

2020 Draft Escapement Plan Options– Fraser River sockeye

For the 2020 escapement plan, the Department is seeking input on two escapement options and their components. Consistent with other years, the Department will consider all input provided during final escapement plan development. The escapement plan that will be included in the final IFMP may be different from the two options described here.

IFMP Escapement Option Description

The Table below describes escapement plan components that are provided in the IFMP.

From Escapement Options Table		Description
forecast	p10 5,000	run size forecast probability level being used for calculations in this column forecast associated with p-level (above) and this management group
TAM Rule (%)	0%	total allowable mortality (TAM) at this run size forecast
Escapement Target	5,000	escapement goal at this run size
MA	3,500	management adjustment (MA=pMA x escapement target)
Esc. Target + MA	8,500	adds up escapement target and management adjustment
LAER	10%	low abundance exploitation rate
ER at Return	0%	exploitation rate given TAM rule, run size, escapement target, & MA
Allowable ER	10%	larger of the values in the two previous rows
available harvest	500	harvest available for test fish, US, and Canada (=allowable ER x run size)
Performance		
Projected S (after MA)	2,700	projected adult spawners to the grounds (NOT accounting for pre-spawn mortality (PSM))
BY Spawners	8,612	number of adult spawners four years previous (compare to line above)
Proj. S as % BY S	31%	projected spawners as a percentage of brood year spawners
cycle avg S	35,354	average number of spawners on this cycle line (NOT accounting for PSM)
Proj. S as % cycle S	8%	projected spawners as a percentage of cycle line average spawners

Draft Escapement Plan Options

Option 1- Brood Year (2016) Escapement Plan

Management Unit	Harvest Rule Parameters		Lower Fishery Reference Point	Upper Fishery Reference Point	Pre-season pMA @p50
	Low Abundance ER (LAER)	TAM Cap			
Early Stuart	10%	60%	108,000	270,000	0.69
Early Summer (w/o misc)	10%	60%	100,000	250,000	0.52
Summer (w/o misc)	10%	60%	640,000	1,600,000	0.15
Late (w/o misc)	20%	60%	300,000	750,000	0.43

Option 2- Conservative Option: Low TAMs and LAERs, higher reference points.

Management Unit	Harvest Rule Parameters		Lower Fishery Reference Point	Upper Fishery Reference Point	Pre-season pMA @p50
	Low Abundance ER (LAER)	TAM Cap			
Early Stuart	10%	50%	108,000	216,000	0.69
Early Summer (w/o misc)	10%	50%	180,000	360,000	0.52
Summer (w/o misc)	10%	50%	1,000,000	2,000,000	0.15
Late (w/o misc)	10%	50%	300,000	600,000	0.43

Note: Grey cells indicate changes from the 2016 Brood Year Escapement Plan.

Escapement Plan Options Summary

Early Stuarts

LAER	Only one LAER Option. Expect LAER over entire forecast range. No directed harvest expected (potential terminal).
TAM CAP	Two Options (60% and 50%). TAM cap does not come into play given the forecasts are much lower than the lower fishery reference point.
MA	Early Stuart is above Big Bar but the MA does not come into play as there is no TAC expected.
REF POINT	Only 1 Option similar to recent cycle year and recent years.
Option 1	Option 1 for Early Stuarts, no directed harvest expected. Group is expected to pass Big Bar.
Option 2	Option 2 for Early Stuarts, no directed harvest expected. Group is expected to pass Big Bar.
Note: Projected spawners well below cycle average over entire forecast range.	

Figure: Escapement plan option allowable exploitation rates and projected spawners.

