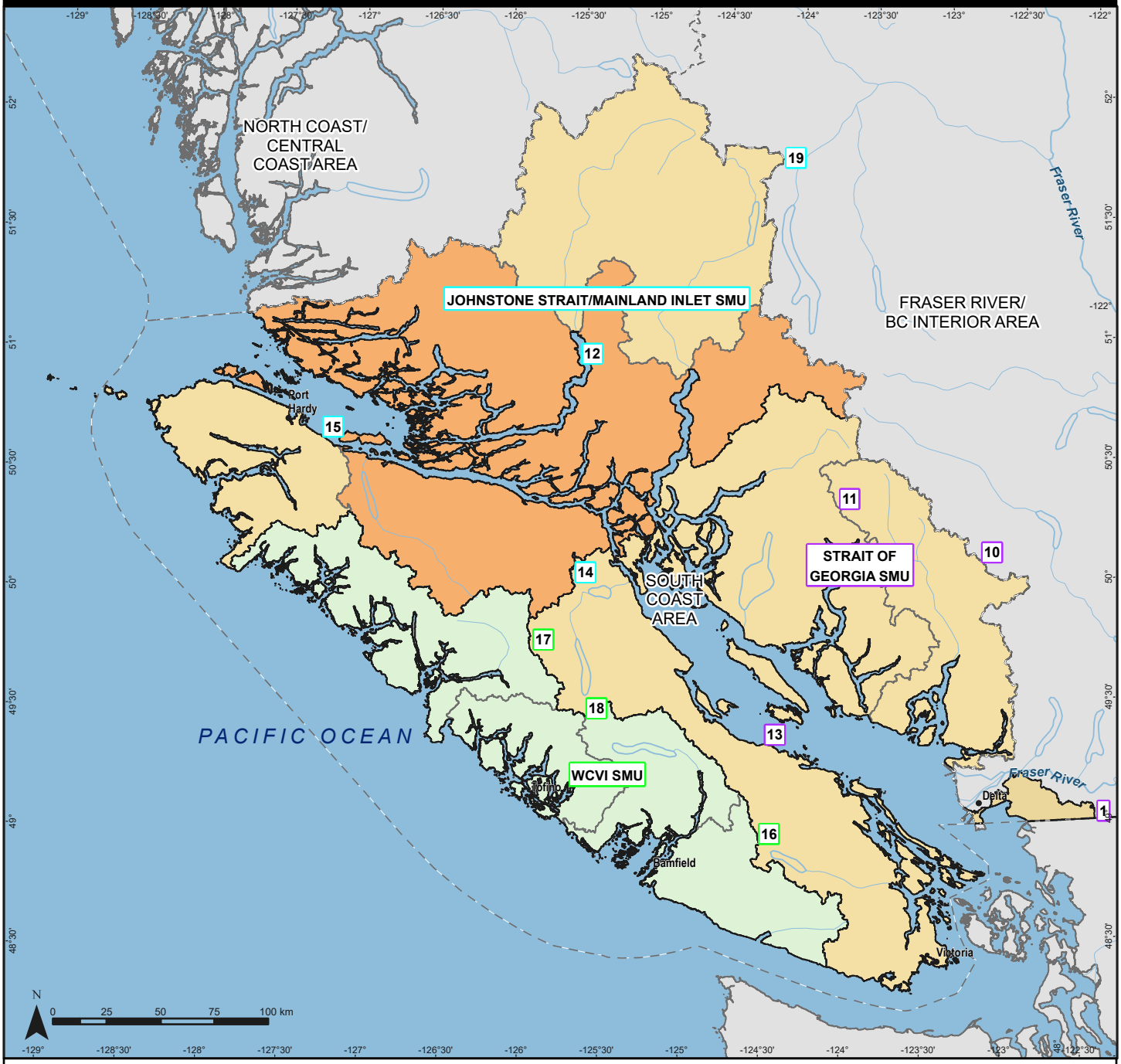

COHO SALMON - SOUTH COAST AREA

