PACIFIC SALMON COMMISSION
TRANSBOUNDARY TECHNICAL
COMMITTEE REPORT

SALMON MANAGEMENT AND ENHANCEMENT PLANS FOR THE STIKINE, TAKU AND ALSEK RIVERS, 2018

REPORT TCTR (18)-1

This plan was finalized May 22, 2018 by the
Transboundary Technical Committee

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ACRONYMS

AABM	Aggregate Abundance Based Management
AC	Allowable Catch
ADF&G	Alaska Department of Fish and Game
ASL	Age, Sex, Length
BEG	Biological Escapement Goal
BY	Brood Year
BLC	Base Level Catch
CAFN	Champagne & Aishihik First Nation
CPUE	Catch Per Unit of Effort
CTC	Chinook Technical Committee of the Pacific Salmon Commission
CWT	Coded-Wire Tag
DFO	Department of Fish and Oceans, Canada
DIPAC	Douglas Island Pink and Chum, Inc.
ESSR	Excess Salmon to Spawning Requirements
FN	First Nation
FSC	Food, Social, Ceremonial
GSI	Genetic Stock Identification
MR	Mark–Recapture
MEF	Mid eye to tail fork length
MSY	Maximum Sustained Yield
N_{MSY}	Escapement goal point estimate
PSARC	Pacific Scientific Advice Review Committee of DFO
PSC	Pacific Salmon Commission
PST	Pacific Salmon Treaty
SCMM	Stikine Chinook Management Model
SEAK	Southeast Alaska
SEPP	Stikine Enhancement Production Plan
SFMM	Stikine Forecast Management Model
SMM	Stikine Management Model
SPA	Scale Pattern Analysis
SW	Statistical Week
TAC	Total Allowable Catch
TEPP	Taku Enhancement Production Plan
TTC	Transboundary Technical Committee of the Pacific Salmon Commission
THA	Terminal Harvest Area
TFN	Tahltan First Nation
TRTFN	Taku River Tlingit First Nation
USFS	United States Forest Service

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INTRODUCTION

Management of transboundary river salmon to achieve conservation, allocation and enhancement objectives, as stipulated by the PST, requires a cooperative approach by Canada and the United States. It is important that both Parties have a clear understanding of the objectives and agree upon procedures to be used in managing the fisheries, including the criteria upon which modifications of fishing patterns will be based. This document is intended to facilitate cooperative salmon management, stock assessment, research and enhancement on transboundary stocks of the Stikine, Taku, and Alsek rivers conducted by DFO, TFN, TRTFN, CAFN, and ADF&G.

This report contains, by river system and species, the 2018 salmon run outlooks, spawning escapement goals, a summary of harvest sharing objectives, and an outline of management procedures to be used during the 2018 fisheries. Numerical forecasts are presented for: Stikine River sockeye and large (MEF > 659 mm; typically age 5–7) Chinook salmon and Taku River large Chinook salmon as required by the PST; Taku River sockeye and coho salmon; and Alsek River sockeye and Chinook salmon. Outlooks for other stocks are given qualitatively with reference to brood year escapement data where available. This report also contains joint plans for fry stocks and egg collections and a detailed list of proposed field projects for 2018, identifying agency responsibility and contacts for the various functions within the projects. Information shown for 2017 and 2018 is preliminary. Unless otherwise define the 10-year average is 2008–2017 and the 5-year average is 2013–2017.

STIKINE RIVER

Chinook Salmon

Preseason Forecast

The bilateral preseason forecast for the Stikine River large Chinook salmon terminal run is 6,900 fish. The forecast uses a sibling model in which the 2017 returns of age 4 (BY 2013) and age 5 (BY 2012) Chinook were used to predict the returns of age 5 (BY2013) and age 6 (BY2012) fish in 2018 using the relationships observed between age classes over the past nine years corrected with the 5-year average (2013–2017) model error. The 95% confidence interval of this forecast is 1,500 to 12,500 fish.

This forecast is well below the 10-year average (2008–2017) terminal run of 22,140 large Chinook salmon. The principal brood years contributing to the 2018 Chinook salmon run are 2012 (22,327 large fish spawning escapement), 2013 (16,783 large fish spawning escapement), and 2014 (24,366 large fish spawning escapement). The 2018 preseason forecast is insufficient for directed and assessment fisheries in both the U.S. and Canada.

Table 1. Stikine River large Chinook salmon terminal run preseason forecasts and postseason estimates from 2004 to 2017, and the 2018 preseason forecast. Forecast performance relative to the actual was determined using postseason run reconstruction. Positive values indicate the forecast was higher than actual while negative values indicate the forecast was less than the actual. Adjusted forecast uses 5-year average (2013–2017) percentage error.

	Forecast Estimate			Forecast Performance	
Year	Sibling	Adjusted	Postseason Run	Sibling	Adjusted
2004	65,900		62,137	6%	
2005	80,300		87,767	-9%	
2006	60,600		62,241	-3%	
2007	37,400		35,954	4%	
2008	46,100		33,619	37%	
2009	31,900		16,468	94%	
2010	22,900		19,615	17%	
2011	30,000		19,796	52%	
2012	40,800		29,911	36%	
2013	32,000	22,400	21,720	47%	3%
2014	37,700	26,100	29,323	29%	-11%
2015	40,600	30,200	27,354	48%	10%
2016	47,100	33,900	15,496	204%	119%
2017	24,700	18,300	8,131	204%	125%
2018	15,700	6,900			

Data source: *Final Estimates of Transboundary River Salmon Production, Harvest, and Escapement and a Review of Joint Enhancement Activities in 2017.*

Escapement Goals

The current N_{MSY} for above border Stikine River large Chinook salmon is 17,400 fish with a MSY goal range of 14,000 to 28,000 fish. Corresponding values for counts through the weir on the Little Tahltan are 2,700 to 5,300 fish with a point estimate of 3,300 fish (Bernard et al 2000). This drainage wide goal is subject to periodic review by the TTC. Based on the 10-year average (2008–2017), Little Tahltan River Chinook salmon represent 7% (Range; 1–18%) of the total spawning population.

Harvest Sharing Objectives

Provisions for harvest sharing and management of directed fisheries for Stikine River large Chinook salmon were successfully negotiated by the Transboundary Panel and implemented in 2005. These arrangements, with slight adjustments, were adopted through PST negotiations in 2008 and are in effect through 2018 (Paragraph 3(a) (3) of Annex IV, Chapter 1 of the PST).

Harvest sharing provisions were developed to acknowledge the traditional harvest in fisheries, referred to as base level catches (BLCs), which occurred prior to the new arrangements, these included: incidental harvests in Canadian and U.S. commercial drift gillnet fisheries, U.S. and Canadian sport fisheries, Canadian First Nation fishery, and the test fishery. For directed fisheries, the allowable catch (AC) will be calculated as follows:

AC = Terminal run - Base terminal run (BTR); [4]

where: BTR = escapement target + test fishery BLC+ U.S. BLC + Cdn BLC. BLCs are as follows:

- U.S. Stikine BLC: 3,400 large Chinook salmon[1];
- Canadian Stikine BLC: 2,300 large Chinook salmon[2];
- Test fishery: 1,400 large Chinook salmon.

Harvest sharing and accounting of the AC shall be as described in Table 2.

Table 2. U.S. and Canadian allowable catches of Stikine large Chinook salmon for directed fisheries.

Allowable Catch Range		Allowable Catch Share			
		U.S.		Canada	
Lower	Upper	Lower	Upper	Lower	Upper
0	5,000	0	500	0	4,500
5,001	20,000	501	11,000	4,500	9,000
20,001	30,000	11,001	17,500	9,000	12,500
30,001	50,000	17,501	30,500	12,500	19,500
50,001	100,000	30,501	63,000	19,500	37,000

Within each allowable catch range, each Party's AC will be calculated proportional to where the AC occurs within the range. The TTC developed a spreadsheet to calculate specific harvest shares. Each Party shall determine the domestic allocation of their respective harvest shares.

When the terminal run is insufficient to provide for the Party's Stikine Chinook salmon BLC and the lower end of the escapement goal range, the reductions in each Party's base level fisheries, i.e. the fisheries that contributed to the BLCs, will be proportionate to the BLC shares, excluding the test fishery.

U.S. harvest of Stikine Chinook salmon AC will not count towards the SEAK AABM allocation (as described in Chapter 3 of the PST). In particular:

1. non-Stikine Treaty Chinook salmon harvested in District 108 will continue to count toward the SEAK AABM harvest limit;
2. U.S. BLC of Stikine Chinook salmon in District 108 will count toward the SEAK AABM harvest limit;
3. U.S. catch of Stikine Chinook salmon in District 108 above U.S. BLC will not count towards the SEAK AABM allocation.

Accounting for the SEAK AABM Chinook salmon catches as pertains to harvests of transboundary river origin Chinook salmon, will continue to be the responsibility of the CTC as modified by (a) through (c) above.

Management Procedures

[1] Includes average combined U.S. gillnet, troll and sport harvest of Stikine River large Chinook salmon in District 108.
[2] Includes average combined Canadian Aboriginal, commercial and sport harvest of Stikine River large Chinook salmon.

Paragraph 3(a) (3) of Annex IV, Chapter 1 of the PST include the following management details for directed fisheries targeting large Chinook salmon that apply in 2018:

- Both Parties shall take the appropriate management action to ensure that the necessary escapement goals for Chinook salmon bound for the Canadian portions of the Stikine River are achieved. The Parties agree to share in the burden of conservation. Fishing arrangements must take biodiversity and eco-system requirements into account.

- Management of directed fisheries will be abundance-based through an approach developed by the Committee. The Parties agree to implement assessment programs in support of the abundance- based management regime.

- Unless otherwise agreed, directed fisheries on Stikine River Chinook salmon will occur only in the Stikine River drainage in Canada, and in District 108 in the U.S.

- Management of Stikine River Chinook salmon will take into account the conservation of specific stocks or conservation units when planning and prosecuting their respective fisheries. To avoid over-harvesting of specific components of the run, weekly guideline harvests or other agreed management measures will be developed by the Committee by apportioning their allowable harvest of each Party over the total Chinook season based on historical weekly run timing.

- Commencing in 2009, the Parties agree to develop and implement through the Committee an agreed Chinook salmon stock identification program to assist the management of Stikine Chinook salmon.

- A preseason forecast of the Stikine River Chinook salmon terminal run size will be made by the Committee by December 1st of each year.

- Directed fisheries may be implemented based on preseason forecasts only if the preseason forecast terminal run size equals or exceeds the midpoint of the MSY escapement goal range plus the combined Canada, U.S., and test fishery BLCs of Stikine River Chinook salmon. The preseason forecast will only be used for management until inseason projections become available.

- For the purposes of determining whether to allow directed fisheries using inseason information in 2018, such fisheries will not be implemented unless the projected terminal run size exceeds the escapement goal point estimate (N_{MSY}) plus the combined Canada, U.S., and test fishery BLCs of Stikine River Chinook salmon. The Committee shall determine when inseason projections can be used for management purposes and shall establish the methodology for inseason projections and update them weekly or at other agreed intervals.

- If the escapement of Stikine River Chinook salmon is below the lower bound of the agreed escapement range for three consecutive years, the Parties will examine the management of base level fisheries and any other fishery which harvests Stikine River Chinook salmon stocks, with a view to rebuilding the escapement.

Fishery openings will be based on weekly run strength and the TAC as defined by the PST. The preseason forecast will serve as the principal run size estimator until approximately May 25, SW21 (May 20–26); when inseason run projections typically become available. Inseason projections are generated based on the Stikine Chinook Management Model (SCMM), or a MR estimate, or a combination of the two methods. On average, approximately 25% of the run has passed the Kakwan Point site (1996–2017) by May 25. An inseason run estimate before May 25 may be adopted if agreed to by Canada and the U.S. Weekly MR estimates are expected to be available by SW22 (May 27–June 2). If available, MR estimates may be used as the principal run size estimator or be used in concert with the SCMM in assessing weekly run sizes. Catch performance of the Lower Stikine River fishery, in conjunction with daily water levels, will be monitored and may also be used, in part, to assess run size. From 2005 to 2017, the MR and SCMM average was deemed to be the most reliable predictor of terminal run size and was the principal method used to predict terminal run after SW22.

Inseason estimates of the inriver run based on a MR estimate will be made using a bilaterally agreed-to sulk rate for tags released in event 1 of the 2-event MR program. Sulk rates will be based on the analysis of inseason data. In the event bilateral agreement cannot be reached with respect to the sulk rate, an assumed 11-day sulk rate will be used. During years with directed fisheries in District 108, a District 108 timing model is used to expand the cumulative catch to date to project the catch for the season, which is added to the inriver run projection to give an estimate of terminal run size. It is also used to determine weekly guideline harvests for the District 108 fisheries. During years without directed fisheries in District108, the average harvest observed in District 108 for similar run sizes will be added to the inriver run projection to give an estimate of terminal run size. For the inseason run projections, MR abundance estimates will be expanded by timing models which include:

1. Average run timing of large Chinook salmon observed in the Canadian commercial/assessment fisheries in 2007–2016. Inriver timing models are used to expand the point MR estimate to project the total inriver run sizes. Inriver timing models are also used to determine weekly guideline harvests for the lower Stikine commercial fishery and;

2. Average run timing of large Chinook salmon in the District 108 drift gillnet fishery. This is based on combination of run timing for the District 108 drift gillnet harvests from 1969 to 1973, select years of Canadian test fishery timing data for lagged by 2 weeks, and Kakwan Point tagging CPUE lagged by 7 days (annual Kakwan Point CPUE data used for run timing was based on fishing conditions that were not unduly fettered by extraordinary high water conditions in any particular year).

United States

The 2018 preseason forecast does not allow for directed Chinook salmon fisheries in District 108. The U.S. does not anticipate any directed fisheries in 2018 based on recent trends of Stikine River Chinook salmon abundance and trends in Chinook salmon abundance throughout Southeast Alaska. As such, the U.S. will be restricting fisheries for Chinook salmon conservation.

The U.S. Federal Stikine River subsistence fishery for Chinook salmon will not open in 2018. If inseason run size estimates produce a U.S. AC during the period of May 15 to June 20, the subsistence fishery may open. A subsistence permit issued by the USFS to federally qualified subsistence users is required to fish in the Stikine River. Permit restrictions include: restricting fishing area to upriver from tidal waters to the U.S./Canadian border; prohibiting fishing at stock assessment sites used by ADF&G and DFO; and restricting fishing gear to dipnets, spears, gaffs, rod and reel, beach seine, or gillnets not exceeding 15 fathoms (27.4 m) in length with mesh size no larger than 8 inches (20.3 cm). Subsistence fishermen will be required to check gillnets twice a day. The subsistence fishery is monitored inseason by USFS biologists who will provide weekly harvest and effort estimates to the ADF&G.

The Chinook salmon sport fishery in District 108 will be closed May 1 through July 15 in 2018. A small area inside District 108, immediately adjacent to City Creek in Petersburg, will be open from June 1 through July 31 to target Alaska hatchery Chinook salmon in this location.

The District 108 directed Chinook salmon drift gillnet fishery will not open and restrictions will be implemented during the sockeye salmon fishery. Restrictions will include the delay of the initial opening by two weeks, a six inch maximum mesh restriction, reduced time, and reduced fishing area.

Spring troll fisheries targeting hatchery Chinook salmon in District 108 will be closed in 2018. In addition, the summer troll fishery in District 108 may be restricted.

Canada

The preseason forecast of 6,900 large Chinook salmon does not allow for a directed fishery in Canada.

Though a directed commercial fishery is not anticipated to occur in 2018, the Canadian lower Stikine River commercial fishery (Figure 2) will be managed on a weekly basis with management actions driven by results of terminal run size projections derived by the SCMM and inseason MR results (for 2018, it is not likely that tag recoveries will be significant enough to generate reliable inseason MR estimates). Weekly inputs to the model may include: catch data from Alaska District 108 gillnet, troll and sport fisheries; catch data from the Canadian Stikine River commercial, test, First Nations, and recreational fisheries; catch and effort from the Kakwan Point tagging site; and, escapement requirements. Weekly inputs required to generate a MR estimate will include: the number of tags to date recovered from large Chinook salmon from the Lower Stikine commercial fishery, the total catch to date of large Chinook salmon, and an estimate the fraction of the run that transited the fishery to date. Total available tags to date entering the fishery will be based on the median travel speed of the tagged fish harvested. This metric (days from tagging site to fishery) will be subtracted from the total tags applied to date at the Kakwan Point tagging site. Openings will be governed by weekly abundance and AC of large Chinook salmon based on historical weekly run timing. The average run timing of large Chinook salmon observed in the Canadian commercial/assessment fisheries in 2008–2017 will be used.

Should inseason projections warrant a directed harvest, fishers will be permitted one net with a maximum length of 135 m (~440 ft.); may be deployed as a set gillnet or drift gillnet. The maximum mesh size permitted is 20.4 cm (~8.0 inch). Daily and weekly catches will be collected by a DFO representative on site. The harvests will be reported to the Whitehorse office on a daily basis.

The fishing zone is bounded by the international boundary upstream to near the confluence of the Porcupine and Stikine rivers. The Iskut River is open to commercial fishing from its mouth upstream approximately 10 km. The management of the lower river commercial fishery will switch to sockeye salmon at 12:00 noon June 17 (SW25) unless Chinook salmon escapement concerns persist then the initial opening will be delayed for a week. Additionally, mesh size restrictions will be adopted, specifically limiting fishers to the use of 14.0 cm (~5.5 inch) mesh size through the Chinook salmon migrational period.

The achievement of escapement objectives is the foremost priority in management considerations. Inriver allocation priority will be to fulfill the food, social and ceremonial requirements of the traditional First Nation fishery. The commercial fisheries, therefore, will be managed to accommodate these fundamental priorities. The area of most intense management will be within the lower Stikine River commercial fishery.

It is anticipated the three primary fishery management responses to inseason Chinook salmon run size projections will include:

1. Adjusting fishing time. Fishing time in the lower Stikine River fishery generally depends upon stock assessment and international and domestic catch allocation considerations. Although the preseason expectation is for a run size not capable of providing commercial fishing opportunities, initial fishing periods would likely be of shorter duration due to uncertainty over the preseason run outlook should

they be warranted. If inseason projections become available, caution will be exercised in providing any fishing opportunities.

2. Adjusting the fishing area. Initially, fishing boundary locations will include the Stikine River upstream to near the mouth of the Porcupine River. The section of the Stikine River from the confluence of the Porcupine and Stikine rivers upstream to near the mouth of the Scud River may be opened should the Chinook salmon return arrive in numbers that are well above spawning escapement and First Nation fishery requirements. In the Iskut River, the area will remain unchanged from previous years, i.e. from the mouth to a marker located approximately 10 km upstream from the mouth.

3. Adjusting the quantity of fishing gear. Initially only one drift or set gillnet may be used. Gear may be increased to two gillnets, should an increase in exploitation rate be warranted based on inseason terminal run size estimates. The maximum mesh size permitted is 20.4 cm (~8.0 inch). The maximum allowable net length will remain at 135 meters (~440 ft.).

In the upper Stikine River commercial fishery, should inseason run projections warrant a directed Chinook salmon harvest, the fishery will be based on the openings fished in the lower Stikine River commercial fishery, lagged one week. The upper Stikine River fishers are permitted to use one net of the same dimensions as that used by fishers participating in the lower Stikine River commercial fishery as noted above. The fishing zone is bounded in the south by the confluence of the Chutine and Stikine rivers, and in the north by the confluence of the Tuya and Stikine rivers. Daily and weekly harvests will be collected by a DFO representative on site. The harvests will be reported to the Whitehorse office on a weekly basis (note: historical information indicates this fishery is largely inactive through late June, SW26).

As in past years, weekly fishing times in the First Nation fishery will not normally be restricted. In the First Nation fishery, reductions in fishing time would be considered only if no other adjustments could be made in the lower and upper river commercial fisheries and in the recreational fishery. Daily and weekly harvests will be collected by a DFO representative on site. The harvests will be reported to the Whitehorse office on a weekly basis. Biological sampling to assess age, size, and stock identification will be conducted throughout the course of the fishery. Records will be delivered to DFO in the postseason.

The Stikine Chinook salmon recreational fishery is centred at the Tahltan River near its confluence with the Stikine River. Minor recreational fishing occurs in the mainstem Stikine River as well as the Iskut River. Due to Chinook salmon escapement concerns, retention of Chinook salmon will not be permitted in the Stikine River drainage. Additionally, the Tahltan River will be closed to recreational salmon fishing June 01 to August 31. Typically, fishers are permitted four Chinook salmon per day, only two of which may be larger than 65 cm (~26 in) fork length. The possession limit consists of a two-day catch quota. The annual harvest by individual anglers is limited to ten large fish. Fishing activity, including harvest and release records, will be monitored and maintained, opportunistically, by a field technician stationed near the Tahltan River should restrictions in the recreational fishery be removed.

Harvest Information Sharing

The U.S. shall provide catches and effort in the following strata for each SW:

1. District 108 gillnet, sport, and troll fisheries;
2. Stikine River subsistence fishery;
3. test fisheries in District 108.

Canada shall provide catch and effort statistics in the following strata for each SW:

1. the lower river commercial fishery (all areas);
2. the upper river commercial fishery;
3. the First Nation fishery;
4. recreational fishery (season estimate);
5. the lower Stikine River assessment fishery conducted near the international border;
6. ESSR or other terminal fishery catches will be reported as data become available.

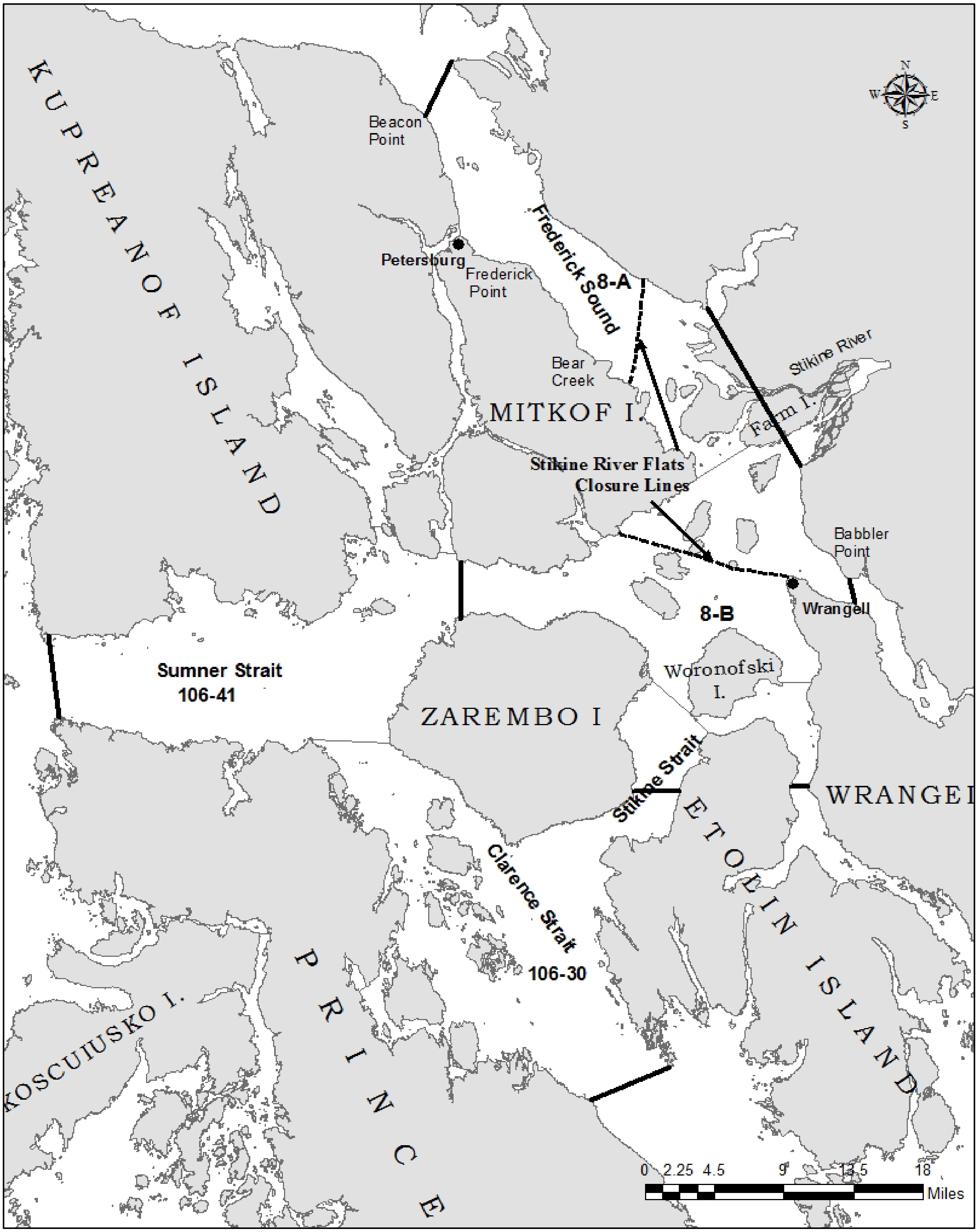

Figure 1. U.S. fishing areas adjacent to the Stikine River.

Stock Assessment Program

Each country shall:

1. provide harvest statistics for the same strata as sockeye salmon are reported;

2. sample its fisheries for: GSI (U.S.), CWT, and spaghetti tags;

3. conduct escapement and stock assessment programs as resources permit (see Appendix A. 1 for projects anticipated to be conducted in 2018).

<u>Stock Composition of U.S. Harvests</u>

Weekly contribution of above border Stikine River large Chinook salmon harvested in Alaska sport and commercial fisheries will be determined inseason by sampling harvest for CWT and ASL. The minimum sampling goal for CWTs is 20% of the harvest. The weekly sampling goal for ASL and GSI is 80 matched scales, tissue, and lengths with an additional 120 lengths for size composition determination.

Stock composition for sport and commercial harvest will be determined postseason. Tissue samples will be taken from sport and commercially harvested Chinook salmon in District 108 and processed postseason by ADF&G Gene Conservation Laboratory in Anchorage. GSI estimates will be used to recalculate contributions of above border Stikine River Chinook salmon in the District 108 sport and commercial fisheries (Appendix C.1). In the absence of GSI data, CWT data will be used to determine stock composition postseason. Scales will be collected inseason and analyzed postseason to determine the age structure composition of the harvest.

<u>Stock Composition of Canadian Harvests (lower River commercial fishery)</u>

GSI samples will be collected from both the lower Stikine River and commercial fishery and from tagged fish originating from the Kakwan Point tagging project. These data will be analyzed to determine weekly abundance and run timing of Little Tahltan /Tahltan origin Chinook salmon contrasted with the combined "other" stock groupings (Appendix C.1). Run timing and abundance of specific stock groupings included in the "other" category will also be determined. It is expected that these analyses will be conducted postseason (2019). Scales will be collected inseason and analyzed postseason to determine the age structure composition of the harvest. A minimum of 50% of the harvest will be sampled for CWT marked fish.

Sockeye Salmon

Stock Definitions

Stikine River sockeye salmon are for research, management, and monitoring purposes, subdivided into four stock groups: 1) wild Tahltan stock, which are those fish originating from naturally spawning sockeye salmon in Tahltan Lake; 2) enhanced Tahltan stock, which are those fish originating from broodstock collected at Tahltan Lake and are subsequently back-planted as fry into Tahltan Lake; 3) Tuya stock, which are those fish originating from broodstock collected at Tahltan Lake and are subsequently planted as fry into Tuya Lake; and 4) mainstem stock, which are all other natural sockeye salmon populations in the Stikine River. For management purposes, collective wild and enhanced Tahltan Lake stocks are referred to as "total Tahltan stock", or sometimes, just "Tahltan stock."

Preseason Forecast

For 2018, the terminal run[3] forecast for Stikine sockeye salmon is 160,900 fish, which constitutes an average run size. For comparison, the 10-year average (2008–2017) total Stikine sockeye salmon run size is approximately 159,000 fish. The 2018 forecast includes approximately 46,300 wild Tahltan (29%), 66,100 enhanced Tahltan (41%), 12,900 enhanced Tuya (8%), and 35,500 mainstem sockeye salmon (22%).

The 2018 overall Stikine River sockeye salmon prediction is based on the following components:

1. A forecast of approximately 112,400 Tahltan wild + enhanced sockeye salmon of which 66,100 fish are expected from the enhancement project, and 46,300 fish are expected from natural spawners. This forecast is based on a smolt model in which the 2-year average (2016 and 2017) age specific marine survival is applied to the number of smolts that emigrated from Tahltan Lake in 2015 and 2016. The smolt forecast, has proven to be more accurate than the sibling forecast in recent years, and in 2018 the average marine survival was changed from a 5-year average to a 2-year average to better reflect recent ocean conditions these sockeye salmon brood years have been exposed to;

2. A forecast of approximately 12,900 Tuya enhanced sockeye salmon, which is based on a fry survival model where the 2-year (2016 and 2017) average age specific fry to adult survival rates for Tuya sockeye salmon are applied to the number of fry outplanted from brood years expected to return in 2018. The last outplant to Tuya Lake was in 2014. Only age 5 fish and older will return in 2018, the last year of returns of any number for the Tuya enhancement project. In 2018 the average marine survival was changed from a 5-year average to a 2-year average to better reflect recent ocean conditions these sockeye salmon brood years have been exposed to;

3. A forecast of approximately 35,500 mainstem sockeye salmon based on a sibling model in which the 2013 brood year returns in 2017 (age 4 fish) were used to predict the returns of sibling fish (age 5) in 2018 using the relationships observed between these age classes over the past thirty four years. The 5-year old forecast is then expanded by average age composition of the run. In past years the mainstem forecast averaged a sibling model with a stock-recruit model, but the sibling model has proven to be more accurate than either the stock-recruit model or the average model in recent years

Due to fluctuations in survival for Stikine River sockeye salmon, there is a high level of uncertainty in the preseason forecasts. There have been wide discrepancies between past forecasts and postseason run size estimates. The performance of the preseason forecasts relative to final postseason estimates is summarized in Table 3. Despite problems with preseason forecasting, the forecasts are useful when used in concert with catch performance (CPUE) for management until inseason data becomes available for inseason run size projections.

[3] Terminal run size = total run excluding allowance for harvests in marine areas outside the terminal Alaskan drift gillnet fisheries (e.g. Districts 106, and 108).

Table 3. Stikine River sockeye salmon preseason run forecasts and the postseason run size estimates from 1983 to 2017, and the 2018 preseason run forecast. The preseason forecasts have been based on combinations of sibling, smolt and stock-recruitment forecast methods. The forecast performance is expressed as % deviation from the postseason run size estimate. Negative numbers indicate the forecast was higher than the actual run size.

Year	Preseason forecast	Postseason run size	Forecast performance	Absolute deviation	Absolute % deviation
1983	62,900	77,457	19%	14,557	19%
1984	37,500	83,961	55%	46,461	55%
1985	91,000	214,494	58%	123,494	58%
1986	262,000	75,456	-247%	186,544	247%
1987	114,000	43,350	-163%	70,650	163%
1988	123,500	45,096	-174%	78,404	174%
1989	80,500	90,549	11%	10,049	11%
1990	94,000	67,384	-39%	26,616	39%
1991	94,000	151,437	38%	57,437	38%
1992	127,300	231,936	45%	104,598	45%
1993	135,000	280,730	52%	145,730	52%
1994	312,000	208,036	-50%	103,964	50%
1995	169,000	218,728	23%	49,728	23%
1996	329,000	372,785	12%	43,785	12%
1997	211,000	226,915	7%	15,915	7%
1998	218,500	121,448	-80%	97,052	80%
1999	126,000	124,644	-1%	1,356	1%
2000	138,000	78,504	-76%	59,496	76%
2001	113,000	127,255	11%	14,255	11%
2002	80,000	79,329	-1%	671	1%
2003	184,000	240,977	24%	56,977	24%
2004	289,500	311,987	7%	22,487	7%
2005	477,100	259,932	-84%	217,188	84%
2006	179,200	268,585	33%	89,407	33%
2007	233,600	197,786	-18%	35,814	18%
2008	228,600	120,209	-90%	108,391	90%
2009	274,500	185,275	-48%	89,225	48%
2010	187,700	157,001	-20%	30,699	20%
2011	183,000	213,399	14%	30,399	14%
2012	134,000	124,540	-8%	9,460	8%
2013	136,000	113,515	-20%	22,485	20%
2014	152,300	153,323	1%	1,023	1%
2015	171,200	174,292	2%	3,092	2%
2016	223,000	247,892	10%	24,892	10%
2017	185,000	NA	---	---	---
2018	160,900				
1983–2017	175,600	165,500		59,200	45%
2008–2017	187,800	159,400		40,000	26%

The 2018 sockeye run forecast is characterized as average. The preseason forecast translates into an expected TAC of 107,000 Stikine River sockeye salmon. Of this approximately 1,800 sockeye salmon are expected to be harvested in test fisheries (stock assessment), leaving approximately 105,200 fish to be shared 50:50 between Canada and the U.S., (i.e. 52,600 fish to each country, excluding terminal Tuya harvest in Canada). The TAC outlook is comprised of the following components:

1. a forecasted Tahltan sockeye salmon TAC of 87,800 fish (total TAC of 88,400 fish minus test harvest of 600 fish). This equates to a maximum exploitation rate of 0.78 at the forecast run size of 112,400 fish with an escapement target of 24,000 fish;

2. a forecasted Tuya sockeye salmon TAC of 9,700 fish (12,900 run size * 0.78 exploitation rate - 400 test fish). As Tuya Lake sockeye are entirely enhanced with no escapement goal, the maximum exploitation rate is based on Tahltan sockeye salmon and estimated at 0.78. This leaves a predicted 2,800 fish surplus for the Tuya stock which would potentially be available for Canadian harvest in the Tuya River or other terminal areas;

3. a forecasted mainstem sockeye salmon TAC of 4,700 fish (total TAC of 5,500 fish minus test harvest of 800 fish), This equates to a maximum exploitation rate of 0.13, at the forecast run size of 35,500 fish with an escapement target of 30,000 fish.

Spawning Escapement Goals

Escapement goals have been established by the TTC for two Stikine River sockeye salmon stock groups; Tahltan stock group and mainstem stock group. Tahltan and mainstem stocks are considered to be independent. Surpluses or deficits in escapement in one stock are not used to balance deficits or surpluses in the other. The Tuya stock, which is enhanced and has no access to spawning or rearing grounds, has an escapement goal of zero.

Escapement goals have been established as ranges which reflect biological data and professional judgment 4regarding stock productivity, the ability of existing management systems to attain established goals, the precision of estimates of escapement generated by stock assessment programs, and the degree of risk considered acceptable.

Subjective management categories have been defined for various escapement ranges. A postseason estimate of escapement that falls within the Green Management Category shall be considered fully acceptable; one that falls within the Yellow Management Category shall be considered acceptable, but not desired; and one that falls within the Red Management Category shall be considered undesirable. The escapement goal ranges by management category represent the best judgment of desired escapement levels.

Tahltan Stock

In 1993, the TTC established an escapement target of 24,000 fish for the Tahltan stock which takes into account 20,000 naturally spawning fish (Wood et. al., unpublished data), and up to 4,000 fish needed for broodstock to meet objectives of the Canada/U.S. Stikine River enhancement program.

Escapement goal ranges for the various management categories for the Tahltan stock are:

	TARGET = 24k				
Escapement	0 - 13k	13k - 18k	18k - 30k	30k - 45k	>45k
Mgmt. Category	Red	Yellow	Green	Yellow	Red

Mainstem Stock

Escapement goal ranges for the various management categories for the mainstem stock are:

	TARGET = 30k				
Escapement	0 - 15k	15k - 20k	20k - 40k	40k - 75k	>75k
Mgmt. Category	Red	Yellow	Green	Yellow	Red

Data Exchange

The following data for the Tahltan sockeye salmon stock will be collected and exchanged for use in evaluating escapement goals:

1. spawning escapements, separated by wild and enhanced components;

2. smolt production, separated by wild and enhanced components;

3. stock-specific harvests in the various fisheries.

The following relationships for the Tahltan stock will be examined:

1. terminal run as a function of spawning escapement level;

2. smolt production as a function of the number of natural spawners and enhanced fry;

3. adult production as a function of the number of smolts;

4. terminal run as a function of the return of age-4 sockeye salmon in the previous year;

5. relationship between the terminal run estimates to patterns of distribution and timing. This will include comparisons of various estimates (Stikine River sockeye forecast models, test fishing vs. commercial fishing CPUE, different stock ID results).

The following data for the mainstem stock will be collected and exchanged for use in evaluating escapement goals:

1. survey counts and escapement estimates based on reconstructions of inriver runs apportioned by stock ID data;

2. mainstem stock component of harvests from the various fisheries;

3. inventory and assessment data regarding historical run patterns of distribution, abundance, and timing of spawning fish.

