DRAFT - 2022 Escapement Plan Review of Options and Recommendations

For the 2022 escapement plan, varying from recent years, the Department is seeking input on three escapement options and their components rather than two. The Department will consider all input provided during final escapement plan development. Dependent on the feedback received, the 2022 escapement plan included in the final IFMP may differ from the three options described here.

Draft Escapement Plan Options:

Option 1- Brood Year (2018) Escapement Plan

	Harvest Rule Parameters				
Management Unit	**Low Abundance ER (LAER)**	**TAM Cap**	**Lower Fishery Reference Point**	**Upper Fishery Reference Point**	**Pre-season pMA @p50**
Early Stuart	10%	60%	108,000	270,000	0.89
Early Summer (w/o misc)	20%	60%	180,000	450,000	0.45
Summer (w/o misc)	20%	60%	1,020,000	2,550,000	0.06
Late (w/o misc)	20-30%	60%	1,100,000	2,750,000	0.22

Option 2: Modified Brood Year (2018) Escapement Plan

	Harvest Rule Parameters				
Management Unit	**Low Abundance ER (LAER)**	**TAM Cap**	**Lower Fishery Reference Point**	**Upper Fishery Reference Point**	**Pre-season pMA @p50**
Early Stuart	10%	20%	108,000	135,000	0.89
Early Summer (w/o misc)	20%	50%	180,000	360,000	0.45
Summer (w/o misc)	20%	50%	1,250,000	2,500,000	0.06
Late (w/o misc)	20%	50%	1,100,000	2,200,000	0.22

Option 3: Conservative Escapement Plan

	Harvest Rule Parameters				
Management Unit	**Low Abundance ER (LAER)**	**TAM Cap**	**Lower Fishery Reference Point**	**Upper Fishery Reference Point**	**Pre-season pMA @p50**
Early Stuart	10%	20%	108,000	135,000	0.89
Early Summer (w/o misc)	10%	40%	180,000	300,000	0.45
Summer (w/o misc)	10%	40%	1,250,000	2,083,000	0.06
Late (w/o misc)	10%	40%	1,100,000	1,833,000	0.22

Note: Blue cells emphasize changes between Option 1 and Option 2 and 3.

Escapement Plan Options and Recommendation:

Early Stuart

Option	LAER	TAM Cap	Lower Fishery Ref. Point	Upper fishery Ref. Point
1	10%	60%	108,000	270,000
2	10%	20%	108,000	135,000
3	10%	20%	108,000	135,000

LAER	Only one LAER Option (10%). **Expect LAER over entire forecast range**, with the exception of a p90 return under option 1. Most likely no directed harvest expected.
TAM CAP	Two Options (60% and 20%). **TAM cap comes into play at the p90 level for Option 1 and the p75 for Options 2 and 3**.
MA	Early Stuart is **above the Big Bar landslide. The MA only comes into play** above the p75 in option 1 when the forecasted run size is above the lower reference point.
REF POINT	Option 1 is similar to the brood year; Option 2 and 3 include slightly lower upper reference points.
Option 1	**Potential for directed harvest at the p90 and above, however unlikely due to management actions to protect early timed stocks**. This group to pass the Big Bar slide. A minimum **3 week window closure is expected to protect Early Stuarts.**
Option 2	**No directed harvest expected**. This group to pass the Big Bar slide. A minimum **3 week window closure is expected to protect Early Stuarts.** Options 2 and 3 are identical for Early Stuart.
Option 3	**No directed harvest expected**. This group to pass the Big Bar slide. A minimum **3 week window closure is expected to protect Early Stuarts.** Options 2 and 3 are identical for Early Stuart.
Note: Projected spawners below cycle average over p10 – p25 forecast range. Over the entire forecast range, projected spawners are essentially identical over all three options.	

