



MEMORANDUM

TO: Sam Rabung, Director, Division of Commercial Fisheries
DATE: March 4, 2020

Dave Rutz, Director, Division of Sport Fish
SUBJECT: Southeast Region Salmon Escapement Goal Memorandum

THRU: Lowell Fair, Regional Supervisor, Division of Commercial Fisheries, Region 1
Judy Lum, Regional Supervisor, Division of Sport Fish, Region 1

FROM: Steve Heinl, Regional Research Biologist, Division of Commercial Fisheries, Region 1
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This memorandum summarizes the Alaska Department of Fish and Game (department) review and recommendations for Southeast Alaska/Yakutat (Southeast) Region salmon escapement goals. The department recognizes the importance of releasing escapement goal recommendations on a schedule that allows the public to submit proposals relative to escapement goal recommendations prior to the April 10, 2020 deadline for the 2020–2021 Alaska Board of Fisheries (board) meeting cycle. An interdivisional review committee consisting of regional staff from the divisions of Commercial Fisheries and Sport Fish, as well as statewide representatives, met in August 2019 and January 2020 to review existing salmon escapement goals in the Southeast Region. These reviews were based on the *Policy for the Management of Sustainable Salmon Fisheries* (5 AAC 39.222) and the *Policy for Statewide Salmon Escapement Goals* (5 AAC 39.223). Escapement goals are classified as either biological or sustainable escapement goals as defined in the *Policy for the Management of Sustainable Salmon Fisheries*:

5 AAC 39.222 (f)(3) “biological escapement goal” or “(BEG)” means the escapement that provides the greatest potential for maximum sustained yield (MSY); and

5 AAC 39.222 (f)(36) “sustainable escapement goal” or “(SEG)” means a level of escapement, indicated by an index or an escapement estimate, that is known to provide for sustained yield over a 5 to 10 year period, used in situations where a BEG cannot be estimated.

In order to complete reviews on an accelerated timeline, the Southeast Region escapement goal review was advanced approximately one year ahead of normal schedule. Therefore, the committee considered primarily those goals with recent information that could potentially result in a substantially different escapement goal from previous reviews (Heinl et al. 2014, 2017) and those goals that should be eliminated or established. The committee determined the most appropriate method to evaluate escapement goals (e.g., spawner-recruit analysis, yield analysis, percentile approach) and determined the goal type (BEG or SEG) based on the quality and quantity of available data. The committee also considered management needs—how escapement goals were integrated into fishery management and how well stocks performed relative to the escapement goal. This review resulted in recommended changes to 2 of 47 (Tables 1–5) Southeast Region salmon escapement goals, as summarized below. No recommendations were made to eliminate existing goals or establish new goals.

The Southeast Region escapement goal review will be documented in more detail in a report to be published prior to the January 2021 Southeast and Yakutat regulatory meeting. In addition to providing methods and rationale used to evaluate escapement goals and make recommendations, the report will include brief overviews of stock assessment, escapement goal history, and escapement goal performance (through 2019) for all Southeast Region salmon escapement goals.

Taku River sockeye salmon:

The Taku River is a transboundary river system that originates in the Stikine plateau of northwestern British Columbia and terminates in Taku Inlet in Southeast Alaska. The river produces one of the largest runs of sockeye salmon harvested in Southeast Alaska. Canadian-origin Taku River salmon runs are jointly managed by Fisheries and Oceans Canada (DFO), the Taku River Tlingit First Nation, and the department through Chapter 1, Annex IV of the Canada/U.S. Pacific Salmon Treaty (treaty). Provisions of the treaty establish conservation and harvest sharing objectives for Canadian-origin Taku River sockeye salmon, which are managed as an aggregate run. (Hereafter, references to Taku River sockeye salmon and associated escapement goals refer specifically to fish of Canadian origin.) Based on current assessment methods, the inriver run has averaged 128,000 fish over the past decade and the terminal run, which includes marine harvest (in U.S. District 111), has averaged 190,000 fish. The harvest rate has averaged 44%, resulting in average spawning escapements of 106,000 fish that spawn throughout the Canadian portions of the drainage in both river and lake habitats. An aggregate escapement goal range of 71,000 to 80,000 fish was established by the Transboundary Technical Committee (technical committee) of the Pacific Salmon Commission (PSC) in 1985. The goal was based on professional judgment and was considered an “interim” goal (TTC 2014). In 2003, the department classified the goal as an SEG (Geiger et al. 2004).