The following relationships for the mainstem stock will be examined:

1. total escapement as a function of survey counts of escapement;

2. terminal run as a function of total spawning escapements;

3. terminal run as a function of the return of age-4 sockeye salmon in the previous year;

4. relationship of terminal run estimates to patterns of distribution and timing. This will include comparisons of various estimates (Stikine River sockeye salmon forecast models, aerial surveys, test fishing vs. commercial fishing CPUE, different stock ID results, etc.).

The following data for the Tuya sockeye salmon stock will be collected and exchanged for use in evaluating adult returns:

1. escapement estimates generated from stock ID, CPUE, and inriver run estimates;

2. stock specific harvests in the various fisheries.

The following relationships for the Tuya stock will be examined:

1. adult production as a function of the number of fry planted;

2. terminal run as a function of the return of age-4 sockeye salmon in the previous year;

3. the relationship of terminal run estimates to patterns of distribution and timing. This will include comparisons of various estimates (Stikine River sockeye salmon forecast models, test fishing vs. commercial fishing CPUE, different stock ID results, etc.).

Harvest Sharing Objectives

Pacific salmon harvest sharing provisions were renegotiated by the PSC in January 2008 for the period 2009 through 2018. Stock assessment and harvest arrangements for Stikine sockeye salmon stocks are found in Annex IV, Chapter 1, of the PST and Appendix to Annex IV, Chapter 1 entitled "*Understanding on the Joint Enhancement of Transboundary River Sockeye Salmon Stocks*".

Management plans for the 2018 Stikine River harvest outline the TAC of Stikine River sockeye salmon, both natural and enhanced, to be shared 50/50 between the Parties in existing, i.e. customary, fisheries. If the existing fisheries do not manage to harvest the entire TAC, Canada will be allowed to harvest those fish in excess to naturally spawning and broodstock needs for Tahltan and Tuya stocks. Through 2018, the harvest sharing provision will be predicated upon carrying out agreed enhancement activities contributing to years 2014–2018. This information will be documented in annual SEPP (see Annex IV, Chapter 1 (3) (a) (1) (iii) of the PST)(Appendix B. 4.).

Management Procedures

United States

Commercial drift gillnet fisheries occur in the waters of northern Clarence Strait and Sumner Strait of District 106 and in the waters surrounding the terminus of the Stikine River in District 108 (Figure 1). Due to their proximity, management of these areas are interrelated, resulting in some major stocks being subject to harvest in both areas. Two distinct management areas exist within each district: Frederick Sound (Section 8-A) and Wrangell (Section 8-B) portions of District 108, and the Sumner Strait (Subdistricts 106-41/42) and Clarence Strait (Subdistrict 106-30) portions of District 106. Fishing gear used in Districts 106 and 108 are similar; with common sockeye salmon net sizes ranging between five and six inches (130–140 mm). Both districts will be managed in accordance with the current Transboundary Rivers Annex of the PST.

The sockeye salmon season could open by regulation as early as 12:00 noon on Monday, June 11 (SW24). However, with an expected poor return of Stikine River Chinook salmon as well as Chinook salmon stocks throughout Southeast Alaska, conservation measures will be in place for the start of the sockeye salmon fishery. Conservation measures include, delaying the start of the sockeye salmon fishery by two weeks in District 108 and by one week on District 106, implementing a six inch maximum mesh size, limiting fishing time, and limiting District 108 fishing area. The initial District 106 opening will be limited to 48 hours. The following week, SW 26, both Districts will be open for an initial 48 hours but may be extended for an additional 72 hours based on observed effort and harvest levels. During the first few weeks of the sockeye salmon fishery, any extended fishing time or midweek openings will be based on the preseason forecasts, harvest estimates, and stock proportion data. Subsequent openings, fishery extensions, or midweek openings will be based primarily on inseason estimates produced by the SMM and other agreed upon methods for the remainder of the sockeye salmon season.

Due to the expected return of Tahltan Lake and mainstem sockeye salmon, fishing time will likely be similar to 2017 fishing time. If the Tahltan Lake component of the run appears to be weaker than forecasted, a more conservative management approach may limit fishing time in District 108 and fishery extensions in District 106 would likely not occur. If inseason estimates of mainstem sockeye salmon fall below expectations, more conservative management actions may be needed during SWs 29–32. If management actions are taken to conserve mainstem sockeye salmon, they will occur in District 108 and midweek fishing extensions would likely not occur. District 106 will be limited to two days a week during SWs 29–32 due to McDonald Lake sockeye salmon concerns.

Pink salmon typically begin entering District 106 in significant numbers by the third or fourth week of July. Management emphasis will transition from sockeye to pink salmon the first week of August. In 2018, the Southeast Alaska pink salmon harvest is forecasted to be 23 million fish, which is below the 10-year average (2008–2017) of 38 million fish. Early portions of the pink salmon fishery will be managed primarily by fishery performance. By early to mid-August, pink salmon destined for local systems will begin to enter the fishery in greater numbers and at that time management will be based on observed local escapements. If escapements are not evenly dispersed throughout the district, area and/or time restrictions may be necessary.

Chum salmon are not managed directly by the department in Districts 106 and 108 and are harvested incidentally while targeting other species. Interest in harvesting chum salmon has increased in recent years due to good market conditions and hatchery chum salmon production. Hatchery produced chum salmon returning to Anita Bay are intercepted by drift gillnet fishermen in both districts. Chum salmon returns to Anita Bay this season are expected to be similar in abundance to 2017 with a forecasted total run of 459,000 fish. Chum salmon returning to Anita Bay have attracted greater fishing effort in the lower sections of District 108 near Anita Bay throughout the month of July and this trend is expected to continue in 2018. However, management actions in District 108 are based primarily on Stikine River sockeye salmon stocks during this period.

Drift gillnet openings throughout the sockeye salmon season will begin at noon on Sundays. Announcements for drift gillnet openings throughout Southeast Alaska are made on Thursday afternoons. Announcements for any fishery extensions, or midweek openings, will be made on the fishing grounds by 10:00 a.m. of the last day of the regularly scheduled fishing period.

A U.S. Stikine River subsistence fishery for sockeye salmon will occur from June 19 to July 31 with a guideline harvest level of 600 fish. A subsistence permit issued by the USFS to federally qualified subsistence users is required to fish in the Stikine River. Permit restrictions include: restricting fishing area to upriver from tidal waters to the U.S./Canadian border; prohibiting fishing in tributaries or at stock assessment sites used by ADF&G and DFO; and restricting fishing gear to dipnets, spears, gaffs, rod and reel, beach seine, or gillnets not exceeding 15 fathoms (27.4 m) in length with mesh size no larger than 5 1/2 inches (14.0 cm). Additionally, subsistence fishermen are required to check gillnets twice a day. The subsistence fishery is monitored inseason by USFS biologists who will provide weekly estimates of harvest and effort to ADF&G.

ADF&G manages a subsistence drift gillnet fishery targeting sockeye salmon in the waters of Sumner Strait near Point Baker, which harvests an unknown number of Stikine River sockeye salmon. Waters of Sumner Strait permitted for this subsistence fishery are within three nautical miles of the Prince of Wales Island shoreline north of “Hole-in-the-Wall” at 56°15.69’ N. lat. and west of the longitude of the western entrance to Buster Bay at 133°29.0’ W. long. Only Alaska residents may participate in this fishery which will open each week from Wednesday noon through Sunday noon from June 13 through July 29 with a limit of 25 sockeye salmon per household per year. Drift gillnet restrictions include a maximum net length of 50 fathoms (91.4 m). Harvests for the past five years have ranged up to 31 sockeye salmon with two to three permits fished. It is anticipated that fewer than 100 sockeye salmon will be harvested in this fishery in 2018. Due to the low effort and harvest in the Point Baker subsistence fishery, the potential interception of Stikine River sockeye salmon is negligible.

Canada

The Canadian lower Stikine River commercial fishery (Figure 2) will be managed on a weekly basis with management actions driven by results of stock, harvest, and escapement projections derived from the SMM, inriver catch performance compared to historical catch performance and run size and water levels, and inseason escapement monitoring projects. Weekly inputs to the model will include: effort and harvest data from Alaska District 106 and 108 gillnet fisheries; harvest, effort and inseason stock composition data from the Canadian lower Stikine River commercial and test fisheries; and escapement requirements.

It is anticipated that the management of sockeye salmon in the lower river commercial fishery will begin at 1200 hrs June 26 (SW26) for an initial 10-hour period. Due to Chinook salmon escapement concerns, the start of the sockeye salmon fishery will be delayed by over a week. Consideration for Tahltan Lake sockeye salmon stock management objectives will likely persist through July 21 (SW29). Thereafter, management attention will be focused primarily on mainstem sockeye salmon stock objectives. Actual time frames of responses to specific stock compositions may be fine-tuned inseason according to the weekly results of the stock ID program.

Annex IV, Chapter 1, paragraph 4 of the PST prescribes that either Party takes corrective action in the event that a Party exceeds its catch allocation in any three of five consecutive years. In 2017, fisheries management actions based on bilaterally agreed to inseason run size information resulted in Canada exceeding its allocation for the third time in the last five years. In response, Canada reviewed its management actions for 2017 in relation to the stock assessment information available during the fishing season. It was found that the preseason forecast was significantly higher than the postseason run estimate, resulting in early season fishing opportunity (SW26–27) that led Canada to exceed its weekly guidelines. Once inseason information became available, run projections dropped significantly but still exceeded the postseason run estimate which further exacerbated Canada's ability to manage within its AC. Through the review, it was found that Canada exceeded the appropriate amount of fishing time by approximately 20% during the Tahltan sockeye salmon management period and approximately 50% during the mainstem sockeye salmon management period.

In an attempt to align the Canadian harvest with its allocation in 2018, Canada will implement the following measures based on anticipated fishing conditions (water levels) and effort (11 licences) being similar to 2017:

- preseason forecast adjusted to reflect the recent observed smolt to adult survival rates for Tahltan sockeye salmon – will be used to inform management in SW26–27;
- for SW28–34, if inseason run projections are at or below the preseason forecast, commercial openings will be reduced by approximately 20% for the Tahltan stock and by approximately 50% for the mainstem stock management periods;
- should inseason run projections exceed the preseason forecast, commercial fishery will be adjusted to reflect a normal fishery.

The achievement of escapement objectives is the foremost priority in management considerations. Inriver allocation priority will be to fulfill the food, social and ceremonial requirements of the traditional First Nation fishery. The commercial fisheries, therefore, will be managed to accommodate these fundamental priorities. The area of most intense management will be within the lower Stikine River commercial fishery.

The three primary fishery management responses to inseason sockeye salmon run size projections will include:

1. Adjusting the fishing time. Fishing time in the lower Stikine River fishery generally depends upon stock assessment and international and domestic catch allocation considerations. Although the preseason expectation is for a run size capable of providing commercial fishing opportunities, initial fishing periods will likely be of shorter duration due to uncertainty over the preseason run outlook. Once inseason projections become available, caution will be exercised in providing further fishing time.

2. Adjusting the fishing area. Initially, fishing boundary locations will extend from the Canada/U.S. boundary upstream to a location near the mouth of the Porcupine River. The area includes the lower 10 km reach of the Iskut River. The section of the Stikine River upstream from the Porcupine-Stikine confluence will be closed for the initial sockeye salmon fishing periods. Consideration for increasing the fishing area upstream to the boundary sign located approximately 9 km below the Stikine-Scud confluence will only be given if the inseason indicators for both Chinook and sockeye salmon indicate a strong run, escapement targets are expected to be exceeded and harvests are below allocation targets. In the Iskut River, the area will remain unchanged from previous years, i.e. from the mouth to a marker located approximately 10 km upstream from the mouth.

3. Adjusting the quantity of fishing gear. Initially, only one net per license will be permitted and may be deployed as a set or drift gillnet. Gear may be increased to two gillnets should an increase in exploitation rate be warranted based on inseason terminal run size estimates. The maximum allowable net length will remain at 135 m (~440 ft) and, in the absence of a directed Chinook salmon fishery, there will be a maximum mesh size restriction of 14.0 cm (~5.5 inch) through the sockeye salmon management period to conserve Chinook salmon.

In the upper Stikine River commercial fishery, the sockeye salmon fishery will open on June 24 (SW26) subject to Chinook salmon escapement concerns for a 24-hour period. Thereafter, weekly fishing times will generally follow those of the lower river lagged by one week. Management regimes designed to reduce exploitation include reducing weekly fishing times and reducing gear from two nets to one net.

As in past years, weekly fishing times in the First Nation fishery are not expected to be restricted. Subject to conservation requirements, terminal harvests in the lower Tuya River and/or at Tahltan Lake may occur under ESSR or other authorizations. In the First Nation fishery, reductions in fishing time would be considered only if no other adjustments could be made in the lower and upper river commercial fisheries.

Summary

Attainment of escapement goals for both the Tahltan Lake and mainstem sockeye salmon stocks is the primary objective of Stikine River sockeye salmon management. Harvest sharing will be based upon the TAC projections derived primarily from the SMM as outlined in the PST. In addition, other methods of estimating run sizes may be used in conjunction with the SMM with consultation between managers. Other factors that may influence harvest management include results from inseason escapement projections, e.g. projected Tahltan Lake weir counts and water levels. The TAC estimates will likely change from week to week as the SMM updates the projected run sizes from the cumulative CPUE's each week. Variations in the TAC estimates will likely be larger early in the season when CPUE is high, than later in the season. Management actions will reflect these week-to-week changes in the TAC estimates. Fishery managers from both countries will have weekly contact in order to evaluate the output from the SMM, SFMM, and other stock assessment tools and to update the outcome of their respective management actions.

Inseason Data Exchange and Review

Canada and the U.S. will conduct data exchanges by telephone and/or email on Wednesday afternoon or Thursday morning of each week during the fishing season. At that time, current harvest statistics and stock assessment data will be updated, exchanged, and reviewed. Management plans for the next week for each country will be discussed at this time. It is anticipated that additional communications will be required each week. Weekly decision deadlines will be: a) for Districts 106 and 108, 11:00 a.m., Thursday, Alaska Daylight Time; and, b) for the Canadian Stikine River fishery, 10:00 a.m., Friday, Pacific Daylight Time.

DFO field personnel will provide weekly otolith samples from the lower Stikine River commercial and test fisheries for pick-up by ADF&G; or, the otoliths may be delivered to Wrangell via select commercial fishers Tuesday each week for processing and analysis in Juneau. Results from preliminary analysis can be expected by Thursday of the current week.

Stock Assessment Program

This section summarizes agreements regarding the data which will be collected by each Party and, when appropriate, procedures that will be used for analysis.

Sockeye Salmon Harvest Statistics

The U.S. shall provide harvest and effort by SW in the following strata:

1. Subdistricts 106-41/42 (Sumner Strait);
2. Subdistrict 106-30 (Clarence Strait);
3. District 108;
4. Stikine River subsistence fishery.

Canada shall provide harvest and effort by SW in the following strata:

1. lower river commercial fishery (all areas);
2. upper river commercial fishery;
3. First Nation fishery;
4. lower Stikine River test fishery conducted near the international border;
4. ESSR or other terminal fishery catches will be reported as data become available.

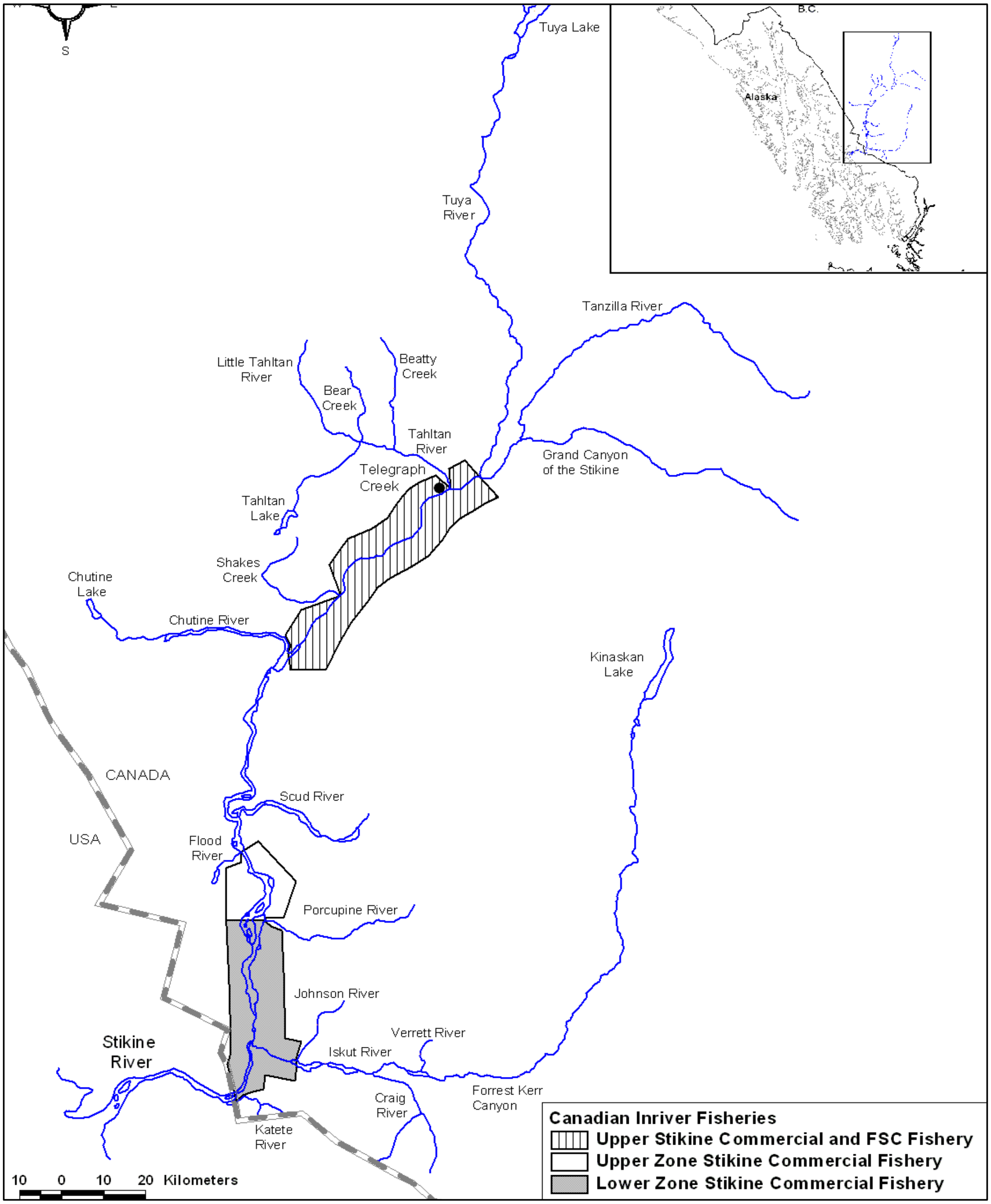

Figure 2. The Stikine River and Canadian fishing areas.

Stock Assessment Program

Stock Composition of U.S. Harvests

Districts 108 and 106 drift gillnet fisheries sockeye salmon harvest will be sampled weekly to obtain biological data used to estimate stock composition and age determination. Per week samples include 300 matched genetic tissue, otolith, and ASL samples in Subdistrict 106-41/42 (no otolith collection after SW 31); 520 matched genetic tissue, otolith, and ASL in District 108; and 300 matched genetic tissue, and ASL samples in Subdistrict 106-30. Otolith samples collected inseason will be sent to the ADF&G Mark, Tag, and Age Laboratory in Juneau to be processed and analyzed, within two days of the end of the fishing period, for contributions of enhanced Tahltan, Tuya, Taku, and U.S. sockeye salmon. In Subdistrict 106-30 weekly enhanced contribution will be estimate by applying the weekly proportion of enhanced Tahltan fish from the total Tahltan fish harvested in Subdistrict 106-41 to the total weekly harvest of Tahltan fish in Subdistrict 106-30. The proportions of enhanced fish and U.S. harvest data will be part of the data used in the weekly Stikine Management Models to estimate Stikine River inriver and terminal run estimates.

Postseason, GSI analysis will provide weekly stock composition estimates, which are used to estimate final contributions of Tahltan and mainstem sockeye salmon stocks to the harvests made each week in District 108 and Subdistrict 106-41/42 and 106-30 (Appendix C.2). Enhanced Tahltan and Tuya stocks will be determined through otolith analysis. Additionally, GSI analysis will provide seasonal estimates of age-specific stock composition for all major contributing age classes (>5%) for use in brood tables. These estimates are produced with a mark- and age-enhanced genetic mixed-stock analysis (MAGMA) model, which is an extension of the Pella-Masuda GSI model (Pella and Masuda 2001) that incorporates paired otolith mark and scale-age data. Age-specific stock composition estimates are only provided at the annual level because weekly sample sizes are not sufficient to meet precision standards. U.S. subsistence sockeye salmon harvest stock composition analysis will be based on postseason estimates of the Canadian lower Stikine River commercial fishery.

Stock Composition of the Inriver Canadian Harvest

Egg diameter data is used to estimate Tahltan/ Tuya stock versus the mainstem stock contributions to the sockeye salmon harvest. Tahltan/Tuya fish generally have smaller diameter eggs (<3.7 mm) compared to mainstem fish. In addition, both enhanced Tahltan and Tuya components will be determined from the analysis of otolith samples collected each week.

In the lower Stikine River commercial fishery, sockeye salmon harvest will be sampled weekly to obtain a total of 400 random samples. The first 200 will be sampled for ASL, egg diameter from females, otoliths, and genetic tissue sample collection. The second 200 will be sampled for length, sex, and egg diameter from females. ADF&G will analyze the thermal otolith marks from a subsample of at least 60 of these samples each week. Arrangements will be made to ensure timely transfer of samples and notification of results for use in management decisions no later than the week following when the samples are collected. Weekly shipment times for the otolith samples from the river to ADF&G will be on Tuesday afternoon or Wednesday morning, unless otherwise agreed. If sample sizes are not available due to lack of fishing effort, samples may be augmented from test fishery harvests. The proportions of enhanced fish, stock proportions, and Canadian harvest data will be part of the data used in the weekly Stikine Management Models to estimate Stikine River inriver and terminal run estimates.

In the upper Stikine River fishing area, up to 600 sockeye salmon will be sampled annually for ASL, egg diameters from females, and otoliths from the combined upper river commercial and First Nation fisheries.

Stock Composition and Run Timing in the Canadian Test Fishery

The proportions of Tahltan/Tuya and mainstem sockeye salmon in test fishery harvest in the lower Stikine River will be estimated inseason in a similar manner to the commercial fishery. Up to 400 fish harvested in the test fishery per week will be sampled for matched ASL, egg diameter from females, and otoliths samples. Two hundred of these will include matched? genetic tissue sample collection. The test fishery otolith samples will be transferred to ADF&G as per the arrangements made for the commercial samples, for inseason analysis.

The postseason sockeye salmon stock composition estimates will be based on egg diameter from females, otolith, and ASL analyses; the enhanced proportion will be determined from otolith samples.

Spawning Escapement Estimates

An adult enumeration weir will be used to estimate the Tahltan Lake sockeye salmon escapement. The age composition will be estimated from scale samples, and contributions of enhanced sockeye salmon will be determined from otolith samples. Approximately 800 fish will be sampled at the weir in proportion to the run for ASL; as well 400 otolith samples (subject to conservation concerns, as this sampling component is lethal), Additionally, 400 otolith samples will be taken from the broodstock.

The mainstem sockeye salmon escapement will be estimated postseason using migratory timing information obtained from CPUE and stock identification data from the commercial and/or test fishery, combined with weekly stock compositions estimated from the commercial and/or test fishery harvest. Aerial surveys of six mainstem sockeye salmon spawning indices will be conducted to serve as ancillary escapement information. The Tuya sockeye salmon escapement will be estimated postseason in a similar way.

Stikine River Run Estimates

The annual inriver Stikine River run is estimated by dividing the total inriver Tahltan run by the inriver stock composition of the Tahltan stock. The inriver Tahltan stock composition is estimated from analyzing data and samples taken in the lower river commercial harvest and/or the lower river test fishery (drift gillnet and set net). Samples include data on egg diameter from females (small eggs are Tahltan/Tuya stocks), otolith marks (Tahltan or Tuya enhanced fish), age, and sex. To estimate the total stock composition postseason, all variables are used to proportion out the known female stock information using egg diameter and otolith marks to derive the male portion of the run. Fishery stock composition is then multiplied by the respective harvest to get stock specific harvest, CPUE, and migratory timing.

Data Evaluation Procedures

Historical Database

Canadian commercial fishing began in the Stikine River in 1975, but the methodology for estimating sockeye salmon terminal run sizes was not well standardized until 1982. Therefore, estimates of run size after this time are considered to be better than those made prior to 1982. The historical databases from 1979 on for the Canadian lower Stikine River, from 1985 on for Alaskan Subdistricts 106-41/42 commercial fisheries, from 1986–2004 for the Canadian test fishery, from 2002 on for the Subdistrict 106-30 fishery, and from 1986 on for the District 108 fishery was used in the development of the Stikine Forecast Management Model (SFMM) for 2016 (note: the incomplete fishing pattern and unusual migratory behavior observed in the Canadian Lower Stikine River commercial fishery in some years may preclude the use of the data from those years in the model).

Management Models: SMM and SFMM

A description of the original SMM is given in the PSC report (1988). Many subtle changes have been made in the model since that documentation was written and was recently updated in Miller and Bednarski 2017. The purpose of the model is to aid managers in making weekly harvest decisions to meet U.S./Canada treaty obligations for harvest sharing and conservation of Stikine River sockeye salmon.

The SMM prediction model, based on the relationship between inriver cumulative CPUE and inriver run size along with the weekly run fraction (based on the cumulative CPUE in the District 108 fishery) and cumulative harvest in District 108, is updated to make weekly inseason predictions of the total terminal run size and the TAC. First, a separate linear regression is used to predict inriver run size using cumulative CPUE from the inriver fishery for each week of the fishery beginning in SW27 (using cumulative CPUE from SW24–26). If the inriver run abundance is expected to be below average (low), the intercept in the linear regression is forced to be zero. Second, to estimate the terminal run, the projected inriver run is added to the projected total season harvest of Stikine River sockeye salmon in District 108. The projected harvest in District 108 is based on an assumed 90% contribution of Stikine River sockeye salmon to the cumulative harvest expanded by historical run timing, and the projected District 106 harvest is based on the assumption that 10% of the terminal run will be harvested in District 106. Therefore, the terminal run projection is the sum of the projection for the inriver run and the projection of the District 108 cumulative harvest expanded by historical run timing and then multiplied by 1/0.9.

The SMM also estimates the stock proportions in District 106 and 108 harvests, from historical postseason SPA into triggers of run size for Tahltan and Mainstem; the averages used each week depended upon whether the run was judged to be below average (0–40,000), average (40,000–80,000), or above average (+80,000). The SMM for 2018 is based on CPUE data from 1994 to 2016 from the Alaska District 106 fishery and the Canadian commercial fishery in the lower river and from the lower Stikine River test fishery from 1986 to 2004. The enhanced Tuya and Tahltan stock proportions are adjusted inseason based on the analysis of otolith samples taken in Districts 106 and 108.

The inriver CPUE from 1994–2000, 2004–2011 (excluding the upper fishing area harvests and when additional nets were introduced into the fishery), is standardized, depending on the management regime expected to be in place, to ensure the annual CPUE values are comparable. The historical CPUE values will reflect those of a one net regime; model inputs of the CPUE from the lower river commercial fishery will be adjusted accordingly depending on whether one or two nets are being fished. If the management regime permits two nets and a fishing zone extended upstream to the mouth of the Flood River, as occurred in 2003–2009, the model will use adjusted data for the lower Stikine River commercial CPUE which will exclude harvest and effort data from the Flood Glacier area, i.e. the extended fishing area fished during 1997–2000, 2004–2007, and 2009. In addition, the weekly CPUE data from 1994–2000, 2005–2009 (excluding the Flood area CPUE data) is decreased by 25% to account for the extra gear allowed during this period. This makes the historical CPUE data comparable with the 2016 data.

Four sets of CPUE data have been used to predict the terminal run. These include:

1. The Subdistrict 106-41/42 cumulative CPUE of Stikine sockeye salmon stocks;
2. The District 108 cumulative CPUE of Stikine sockeye salmon stocks;
3. The lower Stikine River commercial CPUE of Stikine sockeye salmon stocks;
4. The lower river test fishery cumulative CPUE.

For 2018, along with the SMM prediction model, the SFMM preliminary prediction model will be updated to make weekly inseason predictions of the total terminal run size and the TAC. The SFMM gives six estimates of run size compared to three estimates given by the SMM. The first four inseason terminal run size estimates of the SFMM (Model1–Model4) all have the same second order polynomial regression model structure,

$$\hat{Z}_{i,j} = \alpha + \beta_1 X_{i-1,j1} + \beta_2 X^2_{i-1,j1} + \sum_{i=26}^{36} \gamma_i (D_i). \quad (1)$$

In this model structure, $\hat{Z}$ is the predicted terminal run size estimated from data source *j* and for time period *i*, α is the intercept for SW 25, β is the slope of the regression line, γ is the adjustment to the intercept based on the SW of the prediction (*i*=26-36), and *X* is data from data source *j* through time period *i*-1. The four data sources for the inseason model are: (1) cumulative commercial harvest of Subdistrict 106-41/42 through SWs *i*-1; (2) cumulative commercial harvest of the District 108 primary sockeye salmon harvest area through SWs *i*-1; (3) cumulative commercial CPUE of Subdistrict 106-41/42 through SWs *i*-1; or (4) cumulative commercial CPUE of the District 108 sockeye salmon area through SWs *i*-1.

Similar to the SMM model structure, Model5 and Model6 have the model structure,

$$\hat{Z}_{i,j} = \frac{I_{i,k} + (X_{i-1,j} / Y_{i-1})}{0.9}, \quad (2)$$

where *I* is the projected inriver run estimate by model *k* for time period *i* added to the data from data source *j* through the time period *i*-1 (X) divided by the cumulative historical run timing through SWs *i*-1 (*Y*). The data source is the cumulative commercial harvest of the District 108 sockeye salmon area through SWs *i*-1. The projected harvest in the District 108 sockeye salmon area is based on an assumed 90% contribution of total Stikine sockeye salmon to the cumulative harvest. There were two different inriver models (I_k). The first inriver model, used for the Model5 terminal run size prediction, is based on an ANCOVA model,

$$\hat{I}_{i,j} = \alpha + \beta_1 X_{i-1,1} + \sum_{i=27}^{36} \gamma_i (D_i) + \sum_{i=27}^{36} \delta_{1i} (X_{i-1,1} D_i), \quad (3)$$

where *X* is cumulative inriver commercial harvest through SWs *i*-1 and δ is an interaction term. The second inriver model, used for the Model6 terminal run size prediction, is a second order polynomial regression model using cumulative CPUE of the lower inriver commercial fishery through SWs *i*-1 (similar to equation 1).

The 2018 inseason predictions of abundance and TAC will be based on the following datasets:

1. Management actions in SW24–26 (possibly SW27) will be based on the preseason forecast.
2. The forecasts for SW27–30 will be based on the SMM with consideration given to the preliminary SFMM produced forecasts.
3. After SW30, the management models will continue to be updated using the cumulative harvest data from Subdistrict 106-41/42 fishery data; however, run projections tend to be less reliable after SW30 and will be viewed accordingly.
4. Historical timing data will be used to provide weekly guideline harvests for each country.
5. Weekly management decisions may include other considerations such as:
    a. The lower river commercial CPUE of the Tahltan Lake stock grouping may be used to calculate inriver run size by a linear regression equation independent of the model. The run size of the Tuya and mainstem stock grouping will be determined based on the proportion of the CPUE of these stock groupings in the current SW and expanded by run timing (note: water levels and associated changes in exploitation rates will be monitored and used in assessing the run size);
    b. The current week's inriver run size of Tahltan Lake sockeye salmon may be calculated based on the estimated harvest rate in the lower Stikine River commercial fishery expanded by run timing. The harvest rate is estimated based on the historical relationship between effort and inriver run size. The run size projections for the Tuya and mainstem stock groupings will be determined based on the proportion of the CPUE of these stock groupings through the current SW and expanded by run timing (note: water levels and associated changes in exploitation rates will be monitored and used in assessing the run size);

c. Harvest rates in existing fisheries compared to historical averages, run sizes, and water levels;
d. Comparison of current year inriver harvest performance by stock grouping against past harvest performance and run size, and perceived changes in current year run timing information from the run timing regime identified in the management models.

Separate projections of terminal run size will be made for the combined Stikine sockeye salmon stocks (wild plus enhanced), the Tahltan Lake stock (wild plus enhanced), the enhanced Tuya stock, and the mainstem stock. This information will be used inseason to assist in fisheries management and postseason will be evaluated along with other measures of abundance.

The part of the models which determines total and weekly TAC levels for the U.S. and Canadian fisheries has been formulated in EXCEL® for use by managers inseason. This part of the model uses the coefficients from the linear regression model, the established escapement goals, and PST harvest sharing provisions to determine the TAC for each country. Estimates of weekly TAC and effort are provided as guidelines for the managers and are derived from the 1986–2011 average run timing of the stocks and the corresponding average CPUE levels of each fishery.

Inseason Use

For 2018, the models predictions will set the TAC levels; however, additional information may be used to calculate run size to inform decisions regarding fishery openings. The models output will be evaluated and compared with discrepancies from other information available on the run strength (e.g. inriver Tahltan Lake CPUE and water level). The postseason evaluation will be used to improve the SMM and SFMM for the next year.

Postseason Evaluation

After the fishing season is over, the TTC will evaluate how well the SMM and SFMM performed in predicting the terminal run, where discrepancies occurred, and what might have caused them. The TTC will also determine whether escapement goals were met according to the Spawning Escapement Goals section of this report. Results from the evaluation will be presented in the annual harvest and escapement report prepared by the committee.

Coho Salmon

Preseason Forecast

Although annual aerial surveys and past test fishing projects, the latter of which, provided reliable run timing information coupled with “coarse” estimates of coho salmon run size relative to the inriver run size of sockeye salmon, there remains a lack of reliable escapement and marine survival data for Stikine River coho salmon required to generate a sound, defensible outlook.

Escapement Goal

The interim spawning objective for Stikine River coho salmon is 30,000 to 50,000 fish. However, this is not biologically based nor is there an escapement assessment program in place for Stikine River coho salmon.

Harvest Sharing Objectives

The U.S. management intent is to ensure that sufficient coho salmon enter the Canadian section of the Stikine River to meet the agreed spawning objective, plus an annual Canadian harvest of 5,000 coho salmon in a directed coho salmon fishery (PST, Transboundary Rivers, Annex IV, para. 3(a)(2)(ii)).

Stock Assessment Program

Each country shall:

1. provide harvest statistics for the same strata as sockeye salmon;
2. sample its fisheries for CWT;
3. conduct escapement programs as resources permit.

Management Procedures

United States

Drift gillnet fishing for coho salmon will start late August or early September. Alaskan hatcheries contribute substantially to coho salmon harvest in District 106 and 108 fisheries. Inseason estimates from CWT recovery data will be used to identify the hatchery component of the harvest. Only the harvest of wild coho salmon will be used for fishery performance evaluation. If there is a conservation concern for Stikine River coho salmon, the District 108 drift gillnet and troll fisheries will be restricted.

Coho salmon will mostly be harvested in the summer salmon troll fishery in 2018 since the spring salmon troll fisheries will largely be closed in 2018. During the summer troll fishery (July 1 to September 30), the salmon troll fishery in District 108 is opened concurrently with drift gillnet fishing. When first opened, the summer fishery targets Chinook and coho salmon. When Chinook salmon harvest goals are reached, the fishery is closed to Chinook salmon retention but remains open to coho salmon retention. The coho salmon season usually remains open through September 20 but may be closed earlier for conservation and/or allocative reasons in July or August. An extension of the coho salmon season to September 30 may occur during years when the department projects escapements will be met.

A U.S. Stikine River subsistence fishery for coho salmon will occur in 2018 from August 1 to October 31 with a guideline harvest level of 400 fish. A subsistence permit issued by the USFS to federally qualified subsistence users is required to fish in the Stikine River. Permit restrictions include: restricting fishing area to upriver from tidal waters to the U.S./Canadian border; prohibiting fishing in tributaries or at stock assessment sites used by ADF&G and DFO; and restricting fishing gear to dipnets, spears, gaffs, rod and reel, beach seine, or gillnets not exceeding 15 fathoms (27.4 m) in length with mesh size no larger than 5 1/2 inches (14.0 cm). Subsistence fishermen will be required to check gillnets twice a day. The subsistence fishery is monitored inseason by USFS biologists who will provide weekly estimates of harvest and effort to the ADF&G.

Canada

Coho salmon management will commence in SW35 (starting August 26). It is anticipated that the AC of 5,000 pieces will be harvested within a two to three week directed coho salmon fishery. Fishers will be permitted the use of one, 135 metres (~440 ft.) gillnet. The maximum mesh size will be restricted to 20.4 cm (~8.0 inch). The Canadian fishery will be restricted in the event of conservation concerns.