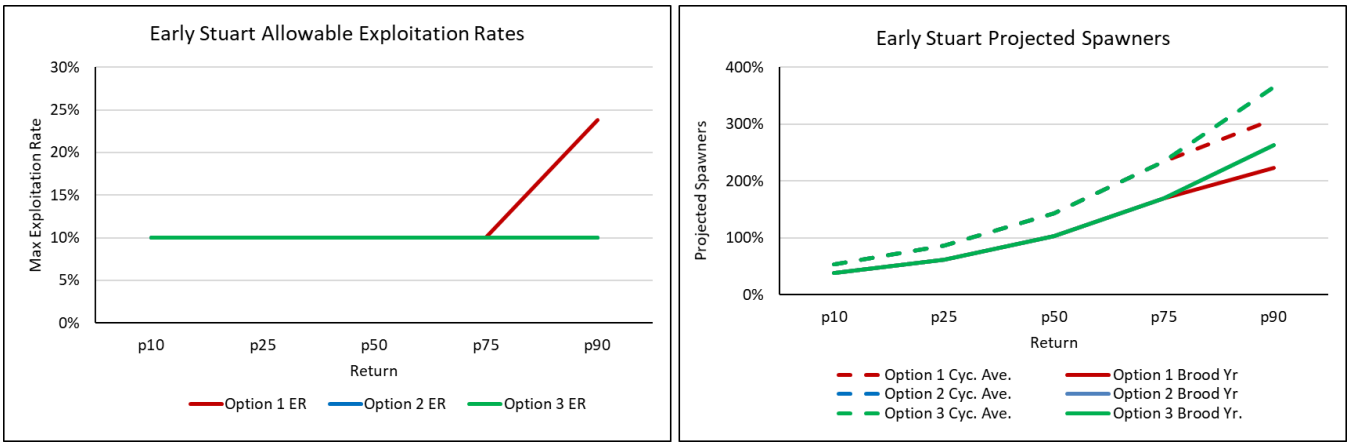


Figure: Allowable exploitation rates and projected spawners for three escapement plan options.

Table: Detailed allowable exploitation rates and projected spawners over the forecast range for three escapement plan options.

Early Stuart	forecast	p10 39,000	p25 63,000	p50 105,000	p75 172,000	p90 268,000
Option 1	Max. Allowable ER	**10%**	**10%**	**10%**	**10%**	**24%**
	Allowable Harvest	**3,900**	**6,300**	**10,500**	**17,200**	**63,900**
	Projected S (after MA)	18,600	30,100	50,100	82,000	108,200
	Proj. S as % BY S	38%	62%	103%	169%	223%
	Proj. S as % cycle S	53%	86%	143%	234%	309%
Option 2	Max. Allowable ER	**10%**	**10%**	**10%**	**10%**	**10%**
	Allowable Harvest	**3,900**	**6,300**	**10,500**	**17,200**	**26,800**
	Projected S (after MA)	18,600	30,100	50,100	82,000	127,800
	Proj. S as % BY S	38%	62%	103%	169%	264%
	Proj. S as % cycle S	53%	86%	143%	234%	365%
Option 3	Max. Allowable ER	**10%**	**10%**	**10%**	**10%**	**10%**
	Allowable Harvest	**3,900**	**6,300**	**10,500**	**17,200**	**26,800**
	Projected S (after MA)	18,600	30,100	50,100	82,000	127,800
	Proj. S as % BY S	38%	62%	103%	169%	264%
	Proj. S as % cycle S	53%	86%	143%	234%	365%

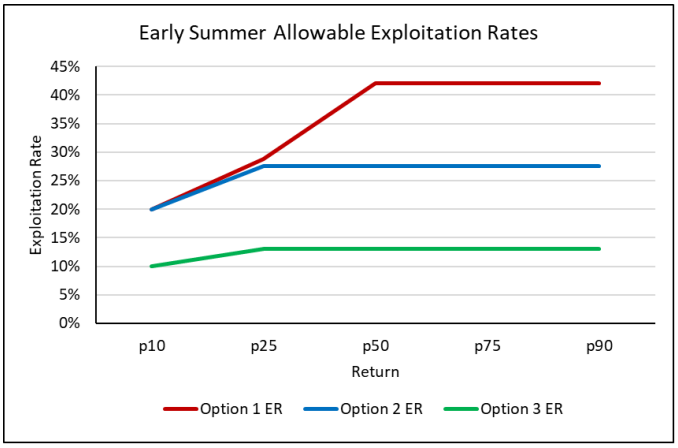
Incidental Harvest (LAER)
Directed Harvest