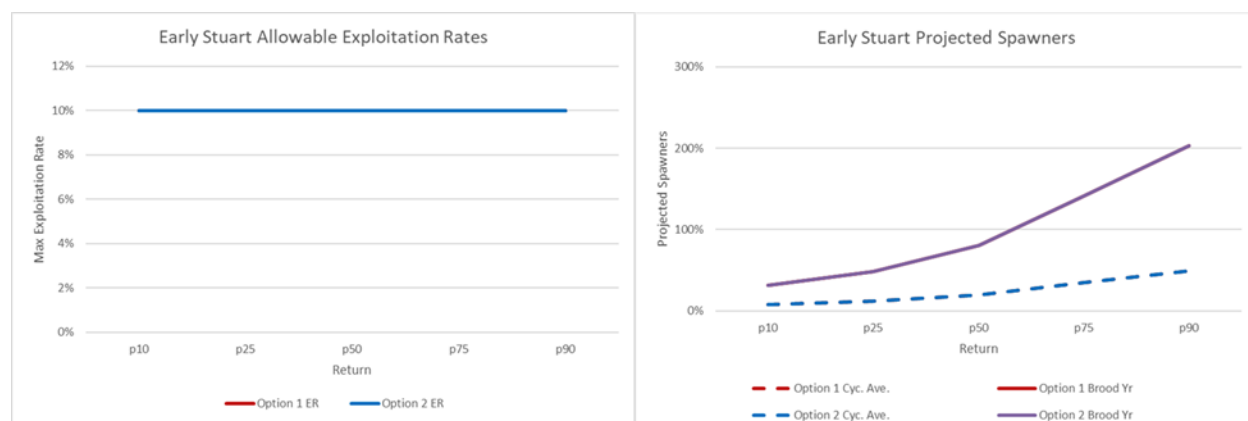


Table: Detailed allowable exploitation rates and projected spawners over the forecast range.

Early Stuart	forecast	p10 5,000	p25 8,000	p50 13,000	p75 23,000	p90 33,000
Option 1	Allowable ER	10%	10%	10%	10%	10%
	Allowable Harvest	500	800	1,300	2,300	3,300
	Projected S (after MA)	2,700	4,200	6,900	12,200	17,500
	Proj. S as % BY S	31%	49%	80%	142%	203%
	Proj. S as % cycle S	8%	12%	20%	35%	49%
Option 2	Allowable ER	10%	10%	10%	10%	10%
	Allowable Harvest	500	800	1,300	2,300	3,300
	Projected S (after MA)	2,700	4,200	6,900	12,200	17,500
	Proj. S as % BY S	31%	49%	80%	142%	203%
	Proj. S as % cycle S	8%	12%	20%	35%	49%

- forecast p-level is below lower fisheries reference point
- forecast p-level is between lower & upper fisheries reference point
- forecast p-level is above upper fisheries reference point

Early Summers

LAER	Only one LAER Option given low return and Big Bar.
TAM CAP	Two Options (60% and 50%). TAM cap comes into play just above the p75 on Option 1 and around the p90 in Option 2
MA	About 35% of the Early Summers expected above Big Bar, the MA is likely going to be higher than currently assumed and may impact expected harvest above the LAER
REF POINT	Option 1 is similar to recent cycle year. Option 2 is more conservative. At the p50 return the difference in reference points impacts harvest under current MA assumptions.
Option 1	Option 1. Will allow some directed harvest above the p50 while the projected spawners will be above the cycle average.
Option 2	Option 2. No directed harvest until the p90. More conservative option given expected low return and Big Bar.
Note: Most stocks throughout the forecast range are projected to escape at levels well below cycle averages, Bowron and Taseko particularly low. Aggregate escapement reaches cycle average above the p50.	

Figure: Escapement plan option allowable exploitation rates and projected spawners.

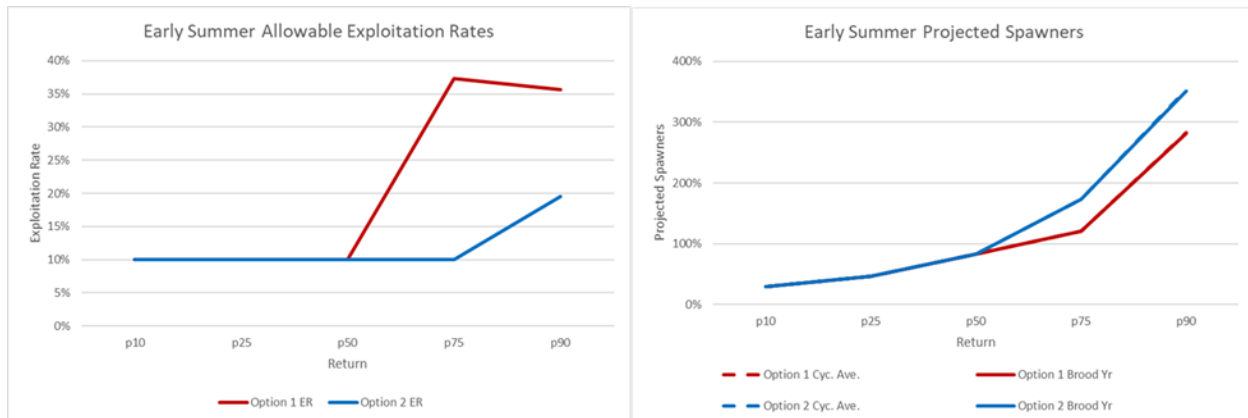


Table: Detailed allowable exploitation rates and projected spawners over the forecast range.