TAKU RIVER

Chinook Salmon

Preseason Forecast

The bilateral preseason forecast for the Taku River large Chinook salmon terminal run is 4,700 fish. The forecast uses a sibling model in which the 2017 returns of age 4 (BY 2013) and age 5 (BY 2012) Chinook were used to predict the returns of age 5 (BY2013) and age 6 (BY2012) fish in 2018 using the relationships observed between age classes over the past nine years corrected with the 5-year average (2013–2017) model error. The 95% confidence interval of this forecast is 2,200 to 7,200 fish.

This forecast is well below the 10-year average (2008–2017) terminal run of 26,000 large Chinook salmon. The principal brood years contributing to the 2018 Chinook salmon run are 2012 (19,538 large fish spawning escapement), 2013 (18,002 large fish spawning escapement), and 2014 (23,532 large fish spawning escapement). The 2018 preseason forecast is insufficient for directed and assessment fisheries in both the U.S. and Canada.

Escapement Goal

The Taku River large Chinook salmon spawning objective is a MSY goal range of 19,000 to 36,000 fish with an $\mathbf{N_{MSY}}$ of 25,500 fish (McPherson et al 2010).

Table 4. Taku River large Chinook salmon terminal run preseason forecasts versus postseason estimates from 1997 to 2017, and the 2018 preseason forecast. Forecast performance relative to the actual was determined using postseason run reconstruction. Positive values indicate the forecast was higher than actual while negative values indicate the forecast was less than the actual. Adjusted forecast uses 5-year average (2013–2017) percentage error.

	Forecast Estimate			Forecast Performance	
Year	Sibling[a]	Adjusted	Postseason Run	Sibling	Adjusted
1997	106,100		126,202	-19%	
1998	47,800		34,916	27%	
1999	24,500		22,445	8%	
2000	32,100		41,512	-29%	
2001	38,600		53,390	-38%	
2002	39,900		61,340	-54%	
2003	44,200		42,882	3%	
2004	56,500		82,681	-46%	
2005	99,600		65,334	34%	
2006	64,200		61,859	4%	
2007	38,700		18,650	52%	
2008	39,400		30,186	23%	
2009	50,200		35,106	30%	
2010	41,300		35,784	13%	
2011	41,000		31,939	22%	
2012	48,000		23,883	50%	
2013	26,100	18,500	19,372	26%	-5%
2014	37,900	26,800	27,227	28%	-2%
2015	36,900	26,100	32,058	13%	-19%
2016	32,600	29,200	14,835	54%	97%
2017	18,100	13,300	9,197	49%	45%
2018	7,100	4,700			

Data source: *Preliminary Estimates of Transboundary River Salmon Production, Harvest, and Escapement and a Review of Joint Enhancement Activities in 2017*

[a.] Preseason forecasts of large Chinook salmon terminal run size based on the sibling models; prior to 2005, forecasts were for escapement.

Harvest Sharing Objectives

Harvest sharing provisions for Taku River large Chinook salmon are included in Paragraph 3(a) (3) of Annex IV, Chapter 1 of the PST. The catch sharing provisions were developed to acknowledge the traditional harvest in fisheries, referred to as base level catches (BLCs), which occurred prior to the new arrangements; these included incidental harvest in Canadian and U.S. commercial gillnet fisheries, U.S. and Canadian sport fisheries, the Canadian First Nation fishery, and the test fishery. For the new directed fisheries, the allowable catch (AC) will be calculated as follows:

AC = Terminal run - Base Terminal Run (BTR); where

BTR = escapement target + test fishery BLC + U.S. BLC + Cdn BLC

BLCs are as follows:

- U.S. Taku BLC: 3,500 large Chinook salmon [4]
- Canadian Taku BLC: 1,500 large Chinook salmon [5]
- Test fishery: 1,400 large Chinook salmon;

Harvest sharing and accounting of the AC is detailed in Table 5.

Table 5. U.S. and Canadian allowable harvests of Taku River large Chinook salmon for directed fisheries.

Allowable Catch Range		Allowable Catch Share			
		U.S.		Canada	
Lower	Upper	Lower	Upper	Lower	Upper
0	5,000	0	0	0	5,000
5,001	20,000	1	11,000	5,000	9,000
20,001	30,000	11,001	17,500	9,000	12,500
30,001	50,000	17,501	30,500	12,500	19,500
50,001	100,000	30,501	63,000	19,500	37,000

Within each allowable catch range, each Party's AC will be calculated proportional to where the AC occurs within the range. The TTC has developed a spreadsheet to calculate specific catch shares. The Parties shall determine the domestic allocation of their respective harvest shares.

When the terminal run is insufficient to provide for the Party's Taku River Chinook salmon BLC and the lower end of the escapement goal range, the reductions in each Party's base level fisheries, i.e. the fisheries that contributed to the BLCs, will be proportionate to the BLC shares, excluding the test fishery.

The U.S. catch of the Taku River Chinook salmon AC will not count towards the SEAK AABM allocation (as described in Chapter 3 of the PST). In particular:

a. non-Taku River Treaty Chinook salmon harvested in District 111 will continue to count toward the SEAK AABM harvest limit;

b. the U.S. BLC of Taku River Chinook salmon in District 111 will count toward the SEAK AABM harvest limit;

c. the U.S. catch of Taku River Chinook salmon in District 111 above the U.S. BLC will not count towards the SEAK AABM allocation.

Accounting for the SEAK AABM Chinook salmon catches as pertains to transboundary rivers harvests will continue to be the responsibility of the CTC as modified by (a) through (c) above.

Management Procedures

The management coordination between U.S. and Canadian fishery managers will involve weekly communication between designated members or alternates. Canadian and U.S. fishery managers will conduct

[4] Includes average combined U.S. drift gillnet and sport harvest of Taku River large Chinook salmon in District 111.
[5] Includes average combined Canadian Aboriginal, commercial and estimated sport harvest of Taku River large Chinook salmon.

data exchanges by telephone and/or email on Wednesday afternoon or Thursday morning of each week during the fishing season. At that time, current harvest statistics and stock assessment data including MR data will be updated, exchanged, and reviewed. Management plans for the next week for each country will be discussed at this time. It is anticipated that additional communications will be required each week. Weekly decision deadlines will be: a) for District 111, 11:00 a.m., Thursday, Alaska Daylight Time; i.e. noon Pacific Daylight Time; and, b) for the Canadian Taku River fishery, 10:00 a.m., Friday, Pacific Daylight Time.

The 2009–2018 Taku River Chinook salmon agreement (Paragraph 3(a) (3) of Annex IV, Chapter 1 of the PST) includes the following management details for directed fisheries:

- This agreement shall apply to large (greater than 659 mm mid eye to fork length) Chinook salmon originating in the Taku River.

- Both Parties shall take the appropriate management action to ensure that the necessary escapement goals for Chinook salmon bound for the Canadian portions of the Taku River are achieved. The Parties agree to share in the burden of conservation. Fishing arrangements must take biodiversity and eco-system requirements into account.

- Management of directed fisheries will be abundance-based through an approach developed by the TTC. The Parties agree to implement assessment programs in support of the abundance-based management regime.

- Unless otherwise agreed, directed fisheries on Taku River Chinook salmon will occur only in the Taku River drainage in Canada, and in District 111 in the U.S.

- Management of Taku River Chinook salmon will take into account the conservation of specific stocks or conservation units when planning and prosecuting their respective fisheries. To avoid over-harvesting of specific components of the run, weekly guideline harvests, or other agreed management measures, will be developed by the TTC by apportioning the allowable harvest of each Party over the total Chinook salmon season based on historical weekly run timing.

- The Parties agree to implement through the TTC an agreed Chinook salmon genetic stock identification (GSI) program to assist the management of Taku River Chinook salmon. The Parties agree to continue the development of joint GSI baselines.

- The Parties agree to periodically review the above border Taku River Chinook salmon spawning escapement goal which will be expressed in terms of large fish (> 659 mm MEF).

- A preseason forecast of the Taku River Chinook salmon terminal run[6] size will be made by the TTC by December 1 of each year.

- Directed fisheries may be implemented based on preseason forecasts only if the preseason forecast terminal run size equals or exceeds the midpoint of the MSY escapement goal range plus the combined Canada, U.S., and test fishery base level catches (BLCs) of Taku River Chinook salmon. The preseason forecast will only be used for management until inseason projections become available.

- For the purposes of determining whether to allow directed fisheries using inseason information, such fisheries will not be implemented unless the projected terminal run size exceeds the bilaterally agreed

[6] Terminal run = total Taku River Chinook salmon run size minus the U.S. troll harvest of Taku River Chinook salmon outside District 111.

escapement goal point estimate (N_{MSY}) plus the combined Canada, U.S. and test fishery BLCs of Taku River Chinook salmon. The Committee shall determine when inseason projections can be used for management purposes and shall establish the methodology for inseason projections and update them weekly or at other agreed intervals.

- When the terminal run is insufficient to provide for the Party's Taku River Chinook salmon BLC and the lower end of the escapement goal range, the reductions in each Party's base level fisheries, i.e. the fisheries that contributed to the BLCs, will be proportionate to the Taku River Chinook BLC shares, excluding the test fishery.

- When the escapement of Taku River Chinook salmon is below the lower bound of the agreed escapement range for three consecutive years, the Parties will examine the management of base level fisheries and any other fishery which harvests Taku River Chinook salmon stocks, with a view to rebuilding the escapement.

Inseason estimates of the inriver run will be made using a bilaterally agreed-to sulk rate for tags released in event 1 of the two-event MR program. Sulk rates will be based on the analysis of inseason data. In the event bilateral agreement cannot be reached with respect to the sulk rate, an assumed 10-day sulk rate will be used. Inseason terminal run projections will be made using average run timing seen in catches at Canyon Island (or other bilaterally agreed-to timing). In addition, the terminal marine harvests will be lagged one week to account for travel time between Taku Inlet and the event 2 sampling area.

For inseason estimates, a valid Petersen will be sought. In the event a valid Petersen is not available, upon agreement, another valid estimate may be used. Should there be no agreement on an alternate valid estimator then the most recent agreed valid estimate will be used. If no agreed-to valid estimate has been generated the preseason forecast will be used.

$$\mathbf{TR = [(P_t + Cus_{(t-1)})/\mathit{p}_t)\ ]}$$

Where:
- TR = the projected terminal run of large Chinook salmon for the season;
- P_t = the inriver population estimate from the MR program through week "t";
- Cus_{t-1} = the cumulative U.S. Chinook salmon catch to week "*t-1*", i.e. U.S. catch lagged one week to account for migration timing;
- p_t = the estimated cumulative proportion of run through to week t determined from the inriver run timing based on historical catch data from Canyon Island. (Both Parties must agree prior to adjusting run timing estimates inseason).

The PST harvest sharing provisions will be applied to the weekly Chinook salmon AC projections to guide the management of the Parties respective commercial fisheries. Run timing will be used to apportion the Parties allowable catches each week to provide guideline harvest levels for use in management. Though not likely to occur in 2018 due to the poor Chinook salmon forecast, test/assessment fisheries will be based on no more than four openings per week and effort will be standardized as best as possible throughout these days.

United States

The 2018 preseason forecast of 4,700 Taku River large Chinook salmon does not provide an AC for any directed Taku River Chinook salmon fisheries in District 111. The U.S. does not anticipate any directed fisheries in 2018 based on recent trends in Chinook salmon abundance throughout Southeast Alaska. Depending on the development of the Taku River Chinook salmon return, Chinook salmon conservation measures including restrictions in time (including night closures), mesh size (6 inch maximum), and area (upper Taku Inlet, Point Bishop and Point Arden south below Grand Island closed) may be imposed during the initial weeks of the directed sockeye salmon fishery.

The Chinook salmon sport fishery in District 111 will not be liberalized in 2018 and will have significant area and retention restrictions imposed during the time period when Taku River fish are historically transiting the district. The Taku River Personal Use sockeye salmon fishery will have a delayed start occurring in the middle of July.

Canada

As in past years, restrictions in weekly fishing times in the Canadian First Nation fishery are not anticipated. Any reductions in fishing time would be considered only if no other adjustments could be made in the commercial and recreational fisheries. Through discussions with the TRTFN, the poor Chinook salmon forecast for 2018 has been conveyed by DFO and it is believed that fishing effort will be limited during the Chinook salmon season. Catches will be collected by TRTFN representatives and reported to the Whitehorse office of DFO on a periodic basis.

The Taku River recreational fishery takes place primarily on the Nakina River; some additional fishing occurs on the Tatsamenie Lake outlet stream and other Taku River tributaries. In light of the poor Chinook salmon forecast, the Taku recreational fishery will be restricted to nonretention of Chinook salmon effective April 1 through to the end of March 2019. The Nakina River fishery will be closed to salmon fishing July 20 through August 15. The Tatsamenie Lake outlet stream will be closed from August 20 through September 15. The aggregate daily limit for salmon is four fish and the possession limit is eight fish. The annual harvest of Chinook salmon over 65 cms (~26 in) fork length is limited to ten fish from all fresh waters of British Columbia.

The Taku River commercial fishing area extends from approximately 50 m (~165 ft) upstream of the Canada/U.S. border to boundary signs located near Yellow Bluff, approximately 18 km (~11 mi) upstream and excluding Flannigan and South Fork sloughs. The vast majority of fishing effort occurs downstream of the Tulsequah River.

The 2018 bilaterally agreed on preseason forecast of 4,700 large Chinook salmon is not sufficient for a directed commercial fishery and is well below the lower end of the escapement goal range. Typically, the inseason management of Taku River Chinook salmon depends on abundance estimates generated from the joint MR program in the lower Taku River with tags being applied at Canyon Island and recoveries being made in the Canadian assessment and/or commercial fisheries or other agreed to recovery methodology. For 2018, there will not be an assessment fishery to support the MR program or any other means of generating reliable inseason run estimates; as such, the preseason forecast will be used to manage the commercial fishery and to make necessary adjustments in the other fisheries with the intention of limiting the interception of Chinook salmon. As per the Taku River commercial conditions of licence, harvest of Chinook salmon will not be permitted.

Harvest Information Sharing

The U.S. shall provide to Canadian managers harvest and effort data by SW for the District 111 drift gillnet, sport, and troll fisheries and for the season in the personal use fishery.

Canada shall provide to U.S. managers harvest and effort data by SW in the commercial and test fisheries and for the season in the First Nation and recreational fisheries.

Stock Assessment Program

Each country shall:

1. provide harvest statistics for the same strata as sockeye salmon are reported;

2. sample its fisheries for CWTs, spaghetti tags, and GSI (U.S. D111 Marine);

3. conduct escapement and stock assessment programs as resources permit (see Appendix A. 2 for projects anticipated to be conducted in 2018).

Stock Composition of U.S. Harvests

Chinook salmon harvested in Alaska will be sampled for CWTs. The minimum sampling goal is 20% of the harvest; the target for 2018 is 30%.

Stock composition for sport and commercial harvest will be determined postseason. Genetic tissue samples will be taken from sport and commercially harvested Chinook salmon in District 111 and processed postseason by ADF&G Gene Conservation Laboratory in Anchorage (Appendix C.1). GSI will be used to recalculate contributions of above border Taku River Chinook salmon in the District 111 sport and commercial fisheries. In the absence of GSI data, CWT data will be used to determine stock composition postseason. ASL data will be collected inseason and analyzed postseason to determine the age structure composition of the harvest.

Stock Composition of Canadian Harvests

If available for 2018, mixed stock Chinook salmon DNA samples will be collected in the Taku River commercial and assessment fisheries for stock identification analysis (Appendix C.1). A minimum of 40% of the Chinook salmon harvested in the commercial fishery and all of the assessment fishery will be examined for adipose clips for CWT's. Further details on these sampling programs are summarized in Appendix A. 2.

Spawning Escapement Estimates

Drainage wide escapement will be determined by the joint Canada/U.S. MR program. Headwater areas will be sampled using a variety of methods including carcass weirs, angling, aerial surveys, etc. (Appendix A. 2). Fish will be sampled for ASL. A study utilizing sonar to estimate escapement to the Nahlin subdrainage will continue for a third season in 2018.

Sockeye Salmon

Preseason Forecast

The preseason forecast for the terminal run of Taku River wild sockeye salmon in 2018 is approximately 159,900 fish, which is below the 10-year average (2008–2017) run size of 181,000 fish. This is a stock-recruitment model forecast that was adjusted using the 10-year model error (2008–2017; 22%) for the first time in 2018. If the run comes in as expected, the TAC of wild sockeye salmon will be approximately 84,900 fish.

Table 6. Taku River sockeye salmon preseason run forecasts and postseason run estimates, 1994 to 2018. Forecast performance relative to the actual was determined using postseason run reconstruction. Positive values indicate the forecast was higher than actual while negative values indicate the forecast was less than the actual.

Year	Preseason Forecast	Forecast Method[a]	Postseason Run Size	Forecast Performance
1994	237,500		229,642	3%
1995	211,300	SR – Total	238,434	-11%
1996	219,000	Average – Total	322,379	-32%
1997	285,200	Average – Total	174,565	63%
1998	238,100	Average – Total	139,824	70%
1999	202,900	Average – Total	176,764	15%
2000	273,200	Average – Total	246,954	11%
2001	250,500	Average – Total	396,678	-37%
2002	293,100	Average – Total	251,633	16%
2003	303,800	Average – Total	330,332	-8%
2004	231,200	Average – Total	204,059	13%
2005	272,100	Average – Total	188,244	45%
2006	204,100	Average – Total	233,425	-13%
2007	211,700	SR – Wild	161,429	31%
2008	181,000	SR – Wild	145,239	25%
2009	213,000	SR – Wild	118,625	80%
2010	205,000	SR – Wild	153,207	34%
2011	230,700	Average – Wild	201,875	14%
2012	197,300	Average – Wild	193,583	2%
2013	255,000	Average – Wild	184,411	38%
2014	190,000	Average – Wild	140,929	35%
2015	216,000	Average – Wild	193,431	12%
2016	200,000	SR – Wild	271,796	-26%
2017	198,000	SR – Wild	199,789	-1%
2018	160,000	SR-Adj. – Wild		
2008–2017		Average absolute difference from postseason run size		+/- 27%

Data source: *Final Estimates of Transboundary River Salmon Production, Harvest, and Escapement and a Review of Joint Enhancement Activities in 2017.*

[a] SR=stock-recruitment model; SR-Adj.= stock-recruitment model adjusted by 10-year average (2008–2017) model error; average=average of stock-recruitment and sibling-based models; Total=Terminal run of wild and enhanced fish; Wild=Terminal run of wild fish.

Tatsamenie Sockeye Salmon

The 2018 terminal run forecast for Tatsamenie sockeye is approximately 18,600 fish, which is near the 10-year average (2008–2017) run size of 18,900 fish. The 2018 forecast is comprised of an enhanced component of 5,400 fish, and a wild component of 13,200 fish.

The enhanced component is based on the average of a smolt and a sibling forecast. The smolt forecast uses enhanced smolt emigration estimates from Tatsamenie Lake and applies the 5- year average (2013–2017) enhanced smolt to adult survival rate of 3.4%. The sibling forecast uses the 2013 enhanced brood year returns in 2017 (age 4 fish) to predict the returns of sibling fish (age 5) in 2018 based on the relationship observed between these age classes over the past nineteen years. The 5-year old forecast is then expanded by average age composition of the run.

The wild component is based on a smolt forecast exclusively. The smolt forecast uses wild smolt emigration estimates from Tatsamenie Lake and applies the 5-year average (2013–2017) smolt to adult survival rate of 3.4%. This is based on assumptions that both the maturity schedule and the 5-year average 2013–2017) smolt to adult survival rate of wild smolt is comparable to that of enhanced smolt.

The escapement of sockeye salmon to Tatsamenie Lake has bearing on the Canada/U.S. egg take program. Based on a fecundity of approximately 4,000 eggs per female, equal sex ratios, a broodstock holding success rate of 80%, along with the guideline that no more than 30% of the escapement can be utilized for enhancement purposes, an escapement of about 4,000 sockeye salmon would be needed to achieve the maximum egg take of 2.5 million eggs referred to in the 2018 Taku Enhancement Production Plan.

Escapement Goals

The Taku River sockeye salmon spawning objective is a range from 71,000 to 80,000 fish with a point goal of 75,000 fish.

Harvest Sharing Objectives

Harvest sharing agreements between Canada and the United States for Taku River sockeye salmon are dictated by Annex IV, Chapter 1 of the PST and are in effect through 2018.

Sockeye salmon arrangements for the 2009–2018 period as specified in the PST include the following:

- Directed fisheries on Taku River sockeye salmon will occur only in the Taku River drainage in Canada, and in District 111 in the U.S.

- Annual abundance of the wild run of Taku River sockeye salmon will be estimated by adding the catch of wild run sockeye salmon in U.S. District 111 to the estimated above border passage of wild run sockeye salmon. The annual Total Allowable Catch (TAC) of wild run Taku River sockeye salmon will be estimated by subtracting the agreed spawning escapement goal from the annual abundance estimate.

- The management of U.S. and Canadian fisheries shall be based on weekly estimates of the TAC of wild sockeye salmon.

- The primary management objective of the Parties is to achieve the agreed spawning escapement goal. If the projected inriver escapement of wild run sockeye salmon is greater than 1.6, or other agreed factor, times the agreed spawning escapement goal, Canada may, in addition to its share of the TAC, harvest the projected surplus inriver escapement apportioned by run timing.

- For inseason management purposes, identifiable enhanced Taku River origin sockeye salmon will not be included in the calculations of the annual TAC. Notwithstanding the paragraph below, enhanced sockeye will be harvested in existing fisheries incidentally to the harvest of wild Taku River sockeye salmon.

- It is anticipated that surplus enhanced sockeye salmon will remain unharvested in existing commercial fisheries due to management actions required to ensure the wild spawning escapement. Canada may implement additional fisheries upstream of the existing commercial fishery to harvest surplus enhanced sockeye salmon.

- Both Parties agree to the objective of increasing sockeye salmon runs in the Taku River. The United States long-term objective is to maintain the 82% U.S. harvest share of wild Taku River sockeye salmon only adjusted based on documented enhanced sockeye salmon returns. Canada's long-term objective is to achieve an equal sharing arrangement for sockeye salmon. The Parties agree to continue to develop and implement a joint Taku River enhancement program intended to eventually produce annually 100,000 returning enhanced sockeye salmon.

- The Parties annual TAC share of Taku River sockeye salmon will be as described in Table 7.

Table 7. U.S and Canadian harvest shares of Taku River sockeye salmon.

Enhanced Production	U.S. TAC Share	Canadian TAC Share
0	82%	18%
1 – 5,000	80%	20%
5,001 – 15,000	79%	21%
15,001 – 25,000	77%	23%
25,001 – 35,000	75%	25%
35,001 – 45,000	73%	27%
45,001 – 55,000	71%	29%
55,001 – 65,000	69%	31%
65,001 – 75,000	68%	32%
75,001 – 85,000	67%	33%
85,001 – 95,000	66%	34%
95,001 – 100,000	65%	35%

The Parties' performance relative to these catch shares will be based on the postseason analysis of documented production of enhanced sockeye salmon.

1. A Taku Enhancement Production Plan (TEPP) shall be prepared annually by the Committee by February 1. The TEPP will detail the planned enhancement activities to be undertaken by the Parties and the expected production from site specific egg takes, access improvements and all other enhancement activities outlined in the annual TEPP. The Committee will use these data to prepare an initial enhancement production forecast based on the best available information.

2. The Panel shall review the annual TEPP and make recommendations to the Parties concerning the TEPP by February 28.

3. The Committee shall annually review and document joint enhancement projects and activities undertaken by the Parties, including the estimated returns of identifiable and unidentifiable enhanced sockeye salmon, and present the results to the Panel during the annual postseason review.

Management Procedures

A similar management process as described for Chinook salmon will be followed for sockeye salmon whereby inriver population estimates from the joint MR program will be used to project inseason run sizes and inseason data exchange and review will occur between parties. Management agencies will collaborate to work toward joint inriver MR estimates. A similar approach will be taken for projecting terminal run sizes with harvest estimates updated frequently.

A coordinated management focus on Tatsamenie sockeye salmon in Taku Inlet and inriver has occurred in the past. Management measures during these periods have attempted to ensure adequate numbers of sockeye salmon escape to Tatsamenie Lake to support wild production and egg-take objectives. If conservation concerns arose, e.g. due to depressed CPUE in fisheries and/or inriver assessment programs, management actions may include conservative and/or reduced fishing time. Managers will be closely monitoring stock assessment data inseason to determine if special management measures will be required for the Tatsamenie stock in 2018.

<u>United States</u>

Directed sockeye salmon fishing in District 111 traditionally opens for a 72-hour fishing period beginning noon on the third Sunday in June (June 17; SW25). Depending on the development of the Taku River Chinook salmon return, Chinook salmon conservation measures including restrictions in time (including night closures), mesh size (6-inch maximum), and area (upper Taku Inlet, Point Bishop and Point Arden south below Grand Island closed) may be imposed. District 111 will be managed through mid-August primarily on the basis of sockeye salmon abundance. Taku River sockeye salmon abundance will be evaluated using District 111 overall harvest and CPUE data and weekly inriver run size estimates from the Taku River MR program. Contributions of enhanced sockeye salmon will be estimated inseason by analysis of salmon otoliths sampled from commercial harvests. For purposes of inseason run size estimation, average weekly historical stock composition data will be used to estimate the contribution of Taku River wild and Port Snettisham enhanced sockeye salmon contributions to the harvest. The above data will be used to generate weekly estimates of the Taku River terminal sockeye salmon run size, Taku River sockeye salmon TAC and U.S. harvest of Taku River sockeye salmon. The age and stock compositions of the harvest of wild sockeye salmon stocks will be revised postseason by analysis of GSI data derived from sampling harvests and escapements.

Returns from domestic hatchery programs are expected to contribute significantly to the District 111 fishery in 2018. The forecast return of Snettisham Hatchery sockeye salmon is 244,000 fish. DIPAC’s summer chum salmon return to Gastineau Channel and Limestone Inlet is forecast to be 1.1 million fish. Portions of these returns will be available for incidental harvest in the directed wild sockeye salmon fisheries in Taku Inlet. Fishing time may be extended in Stephens Passage south of Circle Point during July to harvest hatchery returns of summer chum salmon to Limestone Inlet and during August to harvest returns of Snettisham Hatchery sockeye salmon.

A personal use fishery in U.S. portions of the Taku River was established by the Alaska Board of Fisheries (BOF) in 1989 and will operate from mid-July through mid-August in 2018. The one-month fishery will be delayed by approximately two weeks to further aid in Taku River Chinook salmon conservation. The legal gear type is set nets, not to exceed 15 fathoms in length. The seasonal bag limit was increased at the 2018 BOF meeting and is now ten sockeye salmon for a household of one, or twenty sockeye salmon for a household of two or more persons. Fishing is not allowed within 100 yards of the U.S./Canada research fish wheels.

Canada

For the sockeye salmon season, a directed commercial fishery will be delayed a week and commence at noon Tuesday, June 26 (SW26) restricted to a maximum of a 48-hour period due to the poor large Chinook salmon forecast and the lowest return observed in brood year 2013 at Kuthai Lake. Additional measures will also be implemented based on Chinook salmon considerations. For 2018, as per the Taku River commercial conditions of licence, the harvest of Chinook salmon will not be permitted. The use of set nets will not be permitted for the first commercial opening (SW26) to allow for the release of healthy Chinook salmon. Potentially, an additional week prohibiting the use of set nets may be required dependent upon the level of Chinook salmon interceptions observed in SW26. A maximum mesh size restriction of 140 mm (approximately 5.5 inches) will be in effect through SW29 (ending July 21) and reductions in fishing time may be required if large Chinook salmon harvests are significant during the early weeks of the directed sockeye salmon fishery. The maximum net length will be 36.6 m (120 ft) for both drift- and set-gillnets. Canadian sockeye salmon management decisions for the Taku River fishery (Figure 3) will be based on weekly projections of terminal run sizes of wild and enhanced fish, TAC, and the escapement of wild stocks.

The weekly sockeye salmon TAC projections (wild stocks) will be made using the following calculations:

$$\mathbf{TAC_{(w)} = [(E_{w(t)} + C_{w(t)} + A_{w(t-1)}) / \rho_{w(t)}] - E_w}$$

Where:

Where:	$TAC_{(w)}$	=	the projected total allowable catch of wild *w* sockeye salmon for the season;
	$E_{w(t)}$	=	the cumulative escapement to week *t* based on MR data;
	$C_{w(t)}$	=	the cumulative Canadian wild catch to week *t*;
	$A_{w(t-1)}$	=	the estimated cumulative U.S. harvest of wild Taku sockeye salmon to the preceding week t-1 (preceding week used to allow for migration time).
	$\rho_{w(t)}$	=	the estimated proportion of run through to week *t* determined from the average inriver run timing based on historical inriver CPUE data. (Run timing estimates will be adjusted inseason according to inseason CPUE data relative to historical data in both U.S. and Canadian fisheries);
	E_w	=	the system-wide escapement goal for wild stocks. (A value of 75,000 fish will be used which is close to the midpoint in the interim range of 71,000 to 80,000 fish).

The PST harvest sharing provisions will be applied to the weekly wild sockeye salmon TAC projections to guide the management of the commercial fishery. Run timing will be used to apportion the projected Canadian allowable catch each week and to make projections of the total escapement. The Canadian harvest will be adjusted with the objective of meeting escapement and agreed Canada/US harvest sharing objectives. Since it is expected the production of enhanced sockeye salmon will be between 5,001 and 15,000 fish, Canada’s harvest share will be 21% of the TAC. If inseason projections of enhanced fish drop below 5,001 fish or rise above 15,000 fish, Canada’s share will be adjusted as per the harvest sharing provisions of the PST.

Low escapements of the Kuthai Lake sockeye salmon stock continue to be of concern. The duration of openings in SWs26–27 (June 24 – July 7) may be reduced if it appears that the escapement of the Kuthai Lake stock is at risk of being compromised. During SWs31–33 (July 29 – August 18), management attention will focus on Tatsamenie sockeye salmon to ensure adequate numbers of sockeye salmon escape to Tatsamenie Lake to support wild production and egg-take objectives.

Harvest Information Sharing

The U.S. shall provide harvest and effort data in the following strata for each SW:

1. District 111 (Subdistricts 111- 20, 31, 32, 33, 34);

2. Taku River personal use fishery (season estimate).

Canada shall provide harvest and effort data in the following strata for each SW:

1. Taku River commercial fishery;

2. First Nation fishery (season estimate).

Stock Assessment Program

Stock Composition of U.S. Harvests

The District 111 drift gillnet sockeye salmon harvest will be sampled weekly to obtain 300 matched genetic tissue, otolith, and ASL samples in both Subdistrict 111-31 and 111-32. Otolith samples collected inseason will be sent to the ADF&G Mark, Tag, and Age Laboratory in Juneau to be processed and analyzed, within two days of the end of the fishing period, for contributions of Taku, Stikine, and Port Snettisham enhanced sockeye salmon. Proportions of enhanced fish, combined with inriver MR data, will be used in weekly Taku Management Models to estimate the wild sockeye salmon terminal run size.

Postseason, the matched GSI/otolith samples collected inseason will be used to estimate weekly contributions of wild and enhanced sockeye salmon stocks in the District 111 drift gillnet fishery. Additionally, GSI analysis will provide seasonal estimates of age-specific stock composition for all major contributing age classes (>5%) for use in brood tables (Appendix C.2). These estimates are produced with a mark- and age-enhanced genetic mixed-stock analysis (MAGMA) model, which is an extension of the Pella-Masuda GSI model (Pella and Masuda 2001) that incorporates paired otolith mark and scale-age data. Age-specific stock composition estimates are only provided at the annual level because weekly sample sizes are not sufficient to meet precision standards.

Stock Composition of Canadian Harvests

To evaluate the contribution of enhanced sockeye salmon to the Canadian inriver commercial harvest, 192 otoliths will be collected per week from the inriver commercial gillnet fishery. Otolith samples collected inseason will be flown from Canyon Island, Taku River, to Juneau every Wednesday afternoon. Inseason processing of otoliths by the ADF&G Mark, Age, and Tag Lab will be completed within two days of delivery. Data collected from sampled otoliths will be used both inseason and postseason to estimate the contribution of Tatsamenie enhanced sockeye salmon. In addition, at least 125 genetic samples will be collected each week for postseason stock composition analysis (Appendix C.2).

Spawning Escapement Estimates

System-wide escapement will be determined by the joint Canada/U.S. MR program. Adult enumeration weirs will be used to estimate escapements of sockeye salmon to Tatsamenie, Little Trapper, Kuthai and King Salmon lakes. The age composition will be determined from scale samples, and contributions of enhanced sockeye salmon will be determined from otolith samples. Approximately 750 fish will be sampled during the season at each location for ASL; 400 otoliths will also be taken from Tatsamenie broodstock.

Coho Salmon

Preseason Forecast

The forecast for the total run of Taku River coho salmon in 2018 is 106,000 fish which equates to a terminal run of about 81,000 fish after applying an average nonterminal marine harvest rate of 24%. In comparison, the 10-year average (2008–2017) for total run is 155,000 fish and for the inriver run is 98,000 fish. The 2018 forecast was generated using the relationship between the CPUE in smolt tagging and the total run estimates seen over the past twenty years.

Escapement Goals

The Taku River coho salmon escapement goal has a range from 50,000 to 90,000 fish with an $\mathbf{N_{MSY}}$ of 70,000 fish (Pestal and Johnston 2015). Prior to the development of this goal and from the inception of the PST in 1985, the management intent of the U.S. was to ensure a minimum above border inriver run of 38,000 coho salmon. In 1999, the Party's agreed to implement a new abundance-based approach and development and analysis began in 2014 with eventual approval by the PSC TBR Panel in February 2015.

Harvest Sharing Objectives

Coho salmon arrangements for 2018 as agreed by the TBR Panel in February of 2018 to replace Chapter 1 provision 3(b)(2) are:

- The MSY goal range is 50,000 to 90,000 fish, with an N_{MSY} of 70,000 fish;
- The N_{MSY} will be used by U.S. and Canadian fishery managers as the spawning escapement target for the above border coho salmon run during preseason and inseason management activities;
- A directed Canadian harvest of 5,000 coho salmon is allowed for assessment purposes as part of the joint Canada/U.S. Taku River mark recapture program;
- Canada may harvest all coho salmon that pass above the border in excess of both the N_{MSY} and 5,000 fish assessment fishery.

Management Procedures

<u>United States</u>

Beginning in mid-August, management of the District 111 drift gillnet fishery will be based on the run strength of coho salmon. Inseason management will be based on evaluation of fishery harvest, effort and CPUE relative to historical levels, recovery of CWTs from fishery sampling, and inriver run size estimates from the Taku River MR program. The U.S. will manage its fisheries to allow a minimum above border run of approximately 75,000 coho salmon. A substantial run of coho salmon (37,000 fish) is expected to the Macaulay Hatchery in Gastineau Channel. Portions of these returns will be available for incidental harvest in the directed coho salmon fisheries in Taku Inlet.

Canada

In mid-August (SW34, starting August 19), management actions will shift to coho salmon. The inriver coho salmon projections will be based on the following simplified formula:

$$R_{IR(ACI)} = R_{IR(ACI)}t/T$$

Where: $R_{IR(ACI)}$ = projected total inriver run above Canyon Island;
$R_{IR(ACI)}t$ = estimated run size to time "t" based on MR data;
T= average cumulative run timing at Canyon Island through time "t".

Inseason management will be based on evaluation of fishery harvest, effort and CPUE data relative to historical levels and inriver run size estimates from the Taku River MR program. Based on the escapement goal of 70,000 fish, Canada will endeavor to manage to the agreed goal and harvest the surplus above escapement needs in a combination of commercial and assessment fisheries. In the event reliable inriver run projections fall below 50,000 fish, no commercial or assessment fishing will take place.

To address chum salmon conservation concerns, the retention of chum salmon will be prohibited throughout the season. In addition, fishers must release any steelhead caught. It is anticipated that the commercial fishery will remain closed for pink salmon unless markets are developed.

Stock Assessment Program

All coho salmon caught in the Canadian fisheries missing an adipose fin will be landed head-on and sampled for CWT's to determine the contribution of Taku River origin marked fish.

Inseason Data Exchange and Review

Canada and the U.S. will conduct data exchanges by telephone and/or email on Wednesday afternoon or Thursday morning of each week during the fishing season. At that time, current harvest statistics and stock assessment data will be updated, exchanged, and reviewed. Management plans for the next week for each country will be discussed at this time. It is anticipated that additional communications will be required each week. Weekly decision deadlines will be: a) for Districts 111, 11:00 a.m., Thursday, Alaska Daylight Time; and, b) for the Canadian Taku River fishery, 10:00 a.m., Friday, Pacific Daylight Time.

