

**2020 PRESEASON FORECAST PACKET
FOR HOOD CANAL
SALMON RUNS'**

PRESEASON FORECAST PACKET PREPARED BY:

SKOKOMISH TRIBE

SALMON FORECASTS AGREED TO BY:

LOWER ELWHA TRIBE

PNPTC (FOR JAMESTOWN & PORT GAMBLE)

SKOKOMISH TRIBE

WDFW

FINAL 20FEB20

SUMMARY OF 2020 HOOD CANAL FORECASTS and Forecasting Methods

Species (Ref.#)	Origin	Type	Number	Mass Marked	Number Type	Model Designation
Chinook (A-1)	Mixed	Secondary	4,602		TRS	Natural
	Hatchery	Primary	67,642		TRS	Hatchery
Summer Chum (A-2)	Natural (supplemented)	Secondary	8,858		Total Recruits	
Coho (A-3)¹	Natural	Primary	46,638		Total DA2 ¹ Recruits	Natural
	Natural	Secondary	1,174		Total DA2 ¹ Recruits	Hatchery
	Hatchery	Secondary	95,079	87,829	Total DA2 ¹ Recruits	Hatchery
Fall Chum (A-4)	Natural		190,835		WA Run	Natural
	Hatchery		280,976			Hatchery

¹ See overleaf for Coho FRAM model inputs (DA2 = December Age 2; OA3 = Ocean Age 3).

NOTES: Summer Chum salmon, although classified as “secondary”, are under rehabilitation.
Forecasts for individual Hood Canal Management Units (MU) are:

Mainstem Hood Canal MU	5,190
SE Hood Canal MU	1,863
Quilcene MU	1,805

Natural Chinook salmon, although classified as “secondary”, are under rehabilitation.
Forecasts for individual Hood Canal Management Units (MU) are:

Mid Hood Canal MU	39
Skokomish MU	
(Natural)	4,245
(Hatchery)	34,133
Hoodsport MU	33,509
Miscell.	318

Coho FRAM Model Inputs:

Stock Name	DA2	nuFRAM Stock	nuFRAM OA3 = DA2/1.333	Marked nuFRAM	Marked %
Port Gamble Net Pens	12,935	ptgamh	9,701	9,675	99.73%
Port Gamble Bay Natural	532	ptgamw	399		
Area 12/12B Natural	20,786	ar12bw	15,590		
Quilcene Bay Net Pens	0	qlcnbh	0	0	1.00%
Quilcene Hatchery	52,123	qlcenh	39,092	34,046	87.09%
Area 12A Natural	642	ar12aw	481		
Hoodspport Hatchery	n/a	hoodsh	0		
Area 12C/12D Natural	23,046	ar12dw	17,285		
George Adams Hatchery	30,021	gadamh	22,516	22,151	98.38%
Skokomish River Natural	2,806	skokr	2,105		

A. Pre-season Forecasting Methods

A-1. Summer/Fall Chinook Salmon

The 2020 forecasted terminal run size of summer-run Hood Canal Chinook salmon is the product of brood 2015 fingerling lbs released from WDFW facilities in 2016, multiplied by the average of post-season estimated terminal area return rates (total terminal run / hatchery fingerling lbs released 3 yrs previous) for the last five return years (2015-2019), (Table A-1-a), except for Area 12B (see explanation below). The data series used this year was intended to estimate a terminal return to net fisheries, freshwater sport and escapements. It does not include other run components or contributions. The historical data series was recently reconciled from the 2010 through 2019 return years (2019 remains preliminary), to include this information for 2020 forecasting purposes (Tables A-1-a, A-1-b and Table A-1-c). However, for the 2020 preseason planning cycle only, the co-manager's opted to use a different methodology for the calculation of natural returns to the mid-Hood Canal catch reporting Area 12B, by applying an average based on the proportion of natural origin recruits returning to Area 12B during the years 2016-2019. The resulting terminal area run forecast is 72,244 Chinook salmon. The forecast was apportioned to 67,642 chinook expected to return to hatcheries and 4,602 fish expected to return to natural spawning areas (Table A-1-d). These estimates will be used as inputs to generate ocean recruit forecasts during pre-season simulation modeling.

Table A-1-a. Hood Canal Summer/Fall Chinook Releases at WDFW Hatcheries and Run Sizes.

Return Year (RY)	0+ Lbs. Released in RY-3	Return/Lb	Terminal Run
1984	39,232	0.42295	16,593
1985	40,098	0.50574	20,279
1986	55,499	0.39329	21,827
1987	50,811	0.51412	26,123
1988	55,967	0.50753	28,405
1989	65,510	0.38222	25,039
1990	54,674	0.23280	12,728
1991	100,366	0.18881	18,950
1992	101,102	0.02929	2,961
1993	89,517	0.05293	4,738
1994	78,335	0.04785	3,748
1995	82,895	0.11068	9,175
1996	73,472	0.11065	8,130
1997	32,571	0.23963	7,805
1998	58,652	0.27658	16,222
1999	89,149	0.33894	30,216
2000	87,306	0.23917	20,881
2001	101,591	0.29913	30,389
2002	89,837	0.38332	34,436
2003	106,363	0.36476	38,797
2004	95,282	0.38720	36,893
2005	92,989	0.63831	59,356
2006	76,769	0.61204	46,986
2007	89,952	0.43716	39,323
2008	95,368	0.42885	40,899
2009	88,634	0.49692	44,044
2010	90,491	0.48344	43,747
2011	89,269	0.78651	70,211
2012	89,877	1.08488	97,506
2013	90,075	0.85407	76,930
2014	86,661	0.31241	27,074
2015	89,017	0.40406	35,968
2016	85,353	0.77516	66,162
2017	86,209	1.21818	105,018
2018	82,296	0.89016	73,257
2019*	90,854	0.69919	63,524
Average 2015-2019		0.79735	
2020 Forecast (Original Methodology)			72,442
2020 Alternate Terminal Run Forecast			72,244

(*) 2019 return data are preliminary and subject to revision, following reconciliation of records.