		p10	p25	p50	p75	p90
Early Summer	forecast (incl. misc)	72,500	116,400	217,900	469,000	1,098,000
Option 1	Allowable ER	10%	10%	10%	37%	36%
	Allowable Harvest	7,300	11,600	21,800	175,100	390,900
	Projected S (after MA)	46,600	72,300	130,200	188,400	440,200
	Proj. S as % BY S	30%	46%	83%	120%	281%
	Proj. S as % cycle S	30%	46%	84%	121%	283%
Option 2	Allowable ER	10%	10%	10%	10%	19%
	Allowable Harvest	7,300	11,600	21,800	46,900	214,100
	Projected S (after MA)	46,600	72,300	130,200	270,600	550,200
	Proj. S as % BY S	30%	46%	83%	173%	352%
	Proj. S as % cycle S	30%	46%	84%	174%	353%

	forecast p-level is below lower fisheries reference point
	forecast p-level is between lower & upper fisheries reference point
	forecast p-level is above upper fisheries reference point

Summers

LAER	Only one LAER Option given low return and Big Bar.
TAM CAP	Two Options (60% and 50%). TAM cap does not come into play for either Option given the low returns relative to the upper reference points.
MA	About 63% of the Summers a cre above Big Bar, the MA is likely going to be higher than currently assumed.
REF POINT	Option 1 is similar to recent cycle year. Option 2 more conservative. The higher reference point has an impact on harvest above the p75. Although the allowable harvest is expected to be lower than highlighted given a higher MA expected.
Option 1	Option 1. This Option will allow some directed harvest above the p75 while the projected spawners will be well above the cycle average.
Option 2	Option 2. No directed harvest expected. More conservative option given Big Bar.
Note: Stocks above Big Bar projected to be well below cycle average up to the p50 however in a LAER until the p75. At the p75 aggregate projected spawners are well above the cycle average.	

Figure: Escapement plan option allowable exploitation rates and projected spawners.

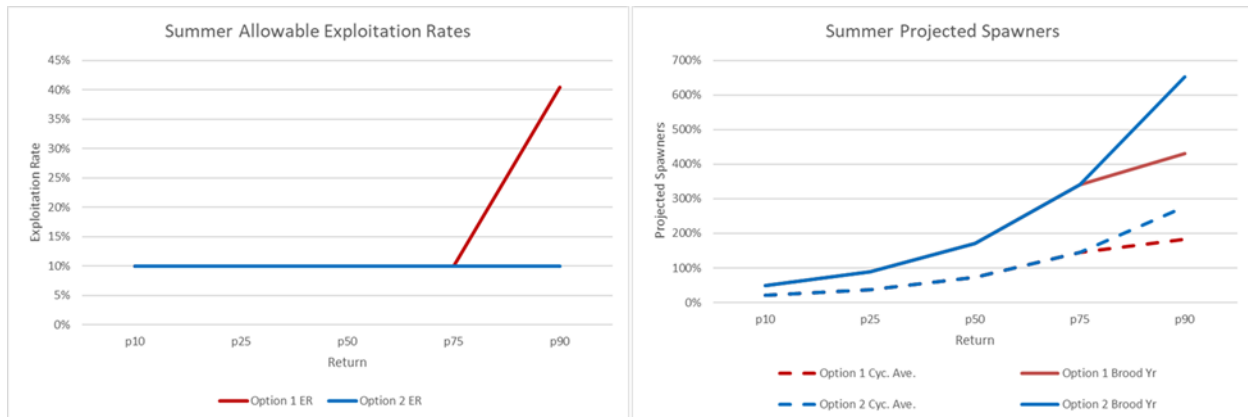


Table: Detailed allowable exploitation rates and projected spawners over the forecast range.