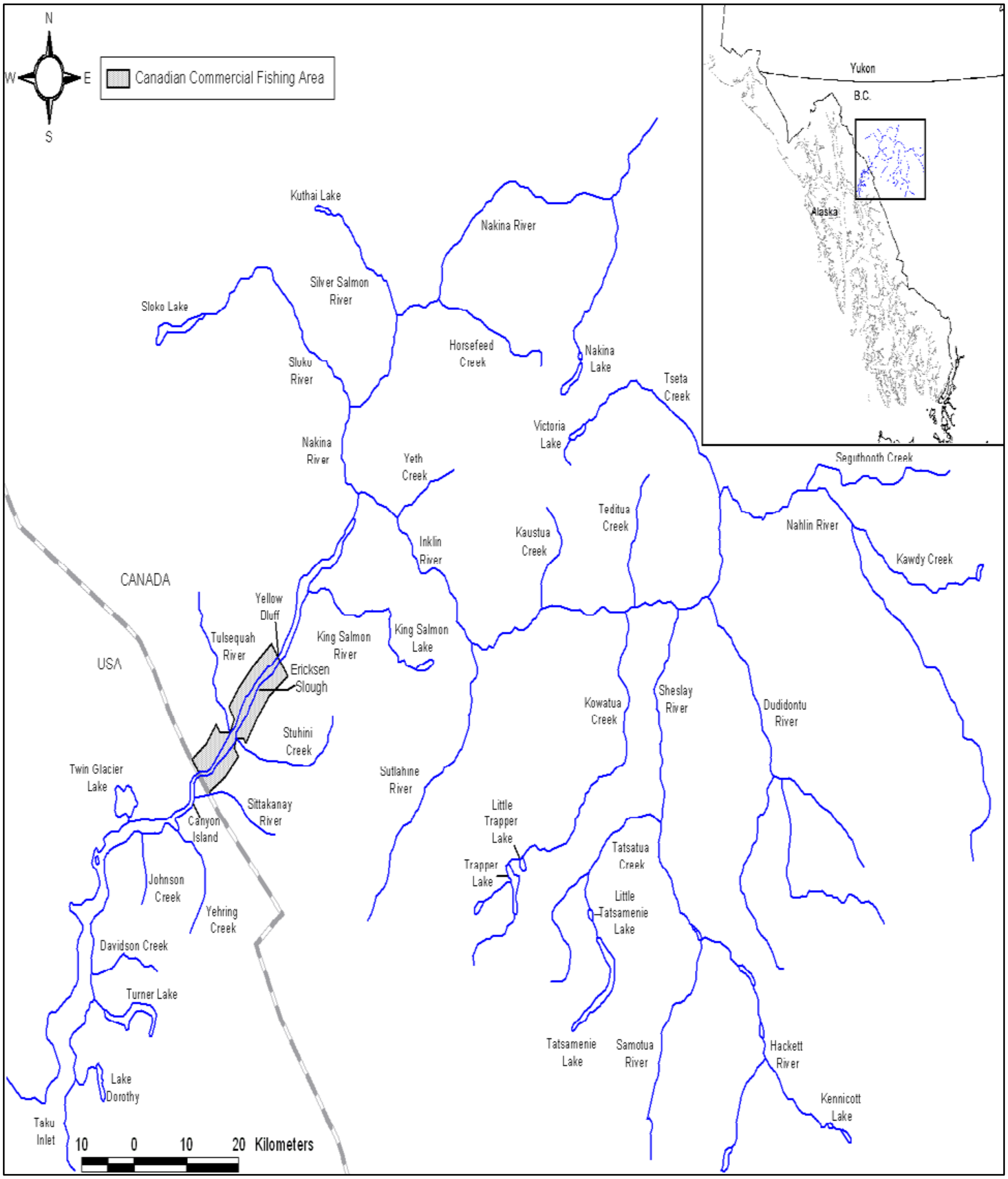

Figure 3. The Taku River showing the Canadian commercial fishing area.

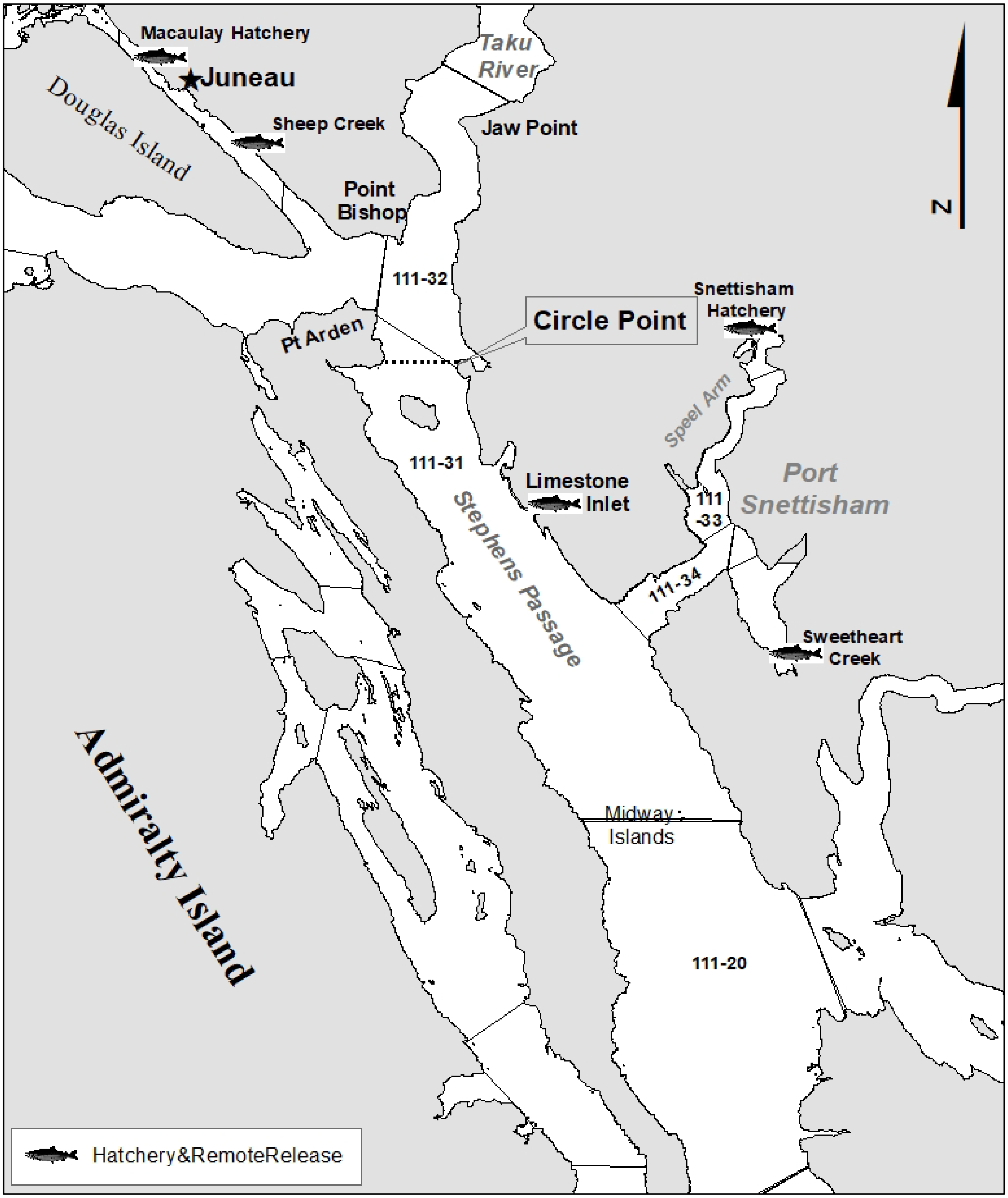

Figure 4. U.S. fishing areas adjacent to the Taku River.

ALSEK RIVER

Salmon stocks returning to the Alsek River drainage (Figure 5) are jointly managed by DFO, CAFN, and ADF&G through the joint TTC of the PSC.

The principal U.S. fishery that targets Alsek River stocks is a commercial set gillnet fishery that operates near Dry Bay, from the Gulf of Alaska approximately 20 km up the Alsek River. A small subsistence fishery also operates in Dry Bay. U.S. fishers target sockeye and coho salmon but other Alsek River stocks are also harvested incidentally.

The principal Canadian fisheries occur in the upper Tatshenshini River drainage. A traditional First Nation fishery also takes place in the upper Tatshenshini River drainage. At present, approximately, 100–150 members of CAFN harvest salmon via traditional and nontraditional methods (gaffs, traps, rod and reel, nets, weir), primarily, in the Klukshu River, and to a lesser extent, in Village Creek, Blanchard River, and Goat Creek. Recreational fisheries take place primarily on the Tatshenshini River in the Dalton Post area and on the Takhanne and Blanchard rivers.

Most Alsek River Chinook, sockeye, and coho salmon spawn in Canada, but spawning occurs in U.S. tributaries as well.

The biological escapement goal for Alsek River Chinook salmon is a NMSY of 4,700 fish (MSY goal range of 3,500 to 5,300 fish) with a Klukshu River Chinook salmon NMSY target of 1,000 fish (MSY goal range of 800 to 1,200 fish) (Bernard and Jones 2010). The biological escapement goal for Alsek River sockeye salmon is a NMSY of 29,700 fish (MSY goal range of 24,000 to 33,500 fish), with a Klukshu River sockeye salmon NMSY of 9,700 fish (MSY goal range 7,500 to 11,000 fish) (Eggers and Bernard 2011).

Preseason Forecasts

The preseason forecast for Klukshu River Chinook salmon escapement in 2018 is 700–1,250 fish. These forecasts are below the 10-year average (2008–2017) of approximately 1,400 fish and bracket the escapement goal range of 800–1,200 Chinook salmon. Two models were used in forecasting: a sibling model (700 fish) and a stock recruit model (1,250 fish). The sibling model uses 2017 returns of age 4 (BY 2013) and age 5 (BY 2012) Chinook salmon to predict the returns of age 5 (BY 2013) and age 6 (BY 2012) in 2018 using the relationships observed between age classes over the past nine years corrected with the 10-year average (2008–2017) model error. The stock recruit model forecast is based on 23 years of Klukshu Chinook production data and was discounted using the 5-year average (2013–2017) model error (45%).

On average, the Klukshu River Chinook salmon stock comprises 25% of the Alsek River drainage wide run (Bernard and Jones 2010). Expanding the Klukshu forecast by a factor of 4.0 provides a 2018 Alsek River Chinook run forecast of approximately 5,000 fish.

The preseason forecast for Klukshu River sockeye salmon escapement in 2018 is 6,500 fish. This is well below the 10-year average (2008–2017) of 14,000 fish and below the escapement goal range of 7,500 – 11,000 fish. The forecast is a stock recruit model based on 23 years of Klukshu sockeye salmon production data and was discounted using the 3-year average (2015-2017) model error (this is a change from past years where forecasts were adjusted using a 5-year model (2013–2017) error, it is assumed that the shorter time series more accurately reflects the ocean conditions that 2018 returning brood years have experienced).

Based on MR results (2000–2004) and run size estimates using GSI (2005–2006, 2011), the Klukshu sockeye stock comprises approximately 23% of the Alsek River drainage wide sockeye salmon run. Expanding the

Klukshu forecast provides a 2018 Alsek River sockeye salmon run forecast of approximately 28,200 fish; this is below the 10-year average (2008–2017) run size estimate of approximately 61,000 Alsek River sockeye salmon.

There is much uncertainty with these forecasts. Recent survival of Chinook and sockeye salmon has been highly variable; therefore, developing accurate forecasts has been problematic.

Management Approach for the 2018 Season

A large and variable proportion of the drainage wide escapements of Alsek River Chinook, and sockeye salmon stocks are enumerated through an enumeration facility located on the Klukshu River operated by DFO.

Escapement goals are in place for Alsek and Klukshu rivers Chinook and sockeye salmon stocks. ADF&G will manage the U.S. Dry Bay commercial set gillnet sockeye salmon fishery to achieve the agreed upon escapement goal range of 800 to 1,200 Klukshu River Chinook salmon and 7,500 – 11,000 (plus 3,000) sockeye salmon as per the 2009–2018 agreement reached during Transboundary PST negotiations in February 2008.

<u>United States</u>

The U.S. commercial sockeye salmon fishery in Dry Bay traditionally opens for a 24- hour period beginning noon on the first Sunday in June (June 3; SW 23). Historically, inseason management decisions have been made by monitoring fishery performance data and comparing it to historical CPUE for a given opening to adjust time and area openings. Parent-year escapement information and harvest trends are also considered when determining the weekly fishing periods. Although there is no directed Chinook salmon fishery, the directed sockeye salmon fishery opens during the peak of the Chinook salmon return to the Alsek River. The peak timing appears to be during the first two weeks of June based on tagging data (1998–2004) and the Chinook salmon test fishery data (2005–2008, 2011 and 2012). Chinook salmon tagging studies conducted from 1998 through 2004 indicated that approximately 15–30% of the Chinook salmon passing through Dry Bay are bound for the Klukshu River drainage. U.S. Alsek River harvests have been less than 1,000 Chinook salmon each year since 1981; with a historical average harvest of approximately 400 Chinook salmon. The 2017 harvest of 124 Chinook salmon was the lowest harvest on record and the 2018 harvest most likely will not exceed average harvests. The 2017 Dry Bay sockeye salmon harvest of just under 5,000 fish was the second lowest harvest since 2007.

Chinook salmon returns to the Klukshu River have been within or above the BEG range since 2009; except in 2012, 2016, and 2017. Sockeye salmon escapements to the Klukshu River have also been variable in recent years. The top end of the BEG range was exceeded in 2012 but fell below the escapement goal range in 2013, 2016, and 2017.

Based on forecasts for 2018 and recent levels of poor production in Klukshu River sockeye and Chinook salmon stocks, the Dry Bay commercial set gillnet fishery will be curtailed in 2018. Restrictions will include the delay of the initial opening by two weeks and a six-inch maximum mesh restriction in place through July 1. Management strategies will remain conservative through SW 29 until it can be ascertained that the Klukshu River sockeye salmon BEG range will be met.

The U.S. conducted Alsek River Chinook salmon test fisheries in 2005–2008, 2011, and 2012 as provided in the current Annex. Because the Chinook salmon escapement goal of 1,100 fish (lower bound BEG range) in place at the time of the fisheries was not attained in 2005 through 2008 the test fishery was suspended in 2009 and 2010 in order to facilitate Chinook salmon escapement. Test fishing has not been conducted since 2012 and the U.S. will not conduct a test fishery in 2018.

Beginning in mid-August, management of the set gillnet fishery will be based on the run strength of coho salmon. Inseason management will be based on evaluation of fishery harvest trends, fishing effort, and CPUE relative to historical levels, similar to the management plan for sockeye salmon. Recent years have seen a decline in fishing effort during the coho salmon season on the Alsek River, mainly due to economic struggles and lack of aircraft charters to transport fish to town. It is anticipated that there will be minimal fishing effort for harvesting coho salmon again in 2018.

Canada

Canadian fisheries for Alsek River salmon will proceed similarly to regimes in recent years. Next to conservation, the priority in management will be to provide for the basic food, social and ceremonial needs of the CAFN. The basic needs allocations are 200 Chinook and 3,000 sockeye salmon, as documented in the CAFN final land claim agreement. As in recent years, some First Nation's salmon harvest will be allowed to occur at the weir which will also provide opportunities to collect biological data and samples. Restrictions in the First Nation fishery will be considered if the projected Klukshu River weir counts are below 800 Chinook salmon, 1,500 early sockeye and/or 7,500 total sockeye salmon. Decisions to implement restrictions will take into account management actions taken to conserve stocks in both the Canadian recreational fishery and the U.S. Dry Bay fishery.

In the recreational fishery, the following closed/open times will be in effect for 2018: the Dalton Post area of the Tatshenshini River will be open seven days per week; the closed times for Klukshu River, Nesketahin Lake and Village Creek will be from June 15 to November 30; the salmon non-retention periods on the Takhanne and Blanchard rivers will be from July 24 to August 31; and salmon non-retention in Klukshu Lake will be in effect year round. Additionally, Chinook and sockeye salmon daily limits will be varied to zero, zero in possession for the season due to conservation concerns. In the event that the Chinook salmon run size into the Klukshu River is well above the minimum management target of 1,000 fish (800 fish escapement plus 200 fish CAFN allocation), Canadian managers may liberalize harvest opportunities. If the early sockeye salmon run size into the Klukshu River is projected to be greater than 4,500 sockeye salmon (1,500 early sockeye plus 3,000 sockeye salmon CAFN allocation); Canadian managers may allow sockeye salmon retention in the recreational fishery prior to August 15. Additionally, if the sockeye salmon count is projected to exceed 10,500 fish (7,500 lower end of the escapement goal range plus 3,000 sockeye salmon CAFN allocation) after August 15, recreational harvest opportunities may be provided. For coho salmon, additional harvesting opportunities through increased catch limits in the recreational fishery may be provided subject to conservation concerns.

Stock Assessment Program

The escapements of Chinook, sockeye, and coho salmon through the Klukshu River escapement monitoring programme and sockeye salmon through the Village Creek (Nesketahin Lake) escapement monitoring programme serve as an inseason indicator of stock strength. Adjustments to above border fisheries may be made on the basis of these results. An estimate of the total Alsek River sockeye salmon run will be made using GSI analysis (funded through the PSC Northern Fund) of U.S. commercial fishery samples and an expansion of the Klukshu River results. A summary of the anticipated field projects in the Alsek River drainage is presented in Appendix A. 3.

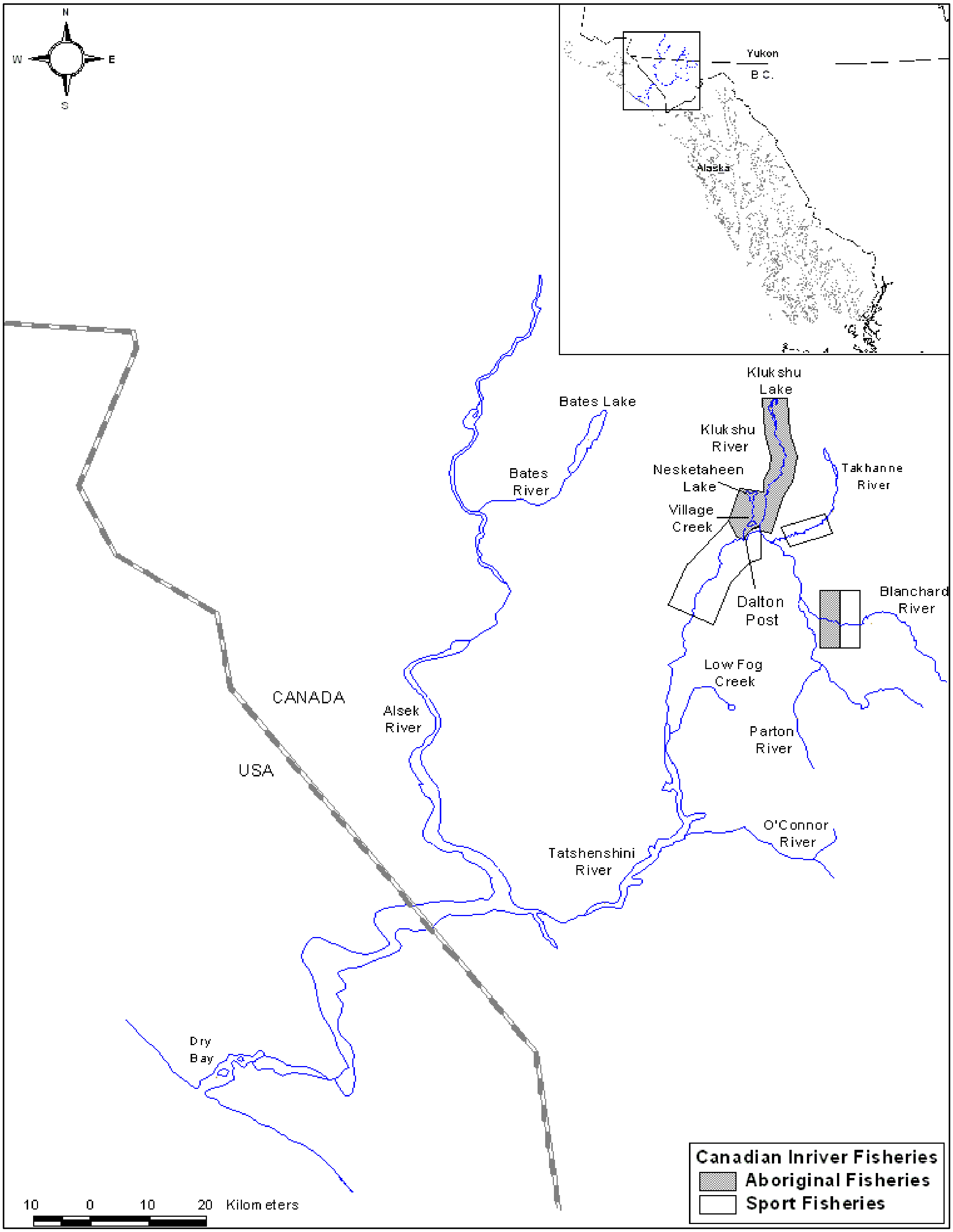

Figure 5. The Alsek River principal Canadian fishing areas.

2018 TRANSBOUNDARY ENHANCEMENT PLANS

Overview

Joint sockeye salmon enhancement projects are conducted on the Stikine and Taku rivers. Broodstock are collected in Canada at Tahltan Lake in the Stikine River drainage and from Tatsamenie Lake in the Taku River drainage. The eggs from these sockeye salmon are incubated and thermally marked at Snettisham Hatchery in Alaska. The fry originating from the Tahltan Lake egg take are back-planted into Tahltan and/or Tuya lakes, both of which are in the Stikine River drainage. The fry originating from the Tatsamenie Lake egg take are returned to their lake of origin. Two other projects of interest on the Taku River include: the investigation of the suitability of Trapper Lake for anadromous salmon production; and feasibility of broodstock capture, egg collection, and back-planting at King Salmon Lake.

As part of the current agreement the parties agreed that:

1. A Stikine Enhancement Production Plan (SEPP) and a Taku Enhancement Production Plan (TEPP) shall be prepared annually by the Committee by February 1. The SEPP and TEPP will detail the planned enhancement activities to be undertaken by the Parties and the expected production from site specific egg takes, access improvements and all other enhancement activities outlined in the annual SEPP and TEPP. The Committee will use these data to prepare an initial enhancement production forecast based on the best available information.

2. The Panel shall review the annual SEPP and TEPP and make recommendations to the Parties concerning them by February 28 (Table 8 and 9).

Table 8. The 2018 SEPP. Reviewed and approved by the Panel at the February 2018 annual meeting.

2018 SEPP			
Enhancement Project	**Activities**	**Expected Production[2]**	**Technique to document production**
Tahltan Lake	Egg take with target of 5.0 million eggs[1]. Guideline for last fishing day will be September 25 (Fry to be planted into Tahltan and/or Tuya lakes)	(72% green egg – fry, 28% fry–smolt, 7% smolt–adult) Fry planted into Tahltan Lake	Thermal mark
		Expected Total Production[3] 70,560	

[1] Egg take target will be based on actual escapement into Tahltan Lake, and matching enhanced smolt production to expected wild smolt production.
[2] Survivals based on historical data starting with brood year 1989.
[3] Prior year SEPPs were developed to comply with Chapter 1, paragraph 3(a)(1)(iii)(a). Those estimates were based upon assumed survivals different than observed long-term averages as well as the intended stocking of both Tahltan and Tuya lakes. The Panel recognizes the result of the SEPP is unlikely to achieve 100,000 enhanced sockeye salmon as identified in Chapter 1, paragraph 3(a)(1)(iii)(a) because: Canada is withdrawing Tuya Lake for stocking in 2019; biological constraints associated with enhancement of Tahltan Lake; the practicality and achievability of Tahltan Lake sockeye salmon egg takes; and there being no other identified enhancement projects.

Table 9. The 2018 TEPP. Reviewed and approved by the Panel at the February 2018 annual meeting.

2018 TEPP			
Enhancement Project	**Activities**	**Expected Production**	**Technique to document production**
Tatsamenie Lake	Egg take with target of 30% of available broodstock ~ goal of up to 2.5 million. (500K eggs) (400K fry for in-lake extended rearing and remainder for lake out-planting)	6,936 adults from out-planting (5.1% green egg – smolt, 6.8% smolt -adult)[1] 2,541 adults from ext. rearing (36.3% green egg – smolt,, 1.4% smolt - adult)[1]	Thermal mark
Trapper Lake	Egg take with target of 250,000. Contingent on barrier removal.	1,400 adults (4% green egg – smolt, 7% smolt – adult)[2]	Thermal mark
		Expected Total Production 10,877	

[1] Estimates based on Extended Rearing experiment period 2008-2012.
[2] Estimate made without Trapper Lake specific survival rates.

The agreement has a provision for possible adjustments in harvest shares if either Party were to intentionally depart from the SEPP. In February 2018, the Panel reviewed the parties' actions relative to the 2013 SEPP and determined no intentional deviation was made.

In January 2018, the Panel reviewed the 2016 SEPP (Table 10) and TEPP (Table 11) results, as well as received an update on activities from the 2017 SEPP (Table 12) and TEPP (Table 13) to date.

Table 10. The 2016 SEPP results.

Enhancement Project	**SEPP**	**Actual**
Tahltan Lake	• Egg take with target of 4.91 million • Guideline for last fishing day will be September 25. (Fry to be planted into Tahltan and/or Tuya lakes)	• Canada revised egg-take target to 5.0million eggs to match wild smolt production in Tahltan Lake. • 5.3 million eggs were collected. • Last fishing day was September 23. • 1 incubator lost to IHNV (174K) • 3.1 million fry released in Tahltan Lake. • No fry released in Tuya Lake.

Table 11. The 2016 TEPP results.

Enhancement Project	Stated Goals	Actual
Tatsamenie Lake	• Egg-take goal of 2,000,000 eggs, including 225,000 for extended rearing.	• Record high weir escapement 32,934. • 1.8 million eggs collected. • One incubator lost to IHNV (89,000 fry). • 1.0 million fry directly released in lake. • 183,000 extended rearing fry placed in 4 in-lake net pens; 149,000 fry released into the lake; 38,000 fry lost to IHNV (1 net pen infected). • Onshore rearing water source was lost.
Trapper Lake	Egg take with target of 250,000. Contingent on barrier removal.	• 277,000 eggs collected. • 212,000 fry released to lake.

Table 12. The 2017 SEPP results. (as of March 2018).

Enhancement Project	SEPP	Actual
Tahltan Lake	• Egg take with target of 5.0 million • Guideline for last fishing day will be September 25. (Fry to be planted into Tahltan and/or Tuya lakes)	• Canada revised egg-take target to 3.72 million eggs to match wild smolt production in Tahltan Lake. • An estimated 3,7200,000 eggs collected. • Last fishing day was on September 21st. • Fry Release pending

Table 13. The 2017 TEPP results. (as of March 2018).

Enhancement Project	TEPP	Actual
Tatsamenie Lake	• Egg take goal of 2,000,000 eggs, including 225,000 for extended rearing.	• High weir escapement (Approx 27,000). • An estimated 2,030,000 eggs collected. • Fry Release pending
Trapper Lake	• Egg take with target of 250,000. Contingent on barrier removal.	• 290,000 eggs collected. • Fry release pending.

A number of assessment projects are conducted to monitor the recipient lakes (e.g. plankton, water chemistry) and the survival of out planted fry (e.g. smolt enumeration, fry sampling). A summary of the enhancement field and incubation projects is presented in Appendix A. 4.

Fry Plants

Fry plants from the 2017 transboundary sockeye salmon egg-takes are scheduled to occur in May, and possibly June, 2018. It is expected the following number of sockeye salmon fry will be out-planted based on estimated fry on hand at Snettisham Hatchery as of March 2018:

Stikine drainage:	Tahltan Lake: All fry from the 2017 egg take will be transported to Tahltan Lake (3,047,000)
Taku drainage:	Tatsamenie Lake: 1,303,000 total fry are available: 219,000 fry for extended onshore rearing; 1,384,000 fry released directly into the lake as unfed fry.
	Trapper Lake: All fry from the 2017 egg take will be transported to Trapper Lake (210,345).

At Tahltan Lake, the plan is to transport fry on several flights during the period from May 20 to May 30 pending ice free lake conditions. Fry will be held for approximately 24 hours in net pens for observations.

At Tatsamenie Lake, the plan is to transport fry on several flights during the last two weeks of May pending ice free lake conditions. The 2018 extended rearing program will involve holding and feeding fry from May 25–June 21 approximately pending ice out conditions. Cap troughs are not able to be used in 2018 due to water supply changes resulting from the stream establishing a new course away from the rearing site. Extended rearing designated fry will be transported to the lake on or near May 25 at 0.5 grams. The fry will be reared in four lake net pens, the same pens as previously used for the latter period of the extended rearing conducted in 2008-2017 after the initial cap trough rearing was complete. Currently, a larger mesh size is being sought to use upon receipt of the fry to mitigate potential stresses to fry by increasing water exchange rates. The fed fry will be released on June 21 at a site located in the mid lake area (pelagic zone) approximately 2 km upstream from the outlet of the lake on or near June 21. The fry that are not subject to the grow-out experiment will be released near shore at various sites within the north section of the lake.

Egg Take Goals

Target sockeye egg takes for the fall of 2018 are as follows:

<u>Tahltan Lake</u>

- Up to 5.0 million eggs or a maximum of 30% of available female escapement.
- Final egg take target to be determined inseason based on actual escapement into Tahltan Lake, and matching enhanced smolt production to expected wild smolt production. In consideration of the desire to minimize disturbance of natural spawning at the adult collection sites, the guideline for the last date that eggs will be collected at Tahltan Lake is September 25.

Tatsamenie Lake

- Up to 2.5 million eggs or a maximum of 30% of available female escapement.

- A total of 400,000 fry will be used in the Tatsamenie extended rearing project with the remainder going to direct lake out planting.

Little Trapper Lake

- Up to 500 thousand eggs. Contingent on barrier removal.

King Salmon Lake

- No egg take is planned.

- Carcass sampling to be completed to assess proportion of enhanced return form previous egg take efforts

GENETIC STOCK IDENTIFICATION PROJECTS

Harvests of transboundary salmon fisheries are subject to the harvest sharing agreement outlined in Annex IV of the PST, and thus stock composition estimates are critical to document compliance with these agreements, as well as to reconstruct runs of wild stocks, estimate the return of enhanced fish, forecast upcoming returns, and support sustainable management. Genetic stock identification is the preferred method for estimating stock contributions in fisheries in and near the Stikine, Taku, and Alsek rivers, and has been in use for transboundary management for sockeye salmon since 2011 and for Chinook salmon since 2005. Members of the TTC met in April 2013 to define agreed-upon reporting groups for each species for Taku and Stikine River fisheries (Table 14 and 15), and to define precision and accuracy goals (to be within 10% of the true mixture 90% of the time). Appendices C.1 and C.2 describes methods that the Parties use to estimate stock composition of Chinook and sockeye salmon in transboundary fisheries, as well as existing Chinook and sockeye salmon collections and identified gaps. Baseline collection priorities for 2018 are listed in Appendix Table A.5.

Table 14. Chinook salmon GSI reporting groups agreed upon by the TTC in April 2013 for fisheries occurring in and near the Taku and Stikine rivers. Reporting groups under the "Treaty" management objective are those necessary for calculating the harvest sharing agreement outlined in Annex IV of the PST. Reporting groups under the "Transboundary" objective are those necessary for run reconstructions and forecasting upcoming returns.

Management Objective	Party	Fishery	Reporting Groups
Treaty	U.S., Canada	U.S. District 108, Inriver Stikine	*Stikine* *Other*
		U.S. District 111, Inriver Taku	*Taku* *Other*
Transboundary	U.S.	U.S. District 108	*Little Tahltan* *Stikine Other* *Non-Stikine*
		U.S. District 111	*Taku* *Other*
	Canada	Inriver Stikine	*Little Tahltan* *Stikine Other*
		Inriver Taku	*Taku*
Domestic (not PST)	U.S.	U.S. District 108	*Taku* *Stikine* *Andrews* *Southern SEAK* *Other*
		U.S. District 111	*Taku* *Stikine* *Andrews* *Other*
		Inriver Stikine	*Early (Little Tahltan, Tahltan, Christine)*[a] *Late (Verrett, Craig)*[a]
		Inriver Taku	*Early (Nahlin, Dudidontu, Tseta)*[a] *Mid (Nakina)*[a] *Late (Kowatua, Tatsatua)*[a]

[a]Indicates a Conservation Unit (CU) under Canada's Wild Salmon Policy.

Table 15. Sockeye salmon GSI reporting groups agreed upon by the TTC in April 2013 for fisheries occurring in and near the Taku and Stikine rivers. Reporting groups under the "Treaty" management objective are those necessary for calculating the harvest sharing agreement outlined in Annex IV of the PST. Reporting groups under the "Transboundary" objective are those necessary for run reconstructions, forecasting upcoming returns, and estimating returns of enhanced fish.

Management Objective	Party	Fishery	Reporting Groups
Treaty	U.S., Canada	U.S. District 106, 108; Inriver Stikine	*Stikine* *Other*
		U.S. District 111, Inriver Taku	*Taku* *Other*
Transboundary	U.S.	U.S. District 106, 108	*Tahltan* *Stikine Other* *Non-Stikine*
		U.S. District 111	*Tatsamenie* *Taku Lakes Other* *Taku River-type* *Non-Taku*
	Canada	Inriver Stikine	*Tahltan* *Stikine Other*
		Inriver Taku	*Tatsamenie* *Taku Lakes Other* *Taku River-type*
Domestic (not PST)	U.S.	U.S. District 106, 108	*Tahltan* *Stikine Other* *McDonald* *SEAK* *Other*
		U.S. District 111	*Tatsamenie* *Taku Lakes Other* *Taku River-type* *Speel* *SEAK* *Other*
		Inriver Stikine	*Chutine*[a] *Christina*[a] *Tahltan*[a] *Mainstem*[a] *Iskut*
		Inriver Taku	*Kuthai*[a] *Little Trapper/Trapper*[a] *Tatsamenie*[a] *Tatsatua/Little Tatsamenie*[a] *King Salmon*[a] *Taku River-type*[a]

[a]Indicates a Conservation Unit (CU) under Canada's Wild Salmon Policy.

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APPENDIX A: ANTICIPATED TRANSBOUNDARY PROJECTS, 2018

Proposed projects regarding the Stikine, Taku, and Alsek salmon stocks are summarized in Appendix A. 1 to A. 5. For each project listed, information regarding the dates of operation, primary objectives, and agency roles are described. Contacts are listed at the bottom of each table. The agencies will endeavor to achieve the proposed field projects detailed below. The agencies acknowledge these projects or elements thereof are subject to funding shortfalls from time to time. In the event there is a deviation from the elements described the agency will provide advance notification, where possible, to the other agency.

Appendix A. 1. Proposed field projects, Stikine River 2018.

Project/ Approx. Dates	Function	Agency	Involvement
Stikine Chinook Mark–Recapture			
5/3 – 7/7	• Tag through June 1 and re-evaluate whether to continue tagging; a target of 445 Stikine River large Chinook salmon captured from Kakwan Point drift net site.	ADF&G/ DFO/ TFN	All aspects except tag recovery
	• Collect GSI samples (from each fish tagged) separated by week; provided to DFO.	ADF&G/ DFO/TFN	
	• Record spaghetti tags and CWTs from Canadian fisheries (non-directed), Little Tahltan weir (record only) and from Iskut tributaries (Verrett). Tags may also be recovered from other spawning sites (e.g. Shakes, Craig, Tashoots).	DFO/TFN	All aspects
	• Sacrifice all adipose-clipped nonlarge Chinook salmon and wand large Chinook salmon with missing adipose for presence/absence of CWT; samples to go to ADF&G lab.	ADF&G/ DFO/TFN	All aspects
Tahltan Lake Smolt Estimation			
5/2 – 6/15	• Enumerate Tahltan Lake sockeye salmon smolts.	DFO/TFN	All aspects
	• Sample up to 800 smolts for age, size, and otoliths.		

