2013 Escapement Strategy and Harvest Rate Calculations: The Fraser River Sockeye Spawning Initiative (FRSSI) was undertaken to develop escapement strategies for Fraser River sockeye.

The Lower and Upper Fishery Reference Points describe the shape of the Total Allowable Mortality (TAM) rule for each management aggregate. The Upper Fishery Reference Point describes the run size above which the TAM plateaus at the TAM cap of 60% and the escapement target is set at 40% of the run size. The Lower Fishery Reference point is 40% of the Upper Fishery Reference Point and describes the numerical escapement target when the run size is between the Upper and Lower Fishery Reference Points. In addition, when the run size is below the Lower Fishery Reference Point, the escapement target is the run size, but it is recognized that there will be some low incidental harvest in the form of low abundance exploitation rates (or LAER, previously called "ER floors") from fisheries directed on co-migrating stocks and species (see "incidental harvest" section, below).

As in recent years, the LAER for Early Stuart, Early Summer, and Summer Run timing groups is 10% and 20% for Late Run and Cultus Lake sockeye. If the return of Late-run sockeye is at or above the p75 forecast, consideration will be given to increasing the Late-run exploitation rate up to 30%.

The preliminary pre-season proportional management adjustments (pMAs) are estimates based on methods implemented in 2012. For Early Stuart the pre-season pMA is the median of the long term data set. For Early Summer sockeye the pre-season pMA is based on the median of the long term data series weighted against a fixed pMA for Chilliwack sockeye (2008-2012; excluding 2009) at the p50 forecast. For Summer Run sockeye the pre-season pMA is based on the median of the long term data series weighted against a fixed pMA for Harrison sockeye (2004-2012; excluding 2010) at the p50 forecast. The pMAs for Early Stuart, Early Summer and Summer Run sockeye will change in-season with updated information on environmental conditions and migration timing. The Late Run pMA in 2012 was comprised of two components: Birkenhead and the remaining Late Run stocks. The pre-season pMA for Late Run in 2013 has yet to be determined. The pMA of 1.0 shown in the escapement options tables is an intermediate number based on two methods but is still under review. The pre-season pMA values for all management groups will continue to be reviewed and updated by the Fraser Panel prior to the start of the 2013 fishing season.

Tables 7-12 and 7-14 show two proposed escapement plan options for 2013 for all four management groups. The fishery reference points shown in this table are evaluated for the stocks that have a long term stock-recruit relationship. For the Early Summers, Summers, and Lates, the fishery reference points are scaled up annually to account for the expected contribution of the unforecasted, or "miscellaneous", stocks to the run timing group (see Table 7-11).

Tables 7-13 and 7-15 show the expected outcomes (e.g., exploitation rates and expected numbers of spawners to the grounds) of the two escapement plan options for the range of the abundance forecast, fisheries reference points and pMAs shown in Tables 7-12 and 7-14. The "projected S after MA" is the number of spawners to the grounds that would occur, given a total adult return shown in the "forecast" row, an exploitation rate as shown in the line "allowable ER", and en-

route loss as represented by the pMA in the "pre-season pMA" section of Tables 7-12 and 7-14. The "projected S after MA" values can be compared directly to the number of spawners that returned in the brood year for four year olds shown in the line "BY spawners", as well as to the cycle average spawners in line "cycle avg S". The lines "Proj. S as % BY S" and "Proj. S as % cycle S" show the "projected S after MA" values as a percentage of the brood year escapement and the cycle average escapement, respectively. Note that these values do not take into account the pre-spawn mortality which can occur after spawners reach the grounds. We currently do not have any methods to forecast pre-spawn mortality rates.

Option 1, termed the 'Like last year' escapement plan option is the escapement plan implemented last year and is displayed in Tables 7-12 and 7-13. The escapement plan presented in Option 2 (Tables 7-14 and 7-15) is similar to Option 1 with an increase in the Lower & Upper Fishery Reference Points for Early Stuart and Summer Run sockeye. The resulting increase in the escapement targets provides more protection to these management groups through decreased exploitation at returns of lower abundance.