Inriver abundance of Taku River sockeye salmon is estimated annually through a mark–recapture project that takes place in the lower Taku River near the U.S./Canada border. Fish are tagged (Event 1) near Canyon Island, in the U.S. portion of the lower Taku River, and, a short distance upriver, catches in the Canadian commercial fishery are sampled (Event 2) for marked and unmarked fish. Radio telemetry studies conducted in 1984, 2015, 2017, and 2018 identified that an average 22% of the tags released in Event 1 were not available for capture and sampling in Event 2, and this loss of tags resulted in estimates of escapement that were biased high (TTC 2019). As a result, the PSC directed the technical committee to account for this bias, revise historical estimates and datasets, and perform detailed spawner-recruit analysis to facilitate development of a biologically-based escapement goal. An interim Taku River

escapement objective of 55,000 to 62,000 fish was bilaterally approved for the 2019 fishing season, based on a 22% adjustment of historical mark–recapture abundance estimates (TTC 2019). In addition, the most recent provisions of the treaty call for development of a bilaterally approved maximum sustainable yield escapement goal to be established prior to the 2020 fishing season.

A Taku River Sockeye Working Group (working group) consisting of representatives from DFO, the department, and the Taku River Tlingit First Nation was created to accomplish this work. Over a two-year period, the working group reviewed the stock assessment program and historical data and conducted a detailed spawner-recruit analysis using revised mark–recapture estimates of abundance (Miller and Pestal 2020). Analyses conducted by the working group were reviewed and ultimately approved by the Canadian Science Advisory Secretariat (CSAS) in November 2019. Results were further reviewed and approved by two expert reviewers (Mr. Robert Clark, retired department Fisheries Scientist and consultant from the U.S., and Dr. Carl Schwarz, consulting biometrician from Canada) and the technical committee. The results are currently being considered by the Pacific Salmon Commission for final approval by June 2020.

Escapement goal review: The escapement goal review committee recommends the Taku River sockeye salmon escapement goal be considered using revised spawner-recruit data from 1980 to 2018 (i.e., total harvest and escapement by brood year), the use of a Bayesian age-structured state-space model (Fleischman et al. 2013), and the linearized Ricker spawner-recruit function (Ricker 1954) as outlined by Miller and Pestal (2020). The committee recommends replacing the current SEG with a BEG range of 40,000 to 75,000 sockeye salmon, a range that has a 92% and 43% probability of achieving at least 80% of maximum sustained yield at the lower and upper bounds, respectively, and a 93% probability of achieving at least 80% of maximum sustained yield at S_{MSY} ($S_{MSY} = 43,857$ fish; 95% CI 28,830–130,640) (Miller and Pestal 2020). This range accounts for uncertainty in the spawner-recruit relationship and the minimal contrast observed within the time series of historical escapement estimates (the 1980–2014 maximum estimate divided by the minimum estimate = 3.8). The escapement goal range also includes the median estimate of spawner abundance that maximizes sustained yield (S_{MSY}). The recommended escapement goal is consistent with Canada’s Wild Salmon Policy and the *Alaska Policy for the Management of Sustainable Salmon Fisheries* and meets the treaty directive for establishing a maximum sustained yield escapement goal.

Situk River coho salmon:

The current Situk River coho salmon escapement goal is a BEG range of 3,300 to 9,800 fish (counted on a peak boat survey). The goal was established in 1994, based on a stock-recruit analysis that was complicated by lack of escapement estimates, age composition data, and stock-specific harvest information (Clark and Clark 1994). Historical coho salmon information is limited primarily to boat survey counts conducted weekly (since 1972) from late August to early October. Mark–recapture and coded wire tagging studies were conducted 2004–2006 to estimate escapement, harvest, smolt production, and survival rates. The total harvest rate on Situk River coho salmon was estimated to be 41% in 2005 (32,400 fish) and 44% in 2006 (18,100 fish), of which an average 85% occurred in the mixed stock Situk-Ahrnklin set gillnet fishery and the freshwater Situk River sport fishery (Shaul et al. 2010). Situk River coho salmon were also harvested in subsistence fisheries, Yakutat Bay commercial set gillnet fisheries, and offshore commercial troll fisheries (Shaul et al. 2010). Peak survey-to-escapement expansion factors derived from mark–recapture studies were too variable (range: 5.3–14.0) to be useful for converting historical survey counts to estimates of escapement. Given uncertainty in survey expansion factors and stock productivity, Shaul et al. (2010) recommended the existing BEG be retained.