Appendix A. 1. (continued)

Project/ Approx. Dates	Function	Agency	Involvement
Upper Stikine Sampling			
6/17 – 8/17	• Sample up to 81 sockeye salmon / week for matched ASL and otoliths from the TFN and commercial fishery at Telegraph Cr. Sample in proportion to the run for a season total of 600 samples.	TFN/DFO	Collect samples, data collection, and data analysis
	• Opportunistically sample Chinook salmon for ASL, CWTs, and spaghetti tags. ASL all tagged/marked Chinook salmon.	TFN/DFO	Sampling and data analysis
Little Tahltan Chinook Salmon Enumeration			
6/21 – 8/9	• Enumerate Little Tahltan Chinook salmon using a video weir located at the mouth of the river.	DFO/TFN	All aspects
	• Record presence/absence of spaghetti tags and adipose fins.	DFO/TFN	All aspects
	• Record estimated lengths through video counter.	DFO/TFN	All aspects
Test Fishery in Lower Stikine			
6/17 – 8/25	• Conduct test fishery for sockeye salmon to assess run size and run timing.	DFO/TFN	All aspects
	• Chinook salmon caught in the test drift net shall be released. In the test set net sample any Chinook salmon for tags/tag loss, CWTs and for ASL. CWT samples to go to DFO lab in Vancouver, unless other arrangements are made.	DFO	All aspects
	• Sample up to 400 sockeye salmon per week for otoliths matched with scales and for females, with egg diameters. Transfer otolith samples to ADF&G weekly for inseason processing.	DFO/TFN, ADF&G	All aspects Otolith analysis

Appendix A. 1. (continued)

Project/ Approx. Dates	Function	Agency	Involvement
Test Fishery in Lower Stikine continued			
	• Sample all coho salmon (caught in sockeye test fishery) for CWTs and ASL; CWT samples to go to DFO lab in Vancouver, unless other arrangements are made.	DFO/TFN	All aspects
Commercial Inriver Fishery Stock ID Sampling			
5/6 – 6/17	• In the unlikely event of a directed commercial Chinook salmon fishery, commercial harvest sampling to include up to 200/week for ASL and secondary marks (operculum punch), plus observe 50% of the harvest for adipose clips. Collect heads from all clipped fish observed. CWT samples to go to DFO lab in Vancouver, unless other arrangements are made. Collect up to 200 GSI samples/week. U.S. port samplers will sample a portion of the lower river harvest delivered to Wrangell-Petersburg.	DFO/TFN/ ADF&G	All aspects Harvest delivered in U.S.
6/26 – 8/25	• Randomly sample the commercial harvest of sockeye salmon to include 200/week for matched ASL, otolith, egg-diameter, and GSI, and another 200/week for egg-diameter and length. Otolith deliveries to be arranged with ADF&G and will require delivery by boat to Wrangell. Analyze 60 to 200 sockeye otolith samples per week.	DFO/TFN, ADF&G	All aspects, Otolith analysis
	• Incidental commercial catch sampling for Chinook salmon during targeted sockeye salmon fishery to include up to 200/week for ASL and secondary marks (operculum punch), plus observe >50% of the catch for adipose clips. Collect heads and ASL information from all clipped fish observed. CWT samples to go to DFO lab in Vancouver, unless other arrangements are made. Collect 200 GSI samples/week.	DFO	All aspects
8/26 – 9/15	Sample all adipose clipped coho for CWTs and ASL; annual commercial fishery sampling target is 500 for ASL, plus observe >50% of the catch for adipose clips. CWT samples to go to DFO lab in Vancouver, unless other arrangements are made.	DFO/TFN	All aspects

Appendix A. 1. (continued)

Project/ Approx. Dates	Function	Agency	Involvement
Districts 106 &108 Stock ID Sampling			
6/24 – 7/21	• Sample a minimum of 20% of Chinook salmon harvest for CWTs as per PSC coastwide standard; sample Chinook salmon for ASL (ASL sampling goals are 600 for the season for D108). GSI sampling targets for Chinook salmon in D108 commercial fisheries are 120/week for directed fisheries and 80/week for nondirected fisheries. •	ADF&G	All aspects
6/17 – 8/11	• Collect 300 sockeye salmon samples/week for ASL, GSI, and otoliths matched samples in drift gillnet fisheries in Subdistrict 106-41 and 520 sockeye salmon samples/week in District 108.	ADF&G	All aspects
6/17 – 10/20	• Sample a minimum 20% of coho catches in the drift gillnet fisheries in each district for CWT and sample 600 coho for ASL (sampling goals are 600 per district for the season).	ADF&G	All aspects
Chinook Salmon Surveys			
7/25 – 8/19	• Survey Chinook salmon in Andrew Creek and sample a minimum 200 Chinook salmon for ASL, spaghetti tags, and CWTs. Conduct aerial and foot surveys.	ADF&G	All aspects
8/1 – 8/10	• Conduct aerial surveys on Verrett, Tahltan, and Little Tahltan rivers, and Christina, Beatty, and Bear creeks.	DFO/TFN	All aspects
Tahltan Lake Salmon Enumeration			
7/4 – 9/15	• Enumerate Tahltan Lake sockeye entering the lake at weir.	DFO/TFN	All aspects
	• Live-sample a minimum of 600 sockeye for ASL and an additional 100 fish per day for sex.	DFO/TFN	All aspects
	• Endeavour to conduct terminal fishery at Tahltan Lake if escapement targets are likely to be exceeded.	DFO/TFN	All aspects

Appendix A. 1. (continued)

Project/ Approx. Dates	Function	Agency	Involvement
Tahltan Lake Salmon Enumeration Continued			
	• If escapement goal is projected to be achieved, lethally sample up to 400 sockeye for ASL and otoliths from the weir (400 fish will also be sampled from the broodstock take).	DFO/TFN	All aspects
	• Sample available postspawn Chinook salmon in Johnny Tashoots Creek for ASL, spaghetti tags, and CWTs. Collect GSI baseline samples to complete inventory.	DFO/TFN	All aspects
Chinook and Coho Coded Wire Tagging			
4/16 – 5/30	• Targets are 40k Chinook smolts and 10k coho smolts.	ADF&G/ DFO/TFN	All aspects
	• Sample every 100th Chinook and 115th Coho smolt for length (FL).	ADF&G/ DFO/TFN	All aspects
Sport Fishery Chinook Salmon Sampling			
7/1 – 8/7	• Survey anglers in the Tahltan River subject to recreational fishery opening (and sample FSC fish at same sites).	TFN/DFO	All aspects
6/1 – 7/21	• Conduct catch sampling program for Petersburg and Wrangell sport fisheries and sample for CWTs, GSI, and ASL. Target is to sample 30% of catch for CWTs. Conduct postseason surveys (statewide survey) to obtain harvest data.	ADF&G	All aspects
Coho and Sockeye Salmon Aerial Surveys			
9/10, 11/04	• Enumerate Stikine sockeye and coho salmon spawning abundance within index areas of the Canadian portion of the river.	TFN	All aspects

Appendix A. 1. (continued)

Contacts: **Stikine Projects**		
Aaron Foos/Johnny Sembsmoen	(DFO)	All DFO projects.
Steve Smith/Bill Waugh	(DFO)	All DFO projects.
Cheri Frocklage/Kerry Carlick	(TFN)	Inriver sampling projects.
Phil Richards/Troy Jaecks	(ADF&G)	Chinook tagging and surveys; Andrew Creek sampling.
Julie Bednarski/Jim Andel	(ADF&G)	106&108 samples, stock assessment.

Canadian staff associated with Stikine projects that may be crossing the Canadian/U.S. border:

Johnny Sembsmoen, Aaron Foos, Steve Smith, Sean Stark, Paul Vecsei, Ian Boyce, Mel Besharah, Mathieu Ducharme, Cheri Frocklage, Kerry Carlick, Kyle Inkster, Jared Dennis, Drew Inkster, Michael Nole, John Nole, Sheldon Dennis, Fabian Vance.

U.S. staff associated with Stikine projects that may be crossing the Canadian/U.S. border:

Troy Thynes, Kevin Clark, Sara Gilk-Baumer, Kyle Shedd, Julie Bednarski, Tom Kowalske, Phil Richards, Stephen Todd, Ed Jones, Chris Ford, Caitlin Cardinell, Kiana Putman, Larry Derby, Clay Culbert, Randy Peterson, Laura Junge, Jeff Williams, Patrick Fowler, Andy Piston, Bob Clark, John H. Clark, Lowell Fair, Scott Forbes, Judy Lum, Jeff Nichols.

Appendix A. 2. Proposed field projects, Taku River, 2018.

Project/Dates	Function	Agency	Involvement
Marking Program			
Mid-May	• Set up camp, build and place fish wheels.	ADF&G/ TRTFN/ DFO	All aspects
4/28 – 10/3	• Fish wheel operation (6/1– ~ early Sept)—wheels will be operated at least 15 hours in daylight with hourly fish wheel checks. • Drift gillnet operation (4/28 – 6/30); 4 wet net hours per day • Mark all Chinook, sockeye, and coho salmon with spaghetti tags. Tagging goals for each species are: - Chinook salmon: o Spaghetti tag xxx large, xxx medium and xxx small o 25 – 30% precision goal for season; o Radio tag 250 large Chinook salmon (drift gillnet); o Collect GSI samples from all large fish (delivered to Canada) o Sample all Chinook salmon for ASL o Sacrifice all adipose-clipped nonlarge Chinook salmon and wand large Chinook salmon with missing adipose for presence/absence of CWT; CWT samples to go to ADF&G lab. - sockeye salmon: o Spaghetti tag 2,000 – 4,000; o Sample up to 260/week for ASL o Precision goals 50% for weekly inseason estimates, 10% for postseason; o Fish wheels spinning by 6/1 o Radio tag at least 400 caught in fish wheels. - coho salmon: o Spaghetti tag 2,500 o Sample 600 per season for ASL o 25% precision goal for season (95% relative precision). o Sacrifice all adipose-clipped coho salmon caught for CWTs; CWT samples to go to ADF&G lab.	ADF&G TRTFN DFO	5 staff 1 staff 2 staff

Appendix A. 2. (continued)

Project/Dates	Function	Agency	Involvement
Salmon Telemetry			
4/28 – 7/1	• 10 towers operated at various sites to account for fish behavior and inform MR estimates; 6 river and 4 lake sites. Towers will remain in place until all fish have passed.	ADF&G/ DFO	All aspects
5/15 – 10/15	• weekly flights to determine radio tag locations within the drainage.		
Smolt Tagging – CWT lower Taku			
4/4 – 5/30	• CWT goals are 40,000 Chinook and 30,000 coho salmon smolt.	ADF&G/ DFO	All aspects ADF&G
	• Sample every 100th Chinook and 115th coho salmon smolt for length (FL) and weight.	ADF&G	4 staff
	• Sample 300 coho salmon smolt for age (12–15 scales per fish).	DFO TRTFN	2 staff 1 staff
Canadian Aboriginal Fishery Monitoring			
5/1 – 10/11	• Collect and record FN catch information.	TRTFN	All aspects
Nahlin Sonar			
6/02 – 7/28	• Enumerate large Chinook salmon using sonar in lower Nahlin River.	DFO	All aspects
Nahlin/Tseta Sampling			
7/25 – 8/7	• Sample Chinook salmon in Nahlin River and Tseta Creek for ASL, spaghetti tags/tag loss, and CWT. CWT samples to go to DFO or ADF&G lab.	ADF&G/ DFO/ TRTFN	All aspects
Dudidontu Sampling			
8/5 – 8/15	• Sample Chinook in Dudidontu River for ASL, CWTs, and spaghetti tags/tag loss. CWT samples to go to DFO or ADF&G lab.	ADF&G/ DFO/ TRTFN	All aspects
Nakina Chinook Salmon Escapement Sampling			
8/1 – 8/26	• Operate the Chinook salmon carcass weir on the Nakina River.	TRTFN	All aspects
	• Sample all Chinook salmon for ASL, spaghetti tags/tag loss, and CWT. CWT samples to go to DFO lab.	TRTFN	All aspects
	• Opportunistically obtain GSI samples from Nakina sockeye salmon (target is 200 over the long term).	TRTFN	All aspects

Appendix A. 2. (continued)

Project/Dates	Function	Agency	Involvement
Canadian Commercial Fishery Sampling			
6/26 – 10/10	• Collect and record commercial harvest information; forward to ADF&G Juneau via Whitehorse.	DFO	All aspects
	• Sample Chinook, sockeye, and coho salmon for ASL and secondary marks; 200 per week for sockeye; 520 per season for coho salmon; 50–150 scale samples per week for Chinook salmon. Examine all Chinook and coho salmon harvest for adipose clips and secondary marks.	DFO	All aspects
	• Sample 125 sockeye salmon per week for GSI samples.	DFO	All aspects
	• Collect 192 sockeye salmon otolith samples per week to estimate contribution of enhanced fish; send otolith samples to ADF&G for processing via Canyon Island.	DFO	All aspects
	• Inseason sockeye salmon otolith analysis.	ADF&G	All aspects
	• Collect and record all spaghetti tags and radio tags caught in commercial fisheries.	DFO	All aspects
	• Collect salmon roe as required for CWT program.	DFO	All aspects
Canadian Coho Assessment Fishery			
9/16 – 10/12	• Capture and inspect up to 500 coho salmon per week for spaghetti tags and CWTs. Sample up to 520 coho salmon for the season for ASL and tag scars. Sample 125 per week for GSI. CWT samples to go to DFO or ADF&G lab.	DFO	All aspects
District 111 Fishery Sampling			
6/17 – 10/20	• Collect and record commercial harvest information and all spaghetti and radio tags; forward to DFO Whitehorse via Juneau.	ADF&G	All aspects
	• Sample a minimum of 20% of Chinook and coho salmon harvests for CWTs/ASL.	ADF&G	All aspects
	• Sample commercial Chinook salmon harvest for GSI samples; targets are 120/week for directed and 80/week for nondirected incidental harvest.	ADF&G	All aspects

Appendix A. 2. (continued)

Project/Dates	Function	Agency	Involvement
District 111 Fishery Sampling Continued			
	• Collect 320 matched GSI/ASL/otolith samples per week from sockeye salmon with subdistrict specific goals.	ADF&G	All aspects
Kuthai Sockeye Sampling			
7/6 – 9/5	• Operate the adult sockeye salmon weir at Kuthai Lake; enumerate and sample for ASL and spaghetti tag loss (750 samples) and recover spaghetti tags.	TRTFN	All aspects
King Salmon Weir			
7/7 – 9/6	• Operate the adult sockeye salmon weir at King Salmon Lake; enumerate and sample for ASL-spaghetti tag loss (750 samples), recover spaghetti tags.	TRTFN	All aspects
Aerial Chinook surveys			
7/21 – 8/25	• Aerial surveys of spawning Chinook salmon in the Nakina, Nahlin, Dudidontu, Tatsatua, Kowatua, and Tseta rivers.	ADF&G	All aspects
Sport Fishery Sampling (Marine)			
6/15 – 7/9	• Conduct harvest sampling program in the Juneau sport fishery and sample for CWTs, ASL, and GSI. Target is to sample 20% of harvest for CWTs. Conduct postseason surveys (statewide survey) to obtain harvest data.	ADF&G	All aspects
Nakina Chinook Fishery Monitoring			
6/14 – 7/15	• Monitor FSC and Recreation Fishery.	TRTFN/DFO	All aspects
Little Trapper Weir			
7/20 – 8/31	• Enumerate adult sockeye salmon through weir and sample for ASL, spaghetti tag loss (750 samples), and recover spaghetti tags.	DFO	All aspects

Appendix A. 2. (continued)

Project/Dates	Function	Agency	Involvement
Tatsamenie Sockeye Weir			
8/3 – 10/5	• Enumerate adult sockeye salmon through weir and sample for ASL, spaghetti tag loss (750 samples), and recover spaghetti tags. 400 broodstock will be sampled for ASL and matched otoliths.	DFO	All aspects
Tatsamenie Area Chinook sampling			
9/1 – 10/1	• On Tatsatua Creek between Tatsamenie and Tatstua Lakes, sample Chinook salmon for ASL, spaghetti tags/tag loss, and CWTs. CWT samples to go to DFO lab.	DFO	All aspects
8/20 – 9/16	• On Tatsatua Creek below Tatsatua Lake, operate a carcass weir and sample postspawn Chinook in and sample all fish recovered for ASL, spaghetti tags/tag loss, and CWTs. CWT samples to go to DFO lab.	DFO/TRTFN	All aspects
Kowatua Creek Sampling			
9/1 – 10/1	• On Kowatua Creek below Little Trapper Lake, sample all postspawn Chinook for ASL, spaghetti tags/tag loss, and CWTs. CWT samples to go to DFO lab.	DFO	All aspects

Contacts:	**Taku Projects**		
	Ed Jones	(ADF&G)	Smolt tagging, adult Chinook escapement sampling
	Jim Andel	(ADF&G)	Canyon Island adult tagging
	Julie Bednarski	(ADF&G)	All ADF&G Com Fish Research Programs
	Phil Richards	(ADF&G)	Smolt tagging, adult Chinook escapement samplingChinook surveys
	Jeff Williams	(ADF&G)	Smolt tagging, adult Chinook escapement samplingChinook surveys
	Sara Gilk-Baumer	(ADF&G)	Genetics
	Aaron Foos	(DFO)	All DFO Taku Programs
	Bonnie Huebschwerlen	(DFO)	All DFO Taku programs
	Bill Waugh	(DFO)	All DFO Taku programs
	Steve Smith	(DFO)	All DFO Taku programs
	Cheri Frocklage	(TFN)	All TFN programs
	Mark Connor	(TRTFN)	All TRTFN programs
	Jason Williams	(TRTFN)	All TRTFN programs

Canadian staff associated with Taku projects that may be crossing the Canadian/U.S. border:

Aaron Foos, Bonnie Huebschwerlen, Ian Boyce, Steve Smith, Paul Vecsei, Mathieu Ducharme, Adam Brennan, Teresa Bachynski, Mark Connor, Richard Erhardt, Jason Williams, Chris Kirby, Trevor Williams, Shauna Yoemans, Logan Fraser, Keith Carlick, Trevor Carlick, Sabrina Williams, Brian Mercer.

U.S. staff associated with Taku projects that may be crossing the Canadian/U.S. border:

Julie Bednarski, Ed Jones, Sara Gilk-Baumer, Kent Crabtree, Dave Harris, Scott Forbes, Phil Richards, John Cooney, David Dreyer, Jeff Nichols, Randy Peterson, Jeff Williams, Zane Chapman, Andy Piston, Nathan Frost, Lee Close, Lars Sorensen, Stephen Todd, , Lowell Fair, Judy Lum, Kyle Shedd, Bob Clark, John H. Clark.

Appendix A. 3. Proposed field projects, Alsek River, 2018.

Project/Dates	Function	Agency	Involvement
Klukshu River Sampling			
6/5 – 10/06	• Enumerate Chinook, sockeye and coho salmon with a video enumeration programme.	DFO/CAFN	All aspects
	• Estimate sport and Champagne and Aishihik First Nations fishery catches.	DFO/CAFN	All aspects
	• Opportunistically collect ASL information from sockeye salmon caught by Champagne and Aishihik First Nations (up to 600 scale samples).	DFO/CAFN	All aspects
	• Opportunistically sample 200 Chinook salmon in each of sport and Champagne and Aishihik First Nations harvest for ASL (MEF), and CWTs.	DFO/CAFN	All aspects
	• Sample Chinook, sockeye, coho salmon opportunistically within the drainage for ASL.	DFO/CAFN	All aspects
Alsek Chinook/sockeye assessment			
	• Pilot project to enumerate Chinook and sockeye salmon on the Blanchard River using sonar	DFO/CAFN	All aspects
	• Alsek sockeye salmon run reconstruction using Dry Bay commercial fishery performance data; stock composition will be determined using GSI	DFO/CAFN	All aspects
Village Creek sockeye enumeration			
6/15 – 9/30	• Enumerate salmon (sockeye salmon focus) using a video enumeration program at Village Creek.	DFO	All aspects
Lower Alsek Sampling			
6/17 – 7/31	• Collect ASL, GSI data (sockeye 800, all Chinook) from Dry Bay commercial fishery.	ADF&G	All aspects
	• Analyze GSI samples to derive drainage wide escapement estimate sockeye salmon based on proportion Klukshu fish expansion of Dry Bay harvest.	DFO	All aspects

Contact:	**Alsek Projects**	
Aaron Foos	(DFO)	All DFO projects
Bill Waugh	(DFO)	All DFO projects
Steve Smith	(DFO)	All DFO projects
Sean Stark	(DFO)	All DFO projects
Nicole Zeiser	(ADF&G)	U.S. fisheries
Rick Hoffman	(ADF&G)	U.S. fisheries
Dixie Smeeton	(CAFN)	CAFN projects

Canadian staff associated with Alsek projects that may be crossing the Canadian/U.S. border:
Aaron Foos, Steve Smith, Sean Stark, Bill Waugh, Ian Boyce, Paul Vecsei, Dixie Smeeton, Monica Krieger.

U.S. staff associated with Alsek projects that may be crossing the Canadian/U.S. border:
Nicole Zeiser, Julie Bednarski, Rick Hoffman, Matt Catterson.

Appendix A. 4. Proposed enhancement projects for Transboundary Stikine and Taku rivers, 2018.

Project	Function	Agency	Involvement
All Projects, Egg Collection and Transport, Fry Releases			
2/1 – 5/15	• Acquire Canadian permitting regarding egg and fry transport •	DFO	All aspects
Tahltan Lake Enhancement Project			
5/5 – 6/20	• Enumeration and sampling of smolts from Tahltan Lake (Stikine River, in Canada) and collection of otolith samples to determine planted contribution.	DFO	All aspects
5/15 – 6/30	• Backplant sockeye fry from Snettisham Hatchery into Tahltan Lake.	DIPAC/ ADF&G	All aspects
6/1 – 8/30	• Limnological samples from Tahltan Lake monthly.	DFO	All Aspects
8/24 – 10/05	• Collect up to 5.0 million sockeye eggs from Tahltan Lake and transport to Snettisham Hatchery in Alaska. (Dates are subject to onsite conditions).	DFO	Egg-take and transport
8/24 – 10/05	• Sample 200 male and 200 female adult sockeye from Tahltan Lake broodstock for otolith samples.	DFO	All aspects

Appendix A. 4. (continued)

Project	Function	Agency	Involvement
Tatsamenie Lake Enhancement Project			
5/10 – 8/30	• Sample smolt out-migration from Tatsamenie (Taku River, in Canada) and conduct mark-recapture program on smolt from Tatsamenie Lake, submit samples to DFO for otolith analysis.	DFO/Northern – funding	All aspects
5/24 – 5/30	• Back-plant sockeye fry from Snettisham Hatchery into Tatsamenie Lake.	DFO/DIPAC/ ADF&G	All aspects
5/25 – 6/21	• Onshore extended rearing - net pen rearing of ~ 225,000 sockeye fry. Expected growth from 0.5 g to 2.0 grams.	DFO/DIPAC/ Mercer and Assoc.	All Aspects
8/15 – 10/30	• Collect up to 30% available broodstock (up to 2.5 million sockeye eggs) from Tatsamenie Lake and transport to Snettisham Hatchery in Alaska.	DFO	Egg-take and transport
9/25 – 10/05	• Sample 200 male and 200 female adult sockeye from Tatsamenie Lake broodstock for otolith samples.	DFO	All aspects
Trapper Lake Enhancement			
6/1 – 9/30	• Egg Take of 500K for planting into Trapper Lake.	DFO/Northern Funding	All aspects
Salmon Egg Incubation			
9/1 – 6/15	• Incubation and thermal marking of juvenile sockeye (eggs & alevins) collected from transboundary lakes at the Snettisham Incubation Facility in Alaska.	DIPAC/ ADF&G	All aspects

<u>Canadian staff that may be crossing the Canadian/US border:</u>

Flight crew

<u>US staff that may be crossing the Canadian/US border:</u>

Snettisham Hatchery Staff, Eric Prestegard, Garold V. Pryor, and Lorraine Vercessi; flight crew from Ward Air airline.

Appendix A. 5. Genetic baseline collection priorities, 2018. (Baseline collections are opportunistic; no identified funding).

Drainage	Location	Priority	Agency
Adjacent Stikine Chinook baseline samples			
	Farragut	M	ADF&G/NMFS
	Bradfield	H	ADF&G/NMFS
	Harding	M	ADF&G/NMFS
Stikine Chinook baseline samples			
	Chutine	M	DFO
	Tuya	M	DFO
	Beatty Creek	M	DFO/ADF&G
	Bear Creek	H	DFO
	Johnny Tashoots Creek	H	DFO
	Craig	M	DFO
	Katete	L	DFO
	Stikine (above Chutine)	L	DFO
	Stikine (below Chutine)	M	DFO
	N. Arm (US section)	L	ADF&G
	Goat (US section)	L	ADF&G
	Alpine/Clear (US section)	L	ADF&G
	Kikahe (US section)	L	ADF&G
Stikine sockeye baseline samples			
	Tahltan Lake	M	DFO
	Stikine mainstem (look alike)	L	DFO
	Iskut (look alike)	L	DFO
	Christina Lake (lake spawners)	H	DFO
	Christina Lake (inlet spawners)	M	DFO
	Katete	M	DFO
Taku Chinook baseline samples			
	Yeth	H	DFO
	King Salmon	H	DFO
	Sloko	M	DFO
	mainstem Taku	L	DFO
	Sutlahine	L	DFO
	Inklin	L	DFO
Taku sockeye baseline samples			
	Taku Mainstem (look alike)	L	DFO/ADF&G
	Nakina	M	TRT
	Johnson (US section)	L	ADF&G
	Samotua	L	DFO
	Kuthai	H	DFO
	Little Trapper	H	DFO
Alsek Chinook baseline samples			
	Goat Creek	H	DFO
	Lofog Creek	L	DFO
	mainstem Tatshenshini (middle, i.e. Kudwat)	H	DFO
	mainstem Tatshenshini (lower)	H	DFO
	mainstem Tatshenshini (upper)	H	DFO
	mainstem Alsek	L	DFO
	Tweedsmuir		DFO

Appendix A. 5. (continued)

Project/Dates	Location	Priority	Agency
Alsek sockeye baseline samples			
	Blanchard Lake	H	DFO
	Takhanne River	H	DFO
	Goat Creek	M	DFO
	Mainstem Tatshenshini (lower)	H	DFO
	Tats Lake	M	DFO
	Detour Creek	L	DFO
	Stinky Creek	M	DFO
	Tweedsmuir	M	DFO
	Alsek mainstem	L	ADF&G
	Border Slough	M	DFO
	Tanis (US section)	L	ADF&G
	Basin (US section)	H	ADF&G
Adjacent Alsek baseline samples			
	Ahrnklin R.	L	ADF&G
	Akwe	L	ADF&G
	Italio	L	ADF&G
	Lost	M	ADF&G

GSI sampling protocol:

- the target sample size is 200 adult samples per population unless otherwise noted.
- the preferred tissue to sample is the axillary appendage. For baseline samples, each fish will be sampled for two appendages; one to be sent to the DFO lab and the other to the ADF&G lab. If only one appendage is sampled, that party's lab will subsample the existing tissue and send to the other lab. For fishery samples, each fish will be sampled for one axillary appendage which will be shared if requested.
- If opercular punches are taken, two punches will be taken from each fish, again one for each of the respective labs. To eliminate problems associated with potential delamination of punches in composite samples i.e. where punches from one population and/or location are all stored in one vial as has been the practice, opercular punches will now be stored in individual labeled vials.
- Axillary appendages and opercular punches will be stored in ethanol (full strength) or dried onto Whatman tissue paper and each sample appropriately labeled (date, location (**GPS**), species, number of samples, fixative and volume thereof, collector, contact name, agency, phone number).
- Although it is recognized that there are potential efficiencies in terms of effort, time, storage, shipping and archiving associated with using scale samples for GSI, this should not be a tissue of choice when obtaining fishery or other samples for GSI (e.g. out of a tote) but may be used as last resort.

APPENDIX B: TRANSBOUNDARY ENCHANCEMENT PRODUCTION PLANS, 2018

Appendix B. 1. Stikine Enhancement Production Plan 2018 (Signed by TBR Panel Chairs).

2018 SEPP			
Enhancement Project	**Activities**	**Expected Production[2]**	**Technique to document production**
Tahltan Lake	Egg take with target of 5.0 million eggs[1] Guideline for last fishing day will be Sept. 25 (Fry to be planted into Tahltan and/or Tuya lakes)	(72% green egg – fry, 28% fry-smolt, 7% smolt-adult) Fry planted into Tahltan Lake.	Thermal mark
		Expected Total Production[3] 70,560	

[1] Egg take target will be based on actual escapement into Tahltan Lake, and matching enhanced smolt production to expected wild smolt production.
[2] Survivals based on historical data starting with brood year 1989.
[3] Prior year SEPPs were developed to comply with Chapter 1, paragraph 3(a)(1)(iii)(a). Those estimates were based upon assumed survivals different than observed long term averages as well as the intended stocking of both Tahltan and Tuya lakes. The Panel recognizes the result of this SEPP is unlikely to achieve 100,000 enhanced sockeye salmon as identified in Chapter 1, paragraph 3(a)(1)(iii)(a) because: Canada is withdrawing Tuya Lake for stocking in 2018; biological constraints associated with enhancement of Tahltan Lake; the practicality and achievability of Tahltan Lake sockeye salmon egg takes; and there being no other identified enhancement projects.

[signature] Canada, TBR Panel Co-Chair — FEB 15, 2018 Date

[signature] U.S., TBR Panel Co-Chair — 2/15/18 Date

Appendix B. 2. Stikine Enhancement Production Plan 2013 Five-Year Review (Signed by TBR Panel Chairs).

2013 Stikine Enhancement Production Plan (SEPP) Overview and Results (5-year Review).

2013 SEPP			
Enhancement Project	**Activities**	**Expected Production**	**Actual**
Tahltan Lake	Egg take with target of 6 million eggs[1] Guideline for last fishing day will be Sept. 25 Fry to be planted into Tahltan and/or Tuya Lake(s)	100,000 adults (80% green egg – fry, 25% fry-smolt, 8% smolt-adult)	• Egg take of 4.22 million eggs • 2.07 million fry release to Tahltan Lake. • 0.462 million fry released to Tuya Lake • 0.370 million eggs lost to IHNV
		Expected Total Production 100,000	

Tahltan Lake Weir Escapement of 15,828.

[signature] FEB 15, 2018

Canada, TBR Panel Co-Chair — Date

[signature] 2/15/18

U.S., TBR Panel Co-Chair — Date

Appendix B. 3. Taku Enhancement Production Plan 2018 (Signed by TBR Panel Chairs).

2018 TEPP			
Enhancement Project	**Activities**	**Expected Production**	**Technique to document production**
Tatsamenie Lake	Egg take with target of 30% of available brood stock ~ goal of up to 2.5 million (500K eggs) (400K) fry for in-lake extended rearing and remainder for lake outplanting)	6,936 adults from out-planting (5.1% green egg – smolt, 6.8% smolt – adult) [1] 2,541 adults from ext. rearing (36.3% green egg – smolt, 1.4% smolt – adult) [1]	Thermal mark
Trapper Lake	Egg take with target of 500,000. Program continuation contingent on barrier removal.	1,400 adults (4% green egg – smolt, 7% smolt – adult)[2]	Thermal mark
		Expected Total Production 10,877	

[1] Estimates based on Extended Rearing experiment period 2008-2012.
[2] Estimate made without Trapper Lake specific survival rates.

[signature] FEB 15/2018

Canada, TBR Panel Co-Chair — Date

[signature] 2/15/18

U.S., TBR Panel Co-Chair — Date

Appendix B. 4. Stikine Enhancement Production Plan Compliance as determined by the Panel.

Compliance with Plan		**Harvest Sharing Arrangement**	
Year		**Year**	**Percent U.S./Canada**
2009	Yes	2014	50/50
2010	Yes	2015	50/50
2011	Yes	2016	50/50
2012	Yes	2017	50/50
2013	Yes	2018	50/50

APPENDIX C: GENETIC STOCK IDENTIFICATION METHODS, 2018

Appendix C. 1. Genetic stock identification methods for Chinook salmon stocks in the Transboundary rivers, 2018.

United States

The following methods are used by the ADF&G Gene Conservation Laboratory to estimate stock proportions of transboundary Chinook salmon harvested by commercial fishers in U.S. Districts 108 and 111 in Southeast Alaska.

Fishery Sampling

Chinook salmon were collected from commercial gillnet landings at processors in Southeast Alaska, and in the sport fishery by onboard participants and by creel census samplers. During sampling, Chinook salmon were selected without regard to size, sex, adipose fin-clip, or position in the hold. Axillary process tissue was dissected from sampled fish and placed in alcohol in 2ml cryovials or dried onto Whatman paper. Along with each individual sampled, basic information were recorded such as size, sex, date, vessel, and age (from scale samples). At the end of the fishery, samples were transported back to the ADF&G Gene Conservation Laboratory, Anchorage, for analysis. Associated data was archived as part of the ASL database maintained by ADF&G.

Representative tissue collections of individuals for mixture analysis were created by subsampling 1,600 large (> 659 mm MEF) individuals from the collected samples in proportions weighted by harvest in the ports and quadrants that comprise the mixture composition to be estimated. Because the PST applies to large Chinook salmon, only large Chinook salmon were included in the analysis. Where sufficient samples exist, the sample was randomly subsampled proportional to harvests. Target mixture sample sizes was 400 individuals to achieve acceptable levels of accuracy and precision. But due to the vagaries of fisheries and fishery sampling, target sample sizes were not always available for every stratum. Sample sizes smaller than the target could be analyzed, but strata represented by fewer than 100 individuals were pooled into larger groups for analysis whenever possible. If directed gillnet fisheries did not occur, commercial fishery samples were obtained by sampling Chinook salmon caught incidentally in sockeye gillnet fisheries in Districts 108 and 111.

Laboratory Analysis

Samples were assayed for DNA loci developed by the GAPS group for use in Treaty fisheries (Seeb et al. 2007). DNA was extracted from axillary process tissue using DNeasy®, 96-tissue kits (QIAGEN® Valencia CA). Polymerase chain reaction (PCR) was carried out in 10 ul reaction volumes (10 mM Tris-HCl, 50 mM KCl, 0.2 mM each dNTP, 0.5 units Taq DNA polymerase [Promega, Madison, WI]) using an Applied Biosystems (AB, Foster City CA) thermocycler. Primer concentrations, $MgCl_2$ concentrations and the corresponding annealing temperature for each primer are available in Seeb et al. 2007. PCR fragment analysis was done on an AB 3730 capillary DNA sequencer. A 96-well reaction plate was loaded with 0.5 ul PCR product along with 0.5 ul of GS500LIZ (AB) internal lane size standard and 9.0 ul of Hi-Di (AB). PCR bands were visualized and separated into bin sets using AB GeneMapper software v4.0. All laboratory analyses followed protocols accepted by the CTC.

Genetic data was collected as individual multilocus genotypes for the 13 microsatellite loci currently included in the CTC standardized baseline. According to the convention implemented by the CTC, at each locus, a standardized allele is one that has a recognized holotype specimen from which the standardized allele can be reproduced using commonly applied fragment analysis techniques. By the process of sizing the alleles from the holotype specimens, any individual laboratory should be able to convert allele sizes obtained in the laboratory to standardized allele names. Genotype data were stored as GeneMapper (*.fsa) files on a network drive that is backed up nightly. Long-term storage of the data was in an *Oracle* database (*LOKI*) on a network drive maintained by ADF&G computer services.

Quality Control

Several measures were implemented to insure the quality of data produced. First, each individual tissue sample was assigned a unique accession identifier. At the time DNA is extracted or analyzed from each sample, a sample sheet was created that linked each individual sample's code to a specific well number in a uniquely numbered 96-well plate. This sample sheet followed the sample through all phases of the project, minimizing the risk of misidentification of samples through human-induced errors. Second, genotypes were assigned to individuals using a system in which two individuals score the genotype data independently. Discrepancies between the two sets of scores were then resolved with one of two possible outcomes: (1) one score was accepted and the other rejected, or (2) both scores were rejected and the score was blanked. Lastly, approximately 8% of the individuals, eight samples from each 96-well DNA extraction plate, were reanalyzed for all loci. This insures that the data were reproducible, and any errors created from the processing of individual plates were corrected.

Estimating Stock Compositions

Whenever possible, representative mixtures of individuals for GSI were created by subsampling individuals from the collected tissue samples in proportion to harvest by SW. The stock composition of fishery mixtures were estimated using the program BAYES (Pella and Masuda 2001). The Bayesian method of MSA estimates the proportion of stocks caught within each fishery using 4 pieces of information: 1) a baseline of allele frequencies for each population, 2) the grouping of populations into the reporting groups desired for MSA, 3) prior information about the stock proportions of the fishery, and 4) the genotypes of fish sampled from the fishery.

The baseline of allele frequencies for Chinook salmon populations was obtained from the Genetic Analysis of Pacific Salmon (GAPS) consortium baseline database. Version 3.0 of the CTC baseline contains allele frequencies from 357 populations contributing to PSC fisheries, ranging from the Situk River in Alaska to the Central Valley of California (Table C.1.1). A catalog of existing tissues and potential gaps in this baseline for transboundary applications is described in Table C.1.2. Reporting groups have been defined based upon transboundary management needs and meeting criteria set by the Gene Conservation Laboratory (Habicht et al. 2012). The reporting groups for these fisheries are: 1) Taku, 2) Andrew, 3) Stikine, 4) Southern Southeast Alaska, and 5) Other. At the request of the TTC, these reporting groups will be rolled up into the agreed-upon reporting groups. These reporting groups meet the minimum critical level of 90% correct allocation in repeated proof tests (Seeb et al. 2000). Results were noted if estimates do not meet the precision and accuracy guidelines set by the TTC in April 2013 (to estimate the proportion of mixtures within 10% of the true mixture 90% of the time).