Early Summer

Option	LAER	TAM Cap	Lower Fishery Ref. Point	Upper fishery Ref. Point
1	20%	60%	180,000	450,000
2	20%	50%	180,000	360,000
3	10%	40%	180,000	300,000

LAER	Two LAER Options considered (20% and 10%). **Option 1 and 2 are similar to 2018 brood year with increased flexibility for incidental harvest. Option 3 is more conservative** given recent low returns.
TAM CAP	Three Options (60%, 50%, and 40%). **TAM caps come into play at the p50 level under Option 1 and at the p25 level for Options 2 and 3.**
MA	**About 14% of the Early Summers projected above Big Bar**, the MA may be higher than currently assumed which could impact expected harvest above the LAER.
REF POINT	Option 1 is similar to brood year; Option 2 and 3 include lower upper reference points. **At the current pre-season MA, the reference points make a difference when the run approaches the p25.** At that level, all options have variable ER levels as a result.
Option 1	Option 1. **Will allow some directed harvest at p25 and above while the projected spawners will be above the cycle average.**
Option 2	Option 2 is more conservative; **Will allow some directed harvest at the p25 and above while the projected spawners will be above the cycle average.** Very similar to Option 1, though will permit lower ER at all forecast levels.

Option 3	Option 3 is the most conservative; **Will allow a small amount of directed harvest at or above the p25 while the projected spawners will be above the cycle average.** Compared to Options 1 and 2, Option 3 permits the lowest ER levels is maximized at 13%.
Note: Largest forecast contributors to the Early Summer group are Early Shuswap (51%) 2022 represents the dominant cycle-line for this stock,, and Nadina (13%). Many stocks throughout the forecast range are projected to **escape at levels well below cycle averages, Bowron and Taseko are forecasted at particularly low abundance**. **Aggregate escapement reaches the cycle average above the p25.**	



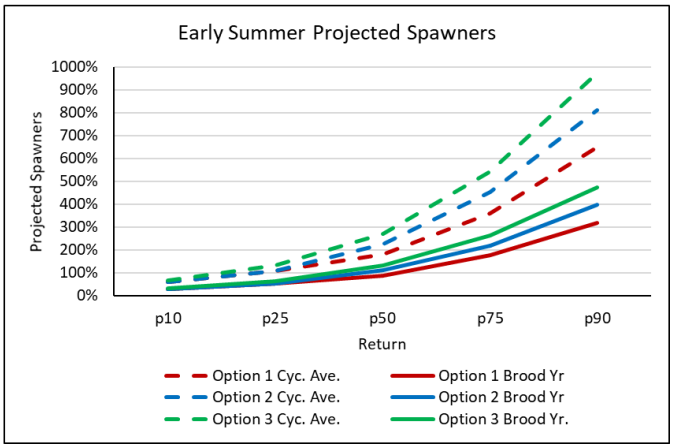


Figure: Allowable exploitation rates and projected spawners for three escapement plan options.

Table: Detailed allowable exploitation rates and projected spawners over the forecast range for three escapement plan options.