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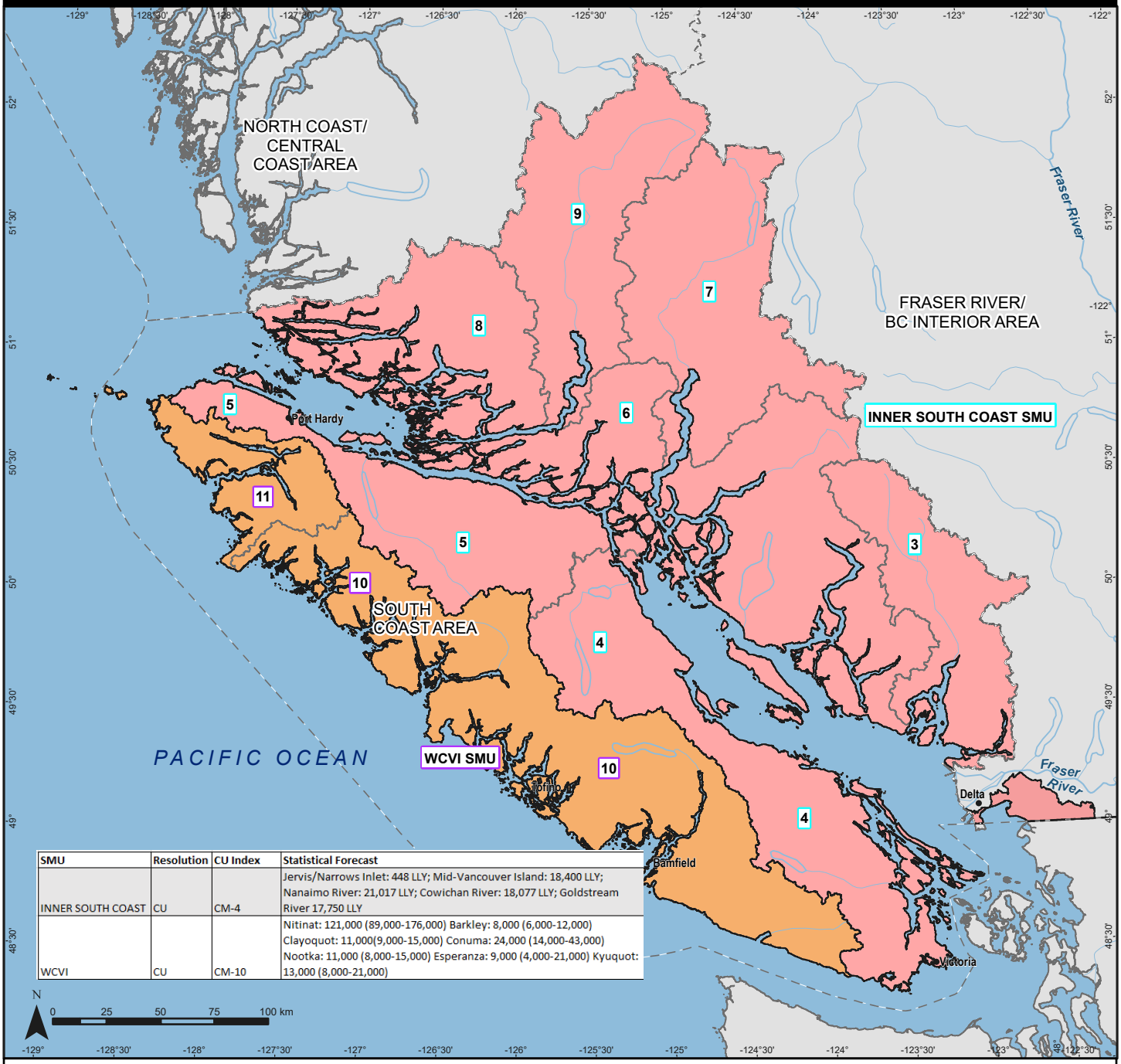
Canada