The choice of prior information about stock proportions in a fishery (the prior probability distribution hereafter referred to as the prior) is important to the outcome of MSA (Habicht et al. 2012a). In this analysis, the estimated stock proportions from the previous year in a given stratum were used as the prior for that stratum across years. The prior information about stock proportions was incorporated in the form of a Dirichlet probability distribution. The sum of all prior parameters was set to 1 (prior weight), which is equivalent to adding 1 fish to each mixture (Pella and Masuda 2001).

For each fishery mixture, 5 independent Markov Chain Monte Carlo (MCMC) chains of 40,000 iterations were run with different starting values and discarded the first 20,000 iterations to remove the influence of the initial start values. In order to assess the among-chain convergence, the Gelman-Rubin shrink factors computed for all stock groups in BAYES were examined (Gelman and Rubin 1992). If a shrink factor for any stock group in a mixture was greater than 1.2, the mixture was reanalyzed with 80,000 iterations. If a mixture still had a shrink factor greater than 1.2 after the reanalysis, results from the 5 chains were averaged and a note made in the results. We combined the second half of the 5 chains to form the posterior distribution and tabulated mean estimates, 90% credibility intervals, and standard deviations from a total of 100,000 iterations.

Canada

The following methods are used by the DFO's Molecular Genetics Laboratory, Pacific Biological Station, Nanaimo, B.C. to estimate stock proportions of transboundary Chinook salmon harvested by inriver fisheries on the Alsek, Taku, and Stikine rivers.

Laboratory Analysis
Once Chinook salmon genomic DNA was available, surveys of variation at the following 15 microsatellite loci were conducted: *Ots100, Ots101, Ots104, Ots107* (Nelson and Beacham 1999), *Ssa197* (O'Reilly et al. 1996), *Ogo2, Ogo4* (Olsen et al. 1998), *Oke4* (Buchholz et al. 2001), *Omy325* (O'Connell et al. 1997), *Oki100* (Beacham et al.2008), *Ots2, Ots9* (Banks et al. 1999), *Ots201b, Ots211, Ots213* (Grieg et al. 2003). This panel of loci called "DFO plus 3" consists of the DFO markers plus three loci from the Genetic Analysis of Pacific Salmon (GAPs) consortium panel of markers. Microsatellites were size fractionated in an Applied Biosystems (ABI) 3730 capillary DNA sequencer, and genotypes were scored by GeneMapper software 3.0 (Applied Biosystems, Foster City, CA) using an internal lane sizing standard.

In general, polymerase chain (PCR) reactions were conducted in 10 µl volumes consisting of 0.06 units of Taq polymerase, 1µl of 30ng DNA, 1.5-2.5mM MgCl2, 1mM 10x buffer, 0.8mM dNTP's, 0.006-0.065µM of labeled forward primer (depending on the locus), 0.4µM unlabeled forward primer, 0.4µM unlabeled reverse primer, and deionized H2O. PCR was completed on an MJResearch™ DNA Engine™ PCT-200 or a DNA Engine Tetrad™ PCT-225. The amplification profile involved one cycle of 2 min @ 92°C, 30 cycles of 15 sec @ 92°C, 15 sec @ 52-60°C (depending on the locus) and 30 sec @ 72°C, and a final extension for 10 min @ 72°C. Specific PCR conditions for a particular locus could vary from this general outline. Further information on laboratory equipment and techniques is available at the Molecular Genetics Laboratory website at http://www.pac.dfo-mpo.gc.ca/science/facilities-installations/pbs-sbp/mgl-lgm.

Baseline Populations
Mixture analysis required microsatellite analysis of Chinook salmon from drainage specific baselines within Canada, consisting of 11 populations/sampling sites for the Stikine River, six populations/sampling sites for the Alsek River, and nine populations/sampling sites for the Taku River (Table C.1.3). A catalog of existing tissues and potential gaps in this baseline for transboundary applications is described in Table C.1.2. All annual baseline samples available for a specific sample location were combined to estimate population allele frequencies, as was recommended by Waples (1990).

Estimation of Stock Composition
Analysis of fishery samples was conducted with a Bayesian procedure (BAYES) as outlined by Pella and Masuda (2001). Each locus was assumed to be in Hardy-Weinberg equilibrium, and expected genotypic frequencies were determined from the observed allele frequencies and used as model inputs. For BAYES, the initial FORTRAN-based computer program as outlined by Pella and Masuda (2001) required large amounts of computer analytical time when applied to stock identification problems with a baseline as comprehensive as employed in the current study. Given this limitation, a new version of the program was developed by our laboratory as a C-based program which is available from the Molecular Genetics

Laboratory website (Neaves et al. 2005). In the analysis, ten 20,000-iteration Monte Carlo Markov chains of estimated stock compositions were produced, with initial starting values for each chain set at 0.90 for a particular population which was different for each chain. Estimated stock compositions were estimated when all Monte Carlo Markov chains had converged producing a Gelman-Rubin coefficient < 1.2 (Pella and Masuda 2001). The last 1,000 iterations from each of the 10 chains were combined, and for each fish the probability of originating from each population in the baseline was determined. These individual probabilities were summed over all fish in the sample, and divided by the number of fish sampled to provide the point estimate of stock composition. Standard deviations of estimated stock compositions were also determined from the last 1,000 iterations from each of the 10 Monte Carlo Markov chains incorporated in the analysis.

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Appendix Table C.1.1. Chinook salmon coastwide baseline of microsatellite data used by the ADF&G Gene Conservation Laboratory. Location and reporting group details for each population by reporting groups, sample size, and collection dates. This baseline is used by ADF&G for GSI of Chinook salmon in U.S. Districts 108 and 111 fisheries of Chinook salmon. Reporting groups may be rolled up to correspond with those identified as necessary to meet transboundary management objectives.

	Reporting Group	Population	N	Collection Date
1	Other	Situk River	127	1988, 1990, 1991, 1992
2		Blanchard River	349	2000, 2001, 2002, 2003
3		Goat Creek	62	2007, 2008
4		Klukshu River	238	1987, 1989, 1990, 1991, 2000, 2001
5		Takhanne River	196	2000, 2001, 2002, 2003, 2008
6		Big Boulder Creek	138	1992, 1995, 2004
7		Tahini River--Macaulay Hatchery	77	2005
8		Tahini River	119	1992, 2004
9		Kelsall River	153	2004
10		King Salmon River	143	1989, 1990, 1993
11	Taku	Dudidontu River	233	2002, 2004, 2005, 2006
12		Kowatua Creek	288	1989, 1990, 2005
13		Little Tatsamenie River	684	1999, 2005, 2006, 2007
14		Little Trapper River	74	1999
15		Upper Nahlin River	132	1989, 1990, 2004
16		Nakina River	428	1989, 1990, 2004, 2005, 2006, 2007
17		Tatsatua Creek	171	1989, 1990
18	Andrew	Andrew Creek	131	1989, 2004
19		Andrew Creek–Crystal Hatchery	207	2005
20		Andrew Creek–Macaulay Hatchery	135	2005
21		Andrew Creek–Medvejie Hatchery	177	2005
22	Stikine	Christina River	164	2000, 2001, 2002
23		Craig River	96	2001
24		Johnny Tashoots Creek	62	2001, 2004, 2005, 2008
25		Little Tahltan River	126	2001. 2004
26		Shakes Creek	164	2000, 2001, 2002, 2007
27		Tahltan River	80	2008
28		Verrett River	482	2000, 2002, 2003, 2007
29	S. Southeast Alaska	Chickamin River	126	1990, 2003
30		King Creek	136	2003
31		Butler Creek	190	2004
32		Leduc Creek	43	2004
33		Humpy Creek	124	2003
34		Chickamin River–Little Port Walter H.	218	1993, 2005
35		Chickamin River–Whitman Hatchery	193	2005
36		Clear Creek	134	1989, 2003, 2004
37		Cripple Creek	141	1988, 2003
38		Gene's Lake	92	1989, 2003, 2004
39		Kerr Creek	151	2003, 2004
40		Unuk River–Little Port Walter H.	149	2005
41		Keta River	200	1989, 2003, 2004
42		Blossom River	190	2004
43	Other	Cranberry River	158	1996, 1997
44		Damdochax River	63	1996
45		Ishkheenickh River	192	2004, 2006
46		Kincolith River	220	1996, 1999
47		Kiteen River	54	2006
48		Kwinageese River	67	1996, 1997
49		Meziadin River	45	1996
50		Oweegie Creek	147	1996, 1997, 2004
51		Tseax River	198	1995, 1996, 2002, 2006, 2008
52		Cedar River	112	1996

Appendix Table C.1.1. Continued

	Reporting Group	Population	N	Collection Date
53	Other (cont)	Ecstall River	149	2000, 2001, 2002
54		Exchamsiks River	106	1995, 2009
55		Exstew River	140	2009
56		Gitnadoix River	170	1995, 2009
57		Kitsumkalum River (Lower)	449	1996, 1998, 2001, 2009
58		Kasiks River	60	2006
59		Zymagotitz River	119	2006, 2009
60		Zymoetz River (Upper)	54	1995, 2004, 2009
61		Kispiox River	88	1995, 2004, 2006, 2008
62		Kitseguecla River	258	2009
63		Kitwanga River	169	1996, 2002, 2003
64		Shegunia River	78	2009
65		Sweetin River	60	2004, 2005, 2008
66		Bear River	99	1991, 1995, 1996, 2005
67		Kluakaz Creek	98	2007, 2008, 2009
68		Kluayaz Creek	144	2007, 2008, 2009
69		Kuldo Creek	170	2008, 2009
70		Osti Creek	90	2009
71		Sicintine River	105	2009
72		Slamgeesh River	125	2004, 2005, 2006, 2007, 2008, 2009
73		Squingala River	259	2008, 2009
74		Sustut River	337	1995, 1996, 2001, 2002, 2005, 2006
75		Babine River	105	1996
76		Bulkley River (Upper)	206	1991, 1998, 1999
77		Morice River	105	1991, 1995, 1996
78		Suskwa River	85	2004, 2005, 2009
79		Yakoun River	131	1989, 1996, 2001
80		Atnarko Creek	142	1996
81		Chuckwalla River	46	1999, 2001, 2005
82		Dean River	175	2002, 2003, 2004, 2006
83		Dean River (Upper)	176	2001, 2002, 2003, 2004, 2006
84		Docee River	42	1999, 2002, 2007
85		Kateen River	128	2004, 2005
86		Kilbella River	50	2001, 2005
87		Kildala River	197	1999, 2000
88		Kitimat River	135	1997
89		Kitlope River	181	2004, 2006
90		Takia River	46	2002, 2003, 2006
91		Wannock River	129	1996
92		Capilano River	75	1999
93		Cheakamus River	54	2006, 2007, 2008
94		Devereux River	148	1997, 2000
95		Klinaklini River	198	1997, 1998, 2002
96		Phillips River	287	2000, 2004, 2006, 2007, 2008
97		Squamish River	181	2003
98		Burman River	218	1985, 1989, 1990, 1991, 1992, 2000, ‘02, 2003
99		Conuma River	140	1997
100		Gold River	258	1983, 1985, 1986, 1987, 1992, 2002
101		Kennedy River (Lower)	320	2005, 2007, 2008
102		Marble River	136	1996, 1999, 2000
103		Nahmint River	43	2002, 2003
104		Nitinat River	125	1996
105		Robertson Creek	124	1996, 2003
106		San Juan River	175	2001, 2002
107		Sarita River	137	1997, 2001
108		Tahsis River	174	1996, 2002, 2003
109		Thornton Creek	158	2001
110		Tlupana River	58	2002, 2003
111		Toquart River	68	1999, 2000

Appendix Table C.1.1. Continued

	Reporting Group	Population	N	Collection Date
112	Other (cont)	Tranquil Creek	227	1996, 1999, 2004
113		Zeballos River	148	2002, 2005, 2006, 2007, 2008
114		Chemainus River	202	1996, 1999
115		Nanaimo River (Fall)	122	1996, 2002
116		Nanaimo River (Summer)	166	1996, 2002
117		Nanaimo River (Spring)	94	1998
118		Nanaimo River (Upper)	114	2003, 2004
119		Nimpkish River	68	2004
120		Puntledge River (Fall)	279	2000, 2001
121		Puntledge River (Summer)	255	1998, 2000, 2006
122		Qualicum River	79	1996
123		Quinsam River	143	1996, 1998
124		Harrison River	216	1999, 2002
125		Big Silver Creek	54	2004, 2005, 2006, 2007, 2008
126		Birkenhead River	154	1998, 1999, 2001, 2002, 2005, 2006
127		Pitt River (Upper)	65	2004, 2005, 2006, 2007, 2008
128		Maria Slough	271	1999, 2000, 2001, 2002, 2005
129		Baezaeko River	80	1984, 1985
130		Bridge River	157	1996
131		Cariboo River	76	1996, 2007, 2008
132		Cariboo River (Upper)	166	2001
133		Chilcotin River	201	1996, 1997, 1998, 2001
134		Chilcotin River (Lower)	173	1996, 2000, 2001
135		Chilko River	144	1995, 1999, 2001, 2002
136		Cottonwood River (Upper)	118	2004, 2007, 2008
137		Elkin Creek	190	1996
138		Endako River	42	1997, 1998, 2000
139		Nazko River	179	1983, 1984, 1985
140		Nechako River	128	1992, 1996
141		Portage Creek	138	2002, 2004, 2005, 2006, 2008
142		Quesnel River	119	1996, 1997
143		Stuart River	125	1996
144		Taseko River	120	1997, 1998, 2002
145		Bowron River	78	1997, 1998, 2001, 2003
146		Fontoniko Creek	46	1996
147		Goat River	46	1997, 2000, 2001, 2002
148		Holmes River	100	1996, 1999, 2000, 2001, 2002
149		James Creek	53	1984, 1988
150		McGregor River	119	1997
151		Morkill River	152	2001
152		Salmon River (Fraser)	153	1996, 1997
153		Slim Creek	113	1996, 1998, 2001
154		Swift Creek	120	1996, 2000
155		Fraser River above Tete Jaune	183	2001
156		Torpy River	135	2001
157		Willow River	37	1997, 2002, 2004
158		Coldwater River	109	1995, 1997, 1998, 1999
159		Coldwater River (Upper)	69	2004, 2005, 2006
160		Deadman River	256	1997, 1998, 1999, 2006
161		Lois River	259	1997, 1999, 2001, 2006, 2008
162		Nicola Hatchery	135	1998, 1999
163		Nicola River	88	1998, 1999
164		Spius Creek	52	1998, 1999
165		Spius Creek (Upper)	82	2001, 2006
166		Spius Hatchery	95	1996, 1997, 1998
167		Blue River	57	2001, 2002, 2003, 2004, 2006, 2007
168		Clearwater River	112	1997
169		Finn Creek	174	1996, 1998, 2002, 2006, 2008

Appendix Table C.1.1. Continued

	Reporting Group	Population	N	Collection Date
170	Other (cont)	Lemieux Creek	56	2001, 2002, 2004, 2006
171		North Thompson River	77	2001
172		Raft River	105	2001, 2002, 2006, 2008
173		Adams River	76	1996, 2001, 2002
174		Bessette Creek	103	1998, 2002, 2003, 2004, 2006, 2008
175		Eagle River	76	2003, 2004
176		Shuswap River (Lower)	93	1996, 1997
177		Shuswap River (Middle)	149	1997, 2001
178		South Thompson River	73	1996, 2001
179		Salmon River	126	1997, 1998, 1999
180		Thompson River (Lower)	175	2001, 2008
181		Dungeness River	123	2004
182		Elwha Hatchery	209	1996, 2004
183		Elwha River	139	2004, 2005
184		Upper Cascade River	43	1998, 1999
185		Marblemount Hatchery	91	2006
186		North Fork Nooksack River	137	1998, 1999
187		North Fork Stilliguamish River	290	1996, 2001, 2004
188		Samish Hatchery	74	1998
189		Upper Sauk River	120	1994, 1998, 1999, 2006
190		Skagit River (Summer)	99	1994, 1995
191		Skagit River (Lower; Fall)	95	1998, 2006
192		Skagit River (Upper)	53	1998
193		Skykomish River	73	1996, 2000
194		Snoqualmie River	49	2005
195		Suiattle River	122	1989, 1998, 1999
196		Wallace Hatchery	191	1996, 2004, 2005
197		Bear Creek	204	1998, 1999, 2003, 2004
198		Cedar River	170	1994, 2003, 2004
199		Nisqually River–Clear Creek Hatchery	132	2005
200		Grovers Creek Hatchery	95	2004
201		Hupp Springs Hatchery	90	2002
202		Issaquah Creek	166	1999, 2004
203		Nisqually River	94	1998, 1999, 2000, 2006
204		South Prairie Creek	78	1998, 1999, 2002
205		Soos Creek	178	1998, 2004
206		Univ of Washington Hatchery	125	2004
207		Voights Hatchery	93	1998
208		White River	146	1998
209		George Adams Hatchery	131	2005
210		Hamma Hamma River	128	1999, 2000, 2001
211		North Fork Skokomish River	87	1998, 1999, 2000, 2004, 2005, 2006
212		South Fork Skokomish River	96	2005, 2006
213		Forks Creek Hatchery	140	2005
214		Hoh River (Fall)	115	2004, 2005
215		Hoh River (Spring/Summer)	138	1995, 1996, 1997, 1998, 2005, 2006
216		Hoko Hatchery	73	2004, 2006
217		Humptulips Hatchery	60	1990
218		Makah Hatchery	128	2001, 2003
219		Queets River	53	1996, 1997
220		Quillayute River	52	1995, 1996
221		Quinault River	54	1995, 1997, 1998
222		Quinault Hatchery	82	2001, 2006
223		Sol Duc Hatchery	94	2003
224		Cowlitz Hatchery (Spring)	124	2004
225		Kalama Hatchery	133	2004
226		Lewis Hatchery	116	2004
227		Abernathy Creek	89	1995, 1997, 1998, 2000

Appendix Table C.1.1. Continued

	Reporting Group	Population	N	Collection Date
228	Other (cont)	Abernathy Hatchery	91	1995
229		Coweeman River	109	1996, 2006
230		Cowlitz Hatchery (Fall)	116	2004
231		Elochoman River	88	1995, 1997
232		Green River	55	2000
233		Lewis River (Fall)	79	2003
234		Lewis River (Lower; Summer)	83	2004
235		Lewis River (Summer)	128	2004
236		Sandy River (Fall)	106	2002, 2004
237		Washougal River	108	1995, 1996, 2006
238		Big Creek Hatchery	95	2004
239		Elochoman Hatchery	94	2004
240		Spring Creek	194	2001, 2002, 2006
241		Sandy River (Spring)	63	2006
242		McKenzie Hatchery	127	2002, 2004
243		McKenzie River	90	1997
244		North Fork Clackamas River	62	1997
245		North Santiam Hatchery	125	2002, 2004
246		North Santiam River	83	1997
247		Klickitat Hatchery	82	2002, 2006
248		Klickitat River (Spring)	40	2005
249		Shitike Creek	127	2003, 2004
250		Warm Springs Hatchery	127	2002, 2003
251		Granite Creek	54	2005, 2006
252		John Day River (upper mainstem)`	65	2004, 2005, 2006
253		Middle Fork John Day River	83	2004, 2005, 2006
254		North Fork John Day River	105	2004, 2005, 2006
255		American River	116	2003
256		Upper Yakima Hatchery	179	1998
257		Little Naches River	73	2004
258		Yakima River (Upper)	46	1992, 1997
259		Naches River	64	1989, 1993
260		Carson Hatchery	168	2001, 2004, 2006
261		Entiat Hatchery	127	2002
262		Little White Salmon Hatchery (Spring)	93	2005
263		Methow River (Spring)	85	1998, 2000
264		Twisp River	122	2001, 2005
265		Wenatchee Hatchery	43	1998, 2000
266		Wenatchee River	62	1993
267		Tucannon River	112	2003
268		Chamberlain Creek	45	2006
269		Crooked Fork Creek	100	2005, 2006
270		Dworshak Hatchery	81	2005
271		Lochsa River	125	2005
272		Lolo Creek	92	2001, 2002
273		Newsome Creek	75	2001, 2002
274		Rapid River Hatchery	136	1997, 1999, 2002
275		Rapid River Hatchery	46	2001, 2002
276		Red River/South Fork Clearwater	172	2005
277		Catherine Creek	111	2002, 2003
278		Lookingglass Hatchery	188	1994, 1995, 1998
279		Minam River	136	1994, 2002, 2003
280		Wenaha Creek	46	2002
281		Imnaha River	132	1998, 2002, 2003
282		Bear Valley Creek	45	2006
283		Johnson Creek	186	2001, 2002, 2003
284		Johnson Hatchery	92	2002, 2003, 2004
285		Knox Bridge	90	2001, 2002

Appendix Table C.1.1. Continued

	Reporting Group	Population	N	Collection Date
286	Other (cont)	McCall Hatchery	80	1999, 2001
287		Poverty Flat	88	2001, 2002
288		Sesech River	115	2001, 2002, 2003
289		Stolle Meadows	91	2001, 2002
290		Big Creek	142	2001, 2002, 2003
291		Big Creek (Lower)	74	1999, 2002
292		Big Creek (Upper)	87	1999, 2002
293		Camas Creek	42	2006
294		Capehorn Creek	51	2006
295		Marsh Creek	95	2001, 2002
296		Decker Flat	78	1999, 2002
297		Valley Creek (Lower)	94	1999, 2002
298		Valley Creek (Upper)	95	1999, 2002
299		East Fork Salmon River	141	2004, 2005
300		Pahsimeroi River	71	2002
301		Sawtooth Hatchery	260	2002, 2003, 2005, 2006
302		West Fork Yankee Fork	59	2005
303		Hanford Reach	163	1999, 2000, 2001
304		Klickitat River (Summer/Fall)	149	1994, 2005
305		Little White Salmon Hatchery (Fall)	94	2006
306		Marion Drain	131	1989, 1992
307		Methow River (Summer)	115	1992, 1993, 1994
308		Okanagan River	72	2000, 2002, 2003, 2004, 2006, 2007, 2008
309		Priest Rapids Hatchery	181	1998, 1999, 2000, 2001
310		Priest Rapids Hatchery	67	1998
311		Umatilla Hatchery	90	2006
312		Umatilla Hatchery	94	2003
313		Wells Dam Hatchery	128	1993
314		Wenatchee River	119	1993
315		Yakima River (Lower)	102	1990, 1993, 1998
316		Deschutes River (Lower)	101	1999, 2001, 2002
317		Deschutes River (Upper)	128	1998, 1999, 2002
318		Clearwater River	88	2000, 2001, 2002
319		Lyons Ferry	185	2002, 2003
320		Nez Perce Tribal Hatchery	123	2003, 2004
321		Alsea River	108	2004
322		Kilchis River	44	2000, 2005
323		Necanicum Hatchery	50	2005
324		Nehalem River	131	2000, 2002
325		Nestucca Hatchery	119	2004, 2005
326		Salmon River	83	2003
327		Siletz River	107	2000
328		Trask River	123	2005
329		Wilson River	120	2005
330		Yaquina River	113	2005
331		Siuslaw River	105	2001
332		Coos Hatchery	58	2005
333		Coquille River	118	2000
334		Elk River	129	2004
335		South Coos Hatchery	73	2005
336		South Coos River	45	2000
337		South Umpqua Hatchery	128	2002
338		Sixes River	107	2000, 2005
339		Umpqua Hatchery	132	2004
340		Applegate Creek	110	2004
341		Cole Rivers Hatchery	126	2004
342		Klaskanine Hatchery	96	2009
343		Chetco River	136	2004
344		Klamath River	111	2004
345		Trinity Hatchery (Fall)	144	1992
346		Trinity Hatchery (Spring)	127	1992
347		Eel River	122	2000, 2001
348		Russian River	142	2001
349		Battle Creek	99	2002, 2003
350		Butte Creek	61	2002, 2003

Appendix Table C.1.1. Continued

	Reporting Group	Population	N	Collection Date
351	Other (cont)	Feather Hatchery (Fall)	129	2003
352		Stanislaus River	61	2002
353		Butte Creek	101	2002, 2003
354		Deer Creek	42	2002
355		Feather Hatchery (Spring)	144	2003
356		Mill Creek	76	2002, 2003
357		Sacramento River (Winter)	95	1992, 1993, 1994, ‘95, ‘97, ‘98, 2001, ‘03, ‘04

Appendix Table C.1.2. Catalog of genetic tissue collections for transboundary Chinook salmon stocks. Information from 2007 (number of samples held by the U.S. and Canada and baseline gaps identified) is from Report TCTR(07)-02, "Summary of the Transboundary Genetic Stock ID Workshop: January 18–19, 2007".

	Sample	No. samples 2007		2007	No. samples 2016		Collection Years		2018
Location/Pop	Goal	U.S.	Can.	Gap	U.S.	Can.	U.S.	Canada	Gap
Stikine Adjacent									
Unuk									
Clear	200	194		6	197		89,03,04		3
Cripple	200	153		47	153		88,03		47
Gene's Lake	200	152		48	125		89,03,04		75
Boundary	200	24		176	23		03		177
Kerr	200	154		46	156		03,04		44
Lake Creek	200	27		173	30		03		170
Eulachon	200	0		200	0				200
Bradfield	400	39		161	447		12,15		0
Farragut	400	186		14	190		93,94,13		210
Harding	400	45		155	318		89,12,15		82
Aaron	200	0		200	0				200
Eagle	200	0		200	0				200
Stikine									
North Arm Ck (US)	200	18		182	18		89		182
Alpine/Clear (US)	200			200	121		07,09,10,13,14		79
Andrews Ck (US)	200	348	25		255	144	89,04	00	0
Goat Ck (US)	200			200	57		07,09,12-14		143
Kikahe (US)	200				17		09		183
Katete	200			200					200
Verrett	200		472		423	854	07,10,15	00,02,03,07,09,10	0
Craig	200		113	87		114		01	86
Christina (or Christine?)	200		205			240		00-02	0
Bear Ck	200			200		5		11	195
Stikine (below Chutine)	200			200					200
Chutine	200			200		7		02	193
Stikine (above Chutine)	200			200					200
Shakes	200		169	31	84	225	93,07	00-03,07	0
Tahltan R	200			200	360	212	89,90,08,09,11	08,09,11	0
Little Tahltan R	400	409	130		1,486	745	91,05,08,10,12-15	99,01,04,10	0
Johnny Tashoots	200		26	174	76	99	08,09	01,04,05,08,09	101
Beatty	200			200					200
Tuya	200			200	48	32	07-09,11-13	08,09,11,13	152

Location/Pop	Sample Goal	No. samples 2007 U.S.	No. samples 2007 Can.	2007 Gap	No. samples 2016 U.S.	No. samples 2016 Can.	Collection Years U.S.	Collection Years Canada	2018 Gap

Appendix Table C.1.2. Continued

Location/Pop	Sample Goal	No. samples 2007 U.S.	No. samples 2007 Canada	2007 Gap	No. samples 2016 U.S.	No. samples 2016 Canada	Collection Years U.S.	Collection Years Canada	2018 Gap
Taku Adjacent									
Chilkat - Big Boulder Ck	200	175		25	180		91,92,95,04		20
Whiting	200			200					200
Taku									
mainstem Taku	200			200					200
King Salmon	200			200	17		07,08,10		183
Inklin	200			200					
Sutlahine	200			200	4	3	10	10	196
Yeth	200			200	56	53	08-10	08-10	144
Kowatua/Little Trapper	200	321	78		190	379	89,90	89,90,99,05	0
Tatsatua/Tatsamenie	200	437	299		887	736	89-90,03-05,07	99,05-07	0
Hackett	200			200	189	233	07-08	06-08	0
Dudidontu	200	189		11	358	352	90,05,06,08	02,04-06,08	0
Tseta	200	132		68	374	327	89,03,08,10	89,08,10	0
Nahlin	200	210			297	303	89,90,04,05	99,04,06,07	0
Sloko	200			200					200
Nakina	400	198	76		214	480	89,90,07	01,04-07	0
Alsek Adjacent									
Situk	400	174	132	26	513		88,90-92,11,13		0
Alsek									
mainstem Alsek	200			200					200
Tatshenshini						24		01	
Mainstem (lower)	200			200					200
Mainstem (upper)	200			200					200
Low Fog	200			200	2		10		198
Mainstem (middle)/Kudwat	200			200	72	70	08,10,11	08,10,11	128
Klukshu	200	250			228	433	89,90,91	87,00,01	0
Village Creek	200				16		12,13		184
Takhanne	200			12	35	218	08,10,11	00-03,08,10,11	0
Blanchard	200					381		00,01,02,03	0
Stanley Ck	200				34		10-13		166
Goat Ck	200			200	164	174	07-13	07-13	36
Tweedsmuir	200				6	6	09,11	09,11	194

Appendix Table C.1.3. Inventory of DFO sample collections analyzed for Chinook salmon microsatellite variation reported by region, population, sampling year, and sample size from which a subset is used for the Transboundary GSI analysis.

Region Code	Region Name	Stock Code	Population Name	Collection Year	Sample Size
1	UPFR	37	Dome	1991 1994 1995 1996 2000 2001	382
1	UPFR	38	Salmon@PG	1996 1997	263
1	UPFR	39	Tete_Jaune	1993 1994 1995 2001	475
1	UPFR	49	Bowron	1995 1997 1998 2001 2003 2009	250
1	UPFR	63	Horsey	1995 1997 2000 2001 2002 2003 2004 2010	47
1	UPFR	64	Goat	1995 1997 2000 2001 2002	76
1	UPFR	65	Holmes	1995 1996 1999 2000 2001 2002	219
1	UPFR	66	Swift	1995 1996 2000 2001 2006 2009 2010 2012	452
1	UPFR	67	Slim_C	1995 1996 1998 2001	240
1	UPFR	68	Indianpoint	1995	47
1	UPFR	69	Willow_R	1995 1996 1997 2000 2002 2004	117
1	UPFR	98	Fontoniko	1996	63
1	UPFR	100	Herrick	1996	1
1	UPFR	134	Holliday_Cr	2000 2001 2002 2003 2004 2005	29
1	UPFR	142	McGregor	1997	125
1	UPFR	182	Antler	1998	5
1	UPFR	185	Small	1998 2000 2001 2002 2003	19
1	UPFR	225	Nevin_Cr	2001 2002 2003 2004 2010 2011	50
1	UPFR	229	Snowshoe	2000 2001 2002	8
1	UPFR	230	RedMountain	2001	4
1	UPFR	231	Kenneth_Cr	2001 2002 2004	98
1	UPFR	232	Ptarmigan	2000 2001 2002 2004	32
1	UPFR	233	Walker	2000 2001	45
1	UPFR	234	Humbug	2000 2002 2009	6
1	UPFR	246	Morkill	2001	208
1	UPFR	247	Torpy	2001	174
1	UPFR	259	Robson	2000 2002	22
1	UPFR	269	Driscoll_Cr	2002	5
1	UPFR	327	EastTwin_Cr	2002 2004 2006 2012	7
1	UPFR	328	McKale	2002 2012	13
1	UPFR	339	Menzies	2002	3
1	UPFR	350	James	1984 1988	58
1	UPFR	447	Hay_Cr	2004	12
1	UPFR	448	Narcosli_Cr	2004 2008	8
1	UPFR	449	Twan_Cr	2004	1
2	MUFR	8	Quesnel	1990 1994 1995 1996 1997	562
2	MUFR	29	Stuart	1991 1992 1994 1995 1996	545
2	MUFR	30	Nechako	1991 1992 1994 1995 1996	562
2	MUFR	44	Chilko	1994 1995 1996 1999 2001 2002	425
2	MUFR	45	Bridge	1994 1995 1996 2011	424
2	MUFR	50	Cottonwood	1995 2004 2007 2008	176
2	MUFR	71	Elkin_R	1995 1996 2010	248
2	MUFR	73	U_Chilcotin	1995 1996 1997 1998 2001	276
2	MUFR	74	Portage_C	1995 1996 2001 2002 2004 2005 2006 2008 2011	286
2	MUFR	96	Horsefly	1996 1997 2004 2011 2012 2013	100

2	MUFR	99	L_Cariboo	1996 1998 2007 2008	104
2	MUFR	102	L_Chilcoti	1996 2000 2001	236
2	MUFR	103	Westroad	1996 1997 2007 2008	104
2	MUFR	104	Endako	1996 1997 1998 2000 2006 2007 2008 2009	207
2	MUFR	143	Taseko	1997 1998 2001 2002 2010	205
2	MUFR	149	Seton_Dam	2001	4
2	MUFR	206	Chilako	1998	45
2	MUFR	207	Pinchi	2000 2003 2005 2008 2009 2011 2012 2013	27
2	MUFR	228	Kuzkwa_Cr	2001 2003 2004 2007 2008 2009 2011 2012 2013	114
2	MUFR	254	U_Cariboo	2001	171
2	MUFR	264	Tachie	2005 2009	3
2	MUFR	349	Nazko	1983 1984 1985	194
2	MUFR	351	Baezaeko	1984 1985	82
2	MUFR	450	Ahbau_Cr	2004	5
2	MUFR	451	John_Boyd_Cr	2004	13
2	MUFR	452	Lightning_Cr	2004	14
2	MUFR	453	Wansa_Cr	2004	5
2	MUFR	472	McKinley_R	2007	1
2	MUFR	481	U_Mckinley_R	2006	1
2	MUFR	482	Baker_Cr	2008	31
2	MUFR	483	Kazchek_Cr	2008 2009 2013	7
2	MUFR	484	Stellako_R	2008 2010 2011	7
3	LWFR-F	6	Harrison	1988 1992 1994 1999 2002	686
3	LWFR-F	40	Chilliwack_F	1994 1995 1998 1999 2002 2010	696
3	LWFR-F	194	Chilliwac@Stav	1994 1999 2000 2001 2002	381
3	LWFR-F	333	Inch_Cr	2002	1
3	LWFR-F	471	Sweltzer_Cr	2006	22
4	NOTH	70	Raft_R	1995 1996 2001 2002 2006 2008 2009 2010 2011 2013	496
4	NOTH	77	Mahood	1995	19
4	NOTH	87	Finn	1996 1998 2002 2006 2008 2009 2010 2011 2013	216
4	NOTH	145	Clearwater	1997 1998	281
4	NOTH	208	Barriere	2000 2001 2002	55
4	NOTH	210	Blue	2000 2001 2002 2003 2004 2006 2007 2009 2010 2011	84
4	NOTH	211	Lemieux_Cr	2000 2001 2002 2004 2006 2008 2009 2010 2011 2013	161
4	NOTH	226	N_Thom@Main	2001 2011	116
4	NOTH	260	Albreda	2000	1
4	NOTH	441	West_Twin_Cr	2003 2004	13
5	SOTH	43	L_Shuswap	1994 1995 1996 1997 2010	389
5	SOTH	47	M_Shuswap	1994 1995 1997 2001	375
5	SOTH	75	Eagle_R	1995 2000 2001 2003 2004 2009 2010 2011	331
5	SOTH	76	Salmon@SA	1995 1996 1997 1998 1999 2011	215
5	SOTH	84	L_Adams	1996 2001 2002 2010	340
5	SOTH	85	South_Thom	1996 2000 2001	266
5	SOTH	95	Little_R	1996 2001 2010	254
5	SOTH	136	Scotch_Cr	2001	2
5	SOTH	137	L_Thompson	2001 2008	229