Escapement goal review: The escapement goal review committee recommends the Situk River coho salmon escapement goal be based on percentiles of escapement survey counts, as lack of information on

age composition, escapement, and stock-specific harvest precluded escapement goal analysis based on production models. The Situk River coho salmon run could qualify as a “Tier 1” stock (Clark et al. 2014), as there is high measurement error and high contrast in escapement survey counts (the maximum count divided by the minimum count = 26). For stocks that experience harvest rates $\geq 40\%$, however, Clark et al. (2014) recommended sustainable escapement goal (SEG) ranges should be set at the 25–75th percentiles as a precautionary approach to prevent overfishing. The 25–75th percentiles of Situk River coho salmon escapement survey counts produced a range of 3,775 to 9,630 fish, or approximately 3,800 to 9,600 fish. The lower bound of the range is slightly more conservative than the current BEG range, but the approach is consistent with the quality of information used to assess and manage the stock. The committee recommends replacing the current BEG with an SEG range of 3,800 to 9,600 coho salmon counted on a peak survey.

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Table 1.—Southeast Alaska Chinook salmon escapement goals and escapement performance 2014–2019, and 2020 escapement goal recommendations.

System	Assessment method	Goal type	Escapement goal ^a	Year established	Escapement						Escapement goal recommendation
					2014	2015	2016	2017	2018	2019	
Keta River	HS expansion	BEG	550–1,300	2018	1,321	915	1,342	903	1,662 ^b	1,041 ^b	No change
Blossom River	HS expansion	BEG	500–1,400	2018	840	642	522	341	1,087 ^b	557 ^b	No change
Chickamin River	HS expansion	BEG	2,150–4,300	2018	3,097	2,760	964	722	2,052 ^b	1,610 ^b	No change
Unuk River	HS/FS expansion	BEG	1,800–3,800	2009	1,691	2,623	1,463	1,203	1,971 ^b	3,115 ^b	No change
Stikine River	MR	BEG	14,000–28,000	2000	24,374 ^b	21,597 ^b	10,554 ^b	7,335 ^b	8,603 ^b	13,817 ^b	No change
Andrew Creek	AS/HS/FS expansion	BEG	650–1,500	1998	1,261	796	402	349	482 ^b	698 ^b	No change
King Salmon River	HS expansion	BEG	120–240	1997	68	50	149	85	30 ^b	27 ^b	No change
Taku River ^c	MR, HS expansion	BEG	19,000–36,000	2009	23,532 ^b	23,567 ^b	9,177 ^b	8,214 ^b	7,271 ^b	11,558 ^b	No change
Chilkat River	MR	Inriver ^d	1,850–3,600	2003	1,534 ^b	2,456 ^b	1,386 ^b	1,173 ^b	873 ^b	2,028 ^b	No change
	MR	BEG	1,750–3,500	2003	1,529 ^b	2,452 ^b	1,380 ^b	1,173 ^b	873 ^b	2,028 ^b	No change
Alsek River	Weir expansion	BEG	3,500–5,300	2013	3,357	5,697	2,834	1,926	4,312 ^b	6,341 ^b	No change
Situk River	Weir	BEG	450–1,050	2003	475	174	329	1,187 ^b	420 ^b	623 ^b	No change

Note: AS = aerial survey, FS = foot survey, HS = helicopter survey, MR = mark-recapture, BEG= biological escapement goal; gray cells indicate lower bound of the escapement goal not met.

^a Goals and escapement numbers for Chinook salmon are for large fish (≥ 660 mm mid eye to fork length, or fish age 1.3 and older), except Alsek River goal which is germane to fish age 1.2 and older and can include fish < 660 mm mid eye to fork length.

^b Preliminary estimate pending publication of final report.

^c Estimates are based on mark-recapture studies.

^d The Chilkat River Chinook salmon escapement is the mark–recapture estimate of inriver run minus reported subsistence harvest. The inriver goal of 1,850–3,600 (5 AAC 33.384) is directly measured through mark–recapture and is not discounted for inriver subsistence harvests that average < 100 fish.

Table 2.—Southeast Alaska sockeye salmon escapement goals and escapement performance 2014–2019, and 2020 escapement goal recommendations.