2022 Salmon Outlook - Pacific Region



SMU	Resolution	CU Index	Statistical Forecast
INNER SOUTH COAST	CU	CM-4	Jervis/Narrows Inlet: 448 LLY; Mid-Vancouver Island: 18,400 LLY; Nanaimo River: 21,017 LLY; Cowichan River: 18,077 LLY; Goldstream River 17,750 LLY
WCVI	CU	CM-10	Nitinat: 121,000 (89,000-176,000) Barkley: 8,000 (6,000-12,000) Clayoquot: 11,000(9,000-15,000) Conuma: 24,000 (14,000-43,000) Nootka: 11,000 (8,000-15,000) Esperanza: 9,000 (4,000-21,000) Kyuquot: 13,000 (8,000-21,000)

CHUM SALMON - SOUTH COAST AREA

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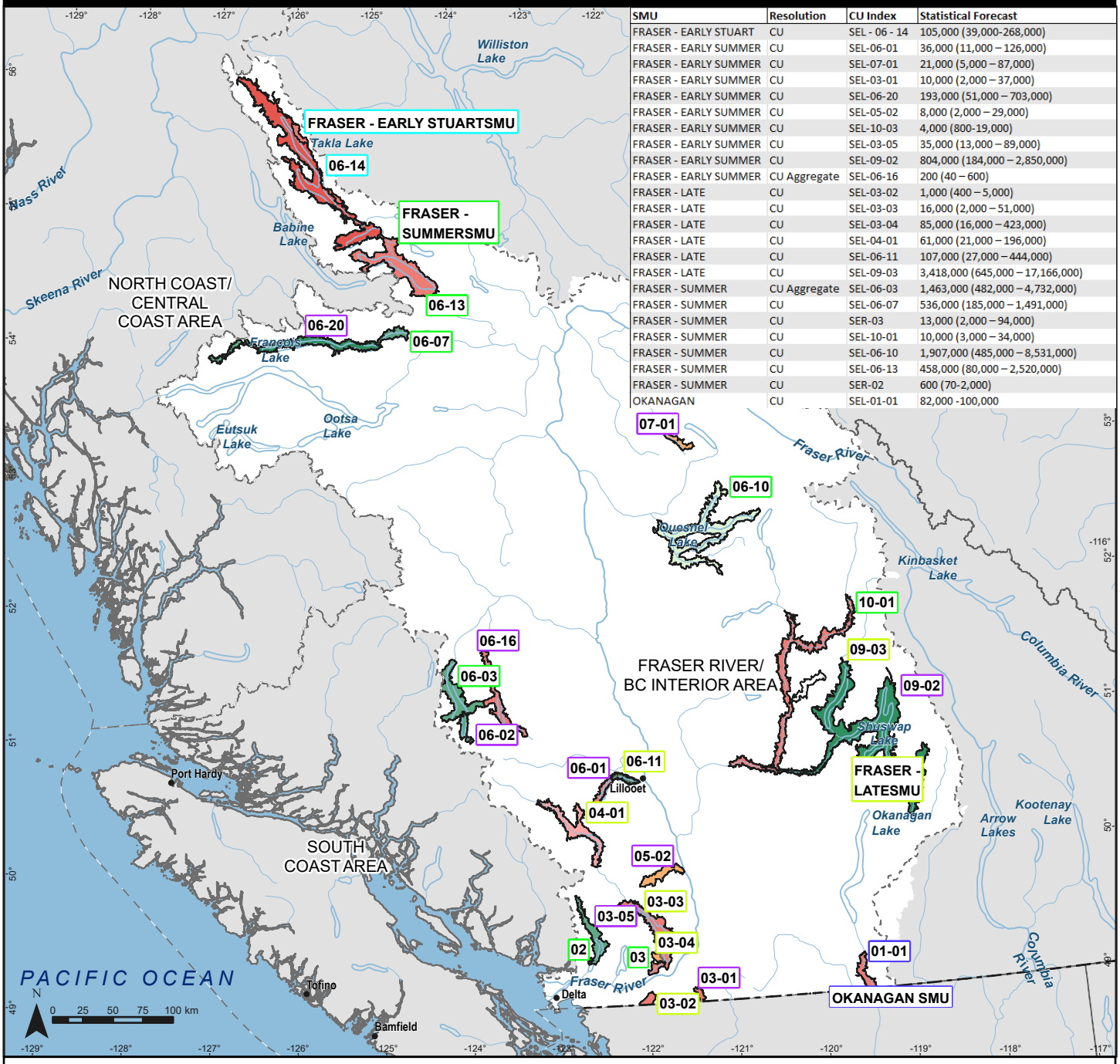