5	SOTH	183	Bessette	1998 2001 2002 2003 2004 2006 2008 2011 2012 2013 2014	201
5	SOTH	195	L_Shus@U_Adams	1993 1997 2001	46
5	SOTH	235	Duteau_Cr	2001 2002 2003 2006 2010 2013	75
5	SOTH	268	Harris_Cr	2001 2010 2013	5
5	SOTH	270	Seymour@Thomp	2002 2003 2010	44
6	LWTH	42	Nicola	1992 1994 1995 1997 1998 1999	433
6	LWTH	46	Coldwater	1994 1995 1996 1997 1998 1999	274
6	LWTH	81	Spius	1996 1998 1999	137
6	LWTH	82	Deadman	1996 1997 1998 1999 2006	492
6	LWTH	83	Bonaparte	1996 2006	344
6	LWTH	90	Louis	1996 1997 1999 2000 2001 2006 2008 2010 2011 2013	621
6	LWTH	223	U_Coldwat_SP	2001 2002 2004 2005 2006	221
6	LWTH	224	U_Spius_SP	2001 2002 2006 2009	175
7	ECVI	2	Big_Qualicum	1988 1992 1996 1997	365
7	ECVI	3	Quinsam	1988 1992 1996 1997 1998 2012 2014 2015	564
7	ECVI	7	Nanaimo_SU	1996 1998 1999 2002 2005	459
7	ECVI	11	Cowichan	1988 1996 1999 2000	680
7	ECVI	18	Chemainus	1996 1999	261
7	ECVI	94	Nimpkish	1996 2004 2007 2010 2011	316
7	ECVI	97	L_Qualicum	1996 1998 2002 2007	305
7	ECVI	101	Nanaimo_F	1996 1997 1998 1999 2002 2003	523
7	ECVI	105	Puntledge_Su	1988 1996 1997 1998 2000 2001 2005 2006	1120
7	ECVI	106	Puntledge_F	1988 1996 1997 1998 2000 2001 2005 2006	652
7	ECVI	110	Quatse	1996 2000	30
7	ECVI	266	Goldstream	1998	22
7	ECVI	335	Woss_Lake	2001	31
7	ECVI	386	NanaimoUpper	1996 1998 2002 2003 2004 2005	135
7	ECVI	553	PuntledgeSum	2013 2014	844
8	WCVI	1	Robertson	1988 1996 2003 2013 2014 2015	965
8	WCVI	5	Conuma	1988 1996 1997 1998 2013 2014 2015	1052
8	WCVI	9	Nitinat	1989 1996 2003 2013 2014 2015	1019
8	WCVI	31	Kennedy	1992 2005 2007 2008 2015	431
8	WCVI	34	Thornton	1992 1999 2000 2001 2015	621
8	WCVI	72	Marble@NVI	1994 1996 1999 2000 2015	553
8	WCVI	107	Sarita	1996 1997 2001 2013 2015	928
8	WCVI	108	Nahmint	1996 2001 2002 2003 2004 2005	411
8	WCVI	109	Stamp	1973 1996 1998 2015	339
8	WCVI	111	Tranquil	1996 1999 2004 2014 2015	409
8	WCVI	135	San_Juan	2001 2002 2014 2015	401
8	WCVI	242	Burman	1976 1985 1986 1989 1990 1991 1992 2000 2002 2003 2006 2013 2015	960
8	WCVI	257	Toquart	1999 2000 2015	111
8	WCVI	314	Gold_R	1987 1992 1999 2002	227
8	WCVI	315	Zeballos	2002 2004 2005 2006 2007 2008 2009	199
8	WCVI	330	Colonial_Cay	1999 2004 2015	82
8	WCVI	331	Tahsis	1996 1999 2002 2003 2014 2015	437
8	WCVI	332	Tlupana	2002 2003 2013	98
8	WCVI	340	Sucwoa	2002 2005	10
8	WCVI	405	Sooke	2004 2014 2015	233

8	WCVI	406	Cardy	2004	11
8	WCVI	458	Cypre_R	2004 2014 2015	68
8	WCVI	459	Megin_R	2003 2004 2006 2007 2015	97
8	WCVI	460	Ursus_Cr	2003 2004 2006	8
8	WCVI	461	Bedwell_R	2004 2007 2014 2015	51
8	WCVI	463	Kaouk_R	2010 2011 2015	223
8	WCVI	464	Moyeha_R	2003 2004 2006 2010 2011	57
8	WCVI	491	Taylor_R	2015	2
8	WCVI	550	Clemens_Cr	2011 2015	3
8	WCVI	551	Sprout_R	2013	12
8	WCVI	557	Gordon_R	2014	33
8	WCVI	558	Leiner_R	2014 2015	140
8	WCVI	567	Artlish	2015	36
8	WCVI	568	AshRiver	2015	9
8	WCVI	570	Tahsish	2015	39
8	WCVI	571	WarnBayCr	2015	1
9	SOMN	12	Squamish	1990 1996 1997	161
9	SOMN	119	Mamquam	1996 2003 2005 2007 2008 2012	38
9	SOMN	123	Shovelnose	1996 2002 2004 2008	22
9	SOMN	147	Klinaklini	1997 1998 2002	472
9	SOMN	148	Devereux	1997 1998 2000	325
9	SOMN	177	Homathko	1997 1998	51
9	SOMN	241	Phillips	2000 2004 2005 2006 2007 2008 2009 2010 2011 2014	677
9	SOMN	262	Capilano	1999	126
9	SOMN	338	Quatam	2003	3
9	SOMN	409	Ahnuhati	2004	2
9	SOMN	410	Clear	2004	1
9	SOMN	412	Heydon	2003	3
9	SOMN	415	Cheakamus	2005 2006 2007 2008 2009 2012	99
9	SOMN	445	Kingcome_Cr	2004	2
9	SOMN	457	Ashlu_Cr	2004 2005 2007	6
9	SOMN	470	Cheakamus_F	2006 2007 2008 2011	114
9	SOMN	486	Squamish_28Mile	2004	3
9	SOMN	487	Mashiter_Cr	2004 2005 2012	5
9	SOMN	488	Cheakamus_Su	2008	40
9	SOMN	489	Furry_Cr	2007 2008 2009	4
9	SOMN	509	Highfalls_Cr	2008	1
10	NOMN	4	Kitimat	1996 1997 1998	483
10	NOMN	23	Wannock_R	1991 1996 1997 2000	506
10	NOMN	27	Atnarko	1991 1996	275
10	NOMN	32	Marble@CC	2000	41
10	NOMN	112	U_Atnarko	1996 2011	200
10	NOMN	116	Kilbella	1996 1998 2000 2001 2005	196
10	NOMN	117	Chuckwalla	1996 1998 1999 2000 2001 2005	315
10	NOMN	118	Kildala	1996 1997 1998 1999 2000	441
10	NOMN	121	Nusatsum	1996 2006	103
10	NOMN	122	Saloompt	1996 2006	138
10	NOMN	184	Hirsch	1998 1999 2000	474
10	NOMN	214	Neechanz	2000 2002 2003 2005	57
10	NOMN	215	Ashlulm	2000 2002 2003 2005	66

10	NOMN	216	Washwash	2000	1
10	NOMN	217	Tzeo	2000	3
10	NOMN	222	Kwinamass	2000 2001 2002 2003	362
10	NOMN	249	U_Dean	2001 2002 2003 2004 2006	203
10	NOMN	250	Dean@Main	2001	25
10	NOMN	256	Dala	1998	14
10	NOMN	261	Docee	1998 1999 2002 2004 2007 2010	126
10	NOMN	334	Khutzeymateen	2002	3
10	NOMN	343	Sheemahant	2002 2003	18
10	NOMN	344	Amback	2002	1
10	NOMN	345	Takia	2002 2003 2006	63
10	NOMN	346	Dean	2002 2003 2004 2006	219
10	NOMN	394	Kitlope	2004 2006	201
10	NOMN	395	Kateen	2004 2005 2006	244
10	NOMN	408	Kumealon	2004 2010	4
10	NOMN	425	Jayesco	2006	11
10	NOMN	534	LowAtnarko	2011	50
11	NASS	25	Kwinageese	1996 1997	266
11	NASS	53	Damdochax	1995 1996 1997	273
11	NASS	57	Meziadin	1995 1996 1997	194
11	NASS	58	Owegee	1995 1996 1997 2004	235
11	NASS	59	Seaskinnish	1995 1996 1997	99
11	NASS	61	Tseax	1995 1996 2002 2006 2008	244
11	NASS	62	Cranberry	1996 1997	175
11	NASS	78	Snowbank	1996	51
11	NASS	79	Kincolith	1996 1999	286
11	NASS	80	Teigen	1996 1997	30
11	NASS	88	Bowser	1996	1
11	NASS	397	Ishkheenickh	2004 2006	199
11	NASS	398	Kiteen	2004 2006	59
12	LWFR-Sp	92	Big_Silver	1996 2002 2003 2004 2005 2006 2007 2008 2009 2012	210
12	LWFR-Sp	93	Birkenhead	1991 1993 1994 1996 1997 1998 1999 2000 2001 2002 2003 2005 2006 2009 2010	347
12	LWFR-Sp	209	Chilliwack_Sp	2000 2001 2002 2005 2006	16
12	LWFR-Sp	272	Upper_Pitt	2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012	235
12	LWFR-Sp	341	Sloquet_Cr	2002 2003 2004 2006	35
12	LWFR-Sp	342	Douglas_Cr	2002	3
12	LWFR-Sp	387	DollyVarden	2003 2009	3
12	LWFR-Sp	426	BlueCr_UpPitt	2006 2007 2008 2011 2012	50
13	LWFR-Su	91	Nahatlatch_R	1991 1996 2001 2002 2003 2007 2013	29
13	LWFR-Su	212	Maria_Slough	1999 2000 2001 2002 2005	366
14	QCI	186	Yakoun	1987 1989 1996 2001	211
15	Alaska	187	Unuk	1989 1999 2003 2004	336
15	Alaska	188	King_Salmon	1989 1990 1993 1999 2007 2008 2010	266
15	Alaska	190	Chickamin	1990 1993 1999	259
15	Alaska	428	Tahini	1992 2004	142
15	Alaska	429	Situk	1988 1990 1991 1992	132
15	Alaska	430	Big_Boulder_C	1992 1995 2004	144
17	Taku	189	Little_Tatsam	1999 2005 2006 2007	698

17	Taku	192	Nahlin	1999 2004 2006 2007	303
17	Taku	253	Nakina	2001 2004 2005 2006 2007	480
17	Taku	326	Dudidontu	2002 2004 2005 2006 2008	352
17	Taku	414	Tseta	1989 2008 2010	327
17	Taku	422	Kowatua	1989 1990 1999 2005	379
17	Taku	437	Hackett_r	2006 2007 2008	233
17	Taku	465	Tatsamenie	2005	38
17	Taku	505	Yeth_Cr	2008 2009 2010	53
17	Taku	516	Satlahine_R	2010	3
18	Stikine	191	Little_Tahltan	1999 2001 2004 2010	745
18	Stikine	220	Andrew_Cr	2000	144
18	Stikine	240	Christina	2000 2001 2002	240
18	Stikine	243	Verrett	2000 2002 2003 2007 2009 2010	854
18	Stikine	248	Shakes_Cr	2000 2001 2002 2003 2007	225
18	Stikine	252	Craig	2001	114
18	Stikine	336	Johnny_Tashoot	2001 2004 2005 2008 2009	99
18	Stikine	337	Chutine	2002	7
18	Stikine	476	Tahltan_R	2008 2009 2011	212
18	Stikine	477	Tuya_R	2008 2009 2011 2012 2013	41
18	Stikine	533	BearCr	2011	5
18	Stikine	565	Goat_Cr	2013 2014	21
18	Stikine	566	Alpine_Cr	2013	5
18	Stikine	569	LowryCr	2015	1
19	Skeena Upper	20	Bear	1991 1995 1996 2005 2012	270
19	Skeena Upper	51	Sustut	1995 1996 1999 2001 2002 2003 2005 2006 2012	603
19	Skeena Upper	396	Slamgeesh	2004 2005 2006 2007 2008 2009	129
19	Skeena Upper	418	Kluatantan	2006 2008 2009 2010	38
19	Skeena Upper	466	Kluayaz_Cr	2007 2008 2009 2010	165
19	Skeena Upper	479	Squingula_R	2008 2009	271
19	Skeena Upper	480	Kuldo_C	2008 2009 2010	171
19	Skeena Upper	492	Otsi_Cr	2007 2008 2009 2010 2011	276
19	Skeena Upper	495	Sicintine_R	2009 2010	319
20	Skeena Babine	511	Babine	2010 2011	198
21	Skeena Bulkley	15	Bulkley_Early	1991 1996 1998 1999	567
21	Skeena Bulkley	399	Suskwa	2004 2005 2009 2010 2011 2012	201
21	Skeena Bulkley	510	Morice_R	2010 2011	243
22	Skeena Mid	16	Kitwanga	1991 1996 2002 2003	284
22	Skeena Mid	55	Kispiox	1979 1985 1989 1991 1995 2004 2006 2008 2010	197
22	Skeena Mid	401	Sweetin	2004 2005 2008 2010	245
22	Skeena Mid	493	Shegunia_R	2009 2010 2011 2012	255
22	Skeena Mid	494	Kitseguecla_R	2009	260
22	Skeena Mid	501	Nangeese_R	2010	32
23	Skeena Lower	21	Ecstall	1995 2000 2001 2002 2003 2013	371
23	Skeena Lower	24	Kitsumkalum_R	1991 1995 1996 1998 2001 2009	810
23	Skeena Lower	54	Exchamsiks	1995 2009	116
23	Skeena Lower	86	Cedar_Early	1996	116
23	Skeena Lower	271	Gitnadoix	1995 2002 2003 2009	245
23	Skeena Lower	402	Thomas_Cr	2003 2004 2009 2010	117
23	Skeena Lower	496	Exstew_R	2009	140

23	Skeena Lower	497	Kasiks_R	2009	63
23	Skeena Lower	498	Zymogotitz_R	2006 2009	120
23	Skeena Lower	500	Fiddler_Cr	2010	113
23	Skeena Lower	502	Khyex_R	2010	37
23	Skeena Lower	503	Lakelse_R	2010	10
23	Skeena Lower	504	McDonell	2010	5
24	Alsek	236	Blanchard	2000 2001 2002 2003	381
24	Alsek	237	Klukshu	1987 2000 2001	433
24	Alsek	239	Takhanne	2000 2001 2002 2003 2008 2010 2011	218
24	Alsek	251	Tatshenshi	2001	24
24	Alsek	469	Goat_Cr	2007 2008 2009 2010 2011 2012 2013	174
24	Alsek	478	Kudwat_Cr	2008 2010 2011	70
24	Alsek	506	Tweedmuir	2009 2011	6
25	Unuk River	427	Cripple_Cr	1988 2003	143
50	Puget Sound	160	Skagit_Su	1994 1995 1996	310
50	Puget Sound	164	White_F	1994 1998	252
50	Puget Sound	165	Nooksack_SP@Ke	1998	200
50	Puget Sound	166	Green_F@Soos	1998	100
50	Puget Sound	168	Green@Kendal_F	1998	50
50	Puget Sound	171	Skykomish_Su	1996 2004 2005	114
50	Puget Sound	173	StillaguamishS	1996	87
50	Puget Sound	317	Serpentine	2002	46
50	Puget Sound	439	Soos_Cr_H	1998 2004	183
50	Puget Sound	499	Snohomish_R	2009 2010	306
51	Juan de Fuca	167	Elwha_F	1996	99
52	Coastal Wash	161	Solduc_F	1995	98
52	Coastal Wash	162	Quinault_F	1995 1997 2006	100
52	Coastal Wash	163	Hoh_River_SP_S	1995 1996 1997	59
52	Coastal Wash	169	Queets	1996 1997	138
52	Coastal Wash	515	Willapa_Cr	2005 2010	261
53	Low Col	158	Abernathy_F	1995	100
53	Low Col	170	Coweeman	1996 2006	195
53	Low Col	433	Cowlitz_H_Sp	2004	138
54	Up Col-Sp	154	Chewuch_SP	1993	100
54	Up Col-Sp	159	Twisp_SP	1995 2001 2005	227
54	Up Col-Sp	175	Chiwawa_SP	1993	100
54	Up Col-Sp	299	Entiat_Sp	2002	142
55	Up Col-Su/F	172	Silmilkameen_S	1993 2005 2006	370
55	Up Col-Su/F	174	Wenatchee_Su	1993	235
55	Up Col-Su/F	204	Hanford_Reach	1998 1999 2000 2001 2004 2006	617
55	Up Col-Su/F	281	Deschutes-F	1998 1999 2001 2002	230
55	Up Col-Su/F	347	Okanagan	2000 2002 2003 2004 2005 2006 2007 2008	132
55	Up Col-Su/F	348	Osoyoos_Resid	2003 2004 2009	35
55	Up Col-Su/F	407	OkanaganJuv	2003	7
56	Snake-Sp/Su	155	Snake_S	1993	36
56	Snake-Sp/Su	157	Tucannon_SP	1995 2003	274
56	Snake-Sp/Su	196	McCall_Hat	1989	41
56	Snake-Sp/Su	198	Valley_Cr	1989	43
56	Snake-Sp/Su	199	Imnaha	1998 1999 2002 2003	239
56	Snake-Sp/Su	200	Rapid_Sp	1997 1999 2002	363

56	Snake-Sp/Su	201	Upper_Valley	1998	77
56	Snake-Sp/Su	202	Wenaha	1998 2002	89
56	Snake-Sp/Su	203	Marsh_Cr	1989 1991 1998 1999	220
56	Snake-Sp/Su	205	McCall	1997	32
56	Snake-Sp/Su	278	Up_Salmon-SP	1989 1992 1993	165
56	Snake-Sp/Su	279	Frenchman-SP	1991 1992	61
56	Snake-Sp/Su	280	Decker_FlatSP	2000	16
56	Snake-Sp/Su	293	Salmon_E_Fork	1999	53
56	Snake-Sp/Su	434	Minam_Cr	1994 2002 2003	144
56	Snake-Sp/Su	435	Secech	2001 2002 2003	277
56	Snake-Sp/Su	440	Johnson_Cr	2001 2002 2003	240
57	Snake-F	156	Lyon's_Ferry_F	1993 1998 2002 2003	370
58	North & Central Oregon	178	Trask_hat_SP	1997	48
58	North & Central Oregon	179	Trask_hat_F	1997 2005	236
58	North & Central Oregon	273	Euchre_Cr	1996	57
58	North & Central Oregon	275	Umpqua_Smith	1997 1998 2004	229
58	North & Central Oregon	282	Elk	1995 2004	206
58	North & Central Oregon	311	Nehalem	1996 2000 2002 2004 2005	327
58	North & Central Oregon	312	Siuslaw	1995 2011	258
58	North & Central Oregon	535	Cle_Elm_Hatch	2004	95
59	South Oregon coastal	274	Hunter_Cr	1995	96
59	South Oregon coastal	276	Cole	1995 2004	188
59	South Oregon coastal	277	Pistol	1995	98
59	South Oregon coastal	298	Winchuk	1995	80
59	South Oregon coastal	300	Lobster_Cr	1998	49
59	South Oregon coastal	436	Umpqua_Sp	2004	136
59	South Oregon coastal	438	Nestucca_F	2004 2005	153
61	Klamath/Trinity	213	Trinity_SP	1998	100
61	Klamath/Trinity	219	Trinity_F	1992 1998	244
61	Klamath/Trinity	289	Salmon_Cal	1998	28
61	Klamath/Trinity	297	Blue_Cr	1999	94
61	Klamath/Trinity	307	Trinity_S_Fork	1997	15
62	Mid Col-Sp	176	Naches_Sp	1989 1993	109
62	Mid Col-Sp	291	Granite	2000 2005 2006	93
62	Mid Col-Sp	294	John_Day_Mid	2000	40
62	Mid Col-Sp	295	John_Day_N	2000	40
62	Mid Col-Sp	296	John_Day_main	2000 2004 2005 2006	228
62	Mid Col-Sp	432	Spring_Cr_H	2001 2002	137
63	Up Willamette	180	North_Santiam	1997 2002 2004	236
63	Up Willamette	285	Sandy	1997 2002 2004	208

63	Up Willamette	292	Mackenzie	1997	12
63	Up Willamette	308	Clackamas_N	1997	79
64	Cent Val-F	124	Sacr_F	1993 1995	129
64	Cent Val-F	125	Sacr_LF	1992 1993 1994 1995 1997 1998 2001 2003 2004	211
64	Cent Val-F	197	Mokelumne	1995	95
64	Cent Val-F	283	Toulumne	1998	34
64	Cent Val-F	284	Merced	1998 1999	200
64	Cent Val-F	286	Yuba	2000	50
64	Cent Val-F	287	Stanislaus	1998 2002	101
64	Cent Val-F	302	American	1999	69
64	Cent Val-F	303	Feather_F	1999 2000 2003	272
64	Cent Val-F	305	Battle_Cr	1999 2002 2003	183
64	Cent Val-F	309	Butte_F	2000	49
64	Cent Val-F	310	Deer_Cr	2000	15
65	Cent Val-Sp	288	Butte_Sp	2000 2002 2003	186
65	Cent Val-Sp	304	Feather_Sp	1999 2000 2003	226
65	Cent Val-Sp	306	Yuba_Sp	2000	32
66	Coastal California	431	Eel_F	2000 2001	279

Appendix C. 2. Genetic stock identification methods for sockeye salmon stocks in the Transboundary rivers, 2018.

United States

The following methods are used by the ADF&G Gene Conservation Laboratory to estimate stock proportions of transboundary sockeye salmon harvested by commercial fishers in U.S. Districts 106, 108, and 111 in Southeast Alaska.

Fishery Sampling

Landings from drift gillnet fisheries in Subdistricts 106-30 and 106-41 (District 106), in District 108, and in District 111 were sampled by ADF&G at fish processing facilities in Ketchikan, Wrangell, Petersburg, and Juneau, and by observers on tenders. Sampling protocols ensured that the fish sampled were as representative of catches as possible. Axillary processes were excised and placed into individually labeled vials and preserved in ethanol or dried onto Whatman paper. Associated data for each sample including fishery and capture date were recorded, and the tissue sample for each fish was paired with age, sex, and length (ASL) information and with otolith samples. Otolith samples were examined for enhanced marks by the ADF&G Mark, Tag, and Age Laboratory in Juneau.

Laboratory Analysis

We extracted genomic DNA from tissue samples using a DNeasy® 96 Blood and Tissue Kit by QIAGEN® (Valencia, CA). We screened 96 SNP markers using Fluidigm® 96.96 Dynamic Array™ Integrated Fluidic Circuits (IFCs), which systematically combine up to 96 assays and 96 samples into 9,216 parallel reactions. The components are pressurized into the IFC using the IFC Controller HX (Fluidigm). Each reaction is conducted in a 7.2nL volume chamber consisting of a mixture of 20X Fast GT Sample Loading Reagent (Fluidigm), 2X TaqMan® GTXpress™ Master Mix (Applied Biosystems™), Custom TaqMan® SNP Genotyping Assay (Applied Biosystems™), 2X Assay Loading Reagent (Fluidigm), 50X ROX Reference Dye (Invitrogen™), and 60-400ng/µl DNA. Thermal cycling is performed on a Fluidigm FC1™ Cycler using a Fast-PCR protocol as follows: a "Thermal-Mix" step of 70ºC for 30 min and 25ºC for 10 min, an initial "Hot-Start" denaturation of 95ºC for 2 min followed by 40 cycles of denaturation at 95ºC for 2 sec and annealing at 60ºC for 20 sec, with a final "Cool-Down" at 25ºC for 10 sec. The Dynamic Array IFCs were read on a Biomark™ or EP1™ System (Fluidigm) after amplification and scored using Fluidigm SNP Genotyping Analysis software.

Assays that failed to amplify on the Fluidigm system were reanalyzed with the QuantStudio™ 12K Flex Real-Time PCR System (Life Technologies). Each reaction was performed in 384-well plates in a 5µL volume consisting of 6–40ng/µl of DNA, 2X TaqMan® GTXpress™ Master Mix (Applied Biosystems™), and Custom TaqMan® SNP Genotyping Assay (Applied Biosystems). Thermal cycling was performed on a Dual 384-Well GeneAmp® PCR System 9700 (Applied Biosystems) as follows: an initial "Hot-Start" denaturation of 95°C for 10 min followed by 40 cycles of denaturation at 92°C for 1 sec and annealing at 60°C for 1 min, with a final "Cool-Down" hold at 10°C. The plates were scanned on the system after amplification and scored using the Life Technologies QuantStudio 12K Flex Software. Genotypes produced on both platforms were imported and archived in the Gene Conservation Lab Oracle database, LOKI.

Quality Control

Quality control methods consisted of reextracting 8% of project fish and genotyping them for the same SNPs assayed in the original extraction. Discrepancy rates were calculated as the number of conflicting genotypes, divided by the total number of genotypes examined. These rates describe the difference between original project data and quality control data for all SNPs and can identify extraction, assay plate, and genotyping errors. This quality control method is the best representation of the error rate of our current genotype production.

Error rates for the original genotyping can be estimated as half the rate of discrepancy by assuming that the discrepancies among analyses were due equally to errors during the original genotyping and to errors during quality control, and by assuming that at least one of these assays produced the correct genotype.

Estimating Stock Compositions

A single nucleotide polymorphism (SNP) baseline was recently developed for Southeast Alaska (SEAK) and British Columbia (BC) (Rogers Olive et al. in review). This baseline included populations spanning from Prince William Sound, south to Washington State for a total of 171 populations (Table C.2.1). This baseline was analyzed at a total of 96 markers, of which 91 markers were kept for MSA (Table C.2.2). A catalog of existing tissues and potential gaps in this baseline for transboundary applications is described in Table C.2.3.

Reporting groups were defined based upon transboundary management needs and meeting criteria set by the Gene Conservation Laboratory (Habicht et al. 2012). Once defined, reporting groups underwent extensive testing for use in MSA. This included repeated proof tests, in which we sampled 200 individuals without replacement from each reporting group and analyzed them as a mixture against the reduced baseline. The reporting groups tested for Stikine River area fisheries included: 1) Tahltan, 2) Stikine Other, and 3) Non-Stikine. Reporting groups tested for Taku River area fisheries included: 1) Tatsamenie, 2) Taku Lakes Other, 3) Taku/Stikine Mainstem, and 4) Other. These reporting groups meet the minimum critical level of 90% correct allocation in repeated proof tests (Seeb et al. 2000).

Methods for mixture analysis have improved since the inception of this project, and can now include additional available data to help inform the genetic estimates. Specifically, ages from matched scales and hatchery marks on matched otoliths allow more detailed stock composition estimates. With the additional information gained from including ages and otolith marked fish, results were reported for 5 reporting groups for Stikine River area fisheries (Stikine/Taku Mainstem, Tahltan Wild, Enhanced Tahltan, Enhanced Tuya, and Non-Stikine). At the request of the TTC, these groups will be rolled up into the agreed-upon reporting groups, with the Tahltan reporting groups including Tahltan Wild, Enhanced Tahltan, and Enhanced Tuya. For Taku River area fisheries, results were reported for 9 reporting groups (Taku/Stikine Mainstem, Taku Lakes, Tatsamenie Wild, Speel Wild, Enhanced Tatsamenie, Enhanced Trapper, Enhanced Snettisham, and Enhanced Stikine). At the request of the TTC, these reporting groups will be rolled up into the agreed-upon reporting groups, with the Tatsamenie reporting group including Tatsamenie Wild and Enhanced Tatsamenie, the Taku Lakes Other reporting group including Taku Lakes and Enhanced Trapper, the Taku/Stikine Mainstem reporting group staying the same, and the Other reporting group including Speel Wild, Enhanced Snettisham, Enhanced Stikine, and Other. Results were noted if estimates do not meet the precision and accuracy guidelines set by the TTC in April 2013 (to estimate the proportion of mixtures within 10% of the true mixture 90% of the time).

In the mark- and age-enhanced GSI model, the Bayesian methods of the Pella-Masuda Model (Pella and Masuda 2001) were extended to include otolith-marked and aged individuals for estimating stock compositions where unmarked fish have unknown origin, but are known to belong to some wild stock in the genetic baseline and otolith-marked individuals are known to belong to a hatchery stock. While all individuals were aged, none of the otolith-marked fish were genotyped and only a subset of wild fish were genotyped. Thus, the entire mixture sample was comprised of 3 sample components: 1) the number of wild individuals that are aged and genotyped; 2) the number of wild individuals that are aged but not genotyped; and 3) the number of aged and otolith-marked fish.

Two sets of parameters were required for running the model: 1) a vector of stock compositions, summing to one, with a proportion for each of the wild and hatchery stocks weighted by harvest per stratum; and 2) a matrix of age composition, with a row for each of the wild and hatchery stocks (summing to one), and a column for each age class. This information was "completed" iteratively by stochastically assigning each wild fish to a population, then estimating the stock proportions based on summaries of assignments from each iteration.

To initialize the algorithm, all wild fish were given a stock assignment stochastically. The initialized algorithm then proceeded in the following steps:

1) Summarize all age data by assigned and observed stocks for both wild and hatchery individuals;
2) Estimate the stock proportions and age composition from previous summaries (accounting for sampling error);
3) Stochastically assign each wild fish with genotypes to a wild stock of origin based on the product of its genotypic frequency, age frequency, and stock proportion for each population;
4) Stochastically assign each wild fish without genotypes to a stock of origin based on the product of its age frequency and stock proportion for each population; and
5) Repeat steps 1-4 while updating and recording the estimates of the stock proportions and age compositions with each iteration.

This algorithm was run for 40,000 iterations, discarding the first 20,000 iterations to eliminate the effect of the initial state. Multiple chains were run to assess convergence via the Gelman-Rubin shrink factor which compares variation within a chain to the total variation among chains (Gelman and Rubin 1992). Shrink factors greater than 1.2 indicated that the chains did not converge for a given mixture. To address this, we reanalyzed the mixture in question with double the number of iterations. The point estimates and credibility intervals for the stock proportions and age composition were summary statistics of the output.

Canada

The following methods are used by the DFO's Molecular Genetics Laboratory, Pacific Biological Station, Nanaimo, B.C. to estimate stock proportions of transboundary Sockeye salmon harvested by inriver fisheries on the Alsek, Taku, and Stikine rivers.

Laboratory Analysis

Once sockeye salmon genomic DNA was available, surveys of variation at the following 15 microsatellite loci were conducted: Ots2, Ots3 (Banks et al. 1999); Ots100, Ots103, Ots107 (Beacham et al. 1998; Nelson and Beacham 1999); Oki1a Oki1b, Oki6, Oki10, Oki16, and Oki29 (Smith et al. 1998 and unpublished); One8 (Scribner et al. 1996); and Omy77 (Morris et al. 1996). Microsatellites were size fractionated in an Applied Biosystems (ABI) 3730 capillary DNA sequencer, and genotypes were scored by GeneMapper software 3.0 (Applied Biosystems, Foster City, CA) using an internal lane sizing standard.

In general, polymerase chain (PCR) reactions were conducted in 10 µl volumes consisting of 0.06 units of Taq polymerase, 1µl of 30ng DNA, 1.5-2.5mM MgCl2, 1mM 10x buffer, 0.8mM dNTP's, 0.006-0.065µM of labeled forward primer (depending on the locus), 0.4µM unlabeled forward primer, 0.4µM unlabeled reverse primer, and deionized H2O. PCR was completed on an MJResearch™ DNA Engine™ PCT-200 or a DNA Engine Tetrad™ PCT-225. The amplification profile involved one cycle of 2 min @ 92°C, 30 cycles of 15 sec @ 92°C, 15 sec @ 52-60°C (depending on the locus) and 30 sec @ 72°C, and a final extension for 10 min @ 72°C. Specific PCR conditions for a particular locus could vary from this general outline. Further information on laboratory equipment and techniques is available at the Molecular Genetics Laboratory website at http://www.pac.dfo-mpo.gc.ca/science/facilities-installations/pbs-sbp/mgl-lgm.

Baseline Populations

Mixture analysis required microsatellite analysis of Sockeye salmon from drainage specific baselines within Canada, consisting of 16 populations/sampling sites for the Stikine River, 16 populations/sampling sites for the Alsek River, and 17 populations/sampling sites for the Taku River (Table C.2.4). All annual baseline samples available for a specific sample location were combined to estimate population allele frequencies, as was recommended by Waples (1990). A catalog of existing tissues and potential gaps in this baseline for transboundary applications is described in Table C.2.3.

Estimation of Stock Composition

Analysis of fishery samples was conducted with a Bayesian procedure (BAYES) as outlined by Pella and Masuda (2001). Each locus was assumed to be in Hardy-Weinberg equilibrium, and expected genotypic frequencies were determined from the observed allele frequencies and used as model inputs. For BAYES, the initial FORTRAN-based computer program as outlined by Pella and Masuda (2001) required large amounts of computer analytical time when applied to stock identification problems with a baseline as comprehensive as employed in the current study. Given this limitation, a new version of the program was developed by our laboratory as a C-based program which is available from the Molecular Genetics Laboratory website (Neaves et al. 2005). In the analysis, ten 20,000-iteration Monte Carlo Markov chains of estimated stock compositions were produced, with initial starting values for each chain set at 0.90 for a particular population which was different for each chain. Estimated stock compositions were estimated when all Monte Carlo Markov chains had converged producing a Gelman-Rubin coefficient < 1.2 (Pella and Masuda 2001). The last 1,000 iterations from each of the 10 chains were combined, and for each fish the probability of originating from each population in the baseline was determined. These individual probabilities were summed over all fish in the sample, and divided by the number of fish sampled to provide the point estimate of stock composition. Standard deviations of estimated stock compositions were also determined from the last 1,000 iterations from each of the 10 Monte Carlo Markov chains incorporated in the analysis.

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Appendix Table C.2.1. Sockeye salmon genetic baseline by reporting groups for 171 wild populations used in Southeast Alaska. Hatchery populations of sockeye salmon determined using otolith information. This baseline is used by ADF&G for GSI of sockeye salmon in U.S. Districts 106, 108, and 111. Reporting groups may be rolled up to correspond with those identified as necessary to meet transboundary management objectives.