System	Assessment method	Goal type	Escapement goal	Year established	Escapement						Escapement goal recommendation
					2014	2015	2016	2017	2018	2019	
Hugh Smith Lake	Weir	OEG ^a	8,000–18,000	2003	10,397	21,296	12,865	14,748	2,039	2,240	No change
McDonald Lake	FS expansion	SEG	55,000–120,000	2009	43,400	70,200	15,600	24,000	11,000	24,200	No change
Mainstem Stikine River	Run reconstruction	SEG	20,000–40,000	1987	16,197	26,432	28,646	11,678	10,232 ^b	23,226 ^b	No change
Tahltan Lake	Weir	BEG	18,000–30,000	1993	39,745	33,159	38,458	19,241	19,001 ^b	36,787 ^b	No change
Speel Lake	Weir	SEG	4,000–9,000	2015	5,062	4,888	5,538	3,435	4,244	6,447	No change
Taku River	MR	SEG	71,000–80,000	1986	92,189	132,523	179,103	108,416	119,033	---	Eliminate SEG based on historical dataset Change to BEG 40,000–75,000
Taku River ^c	MR	BEG	40,000–75,000	Pending	50,738 ^b	82,657 ^b	108,860 ^b	60,785 ^b	66,845 ^b	82,571 ^b	Based on revised dataset
Redoubt Lake	Weir	OEG ^d	7,000–25,000	2003	18,694	12,540	22,553	55,397	72,409	59,106	No change
		BEG	10,000–25,000	2003	18,694	12,540	22,553	55,397	72,409	59,106	No change
Chilkat Lake	Sonar	BEG	70,000–150,000	2009	70,470	175,874	88,513	88,197	108,092	134,958	No change
Chilkoot Lake	Weir	SEG	38,000–86,000	2009	105,713	71,515	86,721	43,098	85,453	140,378	No change
East Alsek River	AS, IE	SEG	9,000–24,000	2018	9,800	12,000	19,200	20,500	10,500	27,300	No change
Klukshu (Alsek) River	Weir	BEG	7,500–11,000	2013	12,148	11,363	7,391	3,711	7,143	18,749	No change
Situk River	Weir	BEG	30,000–70,000	2003	102,318	95,093	57,693	92,168	26,704	72,561	No change

Note: AS = aerial survey, FS = foot survey, IE = index escapement, MR = mark–recapture, BEG = biological escapement goal, SEG = sustainable escapement goal, OEG = optimal escapement goal; gray cells indicate lower bound of the escapement goal not met.

^a Hugh Smith Lake sockeye salmon OEG was set by the Alaska Board of Fisheries (5 AAC 33.390); the OEG is the same as the BEG (8,000–18,000 fish) but includes wild and hatchery-produced fish. No lake stocking has occurred since 2003.

^b Preliminary estimate pending publication of final report.

^c In 2019, a revised “interim” Taku River escapement objective of 55,000–62,000 sockeye salmon was agreed to by the Pacific Salmon Commission Transboundary River Panel for the 2019 fishing season, based on a 22% adjustment of historical mark–recapture abundance estimates (TTC 2019). A new BEG of 40,000–75,000 sockeye salmon is pending adoption prior to the 2020 fishing season.

^d Redoubt Lake sockeye salmon OEG was set by the Alaska Board of Fisheries (5 AAC 01.760).

Table 3.—Southeast Alaska coho salmon escapement goals and escapement performance 2014–2019, and 2020 escapement goal recommendations.

System	Assessment method	Goal type	Escapement goal	Year established	Escapement						Escapement goal recommendation
					2014	2015	2016	2017	2018	2019	
Hugh Smith Lake	Weir	BEG	500–1,600	2009	4,110	956	948	1,266	619	1,235	No change
Klawock River ^a	Weir	SEG	4,000–9,000	2013	7,698	12,780	24,242	7,412	13,643	5,287	No change
Taku River	MR	BEG	50,000–90,000	2015	124,171 ^b	60,178 ^b	87,704 ^b	57,868 ^b	51,173 ^b	82,759 ^b	No change
Auke Creek	Weir	BEG	200–500	1994	1,533	517	204	283	146	345	No change
Juneau Roadside	Montana Creek FS, IE	SEG	400–1,200	2006	911	1,204	717	634	1,161	203	No change
Index	Peterson Creek FS, IE	SEG	100–250	2006	284	202	52	20	172	NC ^c	No change
Ketchikan Survey Index	HS, IE	BEG	4,250–8,500	2006	16,675	10,128	13,420	11,557	13,764	7,916	No change
Sitka Survey Index	FS, IE	BEG	400–800	2006	2,161	2,244	2,943	1,280	1,502	1,480	No change
Berners River	FS, HS, IE	BEG	3,600–8,100	2018	15,480	9,940	6,733	7,040	3,550	9,405	No change
Chilkat River	AS/FS, MR, IE	BEG	30,000–70,000	2006	130,200	47,930	26,280	34,742	66,085	34,779	No change
Tawah Creek (Lost River)	BS, IE	SEG	1,400–4,200	2015	3,555	2,015	746	1,455	2,211	1,866	No change
Situk River	BS, IE	BEG	3,300–9,800	1994	8,226	7,062	6,177	4,122	6,198	10,381	Change to SEG 3,800–9,600
Tsiu-Tsivat rivers	AS, IE	SEG	10,000–29,000	2018	27,000	19,500	31,000	38,000	48,600	NS ^d	No change