Table A-1-b. Hood Canal Summer/Fall Chinook Terminal Runs

Year	12A	12/12B	12C	12D	Skokomish	G.A. Hatchery	Hoodspport Hatchery	Total
1984	0	758	0	440	5,302	5,537	4,183	16,220
1985	0	1,908	0	1,040	8,297	5,739	3,044	20,028
1986	0	21	0	169	8,690	10,628	2,221	21,729
1987	0	112	0	64	8,064	12,743	4,311	25,294
1988	0	150	0	79	7,078	13,086	6,888	27,281
1989	0	129	0	158	6,133	13,023	5,175	24,618
1990	0	47	0	49	2,484	8,454	1,577	12,611
1991	0	88	0	73	5,461	9,746	3,514	18,882
1992	0	96	0	20	1,373	490	965	2,944
1993	29	143	0	46	1,385	883	2,242	4,728
1994	4	384	1	30	809	609	1,889	3,726
1995	7	103	2	491	1,398	5,196	1,978	9,175
1996	8	24	1	1	995	3,100	4,001	8,130
1997	27	6	15	7	452	1,887	5,411	7,805
1998	0	288	0	177	1,187	5,630	8,940	16,222
1999	0	876	86	249	2,123	10,332	16,550	30,216
2000	0	439	262	194	1,203	5,238	13,545	20,881
2001	0	326	605	204	3,247	14,965	11,042	30,389
2002	0	95	38	114	2,273	14,439	17,477	34,436
2003	0	194	93	107	1,928	17,175	19,300	38,797
2004	0	129	1,094	95	3,677	18,824	13,074	36,893
2005	0	45	623	109	3,579	28,226	26,774	59,356
2006	0	30	292	34	2,537	25,930	18,163	46,986
2007	0	73	40	22	959	29,664	8,565	39,323
2008	0	275	10	26	2,416	29,172	9,000	40,899
2009	0	130	20	31	2,199	27,271	14,393	44,044
2010	0	84	32	15	2,800	30,191	10,625	43,747
2011	0	290	21	4	2,377	46,320	21,199	70,211
2012	0	431	21	32	3,193	55,161	38,667	97,506
2013	3	674	49	96	2,805	39,358	33,945	76,930
2014	0	141	1	63	1,564	13,912	11,392	27,074
2015	0	259	221	29	1,014	17,384	17,061	35,968
2016	0	292	98	84	2,100	34,538	29,052	66,162
2017	0	375	100	86	12,334	53,772	38,350	105,018
2018	0	63	536	78	3,693	35,741	33,145	73,257
2019*	2	21	76	57	4,141	22,274	36,953	63,524

*Note: Values for years prior to 1998 DO NOT include freshwater recreational catch and the 2019 run reconstruction is preliminary and subject to revision.

Table A-1-c. Proportional Distribution of Hood Canal Summer/Fall Chinook Returns

Year	12A	12B	12C	12D	Skokomish	G.Adams	Hoodsport
2015	0.00000	0.00720	0.00614	0.00080	0.02819	0.48333	0.47435
2016	0.00000	0.00441	0.00148	0.00127	0.03173	0.52202	0.43910
2017	0.00000	0.00357	0.00095	0.00082	0.11745	0.51203	0.36518
2018	0.00000	0.00086	0.00732	0.00106	0.05041	0.48789	0.45245
2019	0.00003	0.00033	0.00119	0.00090	0.06519	0.35063	0.58172
2015-19 Mean	0.00001	0.00328	0.00342	0.00097	0.05860	0.47118	0.46256

Table A-1-d. Apportionment of the Hood Canal Summer/Fall Chinook Forecast

Hood Canal Production Unit	Terminal Run Forecast	Proportion	Alternate Forecast NOR
12A	0.46	0.00001	0
12B	237	0.00328	39
12C	248	0.00342	248
12D	70	0.00097	70
Skokomish	4,245	0.05860	4,245
Natural Subtotal	4,800	0.06626	4,602
George Adams	34,133	0.47118	
Hoodsport	33,509	0.46256	
Hatchery Subtotal	67,642	0.93374	
Total*	72,442	1.0	
2020 Alternate Terminal Run Forecast	72,244		

*Note: The forecasted proportions are derived from the 2015-2019 mean distribution.

A-2. Summer Chum Salmon

A-2.1 Natural Summer Chum Runs

The 2020 Hood Canal (HC) summer chum salmon preseason forecast is based on the ocean environmental regime experienced by summer chum during their marine life stage. The forecast method presumes that the marine survival of summer chum is a primary driver of population abundance, and marine survival is either higher or lower depending on the environmental state of the ocean as measured by multi-year averages of the Pacific Decadal Oscillation (PDO), North Pacific Gyre Oscillation (NPGO), Oceanic Nino Index (ONI), and the Multivariate El Nino/Southern Oscillation Index (MEI).

The averages of these ocean indices are highly correlated with each other, therefore a single ensemble variable was developed, which attempts to best capture the underlying in-common pattern of oceanic changes being detected by these indices. This ensemble variable was used to forecast the HC summer chum population. Please note that this methodology is currently accepted by the co-managers for use during the 2020 forecasting purposes.

The 2020 total forecasted return of summer chum salmon to Hood Canal is 8,858 (Table A-2-a). The forecast was further subdivided into individual management unit (MU) forecasts, based on recent trends in relative proportions. The forecasted Hood Canal management unit returns are 5,190 summer chum to the Mainstem Hood Canal MU, 1,805 summer chum to the Quilcene/Dabob Bays MU, and 1,863 summer chum to the SE Hood Canal MU.

The Summer Chum Salmon Conservation Initiative (SCSCI) defines interim Critical and Recovery abundance thresholds for each MU. The interim abundance thresholds are 1,260 (Critical) and 4,570 (Recovery) for the Quilcene/Dabob MU, 2,980 (Critical) and 15,740 (Recovery) for the Mainstem Hood Canal MU, and 340 (Critical) and 550 (Recovery) for the SE Hood Canal MU.

The 2020 forecasted returns of summer chum exceed the interim Critical threshold for each Hood Canal Management Unit and exceeds the interim Recovery threshold for the SE Hood Canal MU.

Table A-2-a. Hood Canal Summer Chum Salmon Natural and Supplementation Origin Recruits.

Year	Mainstem Hood Canal	Quilcene / Dabob	SE Hood Canal
2020 Forecast	5,190	1,805	1,863
2020 Total Hood Canal Forecast			8,858

The Co-managers have agreed to monitor the incidental harvest of summer chum in all scheduled fisheries and to monitor the in-season abundance of summer chum in the Quilcene / Dabob Bays MU. The Co-managers agree that no gillnet fisheries will occur in 2020 until spawner escapement exceeds 1,500 summer chum in the Big and Little Quilcene rivers.

The Co-managers will conduct annual post-season abundance assessments comparing the forecasts to actual returns for each MU. All of the above actions are consistent with the requirements and provisions of the SCSCI.

A-3. Coho Salmon

A-3.1 Coho Salmon Natural Runs

The forecasted recruitment of 2020 Hood Canal natural coho salmon runs was based on a linear regression model that related the return of tagged natural jack coho at Big Beef Creek (BBC) to Hood Canal December Age 2 (DA2) recruits in the subsequent run year. This model used recruit data from brood years 1983-1998 and 2002-2015 (Table A-3-a). Recruit data from brood years 1999-2001 were excluded because of their unusually high recruit per tagged jack ratio, which is not expected to occur this year. The final form of the regression is shown below:

$$\text{Hood Canal Recruitment} = 37615.85 + (334.401 * (\text{BBC Tagged Jacks}))$$

Relevant statistics of the model used to derive the 2020 forecast are shown below.