Summer	forecast (incl. misc)	p10	p25	p50	p75	p90
Option 1	Allowable ER	10%	10%	10%	10%	40%
	Allowable Harvest	16,939	31,130	61,070	123,100	960,900
	Projected S (after MA)	135,800	246,800	476,800	947,400	1,197,100
	Proj. S as % BY S	49%	89%	172%	341%	431%
	Proj. S as % cycle S	21%	38%	73%	145%	183%
Option 2	Allowable ER	10%	10%	10%	10%	10%
	Allowable Harvest	16,939	31,130	61,070	123,100	237,600
	Projected S (after MA)	135,800	246,800	476,800	947,400	1,809,000
	Proj. S as % BY S	49%	89%	172%	341%	651%
	Proj. S as % cycle S	21%	38%	73%	145%	277%

	forecast p-level is below lower fisheries reference point
	forecast p-level is between lower & upper fisheries reference point
	forecast p-level is above upper fisheries reference point

Late Runs

LAER	Two LAER Options considered. Option 1 is similar to prior cycle years. Option 2 is more conservative given low expected returns. Cultus is not expected to meet recovery objectives over the forecast range.
TAM CAP	Two Options (60% and 50%). TAM cap does not come into play for either Option given the low returns relative to the upper reference points.
MA	Late run not affected by Big Bar and not expected to have management implications due to being in a LAER over forecast range.
REF POINT	No change in reference points. Cycle year reference points.
Option 1	Option 1. No directed harvest expected. Option 1 will provided some small about of additional flexibility for incidental harvest over Option 2 (LAER).
Option 2	Option 2. No directed harvest expected. Option 2 will provided some small incidental harvest flexibility (LAER).
Note: At the p50 size the aggregate projected spawners is expected to rebuild over brood but well below the cycle average over entire forecast range. Many stocks are projected to return well below cycle and brood year.	

Figure: Escapement plan option allowable exploitation rates and projected spawners.

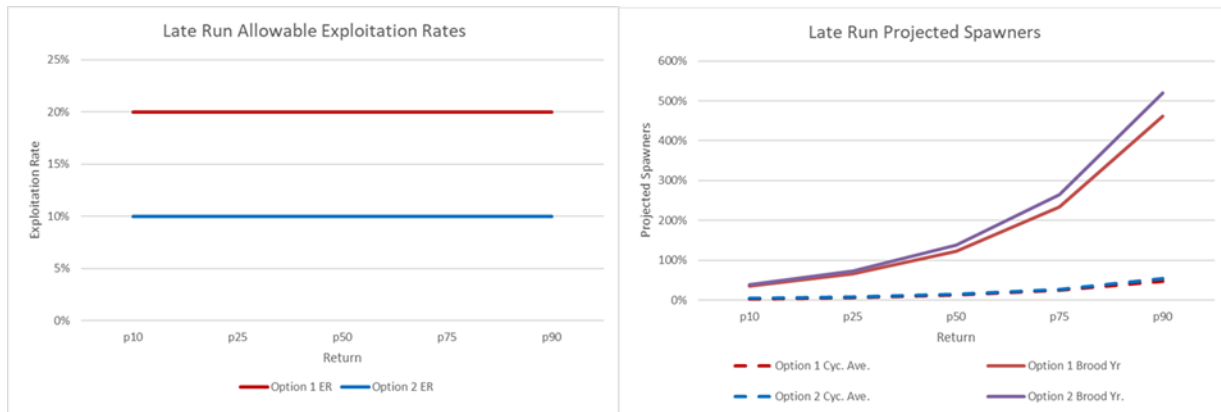


Table: Detailed allowable exploitation rates and projected spawners over the forecast range.

		p10	p25	p50	p75	p90
Lates	forecast (incl. misc)	28,180	52,800	99,000	189,800	374,000
Option 1	Allowable ER	20%	20%	20%	20%	20%
	Allowable Harvest	5,636	10,560	19,800	37,960	74,800
	Projected S (after MA)	15,600	29,500	55,500	105,800	208,300
	Proj. S as % BY S	35%	65%	123%	235%	462%
	Proj. S as % cycle S	4%	7%	13%	24%	48%
Option 2	Allowable ER	10%	10%	10%	10%	10%
	Allowable Harvest	2,818	5,280	9,900	18,980	37,400
	Projected S (after MA)	17,600	33,200	62,400	119,100	234,300
	Proj. S as % BY S	39%	74%	138%	264%	520%
	Proj. S as % cycle S	4%	8%	14%	27%	54%

	forecast p-level is below lower fisheries reference point
	forecast p-level is between lower & upper fisheries reference point
	forecast p-level is above upper fisheries reference point

Table: The difference between harvest and projected escapement between the two Options over the forecast range.