SMU	Resolution	CU Index	Statistical Forecast
FRASER - EARLY STUART	CU	SEL - 06 - 14	105,000 (39,000-268,000)
FRASER - EARLY SUMMER	CU	SEL-06-01	36,000 (11,000 – 126,000)
FRASER - EARLY SUMMER	CU	SEL-07-01	21,000 (5,000 – 87,000)
FRASER - EARLY SUMMER	CU	SEL-03-01	10,000 (2,000 – 37,000)
FRASER - EARLY SUMMER	CU	SEL-06-20	193,000 (51,000 – 703,000)
FRASER - EARLY SUMMER	CU	SEL-05-02	8,000 (2,000 – 29,000)
FRASER - EARLY SUMMER	CU	SEL-10-03	4,000 (800-19,000)
FRASER - EARLY SUMMER	CU	SEL-03-05	35,000 (13,000 – 89,000)
FRASER - EARLY SUMMER	CU	SEL-09-02	804,000 (184,000 – 2,850,000)
FRASER - EARLY SUMMER	CU Aggregate	SEL-06-16	200 (40 – 600)
FRASER - LATE	CU	SEL-03-02	1,000 (400 – 5,000)
FRASER - LATE	CU	SEL-03-03	16,000 (2,000 – 51,000)
FRASER - LATE	CU	SEL-03-04	85,000 (16,000 – 423,000)
FRASER - LATE	CU	SEL-04-01	61,000 (21,000 – 196,000)
FRASER - LATE	CU	SEL-06-11	107,000 (27,000 – 444,000)
FRASER - LATE	CU	SEL-09-03	3,418,000 (645,000 – 17,166,000)
FRASER - SUMMER	CU Aggregate	SEL-06-03	1,463,000 (482,000 – 4,732,000)
FRASER - SUMMER	CU	SEL-06-07	536,000 (185,000 – 1,491,000)
FRASER - SUMMER	CU	SER-03	13,000 (2,000 – 94,000)
FRASER - SUMMER	CU	SEL-10-01	10,000 (3,000 – 34,000)
FRASER - SUMMER	CU	SEL-06-10	1,907,000 (485,000 – 8,531,000)
FRASER - SUMMER	CU	SEL-06-13	458,000 (80,000 – 2,520,000)
FRASER - SUMMER	CU	SER-02	600 (70-2,000)
OKANAGAN	CU	SEL-01-01	82,000 -100,000