Using Brood Years 1983-1998, 2002-2015		Scaled by Jackknife MPE -22.5
Multiple R	0.71226	NA
R ²	0.50732	NA
Adj. R ²	0.48972	NA
Std Error of Estimate	38932.59	NA
N	30	NA
Intercept	37615.850	NA
Slope	334.401	NA
2019 Jacks	72	NA
2020 Forecast	61,693	47,812

For 2020 as was done in 2016-2019, the co-managers have agreed to apply a bias correction to the current accepted methodology described above) for forecasting natural coho in Hood Canal. The co-managers felt that this was a conservative approach in order to address concerns of possible poor ocean survival, accounting for and encompasses the same range of error in the regression parameters that would adjust for the known tendency of the BBC jack model to overestimate the recruitment of Hood Canal natural DA2's.

This bias correction factor was calculated by applying the Mean Percent Error (MPE) to the 2020 primary DA2 forecast, as calculated through the Jackknife analysis. The percent error in the MPE, in this case, is an indication of the overestimation of the regression. The subsequent application of the MPE value -22.5 reduces the forecast on the primary DA2 from 61,693 to 47,812. The forecasted recruits were subsequently apportioned to primary and secondary units on the basis of the distribution of their parent brood escapement.

The total adjusted forecast of 47,812 natural DA2 recruits was thus apportioned into 46,638 primary and 1,174 from secondary units, on the basis of their parent brood spawner distribution (Table A-3-b).

Table A-3-a. 2020 Hood Canal Natural Coho Forecast Data

Brood Year	Big Beef Creek Total Smolts	Big Beef Total Natural Jacks	Big Beef Tagged Natural Jacks	Hood Canal Total Dec Age-2 Recruits
1975	35,025			
1976	17,619		36	
1977	45,634		452	
1978	20,715		265	
1979	41,054		398	
1980	25,225			
1981	25,333		210	
1982	36,636		554	
1983	26,062	427	346	211,127
1984	23,994	445	350	232,860
1985	11,510	201	121	40,236
1986	26,534	314	208	117,460
1987	17,594	336	234	118,316
1988	<i>19,739</i>	173	122	<i>81,147</i>
1989	<i>23,646</i>	167	144	<i>66,306</i>
1990	<i>18,677</i>	273	202	<i>67,729</i>
1991	<i>13,071</i>	206	149	<i>140,612</i>
1992	<i>18,431</i>	188	157	<i>95,144</i>
1993	<i>16,574</i>	224	185	<i>73,734</i>
1994	<i>25,820</i>	410	298	<i>149,823</i>
1995	<i>40,828</i>	610	510	<i>180,517</i>
1996	<i>22,222</i>	60	45	<i>23,437</i>
1997	<i>20,967</i>	96	85	<i>55,909</i>
1998	<i>47,088</i>	189	179	<i>165,500</i>
1999	<i>21,803</i>	120	111	<i>107,024</i>
2000	<i>24,352</i>	80	70	<i>268,753</i>
2001	<i>36,060</i>	339	254	<i>298,347</i>
2002	25,060	294	235	76,798
2003	32,949	61	33	57,206
2004	38,579	161	86	111,437
2005	29,911	47	39	39,674
2006	27,416	111	95	96,089
2007	45,399	32	26	18,994
2008	24,396	197	177	102,243
2009	51,932	212	178	154,318
2010	18,732	90	70	53,757
2011	24,028	124	84	82,550
2012	56,389	172	127	56,214
2013	8,115	91	69	45,971
2014	23,912	511	408	90,075
2015	23,912	218	171	41,886
2016	21,916	131	105	
2017	27,954	83	72	

*Data italicized denotes methodology currently under review and agreed to for forecasting purposes only.

Table A-3-b. Apportionment of the 2020 Hood Canal Natural Coho Forecast

Area	Escapement Capacity	Escapement BY 2017	Management Unit Type	Proportion of Brood Escapement	December Age-2 Recruits	Scaled by Jack-knife MPE -22.5
12 / 12B	28.88%	10,007	Primary	43.47%	26,821	20,786
12C / 12D	31.66%	11,095	Primary	48.20%	29,737	23,046
Skokomish	29.01%	1,351	Primary	5.87%	3,621	2,806
9A	1.25%	256	Secondary	1.11%	686	532
12A	9.20%	309	Secondary	1.34%	828	642
Primary Subtotal	89.55%	22,454		97.55%	60,178	46,638
Secondary Subtotal	10.45%	565		2.45%	1,514	1,174
Grand Total	100.00%	23,018		100.00%	61,693	47,812

**Table A-3-c. Escapement of Coho Salmon to
Primary Natural Spawning Areas of Hood Canal**

Year	North (12-12B)	South (12C-12D)	Skokomish	Total
1986	17,865	19,679	3,432	40,976
1987	7,286	8,026	3,510	18,822
1988	4,523	4,983	1,948	11,454
1989	6,488	7,148	934	14,570
1990	2,518	2,774	1,281	6,573
1991	5,118	5,638	1,541	12,297
1992	8,026	8,842	2,179	19,047
1993	9,800	10,795	1,327	21,922
1994	20,847	22,965	12,128	55,940
1995	16,340	18,000	5,560	39,900
1996	18,428	20,300	4,008	42,736
1997	37,016	40,777	17,568	95,361
1998	40,323	44,420	14,957	99,700
1999	6,854	7,550	1,847	16,251
2000	8,724	9,610	8,288	26,622
2001	35,134	38,703	20,601	94,438
2002	26,170	28,829	13,647	68,646
2003	60,546	66,697	44,757	172,000
2004	39,439	43,445	62,995	145,879
2005	14,854	16,363	6,286	37,503
2006	5,554	6,118	1,597	13,269
2007	19,017	20,949	6,381	46,347
2008	5,082	5,598	836	11,516
2009	12,330	13,583	1,048	26,961
2010	1,906	2,099	192	4,197
2011	9,106	10,030	5,252	24,388
2012	22,400	24,673	4,709	51,782
2013	6,779	7,467	1,798	16,044
2014	8,319	9,163	4,647	22,129
2015	12,252	13,495	590	26,337
2016	6,587	7,255	5,235	19,078
2017	10,007	11,095	1,351	22,520
2018	3,560	3,921	484	7,965

A-3.2 Coho Salmon Hatchery Runs

The 2020 forecast utilized survival rates for two complete brood cycles, or six brood years (Table A-3-d). Historic marine survival rates were estimated from CWT-based cohort reconstruction of December Age-2 recruits, as were those of natural coho. Because there are several enhancement facilities in Hood Canal, and tag data were not available for all facilities for all years, marine survival rates were estimated from reconstructed cohorts, using the assumption that untagged releases contributed to preterminal fisheries in a way that maintained the same ratio to tagged releases, as estimated by RRTERM to have entered the Hood Canal terminal area (Table A-3-d).