Table 7-12. Secnario 1: Escapement Plan similar to last year

	Harvest Rule Parameters				
Management Unit	Low Abundance ER	TAM Cap	Lower Fishery Reference Point	Upper Fishery Reference Point	Pre-season pMA
Early Stuart	10%	60%	52,000	130,000	0.67
Early Summer (w/o misc)	10%	60%	100,000	250,000	0.51
Summer	10%	60%	640,000	1,600,000	0.10
Late (w/o misc)	20-30%	60%	300,000	750,000	1.00

Table 7-13. Scenario 1: Escapement Plan for the Fraser River Sockeye timing groups over a range of preseason forecasts

Management		Pre-season Forecast Return				
Unit		p10	p25	**p50**	p75	p90
Early Stuart	forecast	92,000	137,000	**211,000**	331,000	507,000
	TAM Rule (%)	43%	60%	**60%**	60%	60%
	Escapement Target	52,000	54,800	**84,400**	132,400	202,800
	MA	34,800	36,700	**56,500**	88,700	135,900
	Esc. Target + MA	86,800	91,500	**140,900**	221,100	338,700
	LAER	10%	10%	**10%**	10%	10%
	ER at Return	6%	33%	**33%**	33%	33%
	Allowable ER	10%	33%	**33%**	33%	33%
	TAC	9,200	45,500	**70,100**	109,900	168,300
	2013 Performance					
	Projected S (after MA)	50,000	55,000	**84,000**	132,000	203,000
	BY Spawners	45,300	45,300	**45,300**	45,300	45,300
	Proj. S as % BY S	110%	121%	**185%**	291%	448%
	cycle avg S	210,300	210,300	**210,300**	210,300	210,300
	Proj. S as % cycle S	24%	26%	**40%**	63%	97%
Management		Pre-season Forecast Return				
Unit		p10	p25	**p50**	p75	p90
Early Summer	*lower ref. pt. (w misc)*	141,000	141,000	141,000	141,000	141,000
(w/o RNT)	*upper ref. pt. (w misc)*	351,000	351,000	351,000	351,000	351,000
	forecast (incl. misc)	73,000	130,000	253,000	468,000	844,000
	TAM Rule (%)	0%	0%	**44%**	60%	60%
	Escapement Target	73,000	130,000	**141,000**	187,200	337,600
	MA	37,200	66,300	**71,900**	95,500	172,200
	Esc. Target + MA	110,200	196,300	**212,900**	282,700	509,800
	LAER	10%	10%	**10%**	10%	10%
	ER at Return	0%	0%	**16%**	40%	40%
	Allowable ER	10%	10%	**16%**	40%	40%
	TAC	7,300	13,000	**40,100**	185,300	334,200
	2013 Performance					
	Projected S (after MA)	44,000	77,000	**141,000**	187,000	338,000
	BY Spawners	80,200	80,200	**80,200**	80,200	80,200
	Proj. S as % BY S	55%	96%	**176%**	233%	421%
	cycle avg S	91,000	91,000	**91,000**	91,000	91,000
	Proj. S as % cycle S	48%	85%	**155%**	205%	371%
Management		Pre-season Forecast Return				
Unit		p10	p25	**p50**	p75	p90
Summer	*lower ref. pt. (w misc)*	642,000	642,000	**642,000**	642,000	642,000
(w. RNT & Har)	*upper ref. pt. (w misc)*	1,606,000	1,606,000	**1,606,000**	1,606,000	1,606,000
	forecast	1,222,000	2,095,000	**3,718,000**	6,663,000	12,131,000
	TAM Rule (%)	47%	60%	**60%**	60%	60%
	Escapement Target	642,000	838,000	**1,487,200**	2,665,200	4,852,400
	MA	64,200	83,800	**148,700**	266,500	485,200
	Esc. Target + MA	706,200	921,800	**1,635,900**	2,931,700	5,337,600
	LAER	10%	10%	**10%**	10%	10%
	ER at Return	42%	56%	**56%**	56%	56%
	Allowable ER	42%	56%	**56%**	56%	56%
	TAC	515,800	1,173,200	**2,082,100**	3,731,300	6,793,400
	2013 Performance					
	Projected S (after MA)	642,000	838,000	**1,487,000**	2,665,000	4,852,000
	BY Spawners	796,200	796,200	796,200	796,200	796,200
	Proj. S as % BY S	81%	105%	**187%**	335%	609%
	cycle avg S	1,825,400	1,825,400	**1,825,400**	1,825,400	1,825,400
	Proj. S as % cycle S	35%	46%	**81%**	146%	266%
Management		Pre-season Forecast Return				
Unit		p10	p25	**p50**	p75	p90
Late	*lower ref. pt. (w misc)*	313,000	313,000	**313,000**	313,000	313,000
(w/o Har)	*upper ref. pt. (w misc)*	782,000	782,000	**782,000**	782,000	782,000
	forecast	167,000	293,000	**583,000**	1,133,000	2,126,000
	TAM Rule (%)	0%	0%	**46%**	60%	60%
	Escapement Target	167,000	293,000	**313,000**	453,200	850,400
	MA	167,000	293,000	**313,000**	453,200	850,400
	Esc. Target + MA	334,000	586,000	**626,000**	906,400	1,700,800
	LAER	20%	20%	**20%**	30%	30%
	ER at Return	0%	0%	**0%**	20%	20%
	Allowable ER	20%	20%	**20%**	30%	30%
	TAC	33,400	58,600	**116,600**	339,900	637,800
	2013 Performance					
	Projected S (after MA)	67,000	117,000	**233,000**	397,000	744,000
	BY Spawners	134,000	134,000	134,000	134,000	134,000
	Proj. S as % BY S	50%	87%	**174%**	296%	555%
	cycle avg S	104,200	104,200	**104,200**	104,200	104,200
	Proj. S as % cycle S	64%	112%	**224%**	381%	714%
Available Harvest (TF, US, CDN)		565,700	1,290,300	**2,308,900**	4,366,400	7,933,700
Total projected spawners		803,000	1,087,000	**1,945,000**	3,381,000	6,137,000