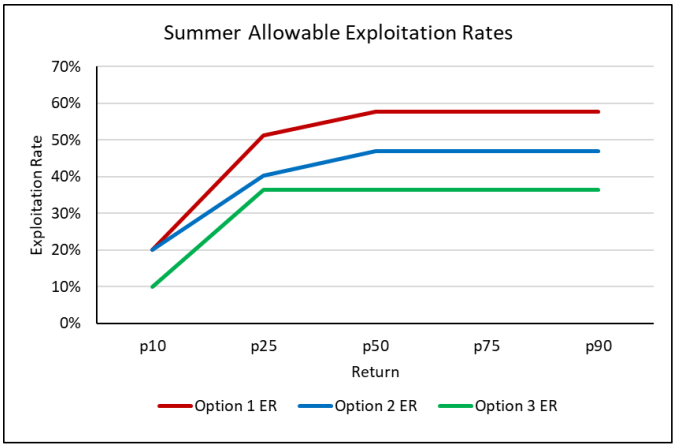
Early Summer	forecast (incl. misc)	p10 383,840	p25 764,100	p50 1,579,200	p75 3,159,400	p90 5,685,600
Option 1	Max. Allowable ER	**20%**	**29%**	**42%**	**42%**	**42%**
	Allowable Harvest	**76,800**	**219,600**	**663,200**	**1,326,900**	**2,388,000**
	Projected S (after MA)	211,900	375,700	632,000	1,264,400	2,275,300
	Proj. S as % BY S	29%	52%	88%	176%	317%
	Proj. S as % cycle S	60%	107%	180%	361%	649%
Option 2	Max. Allowable ER	**20%**	**28%**	**28%**	**27%**	**27%**
	Allowable Harvest	**76,800**	**210,200**	**434,300**	**868,800**	**1,563,500**
	Projected S (after MA)	211,900	382,200	790,000	1,580,500	2,844,200
	Proj. S as % BY S	29%	53%	110%	220%	396%
	Proj. S as % cycle S	60%	109%	225%	451%	812%
Option 3	Max. Allowable ER	**10%**	**13%**	**13%**	**13%**	**13%**
	Allowable Harvest	**38,400**	**99,300**	**205,300**	**410,800**	**739,100**
	Projected S (after MA)	238,400	458,700	948,000	1,896,500	3,413,100
	Proj. S as % BY S	33%	64%	132%	264%	475%
	Proj. S as % cycle S	68%	131%	271%	541%	974%

Incidental Harvest (LAER)
Directed Harvest

Summers

Option	LAER	TAM Cap	Lower Fishery Ref. Point	Upper fishery Ref. Point
1	20%	60%	1,020,000	2,550,000
2	20%	50%	1,250,000	2,500,000
3	10%	40%	1,250,000	2,083,000

LAER	Two LAER Options considered (20% and 10%). **Option 1 and 2 are similar to 2018 brood year with increased flexibility for incidental harvest. Option 3 is more conservative** given recent low returns.
TAM CAP	Three Options (60%, 50%, and 40%). TAM cap comes into play at the **p50 forecast level for Options 1 and 2, and at the p25 for Option 3.**
MA	About 99% of the Summers are above Big Bar and would have migrated past the slide as juveniles, the MA is likely going to be higher than currently assumed. The impact of migration past Big Bar as a juvenile on survival is unknown.
REF POINT	**Option 1 has a reduced lower reference point compared to Option 2 and 3**; All Options project some harvest **starting at the p25.**
Option 1	Option 1 will allow **directed harvest at the p25. At this level the projected spawners will be above the cycle average but below the brood year**.
Option 2	Option 2 is very similar to Option 1, with **directed harvest at the p25. At this level the projected spawners will be above the cycle average but below the brood year.**
Option 3	This is a **more conservative** option; **harvest will begin at p25 at levels near the TAM cap. At this level the projected spawners will be above the cycle average but below the brood year.**
Note: projected escapements are **above the cycle line average at all forecast levels, but approaching brood year abundance and above the p50 for all Options.**	