The 2020 forecast of 95,079 hatchery reared December Age-2 coho recruits (Table A-3-d) was predicted from the brood year 2017 smolt releases multiplied by the average estimated marine survival rate for smolts from the six most recent available brood years for all facilities (Table A-3-d). The coho pre-smolts destined for the Quilcene Bay Net Pens during 2017-2019 (BY2015- BY2017) did not take place due to harmful algal blooms and net pen damage, these fish were held and reared at QNFH. Also, in the winter of 2012-2013 a storm damaged the Quilcene Bay Net Pens, as a result BY12 fish destined for the net pens were held and released on station at the Quilcene National Fish Hatchery.

Table A-3-d. Hood Canal Hatchery and Net Pen Smolt to Dec-2 Recruit Survival

Brood Year	George Adams Hatchery			Port Gamble Net Pens			Quilcene NFH			Quilcene Bay Net Pens		
	Smolts	Recruits	R/Sm	Smolts	Recruits	R/Sm	Smolts	Recruits	R/Sm	Smolts	Recruits	R/Sm
1979	1,406,424			682,900			502,189					
1980	322,580			454,000			498,166					
1981	351,474			400,000			352,298					
1982	364,000			394,000			271,035					
1983	310,100	106,593	0.34374	586,400	89,105	0.15195	223,128					
1984	312,800	52,163	0.16676	394,400	73,890	0.18735	542,480			247,221	40,095	0.16218
1985	355,400	20,960	0.05898	351,900	9,450	0.02685	617,231			85,575	4,363	<i>0.05098</i>
1986	337,700	32,908	0.09745	429,141	29,183	0.06800	574,171	<i>98,188</i>	<i>0.17101</i>	193,522	<i>16,075</i>	<i>0.08307</i>
1987	298,000	28,068	0.09419	407,600	157,116	0.38547	753,390	75,121	0.09971	146,000	<i>30,269</i>	0.20732
1988	310,700	14,698	0.04731	383,629	74,033	0.19298	491,303	64,066	0.13040	311,327	21,484	0.06901
1989	300,300	7,106	0.02366	298,944	53,439	0.17876	352,556	9,874	0.02801	266,193	7,834	0.02943
1990	307,300	7,894	0.02569	403,600	32,220	0.07983	501,254	27,662	0.05519	353,263	18,203	0.05153
1991	304,197	20,054	0.06592	383,419	63,120	0.16462	397,701	49,061	0.12336	337,800	<i>24,903</i>	<i>0.07372</i>
1992	301,019	15,688	0.05212	361,553	13,281	0.03673	400,700	34,709	0.08662	287,187	<i>8,379</i>	<i>0.02918</i>
1993	303,054	31,320	0.10335	414,844	4,672	0.01126	425,334	29,577	0.06954	216,737	1,864	0.00860
1994	396,084	17,542	0.04429	378,686	8,741	0.02308	625,700	40,118	0.06412	0		
1995	434,140	6,963	0.01604	342,828	8,450	0.02465	425,971	17,650	0.04143	220,000	5,756	0.02616
1996	527,317	11,878	0.02253	441,656	17,564	0.03977	452,203	9,322	0.02061	225,269	3,421	0.01234
1997	534,554	22,621	0.04232	420,482	3,830	0.00911	437,222	22,091	0.05053	189,951	10,872	0.05724
1998	502,266	38,971	0.07759	391,765	7,196	0.01837	368,399	23,966	0.06505	208,000	9,780	0.04702
1999	493,992	46,008	0.09314	432,847	4,931	0.01139	428,995	33,187	0.07736	0		
2000	587,937	36,351	0.06183	432,161	6,521	0.01509	411,674	27,053	0.06571	210,627	12,982	0.06164
2001	336,886	44,572	0.13231	409,221	4,803	0.01174	388,212	42,242	0.10881	90,000	2,272	0.02524
2002	501,031	55,380	0.11053	423,746	16,270	0.03840	404,582	51,373	0.12698	200,835	15,035	0.07486
2003	309,179	28,359	0.09172	437,306	14,502	0.03316	361,891	<i>25,250</i>	<i>0.06977</i>	179,711	<i>8,165</i>	<i>0.04543</i>
2004	290,570	<i>20,739</i>	<i>0.09056</i>	540,000	<i>13,871</i>	<i>0.02569</i>	488,080	<i>41,686</i>	<i>0.08541</i>	215,731	<i>2,817</i>	<i>0.01306</i>
2005	245,608	<i>26,842</i>	<i>0.10929</i>	247,500	<i>5,081</i>	<i>0.02053</i>	273,099	<i>23,247</i>	<i>0.08512</i>	124,813	<i>8,331</i>	<i>0.06675</i>
2006	294,151	31,150	0.10590	415,000	16,421	0.03957	358,131	57,903	0.16168	193,808	<i>4,945</i>	<i>0.02551</i>
2007	296,474	23,275	0.07851	412,208	4,929	0.01196	357,967	32,815	0.09167	162,381	3,384	<i>0.02084</i>
2008	292,529	27,729	0.09479	423,584	23,035	0.05438	441,117	68,719	0.15578	200,499	3,586	<i>0.01789</i>
2009	306,329	29,754	0.09713	223,210	28,708	0.12861	345,604	68,639	0.19861	179,587	<i>6,025</i>	<i>0.03355</i>
2010	239,228	43,553	0.182056	397,581	15,470	0.03891	393,654	38,934	0.09890	204,578	<i>3,204</i>	<i>0.01566</i>
2011	289,734	15,845	0.05469	397,442	5,667	0.01426	426,115	10,279	0.02412	199,195	<i>2,012</i>	<i>0.01010</i>
2012	301,569	14,428	0.04784	414,013	1,505	0.00364	627,039	21,691	0.03459	0		
2013	314,174	21,011	0.06688	394,424	30,074	0.07625	441,446	59,869	0.13562	199,552	27	<i>0.00014</i>
2014	318,458	39,156	0.12296	383,040	9,857	0.02573	443,838	47,171	<i>0.10628</i>	196,706	<i>2,022</i>	<i>0.01028</i>
2015	298,219	28,805	0.09659	322,219	1,290	<i>0.00400</i>	623,342	42,475	0.06814	0		
2016	315,454			383,148			668,729			0		
2017	285,089			476,744			603,346			0		
Average (2010-15)			0.09517	0.02713			0.07794			0.00904		
2019 Forecast:		30,021		12,935			52,123			0		

Note: Values in italics indicate values agreed to for pre-season forecasting only. Values in boldface were excluded from the analysis

A-4. Fall Chum Salmon

The 2020 forecast of the Hood Canal fall chum salmon run was estimated separately for natural production units, off-station augmented production in natural rearing areas, and individual hatchery production units. The following descriptions of methods and source data are intended to provide documentation of the methods and approaches used.