	p10	p25	p50	p75	p90
Option 1					
Allowable Harvest (TF, US, CDN)	30,375	54,090	103,970	338,460	1,429,900
Total projected spawners	200,700	352,800	669,400	1,253,800	1,863,100
Option 2					
Allowable Harvest (TF, US, CDN)	27,557	48,810	94,070	191,280	492,400
Total projected spawners	202,700	356,500	676,300	1,349,300	2,611,000
Difference (Option 2 - Option 1)					
Allowable Harvest (TF, US, CDN)	(2,818)	(5,280)	(9,900)	(147,180)	(937,500)
Total projected spawners	2,000	3,700	6,900	95,500	747,900

The main difference in harvest occurs above the p50 return as the LAER would be implemented for all stock groups at lower p-level returns. The actual difference in harvest may be less than described above (at the higher p-levels) because the MA for Big Bar stocks may be higher than currently assumed.

Historical Reference Points TAMS and LAERs

See below the historical selection of reference points including the Brood Year and the reference points proposed 2020 Options IFMP feedback.

Fraser River Sockeye Spawning Initiative fishery reference points by management unit

Management Unit Fishery Reference Points	Early Stuart		Early Summer ^a		Summer ^a		Late ^{a b}	
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
2011	108,000	270,000	120,000	300,000	520,000	1,300,000	400,000	1,000,000
2012	52,000	130,000	100,000	250,000	640,000	1,600,000	300,000	750,000
2013	108,000	270,000	100,000	250,000	1,250,000	3,125,000	300,000	750,000
2014	108,000	270,000	180,000	450,000	1,020,000	2,550,000	1,100,000	2,750,000
2015	108,000	270,000	100,000	250,000	1,000,000	2,500,000	300,000	750,000
2016	108,000	270,000	100,000	250,000	640,000	1,600,000	300,000	750,000
2017	108,000	270,000	100,000	250,000	1,250,000	3,125,000	300,000	750,000
2018	108,000	270,000	100,000	250,000	1,250,000	3,125,000	300,000	750,000
2019	108,000	270,000	100,000	250,000	1,000,000	2,500,000	300,000	750,000
2020	108,000	270,000	100,000	250,000	640,000	1,600,000	300,000	750,000
2020	108,000	270,000	180,000	450,000	1,000,000	2,500,000	300,000	750,000

Notes:

a) For Early Summers, Summers, and Lates, the fishery reference points may be scaled up annually to account for the expected contribution of unforecasted miscellaneous stocks in the MU.

b) A separate management objective is identified for Cultus Lake sockeye in the salmon IFMP and includes an exploitation rate constraint that limits harvest of Late run sockeye.

See below the historical selection of LAERs and TAMS including the Brood Year.

MU/Year	LAERs				TAMs			
	2016	2017	2018	2019	2016	2017	2018	2019
E. Stuart	10%	10%	10%	10%	60%	60%	60%	60%
E. Summer	10%	10%	20%	20%	60%	60%	60%	60%
Summer	10%	10%	20%	20%	60%	60%	60%	60%
Lates	20%	20-30%	20-30%	20%	60%	60%	60%	60%