SOCKEYE SALMON - FRASER RIVER/BC INTERIOR AREA

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ODD YEAR PINK SALMON - FRASER RIVER/BC INTERIOR AREA

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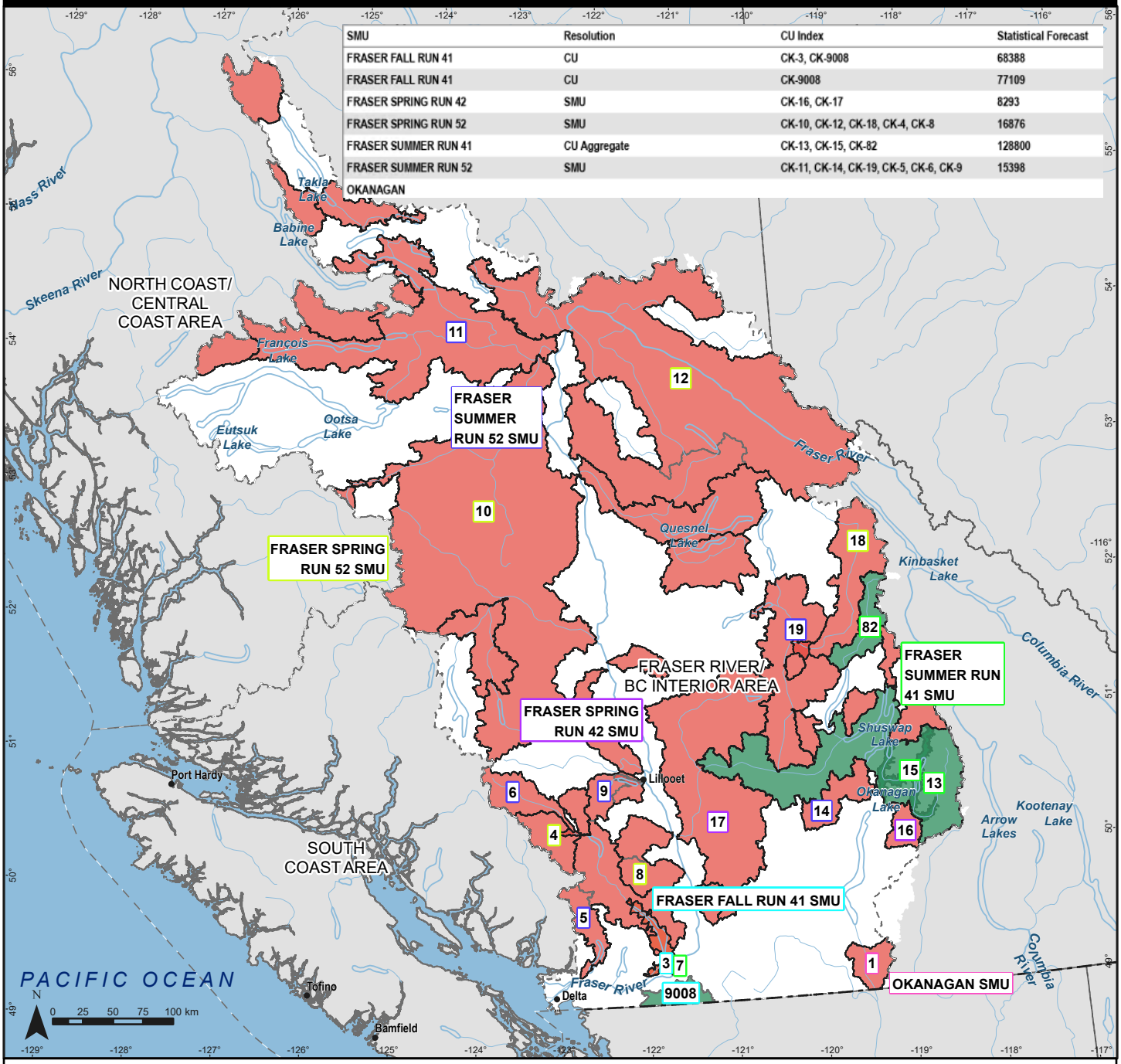

SMU	Resolution	CU Index	Statistical Forecast
FRASER FALL RUN 41	CU	CK-3, CK-9008	68388
FRASER FALL RUN 41	CU	CK-9008	77109
FRASER SPRING RUN 42	SMU	CK-16, CK-17	8293
FRASER SPRING RUN 52	SMU	CK-10, CK-12, CK-18, CK-4, CK-8	16876
FRASER SUMMER RUN 41	CU Aggregate	CK-13, CK-15, CK-82	128800
FRASER SUMMER RUN 52	SMU	CK-11, CK-14, CK-19, CK-5, CK-6, CK-9	15398
OKANAGAN			