A-4.1.1 Natural Run Forecasts (Tribal)

The 2020 return of Hood Canal natural fall-timed chum salmon of each returning age group (3, 4, and 5 year olds) was forecast using the available mean return-per-spawner-at-age rates for the brood years 2006-13. The mean recruit-per-spawner return rates were 1.42755, 1.87771, and .80715, for 3, 4, and 5 year-olds respectively (Table A-4-a). These adjusted rates of return were multiplied with the 2017, 2016, and 2015 brood escapements (58,122; 59,905, and 63,236; respectively) to estimate the total 2020 forecast of 246,498 Hood Canal natural fall chum returning to Puget Sound, before the addition of anticipated returns from in-stream supplementation projects. The Hood Canal natural run forecast was further apportioned to individual production units (Tables A-4-d and A-4-e), on the basis of relative proportion attributable to each production unit's spawners (brood year escapements), for each returning age group.

The grand total return of 246,693 to each natural production unit was estimated by adding the estimated 195 return from in-stream enhancement and supplementation efforts. The forecast of this latter component is described under "Hatchery runs" (Section A-4.2).

A-4.1.2 Natural Run Forecasts (WDFW)

Natural fall chum forecasts were calculated using the Puget Sound-wide recruit/spawner (R/S) method, with the regional (Hood Canal) forecast, and terminal forecasts within Hood Canal, allocated according to parent escapement and terminal forecasts allocated by escapement goal.

The WDFW natural fall chum salmon forecast was estimated for Puget Sound using the recruit/spawner regression method. Escapement of parent broods of 2015, 2016, and 2017 and age composition were used to estimate 2020 returns of Age 3, Age 4, and Age 5 natural fall chum. The 2020 forecast of natural fall chum to Puget Sound is 35,241 Age 3, 419,043 Age 4, and 167,541 Age 5 fish for a total run size of 621,825 natural fall chum (Table A-4b).

The apportionment of 621,825 Puget Sound natural fall chum to Hood Canal was determined by applying the Hood Canal parent escapement proportion to each age class. The Hood Canal forecast by age is 41,595 Age 3, 84,927 Age 4, and 8,261 Age 5 fish for a total Hood Canal forecast of 134,782 natural fall chum (Table A-4c).

The Hood Canal natural run forecast was further apportioned to individual production units (Tables A-4-d and A-4-e), on the basis of relative proportion attributable to each production unit's spawners (brood year escapements), for each returning age group. The forecasted return of each age group to Puget Sound was apportioned to Hood Canal using the proportions of the parent escapement of each brood (Table A-4-f).

A-4.1.3 Joint 2020 Hood Canal Natural Fall Chum Salmon Forecast

For preliminary preseason planning, we agreed to use a forecast of 190,835 natural fall chum, the average of the Tribal and WDFW results. The total forecast was then apportioned to individual production units on the basis of the age specific brood escapement distribution (Table A-4-g).

Table A-4-a. Hood Canal Natural Fall Chum Returns-at-Age per Spawner

Brood Year	Brood Escape	3's	4's	5's	Total
1968	47,802	0.58849	1.63839	0.09531	2.32219
1969	30,070	0.55346	1.14771	0.09264	1.79381
1970	41,698	0.55975	1.58101	0.01314	2.15390
1971	41,139	0.58683	0.41252	0.33535	1.33470
1972	41,602	0.26600	1.27781	0.00000	1.54381
1973	27,870	1.77432	2.60438	0.07441	4.45311
1974	52,224	0.81057	4.42759	0.07083	5.30899
1975	16,266	7.39080	0.05030	0.00000	7.44110
1976	48,078	0.53107	0.20951	0.03284	0.77342
1977	26,074	2.63782	2.75187	0.13638	5.52607
1978	79,156	0.00000	0.60521	0.05628	0.66149
1979	14,323	1.90574	2.12510	0.00000	4.03084
1980	21,672	0.51985	2.14281	0.23020	2.89286
1981	14,311	3.49591	12.57517	0.62961	16.70069
1982	12,134	2.88354	7.08386	0.94399	10.91139
1983	7,121	9.05912	24.36310	1.13297	34.55519
1984	22,751	1.29322	5.88289	0.37653	7.55264
1985	50,910	0.47585	2.67119	0.33941	3.48645
1986	29,549	0.00000	3.15515	0.44356	3.59871
1987	24,481	0.00000	3.54568	1.04655	4.59223
1988	30,704	1.51411	8.58958	1.42974	11.53343
1989	24,873	0.11184	6.46342	5.71902	12.29428
1990	20,811	1.48264	8.26697	0.69326	10.44287
1991	44,745	0.59753	1.58643	0.12973	2.31369
1992	96,382	2.21238	4.21549	0.20013	6.62800
1993	67,770	1.07479	1.38931	0.10130	2.56540
1994	151,821	0.30984	0.88726	0.03062	1.22772
1995	119,344	0.58343	0.40133	0.01270	0.99746
1996	251,803	0.01977	0.20395	0.00000	0.22372
1997	53,492	0.52960	2.05414	0.40225	2.98599
1998	101,631	1.54720	2.17750	0.01927	3.74398
1999	33,924	2.88881	8.36176	1.46228	12.71284
2000	37,131	2.95919	12.40288	0.25103	15.61310
2001	103,713	1.92253	0.71772	0.08583	2.72608
2002	173,037	0.36398	1.62283	0.09993	2.08674
2003	148,512	0.21273	1.32788	0.21269	1.75329
2004	168,126	0.15014	0.91883	0.05347	1.12244
2005	47,598	1.76695	1.02192	0.00000	2.78887
2006	97,104	0.17061	0.44776	0.05885	0.67722
2007	78,218	0.70884	2.44524	0.67400	3.82808
2008	38,512	0.00000	1.52348	0.25191	1.77540
2009	13,961	6.79236	19.92271	2.19560	28.91066
2010	17,223	0.00000	12.36997	2.96419	15.33417
2011	48,446	0.40060	3.12638	0.24802	3.77501
2012	38,102	1.57339	1.76076	0.06403	3.39818
2013	61,190	1.77464	2.83265	0.00000	4.60729
2014	49,675	0.99576	1.57508		
2015	63,236				
2016	59,905				
2017	58,122				
Mean: Brood Years 1968-13 (exclusive of outliers, in bold)					
All Odd Years	48,788	1.73570	2.35185	0.65351	4.89082
All Even Years	69,145	0.86465	2.73543	0.36433	4.37175
Years 2006-13*	49,094	1.42755	1.87771	0.80715	2.97663
		3's	4's	5's	
2020 Tribal Forecast*		82,973	112,484	51,041	246,498