Note: AS = aerial survey, FS = foot survey, BS = boat survey, HS = helicopter survey, IE = index escapement, MR = mark–recapture, BEG = biological escapement goal, SEG = sustainable escapement goal, NC = no count; NS = no survey; gray cells indicate lower bound of the escapement goal not met.

^a Klawock coho salmon escapement goal was officially adopted in 2013, but escapement was managed for this goal beginning in 2007.

^b Preliminary estimate pending publication of final report.

^c In 2019, a coho salmon survey was conducted at Peterson Creek; however, river conditions precluded a valid count (index of escapement) from being obtained.

^d In 2019, no peak index survey available for Tsiu/Tsivat river coho salmon due to lack of available aircraft.

Table 4.—Southeast Alaska pink salmon escapement goals and escapement performance 2014–2019, and 2020 escapement goal recommendations.

System	Assessment method	Goal type	Escapement goal	Year established	Escapement						Escapement goal recommendation
					2014	2015	2016	2017	2018	2019	
Southern Southeast	AS, IE	BEG	3.0–8.0 million	2009	9.7 million	4.3 million	6.6 million	6.4 million	4.9 million	5.6 million	No change
Northern Southeast Inside	AS, IE	BEG	2.5–6.0 million	2009	1.4 million	5.2 million	1.8 million	4.7 million	1.4 million	1.7 million	No change
Northern Southeast Outside	AS, IE	BEG	0.75–2.5 million	2009	2.8 million	2.8 million	1.7 million	2.8 million	1.9 million	1.5 million	No change

Note: AS = aerial survey, IE = index escapement, BEG = biological escapement goal; gray cells indicate lower bound of the escapement goal not met.

Table 5.—Southeast Alaska chum salmon escapement goals and escapement performance 2014–2019, and 2020 escapement goal recommendations.

System	Assessment method	Goal type	Escapement goal	Year established	Escapement						Escapement goal recommendation
					2014	2015	2016	2017	2018	2019	
Chum salmon (summer run)											
Southern Southeast	AS/FS/HS, IE	LB SEG	62,000	2015	47,000	115,000	90,000	84,000	127,000	105,000	No change
Northern Southeast Inside	AS/FS, IE	LB SEG	107,000	2018	93,000	166,000	66,000	277,000	109,000	123,000	No change
Northern Southeast Outside	AS/FS, IE	LB SEG	25,000	2015	27,600	26,300	26,000	24,800	19,400	25,500	No change
Chum salmon (fall run)											
Cholmondeley Sound	AS, IE	SEG	30,000–48,000	2009	48,000	73,000	30,000	52,000	70,000	20,000	No change
Port Camden	AS, IE	SEG	2,000–7,000	2009	4,300	7,300	4,700	4,200	1,000	4,800	No change
Security Bay	AS, IE	SEG	5,000–15,000	2009	6,300	21,500	14,300	15,500	5,600	14,300	No change
Excursion River	AS, IE	SEG	4,000–18,000	2009	10,800	12,000	1,400	14,500	6,200	3,600	No change
Chilkat River	FW expansion	SEG	75,000–250,000	2015	142,000	207,000	218,000	130,000	NA ^a	224,000	No change

Note: AS = aerial survey, FS = foot survey, HS = helicopter survey, IE = index escapement, FW = fish wheel, SEG = sustainable escapement goal, LB SEG = lower-bound SEG; gray cells indicate lower bound of the escapement goal not met.

^a In 2018, Chilkat River fish wheel counts unreliable due to extremely low water; fall chum salmon escapement estimate not available.