CHINOOK SALMON - FRASER RIVER/BC INTERIOR AREA

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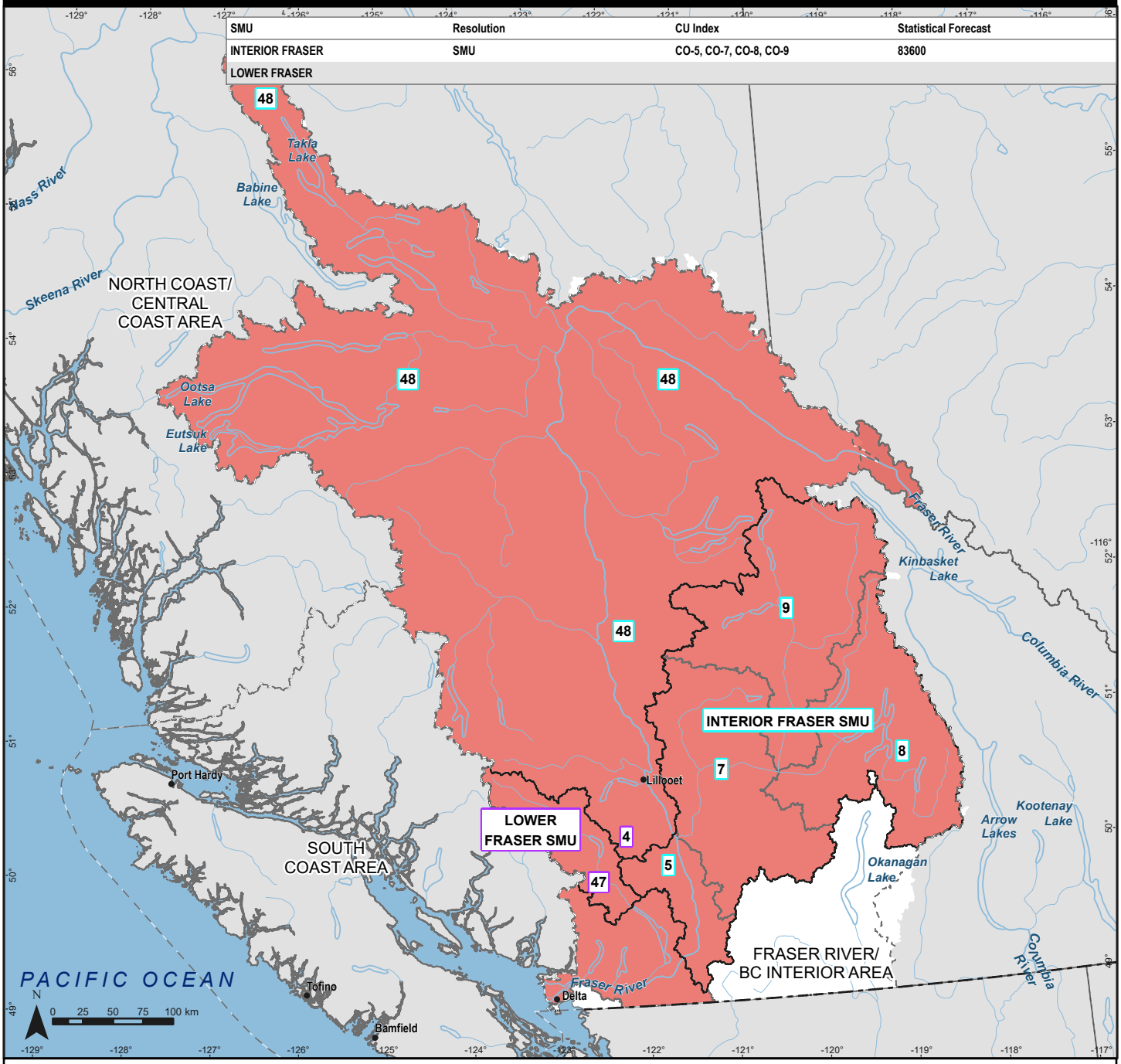
SMU	Resolution	CU Index	Statistical Forecast
INTERIOR FRASER	SMU	CO-5, CO-7, CO-8, CO-9	83600
LOWER FRASER			