Table A-4-b. 2020 WDFW Puget Sound Natural Fall Chum Salmon Forecast

Parent Brood	Age	Parent Escapement	Average R/S*	Regression R/S	Estimated R/S (all ages)	Mean Age Composition ¹	Natural Forecast
2015	5	269,777	2.38	1.94	522,674	0.0670000	35,241
2016	4	295,579	3.00	1.88	556,015	0.7540000	419,043
2017	3	234,115	2.38	2.03	474,836	0.3530000	167,541
						Total	621,825

Note*: Uses odd or even brood year average, depending on brood year

Table A-4-c. 2020 WDFW Hood Canal Natural Fall Chum Salmon Forecasts

	Puget Sound Forecast	HC Parent Escapement Proportion	HC Forecast by Age
Age 3 (2017 Brood) Forecast	167,541	0.2482646	41,595
Age 4 (2016 Brood) Forecast	419,043	0.2026700	84,927
Age 5 (2015 Brood) Forecast	35,241	0.2344030	8,261
Total WDFW Forecast	621,825		134,783

Table A-4-d. 2020 Hood Canal Natural Fall Chum Salmon Parent Brood Escapement Distribution

Area	2015	2016	2017
9A	0.00%	0.00%	0.00%
12	3.87%	4.84%	4.96%
12A	4.41%	2.94%	0.89%
12B	28.57%	37.43%	16.82%
12C	21.49%	27.01%	37.77%
82G	24.95%	15.59%	8.87%
12D	16.71%	12.18%	30.69%

Table A-4-e. Apportionment of the 2020 Tribal Hood Canal Natural Fall Chum Salmon Forecast

Area	3's	4's	5's	Total
9A	0	0	0	0
12	4,117	5,444	1,977	11,538
12A	742	3,312	2,249	6,303
12B	13,956	42,108	14,583	70,646
12C	31,335	30,383	10,971	72,689
82G	7,360	17,532	12,732	37,624
12D	25,462	13,705	8,529	47,697
Total	82,973	112,484	51,041	246,498

Table A-4-f. Apportionment of the 2020 WDFW Hood Canal Natural Fall Chum Salmon Forecast

Area	3's	4's	5's	Total
9A	0	0	0	0
12	2,064	4,110	320	6,494
12A	372	2,501	364	3,237
12B	6,996	31,792	2,360	41,148
12C	15,708	22,940	1,776	40,424
82G	3,690	13,237	2,061	18,987
12D	12,764	10,348	1,380	24,492
Total	41,595	84,927	8,261	134,783

Table A-4-g. Apportionment of the 2020 Joint Hood Canal Natural Fall Chum Salmon Forecast

Area	Tribal Forecast	WDFW Forecast	Joint Forecast
9A	0	0	0
12	11,538	6,494	9,016
12A	6,303	3,237	4,770
12B	70,646	41,148	55,897
12C	72,689	40,424	56,557
82G (Skokomish)	37,624	18,987	28,306
12D	47,697	24,492	36,095
12D Off-Station	195		195
Total	246,693	134,783	190,835

A-4.2 Hatchery Runs (Tribal)

The 2020 hatchery-origin returns of fall-timed chum salmon were generally forecasted using average returns-at-age-per-pound of fingerlings released, to Puget Sound net fisheries and escapements, using historical run sizes from the fall chum database, historical releases from each facility, and applying them to releases from brood years 2015, 2016, and 2017. In estimating the returns, the following information was used for each facility. The problems with recent years' terminal area run reconstruction, may have introduced significant positive bias to the estimates of Skokomish River hatchery runs, introducing a negative bias to Hoodsport hatchery runs. Off-station production, resulting from instream augmentation programs was estimated separately and was then added to the forecasted return to natural spawning areas.

The effects of changes to the Hood Canal hatchery chum programs will continue to be seen in 2020, including Area 9A Little Boston Hatchery production increases coupled with the return of Area 12A production unit to natural production, since the last release from the Quilcene National Fish Hatchery occurred with the 2002 brood.

A-4.2.1 Forecasts of Instream Augmentation (Tribal)

Egg box and fry-augmented runs to streams of areas 12, 12B, 12C, 12D, 82G: The Tribal forecast applied one half of the mean return rates of age 3, age 4, and age 5 fish per pound planted at Hoodsport Hatchery (2006-2013 broods) (Tables A-4-h and A-4-i). The resulting forecast for 2020 is 194 fish. This forecast was apportioned to each area, according to the volume released from each brood year and the resulting estimates were added to the corresponding natural run components.

Table A-4-h. Tribal Hood Canal Fall Chum 2020, Off-Station Lbs. Planted

Area	BY 2017	BY 2016	BY 2015
	Lbs	Lbs	Lbs
9A	0.0	0.0	0.0
12	1.3	34.1	31.0
12B	0.0		
12A	0.0		
12C	0.0		
Skokomish	1.4	0.0	0.9
12D	117.6	97.2	117.7
Total	120	131	150

Table A-4-i. Apportionment of the 2020 Tribal Hood Canal Fall Chum Off-Station Forecast

Area	3's	4's	5's	Total
9A	0.00	0.00	0.00	0
12	0.60	34.00	2.00	36
12B	0.00	0.00	0.00	0
12A	0.00	0.00	0.00	0
12C	0.00	0.00	0.00	0
82G	1.00	0.00	0.00	1
12D	53.00	96.00	8.00	157
Total	54	129	10	194

A-4.2.2 Fall Chum Hatchery On-Station Forecasts (Tribal)

Hoodsport Hatchery: Mean return rate of age 3, 4, and 5 fish per pound planted at Finch Creek (2006-2013 broods) (Table A-4-j). The resulting forecast for 2020 is 69,963. Run reconstruction problems have biased this run low.

George Adams/McKernan Hatcheries: Mean return rate of age 3, age 4, and age 5 fish per pound released (1978-2013 broods) (Table A-4-k). The resulting forecast for 2020 is 206,419 (Table A-4-k).

Little Boston Hatchery: Mean return rate of age 3, age 4 and age 5 fish per pound planted at Hoodsport Hatchery (2006-2013 broods) (Table A-4-j). The resulting forecast for 2020 is based on the fingerling releases of 2,247 lbs (BY17), 2,895 lbs. (BY16), and 2,944 lbs. (BY2015), which were used to estimate the return of 3, 4, and 5-year olds respectively, for a total return of 8,124 (Table A-4-n).

Enetai Hatchery: Mean return rates of age 3, age 4 and age 5 fish per pound planted (2006-2013 broods). (Table A-4-l). The resulting forecast for 2020 is based on the fingerling releases of 6,689 lbs (BY17), 6,805 lbs. (BY16), and 7,611 lbs. (BY2015), which were used to estimate the return of 3, 4, and 5-year olds respectively, for a total return of 31,937.