Table Abbreviations
MA Management Adjustment
ER Exploitation Rate
TAM Total Allowable Mortality
pMA Proportional Management Adjustment
BY Brood Year
S Spawners

Table 7-14. Scenario 2: Escapement Plan similar to Scenario 1 with an increase in the Lower & Upper Fishery Reference Points for Early Stuart and Summer Run sockeye.

	Harvest Rule Parameters				
Management Unit	Low Abundance ER	TAM Cap	Lower Fishery Reference Point	Upper Fishery Reference Point	Pre-season pMA
Early Stuart	10%	60%	108,000	270,000	0.67
Early Summer (w/o misc)	10%	60%	100,000	250,000	0.51
Summer	10%	60%	1,250,000	3,125,000	0.10
Late (w/o misc)	20-30%	60%	300,000	750,000	1.00

Table 7-15. Scenario 2: Escapement Plan for the Fraser River Sockeye timing groups over a range of preseason forecasts.

Management		Pre-season Forecast Return				
Unit		p10	p25	**p50**	p75	p90
Early Stuart	forecast	92,000	137,000	**211,000**	331,000	507,000
	TAM Rule (%)	0%	21%	**49%**	60%	60%
	Escapement Target	92,000	108,000	**108,000**	132,400	202,800
	MA	61,600	72,400	**72,400**	88,700	135,900
	Esc. Target + MA	153,600	180,400	**180,400**	221,100	338,700
	LAER	10%	10%	**10%**	10%	10%
	ER at Return	0%	0%	**15%**	33%	33%
	Allowable ER	10%	10%	**15%**	33%	33%
	TAC	9,200	13,700	**30,600**	109,900	168,300
	2013 Performance					
	Projected S (after MA)	50,000	74,000	**108,000**	132,000	203,000
	BY Spawners	45,300	45,300	**45,300**	45,300	45,300
	Proj. S as % BY S	110%	163%	**238%**	291%	448%
	cycle avg S	210,300	210,300	**210,300**	210,300	210,300
	Proj. S as % cycle S	24%	35%	**51%**	63%	97%
Management		**Pre-season Forecast Return**				
Unit		p10	p25	**p50**	p75	p90
Early Summer	*lower ref. pt. (w misc)*	141,000	141,000	141,000	141,000	141,000
(w/o RNT)	*upper ref. pt. (w misc)*	351,000	351,000	351,000	351,000	351,000
	forecast (incl. misc)	73,000	130,000	253,000	468,000	844,000
	TAM Rule (%)	0%	0%	**44%**	60%	60%
	Escapement Target	73,000	130,000	**141,000**	187,200	337,600
	MA	37,200	66,300	**71,900**	95,500	172,200
	Esc. Target + MA	110,200	196,300	**212,900**	282,700	509,800
	LAER	10%	10%	**10%**	10%	10%
	ER at Return	0%	0%	**16%**	40%	40%
	Allowable ER	10%	10%	**16%**	40%	40%
	TAC	7,300	13,000	**40,100**	185,300	334,200
	2013 Performance					
	Projected S (after MA)	44,000	77,000	**141,000**	187,000	338,000