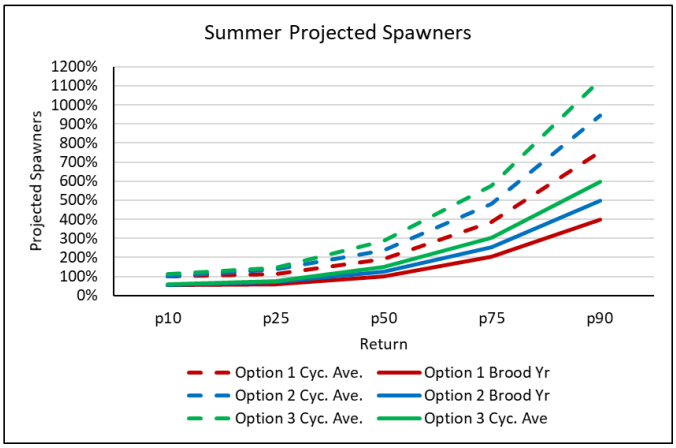


Figure: Allowable exploitation rates and projected spawners for three escapement plan options.

Table: Detailed allowable exploitation rates and projected spawners over the forecast range for three escapement plan options.

Summer	forecast (incl. misc)	p10 1,239,370	p25 2,231,200	p50 4,402,600	p75 8,904,000	p90 17,468,000
Option 1	Max. Allowable ER	**20%**	**51%**	**58%**	**58%**	**58%**
	Allowable Harvest	**247,874**	**1,142,900**	**2,535,860**	**5,128,700**	**10,061,600**
	Projected S (after MA)	932,000	1,023,000	1,754,700	3,548,800	6,962,000
	Proj. S as % BY S	53%	58%	100%	203%	398%
	Proj. S as % cycle S	101%	111%	190%	385%	755%
Option 2	Max. Allowable ER	**20%**	**40%**	**47%**	**47%**	**47%**
	Allowable Harvest	**247,874**	**897,500**	**2,069,200**	**4,184,900**	**8,210,000**
	Projected S (after MA)	932,000	1,253,700	2,193,400	4,436,000	8,702,500
	Proj. S as % BY S	53%	72%	125%	253%	497%
	Proj. S as % cycle S	101%	136%	238%	481%	943%
Option 3	Max. Allowable ER	**10%**	**36%**	**36%**	**36%**	**36%**
	Allowable Harvest	**123,937**	**812,180**	**1,602,540**	**3,241,100**	**6,358,400**
	Projected S (after MA)	1,048,500	1,333,900	2,632,100	5,323,100	10,443,000
	Proj. S as % BY S	60%	76%	150%	304%	597%
	Proj. S as % cycle S	114%	145%	285%	577%	1132%

Incidental Harvest (LAER)
Directed Harvest

Lates

Option	LAER	Tam Cap	Lower Fishery Ref. Point	Upper fishery Ref. Point
1	20%-30%	60%	1,100,000	2,750,000
2	20%	50%	1,100,000	2,200,000
3	10%	40%	1,100,000	1,833,000

LAER	Three LAER Options considered (20%-30%, 20%, and 10%). Option 1 is similar to the 2018 brood year, with high flexibility available for incidental harvest. Option 2 has a slightly lower LAER limit with flexibility available for incidental harvest. Option 3 is the most conservative given recent ~~recent~~ low returns. **Cultus is not expected to meet recovery objectives.**
TAM CAP	Three Options (60%, 50%, and 40%). **TAM cap does not come into play** until the p50 for all Options.
MA	**Late run not affected by Big Bar; MA will not change in response to Big Bar impacts.** The MA is likely to have management implications under all Options.
REF POINT	Option 2 and 3 have lower upper fishery reference points compared Option 1, with Option 3 having the lowest.
Option 1	**Directed harvest expected at the p50 level.** Option 1 will provide an amount of **additional flexibility for incidental harvest** over Options 2 and 3 (LAER). Projected spawners will rebuild compared to the brood year and cycle line average above the p75.