The Tribal forecasts of hatchery returns are summarized in Table A-4-n and indicate a total forecast of on-station hatchery-origin fall chum of 316,444.

A-4.2.3 Fall Chum Hatchery Forecasts (WDFW)

The 2020 return of hatchery-origin fall chum was forecast by multiplying pounds released from each facility by long-term even/odd brood year specific average return rates for that facility. For example, 3-year-old returns were forecast by multiplying pounds released of 2017 brood year chum by the long-term, even-year brood Age 3 return rate for that hatchery. The age 4 and 5 returns were forecast by the same method. For off-station releases (volunteer/cooperative projects), return rates were based on rates for a corresponding hatchery, which in some instances were reduced by a factor of 4 to compensate for smaller size at release and whether the fry were fed prior to release. The resulting totals were then adjusted by 31.48% based on a performance comparison (i.e., R/S 75 Percentile regression) adjustment applied to the Puget Sound Wide wild chum forecast. A summary of the WDFW forecasts by age is shown for Hood Canal hatcheries in Table A – 4 – m. The WDFW Hood Canal hatchery fall chum forecast is 229,965 on-station and 15,543 off-station for total forecast of 245,509 returns in 2020.

A-4.2.4 Joint 2020 Hood Canal Hatchery Fall Chum Salmon Forecast

For preliminary preseason planning, we agreed to use a forecast of 280,976 hatchery fall chum, the average of the Tribal and WDFW forecasting methods' results, apportioned to individual hatchery facilities (Table A-4-o).

**Table A-4-j. Fall Chum Returns-per-Pound,
by Age at Return from Hoodspout Hatchery Releases**

Brood Year	Release Lbs.	3's	4's	5's	Total
1965	888	0.80208	2.35750	0.01558	3.17516
1966	1,771	0.92010	2.66721	0.02299	3.61030
1967	2,301	0.93776	1.15006	0.11132	2.19914
1968	4,373	0.54928	1.56195	0.19686	2.30809
1969	2,424	0.59879	2.69040	0.26275	3.55194
1970	3,036	1.45276	4.96486	0.00000	6.41762
1971	3,794	1.45488	1.48756	0.02969	2.97213
1972	4,126	0.55870	7.49948	0.82970	8.88788
1973	9,202	0.70599	3.60727	0.16357	4.47683
1974	27,368	0.89570	5.68814	0.03343	6.61727
1975	22,776	2.54895	2.78624	0.05244	5.38763
1976	24,490	0.76752	1.80998	0.04155	2.61905
1977	21,883	3.98451	2.02120	0.02757	6.03328
1978	33,256	1.00278	2.34466	0.24428	3.59172
1979	24,238	2.98678	2.89652	0.21504	6.09834
1980	44,336	0.48636	2.23768	0.04039	2.76443
1981	23,589	3.18480	4.51989	0.36118	8.06587
1982	32,058	1.69592	4.43338	0.15862	6.28792
1983	34,748	1.23151	4.91046	0.44689	6.58886
1984	60,763	1.76204	2.85909	0.09411	4.71524

Continued ...

**Table A-4-j (cont'd). Fall Chum Returns-per-Pound,
by Age at Return from Hoodspout Hatchery Releases**

1985	39,279	2.92389	5.00571	0.20595	8.13555
1986	33,036	0.53259	2.21872	0.20579	2.95710
1987	40,323	0.42814	3.70929	0.14736	4.28479
1988	36,877	3.13411	7.17034	0.29712	10.60157
1989	35,149	0.71847	1.79583	0.50845	3.02275
1990	38,422	4.27142	7.01940	0.37401	11.66483
1991	39,379	3.01183	1.98098	0.07460	5.06741
1992	33,678	2.33155	3.93700	0.12497	6.39352
1993	33,920	1.77835	4.03487	0.17676	5.98998
1994	37,075	0.73558	1.96470	0.03943	2.73971
1995	37,583	1.29662	0.93342	0.01997	2.25001
1996	25,374	0.35104	1.66305	0.05572	2.06981
1997	30,276	0.34889	2.52394	0.09089	2.96372
1998	37,534	2.62754	3.21934	0.03818	5.88506
1999	33,196	3.81337	2.85193	0.30443	6.96973
2000	34,067	0.18327	1.12001	0.06995	1.37323
2001	35,033	1.16696	0.88571	0.04609	2.09876
2002	35,574	0.48600	0.98579	0.00808	1.47987
2003	33,231	0.83763	0.63987	0.04794	1.52544
2004	31,410	0.33036	0.56328	0.01959	0.91323
2005	29,031	0.77693	1.52074	0.16253	2.46020
2006	29,958	0.08529	1.31603	0.02103	1.42236
2007	25,523	1.40372	2.16346	0.21276	3.77993
2008	28,653	0.02999	0.29356	0.01520	0.33875
2009	30,092	1.30740	1.65037	0.21783	3.17560
2010	27,262	0.15984	3.06169	0.35500	3.57653
2011	30,171	0.63369	1.12614	0.16702	1.92684
2012	31,246	1.54739	3.21615	0.07462	4.83815
2013	30,347	2.02338	2.90302	0.05383	4.98022
2014	29,497				
2015	21,140				
2016	23,707				
2017	22,693				
All Odd Years	25,637	1.63621	2.48610	0.16490	4.28720
All Even Years	28,806	1.12071	3.07565	0.11004	4.33638
All Years	27,192	1.38372	2.77485	0.13861	4.31129
All Years 65-73	3,546	0.88670	3.10959	0.10035	4.17768
All Years 74-13	32,805	1.49555	2.69954	0.14626	4.34136
All Years 06-13*	29,143	0.89883	1.96630	0.13966	3.00480
2020 Tribal Forecast*		20,397	46,614	2,952	69,963