COHO SALMON - FRASER RIVER/BC INTERIOR AREA

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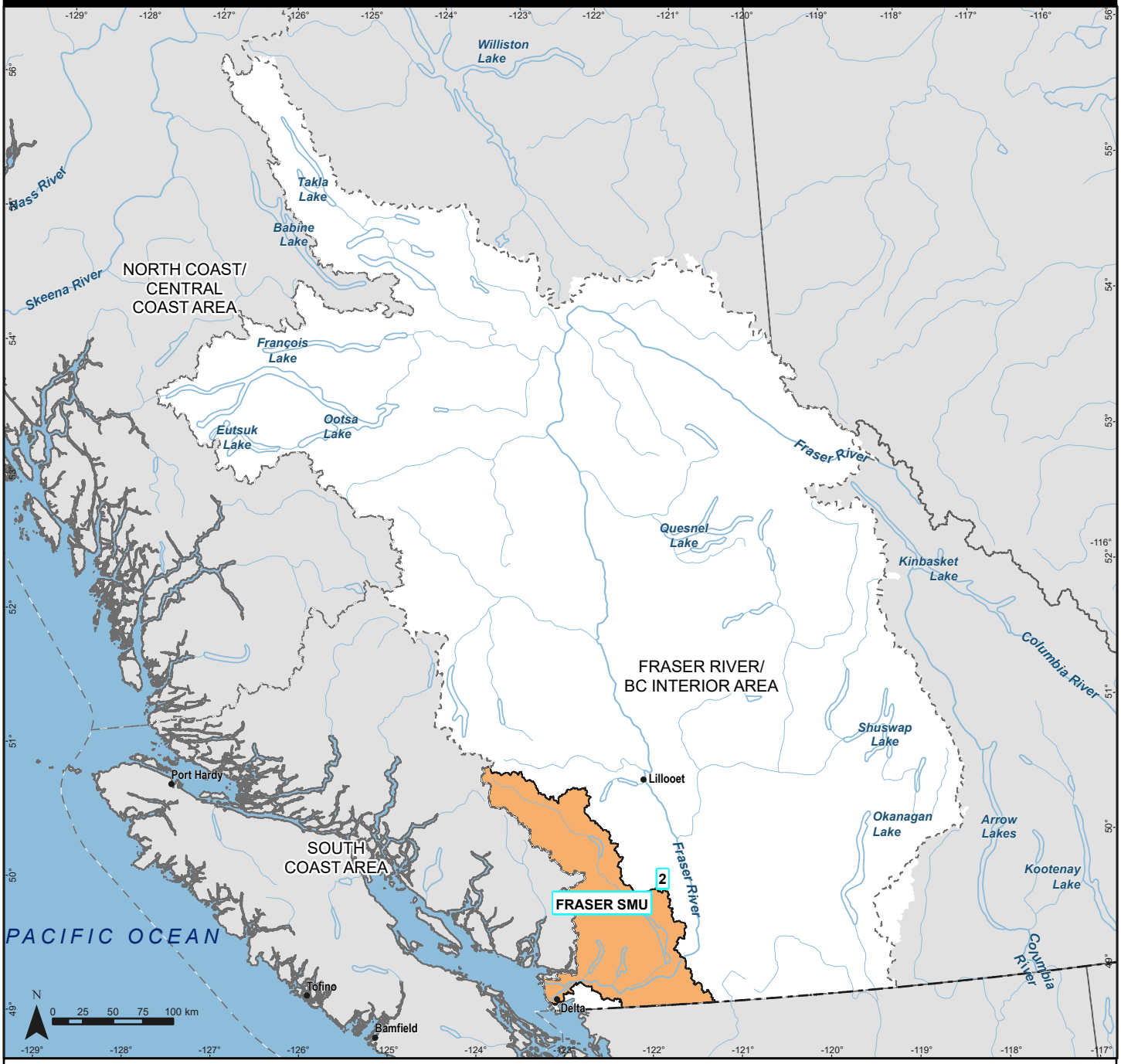

CHUM SALMON - FRASER RIVER/BC INTERIOR AREA

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