Option 2	**Directed harvest expected at/above the p50 level**. Option 2 will provide some small amount of **additional flexibility for incidental harvest** over Option 3 (LAER). Projected spawners will rebuild compared to the brood year and cycle line average above the p75.
Option 3	**Directed harvest expected above the p25 level.** Projected spawners will rebuild compared to the brood year above the p50 and above the cycle line at the p75.
Note: Above the p75 forecast the aggregate projected spawners is expected to rebuild over the brood year and the cycle average. Many stocks are projected to return below cycle but above the brood year at the p50. **Late run Sockeye fisheries may be constrained by Cultus Lake Sockeye recovery objective.**	

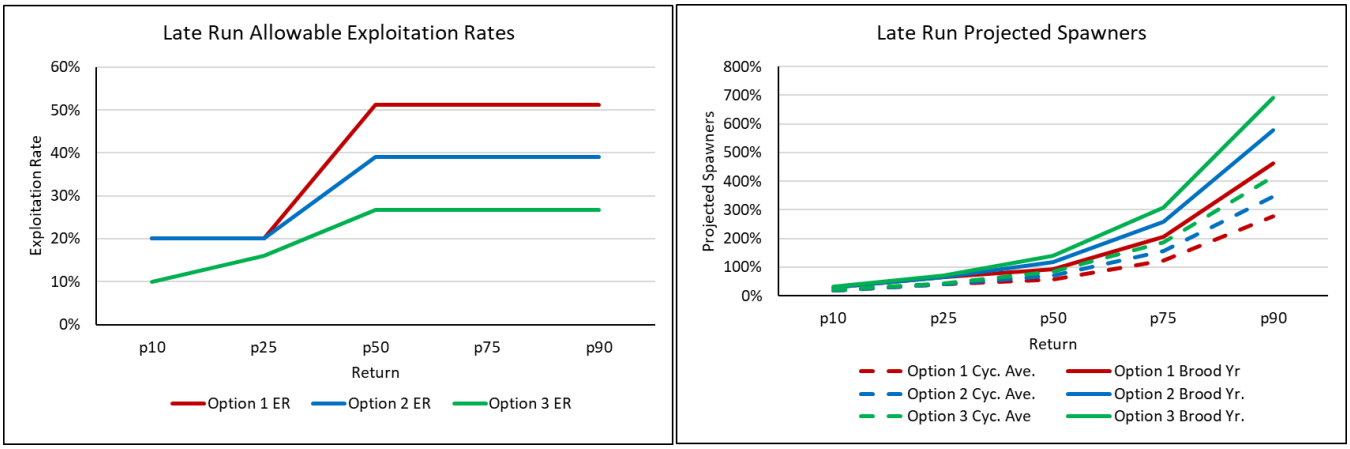


Figure: Allowable exploitation rates and projected spawners for three escapement plan options.

Table: Detailed allowable exploitation rates and projected spawners over the forecast range for three escapement plan options.

Lates	forecast (incl. misc)	p10 711,400	p25 1,603,600	p50 3,688,000	p75 8,160,000	p90 18,285,000
Option 1	Max. Allowable ER	**20%**	**20%**	**51%**	**51%**	**51%**
	Allowable Harvest	**142,280**	**320,720**	**1,888,300**	**4,177,900**	**9,361,900**
	Projected S (after MA)	466,700	1,052,000	1,475,800	3,265,300	7,316,900
	Proj. S as % BY S	29%	66%	93%	206%	462%
	Proj. S as % cycle S	18%	40%	56%	124%	278%
Option 2	Max. Allowable ER	**20%**	**20%**	**39%**	**39%**	**39%**
	Allowable Harvest	**142,280**	**320,720**	**1,438,300**	**3,182,400**	**7,131,100**
	Projected S (after MA)	466,700	1,052,000	1,844,800	4,081,600	9,146,200
	Proj. S as % BY S	29%	66%	116%	258%	577%
	Proj. S as % cycle S	18%	40%	70%	155%	347%
Option 3	Max. Allowable ER	**10%**	**16%**	**27%**	**27%**	**27%**
	Allowable Harvest	**71,140**	**255,700**	**988,400**	**2,186,900**	**4,900,400**
	Projected S (after MA)	525,000	1,105,300	2,213,700	4,897,900	10,975,400
	Proj. S as % BY S	33%	70%	140%	309%	693%
	Proj. S as % cycle S	20%	42%	84%	186%	417%

Incidental Harvest (LAER)
Directed Harvest

Summary:

Table: the difference between harvest and projected escapement between the two (draft) Options over the forecast range.