**Table A-4-k. Fall Chum Returns-per-Pound, by Age at Return
from George Adams/McKernan Hatchery Releases**

Brood Year	Release Lbs.	3's	4's	5's	Total
1978	18,717	0.11901	0.85327	0.15188	1.12416
1979	40,273	0.36752	0.61002	0.06715	1.04469
1980	24,418	0.30902	2.10810	0.05751	2.47463
1981	12,028	3.24075	4.43634	0.36758	8.04467
1982	26,780	1.03328	3.20556	0.20036	4.43920
1983	25,917	1.25574	8.01500	0.44456	9.71530
1984	28,601	1.49188	1.18815	0.05936	2.73939
1985	24,500	0.78202	1.85405	0.20669	2.84276
1986	36,329	0.12036	1.56008	0.24038	1.92082
1987	30,566	0.10195	1.44458	0.20499	1.75152
1988	31,083	1.45527	4.69637	0.54805	6.69969
1989	32,315	0.52929	2.25103	0.20309	2.98341
1990	17,032	0.47710	5.81499	0.43246	6.72455
1991	30,024	1.45064	1.33176	0.05341	2.83581
1992	25,235	1.59492	2.86789	0.09179	4.55460
1993	27,016	1.21873	2.78823	0.32053	4.32749
1994	27,723	0.54142	3.79484	0.03621	4.37247
1995	22,624	3.11094	1.06483	0.00880	4.18457
1996	23,138	0.27842	0.47256	0.11599	0.86697
1997	27,884	0.06412	5.23332	0.21356	5.51100
1998	33,440	5.59772	3.99864	0.27753	9.87389
1999	27,365	4.78742	22.40721	2.17993	29.37456
2000	8,486	4.76506	15.87349	0.72806	21.36661
2001	31,946	3.95554	2.51829	0.00000	6.47383
2002	30,996	1.44617	4.05078	0.09009	5.58704
2003	32,631	5.01811	6.81432	0.32729	12.15972
2004	23,127	5.35825	3.32306	0.06471	8.74602
2005	22,768	5.35290	12.04153	0.75741	18.15184
2006	24,833	0.95216	3.67314	0.08015	4.70544
2007	21,035	5.61999	14.76001	0.80514	21.18514
2008	22,371	0.86000	2.69175	0.09309	3.64483
2009	22,482	13.30859	35.85918	0.97884	50.14661
2010	22,855	10.16291	9.15311	1.05806	20.37408
2011	33,674	1.20429	4.53218	0.17217	5.908632
2012	24,781	9.77925	9.03033	0.20408	19.01365
2013	25,878	6.04876	14.53482	0.23884	20.82242
2014	29,061				
2015	27,066				
2016	34,410				
2017	32,988				
Average Return Brood Years (1978-13) excluding outliers in bold.					
Odd Years	27,549	2.59463	3.29953	0.41944	6.13823
Even Years	25,671	2.12819	3.67545	0.22363	4.56491
All Years	26,610	2.36141	3.51255	0.28285	5.85919
Years 06-13*	24,739	4.07741	5.81610	0.45379	8.10269
2020 Tribal Forecast*		77,897	120,866	7,656	206,419

Table A-4-l. Fall Chum Returns-per-Pound, by Age at Return for Enetai Hatchery Releases

Brood Year	Release Lbs.	3's	4's	5's	Total
1976	3,696	0.181550	0.752140	0.000000	0.933690
1977	5,785	1.531980	3.311160		
1978	6,514	1.402970		0.011720	
1979	2,666		0.622230	0.092130	
1980	3,053	0.433280	1.818250	0.102490	2.354020
1981	4,985	2.122020	2.898710	0.101030	5.121760
1982	6,130	2.231980	2.839080	0.057190	5.128250
1983	2,727	3.662950	4.003460	0.123990	7.790400
1984	5,855	2.347900	1.469020	0.027380	3.844300
1985	5,485	2.226960	2.491880	0.031790	4.750630
1986	5,495	1.130610	1.073040	0.096000	2.299650
1987	4,455	1.078890	1.442170		
1988	4,493	1.463080		0.087040	
1989	4,191		1.679620	0.065310	
1990	3,294	3.146150	6.089970		
1991	2,936	6.393020		0.068150	
1992	2,095		3.076920	0.104680	
1993	4,297	1.779560	2.412670	0.084060	4.276290
1994	6,809	1.376180	3.039700	0.002960	4.418840
1995	3,456	4.326990	0.346790	0.006210	4.679990
1996	2,302	0.418830	0.658930	0.070130	1.147890
1997	4,068	0.208130	1.792540	0.130660	2.131330
1998	3,270	1.823320	3.930450		5.753770
1999	1,542	3.211440		0.364810	3.576250
2000	195		1.779610	1.696900	3.476510
2001	4,326	4.123380	2.116840	0.191630	6.431850
2002	7,081	1.580060	6.809960	0.056110	8.446130
2003	3,264	3.103570	2.258850	0.416000	5.778420
2004	6,613	5.501100	1.074940	0.073000	6.649040
2005	6,603	2.701510	3.153352	0.018529	5.873391
2006	6,895	0.389653	0.416988	0.029314	0.835955
2007	6,469	0.887544	3.412616	0.059682	4.359842
2008	3,951	0.051157	0.703563	0.109023	0.863743
2009	4,700	7.540882	5.648894	0.393020	13.582796
2010	5,531	2.194773	5.510529	0.402003	8.107310
2011	6,301	0.507391	1.398907	0.000000	1.906300
2012	9,637	2.959998	1.699276	0.020792	4.680070
2013	7,976	1.798581	1.467047	0.093291	3.356780
2014	9,705				
2015	7,611				
2016	6,805				
2017	6,689				
Average (Brood Years 1976-13).					
Odd Years	4,787	2.77663	2.54373	0.13419	5.40456
Even Years	5,210	1.68427	2.51426	0.16887	3.92925
All Years	4,999	2.23045	2.44706	0.15255	4.61421
Years 06-13*	6,432	2.04098	2.53223	0.13839	5.02617
2020 Tribal Forecast*		13,652	17,231	1,053	31,937

Note: Because of incomplete reconstruction, and lack of rack sampling, return rates after 2005 were not available

Table A-4-m. Summary of 2020 WDFW Hood Canal Hatchery Fall Chum Forecasts

Facility	Age 3	Age 4	Age 5	Total
Little Boston Hatchery	1,477	4,784	93	6,355
Hoodsport Hatchery	28,101	50,108	4,435	82,644
G. Adams / McKernan Hatchery	51,898	58,374	5,921	116,194
Enetai Hatchery	12,282	11,740	751	24,773
12D Streams - Augmentation	6,873	7,589	1,081	15,543
Total	100,631	132,596	12,282	245,509

Table A-4-n. Summary of 2020 Tribal Hood Canal Hatchery Fall Chum Forecasts

Facility	Age 3	Age 4	Age 5	Total
Little Boston Hatchery	2,020	5,693	411	8,124
Hoodsport Hatchery	20,397	46,614	2,952	69,963
G. Adams / McKernan Hatchery	77,897	120,866	7,656	206,419
Enetai Hatchery	13,652	17,231	1,053	31,937
Total	113,966	190,405	12,073	316,444

Table A-4-o. Apportionment of the 2020 Joint Hood Canal Hatchery Fall Chum Salmon Forecasts

Facility	Tribal Forecast	WDFW Forecast	Joint Forecast
Little Boston Hatchery	8,124	6,355	7,240
Hoodsport Hatchery	69,963	82,644	76,304
G. Adams / McKernan Hatchery	206,419	116,194	161,307
Enetai Hatchery	31,937	24,773	34,045
12D Streams - Augmentation		15,543	
Total	316,444	245,509	280,976