	Stikine Reporting Groups	***Taku Reporting Groups***	Region	Location	N	Year(s) Collected
1	***Non-Stikine***	***Other***	Prince William	Bainbridge Lake	95	2010
2			Sound	Coghill Lake	378	1991, 1992, 2010
3				Eshamy Lake	185	1991, 2008
4				Main Bay	96	1991
5				Miners Lake	191	1991, 2009
6			Copper	Bering Lake	95	1991
7				Clear Creek at 40 Mile	86	2007
8				Eyak Lake - Hatchery Creek	95	2010
9				Eyak Lake - Middle Arm	95	2007
10				Eyak Lake - South beaches	87	2007
11				Fish Creek - East Fork Gulkana R	95	2008
12				Gulkana River - East Fork	75	2008
13				Klutina Lake - inlet	95	2008, 2009
14				Klutina River - mainstem	95	2008
15				Banana Lake - Klutina	80	2008
16				Bear Hole - tributary Klutina	94	2008
17				Kushtaka Lake	189	2007, 2008
18				Long Lake weir	95	2005
19				Mahlo River	94	2008
20				Martin Lake	187	2007, 2008
21				Martin River Slough	95	2008
22				McKinley Lake	95	2007
23				McKinley Lake	95	2008
24				McKinley Lake/Salmon Creek	188	1991, 2007
25				Salmon Creek - Bremner	93	2008
26				Mendeltna Creek	188	2008, 2009
27				Mentasta Lake	95	2008
28				Paxson Lake - outlet	75	2009
29				St. Anne Creek	186	2005, 2008
30				Steamboat Lake - Bremner	95	2008
31				Swede Lake	95	2008
32				Tanada Creek weir	94	2005
33				Tanada Lake - lower outlet	95	2009
34				Tanada Lake - shore	93	2009
35				Tebay River - Outlet	93	2008
36				Tokun Lake	189	2008, 2009
37				Tonsina Lake	94	2009
38			Yakutat	Ahrnklin River	90	2007
39				Akwe River	95	2009
40				Dangerous River	95	2009
41				East Alsek River	94	2003
42				Lost/Tahwah Rivers	93	2003
43				Old Situk River	163	2007
44				Mountain Stream	159	2007
45				Situk Lake	190	2013
46			Alsek	Blanchard River	160	2007- 2009
47				Border Slough	141	2007-2009, 2011
48				Klukshu River	101	2007, 2008
49				Upper Tatshenshini R/Kudwat Ck	195	2003, 2009-2011
50				Tatshenshini - Kwatini River	65	2011
51				Neskataheen Lake	195	2007
52				Tweedsmuir Lake	94	2007, 2009
53				Vern Ritchie	114	2009, 2010
54			N. Southeast	Chilkat Lake	190	2007
55				Chilkat Mainstem - Mosquito Lk	95	2007
56				Chilkat Mainstem - Bear Flats	95	2007
57				Chilkat River - Mule Meadows	190	2003, 2007
58				Chilkoot Lake - beaches	251	2007

Appendix Table C.2.1. Continued

	Stikine Reporting Groups	Taku Reporting Groups	Region	Location	N	Year(s) Collected
59	***Non-Stikine***	***Other***		Chilkoot Lake - Bear Creek	233	2007
60	***(cont.)***	***(cont.)***		Chilkoot River - Chilkoot River	159	2003
61				Berners Bay	165	2003, 2013
62				Lace River	63	2013
63				Steep Creek	91	2003
64				Windfall Lake	142	2003, 2007
65				Lake Creek (Auke Creek Weir)	200	2013
66				Crescent Lake	194	2003
67		***Speel Wild***		Speel Lake	95	2003
68				Snettisham Hatchery	241	2007, 2013
69		***Other***		Vivid Lake	48	1993
70				Bartlett River - Creel survey	69	2013
71				North Berg Bay Inlet	153	1991, 1992
72				Neva Lake	160	2013
73				Sitkoh Lake	351	2003, 2011, 2012
74				Lake Eva	115	2012
75				Kook Lake	346	2007, 2010, 2012-13
76				Pavlof Lake	174	2012, 2013
77				Hasselborg Lake	209	2012, 2013
78				Kanalku Lake[1]	319	2007, 2010, 2013
79				Kutlaku Lake	128	2012, 2013
80				Hoktaheen Lake	96	2004
81				Falls Lake	190	2003, 2010
82				Ford Arm Creek	199	2013
83				Klag Bay Stream outlet	200	2009
84				Redfish Lake Beaches	94	1993
85				Salmon Lake weir	185	2007, 2008
86				Redoubt Lake - outlet	200	2013
87				Benzeman Lake	95	1991, 1993
88		***Taku Lakes***	Taku	King Salmon Lake	214	2010, 2011
89				Little Tatsamenie	139	1990, 1991, 2011
90				Little Trapper Lake	237	1990, 2006
91				Kuthai Lake	171	2006
92		***Tatsamenie Wild***		Tatsamenie Lake	288	2005, 2006
93	***Stikine/Taku***	***Stikine/Taku***		Hackett River	52	2008
94	***Mainstem***	***Mainstem***		Nahlin River	84	2003, 2007
95				Tulsequah River	156	2007, 2008, 2009
96				Yellow Bluff Slough	81	2008, 2010, 2011
97	***Stikine/Taku***	***Stikine/Taku***		Shustahine Slough	185	2008, 2009
98	***Mainstem***	***Mainstem***		Taku River	95	2007
99	***(cont.)***	***(cont.)***		Takwahoni/Sinwa Creek	108	2009, 2011
100				Tuskwa/Chunk/Bear Sloughs	356	2008, 2009
101				Fish Creek	159	2009, 2010
102				Yehring Creek	171	2007, 2009
103			Stikine	Shakes Slough	67	2006, 2007, 2009
104				Iskut River	318	1985-6, 2002, 2006-09
105				Verrett River	65	2010, 2011
106				Scud River	191	2007, 2008, 2009
107				Andy Smith/Porcupine/Fowler Sl	120	2007-2011
108				Devil's Elbow	201	2007, 2008, 2009
109				Chutine River	94	2008
110				Chutine Lake	224	2009, 2011
111				Christina Lake	50	2010, 2011
112	***Tahltan Wild***	***Other***		Little Tahltan River	95	1990
113				Tahltan Lake	196	2006
114	***Non-Stikine***		S. Southeast	Hugh Smith Lake	309	2004, 2007, 2013
115				McDonald Lk - Hatchery Ck	369	2001, 2003, '07, '13
116				Hatchery Creek - Sweetwater Lk	142	2003, 2007
117				Kah Sheets Lake	96	2003
118				Kunk Lake	96	2003
119				Luck Lake	94	2004
120				Big Lake	90	2010, 2011

Appendix Table C.2.1. Continued

	Stikine Reporting Groups	Taku Reporting Groups	Region	Location	N	Year(s) Collected
121	***Non-Stikine***	***Other***		Mill Creek Weir	189	2007
122	***(cont.)***	***(cont.)***		Petersburg Lake	95	2004
123				Red Bay Lake	95	2004
124				Salmon Bay Lake	170	2004, 2007
125				Shipley Lake	94	2003
126				Thoms Lake	66	2004
127				Sarkar Lakes	91	2000, 2005
128				Heckman Lake	189	2004, 2007
129				Helm Lake	94	2005
130				Karta /McGilvery Ck/Salmon Lk	285	1992, 2003, 2004
131				Kegan Lake	95	2004
132				Mahoney Creek	154	2003, 2007
133				Unuk River - Gene's Lake	164	2007, 2008
134				Fillmore Lake - Hoffman Creek	52	2005
135				Klakas Lake	95	2004
136				Bar Creek - Essowah Lake	95	2004
137				Eek Creek	50	2004, 2007
138				Hetta Creek - middle run	95	2009
139				Hetta Creek - early run	95	2010
140				Hetta Lake	281	2003, 2008, 2009
141				Klawock Lake	134	2004, 2008
142			Nass	Bowser Lake	94	2001
143				Damdochax Creek	93	2001
144				Meziadin Lake	186	2001, 2006
145				Tintina Creek	94	2006
146			Skeena	Alastair Lake	85	2006
147				Four Mile Creek/Pierre Creek	180	2006
148				Fulton River/Morrison Creek	187	2006, 2007
149				Kitsumkalum Lake	56	2006
150				Lower Tahlo River/Tahlo Creek	183	1988, 1994, 2007
151				McDonell Lake - Zymoetz River	63	2006
152				Nangeese River	40	2006
153				Nanika River	94	2007
154				Slamgeesh River	95	2006
155				Sustut River - Johanson Lake	95	2006
156				Swan Lake	93	2006
157				Upper Babine River	95	2006
158			BC/Washington	Naden River	95	1995
159				Kitlope Lake	95	2006
160				Baker Lake	90	1996
161				Issaquah Creek	82	1996
162				Cedar River	93	1994
163			Fraser	Adams R - Shuswap Lk (late)	95	2007
164				Birkenhead River	90	2007
165				Chilko Lake	87	2001
166				Gates Creek	90	2009
167				Harrison River	95	2007
168				Horsefly River	274	2001, 2007
169				Raft River	84	2001
170				Stellako River	94	2007
171				Weaver Creek	88	2001
172			PWS	Main Bay Enhanced	NA	NA
173		***Enh. Snettisham***	N. Southeast	Speel Arm Enhanced	NA	NA
174		***Other***		Sweetheart Enhanced	NA	NA
179			S. Southeast	Burnett Enhanced	NA	NA
180				McDonald Enhanced	NA	NA
175		***Enh. Tatsamenie***	Taku	Tatsamenie Enhanced	NA	NA
176		***Enh. Trapper***		Trapper Enhanced	NA	NA
177	***Enh. Tahltan***	***Enh. Stikine***	Stikine	Tahltan Enhanced	NA	NA
178	***Enh. Tuya***			Tuya Enhanced	NA	NA

Appendix Table C.2.2. Ninety-six single nucleotide polymorphism (SNP) markers used by ADF&G to provide GSI of sockeye salmon in U.S. Districts 106, 108, and 111, and the source lab for each marker.

Marker	Source[1]	Marker	Source[1]
One_ACBP-79	A	*One_srp09-127*	C
One_agt-132	B	*One_ssrd-135*	C
One_aldB-152	C	*One_STC-410*	A
One_apoe-83	B	*One_STR07*	A
One_CD9-269	B	*One_SUMO1-6*	C
One_cetn1-167	B	*One_sys1-230*	C
One_CFP1	D	*One_taf12-248*	C
One_cin-177	C	*One_Tf_ex11-750*	A
One_CO1[2]	A	*One_Tf_in3-182*	A
One_ctgf-301	A	*One_tshB-92*	C
One_Cytb_17[2]	A	*One_txnip-401*	C
One_Cytb_26[2]	A	*One_U1003-75*	B
One_E2-65	A	*One_U1004-183*	B
One_gdh-212	C	*One_U1009-91*	B
One_GHII-2165	A	*One_U1010-81*	B
One_ghsR-66	C	*One_U1012-68*	B
One_GPDH-20	A	*One_U1013-108*	B
One_GPH-414	A	*One_U1014-74*	B
One_HGFA-49	A	*One_U1016-115*	B
One_HpaI-71	A	*One_U1024-197*	B
One_HpaI-99	A	*One_U1101*	B
One_hsc71-220	A	*One_U1103*	B
One_Hsp47	D	*One_U1105*	B
One_IL8r-362	A	*One_U1201-492*	B
One_KCT1-453	B	*One_U1202-1052*	B
One_KPNA-422	A	*One_U1203-175*	B
One_LEI-87	A	*One_U1204-53*	B
One_lpp1-44	B	*One_U1205-57*	B
One_metA-253	C	*One_U1206-108*	B
One_MHC2_190	A	*One_U1208-67*	B
One_Mkpro-129	C	*One_U1209-111*	B
One_ODC1-196	B	*One_U1210-173*	B
One_Ots208-234	C	*One_U1212-106*	B
One_Ots213-181	A	*One_U1214-107*	B
One_p53-534	A	*One_U1216-230*	B
One_pax7-248	C	*One_U301-92*	A
One_PIP	D	*One_U401-224*	A
One_Prl2	A	*One_U404-229*	A
One_rab1a-76	B	*One_U502-167*	A
One_RAG1-103	A	*One_U503-170*	A
One_RAG3-93	A	*One_U504-141*	A
One_redd1-414	C	*One_vamp5-255*	C
One_RFC2-102	A	*One_vatf-214*	C
One_RFC2-285	A	*One_VIM-569*	A
One_rpo2j-261	C	*One_ZNF-61*	A
One_sast-211	C	*One_Zp3b-49*	A
One_spf30-207	C	*One_CO1_Cytb17_26*[2]	

1 A) Gene Conservation Laboratory of ADF&G; B) International Program for Salmon Ecological Genetics at the University of Washington; C) Hagerman Genetics Laboratory of the Columbia River Inter-Tribal Fish Commission; and D) Molecular Genetics Laboratory at the Canadian Department of Fisheries and Oceans.

Appendix Table C.2.3. Catalog of genetic tissue collections for transboundary sockeye salmon stocks. Information from 2007 (number of samples held by the U.S. and Canada and baseline gaps identified) is from Report TCTR(07)-02, "Summary of the Transboundary Genetic Stock ID Workshop: January 18-19, 2007".

	Sample	No. samples 2007		2007	No. samples 2016		Collection Years		2018
Location/Pop	Goal	U.S.	Can.	Gap	U.S.	Can.	U.S.	Canada	Gap
Stikine Adjacent									
Hugh Smith - Cobb	200	200		100	450		03,12,13		0
Karta River	200	99		101	139		92, 08		61
Mahoney Creek	200	64		136	198		03,07		2
Salmon Bay Lake	200	139		61	213		92,04,07		0
Virginia	200			200	295		07		0
Hatchery Cr - Sweetwater	200			200	732		03,07,13,15		0
Eek Cr	200			168	52		04,07		148
Fillmore Lk - Hoffman Cr	200			145	55		05		145
Sarkar - Five Finger Cr	200			145	55		05		145
Sarkar Lakes	200			155	45		00		155
Stikine									
Alpine Ck	200				1		09		199
Andrew Ck	200				3	2	05,06	06	197
Shakes Slough Ck	200				367	214	06-13	01,02,06-09,12	0
Mainstem			144		100	154	01	01,10	
Andy Smith Slough	200				42	40	07-09,11	07-09,11	158
Devil's Elbow	200		58	200	257	311	07-09	01,07-09	0
Fowler Slough	200				61	39	07-12	07-10	139
Porcupine Slough	200		70	200	125	187	07-12	00,01,07-12	13
Katete	200		25		31	31	01,02	01,02	169
Iskut		54	87		199	200	85,86,02,06-09	85,02,06-08	
Verrett River/Slough	200		327	200	249	420	00-03,08,10-14,15	86,00-03,10,11	0
Iskut m.s. - Craig/Craigson Sl	200		39		38	88	06-08	01,06-08	112
Iskut m.s. -Bronson Sl/Bugleg	200		68	200	101	149	08,09,12	01,08,09	51
Iskut m.s. - Hoodoo Slough	200				10	26	10	10	174
Iskut m.s.- Zappa	200				7	7	08	08	193
Iskut m.s. - Inhini Slough	200								200
Iskut m.s. - Twin	200		23			29		02	171
Christina									
Lake spawners	400		51	200	134	130	84,10-12	84,10-12	266
Inlet spawners	200								200
Scud	200		376	200	402	623	01,07-12	85,87,00,01,07-12	0
Chutine									
Chutine River	200		371	200	348	537	01,08-10	85,00-02,08,09	0

Appendix Table C.2.3. Continued

Location/Pop	Sample Goal	No. samples 2007 U.S.	No. samples 2007 Canada	2007 Gap	No. samples 2016 U.S.	No. samples 2016 Canada	Collection Years U.S.	Collection Years Canada	2018 Gap
Chutine Lake	200			200	225	258	09,11	09-11	0
Tatalaska Ck	200				50		13		150
Tahltan	400	297	474	200	296	468	90,06	87,96,02	200
Tuya	200		166	200	206	239	08	96,02,07,08	0
Upper Stikine	200					352		96	0
Taku Adjacent									
Chilkat Lake	200	45		155	637		90,07,13		0
Mule Meadows	200	183		17	383		03,07		0
Windfall	200	56		144	432		03,07,14		0
Whiting	200			200	0				200
Taku									
Yehring	200			200	204	109	07,09,11	07,11	0
Fish Ck	200			200	290	107	09,10	10	0
Johnson (US section)	200			200					200
Mainstem					142	126	07,13	07	
Chunk/Bear Sl	200				134	306	09	08,09	0
Shustahini	200				206	210	08,09	00,08,09	0
Takwahoni/Sinwa	200		31	200	176	211	09-11	00,09-11	0
Tuskwa	200		334	200	414	468	04,08,09	00,04,08,09	0
Yonakina	200		48	200	7	54	11	04,11	146
Yellow Bluff	200				82	81	08,10,11	08,10,11	118
Tulsequah	200		43	200	267	306	07-09	00,07-09	0
King Salmon	400		271	200	216	484	10,11	00,03-05,10,11	0
Inklin									
Little Trapper	400	315	106		270	107	90,91,06	92,04	130
Tatsatua Lake (L. Tatsamenie)	400	400	199		280	388	90,91,11,12	85,87,93,05,11,12	12
Tatsamenie Lake	400	92	151		401	151	92,05,06	92,93	0
Samotua	200			200					200
Hackett	200		91	200	192	292	07-09	85,87,07-09	0
Dudidontu	200			200	7		11		193
Tseta	200			200					200
Nahlin River	200	50	65	150	263	459	03,07,12	04-07,12	0
Silver Salmon R	200				33		08		167
Kuthai Lake	400	202	371		300	372	86,04,06	86,87,04,05	28
Nakina	200			200	10	39	08,09,11,12	08,09,11	161

Appendix Table C.2.3. Continued

Location/Pop	Sample Goal	No. samples 2007 U.S.	No. samples 2007 Canada	2007 Gap	No. samples 2016 U.S.	No. samples 2016 Canada	Collection Years U.S.	Collection Years Canada	2018 Gap
Alsek Adjacent									
Ahrnklin River	200	94		106	185		03,07		15
Lost/Tahwah Rivers	200	187		13	187		03		13
Situk Lake	200	40		160	648		95,07,13		0
Old Situk	200			160	309		95,07,15		0
Dangerous	200			200	221		09		0
Italio	200			200	0				200
Akwe	200	40		200	193		09		7
Alsek									
Basin Creek	200			200		45		02,03	155
Tanis (US section)	200			200					200
Alsek mainstem (US)	200			163					200
Border Slough	200				177	145	07-09,11,12	07-09,11	23
Alsek mainstem (Can)	200			168					200
Tashenshini									
Lower	200		79	121		121		00-03,10	79
Upper	200		324	100		318		01-03	0
Tats Lake	200			200	13		10		187
O'Connor	200		22	178		96		01-03	104
Sediment Ck	200				13	11	10	10	187
Low fog	200					3		02,03	197
Detour	200		22	178	4	26	11	01,11	174
Kudwat	200		83	117	349	224	00,01,03,07,09-12	01,07,09-11	0
Stinky	200		64	136	40	103	11	01,11	97
Bridge/Silver	200				105	30	11,12	11	95
Kane	200					108		01-03	92
Nesketahin Lk	200			200	298	832	01,07	00-03,07	0
Klukshu	400	355	539	200	775	1059	02,03,06-08,10	92,00-02,07,08	0
Takhanne	200			200		4		02,03	196
Blanchard Lake	200		23	177	178	252	07-09	01-03,07-09	0
Stanley Ck	200					31		01-03	169
Goat Ck	200				42	56	07,11,12	17,12	144
Kwatini	200				85	65	11,13	11	115
Datlaska Ck	200				111		12		89
Vern Ritchie	200				212	217	07-10	07-10	0
Tweedsmuir	200				150	152	07,09-12	03,07,09-12	48

Appendix C.2.4. Inventory of DFO sample collections analyzed for Sockeye salmon microsatellite variation reported by region, population, sampling year, and sample size from which a subset is used for the Transboundary GSI analysis.

Region Code	Region Name	Stock Code	Population Name	Collection Year	Sample Size
1	Early Stuart(Fr)	25	Kynock	1994 1997	180
1	Early Stuart(Fr)	35	Dust	1988 1991 1994 1997 2005	349
1	Early Stuart(Fr)	36	Gluskie	1997	151
1	Early Stuart(Fr)	37	Forfar	1997	151
1	Early Stuart(Fr)	183	Porter_Cr	2000 2005	120
1	Early Stuart(Fr)	184	Hudson_Bay	2000 2005	120
1	Early Stuart(Fr)	185	Blackwater	2000 2005	123
1	Early Stuart(Fr)	405	Rossette	2005	100
1	Early Stuart(Fr)	406	Sinta	2005	97
1	Early Stuart(Fr)	407	Paula	2005	116
1	Early Stuart(Fr)	408	Sandpoint	2005	97
1	Early Stuart(Fr)	409	Narrows	2005	98
1	Early Stuart(Fr)	410	Bivouac	2005	99
1	Early Stuart(Fr)	411	Felix	2005	99
1	Early Stuart(Fr)	412	FiveMile	2005	99
1	Early Stuart(Fr)	413	Driftwood	2005	98
2	Early Summer(Fr)	9	Scotch	1994 1995 1996 1999 2000	536
2	Early Summer(Fr)	16	Gates_Cr	1986 1992 1995 1999 2000	433
2	Early Summer(Fr)	18	Eagle	2000 2002	198
2	Early Summer(Fr)	19	Nadina	1986 1992 1999 2000	353
2	Early Summer(Fr)	20	Nahatlatch_Lak e	1996 1997 2010	338
2	Early Summer(Fr)	22	Seymour	1986 1996 1999	335
2	Early Summer(Fr)	28	Pitt	1986 2000 2001 2005 2010	447
2	Early Summer(Fr)	29	U_Adams	1996 2000 2010	466
2	Early Summer(Fr)	30	Upper_Barrier	1996 1999 2000 2001	491
2	Early Summer(Fr)	31	Chilliw_lake	1996 2003 2004 2005	226
2	Early Summer(Fr)	32	Raft	1996 2000 2001 2012	319

2	Early Summer(Fr)	33	Chilko_south	1996 1997 2001	410
2	Early Summer(Fr)	104	Bowron	1999 2000 2001	264
2	Early Summer(Fr)	181	Cayenne	2000	100
2	Early Summer(Fr)	298	Thompson_N	2003 2005 2012	225
2	Early Summer(Fr)	443	Taseko	2007 2010 2011	126
2	Early Summer(Fr)	480	Yohetta_Cr	2010 2011	25
2	Early Summer(Fr)	481	Nahatlatch_R	2010	102
2	Early Summer(Fr)	482	Corbold_Cr	2010	102
2	Early Summer(Fr)	483	Anstey_R	2010	98
2	Early Summer(Fr)	485	Sinmax_Cr	2010	54
2	Early Summer(Fr)	486	Nemian_Cr	2010	20
2	Early Summer(Fr)	487	Taseko_R_upper	2010	2
2	Early Summer(Fr)	511	Bridge_R	2011	17
3	Summer(Fr)	1	Stellako	1992 1995 1996 1998 1999 2000 2011	689
3	Summer(Fr)	2	Birkenhead	1992 1995 1997 1998 1999 2001 2010	644
3	Summer(Fr)	12	Chilko	1998 1999	222
3	Summer(Fr)	13	Middle_R	1993 1996 1997 1998 2000 2001	425
3	Summer(Fr)	21	Tachie	1994 1995 1996 1997 1999 2000 2001 2011 2012	682
3	Summer(Fr)	24	Horsefly	1985 1986 1993 1996 1997 1998 1999 2005	946
3	Summer(Fr)	34	Mitchell	1993 1994 1996 1997 1998 2001 2005	537
3	Summer(Fr)	56	Pinchi_Cr	1999 2005	171
3	Summer(Fr)	208	Kuzkwa_Cr	2001	104
3	Summer(Fr)	209	L_Horsefly	2001	200
3	Summer(Fr)	210	M_Horsefly	2001	198
3	Summer(Fr)	211	U_Horsefly	2000 2001	497
3	Summer(Fr)	238	Roaring	2001	100
3	Summer(Fr)	239	McKinley	2001 2005	225
3	Summer(Fr)	241	Wasko_Cr	2001	100
3	Summer(Fr)	242	Blue_Lead_Cr	2001	100
3	Summer(Fr)	327	Cogburn_Cr	2003 2011	29
3	Summer(Fr)	328	DollyVarden_Cr	2001 2003	121
3	Summer(Fr)	414	Quesnel_Decept	2005	77
3	Summer(Fr)	454	Chilko_North	1992 1995 1996 1997 2000 2001 2008 2009	782
3	Summer(Fr)	488	Ormonde_Cr	2010	24
3	Summer(Fr)	489	Sampson_Slough	2010 2011 2012	163
3	Summer(Fr)	490	Nechako_R	2010 2014	29
3	Summer(Fr)	509	GreenRiver	2011 2012	95
3	Summer(Fr)	512	Pemberton_Cr	2011	13
4	Late(Fr)	3	L_Adams	1982 1990 1995 1996 1998 1999	550

4	Late(Fr)	4	Weaver	1982 1986 1992 1996 1998 1999 2000 2001	692
4	Late(Fr)	8	L_Shuswap	1983 1986 1990 1996 1998 1999 2002	408
4	Late(Fr)	10	Harrison	1986 1995 2000	329
4	Late(Fr)	11	Cultus_Lake	1992 1995 1999 2000 2001 2002 2004 2005 2006 2007 2008 2009	2407
4	Late(Fr)	14	Portage_Cr	1986 1997 1998 1999	466
4	Late(Fr)	15	MiddleShuswap	1986 2002	246
4	Late(Fr)	17	WidgeonSlough	2002	97
4	Late(Fr)	23	Big_Silver	2000 2002	199
4	Late(Fr)	256	Eagle_L	1986 1990 2002 2010	384
4	Late(Fr)	257	Douglas_Harr	2002 2003 2011	19
4	Late(Fr)	288	Little	2002	101
4	Late(Fr)	484	Salmon_R_SA	2010 2014	88
5	Washington	182	LakeWashington	2000	198
5	Washington	192	Baker_Lake	1991 1996 2011	189
5	Washington	194	Ozette_Lake	1995	50
5	Washington	519	BigCr_Quinalt_R	1995	100
6	South Coast	252	Sakinaw	1998 2000 2001 2002 2005 2006 2010 2011 2012 2013 2014 2015	834
6	South Coast	292	Phillips	2002 2005	205
6	South Coast	296	Village_Bay	2003 2006	21
6	South Coast	299	Heydon	2003	176
6	South Coast	301	Glendale	2003	188
6	South Coast	431	Stephens_Cr	2004	2
6	South Coast	561	Tzoonie_R	2015	0
7	VI	5	Sproat	1987 1990 1992 2002	469
7	VI	6	Great_Central	1987 1990 1992 2002	750
7	VI	7	Henderson	1988 1993 1995 2002	346
7	VI	54	Hobiton	1992	81
7	VI	145	Kennedy	1986	91
7	VI	149	Woss_Lake	1985 2001 2002	283
7	VI	228	Vernon_L	2001 2002	360
7	VI	229	Nimpkish_L	2001 2002 2003 2011 2014	302
7	VI	297	Quatse	2002 2003	292
7	VI	302	Schoen	2003	29
7	VI	329	Muchalat	2004	65
7	VI	345	Nahwitti	2004	32
8	Columbia	129	Okanagan	1993 1997 1998 1999 2000 2001 2002 2012	908
8	Columbia	193	Lake_Wenatchee	1988 2007	89
8	Columbia	306	Osoyoos	2002 2003 2004	165
8	Columbia	428	Rocky_Reach	2005	80
8	Columbia	468	RedfishLk_Idaho	2008 2009 2010	200
8	Columbia	523	Bedrock_Cr	1996	99
9	Nass	43	Bonney	1987 1994 1996 1998 1999 2001	544
9	Nass	44	Gingit_RT	1987 1988 1997 2011	442
9	Nass	45	Kwinageese	1987 2000 2001	194
9	Nass	47	Damdochax	1987 1994 1998 1999 2000 2001	557

9	Nass	48	Bowser	1986 1987 1994 1998 1999 2000 2001	827
9	Nass	49	Zolzap_juv_RT	1996 1997	60
9	Nass	232	Meziadin_beach	2001	188
9	Nass	233	Tintina_Cr	2001 2002 2006	203
9	Nass	234	Hanna_Cr	2001 2002 2006	253
9	Nass	560	Gitzyon_RTCr	2013 2014	30
10	Lower Skeena	65	McDonnell	1987 1988 1994 2002	283
10	Lower Skeena	68	Swan_Lk	1988 1994 2006	288
10	Lower Skeena	75	Williams	1987 1988 1994 2005 2006	434
10	Lower Skeena	76	Schulbuckhand	1988 2005	102
10	Lower Skeena	79	Alastair	1987 1988 1994 1998 2006	354
10	Lower Skeena	80	Kitwanga_R	1998 2009	153
10	Lower Skeena	82	Kalum	1994	77
10	Lower Skeena	289	Stephens_Lk	2001 2004	202
10	Lower Skeena	436	Kalum_lake	2006	89
10	Lower Skeena	444	Zymoetz_RT	2006	64
10	Lower Skeena	463	KitwangaBeach	2008 2009	401
10	Lower Skeena	530	Kalam/Cedar_Cha	2012	100
11	Upper Skeena	66	Motase	1987	75
11	Upper Skeena	78	SalixBear	1987 1988	116
11	Upper Skeena	173	Sustut	1993 2000 2001 2006	341
11	Upper Skeena	465	Damshilgwit	2004	203
11	Upper Skeena	470	Slamgeesh	2006 2008	469
12	Bulkley	73	Nanika	1988 1994 2003 2012	157
12	Bulkley	466	Bulkley_R_upper	2004 2005 2012 2014	45
13	Babine	67	Grizzly	1987	78
13	Babine	69	U_Babine	1987 1994 2006	291
13	Babine	70	Pinkut	1985 1987 1990 1994	492
13	Babine	71	Fulton_L	1985 1987 1990 1994	536
13	Babine	72	L_Babine	1987 1994	150
13	Babine	77	Pierre	1987 1988 2006 2013	318
13	Babine	118	Twain_Cr	1987 1990	154
13	Babine	123	Four_Mile	1987 1988 2006	227
13	Babine	331	Babine_Fence	1959 1960	190
13	Babine	446	HallidaySlou_RT	2005 2006 2007 2009	68
13	Babine	531	Morrison_L	2012	88

13	Babine	540	Johnston_Lake	2010	121
14	Stikine	40	Tuya	1996 2002 2007 2008	239
14	Stikine	41	Tahltan	1987 1996 2002	468
14	Stikine	42	U_Stikine	1996	352
14	Stikine	81	Scud_RT	1985 1987 2000 2001 2007 2008 2009 2010 2011 2012	623
14	Stikine	95	Iskut_RT	1985 2002 2006 2007 2008	200
14	Stikine	120	ChutineRiver	1985 2000 2001 2002 2008 2009	537
14	Stikine	121	Christina_Lk	1984 2010 2011 2012	130
14	Stikine	139	Iskut_Verrett	1986 2000 2001 2002 2003 2010 2011 2012	459
14	Stikine	165	PorcupineSlo_RT	2000 2001 2007 2008 2009 2010 2011 2012	187
14	Stikine	221	Katete_RT	2001 2002	31
14	Stikine	222	Bugleg_Cr_RT	2001	42
14	Stikine	223	Shakes_Cr_RT	2001 2002 2006 2007 2008 2009 2012	214
14	Stikine	224	Bronson_Slou_RT	2001 2008 2009 2012	126
14	Stikine	225	Devils_Elbow_RT	2001 2007 2008 2009	311
14	Stikine	226	Iskut_Craig_RT	2001 2006 2007 2009	66
14	Stikine	227	Stikine_main_RT	2001 2010	154
14	Stikine	276	Twin	2002	29
14	Stikine	439	St_Main@Fowl_RT	2007 2008 2009 2010	39
14	Stikine	440	St_Main@Andy_RT	2007 2008 2009 2011	40
14	Stikine	457	StikineCraig_RT	2008	22
14	Stikine	458	Isket_Zappa_RT	2008	7
14	Stikine	459	AndrewCr	2006	2
14	Stikine	476	ChutineLake	2009 2010 2011	258
14	Stikine	496	Hoodoo_Slough	152 2010	26
15	Central Coast	57	Tenas	1985	80
15	Central Coast	89	Banks	1986	41
15	Central Coast	99	Namu	1999	93
15	Central Coast	100	Mary_Cove	1999	78
15	Central Coast	101	Lagoon_Cr	1999	50
15	Central Coast	102	Devon_Lake	1985 1999 2004	332
15	Central Coast	103	Mikado_Cr	1986 1999	162
15	Central Coast	106	Lowe_Lake	1986	40
15	Central Coast	107	Kimsquit	1986	78
15	Central Coast	108	Canoona	1986	100
15	Central Coast	109	Tankeeah	1986 2001 2002 2003 2004 2005	399
15	Central Coast	110	Kitlope	1986 2006 2010	270
15	Central Coast	111	Koeye	1986 2004	86
15	Central Coast	119	Lonesome	1997	99
15	Central Coast	126	Long_Lake	1989 1998 1999 2000 2001	483
15	Central Coast	130	Klinaklini	1998 2002	319
15	Central Coast	230	Smokehouse_Cr	2001 2002	231

15	Central Coast	231	Canoe_Cr	2001 2002	139
15	Central Coast	295	Klemtu	2002	27
15	Central Coast	305	Martin	2002	1
15	Central Coast	317	Bella_Coola_mix	2003	222
15	Central Coast	335	Prudhomme_Cr	2004	111
15	Central Coast	336	Curtis_Cr	2004	106
15	Central Coast	337	Kooryet_Cr	2004	129
15	Central Coast	338	Freda_Lake	2004	37
15	Central Coast	340	Keecha_Lake	2004	99
15	Central Coast	341	Kingkown_N	2004	95
15	Central Coast	342	Kingkown_S	2004	107
15	Central Coast	343	Diane_Cr	2004	91
15	Central Coast	347	Shawatlan_Lake	2004	100
15	Central Coast	348	Evelyn_Lake	2004	103
15	Central Coast	349	Kent_Lake	2004	105
15	Central Coast	350	L_Kwakwa_Lake	2004	57
15	Central Coast	351	U_Kwakwa_Lake	2004	66
15	Central Coast	352	Deer_Lake	2004 2008	185
15	Central Coast	353	Kitkiata_Lake	2004	100
15	Central Coast	363	Maria	2004	1
15	Central Coast	364	Kadjusdis	2004	98
15	Central Coast	365	Kwakusdis	2004	7
15	Central Coast	366	Hooknose	2004	6
15	Central Coast	367	Dean	2004	1
15	Central Coast	426	Kitimat	2005 2010	312
15	Central Coast	427	West_Arm_Cr	2005 2006 2008	137
15	Central Coast	429	Bloomfield_Cr	2005	117
15	Central Coast	471	Moore_Lk	2006	22
15	Central Coast	472	Tsimtack_Cr	2006	22
15	Central Coast	473	Atnarko	2005	44
15	Central Coast	475	NWMoorelake	2009	18
15	Central Coast	493	Tezwa_R	2006	21
16	Taku	55	Kuthai	1986 1987 2004 2005	372
16	Taku	58	Tatsatua	1985 1987 1993 2005 2011 2012	388
16	Taku	85	Hackett_RT	1985 1987 2007 2008 2009	292
16	Taku	90	Little_Trapper	1992 2004	107
16	Taku	144	B_Tatsamenie	1992 1993	151
16	Taku	167	Tuskwa_RT	2000 2004 2008 2009	468
16	Taku	169	Taku_KingSalmon	2000 2003 2004 2005 2010 2011 2013	557
16	Taku	170	Tulsequah_RT	2000 2007 2008 2009	306
16	Taku	171	Shustahini_RT	2000 2008 2009	210
16	Taku	172	Takwahoni_RT	2000 2009 2010 2011	211
16	Taku	316	Nahlin	2004 2005 2006 2007 2012	459
16	Taku	344	Yonakina_RT	2004 2011	54
16	Taku	445	TakuMainstem_RT	2007	126

16	Taku	460	YellowBluff_RT	2008 2010 2011	81
16	Taku	461	BearSlough_RT	2008 2009	306
16	Taku	462	NakinaR	2008 2009 2011	39
16	Taku	495	Yehring_Cr_RT	2007 2011	109
16	Taku	516	Fish_Cr	2010	107
17	Alsek	59	Klukshu_mix	1992 2000 2007 2008	524
17	Alsek	166	Neskataheen	2000 2001 2002 2003 2007	832
17	Alsek	168	L_Tatshenshi_RT	2000 2001 2002 2003 2010	121
17	Alsek	217	Kudwat_Cr_RT	2001 2007 2009 2010 2011 2012	249
17	Alsek	218	Detour_Cr_RT	2001 2011	26
17	Alsek	219	U_Tatshensh_RT	2001 2002 2003	318
17	Alsek	220	Stinky_Cr_RT	2001 2011	103
17	Alsek	236	Klukshu_Early	2000 2001 2002	226
17	Alsek	237	Klukshu_Late	2000 2001 2002	309
17	Alsek	243	Alsek_T_down	2001 2002 2003	75
17	Alsek	244	Stanley_Cr_RT	2001 2002 2003	31
17	Alsek	245	Alsek_T_up	2001 2002 2003	50
17	Alsek	246	Blanchard	2001 2002 2003 2007 2008 2009	252
17	Alsek	247	OConnor_RT	2001 2002 2003	96
17	Alsek	249	Kane	2001 2002 2003	108
17	Alsek	250	Uknown_Alsek	2001	35
17	Alsek	432	Basin_Cr_RT	2002 2003	45
17	Alsek	433	Tweedsmuir_RT	2003 2007 2009 2010 2011 2012	152
17	Alsek	434	LowFog_RT	2002 2003	3
17	Alsek	435	Takhanne_RT	2002 2003	4
17	Alsek	437	VernRichie_RT	2007 2008 2009 2010	217
17	Alsek	438	Goat_Cr_RT	2007 2012	66
17	Alsek	441	BorderSlough_RT	2007 2008 2009 2011 2012	185
17	Alsek	497	Sediment_Cr_RT	2010	11
17	Alsek	513	Kwatine_Cr	2011	65
17	Alsek	515	Bridge_Silver	2011 2012	105
18	Owikeno	97	Inziana	1997 2000 2001 2002	397
18	Owikeno	98	Washwash	1997 2000 2001 2002	366
18	Owikeno	132	Ashlulm	2000 2001 2002 2004 2007	234
18	Owikeno	133	Dallery	2000 2001 2002	161
18	Owikeno	134	Genesee	2000 2001 2002 2004 2007	190
18	Owikeno	135	Neechanz	2000 2001 2002 2004	328
18	Owikeno	136	Amback	2000 2001 2002 2004	411
18	Owikeno	137	Sheemahant	2000 2001 2002 2004	282
18	Owikeno	251	Marble_Cr	2001 2002	121
18	Owikeno	300	Wannock	2002	86
19	QCI	128	CopperR_QCI	1993 1996 2001	170
19	QCI	131	Yakoun	1989 1993	160
19	QCI	188	Awun	1995	79
19	QCI	189	Naden	1995	98

19	QCI	235	Mercer_Lake	1983	41
20	SE Alaska	113	Hugh_Smith	1992 2000	282
20	SE Alaska	114	Heckman	1992 2000	296
20	SE Alaska	116	McDonald	1992 2000	276
20	SE Alaska	117	Karta	1992 2000	265
20	SE Alaska	147	Thoms_Lake	2000	212
20	SE Alaska	154	Kutlaku_Lake	2000	203
20	SE Alaska	155	Red_Bay_Lake	2000	201
20	SE Alaska	162	Sitkoh	2000 2001	382
20	SE Alaska	174	PetersburgLake	2000	193
20	SE Alaska	175	Salmon_Bay	2000	198
20	SE Alaska	176	Sarkar	2000	45
20	SE Alaska	177	Luck	2000	200
20	SE Alaska	178	Hetta	2000 2002	313
20	SE Alaska	179	Klakas	2000	200
20	SE Alaska	180	Kegan	2000	196
20	SE Alaska	272	Mahoney	2002	71
20	SE Alaska	273	Kah_Sheets	2002	105
20	SE Alaska	274	Kunk	2002	107
20	SE Alaska	275	Shipley	2002	105
20	SE Alaska	455	Chilkoot	2003	95
20	SE Alaska	456	ChilkootLkBeach	2007	95
20	SE Alaska	477	Klawock	2004 2010	288
21	Unuk	60	Border_Lake	1987	50