Option 1					
Max Allowable Harvest Rate	20%	36%	52%	52%	52%
Allowable Harvest (TF, US, CDN)	470,854	1,689,520	5,097,860	10,650,700	21,875,400
Total projected spawners	1,629,200	2,480,800	3,912,600	8,160,500	16,662,400
Option 2					
Max Allowable Harvest Rate	20%	31%	40%	40%	41%
Allowable Harvest (TF, US, CDN)	470,854	1,434,720	3,952,300	8,253,300	16,931,400
Total projected spawners	1,629,200	2,718,000	4,878,300	10,180,100	20,820,700
Option 3					
Max Allowable Harvest Rate	10%	25%	29%	29%	29%
Allowable Harvest (TF, US, CDN)	237,377	1,173,480	2,806,740	5,856,000	12,024,700
Total projected spawners	1,830,500	2,928,000	5,843,900	12,199,500	24,959,300

Historical Reference Points TAM and LAER:

Management Unit Fishery Reference Points	Early Stuart		Early Summer[a]		Summer[a]		Late[a b]		*Cultus Sockeye*[b]
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Exploitation rate limit
2011	108,000	270,000	120,000	300,000	520,000	1,300,000	400,000	1,000,000	20%[c]
2012	52,000	130,000	100,000	250,000	640,000	1,600,000	300,000	750,000	20%[c]
2013	108,000	270,000	100,000	250,000	1,250,000	3,125,000	300,000	750,000	20%[c]
2014	108,000	270,000	180,000	514,000	1,020,000	2,914,000	1,100,000	3,143,000	20%[c]
2015	108,000	270,000	100,000	250,000	1,000,000	2,857,000	300,000	750,000	20%[c]
2016	108,000	270,000	100,000	250,000	640,000	1,600,000	300,000	750,000	20%[c]
2017	108,000	270,000	100,000	250,000	1,250,000	3,125,000	300,000	750,000	20%[c]
2018	**108,000**	**270,000**	**180,000**	**450,000**	**1,020,000**	**2,550,000**	**1,100,000**	**2,750,000**	**20%[c]**
2019	108,000	270,000	100,000	250,000	1,000,000	2,500,000	300,000	750,000	20%[c]
2020	108,000	216,000	100,000	200,000	640,000	1,280,000	300,000	600,000	10%
2021	108,000	216,000	100,000	200,000	1,250,000	2,500,000	300,000	600,000	10%
2022 (1)	**108,000**	**270,000**	**180,000**	**450,000**	**1,020,000**	**2,550,000**	**1,100,000**	**2,750,000**	**20%**
2022 (2)	**108,000**	**135,000**	**180,000**	**360,000**	**1,250,000**	**2,500,000**	**1,100,000**	**2,200,000**	**20%**
2022 (3)	**108,000**	**135,000**	**180,000**	**300,000**	**1,250,000**	**2,083,000**	**1,100,000**	**1,833,000**	**10%**

Notes:

a) For Early Summers, Summers, and Lates, the fishery refernce 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.

c) Beginning in 2010, the maximum allowable exploitation rate for Cultus sockeye was permitted to increase above 20% if conditions were expected to permit continued rebuilding of the population based on inseason information on returns of Late run sockeye and potential numbers of effective spawners.

Historical selection of LAERs and TAMs including the brood year:

	LAERs				TAMs			
MU/Year	**2018**	**2019**	**2020**	**2021**	**2018**	**2019**	**2020**	**2021**
E. Stuart	10%	10%	10%	10%	60%	60%	50%	50%
E. Summer	20%	20%	10%	10%	60%	60%	50%	50%
Summer	20%	20%	10%	10%	60%	60%	50%	50%
Lates	20-30%	20%	10-20%	10%	60%	60%	50%	50%