	BY Spawners	80,200	80,200	**80,200**	80,200	80,200
	Proj. S as % BY S	55%	96%	**176%**	233%	421%
	cycle avg S	91,000	91,000	**91,000**	91,000	91,000
	Proj. S as % cycle S	48%	85%	**155%**	205%	371%
Management		**Pre-season Forecast Return**				
Unit		p10	p25	**p50**	p75	p90
Summer	*lower ref. pt. (w misc)*	1,254,000	1,254,000	**1,254,000**	1,254,000	1,254,000
(w. RNT & Har)	*upper ref. pt. (w misc)*	3,136,000	3,136,000	**3,136,000**	3,136,000	3,136,000
	forecast	1,222,000	2,095,000	**3,718,000**	6,663,000	12,131,000
	TAM Rule (%)	0%	40%	**60%**	60%	60%
	Escapement Target	1,222,000	1,254,000	**1,487,200**	2,665,200	4,852,400
	MA	122,200	125,400	**148,700**	266,500	485,200
	Esc. Target + MA	1,344,200	1,379,400	**1,635,900**	2,931,700	5,337,600
	LAER	10%	10%	**10%**	10%	10%
	ER at Return	0%	34%	**56%**	56%	56%
	Allowable ER	10%	34%	**56%**	56%	56%
	TAC	122,200	715,600	**2,082,100**	3,731,300	6,793,400
	2013 Performance					
	Projected S (after MA)	1,000,000	1,254,000	**1,487,000**	2,665,000	4,852,000
	BY Spawners	796,200	796,200	796,200	796,200	796,200
	Proj. S as % BY S	126%	157%	**187%**	335%	609%
	cycle avg S	1,825,400	1,825,400	**1,825,400**	1,825,400	1,825,400
	Proj. S as % cycle S	55%	69%	**81%**	146%	266%
Management		**Pre-season Forecast Return**				
Unit		p10	p25	**p50**	p75	p90
Late	*lower ref. pt. (w misc)*	313,000	313,000	**313,000**	313,000	313,000
(w/o Har)	*upper ref. pt. (w misc)*	782,000	782,000	**782,000**	782,000	782,000
	forecast	167,000	293,000	**583,000**	1,133,000	2,126,000
	TAM Rule (%)	0%	0%	**46%**	60%	60%
	Escapement Target	167,000	293,000	**313,000**	453,200	850,400
	MA	167,000	293,000	**313,000**	453,200	850,400
	Esc. Target + MA	334,000	586,000	**626,000**	906,400	1,700,800
	LAER	20%	20%	**20%**	30%	30%
	ER at Return	0%	0%	**0%**	20%	20%
	Allowable ER	20%	20%	**20%**	30%	30%
	TAC	33,400	58,600	**116,600**	339,900	637,800
	2013 Performance					
	Projected S (after MA)	67,000	117,000	**233,000**	397,000	744,000
	BY Spawners	134,000	134,000	134,000	134,000	134,000
	Proj. S as % BY S	50%	87%	**174%**	296%	555%
	cycle avg S	104,200	104,200	**104,200**	104,200	104,200
	Proj. S as % cycle S	64%	112%	**224%**	381%	714%
Available Harvest (TF, US, CDN)		172,100	800,900	**2,269,400**	4,366,400	7,933,700
Total projected spawners		1,161,000	1,522,000	**1,969,000**	3,381,000	6,137,000