= or > 125%
< 125%
< 75%
< 25%

Option 1- Projected Escapements Relative to Cycle Average and Brood Year

Run timing group Stocks	Total Escapement		Comparisons @p10		Comparisons @p25		Comparisons @p50		Comparisons @p75	
	Cycle Ave	Brood Year	Cycle Ave	Brood Year	Cycle Ave	Brood Year	Cycle Ave	Brood Year	Cycle Ave	Brood Year
Early Stuart	35,354	8,612	8%	31%	12%	49%	20%	80%	35%	142%
Early Summer	155,761	156,520	30%	30%	46%	46%	84%	83%	121%	120%
Bowron	6,895	143	4%	203%	8%	364%	17%	804%	17%	839%
Upper Barriere	8,716	1,152	20%	150%	33%	250%	53%	400%	64%	487%
Gates	29,655	8,797	12%	39%	18%	59%	29%	98%	38%	128%
Nadina	23,521	26,632	64%	56%	103%	91%	176%	156%	227%	200%
Pitt	32,360	58,241	64%	35%	76%	42%	97%	54%	94%	52%
Scotch	2,085	990	28%	59%	55%	116%	110%	232%	154%	324%
Seymour	7,412	374	6%	123%	16%	307%	23%	463%	33%	644%
Misc (EShu)	12,065	203	5%	286%	14%	852%	33%	1985%	43%	2567%
Misc (Taseko)	2,149	164	6%	73%	13%	177%	24%	317%	37%	488%
Misc (Chilliwack)	25,927	57,928	10%	5%	32%	14%	115%	51%	268%	120%
Misc (Nahatlatch)	4,976	1,896	23%	61%	46%	121%	93%	243%	113%	296%
Summer	653,758	277,805	21%	49%	38%	89%	73%	172%	145%	341%
Chilko	457,386	155,687	17%	50%	28%	81%	46%	136%	79%	233%
Late Stuart	47,528	10,066	10%	49%	24%	115%	61%	288%	145%	683%
Quesnel	11,041	1,081	6%	61%	8%	77%	15%	154%	30%	306%
Stellako	109,427	30,307	22%	79%	38%	137%	70%	254%	129%	467%
Harrison	10,782	65,758	158%	26%	390%	64%	1024%	168%	2553%	419%
Raft	14,903	8,150	28%	51%	50%	91%	100%	183%	178%	325%
Misc (N. Thomp. Tribs)	610	511	67%	80%	136%	162%	272%	325%	679%	810%
Misc (N. Thomp River)	1,142	5,926	580%	112%	1450%	279%	2610%	503%	5583%	1076%
Misc (Widgeon)	939	319	6%	19%	21%	63%	49%	144%	70%	207%
Late	435,329	45,091	4%	35%	7%	65%	13%	123%	24%	235%
Cultus	11,247	2,606	0%	1%	0%	2%	1%	2%	1%	5%
Late Shuswap	310,704	49	0%	20%	0%	41%	0%	82%	0%	122%
Portage	1,223	41	1%	24%	1%	24%	2%	73%	4%	122%
Weaver	28,414	300	0%	10%	0%	13%	0%	20%	1%	63%
Birkenhead	78,517	36,441	17%	36%	28%	60%	50%	107%	96%	207%
Misc. non-Shuswap	5,224	5,654	44%	41%	143%	132%	309%	285%	573%	530%

= or > 125%
< 125%
< 75%
< 25%

Option 2- Projected Escapements Relative to Cycle Average and Brood Year

Run timing group Stocks	Total Escapement		Comparisons @p10		Comparisons @p25		Comparisons @p50		Comparisons @p75	
	Cycle Ave	Brood Year	Cycle Ave	Brood Year	Cycle Ave	Brood Year	Cycle Ave	Brood Year	Cycle Ave	Brood Year
Early Stuart	35,354	8,612	8%	31%	12%	49%	20%	80%	35%	142%
Early Summer	155,761	156,520	30%	30%	46%	46%	84%	83%	174%	173%
Bowron	6,895	143	4%	203%	8%	364%	17%	804%	25%	1210%
Upper Barriere	8,716	1,152	20%	150%	33%	250%	53%	400%	92%	700%
Gates	29,655	8,797	12%	39%	18%	59%	29%	98%	54%	183%
Nadina	23,521	26,632	64%	56%	103%	91%	176%	156%	326%	288%
Pitt	32,360	58,241	64%	35%	76%	42%	97%	54%	135%	75%
Scotch	2,085	990	28%	59%	55%	116%	110%	232%	221%	466%
Seymour	7,412	374	6%	123%	16%	307%	23%	463%	47%	925%
Misc (EShu)	12,065	203	5%	286%	14%	852%	33%	1985%	62%	3690%
Misc (Taseko)	2,149	164	6%	73%	13%	177%	24%	317%	54%	701%
Misc (Chilliwack)	25,927	57,928	10%	5%	32%	14%	115%	51%	385%	172%
Misc (Nahatlatch)	4,976	1,896	23%	61%	46%	121%	93%	243%	162%	425%
Summer	653,758	277,805	21%	49%	38%	89%	73%	172%	145%	341%
Chilko	457,386	155,687	17%	50%	28%	81%	46%	136%	79%	233%
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Late	435,329	45,091	4%	39%	8%	74%	14%	138%	27%	264%
Cultus	11,247	2,606	0%	2%	0%	2%	1%	3%	1%	5%
Late Shuswap	310,704	49	0%	20%	0%	41%	0%	82%	0%	143%
Portage	1,223	41	1%	24%	1%	24%	2%	73%	5%	146%
Weaver	28,414	300	0%	10%	0%	13%	0%	23%	1%	73%
Birkenhead	78,517	36,441	19%	41%	31%	68%	56%	121%	108%	233%
Misc. non-Shuswap	5,224	5,654	50%	46%	161%	149%	347%	321%	645%	596%